Workshop Manual

Audi A6 1998 ➢
Audi A8 1994 ➢

Servicing automatic gearbox 01L, four-wheel drive

Edition 09.2010

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

00 - Technical data

32 - Torque converter

37 - Controls, housing

38 - Gears, control

39 - Final drive - front differential

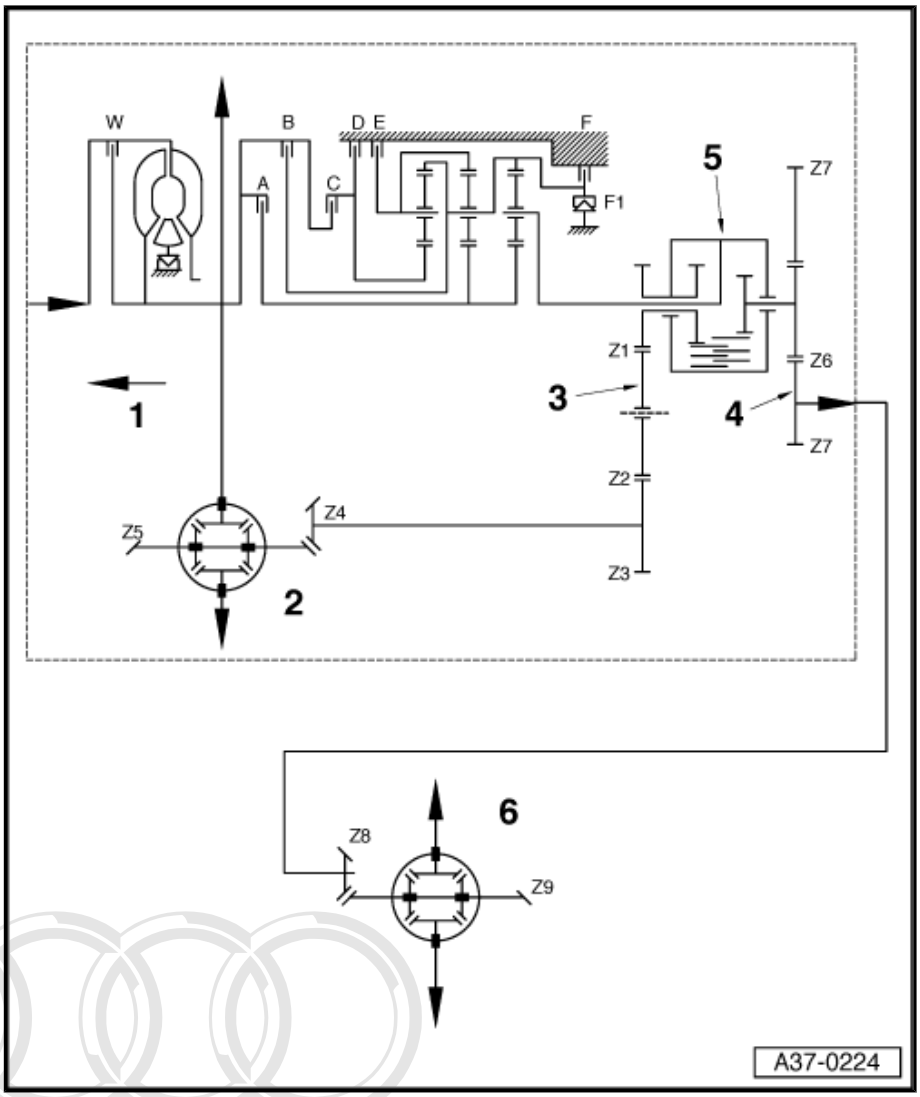
Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of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

Contents

00 – Technical data

1 Transmission layout

Gearbox diagram



A - Clutch A

B - Clutch B

C - Clutch C

D - Clutch D

E - Clutch E

F - Clutch F

F1 - Freewheel 1

W - Torque converter clutch

1 - Direction of travel

2 - Front differential

- ❑ Z4, Z5 = Front final drive gear set

3 - Output shaft for front axle

- ❑ Z1, Z2 and Z3 = Spur gears (intermediate drive for front axle)

4 - Input shaft for rear axle

- ❑ Z6, Z7 = Spur gears (intermediate drive for rear axle)

5 - Self-locking centre differential

6 - Rear differential

- ❑ Z8, Z9 = Rear final drive gear set

Actuation of selector elements

- ♦ In the event of malfunctions or poor acceleration and performance, the following table shows which selector elements are operated in the individual gears. It is thus possible to establish which selector elements are not functioning correctly.
- ♦ Unless otherwise stated, the actuation of the clutches and solenoid valves in the various selector lever positions corresponds to the actuation for the drive position D.

Gear		Solenoid valves		Clutches	
Item	Gear position	Solenoid valves	Pressure regulating valves	Clutch	Freewheel

Gear	Solenoid valves								Clutches						
	- N88 -	- N89 -	- N90 -	- N215-	- N216-	- N217-	- N218-	- N233-	A	B	C	D	E	F	1st gear
R = Reverse gear	–	x	–	x	x –	x	–	x –	–	–	x	–	–	x	–
N = Neutral	x	–	x	x	– x	x	–	– x	–	–	–	–	–	x	–
D = 1st gear	x	–	–	x	x –	x	–	x –	x	–	–	–	–	–	x
D = 2nd gear	x	x	–	x	–	x	– (x)–	x	x	–	–	–	x	–	–
D = 3rd gear	–	x	–	x	x	x	– (x)–	–	x	–	–	x	–	–	–
D = 4th gear	–	x	–	x	–	–	–x–	–	x	x	–	–	–	–	–
D = 5th gear	–	–	–	x	x	–	–x–	–	–	x	–	x	–	–	–
2 = 1st gear	x	–	–	x	x	x	–	x	x	–	–	–	–	x	x
D = 5th to 4th gear	–	x	–	x	–	x	–	–	(x)	x	–	(x)	–	–	–
W= Torque converter clutch	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–

„x“ = Component is actuated

„–“ = Component is not actuated

„(x)“ = Component is actuated according to driving situation (overlap)

2 Repair instructions

2.1 General repair instructions

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

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

Gearbox

- Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .
- If gearbox has been removed from vehicle, secure torque converter to prevent it from falling out.
- Thoroughly clean all joints and connections and the surrounding areas before dismantling.
- Place removed parts on a clean surface and cover them over. Use sheeting and paper. Use lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components: do not remove replacement parts from packaging until just before installation.
- Clean ATF pipes and ATF cooler after performing repairs on the gearbox and renew ATF strainer.

O-rings, oil seals, gaskets

- Always renew O-rings, oil 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.
- The open side of the oil seals faces toward the side with fluid filling.
- Lightly lubricate the outer circumference and sealing lip of seals with ATF before installing.
- Lightly lubricate O-rings with ATF before installation to prevent them getting crushed during assembly.
- Use only ATF or vaseline on all parts running in ATF. Other lubricants will cause malfunction of the gearbox hydraulics.
- When installing a new oil seal, position the seal in the housing so that the sealing lip does not contact the shaft in the same place as the old seal (make use of installation depth tolerances).
- Renew paper gaskets, clean all sealing surfaces thoroughly and remove previous gaskets completely.

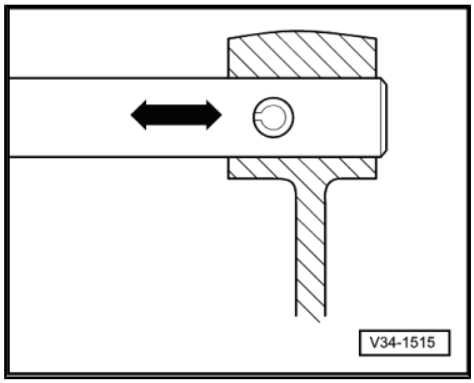
Nuts, bolts

- Slacken bolts in reverse sequence to the specified tightening sequence.
- Nuts and bolts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.

- The tightening torques stated apply to non-oiled nuts and bolts.
- Always renew self-locking bolts and nuts.

Locking elements

- Do not over-stretch circlips.
- Always renew circlips which have been damaged or over-stretched.
- Circlips must be properly seated in the base of the groove.
- Renew spring pins. Installation position: slot must be in line with direction of force.



Bearings

- Lightly lubricate bearings with ATF before inserting.
- Fit bearings and shims loosely with vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

ATF/oil pipes

- The removed oil pipes must always be renewed.
- The oil pipes must be renewed if the gearbox is very dirty.

2.2 Special tools

Special tools

List of special tools used in this Workshop Manual ⇒ "Workshop equipment and special tools"

Special tools and workshop equipment required

- Support plate -VW 309-
- Measuring bridge -VW 382/7- from measuring tool -VW 382-
- Universal dial gauge bracket -VW 387-
- Thrust plate -VW 401-
- Thrust plate -VW 402-
- Shackle -10-222 A/12-
- Hook and support tool -3311-
- Used oil collection and extraction unit -V.A.G 1782-
- Dial gauge -VAS 6080-
- Digital depth gauge -VAS 6087-
- Engine and gearbox support -VAS 6095-
- Workshop hoist -VAS 6100-
- Dial gauge extension -T10170/1-
- Puller for ATF supply unit -T10270-
- Extractor tool -T10271-
- Lifting device -T10272-
- Guide pin M8 -T10273-
- Drive-in tool -T10274-
- Drive-in tool -T10275-
- Mounting bracket -T10276-

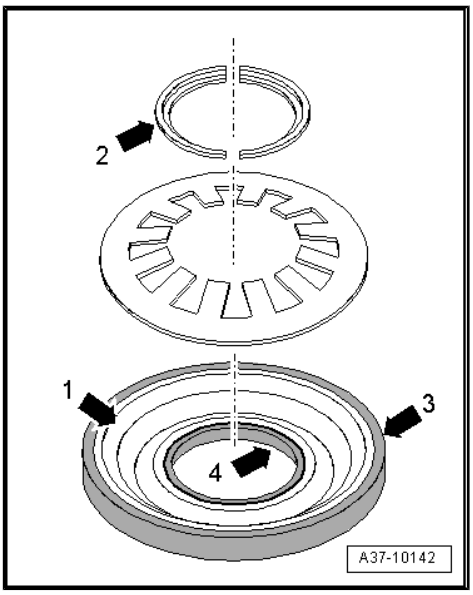
- Mounting bracket -T10277-
- Mounting bracket -T10278-
- Plate -T10279-
- Plate -T10280-
- Plate -T10281-
- Support element -T10282-
- Support element -T10283-
- Torque converter adapter -T10284-
- Compressor tool -T10285-
- Guide pins M6 -T10288/4-
- Internal puller -Kukko 21/6-
- Counter-support -Kukko 22/2-
- Commercially available torque wrench with scale 3 … 23 Nm.
- Torx bit, size 45 (with hole)
- Safety goggles

3 Rules for cleanliness when working on the automatic gearbox

- Thoroughly clean all joints and connections and the surrounding areas before dismantling.
- Use cleaning fluid -D 009 401 04- to clean the gearbox and its components.
- Use lint-free cloths (commercially available) for cleaning.
- Seal off open lines and connections immediately with clean plugs or sealing caps from engine bung set -VAS 6122- immediately.
- Place removed parts on a clean surface and cover them over. Use sheeting and paper. Use lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components: do not remove replacement parts from packaging until just before installation.
- Use only ATF for parts running in ATF. Other lubricants will cause malfunction of the gearbox hydraulics.
- The ATF cooler and ATF pipes must be cleaned before the gearbox is installed in the vehicle ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 . The ATF cooling system must be flushed out with ATF if the ATF is very dirty. For this purpose use the hand pump for gear oil -VAS 6617- or similar.
- After installing the gearbox in the vehicle check the following fluid levels and top up if necessary: ATF in planetary gearbox ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 , gear oil in front final drive ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 , gear oil in transfer box ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 . Capacities and specifications ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 00 .

4 Common faults

4.1 No power transmission in reverse gear



♦ Fault:

Clutch piston „F“ deformed -arrow 1-, sealing lips damaged -arrow 3- and -arrow 4-, retaining rings deformed -arrow 2-

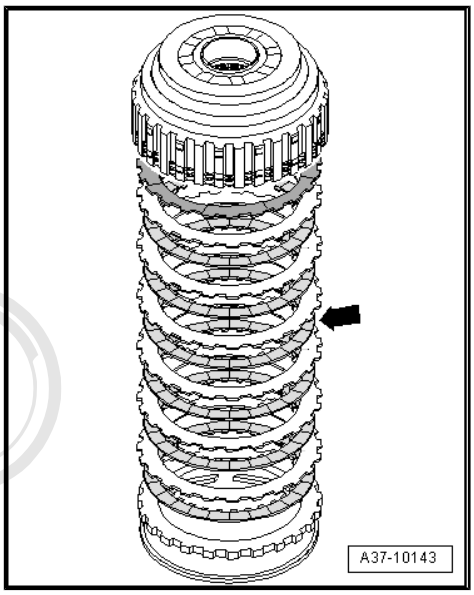
♦ Cause of fault:

Main pressure valve in valve body is worn, leading to excessive pressure on piston „F“, piston „F“ is thus deformed, sealing lips on piston „F“ are damaged and the split retaining ring is bent.

♦ Fault rectification:

– Dismantle complete gearbox and clean all parts, renew ATF pipes.
– Clean ATF pipes and ATF cooler.
– Dismantle and check all clutches.
– Check friction lining of torque converter clutch ⇒ page 11 .
– If ATF is suspected to be very dirty ⇒ page 157 , renew torque converter (cannot be cleaned).
– Renew valve body.
– Check cylinder „F“ for scoring, eliminate scoring or renew cylinder „F“ if necessary.
– Renew ATF strainer.

4.2 Gearshift jolts, power transmission problems in 4th and 5th gear



♦ Fault:

Clutch plates „B“ -arrow- burnt out

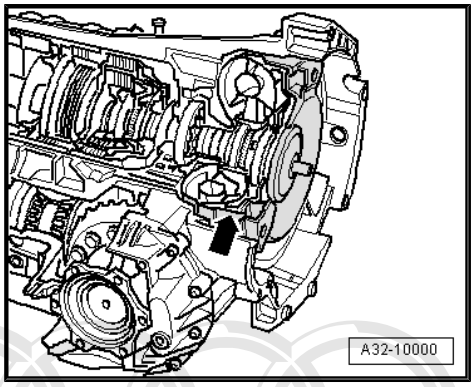
♦ Cause of fault:

Torque converter clutch worn or defective

♦ Fault rectification:

– Dismantle complete gearbox and clean all parts, renew ATF pipes.
– Clean ATF pipes and ATF cooler.
– Dismantle and check all clutches.
– Check friction lining of torque converter clutch ⇒ page 11 .
– If ATF is suspected to be very dirty ⇒ page 157 , renew torque converter (cannot be cleaned).
– Renew clutch plates „B“.
– Renew overheated cylinder „B“ (visible by blue discolouring).
– Check clutch „A“, renew clutch „A“ if necessary.
– Renew ATF strainer.

4.3 Power transmission problems in 4th and 5th gear, ATF pump noisy



♦ Fault:

Friction lining of torque converter clutch -arrow- worn.

At an advanced stage: particles of friction lining enter ATF pump, causing noise when in neutral

♦ Cause of fault:

Friction lining of torque converter clutch comes loose or is worn

♦ Fault rectification:

– Dismantle complete gearbox and clean all parts, renew ATF pipes.

– Dismantle and check all clutches.

– Dismantle ATF pump and check.

– Check friction lining of torque converter clutch ⇒ page 11 , renew torque converter if necessary ⇒ page 13 .

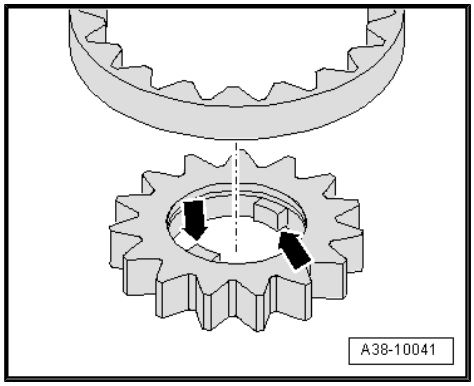
Note

It is advisable to renew the torque converter when servicing a gearbox with very high mileage (wear of torque converter clutch).

– If torque converter is suspected to be very dirty: Renew valve body (cannot be cleaned).

– Renew ATF strainer.

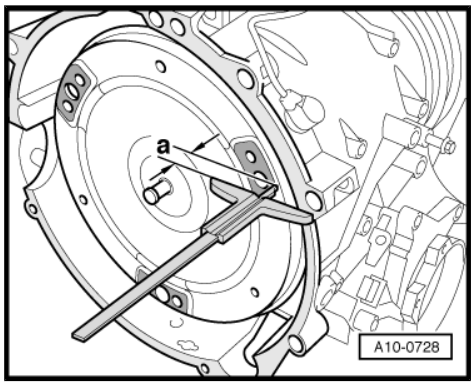
4.4 No power transmitted in any gear



♦ Fault:

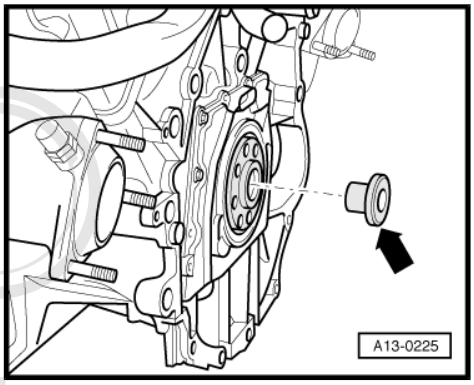
Drive lugs -arrows- on ATF pump gear broken off

♦ Cause of fault:



A - Installation incorrect: torque converter not inserted properly when installing gearbox or engine. Check installation depth ⇒ page 13 .

B - Installation incomplete: torque converter centring sleeve -arrow- not inserted in crankshaft ⇒ Engine, mechanics; Rep. gr. 13



♦ Fault rectification:

– Dismantle ATF pump and check; remove broken-off drive lugs.

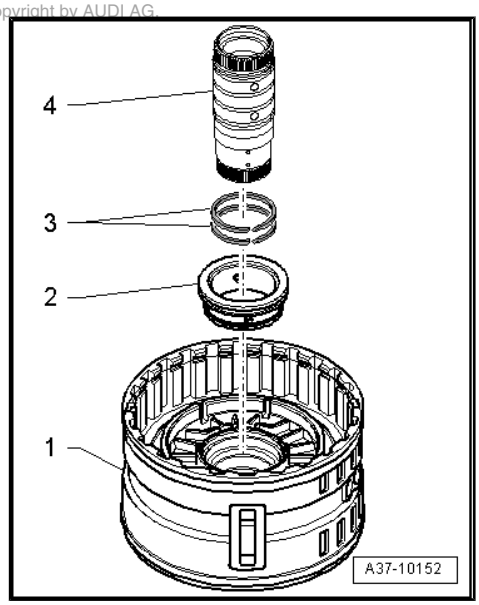
Caution

Make sure that broken-off drive lugs are found and removed.

4.5 Power transmission delay (approx. 5 … 6 seconds) after engaging reverse gear

♦ Fault:

Radial wear of rectangular section seals -3- on sun shaft.



♦ Cause of fault:

Excessive roughness on internal contact surface of bearing bush -2- in cylinder „D/E“ -item 1-.

♦ Fault rectification:

– Check internal surface of bearing bush for roughness and renew bearing bush if necessary; renew rectangular section seals.

32 – Torque converter

1 Exploded view - torque converter

Caution

Before installing gearbox check position of torque converter ⇒ page 13 .

Note

- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *General repair instructions ⇒ page 3 .*

1 - Torque converter

- ❑ Secure to prevent it falling out when gearbox is removed
- ❑ Code letters ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 00
- ❑ ⇒ „1.1 Checking friction lining of torque converter clutch“, page 11
- ❑ ⇒ „1.2 Draining torque converter“, page 11
- ❑ ⇒ „1.4 Checking torque converter“, page 13
- ❑ ⇒ „1.5 Installing torque converter“, page 13

2 - Circlip

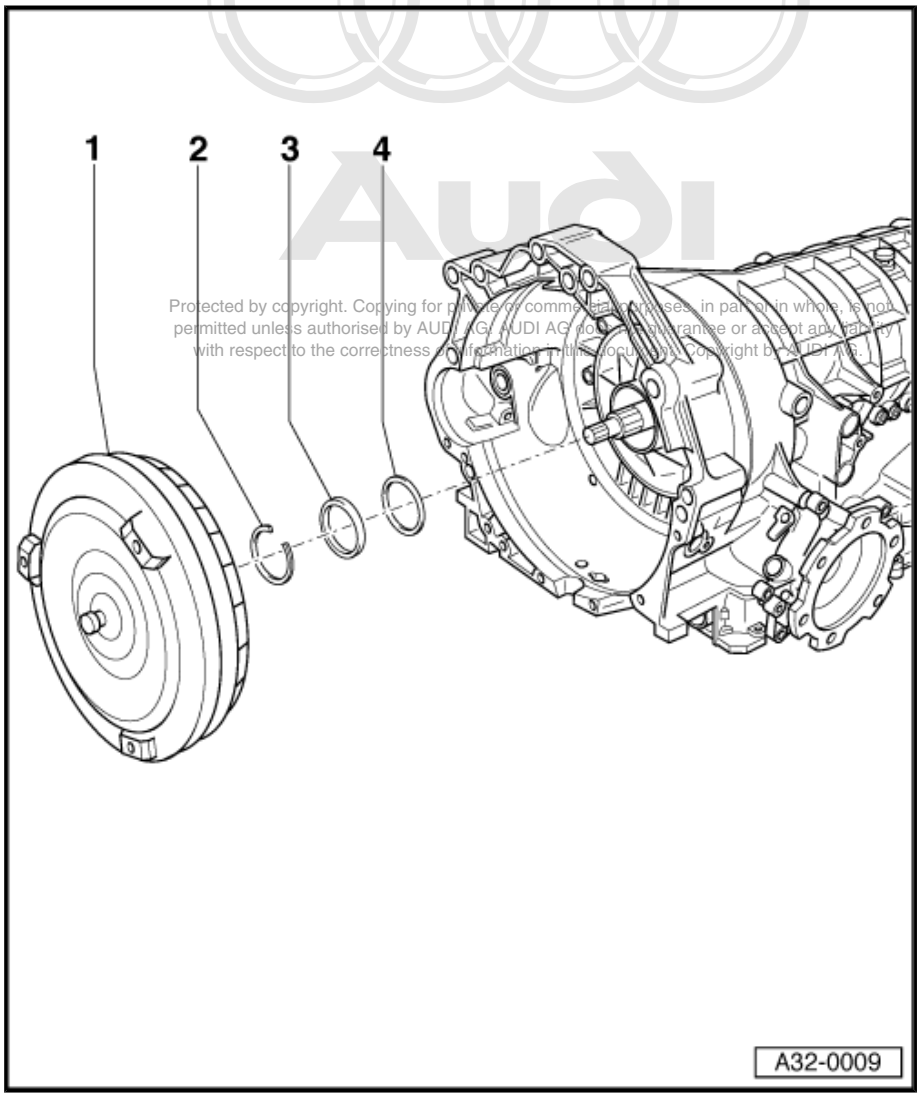
- ❑ In front of oil seal
- ❑ Renew if damaged

3 - Oil seal

- ❑ For torque converter
- ❑ ⇒ „1.3 Renewing oil seal for torque converter“, page 12

4 - Corrugated washer

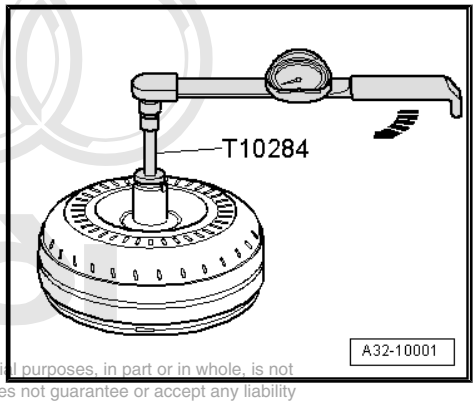
- ❑ Corrugated
- ❑ Behind oil seal
- ❑ Renew if damaged



1.1 Checking friction lining of torque converter clutch

– Insert torque converter adapter -T10284- into splines of torque converter.

– Fit commercially available torque wrench with scale 3 … 23 Nm onto adapter.



Note

Use an adapter modifying drive from 1/4" to 1/2" if necessary.

– Turn torque wrench in -direction of arrow- (a second mechanic is required to hold torque converter in position).

• Specification: min. 10 Nm.

If the torque is below specification, the torque converter clutch is defective:

– Renew torque converter.

If ATF is suspected to be very contaminated by particles of loose friction lining ⇒ page 157 :

– Dismantle complete gearbox and clean all parts, renew ATF pipes.

– Dismantle and check all clutches.

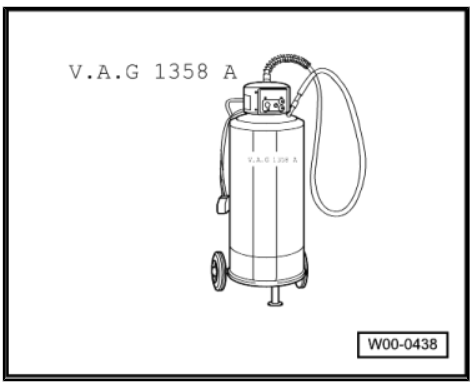
– Renew torque converter (cannot be cleaned).

– Renew valve body (cannot be cleaned).

1.2 Draining torque converter

Special tools and workshop equipment required

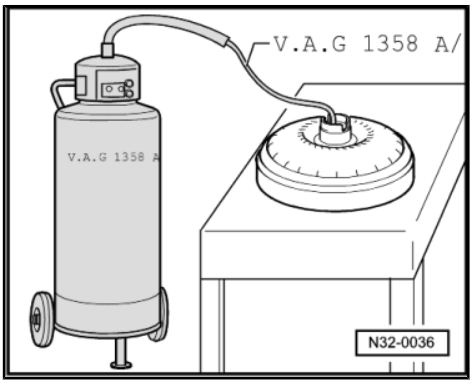
♦ Oil extractor -V.A.G 1358 A- with oil extractor probe -V.A.G 1358 A/1-



Procedure

If the torque converter has become obstructed by abrasion or when performing a major overhaul of the gearbox, drain the torque converter as follows:

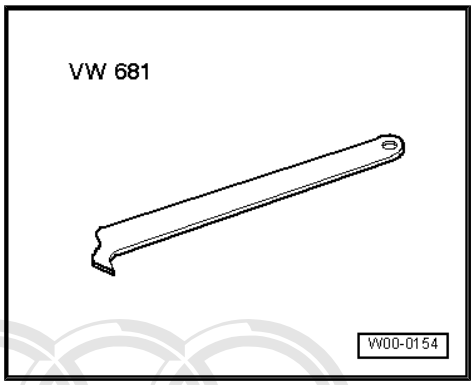
– Extract ATF from torque converter using oil extractor -V.A.G 1358 A- and oil extractor probe -V.A.G 1358 A/1- .



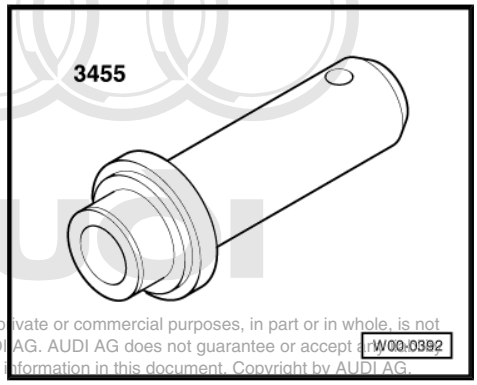
1.3 Renewing oil seal for torque converter

Special tools and workshop equipment required

- Oil seal extractor lever -VW 681-



- Thrust piece -3455-



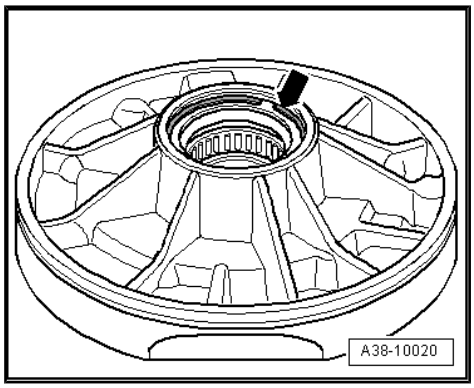
Procedure

- Gearbox removed

– Secure gearbox to assembly stand ⇒ page 17 .

– Carefully pull out torque converter.

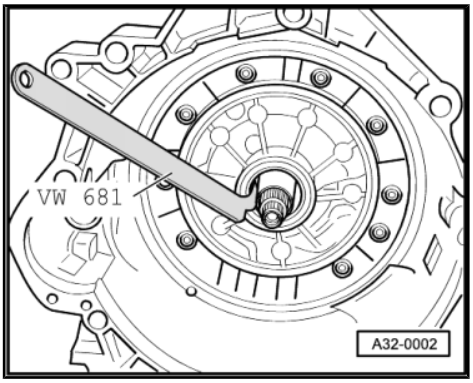
– Remove circlip -arrow-



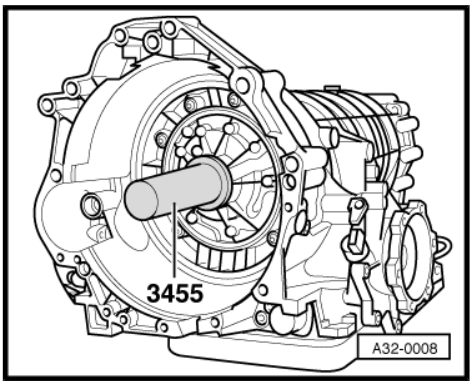
Note

Shown with ATF pump removed.

– Apply oil seal extractor lever -VW 681- directly behind the sealing lip of the oil seal to avoid damaging the corrugated washer ⇒ Item 4 (page 10) .
– Pry out oil seal using oil seal extractor lever -VW 681- .
– Fit corrugated washer - renew washer if damaged.
– Apply a thin coating of vaseline to the outer circumference and sealing lips of the oil seal.
• Installation position: open side of oil seal points towards gearbox



– Drive in torque converter oil seal with thrust piece -3455- until thrust piece reaches stop.
– Insert the circlip into the groove.



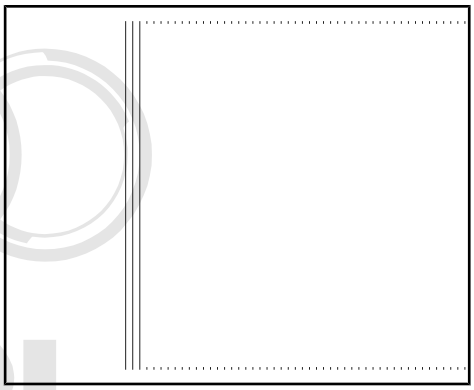
Note

♦ *Make sure corrugated washer ⇒ Item 4 (page 10) has been correctly fitted and is not damaged prior to driving in oil seal.*

♦ *The circlip must be properly seated in the base of the groove.*

1.4 Checking torque converter

– Check torque converter hub -arrow- for scoring.



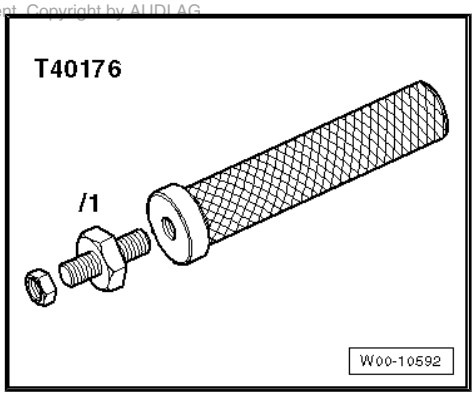
Note

The torque converter must be renewed as a complete unit if it is damaged or defective.

1.5 Installing torque converter

Special tools and workshop equipment required

♦ Extractor -T40176-



♦ Depth gauge

Procedure

– Attach extractor -T40176- to torque converter.

– Coat torque converter hub with ATF.

– Push the torque converter hub through the oil seal onto the gearbox shaft as far as the first stop.

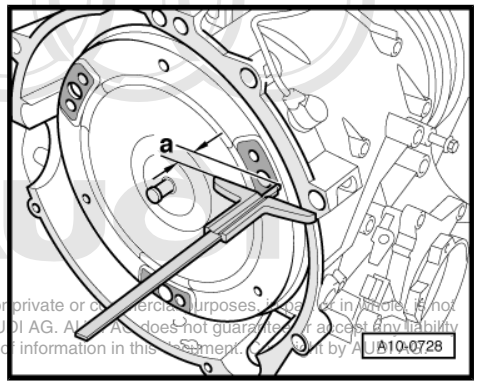
– Push torque converter into torque converter bellhousing by hand, turning it so that torque converter hub engages in slots of internal gear of ATF pump. You should feel the torque converter slide into place.

Installation depth

Caution

Drive lugs on ATF pump can be damaged if torque converter is not fitted correctly.

- *Checking position of torque converter.*



• If the torque converter is correctly installed, the depth -a- between the contact surfaces of the tapped holes on the torque converter and the contact surface of the torque converter bellhousing is about 22 mm.

Note

If the torque converter has not been fully inserted, the distance will be only approx. 10 mm.

– Use genuine bolts to secure torque converter to drive plate ⇒ Electronic parts catalogue .

When you then install the gearbox, adhere to the following instructions:

Caution

The gearbox can be damaged if the torque converter is not fitted correctly.

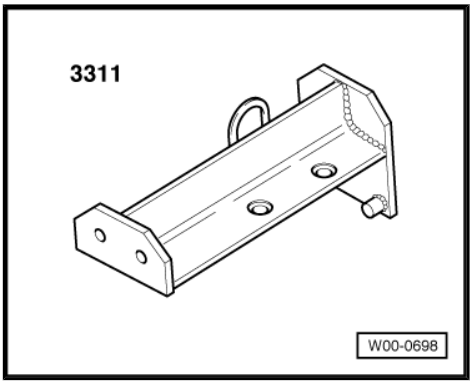
- *Before and while you are tightening the bolts on the engine/gearbox connection keep checking that the torque converter can still be rotated behind the drive plate.*
- *If the torque converter cannot be turned, the drive lugs on the ATF pump and consequently the gearbox will be irreparably damaged when the bolts are fully tightened.*

37 – Controls, housing

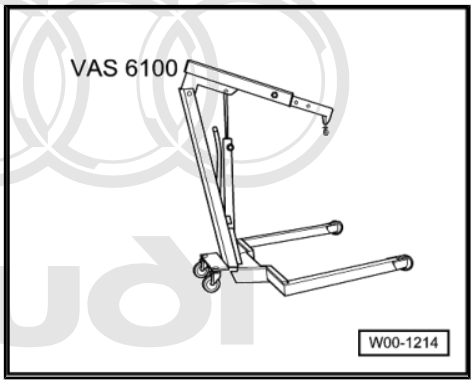
1 Transporting the automatic gearbox

Special tools and workshop equipment required

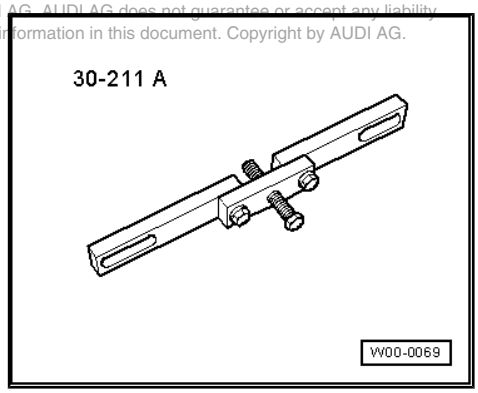
- Hook and support tool -3311-



- Workshop hoist -VAS 6100-

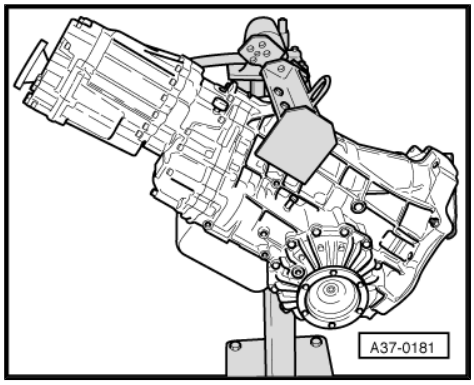


- Support bridge -30 - 211 A-



Procedure

- Gearbox removed
- Secure torque converter in gearbox using support bridge -30 - 211 A- to prevent it falling out.



Caution

Risk of damage to gearbox components if gearbox is not supported correctly when removed.

- *Do not set down the gearbox on its ATF oil pan.*

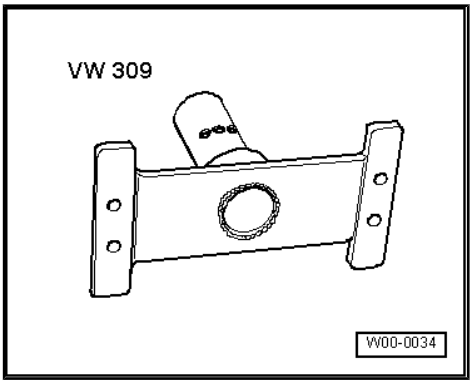
– Fit hook and support tool -3311- to attachment points on gearbox housing and secure in place.

– Lift gearbox with workshop hoist -VAS 6100- and hook and support tool -3311- .

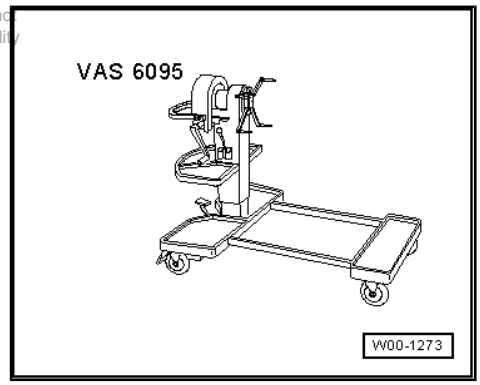
2 Securing gearbox to engine and gearbox support

Special tools and workshop equipment required

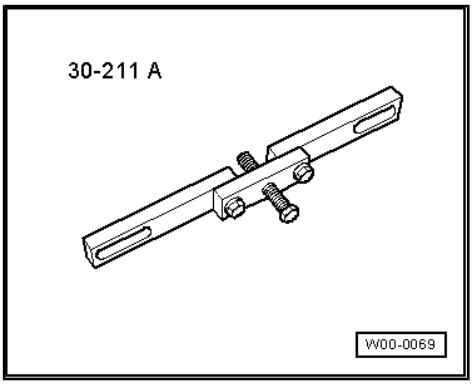
- Support plate -VW 309-



- Engine and gearbox support -VAS 6095-



- Support bridge -30 - 211 A-

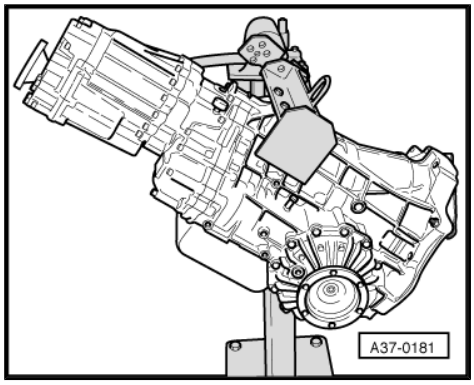


Procedure

- Gearbox removed
- Secure torque converter in gearbox using support bridge -30 - 211 A- to prevent it falling out.

– Secure support plate -VW 309- to hook and support tool -3311- .

– Using workshop hoist -VAS 6100- , insert gearbox into engine and gearbox support -VAS 6095- .



Note

If the gearbox is full and it is to be turned in the engine and gearbox support so that the oil pan points upwards, the breather holes for the gearbox housing and final drive must be sealed.

3 Dismantling and assembling planetary gearbox; notes and preparations

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *Lightly lubricate O-rings and seals with ATF or vaseline. Other types of lubricant will cause the gearbox hydraulics to malfunction.*
- *Fit bearings and shims loosely with vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.*

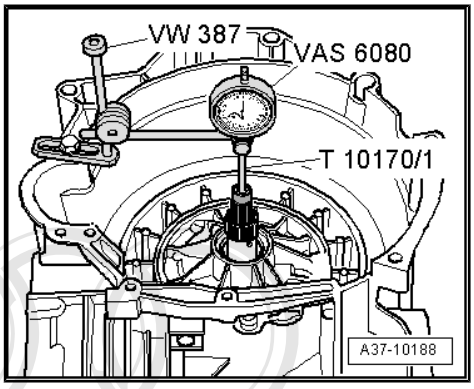
The axial clearance of the input shaft should be measured and noted down before dismantling the gearbox. This serves to document the original condition of the gearbox as received and can be used to trace a possible cause of faults.

– Gearbox secured to assembly stand ⇒ page 17 .

Measuring axial clearance of input shaft:

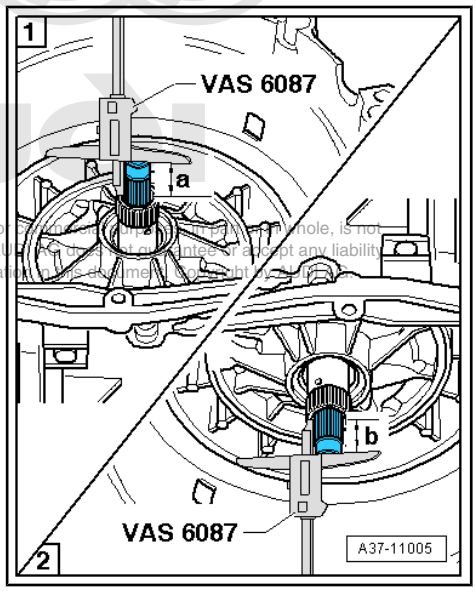
Measuring with dial gauge -VAS 6080- :

– Set up dial gauge -VAS 6080- with universal dial gauge bracket -VW 387- on gearbox flange.
– Apply dial gauge -VAS 6080- with dial gauge extension -T10170/1- to input shaft of gearbox.
– Wrap insulating tape around input shaft to prevent damage.
– Move input shaft up and down with pliers (avoid diagonal movements).
– Read off axial clearance of input shaft.



Alternatively, the measurement can be carried out using the digital depth gauge -VAS 6087- :

– Measure from input shaft to stator shaft and note measured value -a-.
– Turn gearbox through 180° on assembly stand and repeat measurement. Note measured value -b-.



Note

The input shaft is pressed out towards the bottom by the weight of the clutches.

– The difference between the two measured values -b- and -a- gives the axial clearance of the input shaft.

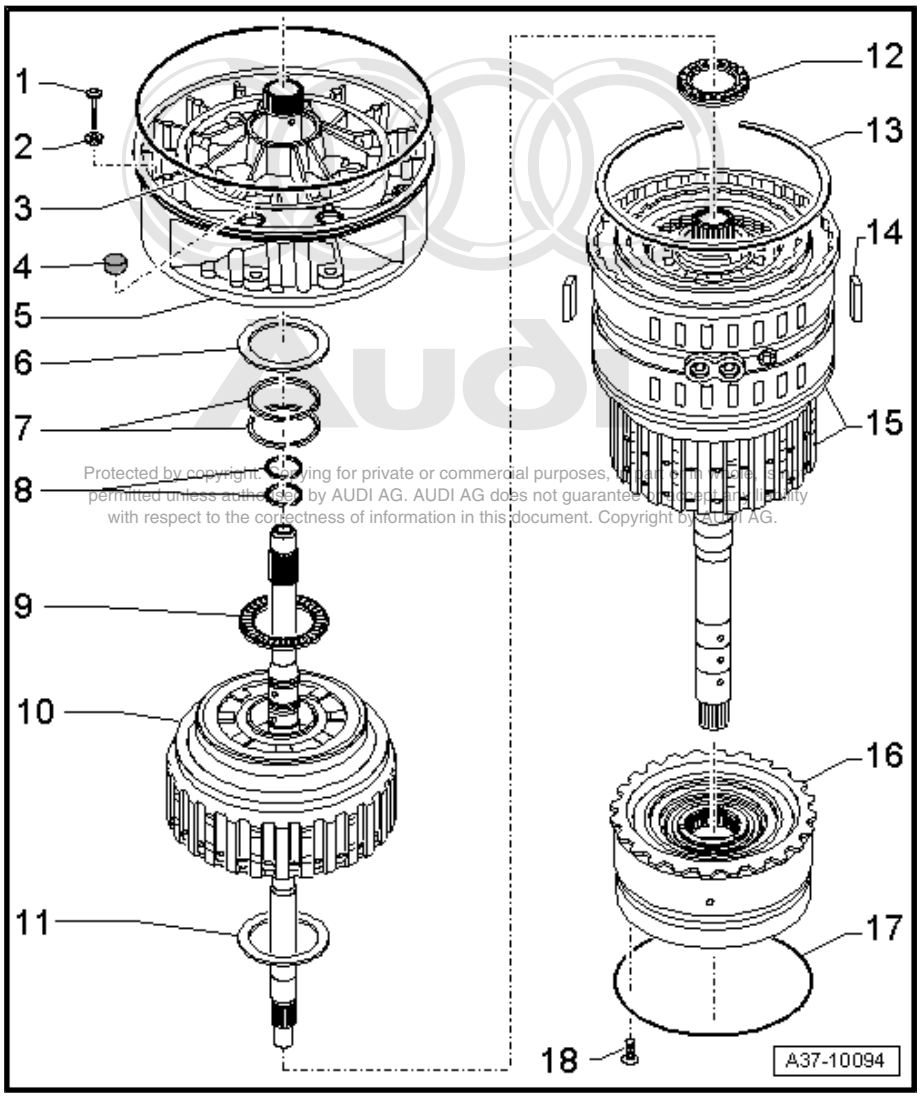
Specification for axial clearance (applies to both measurement methods):

- Specification: 0.15 ... 0.45 mm

3.1 Planetary gearbox - exploded view of components

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .



1 - Bolt, 10 Nm

2 - Washer
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - Sealing cap
- ❑ Renew

5 - ATF supply unit
- ❑ With ATF pump
- ❑ Dismantling and assembling ⇒ page 114

6 - Shim
- ❑ Determining thickness ⇒ page 35

7 - Rectangular section seal for ATF supply unit
- ❑ Renew

8 - Rectangular section seal for input shaft
- ❑ Renew

9 - Axial needle bearing

10 - Body „II“
- ❑ Dismantling and assembling ⇒ page 76

11 - Thrust washer

12 - Axial needle bearing

13 - Circlip

14 - Parallel key

15 - Body „I“
- ❑ Dismantling and assembling ⇒ page 50

16 - Clutch „F“ with freewheel
- ❑ Dismantling and assembling ⇒ page 41

17 - O-ring
- ❑ Renew

18 - Bolt
- ❑ Depending on version: Countersunk head bolt or oval head bolt
- ❑ Tightening torque ⇒ page 28

3.2 Dismantling and assembling planetary gearbox

Dismantling

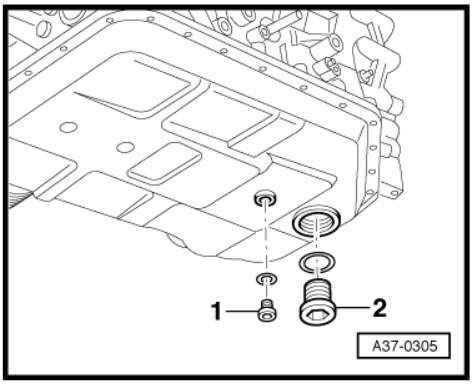
- Gearbox secured to assembly stand ⇒ page 17 .

– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.

WARNING

Wear safety goggles.

– Remove ATF drain plug -1- and allow ATF to drain off.



Note

- *Observe relevant disposal regulations.*
- *Some ATF always remains in the oil pan.*

– Remove torque converter.

– Extract ATF from torque converter ⇒ page 11 .

– Drain off gear oil in front final drive.

– Secure gearbox to assembly stand ⇒ page 17 .

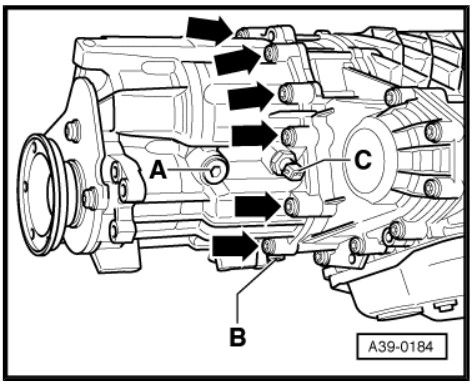
– Place used oil collection and extraction unit -V.A.G 1782- below transfer box.

– Remove drain plug -B- and allow gear oil to drain off.

– Remove gearbox output speed sender -G195- .

– Slacken bolts -arrows- on transfer gear housing in diagonal sequence.

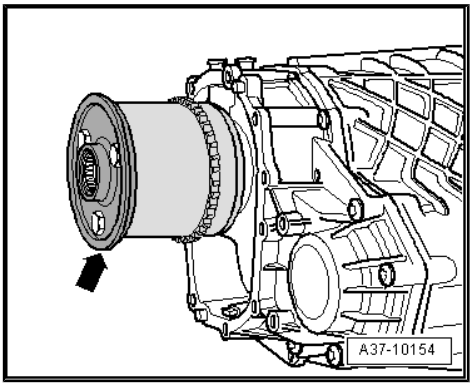
– Unscrew bolts.



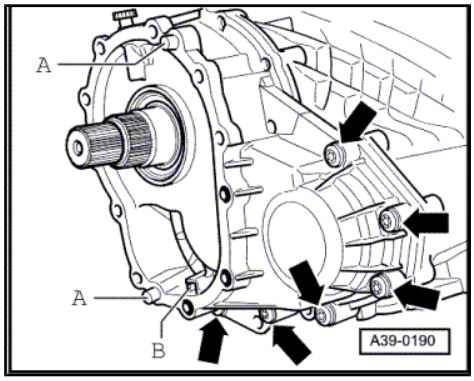
Caution

Detach transfer box housing slowly and carefully from rear of gearbox. The Torsen differential may otherwise fall out of the gearbox.

– Pull complete Torsen differential -arrow- off output shaft towards the rear.



– Remove bolts -arrows- on intermediate flange for front axle drive.



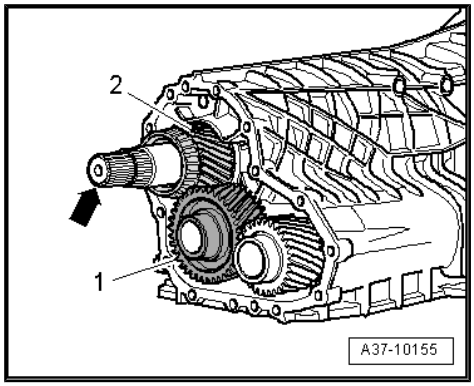
Caution

- *Remove the intermediate flange for front axle drive from the gearbox housing slowly and carefully. Otherwise spur gears could drop out of gearbox.*
- *Spur gears which have dropped to the ground can no longer be installed. Renew gearbox if spur gears have dropped to the ground.*

– Lift off intermediate flange for front axle drive.

– Cover splines on end of input shaft -arrow- completely with insulating tape to prevent damage to seal when pulling off input pinion. Take care not to crease or overlap the tape.

– Mark installation position of intermediate pinion -1-.



Caution

- *The intermediate pinion -1- is symmetrical. However, it must be re-fitted in the same position to make sure the direction of rotation is maintained.*
- *Mark installation position of intermediate pinion or note whether marking on gear teeth faces gearbox or towards the rear.*

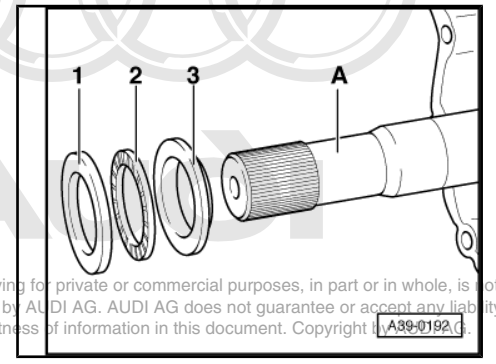
– Remove the input pinion -2- together with the intermediate pinion.

– Pull washer elements -1 … 3- off input shaft -A-.

1 - Shim

2 - Roller bearing

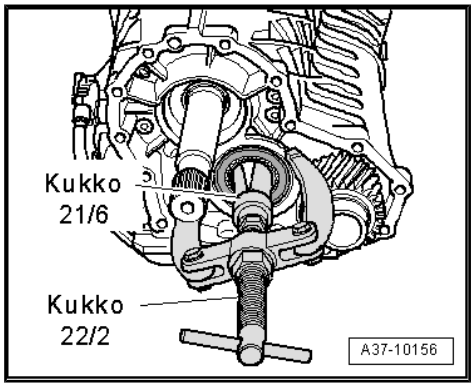
3 - Tapered thrust washer (taper faces gearbox)



Note

All three elements are specially calibrated and must not be exchanged with any non-calibrated elements.

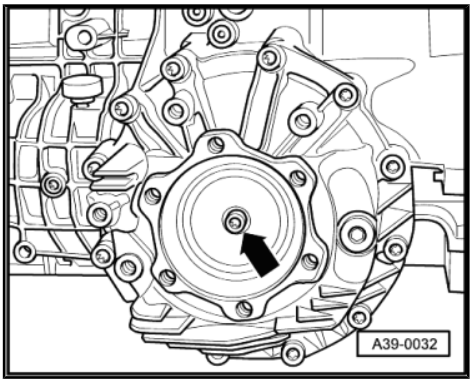
– Pull out bearing for intermediate pinion -1- with internal puller -Kukko 21/6- and counter-support -Kukko 22/2- .



Note

The intermediate shaft bearing must be pulled off to gain access to the bolts for clutch „F“ with „1st gear freewheel“.

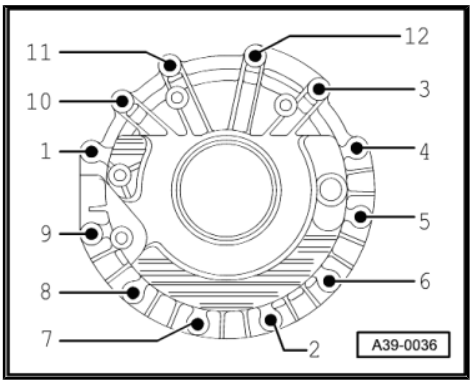
– Unscrew flange shaft bolt -arrow- (counterhold flange shaft with drift to prevent it from turning).
– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.
– Pull out flange shaft (right-side).



– Unscrew bolts of cover for final drive in the reverse sequence to the tightening sequence shown and remove cover.

Caution

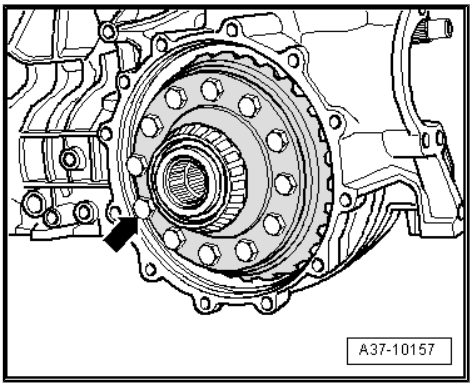
- *Detach cover for final drive from gearbox housing slowly and carefully. The differential may otherwise fall out of the gearbox.*
- *A differential which has fallen to the ground can no longer be installed. Renew gearbox if differential has fallen to the ground.*
- *Make sure that bearing races and shims for differential do not drop out of gearbox housing and cover for final drive.*
- *Bearing races and shims cannot be re-allocated to their original positions by the workshop if they have dropped out.*



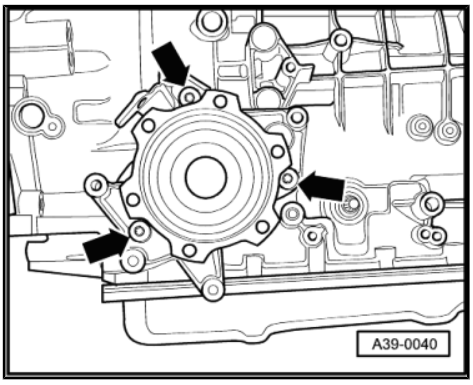
– Carefully take out differential -arrow-.

Note

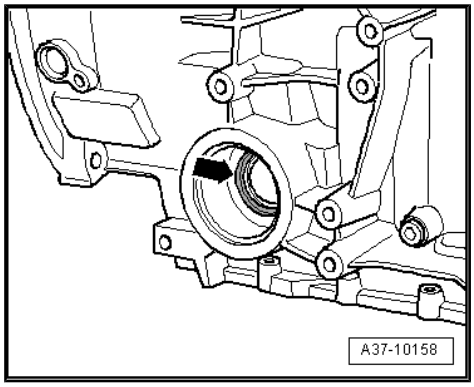
Alternatively, differential can also be removed with flange shaft (right-side) installed, together with cover for final drive.



– Unbolt mounting bracket for flange shaft (left-side) -arrows-.
– Pull out flange shaft (left-side).



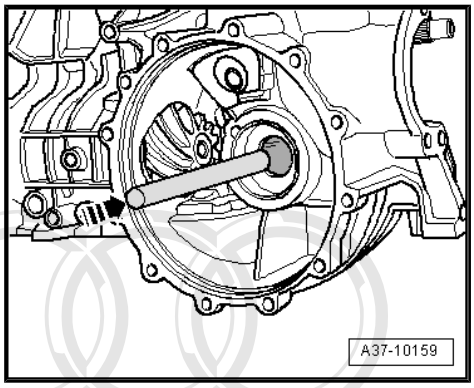
– Lever off circlip for inside tube located at left side of gearbox using a screwdriver -arrow-.



Note

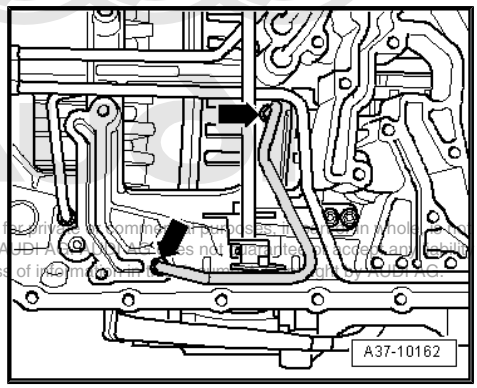
- *On gearbox housings not equipped with a slot for applying screwdriver, the slot can be machined with an electric grinder.*
- *Remove grinding residue.*

– Press out inside tube -1- from differential side sideways out of gearbox -arrow- using a suitable drift.



– Remove O-rings from inside tube and gearbox housing.
– Remove ATF oil pan ⇒ page 102 .
– Remove ATF strainer ⇒ page 104 .
– Remove valve body ⇒ page 105 .

– Lever off ATF pipe for clutch „E“ from gearbox housing -arrows- with even pressure using a screwdriver.



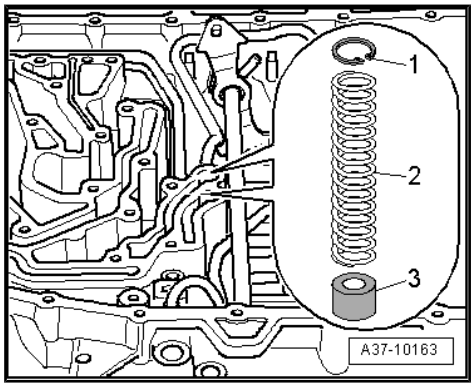
Caution

- ***It is advisable to renew all ATF pipes to ensure proper flow of ATF ⇒ page 120 (remove selector shaft for this purpose ⇒ page 94).***
- ***The ATF pipe for clutch „E“ must always be renewed when removing „body II“.***

Note

If the ATF pipe for clutch „E“ is not renewed it will no longer be properly clamped in the gearbox housing when it is re-used.

– Remove two circlips -1-.
– Detach coil springs -2-.
– Pull out sleeve -3- (use extractor tool -T10271- for this purpose).

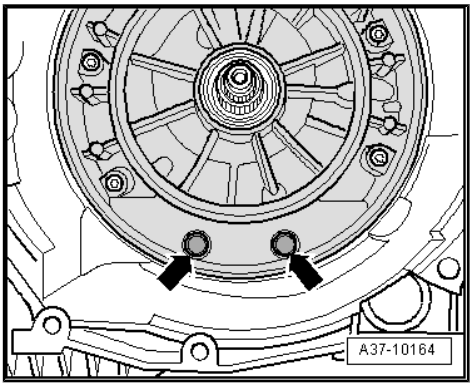


– Turn gearbox on assembly stand.

• ATF supply unit points upwards.

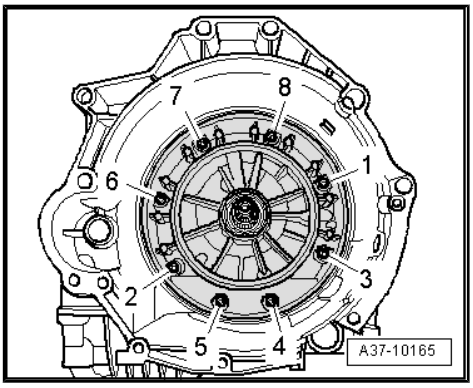
– Drive out two sealing plugs -arrows- for ATF supply unit connection at bottom of torque converter bellhousing downwards.

– Take out sealing plugs sideways from hole in housing for flange shaft.



– Unscrew bolts for ATF supply unit in sequence -8 ... 1-.

– Remove bolts with washers.



– Unscrew spindle -A- of puller for ATF supply unit -T10270- several turns.

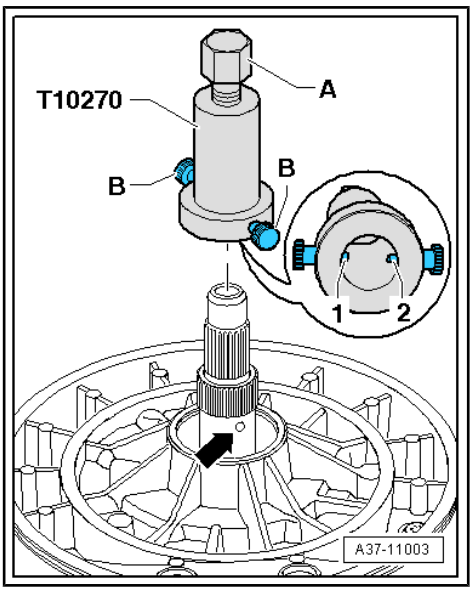
– Unscrew knurled screws -B- far enough to ensure that retainers -1- and -2- do not make contact with splines of stator shaft when puller for ATF supply unit -T10270- is brought into position.

– Position puller for ATF supply unit -T10270- on stator shaft.

Requirement:

• Retainers -1- and -2- on knurled screws -B- must engage exactly in openings -arrow- on stator shaft.

• The retainers -1- and -2- must not be clamped onto the splines of the stator shaft. The stator shaft must be renewed if the splines are damaged.

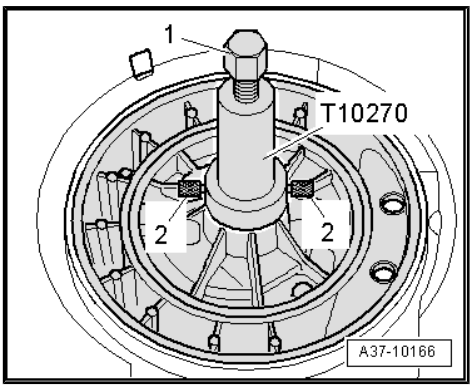


– Fit knurled screws -2- into stator shaft bore.

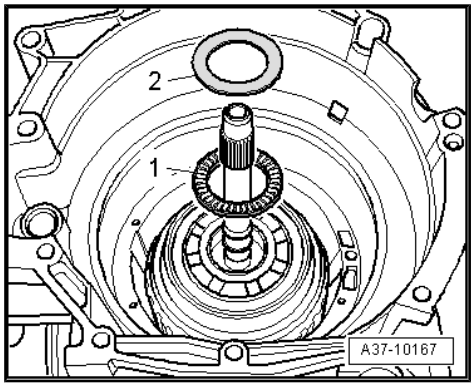
– Check puller for ATF supply unit -T10270- for proper seating.

– Turn spindle -1- of puller for ATF supply unit -T10270- clockwise to pull off ATF supply unit.

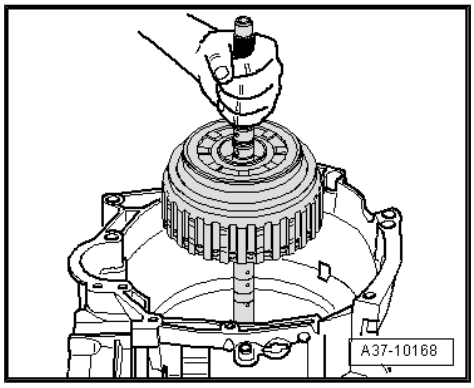
– Detach ATF supply unit.



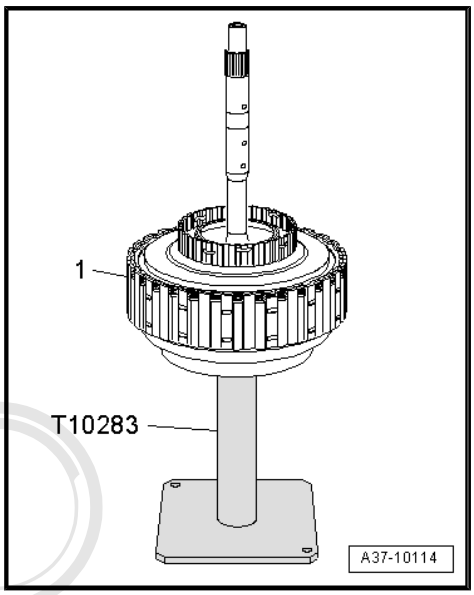
– Remove shim -2- and axial needle bearing -1-.



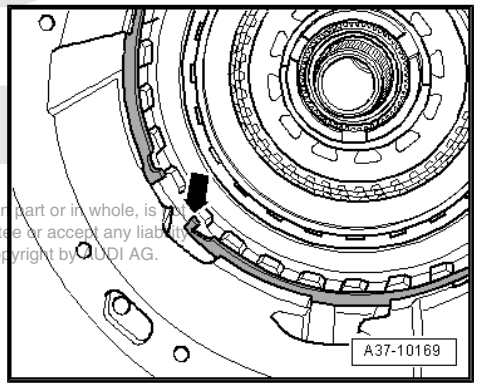
– Pull body „II“ out of gearbox housing.



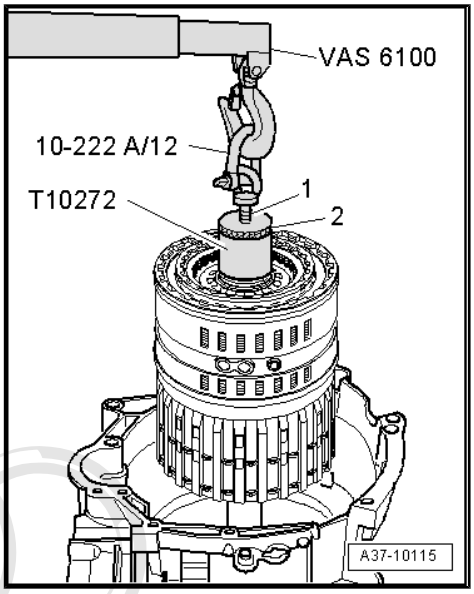
– Turn over body „II“ -item 1- and place in support element -T10283- (ATF pump end faces downwards).



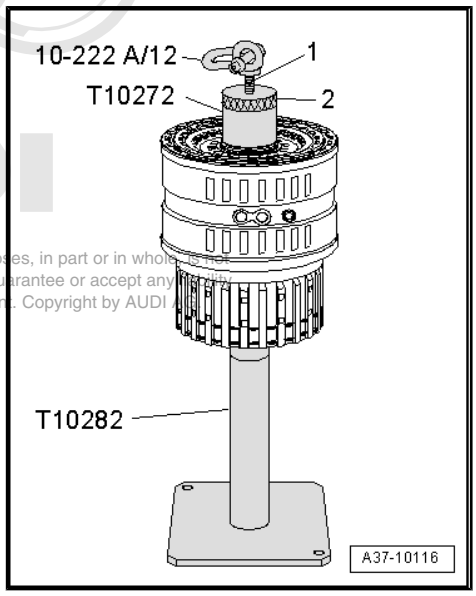
– Remove circlip -arrow- for body „I“.



– Screw in threaded spindle -1- for lifting tool -T10272- for body „I“ into tapped hole of body „I“ as far as stop.
– Secure individual components of body „I“ from from being pulled apart (screw in sleeve -2- on threaded spindle all the way until finger-tight)
– Connect eye of lifting tool -T10272- for body „I“ to workshop hoist -10-222 A/12- via shackle -VAS 6100- .
– Lift out body „I“ from gearbox housing using workshop hoist -VAS 6100- .



– Place body „I“ in support element -T10282- .

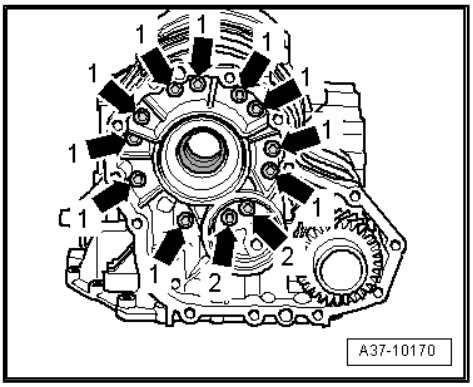


– Turn gearbox on assembly stand back to horizontal position.
– Loosen bolts -arrows 1- and -arrows 2- for clutch „F“ in diagonal sequence.

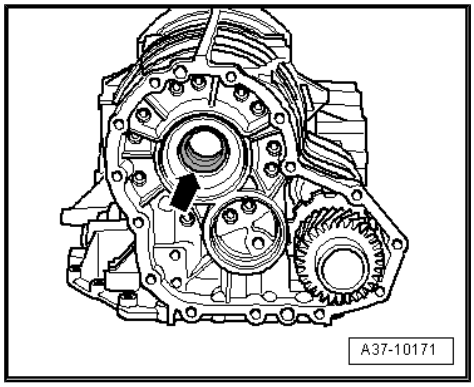
Note

Depending on the version, special bolts with a projecting pin may be installed here. A special Torx bit with corresponding hole is required to loosen these bolts.

– Then remove bolts.



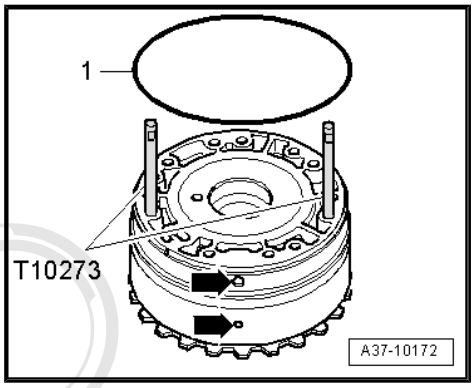
– Knock loose clutch „F“ from rear of gearbox housing -arrow- by tapping gently with a rubber-headed hammer.
– Take clutch „F“ out of gearbox housing from front.



Assembling

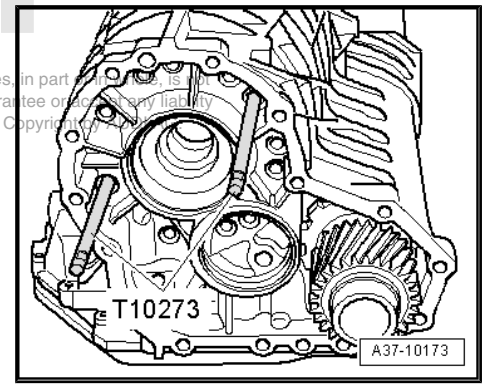
Note

- *Always renew seals/gaskets, oil seals and O-rings.*
- *Lightly lubricate O-rings and seals with vaseline. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.*



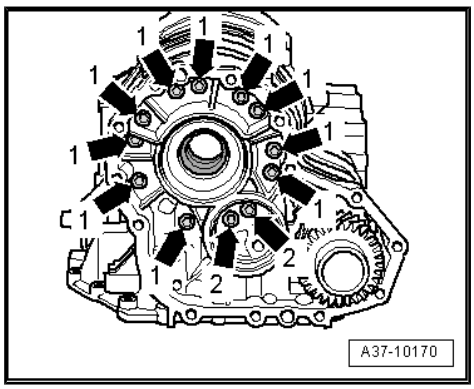
– Renew O-ring -1- on cylinder of clutch „F“.
– Screw guide pins -T10273- into the two opposite bores in clutch „F“.
– Position cylinder of clutch „F“ in installation position.
• The oil drillings -arrows- face underside of gearbox (valve body).

– Insert clutch „F“ into gearbox housing; insert guide pins -T10273- into bores at gearbox housing when doing this.
– Clutch „F“ and gearbox housing bores must align.



Note

- *Which type of bolts -arrows 1- (countersunk head bolts or oval-head bolts) are fitted depends on the gearbox housing.*
- *Always use the same type of bolts as were fitted before dismantling.*
- *Always renew oval head bolts.*
- *Always use countersunk head bolts for bolt connections -arrows 2-.*

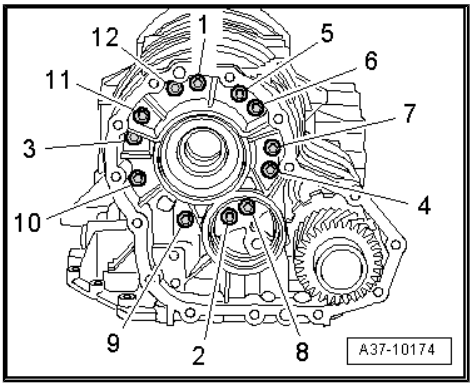


– Initially screw in bolts -arrow 1- and -arrow 2- for clutch „F“ in diagonal sequence until finger-tight; unscrew guide pins -T10273- for this purpose.

Tightening sequence for gearbox with countersunk head bolts

– Tighten bolts as follows.

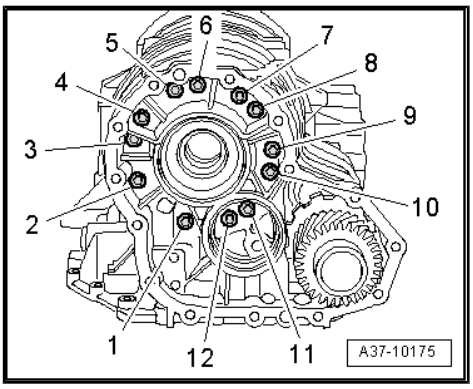
Stage	Tightening sequence
I	– Tighten countersunk head bolts in the sequence -1 ... 12- to 23 Nm.



Tightening sequence for gearbox with oval-head bolts and countersunk head bolts

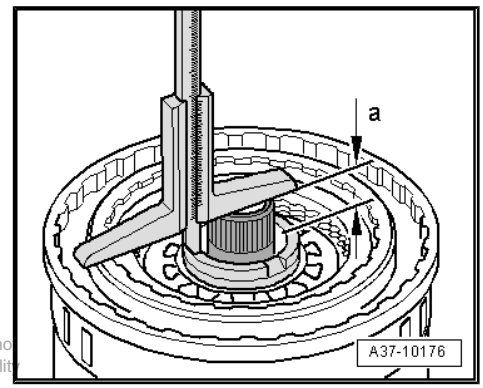
– Tighten bolts as follows.

Stage	Tightening sequence
I	– Tighten bolts -6- and -12- to 5 Nm.
II	– Tighten oval-head bolts in the sequence -1 ... 10- to 13.2 Nm.
III	– Turn oval-head bolts in the sequence -1 ... 10- 65° further using rigid wrench.
IV	– Tighten countersunk head bolts -11- and -12- to 23 Nm.



– Check dimension of body „I“.

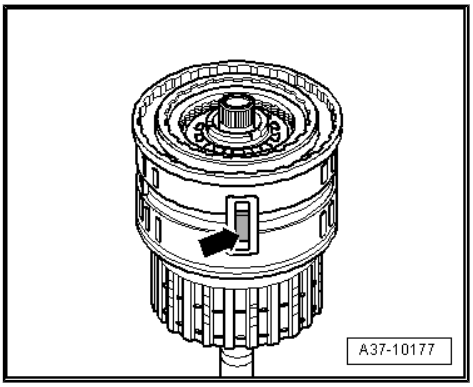
• Dimension -a- = 21.7 mm (minimum)



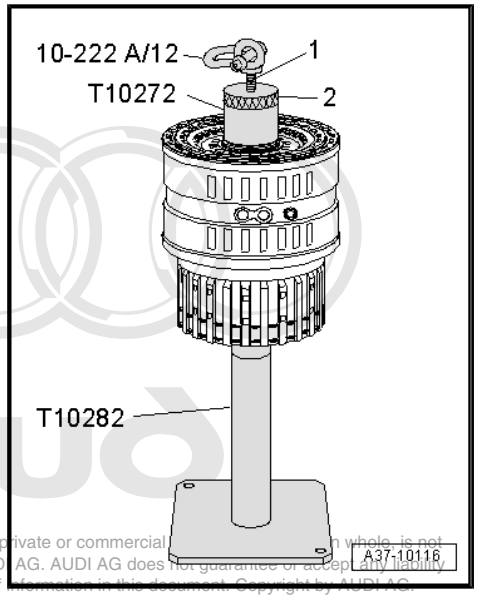
Note

If dimension -a- is below specification, check assembly of body „I“ *⇒ page 73* *.*

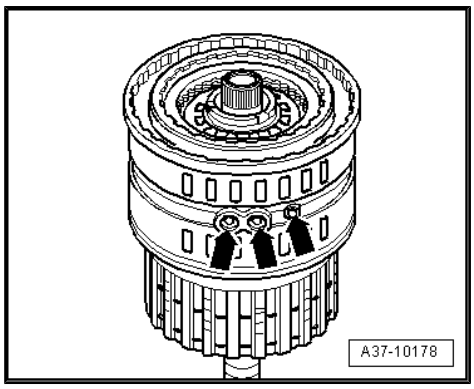
– Check whether parallel keys -arrow- are centred on both sides of cylinder „D/E“.



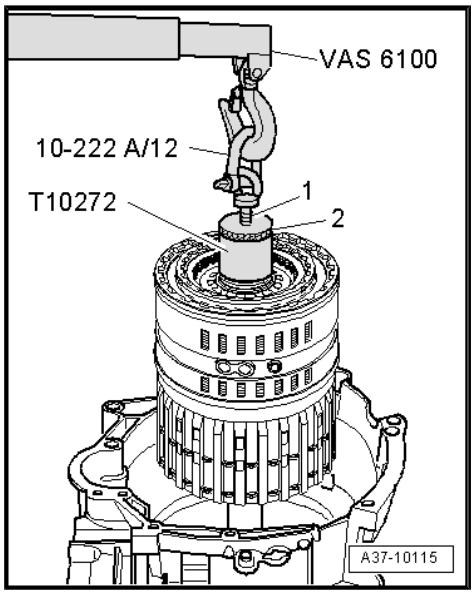
– Screw in threaded spindle -1- of lifting tool for body I -T10272- into tapped hole of body „I“ as far as stop.
– Secure individual components of body „I“ from from being pulled apart (screw in sleeve -2- on threaded spindle all the way until finger-tight)



– Move body „I“ to installation position.
• The oil drillings -arrows- on cylinder „D/E“ face underside of gearbox (valve body).

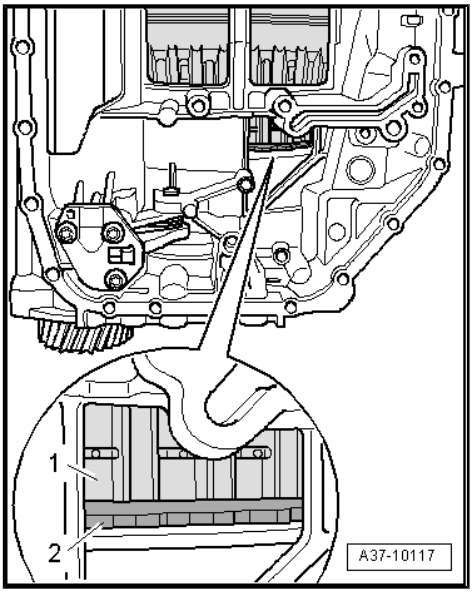


– Connect eye of lifting tool -T10272- to workshop hoist -10-222 A/12- via shackle -VAS 6100- .
– Lower body „I“ into gearbox housing using workshop hoist -VAS 6100- .



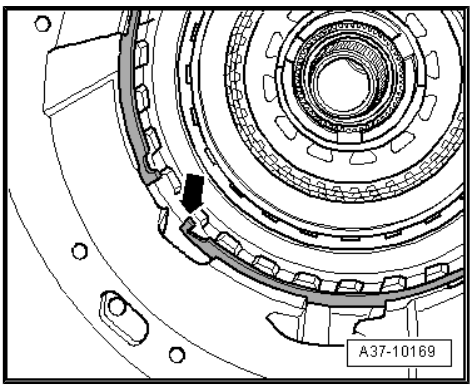
– When inserting body „I“, make sure that splines -2- of freewheel in cylinder „F“ engage in splines on annulus of planetary drive -1-.

• Visible from valve body side of gearbox.



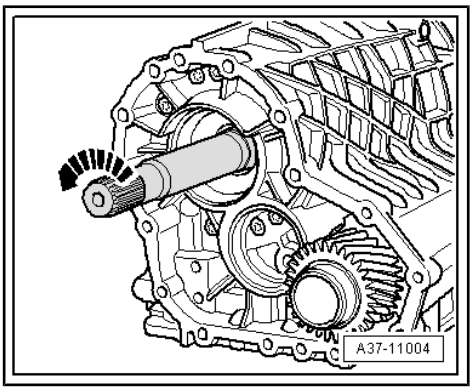
– Carefully insert circlip -arrow- for body „I“ into gearbox housing.

– Make sure that circlip locates securely in groove of gearbox housing; knock circlip into groove all round with a punch if necessary.



– Check proper installation of body „I“.

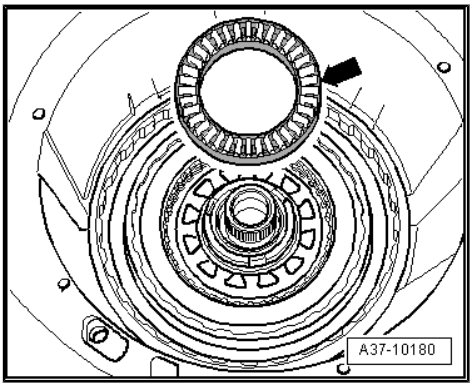
• It should be possible to turn input shaft by hand in direction of -arrow-.



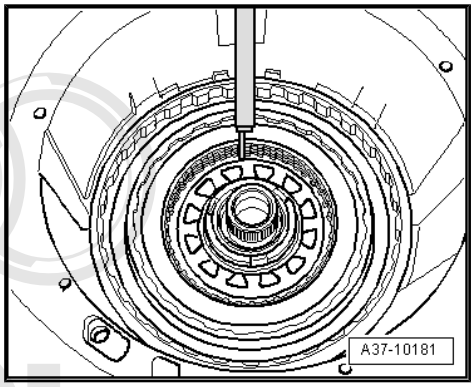
Note

Because of the freewheel, the input shaft can only be turned in this direction.

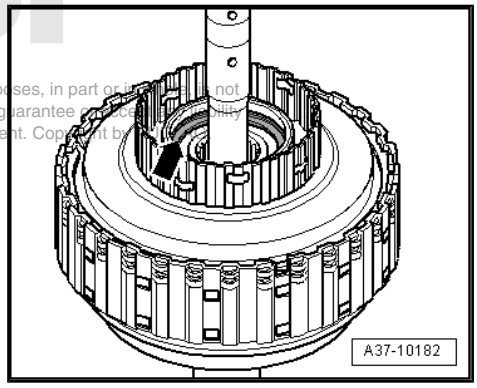
– Place needle bearing -arrow- for body „II“ onto cylinder „C“ of body „I“.



– Align plates of clutch „C“ vertically using measuring tip of depth gauge, or similar.

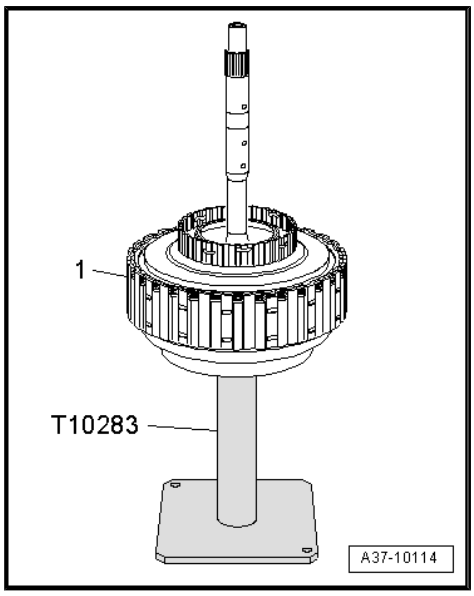


– Check that thrust washer -arrow- for needle bearing at bottom of body „II“ is fitted.



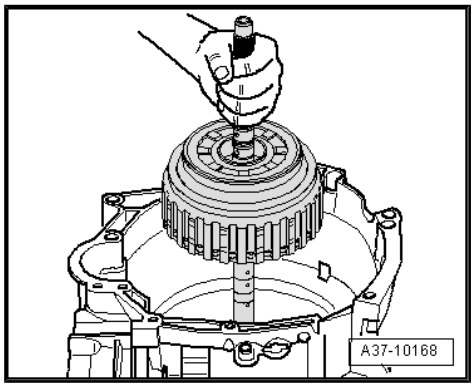
– Take „body II“ out of support element for body II -T10283- and turn to installation position.

• ATF pump end points upwards.



– Insert „body II“ into gearbox by hand.

– Allow plate carrier on body „II“ to engage into all plates of clutch „C“ (lift and rotate plate carrier slightly as required.)

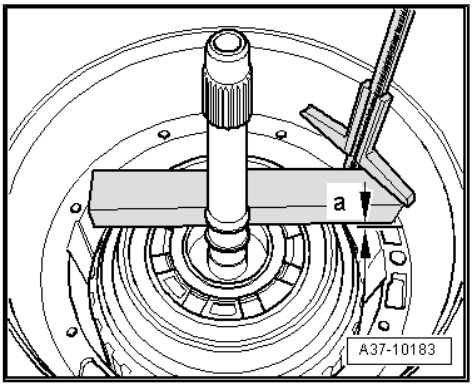


– Check proper installation of body „II“.

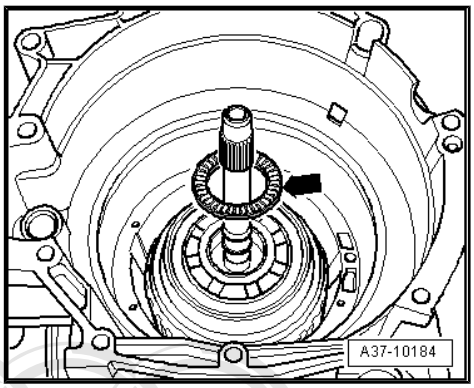
– Measure height of top edge of body „II“ above contact surface for ATF pump.

• Dimension -a- = max. 8 mm.

If the dimension -a- is exceeded, some of the gearbox components are not fitted properly - repeat installation procedure.



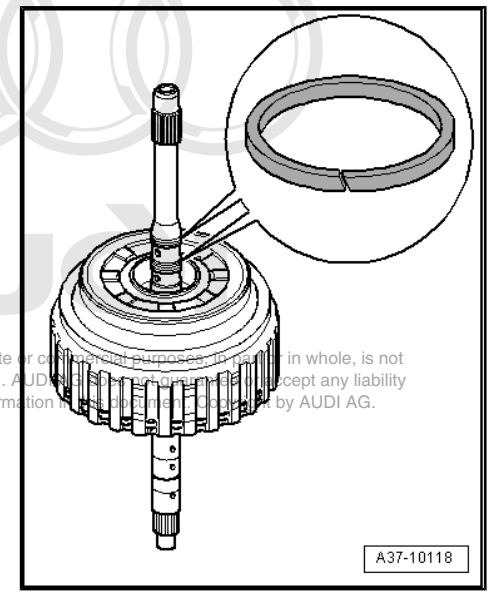
– Place needle bearing -arrow- onto body „II“.



– Renew the two rectangular section seals on input shaft of body „II“.

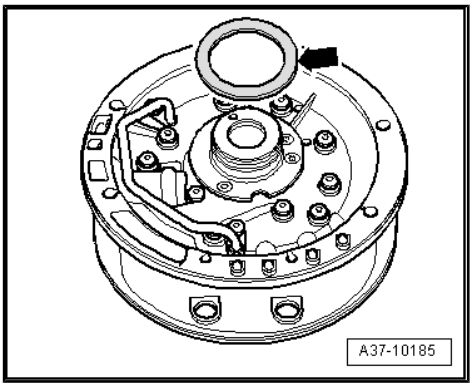
– Lightly lubricate the two rectangular section seals on input shaft of body „II“ with vaseline before inserting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

– Make sure that rectangular section seals are seated properly all round in groove on input shaft.

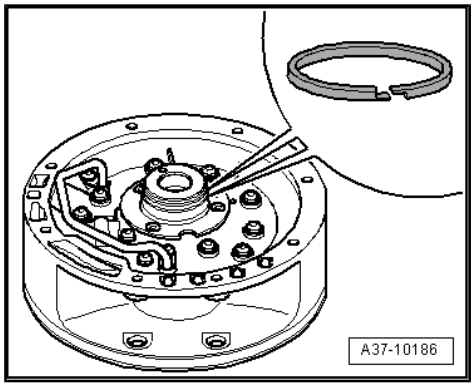


– Lightly lubricate the old shim -arrow- with vaseline. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

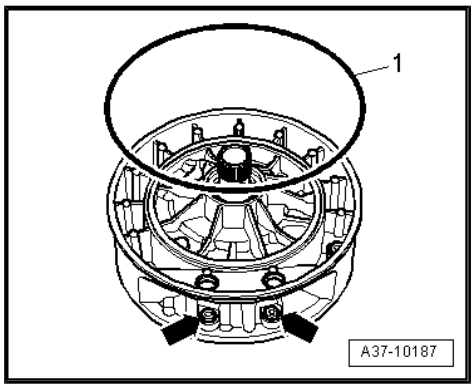
– Attach shim for axial clearance of body „I“ and body „II“ onto ATF supply unit from rear.



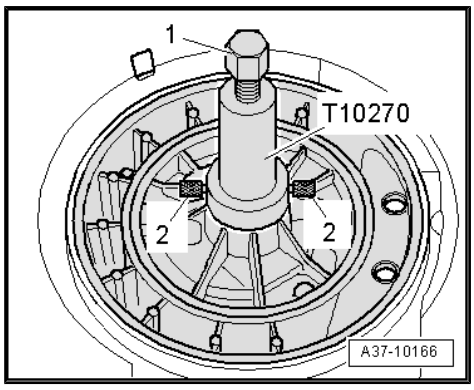
– Renew two rectangular section seals on stator shaft.
– Lightly lubricate the two rectangular section seals on ATF supply unit with vaseline before inserting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Make sure that the rectangular section seals are seated properly all round in the stator shaft grooves.



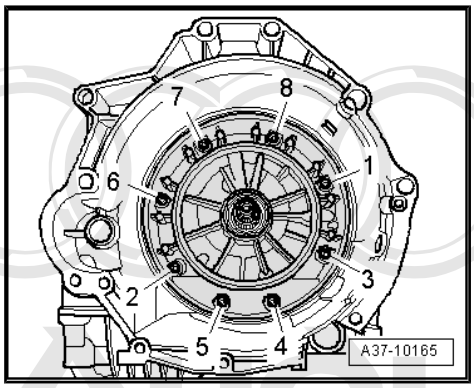
– Renew O-ring -1- on ATF supply unit.
– Insert two bottom bolts for ATF supply unit with new washers into ATF supply unit housing.
– Insert remaining bolts for ATF supply unit with washers into gearbox housing.



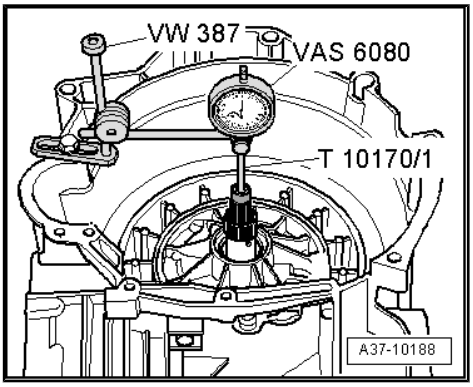
– Unscrew spindle -1- of puller for ATF supply unit -T10270- several turns.
– Apply puller for ATF supply unit -T10270- to stator shaft.
– Fit knurled screws -2- into stator shaft bore.
– Check puller for ATF supply unit -T10270- for proper seating.
– Install ATF supply unit into gearbox housing.
• The cut out for the flange shaft tube points towards bottom of gearbox (valve body side).
– Detach puller for ATF supply unit -T10270- .



– Tighten bolts for ATF supply unit in sequence -1 ... 8-.
• Tightening torque: 10 Nm



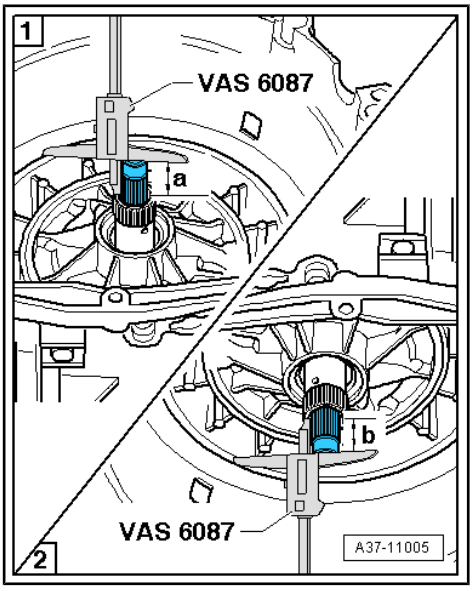
Measuring axial clearance of input shaft:



Measuring with dial gauge -VAS 6080- :

– Set up dial gauge -VAS 6080- with universal dial gauge bracket -VW 387- on gearbox flange.
– Apply dial gauge -VAS 6080- with dial gauge extension -T10170/1- to input shaft of gearbox.
– Wrap insulating tape around input shaft to prevent damage.
– Move input shaft up and down with pliers (avoid diagonal movements).
– Read off axial clearance of input shaft.

Alternatively, the measurement can be carried out using the digital depth gauge -VAS 6087- :



– Measure from input shaft to stator shaft and note measured value -a-.
– Turn gearbox through 180° on assembly stand and repeat measurement. Note measured value -b-.

Note

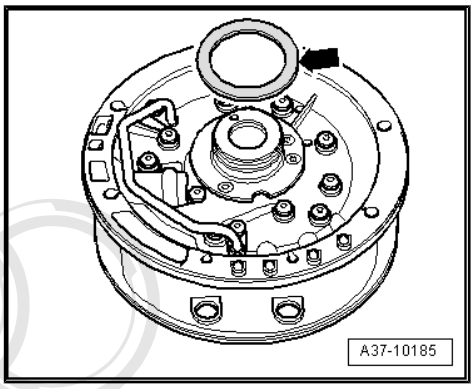
The input shaft is pressed out towards the bottom by the weight of the clutches.

– The difference between the two measured values -b- and -a- gives the axial clearance of the input shaft.

Specification for axial clearance (applies to both measurement methods):

- Specification: 0.15 ... 0.45 mm

– Remove ATF supply unit for a second time if the specification is not obtained.



– Determine proper thickness of shim -arrow- according to table.

- If measured axial clearance is below specification: insert thinner shim of appropriate thickness.
- If determined axial clearance is above specification: insert thicker shim of appropriate thickness.

Shims available:

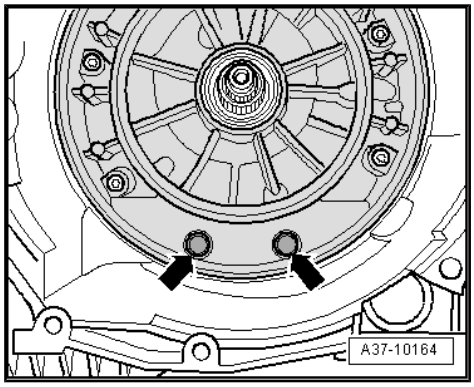
Shim thickness (mm)		
1.4	2.0	2.6
1.6	2.2	
1.8	2.4	

– Install ATF supply unit again with new shim, new washers and new O-ring ⇒ page 33 .
– Read off axial clearance of input shaft again ⇒ page 35 .

If reading again does not match specification:

– Repeat adjustment.

– If the specification is obtained, press in sealing plugs -arrows- with suitable drift until flush.



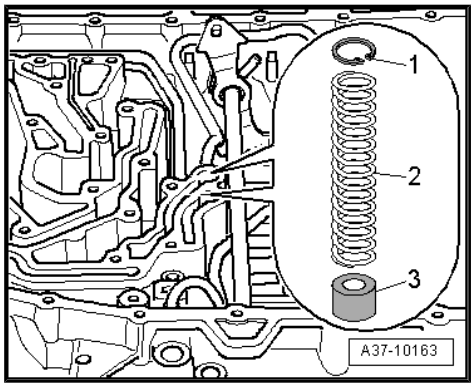
– Turn gearbox on assembly stand.

• Valve body side faces upwards.

– Insert sleeve -3- and coil springs -2- into bores in gearbox housing.

– Secure coil springs in bores with circlips -1-.

• Fitting depth of circlips = 2 … 5 mm.

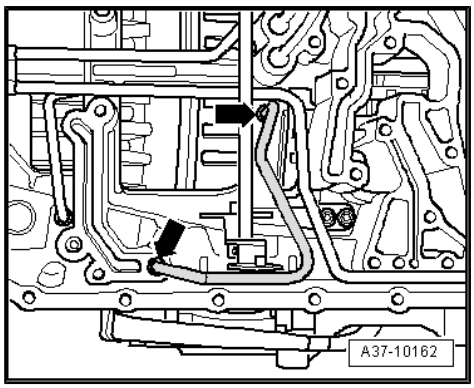


– Renew ATF pipe for clutch „E“.

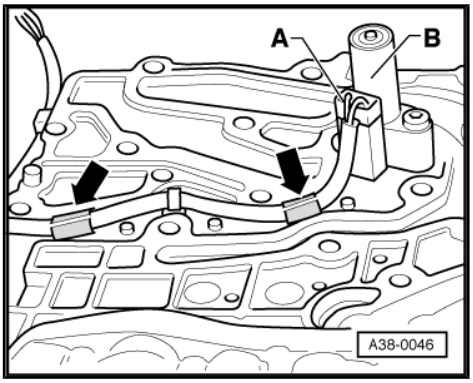
Note

Keep ATF pipe straight when driving in.

– Drive in ATF pipe for clutch „E“ gradually into gearbox housing -arrows- using drive-in tool for ATF pipe -T10274- at alternate ends of pipe.



– Check that electrical connectors of wiring harness are attached to corresponding solenoid valves.



Note

The retaining lugs must be engaged.

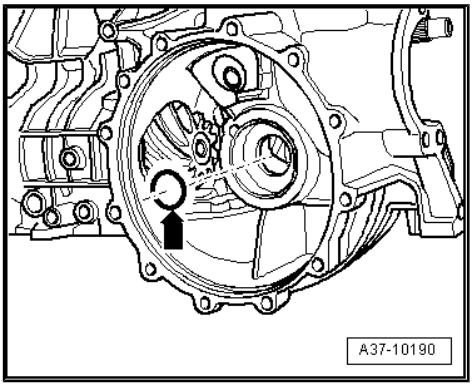
– The connector -A- for gearbox input speed sender -G182- -item B- on reverse side of valve body must be attached.
– Check that wiring harness is secured with retaining clips -arrows-.

Caution

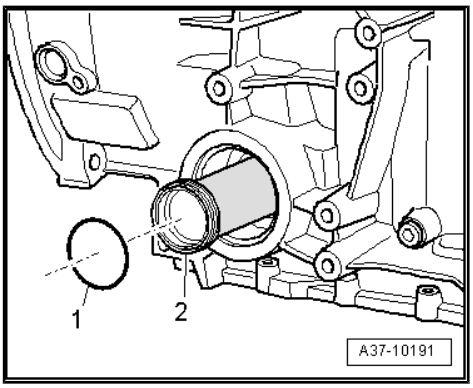
- ***Renew damaged retaining clips.***
- ***The wiring harness must be routed as shown in illustration.***
- ***If the wiring harness is routed differently, it may become trapped and damaged when the valve body is installed.***

– Install valve body ⇒ page 106 .
– Install ATF strainer ⇒ page 104 .
– Install ATF oil pan ⇒ page 102 .

– Lightly lubricate new O-ring with vaseline. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Insert new O-ring -arrow- into gearbox housing on differential side.



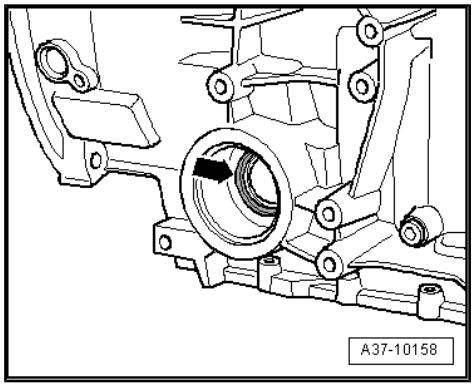
– Lightly lubricate new O-ring with vaseline. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Fit new O-ring -1- onto inside tube -2-.
– Press inside tube into opening on left side of gearbox housing.



– Secure inside tube with circlip -arrow-.

– Check oil seal for flange shaft (left-side) and renew if necessary ⇒ page 126 .

– Install flange shaft (left-side) ⇒ page 124 .



Caution

- ***Make sure that the bearing races and shims of the differential do not drop out of the gearbox housing and the differential cover.***
- ***Bearing races and shims cannot be re-allocated to their original positions by the workshop if they have dropped out.***

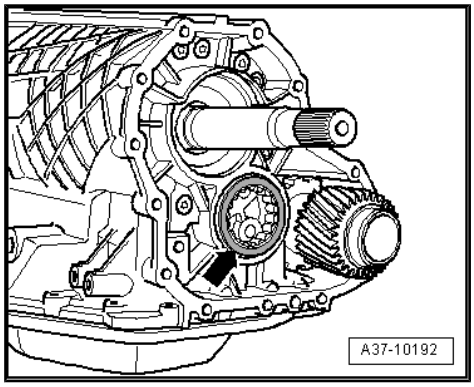
– Install cover for final drive ⇒ page 134 .

– If necessary, renew oil seal for flange shaft (right-side) ⇒ page 133 .

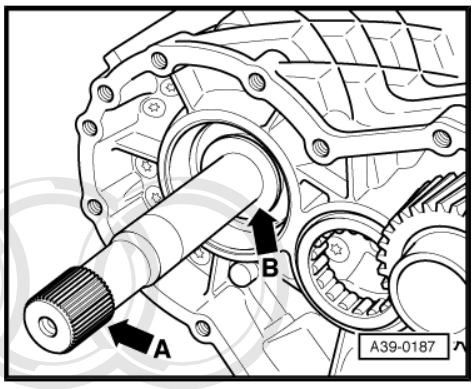
– Install flange shaft (right-side) ⇒ page 132 .

– Renew roller bearing -arrow- for intermediate pinion.

– Carefully drive in roller bearing for intermediate pinion as far as stop (apply light blows all round with a plastic-headed hammer).



– Cover splines on end of input shaft -arrow A- completely with insulating tape to prevent damage to oil seal when pushing on input pinion. Take care not to crease or overlap the tape.



Note

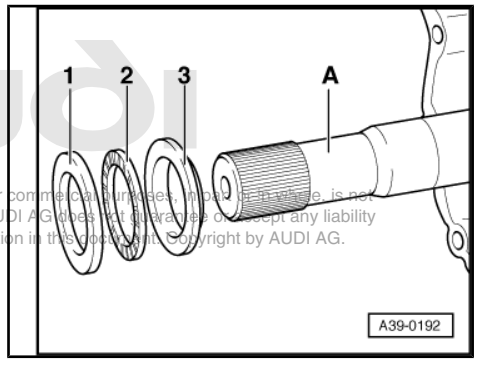
-Arrow B- can be disregarded.

– Fit washer elements -1 … 3- on input shaft -A-.

1 - Shim

2 - Roller bearing

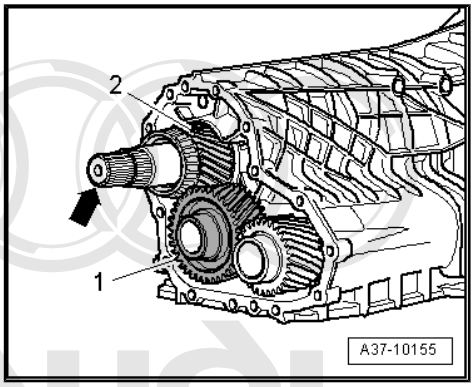
3 - Tapered thrust washer (taper faces gearbox)



Note

All three elements are specially calibrated and must not be exchanged with any non-calibrated elements.

– Insert input pinion -2- together with intermediate pinion -1- into gearbox housing in line with markings made on removal.

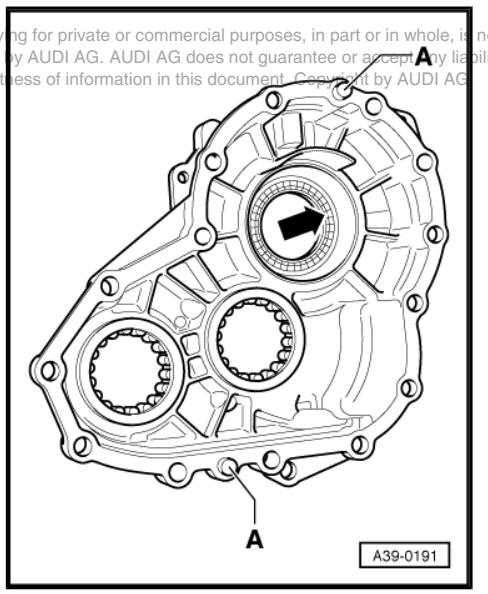


Caution

- *The intermediate pinion -1- is symmetrical. Nevertheless it must be re-fitted in same position in line with markings made upon removal to make sure direction of rotation is maintained.*
- *If the input pinion -2- is not fitted correctly, the twin-lip oil seal in the input pinion may be damaged. Renewing twin-lip oil seal* *⇒ page 149* *.*

– Check that dowel sleeves -A- in intermediate flange for front axle drive are fitted correctly.

– Place new gasket in position.



Note

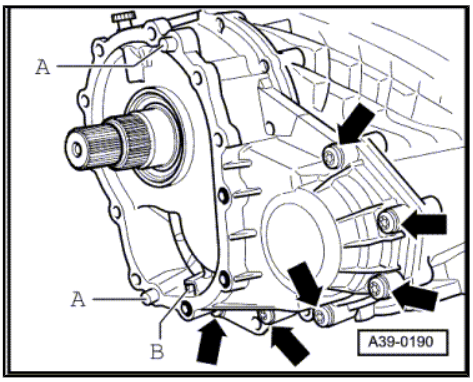
Before attaching the gasket, apply a thin coating of gear oil to the sealing surface to prevent it from slipping.

– Carefully place intermediate flange for front axle drive in position.

Caution

Fitting the intermediate flange onto the input shaft without sufficient care can damage the sealing lips of the oil seal -arrow-.

– Screw in bolts -arrows- hand-tight.



Note

When screwing in the bolts hand-tight, ensure that the gap between the intermediate flange for the front axle drive and the gearbox housing is reduced evenly all round.

– Then tighten bolts.

• Tightening torque: 23 Nm

– Check that dowel sleeves -A- in intermediate flange for front axle drive are fitted correctly.

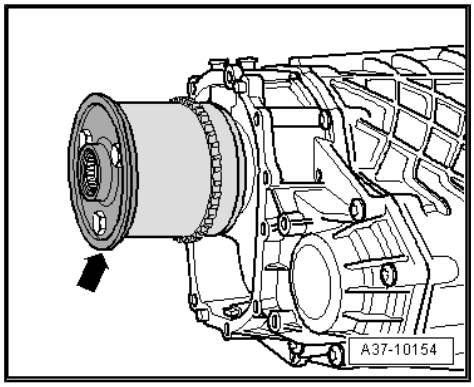
– Place new gasket in position.

Note

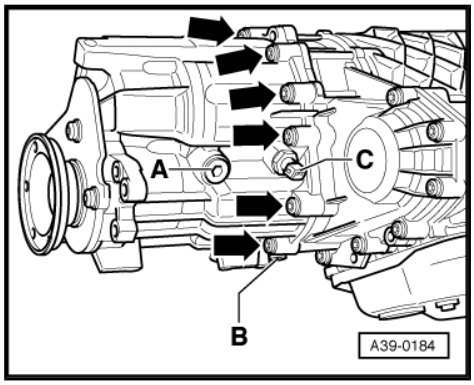
Before attaching the gasket, apply a thin coating of gear oil to the sealing surface to prevent it from slipping.

– Clean magnet and insert it in chamber -B- on the casting of the intermediate flange.

– Push Torsen differential -arrow- onto output shaft.



– Position transfer gear housing at rear of gearbox with spur gears and output flange fitted.
– Screw in bolts -arrows- for transfer gear housing hand-tight.



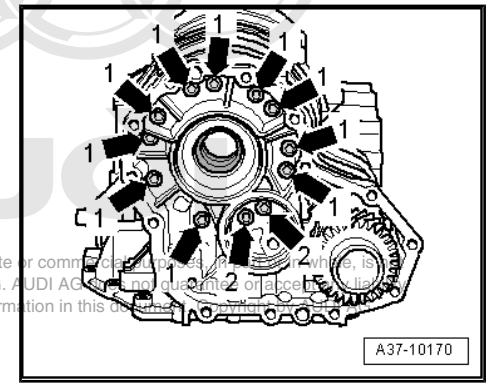
Note

When screwing in the bolts by hand, ensure that the gap between the transfer gear housing and the gearbox housing is reduced by the same amount all the way round.

– Then tighten bolts in diagonal sequence.
• Tightening torque: 23 Nm
– Detach gearbox from assembly stand.
– Place torque converter in position and secure against falling out.
– Check installation depth of torque converter ⇒ page 13 .
– Check and top up ATF level ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .
– Fill front final drive with gear oil and check oil level ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .
– Fill transfer box with gear oil and check oil level ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

Tightening torques

Component		Nm
Bolts -arrows 1- and -arrows 2-	Different versions: observe tightening sequence	⇒ page 28
ATF supply unit to gearbox housing		10
Valve body to gearbox housing		8
ATF strainer to valve body		6
ATF oil pan to gearbox housing		11
Mounting bracket for flange shaft (left-side) to gearbox		23
Differential cover to gearbox		23
Flange shaft (right-side)		25
Intermediate flange to gearbox		23
Transfer gear housing to gearbox		23



4 Dismantling and assembling clutch „F“ with freewheel

4.1 Clutch „F“ with freewheel - exploded view of components

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of clutch „F“ for traces of wear and damage ⇒ „6.2 Clutch F with freewheel“, page 158 .*

1 - Circlip

2 - Freewheel (1st gear)

3 - Cover (top)

- ❑ Open side faces free-wheel cage

4 - Freewheel cage

5 - Cover (bottom)

- ❑ Open side faces free-wheel cage

6 - Freewheel inner race

7 - Retaining plate

8 - Circlip

9 - Circlip

- ❑ Determining thickness of circlip ⇒ page 48

10 - Thick outer plate

11 - Friction plate

12 - Outer plate

13 - Corrugated washer

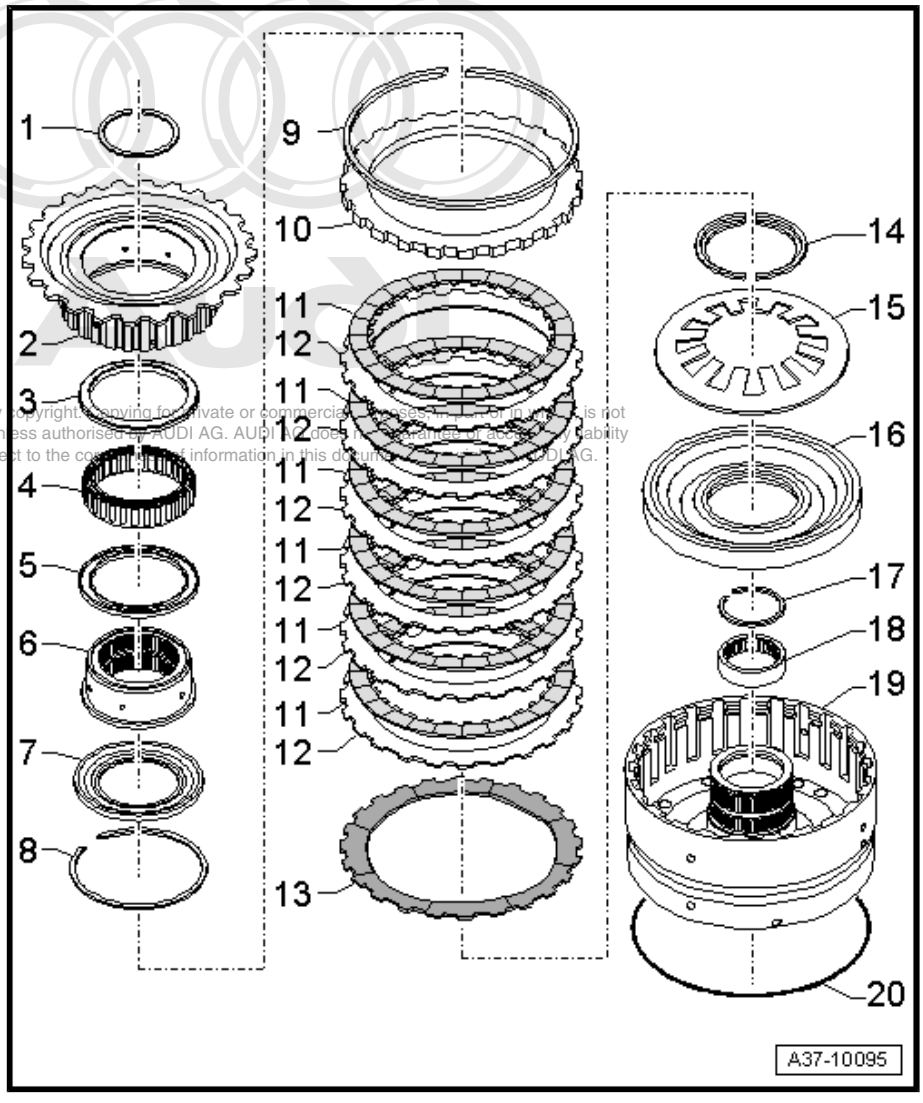
14 - Split retaining ring

- ❑ Shoulder faces dished spring

15 - Dished spring

16 - Piston „F“

- ❑ To gearbox No. 069 312: always replace piston „F“ (Part No. 0 501 208 317) with new type (Part No. 0 501 212 967)
- ❑ The part No. is marked on the rubberised piston end



17 - Circlip

18 - Needle bearing

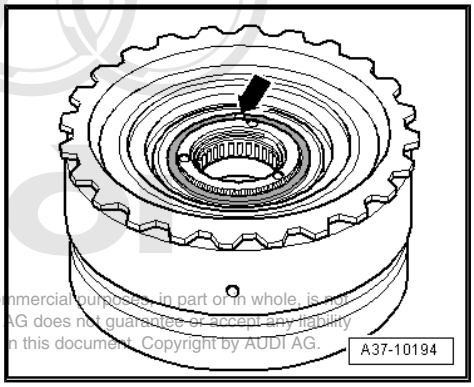
19 - Cylinder „F“

20 - O-ring

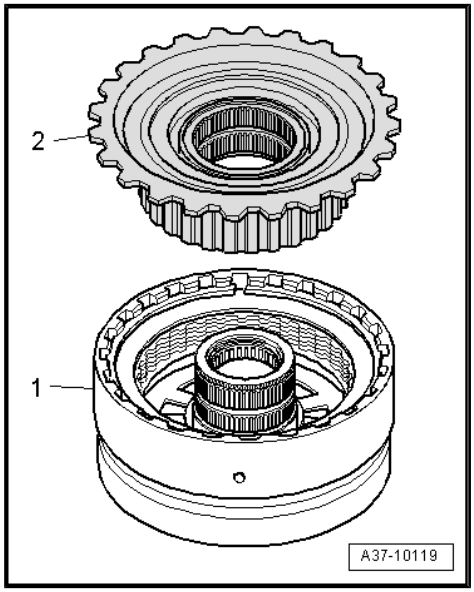
- ❑ Renew

4.2 Dismantling clutch „F“

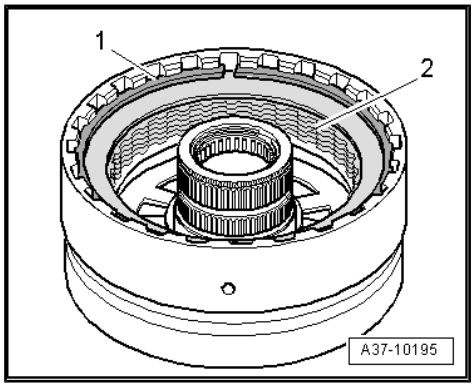
– Remove circlip -arrow-.



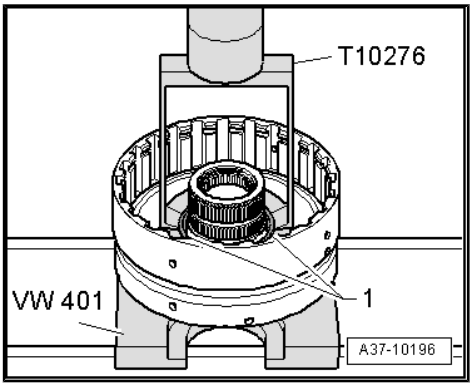
– Detach freewheel (1st gear) -item 2- from cylinder „F“ -item 1-.



– Detach circlip -1- and remove clutch pack -2- from cylinder „F“.



– Press dished spring down using workshop press with mounting bracket -T10276- .
– Detach split retaining ring -1- and release workshop press.

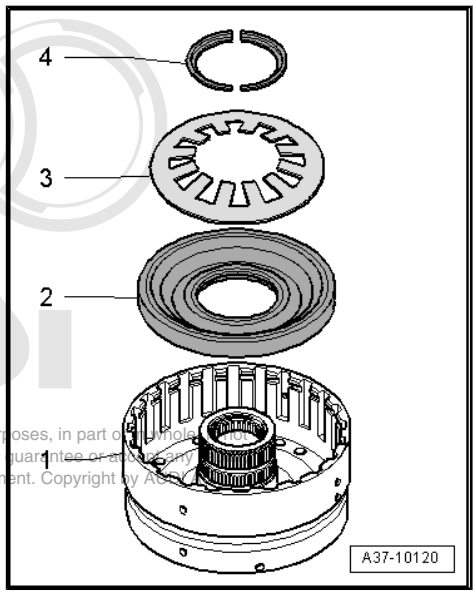


– Detach dished spring -3-.
– Pull piston „F“ -item 2- out of cylinder „F“ -item 1-.

4 - Split retaining ring

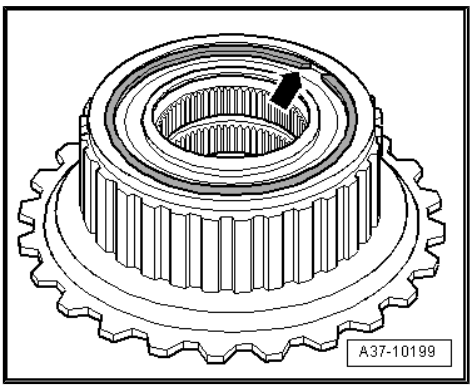
Note

If piston „F“ is difficult to pull out, use two plastic drifts to push out piston from the rear.

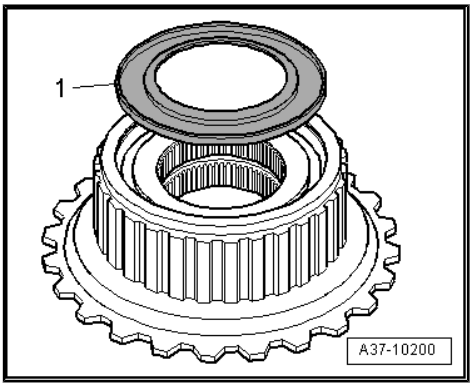


4.3 Dismantling freewheel

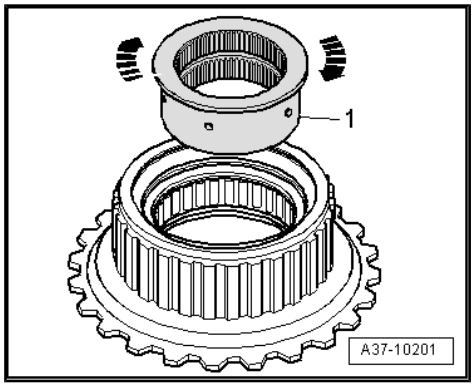
– Pry out circlip -arrow-.



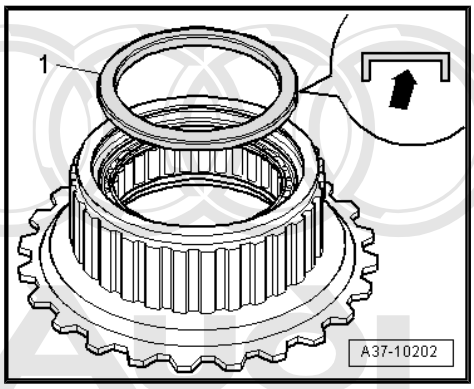
– Detach retaining plate -1-.



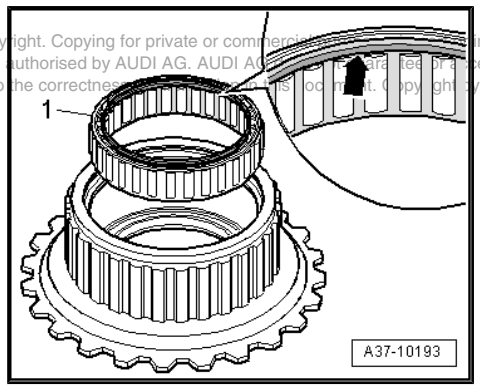
– Pull out freewheel inner race -1- (turn clockwise to facilitate removal).



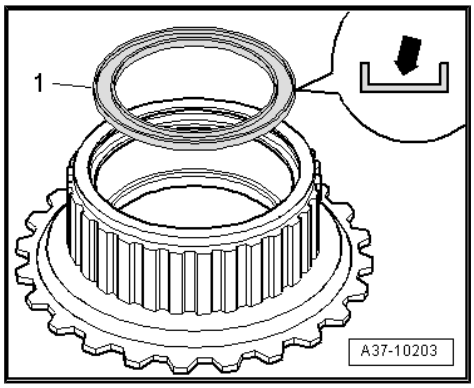
– Detach cover (top) -1-.



– Pull out freewheel cage -1-.



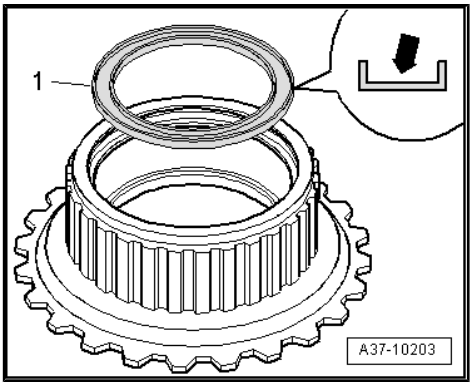
– Detach cover (bottom) -1-.



4.4 Assembling freewheel

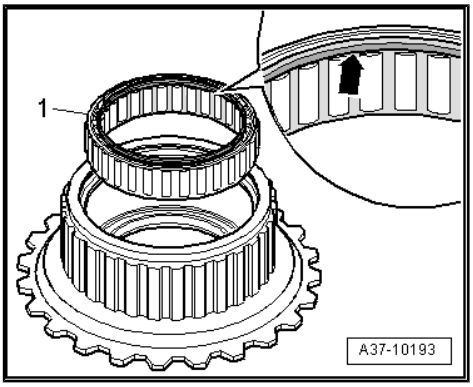
– Insert cover (bottom) -1-.

• Open side -arrow- faces upwards.



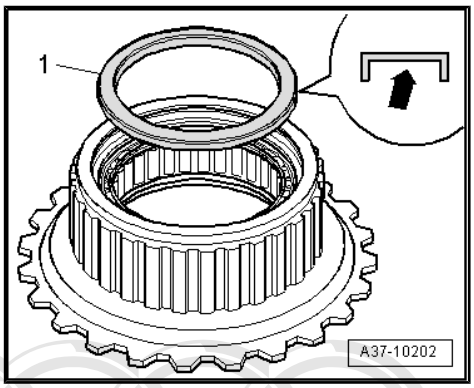
– Press in freewheel cage -1- (press together freewheel rollers slightly to facilitate assembly).

• Collar -arrow- on inside of cage faces upwards.



– Insert cover (top) -1-.

• Open side -arrow- faces downwards.

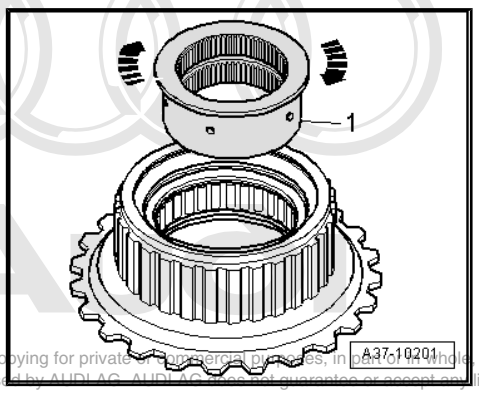


– Insert freewheel inner race -1- (turn clockwise to facilitate assembly).

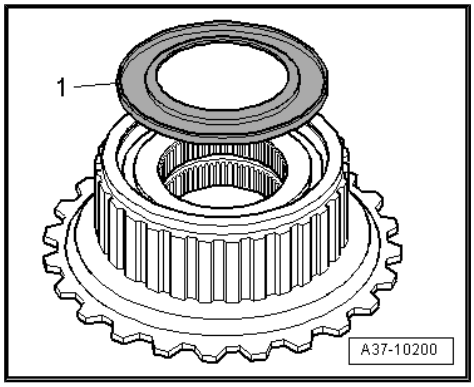
Caution

Checking installation position of freewheel.

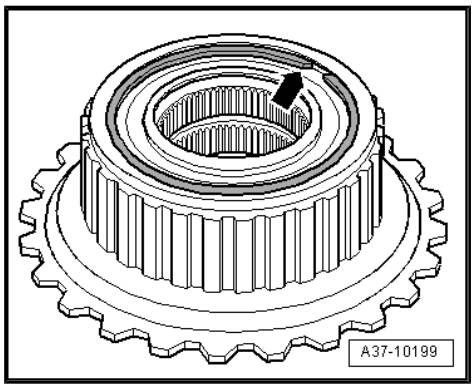
- *The inner race should turn in a clockwise direction and lock when turned anti-clockwise.*



– Fit retaining plate -1-.



– Fit circlip -arrow-.

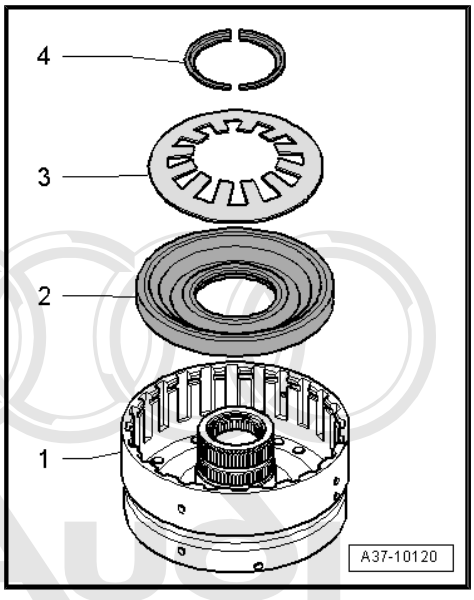


4.5 Assembling clutch „F“

Caution

Check the individual components of clutch „F“ for traces of wear and damage *⇒ „6.3 Clutch C with sun shaft“, page 160* *.*

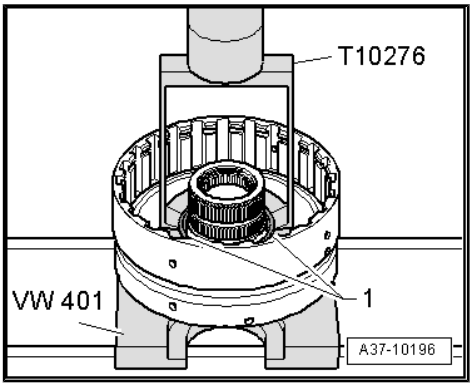
– To gearbox No. 069 312: always replace piston „F“ (part No. 0 501 208 317) with new type (part No. 0 501 212 967); the part No. is marked on the rubberised piston end.
– Insert piston „F“ -item 2- into cylinder „F“ -item 1-.
• Rubberised end faces downwards.
– Fit dished spring -3-.



– Press dished spring down using workshop press with mounting bracket -T10276- and fit split retaining ring.

• Collar of split retaining ring faces downwards.

– Release workshop press.

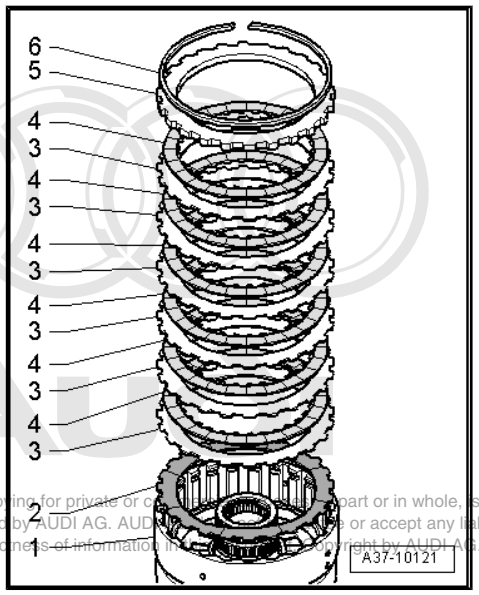


– Insert corrugated spring -2- into cylinder „F“ -item 1-.

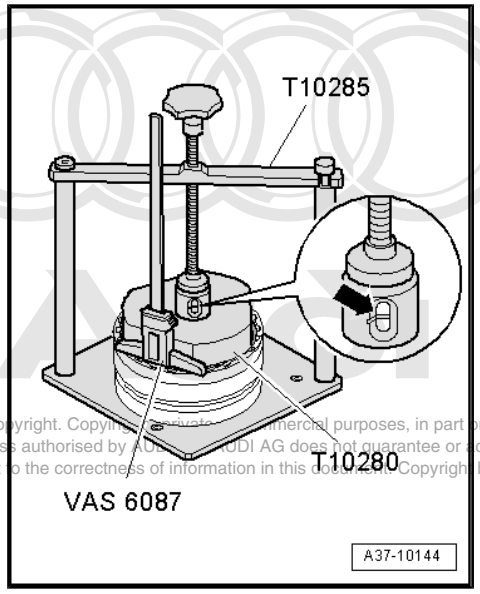
– Fit outer plates -3- and friction plates -4- alternately.

– Insert thick outer plate -5-.

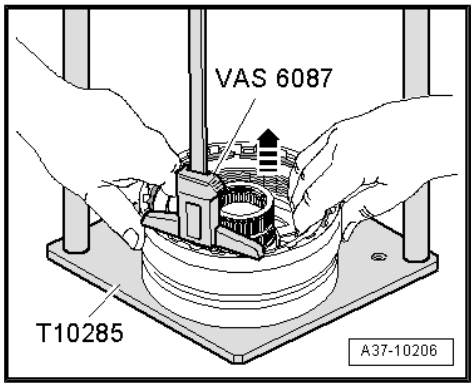
– Insert circlip -6-.



Adjusting clearance of clutch „F“



– Position cylinder „F“ onto compressor tool -T10285- .
– Position holding plate -T10280- onto outer plate of clutch „F“.
• Avoid any contact between holding plate and circlip.
– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.
– Bring cylinder „F“ into correct position on holding plate of compressor tool.
• Thrust piece must be positioned centrally below thrust plate of spindle.
– Turn spindle of compressor tool downwards.
• The markings on the inspection hole of the thrust piece must align -arrow-.
– Position digital depth gauge -VAS 6087- at upper end of cylinder „F“ as shown in illustration.
– Bring measuring tip into contact with outer plate and note value obtained.
– Mark contact point on cylinder „F“.
– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.
– Determine average value from the three measurements under load.
– Release spindle and remove holding plate.



– Use both hands to pull clutch pack upwards as far as stop in clutch „F“.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „F“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

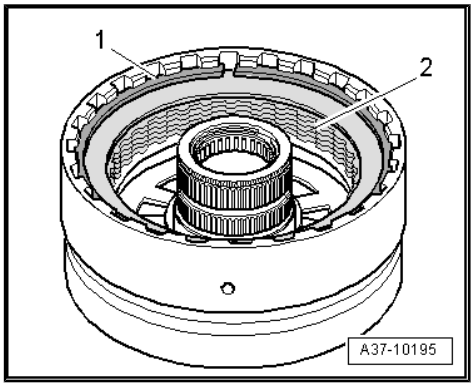
– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance of clutch „F“:

• Specification: 2.40 ... 2.90 mm

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

The following circlips are available:

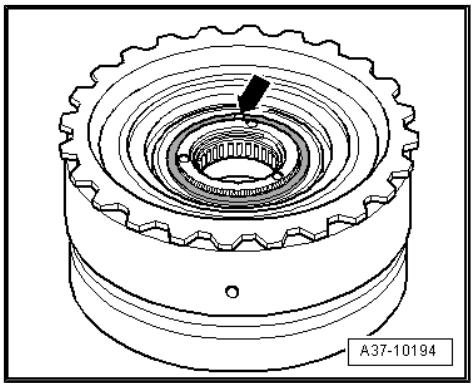
Circlips available (in mm):	
2.6	3.4
3.0	3.8

– Check clearance again after inserting circlip.

– Insert freewheel (1st gear) -item 2- into clutch „F“ -item 1- (turn in clockwise direction to facilitate assembly).

- The set of plates for clutch „F“ have meshed properly if the groove accommodating the circlip is visible.

– Insert circlip -arrow-.

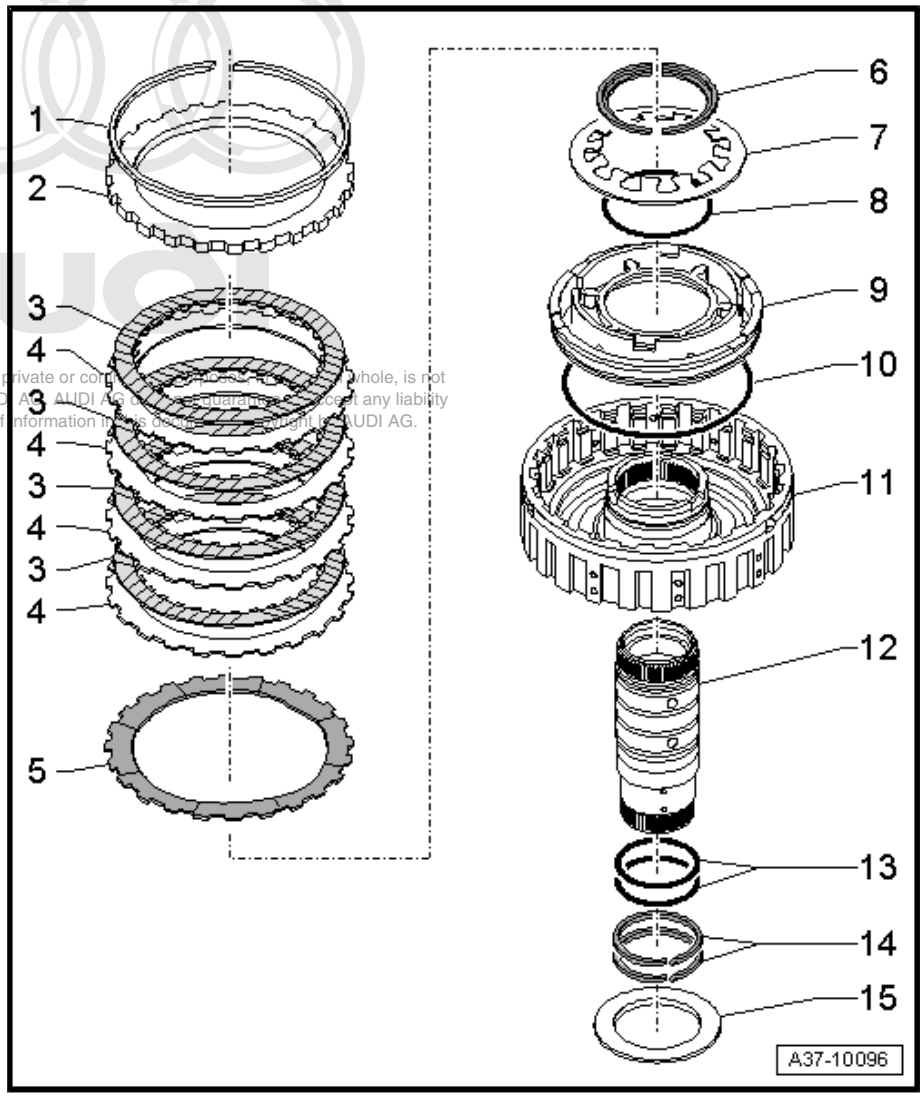


5 Dismantling and assembling body „I“

5.1 Clutch „C“ with sun shaft - exploded view of components

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of clutch „C“ for traces of wear and damage ⇒ „6.3 Clutch C with sun shaft“, page 160 .*



1 - Circlip

- ❑ Determining thickness ⇒ page 54

2 - Thick outer plate

3 - Friction plate

4 - Outer plate

5 - Corrugated spring

Corrugated springs of different thicknesses are installed depending on the version. If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

For gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM:

- ❑ Thickness of corrugated spring: 1.15 mm

For gearboxes with code letters ECF, ECX, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

- ❑ Thickness of corrugated spring: 0.79 mm

6 - Split retaining ring

- ❑ Shoulder faces dished spring

7 - Dished spring

8 - O-ring

- ❑ Renew

9 - Piston„C“

10 - O-ring

- ❑ Renew

11 - Cylinder „C“

12 - Sun shaft

13 - O-rings

- ❑ Renew

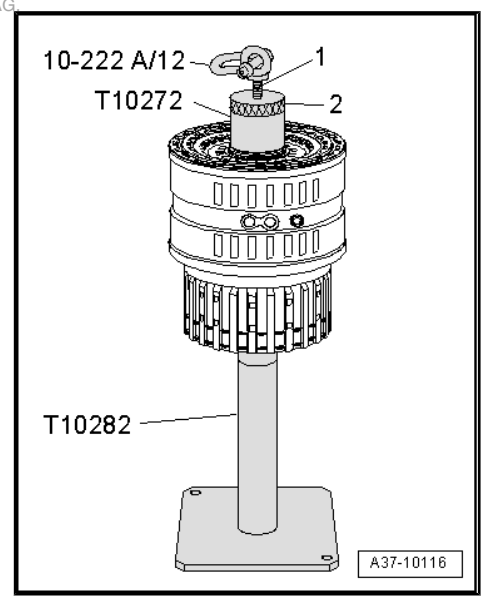
14 - Rectangular section seals

- ❑ Renew

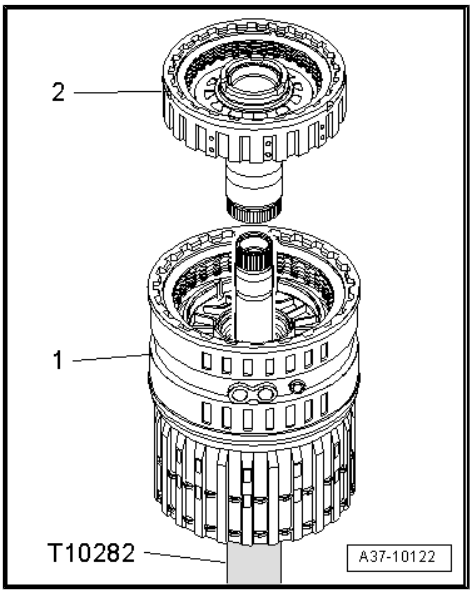
15 - Axial needle bearing

5.2 Dismantling and assembling clutch „C“ with sun shaft

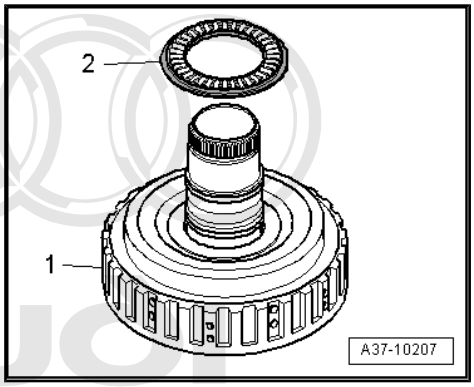
– Detach lifting tool for body I -T10272- from body „I“.



– Detach clutch „C“ -item 2- with sun shaft from cylinder „D/E“ -item 1-.



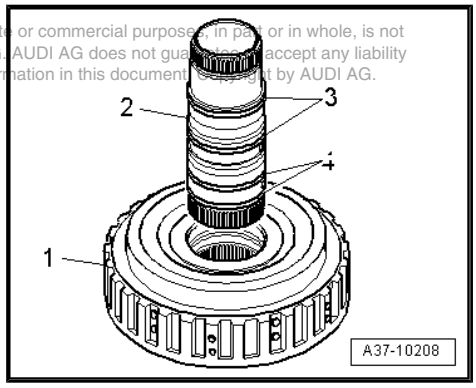
– Turn clutch „C“ upside down.
– Detach axial needle bearing -2- from clutch „C“ -item 1-.



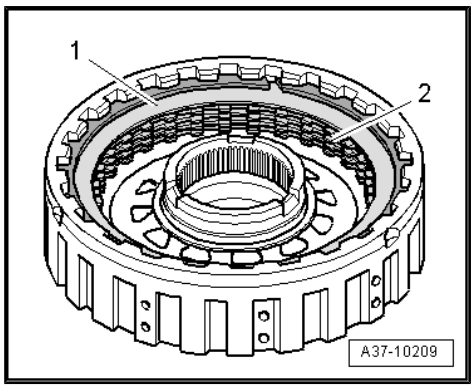
– Pull out sun shaft -2- from clutch „C“ -item 1- (drive out with plastic drift if necessary).

Note

-Item 3- and -item 4- can be disregarded.



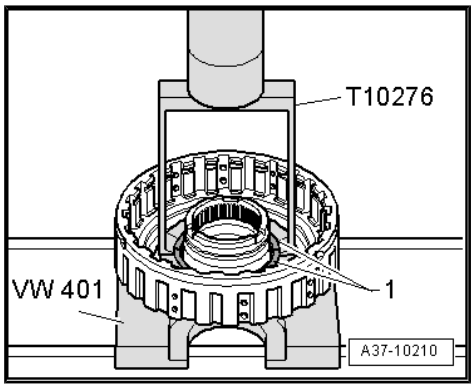
– Turn clutch „C“ upside down.
– Remove circlip -1- and remove clutch pack -2- from cylinder „C“.



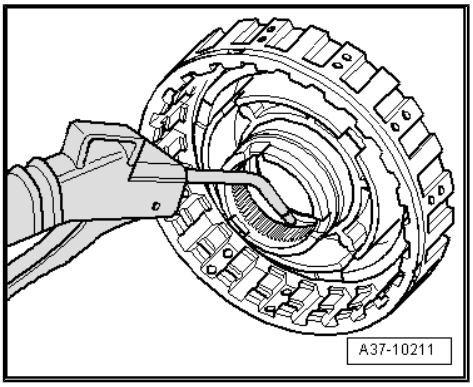
– Press dished spring down using workshop press with mounting bracket -T10276- .
– Detach split retaining ring -1- and release workshop press.
– Remove dished spring.

WARNING

Wear safety goggles.



– Carefully press out piston „C“ from cylinder „C“ by applying compressed air (cover remaining two oil drillings with your fingers).

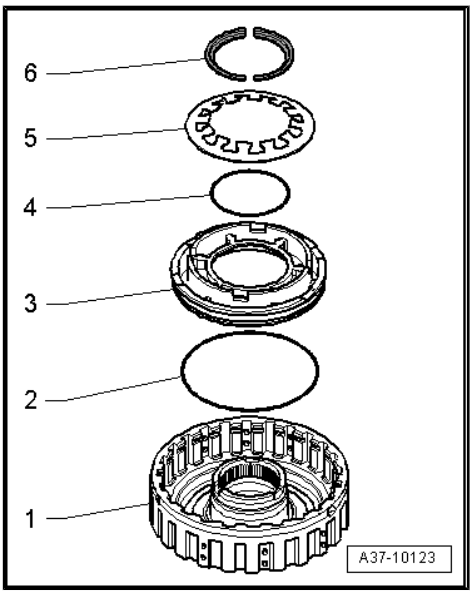


Caution

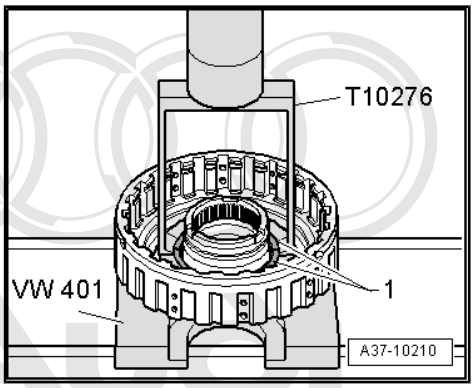
Check the individual components of clutch „C“ for traces of wear and damage ⇒ „6.3 Clutch C with sun shaft“, page 160 .

– Renew O-rings -2- and -4- for piston „C“ -item 3-.
– Insert piston „C“ -item 3- into cylinder „C“ -item 1- as far as stop.
– Fit dished spring -5-.

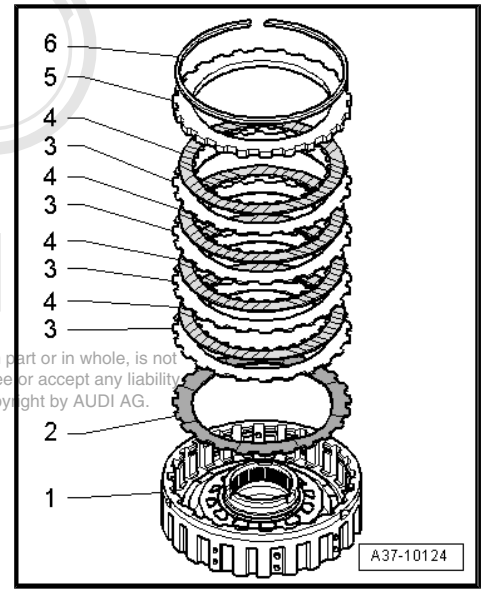
6 - Split retaining ring



– Press dished spring down using workshop press with mounting bracket -T10276- .
– Insert split retaining ring -1-.
• Collar of split retaining ring faces downwards.
– Release workshop press.

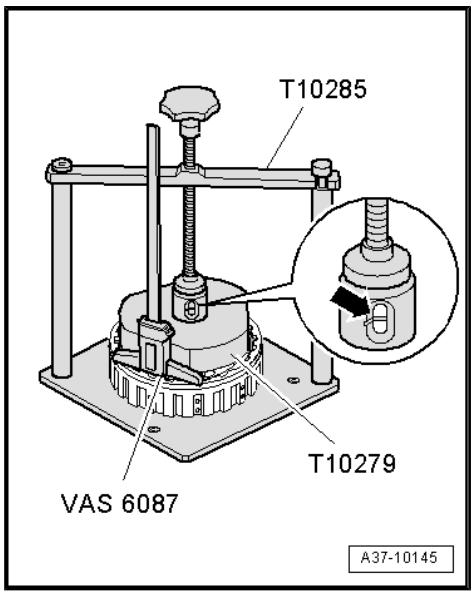


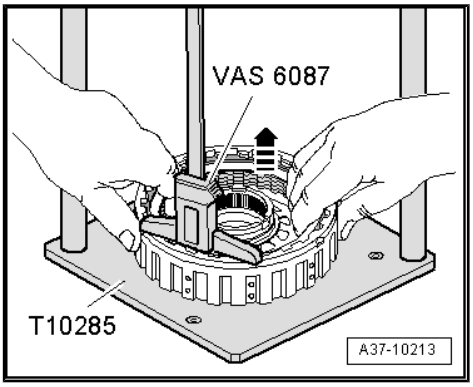
– Insert corrugated spring -2- into cylinder „C“ -item 1-.
– Fit outer plates -3- and friction plates -4- alternately.
– Insert thick outer plate -5-.
– Insert circlip -6-.



Adjusting clearance of clutch „C“

– Fit cylinder „C“ onto compressor tool -T10285- .
– Position holding plate -T10279- onto outer plate of clutch „C“.
• Avoid any contact between holding plate and circlip.
– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.
– Bring cylinder „C“ into correct position on holding plate of compressor tool.
• Thrust piece must be positioned centrally below thrust plate of spindle.
– Turn spindle of compressor tool downwards.
• The markings on the inspection hole of the thrust piece must align -arrow-.
– Position digital depth gauge -VAS 6087- at upper end of cylinder „C“ as shown in illustration.
– Bring measuring tip into contact with outer plate and note value obtained.
– Mark contact point on cylinder „C“.
– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.
– Determine average value from the three measurements under load.
– Release spindle and remove holding plate.





– Use both hands to pull clutch pack upwards as far as possible in clutch „C“.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „C“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance of clutch „C“ on gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM:

Thickness of corrugated spring: 1.15 mm

- Specification: 1.35 ... 1.65 mm

Clearance of clutch „C“ on gearboxes with code letters ECF, ECX, ECY, ECZ, EDG, ECF, EFN, ESX, FBC, FBE, FBF, FBH, EYL, FBJ, FGS, FBD, FBG, FUL, FUM, FUN, FUU, GAG:

Thickness of corrugated spring: 0.79 mm

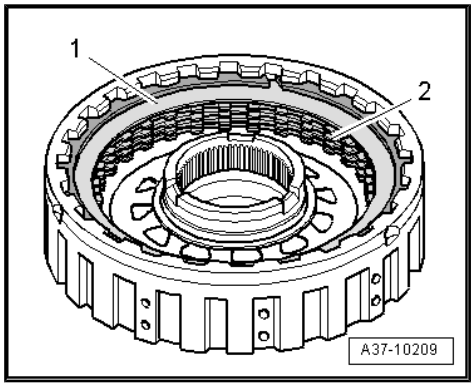
- Specification: 1.35 ... 1.65 mm

Note

The thicknesses of the corrugated springs of clutch „C“ are different for the gearbox code letters listed above. Note correct assignment ⇒ Item 5 (page 50) . If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

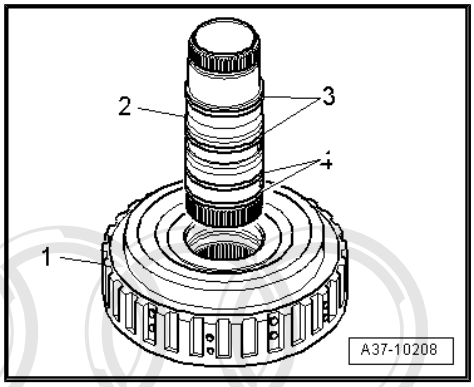
The following circlips are available:

Circlips available (in mm):		
2.2	2.8	3.4
2.4	3.0	
2.6	3.2	

– Check clearance again after inserting circlip.

– Renew rectangular section seals -3- and O-rings -4- on sun shaft.

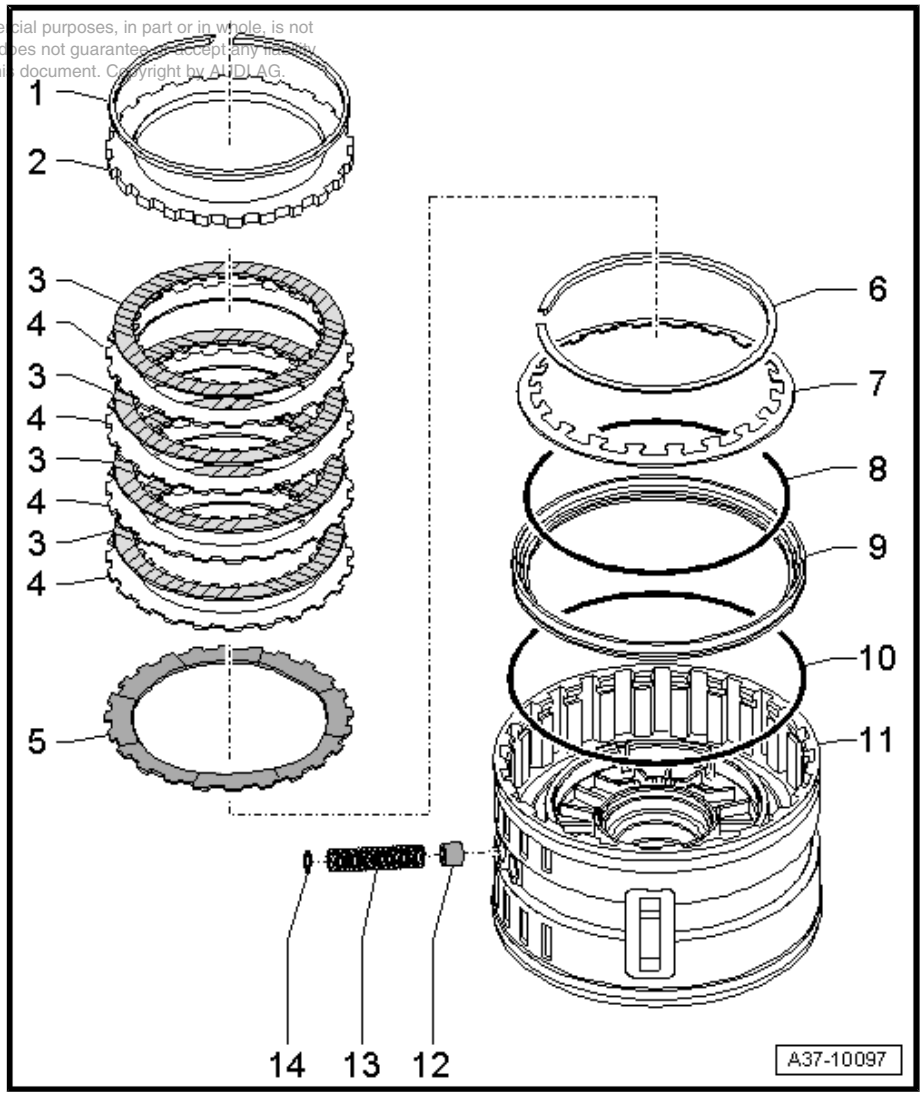
– Press in sun shaft -2- into clutch „C“ -item 1- as far as stop.



5.3 Clutch „D“ - exploded view of components

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of clutch „D“ for traces of wear and damage ⇒ „6.4 Clutch D “, page 163 .*
- *The gearbox in the Audi RS 6 is fitted with an uprated clutch „D“ with 5 pairs of plates instead of 4. For correct version refer to ⇒ Parts catalogue .*



1 - Circlip

- ❑ Determining thickness ⇒ page 63

2 - Thick outer plate

3 - Friction plate

- ❑ 3, 4 or 5 friction plates fitted, depending on version

4 - Outer plate

- ❑ 3, 4 or 5 outer plates fitted, depending on version

5 - Corrugated spring

Corrugated springs of different thicknesses are installed depending on the version. If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

For gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:

- ❑ Thickness of corrugated spring: 0.9 mm

For gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

- ❑ Thickness of corrugated spring: 0.8 mm

6 - Circlip

- ❑ Shoulder faces dished spring

7 - Dished spring

8 - O-ring

- ❑ Renew

9 - Piston

10 - O-ring

- ❑ Renew

11 - Cylinder „D/E“

- ❑ Different versions possible

12 - Sleeve

- ❑ Renew

13 - Coil spring

14 - Circlip

5.4 Clutch „E“ - exploded view of components

Note

- ♦ *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- ♦ *Check the individual components of clutch „E“ for traces of wear and damage* *⇒ „6.5 Clutch E “, page 165* .

1 - Bearing bush

2 - O-rings

- ❑ Renew

3 - Cylinder „D/E“

4 - O-ring

- ❑ Renew

5 - Piston „E“

6 - O-ring

- ❑ Renew

7 - Dished spring

8 - Split retaining ring

- ❑ Shoulder faces dished spring

9 - Corrugated spring

Corrugated springs of different thicknesses are installed depending on the version. If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

10 - Outer plate

- ❑ 4, 5 or 6 outer plates fitted, depending on version

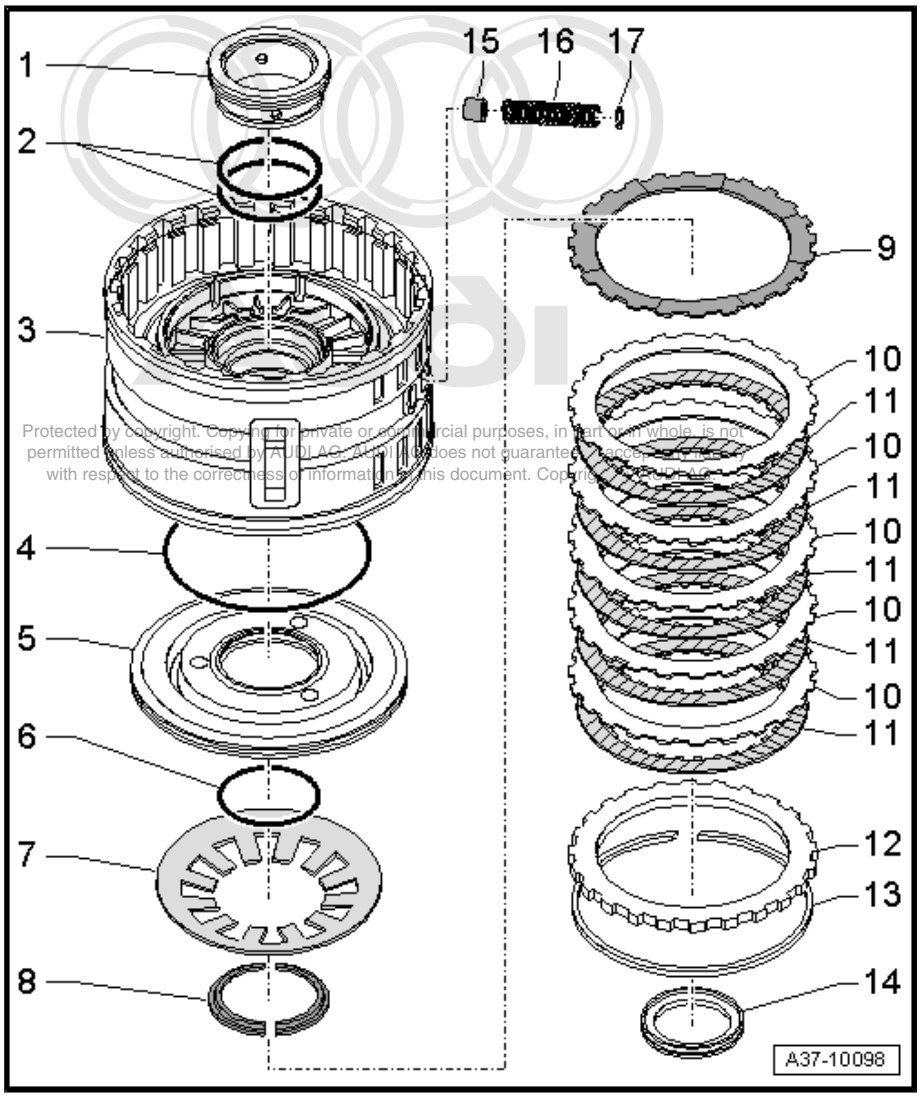
11 - Friction plate

- ❑ 4, 5 or 6 friction plates fitted, depending on version

12 - Thick outer plate

13 - Circlip

- ❑ Determining thickness ⇒ page 66



14 - Axial needle bearing

15 - Sleeve

- ❑ Renew

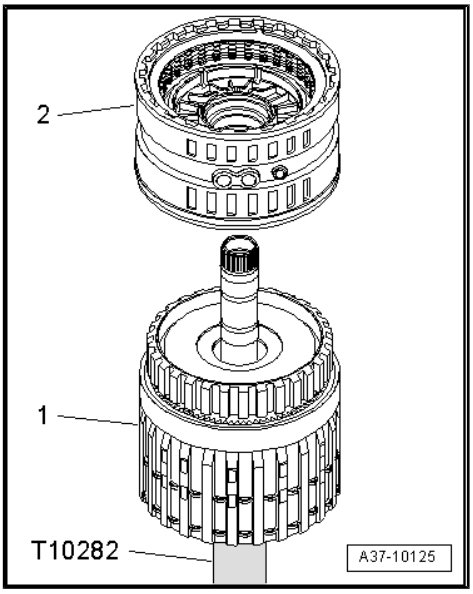
16 - Coil spring

17 - Circlip

5.5 Dismantling and assembling clutch „D/E“

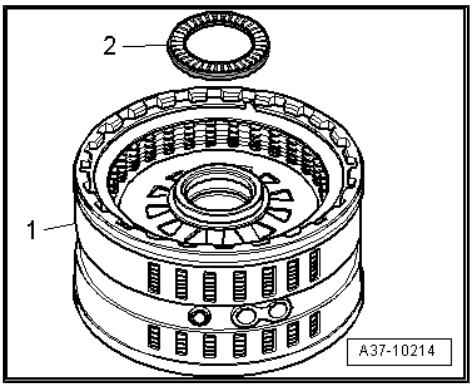
Dismantling clutch „E“

– Remove cylinder „D/E“ -item 2- from planetary drive -1-.

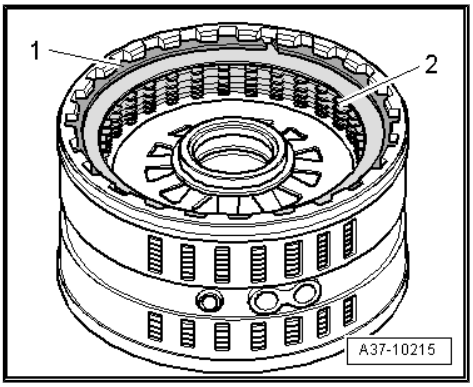


– Turn cylinder „D/E“ -item 1- upside down.

– Detach axial needle bearing -2- from clutch „E“.



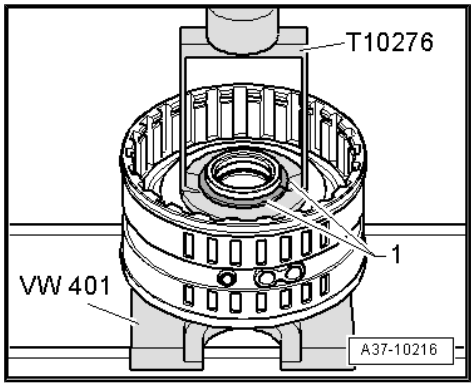
– Detach circlip -1- and remove clutch pack -2- from cylinder „E“.



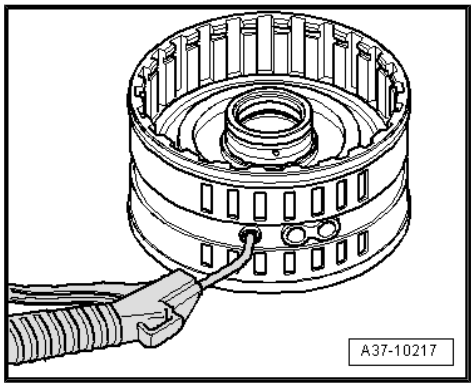
– Press dished spring down using workshop press with mounting bracket -T10276- .
– Detach split retaining ring -1- and release workshop press.
– Remove dished spring.

WARNING

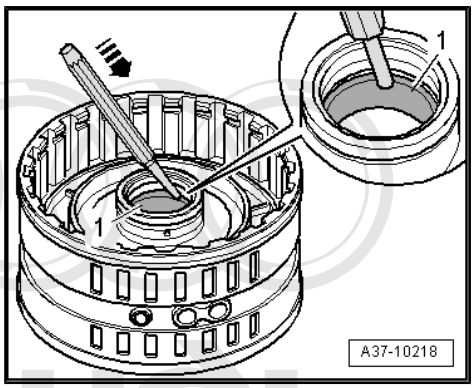
Wear safety goggles.



– Carefully press piston „E“ out of cylinder „E“ by applying compressed air.

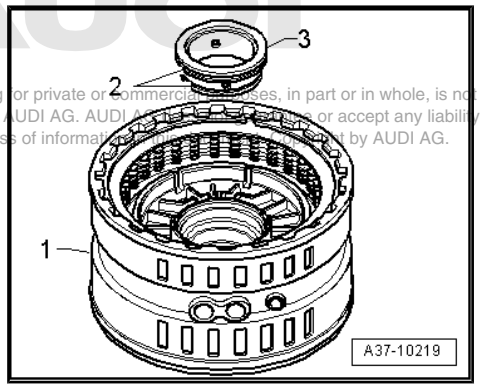


– Carefully drive out bearing bush from cylinder „D/E“ by applying careful knocks all the way round.

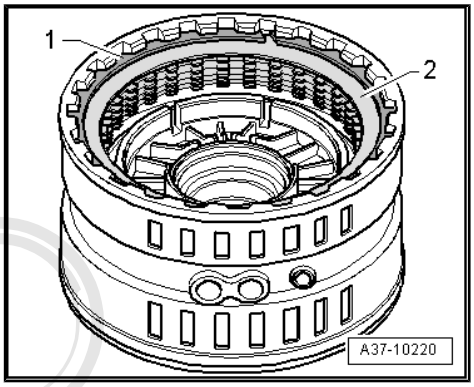


Dismantling clutch „D“

– Turn cylinder „D/E“ -item 1- upside down.
– Remove bearing bush -3- from cylinder „D/E“.



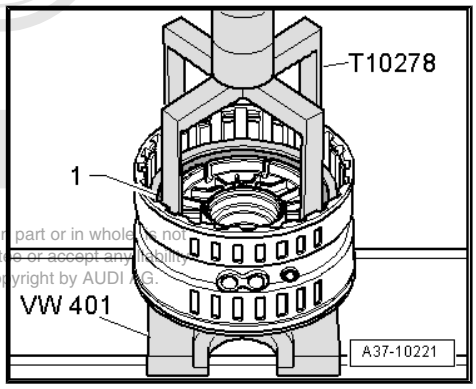
– Detach circlip -1- and remove clutch pack -2- from cylinder „D“.



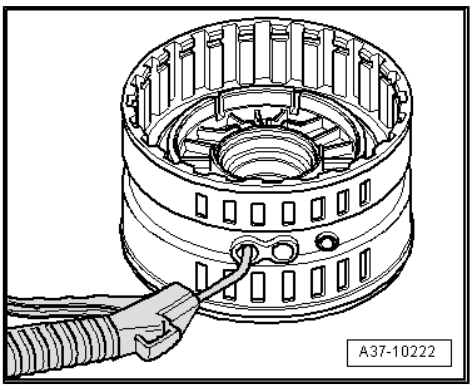
– Press dished spring down using workshop press with mounting bracket -T10278- .
– Detach circlip -1- and release workshop press.
– Remove dished spring.

WARNING

Wear safety goggles.



– Carefully press piston „D“ out of cylinder „D“ by applying compressed air.

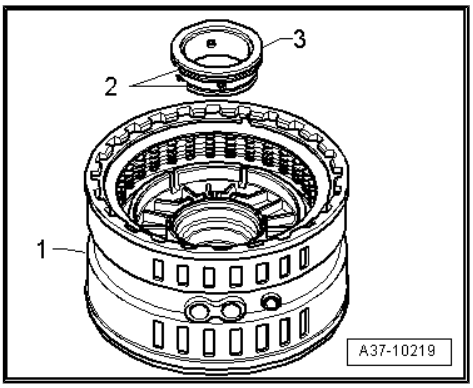


Assembling clutch „D“

Caution

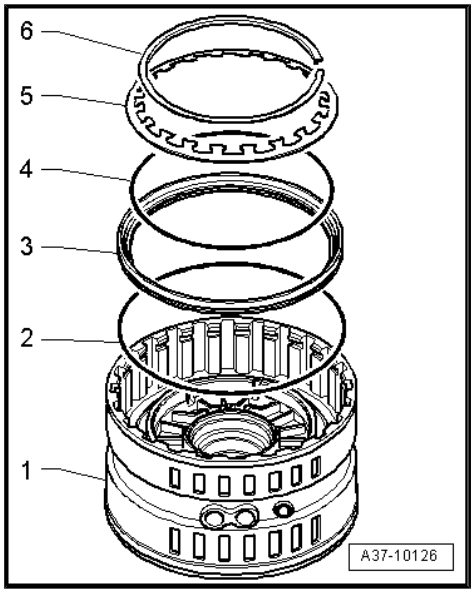
Check the individual components of clutch „D“ for traces of wear and damage ***⇒ „6.4 Clutch D “, page 163*** ***.***

– Renew O-rings -2- on bearing bush -3-.
– Press bearing bush -3- into cylinder „D/E“ -item 1-.

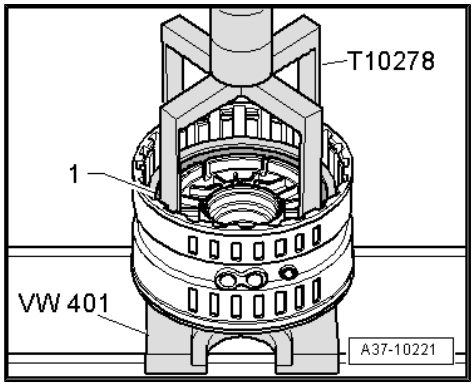


– Renew O-rings -2- and -4- for piston „D“ -item 3-.
– Insert piston „D“ -item 3- into cylinder „D“ -item 1- as far as stop.
– Fit dished spring -5-.

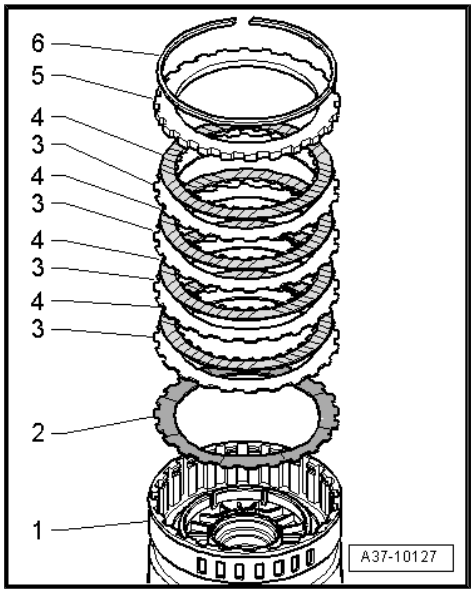
6 - Circlip



– Press dished spring down using workshop press with mounting bracket -T10278- .
– Insert circlip -1-.
• Inside collar of circlip faces downwards.
– Make sure that circlip locates securely in groove of cylinder „D/E“; drive circlip into groove all round using screwdriver if necessary.
– Release workshop press.



– Insert corrugated spring -2- into cylinder „D“ -item 1-.
– Alternately insert outer plates -3- and friction plates -4- (fitted with 3, 4 or 5 outer plates and friction plates depending on type of gearbox).
– Insert thick outer plate -5-.
– Insert circlip -6-.



Adjusting clearance of clutch „D“

– Fit cylinder „D/E“ onto compressor tool -T10285- .

• Clutch „D“ faces upwards.

– Position holding plate -T10281- onto outer plate of clutch „D“.

• Avoid any contact between holding plate and circlip.

– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.

– Bring cylinder „D/E“ into correct position on holding plate of compressor tool.

• Thrust piece must be positioned centrally below thrust plate of spindle.

– Turn spindle of compressor tool downwards.

• The markings on the inspection hole of the thrust piece must align -arrow-.

– Position digital depth gauge -VAS 6087- at upper end of cylinder „D/E“ as shown in illustration.

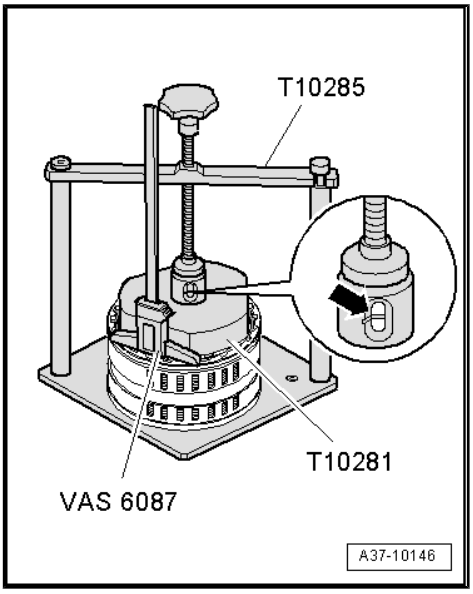
– Bring measuring tip into contact with outer plate and note value obtained.

– Mark contact point on cylinder „D/E“.

– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.

– Determine average value from the three measurements under load.

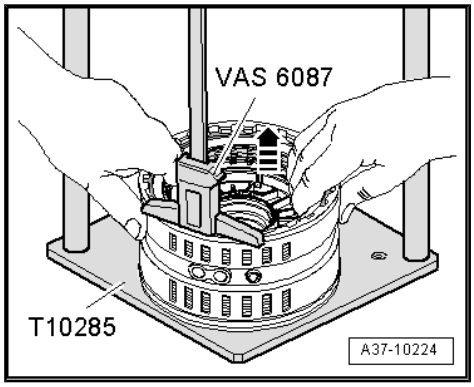
– Release spindle and remove holding plate.



– Use both hands to pull clutch pack upwards in clutch „D“ as far as stop.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „D/E“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.



Clearance of clutch „D“ on gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:

Thickness of corrugated spring: 0.9 mm

- If fitted with 3 friction plates: 1.05 … 1.35 mm
- If fitted with 4 friction plates: 1.35 … 1.65 mm
- If fitted with 5 friction plates: 1.65 … 1.95 mm

Clearance of clutch „D“ on gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU and GAG:

Thickness of corrugated spring: 0.8 mm

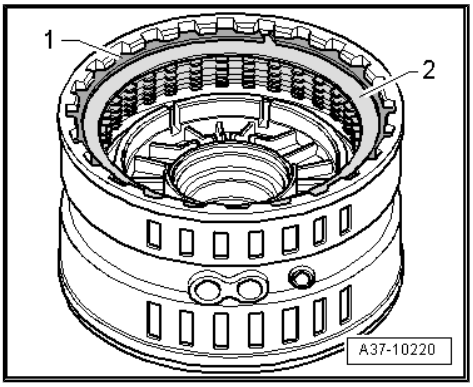
- If fitted with 3 friction plates: 1.30 … 1.60 mm
- If fitted with 4 friction plates: 1.55 … 1.85 mm
- If fitted with 5 friction plates: 1.93 … 2.22 mm

Note

The thicknesses of the corrugated springs of clutch „D“ are different for the gearbox code letters listed above. Note correct assignment ⇒ Item 5 (page 57) . If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

The following circlips are available:

Circlips available (in mm):		
2.4	3.2	4.0
2.6	3.4	4.2
2.8	3.6	
3.0	3.8	

– Check clearance again after inserting circlip.

Assembling clutch „E“

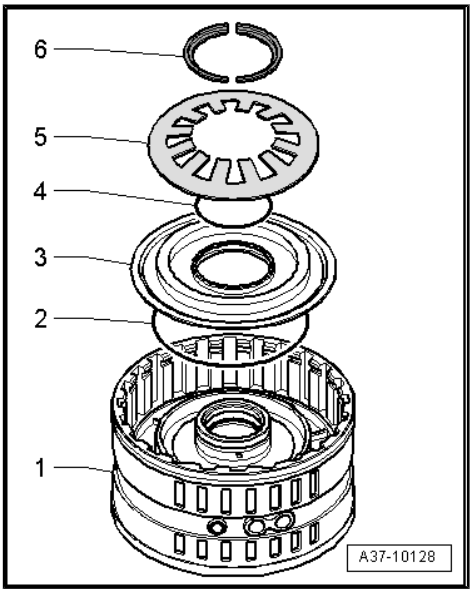
Caution

Check the individual components of clutch „E“ for traces of wear and damage ⇒ „6.3 Clutch C with sun shaft“, page 160 .

– Turn cylinder „D/E“ upside down.
- Clutch „E“ faces upwards.

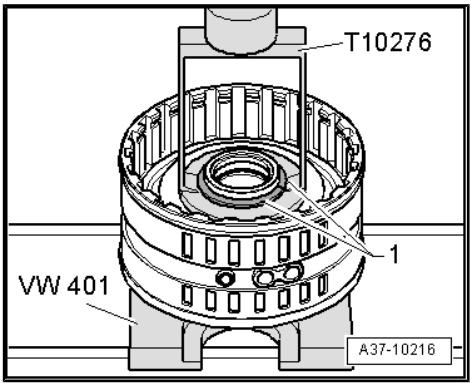
– Insert O-ring -2- into cylinder „E“ -item 1-.
– Insert O-ring -4- into piston „E“ -item 3-.
– Insert piston „E“ into cylinder „E“.
– Fit dished spring -5-.

6 - Split retaining ring

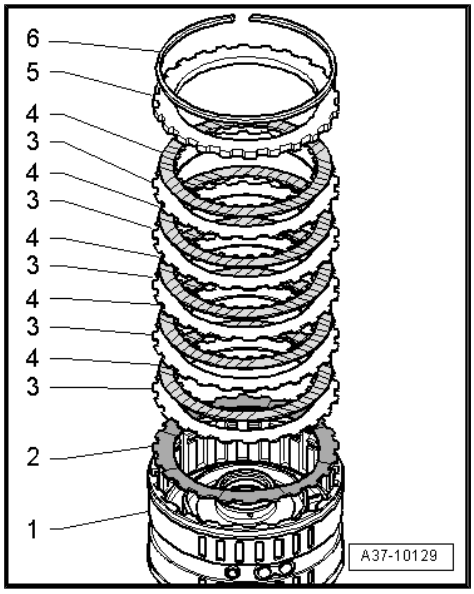


– Press dished spring down using workshop press with mounting bracket -T10276- .
– Insert split retaining ring -1-.
- Inside collar of split retaining ring faces downwards.

– Release workshop press.

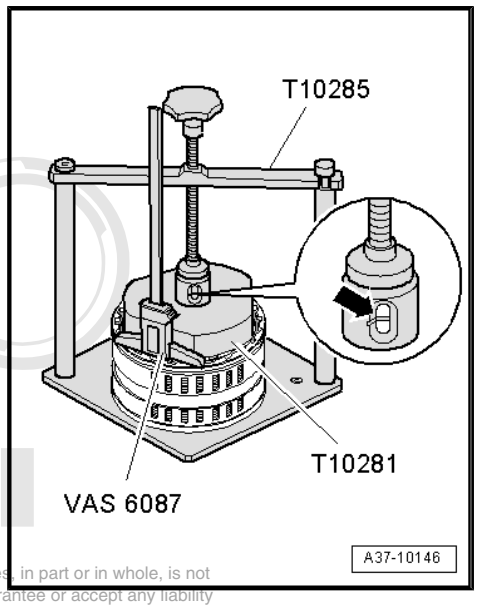


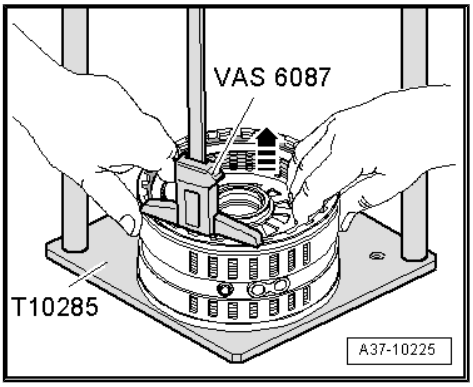
– Insert corrugated spring -2-.
– Alternately insert outer plates -3- and friction plates -4- (fitted with 4 or 5 outer plates and friction plates depending on type of gearbox).
– Insert thick outer plate -5-.
– Insert circlip -6-.



Adjusting clearance of clutch „E“

– Fit cylinder „D/E“ onto compressor tool -T10285- .
• Clutch „E“ faces upwards.
– Position holding plate -T10281- onto outer plate of clutch „E“.
• Avoid any contact between holding plate and circlip.
– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.
– Bring cylinder „D/E“ into correct position on holding plate of compressor tool.
• Thrust piece must be positioned centrally below thrust plate of spindle.
– Turn spindle of compressor tool downwards.
• The markings on the inspection hole of the thrust piece must align -arrow-.
– Position digital depth gauge -VAS 6087- at upper end of cylinder „D/E“ as shown in illustration.
– Bring measuring tip into contact with outer plate and note value obtained.
– Mark contact point on cylinder „D/E“.
– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.
– Determine average value from the three measurements under load.
– Release spindle and remove holding plate.





– Use both hands to pull clutch pack upwards in clutch „E“ as far as stop.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „D/E“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance of clutch „E“ on gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM:

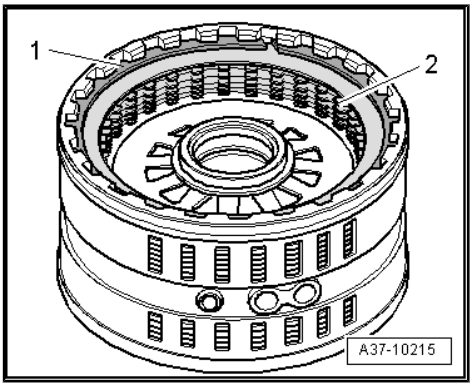
- If fitted with 4 friction plates: 1.10 … 1.40 mm
- If fitted with 5 friction plates: 1.40 … 1.70 mm
- If fitted with 6 friction plates: 1.70 … 2.00 mm

Clearance of clutch „E“ on gearboxes with code letters ECF, ECX, ECY, ECZ, EDG, ECF, EFN, ESX, FBC, FBE, FBF, FBH, EYL, FBJ, FGS, FBD, FBG, FUL, FUM, FUN, FUU, GAG:

- If fitted with 4 friction plates: 1.50 … 1.80 mm
- If fitted with 5 friction plates: 1.80 … 2.10 mm

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

The following circlips are available:

Circlips available (in mm):		
2.2	2.8	3.4
2.4	3.0	3.6
2.6	3.2	3.8

5.6 Planetary drive - exploded view of components

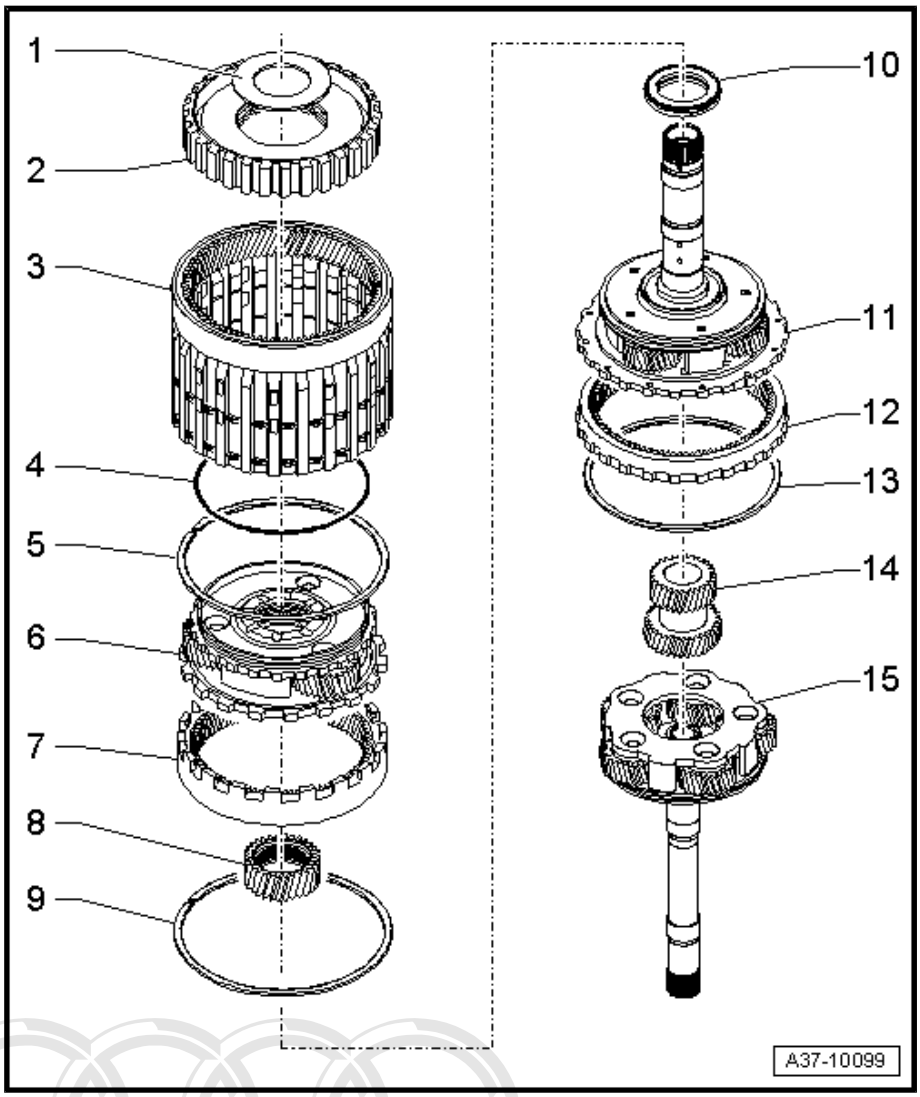
Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .

1 - Thrust washer
2 - Plate carrier „E“
3 - Annulus „I“
4 - O-ring
- ❑ Renew

5 - Circlip
- ❑ Renew

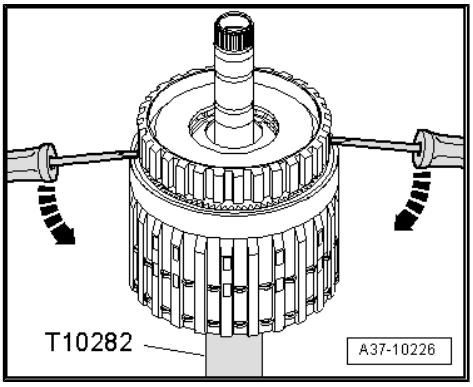
6 - Planet carrier „I“
7 - Annulus -II-
8 - Sun gear 1
9 - Circlip
10 - Axial needle bearing
11 - Planet carrier „II“
12 - Annulus „III“
13 - Circlip
14 - Sun gear 2 and 3
15 - Planet carrier „III“



5.7 Dismantling and assembling planetary drive

Dismantling

– Lever off plate carrier „E“ from planetary drive using two screwdrivers.

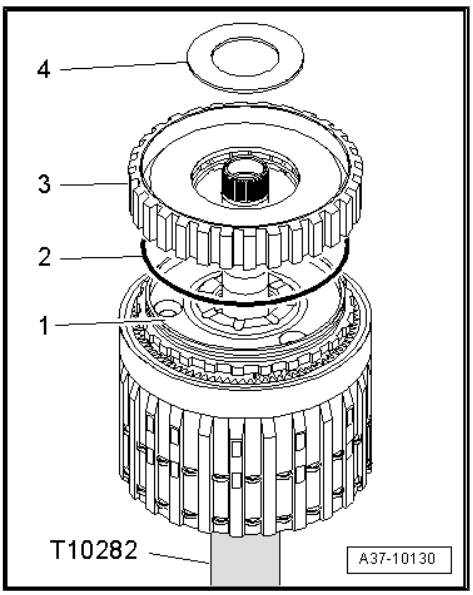


Note

Make sure screwdrivers are applied only at rim of plate carrier „E“; do not insert any further.

– Remove plate carrier „E“ -item 3- and pull thrust washer -4- out of plate carrier „E“.

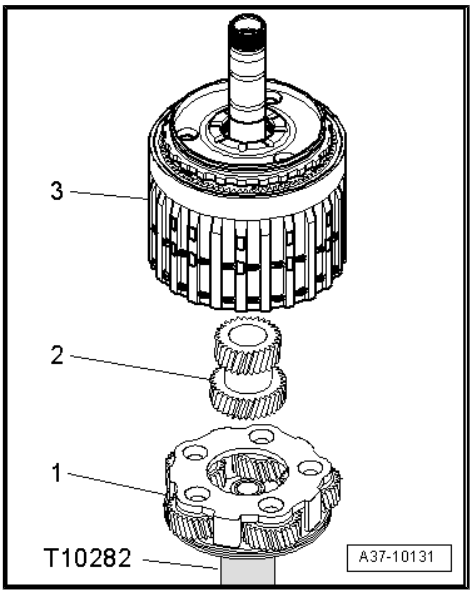
– Remove O-ring -2- from planet carrier „I“ -item 1-.



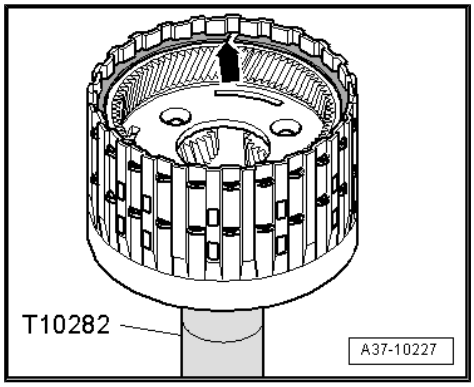
– Lift planetary drive „I“ + „II“ -item 3- off planet carrier „III“ -item 1-.

– Remove sun gear -2-.

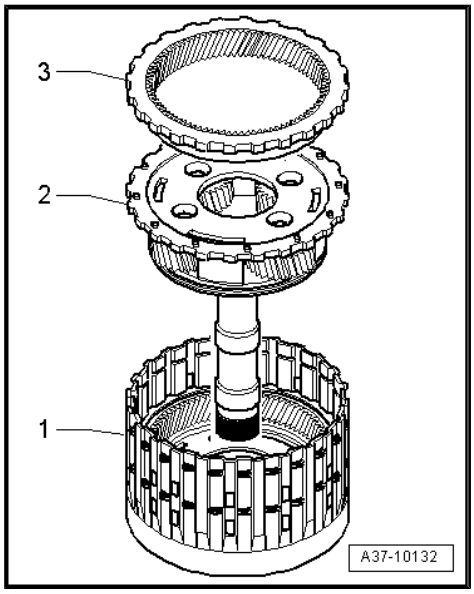
– Remove planet carrier „III“ from support element -T10282- .



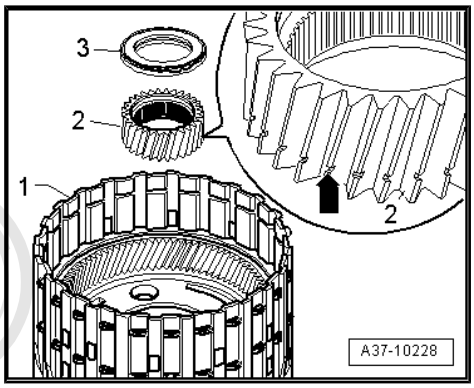
– Turn planetary drive „I“ + „II“ upside down and position in support element -T10282- .
– Remove circlip -arrow-.



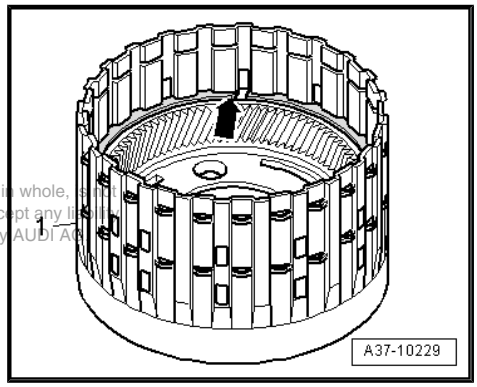
– Remove annulus „III“ -item 3- and planet carrier „II“ -item 2- from annulus „I“ -item 1-.



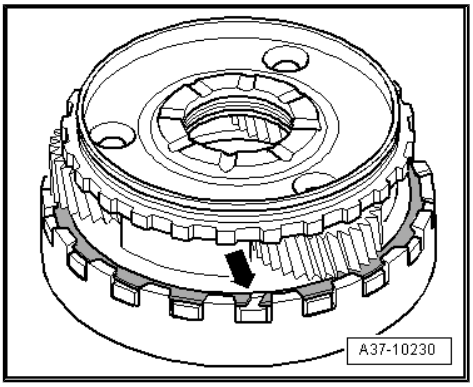
– Remove axial needle bearing -3- and sun gear -2- from annulus „I“ -item 1-.



– Detach circlip -arrow- (hold annulus „I“ -item 1- while removing circlip and then lower it over support element -T10282- without letting it drop).

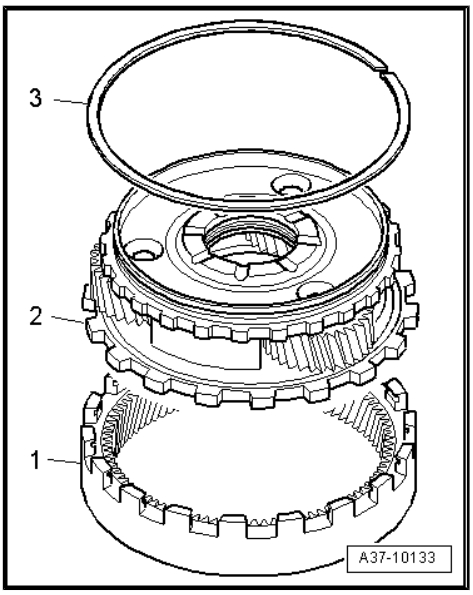


– Turn planet carrier „I“ upside down and place onto workbench.
– Remove circlip -arrow- and detach annulus „II“ from planet carrier „I“.

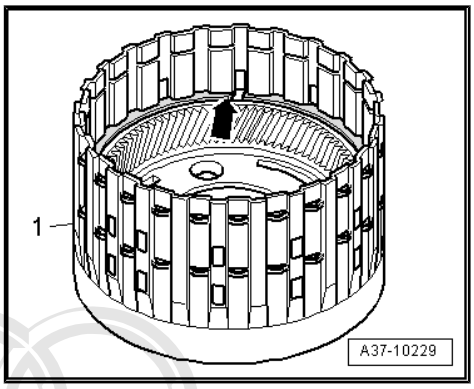


Assembling

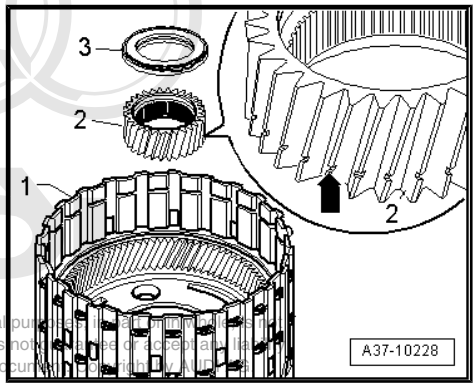
– Insert planet carrier „I“ -item 2- into annulus „II“ -item 1-.
– Install new circlip -3-.



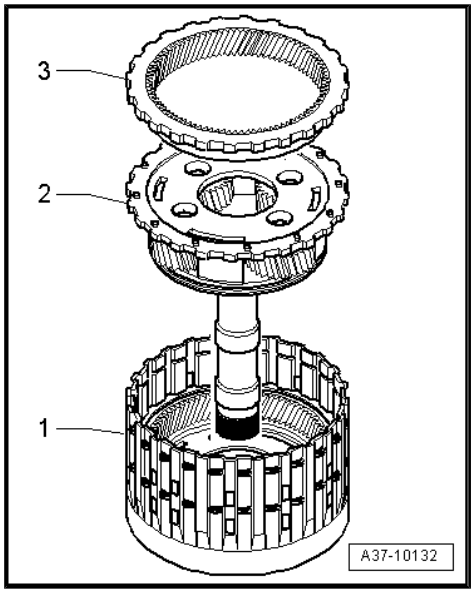
– Turn planet carrier „I“ upside down, insert in annulus „I“ -item 1- and secure with circlip -arrow-.
– Position annulus „I“ together with planet carrier „I“ in support element -T10282- .



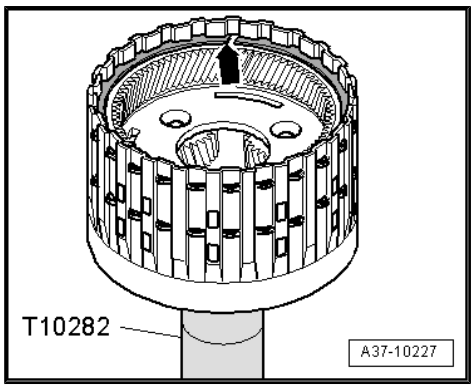
– Install sun gear -2- into planet carrier „I“ in annulus „I“ -item 1-.
• Notches -arrow- on teeth point downwards.
– Fit axial needle bearing -3-.
• Open side faces upwards



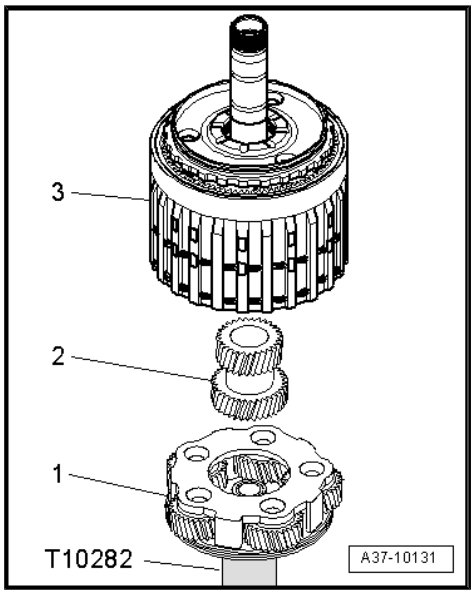
– Insert planet carrier „II“ -item 2- into annulus „I“ -item 1-.
– Insert annulus III -item 3- into annulus „I“ -item 1-.
• Lugs on outer circumference of annulus III point upwards.



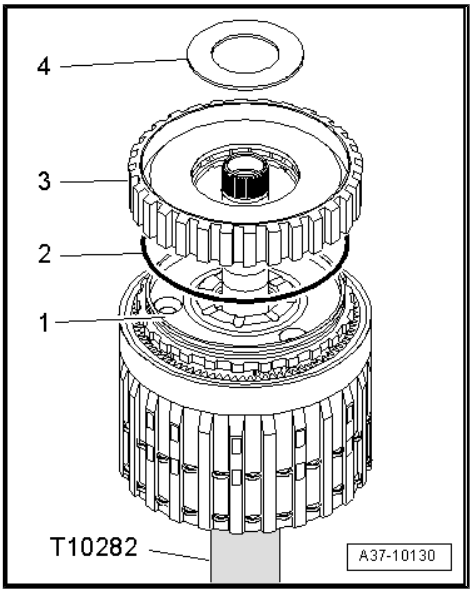
– Insert circlip -arrow-.
– Remove planet carrier „I“ and „II“ from support element -T10282- .



– Place planet carrier „III“ into support element -T10282- .
– Insert sun gear 2 in planet carrier „III“ -item 1-.
– Fit planetary drive „I“ + „II“ -item 3- onto planet carrier „III“ (turn planet carrier backwards and forwards as required).



– Fit new O-ring -2- on planet carrier „I“ -item 1-.
– Press plate carrier „E“ -item 3- onto planet carrier „I“.
– Fit thrust washer -4-.

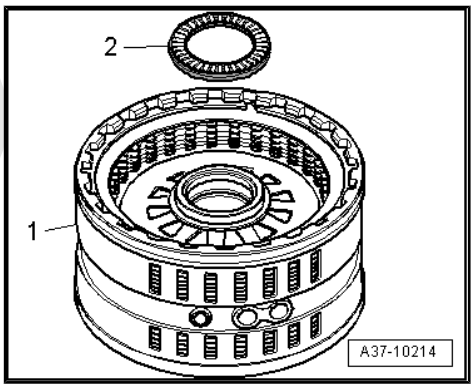


5.8 Assembling body „I“

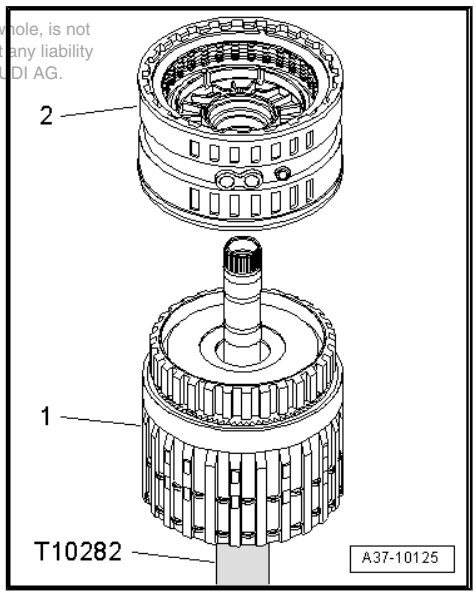
– Fit axial needle bearing -2- to clutch „E“ loosely with vaseline (in cylinder „D/E“ -item 1-). Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

Note

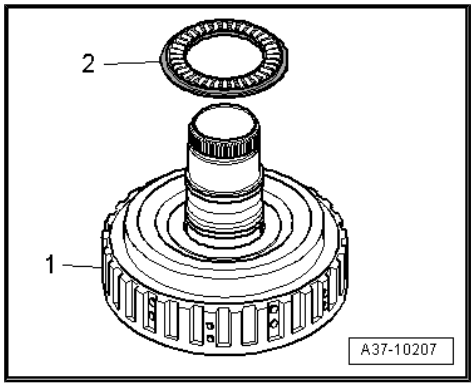
Clutch „E“ can be identified by the dished spring and the split retaining ring.



– Turn cylinder „D/E“ -item 2- upside down.
• Clutch „E“ faces downwards.
– Position cylinder „D/E“ onto planetary drive -1- (support cylinder by lifting and rotating it gently).
• Make sure that all plates of clutch „E“ mesh one after the other with the plate carrier of the planetary drive.
– Lift and drop cylinder „D/E“ a few millimetres to check whether the plates mesh.
♦ If you hear a metallic sound, all the plates have meshed.
♦ If you only hear a muffled sound, some of the plates have not meshed.

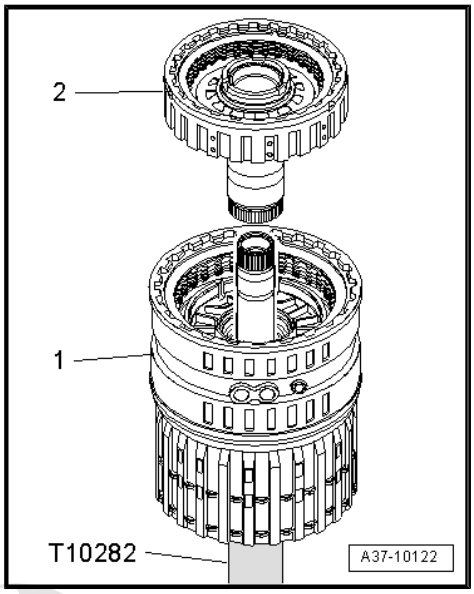


– Apply a thin coat of vaseline to flat side of axial needle bearing -2-. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Fit axial needle bearing to reverse side of clutch „C“ -item 1-.



– Insert clutch „C“ with sun shaft -2- into cylinder „D/E“ -item 1-.
– Allow cylinder „C“ to engage in all plates of clutch „D“ (lift and rotate cylinder slightly as required).
– Lift and drop cylinder „D/E“ a few millimetres to check whether the plates mesh.

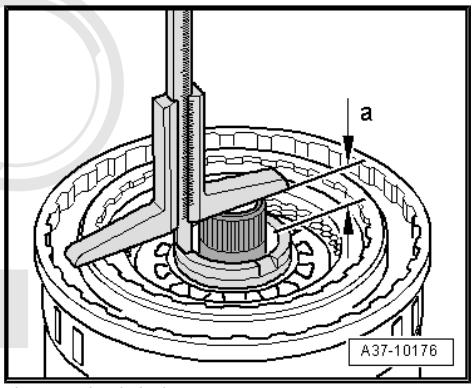
♦ If you hear a metallic sound, all the plates have meshed.
♦ If you only hear a muffled sound, some of the plates have not meshed.



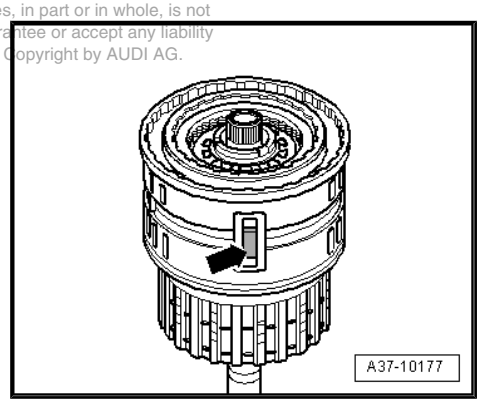
– Check dimension of „body I“.
• Dimension -a- = 21.7 mm (minimum)

Note

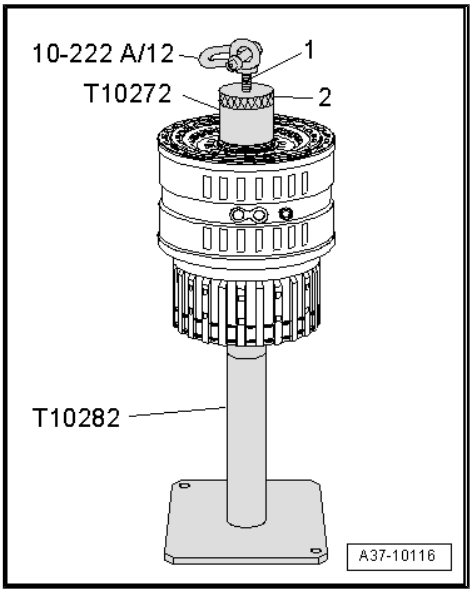
If dimension -a- is below specification, check assembly of body „I“ *⇒ page 73* *.*



– Check that parallel keys -arrow- are centred on both sides of cylinder -D … E-.



– Screw in threaded spindle -1- for lifting tool -T10272- for body „I“ into tapped hole of body „I“ as far as stop.
– Secure individual components of „body I“ from from being pulled apart (screw in sleeve -2- on threaded spindle all the way until finger-tight).



6 Dismantling and assembling body „II“

6.1 Body „II“ - exploded view of components

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .

1 - Axial needle bearing

2 - Clutch „B“

3 - Rectangular section seal
- ❑ Renew

4 - O-ring
- ❑ Renew

5 - Clutch „A“

6 - Axial needle bearing

7 - Intermediate shaft with inner plate carrier „A“

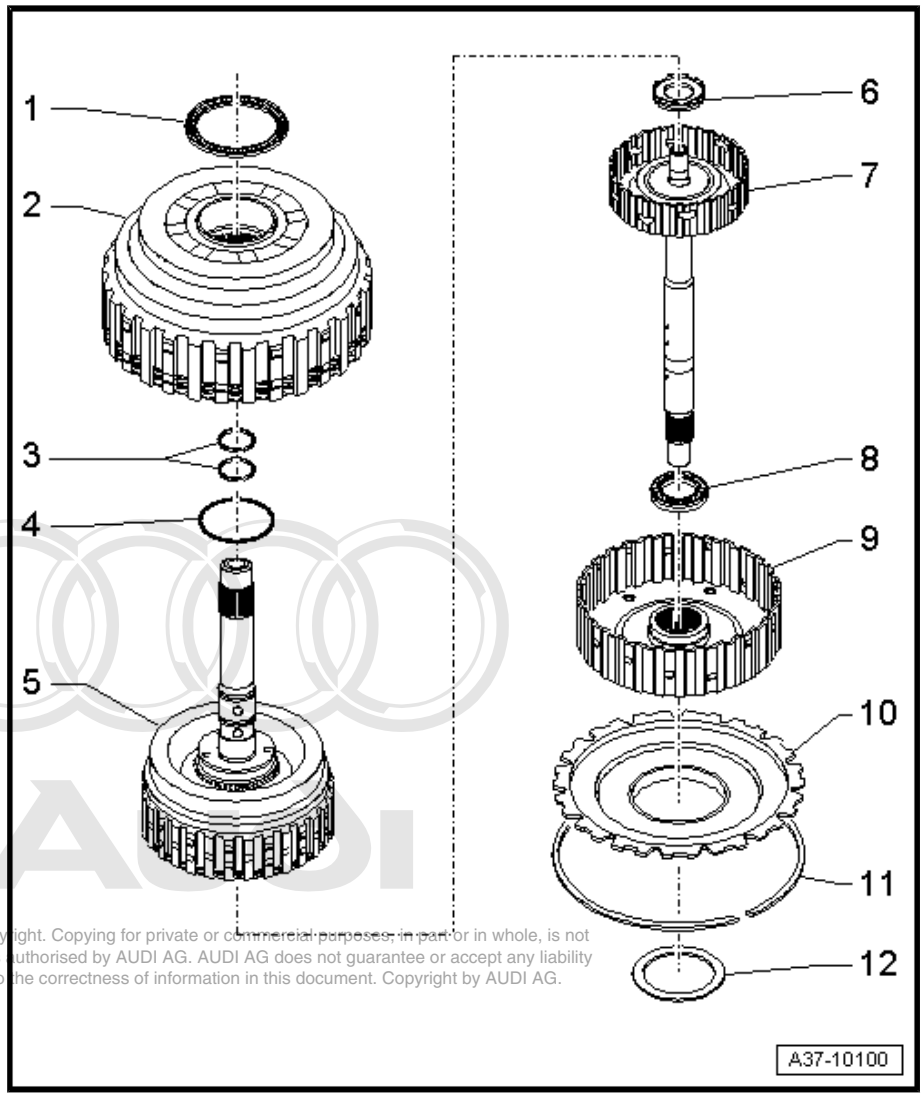
8 - Axial needle bearing

9 - Inner plate carrier „B“

10 - Inner plate carrier „C“

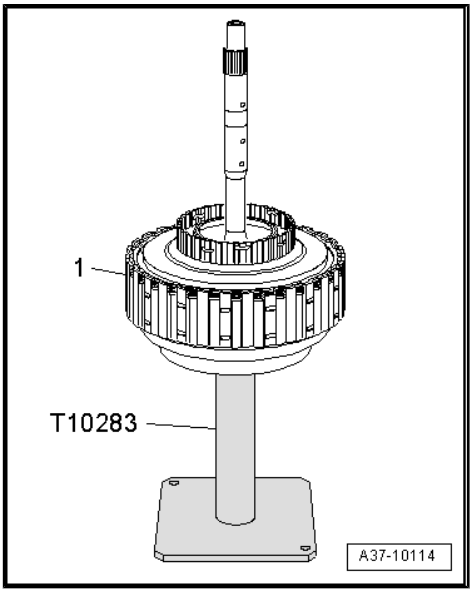
11 - Circlip

12 - Thrust washer for needle bearing, body „II“

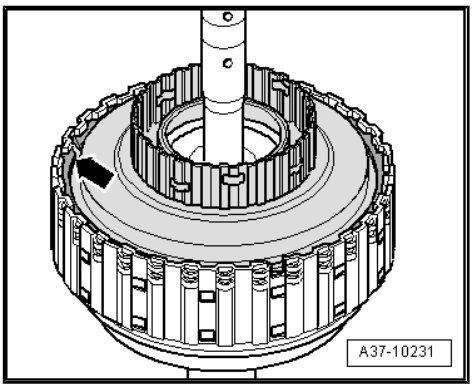


6.2 Dismantling body „II“

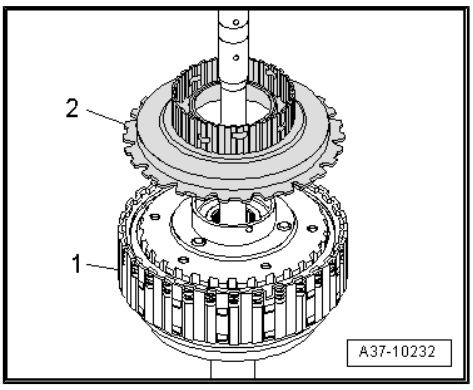
– Place body „II“ into support element -T10283- (ATF pump end points downwards).



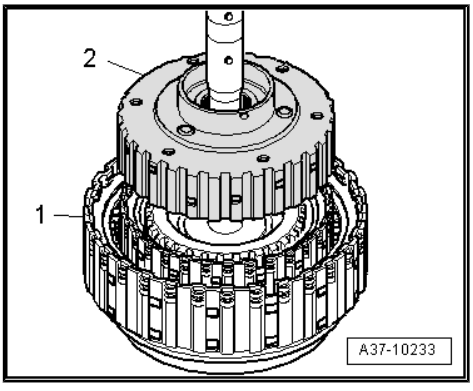
– Remove circlip -arrow-.



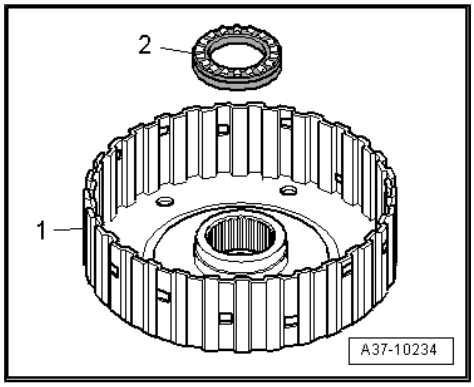
– Detach inner plate carrier „C“ -item 2- from clutch „A/B“ -item 1-.



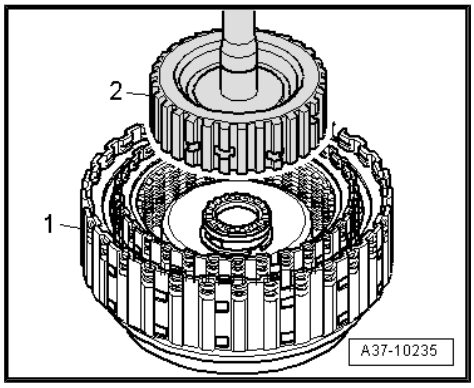
– Detach inner plate carrier „B“ -item 2- from clutch „A/B“ -item 1-.



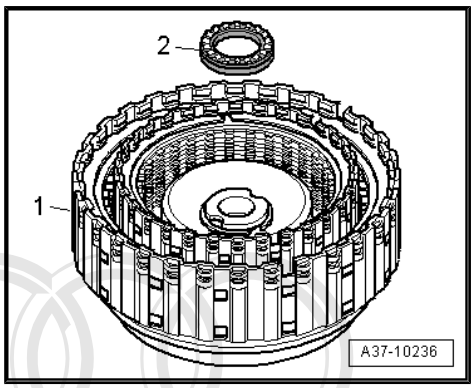
– Turn inner plate carrier „B“ -item 1- upside down and remove axial needle bearing -2-.



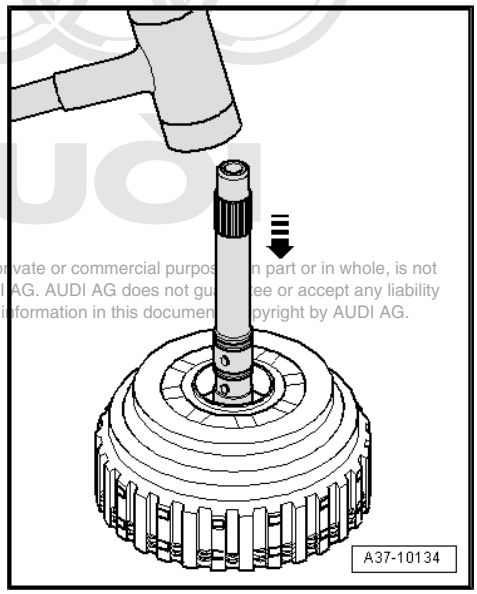
– Detach intermediate shaft with inner plate carrier „A“ -item 2- from clutch „A/B“ -item 1-.



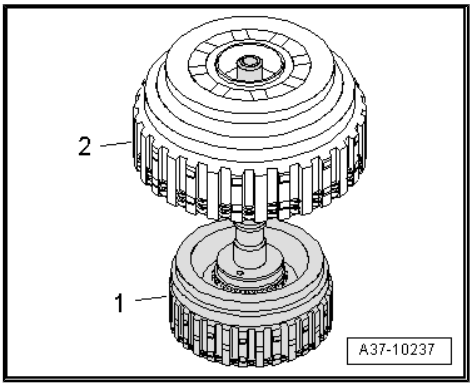
– Detach axial needle bearing -2- from clutch „A/B“ -item 1-.



– Take clutch „A/B“ out of support element -T10283- .
– Turn clutch „A/B“ upside down and place onto workbench.
– Apply a gentle blow to input shaft using a plastic-headed hammer.



– Detach clutch „B“ -item 2- from clutch „A“ -item 1-.



6.3 Clutch „A“ - exploded view of components

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of clutch „A“ for traces of wear and damage ⇒ „6.7 Clutch A “, page 170 .*

1 - Rectangular section seal
- ❑ Renew

2 - O-ring
- ❑ Renew

3 - Cylinder „A“

4 - O-ring
- ❑ Renew

5 - Piston „A“

6 - O-ring
- ❑ Renew

7 - Dished spring
- ❑ Depending on version: Qty. 1 or 2

8 - Retaining plate

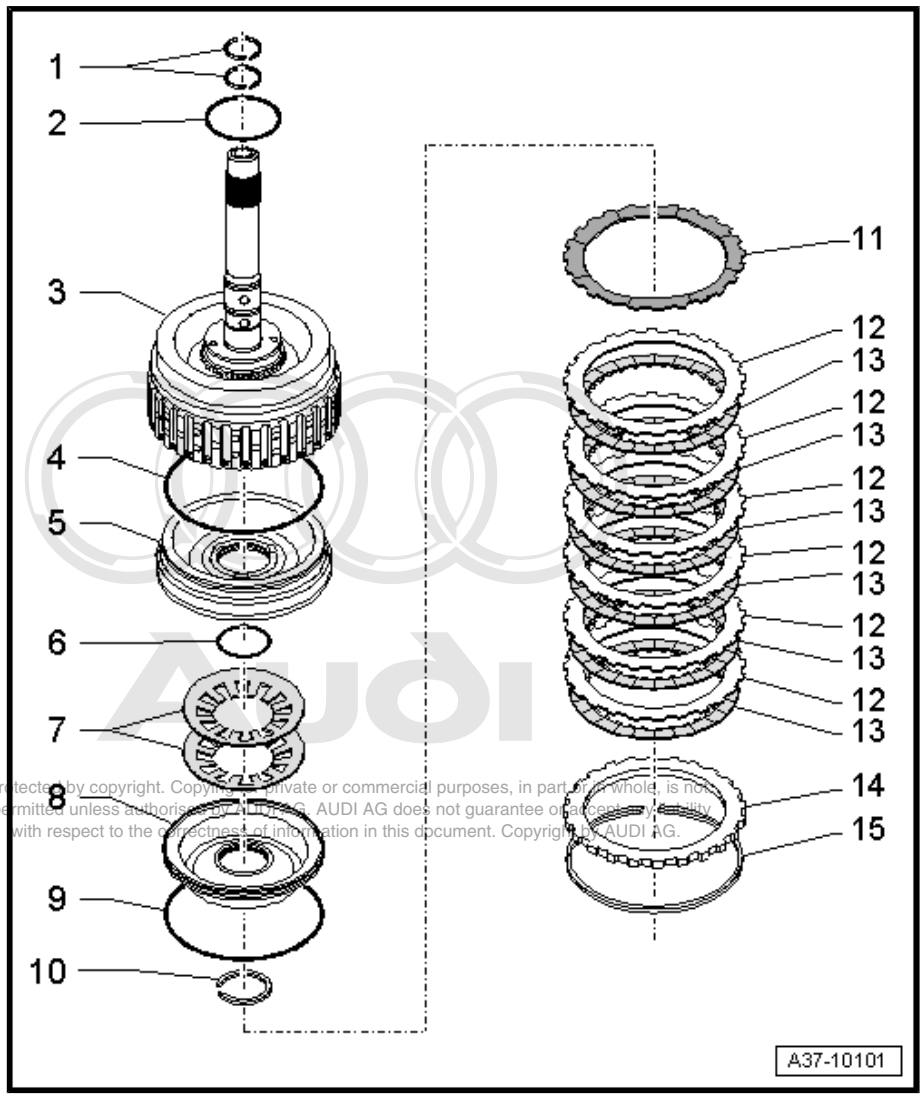
9 - O-ring
- ❑ Renew

10 - Circlip
- ❑ Renew

11 - Corrugated spring

Corrugated springs of different thicknesses are installed depending on the version. If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

For gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:



- ❑ Thickness of corrugated spring: 1.18 mm

For gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

- ❑ Thickness of corrugated spring: 0.79 mm

12 - Outer plate

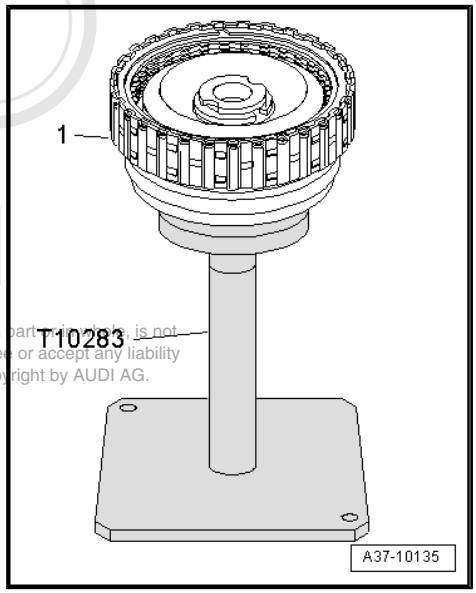
13 - Friction plate

14 - Thick outer plate

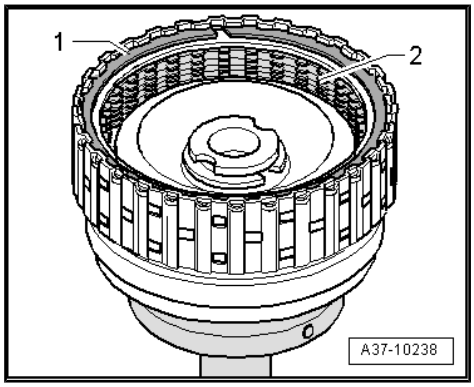
15 - Circlip

6.4 Dismantling and assembling clutch „A“

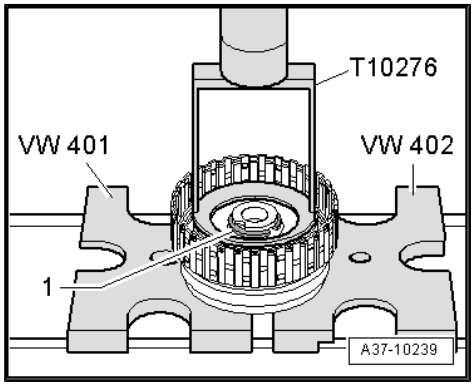
– Place clutch „A“ -item 1- into support element -T10283- .



– Detach circlip -1- and remove clutch pack -2- from cylinder „A“.



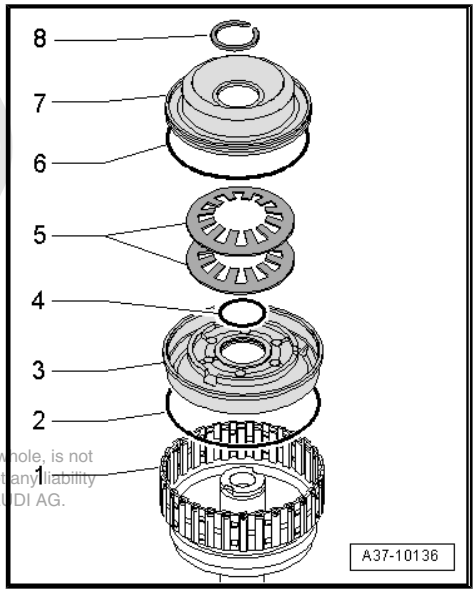
– Press retaining plate down using workshop press with mounting bracket -T10276- .
– Remove circlip -1-.



– Detach retaining plate -7-.
– Detach dished springs -5-.

Note

Depending on version: one or two dished springs -5- fitted. Make sure to use the same amount of dished springs fitted previously when installing.

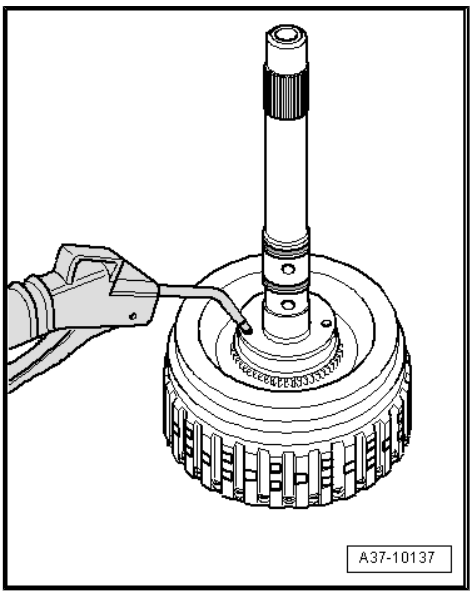


– Turn cylinder „A“ upside down.

WARNING

Wear safety goggles.

– Carefully press out piston „A“ from cylinder „A“ by applying compressed air (cover remaining oil drilling with your finger).



Caution

Check the individual components of clutch „A“ for traces of wear and damage ⇒ „6.7 Clutch A “, page 170 .

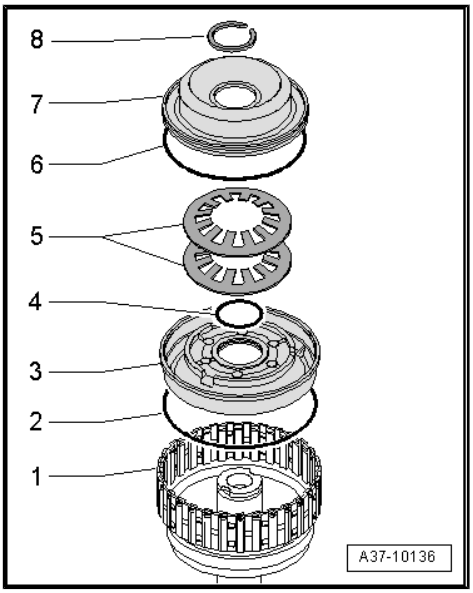
– Renew O-rings -2- and -4- for piston „A“ -item 3-.
– Insert piston „A“ -item 3- into cylinder „A“ -item 1- as far as stop.
– Fit dished springs -5-.

Note

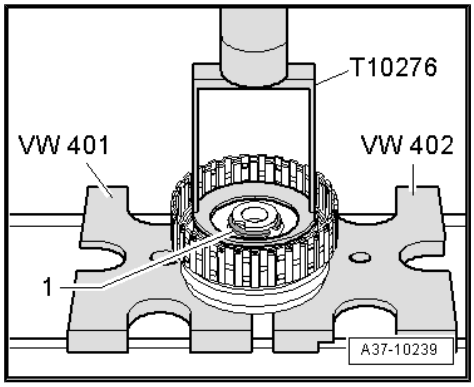
On this version: two dished springs -5- fitted. Make sure to use the same amount of dished springs fitted previously when installing.

– Renew O-ring -6- in retaining plate -7-.
– Insert retaining plate -7-.

8 - Circlip



– Press retaining plate down using workshop press with mounting bracket -T10276- .



Caution

Take care not to stretch circlip too far when installing.

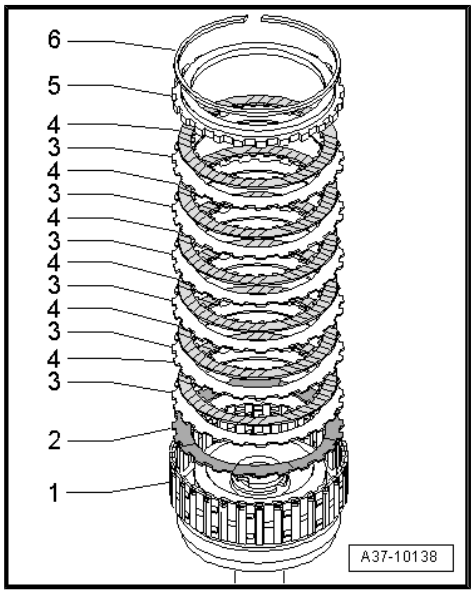
– Renew circlip -1- and install new circlip with care.

Caution

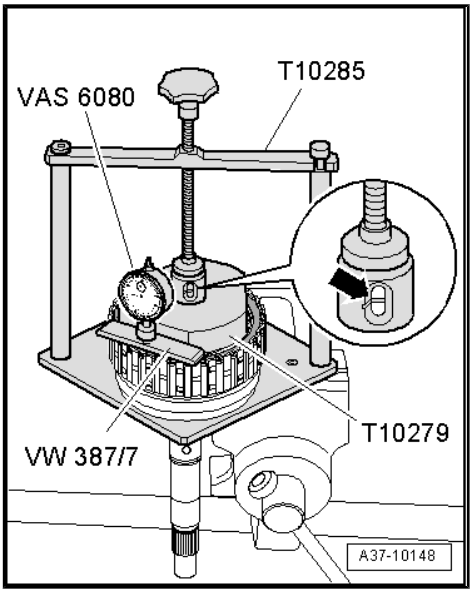
After installing, check that circlip is seated properly:

- *It should no longer be possible to move the circlip and the circlip must locate properly in the base of the groove.*

– Insert corrugated spring -2- into cylinder „A“ -item 1-.
– Fit outer plates -3- (6x) and friction plates -4- (6x) alternately.
– Insert thick outer plate -5-.
• Smooth side must face the last friction plate.
– Insert circlip -6-.



Adjusting clearance of clutch „A“



– Clamp support leg of compressor tool -T10285- in vice.

– Insert cylinder „A“ in compressor tool.

• The input shaft projects out of drilling in base plate.

– Position holding plate -T10279- onto outer plate of clutch „A“.

• Avoid any contact between holding plate and circlip.

– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.

– Bring cylinder „A“ into correct position on holding plate of compressor tool.

• Thrust piece must be positioned centrally below thrust plate of spindle.

– Turn spindle of compressor tool downwards.

• The markings on the inspection hole of the thrust piece must align -arrow-.

– Insert dial gauge -VAS 6080- into measuring bridge -VW 382/7- and secure with knurled nut.

– Position measuring bridge on upper end of cylinder „A“ as shown in illustration.

– Check that measuring bridge is seated properly on end of cylinder „A“.

– Bring measuring tip into contact with outer plate and note value obtained.

– Mark exact contact point on cylinder „A“.

– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.

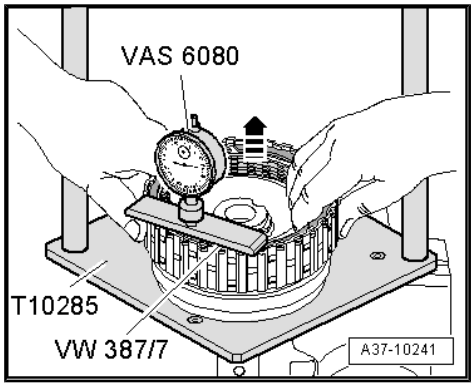
– Determine average value from the three measurements under load.

– Release spindle and remove holding plate.

– Use both hands to pull clutch pack upwards as far as possible in clutch „A“.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „A“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.



Clearance of clutch „A“ on gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:

Thickness of corrugated spring: 1.18 mm

- Specification: 1.95 ... 2.25 mm

Clearance of clutch „A“ on gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

Thickness of corrugated spring: 0.79 mm

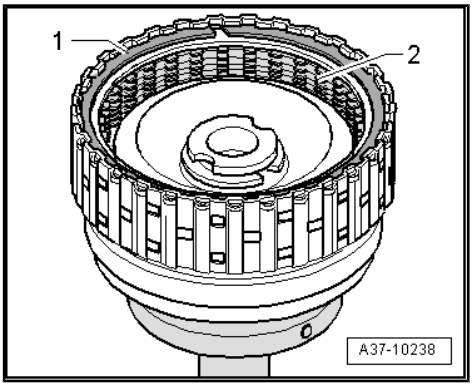
- Specification: 1.95 ... 2.25 mm

Note

The clearance of clutch „A“ is the same for all gearbox code letters, but the thicknesses of the corrugated springs are different. Note correct assignment ⇒ Item 11 (page 79) . If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

The following circlips are available:

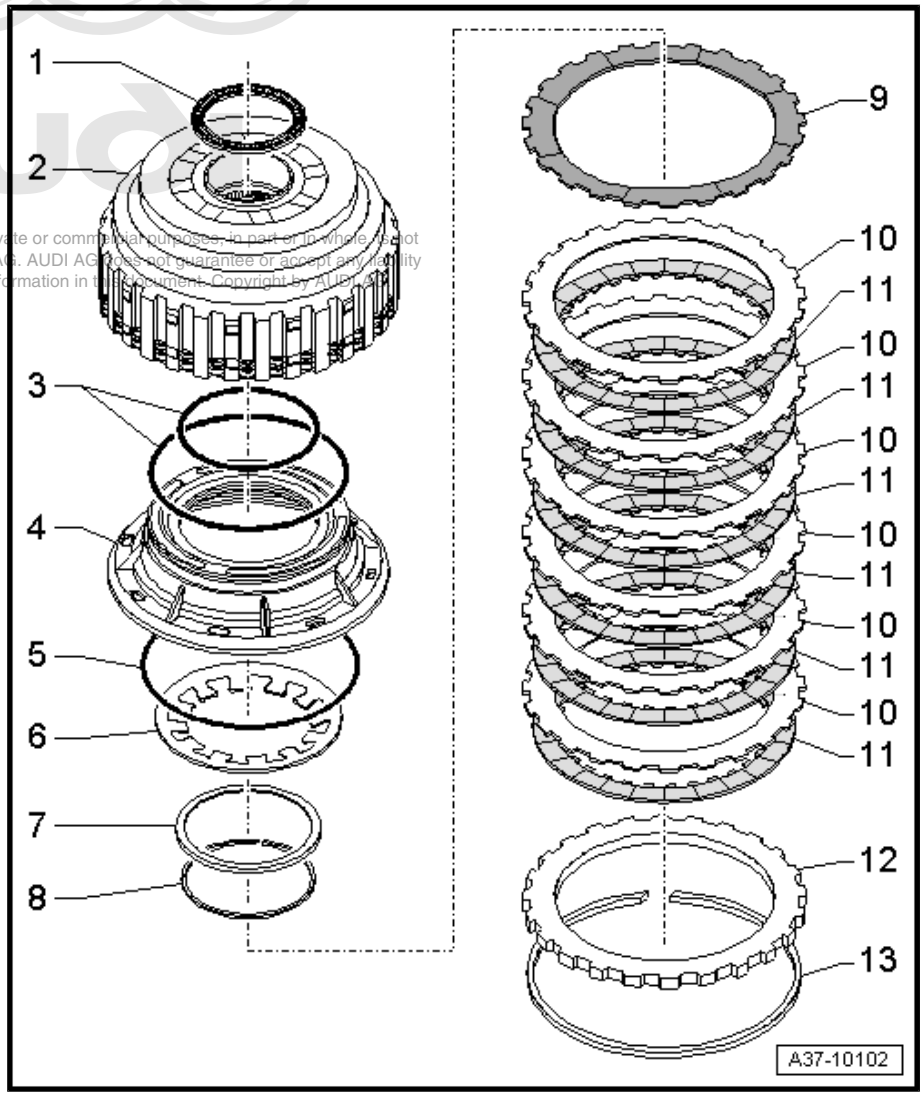
Circlips available (in mm):		
1.8	2.6	3.4
2.0	2.8	3.6
2.2	3.0	
2.4	3.2	

– Check clearance again after inserting circlip.

6.5 Clutch „B“ - exploded view of components

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of clutch „B“ for traces of wear and damage ⇒ „6.8 Clutch B “, page 172 .*



1 - Axial needle bearing

2 - Cylinder „B“

3 - O-rings

- ❑ Renew

4 - Piston „B“

5 - Seal

- ❑ Renew

6 - Dished spring

- ❑ Renew

7 - Retaining ring

8 - Circlip

9 - Corrugated spring

Corrugated springs of different thicknesses are installed depending on the version. If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

For gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:

- ❑ Thickness of corrugated spring: 0.9 mm

For gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

- ❑ Thickness of corrugated spring: 0.8 mm

10 - Outer plate

11 - Friction plate

12 - Thick outer plate

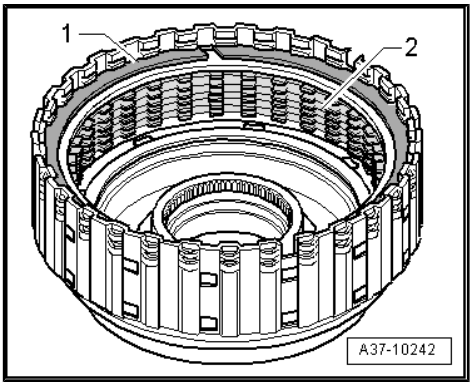
13 - Circlip

- ❑ Determining thickness ⇒ page 89

6.6 Dismantling and assembling clutch „B“

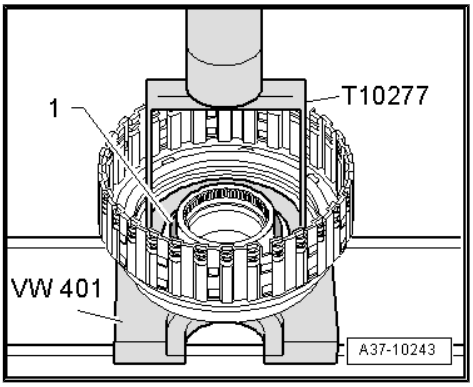
– Turn clutch „B“ upside down and place onto workbench.

– Detach circlip -1- and remove clutch pack -2- from cylinder „B“.



– Press dished spring down using workshop press with mounting bracket -T10277- .

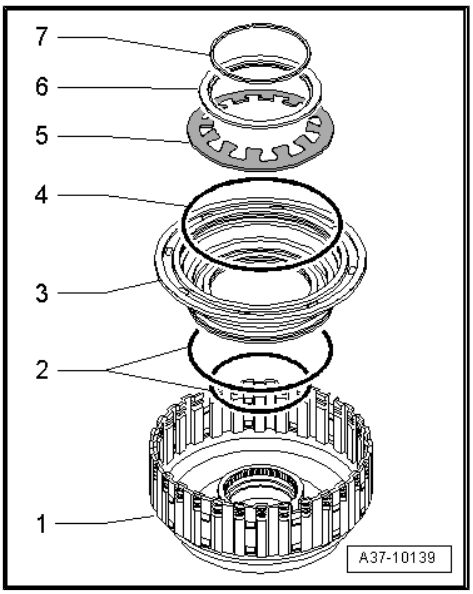
– Remove circlip -1-.



– Remove retaining ring -6-.

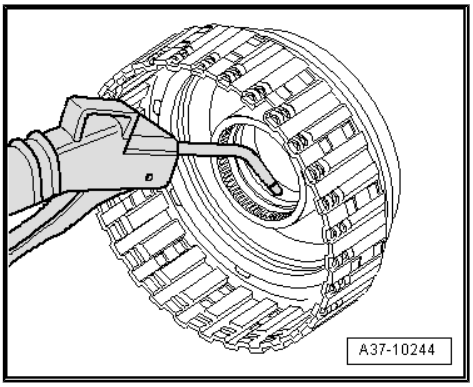
– Detach dished spring -5-.

> **WARNING**
>
> *Wear safety goggles.*

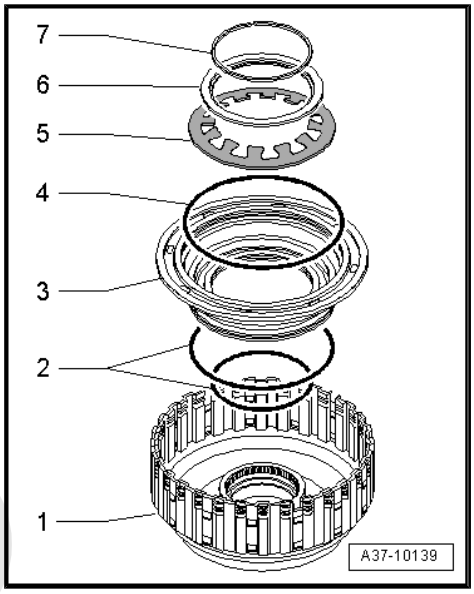


– Carefully press piston „B“ out of cylinder „B“ by applying compressed air (cover remaining oil drilling with your finger).

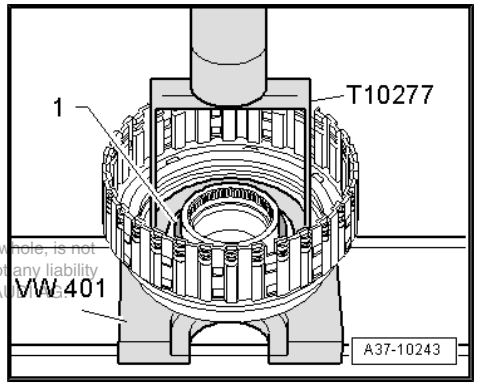
> **Caution**
>
> *Check the individual components of clutch „B“ for traces of wear and damage* *⇒ „6.8 Clutch B “, page 172* *.*



– Renew O-rings -2- for piston „B“ -item 3-.
– Renew seal -4- in piston „B“.
– Insert piston „B“ -item 3- into cylinder „B“ -item 1- as far as stop.
– Renew dished spring -5- and place dished spring and retaining ring -6- in position.



– Press dished spring down using workshop press with mounting bracket -T10277- .
– Insert circlip -1-.

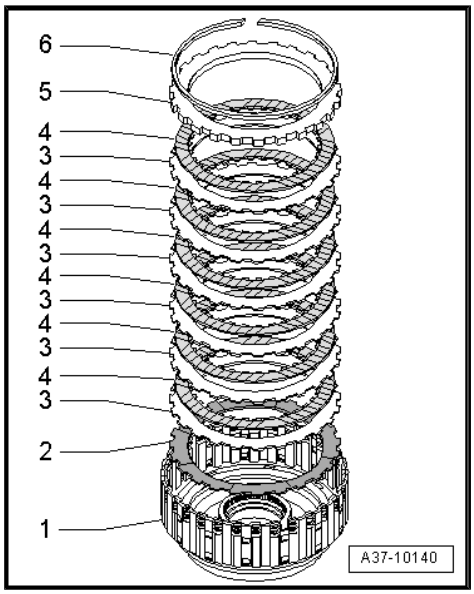


Note

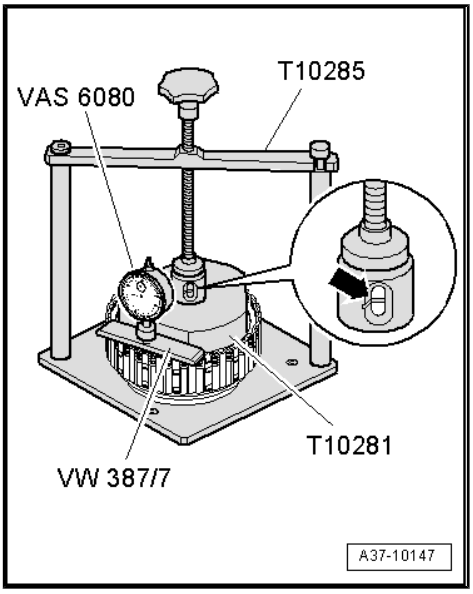
Take care not to stretch circlip too far when installing. After installing, check that circlip is seated properly.

– Release workshop press.

– Insert corrugated spring -2- into cylinder „B“ -item 1-.
– Fit outer plates -3- and friction plates -4- alternately.
– Insert thick outer plate -5-.
• Smooth side must face the last friction plate.
– Insert circlip -6-.



Adjusting clearance of clutch „B“



– Fit cylinder „B“ onto compressor tool -T10285- .

– Position holding plate -T10281- onto outer plate of clutch „B“.

• Avoid any contact between holding plate and circlip.

– Fit centring pin of thrust piece -T10285/1- into drilling in holding plate.

– Bring cylinder „B“ into correct position on holding plate of compressor tool.

• Thrust piece must be positioned centrally below thrust plate of spindle.

– Turn spindle of compressor tool downwards.

• The markings on the inspection hole of the thrust piece must align -arrow-.

– Insert dial gauge -VAS 6080- into measuring bridge -VW 382/7- and secure with knurled nut.

– Position measuring bridge on upper end of cylinder „B“ as shown in illustration.

– Check that measuring bridge is seated properly on end of cylinder „B“.

– Bring measuring tip into contact with outer plate and note value obtained.

– Mark exact contact point on cylinder „B“.

– Repeat measurement at two other points on outer plate (offset by 120°) and mark measuring points.

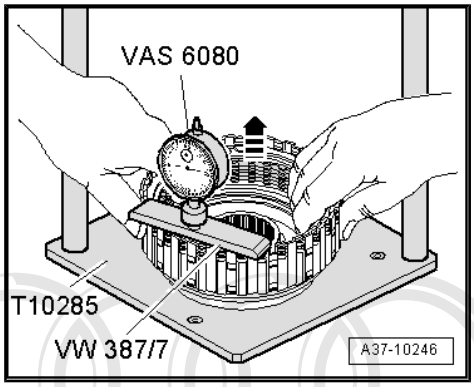
– Determine average value from the three measurements under load.

– Release spindle and remove holding plate.

– Use both hands to pull clutch pack upwards as far as stop in clutch „B“.
– With clutch pack pulled up as far as stop, measure distance between upper end of cylinder „B“ and outer plate at one of the points marked (assistance of second mechanic required).
– Repeat measurement at the two remaining markings on the outer plate.
– Determine average value from the three measurements with clutch pack pulled up as far as stop.
– Determine clearance using the following formula:

	Mean value of measurements under load (value 1 + value 2 + value 3) : 3
–	Mean value of measurements with clutch pack pulled up as far as stop (value 1 + value 2 + value 3) : 3
=	Clearance

– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.



Clearance of clutch „B“ on gearboxes with code letters CUE, DPZ, DSL, DSM, DTD, DTE, DYM, ECX:

Thickness of corrugated spring: 0.9 mm

- Specification: 1.95 ... 2.25 mm

Clearance of clutch „B“ on gearboxes with code letters ECF, ECY, ECZ, EDG, EFN, ESX, EYL, FBC, FBD, FBE, FBF, FBG, FBH, FBJ, FGS, FUL, FUM, FUN, FUU, GAG:

Thickness of corrugated spring: 0.8 mm

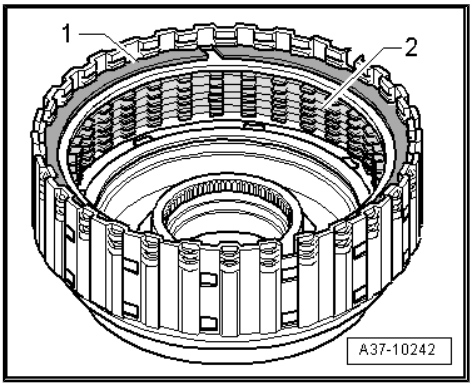
- Specification: 2.15 ... 2.45 mm

Note

The thicknesses of the corrugated springs of clutch „B“ are different for the gearbox code letters listed above. Note correct assignment ⇒ Item 9 (page 86) . If the springs are interchanged by mistake, it will not be possible to adjust the clearance correctly.

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

- If measured value is below specification: insert thinner circlip of appropriate thickness.
- If measured value is above specification: insert thicker circlip of appropriate thickness.

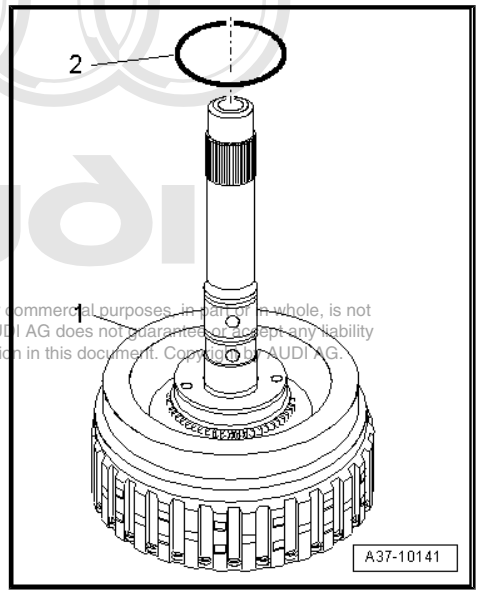
The following circlips are available:

Circlips available (in mm):		
2.6	3.4	4.2
2.8	3.6	4.4
3.0	3.8	4.6
3.2	4.0	

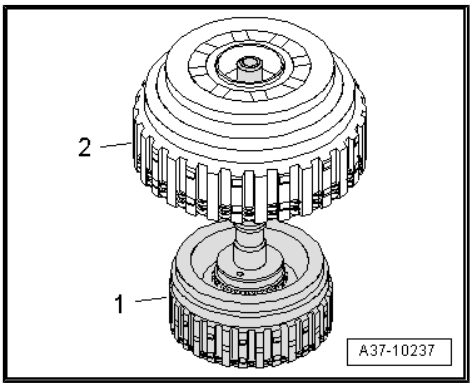
– Check clearance again after inserting circlip.

6.7 Assembling body „II“

– Apply a thin coat of vaseline to insert O-ring -2- in clutch „A“ -item 1-. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

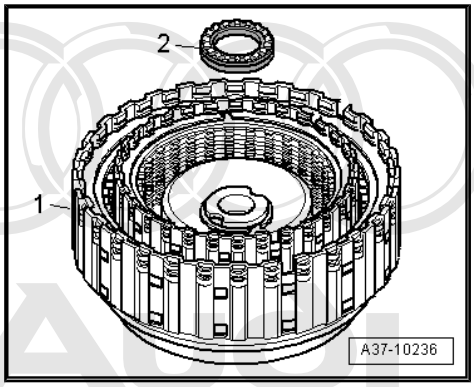


– Press clutch „B“ -item 2- onto clutch „A“ -item 1- as far as stop.
– Turn clutches „A/B“ upside down and place into .support element -T10283- .



– Place axial needle bearing -2- onto clutch „A/B“.

– Align plates of clutch „A“ vertically using measuring tip of measuring gauge, or similar.



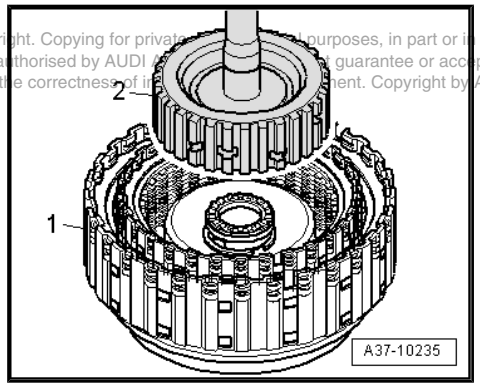
– Insert inner plate carrier „A“ -item 2- in clutch pack of clutch „A“ (lift and rotate inner plate carrier slightly as required).

• Make sure that all plates of clutch „A“ mesh one after the other with the plate carrier of the planetary drive.

– Lift and drop inner plate carrier „A“ a few millimetres to check that the plates mesh.

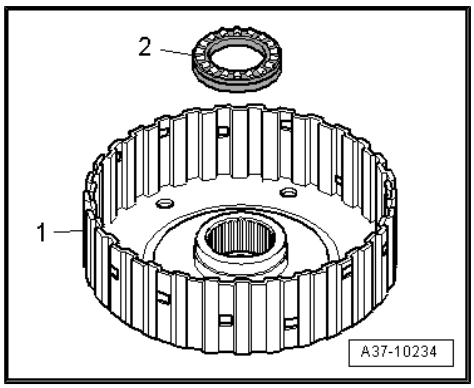
♦ If you hear a metallic sound, all the plates have meshed.

♦ If you only hear a muffled sound, some of the plates have not meshed.



– Apply a thin coat of vaseline to flat side of axial needle bearing -2-. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

– Fit axial needle bearing to reverse side of inner plate carrier „B“ -item 1-.



– Align plates of clutch „B“ vertically using measuring tip of measuring gauge or similar.

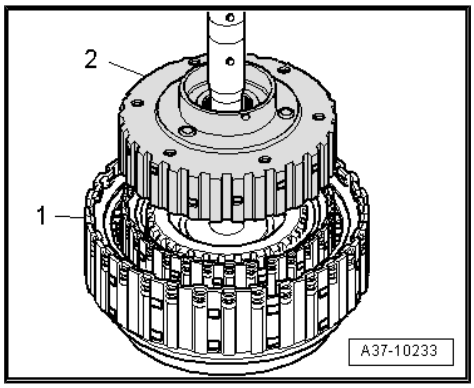
– Rotate inner plate carrier „B“ -item 2- and insert in clutch pack of clutch „B“ (lift and rotate inner plate carrier slightly as required).

• Make sure that all plates of clutch „B“ mesh one after the other with the plate carrier of planetary drive.

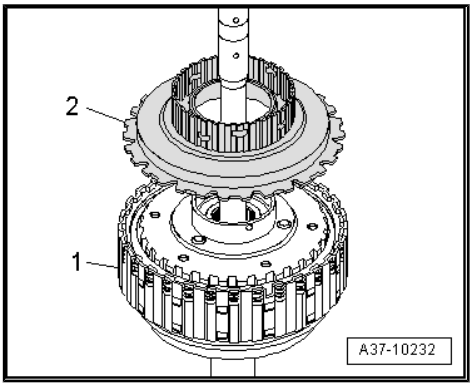
– Lift and drop inner plate carrier „A“ a few millimetres to check that the plates mesh.

♦ If you hear a metallic sound, all the plates have meshed.

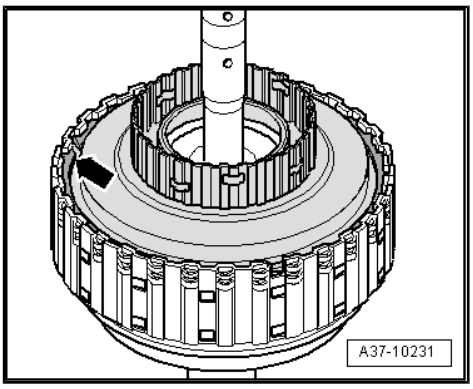
♦ If you only hear a muffled sound, some of the plates have not meshed.



– Place inner plate carrier „C“ -item 2- onto clutch „A/B“ -item 1-.



– Insert circlip -arrow-.

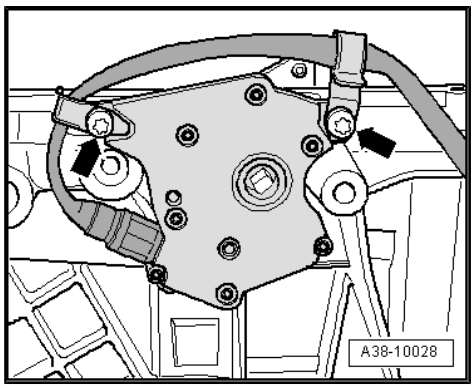


7 Removing and installing selector shaft

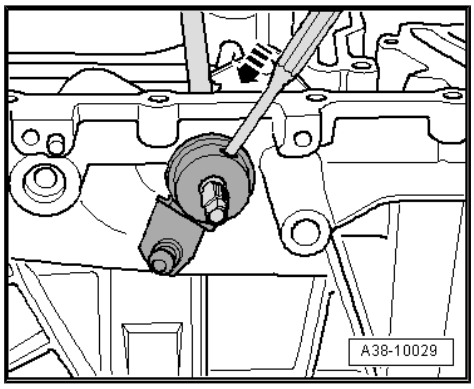
Removing

- Valve body removed.

– Remove multifunction switch -F125- ⇒ page 110 .

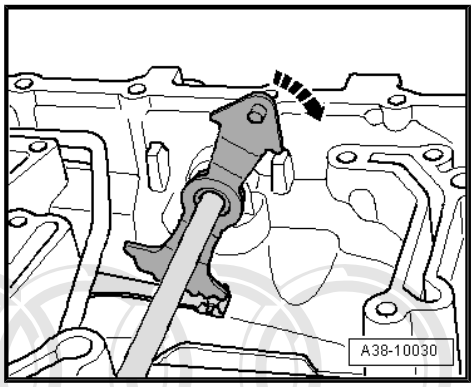


– Drive out roll pin at selector shaft lever -arrow- until selector shaft lever can be detached from selector shaft.



– Move selector shaft to „1 o'clock“ position -arrow-.

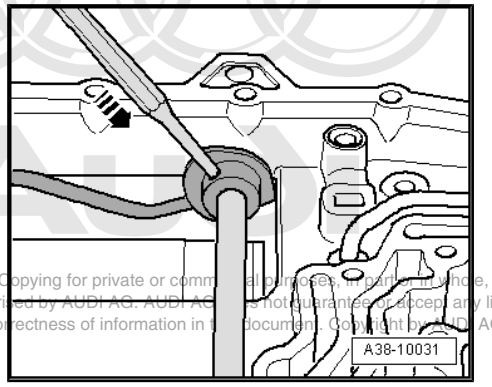
– Press selector shaft past last detent lug until limit stop to make use of the entire amount of selector shaft travel in -direction of arrow-.



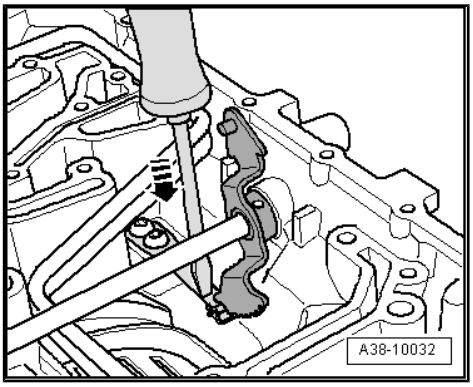
– Carefully drive down spring pin for parking lock operating lever -arrow- just far enough so that operating lever will move on selector shaft.

Note

Do not drive in the spring pin any further, otherwise the input shaft seal will be damaged. The seal cannot be replaced separately.



– Move selector shaft back to position „P“.



Note

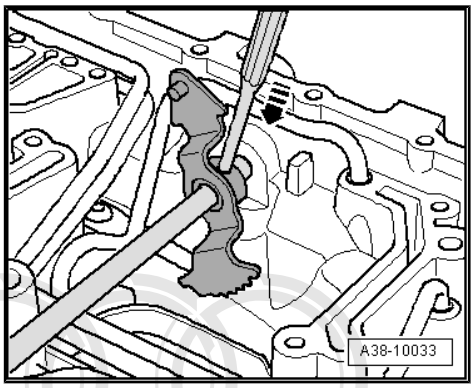
Do not unscrew securing bolts for detent spring - adjustment at the workshop is not possible.

– Press detent spring downwards using a screwdriver -arrow- and drive selector shaft slightly towards right side of gearbox (differential side) using plastic-headed hammer.

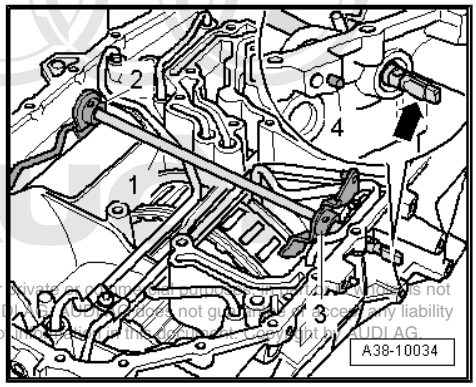
Note

The selector shaft sealing plug is thus pressed out at the right side of the gearbox.

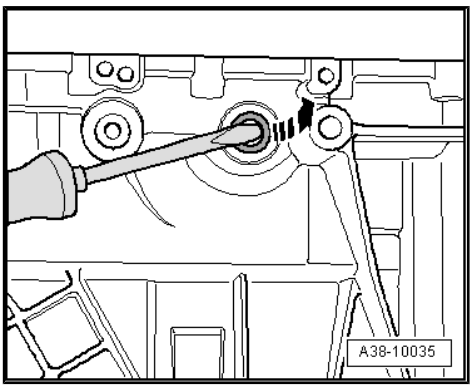
– Carefully drive spring pin for detent plate down just far enough so that detent plate will move on selector shaft.



– Pull selector shaft -1- out of gearbox housing.
– Detach operating lever -2- with parking lock operating rod.
– Detach detent plate -3-.
– Pull out spring pins from operating lever and detent plate.



– Lever out selector shaft oil seal.

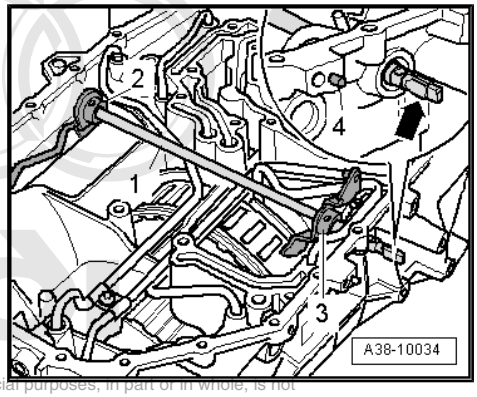


Installing

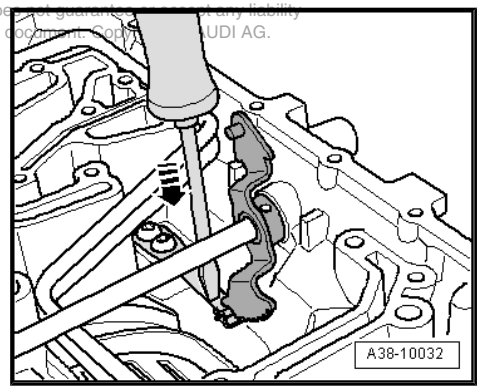
– Push selector shaft -1- into gearbox housing and at the same time fit detent plate -3- and parking lock operating lever -2-.

– Pay attention to selector shaft position:

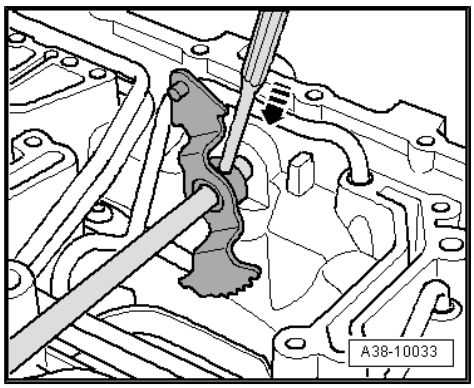
• The flat profile of selector shaft -arrow- faces centralising pin -4- for multifunction switch -F125- .



– Press detent spring downwards using a screwdriver and push detent plate onto detent spring roller in position „P“.

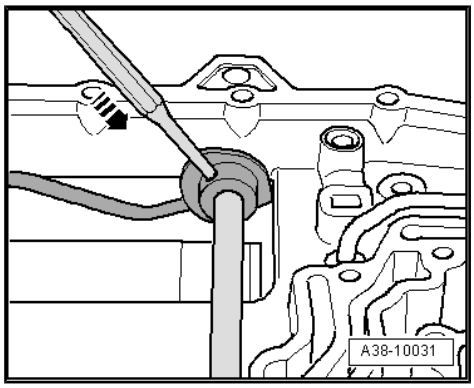


– Drive in spring pin for detent plate until flush.

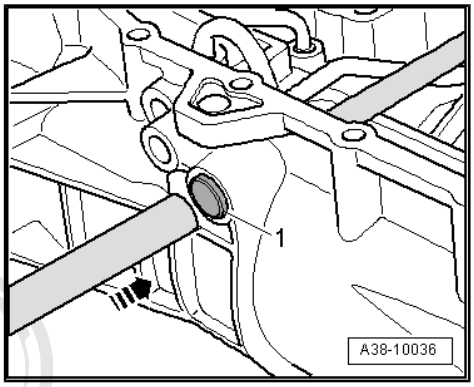


– Move selector shaft with detent plate to position „D“ (centre position).

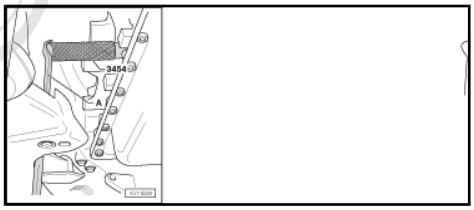
– Drive in spring pin for parking lock operating lever until flush -arrow-.



– Drive in selector shaft sealing plug -1- using a suitable drift -arrow-.



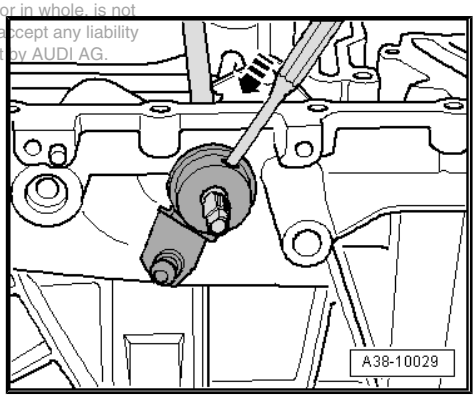
– Fit new oil seal onto assembly sleeve -3454- and press in as far as stop.



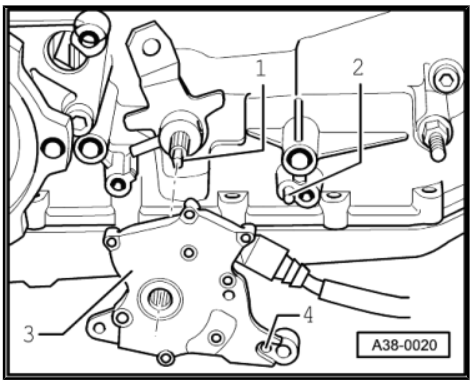
Note

The illustration shows the fitting procedure using assembly lever -A- with gearbox installed.

– Position gearbox selector lever as shown in illustration and drive in spring pin until flush.



– Install multifunction switch -F125- -item 3- ⇒ page 111 .



38 – Gears, control

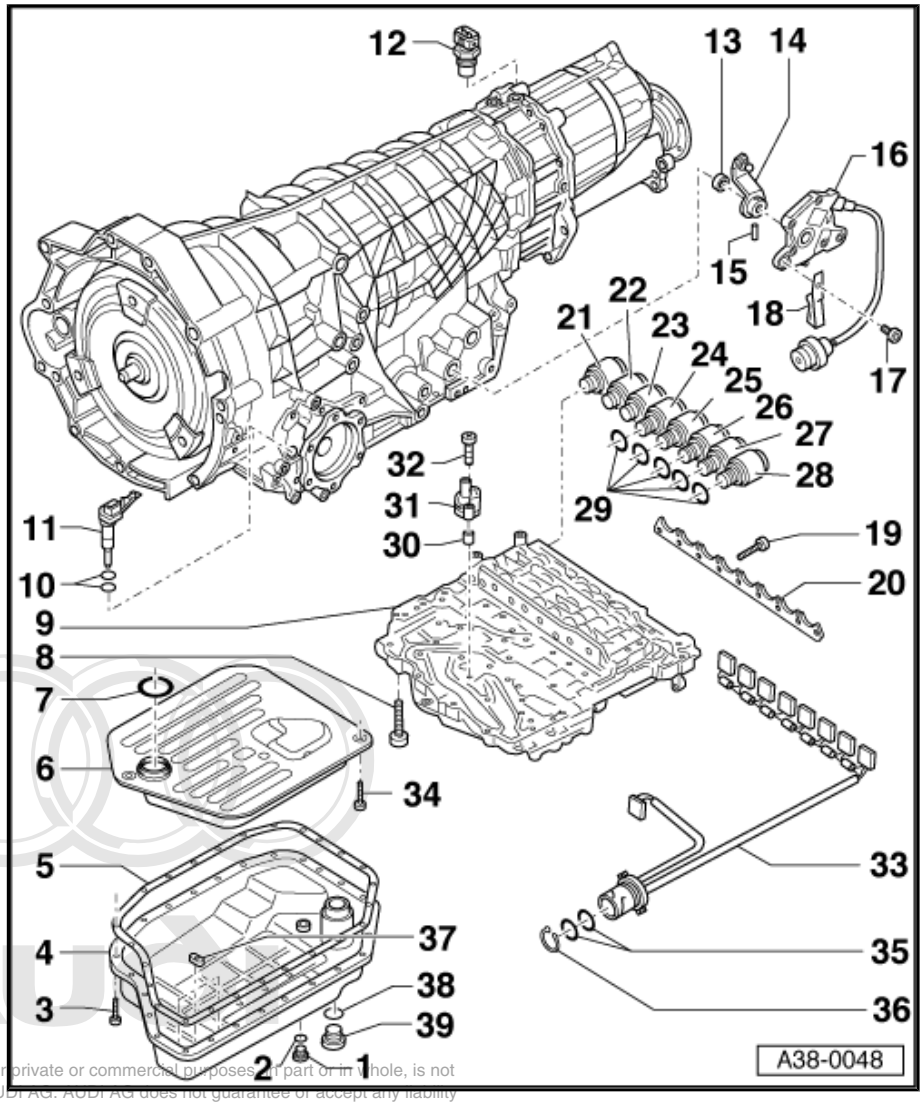
1 Exploded view - ATF oil pan, ATF strainer and valve body

WARNING

Do not run engine or tow vehicle with ATF oil pan removed or when there is no ATF in the gearbox.

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *Lubricate O-rings with ATF. Other types of lubricant will cause the gearbox hydraulics to malfunction.*
- *Always renew valve body if it has collected dirt or if it is defective.*
- *The components shown in the following illustration can be removed with the gearbox in the vehicle.*



1 - ATF drain plug
- ❑ Renew with seal
- ❑ 12 Nm

2 - Seal
- ❑ Not available separately

3 - Bolt
- ❑ Tightening torque and sequence ⇒ page 101

4 - ATF oil pan
- ❑ Removing and installing ⇒ page 102

5 - Gasket
- ❑ Renew

6 - ATF strainer
- ❑ Removing and installing ⇒ page 104

7 - O-ring
- ❑ Renew
- ❑ Lubricate with ATF when fitting

8 - Bolt
- ❑ Different lengths ⇒ page 101
- ❑ Tightening torque and sequence ⇒ page 102

9 - Valve body
- ❑ Removing and installing ⇒ page 105

10 - O-ring
- ❑ Renew
- ❑ Lubricate with ATF when fitting

11 - Speedometer sender -G22-
- ❑ Removing and installing ⇒ page 110

12 - Gearbox output speed sender -G195-
- ❑ Removing and installing ⇒ page 109
- ❑ 30 Nm

13 - Oil seal
- ❑ For selector shaft
- ❑ Removing and installing ⇒ page 111

14 - Lever
- ❑ For selector shaft
- ❑ To remove, first remove spring pin -item 15-

15 - Spring pin

16 - Multifunction switch -F125-
- ❑ Removing and installing ⇒ page 110

17 - Bolt
- ❑ 8 Nm

18 - Bracket

- ❑ For multifunction switch wiring harness
- ❑ Secured with bolts for multifunction switch

19 - Bolt

- ❑ 5 Nm

20 - Bracket

- ❑ For solenoid valves
- ❑ Must be removed when the solenoid valves are renewed

21 - Solenoid valve 3 -N90-

- ❑ Without O-ring
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

22 - Solenoid valve 2 -N89-

- ❑ Without O-ring
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

23 - Solenoid valve 1 -N88-

- ❑ Without O-ring
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

24 - Automatic gearbox pressure regulating valve 5 -N233-

- ❑ With O-ring
- ❑ Lubricate O-ring with ATF before fitting
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

25 - Automatic gearbox pressure regulating valve 2 -N216-

- ❑ With O-ring
- ❑ Lubricate O-ring with ATF before fitting
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

26 - Automatic gearbox pressure regulating valve 3 -N217-

- ❑ With O-ring
- ❑ Lubricate O-ring with ATF before fitting
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

27 - Automatic gearbox pressure regulating valve 4 -N218-

- ❑ With O-ring
- ❑ Lubricate O-ring with ATF before fitting
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

28 - Automatic gearbox pressure regulating valve 1 -N215-

- ❑ With O-ring
- ❑ Lubricate O-ring with ATF before fitting
- ❑ For removing and installing ⇒ „1.1 Removing and installing ATF oil pan“, page 102

29 - O-ring

- ❑ Renew
- ❑ Lubricate with ATF when fitting

30 - Spacer sleeve

- ❑ Length: 8.7 mm

31 - Gearbox input speed sender -G182-

- ❑ Removing and installing ⇒ page 108

32 - Bolt

- ❑ 5 Nm

33 - Wiring harness in gearbox

- ❑ Gearbox oil temperature sender -G93- integrated in wiring harness
- ❑ Removing and installing ⇒ page 108

34 - Bolt

- ❑ For securing ATF strainer
- ❑ 6 Nm

35 - O-ring

- ❑ Renew
- ❑ Lubricate with ATF when fitting

36 - Circlip

- ❑ Renew if damaged

37 - Magnet

- ❑ Qty. 4; located in recesses on oil ATF pan
- ❑ Clean
- ❑ Ensure that the magnet is in full contact with the ATF oil pan

38 - O-ring

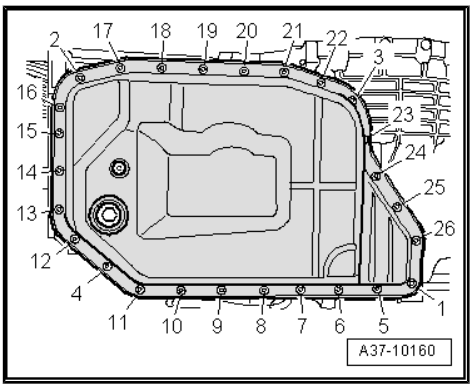
- ❑ Renew

39 - ATF inspection and filler plug

- ❑ 80 Nm

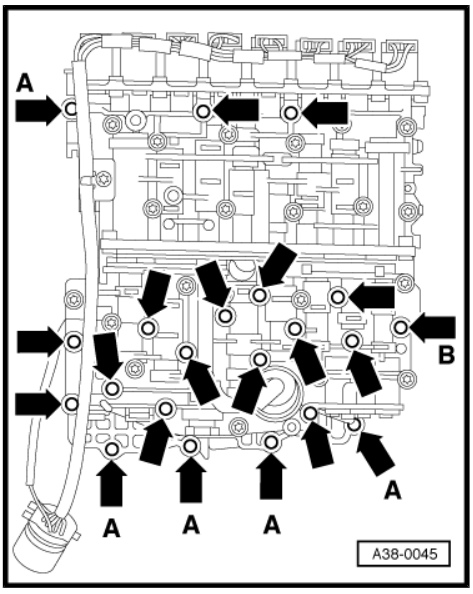
ATF oil pan - tightening torque and sequence

– Tighten bolts for ATF oil pan in sequence -1 … 26- in several stages to 10 Nm.



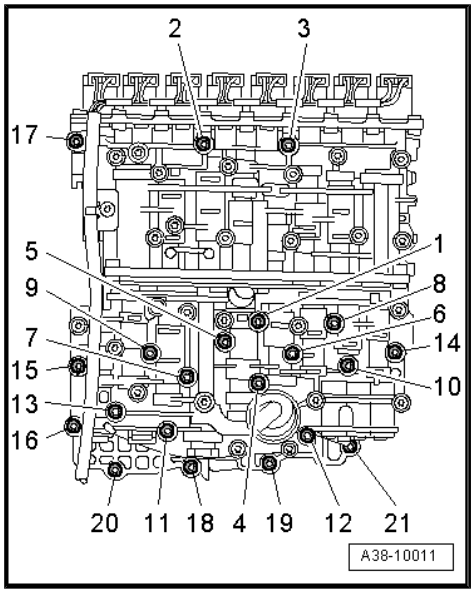
Bolts for valve body - allocation

Location	Number	Length
-Arrow-	15	M6x60
-Arrow A-	5	M6x30
-Arrow B-	1	M6x55 (chromated, silver colour)



Valve body - tightening torque and sequence

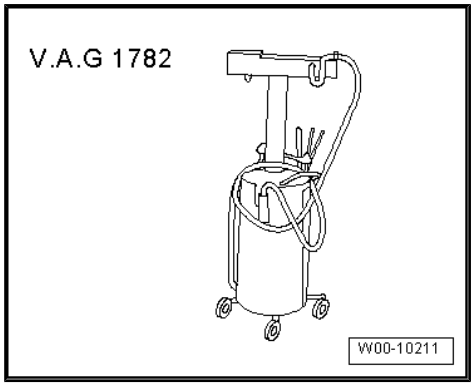
– Tighten bolts in the sequence -1 ... 21-.



1.1 Removing and installing ATF oil pan

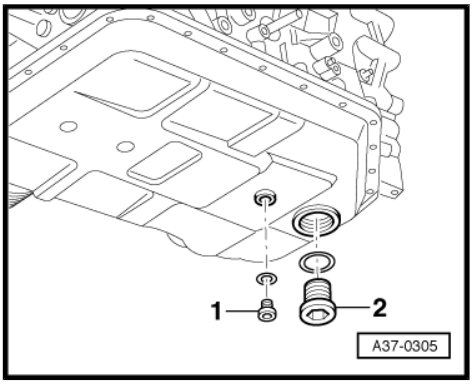
Special tools and workshop equipment required

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



- Safety goggles

Removing



Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*

– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.

WARNING

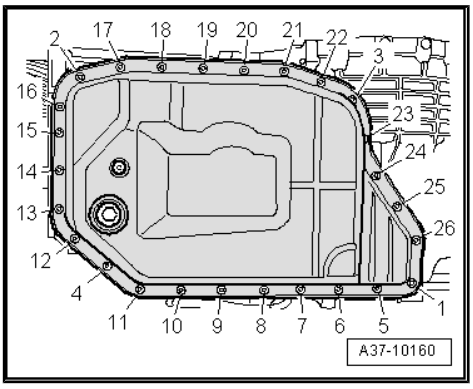
Wear safety goggles.

– Remove ATF drain plug -1-.

– Drain ATF.

Note

- *Observe relevant disposal regulations.*
- *Some ATF always remains in the oil pan.*
- *The engine must not be started and vehicle must not be towed without ATF in gearbox.*



– Unscrew bolts for ATF oil pan in sequence -26 ... 1-.

– Remove ATF oil pan.

Installing

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

Tightening torques ⇒ page 98

Note

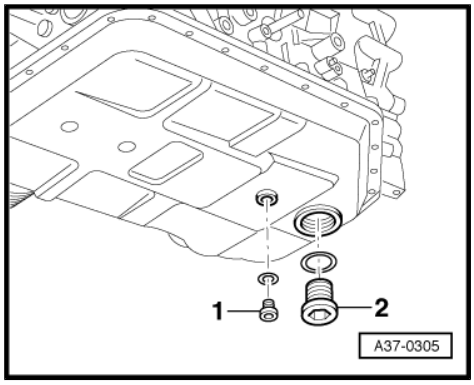
Renew gasket.

– Clean all magnets in recesses on ATF oil pan. Ensure that magnets make full contact with ATF oil pan.

– Clean sealing surface thoroughly; remaining material from the previous gasket must be removed completely.

– Tighten bolts for ATF oil pan ⇒ page 101 .

– Tighten new drain plug -1-.
– Fill up with ATF ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

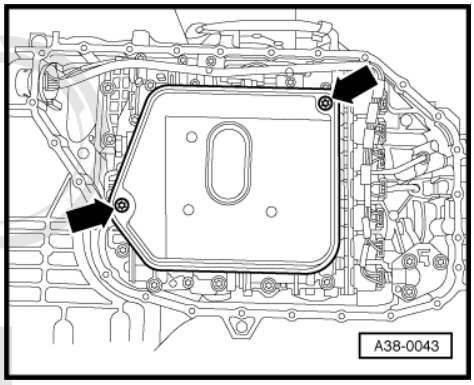


1.2 Removing and installing ATF strainer

Removing

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*



– Remove ATF oil pan ⇒ page 102 .
– Remove bolts -arrows-.
– Carefully pull ATF strainer off valve body.

Installing

- Tightening torque ⇒ page 98

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

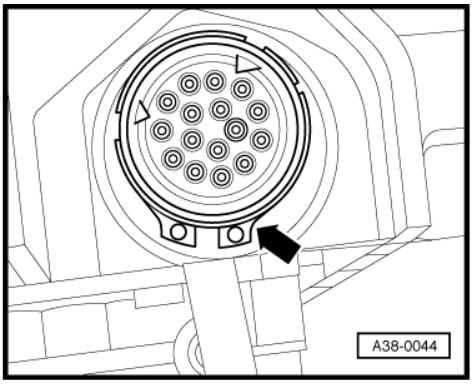
– Lightly lubricate the seal around the intake neck of the ATF strainer with ATF.
– Carefully press intake neck of ATF strainer into opening on valve body until stop.

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

– Install ATF oil pan ⇒ page 102 .
– Fill up with ATF ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

1.3 Removing and installing valve body

Removing



Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *Always renew valve body if it has collected dirt or if it is defective.*

– Remove ATF oil pan ⇒ page 102 .

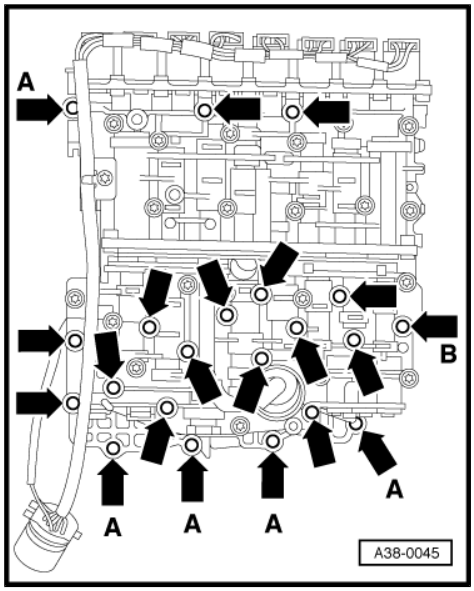
– Remove ATF strainer ⇒ page 104 .

– Remove circlip -arrow- for wiring harness connector from outside of gearbox housing.

– Press wiring harness connector inwards and remove from gearbox housing.

Caution

- *Only loosen the securing bolts indicated in the illustration -arrows-.*
- *If other bolts are loosened, this may affect the operation of the valve body or the valve body could come apart.*



– Unfasten securing bolts -arrows- on valve body and take out valve body together with wiring harness.

Note

The bolts have different lengths. Allocation ⇒ page 101 .

– Remove valve body from gearbox, at the same time guide out wiring harness connector.

Caution

To prevent damage after removal, do not put down the valve body on the gearbox input speed sender -G182- (located on reverse side of valve body).

Installing

Note

Renew O-rings.

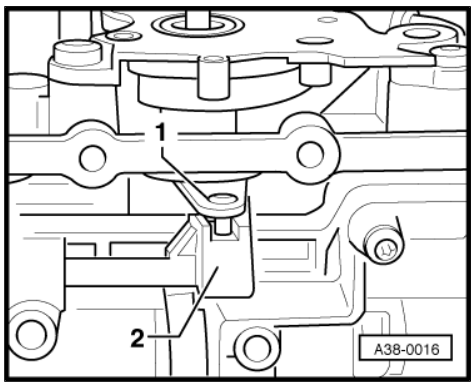
– Lightly lubricate O-rings on wiring harness connector with ATF.

– Install wiring harness connector in gearbox housing.

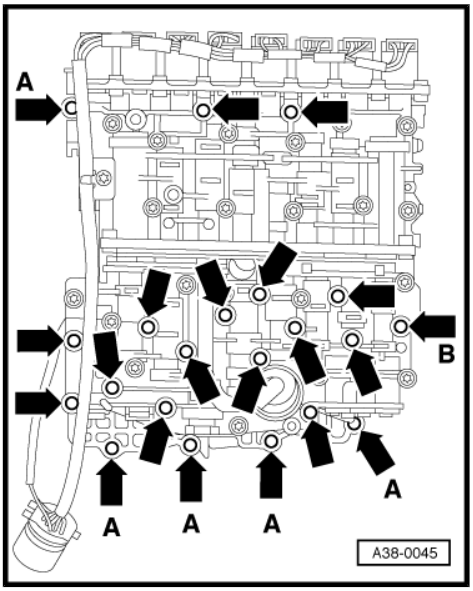
- Installation position: flat part of rear shoulder faces downwards, lugs on shoulder are horizontal and flat side of connector should be parallel to sealing surface for oil pan.
- Pay attention to instructions regarding securing and routing of wiring harness on valve body ⇒ „1.5 Removing and installing wiring harness in gearbox“, page 108 .

– Place valve body in position on gearbox housing (do not apply force).

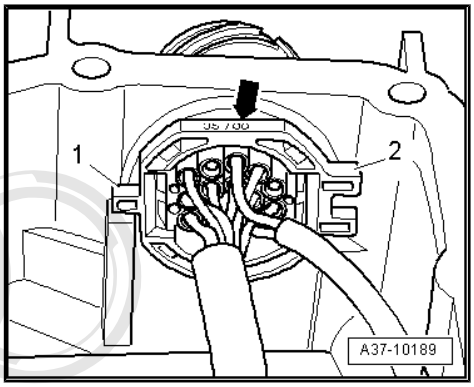
– At the same time insert pin of detent plate -1- so that it engages in slot on selector slide -2-.



– Screw in bolts -arrows- for valve body evenly by hand until they make contact; allocation ⇒ page 101 .
– Tighten bolts for valve body ⇒ page 102 .



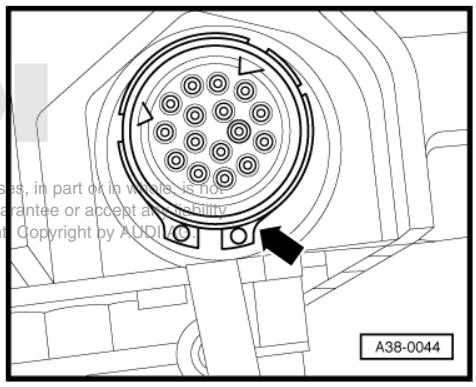
– Renew O-rings on wiring harness connector and lubricate lightly with ATF.
– Insert wiring harness connector in gearbox housing.
• Installation position: lugs -1- and -2- on shoulder are horizontal, flat part -arrow- of connector should be parallel to sealing surface for oil pan.



– Push circlip -arrow- onto wiring harness connector.

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

– Install ATF strainer ⇒ page 104 .
– Install ATF oil pan ⇒ page 102 .



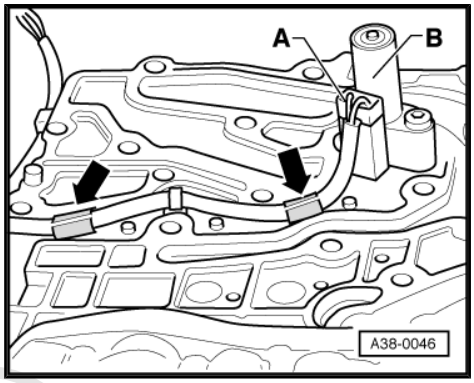
1.4 Removing and installing gearbox input speed sender -G182-

Removing

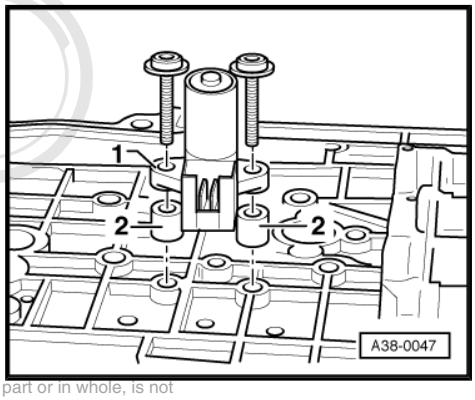
– Remove valve body ⇒ page 105 .

– Turn valve body upside down.

– Unplug electrical connector -A- at gearbox input speed sender -G182- -item B-.



– Unscrew bolts and remove gearbox input speed sender -G182- -item 1-.



Installing

• Tightening torque ⇒ page 98

Note

Speed senders that have been dropped can no longer be used (permanent magnet broken).

– Fit gearbox input speed sender -G182- -item 1- with spacer bushes -2- to valve body and tighten bolts.

• Length of spacer bushes: 8.7 mm.

• Installation position: the contacts of gearbox input speed sender -G182- point towards the centre of the valve body.

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

– Install valve body ⇒ page 105 .

– Fill up with ATF ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

1.5 Removing and installing wiring harness in gearbox

Removing

– Remove valve body ⇒ page 105 .

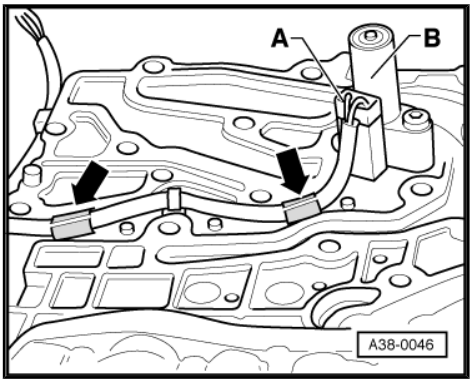
– Lever out retaining tabs of electrical connectors on solenoid valves using a small screwdriver and unplug connectors one after the other.

– Detach the wiring harness from the side retaining tabs on the valve body.

– Turn valve body upside down.

– Unplug electrical connector -A- at gearbox input speed sender -G182- -item B-.

– Carefully pull out both retaining clips -arrows- using pliers and detach wiring harness from retaining clips.



Installing

– Attach wiring harness connectors onto corresponding solenoid valves and senders.

• The retaining tabs must engage with a click.

– Clip wiring harness into corresponding retaining clips. If the wiring harness is not installed correctly, it may become trapped when the valve body is installed.

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

– Install valve body ⇒ page 105 .

– Fill up with ATF ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

1.6 Removing and installing gearbox oil temperature sender -G93-

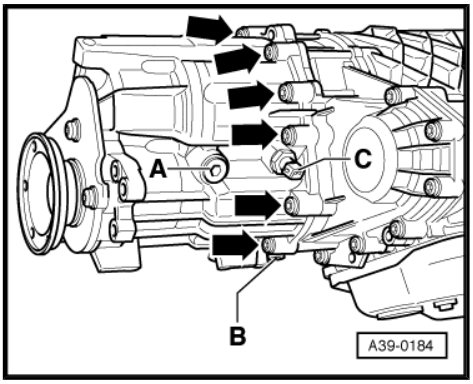
The gearbox oil temperature sender -G93- is integrated in the gearbox wiring harness. Removing and installing ⇒ „1.5 Removing and installing wiring harness in gearbox“, page 108 .

1.7 Removing and installing gearbox output speed sender -G195-

Removing

– Unplug electrical connector.

– Unscrew gearbox output speed sender -G195- -item C- from transfer box.



Note

-Items A, B- and -arrows- can be disregarded.

Installing

• Tightening torque ⇒ page 98

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

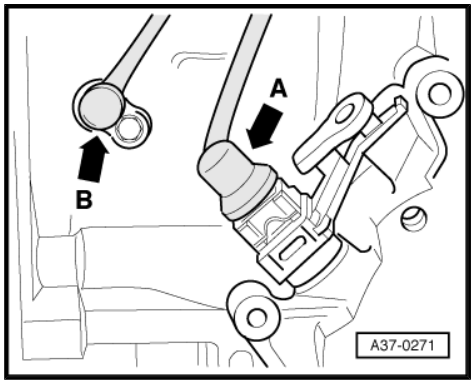
Note

♦ *Speed senders that have been dropped can no longer be used (permanent magnet broken).*

♦ *If gear oil comes out when the sender is renewed, change or fill up the gear oil in the transfer box after completing the repair work ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .*

1.8 Removing and installing speedometer sender -G22-

Removing



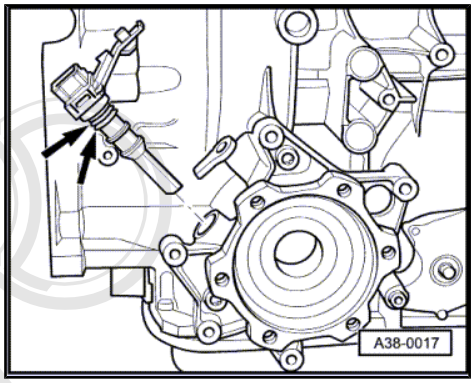
– Unplug electrical connector -arrow A- for speedometer sender -G22- on gearbox.

Note

-Arrow B- can be disregarded.

– Push down the retaining clip holding the sender, turn it, and pull out the sender.

Installing



• Tightening torque ⇒ page 98

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

Note

Renew O-rings.

– Lightly lubricate O-rings -arrows- with ATF before installation to prevent them getting crushed during assembly.

– Fit sender and engage retaining clip on mounting bracket for flange shaft.

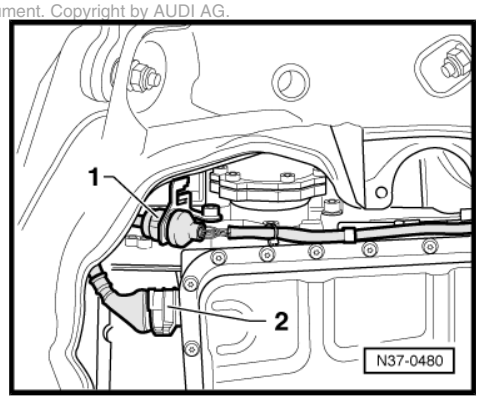
1.9 Removing and installing multifunction switch -F125-

Removing

Gearbox installed:

– Remove gearbox support (left-side) ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

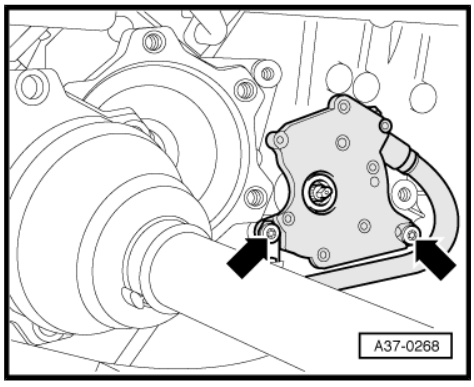
– Unplug electrical connector -1- from multifunction switch -F125- .



Gearbox removed or installed:

– Remove bolts -arrows-.

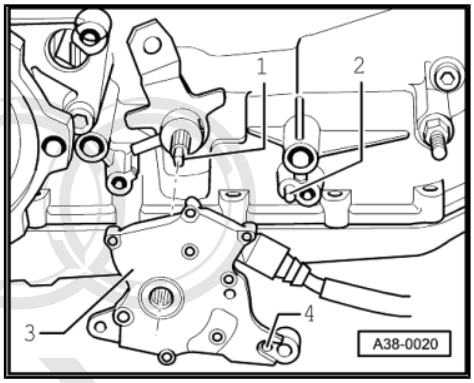
– Move clear wiring harness and pull multifunction switch -F125- off selector shaft.



Installing

- Tightening torque ⇒ page 98

– Fit multifunction switch -F125- onto selector shaft. The flat surface in the splines of the switch -3- must coincide with the flat surface on the selector shaft -1-.



Note

Fit the multifunction switch -F125- centrally on the selector shaft. Take care to keep it straight and do not use excessive force. This could damage the switch contacts.

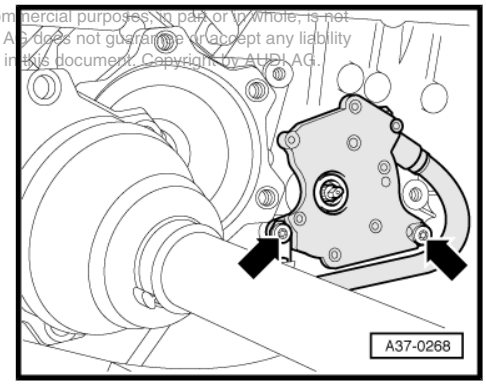
– Turn switch so that drilling -4- on switch housing can be fitted on locating pin -2- on gearbox housing.

– Secure multifunction switch -F125- -arrows-.

Gearbox installed:

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

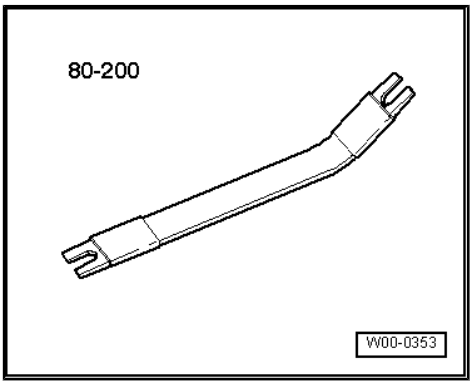
– Install gearbox support (left-side) ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .



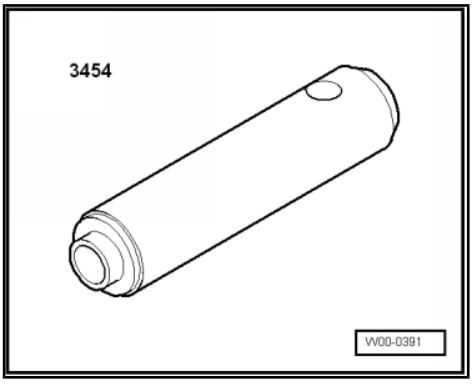
1.10 Renewing oil seal for selector shaft

Special tools and workshop equipment required

♦ Removal lever -80 - 200-



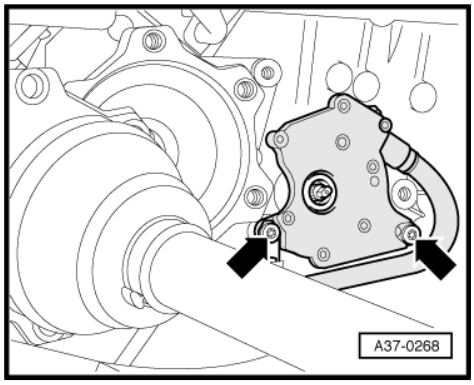
♦ Assembly sleeve -3454-



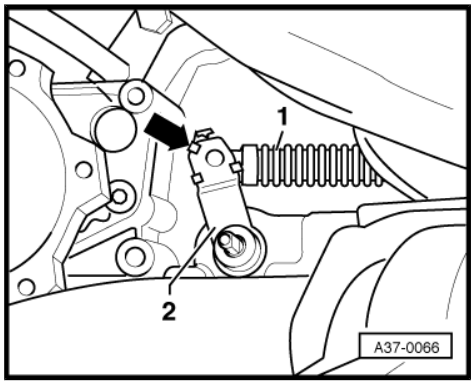
Procedure

– Remove multifunction switch -F125- ⇒ page 110 .

Gearbox installed:



– Use removal lever -80 - 200- to prise selector lever cable -1- off selector shaft lever -2- (remove retaining clip -arrow- if fitted).

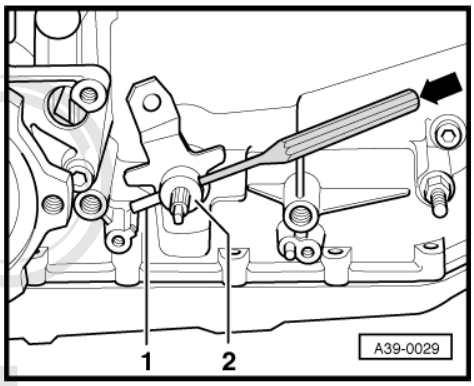


Note

Do not bend or kink the selector lever cable.

Gearbox removed or installed:

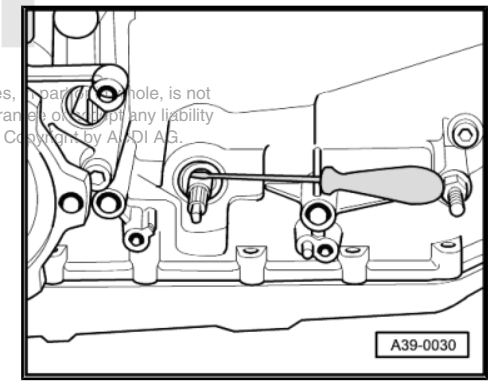
– Drive out roll pin -1- at selector shaft lever -2- towards the front -arrow- (as seen in direction of travel) until it is possible to detach selector shaft lever from selector shaft.



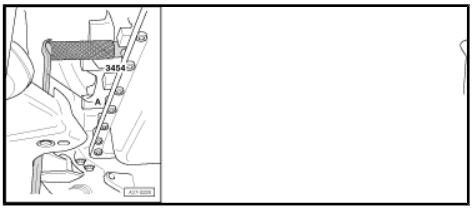
– Push a small screwdriver through the oil seal and pull it out.

– Lubricate the outer circumference and the space between sealing lips with ATF.

• Installation position: open side of oil seal points towards gearbox



– Push new oil seal onto assembly sleeve -3454- and drive in until assembly sleeve reaches stop, ensuring that seal remains straight.



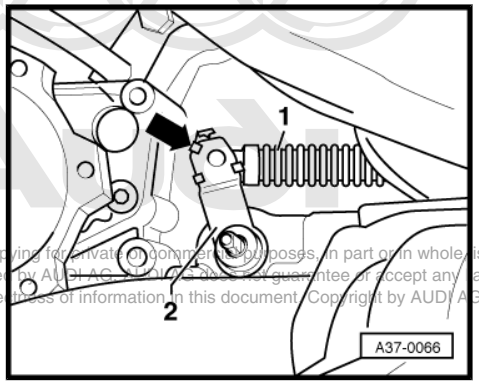
Note

Shown here with gearbox installed. When the gearbox is removed from the vehicle, the oil seal can be knocked in carefully using a plastic-headed hammer.

– Before installing, drive the roll pin in the selector shaft lever back through the lever in the opposite direction.
– Push selector shaft lever onto selector shaft and drive in roll pin.

Gearbox installed:

– Press selector lever cable -1- onto selector shaft lever -2-.



Gearbox removed or installed:

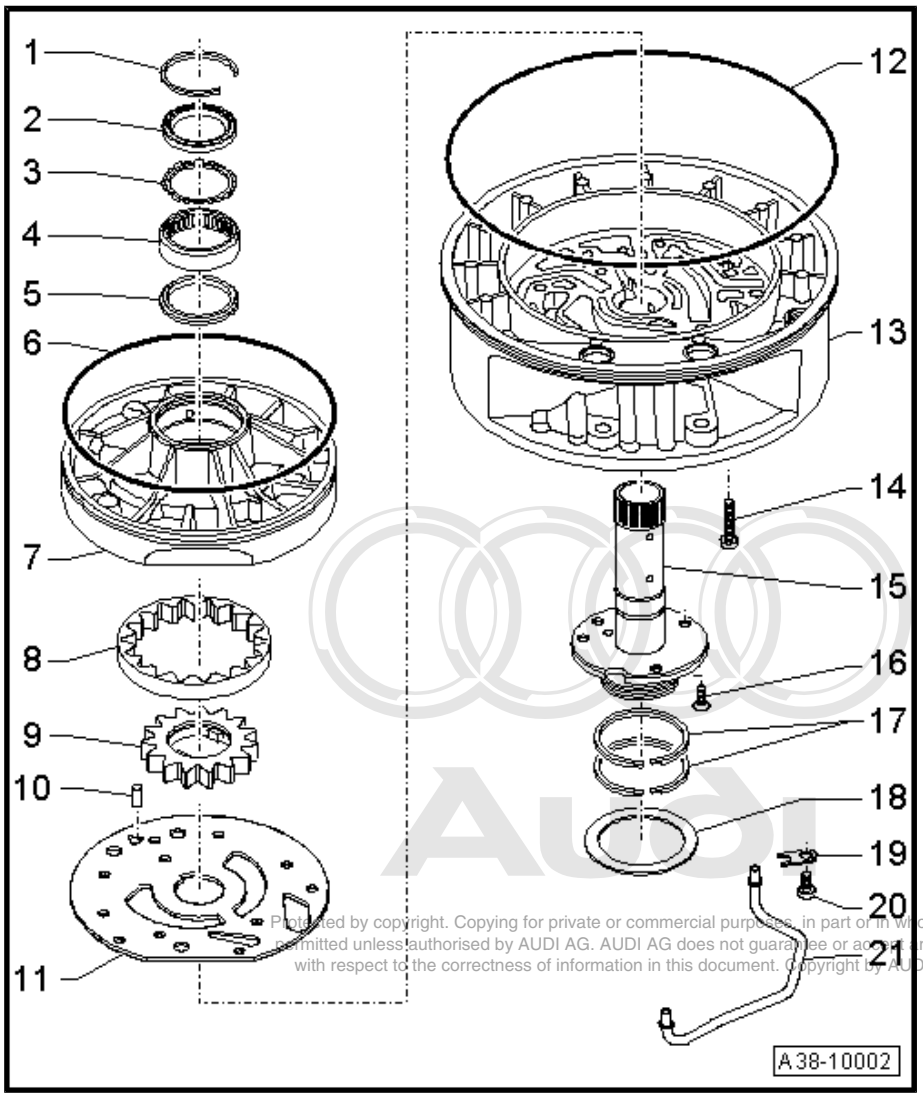
– Install multifunction switch -F125- ⇒ page 110 .

39 – Final drive - front differential

1 Exploded view - ATF supply unit

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as individual components ⇒ Parts catalogue .*
- *Check the individual components of ATF supply unit for traces of wear and damage ⇒ „6.9 ATF supply unit“, page 173 .*



1 - Circlip

2 - Torque converter oil seal

- ❑ Renew

3 - Corrugated washer

4 - Needle bearing

5 - Seal

6 - O-ring

- ❑ Renew

7 - ATF pump housing

8 - Annulus

9 - Pump gear

10 - Locating sleeve

11 - Intermediate plate

12 - O-ring

13 - ATF supply unit

14 - Bolt

- ❑ Tightening torque M5 - 5 Nm, M6 - 10 Nm

15 - Stator shaft

- ❑ Removing and installing ⇒ page 118

16 - Countersunk head bolt, 10 Nm

17 - Rectangular section seal for ATF supply unit

- ❑ Renew

18 - Shim

19 - Retaining bracket for ATF pipe

20 - Bolt, 10 Nm

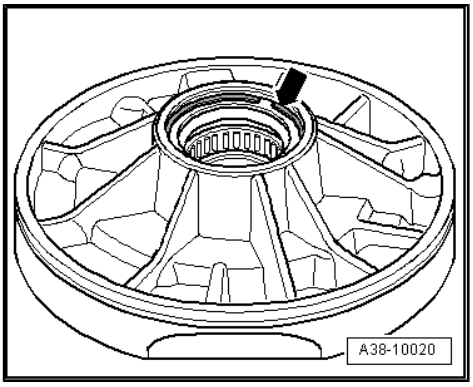
21 - ATF pipe

- ❑ Drive in by by tapping gently on alternate ends using drive-in tool -T10274- .
- ❑ Renew

1.1 Dismantling and assembling ATF supply unit

Removing oil seal for torque converter

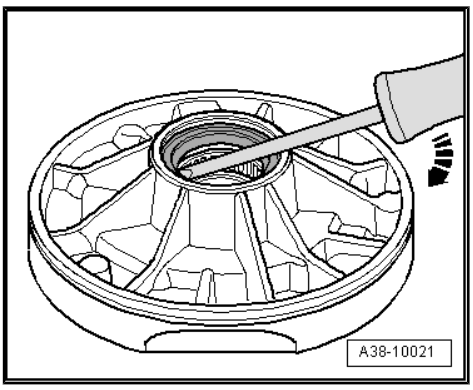
– Remove circlip -arrow-.



Note

Make sure screwdriver is applied only to seal and not to corrugated washer located below.

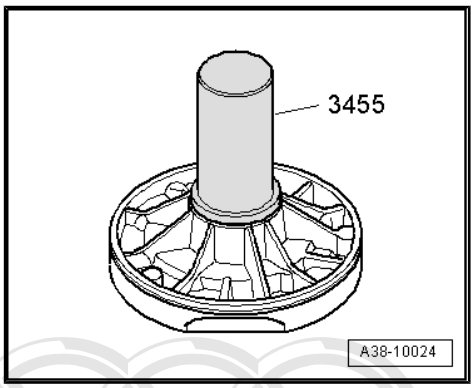
– Use screwdriver to pry off the oil seal -arrow-.



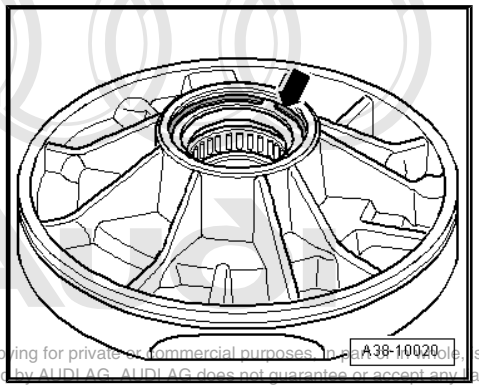
Installing oil seal for torque converter

– Check corrugated washer located below for damage.

– Drive new oil seal in onto stop using thrust piece -3455- .



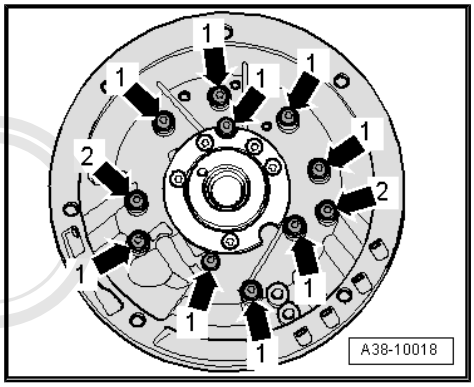
– Fit circlip -arrow-.



Removing ATF pump from housing of ATF supply unit

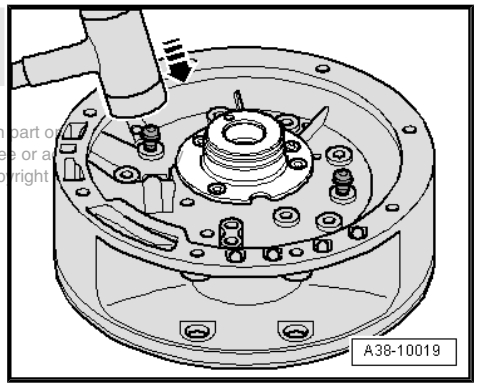
– Remove bolts -arrows 1-.

– Unscrew bolts -arrows 2- approx. 5 turns.



– Loosen ATF supply unit by tapping bolt heads gently with a plastic-headed hammer -arrow-.

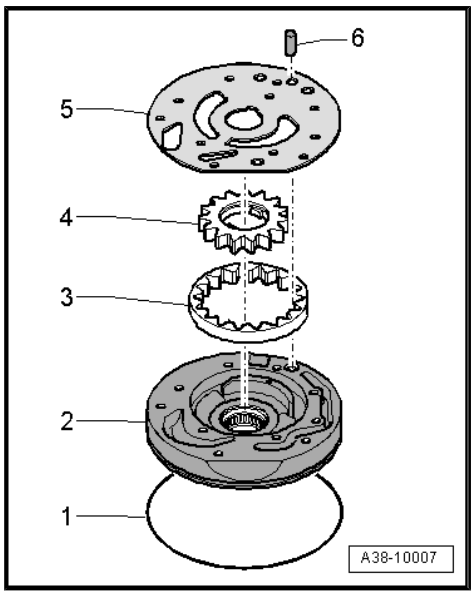
– Unscrew remaining two bolts.



– Remove intermediate plate -5- and locating sleeve -6-.

– Remove ATF pump gears -3- and -4- from ATF pump housing -2-.

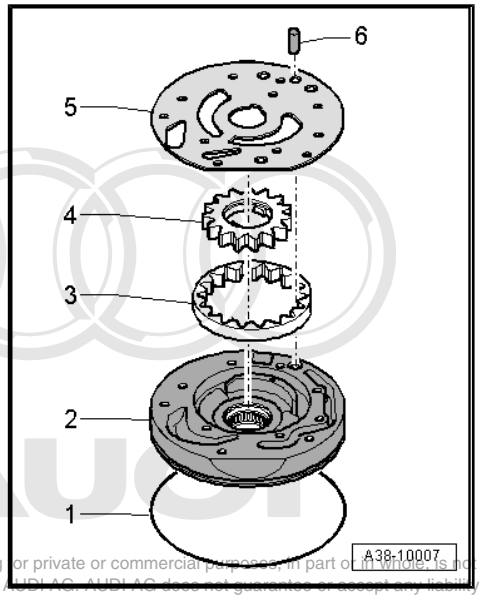
1 - O-ring



Installing ATF pump into housing of ATF supply unit

Caution

Check the individual components of ATF supply unit for traces of wear and damage ⇒ „6.9 ATF supply unit", page 173 .



– Renew O-ring -1- on ATF pump housing.
– Insert pump gears -3- and -4- into ATF pump housing -2-.
• The dots on the pump gears face the intermediate plate -5-.
– Fit intermediate plate and insert locating sleeve -6-.

Installation position of intermediate plate:

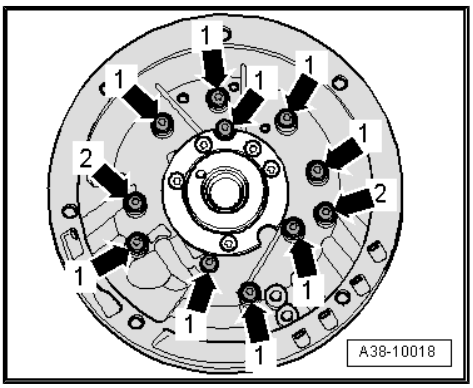
• The flat profile on the intermediate plate must be flush with the flat profile on the ATF pump housing.
• The locating sleeve engages into the rectangular opening on the intermediate plate

– Install ATF pump unit into the ATF supply unit housing.

– Tighten bolts -arrows 1- and -arrows 2- diagonally in stages.

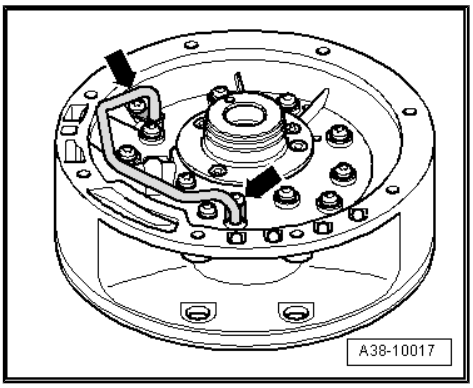
Tightening torque

• M5 bolts: 5 Nm
• M6 bolts: 10 Nm



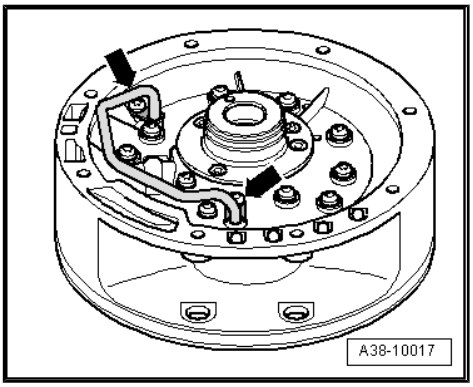
Removing ATF pipe

– Remove bolts -arrows- and carefully lever out ATF pipe from ATF supply unit using a screwdriver.



Installing ATF pipe

– Insert ATF pipe gradually into openings on ATF supply unit as far as stop by tapping pipe gently and carefully at alternate ends using drive-in tool -T10274- .
– Bolt on retaining bracket for ATF pipe -arrows-.
• Tightening torque: 10 Nm

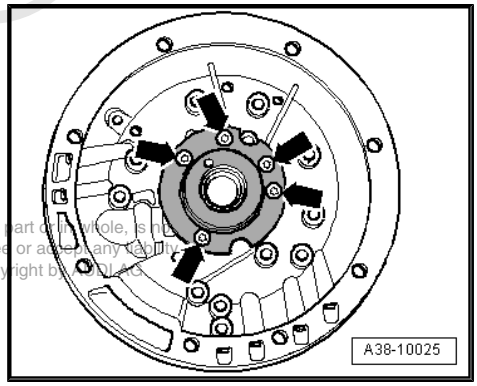


1.2 Removing and installing stator shaft

Removing

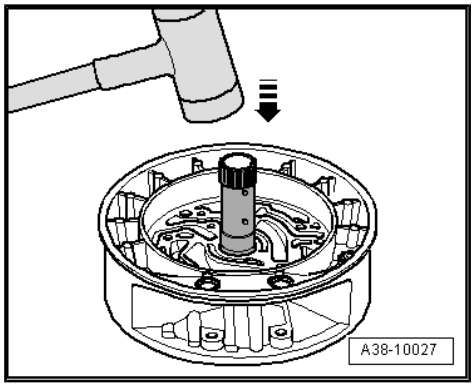
- ATF pump removed from oil supply.

– Remove bolts -arrows-.



– Heat oil supply area around stator shaft to approx. 70 °C using a hot air blower.

– Drive out stator shaft downwards.



Installing

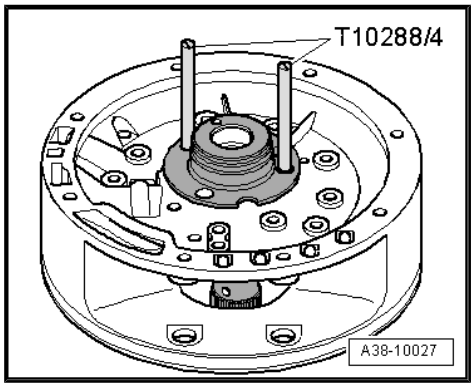
Caution

Check the individual components of ATF supply unit for traces of wear and damage *⇒ „6.9 ATF supply unit“, page 173* *.*

– Screw in guide pins M6 -T10288/4- and place stator shaft in position.

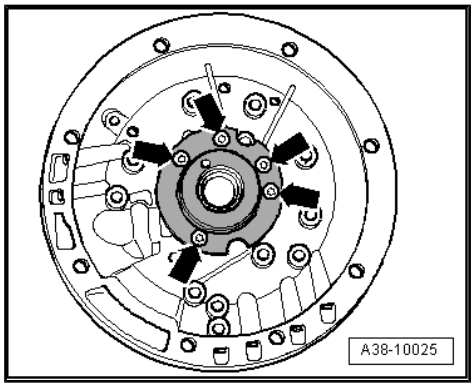
– Heat oil supply area around stator shaft to approx. 70 °C using a hot air blower.

– Press in stator shaft on workshop press.



– Tighten bolts -arrows-.

- Tightening torque: 10 Nm



1.3 Checking flow control valve in ATF supply unit

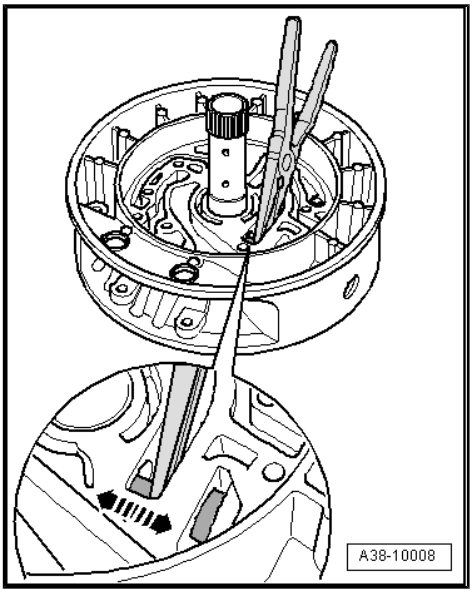
- ATF pump removed from housing of ATF supply unit.

Check flow control valve as follows:

– Move valve piston against spring pressure.

• The valve should move freely.

• The valve should be free of scoring.



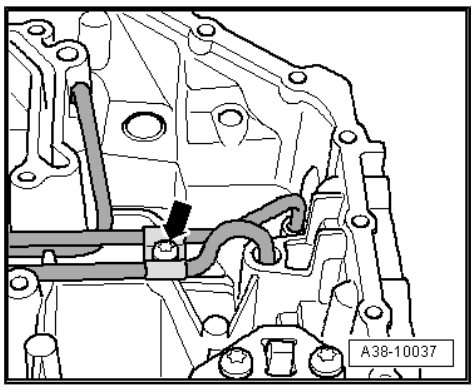
2 Removing and installing ATF/oil pipes

2.1 Removing and installing ATF pipes

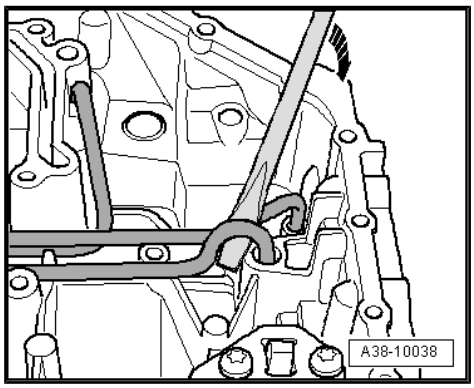
Removing

- Valve body removed.
- Selector shaft removed.

– Remove bolt -arrow- and detach retainer.



– Lever off ATF pipes from gearbox housing -arrow- evenly using a screwdriver.

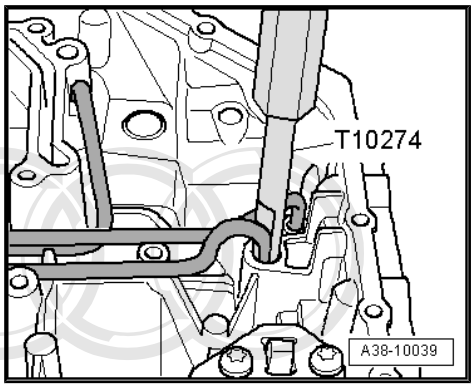


Installing

Note

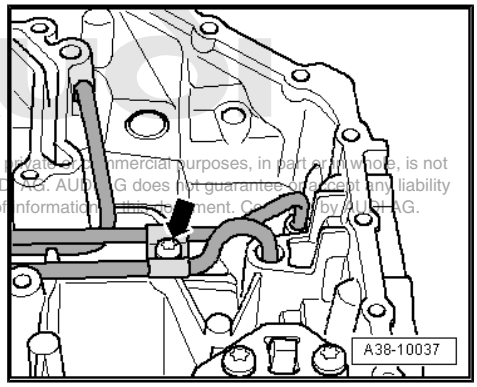
- *The removed oil pipes must always be renewed.*
- *Flush ATF galleries and blow through with compressed air.*

– Drive in ATF pipes into gearbox housing as far as stop by tapping gently and carefully at alternate ends using drive-in tool -T10274- .



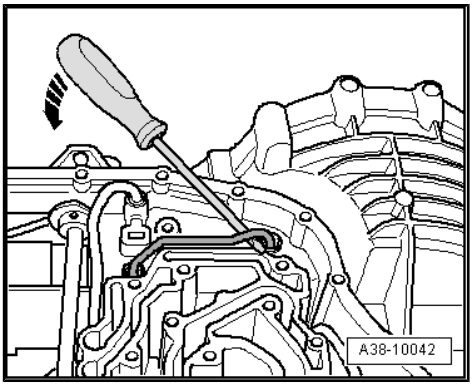
– Place retainer in position and tighten bolt -arrow-.

- Tightening torque: 10 Nm.



2.2 Removing and installing oil pipe for final drive

Removing

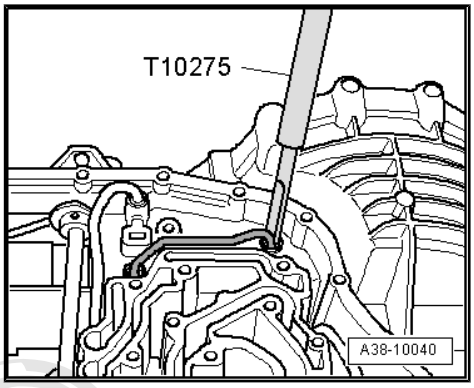


- Valve body removed.

– Lever off final drive oil pipe from gearbox housing -arrow- evenly using a screwdriver.

– Remove both oil pipe O-rings from gearbox housing.

Installing



Note

The removed oil pipes must always be renewed.

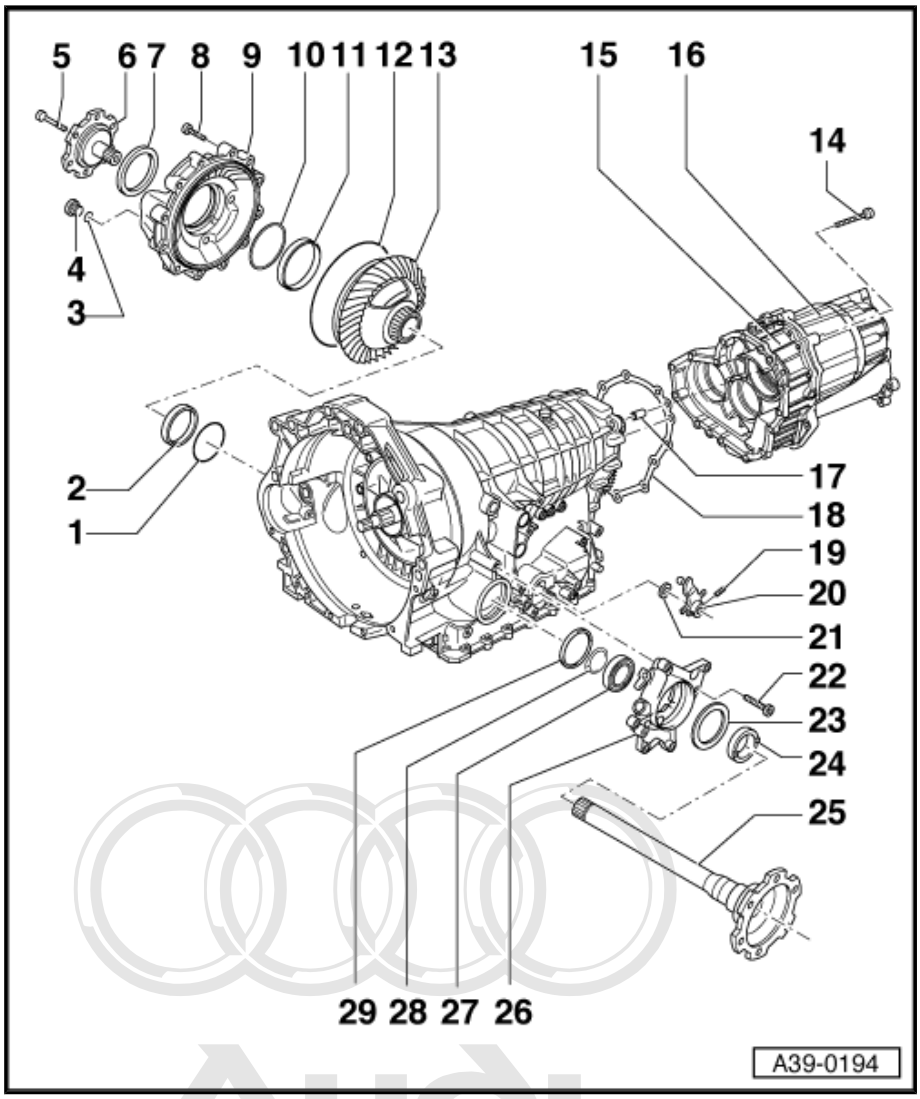
– Renew both O-rings.

– Drive in final drive oil pipe into gearbox housing as far as stop by tapping gently and carefully on alternate ends using drive-in tool -T10275- .

3 Exploded view - front final drive

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *The components shown in the following illustration can also be removed with the gearbox in the vehicle. When the gearbox is in the vehicle extra steps may be necessary for some vehicles ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .*



1 - Shim
- ❑ Behind bearing race
- ❑ Specially calibrated; must not be replaced with a non-calibrated shim

2 - Bearing race
- ❑ Remove and install by hand

3 - Seal
- ❑ Not available separately

4 - Screw plug for oil filler hole
- ❑ Renew
- ❑ 35 Nm

5 - Bolt
- ❑ Conical head
- ❑ 25 Nm

6 - Flange shaft (right-side)
- ❑ Removing and installing ⇒ page 132

7 - Oil seal
- ❑ For flange shaft (right-side)
- ❑ Renewing ⇒ page 133

8 - Bolt
- ❑ Tightening torque and sequence ⇒ page 124

9 - Cover for final drive
- ❑ ⇒ „3.7 Removing and installing cover for final drive“, page 134

10 - Shim
- ❑ Behind bearing race
- ❑ Specially calibrated; must not be replaced with a non-calibrated shim

11 - Bearing race
- ❑ Remove and install by hand

12 - O-ring
- ❑ Renewing ⇒ page 134

13 - Differential

14 - Bolt

- Tightening torque ⇒ page 141

15 - Intermediate flange for front axle drive

- ⇒ „5.4 Removing and installing intermediate flange for front axle drive“, page 146

16 - Transfer box

- Exploded view ⇒ page 139
- Removing and installing ⇒ page 144

17 - Dowel sleeve

18 - Gasket

- Renewing ⇒ page 146

19 - Spring pin

- For gearbox selector lever
- When installing, drive into gearbox selector lever from rear towards front

20 - Selector shaft lever

21 - Oil seal

- For selector shaft
- Renewing ⇒ page 111

22 - Bolt

- 23 Nm

23 - Oil seal

- For flange shaft (left-side)
- Renewing ⇒ page 126

24 - Drive wheel

- For speedometer sender -G22-
- Removing and installing ⇒ page 129

25 - Flange shaft (left-side)

- Removing and installing ⇒ page 124

26 - Mounting bracket for flange shaft (left-side)

27 - Ball bearing for flange shaft (left-side)

- Renewing ⇒ page 131

28 - Circlip

- For ball bearing

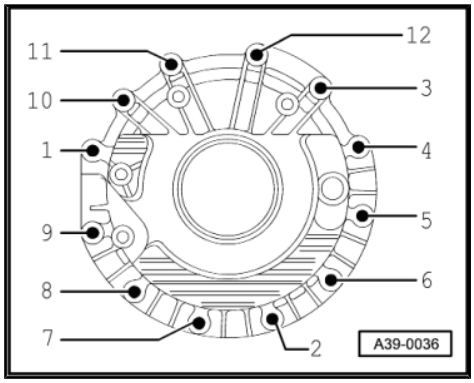
29 - O-ring for flange shaft (left-side)

- Square cross-section
- For renewing ⇒ „3.1 Removing and installing flange shaft (left-side)“, page 124

Cover for final drive - tightening torque and sequence

– Tighten bolts on cover for final drive in two stages as follows:

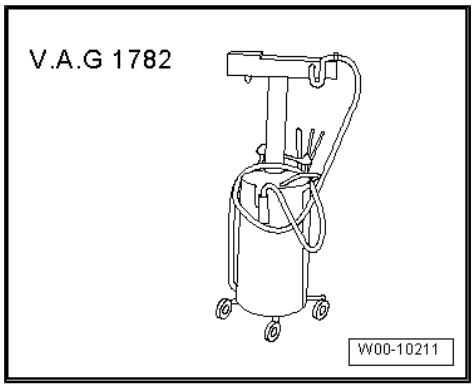
1. Screw in bolts -1 … 3- onto stop by hand.
2. Tighten bolts to 23 Nm in sequence -1 ... 12-.



3.1 Removing and installing flange shaft (left-side)

Special tools and workshop equipment required

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



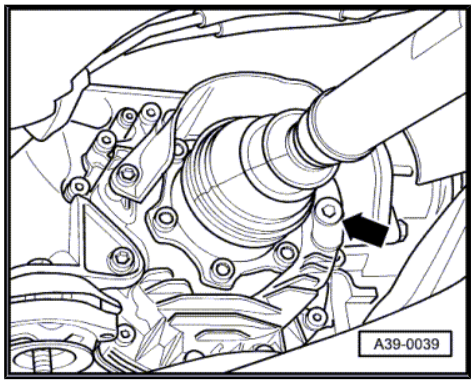
Removing

Note

♦ *General repair instructions ⇒ page 3 .*

♦ *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*

– Remove oil filler/inspection plug -arrow- for front final drive.



Note

Shown in illustration with gearbox installed.

– Extract at least 0.5 litre gear oil from final drive using used oil collection and extraction unit -V.A.G 1782- .

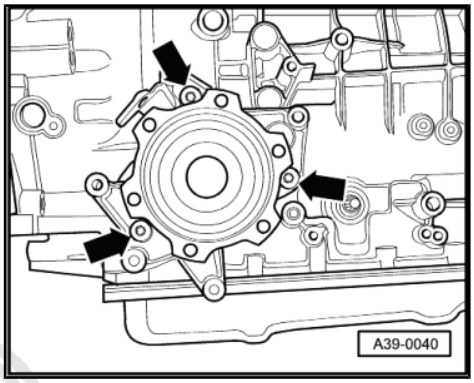
Note

It is essential to extract oil from the final drive as there is otherwise a danger of mixing gear oil with ATF.

– Remove speedometer sender -G22- ⇒ page 110 .

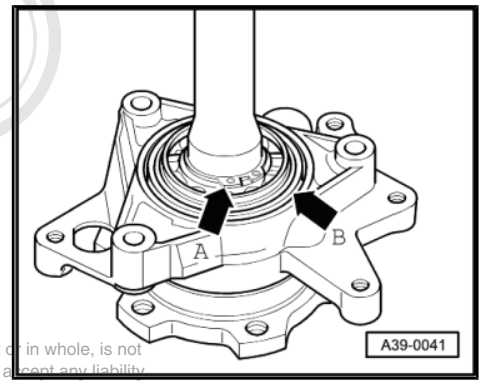
– Unbolt retainer for electrical connector from mounting bracket for flange shaft.

– Unbolt flange shaft mounting bracket -arrows-.
– Pull out flange shaft (left-side).

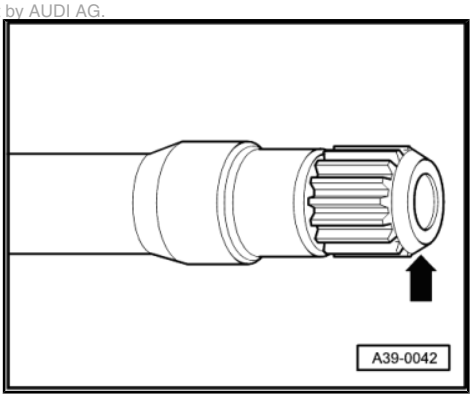


Installing

• Tightening torque ⇒ page 122
– Renew O-ring -arrow B- in mounting bracket for flange shaft (left-side).



– Check that there are no sharp edges on gearbox end of flange shaft -arrow-; deburr edges if necessary.
– Insert flange shaft (left-side) into the gearbox.



Note

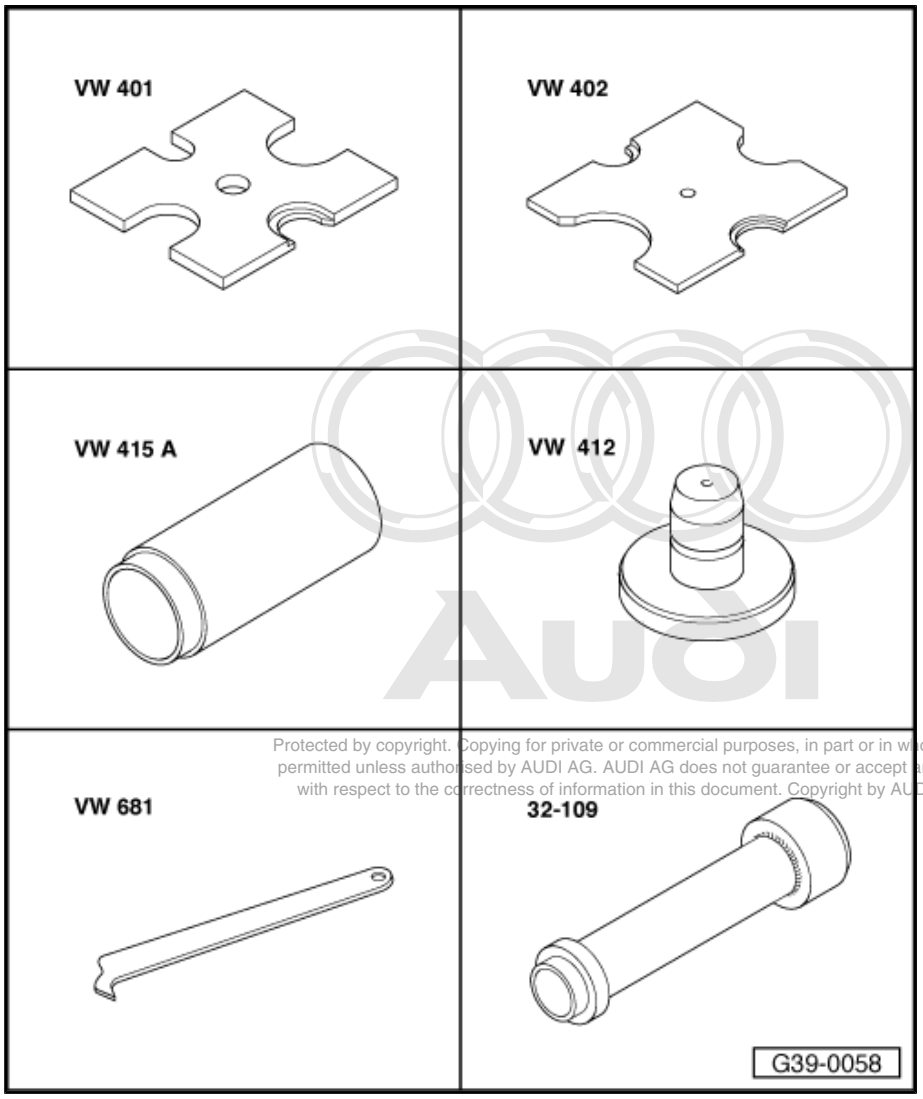
While pushing in the flange shaft (left-side), it must be guided carefully by hand to avoid damaging the twin-lip oil seal in the gearbox.

– Install speedometer sender -G22- ⇒ page 110 .
– Fill up gear oil in front final drive ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

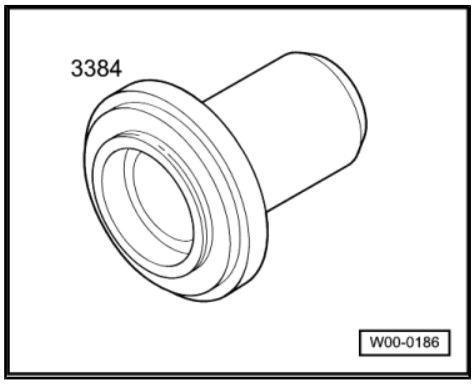
3.2 Renewing oil seal for flange shaft (left-side)

Special tools and workshop equipment required

- Thrust plate -VW 401-
- Thrust plate -VW 402-
- Tube -VW 415 A-
- Press tool -VW 412-
- Oil seal extractor lever -VW 681-
- Tube -32 - 109-



- Drift -3384-



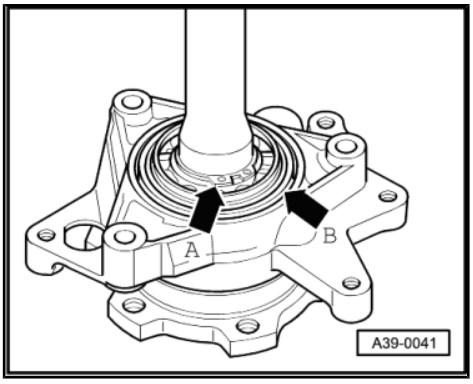
Procedure

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*

– Remove flange shaft (left-side) ⇒ page 124 .

– Remove circlip -arrow A- for ball bearing.

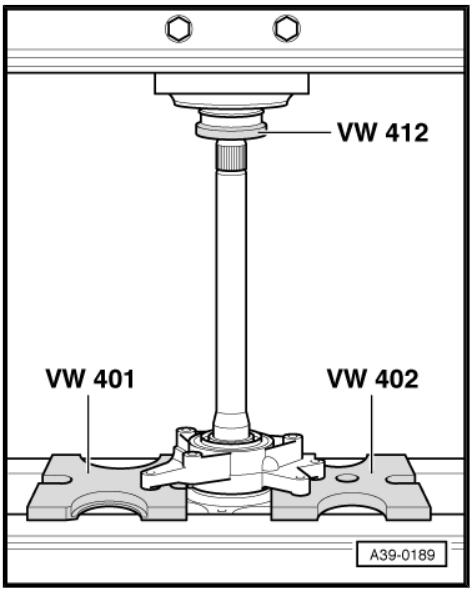


– Press flange shaft out of flange shaft mounting bracket.

Note

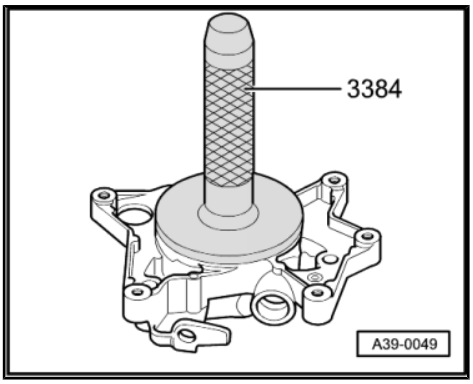
Hold the flange shaft with one hand to prevent it from falling through.

– Pull out flange shaft oil seal using oil seal extractor lever -VW 681- .



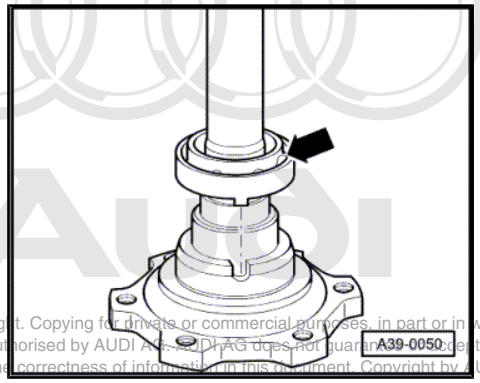
– Drive in new oil seal using drift -3384- until thrust piece contacts stop. Take care to keep oil seal straight when installing.

- Installation position: open side of oil seal points towards gearbox



– Place drive wheel for speedometer sender -G22- onto flange shaft -arrow-.

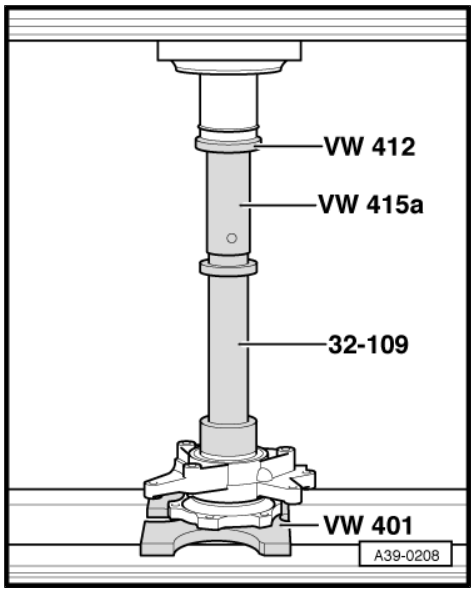
• Installation position: the coupling lugs on the drive wheel must engage in the slots on the flange shaft.



Note

If necessary, apply multi-purpose grease to the contact surface in order to hold the drive wheel in position while installing.

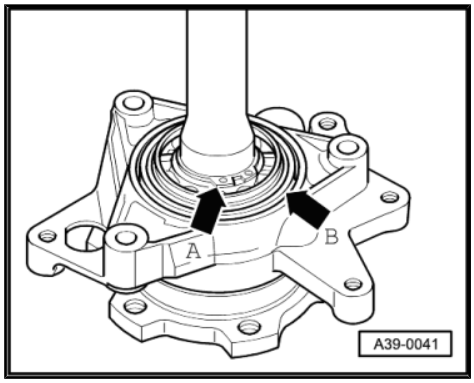
– Press mounting bracket with ball bearing onto flange shaft.



– Insert circlip -arrow A-.

– Install flange shaft (left-side) ⇒ page 124 .

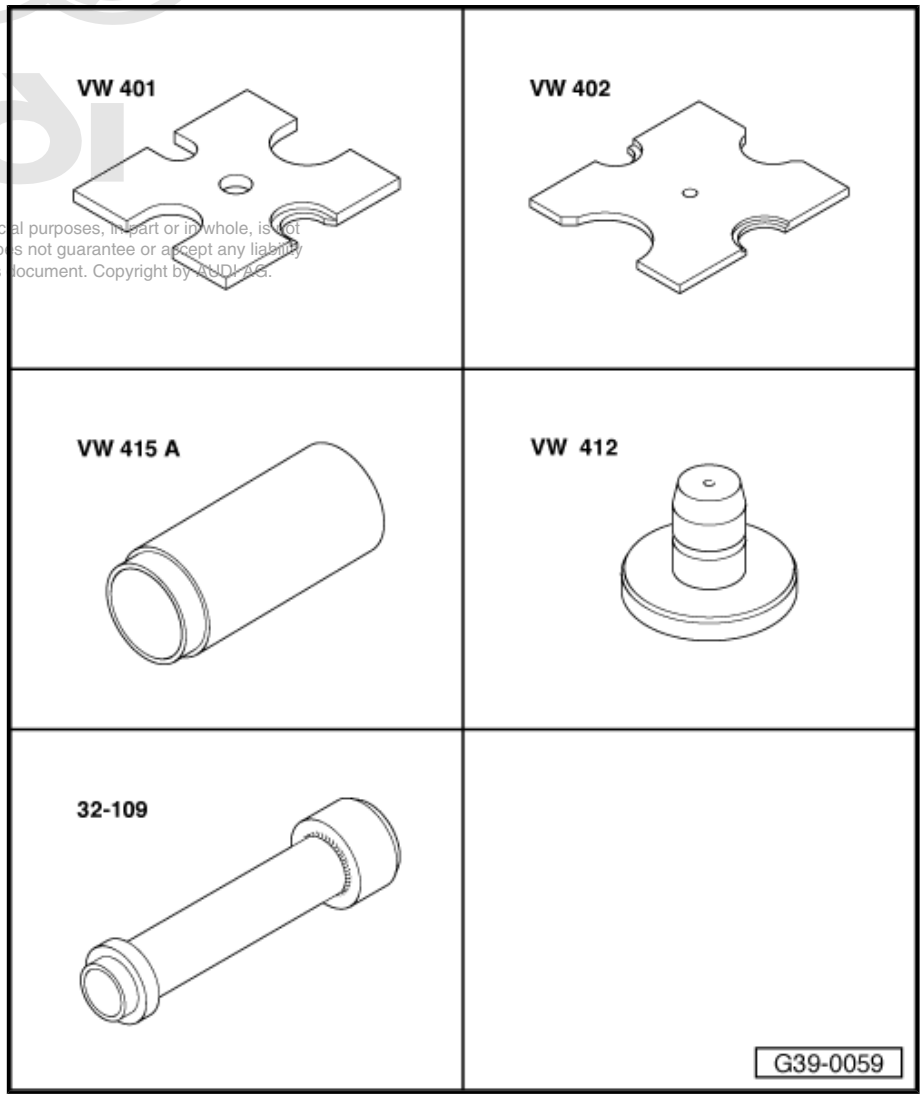
– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



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

Special tools and workshop equipment required

- Thrust plate -VW 401-
- Thrust plate -VW 402-
- Tube -VW 415 A-
- Press tool -VW 412-
- Tube -32-109-



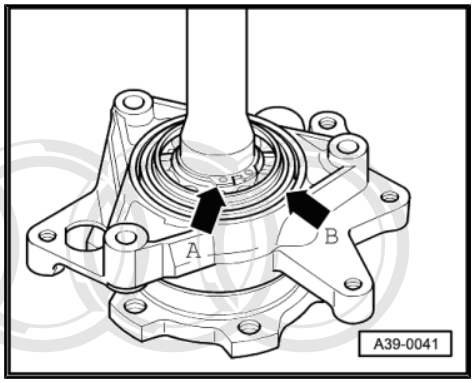
Procedure

Note

- *General repair instructions* ⇒ page 3 .
- *Rules for cleanliness when working on the automatic gearbox* ⇒ page 6 .

– Remove flange shaft (left-side) ⇒ page 124 .

– Remove circlip -arrow A- for ball bearing.

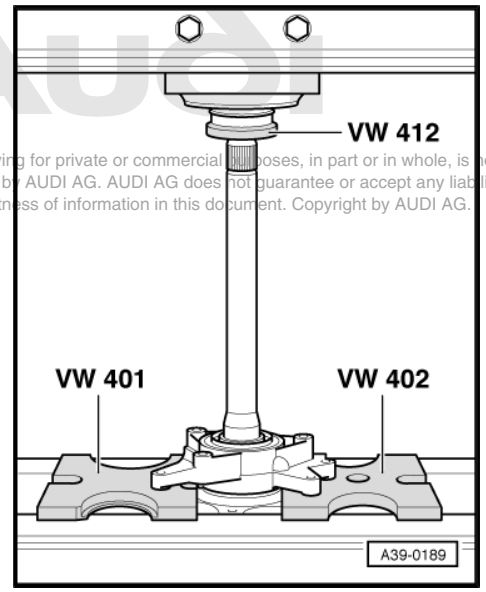


– Press flange shaft out of flange shaft mounting bracket.

Note

Hold the flange shaft with one hand to prevent it from falling through.

– Pull drive wheel for speedometer sender -G22- off flange shaft or remove from mounting bracket.

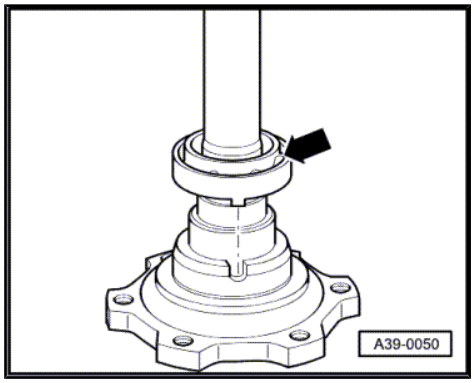


– Place drive wheel for speedometer sender -G22- onto flange shaft -arrow-.

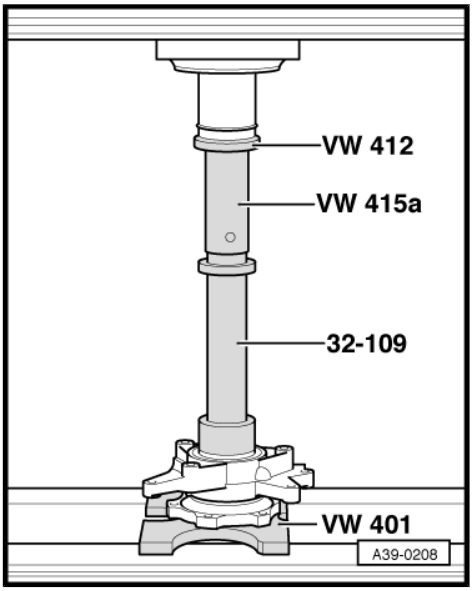
• Installation position: the coupling lugs on the drive wheel must engage in the slots on the flange shaft.

Note

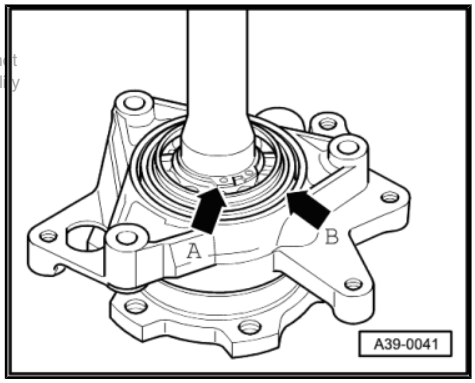
If necessary, apply multi-purpose grease to the contact surface in order to hold the drive wheel in position while installing.



– Press mounting bracket with ball bearing onto flange shaft.



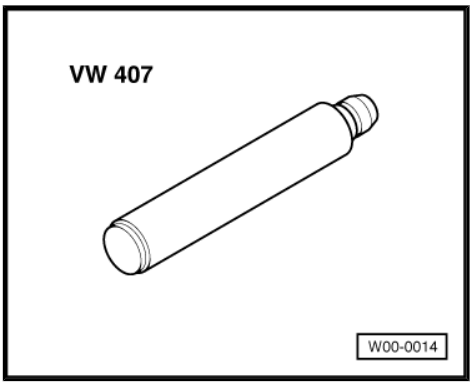
– Insert circlip -arrow A-.
– Install flange shaft (left-side) ⇒ page 124 .
– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



3.4 Renewing ball bearing for flange shaft (left-side)

Special tools and workshop equipment required

♦ Press tool -VW 407-



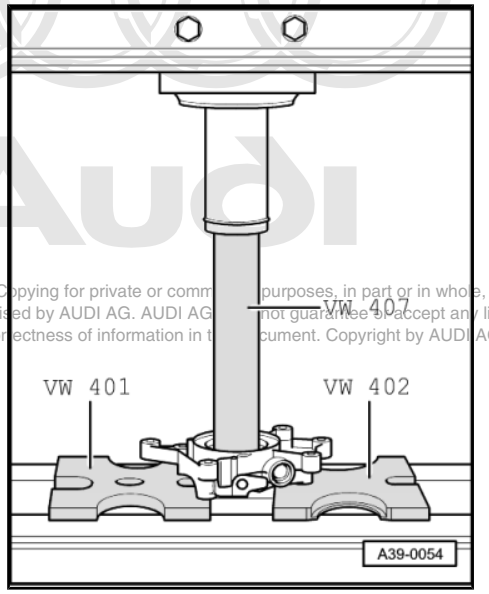
Procedure

Note

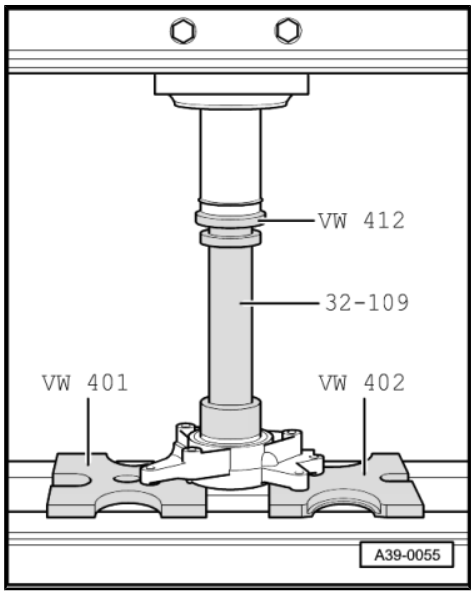
♦ *General repair instructions* ⇒ page 3 .
♦ *Rules for cleanliness when working on the automatic gearbox* ⇒ page 6 .

– Remove flange shaft (left-side) ⇒ page 124 .

– Remove drive wheel for speedometer sender -G22- ⇒ page 129 .
– Press ball bearing out of mounting bracket.



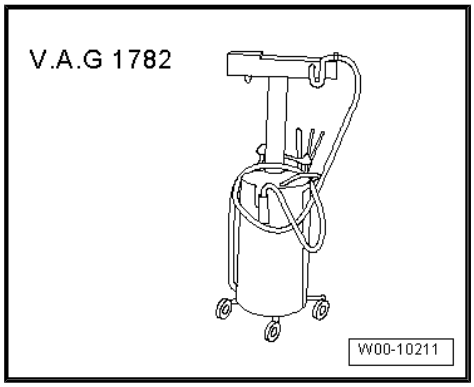
– Press new ball bearing into mounting bracket.
– Install drive wheel for speedometer sender -G22- ⇒ page 129 .
– Install flange shaft (left-side) ⇒ page 124 .
– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



3.5 Removing and installing flange shaft (right-side)

Special tools and workshop equipment required

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



Removing

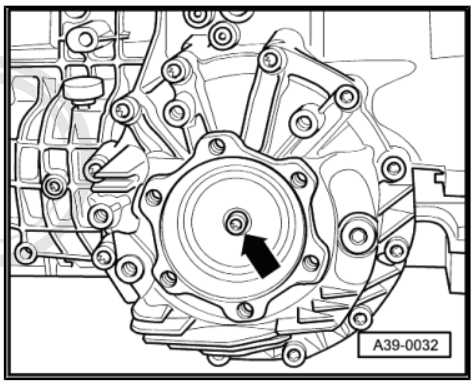
Note

- *General repair instructions* ⇒ page 3 .
- *Rules for cleanliness when working on the automatic gearbox* ⇒ page 6 .

– Remove bolt -arrow- for flange shaft (counterhold flange shaft with drift).

– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.

– Pull out flange shaft (right-side).



Installing

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

• Tightening torque ⇒ page 122

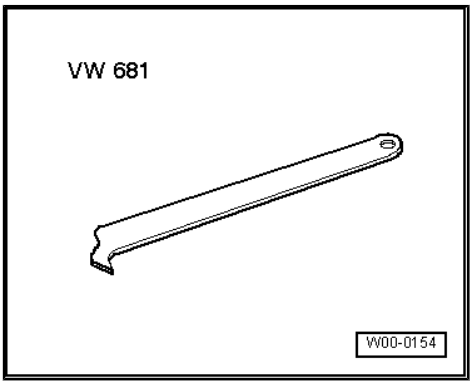
– Tighten bolt -arrow- for flange shaft (counterhold flange shaft with drift).

– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

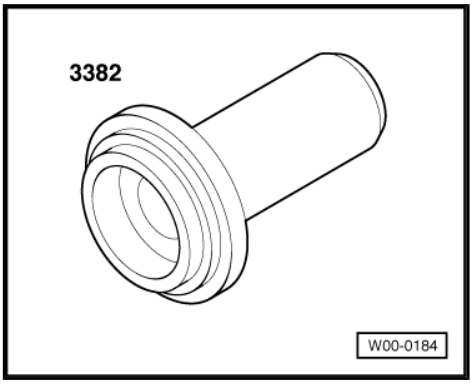
3.6 Renewing oil seal for flange shaft (right-side)

Special tools and workshop equipment required

- Oil seal extractor lever -VW 681-



- Drift -3382-



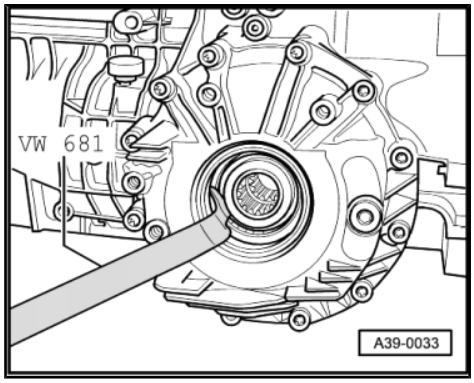
Procedure

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*

– Remove flange shaft (right-side) ⇒ page 132 .

– Pull out flange shaft oil seal using oil seal extractor lever -VW 681- .



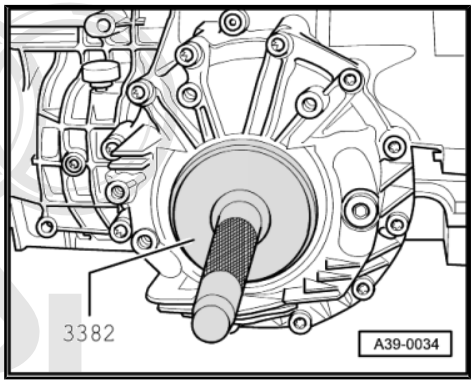
– Lightly lubricate outer circumference of oil seal with gear oil.

– Drive in new oil seal onto stop using drift -3382- . Take care to keep oil seal straight when installing.

• Installation position: the open side of the oil seal should face the gearbox.

– Install flange shaft (right-side) ⇒ page 132 .

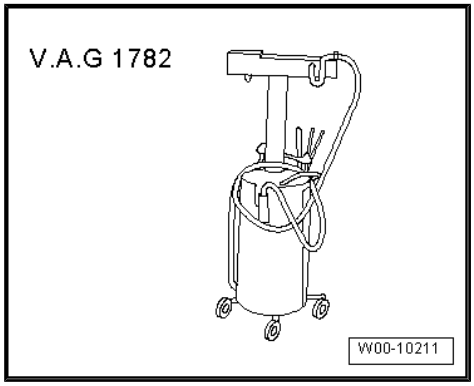
– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



3.7 Removing and installing cover for final drive

Special tools and workshop equipment required

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



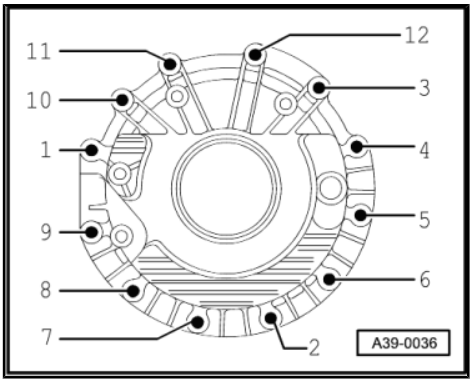
Removing

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*

– Remove flange shaft (right-side) ⇒ page 132 .

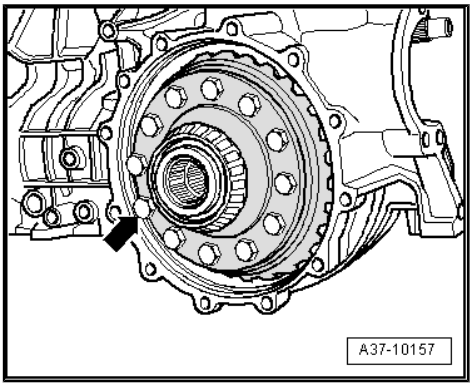
– Unscrew bolts of cover for final drive in the reverse sequence to the tightening sequence shown and remove cover.



Caution

- ***Detach cover for final drive from gearbox housing slowly and carefully. The differential may otherwise fall out of the gearbox.***
- ***A differential which has fallen to the ground can no longer be installed. Renew gearbox if differential has fallen to the ground.***
- ***Make sure that bearing races and shims for differential do not drop out of gearbox housing and cover for final drive.***
- ***Bearing races and shims cannot be re-allocated to their original positions by the workshop if they have dropped out.***

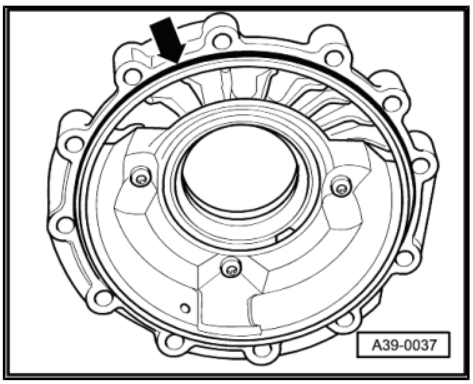
– Carefully take out differential -arrow-.



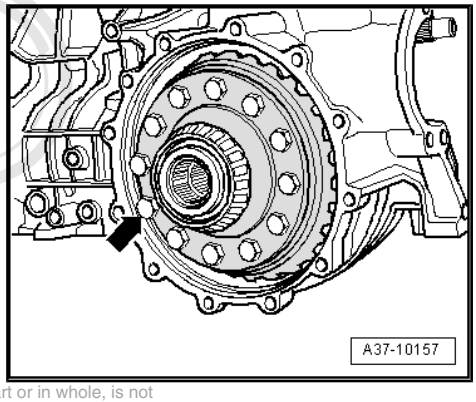
Installing

- Tightening torque ⇒ page 122

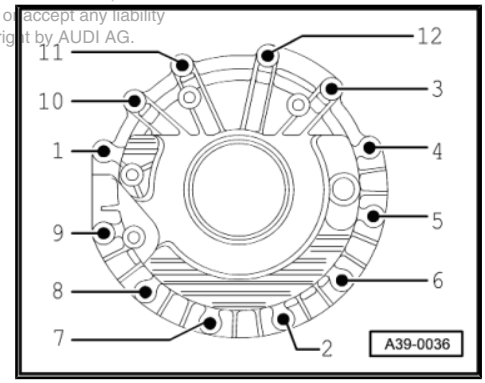
– Renew O-ring -arrow-.



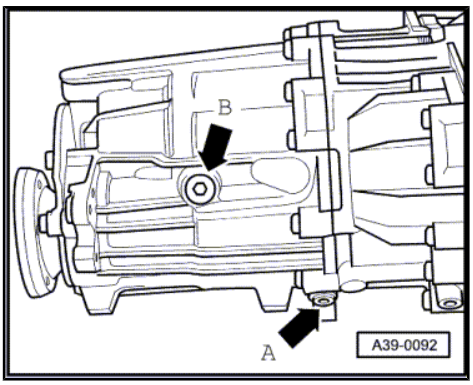
– Carefully insert differential.



– Fit cover for final drive and tighten bolts ⇒ page 124 .
– Install flange shaft (right-side) ⇒ page 132 .
– Fill up gear oil in front final drive after repairs ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



4 Overview - oil drain plug and inspection plug for gear oil in transfer box



Note

Both plugs must be renewed together with the seals after they have been removed.

A - Oil drain plug

- Renew
- Tightening torque: 20 Nm.

B - Oil inspection plug

- Renew
- Tightening torque: 35 Nm.

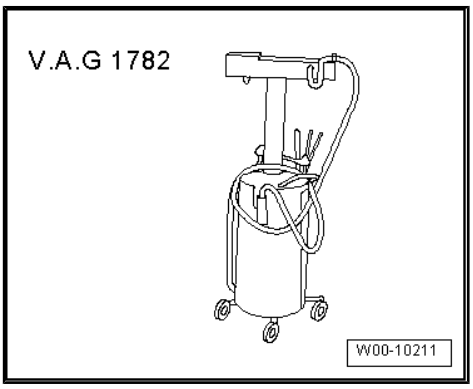
4.1 Checking gear oil level in transfer box and topping up

The gear oil level can only be checked correctly with the gearbox in the vehicle ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

4.2 Draining and filling up gear oil in transfer box

Special tools and workshop equipment required

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



♦ Safety goggles

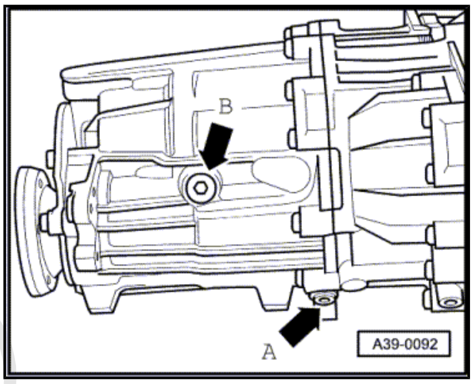
Draining gear oil

- Tightening torques ⇒ page 137

– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.

WARNING

Wear safety goggles.



– Remove oil drain plug -arrow A- and drain gear oil.

Note

The oil drain plug with seal must be renewed.

– Tighten new drain plug.

Filling up gear oil

– Unscrew oil inspection plug -arrow B-.

– Fill gear oil up to bottom lip of oil filler hole; capacities ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 00 , specification ⇒ Electronic parts catalogue .

Note

The gearbox can only be pre-filled when it is removed from the vehicle. The gearbox must be installed in the vehicle in order to obtain the correct gear oil filling.

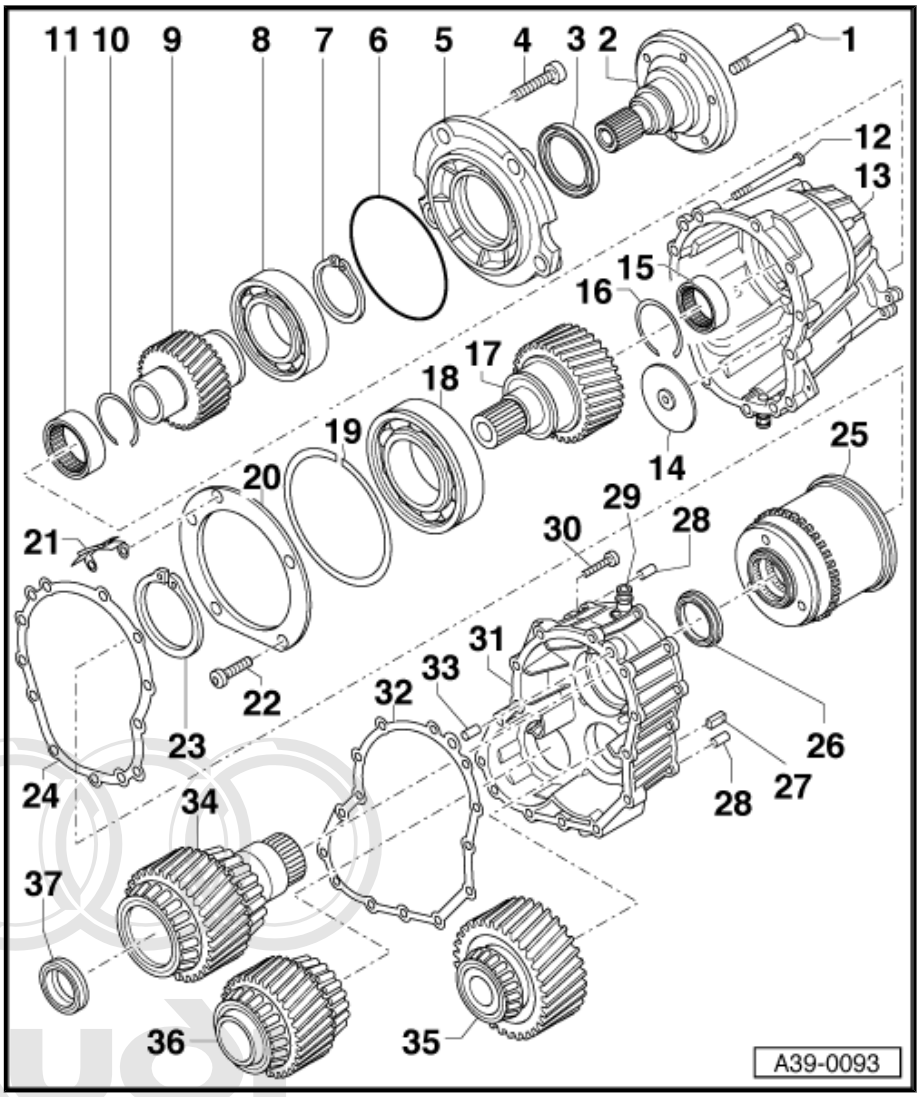
– Screw in old oil inspection plug.

– Fill transfer box with gear oil after repairs, check oil level and correct as necessary ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

5 Exploded view - transfer box

Note

- *General repair instructions ⇒ page 3 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 6 .*
- *The components shown in the following illustration can also be removed with the gearbox in the vehicle. When the gearbox is in the vehicle extra steps may be necessary for some vehicles ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .*



1 - Bolt
- ❑ 25 Nm

2 - Flange shaft (rear)
- ❑ ⇒ „5.1 Removing and installing flange shaft (rear)“, page 142

3 - Oil seal
- ❑ For flange shaft (rear)
- ❑ Renewing ⇒ page 143

4 - Bolt
- ❑ For housing cover
- ❑ 4x
- ❑ 23 Nm

5 - Housing cover

6 - O-ring
- ❑ Lubricate with gear oil

7 - Circlip
- ❑ For ball bearing on spur gear 1

8 - Ball bearing
- ❑ For spur gear 1

9 - Spur gear 1
- ❑ For rear axle drive
- ❑ If damaged, always renew together with spur gear 2
- ❑ To remove and install, pull out of transfer box housing ⇒ Item 13 (page 140) towards the rear, together with ⇒ Item 7 (page 139) and ⇒ Item 8 (page 139)

10 - Circlip
- ❑ For needle bearing

11 - Needle bearing
- ❑ For spur gear 1
- ❑ May only be removed in order to renew
- ❑ To renew, heat transfer box housing to approx. 100 °C and drive out needle bearing to rear with suitable drift (Warning: wear protective gloves)

- ❑ Drive in onto stop using sleeve -30 - 21-

12 - Bolt

- ❑ Loosen in diagonal sequence
- ❑ Tightening torque and sequence ⇒ page 141

13 - Transfer box housing

- ❑ Can be renewed if damaged

14 - Tensioning nut

- ❑ For flange shaft (rear)

15 - Needle bearing

- ❑ For spur gear 2
- ❑ May only be removed in order to renew
- ❑ Renewing ⇒ page 153

16 - Circlip

- ❑ Secures needle bearing in transfer box housing

17 - Spur gear 2

- ❑ For rear axle drive
- ❑ If damaged, always renew together with spur gear 1
- ❑ To remove and install, remove transfer box housing ⇒ page 144 and pull out together with ⇒ Item 18 (page 140) , ⇒ Item 19 (page 140) and ⇒ Item 23 (page 140)

18 - Ball bearing

- ❑ For spur gear 2

19 - Circlip

- ❑ Secures ball bearing in transfer box housing

20 - Securing plate

- ❑ For ball bearing
- ❑ Before installing, clip alignment plate onto securing plate

21 - Alignment plate

- ❑ Clip onto securing plate

22 - Bolt

- ❑ For securing plate
- ❑ 8 Nm

23 - Circlip

- ❑ Secures ball bearing on spur gear 2

24 - Gasket

- ❑ Renewing ⇒ page 144

25 - Self-locking centre differential (PAT)

- ❑ Renew as complete unit if damaged
- ❑ Removing and installing ⇒ page 144

26 - Twin-lip oil seal

- ❑ Renewing ⇒ page 148

27 - Magnet

- ❑ Removing and installing ⇒ page 144

28 - Dowel sleeve

- ❑ 2x

29 - Breather

- ❑ For transfer box

- ❑ With fitted cap
- ❑ Installation position: breather without cap must project 10 ... 11 mm from housing

30 - Bolt

- ❑ Loosen in diagonal sequence
- ❑ Tightening torque and sequence ⇒ page 141

31 - Intermediate flange for front axle drive

- ❑ ⇒ „5.4 Removing and installing intermediate flange for front axle drive“, page 146

32 - Gasket

- ❑ Renewing ⇒ page 146

33 - Dowel sleeve

34 - Input pinion

- ❑ For front axle drive
- ❑ Removing and installing ⇒ page 149

35 - Intermediate pinion

- ❑ For front axle drive
- ❑ Installation position: gear identification faces towards transfer box

36 - Output pinion

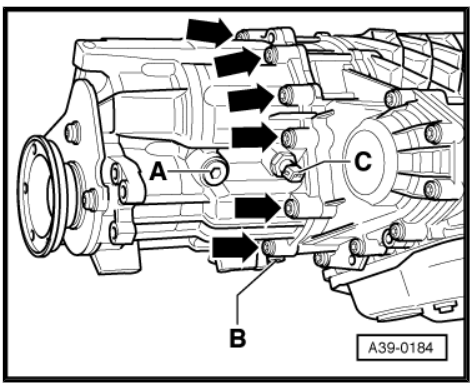
- ❑ For front axle drive
- ❑ Installation position: gear identification faces towards transfer box

37 - Twin-lip oil seal

- ❑ In input pinion
- ❑ Renewing ⇒ page 149

Transfer box - tightening torque and sequence

– Tighten bolts -arrows- for transfer box diagonally in stages to 23 Nm.



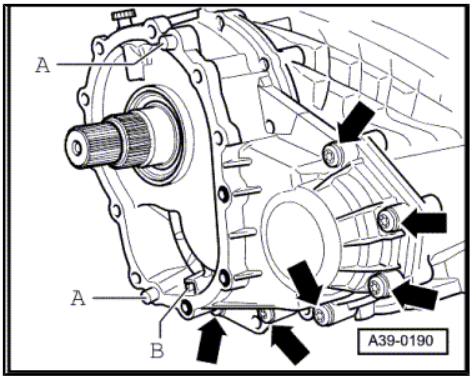
Note

When first tightening the bolts by hand, ensure that the gap between the transfer box and the gearbox housing is reduced by the same amount all the way round.

Intermediate flange for front axle drive - tightening torque

– Tighten bolts -arrows- on intermediate flange for front axle drive in two stages as follows:

1. Screw in bolts onto stop by hand.
2. Tighten bolts to 23 Nm.



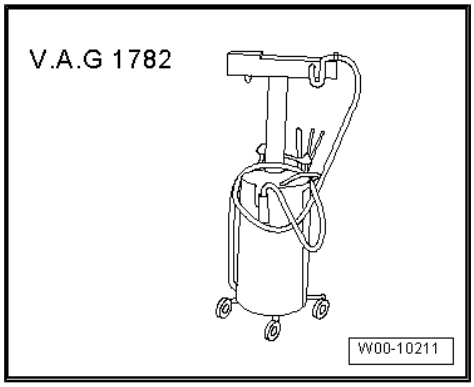
Note

- ♦ *When screwing in the bolts hand-tight, ensure that the gap between the intermediate flange for the front axle drive and the gearbox housing is reduced uniformly all round.*
- ♦ *Ignore -item A- and -item B-.*

5.1 Removing and installing flange shaft (rear)

Special tools and workshop equipment required

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

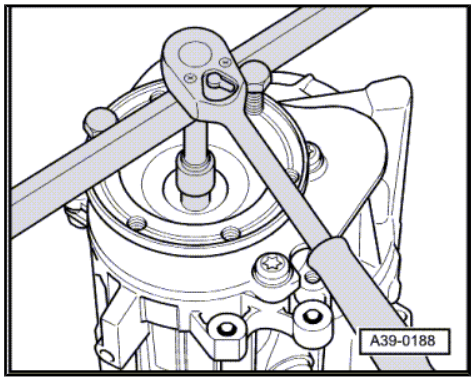


- Safety goggles

Removing

Note

When the gearbox is in the vehicle extra steps may be necessary for some vehicles in order to remove the flange shaft (rear) ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .



– Drain gear oil from transfer box ⇒ page 137 .
– Remove bolt securing flange shaft. To do so, screw two bolts into flange and counterhold flange shaft with suitable lever.
– Pull out flange shaft using the bolts already screwed in; loosen with two levers if necessary.

Note

Take care not to damage the flange on the gearbox housing when levering out the flange shaft.

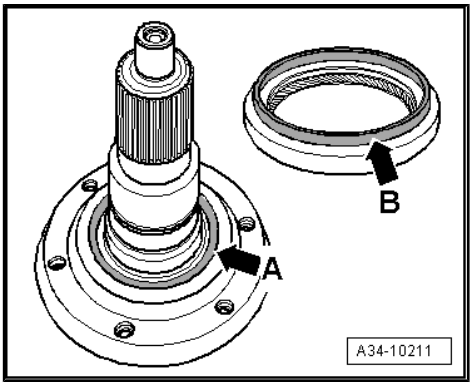
Installing

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

- Tightening torque ⇒ page 139

– Secure flange shaft (rear).
– Fill up gear oil in transfer box ⇒ page 137

5.2 Renewing oil seal for flange shaft (rear)

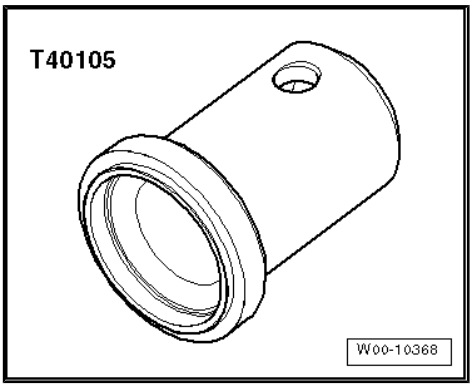


Note

- *A modified oil seal with sealing lip -arrow B- is supplied for the flange shaft (rear) (propshaft output flange). To ensure proper sealing, the flange shaft (rear) must also be renewed; for correct version refer to ⇒ Electronic parts catalogue .*
- *To avoid renewing the flange shaft (rear) a second time when performing a repeat repair, you should check the part number of the flange shaft. The flange shaft (rear) with the slot -arrow A- for the oil seal with sealing lip is identified with Part No. -01V 409 809 A- .*

Special tools and workshop equipment required

- Thrust piece -T40105-



Procedure

- Tightening torque ⇒ page 139

Note

When the gearbox is in the vehicle extra steps may be necessary for some vehicles in order to renew the oil seal for the flange shaft (rear).

Gearbox installed:

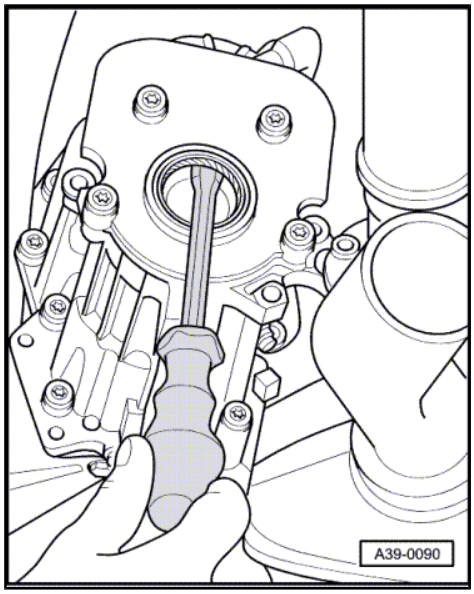
– Remove flange shaft (rear) ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

Gearbox removed:

– Remove flange shaft (rear) ⇒ page 142 .

Gearbox removed or installed:

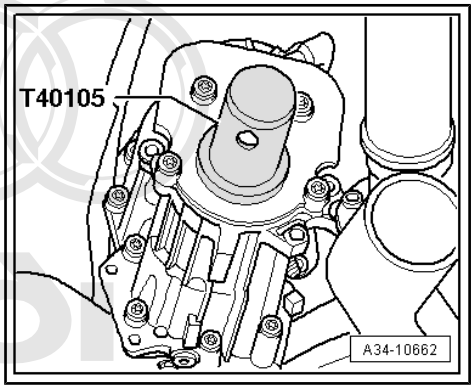
– Remove oil seal using a suitable screwdriver.



Caution

Note the correct installation depth.

DO NOT drive in the seal all the way until the tool reaches the stop.



- Installation depth: 1.7 mm below top of cover.

– Drive in oil seal evenly to specified installation depth using thrust piece -T40105- . Take care to keep seal straight when installing.

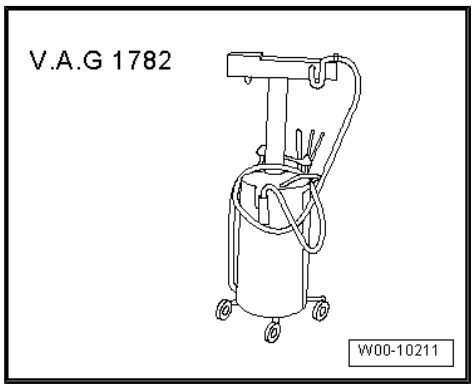
– Install flange shaft (rear) ⇒ page 142.

– Fill up gear oil in transfer box ⇒ page 137

5.3 Removing and installing transfer box

Special tools and workshop equipment required

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



♦ Safety goggles

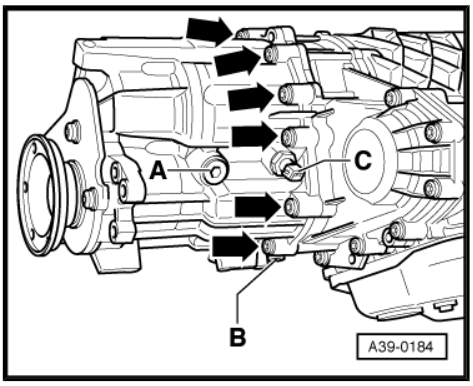
Removing

Note

When the gearbox is in the vehicle extra steps may be necessary for some vehicles in order to remove the transfer box ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 39 .

– Drain gear oil from transfer box ⇒ page 137 .

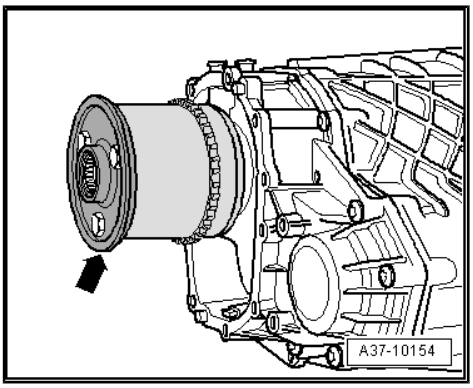
– Loosen bolts -arrows- for transfer box in diagonal sequence and remove.



WARNING

Pull transfer box housing slowly and carefully off gearbox towards the rear. Take care that self-locking centre differential does not drop out of gearbox.

– Pull self-locking centre differential -arrow- off output shaft towards the rear.



Installing

- Tightening torque ⇒ page 139

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

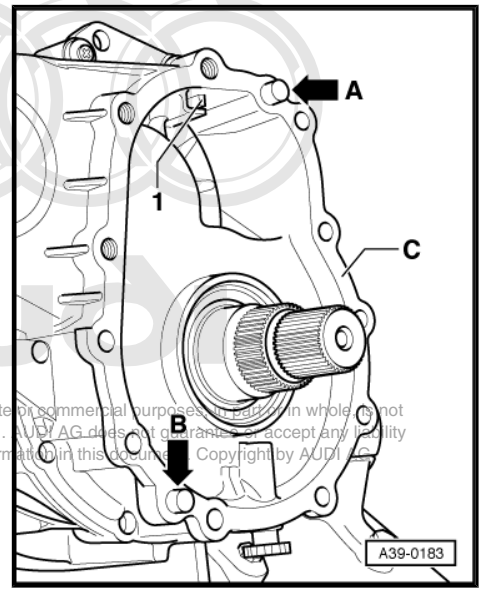
– Check that dowel sleeves -arrow A- and -arrow B- are fitted.

– Install gasket.

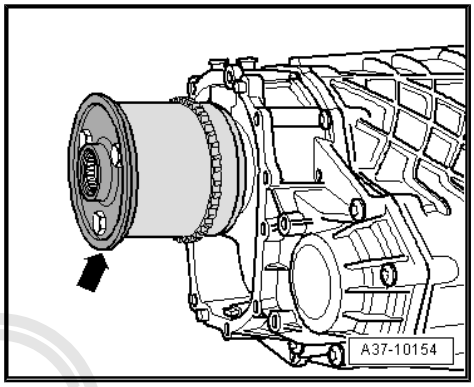
Note

Apply a thin coating of gear oil to sealing surface -C- to prevent gasket from slipping.

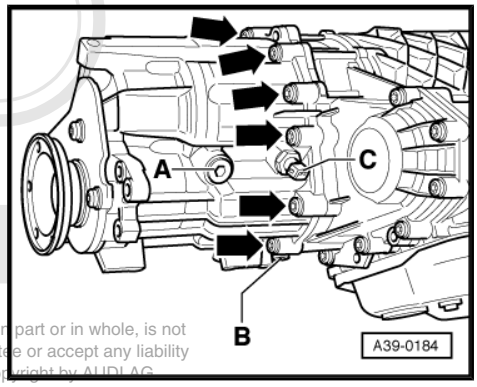
– Clean the magnet and insert it in chamber -1- on the casting of the intermediate flange.



– Fit self-locking centre differential -arrow- on splines of output shaft and lowest spur gear, turning it slightly at the same time.
– Check that self-locking centre differential can be turned by hand when it is in position.



– Fit transfer box (with spur gears and rear output flange installed) onto gearbox flange.
– Fit and tighten bolts -arrows- ⇒ page 141 .



Note

When first tightening the bolts by hand, ensure that the gap between the transfer box and the gearbox housing is reduced by the same amount all the way round.

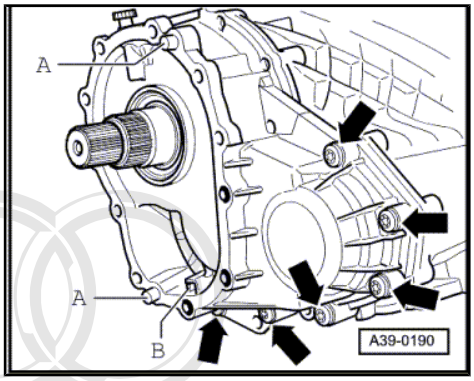
– Fill up gear oil in transfer box ⇒ page 137

5.4 Removing and installing intermediate flange for front axle drive

Removing

– Remove transfer box ⇒ page 144

– Unscrew bolts -arrows- on intermediate flange for front axle drive.



Note

Ignore -item A- and -item B-.

Caution

- ***Detach intermediate flange from gearbox housing slowly and carefully. Otherwise spur gears could drop out of gearbox.***
- ***Spur gears which have been dropped on the floor must not be used again. If this happens, the gearbox must be renewed.***

– Lift off the intermediate flange for front axle drive

Caution

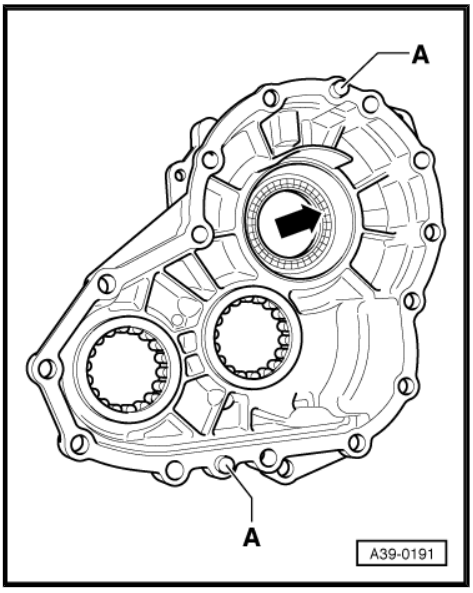
- ***Do not remove the spur gears for the front axle drive. Secure the spur gears to prevent them from falling out.***
- ***If the spur gears for front axle drive are removed for any reason, mark installation position of intermediate pinion.***
- ***The intermediate pinion is symmetrical. However, it must be re-fitted in the same position to make sure the direction of rotation is maintained.***

Installing

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

- Tightening torque ⇒ page 139

– Check that dowel sleeves -A- in intermediate flange for front axle drive are fitted correctly.



Note

Before attaching the gasket, apply a thin coating of gear oil to the sealing surface to prevent it from slipping.

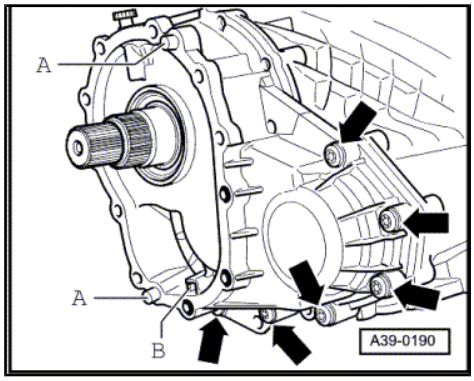
– Fit new gasket.

Caution

Fitting the intermediate flange onto the output shaft without sufficient care can damage the sealing lips of the oil seal -arrow-.

– Fit intermediate flange for front axle drive.

– Tighten bolts for intermediate flange for front axle drive ⇒ page 141 .



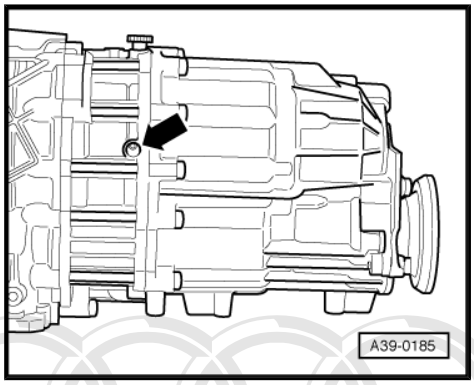
Note

When screwing in the bolts hand-tight, ensure that the gap between the intermediate flange for the front axle drive and the gearbox housing is reduced uniformly all round.

– Install transfer box ⇒ page 144 .

– Check ATF level in planetary gearbox and top up as required ⇒ Automatic gearbox 01L, four-wheel drive; Rep. gr. 37 .

5.5 Renewing twin-lip oil seal in intermediate flange for front axle drive

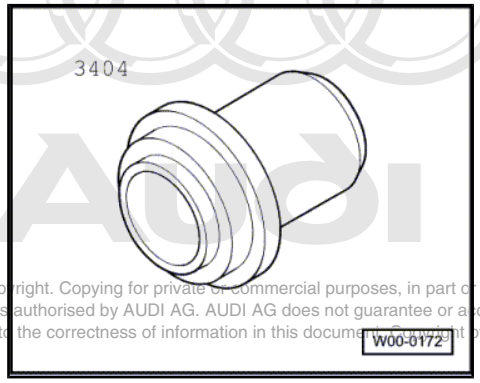


Note

- *An inspection drilling -arrow- is provided on the left side of the intermediate flange to check for oil leaks at the twin-lip oil seals in the input pinion and in the intermediate flange.*
- *If oil comes out of this inspection drilling renew the twin-lip oil seal.*

Special tools and workshop equipment required

- Thrust piece -3404-



Procedure

– Remove transfer box ⇒ page 144 .

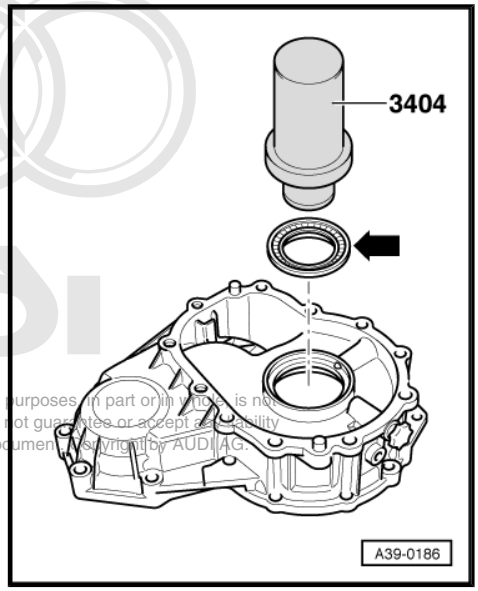
– Remove intermediate flange for front axle drive ⇒ page 146 .

– Knock out twin-lip oil seal towards transfer box using a suitable drift.

– Check seal seat in gearbox housing for damage and rework if necessary.

– Push twin-lip oil seal onto thrust piece -3404- so that the larger, protruding outer ring -arrow- on the oil seal faces towards the tool.

– Drive in twin-lip oil seal using thrust piece -3404- until thrust piece reaches stop.



Note

If the intermediate flange is not positioned correctly on the output shaft, the sealing lips of the seal may become damaged.

– Install intermediate flange for front axle drive ⇒ page 146 .

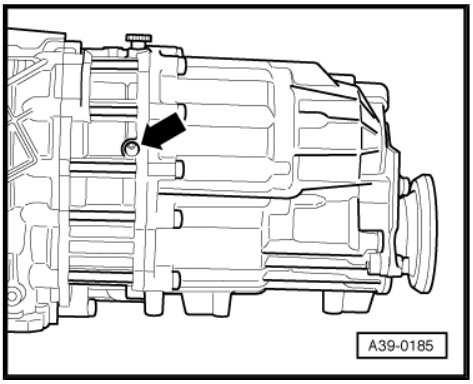
– Install transfer box ⇒ page 144 .

– Fill up gear oil in transfer box ⇒ page 137

5.6 Renewing twin-lip oil seal in input pinion

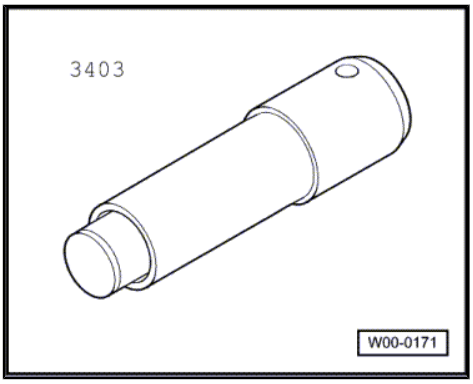
Note

- *An inspection drilling -arrow- is provided on the left side of the intermediate flange to check for oil leaks at the twin-lip oil seals in the input pinion and in the intermediate flange.*
- *If oil comes out at this inspection drilling this oil seal must be renewed.*



Special tools and workshop equipment required

- Thrust piece -3403- with additional ring -3403/1-

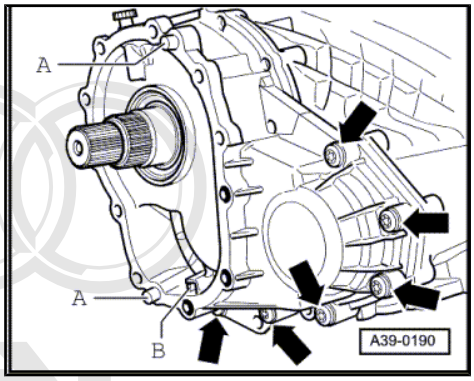


Procedure

- Tightening torque ⇒ page 139

– Remove transfer box ⇒ page 144 .

– Unscrew bolts -arrows- on intermediate flange for front axle drive.

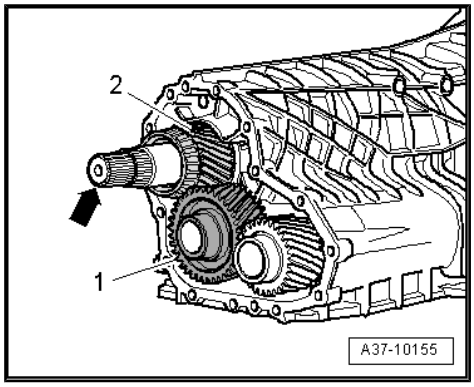


Caution

- *Detach intermediate flange from gearbox housing slowly and carefully. Otherwise spur gears could drop out of gearbox.*
- *Spur gears which have been dropped on the floor must not be used again. If this happens, the gearbox must be renewed.*

– Lift off the intermediate flange for front axle drive

– Mark installation position of intermediate pinion -1-.



Caution

- *The intermediate pinion -1- is symmetrical. However, it must be re-fitted in the same position to make sure the direction of rotation is maintained.*
- *Mark installation position of intermediate pinion or note whether marking on gear teeth faces gearbox or towards the rear.*

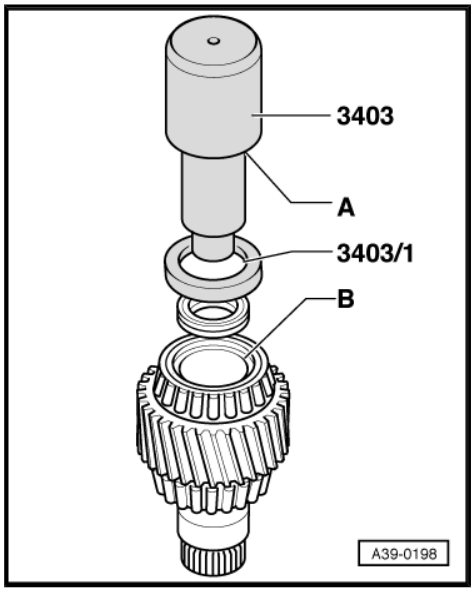
– Remove the input pinion -2- together with the intermediate pinion.

– Drive out seal from input pinion using drift.

– Fit additional ring -3403/1- onto thrust piece -3403- .

– Push the twin-lip oil seal onto the thrust piece -3403- .

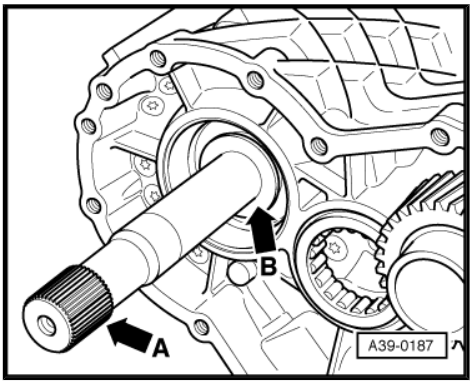
– Drive in twin-lip oil seal using thrust piece -3403- (with additional ring -3403/1- fitted) until thrust piece reaches stop.



Note

The contact surface -A- of thrust piece -3403- must make contact with the additional ring -3403/1- . This additional ring must in turn make contact with the input pinion -B-.

– Cover splines on end of shaft -arrow A- with insulating tape to prevent damage to twin-lip oil seal when fitting input pinion. Take care to cover the splines completely, without creasing or overlapping the tape.

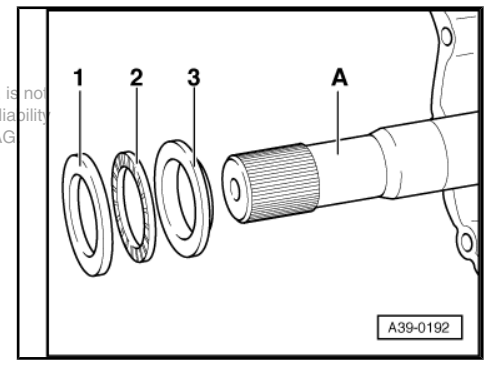


Note

Before fitting input pinion make sure that the three bearing elements -arrow B- are inserted in the correct sequence.

- Installation position of bearing elements on output shaft -A-:

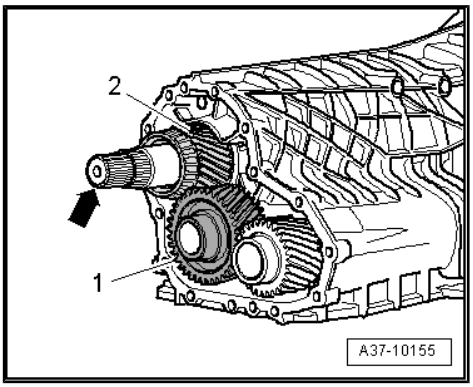
1 - Shim
2 - Roller bearing
3 - Tapered thrust washer (taper faces gearbox)



Note

All three bearing elements are specially calibrated and must not be exchanged with any non-calibrated parts.

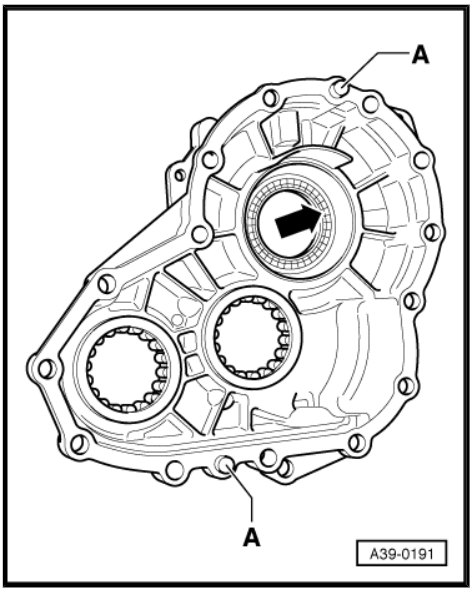
– Insert input pinion -2- together with intermediate pinion -1- into gearbox housing in line with markings made on removal.



Caution

- *The intermediate pinion -1- is symmetrical. Nevertheless it must be re-fitted in same position in line with markings made upon removal to make sure direction of rotation is maintained.*
- *If the input pinion -2- is not fitted correctly, the twin-lip oil seal in the input pinion may be damaged.*

– Check that dowel sleeves -A- in intermediate flange for front axle drive are fitted correctly.



Note

Before attaching the gasket, apply a thin coating of gear oil to the sealing surface to prevent it from slipping.

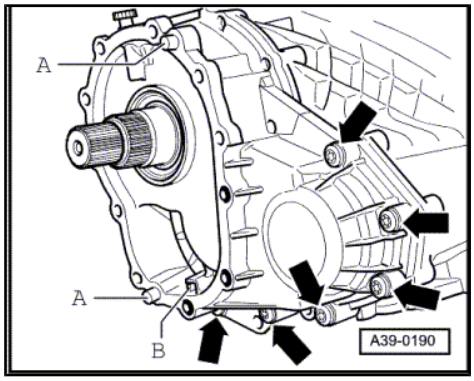
– Fit new gasket.

Caution

Fitting the intermediate flange onto the input shaft without sufficient care can damage the sealing lips of the seal -arrow-.

– Carefully place intermediate flange for front axle drive in position.

– Tighten bolts for intermediate flange for front axle drive ⇒ page 141 .



Note

When screwing in the bolts hand-tight, ensure that the gap between the intermediate flange for the front axle drive and the gearbox housing is reduced uniformly all round.

– Check that dowel sleeves -A- in intermediate flange for front axle drive are fitted correctly.

Note

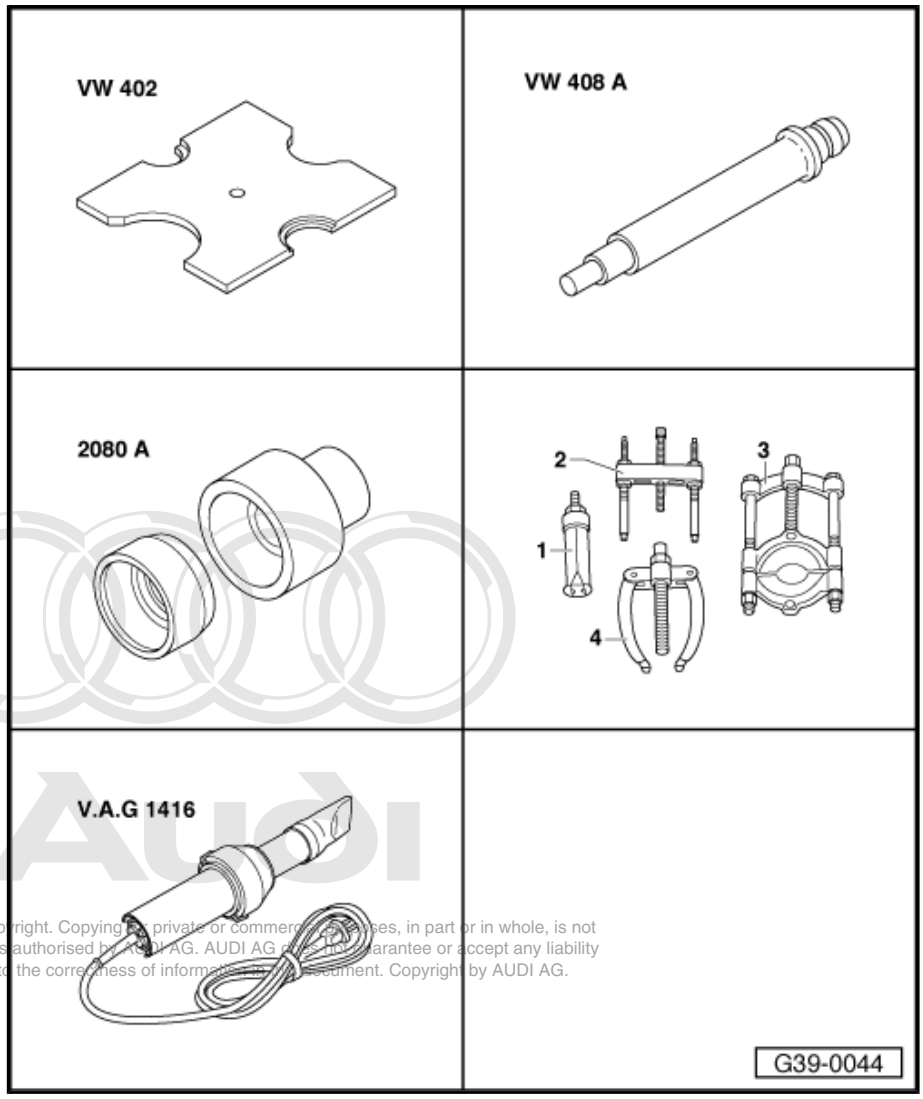
Before attaching the gasket, apply a thin coating of gear oil to the sealing surface to prevent it from slipping.

– Fit new gasket.
– Clean magnet and insert it in chamber -B- on the casting of the intermediate flange.
– Install transfer box ⇒ page 144 .
– Fill up gear oil in transfer box ⇒ page 137

5.7 Renewing needle bearing for spur gear 2

Special tools and workshop equipment required

- Thrust plate -VW 402-
- Press tool -VW 408 A-
- Fitting sleeves for seal -2080 A-
- -1- Kukko internal puller 21/2 and 21/5
- -4- Kukko 22/1 counter-support
- Hot air blower -V.A.G 1416-
- Protective gloves



Procedure

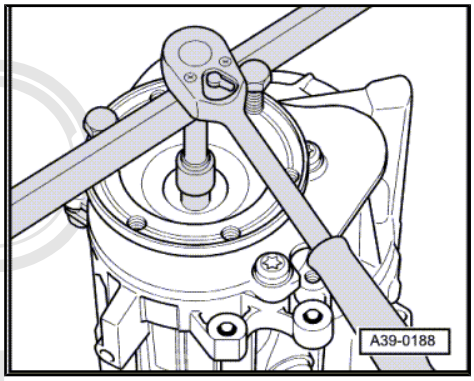
- Tightening torque ⇒ page 139

Note

- *Only remove the needle bearing when renewing it.*
- *The needle bearing will be damaged when it is removed.*

– Remove transfer box ⇒ page 144 .

– Remove bolt securing flange shaft. To do so, screw two bolts into flange and counterhold flange shaft with suitable lever.
– Pull out flange shaft using the bolts already screwed in; loosen with two levers if necessary.

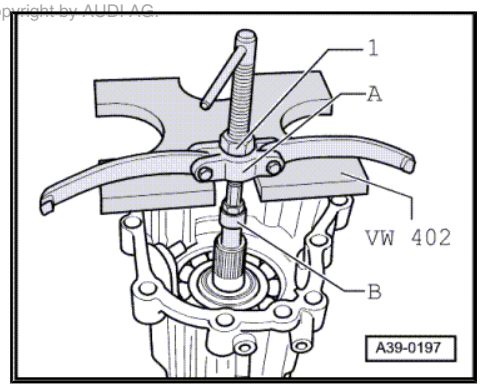


Note

Take care not to damage the flange on the gearbox housing when levering out the flange shaft.

– Carefully push out tensioning nut ⇒ Item 14 (page 140) towards the inside.
– Unscrew bolts ⇒ Item 22 (page 140) (5 x, TORX-T25).
– Remove alignment plate and securing plate.

– Fit counter-support Kukko 22/1 -item A- onto internal puller Kukko 21/2 -item B- as shown in illustration and insert into shaft of spur gear 2.
– Brace counter-support Kukko 22/1 against thrust plate -VW 402- and apply tension with nut -1- of counter-support.
– Pull spur gear 2 out of transfer box housing.
– Carefully lift out spur gear 2.



Note

When removing spur gear 2, ensure that you do not damage the gearbox output speed sender -G195- , which is screwed into the transfer box.

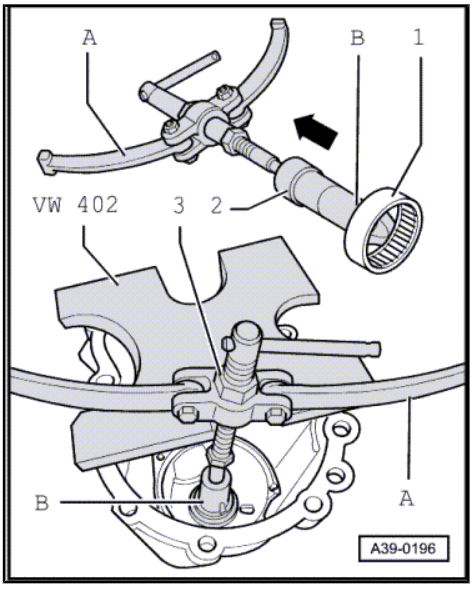
Caution

Spur gears which have been dropped on the floor must not be used again. If this happens, the gearbox must be renewed.

– Remove circlip ⇒ Item 16 (page 140) .

Note

The upper section of the illustration shows how the extractor hooks on the internal puller Kukko 21/5 -item B- must be inserted in the needle bearing -1-.



- Move centralising sleeve -2- of internal puller about 4 mm in direction indicated by -arrow-, so that the extractor hooks of the puller can be opened wide enough.
- Grasp upper lip of needle bearing -1- with internal puller and tension internal puller with nut.
- Fit counter-support Kukko 22/1 -item A- to internal puller as shown in illustration.
- Brace counter-support against thrust plate -VW 402- and apply tension with nut -3- of counter-support.
- Use hot-air blower -V.A.G 1416- to quickly heat up the outside of the transfer box housing (around the seat of the needle bearing) to approx. 100 °C.

WARNING

Wear protective gloves.

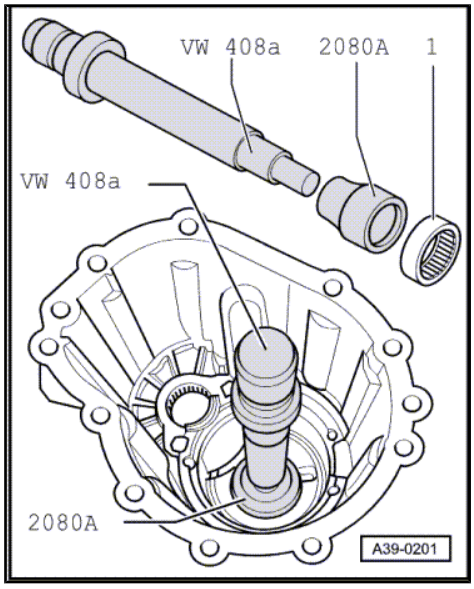
- Pull out needle bearing without delay.
- Check the needle bearing seat in the transfer box housing for damage and rework if necessary.

– Use hot-air blower -V.A.G 1416- to heat up the outside of the transfer box housing (around the seat of the needle bearing) evenly to approx. 100 °C.

WARNING

Wear protective gloves.

– Fit fitting sleeves -2080 A- onto new needle bearing -1-.
– Using press tool -VW 408 A- , drive needle bearing into transfer box housing onto stop.
– Insert circlip ⇒ Item 16 (page 140) to secure needle bearing.
– Carefully insert spur gear 2 into transfer box housing.
– Fit alignment plate and securing plate and then secure using bolts.
– Install tensioning nut ⇒ Item 14 (page 140) .



The following checks must be performed before the transfer box can be installed.

- Check oil seal for flange shaft (rear) for damage and leaks; renew if necessary ⇒ page 143 .
- Check twin-lip oil seal for intermediate flange for front axle drive for damage and leaks; renew if necessary ⇒ page 148 .
- Check twin-lip oil seal in input pinion for damage and leaks; renew if necessary ⇒ page 153 .

– Install transfer box ⇒ page 144 .

6 Assessment of wear on gearbox components

6.1 Assessment of wear by checking ATF for colour and contamination

Colour of ATF

- Colour yellow: ATF is new.
- Colour brown: ATF is used (approx. 60,000 km upwards)
- Colour black, ATF smells burnt: one or more gearbox components defective (e.g. overheating of torque converter clutch, burnt out clutch linings).

Note

On vehicles with TDI engines, the ATF turns black after approx. 60,000 km without the gearbox being defective.

ATF contains metal particles

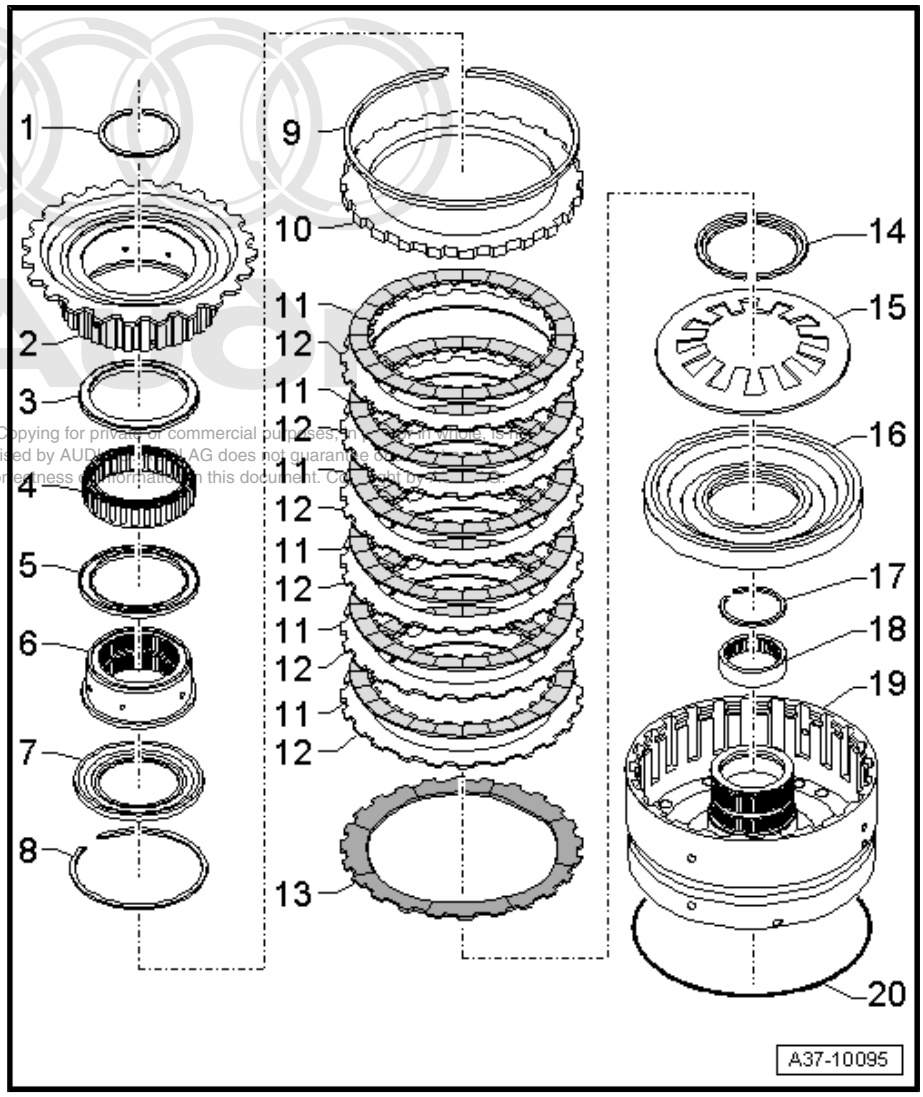
- Wear is within normal range if metal particles on magnet in oil pan or in ATF are smaller than 0.1 mm in ∅ and quantity is not more than 1 cm^3.
- Wear exceeds normal range or there is a mechanical fault if metal particles on magnet in oil pan or in ATF are larger than 0.2 mm in ∅.

Procedure if ATF is contaminated

ATF very contaminated (ATF black or metal particles in ATF ⇒ page 157):

- Dismantle and clean complete gearbox.
- Renew ATF pipes in gearbox.
- Flush ATF galleries and blow through with compressed air.
- Dismantle and check all clutches.
- Renew torque converter (cannot be cleaned).
- Renew valve body (cannot be cleaned).
- Clean ATF pipes and ATF cooler and renew ATF strainer.

6.2 Clutch „F“ with freewheel



2 - Freewheel (1st gear)

- ❑ Check rotating and non-rotating direction of freewheel ⇒ page 159

4 - Freewheel cage

- ❑ Check rotating and non-rotating direction of freewheel ⇒ page 159

6 - Freewheel inner race

- ❑ Check rotating and non-rotating direction of freewheel ⇒ page 159
- ❑ Check splines

11 - Friction plate

- ❑ Checking for wear ⇒ page 159

12 - Outer plate

- ❑ Checking for wear ⇒ page 159

14 - Split retaining ring

- ❑ Check whether retaining ring is bent, renew if necessary

15 - Dished spring

- ❑ Renew if there are traces of scoring or if ends of dished spring are bent.

16 - Piston „F“

- ❑ Check for deformation and defective sealing lips ⇒ page 159
- ❑ To gearbox No. 069 312: always replace piston „F“ (Part No. 0 501 208 317) with new type (Part No. 0 501 212 967)
- ❑ The part No. is marked on the rubberised piston end

18 - Needle bearing

- ❑ Perform visual check for damage: needle bearing should be in as-new condition; renew if necessary.

19 - Cylinder „F“

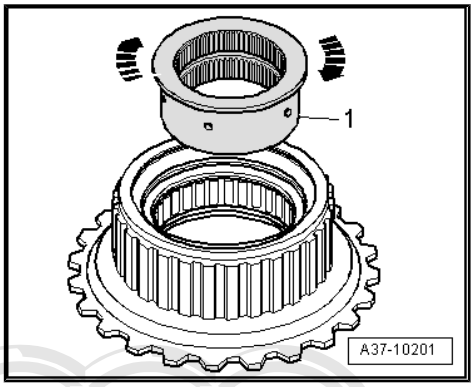
- ❑ Check for traces of scoring on running surface for piston „F“; if there are slight traces of scoring:
  - – Rub down running surface one or two times with abrasive paper and oil (grain size 600).
  - – Clean running surface thoroughly with clean cloth and check running surface. The running surface should now be in as-new condition.
  - – Renew cylinder „F“ if the scores are still visible after this step.
- ❑ Checking for traces of scoring by friction plates ⇒ page 160
- ❑ Check splines
- ❑ Check that valve ball moves freely (ball is not spring-loaded) ⇒ page 159

Checking rotating and non-rotating direction of freewheel

It should be possible to turn inner race of freewheel -1- clockwise. It should lock when turned anti-clockwise.

If it does not lock:

– Renew freewheel cage.



Note

A defective freewheel causes power transmission problems in 1st gear.

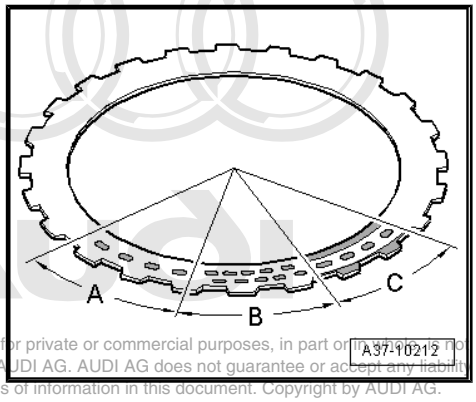
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

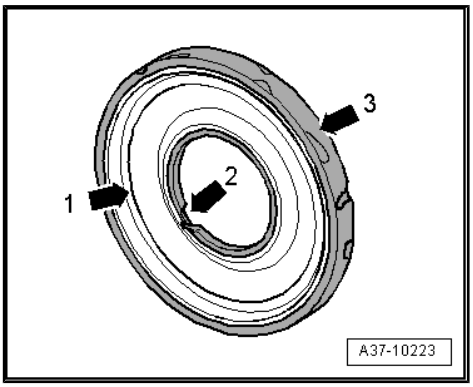
C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.



Checking piston „F“ for deformation and defective sealing lips

– Check piston „F“ for:

- Deformation of metal section -arrow 1-.
- Defective inner sealing lip -arrow 2-.
- Defective outer sealing lip -arrow 3-.



Checking that valve ball in cylinder F „F“ is free to move.

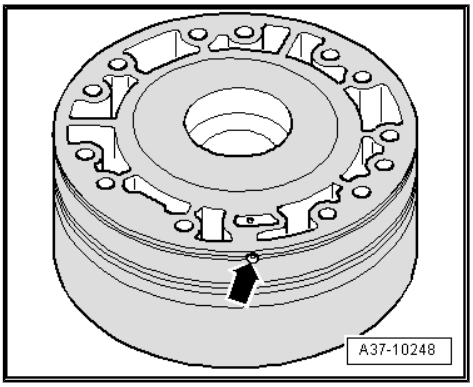
WARNING

Wear safety goggles.

– Lightly lubricate drilling for valve ball -arrow- from the front with oil.

– Apply compressed air to valve ball from the rear.

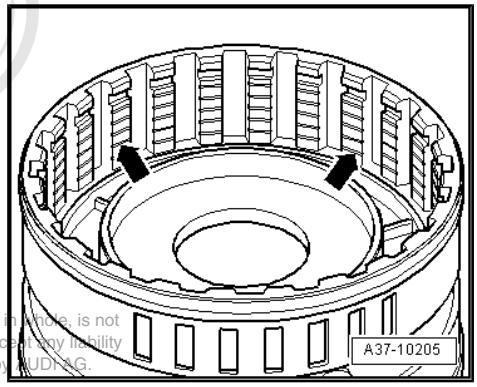
- Lift of ball is small (hardly visible).
- No spring fitted (ball returns slowly).



Traces of scoring on cylinder „F“ caused by friction plates

– Check inner surfaces of cylinder for scoring by friction plates.

- Friction plates must not get stuck in scores.
- Renew cylinder „F“ if the scores caused by friction plates are deeper than 0.5 mm.



6.3 Clutch „C“ with sun shaft

3 - Friction plate

- ❑ Checking for wear ⇒ page 161

4 - Outer plate

- ❑ Checking for wear ⇒ page 161

9 - Piston„C“

- ❑ Check that valve balls move easily ⇒ page 161

11 - Cylinder „C“

- ❑ Check inner surfaces for traces of scoring by friction plates ⇒ page 161
- ❑ Check outer surfaces for traces of scoring by friction plates ⇒ page 161
- ❑ Check splines

12 - Sun shaft

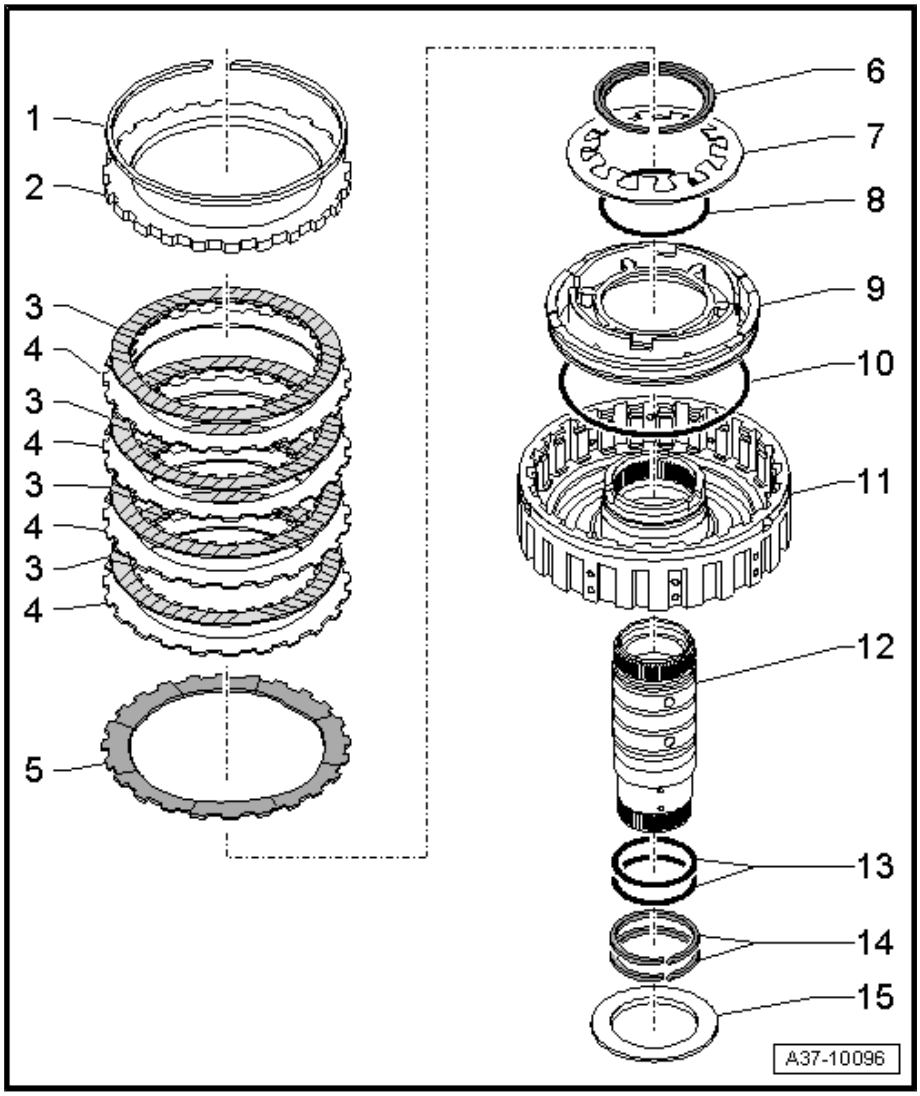
- ❑ Check brass bushes for wear and proper seating ⇒ page 162

14 - Rectangular section seals

- ❑ Checking for wear ⇒ page 162

15 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary.



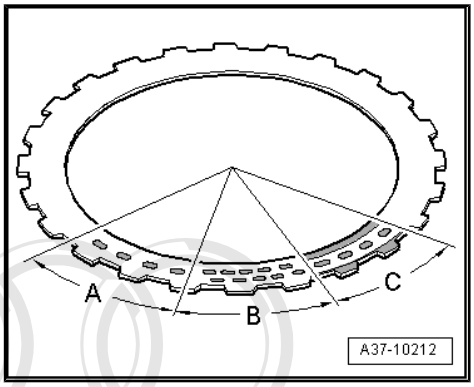
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

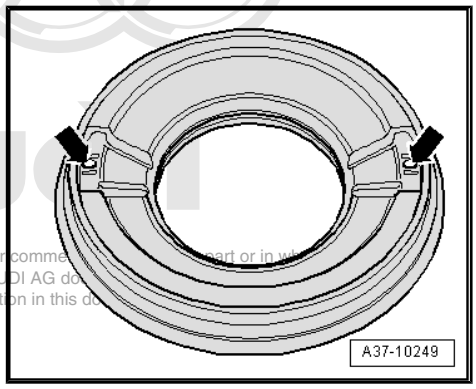
C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.



Checking that valve ball in piston „C“ is free to move

Check that valve balls -arrows- are free to move by moving piston „C“ backwards and forwards.

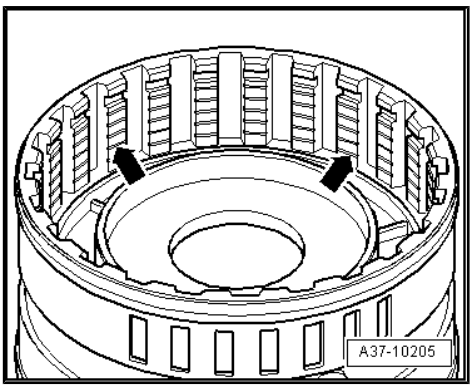
- Ball is not spring-loaded, so it will return slowly.
- Lift of ball is small (hardly visible).



Traces of scoring caused by friction plates on inner surfaces of cylinder „C“

– Check inner surfaces of cylinder for scoring by friction plates.

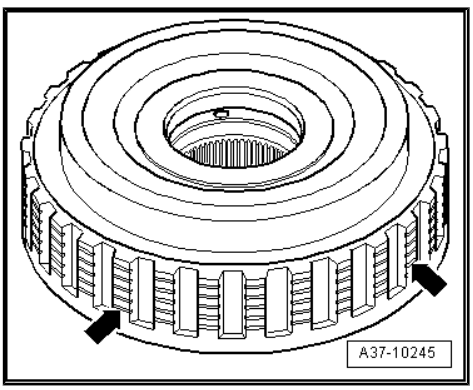
- Friction plates must not get stuck in scores -arrow-.
- Renew cylinder „C“ if the scores -arrows- caused by friction plates are deeper than 0.5 mm.



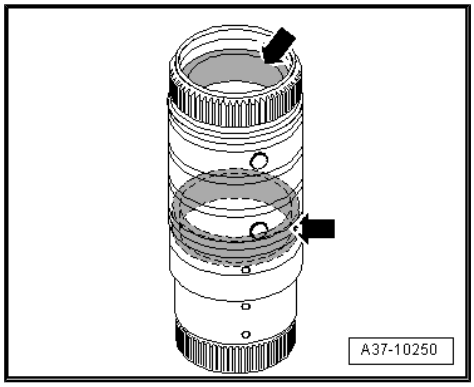
Traces of scoring caused by friction plates on outer surfaces of cylinder „C“

– Check outer surfaces of cylinder for scoring by friction plates.

- Friction plates must not get stuck in scores -arrow-.
- Renew cylinder „C“ if the scores -arrows- caused by friction plates are deeper than 0.5 mm.



Checking brass bushes on sun shaft for wear.



– Check contact surfaces of brass bushes -arrows- inside sun shaft for wear and proper seating.

• If there are deep scores and/or brass bushes are discoloured blue or if brass bushes are not fitted properly:

– Renew sun shaft.

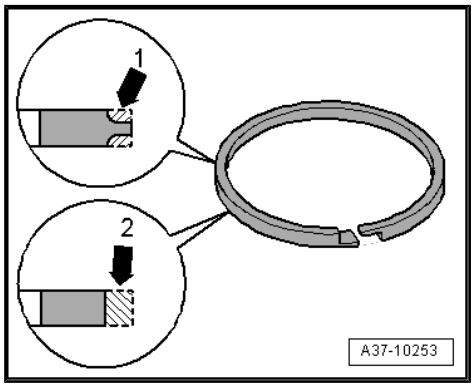
• Proceed as follows if the brass bushes are not discoloured blue and there are only slight scores:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surface should now be in as-new condition.

– Renew sun shaft if scoring is still visible after this step.

Checking rectangular section seals for wear



Always renew rectangular section seals. Nevertheless, the wear pattern on the rectangular section seals gives an indication of the condition of the contact surface for the seals. For this reason it is always advisable to check the rectangular section seals for wear.

• If the axial wear -arrow 1- on the rectangular section seals is excessive (slight wear on the outside corners is normal):

– Renew sun shaft ⇒ Item 12 (page 160) .

• If the radial wear on the rectangular section seals exceeds 0.3 mm -arrow 2- (compare with thickness of new rectangular section seal):

– Renew bearing bush ⇒ Item 1 (page 165) .

Note

Radial wear on rectangular section seals on sun shaft is indicated by a delay in power transmission after engaging reverse gear. In this case renew bearing bush ⇒ Item 1 (page 165) in addition to rectangular section seals.

6.4 Clutch „D“

3 - Friction plate

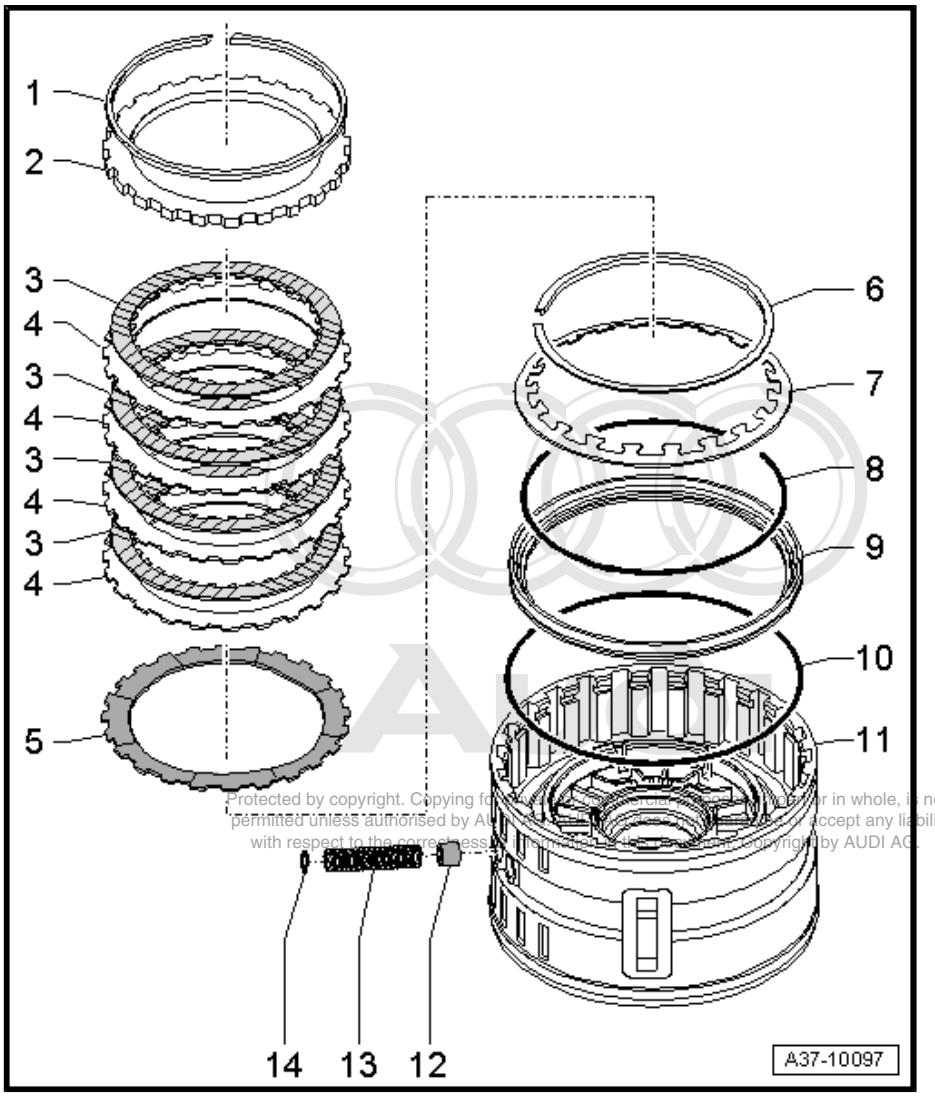
- ❑ Checking for wear ⇒ page 163

4 - Outer plate

- ❑ Checking for wear ⇒ page 163

11 - Cylinder „D/E“

- ❑ Check running surface of piston „D“ for scoring by friction plates ⇒ page 164
- ❑ Check metal bush for scoring ⇒ page 164
- ❑ Check that valve ball moves easily ⇒ page 164



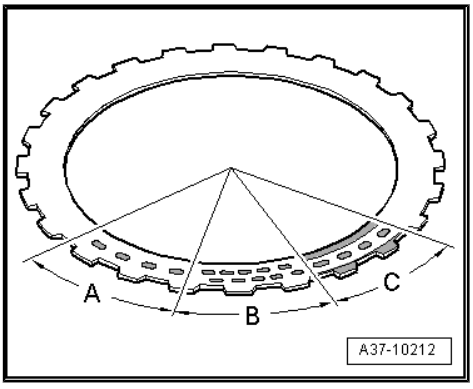
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.

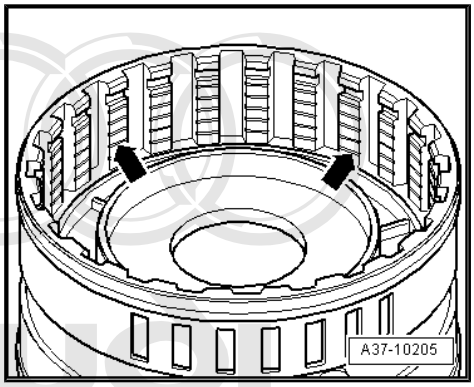


Traces of scoring on cylinder „D/E“ caused by friction plates

– Check inner and outer surfaces of cylinder for scoring by friction plates.

• Friction plates must not get stuck in scores.

• Renew cylinder „D/E“ if the scores caused by friction plates are deeper than 0.5 mm.



Checking metal bush in cylinder „D/E“ for wear

– Check running surface of metal bush -arrow- in cylinder „D/E“ for wear.

• If there are deep scores and/or blue discolouring on the metal bush:

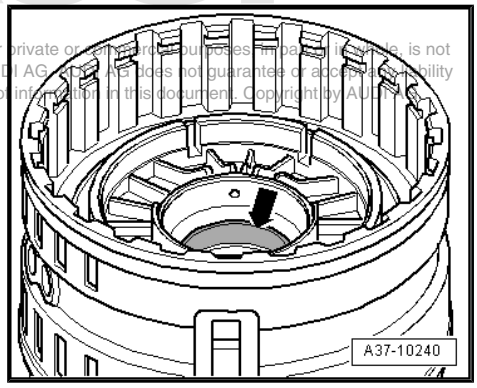
– Renew cylinder „D/E“.

• Proceed as follows if the metal bush is not discoloured blue and there are only slight scores:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surface should now be in as-new condition.

– Renew cylinder „D/E“ if scoring is still visible after this step.



Checking that valve ball in cylinder „D/E“ is free to move.

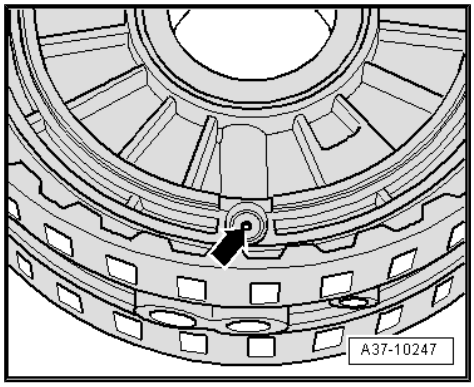
> ⚠ **WARNING**
>
> *Wear safety goggles.*

– Lightly lubricate drilling for valve ball -arrow- from the front with oil.

– Apply compressed air to valve ball from the rear.

♦ Lift of ball is small (hardly visible)

♦ Ball is not spring-loaded, and will return slowly.



6.5 Clutch „E“

1 - Bearing bush

- ❑ Excessive roughness of running surface on inner surface can be checked by assessment of wear on rectangular section seals ⇒ page 162

3 - Cylinder „D/E“

- ❑ Checking for traces of scoring by friction plates ⇒ page 165
- ❑ Check that valve ball moves easily ⇒ page 166

5 - Piston „E“

- ❑ Check for wear

8 - Split retaining ring

- ❑ Check whether retaining ring is bent, renew if necessary

10 - Outer plate

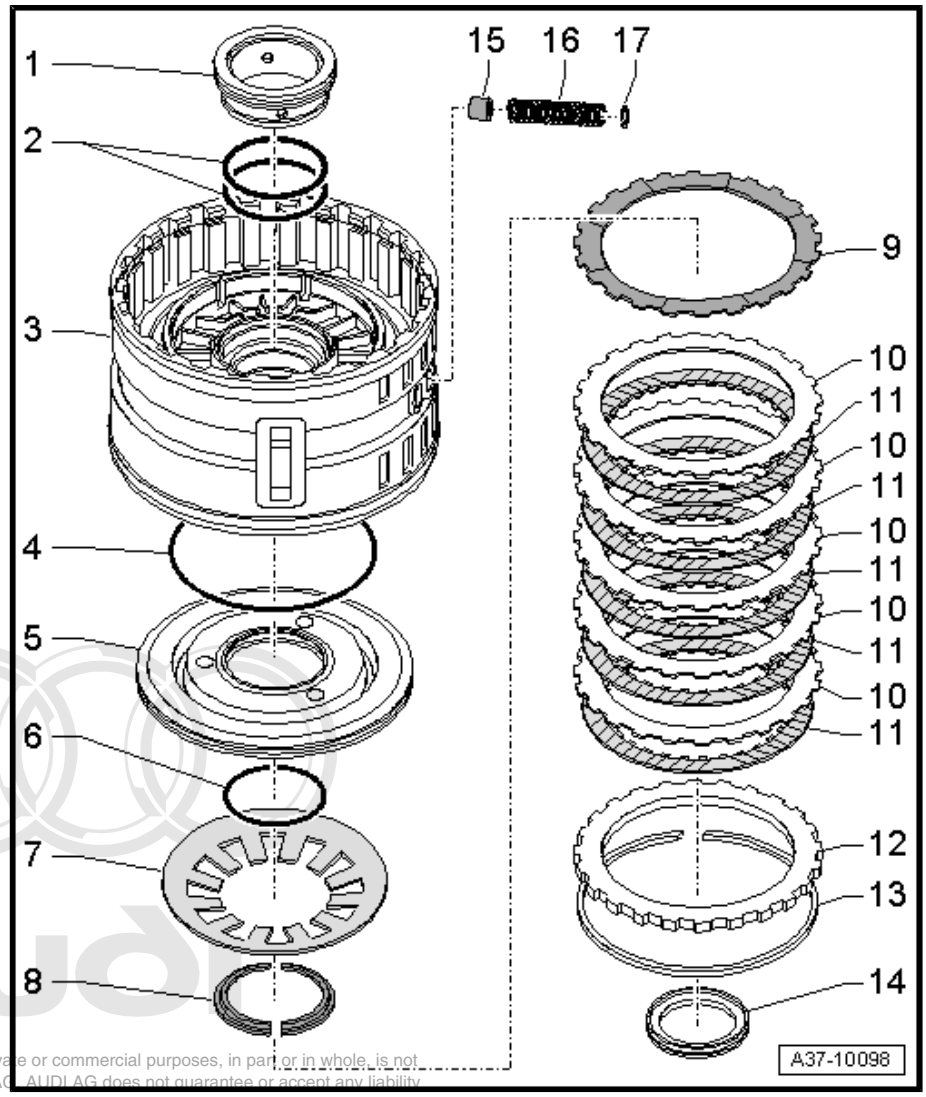
- ❑ Checking for wear ⇒ page 166

11 - Friction plate

- ❑ Checking for wear ⇒ page 166

14 - Axial needle bearing

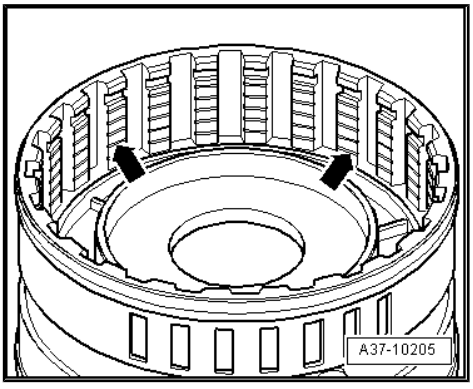
- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary.



Traces of scoring on cylinder „D/E“ caused by friction plates

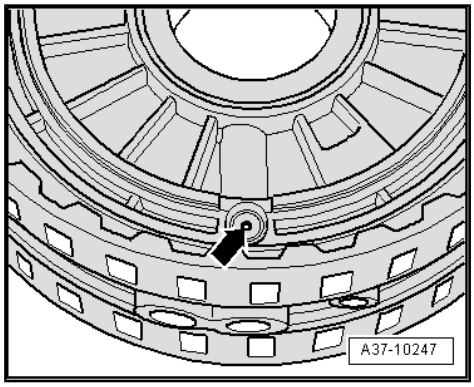
– Check inner and outer surfaces of cylinder for scoring by friction plates.

- Friction plates must not get stuck in scores.
- Renew cylinder „D/E“ if the scores caused by friction plates are deeper than 0.5 mm.



Checking that valve ball in cylinder „D/E“ is free to move.

> **WARNING**
>
> *Wear safety goggles.*



– Lightly lubricate drilling for valve ball -arrow- from the front with oil.
– Apply compressed air to valve ball from the rear.

♦ Lift of ball is small (hardly visible).
♦ No spring fitted (ball returns slowly).

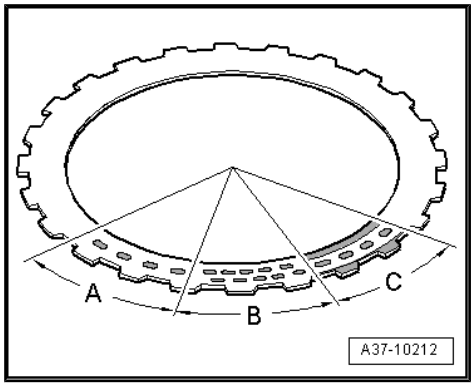
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

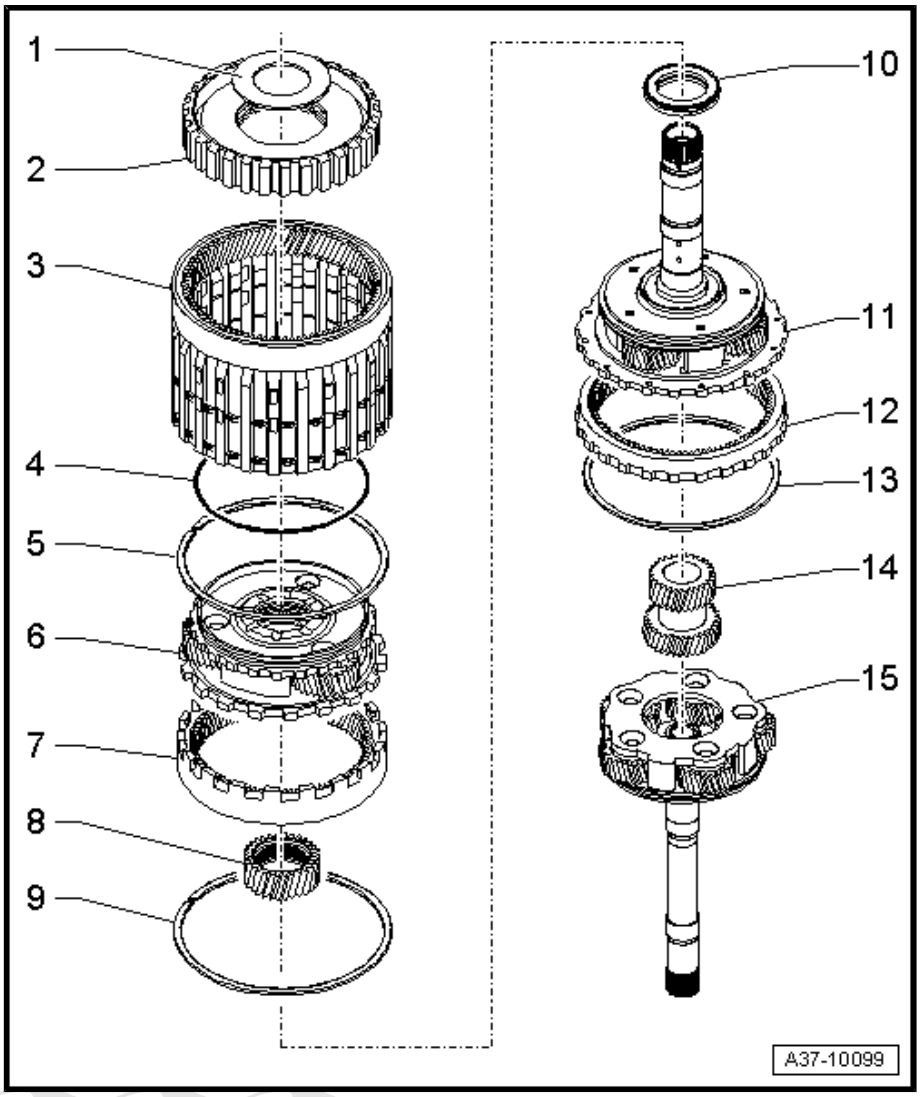
A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.



6.6 Planetary drive



2 - Plate carrier „E“

- ❑ Check outer splines for scores caused by friction plates ⇒ page 168

6 - Planet carrier „I“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged
- ❑ Checking needle bearing for wear ⇒ page 168

7 - Annulus „II“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

8 - Sun gear „I“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

10 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary.

11 - Planet carrier „II“

- ❑ Check running surfaces, brass bush and needle bearing on shaft for wear ⇒ page 168
- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

12 - Annulus „II“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

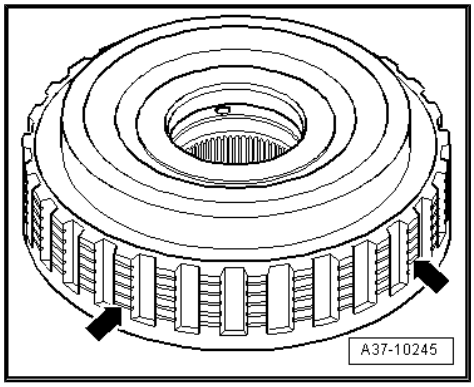
14 - Sun wheel „II“ and „III“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

15 - Planet carrier „III“

- ❑ Check running surfaces, brass bush and needle bearing on shaft for wear ⇒ page 169
- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

Checking outer splines of plate carrier „E“ for scores caused by friction plates

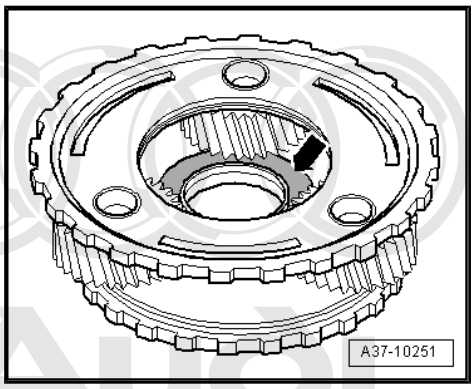


– Check outer splines of plate carrier „E“ for scores caused by friction plates.

• Friction plates must not get stuck in scores.

• Renew plate carrier „E“ if the scores caused by friction plates are deeper than 0.5 mm.

Checking needle bearing of planet carrier shaft „I“ for wear



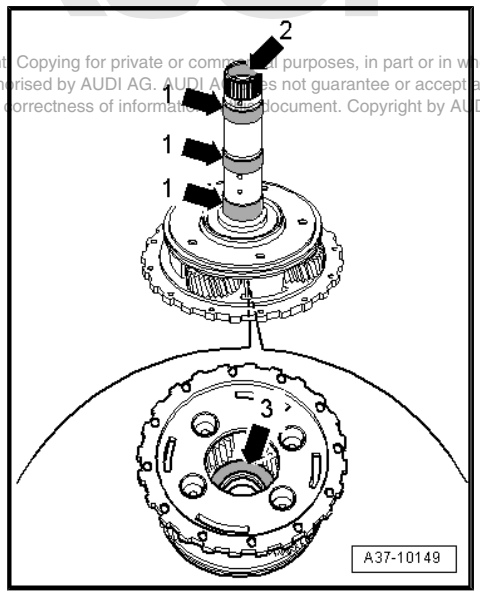
– Check needle bearing -arrow- for wear.

• The needle bearing should rotate smoothly when turned by hand.

If the needle bearing does not rotate smoothly:

– Renew planetary drive.

Checking running surfaces, brass bush and needle bearing on planet carrier shaft „II“ for wear



– Check running surfaces -arrow 1- on shaft for wear.

– Check running surfaces of brass bush -arrow 2- on inside of shaft for wear.

• If there are deep scores and/or blue discolouring:

– Renew planetary drive.

• Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surfaces should now be in as-new condition.

– Renew planetary drive if scoring is still visible after this step.

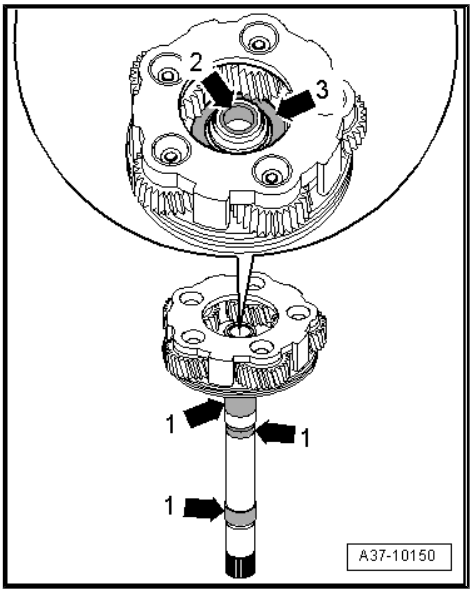
– Check needle bearing -arrow 3- for wear.

• The needle bearing should rotate smoothly when turned by hand.

If the needle bearing does not rotate smoothly:

– Renew planetary drive.

Checking running surfaces, brass bush and needle bearing on planet carrier shaft „III“ for wear



– Check running surfaces -arrow 1- on shaft for wear.

– Check running surfaces of brass bush -arrow 2- on inside of shaft for wear.

• If there are deep scores and/or blue discolouring:

– Renew planetary drive.

• Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surfaces should now be in as-new condition.

– Renew planetary drive if scoring is still visible after this step.

– Check needle bearing -arrow 3- for wear.

• The needle bearing should rotate smoothly when turned by hand.

If the needle bearing does not rotate smoothly:

– Renew planetary drive.

6.7 Clutch „A“

1 - Rectangular section seals

- ❑ Checking for wear
  ⇒ page 170

3 - Cylinder „A“

- ❑ Check running surface of shaft for wear
  ⇒ page 171

10 - Circlip

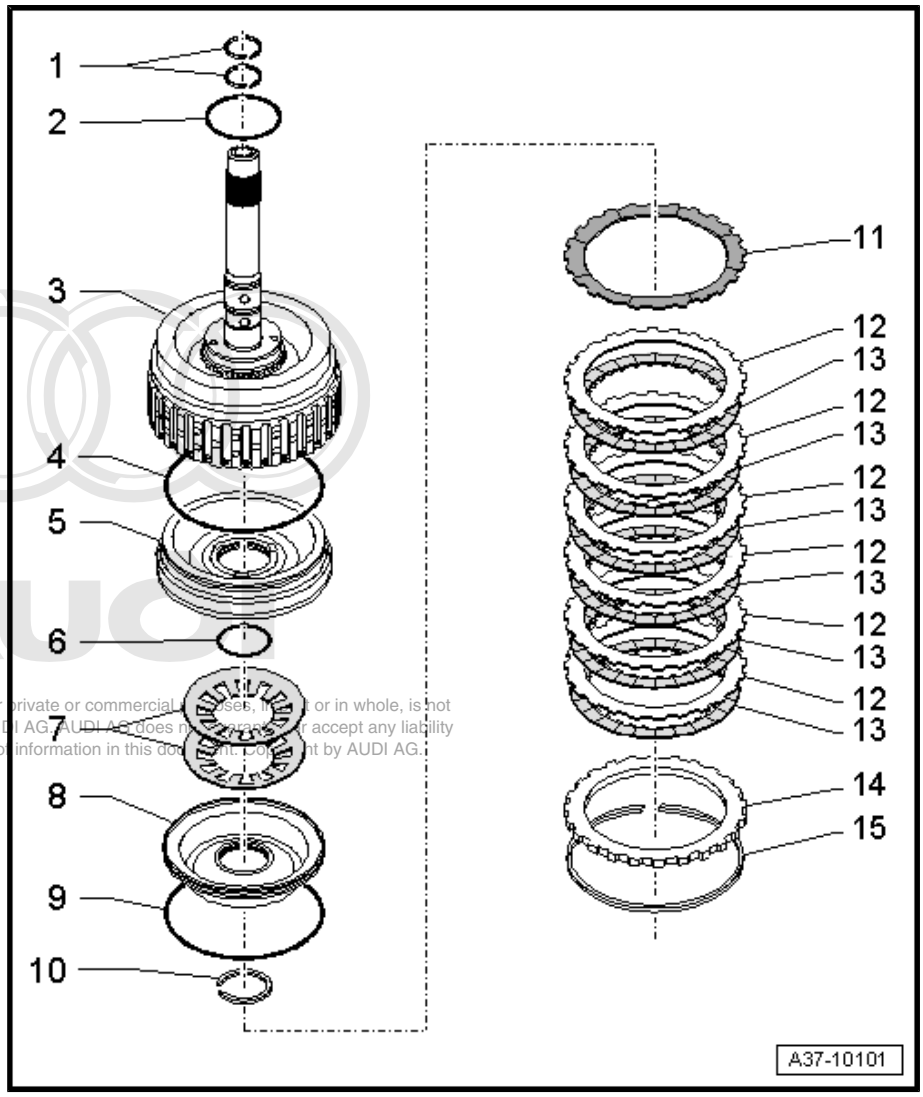
- ❑ Renew
- ❑ Make sure circlip is not stretched too far when installing

12 - Outer plate

- ❑ Checking for wear
  ⇒ page 171

13 - Friction plate

- ❑ Checking for wear
  ⇒ page 171



Checking rectangular section seals for wear

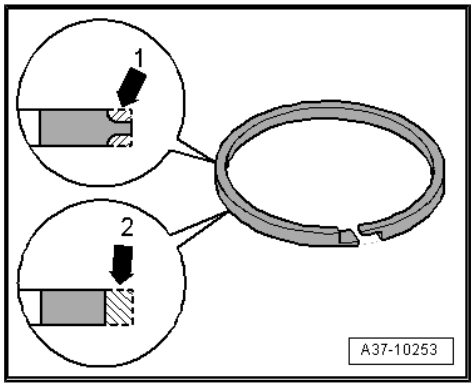
Always renew rectangular section seals. Nevertheless, the wear pattern on the rectangular section seals gives an indication of the condition of the contact surface for the seals. For this reason it is always advisable to check the rectangular section seals for wear.

- If the axial wear on the rectangular section seals exceeds 0.3 mm -arrow 1- (slight wear on the outside corners is normal):

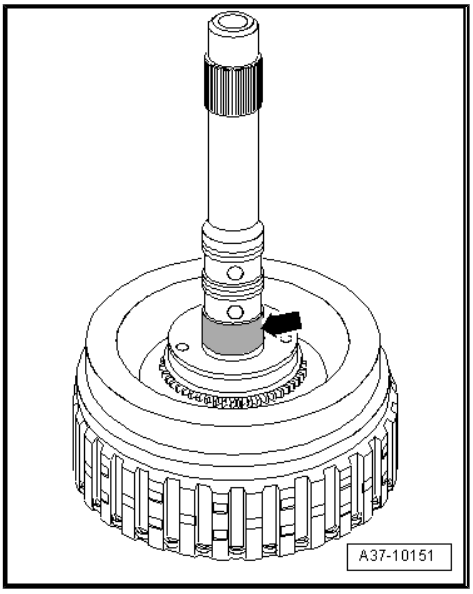
– Renew cylinder „A“ ⇒ Item 3 (page 170) .

- If the radial wear on the rectangular section seals exceeds 0.3 mm -arrow 2- (compare with thickness of new rectangular section seal):

– Renew stator shaft of ATF supply unit ⇒ Item 15 (page 173) .



Checking running surface of shaft for cylinder „A“ for wear



– Check running surface -arrow- of shaft for wear.

• If there are deep scores and/or blue discolouring:

– Renew cylinder „A“.

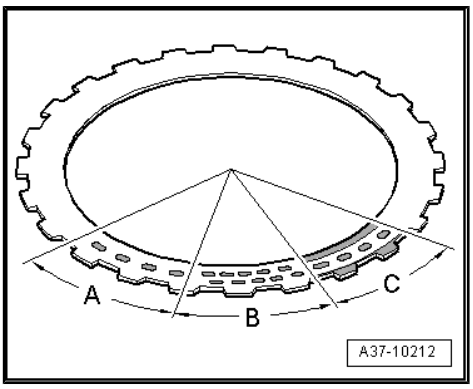
• Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surfaces should now be in as-new condition.

– Renew planetary drive if scoring is still visible after this step.

Checking friction plates and outer plates for wear



Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.

6.8 Clutch „B“

2 - Cylinder „B“

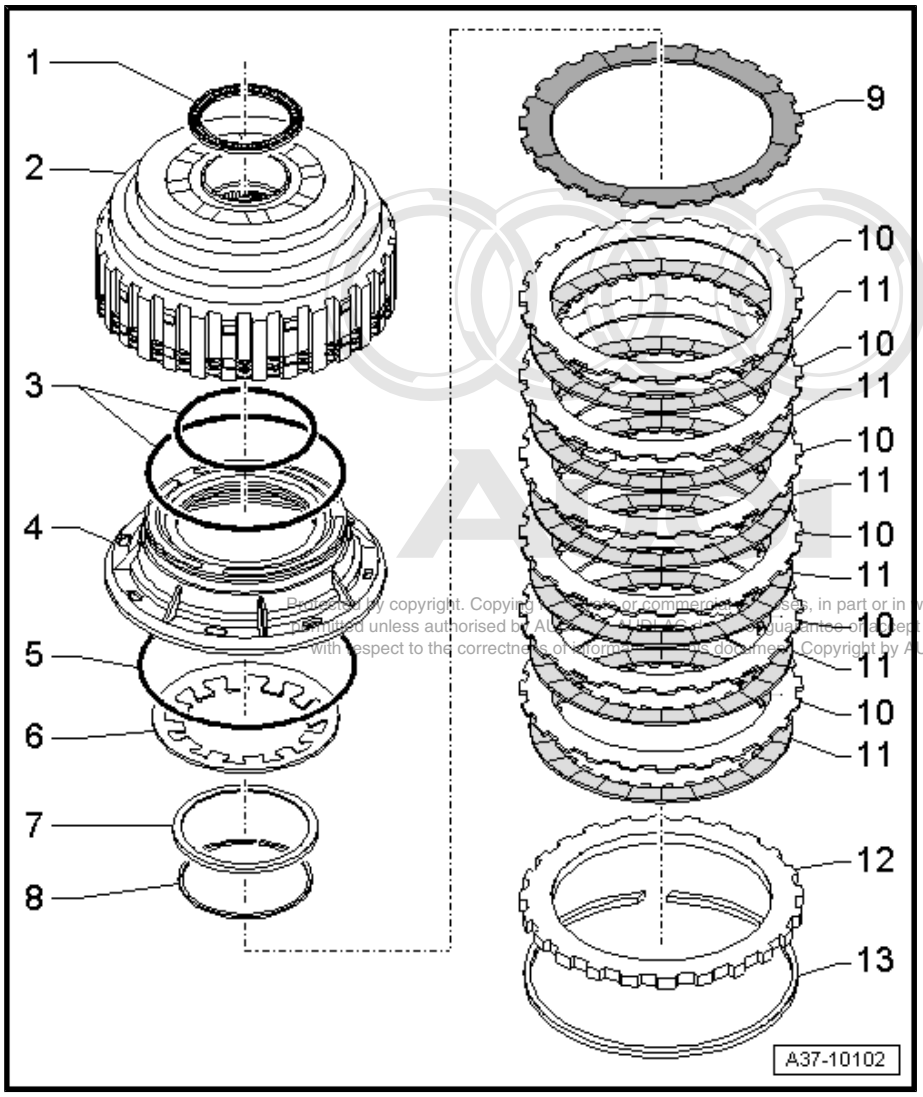
- ❑ Renew cylinder if it has overheated (discoloured blue)
- ❑ Also check clutch „A“ if cylinder has overheated

10 - Outer plate

- ❑ Checking for wear ⇒ page 172

11 - Friction plate

- ❑ Checking for wear ⇒ page 172



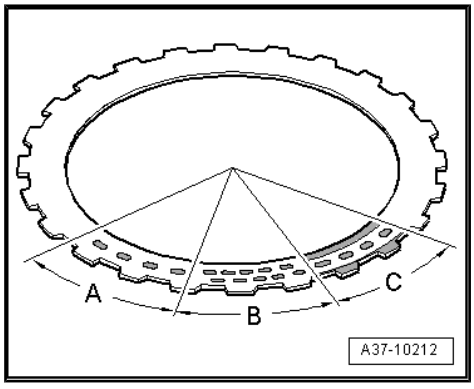
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

B - Heat discoloration spots at intervals of less than 20 mm: outer plates and friction plates are worn and require renewal.

C - If outer and/or inner parts of outer plates are discoloured blue or brown: outer plates and friction plates are worn and require renewal.



6.9 ATF supply unit

7 - ATF pump housing

- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 173

8 - Annulus

- ❑ Check running surfaces for scoring and signs of wear
- ❑ Check drive lugs in pump gear ⇒ page 174

9 - Pump gear

- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 173

11 - Intermediate plate

- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 173

13 - ATF supply unit

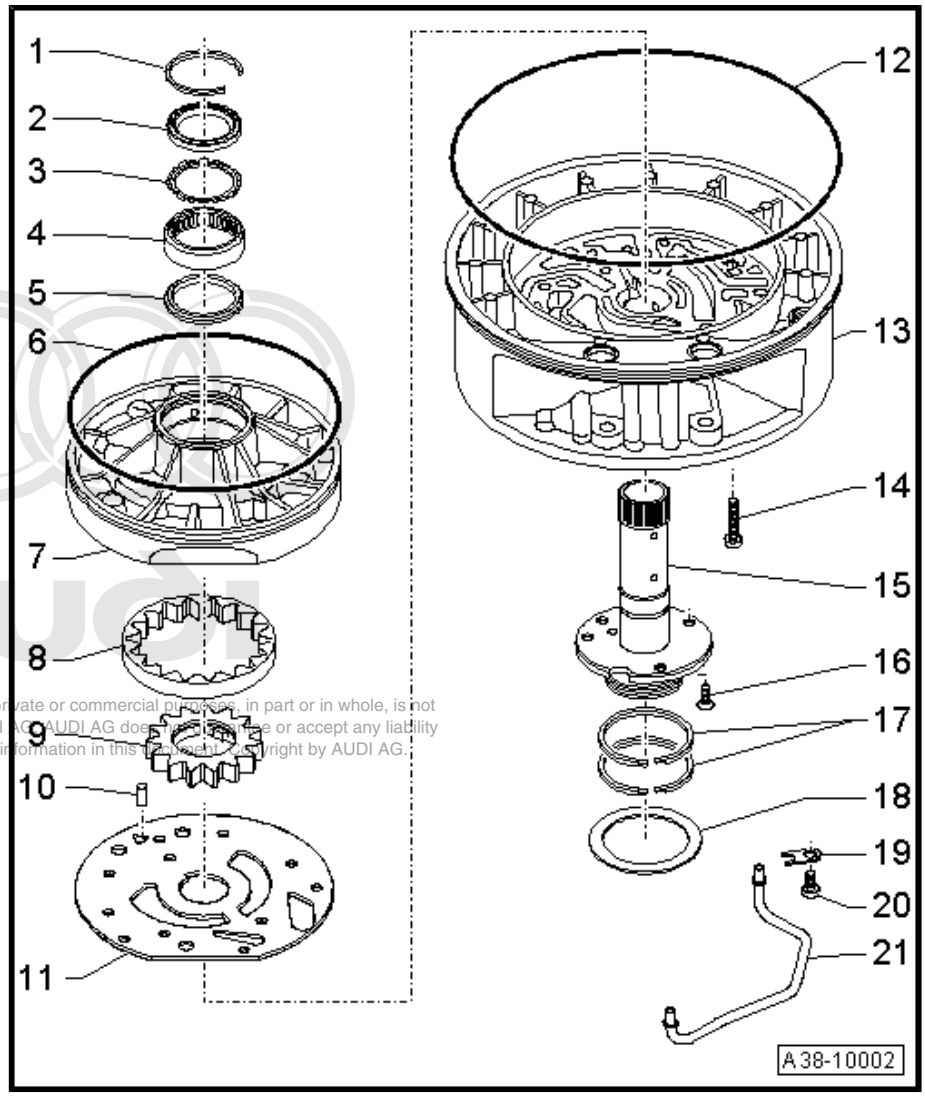
- ❑ Check that flow control valve of ATF supply unit moves freely ⇒ page 118

15 - Stator shaft

- ❑ Check brass bush for wear ⇒ page 174
- ❑ Check splines for wear

17 - Rectangular section seals

- ❑ Checking for wear ⇒ page 174



Checking components of ATF pump for scoring and signs of wear

– Check running surfaces of following components for scoring and signs of wear:

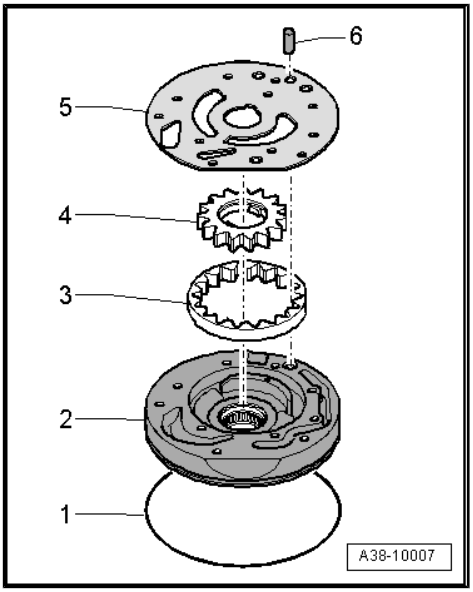
2 - ATF pump housing

3 - Annulus

4 - Pump gear

5 - Intermediate plate

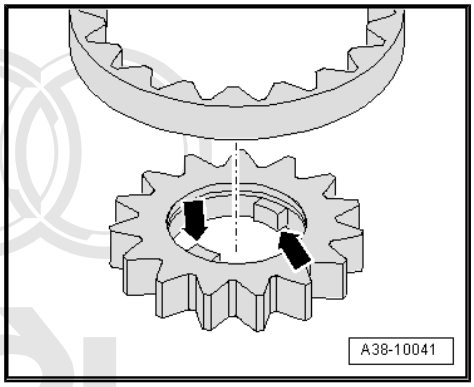
- The running surfaces should have either a dull or bright finish and should be free of even the slightest trace of scoring.



Note

A defective ATF pump causes delays in power transmission and gear changes.

Checking drive lugs in pump gear



– Check whether the drive lugs -arrows- on the ATF pump gear have broken off; renew ATF pump if necessary.

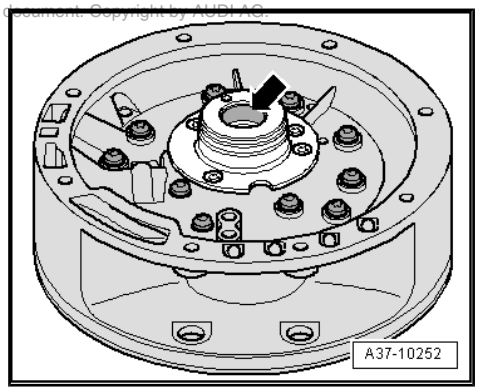
Possible causes of fault:

- ♦ A - Torque converter not inserted properly when installing gearbox or engine
- ♦ B - Centring sleeve for torque converter not inserted in crankshaft

Caution

Make sure that broken-off drive lugs are found and removed.

Checking brass bush on stator shaft for wear.



– Check running surfaces of brass bush -arrow- on inside of shaft for wear.

• If there are deep scores and/or blue discolouring:

– Renew stator shaft.

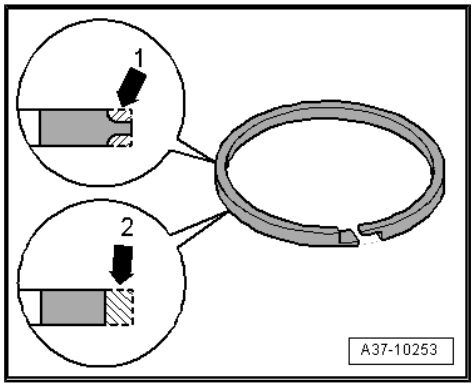
• Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface. The running surfaces should now be in as-new condition.

– Renew stator shaft if scoring is still visible after this step.

Checking rectangular section seals for wear



Always renew rectangular section seals. Nevertheless, the wear pattern on the rectangular section seals gives an indication of the condition of the contact surface for the seals. For this reason it is always advisable to check the rectangular section seals for wear.

• If the axial wear on the rectangular section seals exceeds 0.3 mm -arrow 1- (slight wear on the outside corners is normal):

– Renew stator shaft ⇒ Item 15 (page 173) .

• If the radial wear on the rectangular section seals exceeds 0.3 mm -arrow 2- (compare with thickness of new rectangular section seal):

– Renew cylinder „B“ ⇒ Item 2 (page 172) .