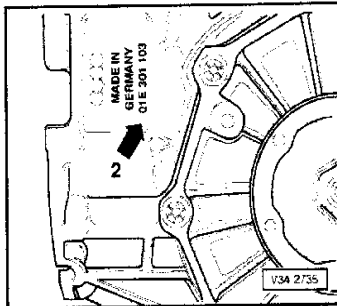


Audi 80 1992 ▶

6-Speed Manual Gearbox 01E Four-Wheel Drive									
Gearbox ID	CGR	CRB							

Edition 02.1997



-> Manual gearbox 01E -arrow 2-

2 - Code letters, allocation, ratios, capacities

2.1 - Code letters, allocation, ratios, capacities

Manual gearbox		6-speed 01E four-wheel drive	
Code letters		CGR1)	CRB
Manufactured	from	11.92	11.93
	to	12.95	12.95
Allocation	Model	Audi80 S2, Audi Avant RS2	Audi Avant RS2
	Engine	2.2 ltr - 169 kW 2.2 ltr - 232 kW	2.2 ltr - 232 kW
Ratios Z2:Z1=i	Final drive	37 : 9 = 4.111	
	1st gear	28 : 8 = 3.500	
	2nd gear	34 : 18 = 1.889	
	3rd gear	33 : 25 = 1.320	
	4th gear	30 : 29 = 1.034	
	5th gear	30 : 35 = 0.857	
	6th gear	27 : 37 = 0.730	
	Reverse gear	38 : 11 = 3.455	

1) From 04.95 onwards (gearbox serial No.77644) the 1st speed gear and sliding gear are wider. At the same time the bearing plate was modified and the width of the cylinder roller bearing inner race was reduced.

Code letters	CGR1)	CRB
Speedometer	electronic	
Capacity	2.7 litres ²⁾	2.3 litres
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch mechanism	hydraulic	
Clutch plate dia.	240 mm	
Drive shaft flange	for triple roller joint	
Overall ratio i _{ov} in top gear	3.000	

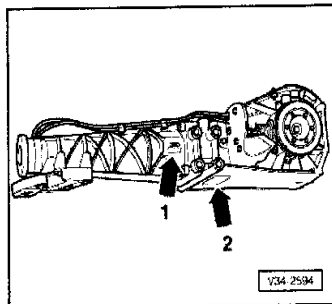
Allocation: rear final drive (code letters)	AZE
------------------------------------------------	-----

- 1) From 04.95 onwards (gearbox serial No.77644) the 1st speed gear and sliding gear are wider. At the same time the bearing plate was modified and the width of the cylinder roller bearing inner race was reduced.
- 2) Capacity for Avant RS2: 2.3 litres

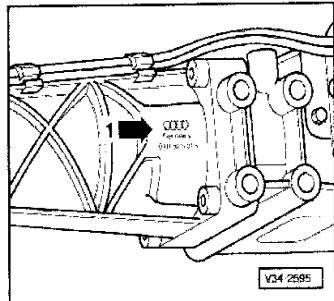
3 - Identification of rear final drive

3.1 - Identification of rear final drive

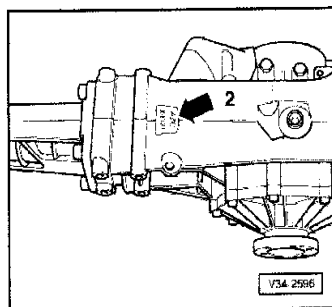
Final drive 01H is fitted in conjunction with manual gearbox 01E (four-wheel drive).
 Allocation=>Page 4 , Technical data.



- > Location on final drive
- ◆ Final drive 01H -arrow 1-
 - ◆ Code letters and date of manufacture -arrow 2-



-> Final drive 01H -arrow 1-





Audi 80 1992 >

Audi 6-Speed Manual Gearbox 01E Four-Wheel Drive - Edition 02.1997

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

Example:	AZC	04	12	1
	Code letters	Day	Month	Year (1991) of manufacture

Note:

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

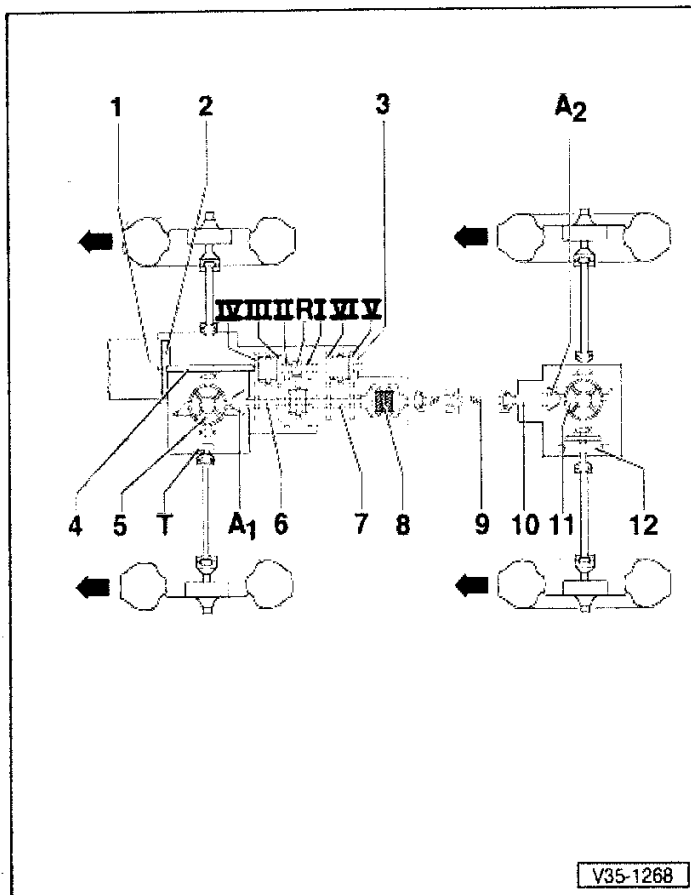
4 - Code letters, allocation, ratios, capacities

4.1 - Code letters, allocation, ratios, capacities

Rear final drive		01H.1
Code letters		AZE
Manufactured	from	11.92
	to	12.95
Allocation	Model	Audi 80 S2, Audi Avant RS2
	Engine	2.2 ltr - 169 kW, 2.2 ltr - 232 kW
Ratio	Final drive	37 : 9 = 4.111
Capacity		1.3 litres
Specification		Gear oil GL 5 SAE 90 (MIL-L 2105 B)
Drive shaft flange dia.		108 mm
Allocation: manual gearbox (code letters)		CGR CRB

5 - Transmission layout

5.1 - Transmission layout

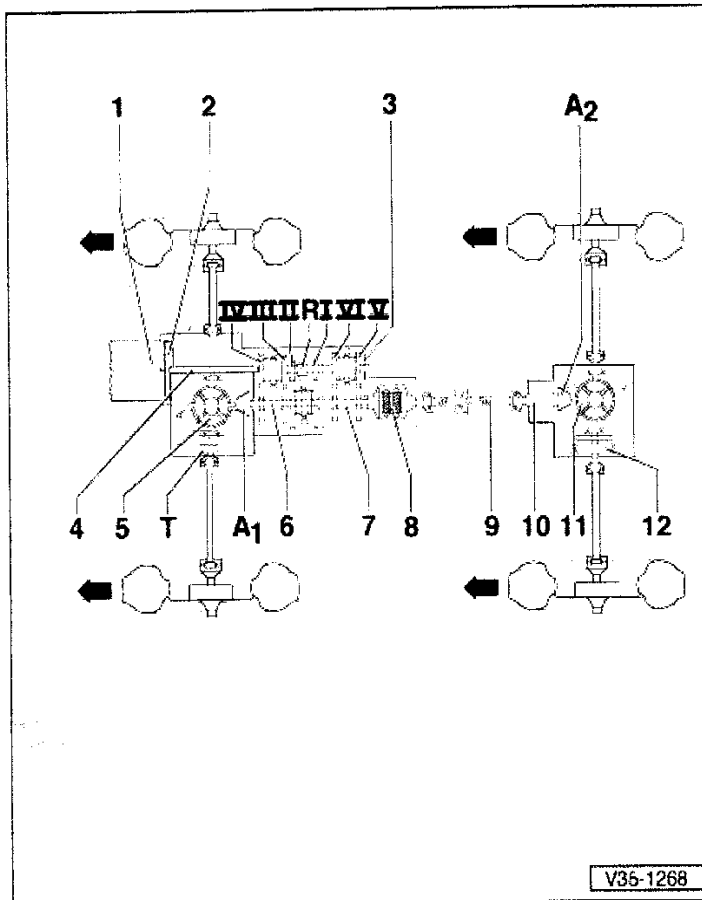


- 1 Engine
- 2 Clutch
- 3 Gearbox
- 4 Input shaft (main shaft)
- 5 Front differential
- 6 Front drive pinion (output shaft)
- 7 Hollow shaft
- 8 Torsen differential



Audi 80 1992 >

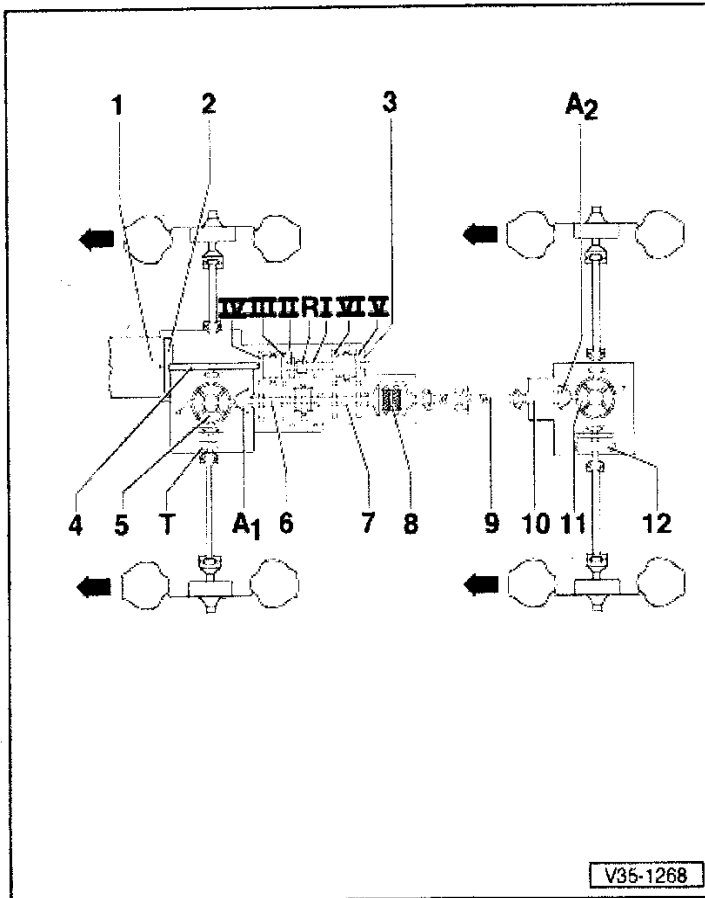
Audi 6-Speed Manual Gearbox 01E Four-Wheel Drive - Edition 02.1997



- 9 Propshaft
- 10 Rear drive pinion
- 11 Rear differential
- 12 Differential lock

Note:

Arrows point in forward direction of travel.



- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- VI - 6th gear
- R - Reverse gear
- A1 - Front final drive
- A2 - Rear final drive
- T - Speedometer drive, electronic

5.2 - Notes on engine output/brake test and towing/tow starting

- ◆ Engine output and brake test
- => Special Information; Transmission; No. 8
- ◆ Tow-starting and towing



=> Booklet; Maintenance

6 - Calculations

6.1 - Calculations

6.2 - Calculating transmission ratios "i"

Transmission ratio

Transmission ratio =	No. of teeth driven gear	:	No. of teeth drive gear
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Ratios		Formula
iG	= gear ratio	ZG2 : ZG1
iA	= axle ratio	ZA2 : ZA1
iov	= overall ratio	iG x iA

Example:		
	6th gear	Final drive
Drive gear	ZG1 = 37	ZA1 = 9
Driven gear	ZG2 = 27	ZA2 = 37

Calculating:	
iA	= 37 : 9 = 4.111
iG	= 27 : 37 = 0.730
iov	= (27 : 37) x (37 : 9) = 0.730 x 4.111 = 3.000

6.3 - Calculating speed "V"

V	= n : iov x UA x 0.06
n	= Engine speed (rpm)
iov	= Overall ratio
UA	= Dynamic rolling circumference of tyres (m)
V	= Road speed (km/h)

Example:

V	= 1000 : 3.000 x 1.93 x 0.06	= 39 km/h
---	------------------------------	-----------

The road speed at an engine speed of 1000 rpm in 6th gear is 39 km/h.

7 - Repair instructions

7.1 - Repair instructions

The maximum possible care and cleanliness and proper tools are essential to ensure satisfactory and successful gearbox repairs. The usual basic safety precautions also, naturally apply when carrying out vehicle repairs.

A number of generally applicable instructions for individual repair operations, which are otherwise mentioned at various points in the Workshop Manual, are summarized here. They apply to this Workshop Manual.

Special tools

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

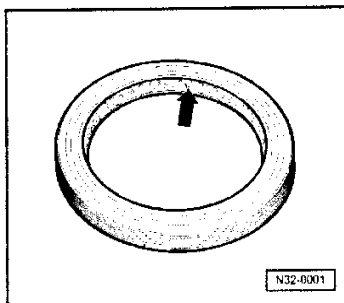
=> Booklet; Special tools, Workshop equipment

Gearbox

- ◆ When exchanging the manual gearbox or rear final drive, check oil level and top-up if necessary => Page 197 .
- ◆ Capacities and specifications => from Page 4 .
- ◆ Thoroughly clean all connections and the surrounding area before disconnecting.
- ◆ When installing gearbox, ensure dowel sleeves are correctly seated.

O-rings, seals, gaskets

- ◆ Always renew O-rings, seals and gaskets.



- ◆ After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Thoroughly clean housing joint surfaces before assembling.
- ◆ -> Before installing radial shaft oil seals, lightly oil outer edge and fill space between sealing lips -arrow- with grease.
- ◆ The open side of the oil seals faces toward the side with fluid filling.
- ◆ When replacing oil seals, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- ◆ Lightly oil O-rings before installing; this prevents the rings being crushed when inserting.
- ◆ Check oil level after renewing gaskets and seals =>Page 197 .

Sealants

- ◆ Thoroughly clean housing joint surfaces before applying sealing paste.
- ◆ Apply sealing paste AMV 188 200 03 evenly and not too thick.
- ◆ Breather holes must remain free of sealing paste.



Locking elements

- ◆ Always renew circlips.
- ◆ Do not over-tension circlips.
- ◆ Circlips must be properly seated in the base of the groove.
- ◆ Always renew roll pins.

Note:

The roll pins for securing the selector fork/selector rail for 5th/6th gear must only be assembled or dismantled using the special tool

=>Page 79.

Nuts, bolts

- ◆ Loosen nuts or bolts, opposite to tightening sequence.
- ◆ Nuts and bolts which secure covers and housings should be slackened and tightened crosswise in stages if no tightening sequence is specified.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Always renew self-locking nuts and bolts.
- ◆ The threads of bolts which are secured by a locking fluid should be cleaned with a wire brush. Then apply AMV 185 101 A1 when inserting.
- ◆ Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

Bearings

- ◆ Install needle bearings with the lettering on the bearing (the side with thicker metal) facing towards the drift or other tool used for installing.
- ◆ Mark needle bearings of 1st to 6th speed sliding gears when removing, this ensures that when installing, the same installation position can be guaranteed.
- ◆ Grease needle bearing for gearbox input shaft in rear of flywheel.
- ◆ Lubricate all bearings in gearbox housing with gear oil before installing.
- ◆ Heat inner races of taper roller bearings to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.
- ◆ Do not interchange the outer or inner races of bearings of the same size.
- ◆ Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.
- ◆ The taper roller bearings for the output shaft and the differential in the gearbox are low-friction bearings. Do not additionally oil new taper roller bearings when measuring friction torque. The bearings are pre-treated at the factory with a special type of oil for this purpose.

Shims

- ◆ Use a micrometer to measure the shims at several points. Different tolerances make it possible to obtain the exact shim thickness required.
- ◆ Inspect for burrs and signs of damage. Install only shims which are in perfect condition.

Synchroniser rings

- ◆ Do not interchange synchroniser rings. When reusing always fit to the same gear.
- ◆ Check for wear, renew if necessary.
- ◆ Lubricate with gear oil before installing.

Gears, synchro-hubs, inner races for sliding gears

- ◆ Heat gears and synchro-hubs to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.
- ◆ Heat inner races for sliding gears to approx. 100 °C when installing.
- ◆ The temperature can be checked with Temperature tester V.A.G 1558.
- ◆ Observe installation position.

Sliding gears

- ◆ After installing, check 1st to 6th speed sliding gears for axial clearance of 0.15 ... 0.35 mm and check that they rotate freely.

Notes:

- ◆ In gearboxes with code letters CGR from serial No.77644onwardsand in gearboxes with code letters CRB the 1st speed gear and sliding gear are wider. At the same time the bearing plate was modified and the width of the cylinder roller bearing inner race was reduced.
- ◆ Mixed installation of components belonging to the old and new versions in the same gearbox is not permissible.

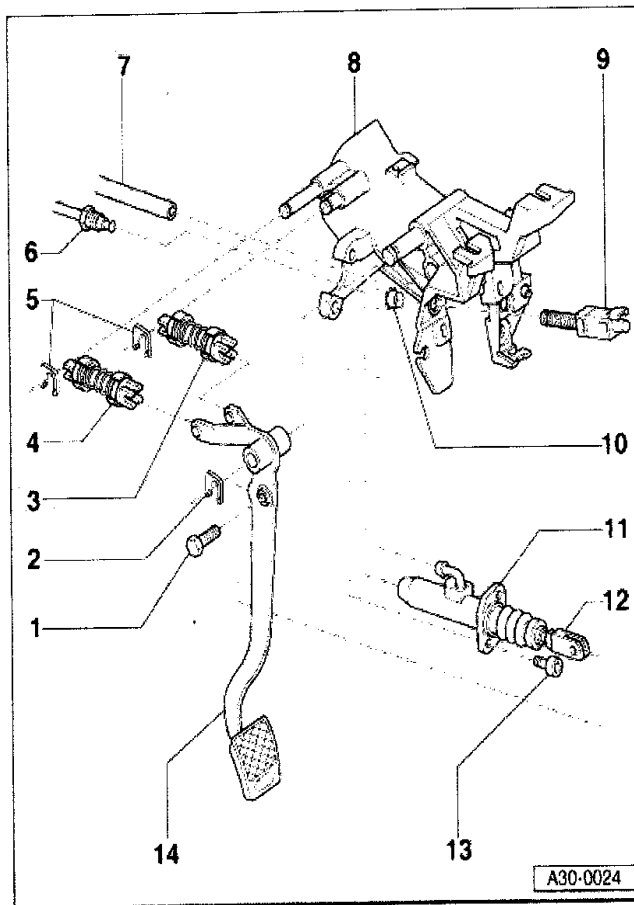
Clutch mechanism

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress clutch pedal after removing slave cylinder. Otherwise the piston will be pressed out of the slave cylinder.
- ◆ Do not cant clutch pressure plate, loosen and tighten in a diagonal sequence and in stages.
- ◆ To reduce odour caused by a burnt clutch, thoroughly clean the clutch bellhousing, the flywheel and the parts of the engine facing the gearbox.

30 - Clutch

1 - Servicing clutch mechanism

1.1 - Servicing clutch mechanism



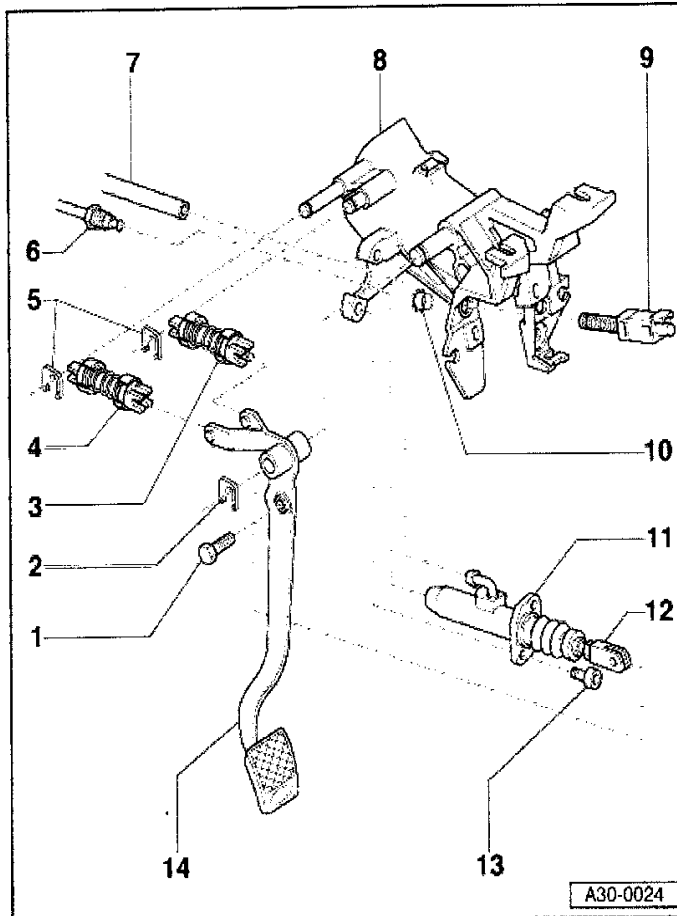
1.2 - Assembly overview, pedal cluster

Notes:

- ◆ Grease all bearing points with polycarbamide grease G 052 142 A2 before assembling.
- ◆ The clutch pedal travel must not be restricted by additional floor coverings.

- 1 Bolt - 25 Nm
- ◆ Self-locking
 - ◆ Always renew

- ◆ Insert in clevis and screw into clutch pedal



2 Securing clip

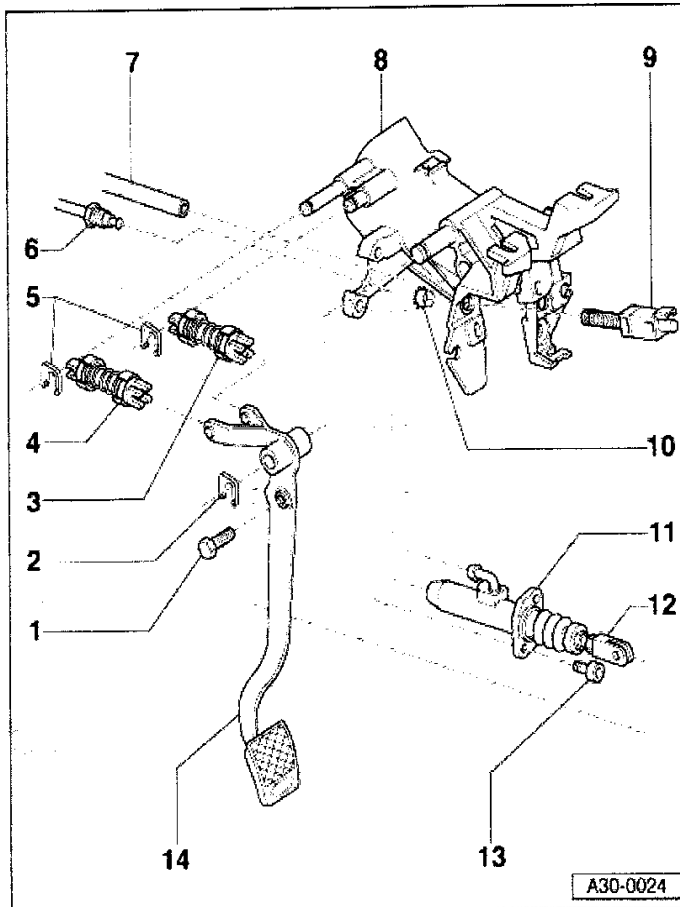
- ◆ Renew
- ◆ Fit onto pivot pin on pedal bracket

3 Assister spring

- ◆ Identification: brown
- ◆ Installation position: goes towards centre tunnel
- ◆ Do not grease spring
- ◆ Only grease moving surfaces on pedal and pedal bracket
- ◆ Removing and installing=>Fig. 3

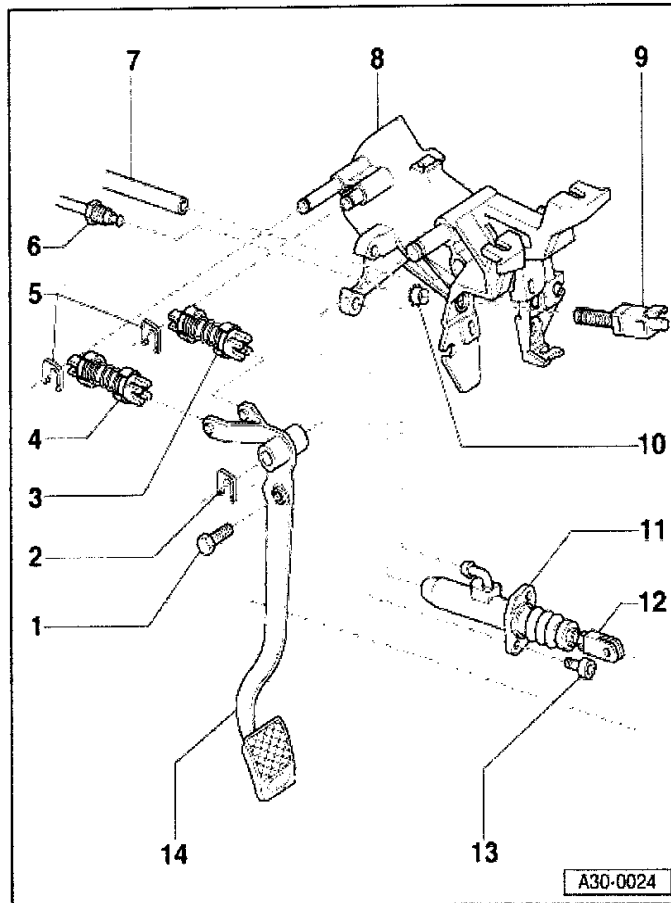
4 Over-centre spring

- ◆ Identification: red
- ◆ Installation position: goes towards outside of vehicle
- ◆ Do not grease spring
- ◆ Only grease moving surfaces on pedal and pedal bracket
- ◆ Removing and installing=>Fig. 2



- 5 Securing clip
 - ◆ Renew
- 6 Pipe
 - ◆ For clutch master cylinder
 - ◆ Tighten nut on pipe connection to 15 Nm
- 7 Supply hose
 - ◆ For master cylinder
 - ◆ Must not touch over-centre spring
 - ◆ Locate accordingly on pedal bracket and secure with cable clip
- 8 Pedal bracket
 - ◆ Removing and installing

=> Running gear, Four-wheel drive; Repair group 46; Removing, installing and servicing pedal cluster for vehicles with 169 kW engine
 Removing, installing and servicing pedal cluster for vehicles with 169 kW engine

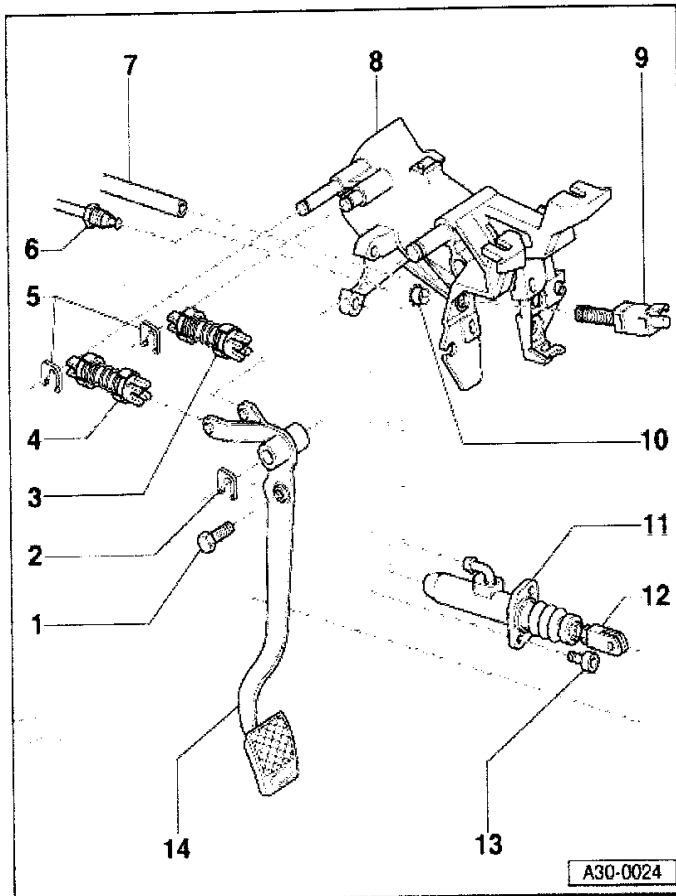


9 Vent valve

- ◆ For cruise control system
- ◆ Renew
- ◆ Press in valve after fitting clip
- ◆ Adjust valve with clevis connected:
 - Depress clutch pedal
 - Press in vent valve onto stop
 - Pull back clutch pedal onto stop by hand

10 Clip

- ◆ Secures vent valve for cruise control
- ◆ Using pliers, press into holes in pedal bracket as far as stop



11 Master cylinder

- ◆ Renew if leaking

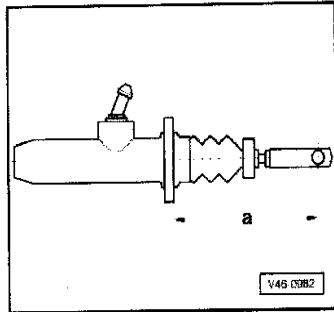
12 Clevis

- ◆ Adjusting=>Fig. 1

13 Bolt - 20 Nm

14 Clutch pedal

- ◆ Is located in correct position by clevis adjustment
- ◆ Can be renewed with pedal bracket installed in vehicle
- ◆ Fit onto pivot pin on pedal bracket
- ◆ Bearing bush cannot be replaced separately; pedal is supplied as replacement part with integral bush.



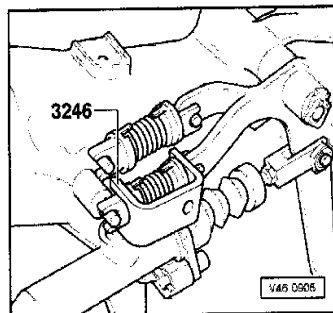
-> Fig.1 Adjusting clevis

- Check distance -a- when master cylinder is renewed, and adjust as necessary.
 - When measuring, clevis must be at right angles to mounting surface of clutch master cylinder.
 - Distance a = 109.5 ± 0.5 mm
- To adjust, turn clevis.

Notes:

If the clevis is correctly adjusted and the clutch pedal does not return properly by itself, this can be caused by the following:

- ♦ Air in hydraulic system.
- ♦ Pedal bearing or over-centre spring not moving freely.



-> Fig.2 Removing and installing over-centre spring

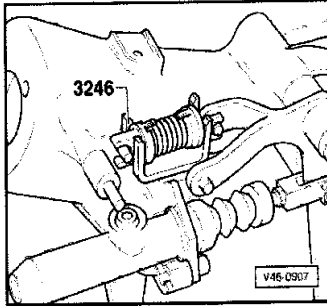
- Remove left-hand storage compartment

=> General body repairs; Repair group 70; Dash panel; Removing driver's side storage compartment
Dash panel
Removing driver's side storage compartment

- Take securing clip off pivot pin.
- Slide installation clamp 3246 onto over-centre spring from the side.
- Depress clutch pedal and remove over-centre spring together with installation clamp.

Notes:

- ♦ Installation clamp 3246 is shown in the illustration with the pedal bracket removed.
- ♦ Before assembling, lubricate moving parts with G 052 142 A2 polycarbamide grease.



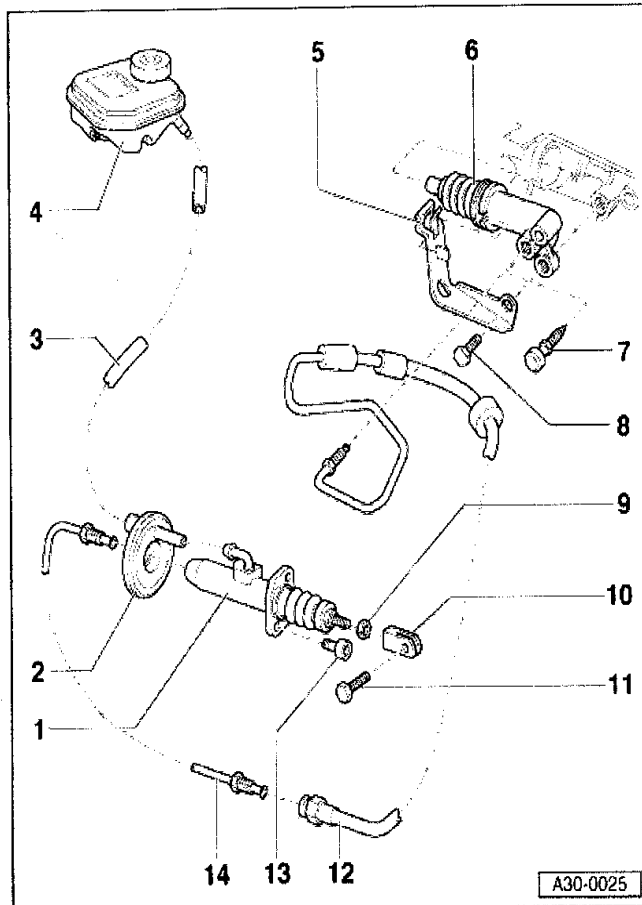
-> Fig.3 Removing and installing assister spring

- Remove over-centre spring=>Fig. 2 .
- Take securing clip off pivot pin.
- With clutch pedal slightly depressed, slide installation clamp 3246 onto assister spring from below.
- Depress clutch pedal and remove assister spring together with installation clamp.

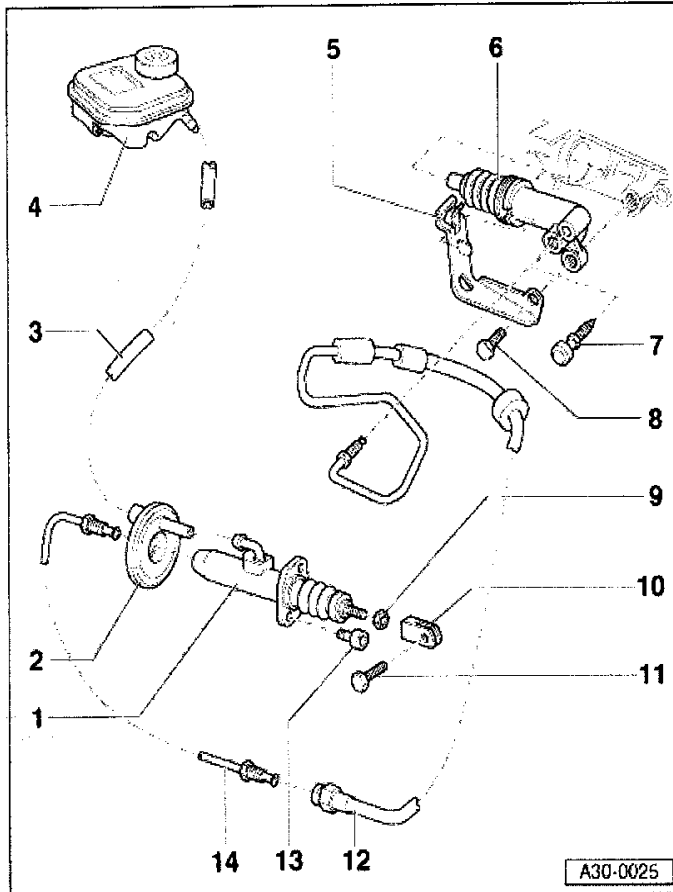
Notes:

- ♦ Installation clamp 3246 is shown in the illustration with the pedal bracket removed.
- ♦ Before assembling, lubricate moving parts with G 052 142 A2 polycarbamide grease.

1.3 - Assembly overview, hydraulics

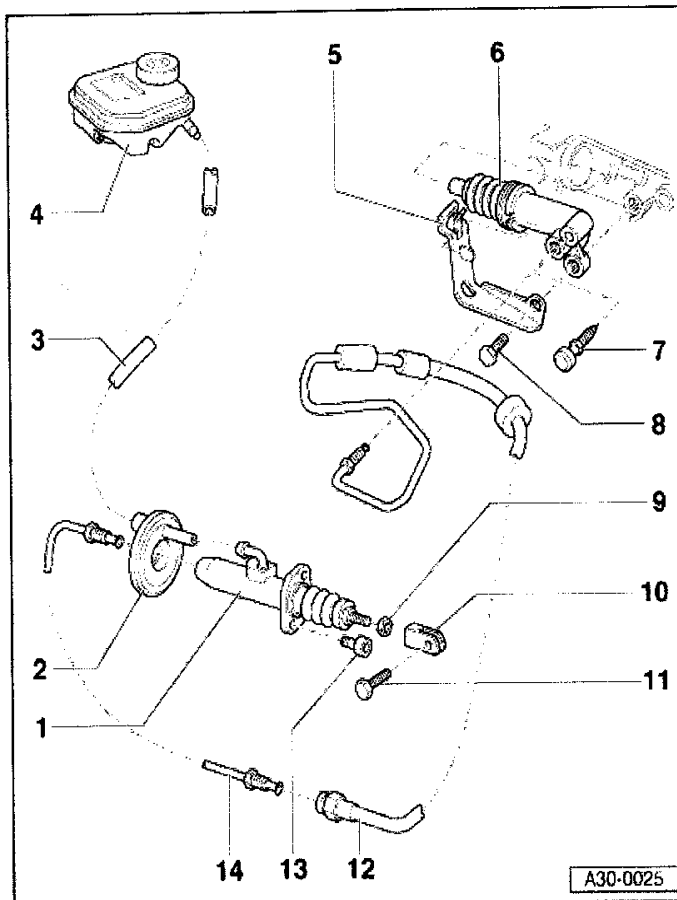


- 1 Master cylinder
 - ♦ Renew if leaking
- 2 Grommet
- 3 Supply hose
 - ♦ For master cylinder
- 4 Brake fluid reservoir
- 5 Bracket
- 6 Slave cylinder
 - ♦ Do not depress clutch pedal after removing slave cylinder
 - ♦ On slave cylinders with plastic support ring, grease outer surface of ring when installing



- ♦ Removing and installing
=>Page 27
- ♦ After working on hydraulic clutch mechanism, bleed slave cylinder => Page 21

- 7 Bleed valve
 - ♦ Bleeding => page 21
- 8 Bolt - 22 Nm
 - ♦ For securing slave cylinder to gearbox housing
- 9 Lock nut - 10 Nm
- 10 Clevis
 - ♦ Adjusting=>Fig. 17
- 11 Bolt - 25 Nm
 - ♦ Self-locking
 - ♦ Renew

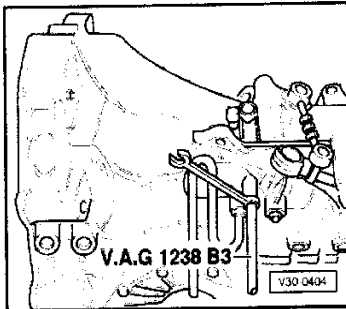


- 12 Pressure hose
 ♦ Tighten nut on pipe connection to 15 Nm
- 13 Bolt - 20 Nm
- 14 Pipe
 ♦ For clutch master cylinder
 ♦ Tighten nut on pipe connection to 15 Nm

1.4 - Bleeding clutch system

Notes:

- ♦ The clutch system must be bled after performing work on hydraulic clutch mechanism.
- ♦ Top-up brake fluid reservoir to "max." marking with brake fluid before bleeding clutch system.
- Bleed clutch system only with a brake bleeding unit.
 - Working pressure 2.5 bar
- Use bleeder hose V.A.G 1238 B3 (670 mm long) for bleeding.
- Connect bleeder hose to pressure hose of brake bleeding unit collector bottle.



- -> Fit ring spanner and hose V.A.G 1238 B3 onto bleed valve and open bleed valve.

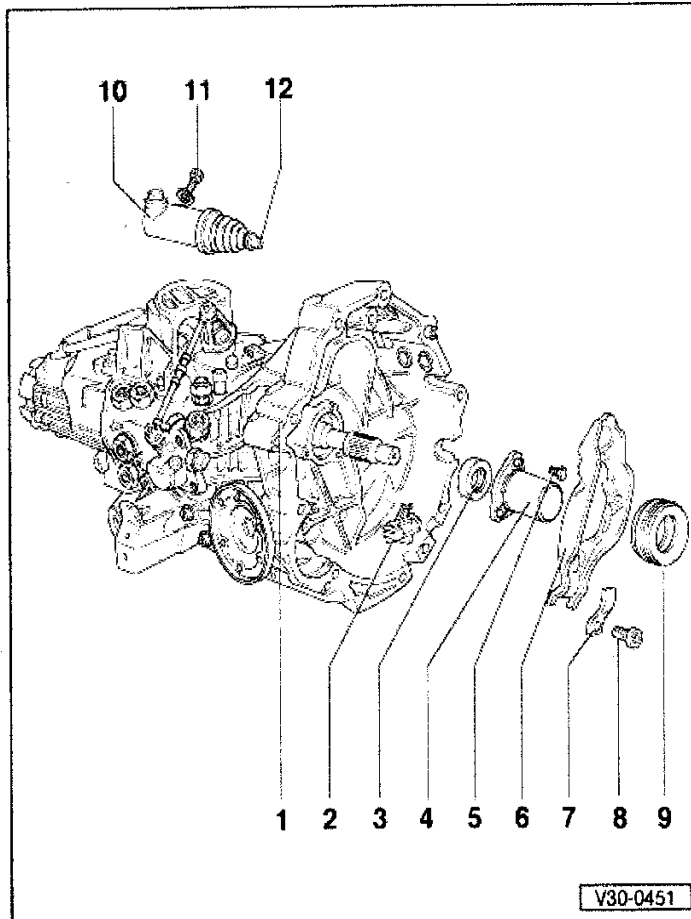
Note:

Ensure bleeder hose is correctly fitted during bleeding operation.

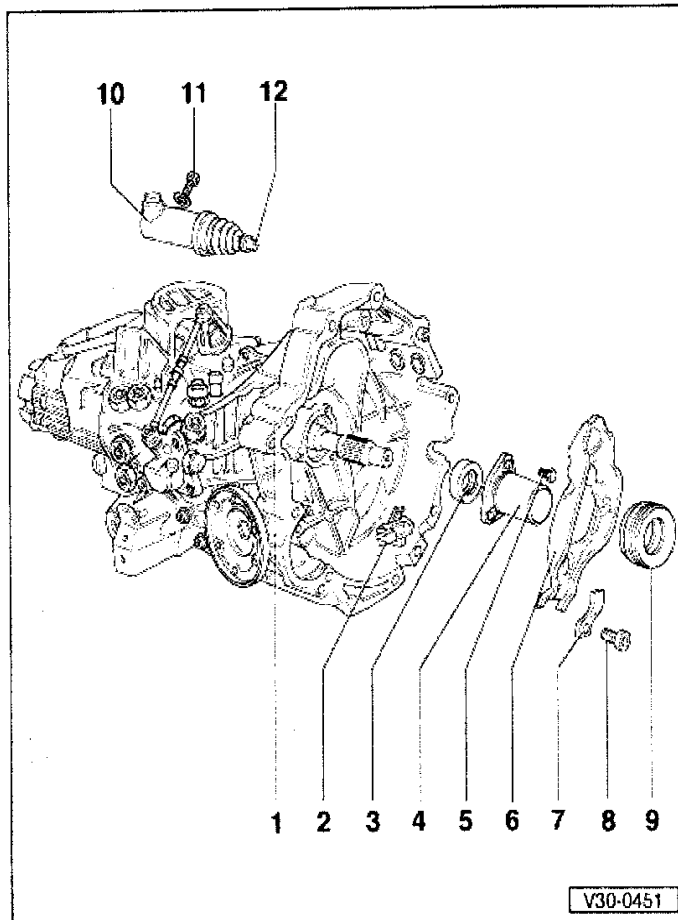
- After completing bleeding operation, depress clutch pedal several times.
- Bleed system again if necessary.

2 - Servicing clutch release mechanism

2.1 - Servicing clutch release mechanism



- 1 Gearbox
- 2 Intermediate piece
- 3 Shaft seal
 - ◆ For input shaft
 - ◆ Removing => Fig. 1
 - ◆ Installing => Fig. 2
 - ◆ Pressed in to a depth of 3.5 mm at the factory
 - ◆ Press in to a depth of 4.5 mm for service replacement
- 4 Guide sleeve
- 5 Bolt - 15 Nm
 - ◆ Qty. 3



6 Clutch release lever

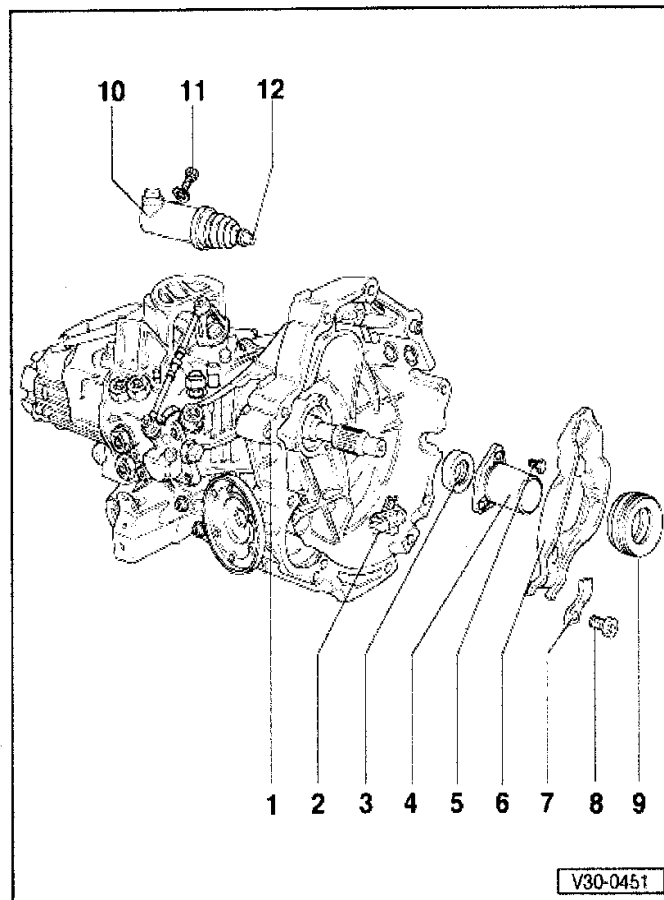
- ◆ Must engage in the lugs in intermediate piece when installed => Fig. 3
- ◆ Before installing, coat clutch slave cylinder push rod contact surface with a thin layer of copper grease, e.g. 381 351 TE

7 Leaf spring

8 Bolt - 25 Nm

9 Release bearing

- ◆ Do not wash out, wipe clean only
- ◆ Renew noisy bearings
- ◆ Fit bearing onto release lever turned approx. 45° to installation position and engage by turning into position



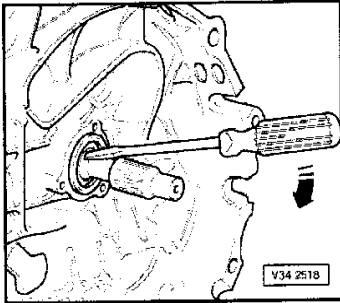
10 Clutch slave cylinder

- ◆ Bleeding clutch system
=> Page 21
- ◆ Removing and installing
=>Page 27
- ◆ When installing, push on until the securing bolt can be fitted
- ◆ To aid installation, the securing bolt with pointed end listed in parts catalogue may be used

11 Bolt - 25 Nm

- ◆ Renew

12 Push rod

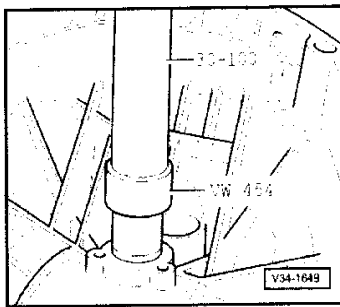


-> Fig.1 Removing shaft seal for input shaft

- Lever seal out carefully with a screwdriver.

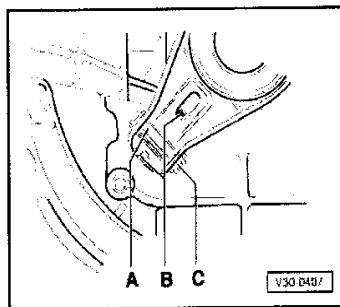
Note:

Do not damage contact surface of shaft seal on input shaft.



-> Fig.2 Installing shaft seal for input shaft

- Pack space between sealing lip and dust lip of new seal for input shaft with multi-purpose grease.
- Fit a thin protective hose tightly over input shaft splines.
- Drive on seal for input shaft.
 - Pressing-in depth: 4.5 mm
- Remove protective hose.



-> Fig.3 Installing clutch release lever

- Fit clutch release lever -A- in intermediate piece -C-, and engage in position (retainer -B- will become visible).

- Insert leaf spring (-item 24) to 25 Nm.

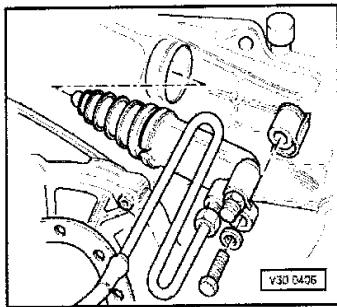
2.2 - Removing and installing clutch slave cylinder

Removing

- Remove selector rod=>Page 39 .
- Disconnect hose/pipe assembly going to clutch slave cylinder at the connection point provided.

Note:

Plug hose connection with dust cap for bleeder valve.



- -> Unscrew retaining bolt for clutch slave cylinder, pull slave cylinder towards the rear and guide out of gearbox housing from the side.

Installing

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

- When inserting the clutch slave cylinder into the mounting hole of the gearbox housing, keep it as far as possible in line with the direction of operation of the push rod.

Notes:

- ♦ If the clutch slave cylinder is inserted off-line there is a danger that the push rod will be guided past the clutch release lever.
- ♦ Pre-tension the clutch slave cylinder far enough for the securing bolt to be easily inserted.
- ♦ Always renew securing bolt. To aid installation, the securing bolt with pointed end listed in parts catalogue may be used.
- Bleed clutch system => page 21 .
- Adjust gear selector mechanism=>Page 42 .

Tightening torques

Component	Nm
Clutch slave cylinder to gearbox	22 1)
Rear selector rod to gear stick	23

- 1) Self-locking bolt, always renew

3 - Servicing clutch

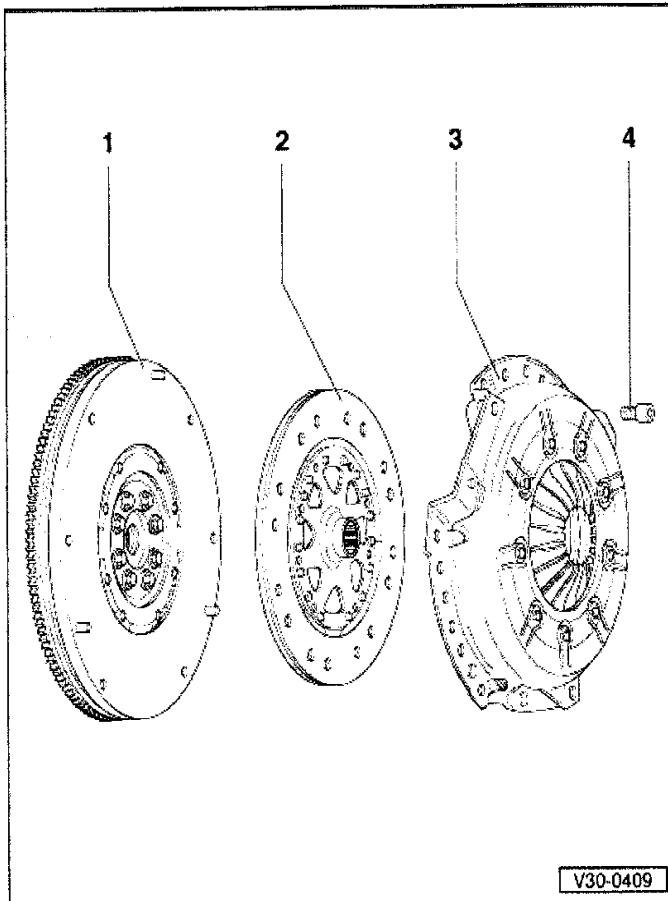
3.1 - Servicing clutch

Notes:

- ◆ Before renewing the clutch plate and pressure plate

=> Fault-finding No. 9 - Defects on the clutch and clutch mechanism

- ◆ Replace clutch plates and pressure plates with damaged or loose rivets.
- ◆ Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease G 000 100 to the splines. Then move clutch plate to and fro on input shaft until hub moves freely on shaft. Excess grease must be removed.
- ◆ Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.
- ◆ If the clutch has burnt out, thoroughly clean the bellhousing, flywheel and parts of the engine facing the gearbox to reduce the smell of burnt linings.

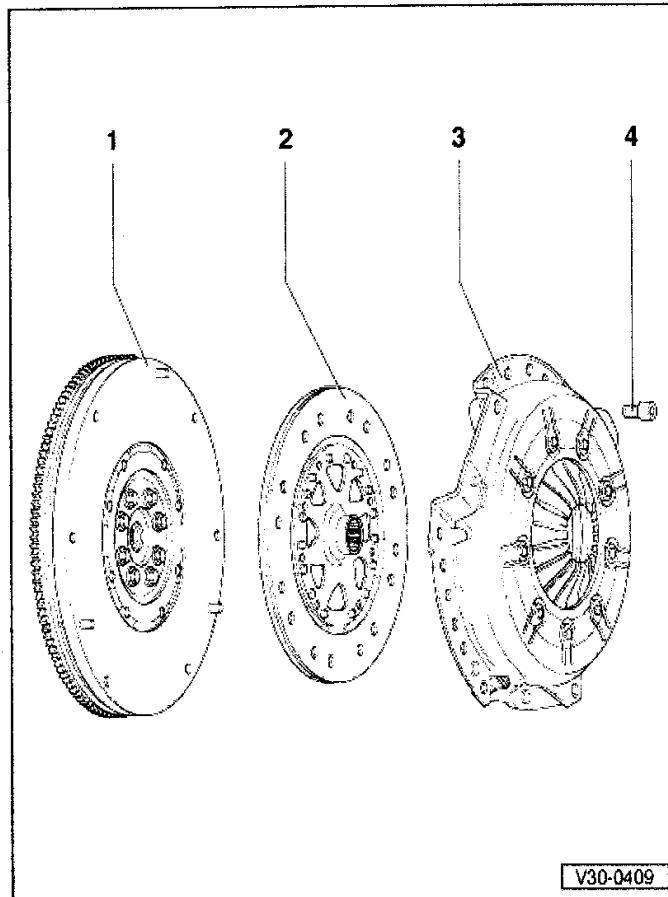


- Remove gearbox to work on clutch => page 44 .

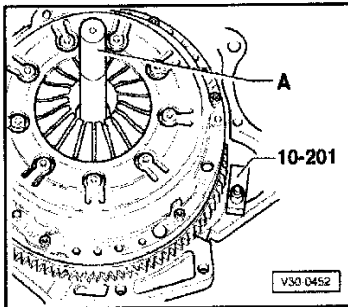
1 Flywheel

- ◆ Ensure centring pins are tightly seated
- ◆ Contact surface for clutch lining must be free of grooves, oil and grease

- ♦ Removing and installing
- ♦ Removing and installing needle bearing in flywheel



- 2 Clutch plate**
- ♦ Installation position: longer side of hub towards pressure plate and gearbox
 - ♦ Centring => Fig. 1
 - ♦ Do not grease
 - ♦ => Notes
 - ♦ Clutch plate diameter
=> from page 2
- 3 Pressure plate**
- ♦ Removing and installing => Fig. 1
 - ♦ Checking ends of diaphragm spring => Fig. 2
 - ♦ Checking spring connection and riveted fastenings => Fig. 3
- 4 Bolt - 25 Nm**
- ♦ Tighten in stages and diagonally



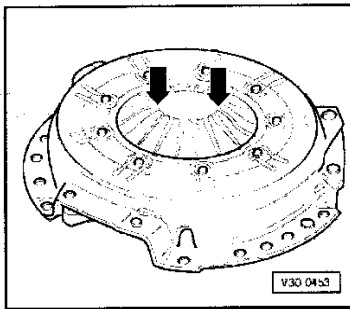
-> Fig.1 Removing and installing clutch

- Loosen and tighten bolts in stages and diagonally - 25 Nm.
- Reverse position of counter-hold tool 10-201 when removing.

A - Centring mandrel 3176

Notes:

- ◆ Clutch lining and contact surface of pressure plate must make full contact with flywheel before securing bolts are inserted.
- ◆ Tighten securing bolts uniformly and in diagonal sequence to avoid damaging centring holes in pressure plate and centring pins on flywheel.

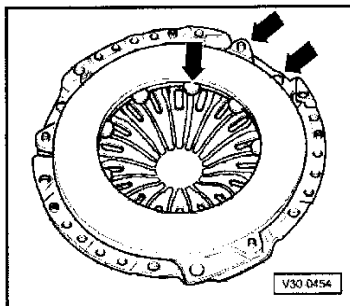


-> Fig.2 Checking ends of diaphragm spring

- ◆ Wear up to half the thickness of the diaphragm spring is permitted

Note:

When performing repairs always match up clutch pressure plate and clutch plate by checking engine code (see parts catalogue).



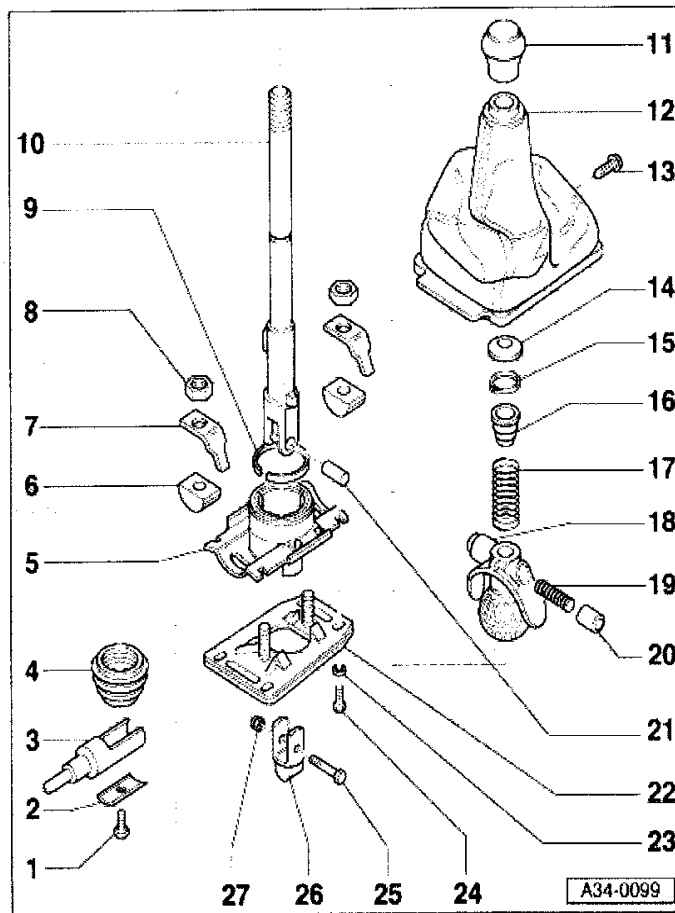
-> Fig.3 Checking spring connection and riveted fastenings

- Check spring connection between pressure plate and cover for cracks and make sure rivet fastenings are seated tightly.
- Renew clutches with damaged springs or loose riveted fastenings -arrows-.

34 - Controls, Housing

1 - Servicing selector mechanism

1.1 - Servicing selector mechanism



1.2 - Removing and installing gear stick

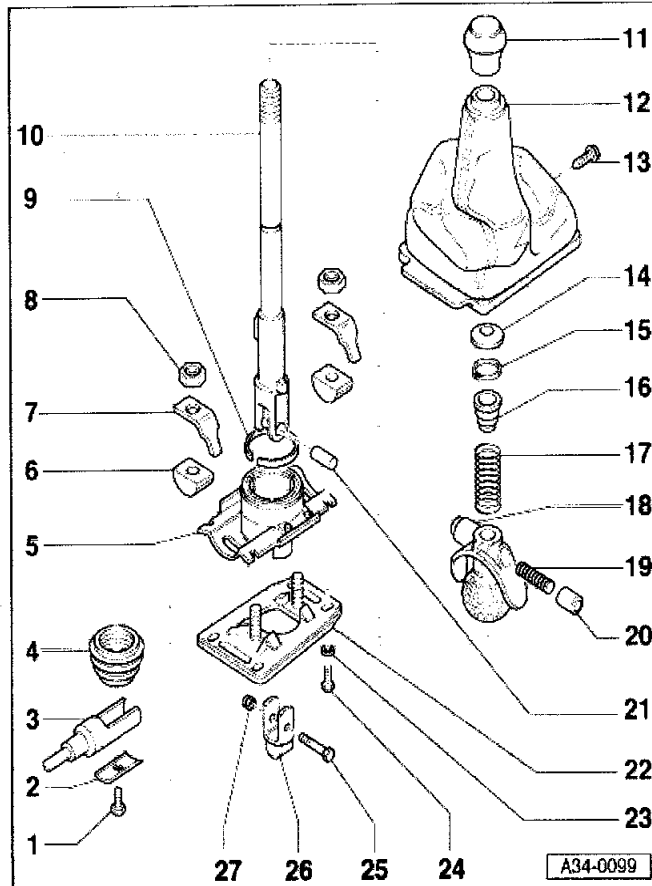
Note:

Adjusting selector mechanism

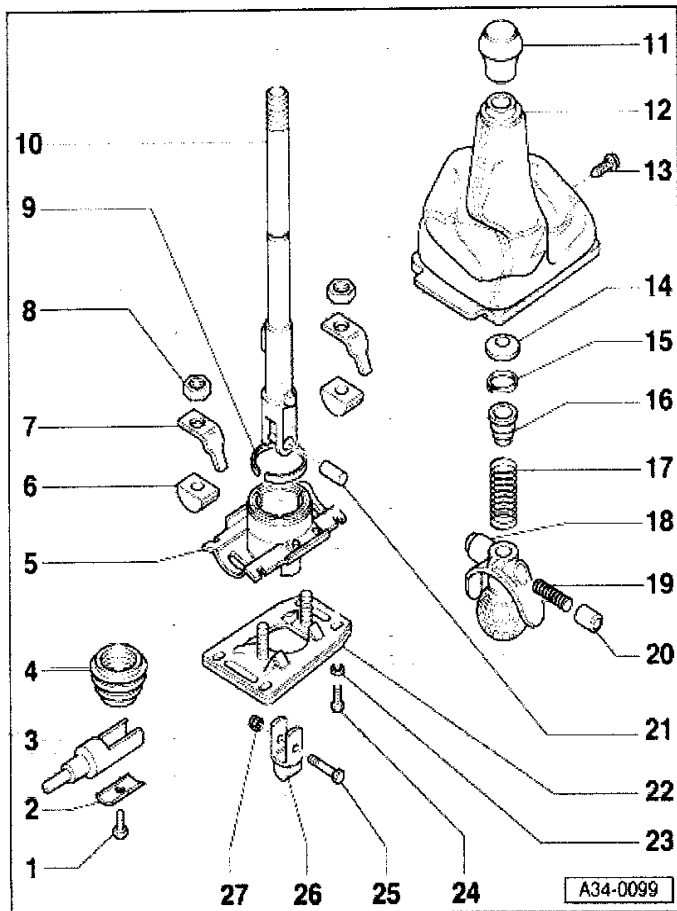
=>Page 42.

- 1 Bolt, 23 Nm
- ♦ On joint
 - ♦ Self-locking

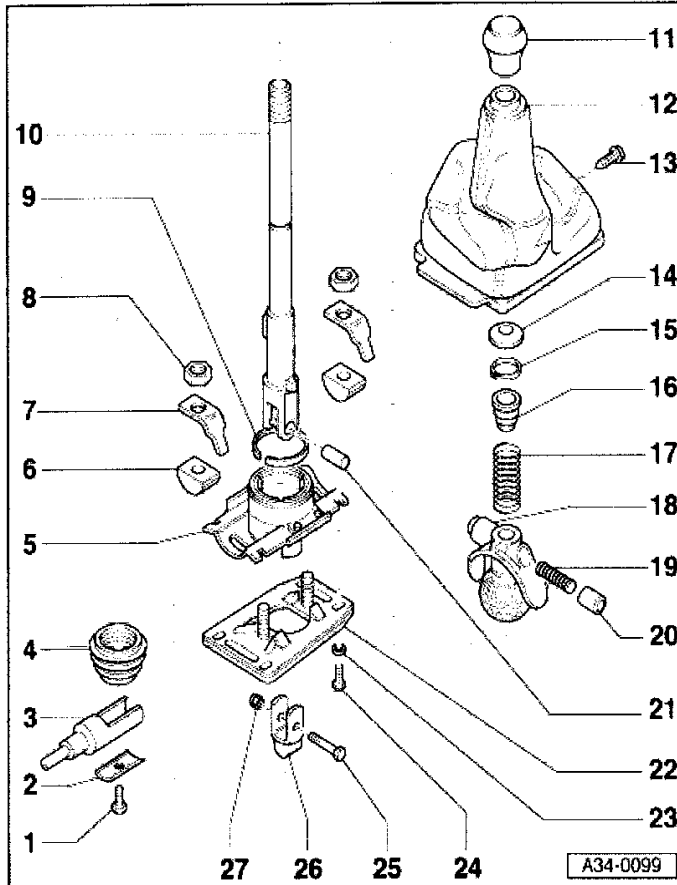
- ♦ Renew
 - ♦ Clean threads in selector fork with tap
- 2 Clamp
3 Rear selector rod



- 4 Sealing collar
- ♦ Engage in gear stick mounting and selector fork
- 5 Ball housing
- ♦ Limit pieces for ball stop on left and right sides must be engaged
 - ♦ Installation position: reverse detent faces left
 - ♦ Lubricate with G 052 142 A2 polycarbamide grease
- 6 Connector
7 Leaf spring
8 Nut - 25 Nm
- ♦ Secures ball housing to to gear stick mounting



- 9 Circlip
 - ◆ Renew
 - ◆ Installation position: rounded side towards ball housing
 - ◆ Remove before taking out ball stop -Item 18 -
- 10 Gear stick
 - ◆ Can only be inserted in ball housing in one position
 - ◆ Lubricate area around bottom drilling with G 052 142 A2 polycarbamide grease
- 11 Gear stick knob
- 12 Gear stick cover
 - ◆ Removing=>Fig. 1
- 13 Bolt
 - ◆ For cover
- 14 Rubber cap
- 15 Circlip
 - ◆ Do not open out too far when fitting



16 Spacer bush

17 Spring

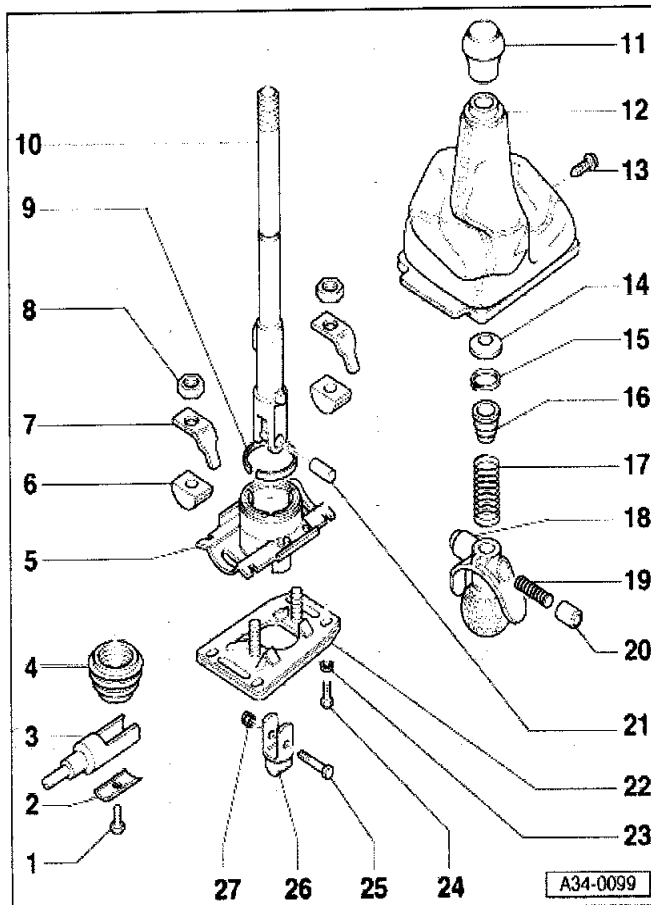
18 Ball stop

- ◆ Insert spring and spacer bush in the ball stop and assemble on the gear stick so that the spring and bush are on the right.
- ◆ Install ball stop before fitting circlip -Item 9 -
- ◆ Lubricate ball with G 052 142 A2 polycarbamide grease

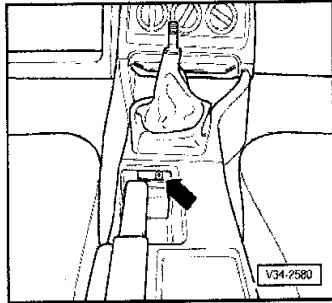
19 Spring

20 Bush

- ◆ Installation position: rounded part towards gear stick
- ◆ Lubricate with G 052 142 A2 polycarbamide grease



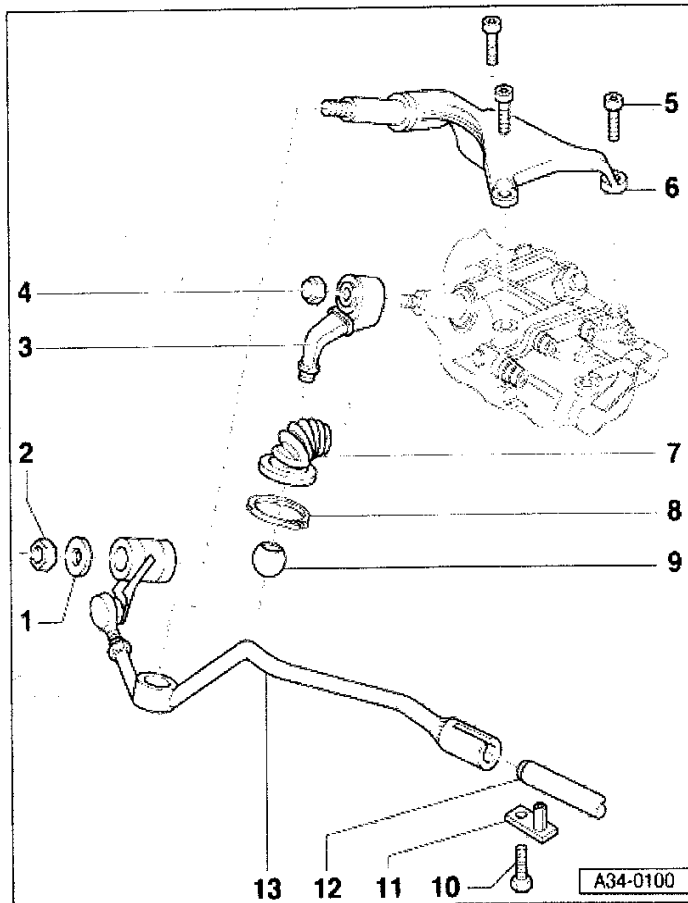
- 21 Spacer tube
 - ◆ Lubricate with G 052 142 A2 polycarbamide grease
- 22 Gear stick mounting
 - ◆ Apply AKD 512 000 05 sealant between gear stick mounting and floor panel
- 23 Washer
- 24 Bolt - 10 Nm
 - ◆ Secures gear stick mounting
- 25 Bolt
 - ◆ Secures selector fork
- 26 Selector fork
 - ◆ Lubricate with G 052 142 A2 polycarbamide grease
- 27 Nut - 10 Nm
 - ◆ Secures selector fork



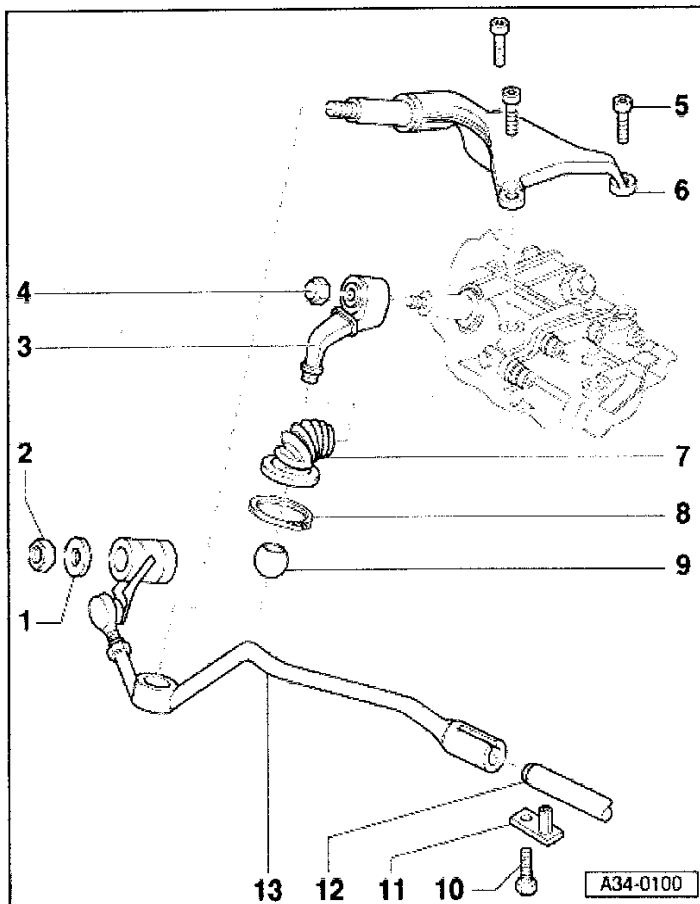
-> Fig.1 Removing gear stick cover

- Unscrew gear stick knob.
- Detach cap on centre console.
- Remove screw -arrow- for cover.
- Lift off the cover.

1.3 - Removing and installing selector rod - assembly overview



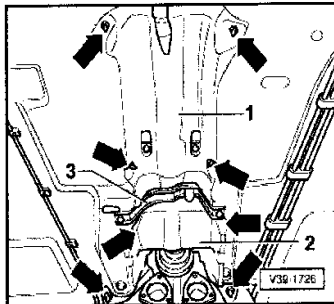
- 1 Washer
- 2 Nut - 10 Nm
 - ◆ Self-locking
 - ◆ Renew
- 3 Gear selector lever
- 4 Cap nut - 23 Nm
- 5 Cheese-head bolt - 35 Nm
- 6 Support bracket
- 7 Sealing collar
- 8 Securing ring
 - ◆ For sealing collar



- 9 Ball
- ♦ For selector joint
 - ♦ Secure to gear selector lever.
- Tightening torque: 40 Nm
- 10 Bolt - 23 Nm
- 11 Clamp
- 12 Rear selector rod
- 13 Front selector rod

1.4 - Removing and installing selector rod

- Gearbox installed

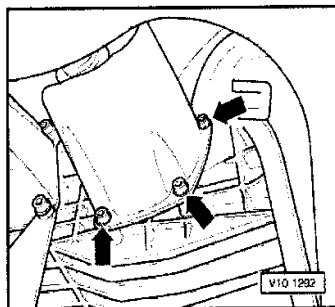


Removing

- Remove exhaust system parts behind catalytic converters

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

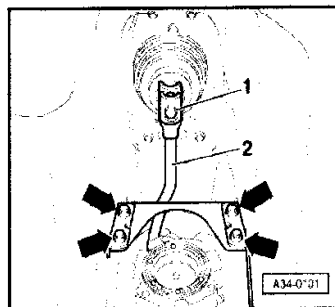
- -> Remove heat shields -1- and -2- -arrows.
- Unbolt cross member -3- below propshaft.
- Remove propshaft => Page 190 .



- Remove left-hand catalytic converter:

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Remove heat shield for left drive shaft -arrows-.
- Remove noise insulation above left drive shaft.
- Remove left gearbox support.
- Unscrew nut for front selector rod at support bracket.
- Unscrew cap nut for gear selector lever.



- -> Unbolt tunnel support -arrows-.
- Remove bolt -1- for rear selector rod -2- at base of gear stick.

Installing

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

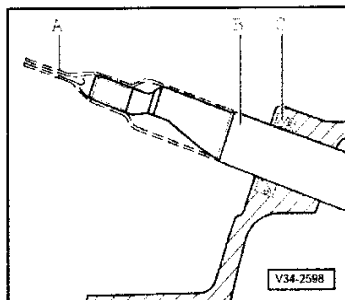
- Adjusting selector mechanism=>Page 42 .

Tightening torques

Component	Nm
Tunnel support to body	23
Front selector rod to support bracket	10
Gear selector lever to gearbox	23
Rear selector rod to gear stick	23
Gearbox support to subframe	40
Gearbox support to gearbox	40

1.5 - Renewing shaft seal for selector shaft

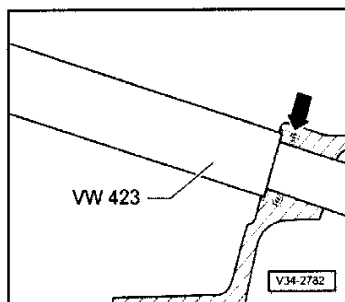
- Gearbox removed but not dismantled



- -> Carefully lever out shaft seal -C- with a small screwdriver.
- Slide assembly sleeve -A-, Part No. 01E 311 120, over selector shaft -B-.

Notes:

- ◆ Lightly oil outside circumference of seal.
- ◆ Pack space between sealing lip and dust lip with multipurpose grease.
- ◆ Always use fitting sleeve to install shaft seal.

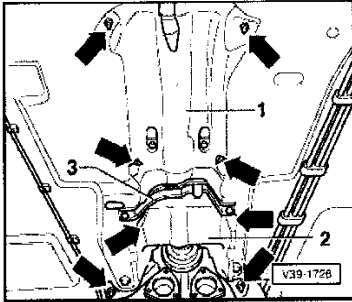


- -> Drive new shaft seal -arrow- into housing onto stop with press piece VW 423.

2 - Adjusting and checking selector mechanism

2.1 - Adjusting and checking selector mechanism

- Gearbox in neutral.

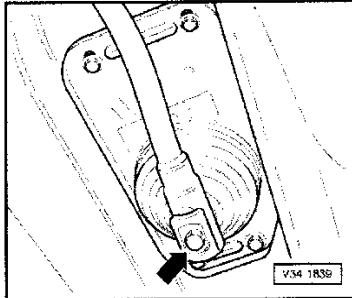


Adjusting gear stick

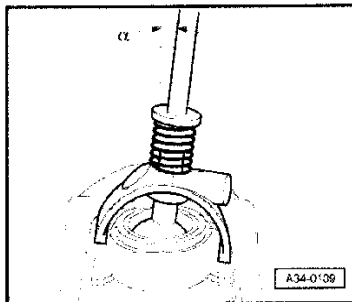
- Remove exhaust system parts behind catalytic converters

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Remove heat shield -2- -arrows-.
- Remove gear stick knob and gear stick cover.



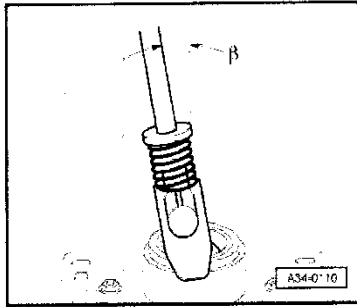
- -> Slacken securing bolt -arrow- for selector rod.



- Adjust gear stick as follows:
 - -> Gear stick at an angle of 5° to the right (angled)

Note:

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



- -> Gear stick at an angle of 7° to the rear (angleβ)

Note:

The illustration shows the gear stick from the right.

- Hold gear stick in this position (second mechanic required).
- Tighten selector rod bolt below vehicle to 23 Nm.

Note:

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

2.2 - Checking gear stick setting

- Check operation of 1st and 2nd gear stop.
- Engage 2nd gear and push gear stick to the left against the stop.
- Reduce pressure on gear stick until it moves back to pressure point.
 - Spring-back measured at gear stick knob: 3 ... 5 mm
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
 - It must be possible to move the gear stick, without pushing and without force, forwards from the reverse gear lock to the 3rd/4th gear plane
- If the gear stick setting is incorrect it can be adjusted as follows:
 - Slacken bolts for ball housing.
 - With gear stick pressed downwards, move it to the left as far as the reverse gear stop in the gearbox, and hold it in this position.
 - Push the ball housing to the right against the gear stick.
 - Hold gear stick in this position and tighten ball housing bolts.
 - Install gear stick cover and knob.
 - Align exhaust system free of stress

=> Avant RS2; Repair group 26; Aligning exhaust system free of stress

3 - Removing and installing gearbox

3.1 - Removing and installing gearbox

Special tools, testers and auxiliary items required:

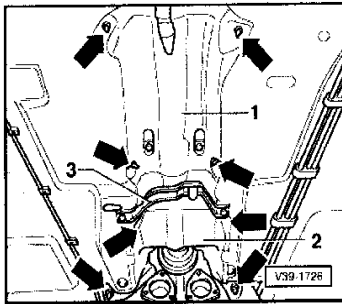
- Engine support bracket 10-222 A
- Gearbox support 3282
- Adjustment plate 3282/12
- Gearbox jack V.A.G 1383 A

Removing

Note:

Obtain anti-theft code for radio before disconnecting the battery.

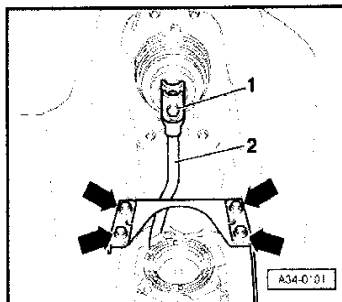
- Remove battery cover.
- Disconnect battery earth strap.
- Remove air cleaner housing cover with air mass meter.
- Detach lower section of air cleaner housing.
- Remove noise insulation below engine compartment and unbolt noise insulation bracket.



- Unbolt exhaust system with catalytic converters from front exhaust pipe and remove

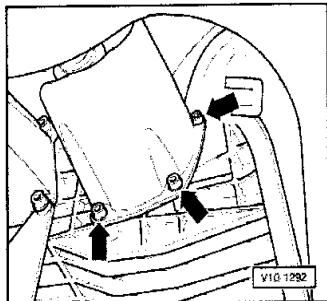
=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Unbolt heat shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.
- Remove propshaft => Page 190 .



- -> Unbolt tunnel support -arrows-.
- Unscrew bolt -1- for rear selector rod -2- at base of gear stick.

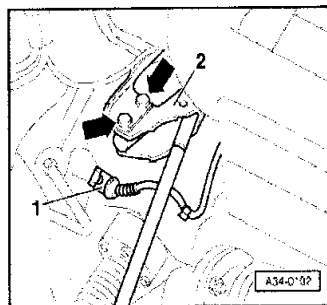
- Unbolt selector rod from gearbox=>Page 39 and remove.



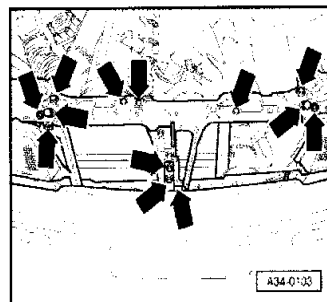
- Remove noise insulation covers above left and right drive shafts.
- -> Remove left and right heat shields for drive shafts -arrows-.
- Remove right drive shaft; unbolt left drive shaft at gearbox, move clear to the rear and tie up

=> Running gear, Four-wheel drive; Repair group 40; Removing and installing suspension strut and drive shaft
 Removing and installing suspension strut and drive shaft

- Pull connector off speedometer sender above left drive shaft flange and move wiring clear.



- -> Unplug connector -1- for reversing light switch and move wiring clear.
- Unscrew bottom nuts on actuator for track rods -2-.
- Pull out bolts -arrows-.
- Press actuator with track rods upwards.
- Unscrew engine/gearbox securing bolts accessible from above.
- Press bracket for coolant pipe upwards.

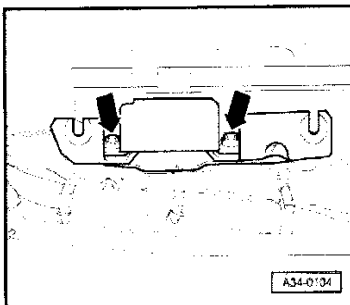


- -> Remove lock carrier support:
 - Slacken bolts -arrows-.
 - Detach radiator air cowls.
 - Using a small screwdriver, unclip bonnet lock cable from retainers.

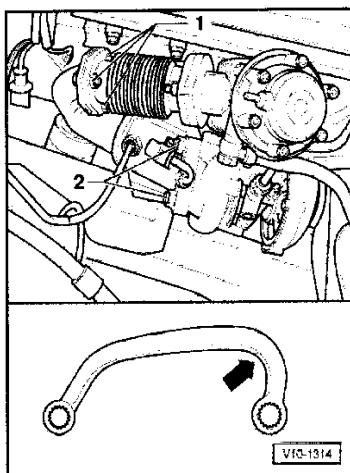
- Slacken bottom nuts on auxiliary radiator two turns and place auxiliary radiator on bumper without opening connections.

Note:

Cover the bumper to prevent damage.



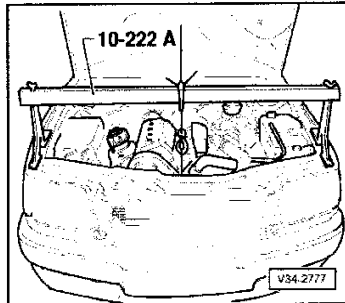
- -> Unbolt stop for torque reaction support -arrows-



- Unplug connector for lambda probe and move wiring clear.
- -> Unbolt three bolted mountings -1- on corrugated pipe.
- Unscrew 4 nuts -2- on flange between turbocharger and front exhaust pipe.

Notes:

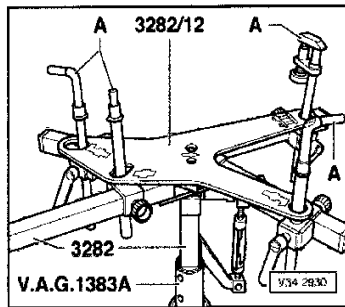
- ♦ To loosen the bottom rear nut on the flange between the turbocharger and the front exhaust pipe, bend a flat ring spanner (15 mm AF) to the required shape -arrow in lower part of illustration-.
- ♦ The other nuts on the flange (turbocharger/front exhaust pipe) are 17 mm AF.
- Remove the front exhaust pipe from underneath.



- -> Set up engine support bracket 10-222 A and take up weight of engine by turning spindle.

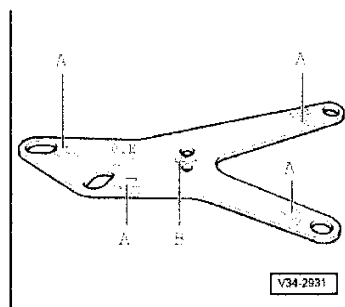
Note:

Do not place support bracket 10-222 A on headlights.



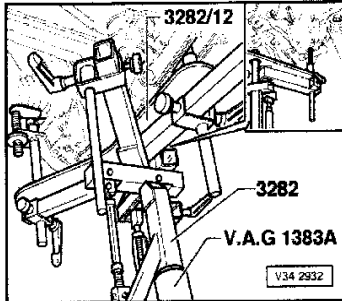
- -> Prepare gearbox support 3282 for removing manual gearbox 01E (four-wheel drive) with adjustment plate 3282/12, and place support on gearbox jack V.A.G. 1383 A.

A - Attachments

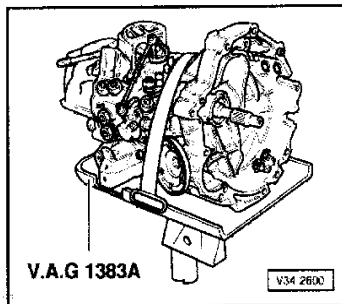


Notes:

- ♦ -> The positions for the attachments are indicated by symbols (-A-). Arrow -B- points in the direction of travel.
- ♦ Adjustment plate 3282/12 can only be fitted in one position.
- ♦ The elongated holes in adjustment plate 3282/12 allow for different versions of the gearbox housing and gearbox cover.



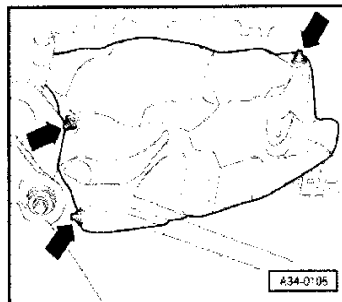
- -> Run gearbox jack V.A.G 1383 A with gearbox support 3282 in under the gearbox and take up the weight of the gearbox.
- Secure gearbox to gearbox support 3282.



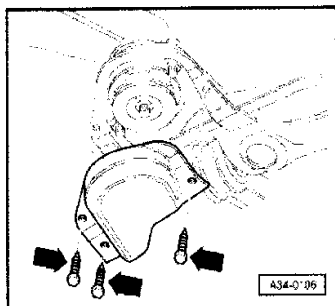
Note:

If gearbox support 3282 is not available, the gearbox can be removed and installed using gearbox jack V.A.G 1383 A.

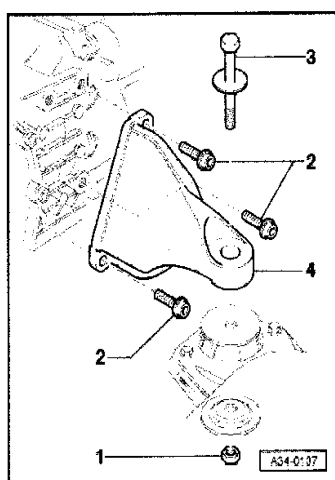
- -> Support gearbox with gearbox jack V.A.G 1383 A.



- -> Remove heat shield on right-hand side of tunnel -arrows-.



- -> Remove heat shields for left and right bonded rubber mountings -arrows-.



- -> Remove nuts and bolts -1 - 3- for gearbox support on left -4- and right; remove gearbox supports.

Note:

Illustration shows left gearbox support from above.

- Unbolt bottom engine/gearbox securing bolts=>Page 50 .
- Place starter motor on subframe and secure with wire to prevent it dropping.
- Lower gearbox jack; at the same time engine support 10-222 A must be readjusted to take up weight (second mechanic required, using a step ladder).
- Lower gearbox slightly until the slave cylinder is just accessible.

Note:

When lowering gearbox ensure hydraulic pipe/hose to slave cylinder is not damaged.

- Remove clutch slave cylinder=>Page 27 . Do not disconnect pipe.

Note:

Do not depress clutch pedal after removing slave cylinder.

- Remove cable holder and cables for procon-ten from gearbox

=> General body repairs; Repair group 68; Repairing procon-ten system, left-hand drive ä 06.94
 Repairing procon-ten system, left-hand drive ä 06.94

- Press gearbox off dowel sleeves and carefully lower with V.A.G 1383 A.
- Lower gearbox completely.

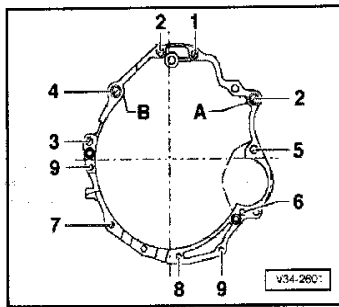
Installing

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

- Before installation it is important to use a tap to clean out the locking fluid left in the threads in the propshaft drive flanges on the gearbox and rear final drive and in the thread of the clutch slave cylinder mounting.
- Check whether dowel sleeves for aligning gearbox with engine are in the gearbox flange. Insert if necessary => Page 50 .
- Renew gaskets at propshaft mountings=>Page 189 and drive shaft mountings.
- Install propshaft => Page 195 .
- Ensure adequate clearance between front exhaust pipe and subframe, and align exhaust system free of stress

=> Avant RS2; Repair group 26; Aligning exhaust system free of stress

- Check oil level in gearbox =>Page 51 .
- Install clutch slave cylinder=>Page 27 .
- Adjust selector mechanism=>Page 42 .



Tightening torques

-> Engine/gearbox mountings

Item No.	Bolt	Qty	Nm
1	M12 x 67	1	65
2	M12 x 80	2	65
3	M12 x 80	1	65
4	M12 x 110	1	65
5	M12 x 110	1	65
6	M10 x 135	1	45
7	M10 x 50	1	45
8	M10 x 45	1	45
9 1)	M8 x 40	2	25

1) Tightening torque for M10 x 45 bolt: 45 Nm

A and B are centring sleeves

Note:

When installing an exchange gearbox with the newer type of gearbox housing, it may be necessary to fit an M10 bolt in place of the M8 bolt near the sump. To do this, drill out the hole in the sump to 11.5 mm dia. Use the M10 bolt specified in the Parts List: tightening torque 45 Nm.

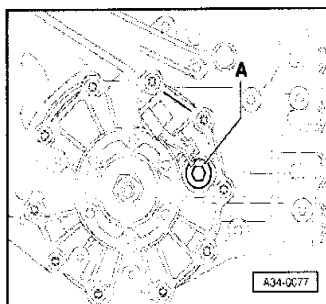
Component	Nm
Clutch slave cylinder to gearbox	25
Gearbox support to subframe	40
Gearbox support to gearbox	40
Drive shaft to flange shaft M10	80
Heat shield for drive shaft	25
Torque reaction support to body	40
Clamp on front selector rod to rear selector rod	23
Propshaft to gearbox and final drive M8	55
Propshaft centre bearing to body	23
Propshaft heat shield to gearbox	25
Tunnel support to body	23

4 - Checking oil level in gearbox

4.1 - Checking oil level in gearbox

Notes:

- When checking the oil level in the gearbox, the vehicle should be standing on a perfectly horizontal surface. An inspection pit or a 4-post lifting platform is ideal.
- The prescribed oil level is to be adhered to exactly; the gearbox reacts very sensitively to over-filling.



- -> To check gearbox oil level, unscrew oil filler plug -A- (behind flange shaft).
- Check oil level with a suitable tool (such as a length of wire bent to shape).

Audi 80 S2:

- Specification: oil level 7 mm below bottom edge of oil filler hole.

Audi Avant RS2:

- Specification: oil level 16 mm below bottom edge of oil filler hole.
- Top up gear oil if necessary. Specification=>Page 2 .
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40

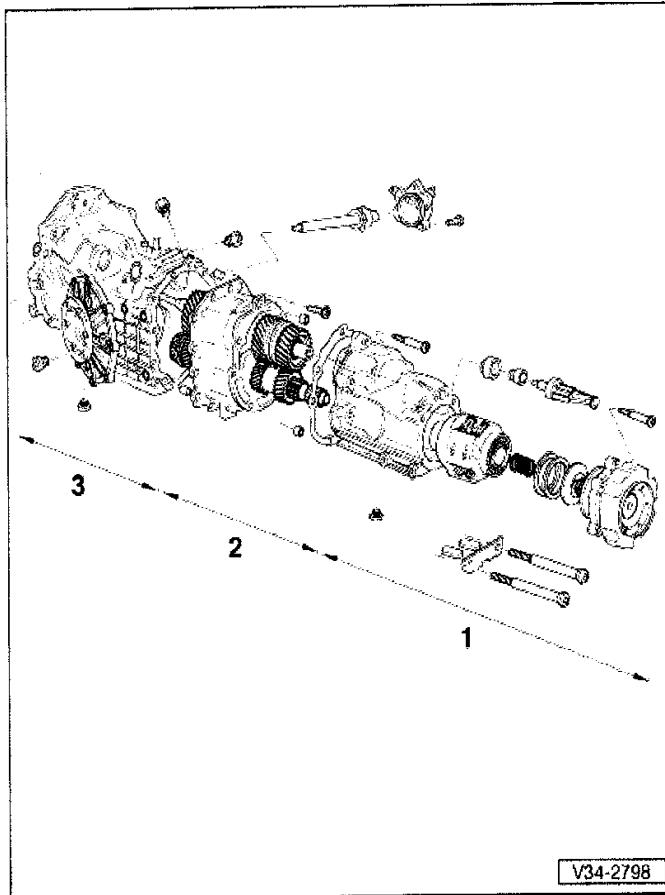
5 - Dismantling and assembling gearbox

5.1 - Dismantling and assembling gearbox

Work sequence=>Page 65.

Notes:

- ♦ In gearboxes with code letters CGR from serial No.77644onwardsand in gearboxes with code letters CRB the 1st speed gear=>Page 107.
- ♦ Mixed installation of components belonging to old and new versions is not permissible.



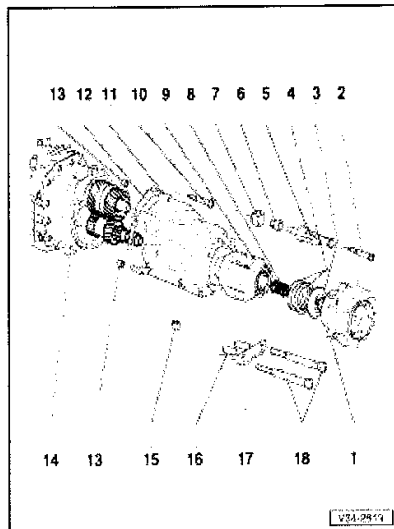
1 Bearing housing, Torsen differential and end cover

- ♦ Removing and installing
=>Page 53

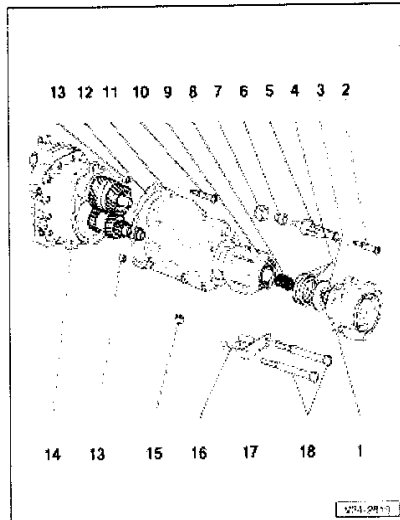
2 Gearbox and selector shaft

- ♦ Removing and installing
=>Page 56
- 3 Differential
 - ♦ Removing and installing
=>Page 160

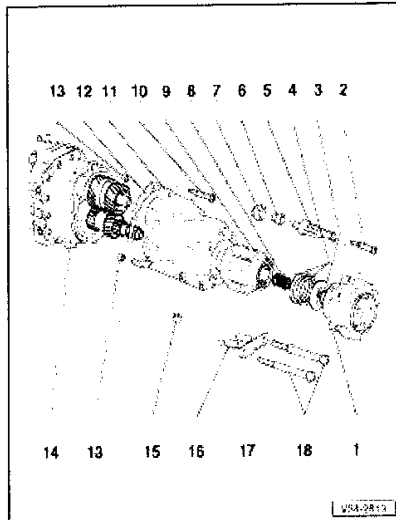
5.2 - Removing and installing bearing housing, Torsen differential and end cover



- 1 Bearing housing
 - ♦ Dismantling and assembling
=>Page 86
- 2 Bolt - 25 Nm
 - ♦ Qty. 6
- 3 Dished spring
 - ♦ Installation position: larger diameter (concave side) faces shims
- 4 Washer
 - ♦ Qty. 2 or 3
 - ♦ Re-determining shims =>Page 84
- 5 Oil collector
 - ♦ Dismantling and assembling
=>Page 83
 - ♦ Removing =>Page 66
 - ♦ Installing =>Page 83

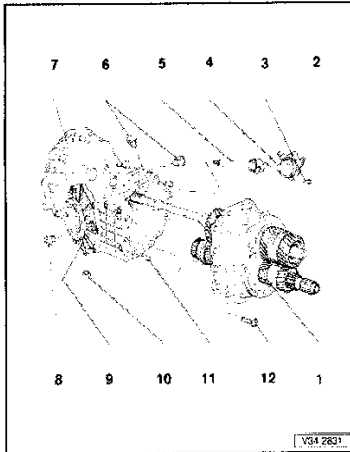


- 6 Multi-point socket head bolt -
150 Nm
 - ♦ Removing =>Page 68
 - ♦ Installing =>Page 83
- 7 2nd inner race for taper roller bearing for input shaft
 - ♦ Removing =>Page 68
 - ♦ Installing =>Page 82
- 8 Spring
- 9 Torsen differential
 - ♦ Can be serviced only by manufacturer
 - ♦ Servicing bearings for Torsen differential =>Page 91
- 10 Bolt - 25 Nm
 - ♦ Qty. 5
- 11 End cover
 - ♦ Servicing =>Page 95



- 12 Gasket
 - ◆ Renew
- 13 Dowel sleeve
 - ◆ Qty. 2
- 14 Gearbox
 - ◆ Removing and installing
=>Page 44
- 15 Oil drain plug - 40 Nm
- 16 Magnet
 - ◆ Qty. 2
 - ◆ Clean
- 17 Support plate
 - ◆ Installation position: lugs face magnets
- 18 Bolt - 25 Nm
 - ◆ Qty. 2

5.3 - Removing and installing gearbox and selector shaft



1 5th and 6th gear

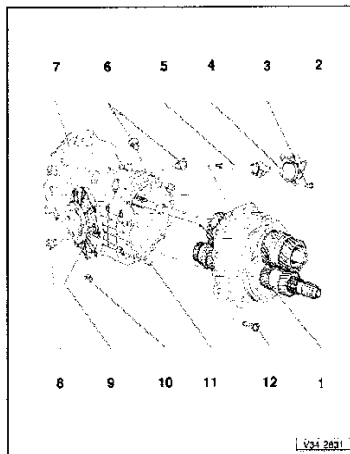
- ◆ Gearbox remains flanged to gearbox housing
- ◆ Removing and installing
=>Page 58

2 Bearing plate (complete)

- ◆ Modified bearing plate in CGR gearbox from serial No. 77644 and in CRB gearbox
- ◆ Removing and installing input shaft, drive pinion, hollow shaft and internal selector mechanism =>Page 62

3 Bolt - 25 Nm

- ◆ Qty. 3
- ◆ Inserted with sealing paste AMV 188 200 03



4 Cover for selector shaft

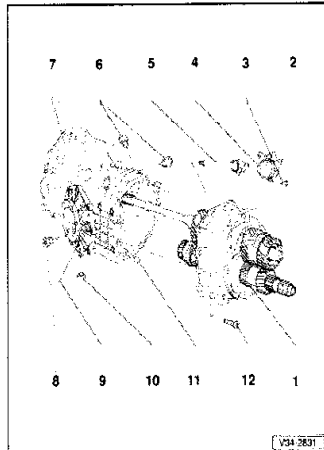
- ◆ Removing =>Page 67
- ◆ Installing =>Page 84

5 Selector shaft complete

- ◆ Removing =>Page 67
- ◆ Installing =>Page 84
- ◆ Dismantling and assembling
=>Page 124

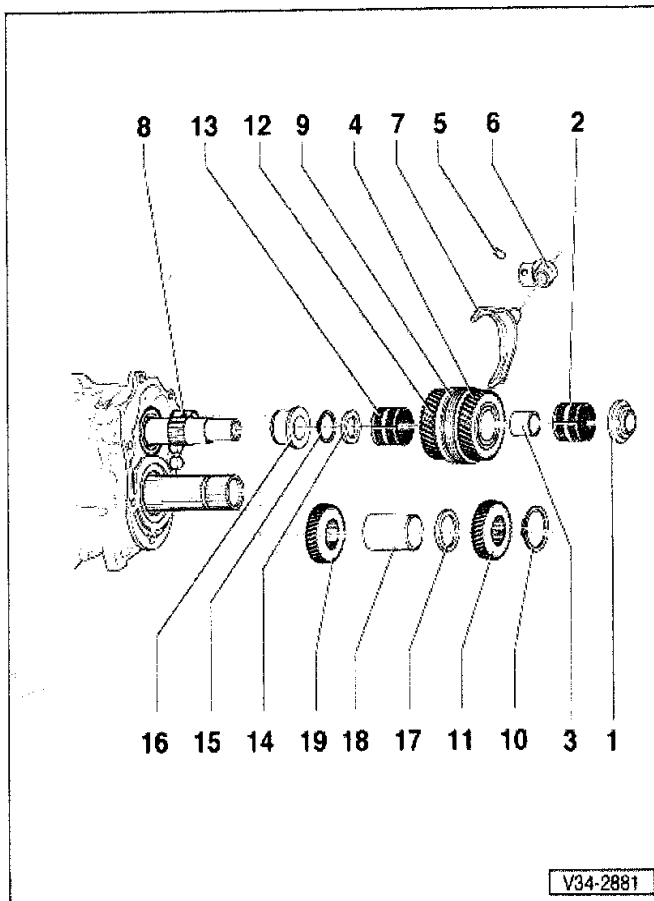
6 Locking bolt

- ♦ For aluminium bolt: 50 Nm
 - ♦ For steel bolt: 70 Nm
 - ♦ Mark installation positions of aluminium bolts and steel bolts; do not interchange
- 7 Gearbox housing
- ♦ Servicing =>Page 112
- 8 Oil filler plug - 40 Nm

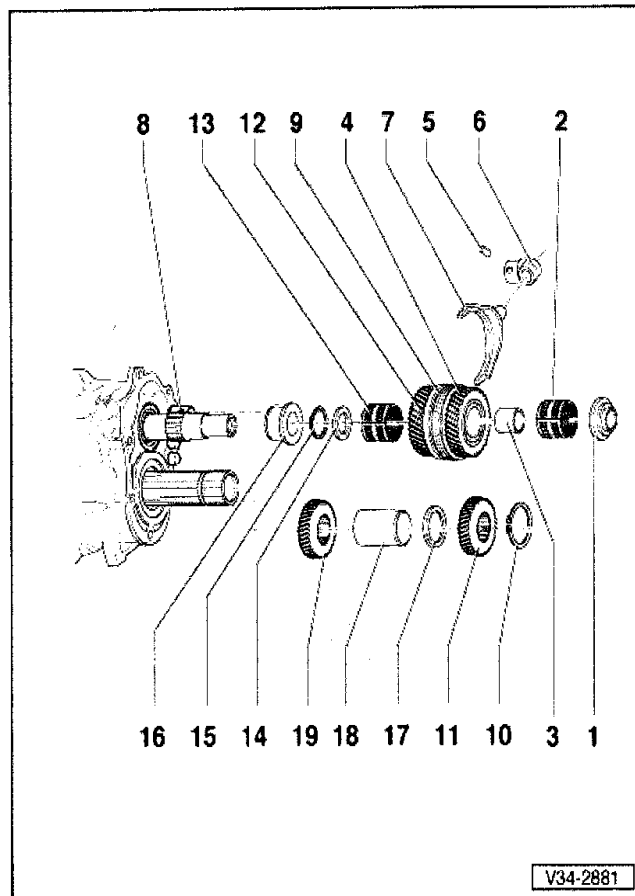


- 9 Differential
- ♦ Removing and installing
=>Page 160
- 10 Oil drain plug - 40 Nm
- 11 Dowel sleeves
- ♦ Qty. 2
- 12 Bolt - 25 Nm
- ♦ Qty. 12

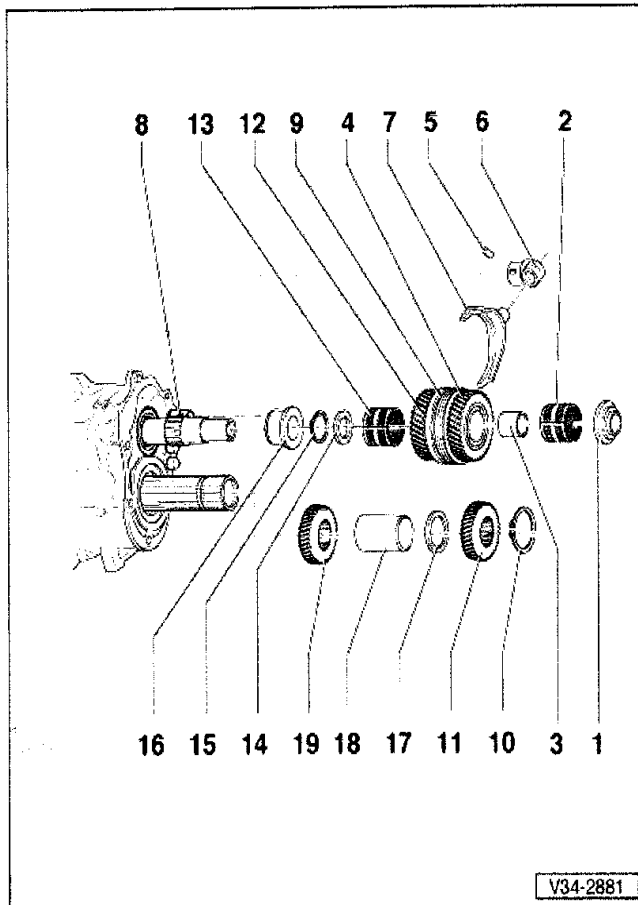
5.4 - Removing and installing 5th and 6th gear



- 1 1st inner race for taper roller bearing for input shaft
 - ◆ Pulling off =>Page 69
 - ◆ Installing =>Page 82
- 2 Needle bearing for 5th gear
- 3 Inner race for 5th speed sliding gear
 - ◆ Pulling off =>Page 70
 - ◆ Driving on =>Page 81
- 4 5th speed sliding gear
 - ◆ Pulling off =>Page 69
 - ◆ Installing =>Page 81
- 5 Roll pin
 - ◆ Pressing out =>Page 69
 - ◆ Pressing in =>Page 79



- 6 Follower
 - ◆ Only renew complete with selector rod for 5th and 6th gear -item 8 -
 - ◆ Pulling off =>Page 70
 - ◆ Fitting =>Page 79
- 7 Selector fork for 5th and 6th gear
 - ◆ Can be renewed individually
- 8 Selector rod for 5th and 6th gear
 - ◆ Only renew complete with follower -item 6 -
 - ◆ Removing =>Page 69
 - ◆ Installing =>Page 76
- 9 Locking collar, synchro-ring, synchro-hub for 5th and 6th gear
 - ◆ Removing =>Page 70
 - ◆ Installing =>Page 79



10 Circlip

- ◆ Re-determining =>Page 81

11 5th speed gear

- ◆ Pulling off =>Page 69
- ◆ Pressing on =>Page 80

12 6th speed sliding gear

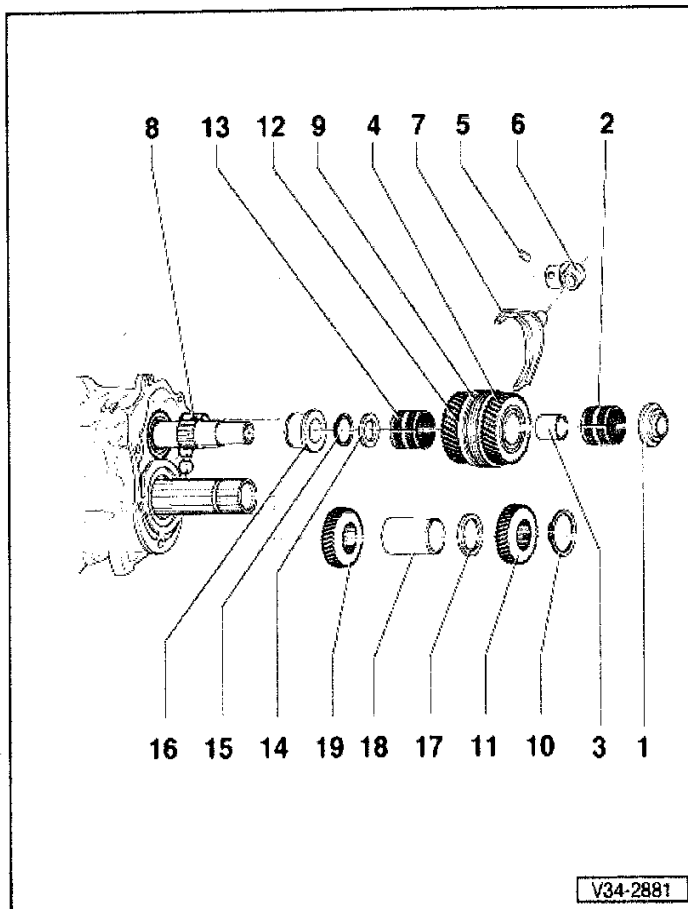
- ◆ Pull off together with synchro-hub and inner race for 5th gear
=>Page 70

13 Needle bearing for 6th gear

14 Thrust washer for needle bearing for 6th gear

- ◆ Installation position: grooves face circlip, smooth face contact surface towards needle bearing

15 Circlip



16 Inner race for cylinder roller bearing

- ◆ Take off by hand =>Page 72
- ◆ Width is changed in CGR gearbox from serial No. 77644 and in CRB gearbox. Allocation=>Fig. 138

17 Shim

- ◆ Re-determining thickness
=>Page 80

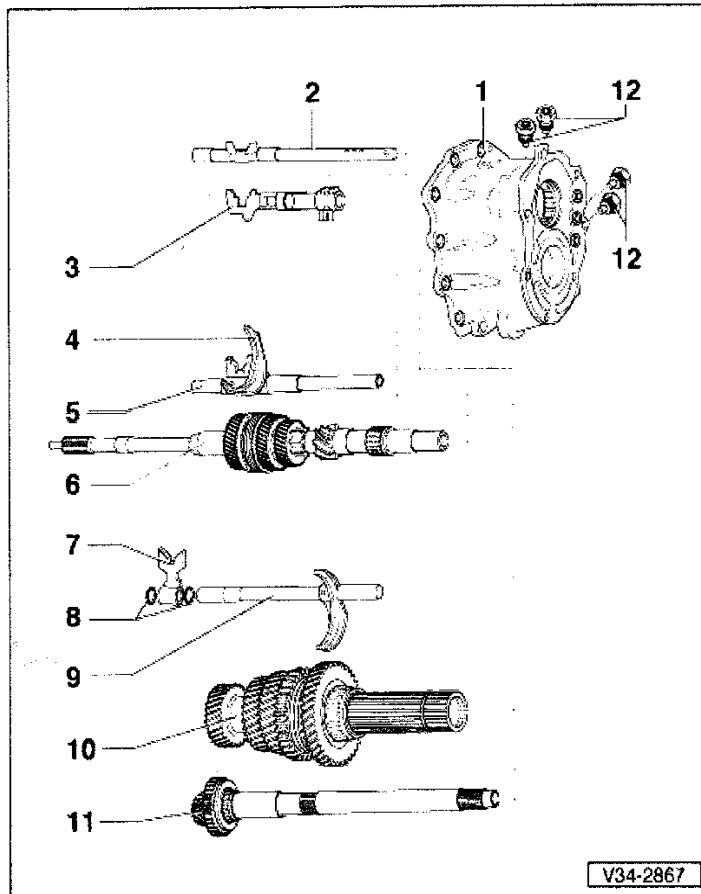
18 Spacer sleeve

- ◆ Length 39.6 mm

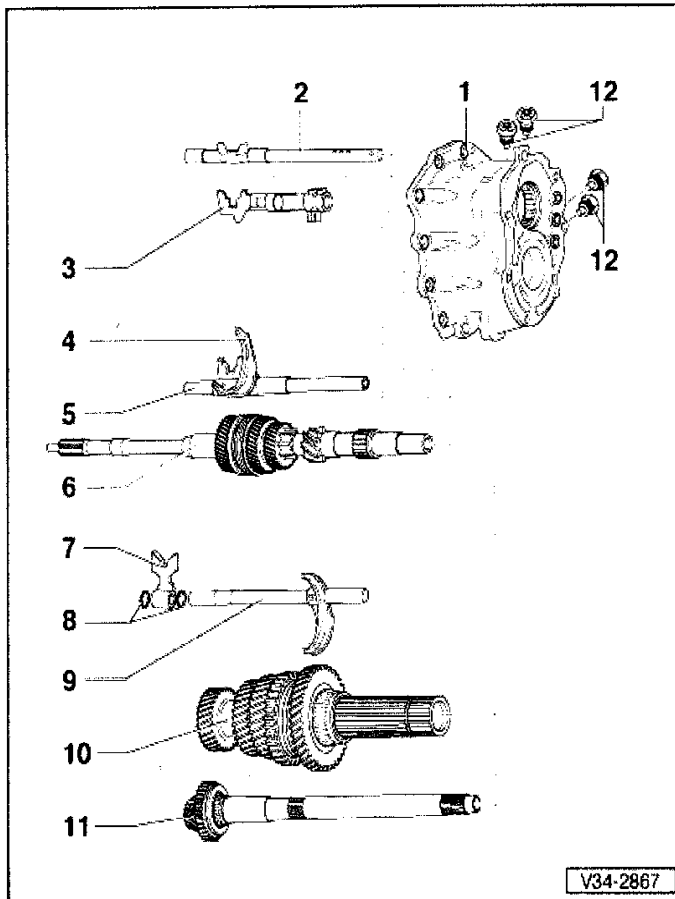
19 6th speed gear

- ◆ To press off, remove bearing plate =>Page 71
- ◆ Pressing off =>Page 73
- ◆ Pressing on =>Page 74

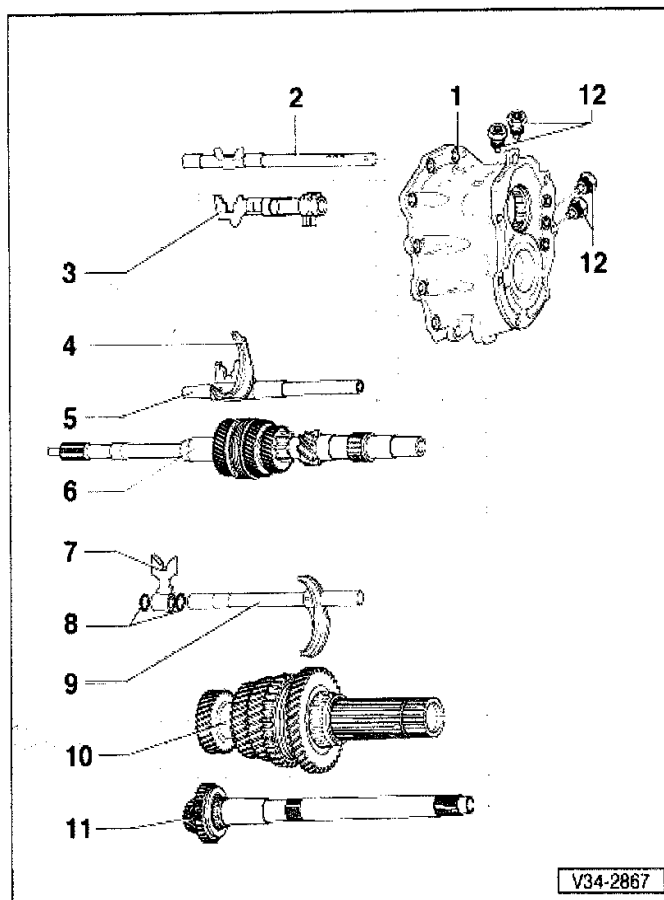
5.5 - Removing and installing input shaft, drive pinion, hollow shaft and internal selector mechanism from bearing plate



- 1 Bearing plate
 - ♦ Modified bearing plate in CGR gearbox from serial No. 77644 and in CRB gearbox
 - ♦ Servicing =>Page 101
- 2 Selector rod for 5th and 6th gear
 - ♦ Only renew complete with follower for 5th and 6th gear =>Page 59
- 3 Follower for reverse gear
 - ♦ Pulling out ball sleeve =>Fig. 106
 - ♦ Driving in ball sleeve =>Fig. 106



- 4 Selector fork for 3rd and 4th gear
 - ◆ Can be replaced individually
 - ◆ Installation position: rib towards follower
- 5 Selector rod for 3rd and 4th gear
 - ◆ Only renew complete with follower for 3rd and 4th gear
- 6 Input shaft
 - ◆ Wider 1st speed gear fitted in CGR gearbox from serial No. 77644 and in CRB gearbox=>Fig. 138
 - ◆ Dismantling and assembling
=>Page 127
- 7 Follower for 1st and 2nd gear
 - ◆ Can be replaced individually

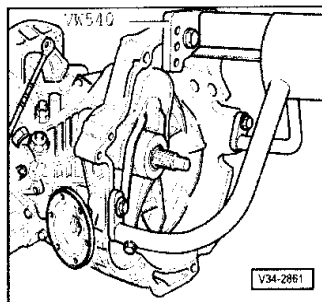


- 8 Circlip
 - ◆ Qty. 2
- 9 Selector rod for 1st and 2nd gear
 - ◆ Only renew together with selector fork for 1st and 2nd gear (secured together by means of a pin)
- 10 Hollow shaft
 - ◆ Dismantling and assembling
=>Page 139
- 11 Drive pinion
 - ◆ Dismantling and assembling
=>Page 139
- 12 Locking bolts
 - ◆ Qty. 4
 - ◆ For aluminium bolt: 50 Nm
 - ◆ For steel bolt: 70 Nm
 - ◆ Mark installation positions of aluminium bolts and steel bolts; do not interchange

6 - Removing and installing bearing housing, Torsen differential, end cover, internal selector mechanism, input shaft, drive pinion and hollow shaft - assembly sequence

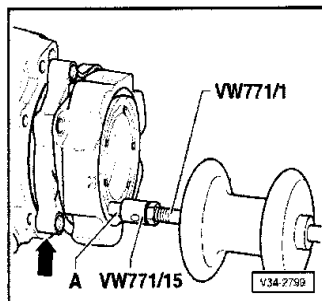
6.1 - Removing and installing bearing housing, Torsen differential, end cover, internal selector mechanism, input shaft, drive pinion and hollow shaft - assembly sequence

6.2 - Removing



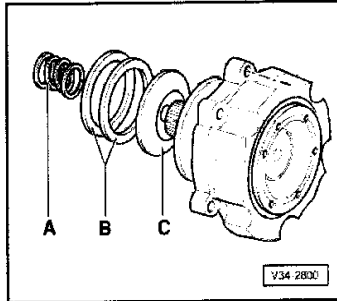
- -> Secure gearbox in assembly stand VW 540.
- Place a drip tray underneath, drain gearbox oil (2 oil drain plugs).
- Remove release bearing, clutch release lever and guide sleeve =>Page 23 .
- Unbolt cable grab for procon-ten system

=> General body repairs; Repair group 68; Repairing procon-ten system, left-hand drive ä 06.94
Repairing procon-ten system, left-hand drive ä 06.94



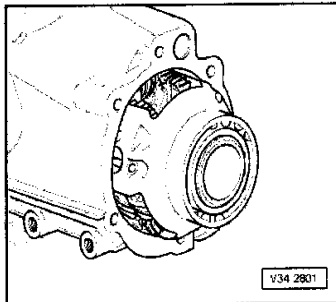
- -> Unbolt bearing housing -arrow- and pull off.

A - M8/M10 stud

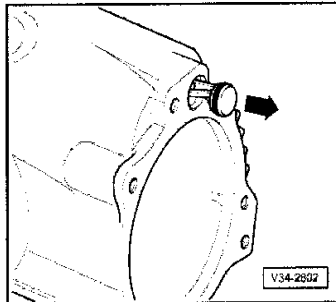


-> When pulling off, the bearing housing is pressed slightly off the end cover by the spring -A-.

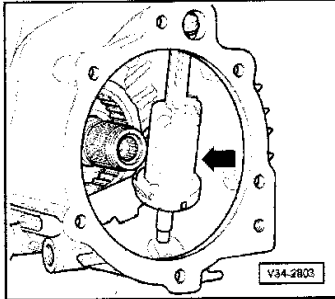
- When removing the bearing housing, note position of spring plate -C-:
 - Outer diameter (concave side) towards shims
- Remove shims -B-, note thickness re-determine if necessary =>Page 84 .



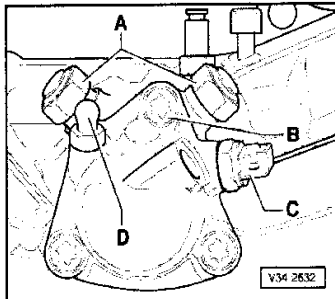
- -> Pull Torsen differential out of end cover.



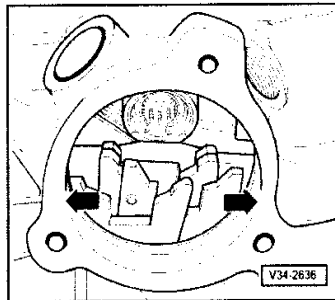
- -> Pull oil collector out of end cover -arrow- until it moves freely.



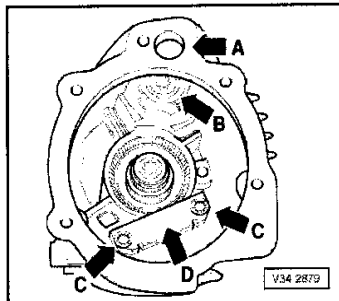
- -> Swing oil collector -arrow- down and guide out through hole in end cover.
- Remove oil collector.



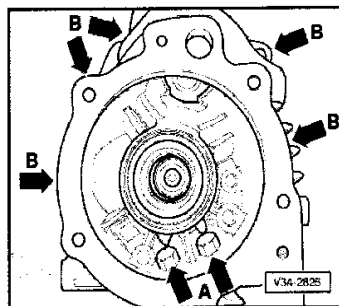
- -> Remove locking bolts -A- for selector shaft from gearbox housing.
- Mark installation positions of aluminium bolts and steel bolts; do not interchange.
- Remove 3 bolts -B- for cover for selector shaft, take off cover.
- Pull out selector shaft.



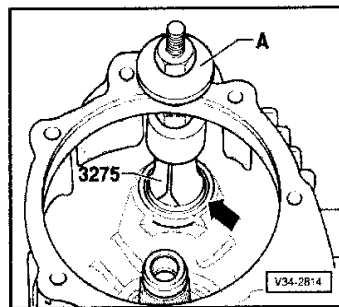
- -> Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates -arrows-.



- -> Loosen and unscrew multi-point socket head bolt -arrow B- in input shaft through hole -arrow A- in end cover.
- Remove 2 securing bolts -arrow C- for end cover for gearbox at supporting plate for needle bearings -arrow D-.
- Take out supporting plate.



- -> Remove the 2 magnets -arrows A- and clean.
- Loosen the 5 bolts -arrows B- for securing end cover for gearbox and remove.



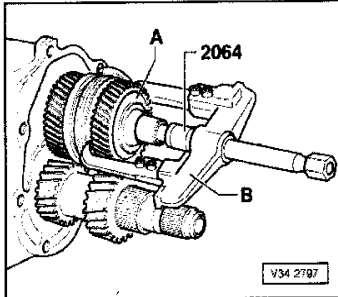
- -> Pull 2nd inner race for ball bearing for input shaft from input shaft.

A - Washer

Note:

The internal extractor 3275 grips the circumferential groove of the inner race -arrow- during the pulling operation.

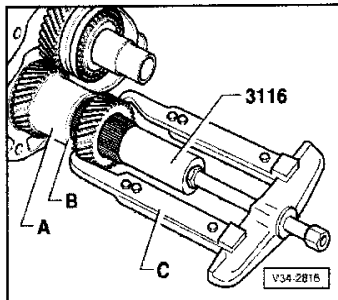
- Take off end cover together with end cover/bearing plate gasket.
- Pull dowel sleeves out of bearing plate.



- -> Pull off 5th speed sliding gear with spring together with 1st inner race -A- for ball bearing for input shaft.

B - Two arm puller, e.g. Kukko 20/10

- Take off 5th gear synchro-ring.
- Take off circlip for 5th speed gear.



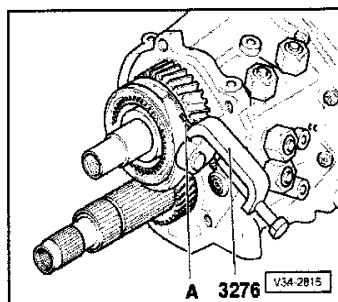
- -> Pull off 5th speed gear, to do this, block hollow shaft by engaging 2 gears =>Page 67 .

Note:

Use only hexagon bolt of tensioning sleeve 3116, length 50 mm.

C - Two arm puller, e.g. Kukko 20/10 with 200 mm long puller arms

- Remove shim -B- for 5th speed gear, note thickness and re-determine if necessary =>Page 80 .
- Take off spacer sleeve -A-.

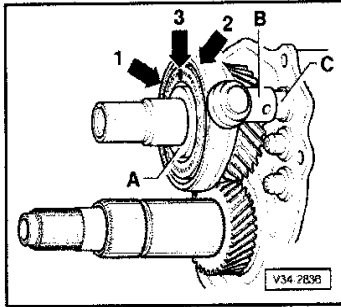


- -> Press out roll pin -A- for selector fork for 5th and 6th gear.

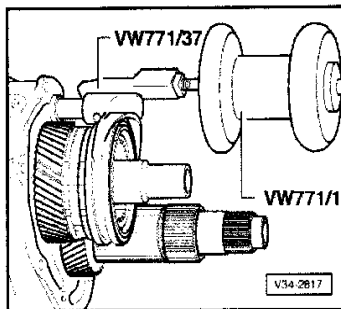
Note:

Do not drive out roll pin, otherwise selector rod bearing will be damaged.

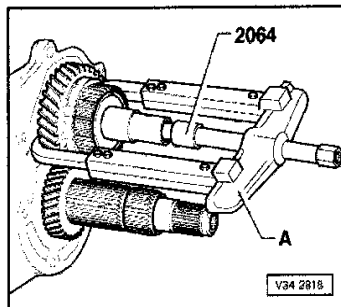
- Pull selector rod on follower together with selector fork for 5th and 6th gear and locking collar as far as possible away from bearing plate (until stop is felt).



- -> Mark installation position -arrow 3- of locking collar for 5th and 6th gear -arrow 1- and synchro-hub -A- (paired).

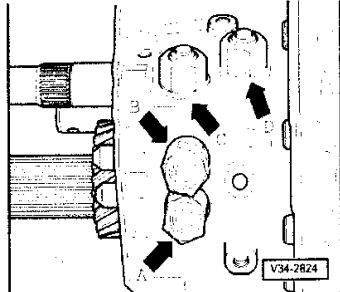


- -> Pull follower together with selector fork and locking collar off selector rod.



- -> Pull off 6th speed sliding gear, synchro-ring for 6th gear, synchro-hub for 5th and 6th speed gears and inner race for 5th speed sliding gear.

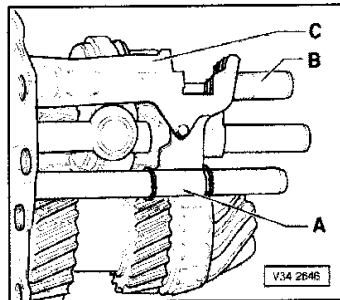
A - Two arm puller, e.g. Kukko 20/10 with 200 mm long hooks



- -> Unscrew selector rod locking bolts.

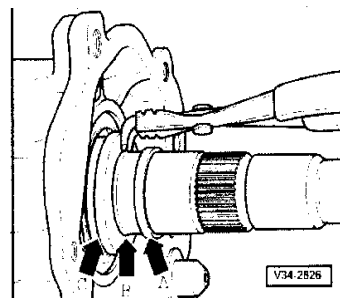
- A - 1st and 2nd gear
- B - 3rd and 4th gear
- C - 5th and 6th gear
- D - Reverse gear

- Mark fitting locations of aluminium and steel bolts. (Bolts must not be interchanged when installing.)
- Drive out dowel sleeves on bearing plate and remove bearing plate from gearbox housing.
- Secure drive pinion relative to hollow shaft (e.g. with hose clip) to prevent it falling out.

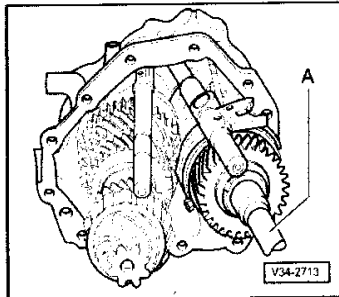


- Separate bearing plate with input shaft, with drive pinion and hollow shaft and with inner selector mechanism from gearbox housing.

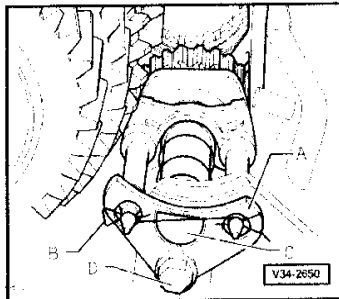
- -> Remove circlip from selector rod for 1st and 2nd gear and take off follower -A-.
- Pull out selector rod -B- for 5th and 6th gear.
- Remove follower -C- for reverse gear.



- -> Pull thrust washer -arrow A- for needle bearing for 6th gear off shaft.
- Use right-angled circlip pliers to remove circlip -arrow B- for inner race for cylinder roller bearing.
- Take out inner race -arrow C- for cylinder roller bearing (not a press fit).



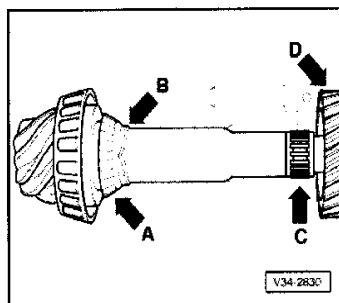
- -> Take input shaft -A- with selector rod and selector fork for 3rd and 4th gear out at an angle from bearing plate.



- -> Unscrew hexagon bolt -D-, take off spring clasp -B- and retaining plate -A-, pull out shaft -C- for reverse idler gear.
- Take out spring, synchro-ring and reverse idler gear.
- Take off relay lever for reverse gear.
- Removing and installing reverse gear=>Page 102 .

Notes:

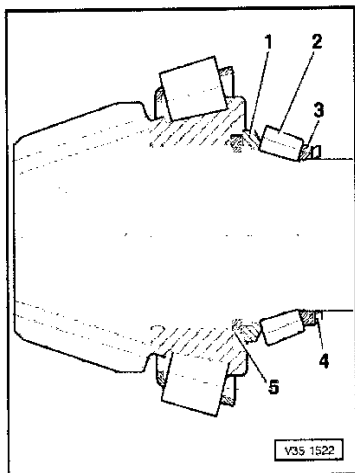
- ♦ Drive pinion and hollow shaft can be removed complete if the 6th speed gear can be easily levered off.
- ♦ If it is necessary to press off the 6th speed gear, the drive pinion must be pulled out of the hollow shaft.
- Remove drive pinion circlip.



- -> Pull drive pinion out of hollow shaft -D-, when doing this catch the taper rollers -A- (Qty. 23).
- Take off corrugated spring -B- and needle ring -C-.

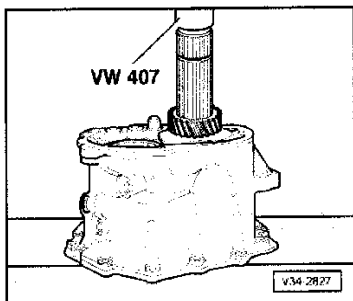
Note:

Carefully protect bearings from dirt, clean if necessary.



- -> Check bearing to ensure it is complete:

- 1 - Flange ring (tapered contact surface to tapered rollers)
- 2 - Tapered rollers (Qty. 23) with larger diameter facing towards drive pinion head
- 3 - Support ring (tapered contact surface to tapered rollers)
- 4 - Corrugated spring
- 5 - Circlip for tapered roller bearing for drive pinion



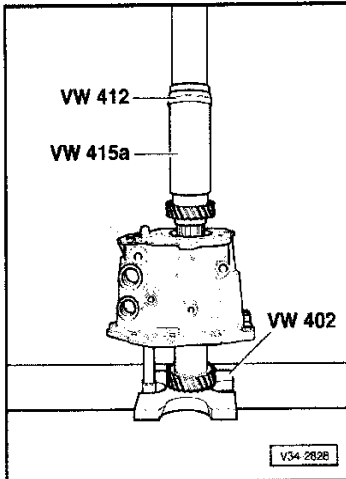
- -> Press off 6th speed gear.

Note:

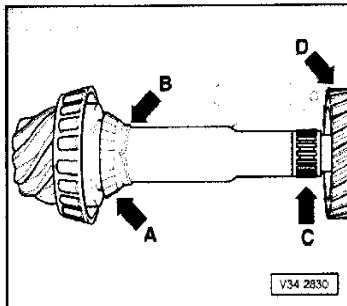
Because of the type of fit, it may be possible to press gear off easily.

- Take hollow shaft or drive pinion and hollow shaft with selector rod and selector fork for 1st and 2nd gear out of the bearing plate.

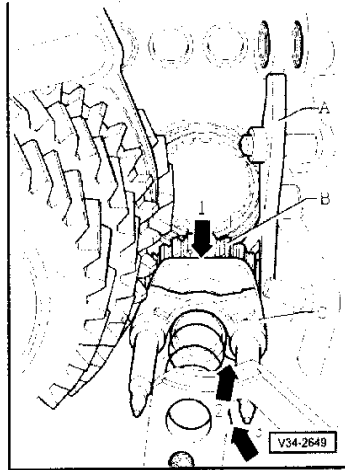
6.3 - Installing



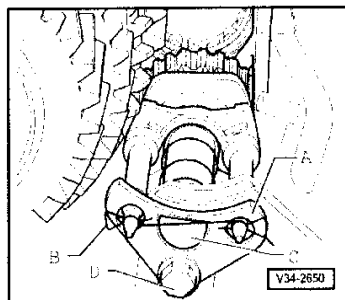
- Fit hollow shaft with selector fork and selector rod for 1st and 2nd gear (without follower) into bearing plate.
- -> Heat 6th gear to approx. 120 °C and fit on.
 - Installation position: shoulder towards taper roller bearing
- Press onto stop; ensure there is no play.
- Grease drive pinion/hollow shaft taper roller bearing with multi-purpose grease before inserting.
 - Allocation =>Page 73



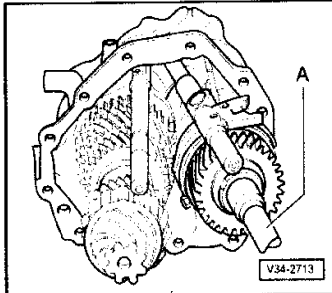
- A - -> Flange ring, tapered rollers (Qty. 23), and support ring
 - B - Corrugated spring
 - C - Needle ring
 - D - Hollow shaft
- Oil needle bearing well.
 - Insert drive pinion into hollow shaft and secure with hose clip to prevent it slipping out.



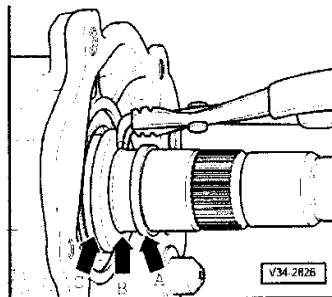
- -> Fit relay lever -A- for reverse gear onto bolt for relay lever. Watch position of pin when doing this (limits relay lever travel to synchro-ring).
- Insert sliding gear -B- and engage relay lever with groove on sliding gear.
- Insert synchro-ring -C-.
 - Installation position: position flat on circumference of synchro-ring towards input shaft (not as yet fitted) -arrow 1-
- Insert spring.
 - Installation position: hook single angled end into recess on synchro-ring -arrow 2-. Turn double angled end anti-clockwise and hook into opening in bearing plate -arrow 3-



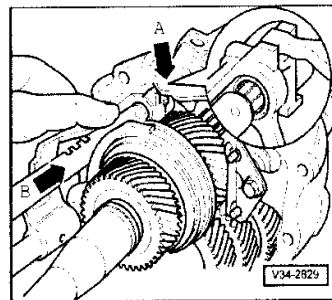
- -> Insert shaft -C-.
- Fit retaining plate -A-.
 - Installation position: chamfers of holes for locking pins of the synchro-ring face bearing plate
- Insert spring clasp -B- into locking pins of the synchro-ring.
- Renew self-locking nut -D- and tighten to 25 Nm.



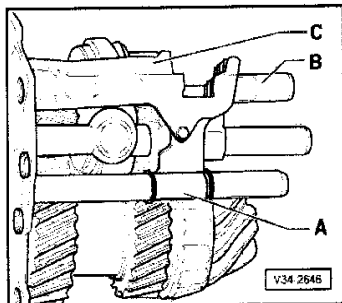
- -> Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into the bearing plate.
 - Selector fork installation position: rib towards follower
- =>Page 63



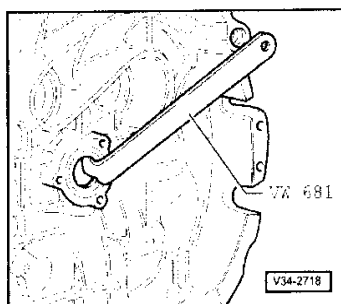
- -> Slide inner race -arrow C- for cylinder roller bearing onto main shaft at flange for end cover (clearance fit).
- Fit circlip -arrow B- using right-angled circlip pliers.



- -> Engage recess in follower for reverse gear with the free end of relay lever -arrow A-.
- Slide selector rod for 5th and 6th through follower for reverse gear in direction of -arrow B-.



- -> Slide follower -A- for 1st and 2nd gear onto selector rod and secure with circlips.
- Oil all bearings of input shaft and drive pinion/hollow shaft in gearbox housing and bearing flange as well as the selector rods with gear oil.

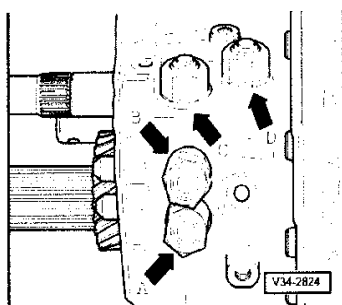


- -> Lever used seal for input shaft carefully out of gearbox housing with VW 681.
- Coat sealing surfaces between bearing plate and gearbox housing with sealing paste AMV 188 200 03.
- Insert complete bearing plate into gearbox housing.

Note:

When inserting the complete bearing plate, ensure that the selector rods align with their mounting points.

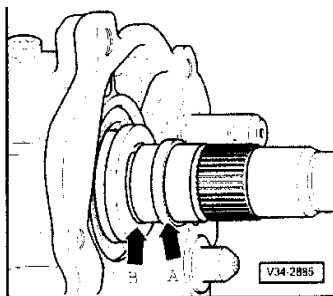
- Drive in 2 dowel sleeves for bearing flange/gearbox housing.
- Tighten 12 bolts using diagonal sequence.



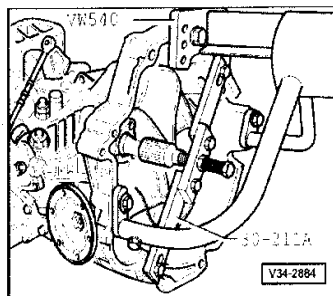
- -> Screw in locking bolts for selector rods.

- A - 1st and 2nd gear
- B - 3rd and 4th gear
- C - 5th and 6th gear
- D - Reverse gear

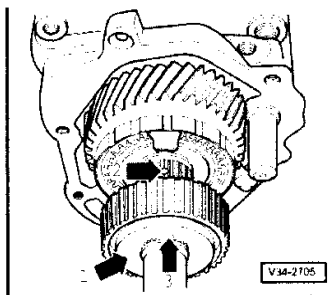
- Aluminium and steel bolts must not be interchanged when installing.
 - Tightening torques:
 - for aluminium locking bolts - 50 Nm
 - for steel locking bolts - 70 Nm



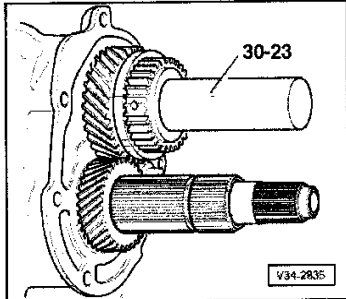
- -> Fit thrust washer -arrow A- for needle bearing for 6th speed gear.
 - Installation position: shoulder towards circlip -arrow B-, smooth contact surface to shaft end.
- Oil needle bearing for 6th speed sliding gear with gear oil and fit.
- Slide on 6th speed sliding gear with spring and synchro-ring.
 - Synchro-ring installation position: the lugs of the synchro-ring engage into the recesses below in the sliding gear



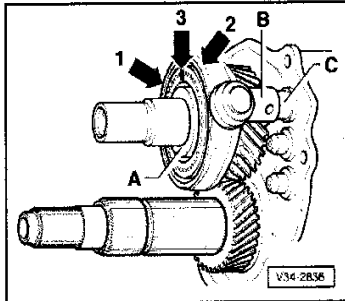
- -> Support input shaft with support bridge 30-211 A.



- > Installation position of synchro-hub for 5th and 6th gear:
 - ◆ Side with projecting face -arrow 1- faces shaft end
 - ◆ The oil drilling of the input shaft -arrow 2- and the oil groove of the synchro-hub -arrow 3- are in line



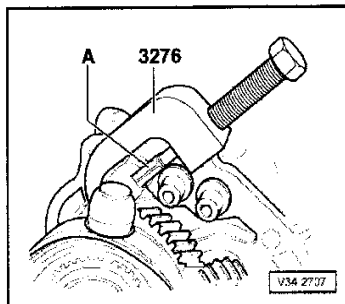
- -> Heat synchro-hub for 5th and 6th gear to approx. 100 °C, fit and drive on; ensure there is no play.
- Check 6th speed sliding gear for axial play.



- -> Line up markings -arrow 3- on paired synchro-hub -A- and locking collar for 5th and 6th gear -arrow 1-.
- Fit locking collar -arrow 1- with selector fork -arrow 2- onto synchro-hub -A- as well as follower for 5th and 6th gear -B- onto selector rod -C- at the same time.

Notes:

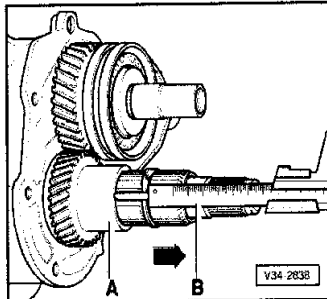
- ◆ Selector fork rib -arrow 2- must face towards shaft end.
- ◆ When sliding follower onto selector rod for 5th and 6th gear remember holes for roll pin.



- -> Press in roll pin -A- flush.

Note:

Do not drive in roll pin, otherwise selector rod mounting will be damaged.

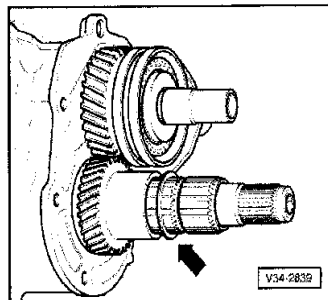


- Re-determining shim for 5th speed gear:
 - -> Fit spacer sleeve -A- (length 39.6 mm) onto hollow shaft.
 - When fitting circlip, push in direction of arrow onto stop.
 - Measure distance between sleeve and fitted circlip with depth gauge -B-.
 - Determine shim from table. Part numbers

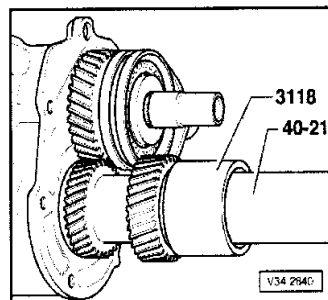
⇒ Parts catalogue

The following shims are available:

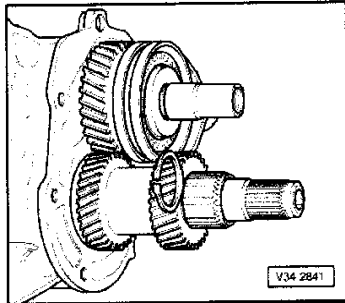
Measured range (mm)	Shim thickness (mm)
31.01 ... 31.11	1.05
31.11 ... 31.21	1.15
31.21 ... 31.31	1.25
31.31 ... 31.41	1.35



- -> Fit shim selected -arrow- onto hollow shaft.



- -> Heat 5th speed gear to approx. 120 °C, fit and drive onto stop free of play.
- Installation position: shoulder towards spacer sleeve



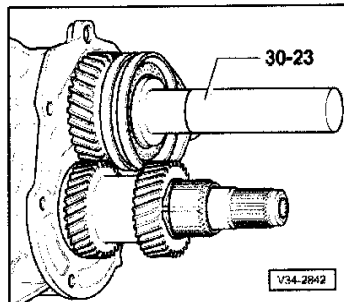
- -> Re-determining circlip for 5th speed gear:
- Determine the thickest circlip that can still just be fitted.
- Determine circlip from table. Part numbers

=> Parts catalogue

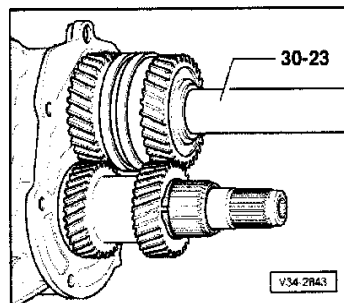
The following circlips are available:

Circlip thickness (mm)		
2.32	2.40	2.48
2.34	2.42	2.50
2.36	2.44	
2.38	2.46	

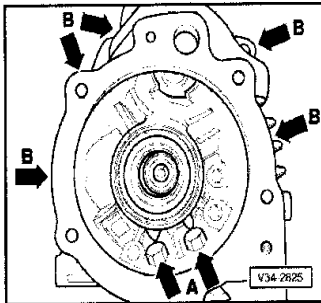
- Fit circlip.



- -> Drive on inner race for 5th speed sliding gear free of axial play.
- Oil needle bearing with gear oil and fit.
- Place synchro-ring for 5th gear in locking collar.
- Slide on 5th speed sliding gear with spring.



- -> Heat 1st inner race for ball bearing for input shaft to approx. 100 °C, fit onto input shaft and drive onto stop; ensure there is no play.
- Check 5th speed sliding gear for axial clearance.
 - Permissible axial clearance: 0.15 ... 0.35 mm
- Insert dowel sleeves into bearing plate.
- Fit new gasket for end cover.

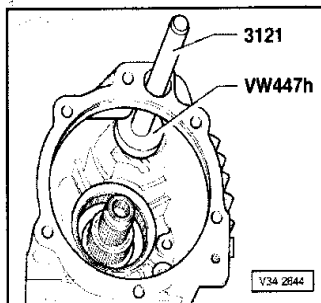


- -> Fit end cover and insert securing bolts -arrows B-.

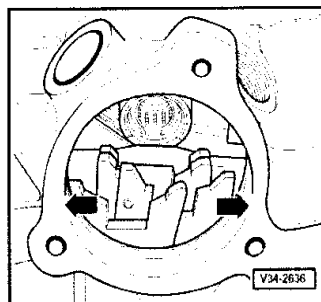
Note:

Do not tighten bolts.

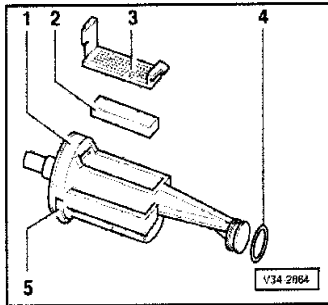
- Clean the two magnets -arrows A- and insert.
- Fit support plate and tighten hand tight.
 - Installation position: Lugs towards magnets
- Tighten bolts for end cover using diagonal sequence.



- -> Oil 2nd inner race and with ball contact surface facing towards input shaft ball bearing, drive onto input shaft through hole in end cover.
- Remove support bridge 30-211 A.



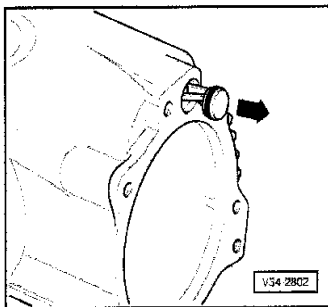
- -> Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear), do this by moving two selector plates -arrows-.
- Tighten multi-point socket head bolt to 150 Nm.



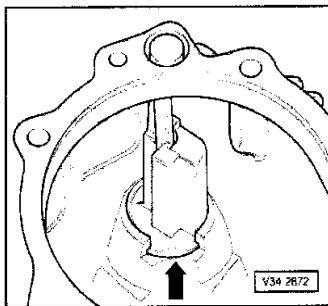
- -> Undip cover -3- for oil collector from oil collector -1- at longer end with a screwdriver and remove magnet -2-.

- 4 - O-ring
- 5 - Positioning segment

- Clean oil collector.
- Assemble oil collector.

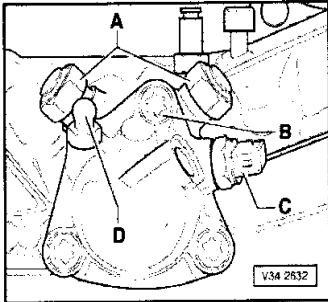


- -> Guide oil collector from interior of end cover with support arm leading through the hole of the end cover -arrow-, until the O-ring can be fitted from outside onto the oil collector.
- Lightly oil new O-ring and fit.

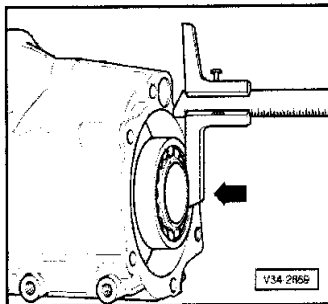


- Insert oil tube of oil collector into input shaft.
- -> Turn oil collector until the positioning segment is located in the machined recess of the end cover -arrow-.
- Press in oil collector onto stop.
- Slide assembly sleeve, Part No. 01E 311 120, onto selector shaft.
- Check neutral position of followers.

- Selector gates must align
- Install complete selector shaft.



- -> Screw locking bolts -A- for selector shaft into gearbox housing.
- Aluminium and steel bolts must not be interchanged when installing.
 - Tightening torques:
 - for aluminium locking bolts - 50 Nm
 - for steel locking bolts - 70 Nm
- Lightly oil new O-ring for cover for selector shaft and fit.
- Fit cover for selector shaft.
- Coat bolts -B- (Qty. 3) with sealing paste AMV 188 200 03 before installing and tighten.



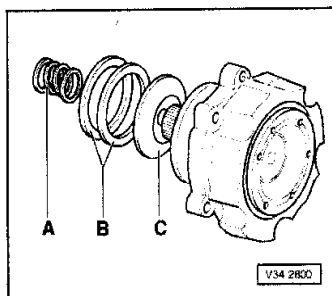
- Slide Torsen differential onto splines of hollow shaft.
- -> Press Torsen differential in direction of arrow, and measure distance between top edge of the bolted end cover and front edge of outer race of ball bearing for Torsen differential.
- Determine required shim(s) from following table. Part numbers

=> Parts catalogue

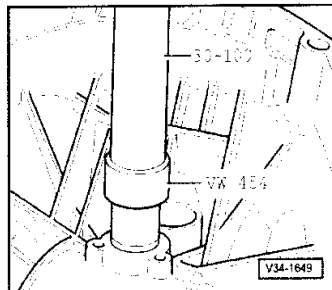
The following shims are available:

Measured range mm	Qty.	Shim thickness (mm)
7.05 ... 7.30	1	1.65
	1	1.45
	1	1.20
7.30 ... 7.55	1	1.65
	1	1.45
	1	0.95
7.55 ... 7.80	1	1.65
	1	1.45
	1	0.70
7.80 ... 8.05	1	1.65
	1	1.45
	1	0.45
8.05 ... 8.25	2	1.65

Measured range mm	Qty.	Shim thickness (mm)
8.25 ... 8.50	1	1.65
	1	1.45
8.50 ... 8.75	1	1.65
	1	1.20
8.75 ... 9.00	1	1.65
	1	0.95
9.00 ... 9.25	1	1.65
	1	0.70
9.25 ... 9.50	1	1.65
	1	0.45



- -> Insert spring plate -C- into bearing housing.
- Installation position: larger diameter (concave side) towards the shims.
- Fit shims -B- as determined in table.
- Fit spring -A- to end of flange shaft.
- Lightly oil new O-ring for bearing housing and fit.
- Oil small needle bearing in drive pinion.
- Insert complete bearing housing and pull home evenly.
- Tighten bearing housing using diagonal sequence.



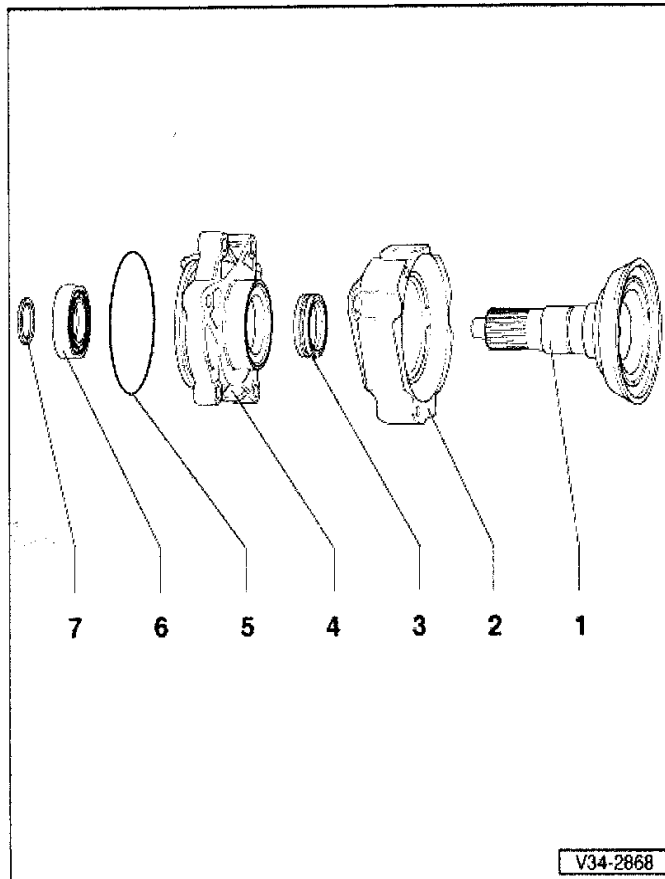
- Fill space between sealing lip and dust lip of new seal for input shaft with multi-purpose grease.
- Pull a thin protective hose tightly onto splines of input shaft.
- -> Drive on seal for input shaft.
 - Installation depth: 4.5 mm
- Remove protective hose.
- Install release bearing, clutch release lever and guide sleeve =>from Page 23 .
- Check that gearbox can be shifted through all gears.
- Fit connecting rod.
- Install cable grab for procon-ten

=> General body repairs; Repair group 68; Repairing procon-ten system, left-hand drive ä 06.94
 Repairing procon-ten system, left-hand drive ä 06.94

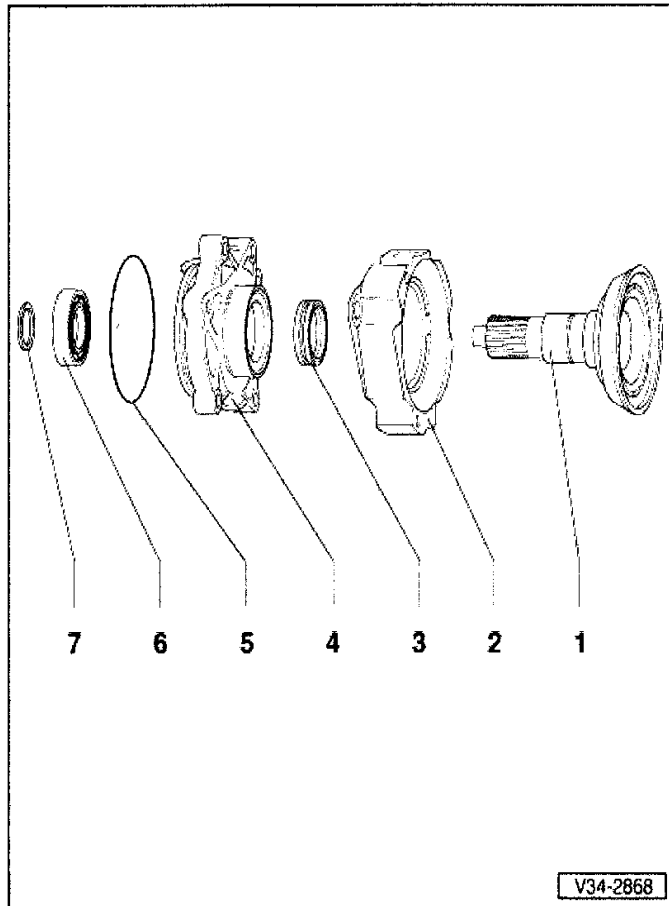
- Check oil level in gearbox =>Page 51 .

7 - Dismantling and assembling bearing housing

7.1 - Dismantling and assembling bearing housing

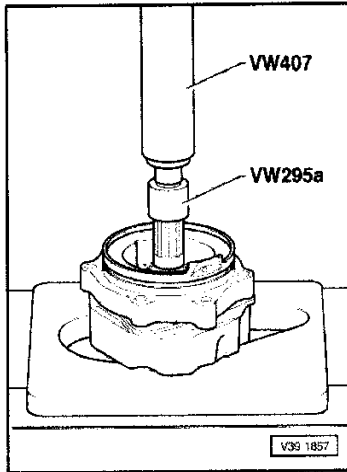


- 1 Flange shaft
 - ◆ Pressing out =>Fig. 1
 - ◆ Pressing in =>Fig. 2
- 2 Balance weight
 - ◆ Pressing off =>Fig. 3
 - ◆ Pressing on =>Fig. 4
- 3 Seal
 - ◆ Pulling out =>Fig. 5
 - ◆ Preparing for installation =>Fig. 6
 - ◆ Driving in =>Fig. 7
- 4 Bearing housing

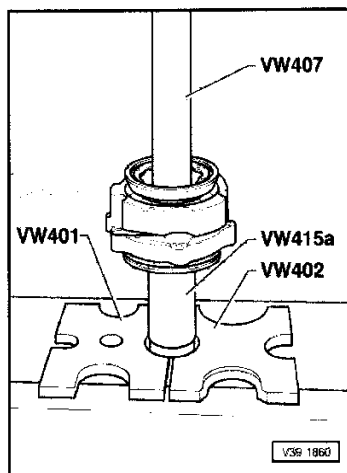


V34-2868

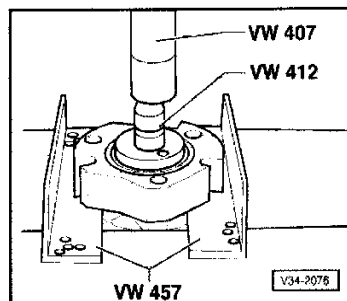
- 5 O-ring
 - ◆ Always renew
 - ◆ Lightly oil before installing
- 6 Ball bearing for flange shaft
 - ◆ Pressing off =>Fig. 8
 - ◆ Pressing in =>Fig.9
- 7 Circlip



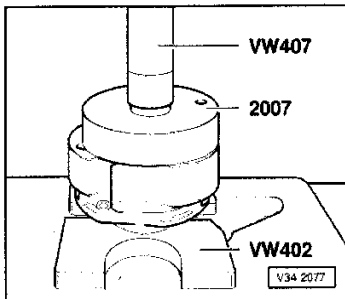
-> Fig.1 Pressing out flange shaft
- Before pressing out flange shaft remove circlip.



-> Fig.2 Pressing in flange shaft
- Before pressing in flange shaft, press on balance weight => Fig. 4 .
- Fit circlip.



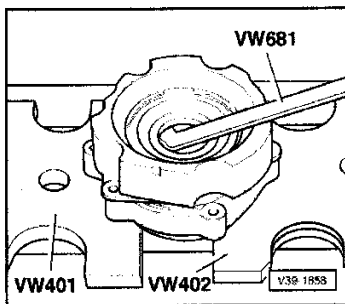
-> Fig.3 Pressing off balance weight



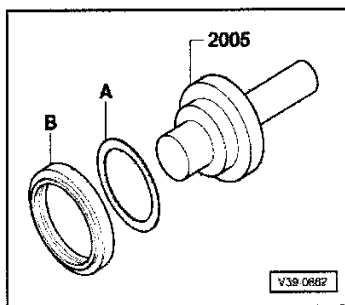
-> Fig.4 Pressing on balance weight

Note:

Note position of holes.



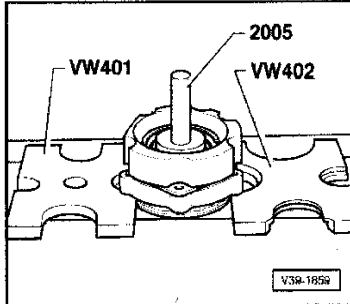
-> Fig.5 Pulling out seal



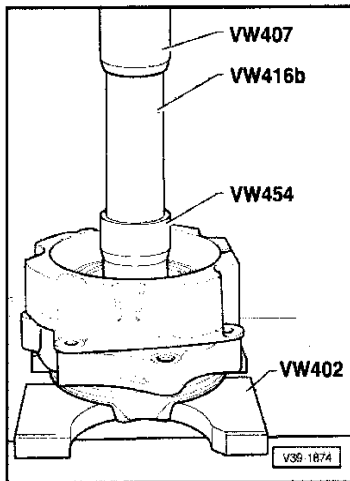
-> Fig.6 Preparing seal for installation

- A - Shim Part No. 016 311 391 B (1.7 mm thick)
- B - Seal

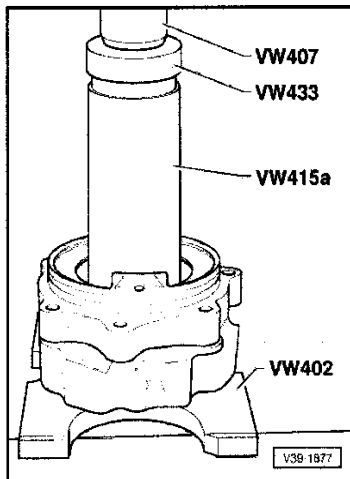
- Fill space between sealing and dust lips with multipurpose grease.
- Fit shim and seal onto tool one after the other.
- Installation position: open side of seal towards bearing housing



-> Fig.7 Driving in seal
- Remove shim.



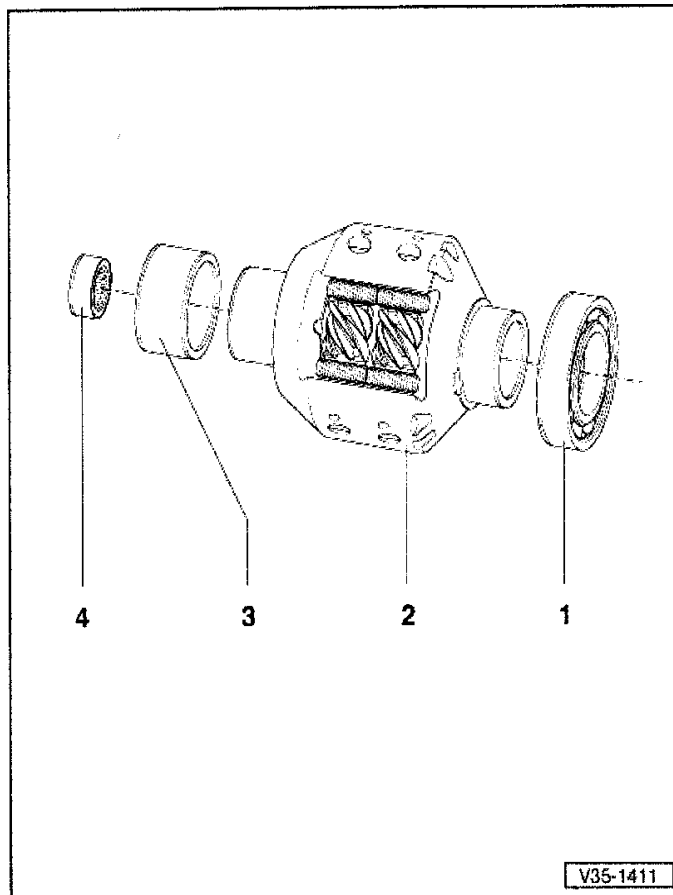
-> Fig.8 Pressing out ball bearing for flange shaft



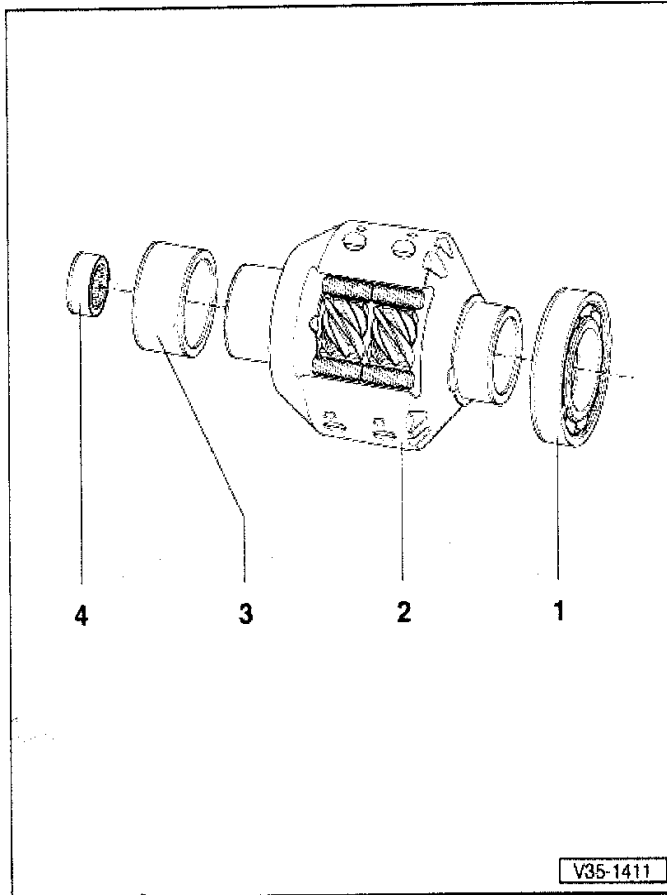
-> Fig.9 Pressing in ball bearing for flange shaft

8 - Servicing bearings for Torsen differential

8.1 - Servicing bearings for Torsen differential



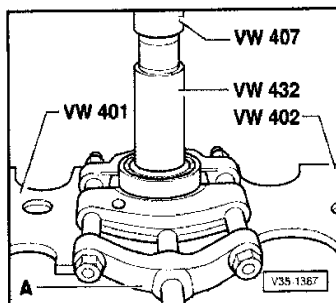
- 1 Ball bearing for Torsen differential
 - ◆ Pressing off => Fig. 1
 - ◆ Pressing on => Fig. 2
- 2 Torsen differential
 - ◆ Can only be serviced by manufacturer
- 3 Inner race for needle bearing for Torsen differential
 - ◆ Pulling off => Fig. 3
 - ◆ Pressing on => Fig. 4
- 4 Needle bearing for drive pinion/Torsen differential
 - ◆ Pulling out => Fig. 5
 - ◆ Pressing in => Fig. 6



Note:

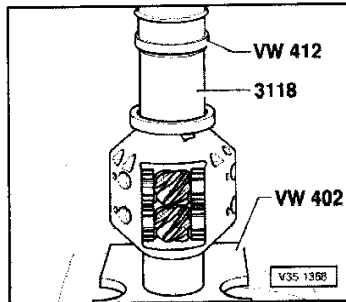
The shims for the Torsen differential must be re-determined after replacing the following parts =>Page 84 :

- End cover
- Inner race for needle bearing
- Torsen differential
- Ball bearing for Torsen differential



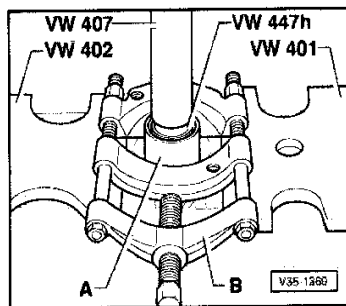
-> Fig.1 Pressing off ball bearing for Torsen differential

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



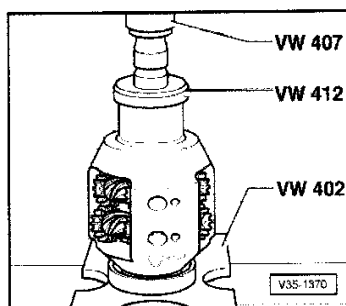
-> Fig.2 Pressing on ball bearing for Torsen differential

♦ Press piece 3118 with shoulder towards press tool VW 412

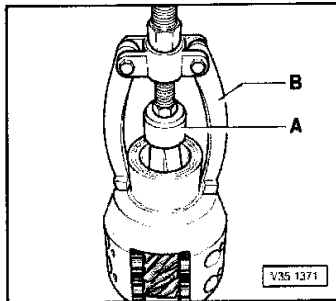


-> Fig.3 Pulling off inner race for needle bearing for Torsen differential

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

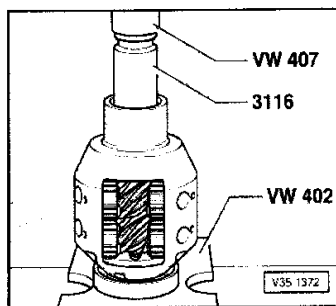


-> Fig.4 Pressing on inner race for needle bearing for Torsen differential



-> Fig.5 Pulling out needle bearing for drive pinion/Torsen differential

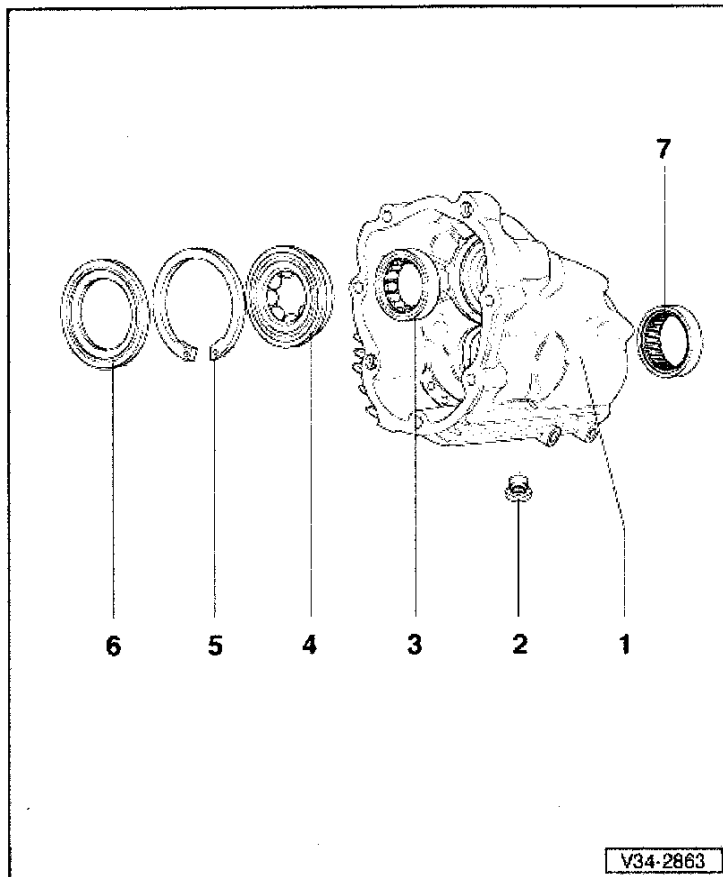
- A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5
- B - Counter support, e.g. Kukko 22/1



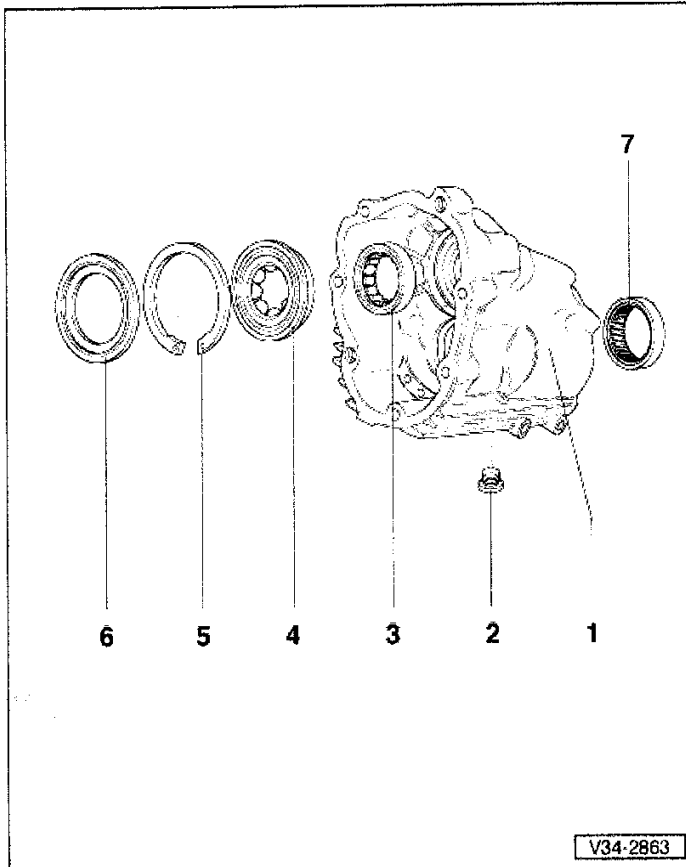
-> Fig.6 Pressing in needle bearing for drive pinion/Torsen differential

9 - Servicing end cover

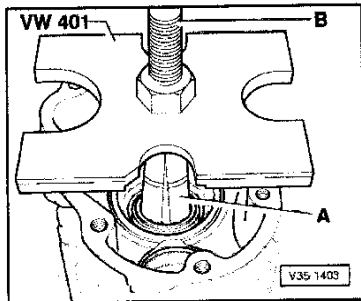
9.1 - Servicing end cover



- 1 End cover
 - ◆ If renewed:
 - Re-determine thickness of circlip -item 5 -.
 - Re-determining shims for Torsen differential => Page 84 .
- 2 Oil drain plug - 40 Nm
- 3 Cylinder roller bearing for input shaft
 - ◆ Pulling out => Fig. 1
 - ◆ Pressing in flush => Fig. 2
- 4 Ball bearing for input shaft
 - ◆ Removing =>Fig. 3
 - ◆ Installing =>Fig. 4
 - ◆ If renewed, re-determine thickness of circlip -item 5 -

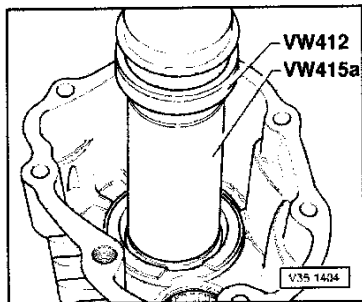


- 5 Circlip
- ◆ Re-determine thickness
=> Page 98
 - ◆ Installing => Fig. 4
- 6 Baffle plate
- ◆ Renew
 - ◆ Removing => Fig. 3
 - ◆ Installing and peening in position when replacing ball bearing for input shaft => Fig. 5
 - ◆ Installing and peening in position when replacing end cover => Fig. 6
- 7 Needle bearing for Torsen differential
- ◆ Pulling out => Fig.
 - ◆ Driving in => Fig. 8



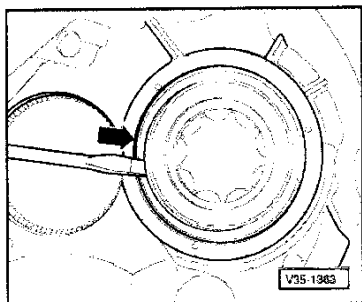
-> Fig.1 Pulling cylinder roller bearing for input shaft out of end cover

- A - Internal puller 37 ... 46 mm, e.g. Kukko 21/6
- B - Spindle from counter support Kukko 22/2



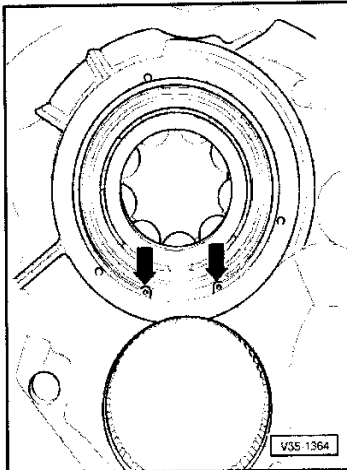
-> Fig.2 Pressing cylinder roller bearing for input shaft flush into end cover

- ♦ Tube VW 415a with shoulder towards press tool VW 412



-> Fig.3 Removing ball bearing for input shaft from end cover

- Position screwdriver as illustrated, drive into baffle plate -arrow- and lever out.
- Remove circlip.
- Take out bearing, remove peening indentations if necessary.



-> Fig.4 Installing ball bearing for input shaft in end cover

Installation position of circlip:

- ♦ Ends of circlip -arrows-, point towards needle bearing

Note:

The thickness of the circlip must be re-determined if the bearing or the end cover are replaced.

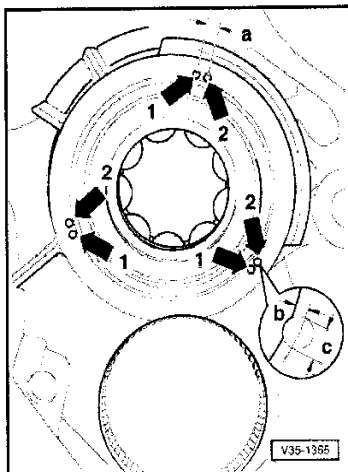
- Determining circlip for ball bearing for input shaft:
 - Press ball bearing outer race onto stop.
 - Determine the thickest circlip that can still just be fitted.
 - Axial play: max. 0.08 mm
 - Determine circlip from table. Part numbers

=> Parts catalogue

The following circlips are available:

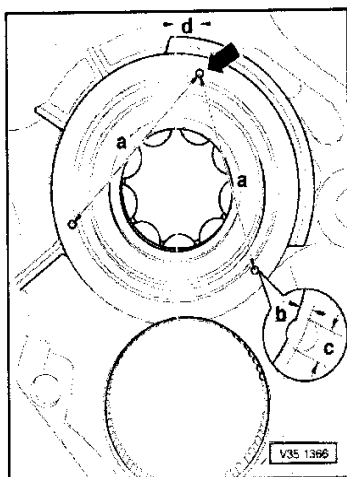
Circlip thickness (mm)	
2.55	2.65
2.60	2.70

- Fit circlip.



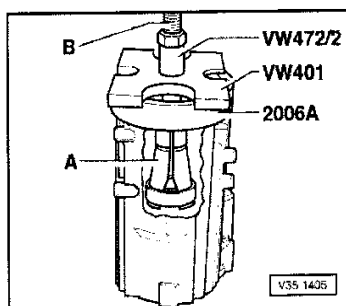
-> Fig.5 Peening baffle plate in position when renewing ball bearing for input shaft

- Use a blunt punch with a ball shaped end (ball diameter 5 mm) to peen in position.
- Insert baffle plate.
- First peen at points marked with -arrows 1-.
- Then peen at points marked with -arrows 2- at distance -a- from first position.
 - Dimension a = 5 mm
- Observe position and diameter of peening positions:
 - Dimension b = 2 mm
 - Dimension c = 3 mm



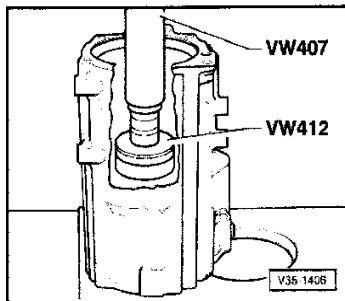
-> Fig.6 Peening baffle plate in position when renewing end cover

- Use a blunt punch with a ball shaped end (ball diameter 5 mm) to peen in position.
- Insert baffle plate.
- Peen in first peening point -arrow- at distance -d- from the centre line of the two shafts.
 - Dimension d = 10 mm
- Observe position and diameter of peening positions.
 - Dimension b = 2 mm
 - Dimension c = 3 mm
- Peen in second and third peening points in same manner at distance -a-.
 - Dimension a = 70 mm



-> Fig.7 Pulling needle bearing for Torsen differential out from end cover

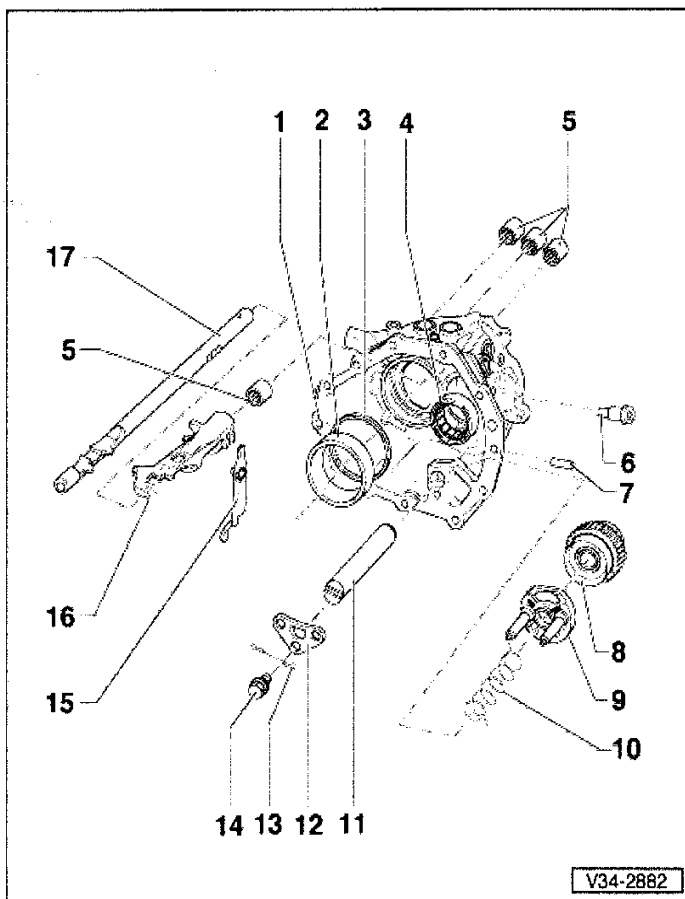
- A - Internal puller 46 ... 58 mm, e.g. Kukko 21/7
- B - Spindle from counter support Kukko 22/2



-> Fig.8 Driving needle bearing for Torsen differential flush into end cover
- Fit press plate VW 412 onto bearing with shoulder facing up.

10 - Servicing bearing plate

10.1 - Servicing bearing plate

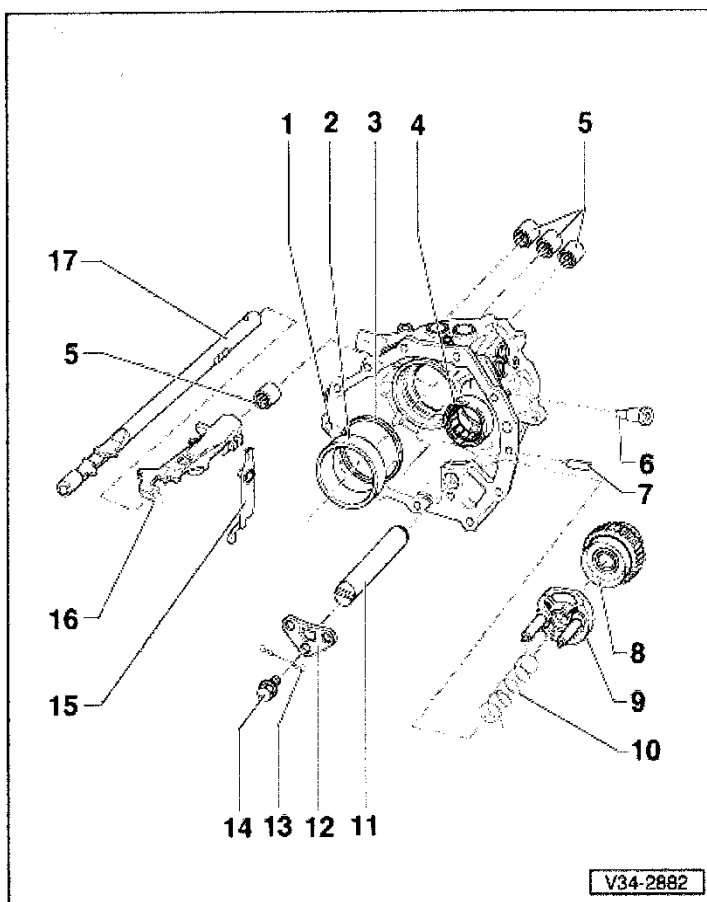


Notes:

- ◆ In gearboxes with code letters CGR from serial No.77644onwardsand in gearboxes with code letters CRB the 1st speed gear and 1st speed sliding gear are wider. At the same time the bearing plate -Item 1 - was modified and the width of the cylinder roller bearing inner race was reduced.
- ◆ Mixed installation of components belonging to old and new versions is not permissible.

1 Bearing plate

- ◆ If replacing, re-determine shim "S4"
- ◆ Provided with machined surface for identification in CGR gearbox from serial No. 77644 and in CRB gearbox=>Fig. 1



2 Outer race for taper roller bearing for drive pinion

- ◆ Driving out => Page 151
- ◆ Pressing in => Page 151
- ◆ If replacing, re-determine shim "S4"

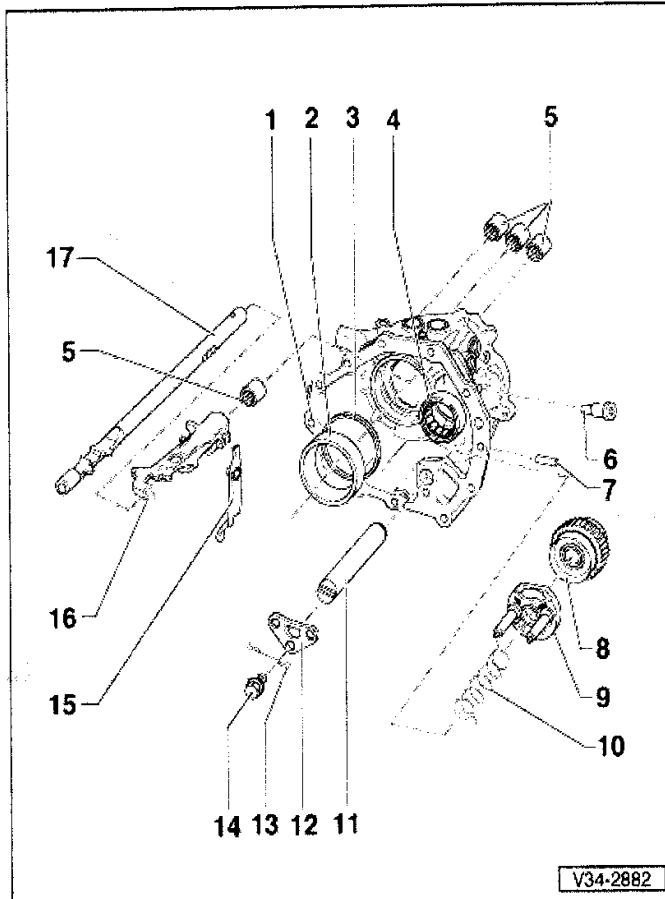
3 Shim "S4"

- ◆ Adjustment overview => Page 175
- ◆ Re-determining => Page 108

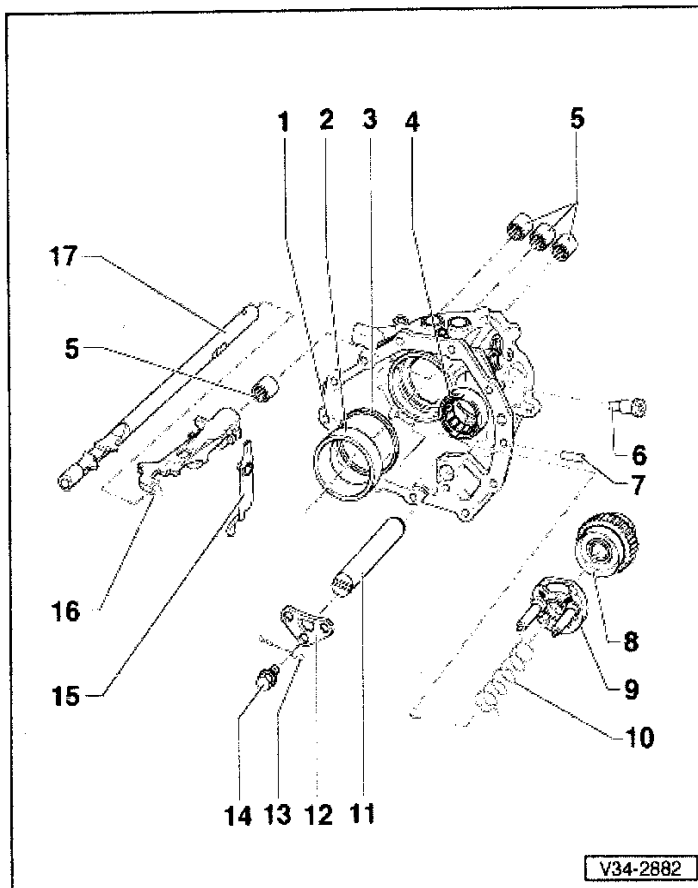
4 Cylinder roller bearing for input shaft

- ◆ Pressing out => Fig. 6
- ◆ Pressing in => Fig. 7
- ◆ Insertion depth is altered in CGR gearbox from serial No. 77644 and in CRB gearbox

- ♦ Measuring insertion depth =>Fig. 8



- 5 Ball sleeve
 - ♦ For selector rods
 - ♦ Removing and installing => Fig. 2
 - ♦ Renew
- 6 Bolt - 35 Nm
 - ♦ For relay lever
- 7 Dowel pin (7 x 28)
 - ♦ Press in flush
- 8 Sliding gear for reverse gear
- 9 Synchro-ring for reverse gear
 - ♦ With locking pins
 - ♦ Checking for wear => Fig. 3
 - ♦ Installation position: position flat on synchro-ring circumference to face input shaft => Page 75



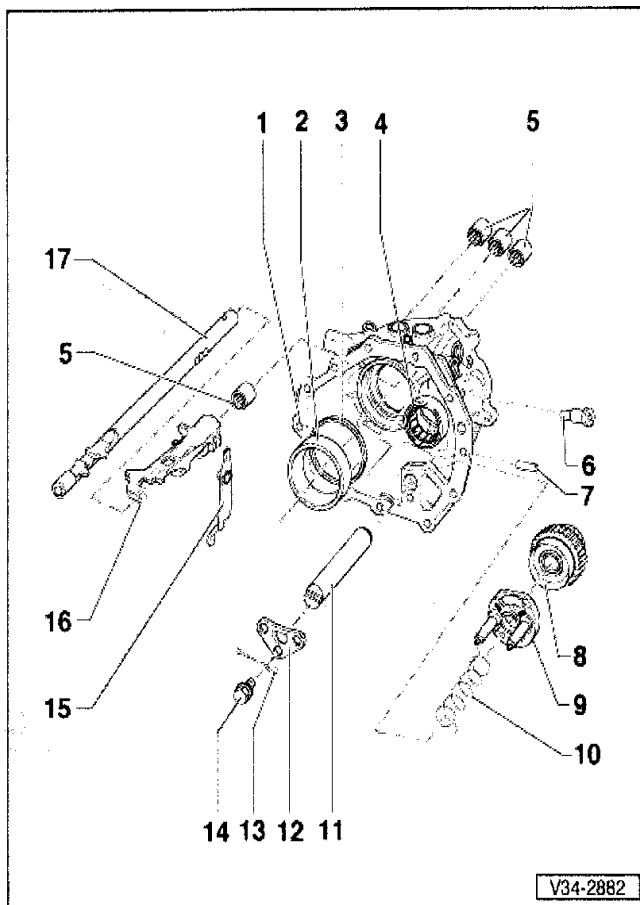
10 Spring

- ♦ Installation position: hook single angled end into recess on synchro-ring. Turn double angled end anti-clockwise and insert into opening on bearing plate.

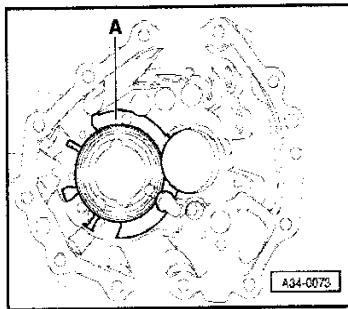
11 Shaft for reverse sliding gear

12 Retaining plate

- ♦ Installation position: the chamfers of the holes for the locking pins of the synchro-ring towards bearing plate
=> Page 75



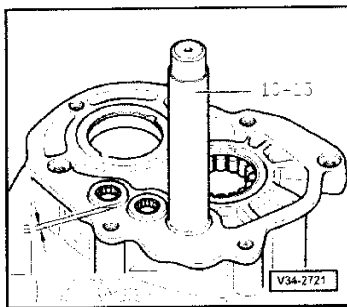
- 13 Spring clasp
- 14 Bolt - 25 Nm
 - ◆ Self-locking
 - ◆ Renew
- 15 Relay lever for reverse gear
- 16 Follower for reverse gear
 - ◆ Pulling out ball sleeve => Fig. 4
 - ◆ Driving in ball sleeve => Fig. 5
- 17 Selector rod for 5th and 6th gear
 - ◆ Renew only complete with follower => Page 59



-> Fig.1 Bearing plate with machined surface for identification

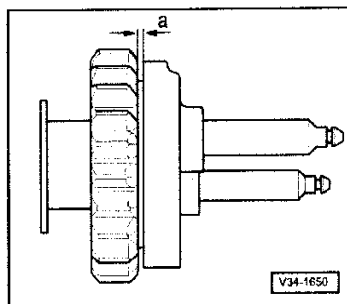
A - Machined surface for identification

- ◆ In gearboxes with code letters CGR from serial No. 77644 onwards and in gearboxes with code letters CRB the 1st speed gear and 1st speed sliding gear are wider. At the same time the bearing plate was provided with a machined surface for identification and the width of the cylinder roller bearing inner race was reduced.
- ◆ Mixed installation of components belonging to old and new versions is not permissible.



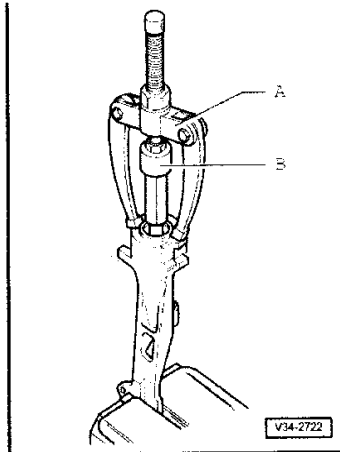
-> Fig.2 Driving selector rod ball sleeves in and out

- ◆ Insertion depth $a = 2.5 \text{ mm}$

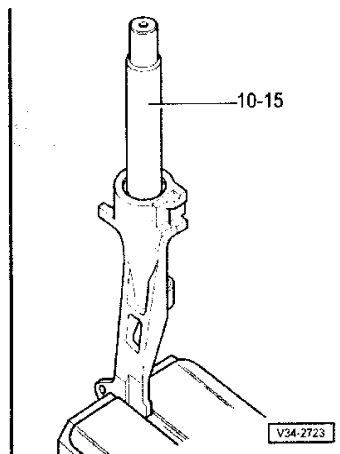


-> Fig.3 Checking synchro-ring for wear

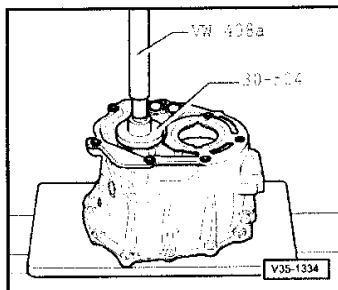
- Press synchro-ring onto cone of the gear.
- Measure gap "a" with a feeler gauge:
 - Dimension, new: $0.75 \dots 2.3 \text{ mm}$
 - Wear limit: 0.2 mm



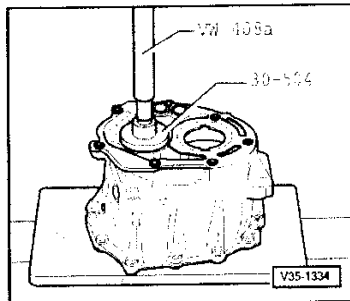
-> Fig.4 Pulling ball sleeve out of follower for reverse gear
A - Counter support, e.g. Kukko 22/1
B - Internal puller 18.5 ... 23.5 mm, e.g. Kukko 21/3



-> Fig.5 Driving ball sleeve flush into follower for reverse gear



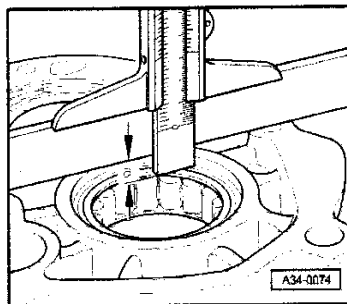
-> Fig.6 Pressing cylinder roller bearing for input shaft out of bearing plate



-> Fig.7 Pressing cylinder roller bearing for input shaft into bearing plate

Insertion depth depends on serial number of gearbox.

- Measuring insertion depth =>Fig. 8 .

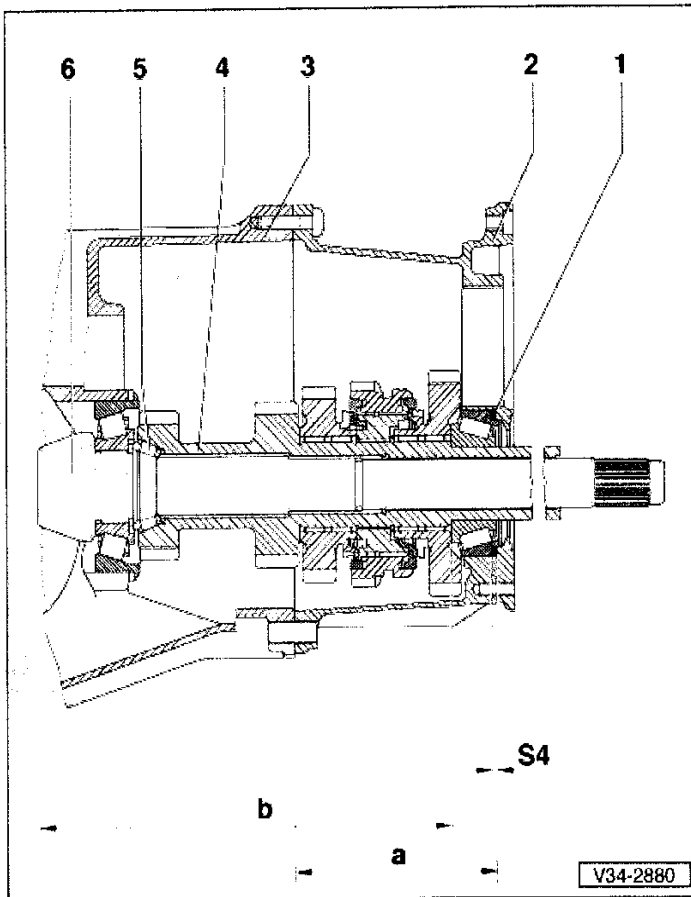


-> Fig.8 Measuring insertion depth of cylinder roller bearing for input shaft

Insertion depth -a- depends on serial number of gearbox:

- ♦ CGR gearbox up to serial number 77643:
a = 9 mm
- ♦ CGR gearbox from serial number 77644 onwards and CRB gearbox:
a = 7 mm

10.2 - Re-determining shim "S4"

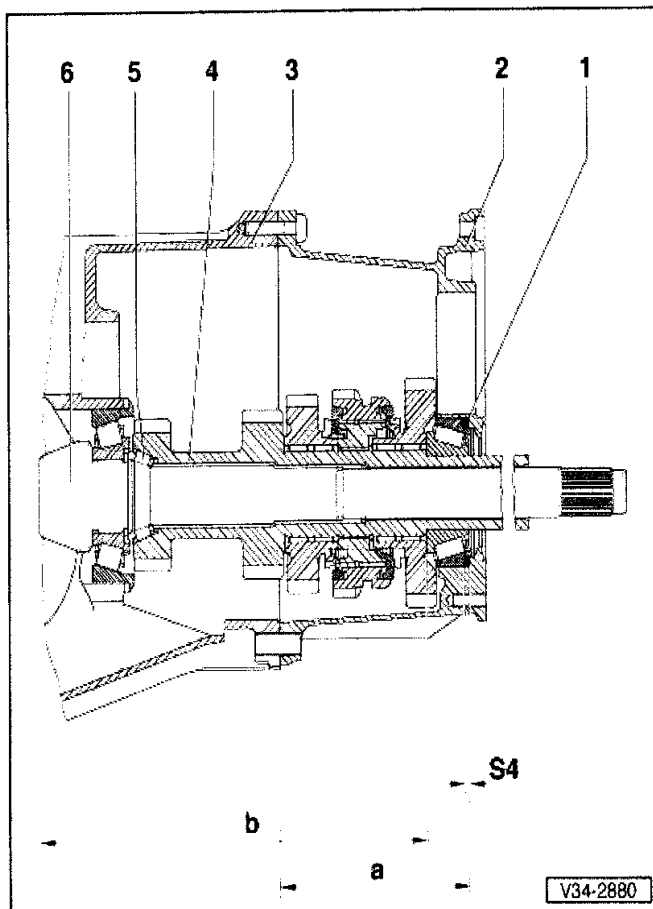


This adjustment is necessary when renewing following components:

- ◆ Bearing plate => Page 110
- ◆ Hollow shaft => Page 110

This adjustment re-creates the preload of the taper rollers for the drive pinion and hollow shaft.

- 1 Shim "S4"
- 2 Bearing plate
- 3 Gearbox housing
- 4 Hollow shaft



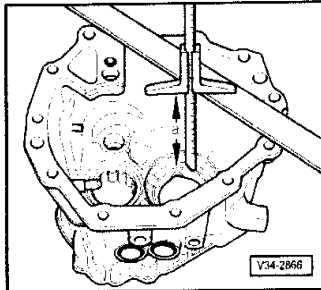
- 5 Drive pinion/hollow shaft taper roller bearing
- 6 Drive pinion

- a - Bearing plate housing depth
- b - Dimension from drive pinion head to contact shoulder of taper roller bearing on hollow shaft
- Taper roller bearing (drive pinion/hollow shaft) preloaded to 10 Nm
- S4 - Thickness of shim "S4"

Note:

When replacing the drive pinion (final drive set), observe adjustment overview

=>Page 175 .



Determining shim when replacing bearing plate

- Use a depth gauge which is accurate to within at least 5/100 mm.
- -> Measure difference of depth "a" on old and new bearing plates

Example:

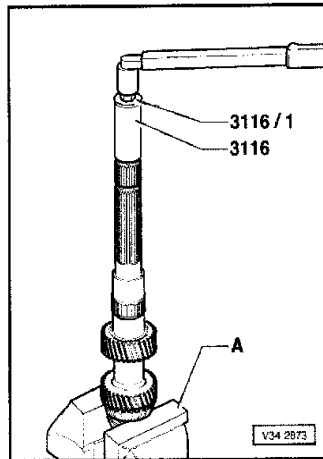
Depth "a" old bearing plate	124.40 mm
Depth "a" new bearing plate	124.65 mm
= Difference	0.25 mm

- If the new bearing plate is deeper, install a thicker "S4" shim.
- If the old bearing plate is deeper, install a thinner "S4" shim.

Example:

Previous "S4" shim	0.95 mm
+ Difference	0.25 mm
= New "S4" shim	1.20 mm

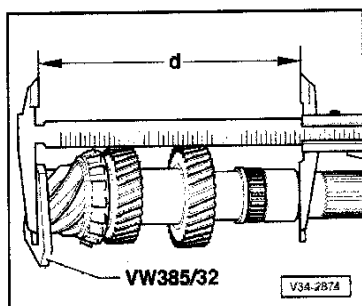
Available shims => Table Page 111 .



Determining shim when replacing hollow shaft

- Use a caliper gauge which is accurate to within at least 5/100 mm.
- -> Tighten tensioning sleeve to exactly 10 Nm.

A - Vice clamps



- -> Fit end measuring plate VW 385/32 onto drive pinion head and measure dimension "d".
- Upper measuring point is the contact shoulder for inner race of small taper roller bearing

Example: 248.50 mm

- Install new hollow shaft and measure dimension "d" again.

Example: 248.70 mm

- Determine difference:

Dimension "d", old hollow shaft	248.50 mm
Dimension "d", new hollow shaft	248.70 mm
= Difference	0.20 mm

- Install a correspondingly thinner shim "S4" if dimension "d" of new hollow shaft is greater.
- Install a correspondingly thicker shim "S4" if dimension "d" of new hollow shaft is less.
- Determine shim(s) from table: part numbers

=> Parts catalogue

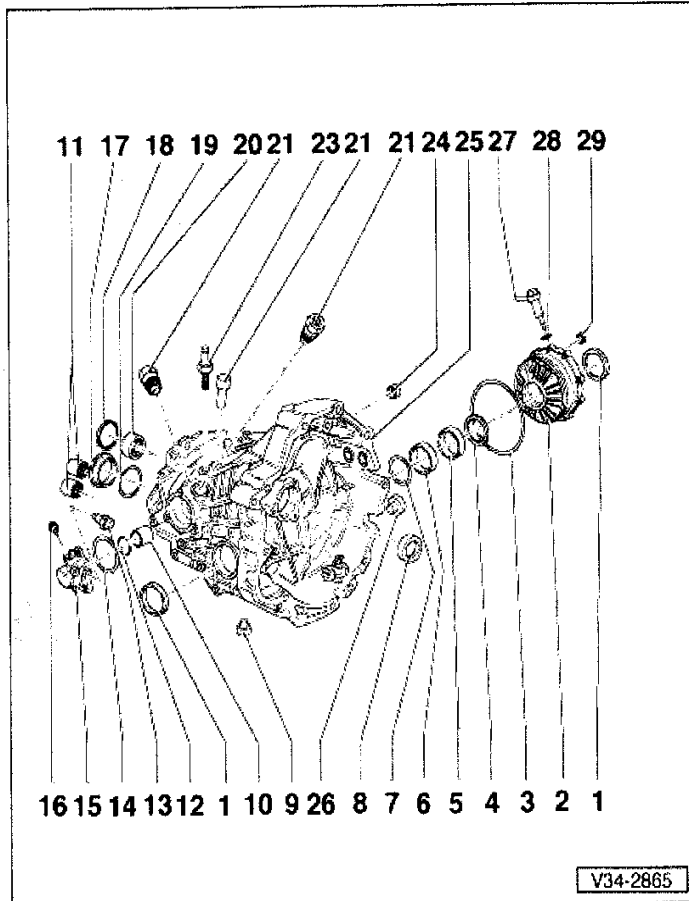
Available shims for "S4"

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

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

11 - Servicing gearbox housing

11.1 - Servicing gearbox housing



Notes:

- ◆ Refer to general repair instructions
=>Page 9.
- ◆ Adjustments are required when replacing components marked 1) =>adjustment overview Page 175.

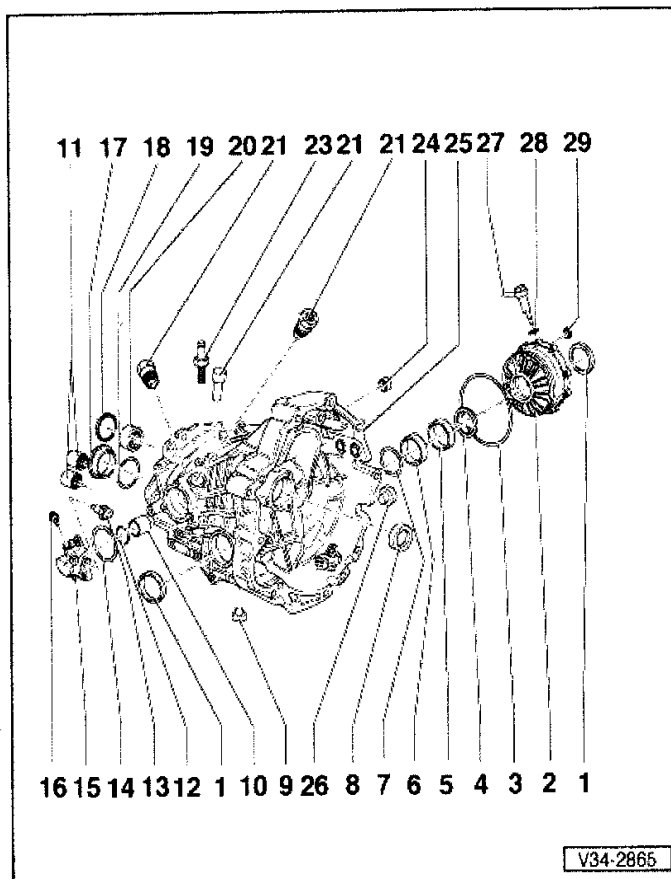
1 Seal

- ◆ For flange shaft
- ◆ Pulling out => Fig. 1
- ◆ Driving in => Fig. 2
- ◆ Fill space between sealing lips with multi-purpose grease
- ◆ Renewing with gearbox installed
=> Page 153

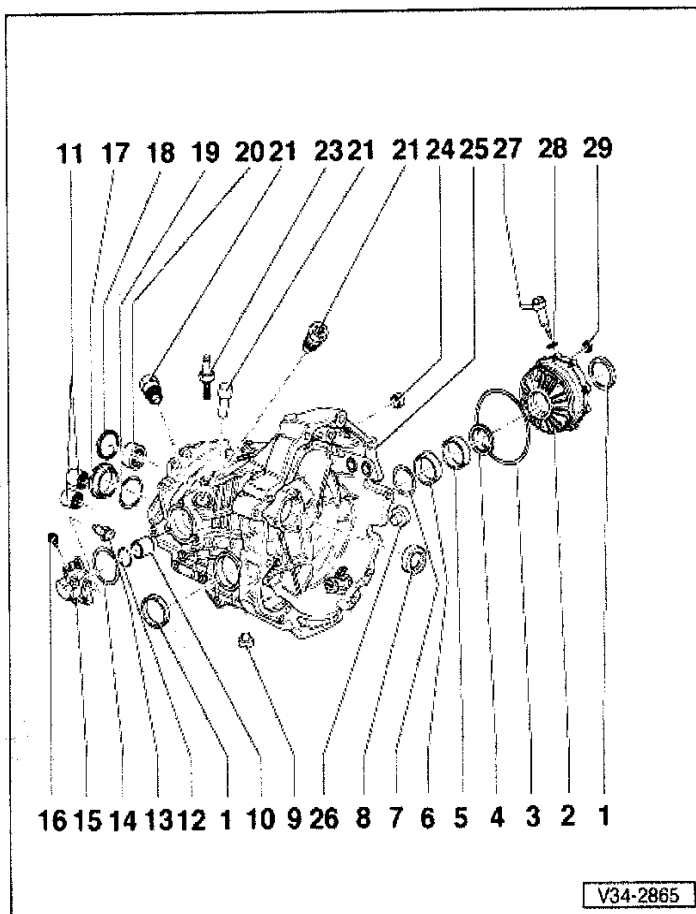
2 Final drive cover 1)

3 O-ring

- ◆ For final drive cover
- ◆ Renew



- 4 Shim "S1"
 - ◆ Note thickness
 - ◆ Adjustment overview => Page 175
- 5 Outer race for large taper roller bearing 1)
 - ◆ For differential
 - ◆ Driving out and driving in => Page 171
- 6 Outer race for small taper roller bearing 1)
 - ◆ For differential
 - ◆ Driving out and driving in => Page 171
- 7 Shim "S2"
 - ◆ Note thickness
 - ◆ Adjustment overview => Page 175



8 Seal

- ◆ For input shaft
- ◆ Levering out => Fig. 3
- ◆ Driving in => Fig. 5
- ◆ Always renew when removing input shaft
- ◆ Renewing when gearbox is not dismantled => Fig. 4 and Fig. 5

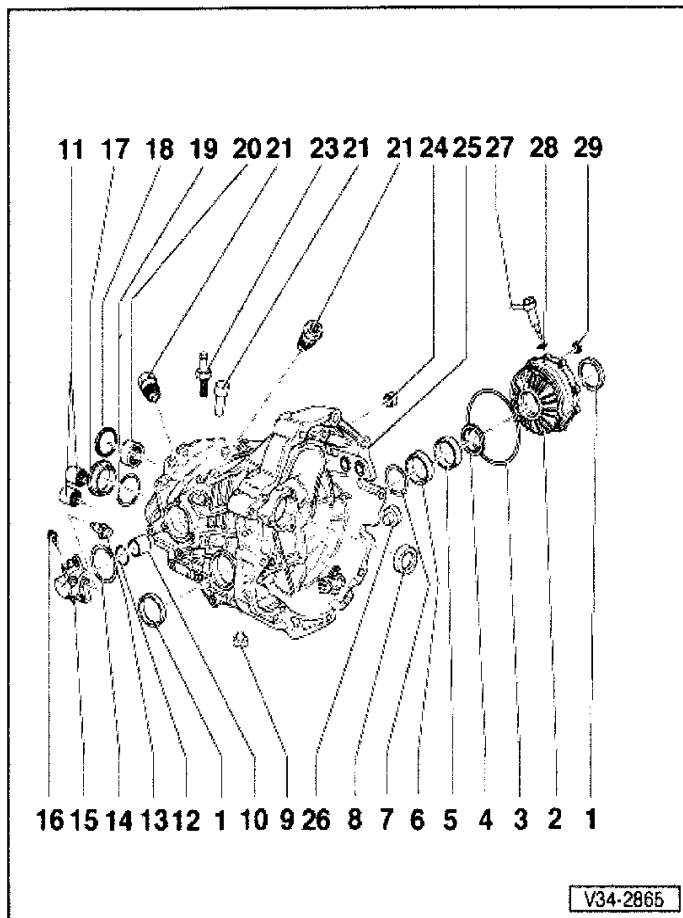
9 Oil drain plug - 40 Nm

10 Ball sleeve

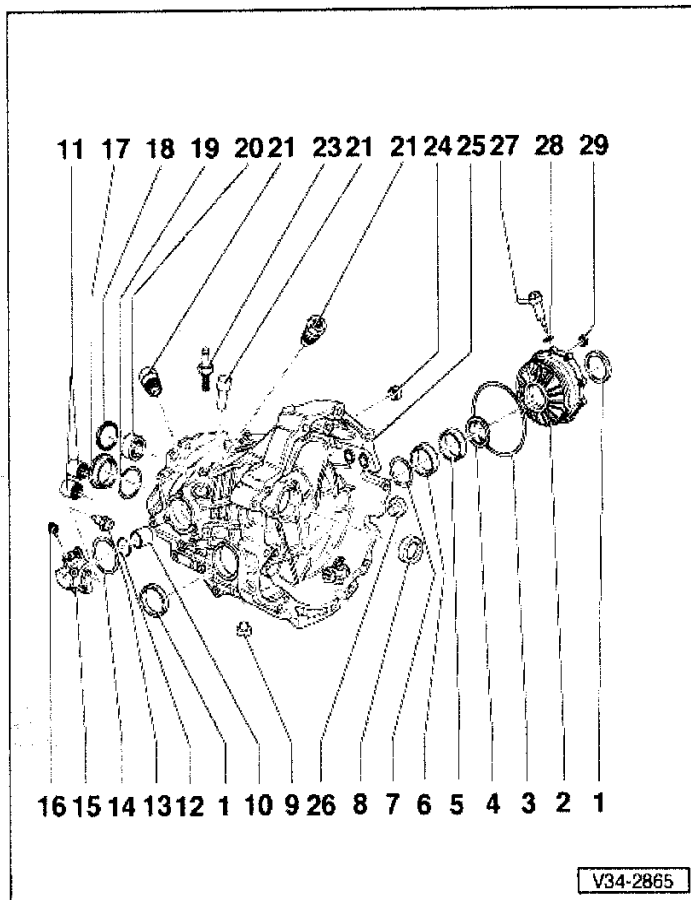
- ◆ For selector shaft
- ◆ Renew
- ◆ Pulling out => Fig. 6
- ◆ Driving in => Fig. 7

11 Ball sleeves

- ◆ For selector shafts
- ◆ Renew
- ◆ Pulling out, as -item 10 -, => Fig. 6
- ◆ Driving in, as -item 10 -, => Fig. 7



- 12 Circlip
 - ◆ Installation position: eyes facing up
- 13 Switch for reversing lights - 20 Nm
- 14 O-ring
 - ◆ For cover for selector shaft
 - ◆ Renew
- 15 Cover for selector shaft
 - ◆ Removing =>Page 67
 - ◆ Installing =>Page 84
- 16 Ball stud - 20 Nm
 - ◆ For connecting rod
- 17 Outer race for large taper roller bearing 1)
 - ◆ For drive pinion
 - ◆ Pulling out =>Fig. 146
 - ◆ Pressing in => Fig. 146



18 Circlip

- ◆ Removing => Fig. 15

19 Shim "S3"

- ◆ Note thickness
- ◆ Adjustment overview => Page 175

20 Needle bearing

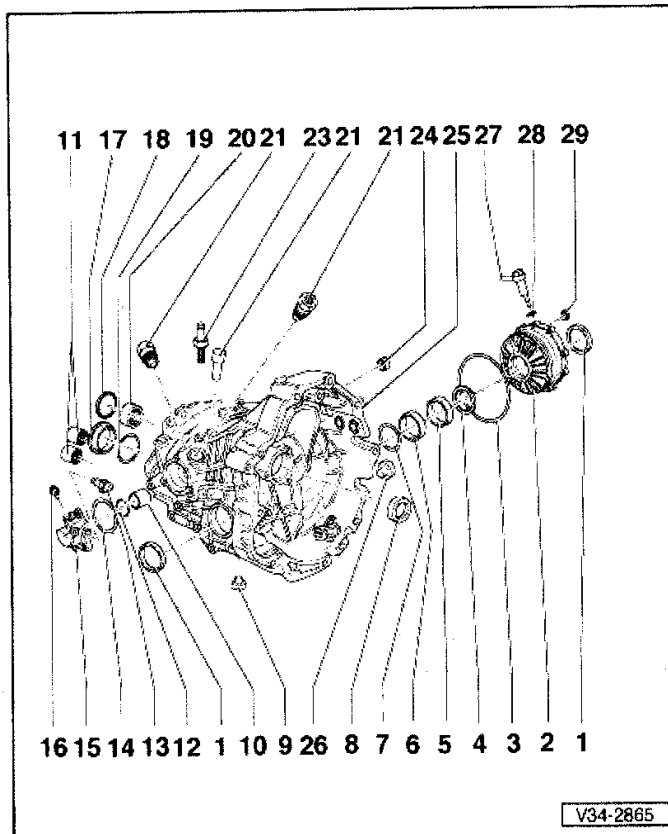
- ◆ For input shaft
- ◆ Pulling out => Fig. 12
- ◆ Driving in => Fig. 13
- ◆ Measuring insertion depth => Fig. 14

21 Locking bolt

- ◆ For selector shaft
- ◆ Removing => Page 67
- ◆ Installing => Page 84
- ◆ Tightening torques:
For aluminium bolt: 50 Nm
For steel bolt: 70 Nm

22 Trunnion bolt - 40 Nm

- ◆ For push rod



23 Breather

- ◆ Insertion depth of sleeve => Fig. 11
- ◆ Clip cap on

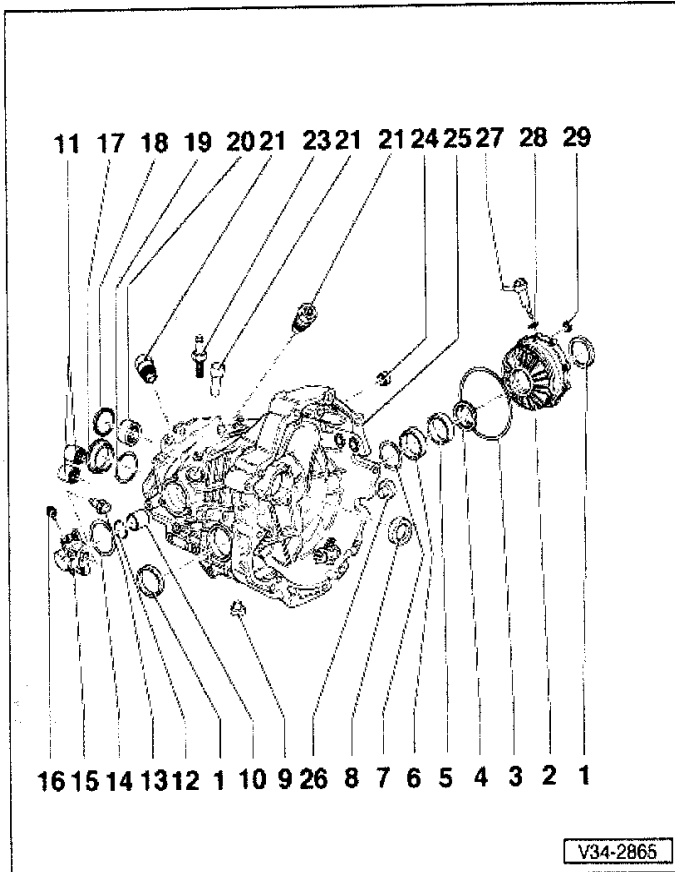
24 Seal for selector shaft

- ◆ Can be renewed when gearbox is removed but not dismantled
- ◆ Renew
- ◆ Pulling out => Fig. 8
- ◆ Driving in => Fig. 9
- ◆ Always use assembly sleeve for installing => Fig. 10

25 Gearbox housing 1)

26 Magnet

- ◆ Clean
- ◆ When renewing gearbox housing drive in with e.g. press tool VW 408 A



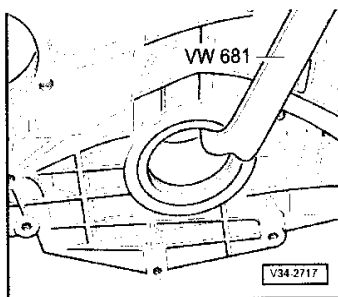
27 Sender for speedometer -G22

- ◆ Renewing => Page 154

28 O-ring

- ◆ Renew

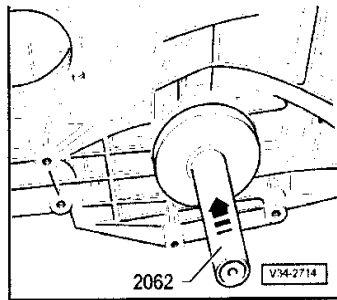
29 Oil filler plug - 40 Nm



-> Fig.1 Pulling out seal for flange shaft

Notes:

- ♦ Illustrated, removing oil seal on right-hand side.
- ♦ Procedure for removing oil seal on left and right-hand sides is identical.

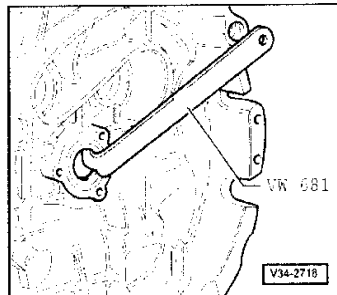


-> Fig.2 Driving in seal for flange shaft

- ♦ Insertion depth: 6.5 mm

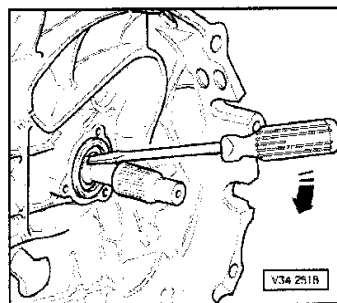
Notes:

- ♦ Illustrated, installing oil seal on right-hand side.
- ♦ Procedure for installing oil seal on left and right-hand sides is identical.



-> Fig.3 Levering out seal for input shaft when gearbox is dismantled

- Lever out seal carefully with VW 681.

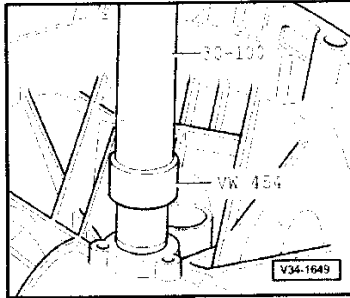


-> Fig.4 Removing seal for input shaft when gearbox is not dismantled

- Lever out seal carefully with a screwdriver.

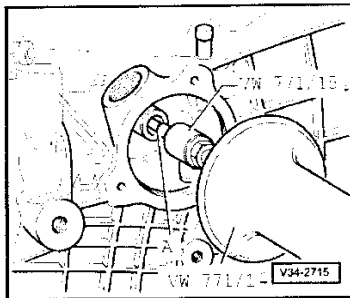
Note:

Do not damage bearing surface on input shaft for shaft seal.



-> Fig.5 Driving in seal for input shaft

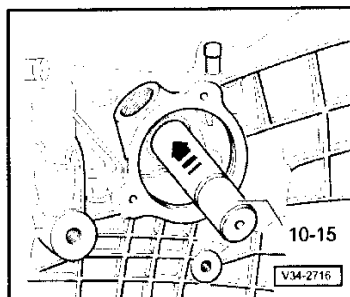
- Fill space between sealing lip and dust lip of new seal for input shaft with multi-purpose grease.
- Fit a thin protective hose tightly over splines of input shaft.
- Drive in seal for input shaft.
 - Insertion depth: 4.5 mm
- Remove protective hose.



-> Fig.6 Pulling out ball sleeve

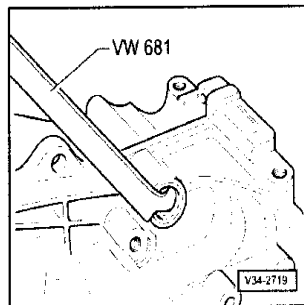
- Remove circlip.

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



-> Fig.7 Driving in ball sleeve

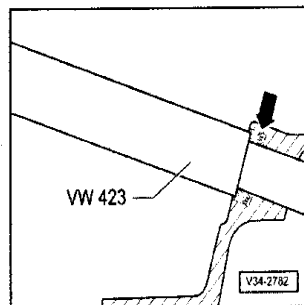
- Drive in onto stop.



-> Fig.8 Pulling out seal for selector shaft

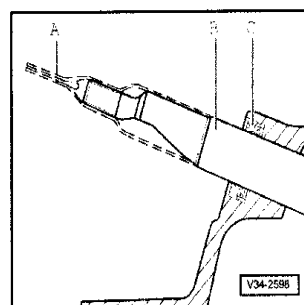
Note:

With gearbox removed but not dismantled, carefully lever out seal without damaging the shaft with a screwdriver.



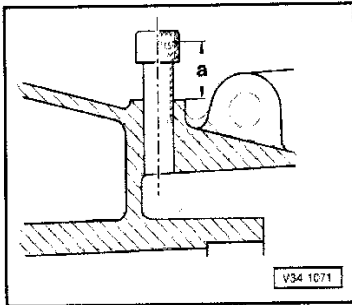
-> Fig.9 Driving in seal for selector shaft

- Selector shaft installed or removed
- Fill space between sealing lip and dust lip with multi purpose grease.
- Pull assembly sleeve onto selector shaft => Fig. 10 .
- Drive seal into housing onto stop.



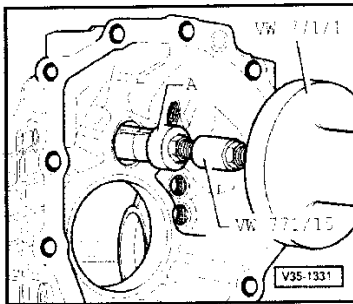
-> Fig.10 Installing seal and selector shaft with assembly sleeve

- To avoid damaging the seal -C- always use assembly sleeve -A-, Part No. 01E 311 120, to install seal or selector shaft.



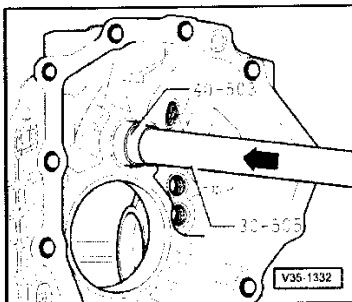
-> Fig.11 Insertion depth of breather sleeve

- ♦ Dimension a = 21 mm



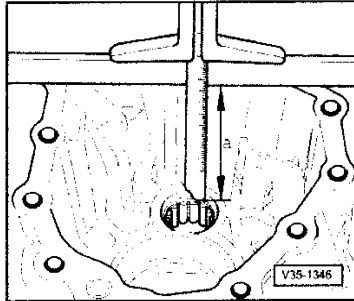
-> Fig.12 Pulling needle bearing out of gearbox housing

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



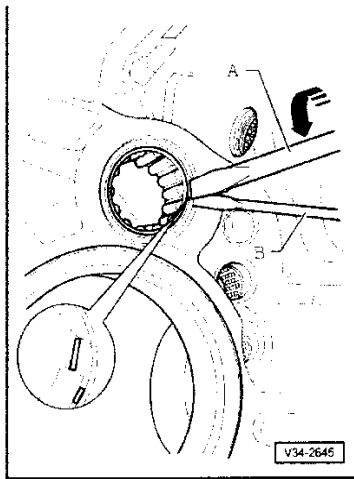
-> Fig.13 Driving needle bearing into gearbox housing

- ♦ Installation position: inscription on bearing faces tool
- ♦ Insertion depth => Fig. 14



-> Fig.14 Insertion depth of needle bearing

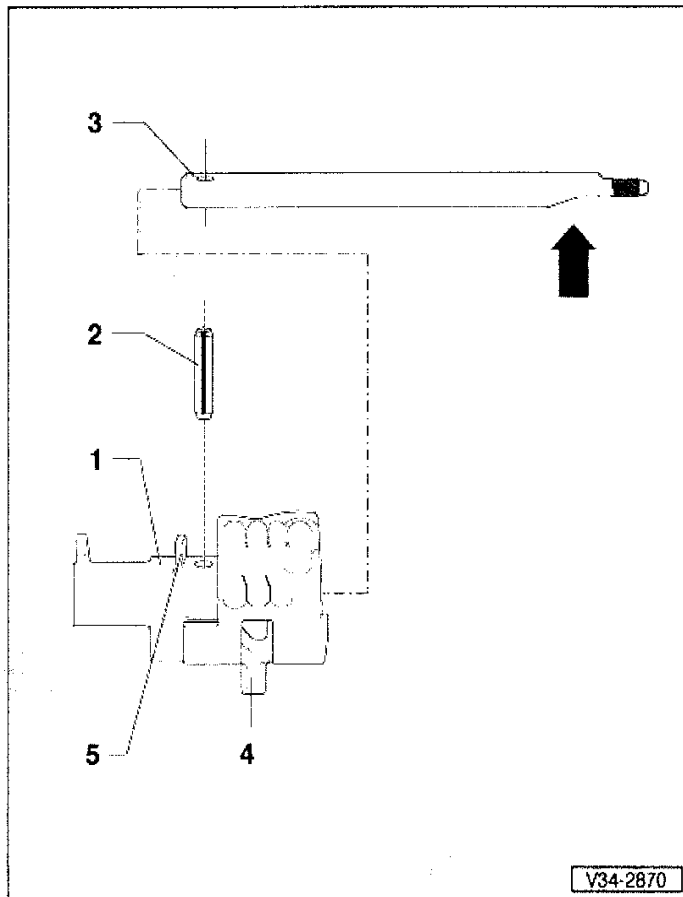
- ◆ Dimension a = 105 mm



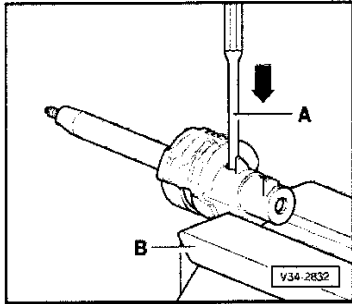
-> Fig.15 Removing circlip

- Lift circlip out of the groove by turning one end of the circlip with a screwdriver -A-.
- Secure this end with a screwdriver -B-.
- Lever circlip out further by repositioning screwdriver -A-.

11.2 - Dismantling and assembling selector shaft complete

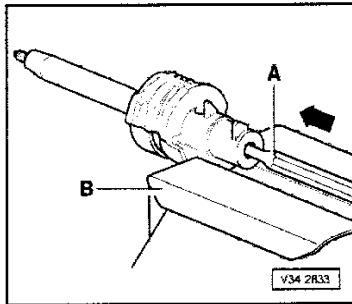


- 1 Selector cylinder
- 2 Roll pin
 - ◆ Driving out and driving in flush
=> Fig. 1
- 3 Selector shaft
 - ◆ Driving out => Fig. 2
 - ◆ Driving in => Fig. 3
 - ◆ Installation position: flat (arrow) and selector finger -item 4 - face in same direction
- 4 Selector finger
 - ◆ Observe installation position to -item 3 -
- 5 Cam for reversing light switch



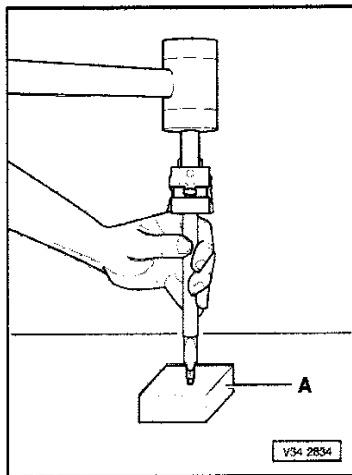
-> Fig.1 Driving out and driving in roll pin flush

- A - Drift
- B - Vice clamps



-> Fig.2 Driving out selector shaft

- A - Drift
- B - Vice clamps





-> Fig.3 Driving in selector shaft

A - Wooden block

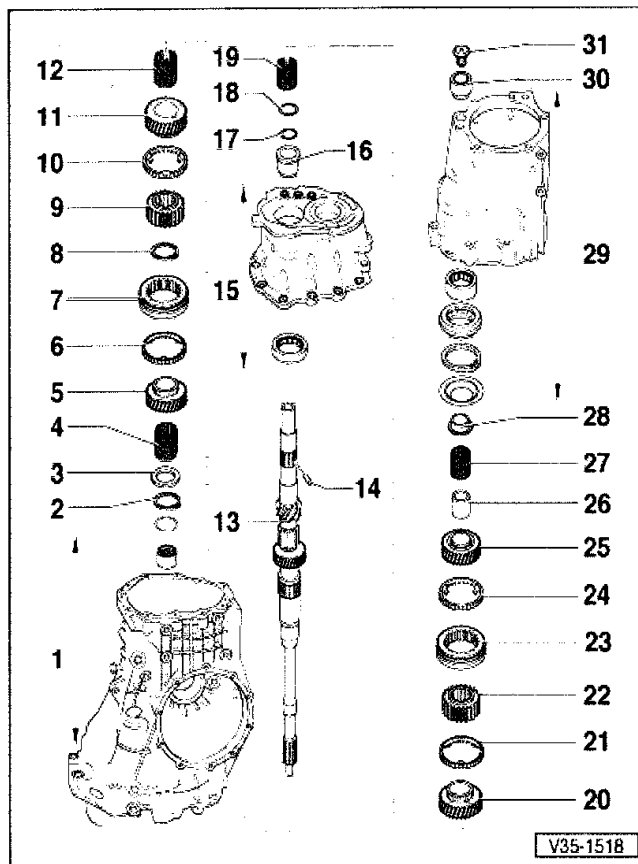
Notes:

- ◆ Bring holes into alignment.
- ◆ Flat on selector shaft and selector finger point in same direction.

35 - Gears, Shafts

1 - Dismantling and assembling input shaft

1.1 - Dismantling and assembling input shaft

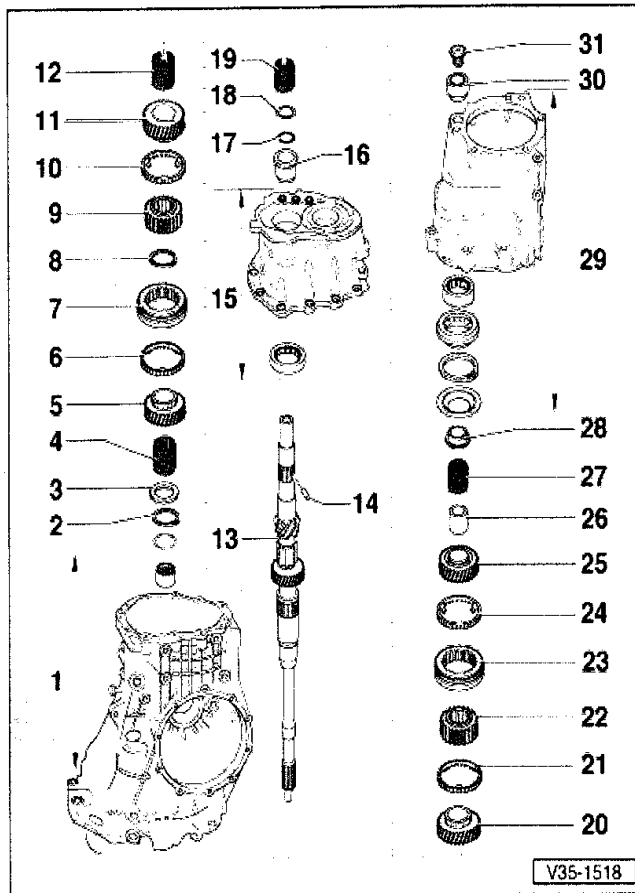


Notes:

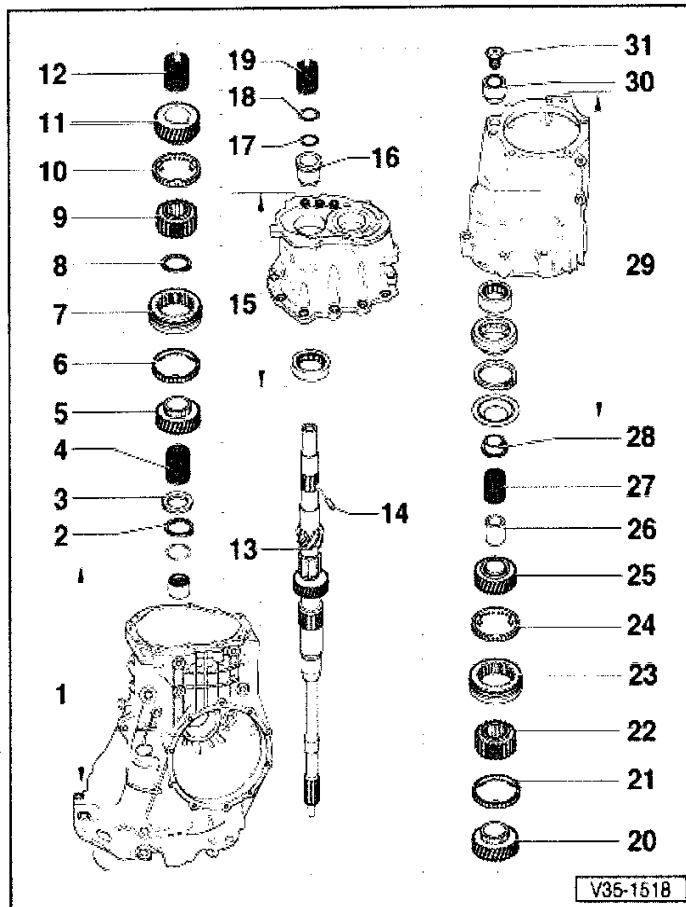
- ♦ When installing new gears, refer to => Technical data, Page 2.
- ♦ In gearboxes with code letters CGR from serial No.77644 onwards and in gearboxes with code letters CRB a wider 1st speed gear (on input shaft -Item 13-) and a wider 1st speed sliding gear are fitted. At the same time the bearing plate -Item 15- was modified and the width of the cylinder roller bearing inner race -Item 16- was reduced.
- ♦ Mixed installation of components belonging to old and new versions is not permissible.

1 Gearbox housing

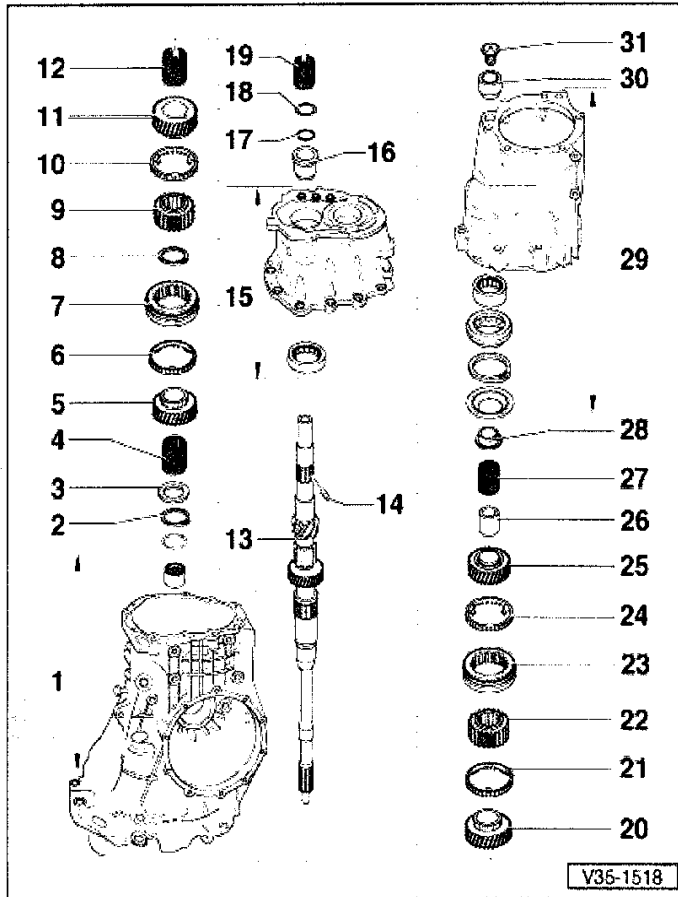
- ♦ Servicing => Page 112



- 2 Circlip
- 3 Thrust washer
- 4 Needle bearing for 4th gear
 - ◆ Mark before removing
 - ◆ Do not interchange with needle bearing for 3rd gear
 - ◆ Oil with gear oil before installing
- 5 4th speed sliding gear
 - ◆ Before installing, insert spring
=> Fig. 1
 - ◆ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)
- 6 Synchro-ring for 4th gear
 - ◆ Checking for wear => Fig. 2



- 7 Locking collar
- ◆ Paired with synchro-hub
 - ◆ Mark before removing => Page 70
- 8 Circlip
- ◆ Re-determine thickness when renewing synchro-hub => Fig. 3
 - ◆ Installation position: ends align with groove of synchro-hub
- 9 Synchro-hub for 3rd and 4th gear
- ◆ Pressing off => Fig. 4
 - ◆ Installation position: => Fig. 5
 - ◆ Pressing on => Fig. 6
- 10 Synchro-ring for 3rd gear
- ◆ Coated with molybdenum
 - ◆ Checking for wear => Fig. 2



11 3rd speed sliding gear

- ◆ Before installing, insert spring
=> Fig. 1
- ◆ After pressing on -item 9 -, check axial clearance with a feeler gauge
(0.15 ... 0.35 mm)

12 Needle bearing for 3rd gear

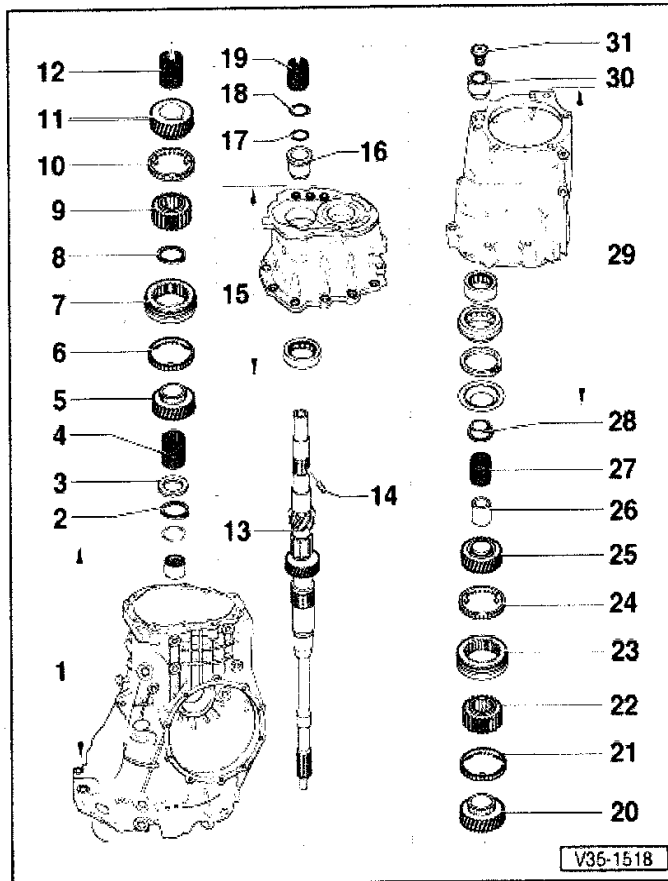
- ◆ Mark before removing
- ◆ Do not interchange with needle bearing for 4th gear
- ◆ Oil with gear oil before installing

13 Input shaft

- ◆ With wider 1st speed gear in CGR gearbox from serial No. 77644 and in CRB gearbox: allocation=>Fig. 8

14 Spring pin

- ◆ Drive in when renewing input shaft
=> Fig. 7



15 Bearing plate

- ◆ Servicing => Page 101
- ◆ With machined surface for identification in CGR gearbox from serial No. 77644 and in CRB gearbox => Fig. 105

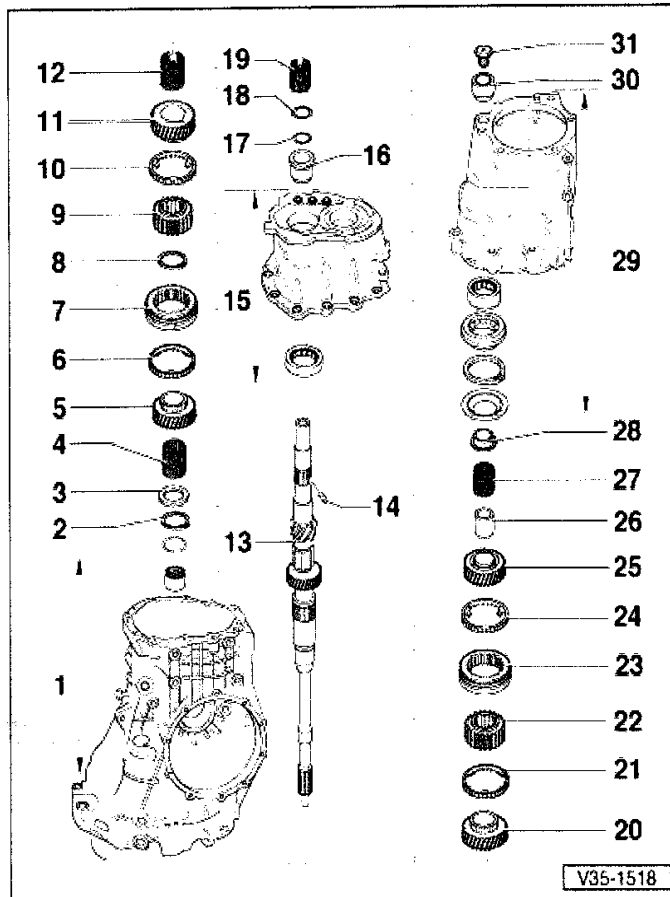
16 Inner race for cylinder roller bearing

- ◆ Altered width in CGR gearbox from serial No. 77644 and in CRB gearbox: allocation=> Fig. 8
- ◆ Take off and fit by hand

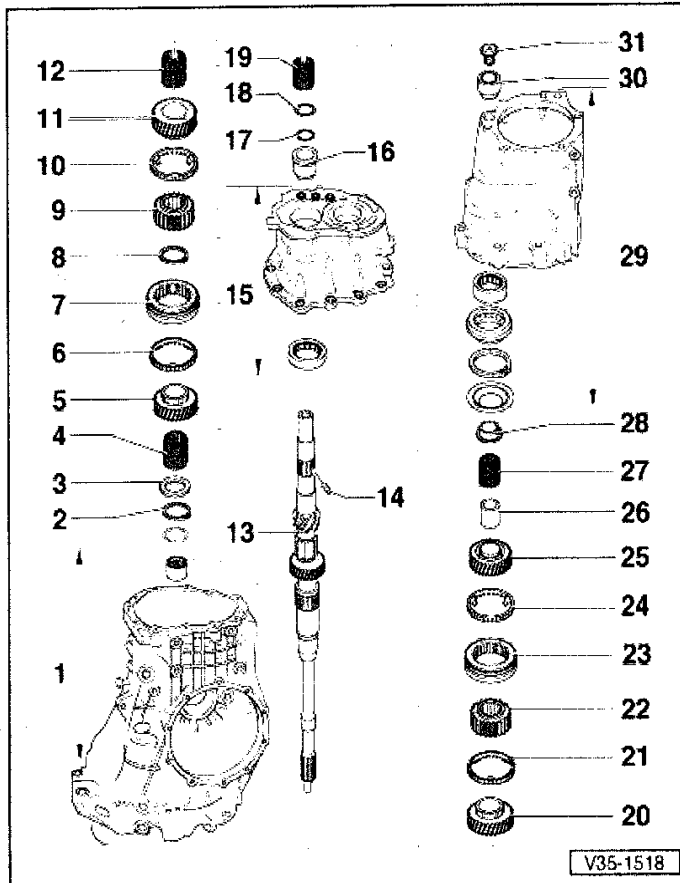
17 Circlip

18 Thrust washer for needle bearing for 6th gear

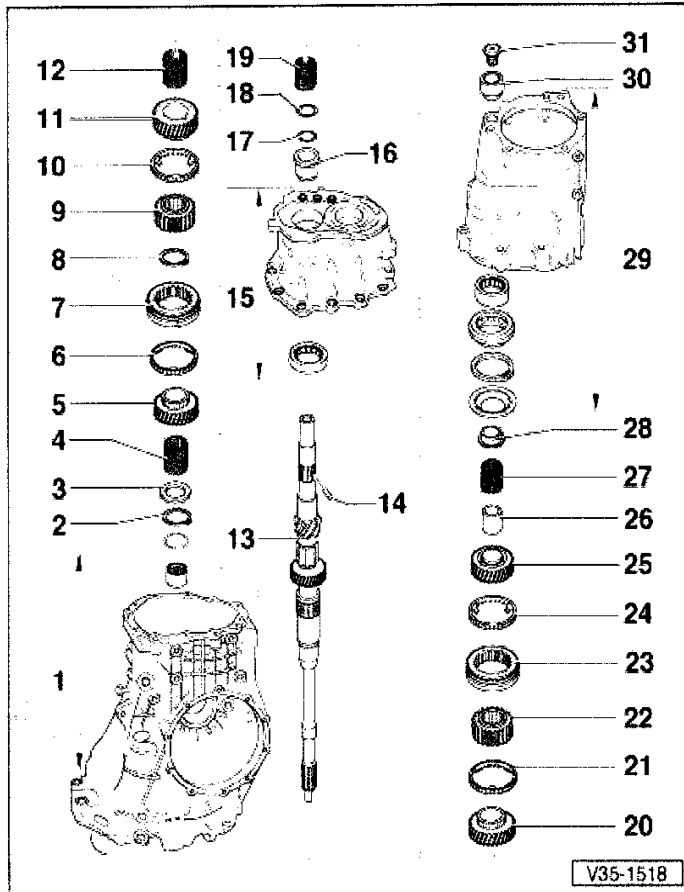
- ◆ Installation position: shoulder towards circlip, smooth contact surface towards needle bearing => Page 78



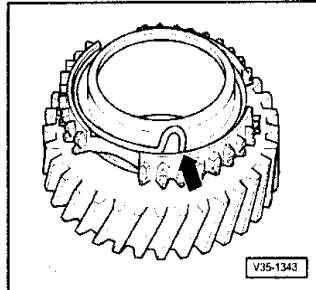
- 19 Needle bearing for 6th gear**
- ♦ Oil with gear oil before installing
- 20 6th speed sliding gear**
- ♦ Before installing, insert spring => Fig. 1
 - ♦ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)
- 21 Synchro-ring for 6th gear**
- ♦ Checking for wear => Fig. 2
- 22 Synchro-hub for 5th and 6th gear**
- ♦ Pulling off => Page 70
 - ♦ Driving on => Page 79
 - ♦ Installation position: projecting hub towards 5th speed sliding gear



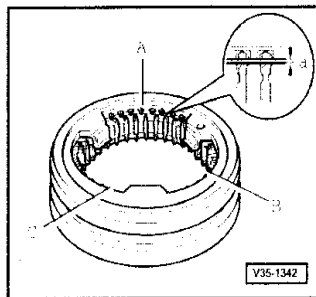
- 23 Locking collar
 - ◆ Paired with synchro-hub
 - ◆ Mark before removing => Page 70
- 24 Synchro-ring for 5th gear
 - ◆ Checking for wear => Fig. 2
- 25 5th speed sliding gear
 - ◆ Before installing, insert spring => Fig. 1
 - ◆ After installing, check axial clearance => Page 82
- 26 Inner race for 5th speed sliding gear
 - ◆ Pulling off => Page 70
 - ◆ Driving on => Page 81



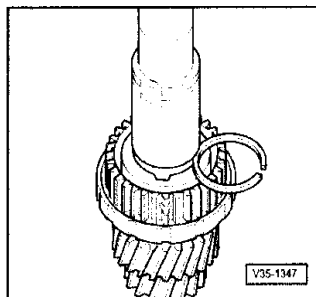
- 27 Needle bearing for 5th gear
 - ◆ Oil with gear oil before installing
- 28 1st inner race for tapered roller bearing for input shaft
 - ◆ Pulling off => Page 69
 - ◆ Driving on =>Page 82
- 29 End cover
 - ◆ Servicing => Page 95
- 30 2nd inner race for tapered roller bearing for input shaft
 - ◆ Pulling off => Page 68
 - ◆ Driving on => Page 82
- 31 Multi-point socket head bolt
 - 150 Nm
 - ◆ Loosening and tightening
=> Page 68



-> Fig.1 Inserting spring in sliding gear
- Insert spring -arrow- in sliding gear, hook angled end into hole.



-> Fig.2 Checking synchro-ring for wear
- Press synchro-ring into locking collar and measure gap "a" with a feeler gauge at positions -A-, -B- and -C-.
- Add together results and divide by three.
- The figure calculated must not be less than 0.5 mm



-> Fig.3 Re-determining thickness of circlip
- Press synchro-hub onto stop.

Note:

Note installation position when pressing on =>Fig. 5.

- Determine the thickest circlip that can still just be fitted.

Note:

The opening of the circlip must align with the groove in the synchro-hub.

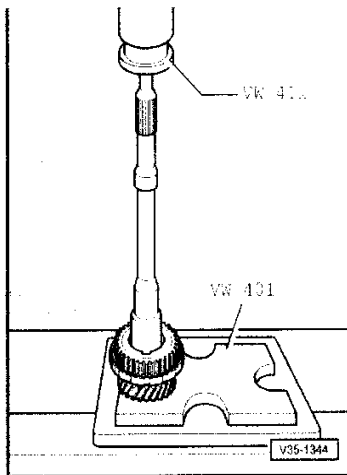
- Determine circlip from table. Part No.

=> Parts catalogue

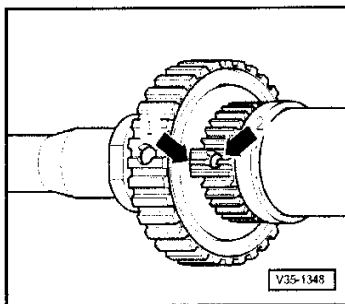
Circlips available

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

- Fit circlip.



-> Fig.4 Pressing off synchro-hub for 3rd and 4th gear

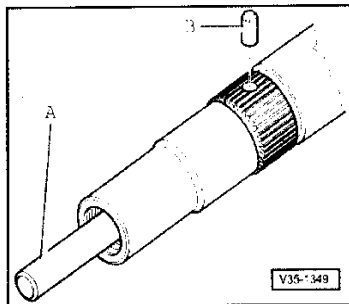


-> Fig.5 Synchro-hub installation position

- ♦ Oil groove in synchro hub -arrow 1- must align with oil drilling -arrow 2- in input shaft

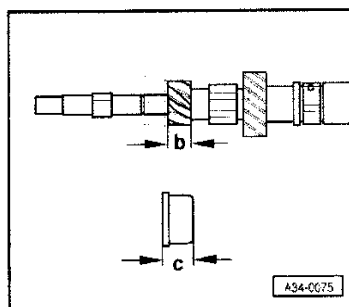
-> Fig.6 Pressing on synchro-hub for 3rd and 4th gear

- Heat synchro-hub to approx. 100 °C, fit and press home.
- Fit circlip.



-> Fig.7 Driving spring pin into input shaft

- Guide a 9 mm diameter drift -A- into oil drilling and drive spring pin -B- in until it touches drift.



-> Fig.8 Allocation of 1st speed gear and cylinder roller bearing inner race
 In the CGR gearbox from serial No. 77644 onwards and in the CRB gearbox 1st speed gear is wider and the cylinder roller bearing inner race is modified to match.

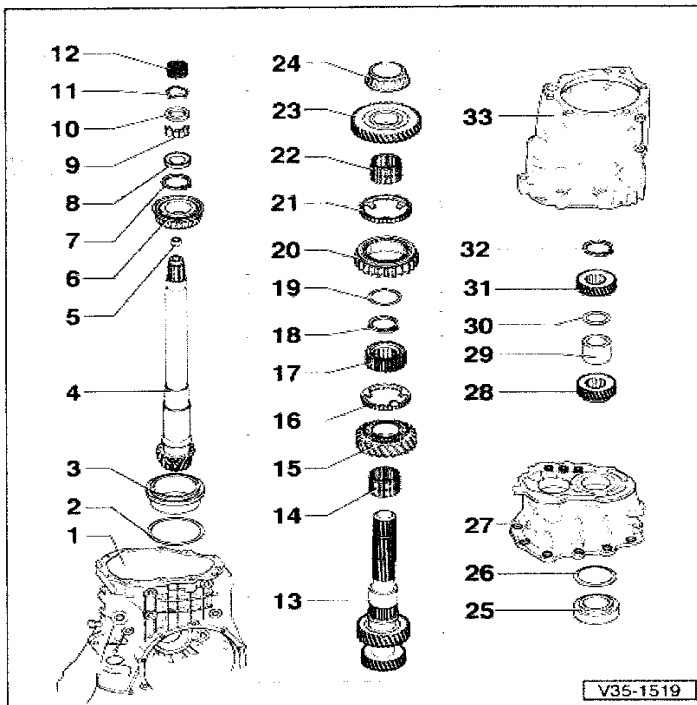
- b - Width of 1st speed gear
- c - Width of cylinder roller bearing inner race

Allocation:

- CGR gearbox up to serial number 77643:
 - b = 22 mm
 - c = 28 mm
- CGR gearbox from serial number 77644 onwards and CRB gearbox:
 - b = 26 mm
 - c = 24 mm

2 - Dismantling and assembling drive pinion and hollow shaft

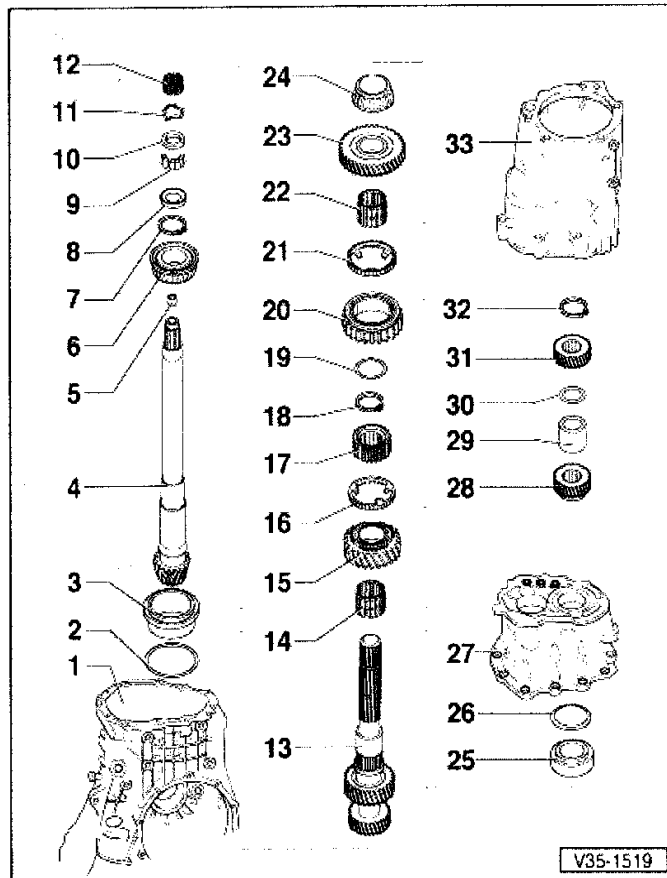
2.1 - Dismantling and assembling drive pinion and hollow shaft



Notes:

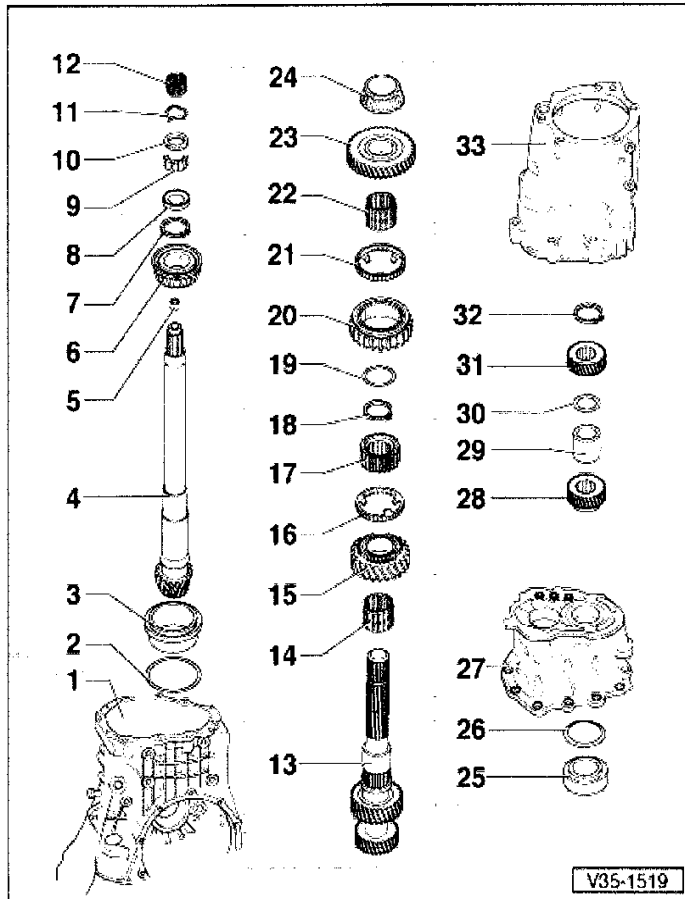
- ◆ When installing new gears or final drive set => Technical data, Page 2.
- ◆ Adjustments are required when renewing components marked 1)
 => Adjustment overview, Page 175.

- 1 Gearbox housing
 - ◆ Servicing => Page 112
- 2 Shim "S3"
 - ◆ Adjustment overview => Page 175

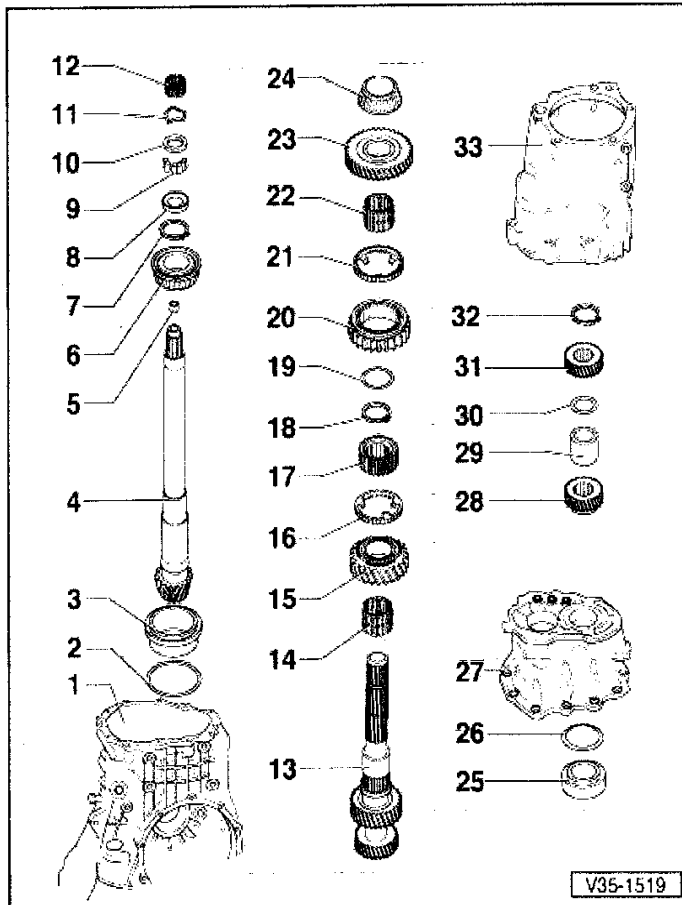


- 3 Outer race for large taper roller bearing 1)
 - ◆ Pulling out => Fig. 1
 - ◆ Pressing in => Fig. 2 and Fig. 3
- 4 Drive pinion 1)
 - ◆ Paired with crown wheel (final drive set)
- 5 Needle bearing for flange shaft/drive pinion
 - ◆ Pulling out => Fig. 4
 - ◆ Driving in => Fig. 5
- 6 Inner race for large taper roller bearing 1)
 - ◆ Pressing off => Fig. 6

- ♦ Pressing on => Fig. 7
- ♦ Low friction bearing; do not oil when measuring frictional torque



- 7 Circlip
 - ♦ Re-determining => Fig. 8
- 8 Flange ring
 - ♦ Installation position => Page 73
- 9 Tapered rollers
 - ♦ Qty. 23
 - ♦ Installation position => Page 73
- 10 Support ring
 - ♦ Installation position => Page 73
- 11 Corrugated spring
- 12 Needle bearing for drive pinion/hollow shaft
 - ♦ Oil before installing
- 13 Hollow shaft with 3rd and 4th speed gears 1)



14 Needle bearing for 2nd speed sliding gear

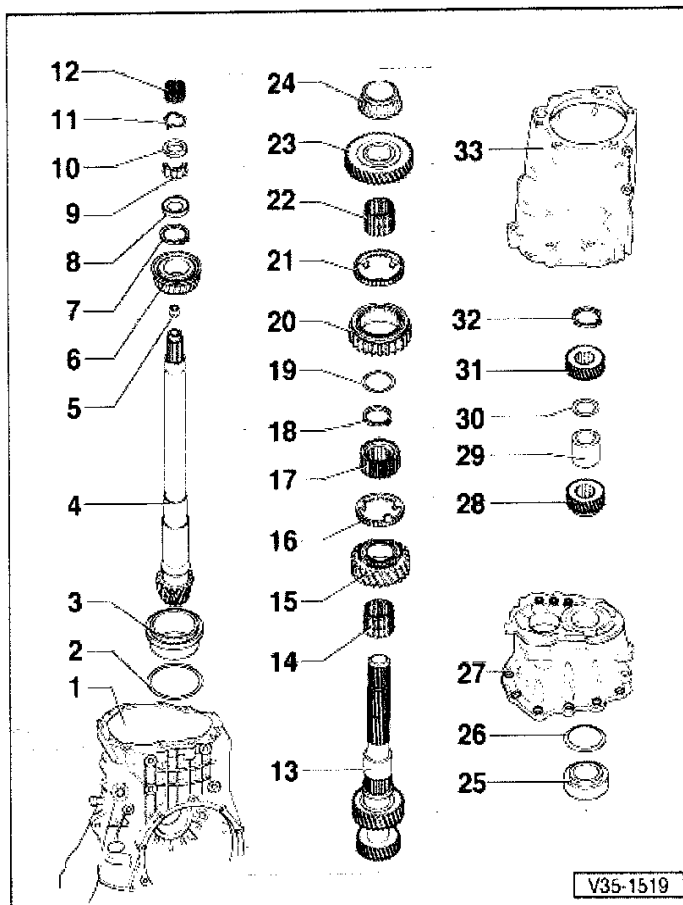
- ◆ Split
- ◆ Oil with gear oil before installing

15 2nd speed sliding gear

- ◆ Pressing off => Fig. 12
- ◆ Before installing, fit spring and slide needle bearing onto hollow shaft
- ◆ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

16 Synchro-ring for 2nd gear

- ◆ Coated with Molybdenum
- ◆ Checking for wear => Fig. 135



17 Synchro-hub for 1st and 2nd gear

- ◆ Pressing off => Fig. 12
- ◆ Pressing on => Fig. 13
- ◆ Installation position: flush hub towards 2nd speed sliding gear

18 Circlip

- ◆ Removing and installing => Fig. 11
- ◆ Re-determining => Fig. 8

19 Washer

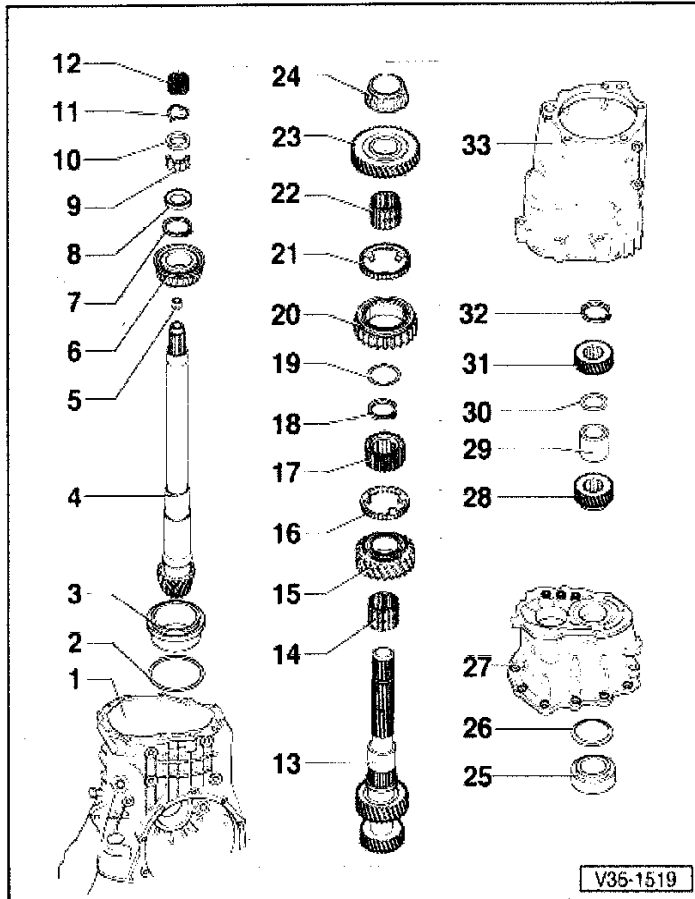
- ◆ Removing and installing => Fig. 11

20 Locking collar for 1st and 2nd gear

- ◆ Installation position: splines for reverse gear towards synchro-ring for 2nd gear

21 Synchro-ring for 1st gear

- ◆ Checking for wear => Fig. 135



22 Needle bearing for 1st speed sliding gear

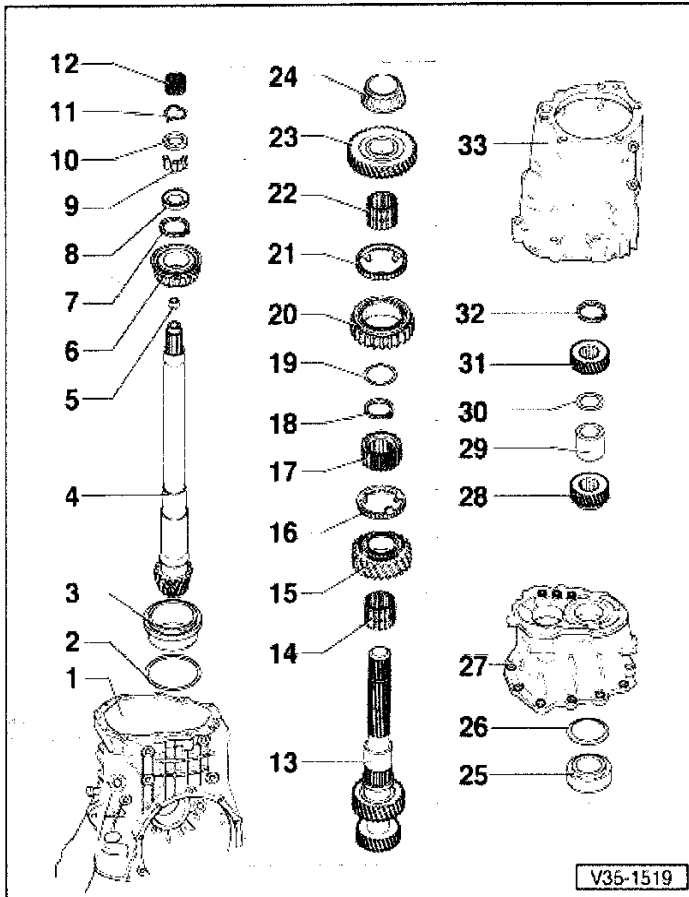
- ◆ Oil with gear oil before installing

23 1st speed sliding gear

- ◆ In CGR gearbox from serial No. 77644 and in CRB gearbox 1st speed sliding gear is wider=>Fig. 17
- ◆ Before installing, insert spring => Fig. 135
- ◆ After pressing on -item 24 -, check axial clearance

24 Inner race for small taper roller bearing 1)

- ◆ Pressing off=> Fig. 9
- ◆ Pressing on => Fig. 10
- ◆ Low friction bearing; do not oil when measuring frictional torque



25 Outer race for small taper roller bearing 1)

- ♦ Driving out => Fig. 15
- ♦ Pressing in => Fig. 16

26 Shim "S4"

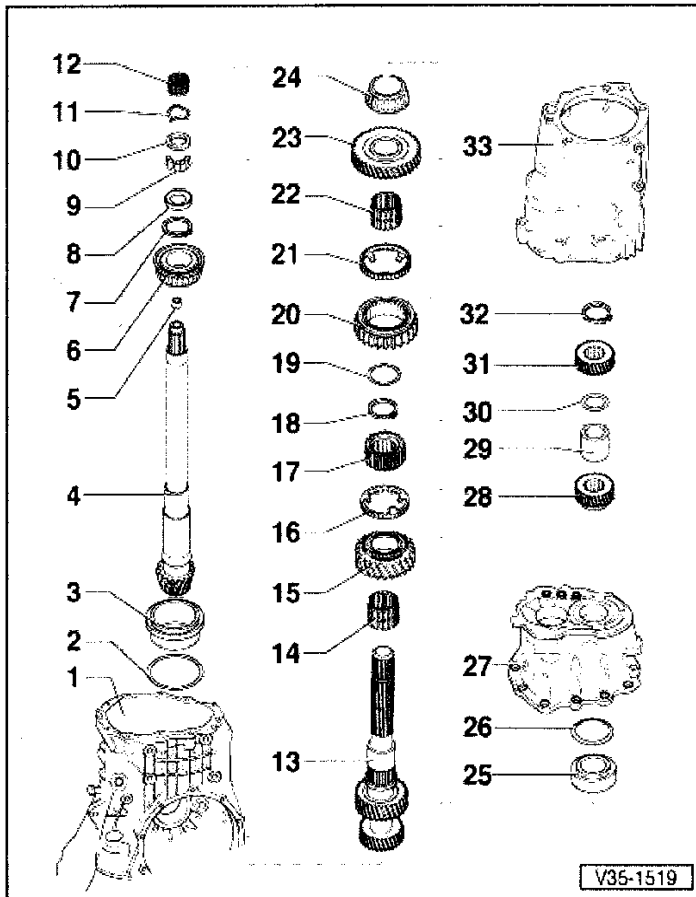
- ♦ Adjustment overview => Page 175

27 Bearing plate 1)

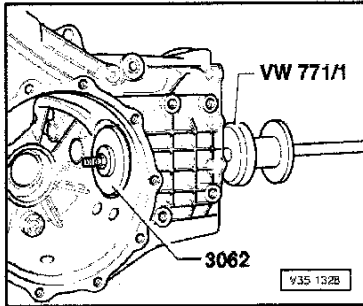
- ♦ Modified bearing plate with machined surface for identification in CGR gearbox from serial No. 77644 and in CRB gearbox=>Fig. 105
- ♦ Servicing => Page 101

28 6th gear wheel

- ♦ Pressing off => Page 73
- ♦ Pressing on => Page 74
- ♦ Installation position: shoulder towards inner race for small taper roller bearing

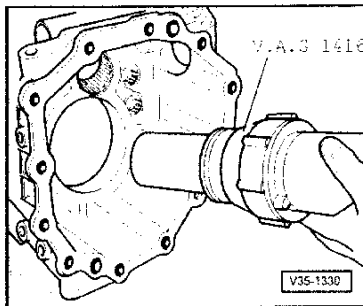


- 29 Spacer sleeve
- 30 Shim
 - ♦ Re-determining =>Page 80
- 31 5th gear wheel
 - ♦ Pulling off => Page 69
 - ♦ Driving on => Page 80
- 32 Circlip for 5th gear wheel
 - ♦ Re-determining => Page 81
- 33 End cover
 - ♦ Servicing => Page 95



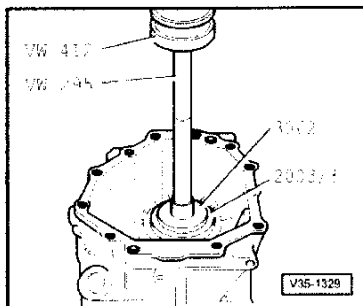
-> Fig.1 Pulling out outer race for large taper roller bearing

- ♦ Stepped side of thrust pad 3062 rests against the outer race



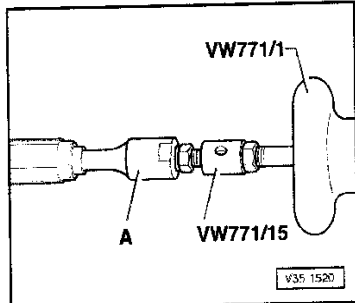
-> Fig.2 Heating gearbox housing to insert the outer race for large taper roller bearing

- Heat gearbox housing in area of bearing seat for approx. 15 minutes, to approx. 100 °C, with a hot air blower.



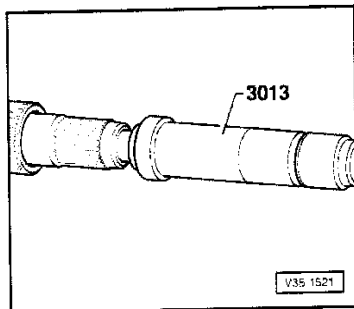
-> Fig.3 Inserting outer race for large taper roller bearing in gearbox housing and pressing home

- Insert outer race only after heating gearbox housing and press home for 1 ... 2 minutes under a repair press until a heat exchange has taken place.

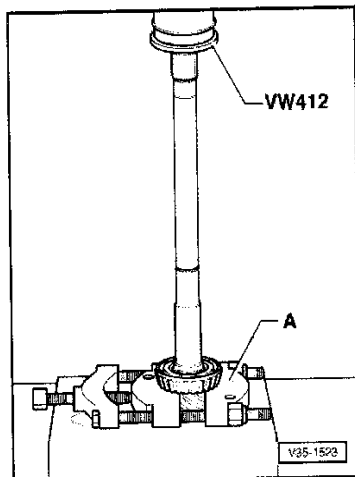


-> Fig.4 Pulling out needle bearing for flange shaft/drive pinion

A - Internal puller 12 ... 14.5 mm, e.g. Kukko 21/1



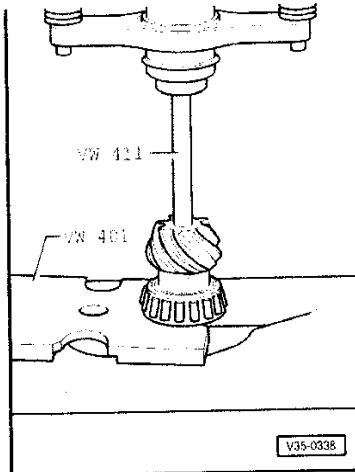
-> Fig.5 Driving needle bearing for flange shaft/ drive pinion in flush



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

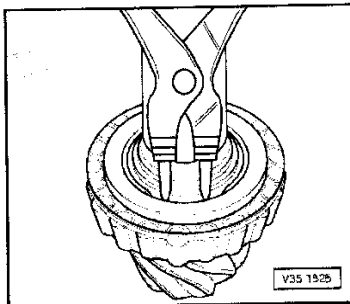
A - Separating device 22 ... 115 mm, e.g. Kukko 17/2

- ◆ Bearing is destroyed when pressing off



-> Fig.7 Pressing on inner race for large taper roller bearing

- Heat inner race to approx. 100 °C and fit.
- Press home ensuring there is no axial play.



-> Fig.8 Determining circlip for large taper roller bearing for drive pinion

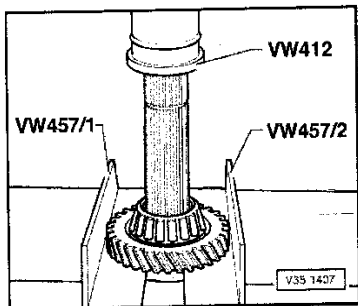
- Determine the thickest circlip that can still just be fitted.
- Determine circlip from table. Part numbers

=> Parts catalogue

The following circlips are available:

Circlip thickness (mm)		
2.34	2.40	2.46
2.36	2.42	2.48
2.38	2.44	

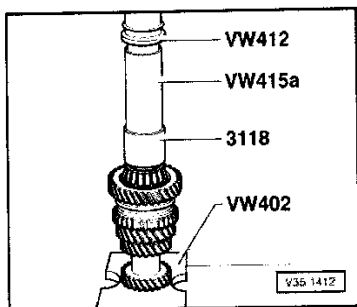
- Fit circlip.



-> Fig.9 Pressing off inner race of small taper roller bearing for drive pinion together with 1st speed sliding gear

Note:

Do not press off together with 1st and 2nd gear synchro-hub and 2nd speed sliding gear.

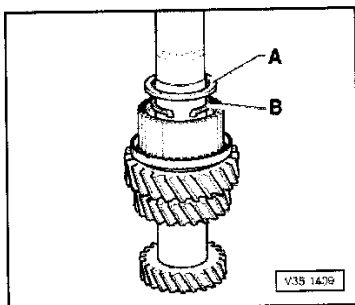


-> Fig.10 Pressing on inner race for small taper roller bearing for drive pinion together with 1st speed sliding gear

- Install circlip, shim for 1st speed sliding gear, synchro-ring for 1st speed, and 1st speed sliding gear with spring and needle bearing.
- Heat inner race to approx. 100 °C and fit.
- Press home ensuring there is no axial play.

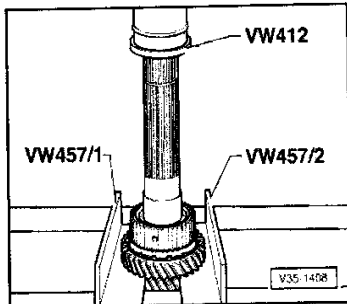
Notes:

- ◆ With shoulder of thrust piece 3118 facing downwards, press only onto bearing inner race.
- ◆ Position stepped shoulder of tube VW 415 A facing up towards press tool VW 412.
- ◆ After pressing on, check axial clearance of 1st speed sliding gear.





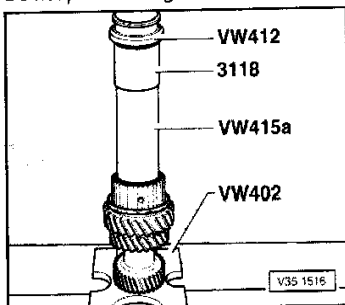
- > Fig.11 Removing and installing circlip for synchro-hub and shim for 1st speed sliding gear
- Removing, take off shim -A- then circlip -B-.
 - Installing, fit circlip -B- then shim -A-.



- > Fig.12 Pressing off 2nd speed sliding gear with synchro-hub for 1st and 2nd gear
- Take off locking collar for 1st and 2nd gear and synchro-ring for 1st gear.
 - Remove shim and circlip for synchro-hub
 - Press off 2nd speed sliding gear together with synchro-hub for 1st and 2nd gear.

Note:

Do not press off together with 1st speed sliding gear and inner race for small taper roller bearing.



- > Fig.13 Fitting 2nd speed sliding gear, pressing on synchro-hub for 1st and 2nd gear
- Install needle bearing (split), sliding gear with spring and synchro-ring for 2nd gear.
 - Oil needle bearing.
 - Heat synchro-hub to approx. 100 °C and fit.
 - Press home ensuring there is no axial play.

Notes:

- ◆ Position tube VW 415 a with shoulder towards synchro-hub.
- ◆ Position thrust pad 3118 with stepped shoulder towards press tool VW 412.

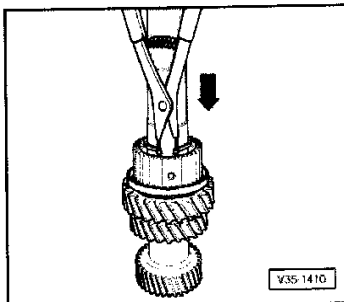


Fig.14 -> Determining thickness of circlip for synchro-hub for 1st and 2nd gear

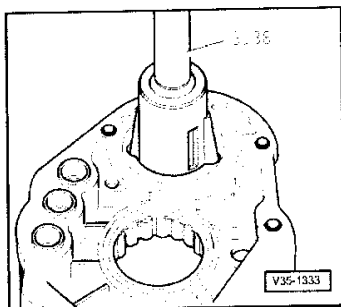
- Determine the thickest circlip that can still just be fitted.
- Determine circlip from table. Part No.

=> Parts catalogue

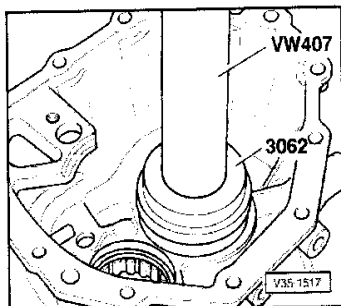
The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- Fit circlip in direction of arrow onto synchro-hub.

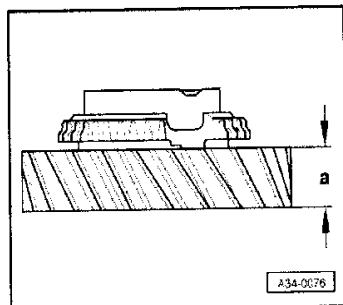


-> Fig.15 Driving out outer race for small taper roller bearing



-> Fig.16 Pressing in outer race for small taper roller bearing

- Insert shim "S4" into bearing flange behind bearing seat.
- Position stepped shoulder of thrust pad 3062 towards press tool VW 407.
- Press outer race for small taper roller bearing onto stop.





-> Fig.17 Width of 1st speed sliding gear

The CGR gearbox from serial No. 77644 and the CRB gearbox have a wider 1st speed sliding gear to match the wider 1st speed gear.

Allocation:

- ◆ CGR gearbox up to serial No. 77643: 1st speed sliding gear with smaller width
a = 18 mm
- ◆ CGR gearbox from serial No. 77644 and CRB gearbox: 1st speed sliding gear with larger width
a = 22 mm

39 - Final drive, Differential rear

1 - Renewing seal for flange shaft

1.1 - Renewing seal for flange shaft

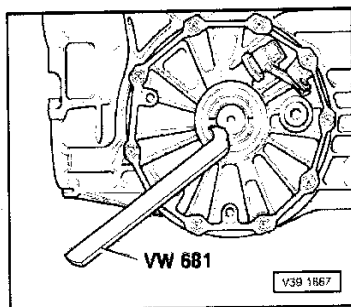
- Gearbox installed

Notes:

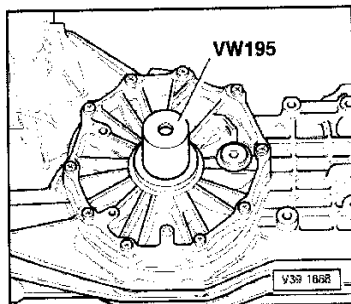
- ♦ Illustrated, removing and installing oil seal on left-hand side.
- ♦ Procedure for removing oil seal on left and right-hand sides is identical.

Removing

- Remove heat shield.
- Disconnect drive shaft.
- Place a drip tray underneath.



- Remove flange shaft, secure with a drift to prevent it turning.
- -> Pull seal out with lever VW 681.



Installing

- Fill space between sealing and dust lips with multipurpose grease.
- Lightly oil outer circumference of seal.
- -> Drive in seal for flange shaft.
 - Insertion depth: 6.5 mm
- Install flange shaft and drive shaft.



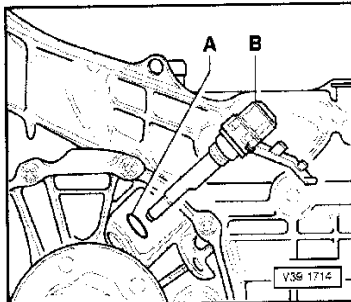
Tightening torques

Component	Nm
Flange shaft to gearbox	10 + 90°1)
Drive shaft to flange shaft	80

1) 90°= 1/4turn

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

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

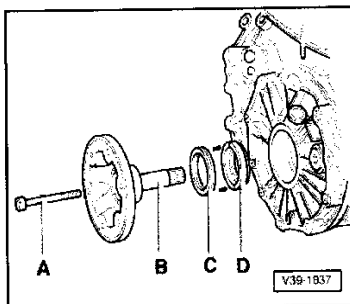


- Gearbox installed

Removing and installing speedometer sender -G22

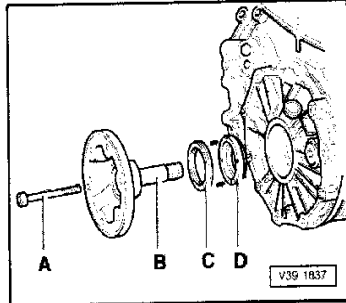
- -> Pull connector off sender -B-.
- Press sender retainer down, turn and pull out sender.
- Renew O-ring -A-.

Removing and installing drive wheel for speedometer sender -G22



Removing:

- Detach drive shaft from left flange shaft -B-.
- -> Unscrew bolt -A-. Secure flange shaft with a drift to prevent it turning.
- Remove flange shaft and seal -C-.



- -> Using a screwdriver, lever out drive wheel for speedometer sender -D- on alternate sides at the follower lugs -arrows-.

Installing:

- Install drive wheel for speedometer sender so that the follower lugs -arrows- face toward the seal.

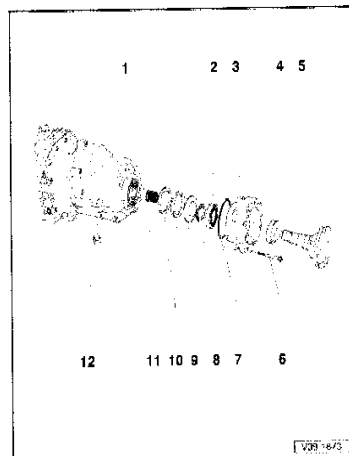
Note:

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

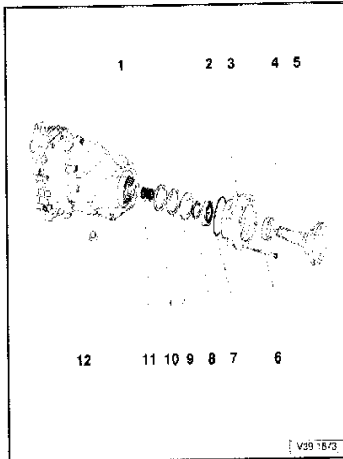
- Follower lugs engage in differential housing grooves.
- Renew seal for flange shaft and install flange shaft => Page 153 .
- Top up oil in gearbox and check oil level => Page 51 .

3 - Renewing seal and grooved ball bearing for flange for propshaft on gearbox

3.1 - Renewing seal and grooved ball bearing for flange for propshaft on gearbox



- Gearbox installed
- 1 Gearbox
- 2 Grooved ball bearing
- 3 Bearing housing on balance weight
- 4 Seal
 - ♦ Driving in => Page 159
- 5 Flange shaft



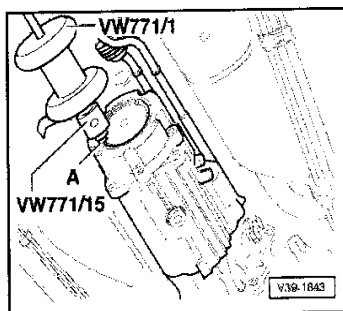
- 6 Bolt - 25 Nm
 - ◆ Qty. 6
- 7 O-ring
 - ◆ Renew
- 8 Circlip
- 9 Spring plate
 - ◆ Mark installation position when removing: larger diameter (concave side) towards shims -item 10
- 10 Shims
- 11 Spring
- 12 Oil drain plug - 40 Nm

Removing

- Disconnect propshaft at the front => Page 190 and tie-up on selector linkage.
- Place a drip tray underneath.
- Unscrew rear oil drain plug (on end cover) and drain gearbox oil.
- Unscrew securing bolts for bearing housing.

Note:

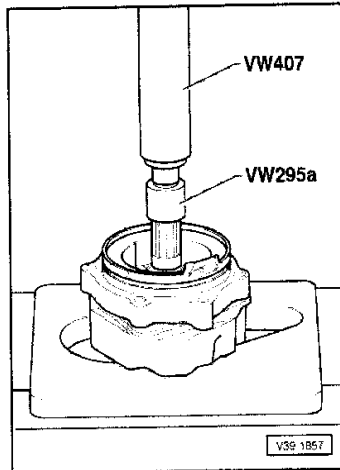
Bearing housing is pressed slightly off end cover by coil spring when securing bolts are loosened.



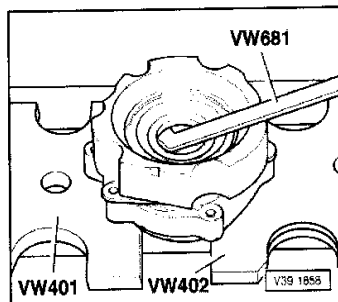
- -> Pull flange shaft together with bearing housing and balance weight off end cover.

A - M8/M10 stud

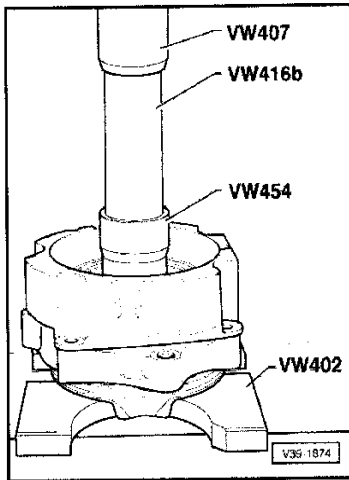
- Take off bearing housing.



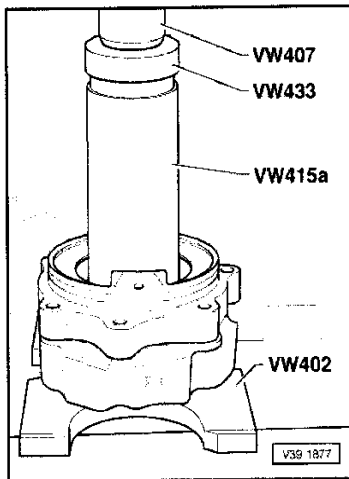
- Take circlip off flange shaft.
- -> Press out flange shaft.



- -> Pull out seal for flange shaft.
- Thoroughly clean seal seat.

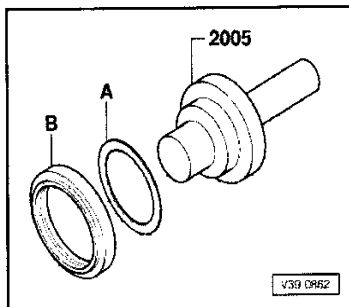


- -> Press out grooved ball bearing.

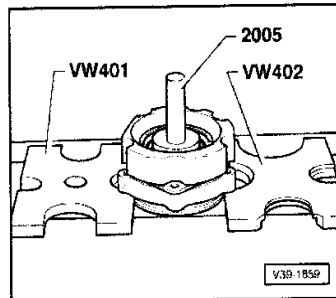


Installing

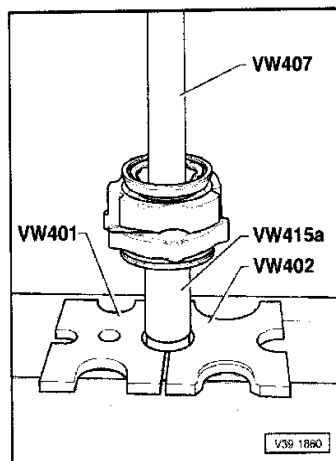
- -> Press grooved ball bearing into bearing housing.



- -> Lightly oil outer circumference of seal -B-.
- Fill space between sealing lips with grease.
- Fit seal with shim -A-, Part No. 016 311 391 B (1.7 mm thick) onto punch 2005.
- Installation position: open side of seal towards gearbox



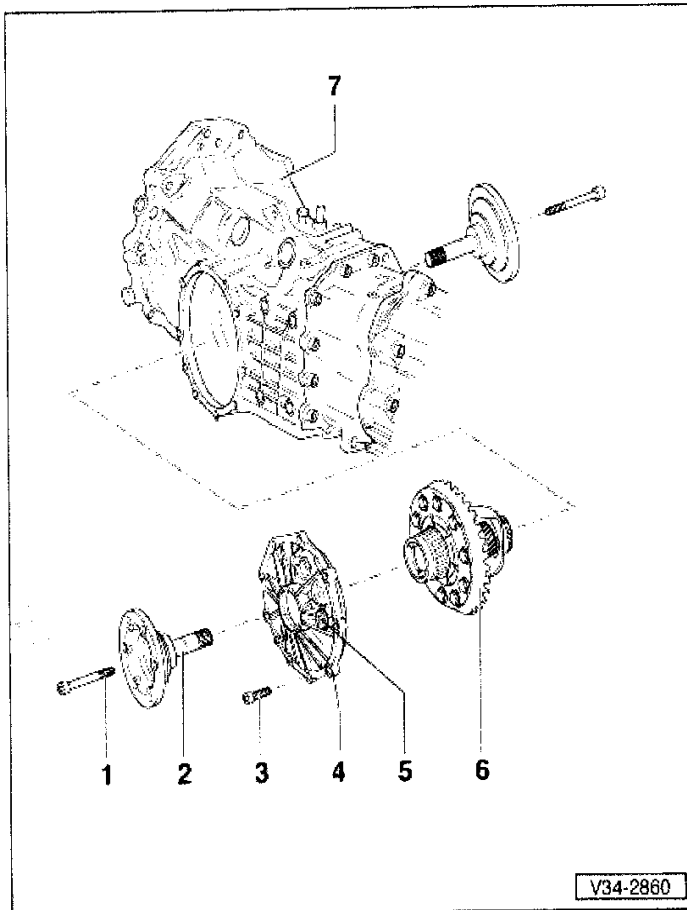
- -> Drive in seal for flange shaft.
- Remove shim after driving in.



- -> Press in flange shaft.
- Fit circlip onto flange shaft.
- Lightly oil O-ring and fit into bearing housing.
- Insert spring plate and shims into bearing housing.
 - Installation position: => Page 156
- Slide coil spring onto flange shaft.
- Tighten securing bolts for bearing housing in diagonal sequence and in stages.
- Bolt on propshaft=>Page 191 .
- Top up oil in gearbox and check oil level => Page 51 .

4 - Removing and installing differential

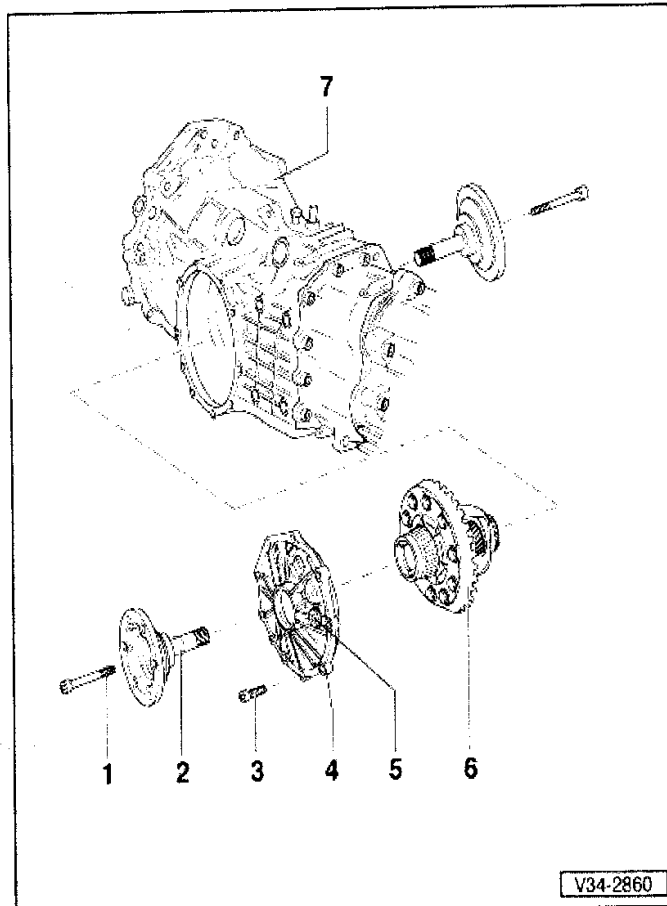
4.1 - Removing and installing differential



Note:

Removing and installing is also possible with gearbox installed in vehicle.

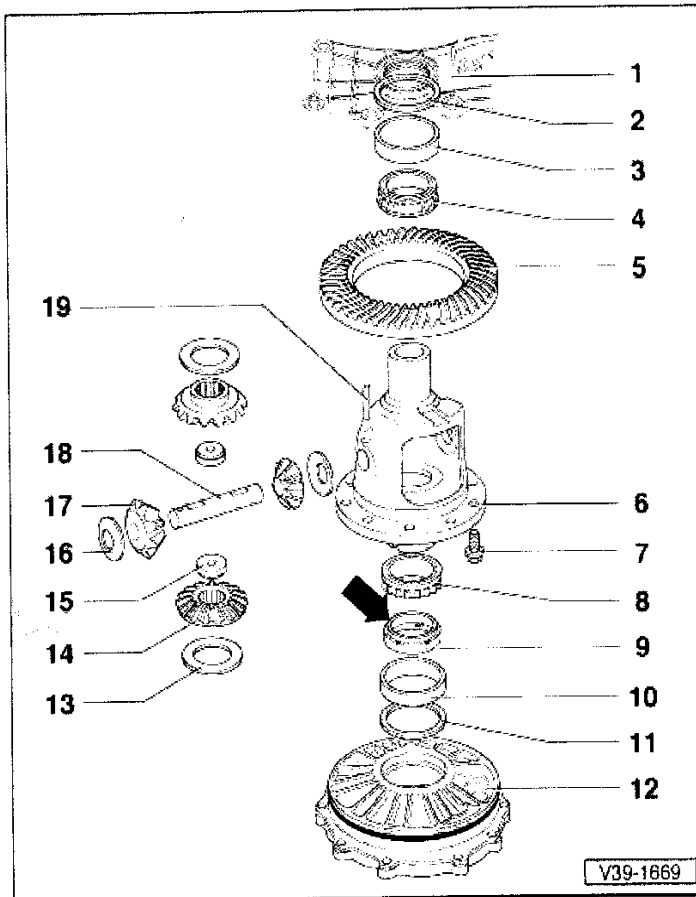
- 1 Bolt - 10 Nm + 1/4turn (90°) further
- 2 Flange shaft
 - ♦ When removing, secure with a drift to prevent it turning
- 3 Bolt - 25 Nm
 - ♦ Qty. 10
- 4 Cover for final drive
 - ♦ Removing and installing drive wheel for speedometer sender -G22
=> Page 154
 - ♦ If renewed: adjust crown wheel => Page 183



- 5 Oil filler plug - 40 Nm
 - ♦ Checking oil level in gearbox
=> Page 51
- 6 Differential
 - ♦ Dismantling and assembling
=> Page 162
 - ♦ If renewed: adjust crown wheel
=> Page 183
- 7 Gearbox housing
 - ♦ Servicing => Page 112

5 - Dismantling and assembling differential

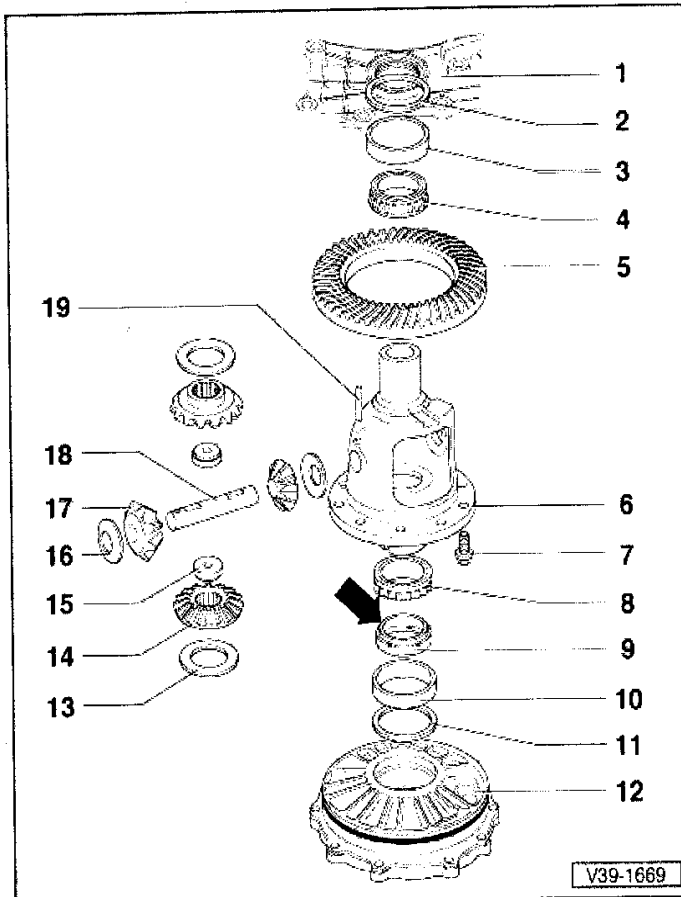
5.1 - Dismantling and assembling differential



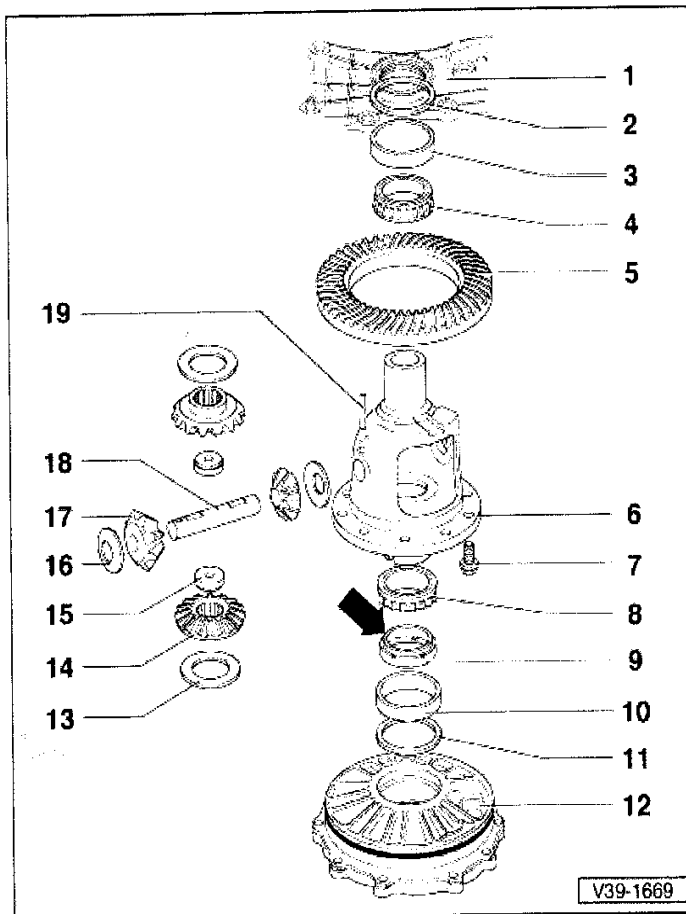
Notes:

- ◆ Removing and installing differential
=>Page 160 .
- ◆ Adjustments are required when replacing components marked 1)
=>adjustment overview Page 175 .

- 1 Gearbox housing 1)
- 2 Shim "S2"
 - ◆ Note thickness
 - ◆ Adjustment overview => Page 175



- 3 Outer race for small taper roller bearing 1)
 - ◆ Driving out => Fig. 9
 - ◆ Driving in => Fig. 10
- 4 Inner race for small taper roller bearing 1)
 - ◆ Pulling out => Fig. 1
 - ◆ Pressing in => Fig. 3
 - ◆ Low friction bearing; do not oil when measuring frictional torque
- 5 Crown wheel 1)
 - ◆ Paired with drive pinion (final drive set)
 - ◆ Removing => Fig. 5
 - ◆ Installing => Fig. 6
- 6 Differential housing 1)



7 Crown wheel bolt - 60 Nm + 45° further

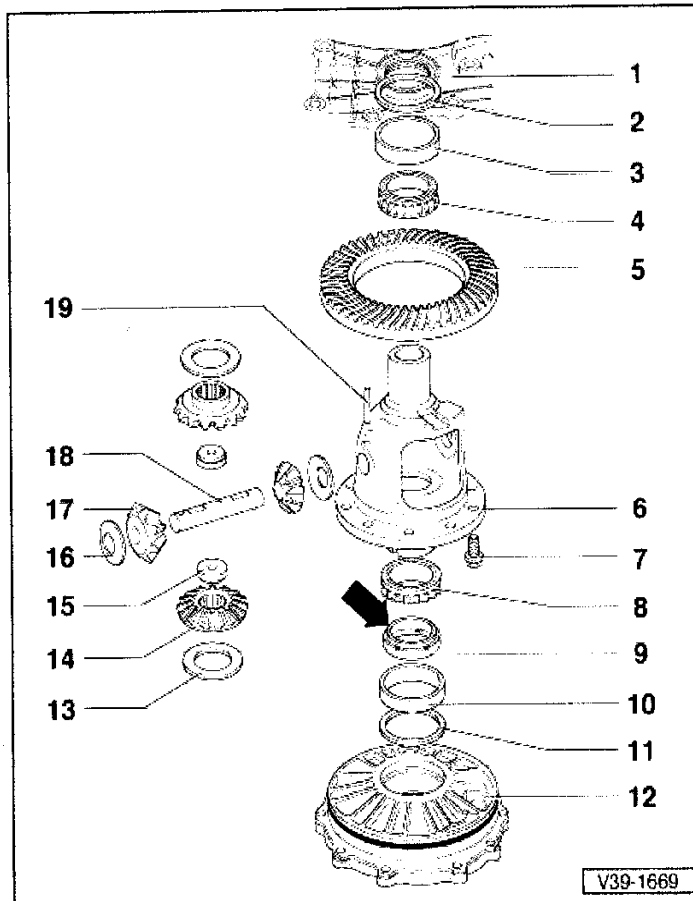
- ◆ Always renew
- ◆ Use only genuine bolts

8 Inner race for large taper roller bearing 1)

- ◆ Pulling off => Fig. 2
- ◆ Pressing on => Fig. 4
- ◆ Low friction bearing; do not oil when measuring frictional torque

9 Drive wheel

- ◆ For speedometer sender
- ◆ Removing and installing => Page 154
- ◆ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use force; the drive wheel can break easily
- ◆ installation position: shoulder -arrow- towards differential



10 Outer race for large taper roller bearing 1)

- ◆ Driving out => Fig. 11
- ◆ Driving in => Fig.12

11 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview => Page 175

12 Cover for final drive 1)

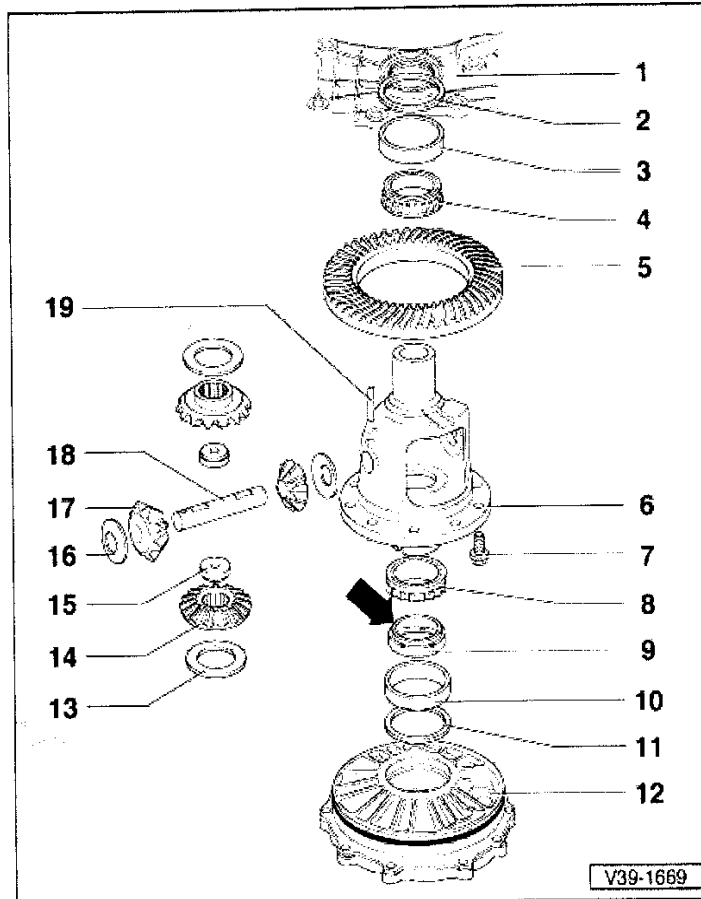
- ◆ With O-ring
- ◆ Renew O-ring
- ◆ Oil O-ring before installing

13 Shims

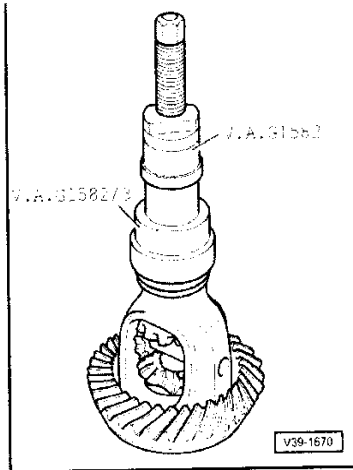
- ◆ Re-determining thickness => Fig. 8

14 Sun wheels

- ◆ Adjusting => Fig. 8

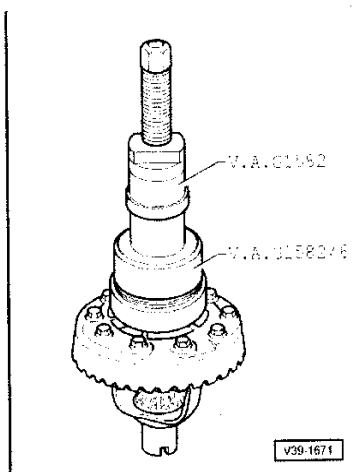


- 15 Threaded piece
- 16 Thrust washer
 - ◆ Check for cracks and chipping
- 17 Planet wheels
 - ◆ Installing => Fig. 7
- 18 Shaft for planet wheels
 - ◆ Drive out with drift after removing spring pin
 - ◆ Before driving in, align thrust washers
- 19 Spring pin
 - ◆ Drive in flush



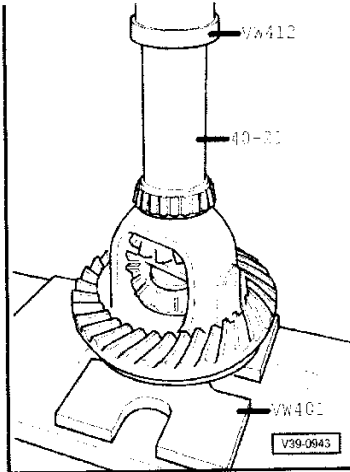
-> Fig.1 Pulling inner race for small taper roller bearing out of housing

- Fit thrust plate 40-105 before fitting puller.

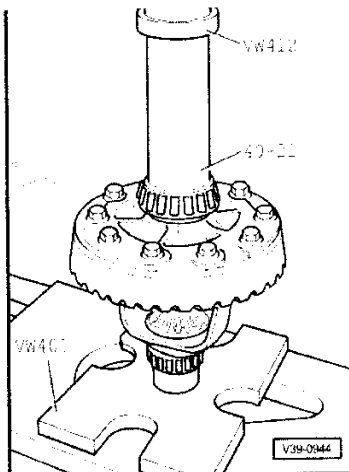


-> Fig.2 Pulling inner race for large taper roller bearing off housing

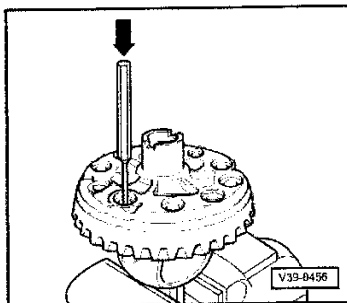
- Fit thrust plate 40-105 before fitting puller.



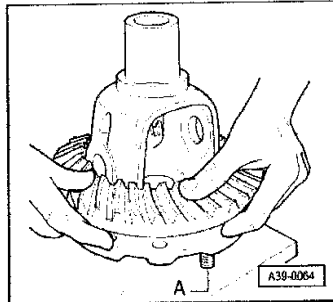
-> Fig.3 Pressing on inner race for small taper roller bearing
- Heat bearing to approx. 100 °C, fit in position and press home.



-> Fig.4 Pressing on inner race for large taper roller bearing
- Heat bearing to approx. 100 °C, fit in position and press home.



-> Fig.5 Driving crown wheel off housing

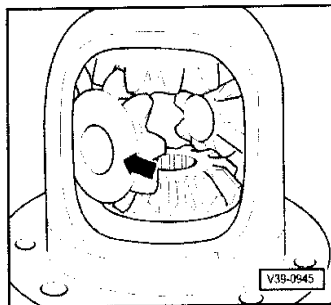


-> Fig.6 Installing crown wheel

- Use 2 centring pins -A- (local manufacture) as a guide.

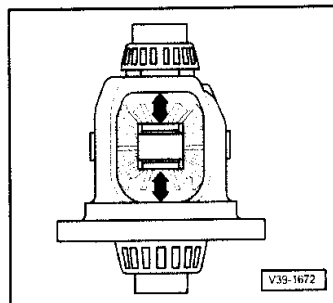
Caution
Wear protective gloves.

- Heat crown wheel to approx. 100 °C and install.
- Allow the crown wheel to cool off slightly before inserting the bolts. Then tighten to specified torque.



-> Fig.7 Installing planet wheels and sun wheels

- Carefully lever out drive wheel for speedometer sender with a screwdriver.
- Insert thrust washers for planet wheels with a small amount of grease.
- Insert sun wheels with selected shims => Fig. 8 .
- Insert planet wheels spaced 180° apart and rotate into place -arrow-.
- Insert threaded pieces.
 - Installation position: stepped shoulder towards sun wheels
- Locate thrust washers and planet wheels so that they align with the holes.
- Drive in shaft for planet wheels into final position and secure.

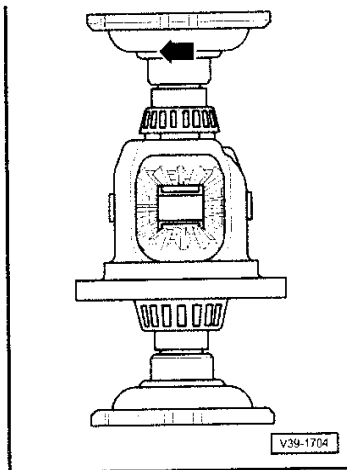


-> Fig.8 Adjusting planet wheels and sun wheels

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet wheels with thrust washers and press in shaft.

Note:

Do not now interchange bevel gears and thrust washers!



- Press planet wheels outwards and check play of sun wheels by hand -arrows-.
- Adjust play by inserting an appropriate shim => Page 170 .
- Specification: max. 0.10 mm

Note:

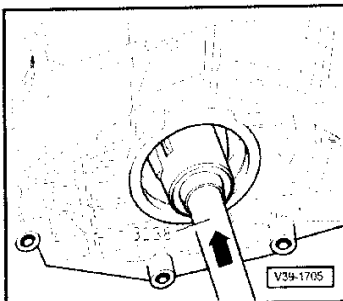
-> The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the differential bevel gears -arrow-.

- Determine shim from table. Part numbers

=> Parts catalogue

The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00



-> Fig.9 Driving outer race for small taper roller bearing out of gearbox housing

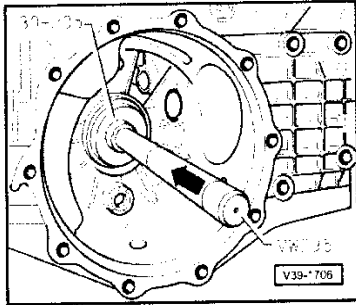
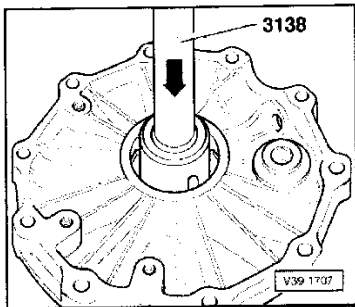
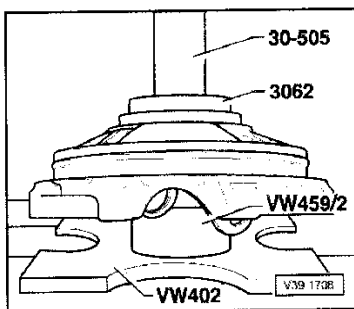


Fig.10 -> Driving outer race for small taper roller bearing into gearbox housing



-> Fig.11 Driving outer race for large taper roller bearing out of cover

- Use suitable base, e.g. VW 470 with recess towards cover.



-> Fig.12 Driving outer race for large taper roller bearing into cover

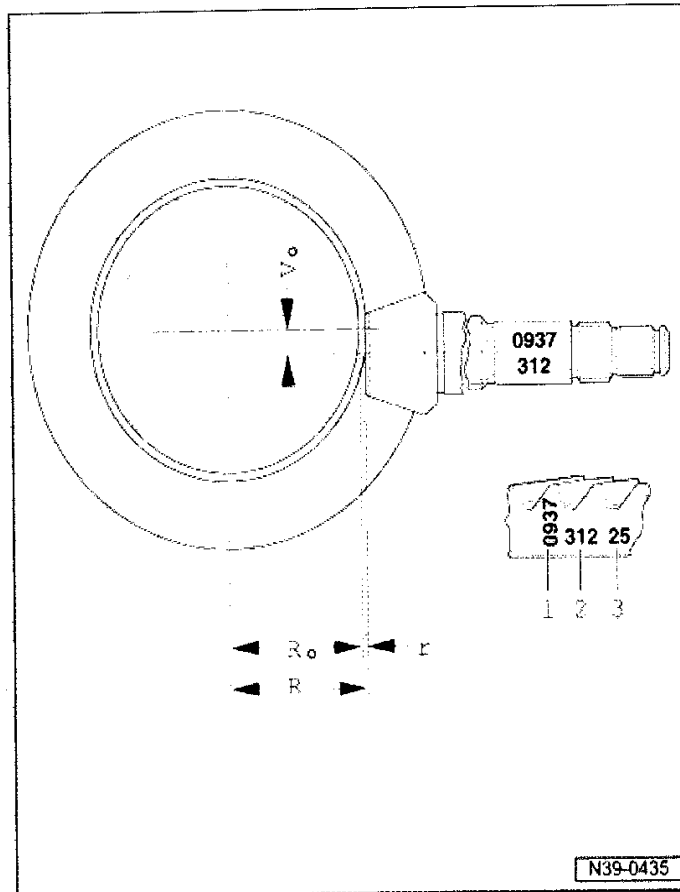
6 - Adjusting drive pinion and crown wheel

6.1 - Adjusting drive pinion and crown wheel

General notes:

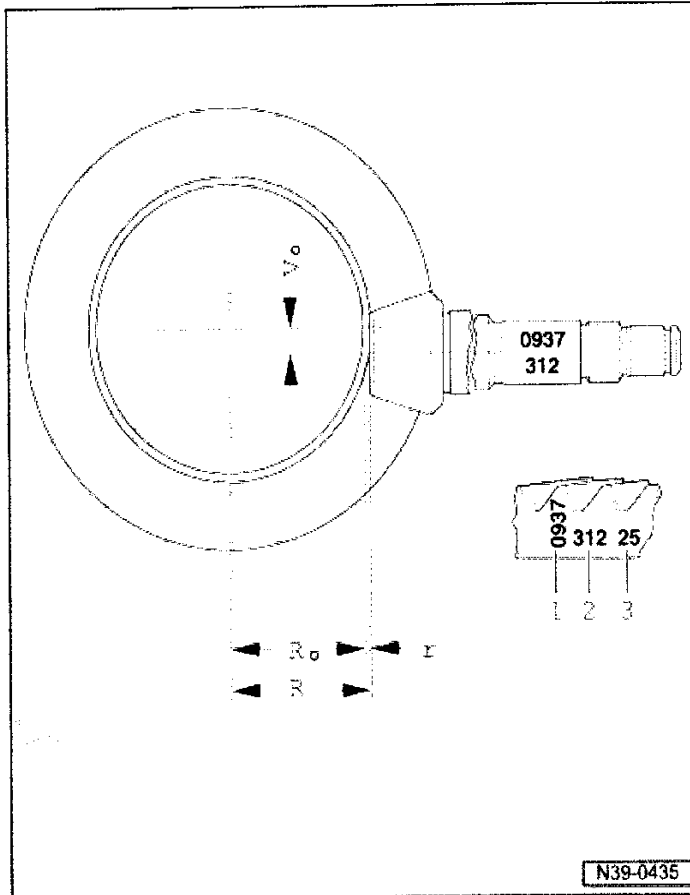
- ◆ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.
- ◆ The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.
- ◆ The deviation (tolerance) "r", which is related to the master gauge "Ro", is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) may only be replaced together as a matched pair.
- ◆ Observe the general repair instructions for taper roller bearings and shims.
- ◆ The frictional torque measurement is only used as a final check to make sure that the adjustment is correct.

6.2 - Adjusting and marking of gear sets



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

R_o - Length of master gauge used on test machine
 $R_o = 59.65$ mm



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

6.3 - Recommended sequence for readjusting final drive set

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

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" (sets preload for taper roller bearings for differential) => from Page 183 .
- 2.) Determine total shim thickness "Stotal" for "S3" + "S4" (sets preload for taper roller bearings for drive pinion) => from Page 177 .
- 3.) Distribute total shim thickness "Stotal" for "S3" + "S4" so that the distance from centre of crown wheel to face of drive pinion is the same as distance "R" which was determined during production => from Page 180 .

4.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash between crown wheel and drive pinion is maintained => from Page 186 .

Note:

Overview of components and shims =>Page 176 .

6.4 - Adjustment overview

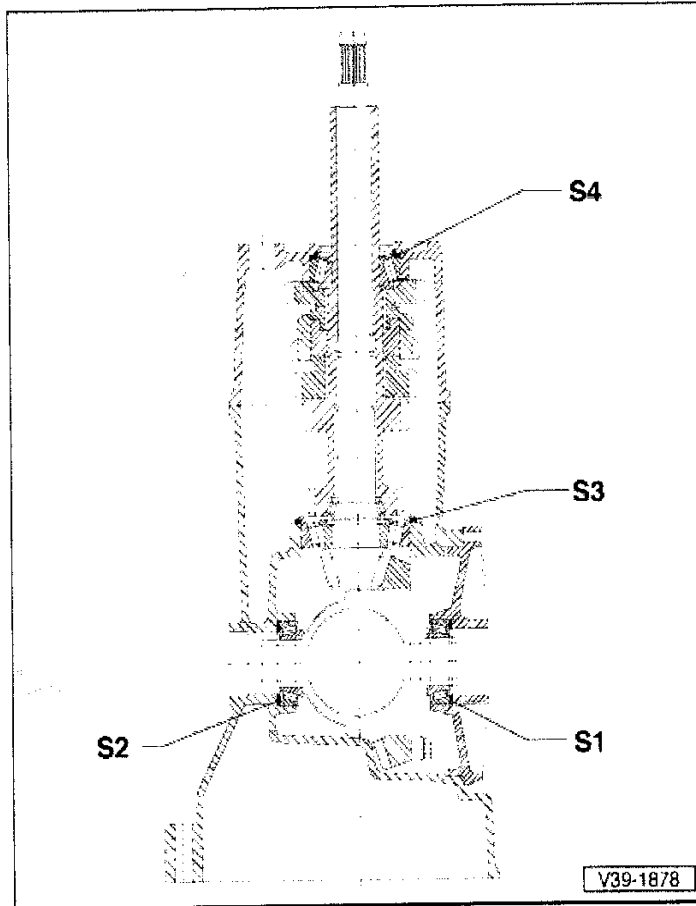
Note:

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

Parts renewed: ▼	to be adjusted:			
	Crown wheel "S1"+"S2" 1) => Page 183	Drive pinion "S3"+"S4" 1) via deviation "r" => Page 176	Drive pinion "S4" 1) => Page 108	Backlash Check => Page 186
Gearbox housing	X	X		X
Bearing plate			X	X
Differential housing	X			X
Taper roller bearing for drive pinion		X		X
Taper roller bearing for differential	X			X
Final drive set 2)	X	X		X
Hollow shaft			X	X
Cover for differential	X			X

- 1) Shims; installation position => Page 176 .
- 2) Drive pinion and crown wheel; only renew together.

6.5 - Position of shims



Note:

Adjustment overview when renewing individual components of gearbox

=>Page 175.

- S1 - Adjustment shim for crown wheel in cover for differential
- S2 - Adjustment shim for crown wheel in gearbox housing
- S3 - Adjustment shim for drive pinion in gearbox housing
- S4 - Adjustment shim for drive pinion in bearing plate

7 - Adjusting drive pinion

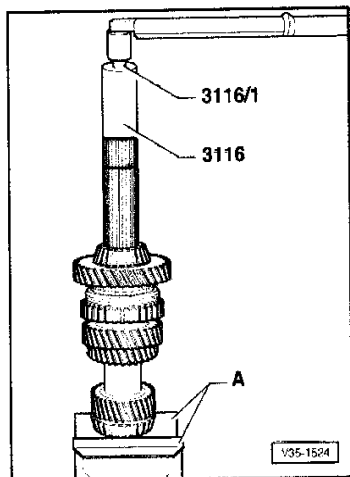
7.1 - Adjusting drive pinion

(Adjusting drive pinion and hollow shaft)

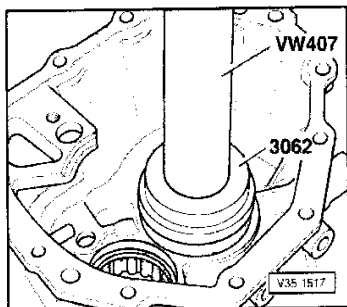
Repairs after which the drive pinion must be adjusted => table on Page 175 .

Determining total shim thickness "Stotal" for shims "S3" + "S4"

(Setting preload of taper roller bearing for drive pinion with hollow shaft)



- Differential removed
- -> Clamp drive pinion in a vice using clamps -A-.
- Insert taper rollers with grease, assemble drive pinion and hollow shaft.
- Turn hollow shaft against drive pinion five turns in both directions so that the taper roller bearings settle.
- Preload drive pinion/hollow shaft to 10 Nm, hold hollow shaft when doing this.
- Insert outer race for taper roller bearing for drive pinion into gearbox housing without shims => Fig. 146 .

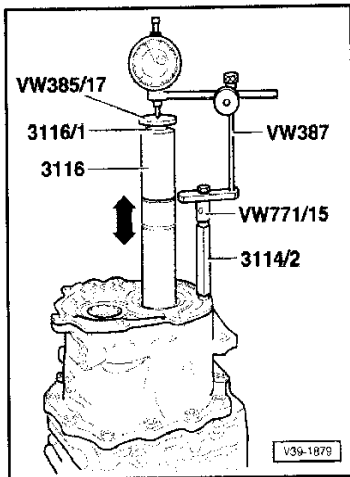


- -> Insert outer race for taper roller bearing for drive pinion with shim "S4*" (1.0 mm thick) into bearing plate.

Note:

For measurement purposes a shim "S4" of 1.0 mm is initially inserted which is designated "S4". After determining measurement "e" "S4*" will be replaced by the correct shim "S4".*

- Insert completely assembled drive pinion in gearbox housing.



- Fit bearing plate with dowel sleeves and tighten to 25 Nm.
- Turn drive pinion with hollow shaft five turns in both directions so that the taper roller bearings settle.
- > Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

Note:

The tip of the dial gauge must be positioned on centre of drive pinion.

- Lift drive pinion, without turning, and read off play on dial gauge.
 - Measurement in example: 0.90 mm

Note:

If the measurement has to be repeated, the drive pinion with hollow shaft must be turned 5 turns in each direction to settle the taper roller bearings. Set dial gauge again to "0" with 2 mm preload.

Formula:
"Stotal" = "S4" + measurement + bearing preload**

Example:	
Inserted shim "S4**"	1.00 mm
+ Measured value (example)	0.90 mm
+ Bearing preload (constant)	0.15 mm
= Total shim thickness "Stotal" for "S3" + "S4"	2.05 mm

Determining thickness of shim "S3"**

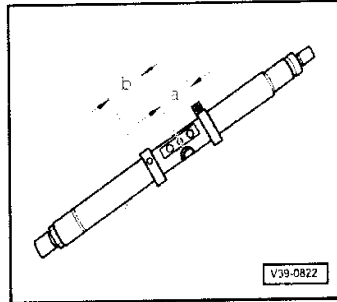
Formula:
"S3" = "Stotal" - "S4**"**

Example:	
Total shim thickness "Stotal" for "S3" + "S4"	2.05 mm
- Inserted shim "S4**"	1.00 mm
= Thickness of shim "S3**"	1.05 mm

- Remove outer race for taper roller bearing, insert shim "S3**" into gearbox housing and install outer race again => Fig. 146 .
- Insert completely assembled drive pinion into gearbox housing again.

- Fit bearing plate with dowel sleeves and tighten securing bolts to 25 Nm.
- Turn drive pinion with hollow shaft five turns in both directions to settle the taper roller bearing.

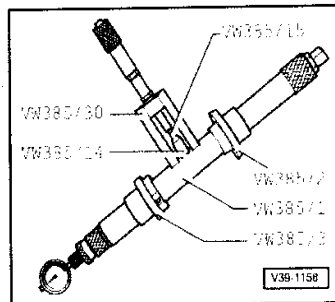
Determining measurement "e"



Note:

Measurement "e" is required to determine the final shim thickness of "S3" and "S4".

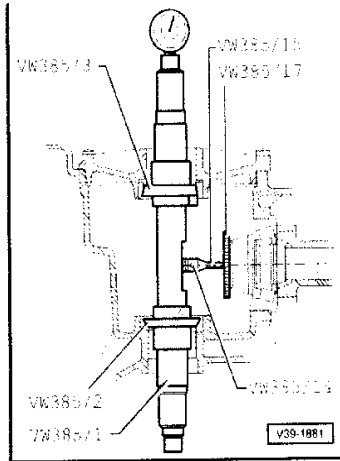
- -> Set adjustment rings of universal mandrel VW 385/1 to the following measurements:
 - Dimension a = 65 mm
 - Dimension b = 55 mm



- -> Assemble universal mandrel VW 385/1 as illustrated:
 - Dial gauge extension VW 385/15, 9.3 mm long
 - Master gauge VW 385/30
- Set master gauge VW 385/30 to $R_o = 59.65$ mm and fit onto mandrel.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

Note:

The gauge VW 385/27 can also be used in place of the master gauge VW 385/30 ($R_o = 59.65$ mm).



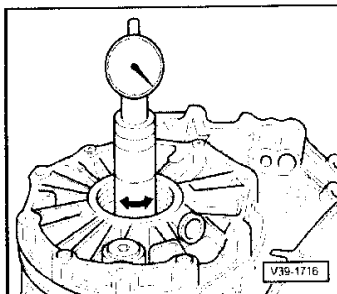
-> Arrangement of measuring equipment when determining dimension "e"

- Place end measuring plate VW 385/17 onto drive pinion head.

Note:

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

- Take master gauge off mandrel.
- Insert mandrel into gearbox housing.
- The centring disc 385/3 faces towards cover for final drive
- Fit cover for final drive and tighten 4 bolts to 25 Nm.
- Using the adjustable ring, pull 2nd centring disc VW 385/2 out as far as possible so that the mandrel can still just be turned by hand.



- -> Turn mandrel until the dial gauge plunger tip touches the end measuring plate on drive pinion head, then measure maximum deflection (return point).
- Measurement in following example: "e" = 0.16 mm (in red scale)

Determining thickness of shim "S3"

Formula:	
"S3"	= "S3*" + "r" + "e"
("e" in black scale)	
or	
"S3"	= "S3*" + "r" - "e"
("e" in red scale)	

Notes:

- ◆ The deviation "r" related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and inscribed on outer circumference of crown wheel.
- ◆ If measurements are obtained on red scale then subtract value "e".
- ◆ If measurements are obtained on black scale then add value "e".

Example:	
Inserted shim "S3"	1.05 mm
+ Deviation "r"	0.38 mm
- Determined "e" (in red scale)	0.16 mm
= Thickness of shim "S3"	1.27 mm

- Determine shim(s) from table. Part numbers

=> Parts catalogue

The following shims are available for "S3"

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

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

Determining thickness of shim "S4"

Formula:	
"S4"	= "Stotal" - "S3"

Example:	
Total shim thickness "Stotal" for "S3" + "S4"	2.05 mm
- Thickness of shim "S3"	1.27 mm
= Thickness of shim "S4"	0.78 mm

- Determine shim(s) from table. Part numbers

=> Parts catalogue

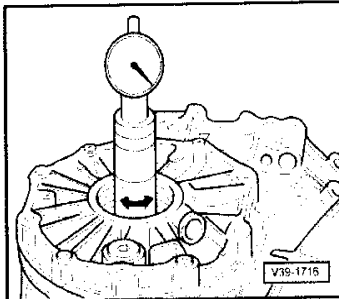
The following shims are available for "S4"

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

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

Performing check measurement

Checking dimension "r"



- Install drive pinion with determined shims "S3" and "S4" and turn 5 turns in both directions.
- -> Insert universal mandrel, => "determining measurement 'e'" on Page 179 and perform check measurement.
- Read off dial gauge anti-clockwise (red scale).
 - If the shims have been correctly selected, the deviation "r" (marked on outer circumference of crown wheel) must be shown - within a tolerance of ± 0.04 mm

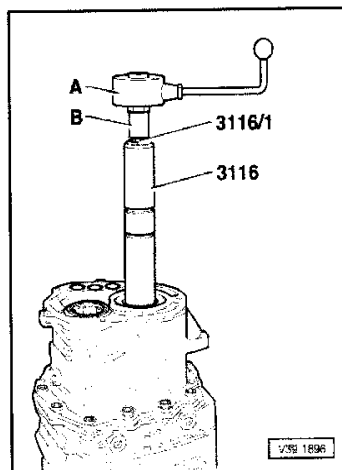
Note:

Then, (after removing universal mandrel) check again that the dial gauge, with master gauge VW 385/30 in place, indicates "0" with 2 mm preload, otherwise correct adjustments.

Measuring frictional torque (check)

Notes:

- ♦ Drive pinion/hollow shaft tapered roller bearings are low friction bearings. Therefore the frictional torque has only a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ♦ Do not additionally oil new tapered roller bearing to perform the frictional torque measurement. These bearings have already been treated with a special oil by the manufacturer.



- -> Fit torque gauge 0 ... 600 Ncm -A- onto drive pinion.

B - Socket

- Insert tensioning sleeve 3116.

Frictional torque specification:

New bearings	Used bearings
80 ... 150 Ncm	30 ... 60 Ncm

8 - Adjusting crown wheel

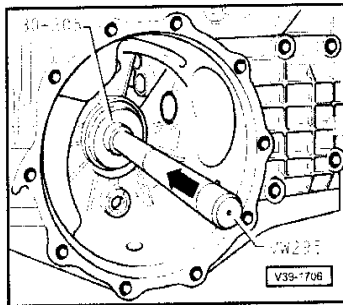
8.1 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted => Page 175 .

Determining total shim thickness "Stotal" for shims "S1" + "S2"

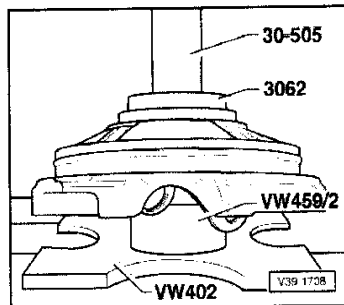
(Setting preload of taper roller bearing for differential)



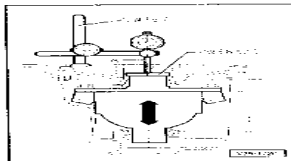
- Drive pinion removed
- Remove seal and outer races of both taper roller bearings for differential.
- Remove shims => Page 162 .
- -> Drive outer race for taper roller bearing with shim "S2" into gearbox housing. For measurement purposes an "S2" shim 1.20 mm thick (2 shims of 0.60 mm) is used.

Note:

For measurement purposes a shim "S2" of 1.20 mm is initially inserted which is designated "S2" in the following. After determining backlash, "S2" will be replaced by the correct shim "S2".



- > Press outer race for taper roller bearing without shim "S1" into cover for differential.
- Insert differential without drive wheel for speedometer sender -S22 into gearbox housing. The crown wheel is positioned on the left-hand side (same side as cover for final drive).
- Install cover for differential with 4 bolts (25 Nm).
- Position gearbox so that the cover for differential faces up.



- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- > Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) "A" to "0" with 2 mm preload.

Note:
 The tip of the dial gauge must be positioned on centre of differential.
 Lift differential, without turning, and read off play on dial gauge.

- Measurement in following example: 0.62 mm.



- > Secure special tools VW 521/4 and VW 521/8 on right o- differential (gearbox side) to lift differential.
- If the measurement has to be repeated, the drive pinion with hollow shaft must be turned 5 turns in each direction first to settle the taper roller bearings.

Formula:	
"Stotal" = "S2" + measurement + bearing preload	
Example:	
+ Inserted shim(s) "S2"	1.20 mm
+ Measured value	0.62 mm

Example:	
+ Bearing preload (constant)	0.25 mm
= Total shim thickness "Stotal" for "S1" + "S2"	2.07 mm

Determining thickness of shim "S1"

Notes:

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

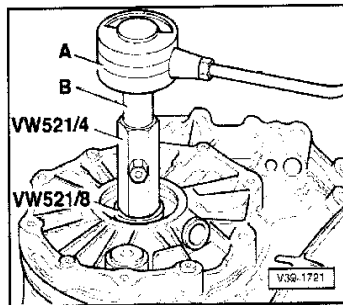
Formula:	
"S1"	= "Stotal" - "S2"

Example:	
Total shim thickness "Stotal" for "S1" + "S2"	2.07 mm
- Inserted shim(s) "S2"	1.20 mm
= Thickness of shim "S1"	0.87 mm

Measuring frictional torque (check)

Notes:

- ◆ Differential tapered roller bearings are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ◆ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- Drive pinion removed



- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.

B - Socket

- Read off frictional torque.

Frictional torque specifications:

New bearings	Used bearings
200 ... 350 Ncm	30 ... 50 Ncm

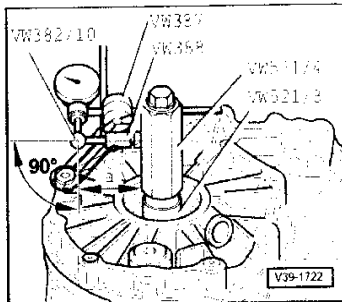
**Note:**

If the final drive set (drive pinion and crown wheel) is being adjusted, perform the adjustment of the drive pinion now and check the adjustment =>Page 176.

Measuring backlash

(Position of crown wheel in gearbox housing)

- Drive pinion with shims "S3" and "S4" installed
- Install differential.



- Turn the differential 5 turns in each direction to settle the taper roller bearings.
- -> Secure dial gauge retainer VW 387 onto housing.
- Insert adjustment device VW 521/4 and VW 521/8 for crown wheel.
- Fit dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension $a = 79$ mm.
- Determine play between the teeth flanks as follows:
 - Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
 - Set dial gauge to "0" with 2 mm preload.
 - Turn crown wheel back until lying against an opposite tooth flank (backlash).
- Read off backlash and note value.
- Turn crown wheel through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the crown wheel or the final drive set itself is not correct. Check installation, replace final drive set if necessary.

Determining average backlash

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

Example:	
1st measurement	0.49 mm
+ 2nd measurement	0.48 mm
+ 3rd measurement	0.50 mm
+ 4th measurement	0.49 mm
= Sum of measured values	1.96 mm

- Result: The average backlash is $1.96 / 4 = 0.49$ mm

Determining thickness of shim "S2"

Formula:	
"S2"	= "S2*" - backlash + lift

Example:	
Inserted shim "S2**"	1.20 mm
- Average backlash	0.49 mm
+ Lift (constant)	0.15 mm
= Thickness of shim "S2"	0.86 mm

- Determine shim(s) from table. Part numbers

=> Parts catalogue

The following shims are available for "S2"

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

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

Determining thickness of shim "S1"

Formula:	
"S1" =	"Stotal" - "S2"

Example:	
Total shim thickness "Stotal" for "S1" + "S2"	2.07 mm
- Thickness of shim "S2"	0.86 mm
= Thickness of shim "S1"	1.21 mm

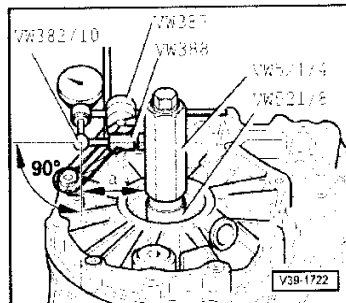
- Determine shim(s) from table. Part numbers

=> Parts catalogue

The following shims are available for "S1"

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

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





-> Performing check measurement

- After installing shims "S1" and "S2", turn differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specifications: 0.12 ... 0.22 mm

Notes:

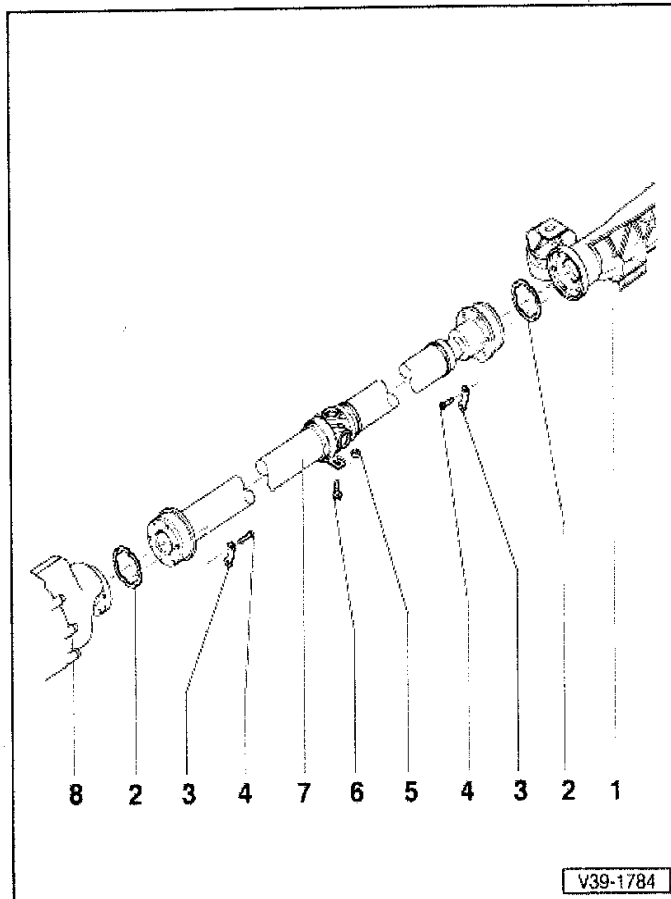
- ◆ If the backlash lies outside the tolerances, the adjustments must be repeated. But the total shim thickness "Stotal" must remain the same.
- ◆ The individual measurements must not differ by more than 0.06 mm from each other.

9 - Servicing propshaft

9.1 - Servicing propshaft

Notes:

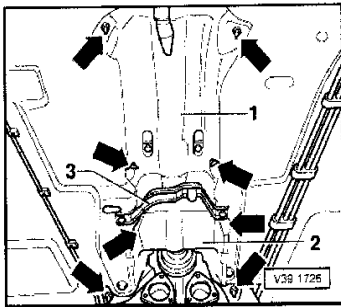
- ◆ Do not bend the propshaft more than 25° at the central joint, otherwise the universal joint will be damaged.
- ◆ Only store and transport propshaft in extended position.
- ◆ Observe General instructions =>Page 9.
- ◆ No repair work can be carried out on the propshaft with the exception of removing, installing and adjusting.
- ◆ If the propshaft is only detached at the gearbox or from rear final drive then the propshaft is to be tied-up or supported at the constant velocity joint.
- ◆ Work on the propshaft should be carried out on a vehicle hoist.
- ◆ If complaints are received (noises, vibrations), it is essential to check whether correct adjustment of the propshaft rectifies the fault before replacing the propshaft.



- 1 Rear final drive
- 2 Gasket
 - ◆ Renew
 - ◆ Pull off backing foil, and stick self-adhesive side of gasket to flange shaft.
 - ◆ Remove grease from flange shaft
- 3 Packing plate
- 4 Bolts - 55 Nm
 - ◆ Self-locking
 - ◆ Renew
- 5 Shims
 - ◆ Adjusting propshaft => Page 195
- 6 Bolt - 20 Nm
- 7 Propshaft
 - ◆ Adjusting => Page 195
- 8 Gearbox

9.2 - Removing and installing propshaft

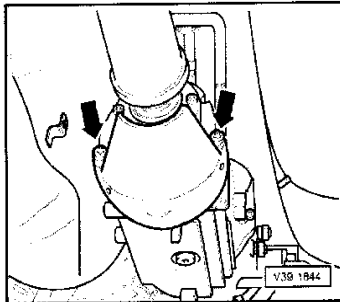
Removing



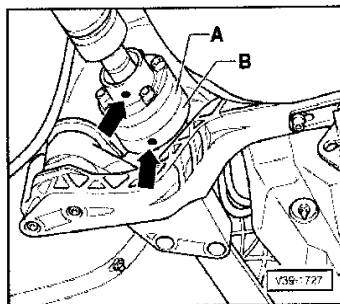
- Observe notes => Page 188 .
- Remove parts of exhaust system behind catalytic converters

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Remove head shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.



- -> Remove heat shield for propshaft from cover for Torsen differential -arrows-.

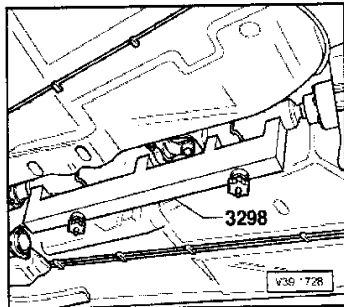


- -> Check whether there is a factory marking (paint spots -arrows-) on the propshaft flange and the flange on the rear final drive. If not, mark the position of the propshaft flange -A- in relation to the rear final drive -arrow B- with paint.

Note:

Only mark if the same propshaft is to be reinstalled.

- Slacken securing bolts on both propshaft flanges.



- -> Attach assembly tool 3298 and tighten plastic nuts.

Note:

Never fit assembly tool onto balance plates.

- Loosen bolts securing centre propshaft mounting to body.
- Remove securing bolts and shims from centre mounting.
- Slide propshaft together towards rear final drive. The constant velocity joints move along their axes.
- Guide out propshaft with assembly tool past rear final drive.

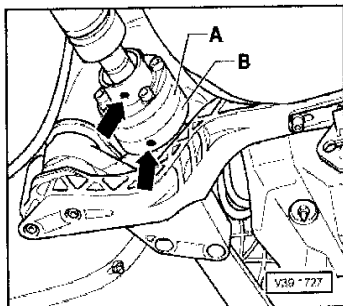
Note:

Only transport and store propshaft in extended position.

Installing

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

Notes:



- ♦ -> To prevent imbalance, the flanges on the propshaft -A- and on the rear final drive -B- must be installed so that the factory markings (or the markings made on removal) are in alignment -arrows-.
- ♦ If a new propshaft is being installed and the factory marking on the rear final drive flange is no longer visible, the radial run-out on the rear final drive flange must be measured=>Page 192, and the paint marking on the propshaft must then be aligned with the new marking on the flange.



- ◆ Renew gaskets on flange shafts (pull off backing foil and stick gasket onto flange). The surface must be free of grease.
 - ◆ After removing the propshaft, it is important to clean any remaining locking compound out of the threads in the flange shafts on the gearbox and rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.
 - ◆ The threaded holes can be cleaned with a thread tap.
 - ◆ Renew propshaft bolts (self-locking).
- Adjust propshaft after installing => Page 195 .

Tightening torques

Component	Nm
Propshaft to gearbox (output flange) M8	55
Propshaft to final drive (input flange) M8	55
Centre propshaft mounting to body	20
Propshaft heat shield to gearbox	25
Cross member to body	25
Catalytic converter to front exhaust pipe	25

9.3 - Measuring radial run-out at flange shaft of rear final drive

Notes:

- ◆ The radial run-out must always be measured when the thrust tube is removed. Remove old paint marking and make new marking.
- ◆ If a new propshaft is being installed and the marking on the flange shaft of the rear final drive is no longer visible, the point of maximum radial run-out must be measured with a dial gauge and marked with paint.
- ◆ The paint marking on the propshaft is then brought into alignment with this paint marking=>Page 191 .

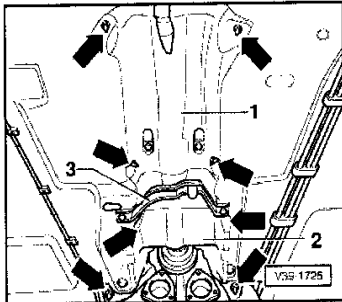


- ◆ The radial run-out can be measured when rear final drive is installed but the propshaft must be disconnected at rear final drive. Observe notes =>Page 188 .
- Remove bolt on front left of rear final drive support.
- -> Remove bar from lifting appliance 2024 A and secure it to the free hole with an M10 x 85 mm bolt -2-. Use approx. 5 M12 nuts -1- as spacers.
- Secure dial gauge bracket VW 387 to the bar when it is secured in position.



- -> Apply dial gauge to ground surface on rim of flange -arrow- and set to "0" with a preload of 1 mm.
- Turn differential via both rear wheels (left and right flange shafts) until the flange on the rear final drive completes one rotation.
- Make a paint marking at the point of greatest radial run-out on the outside of the flange (= greatest distance from axis of rotation).
- Remove old marks on flange.
- Install propshaft=>Page 191 .

9.4 - Adjusting propshaft

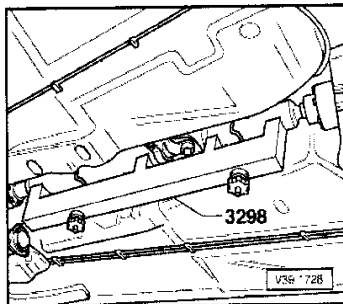


Adjustments should be carried out with care, because a badly adjusted propshaft is often the cause of vibration and droning.

- Remove parts of exhaust system behind catalytic converters

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Remove heat shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.



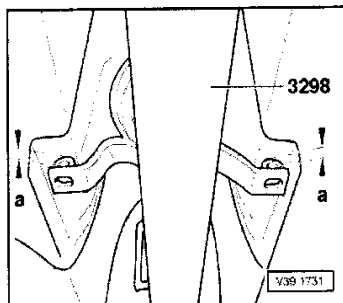
- -> Attach assembly tool 3298 and tighten plastic nuts.

Note:

Never fit assembly tool onto balance plates.

- Loosen bolts securing centre propshaft mounting to body.
- Remove securing bolts and shims from centre mounting.

Adjusting propshaft for height





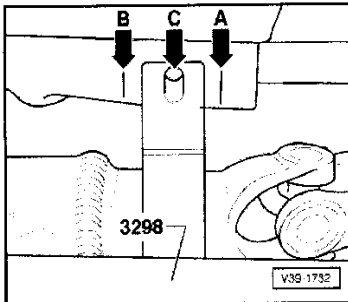
- Align centre propshaft mounting so that the dimension -a- on left-hand side is the same as dimension -a- on right-hand side.
- -> Measure dimension -a-.
- Select shim according to table. Part numbers

=> Parts catalogue

The following shims are available:

Dimension -a- (mm)	Shim thickness (mm)
0 ... 3.0	-
3.1 ... 5.0	2
5.1 ... 7.0	4
7.1 ... 9.0	6
9.1 ... 11.0	8
11.1 ... 13.0	10

Aligning propshaft longitudinally



- -> Slide propshaft with assembly tool towards the rear as far as it will go.
- Mark position of centre mounting on body -arrow A-.
- Slide propshaft with assembly tool forwards.
- Mark position of centre mounting on body -arrow B-.
- Align propshaft -arrow C-.
- The centre mounting must be positioned centrally between the markings -A- and -B-.
- Install securing bolts for propshaft centre mounting with previously selected shims and tighten bolts.
- Remove assembly tool.
- Align exhaust system free of stress

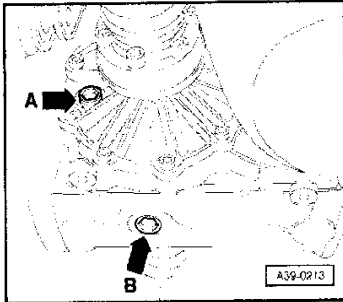
=> Avant RS2; Repair group 26; Aligning exhaust system free of stress

Tightening torques

Component	Nm
Centre propshaft mounting to body	20
Cross member to body	25

10 - Checking oil level in rear final drive

10.1 - Checking oil level in rear final drive



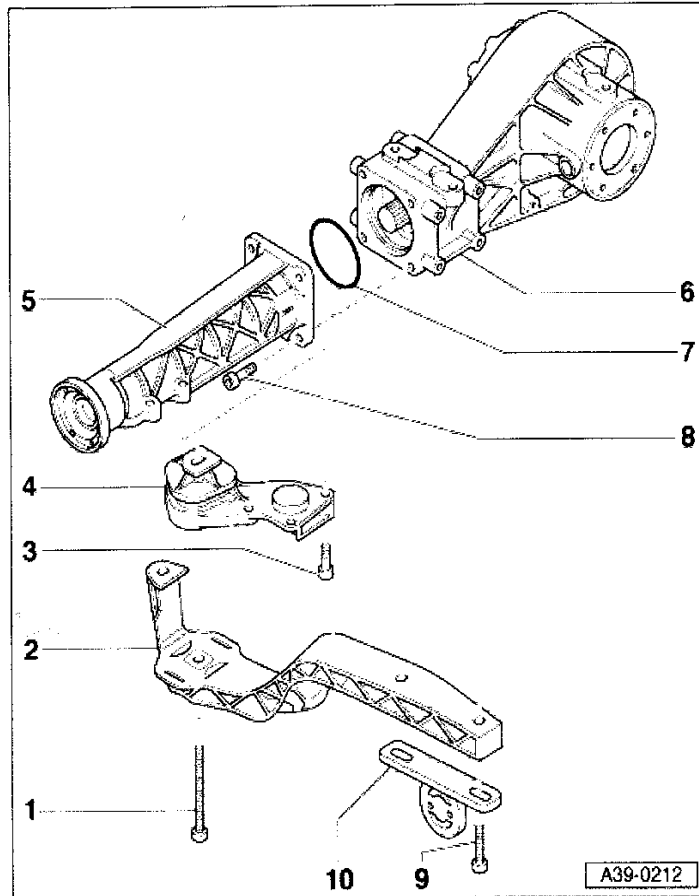
- -> Remove oil filler plug -arrow A- to check gear oil.
- Specification: oil level up to lower edge of filler hole
- Top-up gear oil if necessary. Specification => Page 4 .
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	25

11 - Removing and installing thrust tube

11.1 - Removing and installing thrust tube



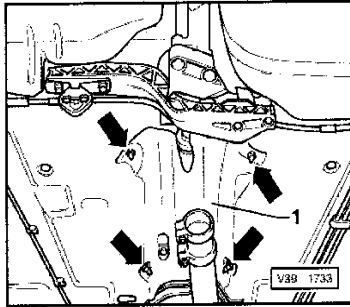
11.2 - Assembly overview

- 1 Bolt - 40 Nm
- 2 Front cross member
- 3 Bolt - 40 Nm
- 4 Final drive support
- 5 Thrust tube
- 6 Rear final drive housing
- 7 O-ring
- 8 Bolt - 35 Nm
- 9 Bolt - 20 Nm
- 10 Bracket
 - ♦ For exhaust system

11.3 - Removing and installing thrust tube

Removing

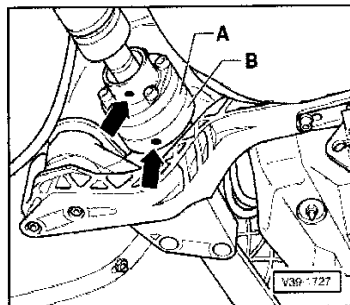
- Rear final drive installed



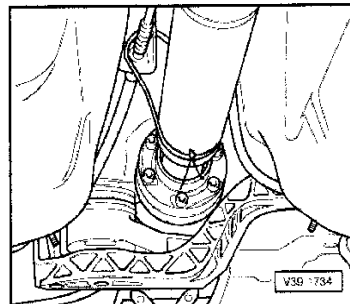
- Place oil tray underneath and drain off gear oil.
- Remove parts of exhaust system behind front exhaust pipe

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

- -> Remove heat shield -1- -arrows-
- Remove heat shield next to rear final drive.



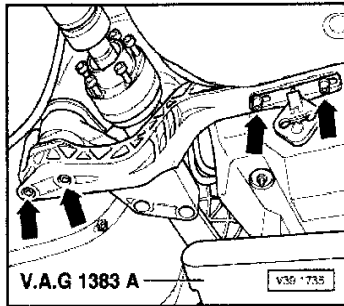
- -> Check whether there is a factory marking (paint spot) on the propshaft. If not, mark the position of the propshaft flange -A- in relation to the rear final drive -arrow B- with paint.
- Unscrew bolts from propshaft flange.



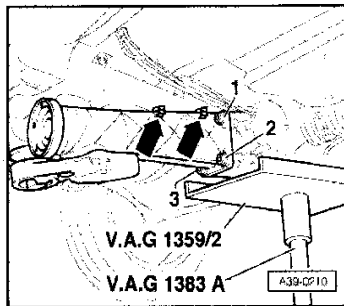
- -> Secure propshaft to handbrake cable bracket with wire.

Note:

If it is not possible to push the propshaft up and off the flange, lower the final drive before tying up the propshaft. When lowering the final drive, prevent the propshaft from dropping down, and do not bend the centre joint further than the maximum angle permitted=>Notes on Page 188 .



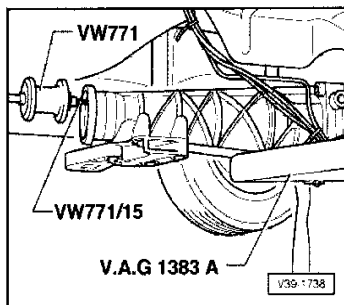
- Support final drive with gearbox jack V.A.G 1383 A.
- -> Unscrew bolts -arrows- on front cross member for rear final drive.
- Detach front cross member.



- -> Unclip electrical wiring and hoses for differential lock actuator at clips -arrows-.
- Lower final drive about 10 cm.
- Remove 4 bolts for thrust tube -1 ... 3-.

Note:

Fourth bolt not shown in illustration.



- -> Pull off flange shaft with thrust tube.

Installing

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

Notes:

- ◆ After removing the propshaft, it is important to clean any remaining locking compound out of the threads in the flange shafts on the gearbox and rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.
 - ◆ The threaded holes can be cleaned with a thread tap.
 - ◆ Renew gasket between propshaft and drive flange (pull off backing foil and stick gasket onto flange shaft). Surface must be free of grease.
 - ◆ Renew propshaft bolts (self-locking).
- If there is a factory marking on the propshaft, measure radial run-out at flange on final drive=>Page 192 and bring marking on propshaft into alignment with new marking on flange.
 - Align exhaust system free of stress

=> Avant RS2; Repair group 26; Aligning exhaust system free of stress

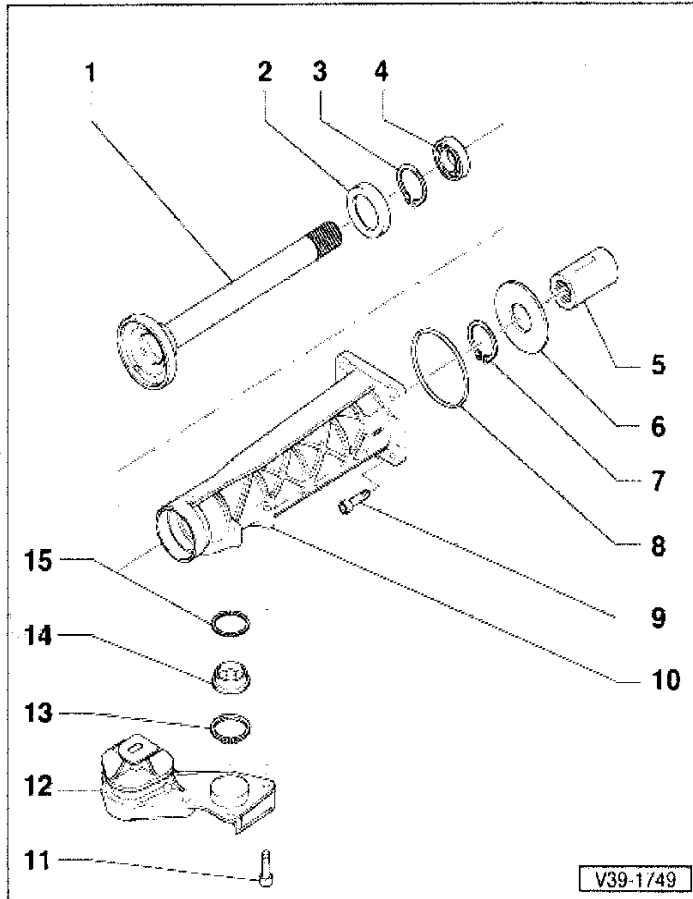
- Top up gear oil in rear final drive and check oil level => Page 197 .

Tightening torques

Component	Nm
Thrust tube to rear final drive	35
Propshaft to final drive (input flange) M8	55
Front cross member for rear final drive to body M10	40
Front cross member for rear final drive with exhaust bracket to body M8	20
Oil filler plug	25
Double clamp for exhaust pipe	40

12 - Dismantling and assembling thrust tube - assembly overview

12.1 - Dismantling and assembling thrust tube - assembly overview

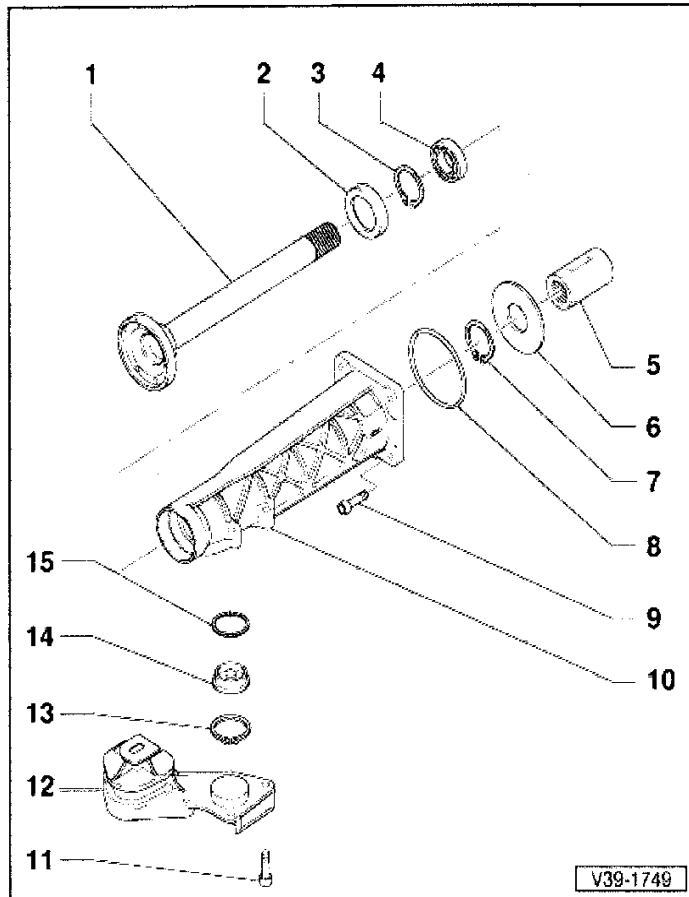


Note:

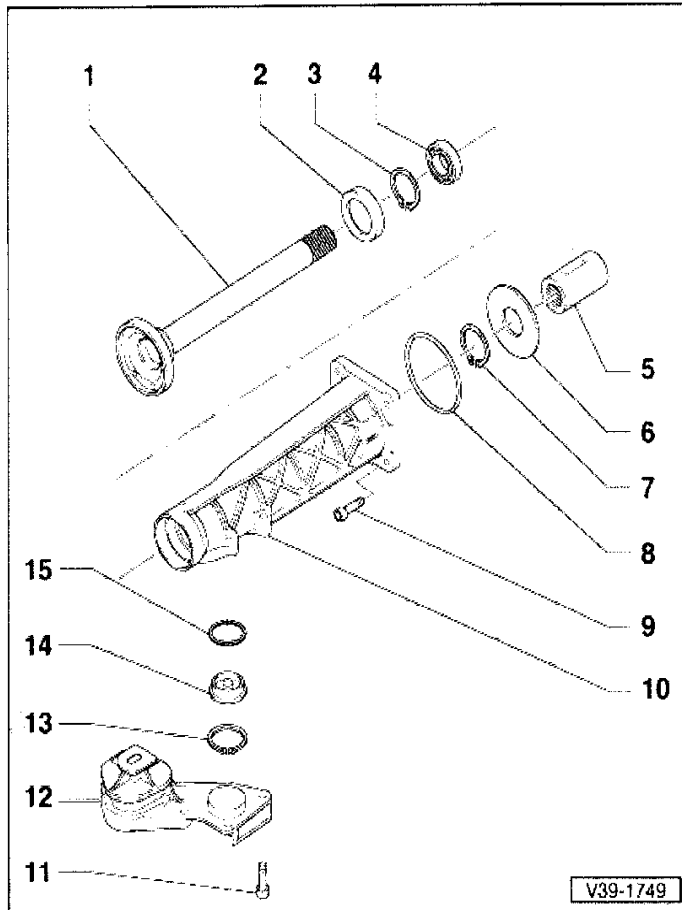
Removing and installing thrust tube

=>Page 198 .

- 1 Flange shaft
 - ♦ Removing=>Page 205
 - ♦ When installing flange shaft, circlip -Item 208
- 2 Seal
 - ♦ Prising off=>Page 206
 - ♦ Driving in=>Page 207
- 3 Circlip
 - ♦ Removing=>Page 206



- 4 Grooved ball bearing for flange shaft
 - ◆ Pulling out=>Page 207
- 5 Sleeve
 - ◆ Pulling off=>Page 205
 - ◆ Pressing on=>Page 208
- 6 Baffle plate
 - ◆ Only press out if damaged
 - ◆ Installing=>Page 207
- 7 Circlip
 - ◆ To remove flange shaft, open out circlip=>Page 205
- 8 O-ring
 - ◆ Renew
- 9 Bolt - 35 Nm
 - ◆ Secures thrust tube to rear final drive housing

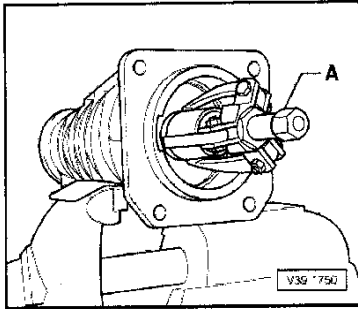


- 10 Thrust tube
- 11 Bolt - 40 Nm
 - ◆ Secures final drive support to thrust tube
- 12 Final drive support
- 13 Circlip
- 14 Cover cap
 - ◆ Removing=>Page 205
- 15 O-ring
 - ◆ Renew

12.2 - Dismantling and assembling thrust tube

Note:

Removing and installing thrust tube=>Page 198 .

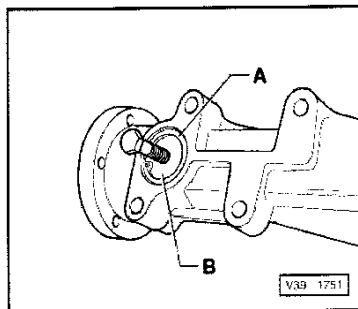


Dismantling

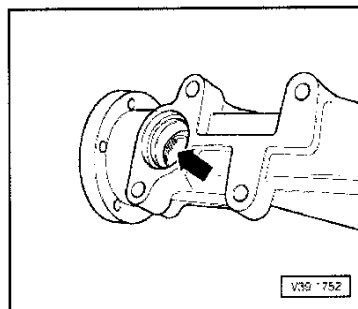
- Clamp thrust tube in vice (use soft jaws).
- -> Pull off sleeve.

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

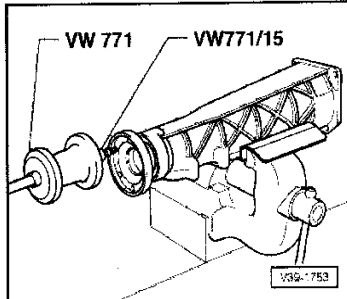
- Detach final drive support.



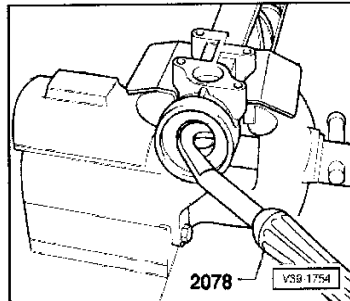
- -> Remove circclip -A-.
- Screw M8 bolt into thread in cover cap -B- and pull out cover cap.



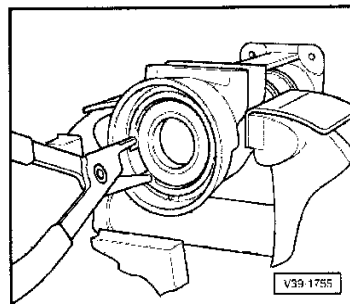
- -> Open out circclip -arrow- on flange shaft and push circclip towards splines.



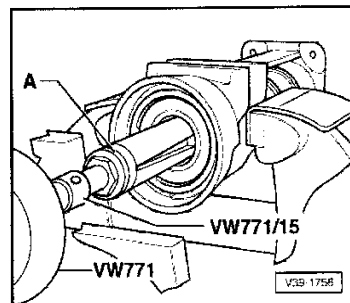
- -> Remove flange shaft.
- Take circlip out of thrust tube.



- -> Prise out seal.



- -> Remove circlip.



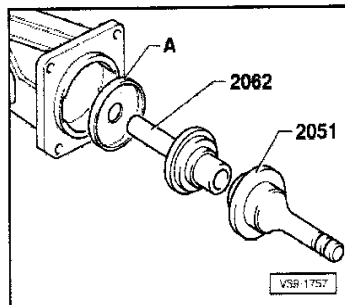
- -> Pull out grooved ball bearing for flange shaft.

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

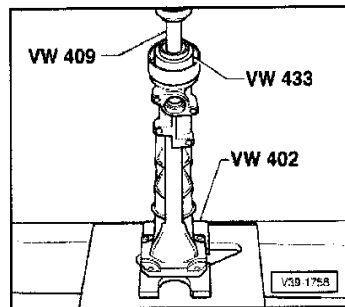
Note:

The bearing will be damaged when it is removed.

Only if baffle plate is damaged:

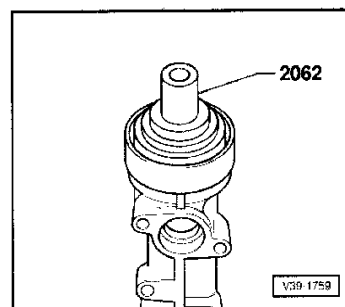


- If baffle plate is damaged, press it out with flange shaft.
- -> To install, drive in baffle plate -A- onto stop.

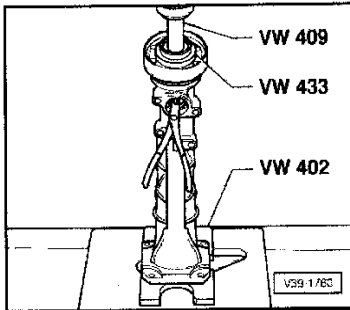


Assembling

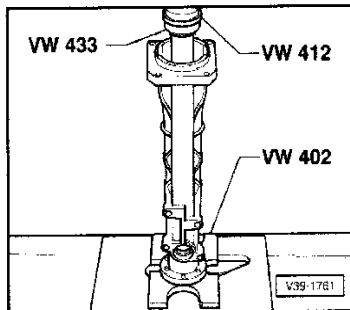
- -> Press grooved ball bearing into thrust tube.
- Fit outer circlip.



- Pack space between sealing lip and dust lip of seal with multi-purpose grease.
- -> Drive in seal onto stop.



- -> Insert inner circlip in thrust tube and hold in position with pliers; press in flange shaft.
- Fit circlip in groove.



- -> Press sleeve onto flange shaft as far as stop.
- Install cover cap with seal.
- Fit circlip.
- Install final drive support.
- Fit O-ring on thrust tube.

13 - Removing and installing oil seals for flange shafts

13.1 - Removing and installing oil seals for flange shafts

- Rear final drive installed

Note:

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

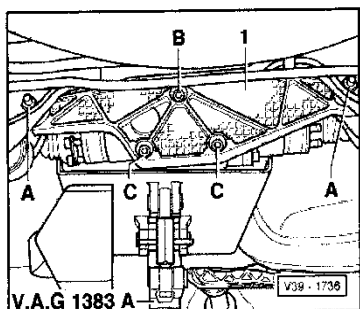
Removing

- Remove parts of exhaust system behind front exhaust pipe

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system
 Removing and installing parts of exhaust system

- Place oil tray underneath and drain off about 0.5 litres of gear oil.
- Remove heat shield next to rear final drive.
- Unclip electrical wiring and hoses for differential lock actuator.
- Support rear final drive with gearbox jack V.A.G 1383 A.
- Unbolt left and right drive shafts from rear final drive and tie up

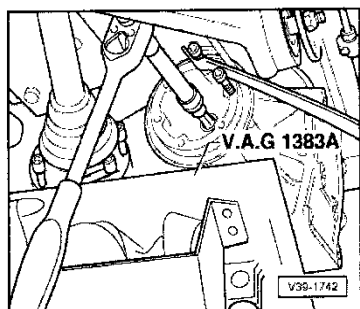
=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft
 Removing and installing drive shaft



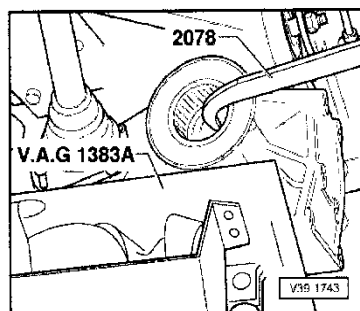
- -> Unscrew bolts from rear cross member -1-:

- A - Cross member to subframe
- B - Cross member to rear final drive
- C - Cross member to rear final drive

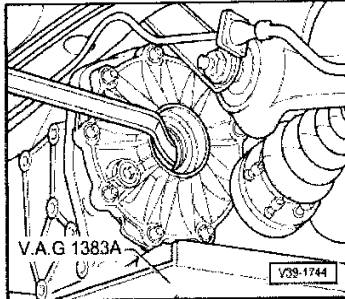
- Push cross member towards the left and take it out downwards to the right.
- Lower final drive slightly on gearbox jack.



- -> Remove flange shaft. To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Pull out flange shaft using the bolts already screwed in.



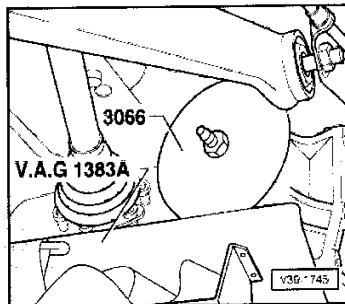
- -> Prise out oil seal for left flange shaft using special tool 2078.



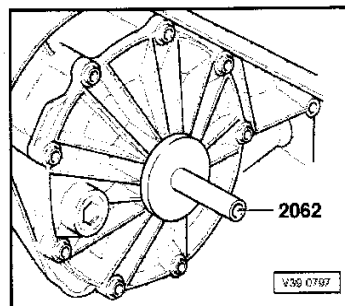
- -> Lever out oil seal for right flange shaft using a suitable lever.

Installing

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

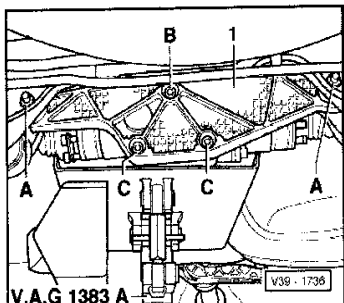


- Clean seat for oil seal.
- Moisten outer circumference of seal with gear oil.
- Fill space between sealing lip and dust lip with multi-purpose grease.
- -> Using assembly tool 3066 with thrust plate, pull in oil seal for left flange shaft onto stop by turning hexagon nut.



- -> Drive in oil seal for right flange shaft onto stop with mandrel 2062, ensuring that seal is kept straight.
- Bolt on drive shaft

=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft



- -> When installing rear cross member -1-, tighten bolts in the sequence -A-, -B-, -C-.
- Align exhaust system free of stress

=> Avant RS2; Repair group 26; Aligning exhaust system free of stress

- Top up gear oil in rear final drive and check oil level=>Page 197 .

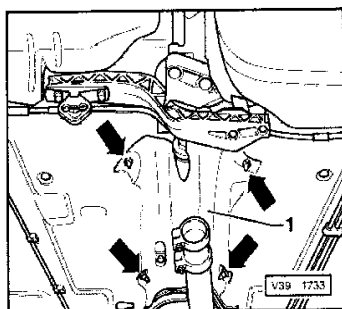
Tightening torques

Component	Nm
Rear cross member for rear final drive to subframe	50
Rear cross member to rear final drive	55
Drive shaft to rear final drive M10	80

14 - Removing and installing rear final drive

14.1 - Removing and installing rear final drive

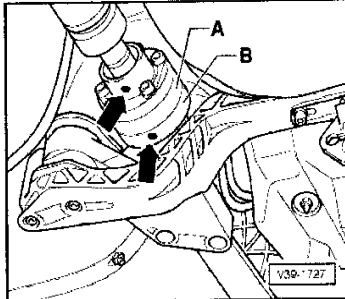
Removing



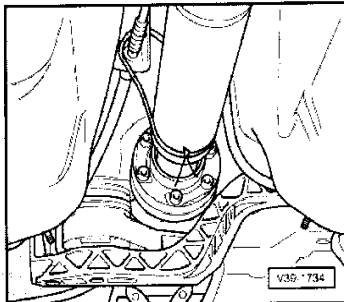
- Remove parts of exhaust system behind the front exhaust pipe

=> Avant RS2; Repair group 26; Removing and installing parts of exhaust system

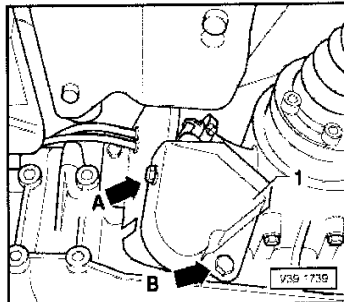
- -> Remove heat shield -1- -arrows-.
- Remove heat shield next to the rear final drive.



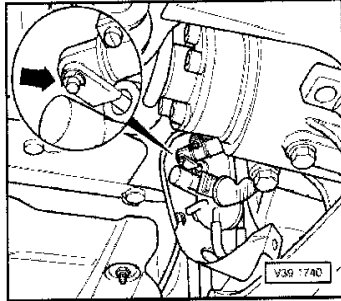
- -> Check whether there is a factory marking (paint spots -arrows-) on the propshaft flange and the flange on the rear final drive. If not, mark the position of the propshaft flange -A- in relation to the rear final drive -arrow B- with paint.
- Slacken bolts on propshaft flange.



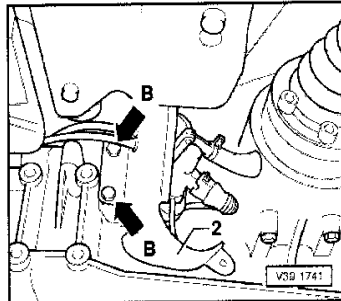
- -> Tie up propshaft to handbrake cable bracket with wire.



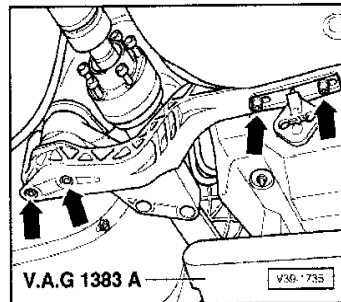
- -> Unbolt heat shield -1- for differential lock actuator -arrows A and B-.



- -> Using a screwdriver, prise off circlip -arrow- on connection between differential lock actuator and differential lock.
- Take out connecting pin from above.



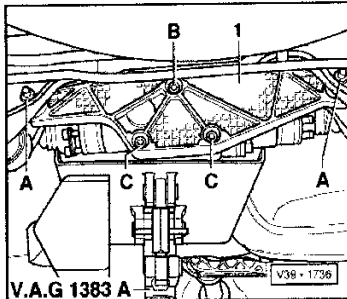
- Unclip electrical wiring and hoses for differential lock actuator.
- -> Unbolt bracket -2- for vacuum unit and switch for differential lock on rear final drive -arrow B-.
- Move bracket clear to the side with wiring and hoses connected, and tie up with wire.



- Unbolt left and right drive shafts from rear final drive and tie up

=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft; Removing and installing drive shaft

- Support final drive with gearbox jack V.A.G 1383 A.
- -> Unscrew bolts -arrows- on front cross member for rear final drive.
- Detach front cross member.



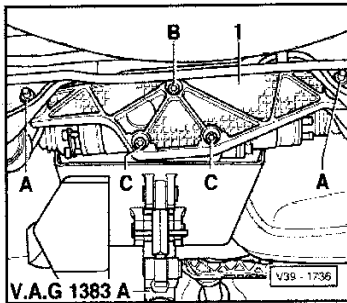
- -> Unscrew bolts from rear cross member -1-:

- A - Cross member to body
- B - Cross member to rear final drive
- C - Cross member to rear final drive

- Push cross member towards the left and take it out downwards to the right.
- Lower final drive on gearbox jack.

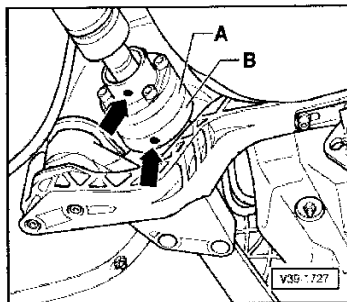
Installing

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



- -> When installing rear cross member -1-, tighten bolts in the sequence -A-, -B-, -C-.

Notes:



- ♦ -> To prevent imbalance, the flanges on the propshaft -A- and on the rear final drive -B- must be installed so that the paint markings are in alignment -arrows-.
- ♦ Renew gasket between propshaft and flange on rear final drive (pull off backing foil and stick gasket onto flange shaft). The surface must be free of grease.

- ♦ After detaching the propshaft, it is important to clean the remaining locking compound out of the threads in the flange shaft on the rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.
- ♦ The threads can be cleaned with a thread tap.
- ♦ Renew propshaft bolts (self-locking).

- Align exhaust system free of stress

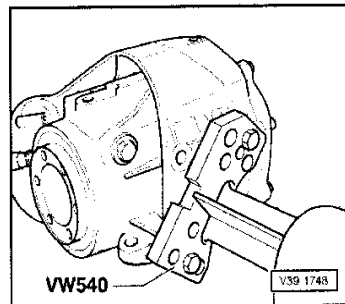
=> Avant RS2; Repair group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

- Top up gear oil in rear final drive and check oil level => Page 197.

Tightening torques

Component	Nm
Propshaft to final drive (input flange) M8	55
Front cross member for rear final drive to body M10	40
Front cross member for rear final drive with bracket for exhaust system to body M8	20
Rear cross member for rear final drive to subframe M10	50
Rear cross member to rear final drive M10	55
Drive shaft to rear final drive M10	80
Heat shield for differential lock actuator to bracket M6	10
Bracket for vacuum unit to rear final drive M8	25

14.2 - Securing rear final drive to repair stand

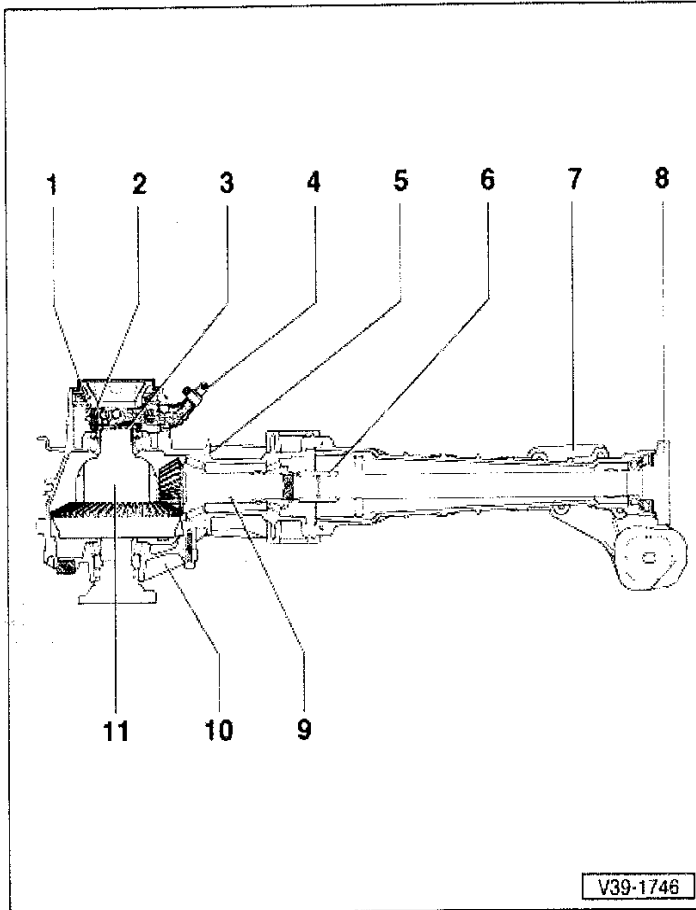


- -> Secure complete rear final drive on a repair stand with bracket VW 540.



15 - Dismantling and assembling rear final drive

15.1 - Dismantling and assembling rear final drive

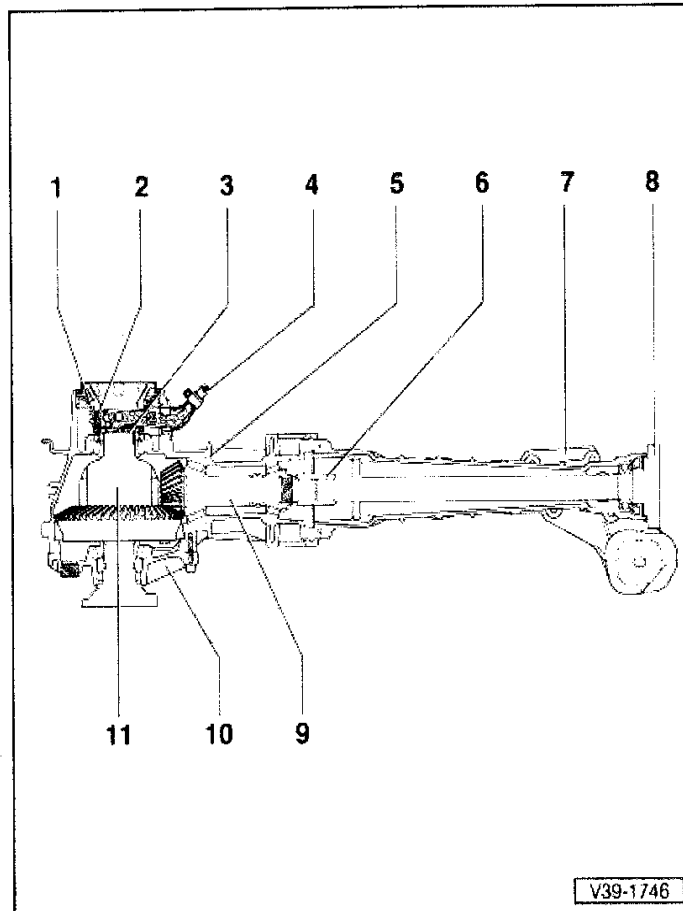


15.2 - Assembly overview

Notes:

- ♦ Removing thrust tube from rear final drive with final drive installed
=>Page 199 .
- ♦ Removing thrust tube from rear final drive with final drive removed
=>Page 217 .

- 1 Locking collar
- 2 Synchro-hub
- 3 Clutch body for differential lock
- 4 Selector fork

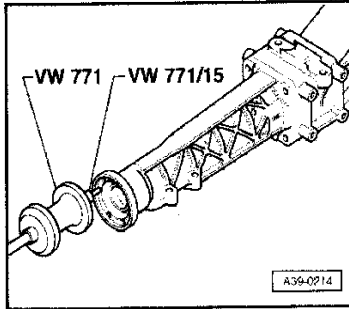


- 5 Final drive housing
- 6 Sleeve
- 7 Final drive support
- 8 Flange shaft
 - ◆ Removing=>Page 205
- 9 Drive pinion
 - ◆ Paired with crown wheel
 - ◆ Removing and installing
=> Page 236
- 10 Cover for final drive
- 11 Differential with crown wheel
 - ◆ Must be removed before dismantling drive pinion
 - ◆ Crown wheel is mated to drive pinion
 - ◆ Removing and installing
=> Page 219
 - ◆ Dismantling and assembling
=> Page 226

Removing thrust tube from rear final drive

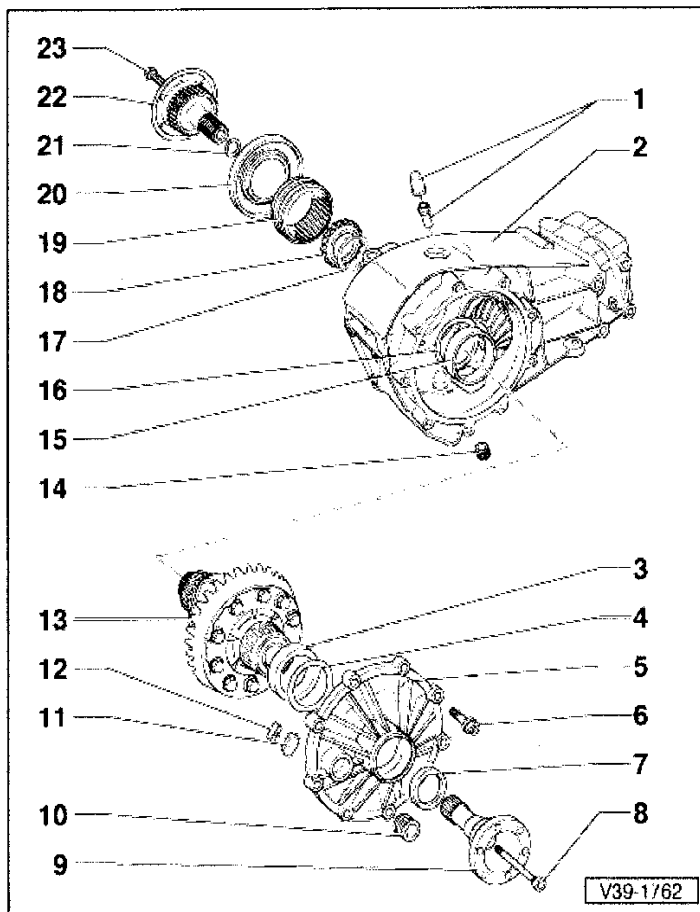
- Rear final drive removed

- Secure rear final drive to repair stand=>Page 215 .
- Place drip tray underneath to collect oil.
- Drain gear oil.
- Remove bolts securing the thrust tube to the rear final drive housing.



- -> Pull off thrust tube with flange shaft ; when doing this, support thrust tube.

15.3 - Removing and installing differential



Notes:

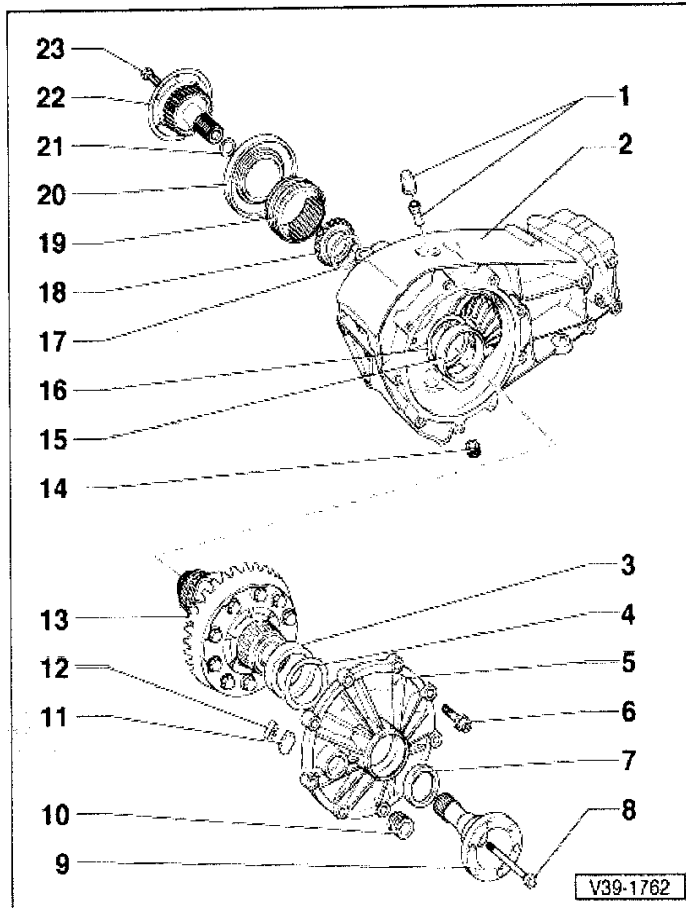
- ◆ Secure final drive on a repair stand => Page 39-97.
- ◆ General repair instructions =>Page 9 .
- ◆ Adjustments are required when replacing components marked 1) => adjustment overview Page 256 .

1 Breather

- ◆ Insertion depth=>Fig. 1

2 Final drive housing1)

- ◆ With drive pinion
- ◆ Removing and installing drive pinion
=>Page 236



3 Outer race for large taper roller bearing 1)

- ◆ Removing and driving in
=> Fig. 235

4 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview => Page 256

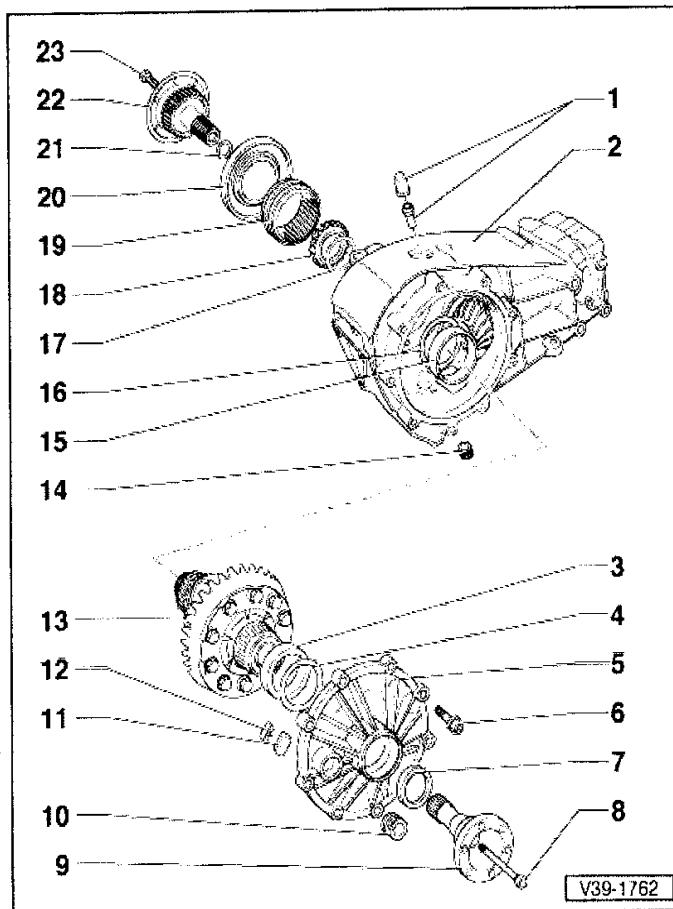
5 Cover for final drive 1)

- ◆ Seal with sealing paste
AMV 188 200 03
- ◆ Installation position: magnet towards the bottom

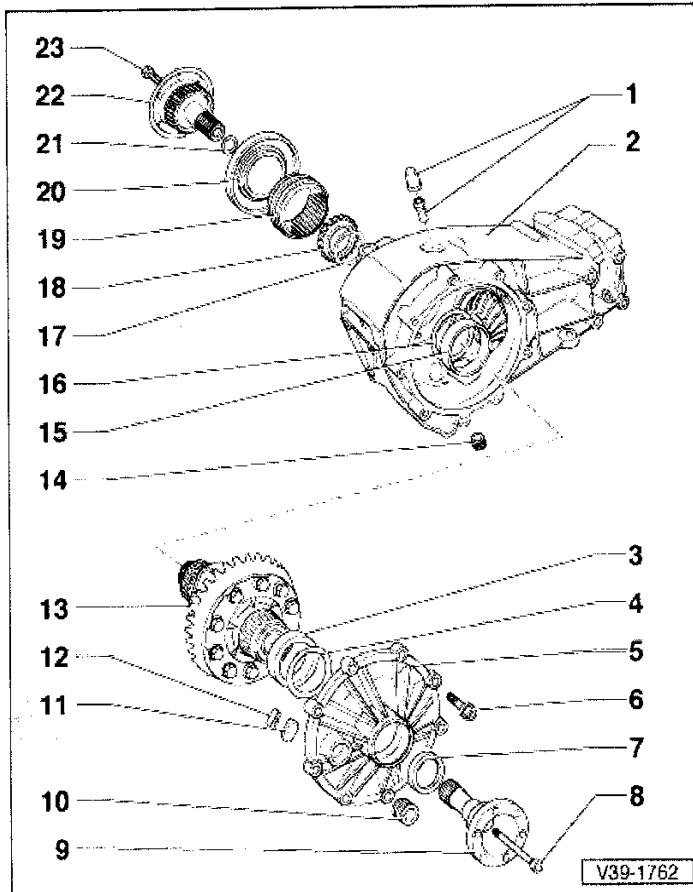
6 Bolt - 25 Nm

7 Seal, right

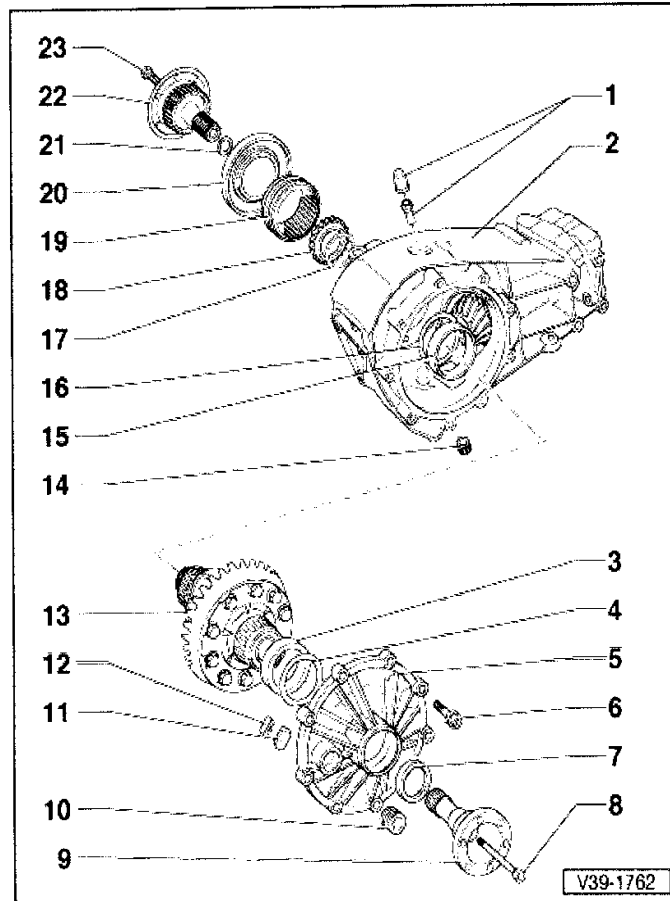
- ◆ Removing=>Page 209
- ◆ Drive in with 2062 as far as stop
=>Page 210



- 8 Taper head bolt M8 - 10 Nm +1/4turn (90°) further
- 9 Flange shaft, right
 - ◆ Removing => Page 225
- 10 Oil filler plug- 25Nm
- 11 Magnet
 - ◆ Installation position=>Fig. 2
- 12 Clip for magnet
 - ◆ Installation position=>Fig. 2
 - ◆ Always renew
- 13 Differential with crown wheel 1)
 - ◆ Removing => Page 224
 - ◆ Dismantling and assembling => Page 226
- 14 Oil drain plug - 25 Nm



- 15 Outer race for small taper roller bearing 1)
 - ♦ Driving out and driving in => Fig. 235
- 16 Shim "S2"
 - ♦ Note thickness
 - ♦ Adjustment overview => Page 256
- 17 Shim for clutch body
 - ♦ Determining thickness
 - =>Fig. 252
- 18 Clutch body for differential lock
 - ♦ Installation position
 - =>Fig. 252
- 19 Locking collar
 - ♦ Installation position: shoulder towards clutch body
 - ♦ Remove and install together with selector fork



20 Seal, left

- ◆ Removing=>Page 209
- ◆ Drive in with 3066 as far as stop
=>Page 210

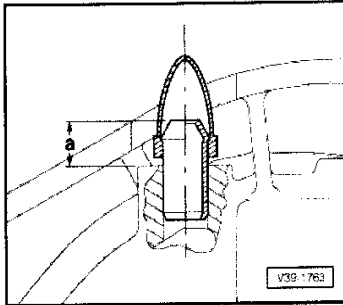
21 Shim for flange shaft

- ◆ Take care not to lose shim when dismantling
- ◆ Determining thickness
=>Page 252
- ◆ Adjustment overview
=>Page 256

22 Flange shaft, left

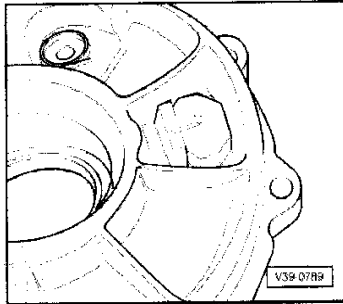
- ◆ Removing => Page 225
- ◆ Adjusting=>Page 252

23 Taper head bolt M8 - 10 Nm +1/4turn (90°) further



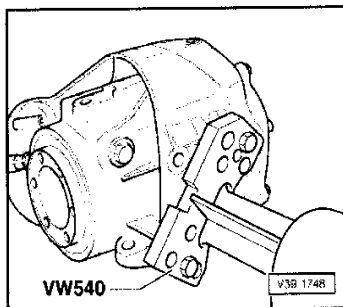
-> Fig.1 Insertion depth for breather sleeve

- ◆ Distance a = 11 mm



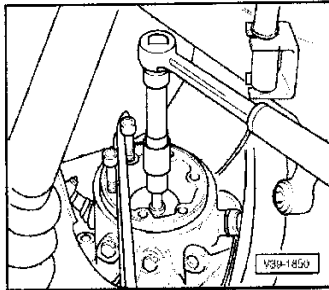
-> Fig.2 Installation position of magnet

- Always fit new clip when performing repairs.



Removing

- Rear final drive removed
- -> Secure complete rear final drive on a repair stand with bracket VW 540.
- Place drip tray underneath to collect oil.
- Drain gear oil.



- -> Remove left and right-hand flange shafts.
- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Mark flange shafts (left and right) and pull out.
- Remove clutch body for differential lock=>Page 246 . Selector fork and locking collar remain in final drive.
- Unscrew securing bolts from cover for final drive.
- Take cover for final drive off axle housing and remove differential.

Installing

Install in reverse order.

- Insert differential.
- Clean sealing surface and coat with sealing paste AMV 188 200 03.
- Fit final drive cover on axle housing and tighten bolts in diagonal sequence.
- Install clutch body for differential lock with correct shim=>from Page 246 .
- Fill space between sealing and dust lips with multipurpose grease.
- Fit flange shafts and tighten.

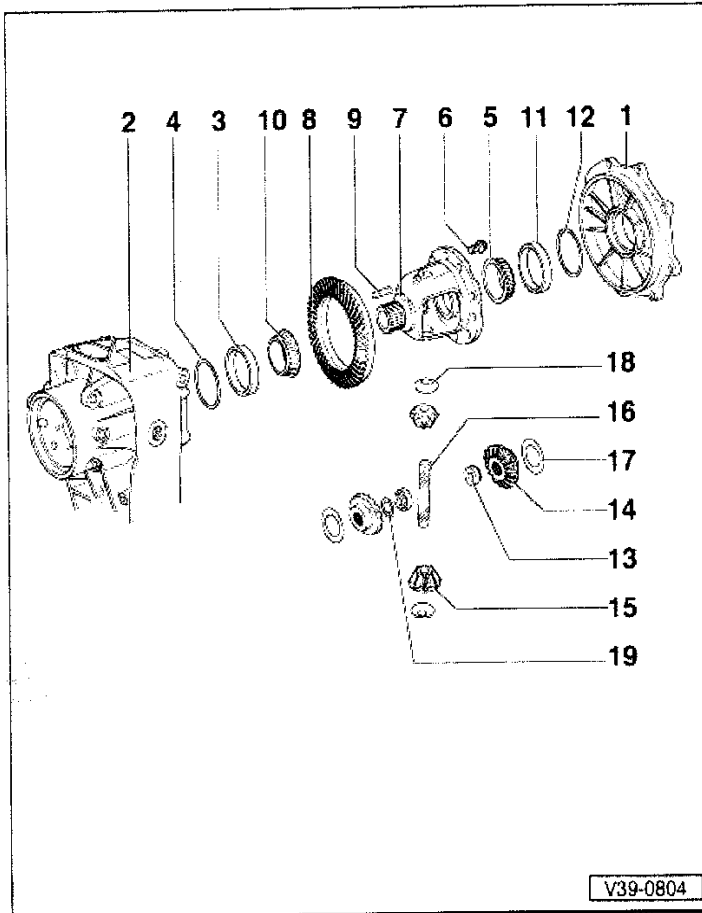
Note:

A shim is fitted between differential and right flange shaft.

- Top-up gear oil in rear final drive and check oil level => Page 197 .



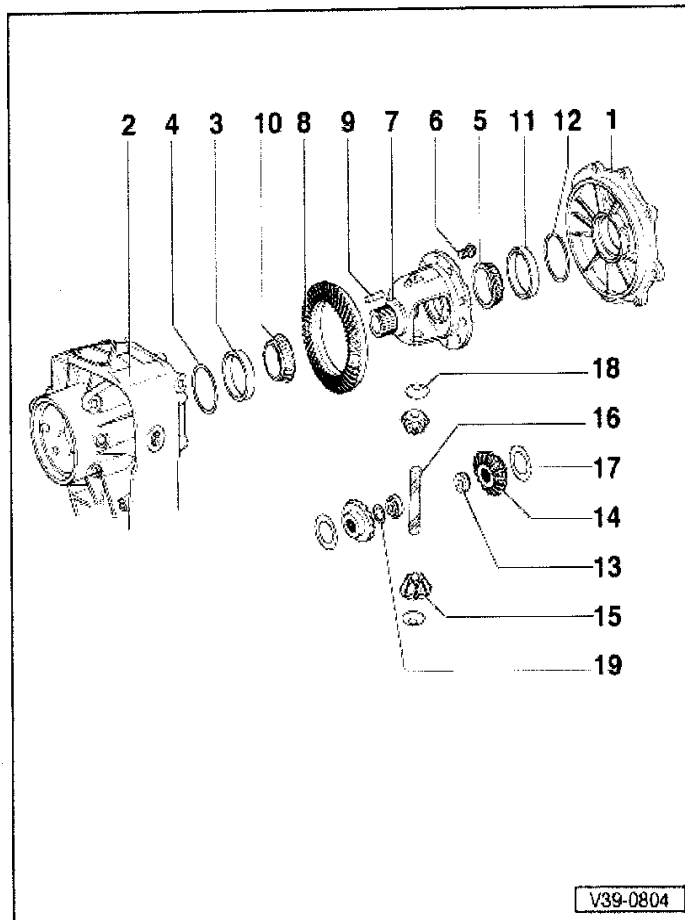
15.4 - Dismantling and assembling differential



Notes:

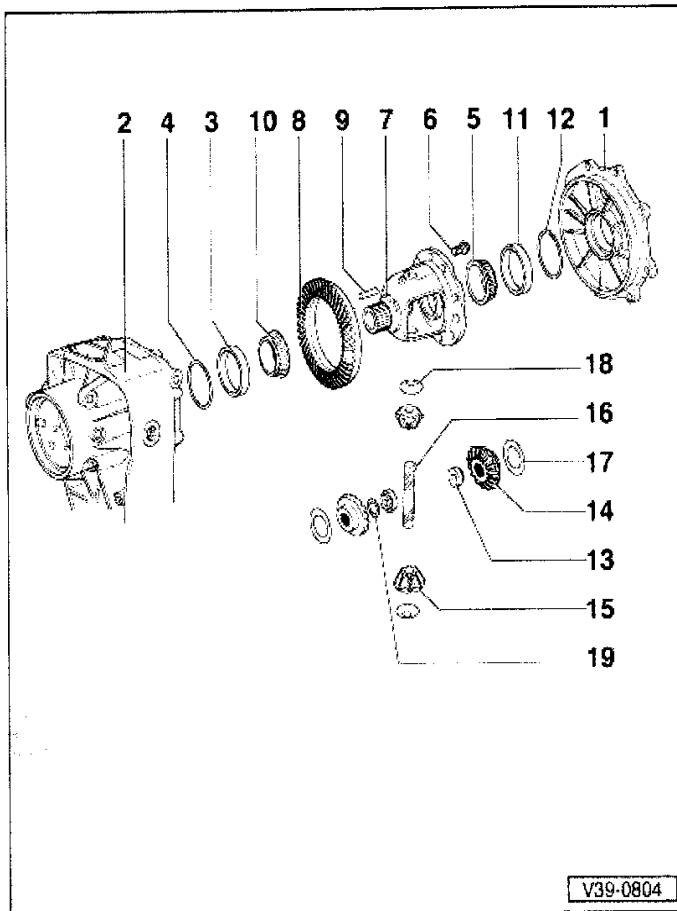
- ◆ General repair instructions =>Page 9 .
- ◆ Replace both taper roller bearings of the differential together. Use same make if possible.
- ◆ Adjustments are required when replacing components marked 1) => adjustment overview Page 256 .

- 1 Cover for final drive 1)
- 2 Final drive housing 1)

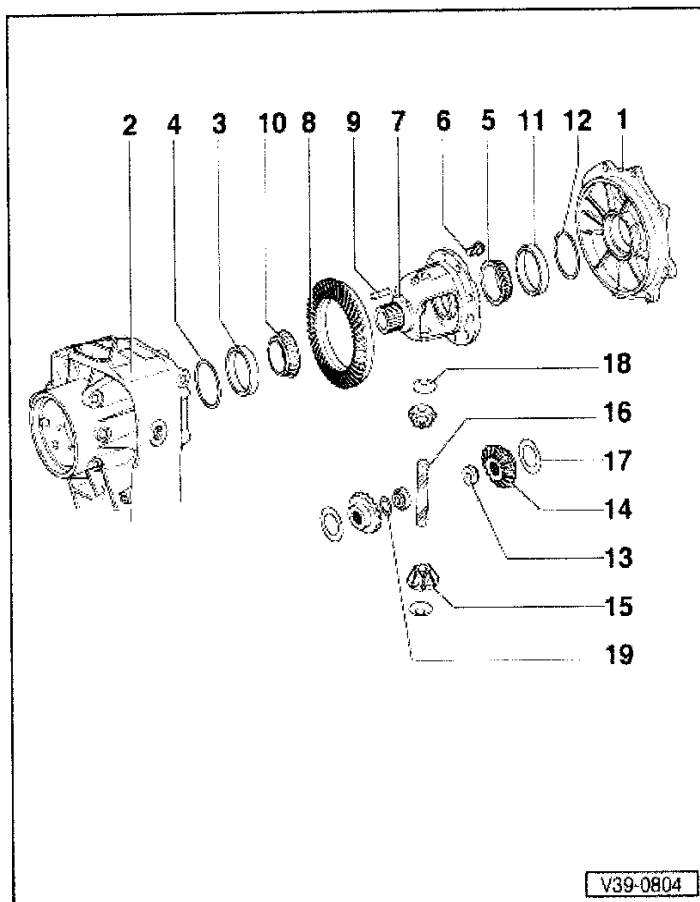


- 3 Outer race for large taper roller bearing 1)
 ♦ Driving out => Fig. 9
 ♦ Driving in => Fig. 10
- 4 Shim "S2"
 ♦ Note thickness
 ♦ Adjustment overview => Page 256
- 5 Inner race for small taper roller bearing 1)
 ♦ Pulling out => Fig. 2
 ♦ Pressing on => Fig. 4
- 6 Crown wheel bolt
 ♦ Renew
 ♦ Use only genuine bolts
 ♦ Counter hold, then tighten using diagonal sequence to 60 Nm and then turn 45° further

V39-0804



- 7 Differential housing 1)
- 8 Crown wheel 1)
- ◆ Paired with drive pinion (final drive set)
 - ◆ Drive off differential housing with a drift => Fig. 5
 - ◆ Installing => Fig. 6
 - ◆ Heat crown wheel to 100 °C when installing
- 9 Spring pin
- ◆ Drive in flush
- 10 Inner race for large taper roller bearing 1)
- ◆ Pulling off => Fig. 1
 - ◆ Pressing in => Fig. 3



11 Outer race for small taper roller bearing 1)

- ◆ Driving out => Fig. 11
- ◆ Driving in=>Fig. 12

12 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview => Page 256

13 Threaded piece

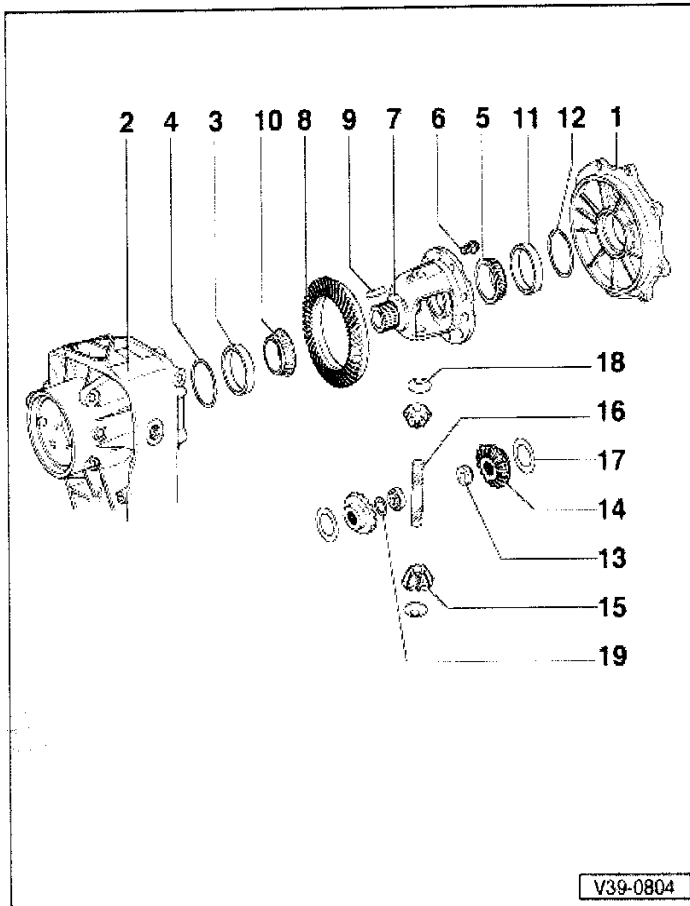
14 Sun wheels

- ◆ Installing => Fig. 7
- ◆ Adjusting => Fig. 8

15 Planet wheels

- ◆ Installing => Fig. 7

V39-0804



16 Shaft for planet wheels

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

17 Shim

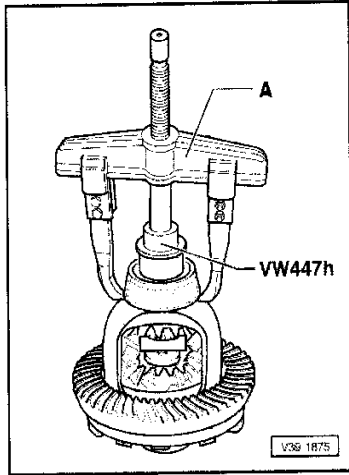
- ◆ Re-determining thickness => Fig. 8

18 Thrust washer

- ◆ Check for cracks and chipping

19 Shim for flange shaft

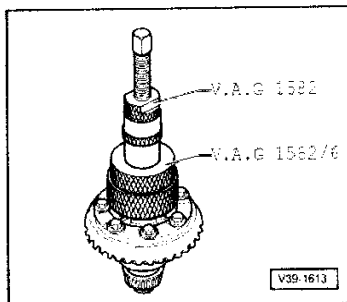
- ◆ Take care not to lose shim when dismantling
- ◆ Determining thickness
=>Page 252
- ◆ Adjustment overview
=>Page 256



-> Fig.1 Pulling off inner race for large taper roller bearing

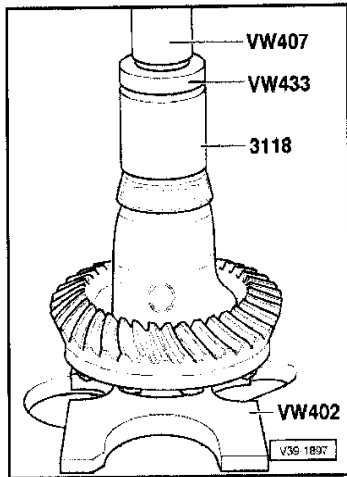
- Before applying puller, fit thrust plate VW 447 h on differential housing.

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

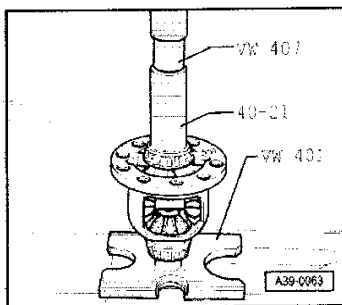


-> Fig.2 Pulling off inner race for small taper roller bearing

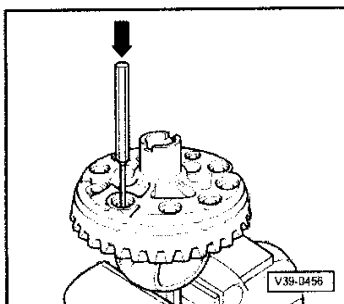
- Fit thrust plate 40-105 onto differential housing before fitting puller.



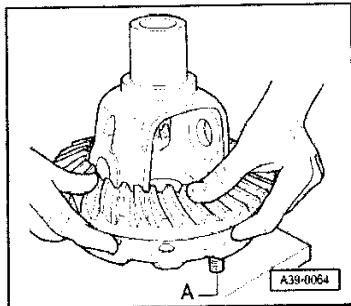
-> Fig.3 Pressing on inner race for large taper roller bearing
- Heat bearing to approx. 100 °C, fit in position and press home.



-> Fig.4 Pressing on inner race for small taper roller bearing
- Heat bearing to approx. 100 °C, fit in position and press home.



-> Fig.5 Driving crown wheel off housing

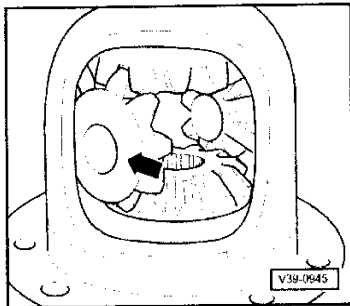


-> Fig.6 Installing crown wheel

- Use 2 centring pins -A- (local manufacture) as a guide.

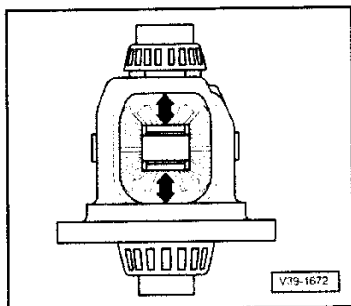
Caution
Wear protective gloves.

- Heat crown wheel to approx. 100 °C and install.



-> Fig.7 Installing differential bevel gears

- Insert sun wheels with correct shims => Fig. 8 .
- Insert planet wheels spaced 180° apart (stick thrust washers on with a small amount of grease) and rotate into position -arrow-.
- Locate thrust washers and planet wheels so they are aligned with the holes.
- Insert threaded pieces.
- Drive in shaft for planet wheels into final position and secure.



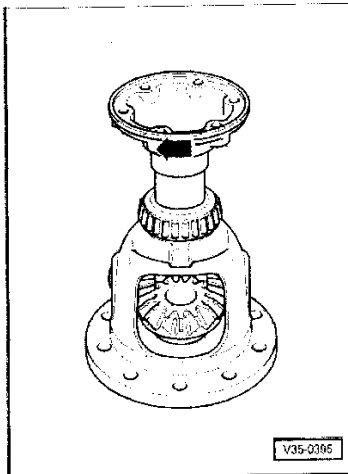
-> Fig.8 Adjusting differential bevel gears

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet wheels with thrust washers and press in shaft.

Note:

Do not now interchange bevel gears and thrust washers.

- Press planet wheels outwards and check play of sun wheels by hand -arrows-.



- Adjust play by inserting an appropriate shim.
- Specification: max. 0.10 mm

Note:

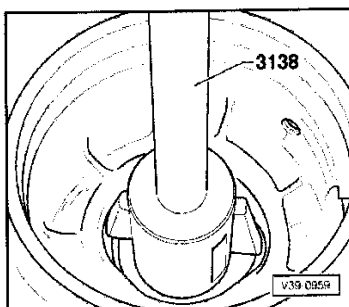
-> The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the differential bevel gears -arrow-.

- Determine shim from table. Part numbers

=> Parts catalogue

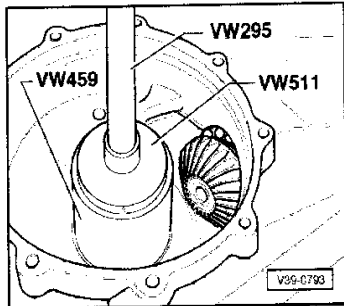
The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00



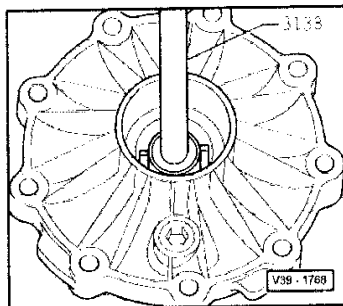
-> Fig.9 Driving outer race for large taper roller bearing out of final drive housing

- After removing check shims for damage.



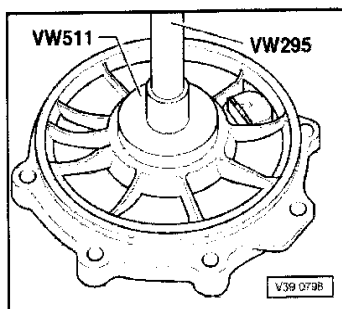
-> Fig.10 Driving outer race for large taper roller bearing into final drive housing

- Position outer race using VW 295 and light even blows with a hammer.
- Then drive in onto stop as shown in illustration.



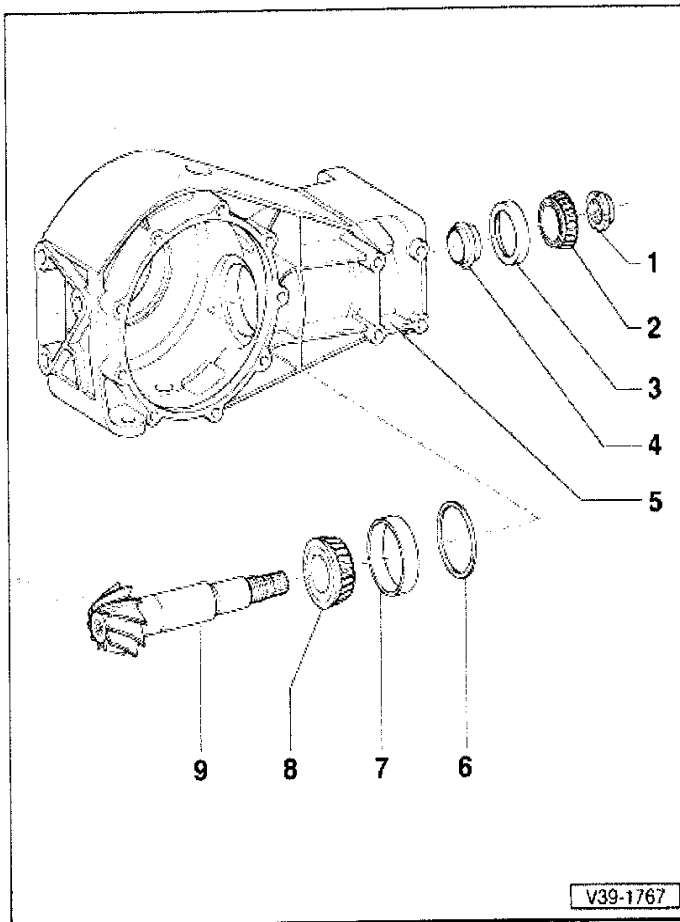
-> Fig.11 Driving outer race for small taper roller bearing out of cover

- After removing check shims for damage.



-> Fig.12 Driving outer race for small taper roller bearing into cover

15.5 - Removing and installing drive pinion

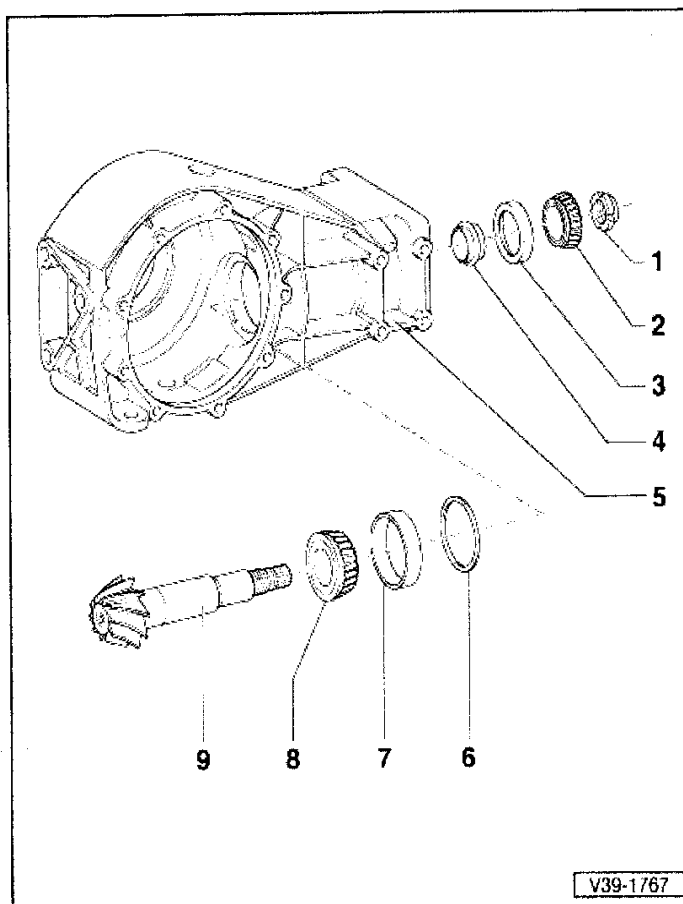


Notes:

- ◆ General repair instructions =>Page 9 .
- ◆ Secure final drive on a repair stand => Page 39-97.
- ◆ Renew both taper roller bearings together. Use bearings made by same manufacturer if possible.
- ◆ Removing differential
=>Page 219 .
- ◆ Adjustments are required when replacing components marked1)
=>Adjustment overview, Page 256 .

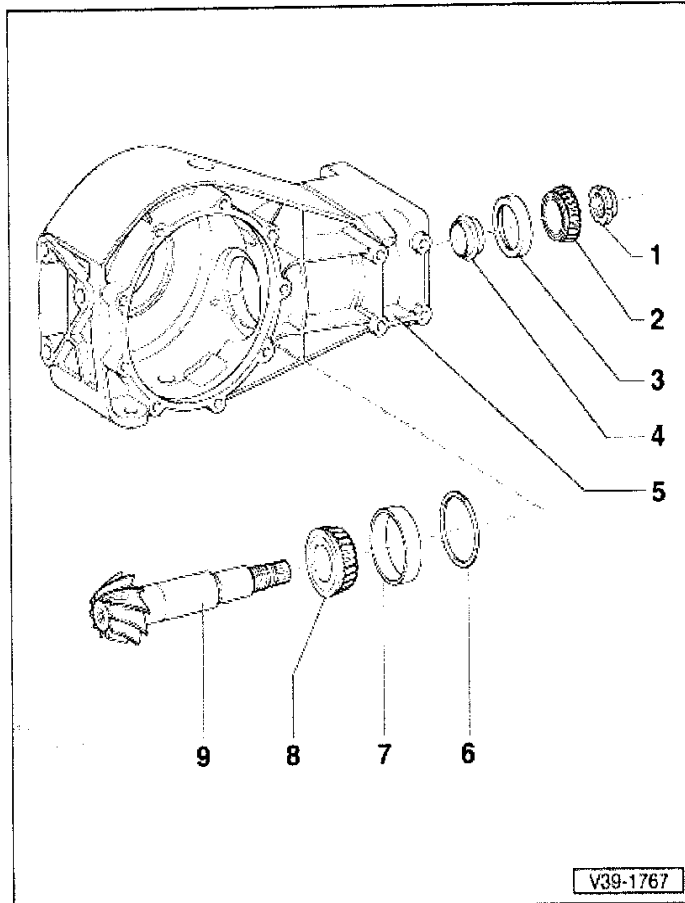
1 Drive pinion nut

- ◆ Slackening=>Fig. 1 and Fig. 2
- ◆ Tightening => Fig. 11
- ◆ Measuring frictional torque => Fig. 12
- ◆ Locking => Fig. 13

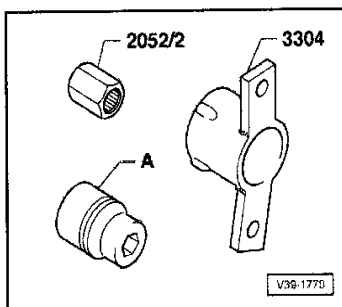


- 2 Inner race for small taper roller bearing 1)
 ♦ Pressing out drive pinion => Fig. 3
 ♦ Installing => Fig. 10
- 3 Outer race for small taper roller bearing 1)
 ♦ Pulling out => Fig. 4
 ♦ Pressing in => Fig. 9
- 4 Spacer sleeve 1)
 ♦ Renew
- 5 Final drive housing 1)
- 6 Shim "S3"
 ♦ Note thickness
 ♦ Adjustment overview => Page 256
- 7 Outer race for large taper roller bearing 1)
 ♦ Driving out => Fig. 5
 ♦ Pulling in => Fig. 8

V39-1767

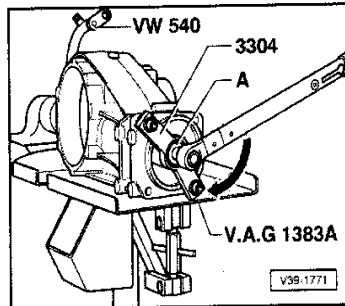


- 8 Inner race for large taper roller bearing 1)
 ♦ Pressing off=>Fig. 6
 ♦ Pressing on => Fig. 7
- 9 Drive pinion 1)
 ♦ Paired with crown wheel
 ♦ Replace only in conjunction with crown wheel



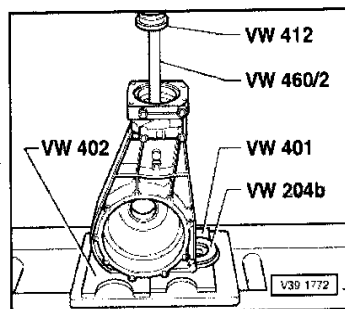
-> Fig.1 Tools for slackening and tightening drive pinion nut

A - Socket (32 mm)

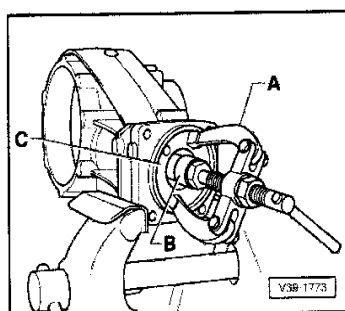


-> Fig.2 Slackening drive pinion nut

The final drive must be adequately supported (e.g. with V. A. G 1383 A) when slackening the drive pinion nut; otherwise the threaded holes in the housing can be damaged.



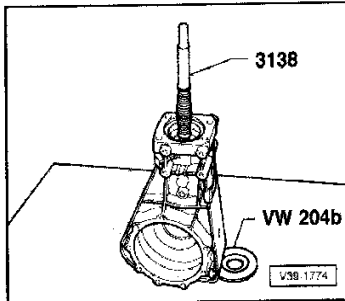
-> Fig.3 Pressing drive pinion out of inner race for small taper roller bearing



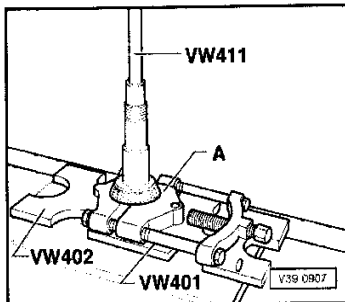
-> Fig.4 Pulling out outer race for small taper roller bearing

- A - Counter support, e.g. Kukko 22/1
- B - Internal puller 46 ... 58 mm, e.g. Kukko 21/7

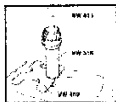
C - Assembly ring 10-9



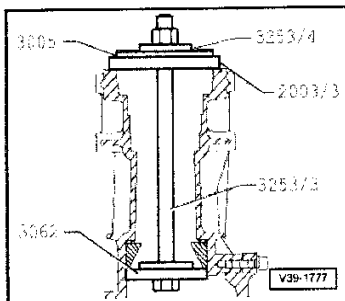
-> Fig.5 Driving out outer race for large taper roller bearing
 - After removing check shims for damage.



-> Fig.6 Pressing inner race for large taper roller bearing off drive pinion
 A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



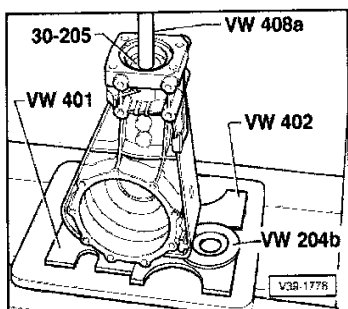
-> Fig.7 Pressing inner race for large taper roller bearing onto drive pinion
 - Heat bearing to approx. 100 °C, fit in position and press home.



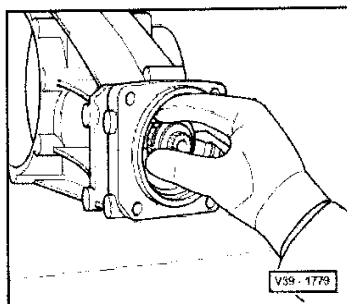
- > Fig.8 Pulling in outer race for large taper roller bearing
- Insert predetermined shim "S3" for drive pinion => Page 256 .

Note:

Marking "Oben" (top) on thrust plate 3253/4 faces towards nut on fitting appliance.



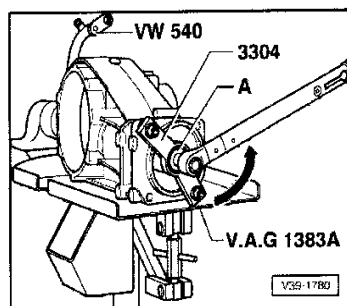
- > Fig.9 Pressing in outer race for small taper roller bearing
- Oil outer race
 - Before pressing in, locate outer race in position with VW 295 and 30-205.



- > Fig.10 Fitting inner race for small taper roller bearing onto drive pinion
- Insert drive pinion with new spacer sleeve.

Caution
Wear protective gloves.

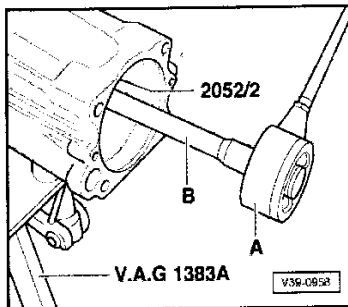
- Heat inner race for small taper roller bearing to approx. 100°C.
- Press drive pinion upwards and fit bearing onto drive pinion as far as stop.



-> Fig.11 Tightening drive pinion nut and setting frictional torque

Notes:

- ♦ Only increase tightening torque slowly and read-off frictional torque frequently. If the specified frictional torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. It is not possible to reuse a spacer sleeve that has been excessively compressed.
- ♦ The final drive must be supported (e.g. with V.A.G 1383 A) when tightening the drive pinion nut, otherwise the threaded holes in the housing will be damaged.

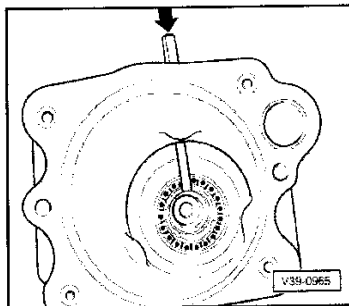


-> Fig.12 Measuring frictional torque

- A - Torque gauge, commercially available, 0 ... 600 Ncm
- B - Socket (32 mm)

- The following frictional torques should be set:

New bearings	Used bearings
250 ... 300 Ncm	30 ... 60 Ncm



-> Fig.13 Locking drive pinion nut

- Peen drive pinion nut with punch.

16 - Servicing differential lock actuator

16.1 - Servicing differential lock actuator

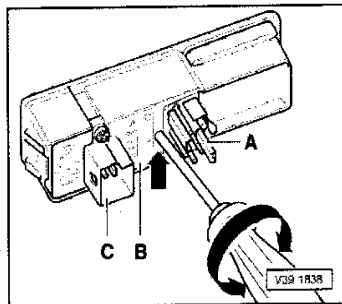
16.2 - Removing and installing switch for differential lock

Notes:

- ♦ The switch for the differential lock is fitted in a trim panel in the centre console.
- ♦ Checking function of switch for differential lock

=> Current flow diagrams, electrical fault-finding and fitting locations binder; Model year 1992 ä; Fault-finding programme No. 36

- Carefully lever switch with trim panel out of centre console.
- Disconnect wiring.



- -> Insert a small screwdriver between switch -A- and conductor plate -B- -arrow-.
- Prise switch out of front catch by turning screwdriver.
- Take switch out of trim panel.
- Conductor plate -B- can be removed from trim panel together with plug housing -C-.

16.3 - Routing hoses and pipes

Notes:

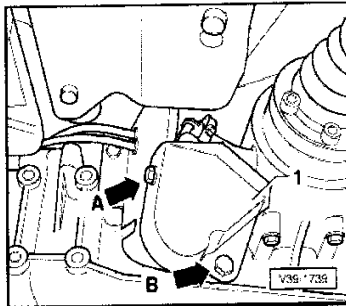
- ♦ Hoses and pipes are supplied as replacement parts in one colour only. When installing, cut hose or pipe to length and mark with a piece of adhesive tape of the appropriate colour (or identify with a written marking).
- ♦ Position and length of hoses and pipes:

=> Parts catalogue

16.4 - Removing and installing vacuum element

- Final drive installed

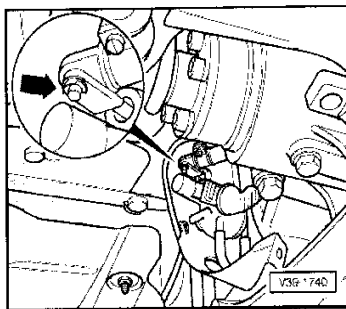
Removing



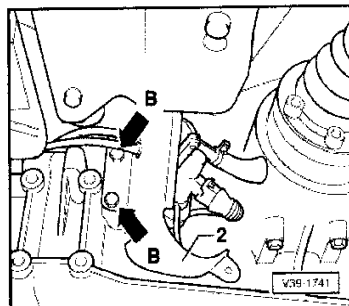
- Slacken double clamp and disconnect exhaust system

=> Avant RS2; Repair group 26; Removing parts of exhaust system

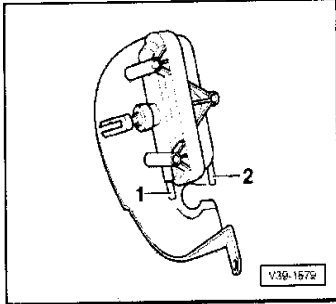
- Disengage main silencer and rear silencer from mountings.
- -> Unbolt heat shield -1- for differential lock actuator -arrows A and B-.



- -> Use a screwdriver to lever off circlip from connection between differential lock actuator and differential lock.
- Take out connecting pin from above.
- Unclip electrical wiring and hoses for differential lock actuator.



- -> Unbolt bracket -2- for vacuum unit and switch for differential lock on rear final drive -arrows B-.
- Pull vacuum hoses off vacuum unit - note colour coding.
- Unbolt vacuum unit from console.



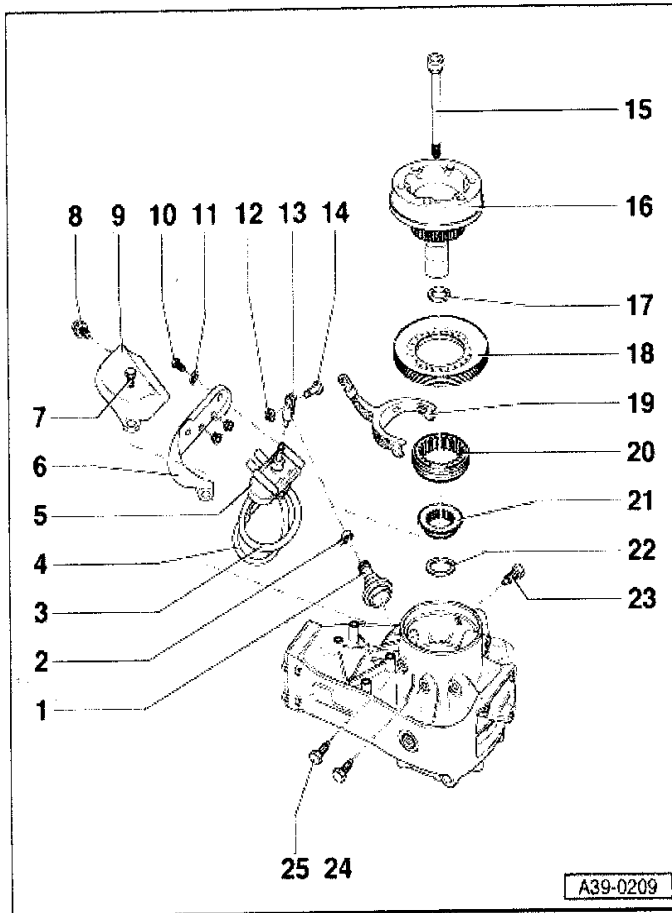
Installing

- -> Note colour coding of vacuum hoses:
 - Yellow hose to connection -1-
 - Blue hose to connection -2-
- Adjust clevis on vacuum unit
=>Page 249 .

Tightening torques

Component	Nm
Heat shield for differential lock actuator to bracket M6	10
Bracket for vacuum unit to rear final drive M8	25
Vacuum unit to bracket M5	2.5
Double clamp on exhaust system	40

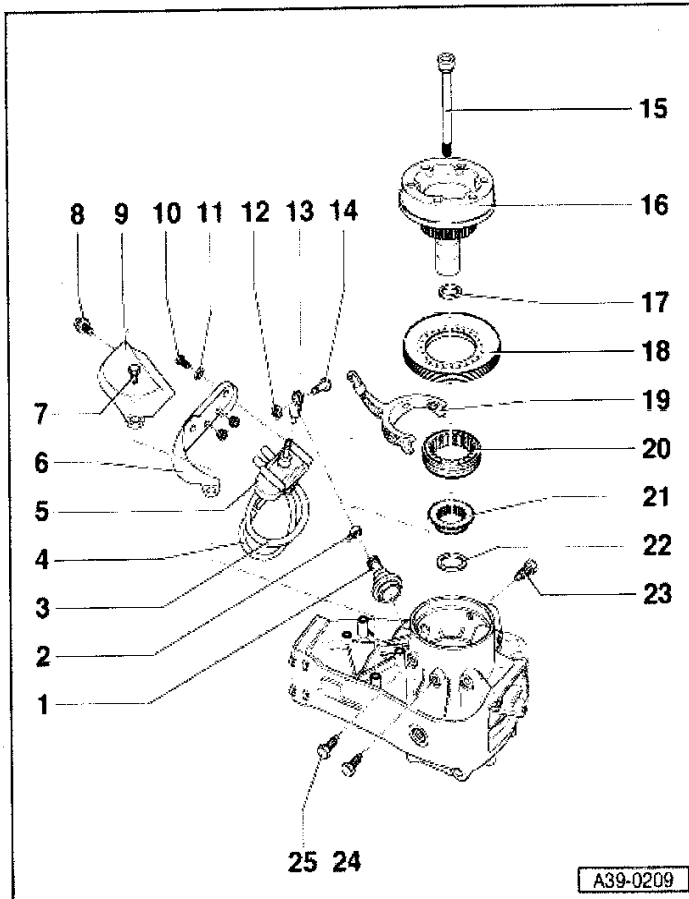
16.5 - Dismantling and assembling differential lock



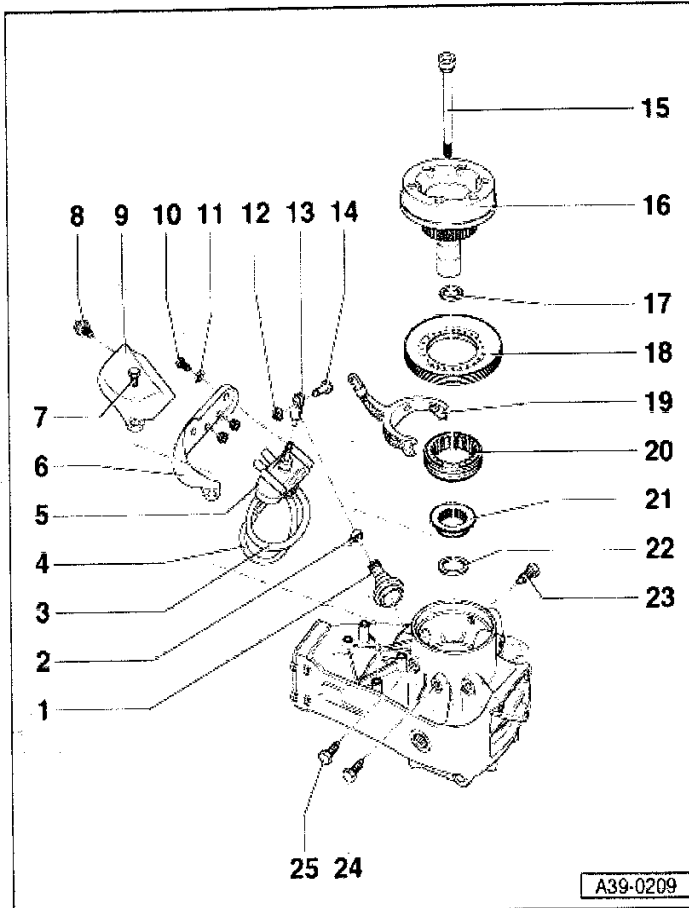
Notes:

- ♦ Can be dismantled with final drive installed
- ♦ The differential lock in the rear final drive can be engaged at speeds up to 25 km/h via a control unit. It is disengaged automatically at speeds above 25 km/h.
- ♦ Fault-finding for the differential lock

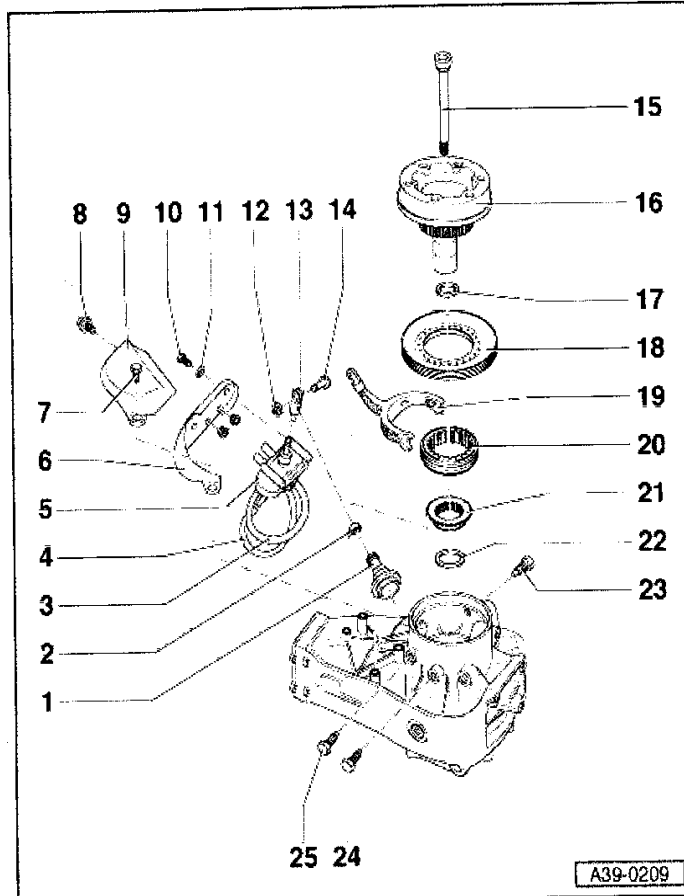
=> Current flow diagrams, fault-finding and fitting locations binder; model year 1992; Fault-finding programme No. 36



- 1 Boot
 - ◆ To remove and install, remove bracket with vacuum element
=>Page 243
- 2 Clamp
 - ◆ Secures boot to selector fork
- 3 Vacuum hose (yellow)
 - ◆ Fit onto outer connection on vacuum unit
- 4 Vacuum hose (blue)
 - ◆ Fit onto inner connection on vacuum unit
- 5 Vacuum unit
 - ◆ Removing and installing
=>Page 243



- 6 Bracket
 - ◆ For vacuum unit
- 7 Bolt - 10 Nm
- 8 Bolt - 10 Nm
- 9 Heat shield
- 10 Bolt - 3.5 Nm
 - ◆ Qty. 3
 - ◆ With corrugated washer
 - ◆ Secures vacuum unit to bracket
- 11 Grommet
 - ◆ Qty. 2
- 12 Circlip
 - ◆ Fit onto pin



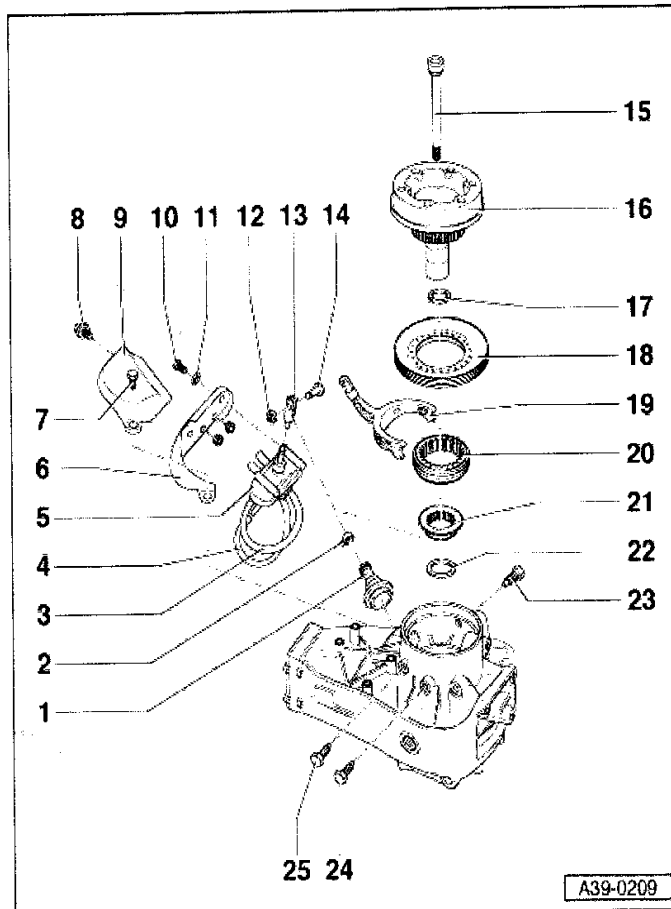
13 Clevis

- ♦ Adjusting
- Final drive must be fully assembled
- Remove pin from selector fork
- Turn clevis so that operating travel of vacuum element moves selector fork all the way to its two end positions (trunnion bolt -Item 24 - serves as the stop).

14 Pin

15 Taper head bolt - 10 Nm +1/4tum (90°) further

16 Flange shaft, left



17 Shim for flange shaft

- ◆ Take care not to lose shim when dismantling
- ◆ Determining thickness
=>Page 252

18 Seal

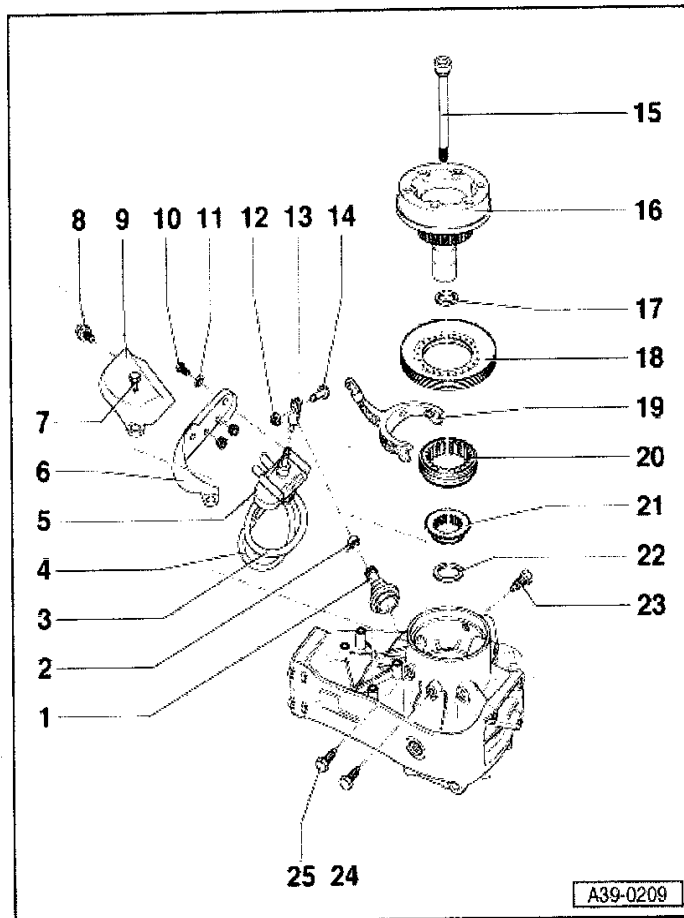
- ◆ Always renew
- ◆ Removing and installing
=>Page 208

19 Selector fork

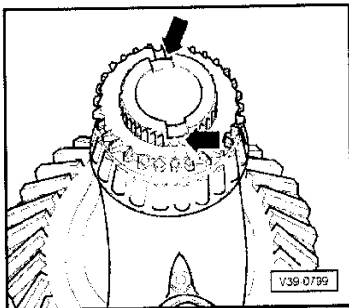
- ◆ Remove and install together with locking collar

20 Locking collar

- ◆ Installation position: shoulder faces towards clutch body
- ◆ Remove and install together with selector fork



- 21 Clutch body for differential lock
 - ♦ Installation position=>Fig. 1
- 22 Shim for clutch body
 - ♦ Determining thickness=>Fig. 2
- 23 Trunnion bolt - 35 Nm
 - ♦ Guide for selector fork
- 24 Trunnion bolt - 35 Nm
 - ♦ Stop for selector fork
- 25 Trunnion bolt - 35 Nm
 - ♦ Guide for selector fork

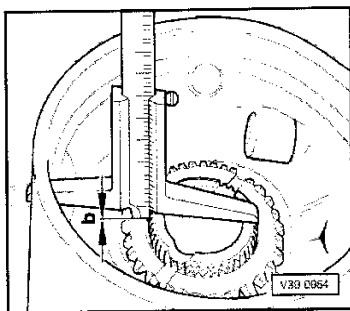


-> Fig.1 Installation position of clutch body

Note:

Shown in illustration with differential removed.

Oil grooves -arrows- on differential and clutch body must be aligned.



-> Fig.2 Determining thickness of shim

- Measure distance -b-
- Select required shim from table. Part numbers

=> Parts catalogue

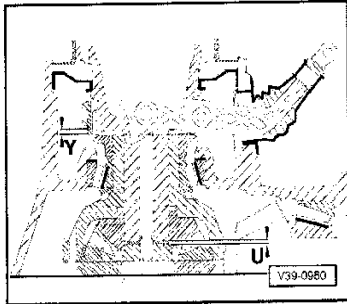
Distance -b-	Shim thickness (mm)
0.00 ... 4.10	no shim
4.11 ... 4.40	0.3
4.41 ... 4.70	0.6
4.71 ... 4.90	0.9

16.6 - Adjusting left flange shaft

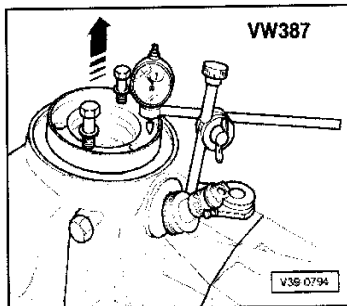
Notes:

- ◆ This adjustment is only required if the left flange shaft, the differential housing or the differential bevel gears are being replaced.
- ◆ The purpose of the adjustment is to obtain a clearance (-Y-) of 0.2 ... 0.5 mm between flange shaft and differential housing. This is necessary to ensure free running and reliable operation of the differential lock.

Determining shim "u"



- -> Measure clearance -y- between flange shaft and differential housing as follows:



- -> Secure dial gauge to rear final drive with universal dial gauge bracket VW 387.
- Press flange shaft in towards differential. Apply dial gauge to flange shaft and set to "0" with 1 mm preload.
- Pull out flange shaft in direction of arrow, and read off the clearance indicated.
 - Specification: 0.2 ... 0.5 mm
- If clearance is too small, install correspondingly thicker shims; if clearance is too large, install correspondingly thinner shims.
- Select required shims from table. Part numbers

=> Parts catalogue

Available shims

Shim thickness (mm)		
0.3	0.6	0.9

17 - Adjusting drive pinion and crown wheel

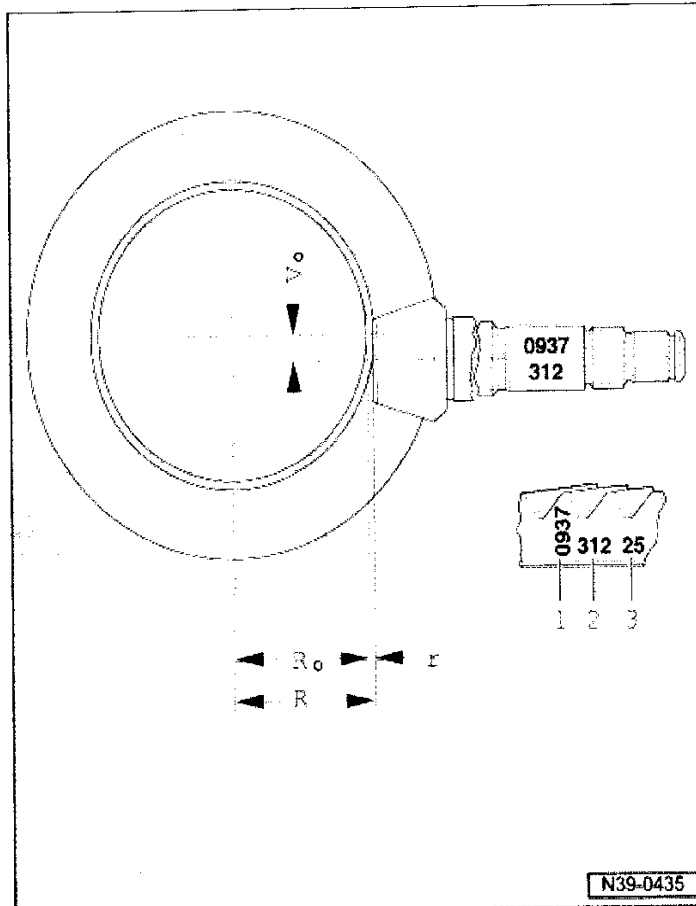
17.1 - Adjusting drive pinion and crown wheel

General notes:

- ◆ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.
- ◆ The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.

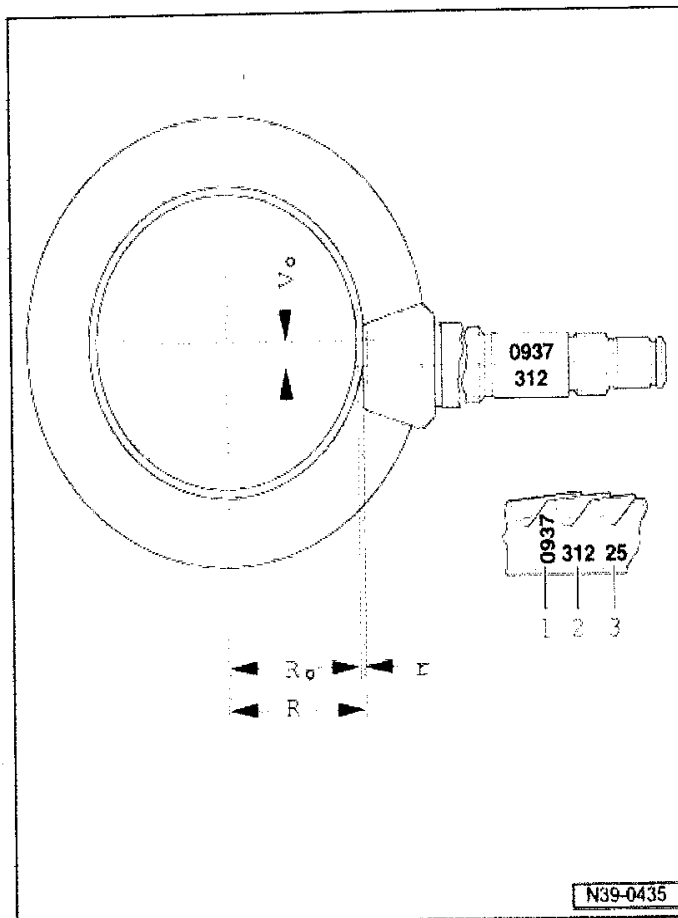
- ♦ The deviation (tolerance) "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) may only be replaced together as a matched pair.
- ♦ Observe the general repair instructions for taper roller bearings and shims.

17.2 - Adjusting and marking of gear sets



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

Ro - Length of master gauge used on test machine
 Ro = 53.15 mm



R - Actual distance between centre axis of crown wheel and face of drive pinion at the point of quietest running for this particular gear set.
 $R = R_0 + r$
 V_0 - Hypoid offset

17.3 - Recommended sequence for readjusting final drive set

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

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" for the specified preload for taper roller bearings for differential.
- 2.) Determine total shim thickness "S3" to reproduce the installation position for the drive pinion determined on the test machine in production.
- 3.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash exists between crown wheel and drive pinion.

Note:

Overview of components and shims =>Page 257 .

17.4 - Adjustment overview

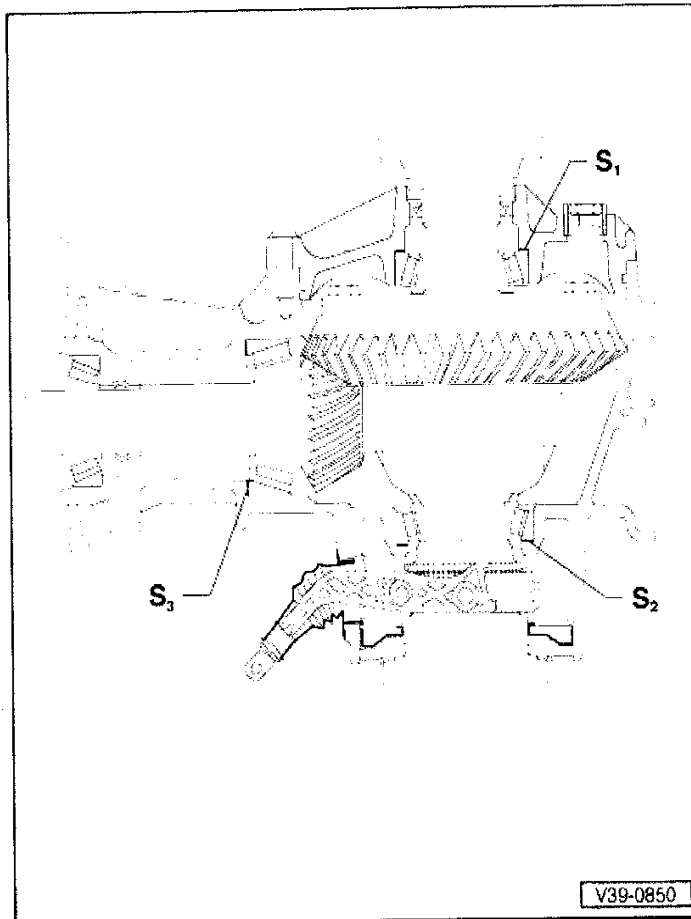
Note:

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

Part renewed: ▼	to be adjusted:			
	Crown wheel "S1"+"S2" 1) => Page 264	Drive pinion "S3" 1) via deviation "r" => Page 257	Backlash 0.12 ... 0.22 mm => Page 266	Left flange shaft => Page 252
Final drive housing	X	X	X	
Differential housing	X		X	X
Taper roller bearing for drive pinion		X	X	
Taper roller bearings for differential	X		X	
Final drive set 2)	X	X	X	
Cover for final drive	X		X	
Flange shaft				X
Differential bevel gears				X

- 1) Shims; installation position => Page 257 .
- 2) Drive pinion and crown wheel; only renew together.

17.5 - Position of shims



Note:

Adjustment overview when renewing individual components of final drive

=>Page 256.

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

18 - Adjusting drive pinion

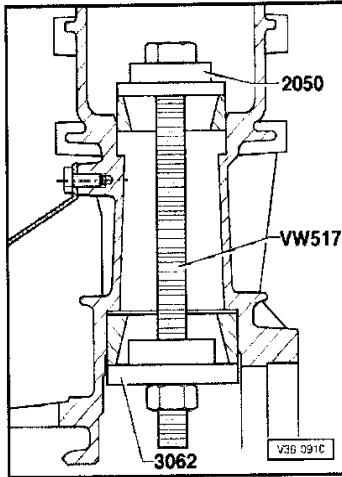
18.1 - Adjusting drive pinion

Notes:

- ♦ Before adjusting drive pinion, adjust crown wheel (determine total shim thickness "Stotal" for shims "S1" + "S2" => Page 264 .

- ♦ Re-adjustment of the drive pinion is only necessary if the final drive set, taper roller bearing for drive pinion or housing for final drive is replaced =>Page 256 .

Determine thickness of shim "S3"

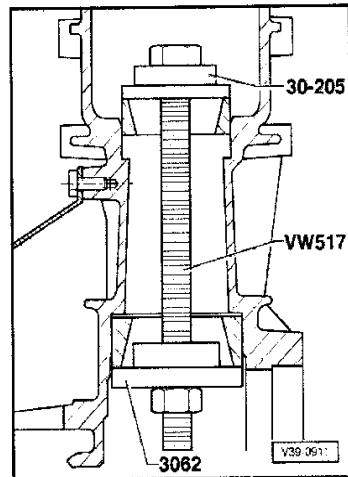


(Setting preload of taper roller bearings for drive pinion)

- Secure final drive on a repair stand.
- -> Pull outer race for large taper roller bearing into housing without shim.

Note:

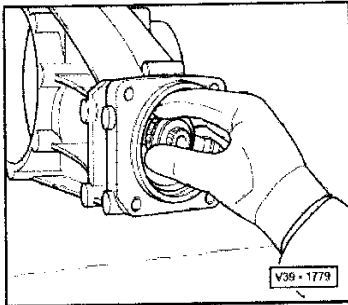
Thoroughly oil bearing race and bearing seat in housing.



- -> Pull outer race for small taper roller bearing into housing.

Note:

Thoroughly oil bearing race and bearing seat in housing.

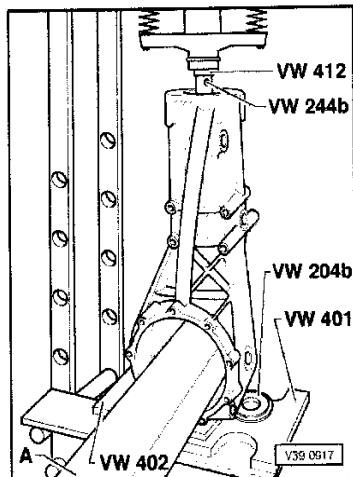


- -> Insert drive pinion without spacer sleeve.
- Heat inner race for taper roller bearing to approx. 100 °C and fit onto drive pinion.

Caution
Wear protective gloves.

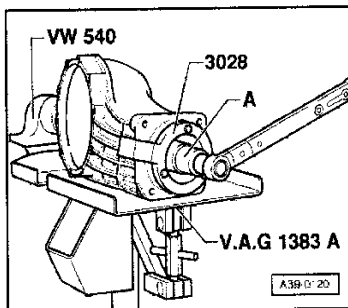
Note:

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



- -> Press taper roller bearing fully home.

A - Wooden block used to support drive pinion

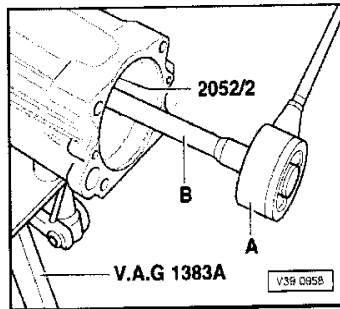


- -> Tighten drive pinion nut until the following friction torque is obtained.

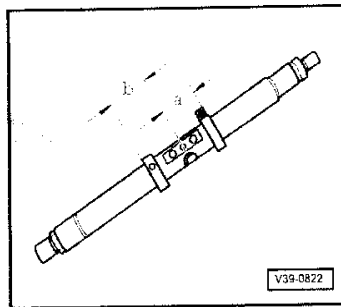
New bearings	Used bearings
250 ... 300 Ncm	30 ... 60 Ncm

Note:

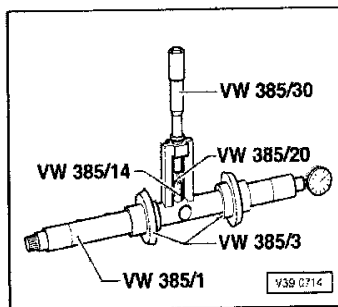
The final drive must be supported (e.g. with V.A.G 1383 A) when tightening the drive pinion nut otherwise the threaded holes in the housing will be damaged.



- A - -> Torque gauge, commercially available, 0 ... 600 Ncm
- B - Extension with 32 mm socket



- -> Set adjustment ring of universal mandrel VW 385/1.
 - Distance "a" = 75 mm
- Set sliding adjustment ring.
 - Distance "b" = 35 mm

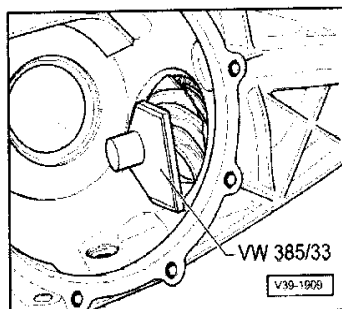


- -> Assemble universal mandrel as illustrated:
 - Dial gauge extension VW 385/20 = 3 mm long
- Set universal master gauge VW 385/30.
 - $R_o = 53.15$ mm

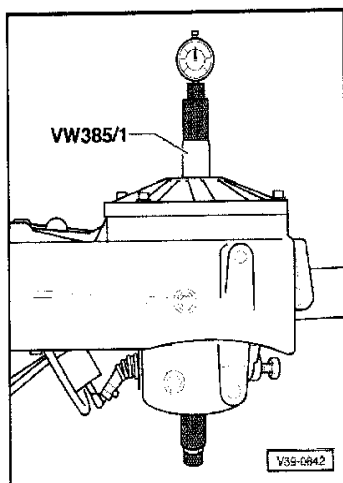
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

Note:

Before performing following measurements turn drive pinion at least five turns in both directions, so that the taper roller bearings settle. Otherwise a false reading will be obtained.



- -> Place end measuring plate VW 385/33 onto drive pinion head.
- Remove master gauge VW 385/30 and insert mandrel into housing.
 - The centring disc 385/3 faces towards cover for final drive
- Fit cover for final drive and tighten 4 bolts.
- Using the adjustable ring, move 2nd centring disc out as far as possible so that the mandrel can still just be turned by hand.



Determining dimension "e"

- -> Turn mandrel until the dial gauge point touches the end measuring plate on drive pinion head, then measure maximum deflection (return point). The measured value is dimension "e" (in red scale).
 - Measurement in following example: "e" = 1.60 mm

Note:

Dimension "e" is required to determine thickness of shim "S3".

- After removing universal mandrel, check once again whether the dial gauge reads "0" with 2 mm preload when master gauge VW 385/30 is in place - otherwise repeat the measurement.

Determining shim thickness "S3"

Formula:	
"S3" = "e" - "r"	
e	= Measured value => Page 261
r	= Deviation (tolerance): marked on crown wheel in 1/100 mm

Example:	
Determined value "e"	1.60 mm
- Deviation "r"	0.42 mm
= Thickness of shim "S3"	1.18 mm

- Determine shim(s) from table. Part numbers

=> Parts catalogue

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.95	1.15	1.35
1.00	1.20	1.45
1.05	1.25	1.50
1.10	1.30	1.55

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

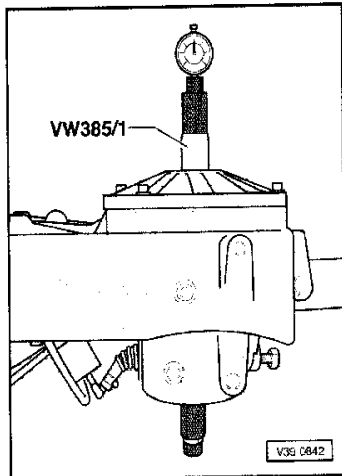
- Remove universal mandrel.
- Remove drive pinion and outer race for large taper roller bearing and reinstall with determined shim(s) and spacer sleeve => Page 236 .
- Insert inner race for small taper roller bearing and tighten drive pinion nut until specified frictional torque is achieved => Page 236 .

Note:

Increase tightening torque slowly and check friction torque at regular intervals. If the specified friction torque is exceeded, the spacer sleeve must be renewed. A spacer sleeve which has been compressed too far cannot be reused.

- Set to following frictional torques:

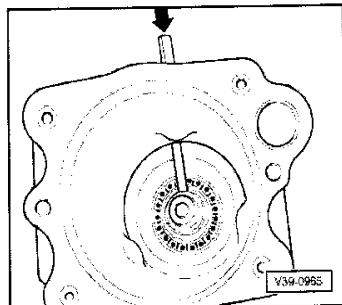
New bearings	Used bearings
250 ... 300 Ncm	30 ... 60 Ncm



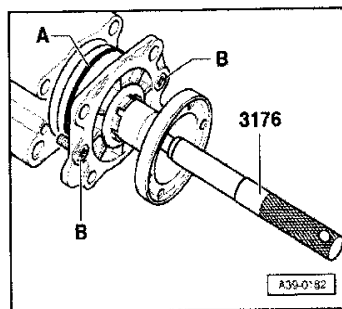
Performing check measurement

Checking dimension "r"

- Turn drive pinion at least 5 turns in both directions.
- -> Insert universal mandrel and perform check measurement.
- If the shims have been correctly selected, the dial gauge should now show the value of "r" as marked on the crown wheel, reading anti-clockwise in the red scale, within a tolerance of ± 0.04 mm.



- -> Peen drive pinion nut by applying a punch through the oil drain hole.



- -> Renew O-ring -A- in cover.
- Install flange for propshaft and cover for final drive.
- Drive in flange shaft with drift 3176.
- Tighten 2 countersunk bolts -B- for cover to 25 Nm.

- Measure radial run-out at flange for propshaft and mark accordingly=>Page 192 .

19 - Adjusting crown wheel

19.1 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted
=> Page 256 .

Determining total shim thickness "Stotal" for shims "S1" + "S2"

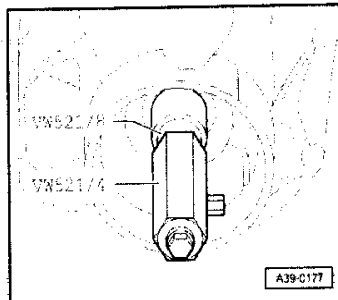
(Setting preload of taper roller bearing for differential)

- Drive pinion removed or crown wheel dismantled from differential housing
- Remove seal and left and right differential outer races for taper roller bearings and take out shims => Page 235 .
- Drive left outer race for taper roller bearing for differential (housing side) with shim "S2" into final drive housing => Page 235 . For measurement purposes an "S2*" shim 1.00 mm thick (2 shims, 1 of 0.80 mm and 1 of 0.20 mm).

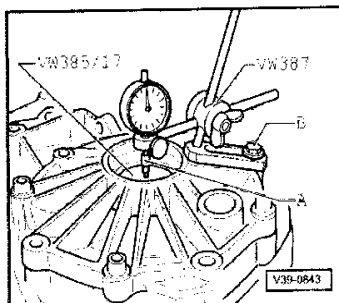
Note:

For measurement purposes a shim "S2" of 1.0 mm is initially inserted which will be designated "S2*" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".

- Drive outer race for right-hand taper roller bearing for differential (cover side) without shim in onto stop => Page 235 .

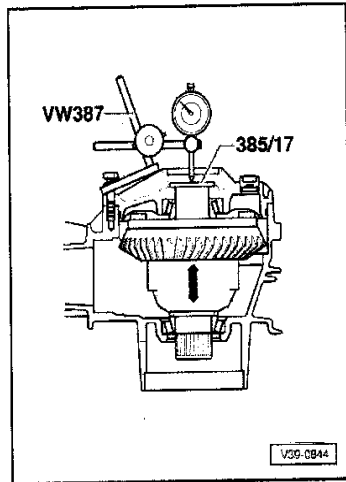


- Insert differential into housing. The crown wheel is positioned on the right side (cover side).
- Fit cover and tighten bolts to 25 Nm.
- -> Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upwards.
- Turn differential 5 turns in both directions to settle the taper roller bearing.



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- Place measuring plate VW 385/17 onto differential.
- -> Assemble measuring tools.
 - A - Dial gauge extension approx. 30 mm long
 - B - Hexagon bolt M8 x 45
- Set dial gauge extension onto centre of plate.
- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.



- -> Lift differential without turning; read off play on dial gauge and note.
- Measurement in following example: 0.50 mm

Note:

If the measurement has to be repeated, the differential must be turned five turns in each direction again so that the taper roller bearings settle.

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

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

Determining thickness of shim "S1"**

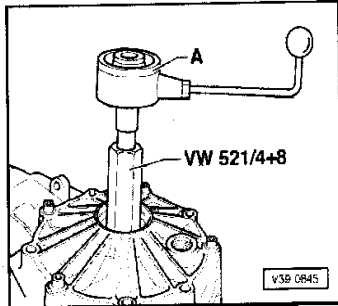
Notes:

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

Formula:
"S1" = "Stotal" - "S2**"**

Example:	
Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm
- Inserted shim(s) "S2"	1.00 mm
= Thickness of shim "S1"	0.80 mm

- Determine shim(s) from table => Page 268 .



Measuring frictional torque (check)

- Drive pinion removed
- Differential fitted with shims "S1" and "S2"
- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.
- Read off frictional torque.

Frictional torque specifications:

New bearings	Used bearings
250 ... 300 Ncm	30 ... 60 Ncm

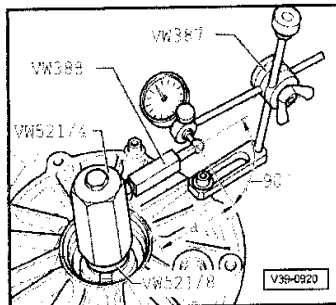
Note:

If the final drive set (drive pinion and crown wheel) is being re-adjusted, the adjustment of the drive pinion should be performed now, and the adjustment checked=>Page 257 .

Adjusting backlash

(Positioning crown wheel in final drive housing)

- Drive pinion with shim "S3" installed
- Differential with shims "S1" + "S2" installed
- Insert differential in final drive housing, install cover and tighten all bolts to 25 Nm.



- Turn differential 5 turns in both directions to settle the taper roller bearings.
- -> Assemble measuring equipment.
- Use dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension "a" = 60 mm.
- Determine play between the teeth flanks as follows:
 - Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
 - Set dial gauge to "0" with 1 mm preload.
- Turn crown wheel back until lying against an opposite tooth flank (backlash).
- Read off backlash and note value.
- Turn crown wheel through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the crown wheel or the final drive set itself is not correct. Check installation, replace final drive set if necessary.

Determining average backlash

Example:	
1st measurement	0.28 mm
+ 2nd measurement	0.30 mm
+ 3rd measurement	0.30 mm
+ 4th measurement	0.28 mm
= Sum of measured values	1.16 mm

- Result: The average backlash is $1.16 / 4 = 0.29$ mm

Determining thickness of shim "S2"

Formula:	
"S2"	= "S2*" - backlash + lift

Example:	
Inserted shim "S2*"	1.00 mm
- Average backlash	0.29 mm
+ Lift (constant)	0.15 mm
= Thickness of shim "S2"	0.86 mm

- Determine shim from table. Part numbers

=> Parts catalogue

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.15	0.60	1.50
0.20	0.65	1.65
0.25	0.80	
0.55	1.35	

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

Determining thickness of shim "S1"

Formula:	
"S1"	= "Stotal" - "S2"



Example:	
Total shim thickness "Stotal" for "S1" + "S2"	1.80 mm
- Thickness of shim "S2"	0.86 mm
= Thickness of shim "S1"	0.94 mm

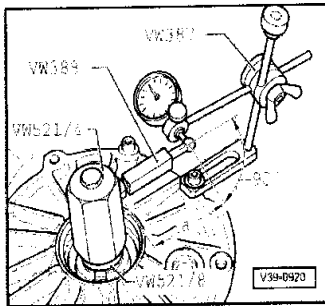
- Determine shim(s) from table. Part numbers

=> Parts catalogue

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.15	0.50	1.50
0.20	0.80	
0.25	1.00	

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



-> Performing check measurement

- Drive pinion with shim "S3" installed
- Differential with shims "S1" + "S2" installed
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specifications: 0.12 ... 0.22 mm

Notes:

- ♦ If the backlash lies outside the tolerances, the adjustments must be repeated, but the total shim thickness "Stotal" must remain unchanged.
- ♦ The individual measurements must not differ by more than 0.06 mm from each other.