Bearing housing, Torsen differential, end cover, internal selector mechanism, input shaft, drive pinion and hollow shaft, removing and installing (assembly sequence)

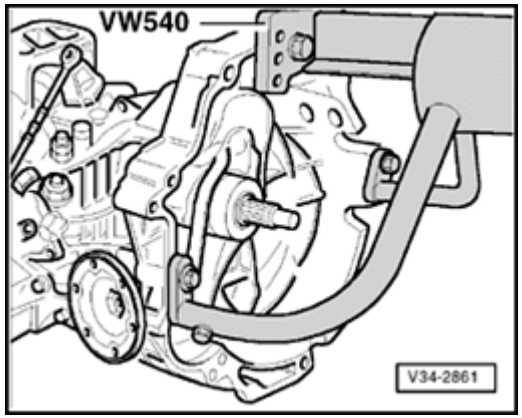
Special tools, testers and auxiliary items required:

- Engine and transmission support VW 540
- Drip tray V.A.G 1306
- Multi-purpose tool 771/1 with attachments 771/15, 771/37 and stud M8/ M10
- Two-arm puller e.g. Kukko 20/10 with 200 mm long hooks
- Mandrel 2064
- Clamping sleeve 3116
- Thrust piece 3118

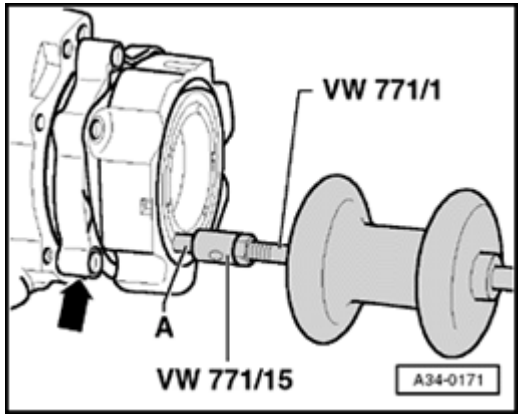
- Drift 3121
- Internal puller 3275
- Pressing tool 3276

- Thrust plate VW 402
- Press tool VW 407
- Press tool VW 412
- Tube VW 415a
- Thrust plate VW 447h
- Thrust pad VW 454
- Extractor lever VW 681
- Extension piece 30-23
- Drift sleeve 30-100
- Support bridge 30-211A
- Press tool 40-21
- Depth gauge

Removing

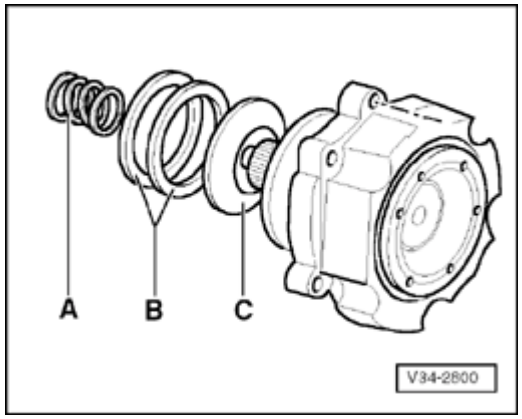


- Secure transmission on engine and transmission support VW 540.
- Place drip tray V.A.G 1306 underneath and drain transmission oil (2 oil drain plugs).
- Remove release bearing, clutch release lever and guide sleeve ⇒ Page 30-27 .



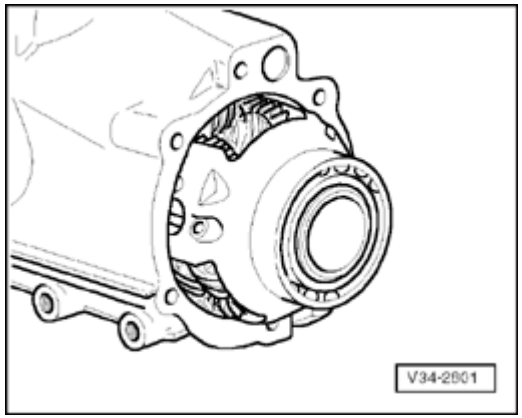
- Remove bearing housing (arrow) and pull off.

A - M8/M10 stud

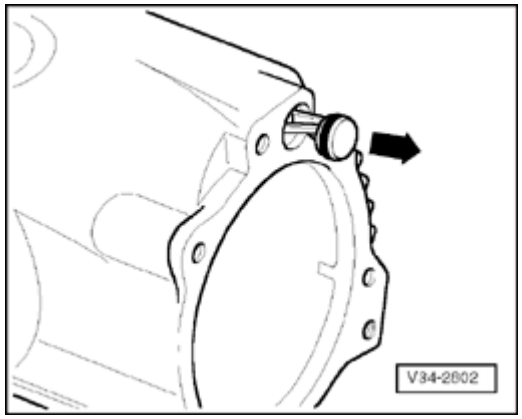


➢ When pulling off, bearing housing is pressed slightly off end cover by spring -A-.

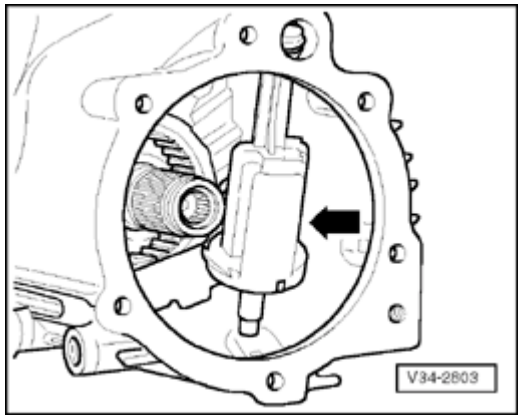
- Note position of spring plate -C- when removing bearing housing.
  - ♦ Outer diameter (concave side) towards shims
- Remove shims -B-, note thickness re-determine if necessary ⇒ Page 34-85 .



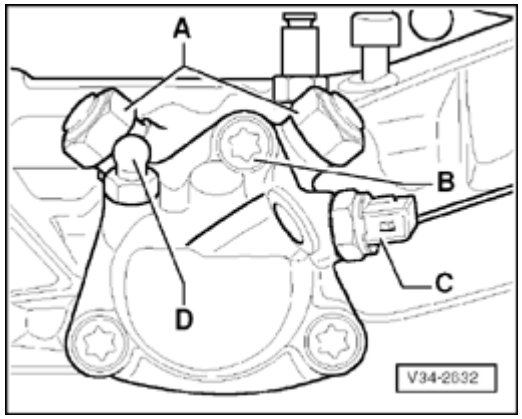
➢ - Pull Torsen differential out of end cover.



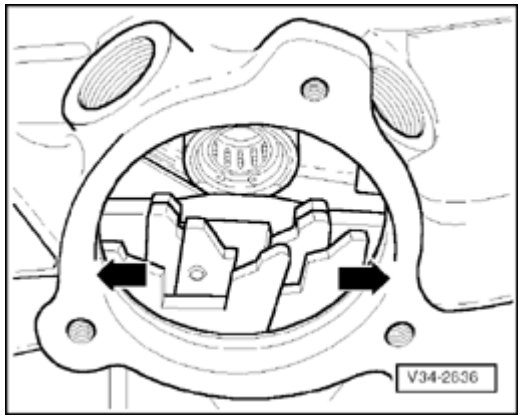
- Pull oil collector out of end cover (arrow) until it moves freely.



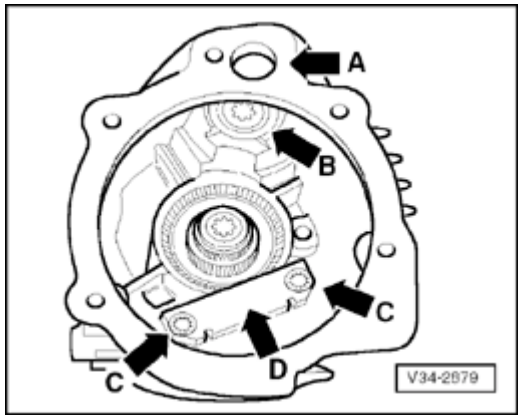
- Swing oil collector (arrow) down and guide out through hole in end cover.
- Remove oil collector.



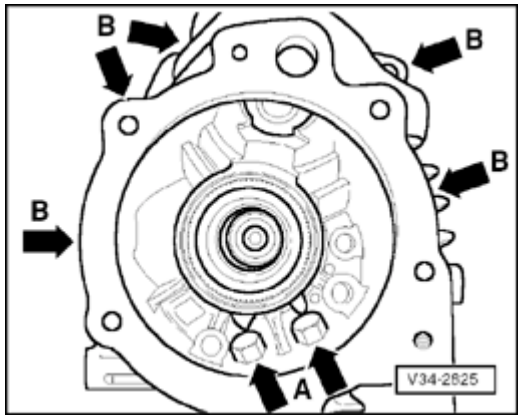
- Remove locking bolts -A- for selector shaft from transmission housing.
- Mark installation positions of aluminium bolts and steel bolts; do not interchange.
- Remove 3 bolts -B- for cover for selector shaft, take off cover.
- Pull out selector shaft.



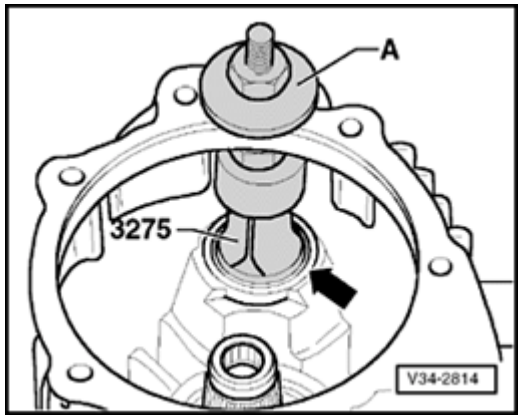
- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates (arrows).



- 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 transmission at supporting plate for needle bearings -arrow D-.
- Take out supporting plate.



- Remove 2 magnets (arrows -A-) and clean.
- Loosen 5 bolts (arrows -B-) for securing end cover for transmission and remove.



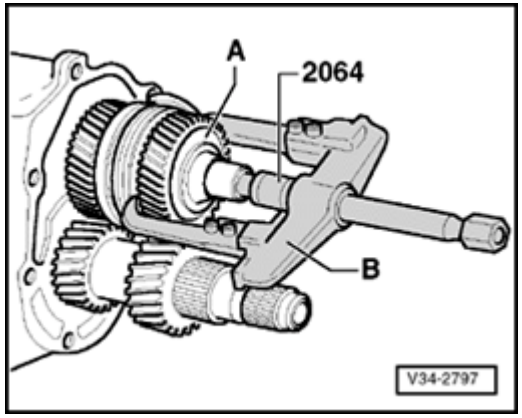
- Pull 2nd inner race for ball bearing for input shaft from input shaft.

A - Washer

Note:

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

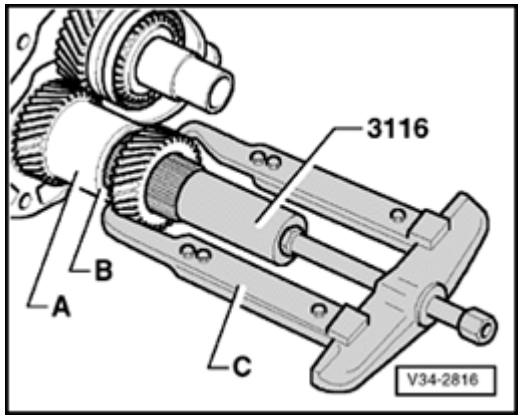
- Take off end cover together with end cover/bearing plate gasket.
- Pull dowel sleeves out of bearing plate.



- 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.



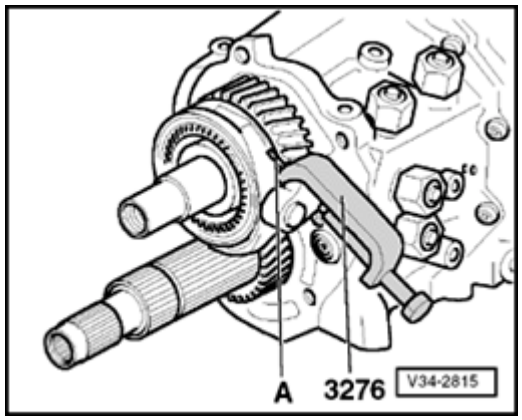
- Pull off 5th speed gear, to do this, block hollow shaft by engaging 2 gears ⇒ Page 34-59 .

Note:

Use only hex 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 34-78 .
- Take off spacer sleeve -A-.

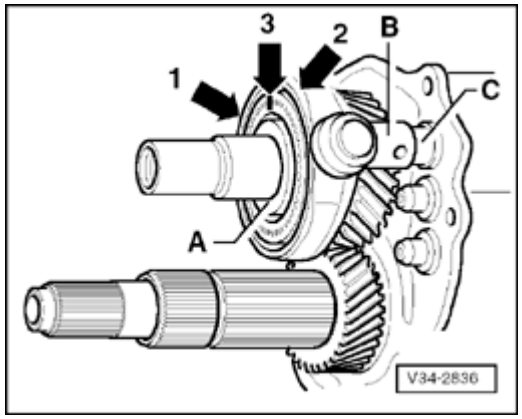


- Press out roll pin -A- for selector fork for 5th and 6th gear.

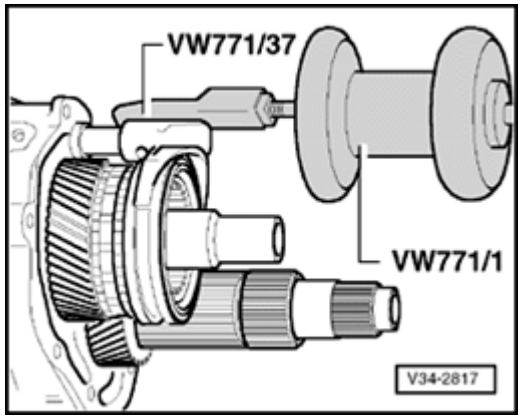
Note:

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

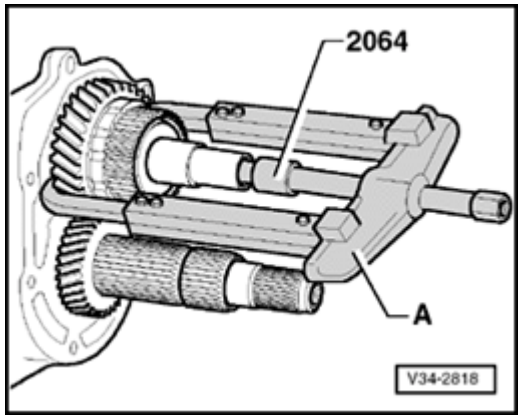
- Pull selector rod on follower together with selector fork for 5th and 6th gear and locking collar as far as possible away from bearing plate (until stop is felt).



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

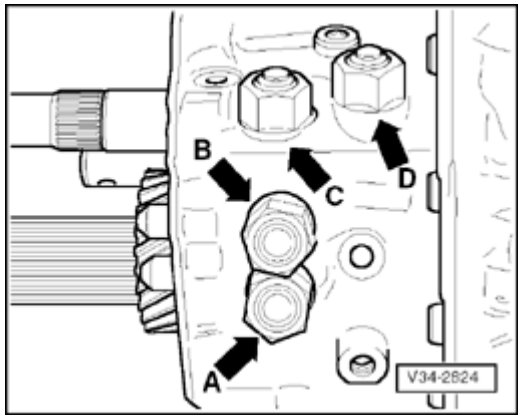


- Pull follower together with selector fork and locking collar off selector rod.



- 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

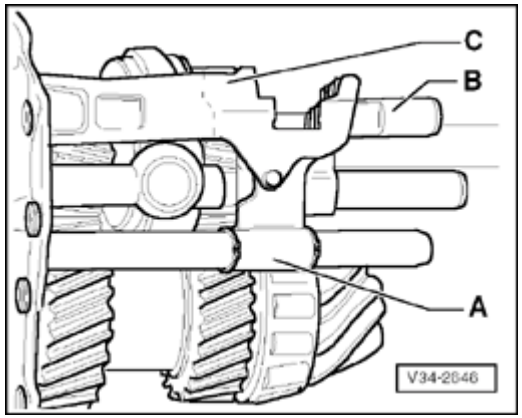
B - 3rd and 4th gear

C - 5th and 6th gear

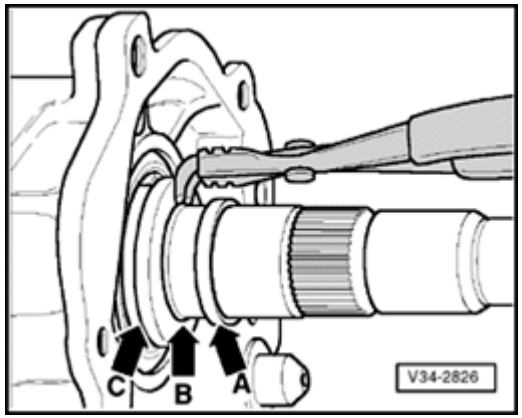
D - Reverse gear

- 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 transmission housing.
- Secure drive pinion relative to hollow shaft e.g. hose tie, to prevent it falling out.

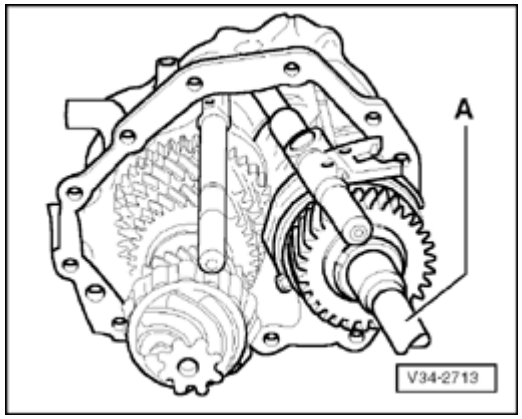
- Separate bearing plate with input shaft, with drive pinion and hollow shaft and with inner selector mechanism from transmission housing.



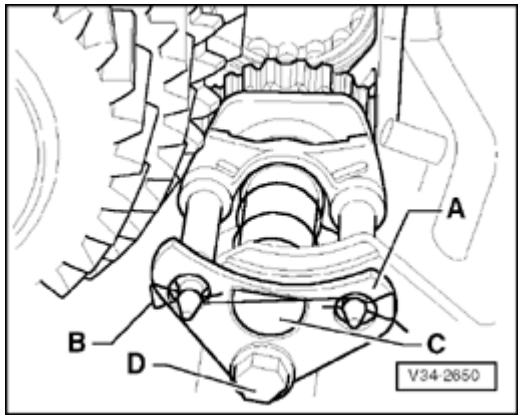
- Remove circlip from selector rod for 1st and 2nd gear and take off follower -A-.
- Pull out selector rod -B- for 5th and 6th gear.
- Remove follower -C- for reverse gear.



- 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.



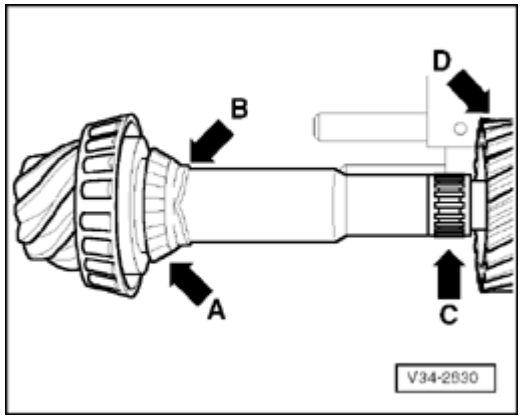
- Unscrew hex bolt -D-, take off spring clasp -B- and retaining plate -A-, pull out shaft -C- for reverse idler gear.
- Take out spring, synchro-ring and reverse idler gear.
- Take off relay lever for reverse gear.

Removing and installing reverse gear ⇒ Page 34-114 .

Note:

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

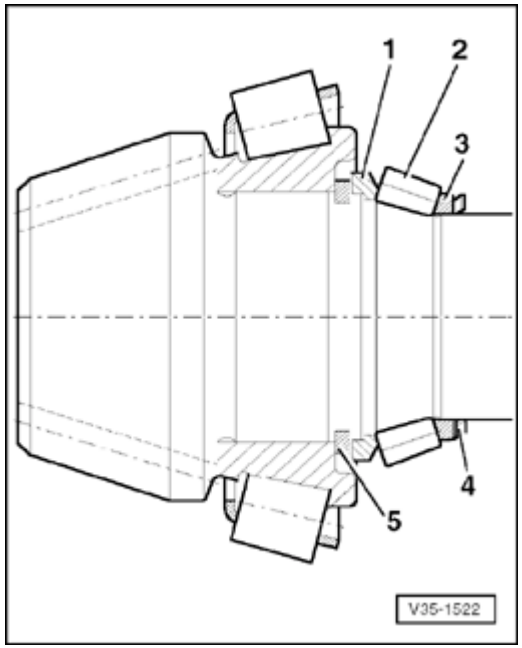
- Remove drive pinion circlip.



- Pull drive pinion out of hollow shaft -D-, when doing this catch tapered 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:

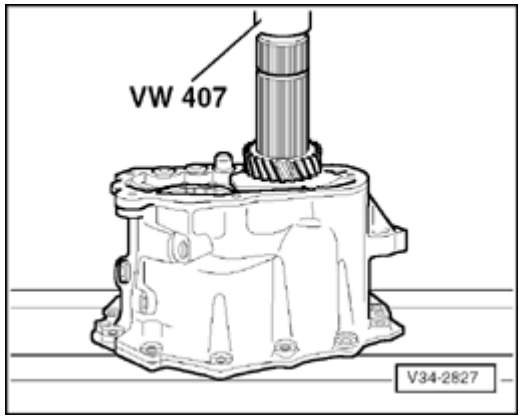
1 - Flange ring (tapered contact surface to tapered rollers)

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.

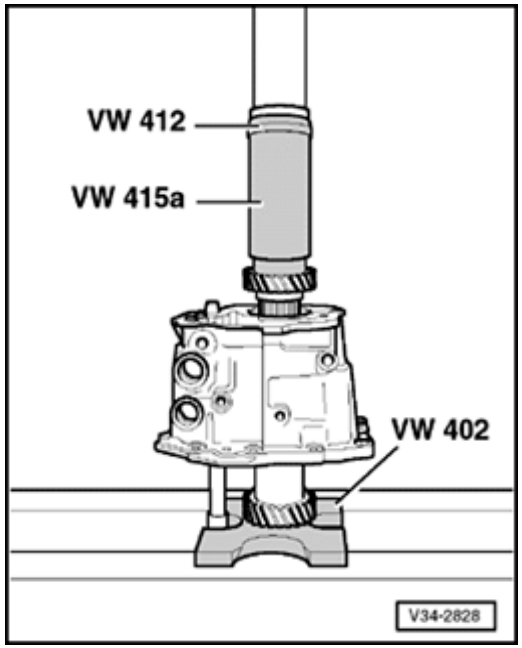
Note:

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 bearing plate.

Installing

- Fit hollow shaft with selector fork and selector rod for 1st and 2nd gear (without follower) into bearing plate.

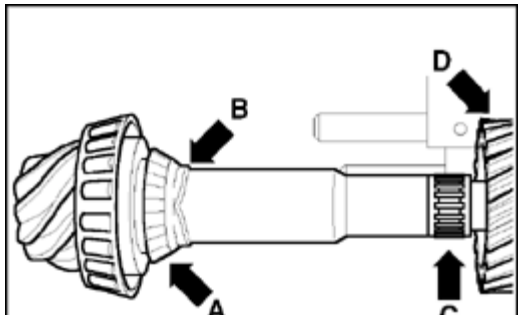


- Heat 6th gear to approx. 120 ° C and fit on.

  Installation position: shoulder towards tapered roller bearing

- Press onto stop; ensure there is no play.
- Grease drive pinion/hollow shaft tapered roller bearing with multi-purpose grease before inserting.

  Allocation ⇒ Page 34-68



A - Flange ring, tapered rollers (Qty. 23), and support ring

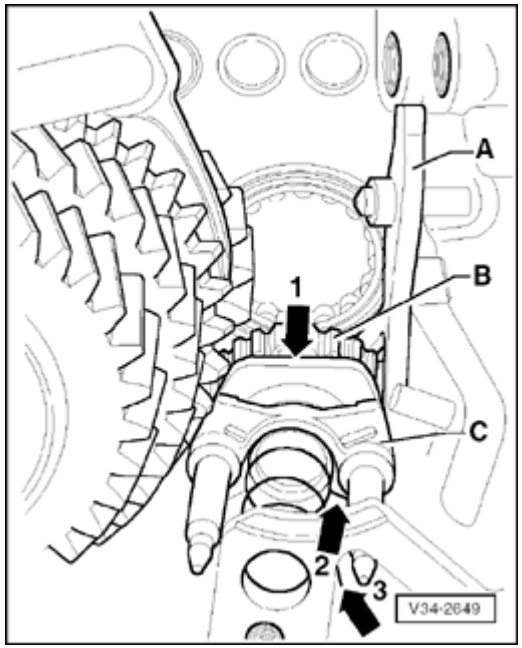
B - Corrugated spring

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.

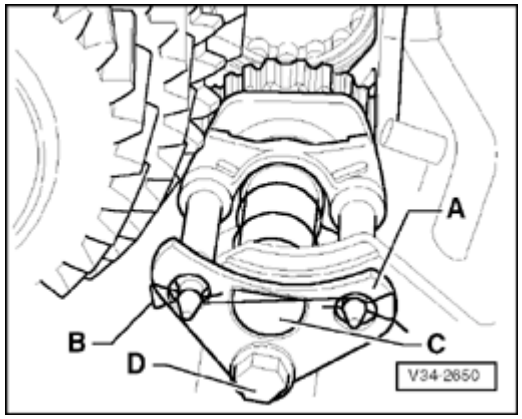


- Fit relay lever -A- for reverse gear onto bolt for relay lever. Watch position of pin when doing this (limits relay lever travel to synchro-ring).
- Insert sliding gear -B- and engage relay lever with groove on sliding gear.
- Insert synchro-ring -C-.

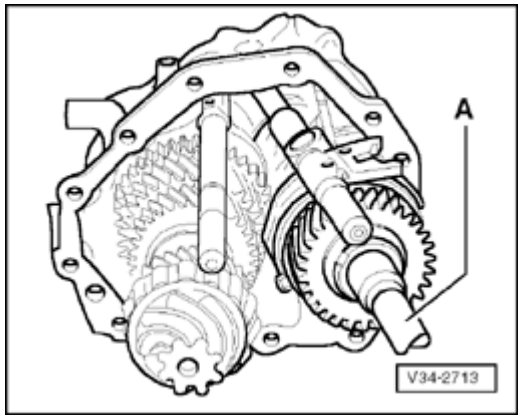
  Installation position: position flat on circumference of synchro-ring towards input shaft (not as yet fitted) (arrow -1-)

- Insert spring.

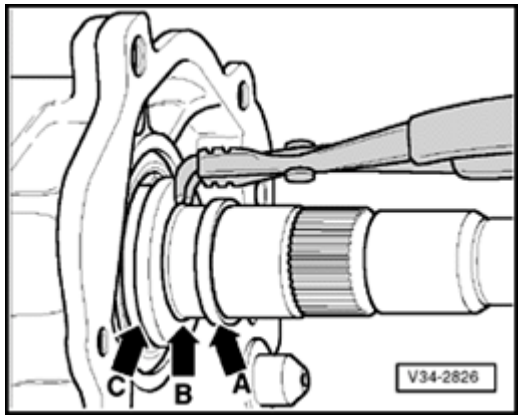
  Installation position: hook single angled end into recess on synchro-ring (arrow -2-). Turn double angled end anti-clockwise and hook into opening in bearing plate (arrow -3-)



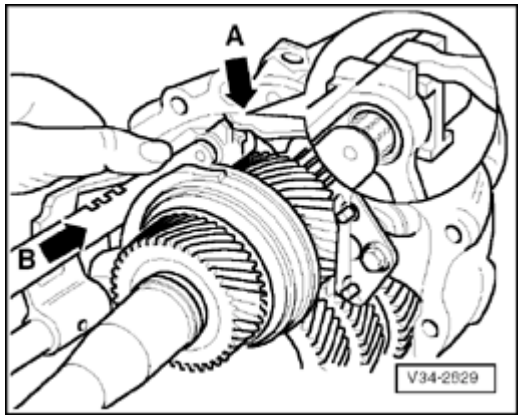
- Insert shaft -C-.
- Fit retaining plate -A-.
  - Installation position: chamfers of holes for locking pins of the synchro-ring face bearing plate
- Insert spring clasp -B- into locking pins of the synchro-ring.
- Replace self-locking nut -D- and tighten to 25 Nm.



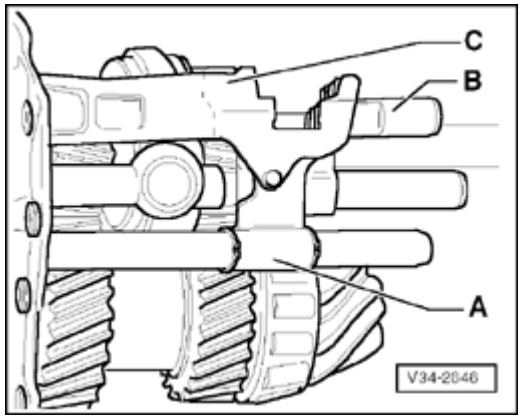
- Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into bearing plate.
  - Selector fork installation position: rib towards follower ⇒ Page 34-52



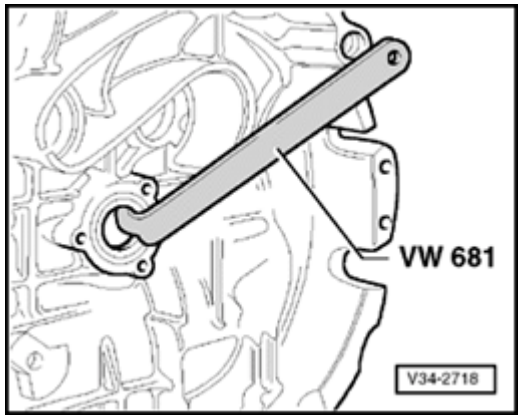
- Slide inner race (arrow -C-) for cylinder roller bearing onto main shaft at flange for end cover (clearance fit).
- Fit circlip (arrow -B-) using right-angled circlip pliers.



- 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 transmission housing and bearing flange as well as selector rods with gear oil.



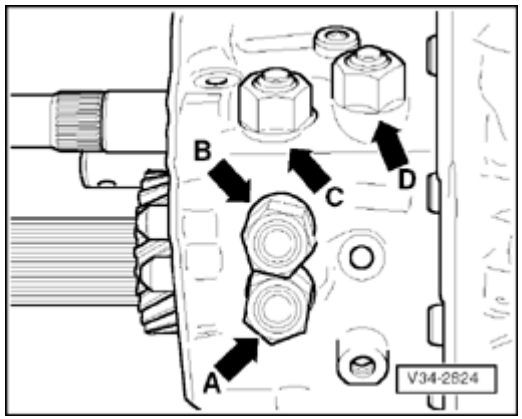
- Pry used seal for input shaft carefully out of transmission housing with VW 681.
- Coat sealing surfaces between bearing plate and transmission housing with sealing paste AMV 188 000 02 or AMV 188 001 02 sealing paste.
- Insert complete bearing plate into transmission housing.

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/transmission housing.

- Tighten 12 bolts using diagonal sequence to 25 Nm.



- Screw in locking bolts for selector rods.

A - 1st and 2nd gear

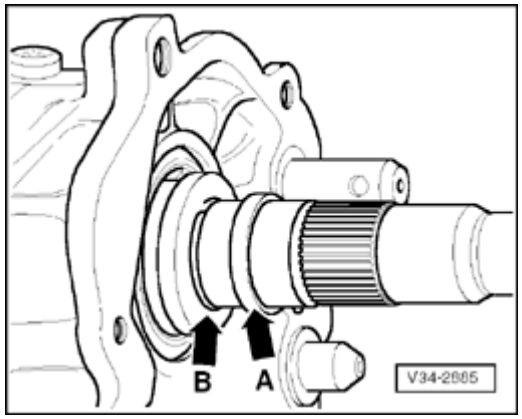
B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

Note:

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

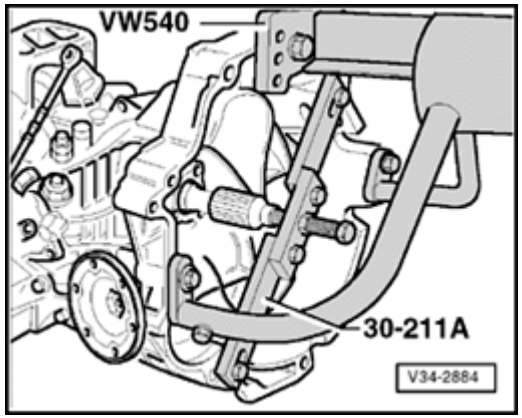


- Fit thrust washer (arrow -A-) for needle bearing for 6th speed gear.

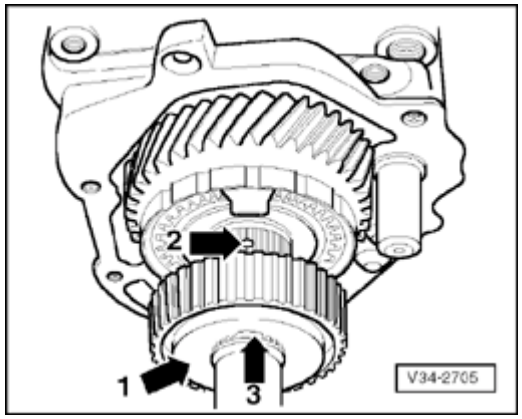
  Installation position: shoulder towards circlip (arrow -B-), smooth contact surface to shaft end

- 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

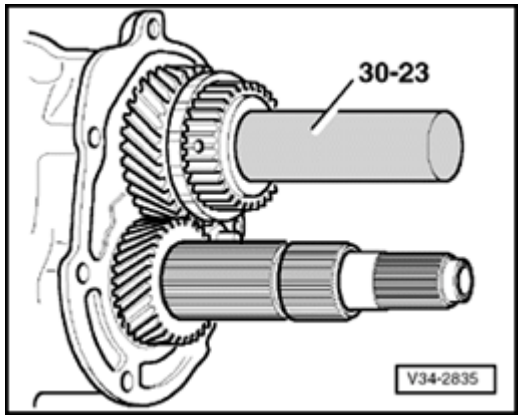


- Support input shaft with support bridge 30-211 A.



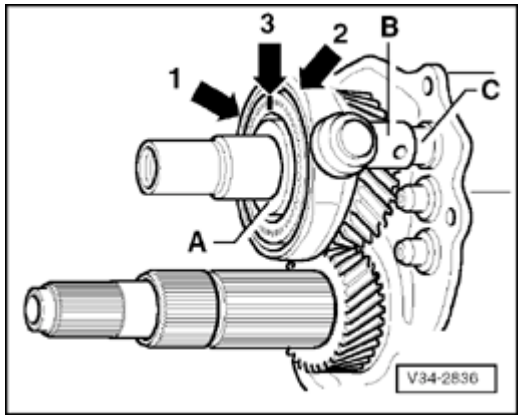
➢ Installation position of synchro-hub for 5th and 6th gear:

- 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



➢

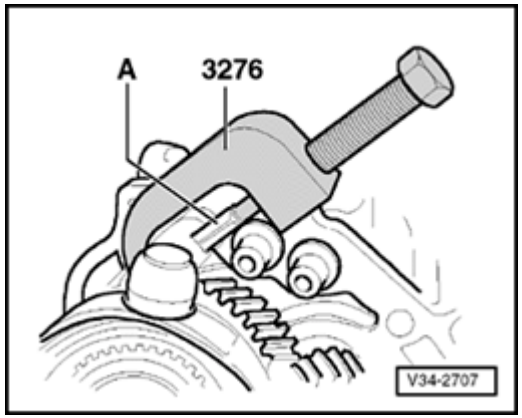
- Heat synchro-hub for 5th and 6th gear to approx. 100 ° C, fit and drive on; ensure there is no play.
- Check 6th speed sliding gear for axial play.



- 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.

Note:

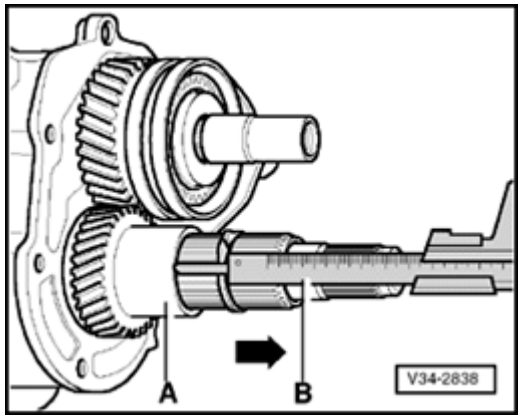
- *Selector fork rib (arrow -2-) must face towards shaft end.*
- *When sliding follower onto selector rod for 5th and 6th gear remember holes for roll pin.*



- Press in roll pin -A- flush.

Note:

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



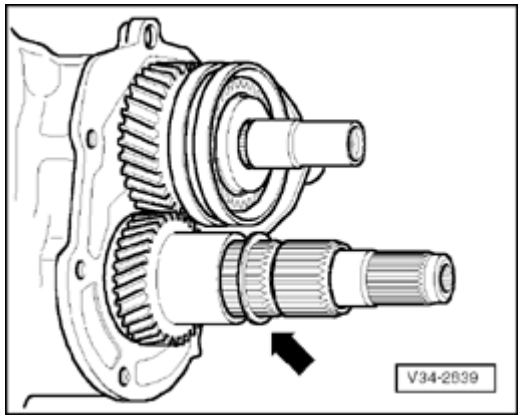
Re-determining shim for 5th speed gear:

- 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.

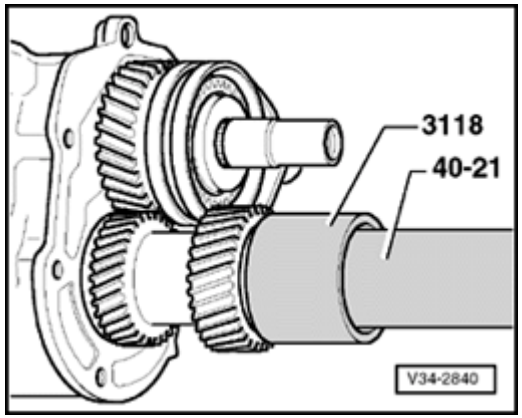
⇒ *Parts catalog*

The following shims are available:

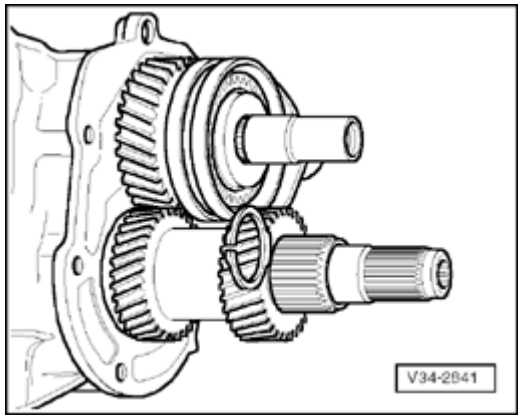
Measured range (mm)	Shim thickness (mm)
31.01-31.11	1.05
31.11-31.21	1.15
31.21-31.31	1.25
31.31-31.41	1.35



- 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 toward spacer sleeve



➢ Re-determining circlip for 5th speed gear:

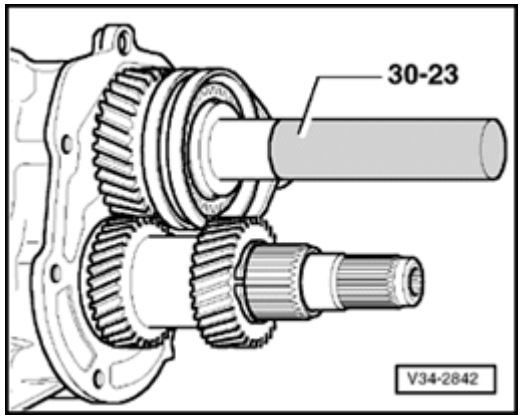
- Determine thickest circlip that can still just be fitted.
- Determine circlip from table.

⇒ *Parts catalog*

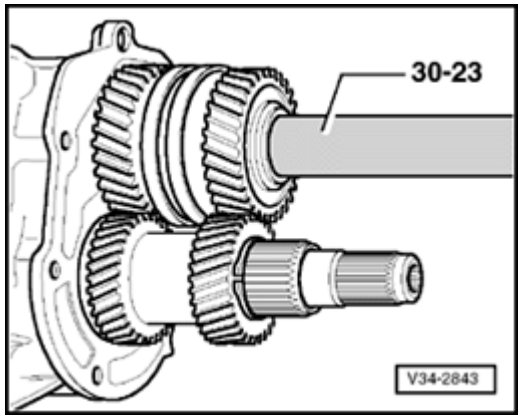
The following circlips are available:

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.

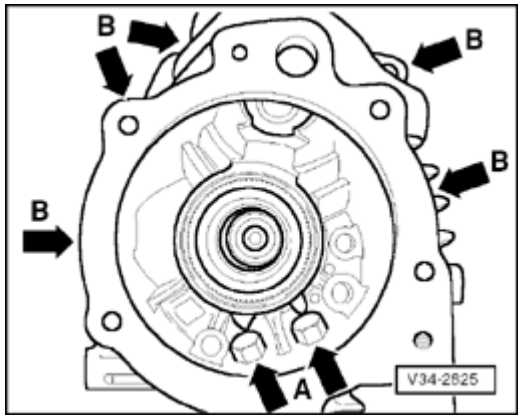


- Drive on inner race for 5th speed sliding gear free of axial play.
- Oil needle bearing with gear oil and fit.
- Place synchro-ring for 5th gear in locking collar.
- Slide on 5th speed sliding gear with spring.



- 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.

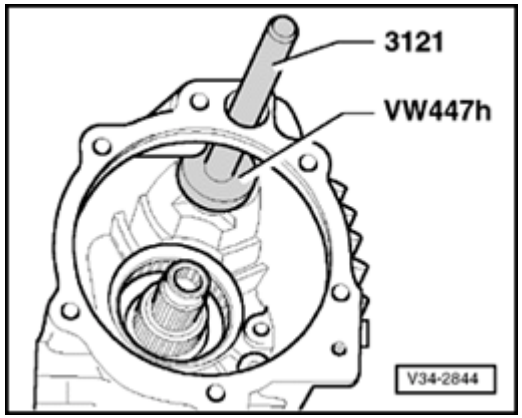


- Fit end cover and insert securing bolts (arrows -B-).

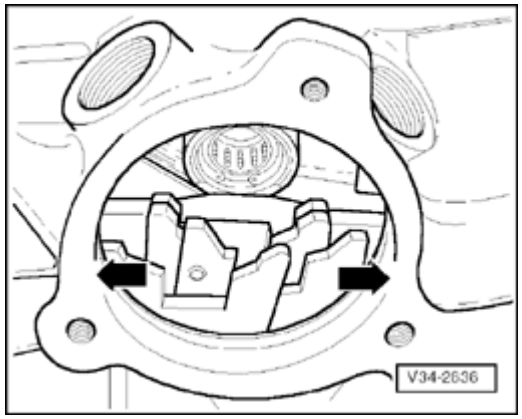
Note:

Do not tighten bolts.

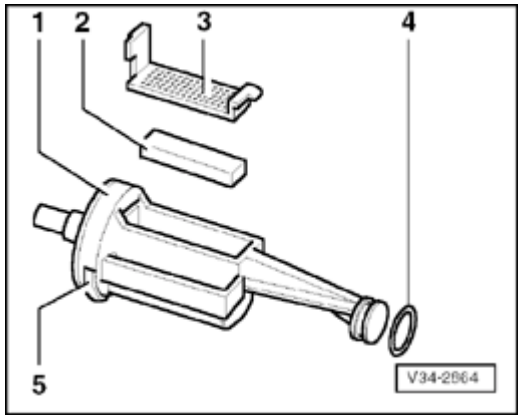
- Clean two magnets (arrows -A-) and insert.
- Fit support plate and tighten hand tight.
  - ♦ Installation position: Lugs towards magnets
- Tighten bolts for end cover using diagonal sequence.



- 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.

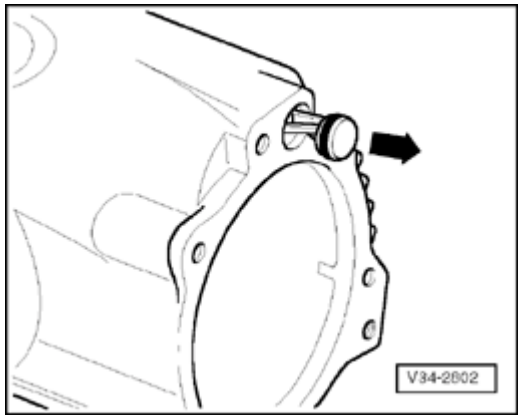


- Unclip cover -3- for oil collector from oil collector -1- at longer end with a screwdriver and remove magnet -2-.

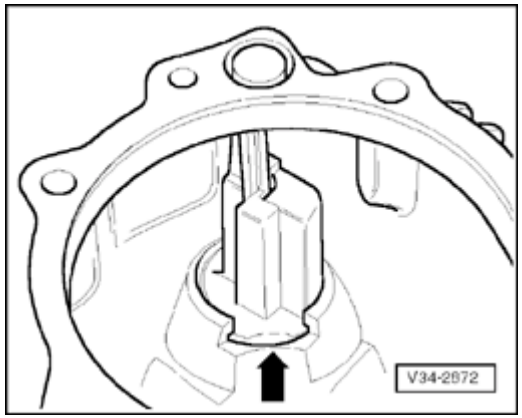
4 - O-ring

5 - Positioning segment

- Clean oil collector.
- Assemble oil collector.



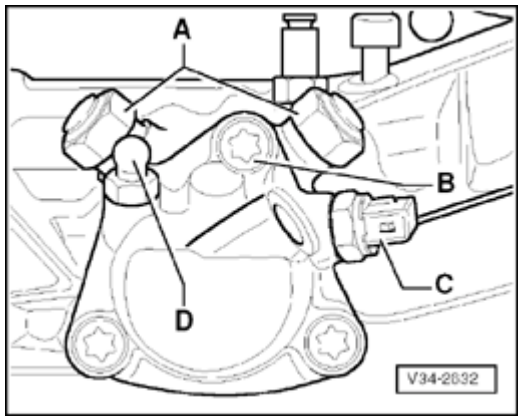
- Guide oil collector from interior of end cover with support arm leading through hole of end cover (arrow), until O-ring can be fitted from outside onto oil collector.
- Lightly oil new O-ring and fit.
- Insert oil tube of oil collector into input shaft.



- 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.

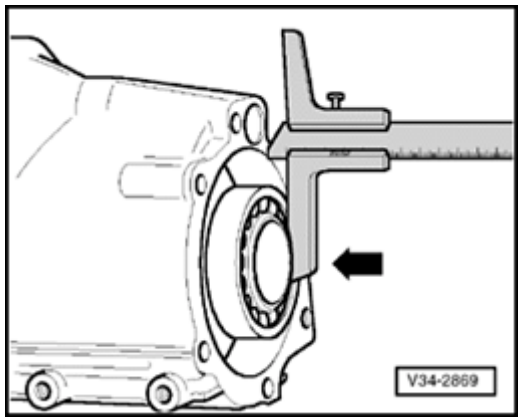
  Selector gates must align.

- Install complete selector shaft.



- Screw locking bolts -A- for selector shaft into transmission housing.
- Aluminium and steel bolts must not be interchanged when installing.

  Tightening torques: for aluminium locking bolts = 50 Nm, and for steel locking bolts = 70 Nm.
- Lightly oil new O-ring for cover for selector shaft and fit.
- Fit cover for selector shaft.
- Apply sealing paste AMV 188 000 02 to bolts -B- (Qty. 3) before installing and tighten.
- Slide Torsen differential onto splines of hollow shaft.



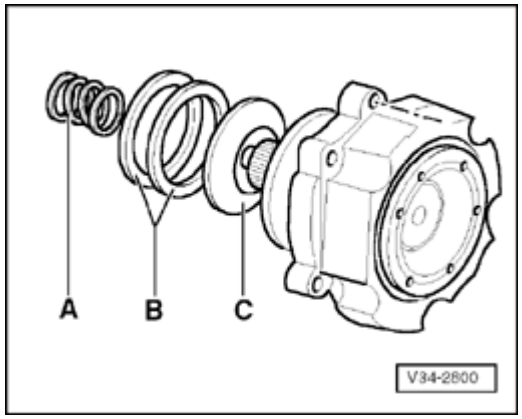
- Press Torsen differential in direction of arrow, and measure distance between top edge of bolted end cover and front edge of outer race of ball bearing for Torsen differential.
- Determine required shim(s) from following table.

⇒ *Parts catalog*

The following shims are available:

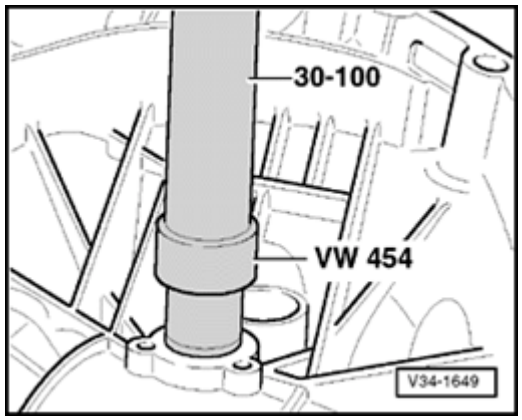
Measured range mm	Qty.	Shim thickness (mm)
7.05-7.30	1	1.65
	1	1.45
	1	1.20
7.30-7.55	1	1.65
	1	1.45
	1	0.95
7.55-7.80	1	1.65
	1	1.45
	1	0.70
7.80-8.05	1	1.65
	1	1.45
	1	0.45
8.05-8.25	2	1.65
8.25-8.50	1	1.65
	1	1.45

8.50-8.75	1 1	1.65 1.20
8.75-9.00	1 1	1.65 0.95
9.00-9.25	1 1	1.65 0.70
9.25-9.50	1 1	1.65 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 drive flange.
- 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 new seal for drive axle between sealing lip and dust lip with sealing grease G52 128 A1.
- Pull a thin protective hose tightly onto splines of input shaft.



- Drive on seal for input shaft.
  - Pressing-in depth (factory): 3.5 mm
  - Pressing in depth (repairs): 4.5 mm

- Remove protective hose.

- Install release bearing, clutch release lever and guide sleeve ⇒ from Page 30-27 .

- Check that transmission can be shifted through all gears.

- Fit connecting rod.

- Check oil level in transmission ⇒ Page 34-39 .