

Workshop Manual Audi A4 1995 ➤

5-speed manual gearbox 01A, four-wheel drive

Edition 02.2012



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List of Workshop Manual Repair Groups

Repair Group

00 - Technical data

30 - Clutch

34 - Controls, housing

35 - Gears, shafts

39 - Final drive - rear differential

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

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00 – Technical data

1 Gearbox identification

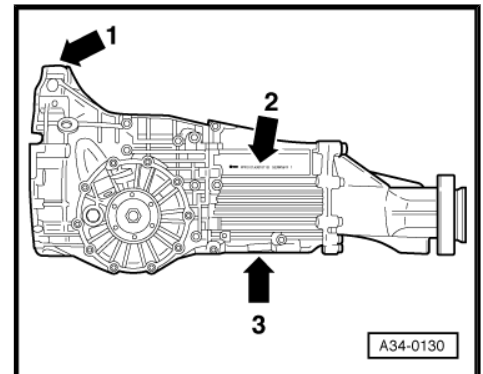
The 5-speed manual gearbox 01A (four-wheel drive) is fitted in conjunction with the 4-cylinder engine and 6-cylinder injection engine in the Audi A4 2001 ➤.

Allocation

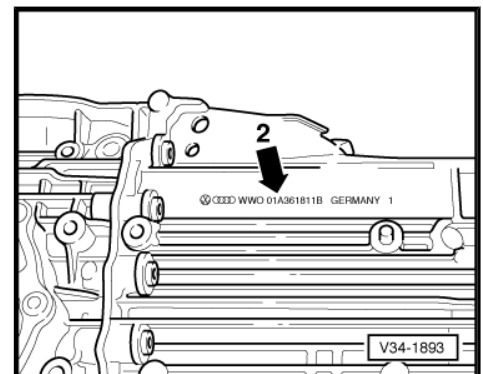
⇒ „1.1 Code letters, allocation, transmission ratios, capacities“, page 1 .

Location on gearbox

Code letters and date of manufacture -arrow 1-
Manual gearbox 01A -arrow 2-
Code letters -arrow 3-



Manual gearbox 01A -arrow 2-



Code letters and date of manufacture of gearbox -arrow 1-

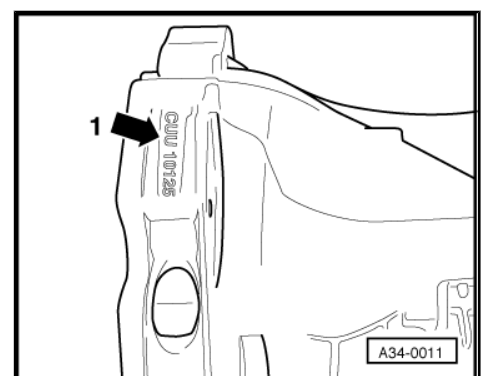
Example:	CUU	10	12	5
	Code letters	Day	Month	Year -1995- of manufacture

Additional data are manufacture-related.



Note

The gearbox code letters are also stamped on the lower part of the gearbox cover and shown on the vehicle data sticker.



1.1 Code letters, allocation, transmission ratios, capacities

The following data can be found in the ⇒ Electronic parts catalogue .

◆ Gear oil specification



◆ Correct type of clutch plate and pressure plate

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CPS ¹⁾	CPU	CTF	CXF
Manufactured	from	04.95	11.94	11.94	11.94
	to	07.96	07.96	07.96	11.94
Allocation	Model Engine	Audi A4 1995 ► 2.6 ltr. - 102 kW	Audi A4 1995 ► 1.8 ltr. - 92 kW	Audi A4 1995 ► 1.8 ltr. - 110 kW	Audi A4 1995 ► 2.8 ltr. - 128 kW
Ratio $Z_2 : Z_1 = i$	Final drive	37 : 9 = 4.111	41 : 9 = 4.556	35 : 9 = 3.889	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778	35 : 10 = 3.500
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	37 : 17 = 2.176	35 : 18 = 1.944
	3rd gear	40 : 28 = 1.429	39 : 30 = 1.300	40 : 28 = 1.429	39 : 30 = 1.300
	4th gear	35 : 34 = 1.029	33 : 35 = 0.943	35 : 34 = 1.029	33 : 35 = 0.943
	5th gear	31 : 37 = 0.838	30 : 38 = 0.789	31 : 37 = 0.838	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
Overall ratio $i_{ov.}$ in top gear		3.444	3.596	3.258	3.070
Drive shaft flange Ø		100 mm	100 mm	100 mm	100 mm
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		CKJ	CKK	CKH DAJ	CKH
¹⁾ CIS, China					

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CXW	CXZ	CYA	CZX ¹⁾
Manufactured	from	11.94	11.94	11.94	07.95
	to	07.96	11.94	07.96	07.96
Allocation	Model Engine	Audi A4 1995 ► 2.8 ltr. - 128 kW	Audi A4 1995 ► 2.6 ltr. - 110 kW	Audi A4 1995 ► 2.6 ltr. - 110 kW	Audi A4 1995 ► 1.8 ltr. - 88 kW
Ratio $Z_2 : Z_1 = i$	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	37 : 9 = 4.111	41 : 9 = 4.556
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
Overall ratio $i_{ov.}$ in top gear		3.070	3.246	3.246	3.596
Drive shaft flange Ø		100 mm	100 mm	100 mm	100 mm
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		CKH	CKJ	CKJ	CKK
¹⁾ CIS, China					

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Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DDL	DGW	DJF ¹⁾	DJJ
Manufactured	from	03.96	07.96	07.96	07.96
	to	07.96	08.98	07.97	08.98

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DDL	DGW	DJF 1)	DJJ
Allocation	Model Engine	Audi A4 1995 ▶ 2.8 ltr. - 142 kW	Audi A4 1995 ▶ 1.9 ltr. - 81 kW TDI	Audi A4 1995 ▶ 2.6 ltr. - 102 kW	Audi A4 1995 ▶ 1.8 ltr. - 110 kW 1.8 ltr. - 132 kW
Ratio $Z_2 : Z_1 = i$	Final drive	35 : 9 = 3.889	35 : 9 = 3.889	37 : 9 = 4.111	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	36 : 17 = 2.118	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	38 : 31 = 1.226	40 : 28 = 1.429	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	31 : 37 = 0.838	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	27 : 41 = 0.659	31 : 37 = 0.838	31 : 37 = 0.838
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
Overall ratio i_{ov} , in top gear		3.070	2.561	3.444	3.258
Drive shaft flange $\varnothing$		100 mm	Triple roller joint	100 mm	100 mm
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		CKH DAJ	DAJ	DAK	DAJ
1) CIS, China					

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DJP	DJR	DJS	DJV 1)
Manufactured	from to	07.96 07.97	07.96 08.98	07.96 08.98	07.96 08.98
Allocation	Model Engine	Audi A4 1995 ▶ 2.8 ltr. - 128 kW	Audi A4 1995 ▶ 2.8 ltr. - 142 kW	Audi A4 1995 ▶ 2.4 ltr. - 120 kW 2.4 ltr. - 121 kW 2.6 ltr. - 110 kW	Audi A4 1995 ▶ 1.8 ltr. - 88 kW 1.8 ltr. - 92 kW
Ratio $Z_2 : Z_1 = i$	Final drive	35 : 9 = 3.889	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
Overall ratio i_{ov} , in top gear		3.068	3.068	3.246	3.596
Drive shaft flange $\varnothing$		100 mm	100 mm	100 mm	100 mm
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		DAJ	DAJ	DAK	CKK
1) CIS, China					

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DWM	DWN	DWQ 1)	DWR
Manufactured	from to	08.98 09.01	08.97 06.00	08.97 09.01	08.97 09.00
Allocation	Model	Audi A4 1995 ▶	Audi A4 1995 ▶	Audi A4 1995 ▶	Audi A4 1995 ▶



Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DWM	DWN	DWQ ¹⁾	DWR
Ratio $Z_2 : Z_1 = i$	Engine	2.8 ltr. - 142 kW 2.8 ltr. - 140 kW	2.4 ltr. - 120 kW 2.4 ltr. - 121 kW	1.8 ltr. - 88 kW 1.8 ltr. - 92 kW	1.8 ltr. - 110 kW 1.8 ltr. - 132 kW
	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	31 : 37 = 0.838
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
Overall ratio i_{ov} in top gear		3.068	3.244	3.595	3.259
Drive shaft flange Ø		100 mm	100 mm	100 mm	100 mm
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		DAJ	DAK	CKK	DAJ
¹⁾ CIS, China					

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		EEP	DTT	ENP	
Manufactured	from	08.98	12.98	09.00	
	to	01.00	12.98	09.01	
Allocation	Model	Audi A4 1995 ►	Audi A4 1995 ►	Audi A4 1995 ►	
	Engine	1.9 ltr. - 81 kW TDI	1.9 ltr. - 85 kW TDI	1.8 ltr. - 110 kW 1.8 ltr. - 132 kW	
Ratio $Z_2 : Z_1 = i$	Final drive	35 : 9 = 3.889	37 : 10 = 3.700	35 : 9 = 3.889	
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778	
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176	
	3rd gear	38 : 31 = 1.226	33 : 27 = 1.222	40 : 28 = 1.429	
	4th gear	31 : 37 = 0.838	28 : 32 = 0.875	35 : 34 = 1.029	
	5th gear	27 : 41 = 0.659	24 : 35 = 0.686	31 : 37 = 0.838	
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	
	Overall ratio i_{ov} in top gear	2.562	2.538	3.259	
Drive shaft flange Ø		Triple roller joint	Triple roller joint	100 mm	
Capacity		2.75 ltr.			
Rear final drive assignment, code letters		DAJ	DRL	DAJ	
¹⁾ CIS, China					

2 Calculations

2.1 Calculating transmission ratios „i“

Transmission ratio

Transmission ratio = $\frac{\text{No. of teeth on driven gear}}{\text{No. of teeth on drive gear}}$

Ratios	Formula
i_G = Gear ratio	$ZG_2 : ZG_1$
i_A = Axle ratio	$ZA_2 : ZA_1$
i_{ov} = Overall ratio	$i_G \times i_A$

Example:

	5th gear	Final drive
Drive gear	$ZG_1 = 38$	$ZA_1 = 9$
Driven gear	$ZG_2 = 30$	$ZA_2 = 37$

Calculations:

$$\begin{aligned}
 i_G &= 30 : 38 = 0.789 \\
 i_A &= 37 : 9 = 4.111 \\
 i_{ov} &= (30 : 38) \times (37 : 9) = 0.789 \times 4.111 = 3.246
 \end{aligned}$$



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3 Rear final drive identification

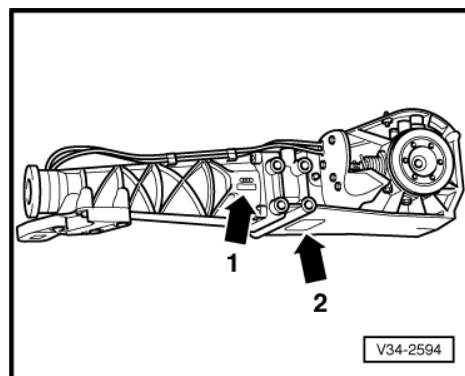
Final drive 01H is fitted in conjunction with manual gearbox 01A (four-wheel drive).

Allocation

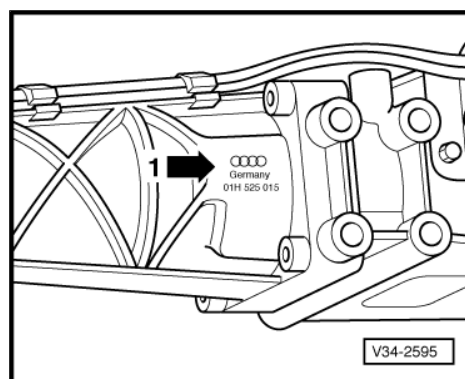
⇒ „3.1 Code letters, allocation, transmission ratios, capacities“, page 6 .

Location on rear final drive

- ◆ Final drive 01H -arrow 1-
- ◆ Code letters and date of manufacture -arrow 2-



Final drive 01H -arrow 1-



Code letters and date of manufacture of rear final drive -arrow 2-:

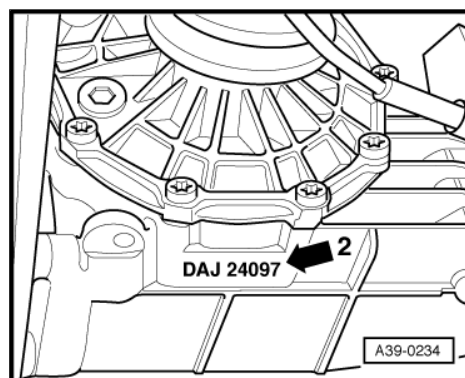
Example:	DAJ	24	09	7
	Code letters	Day	Month	Year -1997- of manufacture

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Note

The code letters for the rear final drive are also given on the vehicle data stickers.



3.1 Code letters, allocation, transmission ratios, capacities

The following data can be found in the ⇒ Electronic parts catalogue .

- ◆ Gear oil specification

Rear final drive		01H		
Code letters		CKH	CKJ	CKK
Manufactured	from	07.94	07.94	07.94
	to	06.96	06.96	09.01

Rear final drive		01H		
Allocation	Model Engine	Audi A4 1995 ► 1.8 ltr. - 110 kW 2.8 ltr. - 128 kW 2.8 ltr. - 142 kW	Audi A4 1995 ► 2.6 ltr. - 102 kW ¹⁾ 2.6 ltr. - 110 kW	Audi A4 1995 ► 1.8 ltr. - 88 kW ¹⁾ 1.8 ltr. - 92 kW
Ratio	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556
Capacity		1.9 ltr.		
Drive shaft flange Ø		100 mm	100 mm	100 mm
Allocation: manual gearbox (code letters)		CTF CXF CXW DDL	CXZ CPS CYA	CZX CPU DJV DWQ
¹⁾ CIS, China				

Rear final drive		01H		
Code letters		DAJ	DAK	DRL
Manufactured	from to	05.96 09.01	06.96 09.01	01.98 06.00
Allocation	Model Engine	Audi A4 1995 ► 1.8 ltr. - 110 kW 1.8 ltr. - 132 kW 1.9 ltr. - 81 kW (TDI) 2.8 ltr. - 128 kW 2.8 ltr. - 142 kW	Audi A4 1995 ► 2.4 ltr. - 120 kW 2.4 ltr. - 121 kW 2.6 ltr. - 102 kW ¹⁾ 2.6 ltr. - 110 kW	Audi A4 1995 ► 1.9 ltr. - 85 kW TD
Ratio	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	37 : 10 = 3.700
Capacity		1.9 ltr.		
Drive shaft flange Ø		100 mm	100 mm	100 mm
Allocation: manual gearbox (code letters)		CTF DJJ DJP DDL DJR DGW DWM DWR EEP ENP	DJS DJF DWN	DTT
¹⁾ CIS, China				

4 General repair instructions

Proper tools and the maximum possible care and cleanliness are essential for satisfactory repairs to the transmission units. The usual basic safety precautions also naturally apply when carrying out repair work.

A number of generally applicable instructions for the various repair procedures - which were previously repeated at numerous places in the Workshop Manual - are summarised here. They apply to the work described in this Manual.

Special tools

For a complete list of special tools used in this Workshop Manual
⇒ Workshop equipment and special tools catalogue .

Gearbox

- ◆ When installing a new gearbox, check the oil level and fill up with oil if necessary ⇒ [page 74](#) .
- ◆ Capacities ⇒ [page 1](#) .
- ◆ For gear oil specification, refer to ⇒ Electronic parts catalogue .
- ◆ Thoroughly clean all joints and connections and the surrounding areas before dismantling.
- ◆ When installing gearbox ensure dowel sleeves are correctly seated.

Rear final drive

- ◆ When fitting a new rear final drive, check the oil level in the rear final drive and top up if necessary ⇒ [page 195](#) .
- ◆ Capacities ⇒ [page 6](#) .
- ◆ For gear oil specification, refer to ⇒ Electronic parts catalogue .
- ◆ Thoroughly clean all joints and connections and the surrounding areas before dismantling.

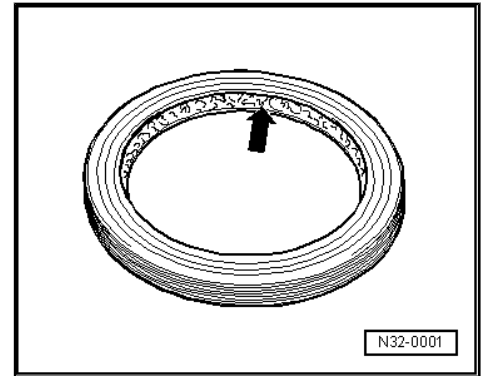
Sealants

- ◆ Thoroughly clean housing contact surfaces before applying sealing paste .
- ◆ Apply sealing paste -AMV 188 001 02- evenly and not too thickly.
- ◆ Breather holes must remain free of sealing paste .

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O-rings, oil seals and gaskets

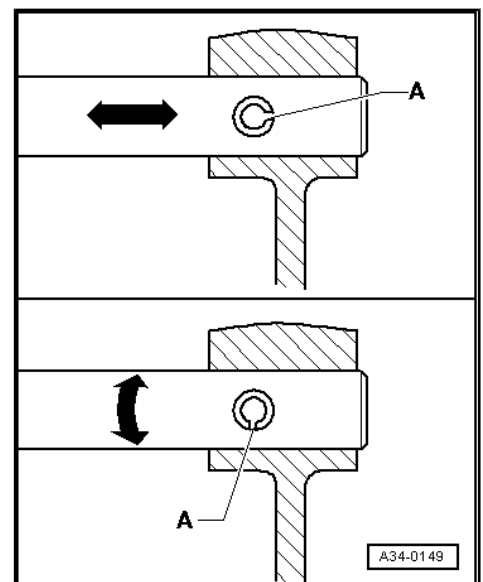
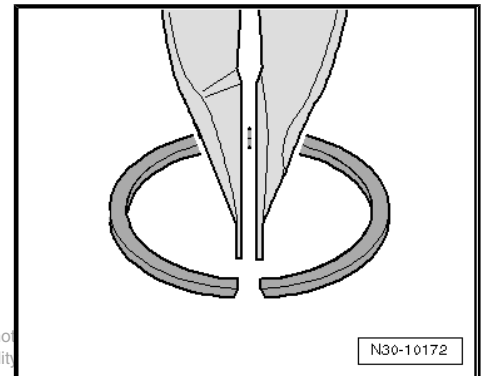
- ◆ Always renew O-rings, oil seals and gaskets.
- ◆ After removing gaskets and oil seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Thoroughly clean housing joint surfaces before assembling.
- ◆ Before installing oil seals, lightly oil the outer circumference of the seal and fill the space between the sealing lips -arrow- about half full with grease -G 052 128 A1- .
- ◆ The open side of the oil seal should face the side containing the fluid.
- ◆ When installing a new oil seal, position the seal such that the sealing lip does not contact the shaft in the same place as the old seal (make use of installation depth tolerances).
- ◆ Lightly lubricate O-rings before installation to prevent them from being trapped and damaged during assembly.
- ◆ After renewing gaskets and oil seals, check and, if necessary, top up oil level in gearbox ⇒ [page 74](#) and ⇒ [page 195](#) .



Locking elements

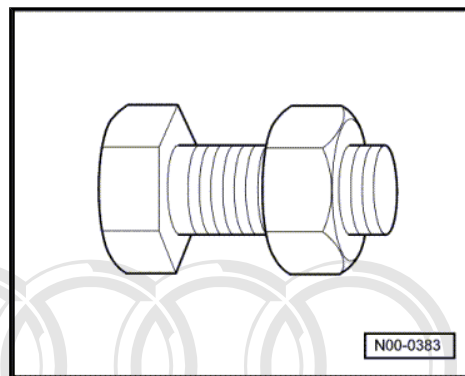
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- ◆ Do not over-stretch circlips.
- ◆ Installation position for some circlips: the circlip is fitted so that the narrow part of the gap is at the top. This also gives the pliers a better grip when removing and installing.
- ◆ Always renew circlips which have been damaged or over-stretched.
- ◆ Circlips must be properly seated in the base of the groove.
- ◆ Renew spring pins. Position: the slit -A- should be in line with the line of force -arrow-.



Nuts, bolts

- ◆ Loosen the nuts and bolts in reverse sequence to the specified tightening sequence.
- ◆ Nuts and bolts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- ◆ Loosen and tighten particularly sensitive parts in diagonal sequence and in stages, taking care to keep them straight.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Always renew self-locking bolts and nuts.
- ◆ Use a wire brush to clean the threads of bolts which are secured with locking fluid. Then apply locking fluid - AMV 185 101 A1- to bolt threads before installing.
- ◆ Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned (using a thread tap or similar). Otherwise there is a danger of the bolts shearing off the next time they are removed.



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Shims

- ◆ Use a micrometer to measure the shims at several points. Tolerance variations make it possible to obtain the exact shim thickness required.
- ◆ Check for burrs and damage.
- ◆ Do not install shims which are damaged or not in perfect condition.

Bearings

- ◆ Install needle bearings so the lettering (side with thicker metal) faces towards the installing tool.
- ◆ Grease needle bearing for gearbox input shaft in flywheel.
- ◆ Mark the needle bearings of the selector gears when removing. This ensures the same installation position when re-installing.
- ◆ Do not additionally oil new tapered roller bearings when measuring friction torque for pinion shaft in rear final drive. The bearings are pre-treated at the factory with a special type of oil for this purpose.
- ◆ Lubricate all bearings in gearbox housing with gear oil before installing.
- ◆ Use inductive heater -VAS 6414- to heat inner races of tapered roller bearings to approx. 100°C before installing. Press home onto stop when installing so there is no axial clearance.
- ◆ Do not interchange the outer or inner races of bearings of the same size (the bearings are paired).
- ◆ Always renew the tapered roller bearings on one shaft together and use new bearings from a single manufacturer.

Gear wheels, synchro-hubs, inner races for selector gears

- ◆ Before installing, heat inner races for selector gears to approx. 100° C using inductive heater -VAS 6414- .
- ◆ Use inductive heater -VAS 6414- to heat gear wheels and synchro-hubs to approx. 100°C before installing. Press home onto stop when installing so there is no axial clearance.
- ◆ Note correct installation position.

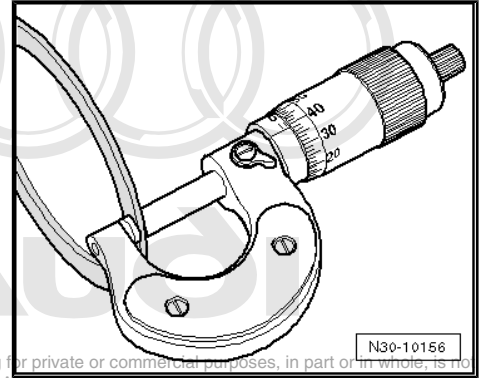
Selector gears

- ◆ After installing, check that 1st to 5th speed selector gears and reverse selector gear have an axial clearance of 0.15 ... 0.35 mm and check that they rotate freely.

Synchro-rings

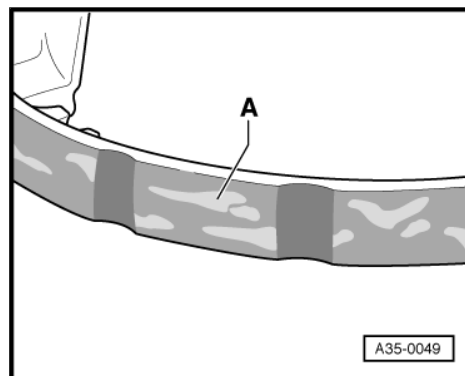
- ◆ Do not interchange synchro-rings. When reusing always fit to the same selector gear.
- ◆ Check for wear; renew if necessary.
- ◆ Lubricate with gear oil when installing.

Checking synchro-rings with molybdenum coating



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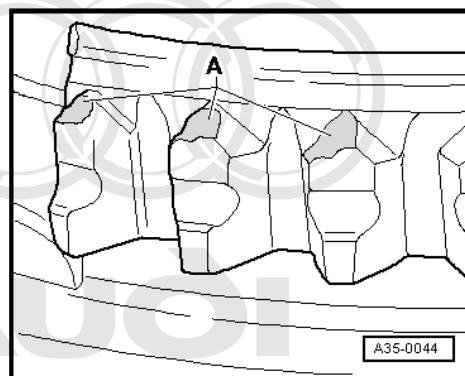
- ◆ The friction surface of an intact synchro-ring with molybdenum coating has a graphite-grey, slightly porous appearance. Clean the synchro-ring and make sure that the friction surface is free of oil.
- ◆ The synchro-ring must be renewed if very shiny areas -A- have formed on the friction surface or if the brass-coloured metal underneath is already visible.



Abnormal wear on selector gears and locking collars

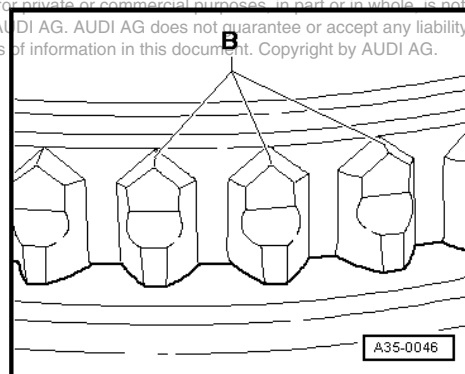
- ◆ Abnormal wear on synchro-ring or selector gear:

A - Worn chamfer on dog teeth of synchro-ring or selector gear



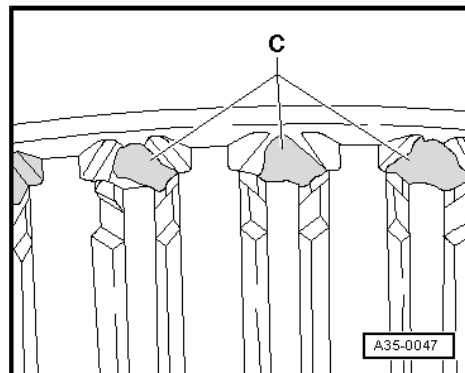
- ◆ In comparison: intact synchro-ring or selector gear:

B - Intact chamfer on dog teeth of synchro-ring or selector gear



- ◆ Abnormal wear on locking collar:

C - Worn chamfer on internal splines of locking collar

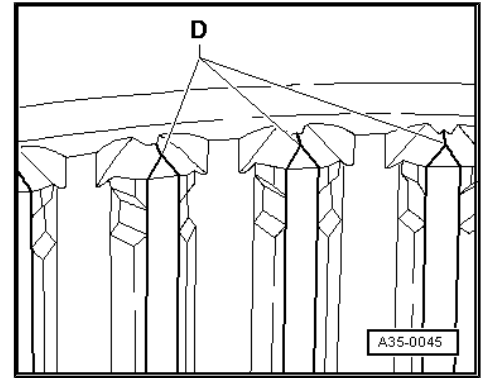


- ◆ In comparison: intact locking collar:

D - Intact chamfer on internal splines of locking collar

Clutch, clutch actuation

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress the clutch pedal after removing the clutch slave cylinder if the hydraulic pipe is still connected. Otherwise the piston will be pressed out of the clutch slave cylinder. As a result the clutch slave cylinder will be destroyed.
- ◆ If the clutch pedal does not return to its initial position after releasing it (clutch pedal in rest position), you must bleed the clutch system (further measures [⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 22](#)).
- ◆ The clutch system should be bled at the same intervals as the brake system.
- ◆ Ensure that the pressure plate is kept straight: loosen and tighten bolts consecutively in steps of 90° (1/4 turn each).
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.



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5 Transmission layout

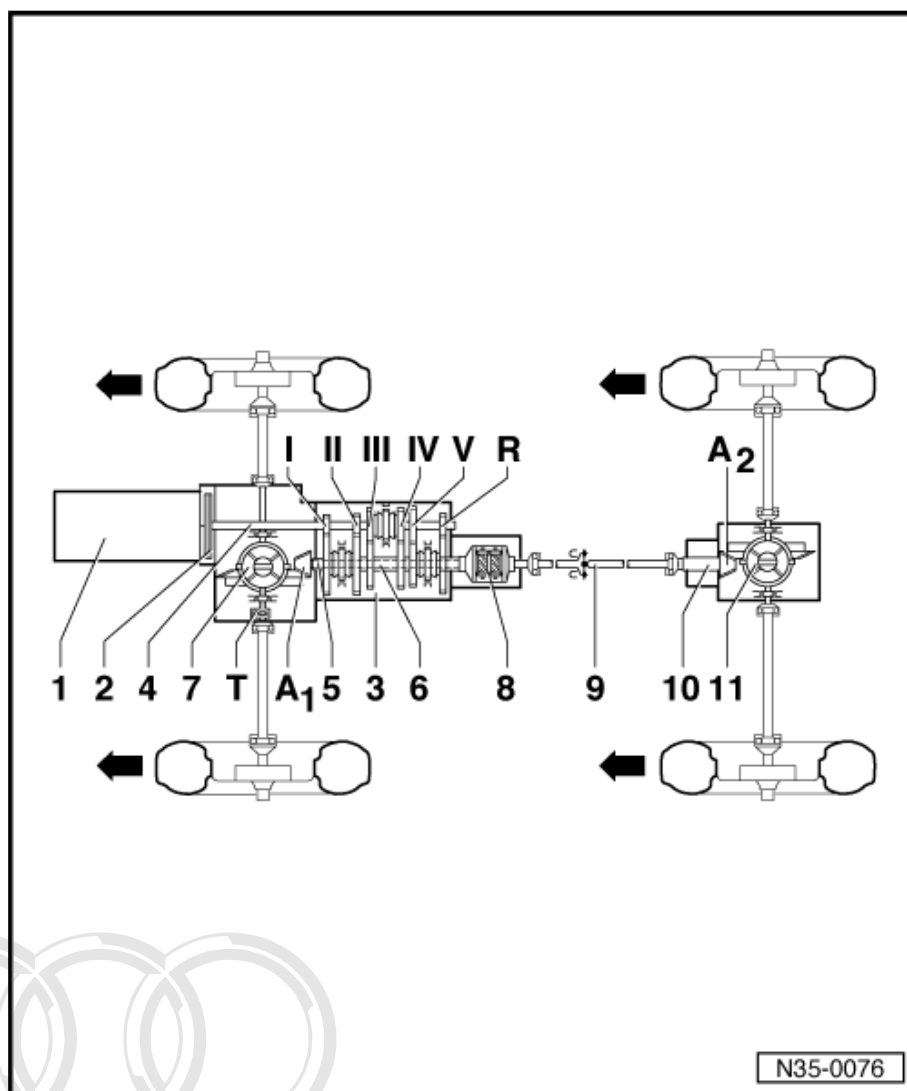
Identification and ratio



Note

-Arrows- point in direction of travel.

- 1 - Engine
- 2 - Clutch
- 3 - Gear cluster
- 4 - Input shaft (main shaft)
- 5 - Front pinion shaft (output shaft)
- 6 - Hollow shaft
- 7 - Front differential
- 8 - Self-locking centre differential
- 9 - Propshaft
- 10 - Rear pinion shaft
- 11 - Rear differential
- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- R - Reverse gear
- A1 - Front final drive
- A2 - Rear final drive
- T - Speedometer drive



N35-0076

30 – Clutch

1 Servicing clutch mechanism

Overview

- ◆ ⇒ „1.1 Exploded view - pedal cluster (LHD vehicles)“, page 15
- ◆ ⇒ „1.2 Removing and installing clutch pedal and over-centre spring“, page 16
- ◆ ⇒ „1.3 Exploded view - pedal cluster (RHD vehicles)“, page 18
- ◆ ⇒ „1.4 Exploded view - hydraulic system“, page 21
- ◆ ⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 22
- ◆ ⇒ „1.6 Function check for clutch master cylinder and slave cylinder“, page 22
- ◆ ⇒ „1.7 Removing and installing clutch master cylinder“, page 23
- ◆ ⇒ „1.8 Bleeding clutch system“, page 28
- ◆ ⇒ „2.2 Removing and installing clutch slave cylinder“, page 32



Caution

Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27.

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Note

- ◆ *Obtain radio code on vehicles with coded radio.*
- ◆ *Disconnect battery earth strap with the ignition switched off.*
- ◆ *Lubricate all bearings and contact surfaces with polycarbamide grease -G 052 142 A2-.*
- ◆ *Before working on pedal cluster, remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68.*
- ◆ *Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*

1.1 Exploded view - pedal cluster (LHD vehicles)

1 - Mounting bracket

- ☐ Removing and installing
⇒ Brake system; Rep. gr. 46

2 - Pivot pin

- ☐ For clutch pedal and brake pedal
- ☐ Installation position:
groove -arrow- towards clutch pedal

3 - Retaining clip

4 - Hexagon socket head bolt

- ☐ 25 Nm

5 - Brake pedal

6 - Clutch pedal

- ☐ Removing and installing
⇒ [page 16](#)

7 - Pin

- ☐ Clip onto clutch pedal

8 - Retaining clip

9 - Clutch master cylinder

- ☐ Removing and installing
⇒ [page 23](#)

10 - Hexagon socket head bolt

- ☐ 20 Nm

11 - Bearing

- ☐ Insert in mounting bracket with over-centre spring

12 - Over-centre spring

- ☐ For correct version, refer to ⇒ Electronic parts catalogue
- ☐ Remove and install with clutch pedal ⇒ [page 16](#)

13 - Hexagon socket head bolt

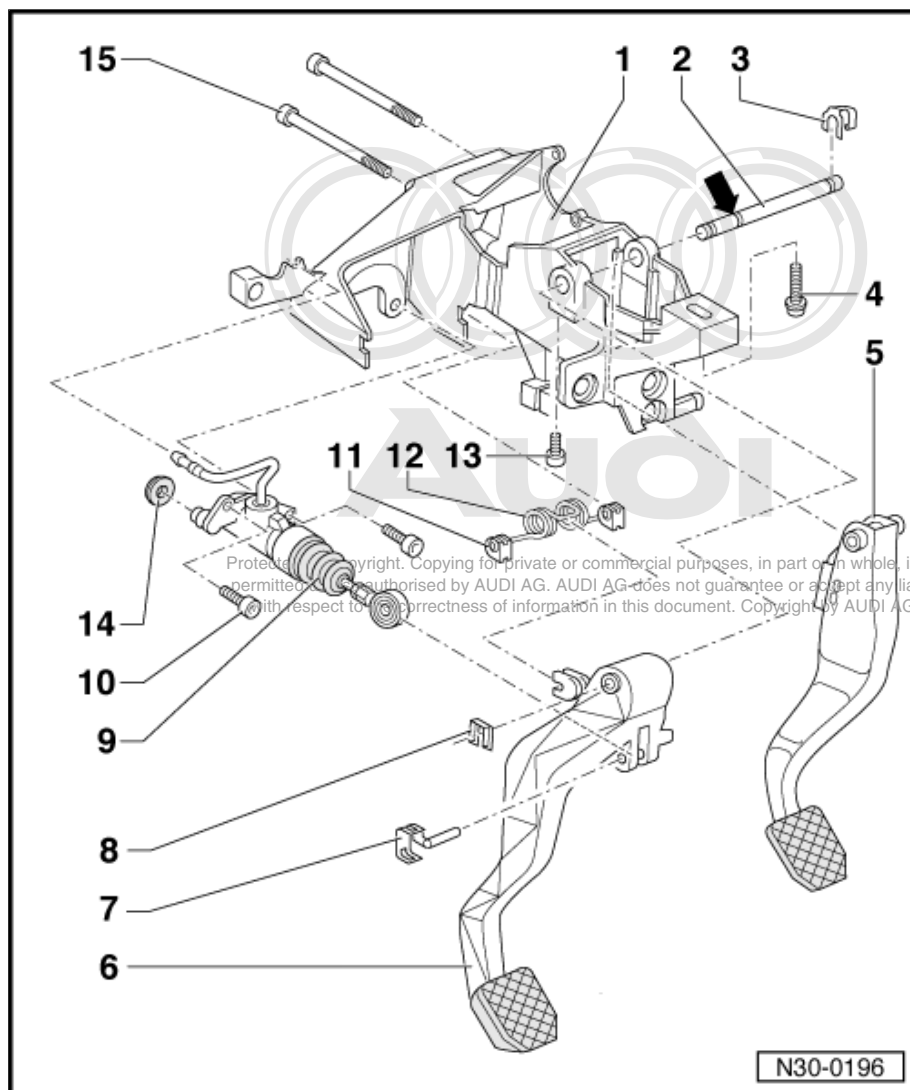
- ☐ 5 Nm
- ☐ Secures clutch and brake pedal pivot pin

14 - Seal

- ☐ Must not be removed

15 - TORX bolt

- ☐ 25 Nm
- ☐ Also secures brake master cylinder with brake servo



1.2 Removing and installing clutch pedal and over-centre spring

Removing

- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



Note

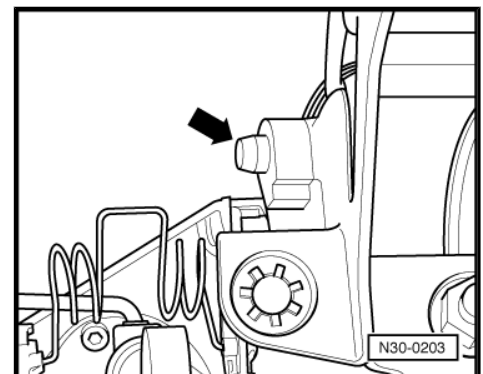
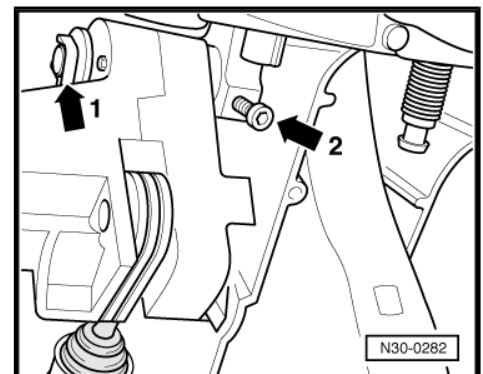
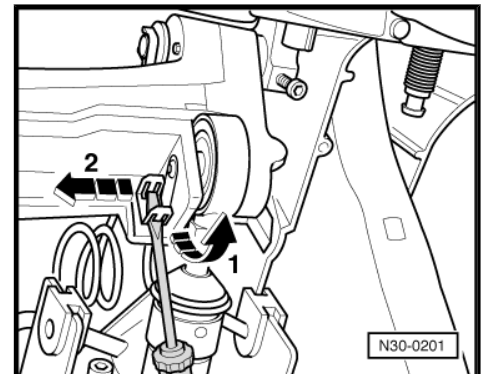
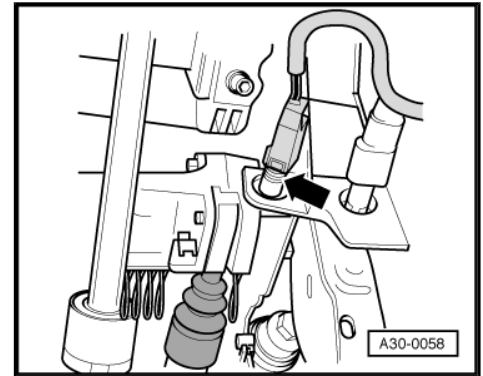
- ◆ *Make sure that clutch pedal switch -arrow- is not pressed out of retaining clip, as this would damage the thread of the switch and the switch would have to be renewed.*
- ◆ *Clutch pedal switch -1- may only be fitted once so as to ensure a firm fit.*

- Detach clutch pedal from clutch master cylinder. To do this, unclip pin using a screwdriver -arrow 1- and pull out pin -arrow 2-.
- Press clutch pedal retaining clip off pivot pin with a screwdriver.
- Remove bolt -arrow 2-.
- Press pivot pin for clutch pedal and brake pedal out to the right until the clutch pedal can be removed.
- If necessary press brake pedal retaining clip off pivot pin with a screwdriver.
- Take out clutch pedal and over-centre spring.

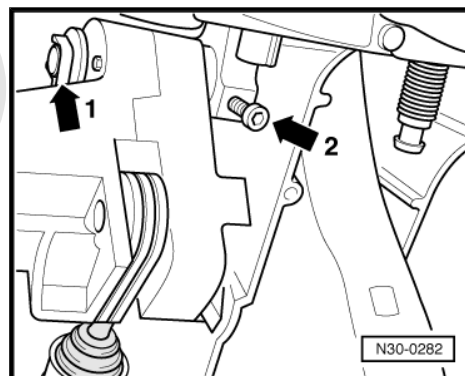
Installing

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

- Align pivot pin for clutch pedal/brake pedal so it protrudes out of mounting bracket on clutch pedal side -arrow-.
- First engage clutch pedal in over-centre spring, then attach to pivot pin.
- Connect clutch master cylinder to clutch pedal. Clip pin onto clutch pedal.



- Do not tighten bolt -arrow 2- until both retaining clips have been fitted on pivot pin for clutch pedal/brake pedal (-arrow 1- for clutch pedal; retaining clip for brake pedal not shown).



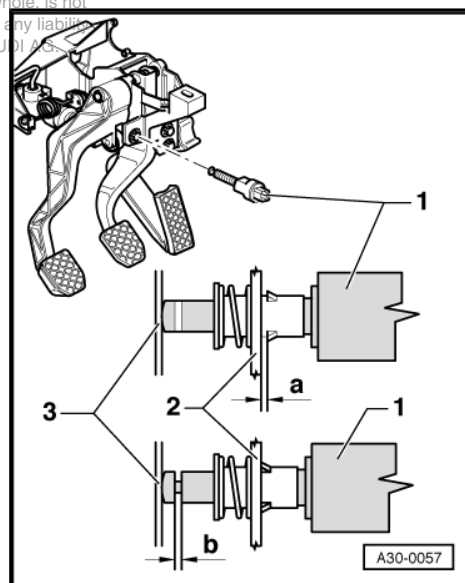
- Check setting of clutch pedal switch -1- above clutch pedal as follows:

- ◆ Switch -1- must make full contact with clutch pedal -3- and be fully actuated.
- ◆ Tolerance for adjustment: gap -a- between retaining clip and mounting bracket -2- (or gap -b- on switch -1-) must not be more than 0.5 mm.
- ◆ To adjust, hold retaining clip and turn clutch pedal switch -1-.



Note

Clutch pedal switch -F36- may only be fitted once so as to ensure a firm fit.



1.3 Exploded view - pedal cluster (RHD vehicles)

1 - Mounting bracket

- ☐ Removing and installing
⇒ Brake system; Rep.
gr. 46

2 - Bearing bush

- ☐ Driving out ⇒ [page 20](#)
- ☐ Driving in ⇒ [page 20](#)

3 - Washer

4 - Brake pedal

- ☐ Bearing pin will only fit in
one position in bearing
bush
⇒ [Item 13 \(page 19\)](#)

5 - Hexagon socket head bolt

- ☐ 25 Nm

6 - Seal

- ☐ Must not be removed

7 - Clutch master cylinder

- ☐ Removing and installing
⇒ [page 23](#)

8 - Hexagon socket head bolt

- ☐ 20 Nm

9 - Retaining clip

10 - Clutch pedal

- ☐ Removing and installing
⇒ [page 16](#)

11 - Needle bearing

- ☐ Pulling out ⇒ [page 20](#)
- ☐ Clamp in vice to press
in; use aluminium pro-
tective jaw covers

12 - Cap

13 - Bearing bush

- ☐ With internal splines to accommodate pins of brake pedal and lever ⇒ [Item 17 \(page 19\)](#)

14 - Bearing

- ☐ Insert in mounting bracket with over-centre spring

15 - Over-centre spring

- ☐ For correct version, refer to ⇒ Electronic parts catalogue

16 - Bolt

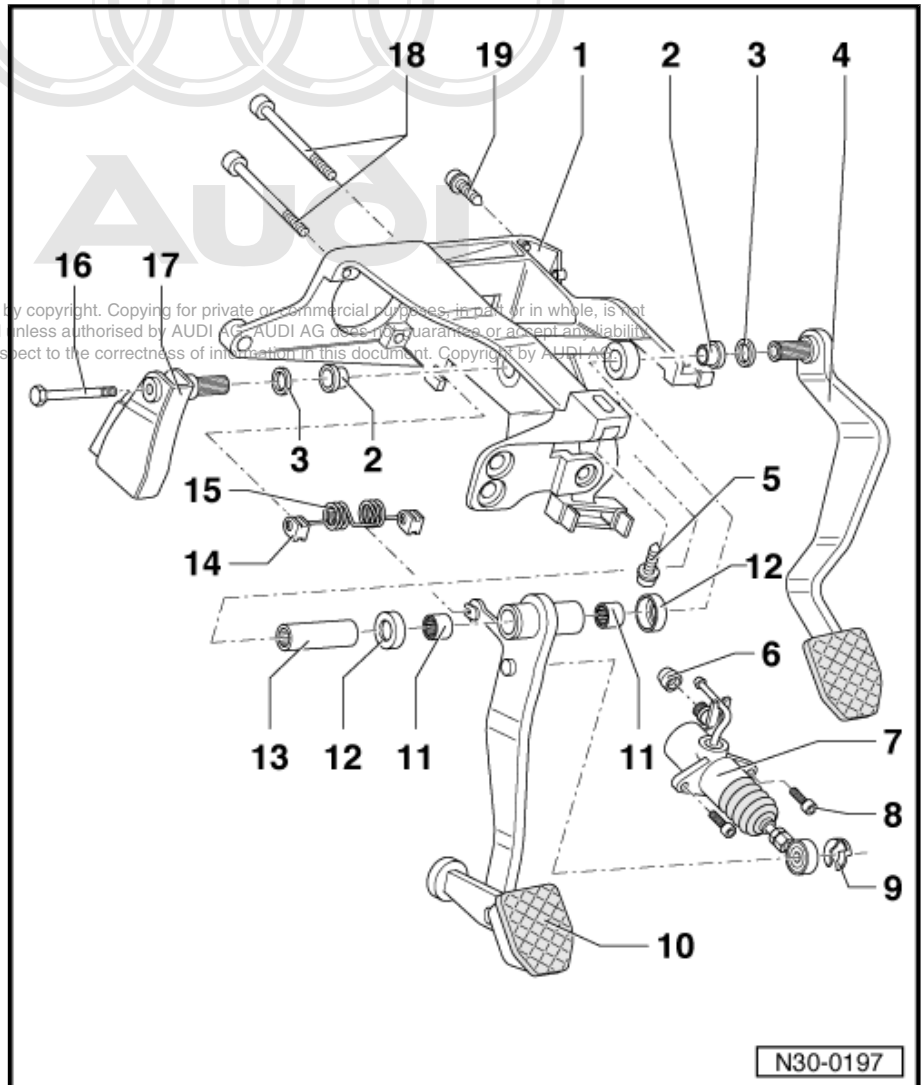
- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

17 - Lever

- ☐ Bearing pin will only fit in one position in bearing bush ⇒ [Item 13 \(page 19\)](#)

18 - TORX bolt

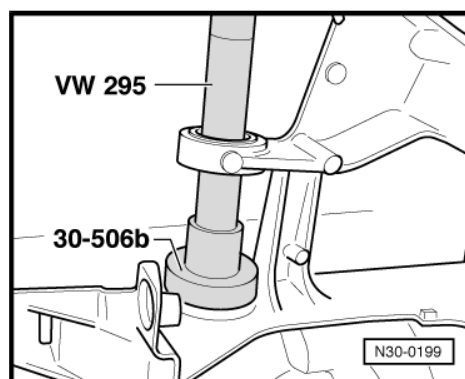
- ☐ 25 Nm
- ☐ Also secures brake master cylinder with brake servo



19 - Bolt

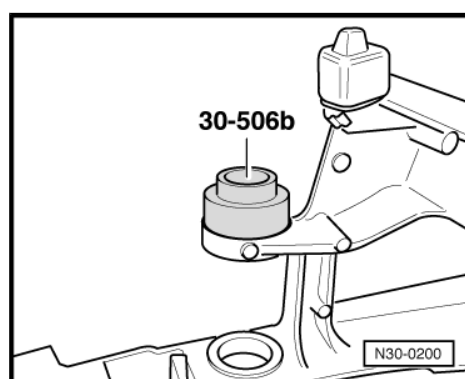
□ 25 Nm

Knocking bush out of mounting bracket



Knocking bush into mounting bracket

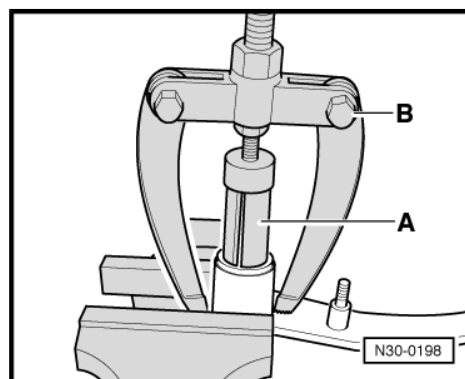
- If the bush is very tight the mounting bracket must be supported in the area of the bore hole.



Pulling out needle bearing

A - Internal puller 30 ... 37 mm , e.g. -Kukko 21/5-

B - Counter-support , e.g. -Kukko 22/2-



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1.4 Exploded view - hydraulic system

1 - Brake fluid reservoir

2 - Supply hose

- ☐ For clutch master cylinder

3 - Pipe/hose assembly

- ☐ Allocation for LHD and RHD vehicles ⇒ Electronic parts catalogue

4 - Connecting nut for pipe

- ☐ 15 Nm
- ☐ New version has push-on connection

5 - Mounting bracket

6 - Clutch pedal

- ☐ Removing and installing ⇒ [page 16](#)

7 - Hexagon socket head bolt

- ☐ 20 Nm

8 - Pin

- ☐ Apply polycarbamide grease -G 052 142 A2-

9 - Clutch master cylinder

- ☐ Removing and installing ⇒ [page 23](#)

10 - Gearbox

11 - Clutch slave cylinder

- ☐ Removing and installing ⇒ [page 32](#)
- ☐ After working on hydraulic clutch mechanism, bleed clutch system ⇒ [page 28](#)

- ☐ Do not operate clutch pedal after slave cylinder has been removed

12 - Bleeder valve

- ☐ Tighten to 4.5 Nm
- ☐ Follow correct procedure when bleeding ⇒ [page 28](#)

13 - Bracket

- ☐ Secured to gearbox

14 - Hexagon socket head bolt

- ☐ 25 Nm

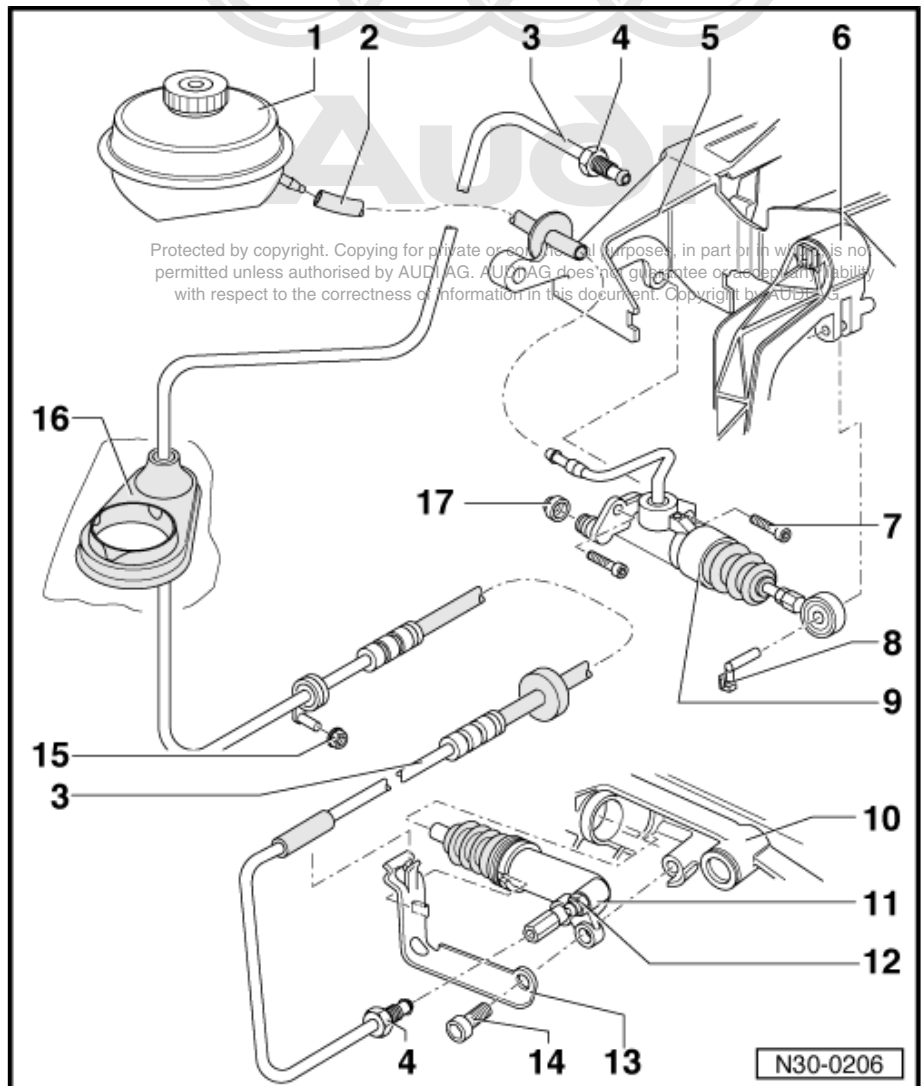
15 - Nut

- ☐ 2 Nm

16 - Gasket

17 - Seal

- ☐ Must not be removed



1.5 Notes on removing and installing clutch master cylinder and slave cylinder

- ◆ Before renewing the clutch master cylinder or slave cylinder on the assumption that it is defective, you must first carry out the appropriate function check
⇒ „1.6 Function check for clutch master cylinder and slave cylinder“, page 22 .
- ◆ If the slave cylinder is removed from gearbox with the pipe/hose assembly still attached, make sure you do not press the clutch pedal. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.
- ◆ After installing the slave cylinder, carefully press the clutch pedal. If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further. The plunger of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

1.6 Function check for clutch master cylinder and slave cylinder

Before you renew the clutch master cylinder or slave cylinder you must - in the case of the following faults - first carry out the appropriate checks.

Noises when operating the clutch:

- ◆ First check the over-centre spring / clutch pedal switch for noise.
- ◆ If you hear a noise, remove over-centre spring and repeat check.
- ◆ Renew relevant component.

After releasing clutch pedal it still remains depressed / does not return to its initial position.

- ◆ Check whether the clutch pedal returns all the way to its initial position, thereby uncovering the vent opening in the master cylinder.
- ◆ The vent opening is integrated in the clutch master cylinder. It is not visible from the outside.
- ◆ The vent opening must be uncovered, otherwise the permanent self-bleeding function for the hydraulic clutch system will no longer be effective.
- ◆ Make the customer aware that the driver must NOT rest his/her foot on the clutch pedal for long periods of time. This could impair the self-bleeding function of the clutch system as the vent opening in the master cylinder can no longer function.
- ◆ The self-bleeding function of the clutch system can be impaired if the footwell trim or floor mats get trapped, if the clutch pedal switch jams or if the driver rests his foot on the clutch pedal for long periods of time.

Check the complete hydraulic system for leaks.

- ◆ Check brake fluid level in brake fluid reservoir.
- ◆ Check clutch master cylinder and slave cylinder as well as the pipe/hose assembly including connections for external leaks (visual inspection).
- ◆ If you identify any leaks you must renew the leaking component.

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- ◆ Bleed clutch system ⇒ [page 28](#) .

High pedal force:

- ◆ Clutch plate worn
- ◆ Mechanically defective pressure plate/clutch plate
⇒ [page 36](#) .

Pedal forces:

- Clutch lining when new: approx. 115 N
- Clutch lining at wear limit: approx. 160 N

Clutch does not disengage or does not disengage fully:

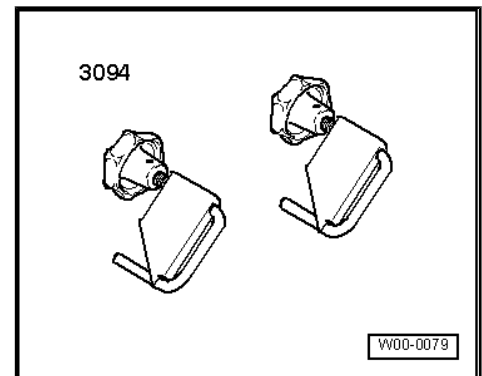
- ◆ Air in hydraulic system: bleed clutch system ⇒ [page 28](#) and check hydraulic system for external and internal leaks.
- ◆ Clutch plate does not move smoothly on input shaft splines (due to corrosion or dirt, etc.).
- ◆ Needle bearing in flywheel (centring bearing for input shaft) defective, renew needle bearing ⇒ Rep. gr. 13 .
- ◆ Foreign body in clutch system.
- ◆ Mechanically defective pressure plate/clutch plate
⇒ [page 36](#) .
- ◆ Wrong components used or components forgotten when carrying out repair work (e.g. intermediate plate).

1.7 Removing and installing clutch master cylinder

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Special tools and workshop equipment required

- ◆ Hose clamp -3094-



Removing



Note

If you suspect a defective clutch master cylinder, perform function test prior to renewing
⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, [page 22](#) .



Caution

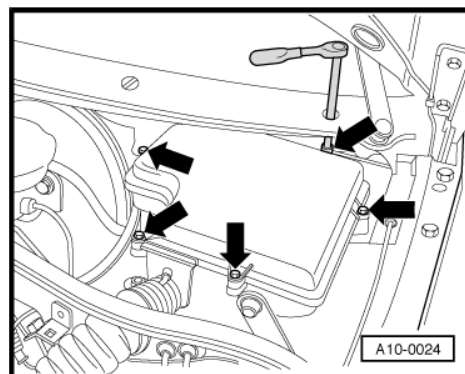
- ◆ *Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27 .*

- If fitted, remove cover over plenum chamber.

- With the ignition switched off, disconnect battery earth strap
⇒ Electrical system; Rep. gr. 27 .
- Take the electronics box out of the plenum chamber as follows:

Old version with assembly hole in cowl panel trim:

- Unscrew bolts -arrows- and take off the cover.

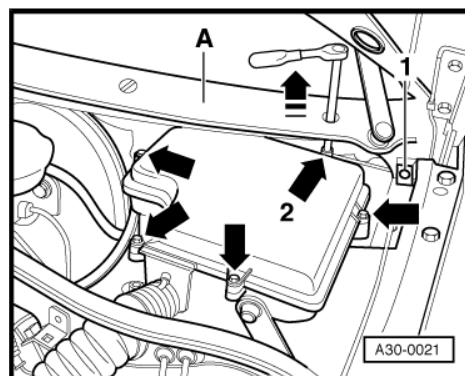


New version without assembly hole in cowl panel grille:

- Pull off retaining clip -1- and lift cowl panel trim -A- slightly. Now remove bolt -arrow 2-.
- Remove remaining bolts -arrows- and pull off cover.

All versions:

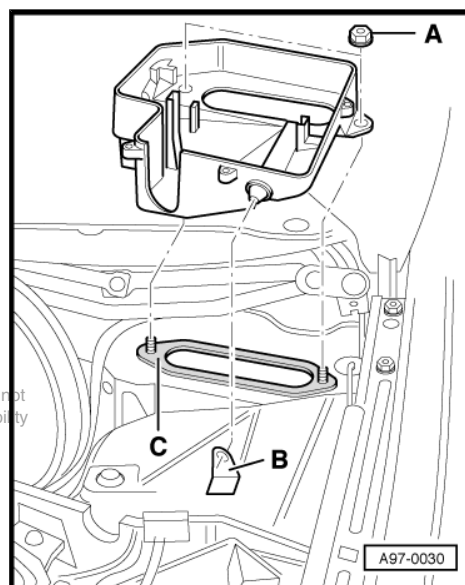
- Remove engine control unit; if necessary, remove auxiliary relay carrier and auxiliary fuse carrier: ⇒ Electrical system; Rep. gr. 97 .
- Unplug connector from connector point.
- Pull engine wiring harness together with rubber grommet out through opening in electronics box.
- Unscrew both nuts -A-.
- Lift electronics box off studs at rear and detach from securing point -B-.



Note

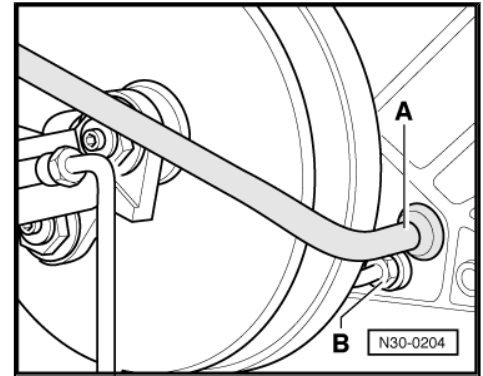
- ◆ *In the following steps make sure that no brake fluid escapes into the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*

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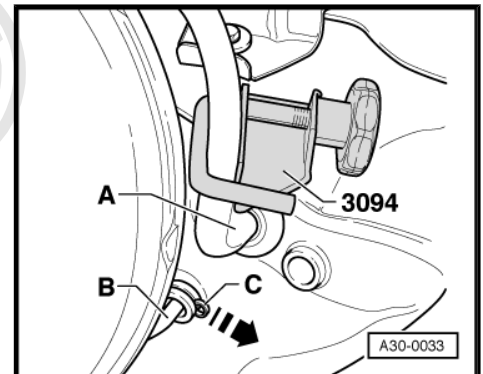
Old version with aluminium clutch master cylinder:

- Clamp off supply hose -A- from brake fluid reservoir using hose clamp -3094-. Disconnect hose from clutch master cylinder and plug hose.
- Remove rubber grommet from bulkhead above connecting pipe for supply hose.
- Remove pipe -B- from clutch master cylinder and seal off.



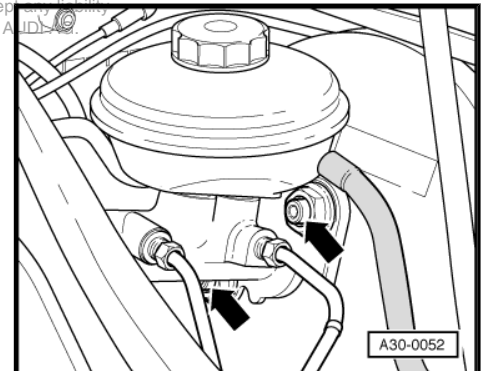
New version with plastic clutch master cylinder:

- Clamp off supply hose -A- from brake fluid reservoir using hose clamp -3094-. Disconnect hose from clutch master cylinder and plug hose.
- Remove rubber grommet from bulkhead above connecting pipe for supply hose.
- Use screwdriver to prise out clip -C- and pull out pipe -B- slightly.

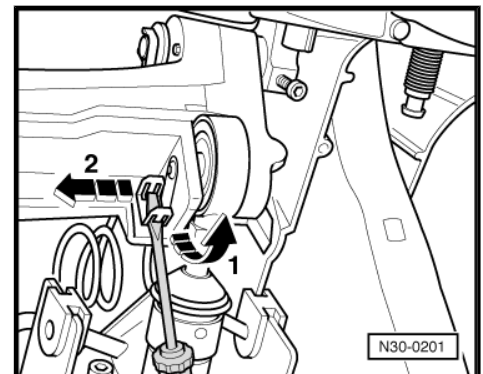


All versions:

- Remove the two TORX bolts -arrows-.
- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



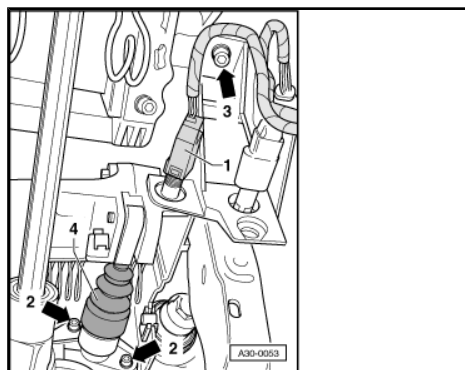
- Detach clutch pedal from clutch master cylinder. To do so, use screwdriver to prise out pin locking element -arrow 1-, pull out pin -arrow 2- and press out clutch pedal.





Note

- ◆ When performing the following steps, make sure clutch pedal does not press the clutch pedal switch -1- out of the retaining clip, as this would damage the thread of the switch and the switch would have to be renewed.
- ◆ Switch may only be fitted once so as to ensure a firm fit.
- Unscrew securing bolts for clutch master cylinder -arrow 2- and mounting bracket -arrow 3-.
- Pull entire pedal cluster slightly towards passenger compartment and take out clutch master cylinder -4-.



Installing

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

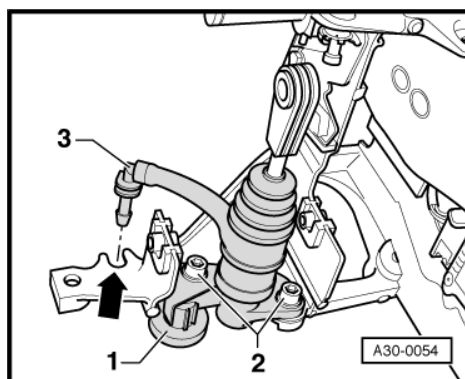
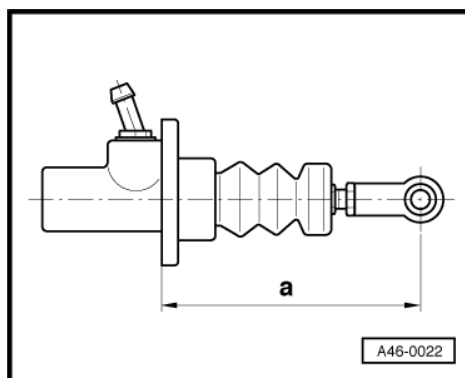
For aluminium clutch master cylinder with adjustable push rod joint only:

- When renewing clutch master cylinder, check distance -a- at push rod joint (extended) and adjust if necessary.
- ◆ LHD: Dimension -a- = 165 ± 0.5 mm
- ◆ RHD: Dimension -a- = 139 ± 0.5 mm

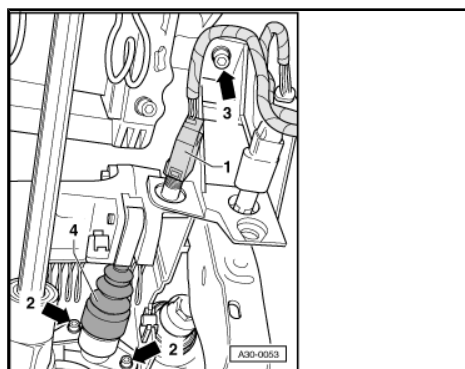
All versions:

- Fit clutch master cylinder so that seal -1- makes full surface contact with washer behind mounting bracket and tighten bolts -2- to 20 Nm.
- Press guide -arrow A- on connecting pipe -3- into recess -arrow B- on mounting bracket.

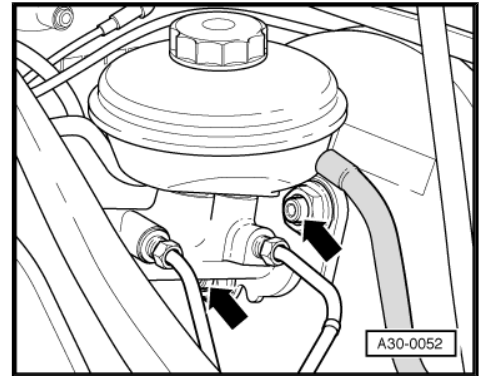
A second mechanic is required for the next step.



- Slide complete pedal cluster forwards towards bulkhead, fit bolt -arrow 3- and tighten it by hand. Have second mechanic guide connecting pipe into clutch master cylinder from plenum chamber.

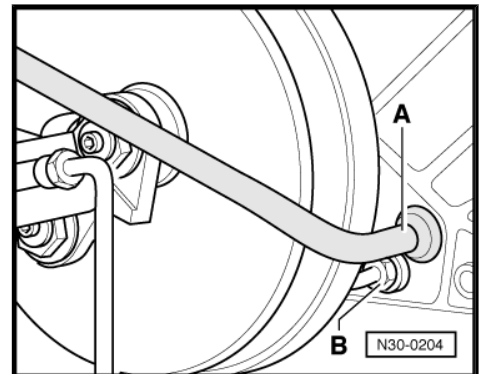


- Tighten bolts for brake servo -arrows- to 25 Nm.



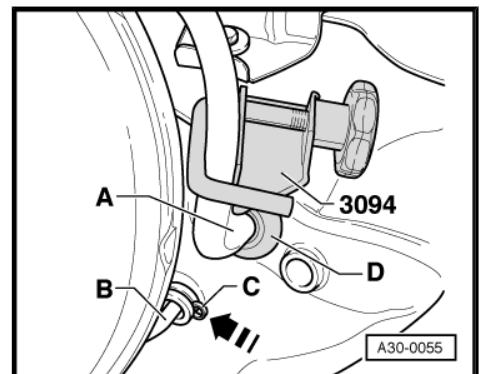
Old version with aluminium clutch master cylinder:

- Tighten pipe union nut -B- to 15 Nm at clutch master cylinder.
- Fit rubber grommet over connecting pipe for supply hose -A- in bulkhead.
- Push supply hose -A- from brake fluid reservoir on as far as it will go.
- Detach hose clamp -3094- from supply hose -A-.



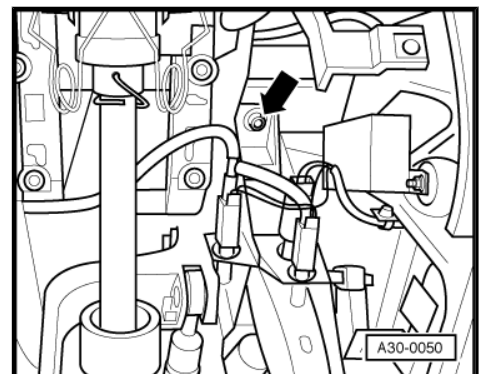
New version with plastic clutch master cylinder:

- Press in retaining clip -C- as far as it will go.
- Push pipe -B- into clutch master cylinder until it engages audibly.
- Fit rubber grommet -D- on connecting pipe for supply hose -A- in bulkhead.
- Push supply hose -A- from brake fluid reservoir on as far as it will go.
- Detach hose clamp -3094- from supply hose -A-.



All versions:

- Tighten hexagon socket head bolt -arrow- securing pedal cluster to central tube for dash panel to 25 Nm.
- Connect clutch master cylinder to clutch pedal. Clip pin onto clutch pedal.
- After installing clutch master cylinder, bleed clutch system ➔ [page 28](#).



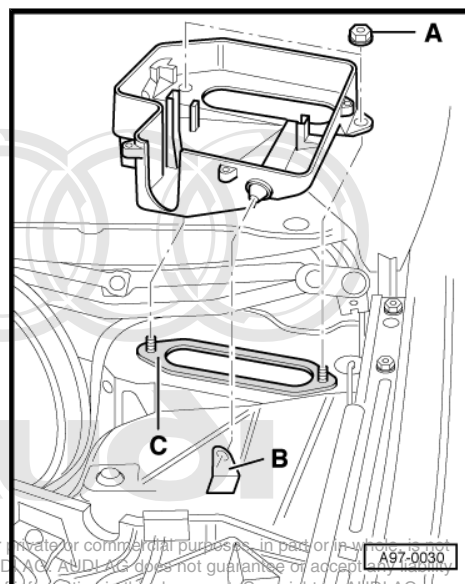
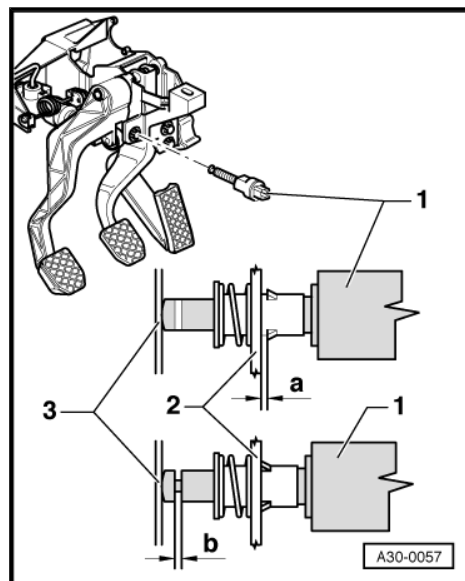
- Check setting of clutch pedal switch -1- above clutch pedal as follows:
- ◆ Switch -1- must make full contact with clutch pedal -3- and be fully actuated.
- ◆ Tolerance for adjustment: gap -a- between retaining clip and mounting bracket -2- (or gap -b- on switch -1-) must not be more than 0.5 mm.
- ◆ To adjust, hold retaining clip and turn clutch pedal switch -1-.



Note

Clutch pedal switch -F36- may only be fitted once so as to ensure a firm fit.

- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Always renew gasket -C-.
- Make sure gasket does not conceal opening in body and raised metal edge.
- Fit electronics box at attachment point -B- and tighten nuts -A- to 4 Nm.
- Press on cover hand-tight and tighten bolts in a diagonal sequence to 4 Nm (also see marking on cover).
- Route engine wiring harness and plug in connector in connector console.
- Install engine control unit and, if removed, also auxiliary relay carrier and auxiliary fuse carrier ⇒ Electrical system; Rep. gr. 97 .
- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .

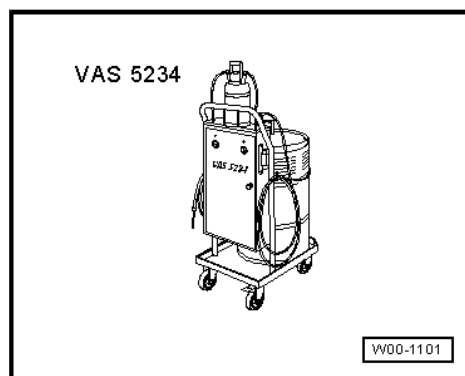


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1.8 Bleeding clutch system

Special tools and workshop equipment required

- ◆ Brake filling and bleeding equipment -VAS 5234- or brake filling and bleeding equipment -V.A.G 1869-



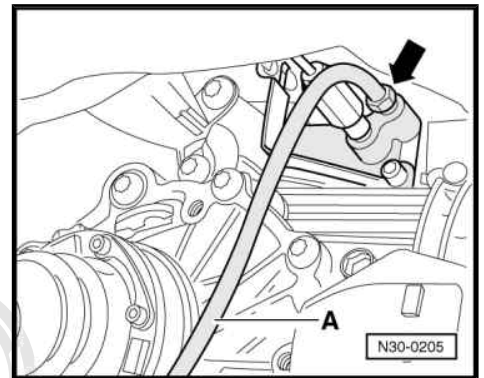
- ◆ Brake fluid specification ⇒ Brake system; Rep. gr. 47 .

Procedure



Note

- ◆ *The clutch system must be bled after performing work on the hydraulic clutch mechanism.*
- ◆ *Before bleeding the clutch system, pull back the clutch pedal to the normal position and top up brake fluid to „Max“ marking on brake fluid reservoir.*
- ◆ *Open the bleeder valve before switching on the bleeding appliance.*
- ◆ *When performing the following steps, make sure that no brake fluid escapes onto the gearbox.*
- ◆ *The clutch system should be bled at the same intervals as the brake system.*
- Connect brake filling and bleeding equipment -V.A.G 1869- or -VAS 5234- , but do not switch on at this stage ⇒ Brake system; Rep. gr. 47 ; Bleeding brake system .
- If fitted, remove noise insulation beneath gearbox.
- Connect bleeder hose -A- to slave cylinder -arrow- and open bleeder valve.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on bleeding appliance and allow about 100 cm³ of brake fluid to drain out.
- ◆ Operating pressure 2.0 bar



Note

- ◆ *Ensure bleeder hose is correctly fitted during bleeding operation.*
- ◆ *Do not allow brake fluid to come into contact with the gearbox.*
- Close bleeder valve; tightening torque: 4.5 Nm.
- Depress clutch pedal several times after bleeding process is completed.
- Repeat bleeding procedure if necessary.
- Disconnect bleeder hose and fit protective cap.
- Remove brake filling and bleeding equipment -VAS 5234- or -V.A.G 1869- from brake fluid reservoir.
- If originally fitted, install noise insulation beneath gearbox.

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2 Servicing clutch release mechanism

Overview:

- ◆ ⇒ „2.1 Exploded view - clutch release mechanism“, page 30
- ◆ ⇒ „2.2 Removing and installing clutch slave cylinder“, page 32

2.1 Exploded view - clutch release mechanism

1 - Clutch slave cylinder

- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ Removing and installing ⇒ page 32
- ☐ Press in slave cylinder so that securing bolt can be fitted easily
- ☐ Grease lightly before installing ⇒ page 34
- ☐ Disconnecting pipe/hose assembly ⇒ page 33
- ☐ Follow correct procedure when bleeding ⇒ page 28
- ☐ Tighten bleeder valve to 4.5 Nm

2 - Bolt

- ☐ Apply locking fluid - D 185 400 A2- to hexagon bolt when fitting
- ☐ Tighten to 25 Nm
- ☐ Hexagon socket head bolt is self-locking
- ☐ Renew
- ☐ Tighten to 23 Nm

3 - Bracket

- ☐ For pipe/hose assembly
- ☐ Attached to gearbox together with slave cylinder
- ☐ Installing ⇒ page 34

4 - Plunger

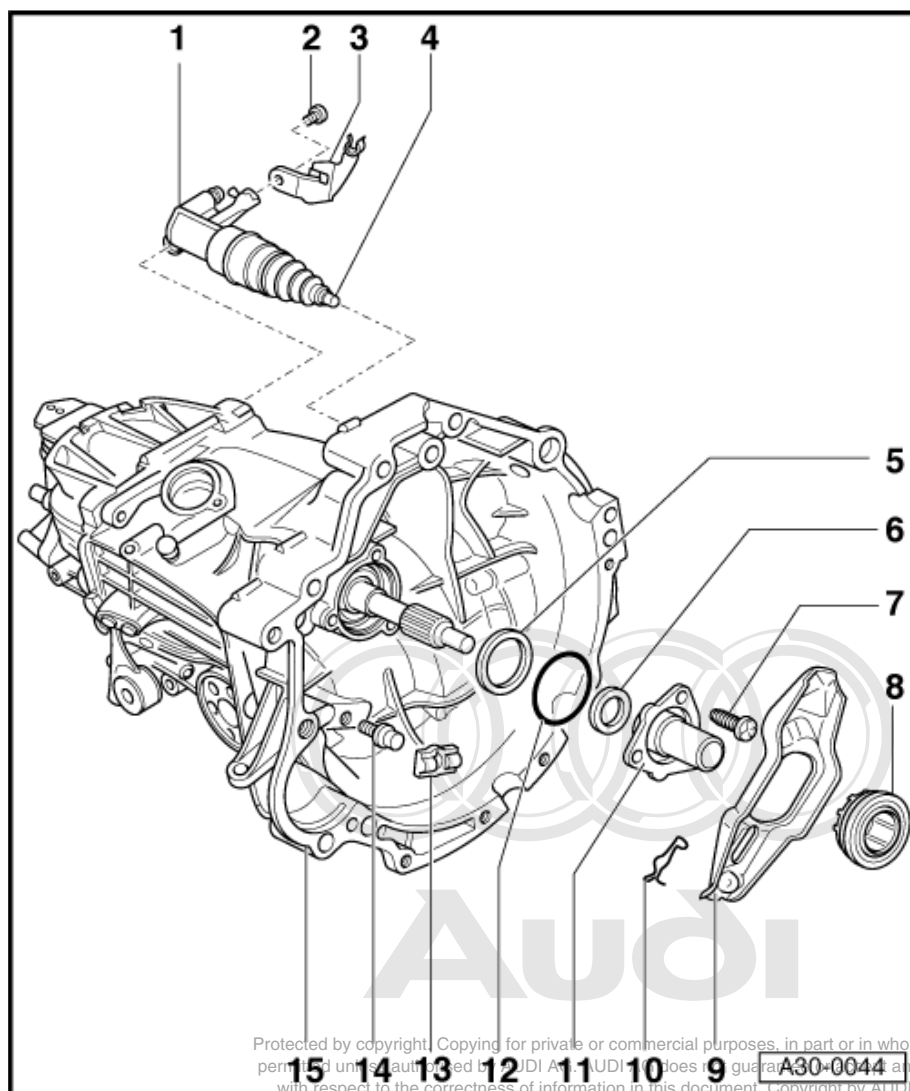
- ☐ Lubricate end of plunger with copper grease (commercially available)

5 - Dished spring

- ☐ Smaller diameter (convex side) faces guide sleeve

6 - Input shaft oil seal

- ☐ Pull out of guide sleeve using oil seal extractor lever -VW 681- or puller hook -T20143-
- ☐ Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1-
- ☐ Knock in onto stop with drift sleeve -VW 192-



7 - Torx socket head bolt

- ☐ 35 Nm
- ☐ Self-locking
- ☐ Renew

8 - Release bearing

- ☐ With or without plastic ring, depending on design
- ☐ Checking and servicing release bearing with glued plastic ring ⇒ [page 31](#)
- ☐ Checking release bearing with mechanically attached plastic ring ⇒ [page 32](#)
- ☐ Renew if groove worn on plastic ring is too deep ⇒ [page 32](#)
- ☐ Do not wash out bearing, wipe clean only
- ☐ Renew bearing if noisy
- ☐ Retainer lugs on release bearing must engage in release lever

9 - Clutch release lever

- ☐ Before installing, lubricate area which makes contact with plunger of slave cylinder with copper grease (commercially available).

10 - Retaining spring

- ☐ Secure to clutch release lever

11 - Guide sleeve

- ☐ Before removing and installing, cover input shaft splines with a shrink-fit hose to protect oil seal
⇒ [Item 6 \(page 30\)](#)
- ☐ Installation position: Oil drain hole points downwards (if provided)

12 - O-ring

- ☐ Renew

13 - Intermediate piece

14 - Ball-head pin

- ☐ Tighten to 25 Nm
- ☐ Lubricate with MoS₂ grease

15 - Gearbox



Note

The illustration shows gearbox 012.

Checking and servicing release bearing with glued plastic ring

- Identification: inner side of plastic ring has three lugs -arrows-.

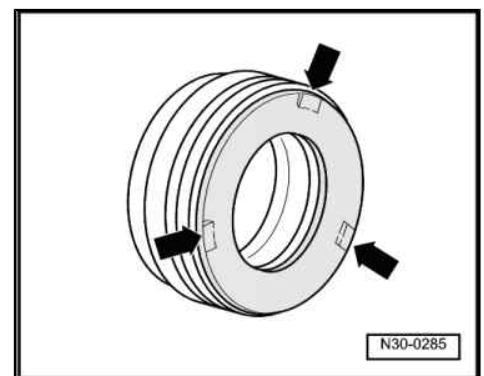
The plastic ring -arrows- may come loose from the release bearing when the gearbox or release bearing is removed. The release bearing does not have to be renewed if this happens.

- Before installing the gearbox, glue the loose plastic ring back onto the bearing with adhesive -AMV 195 KD1 01- .
- The three square lugs -arrows- on the plastic ring engage in the recesses of the bearing.



Note

The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.



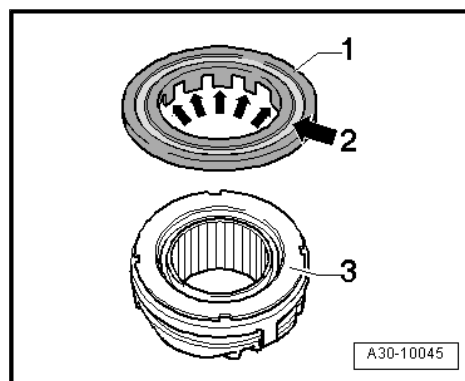
Checking release bearing with mechanically attached plastic ring

- Identification: retaining tabs around plastic ring -arrows-.



Note

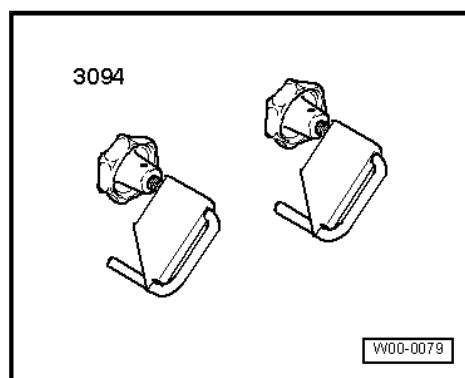
- ◆ The release bearing must be renewed if the plastic ring -1- has come loose.
- ◆ The release bearing -3- must be renewed if the groove -arrow 2- worn on the plastic ring -1- is deeper than 0.8 mm.



2.2 Removing and installing clutch slave cylinder

Special tools and workshop equipment required

- ◆ Hose clamps, up to Ø 25 mm -3094-



- ◆ Lithium grease -G 052 150 A2-
- ◆ Copper grease (commercially available)

Removing clutch slave cylinder



Note

- ◆ If you suspect a defective clutch master cylinder, perform function test prior to renewing
⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 22 .
- ◆ Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.



Caution

Make sure you do not press the clutch pedal if the clutch slave cylinder is removed from the gearbox with the pipe/hose assembly still attached. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.

- If fitted, remove noise insulation beneath gearbox.

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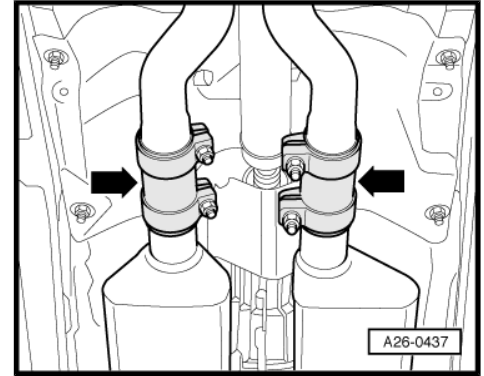
Vehicles with 6-cylinder engine:

- Disconnect exhaust system at clamp (left-side) -left arrow-.

Note

Flexible element in front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

- Remove heat shield for drive shaft (left-side).
- Remove front exhaust pipe with catalytic converter (left-side)
⇒ Engine, mechanics; Rep. gr. 26 .



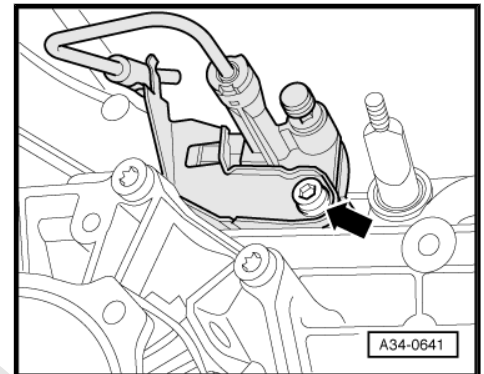
Continued for all vehicles:

- Remove bolt -arrow- and take out clutch slave cylinder from the rear.



Caution

Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.



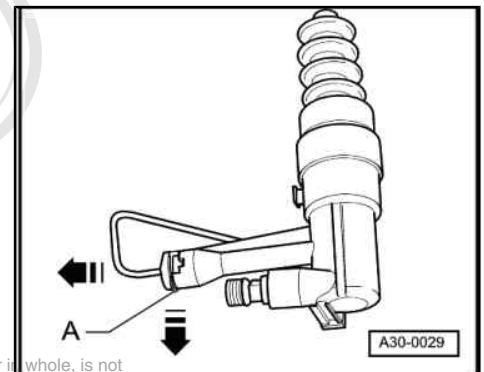
- Using hose clamp -3094- , clamp off pipe/hose assembly.
- Release retaining clip -A- using a screwdriver and pull out to limit stop.
- Detach pipe/hose assembly from clutch slave cylinder.

Installing clutch slave cylinder

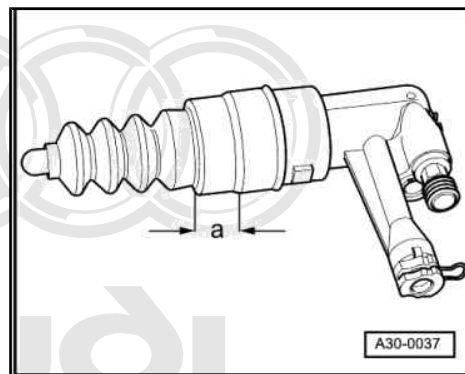
Installation is carried out in reverse sequence; note the following:

Note

- ◆ ***Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.***
- ◆ ***If the clutch slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.***
- ◆ ***When installing, press in slave cylinder so that securing bolt can be fitted easily.***
- ◆ ***Renew securing bolt for slave cylinder.***

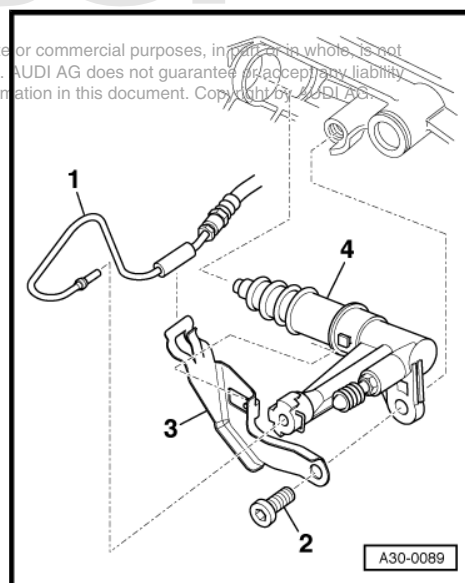


- Before inserting clutch slave cylinder into gearbox housing, lubricate area -a- of sleeve with lithium grease -G 052 150 A2-.
- Using copper grease (commercially available), lightly lubricate surface where plunger and clutch release lever make contact.



- If fitted, attach bracket -3- for hose/pipe assembly to clutch slave cylinder -4-.

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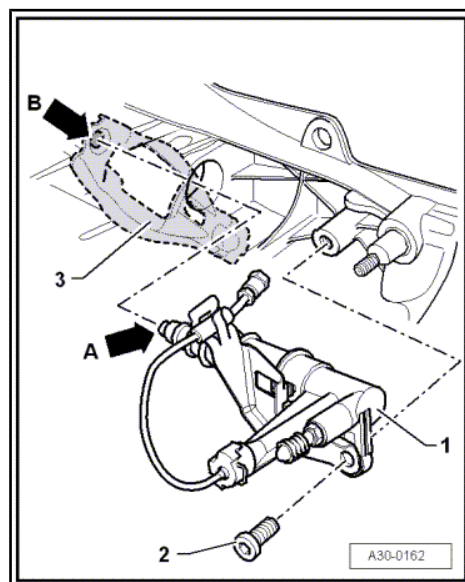


- Guide slave cylinder -1- into mounting hole in gearbox housing, keeping it as far as possible in line with the operating direction of the plunger -arrow A-.
- At the same time insert in recess -arrow B- on clutch release lever -3-.
- Secure slave cylinder -1- with new bolt -2-. Tightening torque ⇒ [Item 2 \(page 30\)](#)



Note

If the slave cylinder is inserted at an angle, there is a danger that the plunger -arrow A- will be guided past the recess -arrow B- on the clutch release lever.

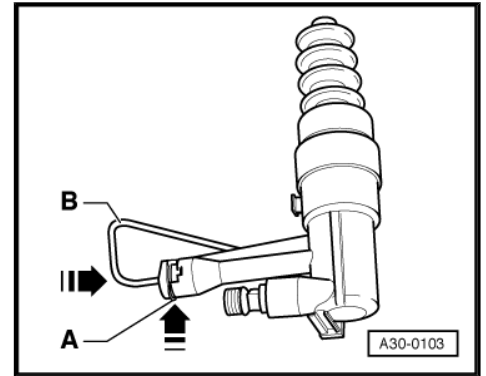


- To connect pipe to clutch slave cylinder, press in retaining clip -A- as far as it will go.
- Push pipe -B- into clutch slave cylinder until it engages audibly.
- Pull pipe/hose assembly to check that it is securely seated.



Caution

- ◆ *After installing the slave cylinder carefully press the clutch pedal.*
- ◆ *If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further.*
- ◆ *The plunger of the slave cylinder is likely to have been guided past the clutch release lever.*
- ◆ *The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.*
- ◆ *For comparison: normal pedal force is approx. 115 N.*



Vehicles with 6-cylinder engine:

- Install front exhaust pipe and ensure stress-free alignment of exhaust system ⇒ Engine, mechanics; Rep. gr. 26 .
- Install heat shield for drive shaft (left-side).

Continued for all vehicles:

- If the pipe-hose assembly was disconnected at the slave cylinder, the clutch system has to be bled after installing slave cylinder ⇒ [page 28](#) .
- If originally fitted, install noise insulation beneath gearbox.

Tightening torques

Component	Nm
Heat shield for drive shaft to gearbox	23

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3 Servicing clutch

Overview

- ◆ ⇒ „3.1 Exploded view - clutch unit“, page 36
- ◆ ⇒ „3.2 Removing and installing clutch“, page 38



Note

- ◆ Refer to general repair instructions ⇒ [page 8](#).
- ◆ Check that dowel sleeves for centralising engine/gearbox are in the cylinder block; install if necessary.
- ◆ If the dowel sleeves are not fitted, this will lead to gear-change problems, clutch malfunction and in some cases gearbox noise (gears will make rattling noises).
- ◆ Renew clutch plate and pressure plate if riveted fastening is damaged or loose.
- ◆ Select the correct clutch plate and pressure plate according to engine code ⇒ *Electronic parts catalogue*.
- ◆ Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines -G 000 100- to the splines. Then move clutch plate backwards and forwards on input shaft until hub moves freely on shaft. It is important to remove excess grease.
- ◆ Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.
- ◆ The friction surface of the pressure plate and the dual-mass flywheel must be cleaned (degreased) thoroughly.
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.

3.1 Exploded view - clutch unit



Note

- ◆ The gearbox has to be removed before working on the clutch ⇒ [page 62](#).
- ◆ If components are marked, coloured marking on dual mass flywheel must be aligned with coloured marking on pressure plate.

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1 - Flywheel/dual mass fly-wheel

- ☐ Ensure that dowel pins fit tightly
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease
- ☐ Removing and installing
⇒ Engine, mechanics; Rep. gr. 13

2 - Bolt for flywheel

- ☐ Renew
- ☐ Vehicles without dual mass flywheel: 60 Nm + turn 90° further
- ☐ Vehicles with dual mass flywheel: 60 Nm + turn 180° further

3 - Clutch plate

- ☐ Installation position:
Clutch lining must make full contact with flywheel
- ☐ The marking „Getriebeseite“ (gear-box side), if provided, faces towards pressure plate/gearbox
- ☐ Coil springs (damper assembly) point towards pressure plate and gearbox
- ☐ Select diameter of clutch plate according to engine code ⇒ Electronic parts catalogue
- ☐ Centralising ⇒ [page 39](#)
- ☐ Lightly grease splines ⇒ [page 36](#)

4 - Pressure plate

- ☐ Removing and installing ⇒ [page 38](#)
- ☐ Checking ends of diaphragm spring ⇒ [page 38](#)
- ☐ Checking spring connection and rivets ⇒ [page 38](#)
- ☐ Checking wire ring ⇒ [page 38](#)

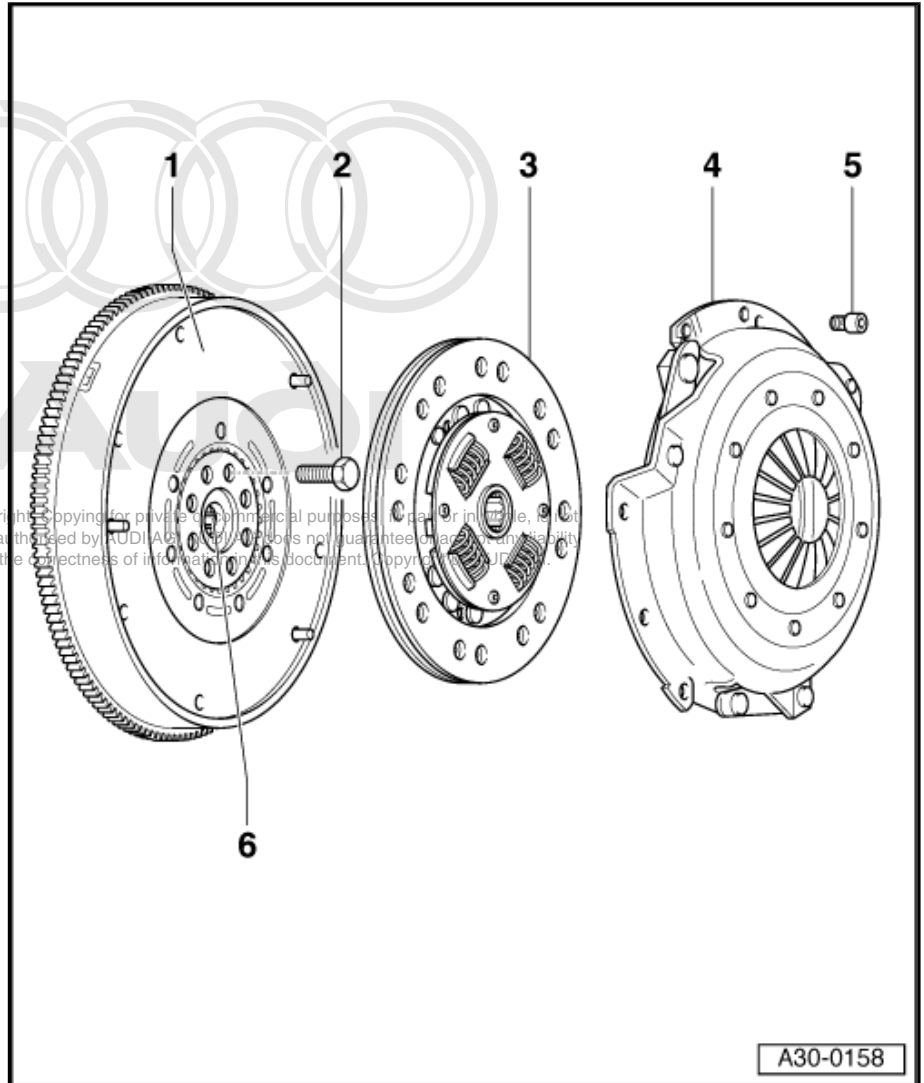
5 - Bolt

- ☐ 22 Nm

Observe tightening sequence ⇒ [page 39](#)

6 - Needle bearing

- ☐ Check for damage or wear
- ☐ Driving in and driving out ⇒ Engine, mechanics; Rep. gr. 13



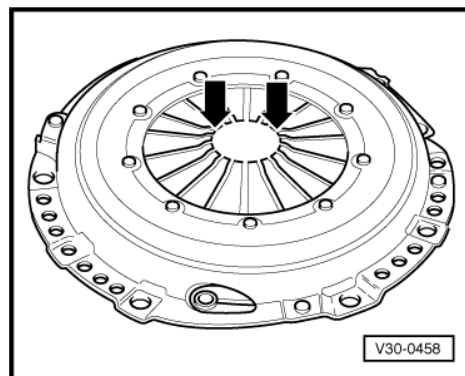
Checking ends of diaphragm spring

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



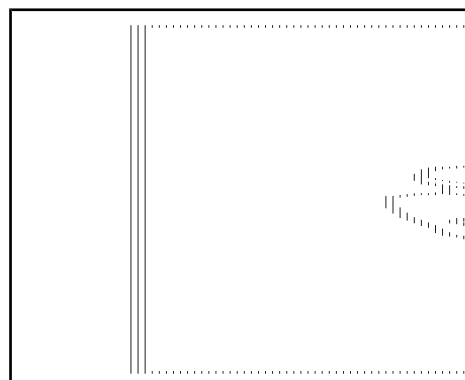
Note

When performing repairs always match up clutch pressure plate and clutch plate by checking engine code ⇒ Electronic parts catalogue .



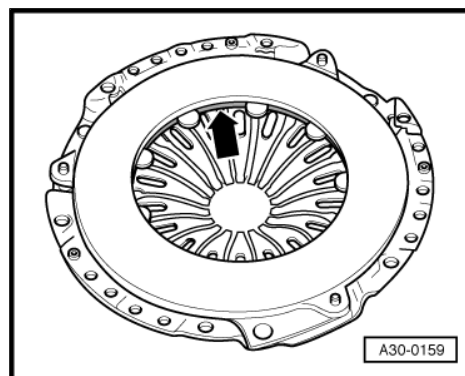
Checking spring connections and rivets

- Check spring connection between pressure plate and cover -centre arrow- for cracks and make sure rivet fastenings -right arrows- are seated tightly.
- Renew pressure plate if spring connections are broken or badly bent, or if riveted fastenings are loose.



Checking wire ring

- Check that wire ring in pressure plate -arrow- is not damaged.
- Renew pressure plate if wire ring is broken.

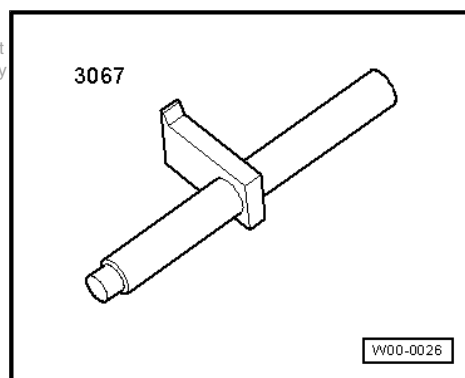


3.2 Removing and installing clutch

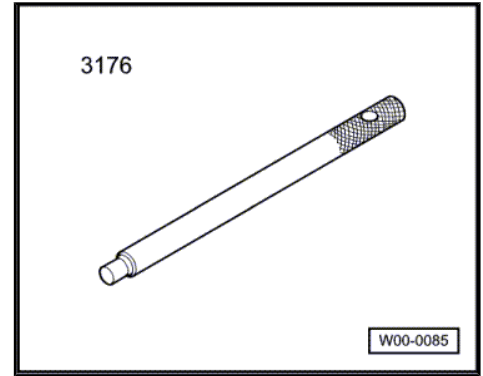
Special tools and workshop equipment required

- ◆ Counterhold tool -3067-

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◆ Centring mandrel -3176-



◆ Grease for clutch plate splines -G 000 100-

Removing

- Attach counterhold tool -3067- before loosening bolts.

To prevent the pressure plate from becoming distorted during removal (causes clutch grab when driving off), always adhere to the following procedure when unbolting the pressure plate:

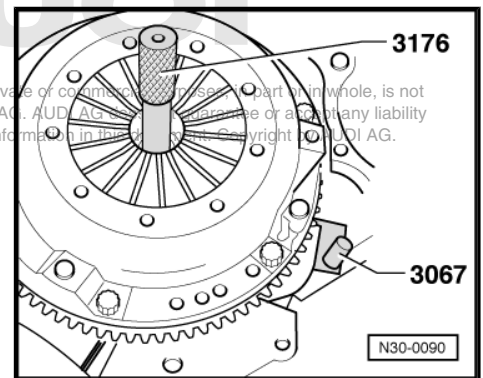
- Loosen all bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until the pressure plate is released.

Installing

- Re-position counterhold tool -3067- to tighten bolts.
- Installation position of clutch plate: coil springs (damper assembly) or marking „Getriebeseite“ point towards pressure plate and gearbox.
- Use centring mandrel -3176- to centralise clutch plate.

To prevent the pressure plate from becoming distorted during installation (causes clutch grab when driving off), always adhere to the following procedure when installing the pressure plate:

- Position pressure plate on centring pins.
- Screw in all bolts evenly by hand until bolt heads make contact with pressure plate.
- Tighten all bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until housing makes contact with fly-wheel.
- Tighten all bolts to final torque (22 Nm) consecutively in clockwise direction.





34 – Controls, housing

1 Servicing gear selector mechanism for vehicles up to 05.99

Identification: gear lever must be pressed down when engaging reverse gear.



Note

Servicing gear selector mechanism for vehicles from 05.99 onwards ⇒ [page 52](#)

Overview

- ◆ ⇒ [„1.1 Exploded view - standard-travel selector mechanism“, page 40](#)
- ◆ ⇒ [„1.2 Removing and installing standard-travel selector mechanism“, page 42](#)
- ◆ ⇒ [„1.3 Adjusting standard-travel selector mechanism“, page 42](#)
- ◆ ⇒ [„1.4 Exploded view - servicing short-travel selector mechanism“, page 44](#)
- ◆ ⇒ [„1.5 Removing and installing short-travel selector mechanism“, page 47](#)
- ◆ ⇒ [„1.6 Adjusting short-travel selector mechanism“, page 48](#)

1.1 Exploded view - standard-travel selector mechanism



Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ *Electronic parts catalogue*.



Audi

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1 - Bolt

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Always renew

2 - Selector rod

- ☐ With selector joint

3 - Bush

- ☐ Installation position: rounded end faces gear lever

4 - Spring

5 - Ball stop

- ☐ Insert spring and bush in ball stop and fit on gear lever so that spring and bush are on the right when looking forwards
- ☐ Install before fitting circlip
⇒ [Item 21 \(page 41\)](#)

6 - Spring

7 - Spacer bush

8 - Circlip

- ☐ Do not overstretch when fitting

9 - Rubber ring

10 - Bush

11 - Cross-head screw

12 - Mounting frame (bottom section)

13 - Mounting frame (top section)

14 - Boot

- ☐ Retaining hook on rear of cover; pry out carefully from centre console

15 - Bush

16 - Gear knob

17 - Gear lever

- ☐ Can only be fitted into ball housing in one position

18 - Nut

- ☐ 23 Nm

19 - Spacer tube

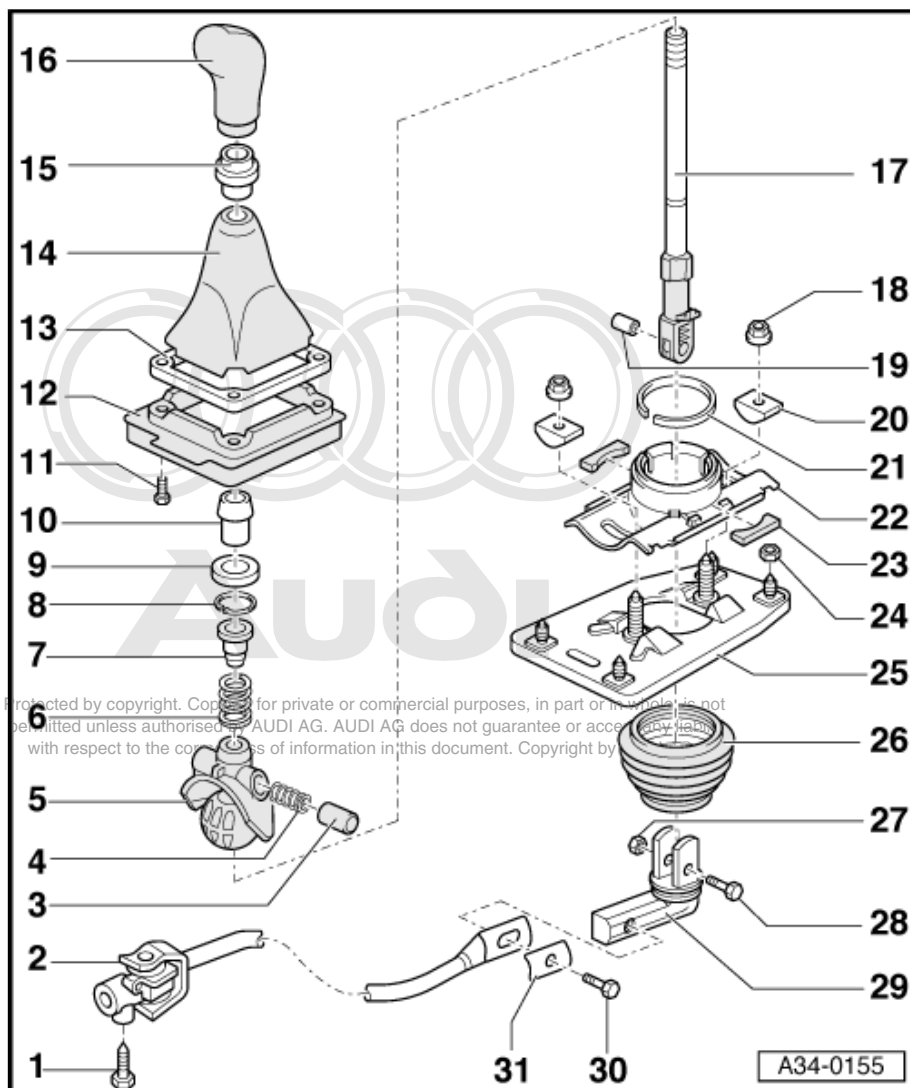
20 - Connecting piece

21 - Circlip

- ☐ Renew
- ☐ Take out before removing ball stop
- ☐ Installation position: rounded side faces ball housing ⇒ [Item 22 \(page 41\)](#)

22 - Ball housing

- ☐ Limit pieces for ball stop on left and right must be engaged
- ☐ Installation position: reverse detent faces left



23 - Buffer

24 - Nut

- 10 Nm

25 - Selector mechanism housing

26 - Boot

- Remove heat shield before removing and installing
- Pull carefully over selector rod

27 - Nut

- 10 Nm
- Self-locking
- Renew

28 - Bolt

29 - Selector fork

- Before dismantling, detach heat shield and push towards rear

30 - Bolt

- 23 Nm

31 - Clamp

1.2 Removing and installing standard-travel selector mechanism

Removing

- Remove heat shield.
- Pull boot -7- downwards off bottom of selector mechanism.
- Slacken nut -1- securing selector fork to gear lever.
- Remove bolt -8- from selector fork.
- Remove gear knob and gear lever boot.
- Detach noise insulation.
- Unscrew nuts -3- and -4- securing ball housing and remove the two connecting pieces -2- and -5-.
- Lift ball housing -6- out of centre console together with gear lever.

Installing

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

- Push selector rod on so that the securing bolt fits in the recess in the selector shaft.

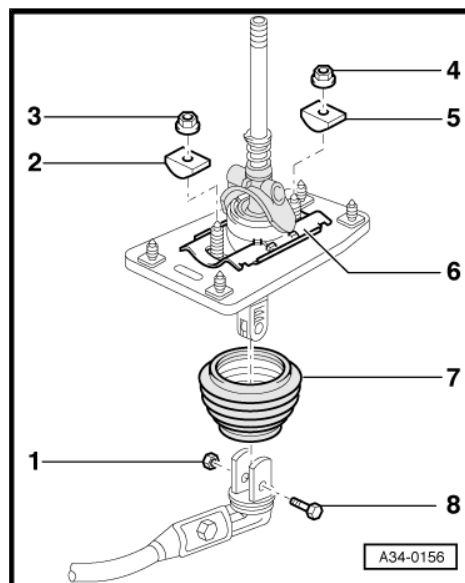
Tightening torques

Component	Nm
Ball housing to selector mechanism housing	23
Selector fork to gear lever	10
Selector rod to selector fork	23

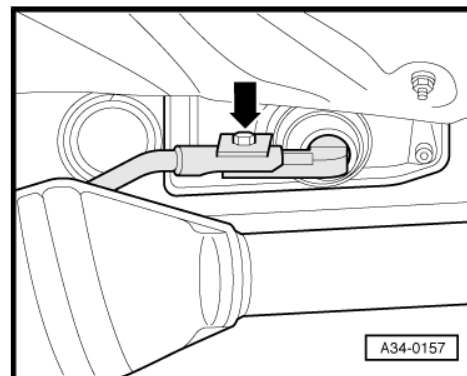
1.3 Adjusting standard-travel selector mechanism

The following are prerequisites for correct gear lever alignment:

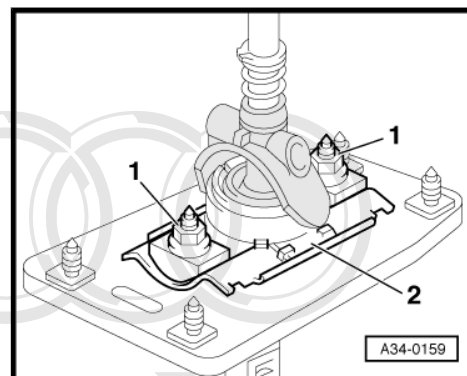
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- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.
- Gearbox in neutral.
- Remove heat shield.
- Loosen bolt -arrow- securing selector rod.
- Remove gear knob and gear lever boot.
- Detach noise insulation.



- Loosen nuts -1- for ball housing.
- Align ball housing -2- horizontally.
- Tighten nuts for ball housing to 23 Nm.



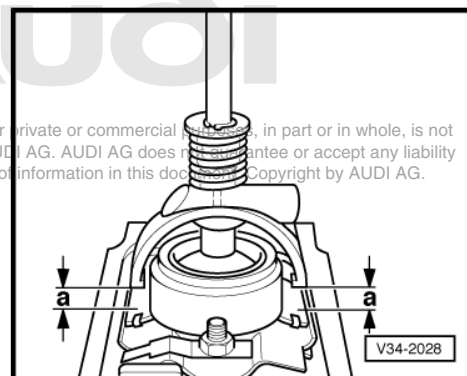
- Adjust gear lever as follows:
- ◆ Gear lever vertical
- ◆ Distance -a- between ball stop buffers and ball housing should be equal on both sides.



Note

The illustration shows the gear lever from behind (looking towards the front of the vehicle).

- Align gear lever so that it is angled slightly to the rear.
- Hold gear lever in this position (second mechanic required).
- Tighten bolt securing selector rod under vehicle to 23 Nm.



Note

The gear lever must remain in the same position while the bolt is being tightened.

- Install heat shield.

1.3.1 Checking gear lever adjustment

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Depress clutch.
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
- Put gear lever into the 5th/reverse gear gate and move gear lever towards reverse gear (without applying excessive pressure on the gear lever).
- ◆ The amount of travel until contact is made with reverse gear lock should measure 5 ... 10 mm (measured at gear knob).
- Reduce pressure on gear lever to let it move back.
- ◆ The gear lever should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- Check fine adjustment if necessary.

Fine adjustment

- If the gear lever setting is incorrect it can be adjusted as follows:
- Loosen nuts for ball housing.
- Move gear lever with ball housing to the right towards 5th/reverse gate as far as the stop in the gearbox, and hold in this position.
- When doing this push the ball housing to left against the gear lever.
- Then hold gear lever and ball housing in this position and tighten.
- Fit boot, cover and gear knob.



Note

*If only 5th gear and reverse gear cannot be engaged, check the 5th and reverse gear locking unit and renew if necessary
⇒ [page 105](#).*

1.4 Exploded view - servicing short-travel selector mechanism



Note

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- ◆ *Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ [Electronic parts catalogue](#).*
- ◆ *To remove the entire selector mechanism, first remove exhaust system ⇒ [Engine, mechanics; Rep. gr. 26](#).*
- ◆ *To dismantle selector mechanism without removing from vehicle, lower selector mechanism housing.*

1 - Gear knob

2 - Bush

3 - Boot

- ☐ Retaining hook on rear of cover; pry out carefully from centre console

4 - Mounting frame (top section)

5 - Mounting frame (bottom section)

6 - Bush

7 - Rubber ring

8 - Circlip

- ☐ Do not overstretch when fitting

9 - Spacer bush

10 - Spring

11 - Ball stop

- ☐ Insert spring and bush in ball stop and fit on gear lever so that spring and bush are on the right when looking forwards
- ☐ Install before fitting circlip
⇒ [Item 23 \(page 45\)](#)

12 - Spring

13 - Bush

- ☐ Installation position: rounded end faces gear lever

14 - Gear lever

- ☐ Can only be fitted into ball housing in one position

15 - Spacer tube

16 - Nut

- ☐ 8 Nm

17 - Nut

- ☐ 8 Nm

18 - Noise insulation

19 - Nut

- ☐ M6 - 10 Nm
- ☐ M8 - 23 Nm

20 - Connecting piece

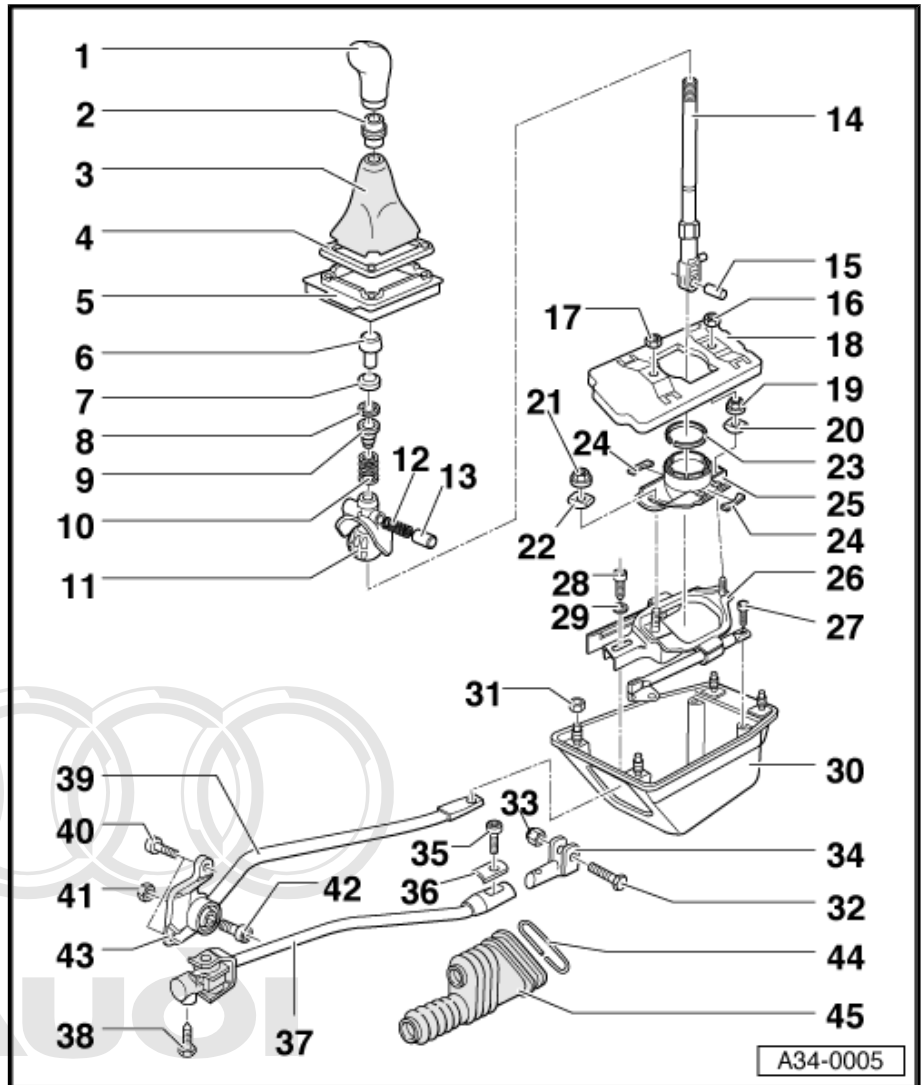
21 - Nut

- ☐ 23 Nm

22 - Connecting piece

23 - Circlip

- ☐ Renew
- ☐ Take out before removing ball stop



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- ☐ Installation position: rounded side faces ball housing ⇒ [Item 25 \(page 46\)](#)

24 - Buffer

25 - Ball housing

- ☐ Limit pieces for ball stop on left and right must be engaged
- ☐ Installation position: reverse detent faces left

26 - Push rod (rear)

27 - Bolt

- ☐ 10 Nm

28 - Bolt

- ☐ 23 Nm

29 - Washer

30 - Selector mechanism housing

31 - Nut

- ☐ 10 Nm

32 - Bolt

33 - Nut

- ☐ 10 Nm
- ☐ Self-locking
- ☐ Renew

34 - Selector fork

35 - Bolt

- ☐ 23 Nm

36 - Clamp

37 - Selector rod (front)

- ☐ With selector joint

38 - Bolt

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Renew

39 - Push rod (front)

- ☐ To avoid tension, first secure push rod (front) to selector mechanism housing and push rod (rear)
- ☐ Counterhold bolt ⇒ [Item 42 \(page 46\)](#) when tightening nut ⇒ [Item 41 \(page 46\)](#)
- ☐ Securing push rod from 06.96 onwards ⇒ [page 47](#)

40 - Bolt

- ☐ 40 Nm

41 - Nut

- ☐ 40 Nm

42 - Bolt

43 - Bracket for push rod

- ☐ Illustration shows method of securing push rod up to 05.96
- ☐ Securing push rod from 06.96 onwards ⇒ [page 47](#)

44 - Tensioning ring

45 - Boot

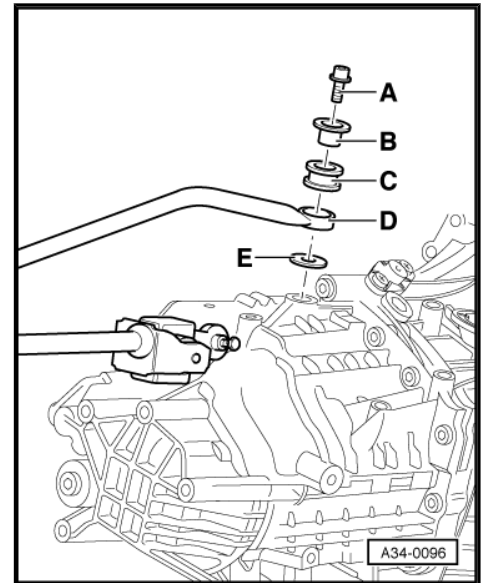
- ☐ Remove catalytic converter and heat shield before removing and installing
- ☐ Carefully pull over selector rod and push rod

- ❑ Align with markings on selector rod and push rod when installing

Securing push rod on gearbox from 06.96 onwards

From 06.96 onwards, push rod is bolted directly onto gearbox. Additional bracket ⇒ [Item 43 \(page 46\)](#) and bolts for bracket have been discontinued. The gearbox cover has been modified accordingly and now has an additional mounting boss.

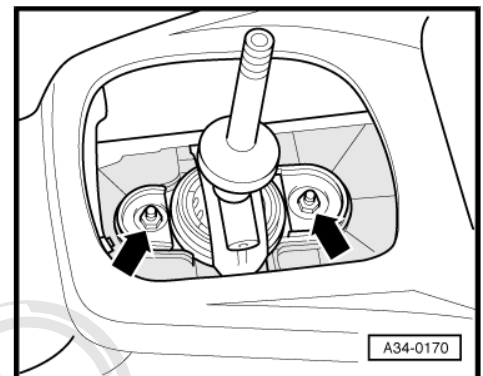
- A - Hexagon socket head bolt, 40 Nm
- B - Sleeve, convex side faces push rod
- C - Bonded rubber bush
- D - Push rod (front)
- E - Washer



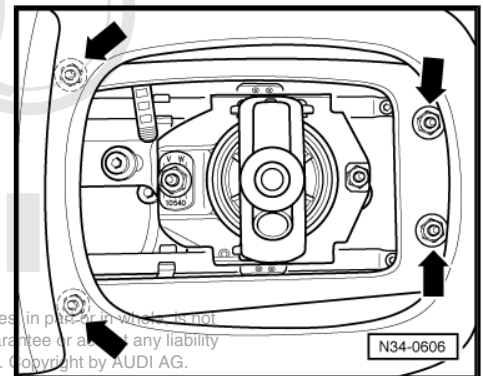
1.5 Removing and installing short-travel selector mechanism

Removing

- Remove gear knob and gear lever boot.
- Remove centre console ⇒ General body repairs, interior; Rep. gr. 68 .
- Detach noise insulation.
- Remove noise insulation for selector mechanism housing -arrows-.



- Remove nuts securing selector mechanism housing -arrows-.
- Remove rear section of exhaust system (rearward of clamp(s)) and, if necessary, front exhaust pipe with catalytic converter ⇒ Engine, mechanics; Rep. gr. 26 .
- Remove propshaft ⇒ [page 186](#) .



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- Remove selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.



Note

Shown in illustration on gearbox 012.

- Pivot selector mechanism housing downwards with selector rod and push rod, and remove.

Installing

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

- Push selector rod on so that the new securing bolt fits in the recess in the selector shaft.

- Then secure selector rod -arrow A-.
- Then bolt push rod to gearbox -arrow B-.

- Adjust selector mechanism ⇒ [page 48](#) .

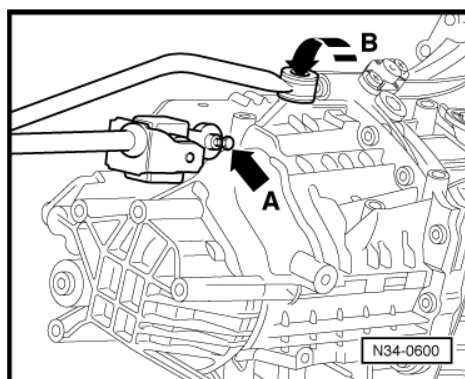
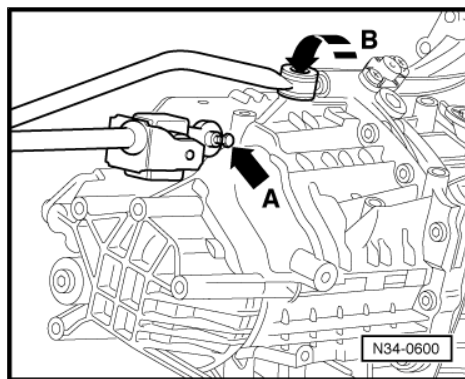
- Secure propshaft ⇒ [page 187](#) .

- Adjust propshaft ⇒ [page 192](#) .

- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .

Tightening torques

Component	Nm
Selector housing to body	10
Push rod to gearbox	40
Selector rod to gearbox	23 ¹⁾
• ¹⁾ Renew bolt.	

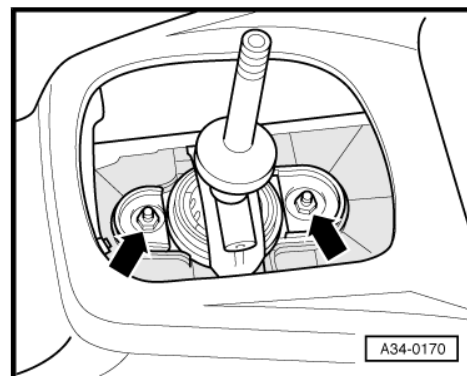


1.6 Adjusting short-travel selector mechanism

The following are prerequisites for correct gear lever alignment:

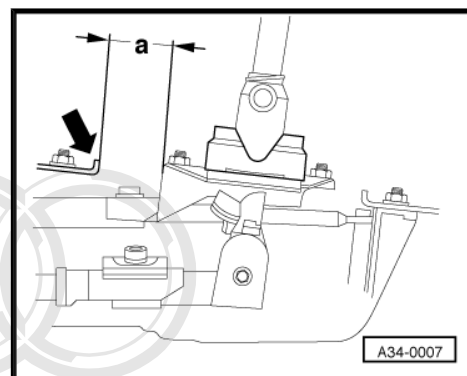
- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.
- Gearbox in neutral.
- Remove gear knob and gear lever boot.

- Remove noise insulation for selector mechanism housing -arrows-.
- Measure distance between body and rear push rod (in selector mechanism).



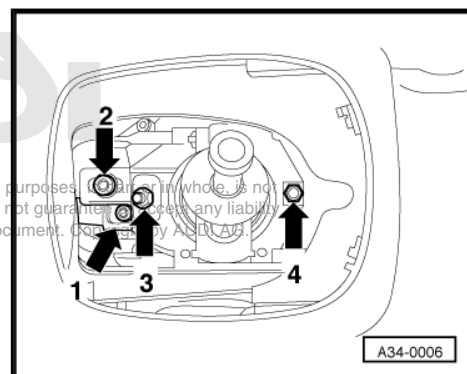
◆ Specification: distance -a- = 37 mm

- If distance measured is not correct, adjust dimension -a- as follows:

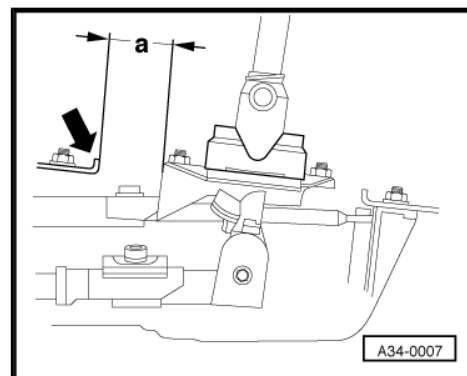


- Loosen bolt -arrow 2- for push rod.

◆ Rear push rod (in selector mechanism) should move freely in both directions on slide.

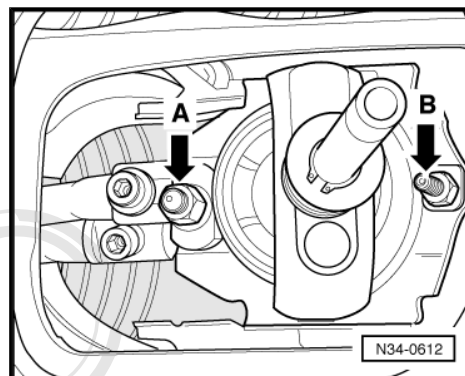


- Set to distance -a- by moving rear push rod (in selector mechanism).
- Tighten push rod bolt to 23 Nm.

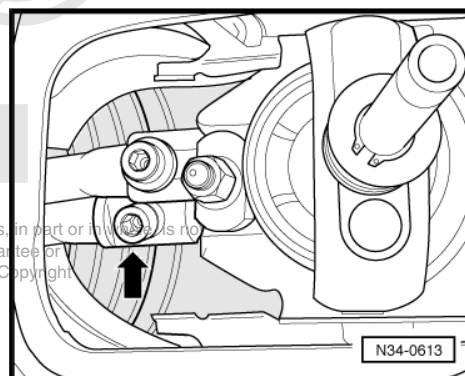


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- Loosen nuts for ball housing -arrow A- and -arrow B-.
- Align ball housing ⇒ [Item 25 \(page 46\)](#) horizontally.
- Tighten nuts for ball housing: -arrow A- to 25 Nm and -arrow B- to specified torque ⇒ [Item 19 \(page 45\)](#) .



- Slacken bolt -arrow- for selector rod.
- ◆ Connection between selector rod and selector mechanism should move freely.
- Align gear lever so that it is angled slightly to the rear.

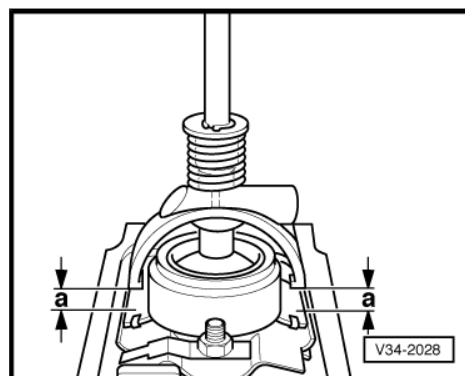


- ◆ Distance -a- between ball stop buffers and ball housing should be equal on both sides.
- Hold gear lever in this position (second mechanic required).
- Tighten bolt for selector rod to 23 Nm.



Note

The gear lever must remain in the same position while the bolt is being tightened.

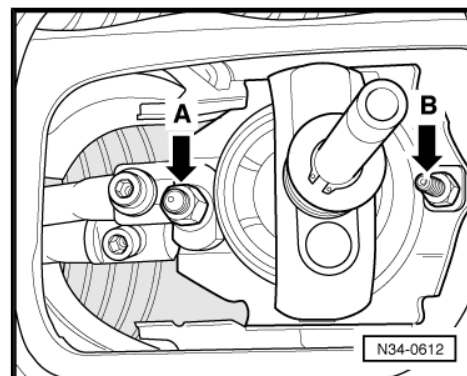


1.6.1 Checking gear lever adjustment

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Depress clutch.
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
- Put gear lever into the 5th/reverse gear gate and move gear lever towards reverse gear (without applying excessive pressure on the gear lever).
- ◆ The amount of travel until contact is made with reverse gear lock should measure 5 ... 10 mm (measured at gear knob).
- Reduce pressure on gear lever to let it move back.
- ◆ The gear lever should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- Check fine adjustment if necessary.

Fine adjustment

- If the gear lever setting is incorrect it can be adjusted as follows:
 - Loosen nuts for ball housing -arrow A- and -arrow B-.
 - Move gear lever with ball housing to the right towards 5th/reverse gate as far as the stop in the gearbox, and hold in this position.
 - When doing this push the ball housing to left against the gear lever.
 - Then hold gear lever and ball housing in this position and tighten nuts for ball housing. Tightening torques: -arrow A- to 25 Nm and -arrow B- to specified torque
⇒ [Item 19 \(page 45\)](#)
 - Fit boot, cover and gear knob.



Note

*If only 5th gear and reverse gear cannot be engaged, check the 5th and reverse gear locking unit and renew if necessary
⇒ [page 105](#).*

2 Servicing selector mechanism for vehicles from 05.99 onwards, vehicle identification number 8D-X-260 001



Identification: It is no longer necessary to press down the gear lever when engaging reverse gear.

Overview

- ◆ ⇒ „2.1 Exploded view - selector mechanism“, page 52
- ◆ ⇒ „2.2 Exploded view - servicing gear lever and push rod (rear)“, page 54
- ◆ ⇒ „2.3 Exploded view - servicing selector rod and push rod (front)“, page 55
- ◆ ⇒ „2.4 Removing and installing gear lever with push rod (rear)“, page 56
- ◆ ⇒ „2.5 Removing and installing selector mechanism from 05.99 onwards“, page 57
- ◆ ⇒ „2.6 Adjusting selector mechanism from 05.99 onwards“, page 59

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2.1 Exploded view - selector mechanism

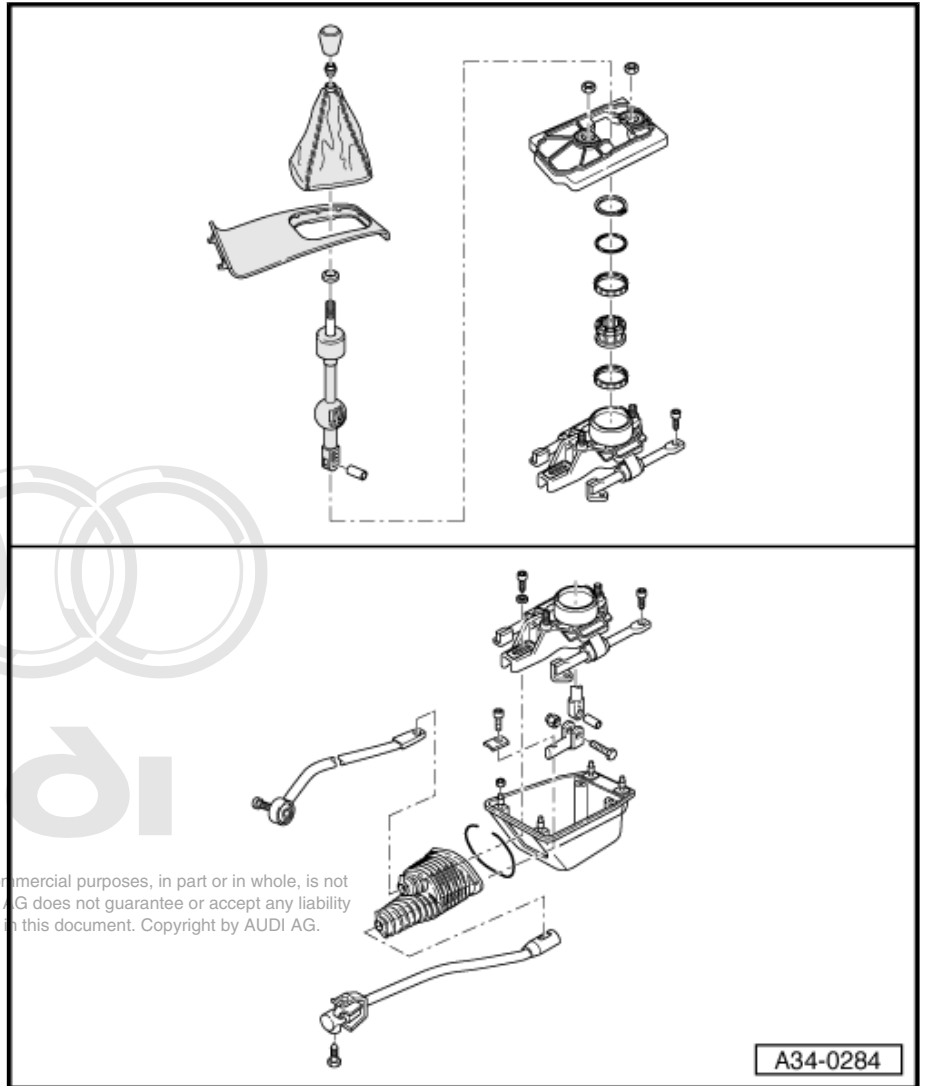


Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ Electronic parts catalogue .

I - Exploded view - servicing
gear knob, boot, gear lever and
push rod (rear) ⇒ [page 54](#)

II - Exploded view - servicing
selector rod and push rod
(front) ⇒ [page 55](#)



2.2 Exploded view - servicing gear lever and push rod (rear)

1 - Gear knob

2 - Bush

3 - Gear lever boot

4 - Cover for centre console

- ☐ Retainer on rear of cover; pry out carefully from centre console
- ☐ Removing and installing

⇒ [page 56](#)

5 - Bush

6 - Gear lever

- ☐ Grease area around bottom bore
- ☐ Grease ball

7 - Spacer tube

- ☐ Grease

8 - Nut

- ☐ 10 Nm

9 - Noise insulation

10 - Circlip

- ☐ Take out before removing ball stop

11 - Washer

12 - Rubber ring

13 - Ball socket

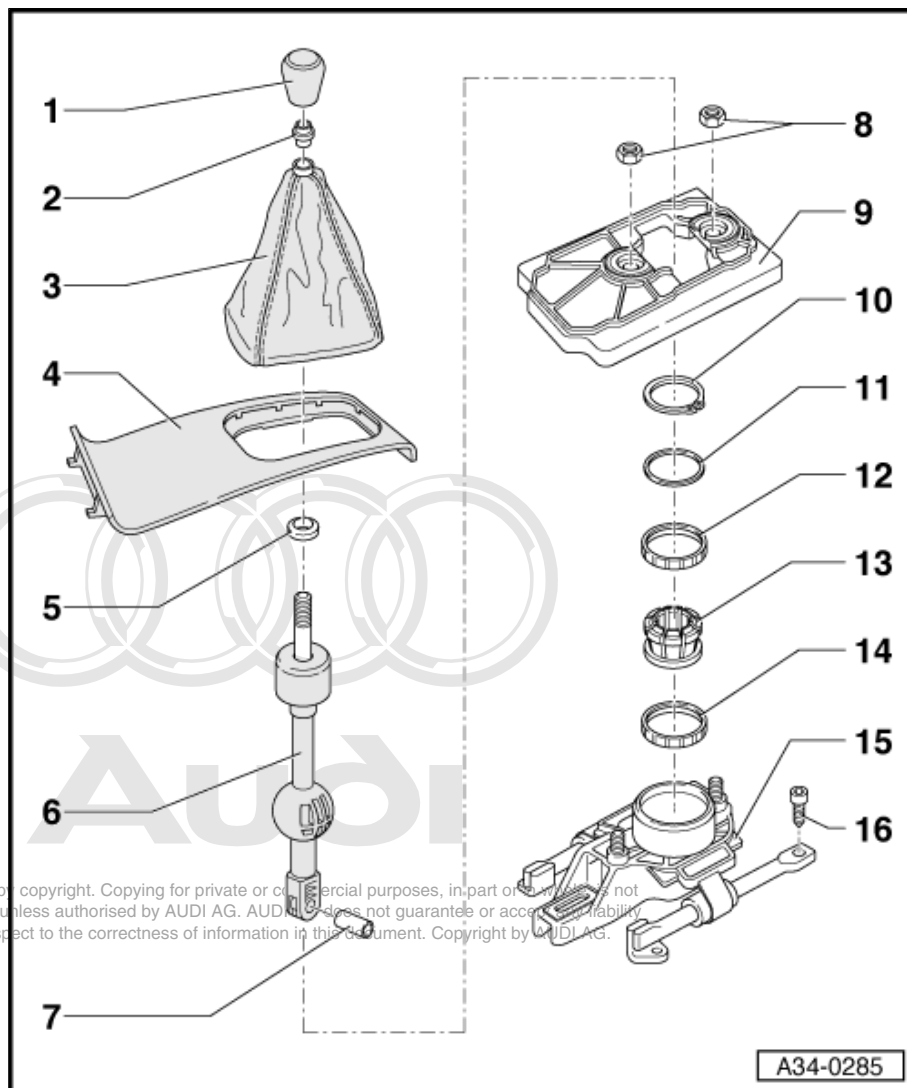
14 - Rubber ring

15 - Push rod (rear)

- ☐ With ball housing

16 - Bolt

- ☐ 6 Nm
- ☐ 4x
- ☐ For push rod (rear) to selector housing



2.3 Exploded view - servicing selector rod and push rod (front)

1 - Push rod (rear)

- ☐ With ball housing

2 - Bolt

- ☐ 6 Nm
- ☐ 4x
- ☐ Push rod (rear) to selector housing

3 - Hexagon socket head bolt

- ☐ 25 Nm

4 - Washer

5 - Hexagon socket head bolt

- ☐ 25 Nm

6 - Clamp

7 - Nut

- ☐ 10 Nm
- ☐ 4x
- ☐ Secures selector housing to body

8 - Nut

- ☐ 10 Nm
- ☐ Secures selector fork
- ☐ Self-locking
- ☐ Always renew

9 - Gear lever

10 - Spacer tube

- ☐ Grease

11 - Selector fork

12 - Bolt

- ☐ Secures selector fork

13 - Selector housing

14 - Tensioning ring

15 - Boot

- ☐ Remove catalytic converter and front heat shield before removing and installing



Note

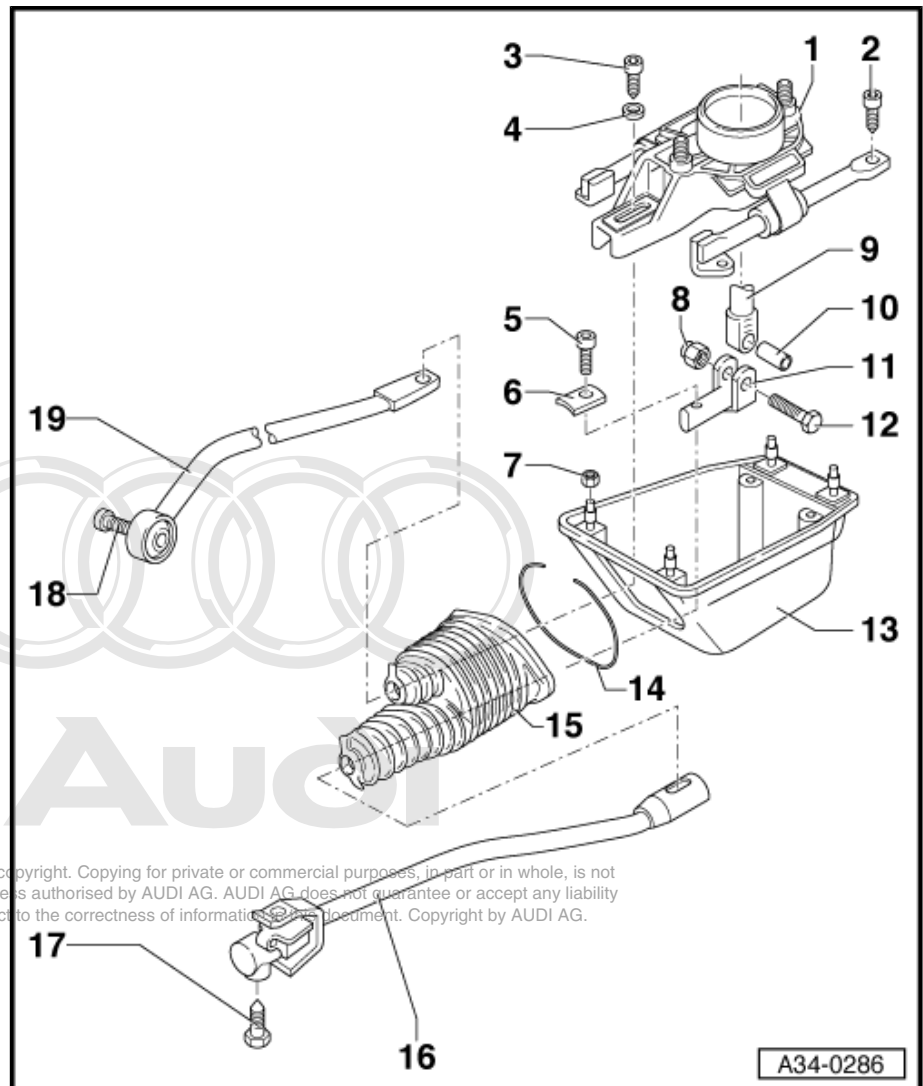
- ◆ Carefully pull boot over selector rod.
- ◆ Align boot with markings on selector rod and push rod.

16 - Selector rod

- ☐ With selector joint

17 - Bolt

- ☐ 23 Nm
- ☐ Self-locking



- ❑ Always renew

18 - Hexagon socket head bolt

- ❑ 40 Nm
- ❑ Cannot be removed from push rod (front) bearing bush

19 - Push rod (front)

- ❑ With bearing bush, bolt and washers

2.4 Removing and installing gear lever with push rod (rear)

Removing

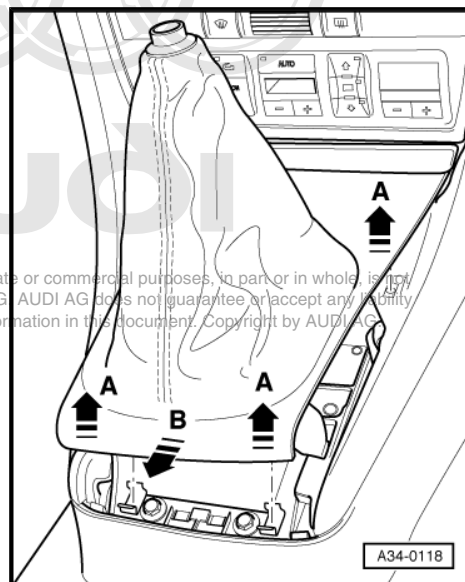
- Unscrew gear knob from gear lever.



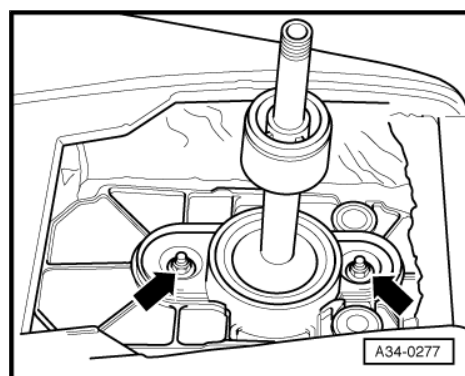
Note

The gear lever boot is removed together with the cover for the centre console.

- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.



- Unscrew noise insulation for selector housing -arrows-.



- Remove nuts -1- for selector housing.

This lowers the selector housing.

- Unscrew hexagon socket head bolt -2- and detach push rod.
- Unscrew hexagon socket head bolt -3- and detach selector rod.
- Then detach entire push rod (rear) from selector housing -arrows-.
- Remove gear lever with push rod (rear) from selector housing.

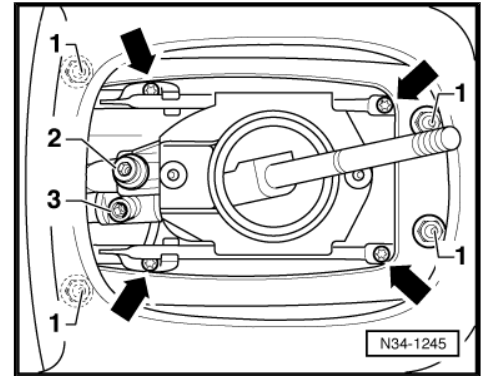
Installing

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

- Adjust selector mechanism ⇒ [page 59](#) .

Tightening torques

Component	Nm
Push rod (rear) to selector housing	6
Selector rod to selector fork/gear lever	25
Push rod (front) to push rod (rear)	25
Selector housing to body	10
Noise insulation for selector housing to push rod (rear)	10



2.5 Removing and installing selector mechanism from 05.99 onwards

Removing

- Unscrew gear knob from gear lever.

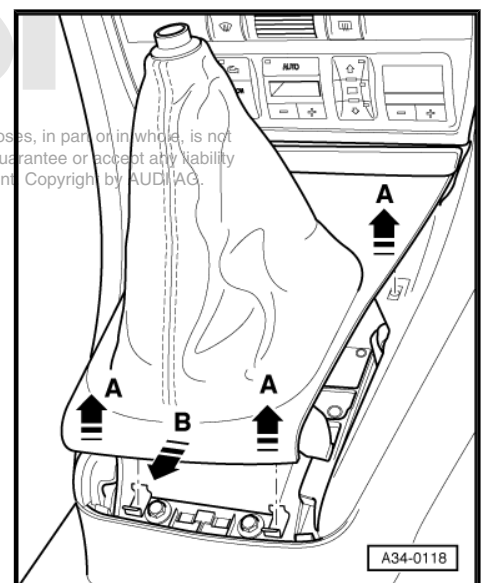


Note

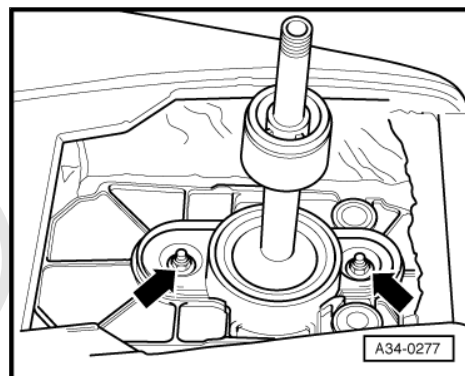
The gear lever boot is removed together with the cover for the centre console.

- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.

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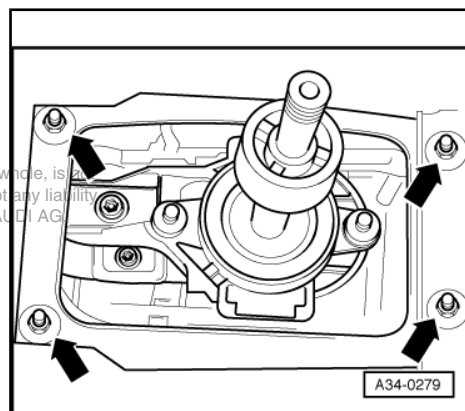


- Unscrew noise insulation for selector housing -arrows-.



- Unscrew nuts for selector housing -arrows-.
- Remove rear section of exhaust system (rearward of clamp(s)) and, if necessary, front exhaust pipe with catalytic converter
⇒ Engine, mechanics; Rep. gr. 26 .

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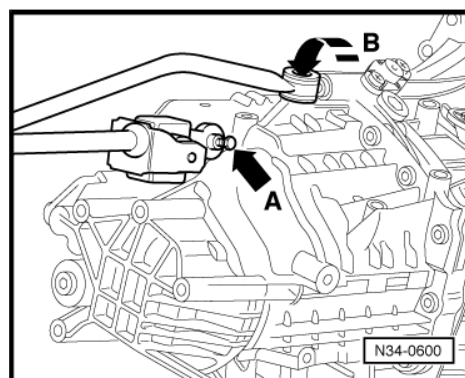
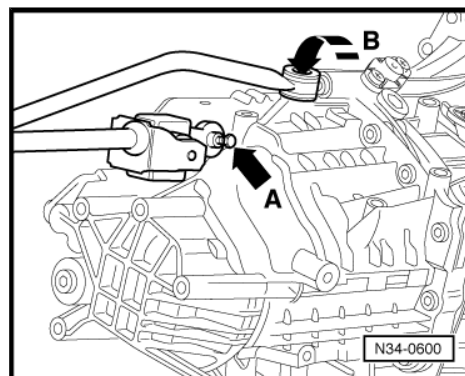


- Remove selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.
- Remove heat shield (front) above exhaust system.
- Pivot selector housing with selector rod and push rod downwards and remove.

Installing

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

- Push selector rod on so that the new securing bolt fits in the recess in the selector shaft.
- Then secure selector rod (-arrow A-).
- Then bolt push rod to gearbox (-arrow B-).
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .
- Adjust selector mechanism ⇒ [page 59](#) .



Tightening torques

Component	Nm
Noise insulation for selector housing to push rod (rear)	10
Selector housing to body	10
Push rod to gearbox	40
Selector rod to gearbox	23 ¹⁾
• ¹⁾ Renew bolt.	

2.6 Adjusting selector mechanism from 05.99 onwards

The following are prerequisites for correct gear lever alignment:

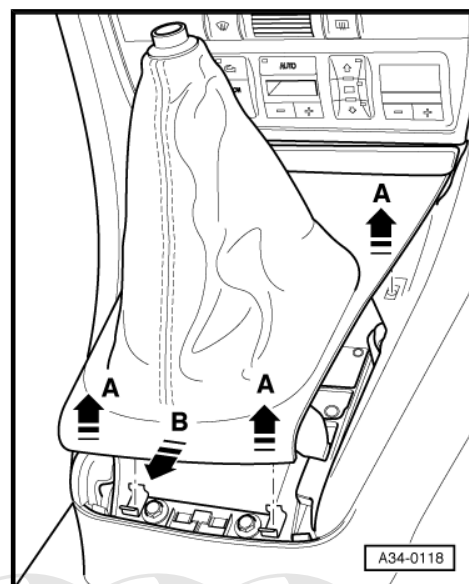
- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.
- Gearbox in neutral.
- Unscrew gear knob from gear lever.



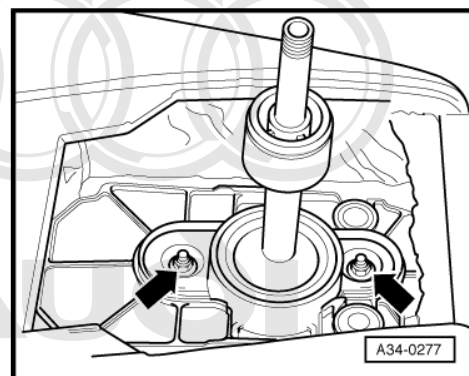
Note

The gear lever boot is removed together with the cover for the centre console.

- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.

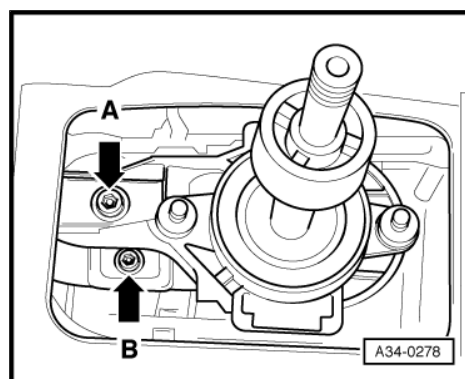
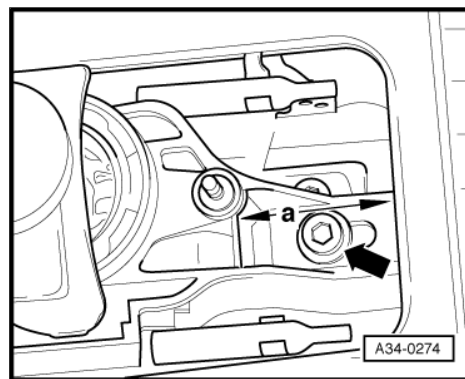


- Unscrew noise insulation for selector housing -arrows-.



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- Measure distance between body and rear push rod (in selector mechanism).
- ◆ Specification: distance -a- = 41 mm
- If distance measured is not correct, adjust dimension -a- as follows:
- Loosen bolt -arrow- for push rod.
- ◆ Rear push rod (in selector mechanism) should move freely in both directions on slide.
- Set to distance -a- by moving rear push rod (in selector mechanism).
- Tighten bolt for push rod -arrow- to 25 Nm.
- Loosen bolt for selector rod -arrow B-.
- ◆ Connection between selector rod and selector mechanism should move freely.



Adjust gear lever as follows:

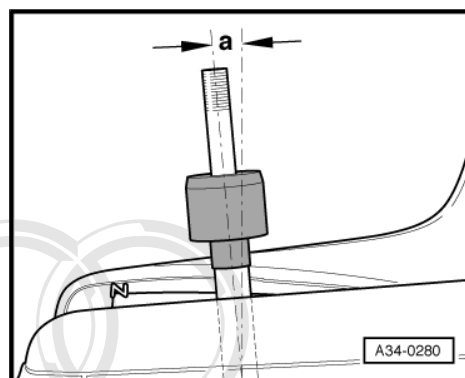
- ◆ Gear lever is vertical in direction of travel.
- ◆ Gear lever inclined slightly to the rear (angle -a- approx. 5°).



Note

The illustration shows the gear lever from the right.

- Hold gear lever in this position.
- Tighten bolt for selector rod to 25 Nm.



Note

The gear lever must remain in the same position while the bolt is being tightened.

2.6.1 Checking gear lever adjustment

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Depress clutch.
- Select all gears several times. Pay particular attention to the operation of the reverse gear locking mechanism.
- The gear lever should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- It should only be possible to engage reverse gear after moving the gear lever into the 3rd/4th gate in neutral.

- It should not be possible to select reverse gear directly from 5th gear.



Note

If it is possible to select reverse gear directly from 5th gear, or if only 5th gear and reverse cannot be engaged, the locking unit for 5th and reverse gear should be checked and if necessary renewed ⇒ [page 105](#).

- Fit boot, cover and gear knob.



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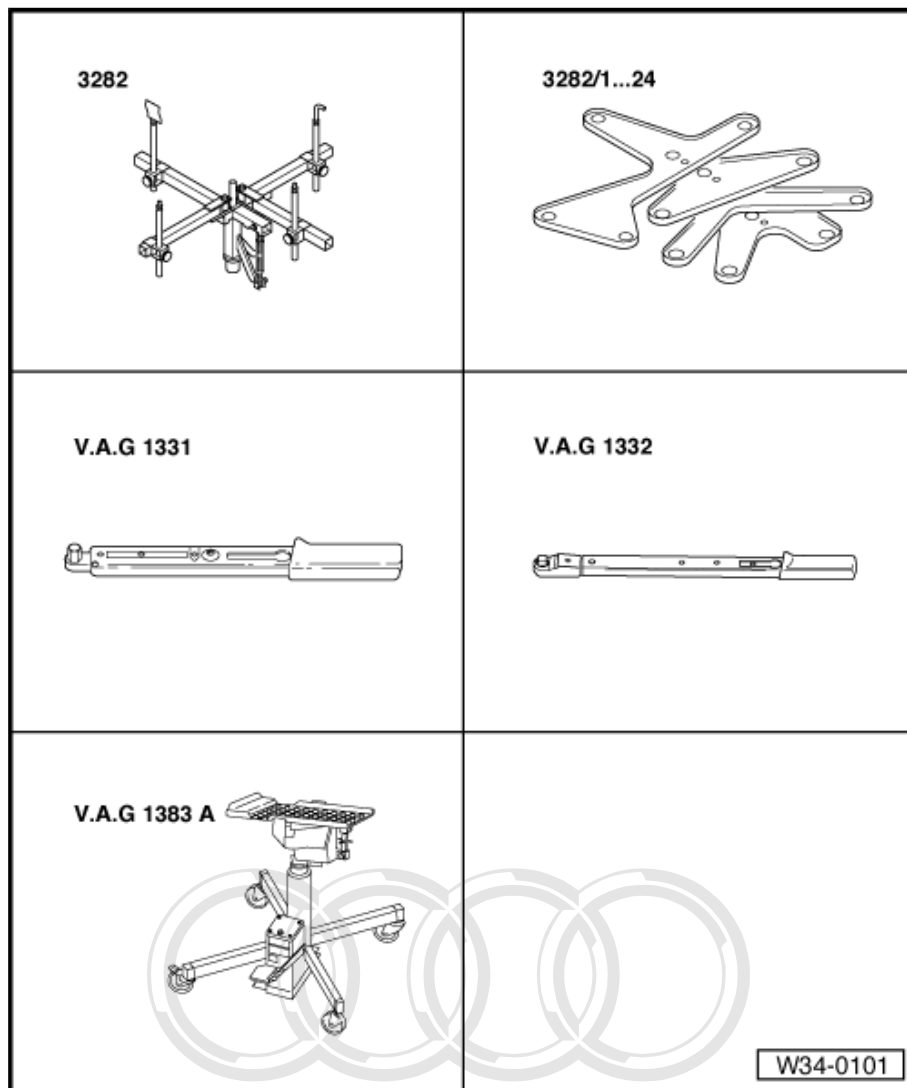
3 Removing and installing gearbox

Overview

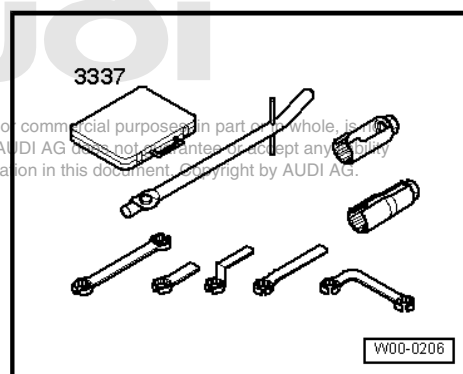
- ◆ ⇒ „3.1 Removing gearbox“, page 63
- ◆ ⇒ „3.2 Installing gearbox“, page 69
- ◆ ⇒ „3.3 Transporting gearbox“, page 72

Special tools and workshop equipment required

- ◆ Gearbox support -3282-
- ◆ Adjustment plate -3282/10-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Engine and gearbox jack - V.A.G 1383 A-



- ◆ Set of open ring spanners for lambda probe -3337-



3.1 Removing gearbox

Note

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

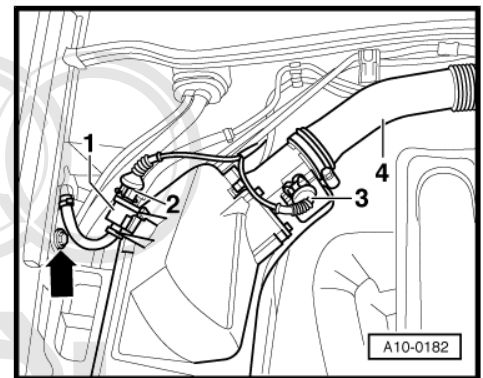
Caution

◆ *Follow steps required when disconnecting battery ➔ Electrical system; Rep. gr. 27.*

- Obtain radio code on vehicles with coded radio.
- With the ignition switched off, disconnect battery earth strap.

Vehicles with 4-cylinder normally aspirated engine:

- Unplug connectors -2- and -3- at air mass meter and ACF valve.
- Pull ACF valve -1- off air cleaner housing.
- Remove O-type clips from air duct -4-.
- Remove air cleaner housing -arrow-; air duct -4- remains installed.
- Remove nuts for exhaust manifold/front exhaust pipe ➔ Engine, mechanics; Rep. gr. 26.



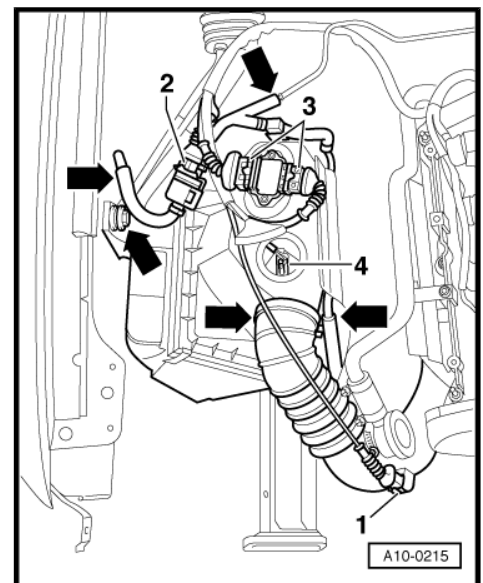
Note

Flexible element in front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

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Vehicles with 4-cylinder turbo engine:

- Disconnect wires/connectors:
 - 1 - At solenoid valve for charge pressure control -N75-
 - 2 - At ACF valve
 - 3 - At output stage -N122-
 - 4 - At air mass meter
- Disconnect hoses and remove air cleaner housing -arrows-.
- Unbolt coolant expansion tank and move it to one side.

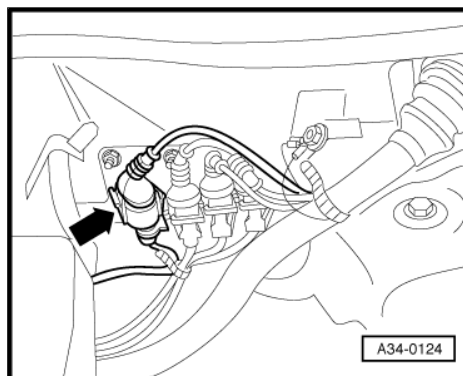


- Unplug connector for lambda probe -arrow- and move wiring clear.
- Remove nuts for turbocharger/front exhaust pipe ⇒ Engine, mechanics; Rep. gr. 26 .



Note

Flexible element in front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

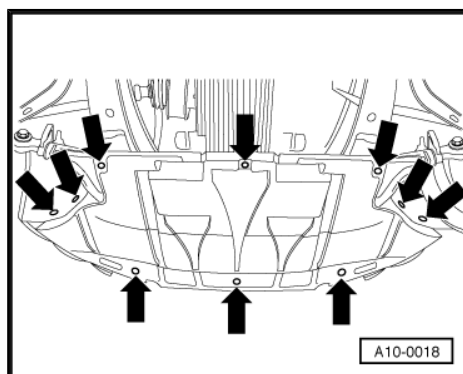
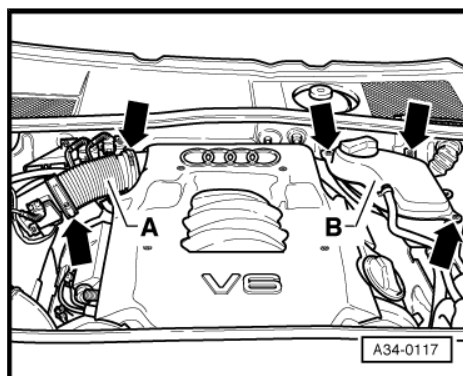


Vehicles with 6-cylinder engine:

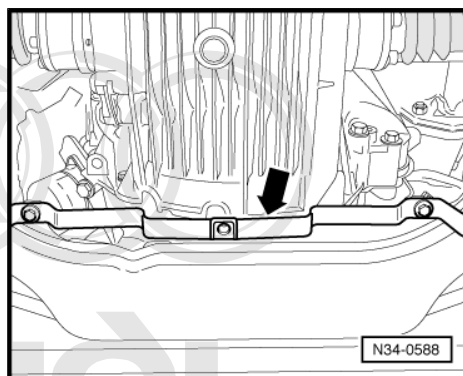
- Remove intake hose -A- -arrows-.
- Unbolt coolant expansion tank -B- -arrows- and place to one side.
- Detach Lambda probes from exhaust pipes (left and right) using Lambda probe open ring spanner set -3337- and move clear to the side.

All vehicles:

- Unscrew engine/gearbox securing bolts accessible from above.
- Remove noise insulation -arrows-.

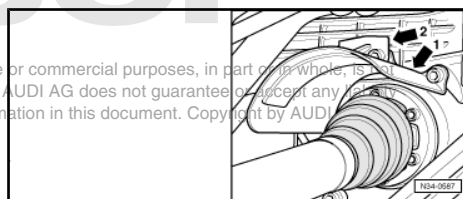


- Unbolt bracket for noise insulation -arrow-.

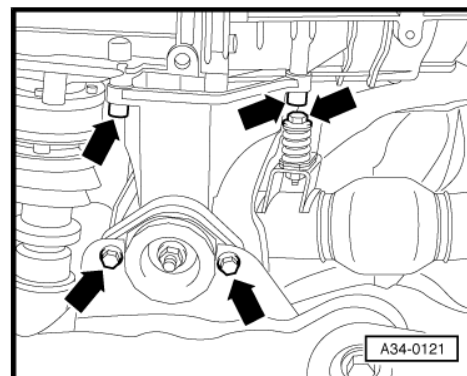


Vehicles with 4-cylinder engine:

- Detach heat shields -arrow 1- and -arrow 2- above right-hand drive shaft.

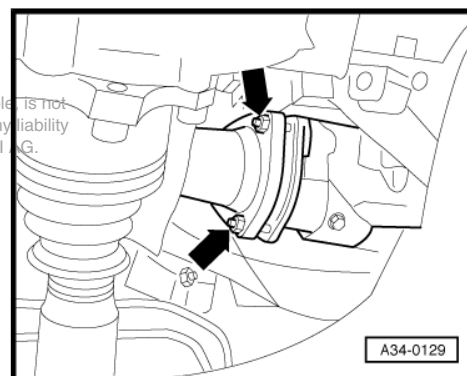


- Unbolt right-hand gearbox support complete with bonded rubber mounting -arrows-
- Release clamps on exhaust system and push them towards catalytic converter.
- Pull catalytic converter out downwards together with exhaust pipe.



Vehicles with 6-cylinder engine:

- Detach heat shield above left and right drive shafts.
- Unbolt front exhaust pipes with catalytic converters (left and right) from exhaust manifold -arrows- (3 nuts on each side) → Engine, mechanics; Rep. gr. 26 .



- Remove engine speed sender -G28- on left of gearbox -arrow- and move clear.

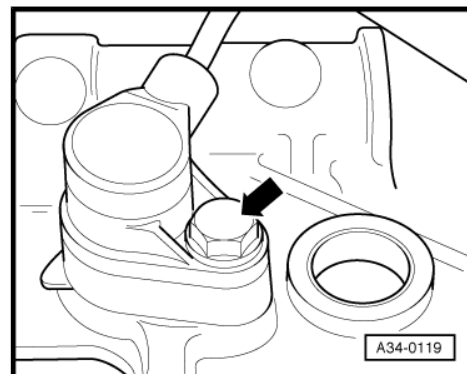
All vehicles:

- Detach drive shafts from flange shafts and place them on transverse links.

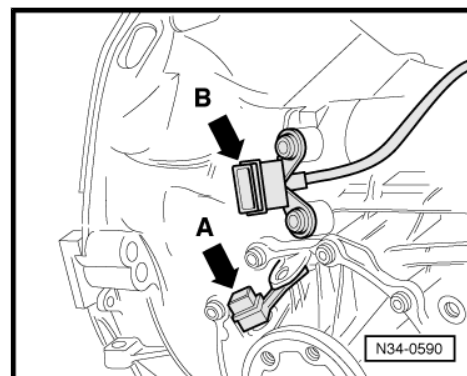


Note

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



- Unplug connector from speedometer sender -G22- -arrow A-.
- Unplug connector from reversing light switch -F4- (multi-function sender) -arrow B-.
- Disconnect all other electrical connections and earth wires from gearbox and from engine/gearbox securing bolts.

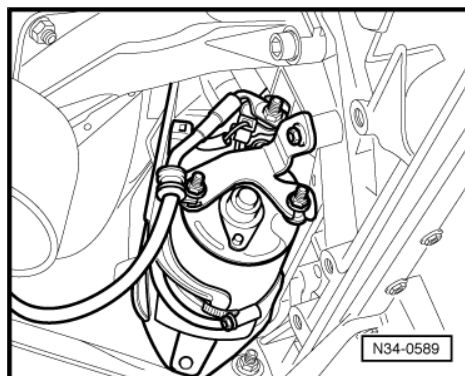


- Detach starter from engine/gearbox and secure if necessary
⇒ Electrical system; Rep. gr. 27 .



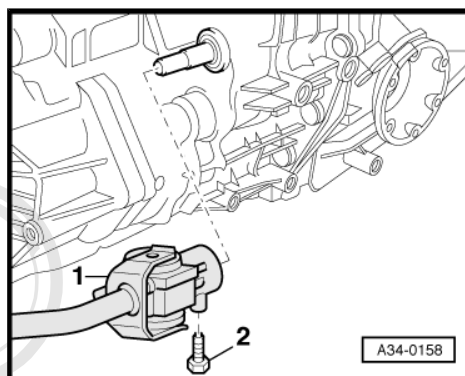
Note

Starter cables do not need to be disconnected.



Vehicles with standard-travel selector mechanism:

- Remove bolt -2- at selector joint -1- on selector rod.



Vehicles with short-travel selector mechanism and selector mechanism from 05.99 onwards:

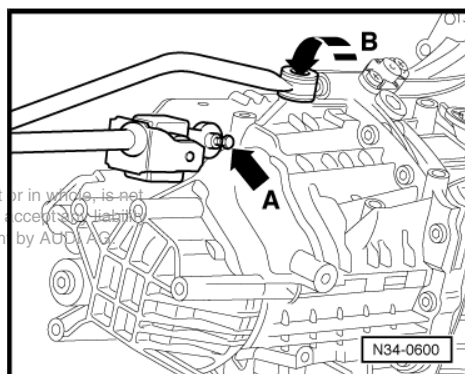
- Remove selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.



Note

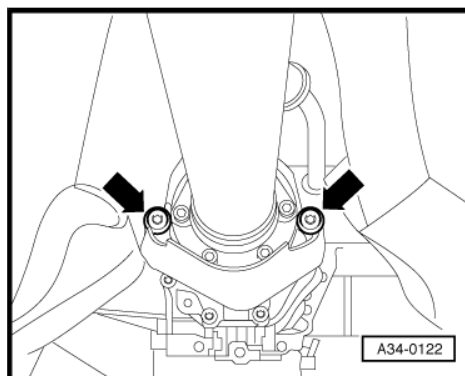
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Shown in illustration on manual gearbox 012.

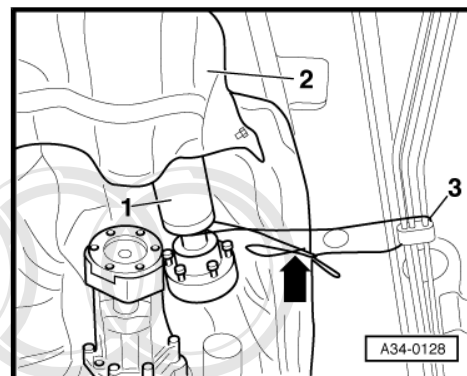


All vehicles:

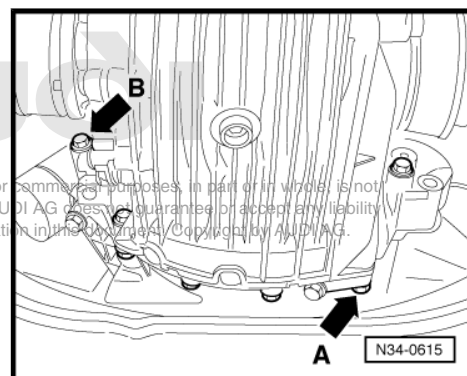
- Remove heat shield for propshaft from cover for centre differential -arrows-.



- Unbolt propshaft -1- from gearbox and rest it on heat shield -2-.
- Use wire -arrow- to secure propshaft to bracket -3- for fuel pipes.



- Unscrew bottom engine/gearbox securing bolts, except for bolts indicated by arrows -A- and -B-.



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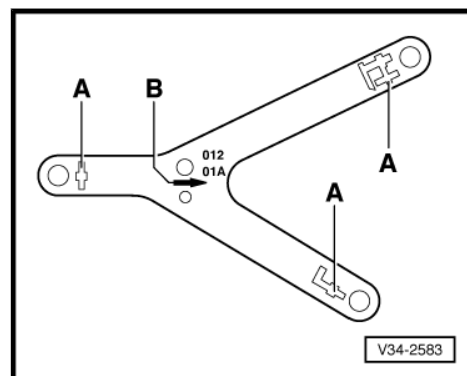
- To remove manual gearbox 01A (four-wheel drive) set up gearbox support -3282- with adjustment plate -3282/10- and place on engine and gearbox jack -V.A.G 1383 A- .

A - Support elements



Note

- ◆ The support elements are shown in schematic form -A-, arrow -B- points in the direction of travel.
- ◆ Adjustment plate -3282/10- can only be fitted in one correct position.

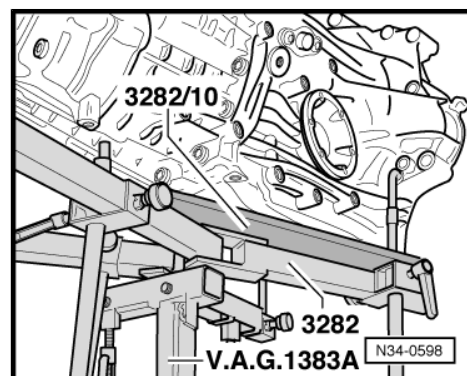


- Place engine and gearbox jack -V.A.G 1383 A- with gearbox support -3282- underneath gearbox and support gearbox.

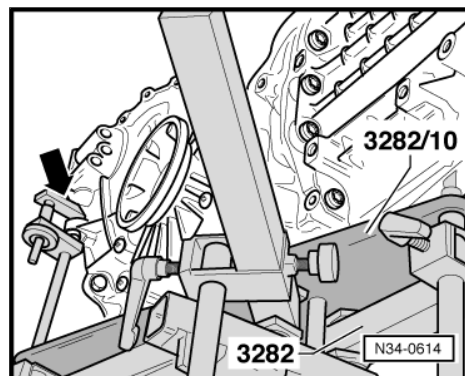


Note

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

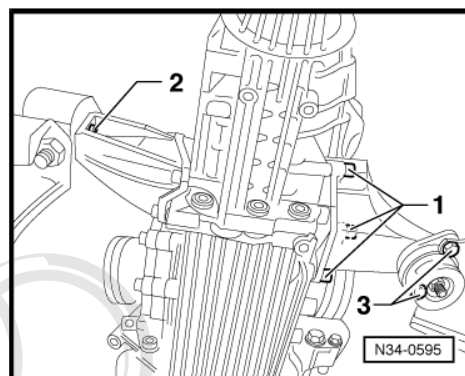


- Align adjustment plate -3282/10- parallel to gearbox and lock safety support -arrow- on gearbox.



Vehicles with 4-cylinder engine:

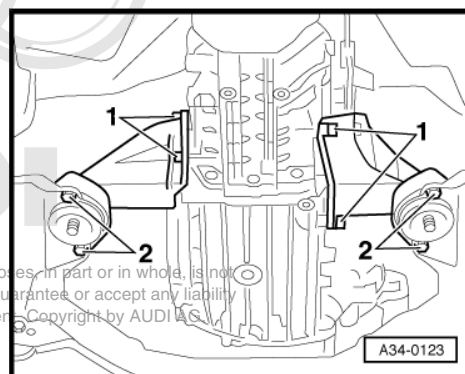
- Unbolt gearbox support (left-side) from bonded rubber mounting. -2-.



Vehicles with 6-cylinder engine:

- Unbolt gearbox supports on both sides complete with bonded rubber mountings from gearbox and subframe -1- and -2-.

All vehicles:

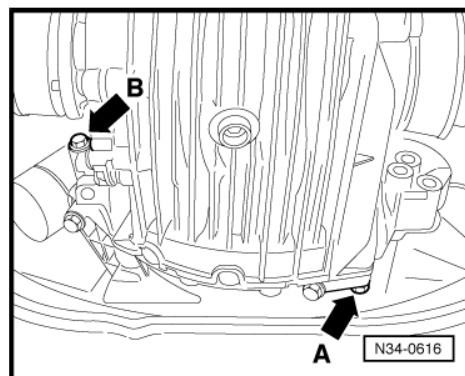


- Remove remaining engine/gearbox securing bolts -arrow A- and -arrow B-.
- Press gearbox off dowel sleeves and lower carefully with engine and gearbox jack -V.A.G 1383 A- just far enough to gain access to the clutch slave cylinder.



Note

When lowering gearbox, take care not to damage pipe/hose assembly for clutch slave cylinder.



- Detach clutch slave cylinder from gearbox -arrow- and secure with wire; do not open pipe/hose system.



Caution

Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

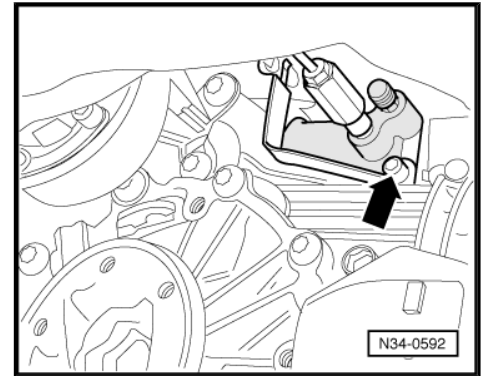
- Lower gearbox.



Note

When lowering gearbox, make sure there is sufficient clearance from drive shafts.

- Before carrying out assembly work, secure gearbox with gearbox support -VW 353- or retaining plate -VW 309- to assembly stand or engine and gearbox support -VAS 6095-
⇒ [page 75](#) .



3.2 Installing gearbox

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

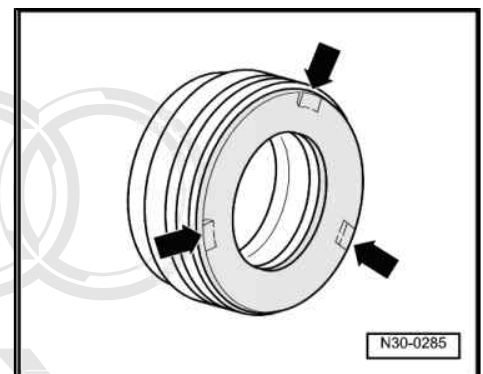
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines -G 000 100- to the splines. Do not grease the guide sleeve.
- It should be possible to push the clutch plate back and forth slightly on the input shaft.
- Check clutch release bearing for wear and renew if necessary
⇒ [Item 8 \(page 31\)](#) .
- If plastic ring -arrows- has come loose, service release bearing as required ⇒ [page 31](#) .



Note

The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.

- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing gearbox, tie electrical wires and brackets off to one side so that they are **not trapped between the engine and the gearbox**.
- Before installing, use a thread tap to clean all remaining locking fluid out of tapped holes for bolted connection between clutch slave cylinder and gearbox and between selector joint and selector rod.
- Renew all self-locking nuts.



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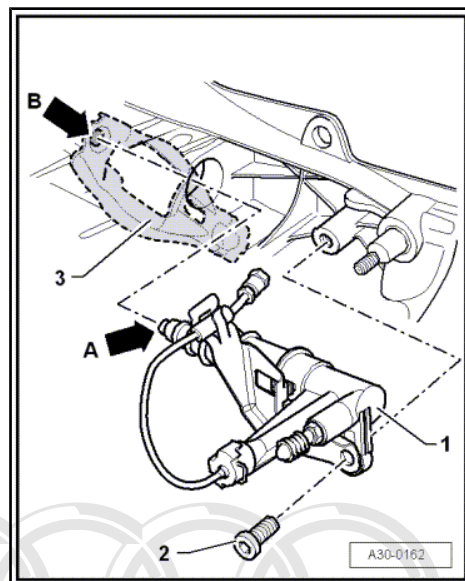
- Lightly lubricate surface where plunger and clutch release lever make contact -arrow B- using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder with bracket for pipe/hose assembly.
- Guide slave cylinder -1- into opening in gearbox housing, keeping it as straight as possible (without tilting plunger -arrow A-) and insert in recess -arrow B- on clutch release lever -3-.



Note

If the slave cylinder -1- is inserted at an angle, there is a danger that the plunger -arrow A- will be guided past the clutch release lever -3-.

- Secure slave cylinder with new bolt -2-. Tightening torque
⇒ [Item 2 \(page 30\)](#)
- When aligning the gearbox with the engine, turn crankshaft back and forth slightly to make it easier to insert the gearbox input shaft splines into the clutch plate.



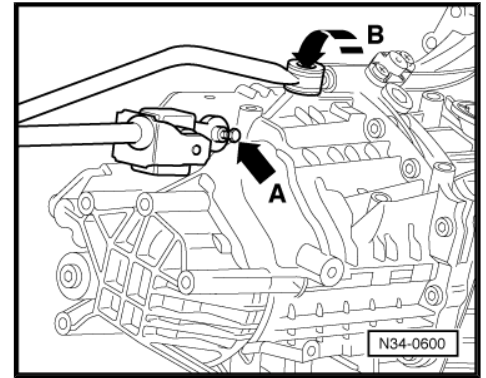
Caution

- ◆ **Press the clutch pedal carefully after installing the gearbox.**
- ◆ **If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further.**
- ◆ **The plunger of the slave cylinder is likely to have been guided past the clutch release lever.**
- ◆ **The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.**
- ◆ **For comparison: normal pedal force is approx. 115 N.**

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- Screw in bottom engine/gearbox securing bolts and bolts for starter; at the same time, install starter ⇒ Electrical System; Rep. gr. 27 .
- Tighten top bolts securing engine to gearbox to specified torque ⇒ [page 71](#) .
- Push selector rod on so that the new securing bolt fits in the recess in the selector shaft.

- Then secure selector rod -arrow A-.
- Then bolt push rod to gearbox -arrow B-.
- If previously removed, install gearbox supports with bonded rubber mountings. Tightening torque ➔ [page 71](#)
- Bolt drive shafts to flange shafts ➔ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Before installing, use a thread tap to clean all remaining locking fluid out of tapped holes in gearbox flange shaft for connection to propshaft.
- Renew gaskets on front of propshaft ➔ [Item 2 \(page 187\)](#) and on drive shafts.
- Secure propshaft ➔ [page 187](#) .
- Install exhaust system so it is free of stress ➔ Engine, mechanics; Rep. gr. 26 .
- Check selector mechanism setting and adjust if necessary.
- ◆ ➔ [„1.3 Adjusting standard-travel selector mechanism“, page 42](#)
- ◆ ➔ [„1.6 Adjusting short-travel selector mechanism“, page 48](#)
- ◆ ➔ [„2.6 Adjusting selector mechanism from 05.99 onwards“, page 59](#)
- Check gear oil level in gearbox ➔ [page 74](#) .
- Follow steps required after connecting battery ➔ Electrical system; Rep. gr. 27 .



Tightening torques

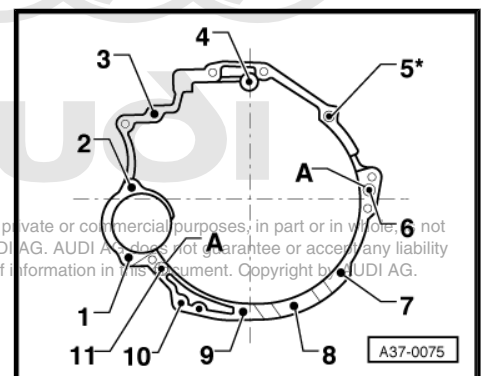


Note

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is $\pm 15\%$.*

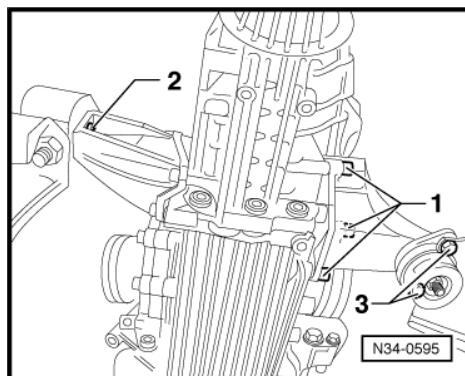
Engine (4-cylinder) to gearbox

Item	Bolt	Nm
1, 3, 4	M12 x 67	65
2, 6	M12 x 90	65
5, 11	M12 x 110	65
7 ... 10	M10 x 45	45
A	Dowel sleeves for centralising	



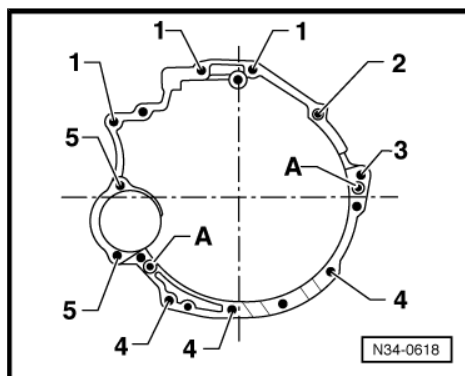
Engine/gearbox assembly mountings (4-cylinder)

Item	Bolt	Qty.	Nm
1	M10 x 30	3	40
2	M10 x 35	1	50
3	M8 x 20	2	23



Engine (6-cylinder) to gearbox

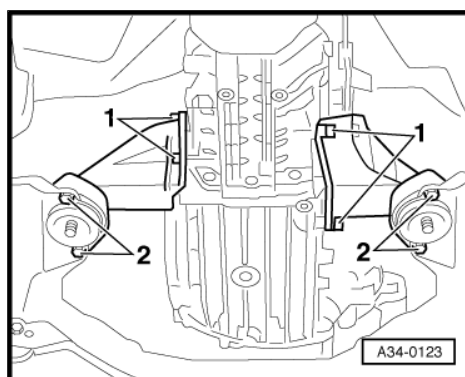
Item	Bolt	Qty.	Nm
1	M12 x 67	3	65
2	M12 x 90	1	65
3	M12 x 80	1	65
4	M10 x 45	3	45
5	M10 x 135	1	45
5 ¹⁾	M12 x 130	1	65
A	Dowel sleeves for centralising		
• ¹ Top starter bolt			



Engine/gearbox assembly mountings (6-cylinder)

Item	Bolt	Qty.	Nm
1	M10 x 35	3	40
2	M8 x 20	2	23

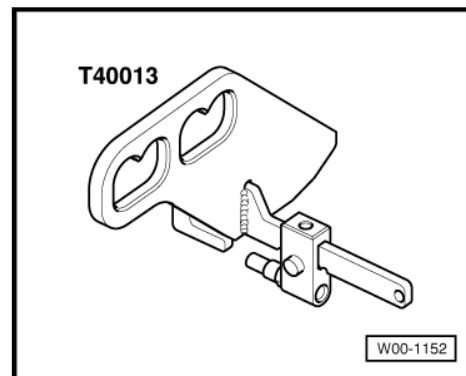
Component	Nm
Engine speed sender -G28-	10
Heat shields above drive shafts to gearbox	23
Selector rod/selector joint to gearbox ¹⁾	23
Push rod to gearbox	40
Propshaft to manual gearbox ¹⁾	55
Heat shield for propshaft to centre differential cover	25
Catalytic converter to mounting lugs	25
Front exhaust pipe to turbocharger/exhaust manifold	25
Clamp for exhaust pipe	40
Bracket for noise insulation to subframe	10
• ¹⁾ Renew bolts	



3.3 Transporting gearbox

Special tools and workshop equipment required

◆ Lifting aid -T40013-



The lifting aid -3282- can be used to transport the gearbox and also when setting up the gearbox on gearbox support -T40013-.

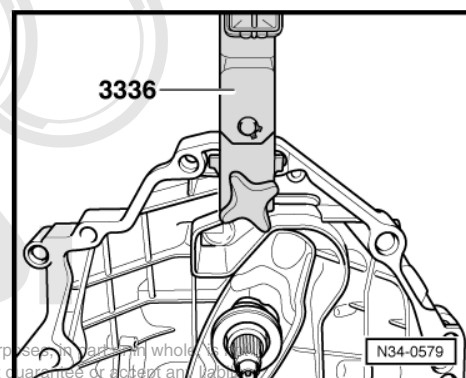
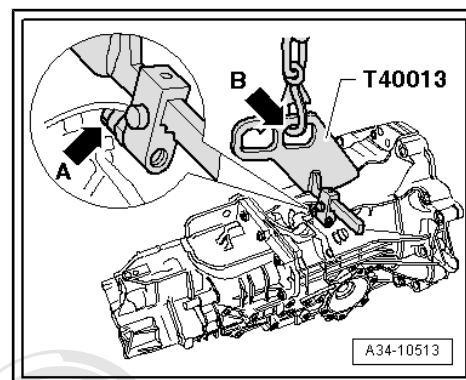
- Insert lifting aid -T40013- in drillings on gearbox housing -arrow A- and secure.
- Push together adjusting mechanism of lifting aid as far as stop.



Note

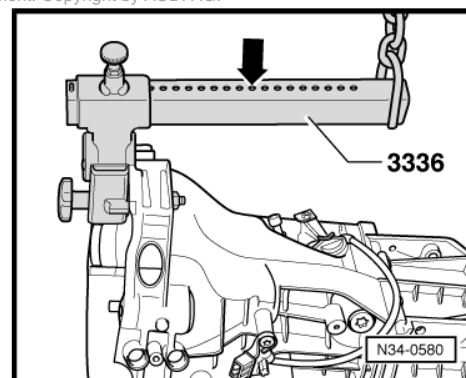
The illustration shows gearbox 012.

- Engage hook of workshop hoist in 2nd notch -arrow B- on lifting aid.
- Lift gearbox with workshop hoist and lifting aid.



Note

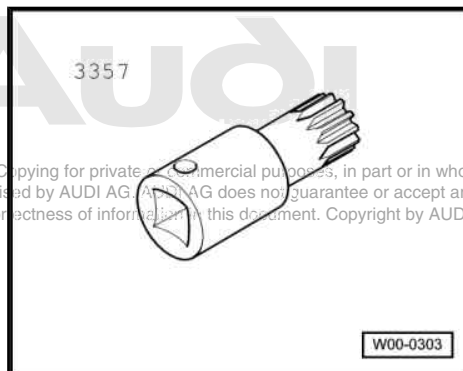
- ◆ Gearbox can also be transported using gearbox lifting tackle -3336- (bolt onto clutch housing),
- ◆ Set support arm on sliding bracket by means of locking pin -arrow-. Number of holes visible = 17.



4 Checking oil level in manual gearbox

Special tools and workshop equipment required

- ◆ Multi-point bit -3357-

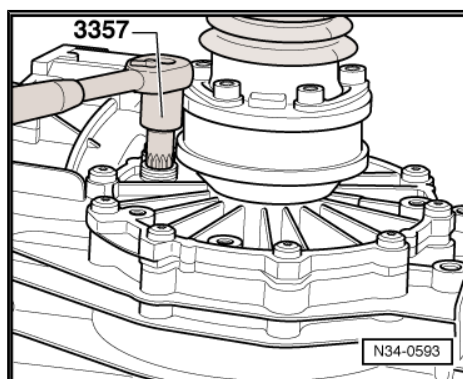


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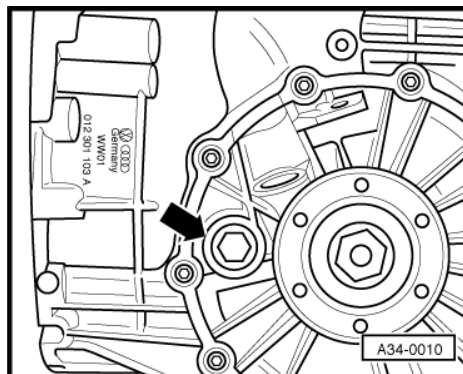


Note

- ◆ The vehicle must be horizontal when checking gear oil level. An inspection pit or a 4-post lifting platform is ideal.
- ◆ The oil filler plug is on the left of the gearbox below the speedometer sender; it may be concealed by the heat shield for the drive shaft.
- ◆ Use either multi-point bit -3357- or Allen key (17 mm) (according to plug version) to loosen gear oil filler plug.



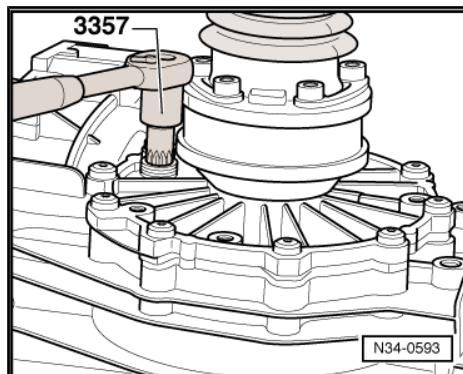
- To check oil level, unscrew oil filler plug -arrow-.
- ◆ Specification: oil level up to bottom lip of filler hole
- Top up with gear oil if necessary. Specifications ⇒ Electronic parts catalogue .



- Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	25

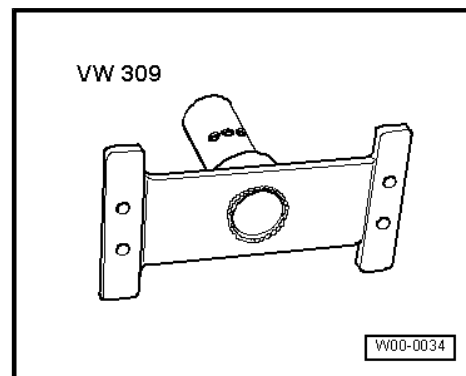


5 Securing gearbox to assembly stand

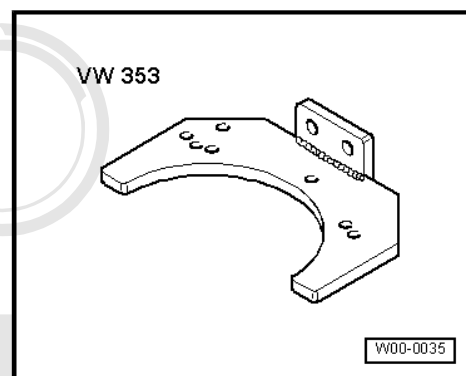
5.1 Special tools, testers and auxiliary items required

Special tools and workshop equipment required

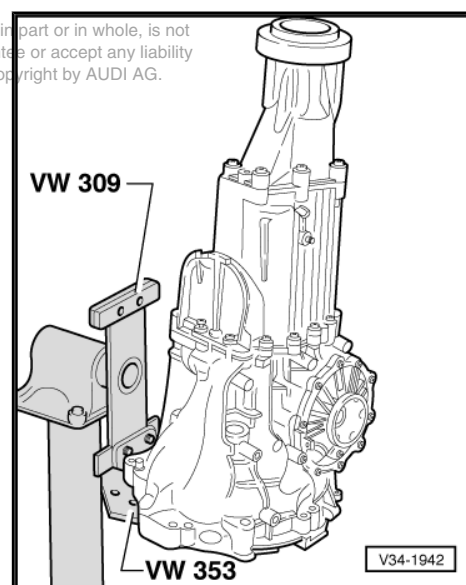
- ◆ Support plate -VW 309-



- ◆ Gearbox support -VW 353-



- To carry out repairs, secure gearbox to assembly stand or engine and gearbox support -VAS 6095- with gearbox support -VW 353- and support plate -VW 309-.



6 Dismantling and assembling gearbox

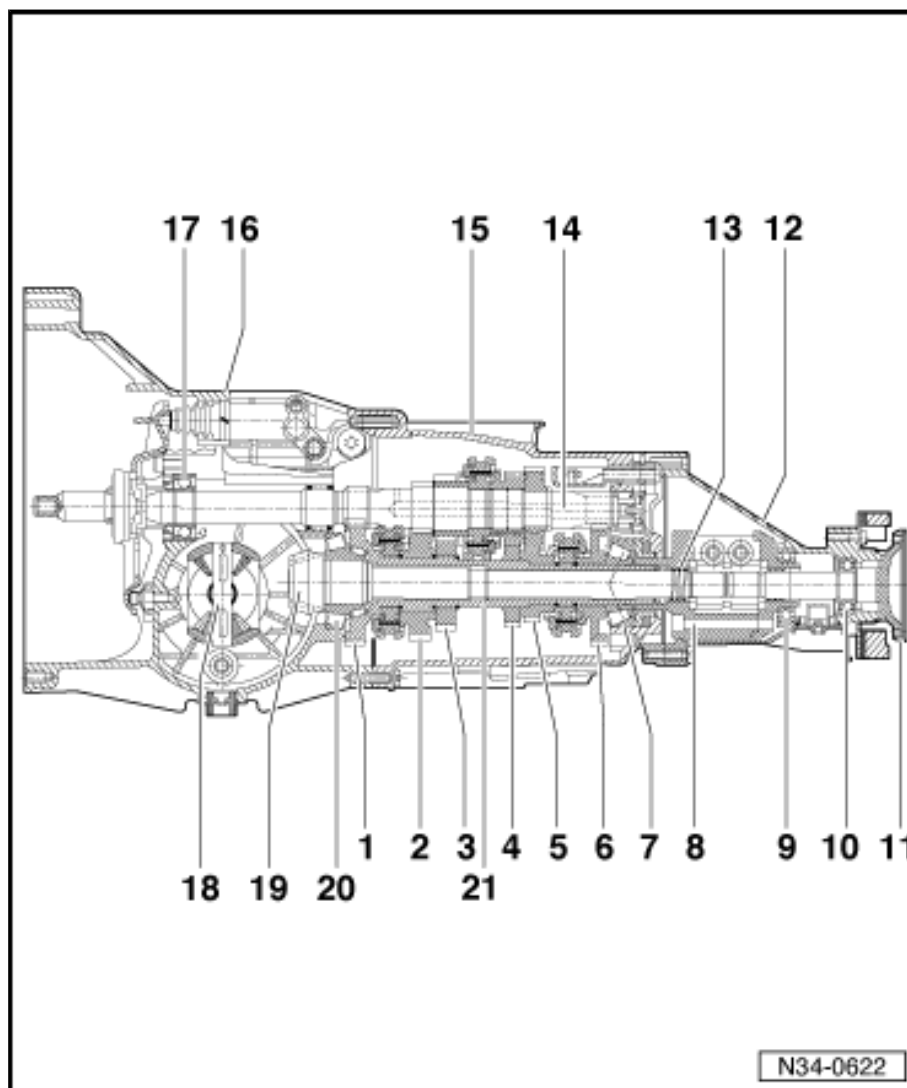
Overview

- ◆ ⇒ „6.1 General layout of gearbox“, page 76
- ◆ ⇒ „6.2 Exploded view - dismantling and assembling gearbox“, page 77
- ◆ ⇒ „6.3 Exploded view - removing and installing input shaft ball bearing and multi-function sender“, page 78
- ◆ ⇒ „6.4 Exploded view - removing and installing input shaft, pinion shaft, hollow shaft, selector rods, gearbox cover and cover with centre differential“, page 80
- ◆ ⇒ „6.5 Assembly sequence - dismantling and assembling gearbox“, page 81

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6.1 General layout of gearbox

- 1 - 1st gear
- 2 - 2nd gear
- 3 - 3rd gear
- 4 - 4th gear
- 5 - 5th gear
- 6 - Reverse gear
 - ❑ Removing and installing reverse gear wheel ⇒ page 136
- 7 - Tapered roller bearing
 - ❑ Adjusting ⇒ page 165
- 8 - Centre differential
 - ❑ Can only be serviced by manufacturer
 - ❑ Removing and installing with cover ⇒ page 89
- 9 - Ball bearing
- 10 - Ball bearing
- 11 - Flange shaft/propshaft
- 12 - Cover for centre differential
- 13 - Spring
 - ❑ Between centre differential and hollow shaft
- 14 - Input shaft
 - ❑ Dismantling and assembling ⇒ page 107
- 15 - Gearbox cover
- 16 - Gearbox housing
- 17 - Ball bearing
 - ❑ Adjusting ⇒ page 118
- 18 - Differential
 - ❑ Removing and installing ⇒ page 149



- ❑ Dismantling and assembling ⇒ [page 152](#)

19 - Pinion shaft

- ❑ Dismantling and assembling hollow shaft and pinion shaft ⇒ [page 121](#)

20 - Double tapered roller bearing

- ❑ Adjusting ⇒ [page 165](#)

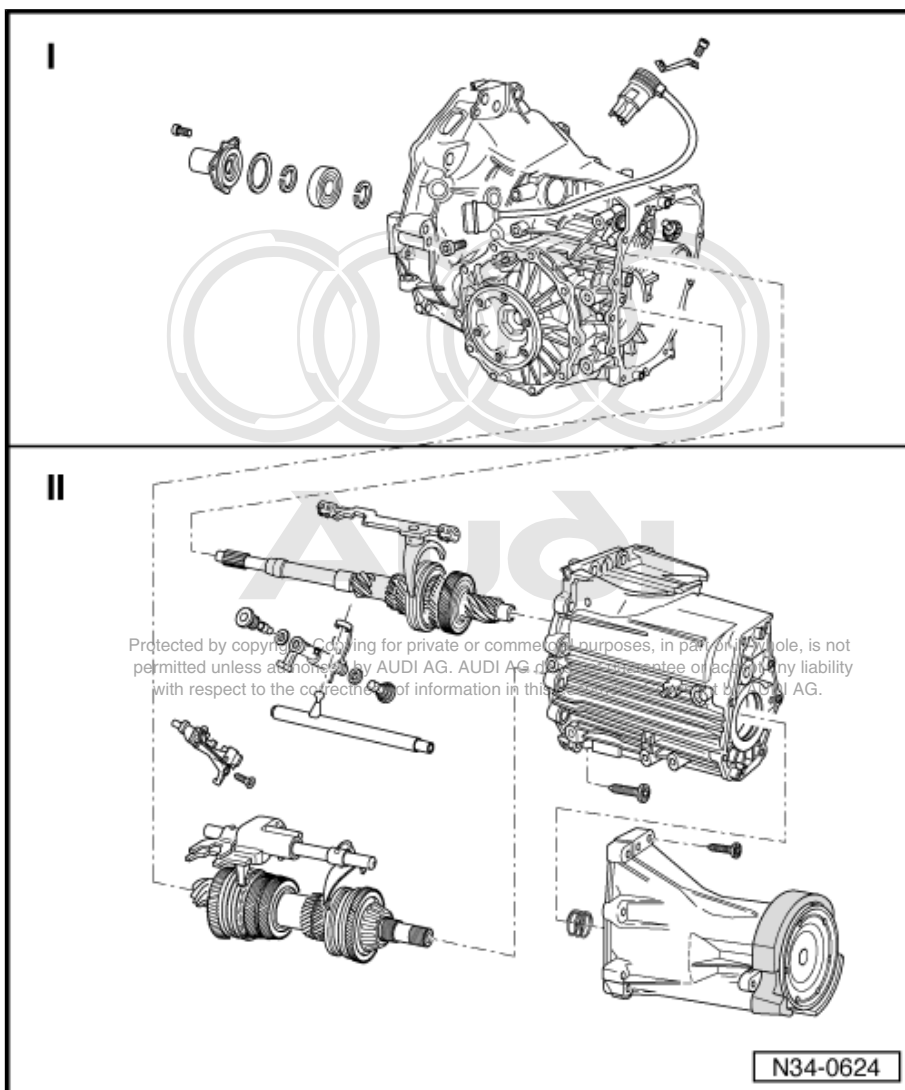
21 - Hollow shaft

- ❑ Dismantling and assembling hollow shaft and pinion shaft ⇒ [page 121](#)

6.2 Exploded view - dismantling and assembling gearbox

I - Exploded view - removing and installing input shaft ball bearing and multi-function sender ⇒ [page 78](#)

II - Exploded view - removing and installing input shaft, pinion shaft, hollow shaft, selector rods, gearbox cover and cover with centre differential ⇒ [page 80](#)



6.3 Exploded view - removing and installing input shaft ball bearing and multi-function sender

1 - Gearbox housing

- ☐ With differential and flange shafts
- ☐ Removing and installing flange shafts
⇒ [page 137](#)
- ☐ Removing and installing differential ⇒ [page 149](#)
- ☐ Removing and installing speedometer sender and drive wheel
⇒ [page 146](#)
- ☐ Installation position of breather ⇒ [page 79](#)

2 - TORX bolt

- ☐ 35 Nm
- ☐ Self-locking
- ☐ Renew

3 - Guide sleeve

- ☐ With O-ring and oil seal for input shaft
- ☐ Before removing and installing, cover input shaft splines with a shrink-fit hose to protect oil seal
⇒ [Item 6 \(page 30\)](#)
- ☐ Installation position: Oil drain hole points downwards (if provided)

4 - Dished spring

- ☐ Smaller diameter (convex side) faces guide sleeve

5 - Circlip

- ☐ Determining thickness ⇒ [page 118](#)

6 - Ball bearing

- ☐ Removing and installing ⇒ [page 81](#)

7 - Circlip

- ☐ Determining thickness ⇒ [page 118](#)

8 - Input shaft

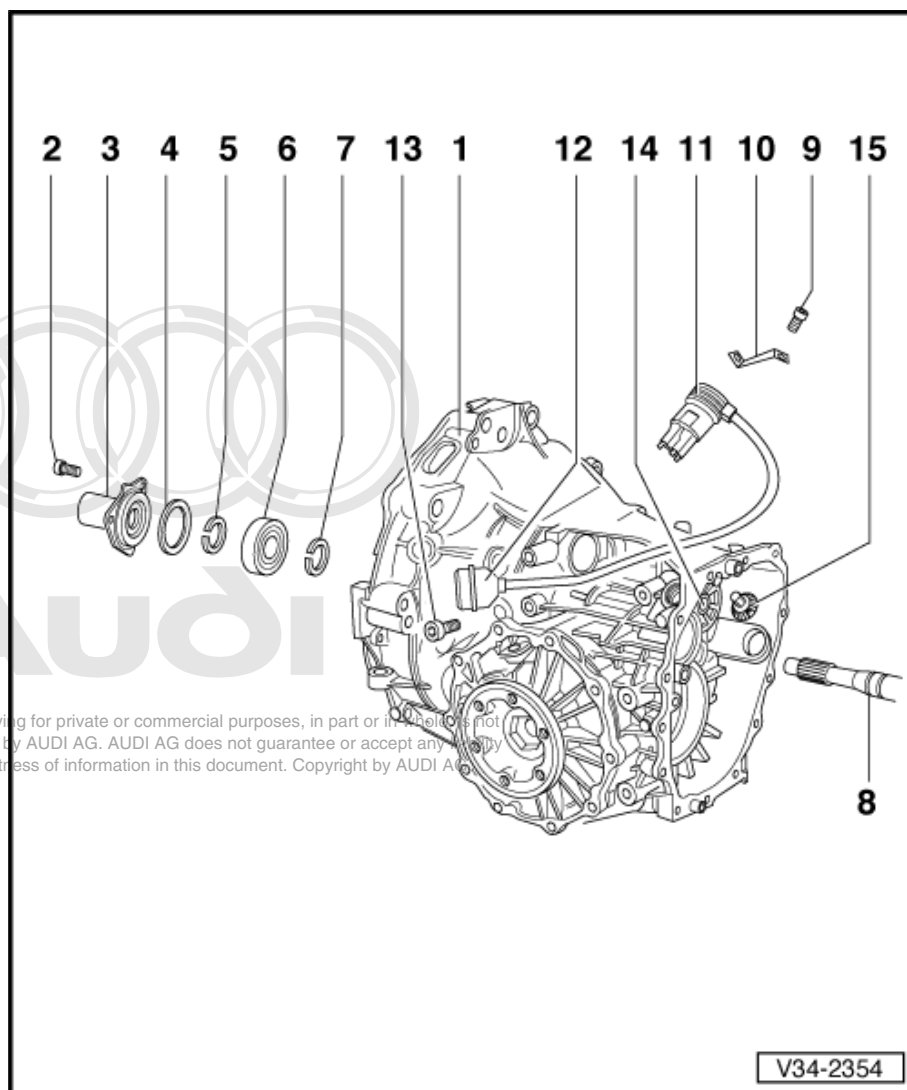
- ☐ Removing and installing ⇒ [page 80](#)
- ☐ Dismantling and assembling ⇒ [page 107](#)
- ☐ Adjusting ⇒ [page 118](#)
- ☐ Servicing bearings for input shaft ⇒ [page 107](#)

9 - Bolt

- ☐ 25 Nm

10 - Locking plate

- ☐ For multi-function sender



11 - Multi-function sender

12 - Connector

- ☐ For multi-function sender

13 - Bolt

- ☐ 10 Nm

14 - Selector shaft cover

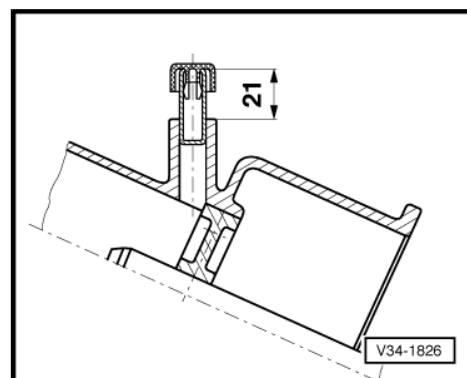
- ☐ Removing and installing ⇒ [page 100](#)

15 - Locking unit for 5th gear and reverse gear

- ☐ Removing and installing ⇒ [page 105](#)

Installation position of breather

After pressing in, the breather must project 21 mm out of the housing.



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6.4 Exploded view - removing and installing input shaft, pinion shaft, hollow shaft, selector rods, gearbox cover and cover with centre differential

1 - Gearbox housing

2 - Input shaft

- ❑ Dismantling and assembling ⇒ [page 107](#)
- ❑ Adjusting ⇒ [page 118](#)
- ❑ Servicing bearings for input shaft ⇒ [page 107](#)

3 - Selector rod with selector fork for 3rd and 4th gear

- ❑ Dismantling and assembling ⇒ [page 100](#)
- ❑ Renewing bearing bushes ⇒ [page 100](#)

4 - Stop bolt (left-side)

- ❑ 40 Nm

5 - Seal

6 - Relay shaft

- ❑ Installation position ⇒ [Item 6 \(page 100\)](#)

7 - Seal

8 - Stop bolt (right-side)

- ❑ 40 Nm

9 - Selector shaft

- ❑ Installation position ⇒ [Item 24 \(page 101\)](#)
- ❑ Renewing oil seal for selector shaft ⇒ [Item 25 \(page 101\)](#)

10 - Detent segment

- ❑ Installation position ⇒ [Item 9 \(page 100\)](#)

11 - TORX bolt

- ❑ 25 Nm
- ❑ With collar to secure detent segment spring

12 - Selector rod with 1st/2nd/5th and reverse gear selector forks

- ❑ Dismantling and assembling ⇒ [page 100](#)
- ❑ Removing and installing ball sleeves ⇒ [page 103](#)

13 - pinion shaft with hollow shaft

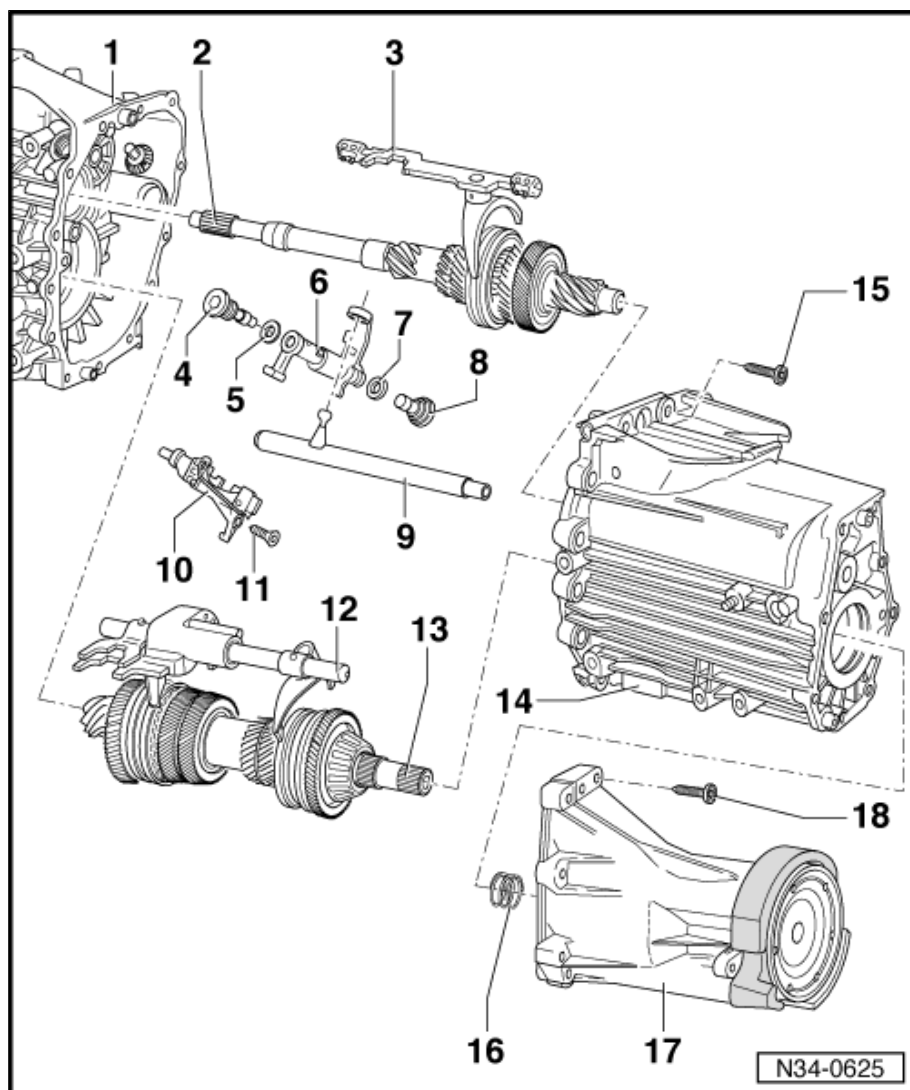
- ❑ Dismantling and assembling ⇒ [page 121](#)
- ❑ Adjusting ⇒ [page 162](#)
- ❑ Servicing bearings for pinion shaft and hollow shaft ⇒ [page 121](#)

14 - Gearbox cover

- ❑ Removing and installing oil collector ⇒ [page 81](#)

15 - TORX bolt

- ❑ 22 Nm



16 - Spring

17 - Cover with centre differential

- ☐ Removing and installing with gearbox installed → [page 89](#)
- ☐ Removing and installing centre differential in cover → [page 92](#)
- ☐ Servicing cover → [page 92](#)

18 - TORX bolt

- ☐ 22 Nm

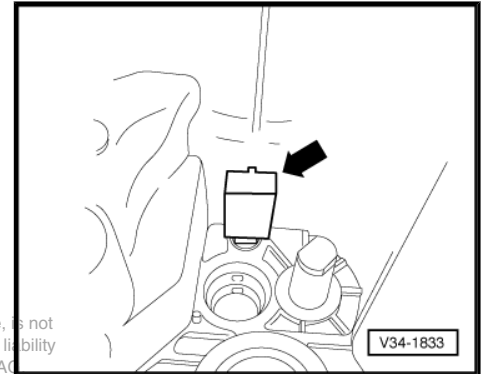
Removing and installing oil collector

Removing

- Turn oil collector -arrow- and then pull out.

Installing

- Push oil collector into gearbox cover until it snaps into place.
- ◆ Installation position: oil collector faces upwards in gearbox cover.



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6.5 Assembly sequence - dismantling and assembling gearbox

Removing and installing input shaft ball bearing, multi-function sender, input shaft, pinion shaft, selector rods, gearbox cover and cover with centre differential

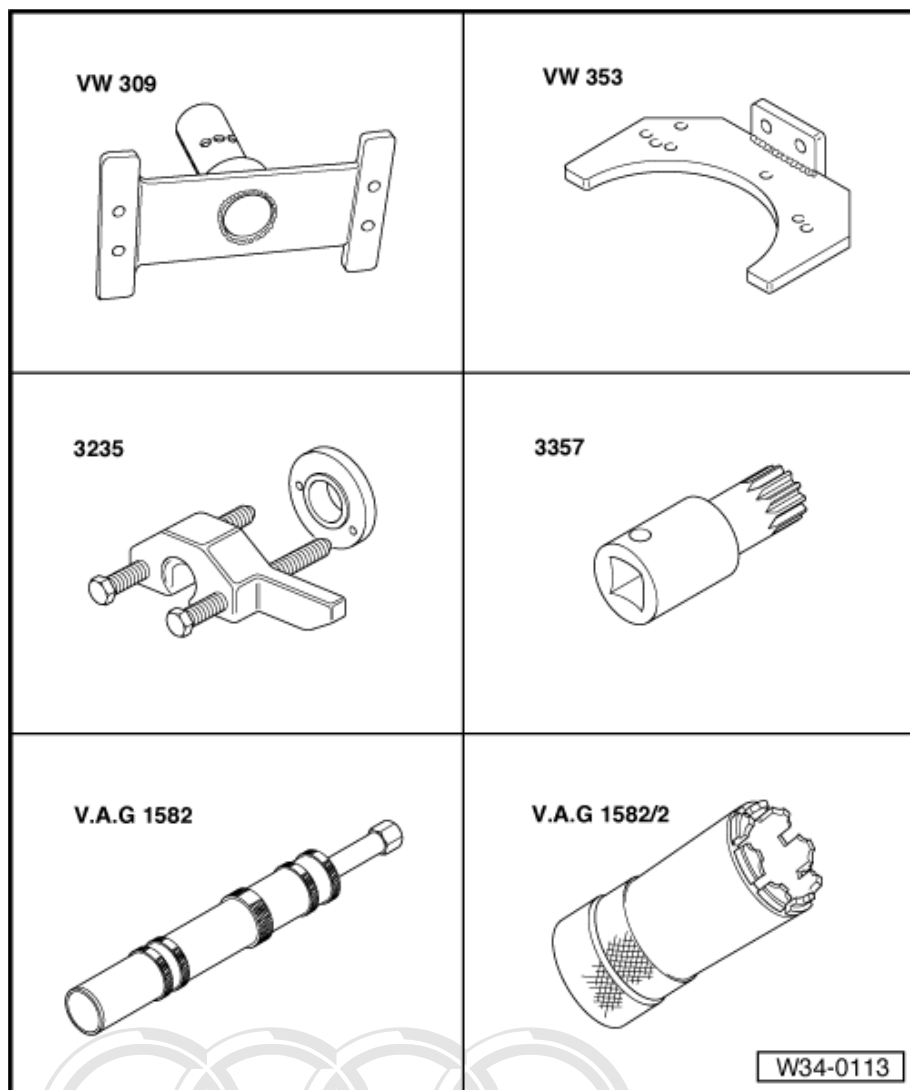


Note

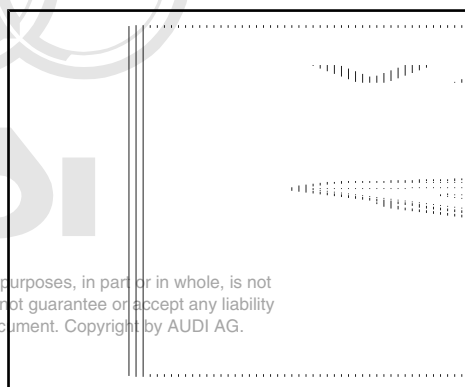
- ◆ *The differential does not have to be removed in order to remove the above-mentioned components.*
- ◆ *Removal is only necessary when adjustment work has to be carried out → [page 164](#).*

Special tools and workshop equipment required

- ◆ Support plate -VW 309-
- ◆ Gearbox support -VW 353-
- ◆ Fitting tool -3235- or fitting tool -T10246-
- ◆ Multi-point bit -3357-
- ◆ Tapered roller bearing puller -V.A.G 1582-
- ◆ Adapter -V.A.G 1582/2-



- ◆ Drip tray , e.g. -VAS 6208-



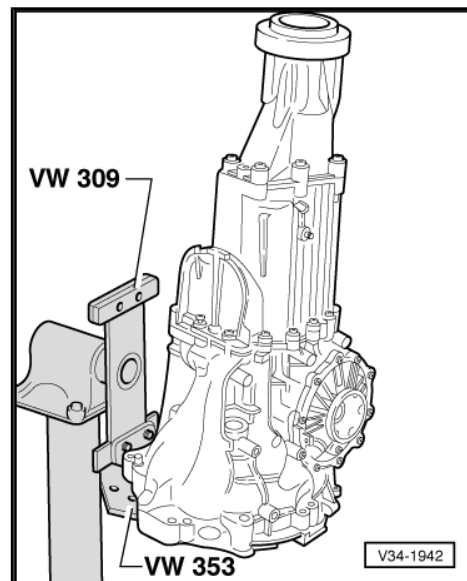
- ◆ Sealing paste -AMV 188 001 02-

Dismantling gearbox

- Place drip tray e.g. -VAS 6208- under the gearbox.
- Remove oil drain plug using multi-point bit -3357- and drain gear oil.

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- Mount gearbox on assembly stand.



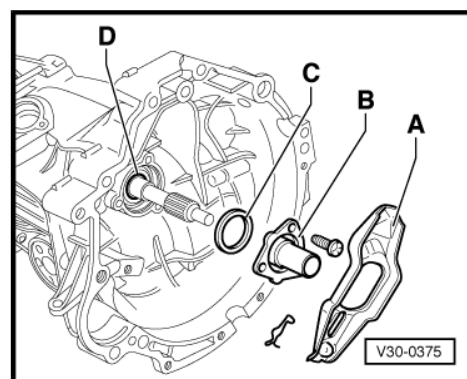
- Remove clutch release lever -A- together with release bearing.



Note

Before pulling off guide sleeve, cover splines on input shaft with a shrink-fit hose to protect oil seal.

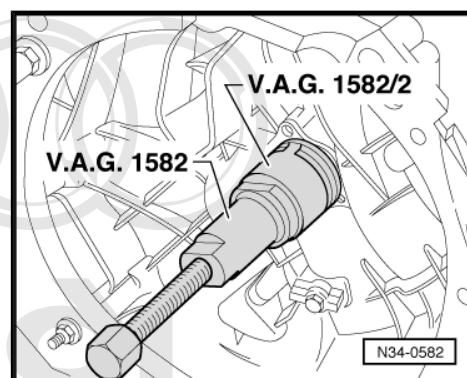
- Remove guide sleeve -B-
- Remove dished spring -C-
- Remove circlip -D- in front of input shaft ball bearing.
- If the ball bearing, input shaft or gearbox housing is not to be replaced, note the thickness of the circlip.



Note

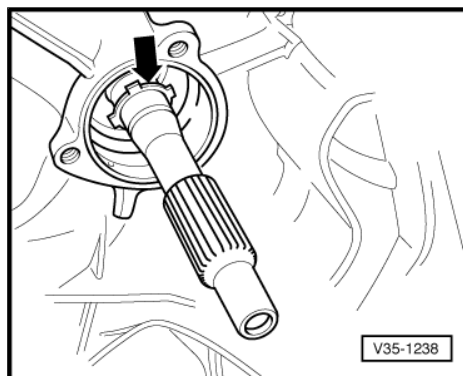
If ball bearing, input shaft or gearbox housing are renewed, determine required thickness of new circlip ➔ [page 118](#).

- Pull the ball bearing for input shaft out of gearbox housing.

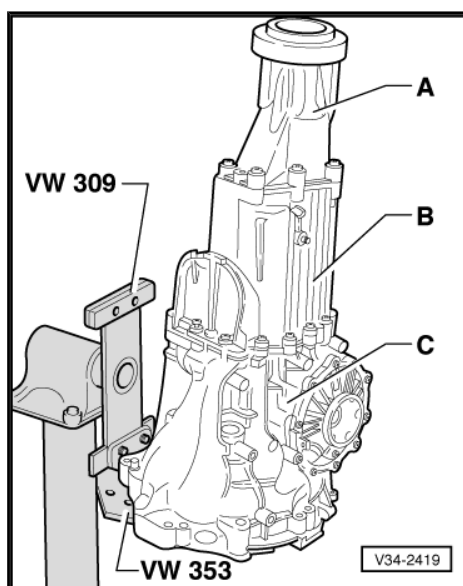


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- Remove the circlip -arrow- behind the ball bearing for input shaft.
- Note thickness of circlip. If ball bearing, input shaft or gearbox housing are renewed, determine required thickness of new circlip ⇒ [page 118](#) .

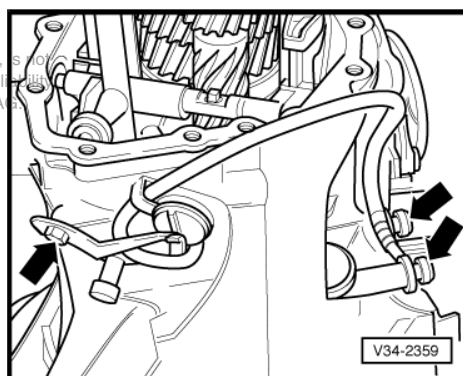


- Unbolt cover -A- with centre differential from gearbox cover -B-.
- Remove spring from pinion shaft.
- Then unbolt gearbox cover -B- from gearbox housing -C-.

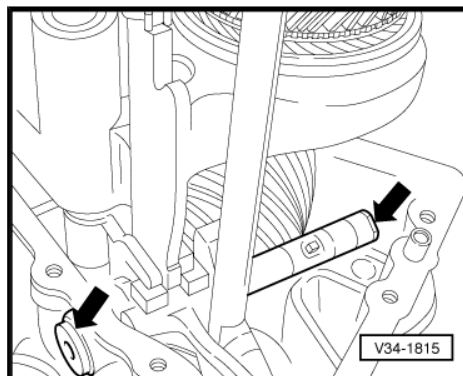


- Remove bolts -arrows- and pull out multi-function sender.

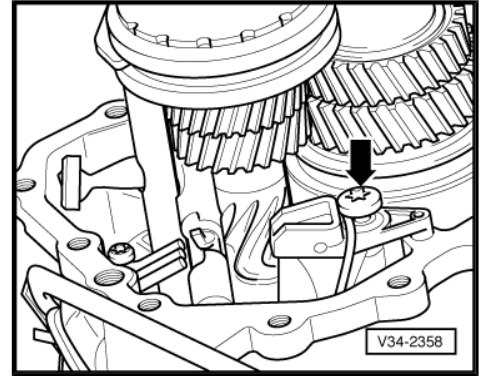
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- Remove relay shaft bolts -arrows-.



- Unscrew detent segment -arrow- and swing it out.



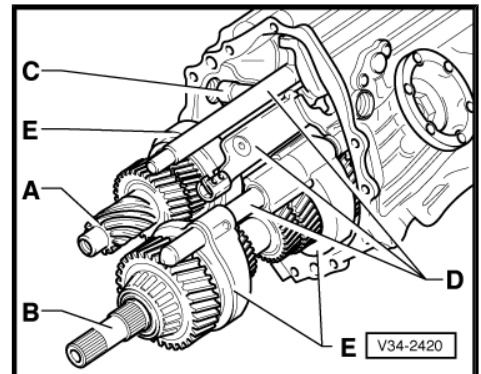
- The input shaft -A-, the pinion shaft-B-, the relay shaft -C-, the selector rods-D- with selector shaft and the selector forks-E- must be carefully pulled out together.

Assembling gearbox

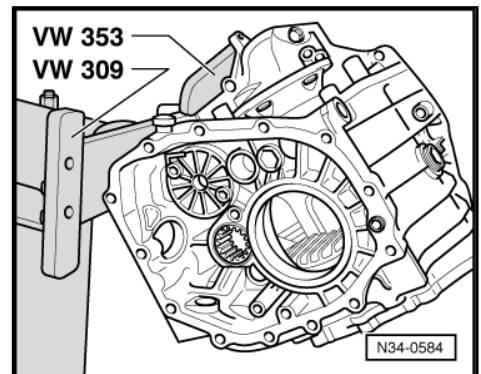


Note

If the input shaft ball bearing, the input shaft or the gearbox housing have been renewed, you must first re-determine the thickness of the circlips for the input shaft before installing the components ⇒ [page 118](#).



- Swing the gearbox housing into the position shown. The components listed below can then be fitted more easily.



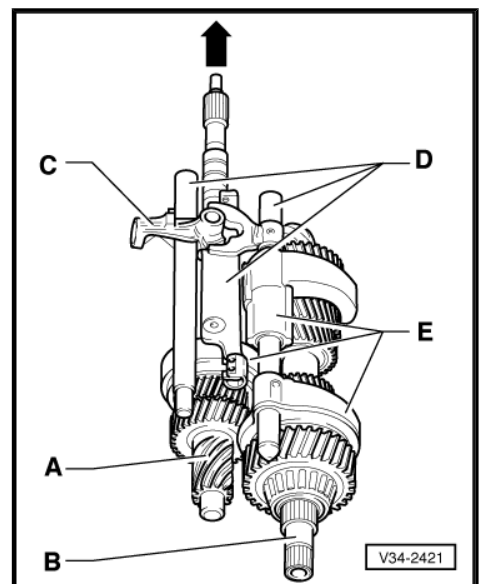
- Assemble the input shaft -A-, the pinion shaft-B-, the relay shaft -C-, the selector rods -D- with selector shaft and selector forks -E- together.
- Install these components together into the gearbox housing.



Note

If necessary, the relay shaft -C- and the selector shaft can also be fitted later ⇒ [page 86](#) and ⇒ [page 86](#).

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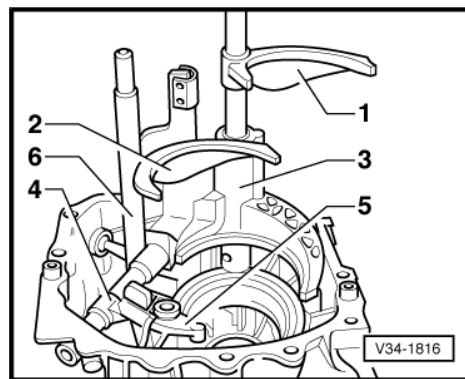
Location of selector mechanism in gearbox:

- 1 - Selector fork for 5th gear and reverse gear
- 2 - Selector fork for 3rd gear and 4th gear
- 3 - Selector fork for 1st gear and 2nd gear
- 4 - Relay shaft
- 5 - Detent segment
- 6 - Selector shaft

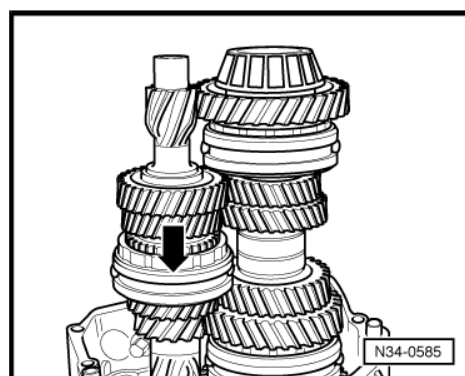


Note

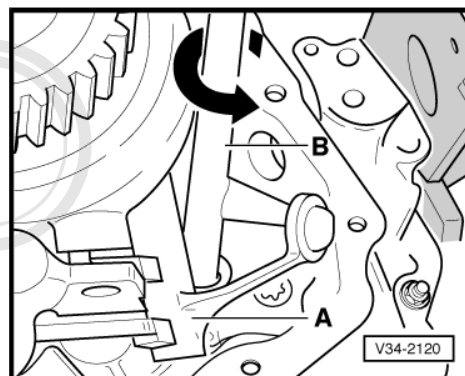
Shown in illustration with input shaft and pinion shaft removed.



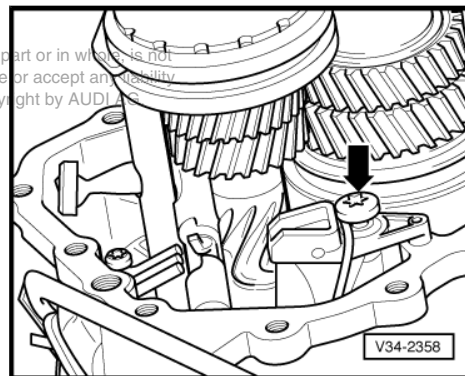
- Pivot gearbox housing and engage 3rd gear in direction of -arrow-



- Now install relay shaft -A-.
- Insert selector shaft -B- sideways onto drilling in gearbox housing and fit into mounting eye.
- Then pivot selector shaft carefully into position in direction of -arrow-.

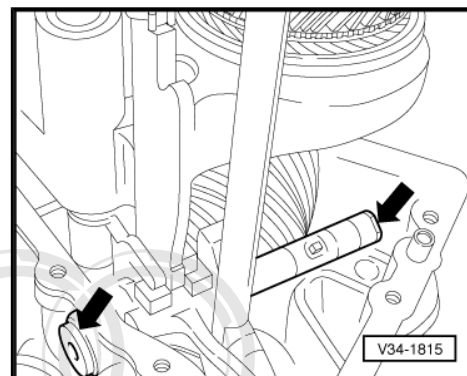


- Then fit detent segment and secure -arrow-.

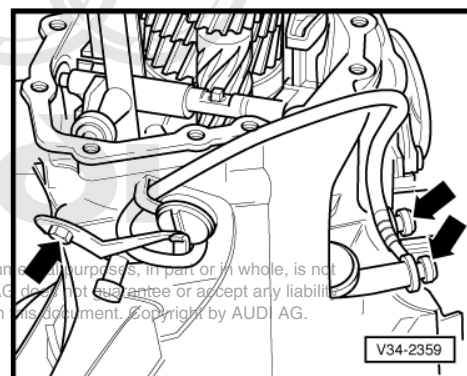


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- Fit relay shaft bolts -arrows-.
- Renew O-ring for multi-function sender.

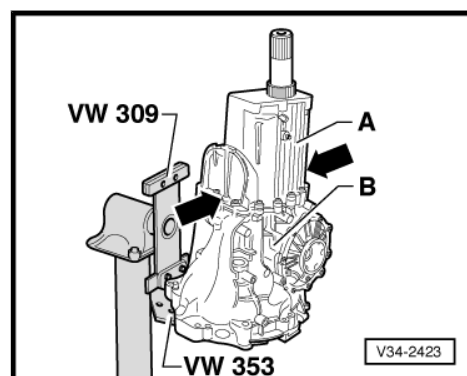


- Carefully insert multi-function sender and secure -arrows-.

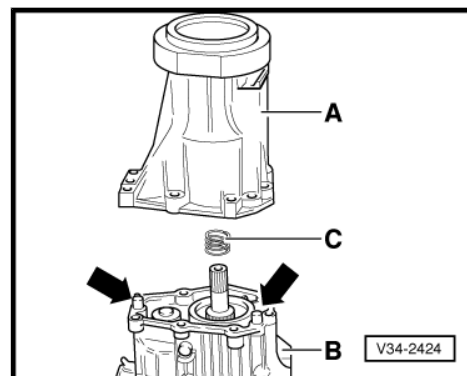


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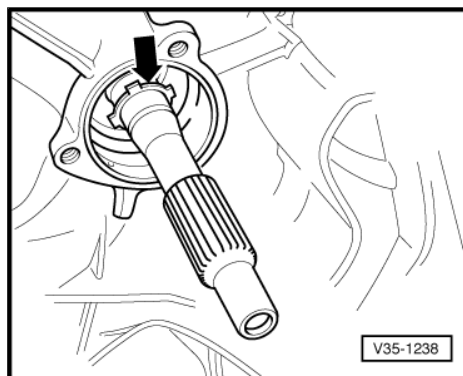
- Check whether dowel sleeves -arrows- for gearbox cover -A- are fitted in gearbox housing -B-.
- Coat sealing surfaces lightly with sealing paste -AMV 188 001 02-.
- Fit gearbox cover onto gearbox housing and secure.



- Check whether dowel sleeves -arrows- for cover -A- are fitted in gearbox cover -B-.
- Fit spring -C-.
- Install cover with centre differential -A- on gearbox cover -B-.



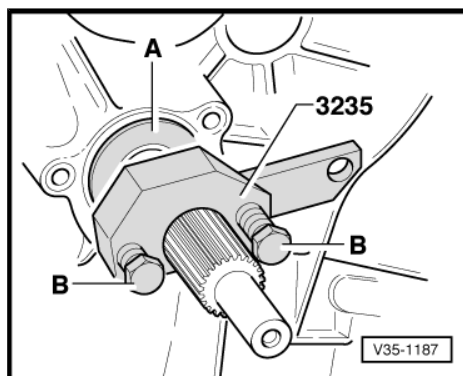
- Fit rear circlip -arrow- for input shaft ball bearing.
- Slide ball bearing onto input shaft.
- ◆ Position: closed side of ball cage faces towards gearbox housing.



- Pressing in ball bearing:
- Slide thrust piece -A- of fitting tool onto input shaft.
- Position fitting tool behind splines for clutch plate.
- Screw in bolts -B- until they make contact.
- ◆ The bolts locate in the recess in the thrust plate -A-.


Note

Fitting tool -3235- can also be used if fitting tool -T10246- is not available.



- Press in ball bearing onto its seat by alternately tightening the bolts ($1\frac{1}{2}$ turn at a time).
- Now fit front circlip -D- for input shaft ball bearing.
- Then fit dished spring -C-.
- ◆ Position: convex side towards guide sleeve -B-.

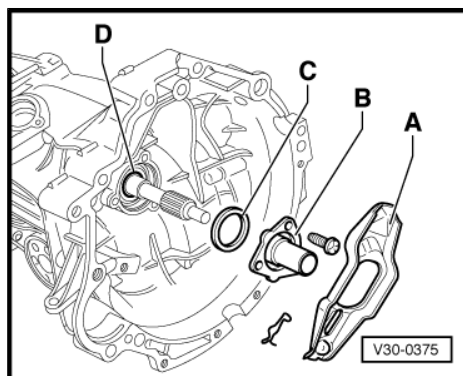

Note

- ◆ *Before fitting guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.*

- ◆ *Installing oil seal in guide sleeve ⇒ [Item 6 \(page 30\)](#)*

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- Fit guide sleeve -B- for release bearing with new O-ring ⇒ [page 30](#).
- Remove shrink hose.
- Fit clutch release lever -A- and release bearing ⇒ [page 30](#).

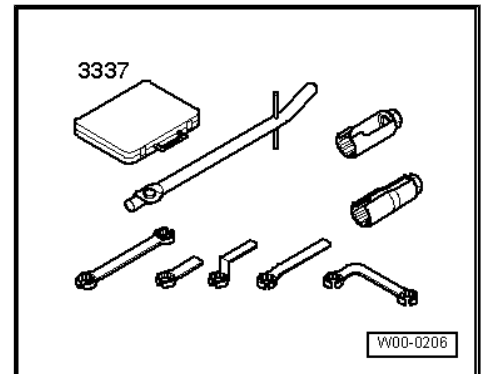


7 Removing and installing cover with centre differential

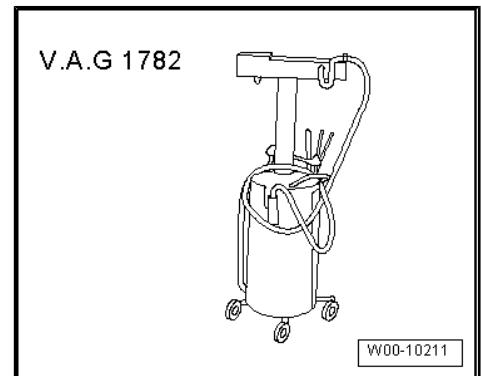
- Gearbox installed

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337- (only for vehicles with 6-cylinder engine)



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



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7.1 Removing cover with centre differential

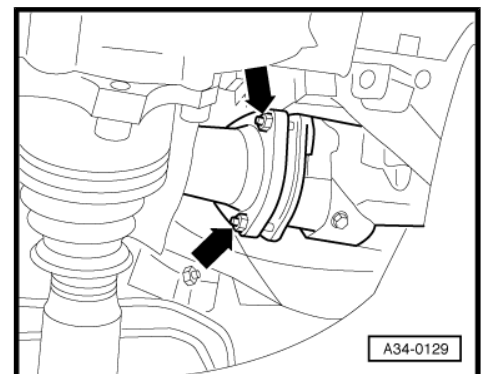
Vehicles with 4-cylinder engine:

- Remove rear section of exhaust system (rearward of clamp)
⇒ Engine, mechanics; Rep. gr. 26 .

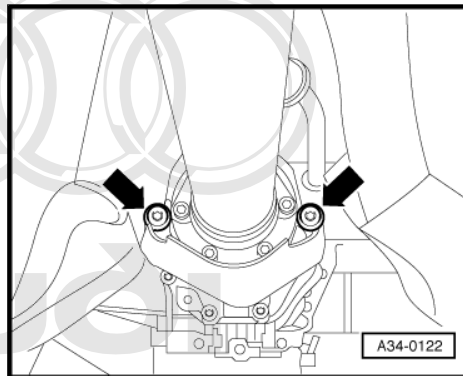
Vehicles with 6-cylinder engine:

- Unscrew Lambda probe (right-side) from exhaust pipe using Lambda probe open ring spanner set -3337- and move to one side.
- Remove heat shield above drive shaft (right-side).
- Unbolt front exhaust pipe (right-side) with catalytic converter (right-side) from exhaust manifold -arrows- (3 nuts) ⇒ Engine, mechanics; Rep. gr. 26 .

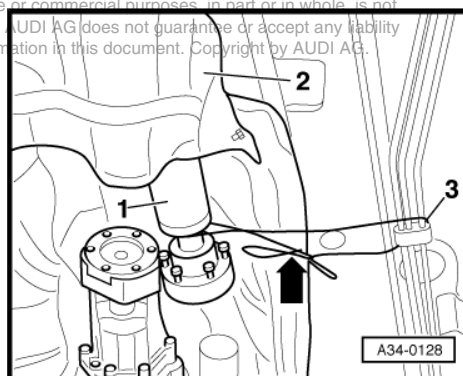
All vehicles:



- Remove heat shield for propshaft from cover for centre differential -arrows-.



- Unbolt propshaft -1- from gearbox and rest it on heat shield -2-.
- Use wire -arrow- to secure propshaft to bracket -3- for fuel pipes.
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gearbox oil.



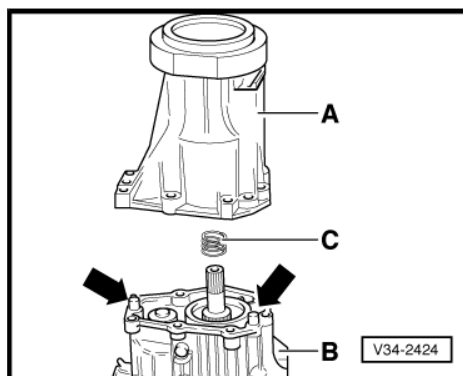
- Unbolt cover -A- with centre differential from gearbox cover -B-.



Note

Shown in illustration with gearbox removed.

- Remove spring -C- from pinion shaft.
- Removing and installing centre differential in cover ⇒ [page 92](#) .
- Servicing cover ⇒ [page 92](#) .



7.2 Installing cover with centre differential

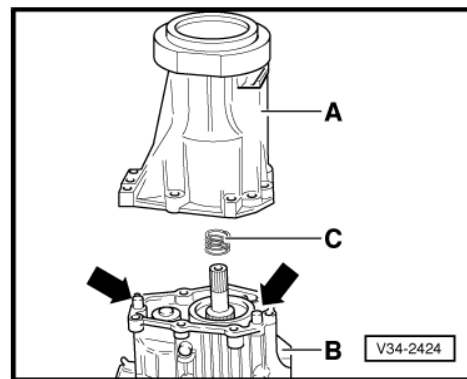
Installation is carried out in reverse sequence; note the following:

- Clean sealing surface and coat with sealing paste -AMV 188 001 02- .

- Check that dowel sleeves -arrows- are fitted in gearbox cover -B-.
- Fit spring -C- onto hollow shaft over pinion shaft.
- Fit cover -A- with centre differential on gearbox cover -B- and secure in place.
- Bolt propshaft to gearbox ➔ [page 187](#) .
- Top up gear oil and check oil level in gearbox ➔ [page 74](#) .
- Install exhaust system so it is free of stress ➔ Engine, mechanics; Rep. gr. 26 .

Tightening torques

Component	Nm
Cover with centre differential to gearbox	25
Propshaft to manual gearbox ¹⁾	55
Heat shield for propshaft to centre differential cover	25
• ¹⁾ Renew bolts	



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8 Servicing cover for centre differential, removing and installing centre differential

Overview

- ◆ ⇒ „8.1 Exploded view - cover for centre differential and centre differential“, page 92
- ◆ ⇒ „8.2 Servicing cover for centre differential and centre differential“, page 94

8.1 Exploded view - cover for centre differential and centre differential

1 - Gearbox cover

2 - Spring

3 - Front needle bearing

- ☐ Pulling out ⇒ [page 98](#)
- ☐ Installation position ⇒ [page 98](#)
- ☐ Pressing in ⇒ [page 99](#)

4 - Centre differential

- ☐ Do not dismantle
- ☐ Press out after removing flange shaft/propshaft ⇒ [page 97](#)
- ☐ Renew if damaged
- ☐ Pressing in ⇒ [page 99](#)

5 - Rear needle bearing

- ☐ Pulling out ⇒ [page 98](#)
- ☐ Installation position ⇒ [page 98](#)
- ☐ Pressing in ⇒ [page 99](#)

6 - Ball bearing

- ☐ For centre differential
- ☐ Pressing off ⇒ [page 97](#)
- ☐ Pressing on ⇒ [page 97](#)

7 - Circlip

8 - Circlip

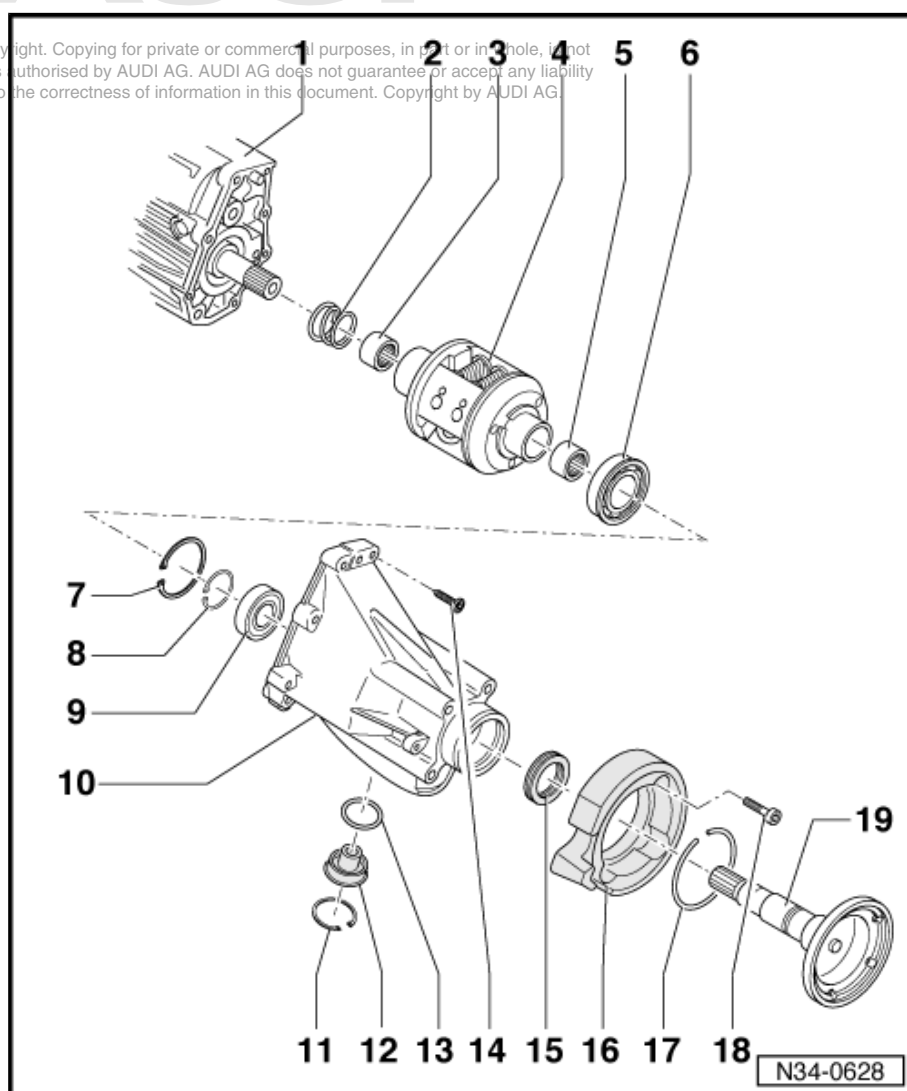
- ☐ Remove and install together with flange shaft ⇒ [page 96](#)

9 - Ball bearing

- ☐ For flange shaft/propshaft
- ☐ Pressing out ⇒ [page 97](#)
- ☐ Pressing in ⇒ [page 98](#)

10 - Cover for centre differential

- ☐ Removing and installing ⇒ [page 89](#)



11 - Circlip

12 - Sealing cap

- ☐ Removing ⇒ [page 96](#)

13 - O-ring

- ☐ Renew
- ☐ Grease when installing

14 - TORX bolt

- ☐ 22 Nm

15 - Oil seal

- ☐ For flange shaft/propshaft
- ☐ Use oil seal extractor lever -VW 681- or extractor tool -T20143- to pull out.
- ☐ Driving in ⇒ [page 99](#)

16 - Damper weight

17 - Circlip

18 - TORX bolt

- ☐ 35 Nm
- ☐ Self-locking
- ☐ Renew

19 - Flange shaft/propshaft

- ☐ Removing and installing ⇒ [page 96](#)

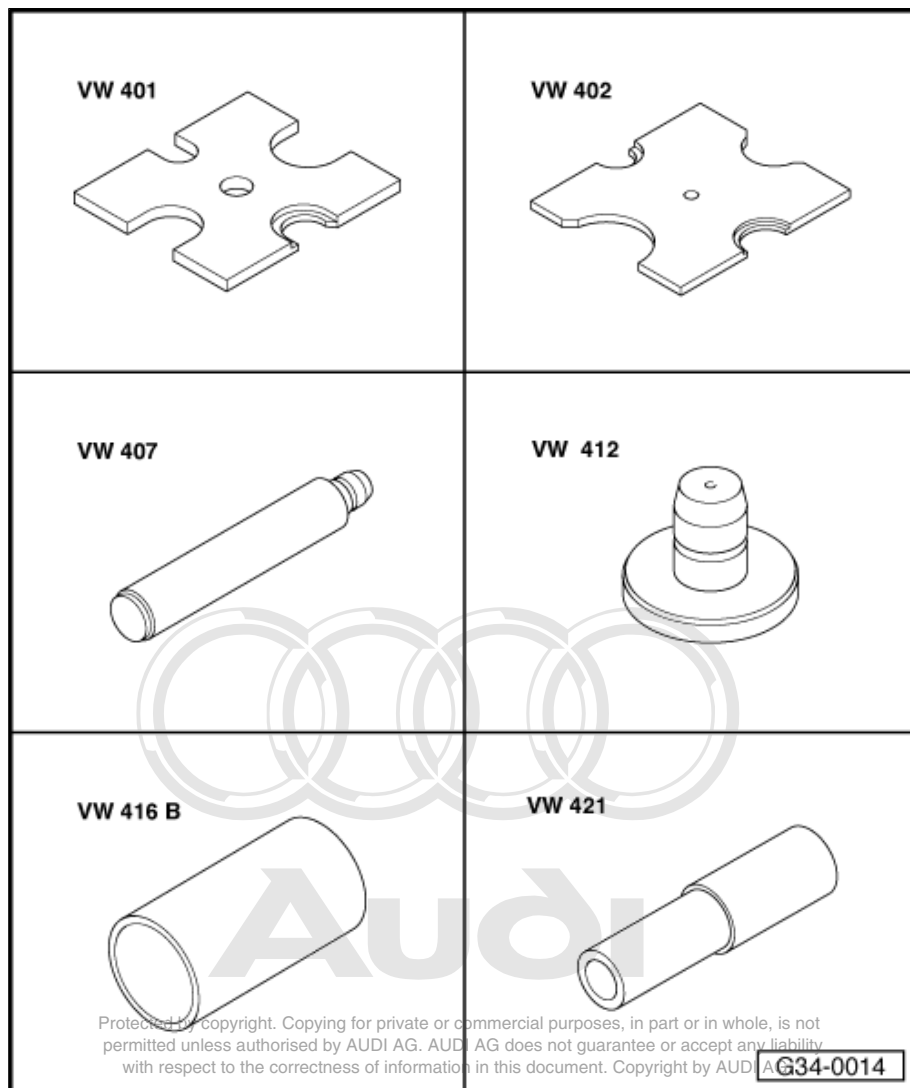


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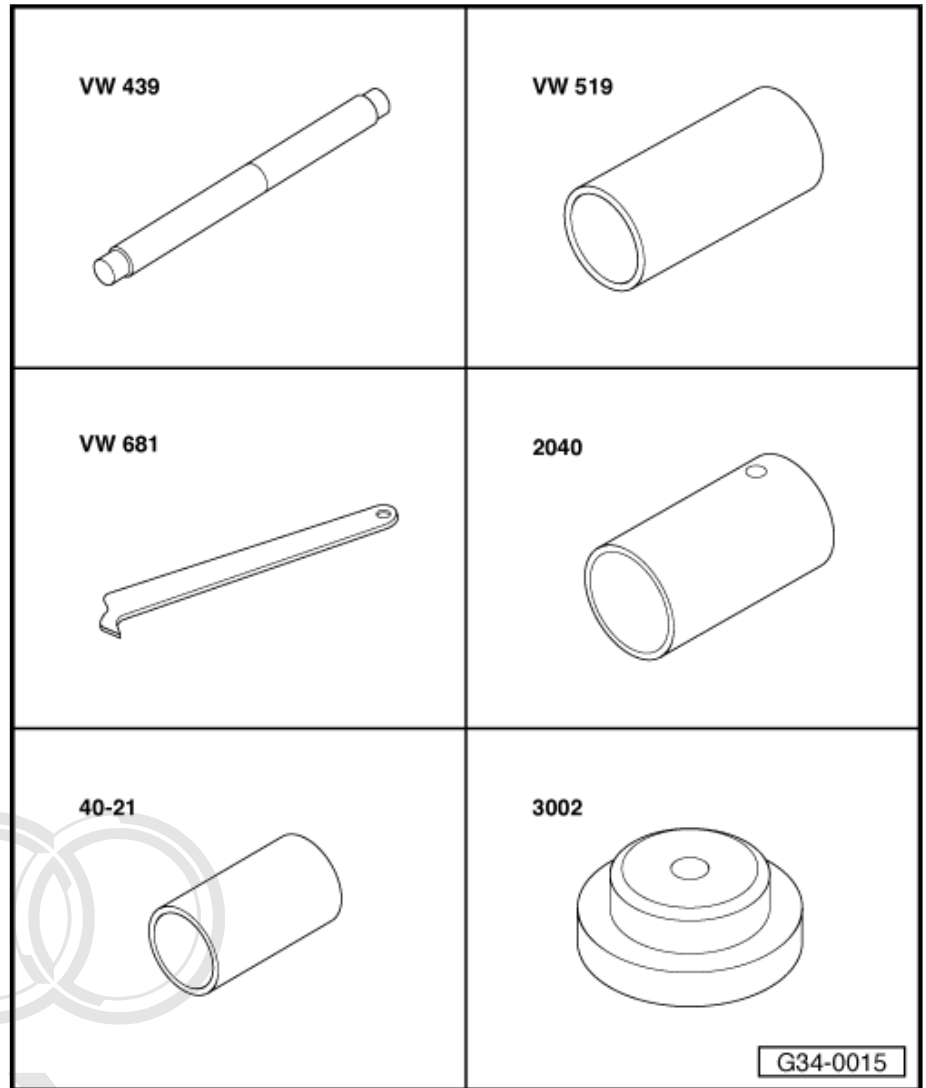
8.2 Servicing cover for centre differential and centre differential

Special tools and workshop equipment required

- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 416 B-
- ◆ Tube -VW 421-

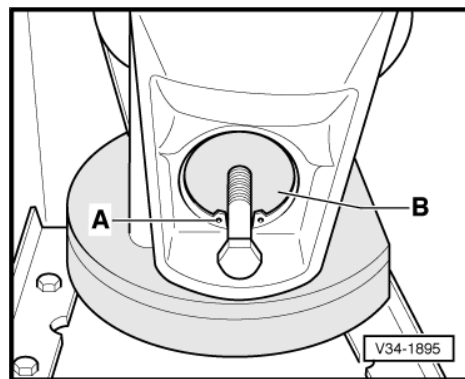
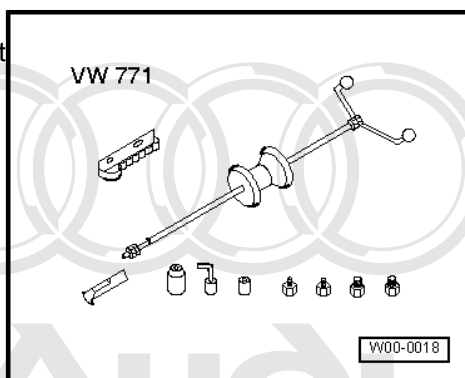


- ◆ Guide pin -VW 439-
- ◆ Tube -VW 519-
- ◆ Oil seal extractor lever -VW 681-
- ◆ Press tool -40 - 21-
- ◆ Tube -2040-
- ◆ Thrust piece -3002-

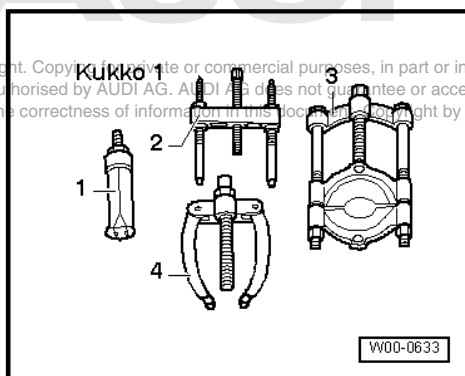


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- ◆ -VW 771/15- from multi-purpose tool set
- VW 771-



- ◆ -1- Internal puller 23.5...30 mm, e.g. -Kukko21/4-



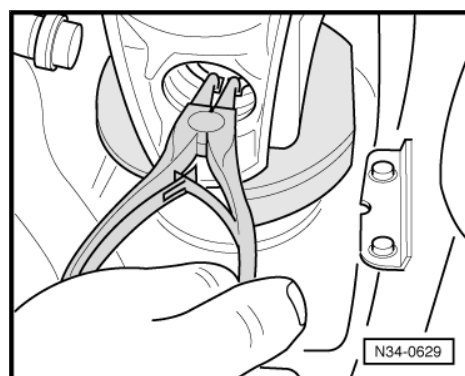
- ◆ -3- Splitter 12...115 mm, e.g. -Kukko17/2-

Removing sealing cap

- Remove circlip -A-.
- Screw an M8 bolt into thread of sealing cap -B-.
- Pull out sealing cap -B- using bolt.

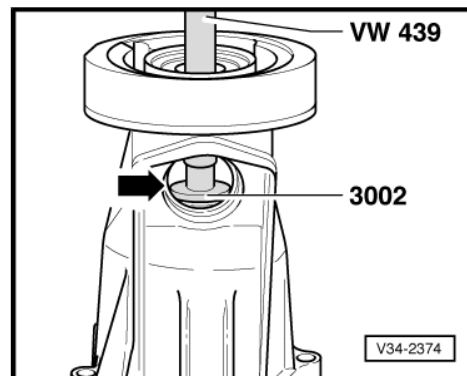
Removing and installing flange shaft/propshaft

- Bend open circlip and pull out flange shaft.
- When inserting flange shaft, fit circlip at the same time.
- ◆ The circlip must be seated in the bottom of the groove.



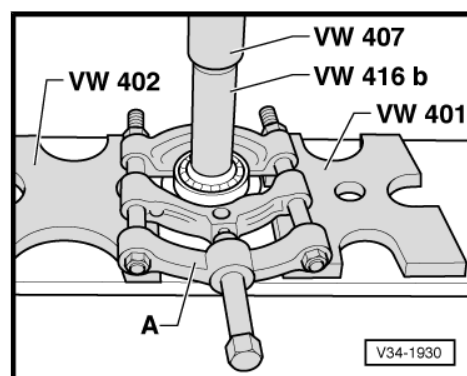
Pressing out centre differential

- Position thrust piece -3002- directly on centre differential through opening -arrow-.



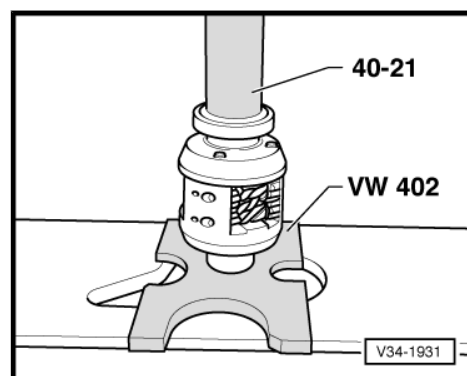
Pressing ball bearing off centre differential

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



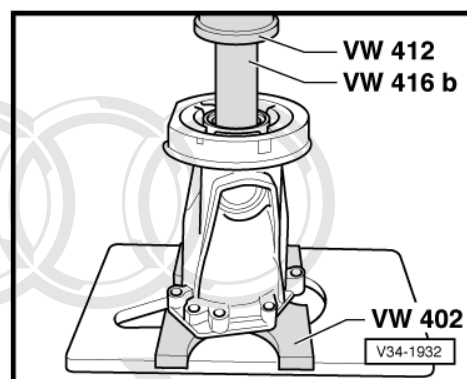
Pressing ball bearing onto centre differential

- Press ball bearing on as far as stop.



Pressing out ball bearing for flange shaft/propshaft

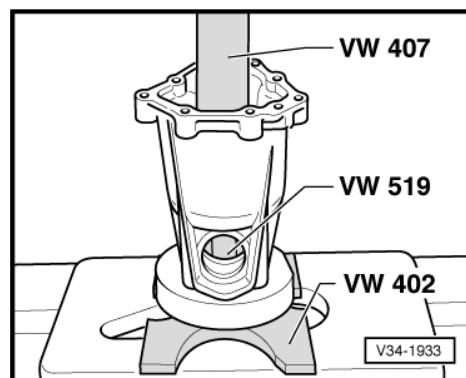
- Remove circlip before pressing out bearing.



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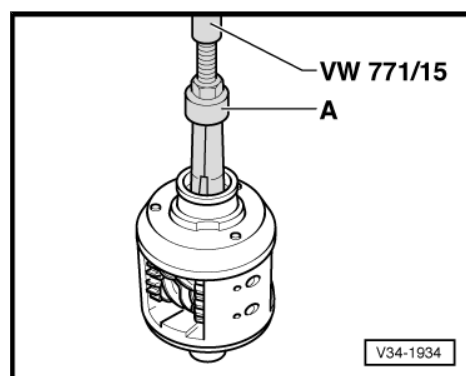
Pressing in ball bearing for flange shaft/propshaft

- Fit circlip after pressing in bearing.



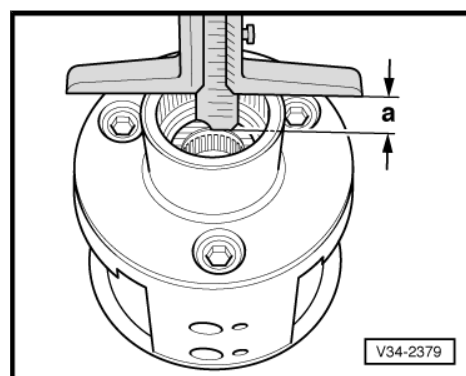
Pulling out needle bearings

- A- Internal puller 23.5...30 mm , e.g. -Kukko 21/4-
- Both needle bearings in the centre differential are removed with the same puller .



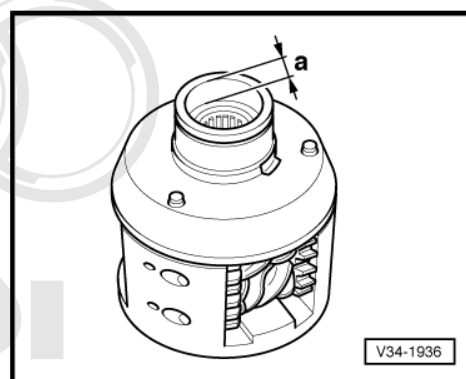
Installation position of front needle bearing

- ◆ Dimension -a- = 32.5 mm



Installation position of rear needle bearing

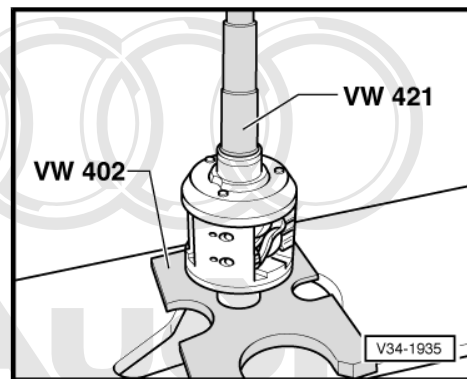
- ◆ Dimension -a- = 14 mm



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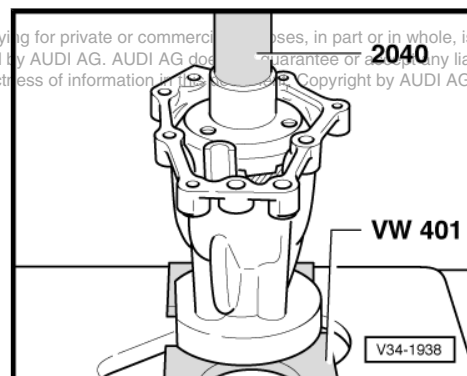
Pressing in needle bearing

- Both needle bearings in the centre differential are pressed in with the same special tool.



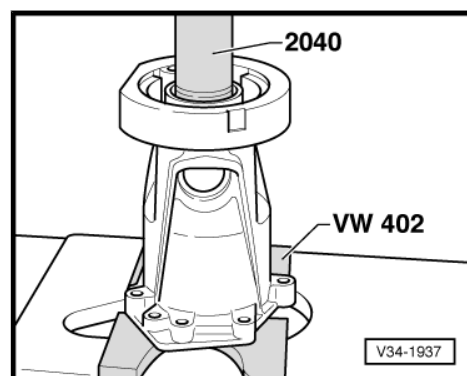
Pressing in centre differential

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Driving in oil seal for flange shaft/propshaft

- Lightly oil outer circumference of oil seal.
- ◆ Installation position: 2 mm below surface of cover
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .



9 Dismantling and assembling selector mechanism in gearbox

Overview

- ◆ ⇒ „9.1 Exploded view - selector mechanism in gearbox“, page 100
- ◆ ⇒ „9.2 Dismantling and assembling selector mechanism in gearbox“, page 102
- ◆ ⇒ „9.3 Removing and installing locking unit for 5th gear and reverse gear“, page 105

9.1 Exploded view - selector mechanism in gearbox

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Note

Installation position of complete selector mechanism in gearbox ⇒ [page 104](#).

1 - Locking unit for 5th gear and reverse gear

- Removing and installing
⇒ [page 105](#)

2 - TORX bolt

- 10 Nm

3 - O-ring

- Renew

4 - Stop bolt (right-side)

- 40 Nm

5 - Seal

6 - Relay shaft

7 - Seal

8 - Stop bolt (left-side)

- 40 Nm

9 - Detent segment

10 - TORX bolt

- 25 Nm

11 - Spring pin

12 - Selector fork for 5th gear and reverse gear

- Installation position
⇒ [page 103](#)

13 - Selector rods for 1st/2nd and 5th/reverse gear

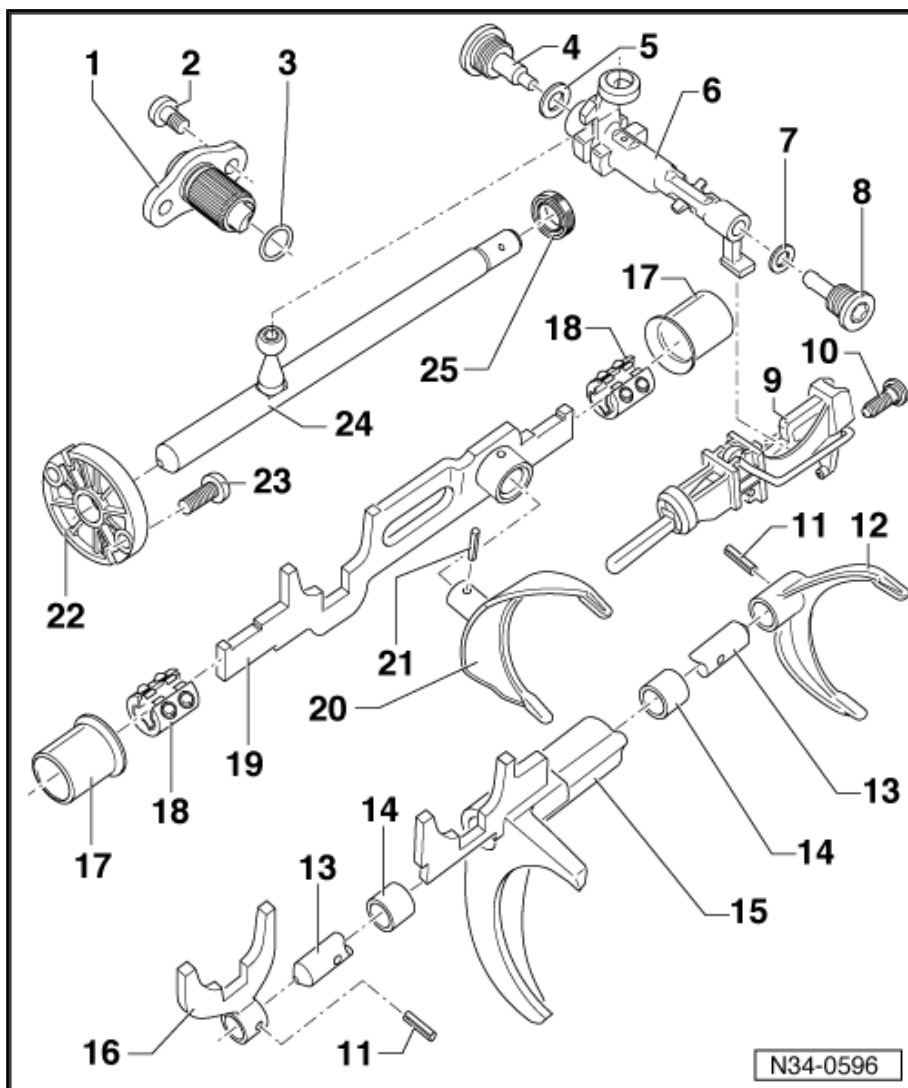
14 - Ball sleeve

- Removing and installing
⇒ [page 103](#)

15 - Selector fork for 1st and 2nd gear

16 - Yoke

- Installation position ⇒ [page 103](#)



17 - Bearing bush for 3rd and 4th gear

- ☐ Pulling out ⇒ [page 104](#)
- ☐ Driving in ⇒ [page 104](#)

18 - Ball sleeve

- ☐ Lever off the selector rod with a screwdriver
- ☐ Press onto the selector rod

19 - Selector rod for 3rd and 4th gear

20 - Selector fork for 3rd and 4th gear

21 - Spring pin

22 - Cover

- ☐ For selector shaft

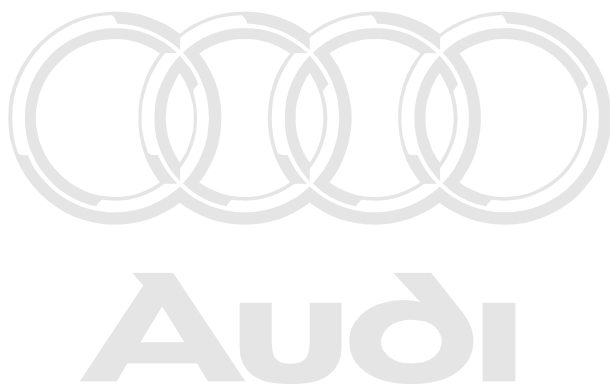
23 - TORX bolt

- ☐ 20 Nm

24 - Selector shaft

25 - Oil seal for selector shaft

- ☐ Lever out with screwdriver
- ☐ Use tube -VW 420- to insert
- ☐ Installation position ⇒ [page 104](#)

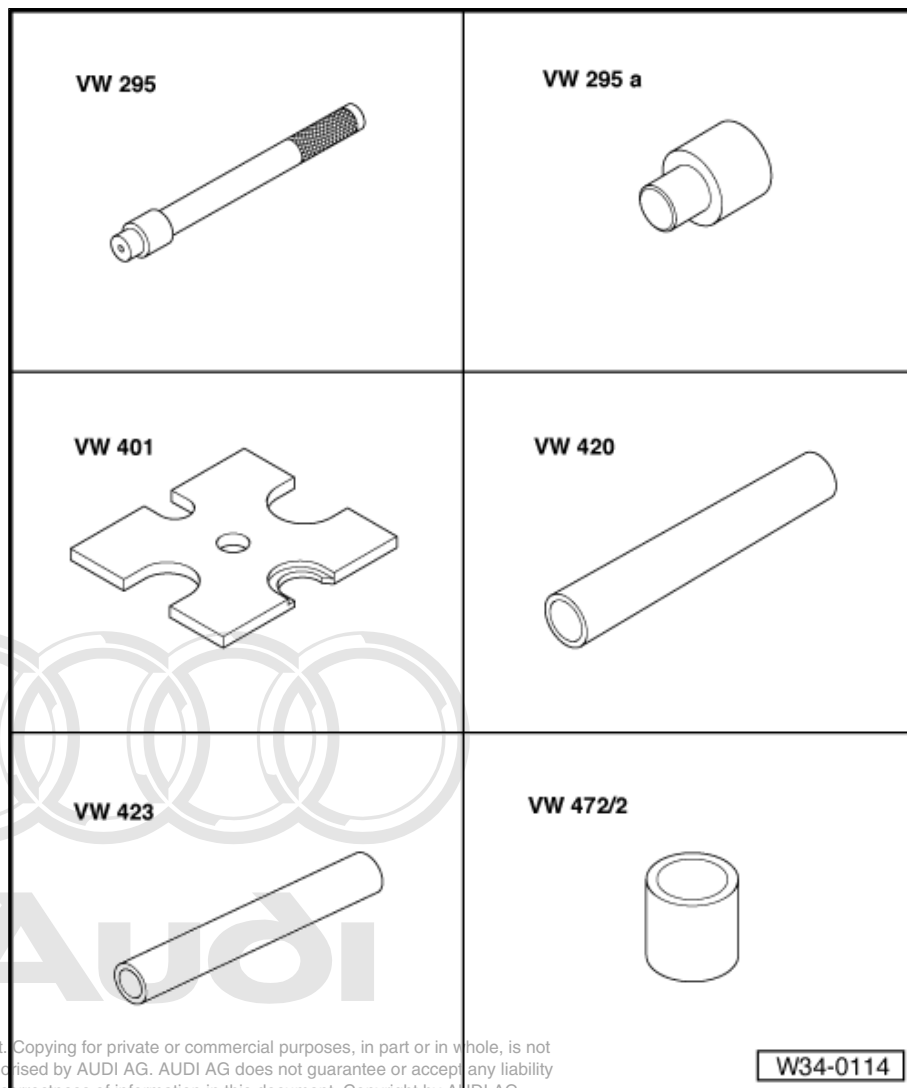


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9.2 Dismantling and assembling selector mechanism in gearbox

Special tools and workshop equipment required

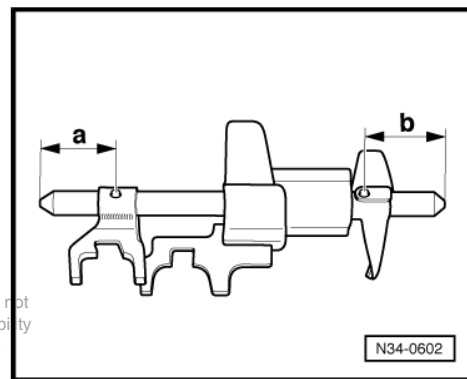
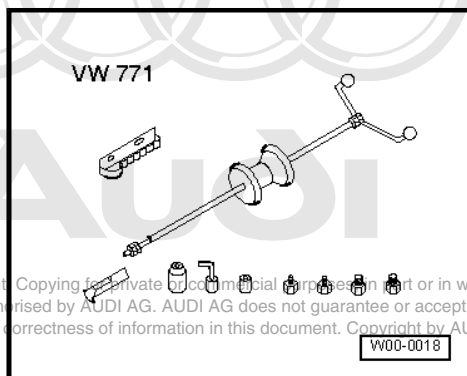
- ◆ Drift -VW 295-
- ◆ Adapter -VW 295 A-
- ◆ Thrust plate -VW 401-
- ◆ Tube -VW 420-
- ◆ Tube -VW 423-
- ◆ Spacer sleeve -VW 472/2-



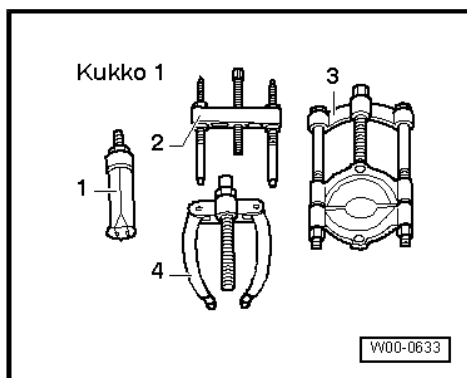
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W34-0114

- ◆ Multi-purpose tool - VW 771-



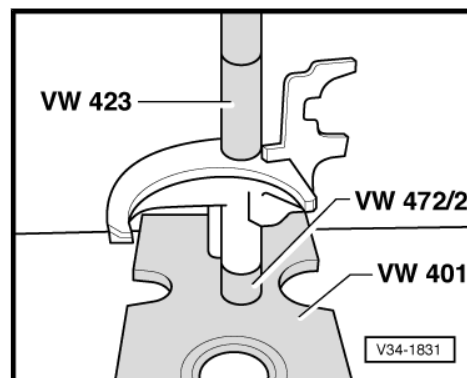
- ◆ -1- Internal puller 23.5...30 mm, e.g. - Kukko21/4-



Installation position of selector fork for 5th and reverse gear and yoke for selector rod

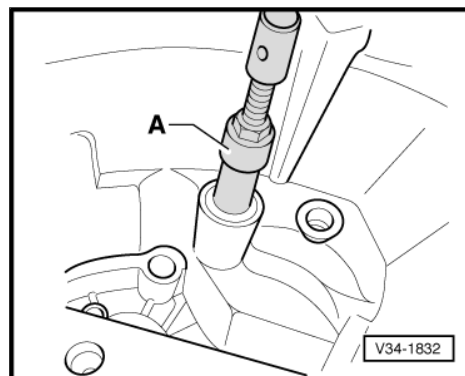
- ◆ Dimension -a- = 55 mm
- ◆ Dimension -b- = 60 mm

Removing and installing ball sleeve

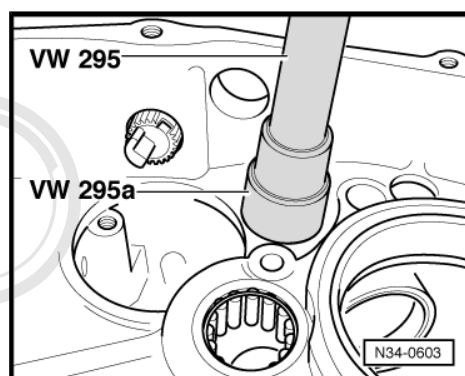


Pulling out bearing bush for 3rd and 4th gear selector rod

A - Internal puller 23.5 ... 30 mm , e.g. -Kukko 21/4- together with multi-purpose tool -VW 771-

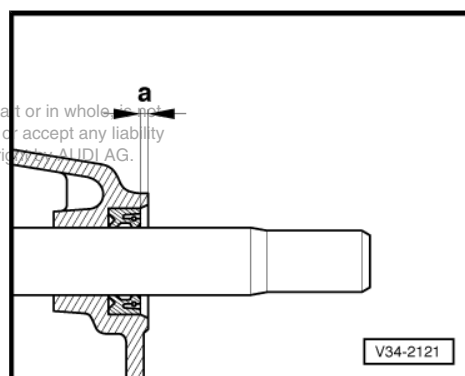


Driving in bearing bush for 3rd and 4th gear selector rod onto stop



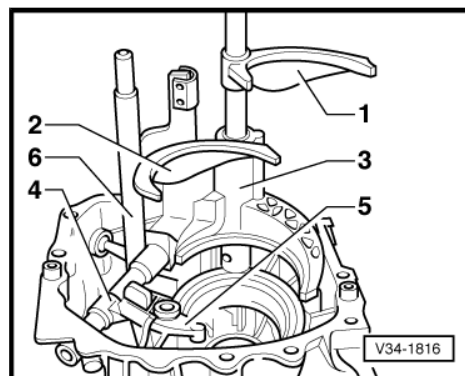
Installation position of oil seal

- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1-
- Lightly oil outer circumference of oil seal.
- Use tube -VW 420- to insert oil seal.
- ◆ Dimension -a- = 1 mm



Installation position of complete selector mechanism in gearbox:

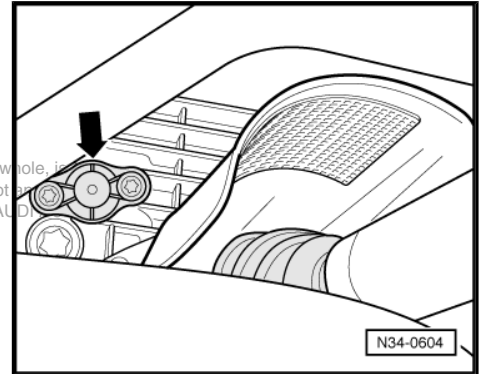
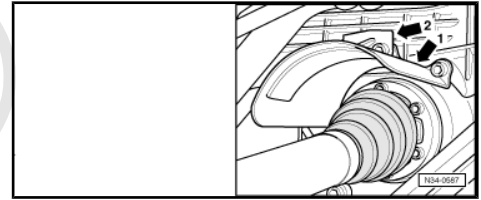
- 1 - Selector fork for 5th gear and reverse gear
- 2 - Selector fork for 3rd gear and 4th gear
- 3 - Selector fork for 1st gear and 2nd gear
- 4 - Relay shaft
- 5 - Detent segment
- 6 - Selector shaft



9.3 Removing and installing locking unit for 5th gear and reverse gear

Removing

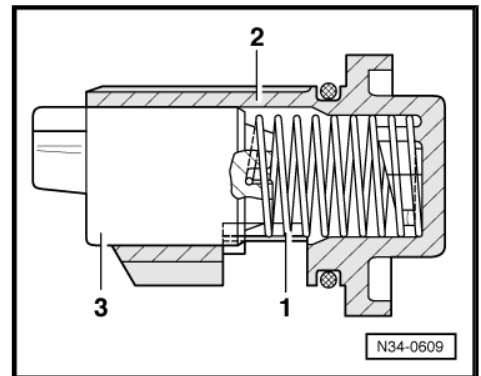
- Remove heat shield -arrow 2- above drive shaft (right-side).
- Detach heat shield -arrow 1- above drive shaft (right-side) and pivot downwards.
- Remove locking unit -arrow-.



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Assembling locking unit:

- Insert spring -1- into housing -2- and, while exerting light pressure, turn spring to the left until it locates in the base of the housing.
- Insert bush -3- onto the spring so that the bent end of the spring locates in the groove.
- Push bush -3- against spring and turn approx. one turn to the left, until the lug on the bush aligns with the groove in the housing -2-.
- Press lug on bush -3- onto stop in the groove in the housing -2-.
- Turn bush -3- to right and release.
- ◆ The bush -3- will spring into installation position

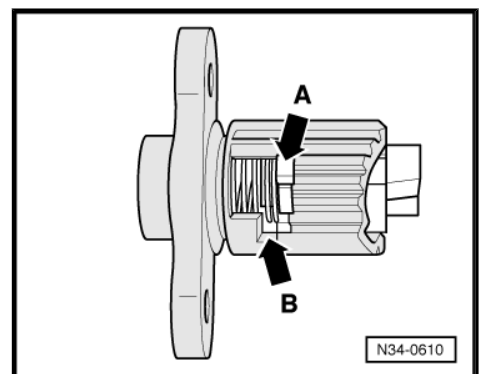


Installation position of bush:

- The lug -arrow A- on the bush must always be opposite the groove in the housing -arrow B-.

Checking installation position:

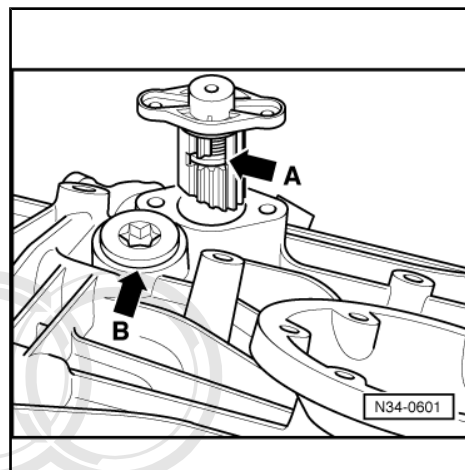
- Turn bush to left and release.
- The bush should spring back into position; the lug must be against the stop (direction indicated by -arrow A-).





Installation position of complete locking unit in gearbox:

The recess -arrow A- faces bolt -arrow B-.



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35 – Gears, shafts

1 Dismantling and assembling input shaft

Overview

- ◆ [⇒ „1.1 Exploded view - input shaft“, page 107](#)
- ◆ [⇒ „1.2 Dismantling and assembling input shaft“, page 110](#)
- ◆ [⇒ „1.3 Adjusting input shaft“, page 118](#)

1.1 Exploded view - input shaft



Note

- ◆ *When installing new gear wheels or input shaft, consult technical data [⇒ page 1](#).*
- ◆ *Before installing, heat gear wheels and synchro-hubs to approx. 100 °C (max.) using inductive heater -VAS 6414- (wear protective gloves).*
- ◆ *The position of the ball bearing is affected when the ball bearing, gearbox housing or input shaft is renewed. In this case the input shaft must be re-adjusted [⇒ page 118](#).*

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1 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 116](#)
- ☐ Determining thickness
⇒ [page 118](#)

2 - Ball bearing

- ☐ Removing and installing
⇒ [page 81](#)

3 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 116](#)
- ☐ Determining thickness
⇒ [page 118](#)

4 - Gearbox housing

5 - Needle bearing

- ☐ Secured with bolt on some gearboxes
⇒ [page 113](#)
- ☐ Driving out ⇒ [page 113](#)
- ☐ Selecting correct needle bearing for input shaft
⇒ [page 113](#)
- ☐ Installation position
⇒ [page 114](#)
- ☐ Pressing in
⇒ [page 114](#)
- ☐ Securing ⇒ [page 114](#)

6 - Input shaft

- ☐ With oil feed sleeve
- ☐ Knocking in oil feed sleeve ⇒ [page 114](#)
- ☐ Selecting correct needle bearing for input shaft ⇒ [page 113](#)
- ☐ Adjusting ⇒ [page 118](#)

7 - Needle bearing for 3rd gear

8 - 3rd speed selector gear

9 - Spring

- ☐ Insert in 3rd speed selector gear ⇒ [page 116](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

10 - Synchro-ring for 3rd gear

- ☐ Checking for wear ⇒ [page 116](#)

11 - Circlip

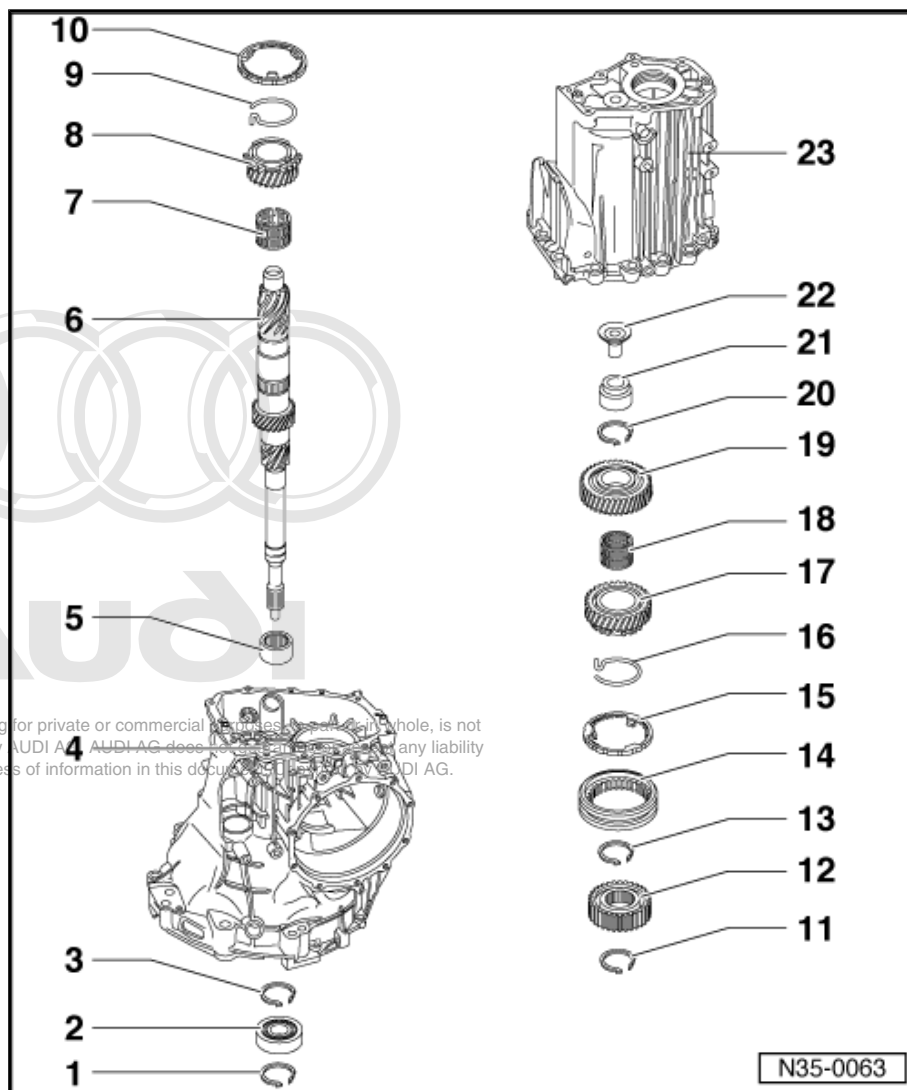
- ☐ Mark
- ☐ Installation position ⇒ [page 116](#)

12 - Synchro-hub for 3rd and 4th gear

- ☐ Higher shoulder faces towards 3rd gear
- ☐ Pressing off ⇒ [page 116](#)
- ☐ Pressing on ⇒ [page 117](#)

13 - Circlip

- ☐ Mark



- ☐ Installation position ⇒ [page 116](#)
- ☐ Redetermine thickness if synchro-hub is replaced ⇒ [page 117](#)

14 - Locking collar for 3rd and 4th gear

- ☐ Installation position ⇒ [page 117](#)

15 - Synchro-ring for 4th gear

- ☐ Checking for wear ⇒ [page 116](#)

16 - Spring

- ☐ Insert in 4th speed selector gear ⇒ [page 116](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

17 - 4th speed selector gear

18 - Needle bearing for 4th gear

19 - 5th gear wheel

- ☐ Pressing off ⇒ [page 115](#)
- ☐ Pressing on ⇒ [page 118](#)

20 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 116](#)
- ☐ If the 5th gear wheel is renewed determine thickness of required new circlip ⇒ [page 117](#)

21 - Roller bearing

- ☐ Renew
- ☐ Will be damaged during removal
- ☐ Pulling out ⇒ [page 115](#)
- ☐ Installation position ⇒ [page 115](#)
- ☐ Driving in ⇒ [page 115](#)

22 - Sleeve

- ☐ Made of plastic

23 - Gearbox cover



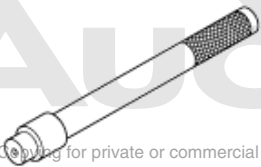
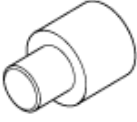
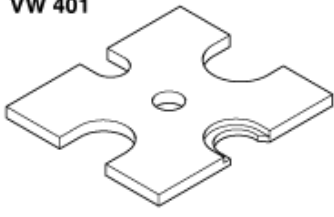
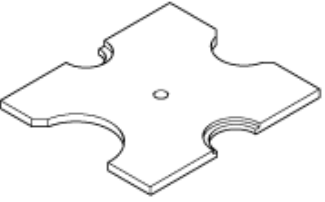
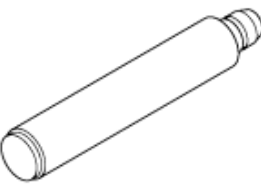
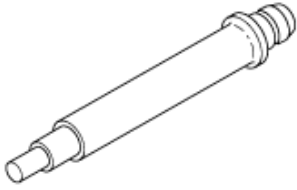
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1.2 Dismantling and assembling input shaft

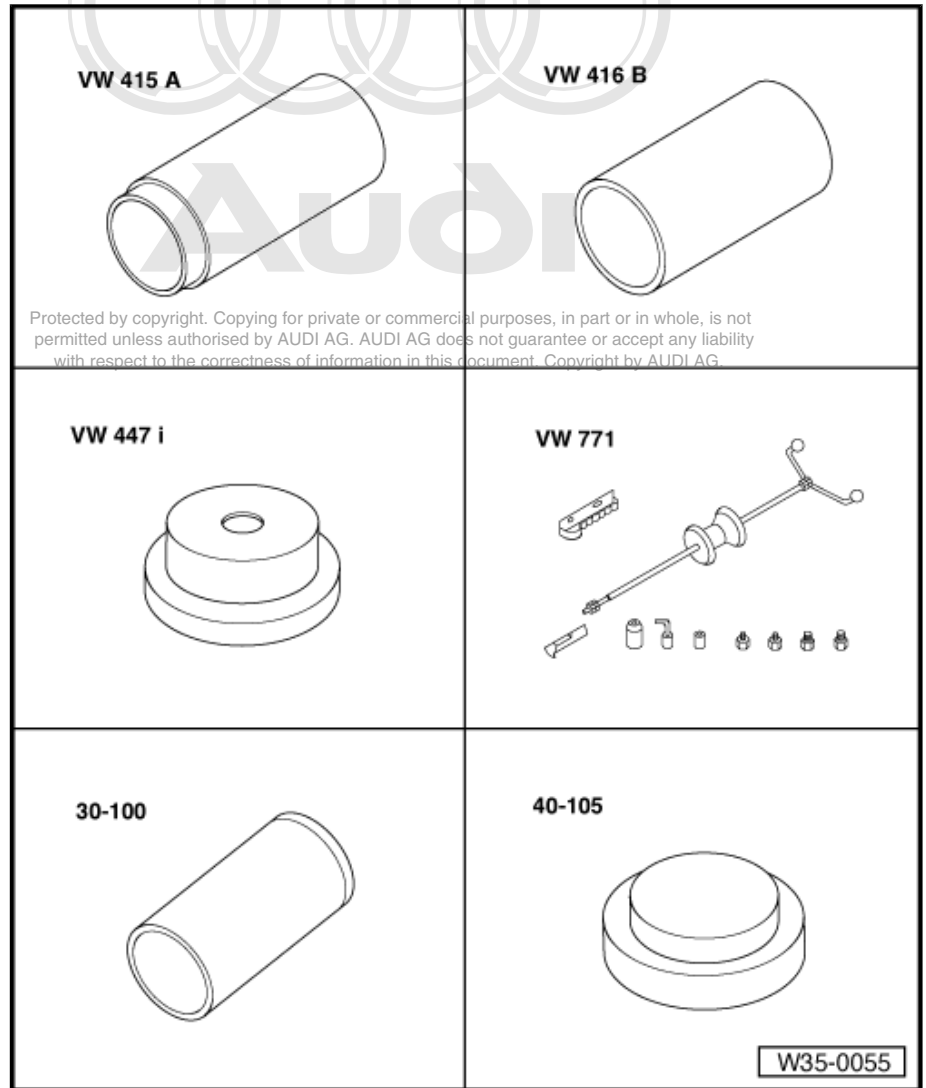
Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Adapter -VW 295 A-
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 408 A-

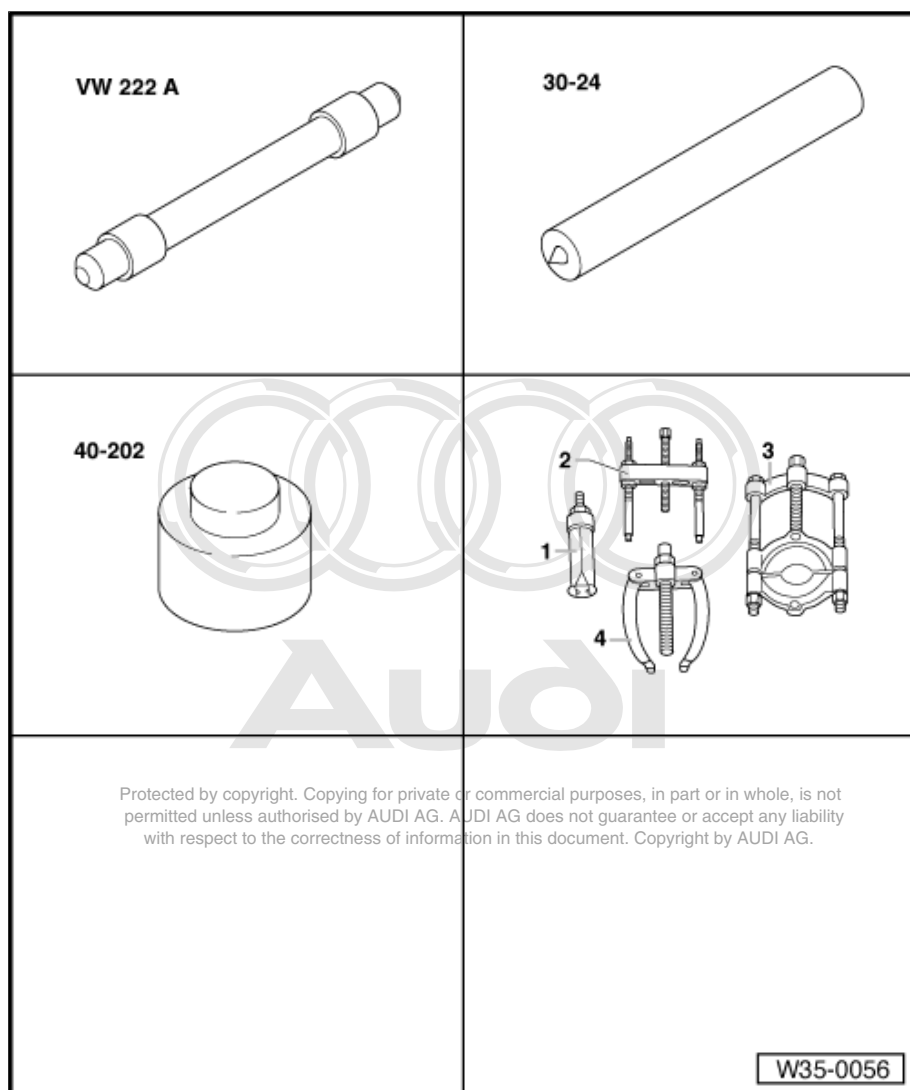
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VW 295 	VW 295 a 
VW 401 	VW 402 
VW 407 	VW 408 A  W35-0054

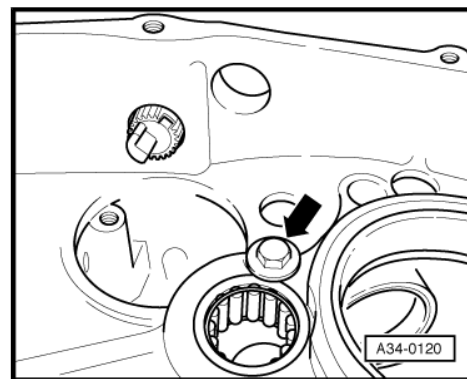
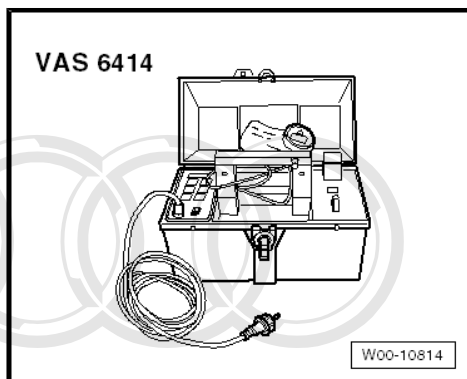
- ◆ Tube -VW 415 A-
- ◆ Tube -VW 416 B-
- ◆ Thrust plate -VW 447 i-
- ◆ Multi-purpose tool - VW 771-
- ◆ Drift sleeve -30 - 100-
- ◆ Thrust plate -40 - 105-



- ◆ Drift -VW 222 A-
- ◆ Drift -30 - 24-
- ◆ Extractor -40 - 202-
- ◆ -1- Internal puller -Kukko 21/4-
- ◆ -3- Splitter -Kukko 17/2-



- ◆ Inductive heater - VAS 6414-



- ◆ Feeler gauge

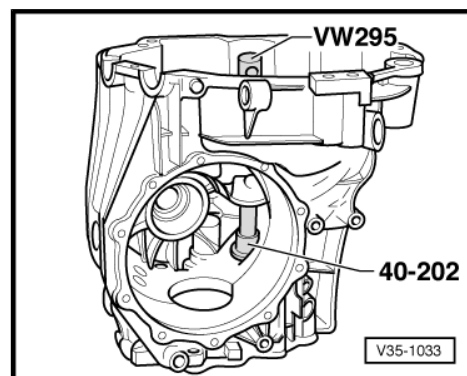
Removing securing bolt -arrow- for needle bearing

- Unscrew securing bolt -arrow-.



Bolt is not fitted on all versions.

Driving out needle bearing

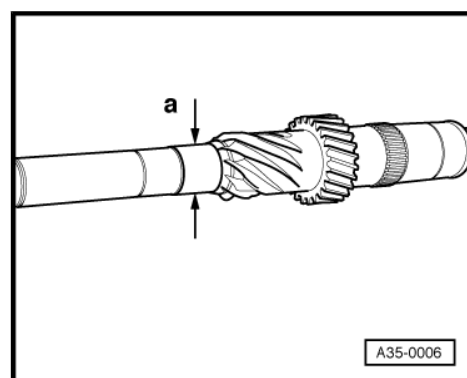


Selecting correct needle bearing for input shaft

Ø Input shaft	Needle bearing part number
Dimension -a- = 27 mm	012 311 123 D
Dimension -a- = 29 mm	012 311 123



- ◆ To avoid damage resulting from incorrect assembly, check the following after renewing the input shaft:
- ◆ It must be possible to guide input shaft into place.
- ◆ Input shaft must be free of play.



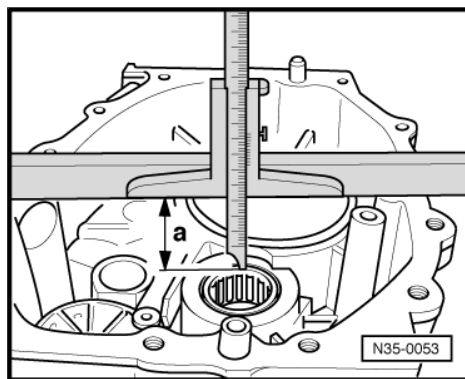
Installation position of needle bearing

Distance -a- from lower edge of straight edge to upper edge of needle bearing = 39.5 mm

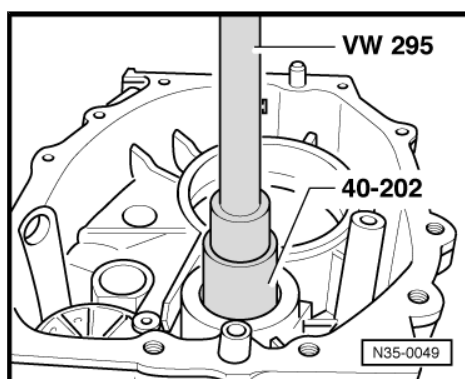


Note

Measure distance from top edge of straight-edge and subtract the width of the straight-edge from the measured distance.

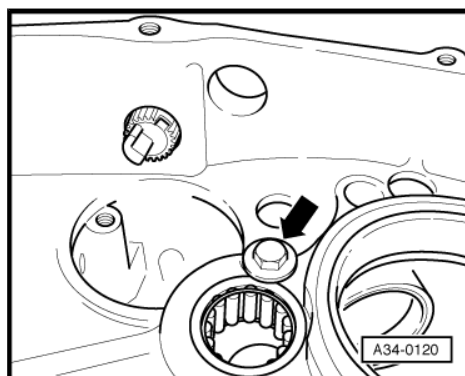


Pressing in needle bearing



Installing securing bolt -arrow- for needle bearing

- If fitted, screw in securing bolt and tighten to 25 Nm.



Knocking oil feed sleeve into input shaft

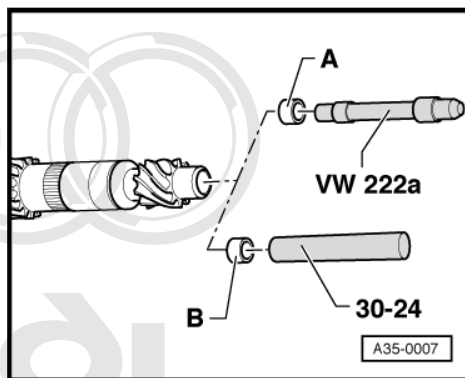
Item	Ø Oil feed sleeve	Fitting tool
A	14 mm	Drift -VW 222 A-
B	16 mm	Drift -30 - 24-

◆ Installation position:

Flanged edge on oil feed sleeve faces towards fitting tool.

◆ Installation depth:

3.5 mm below end of shaft

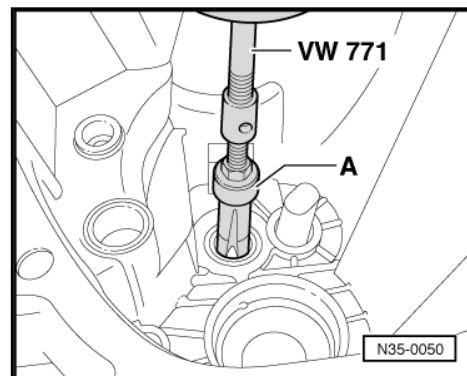


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Pulling out roller bearing

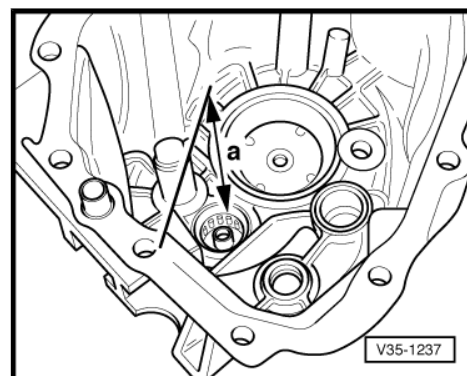
A - Internal puller 23.5 ... 30 mm , e.g. -Kukko 21/4-

- Before fitting internal puller the plastic sleeve inside the roller bearing must be destroyed.

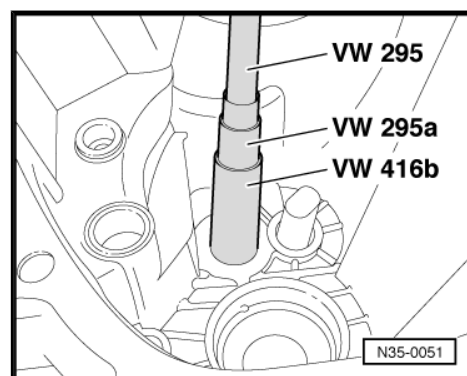


Installation position of roller bearing

- ◆ Dimension -a- = 216 mm



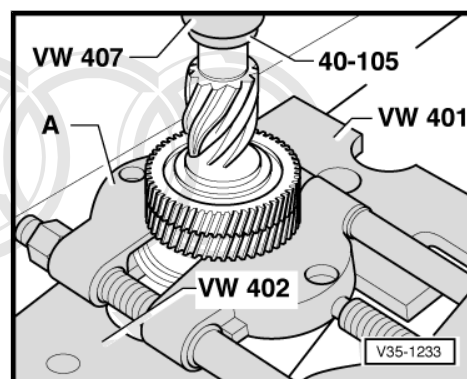
Driving in roller bearing



Pressing off 5th gear wheel

- Remove circlip before pressing off.

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

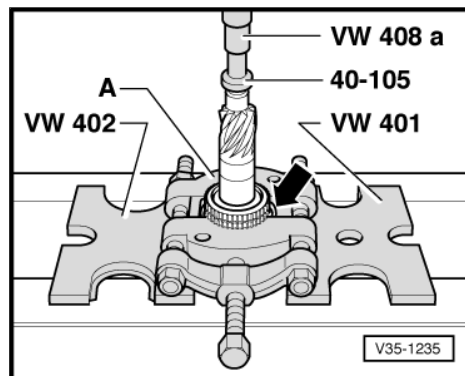


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Pressing off 3rd and 4th gear synchro-hub

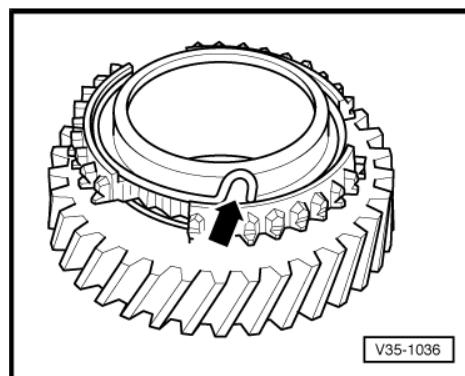
- Remove circlip before pressing off.
- Place splitter -A- below 3rd speed selector gear. Press off synchro-hub with 3rd speed selector gear.

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



Inserting spring in selector gear

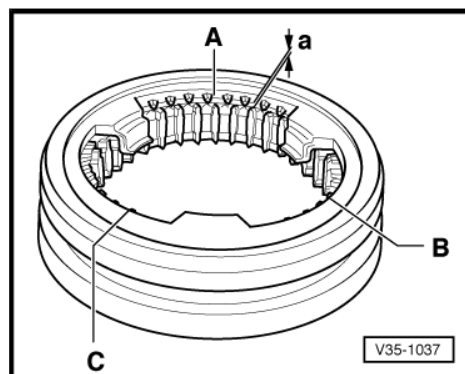
The bent end of the spring -arrow- must be hooked into the hole in the selector gear.



Checking synchro-ring for wear

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

The average gap must not be less than 0.5 mm.



Installation position of circlips

- ◆ The circlips -1- and -2- secure the input shaft ball bearing.
- Determining thickness ⇒ „1.3 Adjusting input shaft“, page 118 .

- ◆ The circlip -3- secures the 3rd and 4th gear synchro-hub.

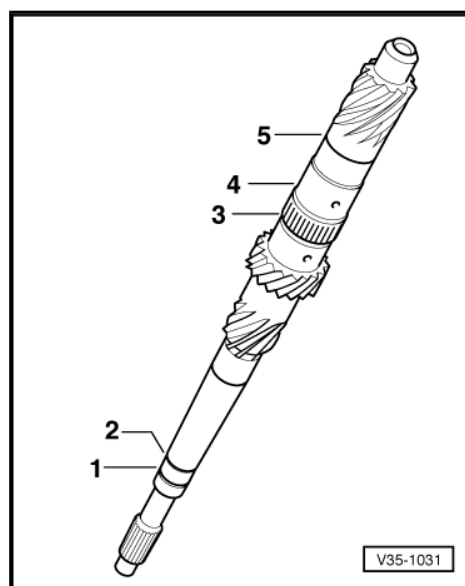
Thickness: 2.00 mm. Identification: brown colour.

- ◆ The circlip -4- secures the 3rd and 4th gear synchro-hub.

Determining thickness ⇒ page 117 . Identification: blue colour.

- ◆ Circlip -5- secures 5th gear wheel.

Determining thickness ⇒ page 117 .



Determining thickness of circlip

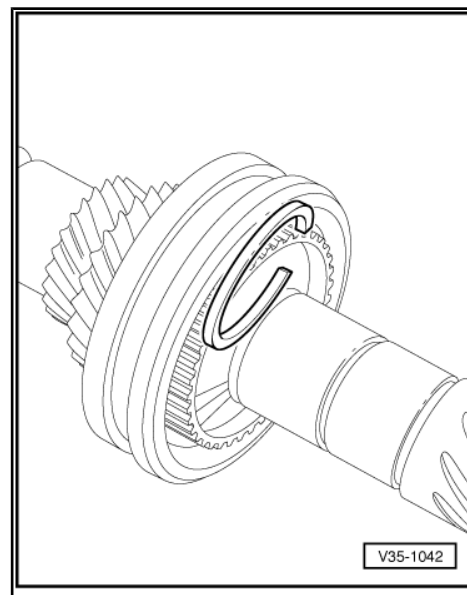
- Determine the thickest circlip that will just fit and install it.
- Determine circlip as accurately as possible from table. For part number, refer to ⇒ Electronic parts catalogue .

The following circlips are available for 3rd and 4th gear synchro-hub

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

The following circlips are available for 5th gear wheel

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	



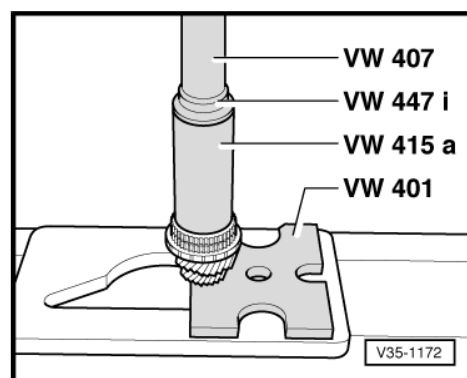
Heating synchro-hub for 3rd and 4th gear to approx. 100° C and pressing on



WARNING
Wear protective gloves.

◆ Installation position:

Higher inside collar faces 3rd gear.



Installation position of locking collar

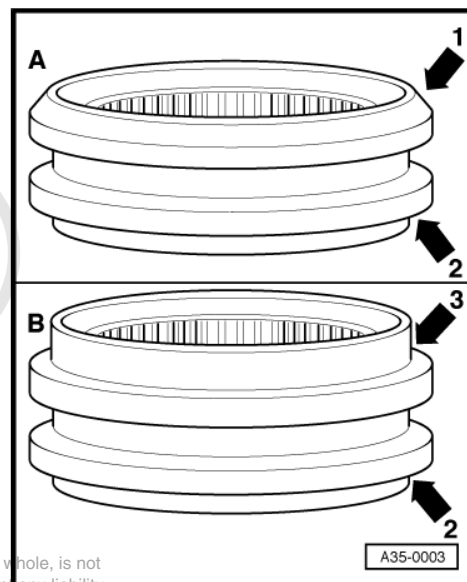
Different types of locking collar are installed: version -A- with chamfered surface -arrow 1- or version -B- with large shoulder -arrow 3-.

◆ Installation position:

Chamfered surface -arrow 1- faces 4th gear.

Small shoulder -arrow 2- faces 3rd gear.

Large shoulder -arrow 3- faces 4th gear.



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Heating 5th gear wheel to approx. 100°C and pressing on

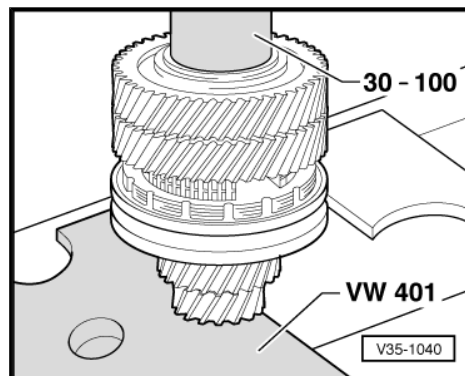


WARNING

Wear protective gloves.

◆ Installation position:

Higher shoulder faces towards reverse gear.

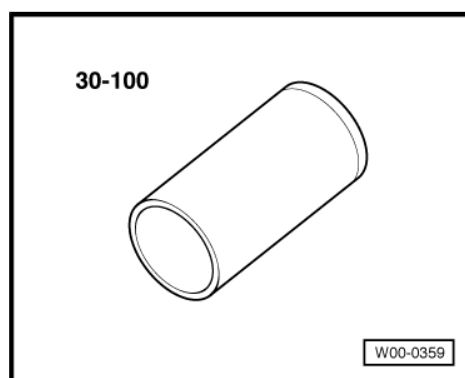


1.3 Adjusting input shaft

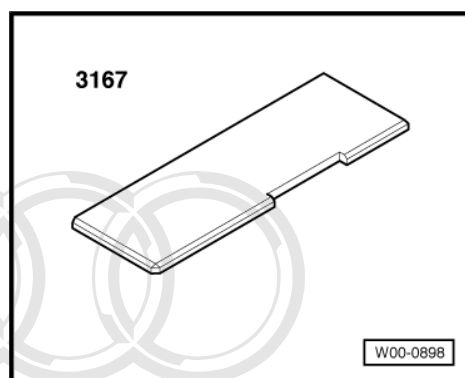
(Determining thickness of circlips for input shaft)

Special tools and workshop equipment required

◆ Drift sleeve -30 - 100-



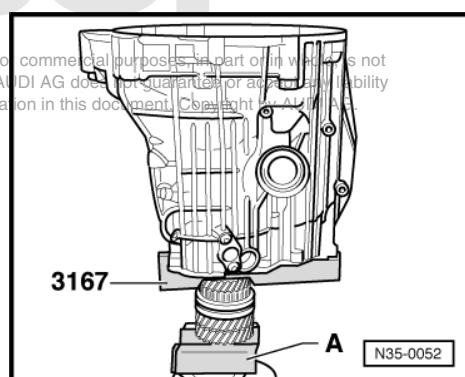
◆ Distance gauge -3167-



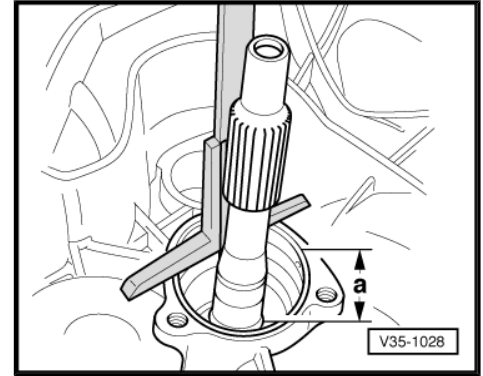
◆ Depth gauge

The input shaft must be readjusted if the gearbox housing, the input shaft or the ball bearing have been renewed.

- Clamp input shaft in vice using jaw covers -A-.
- Place distance gauge -3167- onto 3rd speed selector gear.
- Place gearbox housing over input shaft and onto distance gauge .



- Apply depth gauge to gearbox housing and measure down to the lower circlip groove in the input shaft.
- ◆ Measurement in the following example: -a- = 28.50 mm



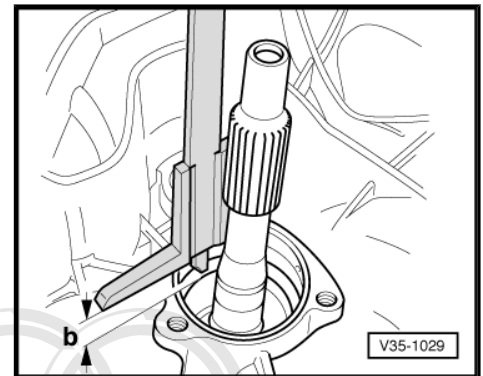
- Apply depth gauge to gearbox housing and measure down to seating surface for ball bearing.
- ◆ Measurement in the following example: -b- = 26.80 mm

Determining thickness for circlip x behind input shaft ball bearing

Formula: „x“ = distance „a“ – distance „b“

Example:

Dimension „a“	28.50 mm
- Dimension „b“	26.80 mm
= Dimension „x“ (thickness of circlip)	1.70 mm



- Select circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Circlips available

Dimension „x“	Thickness (mm)
1.48 ... 1.56	1.54
1.57 ... 1.65	1.63
1.66 ... 1.74	1.72
1.75 ... 1.83	1.81
1.84 ... 1.92	1.90
1.93 ... 2.01	1.99
2.02 ... 2.10	2.08
2.11 ... 2.20	2.17
2.21 ... 2.27	2.25
2.28 ... 2.35	2.33

Determining thickness for circlip in front of input shaft ball bearing

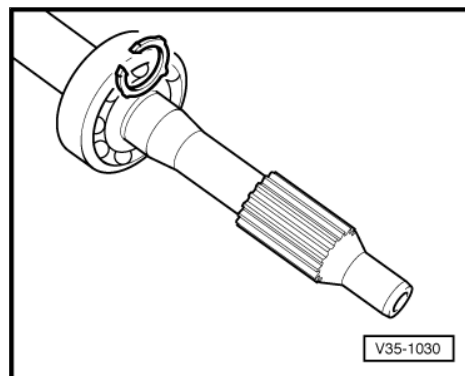
- Knock rear circlip (as determined) and ball bearing onto input shaft using drift sleeve -30-100- .



- Determine the thickest circlip which will still just fit.
- Determine circlip as accurately as possible from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Circlips available

Circlip thickness (mm)		
1.45	1.72	1.99
1.54	1.81	2.08
1.63	1.90	2.17



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2 Dismantling and assembling pinion shaft and hollow shaft

2.1 Exploded view - pinion shaft and hollow shaft

Note

- ◆ Refer to technical data [⇒ page 1](#) when installing new gear wheels or the final drive gear set.
- ◆ Before installing, heat tapered roller bearing inner races and synchro-hubs to approx. 100 °C (max.) using inductive heater - VAS 6414- (wear protective gloves).
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾
[⇒ „5.3 Table of adjustments - gearbox“, page 164](#).

1 - Gearbox housing ¹⁾

2 - Shim „S3“

- ☐ Table of adjustments
[⇒ page 164](#)

3 - Double tapered roller bearing outer race ¹⁾

- ☐ Renew together with
[⇒ Item 5 \(page 121\)](#)
- ☐ Pulling out [⇒ page 127](#)
- ☐ Pressing in
[⇒ page 127](#)

4 - Pinion shaft ¹⁾

- ☐ Is mated with crown wheel, always renew together as a set
- ☐ Adjusting pinion shaft and crown wheel
[⇒ page 162](#)

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5 - Double tapered roller bearing inner race ¹⁾

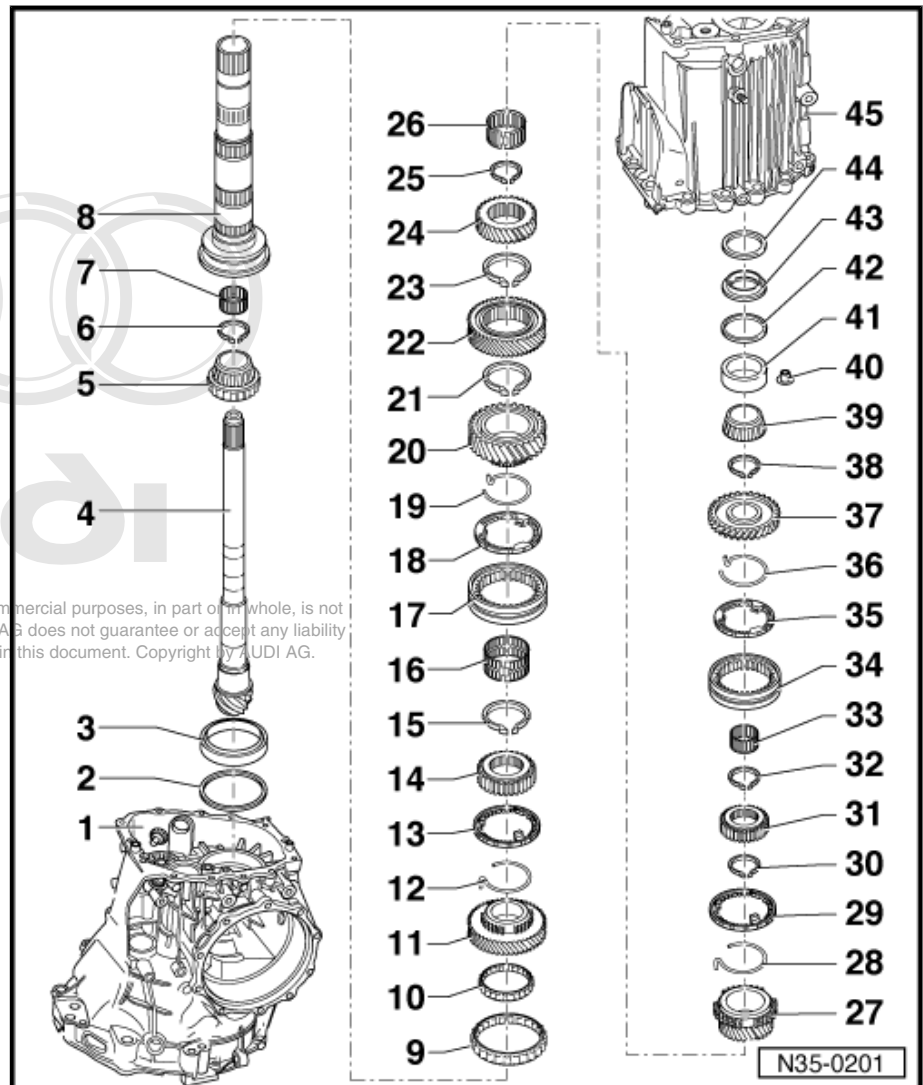
- ☐ Renew
- ☐ Will be damaged during removal
- ☐ Pressing off
[⇒ page 127](#)
- ☐ Pressing on
[⇒ page 128](#)

6 - Circlip

- ☐ Redetermine thickness if double tapered roller bearing is renewed
[⇒ page 128](#)

7 - Needle bearing

- ☐ For pinion shaft in hollow shaft
- ☐ Lubricate with MoS₂ grease



8 - Hollow shaft ¹⁾

- ☐ Reinforcements on gearboxes manufactured from 17 08 8 onwards ⇒ [page 134](#)

9 - Needle bearing for 1st gear**10 - Needle bearing for 1st gear****11 - 1st speed selector gear****12 - Spring**

- ☐ Insert in 1st speed selector gear ⇒ [page 132](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

13 - Synchro-ring for 1st gear

- ☐ Checking for wear ⇒ [page 132](#)

14 - Synchro-hub for 1st and 2nd gear

- ☐ Pressing off ⇒ [page 130](#)
- ☐ Pressing on ⇒ [page 132](#)

15 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)
- ☐ Redetermine thickness if synchro-hub is replaced ⇒ [page 128](#)

16 - Needle bearing for 2nd gear**17 - Locking collar for 1st and 2nd gear**

- ☐ Installation position ⇒ [page 132](#)

18 - Synchro-ring for 2nd gear

- ☐ Checking for wear ⇒ [page 132](#)

19 - Spring

- ☐ Insert in 2nd speed selector gear ⇒ [page 132](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

20 - 2nd speed selector gear**21 - Circlip**

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)

22 - 3rd gear wheel

- ☐ Pressing off ⇒ [page 130](#)
- ☐ Pressing on ⇒ [page 133](#)

23 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)
- ☐ If the 3rd gear wheel is renewed determine thickness of required new circlip ⇒ [page 128](#)

24 - 4th gear wheel

- ☐ Pressing off ⇒ [page 130](#)
- ☐ Pressing on ⇒ [page 133](#)
- ☐ Reinforcements on gearboxes manufactured from 17 08 8 onwards ⇒ [page 134](#)

25 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)
- ☐ If the 4th gear wheel is renewed determine thickness of required new circlip ⇒ [page 128](#)
- ☐ Reinforcements on gearboxes manufactured from 17 08 8 onwards ⇒ [page 134](#)



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26 - Needle bearing for 5th gear

- ☐ Reinforcements on gearboxes manufactured from 17 08 8 onwards ⇒ [page 134](#)

27 - 5th speed selector gear

- ☐ Reinforcements on gearboxes manufactured from 17 08 8 onwards ⇒ [page 134](#)

28 - Spring

- ☐ Insert in 5th speed selector gear ⇒ [page 132](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

29 - Synchro-ring for 5th gear

- ☐ Checking for wear ⇒ [page 132](#)

30 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)

31 - 5th gear and reverse gear synchro-hub

- ☐ Pressing off ⇒ [page 129](#)
- ☐ Pressing on ⇒ [page 133](#)

32 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)
- ☐ Redetermine thickness if synchro-hub is replaced ⇒ [page 128](#)

33 - Needle bearing

- ☐ For reverse gear
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34 - 5th and reverse gear locking collar

- ☐ Installation position ⇒ [page 133](#)

35 - Synchro-ring for reverse gear

- ☐ Checking for wear ⇒ [page 132](#)

36 - Spring

- ☐ Insert into reverse selector gear ⇒ [page 132](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

37 - Reverse selector gear

38 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 131](#)

39 - Tapered roller bearing inner race ¹⁾

- ☐ Pressing off ⇒ [page 129](#)
- ☐ Pressing on ⇒ [page 129](#)

40 - Bush

- ☐ Secures tapered roller bearing outer race ⇒ [Item 41 \(page 123\)](#)
- ☐ Pulling out ⇒ [page 128](#)
- ☐ Need not be fitted after tapered roller bearing has been renewed

41 - Tapered roller bearing outer race ¹⁾

- ☐ Pressing out ⇒ [page 128](#)
- ☐ Pressing in ⇒ [page 129](#)

42 - Shim „S4“

- ☐ Table of adjustments ⇒ [page 164](#)

43 - Ring

- ☐ For rubber washer

- ☐ For correct version, refer to ⇒ Electronic parts catalogue

44 - Rubber washer

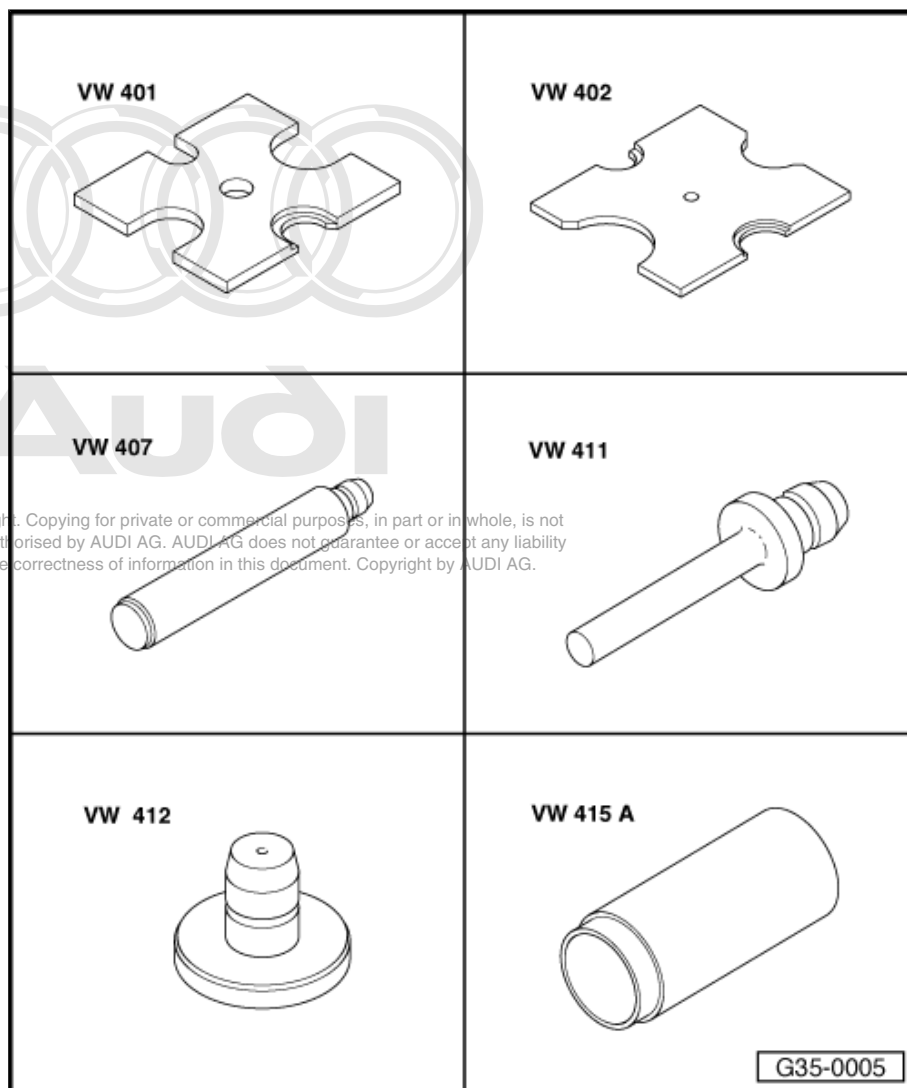
- ☐ Compensates length variations
☐ For correct version, refer to ⇒ Electronic parts catalogue

45 - Gearbox cover

2.2 Dismantling and assembling pinion shaft

Special tools and workshop equipment required

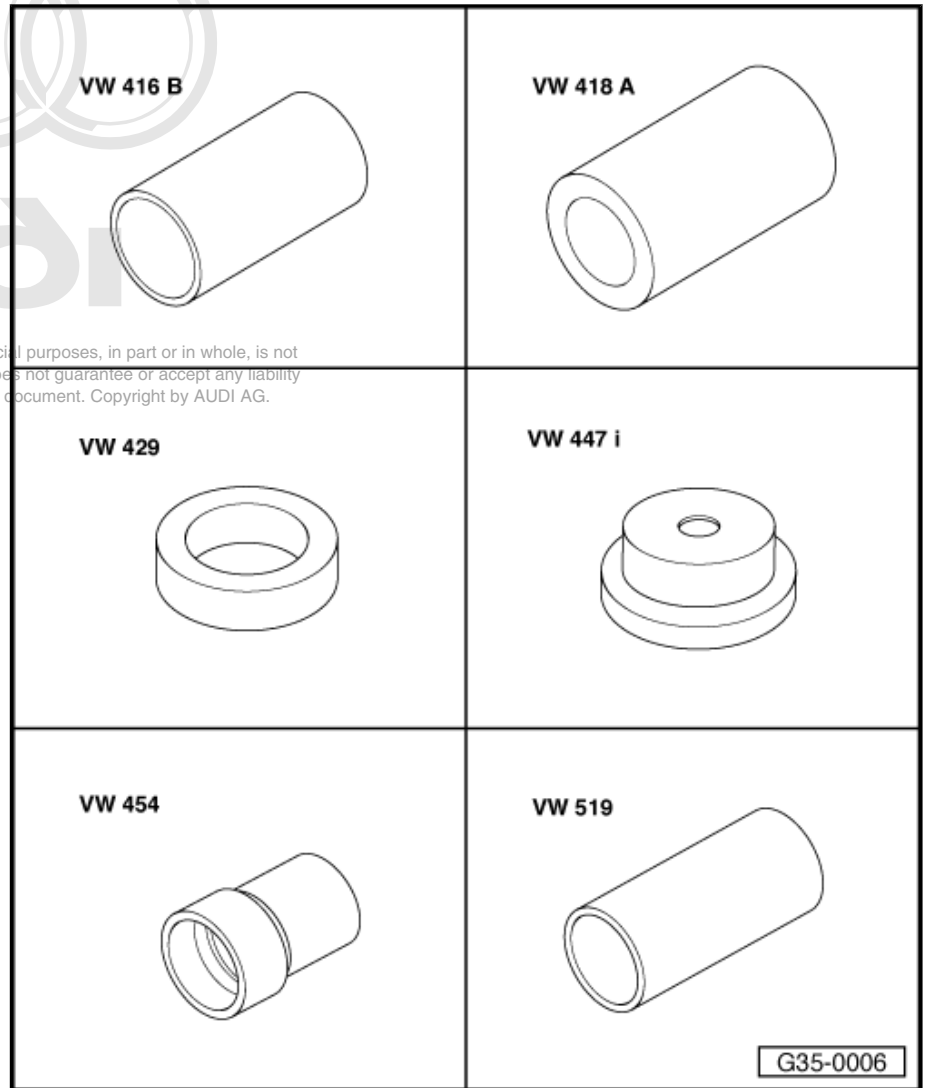
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 411-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 415 A-



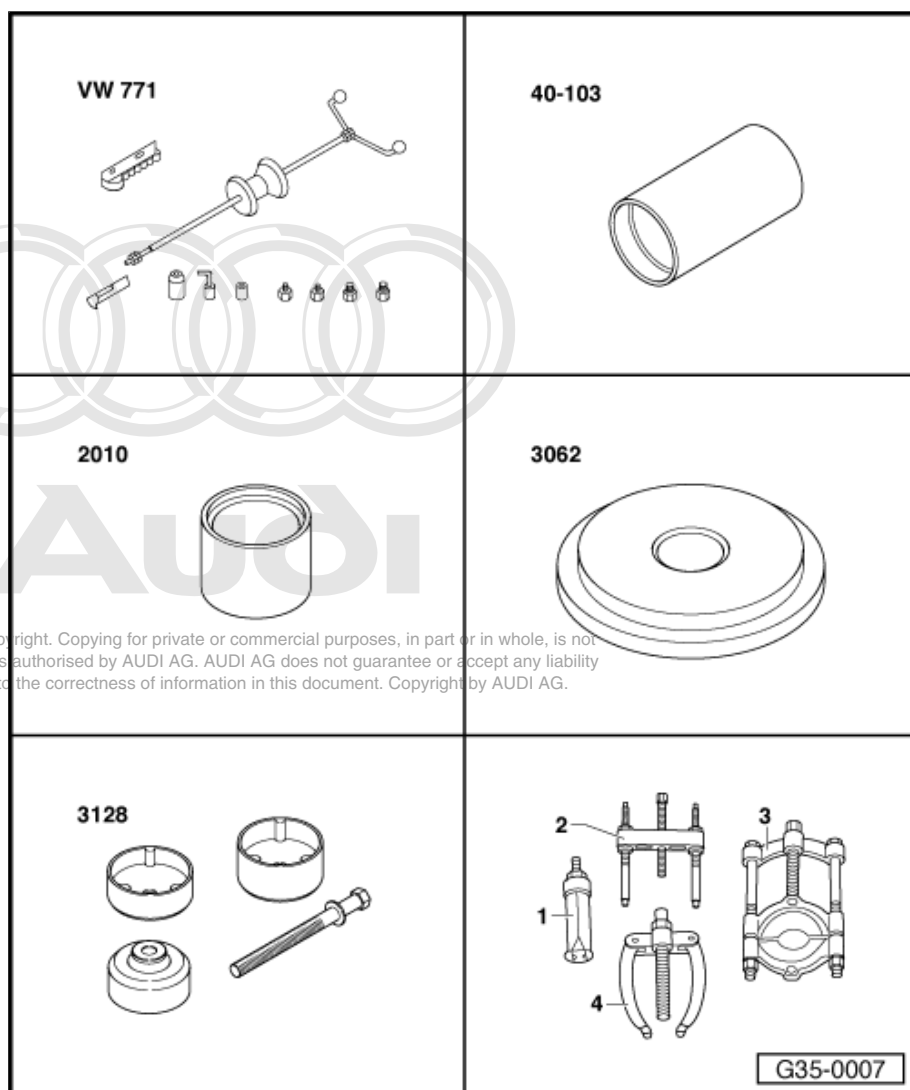
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- ◆ Tube -VW 416 B-
- ◆ Tube -VW 418 A-
- ◆ Thrust ring -VW 429-
- ◆ Thrust plate -VW 447 i-
- ◆ Press tool -VW 454-
- ◆ Tube -VW 519-

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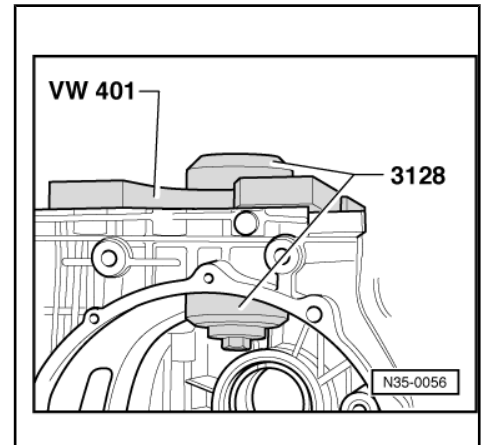
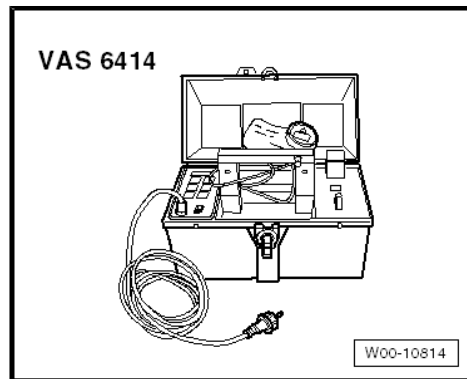


- ◆ Multi-purpose tool - VW 771-
- ◆ Support -40 - 103-
- ◆ Tube -2010-
- ◆ Thrust pad -3062-
- ◆ Fitting tool -3128-
- ◆ -1- Internal puller -Kukko 21/1-
- ◆ -3- Splitter -Kukko 17/2-



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- ◆ Inductive heater - VAS 6414-



Pulling out double tapered roller bearing outer race

- Remove differential
⇒ [page 149](#).
- Place thrust piece of fitting tool -3128- below the outer race.
- Attach threaded part of fitting tool -3128- with thrust plate -VW 401- onto gearbox housing.

The outer race will be pulled out of the housing when the bolt is tightened.

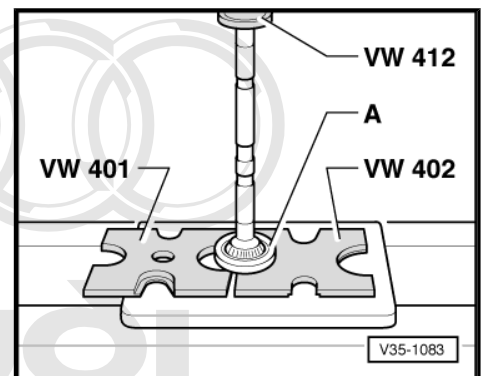
Pressing off double tapered roller bearing inner race

- Remove circlip before pressing off.
- The outer race -A- must be fitted to press off the inner race.



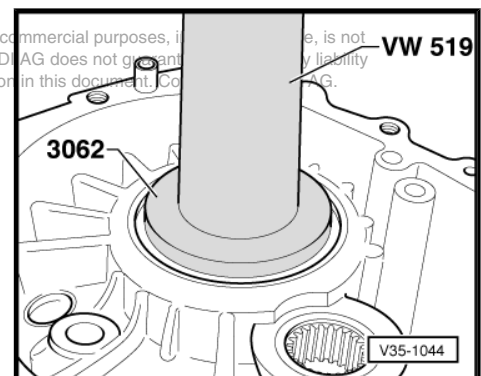
Note

The double tapered roller bearing inner race will be destroyed when it is pressed off.

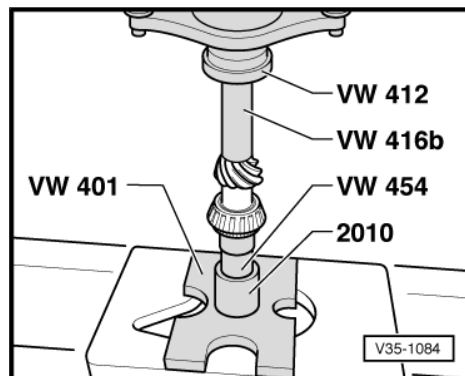


Pressing in double tapered roller bearing outer race

Smaller diameter of thrust pad -3062- faces outer race.



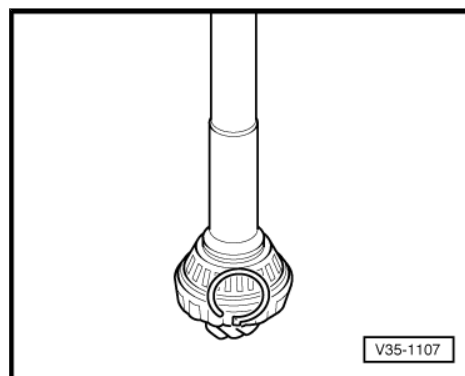
Pressing on double tapered roller bearing inner race



Determining thickness of circlip

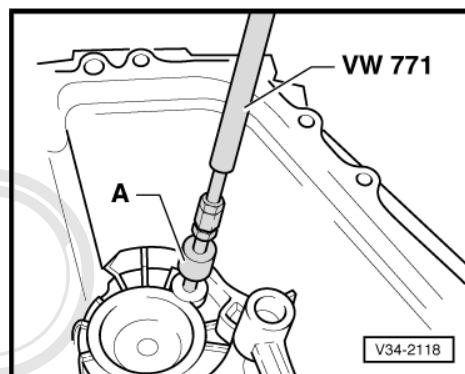
- Determine the thickest circlip that will just fit and install it.
- The required circlips for the synchro-hubs, needle bearings and individual gear wheels should be determined as shown for the double tapered roller bearing.

For available circlips refer to ⇒ Electronic parts catalogue .



Pulling out securing bush for tapered roller bearing outer race

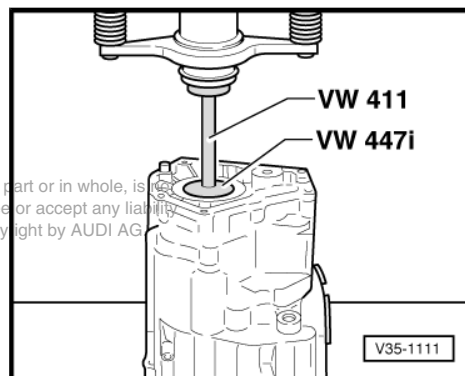
A - Internal puller 12 ... 16 mm , e.g. -Kukko 21/1-



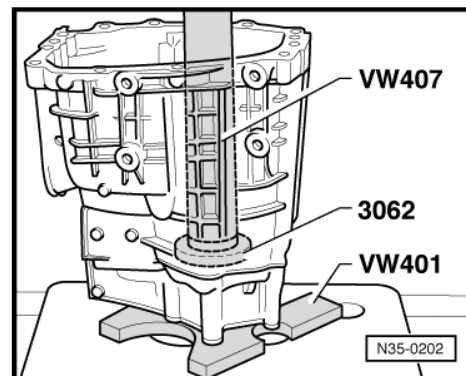
Pressing out tapered roller bearing outer race

- The outer race is pressed out together with the ring ⇒ [Item 43 \(page 123\)](#) , shim „S4“ ⇒ [Item 42 \(page 123\)](#) and the rubber washer for compensating length variations ⇒ [Item 44 \(page 124\)](#) .

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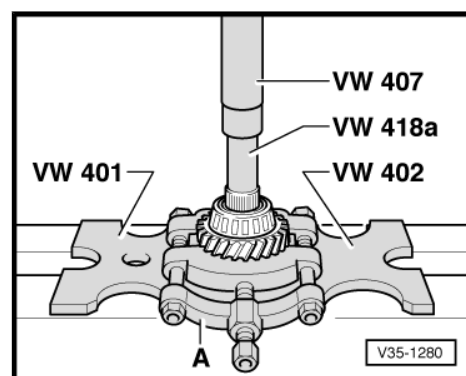
Pressing in tapered roller bearing outer race



Pressing off tapered roller bearing inner race

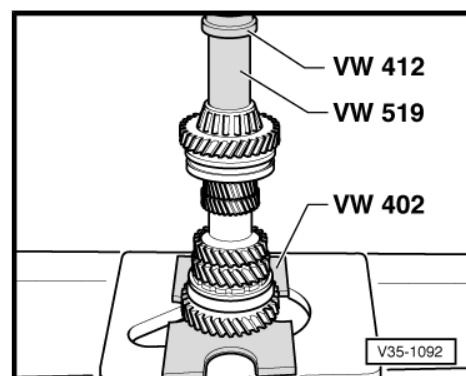
- Press off inner race with reverse gear selector gear

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



Pressing on tapered roller bearing inner race

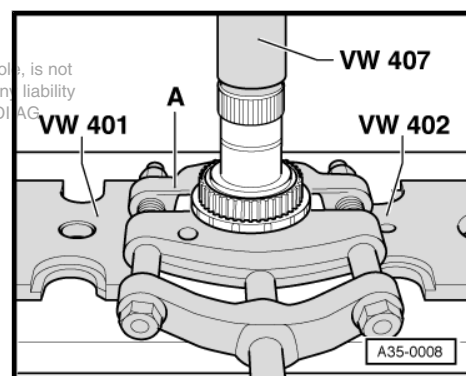
- Fit circlip before pressing on inner race.



Pressing off 5th gear and reverse gear synchro-hub

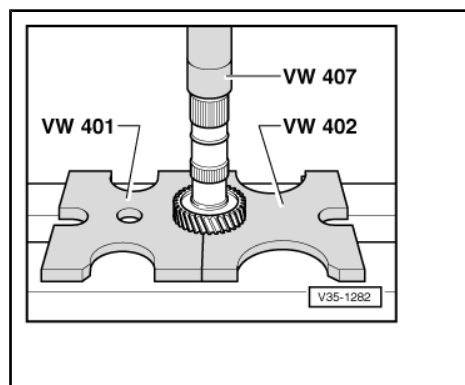
- Remove circlip before pressing off.
- Press off synchro-hub with 5th speed selector gear.

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



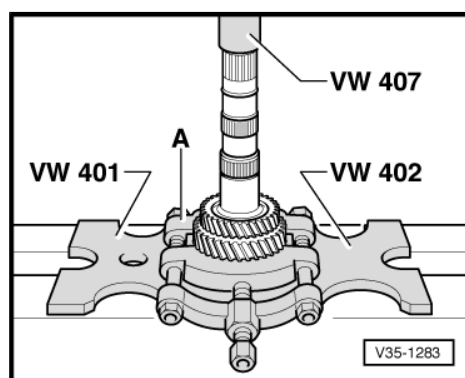
Pressing off 4th gear wheel

- Remove circlip before pressing off.

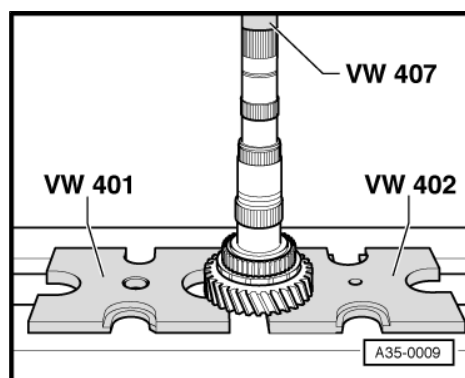
**Pressing off 3rd gear wheel**

- Remove circlip before pressing off.
- Press off 3rd gear wheel with 2nd speed selector gear.

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

**Pressing off 1st and 2nd gear synchro-hub**

- Remove circlip before pressing off.
- Press off synchro-hub with 1st speed selector gear.



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Installation position of circlips

- The required circlips for the synchro-hubs, needle bearings and individual gear wheels should be selected as shown in ➔ [page 128](#) .

- ◆ Circlip -1- secures the 1st and 2nd gear synchro-hub.

Identification: blue colour

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- ◆ Circlip -2- secures the needle bearing for 2nd speed selector gear.

Identification: blue colour.

Circlip thickness (mm)		
2.50		

- ◆ Circlip -3- secures the 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	

- ◆ Circlip -4- secures the 4th gear wheel.

Circlip thickness (mm)		
1.86	1.94	
1.90	1.98	

- ◆ Circlip -5- secures the needle bearing for 5th speed selector gear.

Identification: brown colour.

Circlip thickness (mm)		
2.00		

- ◆ Circlip -6- secures the synchro-hub for 5th and reverse gear.

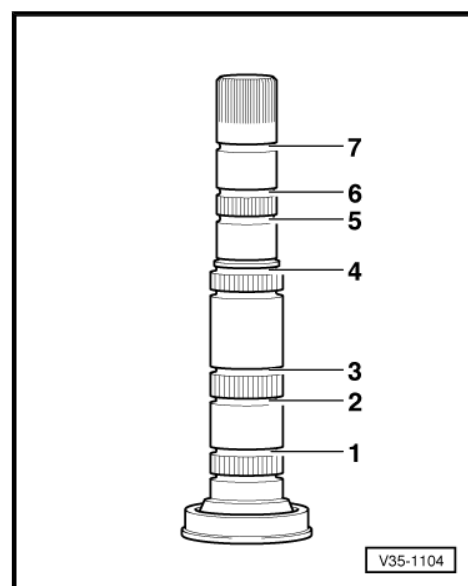
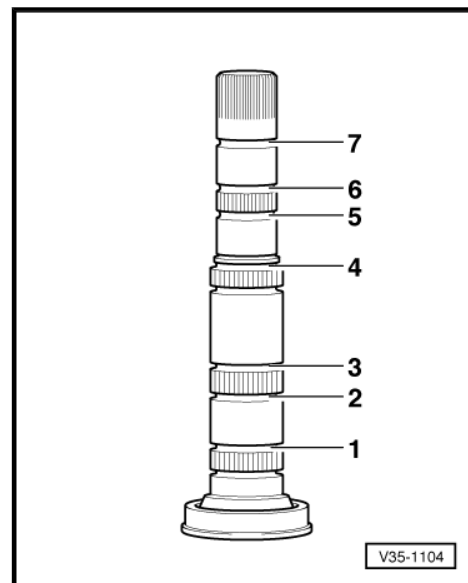
Identification: blue colour.

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

- ◆ Circlip -7- secures needle bearing for reverse selector gear.

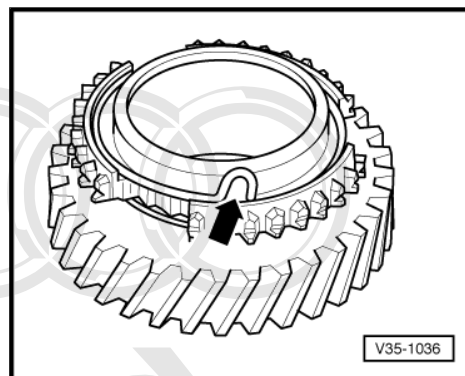
Circlip thickness (mm)		
2.50		

- Determine circlips according to table. For part numbers refer to ➔ Electronic parts catalogue .



Inserting spring in selector gear

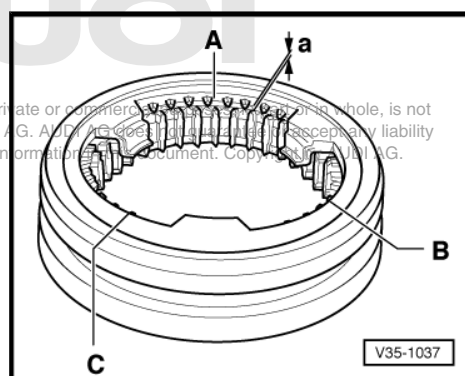
The bent end of the spring -arrow- must be hooked into the hole in the selector gear.



Checking synchro-ring for wear

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

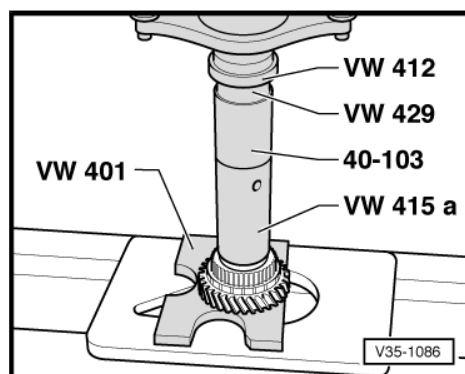
The average gap must not be less than 0.5 mm.



Heating 1st and 2nd gear synchro-hub and pressing on

- ◆ Installation position:

Higher inside collar faces 2nd gear.

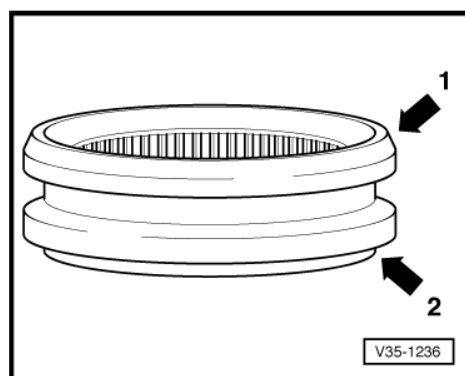


Installation position of locking collar for 1st and 2nd gear

- ◆ Installation position:

Chamfered surface -arrow 1- faces 2nd gear.

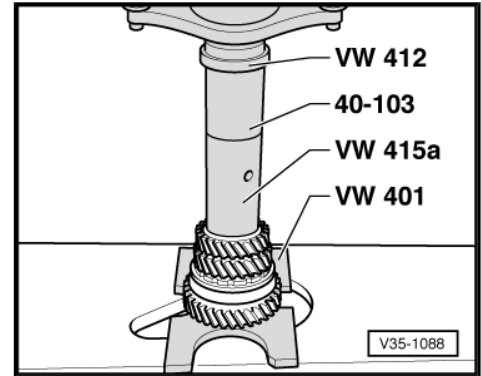
Shoulder -arrow 2- faces 1st gear.



Heating 3rd gear wheel and pressing on

◆ Installation position:

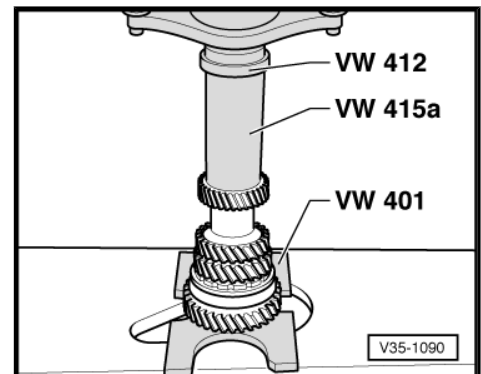
Groove on gear wheel faces towards 4th gear.



Heat 4th gear wheel and press on.

◆ Installation position:

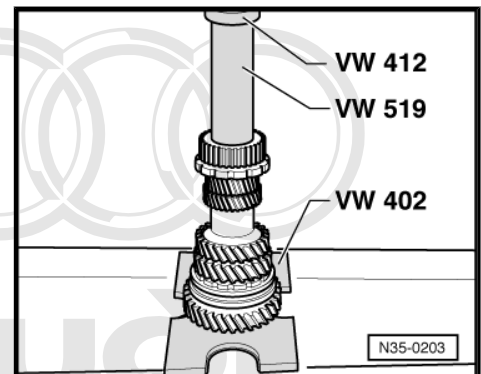
Higher inside collar faces 3rd gear.



Heating synchro-hub for 5th gear and reverse gear and pressing on

◆ Installation position:

Higher inside collar faces 5th gear.



Installation position of locking collar for 5th and reverse gear

Different types of locking collar are installed: **version -A-** with chamfered surface -arrow 1- or **version -B-** with large shoulder -arrow 3-.

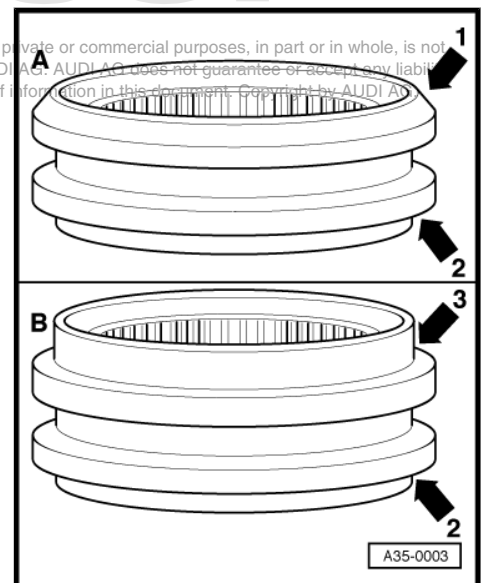
◆ Make sure locking collar is correct version for reverse gear wheel ⇒ [page 134](#)

◆ Installation position:

Chamfered surface -arrow 1- faces towards reverse gear.

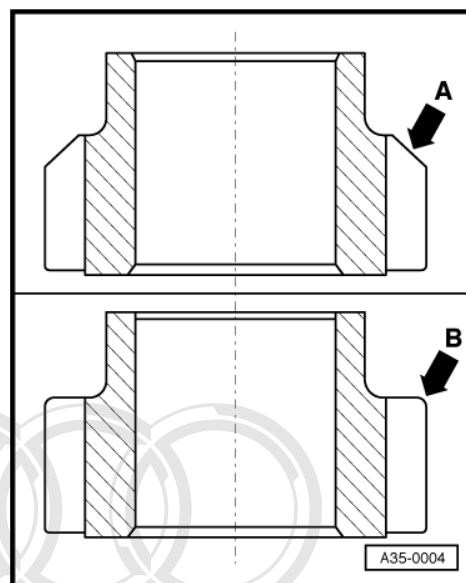
Small shoulder -arrow 2- faces towards 5th gear.

Large shoulder -arrow 3- faces towards reverse gear.



Selecting correct locking collar for reverse gear wheel

-Arrow A- reverse gear wheel with chamfered surface	Both types of locking collar can be installed (with chamfered surface or with large shoulder)
-Arrow B- reverse gear wheel without chamfered surface	Install only locking collar with large shoulder; do not use locking collar with chamfered edge



2.3 Reinforcements from 08.98 onwards (from gearbox manufacturing date 17 08 8 onwards) in area of 4th gear wheel

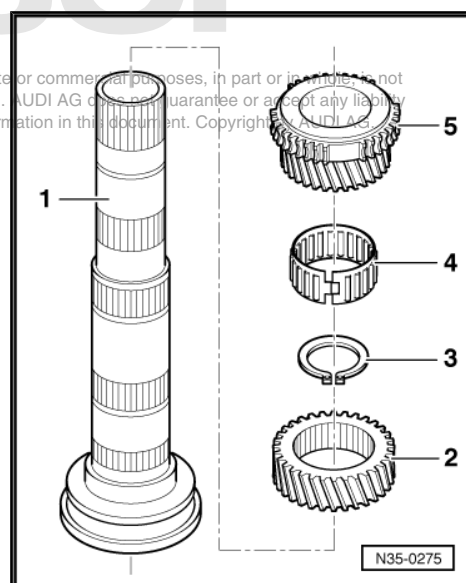
The following components are affected by this modification:

- 1 - Hollow shaft, identification ⇒ [page 134](#)
- 2 - 4th gear wheel, identification ⇒ [page 135](#)
- 3 - Circlip, identification ⇒ [page 135](#)
- 4 - Needle bearing, identification ⇒ [page 135](#)
- 5 - 5th selector gear, identification ⇒ [page 135](#)



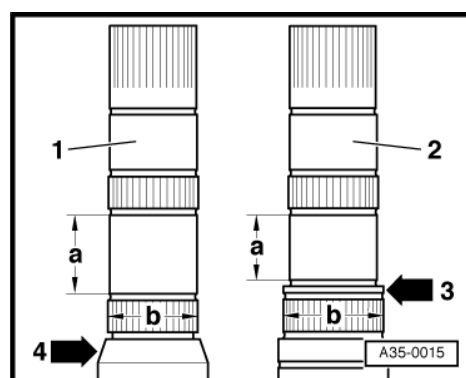
Note

- ◆ Components from gearboxes with reinforced 4th gear and components from gearboxes without reinforced 4th gear must never be installed together; for allocation of parts, refer to ⇒ *Electronic parts catalogue*.
- ◆ Dismantling and assembly of the new parts is carried out as described in the *Workshop Manual*.



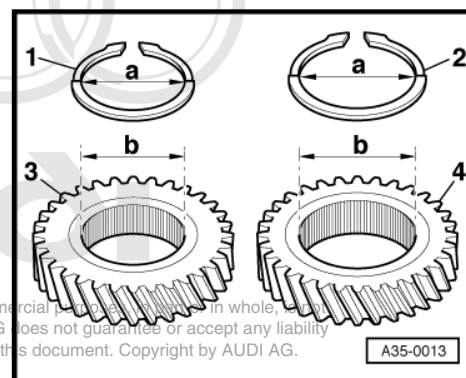
Identification of hollow shafts

	Hollow shaft 1 New version from 08.98 onwards	Hollow shaft 2 Old version up to 08.98
	For reinforced 4th gear wheel	For non-reinforced 4th gear wheel
Dimension -a-	approx. 27.5 mm	approx. 23.8 mm
Dimension -b-	approx. 40.0 mm	approx. 43.5 mm
-Arrow 3-	-	With projection above splines
-Arrow 4-	With chamfered edges below splines	-



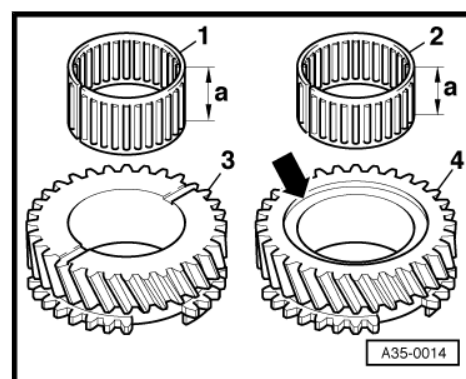
Distinguishing features of circlips and gear wheels

Circlip	-1- New version from 08.98 onwards	-2- Old version up to 08.98
Dimension -a-	approx. 34.5 mm	approx. 38.0 mm
4th gear wheel	-3- New version from 08.98 onwards	-4- Old version up to 08.98
Dimension -b-	approx. 40.0 mm	43.5 mm



Distinguishing features of needle bearings and 5th selector gears

Needle bearing	-1- New version from 08.98 onwards	-2- Old version up to 08.98
Dimension -a-	approx. 26.8 mm	approx. 24.8 mm
5th speed selector gear	-3- New version from 08.98 onwards	-4- Old version up to 08.98
	Without shoulder	With shoulder -arrow-



3 Removing and installing reverse gear wheel

1 - Circlip

2 - Support plate

3 - Reverse gear wheel

- ❑ Different versions; allocation ⇒ [page 134](#)

4 - Needle bearing

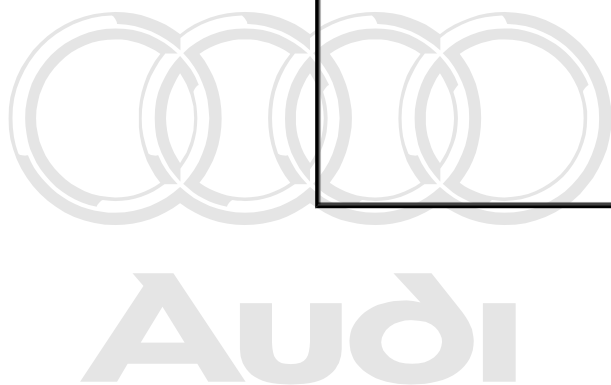
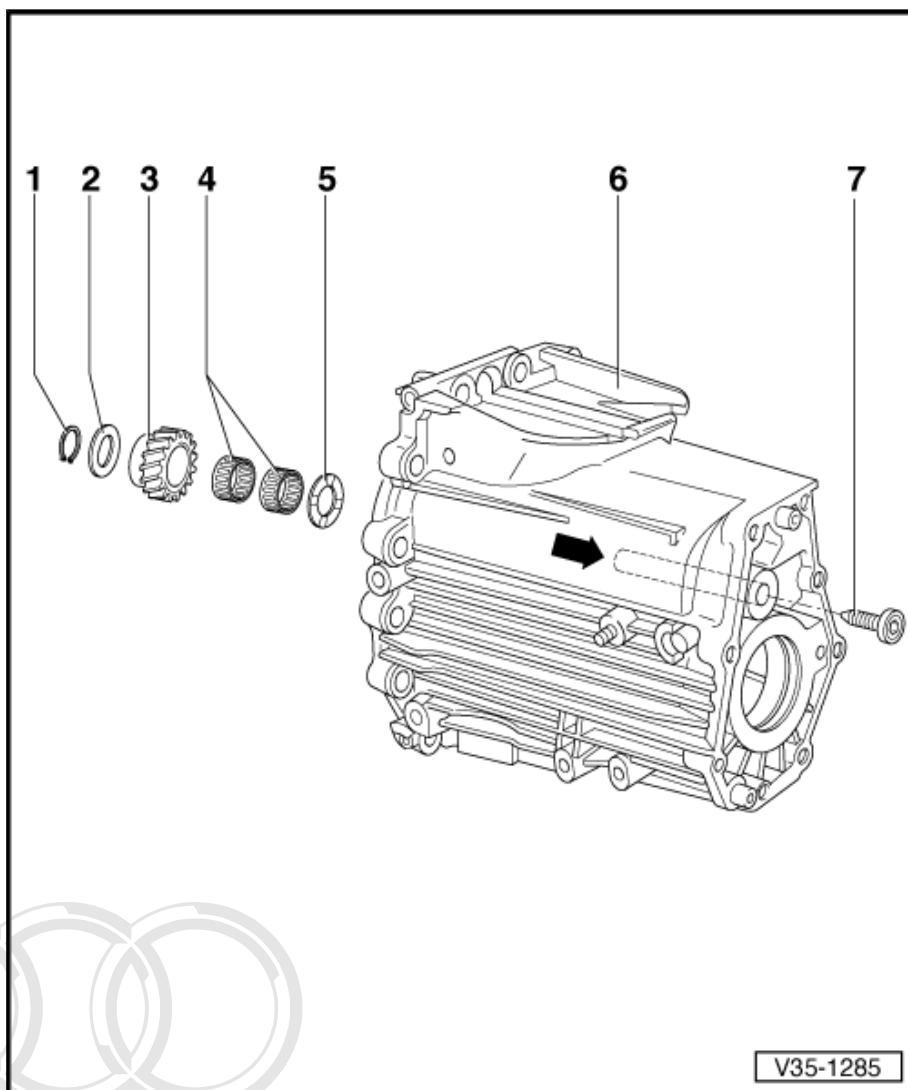
5 - Thrust washer

6 - Gearbox cover

- ❑ With reverse gear shaft -arrow-
- ❑ To remove the reverse gear wheel it is not necessary to remove the reverse gear shaft.
- ❑ The reverse gear shaft is not available as a replacement part.

7 - TORX bolt

- ❑ 35 Nm
- ❑ Serves as an additional method of securing the reverse gear shaft



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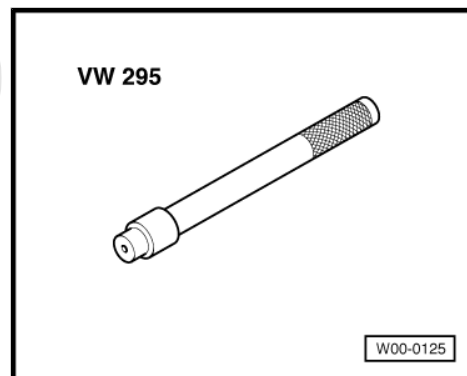
39 – Final drive - rear differential

1 Renewing flange shaft oil seals on gearbox

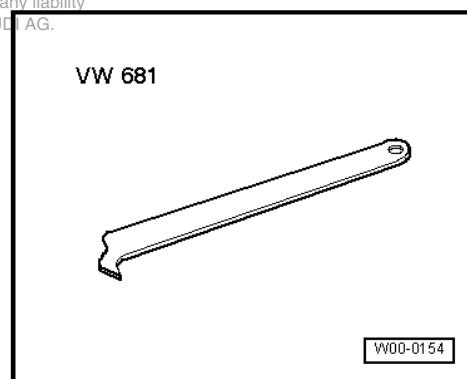
- Gearbox in vehicle
- Refer to general repair instructions ⇒ [page 8](#) .

Special tools and workshop equipment required

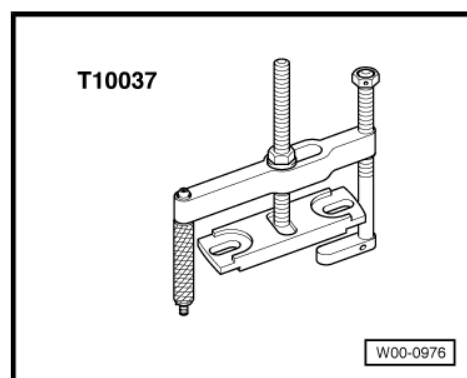
- ◆ Drift -VW 295-



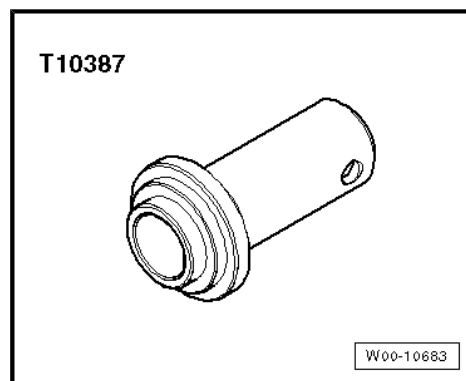
- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-



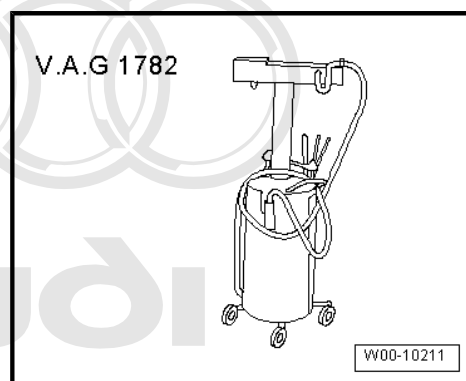
- ◆ Puller -T10037-



◆ Thrust piece -T10387-



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



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◆ Sealing grease -G 052 128 A1-

Removing flange shaft oil seal



Note

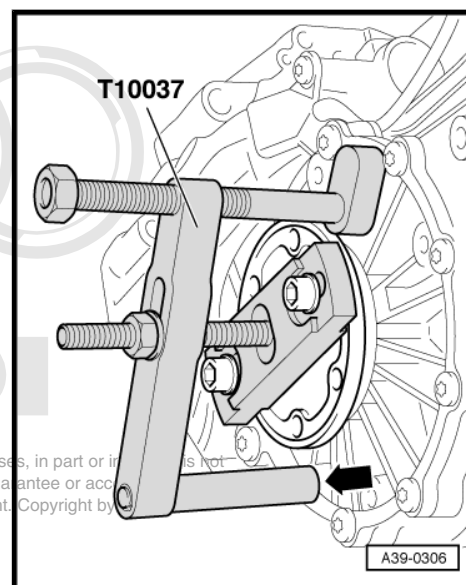
- ◆ *The procedure for removing the oil seals is identical on both sides.*
- ◆ *The exhaust system does not have to be removed.*
- ◆ *Flange shaft may be with or without a polygon bearing
⇒ [page 140](#).*
- ◆ *Flange shafts without polygon bearings are installed on gearboxes with code letters CPU, CXF and CXZ.*
- ◆ *A spacer ring is fitted between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter ⇒ [page 140](#).*
- If fitted, remove noise insulation beneath gearbox.
- If fitted, detach heat shield for drive shaft.
- Turn steering to left onto full lock.
- Unbolt drive shaft from gearbox flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40.
- Tie-up drive shaft as high as possible. Do not damage paint on drive shaft.
- Place used oil collection and extraction unit -V.A.G 1782- underneath.

 Note

In order to prevent damage to the needle bearings (polygon bearings) or the differential during removal, the flange shaft must be kept straight when removing (pull out evenly).

When renewing oil seal (left-side):

- Remove flange shaft, to do so, secure puller -T10037- to cover for final drive -arrow-.

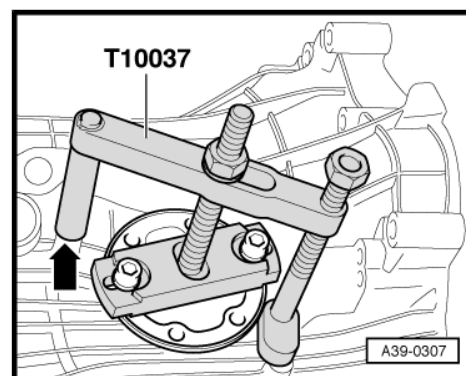


When renewing oil seal (right-side):

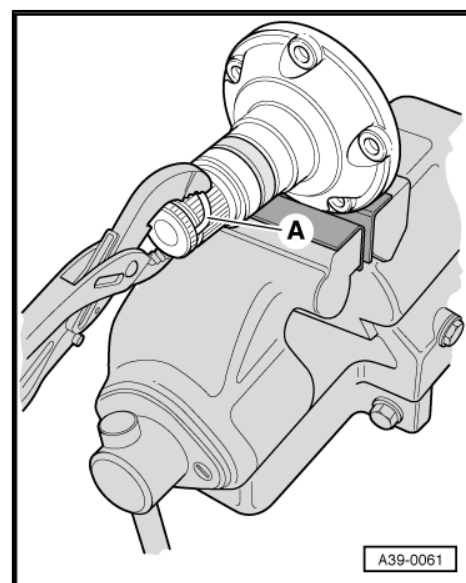
- Remove flange shaft; to do so, secure puller -T10037- to gearbox housing -arrow-.

Both sides

- Pull out flange shaft oil seal using oil seal extractor lever -VW 681- or extractor hook -T20143-.



- Always renew circlip for flange shaft.
- Clamp flange shaft in vice, using jaw protectors. Use new circlip -A- to press old circlip out of groove in flange shaft.



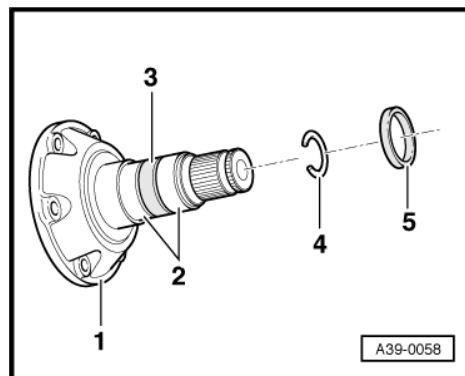
Assembling flange shaft with polygon bearing

- 1 - Flange shaft
- 2 - Needle bearing (polygon bearing)
- 3 - Spacer ring
- 4 - Circlip
- 5 - Spacer ring - fitted additionally on shafts with 30 mm spline diameter



Note

- ◆ *If the polygon bearings do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.*
- ◆ *Inspect for signs of damage to polygon bearings (such as cracking in outer race).*
- ◆ *The polygon bearings can only be renewed together with the flange shaft.*
- ◆ *A spacer ring -5- is fitted between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter.*



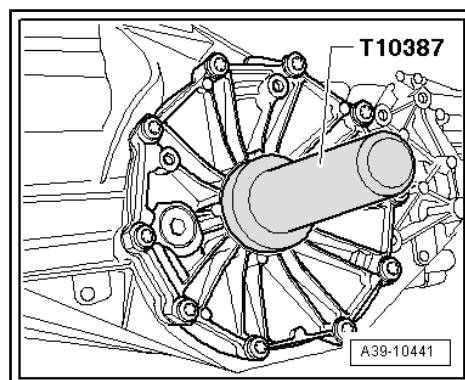
Installing flange shaft oil seal

- Lightly oil outer circumference of new oil seal.
- Drive in new flange shaft oil seal (left-side) using thrust piece -T10387- until thrust piece reaches stop; keep seal straight when installing.



Note

- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of cover*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387-, so that the new seal does not bear on the same contact surface on the used flange shaft.*



- Drive in new flange shaft oil seal (right-side) using thrust piece -T10387- until thrust piece reaches stop; keep seal straight when installing.

 Note

- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of cover*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387-, so that the new seal does not bear on the same contact surface on the used flange shaft.*

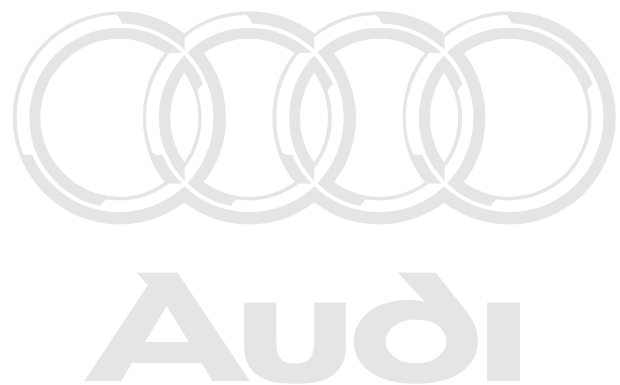
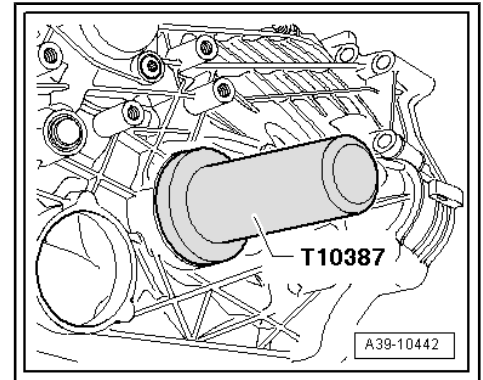
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Knock flange shaft in with drift -VW 295- .

The remaining installation steps are carried out in the reverse sequence; note the following points:

- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Check gear oil level in gearbox ⇒ [page 74](#) .
- If originally fitted, bolt on heat shield for drive shaft.
- If originally fitted, install noise insulation panels.

Tightening torque

Component	Nm
Heat shields for drive shafts to gearbox	23



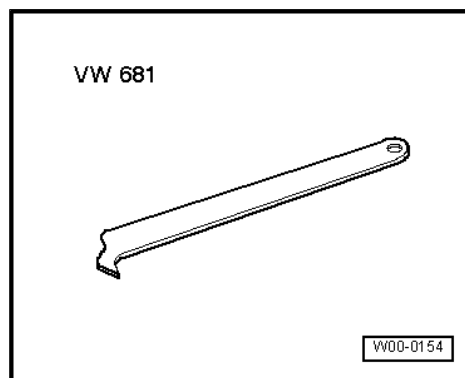
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2 Renewing oil seal for flange shaft/ propshaft on gearbox

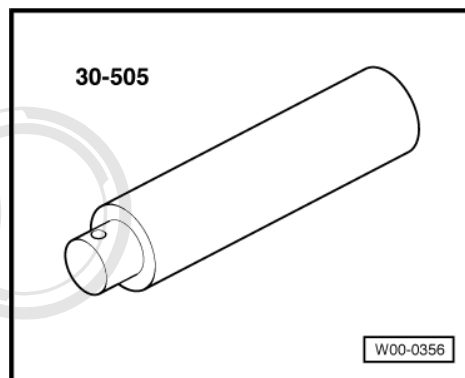
- Gearbox in vehicle
- Refer to general repair instructions ⇒ [page 8](#).

Special tools and workshop equipment required

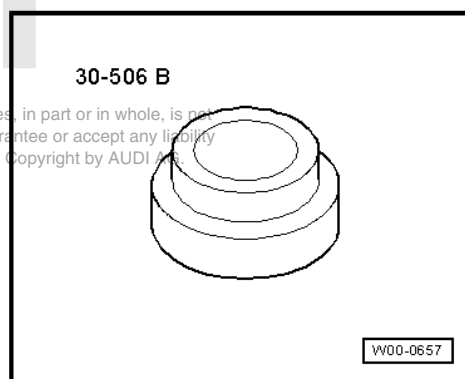
- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-



- ◆ Mandrel -30 - 505-

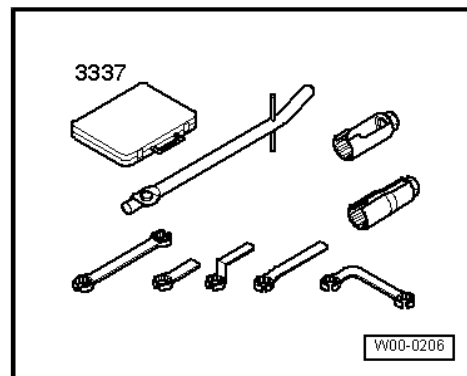


- ◆ Press tool -30 - 506 B-

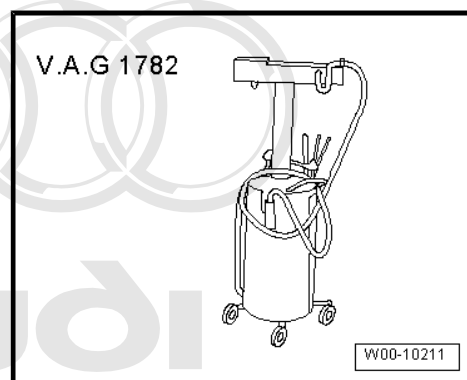


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- ◆ Set of open ring spanners for lambda probe -3337-



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



- ◆ Sealing grease -G 052 128 A1-

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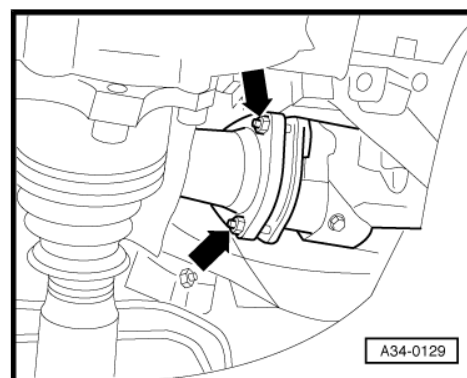
Vehicles with 4-cylinder engine:

- Remove rear section of exhaust system (rearward of clamp)
⇒ Engine, mechanics; Rep. gr. 26 .

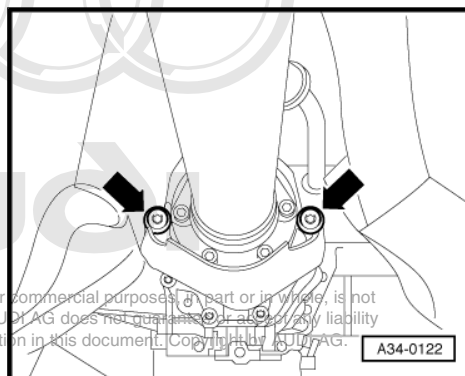
Vehicles with 6-cylinder engine:

- Unscrew Lambda probe (right-side) from exhaust pipe using Lambda probe open ring spanner set -3337- and move to one side.
- Remove heat shield above drive shaft (right-side).
- Unbolt front exhaust pipe (right-side) with catalytic converter (right-side) from exhaust manifold -arrows- (3 nuts) ⇒ Engine, mechanics; Rep. gr. 26 .

All vehicles:

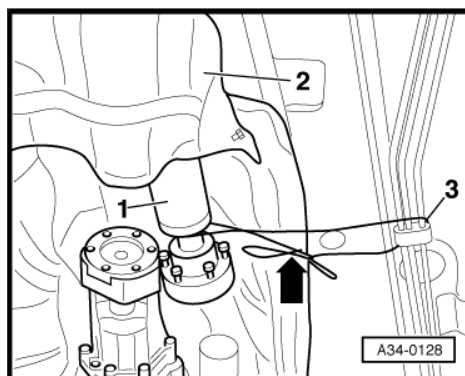


- Remove heat shield for propshaft from cover for centre differential -arrows-.



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- Unbolt propshaft -1- from gearbox and rest it on heat shield -2-.
- Use wire -arrow- to secure propshaft to bracket -3- for fuel pipes.
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gearbox oil.

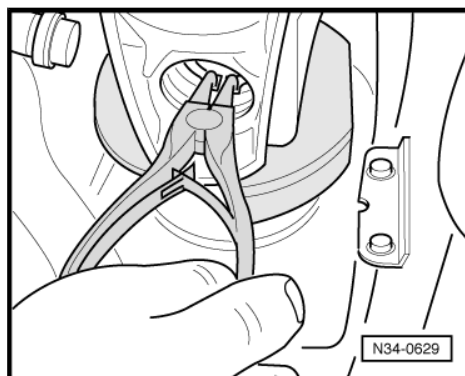
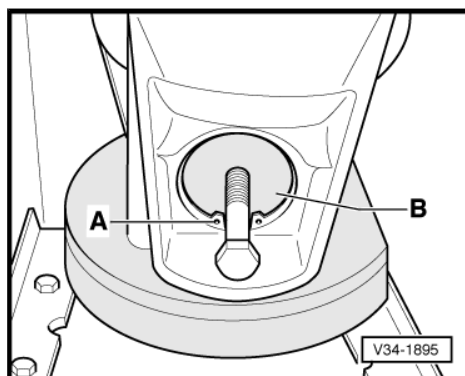


- Then place used oil collection and extraction unit -V.A.G 1782- below sealing cap -B-.


Note

Oil flows out when sealing cap -B- is removed.

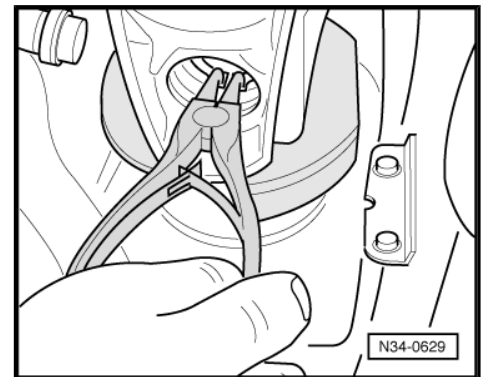
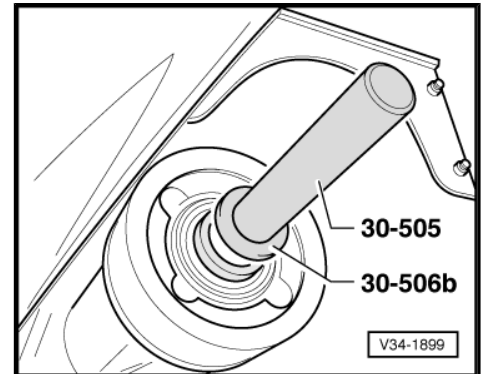
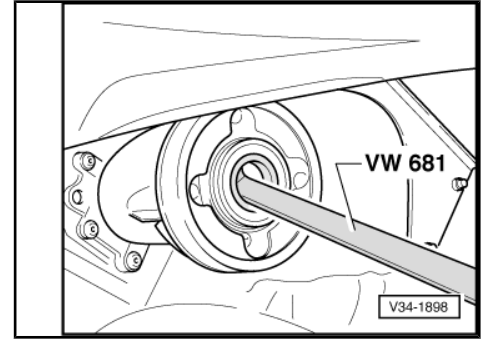
- Remove circlip -A-.
- Screw an M8 bolt into thread of sealing cap.
- Pull out sealing cap using bolt.
- Bend open circlip and pull out flange shaft.



- Pull out flange shaft oil seal using oil seal extractor lever -VW 681- or extractor hook -T20143- .

Installing

- Lightly oil outer circumference of oil seal.
- Knock in new flange shaft oil seal to a depth of 2 mm below surface of housing; keep seal straight when installing.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Install flange shaft.
- When installing flange shaft, fit circlip at the same time.
- ◆ The circlip must be seated in the bottom of the groove.
- Renew O-ring ⇒ [Item 13 \(page 93\)](#) for sealing cap.
- Install sealing cap with new O-ring and secure in place.
- Fill up oil in gearbox and check oil level ⇒ [page 74](#) .
- Bolt propshaft to gearbox ⇒ [page 187](#) .
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .



Tightening torques

Component	Nm
Propshaft to manual gearbox ¹⁾	55
Heat shield for propshaft to centre differential cover	25
• ¹⁾ Renew bolts	

3 Removing and installing speedometer sender and drive wheel

- Gearbox in vehicle
- Refer to general repair instructions ⇒ [page 8](#).

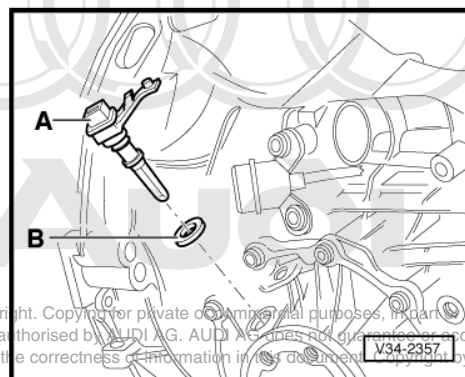
3.1 Removing and installing speedometer sender -G22-

Removing

- Unplug connector from speedometer sender -A-.
- Press down retainer, swivel speedometer sender aside and take out upwards.

Installing

- Install new O-ring -B-.
- Insert speedometer sender -A- and engage.
- Take care not to damage speedometer sender. Speedometer reading may be inaccurate if sender is damaged.

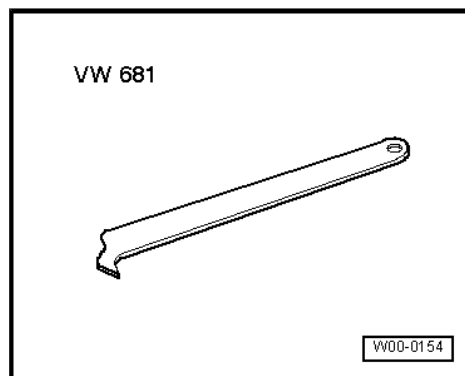
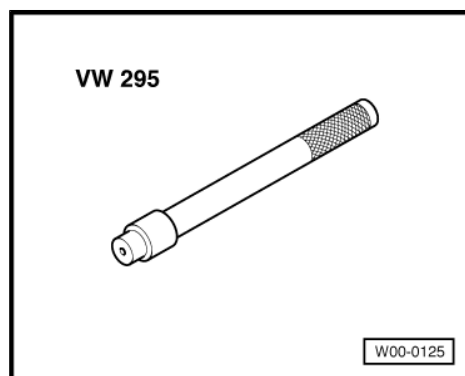


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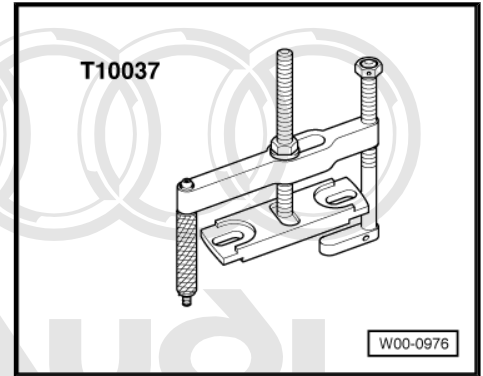
3.2 Removing and installing speedometer drive wheel

Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-

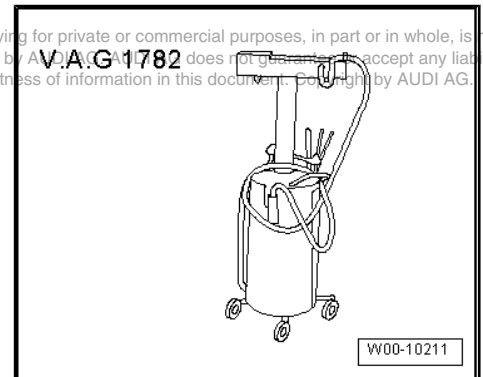


◆ Puller -T10037-



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

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Removing

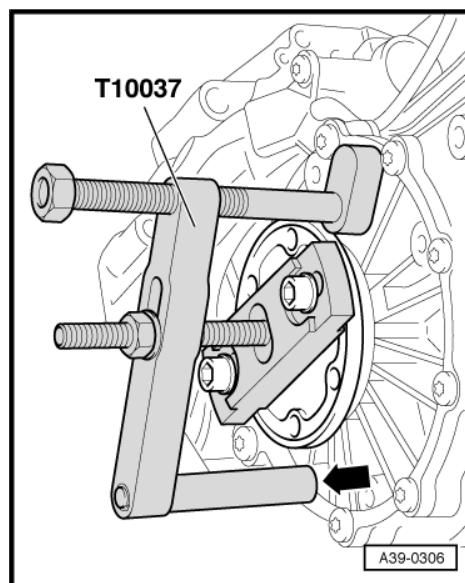
- If fitted, remove noise insulation beneath gearbox.
- If fitted, detach heat shield for drive shaft.
- Turn steering to left onto full lock.
- Unbolt drive shaft from gearbox flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Tie-up drive shaft as high as possible. Do not damage paint on drive shaft.
- Place used oil collection and extraction unit -V.A.G 1782- underneath.



Note

In order to prevent damage to the needle bearings (polygon bearings) or the differential during removal, the flange shaft must be kept straight when removing (pull out evenly).

- Remove flange shaft, to do so, secure puller -T10037- to cover for final drive -arrow-.
- Pull out flange shaft oil seal using oil seal extractor lever - VW 681- or extractor hook -T20143- .
- Remove speedometer sender -G22- ⇒ [page 146](#) .



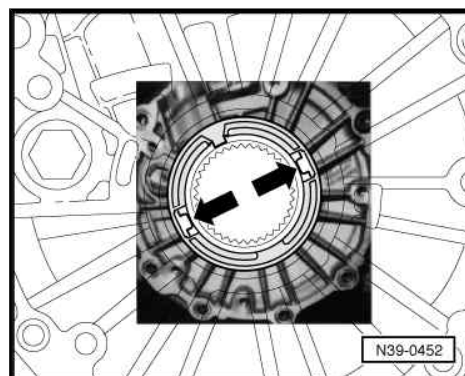
- Press retaining clips in direction of -arrows- with a screwdriver.
- Remove drive wheel by levering out, alternating between sides.

Installing

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

Note

Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use force; the drive wheel can break easily.



Installation position:

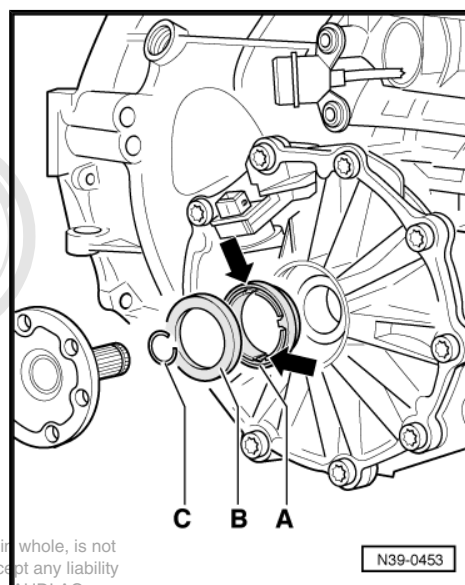
The follower lug of the drive wheel -A- faces towards oil seal -B- and locates in the slot on the differential.

The retaining clips -arrows- locate in the annular groove in the differential.

- Always renew circlip -C- for flange shaft ⇒ [page 139](#) .
- Install new flange shaft oil seal -B- ⇒ [page 140](#) .
- Knock flange shaft in with drift -VW 295- .
- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Check gear oil level in gearbox ⇒ [page 74](#) .
- If originally fitted, bolt on heat shield for drive shaft.

Tightening torque

Component	Nm
Heat shields for drive shafts to gearbox	23



4 Differential

Overview

- ◆ ➔ „4.1 Removing and installing differential“, page 149
- ◆ ➔ „4.2 Dismantling and assembling differential“, page 152

4.1 Removing and installing differential



Note

- ◆ *Removing and installing is possible with the gearbox installed.*
- ◆ *The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft and gearbox cover. These components must be removed if the differential needs to be adjusted.*
- ◆ *Flange shafts may be with or without a polygon bearing; allocation ➔ Electronic parts catalogue .*
- ◆ *The polygon bearings can only be renewed together with the flange shaft.*
- ◆ *Inspect polygon bearings for visible damage.*
- ◆ *If the polygon bearings do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.*
- ◆ *A spacer ring is fitted between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter ➔ page 152 .*
- ◆ *Adjustment work is required when renewing the parts marked with ¹⁾
➔ „5.3 Table of adjustments - gearbox“, page 164 .*

1 - Gearbox housing ¹⁾
2 - Oil seal

- ☐ Renewing ⇒ [page 137](#)

3 - Circlip

- ☐ Renew
- ☐ Removing and installing
⇒ [page 151](#)

4 - Spacer ring

- ☐ Is only fitted on flange shafts with polygon bearings and a spline diameter of 30 mm
⇒ [page 152](#)
- ☐ Removing ⇒ [page 151](#)
- ☐ Installing ⇒ [page 151](#)

5 - Flange shaft

- ☐ Removing and installing
⇒ [page 137](#)
- ☐ Assembling flange shaft with polygon bearing
⇒ [page 152](#)

6 - Differential with crown wheel ¹⁾

- ☐ Can be removed without removing gearbox
- ☐ Dismantling and assembling ⇒ [page 152](#)
- ☐ From 08.98 onwards: reinforcements (introduced gradually)
⇒ [page 152](#)

7 - Cover for final drive ¹⁾

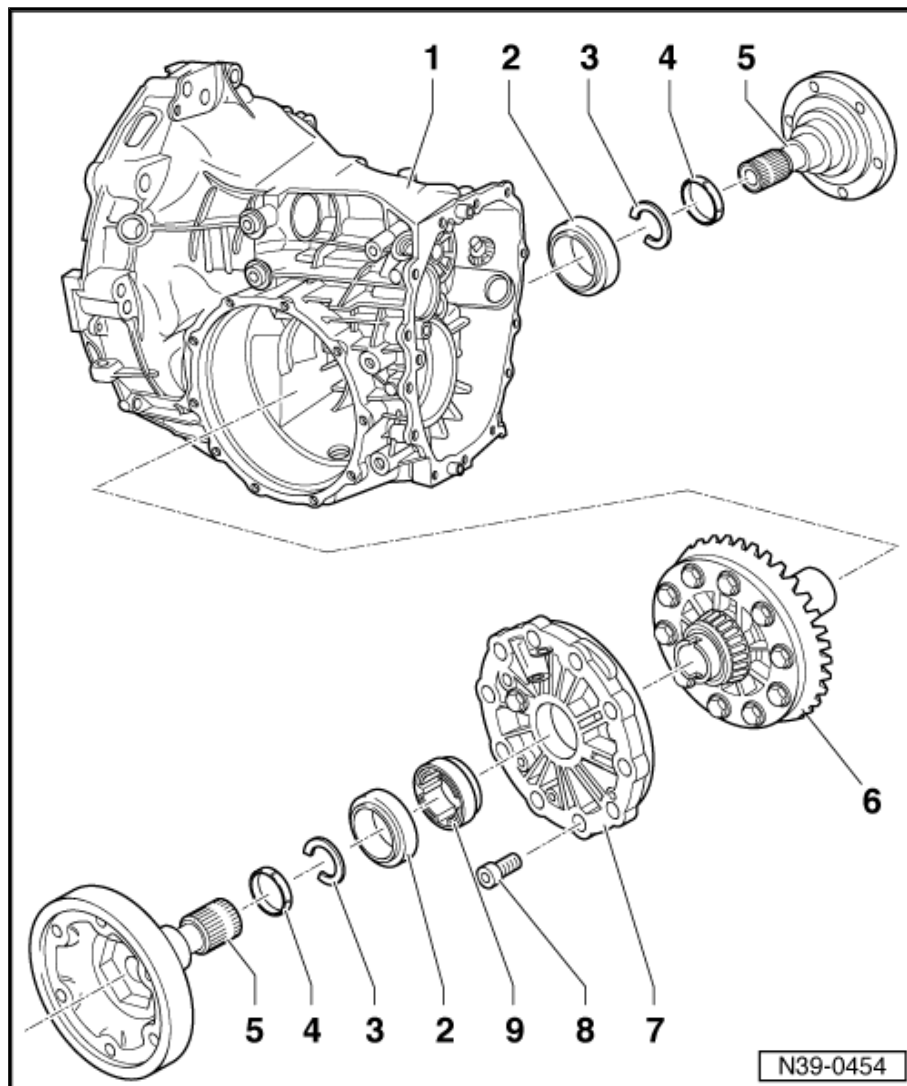
- ☐ From 08.98 onwards: reinforcements (introduced gradually) ⇒ [page 152](#)
- ☐ Coat sealing surfaces lightly with sealing paste -AMV 188 001 02-

8 - TORX bolt

- ☐ 25 Nm

9 - Speedometer drive wheel

- ☐ Removing and installing ⇒ [page 146](#)
- ☐ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use force; the drive wheel can break easily

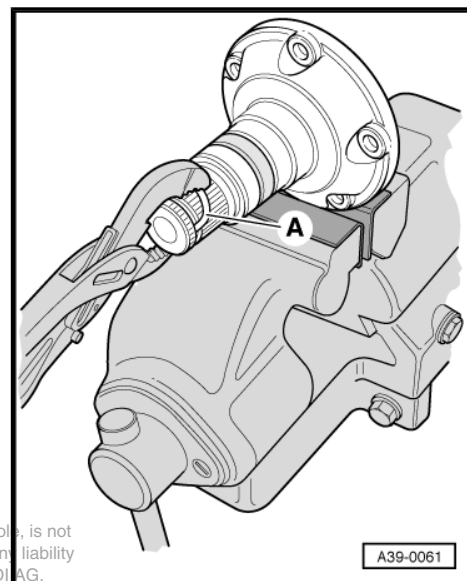


Removing and installing circlip

- Clamp flange shaft in vice, using jaw protectors. Use new circlip -A- to press old circlip out of groove in flange shaft.



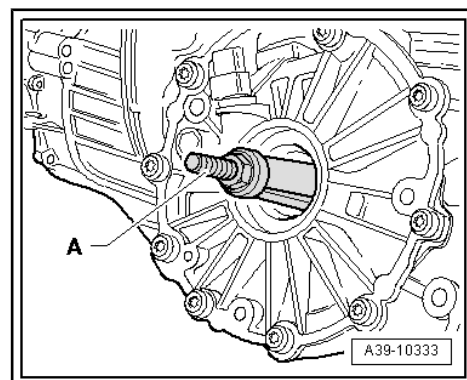
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Removing spacer ring

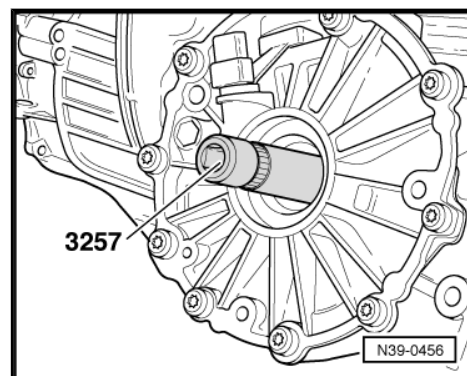
A - Internal puller 18.5 ... 23.5 mm , e.g. -Kukko 21/3-

- If the spacer ring is tight, pull out using multi-purpose tool - VW 771- .



Installing spacer ring

- Drive new spacer ring in onto stop, taking care to keep ring straight.



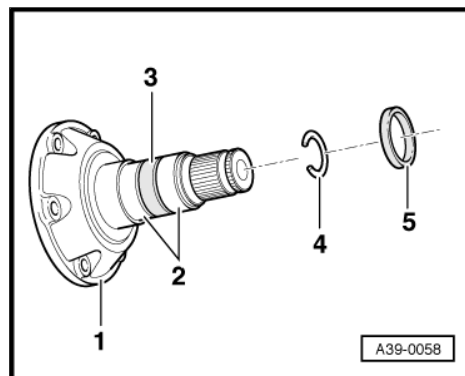
Assembling flange shaft with polygon bearing

- 1 - Flange shaft
- 2 - Needle bearing (polygon bearing)
- 3 - Spacer ring
- 4 - Circlip
- 5 - Spacer ring - fitted additionally on shafts with 30 mm spline diameter



Note

The needle bearings (polygon bearings) do not turn easily when the flange shaft is removed. This does not indicate that a bearing is defective.

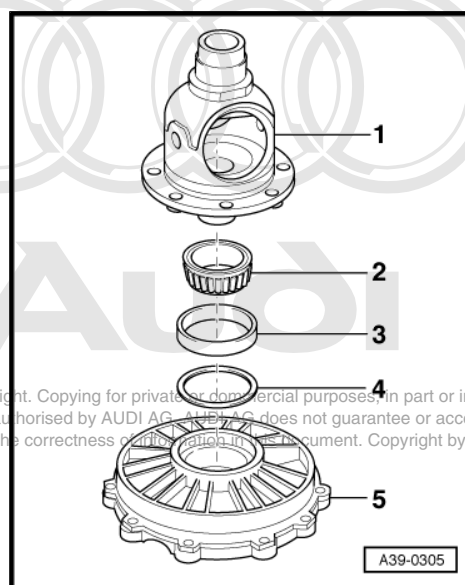


Reinforcements from 08.98 onwards (tapered roller bearing with larger inner and outer diameter) on left side of differential (crown wheel side). The modification was introduced gradually from gearbox manufacturing date 17 08 8 onwards but applies to all gearboxes from gearbox manufacturing date 11 01 9 onwards.

The following components are affected by this modification:

- 1 - Differential cage
- 2 - Tapered roller bearing inner race
- 3 - Tapered roller bearing outer race
- 4 - Shim „S1“
- 5 - Cover for final drive

Allocation of parts: ⇒ Electronic parts catalogue

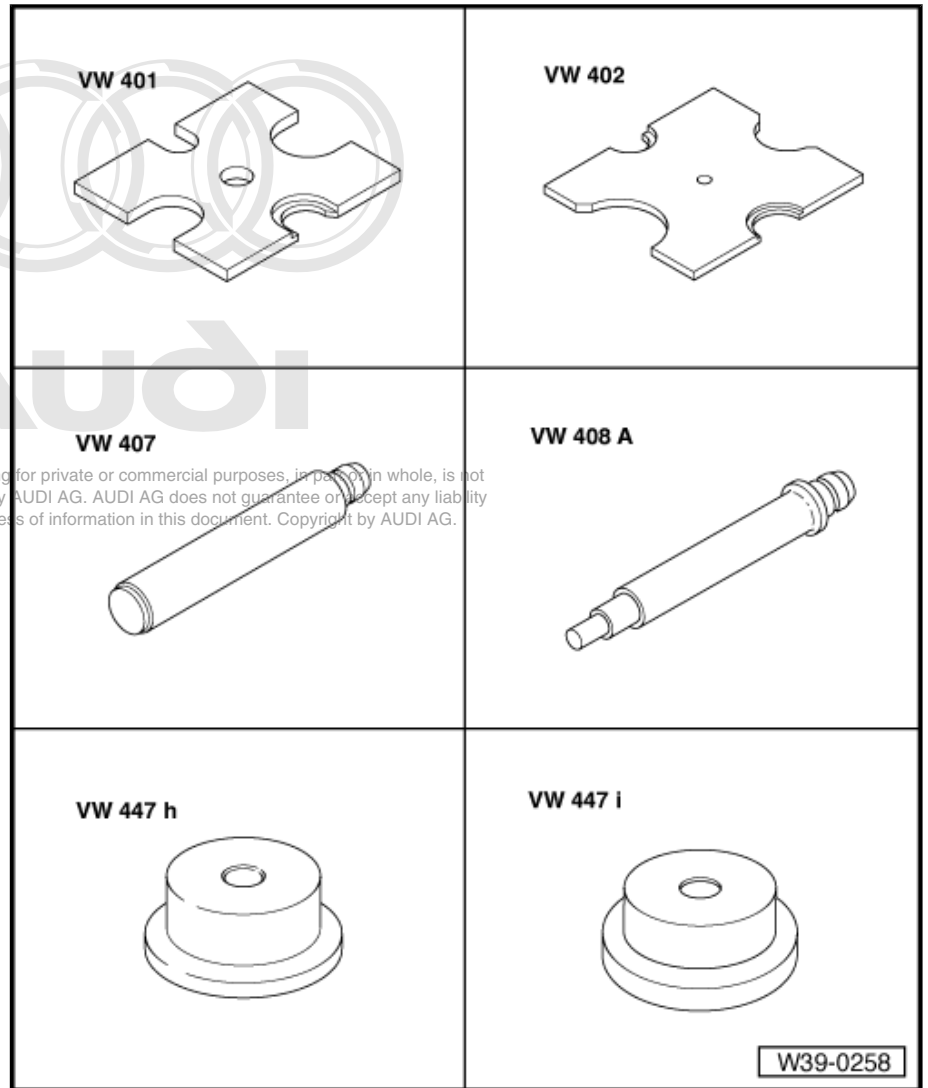


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4.2 Dismantling and assembling differential

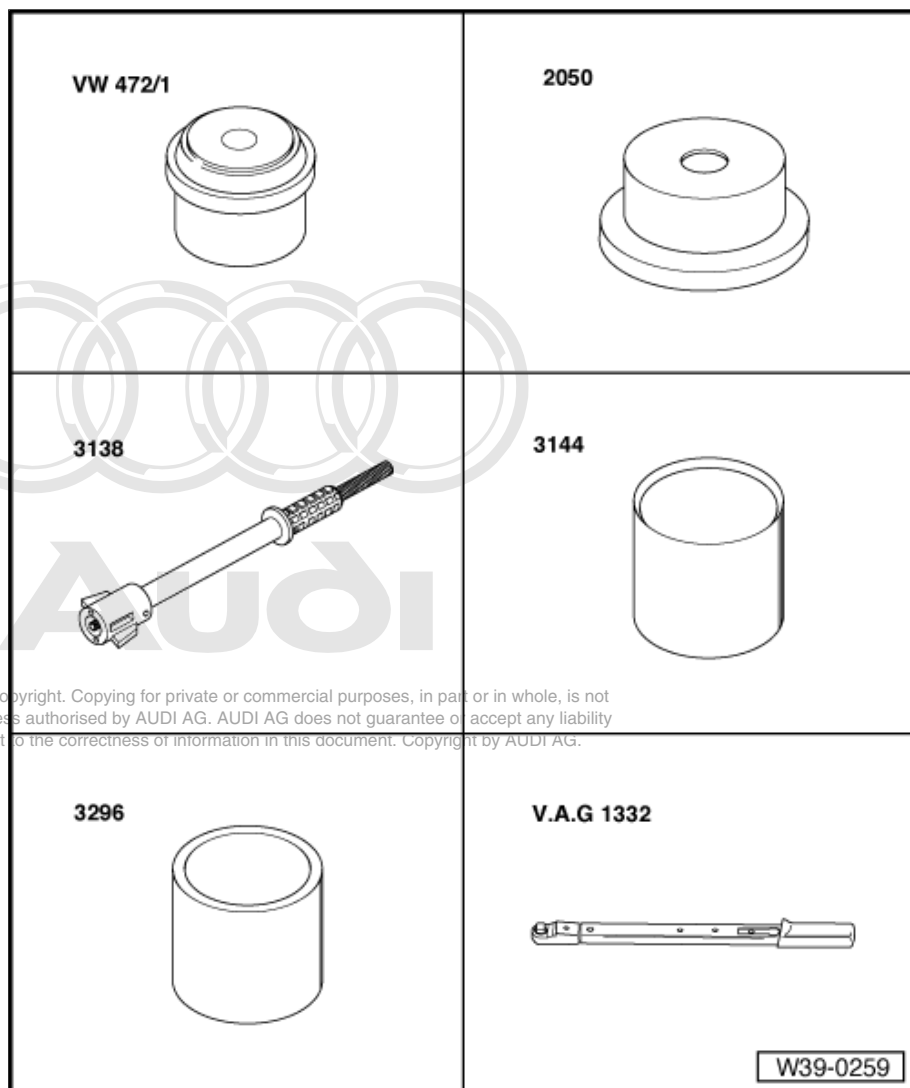
Special tools and workshop equipment required

- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 408 A-
- ◆ Thrust plate -VW 447 H-
- ◆ Thrust plate -VW 447 i-



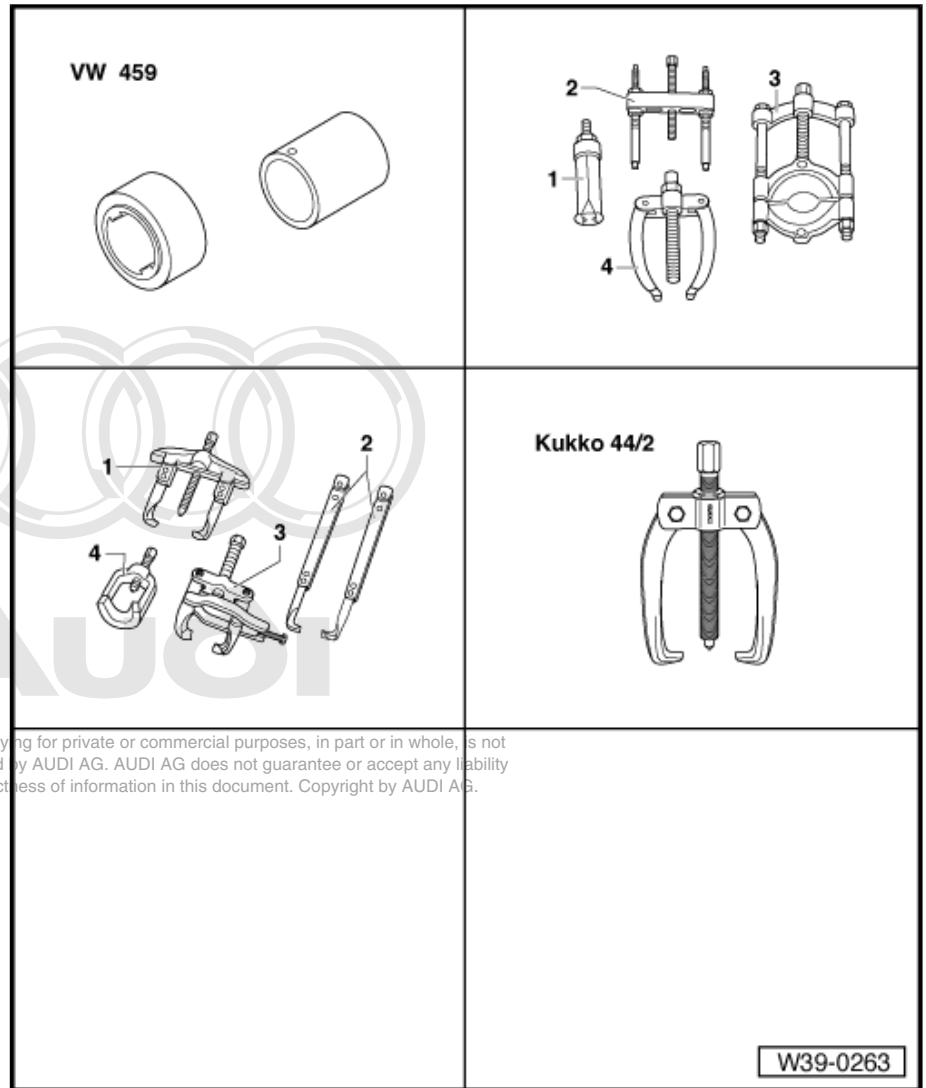
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- ◆ Press tool -VW 472/1-
- ◆ Thrust piece -2050-
- ◆ Drift -3138-
- ◆ Sleeve -3144-
- ◆ Tube -3296-
- ◆ Torque wrench -V.A.G 1332-

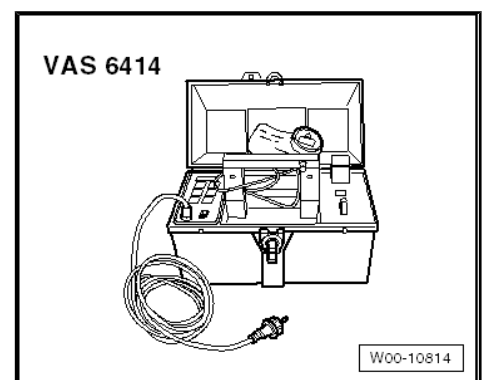


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- ◆ Removal and installing tool -VW 459-
- ◆ -1- Internal puller -Kukko 21/7-
- ◆ -4- Counter-support -Kukko 22/2-
- ◆ -3- Puller -Kukko 204/2-
- ◆ Two-arm puller -Kukko 44/2-



- ◆ Inductive heater -VAS 6414-





Note

- ◆ Removing and installing differential ⇒ [page 149](#)
- ◆ Use inductive heater -VAS 6414- to heat tapered roller bearing inner race to 100°C before installing.
- ◆ Always renew both tapered roller bearings together.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾
⇒ „5.3 Table of adjustments - gearbox“, [page 164](#) .

1 - Gearbox housing ¹⁾

2 - Shim „S2“

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 164](#)

3 - Outer race for tapered roller bearing (right-side) ¹⁾

- ☐ Pulling out ⇒ [page 157](#)
- ☐ Pressing in
⇒ [page 158](#)

4 - Inner race for tapered roller bearing (right-side) ¹⁾

- ☐ Pulling off ⇒ [page 158](#)
- ☐ Pressing on
⇒ [page 158](#)

5 - Crown wheel¹⁾

- ☐ Is paired with pinion shaft (final drive gear set)
- ☐ Select correct version according to gearbox code letters ⇒ Electronic parts catalogue
⇒ [page 1](#)
- ☐ Drive crown wheel off differential cage using a punch ⇒ [page 160](#)
- ☐ Fitting on differential cage ⇒ [page 160](#)

6 - Differential cage¹⁾

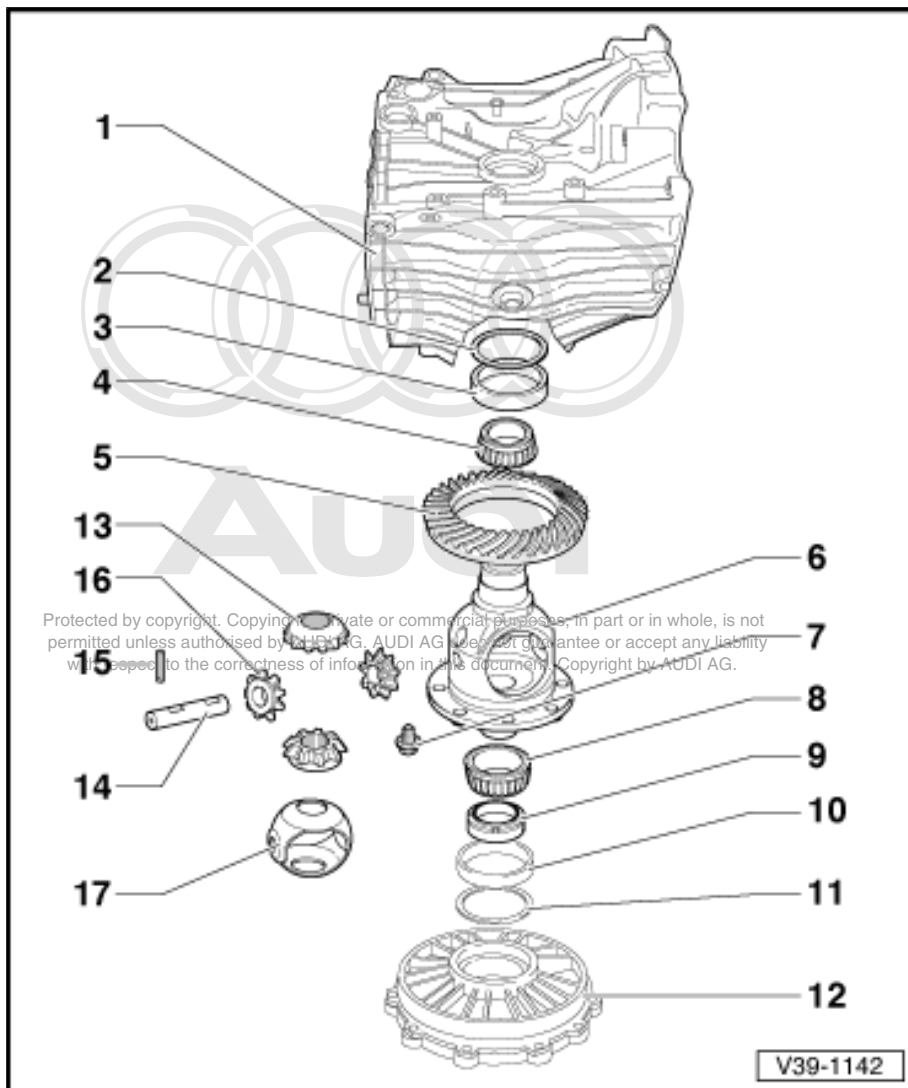
- ☐ Select correct version according to gearbox code letters ⇒ Electronic parts catalogue ⇒ [page 1](#)
- ☐ From 08.98 onwards: reinforcements (introduced gradually) ⇒ [page 152](#)

7 - Bolt

- ☐ 60 Nm and turn 45° further
- ☐ Renew
- ☐ Tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage. Then tighten to specified torque.

8 - Inner race for tapered roller bearing (left-side) ¹⁾

- ☐ Pulling off ⇒ [page 159](#)
- ☐ Pressing on ⇒ [page 158](#)



- ☐ From 08.98 onwards: reinforcements (introduced gradually) ⇒ [page 152](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

9 - Speedometer drive wheel

- ☐ Removing and installing ⇒ [page 146](#)
- ☐ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use force; the drive wheel can break easily.

10 - Outer race for tapered roller bearing (left-side) ¹⁾

- ☐ Driving out ⇒ [page 159](#)
- ☐ Pressing in, up to approx. 08.98 ⇒ [page 159](#)
- ☐ From 08.98 onwards: reinforcements (introduced gradually) ⇒ [page 152](#)
- ☐ Pressing in, from 08.98 onwards ⇒ [page 160](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

11 - Shim „S1“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 164](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

12 - Cover for final drive ¹⁾

- ☐ From 08.98 onwards: reinforcements (introduced gradually) ⇒ [page 152](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue
- ☐ Coat sealing surfaces lightly with sealing paste -AMV 188 001 02-

13 - Sun wheel

- ☐ Installing ⇒ [page 160](#)

14 - Differential pinion pin

- ☐ Drive out with drift after removing spring pin

15 - Spring pin

- ☐ Secures differential pinion pin
- ☐ Version with annular groove: removing and installing ⇒ [page 161](#)
- ☐ Version without annular groove: knock out with punch

16 - Planet pinion

- ☐ Installing ⇒ [page 160](#)

17 - One-piece thrust washer

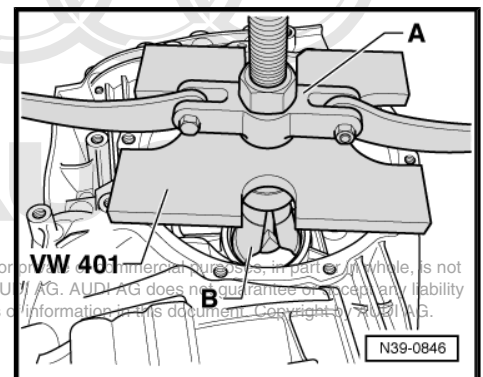
- ☐ Lubricate with gear oil before installing

Pulling tapered roller bearing outer race out of gearbox housing

A - Counter-support , e.g. -Kukko 22/2-

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

– After removing, check shims for damage.



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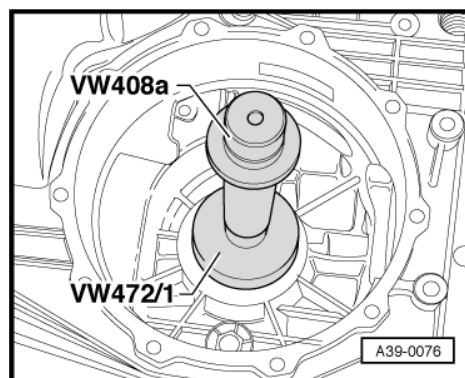
Pressing tapered roller bearing outer race (right-side) into gearbox housing

- The taper of press tool -VW 472/1- is applied in the outer race.
- Support gearbox housing with -VW 459/2- directly below bearing mounting.



Note

Use thrust plate -30 - 205- in place of press tool -VW 472/1- on gearboxes which have flange shafts without polygon bearings.



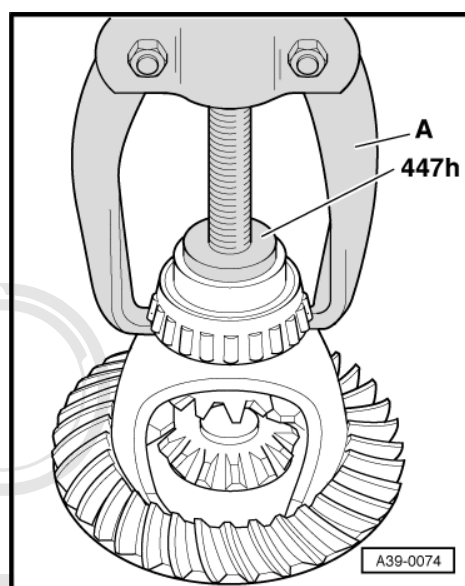
Pulling off inner race for tapered roller bearing (right-side)

A - Two-arm puller , e.g. -Kukko 44/2- or -Kukko 20/10-



Note

- ♦ If using a puller with small-diameter spindle, thrust plate -30 - 11- must also be fitted between thrust plate -VW 447 H- and puller.
- ♦ Use thrust plate -40 - 105- in place of thrust plate -VW 447 H- on gearboxes which have flange shafts without polygon bearings.
- ♦ There is a slot under the bearing seat in the differential cage for applying puller -A-.



Pressing on inner race for tapered roller bearing (right-side)



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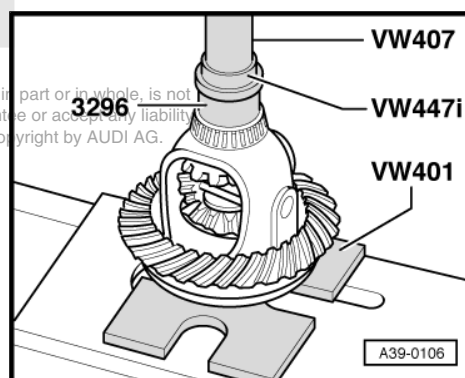
Wear protective gloves.

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



Note

Use press tool -40 - 21- in place of tube -3296- on gearboxes which have flange shafts without polygon bearings.

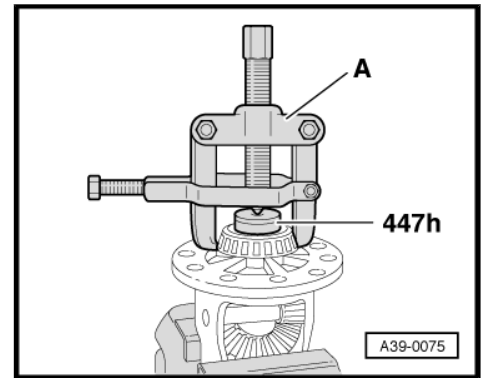


Pulling off inner race for tapered roller bearing (left-side)

A - Two-arm puller , e.g. -Kukko 204/2-

Note

- ◆ If using a puller with small-diameter spindle, thrust plate -30 - 11- must also be fitted between thrust plate -VW 447 H- and puller.
- ◆ Use thrust plate -40 - 105- in place of thrust plate -VW 447 H- on gearboxes which have flange shafts without polygon bearings.
- ◆ There is a slot under the bearing seat in the differential cage for applying puller -A-.



Fitting inner race for tapered roller bearing (left-side)



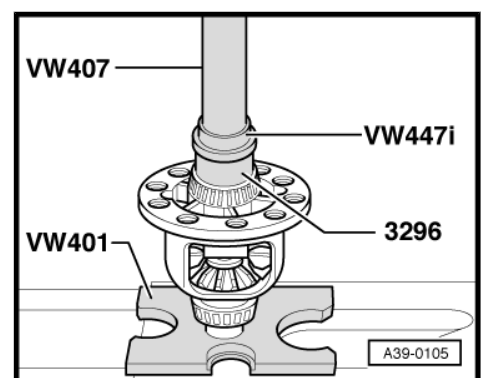
WARNING

Wear protective gloves.

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

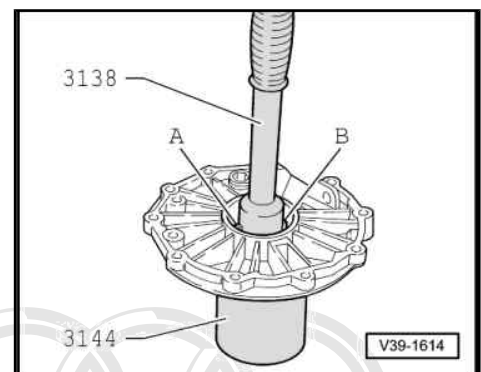
Note

Use press tool -40 - 21- in place of tube -3296- on gearboxes which have flange shafts without polygon bearings.



Knocking outer race for tapered roller bearing (left-side) out of cover

- Turn projections -A- and -B- out until they are located on outer race within recess in cover for final drive.
- After removing, check shims for damage.

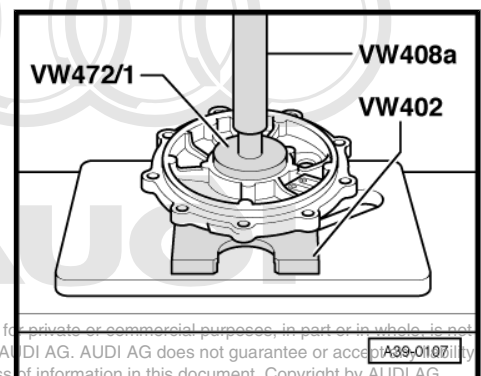


Pressing tapered roller bearing outer race (left-side) into cover on gearboxes without reinforcements

- The taper of press tool -VW 472/1- is applied in the outer race.

Note

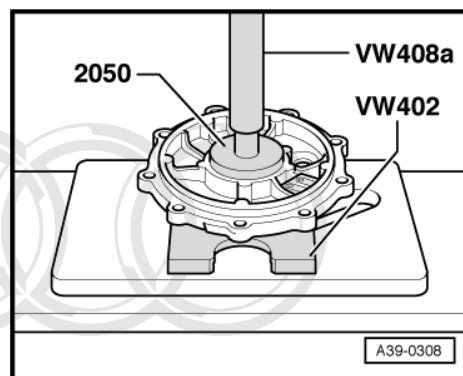
Use thrust pad -VW 511- in place of press tool -VW 472/1- on gearboxes which have flange shafts without polygon bearings.



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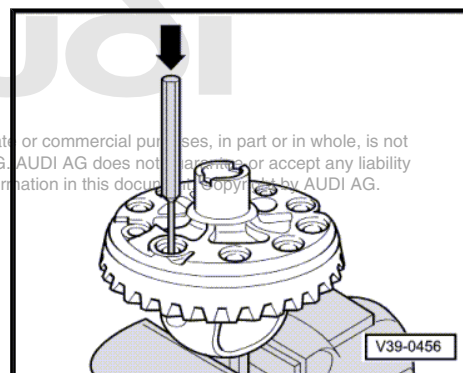
Pressing tapered roller bearing outer race (left-side) into cover on gearboxes with reinforcements from 08.98 onwards

- Press outer race for tapered roller bearing (left-side) into cover using thrust piece -2050- .
- The shoulder of thrust piece -2050- is applied in the outer race.



Driving crown wheel off differential cage

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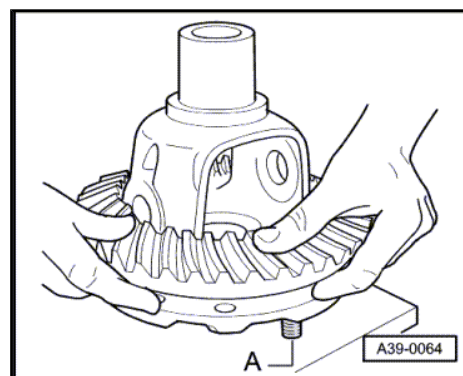
Heating crown wheel to approx. 100 °C and installing



WARNING

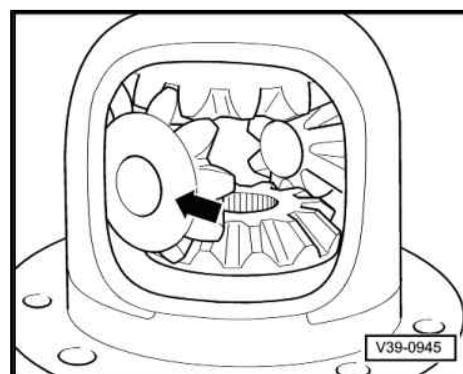
Wear protective gloves.

- When fitting crown wheel, use centralising pins -A- (shop-made tool) to locate.
- Allow to cool slightly before screwing in new securing bolts.
- Then tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage.
- Then tighten bolts to specified torque ⇒ [Item 7 \(page 156\)](#) .



Installing differential bevel gears

- Lubricate one-piece thrust washer with gear oil and install.
- Fit sun wheels.
- Insert planet pinions (spaced 180° apart) and pivot into position -arrow-.
- Drive differential pinion pin into final position and secure.



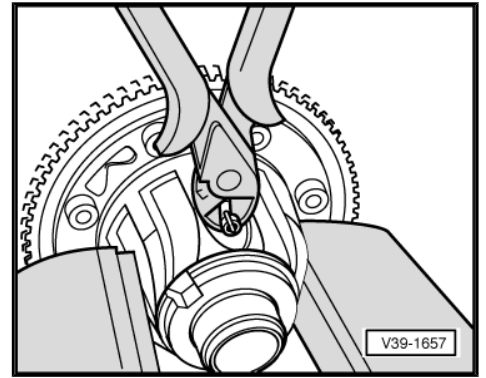
Removing and installing spring pin

Removing

- Spring pin with annular groove: pull out using side-cutting pliers.
- Spring pin without annular groove: knock out from behind using a punch.

Installing

- Drive in spring pin as far as the stop.



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5 Adjusting pinion shaft and crown wheel on gearbox



Note

- ◆ *Careful adjustment of the crown wheel and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*
- ◆ *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*
- ◆ *The allowance „r“ in relation to the master gauge „Ro“ is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive gear set (pinion shaft and crown wheel) may only be renewed together as a matched pair.*
- ◆ *Observe the general repair instructions for tapered roller bearings and shims ⇒ [page 8](#).*

5.1 Adjustment and marking of final drive gear set



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1 - Identification „0937“ denotes an Oerlikon gear set with a ratio of 37 : 9.

2 - -312- number of matched pair of gears

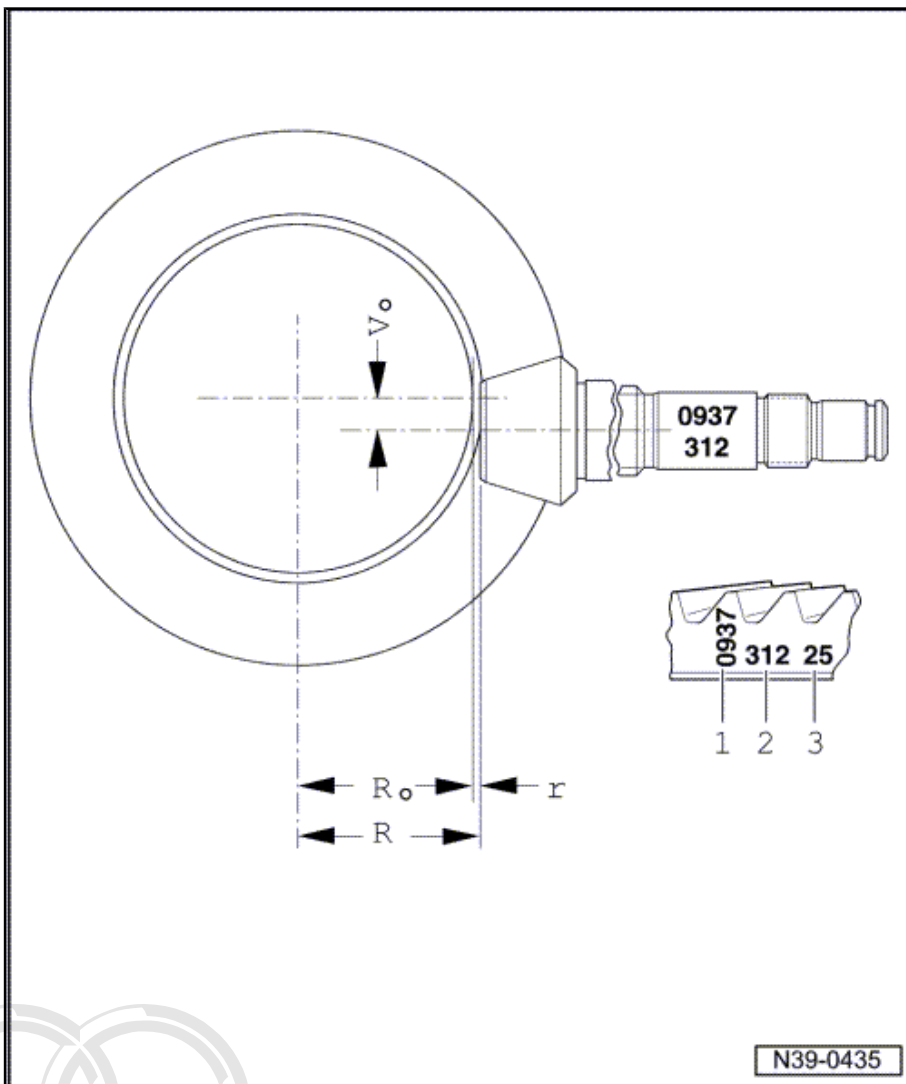
3 - Allowance „r“ is based on the master gauge used on the test machine in production. The allowance „r“ is always given in 1/100 mm. For example: „25“ indicates $r = 0.25$ mm

R_o - Length of master gauge used on test machine in production.

- Crown wheel $\varnothing$ 170 mm
= 54.95 mm

R - Actual distance between centre axis of crown wheel and face of pinion shaft in position of quietest running for this gear set

V_o - Hypoid offset



N39-0435

5.2 Position of shims



Note

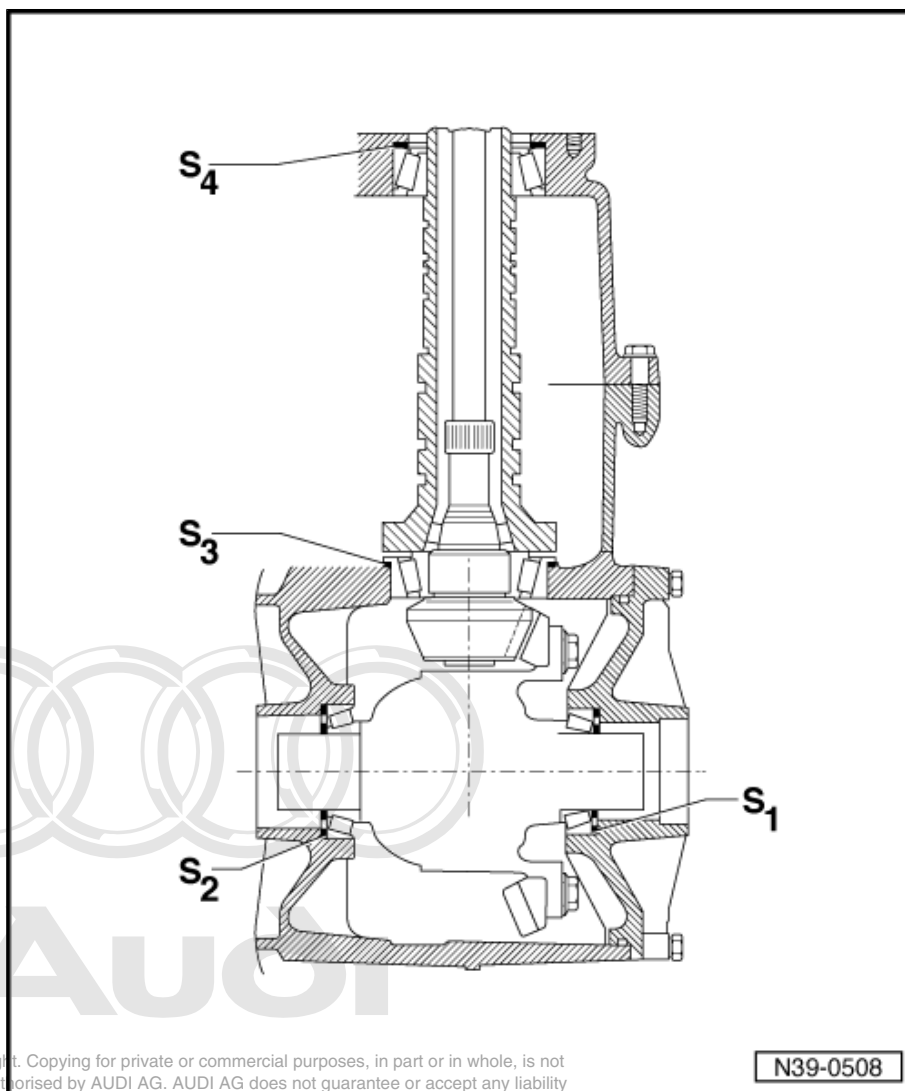
Table of adjustments when renewing individual components of gearbox ⇒ [page 164](#) .

S1 - Shim for crown wheel in cover for final drive

S2 - Shim for crown wheel in gearbox housing

S3 - Shim for pinion shaft in gearbox housing

S4 - Shim for pinion shaft in gearbox cover



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N39-0508

5.3 Table of adjustments - gearbox



Note

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

Components requiring adjustment:	Crown wheel	Pinion shaft	Pinion shaft	Backlash
	(„S1“ + „S2“)	(„S3“ + „S4“) via allowance „r“	Shim „S4“ only	0.12 - 0.22 mm
	⇒ page 176	⇒ page 165	⇒ page 174	⇒ page 181
Component renewed				
Gearbox housing ¹⁾	X	X		X
Gearbox cover			X	
Differential cage	X			X
Double tapered roller bearing and tapered roller bearing for pinion shaft/hollow shaft		X		X
Tapered roller bearings for differential	X			X
Final drive gear set ²⁾	X	X		X
Cover for final drive	X			X

1) If the gearbox housing is renewed the input shaft must also be adjusted ⇒ [page 118](#) .
2) Pinion shaft and crown wheel should only be replaced together.
For positions of shims refer to ⇒ [page 164](#) .

5.4 Re-adjustment sequence for final drive gear set

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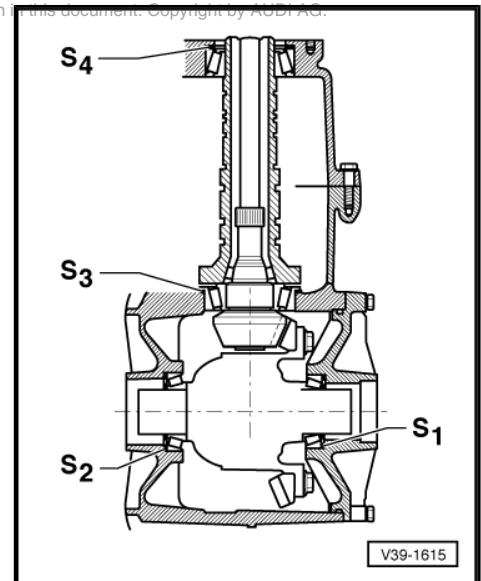
The following work sequence is recommended to save time when the crown wheel and pinion shaft have to be adjusted:

- ◆ Determine total shim thickness „S_{total}“ (S₁ plus S₂) for specified preload on tapered roller bearings for differential ⇒ [page 179](#) .
- ◆ Determine total shim thickness „S_{total}“ (S₃ plus S₄) for specified preload on tapered roller bearings for pinion shaft ⇒ [page 167](#) .
- ◆ Distribute total shim thickness „S_{total}“ (S₃ plus S₄) so that dimension from centre of crown wheel to end face of pinion corresponds to installation dimension „R“ determined during production ⇒ [page 173](#) .
- ◆ Distribute total shim thickness „S_{total}“ (S₁ plus S₂) so that specified backlash between crown wheel and pinion shaft is obtained ⇒ [page 183](#) .



Note

Overview of components and shims ⇒ [page 164](#) .



5.5 Adjusting pinion shaft

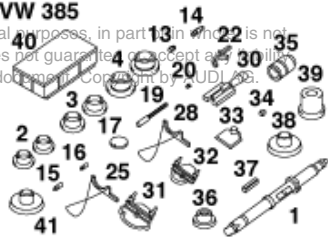
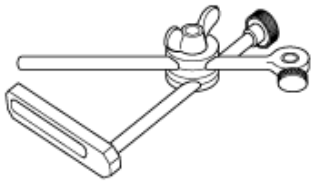
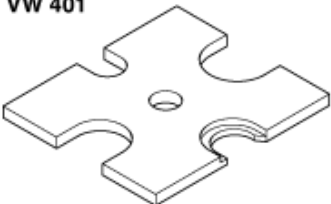
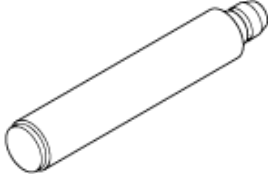
(Adjusting pinion shaft and hollow shaft)

Repairs after which the pinion shaft must be adjusted
⇒ „5.3 Table of adjustments - gearbox“, [page 164](#) .

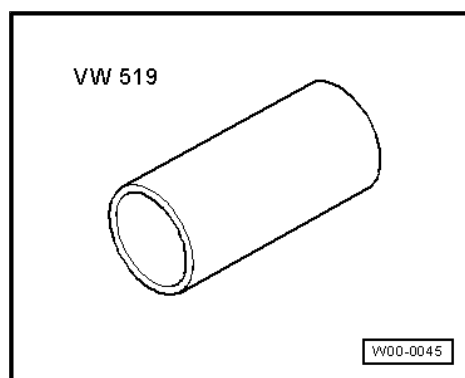
Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Transmission removal lever -VW 296-
- ◆ Universal measuring tool -VW 385-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 407-

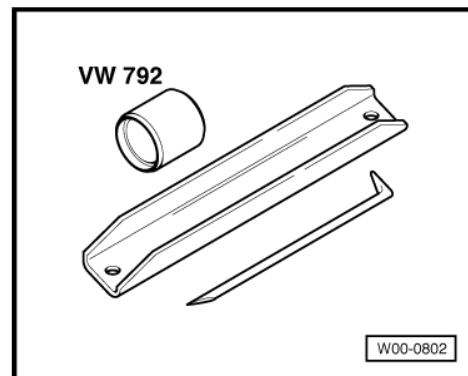
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V.A.G 1331 	VW 296 
VW 385 	VW 387 
VW 401 	VW 407  G39-0098

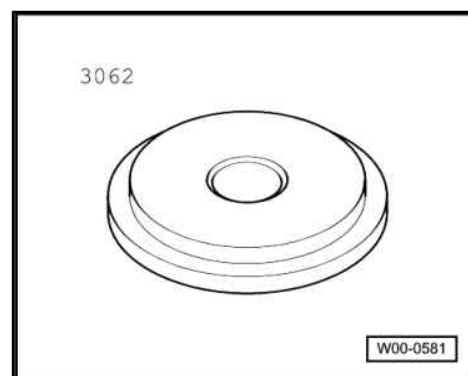
- ◆ Tube -VW 519-



◆ Assembly device -VW 792-



◆ Thrust pad -3062-



Determining total shim thickness „S_{total}“ for shims „S₃“ plus „S₄“

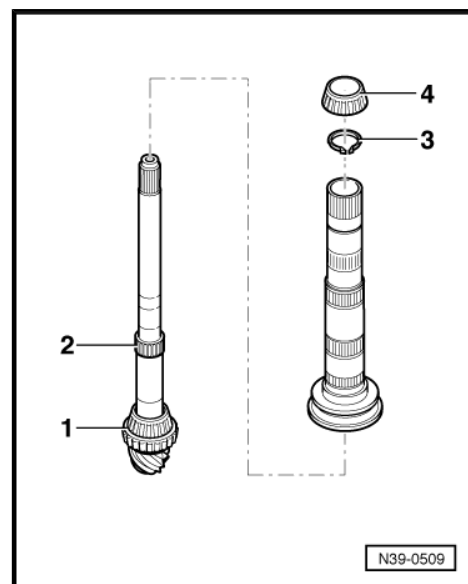
(Adjustment of preload of tapered roller bearings for pinion shaft with hollow shaft)

- Differential removed
- Press double tapered roller bearing inner race -1- onto pinion shaft and secure [⇒ page 121](#).
- Fit needle bearing -2-.
- Fit circlip -3- onto hollow shaft and press on tapered roller bearing inner race -4- [⇒ page 121](#).
- Fit pinion shaft in hollow shaft.



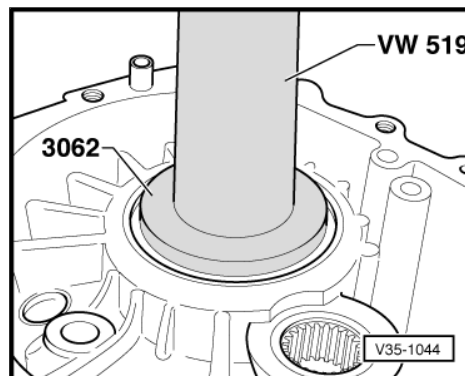
Note

The hollow shaft is shown in the illustration without gears. The adjustment of the pinion shaft can be performed either with or without the gears fitted.



- Press double tapered roller bearing outer race for pinion shaft into gearbox housing without shims.

Smaller diameter of thrust pad -3062- faces outer race.

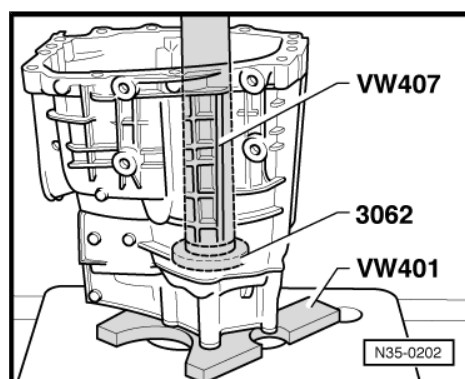


- Press tapered roller bearing outer race for pinion shaft together with a 0.85 mm thick provisional shim „S4“ fully into gearbox cover.



Note

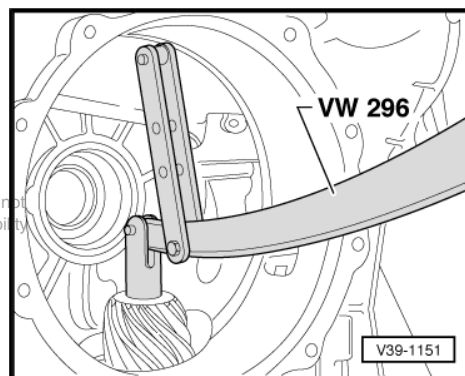
- ◆ For measurement purposes a shim „S4“ with a thickness of 0.85 mm is inserted provisionally. This is referred to in the following as „S4*“. „S4*“ is exchanged with the final shim „S4“ after determining measured value „e“.
- ◆ When taking measurements, always fit the rubber washer together with the ring for the rubber washer
⇒ [Item 44 \(page 124\)](#).



- Fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit gearbox cover and tighten bolts to 22 Nm.
- Turn gearbox so that the gearbox cover points downwards.

- Press down on face of pinion shaft with transmission removal lever -VW 296- until the outer race for the tapered roller bearing contacts the gearbox cover.
- While still maintaining pressure, rotate the pinion shaft 5 turns in each direction in relation to the hollow shaft to settle the double tapered roller bearing.

- Then rotate pinion shaft together with hollow shaft 5 turns in each direction to settle tapered roller bearing.



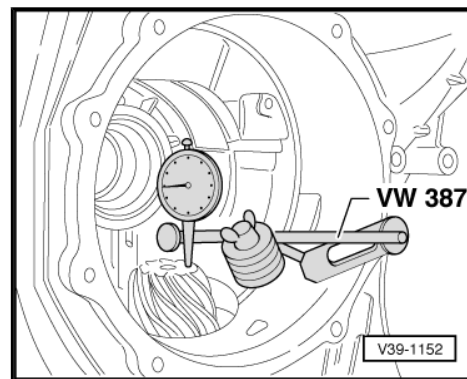
- Mount dial gauge (3 mm measuring range) and set to „0“ with 2 mm preload.
- Use dial gauge extension (length 30 mm).



Note

The dial gauge extension must contact the machined surface on the face of the pinion.

- Turn gearbox 180° so that the gearbox cover faces upwards.
- Rotate pinion shaft together with hollow shaft 5 turns in both directions to settle taper roller bearing. Otherwise the result of the measurement will be incorrect.



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– Read off play on dial gauge and note reading.

◆ Measurement in example: 0.55 mm



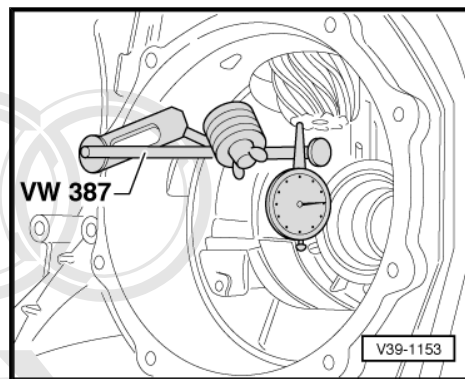
Note

If the measurement has to be repeated, the pinion shaft with the hollow shaft must first be rotated another 5 turns in each direction. Preload dial gauge to 2 mm and set to „0“ again.

Formula: „S_{total}“ = „S₄“ + measured value + bearing preload

Example:

Inserted shim „S ₄ “	0.85 mm
+ Measured value (example)	0.55 mm
+ Bearing preload (constant value)	0.15 mm
= Total shim thickness „S _{total} “ for „S ₃ “ + „S ₄ “	1.55 mm



Determining thickness of provisional shim „S₃“



Note

Provisional shim S₃ is replaced with final shim S₃ after determining measured value „e“.*

Formula: „S₃“ = „S_{total}“ – „S₄“

Example:

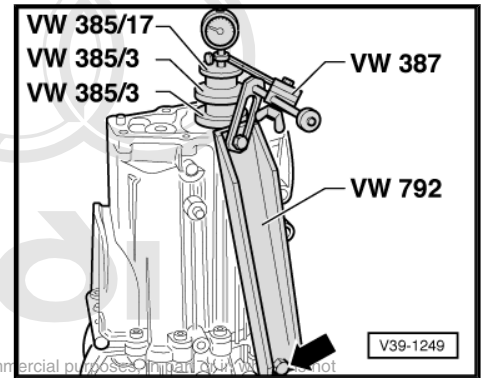
Total shim thickness „S _{total} “ for „S ₃ “ + „S ₄ “	1.55 mm
- Inserted shim „S ₄ “	0.85 mm
= Thickness of shim „S ₃ “	0.70 mm

- Remove double tapered roller bearing outer race
⇒ [page 127](#) .
- Fit provisional shim „S₃“ in gearbox housing and press in outer race again ⇒ [page 127](#) .
- Re-fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit gearbox cover and tighten bolts to 22 Nm.

Checking preload of tapered roller bearings for pinion shaft

- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.

- Set up measuring tools and secure with bolt -arrow- to gearbox housing.
- Set dial gauge (3 mm measuring range) to „0“ with 2 mm pre-load.
- Loosen gearbox cover bolts and turn pinion shaft several times.
- If the correct shims have been selected the dial gauge will now indicate the following value:
 - ◆ 0.05...0.15 mm
- Tighten gearbox cover bolts again to 22 Nm.
- Take down measuring tools.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.



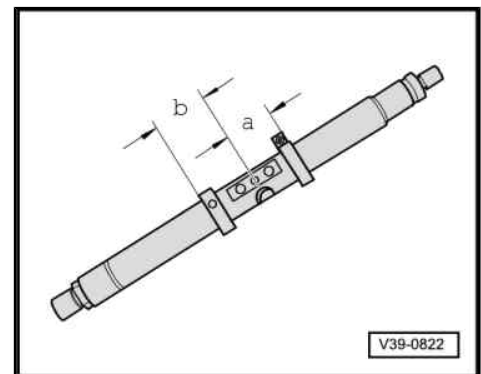
Determining dimension „e“



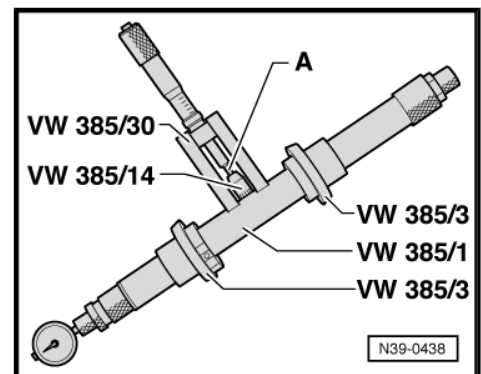
Note

Dimension „e“ is required to determine the final shim thickness of „S3“ and „S4“.

- Set adjustment rings of universal measuring tool -VW 385/1- to the following values:
 - ◆ Dimension -a- = 35 mm
 - ◆ Dimension -b- = 75 mm



- Assemble universal measuring tool -VW 385/1- as illustrated.
 - ◆ Dial gauge extension -A-, 6.5 mm long
 - ◆ Master gauge -VW 385/30-
- Set master gauge -VW 385/30- to $R_o = 54.95$ mm and fit onto universal measuring tool (for crown wheel $\varnothing 170$ mm).
- Set dial gauge (3 mm measuring range) to „0“ with 2 mm pre-load.



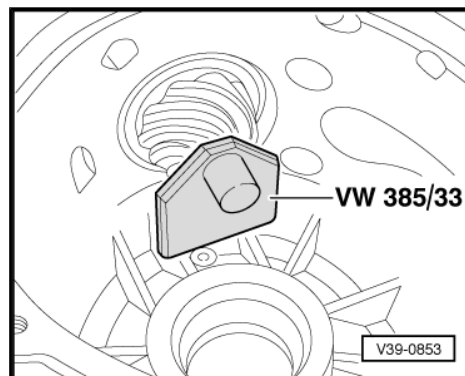
Note

Use centring ring 61 mm -VW 385/2- in place of centring ring 69 mm -VW 385/3- opposite dial gauge on gearboxes which have flange shafts without polygon bearings.

- Place end measuring plate on face of pinion gear.


Note

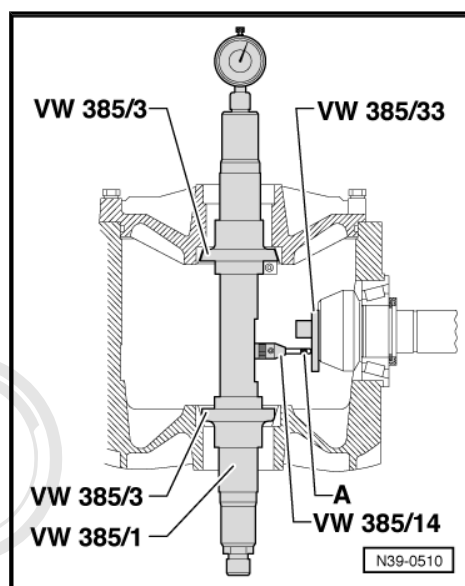
Ensure contact surface of end measuring plate fits exactly and is free of oil.



- Detach master gauge and insert universal measuring tool in housing.
- ◆ Dial gauge extension -A- (length = 6.5 mm) must be screwed in.
- ◆ The dial gauge faces towards the final drive cover.
- Fit cover for final drive and tighten 4 bolts to 22 Nm.
- Using the adjustable ring, pull 2nd centring disc -VW 385/3- out as far as possible so that the universal measuring tool can still just be turned by hand.


Note

Use centring ring 61 mm -VW 385/2- in place of centring ring 69 mm -VW 385/3- opposite dial gauge on gearboxes which have flange shafts without polygon bearings.

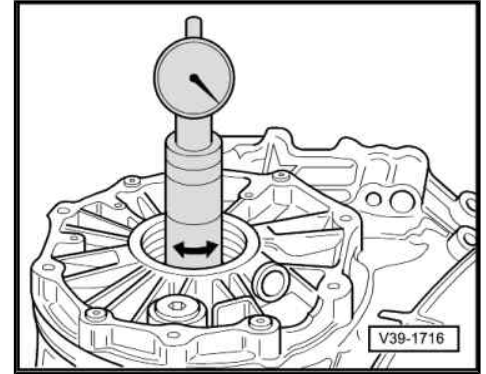


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- Turn universal measuring tool until tip of dial gauge touches end measuring plate on face of pinion gear, and measure maximum deflection (return point).
- ◆ Measurement in following example: „e“ = 0.33 mm (in red scale)

 Note

Then (after removing universal measuring tool), check once again that the dial gauge indicates „0“ with 2 mm preload when master gauge -VW 385/30- is in place.



Determining thickness of shim „S3“

- ◆ The allowance „r“ referenced to the master gauge „Ro“ is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel.
- ◆ Subtract value „e“ if measurement is obtained on red scale.
- ◆ Add value „e“ if measurement is obtained on black scale.

Formula:

$$„S_3“ = „S_3^{**}“ + „r“ + „e“ \text{ („e“ on black scale)}$$

$$„S_3“ = „S_3^{**}“ + „r“ - „e“ \text{ („e“ on red scale)}$$

Example:

Inserted shim „S3**“	0.70 mm
+ Allowance „r“	0.38 mm
- Determined value „e“ (in red scale)	0.33 mm
= Thickness of shim „S3“	0.75 mm

- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue.

Available shims for „S3“

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Shim thickness (mm) ¹⁾		
0.40	0.55	0.70
0.45	0.60	0.75
0.50	0.65	

• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim „S4“

Formula: „S4“ = „S_{total}“ - „S3“

Example:

Total shim thickness „S _{total} “ for „S3“ + „S4“	1.55 mm
- Thickness of shim „S3“	0.75 mm
= Thickness of shim „S4“	0.80 mm

- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue.

Shims available for „S4“

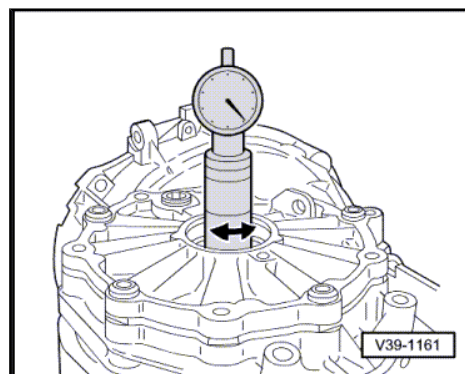
Shim thickness (mm) ¹⁾		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

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Checking dimension „r“

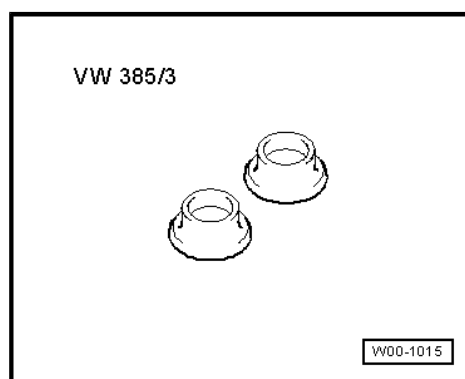
- Install pinion shaft/hollow shaft with appropriate measured shims „S3“ and „S4“.
- Rotate hollow shaft against pinion shaft 5 turns in both directions to settle tapered roller bearing.
- Rotate pinion shaft together with hollow shaft 5 turns in both directions to settle taper roller bearing.
- Insert universal measuring tool ⇒ [page 171](#) and check adjustment.
- Read off dial gauge anti-clockwise (red scale).
- ◆ If the shims have been correctly selected, the allowance „r“ (marked on outer circumference of crown wheel) should be indicated within a tolerance of ± 0.04 mm.



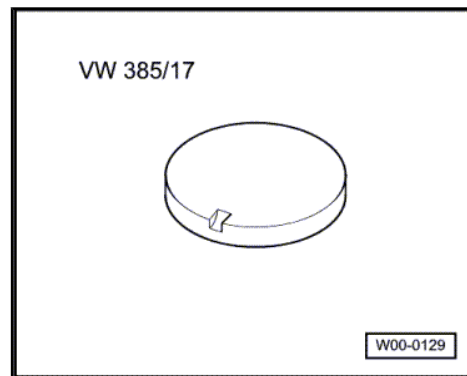
5.6 Re-determining shim „S4“ when renewing gearbox cover

Special tools and workshop equipment required

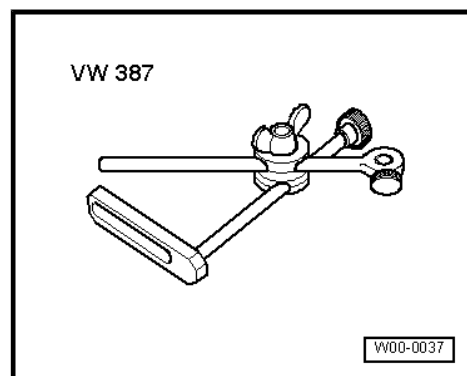
- ◆ 2 x centring disc -VW 385/3-



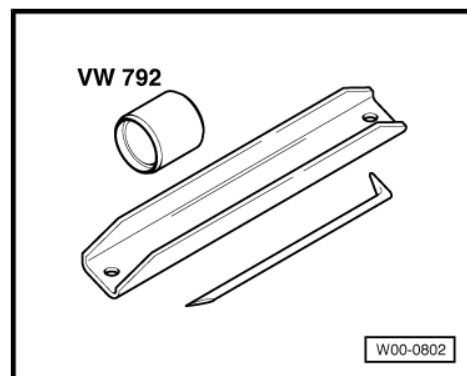
- ◆ End measuring plate -VW 385/17-



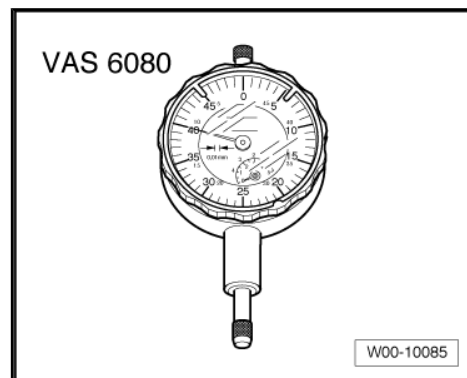
- ◆ Universal dial gauge bracket -VW 387-



- ◆ Assembly device -VW 792-



- ◆ Dial gauge , e.g. -VAS 6080-



- ◆ Dial gauge extension
- ◆ Depth gauge (accurate to within $\frac{5}{100}$ mm or less)
- ◆ Sealing paste -AMV 188 001 02-
 - Thoroughly clean contact surface of housing and bearing seat on old and new gearbox covers.

- Measure difference in depth -a- on old and new gearbox cover.

Example:

Depth „a“ (old gearbox cover)	257.40 mm
Depth „a“ (new gearbox cover)	257.55 mm
= Difference	0.15 mm

- If new gearbox cover is deeper, install a thicker „S4“ shim.
- If previous gearbox cover is deeper, install a thinner „S4“ shim.

Example:

Previous shim „S4“	0.70 mm
+ Difference	0.15 mm
= New shim „S4“	0.85 mm

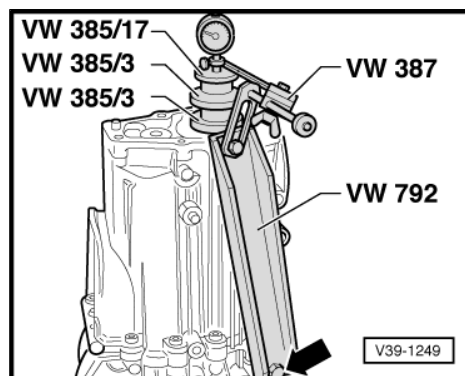
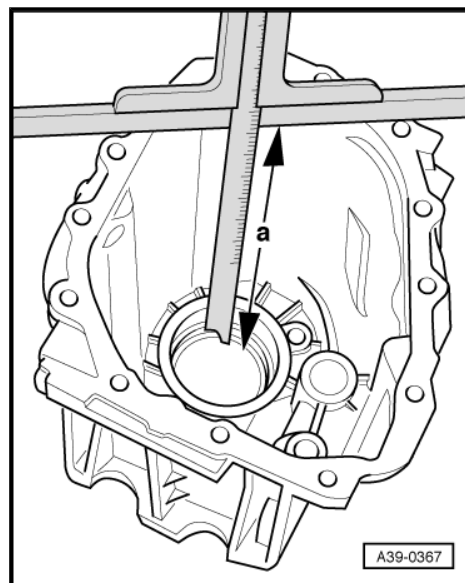
Shims available ⇒ [page 174](#) .

- Press tapered roller bearing outer race with shim „S4“ into gearbox cover ⇒ [page 129](#) .
- Re-fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit gearbox cover and tighten bolts to 22 Nm.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.

- Set up measuring tools and secure with bolt -arrow- to gearbox housing.
- Set dial gauge (3 mm measuring range) to „0“ with 2 mm pre-load.
- Loosen all gearbox cover bolts approx. one turn.
- If the correct shims have been selected the dial gauge will now indicate the following value:
 - 0.05...0.15 mm

If this reading is not obtained, the adjustment must be corrected.

- Detach measuring tools and gearbox cover.


Note

Check that the two dowel sleeves for centralising the gearbox cover are fitted in the gearbox housing.

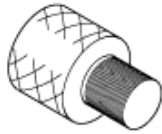
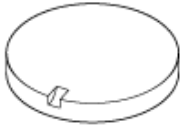
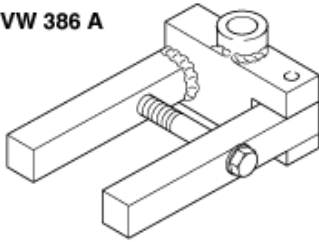
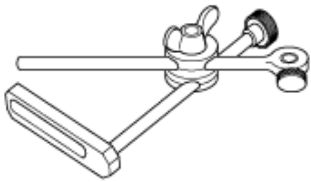
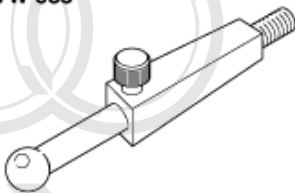
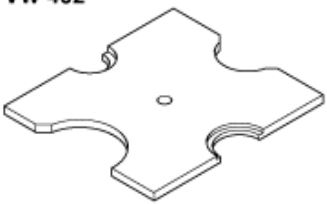
- Clean sealing surfaces thoroughly for a second time and apply a thin coat of sealing paste -AMV 188 001 02- .
- Fit gearbox cover and tighten bolts to 22 Nm.

5.7 Adjusting crown wheel

(Adjusting differential)

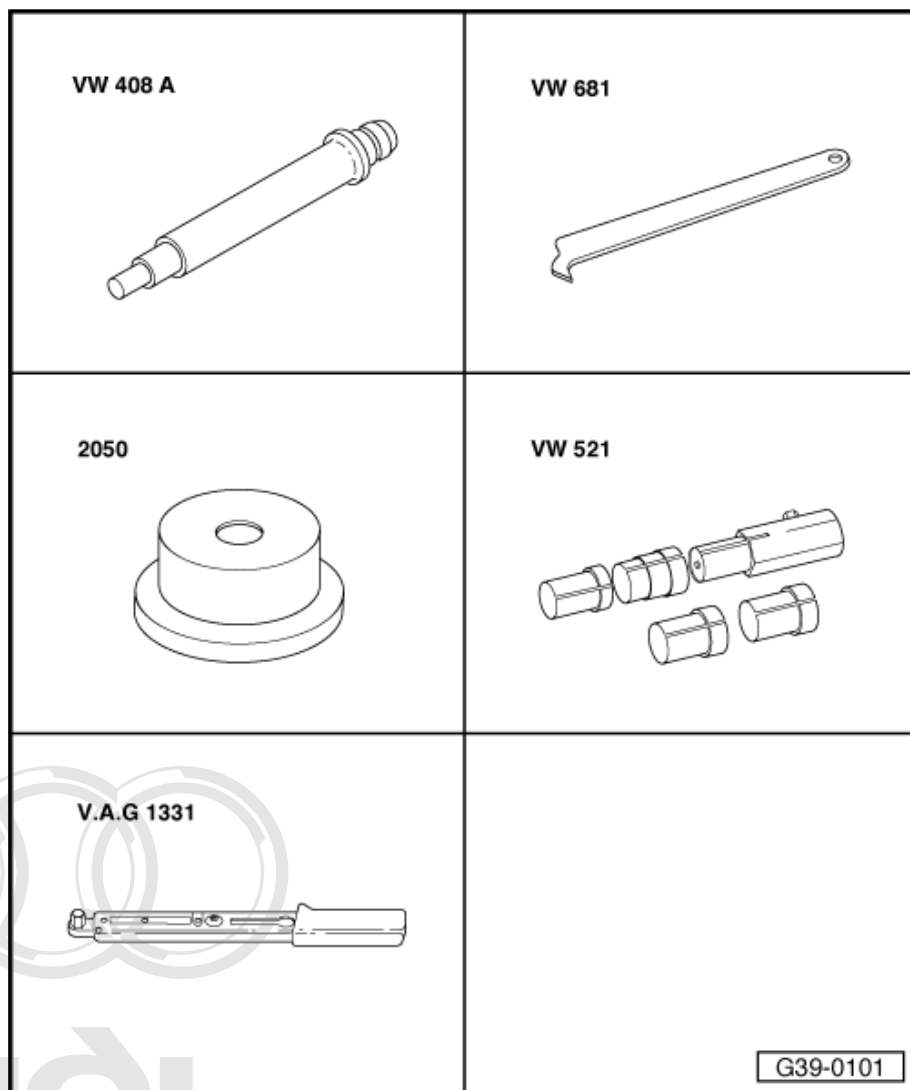
Special tools and workshop equipment required

- ◆ Dial gauge extension - VW 382/10-
- ◆ End measuring plate - VW 385/17-
- ◆ Drive pinion clamp -VW 386 A-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Adjustable measuring lever -VW 388-
- ◆ Thrust plate -VW 402-

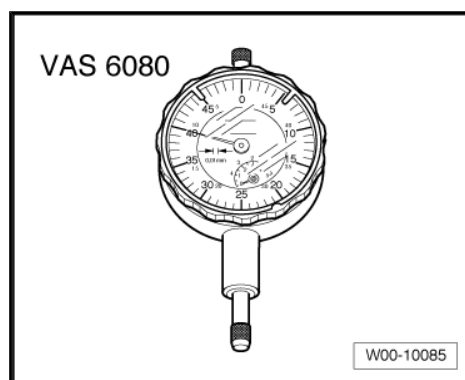
VW 382/10 	VW 385/17 
VW 386 A 	VW 387 
VW 388 	VW 402  G39-0100

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- ◆ Press tool -VW 408 A-
- ◆ Oil seal extractor lever -VW 681-
- ◆ Thrust piece -2050-
- ◆ Crown wheel adjusting tool -VW 521-
- ◆ Torque wrench -V.A.G 1331-



- ◆ Dial gauge, e.g. -VAS 6080-
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- ◆ Dial gauge extension, 30 mm

The crown wheel only has to be re-adjusted if:

The gearbox housing, cover for final drive, tapered roller bearings for differential, differential cage or final drive gear set have been renewed. Table of adjustments ➔ [page 164](#)

Determining total shim thickness „S_{total}“ for shims „S₁“ plus „S₂“

(Setting preload of tapered roller bearings for differential)

- Pinion shaft removed

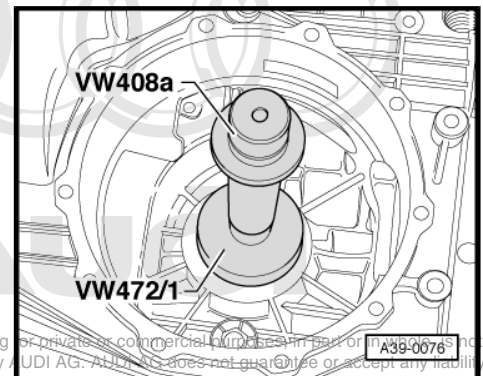
 Note

If only the tapered roller bearings for the differential are being renewed, the crown wheel can be removed from the differential cage. The pinion shaft then does not have to be removed.

- Remove flange shaft oil seals.
- Remove tapered roller bearing outer races for differential and take out shims ➔ [page 152](#).
- Drive outer race for tapered roller bearing (right-side) with shim „S₂“ into gearbox housing. For measurement purposes use a 1.22 mm thick „S₂“ shim (or 2 shims of 0.61 mm).

 Note

- ◆ *For measurement purposes a 1.22 mm thick shim „S₂“ is inserted provisionally in gearboxes from 08.98 onwards. This is referred to in the following as „S₂“*. „S₂“* is exchanged with the final shim „S₂“ after determining backlash.*
- ◆ *For gearboxes up to approx. 08.98, insert a 1.20 mm thick shim „S₂“* (two 0.60 mm shims) provisionally.*
- ◆ *Use thrust plate -30 - 205- in place of press tool -VW 472/1- on gearboxes which have flange shafts without polygon bearings.*



- Press outer race for tapered roller bearing (left-side) without shim „S₁“ into cover for final drive.

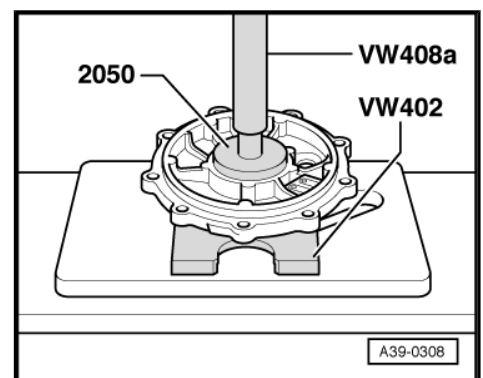
 Note

For gearboxes without reinforcements up to approx. 08.98, press tool -VW 472/1- must be used in place of thrust piece -2050- ➔ [page 159](#).

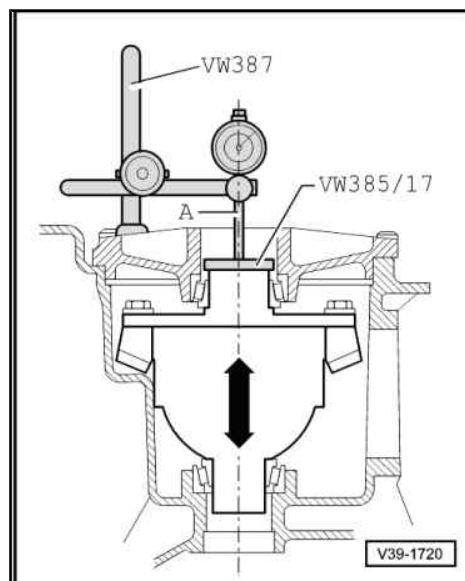
- Insert differential without drive wheel for speedometer sender -G22- into gearbox housing.

The crown wheel is located on the left side (cover side).

- Fit cover for final drive and tighten 4 bolts to 25 Nm in diagonal sequence.
- Turn gearbox so that cover for final drive points upwards.
- Turn differential 5 turns in both directions so that the tapered roller bearings settle.



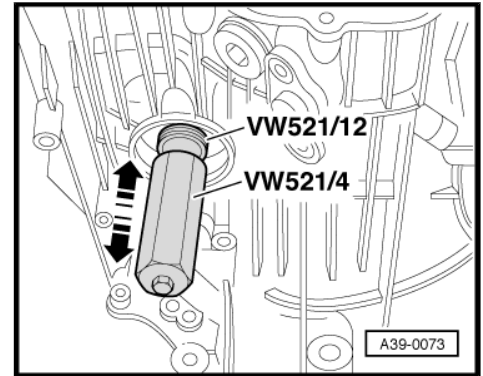
- Place measuring plate -VW 385/17- on differential.
- Set up measuring tool using 30 mm dial gauge extension -A-.
- Set dial gauge e.g. -VAS 6080- (3 mm measuring range) to „0“ with 2 mm preload.
- The tip of the dial gauge must be applied to the centre of the differential.
- Raise differential without turning, read clearance off dial gauge and note down.
- Measurement in following example: 0.62 mm



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 Note

- ◆ To lift differential, secure crown wheel adjusting tool -VW 521/4- and -VW 521/12- (for gearboxes with polygon bearing on right side of differential (housing side).
- ◆ Use sleeve -VW 521/8- in place of sleeve -VW 521/12- on gearboxes which have flange shafts without polygon bearings.
- ◆ If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the tapered roller bearings.



Formula: „S_{total}“ = „S₂“ + measured value + bearing preload

Example:

Example:

Inserted shim(s) „S ₂ “	1.22 mm
+ Measured value	0.62 mm
+ Bearing preload (constant value)	0.25 mm
= Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	2.09 mm

Determining thickness of shim „S₁“

 Note

- ◆ Provisional shim „S₁“ is replaced with final shim „S₁“ after determining backlash.
- ◆ Total shim thickness „S_{total}“ remains unchanged.

Formula: „S₁“ = „S_{total}“ – „S₂“

Example:

Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	2.09 mm
- Inserted shim(s) „S ₂ “	1.22 mm
= Thickness of shim „S ₁ “	0.87 mm

Select correct shims from ⇒ Electronic parts catalogue .

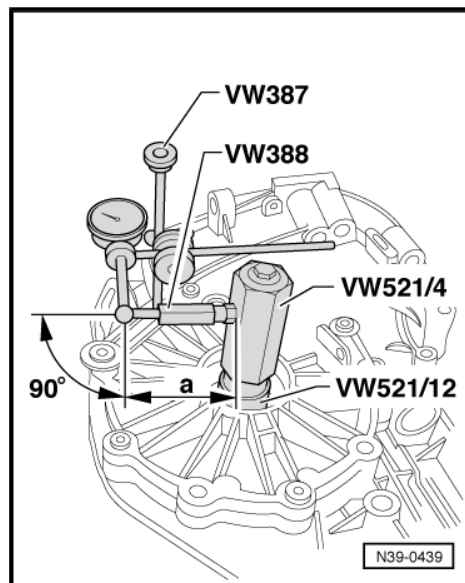
Measuring backlash

(Position of crown wheel in gearbox housing)

- Pinion shaft fitted with shims „S₃“ and „S₄“.
- Install differential with shims „S₁“ and „S₂“.
- Fit cover for final drive and tighten bolts to 25 Nm.
- Turn differential 5 turns in both directions to settle tapered roller bearings.

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- Secure dial gauge bracket -VW 387- to housing.
- Attach crown wheel adjusting device -VW 521/4- and -VW 521/12- (on gearbox with polygon bearings), or -VW 521/8- (on gearbox without polygon bearings).
- Fit dial gauge with dial gauge extension -VW 382/10- (6 mm flat).
- Adjust measuring lever -VW 388- to distance „a“ = 67 mm (for $\varnothing$ 170 mm crown wheel).
- Measure play between teeth faces (backlash) as follows:
- Turn crown wheel until it makes contact with the face of one tooth (end of backlash travel).
- Preload dial gauge to 2 mm and set to „0“.
- Turn back crown wheel until it makes contact with opposite tooth face (backlash).
- Take backlash reading and note down measured value.
- Turn crown wheel through 90° and repeat measurements another 3 times.



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 Note

- ◆ If the pinion shaft rotates when the differential is turned, attach drive pinion clamp -VW 386 A- so that the backlash can be measured accurately.
- ◆ Loosen the clamp in order to turn the crown wheel.

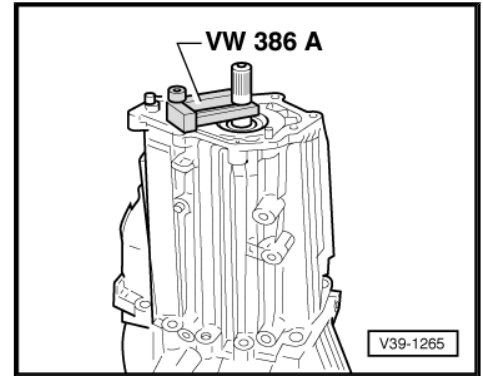
Determining average backlash

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

Example:

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

- Result: the average backlash is $1.16 \text{ mm} : 4 = 0.29 \text{ mm}$



 Note

If the individual measurements differ by more than 0.06 mm, this means that the installation of the crown wheel is not correct or that the final drive gear set itself is defective. Check the installation; renew the final drive gear set if necessary.

Determining thickness of shim „S2“

Formula: „S2“ = „S2*“ – backlash + lift

Example:

Inserted shim(s) „S2*“	1.22 mm
- Average backlash	0.29 mm
+ Lift (desired average value for backlash)	0.15 mm
= Thickness of shim „S2“	1.08 mm

- Select thickness of required shim(s) from following tables:

Available shims „S2“ up to approx. 08.98

Shim thickness (mm) ¹⁾²⁾		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	
• ¹⁾ For part numbers, refer to ⇒ Electronic parts catalogue . • ²⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.		

Available shims „S₂“ from 08.98 onwards

Shim thickness (mm) ¹⁾²⁾		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	
1) For part numbers, refer to ⇒ Electronic parts catalogue . 2) The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.		

Determining thickness of shim „S₁“

Formula: „S₁“ = „S_{total}“ – „S₂“

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Example:

Total shim thickness „S _{total} “	2.09 mm
for „S ₁ “ plus „S ₂ “	
- Thickness of shim „S ₂ “	1.08 mm
= Thickness of shim „S ₁ “	1.01 mm

– Select thickness of required shim(s) from following tables:

Available shims „S₁“ up to approx. 08.98

Shim thickness (mm) ¹⁾²⁾		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	
1) For part numbers, refer to ⇒ Electronic parts catalogue . 2) The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.		

Available shims „S₁“ from 08.98 onwards

Shim thickness (mm) ¹⁾²⁾		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	
1) For part numbers, refer to ⇒ Electronic parts catalogue . 2) The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.		

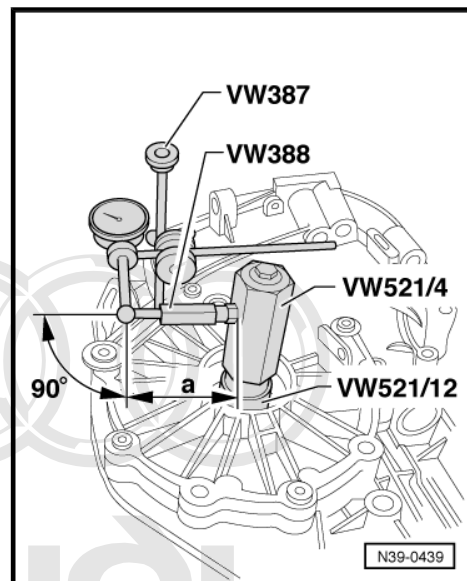
Checking adjustment

- After installing shims „S1“ and „S2“, turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.
- Specification: 0.12 ... 0.22 mm



Note

- ◆ *Use sleeve -VW 521/8- in place of sleeve -VW 521/12- on gearboxes which have flange shafts without polygon bearings.*
- ◆ *Adjustment must be repeated if backlash is outside tolerance. The total shim thickness „S_{total}“ must remain unchanged.*
- ◆ *The discrepancy between individual measured values must not exceed 0.06 mm.*



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6 Servicing propshaft

Overview

- ◆ ⇒ „6.1 Exploded view - propshaft“, page 186
- ◆ ⇒ „6.2 Removing and installing propshaft“, page 187
- ◆ ⇒ „6.3 Measuring and marking radial run-out at flange for propshaft“, page 190
- ◆ ⇒ „6.4 Adjusting propshaft“, page 192



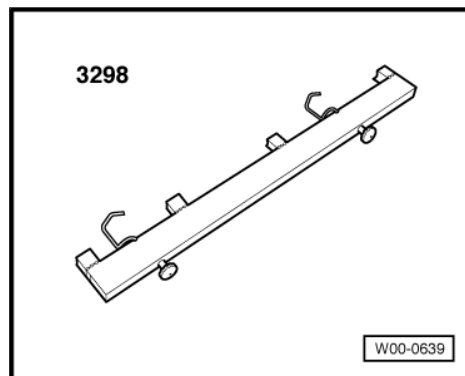
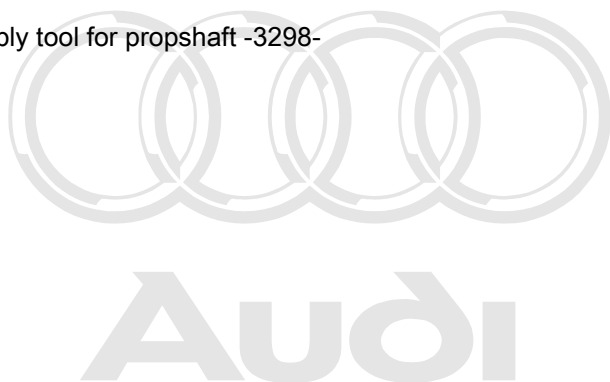
Note

- ◆ General repair instructions ⇒ [page 8](#).
- ◆ Do not bend propshaft further than 25 °. The universal joint can otherwise become damaged.
- ◆ The propshaft must be kept straight when it is stored or transported.
- ◆ No repair work can be carried out on the propshaft with the exception of removing, installing and adjusting.
- ◆ If the propshaft is detached only at the gearbox or at the rear final drive, it must be tied up or supported at the constant velocity joints.
- ◆ Before removing, mark the positions of all parts in relation to each other. Reinstall in the same position to avoid excessive imbalance, resulting in bearing damage and rumbling noise.
- ◆ If problems occur (noise or vibration), ensure that the centre bearing is free of stress and check the radial runout of the propshaft flange at the rear final drive before renewing the propshaft ⇒ [page 190](#).
- ◆ After detaching the propshaft from the rear final drive, the additional balancing washer (thicker washer) that may be fitted between the lock plate and one of the bolt heads must not be reinstalled.

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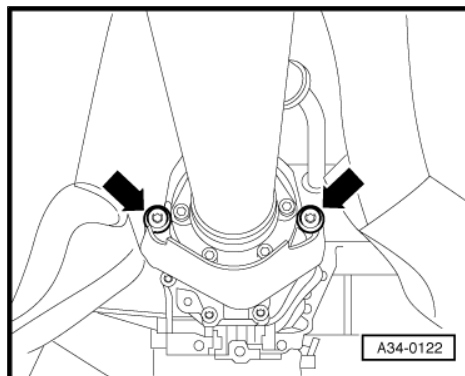
6.1 Exploded view - propshaft

◆ Assembly tool for propshaft -3298-

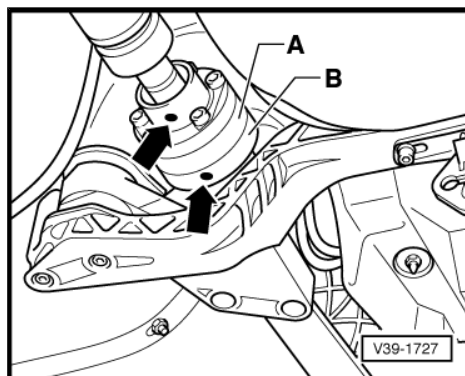


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- Observe notes ⇒ [page 186](#) .
- If fitted, remove cross member below exhaust system.
- Remove rear section of exhaust system (rearward of clamp(s))
⇒ Engine, mechanics; Rep. gr. 26 .
- Remove heat shields above propshaft.
- Remove heat shield for propshaft from cover for centre differential -arrows-.

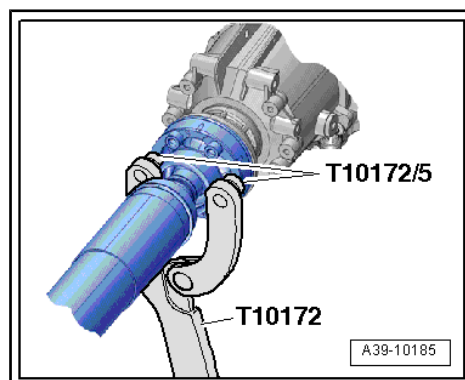


- Check whether there is a factory marking (coloured dot -arrows-) on the propshaft flange and on the rear final drive flange. If no factory marking is visible, mark the position of the propshaft flange -A- relative to the rear final drive -B-.
- Loosen securing bolts for both propshaft flanges.

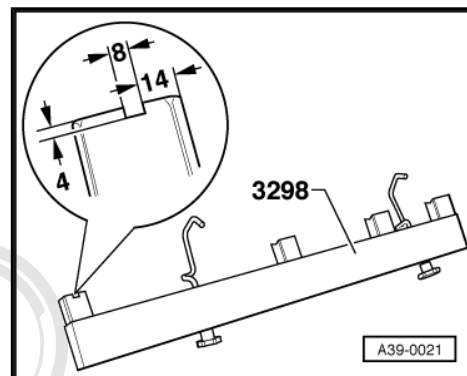


Note

Counterhold tool -T10172- with -T10172/5- may be used to counterhold propshaft.



- Cut out notch in assembly tool for propshaft -3298-, as shown in illustration.
- Unscrew the three upper securing bolts at each constant velocity joint on propshaft.
- Loosen securing bolts for centre bearing slightly.



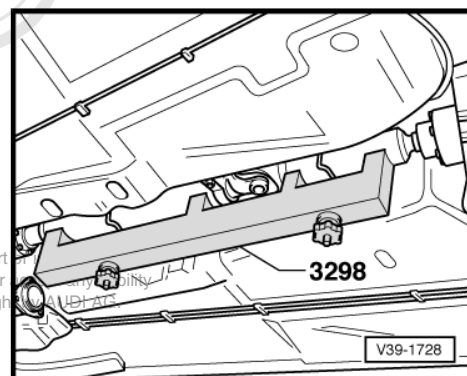
- Attach assembly tool for propshaft -3298- and tighten plastic nuts.



Note

Do not fit assembly tool for propshaft onto balance plates.

- Remove bolts securing flanges to gearbox and to rear final drive, as well as securing bolts for centre bearing.
- Slide propshaft together towards rear final drive. The constant velocity joints can be moved axially.
- Guide propshaft out of gearbox flange using assembly tool for propshaft.

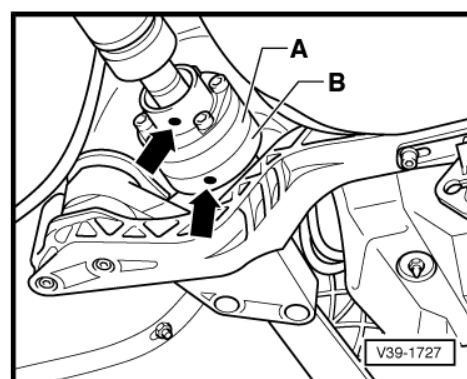


Note

The propshaft must be kept straight when it is stored or transported.

Installing

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





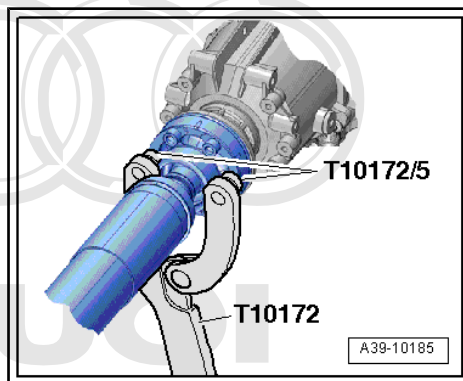
Note

- ◆ Clean all remaining locking fluid out of the tapped holes in the propshaft flange shafts on the gearbox and rear final drive. The residue can be removed using a tap. Otherwise the securing bolts can shear off when they are screwed in.
- ◆ Renew gaskets on flange shafts (pull off protective foil and stick gasket onto flange shaft). Bonding surface must be free from grease.
- ◆ To prevent imbalance, the flange on the propshaft -A- and the flange on the rear final drive -B- must be installed so that the factory markings (or the markings made on removal) are in alignment -arrows-.
- ◆ If you are installing a new propshaft and the factory marking on the rear final drive flange is no longer visible, you must measure the radial run-out at the flange for the propshaft ⇒ [page 190](#) , and the coloured marking on the new propshaft must be aligned with the new marking on the flange.
- ◆ After detaching the propshaft from the rear final drive, the additional balancing washer (thicker washer) that may be fitted between the lock plate and one of the bolt heads must not be reinstalled.
- ◆ Renew propshaft bolts (self-locking).
- ◆ Counterhold tool -T10172- with -T10172/5- may be used to counterhold propshaft.

- Adjust propshaft after installing ⇒ [page 192](#) .
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .

Tightening torques

Component	Nm
Propshaft to manual gearbox ¹⁾	55
Propshaft to rear final drive ¹⁾	55
Centre propshaft bearing to body	23
Heat shield for propshaft to gearbox	23
Cross member to body	25
Nuts for exhaust pipe clamp	40
• ¹⁾ Renew bolts.	

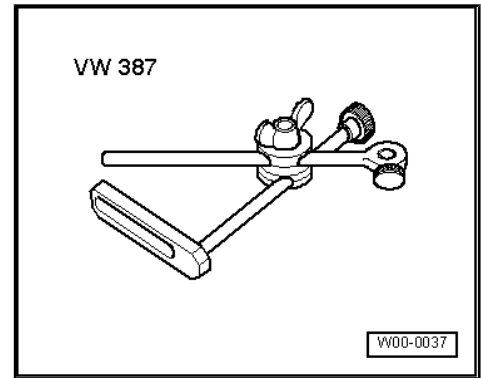


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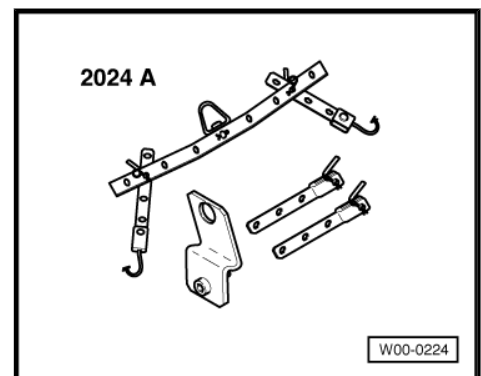
6.3 Measuring and marking radial run-out at flange for propshaft

Special tools and workshop equipment required

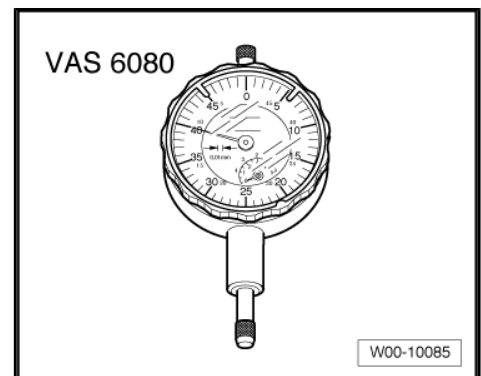
- ◆ Universal dial gauge bracket -VW 387-



- ◆ Lifting tackle -2024 A-



- ◆ Dial gauge , e.g. -VAS 6080-



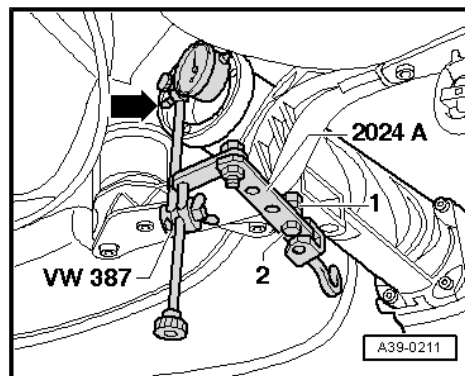
- ◆ Bolt M10 x 85



Note

- ◆ *Radial run-out must always be measured after removing thrust tube. Remove old paint marking and make new marking.*
 - ◆ *If a new propshaft is being installed and the marking on the flange shaft of the rear final drive is no longer visible, the point of maximum radial run-out must be measured with a dial gauge and marked with a coloured dot.*
 - ◆ *The coloured dot on the propshaft is then brought into alignment with this marking ⇒ [page 187](#) .*
 - ◆ *Radial run-out can also be measured with rear final drive in position. This involves disconnecting propshaft at rear final drive. Observe notes ⇒ [page 186](#) .*
- Remove bolt (front left) at final drive support.

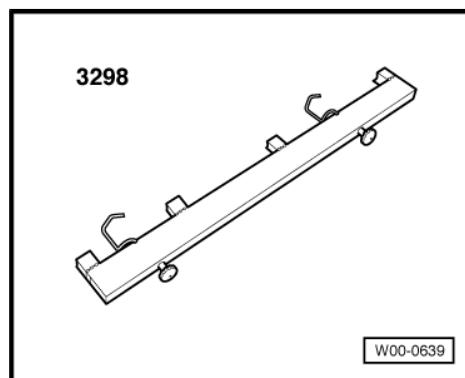
- Remove bracket from lifting tackle -2024 A- and secure at open hole with a bolt M10 x 85 mm -2-. Fit approx. 5 nuts M12 -1- beneath bracket.
- After fitting bracket, secure universal dial gauge bracket - VW 387- to bracket.
- Apply dial gauge to machined surface -arrow- on flange for propshaft and set to „0“ with a preload of 1 mm.
- Rotate the differential by turning the two rear wheels (right and left flange shafts) simultaneously in one direction until flange for propshaft has undergone one complete revolution.
- Mark point of maximum radial run-out with coloured dot on outside of flange (corresponding to maximum distance from axis of rotation).
- Remove old marking from flange for propshaft.
- Install propshaft ⇒ [page 187](#) .



6.4 Adjusting propshaft

Special tools and workshop equipment required

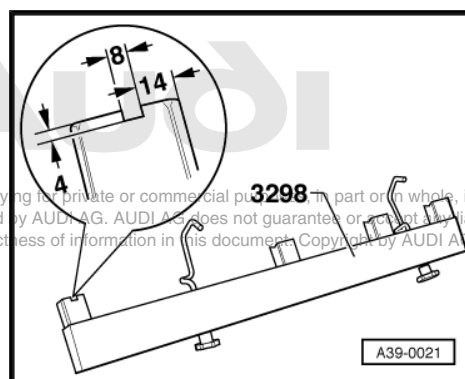
- ◆ Assembly tool for propshaft -3298-



- Observe notes ⇒ [page 186](#) .

Adjustments must be carried out with the greatest possible care since a poorly adjusted propshaft is often the cause of vibration and droning.

- If fitted, remove cross member below exhaust system.
- Remove rear section of exhaust system (rearward of clamp(s)) ⇒ Engine, mechanics; Rep. gr. 26 .
- Remove heat shields above propshaft.
- Cut out notch in assembly tool for propshaft -3298- , as shown in illustration.
- Loosen securing bolts for centre bearing slightly.



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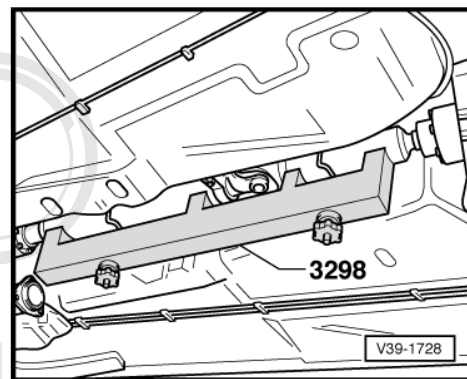
- Attach assembly tool for propshaft -3298- and tighten plastic nuts.



Note

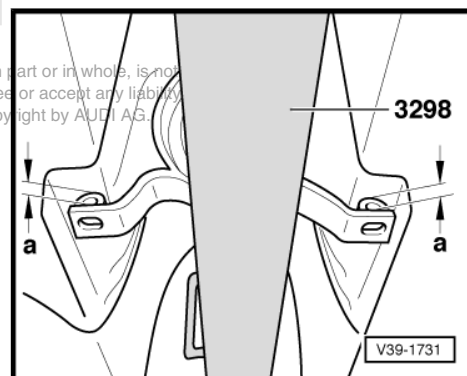
Do not fit assembly tool for propshaft onto balance plates.

- Remove securing bolts and shims for centre bearing.



- Align centre propshaft bearing so that gap -a- is the same on both sides.
- Measure gaps -a-.
- Select required shims from table. For part numbers, refer to ⇒ Electronic parts catalogue .

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Available shims

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

- Fit selected shims on left and right.

Axial alignment of propshaft

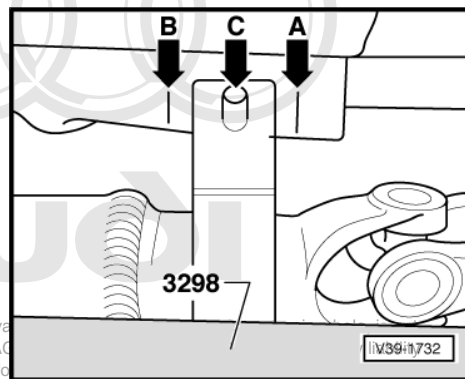
- Push propshaft with assembly tool for propshaft -3298- towards rear as far as it will go.
- Mark position of centre bearing on body -arrow A-.
- Push propshaft with assembly tool for propshaft towards front as far as it will go.
- Mark position of centre bearing on body -arrow B-.
- Move propshaft to central position -arrow C-:
- ◆ The centre bearing must be aligned centrally between markings -A- and -B-.
- Fit bolts for centre propshaft bearing and previously selected shims and tighten bolts.
- Detach assembly tool for propshaft .
- Install heat shield above propshaft.

The remaining installation steps are carried out in the reverse sequence; note the following points:

- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .

Tightening torques

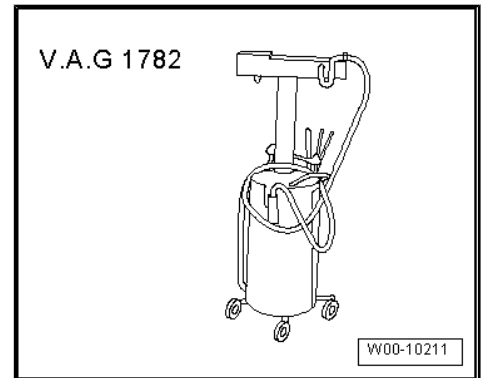
Component	Nm
Centre propshaft bearing to body	23
Cross member to body	25
Nuts for exhaust pipe clamp	40



7 Checking oil level in rear final drive

Special tools and workshop equipment required

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



- Place used oil collection and extraction unit -V.A.G 1782- below rear final drive.
- Remove oil filler plug -1- to check oil level in final drive.

- ◆ Specification: oil level up to bottom lip of filler hole

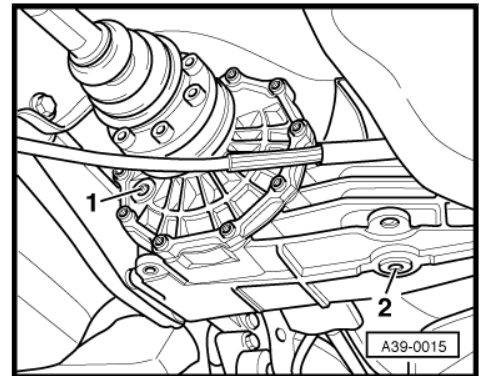
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– Top up with gear oil if necessary. Specifications → Electronic parts catalogue .

- Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	35



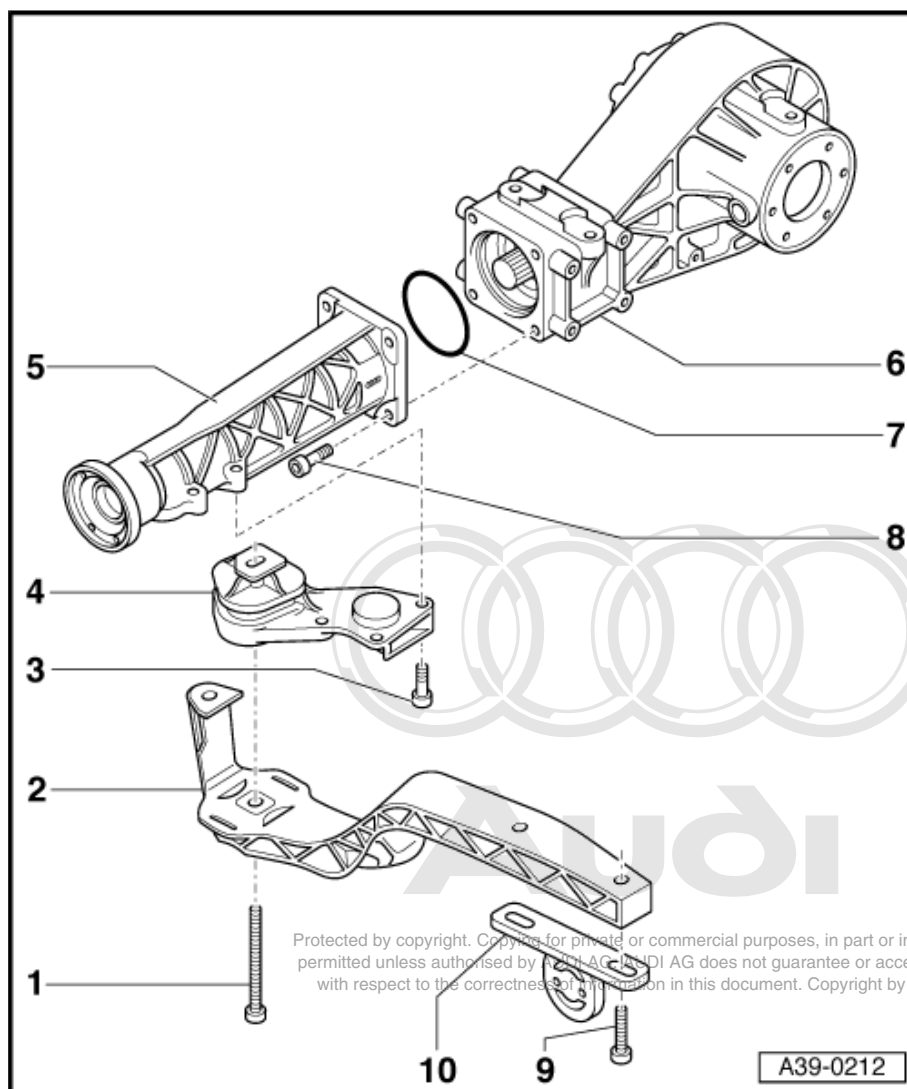
8 Removing and installing thrust tube

Overview

- ◆ ⇒ „8.1 Exploded view - removing and installing thrust tube“, page 196
- ◆ ⇒ „8.2 Assembly sequence- removing and installing thrust tube“, page 196

8.1 Exploded view - removing and installing thrust tube

- 1 - Bolt
 - 40 Nm
- 2 - Front cross member
- 3 - Bolt
 - 40 Nm
- 4 - Final drive support
- 5 - Thrust tube
- 6 - Rear final drive housing
- 7 - O-ring
- 8 - Bolt
 - 35 Nm
- 9 - Bolt
 - 23 Nm
- 10 - Bracket
 - For exhaust system

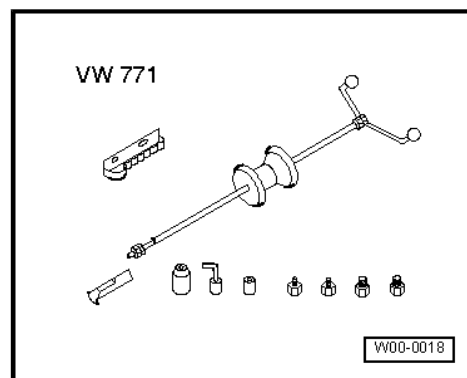


8.2 Assembly sequence- removing and installing thrust tube

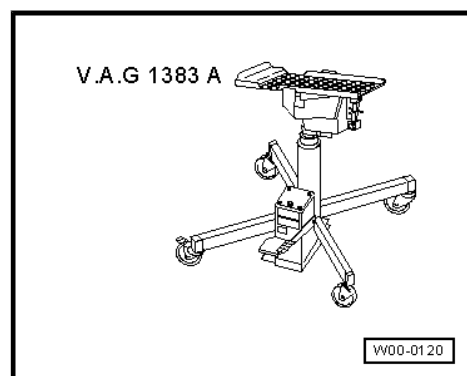
- Rear final drive installed.

Special tools and workshop equipment required

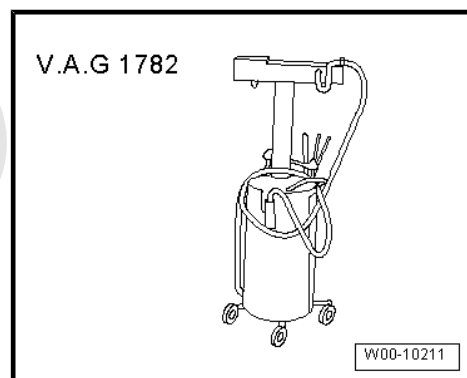
- ◆ Multi-purpose tool -VW 771-



- ◆ Engine and gearbox jack -V.A.G 1383 A- with universal support -V.A.G 1359/2-



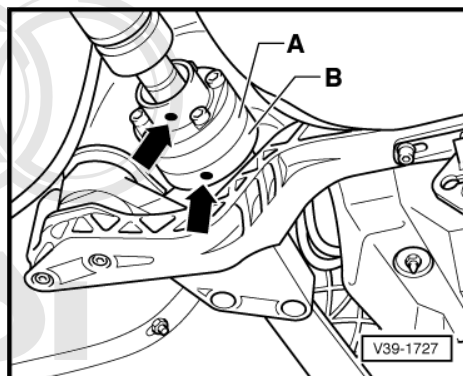
- ◆ Used oil collection and extraction unit -V.A.G 1782-



Removing thrust tube

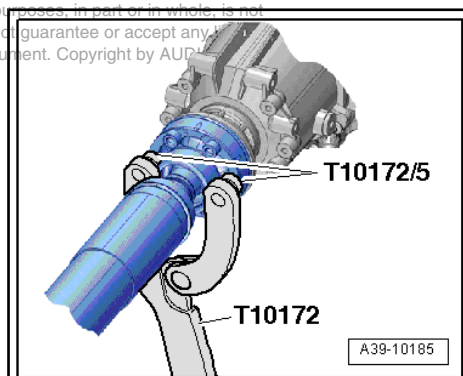
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gear oil out of rear final drive.
- Remove rear section of exhaust system (rearward of clamp(s))
⇒ Engine, mechanics; Rep. gr. 26 .
- Remove heat shield above propshaft.
- Remove heat shield next to rear final drive.

- Check whether there is a factory marking (coloured dot) on the propshaft -arrows-. If no factory marking is visible, mark the position of the propshaft flange -A- relative to the rear final drive -B-.
- Unscrew securing bolts for propshaft flange.


Note

Counterhold tool -T10172- with -T10172/5- may be used to counterhold propshaft.

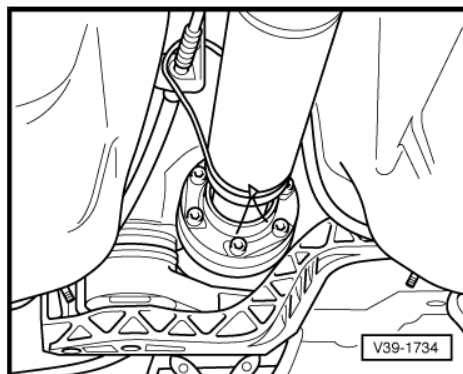
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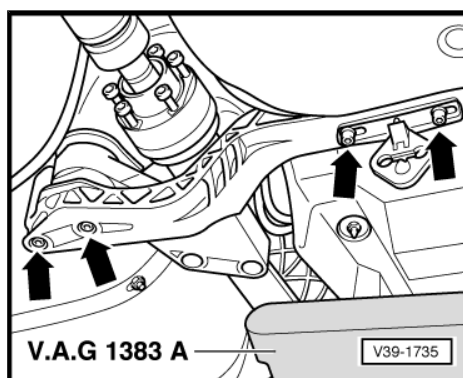
- Tie up propshaft to bracket for handbrake cable with wire.


Note

If propshaft cannot be pressed upwards past flange, lower final drive and then tie up propshaft. When lowering the final drive, prevent the propshaft from dropping and do not bend the centre joint further than the maximum bending angle ⇒ Notes ⇒ „6 Servicing propshaft“, page 186 .



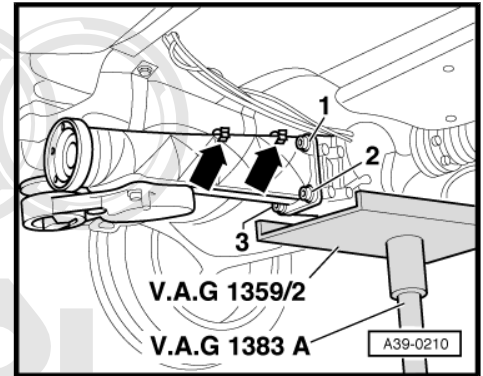
- Support rear final drive with engine and gearbox support - V.A.G 1383 A- .
- Unscrew bolts -arrows- at front cross member for rear final drive.
- Detach front cross member.
- Lower final drive approx. 100 mm.



- Remove 4 bolts for thrust tube -1 ... 3-



4th bolt is not shown in illustration.



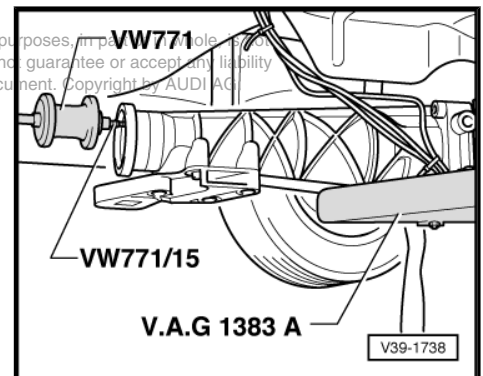
- Pull off flange shaft with thrust tube.

Installing thrust tube

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



- ◆ Clean all remaining locking fluid out of the tapped holes in the propshaft flange shaft on rear final drive. The residue can be removed using a tap. Otherwise the securing bolts can shear off when they are screwed in.
- ◆ Renew gasket between propshaft and input flange (remove protective foil and stick gasket onto flange shaft). Bonding surface must be free from grease.
- ◆ Renew propshaft bolts (self-locking).



- If there is a factory marking on the propshaft, measure the radial run-out at the propshaft flange ⇒ [page 190](#) and align the paint marking on the propshaft with the new marking on the flange.
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .
- Top up gear oil in rear final drive and check oil level ⇒ [page 195](#) .

Tightening torques

Component	Nm
Thrust tube to rear final drive	35
Propshaft to rear final drive ¹⁾	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive with bracket for exhaust system to body	23
Oil filler plug	35
Nuts for exhaust pipe clamp	40
• ¹⁾ Renew bolts.	

9 Dismantling and assembling thrust tube - exploded view

Overview

- ◆ ⇒ „9.1 Exploded view - dismantling and assembling thrust tube“, page 200
- ◆ ⇒ „9.2 Assembly sequence - dismantling and assembling thrust tube“, page 201

9.1 Exploded view - dismantling and assembling thrust tube



Note

Removing and installing thrust tube ⇒ [page 196](#).

1 - Flange shaft

- ☐ Removing ⇒ [page 203](#)
- ☐ When installing flange shaft, circlip ⇒ [Item 7 \(page 200\)](#) must be inserted through opening in housing at the same time ⇒ [page 205](#)

2 - Oil seal

- ☐ For flange shaft
- ☐ Levering out ⇒ [page 203](#)
- ☐ Driving in ⇒ [page 205](#)

3 - Circlip

- ☐ Removing ⇒ [page 204](#)

4 - Grooved ball bearing for flange shaft

- ☐ Pulling out ⇒ [page 204](#)
- ☐ Pressing in ⇒ [page 204](#)

5 - Sleeve

- ☐ Pulling off ⇒ [page 202](#)
- ☐ Pressing on ⇒ [page 205](#)

6 - Retaining plate

- ☐ Only press out if damaged
- ☐ Installing ⇒ [page 204](#)

7 - Circlip

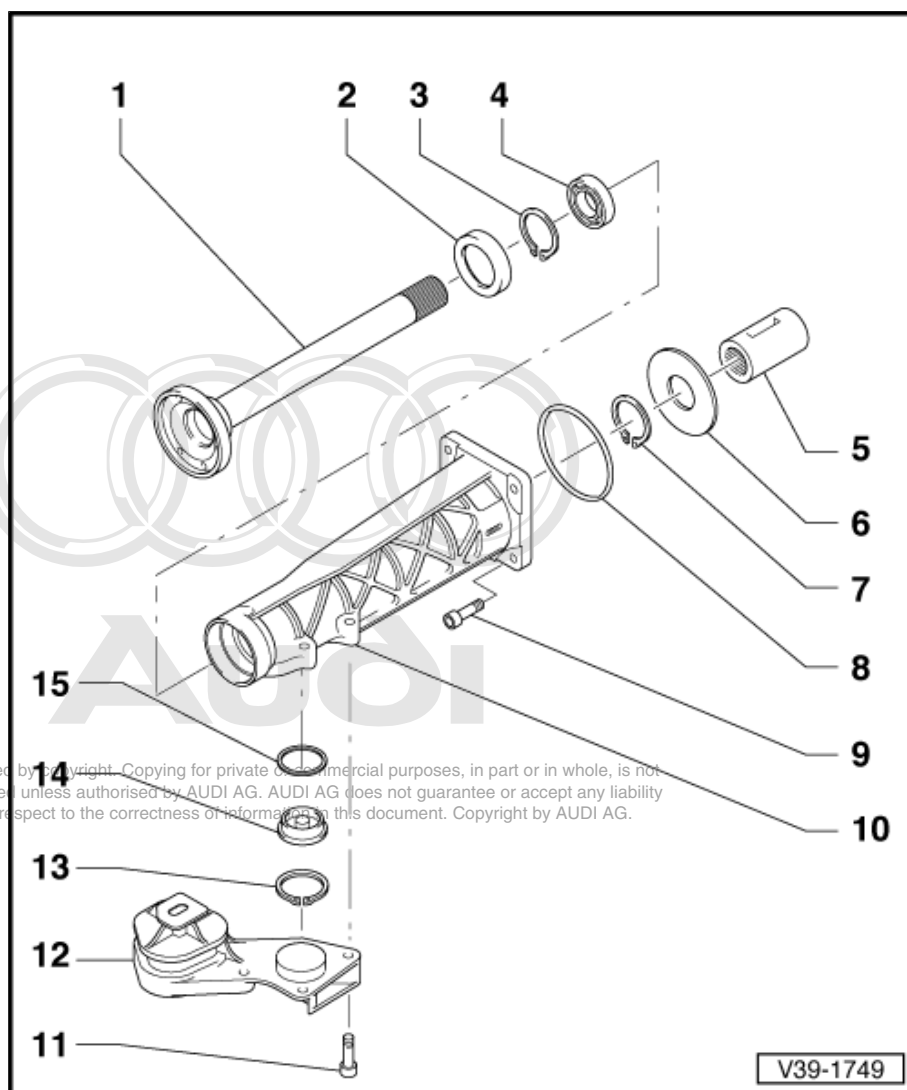
- ☐ Bend open to remove flange shaft ⇒ [page 203](#)

8 - O-ring

- ☐ Renew

9 - Bolt

- ☐ 35 Nm



- ☐ For securing thrust tube to rear final drive housing

10 - Thrust tube

11 - Bolt

- ☐ 40 Nm
- ☐ For securing final drive support to thrust tube

12 - Final drive support

13 - Circlip

- ☐ Removing ⇒ [page 203](#)

14 - Cap

- ☐ Removing ⇒ [page 203](#)

15 - O-ring

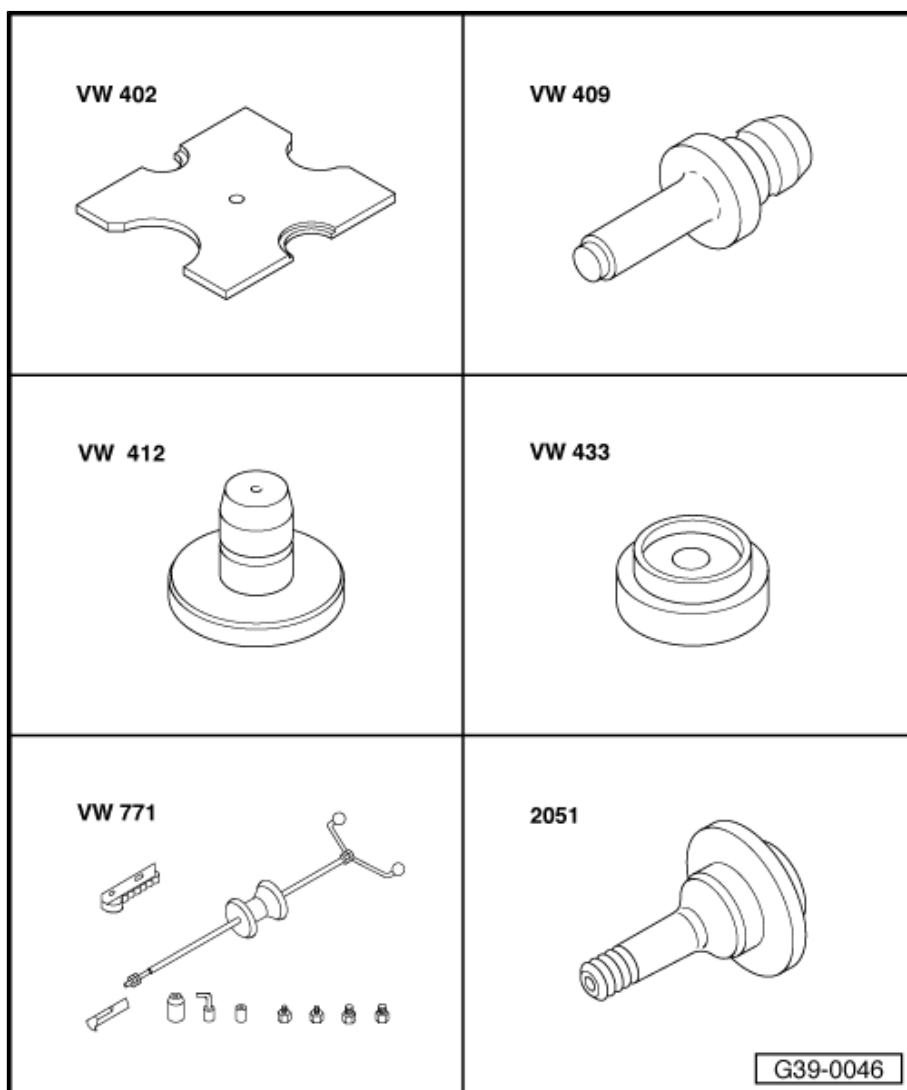
- ☐ Renew

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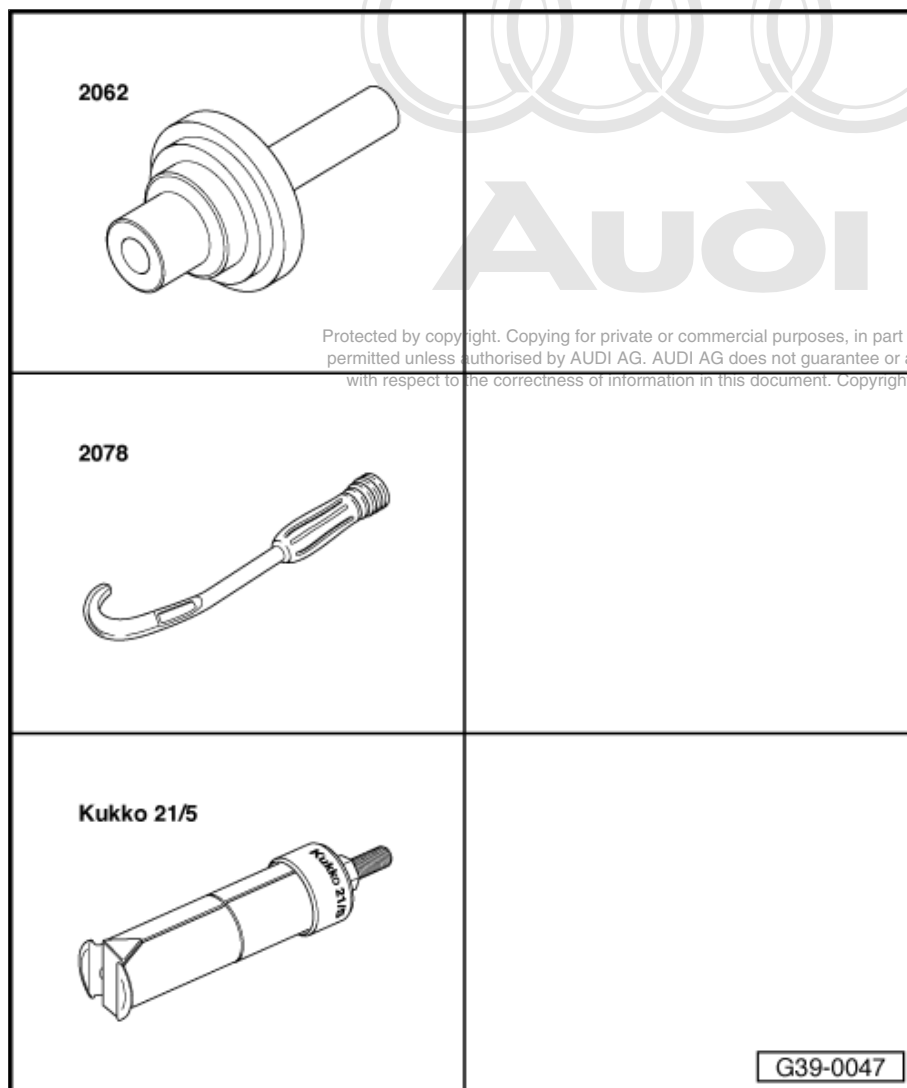
9.2 Assembly sequence - dismantling and assembling thrust tube

Special tools and workshop equipment required

- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 409-
- ◆ Press tool -VW 412-
- ◆ Press tool -VW 433-
- ◆ Multi-purpose tool -VW 771-
- ◆ Punch -2051-



- ◆ Punch -2062-
- ◆ Hold down tool for bucket tappet -2078-
- ◆ -1- Internal puller 30...37 mm , e.g. -Kukko 21/5-
- ◆ Sealing grease - G 052 128 A1-

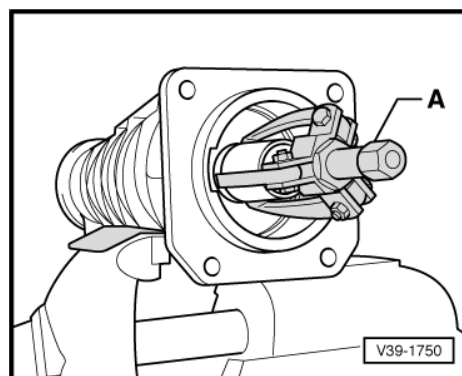


Dismantling

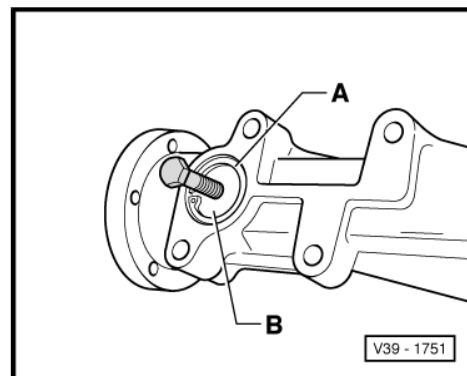
- Clamp thrust tube in vice using protective jaw covers.
- Pull off sleeve.

A - Internal puller 30 ... 37 mm , e.g. -Kukko 21/5-

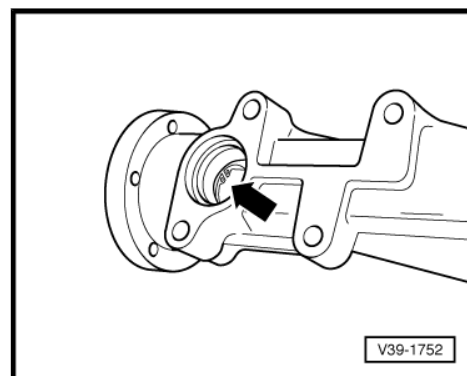
- Detach final drive support.



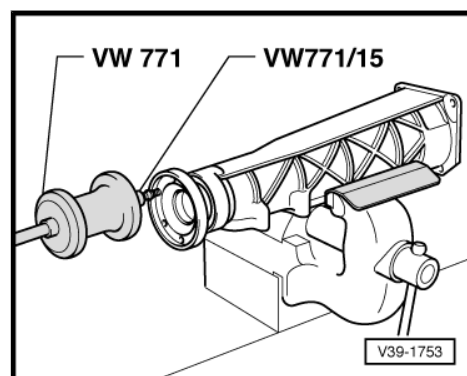
- Remove circlip -A-.
- Screw M8 bolt into threaded hole in cover cap -B- and pull out cover cap.



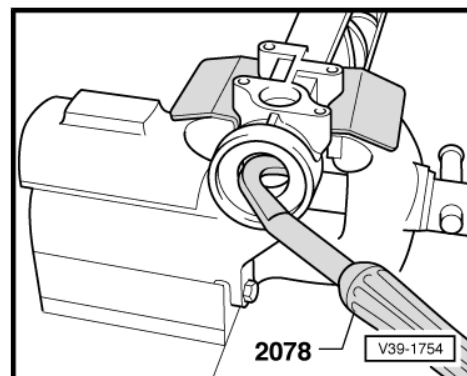
- Bend open circlip -arrow- on flange shaft and push circlip towards splines.



- Remove flange shaft.
- Take circlip out of thrust tube.

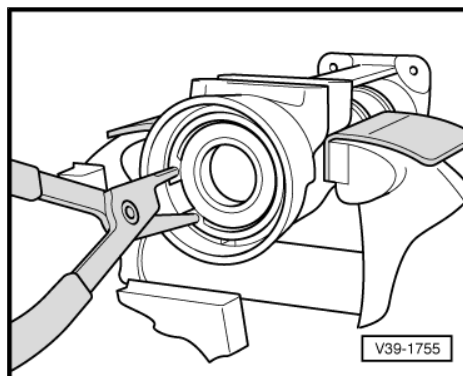


- Lever out flange shaft oil seal.



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- Remove circlip.



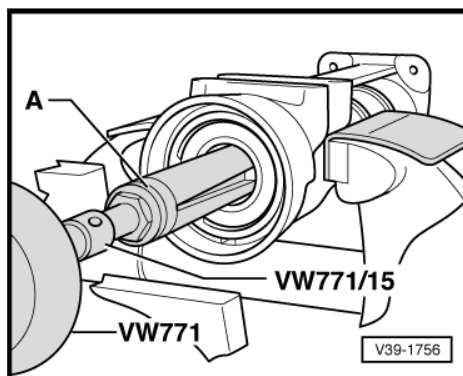
- Pull out grooved ball bearing for flange shaft.
A - Internal puller 30 ... 37 mm , e.g. -Kukko 21/5-


Note

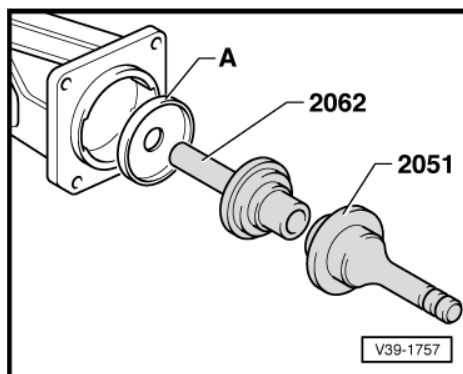
Bearing is damaged on removal.

Only if retaining plate damaged:

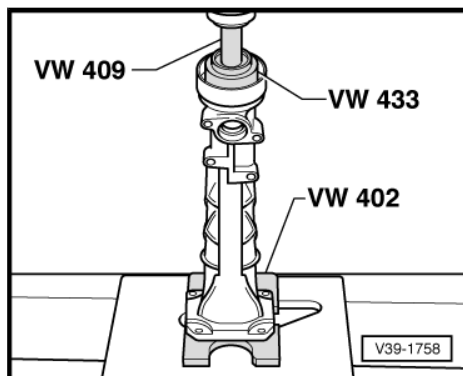
- If retaining plate is damaged, press out with flange shaft.



- Drive in retaining plate -A- as far as stop.

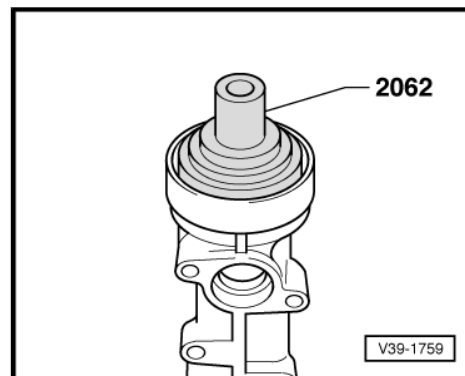
Assembling


- Press grooved ball bearing into thrust tube.
- Fit outer circlip.
- Lightly oil outer circumference of new oil seal.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .

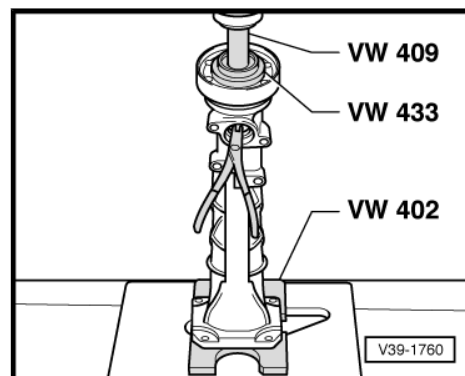


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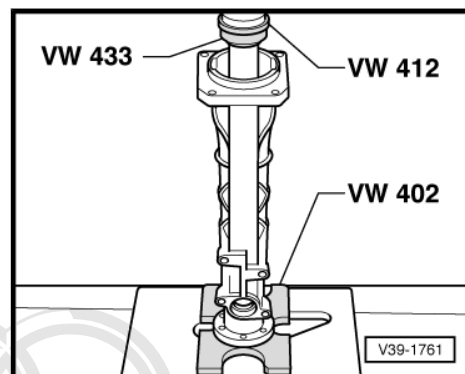
- Drive in flange shaft oil seal onto stop.



- Fit inner circlip in thrust tube and hold in position with pliers; press in flange shaft.
- Fit circlip in groove.



- Press sleeve onto flange shaft as far as stop.
- Install cover cap with new O-ring.
- Fit circlip.
- Install final drive support.
- Fit new O-ring on thrust tube.

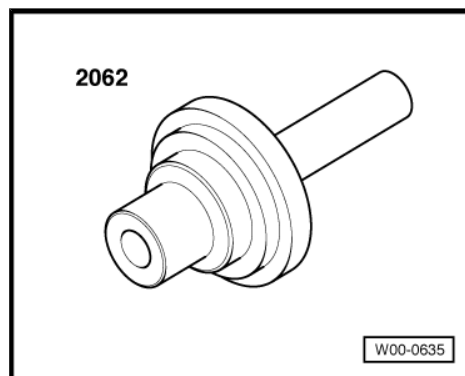


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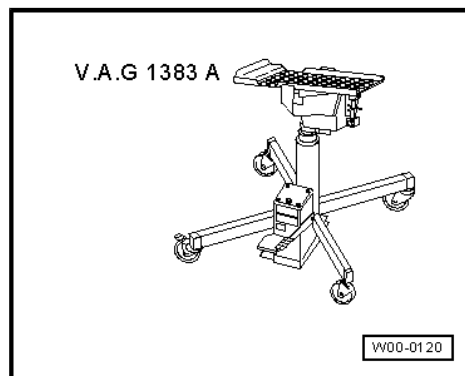
10 Renewing flange shaft oil seals on rear final drive

Special tools and workshop equipment required

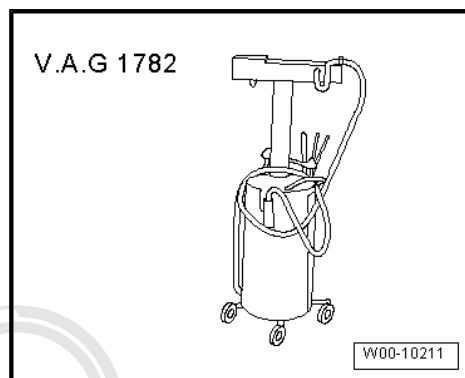
- ◆ Punch -2062-



- ◆ Engine and gearbox jack -V.A.G 1383 A- with universal support -V.A.G 1359/2-



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



- ◆ Sealing grease -G 052 128 A1-

Removing

- Rear final drive installed.
- Refer to general repair instructions ⇒ [page 8](#) .

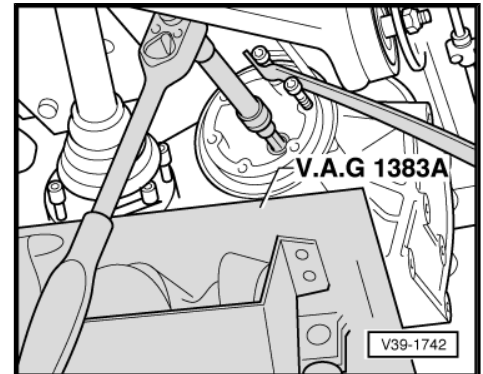


Note

It is only necessary to remove the rear section of the exhaust system if the oil seal (left-side) is being renewed.

- Remove rear section of exhaust system (rearward of clamp(s))
⇒ Engine, mechanics; Rep. gr. 26 .

- Detach drive shaft (left or right) from rear final drive and place to one side ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 42 .
- Remove flange shaft. To loosen securing bolt, screw two bolts into flange shaft and counterhold with suitable lever.
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gearbox oil.
- Pull out flange shaft.

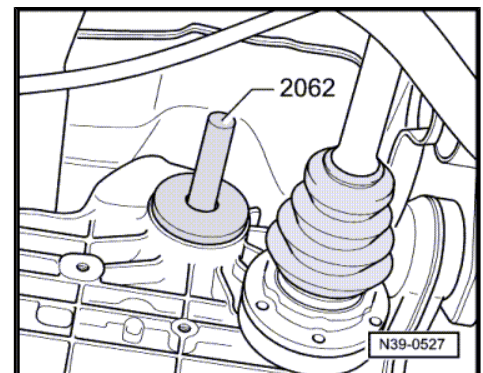
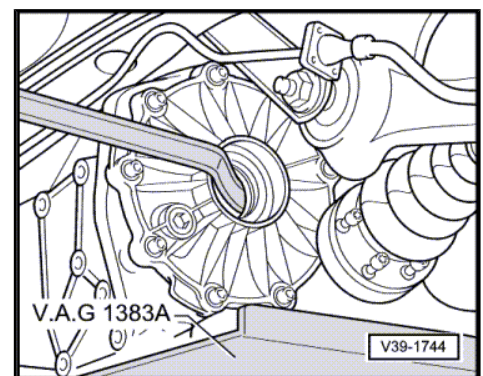


- Remove flange shaft oil seal using suitable lever.

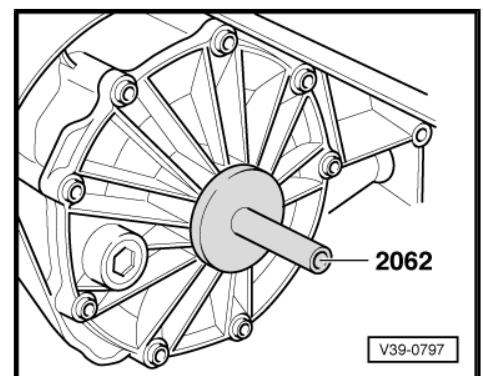
Installing

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

- Clean seat for oil seal.
- Lightly lubricate outer circumference of oil seal with gear oil.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Drive flange shaft oil seal (left-side) as far as stop using punch -2062- ; keep seal straight when installing.



- Drive in flange shaft oil seal (right-side) as far as stop using punch -2062- ; keep seal straight when installing.
- Install drive shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 42 .
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .
- Top up gear oil in rear final drive and check oil level ⇒ [page 195](#) .



Tightening torque

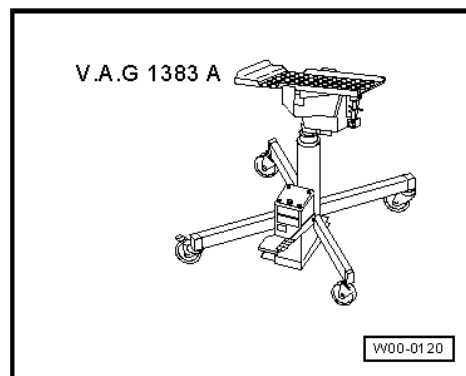
Component	Nm
Flange shaft to final drive	25

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11 Removing and installing rear final drive

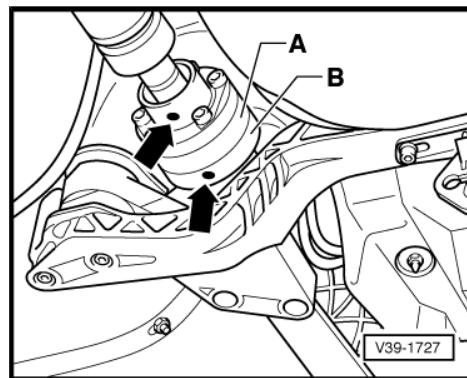
Special tools and workshop equipment required

- ♦ Engine and gearbox jack -V.A.G 1383 A- with universal support -V.A.G 1359/2-



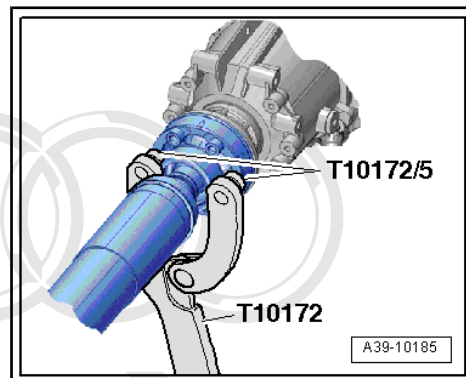
Removing

- Remove rear section of exhaust system (rearward of clamp(s))
⇒ Engine, mechanics; Rep. gr. 26 .
- Remove heat shield above propshaft.
- Check whether there is a factory marking (coloured dot) on the propshaft. If no factory marking is visible, mark the position of the propshaft flange -A- relative to the rear final drive -B- -arrows-.
- Unscrew securing bolts for propshaft flange.



Note

Counterhold tool -T10172- with -T10172/5- may be used to counterhold propshaft.



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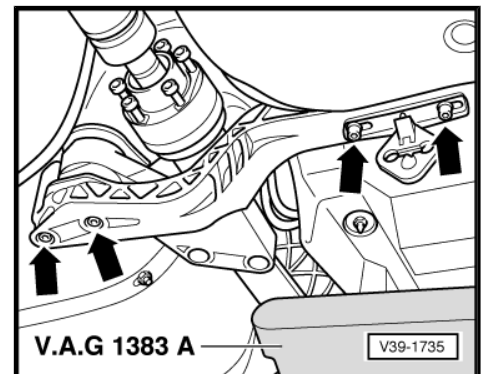
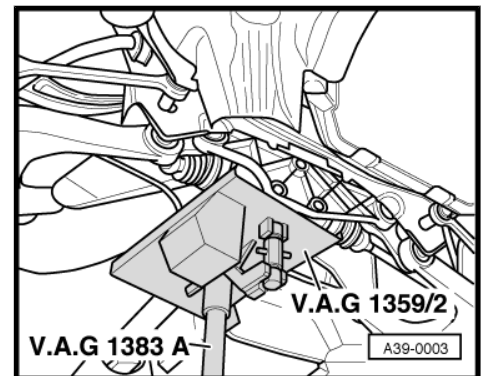
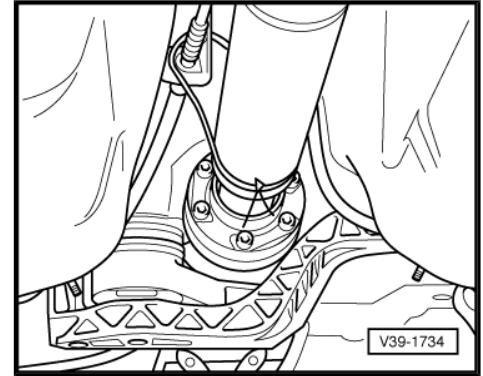
- Tie up propshaft to bracket for handbrake cable with wire.



Note

If propshaft cannot be pressed upwards past flange, lower final drive and then tie up propshaft. When lowering the final drive, prevent the propshaft from dropping and do not bend the centre joint further than the maximum bending angle ⇒ Notes ⇒ „6 Servicing propshaft“, page 186 .

- Detach drive shafts (left and right) from rear final drive and place to one side ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 42 .
- Support final drive with engine and gearbox jack -V.A.G 1383 A- and universal support -V.A.G 1359/2- .
- Secure final drive with strap.
- Unscrew bolts -arrows- at front cross member for rear final drive.
- Detach front cross member.



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- Unscrew securing bolts -B- and -C- for rear cross member at rear final drive.
- Lower final drive using engine/gearbox jack


Note

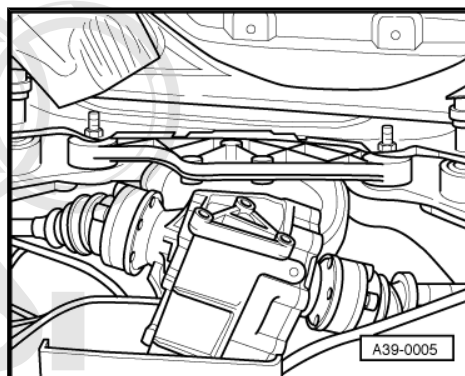
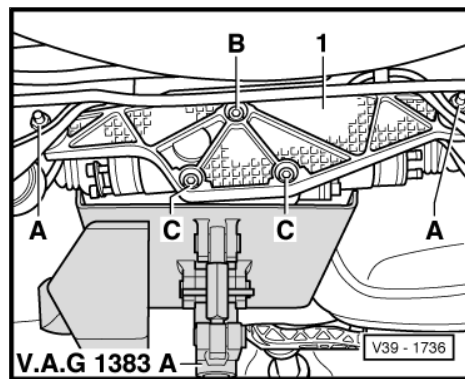
Cross member -1- does not need to be removed.

Installing

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


Note

- ◆ *Always renew self-locking nuts.*
 - ◆ *Clean all remaining locking fluid out of the tapped holes in the propshaft flange shaft on rear final drive. The residue can be removed using a tap. Otherwise the securing bolts can shear off when they are screwed in.*
 - ◆ *Renew gasket between propshaft and flange shaft (pull off protective foil and stick gasket onto flange shaft). Bonding surface must be free from grease.*
 - ◆ *Renew propshaft bolts (self-locking).*
- Raise final drive with engine and gearbox jack until both drive shafts can be connected ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 42 .
 - Lightly tighten bolts for drive shafts.
 - Raise final drive and bolt to cross member and final drive support.
 - Secure propshaft ⇒ [page 187](#) .

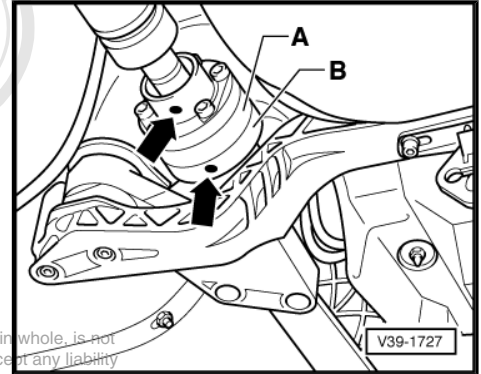


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Note

- ◆ To prevent imbalance, the flange on the propshaft -A- and the flange on the rear final drive -B- must be installed so that the coloured markings are in alignment -arrows-.
- ◆ After detaching the propshaft from the rear final drive, the additional balancing washer (thicker washer) that may be fitted between the lock plate and one of the bolt heads must not be reinstalled.
- ◆ Renew propshaft bolts (self-locking).



- Check oil level in rear final drive ⇒ [page 195](#).
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26.

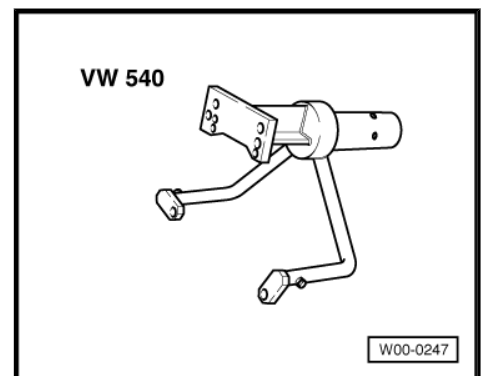
Tightening torques

Component	Nm
Propshaft to rear final drive ¹⁾	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive with bracket for exhaust system to body	23
Rear cross member for rear final drive to subframe	50
Rear cross member to rear final drive	55
• ¹⁾ Renew bolts.	

11.1 Securing rear final drive to assembly stand

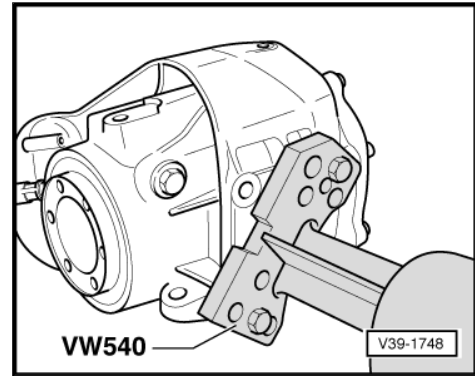
Special tools and workshop equipment required

- ◆ Engine and gearbox support -VW 540-





- ◆ Secure complete rear final drive with engine and gearbox support -VW 540- to assembly stand or engine and gearbox support -VAS 6095- .



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12 Dismantling and assembling rear final drive

Overview

- ◆ ⇒ „12.1 Exploded view - rear final drive“, page 213
- ◆ ⇒ „12.2 Exploded view - removing and installing differential“, page 215
- ◆ ⇒ „12.3 Dismantling and assembling differential“, page 218
- ◆ ⇒ „12.4 Removing and installing pinion shaft; dismantling and assembling pinion shaft“, page 227

12.1 Exploded view - rear final drive



Note

- ◆ Detaching thrust tube from rear final drive with final drive installed ⇒ [page 196](#).
- ◆ Detaching thrust tube from rear final drive with final drive removed ⇒ [page 214](#).

1 - Final drive housing

2 - Sleeve

3 - Final drive support

4 - Flange for propshaft

- ☐ Removing ⇒ [page 203](#)

5 - Thrust tube

- ☐ Removing and installing ⇒ [page 196](#)
- ☐ Detaching thrust tube from rear final drive ⇒ [page 214](#)

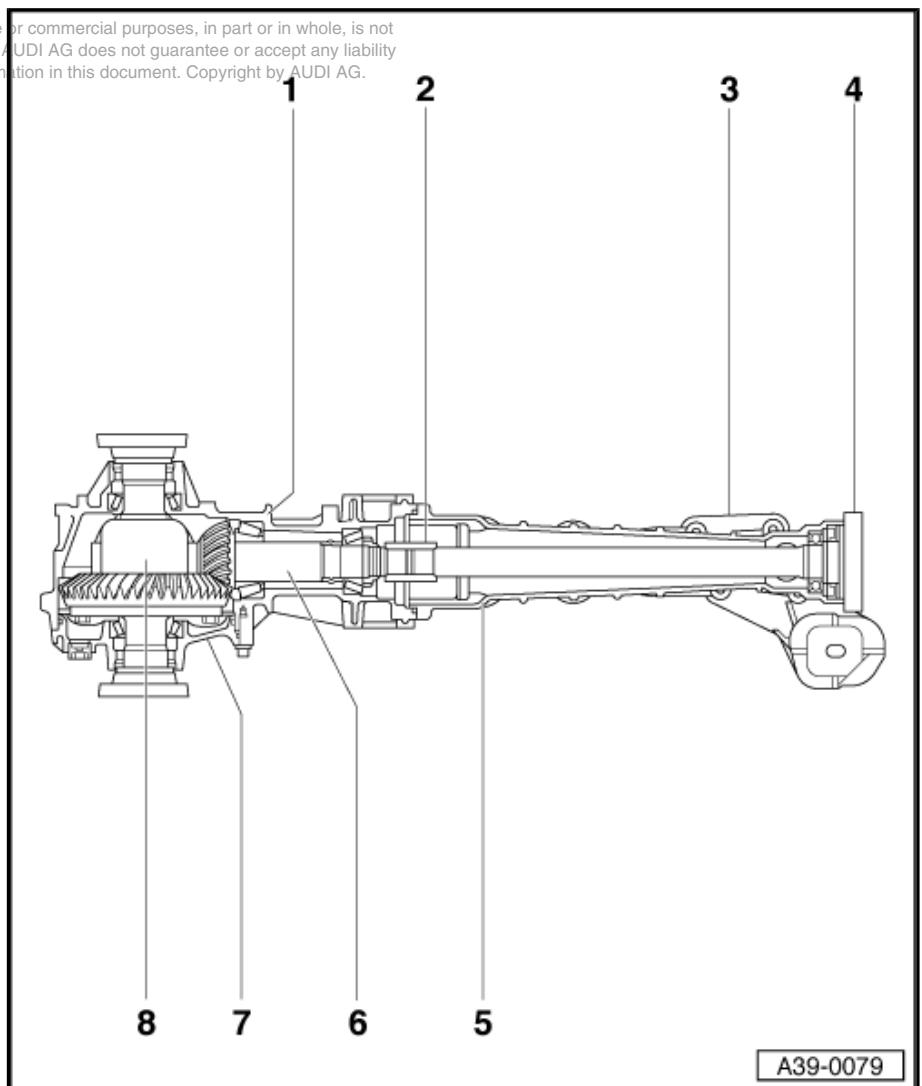
6 - Pinion shaft

- ☐ Paired with crown wheel
- ☐ Removing and installing ⇒ [page 227](#)

7 - Cover for final drive

8 - Differential

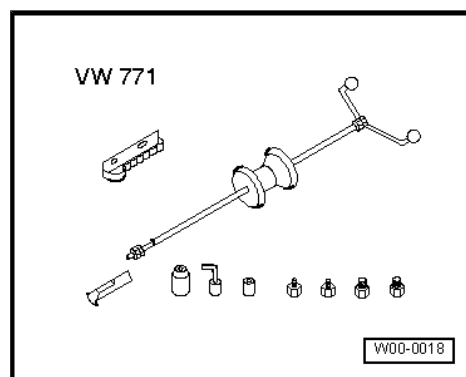
- ☐ Must be removed before taking out pinion shaft
- ☐ Removing and installing ⇒ [page 215](#)
- ☐ Dismantling and assembling ⇒ [page 218](#)



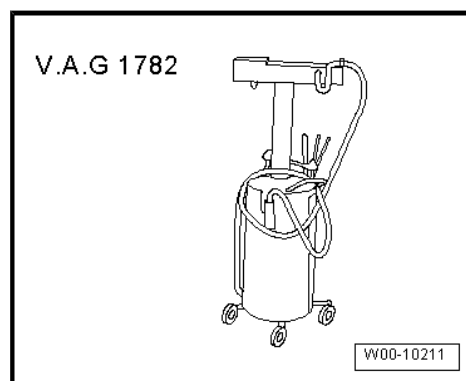
12.1.1 Detaching thrust tube from rear final drive

Special tools and workshop equipment required

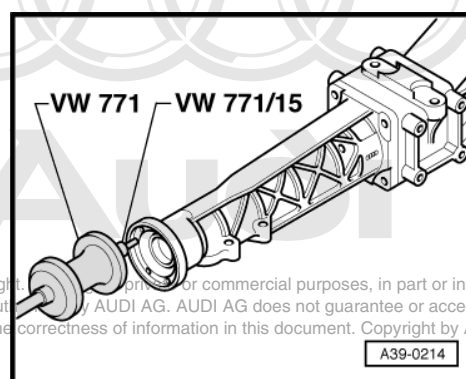
- ◆ Multi-purpose tool -VW 771-



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



- Rear final drive removed.
- Secure rear final drive to assembly stand ⇒ Page [⇒ page 211](#) .
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gearbox oil.
- Remove bolts securing thrust tube to rear final drive housing.
- Pull of thrust tube via flange shaft (support thrust tube while removing).



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12.2 Exploded view - removing and installing differential



Note

- ◆ General repair instructions ⇒ [page 8](#).
- ◆ Secure rear final drive to assembly stand ⇒ [Page ⇒ page 211](#).
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾
⇒ „13.2 Table of adjustments - rear final drive“, [page 236](#).

1 - Breather sleeve

- ☐ With rubber valve
- ☐ Installation position
⇒ [page 217](#)

2 - Rear final drive housing ¹⁾

- ☐ With pinion shaft
- ☐ Removing and installing
pinion shaft
⇒ [page 227](#)

3 - Outer race for large tapered roller bearing ¹⁾

- ☐ Driving out ⇒ [page 225](#)
- ☐ Pressing in
⇒ [page 225](#)

4 - Shim „S1“

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 236](#)

5 - Cover for rear final drive ¹⁾

- ☐ With O-ring
- ☐ Renew O-ring
- ☐ Lubricate O-ring with
gear oil before fitting

6 - TORX bolt

- ☐ 25 Nm

7 - Oil seal

- ☐ For flange shaft (right-
side)
- ☐ Renewing ⇒ [page 206](#)

8 - Hexagon socket head bolt

- ☐ 25 Nm

9 - Flange shaft (right-side)

- ☐ Removing and installing ⇒ [page 216](#)

10 - Oil filler plug

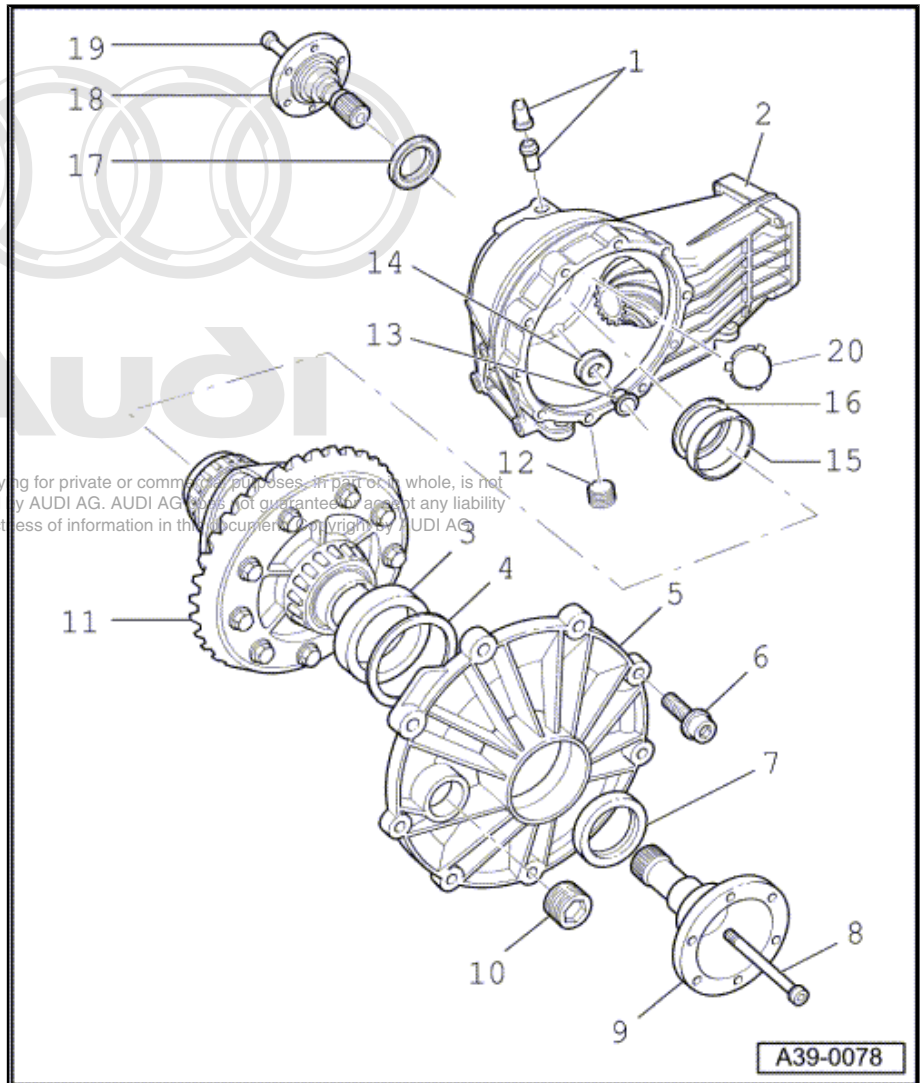
- ☐ 35 Nm

11 - Differential with crown wheel ¹⁾

- ☐ Dismantling and assembling ⇒ [page 218](#)

12 - Oil drain plug

- ☐ 35 Nm



13 - Bush

- ☐ Holds magnet in position
- ☐ Drive in onto stop

14 - Magnet**15 - Outer race for small tapered roller bearing ¹⁾**

- ☐ Driving out ⇒ [page 223](#)
- ☐ Pressing in ⇒ [page 223](#)

16 - Shim „S2“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 236](#)

17 - Oil seal

- ☐ For flange shaft (left-side)
- ☐ Renewing ⇒ [page 206](#)

18 - Flange shaft (left-side)

- ☐ Removing and installing ⇒ [page 216](#)

19 - Hexagon socket head bolt

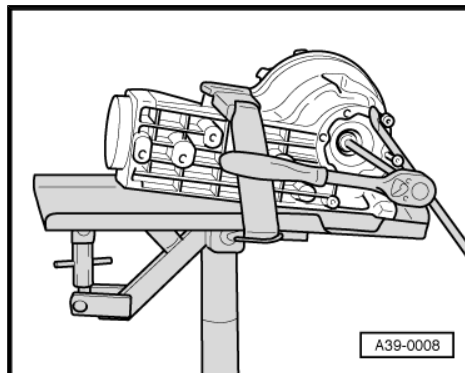
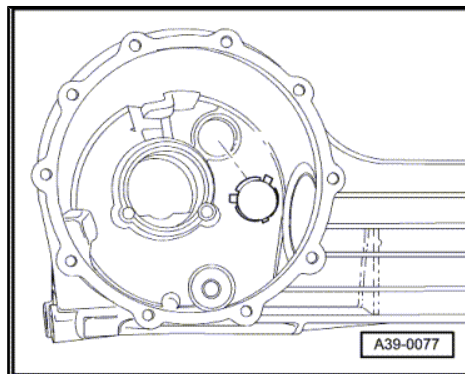
- ☐ 25 Nm

20 - Cover

- ☐ Installing ⇒ [page 216](#)

Removing and installing flange shaft

- To slacken off securing bolt, screw 2 bolts into flange shaft and counterhold with assembly lever.
- Remove the flange shaft by pulling on the bolts that you previously screwed in.

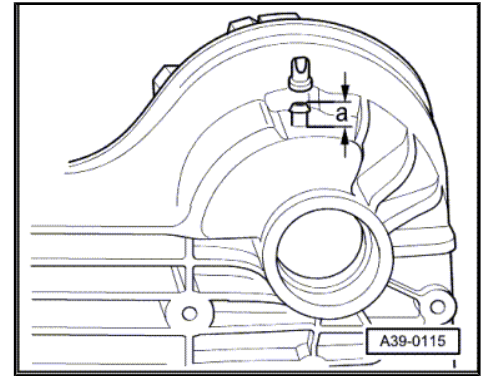
**Driving in cover onto stop**

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Installation position of breather sleeve

After pressing in, breather sleeve must protrude 13 mm out of housing (dimension -a-).

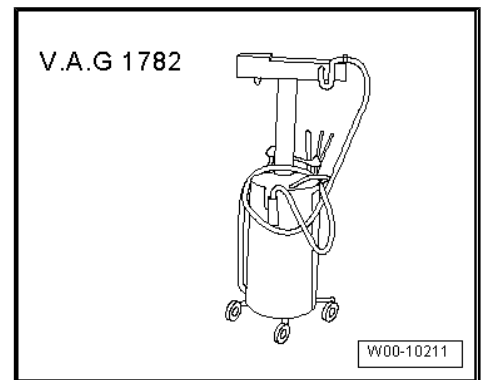
Slot in rubber valve must be aligned in direction of travel.



12.2.1 Assembly sequence - removing and installing differential

Special tools and workshop equipment required

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



Removing

- Rear final drive removed.
- Secure complete rear final drive on a repair stand
⇒ [page 211](#) .
- Place used oil collection and extraction unit -V.A.G 1782- underneath and drain gearbox oil.

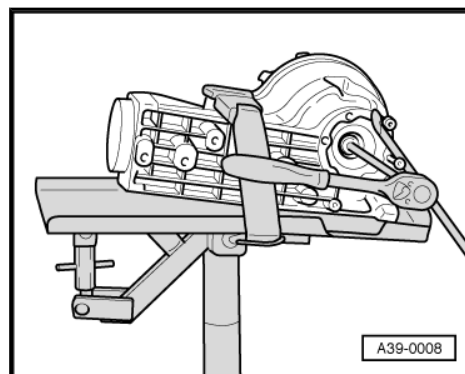
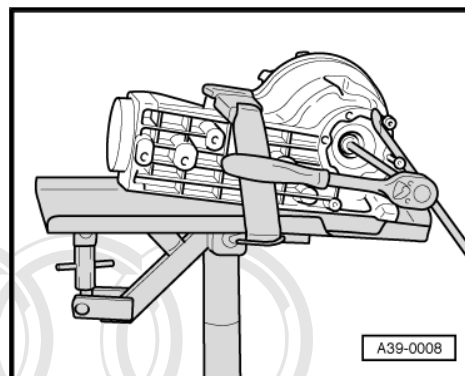
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- Remove flange shafts on both sides.
- To slacken off securing bolt, screw 2 bolts into flange shaft and counterhold with assembly lever.
- Mark flange shafts (left and right).
- Remove the flange shaft by pulling on the bolts that you previously screwed in.
- Unscrew securing bolts from cover for rear final drive.
- Detach cover for rear final drive from rear final drive housing and take out differential.

Installing

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

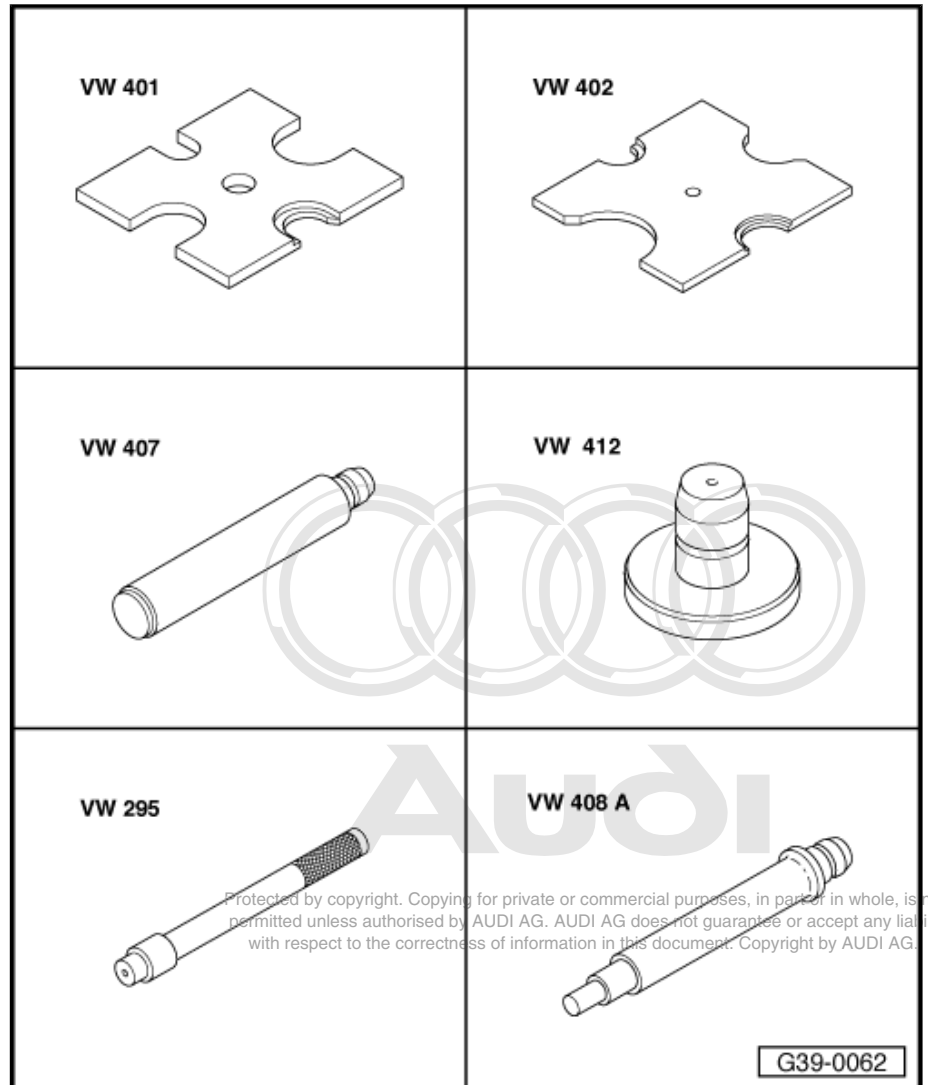
- Fit differential.
- Renew O-ring on cover for rear final drive and lubricate before installing.
- Fit cover for rear final drive onto final drive housing and tighten to 25 Nm in diagonal sequence.
- Renew flange shaft oil seals ⇒ [page 206](#).
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Install flange shafts and tighten to 25 Nm.
- Top up gear oil in rear final drive and check oil level ⇒ [page 195](#) .



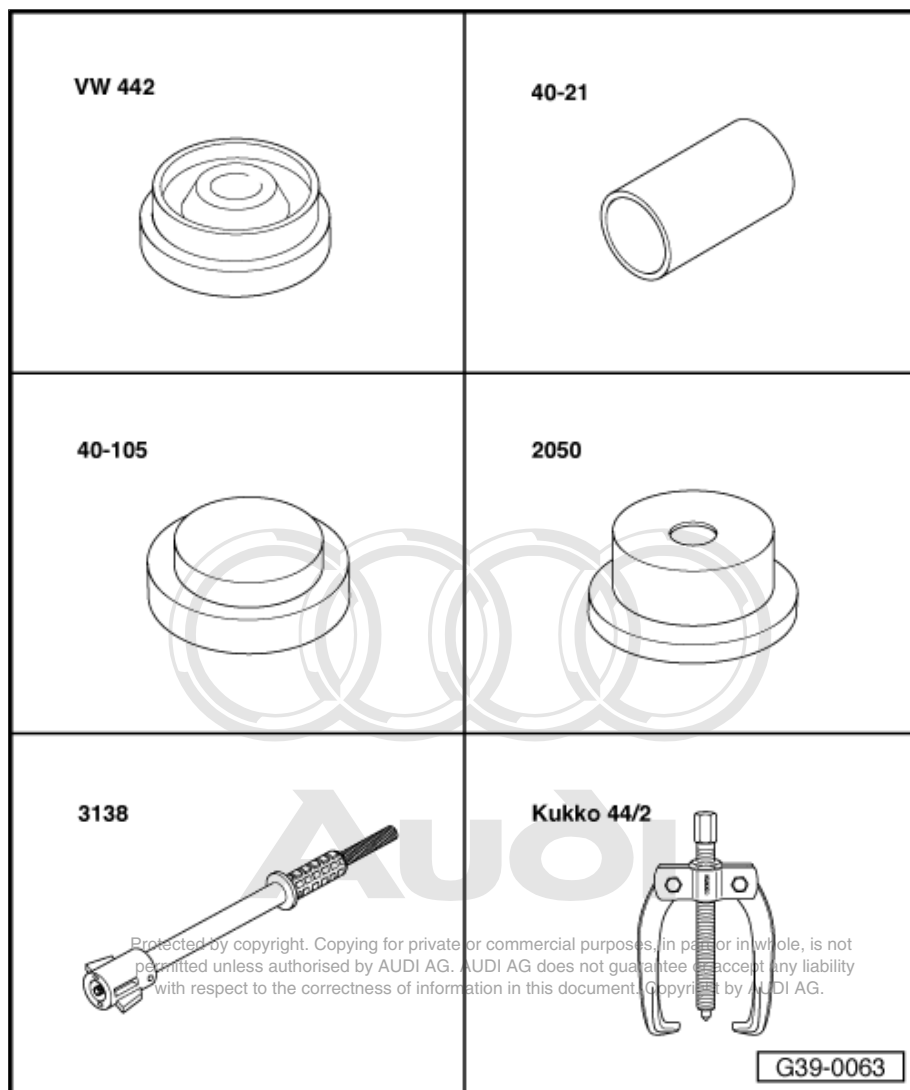
12.3 Dismantling and assembling differential

Special tools and workshop equipment required

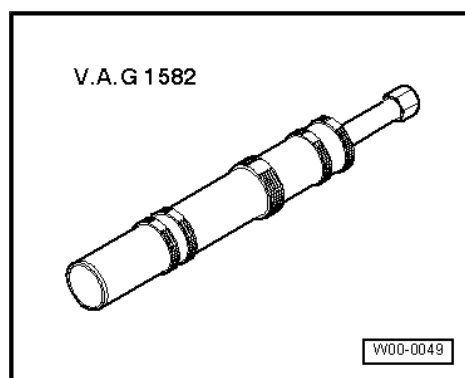
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 412-
- ◆ Drift -VW 295-
- ◆ Press tool -VW 408 A-



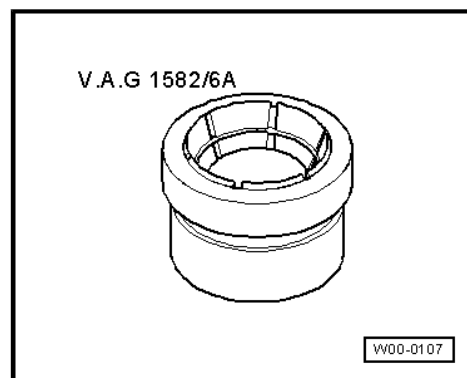
- ◆ Press tool -VW 442-
- ◆ Press tool -40 - 21-
- ◆ Thrust plate -40 - 105-
- ◆ Thrust piece -2050-
- ◆ Drift -3138-
- ◆ Two-arm puller -Kukko 44/2-



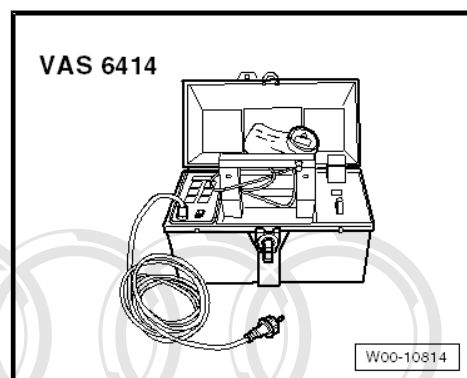
- ◆ Tapered roller bearing puller -V.A.G 1582-



- ◆ Adapter -V.A.G 1582/6-



- ◆ Inductive heater -VAS 6414-



Note

- ◆ Refer to general repair instructions ⇒ [page 8](#).
- ◆ Secure rear final drive to assembly stand ⇒ Page ⇒ [page 211](#).
- ◆ Renew both tapered roller bearings for the differential together.
- ◆ Use inductive heater -VAS 6414- to heat tapered roller bearing inner race to 100°C before installing.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾
⇒ „13.2 Table of adjustments - rear final drive“, [page 236](#).

1 - Cover for rear final drive ¹⁾
2 - O-ring

- ☐ Renew
- ☐ Lubricate with oil when installing

3 - Final drive housing ¹⁾
4 - Shim „S2“

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 236](#)

5 - Outer race for small tapered roller bearing ¹⁾

- ☐ Driving out ⇒ [page 223](#)
- ☐ Pressing in
⇒ [page 223](#)

6 - Inner race for small tapered roller bearing ¹⁾

- ☐ Pulling off ⇒ [page 224](#)
- ☐ Pressing on
⇒ [page 224](#)

7 - Bolt

- ☐ 60 Nm and turn 45° further
- ☐ Renew
- ☐ Allocate according to ⇒ Electronic parts catalogue
- ☐ Tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage. Then tighten to specified torque.

8 - Differential cage ¹⁾
9 - Crown wheel ¹⁾

- ☐ Is paired with pinion shaft (final drive gear set)
- ☐ Select correct version according to gearbox code letters ⇒ Electronic parts catalogue
- ☐ Drive crown wheel off differential cage using a punch ⇒ [page 225](#)
- ☐ Fitting on differential cage ⇒ [page 226](#)

10 - Spring pin

- ☐ Secures differential pinion pin
- ☐ Drive in flush

11 - Inner race for large tapered roller bearing ¹⁾

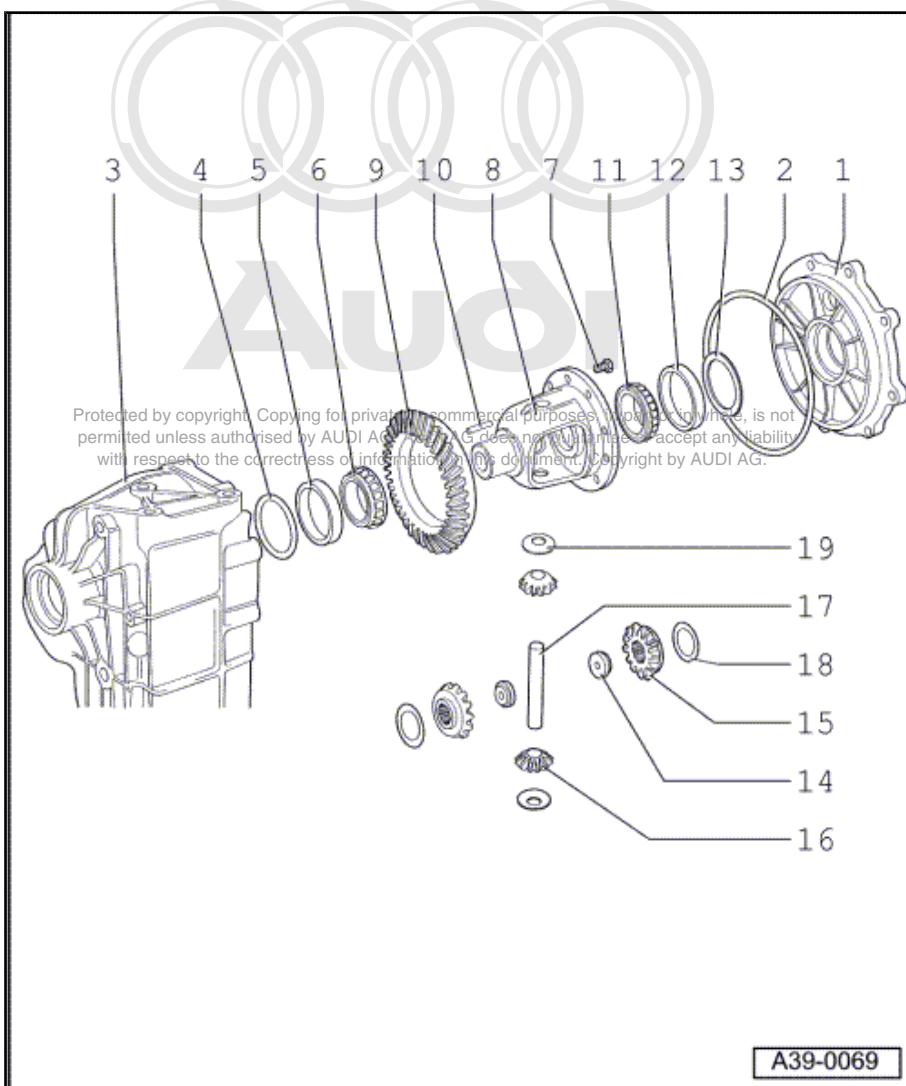
- ☐ Pulling off ⇒ [page 224](#)
- ☐ Pressing on ⇒ [page 225](#)

12 - Outer race for large tapered roller bearing ¹⁾

- ☐ Driving out ⇒ [page 225](#)
- ☐ Pressing in ⇒ [page 225](#)

13 - Shim „S1“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 236](#)



14 - Threaded piece

15 - Sun wheel

- ☐ Installing ➔ [page 226](#)
- ☐ Adjusting ➔ [page 226](#)

16 - Planet pinion

- ☐ Installing ➔ [page 226](#)

17 - Differential pinion pin

- ☐ Drive out with drift
- ☐ Drive in carefully to prevent damage to thrust washers
- ☐ Secure with spring pin ➔ [Item 10 \(page 222\)](#)

18 - Shim

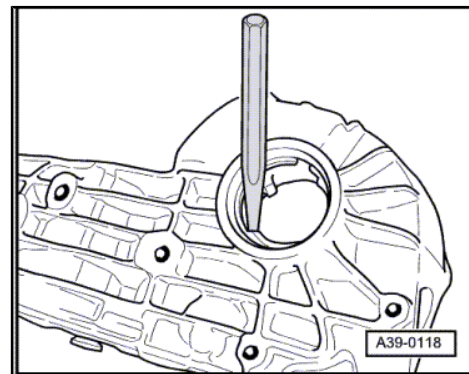
- ☐ Re-determining thickness ➔ [page 226](#)

19 - Thrust washer

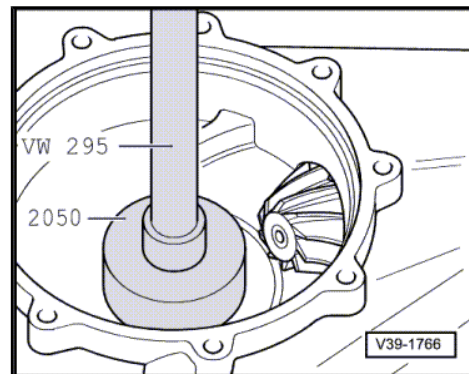
- ☐ Check for cracks

Driving outer race for small tapered roller bearing out of final drive housing

- After removing, check shims for damage.



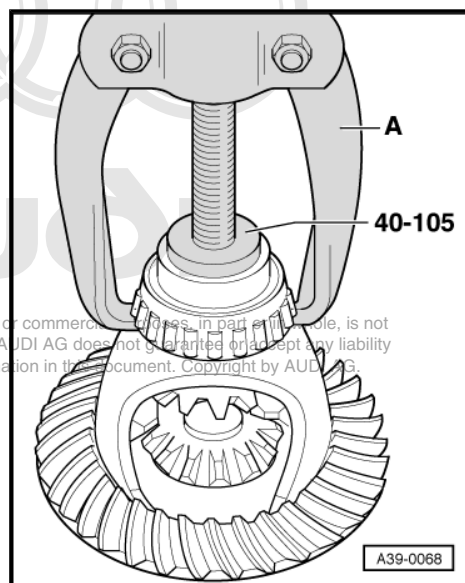
Pressing outer race for small tapered roller bearing into final drive housing as far as stop



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Pulling off inner race for small tapered roller bearing

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



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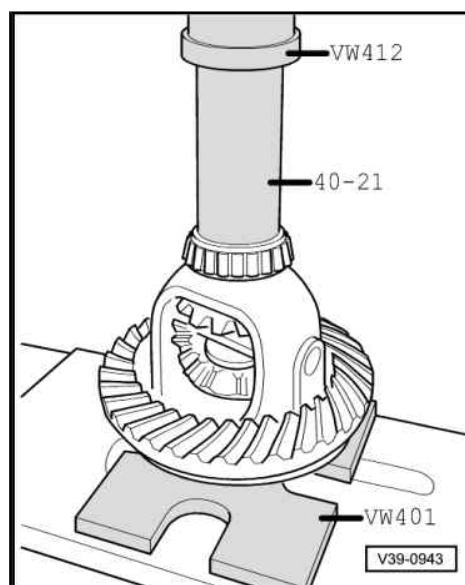
Pressing on inner race for small tapered roller bearing



WARNING

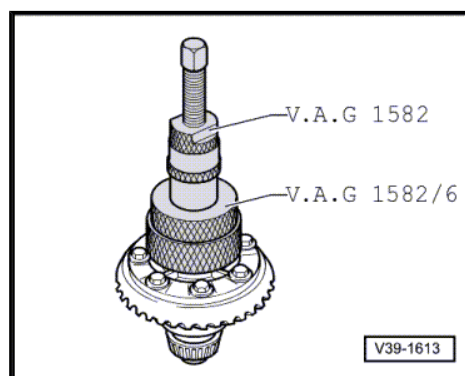
Wear protective gloves.

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



Pulling off inner race for large tapered roller bearing

- Before setting up the puller, place thrust plate -40 - 105- on differential cage.



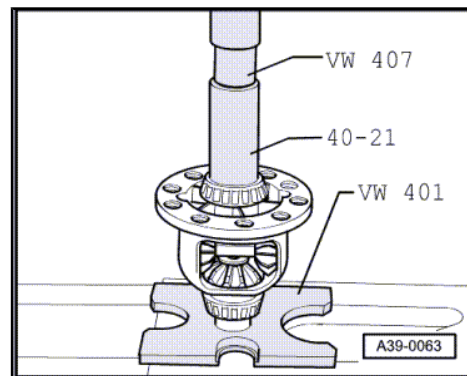
Pressing on inner race for large tapered roller bearing



WARNING

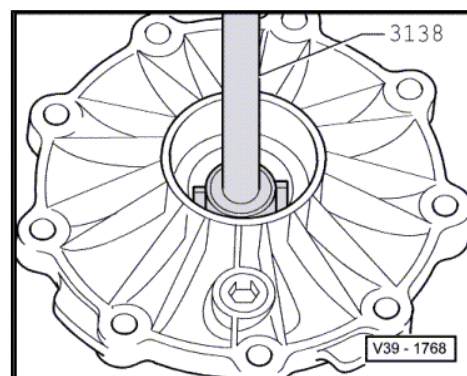
Wear protective gloves.

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

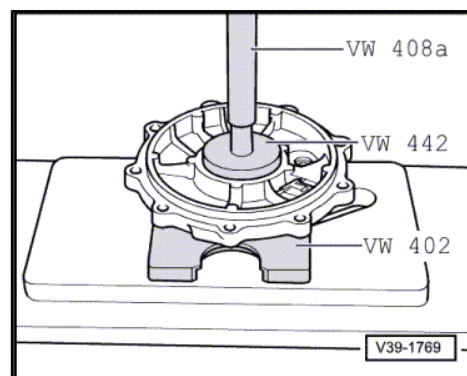


Driving outer race for large tapered roller bearing out of cover

- After removing, check shims for damage.



Pressing outer race for large tapered roller bearing into cover

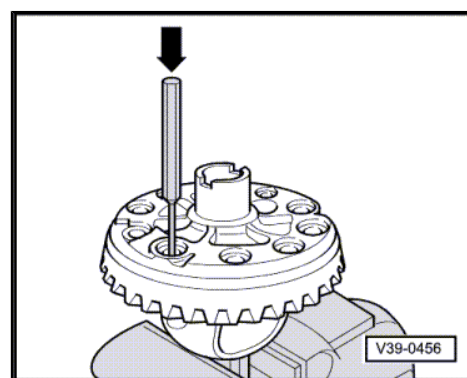


Driving crown wheel off cage



Audi

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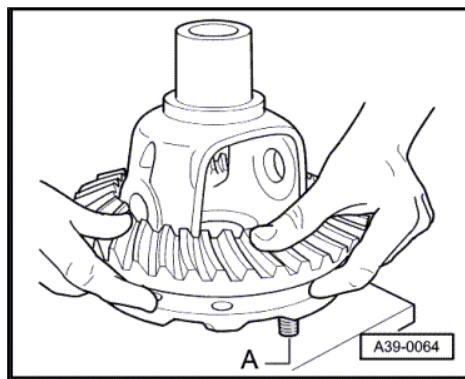
Installing crown wheel



WARNING

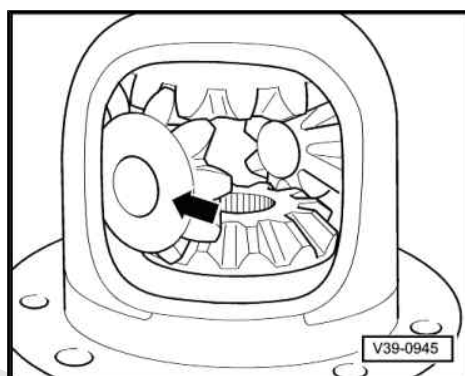
Wear protective gloves.

- When fitting crown wheel, use centralising pins -A- (shop-made tool) to locate.
- Heat crown wheel to approx. 100°C and install.
- Allow to cool slightly before screwing in new securing bolts.
- Then tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage.
- Then tighten bolts to specified torque ⇒ [Item 7 \(page 222\)](#) .



Installing differential bevel gears

- Shim thicknesses must be re-determined if sun wheels have been renewed ⇒ [page 226](#) .
- Install sun wheels with correct shims (as measured).
- Insert planet pinions (spaced 180° apart) and pivot into position -arrow-.
- Fit and align thrust washers.
- Insert threaded pieces.
- Drive differential pinion pin into final position and secure.



Adjusting differential bevel gears

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



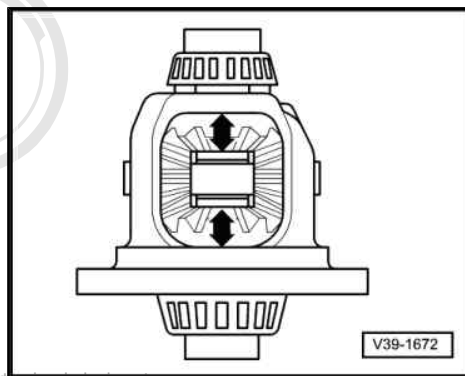
Note

Ensure that bevel gears and thrust washers are not interchanged from this point onwards.

- Drive in differential pinion pin.
- Press planet pinions outwards.
- Press sun wheels in direction of -arrows- and check the amount of play.
- Determine the thickest shim that can still just be fitted for the sun wheels on each side.
- ◆ Shims for both sides should be of same thickness
- Select required shims from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Shims available:

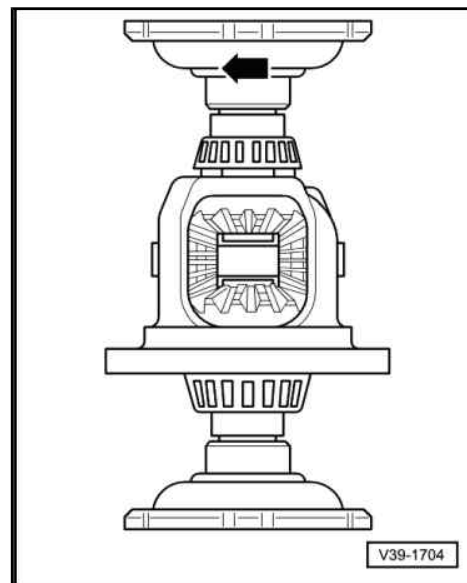
Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00





Note

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

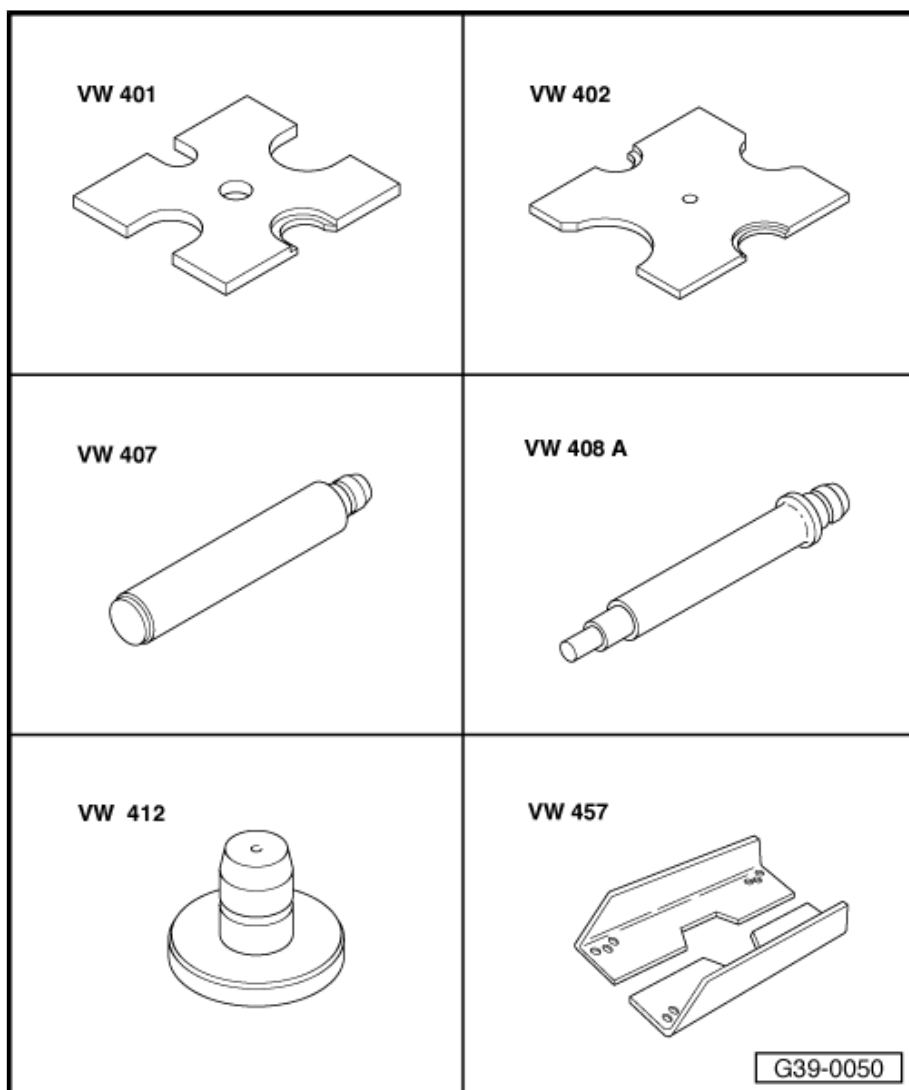


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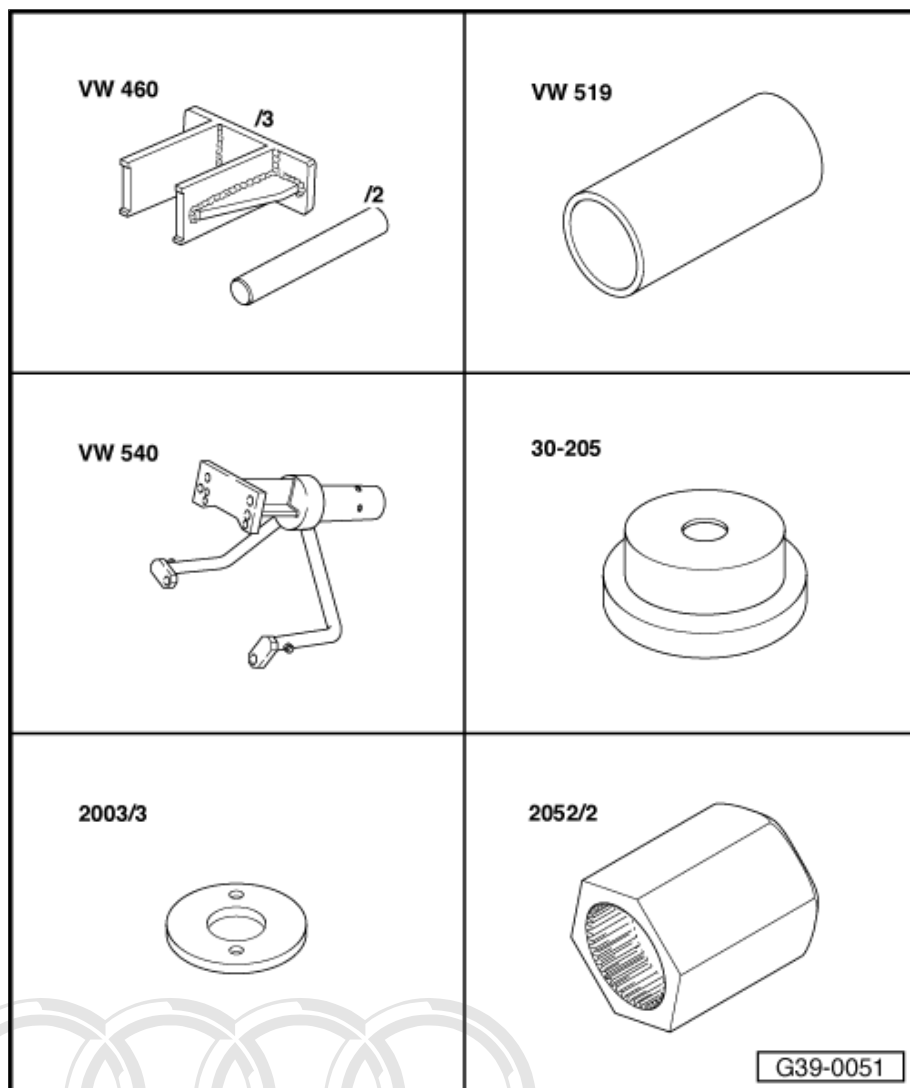
12.4 Removing and installing pinion shaft; dismantling and assembling pinion shaft

Special tools and workshop equipment required

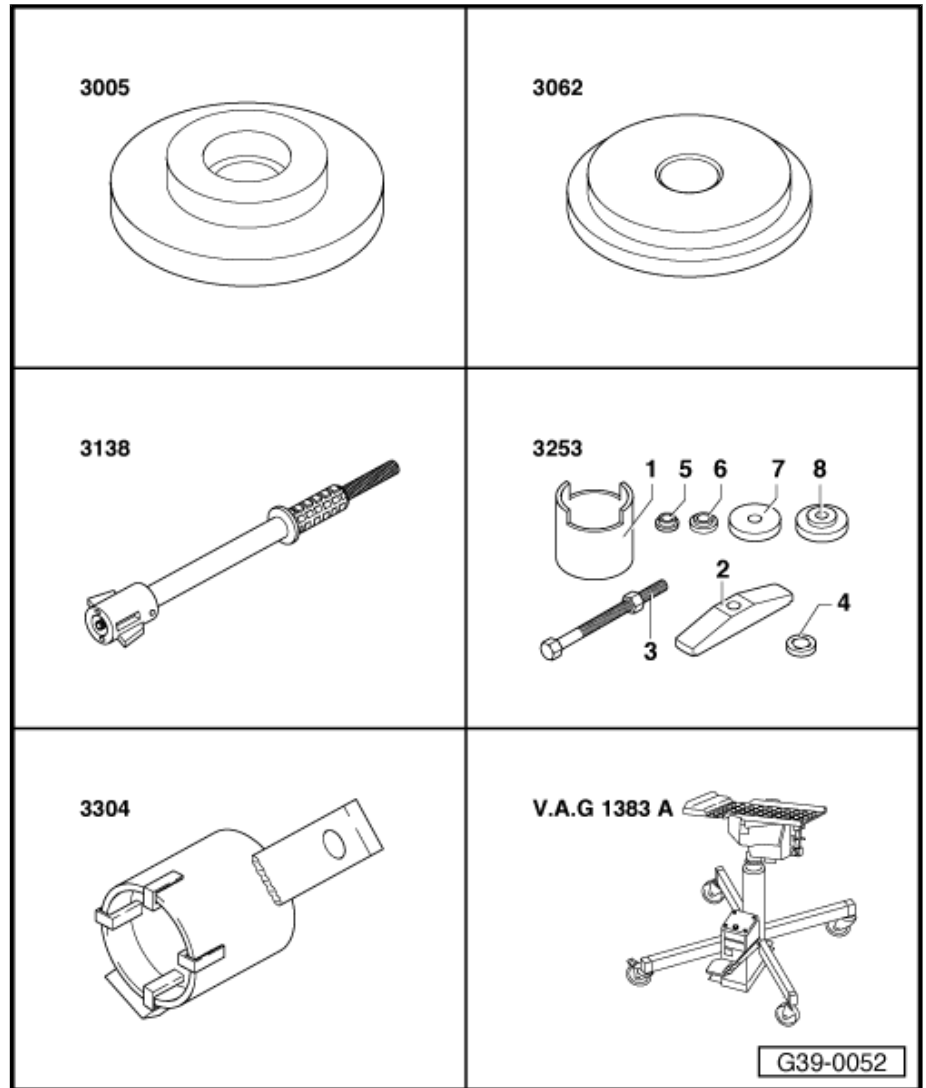
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 408 A-
- ◆ Press tool -VW 412-
- ◆ Support rails -VW 457-



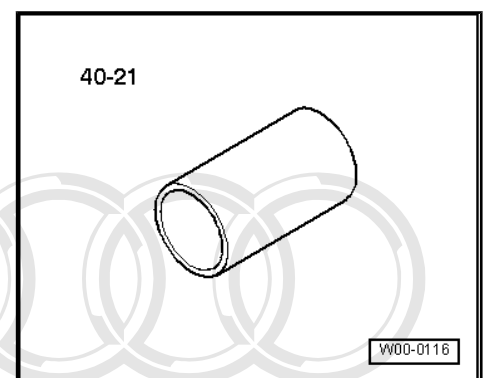
- ◆ Removing tool -VW 460-
- ◆ Tube -VW 519-
- ◆ Engine and gearbox support -VW 540-
- ◆ Thrust plate -30-205-
- ◆ Installing ring -2003/3-
- ◆ Pinion assembly tool -2052/2-



- ◆ Thrust plate -3005-
- ◆ Thrust pad -3062-
- ◆ Drift -3138-
- ◆ Assembly tool -3253-
- ◆ Counterhold tool -3304-
- ◆ Engine and gearbox jack - V.A.G 1383 A- with universal support -V.A.G 1359/2-



- ◆ Press tool -40 - 21-

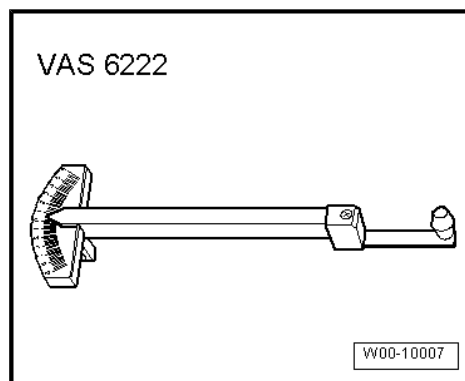


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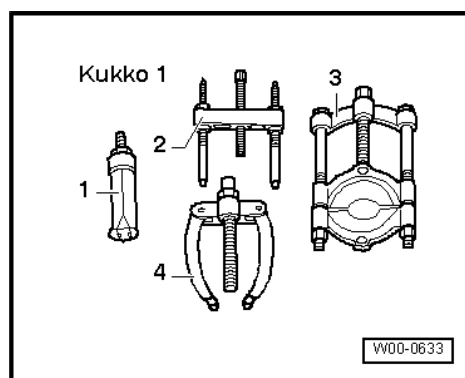
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◆ Friction gauge -VAS 6222-



◆ -1- Internal puller -Kukko 21/7-



◆ -3- Splitter -Kukko 17/2-

◆ -4- Counter-support -Kukko 22/2-

◆ Socket attachment (long), 32 mm



Note

- ◆ *General repair instructions ⇒ [page 8](#) .*
- ◆ *Detaching thrust tube from rear final drive with final drive installed ⇒ [page 196](#) .*
- ◆ *Detaching thrust tube from rear final drive with final drive removed ⇒ [page 214](#) .*
- ◆ *Always renew both tapered roller bearings together. Use new bearings from a single manufacturer wherever possible.*
- ◆ *Do not use additional lubricant on new tapered roller bearings for friction torque measurement. The bearings have already been treated with special oil by the manufacturer.*
- ◆ *Remove differential ⇒ [page 215](#) .*
- ◆ *Adjustment work is required when renewing the parts marked with ¹⁾ ⇒ „13.2 Table of adjustments - rear final drive“, [page 236](#) .*

1 - Nut

- ☐ For pinion shaft
- ☐ Renew
- ☐ Removing ⇒ [page 231](#)
and ⇒ [page 232](#)
- ☐ Installing ⇒ [page 234](#)
- ☐ Measuring friction torque ⇒ [page 234](#)
- ☐ Securing ⇒ [page 234](#)

2 - Inner race for small tapered roller bearing ¹⁾

- ☐ Pressing out pinion shaft ⇒ [page 232](#)
- ☐ Pressing on ⇒ [page 234](#)

3 - Outer race for small tapered roller bearing ¹⁾

- ☐ Pulling out ⇒ [page 232](#)
- ☐ Pressing in ⇒ [page 233](#)

4 - Spacer sleeve ¹⁾

- ☐ Renew

5 - Final drive housing ¹⁾

6 - Shim „S3“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 236](#)

7 - Outer race for large tapered roller bearing ¹⁾

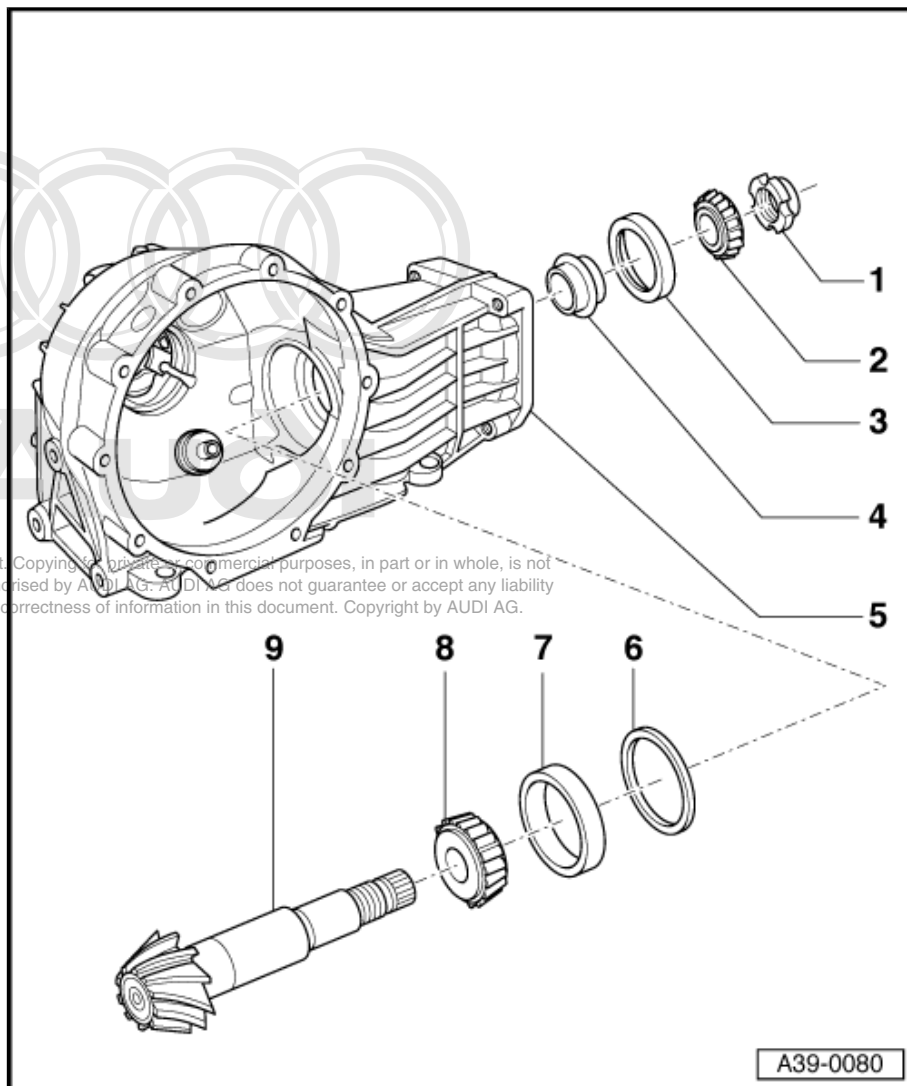
- ☐ Driving out ⇒ [page 232](#)
- ☐ Drawing in ⇒ [page 233](#)

8 - Inner race for large tapered roller bearing ¹⁾

- ☐ Pressing off ⇒ [page 233](#)
- ☐ Pressing on ⇒ [page 233](#)

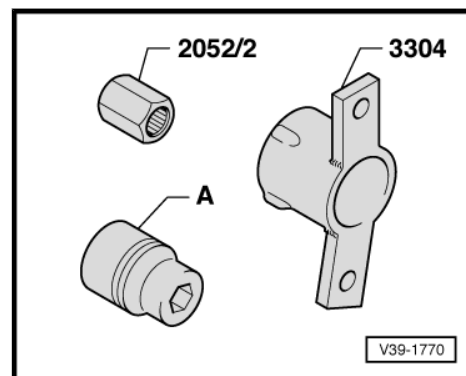
9 - Pinion shaft ¹⁾

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



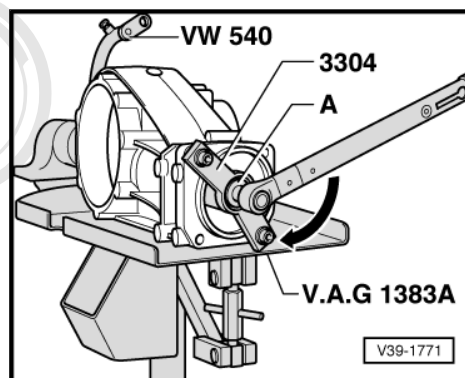
Tools for loosening and tightening nut for pinion shaft

A - Socket attachment (long), 32 mm



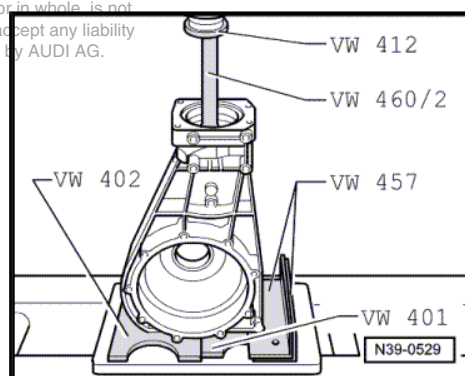
Removing nut for pinion shaft

- Fit counterhold tool -3304- with two bolts M8 x 30.
- The final drive must be supported when loosening the nut (e.g. using universal support -V.A.G 1359/2- in combination with engine and gearbox jack -V.A.G 1383 A-).



Pressing pinion shaft out of inner race for small tapered roller bearing

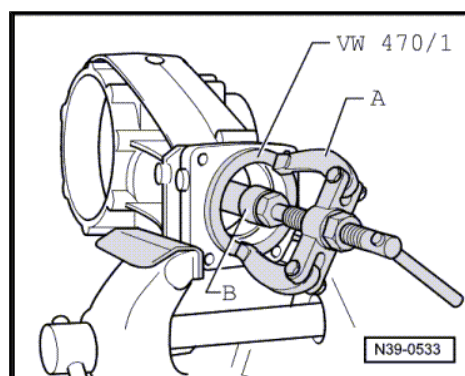
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Pulling out outer race for small tapered roller bearing

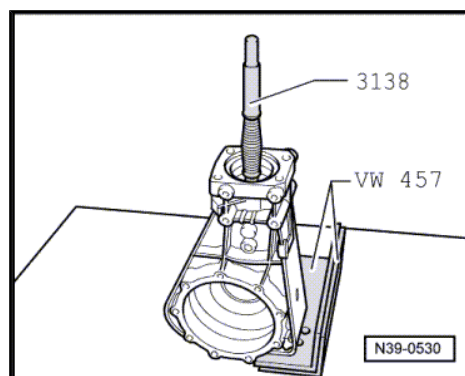
A - Counter-support , e.g. -Kukko 22/2-

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



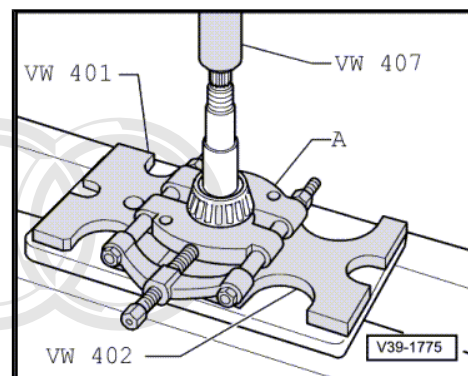
Driving out outer race for large tapered roller bearing

- After removing, check shims for damage.



Pressing inner race for large tapered roller bearing off pinion shaft

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



Pressing inner race for large tapered roller bearing onto pinion shaft

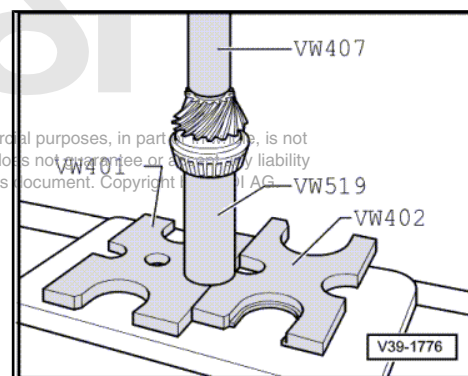


WARNING

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



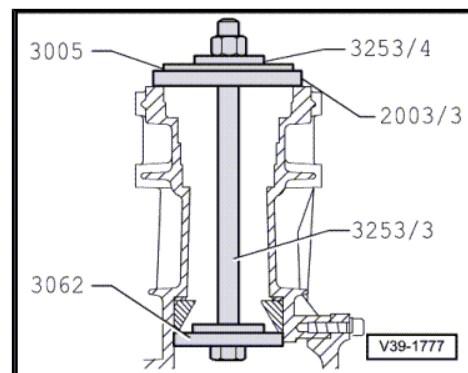
Pulling in outer race for large tapered roller bearing

- Fit previously determined shim „S3“ for pinion shaft
⇒ [page 238](#) .



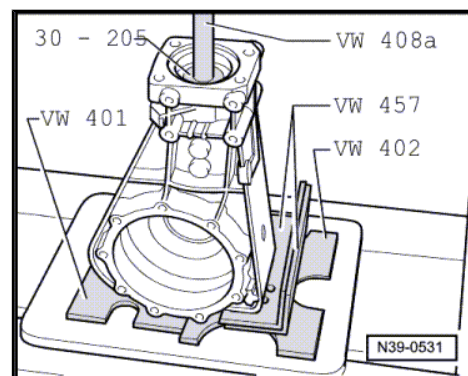
Note

Marking „Oben“ (top) on thrust piece -3253/4 - faces the nut of the assembly tool.



Pressing in outer race for small tapered roller bearing

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



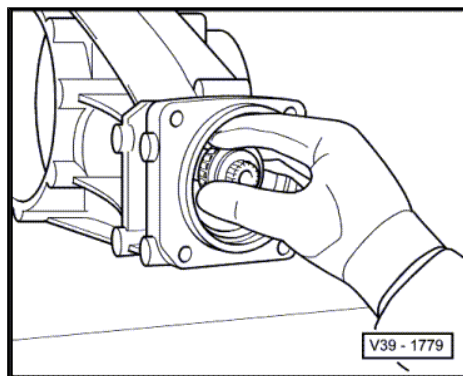
Pressing on inner race for small tapered roller bearing



WARNING

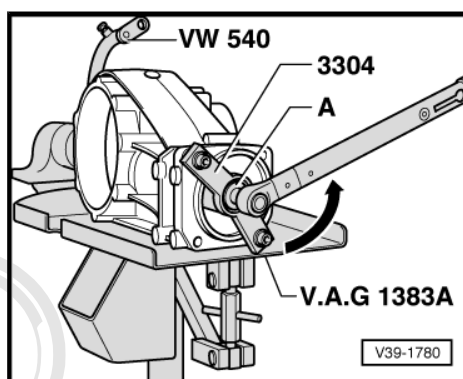
Wear protective gloves.

- Insert pinion shaft with new spacer sleeve.
- Heat inner race for small tapered roller bearing to approx. 100 °C and fit onto pinion shaft.
- Press up pinion shaft and insert bearing using press tool -40 - 21- up to stop.



Tightening nut for pinion shaft and setting friction torque

- Fit counterhold tool -3304- with two bolts M8 x 30.
- The final drive must be supported when tightening the nut (e.g. using universal support -V.A.G 1359/2- in combination with engine and gearbox jack -V.A.G 1383 A-).
- Fit a new pinion shaft nut.
- Tighten new pinion shaft nut just enough so that no play can be felt at pinion shaft.
- Increase tightening torque until the required friction torque is attained, measuring friction torque at regular intervals
⇒ [page 234](#).



Note

If required friction torque is exceeded, spacer sleeve must be renewed and adjustment procedure repeated. A spacer sleeve which has been compressed too much cannot be re-used.

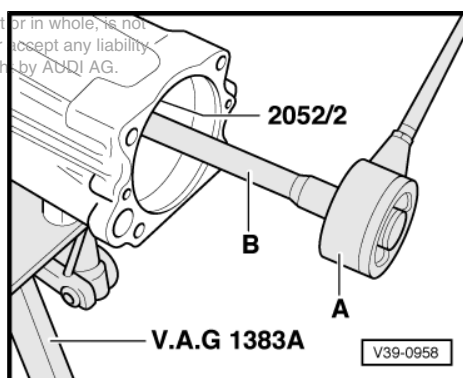
Measuring friction torque

A - Friction gauge -VAS 6222-, 0 ... 600 Ncm

B - Extension with socket attachment, 32 mm

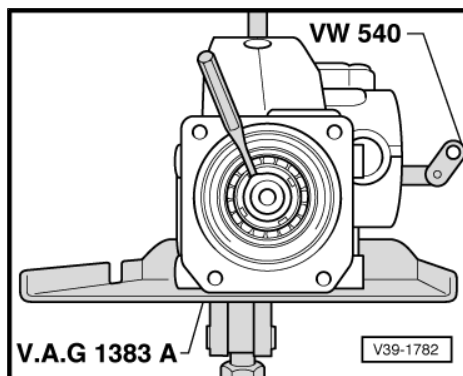
- Set the following friction torque:

New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm
• ¹⁾ run at least 50 km (30 miles)	



Securing nut for pinion shaft

- Peen pinion shaft nut with a punch.



13 Adjusting pinion shaft and crown wheel on rear final drive

Overview

- ◆ ⇒ „13.1 Adjustment and marking of final drive gear set“, page 235
- ◆ ⇒ „13.2 Table of adjustments - rear final drive“, page 236
- ◆ ⇒ „13.3 Position of shims“, page 237
- ◆ ⇒ „13.4 Re-adjustment sequence for final drive gear set“, page 237
- ◆ ⇒ „13.5 Adjusting pinion shaft“, page 238
- ◆ ⇒ „13.6 Adjusting crown wheel“, page 243



Note

- ◆ *Careful adjustment of the crown wheel and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*
- ◆ *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*
- ◆ *The allowance „r“ in relation to the master gauge „Ro“ is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive gear set (pinion shaft and crown wheel) may only be renewed together as a matched pair.*
- ◆ *Observe the general repair instructions for tapered roller bearings and shims ⇒ [page 8](#).*
- ◆ *For good results, maximum care and cleanliness are very important when performing repairs and taking measurements.*

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13.1 Adjustment and marking of final drive gear set

1 - Identification „0937“ denotes an Oerlikon gear set with a ratio of 37 : 9.

2 - -312- number of matched pair of gears.

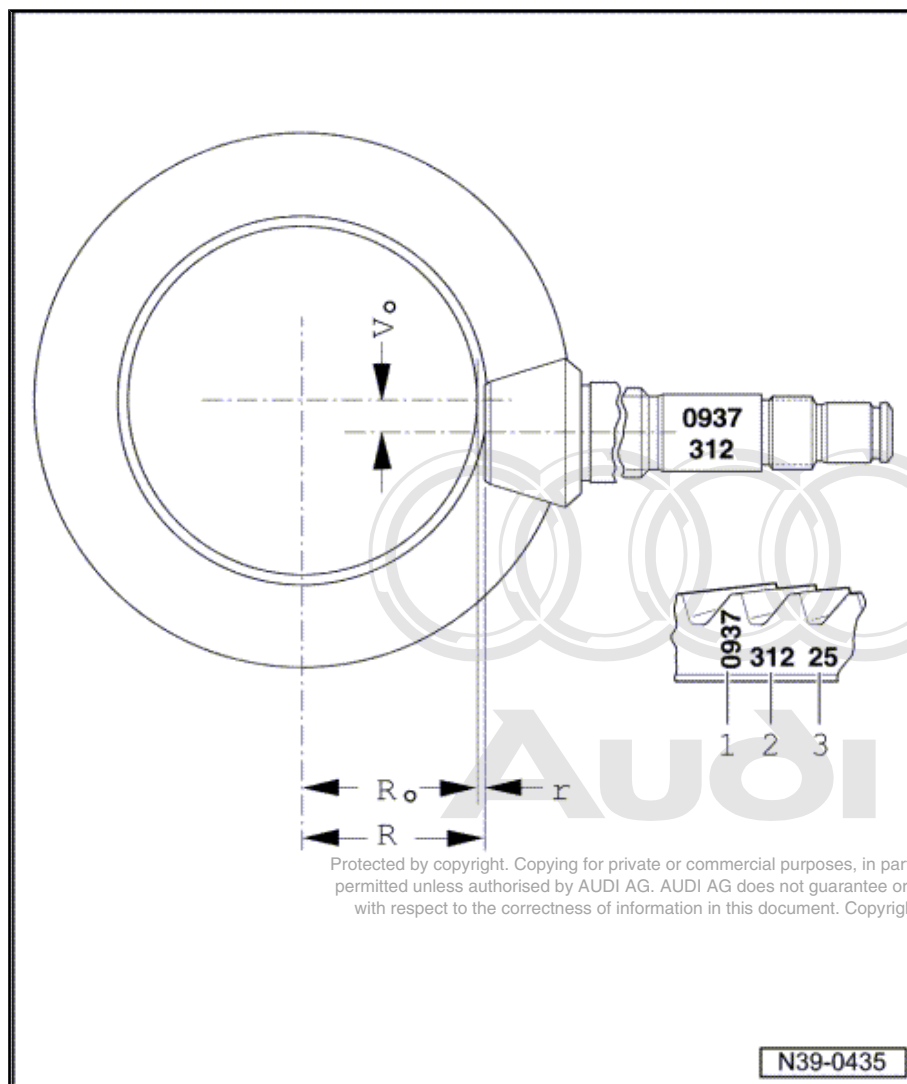
3 - Allowance „r“ is based on the master gauge used on the test machine in production. The allowance „r“ is always given in 1/100 mm. For example: „25“ indicates $r = 0.25$ mm

Ro - Length of master gauge used on test machine „Ro“.

Ro - = 57.50 mm

R - Actual distance between centre axis of crown wheel and face of pinion shaft in position of quietest running for this gear set

Vo - Hypoid offset



13.2 Table of adjustments - rear final drive



Note

If repairs have been carried out on the rear final drive it is only necessary to re-adjust the pinion shaft or the complete gear set if components have been renewed which have a direct effect on the adjustment of the final drive. Refer to the following table to avoid unnecessary adjustment work:

Components requiring adjustment:	Crown wheel („S1“ + „S2“)	Pinion shaft „S3“ via allowance „r“	Backlash 0.12 - 0.22 mm
	⇒ page 243	⇒ page 238	⇒ page 247
Component renewed			
Rear final drive housing	X	X	X
Differential cage	X		X
Tapered roller bearings for pinion shaft		X	X

Tapered roller bearings for differential	X		X
Final drive gear set ¹⁾	X	X	X
Cover for rear final drive	X		X
¹⁾ Pinion shaft and crown wheel; always renew together			

13.3 Position of shims

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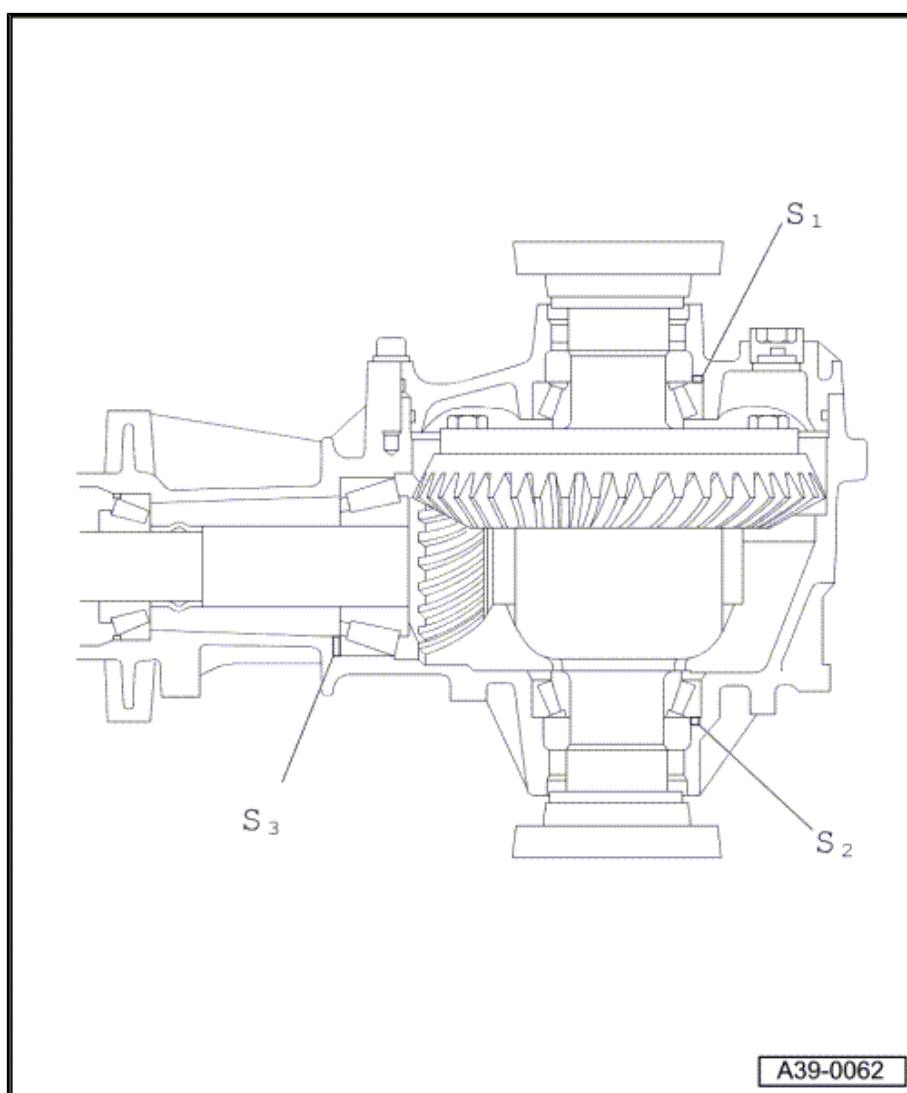
Note

Table of adjustments when renewing individual components of gearbox ➔ [page 236](#).

S1 - Shim for crown wheel in cover for rear final drive

S2 - Shim for crown wheel in rear final drive housing

S3 - Shim for pinion shaft in rear final drive housing



13.4 Re-adjustment sequence for final drive gear set

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

- ◆ Determine total shim thickness „ S_{total} “ (S_1 plus S_2) for specified preload on tapered roller bearings for differential
⇒ [page 244](#) .
- ◆ Determine shim thickness „ S_3 “ to reproduce the installation position for the pinion shaft determined on the test machine in production ⇒ [page 242](#) .
- ◆ Distribute total shim thickness „ S_{total} “ (S_1 plus S_2) so that specified backlash between crown wheel and pinion shaft is obtained ⇒ [page 246](#) .


Note

Overview of components and shims ⇒ [page 237](#) .

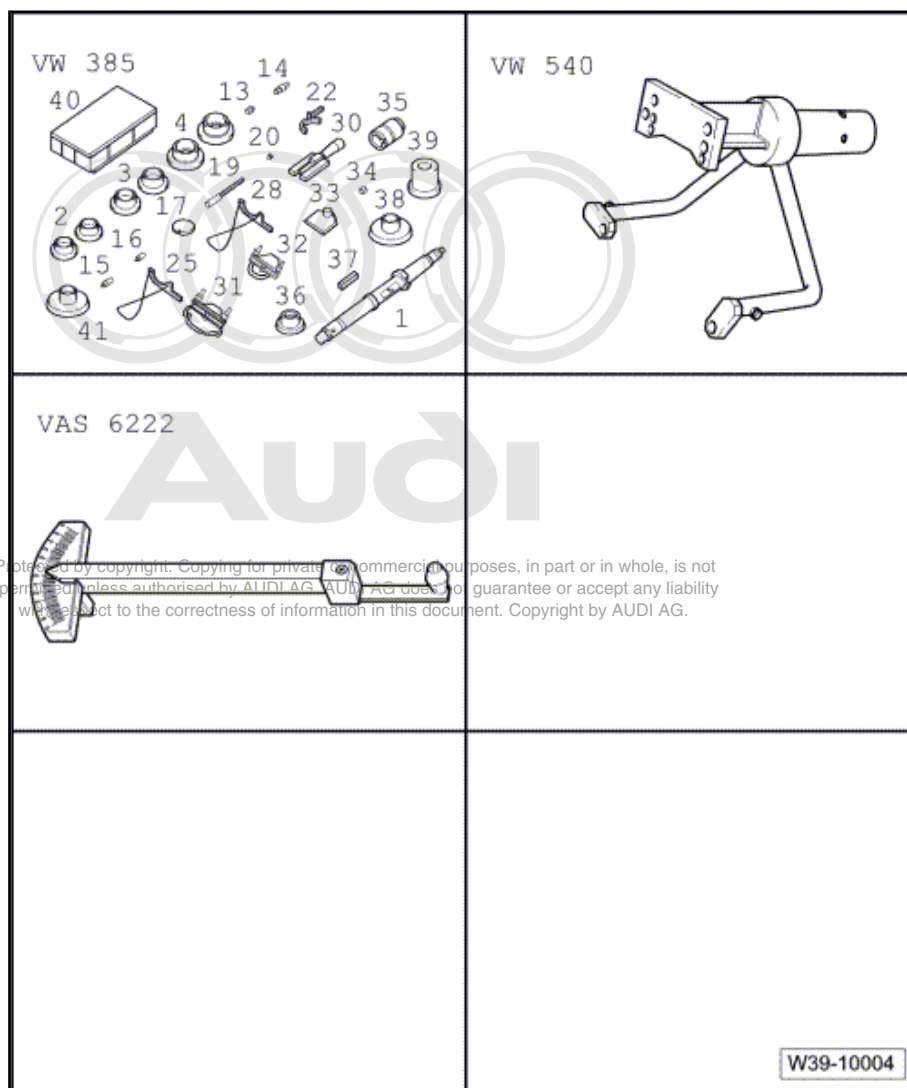
13.5 Adjusting pinion shaft

Re-adjustment of the pinion shaft is only necessary if the final drive gear set, tapered roller bearings for pinion shaft or rear final drive housing are being renewed. Table of adjustments

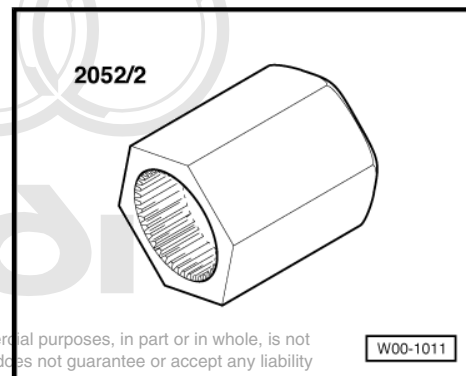
⇒ [page 236](#)

Special tools and workshop equipment required

- ◆ Universal measuring tool - VW 385-
- ◆ Engine and gearbox support -VW 540-
- ◆ Bearing preload gauge - VAS 6222-

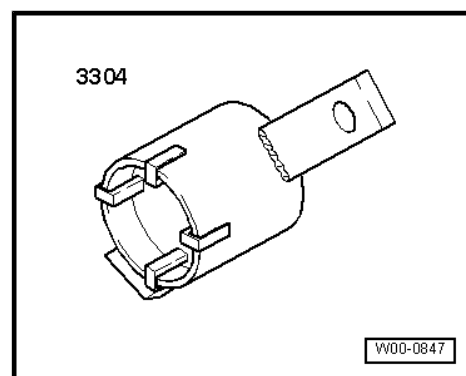


◆ Pinion assembly tool -2052-

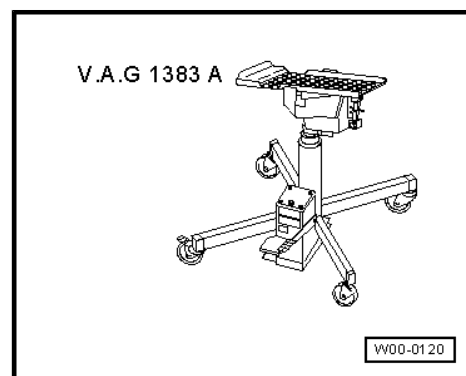


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◆ Counterhold tool -3304-



◆ Engine and gearbox jack -V.A.G 1383 A- with universal support -V.A.G 1359/2-



◆ Dial gauge

◆ Socket (long) -SW 32-

- Before adjusting pinion shaft, first determine total shim thickness „S_{total}“ (S₁ plus S₂) required for specified preload on differential tapered roller bearings ⇒ [page 244](#) .

Determining thickness of shim „S₃“

(Setting preload of tapered roller bearings for pinion shaft)

- Secure rear final drive to assembly stand ⇒ Page [⇒ page 211](#) .
- Install outer races of both tapered roller bearings for pinion shaft in final drive housing (without shims) ⇒ [page 233](#) and [⇒ page 233](#) .


Note

- ◆ *Do not use additional lubricant on new tapered roller bearings for friction torque measurement. The bearings have already been treated with special oil by the manufacturer.*
- ◆ *Only install spacer sleeve for final friction torque measurement (after determining shim „S3“).*

- Insert pinion shaft without spacer sleeve.


WARNING

Wear protective gloves.

- Heat inner race for tapered roller bearing to approx. 100 °C and fit onto pinion shaft.
- Fit counterhold tool -3304- with two bolts M8 x 30.
- The final drive must be supported when tightening the nut (e.g. using universal support -V.A.G 1359/2- in combination with engine and gearbox jack -V.A.G 1383 A-).
- Tighten pinion shaft nut just far enough so that no play can be felt at pinion shaft.

- Increase tightening torque until the required friction torque is attained, measuring friction torque at regular intervals.

A - Friction gauge -VAS 6222- , 0 ... 600 Ncm

B - Extension with socket attachment SW 32 mm

- Set the following friction torque:

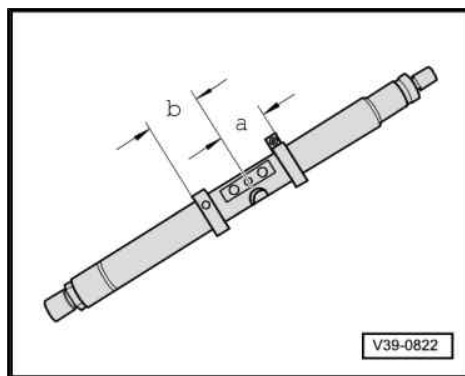
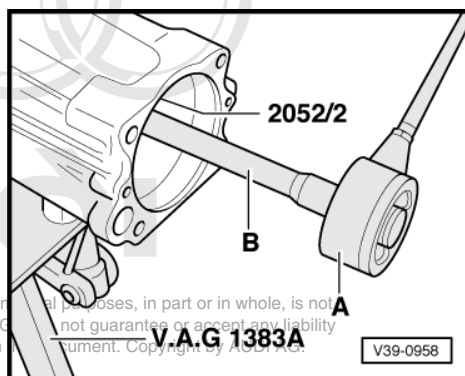
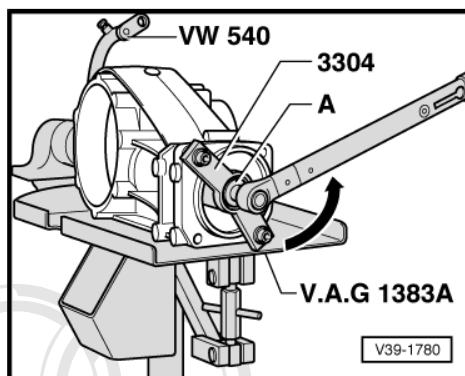
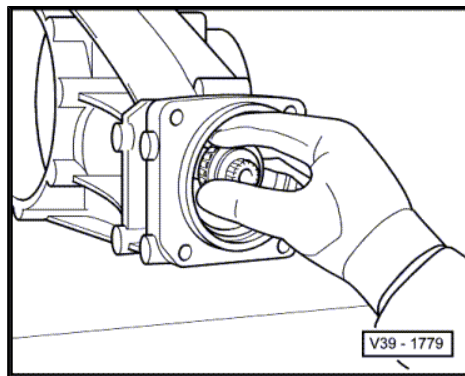
New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm
• 1) run at least 50 km (30 miles)	

- Set adjusting ring of universal measuring tool -VW 385/1- .

- ◆ Dimension -a- = 60 mm

- Set moveable adjusting ring.

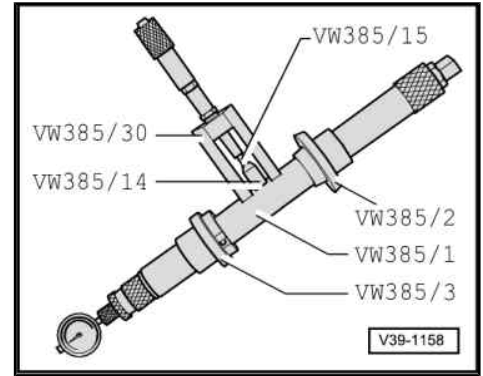
- ◆ Dimension -b- = 55 mm



- Assemble universal measuring tool as illustrated.
- ◆ Dial gauge extension -VW 385/15- = 9 mm long
- Set universal master gauge -VW 385/30- .
- ◆ Ro = 57.50 mm
- Set dial gauge (3 mm measuring range) to „0“ with 2 mm pre-load.

 Note

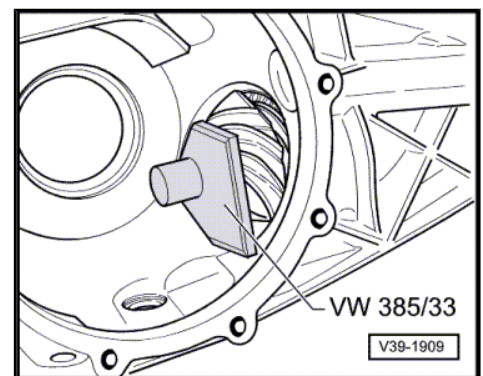
Prior to the following measurement, give the pinion shaft at least 5 turns in each direction so that the tapered roller bearings settle. Otherwise the result of the measurement will be incorrect.



- Place end measuring plate -VW 385/33- on face of pinion gear.

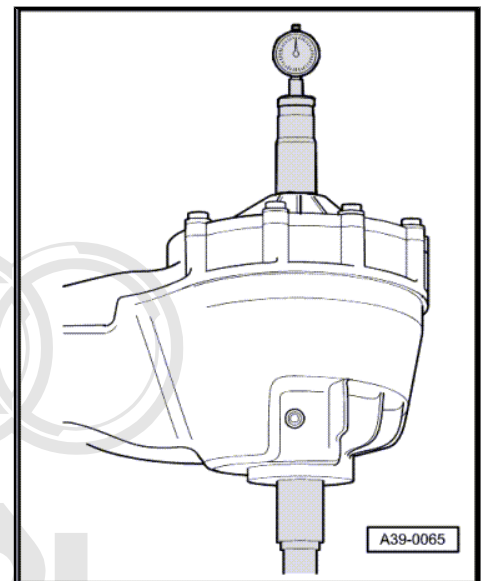
 Note

Ensure contact surface of end measuring plate fits exactly and is free of oil.



- Detach master gauge -VW 385/30- and insert universal measuring tool in housing.
- ◆ The centring disc -VW 385/3- faces towards cover for rear final drive
- Fit cover for rear final drive and tighten 4 bolts to 25 Nm.
- Using the adjustable ring, pull 2nd centring disc out as far as possible so that the universal measuring tool can still just be turned by hand.

Determining dimension „e“



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- Turn universal measuring tool until tip of dial gauge touches end measuring plate on face of pinion gear, and measure maximum deflection (return point). Measured value is dimension „e“.
- ◆ Measurement in following example: „e“ = 1.60 mm (in red scale)



Note

Dimension „e“ is required to determine thickness of shim „S3“.

- Then (after removing universal measuring tool), check once again that the dial gauge indicates „0“ with 2 mm preload when master gauge -VW 385/30- is in place; otherwise, repeat measurement.

Determining thickness of shim „S3“

Formula: „S3“ = „e“ – „r“

e - Determined value

r - Allowance (indicated on crown wheel in $\frac{1}{100}$ mm)

Example:

Determined value „e“	1.60 mm
- Allowance „r“	0.42 mm
= Thickness of shim „S3“	1.18 mm

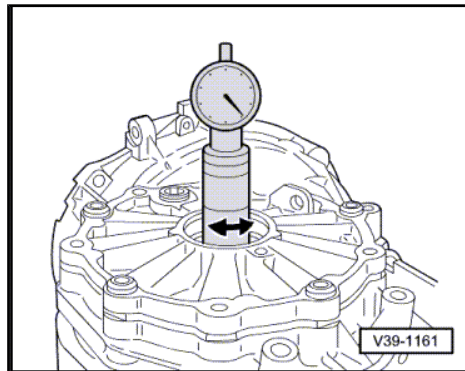
- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue .

Available shims for „S3“

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

- ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

- Remove universal measuring tool .
- Remove pinion shaft and outer race of large tapered roller bearing and re-install together with calculated shims „S3“ and spacer sleeve ⇒ [page 232](#) .
- Install inner race of small tapered roller bearing and tighten new nut for pinion shaft until specified friction torque is obtained ⇒ [page 234](#) .





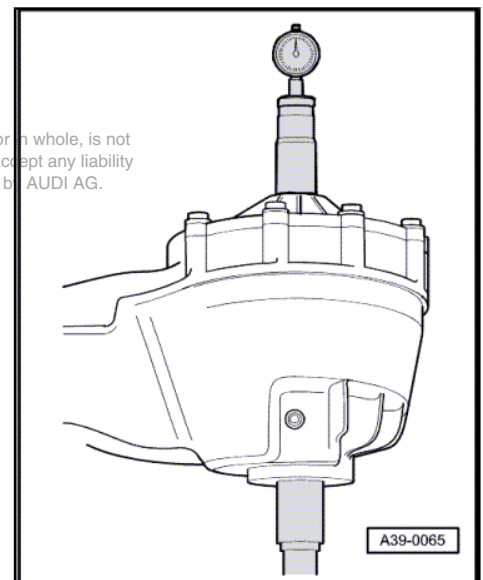
Note

- ◆ Do not use additional lubricant on new tapered roller bearings for friction torque measurement. The bearings have already been treated with special oil by the manufacturer.
 - ◆ Only increase tightening torque slowly. Stop and check friction torque several times. If the specified friction torque is exceeded, the spacer sleeve must be renewed and the adjustment procedure repeated. A spacer sleeve which has been compressed too much cannot be re-used.
- Set the following friction torque:

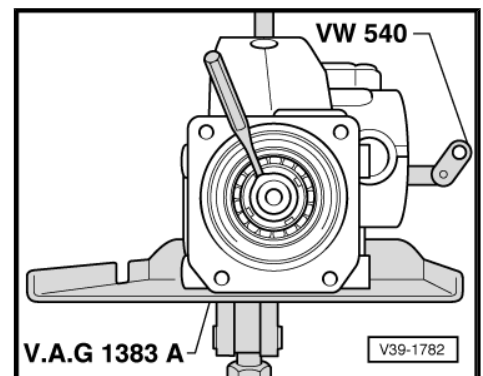
New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm
• ¹⁾ run at least 50 km (30 miles)	

Checking dimension „r“

- Give pinion shaft at least 8 turns in each direction so that tapered roller bearings settle.
- Insert universal measuring tool and check adjustment.
- ◆ If the correct shims have been selected, the dial gauge (reading anti-clockwise in the red range) should now show the allowance „r“ within a tolerance of ± 0.05 mm.



- Peen pinion shaft nut with a punch.



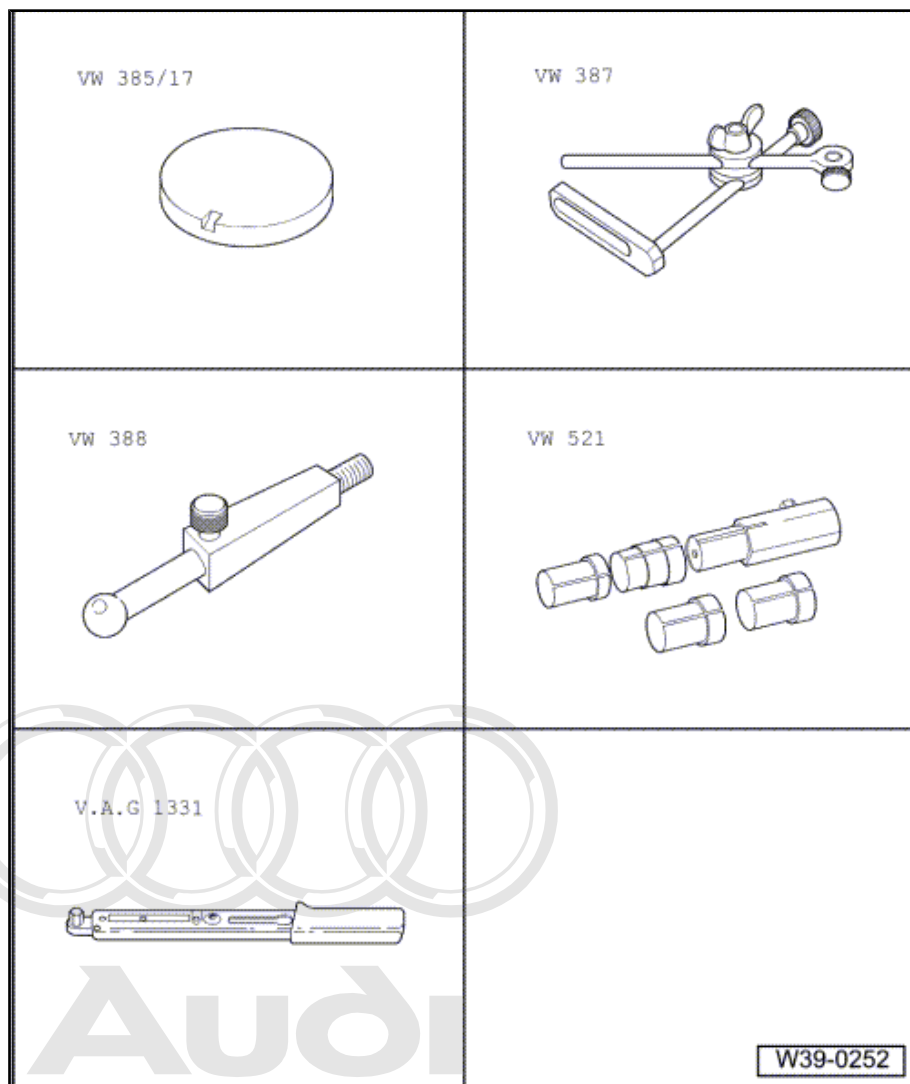
13.6 Adjusting crown wheel

(Adjusting differential)

Re-adjustment of the crown wheel is required if the rear final drive housing, cover for rear final drive, differential tapered roller bearings, differential cage or final drive gear set have been renewed
⇒ „13.2 Table of adjustments - rear final drive“, page 236 .

Special tools and workshop equipment required

- ◆ End measuring plate - VW 385/17-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Measuring lever -VW 388-
- ◆ Crown wheel adjusting tool -VW 521-
- ◆ Torque wrench - V.A.G 1331-



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- ◆ Dial gauge , e.g. -VAS 6080-



- ◆ Dial gauge extension, 30 mm
- ◆ Bolt M 8 x 45

Determining total shim thickness „S_{total}“ for shims „S₁“ plus „S₂“

(Setting preload of tapered roller bearings for differential)

- Pinion shaft is removed.

- If only the tapered roller bearings for the differential are being renewed, the crown wheel can be removed from the differential cage. The pinion shaft then does not have to be removed.
- Available shims for „S1“ + „S2“ ⇒ Electronic parts catalogue .
- Pry out flange shaft oil seal using assembly lever.
- Remove tapered roller bearing outer races for differential and take out shims ⇒ [page 218](#) .
- Press tapered roller bearing outer race together with a 1.00 mm thick shim onto stop in rear final drive housing (S2 side) ⇒ [page 223](#) .

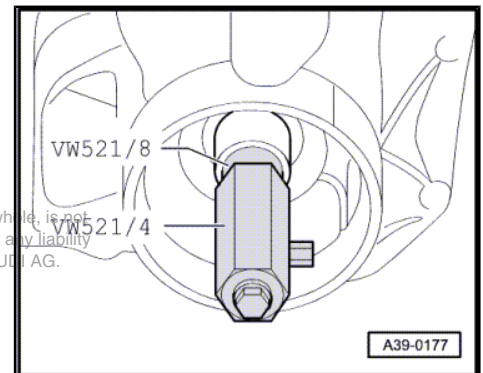


Note

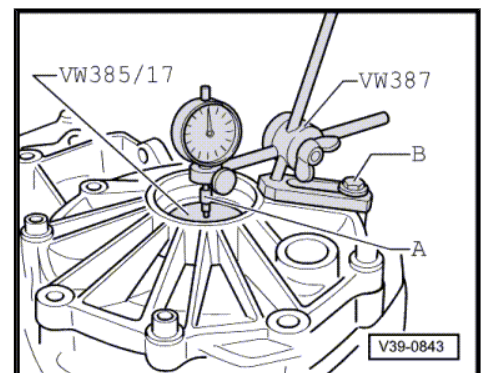
For measurement purposes a 1.0 mm thick shim „S2“ is inserted provisionally. This is referred to in the following as „S2“. „S2*“ is exchanged with the final shim „S2“ after determining backlash.*

- Press tapered roller bearing outer race without shim „S1“ into cover for rear final drive ⇒ [page 225](#) .
 - Fit differential in rear final drive housing.
- Crown wheel is on same side as cover.
- Fit cover for rear final drive and tighten 4 bolts to 25 Nm in diagonal sequence.
 - Fit crown wheel adjusting tool -VW 521/4- and -VW 521/8- in differential cage on housing side.
 - Turn rear final drive so that cover side faces upwards.
 - Turn differential 8 turns in both directions to settle tapered roller bearings.

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- Attach measuring equipment to rear final drive.
- Place measuring plate -VW 385/17- on differential.
- A- - Dial gauge extension -30 mm-
- Screw in bolt M 8 x 45 -B-.
- Apply dial gauge extension to centre of measuring plate -VW 385/17- .
- Set dial gauge (3 mm measuring range) to „0“ with 2 mm pre-load.



- Raise differential in direction of -arrow- without turning, read clearance off dial gauge and note down.
- ◆ Measurement in following example: 0.50 mm


Note

If the measurement has to be repeated, the differential must again first be turned 8 turns in each direction to settle the tapered roller bearings.

If the measurement has to be repeated, the differential must again first be turned 8 turns in each direction to settle the tapered roller bearings.

Formula: „S_{total}“ = „S₂“ + measured value + bearing preload

Example:
Example:

Inserted shim „S ₂ “	1.00 mm
+ Measured value	0.50 mm
+ Bearing preload (constant value)	0.30 mm
= Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	1.80 mm

Determining thickness of shim „S₁“

Note

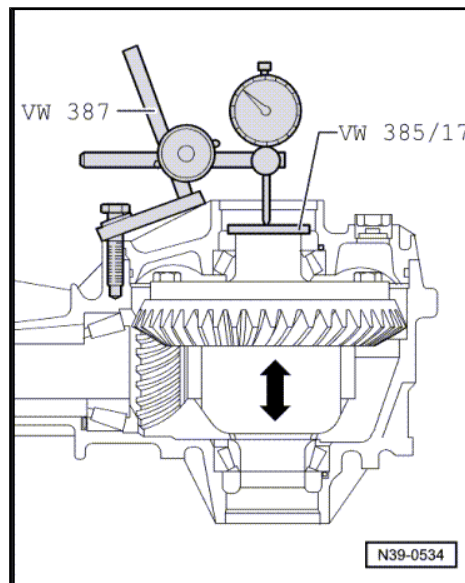
- ◆ *Provisional shim „S₁“ is replaced with final shim „S₁“ after determining backlash.*
- ◆ *Total shim thickness "S_{total}" remains unchanged.*

Formula: „S₁“ = „S_{total}“ – „S₂“

Example:

Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	1.80 mm
- Inserted shim(s) „S ₂ “	1.00 mm
= Thickness of shim „S ₁ “	0.80 mm

- Select correct shim(s) from ⇒ **Electronic parts catalogue**



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Measuring backlash

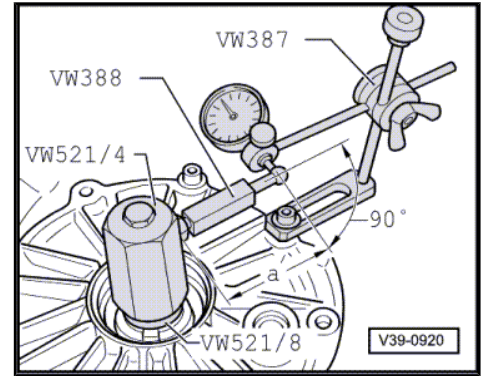
(Position of crown wheel in final drive housing)

- Pinion shaft installed with shim S₃
- Tapered roller bearing outer races with shims „S₁“ + „S₂“ installed in rear final drive housing
- Differential installed
- Fit cover for rear final drive and tighten bolts to 25 Nm.
- Turn differential 5 turns in both directions to settle tapered roller bearings.
- Attach measuring equipment.
- Fit dial gauge with dial gauge extension -VW 382/10- (6 mm flat).

Set measuring lever -VW 388- to dimension „a“ = 60 mm.

Measure play between teeth faces (backlash) as follows:

- Turn crown wheel until it makes contact with the face of one tooth (end of backlash travel).
- Preload dial gauge to 2 mm and set to „0“.
- Turn back crown wheel until it makes contact with opposite tooth face (backlash).
- Take backlash reading and note down measured value.
- Turn crown wheel through 90° and repeat measurements another 3 times.



Determining average backlash

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

Example:

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

- Result: the average backlash is 1.16 mm : 4 = 0.29 mm



Note

If the individual measurements differ by more than 0.06 mm, this means that the installation of the crown wheel is not correct or that the final drive gear set itself is defective. Check installation; renew final drive gear set if necessary.

Determining thickness of shim „S₂“

Formula: „S₂“ = „S₂“ – backlash + lift

Example:

Inserted shim(s) „S ₂ “	1.00 mm
- Average backlash	0.29 mm
+ Lift (desired average value for backlash)	0.15 mm
= Thickness of shim „S ₂ “	0.86 mm

- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue .

Available shims for „S2“

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

• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim „S1“

Formula: „S1“ = „S_{total}“ – „S2“

Example:

Total shim thickness „S _{total} “ for „S1“ plus „S2“	1.80 mm
- Thickness of shim „S2“	0.86 mm
= Thickness of shim „S1“	0.94 mm

- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue .

Available shims for „S1“

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

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• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

- Install correct shims: S₁ on crown wheel side, and S₂ opposite crown wheel. If necessary use 2 shims.

Checking adjustment

- Install correct shims: „S1“ on crown wheel side, and „S2“ opposite crown wheel. If necessary use 2 shims.
- After installing shims „S1“ and „S2“, turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.
- Specification: 0.12 ... 0.22 mm



Note

- ◆ Adjustment must be repeated if backlash is outside tolerance. The total shim thickness „S_{total}“ must remain unchanged.
- ◆ The discrepancy between individual measured values must not exceed 0.06 mm.

