

Workshop Manual OCTAVIA

6-Speed Manual Gearbox 02M

List of Supplements for OCTAVIA Workshop Manual

Edition: 04.04

6-Speed Manual Gearbox 02M

Replaces List of Supplements - Edition: 08.02

Supplement	Edition	Subject	Article Number
	09.00	Basic Edition of Workshop Manual	S00.5140.50.20
1	04.02	Supplement to Basic Edition	S00.5140.51.20
2	08.02	Vehicles with Front Wheel Drive	S00.5140.52.20
3	04.04	Supplement to gearboxes with engine code letters FMH and FMU	S00.5140.53.20
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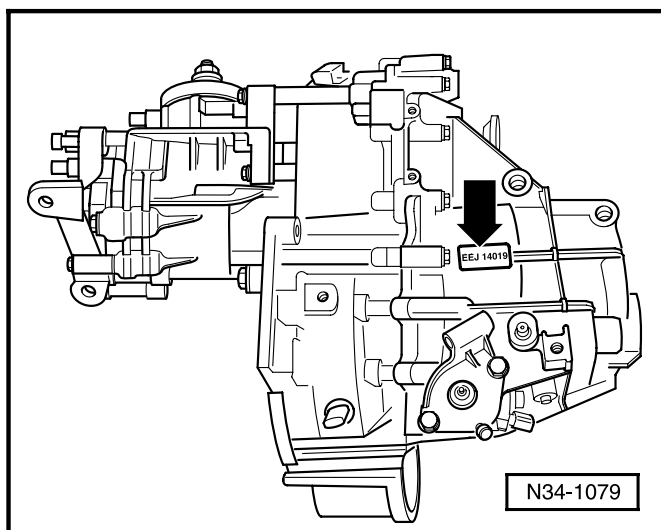
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* 5-Speed Manual Gearbox 02C 4x4

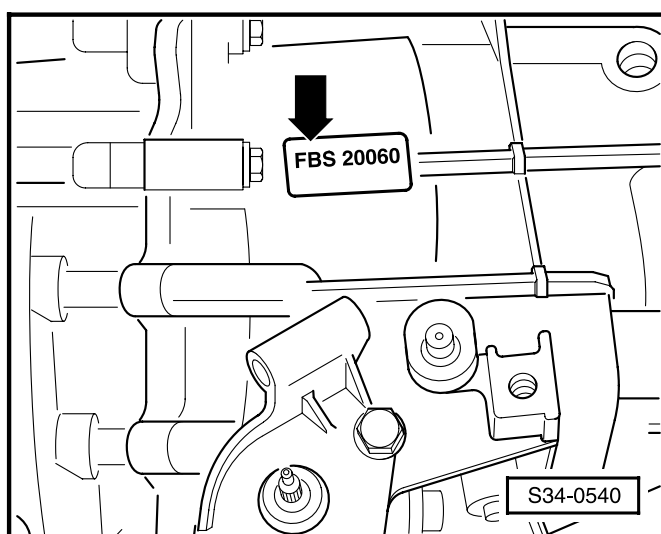


Identification of gearbox

Assignment ⇒ page 00-2

◀ Location on gearbox

Code letters and date of manufacture of gearbox -arrow-



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

Example:

FBS	20	06	0
Code letters	Day	Month	Year (1999) of manufacture

Additional data are production-related.

Note:

The code letters of the gearbox are also listed in the vehicle data stickers.

Identification of rear final drive

Final drive 02D is assigned to the 6-Speed Manual Gearbox 02M 4x4.

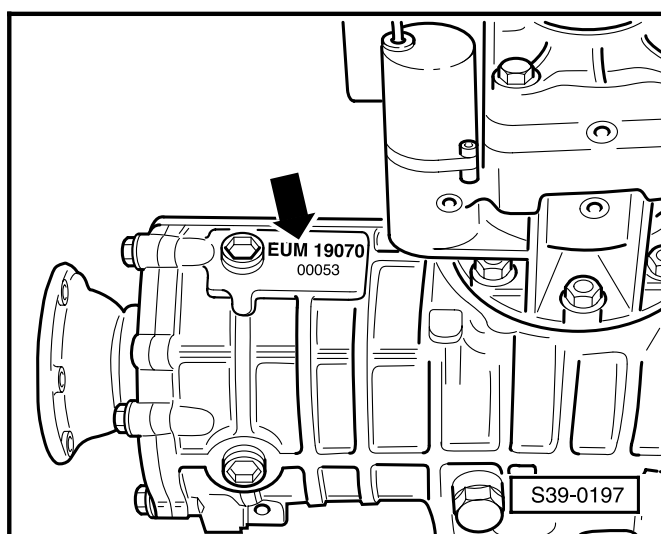
Assignment ⇒ page 00-2.

◀ Code letters and date of manufacture of gearbox

Example:

EUM	19	07	0
Code letters	Day	Month	Year (1999) of manufacture

Additional data are production-related.



Code letters, component assignment, transmission ratios, capacities

Manual gearbox		6-Speed 02M 4x4	
Code letters		FBS	FEM
Manufactured	from to	08.00 09.00	10.00 07.01
Assignment:	Engine	1.9-ltr./74 kW TDI	1.9-ltr./74 kW TDI
Transmission ratio:	Final drive for 1st to 4th gear	63 : 15 = 4.200	63 : 15 = 4.200
	Final drive for 5th and 6th gear	63 : 19 = 3.316	63 : 19 = 3.316
	1st gear	42 : 11 = 3.818	42 : 11 = 3.818
	2nd gear	40 : 19 = 2.105	40 : 19 = 2.105
	3rd gear	38 : 29 = 1.310	38 : 29 = 1.310
	4th gear	34 : 37 = 0.919	34 : 37 = 0.919
	5th gear	31 : 34 = 0.912	31 : 34 = 0.19
	6th gear	28 : 37 = 0.757	28 : 37 = 0.757
	Reverse gear	23 : 14 x 31 : 11 = 4.630	23 : 14 x 31 : 11 = 4.630
Speedo		electronic	
Capacity		2.6 litres	
Specification		Gear oil G51 SAE 75W90 (synthetic oil)	
Gear oil change interval		filled for life	
Clutch mechanism		hydraulic	
Clutch plate Ø		240 mm	240 mm
Drive shaft flange Ø		108 mm	108 mm
Assignment of rear final drive code letters		EUM	EUM

Rear final drive		02D	
Code letters		EUM	EUM
Manufactured	from to	08.00 09.00	10.00 07.01
Assignment:	Engine	1.9-ltr./74 kW TDI	1.9-ltr./74 kW TDI
Ratio: $Z_2 : Z_1$ front/rear bevel drive		17 : 27 x 27 : 17 = 1.00	17 : 27 x 27 : 17 = 1.00
Capacity in final drive		1.0 litre	
Specification		Gear oil G50 SAE 75W90 (synthetic oil)	
Gear oil change interval		filled for life	
Capacity in Haldex coupling		0.42 litre	
Change quantity in Haldex coupling		0.25 litre	
Specification		High-performance oil for Haldex coupling G 052 175 A1	
Drive shaft flange Ø		100 mm	100 mm
Assignment of manual gearbox code letters		FBS	FEM

Assembly codes, assembly assignment, ratios, capacities

Manual gearbox		6-speed 02M 4x4
Code		ESW
Manufactured	from to	08.01
Assignment	Engine	1.9-ltr./74 kW TDI
Ratio:	Final drive for 1st to 4th gear	72 : 17 = 4.235
	Final drive for 5th and 6th gear	72 : 22 = 3.273
	1st gear	42 : 17 = 3.769
	2nd gear	48 : 23 = 2.087
	3rd gear	45 : 34 = 1.324
	4th gear	41 : 45 = 0.911
	5th gear	37 : 41 = 0.902
	6th gear	34 : 45 = 0.756
	Reverse	23 : 14 x 36 : 13 = 4.630
Speedometer		electronic
Capacity		2.6 litres
Specification		Gear oil G51 SAE 75W90 (synthetic oil)
Gear oil change interval		filled for life
Clutch mechanism		hydraulic
Clutch plate Ø		240 mm
Drive shaft flange Ø		108 mm
Assignment of rear final drive code		FWU

Rear final drive		02D
Code		FWU
Manufactured	from to	08.01
Assignment	Engine	1.9-ltr./74 kW TDI
Ratio: $Z_2 : Z_1$ bevel gear front/rear		17 : 27 x 27 : 17 = 1.00
Capacity in final drive		1.0 litre
Specification		Gear oil G50 SAE 75W90 (synthetic oil)
Gear oil change interval		filled for life
Capacity in Haldex coupling		0.42 litre
Change quantity in Haldex coupling		0.25 litre
Specification		High-performance oil for Haldex coupling G 052 175 A1
Drive shaft flange Ø		100 mm
Assignment of manual gearbox code		ESW

Code letters, component assignment, transmission ratios, capacities

Manual gearbox		6-Speed 02M 4x4	
Code letters		ESW	FMU
Manufactured	from to	08.01 07.03	08.03
Assignment	Engine	1.9 l/74 kW TDI	1.9 l/74 kW TDI
Transmission ratio:	Final drive for 1st to 4th gear	72 : 17 = 4.235	72 : 17 = 4.235
	Final drive for 5th and 6th gear	72 : 22 = 3.273	72 : 22 = 3.273
	1st gear	42 : 17 = 3.769	49 : 13 = 3.769
	2nd gear	48 : 23 = 2.087	48 : 23 = 2.087
	3rd gear	45 : 34 = 1.324	45 : 34 = 1.324
	4th gear	41 : 45 = 0.911	41 : 45 = 0.911
	5th gear	37 : 41 = 0.902	37 : 41 = 0.902
	6th gear	34 : 45 = 0.756	34 : 45 = 0.756
	Reverse gear	23 : 14 x 36 : 13 = 4.549	23 : 14 x 36 : 13 = 4.549
Speedo		electronic	
Capacity		2.6 litres	
Specification		Gear oil G51 SAE 75W90 (synthetic oil)	
Gear oil change interval		filled for life	
Clutch mechanism		hydraulic	
Clutch plate Ø		240 mm	
Drive shaft flange Ø		108 mm	
Assignment of rear final drive code letters		FMU	

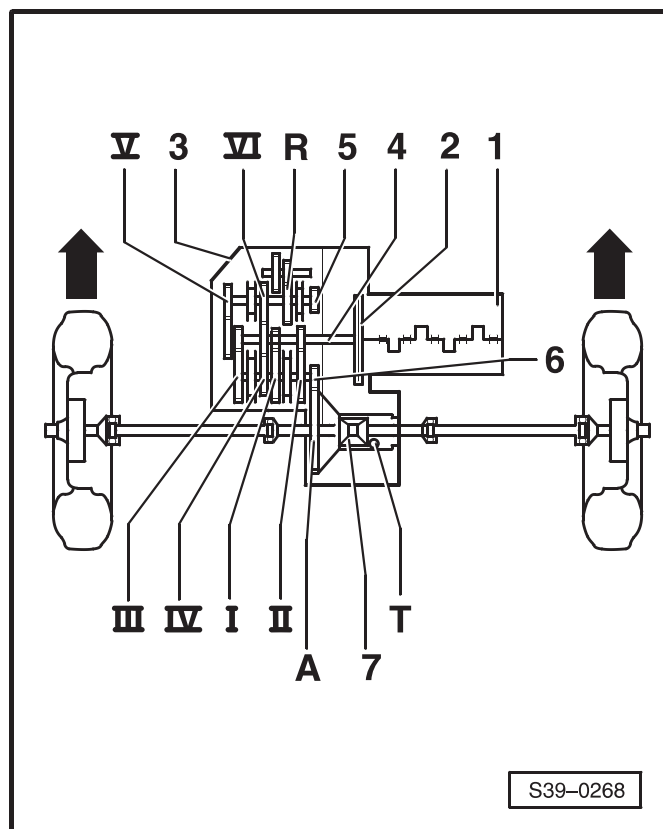
Rear final drive		02D	
Code letters		FWU	FWU
Manufactured	from to	08.01 07.03	08.03
Assignment	Engine	1.9 l/74 kW TDI	1.9 l/74 kW TDI
Ratio: $Z_2 : Z_1$ front/rear bevel drive		17 : 27 x 27 : 17 = 1.00	
Capacity in final drive		1.0 litre	
Specification		Gear oil G50 SAE 75W90 (synthetic oil)	
Gear oil change interval		filled for life	
Capacity in Haldex coupling		0.42 litre	
Change quantity in Haldex coupling		0.25 litre	
Specification		High-performance oil for Haldex coupling G 052 175 A1	
Drive shaft flange Ø		100 mm	100 mm
Assignment of manual gearbox code letters		ESW	FMU

Code letters, component assignment, transmission ratios, capacities

Manual gearbox		6-Speed 02M Front Wheel Drive	
Code letters		ERF	FMH
Manufactured	from to	09.02 07.03	08.03
Assignment	Engine	1.9 l/96 kW TDI	
Transmission ratio:	Final drive for 1st to 4th gear	68 : 21 = 3.238	
	Final drive for 5th to 6th gear	68 : 26 = 2.615	
	1st gear	49 : 13 = 3.769	
	2nd gear	48 : 23 = 2.087	
	3rd gear	45 : 34 = 1.324	
	4th gear	42 : 43 = 0.977	
	5th gear	39 : 40 = 0.975	
	6th gear	35 : 43 = 0.814	
	Reverse gear	23 : 14 x 36 : 13 = 4.549	
	Speedo	electronic	
Capacity		2.3 litres	
Specification		Gear oil G51 SAE 75W90 (synthetic oil)	
Gear oil change interval		filled for life	
Clutch mechanism		hydraulic	
Clutch plate Ø		240 mm ¹⁾	
Drive shaft flange Ø		108 mm	

¹⁾ Two-mass flywheel

Overview of power transmission for vehicles with Front Wheel Drive



Designation

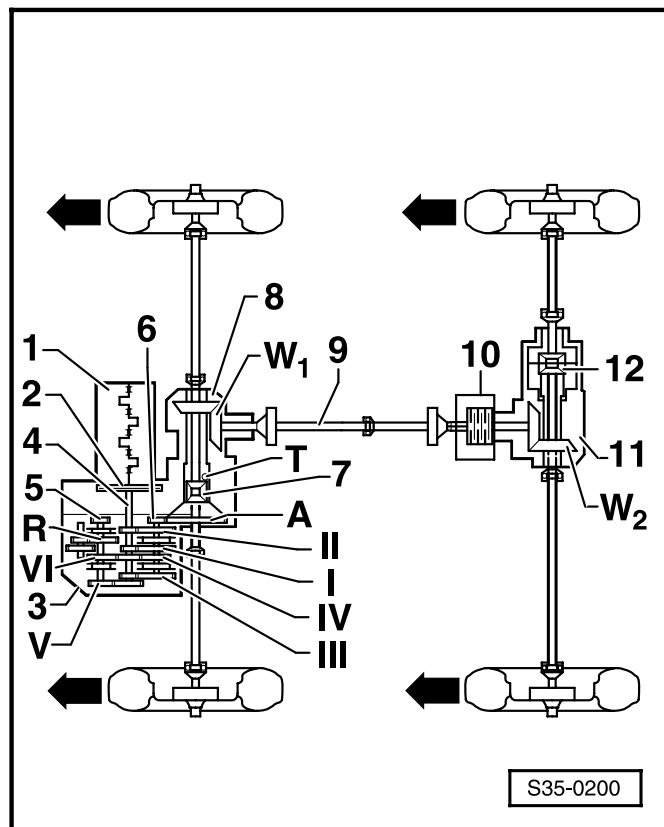
- 1 - Engine
- 2 - Clutch
- 3 - Manual gearbox
- 4 - Input shaft
- 5 - Output shaft of 5th/6th and reverse gear
- 6 - Output shaft of 1st to 4th gear
- 7 - Differential

Arrows point in direction of travel

Transmission ratio

- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- VI - 6th gear
- R - Reverse
- A - Final drive
- T - Speedometer drive

Overview of power transmission for 4 Wheel Drive



Designation

- 1 - Engine
- 2 - Clutch
- 3 - Manual gearbox
- 4 - Input shaft
- 5 - Output shaft of 5th/6th and reverse gear
- 6 - Output shaft of 1st to 4th gear
- 7 - Differential
- 8 - Bevel gear
- 9 - Propeller shaft
- 10 - Haldex coupling
- 11 - Rear final drive
- 12 - Differential

Arrows point in direction of travel

Transmission ratio

- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- VI - 6th gear
- R - Reverse
- A - Final drive
- T - Speedometer drive
- W_1 - Front bevel gear
- W_2 - Rear bevel gear

Information on brake and performance test and on towing for vehicles with 4 Wheel Drive

Brake test on roller dynamometer

- ◆ Use only roller dynamometers for 4x4 vehicles.
- ◆ If a roller dynamometer for a two-wheel drive vehicle is used, 1 to 2 brake tests can be conducted with the ignition switched on and engine not running.

Warning!

Let engine run for about 5 seconds between the brake tests in order to build up sufficient vacuum in the brake system.

Performance test on roller dynamometer

- ◆ Use only roller dynamometers for 4x4 vehicles.
- ◆ On roller dynamometers for two-wheel drive vehicles, it is necessary to first of all remove the front part of the propeller shaft. Pay attention to marking when assembling.

General repair information

Extreme care and scrupulous cleanliness, as well as proper tools are essential requirements for conducting proper and successful repairs to the gearbox. The general applicable basic rules of safety naturally also apply to repair work.

A number of generally applicable items of information regarding individual repair procedures - which are otherwise listed at various points in the Workshop Manual - are summarised here. They apply to this Workshop Manual.

Gearbox

- ◆ When installing, ensure that the dowel sleeves between engine and gearbox are correctly located.
- ◆ When removing and installing bearing brackets as well as waxed components, clean the contact surfaces. The contact surfaces must be free of wax and grease.
- ◆ If the manual gearbox, bevel gear or the rear final drive is replaced, replenish the gear oil up to the bottom edge of the filler hole.
- ◆ Capacities and specifications for manual gearbox with bevel gear, final drive, Haldex coupling ⇒ page 00-2

Gaskets, seals

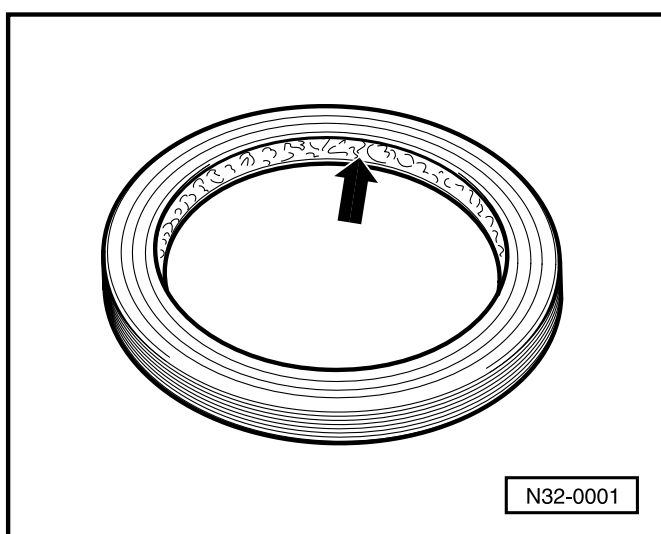
- ◆ Thoroughly clean contact surfaces and apply sealant AMV 188 200 03.
- ◆ Apply an even film sealant - not too thick.
- ◆ Always replace O-rings.
- ◆ Radial shaft seals:

Before installing:

- ◀ Lightly oil the outer diameter and pack the space between the sealing lips -arrow- half-full with grease G 052 128 A1.

After installing:

- ◆ Inspect gear oil level in manual gearbox with bevel gear ⇒ page 34-33.

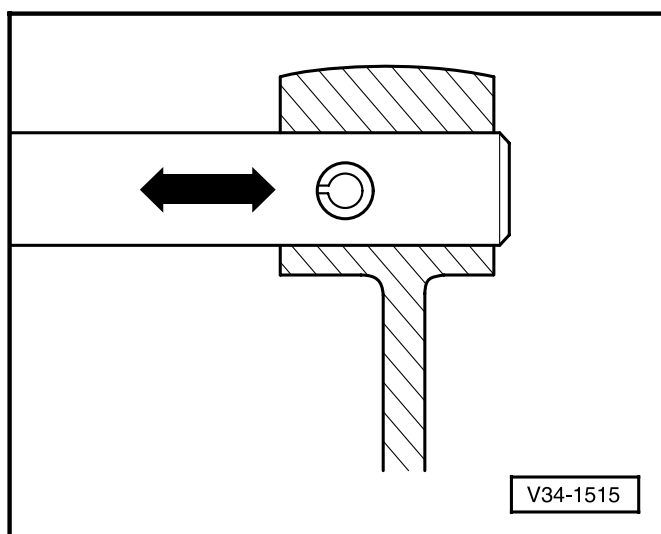


Vehicles with 4 Wheel Drive

- ◆ Inspect gear oil level in rear final drive
- ⇒ 5-Speed Manual Gearbox 02C 4x4; Repair Group 39; Inspecting gear oil in rear final drive

Radial shaft seal for flange/propeller shaft at rear final drive

- ◆ Before installing, lightly oil outer diameter and space between sealing lips with high-performance oil for Haldex coupling G 052 175 A1
- ◆ After installing, inspect oil level at Haldex coupling
- ⇒ 5-Speed Manual Gearbox 02C 4x4; Repair Group 39; Inspecting oil level in Haldex coupling



Continued for all vehicles

Locking elements

- ◆ Replace circlips
- ◆ Do not over-tension circlips.
- ◆ Circlips must be inserted into the base of the groove.
- ◆ Replace roll pins
Fitting location: slot lengthwise relative to power flow.

Nuts, bolts

- ◆ Slacken and tighten nuts and bolts for attaching covers and housings diagonally across.
- ◆ Do not twist particularly sensitive parts - such as clutch pressure plates - and slacken and tighten diagonally across in stages.
- ◆ The tightening torques apply to non-oiled nuts and bolts.
- ◆ Always replace self-locking nuts and bolts.
- ◆ It is important to ensure that the contact surfaces at all bolted connections as well as the nuts and bolts are waxed, if necessary, only after installation.

Bearings

- ◆ Install new tapered roller bearings as supplied, and do not additionally oil.
- ◆ Insert needle bearings in gearbox with gear oil.
- ◆ Always replace all the tapered roller bearings mounted on a shaft. Use the same makes if possible!
- ◆ Heat inner races to about 100 °C for installing
- ◆ Do not mix up the outer and inner races of bearings of identical size; bearings are matched.
- ◆ Position needle bearing with the inscribed side (large metal thickness) facing the insertion drift.

Shims

- ◆ Re-gauge shims at several points with a micrometer. Different tolerances make it possible to exactly gauge the required thickness of shim.
- ◆ Inspect for burns and damage.
- ◆ Use only shims which are in perfect condition.

Synchroniser rings

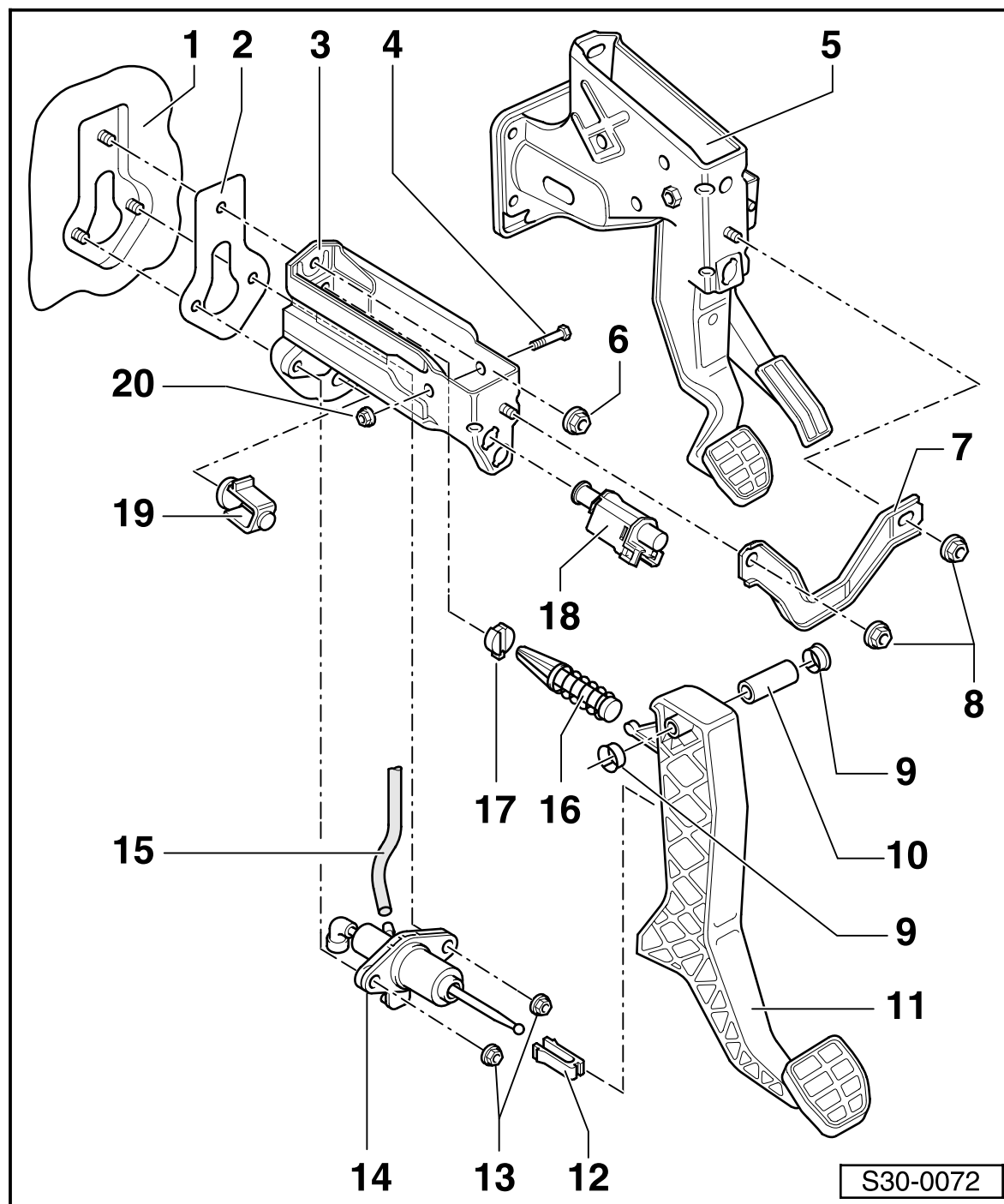
- ◆ Do not mix up. Assign synchroniser rings to the same gearwheel when re-installing.
- ◆ Inspect for wear, replace if necessary.
- ◆ Insert with gear oil

Gearwheels

- ◆ Clean and heat on a heating plate to about 100 °C before pressing on.
- ◆ The temperature can be checked with a temperature measuring instrument (e.g. V.A.G 1558).

Servicing clutch mechanism

Assembly overview - pedals



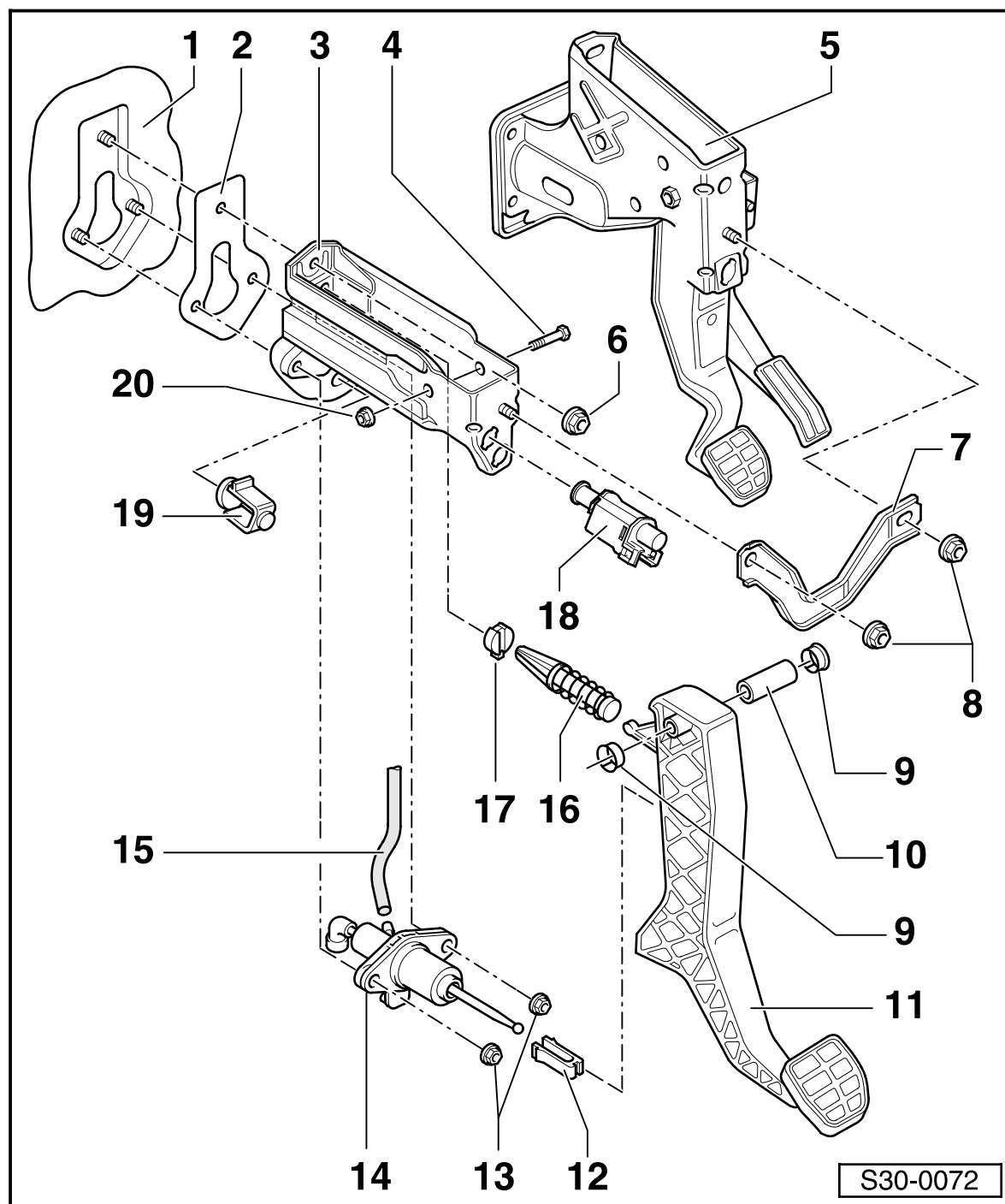
Special tools, testers and aids required

- ◆ Poly resin grease G 052 142 A2
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331

Notes:

- ◆ Assembly overview of hydraulics
⇒ page 30-6.

- ◆ Disconnect earth strap of battery.
- ◆ Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.
- ◆ Grease all bearing and contact surfaces with poly resin grease G 052 142 A2.
- ◆ Before commencing work on the pedal assembly, remove storage compartment on driver side:
⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel

**1 - Bulkhead mount**

- ◆ For master cylinder and bearing bracket

2 - Gasket

- ◆ Always replace

3 - Bearing bracket

- ◆ For mounting clutch pedal

4 - Bolt**5 - Accelerator/brake pedal assembly****6 - 25 Nm**

- ◆ Always replace

7 - Connecting plate**8 - 20 Nm**

- ◆ Always replace

9 - Bearing bush**10 - Bearing pin****11 - Clutch pedal**

- ◆ Removing and installing ⇒ page 30-4

12 - Mount

- ◆ Removing and installing ⇒ page 30-6

13 - 25 Nm

- ◆ Always replace

14 - Master cylinder

- ◆ Removing and installing ⇒ page 30-7

15 - Feed hose**16 - Over-centre spring**

- ◆ Removing and installing ⇒ page 30-3

17 - Mounting of over-centre spring

- ◆ Insert into bearing bracket
- ◆ Always replace

18 - Clutch pedal switch

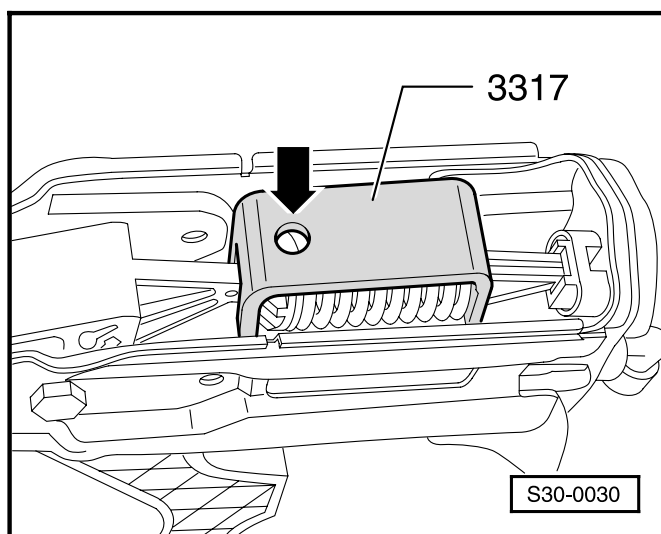
- ◆ Removing and installing ⇒ page 30-5

19 - Pedal stop

- ◆ For clutch pedal
- ◆ Fitting location ⇒ page 30-5

20 - 25 Nm

- ◆ Always replace

**Removing and installing over-centre spring****Special tools, testers and aids required**

- ◆ Assembly clamp 3317

Removing

- Remove storage compartment on driver side at bottom left.
⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel.
- ← - Tension over-centre spring with the clutch pedal and press on assembly clamp 3317 from above.

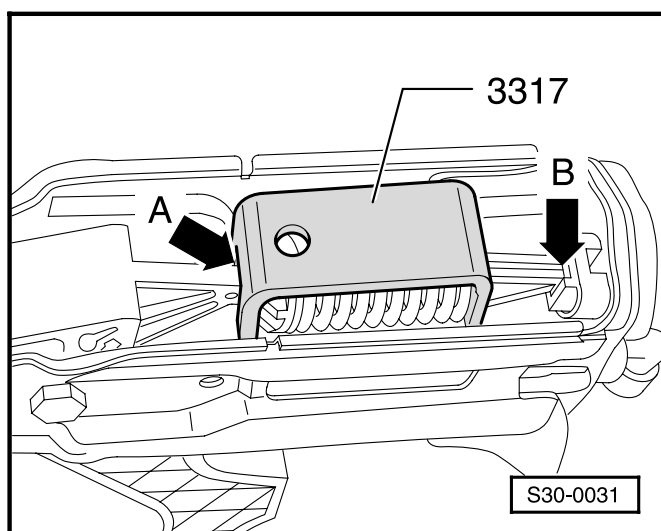
Note:

The hole -arrow- points toward the clutch pedal.

- Move clutch pedal into rest position and take off over-centre spring together with assembly clamp 3317.

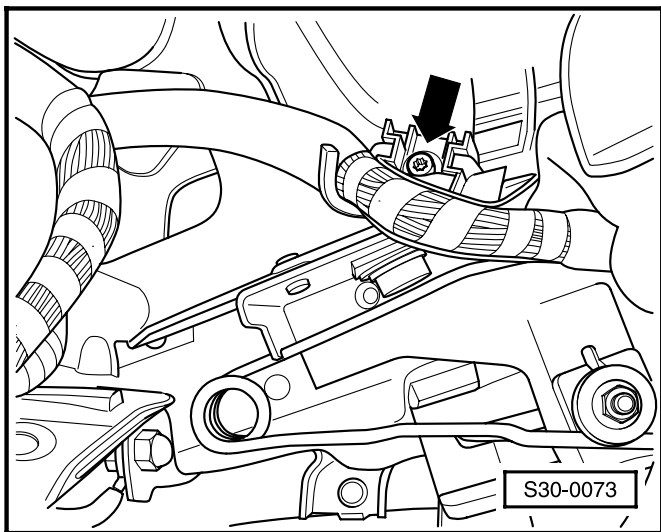
Installing

- Move clutch pedal into rest position.
- ← - First of all, position over-centre spring at the mounting of the over-centre spring -B-, then depress clutch pedal fully until the mounting stud of the clutch pedal -A- is positioned against the over-centre spring.
- Tension over-centre spring with clutch pedal; remove assembly clamp 3317.

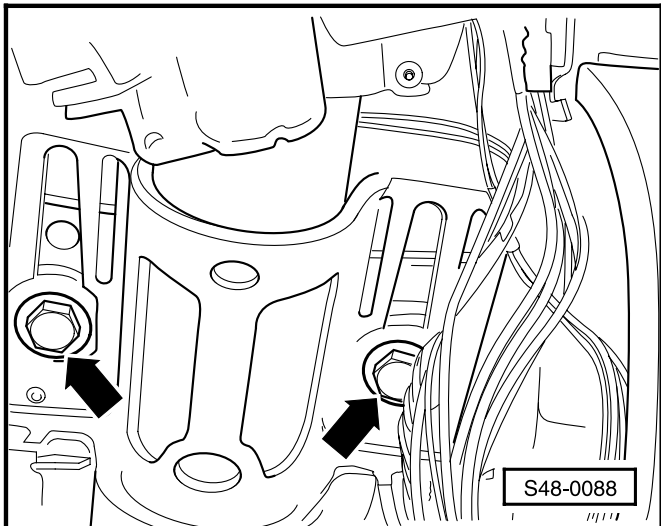


Removing and installing clutch pedal

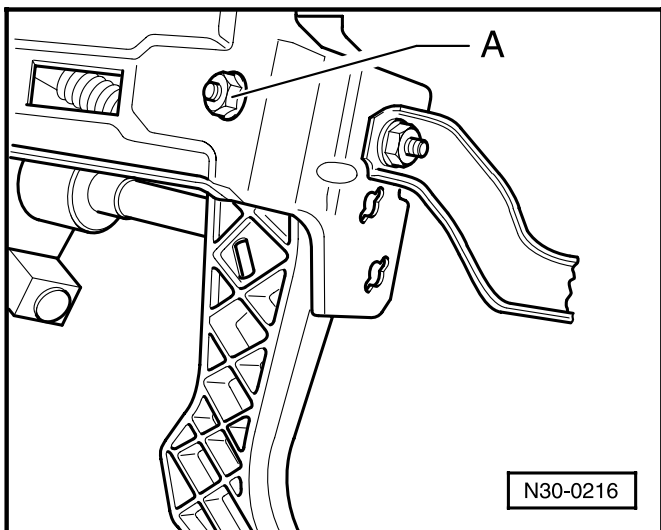
Removing



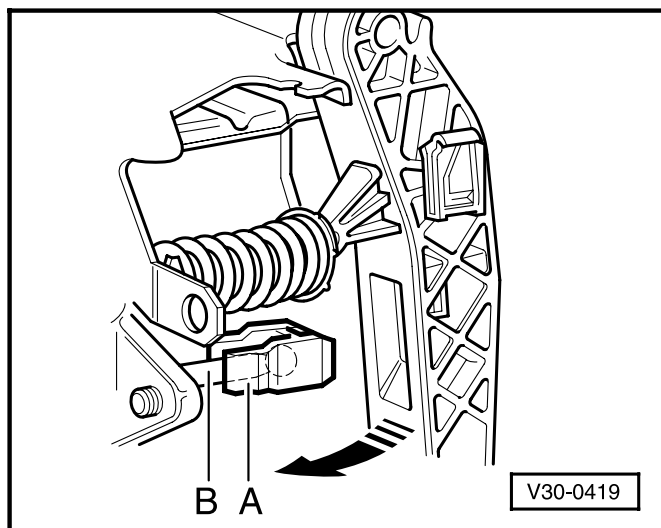
- Remove storage compartment on driver side at bottom left.
⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel
- Remove clutch pedal switch if fitted ⇒ page 30-5.
- Remove over-centre spring ⇒ page 30-3.
- Separate clutch pedal from master cylinder ⇒ page 30-7
- ◀ - Take off the left-hand bracket with wiring loom from steering column -arrow-.



- ◀ - Unscrew hexagon bolts -arrows- of steering column.
- Carefully lower steering column and secure at dash panel e.g. with wire.



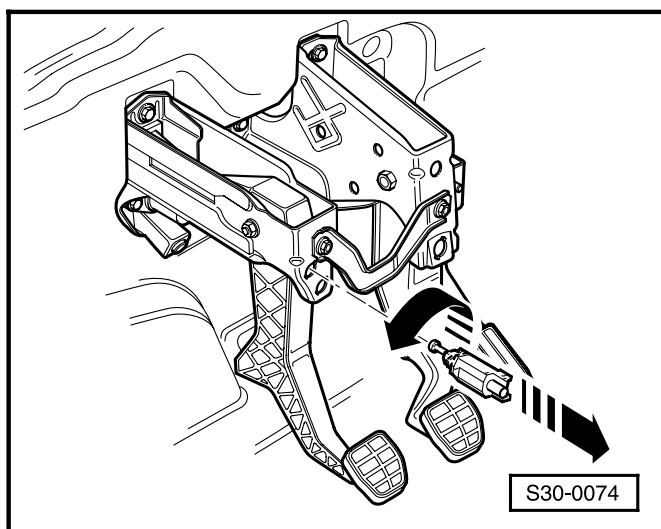
- ◀ - Unscrew hexagon nut -A- and pull hexagon bolt out of bearing bracket.
- Remove clutch pedal.



Installing

Installation is carried out in the reverse order; pay attention to the following points:

- ◀ - The mount -A- must be fitted onto the operating rod -B- of the master cylinder.
 - To lock mount in place, depress clutch pedal toward bulkhead -direction of arrow-, ensure it is correctly locked in place.
 - Fit steering column onto cross member.
- ⇒ Running Gear; Repair Group 48; Removing and installing steering column

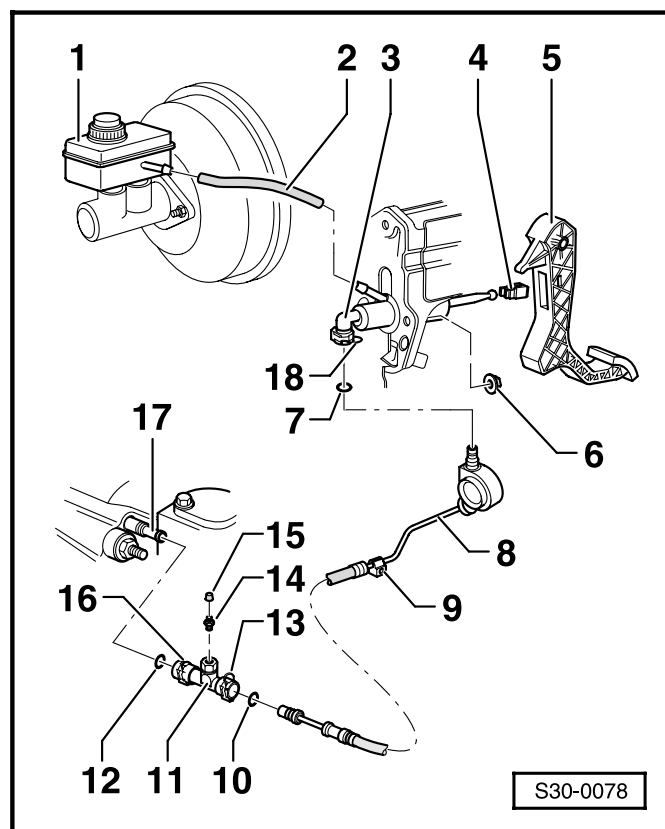


Removing and installing clutch pedal switch

- ◀ - Turn clutch pedal switch 90° to the left and take it out of the clutch pedal bearing bracket -arrows-.
- Press down clutch pedal as far as the stop with your hand.
- Now, insert clutch pedal switch into the assembly opening.
- Then, turn it 90° to the right to secure.
- Release clutch pedal.

The clutch pedal must be in the end position.

Assembly overview - hydraulics



7 - O-ring

- ◆ Fit onto line connection
- ◆ Insert with brake fluid

8 - Pipe-hose line

9 - Fixture

- ◆ Attached to body

10 - O-ring

- ◆ Fit onto line connection
- ◆ Insert with brake fluid

11 - Bleeder

12 - O-ring

- ◆ Fit onto connection
- ◆ Insert with brake fluid

13 - Clamp

- ◆ Pull out clamp only as far as the stop for removing and installing the line

14 - Bleeder valve

- ◆ Bleeding clutch system ⇒ page 30-12

15 - Dust cap

16 - Clamp

- ◆ Pull out only as far as the stop for removing and installing the bleeder

17 - Slave cylinder

- ◆ Take out gearbox for removing and installing ⇒ page 30-13

18 - Clamp

- ◆ Pull out only as far as the stop for removing and installing the line

Special tools, testers and aids required

- ◆ Brake filling and bleeding appliance ROMESS S15
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331

1 - Brake fluid reservoir

2 - Feed hose

3 - Master cylinder

- ◆ Removing and installing ⇒ page 30-7

4 - Mount

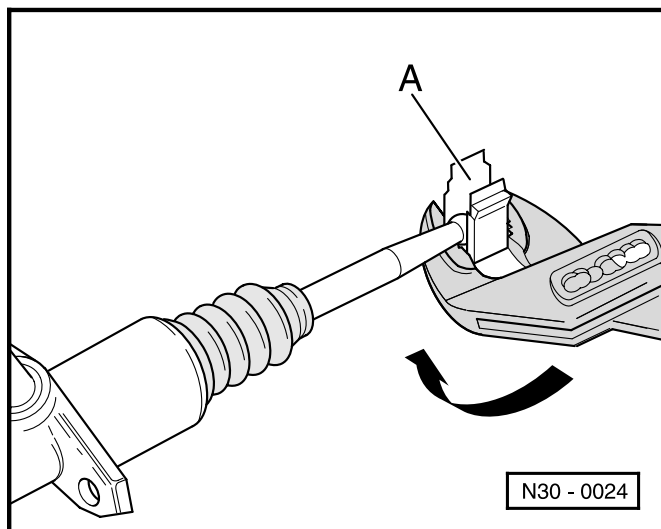
- ◆ Replace only when master cylinder removed
- ◆ Removing ⇒ Fig. 1
- ◆ Fitting on ⇒ Fig. 2

5 - Clutch pedal

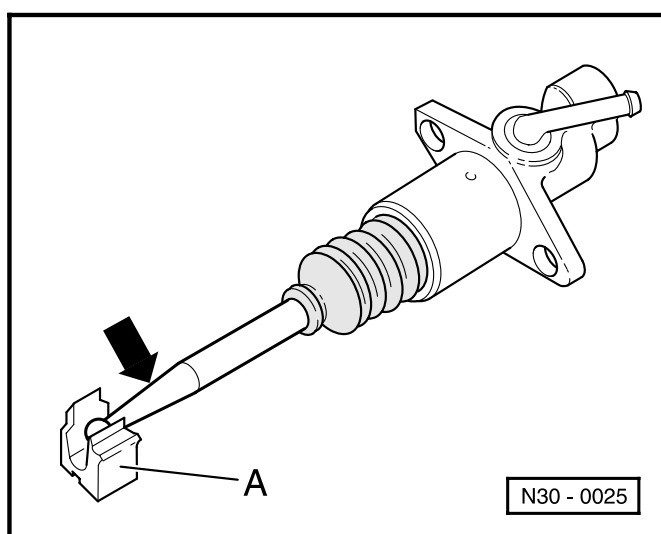
- ◆ Removing and installing ⇒ page 30-4

6 - 25 Nm

- ◆ Always replace



◀ Fig. 1 Levering off mount -A- in direction of arrow



◀ Fig. 2 Pressing operating rod of master cylinder into mount -A- (direction of arrow)

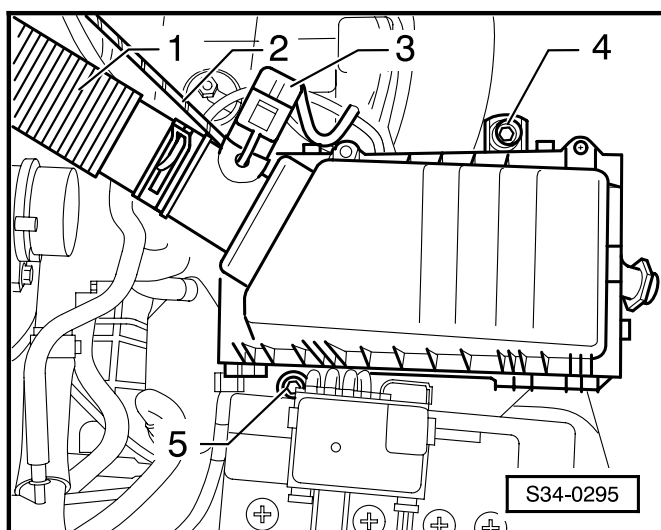
Removing and installing master cylinder

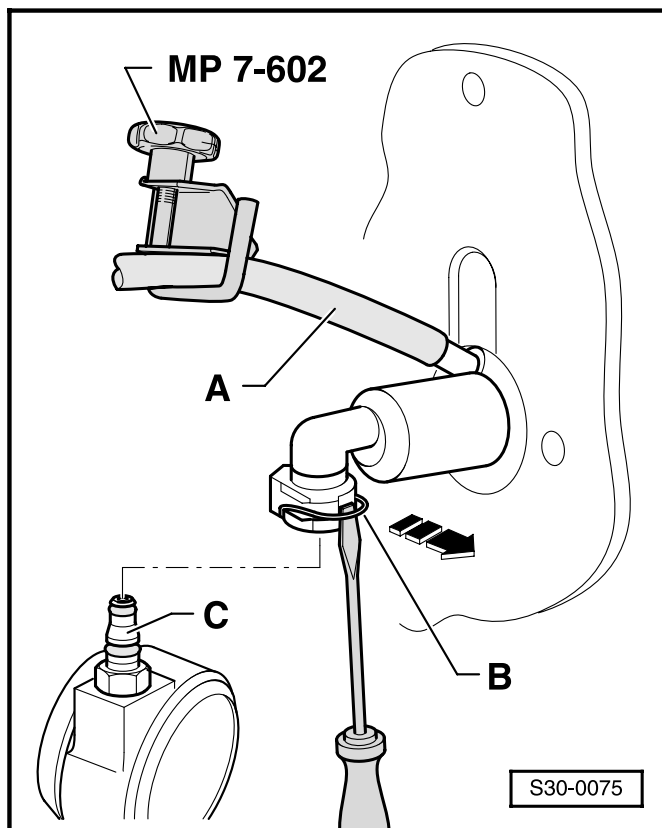
Special tools, testers and aids required

- ◆ Hose clamp MP 7-602
- ◆ Pliers T10005

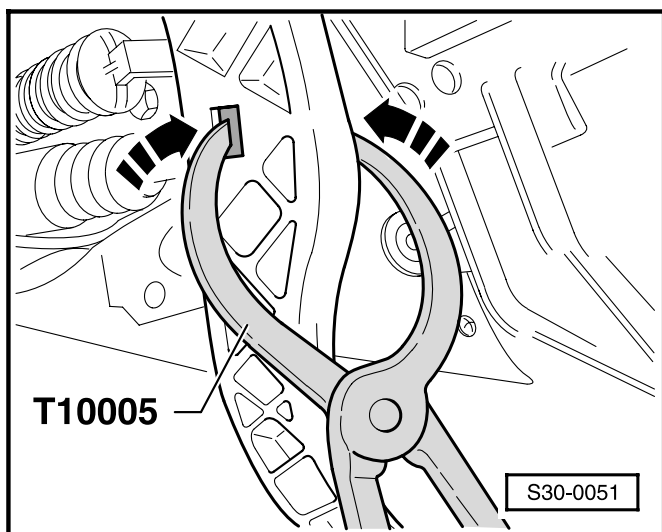
Removing

- ◀ - Take off inlet hose -1-.
- Detach bleeder hose -2- and connector -3- of air mass meter.
- Remove air filter housing complete; take out screws -4- and -5- for this step.
- Take off additional relay carrier in left of engine compartment and unclip cable holder.

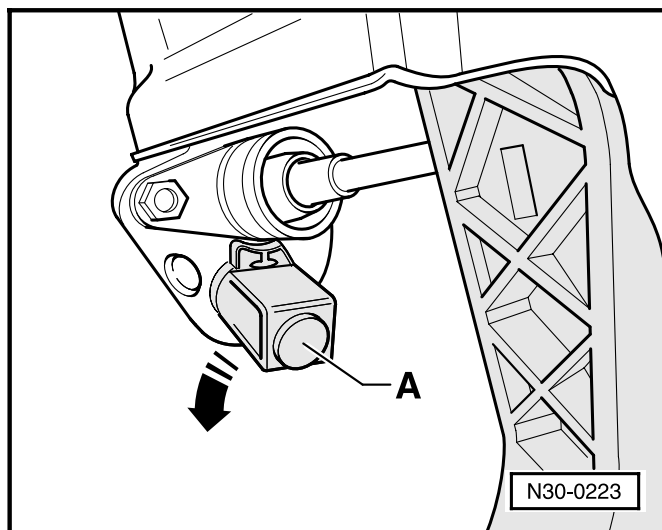




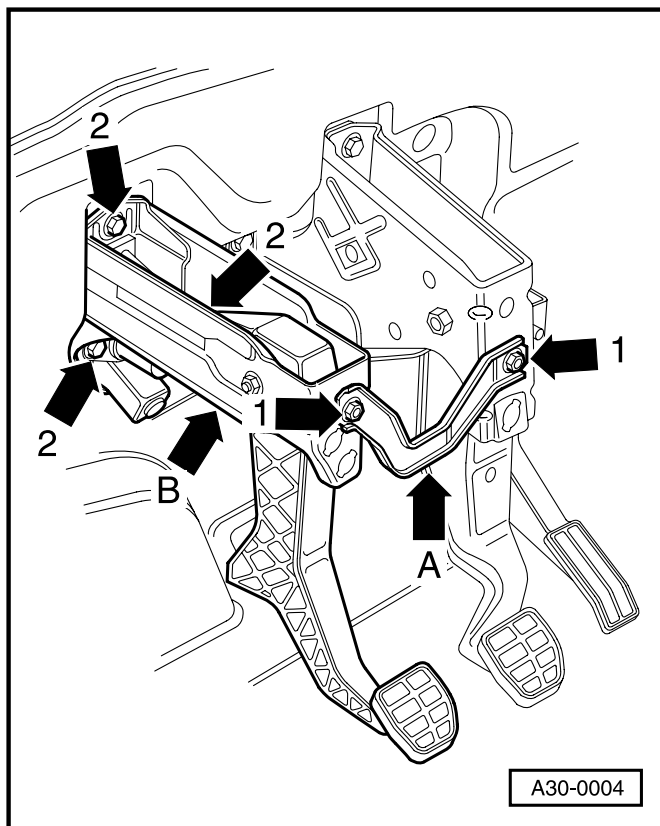
- ◀ - Pinch off feed hose -A- to brake fluid reservoir with hose clamp MP 7-602.
- Use a screwdriver to lever out clamp -B- for pipe-hose line in direction of arrow as far as the stop.
- Pull pipe-hose line -C- out of master cylinder and seal.
- Remove storage compartment on driver side at bottom left.
⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel.
- Remove clutch pedal switch, if fitted ⇒ page 30-5.



- ◀ Unlock operating rod of master cylinder from clutch pedal as follows:
- Insert pliers T10005 into the recesses of the clutch pedal.
- Press the mount together and separate the clutch pedal from the master cylinder.

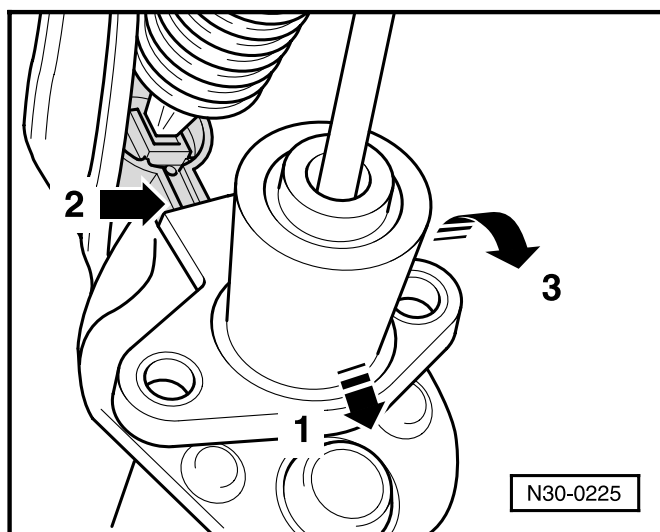


- ◀ - Turn the stop -A- for the clutch pedal in direction of -arrow- and take it out.

**Note:**

The clutch pedal assembly is removed complete in order to take out the master cylinder.

- ◀ - Unscrew hexagon nuts -arrows 1- and take off connecting plate -arrow A-.
- Unscrew hexagon nuts -arrows 2- and remove clutch pedal assembly -arrow B- complete with master cylinder.

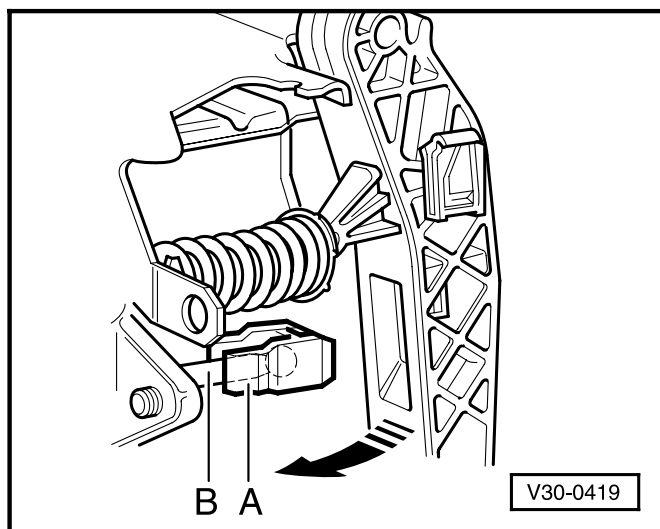


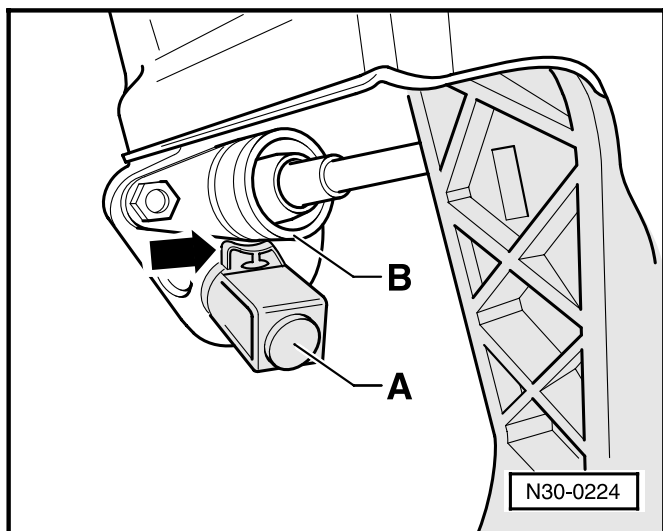
- ◀ - Then, first of all push the master cylinder as far as the stop in direction of -arrow 1-.
- It must not be concealed in the top area by the mounting for the over-centre spring -arrow 2-.
- Then, swivel it out of the bearing bracket in direction of -arrow 3-.

Installing

Installation is carried out in the reverse order; pay attention to the following points:

- ◀ - The mount -A- must be positioned on the operating rod -B- of the master cylinder.
- Press clutch pedal in direction of -arrow- to lock it; ensure it is correctly locked.





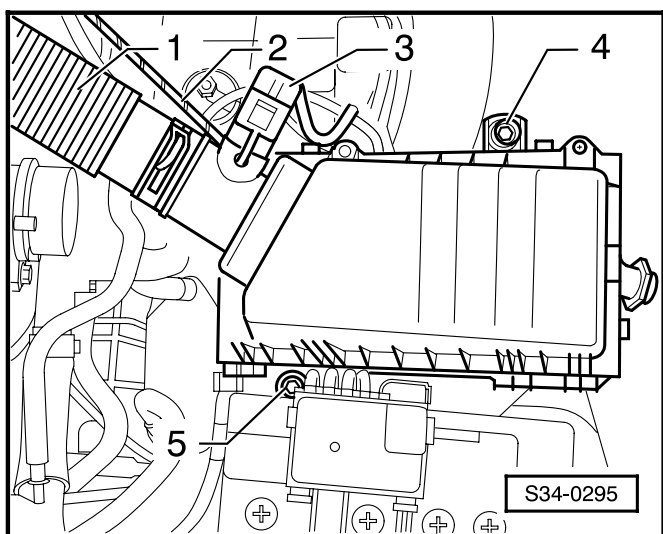
- ◀ - Re-insert the stop -A- for the clutch pedal.

Fitting location:

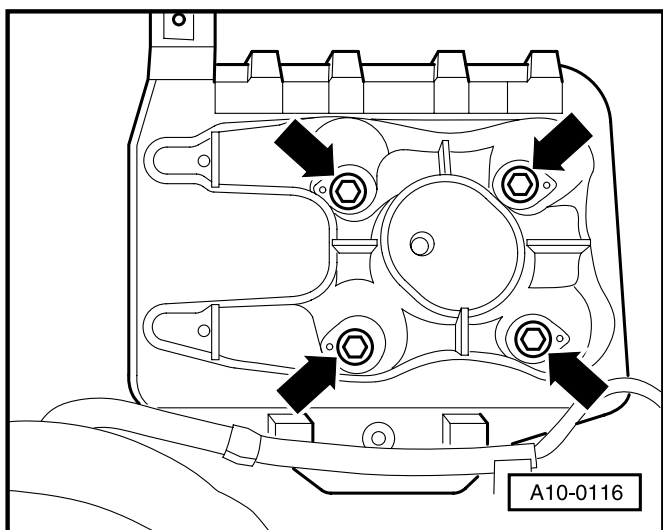
The shoulder -arrow- points toward master cylinder -B-.

- After installing the master cylinder, bleed clutch system ⇒ page 30-12.

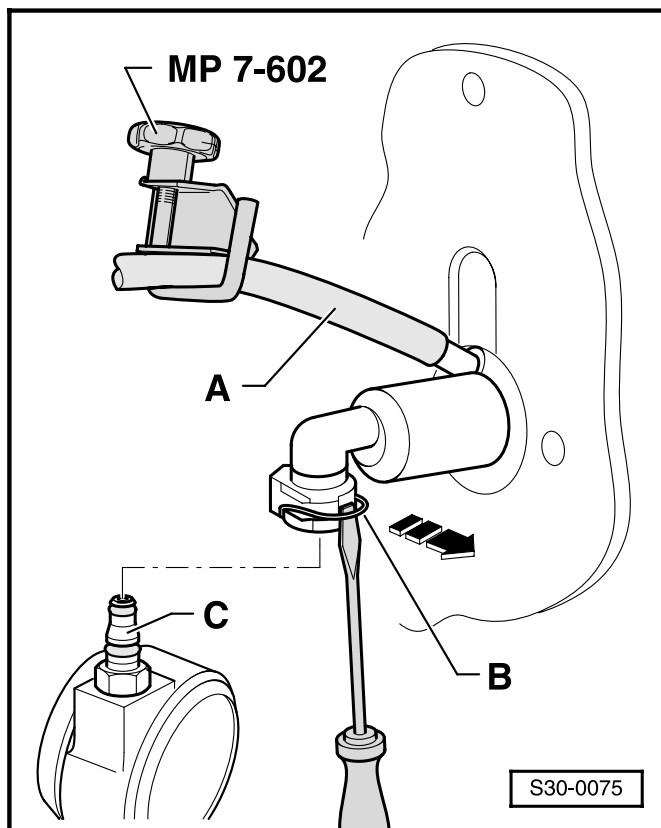
Removing and installing pipe-hose line



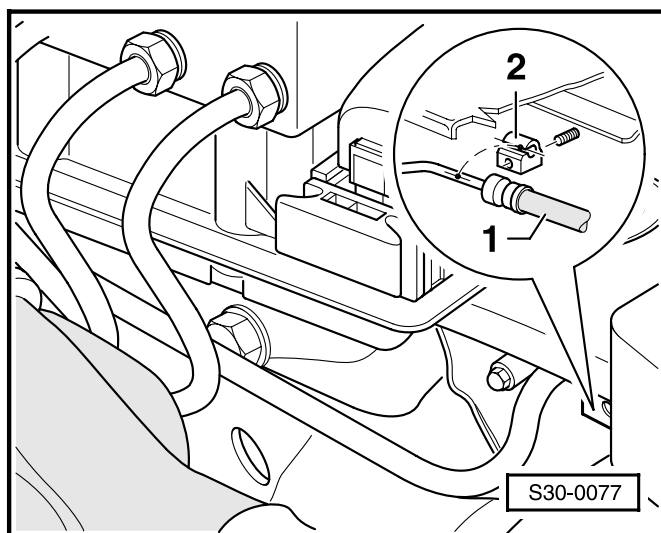
- ◀ - Take off inlet hose -1-.
- Detach bleeder hose -2- and connector -3- of air mass meter.
 - Remove air filter housing complete; take out screws -4- and -5- for this step.
 - Take off additional relay carrier in left of engine compartment and unclip cable holder.



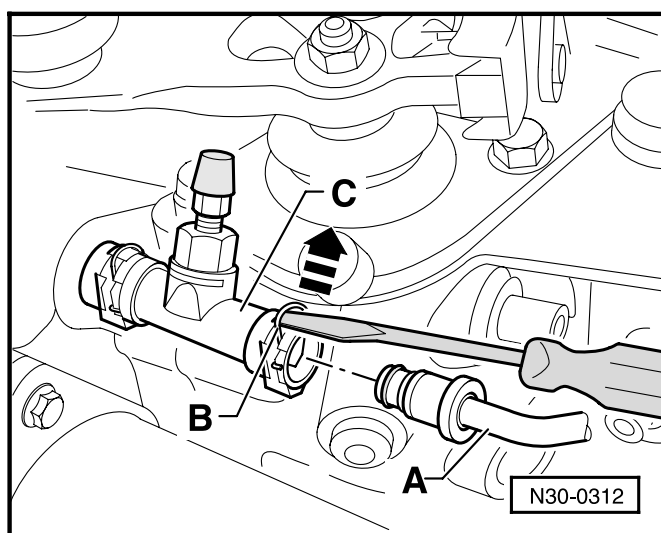
- ◀ - Remove battery and battery support -arrows-.



- ◀ - Pinch off feed hose -A- to brake fluid reservoir with hose clamp MP 7-602.
- Use a screwdriver to lever out clamp -B- for pipe-hose line in direction of arrow as far as the stop.
- Pull pipe-hose line -C- out of master cylinder.



- ◀ - Detach pipe-hose line -1- from fixture -2- at longitudinal member.



- ◀ - Use a screwdriver to lever out clamp -B- for pipe-hose line -A- in direction of arrow as far as the stop.
- Pull pipe-hose line out of bleeder -C-.
- Remove pipe-hose line.

Installing

Installation is carried out in the reverse order; pay attention to the following point:

- After installing pipe-hose line, bleed clutch system ⇒ page 30-12.

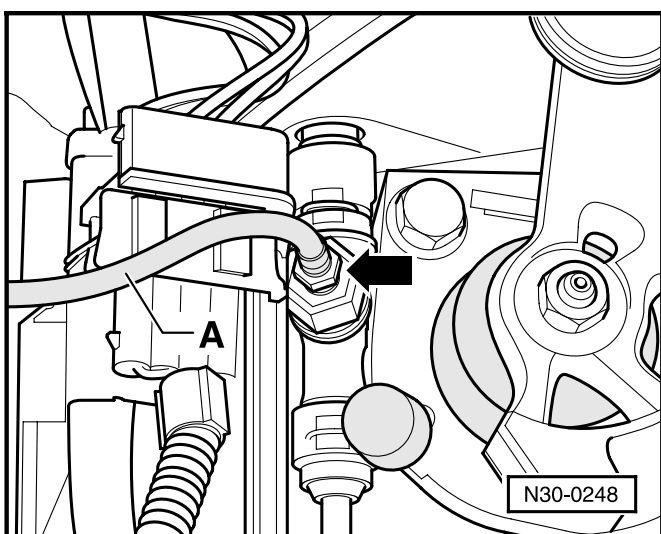
Note:

Carry out additional operations when disconnecting and reconnecting the battery earth strap ⇒ Electrical System; Repair Group 27.

Bleeding clutch system

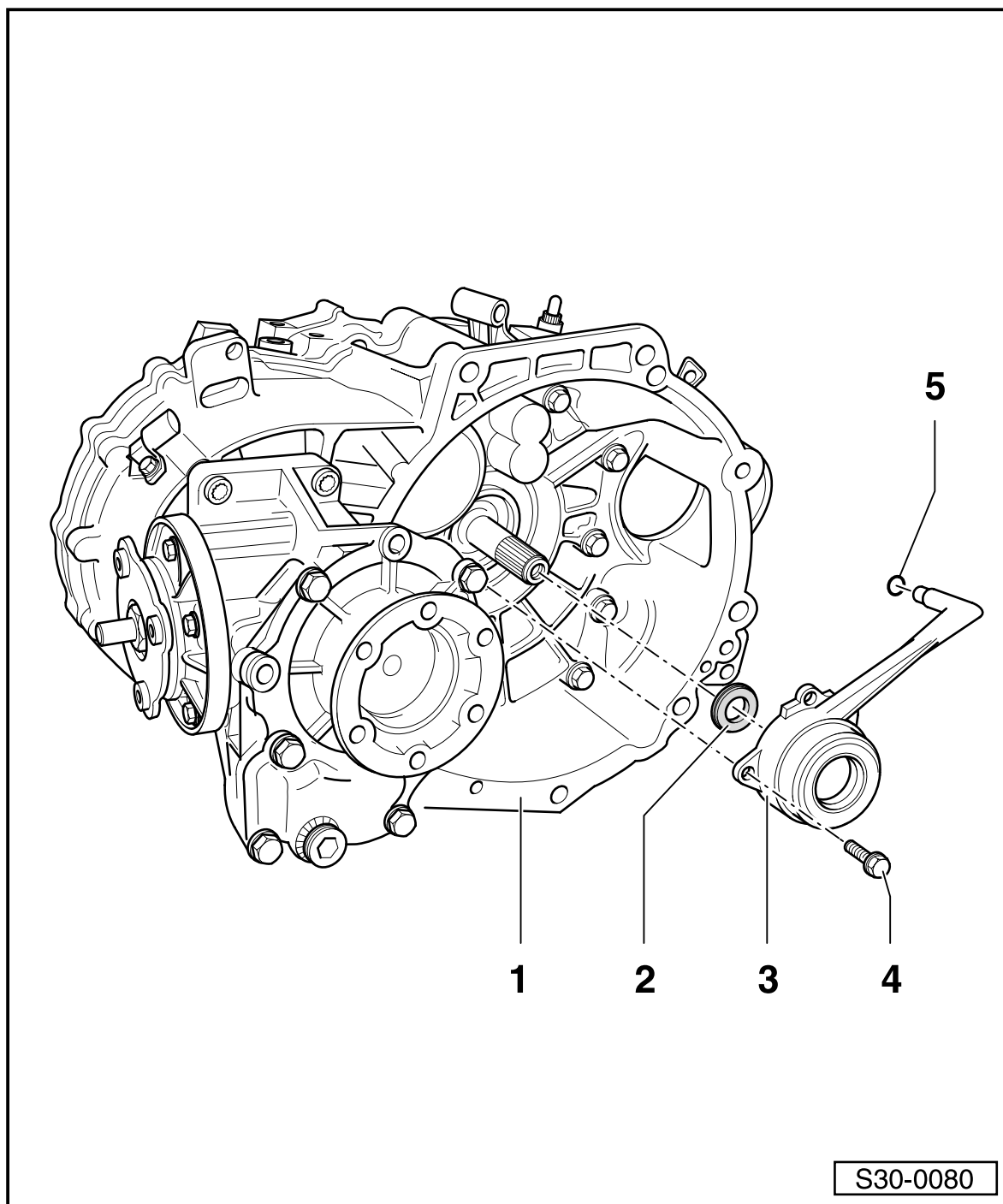
Special tools, testers and aids required

- ◆ Brake filling and bleeding appliance ROMESS S15
- ◆ Specification of brake fluid
⇒ Running Gear; Repair Group 47; Bleeding brake system, models with and without ABS



- Connect the ROMESS S15 brake filling and bleeding appliance.
- ◀ Fit bleed hose -A- onto bleeder -arrow- and open bleeder.
- Pressurise the system with a pressure of 0.2 MPa (2 bar).
- Allow about 100 cm³ of brake fluid to flow out until no further air bubbles are visible.
- Close the bleeder valve.
- Depress the pedal briskly 10 to 15 times.
- Open the bleeder valve.
- Allow a further approx. 100 cm³ of brake fluid to flow out.
- Close the bleeder valve.
- After completing the bleeding operation, depress the clutch pedal several times.
- Disconnect brake fluid and bleeding appliance.

Servicing clutch release mechanism



Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm, e.g. V.A.G 1331

1 - Gearbox

2 - Input shaft seal

- ◆ Replacing ⇒ page 34-56

3 - Slave cylinder with release bearing

- ◆ Single unit, can only be replaced together
- ◆ Do not wash out bearings, only wipe off
- ◆ Replace loud bearings together with slave cylinder

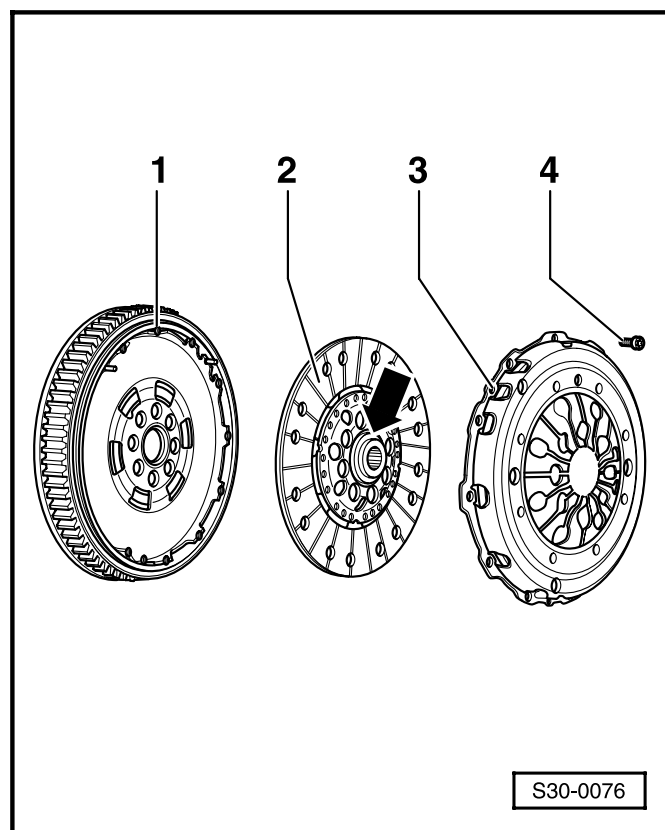
4 - 12 Nm

- ◆ 3 in total

5 - O-ring

- ◆ Fit onto line connection
- ◆ Insert with brake fluid

Servicing clutch



(Gearbox removed)

Special tools, testers and aids required

- ◆ Counterholder MP 1-223
- ◆ Torque wrench 5...50 Nm, e.g. V.A.G 1331
- ◆ Centring drift T10097

Notes:

- ◆ Replace clutch plates and pressure plates which have damaged or loose riveted connections.
- ◆ Assign clutch plate and pressure plate by referring to Parts List and to engine code letters.

1 - Flywheel

- ◆ Ensure tightly fitted on centring pins
- ◆ Contact surface for clutch lining free of grooves, oil and grease
- ◆ Removing and installing

⇒ Engine, Mechanical Components; Repair Group 13

2 - Clutch plate

- ◆ Diameter ⇒ page 00-2
- ◆ Fitting location: shorter hub end -arrow- points toward pressure plate
- ◆ Centring ⇒ Fig. 1
- ◆ Lightly grease splines

Note:

Clean splines of input shaft and, if clutch plates are used, splines of hub. Remove corrosion and apply only a very thin layer of grease Part No. G 000 100, to the splines of the input shaft.

After this, move clutch plate back and forward on the input shaft until the hub moves freely on the shaft. It is essential to remove excess grease.

3 - Pressure plate

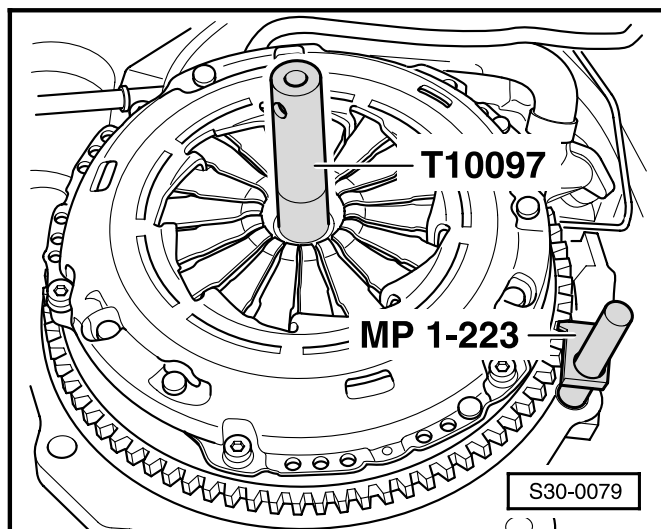
- ◆ Removing and installing ⇒ Fig. 1
- ◆ Inspect ends of diaphragm spring ⇒ Fig. 2

Note:

Pressure plates are protected against corrosion and grease. They must be cleaned only on the contact surface otherwise the life of the clutch will be considerably reduced.

4 - 22 Nm

- ◆ Always replace
- ◆ Slacken and tighten in stages diagonally across



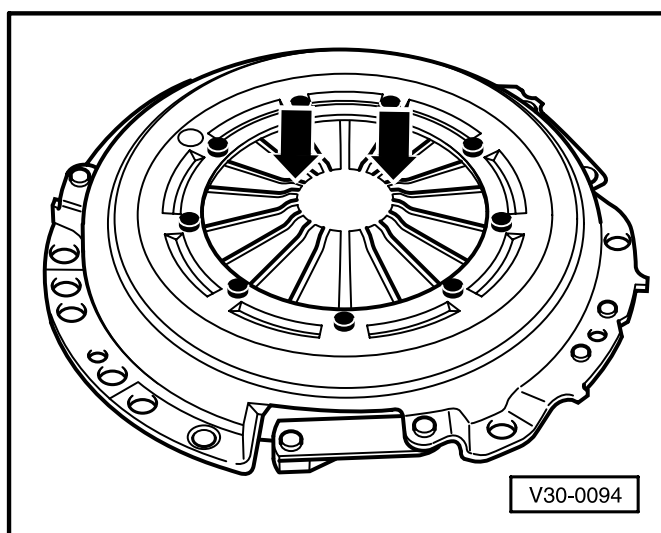
◀ Fig. 1 Centring clutch plate and removing and installing pressure plate

- Slacken and tighten bolts in stages diagonally across.
- Position counterholder MP 1-223 accordingly when removing.

Note:

Contact surface of pressure plate and lining of clutch plate must be making contact with the flywheel all round.

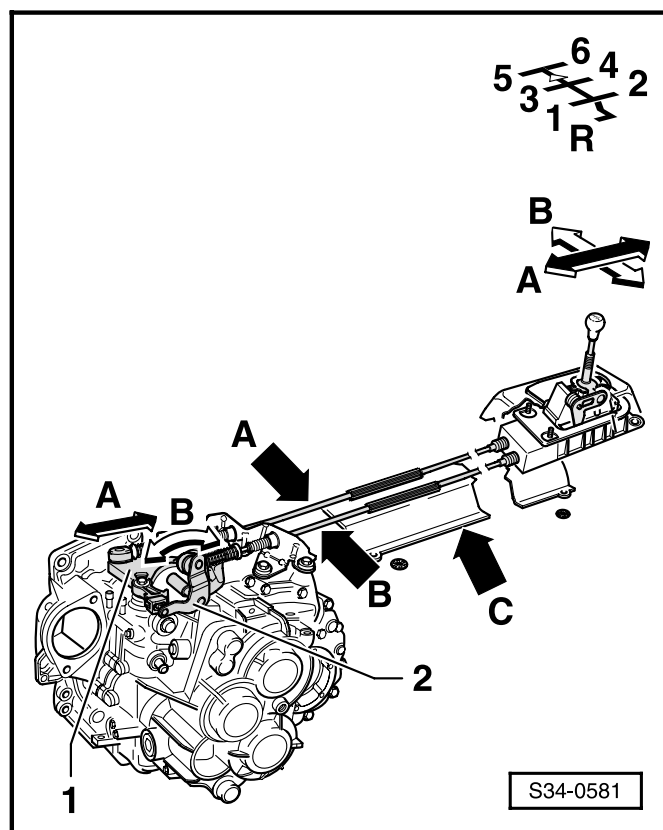
Counter-tighten securing bolts evenly diagonally across in order not to damage the centring holes of the pressure plate and the centring pins of the flywheel.



◀ Fig. 2 Inspecting ends of diaphragm spring

- May be worn down to half the thickness of the diaphragm spring.

Servicing shift mechanism



Fitting location of shift mechanism

A - Shift cable for shift movement

B - Selector cable for selector movement

C - Heat shield

- ◆ Take off before removing shift mechanism.

Arrow -A-Shift movement

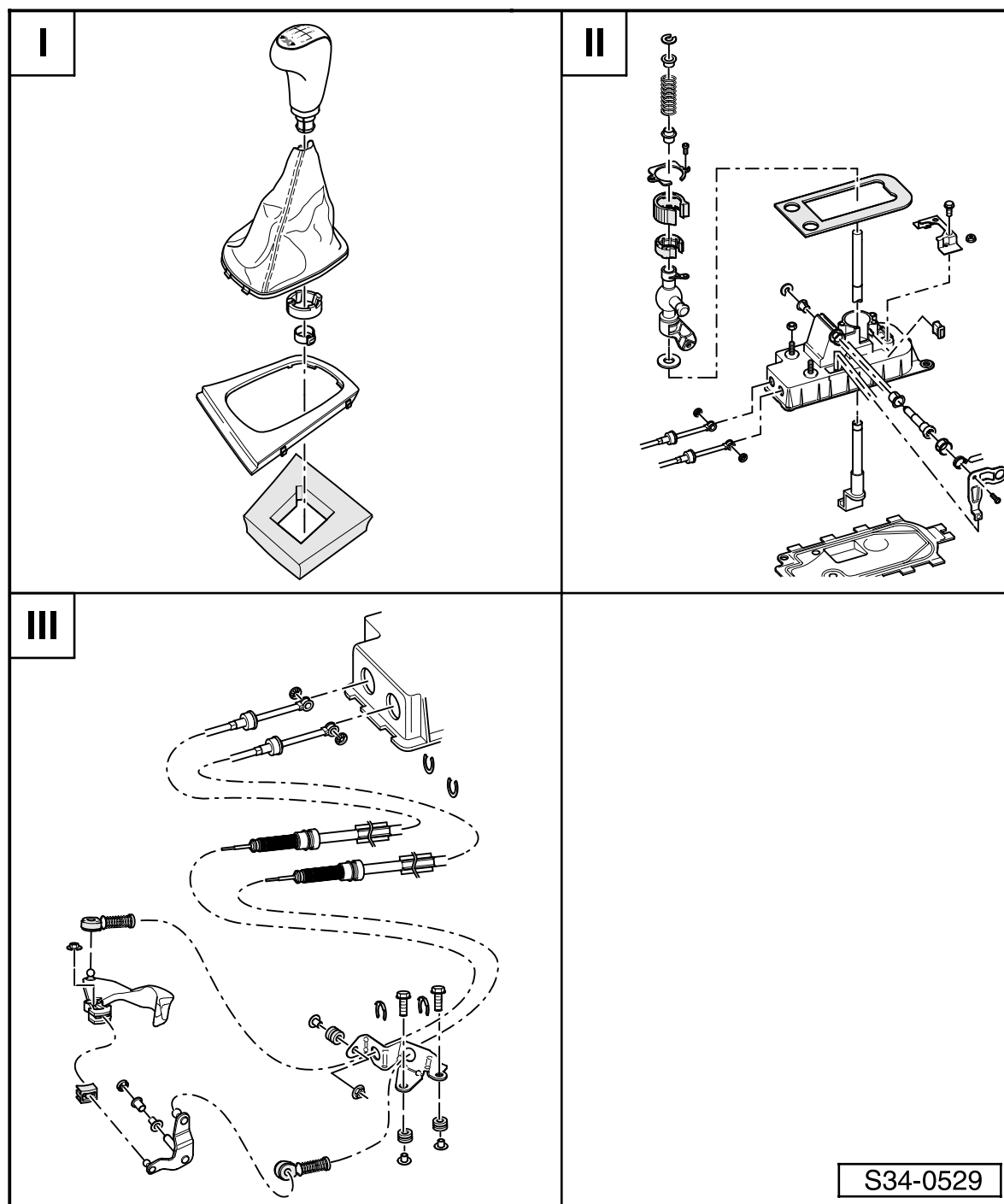
Arrow -B-Selector movement

1 - Gearbox shift lever

2 - Relay lever

Notes:

- ◆ Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.
- ◆ Remove shift mechanism in order to replace the shift mechanism cables ⇒ page 34-10.
- ◆ Do not kink shift mechanism cables.



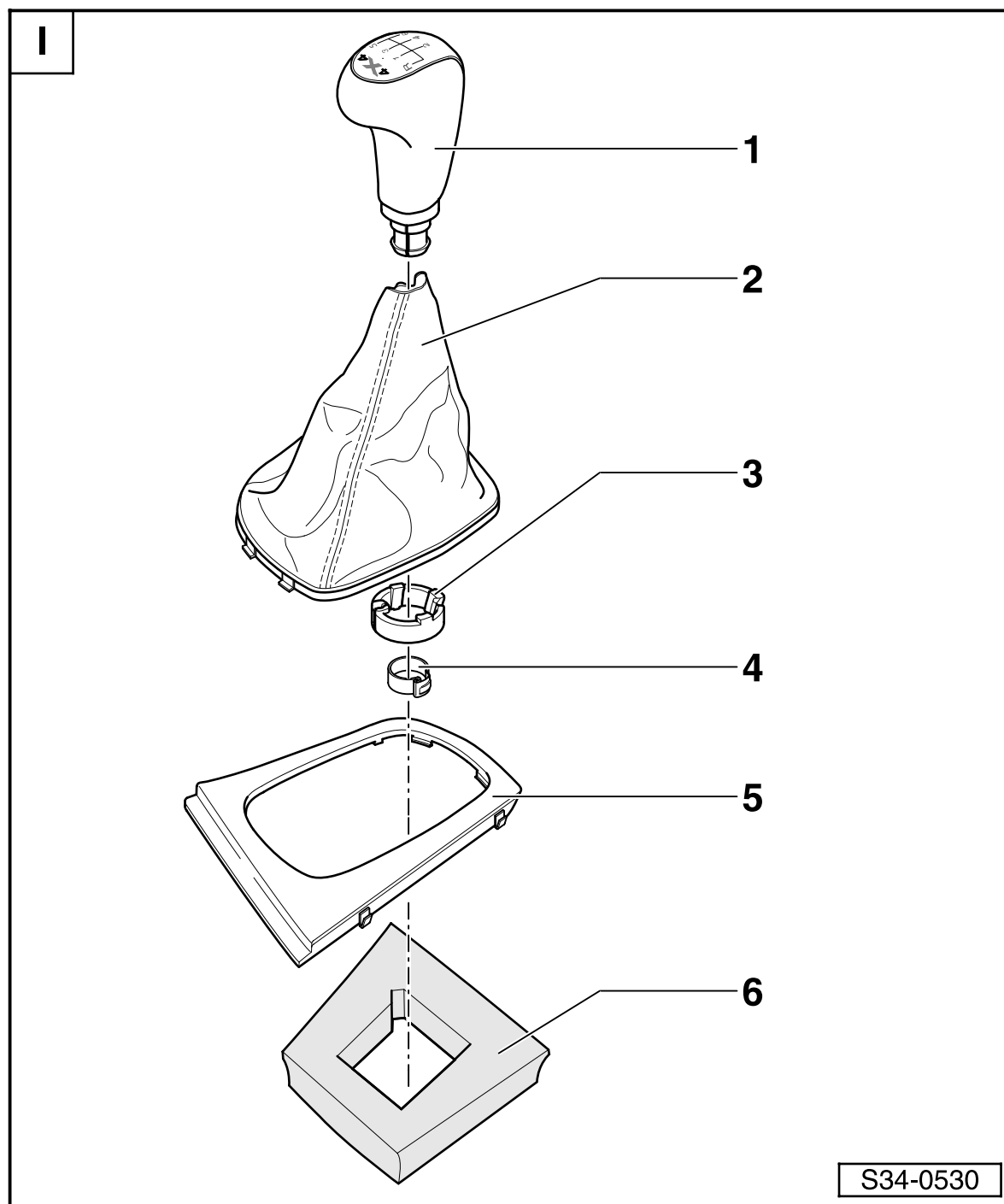
I - Assembly overview - gearshift knob and cover ⇒ page 34-3

II - Assembly overview - gearshift lever and shift housing ⇒ page 34-5

III - Assembly overview - shift mechanism cables ⇒ page 34-8

Removing and installing shift mechanism ⇒ from page 34-10.

Setting shift mechanism ⇒ page 34-14.

I - Assembly overview - gearshift knob and cover**1 - Gearshift knob**

- ◆ When removing, also take off cover -item 2-
- ◆ Removing ⇒ page 34-10

2 - Cover

- ◆ When removing, also take off gearshift knob -item 1-
- ◆ Removing ⇒ page 34-10
- ◆ Separating cover from gearshift knob ⇒ page 34-4

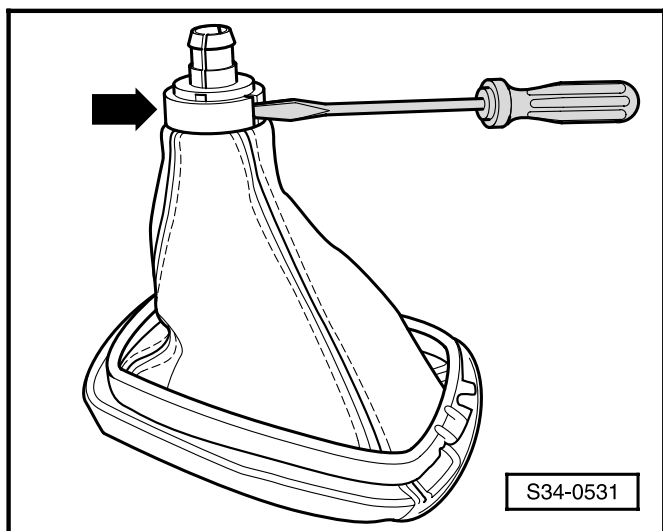
3 - Connection piece

- ◆ Connects cover to gearshift knob
- ◆ Removing ⇒ page 34-4

4 - Collar clamp

- ◆ For attaching gearshift knob to lever

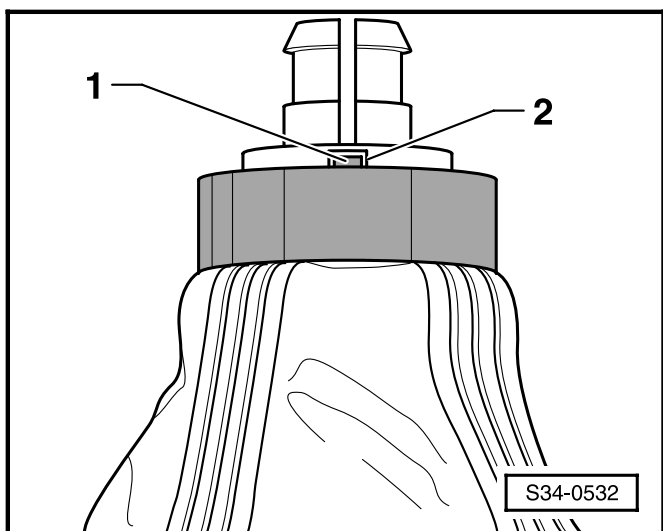
5 - Surround of centre console**6 - Noise insulation**

Separating cover from gearshift knob

- Turn inside of cover out.
- ◀ - Use a screwdriver to lever apart connection part -arrow-.
- Pull connection part off gearshift knob.
- Turn cover to outside and pull it off the gearshift knob.

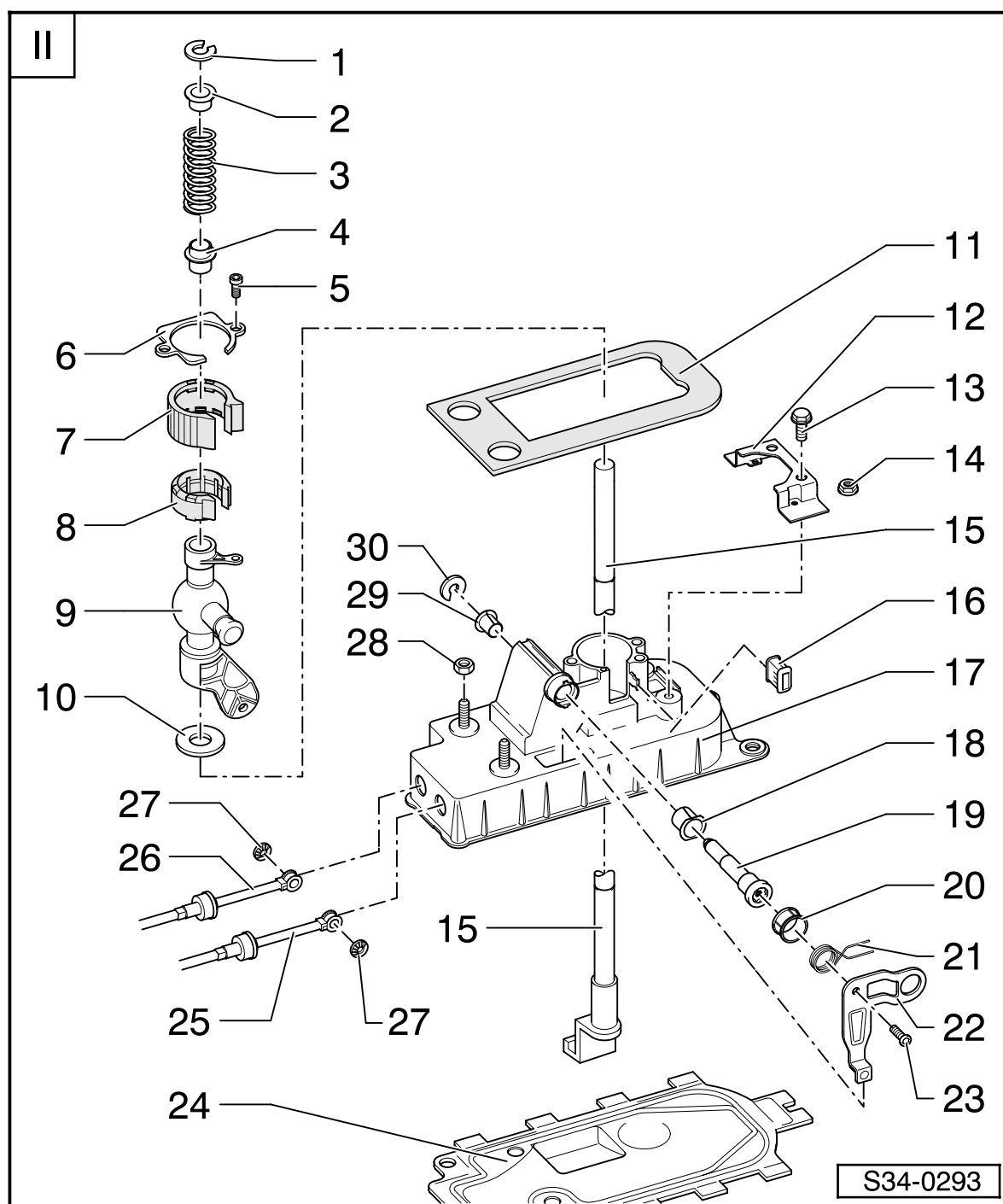
Installing

- Turn inside of cover out.
- Insert gearshift knob into cover.
- Push connection piece over gearshift knob and cover and then compress connection piece until it locks in place.



- ◀ The two small catches -1- of the connection piece must engage in the recesses of the gearshift knob -2-.

II - Assembly overview - gearshift lever and shift housing



Note:

Grease bearing points and contact surfaces with poly resin grease Part No. G 052 142 A2.

1 - Lock washer

♦ Removing and installing ⇒ Fig. 1

2 - Bush

3 - Compression spring

4 - Bush

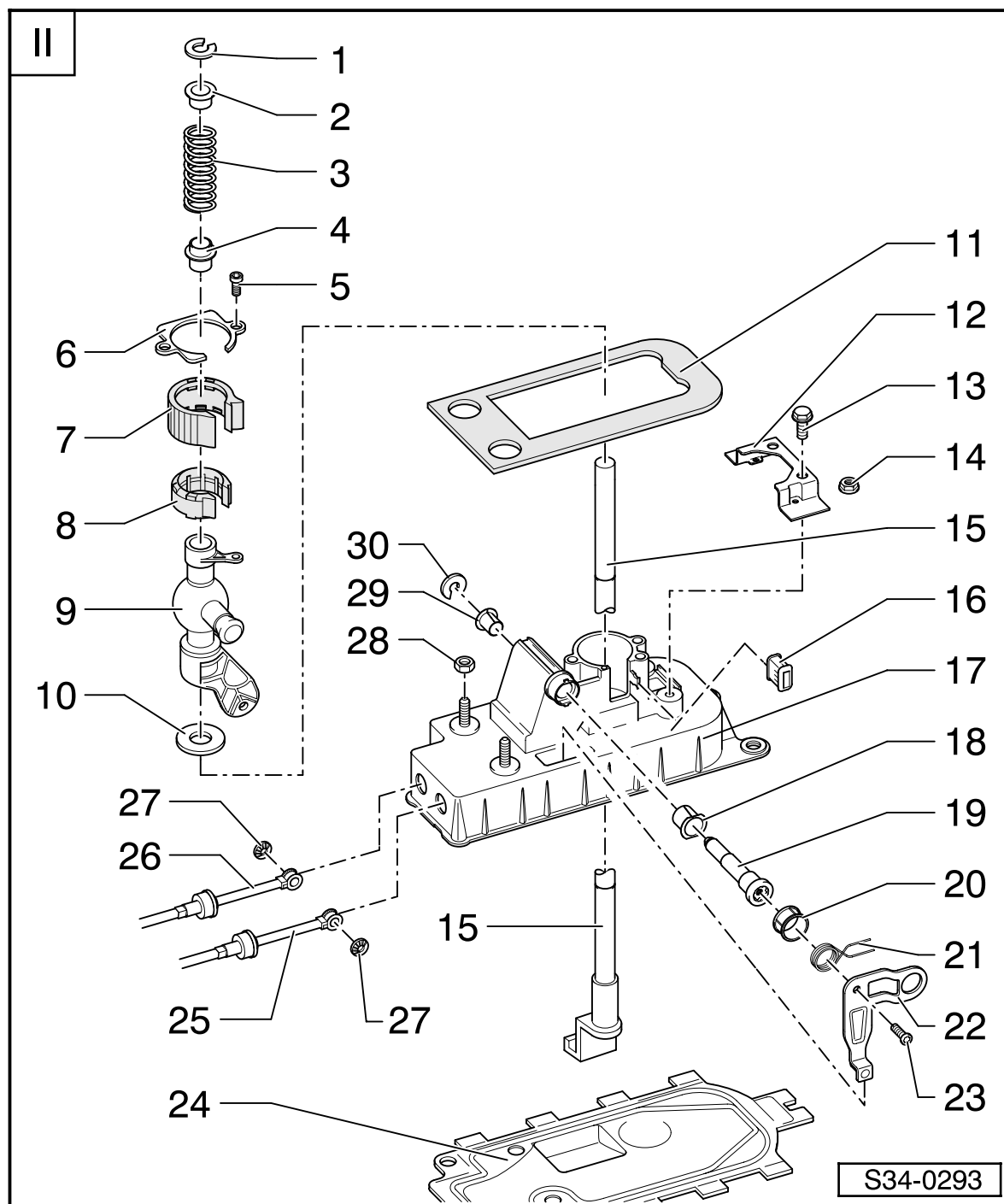
5 - 5 Nm

6 - Cover

7 - Noise insulation

8 - Bearing shell

9 - Shift lever guide



10 - Noise insulation washer

11 - Gasket

- ◆ Between shift housing and underfloor
- ◆ Self-adhesive
- ◆ Stick onto shift housing

12 - Bracket

- ◆ Attached to body

13 - 25 Nm

14 - 25 Nm

- ◆ For bracket attached to body

15 - Shift lever

16 - Insulation piece

17 - Shift housing

18 - Bearing bush

19 - Bearing pin

20 - Guide bush**21 - Compression spring**

- ◆ Installing ⇒ Fig. 2

22 - Selector angle bracket**23 - 5 Nm****24 - Floor plate**

- ◆ Bend up shoulders for removing
- ◆ Replace

25 - Selector cable

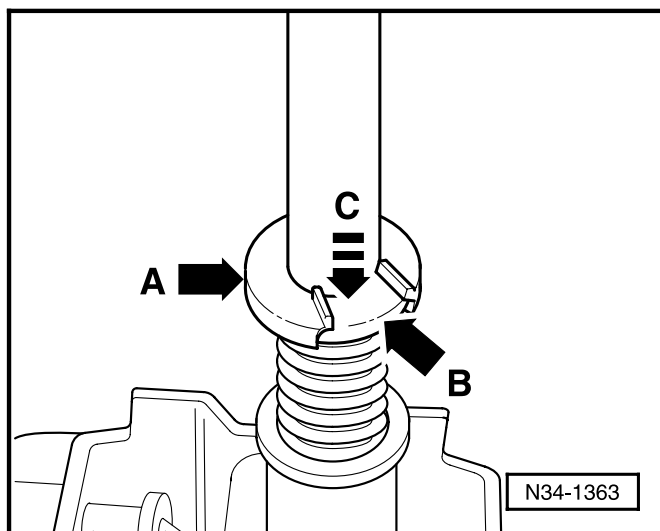
- ◆ Attached to selector angle bracket
- ◆ Fitting location ⇒ page 34-1

26 - Shift cable

- ◆ Press onto shift lever guide
- ◆ Fitting location ⇒ page 34-1

27 - Lock washer**28 - 25 Nm****29 - Bearing bush**

- ◆ Fits only in one position

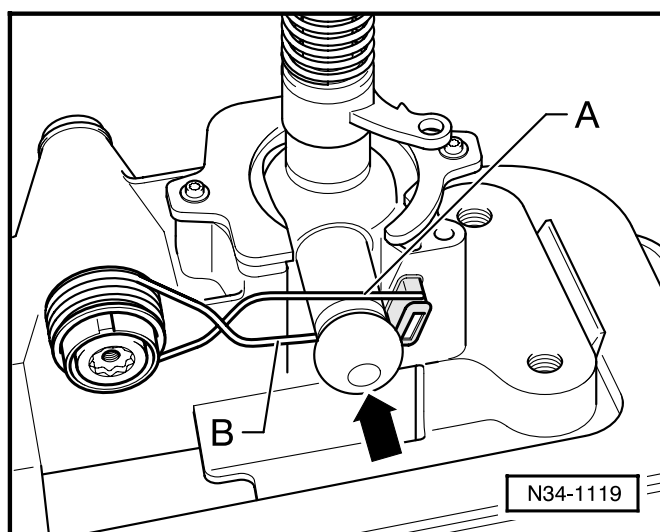
30 - Lock washer

◀ Fig. 1 Removing and installing lock washer

- To remove and install the lock washer -A-, press spacer bush -B- with screwdriver in direction of arrow -C- as far as the stop and pull off lock washer.

Note:

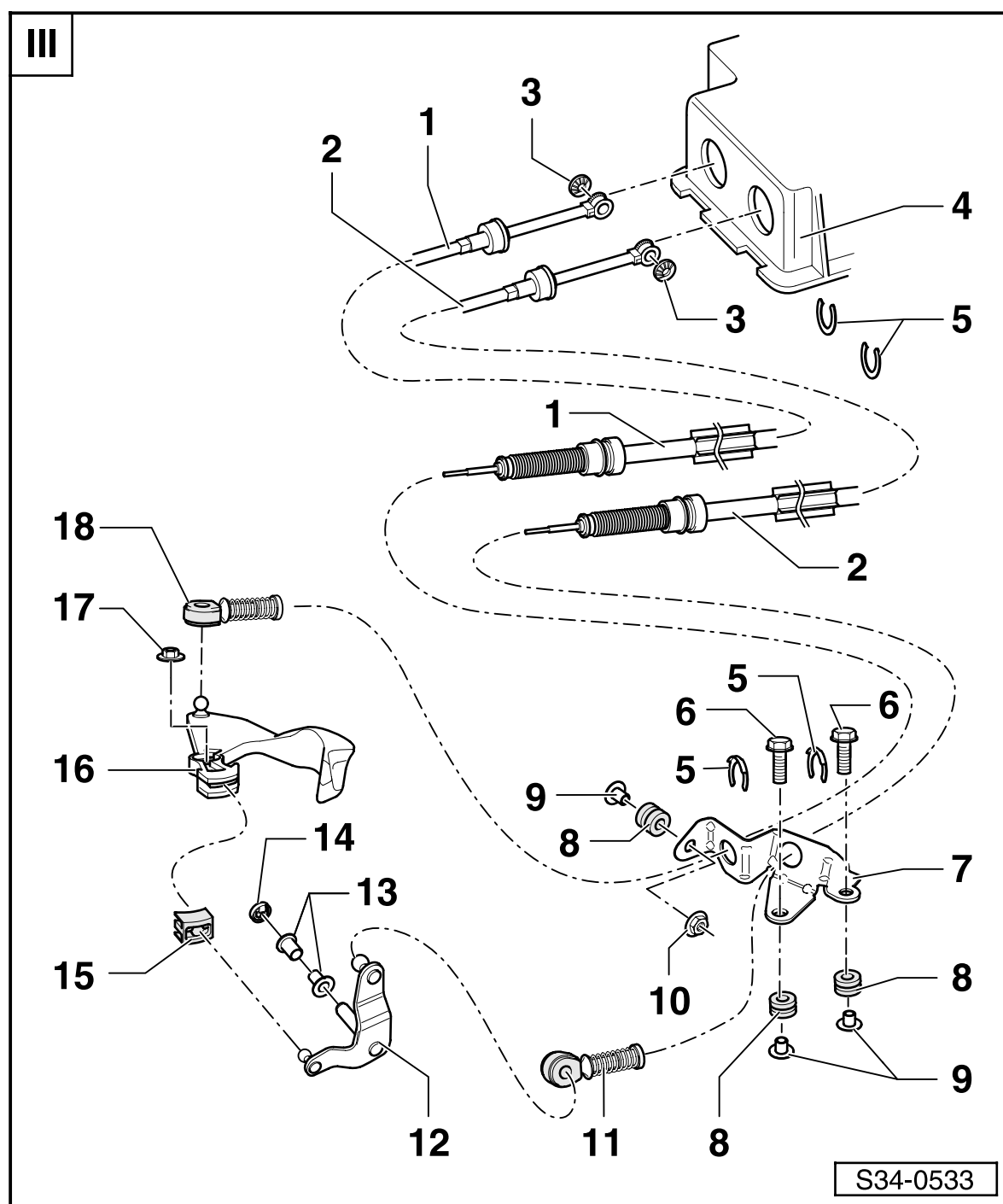
Do not twist spacer bush when pressing down. Release spring carefully.



◀ Fig. 2 Installing compression spring

- Insert the compression spring so that the leg -A- is positioned above the stud -arrow-.
- After this, pull the leg -B- down far enough so that it is positioned on the underside of the stud -arrow-.

III - Assembly overview - shift mechanism cables



Note:

Grease bearing points and contact surfaces with poly resin grease Part No. G 052 142 A2.

1 - Shift cable

- ◆ Press onto shift lever guide
- ◆ Fitting location ⇒ page 34-1

2 - Selector cable

- ◆ Fitted to relay lever
- ◆ Fitting location ⇒ page 34-1

3 - Lock washer

4 - Shift housing

5 - Lock washer

- ◆ Do not damage cables when removing

6 - 25 Nm

- ◆ For support bracket

7 - Support bracket

8 - Grommet

- ◆ Mounting of support bracket to gear-box

9 - Spacer**10 - 25 Nm****11 - Cable lock**

- ◆ For selector cable at relay lever
- ◆ Replace after levering off at relay lever -item 12-

12 - Relay lever

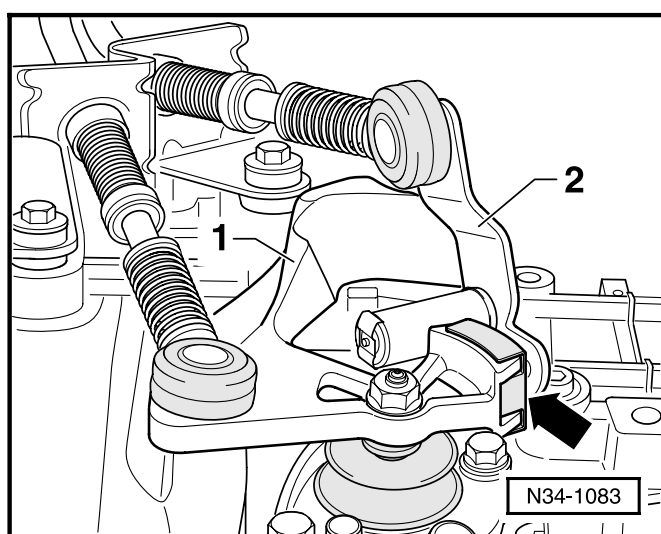
- ◆ Fitting location ⇒ page 34-9

13 - Bearing bush**14 - Lock washer****15 - Sliding shoe****16 - Gearbox shift lever**

- ◆ With balancing weight
- ◆ Insert so that interrupted spacing of teeth matches shift shaft
- ◆ After installing, set shift mechanism p page 34-14
- ◆ Fitting location p page 34-9

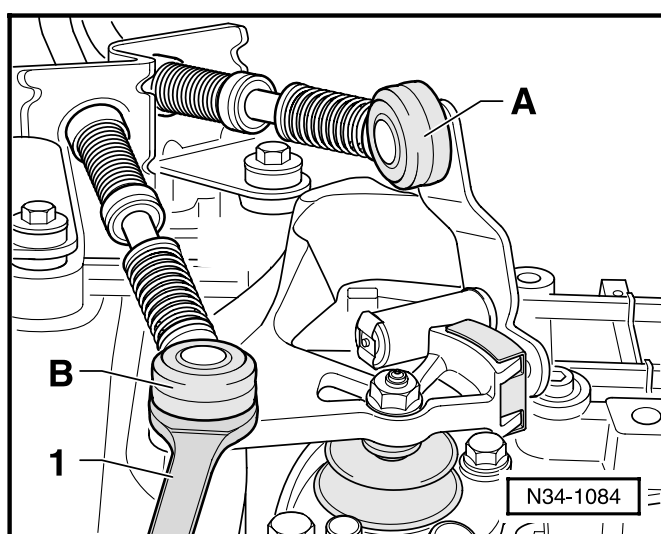
17 - 20 Nm**18 - Cable lock**

- ◆ For shift cable at shift lever
- ◆ Replace after levering off at gearbox shift lever -item 16-



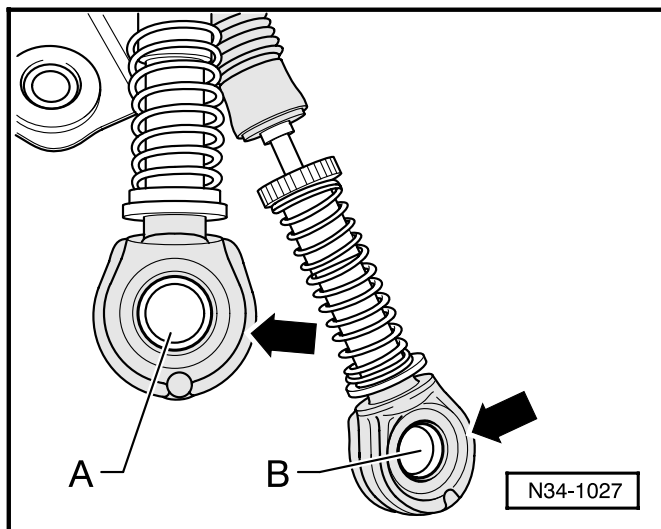
◀ **Fitting location of gearbox shift lever/relay lever**

- 1 - Gearbox shift lever with balancing weight
- 2 - Relay lever meshes by means of sliding shoe in sliding rail of gearbox shift lever -arrow-.



Removing and installing cable lock

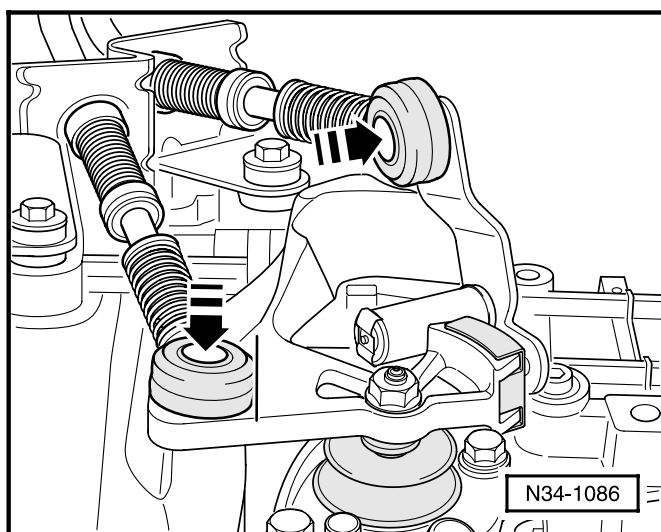
- ◀ - Use open-end wrench to lever selector cable -A- and shift cable -B- off the gearbox.
- 1 - Commercially available size 13 open-end wrench



- ◀ - Coat a small quantity of poly resin grease in the ball socket of the shift cable lock -A- and the selector cable lock -B-.

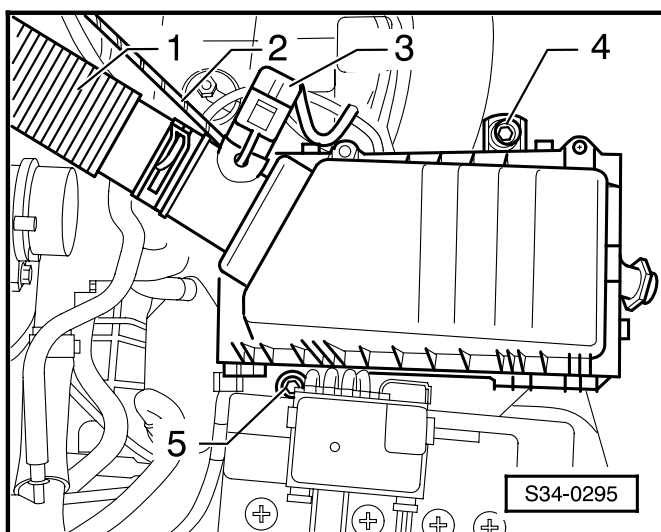
Note:

The seals -arrows- outside of the ball socket must be free of grease.



- ◀ - Press the shift cable onto the gearbox shift lever and the selector cable onto the relay lever -arrows-.

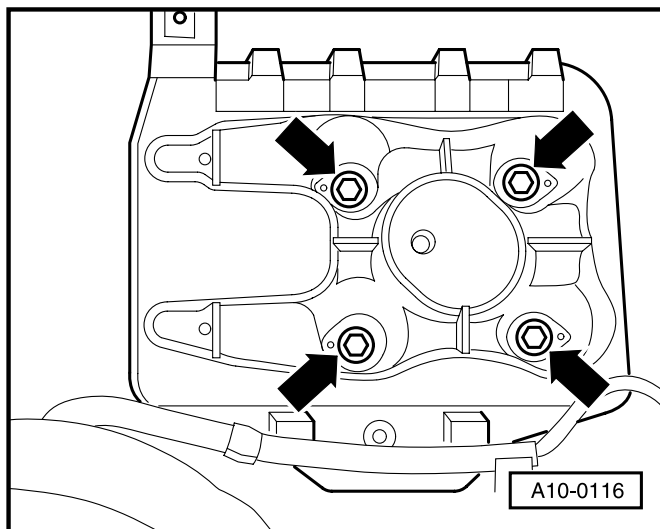
Setting shift mechanism ⇒ page 34-14.



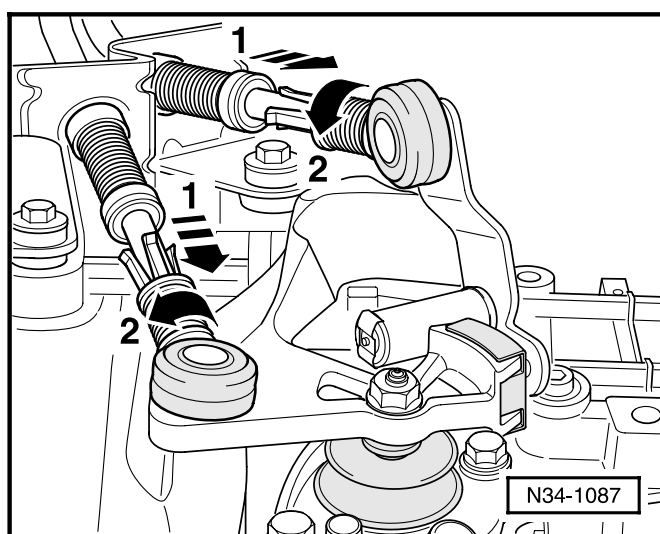
Removing and installing shift mechanism

Removing

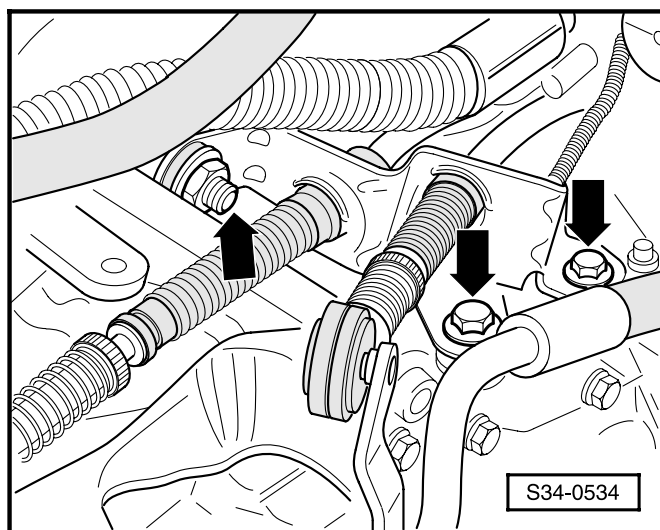
- Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.
- Switch off ignition (if not already off) and disconnect earth strap at the battery.
- ◀ - Take off intake hose -1-.
- Detach bleeder hose -2- and unplug connector -3- of air mass meter.
- Remove air filter housing complete; take out screws -4- and -5- for this step.



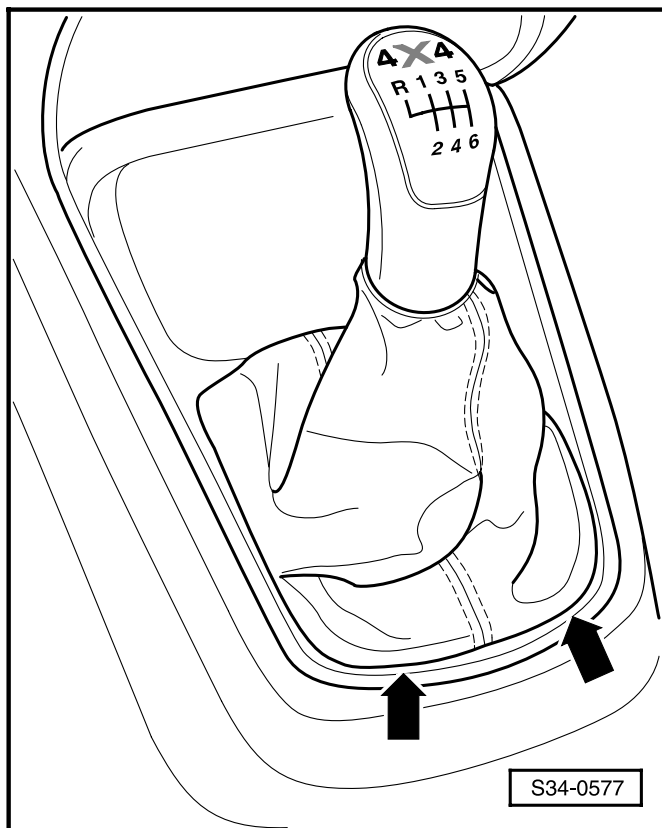
◀ - Remove battery and battery carrier -arrows-.



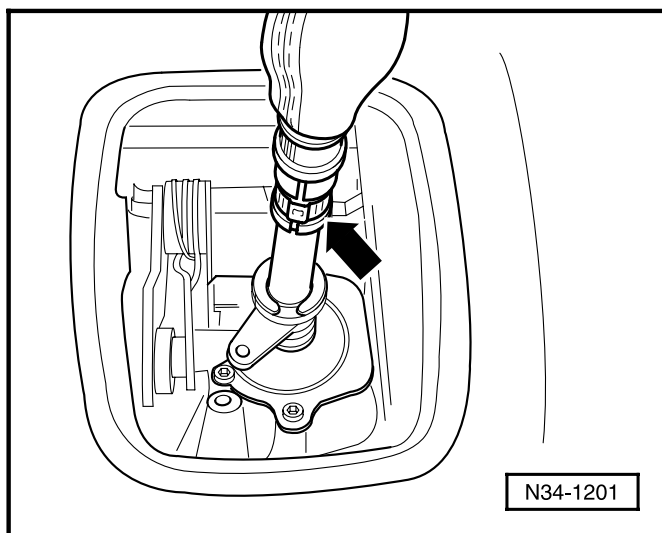
◀ - Pull lock mechanism at shift cable and at selector cable fully forward -arrows 1- and then lock by turning to the left -arrows 2-.



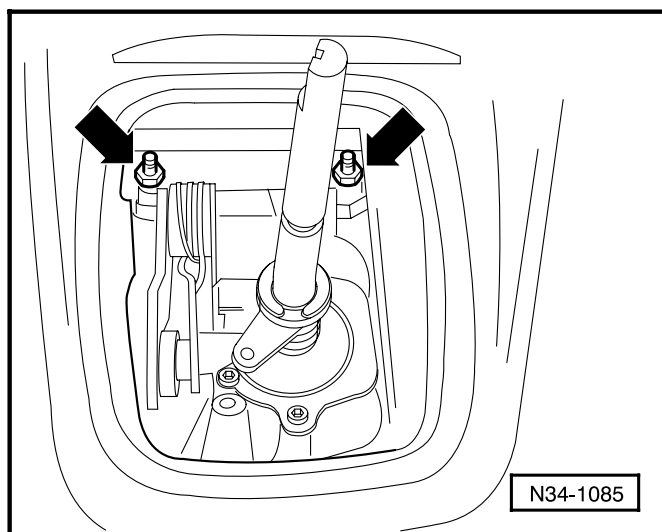
◀ - Detach cable support bracket from gearbox -arrows-.



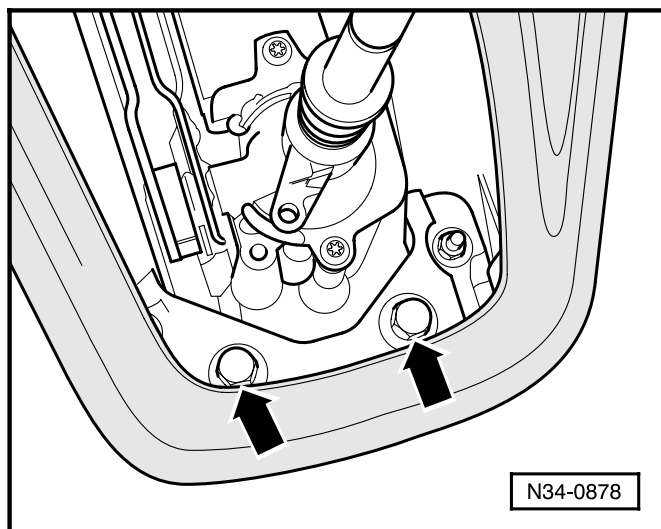
- ◀ - Lever cover together with surround up and out of centre console -arrows-.



- Fold cover up and over gearshift knob.
- ◀ - Open clip -arrow- and pull off gearshift knob together with cover.
- Remove noise insulation.



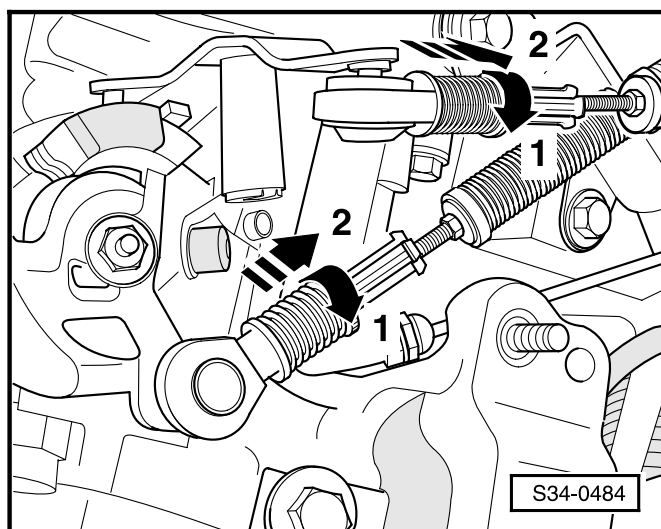
- ◀ - Unscrew front nuts -arrows- attaching shift housing.



- ◀ - Unscrew the rear bolts -arrows- attaching the shift housing.
- Remove catalytic converter.
⇒ Engine, Mechanical Components; Repair Group 26; Removing and installing parts of the exhaust system
- Remove front and middle shields.
- Remove propshaft.
⇒ 5-Speed Manual Gearbox 02C 4x4; Repair Group 39; Removing and installing propshaft
- Swivel shift housing down and take out together with cables.

Installing

Installation is carried out in the reverse order; pay attention to the following points:



- Assembly exhaust system free of stress.
⇒ Engine, Mechanical Components; Repair Group 26; Removing and installing parts of exhaust system
- ◀ - Turn the locking mechanism at the shift cable and at the selector cable fully to the right -arrows 1-.

The spring pushes the locking mechanism into the initial position -arrows 2-.

Adjust shift mechanism ⇒ page 34-14.

- Install battery and battery rack.
⇒ Electrical System; Repair Group 27

Note:

Carry out additional operations when disconnecting and reconnecting the battery earth strap
⇒ Electrical System; Repair Group 27.

Tightening torques

Components	Tightening torque
Shift housing to body	25 Nm
Cable support to gearbox	25 Nm

Setting shift mechanism

Special tools, testers and aids required

- ◆ Locking pin T10027

Notes:

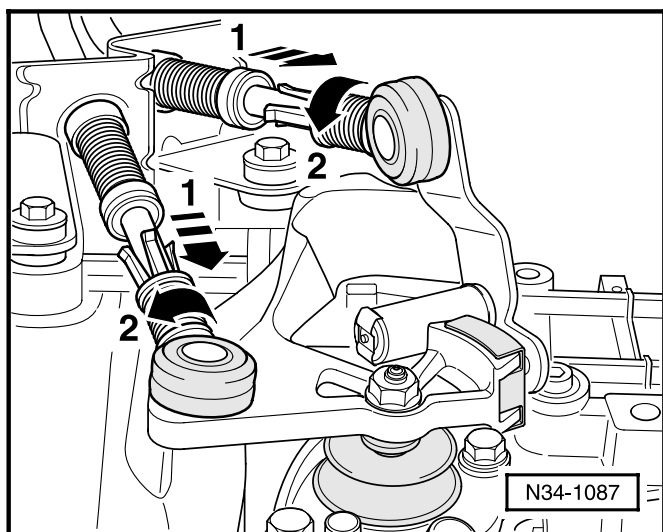
The following points are essential for correctly setting the shift mechanism:

- ◆ Operating and transmission elements of the shift mechanism in proper condition.
- ◆ Shift mechanism operates freely.

In addition, gearbox, clutch and clutch mechanism must be in proper condition.

- Gearbox in Neutral.

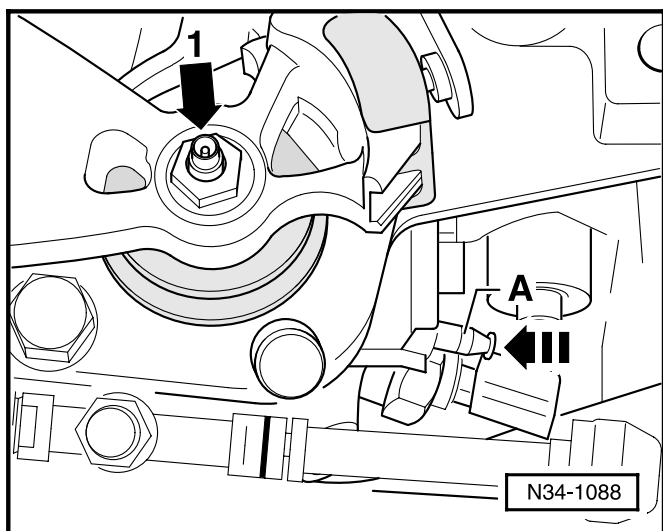
- ◀ - Pull lock mechanism at shift cable and at selector cable fully forward -arrows 1- and then lock by turning to the left -arrows 2-.

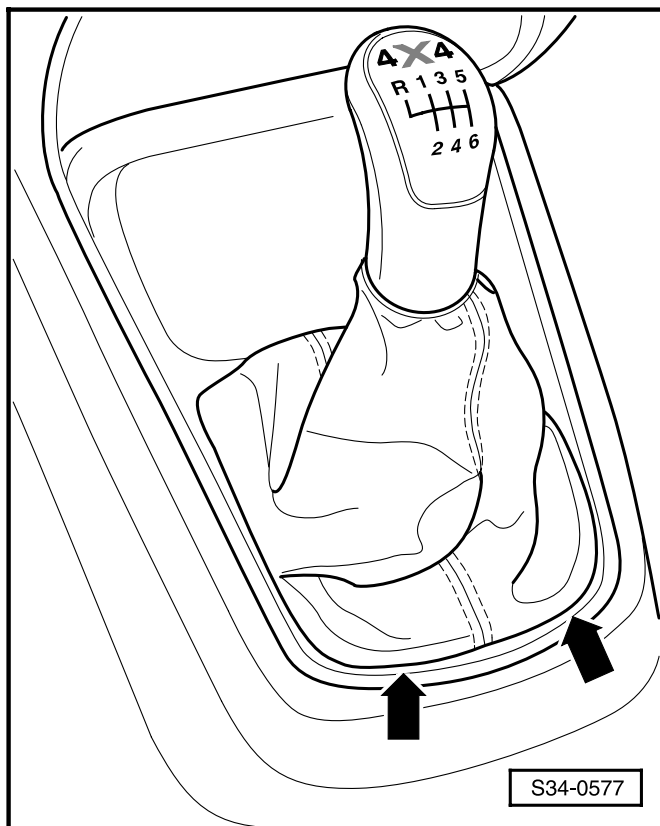


- ◀ Lock the shift shaft as follows:

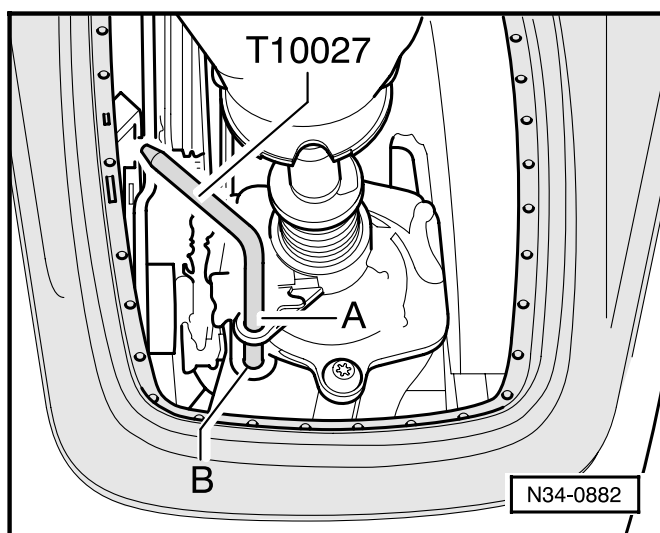
- Carefully press the shift shaft down -direction of arrow 1-.
- After pressing down the shift shaft, then insert the locking pin -A- into the gearbox -direction of arrow- until the pin locks in place.

The shift shaft is now locked and can no longer be moved.



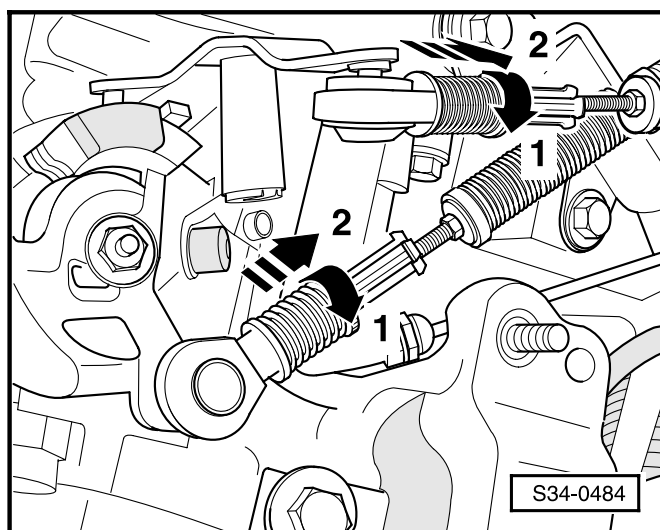


- ◀ - Lever cover together with surround up and out of the centre console -arrows-.



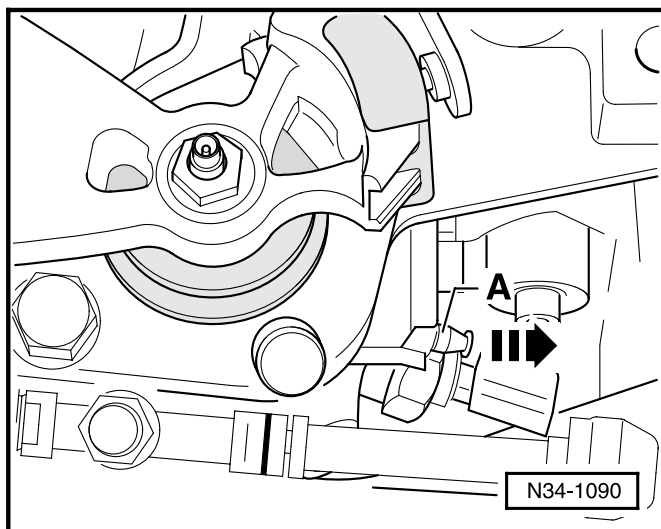
- ◀ Now, lock the gearshift lever as follows:

- Guide gearshift lever in Neutral to the left into the gate of 1st/2nd gear.
- Insert the locking pin T10027 through the hole -A- into the hole -B-.

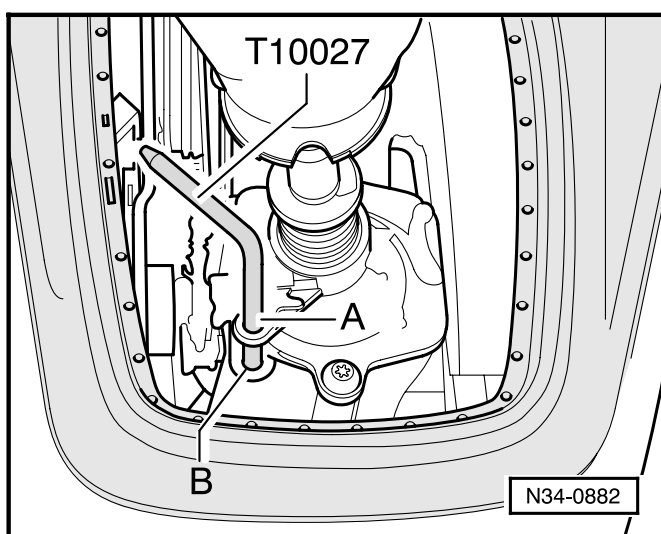


- ◀ - Now, turn the lock mechanism at the shift cable and at the selector cable fully to the right -arrows 1-.

The spring pushes the lock mechanism into its initial position -arrows 2-.



- ◀ - Now, pull back the locking pin -A- into the initial position -direction of arrow-.

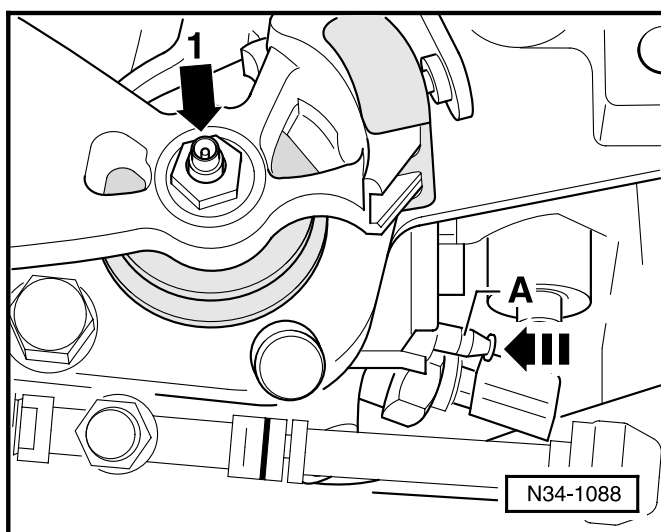


- ◀ - Pull the locking pin T10027 out of the holes -A- and -B-.
- Fit cover into the surround.

Function

- Gearshift lever must be in Neutral in the gate of 3rd/4th gear.
- Depress clutch.
- Shift through all gears several times. Pay particular attention to ensure that the reverse gear lock operates properly.

If the gearshift lever snatches when 1st/2nd/5th or 6th gear are repeatedly engaged, check the following points:



- Carefully guide gearshift lever in Neutral to the left into the gate of 1st/2nd gear.
- ◀ - The shift shaft must move down -arrow 1-.
- If the shift mechanism is correctly set, the locking pin -A- must now be pushed into the gearbox -direction of arrow- and thus into the gate of the shift shaft (2nd person required).
- If this is not the case, set shift mechanism ⇒ page 34-14.

Removing and installing gear-box

Special tools, testers and aids required

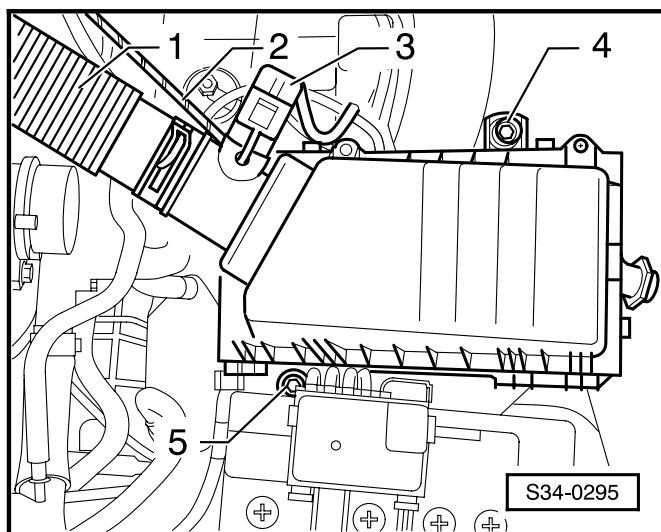
- ◆ Gearbox lifting device MP 3-478
- ◆ Hose clamp MP 7-602
- ◆ Supporting device MP 9-200
- ◆ Adapter MP 9-200/3
- ◆ Gearbox mount 3282
- ◆ Adjusting plate 3282/27
- ◆ Bolt (2x) 3282/48
- ◆ Mount 3282/52
- ◆ Torque wrench
- ◆ Engine/gearbox jack, (e.g. V.A.G 1383 A)
- ◆ Drip tray

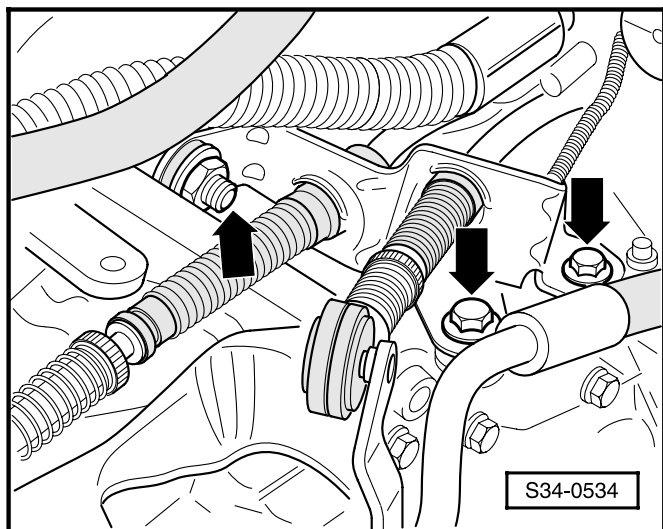
Note:

If the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Repair Group 27.

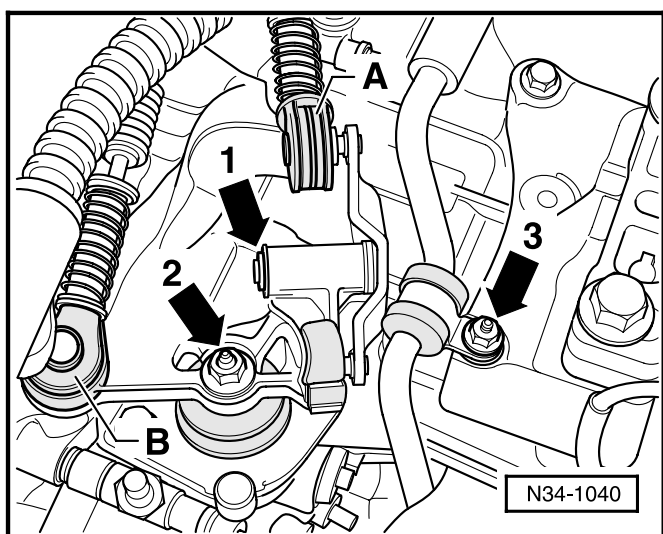
Removing

- Switch off ignition and disconnect earth strap at the battery.
- Remove engine trim panel.
- Remove battery.
- Remove battery carrier.
- ◀ - Take off intake hose -1-.
- Detach bleeder hose -2- and unplug connector -3- of air mass meter.
- Remove air filter housing complete; remove screws -4- and -5- for this step.

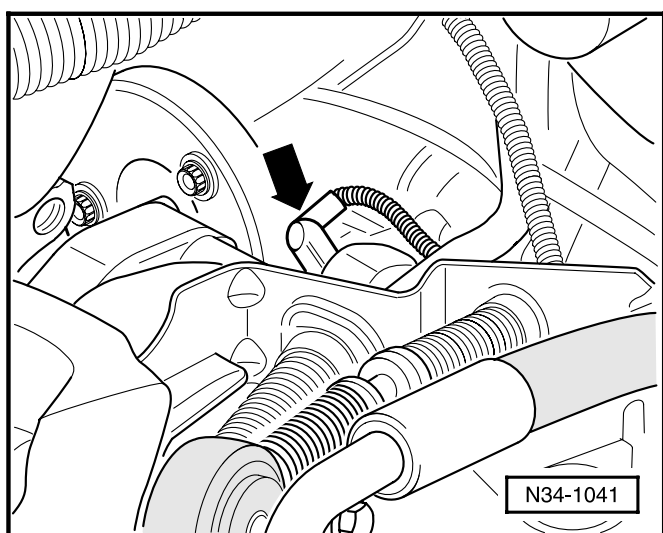




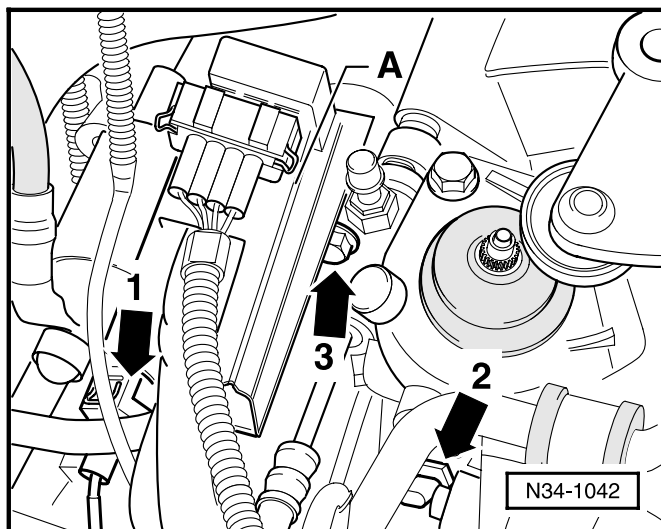
- ◀ - Take off cable support bracket at gearbox -arrow-.



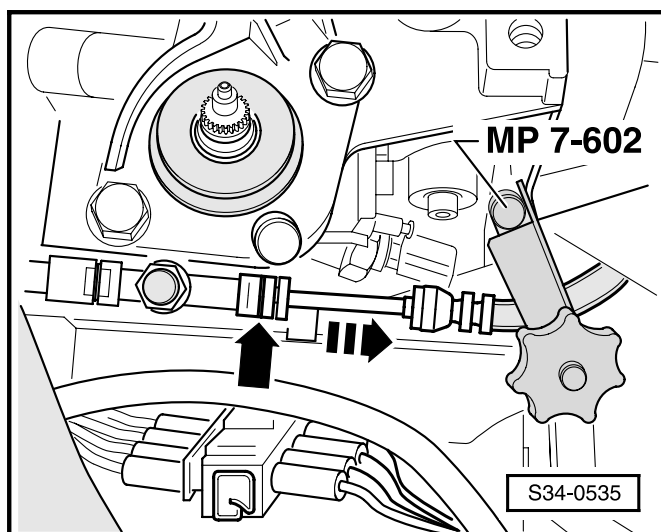
- ◀ - Pull off lock washer -arrow 1- of relay lever of selector cable -A-.
 - Detach shift cable -B- together with gearshift lever; unscrew nut -arrow 2- for this step.
- Use puller, e.g. Kukko 20-10, for this step if necessary.
- Detach the PAS line -arrow 3-.



- ◀ - Unplug connector from the speedometer sender -arrow-.



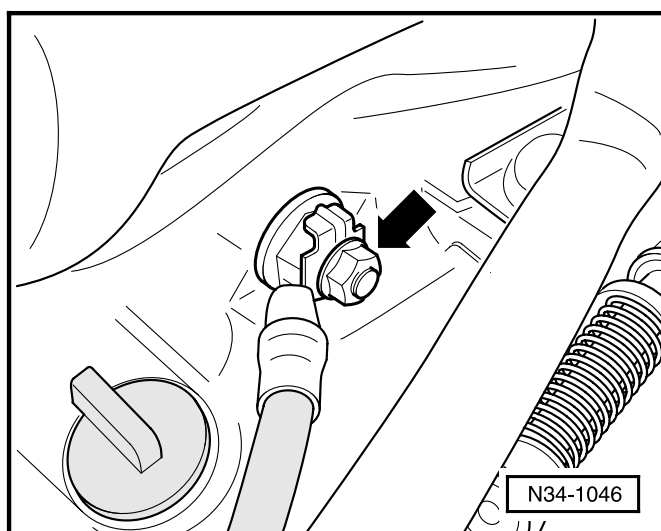
- ◀ - Disconnect cable -arrow 1- from starter.
- Unplug connector for reversing lights -arrow 2-.
- Remove cable holder -A- at starter -arrow 3-.
- After this, remove the top bolt attaching the starter.



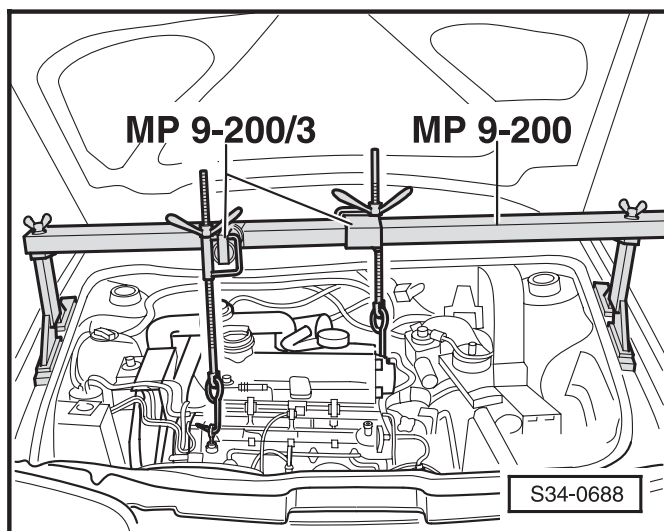
- ◀ - Pinch off the hose to the slave cylinder with hose clamp MP 7-602.
- Use a screwdriver to lever out clip -arrow- for pipe-hose line as far as the stop.
- Pull out pipe-hose line in direction of arrow.

Note:

Do not depress clutch pedal.



- ◀ - Disconnect earth strap from bolt connecting engine/gearbox at top -arrow-.
- Remove bolts connecting engine/gearbox at top.

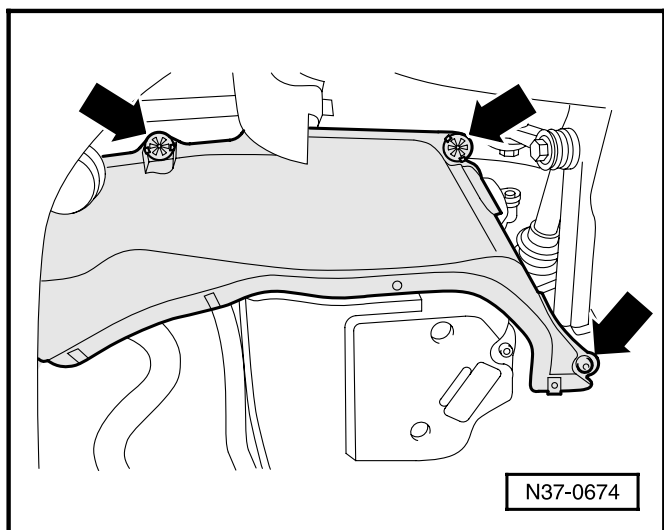


- ◀ - Install supporting device MP 9-200 in combination with adapters MP 9-200/3.

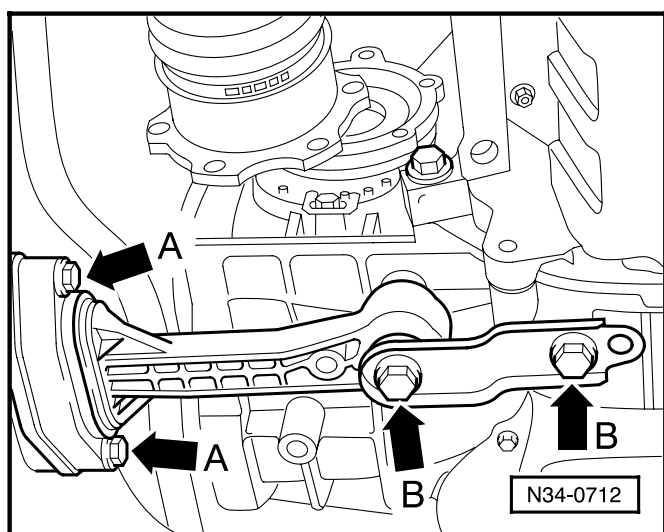
Note:

When installing the mounting hooks of the supporting device, pay attention to hose and cable connections in the area of the lifting eyes of the engine to ensure that they are not damaged.

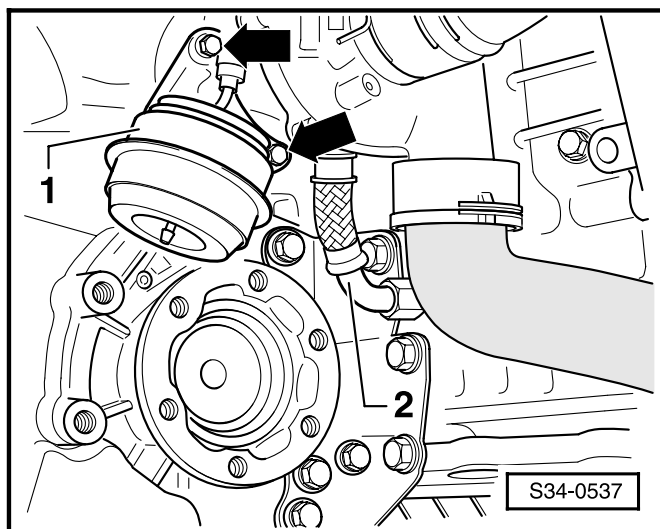
- Take up weight of engine/gearbox at the spindles.
 - Turn the wheels to full left lock.
 - Raise vehicle.
 - Detach noise insulation panel.
- ⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine



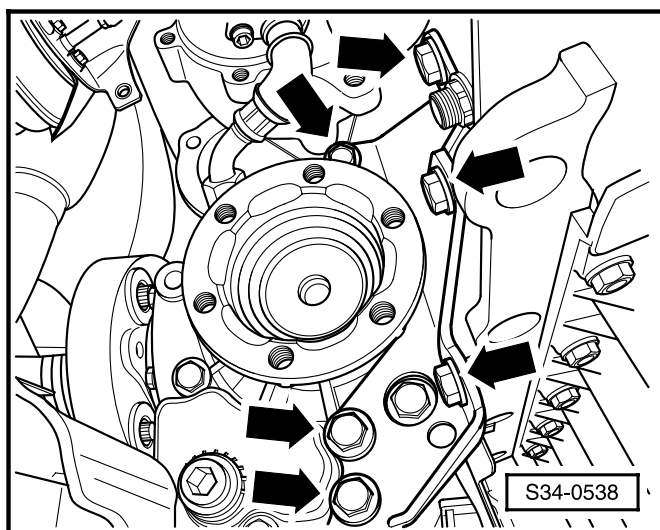
- ◀ - Remove noise insulation panel on left -arrows-.
 - Remove the charge air pipe between charge air cooler and turbocharger.
 - Remove the noise insulation panel on the right.
 - Unbolt drive shafts from the flange shafts of the gearbox.
 - Raise left drive shaft and secure.
 - Remove right drive shaft.
- ⇒ Running Gear; Repair Group 40; Servicing front suspension; Removing and installing drive shafts



- Separate exhaust system and detach front exhaust pipe at turbocharger.
- ⇒ Engine, Mechanical Components; Repair Group 26; Removing and installing parts of exhaust system
- ◀ - Remove pendulum support -arrows A and B-.
 - Detach the PAS line from the starter and from the gearbox.
 - Remove starter.
- ⇒ Electrical System; Repair Group 27; Removing and installing starter

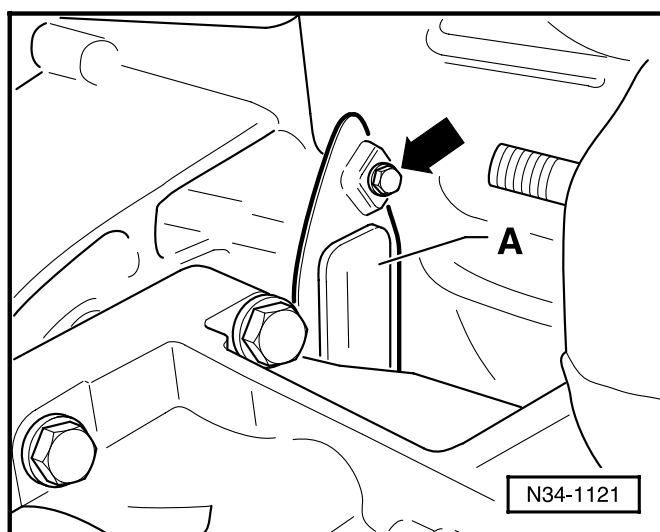


- ◀ - Unbolt charge pressure control vacuum unit -1- from the turbocharger -arrows- and tie up.
- ⇒ Engine; Mechanical Components; Repair Group 21; Charge air system with turbocharger; Removing and installing vacuum unit for charge pressure control
- Place drip tray below gearbox and below engine.
- Unbolt the oil return-flow line -2- for turbocharger at engine.
- ⇒ Engine, Mechanical Components; Repair Group 21; Charge air system with turbocharger; Removing and installing turbocharger with attached parts

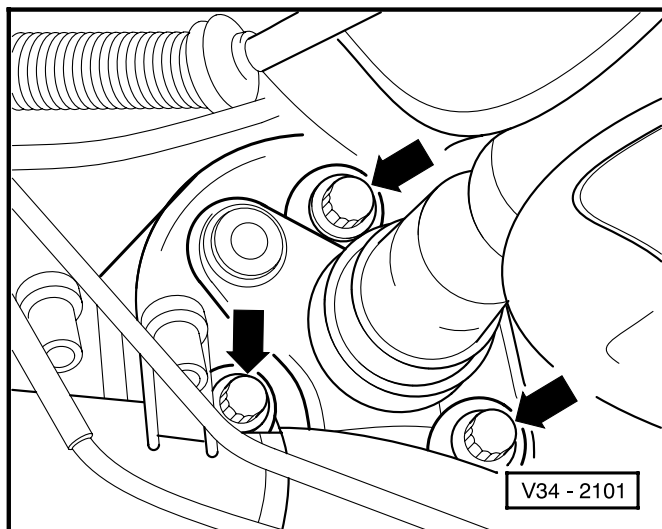


Vehicles with 4 Wheel Drive

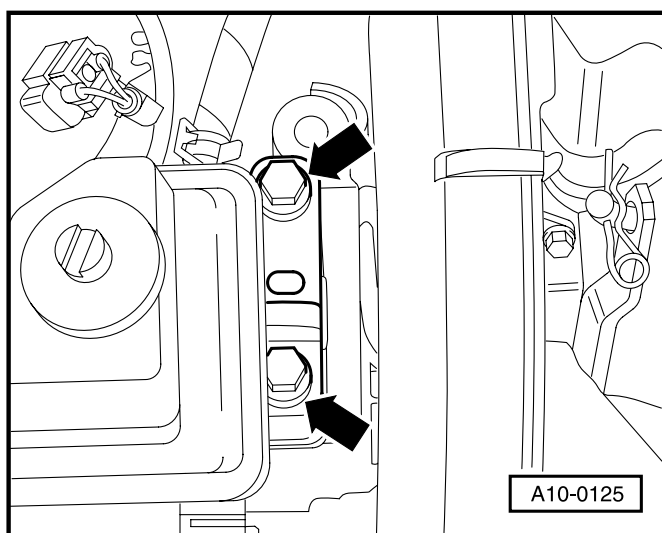
- ◀ - Unbolt gearbox support for bevel gear from engine and bevel gear -arrows-.



- ◀ - Remove small cover plate -A- for flywheel behind bevel gear -arrow-.

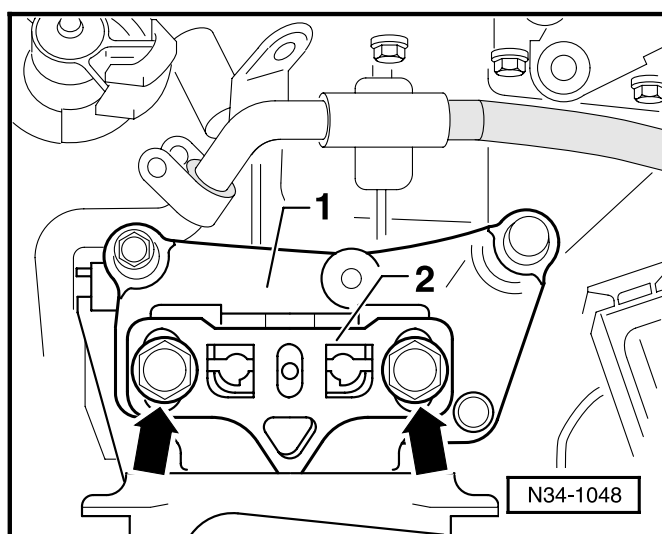


- Mark position of propeller shaft with flexible joint to the flange of the bevel gear.
- ◀ - Unbolt propeller shaft with flexible joint from the flange of the bevel gear -arrows-.
- Take up weight of engine/gearbox unit at the spindles.



Continued for all vehicles

- ◀ - Unbolt unit mounting at the engine side from above from the engine mount -arrows-.



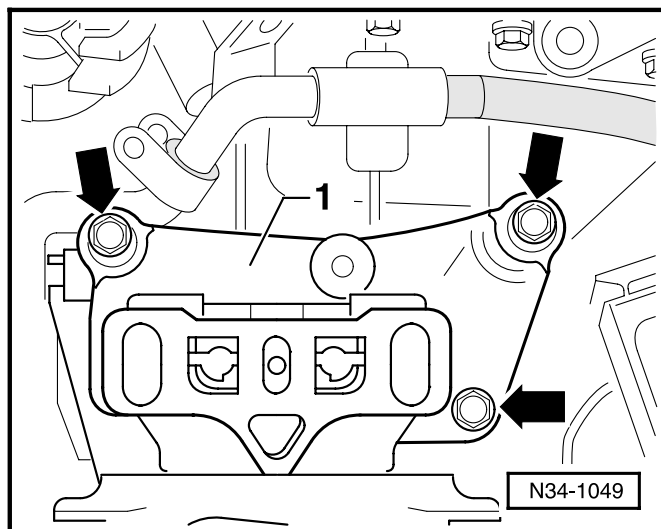
- ◀ - Unscrew hexagon bolts -arrows- of the unit mounting on the left -2- from the left supporting bracket -1-.

Vehicles with 4 Wheel Drive

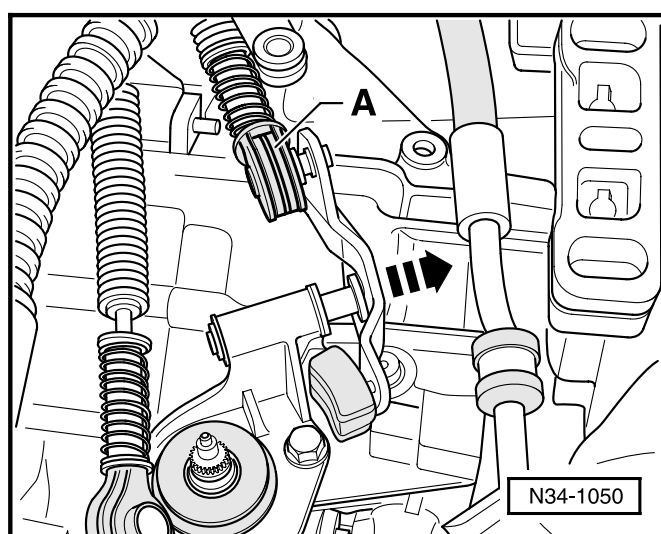
- Carefully push engine/gearbox unit forward to expose the guide stud of the bevel gear.

Continued for all vehicles

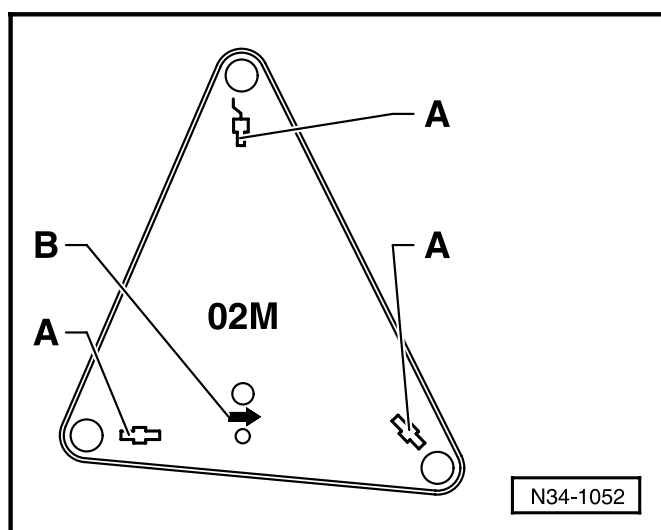
- Carefully move engine and gearbox into angled position; turn down the left spindle of the supporting device MP 9-200 about 60 mm for this purpose.



- Take left supporting bracket -1- off gearbox -arrows-.

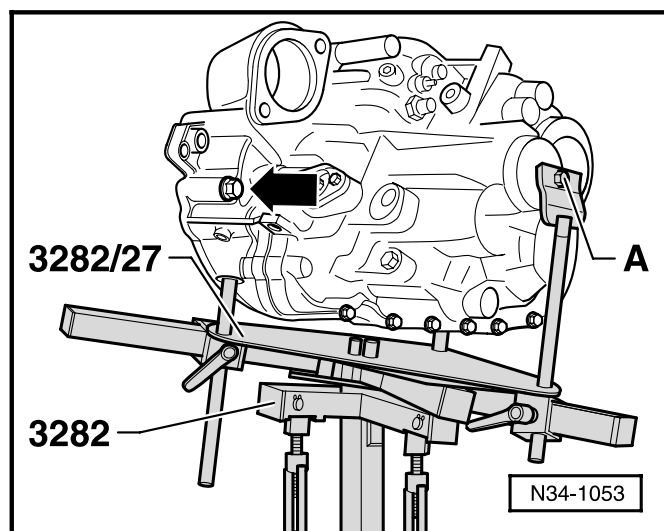


- Pull off selector cable -A- together with relay lever in direction of arrow.
- Then, tie up the shift cable with the gearbox shift lever and the selector cable with the relay lever.
- Move engine/gearbox unit a further 20 mm into angled position; lower at the left spindle of the supporting device MP 9-200 for this step.
- Remove rear bolt connecting engine/gearbox at bottom.
- Remove bolts connecting engine/gearbox at bottom.

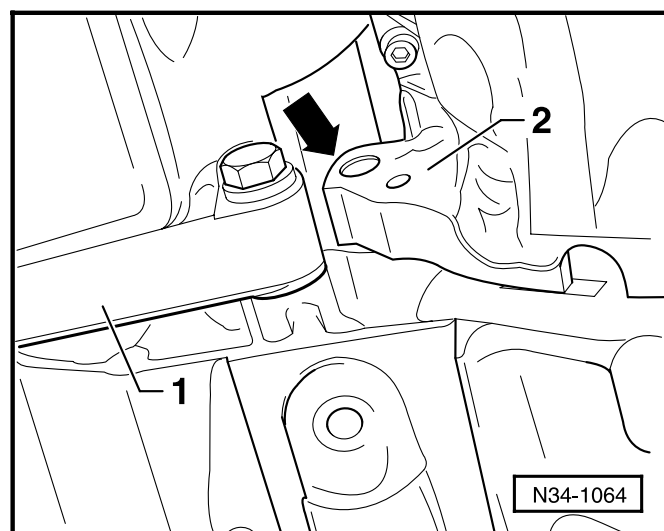


The gearbox mount 3282 is set up with the adjusting plate 3282/27 for removing gearbox 02M.

- Align the arms of the gearbox mount to match the holes in the adjusting plate.
- Screw in mounting elements -A-, as shown on adjusting plate.



- ◀ - Position gearbox jack below vehicle, arrow symbol -B- (⇒ page 34-23, Fig. N34-1052) on adjusting plate points in direction of travel/ vehicle.
- Align adjusting plate parallel to gearbox.
- Secure gearbox on gearbox mount 3282 with bolt -A-.
- Remove bolt connecting engine/gearbox -arrow-.
- Press gearbox off the dowel sleeves and carefully swivel toward the subframe.
- Lower gearbox slightly and position at an angle with the spindles of the gearbox mount 3282 on the left.



- ◀ - When lowering gearbox -1-, pay attention to the corner -arrow- of the oil pan -2-.

Vehicles with 4 Wheel Drive

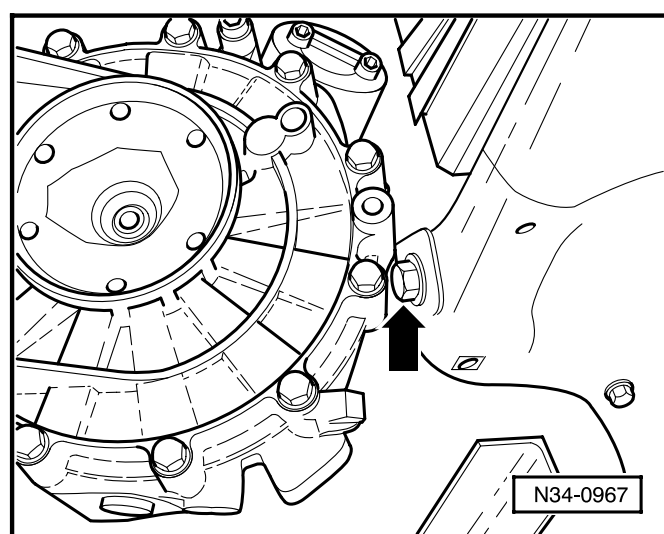
- Alter position of gearbox by means of the spindles of the gearbox mount 3282 to allow the bevel gear to be guided past the oil pan.

Continued for all vehicles

- Carefully push engine forward with the aid of a 2nd person.

Note:

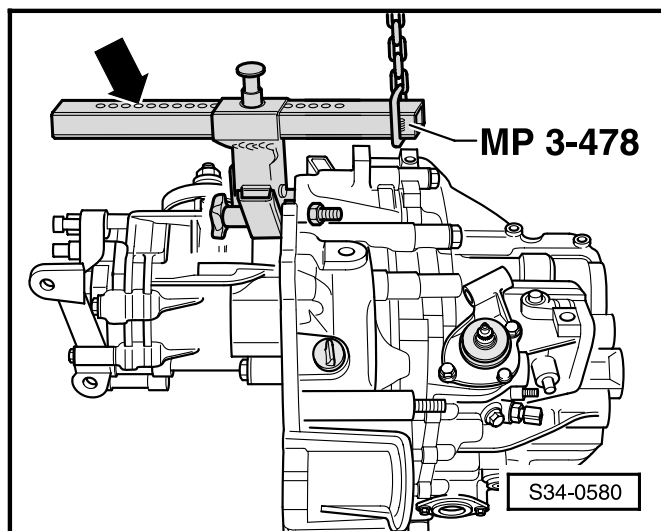
Pay attention to all connection lines and hoses when altering the position of the engine/gearbox unit



- ◀ - Lower the gearbox; pay attention to the subframe when carrying out this step -arrow-.
- Alter the position of the gearbox when lowering it by means of the spindles of the gearbox mount 3282.

Note:

Pay attention to PAS line when lowering gearbox.



Transporting gearbox

- ◀ - Bolt gearbox supporting device MP 3-478 to clutch housing.
- Set supporting arm at sliding piece with locking pin -arrow-.

Number of holes visible = 9

- Lift gearbox with workshop crane and gearbox supporting device MP 3-478.
- Place gearbox down.

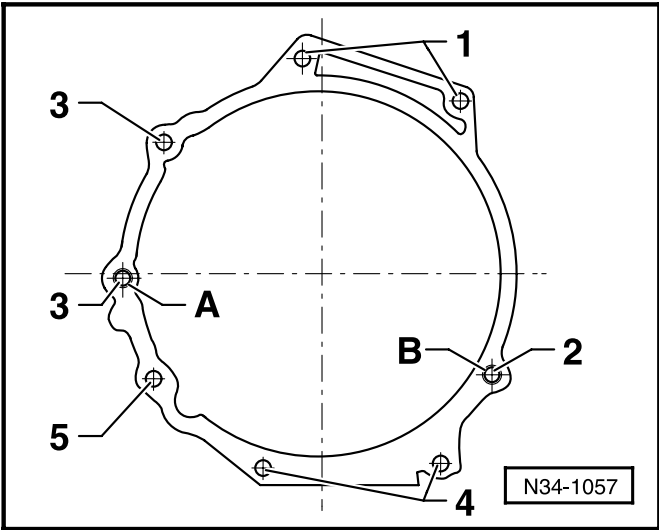
Installing

Installation of the gearbox is carried out in the reverse order. Install engine/gearbox mounting free of stress:

⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

Notes:

- ◆ *Check whether dowel sleeves for centering engine/gearbox are present in the cylinder block; insert if necessary*
- ◆ *Installing drive shaft:*
⇒ Running Gear; Repair Group 40; Servicing front suspension; Removing and installing drive shafts
- ◆ *Installing starter/cables:*
⇒ Electrical System; Repair Group 27; Removing and installing starter
- ◆ *Inspecting gear oil in manual gearbox*
⇒ page 34-33
- ◆ *Setting shift mechanism* ⇒ page 34-14



Tightening torques for vehicles with Front Wheel Drive

◀ Gearbox to engine

Item	Bolt	Qty.	Nm
1	M 12 x 55	2	80
2	M 12 x 70	1	80
3 ¹⁾	M 12 x 165	2	80
4	M 10 x 55	2	40
5	M 10 x 105	1	40

1) Additionally starter to gearbox

Items A + B - Dowel sleeves

Tightening torques for vehicles with 4 Wheel Drive

Gearbox to engine

Item	Bolt	Qty.	Nm
1	M12 x 55	2	80
2	M12 x 70	1	80
3 ¹⁾	M12 x 165	2	80
4	M10 x 50	2	40
5	M10 x 105	1	60

1) Additionally starter to gearbox

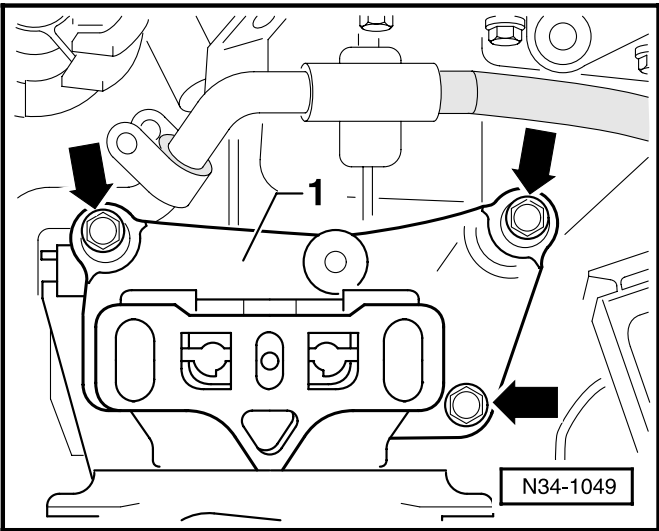
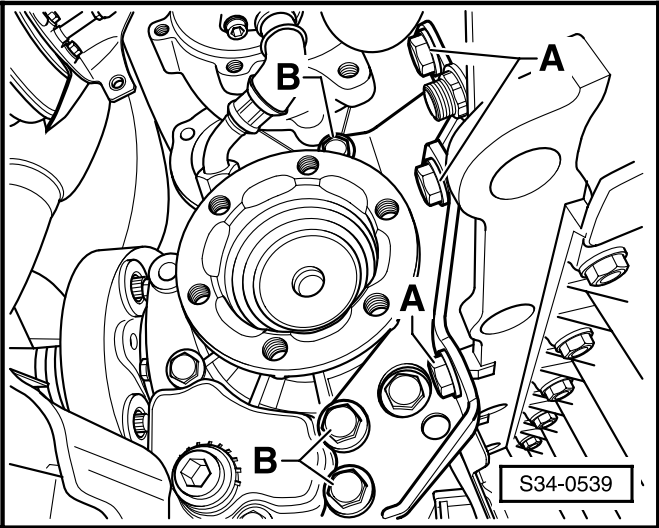
◀ Pay attention to the following sequence of operations when installing the gearbox support:

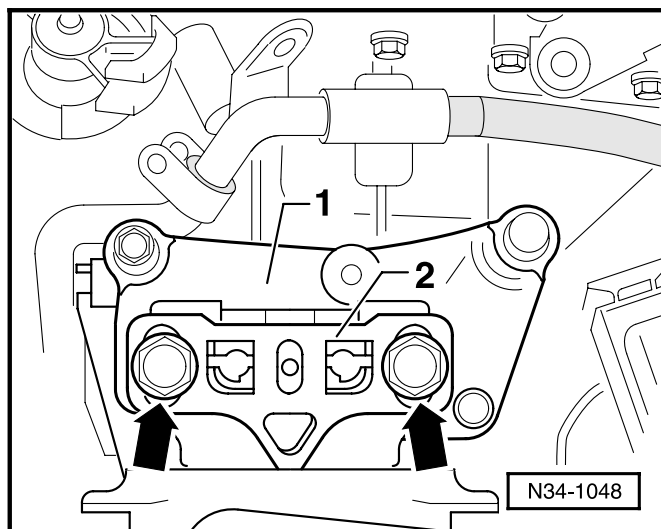
- Screw in all bolts by hand.
- Tighten bolts -A- initially to 10 Nm.
- Tighten bolts -B- fully to 45 Nm.
- Tighten bolts -A- fully to 40 Nm.

◀ Gearbox supporting bracket -1- to gearbox.

Bolts -arrows- 50 Nm + 90°

- Use new bolts.



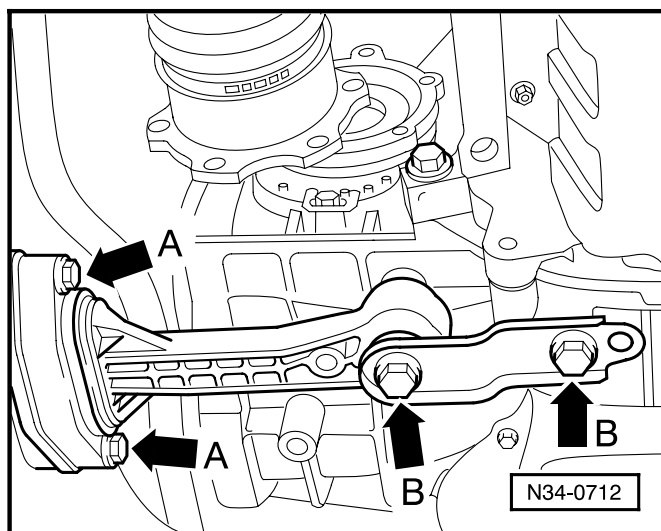


◀ Gearbox to body

Bolts -arrows-

100 Nm

- Use new bolts.



◀ Rear gearbox mounting

Bolts -arrows A-

20 Nm + 90°

Bolts -arrows B-

40 Nm + 90°

- Use new bolts.

Note:

Install engine/gearbox mounting free of stress.

⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

Components	Tightening torque
Drive shaft to flange shaft, tighten diagonally across in 2 stages (I and II) M10 ¹⁾	I - 10 Nm II - 70 Nm
Cable support bracket to gearbox	25 Nm
Gearbox shift lever to gearbox	20 Nm
Hydraulic line to gearbox	25 Nm
Flexible joint/propshaft to bevel box	60 Nm
Small cover plate for flywheel to intermediate plate/engine	10 Nm

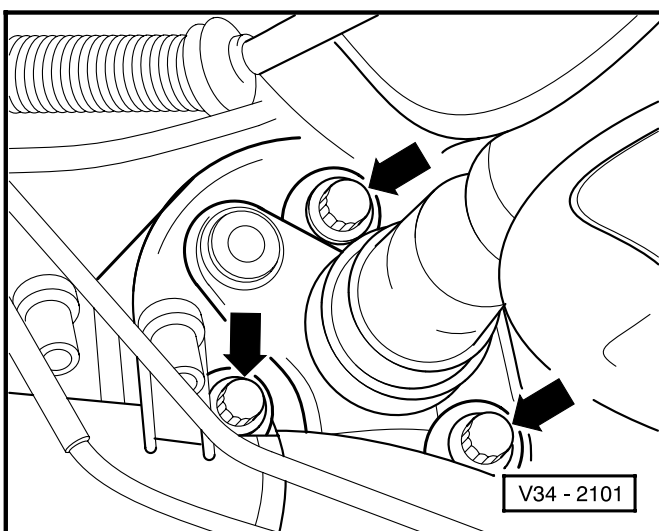
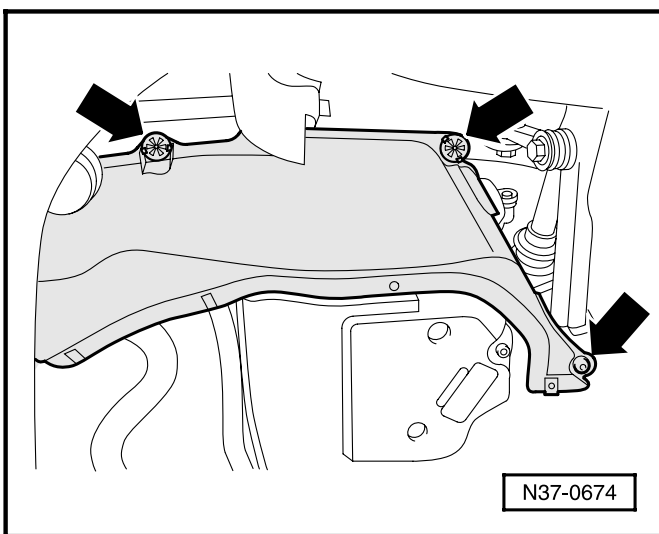
¹⁾ Always replace these bolts.

Removing and installing bevel gear

Special tools, testers and aids required

- ◆ Size 6 mm wrench socket, e.g. V.A.G 1669
- ◆ Torque wrench (40...200 Nm), e.g. V.A.G 1332
- ◆ Drip tray
- ◆ M8 x 80 mm bolt with nut

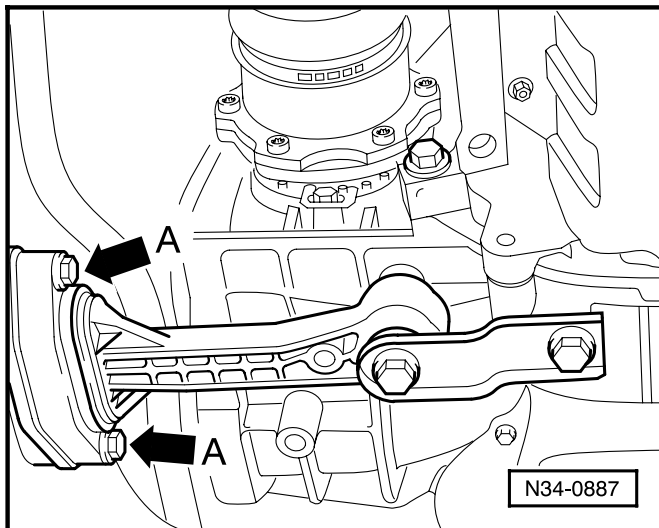
Removing



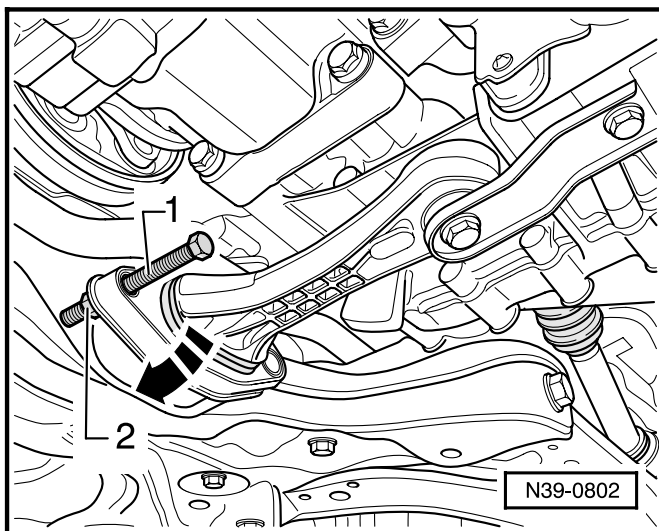
- Take off noise insulation.
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine
- ◀ - Remove noise insulation panel on left -arrows-.
- Take out the charge air pipe between charge air cooler and turbocharger.
- Remove right drive shaft.
⇒ Running Gear; Repair Group 40; Servicing front suspension; Removing and installing drive shafts
- Separate exhaust system at the double clamp.
⇒ Engine, Mechanical Components; Repair Group 26; Removing and installing parts of the exhaust system
- Take off exhaust pipe bracket on the sub-frame.
- Mark position of the propshaft with flexible joint relative to the flange of the bevel gear.
- ◀ - Unbolt propshaft with flexible joint from the flange of the bevel gear -arrows-.

Note:

When the bolts -A- (⇒ page 34-29, Fig. N34-0887) are slackened, the engine/gearbox unit moves forward slightly. Ensure that the seal in the flange of the propshaft is not damaged when removing and installing.



- Take pendulum support off the subframe -arrows A-.

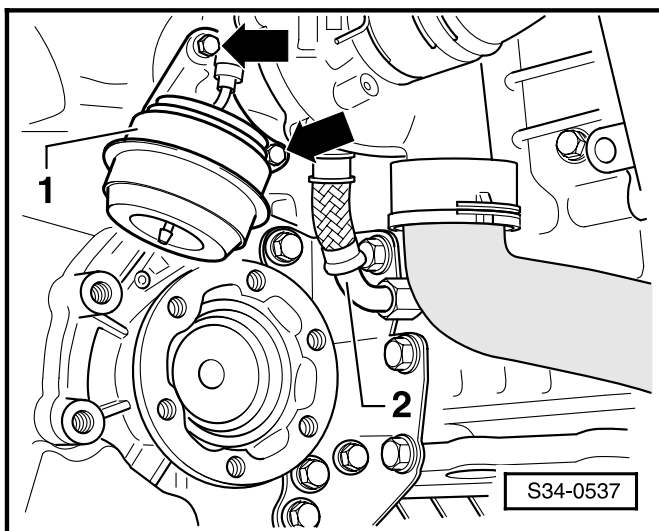


- Carefully push engine/gearbox unit forward and position the pendulum support in front of the subframe -arrow-.
- Secure pendulum support to subframe with bolt -1- (M8x80 mm) and nut -2-.

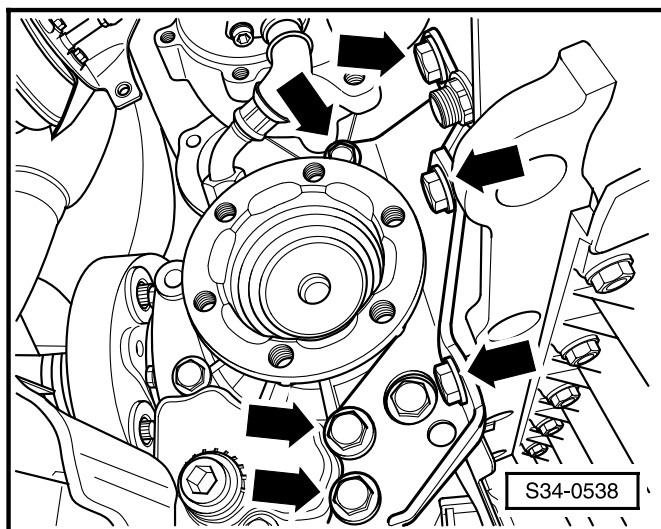
Note:

Eliminate any damage to paintwork, as follows:

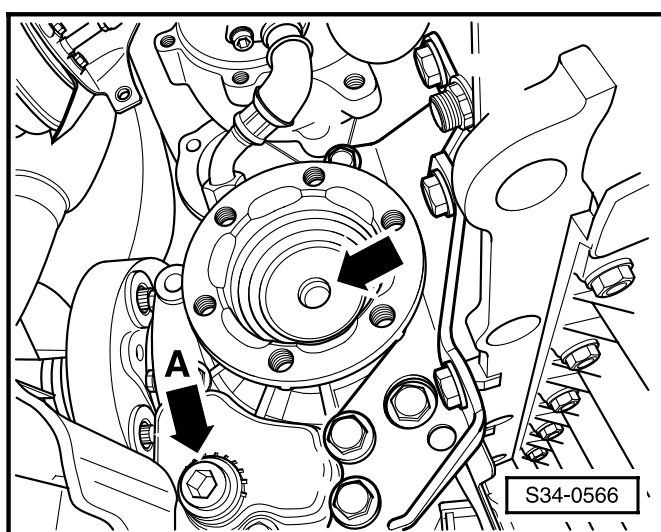
- Remove grease residues with Nitro thinner L001 600.
- Apply 2-component acrylic varnish ALN 769 041 with hardener ALZ 009 001.



- Unbolt vacuum unit -1- for charge pressure control valve from turbocharger -arrows- and tie up.
⇒ Engine, Mechanical Components; Repair Group 21; Charge air system with turbo-charger; Removing and installing vacuum unit for charge pressure control valve
- Place drip tray below gearbox and below engine.
- Unbolt the oil return-flow line -2- for the turbo-charger from the engine.
⇒ Engine, Mechanical Components; Repair Group 21; Charge air system with turbo-charger; Removing and installing turbo-charger with attached parts



- ◄ - Unbolt gearbox support for bevel gear from engine and bevel gear -arrows-.
- Place drip tray below gearbox and below engine.



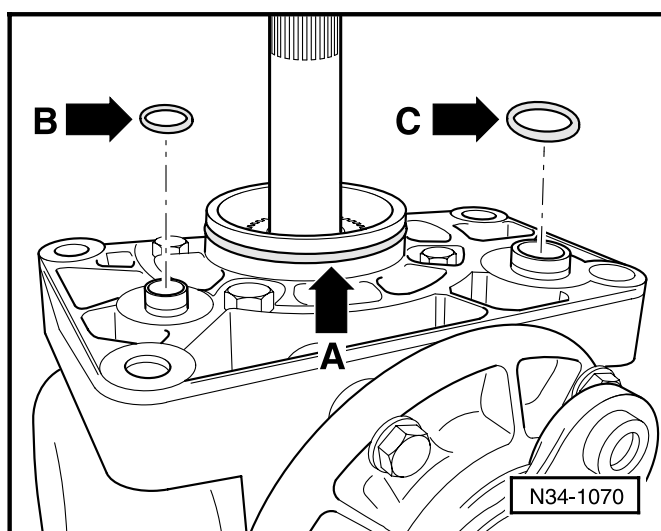
- ◄ - Unscrew oil drain plugs -arrow A-.
- Drain gear oil from bevel gear.
- Use V.A.G 1669 or 6 mm commercially available wrench socket to unscrew bolt for right flange shaft -arrow-.
- Take out bolts connecting bevel gear/manual gearbox.
- Press bevel gear off manual gearbox.
- Take off the gearbox support for bevel gear.
- Take out bevel gear.

Installing

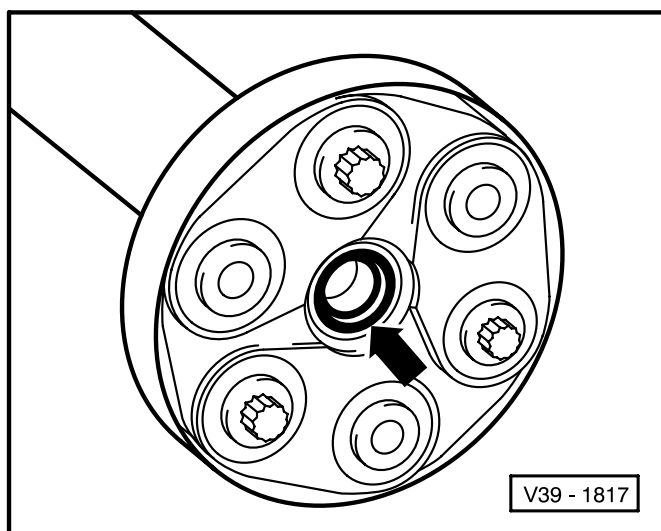
Installation is carried out in the reverse order; pay attention to the following points:

Notes:

- ◄ - Always replace the O-ring for sealing bevel gear/manual gearbox -arrow A- and the O-rings for sealing oil supply sleeves -arrow B and C-; oil lightly.
- Move bevel gear up fully against manual gearbox; centre splines of input shaft of bevel gear with connecting sleeve of differential.



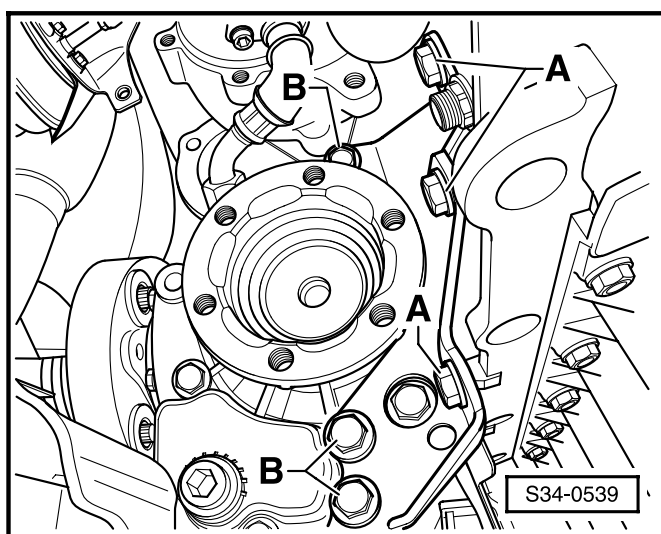
- Likewise align the splines of the right flange shaft and the differential bevel gear; rotate flange shaft, if necessary.
- If the teeth are correctly positioned and centred, the bevel gear slips fully against the manual gearbox as far as the stop.
- Insert the gearbox support for the bevel gear before inserting the bolts connecting the bevel gear and manual gearbox.
- Do not use the bolts connecting the bevel gear and the manual gearbox to pull bevel gear toward gearbox otherwise the bevel gear will be twisted and the securing eyes may shear off.



- ◆ Seals -arrow- in the flanges of the propshaft must not be damaged when removing and installing.
- ◆ If seal is damaged, replace propshaft.
- ◆ Push propshaft horizontally onto the guide stud.
- ◆ Install exhaust pipe at the double clamp.
⇒ Engine, Mechanical Components; Repair Group 26; Removing and installing parts of the exhaust system
- ◆ Bolt oil return-flow line for turbocharger and vacuum unit for charge pressure control valve onto the engine.
⇒ Engine, Mechanical Components; Repair Group 21; Charge air system with turbocharger; Removing and installing turbocharger with attached parts
- ◆ Inspect gear oil in manual gearbox and bevel gear ⇒ page 34-33.

Installing gearbox support of bevel gear/engine free of stress

- ▶ Pay attention to the following sequence of operations when installing the gearbox support:
 - Screw in all bolts by hand.
 - Tighten bolts -A- initially to 10 Nm.
 - Tighten bolts -B- fully to 45 Nm.
 - Tighten bolts -A- fully to 40 Nm.



Tightening torques

Components	Tightening torque
Bevel gear to gearbox ¹⁾	40 Nm + 45°
Oil drain plug in bevel gear	60 Nm
Flexible joint/propshaft to bevel gear	60 Nm
Pendulum support to subframe ¹⁾ M8	20 Nm + 90°
Joint flange/output shaft to gearbox (spherical bolt)	25 Nm
Drive shaft to flange shaft M10 ¹⁾ , tighten diagonally across in 2 stages (I and II)	I - 10 Nm II - 70 Nm

¹⁾ Always replace these bolts.

Inspecting gear oil in manual gearbox

Special tools, testers and aids required

- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331

Note:

Valid only for vehicles with 4 Wheel Drive

Manual gearbox and bevel gear are filled together through the oil filler hole of the manual gearbox.

Gear oil specification ⇒ page 00-2.

- ◀ - Unscrew plug for inspecting gear oil -arrow-.

The oil is at the correct level if the gearbox is filled up to the lower edge of the oil filler hole.

- Screw in plug -arrow-.

Pay attention to the following sequence when refilling:

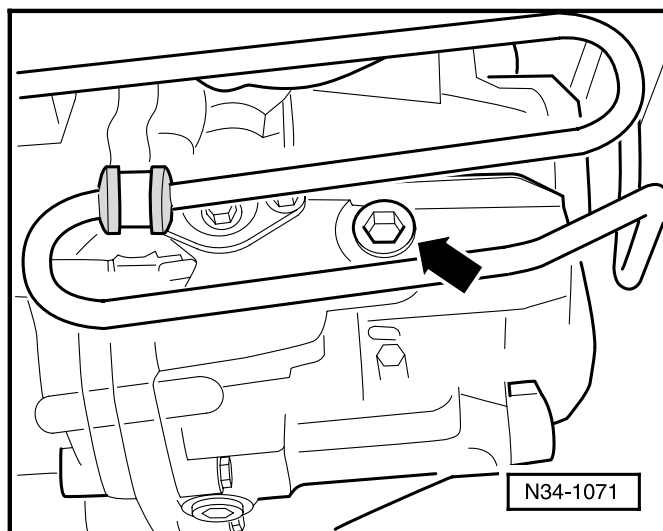
- Unscrew plug -arrow-.
- Pour in gear oil up to lower edge of filler hole.
- Screw in plug -arrow-.
- Start engine, engage gear and allow gearbox to rotate for about 2 minutes.
- Switch off engine and unscrew plug -arrow-.
- Once again, pour in gear oil up to lower edge of filler hole.
- Screw in plug -arrow-.

Tightening torque:

Plug for oil filler hole

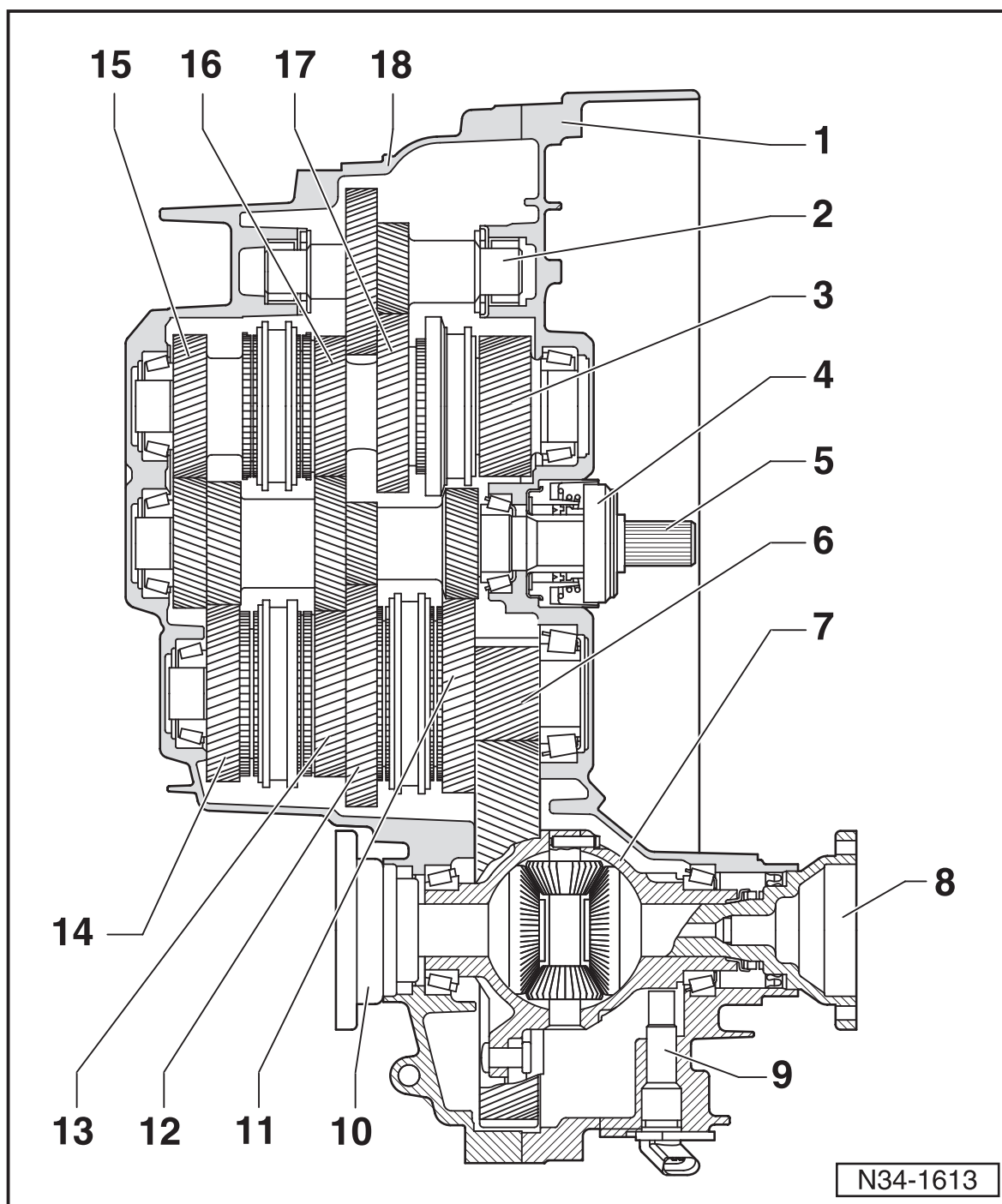
30 Nm

Always replace plug



Disassembling and assembling gearbox on vehicles with Front Wheel Drive

Overview of gearbox



Removal and installation sequence ⇒ page 34-42

1 - Clutch housing

2 - Reverse idler shaft

3 - 5th/6th and Reverse gear output shaft

4 - Slave cylinder with release bearing

5 - Input shaft

6 - 1st to 4th gear output shaft

7 - Differential

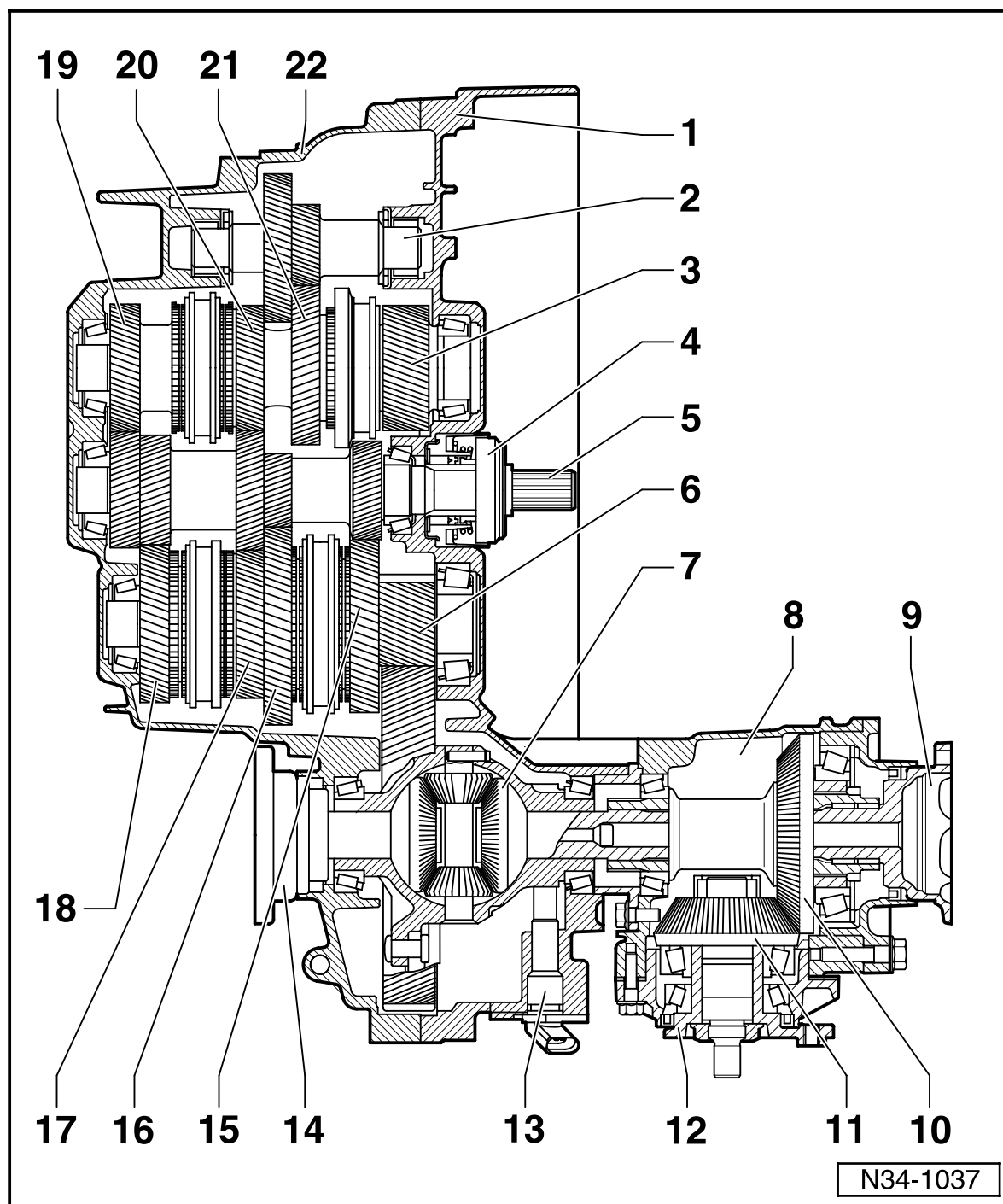
8 - Right flange shaft

9 - Speedometer sender

10 - Left flange shaft**15 - 5th speed sliding gear****11 - 2nd speed sliding gear****16 - 6th speed sliding gear****12 - 1st speed sliding gear****17 - Reverse sliding gear****13 - 4th speed sliding gear****18 - Gearbox housing****14 - 3rd speed sliding gear**

Disassembling and assembling gearbox on vehicles with 4 Wheel Drive

Overview of gearbox



Removal and installation sequence ⇒ page 34-42

1 - Clutch housing

2 - Reverse idler shaft

3 - 5th/6th and Reverse gear output shaft

4 - Slave cylinder with release bearing

5 - Input shaft

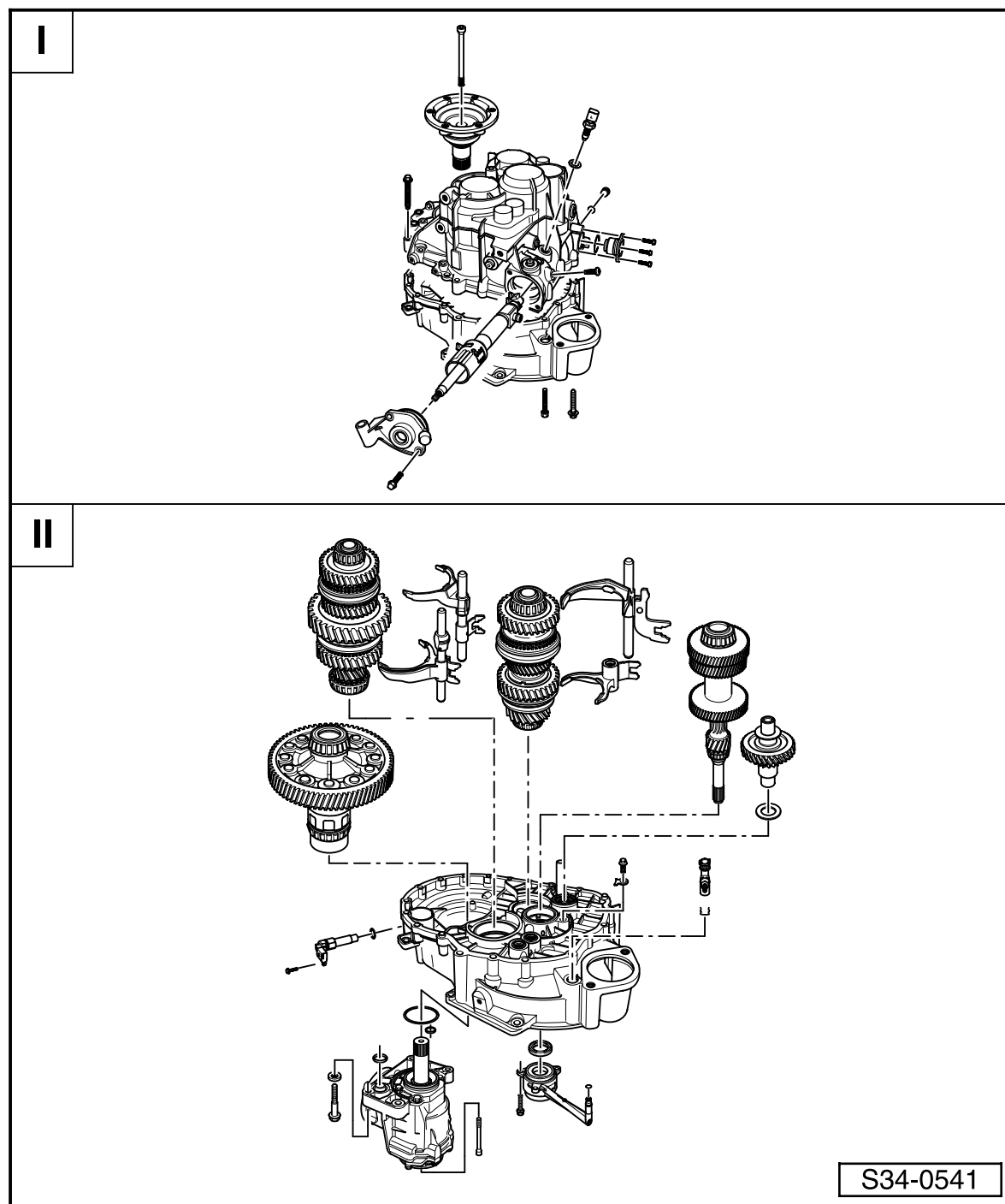
6 - 1st to 4th gear output shaft

7 - Differential

8 - Bevel box

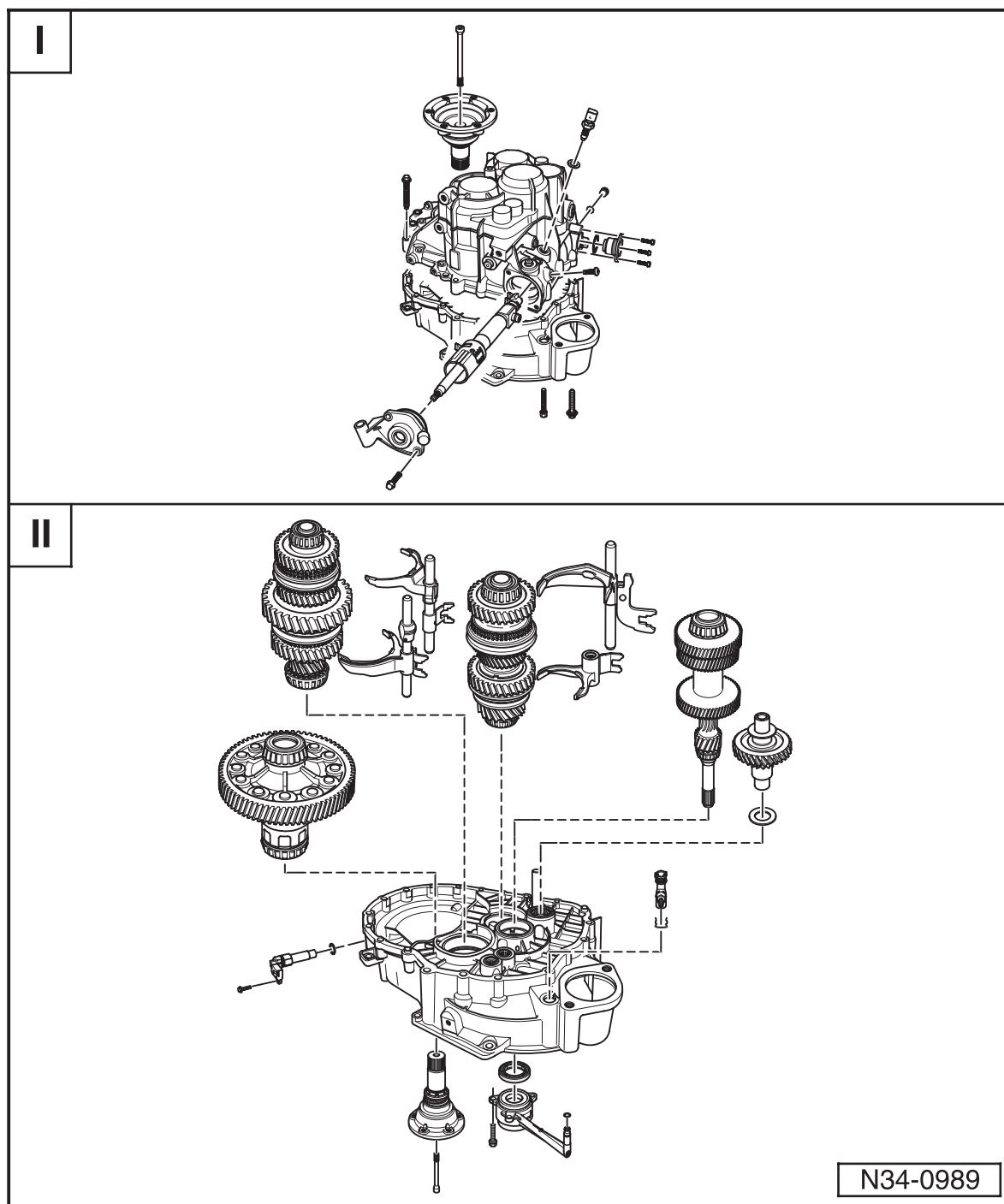
9 - Right flange shaft

10 - Head bevel gear with input shaft	17 - 4th speed sliding gear
11 - Shaft bevel gear	18 - 3rd speed sliding gear
12 - Output flange	19 - 5th speed sliding gear
13 - Speedometer sender	20 - 6th speed sliding gear
14 - Left flange shaft	21 - Reverse sliding gear
15 - 2nd speed sliding gear	22 - Gearbox housing
16 - 1st speed sliding gear	

Assembly overview for vehicles with 4 Wheel Drive

I - Removing and installing gearbox housing and shift mechanism ⇒ page 34-37

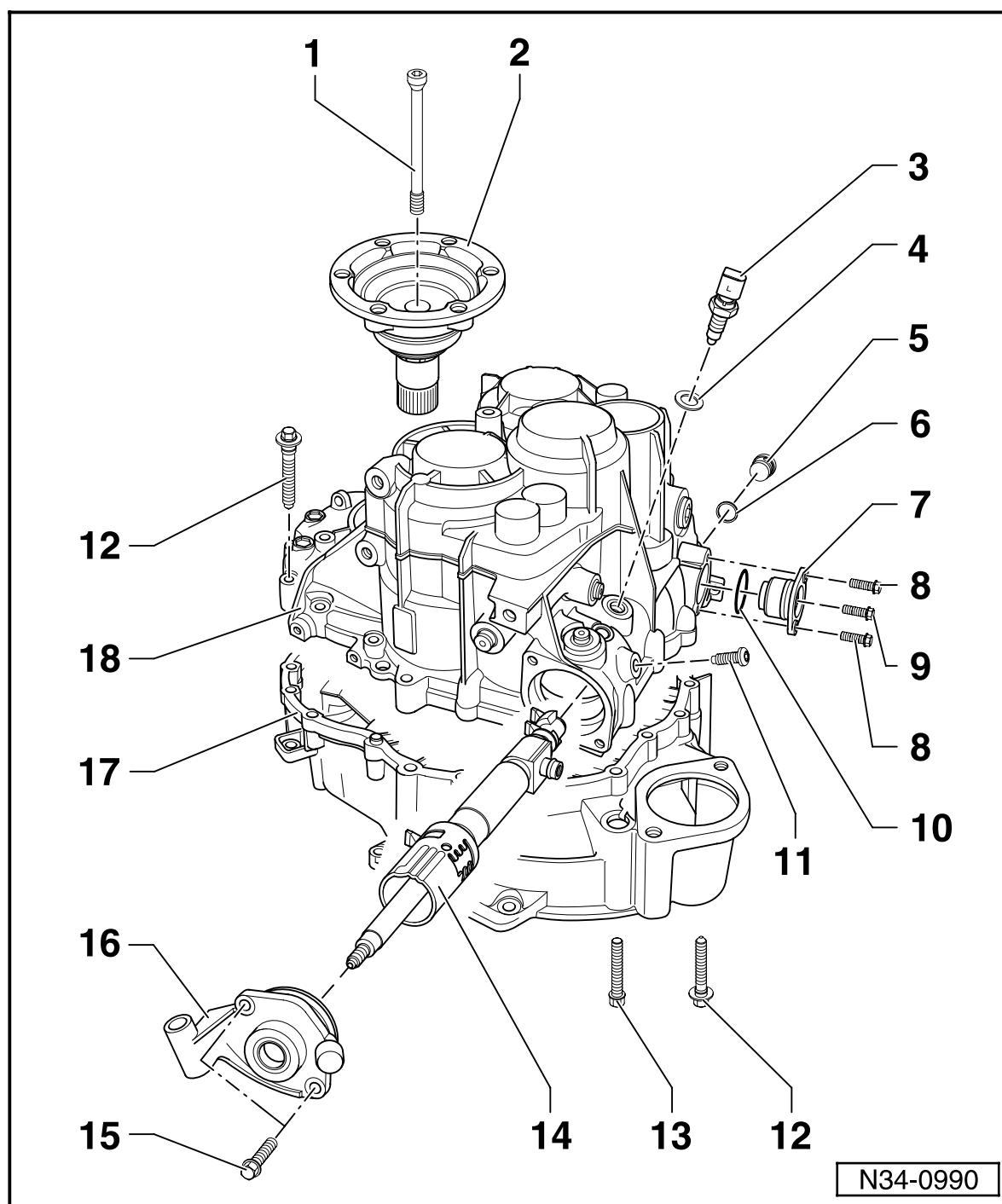
II - Removing and installing input shaft, output shafts (pinion shafts), differential, bevel gear and shift rods ⇒ page 34-40

Assembly overview for vehicles with Front Wheel Drive

I - Removing and installing gearbox housing and shift mechanism ⇒ page 34-37

II - Removing and installing input shaft, output shafts (pinion shafts), differential, bevel gear and shift rods ⇒ page 34-40

Removing and installing gearbox housing and shift mechanism



1 - Spherical bolt, 25 Nm

2 - Flange shaft with compression spring
 ♦ Removing and installing ⇒ page 39-1

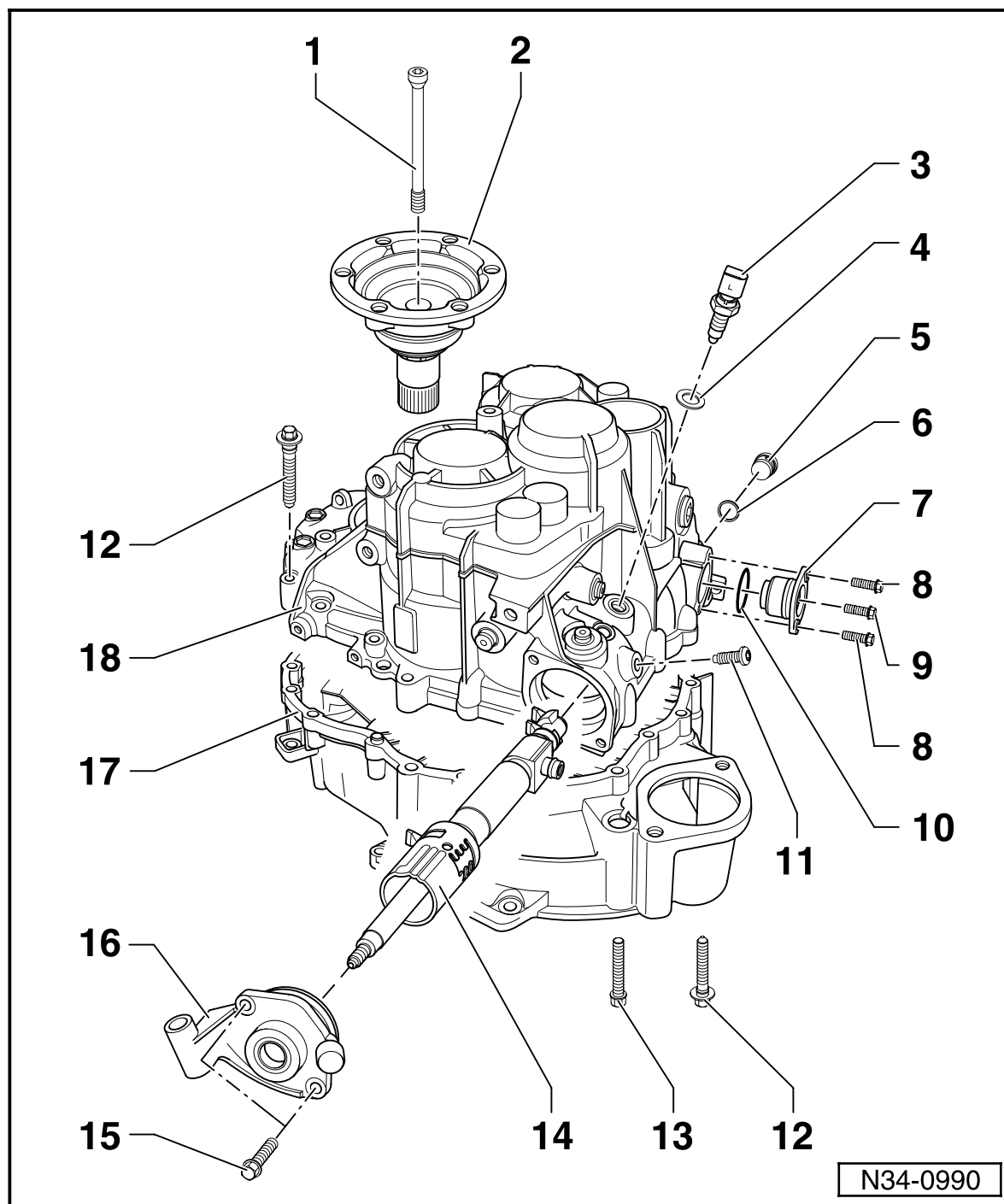
3 - Reversing light switch, 20 Nm

4 - Seal
 ♦ Always replace

5 - Oil drain plug, 30 Nm
 ♦ Always replace

6 - Seal
 ♦ Always replace

7 - End cover

**8 - 20 Nm**

- ◆ Always replace

9 - 20 Nm

- ◆ For shift shaft -item 14- at end cover
- ◆ Always replace

10 - O-ring

- ◆ Always replace
- ◆ Insert into groove of end cover

11 - 15 Nm

- ◆ For gate of shift shaft
- ◆ Always replace
- ◆ Insert with locking fluid D 000 600 A2

12 - 25 Nm and torque a further 45°

- ◆ With captive washer
- ◆ Always replace

13 - 25 Nm and torque a further 45°

- ◆ Without washer
- ◆ Always replace

14 - Shift shaft

- ♦ Disassembling and assembling
⇒ page 34-60, Disassembling and assembling shift mechanism at gearbox side

15 - 20 Nm

- ♦ Always replace

16 - Shift cover

- ♦ Disassembling and assembling
⇒ page 34-60, Disassembling and assembling shift mechanism at gearbox side

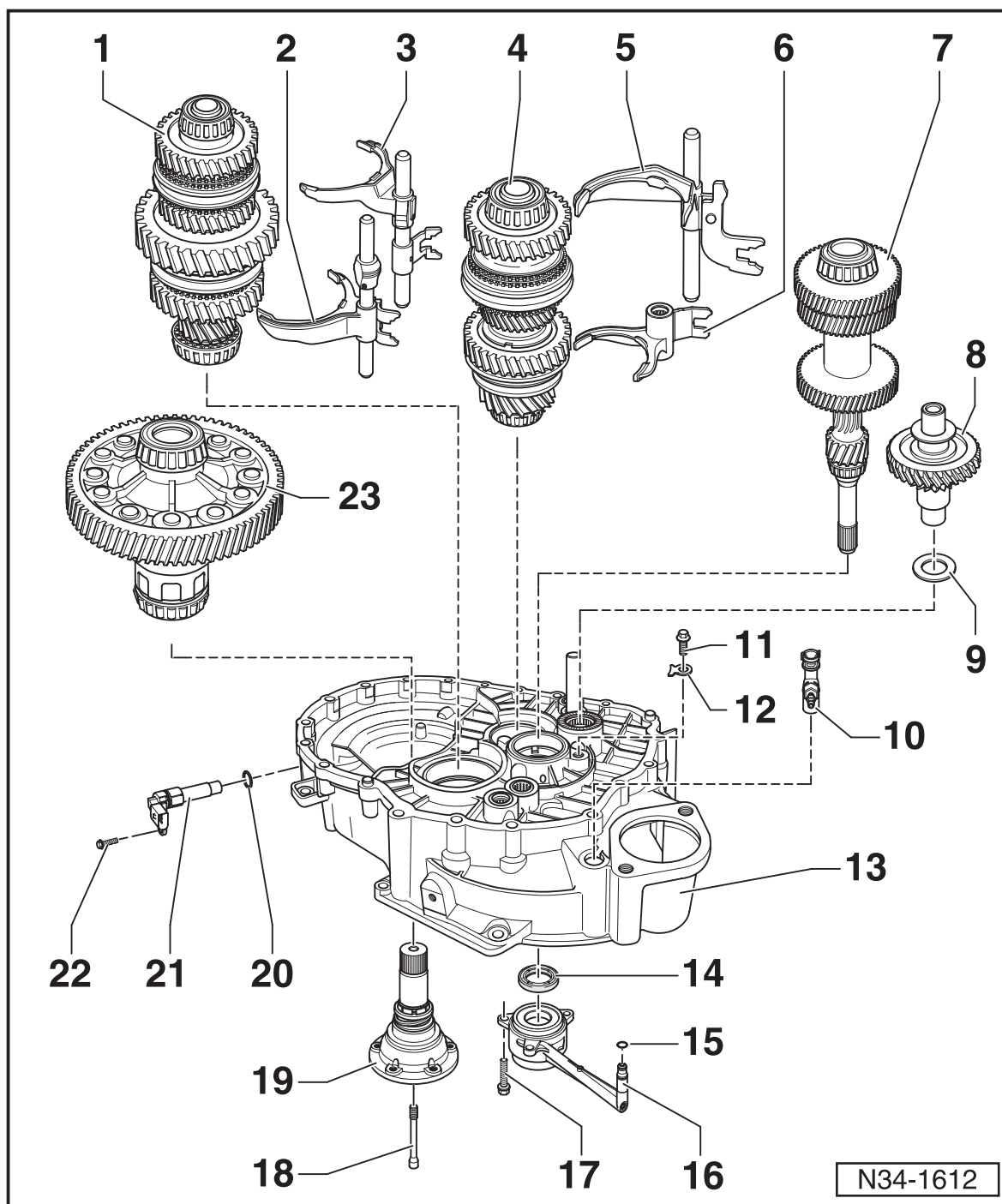
17 - Clutch housing

- ♦ Servicing ⇒ page 34-55

18 - Gearbox housing

- ♦ Servicing ⇒ page 34-50

Removing and installing input shaft, output shafts (pinion shafts), differential, bevel gear and shift rods on vehicles with Front Wheel Drive



1 - 1st to 4th gear output shaft

- ◆ Disassembling and assembling
⇒ page 35-11
- ◆ Fitting location ⇒ Fig.1

2 - Shift rod and shift fork for 1st and 2nd gear

- ◆ Fitting location ⇒ Fig. 2

3 - Shift rod and shift fork for 3rd and 4th gear

- ◆ Fitting location ⇒ Fig. 2

4 - 5th/6th and Reverse gear output shaft

- ◆ Disassembling and assembling
⇒ page 35-28
- ◆ Fitting location ⇒ Fig. 1

5 - Shift rod and shift fork for 5th and 6th gear

- ◆ Fitting location ⇒ Fig. 2

6 - Reverse gear shift fork

- ◆ Fitting location ⇒ Fig. 2

7 - Input shaft

- ◆ Disassembling and assembling
⇒ page 35-1

8 - Reverse idler shaft

- ◆ Removing and installing ⇒ from page 34-42

9 - Thrust washer**10 - Bleeder**

- ◆ Connect to slave cylinder -item 16-

11 - 12 Nm

- ◆ Self-locking
- ◆ Always replace

12 - Tab washer

- ◆ Secures taper roller bearing outer race of input shaft

13 - Clutch housing**14 - Input shaft seal****15 - O-ring**

- ◆ Always replace

16 - Slave cylinder with release bearing**17 - 12 Nm**

- ◆ 3 in total
- ◆ Always replace

18 - Spherical bolt, 25 Nm**19 - Flange shaft with compression spring**

- ◆ Removing and installing ⇒ page 39-1

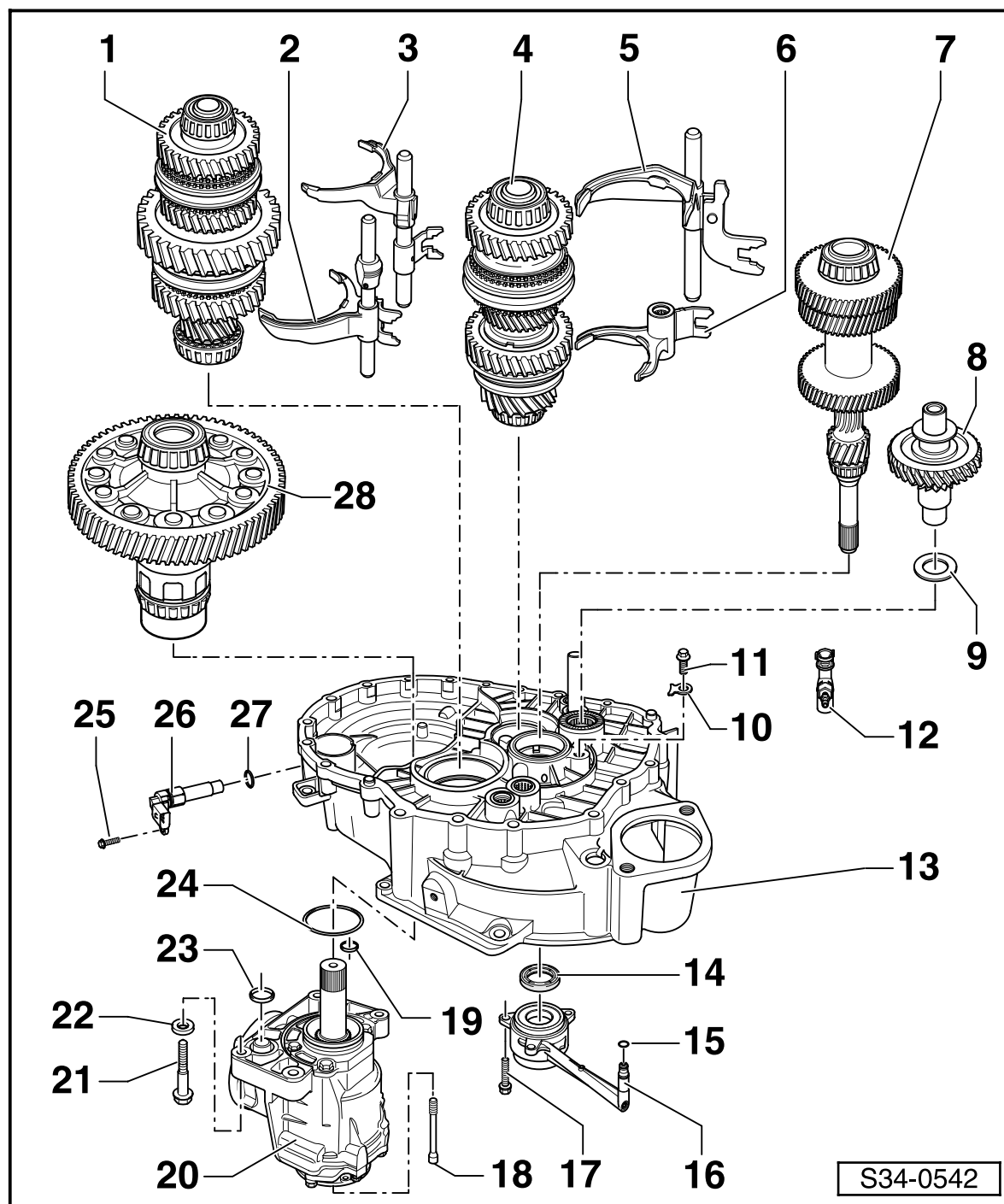
20 - O-ring

- ◆ Always replace

21 - Speedometer sender**22 - 12 Nm****23 - Differential**

- ◆ Disassembling and assembling
⇒ page 39-8

Removing and installing input shaft, output shafts (pinion shafts), differential, bevel gear and shift rods on vehicles with 4 Wheel Drive



1 - 1st to 4th gear output shaft

- ◆ Disassembling and assembling
⇒ page 35-11
- ◆ Fitting location ⇒ Fig.1

2 - Shift rod and shift fork for 1st and 2nd gear

- ◆ Fitting location ⇒ Fig. 2

3 - Shift rod and shift fork for 3rd and 4th gear

- ◆ Fitting location ⇒ Fig. 2

4 - 5th/6th and Reverse gear output shaft

- ◆ Disassembling and assembling
⇒ page 35-28
- ◆ Fitting location ⇒ Fig. 1

5 - Shift rod and shift fork for 5th and 6th gear

- ◆ Fitting location ⇒ Fig. 2

6 - Reverse gear shift fork

- ◆ Fitting location ⇒ Fig. 2

7 - Input shaft

- ◆ Disassembling and assembling
⇒ page 35-1

8 - Reverse idler shaft

- ◆ Removing and installing ⇒ from page 34-42

9 - Thrust washer**10 - Tab washer**

- ◆ Secures taper roller bearing outer race of input shaft

11 - 12 Nm

- ◆ Self-locking
- ◆ Always replace

12 - Bleeder

- ◆ Connect to slave cylinder -item 16-

13 - Clutch housing**14 - Input shaft seal****15 - O-ring**

- ◆ Replace

16 - Slave cylinder with release bearing**17 - 12 Nm**

- ◆ 3 in total

18 - Spherical bolt, 25 Nm**19 - O-ring**

- ◆ Always replace

20 - Bevel gear

- ◆ Disassembling and assembling
⇒ page 39-20

21 - 40 Nm and torque a further 45°

- ◆ Always replace

22 - Washer**23 - O-ring**

- ◆ Always replace

24 - O-ring

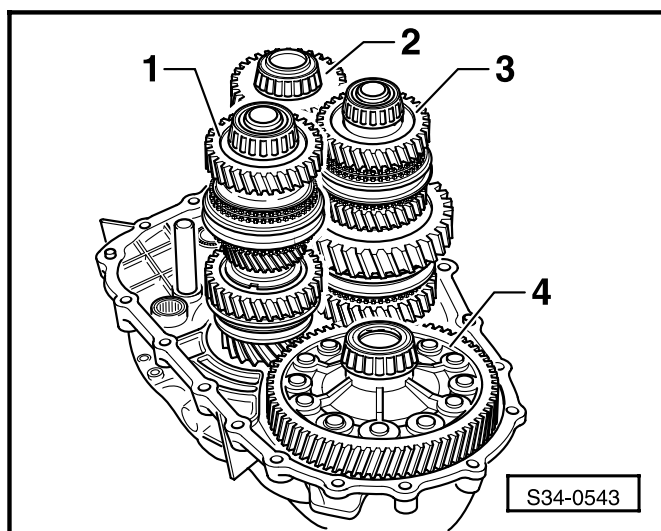
- ◆ Always replace

25 - 12 Nm**26 - Speedometer sender****27 - O-ring**

- ◆ Always replace

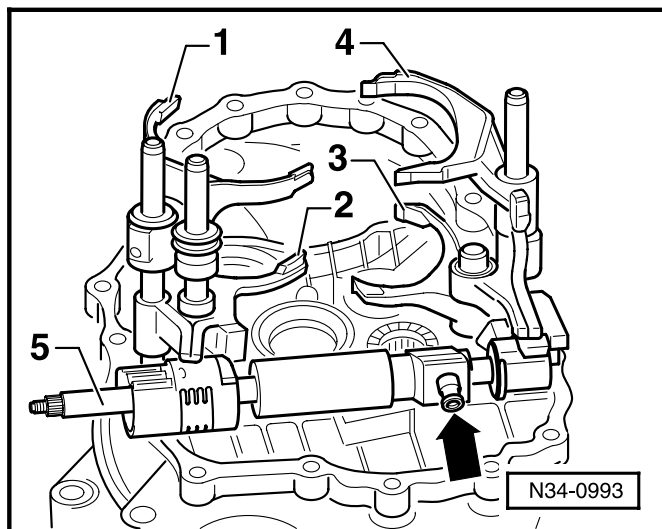
28 - Differential

- ◆ Disassembling and assembling
⇒ page 39-8



◀ **Fig. 1 Fitting location of output shafts (pinion shafts) in gearbox:**

- 1 - 5th/6th and Reverse gear output shaft
- 2 - Input shaft
- 3 - 1st to 4th gear output shaft
- 4 - Differential



◀ **Fig. 2 Fitting location of complete shift mechanism in gearbox:**

- 1 - 3rd and 4th gear shift fork
- 2 - 1st and 2nd gear shift fork
- 3 - Reverse gear shift fork
- 4 - 5th and 6th gear shift fork
- 5 - Shift shaft

The bottom mounting of the shift shaft -arrow- is bolted to the end cover at the gearbox housing.

Removal and installation sequence

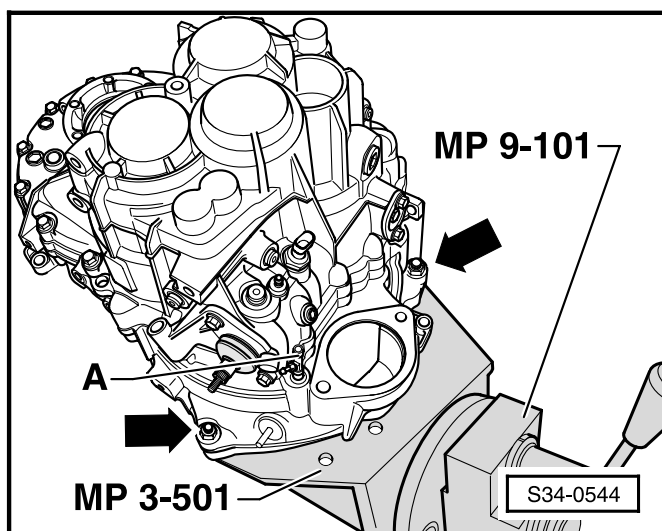
Removing and installing gearbox housing, shift mechanism, input shaft, output shafts (pinion shafts), differential, bevel gear and shift rods

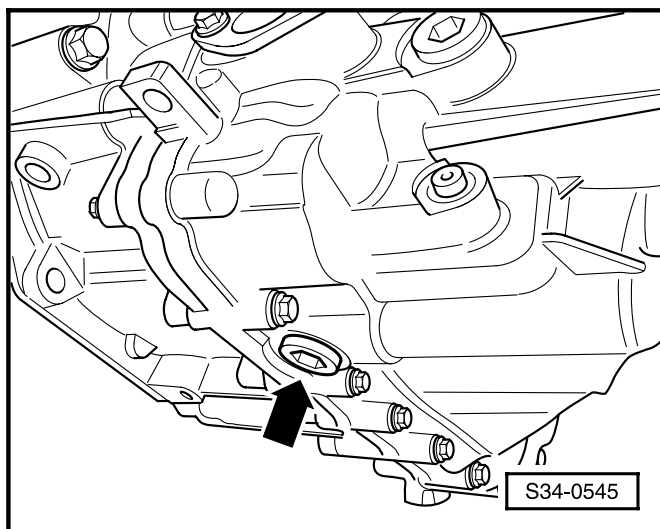
Special tools, testers and aids required

- ♦ Sleeve MP 3-424
- ♦ Gearbox holder MP 3-501
- ♦ Repair stand MP 9-101
- ♦ Thrust piece T40008
- ♦ Torque wrench 5...50 Nm, e.g. V.A.G 1331
- ♦ Torque wrench 40...200 Nm, e.g. V.A.G 1332
- ♦ 6 mm wrench socket, e.g. V.A.G 1669
- ♦ Drip tray

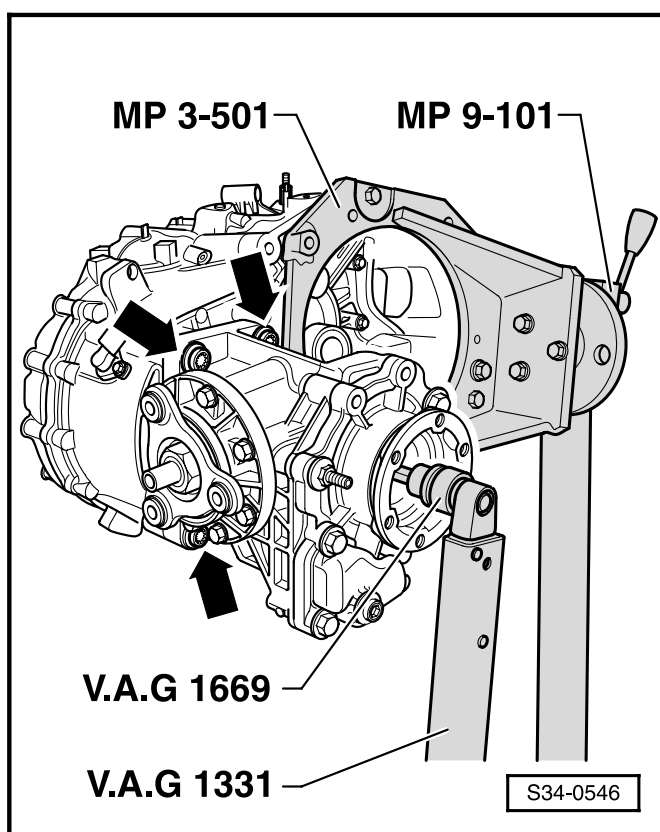
Removing

- ◀ - Attach gearbox to repair stand with bolts -arrows-.
- Take off bleeder -A-; pull out clip as far as the stop for this purpose.





- Turn the gearbox in the repair stand until the oil drain plug is facing down.
- Place drip tray below
- ◀ - Unscrew oil drain plug -arrow-
- Drain gear oil from the manual gearbox and the bevel gear



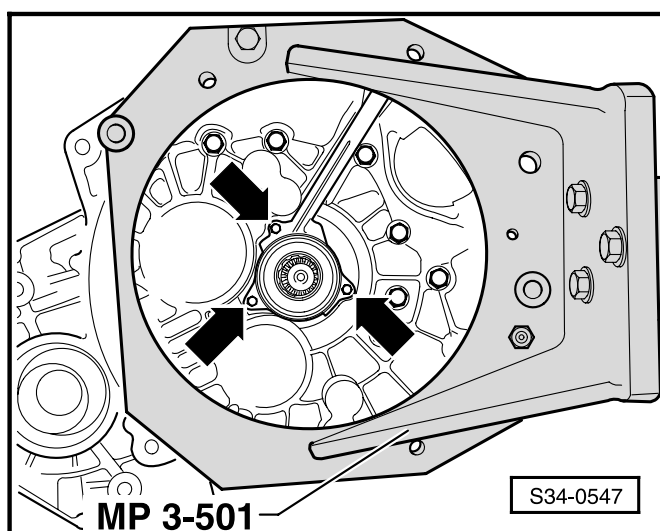
Vehicles with 4 Wheel Drive

- ◀ - Use V.A.G 1669 or commercially available 6 mm wrench socket to remove bolt for right flange shaft.

Note:

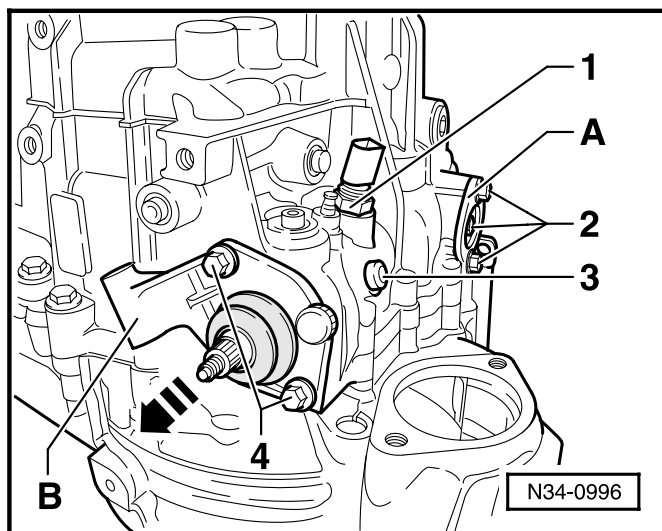
Right flange shaft remains in bevel gear.

- Remove the four bolts connecting bevel gear and manual gearbox -arrows- (illustration shows only three of them).
- Press bevel gear off the manual gearbox



Continued for all vehicles

- ◀ - Take off slave cylinder together with release bearing -arrows-.
- Move shift shaft into Neutral position.



- ◀ - Remove reversing light switch -1-.
- Unscrew hexagon bolts -2- for end cover of shift shaft -A-.
- Carefully pull out end cover
- Remove locking bolt -3- for gate of shift shaft
- Then, unscrew bolts -4- and press shift cover -B- off the gearbox housing.
- Pull shift shaft out of the gearbox housing

Vehicles with Front Wheel Drive

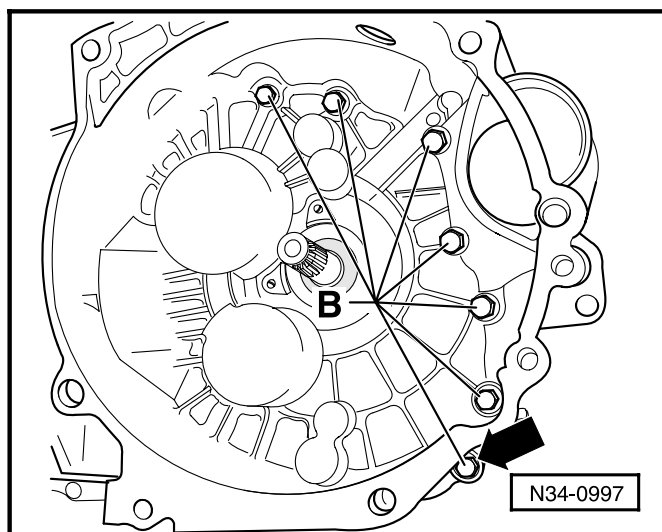
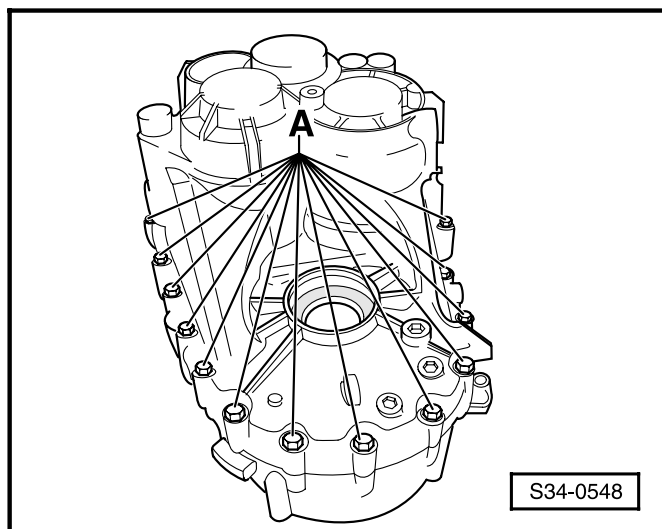
- Remove both flange shafts

Vehicles with 4 Wheel Drive

- Remove left flange shaft

Continued for all vehicles

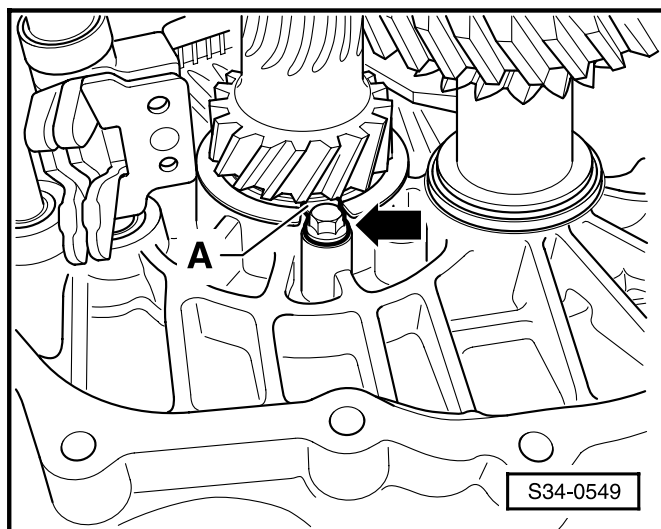
- ◀ - Remove bolts -A- attaching gearbox housing to clutch housing in the area of the differential.



- ◀ - Unscrew bolts -B- which are used to attach the clutch housing to the gearbox housing.

Notes:

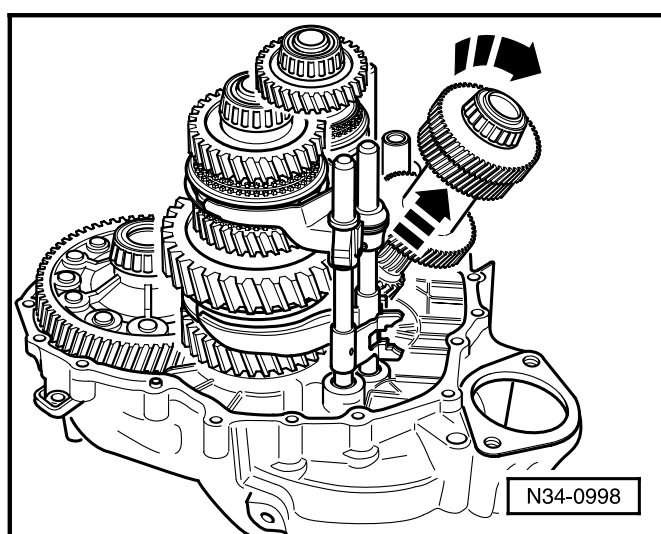
- ♦ The hexagon bolt -arrow- is positioned outside of the bolted flange. It is installed with a washer.
- ♦ Illustration does not show gearbox holder



- Take off gearbox housing; if necessary, use assembly iron to lever off alternately at the housing shoulders positioned all round. Do not damage sealing surfaces when performing this step.

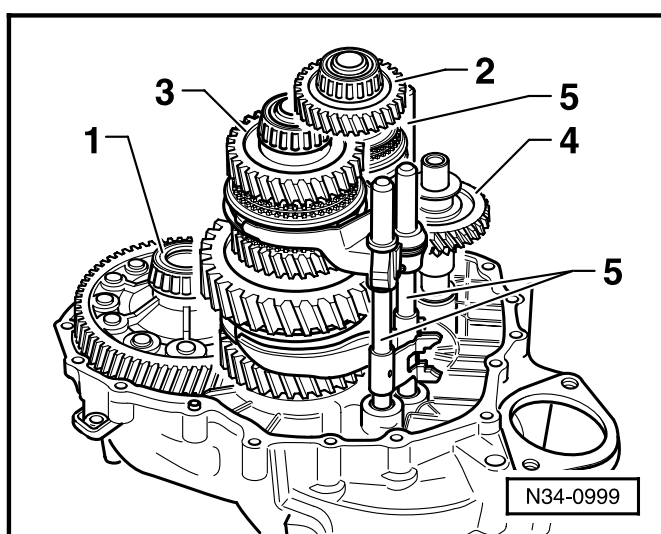
◀ - Unscrew bolt -arrow- for tab washer -A-.

- Take off tab washer -A-.



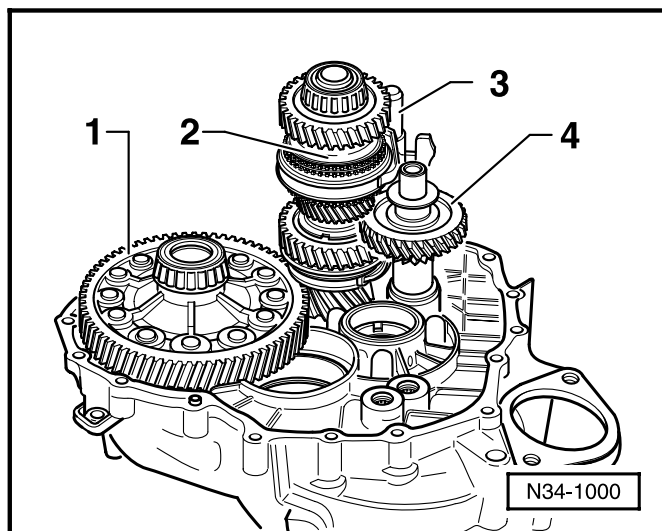
◀ - Swivel input shaft in direction of arrow and take off.

- Remove speedometer sender.



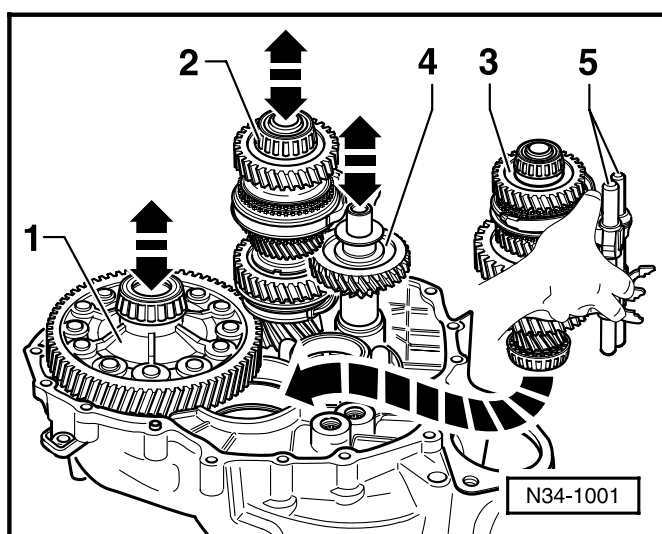
◀ - Carefully take the differential -1-, the output shafts -2- and -3-, the reverse idler shaft -4- as well as the shift rods -5- off the clutch housing (aid of a 2nd person required for this step).

- Use sleeve MP 3-424 to knock out seal for input shaft.



Installing

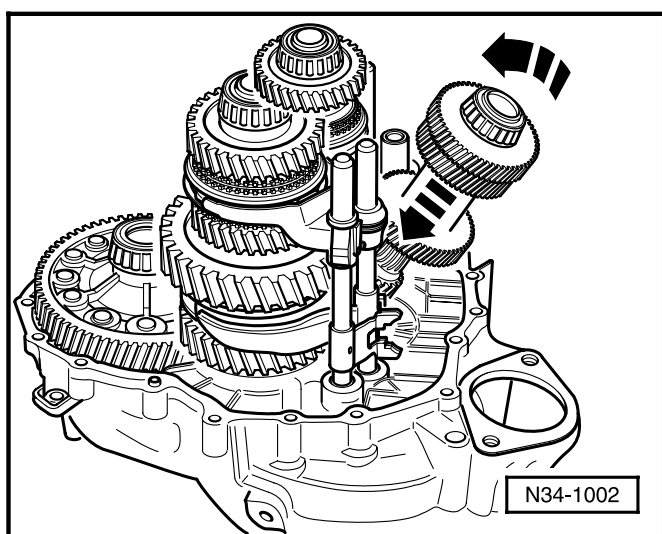
- ◀ - Insert differential -1-.
- Insert 5th/6th and reverse gear output shaft -2- together with reverse gear shift fork, 5th/6th gear shift rod -3- and reverse idler shaft -4-.

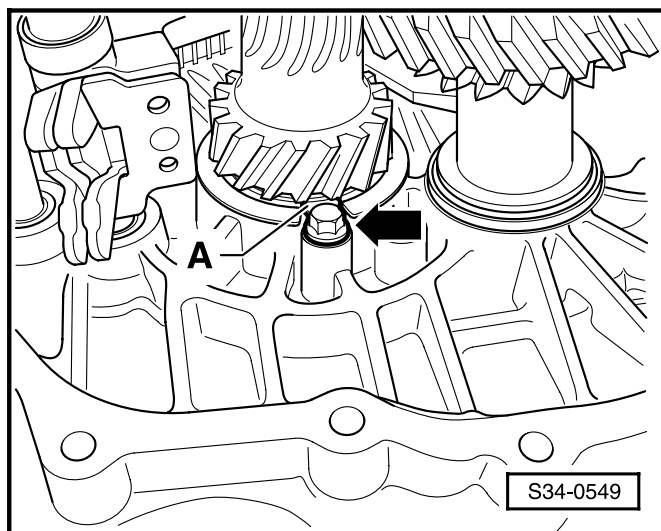


- ◀ - Take the 1st to 4th gear output shaft -3- together with the shift rods -5- in your right hand, as shown in the illustration.
- With your left hand, raise the differential slightly.
- At the same time, a 2nd person raises the 5th/6th gear and reverse gear output shaft -2- together with the reverse idler shaft -4- slightly.
- Now, insert the 1st to 4th gear output shaft in the direction of the arrow.

The splines of the output shafts and of the final drive gear/differential must mesh.

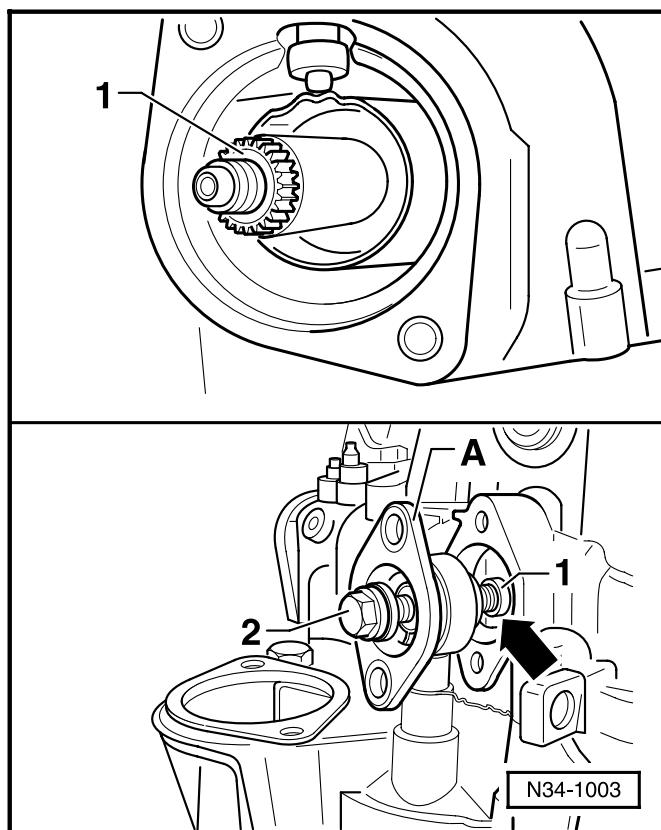
- Now, together with the 2nd mechanic, place the shafts into the bearing seats.
- ◀ - Place the input shaft into the clutch housing and swivel into place -arrows-.



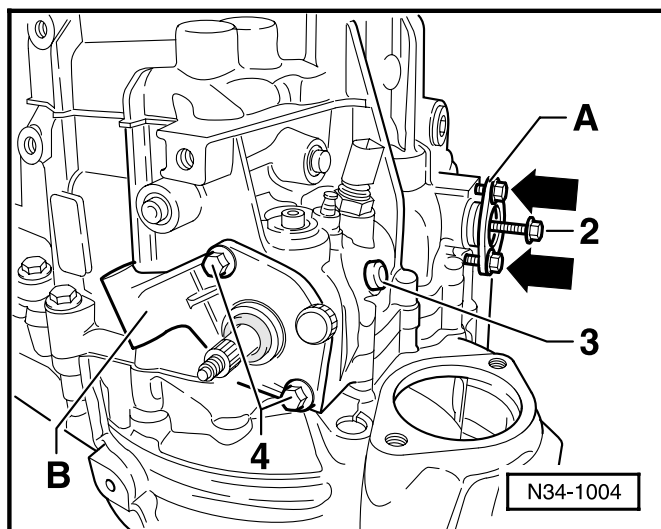


- ◀ - Place the tab washer -A- into the recess of the clutch housing.
- Tighten new bolts -arrow- to 12 Nm.
- Install gearbox housing.

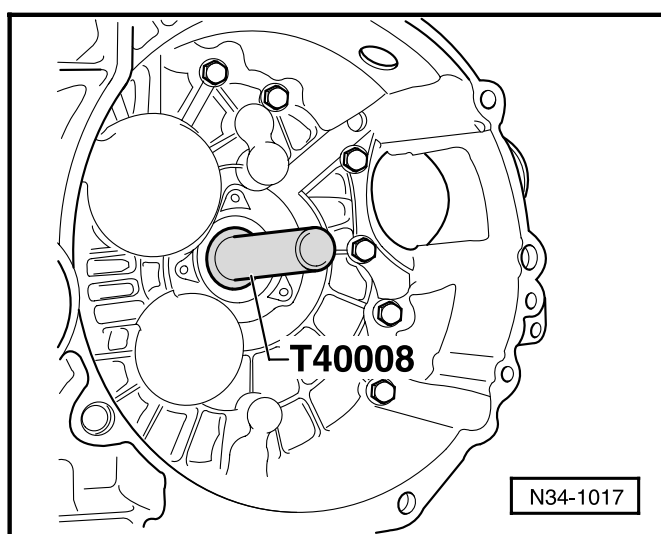
Procedure for installing shift shaft:



- Move shift rods into Neutral position.
- ◀ - Insert shift shaft -1-.
- Position shift shaft so that it is inserted together with the shift fingers into the shift rods ⇒ page 34-42, Fig. 2.
- When carrying out this step, align the bottom bearing -arrow- of the shift shaft through the hole for the end cover.
- Bolt the end cover -A- to the bottom bearing for the shift shaft -1- with an M8 x 60 mm bolt -2-.



- ◀ - Draw in end cover -A- by alternately tightening the bolts -arrows- by hand (1/2 turn).
- Unscrew bolt -2- and screw in the original bolt by hand in its place.
- Install shift cover -B- for shift shaft and tighten hexagon bolts -4- fully to 20 Nm.
- Now, tighten hexagon bolts for the end cover fully to 20 Nm.
- Insert locking bolt -3- for gate of shift shaft with locking fluid D 000 600 A2 and tighten fully to 15 Nm.
- Tighten reversing light switch fully to 20 Nm.



Vehicles with Front Wheel Drive

- Install complete left flange shaft
⇒ page 34-37.

Vehicles with 4 Wheel Drive

- Install left flange shaft ⇒ page 34-37

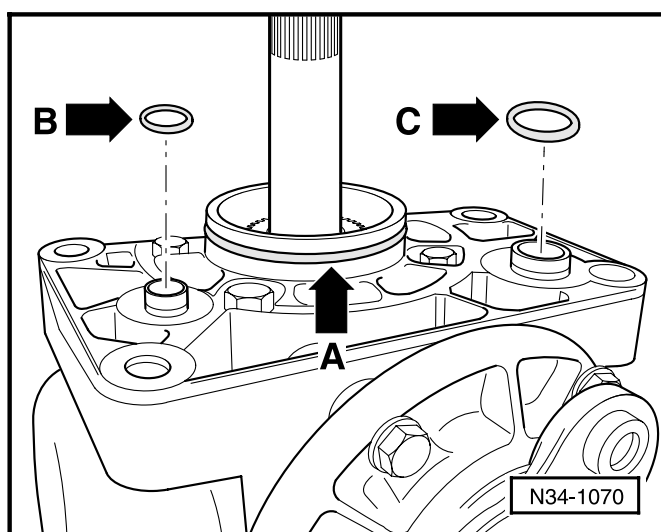
Continued for all vehicles

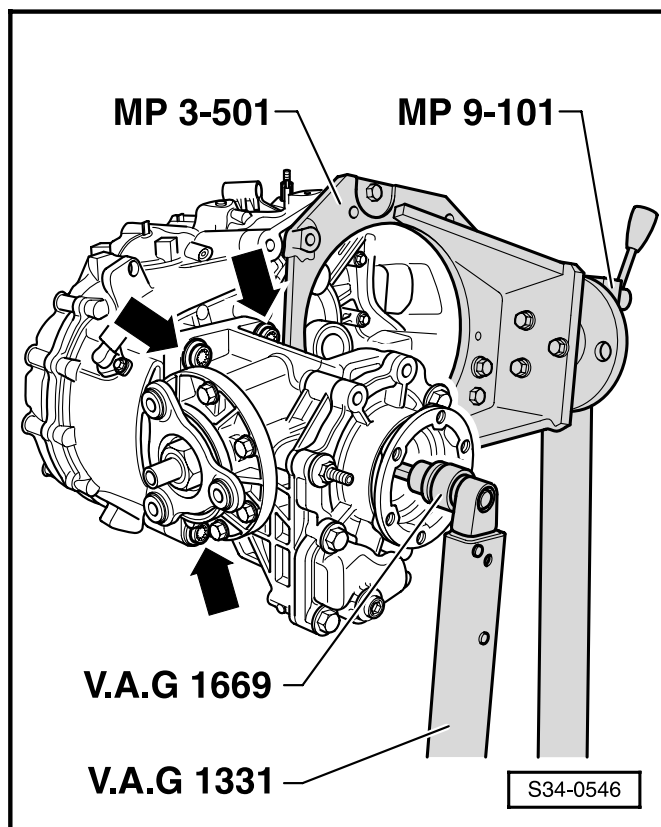
- Install speedometer sender
- ◀ - Knock in seal for input shaft
- Install slave cylinder together with release bearing
- Install bleeder

Vehicles with 4 Wheel Drive

Procedure for attaching bevel gear:

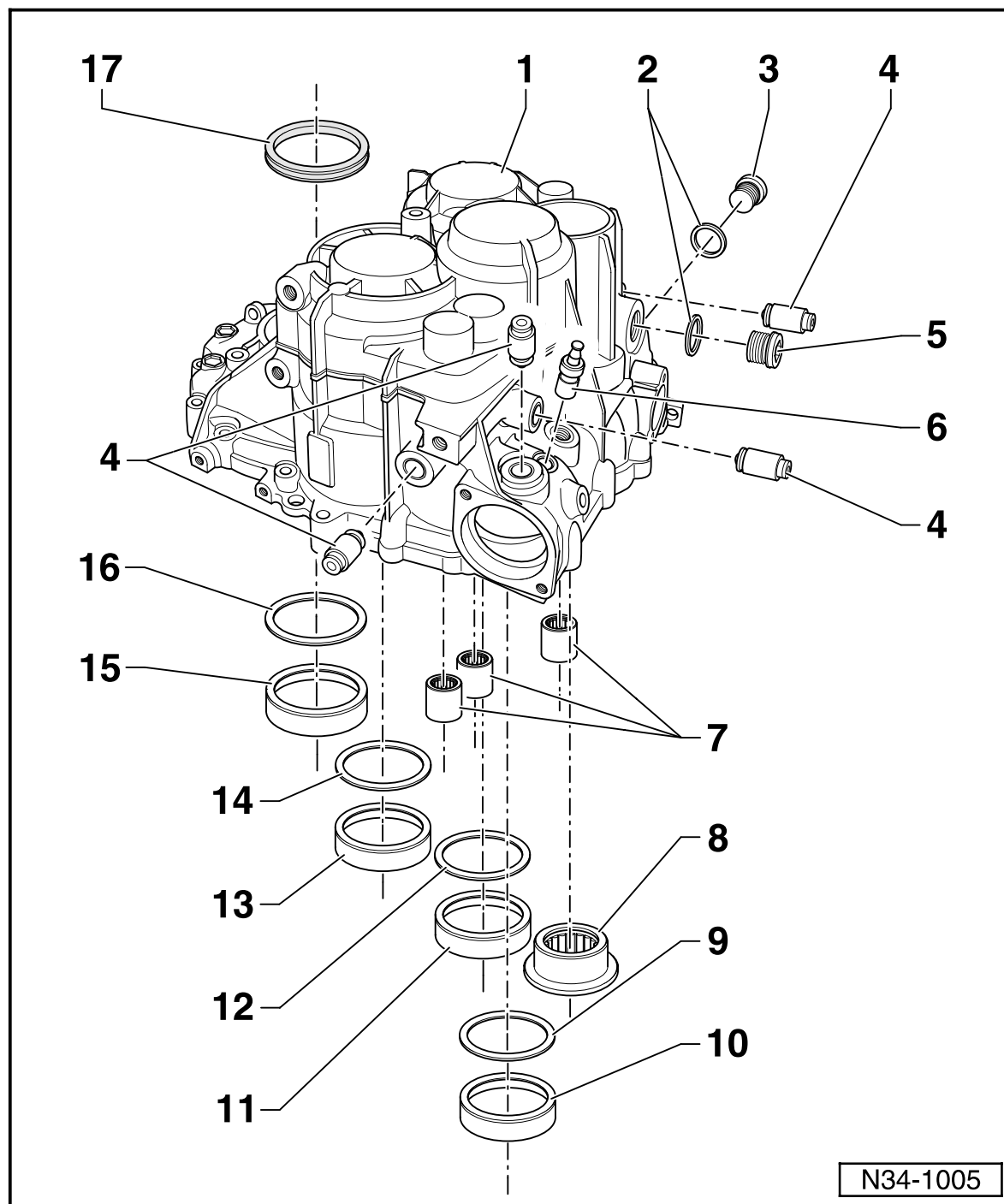
- ◀ - Always replace the O-ring for sealing bevel gear/manual gearbox -arrow A- and the O-rings for sealing the oil supply sleeves -arrow B and C-; oil lightly.
- Push bevel gear fully up against manual gearbox; when doing this, fit together the splines of the input shaft of the bevel gear with connecting sleeve of the differential so that they are centered.





- Likewise align the splines of the right flange shaft and of the differential bevel gear; rotate at flange shaft, if necessary.
- If the teeth are correctly positioned and the parts are centered, the bevel gear will slip against the manual gearbox as far as the stop.
- Do not use the connecting bolts to pull the bevel gear against the manual gearbox otherwise the bevel gear will be twisted and the securing eyes may shear off.
- ◀ - Tighten the four bolts connecting the bevel gear and manual gearbox to 40 Nm and torque a further 45° -arrows- (illustration shows only three of the bolts).
- Use V.A.G 1669 or commercially available 6 mm wrench socket to tighten spherical bolt for right flange shaft to 25 Nm; secure with drift to prevent it turning.

Servicing gearbox housing



Special tools, testers and aids required

- ◆ Insertion tool MP 1-233
- ◆ Universal tool MP 3-419
- ◆ Thrust plunger MP 3-423
- ◆ Centring drift MP 3-463
- ◆ Gearbox holder MP 3-501
- ◆ Tube section MP 3-4012
- ◆ Repair stand MP 9-101
- ◆ Torque wrench 5...50 Nm, e.g. V.A.G 1331
- ◆ Centring drift T30029
- ◆ Internal extractor 14.5...18.5 mm, e.g. Kukko 21/2
- ◆ Internal extractor 23.5...30 mm, e.g. Kukko 21/4

1 - Gearbox housing

- ◆ Clamp in repair stand ⇒ Fig. 1
- ◆ If replaced: set input shaft, output shafts and differential ⇒ page 39-16

2 - Seal

- ◆ Always replace

3 - Oil drain plug, 30 Nm

- ◆ Always replace

4 - Detent sleeves

- ◆ Knocking out ⇒ Fig. 2
- ◆ Knocking in ⇒ Fig. 3

5 - Oil filler plug, 30 Nm

- ◆ Always replace

6 - Locking pin

- ◆ Is pressed into gate of shift shaft for setting outer shift mechanism ⇒ page 34-14
- ◆ Knocking out ⇒ Fig. 4
- ◆ Knocking in ⇒ Fig. 5

7 - Bearing bush

- ◆ For shift rods
- ◆ Replace each time removed
- ◆ Removing ⇒ Fig. 6
- ◆ Installing ⇒ Fig. 7

8 - Needle sleeve

- ◆ Replace each time removed
- ◆ Removing ⇒ Fig. 8
- ◆ Pressing in ⇒ Fig. 9

9 - Shim

- ◆ For input shaft
- ◆ List of settings ⇒ page 39-16

10 - Taper roller bearing outer race

- ◆ For input shaft
- ◆ Removing and installing ⇒ from page 35-1
- ◆ If replaced: set input shaft ⇒ page 35-8

11 - Taper roller bearing outer race

- ◆ For 5th/6th and reverse gear output shaft
- ◆ Removing and installing ⇒ from page 35-28
- ◆ If replaced: set 5th/6th and reverse gear output shaft ⇒ page 35-38

12 - Shim

- ◆ For 5th/6th and reverse gear output shaft
- ◆ List of settings ⇒ page 39-16

13 - Taper roller bearing outer race

- ◆ For 1st to 4th gear output shaft
- ◆ Removing and installing ⇒ page 35-23
- ◆ If replaced: set 1st to 4th gear output shaft ⇒ page 35-24

14 - Shim

- ◆ For 1st to 4th gear output shaft
- ◆ List of settings ⇒ page 39-16

15 - Taper roller bearing outer race

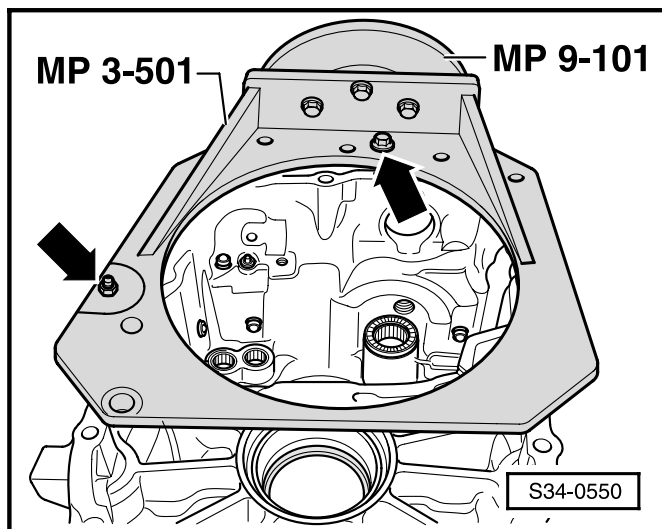
- ◆ For differential
- ◆ Removing and installing ⇒ from page 39-8
- ◆ If replaced: set differential ⇒ page 39-17

16 - Shim

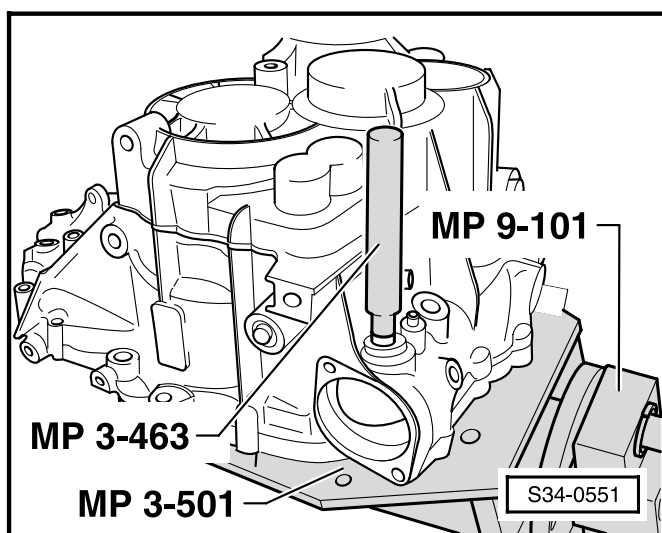
- ◆ For differential
- ◆ List of settings ⇒ page 39-16

17 - Seal

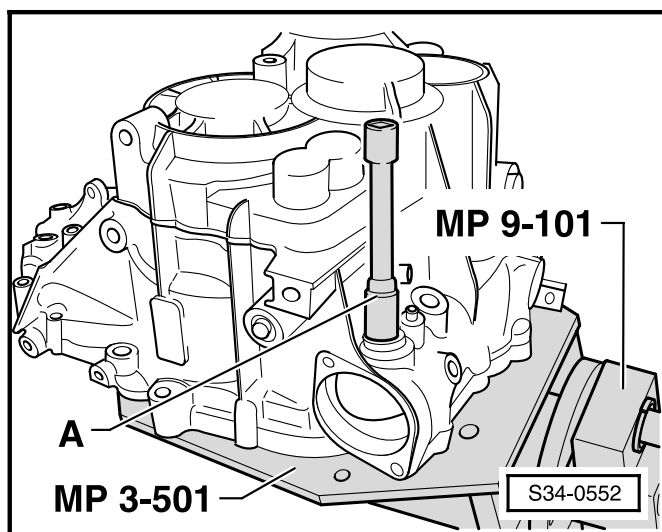
- ◆ Replacing ⇒ page 39-1



◀ Fig. 1 Attaching gearbox housing to repair stand with bolts -arrows-

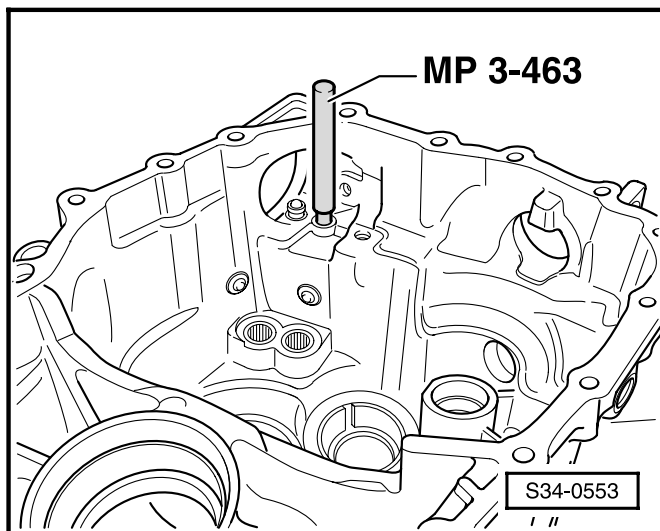


◀ Fig. 2 Knocking out detent sleeve

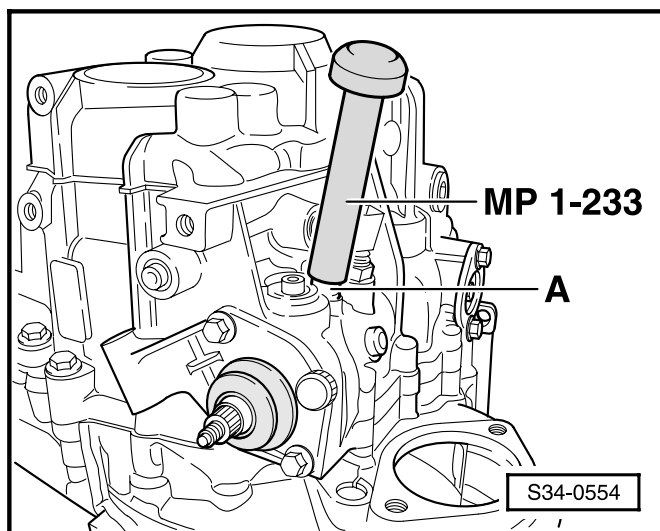


◀ Fig. 3 Knocking in detent sleeve as far as the stop

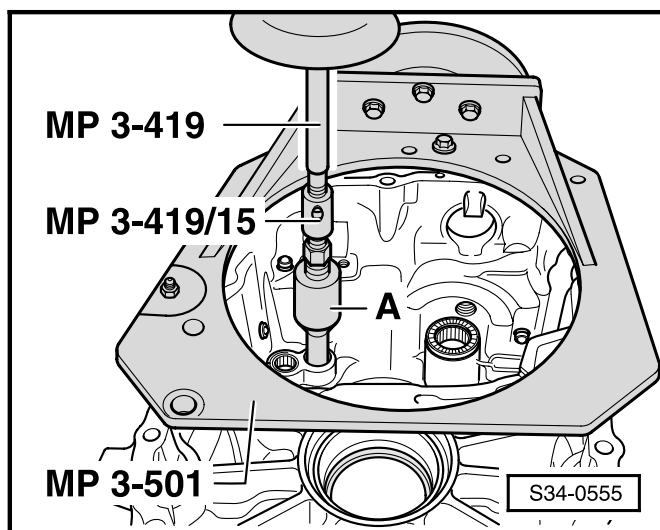
- Use size 13 wrench socket -A- and plastic-headed hammer to knock in detent sleeve as far as the stop.



◀ Fig. 4 Knocking out locking pin

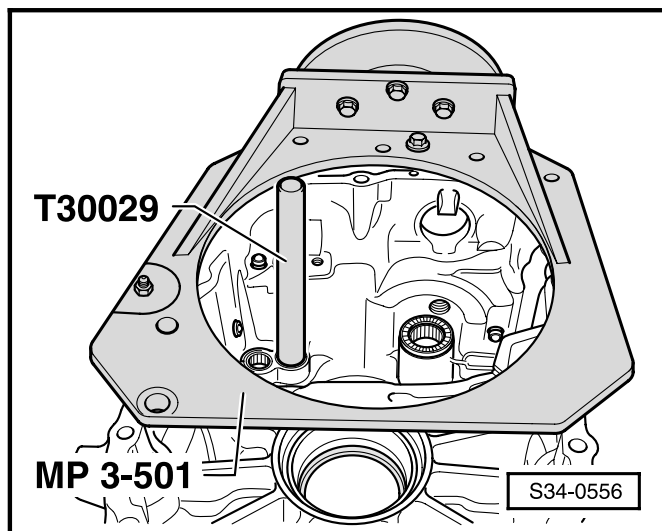


◀ Fig. 5 Knocking in locking pin -A- as far as the stop

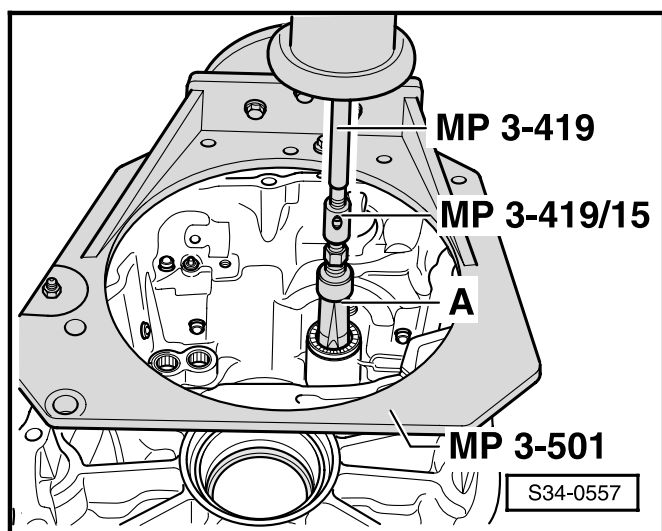


◀ Fig. 6 Pulling out bearing bush for shift rod

A - Internal extractor 14.5...18.5 mm,
e.g. Kukko 21/2



◀ Fig. 7 Knocking in bearing bush for shift rod flush

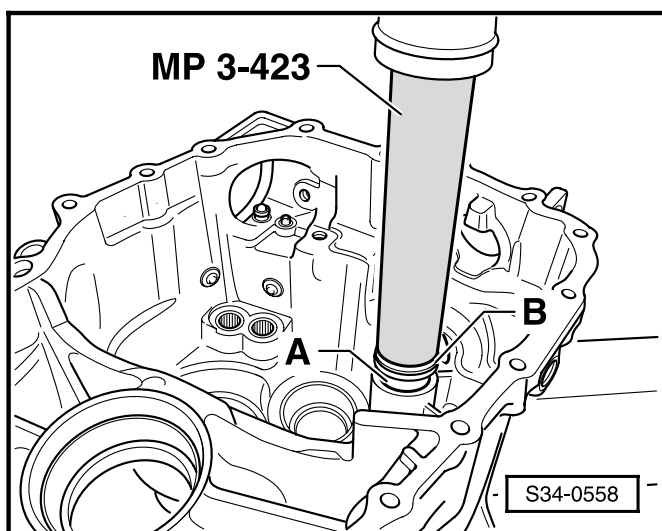


◀ Fig. 8 Pulling needle sleeve for reverse idler shaft out of gearbox housing

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

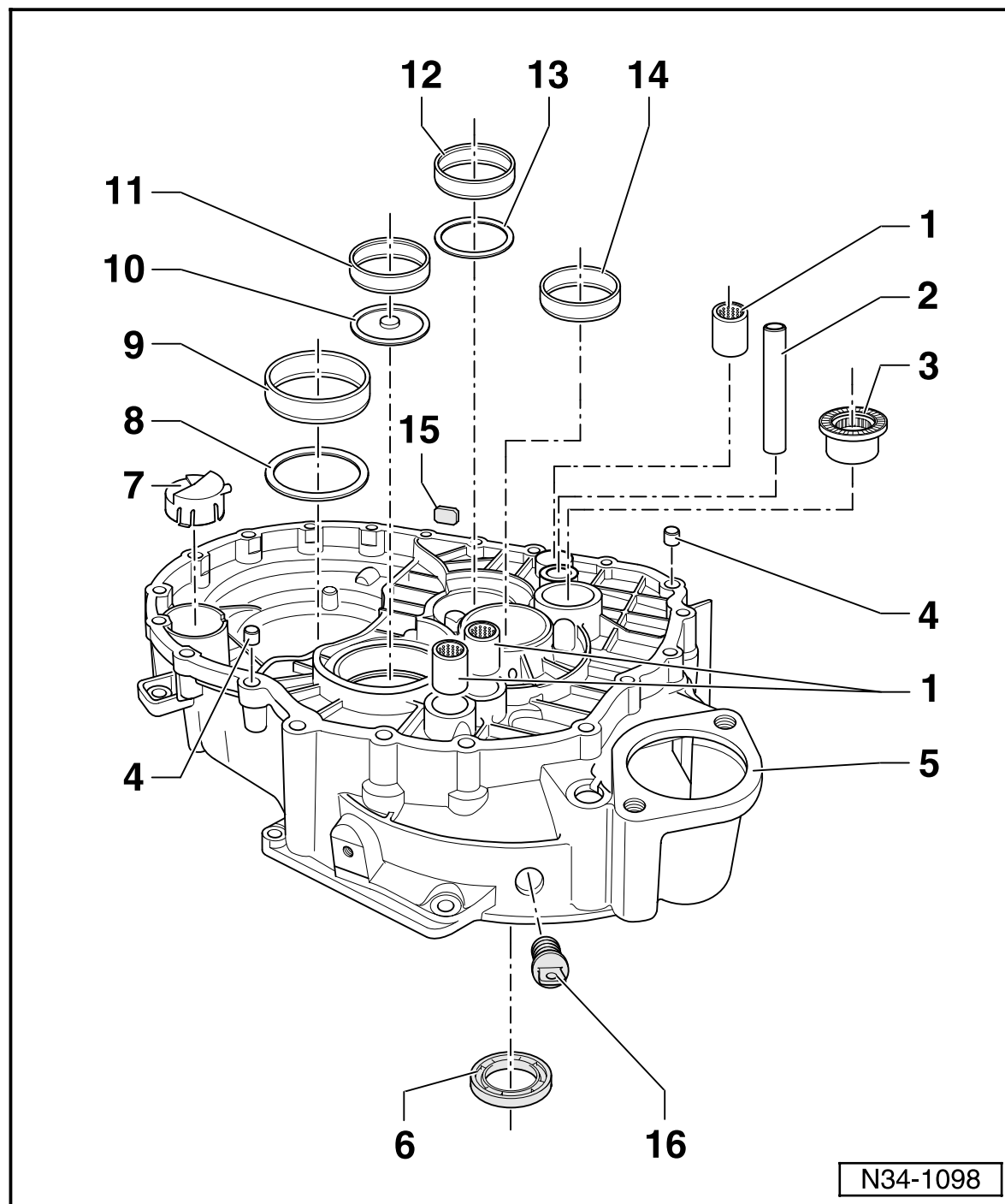
Note:

Needle sleeve is destroyed when it is removed and must be replaced.



◀ Fig. 9 Pressing needle sleeve -A- into gearbox housing

- During the insertion operation, place the thrust washer -B- of the reverse idler shaft onto the needle sleeve.
- Use tube section MP 3-4012 to support gearbox housing directly below the bearing mount.



N34-1098

2 - Shaft for reverse gear shift fork

- ◆ Shaft cannot be removed with workshop equipment
- ◆ Pressing shaft into clutch housing ⇒ Fig. 7

3 - Needle sleeve

- ◆ Replace each time removed
- ◆ Extracting ⇒ Fig. 3
- ◆ Inserting ⇒ Fig. 4

4 - Dowel sleeve

- ◆ 2 in total

5 - Clutch housing

- ◆ If replaced ⇒ List of settings, page 39-16

6 - Input shaft seal

- ◆ Removing ⇒ Fig. 5
- ◆ Installing ⇒ Fig. 6

7 - Oil guide

- ◆ Installed only on vehicles with 4 Wheel Drive
- ◆ Use a screwdriver for levering out
- ◆ Fits only in one position

8 - Washer

- ◆ For differential

9 - Taper roller bearing outer race

- ◆ For differential
- ◆ Removing and installing ⇒ from page 39-8
- ◆ If replaced: set differential ⇒ page 39-17

10 - Oil deflector plate

- ◆ Fitting location: shoulder at hole points toward output shaft

11 - Taper roller bearing outer race

- ◆ For 1st to 4th gear output shaft
- ◆ Removing and installing ⇒ page 35-15
- ◆ If replaced: set 1st to 4th gear output shaft ⇒ page 35-24

12 - Taper roller bearing outer race

- ◆ For 5th/6th and reverse gear output shaft
- ◆ Removing and installing ⇒ from page 35-28
- ◆ If replaced: set 5th/6th and reverse gear output shaft ⇒ page 35-38

13 - Washer

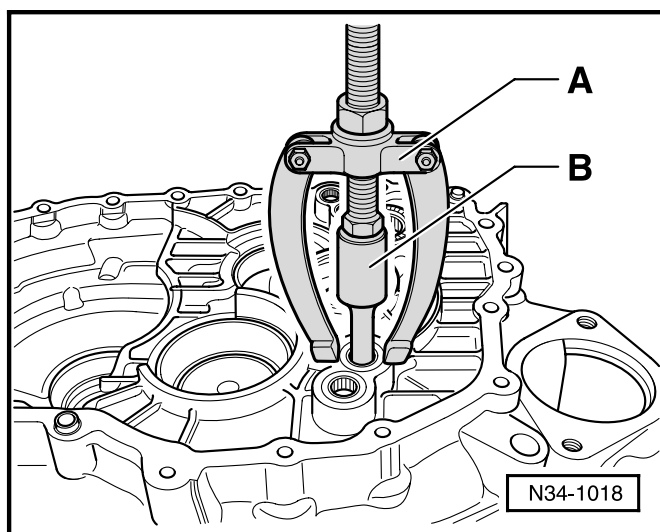
- ◆ For output shaft
- ◆ Always 0.65 mm thick

14 - Taper roller bearing outer race

- ◆ For input shaft
- ◆ Removing and installing ⇒ from page 35-1
- ◆ If replaced: set input shaft ⇒ page 35-8

15 - Magnet

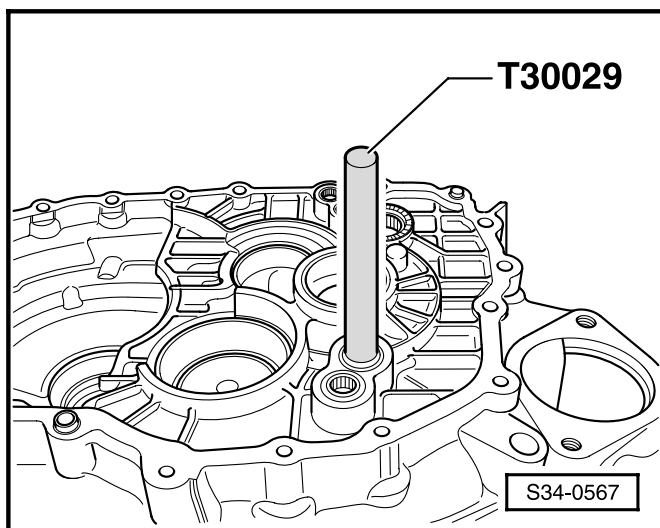
- ◆ Is held by contact surface of housing

16 - Cap

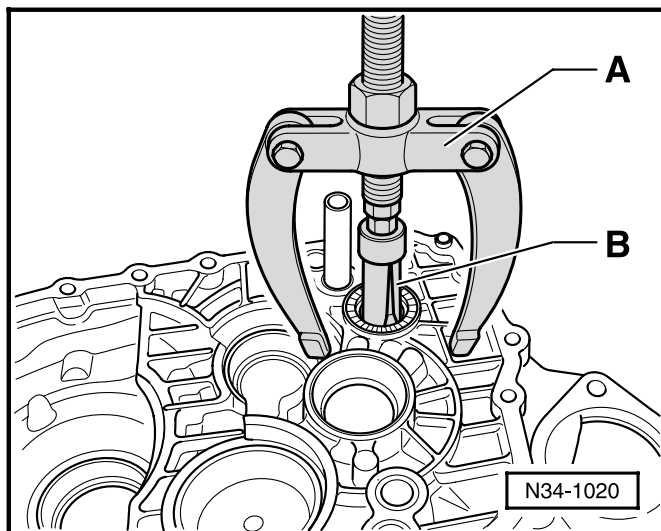
◀ Fig. 1 Pulling out bearing bush for shift rod

A - Countersupport, e.g. Kukko 22/1

B - Internal extractor 14.5...18.5 mm, e.g. Kukko 21/2



◀ Fig. 2 Knocking in bearing bush for shift rod flush



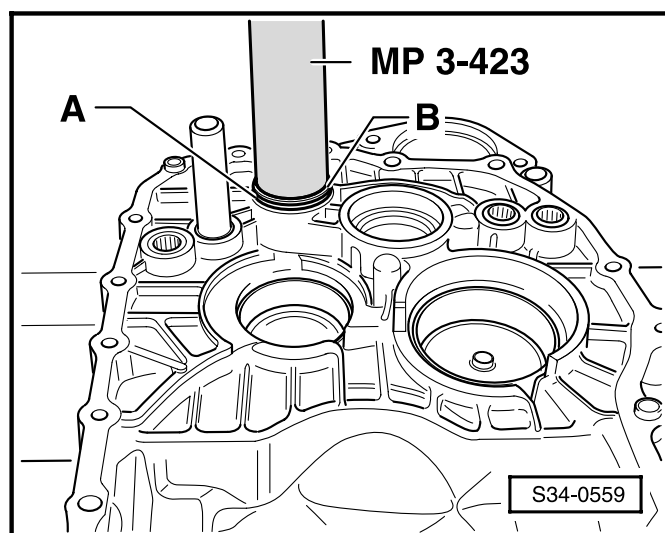
◀ Fig. 3 Pulling needle sleeve out of clutch housing

A - Countersupport, e.g. Kukko 22/2

B - Internal extractor 23.5...30 mm,
e.g. Kukko 21/4

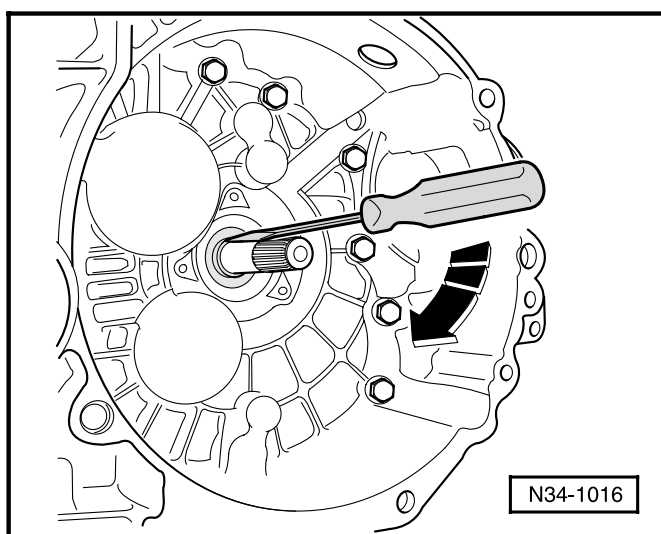
Note:

Needle sleeve is destroyed when it is removed and must be replaced.



◀ Fig. 4 Pressing needle sleeve -A- into clutch housing

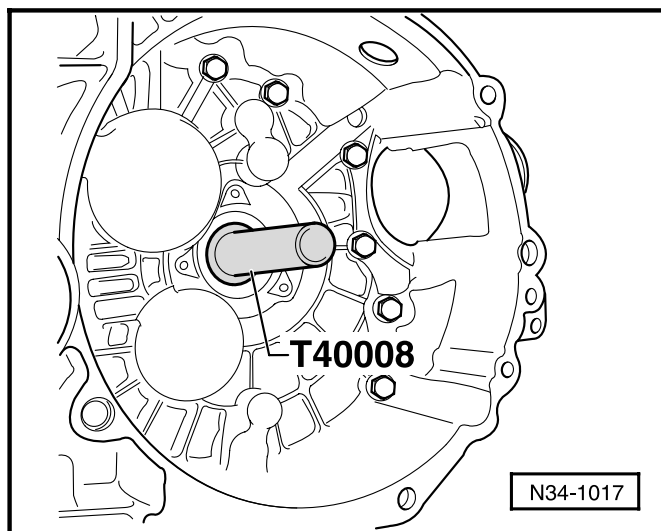
- During the insertion process, place the thrust washer -B- of the reverse idler shaft onto the needle sleeve.



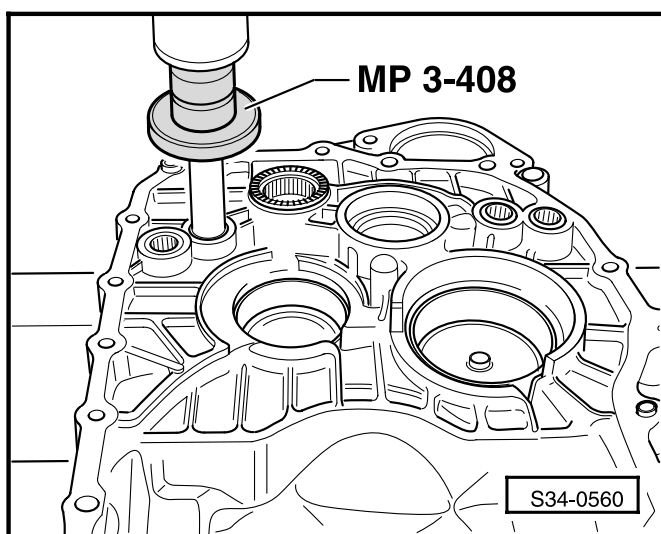
◀ Fig. 5 Removing input shaft seal

- Use a screwdriver to carefully lever out seal.

Seal can be removed with sleeve MP 3-424 when gearbox is disassembled.

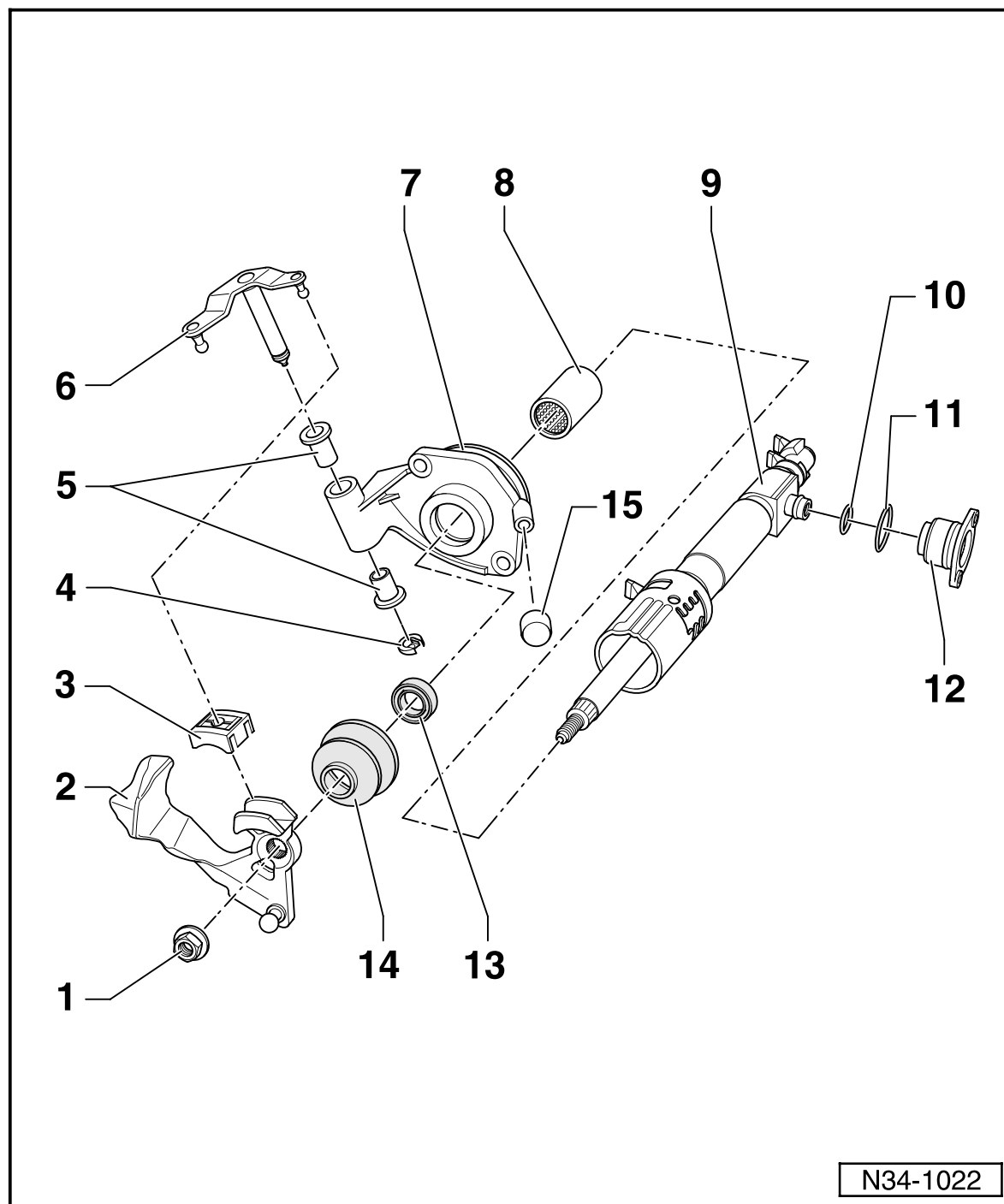


◀ Fig. 6 Knocking in seal for input shaft flush



◀ Fig. 7 Pressing shaft for reverse gear shift fork into clutch housing

Disassembling and assembling shift mechanism at gearbox side



Special tools, testers and aids required

- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Pipe MP 3-472
- ◆ Tube section MP 3-479
- ◆ Tube section MP 3-4013

1 - 20 Nm

2 - Gearbox shift lever

- ◆ Insert so that uninterrupted tooth spacing matches shift shaft
- ◆ Can be replaced with shift mechanism installed
- ◆ Fitting location ⇒ page 34-9

3 - Sliding shoe

- ◆ Clip into relay lever -item 6-

4 - Lock washer

- ◆ Removing ⇒ Fig. 1

5 - Bearing bush**6 - Relay lever**

- ◆ Fitting location ⇒ page 34-9

7 - Shift cover**8 - Spherical sleeve**

- ◆ For shift shaft
- ◆ Removing ⇒ Fig. 2
- ◆ Inserting ⇒ Fig. 3

9 - Shift shaft**10 - O-ring**

- ◆ Always replace

11 - O-ring

- ◆ Always replace

12 - End cover**13 - Seal**

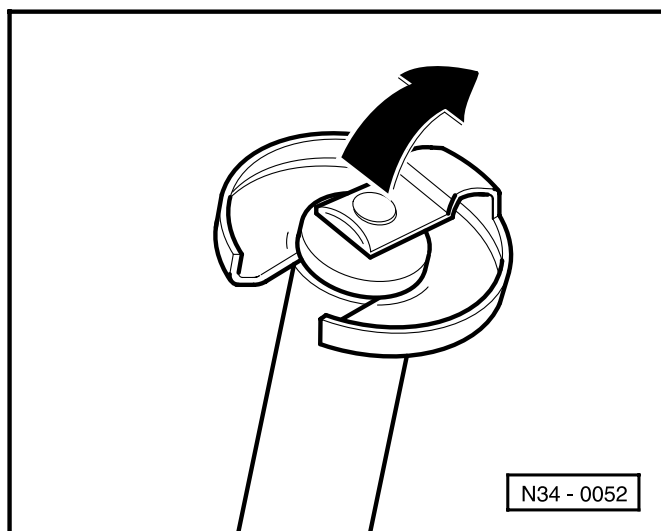
- ◆ Use screwdriver to lever out
- ◆ Installing ⇒ Fig. 4

14 - Cap

- ◆ For shift shaft

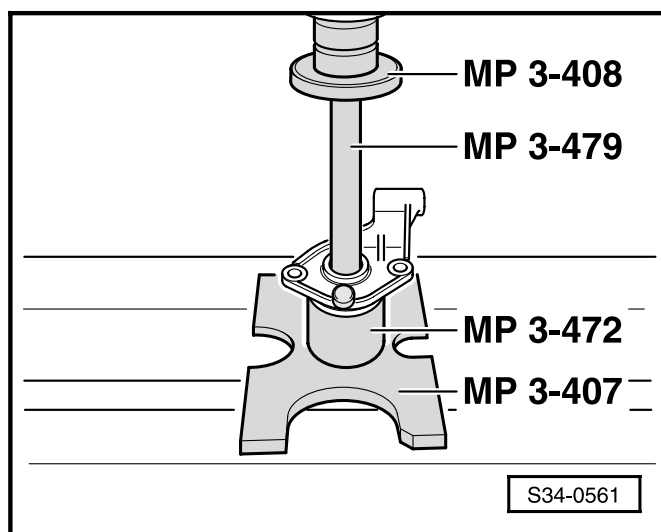
15 - Cap

- ◆ For gearbox breather

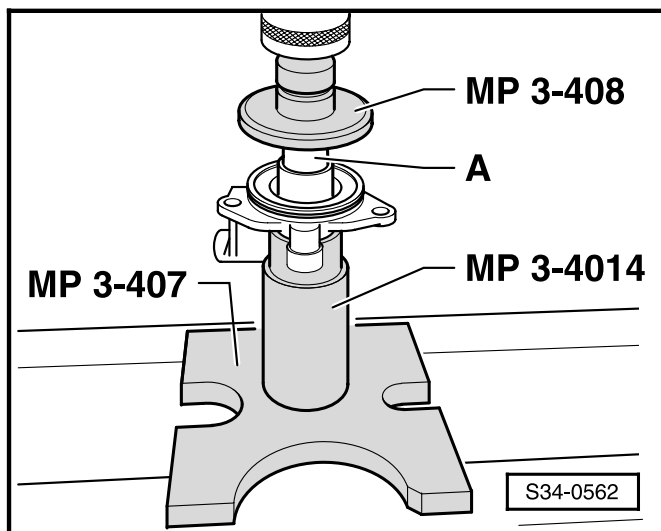


◀ Fig. 1 Removing lock washer for relay lever

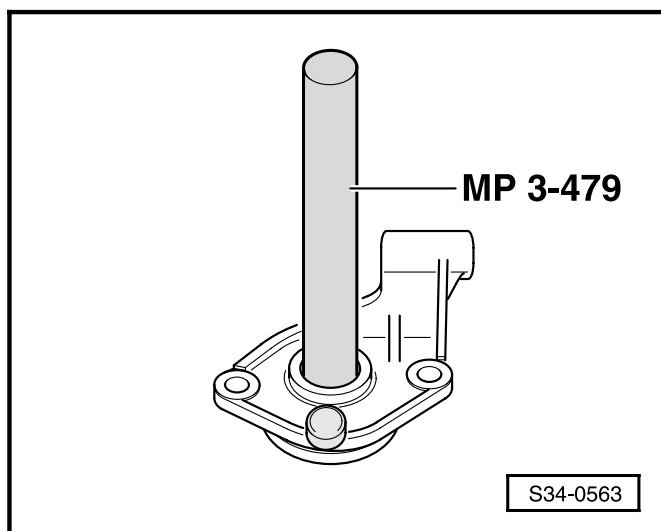
- Raise clip in direction of arrow.



◀ Fig. 2 Pressing spherical sleeve out of shift cover

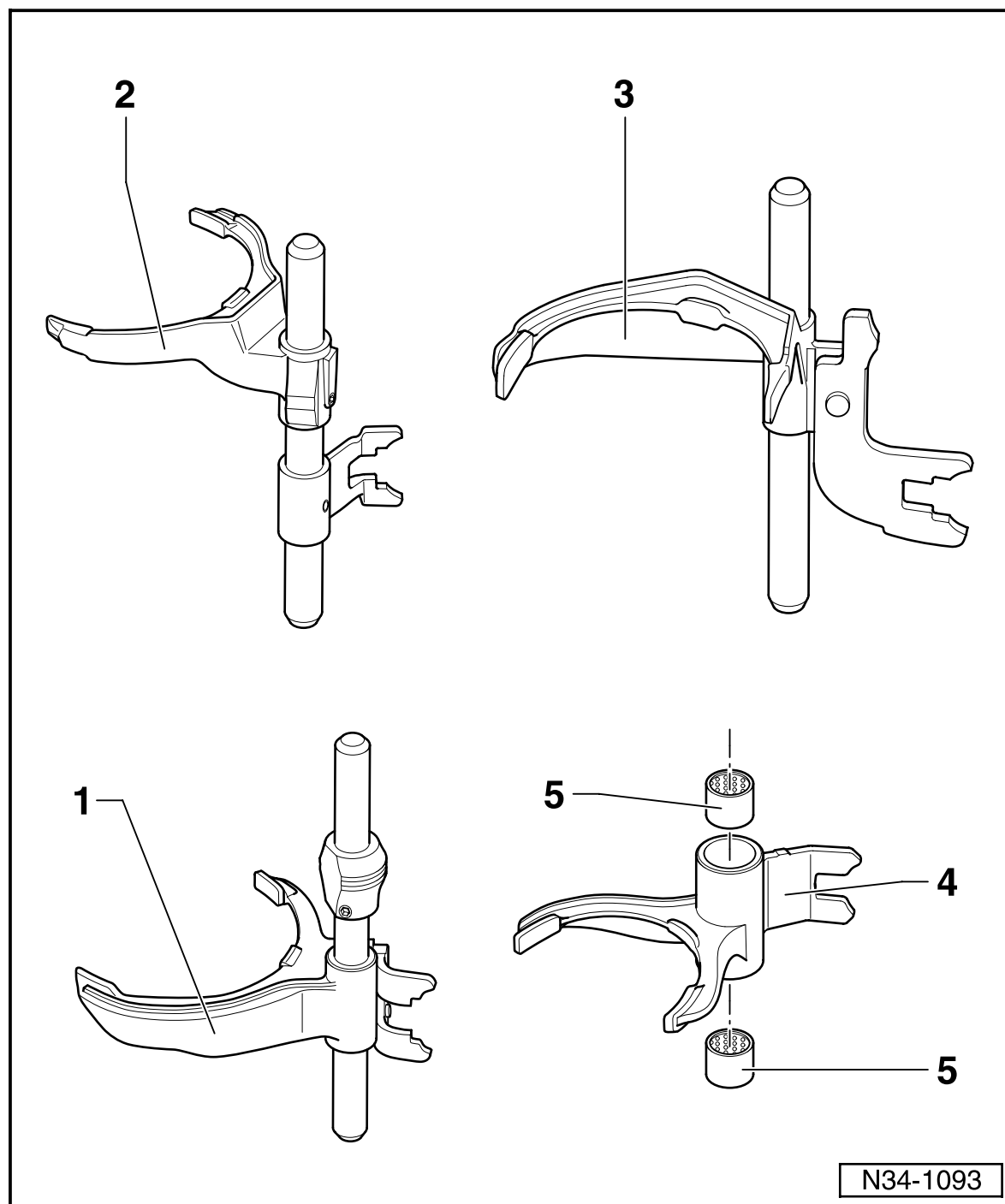


◀ Fig. 3 Pressing spherical sleeve into shift cover



◀ Fig. 4 Inserting seal fully

Disassembling and assembling shift forks



Special tools, testers and aids required

- ◆ Thrust plate MP 3-407
- ◆ Spacer sleeve MP 3-458
- ◆ Thrust piece MP 3-4014
- ◆ Thrust plunger MP 6-405
- ◆ Internal extractor 18...23 mm,
e.g. Kukko 21/3
- ◆ Countersupport, e.g. Kukko 22/1

1 - Shift rod with shift fork for 1st and 2nd gear

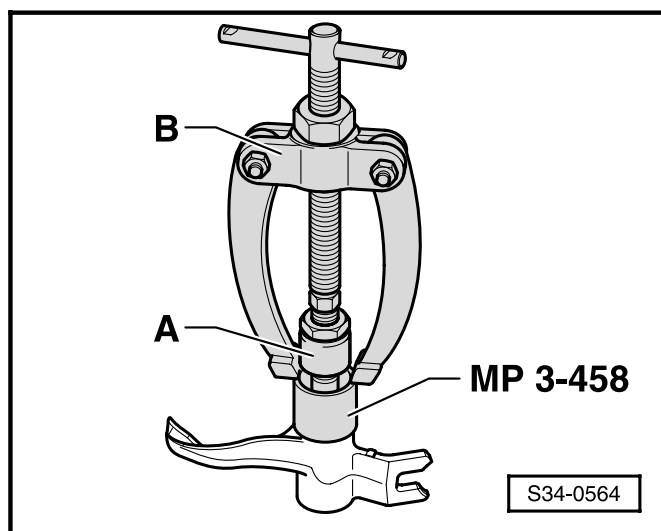
2 - Shift rod with shift fork for 3rd and 4th gear

3 - Shift rod with shift fork for 5th and 6th gear

4 - Reverse gear shift fork

5 - Spherical sleeve

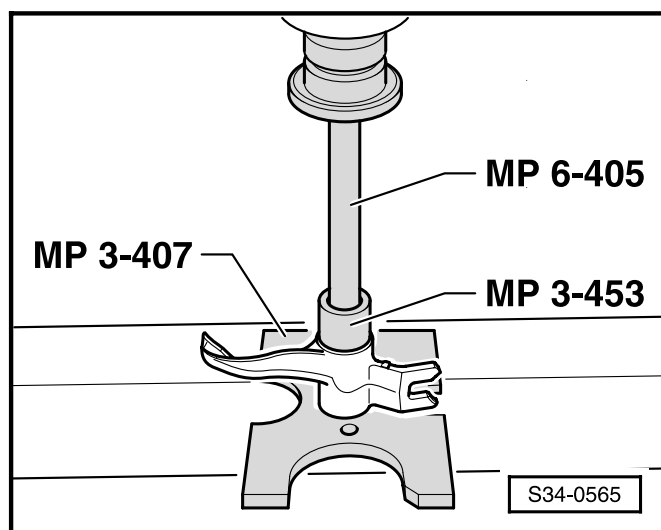
- ◆ Removing ⇒ Fig. 1
- ◆ Inserting ⇒ Fig. 2



◀ Fig. 1 Pulling out spherical sleeve for reverse gear shift fork

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

B - Countersupport, e.g. Kukko 22/1

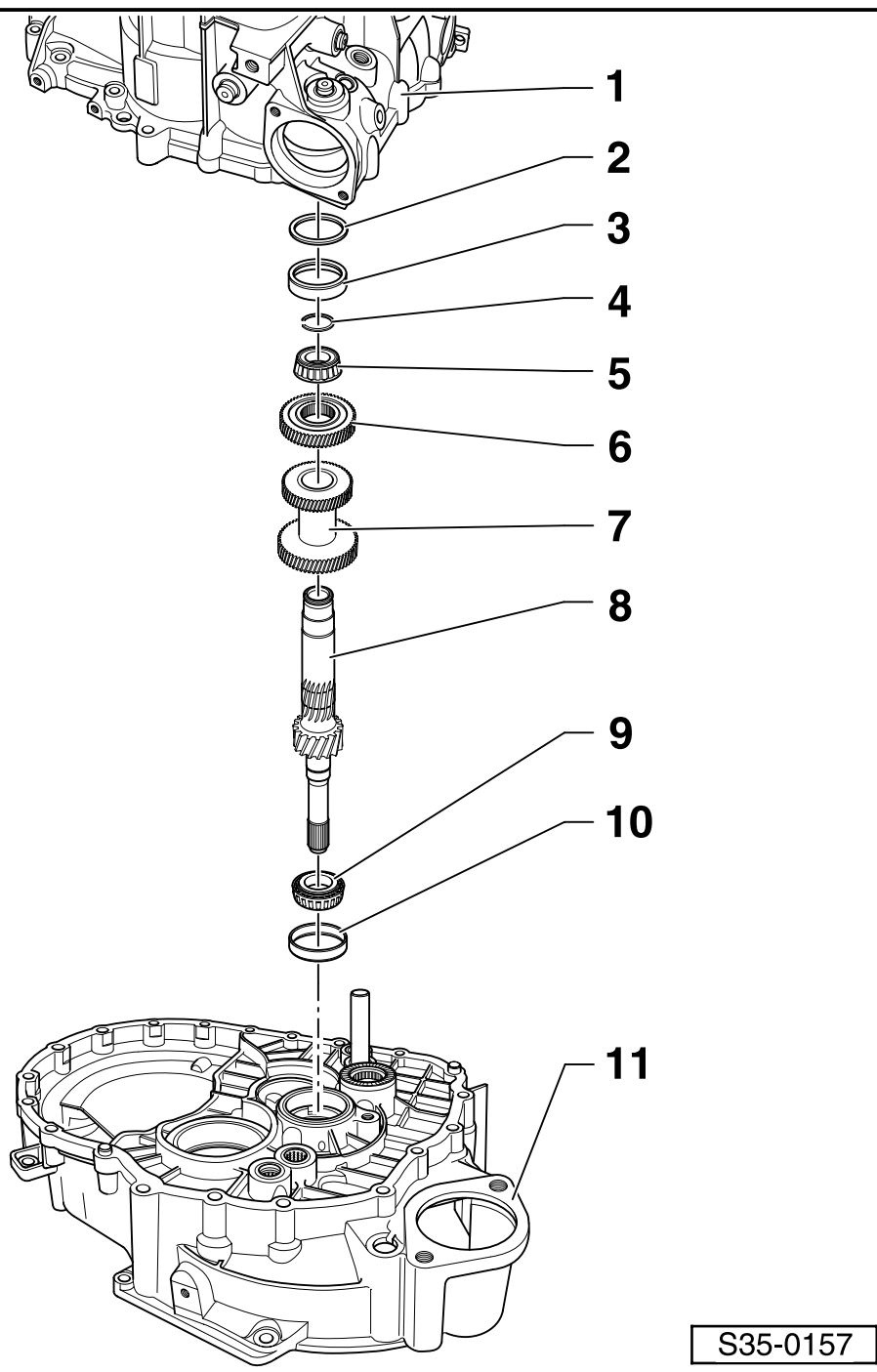


◀ Fig. 2 Pressing in spherical sleeve for reverse gear shift fork

Disassembling and assembling input shaft

Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-411
- ◆ Thrust ring MP 3-413
- ◆ Thrust plunger MP 3-423
- ◆ Insertion sleeve MP 3-427
- ◆ Tube section MP 3-429
- ◆ Thrust piece MP 3-453
- ◆ Thrust disc MP 3-467
- ◆ Tube section MP 3-4012
- ◆ Gearbox holder MP 3-501
- ◆ Disc MP 6-415
- ◆ Retaining plate T30027
- ◆ Insertion sleeve T30034
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/7
- ◆ Separating device 22...115 mm,
e.g. Kukko 17/2
- ◆ Internal extractor 46...58 mm,
e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2



S35-0157

Notes:

- ♦ Pay attention to the technical data when installing new gears ⇒ page 00-2.
- ♦ If the position of the taper roller bearings is affected by replacing parts, it is then necessary to re-set the input shaft. Pay attention to List of settings ⇒ page 39-16.

1 - Gearbox housing**2 - Shim**

- ♦ Determining thickness ⇒ page 35-8

3 - Taper roller bearing outer race

- ♦ Removing ⇒ Fig. 1
- ♦ Inserting ⇒ Fig. 2

4 - Circlip

- ♦ If the taper roller bearing -item 5- and the input shaft -item 8- are replaced, re-determine ⇒ Fig. 11

5 - Taper roller bearing inner race

- ♦ Pulling off ⇒ Fig. 3
- ♦ Fitting on ⇒ Fig. 10

6 - 5th speed gear

- ◆ Pressing off ⇒ Fig. 4
- ◆ Pressing on ⇒ Fig. 9

7 - 3rd/4th and 6th speed gear

- ◆ Pressing off ⇒ Fig. 5
- ◆ Pressing on ⇒ Fig. 7

8 - Input shaft

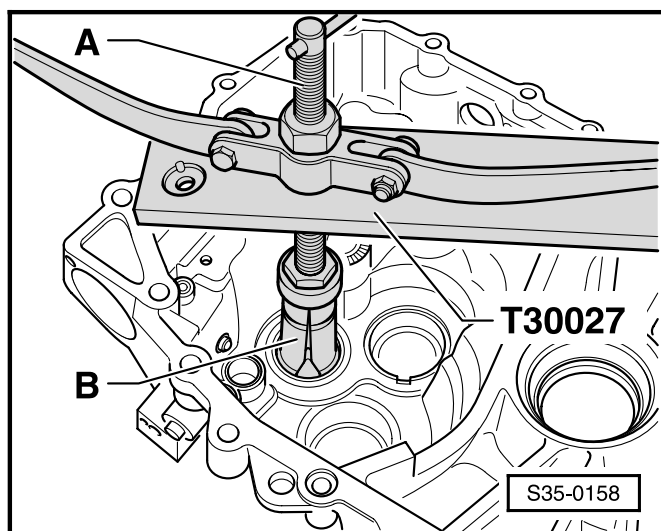
- ◆ Setting ⇒ page 35-8

9 - Taper roller bearing inner race

- ◆ Pressing off ⇒ Fig. 6
- ◆ Pressing on ⇒ Fig. 8

10 - Taper roller bearing outer race

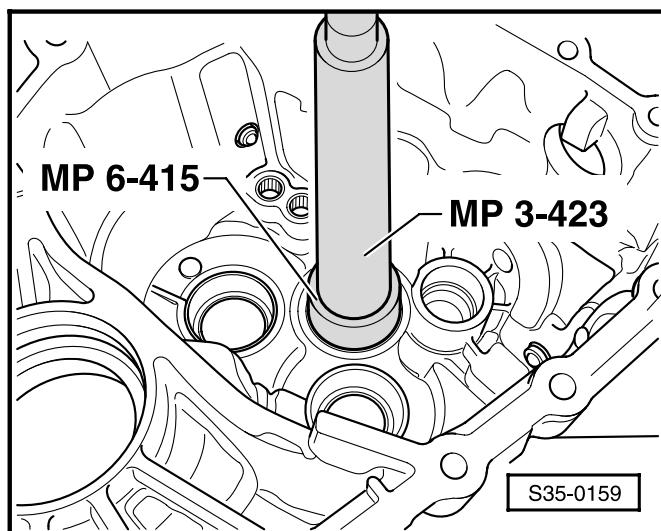
- ◆ Removing ⇒ Fig. 12
- ◆ Fitting location ⇒ Fig. 13
- ◆ Pressing in ⇒ Fig. 14

11 - Clutch housing

◀ **Fig. 1 Pulling taper roller bearing outer race out of gearbox housing**

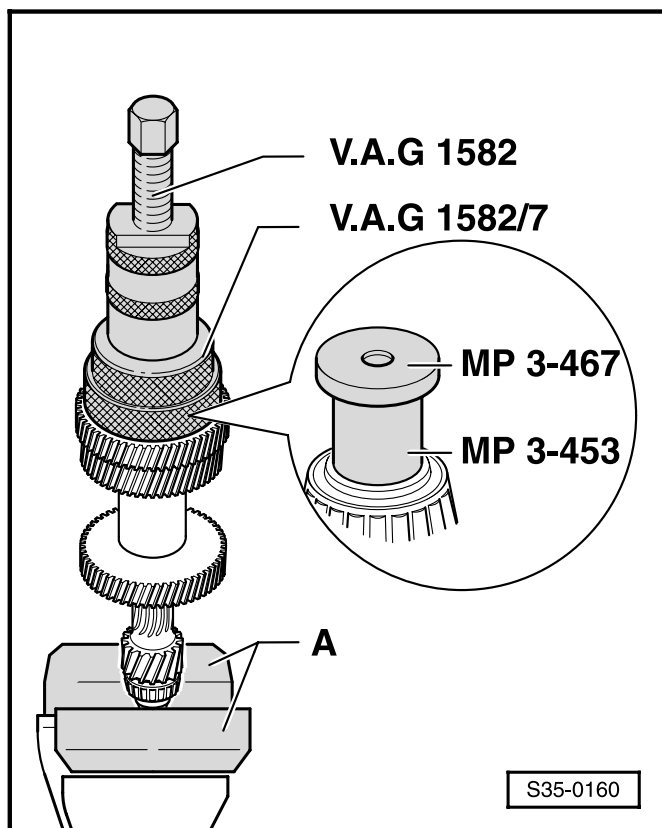
A - Countersupport, e.g. Kukko 22/2

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



◀ **Fig. 2 Pressing taper roller bearing outer race into gearbox housing**

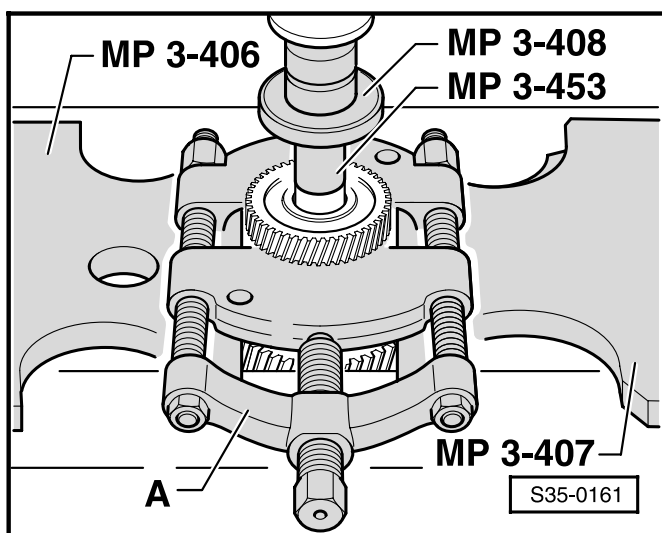
- Support gearbox housing with thrust disc MP 6-415 directly below bearing mount.



◀ Fig. 3 Pulling off taper roller bearing inner race

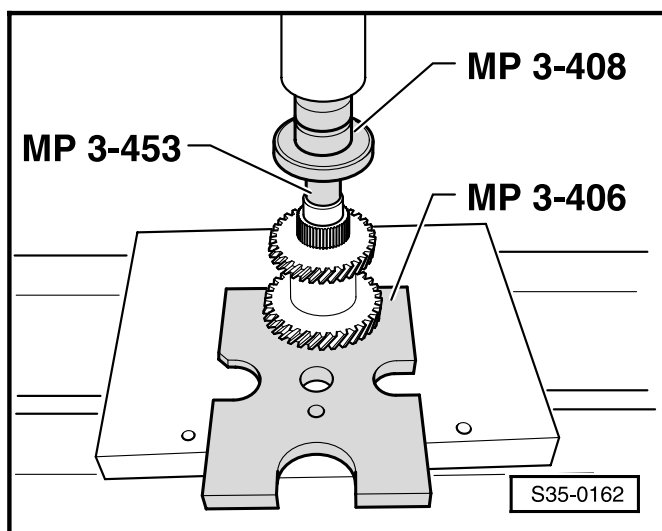
A - Protective jaws of vice

- Before fitting on the pulling device, place thrust piece MP 3-453 and thrust disc MP 3-467 onto the input shaft.

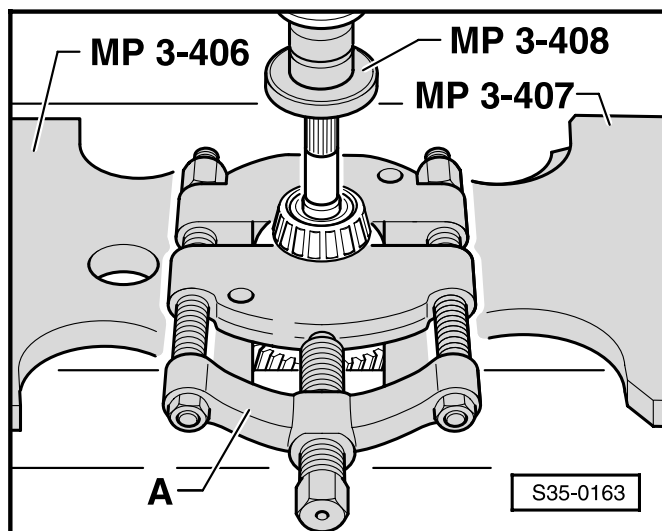


◀ Fig. 4 Pressing off 5th speed gear

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

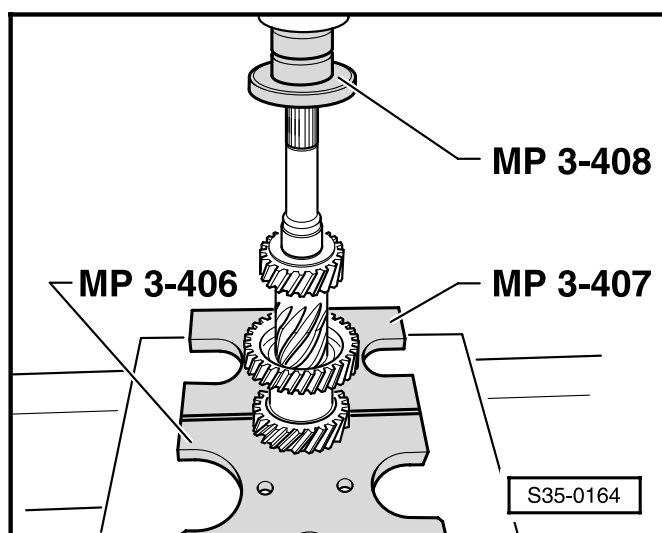


◀ Fig. 5 Pressing off 3rd/4th and 6th speed gear



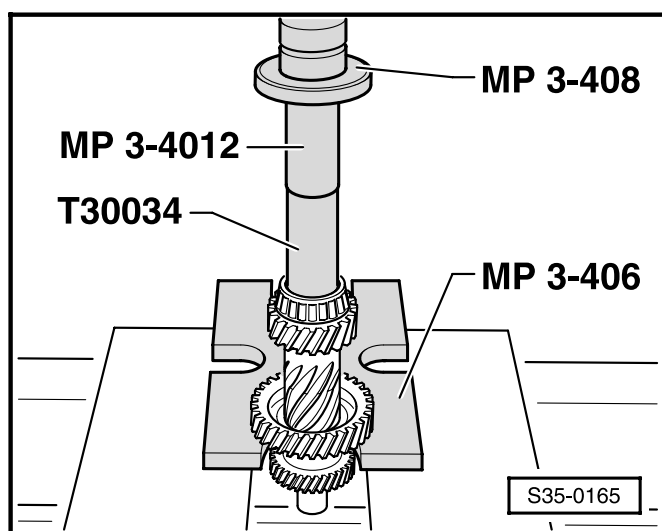
◀ Fig. 6 Pressing off taper roller bearing inner race

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

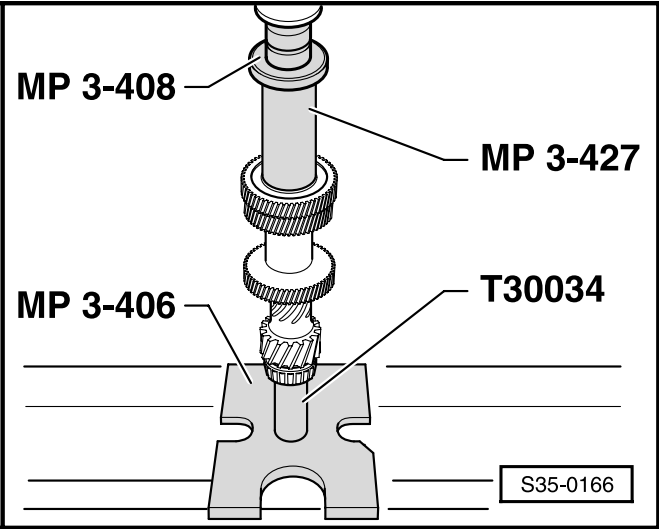


◀ Fig. 7 Pressing on 3rd/4th and 6th speed gear

- Heat gear to about 100 °C.
- Press the gear on without delay so that the heat is not transmitted to the input shaft.

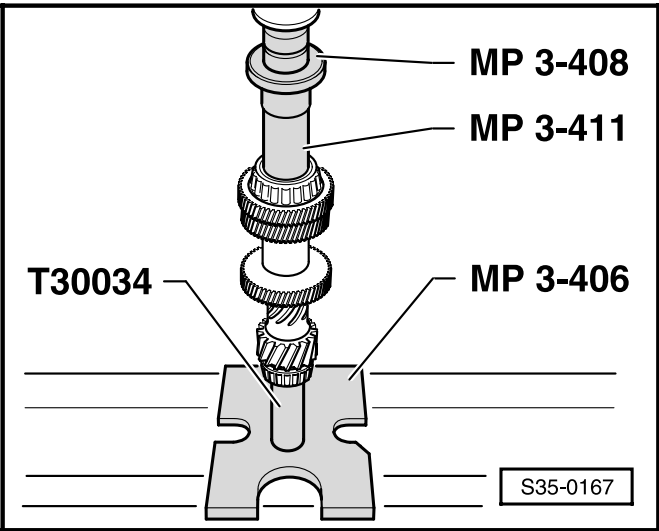


◀ Fig. 8 Pressing on taper roller bearing inner race

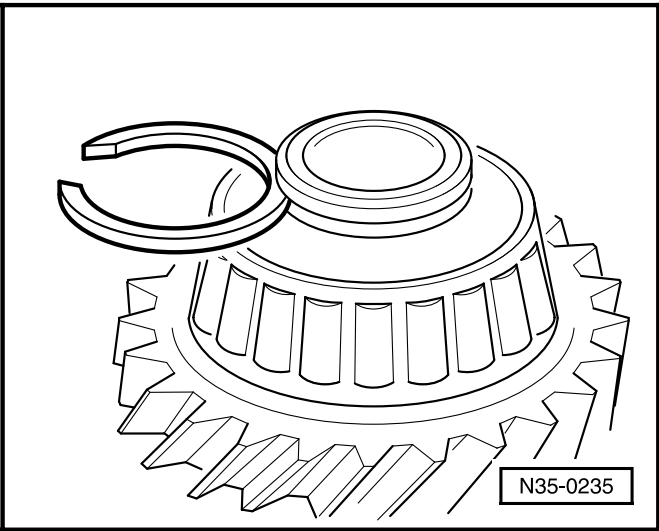


◀ Fig. 9 Pressing on 5th speed gear

Note:
The slot at the 5th speed gear must point to the taper roller bearing.



◀ Fig. 10 Pressing on taper roller bearing inner race

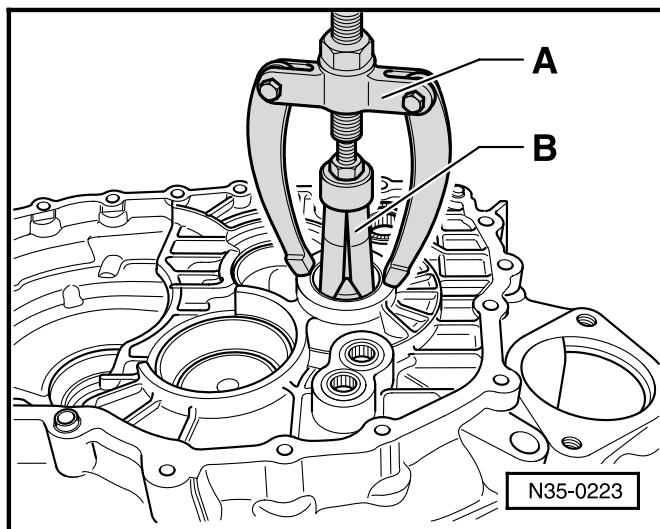


◀ Fig. 11 Determining circlip

- Determine the thickest circlip which can still just be inserted, and insert.

The following circlips are available:

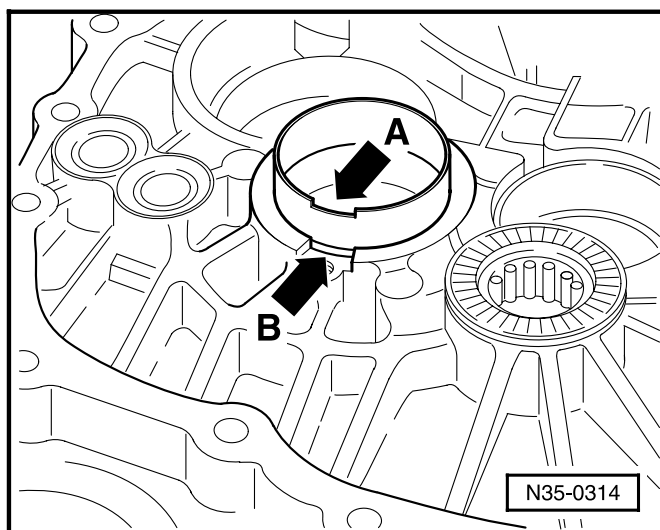
Thickness (mm)	Part No.
1.79	02M 311 187 G
1.83	02M 311 187 F
1.86	02M 311 187 E
1.89	02M 311 187 D
1.92	02M 311 187 C
1.95	02M 311 187 B
1.98	02M 311 187 A



◀ Fig. 12 Pulling taper roller bearing outer race out of clutch housing

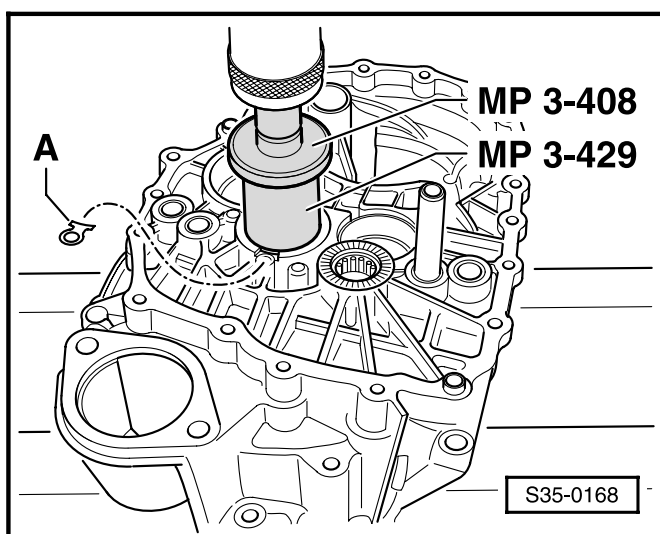
A - Countersupport, e.g. Kukko 22/2

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



◀ Fig. 13 Fitting location of taper roller bearing outer race in clutch housing

Recesses for the tab washer (⇒ Fig. 14) at the taper roller bearing outer race -arrow A- and clutch housing -arrow B- must be positioned one above the other.



◀ Fig. 14 Pressing in taper roller bearing outer race

- After pressing in, check whether the tab washer -A- can be inserted into the recess.

Setting input shaft

(Determining shim for input shaft)

Special tools, testers and aids required

- ◆ End gauge plate MP 3-405/17
- ◆ Thrust plunger MP 3-423
- ◆ Universal dial gauge holder MP 3-447
- ◆ Gearbox holder MP 3-501
- ◆ Disc MP 6-415
- ◆ Retaining plate T30027
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331
- ◆ Internal extractor 46...58 mm, e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/1
- ◆ Dial gauge

It is necessary to re-set the input shaft if the following components are replaced:

- ◆ Gearbox housing
- ◆ Clutch housing
- ◆ Input shaft

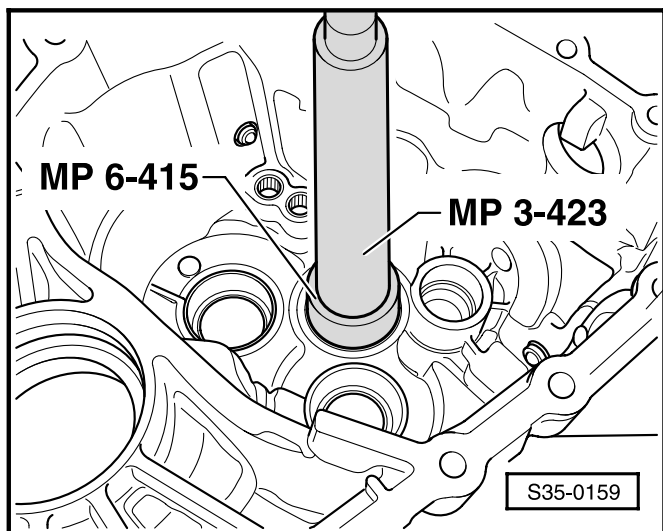
or the

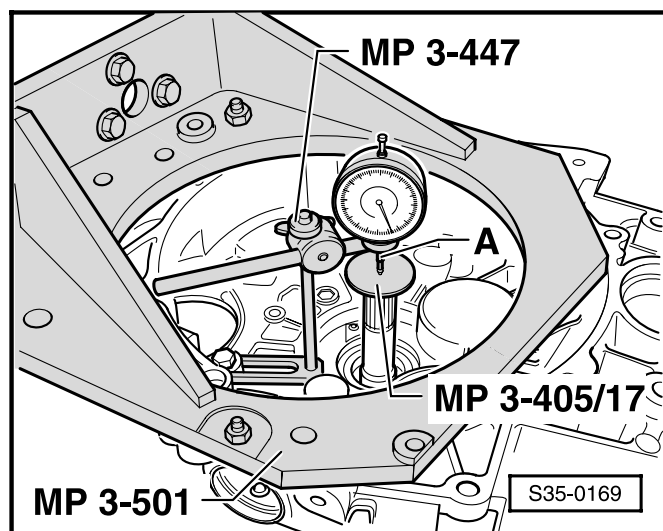
- ◆ Taper roller bearings

List of settings ⇒ page 39-16

- Calculated shims for both output shafts are installed.

- ◀ - Press taper roller bearing fully into the gearbox housing without the shim.
- Place both output shafts and the input shaft into the clutch housing and mount gearbox housing. Tighten hexagon bolts to 25 Nm.





- ◀ - Install measuring device and dial gauge in the clutch housing.
A - Dial gauge extension = 30 mm
- Rotate input shaft before carrying out the measurement so that the taper roller bearings settle. Zero dial gauge with a preload of 1 mm.

Note:

This procedure must be repeated for each further measurement otherwise the dial gauge moves back into its initial position.

- Pull input shaft toward the dial gauge.
- Read off play on dial gauge and note (example 1.63).
- Determine thickness of shim by referring to the table ⇒ page 35-10 (example 1.60).

- ◀ - Take off gearbox housing and pull taper roller bearing outer race out of the gearbox housing.

A - Countersupport, e.g. Kukko 22/2

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

- Press taper roller bearing outer race together with 1.60 shim into the gearbox housing.
- Mount gearbox housing and tighten new hexagon bolts to 25 Nm and torque a further 45°.

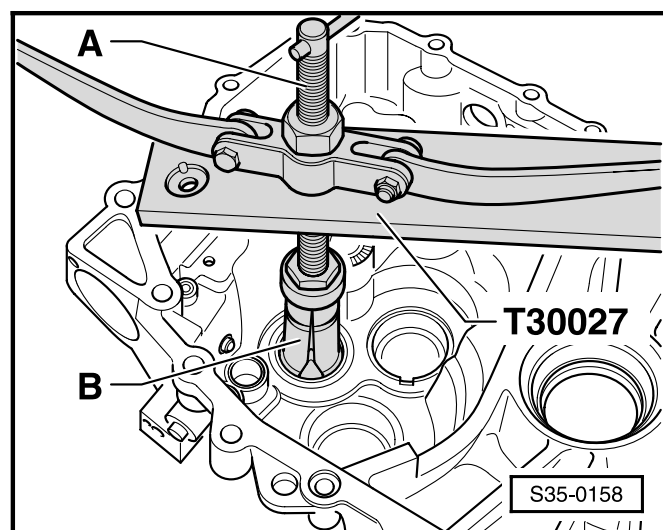
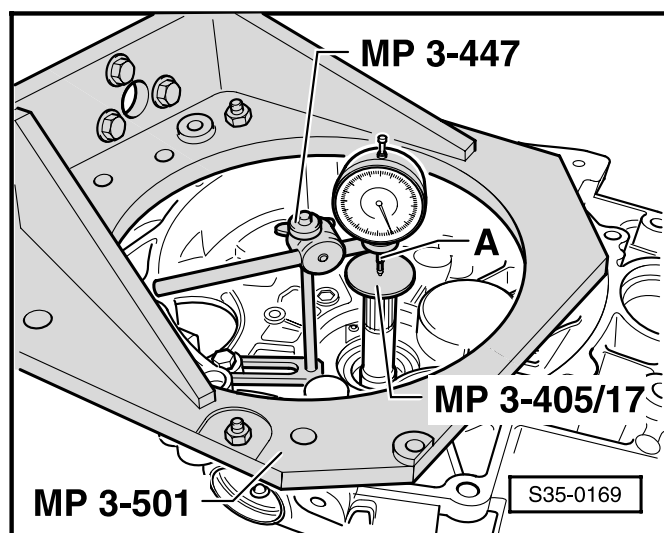


Table of shims

Bearing play Measurement obtained (mm)	Shim	
	Thick- ness (mm)	Part No.
1.480...1.524	1.45	084 409 383 AG
1.525...1.574	1.50	084 409 383 AH
1.575...1.624	1.55	084 409 383 AJ
1.625...1.674	1.60	084 409 383 AK
1.675...1.724	1.65	084 409 383 AL
1.725...1.774	1.70	084 409 383 AM
1.775...1.824	1.75	084 409 383 AN
1.825...1.874	1.80	084 409 383 AP
1.875...1.924	1.85	084 409 383 AQ
1.925...1.974	1.90	084 409 383 AR
1.975...2.024	1.95	084 409 383 AS
2.025...2.074	2.00	084 409 383 AT
2.075...2.124	2.05	084 409 383 BA
2.125...2.174	2.10	084 409 383 BB
2.175...2.224	2.15	084 409 383 BC
2.225...2.274	2.20	084 409 383 BD
2.275...2.324	2.25	084 409 383 BE
2.325...2.374	2.30	084 409 383 BF



Conducting a check measurement

- ◀ - Install measuring device and dial gauge.
A - Dial gauge extension = 30 mm
- Rotate input shaft so that the taper roller bearings settle.
- Pull input shaft toward dial gauge.
- The bearing play should be min. 0.015...max. 0.100 mm.

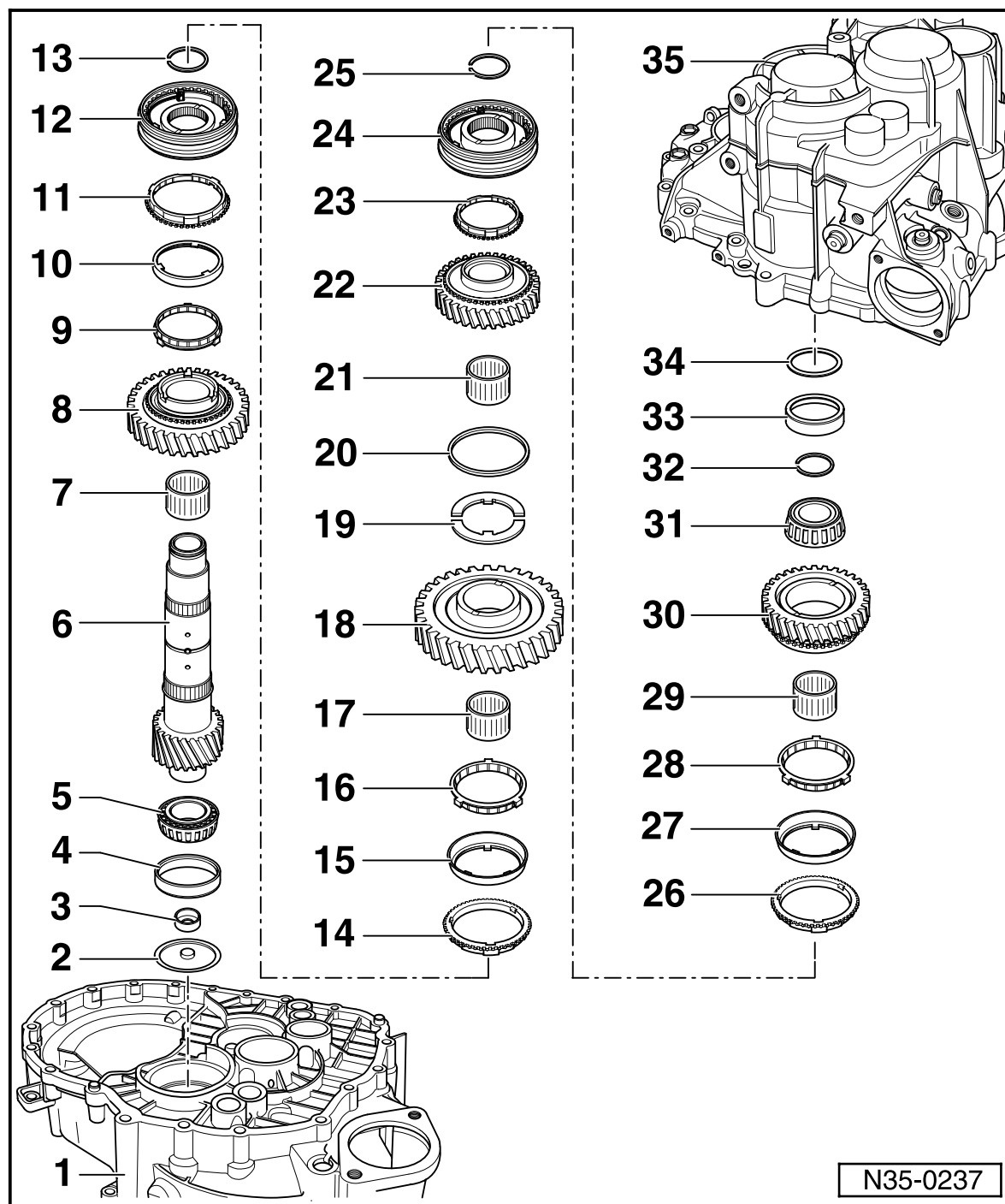
Note:

If no bearing play can be measured but the input shaft has a perceptible rock and can be easily rotated, the setting is also o.k.

Disassembling and assembling 1st to 4th gear output shaft

Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-411
- ◆ Tube section MP 3-414
- ◆ Universal tool MP 3-419
- ◆ Thrust piece MP 3-420
- ◆ Thrust plunger MP 3-423
- ◆ Insertion sleeve MP 3-427
- ◆ Tube section MP 3-450
- ◆ Thrust piece MP 3-453
- ◆ Thrust disc MP 3-460
- ◆ Tube section MP 3-461
- ◆ Thrust disc MP 3-464
- ◆ Thrust disc MP 3-467
- ◆ Retaining plate T30027
- ◆ Attachment piece T30015
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/7
- ◆ Separating device 22...115 mm,
e.g. Kukko 17/2
- ◆ Pulling device, e.g. Kukko 18/2
- ◆ Internal extractor 46...58 mm,
e.g. Kukko 21/7
- ◆ Internal extractor 56...70 mm,
e.g. Kukko 21/8
- ◆ Countersupport, e.g. Kukko 22/2

**Notes:**

- ♦ Pay attention to the technical data when installing new gears or a new output shaft ⇒ page 00-2.
- ♦ If the output shaft or taper roller bearings are replaced, it is then necessary to set the output shaft ⇒ page 35-24.

1 - Clutch housing

2 - Oil deflector plate

3 - Dished washer

- ♦ Removing ⇒ Fig. 1
- ♦ Inserting ⇒ Fig. 2

4 - Taper roller bearing outer race

- ♦ Pulling out ⇒ Fig. 3
- ♦ Pressing in ⇒ Fig. 4

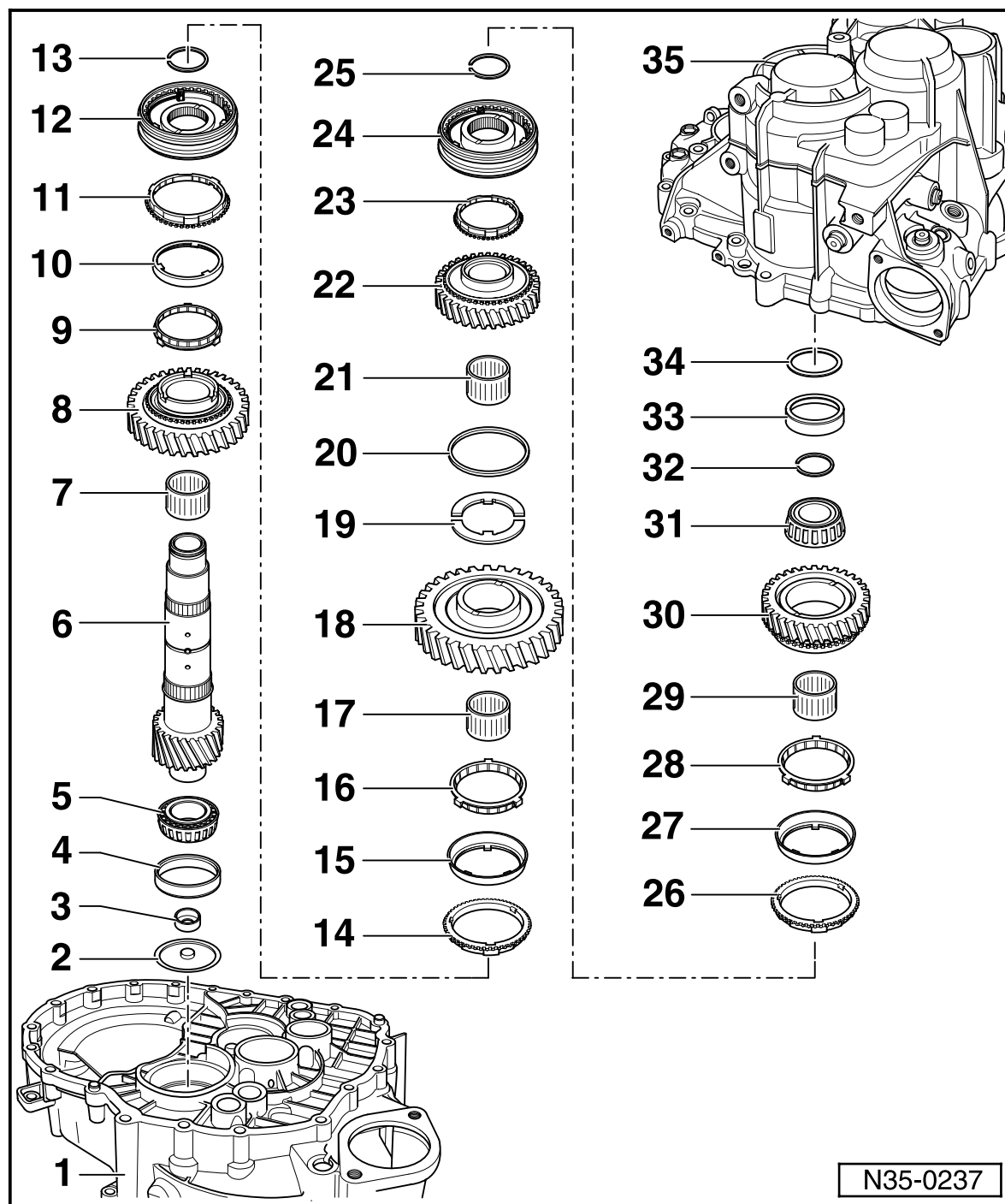
5 - Taper roller bearing inner race

- ♦ Pressing off ⇒ Fig. 8
- ♦ Pressing on ⇒ Fig. 9

6 - Output shaft

- ♦ For 1st to 4th gear
- ♦ Setting ⇒ page 35-24

- 7 - Needle bearing**
- ◆ For 2nd gear
 - ◆ Dimensions 42 x 48 x 26.8
- 8 - 2nd speed sliding gear**
- 9 - 2nd gear inner race**
- ◆ Inspect for wear ⇒ Fig. 10
 - ◆ Inspect lugs for signs of wear
 - ◆ Fitting location ⇒ Fig. 12
- 10 - 2nd gear outer race**
- ◆ Fit onto synchroniser ring -item 9-
 - ◆ Replace if scores or traces of wear present
 - ◆ Fitting location ⇒ Fig. 12
- 11 - 2nd gear synchroniser ring**
- ◆ Inspect for wear ⇒ Fig. 11
 - ◆ Fitting location ⇒ Fig. 12
- 12 - 1st and 2nd gear sliding sleeve with synchroniser body**
- ◆ Press off together with 2nd speed sliding gear after removing circlip -item 13- ⇒ Fig. 7
 - ◆ Disassembling ⇒ Fig. 13
 - ◆ Assembling sliding sleeve/synchroniser body ⇒ Fig. 13 and Fig. 14
 - ◆ Fitting location ⇒ Fig. 15
 - ◆ Pressing on ⇒ Fig. 16
- 13 - Circlip**
- 14 - 1st gear synchroniser ring**
- ◆ Inspect for wear ⇒ Fig. 11
 - ◆ Insert so that the recesses engage in the locking pieces of the sliding sleeve -item 12-
- 15 - 1st gear outer race**
- ◆ Place into synchroniser ring -item 14-, fitting location ⇒ Fig. 17
 - ◆ Replace if scores or signs of wear present
- 16 - 1st gear inner race**
- ◆ Inspect for wear ⇒ Fig. 10
 - ◆ Inspect lugs for signs of wear
 - ◆ Fitting location ⇒ Fig. 18
- 17 - Needle bearing**
- ◆ For 1st gear
 - ◆ Dimensions 42 x 48 x 26.8
- 18 - 1st speed sliding gear**
- ◆ Fitting location ⇒ Fig. 19
- 19 - Thrust washers**
- ◆ For 1st and 4th gear
 - ◆ Insert lugs of thrust washer into hole of output shaft
- 20 - Washer**
- ◆ Holds thrust washers -item 19- in position on output shaft
- 21 - Needle bearing**
- ◆ For 4th gear
 - ◆ Dimensions 42 x 48 x 26.8
- 22 - 4th speed sliding gear**
- 23 - 4th gear synchroniser ring**
- ◆ Inspect for wear ⇒ Fig. 22
- 24 - 3rd and 4th gear sliding sleeve with synchroniser body**
- ◆ Pull off together with 4th speed sliding gear after removing circlip -item 25- ⇒ Fig. 6
 - ◆ Disassembling ⇒ Fig. 13
 - ◆ Fitting location of sliding sleeve/synchroniser body ⇒ Fig. 20
 - ◆ Assembling sliding sleeve/synchroniser body ⇒ Fig. 13 and Fig. 14
 - ◆ Pressing on ⇒ Fig. 21
- 25 - Circlip**
- 26 - 3rd gear synchroniser ring**
- ◆ Inspect for wear ⇒ Fig. 11
- 27 - 3rd gear outer race**
- ◆ Insert into synchroniser ring -item 26-, fitting location ⇒ Fig. 17
 - ◆ Replace if scores or signs of wear present
- 28 - 3rd gear inner race**
- ◆ Inspect for wear ⇒ Fig. 10
 - ◆ Inspect lugs for signs of wear
 - ◆ Fitting location ⇒ Fig. 18
- 29 - Needle bearing**
- ◆ For 3rd gear
 - ◆ Dimensions 38 x 44 x 26.8
- 30 - 3rd speed sliding gear**
- ◆ Fitting location ⇒ Fig. 19
- 31 - Taper roller bearing inner race**
- ◆ Pulling off ⇒ Fig. 5
 - ◆ Pressing on ⇒ Fig. 23

**32 - Circlip**

- ◆ If taper roller bearing -item 31- and output shaft -item 6- are replaced, re-determine ⇒ Fig. 24

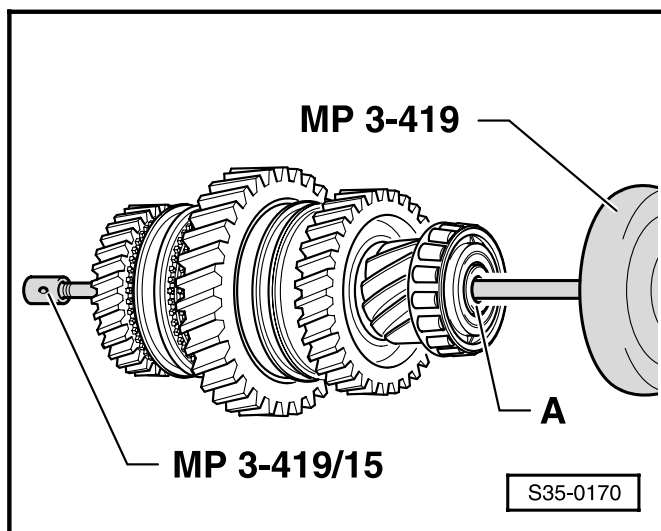
33 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 25
- ◆ Pressing in ⇒ Fig. 26

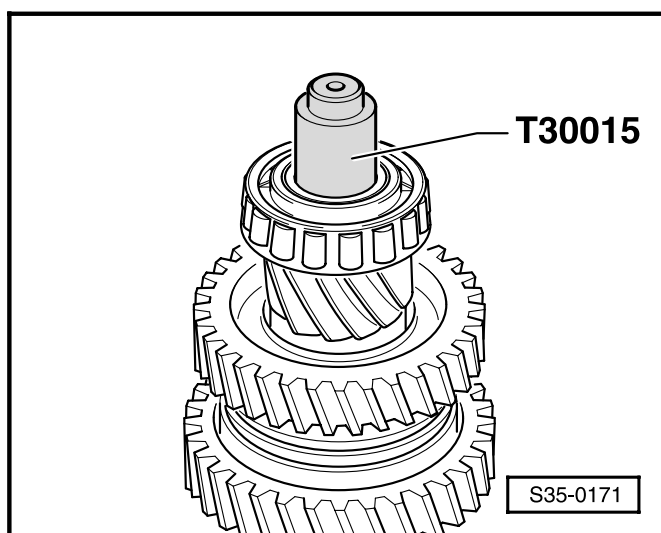
34 - Shim

- ◆ Determining thickness ⇒ page 35-24

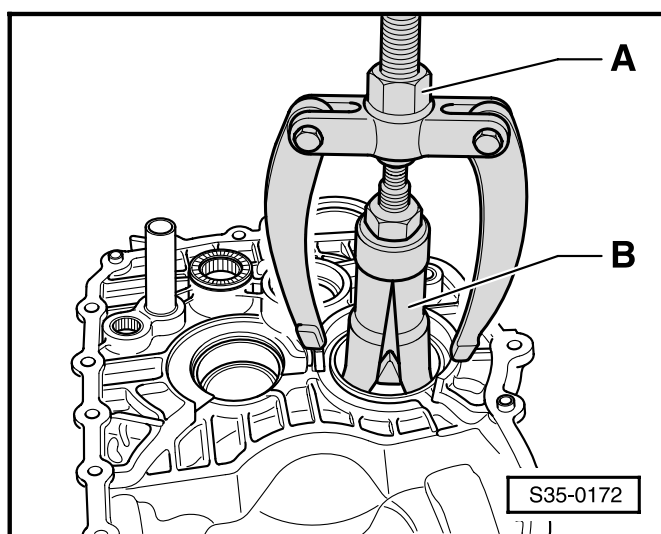
35 - Gearbox housing



◀ Fig. 1 Pulling dished washer -A- out of output shaft



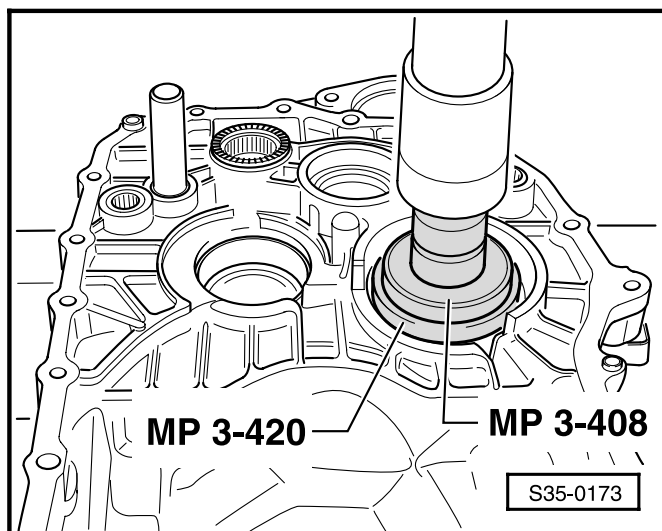
◀ Fig. 2 Pressing dished washer into input shaft until tool abuts



◀ Fig. 3 Pulling out taper roller bearing outer race

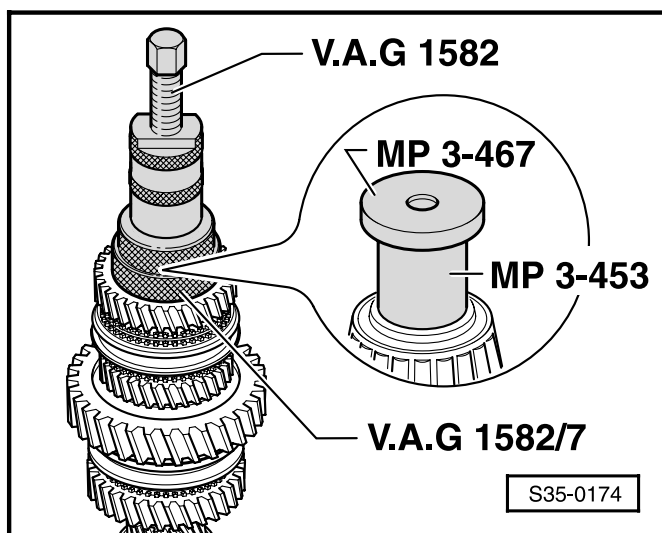
A - Countersupport, e.g. Kukko 22/2

B - Internal extractor 56...70 mm, e.g. Kukko 21/8



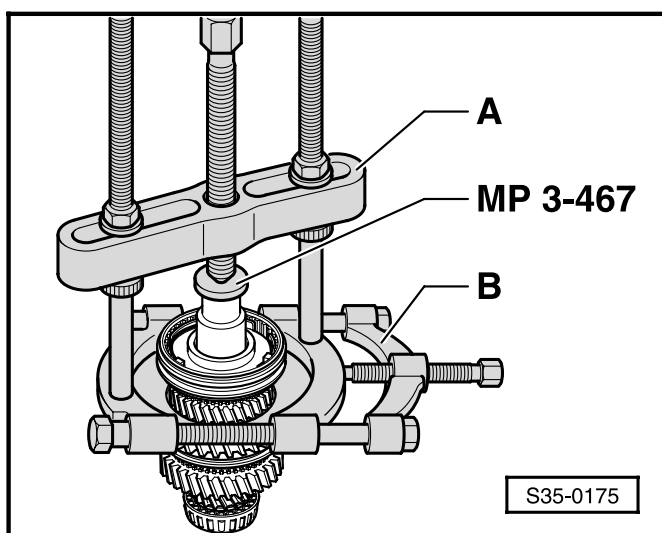
◀ Fig. 4 Pressing taper roller bearing outer race into clutch housing

- Support clutch housing with tube section MP 3-420 directly below bearing mount.



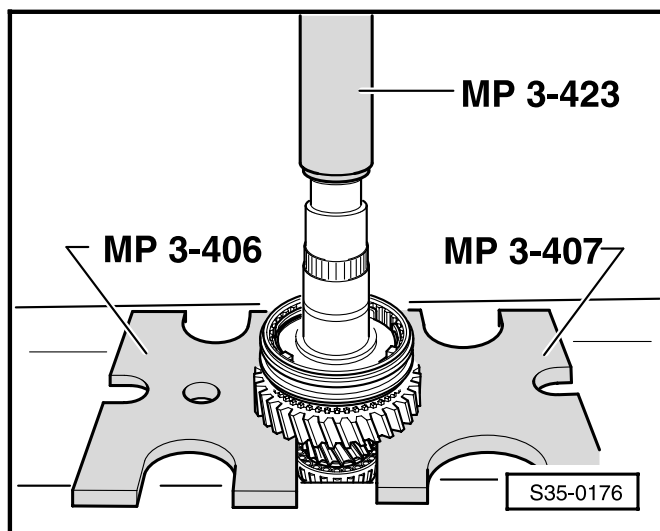
◀ Fig. 5 Pulling off taper roller bearing inner race

- Before attaching pulling device, place thrust piece MP 3-453 into input shaft and place thrust disc MP 3-467 on top.



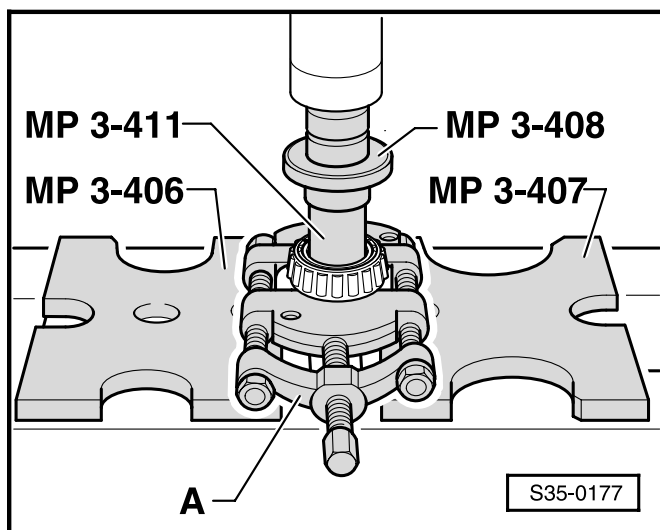
◀ Fig. 6 Pulling off 3rd and 4th gear synchroniser body/sliding sleeve together with 4th speed sliding gear

- Remove circlip first of all (⇒ page 35-13, item 25).
- A - Pulling device, e.g. Kukko 18/2
- B - Separating device 22...115 mm, e.g. Kukko 17/2



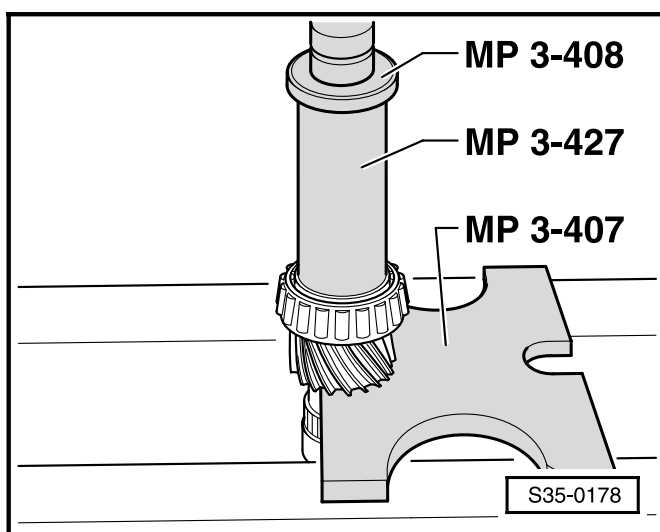
◀ Fig. 7 Pressing off 1st and 2nd gear sliding sleeve and synchroniser body

After removing circlip (⇒ page 35-13, item 13), press off 2nd speed sliding gear and sliding sleeve/synchroniser body together.

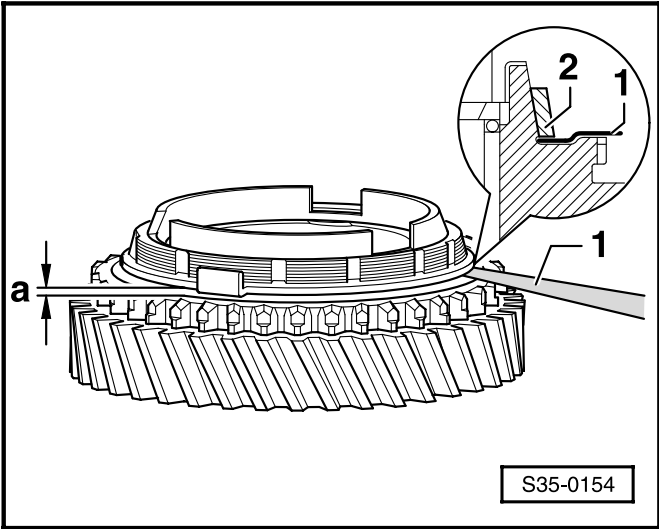


◀ Fig. 8 Pressing off taper roller bearing inner race

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



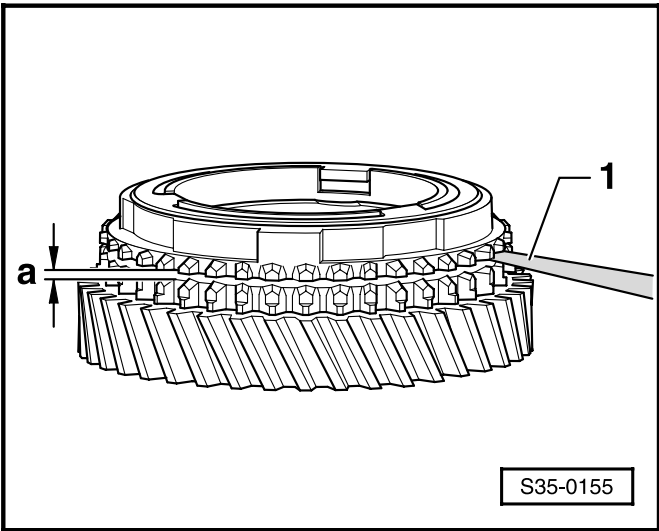
◀ Fig. 9 Pressing on taper roller bearing inner race



◀ Fig. 10 Inspecting inner race for 1st gear, 2nd gear and 3rd gear for wear

- Press inner race -2- onto the taper of the sliding gear and measure size of gap „a“ with feeler gauge -1-.

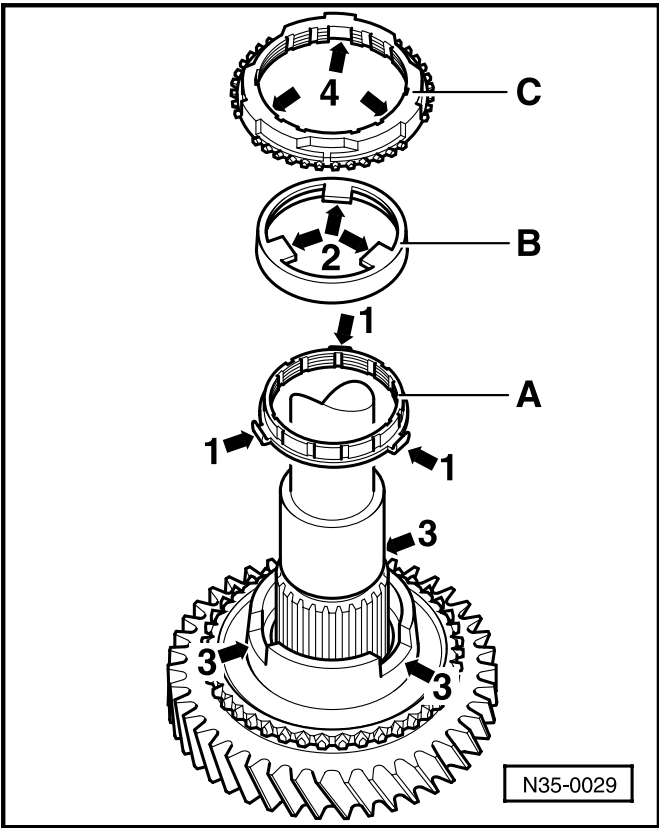
	Installed dim.	Wear limit
Gap „a“	0.75...1.25 mm	0.3 mm



◀ Fig. 11 Inspecting synchroniser rings of 1st, 2nd and 3rd gear for wear

- Press synchroniser ring, outer race and inner race onto the taper of the sliding gear and measure size of gap „a“ with feeler gauge -1-.

	Installed dim.	Wear limit
Gap „a“	1.2...1.8 mm	0.5 mm



◀ Fig. 12 Fitting location of outer race, inner race and synchroniser ring of 2nd gear

- Place inner race -A- onto 2nd speed sliding gear.

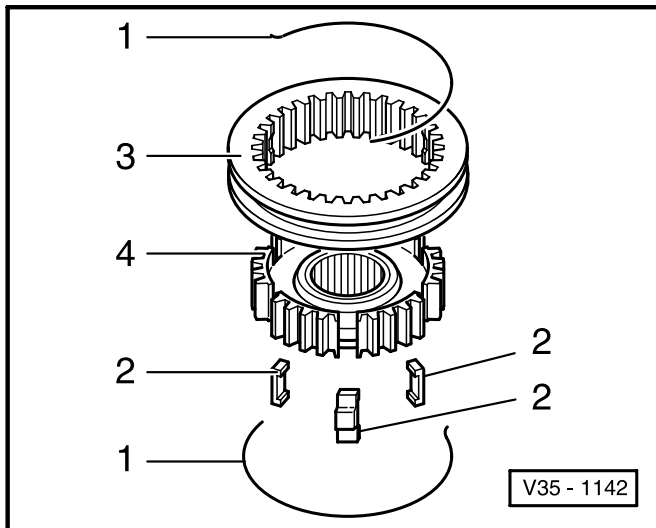
The angled shoulders -arrows 1- point toward outer race -B-.

- Fit on outer race -B-.

The shoulders -arrows 2- engage in the recesses -arrows 3- of the sliding gear.

- Fit on synchroniser ring -C-.

The recesses -arrows 4- engage in the shoulders -arrows 1- of the inner race -A-.

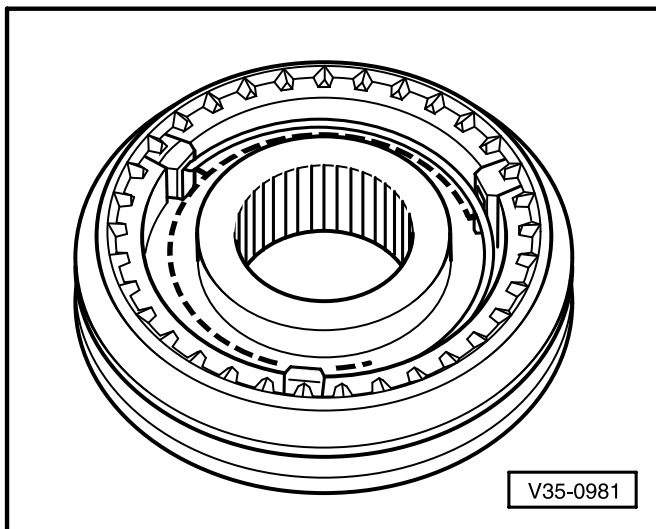


◀ **Fig. 13 Disassembling and assembling 1st and 2nd gear as well as 3rd and 4th gear sliding sleeve and synchroniser body**

- 1 - Spring
- 2 - Locking piece
- 3 - Sliding sleeve
- 4 - Synchroniser body

- Push sliding sleeve over the synchroniser body.

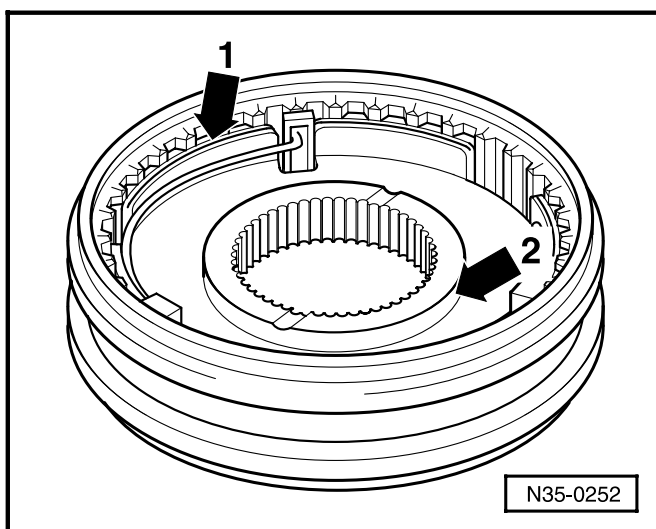
Recesses for locking pieces on synchroniser body and on sliding sleeve must be positioned one above the other.



◀ **Fig. 14 Assembling 1st and 2nd gear as well as 3rd and 4th gear sliding sleeve/synchroniser body**

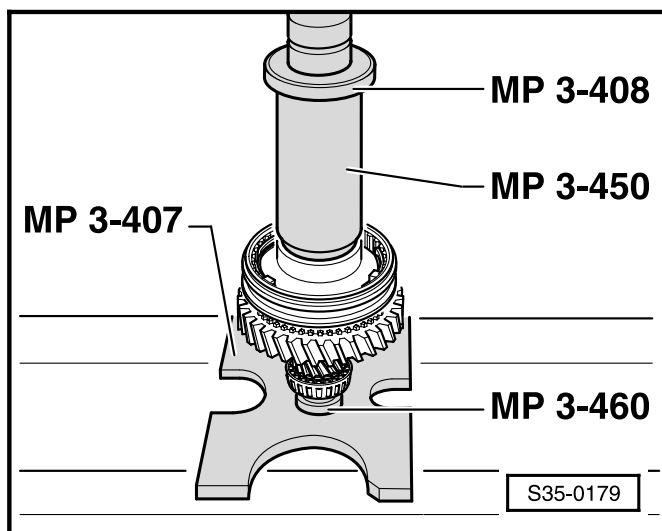
Sliding sleeve has been pushed over synchroniser body.

- Insert locking pieces and install springs off-set 120°. The angled end of the spring must engage in the hollow locking piece.

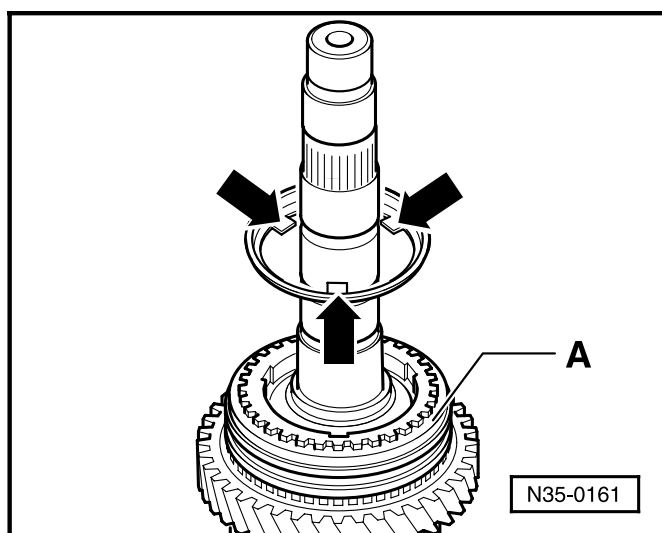


◀ **Fig. 15 Fitting location of 1st and 2nd gear sliding sleeve/synchroniser body**

The identification groove -arrow 1- and the narrow shoulder -arrow 2- of the synchroniser body point toward 1st gear.

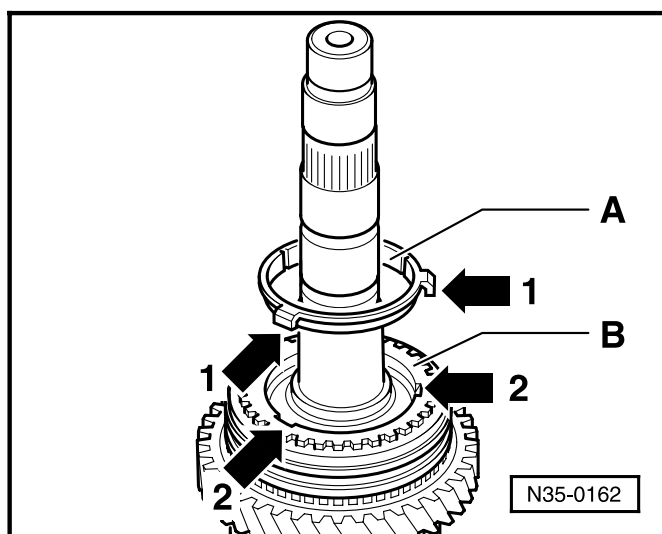


◀ Fig. 16 Pressing on 1st and 2nd gear sliding sleeve/synchroniser body



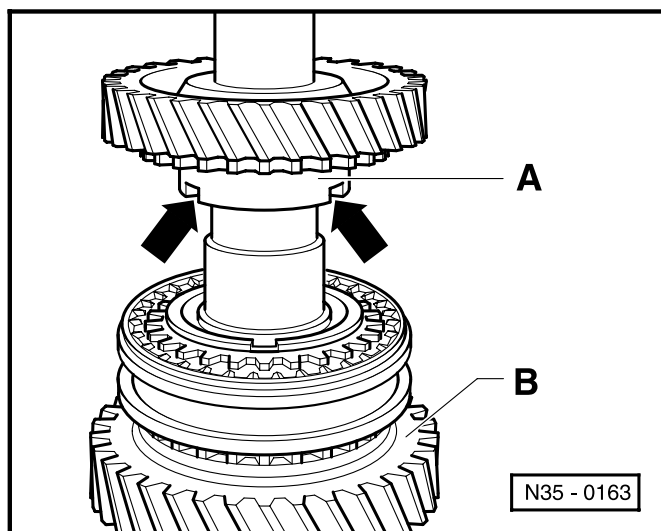
◀ Fig. 17 Fitting location of 1st and 3rd gear outer race

The lugs -arrows- point toward the synchroniser body/sliding sleeve -A-.



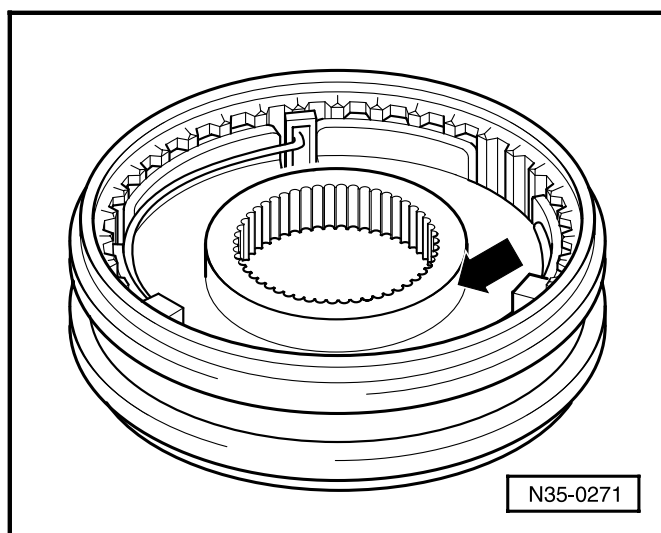
◀ Fig. 18 Fitting location of synchroniser ring -A- (inner race for 1st and 3rd gear)

The lugs -arrows 1- engage in the recesses -arrows 2- of the synchroniser ring -B-.



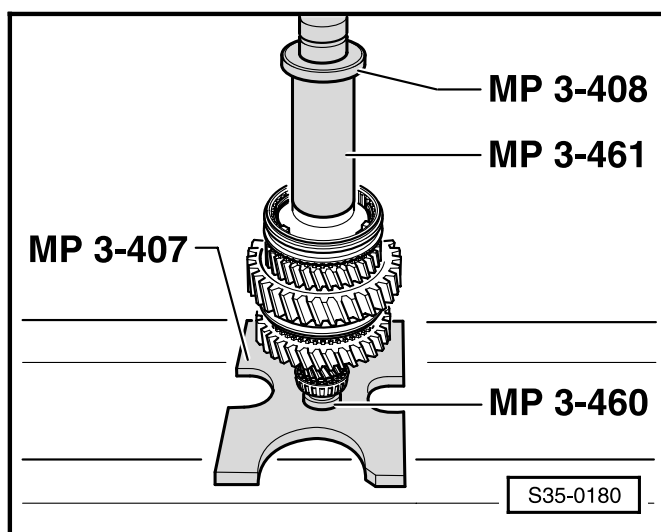
◀ Fig. 19 Fitting location of 1st and 3rd speed sliding gear

The higher shoulder -A- points toward 2nd and 4th gear respectively -B-. The recesses in the shoulder -arrows- engage in the lugs of the outer race (arrows ⇒ Fig. 17).

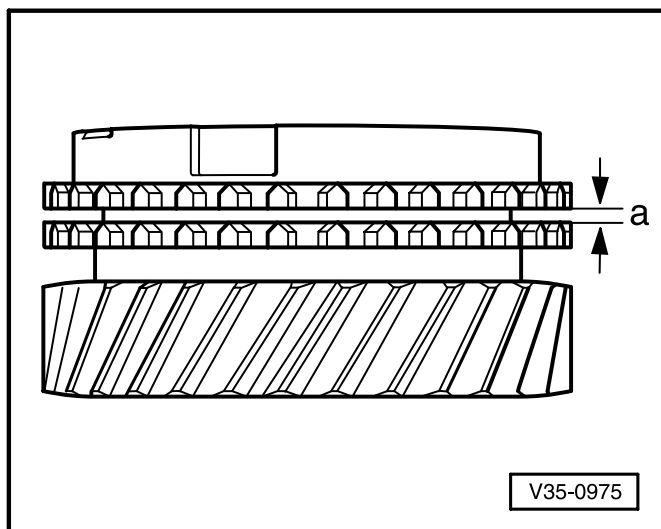


◀ Fig. 20 Fitting location of 3rd and 4th gear sliding sleeve/synchroniser body

The wider shoulder of the synchroniser body -arrow- points toward 3rd gear.



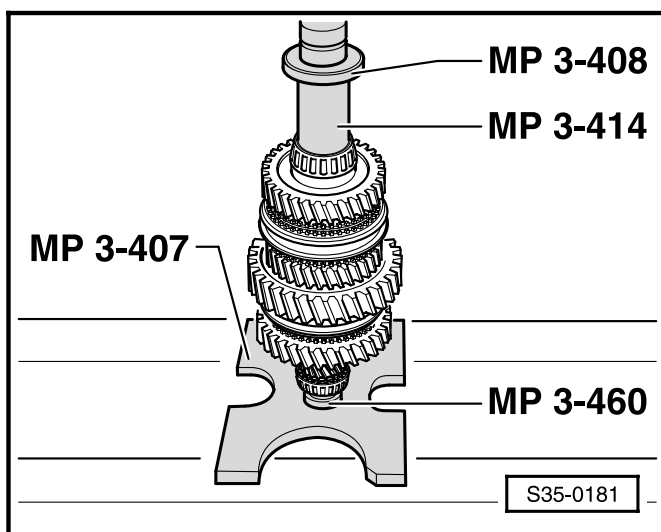
◀ Fig. 21 Pressing on 3rd and 4th gear synchroniser body and sliding sleeve



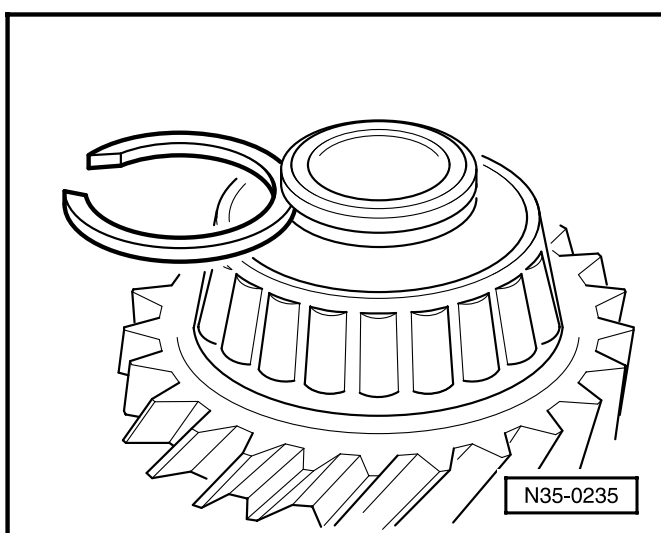
◀ Fig. 22 Inspecting 4th gear synchroniser ring for wear

- Press synchroniser ring onto the taper of the sliding gear and measure size of gap „a“ with a feeler gauge.

	Installed dim.	Wear limit
Gap „a“	1.0...1.7 mm	0.5 mm



◀ Fig. 23 Pressing on taper roller bearing inner race

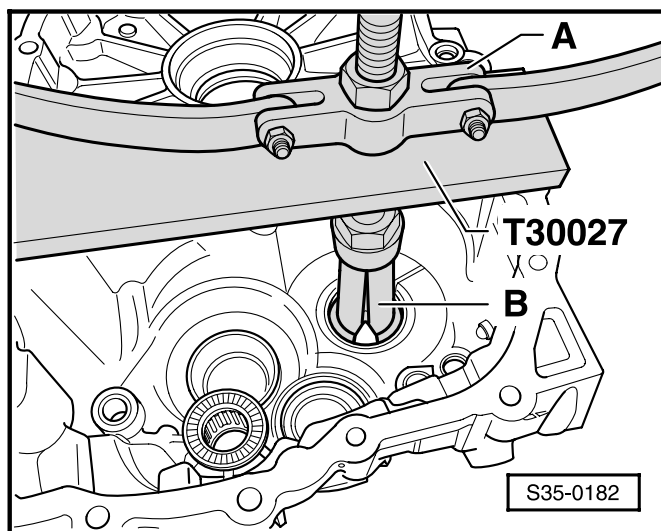


◀ Fig. 24 Determining circlip

- Determine the thickest circlip which can still just be inserted, and insert.

The following circlips are available:

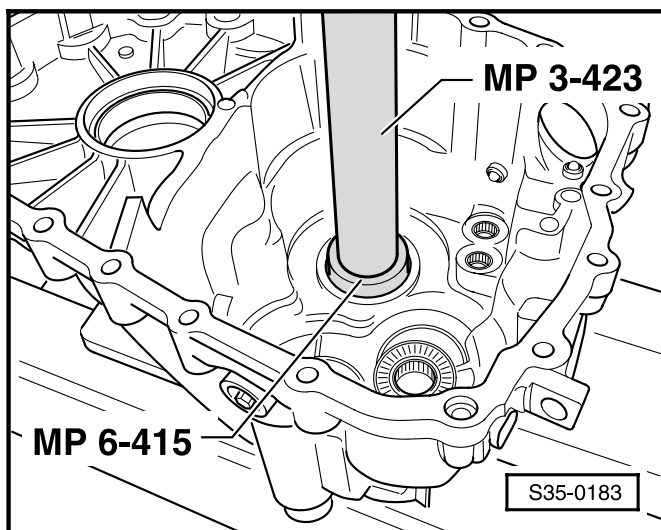
Thickness (mm)	Part No.
1.79	02M 311 187 G
1.83	02M 311 187 F
1.86	02M 311 187 E
1.89	02M 311 187 D
1.92	02M 311 187 C
1.95	02M 311 187 B
1.98	02M 311 187 A



◀ Fig. 25 Pulling taper roller bearing outer race out of gearbox housing

A - Countersupport, e.g. Kukko 22/2

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



◀ Fig. 26 Pressing taper roller bearing outer race into gearbox housing

- Fit shim below outer race.
- Use thrust disc MP 3-464 to support gear-box housing below bearing mount.

Setting 1st to 4th gear output shaft

(Determining shim for output shaft)

Special tools, testers and aids required

- ◆ Thrust plunger MP 3-423
- ◆ Supporting bridge MP 3-425
- ◆ Universal dial gauge holder MP 3-447
- ◆ Thrust disc MP 3-464
- ◆ Disc MP 3-415
- ◆ Retaining plate T30027
- ◆ Torque wrench 5...50 Nm, e.g. V.A.G 1331
- ◆ Internal extractor 46...58 mm, e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2
- ◆ Dial gauge

It is necessary to re-set the output shaft if the following components are replaced:

- ◆ Gearbox housing
- ◆ Clutch housing
- ◆ 1st to 4th gear output shaft

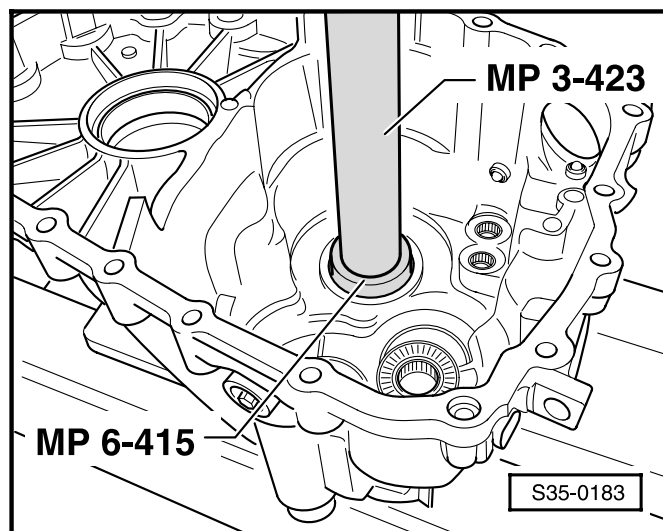
or

- ◆ Taper roller bearings

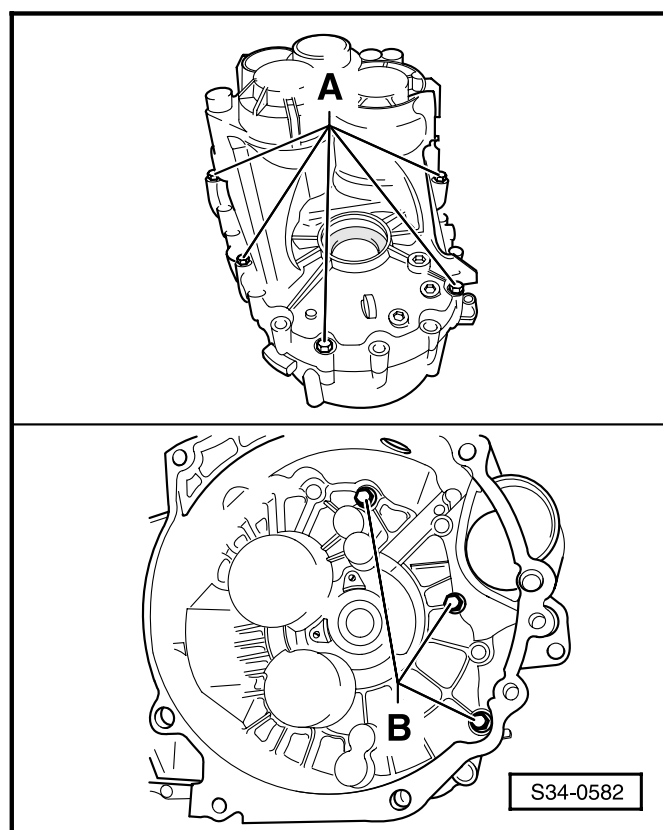
List of settings ⇒ page 39-16

Requirements:

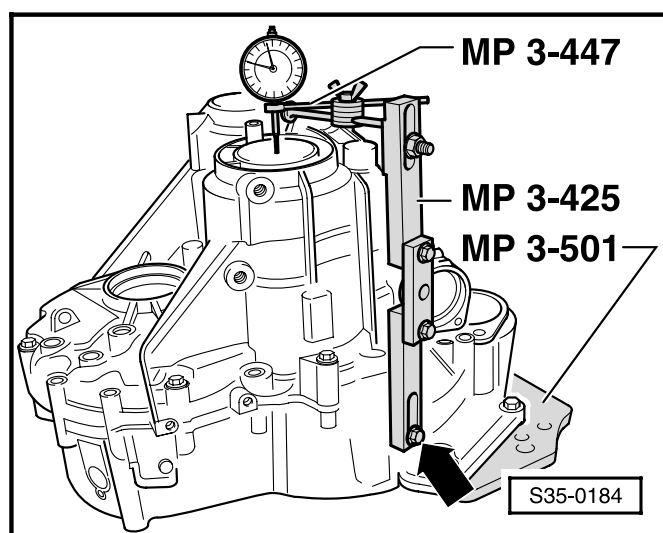
- Sealing surfaces of clutch housing and gear-box housing must be cleaned free of sealant.
- When conducting the measurement, install the shaft to be measured.



- ◀ - Press taper roller bearing outer race together with 1.70 mm thick shim into the gearbox housing. Support gearbox housing with thrust disc MP 3-464 directly below the bearing mount during this step.
- Place complete 1st to 4th gear output shaft into the clutch housing.



- ◀ - Mount gearbox housing and tighten bolts -A- as well as -B- diagonally across to the specified torque.



- ◀ - Install measuring tools and attach with bolt -arrow- to clutch housing.
- Zero dial gauge (3 mm range) with a preload of 1 mm.
- Slacken bolts attaching clutch housing/gearbox housing diagonally across until the bolts release the gearbox housing or the 1st to 4th gear output shaft, respectively.

- Read off measurement indicated on dial gauge and note (example: 0.14 mm).

Note:

If no measurement is indicated on the dial gauge when the bolts attaching the clutch housing/ gearbox housing are slackened, install 1.95 mm shim (Part No. 084 409 383 AS) or, as appropriate, the 2.20 mm shim (Part No. 084 409 383 BD) for the measurement.

Determining shim

The specified bearing preload is achieved if the measurement obtained (0.14 mm) is deducted from the size of shim inserted (1.70 mm) and a constant value for compression (0.20 mm) is added.

Example:

Shim inserted	1.70 mm
- Measurement	0.14 mm
+ Compression (const. value)	0.20 mm
Thickness of shim	1.76 mm

- Determine thickness of shim by referring to the table ⇒ page 35-27.
- ◀ Take off gearbox housing and pull taper roller bearing outer race out of gearbox housing.
 - A - Countersupport, e.g. Kukko 22/2
 - B - Internal extractor 46...58 mm, e.g. Kukko 21/7
- Remove the inserted shim (1.70 mm thick) from the gearbox housing.

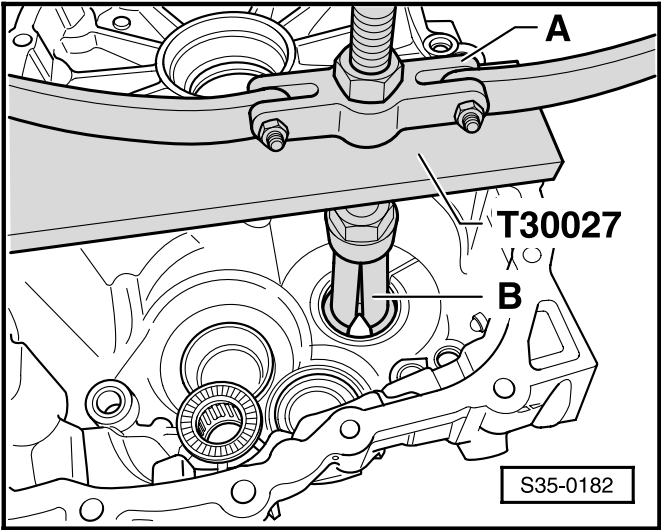
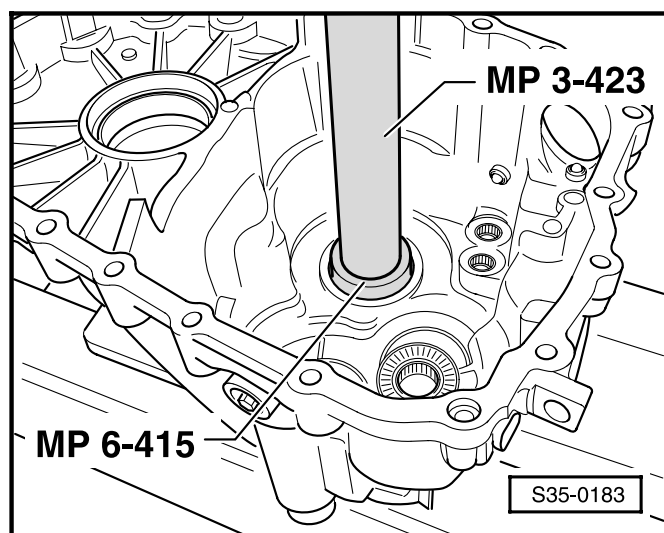


Table of shims

Thickness (mm)	Part No.
1.40	084 409 383 AF
1.45	084 409 383 AG
1.50	084 409 383 AH
1.55	084 409 383 AJ
1.60	084 409 383 AK
1.65	084 409 383 AL
1.70	084 409 383 AM
1.75	084 409 383 AN
1.80	084 409 383 AP
1.85	084 409 383 AQ
1.90	084 409 383 AR
1.95	084 409 383 AS
2.00	084 409 383 AT
2.05	084 409 383 BA
2.10	084 409 383 BB
2.15	084 409 383 BC
2.20	084 409 383 BD



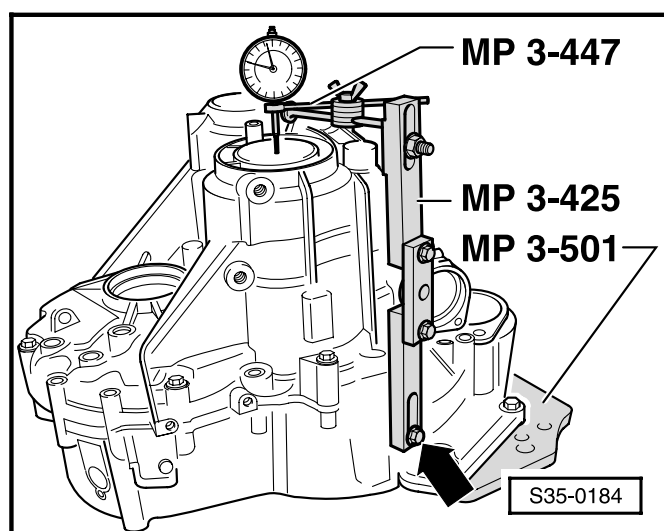
Different tolerances make it possible to exactly gauge the required thickness of shim.

- Press in taper roller bearing outer race with the calculated size of shim (1.75 mm in the example). Support gearbox housing with thrust disc MP 3-464 directly below the bearing mount during this step.

Conducting check measurement

- Calculated size of shim installed.

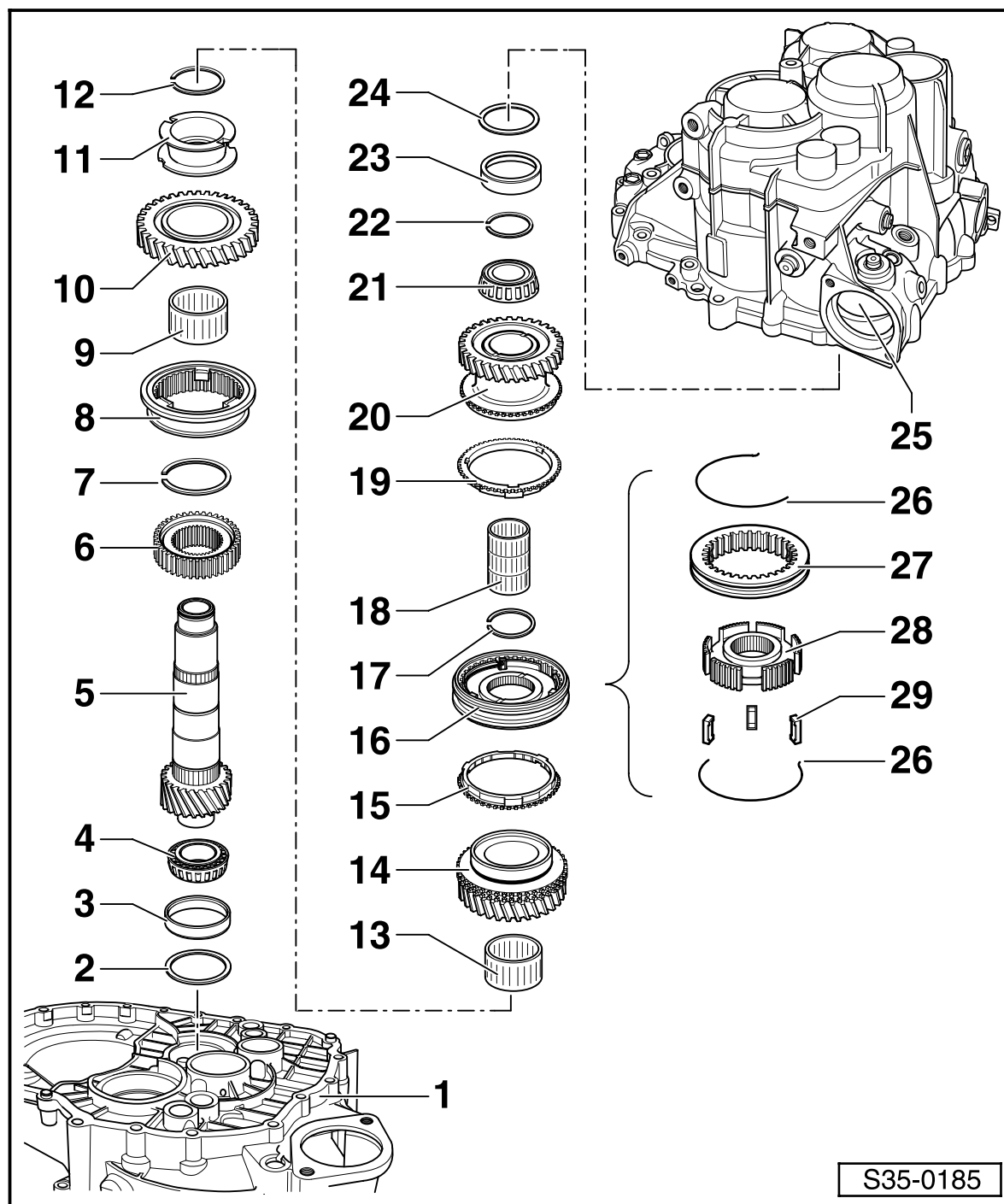
- Install measuring tools and attach with bolt -arrow- at clutch housing.
- Zero dial gauge (3 mm range) with a preload of 1 mm.
- Slacken bolts attaching clutch housing/gearbox housing diagonally across until the bolts release the gearbox housing or the output shaft, respectively.
- If the correct size of shim has been selected, the dial gauge must now indicate a reading of 0.15 mm to 0.25 mm.



Disassembling and assembling 5th/6th and reverse gear output shaft

Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-411
- ◆ Thrust disc MP 3-413
- ◆ Tube section MP 3-414
- ◆ Thrust plunger MP 3-423
- ◆ Thrust piece MP 3-431
- ◆ Thrust plunger MP 3-448
- ◆ Tube section MP 3-450
- ◆ Thrust piece MP 3-453
- ◆ Insertion sleeve MP 3-455
- ◆ Mounting rail MP 3-457
- ◆ Tube section MP 3-461
- ◆ Thrust disc MP 3-464
- ◆ Thrust disc MP 3-467
- ◆ Thrust piece MP 3-472
- ◆ Disc MP 6-415
- ◆ Retaining plate T30027
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/4
- ◆ Grip V.A.G 1582/7
- ◆ Separating device 22...115 mm,
e.g. Kukko 17/2
- ◆ Internal extractor 46...58 mm,
e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2

**Notes:**

- ♦ Pay attention to the technical data when installing new gears or a new output shaft ⇒ page 00-2.
- ♦ If the output shaft or taper roller bearings are replaced, it is necessary to re-set the output shaft ⇒ page 35-38.

1 - Clutch housing**2 - Washer**

- ♦ Always 0.65 mm thick

3 - Taper roller bearing outer race

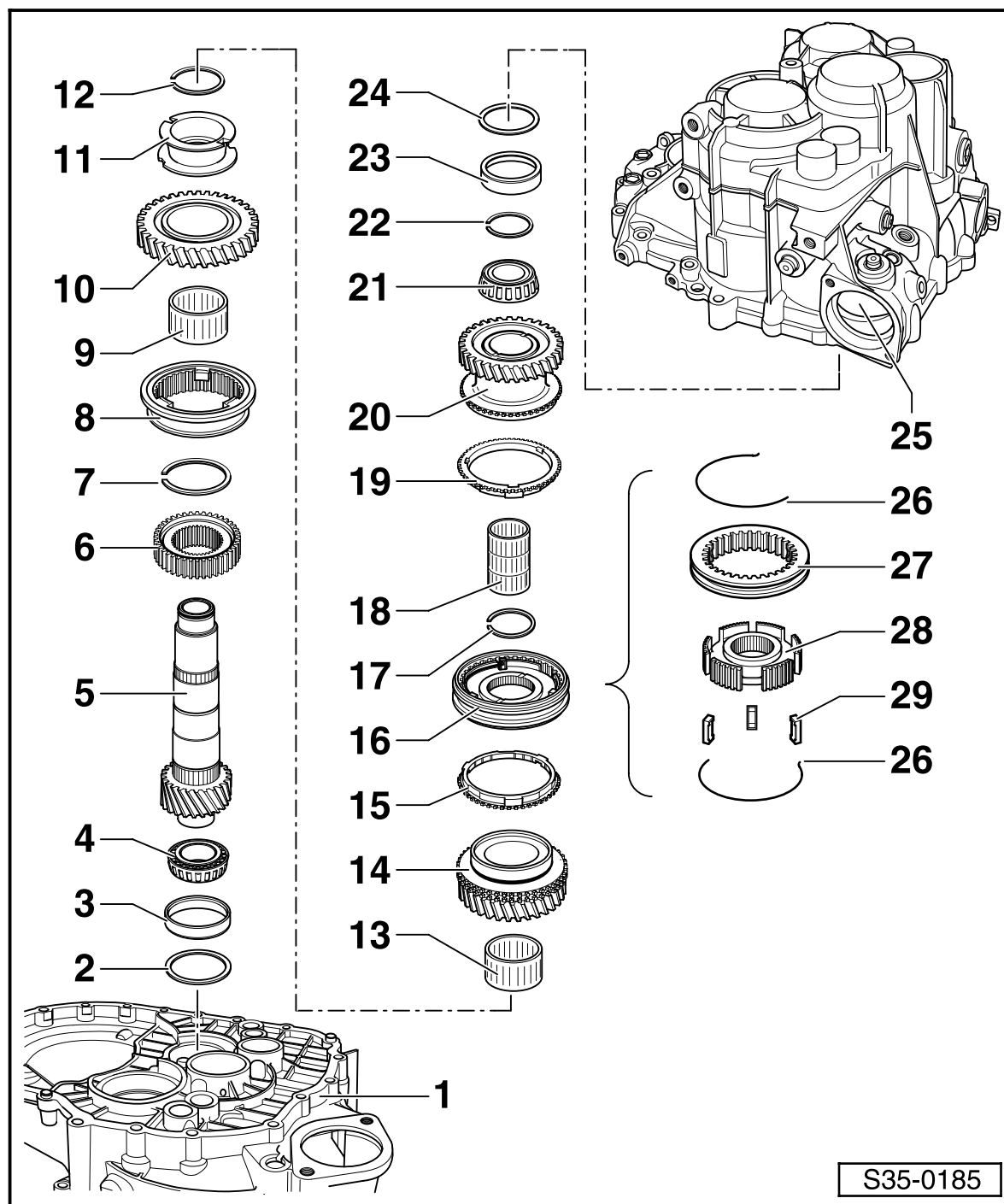
- ♦ Pulling out ⇒ Fig. 1
- ♦ Pressing in ⇒ Fig. 2

4 - Taper roller bearing inner race

- ♦ Pulling off ⇒ Fig. 7
- ♦ Pressing on ⇒ Fig. 17

5 - Output shaft

- ♦ For 5th/6th and reverse gear
- ♦ Setting ⇒ page 35-38



6 - Reverse gear synchroniser body

- ◆ Pressing off ⇒ Fig. 6
- ◆ Fitting location ⇒ Fig. 8
- ◆ Pressing on ⇒ Fig. 9

7 - Circlip

8 - Reverse gear sliding sleeve

- ◆ With synchroniser ring

9 - Needle bearing

- ◆ For reverse sliding gear
- ◆ Dimensions 43 x 51 x 30.8

10 - Reverse sliding gear

11 - Sleeve

- ◆ Press off together with reverse sliding gear ⇒ Fig. 5
- ◆ Fitting location: broad shoulder of sleeve points toward reverse sliding gear
- ◆ Pressing on ⇒ Fig. 10

12 - Circlip

13 - Needle bearing

- ◆ For 6th gear
- ◆ Dimensions 40 x 46 x 26.8

S35-0185

14 - 6th speed sliding gear**15 - 6th gear synchroniser ring**

- ◆ Inspect for wear ⇒ Fig. 11

16 - 5th and 6th gear sliding sleeve with synchroniser body

- ◆ After taking off circlip -item 17-, press off together with 6th speed sliding gear ⇒ Fig. 4
- ◆ Disassembling ⇒ Fig. 12
- ◆ Assembling sliding sleeve/synchroniser body ⇒ Fig. 12 and Fig. 13
- ◆ Pressing on ⇒ Fig. 14

17 - Circlip**18 - Needle bearing**

- ◆ For 5th gear
- ◆ Dimensions 37 x 43 x 46.8

19 - 5th gear synchroniser ring

- ◆ Inspect for wear ⇒ Fig. 11

20 - 5th speed sliding gear**21 - Taper roller bearing inner race**

- ◆ Pulling off ⇒ Fig. 3
- ◆ Pressing on ⇒ Fig. 15

22 - Circlip

- ◆ If taper roller bearing -item 21- and output shaft -item 5- are replaced, re-determine ⇒ Fig. 16

23 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 18
- ◆ Pressing in ⇒ Fig. 19

24 - Shim

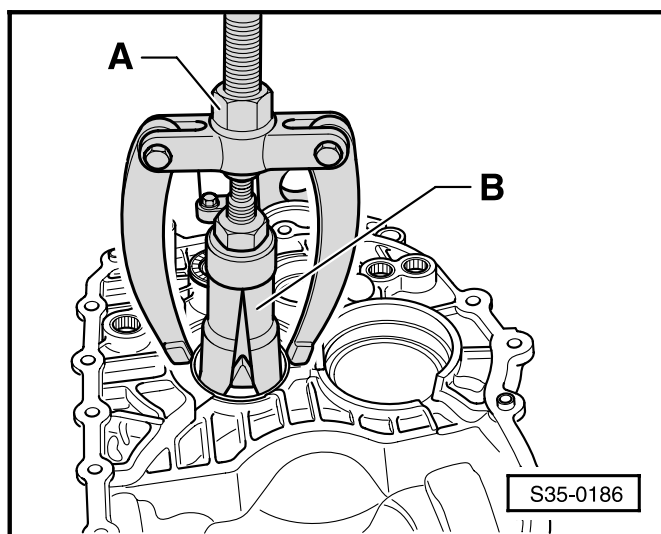
- ◆ Determining thickness ⇒ page 35-38

25 - Gearbox housing**26 - Spring**

- ◆ Fitting location ⇒ Fig. 13

27 - Sliding sleeve**28 - Synchroniser body****29 - Locking pieces (3 in total)**

- ◆ Fitting location ⇒ Fig. 12



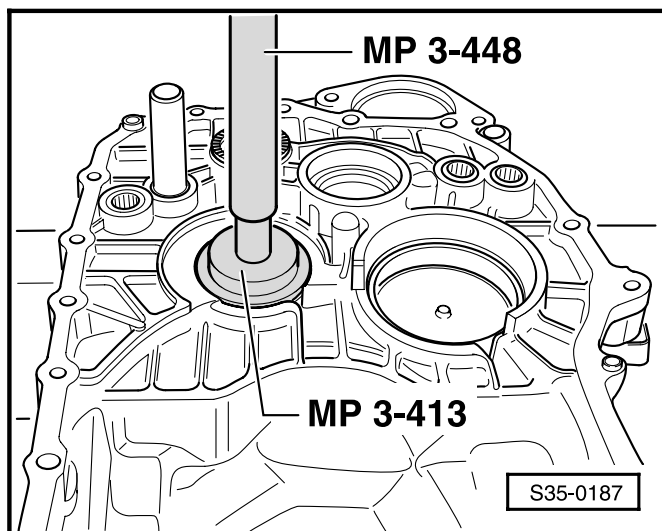
◀ **Fig. 1 Pulling out taper roller bearing outer race**

A - Countersupport, e.g. Kukko 22/2

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

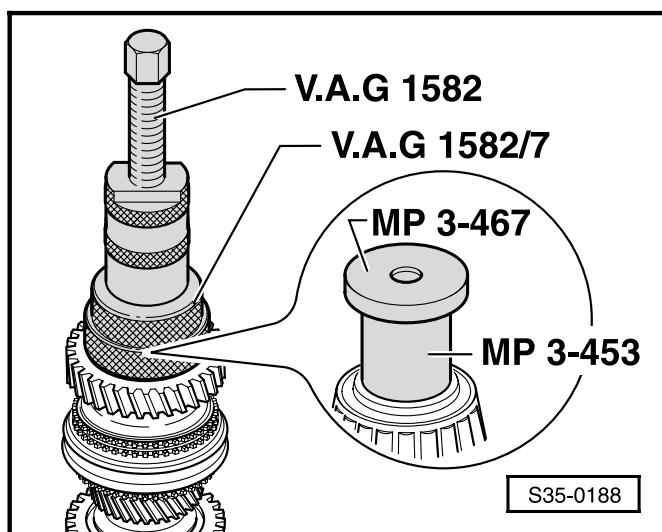
Note:

After removing outer race, inspect washer for damage, replace if necessary.



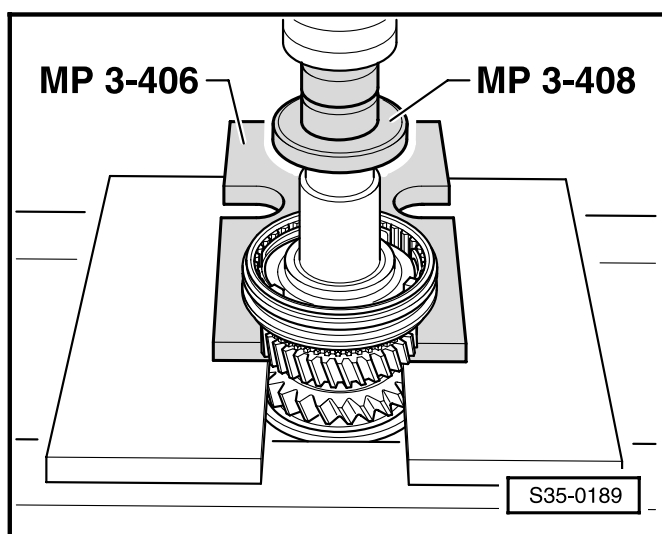
◀ Fig. 2 Pressing taper roller bearing outer race into clutch housing

- Place washer below outer race.
- Support clutch housing with tube section MP 3-450 directly below bearing mount.



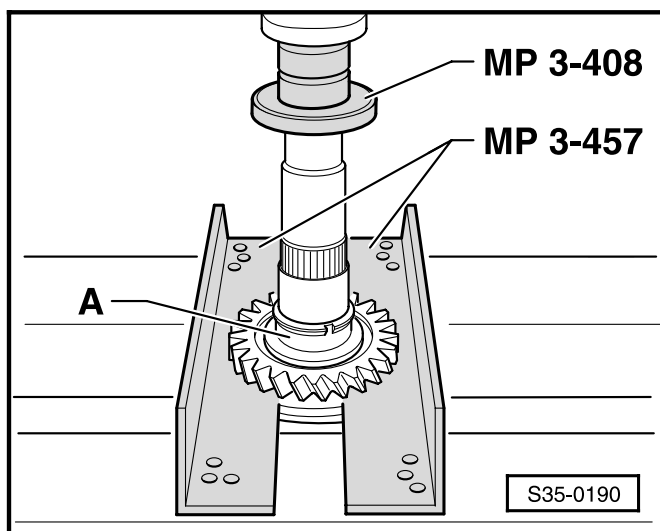
◀ Fig. 3 Pulling off taper roller bearing inner race

- Before fitting on removing device, place thrust piece MP 3-453 and thrust disc MP 3-467 onto output shaft.



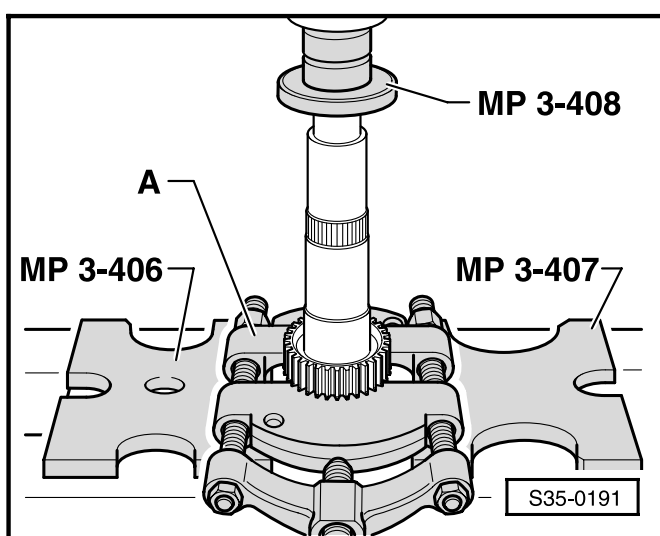
◀ Fig. 4 Pressing off 5th and 6th gear synchroniser body/sliding sleeve together with 6th speed sliding gear

- Remove circlip first of all (⇒ page 35-31, item 17).



◀ Fig. 5 Pressing off sleeve -A- together with reverse speed idler gear

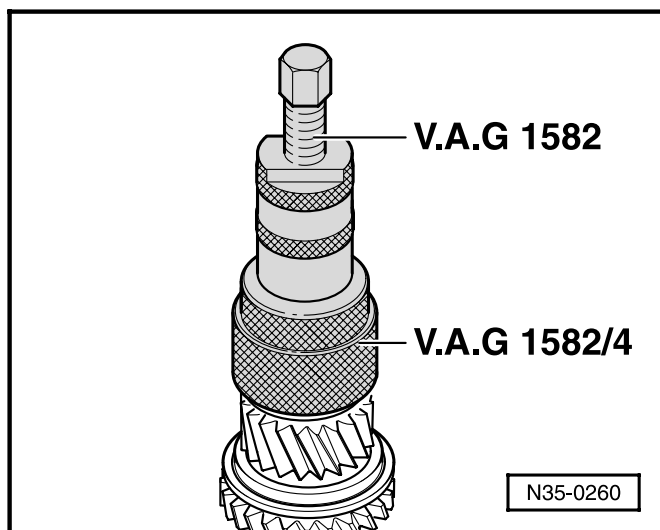
- Remove circlip first of all (⇒ page 35-30, item 12).



◀ Fig. 6 Pressing off reverse gear synchroniser body

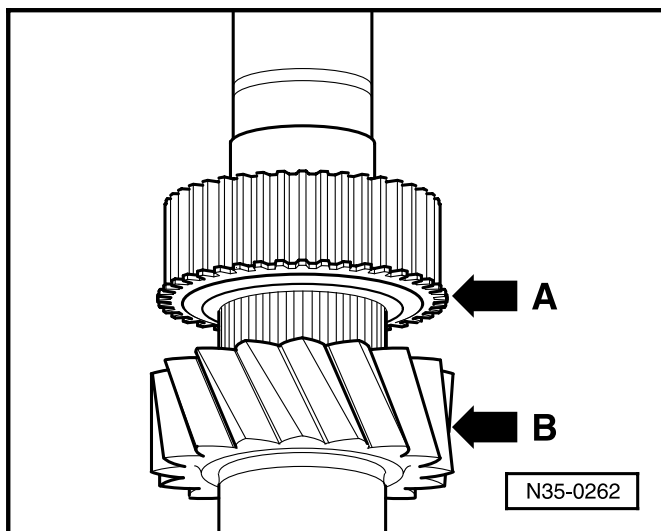
A - Separating device 22...115 mm,
e.g. Kukko 17/2

- Remove circlip first of all (⇒ page 35-30, item 7).



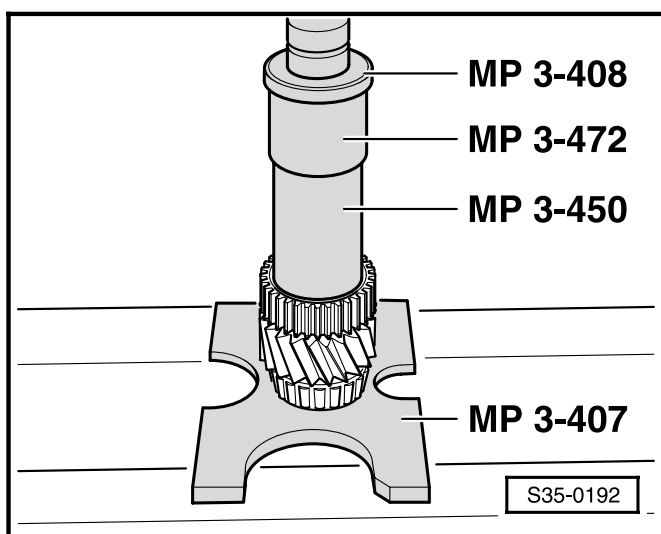
◀ Fig. 7 Pulling off taper roller bearing inner race

- Before fitting on removal device, place thrust piece MP 3-431 onto the output shaft.

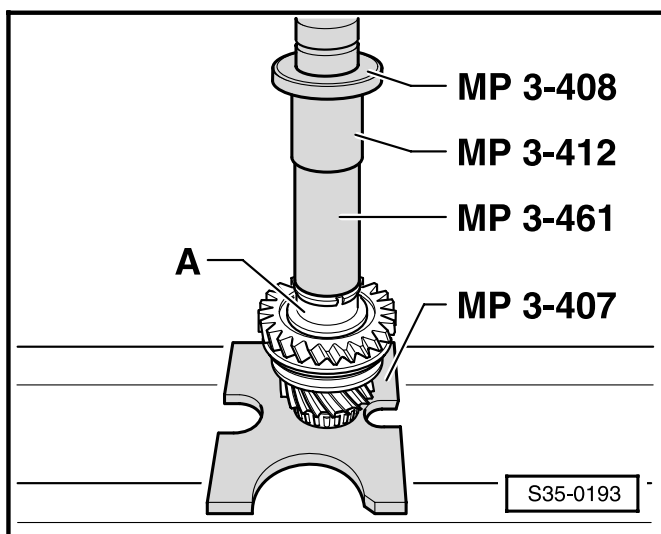


◀ Fig. 8 Fitting location of reverse gear synchroniser body

The stop -arrow A- for the reverse gear sliding sleeve points toward the teeth of the output shaft -arrow B-.

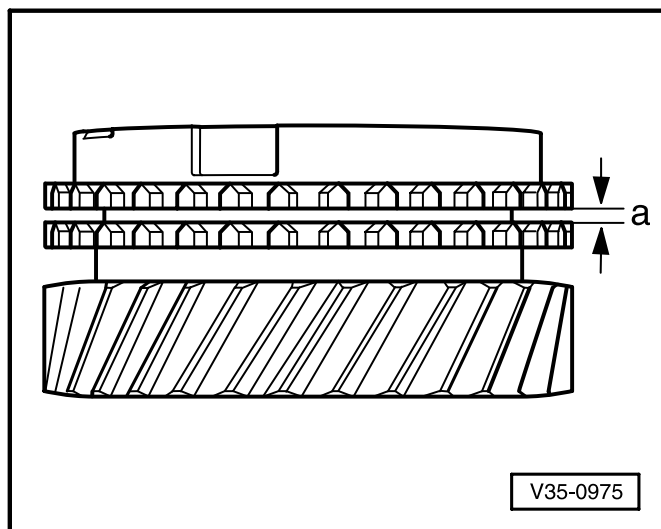


◀ Fig. 9 Pressing on reverse gear synchroniser body



◀ Fig. 10 Pressing on sleeve -A-

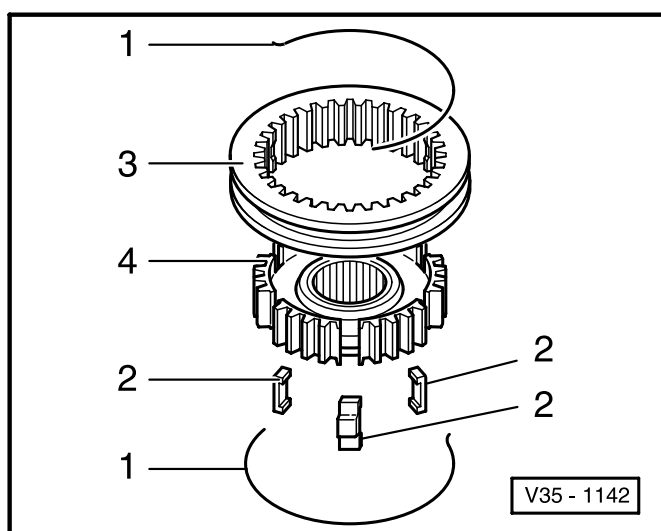
Fitting location: The broad shoulder points toward the reverse sliding gear.



◀ Fig. 11 Inspecting 5th and 6th gear synchroniser ring for wear

- Press synchroniser ring onto the taper of the sliding gear and measure size of gap „a“ with a feeler gauge.

	Installed dim.	Wear limit
Gap „a“	1.0...1.7 mm	0.5 mm

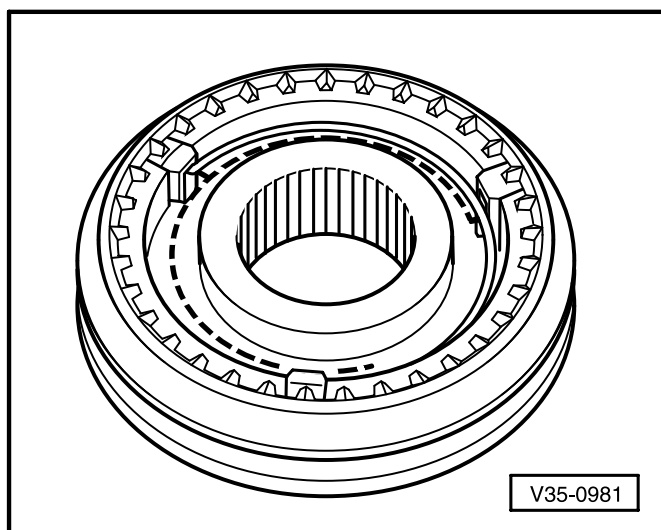


◀ Fig. 12 Disassembling and assembling 5th and 6th gear sliding sleeve and synchroniser body

- 1 - Spring
- 2 - Locking piece
- 3 - Sliding sleeve
- 4 - Synchroniser body

- Push sliding sleeve over synchroniser body.

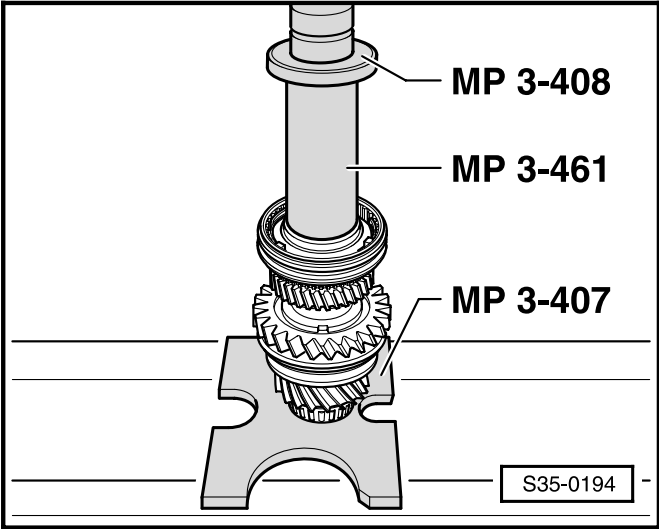
Recesses for locking pieces on the synchroniser body and sliding sleeve must be positioned one above the other.



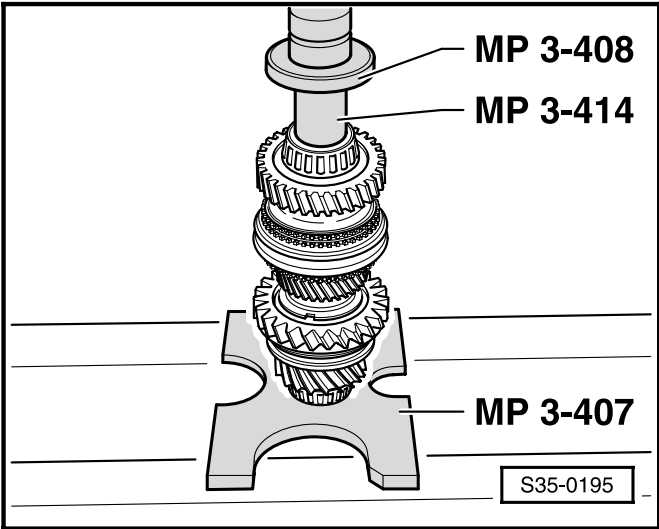
◀ Fig. 13 Assembling 5th and 6th gear sliding sleeve/synchroniser body

Sliding sleeve has been pushed over synchroniser body.

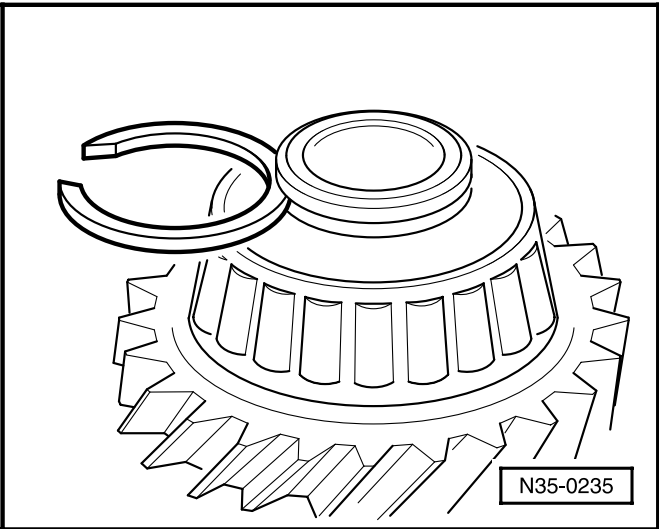
- Insert locking pieces and install springs offset 120°. The angled end of the spring must engage in the hollow locking piece.



◀ Fig. 14 Pressing on 5th and 6th gear sliding sleeve/synchroniser body



◀ Fig. 15 Pressing on taper roller bearing inner race

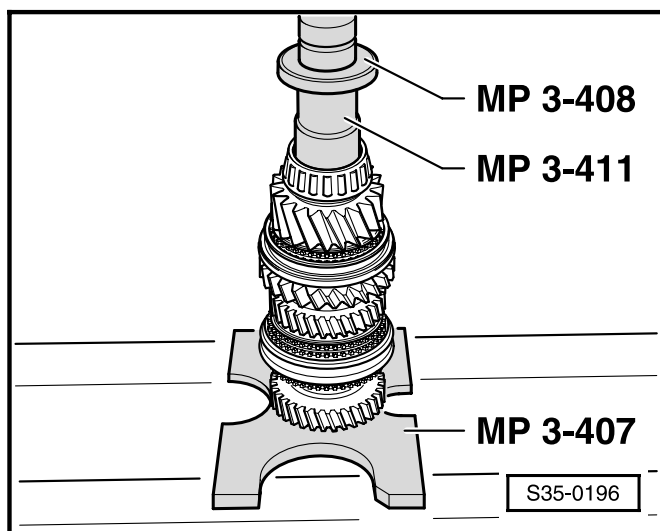


◀ Fig. 16 Determining circlip

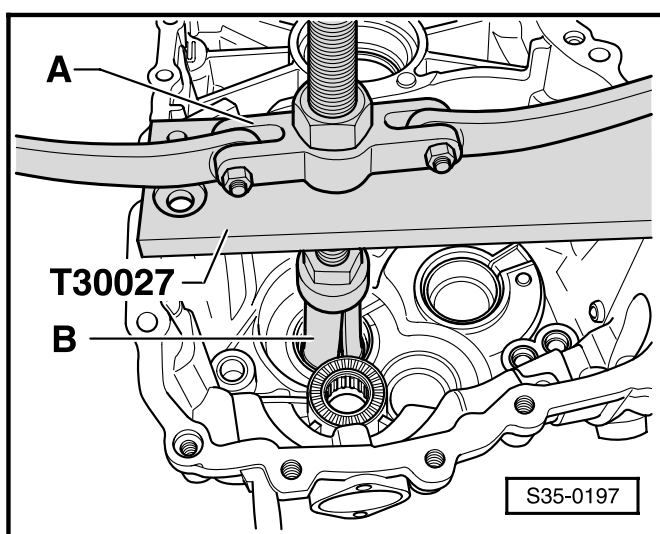
- Determine the thickest circlip which can still just be inserted, and insert.

The following circlips are available:

Thickness (mm)	Part No.
1.79	02M 311 187 G
1.83	02M 311 187 F
1.86	02M 311 187 E
1.89	02M 311 187 D
1.92	02M 311 187 C
1.95	02M 311 187 B
1.98	02M 311 187 A



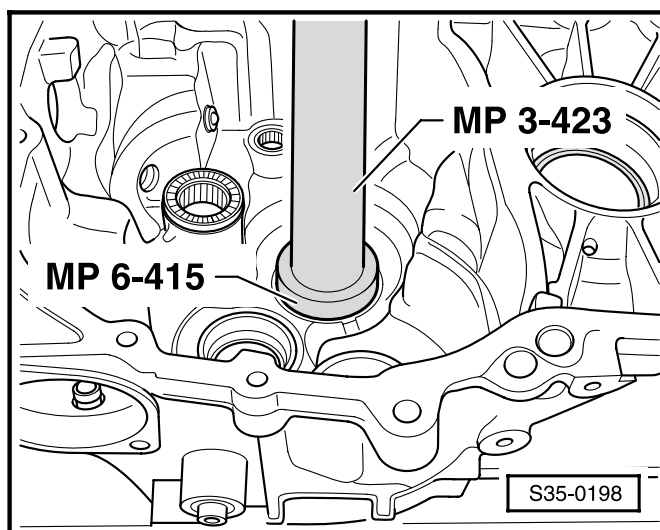
◀ Fig. 17 Pressing on taper roller bearing inner race



◀ Fig. 18 Pulling taper roller bearing outer race out of gearbox housing

A - Countersupport, e.g. Kukko 22/2

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



◀ Fig. 19 Pressing taper roller bearing outer race into gearbox housing

- Use thrust disc MP 3-464 to support gearbox housing below bearing mount.

Setting 5th/6th and reverse gear output shaft

(Determining shim for output shaft)

Special tools, testers and aids required

- ◆ Thrust plunger MP 3-423
- ◆ Supporting bridge MP 3-425
- ◆ Universal dial gauge holder MP 3-447
- ◆ Thrust disc MP 3-464
- ◆ Disc MP 6-415
- ◆ Retaining plate T30027
- ◆ Torque wrench 5...50 Nm, e.g. V.A.G 1331
- ◆ Internal extractor 46...58 mm, e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2
- ◆ Dial gauge

It is necessary to re-set the output shaft if the following components are replaced:

- ◆ Gearbox housing
- ◆ Clutch housing
- ◆ 5th/6th and reverse gear output shaft

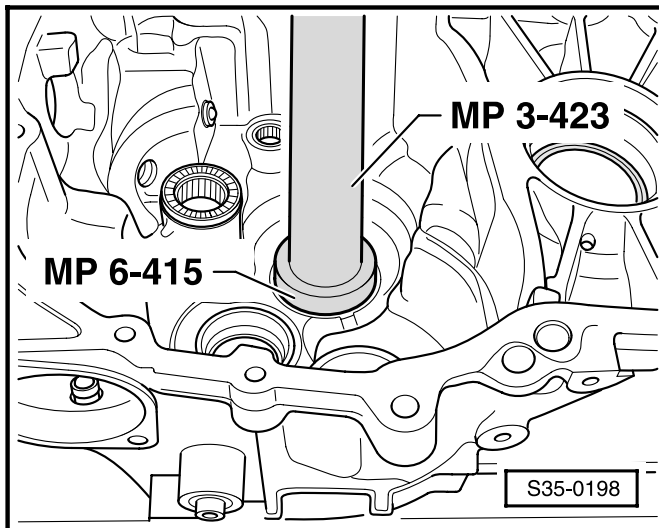
or

- ◆ Taper roller bearings

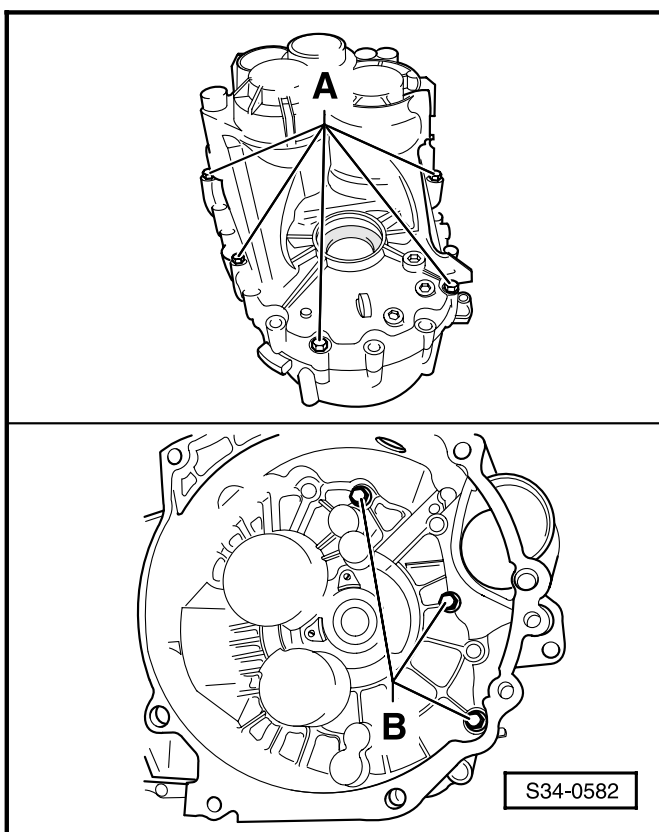
List of settings ⇒ page 39-16

Requirements:

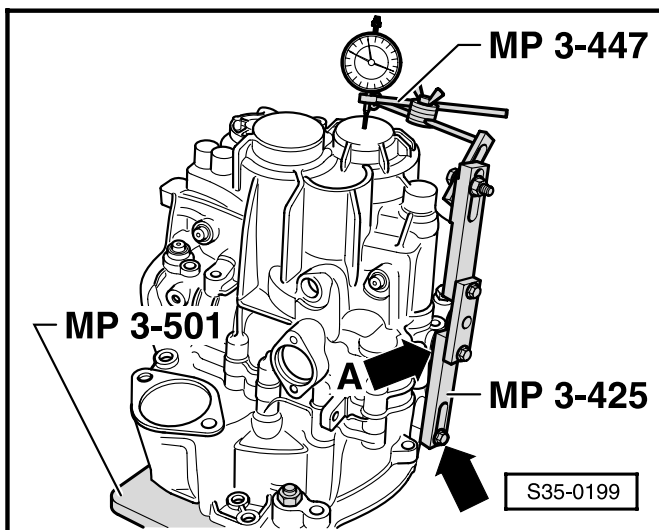
- Sealing surfaces of clutch housing and gear-box housing must be cleaned free of sealant.
- When conducting the measurement, install only the shaft to be measured.



- ◀ - Press taper roller bearing outer race with 1.70 mm thick shim into the gearbox housing. Support gearbox housing with thrust disc MP 3-464 directly below the bearing mount for this step.
- Place complete 5th/6th and reverse gear output shaft into the clutch housing.



- ◀ - Mount gearbox housing and tighten bolts -A- as well as -B- diagonally across to the specified torque.



- ◀ - Install measuring tools and attach with bolt -arrow- to clutch housing.

Note:

Ensure that the supporting bridge is not touching at any point in the area of the contact surface between gearbox housing and clutch housing -arrow A-.

- Zero dial gauge (3 mm range) with a preload of 1 mm.

- Slacken bolts attaching clutch housing/gearbox housing diagonally across until the bolts release the gearbox housing or the output shaft, respectively.
- Read off measurement indicated on dial gauge and note (example: 0.27 mm).

Note:

If no readout is indicated on the dial gauge when the bolts attaching the clutch housing/gearbox housing are slackened, install 1.95 mm shim (Part No. 084 409 383 AS) or, as appropriate, the 2.20 mm shim (Part No. 084 409 383 BD) for the measurement.

Determining shim

The specified bearing preload is achieved if the measurement obtained (0.27 mm) is deducted from the size of shim inserted (1.70 mm) and a constant value for compression (0.20 mm) is added.

Example:

Shim inserted	1.70 mm
- Measurement	0.27 mm
+ Compression (const. value)	0.20 mm
Thickness of shim	1.63 mm

- Determine thickness of shim by referring to the table ⇒ page 35-41.
- ◀ - Take off gearbox housing and pull taper roller bearing outer race out of gearbox housing.
A - Countersupport, e.g. Kukko 22/2
B - Internal extractor 46...58 mm, e.g. Kukko 21/7
- Remove the inserted shim (1.70 mm thick) from the gearbox housing.

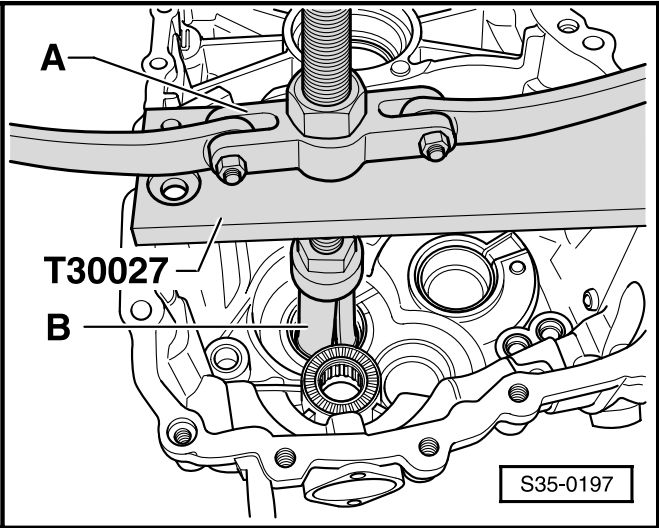
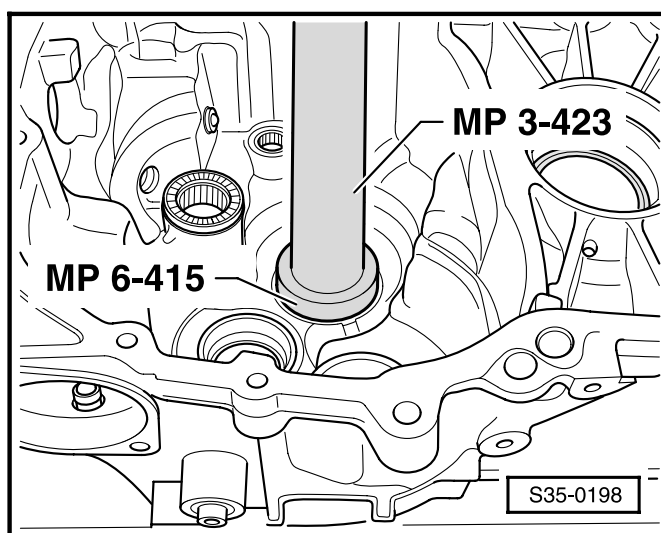


Table of shims

Thickness (mm)	Part No.
1.40	084 409 383 AF
1.45	084 409 383 AG
1.50	084 409 383 AH
1.55	084 409 383 AJ
1.60	084 409 383 AK
1.65	084 409 383 AL
1.70	084 409 383 AM
1.75	084 409 383 AN
1.80	084 409 383 AP
1.85	084 409 383 AQ
1.90	084 409 383 AR
1.95	084 409 383 AS
2.00	084 409 383 AT
2.05	084 409 383 BA
2.10	084 409 383 BB
2.15	084 409 383 BC



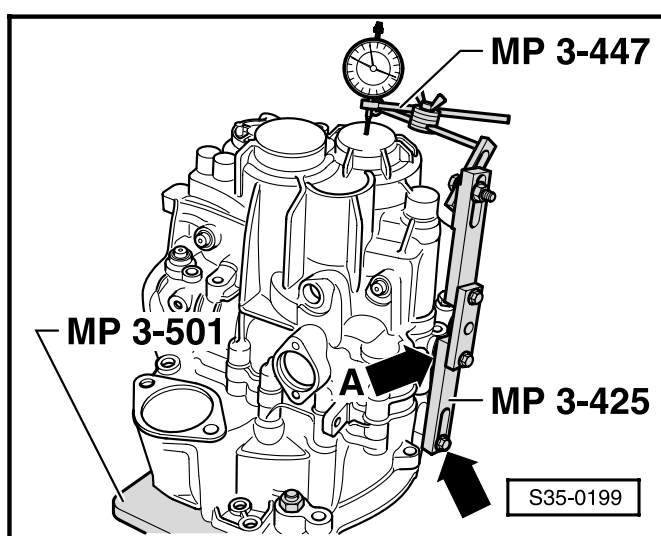
Different tolerances make it possible to exactly gauge the required thickness of shim.

- Press in taper roller bearing outer race with the calculated size of shim (1.65 mm in the example). Support gearbox housing with thrust disc MP 3-464 directly below the bearing mount during this step.

Conducting check measurement

- Calculated size of shim installed.

- Install measuring tools and attach with bolt -arrow- at clutch housing.
- Zero dial gauge (3 mm range) with a preload of 1 mm.
- Slacken bolts attaching clutch housing/gearbox housing diagonally across until the bolts release the gearbox housing or the output shaft, respectively.
- If the correct size of shim has been selected, the dial gauge must now indicate a reading of 0.15 mm to 0.25 mm.



Replacing seals for flange shafts

(Gearbox installed)

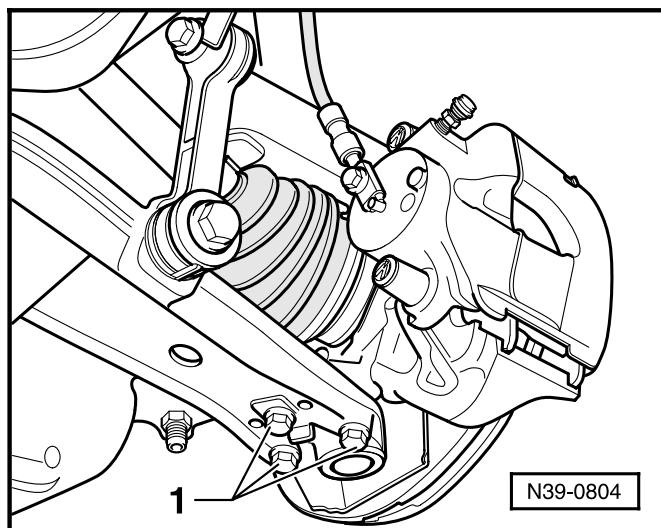
Replacing seal for left flange shaft

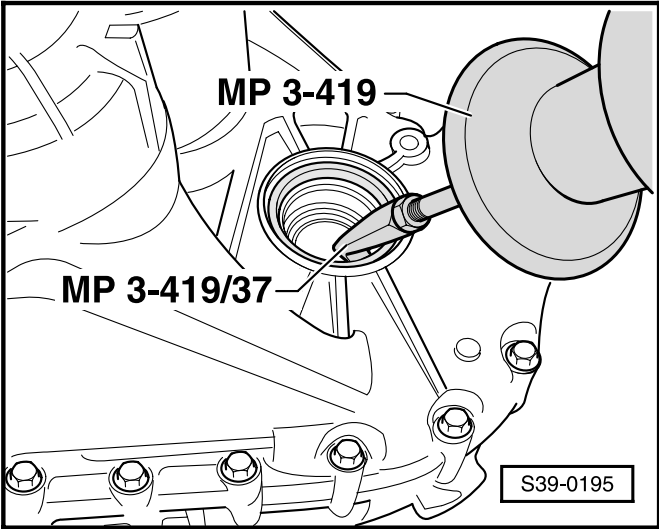
Special tools, testers and aids required

- ◆ Universal tool MP 3-419
- ◆ Extraction hook MP 3-419/37
- ◆ Thrust piece T30028
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331
- ◆ Torque wrench (40...200 Nm), e.g. V.A.G 1332
- ◆ Commercially available 6 mm wrench socket
- ◆ Drip tray

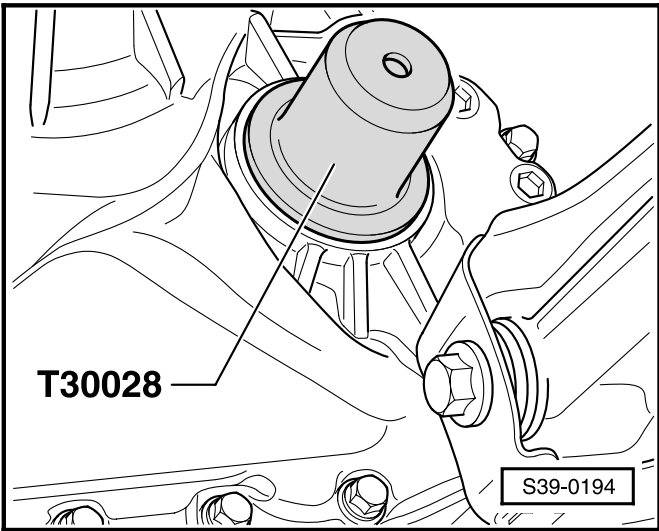
Removing

- Take off wheel.
- Remove middle and left part of noise insulation below engine/gearbox.
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine
- Turn steering to full left lock.
- Unbolt drive shaft from flange shaft.
- ◀ - Mark installation position of bolt -1-.
- Unscrew bolts -1-.
- Tie up drive shaft as far as possible. Do not damage paintwork of drive shaft when doing this.
- Use commercially available 6 mm wrench socket to remove spherical bolt for flange shaft; secure with drift to prevent it turning.
- Place drip tray below gearbox.
- Pull out flange shaft together with compression spring.





◀ - Pull out seal



Installing

- ◀ - Knock in new seal as far as the stop; do not twist seal.
- Pack space between sealing lip and dust lip half with grease G 052 128 A1.
 - Insert flange shaft.
 - Attach flange shaft with spherical bolt.
 - Bolt steering joint and track control arm onto old impression with **new bolts**.
 - Bolt left drive shaft to flange shaft.
 - Fit on wheel.
 - Inspect gear oil in manual gearbox ⇒ page 34-33.
 - Install noise insulation
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine.

Tightening torques

Components	Tightening torque
Flange shaft to gearbox (spherical bolt)	25 Nm
Drive shaft to flange shaft, tighten diagonally across in 2 stages (I and II) M10 ¹⁾	I - 10 Nm II - 70 Nm
Wheel bolts to wheel hub	120 Nm
Steering joint to track control arm ¹⁾	20 Nm + 90°

1) Always replace these bolts.

Replacing seal for right flange shaft (on vehicles with Front Wheel Drive)

Special tools, testers and aids required

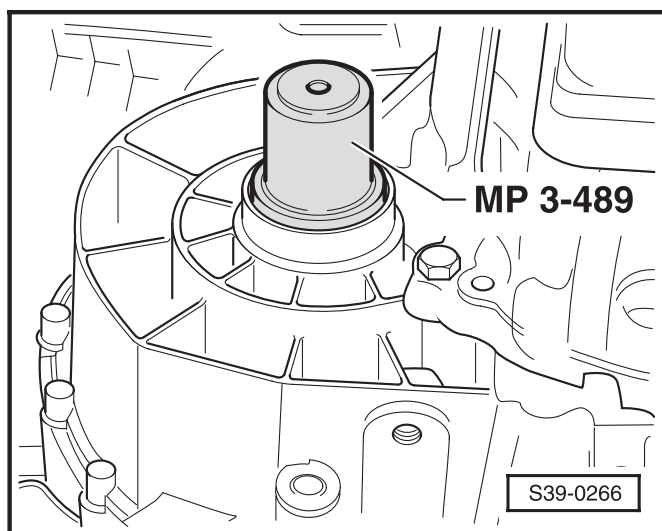
- ◆ Pulling Device T10037
- ◆ Thrust piece T10049
- ◆ 6 mm wrench socket, at least 190 mm long, e.g. V.A.G 1669
- ◆ Dip tray

Removing

- Remove middle and right part of noise insulation below engine/gearbox.
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine
- Turn steering to full right lock.
- Remove drive shaft.
⇒ Running Gear; Repair Group 40; Servicing drive shafts; Removing and installing drive shafts
- Place drip tray below gearbox.
- Use V.A.G 1669 or commercially available 6 mm wrench socket to remove bolt for right flange shaft.
- Pull out flange shaft.
- Use assembly iron to lever out seal.

Installing

- ◀ - Knock in seal as far as the stop; do not twist seal.
- Pack space between sealing lip and dust lip half with grease G 052 128 A1
- Carefully knock in flange shaft;
- Attach flange shaft with spherical bolt and tighten with tightening torque.



- Install drive shaft.
⇒ Running Gear; Repair Group 40; Servicing drive shafts; Removing and installing drive shafts
- Inspect gear oil in manual gearbox ⇒ page 34-33.
- Install noise insulation
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

Tightening torques

Components	Tightening torque
Flange shaft to gearbox (spherical bolt)	25 Nm
Drive shaft to flange shaft, tighten diagonally across in 2 stages (I and II) M10 ¹⁾	I - 10 Nm II - 70 Nm

¹⁾ Always replace these bolts

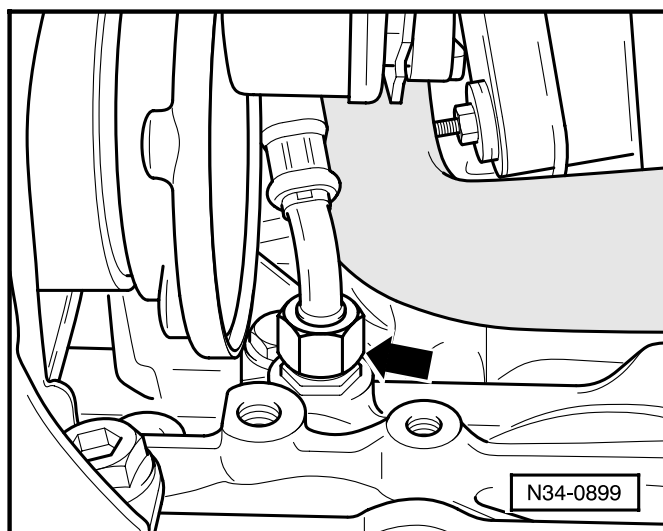
Replacing seal for right flange shaft (on vehicles with 4 Wheel Drive)

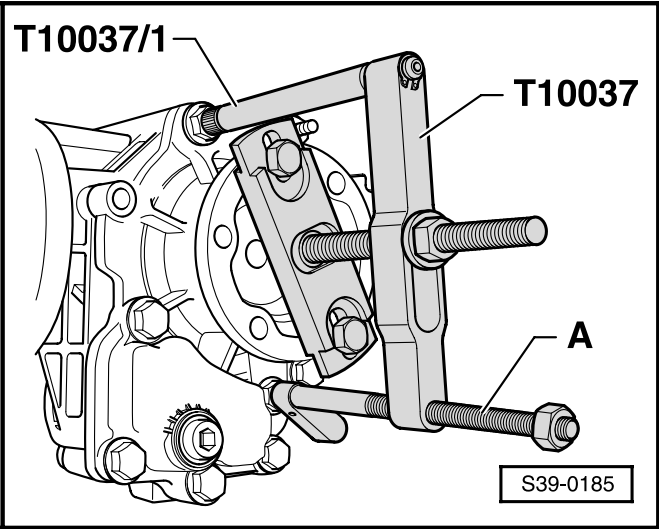
Special tools, testers and aids required

- ◆ Pulling device T10037
- ◆ Thrust piece T10049
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331
- ◆ Torque wrench (40...200 Nm), e.g. V.A.G 1332
- ◆ 6 mm wrench socket, at least 190 mm long, e.g. V.A.G 1669
- ◆ Drip tray

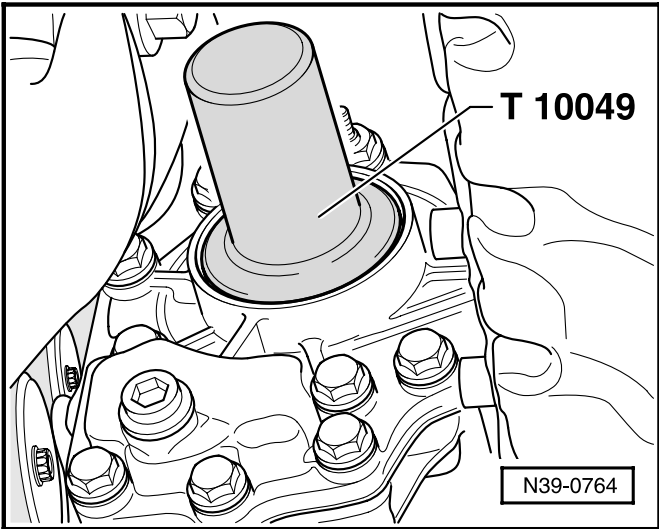
Removing

- Remove middle and right part of noise insulation below engine/gearbox.
⇒ Engine, Mechanical components; Repair Group 10; Removing and installing engine
- Turn steering to full right lock
- Remove drive shaft.
⇒ Running Gear; Repair Group 40; Servicing drive shafts; Removing and installing drive shafts
- Place drip tray below gearbox
- ◀ - Unbolt oil return-flow line for turbocharger from engine -arrow-.
⇒ Engine, Mechanical Components; Repair Group 21; Charge air system for turbocharger
- Use V.A.G 1669 or commercially available 6 mm wrench socket to remove bolt for right flange shaft.

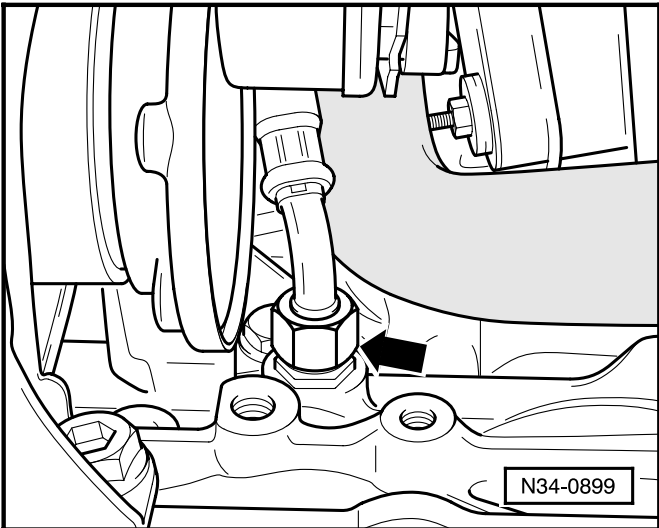




- ◀ Attach extraction device T10037 to the right flange shaft.
- Use knurled nut T10037/1 and bottom support -A- to align pulling device parallel to the flange.
- Pull out flange shaft.
- Use assembly iron to lever out seal.



- Installing**
- ◀ Knock in new seal as far as the stop; do not twist seal.
 - Pack space between sealing lip and dust lip half with grease G 052 128 A1.
 - Carefully knock in flange shaft; rotate during this step
 - Attach flange shaft with spherical bolt.
 - Install drive shaft
 - ⇒ Running Gear; Repair Group 40; Servicing drive shafts; Removing and installing drive shafts



- ◀ Bolt oil return-flow line for turbocharger to the engine -arrow-.
- ⇒ Engine, Mechanical Components; Repair Group 21; Charge air system for turbo-charger
- Inspect gear oil in manual gearbox ⇒ page 34-33
- Install noise insulation
- ⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

Tightening torques

Components	Tightening torque
Flange shaft to gearbox (spherical bolt)	25 Nm
Drive shaft to flange shaft, tighten diagonally across in 2 stages (I and II) M10 ¹⁾	I - 10 Nm II - 70 Nm

1) Always replace these bolts

Replacing seal for output flange of bevel gear (bevel gear removed)

Special tools, testers and aids required

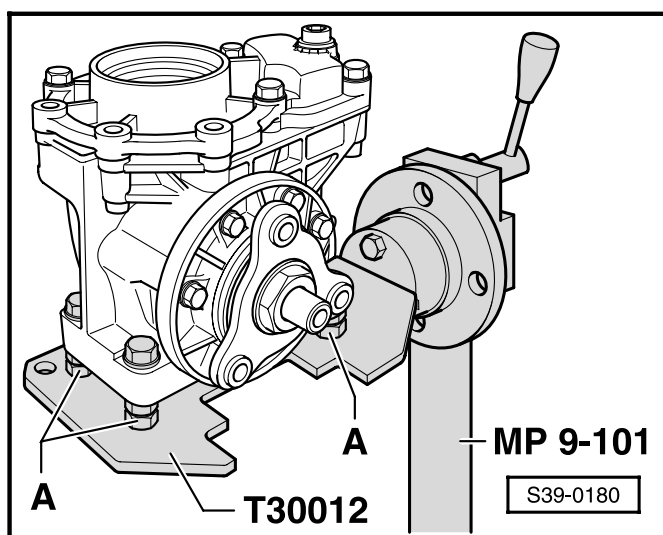
- ◆ Tube section MP 3-414
- ◆ Thrust disc MP 3-467
- ◆ Repair stand MP 9-101
- ◆ Thrust piece T10049
- ◆ Gearbox holder T30012
- ◆ Stop plate T30012/1A
- ◆ Torque wrench (150...800 Nm),
e.g. V.A.G 1601
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/6
- ◆ Two-legged puller, e.g. Kukko 20/10
- ◆ Three-legged puller, e.g. Kukko 45-2

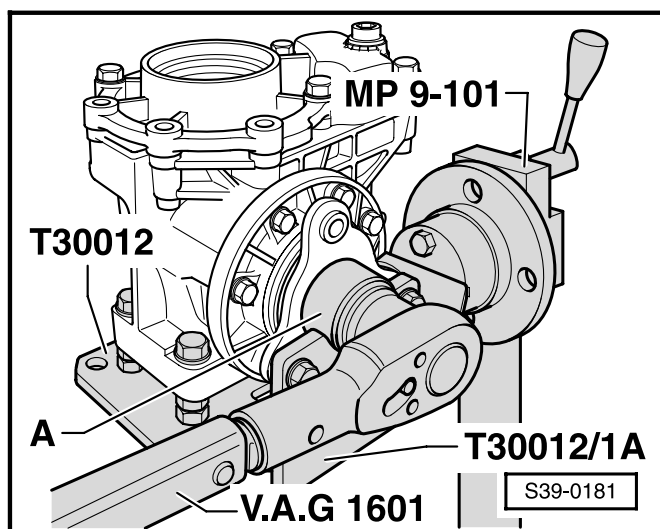
Note:

The seal for the output flange of the propshaft in the bevel gear can only be replaced when the bevel gear is removed.

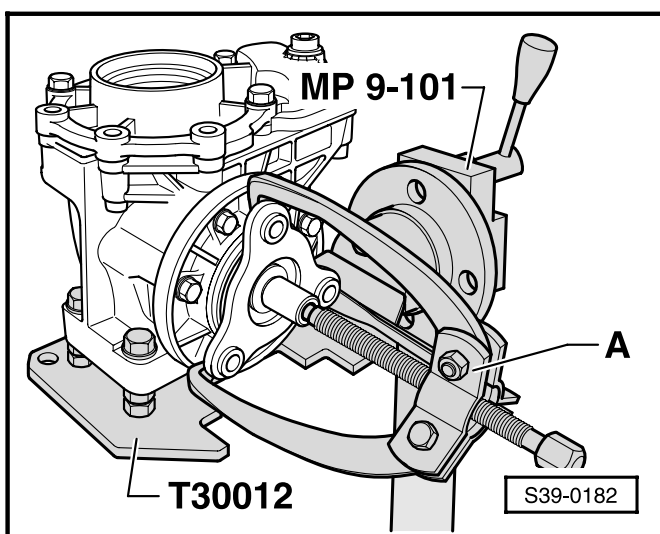
Removing

- Remove bevel gear ⇒ page 34-28.
- ◀ - Attach bevel gear to gearbox holder.
A - M12 x 10 nut (8 in total)

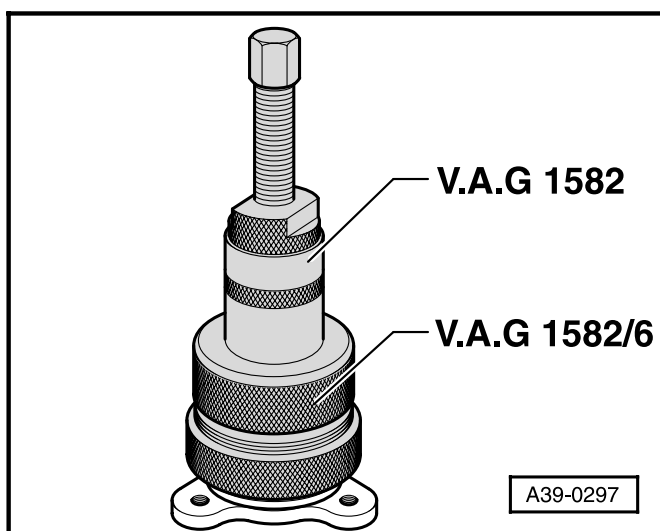




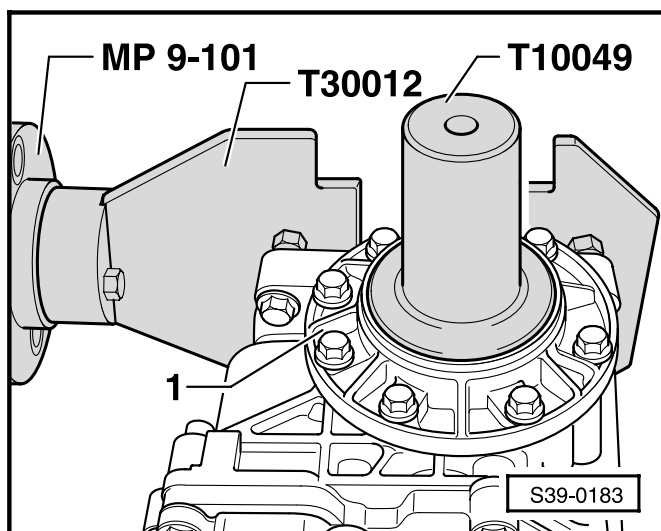
- ◀ - Lock the bevel gear output flange with the stop plate T30012/1A.
- Unscrew hexagon nut for output flange.
- A - Wrench socket for 3/4" drive



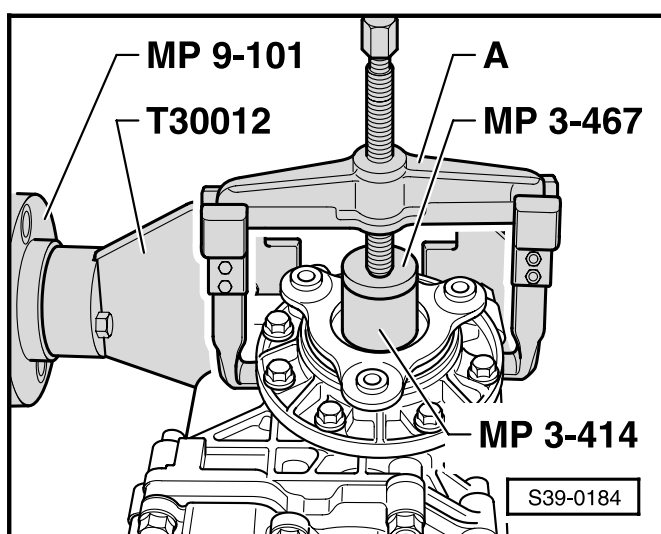
- ◀ - Pull out output flange together with seal and bearing inner race.
- A - Three-legged puller, e.g. Kukko 45-2



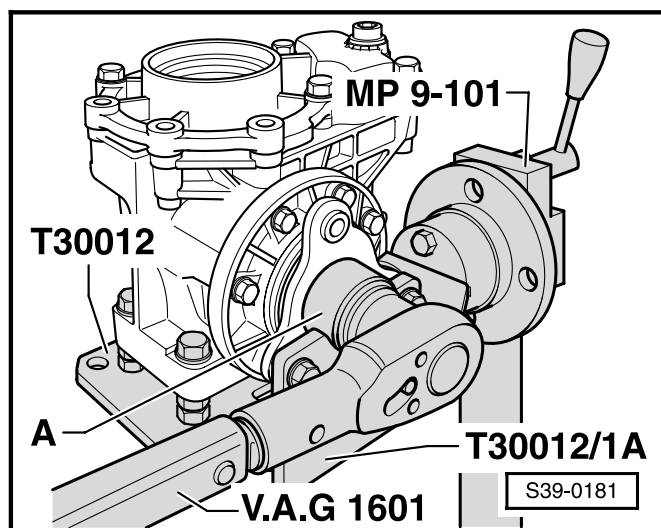
- Place the thrust disc MP 3-467 onto the output flange.
- ◀ - Use the taper roller bearing puller to pull off the bearing inner race of the output flange.
- Take seal off the output flange.

**Installing**

- ◀ - Swivel bevel gear so that the drive pinion/crown wheel housing -1- is facing up.
- Place the bearing inner race into the drive pinion/crown wheel housing.
- Knock in new seal as far as the stop; do not twist seal.
- Pack space between sealing lip and dust lip half with grease G 052 128 A1.

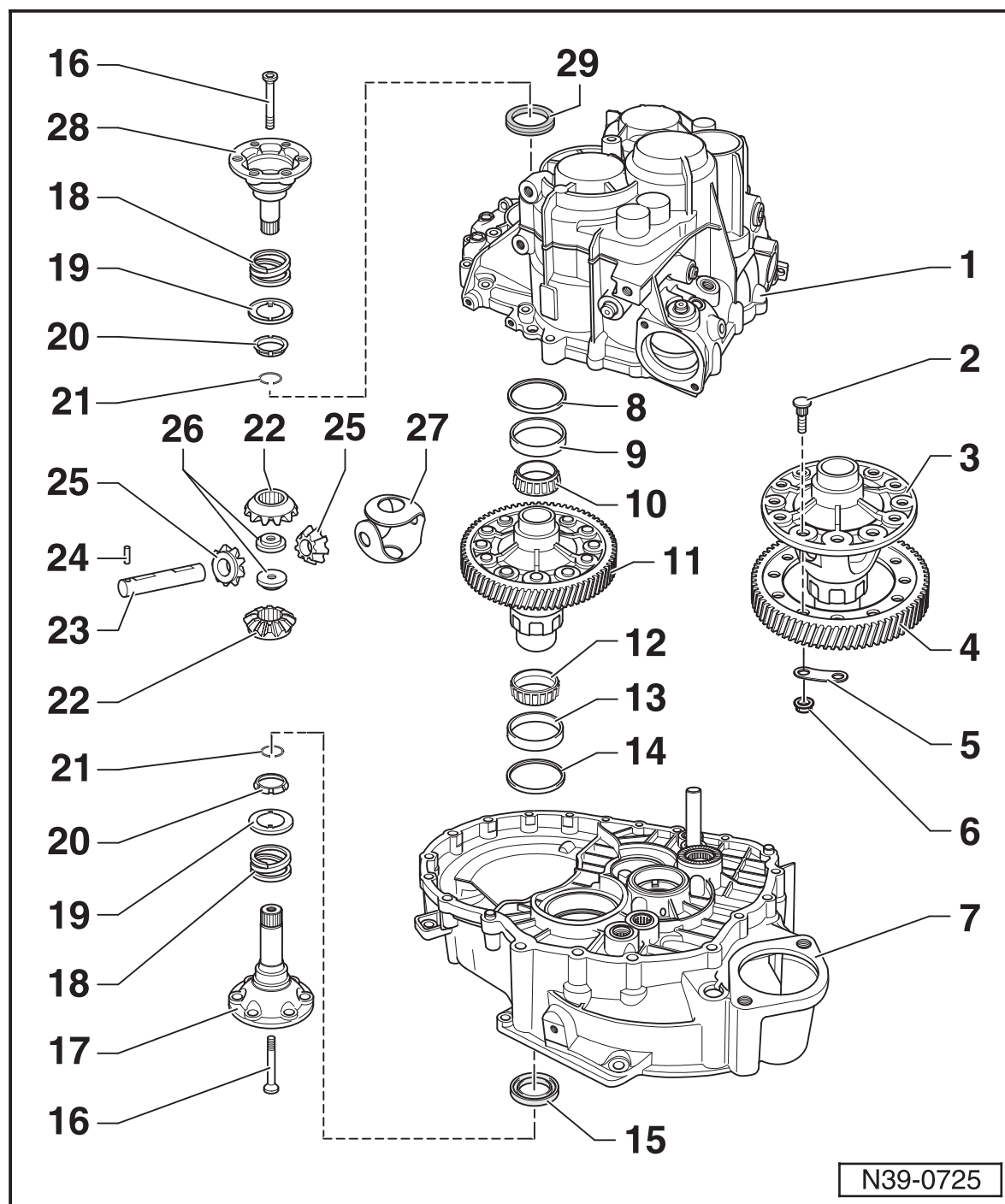


- ◀ - Draw in output flange.
A - Two-legged puller, e.g. Kukko 20/10
- Position extraction hook on the underside of the drive pinion/crown wheel housing.



- ◀ - Tighten new hexagon nut for output flange to 475 Nm.
A - Wrench socket for 3/4" drive
- Install bevel gear ⇒ page 34-28.
- Inspect gear oil in manual gearbox with bevel gear ⇒ page 34-33.

Disassembling and assembling differential on vehicles with Front Wheel Drive



Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-458/1
- ◆ Insertion device MP 9-400
- ◆ Pipe MP 6-419
- ◆ Tube T30019
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/6
- ◆ Separating device 12...75 mm, e.g. Kukko 17/1
- ◆ Puller device, e.g. Kukko 18/0
- ◆ Internal extractor 46...58 mm, e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2

Notes:

- ◆ Heat taper roller bearing inner race to 100 °C before installing.
- ◆ Always replace both taper roller bearings
- ◆ If the taper roller bearings, the differential housing, the gearbox housing or the clutch housing are replaced, set differential ⇒ page 39-17

1 - Gearbox housing**2 - Bolt****3 - Differential housing**

- ◆ Bolt to final drive gear

4 - Final drive gear

- ◆ Riveted in series production
- ◆ Pressing off ⇒ Fig. 8
- ◆ Fitting location: the ground side points toward the bolted surface of the differential housing
- ◆ Heat to 100 °C before installing
- ◆ Place onto differential housing ⇒ Fig. 9
- ◆ Bolted ⇒ Fig. 10

5 - Washer**6 - 40 Nm and torque a further 45°**

- ◆ Always replace

7 - Clutch housing**8 - Shim**

- ◆ For differential
- ◆ Determining thickness ⇒ page 39-17

9 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 5
- ◆ Pressing in ⇒ Fig. 6

10 - Taper roller bearing inner race

- ◆ Pulling off ⇒ Fig. 3
- ◆ Pressing on ⇒ Fig. 4

11 - Differential housing

- ◆ With riveted final drive gear
- ◆ If final drive gear is replaced, drill off rivet heads ⇒ Fig. 7
- ◆ Attach final drive gear with bolts ⇒ Fig. 10

12 - Taper roller bearing inner race

- ◆ Pulling off ⇒ Fig. 3
- ◆ Pressing on ⇒ Fig. 4

13 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 1
- ◆ Pressing in ⇒ Fig. 2

14 - Washer**15 - Seal**

- ◆ For right flange shaft
- ◆ Different diameter on left and right
- ◆ Replacing with gearbox installed ⇒ 39-1

16 - Spherical bolt, 25 Nm

- ◆ Bolt to threaded piece -item 26-

17 - Right flange shaft**18 - Compression spring for flange shaft**

- ◆ Installed behind flange shafts

19 - Thrust washer

- ◆ Fitting location: collar points toward compression spring, shoulders toward conical ring

20 - Conical ring

- ◆ With grooves for meshing with thrust washer
- ◆ Fitting location: cone points toward differential housing

21 - Circlip

- ◆ Holds conical ring, thrust washer and compression spring in position when flange shaft removed

22 - Large differential bevel gear

- ◆ Installing ⇒ Fig. 12

23 - Differential bevel gear shaft

- ◆ Use drift for knocking out
- ◆ Installing ⇒ Fig. 12

24 - Roll pin

- ◆ For locking shaft of differential bevel gears
- ◆ Removing and installing ⇒ Fig. 11

25 - Small differential bevel gear

- ◆ Installing ⇒ Fig. 12

26 - Threaded piece

- ◆ Installing ⇒ Fig. 12

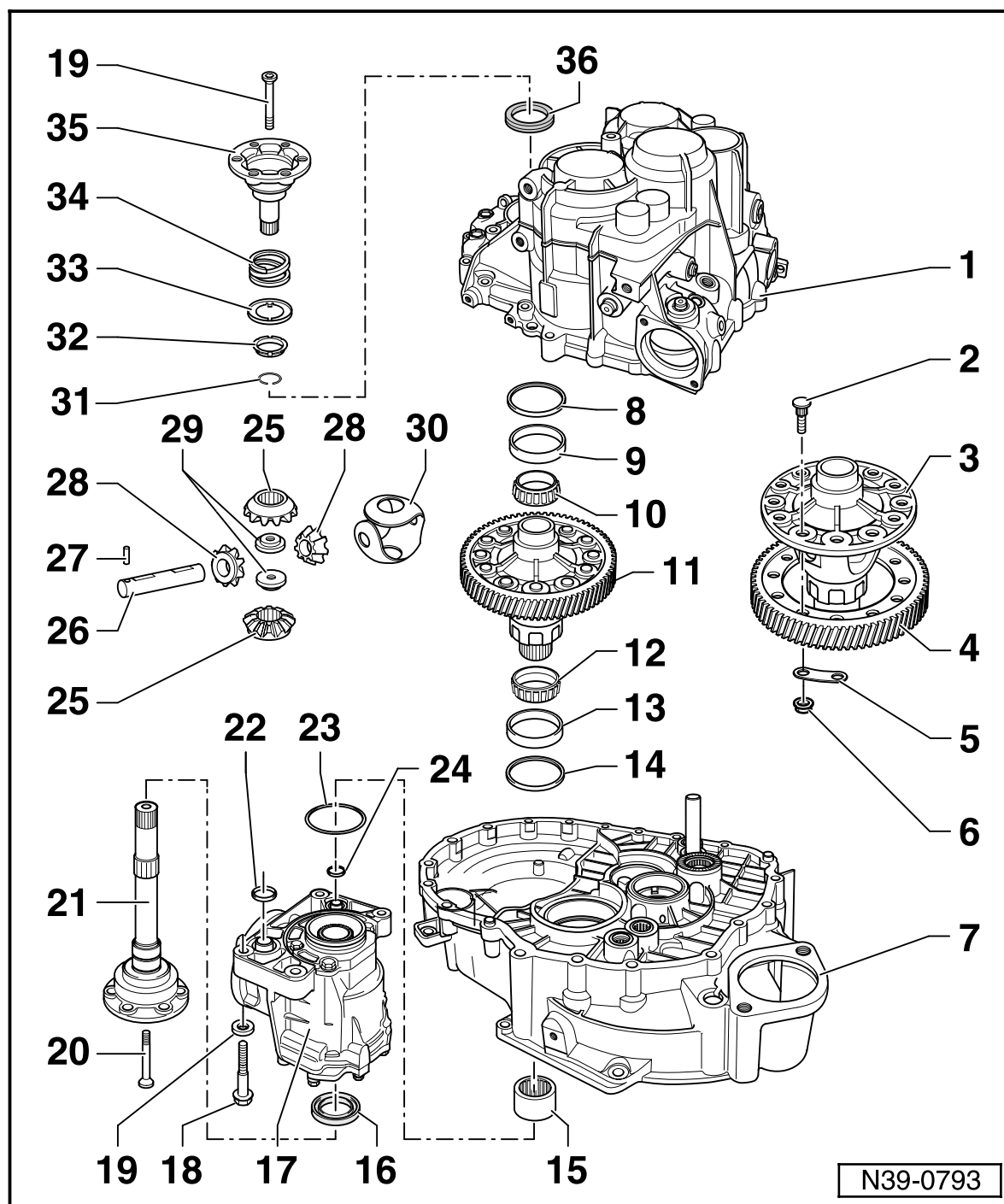
27 - Thrust washer assembly

- ◆ Insert with gear oil

28 - Left flange shaft**29 - Seal**

- ◆ For left flange shaft
- ◆ Different diameter on left and right
- ◆ Replacing with gearbox installed ⇒ page 39-1

Disassembling and assembling differential on vehicles with 4 Wheel Drive



N39-0793

Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-458/1
- ◆ Insertion device MP 9-400
- ◆ Pipe MP 6-419
- ◆ Tube T30019
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip V.A.G 1582/6
- ◆ Separating device 12...75 mm, e.g. Kukko 17/1
- ◆ Puller device, e.g. Kukko 18/0

- ◆ Internal extractor 46...58 mm,
e.g. Kukko 21/7
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331
- ◆ Countersupport, e.g. Kukko 22/2

Notes:

- ◆ *Heat taper roller bearing inner race to 100 °C before installing.*
- ◆ *Always replace both taper roller bearings.*
- ◆ *If the taper roller bearings, the differential housing, the gearbox housing or the clutch housing are replaced, set differential ⇒ page 39-17.*

1 - Gearbox housing**2 - Bolt****3 - Differential housing**

- ◆ Bolt to final drive gear

4 - Final drive gear

- ◆ Riveted in series production
- ◆ Pressing off ⇒ Fig. 8
- ◆ Fitting location: the ground side points toward the bolted surface of the differential housing
- ◆ Heat to 100 °C before installing
- ◆ Place onto differential housing
⇒ Fig. 9
- ◆ Bolted ⇒ Fig. 10

5 - Washer**6 - 40 Nm and torque a further 45°**

- ◆ Always replace

7 - Clutch housing**8 - Shim**

- ◆ For differential
- ◆ Determining thickness ⇒ page 39-17

9 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 5
- ◆ Pressing in ⇒ Fig. 6

10 - Taper roller bearing inner race

- ◆ Pulling off ⇒ Fig. 3
- ◆ Pressing on ⇒ Fig. 4

11 - Differential housing

- ◆ With riveted final drive gear
- ◆ If final drive gear is replaced, drill off rivet heads ⇒ Fig. 7
- ◆ Attach final drive gear with bolts
⇒ Fig. 10

12 - Taper roller bearing inner race

- ◆ Pulling off ⇒ Fig. 3
- ◆ Pressing on ⇒ Fig. 4

13 - Taper roller bearing outer race

- ◆ Pulling out ⇒ Fig. 1
- ◆ Pressing in ⇒ Fig. 2

14 - Washer**15 - Connecting sleeve to bevel gear**

- ◆ Pressed onto differential housing
- ◆ Pull off and press on only when differential housing removed
- ◆ Pulling off ⇒ Fig. 13
- ◆ Pressing on ⇒ Fig. 14

16 - Seal

- ◆ For right flange shaft
- ◆ Different diameter on left and right
- ◆ Replacing with gearbox installed
⇒ page 39-1

17 - Bevel gear

- ◆ Removing and installing with gearbox installed ⇒ page 34-28
- ◆ Removing and installing with gearbox removed ⇒ page 34-43

18 - 40 Nm and torque a further 45°

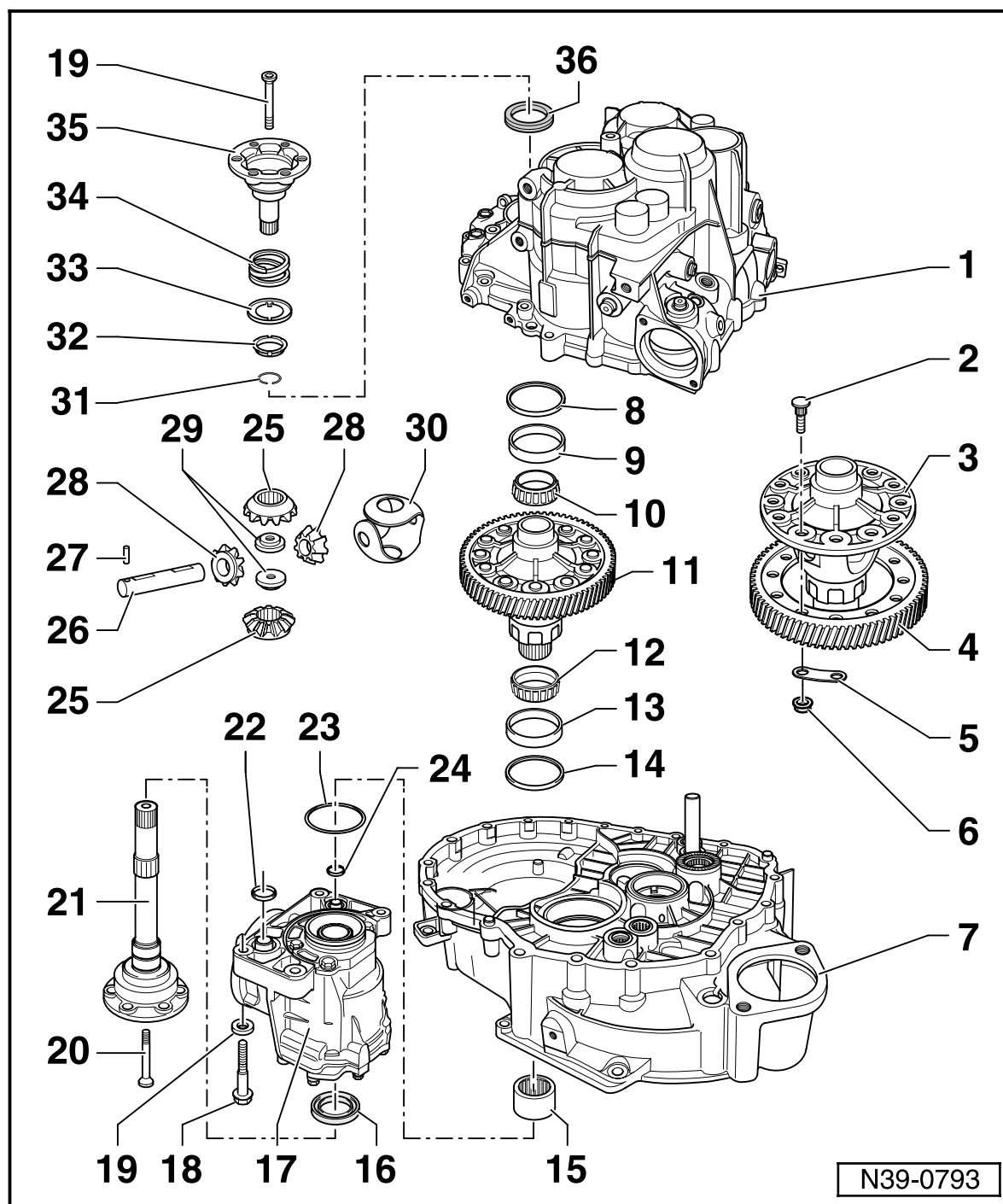
- ◆ Always replace

19 - Washer**20 - Spherical bolt, 25 Nm**

- ◆ Bolt to threaded piece -item 29-

21 - Right flange shaft**22 - O-ring**

- ◆ Always replace

**23 - O-ring**

- ◆ Always replace

24 - O-ring

- ◆ Always replace

25 - Large differential bevel gear

- ◆ Installing ⇒ Fig. 12

26 - Differential bevel gear shaft

- ◆ Use drift for knocking out
- ◆ Installing ⇒ Fig. 12

27 - Roll pin

- ◆ For locking shaft of differential bevel gears
- ◆ Removing and installing ⇒ Fig. 11

28 - Small differential bevel gear

- ◆ Installing ⇒ Fig. 12

29 - Threaded piece

- ◆ Installing ⇒ Fig. 12

30 - Thrust washer assembly

- ◆ Insert with gear oil

31 - Circlip

- ◆ Holds conical ring, thrust washer and compression spring in position when flange shaft removed

32 - Conical ring

- ◆ With grooves for meshing with thrust washer
- ◆ Fitting location: cone points toward differential housing

33 - Thrust washer

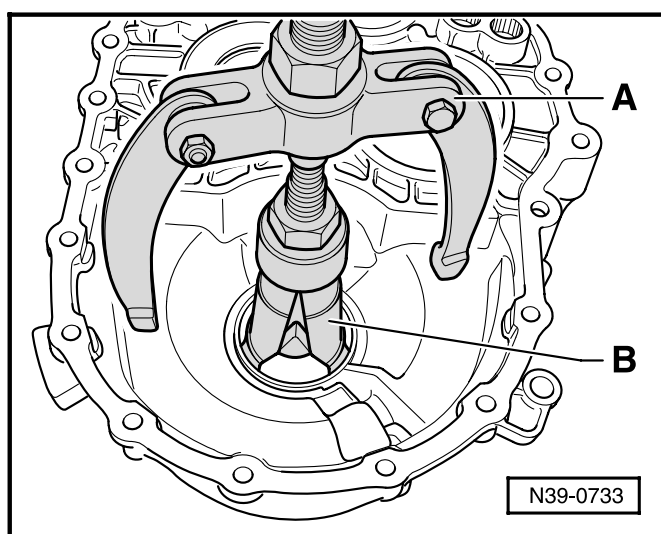
- ◆ Fitting location: collar points toward compression spring, shoulders toward conical ring

34 - Compression spring for flange shaft

- ◆ Installed behind flange shafts

35 - Left flange shaft**36 - Seal**

- ◆ For left flange shaft
- ◆ Different diameter on left and right
- ◆ Replacing with gearbox installed
⇒ page 39-1



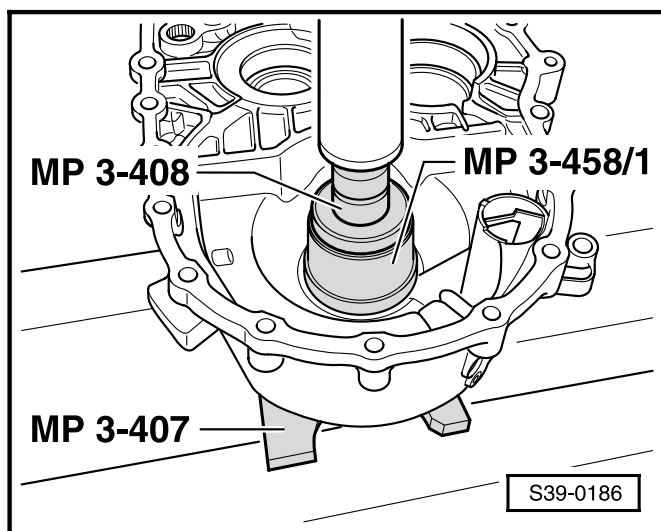
◀ **Fig. 1 Pulling taper roller bearing outer race out of clutch housing**

A - Countersupport, e.g. Kukko 22/2

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

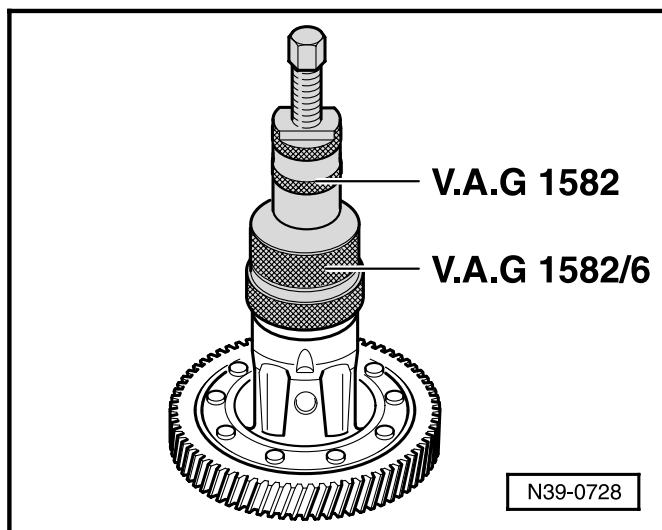
Note:

After removing outer race, inspect washer for damage, replace if necessary.



◀ **Fig. 2 Pressing taper roller bearing outer race into clutch housing**

- Insert washer first of all.

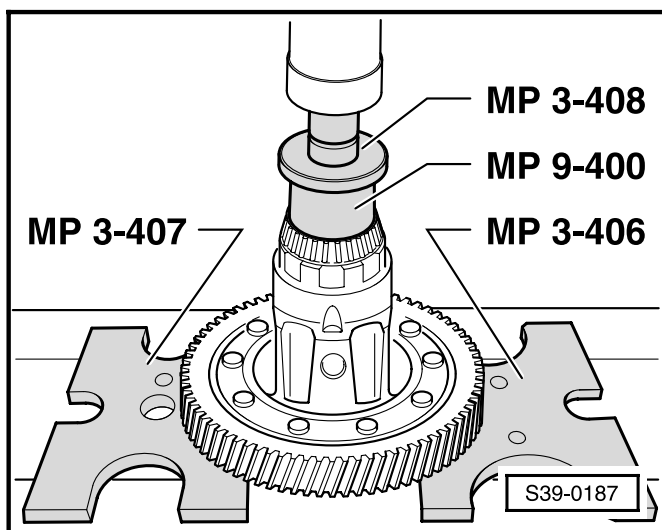


◀ Fig. 3 Pulling off taper roller bearing inner races

- Before fitting on pulling device, place thrust disc MP 3-467 onto differential housing.

Note:

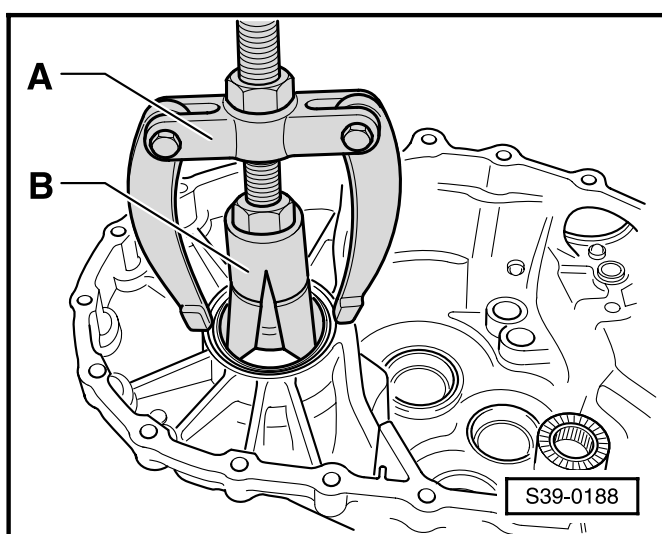
The procedure for pulling off both taper roller bearing inner races of the differential housing is identical.



◀ Fig. 4 Pressing on taper roller bearing inner races

Note:

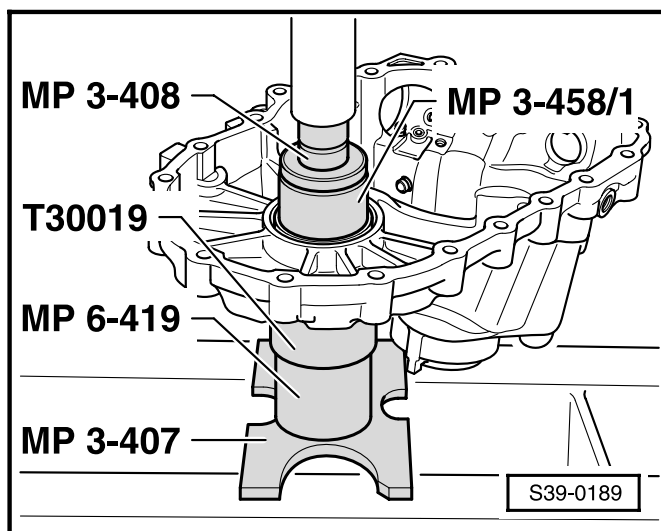
The taper roller bearing inner race for the gear-box housing and for the clutch housing are pressed on with the same pressing tools.



◀ Fig. 5 Pulling taper roller bearing outer race out of gearbox housing

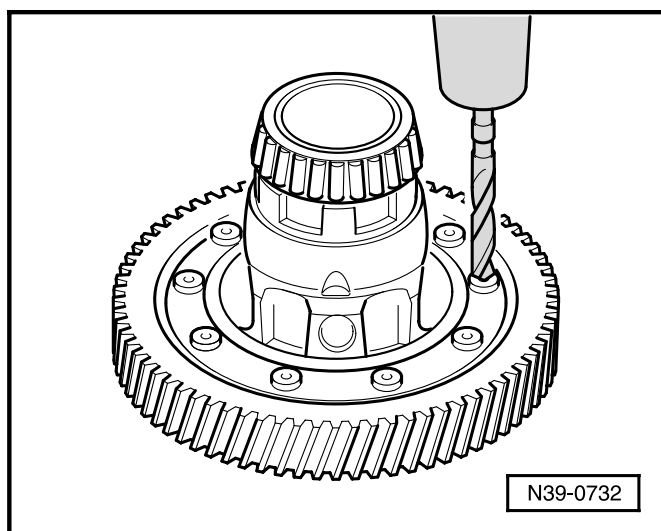
A - Countersupport, e.g. Kukko 22/2

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



◀ Fig. 6 Pressing taper roller bearing outer race into gearbox housing

- Use tube T30019 to support gearbox housing directly below bearing mount.

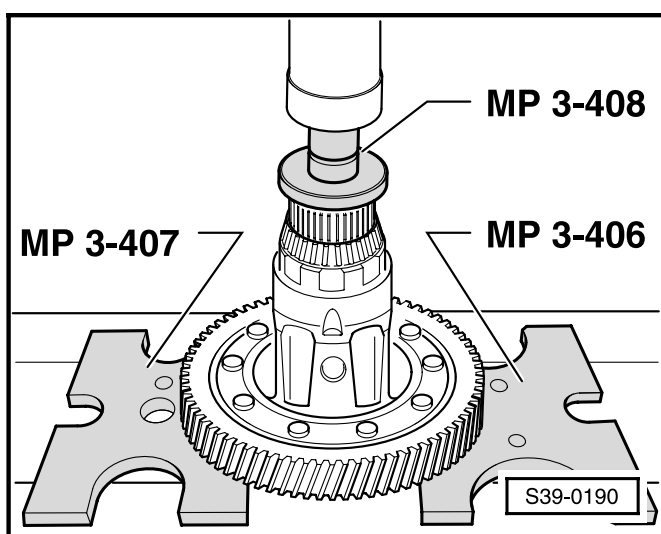


◀ Fig. 7 Drilling off rivet heads

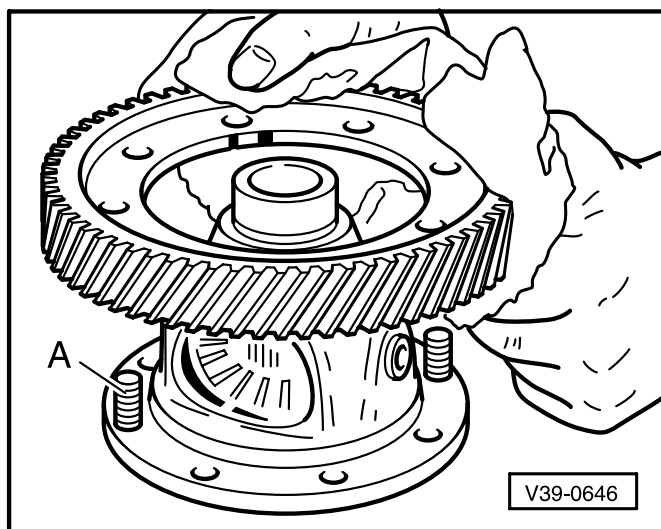
- Drill off rivet heads on the countersunk side with a 12 mm drill and knock out rivets with a drift.

Note:

Clean differential before and after drilling. Protect taper roller bearings from drilling swarf.

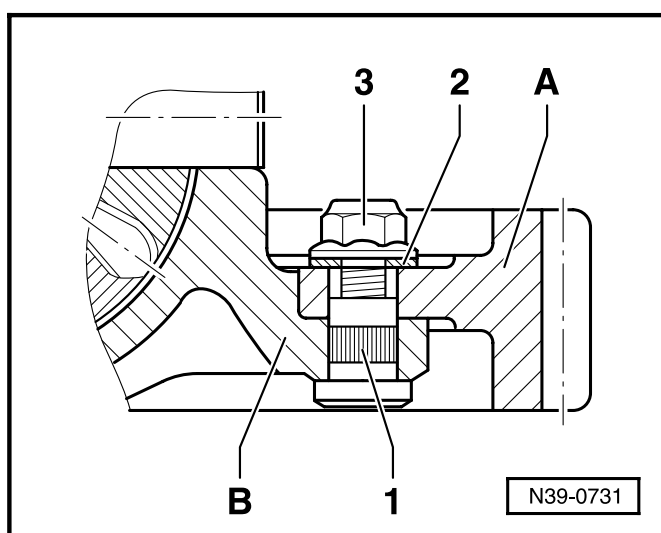


◀ Fig. 8 Pressing off final drive gear



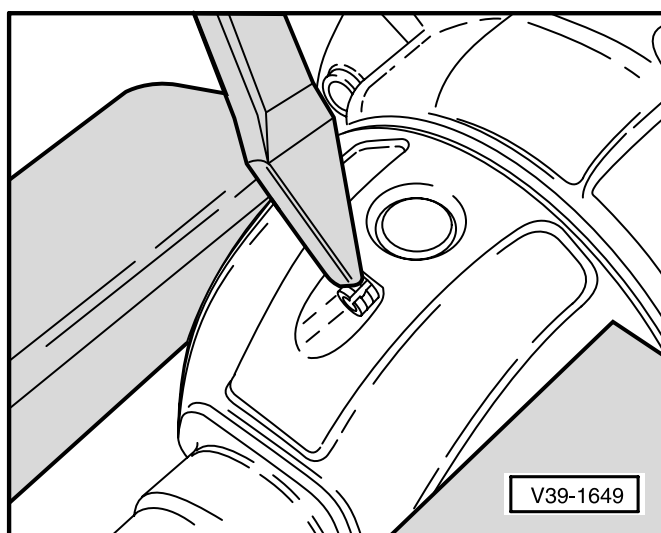
◀ Fig. 9 Heating final drive gear to approx. 100 °C and fitting on

- When fitting on final drive gear, guide with bolts -A- from the repair kit.



◀ Fig. 10 Bolting final drive gear -A- and differential housing -B-

Use special bolts -1-, washers -2- and nuts -3- as specified in the Parts List.



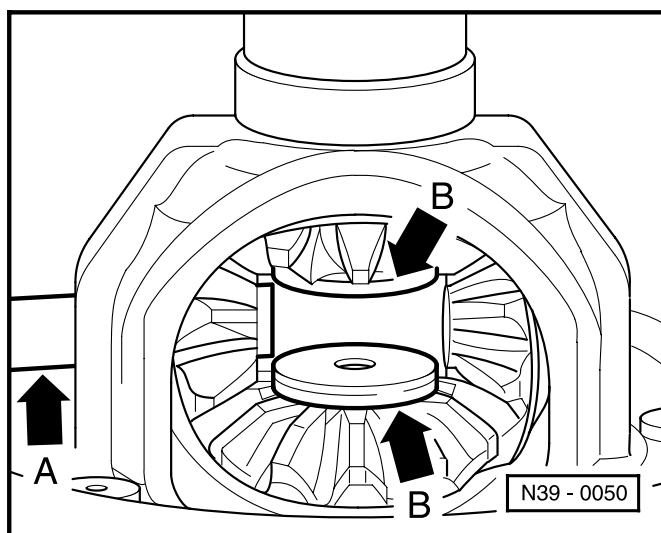
◀ Fig. 11 Removing and installing roll pin for differential bevel gear shaft

Removing

- Cover over taper roller bearing inner race to avoid any damage and swarf getting in.
- Use a chisel to knock out roll pin; position chisel in the groove which runs all round.

Installing

- Knock into the differential housing as far as the stop.

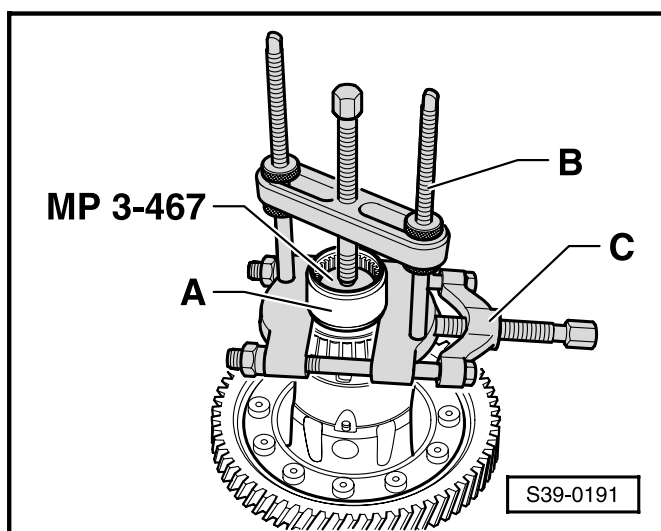


◀ Fig. 12 Installing differential bevel gears

- Insert thrust washer assembly with gear oil.
- Insert both large differential bevel gears and secure (e.g. with flange shaft).
- Insert small differential bevel gears offset 180° and swivel into place.
- Press in differential bevel gear shaft -arrow A- as far as the first small differential bevel gear.
- Fit threaded pieces -arrows B- into large differential bevel gears.

Fitting location: shoulder points toward differential bevel gear

- Knock shaft for differential bevel gears fully into end position and secure with roll pin.

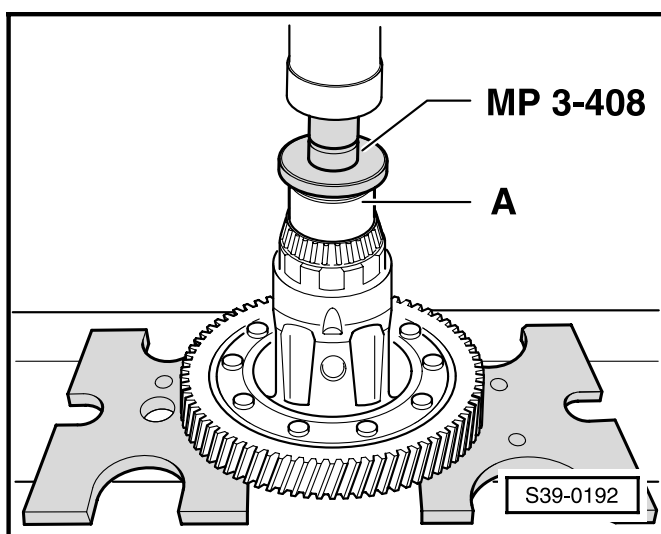


◀ Fig. 13 Pulling off connecting sleeve

A - Connecting sleeve

B - Pulling device, e.g. Kukko 18/0

C - Separating device 12...75 mm,
e.g. Kukko 17/1



◀ Fig. 14 Pressing on connecting sleeve -A- for bevel gear

List of settings

Note:

When carrying out removal and installation operations on the gearbox, it is only necessary to re-set the input shaft, 1st to 4th gear output shaft, 5th/6th and reverse gear output shaft or the differential if parts which directly affect the setting of the gearbox, are replaced. Pay attention to the table below in order to avoid carrying out unnecessary setting operations:

	The following must be set:			
	Input shaft	1st to 4th gear output shaft	5th/6th gear and reverse gear output shaft	Differential
Part replaced:	⇒ page 35-8	⇒ page 35-24	⇒ page 35-38	⇒ page 39-17
Gearbox housing	x	x	x	x
Clutch housing	x	x	x	x
Input shaft	x			
1st to 4th gear output shaft		x		
5th/6th and reverse gear output shaft			x	
Differential housing				x
Taper roller bearings for input shaft	x			
Taper roller bearings for 1st to 4th gear output shaft		x		
Taper roller bearings for 5th/6th and reverse gear output shaft			x	
Taper roller bearings for differential				x

Setting differential

Special tools, testers and aids required

- ◆ End gauge plate MP 3-405/17
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Universal dial gauge holder MP 3-447
- ◆ Thrust piece MP 3-458/1
- ◆ Pipe MP 6-419
- ◆ Tube T30019
- ◆ Torque wrench (5...50 Nm), e.g. V.A.G 1331
- ◆ Internal extractor 46...58 mm, e.g. Kukko 21/7
- ◆ Countersupport, e.g. Kukko 22/2
- ◆ Dial gauge

It is necessary to re-set the differential if

- ◆ gearbox housing
- ◆ clutch housing
- ◆ differential housing

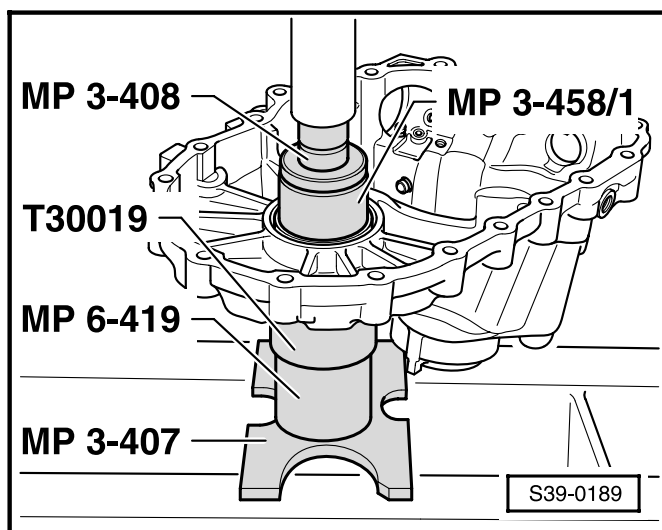
or the

- ◆ taper roller bearings of the differential

are replaced.

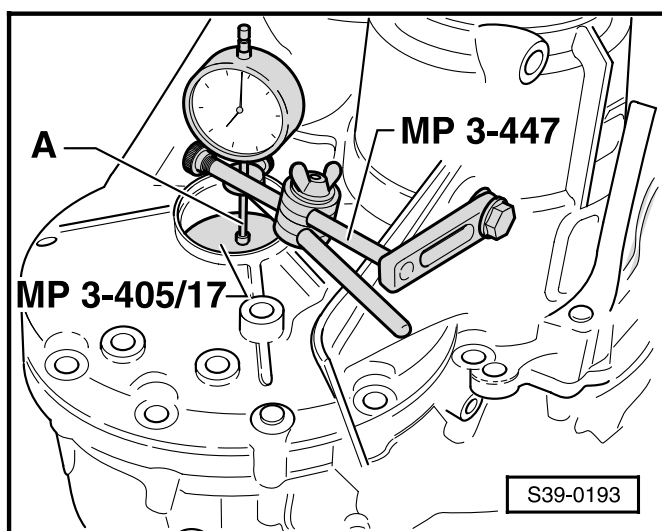
List of settings ⇒ page 39-16.

- Press taper roller bearing outer race together with washer into clutch housing
⇒ page 39-11.

**Note:**

Inner race and outer race of the taper roller bearings are matched. Do not mix up.

- ◀ - Press taper roller bearing outer race without shim into gearbox housing.
- Insert differential into clutch housing.
- Mount gearbox housing and tighten the 5 bolts to the specified torque.



- Push differential in the direction of clutch housing and at the same time rotate eight times.
- Push differential in the direction of gearbox housing and at the same time rotate eight times.

- ◀ - Install dial gauge and zero with a preload of 1 mm.

A - Dial gauge extension 30 mm

- Move differential up and down, read off play on dial gauge and note.

(Example: 0.70 mm)

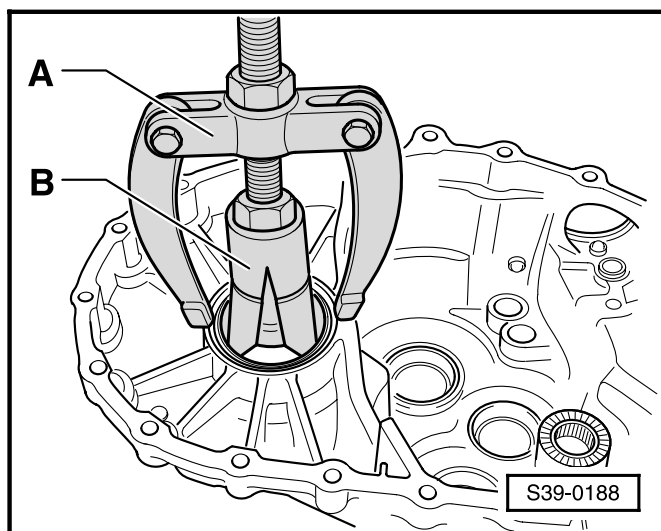
Determining shim

The specified bearing preload is achieved if a constant value for compression (0.30 mm) is added to the measurement obtained.

Example:

Measurement	0.70 mm
+ Compression (const. value)	0.30 mm
Thickness of shim =	1.00 mm

- Take off gearbox housing.



- ◀ - Pull taper roller bearing outer race out of gearbox housing.

A - Countersupport, e.g. Kukko 22/2

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

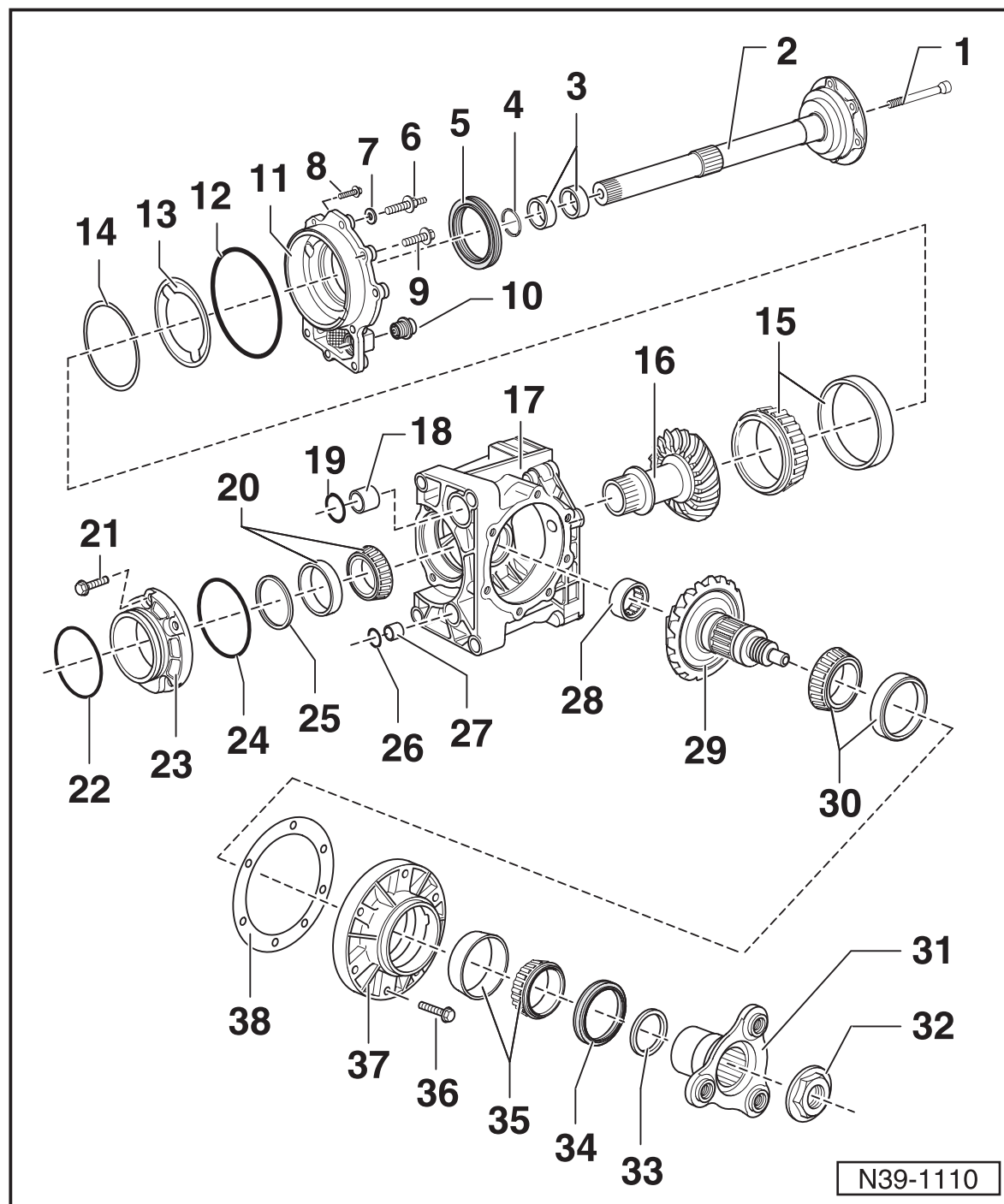
- Insert the calculated thickness of shim, the thickest shim first of all.

The following sizes of shim are available:

Thickness (mm)	Part No.
0.65	02B 409 210
0.70	02B 409 210 A
0.75	02B 409 210 B
0.80	02B 409 210 C
0.85	02B 409 210 D
0.90	02B 409 210 E
0.95	02B 409 210 F
1.00	02B 409 210 G
1.05	02B 409 210 H
1.10	02B 409 210 J
1.15	02B 409 210 K
1.20	02B 409 210 L
1.25	02B 409 210 M
1.30	02B 409 210 N
1.35	02B 409 210 P
1.40	02B 409 210 Q
0.70+0.75=1.45	02B 409 210 A/B
0.75+0.75=1.50	02B 409 210 B/B
0.75+0.80=1.55	02B 409 210 B/C
0.80+0.80=1.60	02B 409 210 C/C
0.80+0.85=1.65	02B 409 210 C/D

- Press in outer race again and tighten gearbox housing to the specified torque.

Disassembling and assembling bevel gear



1) Adjustments need to be made when replacing these parts ⇒ page 39-34

1 - 25 Nm

- ◆ Right flange shaft on threaded piece/differential

2 - Right flange shaft

- ◆ Removing ⇒ page 39-24
- ◆ Pressing in ⇒ page 39-28
- ◆ Removing and installing with gearbox installed ⇒ page 39-3

3 - Needle bearing (polygon bearing)

- ◆ 2 in total
- ◆ Replacing ⇒ page 39-51

4 - Circlip

- ◆ Always replace

5 - Seal

- ◆ Use track control arm for levering out
- ◆ Knock in thrust piece T10049 as far as the stop ⇒ page 39-32
- ◆ Replace with gearbox installed ⇒ page 39-3

6 - Double screw, 45 Nm

- ◆ M10/M8

7 - Washer

- ◆ For double screw -item 6-

- 8 - Bolt, 25 Nm**
 ♦ M8
- 9 - Bolt, 45 Nm**
 ♦ M10
- 10 - Oil drain plug, 60 Nm**
 ♦ With magnet and seal
- 11 - Large cover¹⁾**
 ♦ Removing ⇒ page 39-27
 ♦ Do not twist when installing; tighten securing bolts in stages diagonally across
- 12 - O-ring**
 ♦ Always replace, if existing
- 13 - Oil deflector plate**
 ♦ Pay attention to fitting location ⇒ 39-29
 ♦ Installed onto gearboxes between shim S₁ -item 14- and large taper roller bearing for bearing/head bevel gear -item 15-.
- 14 - Shim S₁**
 ♦ Note thickness
 ♦ Installed onto gearboxes between oil deflector plate -item 13- and large cover -item 11-
 ♦ Overview of setting ⇒ page 39-35
- 15 - Large taper roller bearing for bearing/head bevel gear¹⁾**
 Inner race:
 ♦ Pulling off ⇒ page 39-27
 ♦ Pressing on ⇒ page 39-29
 Outer race
 ♦ Pulling out ⇒ page 39-27
 ♦ Pressing in ⇒ page 39-30
- 16 - Head bevel gear with input shaft¹⁾**
 ♦ Is matched with shaft bevel gear (item. 29)
 ♦ Cannot be pulled off from input shaft
 ♦ Insert ⇒ page 39-45
- 17 - Final drive housing¹⁾**
 ♦ Drain oil, then clamp bevel box in assembly stand with gearbox holder T30097 ⇒ page 39-23
- 18 - Sleeve for oil supply**
 ♦ Pulling out ⇒ page 39-28
 ♦ Pressing in ⇒ page 39-28
- 19 - O-ring**
 ♦ Always replace
- 20 - Small taper roller bearing for bearing/head bevel gear¹⁾**
 Inner race:
 ♦ Position loosely on input shaft
 ♦ Removing ⇒ page 39-27
 ♦ Installing ⇒ page 39-31
 Outer race
 ♦ Position loosely in final drive housing
 ♦ Removing ⇒ page 39-27
 ♦ Installing ⇒ page 39-30
- 21 - Bolt, 25 Nm**
- 22 - O-ring**
 ♦ Always replace
 ♦ Must be located in all-round groove
- 23 - Small cover¹⁾**
 ♦ Removing ⇒ page 39-28
 ♦ Do not twist when installing, tighten securing bolts in stages diagonally across
- 24 - O-ring**
 ♦ Always replace
- 25 - Shim S₂**
 ♦ Note thickness
 ♦ Overview of setting ⇒ page 39-35
- 26 - O-ring**
 ♦ Always replace
- 27 - Sleeve for oil supply**
 ♦ Pulling out ⇒ page 39-28
 ♦ Pressing in ⇒ page 39-29
- 28 - Roller sleeve**
 ♦ Pulling out ⇒ 39-28
 ♦ Pressing in ⇒ 39-28
- 29 - Shaft bevel gear¹⁾**
 ♦ Is matched with head bevel gear
 ♦ Clean thread
 ♦ Grease serration for output flange with multi-purpose grease
 ♦ Insert ⇒ page 39-38
- 30 - Large taper roller bearing for shaft bevel gear¹⁾**
 Inner race:
 ♦ Place onto shaft bevel gear (item. 29)
 Outer race:
 ♦ Pressing out ⇒ page 39-26
 ♦ Pressing in ⇒ page 39-31
- 31 - Output flange**
 ♦ Pulling out ⇒ page 39-25
 ♦ Pulling in ⇒ page 39-32
 ♦ Grease serration with multi-purpose grease

32 - Hexagon nut, 475 Nm

- ◆ Unbolt ⇒ page 39-24
- ◆ Bolt ⇒ page 39-32
- ◆ Always replace
- ◆ Insert with locking fluid D 000 600 A2

33 - Shim S₄

- ◆ Note thickness
- ◆ Overview of setting ⇒ page 39-35
- ◆ Fit onto shaft bevel gear (item 29) before inserting inner race for the small taper roller bearing (item 35)

34 - Seal

- ◆ Replace only with bevel gear installed ⇒ page 39-5

35 - Small taper roller bearing for shaft bevel gear¹⁾

Outer race:

- ◆ Pressing out ⇒ page 39-26
- ◆ Pressing in ⇒ page 39-31

Inner race:

- ◆ Remove from output flange ⇒ page 39-30
- ◆ Insert into the outer race

36 - Bolt, 25 Nm

- ◆ Insert with sealant AMV 188 200

37 - Drive pinion housing¹⁾

- ◆ Removing ⇒ page 39-25
- ◆ Installing ⇒ page 39-31
- ◆ Do not twist when installing; tighten securing bolts in stages diagonally across

38 - Shim S₃

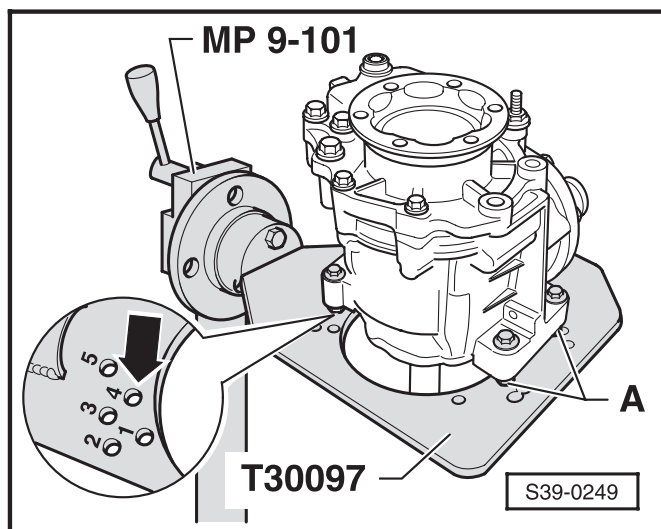
- ◆ Note thickness
- ◆ Overview of setting ⇒ page 39-35
- ◆ Before installing coat both sides with sealant AMV 188 200

Removal and installation sequence

- ◆ Thrust piece T10049

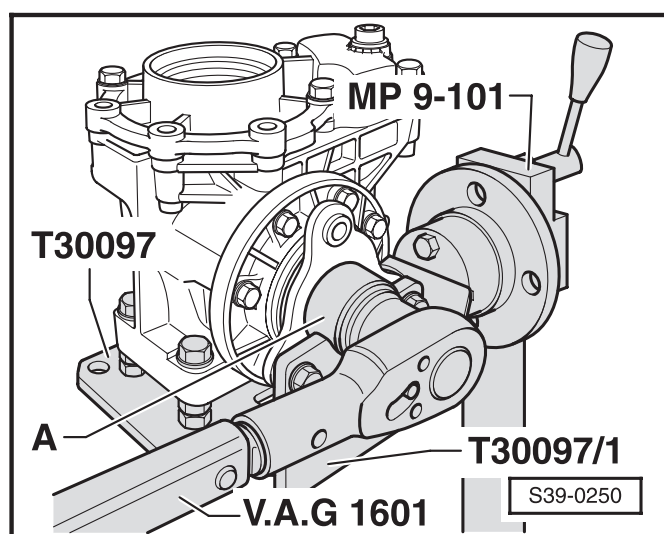
Special tools, testers and aids required

- ◆ Repair stand MP 9-101
- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-448
- ◆ Thrust plunger MP 3-449
- ◆ Thrust plunger MP 3-408
- ◆ Assembly ring T30067/1
- ◆ Thrust piece MP 3-458
- ◆ Tube section MP 3-414
- ◆ Sleeve MP 3-424
- ◆ Thrust disc MP 3-467
- ◆ Tube section MP 3-414
- ◆ Multi-purpose tool MP 3-419
- ◆ Extractor 3138
- ◆ Assembly device MP 6-414
- ◆ Pipe MP 6-419
- ◆ Extractor T10037
- ◆ Three-legged puller, e.g. Kukko 45-2
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Grip, e.g. V.A.G 1582/6
- ◆ Internal extractor 14.5...18.5 mm, e.g. Kukko 21/2
- ◆ Internal extractor 8...12 mm, e.g. Kukko 21/02
- ◆ Internal extractor 22...28 mm, e.g. Kukko 21/4
- ◆ Internal extractor 56...110 mm, e.g. Kukko 21/89
- ◆ Separating device 22...115 mm, e.g. Kukko 17/2
- ◆ Countersupport, e.g. Kukko 22/1
- ◆ Countersupport, e.g. Kukko 22/4
- ◆ Two-arm extractor with hook Matra V/170, e.g. Kukko 20/10
- ◆ Thrust plunger MP 3-423
- ◆ Thrust piece MP 3-468
- ◆ Gearbox holder T30097
- ◆ Stop plate T30097/1

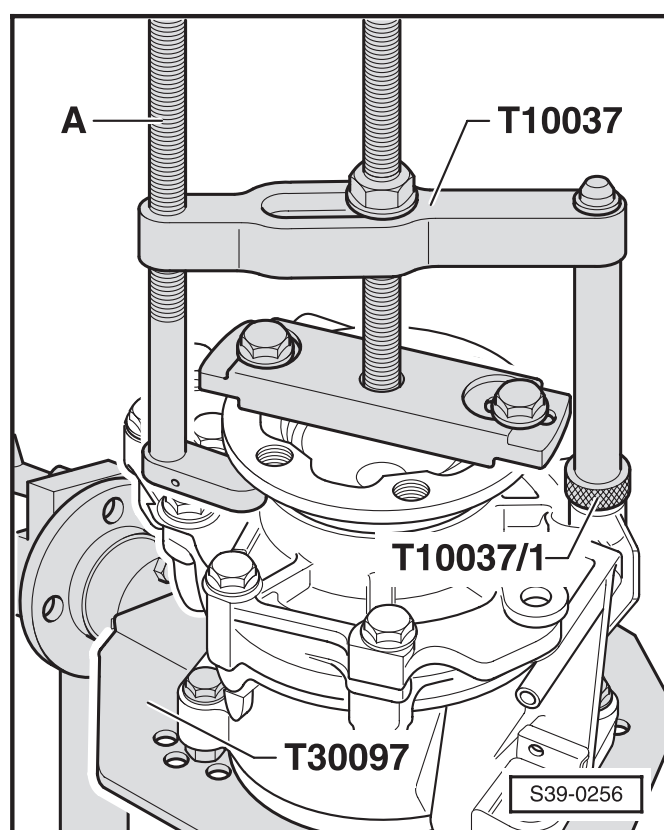


Assembling bevel gear

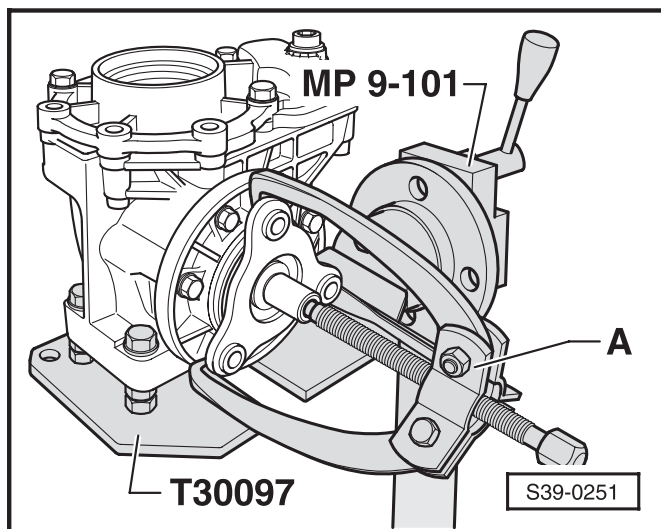
- Drain gear oil
- ◀ - Fit bevel gear onto hole -arrow- number -4- in the gearbox holder
- Align and attach bevel gear to the remaining 3 holes
- A - Nut M12 x 10 (4 in total)



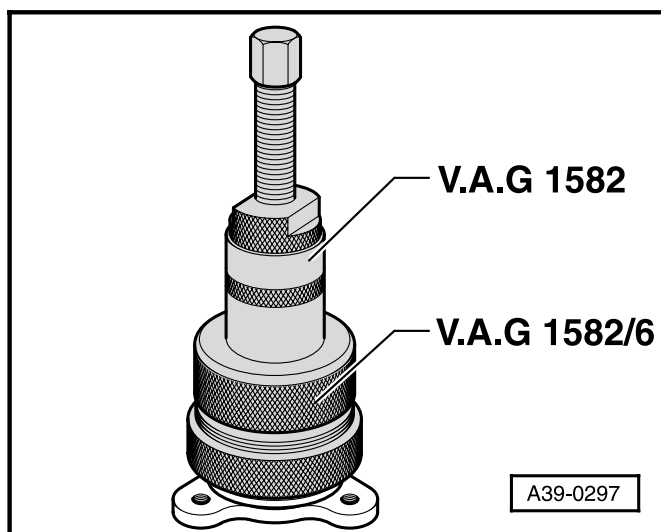
- ◀ - Lock the output flange for the bevel gear with the stop plate T30097/1
- Unbolt hexagon nut for output flange
- A - Wrench socket for input 3/4 inch



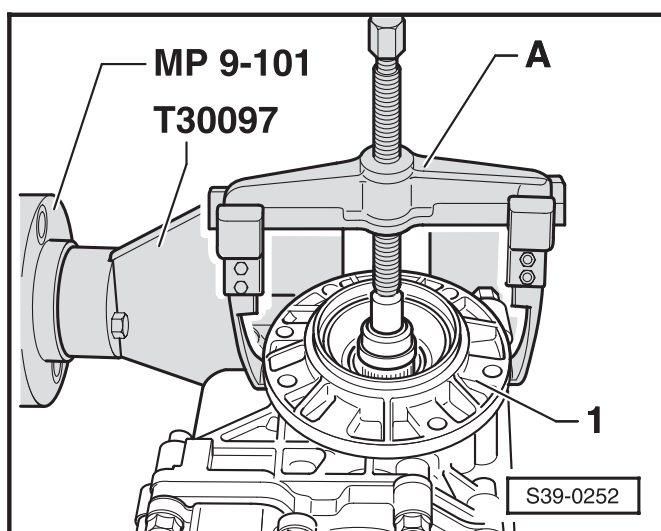
- ◀ - Bolt extractor T10037 to right flange shaft
- With knurled nut T10037/1 align bottom support -A- parallel to the flange.
- Pull out flange shaft
- if the seal has to be replaced, lift it out.



- ◀ - Pull out output flange with seal and inner race bearing.
- A - Two-arm extractor, e.g. Kukko 45-2.
- Fit thrust disc MP3-467 onto the output flange.



- ◀ - Pull off the bearing inner race with the taper roller bearing from the output flange.
- Remove seal from output flange.

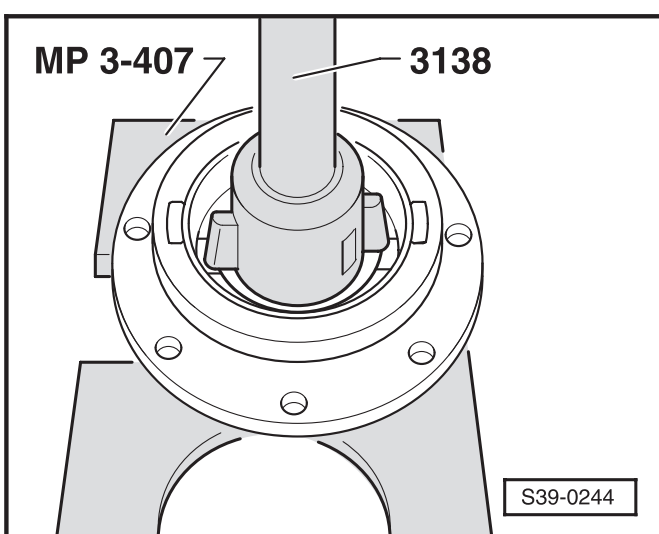


- ◀ - Swivel the bevel gear, so that the drive pinion housing -1- points upward.
- Unscrew hexagon screws for drive pinion housing at final drive housing.
- Pull off drive pinion housing.
- A - Two-arm extractor, e.g. Kukko 20/10 with hook Matra V/170.

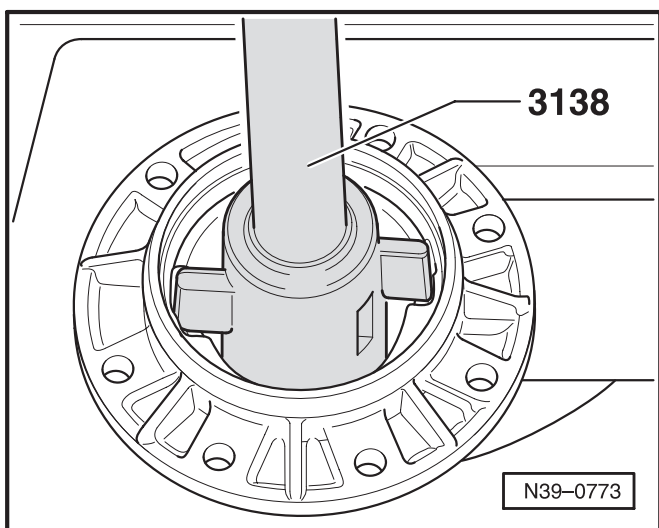
- Remove shim S_3 .
- Remove the shaft bevel gear with shim S_4 and inner race for large taper roller bearing from the final drive housing
- Clean the thread at the shaft bevel gear free from residues of locking fluid.

Notes:

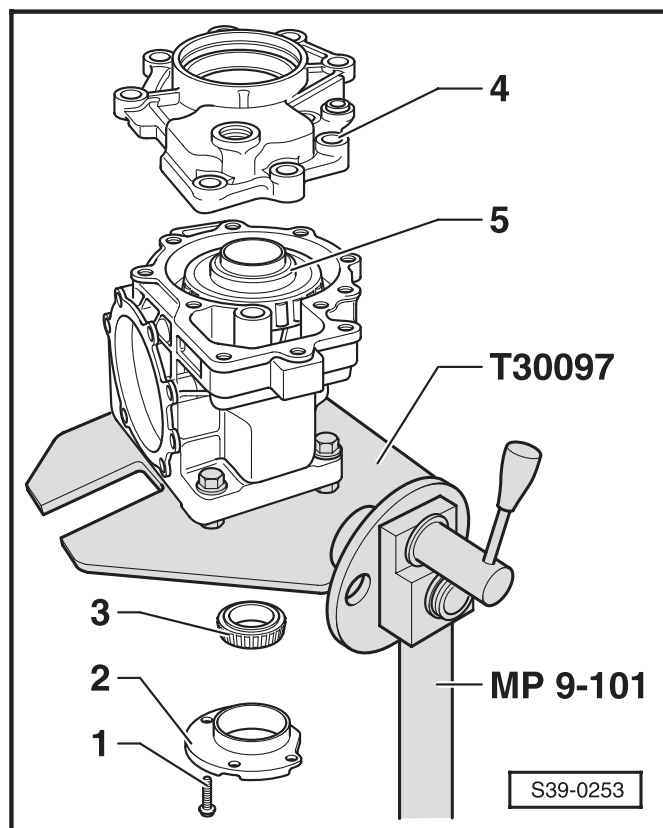
- ◆ *Removing and installing drive pinion housing with installed output flange.*
- ◆ *Clean the sealing surfaces of the drive pinion housing at the final drive housing and shim S_3 free of sealant.*
- ◆ *Clean the threaded holes in the final drive housing as well as the hexagon bolts for attaching the drive pinion housing.*



- ◀ - Press outer race for small taper roller bearing out of drive pinion housing.



- ◀ - Press outer race for large taper roller bearing out of drive pinion housing

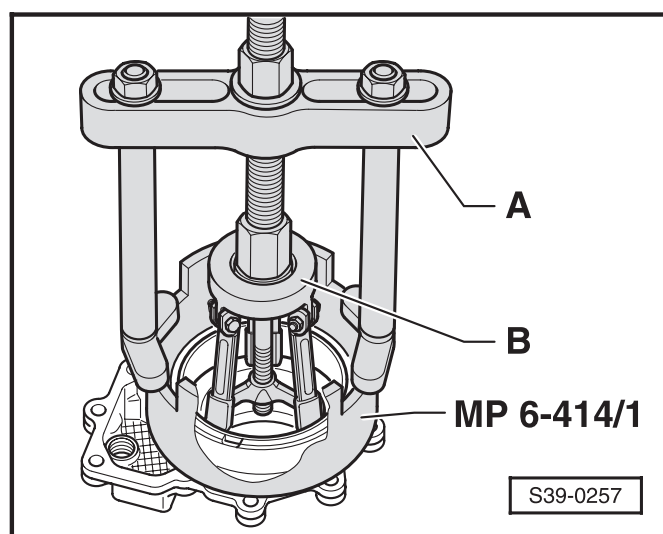


- ◀ - Unscrew the four bolts -1- for the small cover -2-.
- Take off the small cover with outer race/taper roller bearing and shim S_2 .
- Pull off the inner race/taper roller -3- bearing from head bevel gear/input shaft -5-.

Note:

Inner race can be pulled off by hand, if necessary after removing the large cover on the head bevel gear/input shaft carefully lift and pull off inner race.

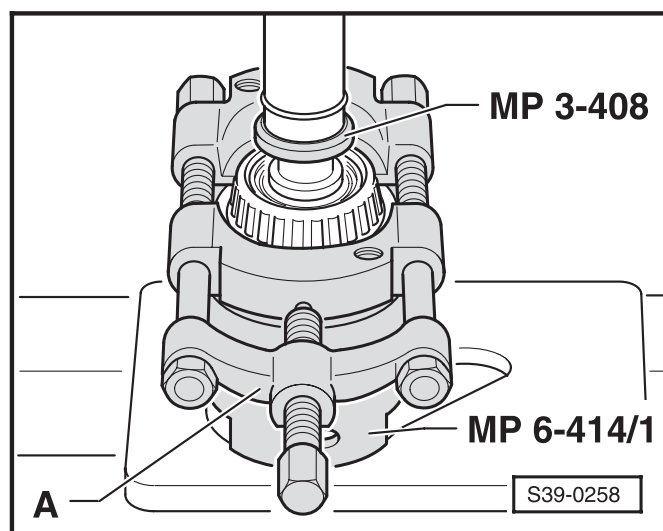
- Remove large cover -4-.
- Remove head bevel gear with input shaft -5-.



- ◀ - Pull out outer race for large taper roller bearing from large cover.

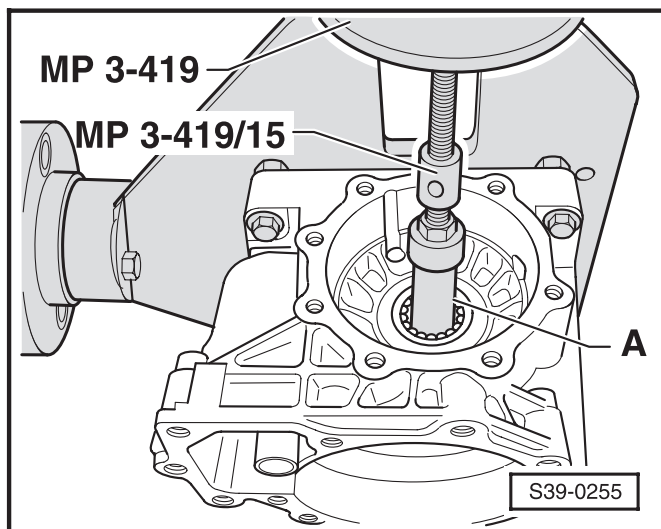
A - Countersupport, e.g. Kukko 22/4

B - Internal extractor 56...110 mm, e.g. Kukko 21/89



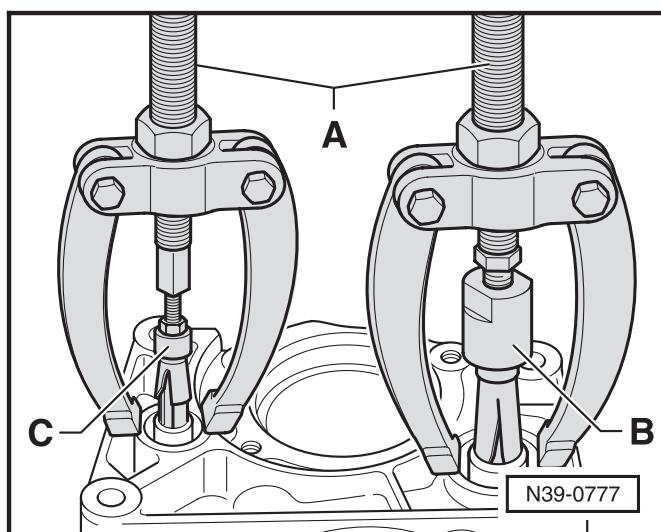
- ◀ - Press off inner race for large taper roller bearing from head bevel gear

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



◀ - Pull roller sleeve out of final drive housing.

A - Internal extractor 22...28 mm,
e.g. Kukko 21/4



◀ - Pull out sleeves for oil supply

A - Countersupport, e.g. Kukko 22/1

B - Internal extractor 14.5...18.5 mm, e.g. Kukko 21/2 (for pulling out large sleeve)

C - Internal extractor 8...12 mm, e.g. Kukko 21/02 (for pulling out small sleeve)

Pulling out the bevel gear is also possible if the bevel gear is not disassembled.

Assembling bevel gear

Note:

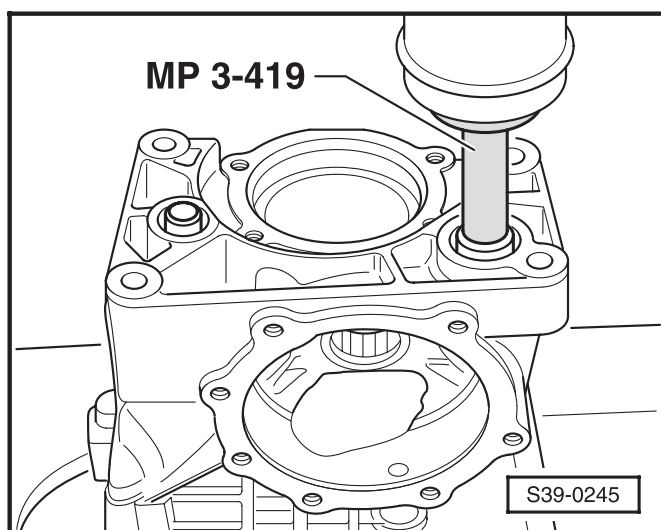
Pay attention to overview of setting
⇒ page 39-35

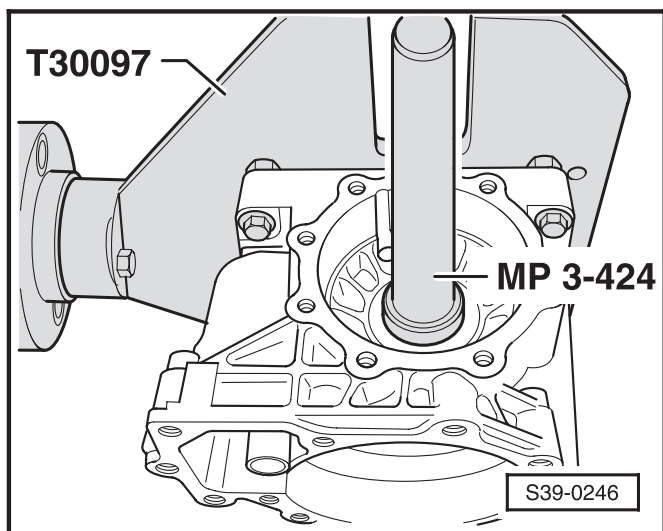
◀ - Press on sleeves for oil supply

Fitting location: marked side of thrust plunger

Carefully press on as far as the stop

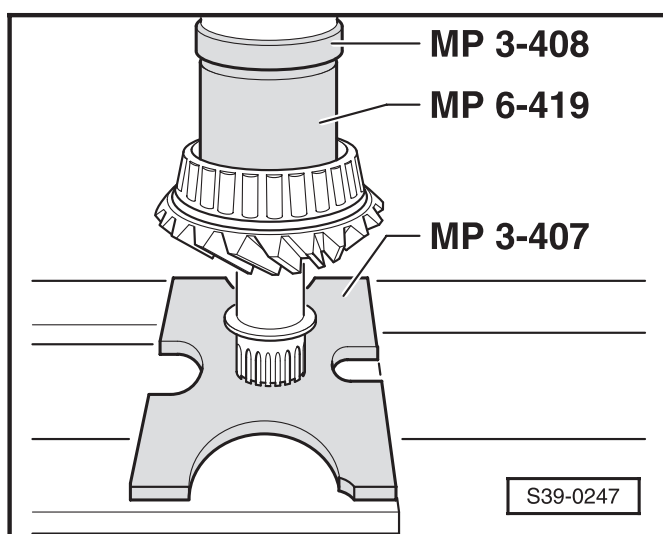
The sleeves can also be knocked in with thrust plunger MP 3-449, if the bevel gear is not disassembled



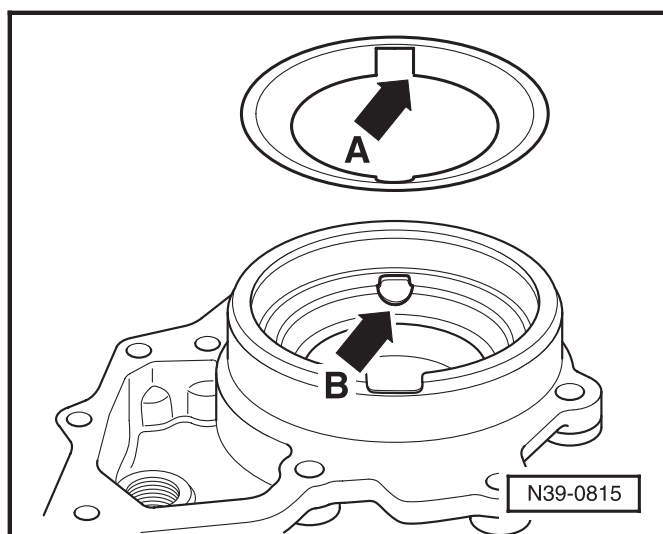


- ◀ - Press roller sleeve carefully into final drive housing with drive bushing MP 3-424 as far as the stop.

The marking points toward pressing tool



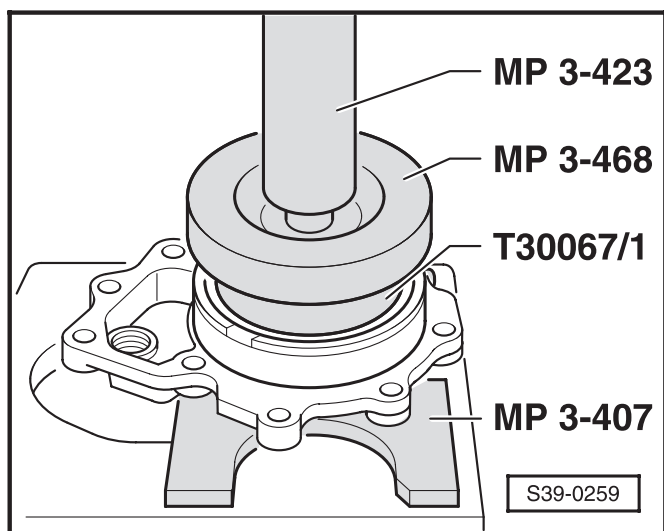
- ◀ - Press inner race for large taper roller bearing on the head bevel gear



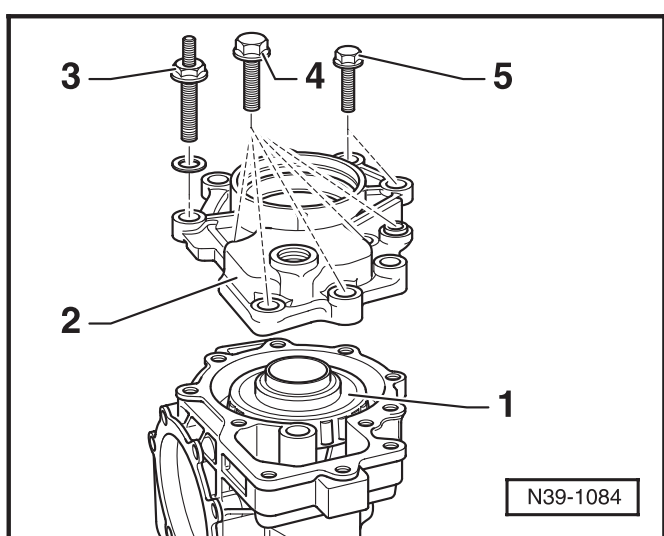
- ◀ - Fit the oil deflector plate with recess -arrow A- onto the lug -arrow B- in the large cover

Note:

On certain gearboxes shim S_1 is located between the oil deflector plate and the large cover and must be re-installed in the same location as previously installed.



- ◀ - Insert shim S_1 into large cover and press on outer race for large taper roller bearing.



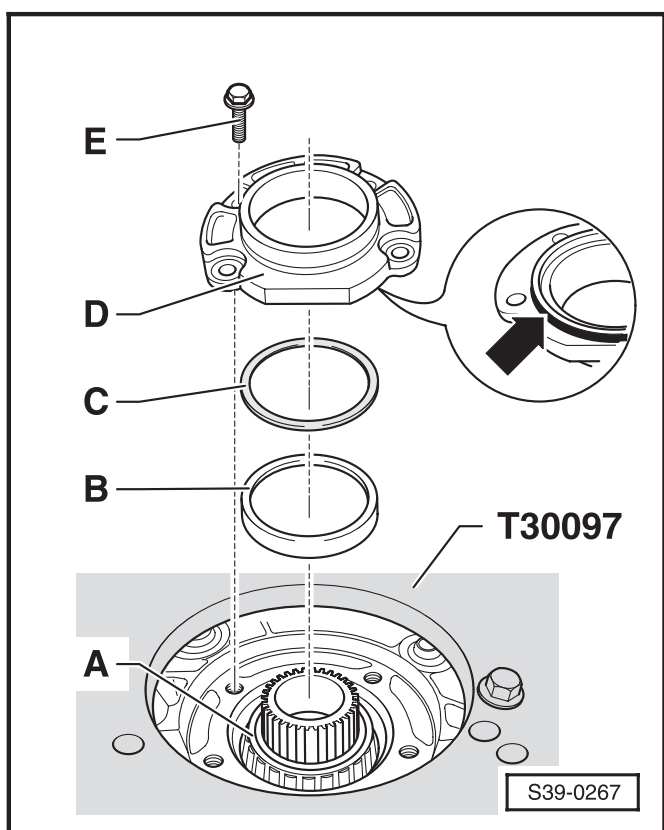
- ◀ - Insert the head bevel gear/input shaft -1- into the final drive housing.

- Moisten new O-ring with oil and position on large cover -2-

Note:

Apply sealant AMV 188 200 on sealing surfaces of gearboxes not installed with O-ring

- Tighten cover with bolts -3-, -4- and -5- evenly and diagonally across with tightening torque ⇒ page 39-20, item 6, page 39-21, item 8 and item 9.



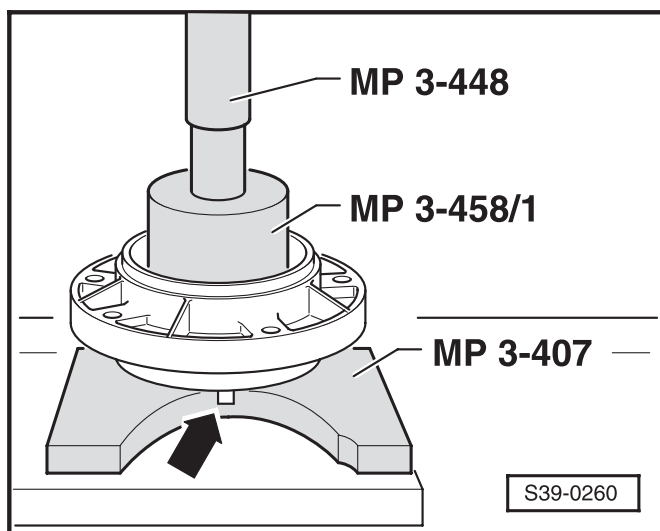
- ◀ - Turn the bevel gear in the assembly stand by 180°.

- Position inner race/taper roller bearing -A- onto head bevel gear/input shaft as far as the stop.

- Fit on outer race/taper roller bearing -B- and shim S_2 -C-.

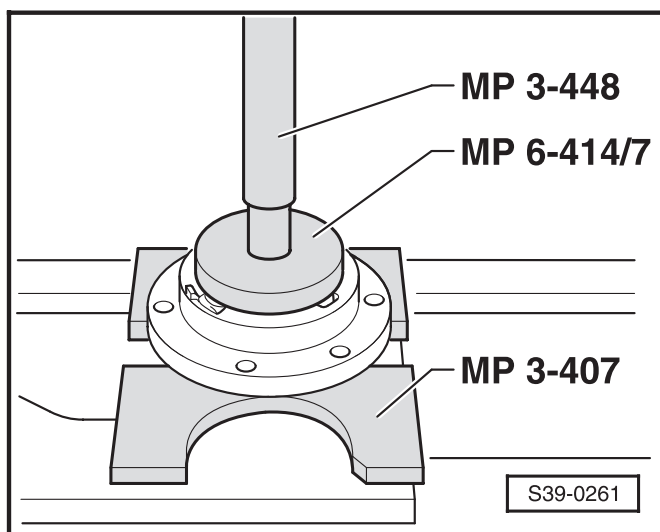
- Fit new O-ring -arrow- on the sealing surface of the small cover -D-.

- Insert the small cover and tighten bolts -E- with tightening torque ⇒ page 39-21, item 21.

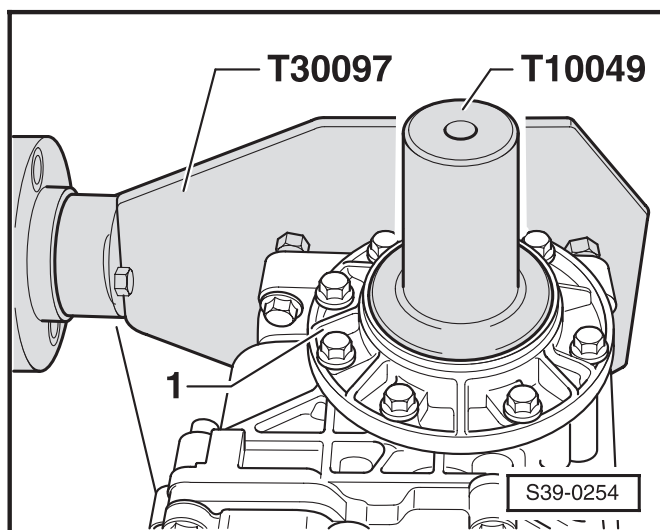


- Press outer race for small taper roller bearing onto the final drive housing.

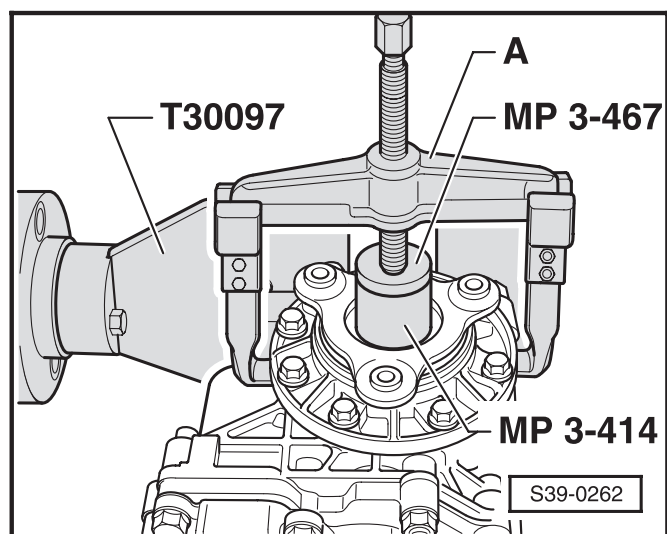
For the pressing procedure, the lug -arrow- must be located at the drive pinion housing in front of the thrust plate MP 3-407.



- Press outer race for large taper roller bearing onto drive pinion housing.
- Insert the shaft bevel gear with shim S_4 and inner race for large taper roller bearing onto final drive housing.
- Coat both sides of shim S_3 with sealant and position on final drive housing.



- Install drive pinion housing -1-, to do so insert bolts with sealant.
- Insert small inner race/taper roller bearing for shaft bevel gear.
- Knock in new seal for output shaft with thrust piece T10049 as far as the stop.
- Pack space between sealing lip and dust lip half with Grease G 052 128 A1.

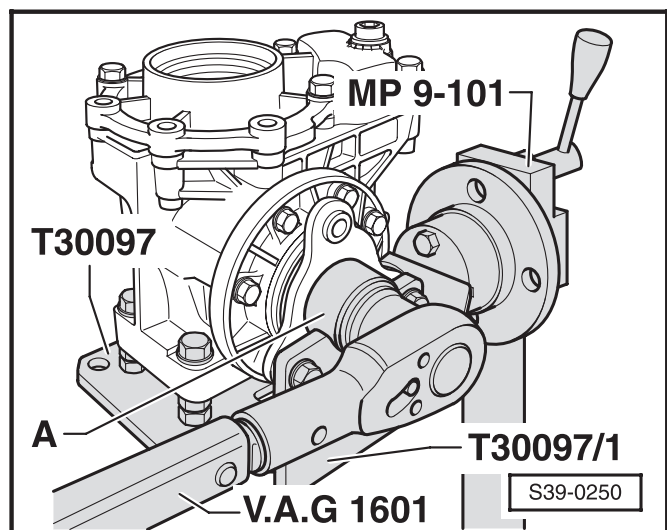


- Grease the serration of the output flange and on the shaft bevel gear evenly with multi-purpose grease.

◀ - Pull in output flange.

A - Two-arm extractor, e.g. Kukko 20/10

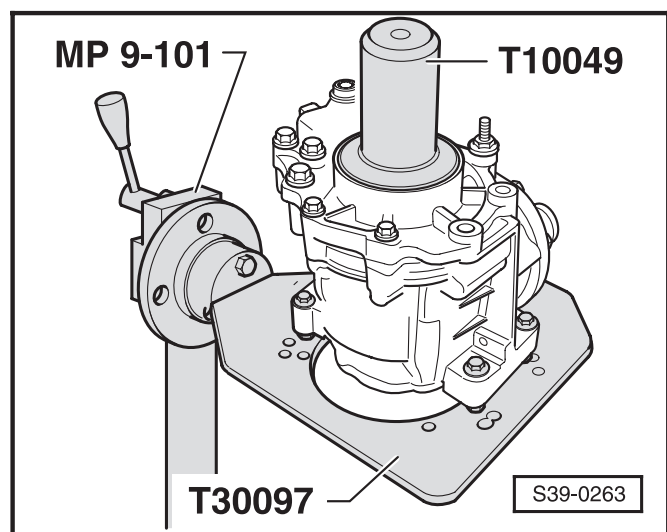
- Fit extractor hooks onto bottom of drive pinion housing.



- Coat the thread of new hexagon nut and shaft bevel gear with locking fluid D 000 600 A2.

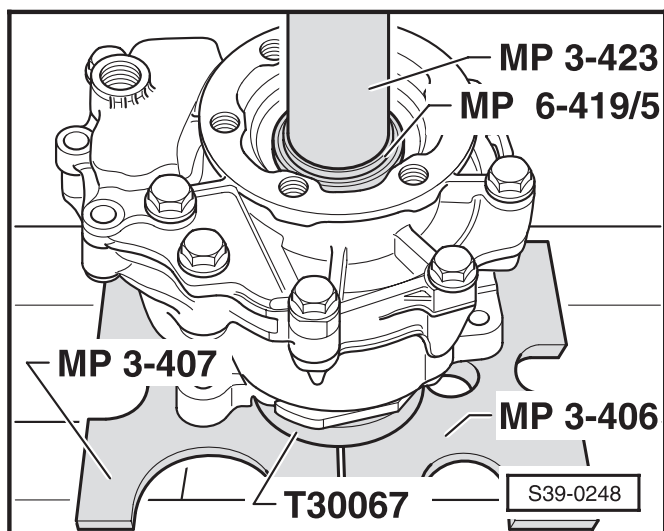
◀ - Screw on new hexagon nut for output flange with tightening torque ⇒ page 39-22, item 32.

A - Wrench socket for 3/4 inch drive



◀ - Knock in new seal for right flange shaft as far as the stop.

- Pack space between sealing lip and dust lip half with Grease G 052 128 A1.



- ◀ - Carefully press on right flange shaft and rotate.
- Check after pressing in, if the flange shaft is rotating
- If necessary knock with a plastic hammer on the opposite side of the flange shaft

Setting shaft and head bevel gear (drive pinion set)

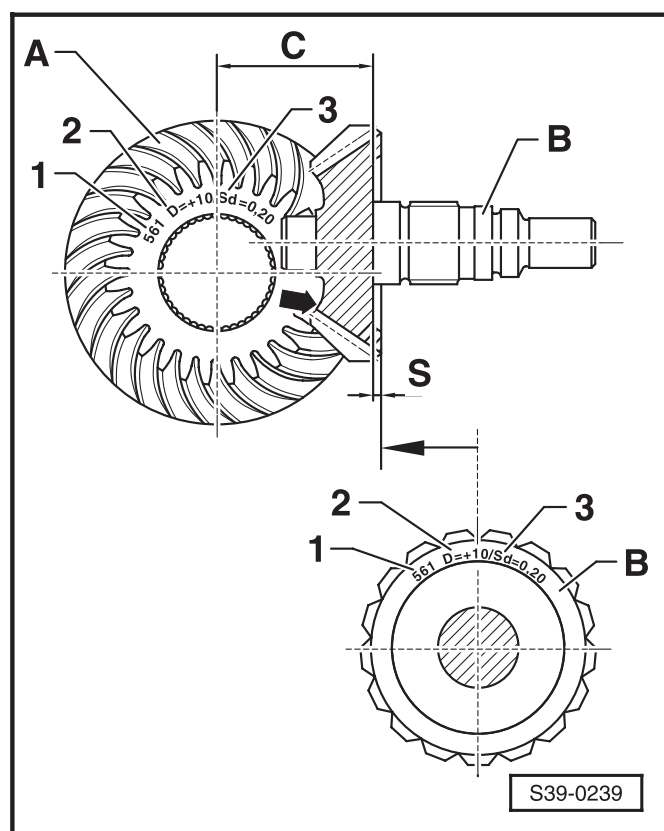
General information

Careful setting the drive pinion set is essential for ensuring long life and quiet running of the bevel box. For this reason, shaft bevel gears and head bevel gears are matched to each other already during the manufacturing process and inspected for proper positioning of the contact pattern and quiet running with a test machine. The position offering the quietest running is de-

termined by shifting the shaft bevel gear axially, with the interlocking clearance being moved within the specified tolerance.

Always replace drive pinion set (shaft and head bevel gear) complete!

Setting and inscription of drive pinion sets



A - Head bevel gear

B - Shaft bevel gear

C - Actual dimension between head bevel gear and face end of shaft bevel gear (location inner race for large taper roller bearing) at the point offering the quietest running for this one drive pinion set.

1 - Matching number (561) of drive pinion set

2 - Shaft bevel gear dimension

(D = +10)

- ◆ Can amount between 0 to 0.35 mm (in this example +0.10 mm)
- ◆ When measuring must be added to the dimension -C-

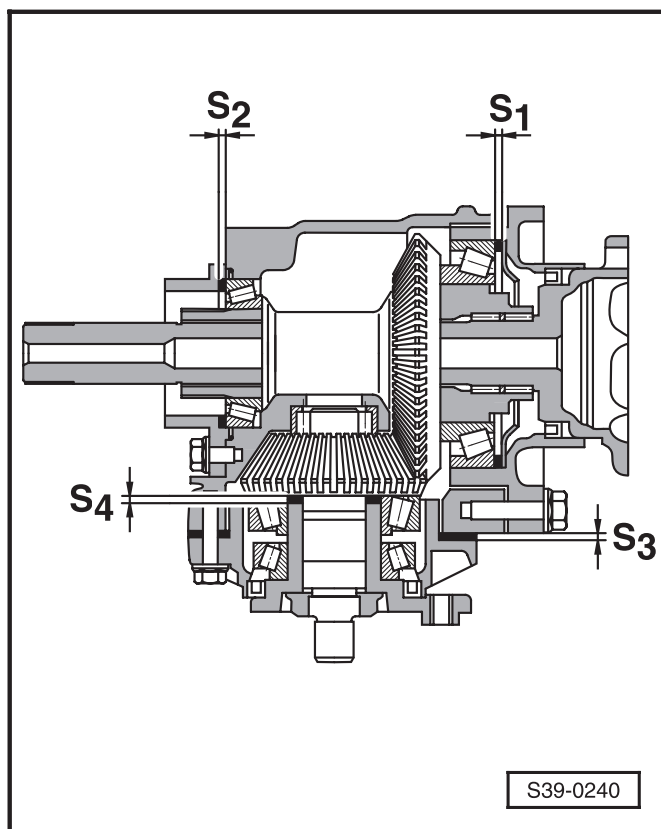
3 - Interlocking clearance (Sd = 0.20)

- ◆ Inspection dimension

S - Stage dimension

- ◆ Is the dimension between the ground face end/serration and contact surfaces of inner race/taper roller bearing and shim S₄ on the shaft bevel gear.
- ◆ This dimension is recorded on the rear side -arrow- of the shaft bevel gear (in this example 3.95)

Position of shims



S₁ - Shim for friction torque of taper roller bearing/head bevel gear

S₂ - Shim for friction torque and positioning of head bevel gear

S₃ - Shim for shaft bevel gear

S₄ - Shim for friction torque of taper roller bearing of shaft bevel gear

Overview of setting (bevel box)

Note:

When carrying out removal and installation work on the gearbox, it is only necessary to re-set the shaft bevel gear, head bevel gear or the complete drive pinion set if parts are replaced which have a direct effect on the setting of the final drive. Pay attention to the table below in order to avoid carrying out unnecessary setting operations:

Parts to be replaced:		Setting of the following:	
		Shaft bevel gear (S ₃ and S ₄) ⇒ page 39-38	Head bevel gear (S ₁ and S ₂) ⇒ page 39-45
	Final drive housing	x ¹⁾	x
	Large cover		x
	Small cover		x
	Drive pinion set (shaft and head bevel gear with input shaft)	x	x
	Taper roller bearing for shaft bevel gear	x	
	Taper roller bearing for head bevel gear		x
	Drive pinion housing	x	
	Output flange	x ²⁾	

1) Only S₃ ⇒ page 39-41. The shaft bevel gear is removed together with the drive pinion housing. Shim S₄ remains unchanged in this case.

2) Only S₄ using differential measurement ⇒ page 39-36.

Recommended sequence for re-setting drive pinion set

If it is necessary to set the shaft bevel gear and head bevel gear, observe the following sequence to ensure a rational workflow:

1. Setting shaft bevel gear (S_3 and S_4)

- Determine thickness of the shim „ S_4 “ and insert. This sets the preload of the taper roller bearings for the shaft bevel gear.
- Determine thickness of shim „ S_3 “ and insert. This fixes the shaft bevel gear axially so that the dimension from the middle of the head bevel gear to the face end of the shaft bevel gear equals the installation dimension „C“ determined during production.

2. Setting head bevel gear (S_1 and S_2)

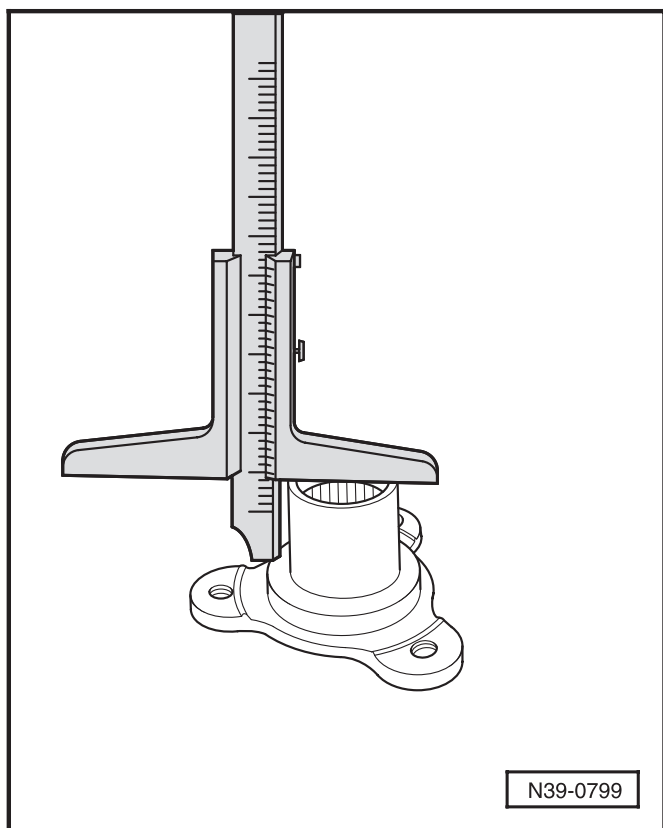
- Set preload of taper roller bearings for the head bevel gear using Stot and the friction torque
- Set interlocking clearance. Select thickness of the shims „ S_1 “ and „ S_2 “ so that the specified interlocking clearance exists between shaft bevel gear and head bevel gear.
- Inspection of interlocking clearance.

The aim of the setting is to recreate the position offering the quietest running which was determined on the test machine during production. Scrupulous care and cleanliness when carrying out all removal and installation work and measurement operations are an essential requirement for achieving a proper result.

Re-determining shim „ S_4 “ when replacing output flange

This setting is only necessary if the output flange is replaced. The purpose of the setting is to create the preload of the taper roller bearings for the shaft bevel gear.

- ◀ - Measure length of shaft at the old and at the new output flange and determine the difference.



Example:

Old output flange	43.50 mm
New output flange	43.30 mm
Difference	0.20 mm

If the new output flange is longer - install a thinner shim S_4 equal to the difference.

If the old output flange is longer - install a thicker shim S_4 equal to the difference.

- Assign determined shim(s) following spare parts catalogue

Setting shaft bevel gear

Special tools, working equipment, testers and measuring devices as well as aids required.

- ◆ Universal measuring device VW 385
- ◆ Universal dial gauge MP 3-447
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust piece MP 3-458
- ◆ Tube section MP 3-414
- ◆ Washer MP 6-414/7
- ◆ Repair stand MP 9-101
- ◆ Tube T30055
- ◆ Gearbox holder T30097
- ◆ Stop plate T30097/1
- ◆ Digital depth gauge (e.g. VAS 6087)
- ◆ Feeler gauge with 0.03 mm stage
- ◆ Dial gauge

It is necessary to re-set the shaft bevel gear if:

- ◆ Final drive housing
- ◆ Taper roller bearing for shaft bevel gear
- ◆ Drive pinion set

or the

- ◆ Drive pinion housing

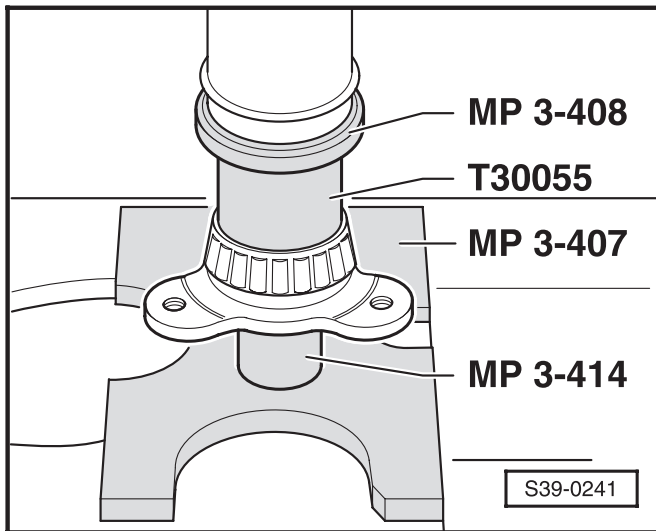
are replaced.

Overview of setting ⇒ page 39-35

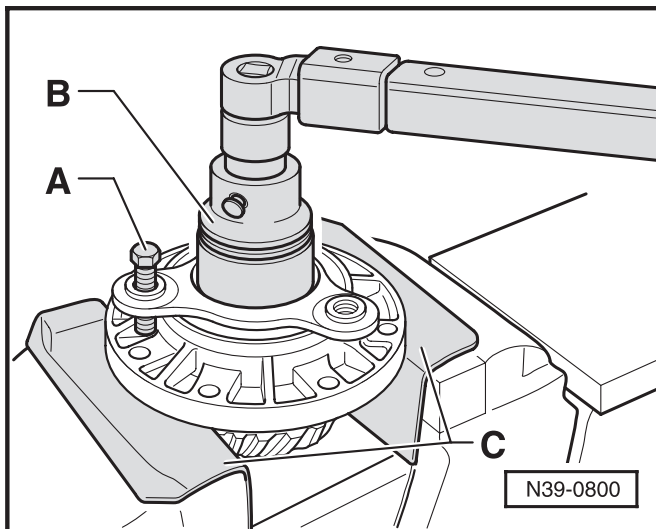
Determine thickness of shim „S4“

Requirements

- Seal for output flange removed



- Press outer race of large taper roller bearing for shaft bevel with thrust piece MP 6-414/7 into the drive pinion housing ⇒ page 39-31.
- Press outer race of small taper roller bearing for shaft bevel gear with thrust piece MP 3-458/1 into the drive pinion housing ⇒ page 39-31.
- Press inner race of large taper roller bearing onto the shaft bevel gear.
- ◀ - Press inner race of small taper roller onto the output flange.
- Insert shaft bevel gear.
- Fit the thickest shim „S₄“ = 2.5 mm (assigned according to spare parts catalogue) onto the shaft bevel gear.



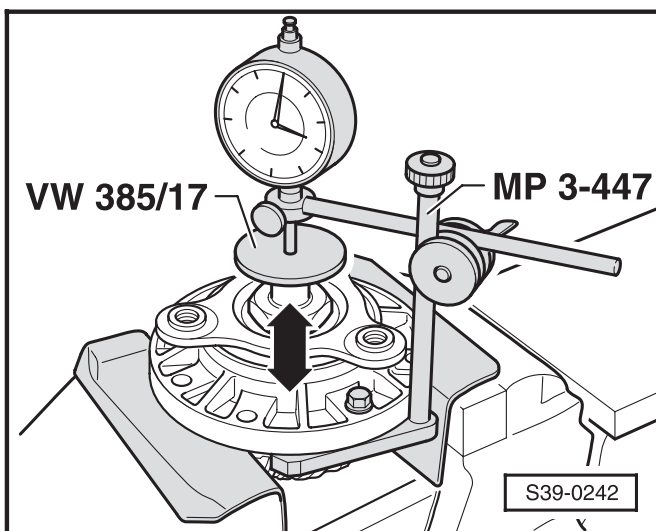
- Insert output flange with inner race and fit on hexagon nut.

◀ - A - Screw in M10 hexagon bolt as counter-support.

B - Wrench socket

C - Protective jaws

- Tighten hexagon nut to 50 Nm, turn back hexagon bolt -A- or turn out fully
- Press shaft head bevel gear in direction of outer race for large taper roller bearing and turn eight times.



◀ - Fit on dial gauge and set it to „0“ with 1 mm preload.

- Move shaft bevel gear up and down (in direction of arrow)
- Read off play on the dial gauge and determine shim S₄.

Example:

Shim	2.50 mm
- Compression (constant value)	0.20 mm
- Play (indicated on dial gauge)	0.35 mm
Shim S_4 =	1.95 mm

Note:

Assign shims following spare parts catalogue

The following sizes for shim S_4 are available:

Thickness (mm)			
1.30	1.65	2.00	2.35
1.35	1.70	2.05	2.40
1.40	1.75	2.10	2.45
1.45	1.80	2.15	2.50
1.50	1.85	2.20	
1.55	1.90	2.25	
1.60	1.95	2.30	

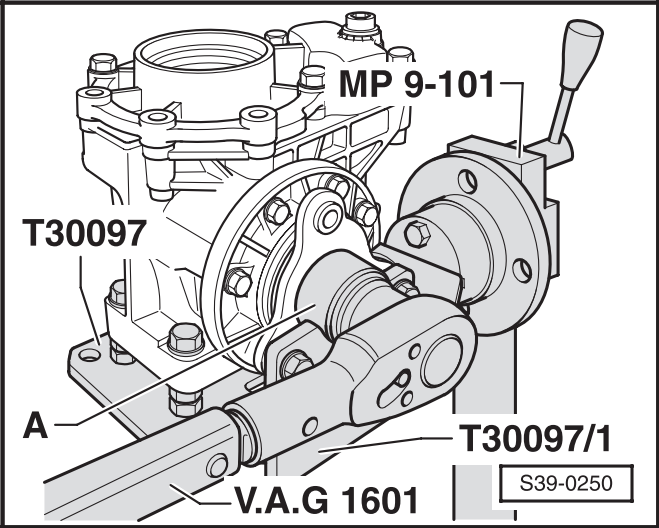
- Install calculated shim S_4 instead of shim thickness 2.50 mm
- Bolt the pinion drive housing with a shim S_3 to the final drive housing

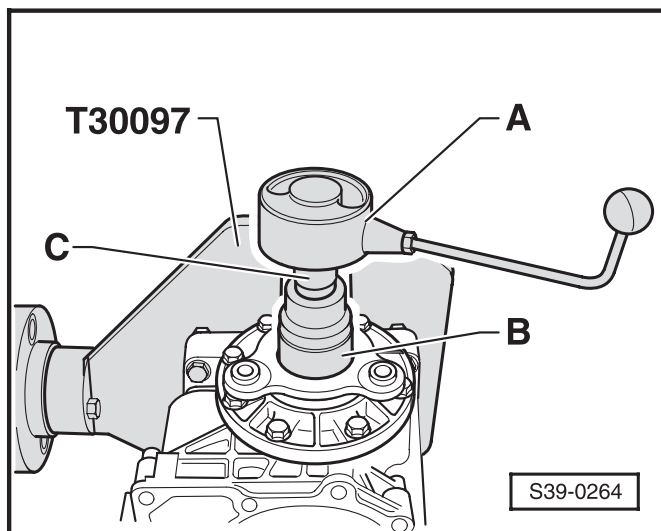
Note:

When attaching drive pinion housing, a shim S_3 (e.g. 1.2 mm) must be attached so that the shaft bevel gear is not positioned at the final drive housing.

- ◀ - Lock output flange for bevel gear with stop plate T10108/1.
- Screw on hexagon nut for output flange with tightening torque $\Rightarrow$ page 39-22, item 32

A - Wrench socket for 3/4 inch drive





- Input shaft with shaft bevel gear is removed.

- ◀ - Measure friction torque
A - Commercially available torque gauge, 0...600 Ncm
B - Wrench socket
C - Use adapter from 1/2 inch to 3/4 inch

Set the follow friction torques:

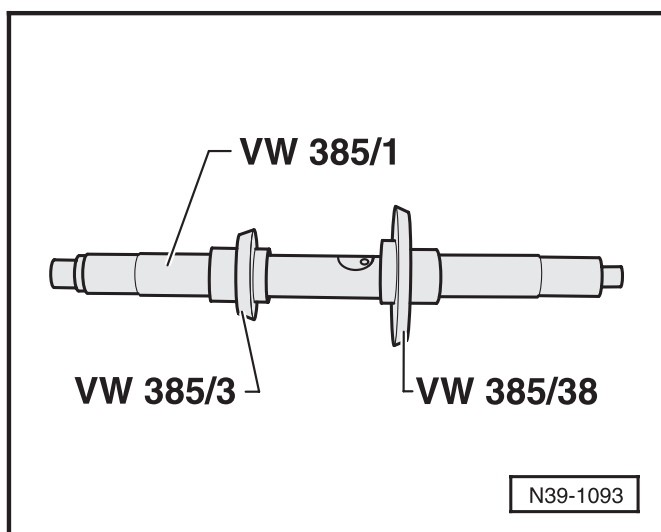
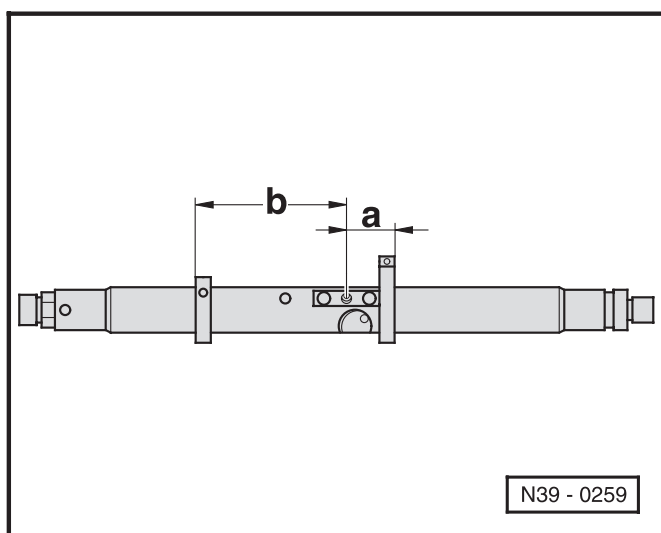
new bearings	used bearings ¹⁾
100...240 Ncm	30...50 Ncm

- ¹⁾ Distance travelled at least 50 km

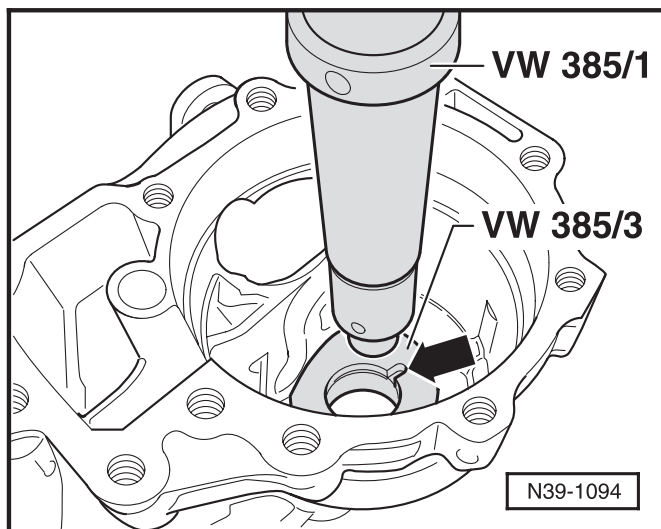
Set correct friction torque, if necessary, by inserting a thinner shim S_4 (to increase friction torque) or a thicker one (to reduce friction torque).

Determining thickness of shim S_3

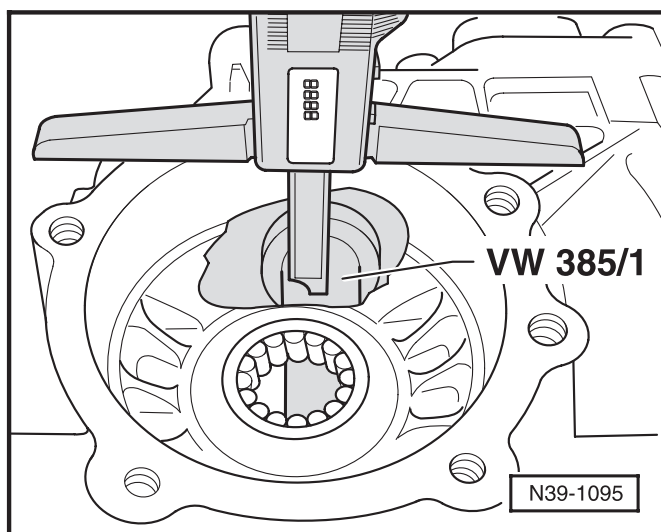
- Input shaft with shaft bevel gear removed
- Outer race/taper roller bearing for bearing of head bevel gear/input shaft) is installed.
- ◀ - Set positioning ring of universal measuring rod VW 385/1 to the dimension $a = 32$ mm
- Set moving positioning ring to dimension $b = 70$ mm



- ◀ - Fit universal measuring rod as shown in illustration.



- ◀ - Position the locating disc VW 385/2 in the outer race for the small taper roller bearing
- Insert universal measuring rod, therefore the lugs of the positioning rings must be locked into the groove -arrow- of the locating disc
- Place large cover and tighten hexagon bolts
- With the movable positioning ring, move the locating disc until the measuring rod can no longer be turned by hand.



Determine dimension -A-

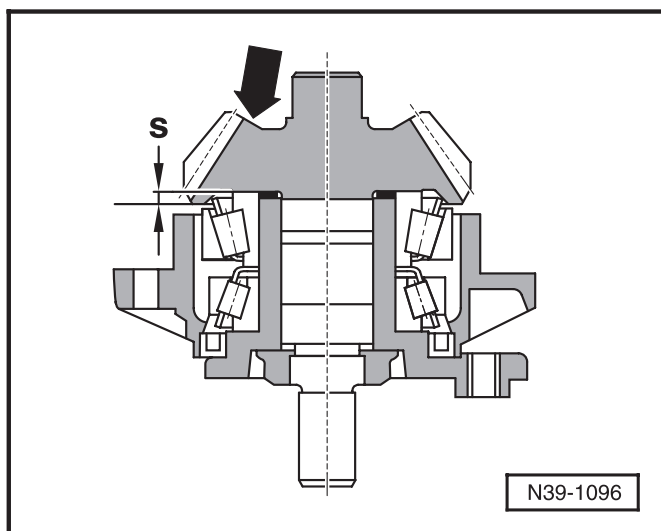
- ◀ - Measure with a digital depth gauge (e.g. VAS 6087) from the screw-on surface for the drive pinion housing to the highest point of the universal measuring rod VW 385/1.

In the example the dimension amounts to 72.50 mm

- Add to this dimension half from the diameter of the universal measuring rod. This value amounts to 16.00 mm.

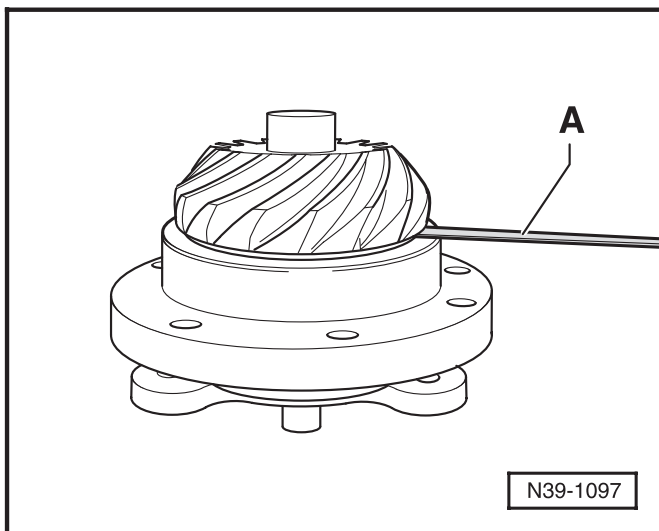
Example:

Indicated on the digital caliper gauge	72.50 mm
Half from the diameter of the universal measuring rod	+ 16.00 mm
Dimension -A-	= 88.50 mm



Determine dimension -B-:

- ◀ The 1st value is the stage dimension -s- and for example amounts to 3.95 mm. This value is recorded on the face end of the shaft bevel gear -arrow-.



- Hexagon nut for output flange is bolted with tightening torque $\Rightarrow$ page 39-22, item 32.

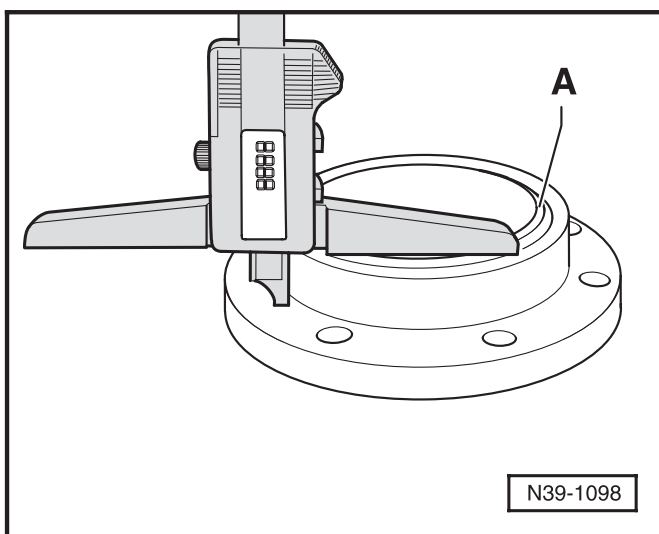
◀ The 2.nd value is obtained when measuring between outer race/large taper roller bearing (installed in the drive pinion housing) on the ground face end of the shaft bevel gear.

- Gap size „f“ is measured with feeler gauge -A-.

Note:

Use feeler gauge with 0.03 mm stage

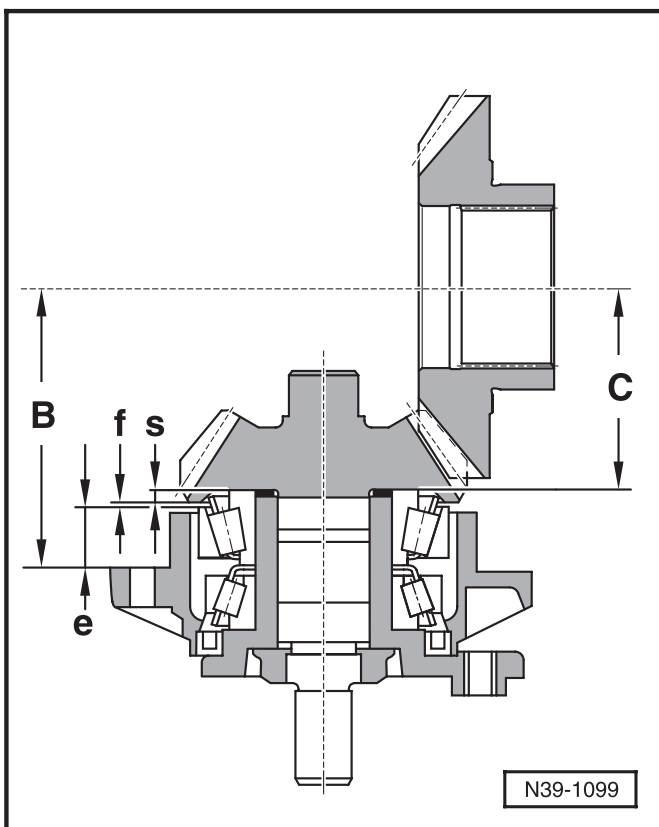
In the example it amounts to 0.93



- For measuring 3rd value remove shaft bevel gear from drive pinion housing

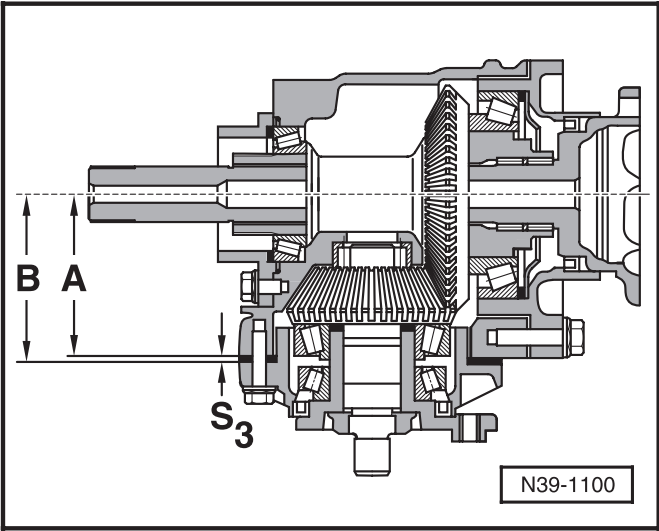
◀ - Measure with a digital depth gauge (e.g. VAS 6087) from outer race/taper roller bearing -A- on the screw-on surface of the drive pinion housing.

- Note the value in the example: 20.12 mm



◀ **Example:**

Recorded stage dimension -s-	3,95 mm
Determine gap size -f- with feeler	+ 0.93 mm
Determine value -e- with depth gauge	+ 20.12 mm
Place dimension „C“ with shaft bevel gear dimension „D“ (C + D)	+ 65.60 mm
Dimension -B-	= 90.60 mm



◀ **Determining thickness of shim „S₃“**

$S_3 = \text{Dimension „B“} - \text{Dimension „A“}$

Dimension -B-	90.60 mm
Dimension -A-	- 88.50 mm
Thickness of shim S ₃	= 2.10 mm

Note:

Assign shims following spare parts catalogue.

The following sizes for shim S₃ are available

Thickness (mm)			
1.20	1.50	1.80	2.10
1.25	1.55	1.85	2.15
1.30	1.60	1.90	2.20
1.35	1.65	1.95	
1.40	1.70	2.00	
1.45	1.75	2.05	

- Different tolerances allow to measure the required thickness for each washer very precisely.

Insert head bevel gear

Special tools, working equipment, testers and measuring devices as well as aids required

- ◆ Repair stand MP 9-101
- ◆ End gauge plate VW 385/17 or end gauge plate MP 3-405/17
- ◆ Varying measuring lever T30014
- ◆ Counterholder T30097
- ◆ Universal dial gauge holder MP-3447
- ◆ Adjusting device MP 3-462/4
- ◆ Adjusting device MP 3-462/12
- ◆ Dial gauge

It is necessary to re-set the head bevel gear

- ◆ Final drive housing
- ◆ Cover
- ◆ Taper roller bearing for head bevel gear/input shaft

or the

- ◆ Drive pinion set

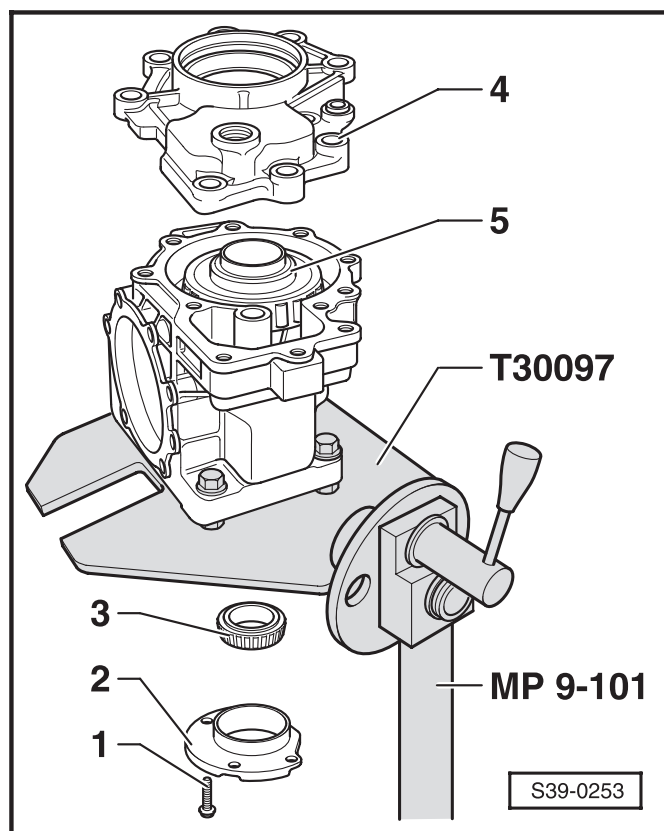
are replaced.

Overview of setting ⇒ page 39-35

Setting preload of taper roller bearings for head bevel gear (friction torque)

The shaft bevel gear is removed

- ◀ - Insert head bevel gear/input shaft -5- into final drive housing.
- Position inner race/taper roller bearing -3- on head bevel gear/input shaft as far as the stop.
- Insert a 1.75 mm shim into the seat of the outer race for the small taper roller bearing (S_2 side) into small cover -2-.



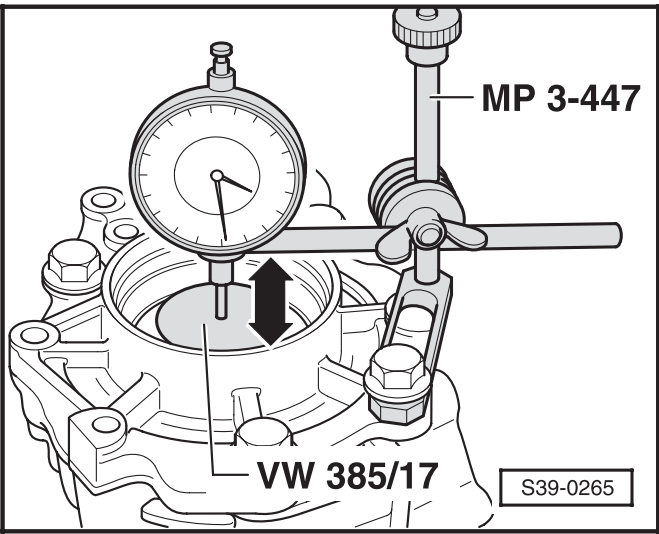
As part of the measuring procedure, a temporary 1.75 mm shim S_2 is inserted. On the following pages, this will be referred to as S_2^* . After taking measurement, temporary shim S_2^* is replaced by permanent shim S_2 .

- Insert small cover and tighten bolts with tightening torque $\Rightarrow$ page 39-21, item 21.

Note:

On certain gearboxes the shim S_1 is located between the oil deflector plate and the large cover. The oil deflector plate must be removed as well as re-installed with temporary shim S_1 , which corresponds to the thickness of the oil deflector plate (e.g. 0.75 mm spare part no. 02D 409 247 B).

- Install large cover with outer race for large taper roller bearing without O-ring, without seal for joint flange and without shim S_1 .
- Press head bevel gear/input shaft in direction of large cover and turn eight times.
- Press head bevel gear/input shaft in direction of outer race for small taper roller bearing and turn eight times.



- Fit on dial gauge and position to „0“ with a 2 mm preload.
- Move head bevel gear/input shaft up and down (in direction of arrow)
- Read off play on the dial gauge and determine S_{tot} .

Example:

„ S_{tot} .“ = S_2^* + Measurement + Preload

Shim inserted S_2^*	1.75 mm
Measurement (example)	+ 0.75 mm
Preload (constant value)	+ 0.20 mm
S_{tot} .	= 2.70 mm

Determining thickness of shim S_1^* **Notes:**

- ♦ The temporary shim S_1^* will be replaced by the permanent shim S_1 after measuring the interlocking clearance.
- ♦ The total thickness of shim „ S_{tot} “ will remain unchanged

$$S_1^* = S_{tot} - S_2^*$$

Example:

Total thickness of shim „ S_{tot} “	2.70 mm
Shim(s) inserted S_2^*	- 1.75 mm
Thickness of shim S_1^*	= 0.95 mm

Note:

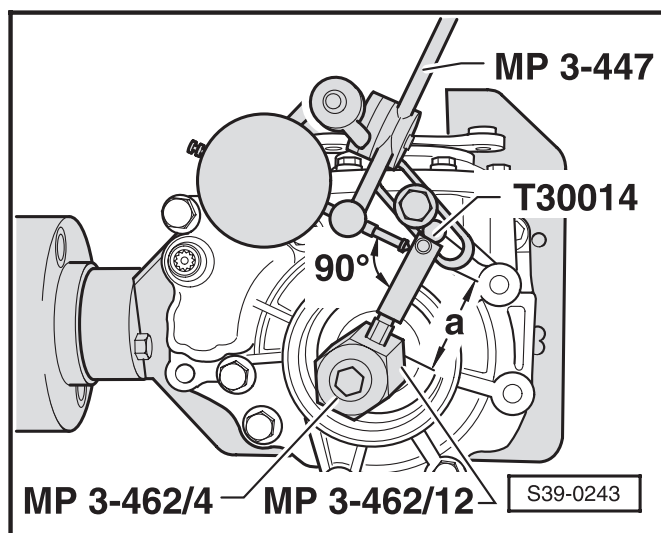
Assign shims following spare parts catalogue.

The following sizes of shims for $S_1 \Rightarrow$ chart page 39-49.

Measure interlocking clearance

Drive pinion housing installed together with shaft bevel gear.

Head bevel gear/input shaft installed: S_1^* is installed on the side of the large cover which S_2^* is installed on the side of the small cover.



- ◀ - Fit on measuring tools.
 - ♦ Dimension „a“ = 43.5 mm
 - ♦ Screw in measuring lever T30014 so that the dial gauge extension is positioned at right angles to the measurement surface.
- Turn head bevel gear/input shaft as far as the stop. The shaft bevel gear must stay in that position. Set dial gauge to zero, turn head bevel/input shaft and read off interlocking clearance. Note reading.
- Slacken clamping bolt of tensioning sleeve and turn on head bevel gear/input shaft by 90°. Add together the four measurements and calculate the average interlocking clearance.

Calculate average interlocking clearance**Example:**

1st measurement	0.30 mm
+ 2nd measurement	0.31 mm
+ 3rd measurement	0.30 mm
+ 4th measurement	0.29 mm
Total	1.20 mm

Average interlocking clearance = 1.20 mm : 4 =
0.30 mm

Determining thickness of shim S_2

$$\begin{aligned}
 S_2^* &= \text{Shim inserted} \\
 &- \text{Average interlocking clearance} \\
 &+ \text{Lift (constant value)}
 \end{aligned}$$

Lift = 0.20 mm

Example:

S_2^*	Shim inserted	1.75 mm
-	Average interlocking clearance	0.30 mm
		1.45 mm
+	Lift (constant value)	0.20 mm
		$S_2 =$ 1.65 mm

Note:

Assign shims following spare parts catalogue.

The following sizes of shims for S_2

Thickness (mm)			
1.45	1.75	2.05	2.35
1.50	1.80	2.10	2.40
1.55	1.85	2.15	2.45
1.60	1.90	2.20	2.50
1.65	1.95	2.25	
1.70	2.00	2.30	

- Insert the calculated size of shim S_2 in place of S_2^* .

If the thickness of shim measured is greater than the shims listed in the table, 2 shims which correspond to the measurement, can be installed.

- Different tolerances make it possible to exactly gauge the required thickness of shim.
- Press in outer race again and insert head bevel gear/input shaft.

Determining thickness of shim S_1

$$S_1 = S_{\text{tot.}} - S_2$$

Example:

$$S_1 = 2.70 \text{ mm} - 1.65 \text{ mm}$$

$$S_1 = 1.05 \text{ mm}$$

Note:

Assign shims following spare parts catalogue.

The following sizes of shims for S_1

Thickness (mm)			
0.65	0.85	1.05	1.25
0.70	0.90	1.10	1.30
0.75	0.95	1.15	1.35
0.80	1.00	1.20	1.40

If the measured thickness of the shim is greater than that listed in the table, 2 shims which equal the measurement obtained, can be installed.

- Insert the calculated size of shim S_1

Note:

On certain gearboxes the shim S_1 is located between the oil deflector plate and the large cover. The installed shim is replaced in the same location as the originally installed oil deflector plate.

- Press in outer race again
- Install on large cover

Performing inspection measurement - measuring interlocking clearance

This must be 0.15...0.20 mm

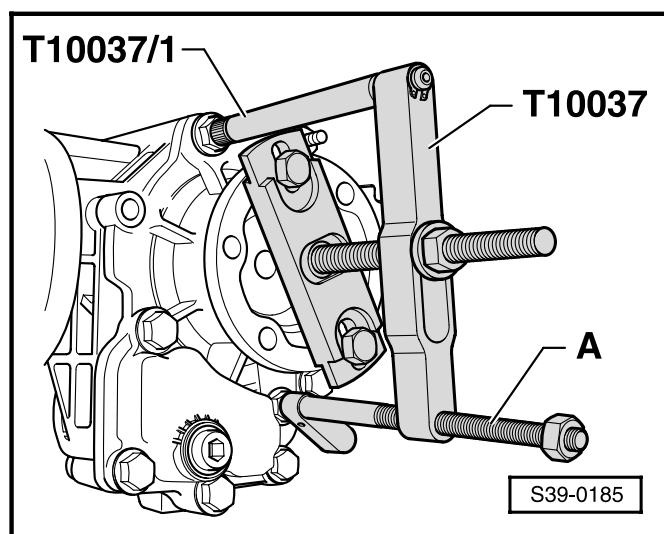
Replacing needle bearing (polygon bearing) for output shaft

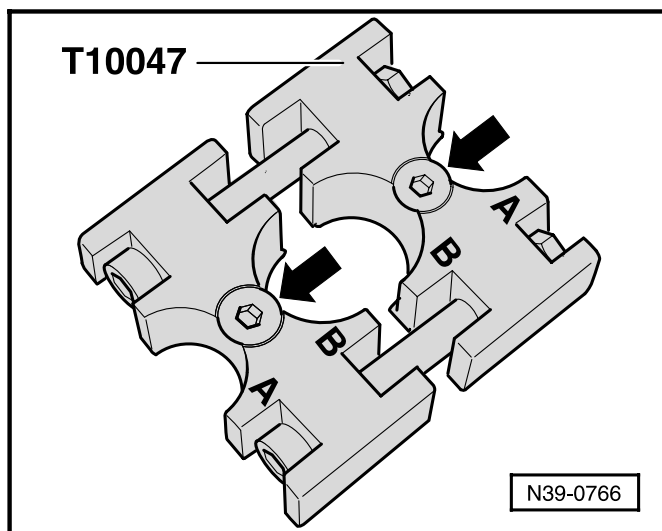
Special tools, testers and aids required

- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-408
- ◆ Thrust plunger MP 3-423
- ◆ Thrust bearing MP 6-414/5 from assembly device MP 6-414
- ◆ Pulling device T10037
- ◆ Assembly device T10047
- ◆ Size SW 6 mm V.A.G 1669 or 6 mm wrench socket at least 190 mm long (commercially available)
- ◆ Drip tray

Removing

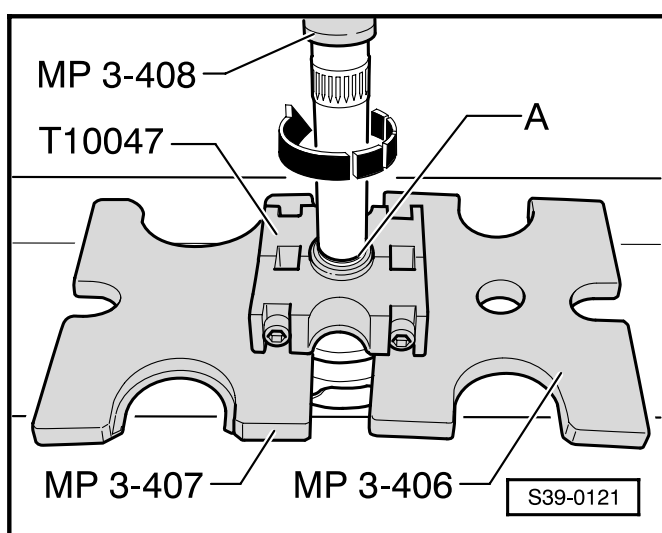
- Take off middle and right part of noise insulation below engine and gearbox
⇒ Engine, Mechanical Components; Repair Group 10, Removing and installing engine
- Remove drive shaft
⇒ Running Gear; Repair Group 40; Servicing drive shafts; Removing and installing
- Place a drip tray below the gearbox.
- Remove bolt for right flange shaft with V.A.G 1669 or 6 mm wrench socket (commercially available)
- ◀ - Attach pulling device T10037 to right flange shaft.
- Align pulling device parallel to flange with the knurled nut T10037/1 and the bottom support -A-.
- Pull out right flange shaft





◀ Now, install the assembly device T10047 as follows:

- Position the two parts of the device so that the markings „B“ are pointing toward each other.
- The shoulders (arrows) must be positioned below the bearing.
- Now, bolt together the two halves as far as the stop.

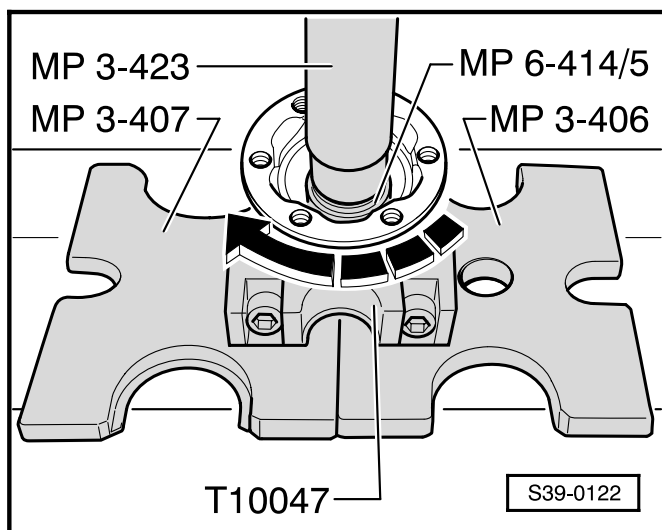


◀ - Lever off circlip -A- for the bearing.

- The shaft must be rotated during the pressing operation (arrow) in order to avoid damaging the contact surface of the bearing on the shaft.

Installing

- Install the assembly device T10047 ⇒ Fig. N39-0766 on page 39-52.



◀ - The shaft must be rotated during the pressing operation (arrow) in order to avoid damaging the contact surface of the bearing on the shaft.

- Secure the bearing with a new circlip
- Carefully knock in right flange shaft and rotate.
- Attach flange shaft with conical bolt.

- Install drive shaft
 - ⇒ Running Gear, Repair Group 40; Servicing drive shafts; Removing and installing drive shafts
- Inspect gear oil in gearbox ⇒ page 34-33.
- Install noise insulation.
 - ⇒ Engine, Mechanical Components: Repair Group 10; Removing and installing engine

Tightening torques

Components	Tightening torque
Right flange shaft to gearbox (conical bolt)	25 Nm
Drive shaft to flange shaft, tighten diagonally across in 2 stages (I and II) M10 ¹⁾	I - 10 Nm II - 70 Nm

¹⁾ Always replace these bolts

