Workshop Manual

Audi A4 2001 ➤
Audi A4 Cabriolet 2003 ➤
Audi A6 2005 ➤
Audi A8 2003 ➤

Servicing automatic gearbox 09L, four-wheel drive

Edition 12.2011

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

Contents

00 – Technical data

1 Repair instructions

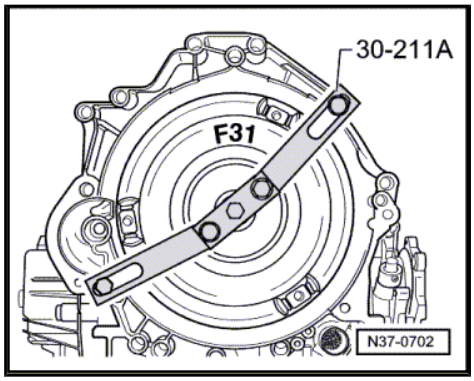
Overview:

1.1 General repair instructions

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

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

Gearbox



- Rules for cleanliness when working on the automatic gearbox ⇒ page 11
- If gearbox has been removed from vehicle, secure torque converter to prevent it from falling out.
- Use only ATF or vaseline on all parts running in ATF. Other lubricants will cause malfunction of the gearbox hydraulics.
- After the gearbox has been overhauled it should be installed and operated as soon as possible to prevent any corrosion forming on the new components.
- After installation, fill up and check all fluid levels. For capacities and specifications refer to ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 00 .

Procedure if ATF is dirty

If the ATF and related components are very dirty (caused by worn clutch linings):

- Dismantle and clean complete gearbox.
- Dismantle and check all clutches.
- Renew torque converter (cannot be cleaned).
- Renew mechatronic unit (cannot be cleaned).
- Clean ATF lines and ATF cooler and renew ATF strainer.

O-rings, seals, oil seals and gaskets

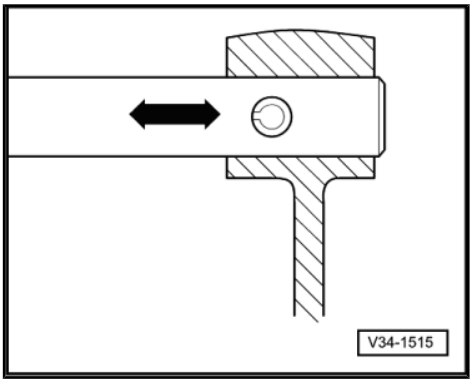
- Always renew O-rings, seals, oil seals and gaskets.
- After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- The open side of the oil seal should face the side containing the fluid.
- Lightly lubricate the outer circumference and sealing lip of oil seals with ATF before installing.
- Lightly lubricate O-rings with ATF or vaseline 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 such that the sealing lip does not contact the shaft in the same place as the old seal (make use of installation depth tolerances).
- Completely remove old gaskets, clean sealing surfaces thoroughly and renew gaskets.

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 -arrow-.



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 oil pipes must be renewed if the gearbox is very dirty.

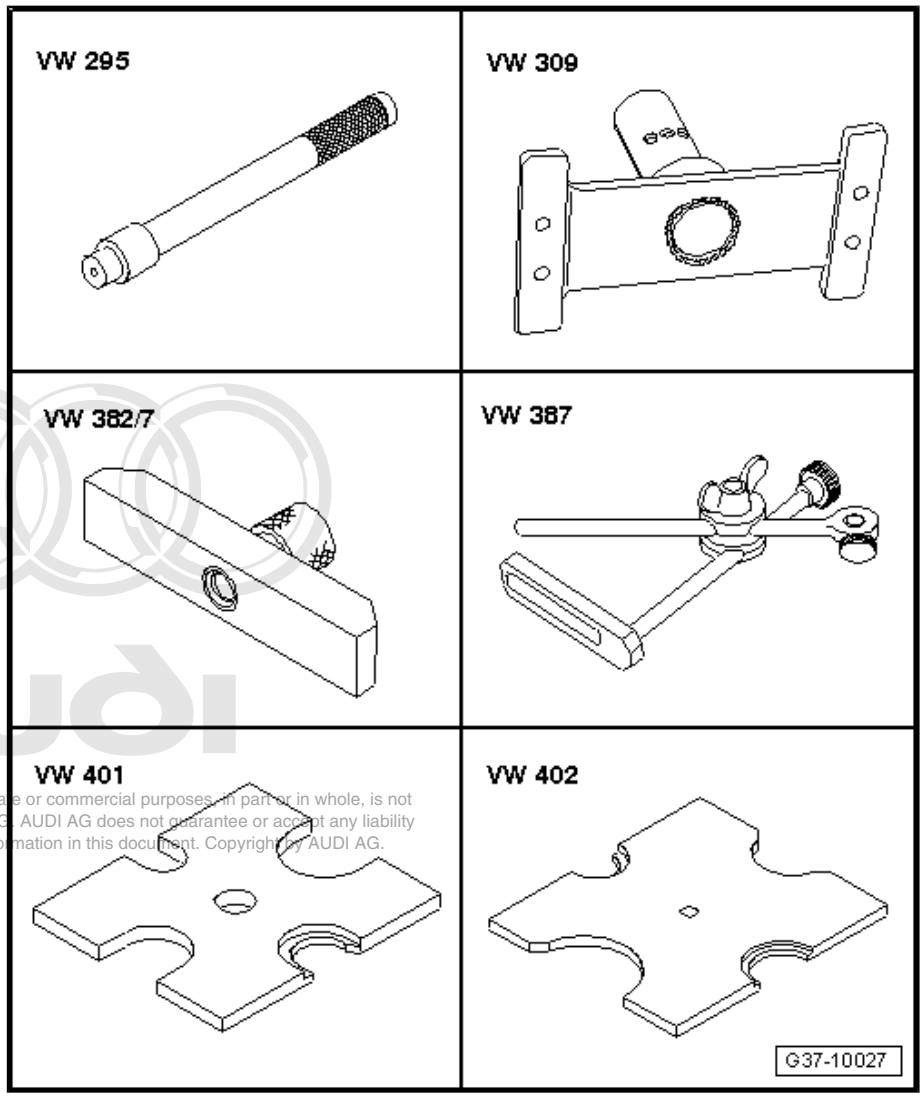
1.2 Special tools

Special tools

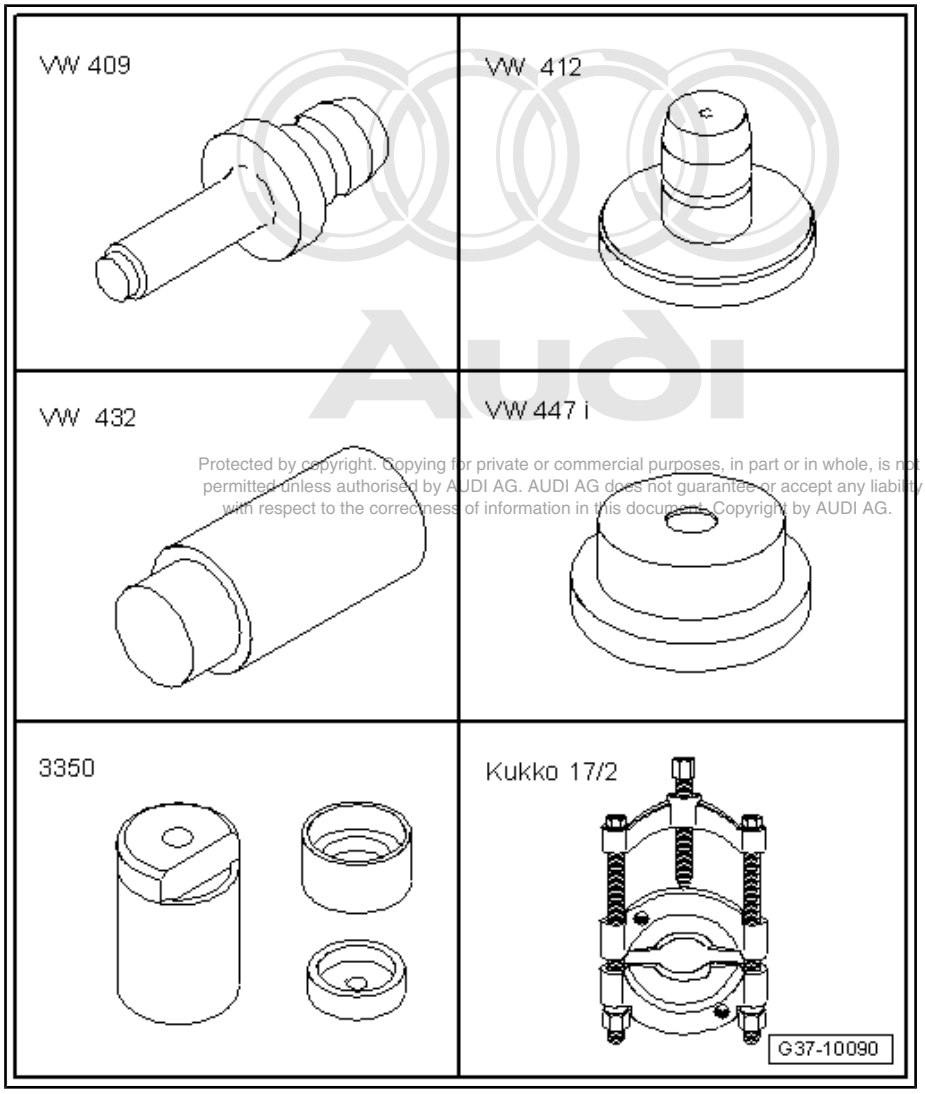
List of special tools used in this Workshop Manual ⇒ "Workshop equipment and special tools"

Special tools and workshop equipment required

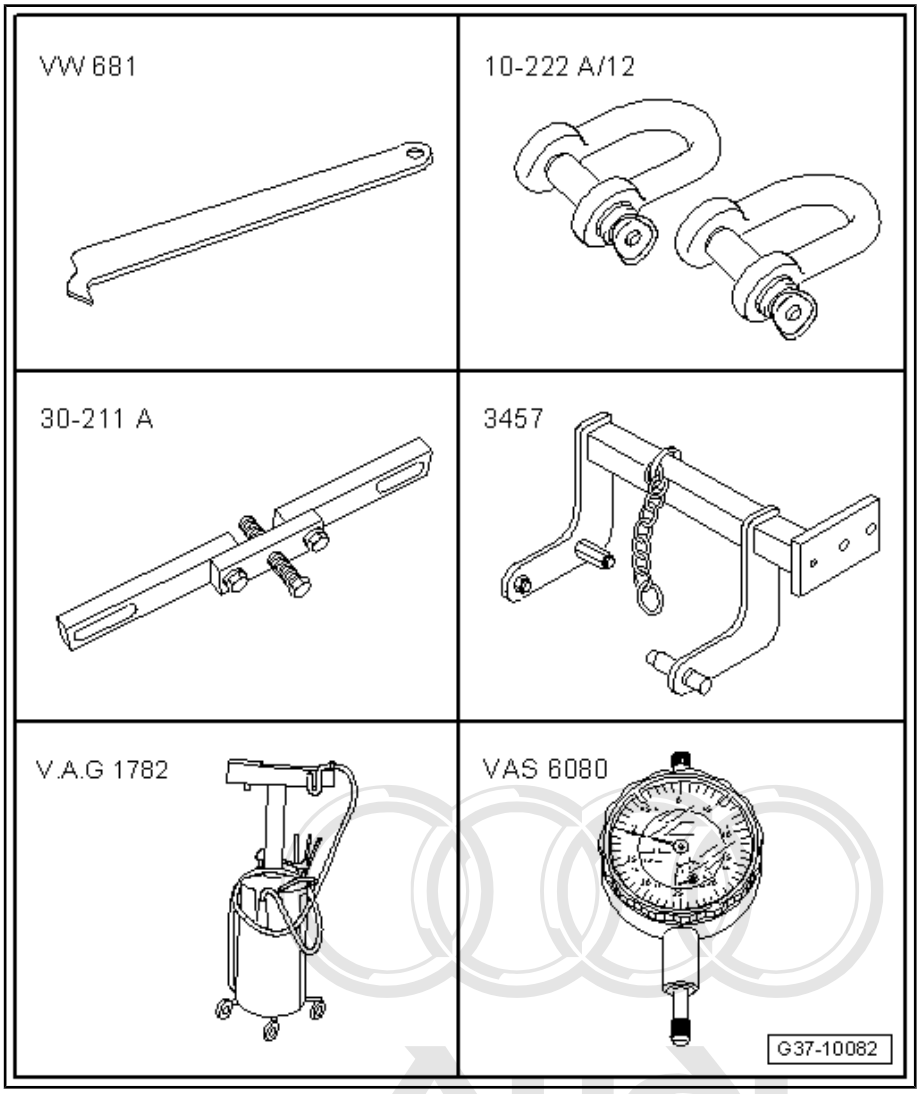
- Drift -VW 295-
- Support plate -VW 309-
- Measuring bridge -VW 382/7-
- Universal dial gauge bracket -VW 387-
- Thrust plate -VW 401-
- Thrust plate -VW 402-



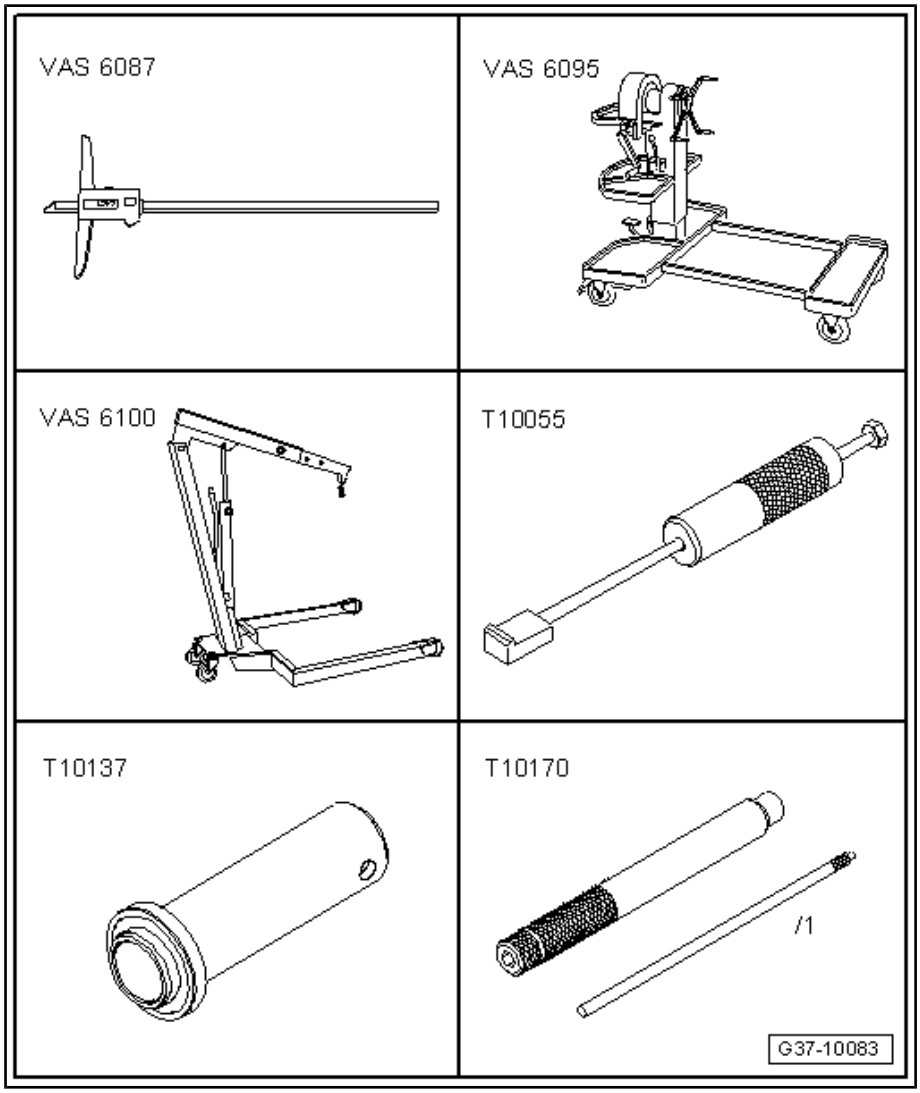
- Press tool -VW 409-
- Press tool -VW 412-
- Thrust piece -VW 432-
- Thrust plate -VW 447 i-
- Assembly tool -3350-
- Splitter 22 ... 115 mm -Kukko 17/2-



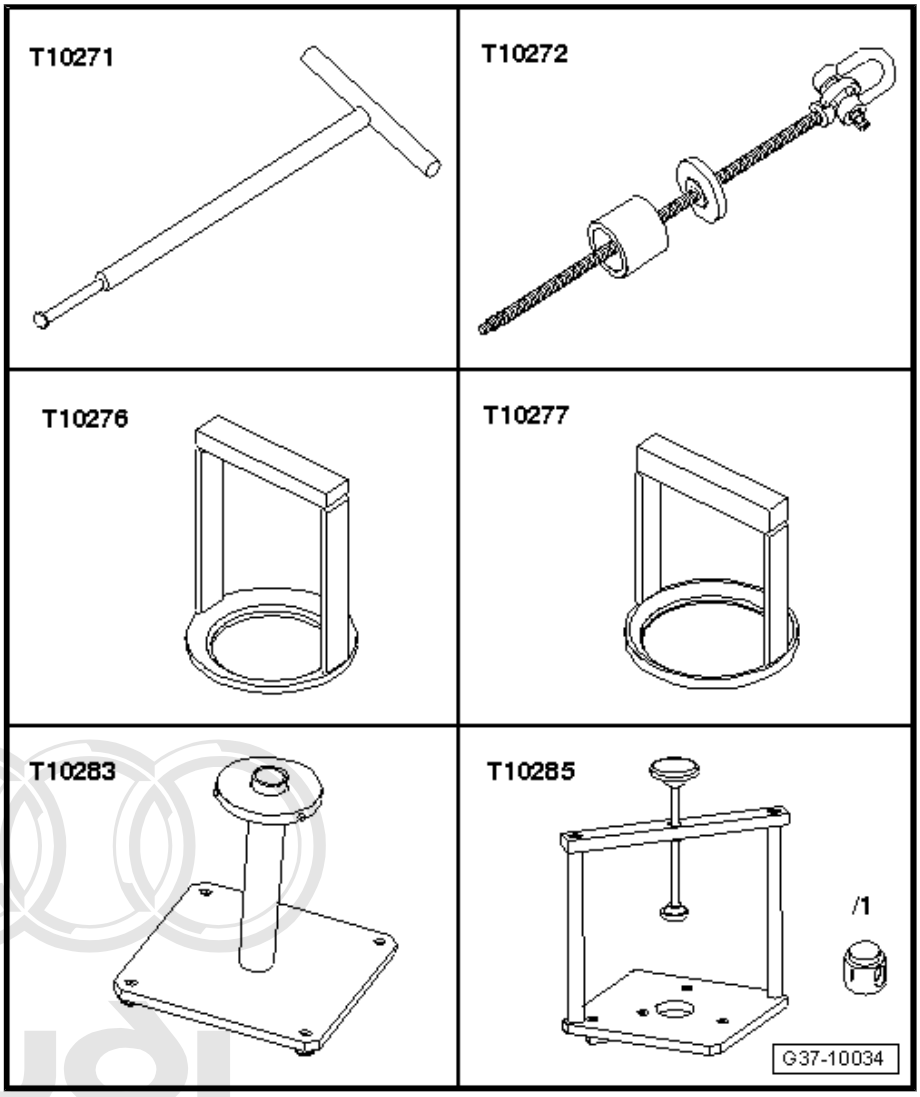
- Oil seal extractor lever -VW 681-
- Shackle -10 - 222 A /12-
- Support bridge -30 - 211 A-
- Transportation tool -3457-
- Used oil collection and extraction unit -V.A.G 1782-
- Dial gauge -VAS 6080-



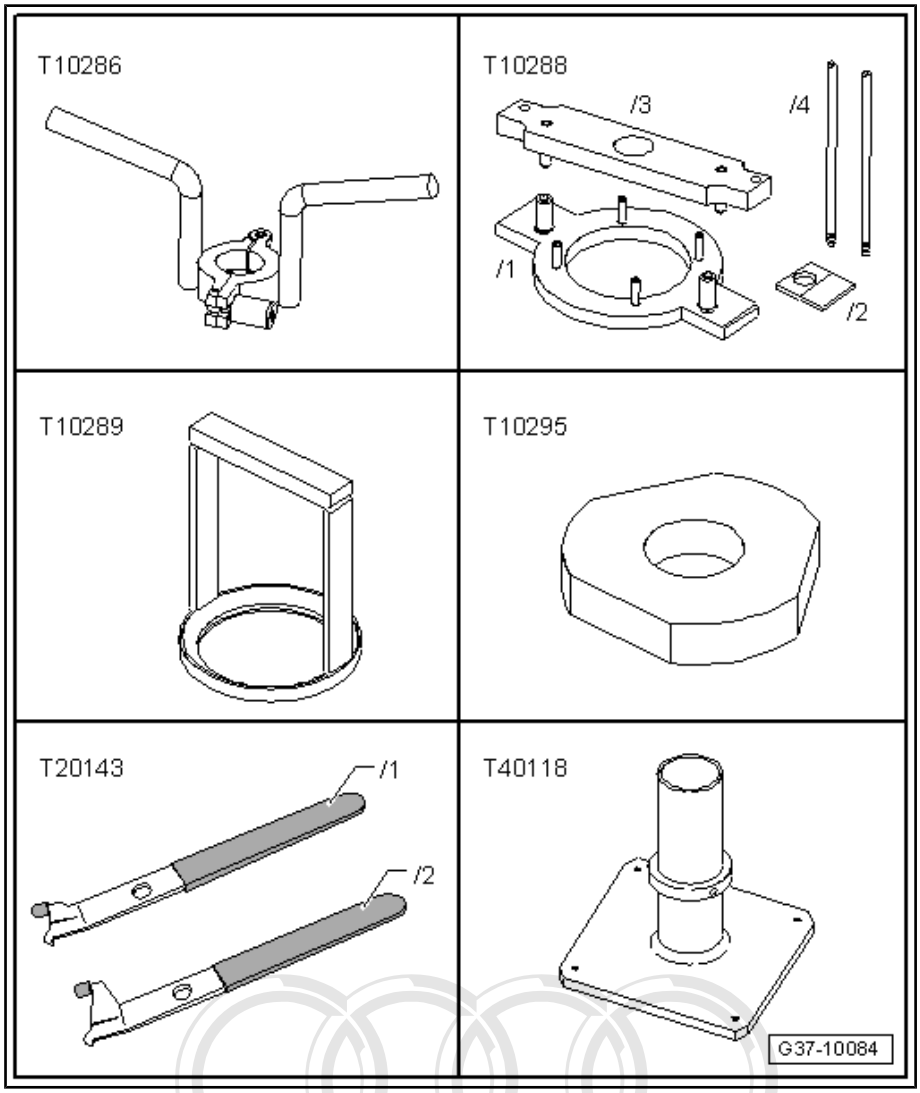
- Digital depth gauge -VAS 6087-
- Engine and gearbox support -VAS 6095-
- Workshop hoist -VAS 6100-
- Thrust piece -T10137-
- Puller -T10055-
- Dial gauge extension -T10170/1-



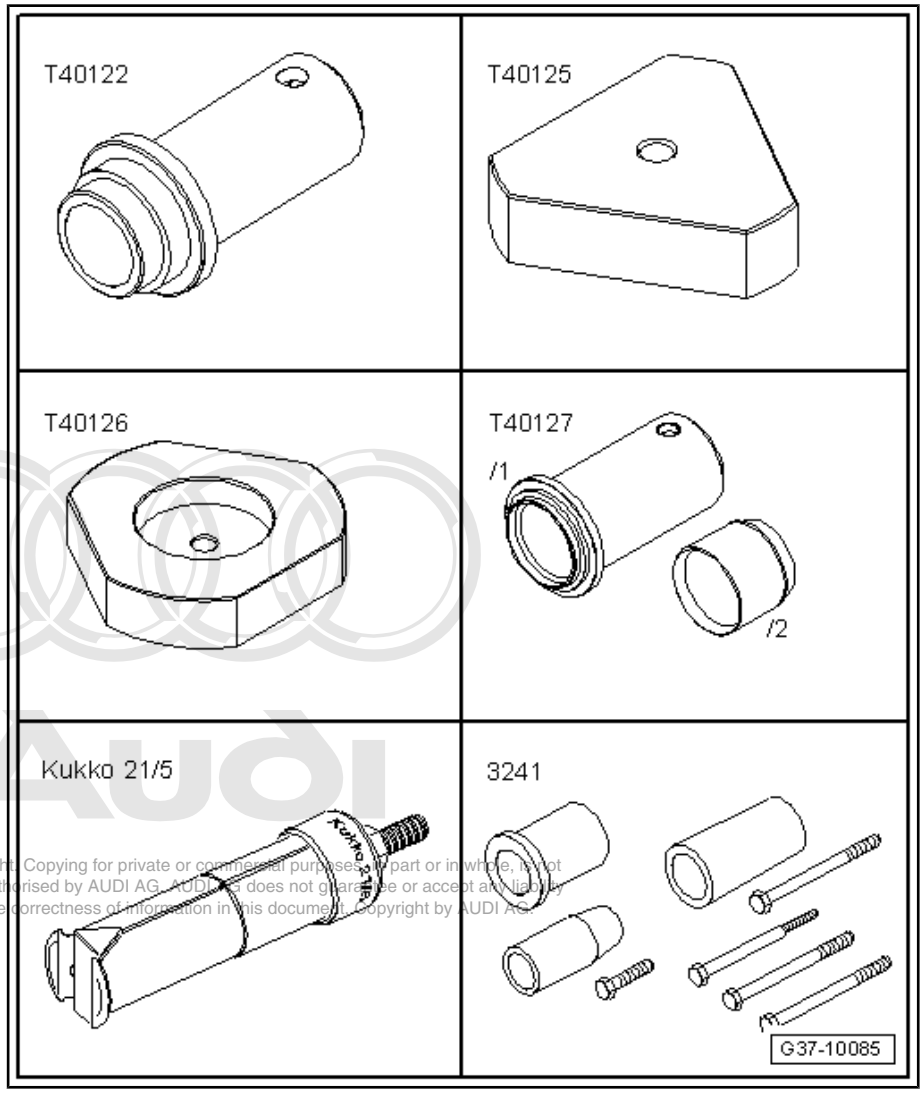
- Extractor tool -T10271-
- Lifting device -T10272-
- Assembly jig -T10276-
- Assembly jig -T10277-
- Support -T10283-
- Compressor tool -T10285-



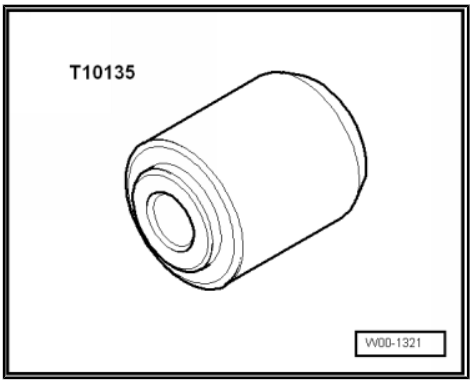
- Puller for oil supply -T10286-
- Guide pins M6 -T10288/4-
- Assembly jig -T10289-
- Plate -T10295-
- Extractor tool -T20143/2-
- Support -T40118-



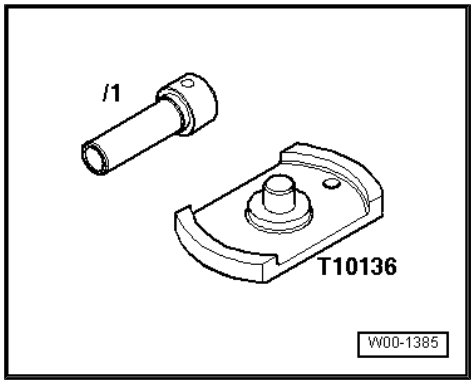
- Thrust piece -T40122-
- Plate -T40125-
- Plate -T40126-
- Assembly tool -T40127-
- Internal puller -Kukko 21/5-
- Fitting sleeve -3241/1-



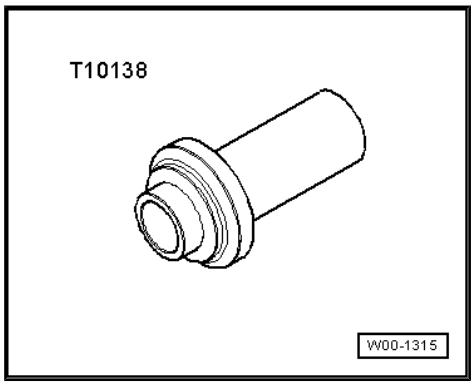
- Thrust piece -T10135-



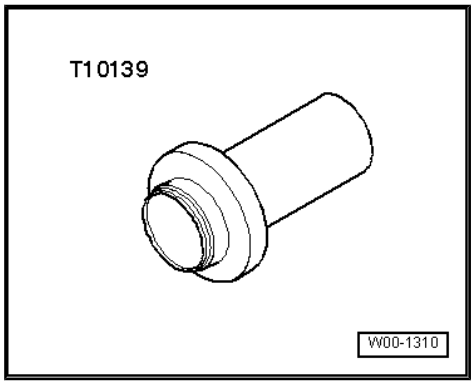
- Fitting tool -T10136-



- Thrust piece -T10138-



- Thrust piece -T10139-



- Hot air blower
- Safety goggles
- Sealing grease -G 052 128 A1-
- Vaseline

2 Rules for cleanliness when working on the 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 commercially available lint-free cloths for cleaning, such as the „WYPALL X70 / WORKHORSE“ cloth from Kimberly-Clark Professional.
- 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 or 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.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

3 Common faults

Note

- *Before commencing fault-finding, interrogate the event memory of the automatic gearbox control unit -J217- ⇒ Vehicle diagnostic tester.*
- *Also interrogate the event memory of the engine control unit, as fault messages from the engine control unit can lead to malfunctioning of the gearbox ⇒ Vehicle diagnostic tester.*
- *Before commencing fault-finding, check ATF level ⇒ Automatic gearbox 09L, four-wheel drive ; Rep. gr. 37 .*

Overview:

3.1 Defective stator shaft bushes

- Possible fault:

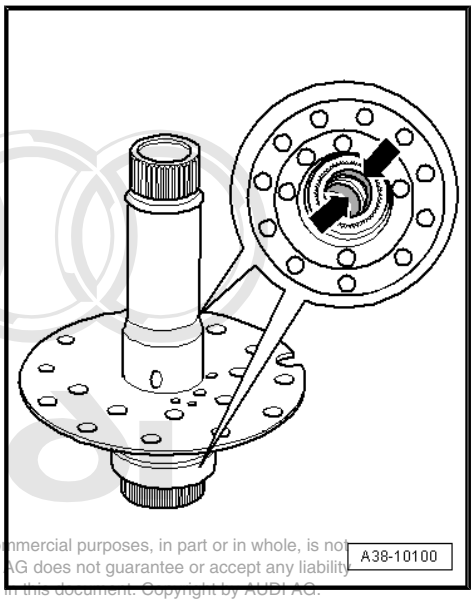
Brass bushes on stator shaft have seized, causing failure of clutch „A“.

- Fault rectification:

– Check brass bushes -arrows- for scoring and traces of seizure.

If traces of seizure are visible:

– Renew ATF supply unit with stator shaft.
– Check rectangular section seals and input shaft of clutch „E“.
– Renew clutch „A“.



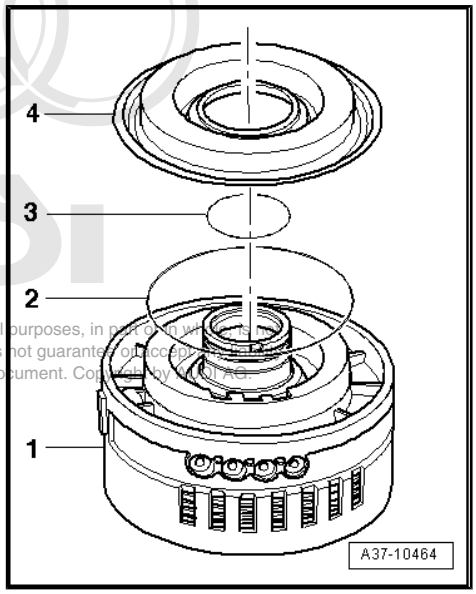
3.2 Gearbox in backup mode (emergency running mode) - entry in event memory „Gear monitoring, reverse gear or 1st gear“

♦ Possible fault:

O-rings -2- and -3- have come loose from clutch „D“.

♦ Fault rectification:

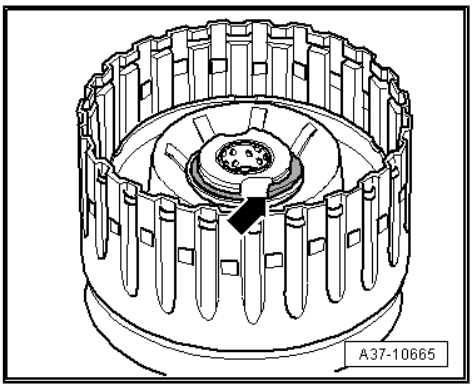
– Check annular grooves for burrs and remove burrs if necessary.



3.3 No power transmitted from 4th gear upwards, gearbox in backup mode (emergency running mode) - entry in event memory „Gear monitoring, 4th, 5th, 6th gear“

♦ Possible fault:

Circlip for retaining plate -arrow- of clutch „E“ has slipped out of groove in shaft.



♦ Fault rectification:

– Dismantle clutch „E“ and renew if necessary.

– Renew circlip -2-.

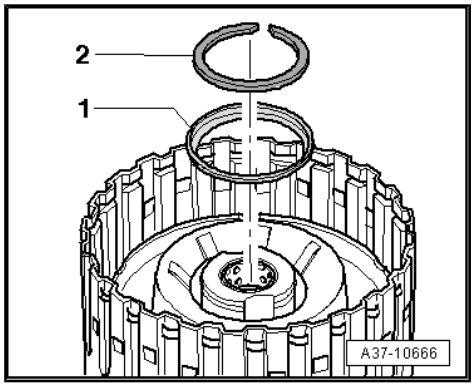
– Make sure that circlip is not over-stretched when installing.

– If not already fitted, retaining plate -1- must also be installed. Installing ⇒ page 79

– Dismantle and clean gearbox if ATF is very dirty ⇒ „3.1 Assessment of wear by checking ATF for colour and contamination“, page 115 .

– Renew mechatronic unit ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 38

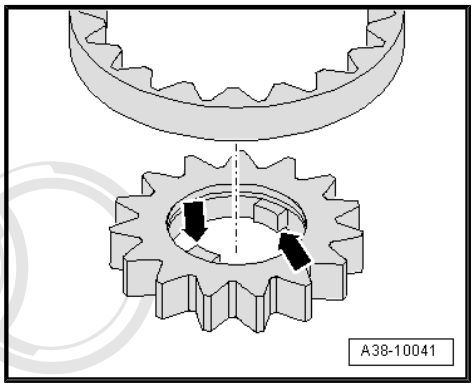
– Check components of clutch „A“ for traces of wear and damage ⇒ page 126 .



3.4 No power transmitted in any gear

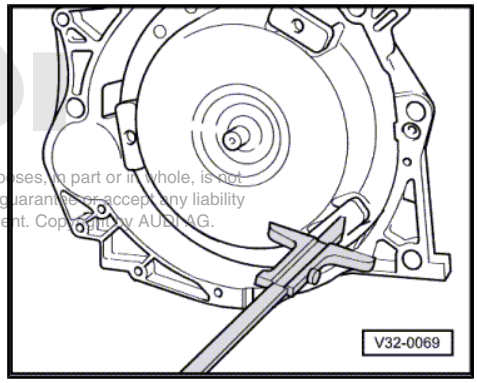
♦ Possible fault:

Drive lugs -arrows- on ATF pump gear broken off

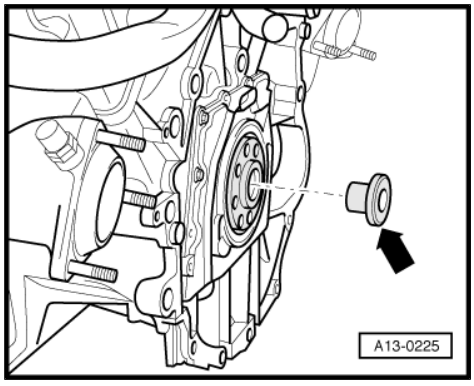


♦ Possible causes:

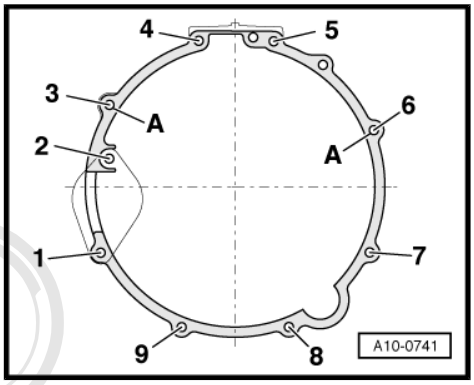
A - Torque converter not inserted properly when installing gearbox or engine. Check installation depth ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 32



B - Torque converter centring sleeve -arrow- not fitted in crankshaft ⇒ Engine, mechanics; Rep. gr. 13 .



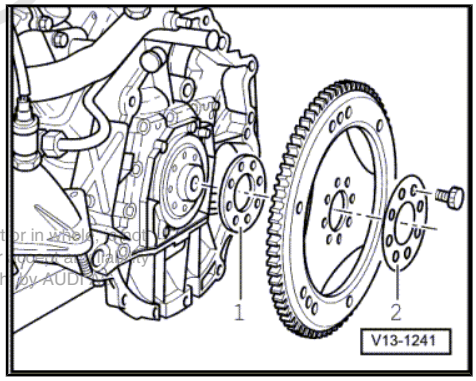
C - One or both dowel sleeves -A- for locating engine/gearbox flange not fitted. Dowel sleeves or drillings in gearbox flange damaged.



Note

-Items 1 ... 9- can be disregarded.

D - Torque converter drive plate not installed in correct position, drive plate not secured to engine with correct shim -1-, or shim -1- and washer -2- interchanged by mistake ⇒ 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.

32 – Torque converter

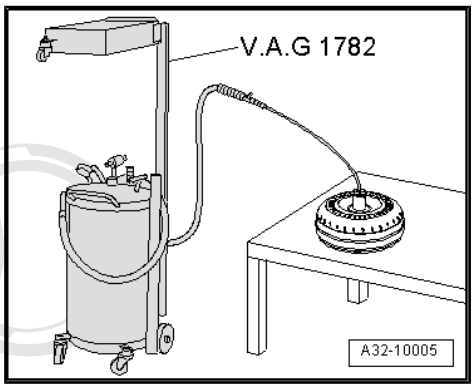
1 Torque converter

Overview:

1.1 Draining torque converter

Drain the torque converter as follows if the ATF is very dirty due to component wear, or when performing a major gearbox overhaul:

– Extract ATF from torque converter with used oil collection and extraction unit -V.A.G 1782- .

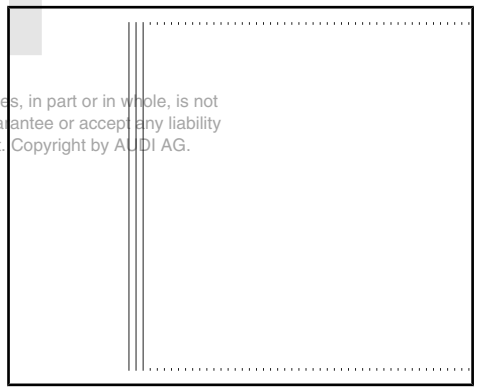


1.2 Checking torque converter

– Check hub -arrow- of torque converter for scoring.

If scoring is visible on the torque converter hub:

– Renew torque converter.

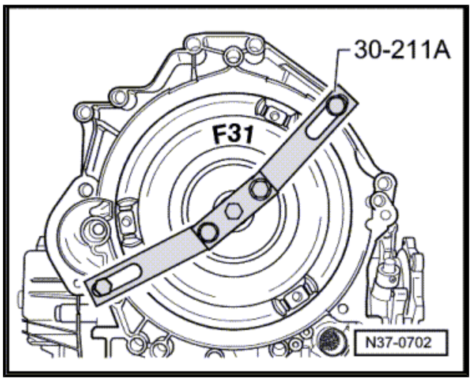


37 – Controls, housing

1 Securing gearbox to assembly stand

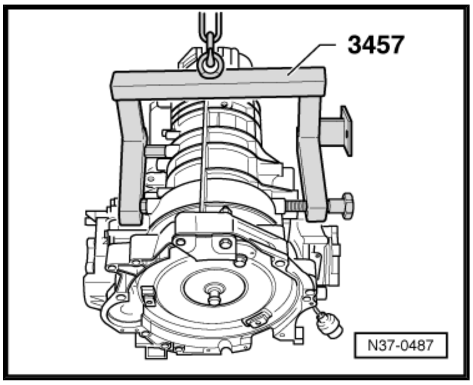
Procedure

- Torque converter must be secured using support bridge -30 - 211 A- to prevent it from falling out.



– Attach support plate -VW 309- to transportation tool -3457- .

– Attach transportation tool -3457- to attachment points on gearbox housing and secure in place.



Note

- ♦ *The bolt on the transportation tool -3457- must only be screwed hand-tight into gearbox.*
- ♦ *The gearbox housing may be damaged if pliers are used to tighten the bolt.*

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

Note

If the filled gearbox with oil pan is to be turned upside-down on the engine and gearbox support, the gearbox housing and final drive breathers must be sealed.

2 Dismantling and assembling planetary gearbox

Note

- *General repair instructions ⇒ page 1 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*
- *Coat 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.*

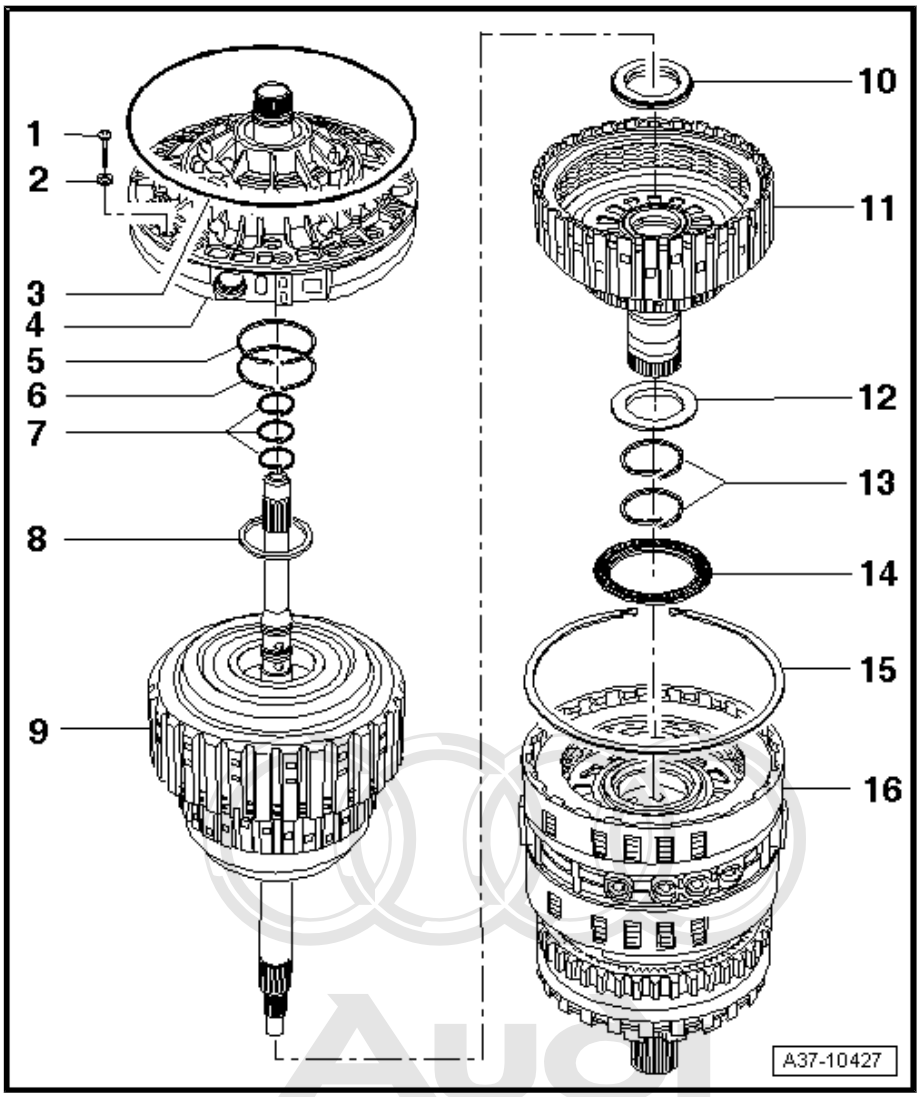
Overview:

- ⇒ „2.1 Planetary gearbox - exploded view“, page 19
- ⇒ „2.2 Dismantling and assembling planetary gearbox“, page 20

2.1 Planetary gearbox - exploded view

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .



1 - Bolt
- ❑ 10 Nm

2 - Sealing washer
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - ATF supply unit
- ❑ With ATF pump
- ❑ Dismantling and assembling ⇒ page 85

5 - Rectangular section seal
- ❑ Renew
- ❑ Hook ends together

6 - Rectangular section seal for ATF supply unit
- ❑ Renew
- ❑ Hook ends together

7 - Rectangular section seals for input shaft
- ❑ Renew

8 - Shim
- ❑ Determining thickness ⇒ page 33

9 - Body „II“
- ❑ Dismantling and assembling ⇒ page 68

10 - Axial needle bearing

11 - Clutch „B“
- ❑ Dismantling and assembling ⇒ page 64

12 - Thrust washer

13 - Rectangular section seals
- ❑ Renew

14 - Axial needle bearing

15 - Circlip
- ❑ For body „I“

16 - Body „I“
- ❑ Dismantling and assembling ⇒ page 44

2.2 Dismantling and assembling planetary gearbox

Dismantling

– Secure gearbox to assembly stand ⇒ page 17 .

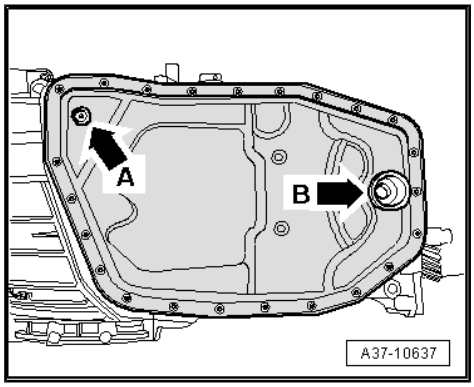
• The gearbox must be horizontal with the ATF oil pan facing downwards.

– Remove torque converter.

– Extract ATF from torque converter ⇒ page 16 .

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

– Remove ATF drain plug -arrow A- and allow ATF to drain off.

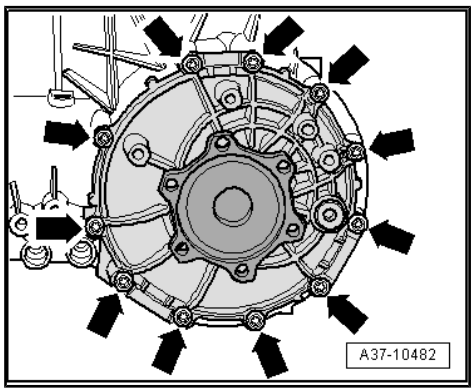


Note

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

– Loosen bolts -arrows- for cover for front final drive in diagonal sequence and remove bolts.

– Catch escaping gear oil using used oil collection and extraction unit -V.A.G 1782- .



Caution

Risk of accident.

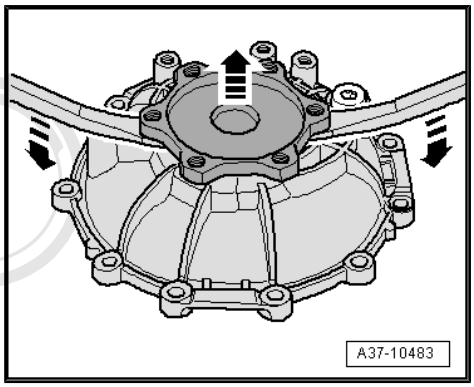
- *The differential is very heavy.*

– Detach cover for front final drive together with differential.

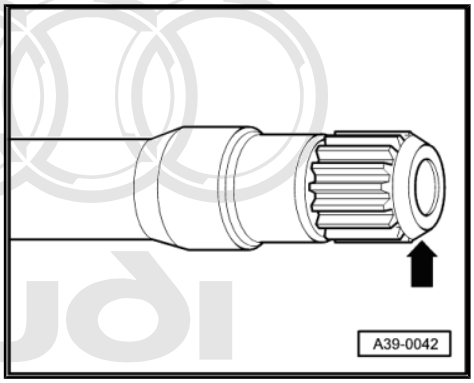
– Place cover for front final drive together with differential on a soft surface.

– Lever flange shaft (right-side) off differential -arrows- using two levers.

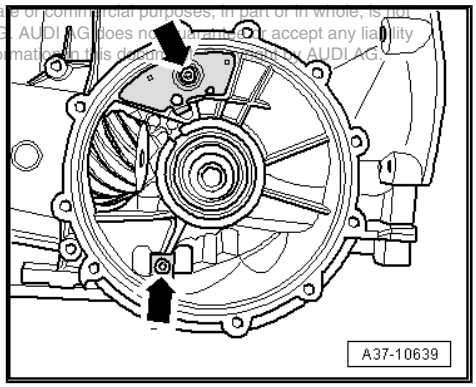
– Drive oil seal for flange shaft (right-side) out of cover for final drive using a drift.



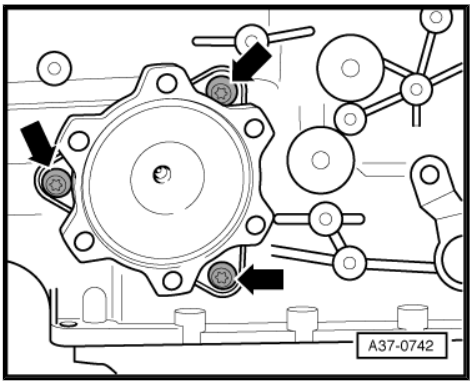
– Cover splines on flange shaft (left-side) -arrow- with insulating tape to prevent damage to oil seal between final drive and gearbox housing when pulling out flange shaft. Take care to cover the splines completely, without creasing or overlapping the tape.



– Remove bolts -arrows- and detach cover plate for breather passage and retaining plate with magnet.

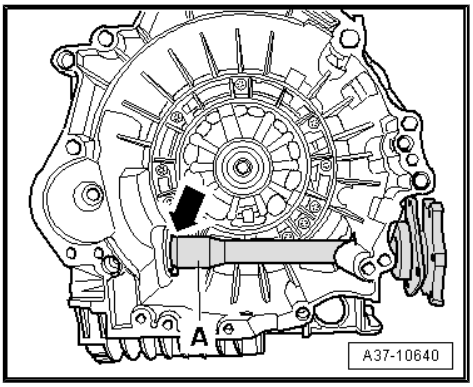


– Remove bolts -arrows- on mounting bracket for flange shaft (left-side).



Caution

While pulling out the flange shaft (left-side), it must be held centrally to avoid damaging the oil seal between the final drive and the gearbox housing.

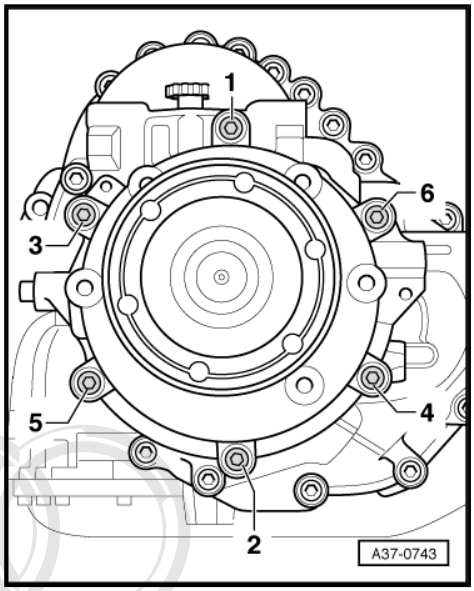


– Pull flange shaft -A- (left-side) out of gearbox, making sure that shaft remains centered in opening at differential -arrow-.

– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.
– Slacken and remove securing bolts for cover for self-locking centre differential in the sequence -6 ... 1- and allow gear oil to drain out.

Caution

The self-locking centre differential can drop out of the gearbox when the cover for the self-locking centre differential is removed.

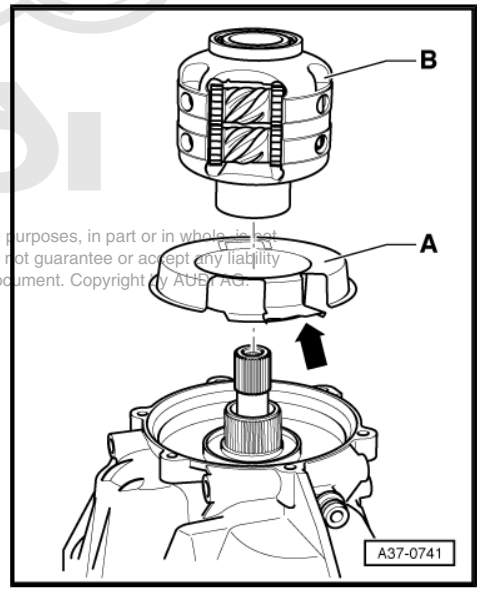


– Slowly and carefully pull cover for self-locking centre differential off gearbox.

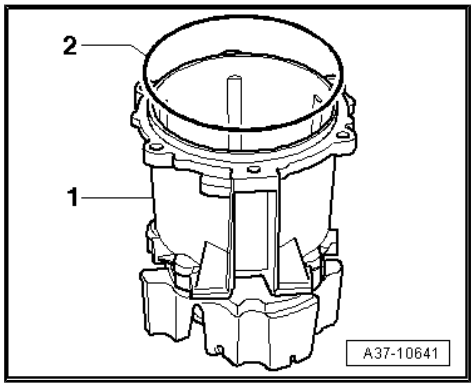
– Pull self-locking centre differential -B- and baffle plate -A- off input shaft.

Note

-Arrow- can be disregarded.

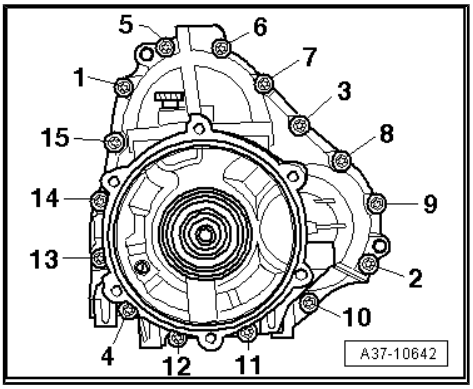


– Detach O-ring -2- from cover for self-locking centre differential -1-.



– Turn gearbox on assembly stand.

• The intermediate flange for front axle drive should face upwards



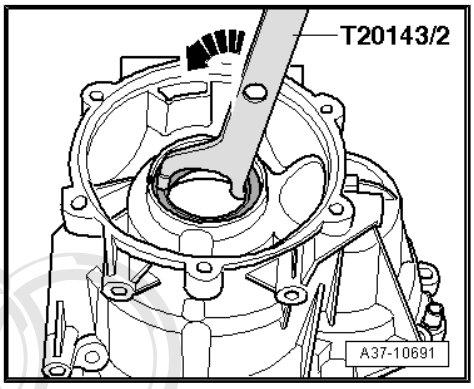
Caution

The gearbox must be in this position when taking off the intermediate flange for front axle drive, otherwise there is a risk that the spur gears (pinions) may drop out.

– Slacken bolts on intermediate flange for front axle drive in the sequence -15 ... 1- and remove bolts.

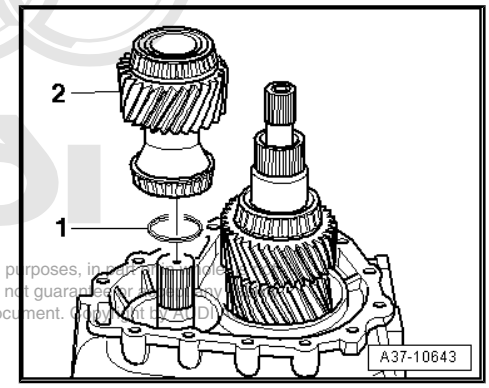
– Take off intermediate flange for front axle drive and gasket.

– Pull out oil seal for shaft for front axle drive using extractor tool -T20143/2- .



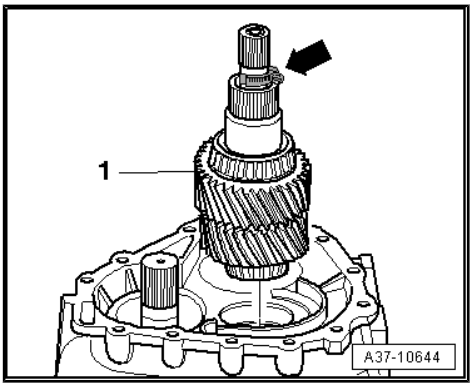
– Remove input pinion -2-.

– Remove shim -1-.



Caution

The intermediate pinion has to be fixed on the shaft for front axle drive so that the two parts do not fall apart and the oil seal inside the intermediate pinion is not damaged.



– Fix intermediate pinion on shaft for front axle drive using hose clip -arrow-,

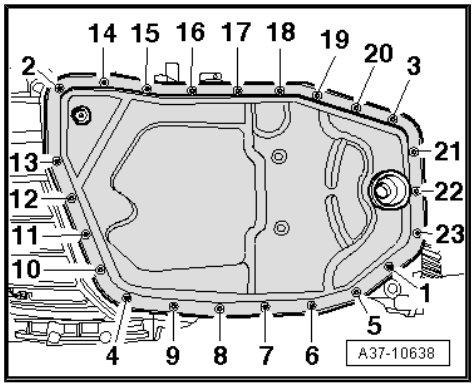
– Take off shaft for front axle drive with intermediate pinion -1-.

– Turn gearbox on assembly stand.

• The ATF oil pan should face upwards.

Oil pan version 1:

– Slacken bolts for ATF oil pan in the sequence -23 ... 1- and remove bolts.

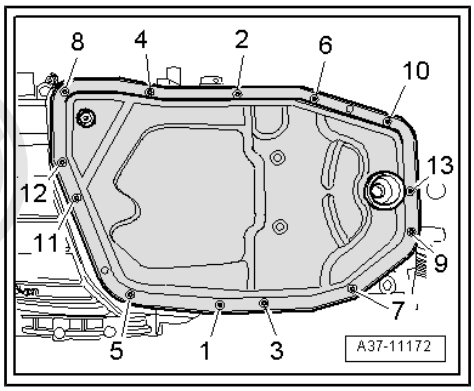


Oil pan version 2:

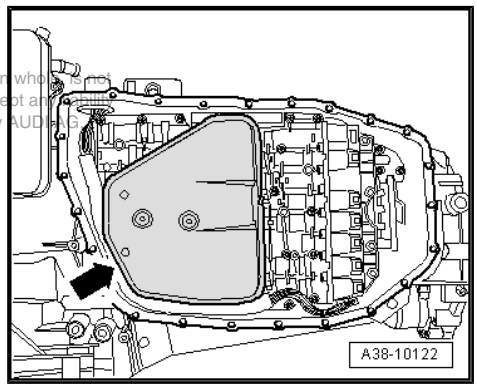
– Slacken bolts for ATF oil pan in the sequence -13 ... 1- and remove bolts.

Continued for all gearboxes:

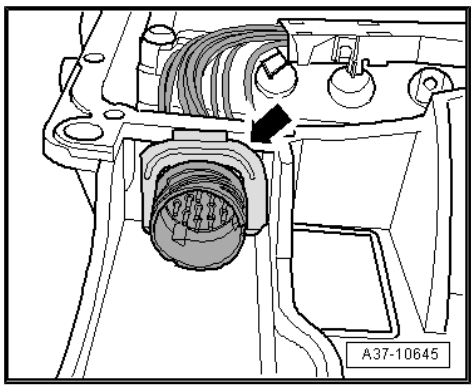
– Take off ATF oil pan and gasket.



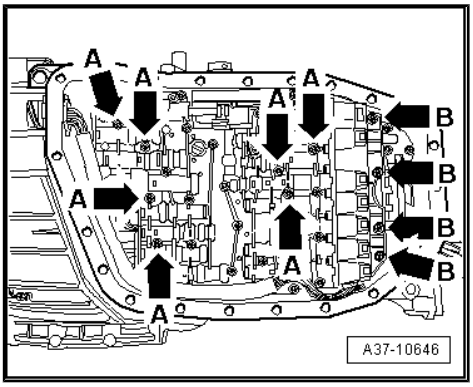
– Pull ATF strainer -arrow- off mechatronic unit.



– Detach retaining clip -arrow- for wiring harness connector and push connector inwards.



– Remove bolts -arrows A- and -arrows B-.



Caution

- *Loosen ONLY the bolts with the larger bolt heads -arrows A- and -arrows B-.*
- *If other bolts are loosened, this may affect the operation of the mechatronic unit or the mechatronic unit could come apart.*
- *Observe different bolt lengths.*

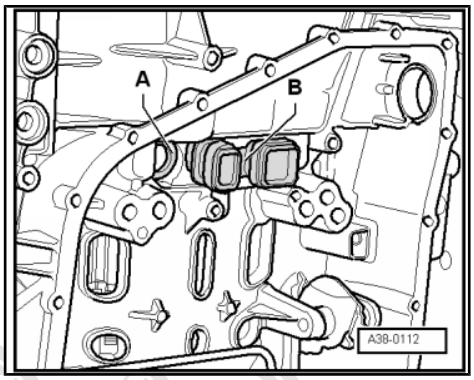
– Lift mechatronic unit slightly and pull wiring harness connector out of gearbox housing.

Caution

To avoid damaging the senders on the rear of the unit, always put down the mechatronic unit so that the side with the bolt heads faces downwards.

– Detach adapter -B- for mechatronic unit.

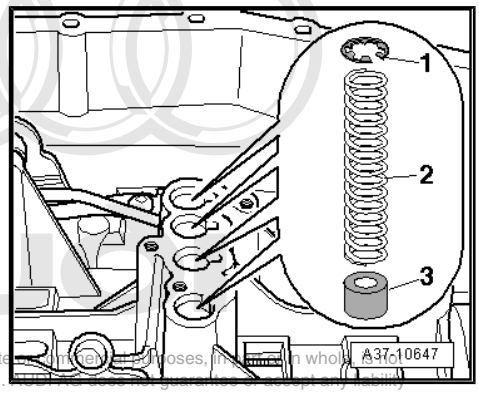
– Pull out gasket -A- for ATF strainer (if it has not already been removed together with the ATF strainer).



– Remove 4 circlips -1-.

– Detach a total of four coil springs -2-.

– Pull out sealing sleeves -3- using extractor tool -T10271- .

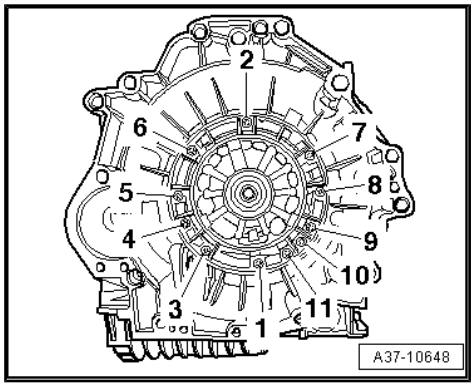


– Turn gearbox on assembly stand.

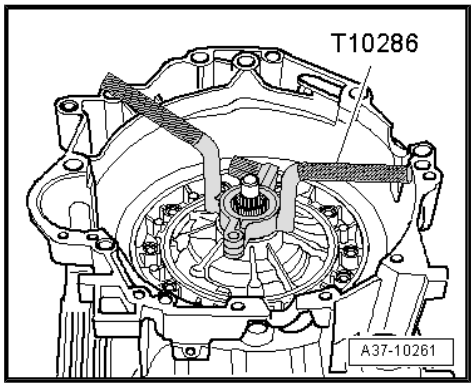
• The torque converter should face upwards.

– Slacken bolts for ATF supply unit in the sequence -11 ... 1- and remove bolts.

– Remove bolts with sealing washers.



– Attach puller for oil supply -T10286- to stator shaft and lift out ATF supply unit by pulling firmly.



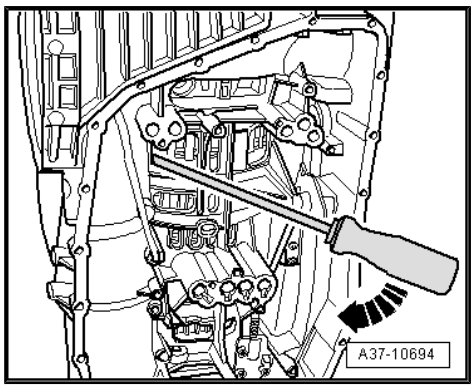
Note

If necessary, release ATF supply unit by tapping gently with a rubber-headed hammer.

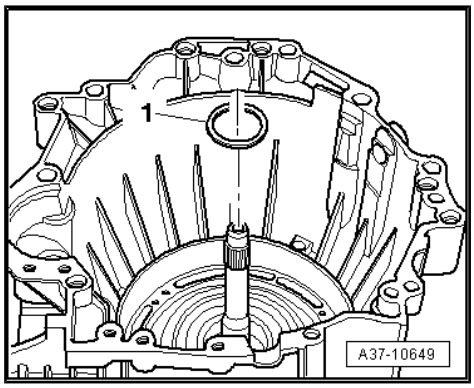
If it is not possible to detach ATF supply unit:

– Insert a screwdriver below clutch „B“ on underside of gearbox and lever components located above clutch „B“ upwards -arrow-.

– Detach O-ring from ATF supply unit.



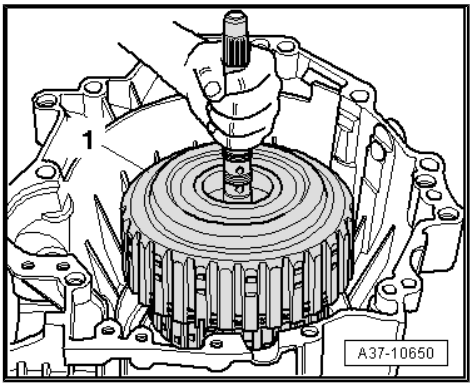
– Detach shim -1- from body „II“ using a magnet.



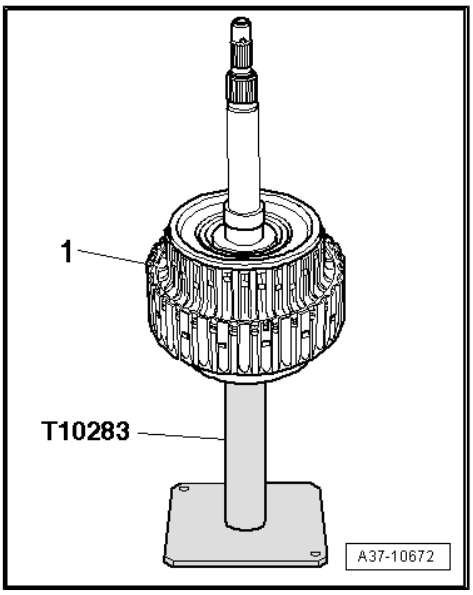
Note

The shim may also remain attached to the ATF supply unit.

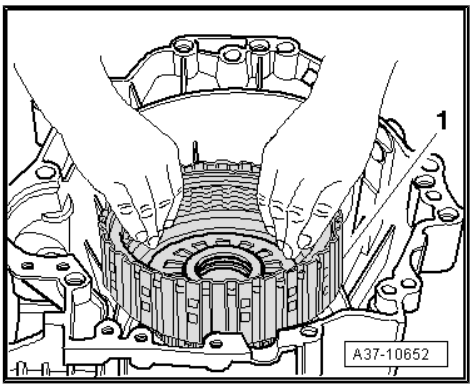
– Lift body „II“ -item 1- out of gearbox housing.



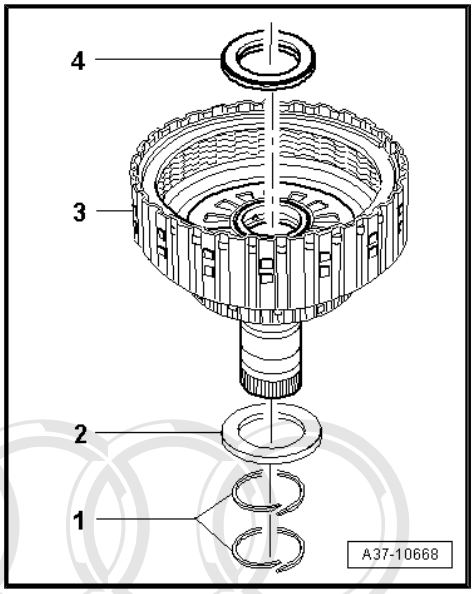
– Secure support plate of support -T10283- approx. 20 mm below top edge of support tube.
– Turn body „II“ -item 1- through 180° and place on support -T10283- .
• The ATF pump end should face downwards.



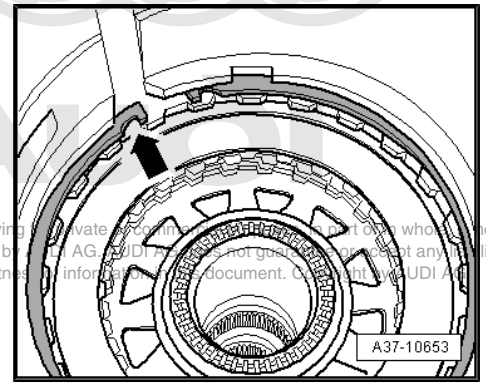
– Take clutch „B“ -item 1- out of gearbox.



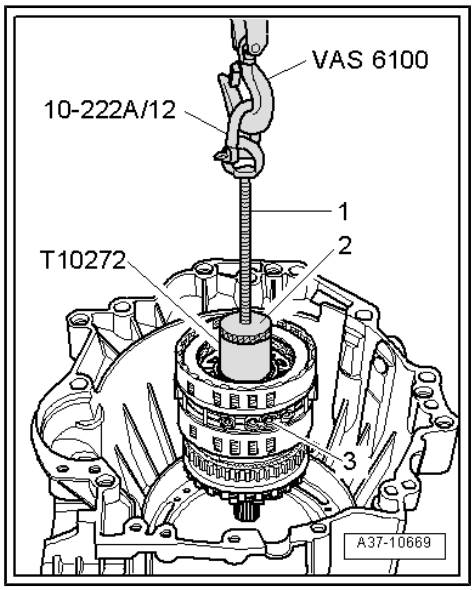
– Detach axial needle bearing -4- from top of clutch „B“ -item 3-.
– Turn clutch „B“ upside down.
– Using two small screwdrivers, unclip thrust washer -2- from clutch „B“ -item 3-.
– Detach rectangular section seals -1- from sun gear shaft of body „II“.



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



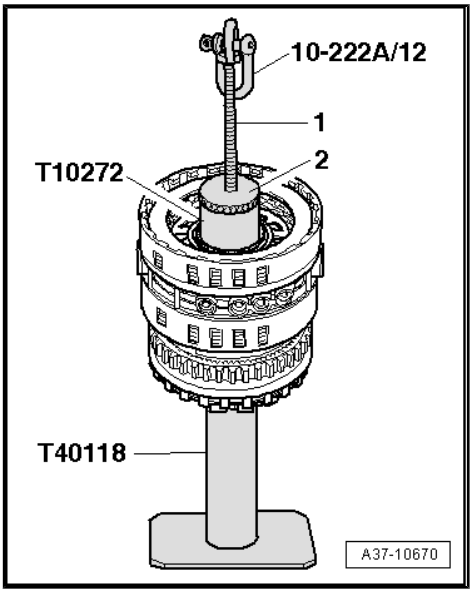
– Screw threaded spindle -1- of lifting device -T10272- into tapped hole of body „I“ as far as stop.
– Secure components of body „I“ to prevent them being pulled apart (by screwing sleeve -2- all the way down on threaded spindle by hand).
– Connect eye of lifting device -T10272- to workshop hoist -VAS 6100- by means of shackle -10-222 A/12- .
– Lift body „I“ out of gearbox housing using workshop hoist -VAS 6100- .



Note

-Item 3- can be disregarded.

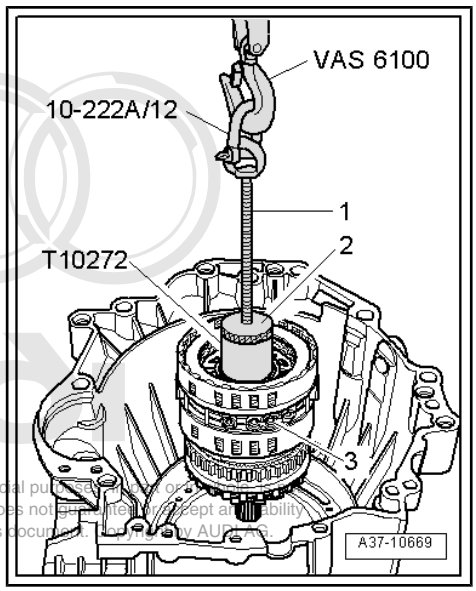
– Secure support plate of support -T40118- flush with top edge of support tube.
– Place body „I“ on support -T40118- .



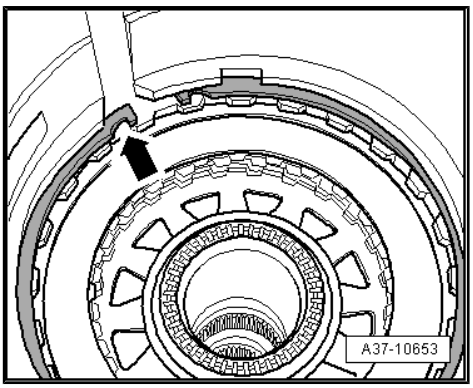
Assembling

– Make sure that lifting device -T10272- is securely attached in body „I“.
– Connect eye of lifting device -T10272- to workshop hoist -VAS 6100- by means of shackle -10-222 A/12- .
– Lift body „I“ off support -T40118- using workshop hoist -VAS 6100- .
– Lower body „I“ into gearbox housing using workshop hoist -VAS 6100- .

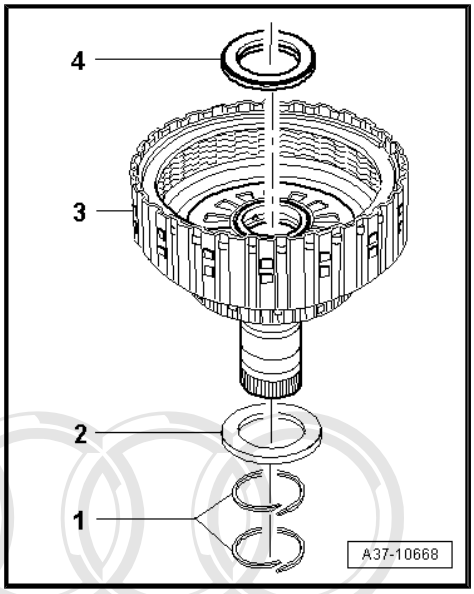
• The oil drillings -3- on cylinder „C/D“ face towards the ATF oil pan end.



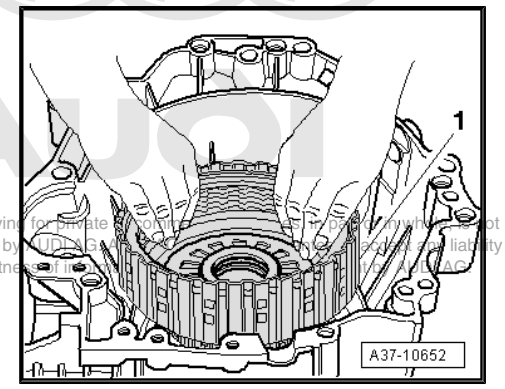
– Carefully insert circlip -arrow- for body „I“ into gearbox housing.
– Make sure that circlip locates securely all round in groove of gearbox housing; if necessary knock circlip into groove all round with a punch or press into groove with circlip pliers.



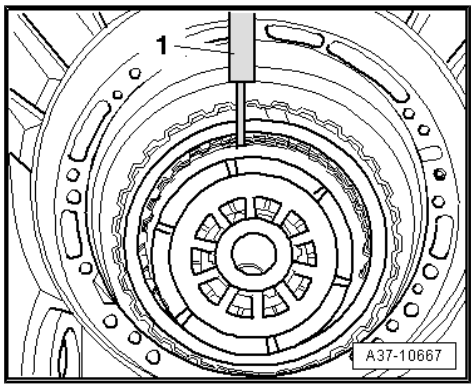
– Clip thrust washer -2- onto clutch „B“ -item 3- from below.
– Renew rectangular section seals -1- on sun gear shaft of body „II“ below clutch „B“ -item 3-.
– Lightly lubricate the rectangular section seals with vaseline before fitting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Fit axial needle bearing -4- on top of clutch „B“ -item 3-.



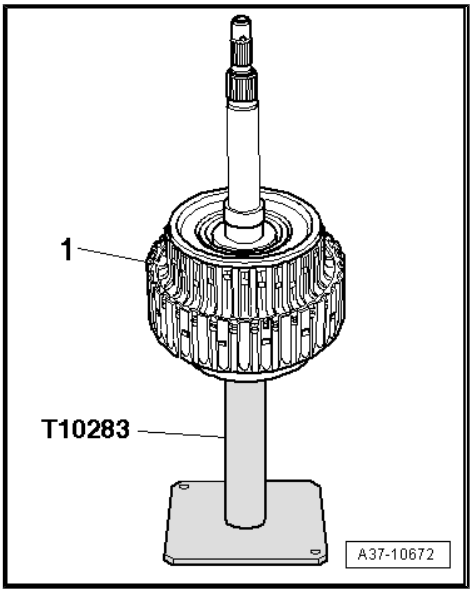
– Fit clutch „B“ -item 1- into clutch „C“.
– Allow clutch „B“ -item 1- to engage in all plates of clutch „C“ by lifting and rotating slightly as required.
– Lift clutch „B“ -item 1- a few millimetres and then let it drop to check that all the plates have meshed.
♦ If you hear a metallic sound, all the plates have meshed.
♦ If you only hear a muffled sound, some of the plates have not meshed.



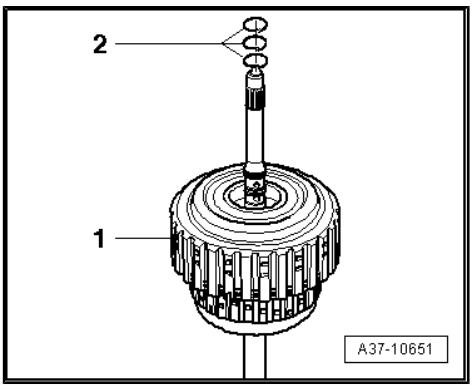
– To make it easier to fit body „II“, use the tip of a depth gauge -1- or similar to align plates of clutch „B“ so that the teeth are in line.



– Take body „II“ -item 1- off support -T10283- .
– Turn body „II“ to installation position.
• The ATF pump end should face upwards.



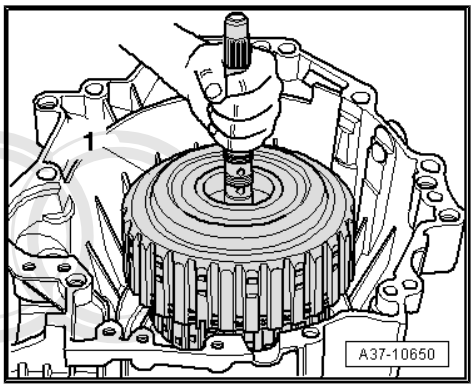
– Renew rectangular section seals -2- on sun gear shaft of body „II“ -item 1-.
– Lightly lubricate the rectangular section seals with vaseline before fitting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Make sure that the rectangular section seals are fully seated all round in the groove on the input shaft of body „II“ -item 1-, otherwise they can be damaged when the ATF pump is fitted later.



– Insert body „II“ -item 1- into gearbox by hand.
– Allow plate carrier on body „II“ to engage into all plates of clutch „B“ (lift and rotate plate carrier slightly as required.)

Note

To prevent body „I“ from turning when performing this step, it may be necessary to hold body „I“ from the ATF oil pan end using a large screwdriver.



– Lift body „II“ a few millimetres and then let it drop to check that the plates have meshed.

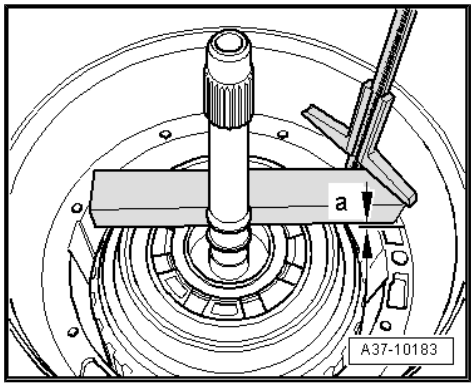
♦ If you hear a metallic sound, all the plates have meshed.
♦ If you only hear a muffled sound, some of the plates have not meshed.

Check proper installation of body „II“:

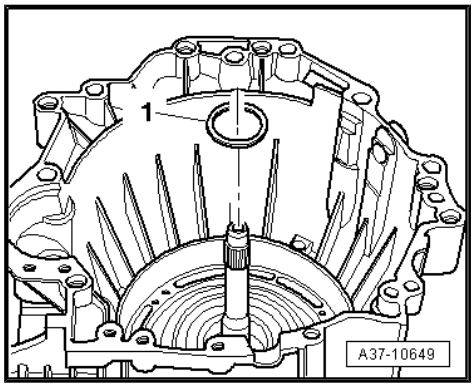
– Measure height of top edge of body „II“ above contact surface for ATF pump.

• Dimension -a- = approx. 15 mm

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



– Fit existing shim -1- onto clutch „A“.



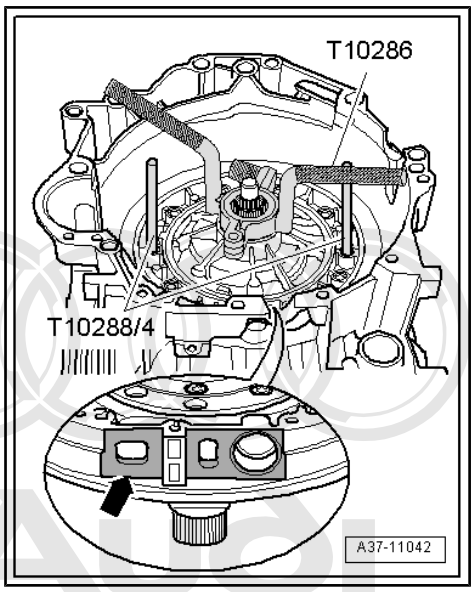
– Screw in guide pins M6 -T10288/4- .

– Apply puller for oil supply -T10286- to stator shaft.

– Fit ATF supply unit in gearbox housing without O-ring at this stage (turn ATF supply unit slightly in both directions).

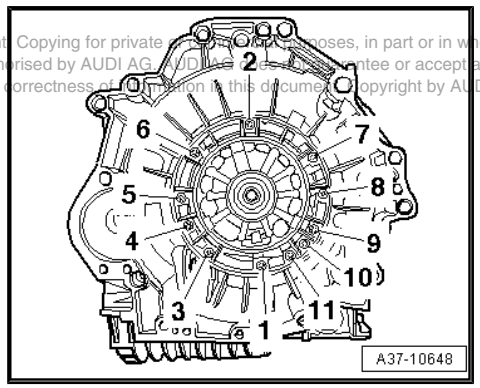
• The opening -arrow- on the housing of the ATF supply unit faces towards the ATF oil pan end.

– Remove puller for oil supply -T10286- .

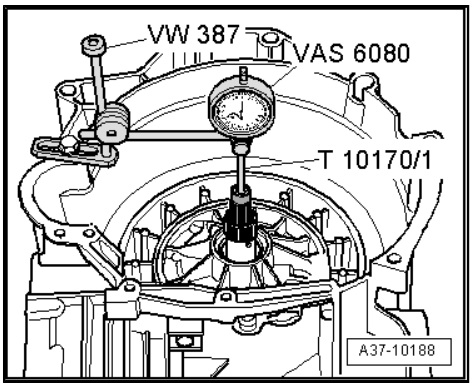


– Fit bolts -1, 2, 5, 8- for ATF supply unit with old sealing washers and tighten bolts.

• Tightening torque: 10 Nm



– Set up dial gauge -VAS 6080- with universal dial gauge bracket -VW 387- on gearbox flange.

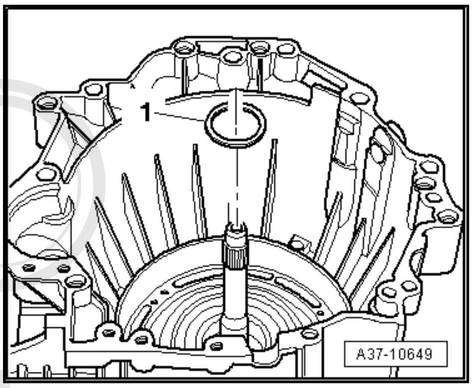


– Apply dial gauge -VAS 6080- with universal dial gauge extension -T10170/1- to drilling in input shaft as shown in illustration.
– Wrap insulating tape around input shaft to prevent damage.
– Move input shaft up and down with pliers (avoid diagonal movements).
– Read off axial clearance of input shaft from dial gauge.
• Specification: 0.20 ... 0.40 mm
– If result does not match specification:
– Select shim of required thickness from following table.
• Axial clearance too small: insert thinner shim of appropriate thickness.
• Axial clearance too large: insert thicker shim of appropriate thickness.

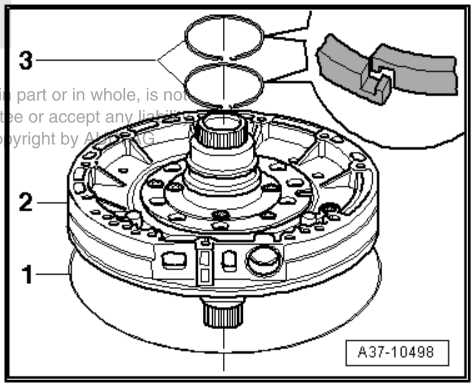
Available shims - thickness of shims in mm		
2.60	3.60	4.60
2.80	3.80	4.80
3.00	4.00	5.00
3.20	4.20	
3.40	4.40	

– Remove ATF supply unit again.

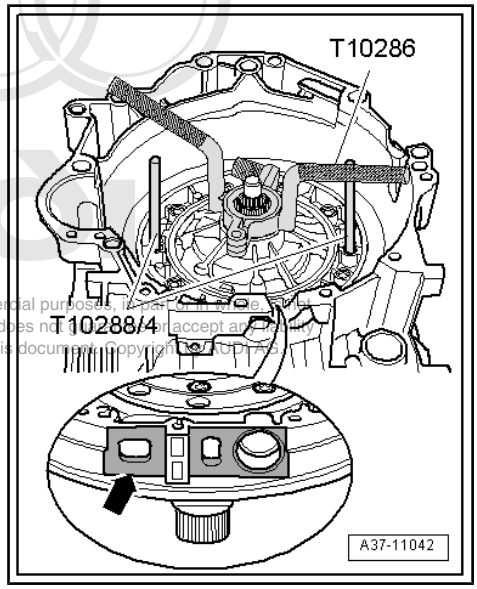
– Fit new shim of required thickness -1- (if applicable) onto clutch „A“.



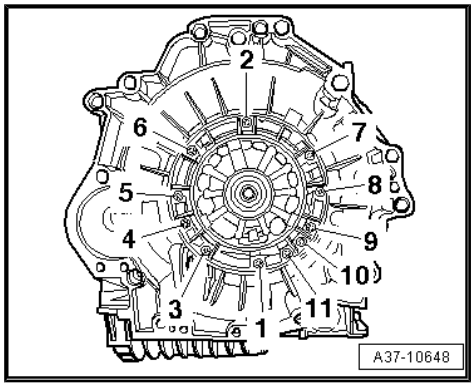
– Renew rectangular section seals -3- on stator shaft.
– Lightly lubricate the rectangular section seals with vaseline before fitting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.
– Hook ends of rectangular section seals together.
– Make sure that the rectangular section seals are seated properly all round in the stator shaft grooves.
– Renew O-ring -1- on ATF supply unit -2-.



– Apply puller for oil supply -T10286- to stator shaft.
– Fit ATF supply unit in gearbox housing again (turn ATF supply unit slightly in both directions).
• The opening -arrow- on the housing of the ATF supply unit faces towards the ATF oil pan end.
– Remove puller for oil supply -T10286- .



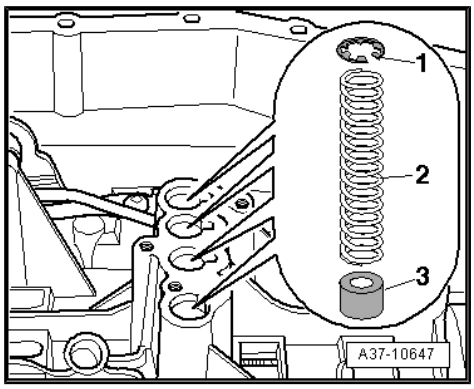
– Fit new sealing washers on bolts for ATF supply unit.
– Tighten bolts for ATF supply unit in sequence -1 ... 11-.
• Tightening torque: 10 Nm
– Check axial clearance of input shaft again ⇒ page 33 .



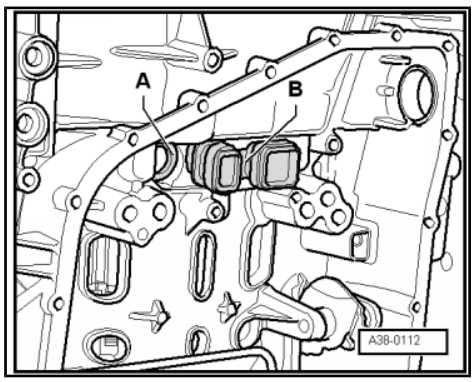
If reading again does not match specification:
– Repeat adjustment.

If reading matches specification:
– Turn gearbox on assembly stand.
• The ATF oil pan should face upwards.

– Press sealing sleeves -3- into bores in gearbox housing as far as stop.
– Fit coil springs -2- and secure with circlips -1- (push circlips down into bores as far as shoulder).



– Renew seals on adapter -B-.
– Install adapter for mechatronic unit.



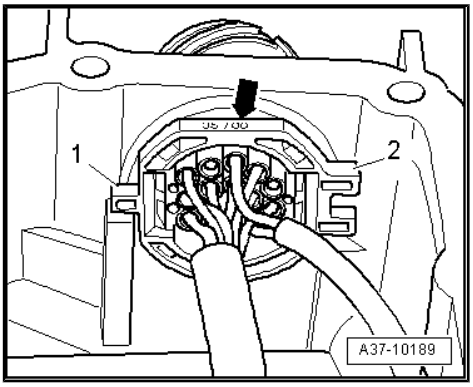
Note

Item -A- can be disregarded.

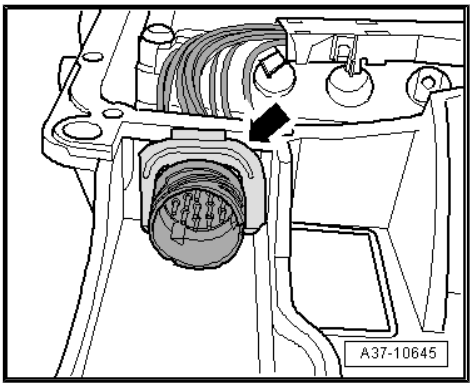
– Renew O-rings for wiring harness connector.

– Fit wiring harness connector in gearbox housing.

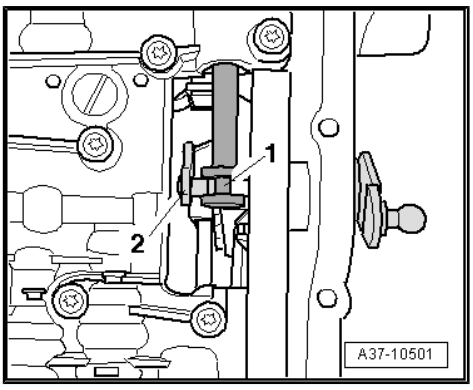
• Lugs -1- and -2- on shoulder are horizontal, flat section -arrow- of connector faces inside of oil pan.



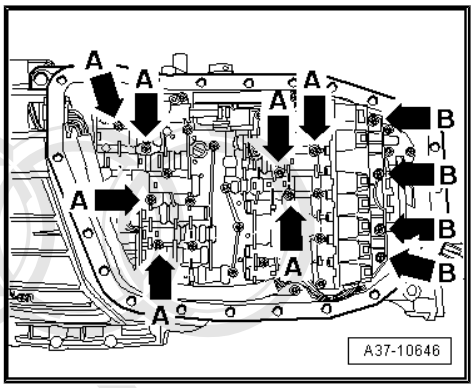
– Fit retaining clip -arrow- for wiring harness connector.



– Place mechatronic unit in position on gearbox housing without using force. At the same time insert pin -2- of detent plate so that it engages in slot on selector slide -1-.



– Screw in bolts -arrows- hand-tight.



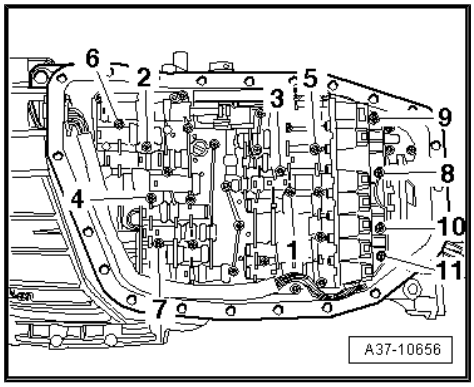
Note

Note different bolt lengths. Allocation:

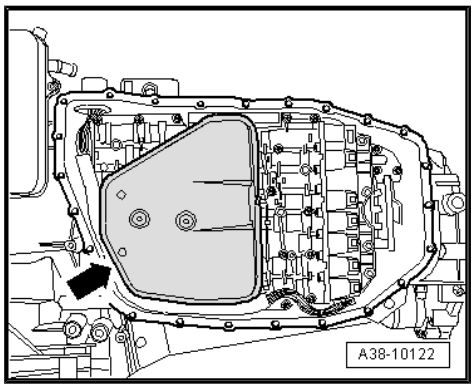
Location		Quantity	Bolt length
-Arrow A-	=	7	M6x50
-Arrow B-	=	4	M6x20

– Tighten bolts in sequence -1 … 11-.

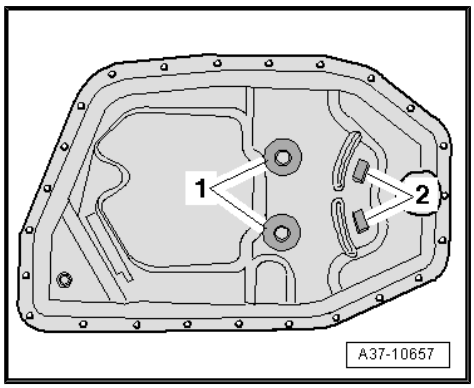
• Tightening torque: 8 Nm



– Renew ATF strainer -arrow-.
– Check whether seal is fitted on new ATF strainer.
– Fit ATF strainer on mechatronic unit.



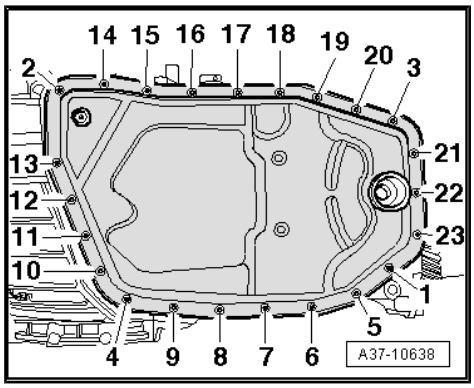
– Clean magnets -1- and -2- in ATF oil pan.
– Ensure that magnets make full contact with ATF oil pan.
– Fit ATF oil pan with new gasket.



Oil pan version 1:

– Tighten bolts for ATF oil pan in sequence -1 ... 23-.

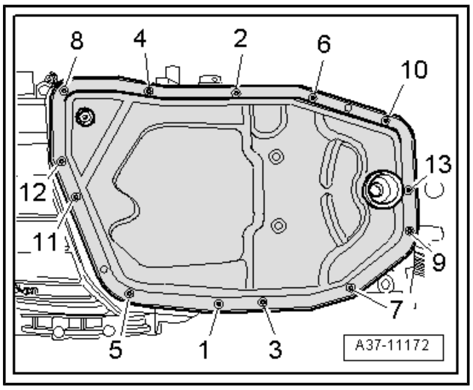
• Tightening torque: 12 Nm



Oil pan version 2:

– Tighten bolts for ATF oil pan in sequence -1 ... 13-.

• Tightening torque: 12 Nm



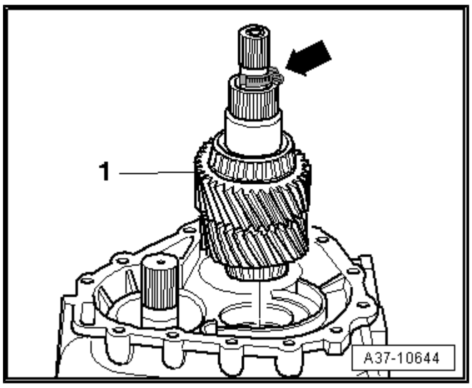
Continued for all gearboxes:

– Turn gearbox on assembly stand.

• The axle drive take-off should face upwards.

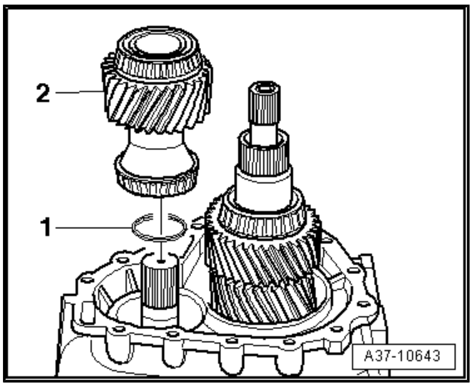
– Insert shaft for front axle drive with intermediate pinion -1- in gearbox housing.

– Remove hose clip -arrow-.



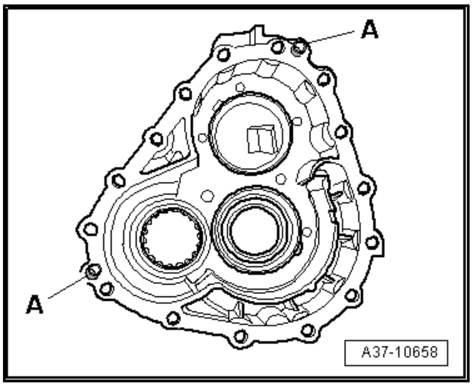
– Fit shim -1- onto output shaft.

– Fit input pinion -2- onto output shaft.



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

– Fit new gasket.



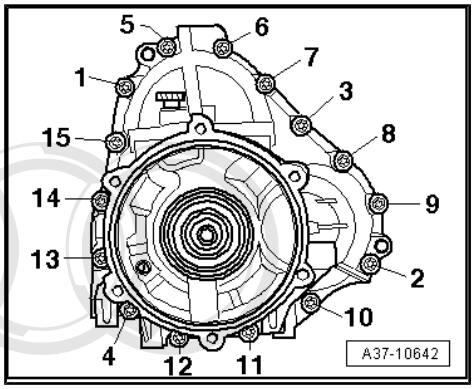
Note

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

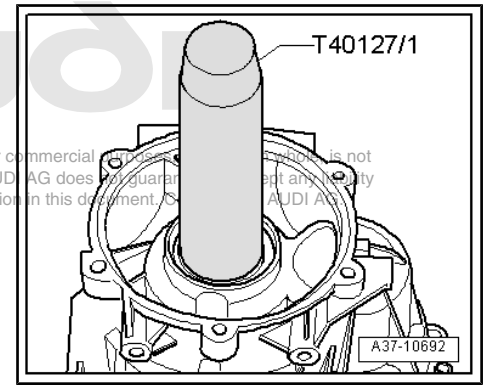
– Carefully place intermediate flange for front axle drive in position.

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

Stage	Tightening sequence
1	– Pre-tighten bolts to 5 Nm in sequence -1 ... 4-.
2	– Tighten bolts to 23 Nm in sequence -1 ... 15-.



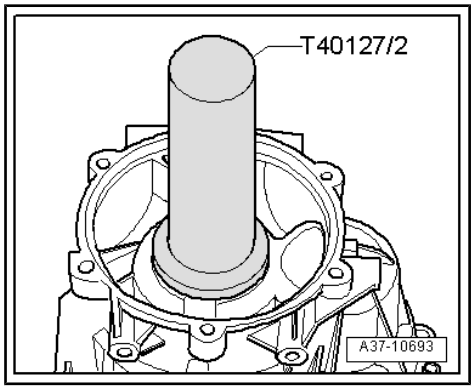
– Fit sleeve -T40127/1- onto shaft for front axle drive.



– Slide twin-lip oil seal onto thrust piece -T40127/2- .

• The twin-lip oil seal will only fit in one position on the thrust piece.

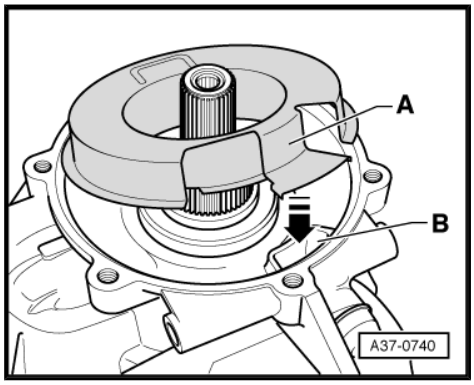
– Press twin-lip oil seal into intermediate flange for front axle drive as far as stop.



– Clean baffle plate.

– Install baffle plate in gearbox.

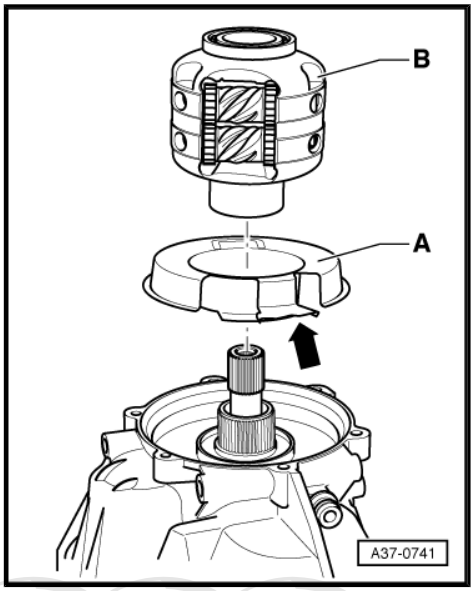
• Plate -A- on the baffle plate should be positioned on the gear-box so that the side lugs are located above opening -B-.



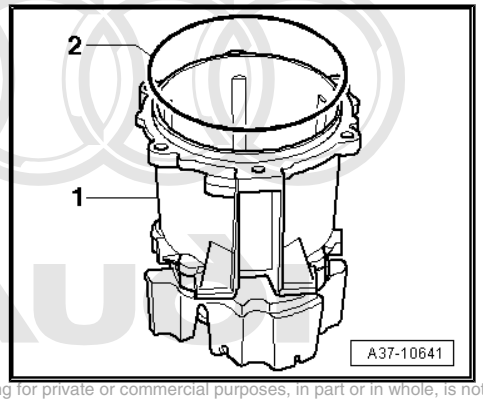
– Push self-locking centre differential -B- onto output shaft.

– Check that self-locking centre differential can be turned by hand when it is in position.

– Check that plate -arrow- on baffle plate -A- is still located correctly.



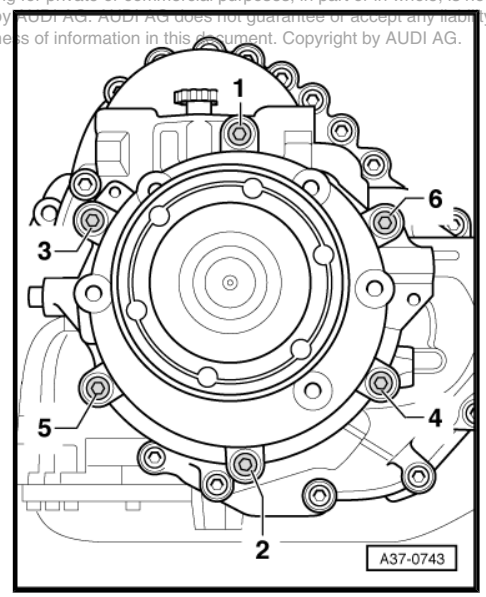
– Fit O-ring -2- on cover for self-locking centre differential -1-.



– Place cover for self-locking centre differential onto self-locking centre differential with output flange for propshaft installed (turn output flange for propshaft slightly if necessary).

– Tighten bolts on cover for self-locking centre differential in two stages as follows:

Stage	Tightening sequence
1	– Tighten bolts -1- and -2- initially to 3 Nm.
2	– Tighten bolts to 23 Nm in sequence -1 ... 6-.

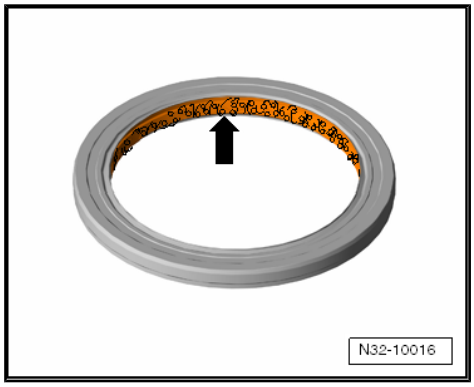


– Turn gearbox on assembly stand.

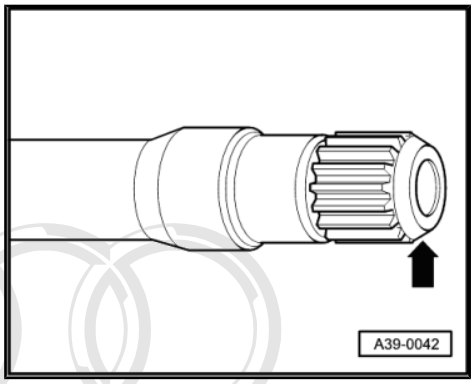
• The ATF oil pan should face downwards.

– If necessary, renew oil seal between final drive and gearbox housing ⇒ page 103 .

– Pack space between sealing lips -arrow- of oil seal half-full with sealing grease -G 052 128 A1- .



– Cover splines on flange shaft (left-side) -arrow- with insulating tape to prevent damage to oil seal between final drive and gearbox housing when inserting flange shaft. Take care to cover the splines completely, without creasing or overlapping the tape.

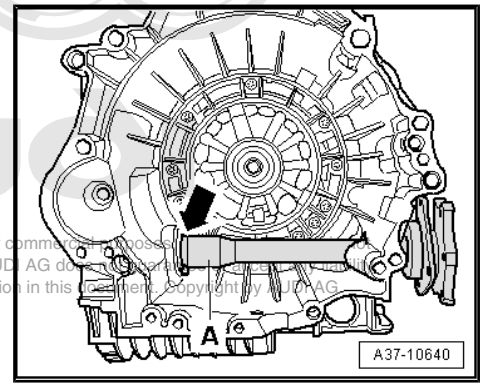


– Clean flange shaft (left-side) and oil seal.

Caution

While inserting the flange shaft (left-side), it must be held centrally to avoid damaging the oil seal between the final drive and the gearbox housing.

– Insert flange shaft -A- (left-side) into gearbox, guiding shaft centrally into oil seal between final drive and gearbox housing -arrow-.

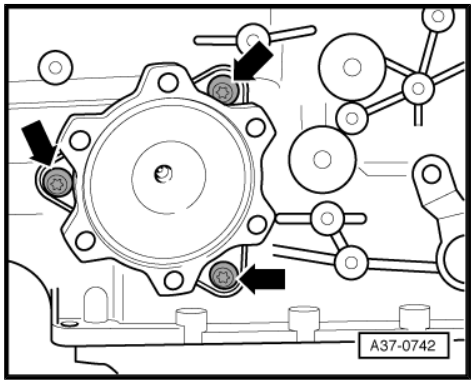


– Tighten bolts -arrows- on mounting bracket for flange shaft (left-side).

- Tightening torque: 23 Nm

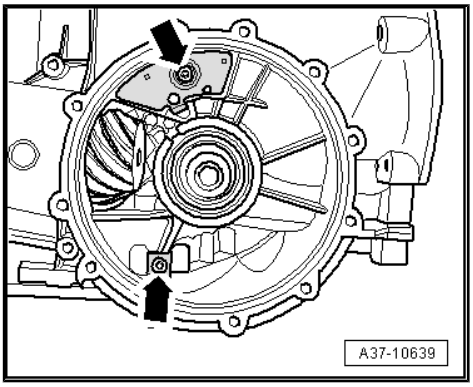
Caution

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

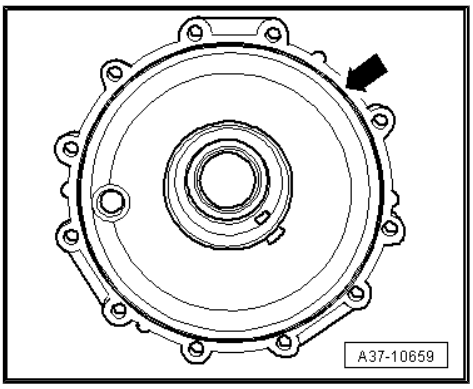


– Clean cover plate for breather passage and magnet with retaining plate.
– Tighten bolts securing cover plate for breather passage and magnet with retaining plate.

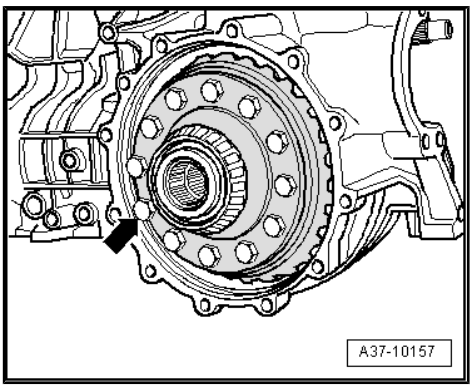
• Tightening torque: 8 Nm



– Renew O-ring -arrow- in cover for front final drive.

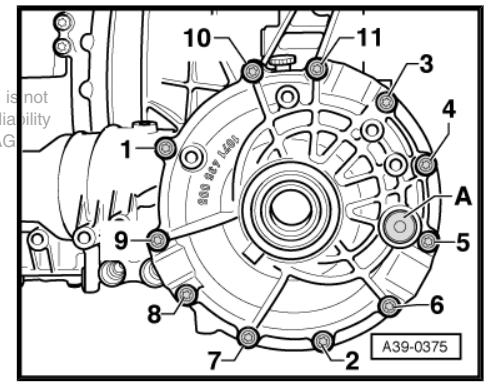


– Carefully install differential -arrow-.

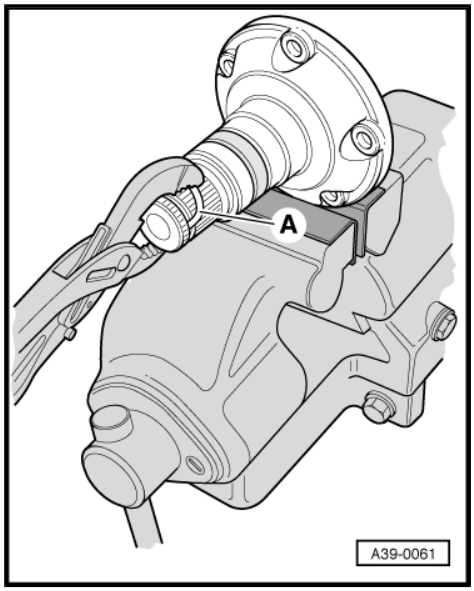


– Locate cover for front final drive on gearbox housing and tighten bolts in two stages as follows:

Stage	Tightening sequence
1	– Pre-tighten bolts to 3 Nm in sequence -1, 2, 3-.
2	– Tighten bolts to 23 Nm in sequence -1 ... 11-.

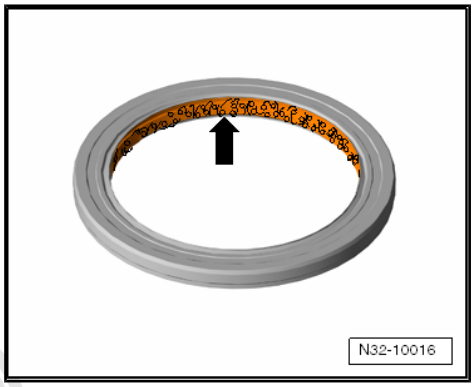


– Clamp flange shaft (right-side) into vice with jaw covers to renew circlip for flange shaft.
– Press old circlip out of groove in flange shaft (right-side) using new circlip -A-.
– If necessary, renew oil seal for flange shaft (right-side) ⇒ page 103 .
– Clean flange shaft (right-side) and oil seal.



– Pack space between sealing lips -arrow- of oil seal half-full with sealing grease -G 052 128 A1- .
– Insert flange shaft (right-side) by hand into splines of differential until splines engage.
– Press in flange shaft (right-side) by hand or with drift -VW 295- as far as stop.

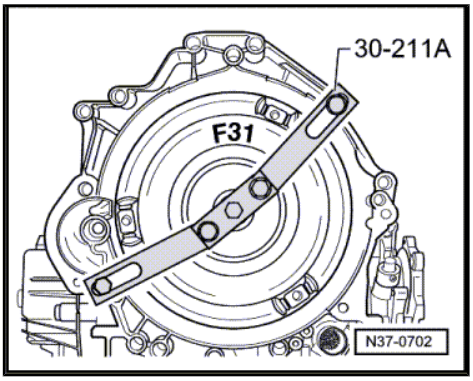
• The circlip on the flange shaft should click into place.



– Install torque converter ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 32 and secure against falling out using support bridge -30 - 211 A- .

– Check position of torque converter ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 32 .

– Detach gearbox from assembly stand.



Caution

Risk of damage to gearbox components.

- *Do not operate gearbox without ATF filling.*
- *After the gearbox has been overhauled it should be installed and operated as soon as possible to prevent any corrosion forming on the new components.*

– Fill up with ATF and check ATF level ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 37 .

– Fill front final drive with gear oil and check oil level ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

– Fill transfer box with gear oil and check oil level ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

Tightening torques

Component	Nm
ATF supply unit to gearbox housing	10
Mechatronic unit to gearbox housing	8
ATF oil pan to gearbox housing	12
Mounting bracket for flange shaft (left-side) to gearbox	23
Cover for front final drive to gearbox	23
Intermediate flange for front axle drive to gearbox	23
Cover plate for breather passage to gearbox	8
Retaining plate for magnet to gearbox	8
Cover for self-locking centre differential to intermediate flange for front axle drive	23

3 Dismantling and assembling body „I“

Overview:

3.1 Body „I“ - exploded view

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .

1 - Clutch „C/D“

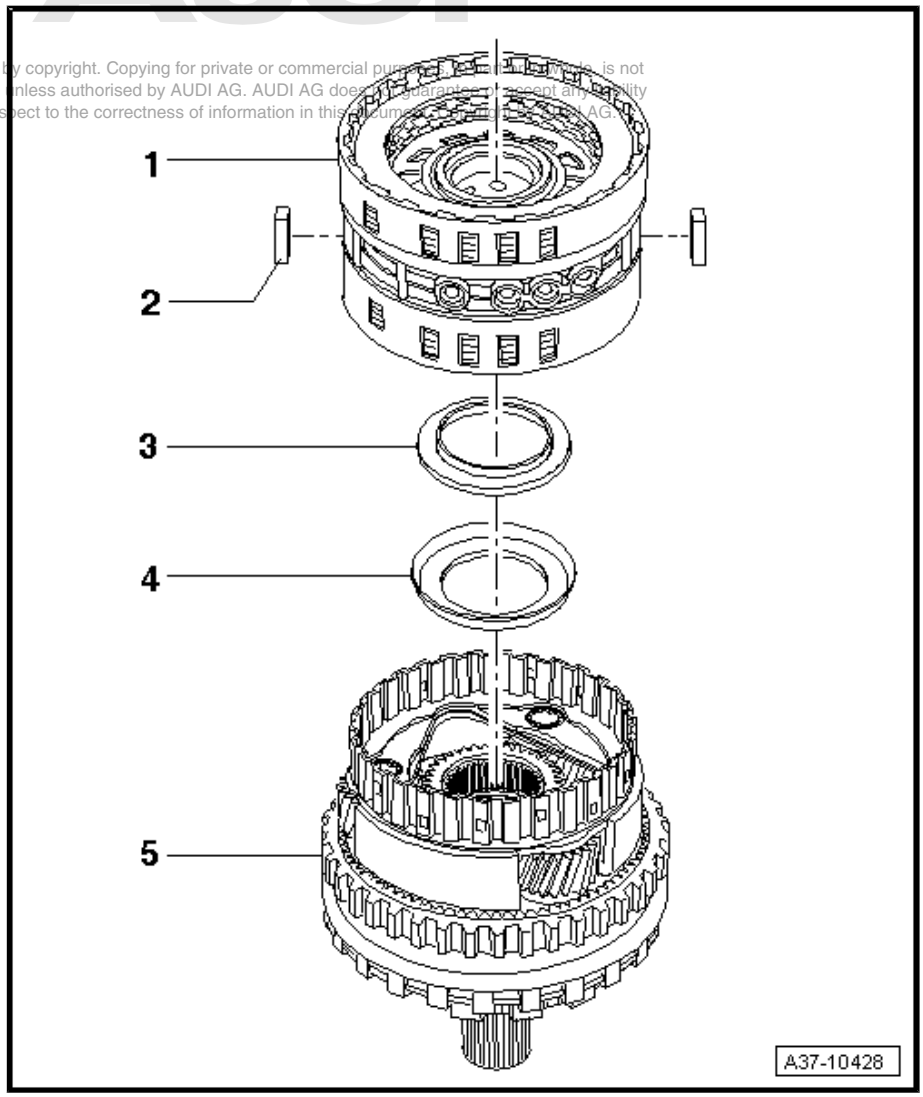
2 - Parallel key

- ❑ Check that it is securely seated

3 - Axial needle bearing

4 - Flange washer

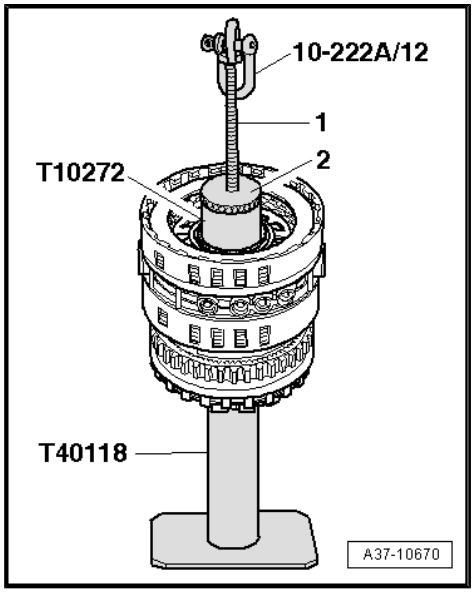
5 - Planetary drive „II“ and „III“



3.2 Dismantling body „I“

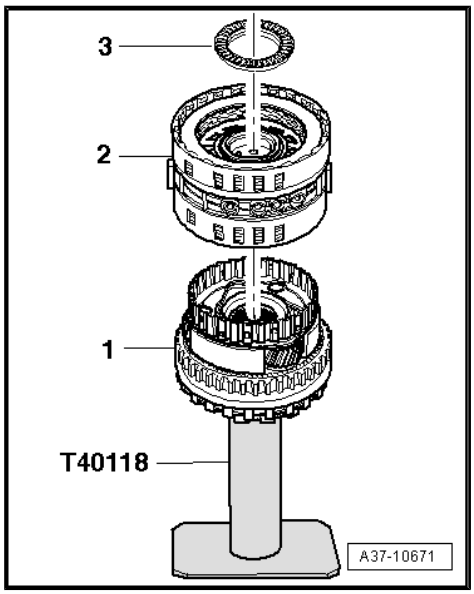
Dismantling

– Detach lifting device -T10272- from body „I“ by releasing sleeve -2- and unscrewing threaded spindle -1-.



– Unclip axial needle bearing -3- from clutch „C/D“ -item 2-.

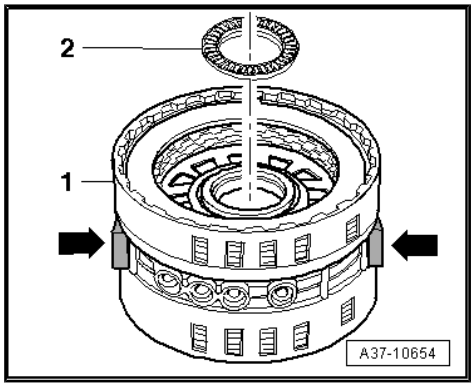
– Detach clutch „C/D“ -item 2- from planetary drive „II“ and „III“ -item 1-.



– Turn clutch „C/D“ upside down.

• Axial needle bearing -2- faces upwards.

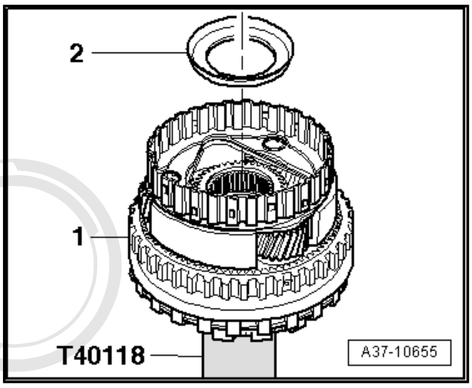
– Unclip axial needle bearing -2- from cylinder „C/D“ -item 1-.



Note

-Arrows- can be disregarded.

– Detach flange washer -2- from planetary drive „II“ and „III“ -item 1-.



3.3 Clutch „C“ - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check components of clutch „C“ for traces of wear and damage ⇒ page 116 .*

1 - Circlip
- ❑ Determining thickness ⇒ page 50

2 - Thick outer plate

3 - Friction plate

4 - Outer plate

5 - Corrugated spring

6 - Split retaining ring

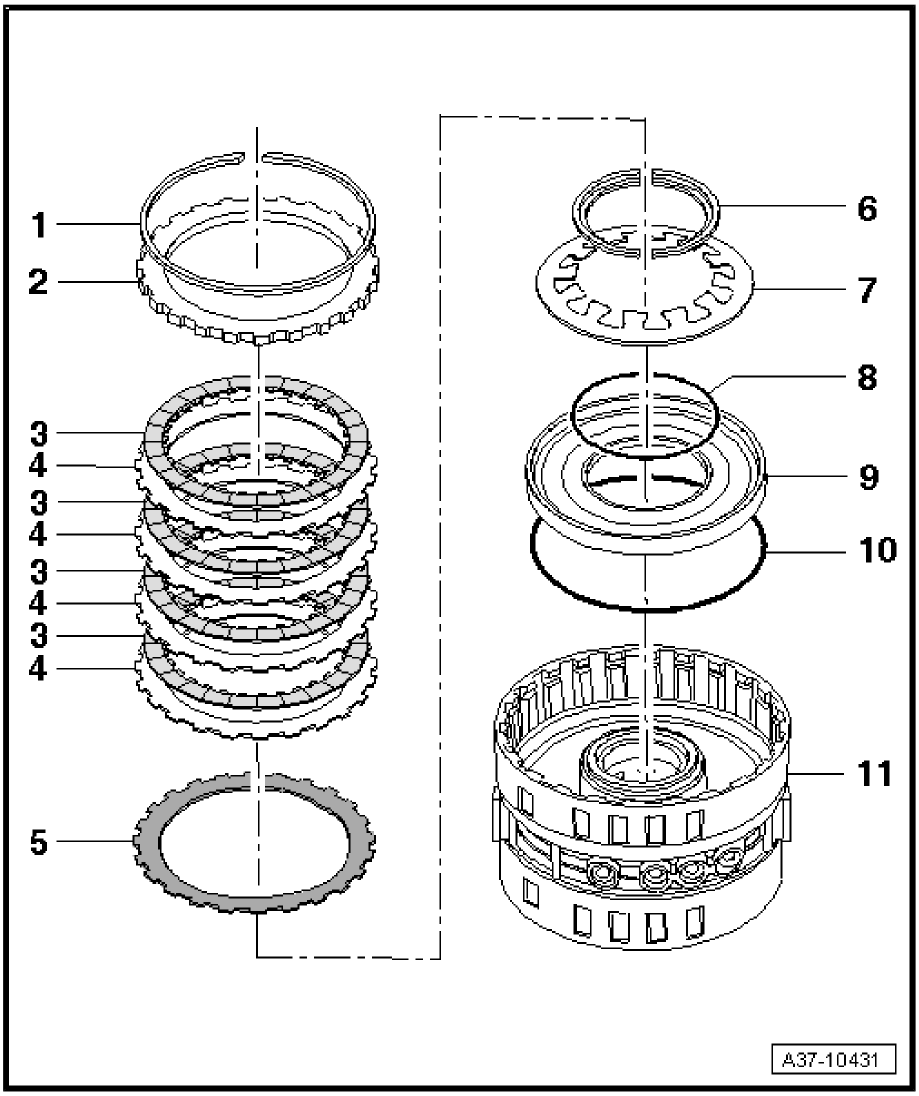
7 - Dished spring

8 - O-ring
- ❑ Renew

9 - Piston„C“

10 - O-ring
- ❑ Renew

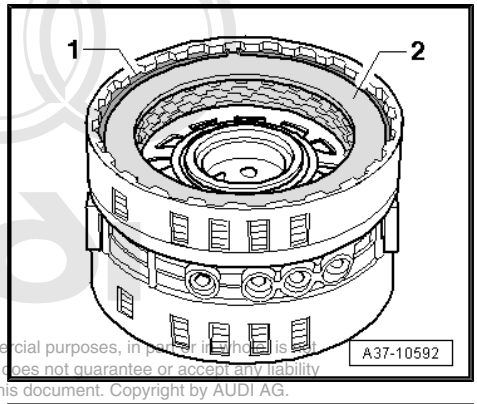
11 - Cylinder „C/D“



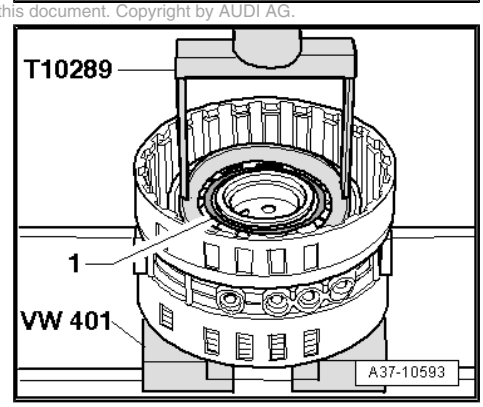
3.4 Dismantling and assembling clutch „C“

Dismantling

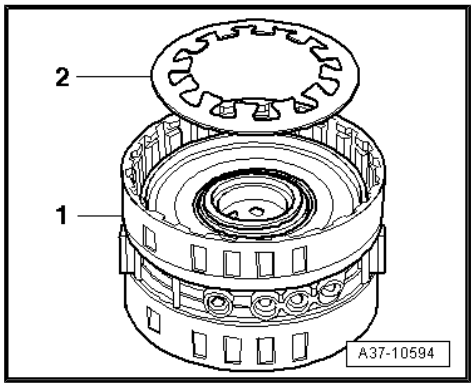
– Detach circlip -1- and remove clutch pack -2- from cylinder „C/D“.



– Press dished spring down using workshop press with assembly jig -T10289- .
– Remove split retaining ring -1-.
– Release workshop press.



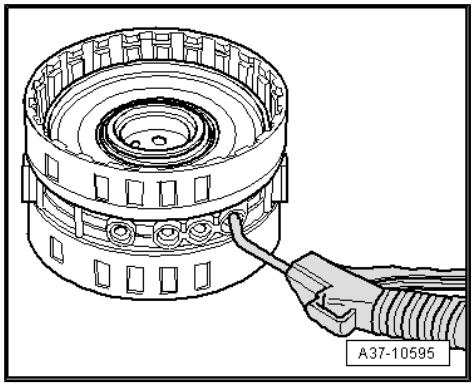
– Detach dished spring -2- from cylinder „C/D“ -item 1-.



WARNING

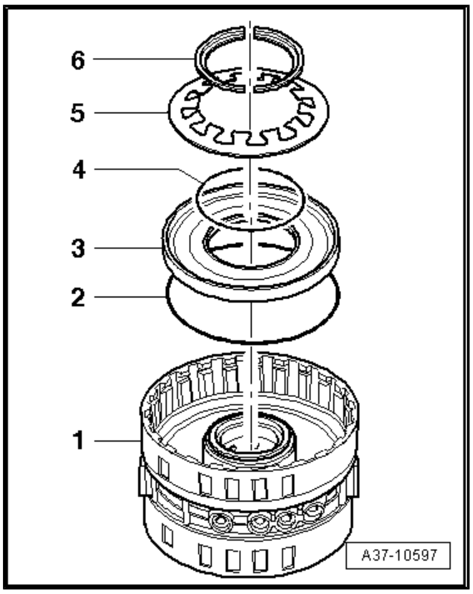
Wear safety goggles.

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



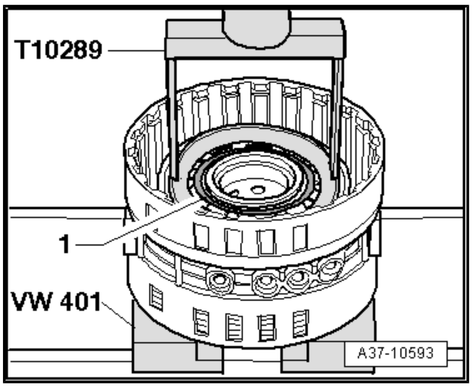
Assembling

> **Caution**
>
> *Check components of clutch „C“ for traces of wear and damage ⇒ „3.2 Clutch C “, page 116 .*



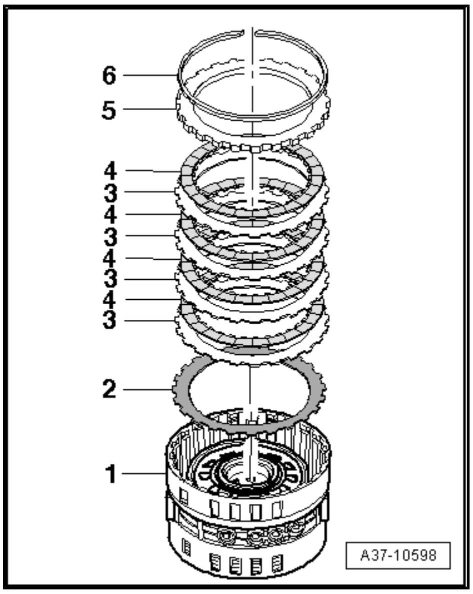
– Renew O-rings -2- and -4- for piston „C“ -item 3-.
– Push piston „C“, -item 3- into cylinder „C/D“, -item 1- as far as stop.
– Fit dished spring -5-.

6 - Split retaining ring



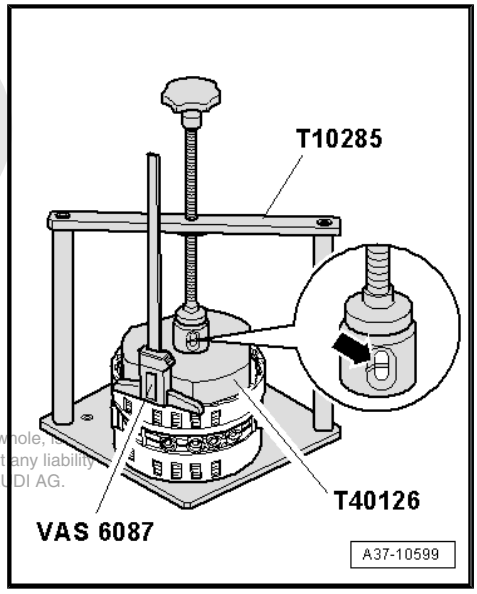
– Press dished spring down using workshop press with assembly jig -T10289- .

– Insert split retaining ring -1-.
– Make sure that split retaining ring is seated securely all round in groove on cylinder „C/D“.
– Release workshop press.



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

Adjusting clearance of clutch „C“



– Place cylinder „C/D“ on compressor tool -T10285- .

• Clutch „C“ faces upwards.

– Place plate -T40126- centrally on outer plate of clutch „C“.

• Avoid any contact between plate and circlip.

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

– Bring cylinder „C/D“ into correct position on 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-.

– Apply digital depth gauge -VAS 6087- to upper rim of cylinder „C/D“ as shown in illustration.

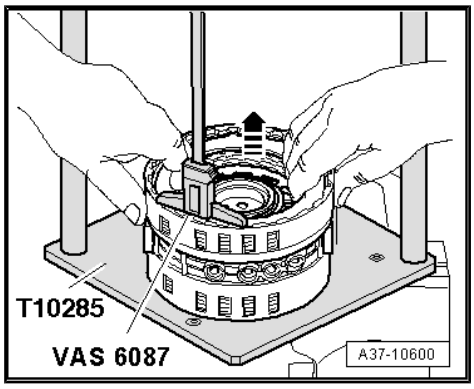
– Bring measuring tip into contact with outer plate and note value obtained.

– Mark measuring point on cylinder „C/D“.

– 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 rim of cylinder „C/D“ and outer plate at one of the points marked (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

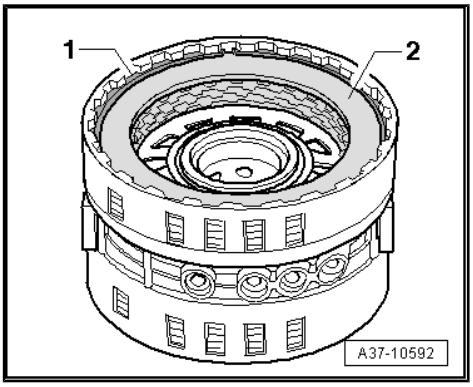
– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance:

• Specification: 1.38 ... 1.67 mm

If result does not match specification:

– Select required new circlip -1- according to following table.



Note

-Item 2- can be disregarded.

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

Available circlips - Thickness of circlips in mm		
1.80	2.60	3.40
2.00	2.80	3.60
2.20	3.00	
2.40	3.20	

– Check clearance again after inserting circlip.

3.5 Clutch „D“ - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check components of clutch „D“ for traces of wear and damage ⇒ page 118 .*

1 - Cylinder „C/D“

2 - O-ring
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - O-ring
- ❑ Renew

5 - Piston„D“

6 - O-ring
- ❑ Renew

7 - Retaining plate

8 - Dished spring

9 - Retaining ring
- ❑ Installation position

10 - Circlip
- ❑ Renew

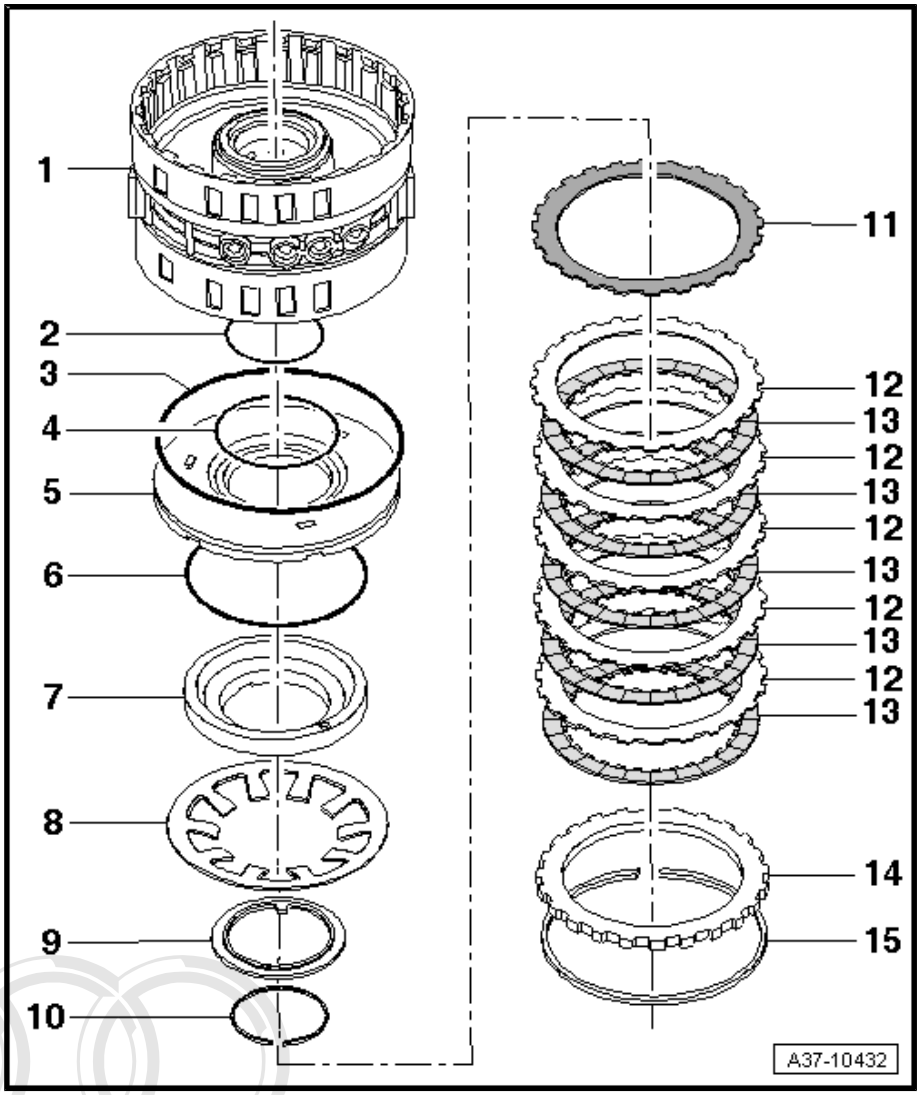
11 - Corrugated spring

12 - Outer plate

13 - Friction plate

14 - Thick outer plate

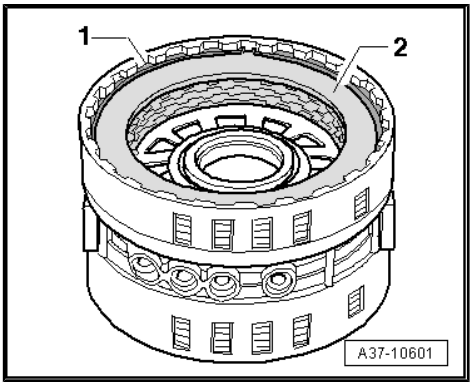
15 - Circlip
- ❑ Determining thickness ⇒ page 55



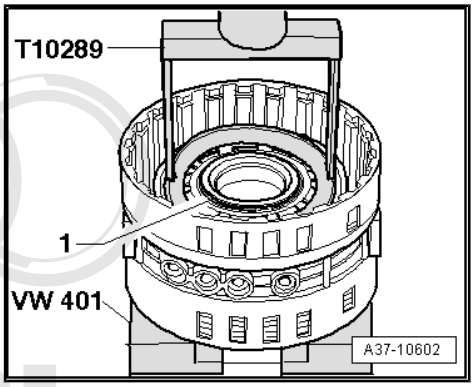
3.6 Dismantling and assembling clutch „D“

Dismantling

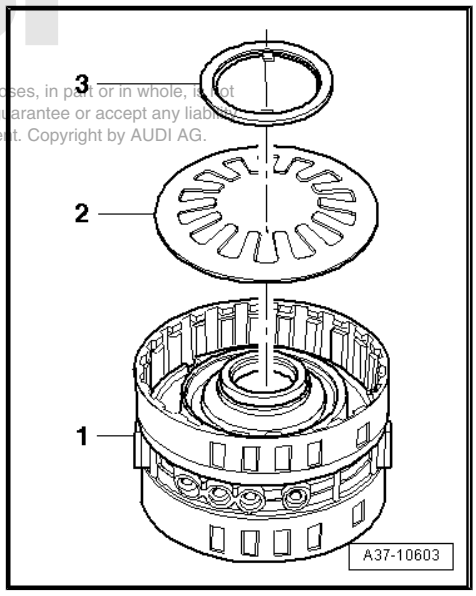
– Detach circlip -1- and remove clutch pack -2- from cylinder „C/D“.



– Press dished spring down using workshop press with assembly jig -T10289- .
– Remove circlip -1-.
– Release workshop press.



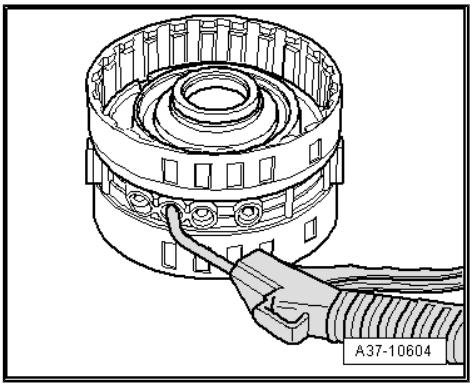
– Detach retaining ring -3- and dished spring -2- from cylinder „C/D“ -item 1-.



WARNING

Wear safety goggles.

– Carefully press piston „D“ together with retaining plate out of cylinder „C/D“ by applying compressed air.



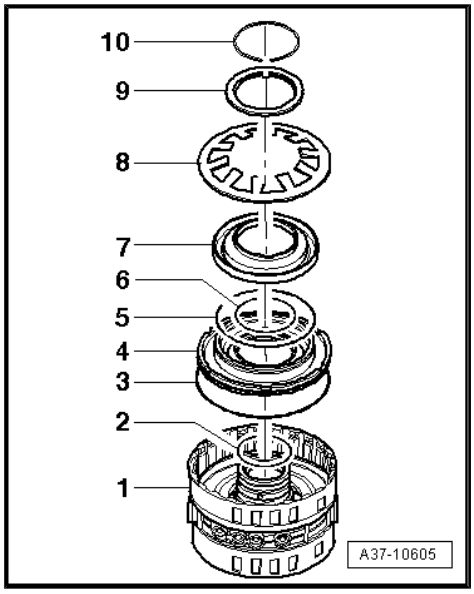
Assembling

Caution

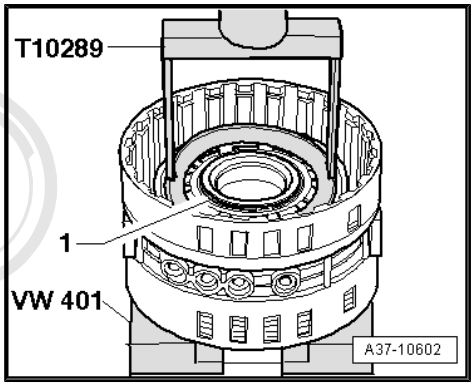
Check components of clutch „D“ for traces of wear and damage *⇒ „3.3 Clutch D “, page 118 .*

– Renew O-ring -2- in cylinder „C/D“ -item 1-.
– Renew O-rings -3, 5 and 6- for piston „D“ -item 4-.
– Push piston „D“, -item 4- into cylinder „C/D“, -item 1- as far as stop.
– Press in retaining plate -7- as far as stop.
– Fit dished spring -8- and retaining ring -9-.

10 - Circlip

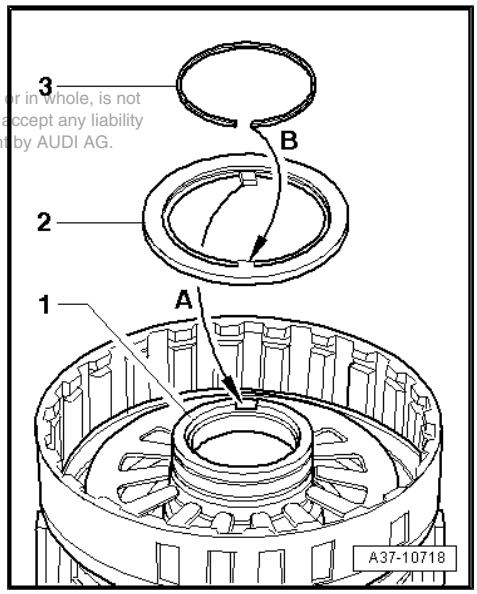


– Press dished spring down using workshop press with assembly jig -T10289- .
– Install new circlip -1-.



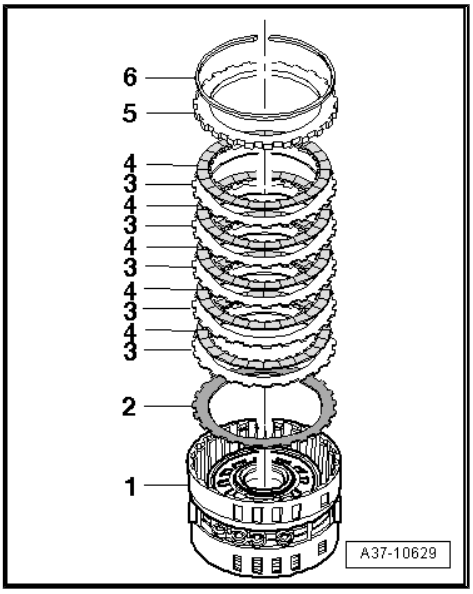
Caution

- *The projecting tab on retaining ring -2- engages in the groove on the inside collar -1- of cylinder „C/D“ -arrow A-.*
- *The ends of circlip -3- must lie against the raised portion of retaining ring -2- -arrow B-.*



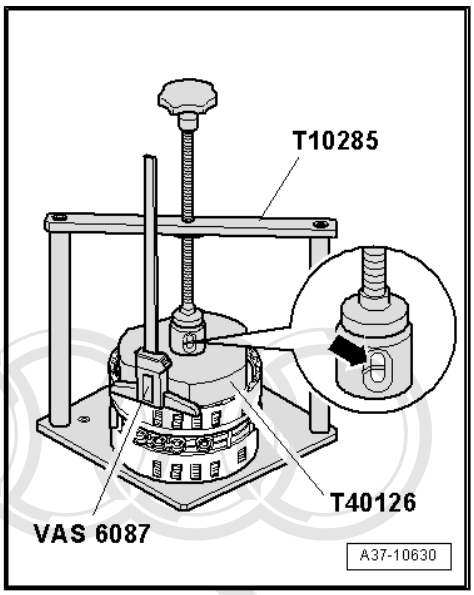
– Make sure that circlip is seated securely all round in groove on cylinder „C/D“.
– Release workshop press.

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

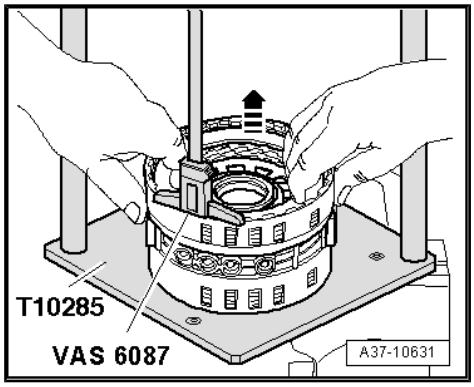


Adjusting clearance of clutch „D“

– Place cylinder „C/D“ on compressor tool -T10285- .
• Clutch „D“ faces upwards.
– Place plate -T40126- centrally on outer plate of clutch „D“.
• Avoid any contact between plate and circlip.
– Fit centring pin of thrust piece -T10285/1- into drilling in plate.
– Bring cylinder „C/D“ into correct position on 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-.
– Apply digital depth gauge -VAS 6087- to upper rim of cylinder „C/D“ as shown in illustration.
– Bring measuring tip into contact with outer plate and note value obtained.
– Mark measuring point on cylinder „C/D“.
– 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 rim of cylinder „C/D“ and outer plate at one of the points marked (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:

• Specification: 1.59 ... 1.88 mm

If result does not match specification:

– Select required new circlip according to following table.
• If clearance is below specification: insert thinner circlip of appropriate thickness.
• If clearance is above specification: insert thicker circlip of appropriate thickness.

Available circlips - Thickness of circlips in mm		
1.80	2.60	3.40
2.00	2.80	3.60
2.20	3.00	
2.40	3.20	

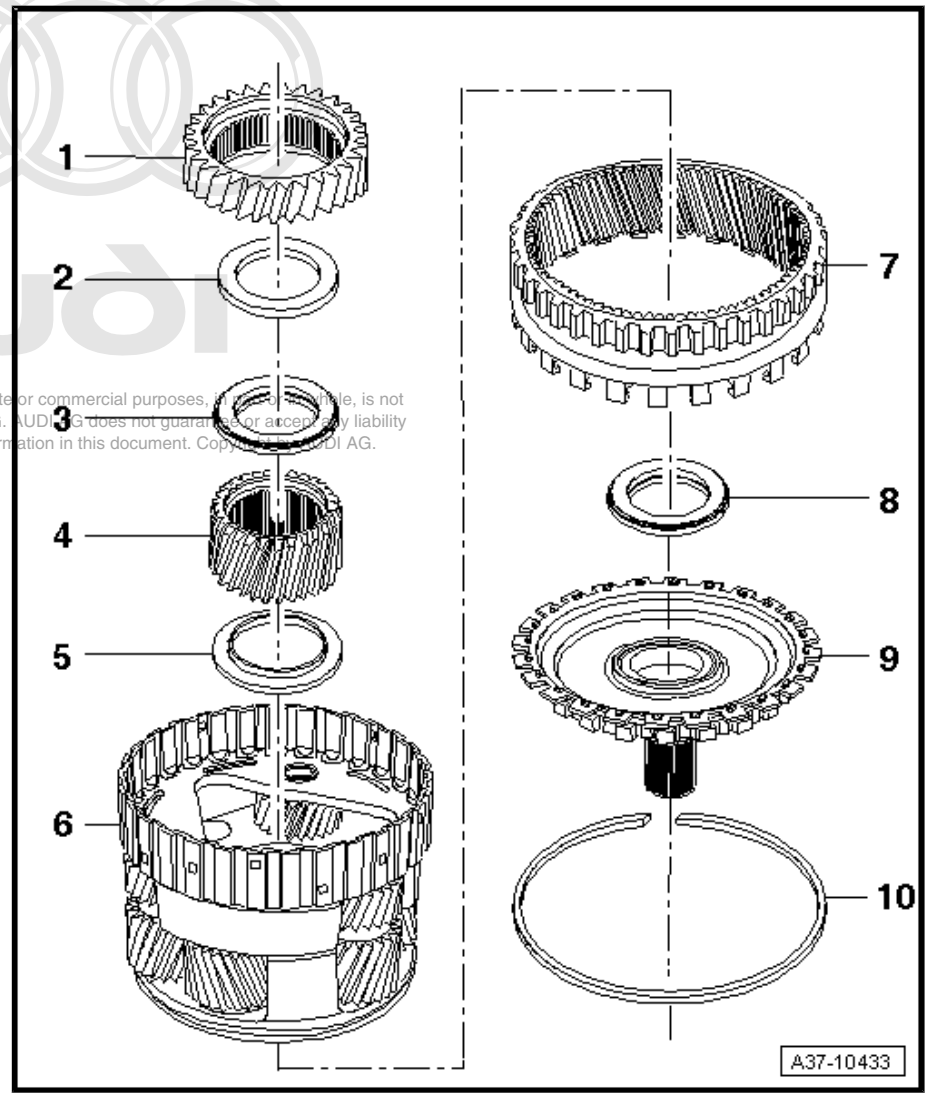
– Check clearance again after inserting circlip.

3.7 Planetary drive „II“ and „III“ - exploded view

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .

1 - Sun gear „II“
2 - Thrust washer
3 - Axial needle bearing
4 - Sun gear „III“
5 - Axial needle bearing
6 - Planet carrier „II“ and „III“
7 - Annulus „III“
8 - Axial needle bearing
9 - Output shaft
10 - Circlip

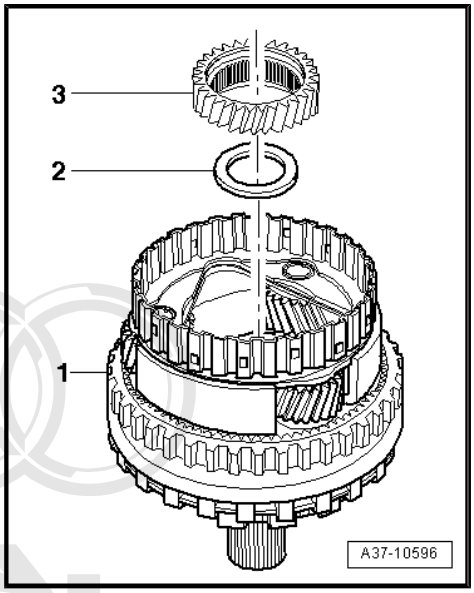


3.8 Dismantling and assembling planetary drive „II“ and „III“

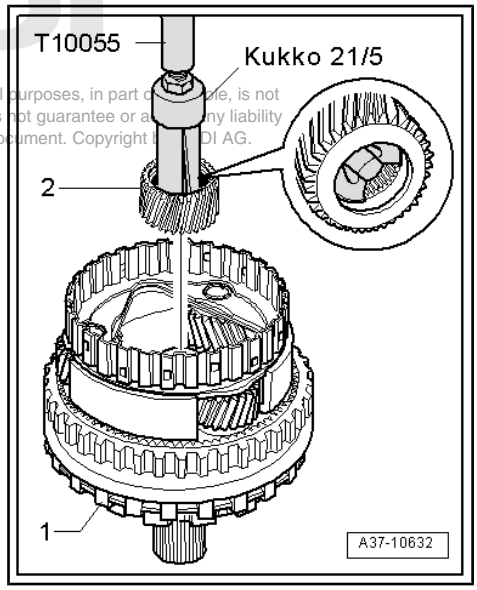
Dismantling

– Take sun gear „II“ -item 3- out of planet carrier „II“ and „III“ -item 1-.

– Unclip thrust washer -2- from sun gear „II“ -item 3-.



– Apply internal puller 30 … 37 mm -Kukko 21/5- by hand to sun gear „III“ -item 2-, as shown in detail view, and pull sun gear „III“ out of planet carrier „II“ and „III“ -item 1- using puller -T10055- .

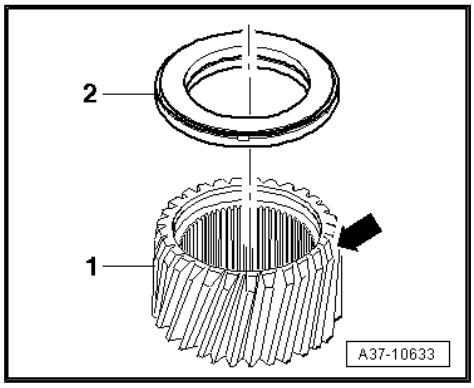


Note

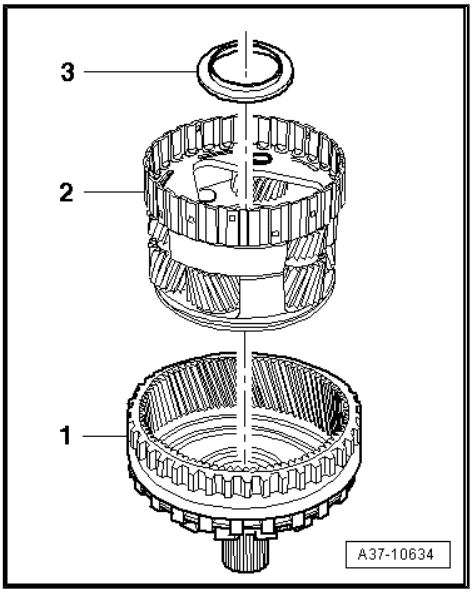
- *The internal puller may only be applied below the teeth and not close to the axial needle bearing.*
- *The lower axial needle bearing will come out of sun gear „III“ -item 2- and remain in planet carrier „II“ and „III“ -item 1-.*

– For re-installation, mark which axial needle bearing was clipped onto chamfer -arrow- (top) of sun gear „III“ -item 1-.

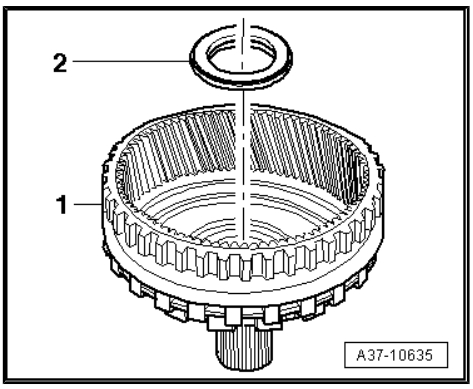
– Unclip axial needle bearing -2- from sun gear „III“ -item 1-.



– Using long-nose pliers, lift lower axial needle bearing -3- at an angle out of planet carrier „II“ and „III“ -item 2-.
– Take planet carrier „II“ and „III“ -item 2- out of annulus „III“ -item 1- with output shaft.



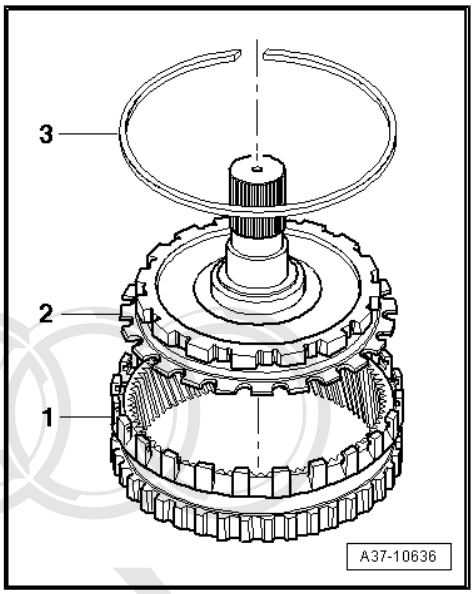
– Unclip axial needle bearing -2- from annulus „III“ -item 1- with output shaft.



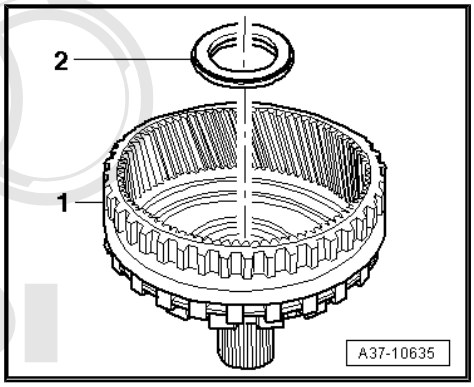
– Turn annulus „III“ with output shaft upside down.
– Remove circlip -3-.
– Detach output shaft -2- from annulus „III“ -item 1-.

Assembling

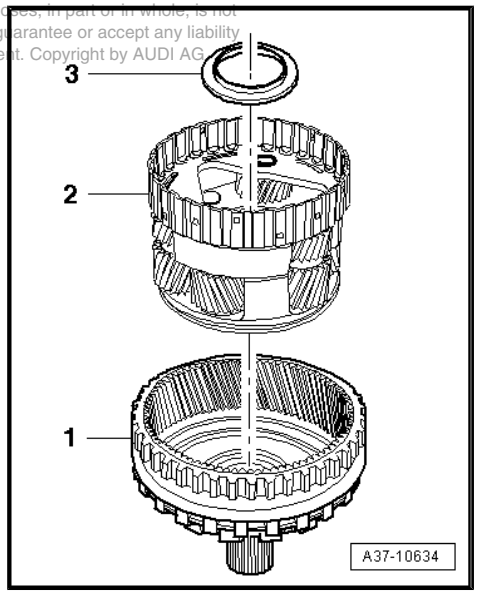
– Engage splines of output shaft -2- in splines of annulus „III“ -item 1-.
– Insert circlip -3-.



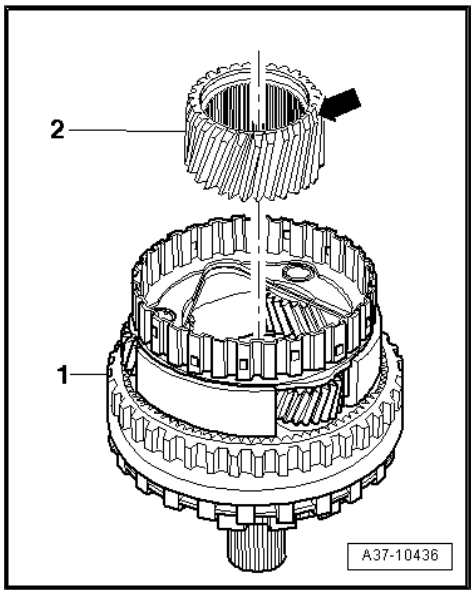
– Turn annulus „III“ with output shaft upside down.
– Clip axial needle bearing -2- into annulus „III“ -item 1- with output shaft.



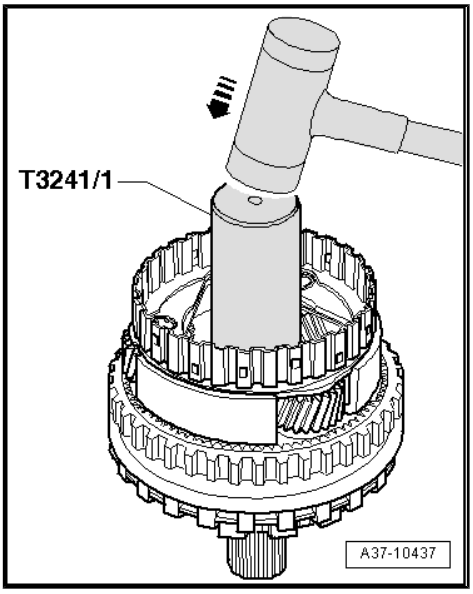
– Turn planet carrier „II“ and „III“ upside down.
– Fit planet carrier „II“ and „III“ -item 2- into annulus „III“ -item 1- with output shaft.
– Fit axial needle bearing -3- in planet carrier „II“ and „III“ -item 2-.
• The angled side faces upwards.



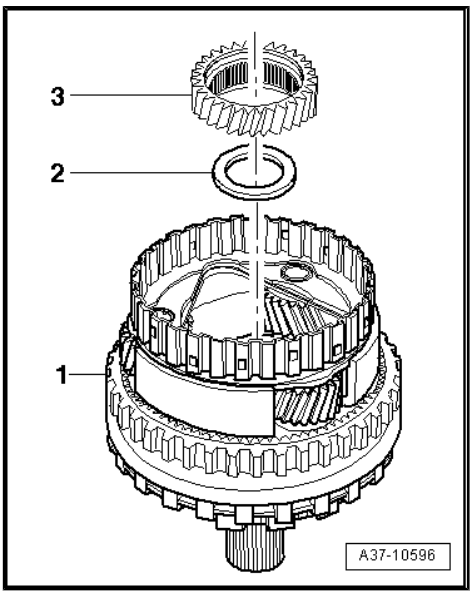
– Fit sun gear „III“ -item 2- in planet carrier „II“ and „III“ -item 1-.
• The chamfer -arrow- on sun gear „III“ faces upwards.



– Drive sun gear „III“ onto lower axial needle bearing using fitting sleeve -3241/1- .
– Clip on upper axial needle bearing.



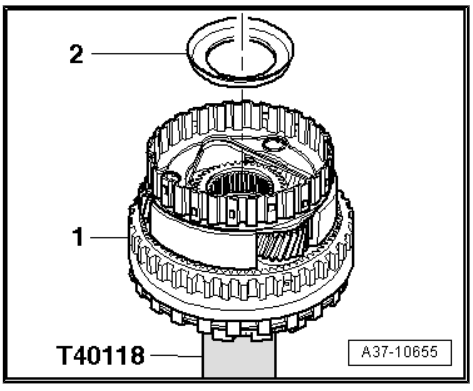
– Clip thrust washer -2- into sun gear „II“ -item 3-.
• The thrust washer can only be fitted on one side of the sun gear.
– Fit sun gear „II“ -item 3- in planet carrier „II“ and „III“ -item 1-.
• The side with the clipped-on thrust washer faces towards planet carrier „II“ and „III“.



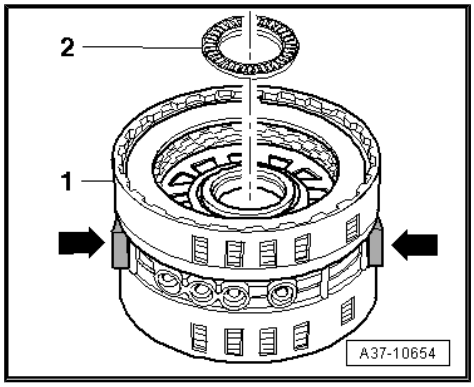
3.9 Assembling body „I“

Assembling

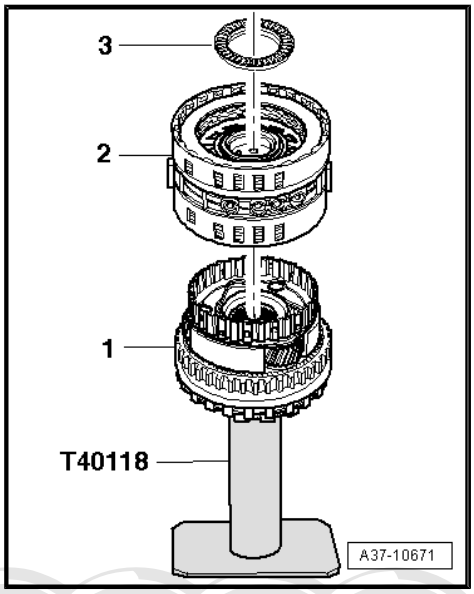
– Place planetary drive „II“ and „III“ -item 1- on support -T40118- .
– Fit flange washer -2- on planetary drive „II“ and „III“ -item 1-.
• The flange on the rim of the flange washer faces upwards.



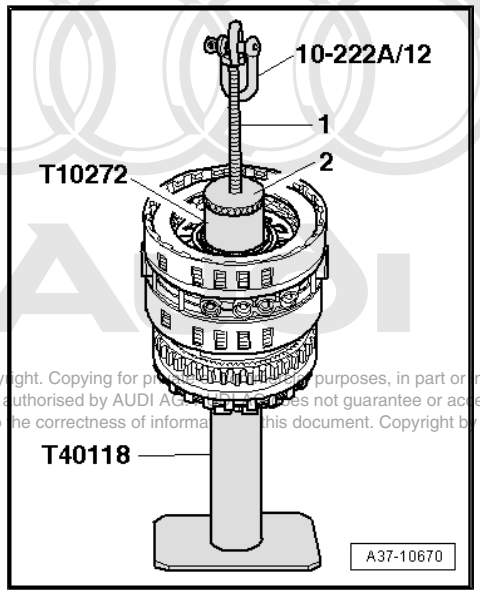
– Clip axial needle bearing -2- onto cylinder „C/D“ -item 1-.
– Check whether parallel keys -arrows- are centred on both sides of cylinder „C/D“.



– Turn clutch „C/D“ upside down.
– Fit clutch „C/D“ -item 2- onto planetary drive „II“ and „III“ -item 1- (hold planetary drive and turn clutch as required).
– Lift clutch „B“ -item 1- a few millimetres and then let it drop to check that all the plates have meshed.
♦ 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.
– Clip axial needle bearing -3- onto clutch „C/D“ -item 2- (top).



– Screw threaded spindle -1- of lifting device -T10272- into tapped hole of body „I“ as far as stop.
– Secure components of body „I“ to prevent them being pulled apart (by screwing sleeve -2- all the way down on threaded spindle by hand).



4 Dismantling and assembling clutch „B“

Overview:

4.1 Clutch „B“ - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check components of clutch „B“ for traces of wear and damage ⇒ page 122 .*

1 - Circlip
- ❑ Determining thickness ⇒ page 66

2 - Thick outer plate

3 - Friction plate

4 - Outer plate

5 - Corrugated spring

6 - Split retaining ring

7 - Dished spring
- ❑ Renew

8 - Retaining plate

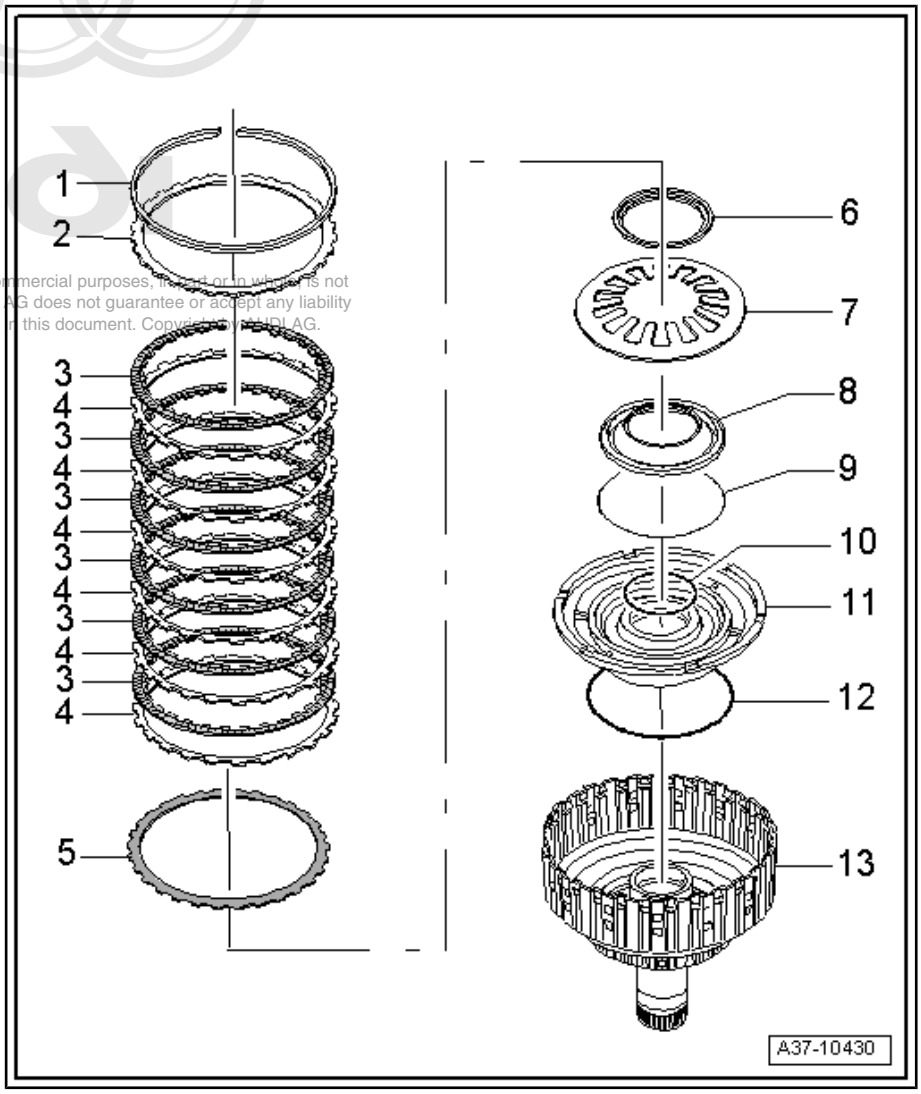
9 - O-ring
- ❑ Renew

10 - O-ring
- ❑ Renew

11 - Piston „B“

12 - O-ring
- ❑ Renew

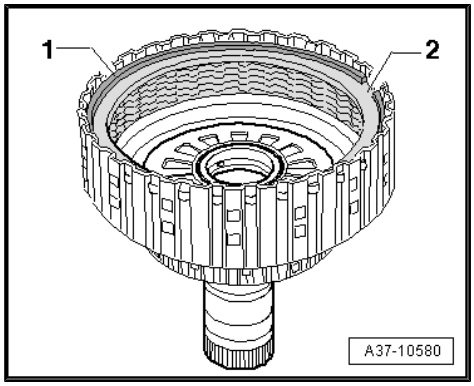
13 - Cylinder „B“



4.2 Dismantling and assembling clutch „B“

Dismantling

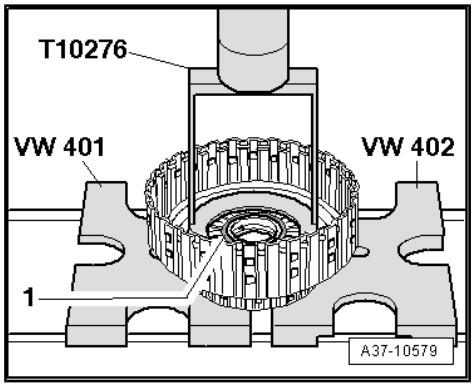
– Detach circlip -1- and remove clutch pack -2- from cylinder „B“.



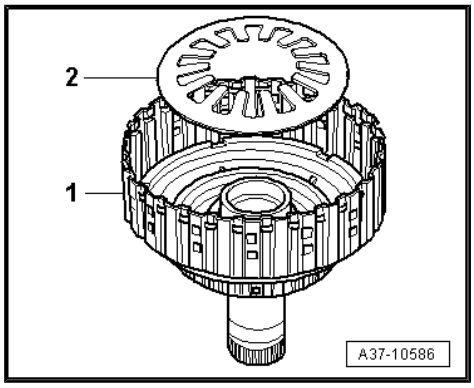
– Press dished spring down using workshop press with assembly jig -T10276- .

– Remove split retaining ring -1-.

– Release workshop press.



– Detach dished spring -2- from cylinder „B“ -item 1-.

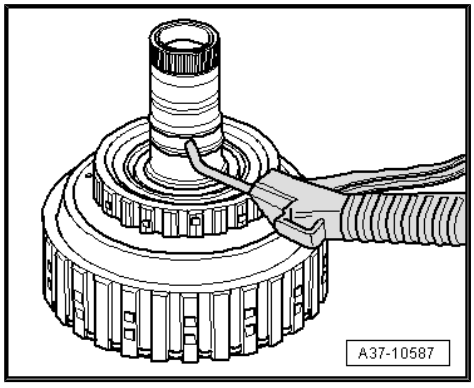


– Turn cylinder „B“ upside down.

WARNING

Wear safety goggles.

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

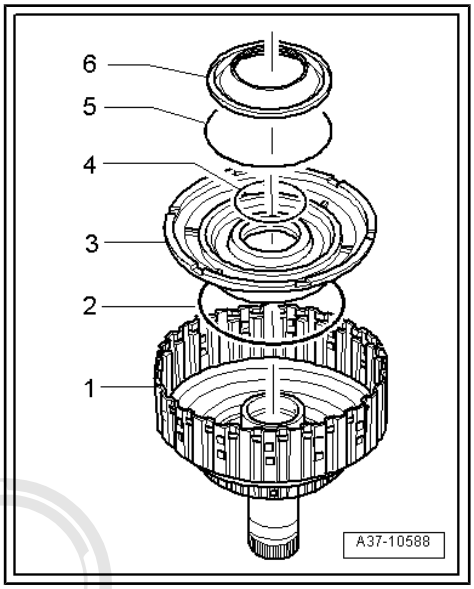


Assembling

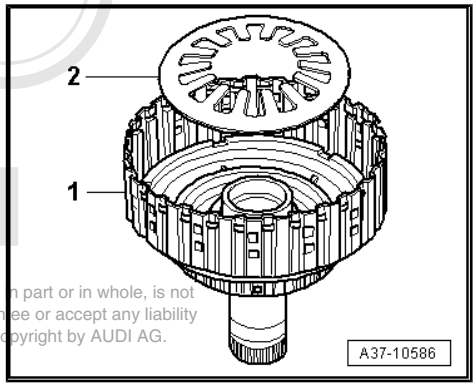
Caution

Check components of clutch „B“ for traces of wear and damage *⇒ „3.5 Clutch B “, page 122* *.*

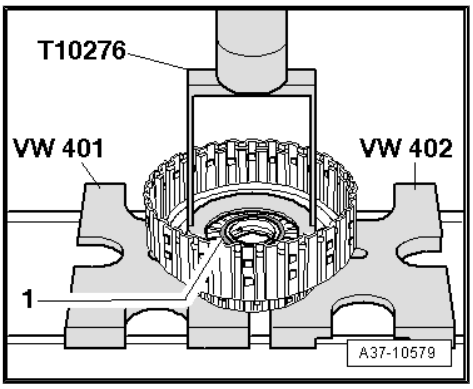
– Renew O-rings -2, 4 and 5-.
– If previously removed, fit retaining plate -6- in piston „B“ -item 3-.
– Push piston „B“ -item 3- into cylinder „B“ -item 1- as far as stop.



– Fit dished spring -2- on cylinder „B“ -item 1-.



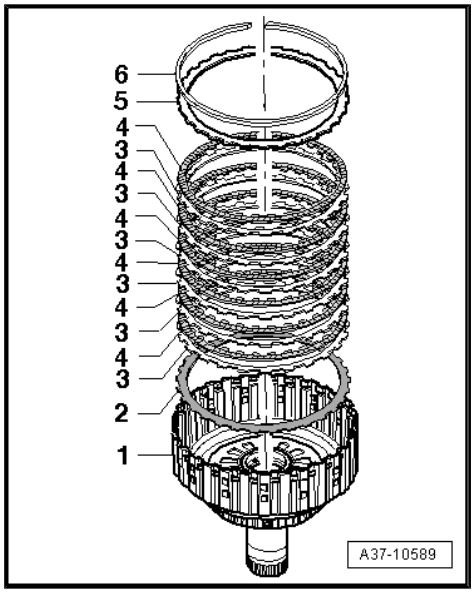
– Press dished spring down using workshop press with assembly jig -T10276- .
– Insert split retaining ring -1-.
– Make sure that split retaining ring is seated securely all round in groove on cylinder „B“.
– Release workshop press.



Caution

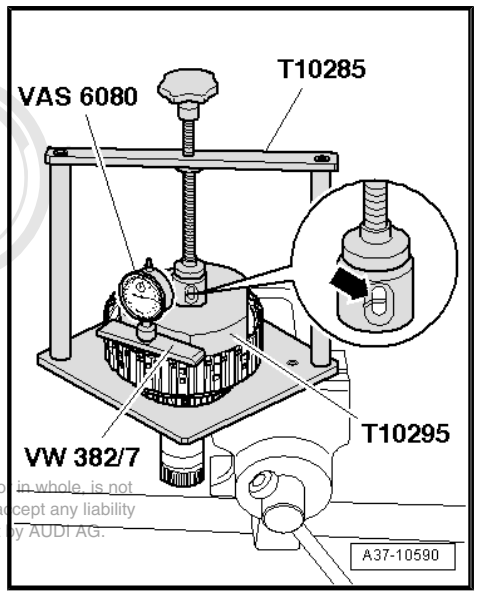
Make sure that the tips of the dished spring are located uniformly below the split retaining ring all round.

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



Adjusting clearance of clutch „B“

– Clamp support leg of compressor tool -T10285- in vice.
– Insert clutch „B“ in compressor tool.
– Position holding plate -T10295- onto outer plate of clutch „B“.
– Fit centring pin of thrust piece -T10285/1- into drilling in plate.
– Bring clutch „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 rim of cylinder „B“ as shown in illustration.
– Check that measuring bridge is seated properly on rim 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.



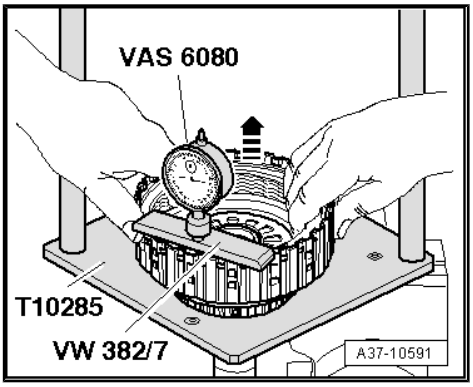
– Use both hands to pull clutch pack upwards as far as stop in clutch „B“.

– With clutch pack pulled up as far as stop, measure distance between upper rim of cylinder „B“ and outer plate at one of the points marked (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

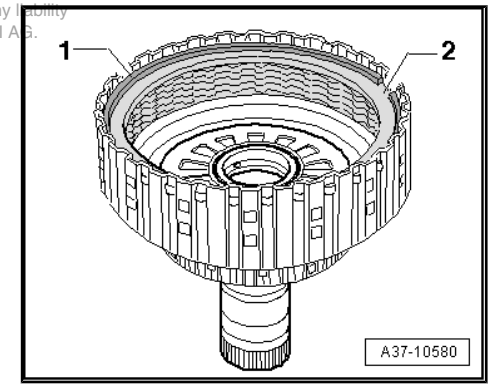
– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance:

• Specification: 1.74 ... 2.03 mm

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

• If clearance is below specification: insert thinner circlip of appropriate thickness.

• If clearance is above specification: insert thicker circlip of appropriate thickness.

Available circlips - Thickness of circlips in mm		
1.80	2.40	3.00
2.00	2.60	3.20
2.20	2.80	

– Check clearance again after inserting circlip.

5 Dismantling and assembling body „II“

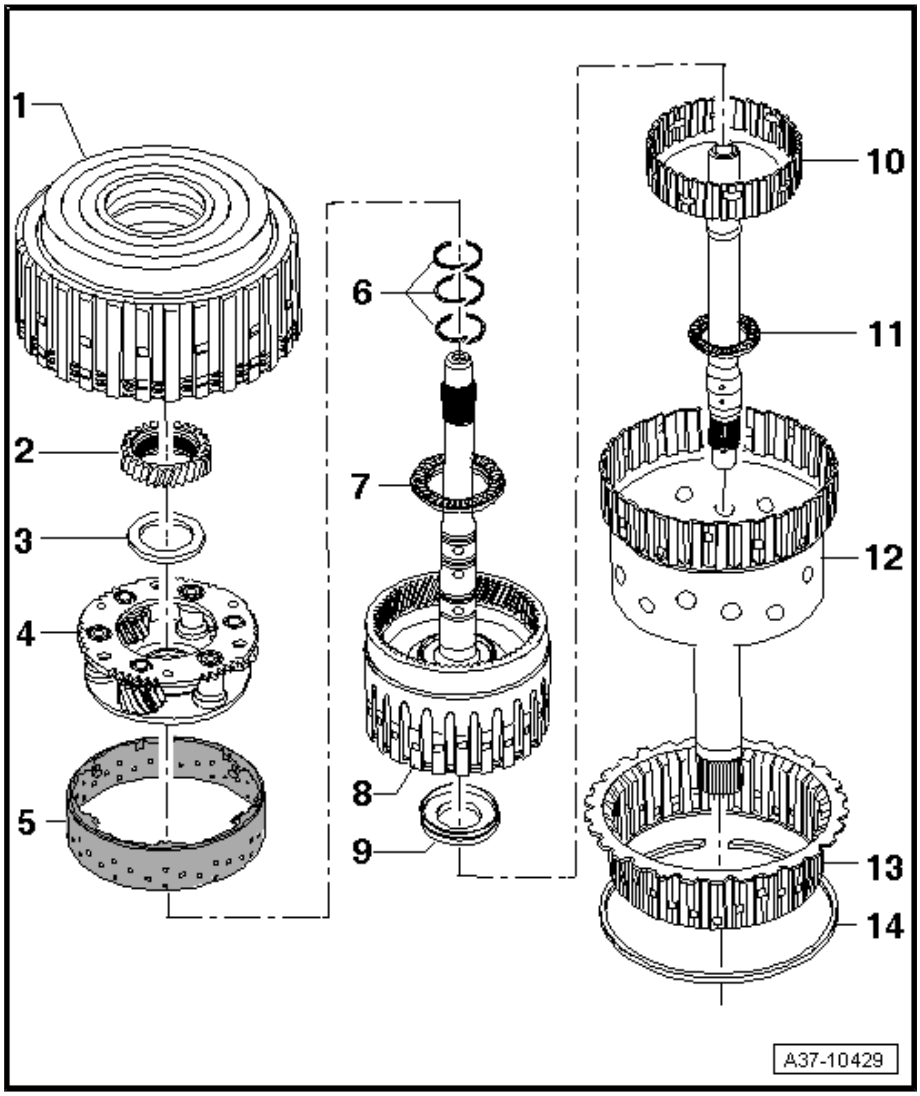
Overview:

5.1 Body „II“ - exploded view

Note

Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .

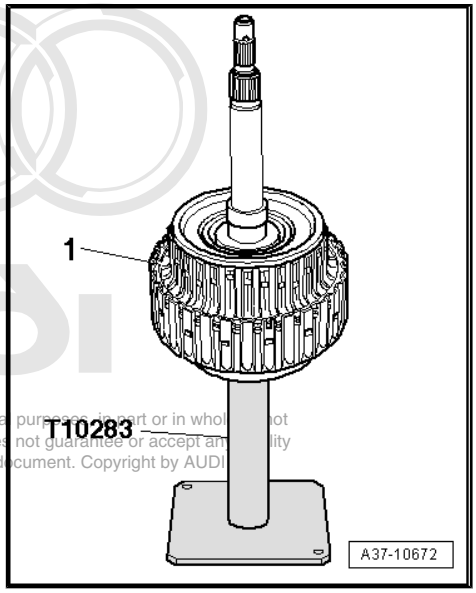
1 - Clutch „A“
2 - Sun gear „I“
3 - Axial needle bearing
4 - Planet carrier „I“
5 - Locking plate
6 - Rectangular section seals
❑ Renew
7 - Axial needle bearing
8 - Clutch „E“ with annulus „I“
9 - Axial needle bearing
10 - Inner plate carrier „E“ with intermediate shaft
11 - Axial needle bearing
12 - Inner plate carrier „A“
13 - Inner plate carrier „B“
14 - Circlip



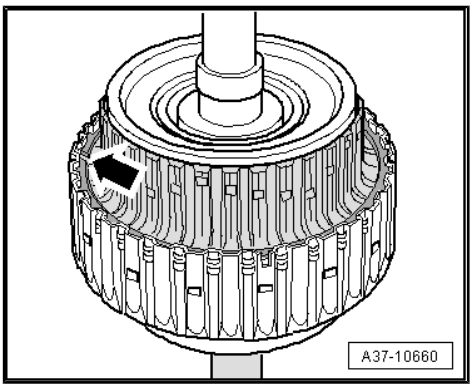
5.2 Dismantling body „II“

– Place body „II“ on support -T10283- .

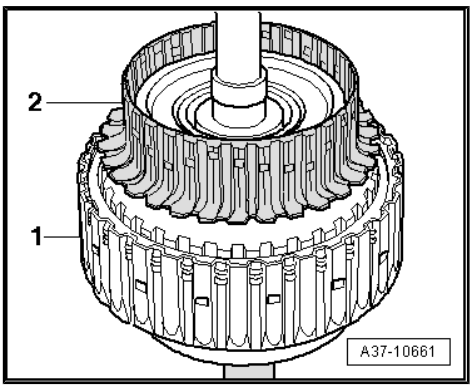
• The ATF pump end should face downwards.



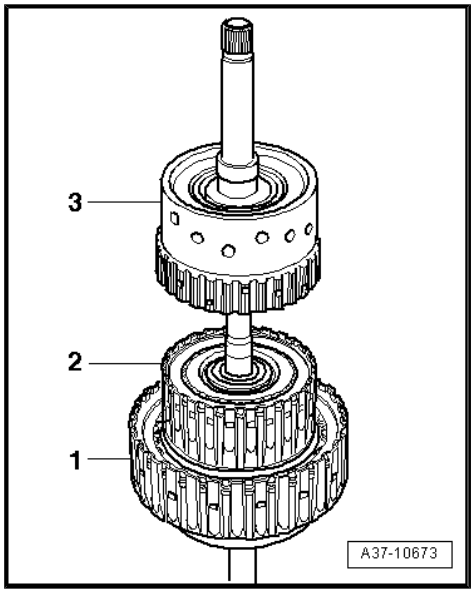
– Remove circlip -arrow-.



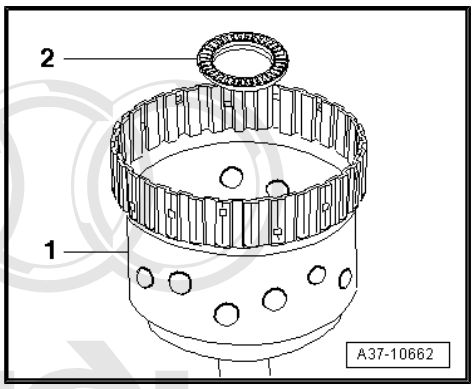
– Detach inner plate carrier „B“ -item 2- from clutch „A“ -item 1-.



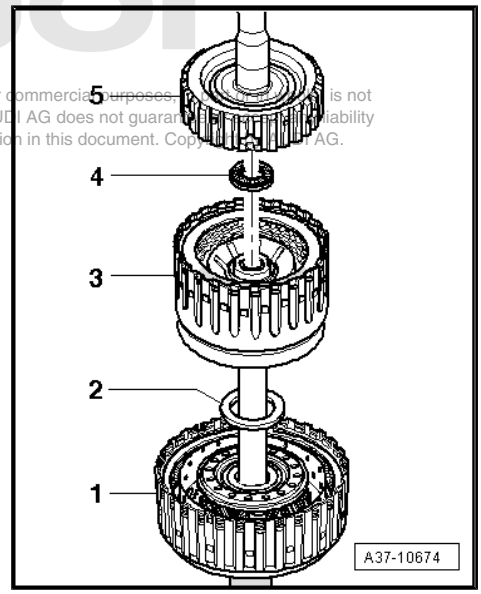
– Detach inner plate carrier „A“ -item 3- from clutch „A“ -item 1- and clutch „E“ -item 2-.



– Turn inner plate carrier „A“ -item 1- upside down.
– Unclip axial needle bearing -2- by inserting a screwdriver through one of the openings in the side of inner plate carrier „A“.



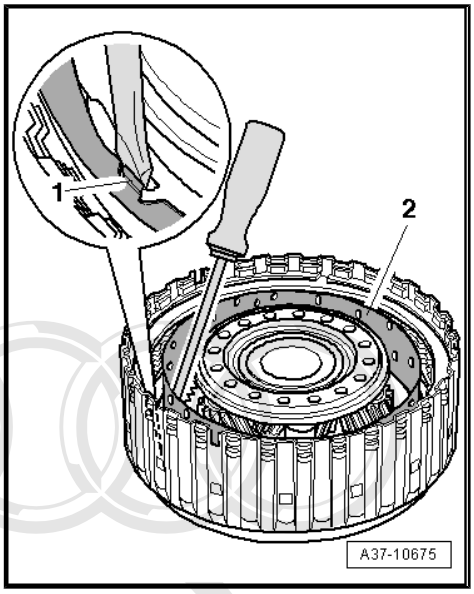
– Detach inner plate carrier „E“ -item 5- with intermediate shaft from clutch „E“ -item 3-.
– Unclip axial needle bearing -4- from clutch „E“ -item 3-.
– Detach clutch „E“ -item 3- from clutch „A“ -item 1-.
– Unclip axial needle bearing -2- from clutch „E“ -item 3-.



Note

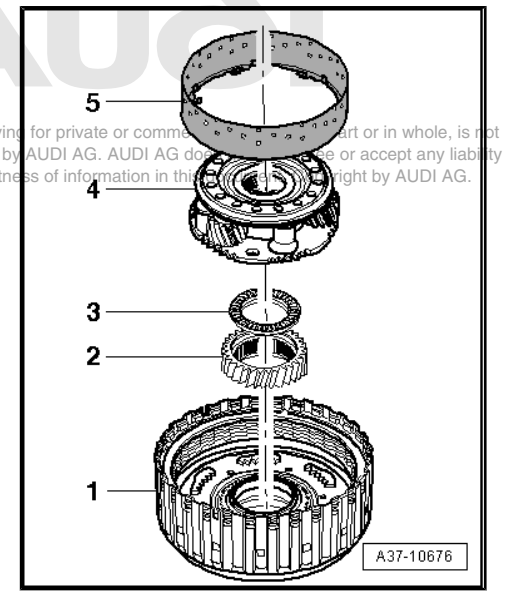
Use a scriber if necessary.

– Place clutch „A“ with planet carrier „I“ on workbench.
– Bend up 6 retaining tabs -1- on locking plate -2-.



– Release locking plate -5- by tuning approx. 30° clockwise and lift out.
– Detach planet carrier „I“ -item 4-.
– Detach sun gear „II“ -item 2- together with axial needle bearing -3-.
– Unclip axial needle bearing -3- from sun gear „II“ -item 2-.

1 - Clutch „A“



5.3 Clutch „A“ - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check components of clutch „A“ for traces of wear and damage ⇒ „3.7 Clutch A “, page 126 .*

1 - Cylinder „A“

2 - O-ring
- ❑ Renew

3 - O-ring
- ❑ Renew
- ❑ Rib on O-ring must be inserted in groove

4 - Piston „A“

5 - Dished spring

6 - O-ring
- ❑ Renew
- ❑ Rib on O-ring must be inserted in groove

7 - Retaining plate

8 - Circlip

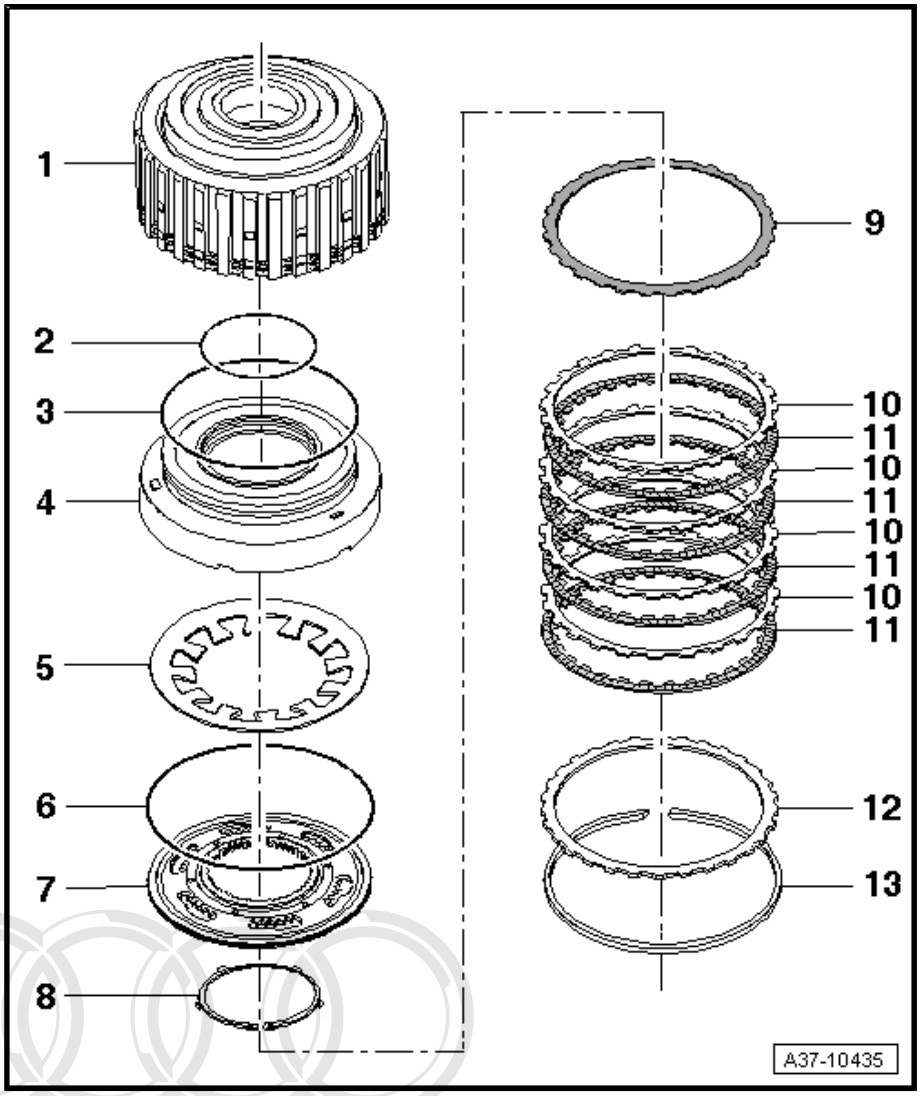
9 - Corrugated spring

10 - Outer plate

11 - Friction plate

12 - Last outer plate

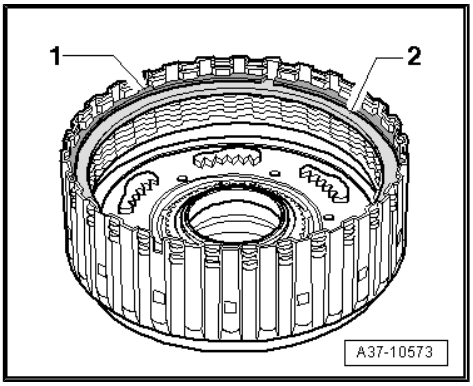
13 - Circlip
- ❑ Determining thickness ⇒ page 75



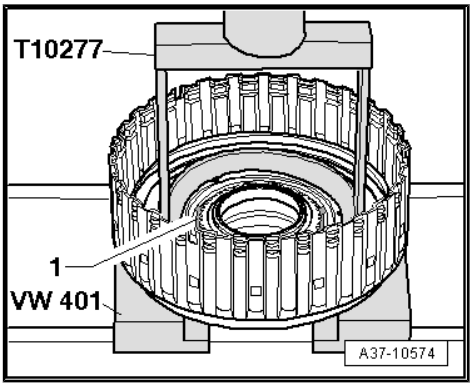
5.4 Dismantling and assembling clutch „A“

Dismantling

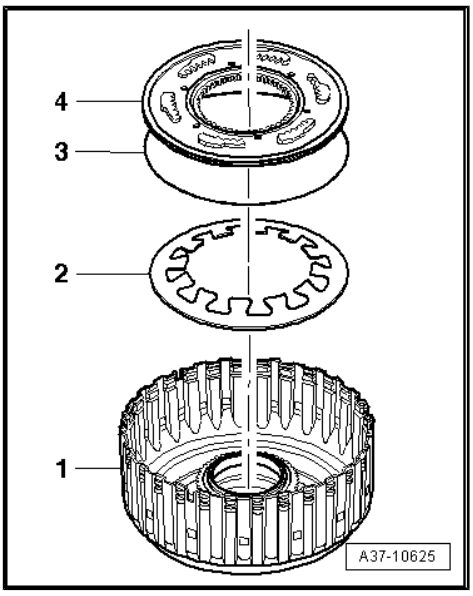
– Detach circlip -1- and remove clutch pack -2- from cylinder „A“.



– Press retaining plate down using workshop press with assembly jig -T10277- .
– Remove circlip -1-.
– Release workshop press.



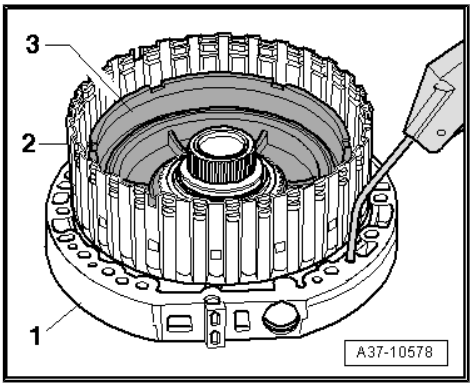
– Detach retaining plate -4- with O-ring -3- from cylinder „A“ -item 1-.
– Detach dished spring -2-.



– Place cylinder „A“ -item 2- on ATF supply unit -1- as shown in illustration.

WARNING

Wear safety goggles.

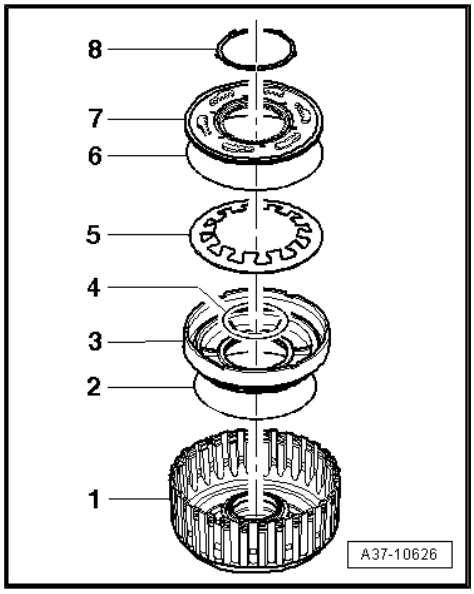


– Carefully press piston „A“ -item 3- out of cylinder „A“ by applying compressed air.

Assembling

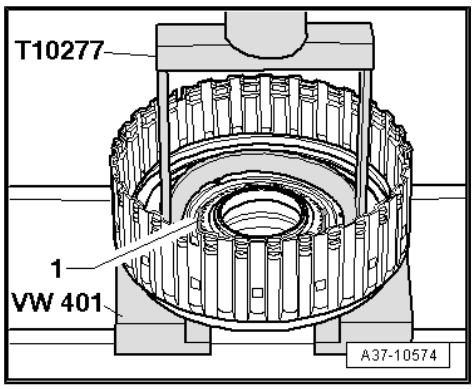
Caution

Check components of clutch „A“ for traces of wear and damage *⇒ „3.7 Clutch A “, page 126* *.*

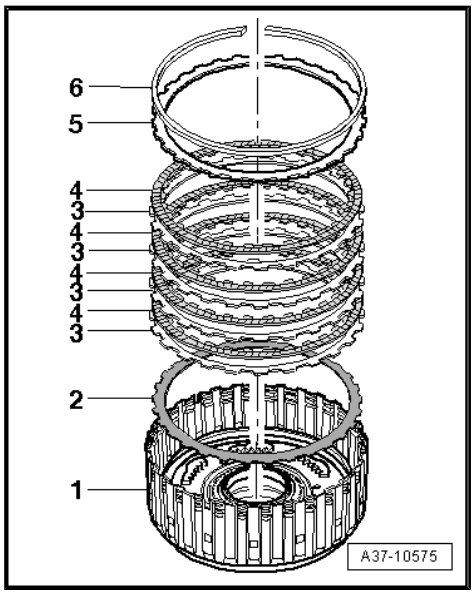


– Renew O-rings -2- and -4- for piston „A“ -item 3-.
• Rib on O-ring -2- must be inserted in groove
– Push piston „A“, -item 3- into cylinder „A“, -item 1- as far as stop.
– Fit dished spring -5-.
– Renew O-ring -6- for retaining plate -7-.
• Rib on O-ring -6- must be inserted in groove
– Insert retaining plate -7-.

8 - Circlip

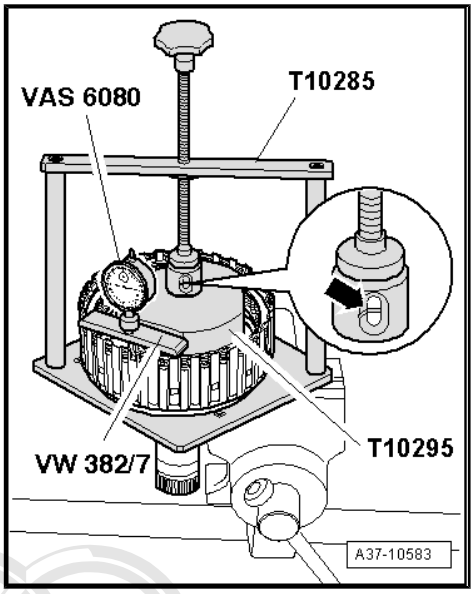


– Press retaining plate down using workshop press with assembly jig -T10277- .
– Renew circlip -1- and install new circlip with care.
– Make sure that circlip is seated securely in groove on cylinder „A“.
– Release workshop press.



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

Adjusting clearance of clutch „A“



– Insert clutch „A“ in compressor tool.

– Position holding plate -T10295- onto outer plate of clutch „A“.

• Avoid any contact between plate and circlip.

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

– Bring clutch „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 rim of cylinder „A“ as shown in illustration.

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

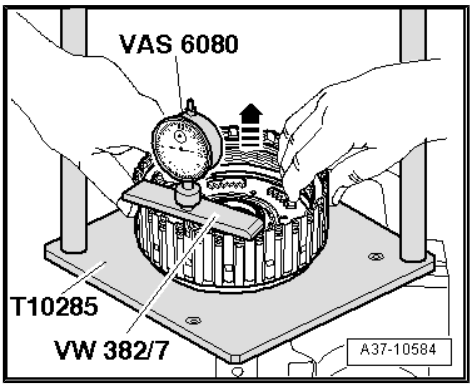
– Bring measuring tip into contact with outer plate and note value obtained.

– 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 rim of cylinder „A“ and outer plate at one of the points marked (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

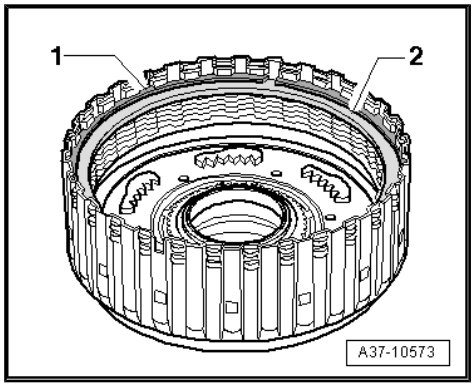
– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance:

• Specification: 1.52 ... 1.81 mm

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

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

Available circlips - Thickness of circlips in mm		
1.80	2.40	3.00
2.00	2.60	3.20
2.20	2.80	

– Check clearance again after inserting circlip.

5.5 Clutch „E“ - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check components of clutch „E“ for traces of wear and damage ⇒ page 128 .*

1 - Cylinder „E“ with annulus „I“

2 - O-ring
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - Piston „E“

5 - Dished spring

6 - O-ring
- ❑ Renew

7 - Retaining plate

8 - Retaining plate
- ❑ Angled outer rim faces towards circlip

9 - Circlip
- ❑ Renew

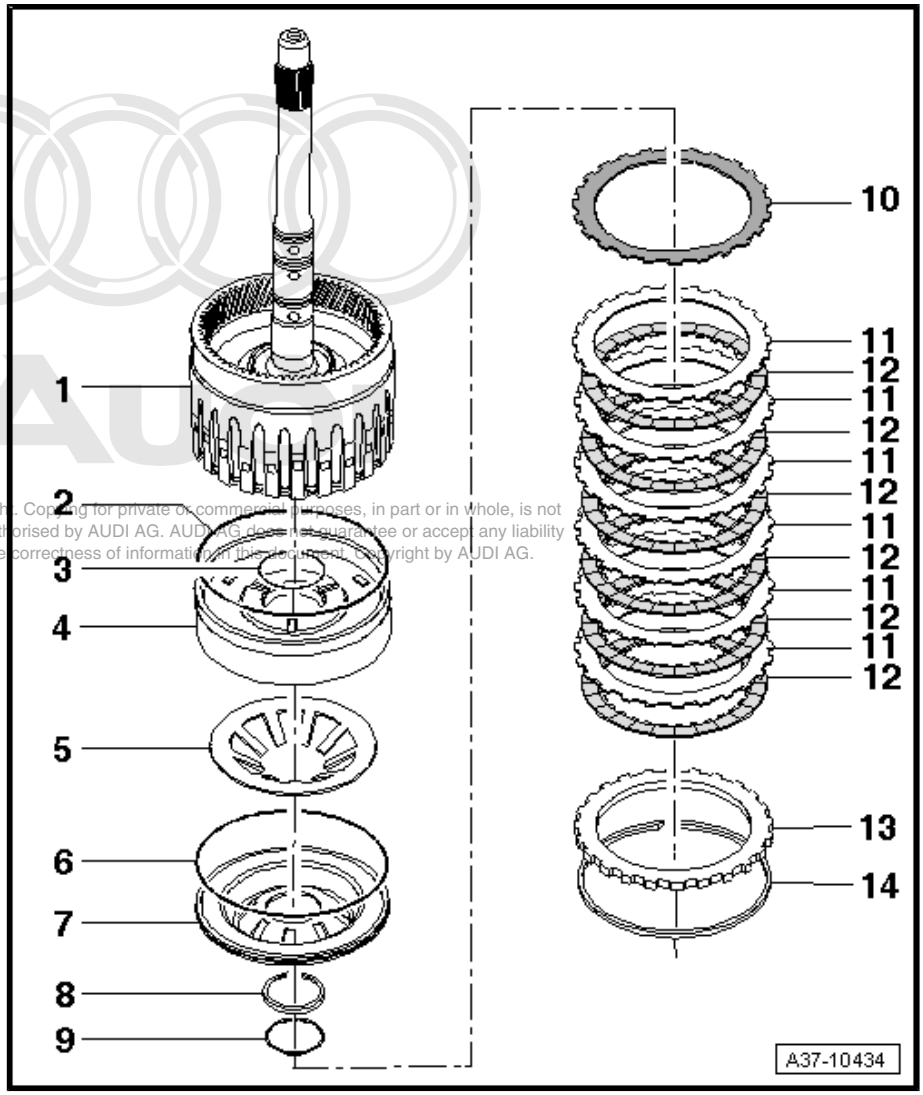
10 - Corrugated spring

11 - Outer plate

12 - Friction plate

13 - Thick outer plate

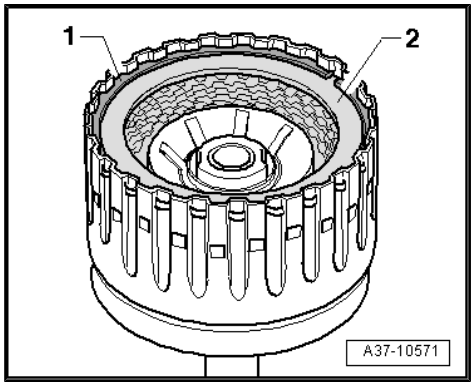
14 - Circlip



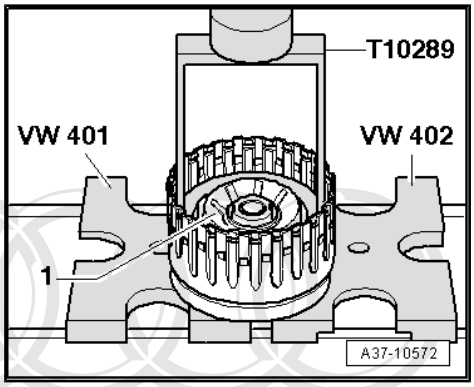
5.6 Dismantling and assembling clutch „E“

Dismantling

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

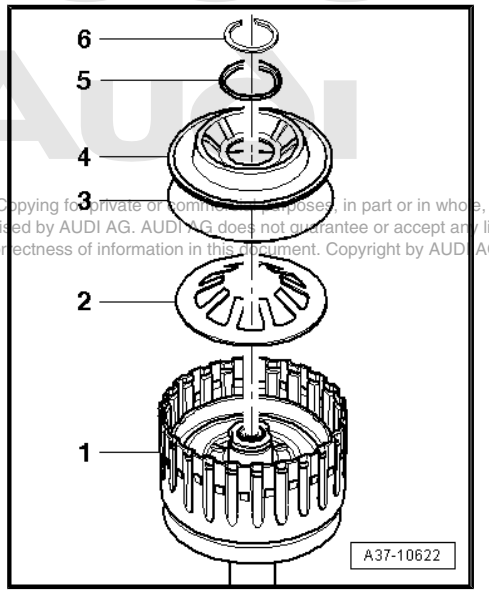


– Press retaining plate down using workshop press with assembly jig -T10289- .
– Detach circlip -1-.
– Release workshop press.



– Detach retaining plate -5-.
– Take out retaining plate -4- with O-ring -3-.
– Detach dished spring -2- from cylinder „E“ -item 1-.

6 - Circlip

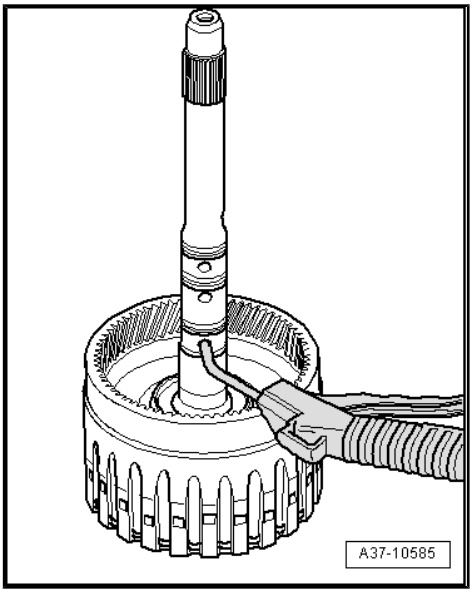


– Turn cylinder „E“ upside down.

WARNING

Wear safety goggles.

– Carefully press piston „E“ out of cylinder „E“ by applying compressed air (cover oil drilling on opposite side with your finger).



Assembling

Caution

Check components of clutch „E“ for traces of wear and damage *⇒ page 128* *.*

– Renew O-rings -2- and -4- for piston „E“ -item 3-.

– Push piston „E“, -item 3- into cylinder „E“, -item 1- as far as stop.

– Fit dished spring -5-.

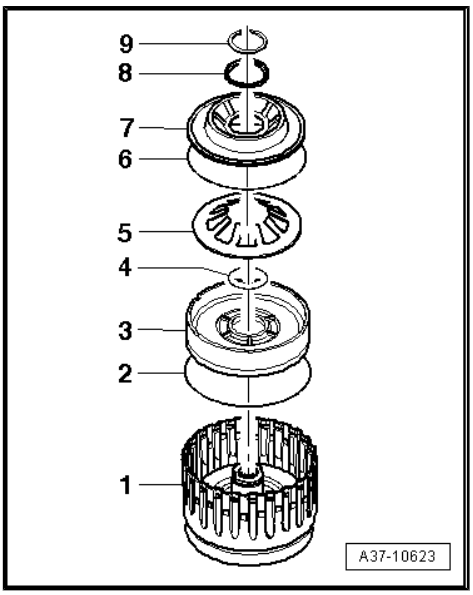
• Tips of dished spring must face upwards.

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

– Insert retaining plate -7-.

– Insert retaining plate -8-.

• The angled outer rim of the retaining plate faces upwards towards -9-.



– Press retaining plate down using workshop press with assembly jig -T10289- .

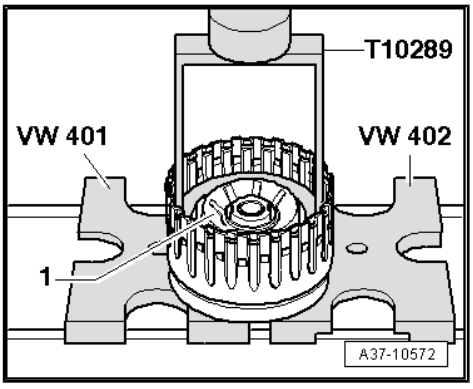
Caution

Take care not to stretch circlip too far when installing.

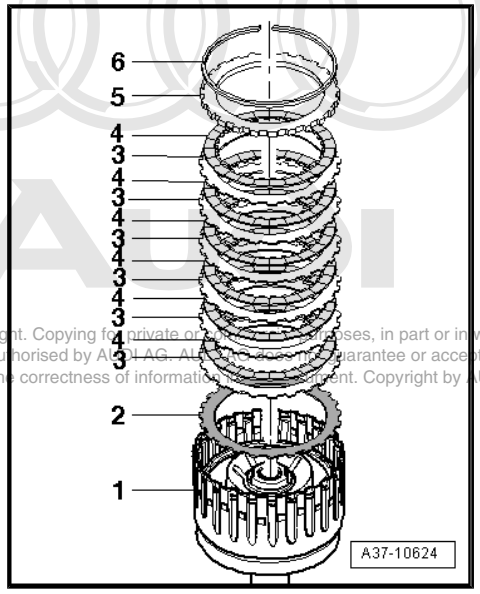
– Renew circlip -1- and install new circlip with care.

– When installing, make sure that circlip is seated securely all round in groove on cylinder „E“.

– Release workshop press.

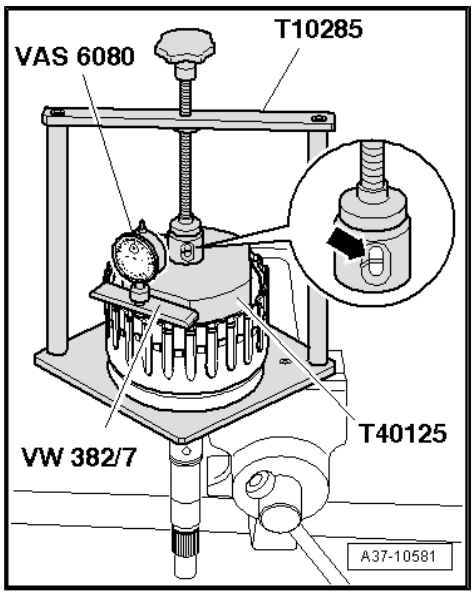


– Fit corrugated spring -2- in cylinder „E“ -item 1-.
– Fit outer plates -3- and friction plates -4- alternately.
– Insert thick outer plate -5-.
– Insert circlip -6-.

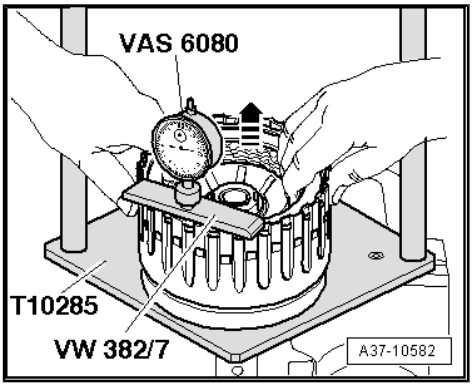


Adjusting clearance of clutch „E“

– Clamp support leg of compressor tool -T10285- in vice.
– Insert clutch „E“ in compressor tool.
• The input shaft projects out of drilling in base plate.
– Position holding plate -T40125- onto outer plate of clutch „E“.
• Avoid any contact between plate and circlip.
– Fit centring pin of thrust piece -T10285/1- into drilling in plate.
– Bring clutch „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-.
– Insert dial gauge -VAS 6080- into measuring bridge -VW 382/7- and secure with knurled nut.
– Position measuring bridge on upper rim of cylinder „E“ as shown in illustration.
– Check that measuring bridge is seated properly on rim of cylinder „E“.
– Bring measuring tip into contact with outer plate and note value obtained.
– Mark exact contact point on cylinder „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 rim of cylinder „E“ and outer plate at one of the points marked (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

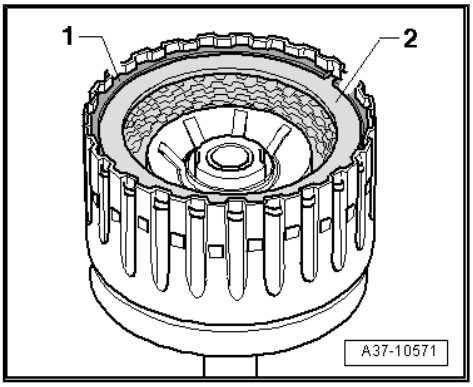
– Subtract mean value of measurements with clutch pack pulled up as far as stop from mean value of measurements under load.

Clearance:

• Specification: 2.00 ... 2.29 mm

If result does not match specification:

– Determine new circlip -1-.



Note

-Item 2- can be disregarded.

• If clearance is below specification: insert thinner circlip of appropriate thickness.
• If clearance is above specification: insert thicker circlip of appropriate thickness.

Available circlips - Thickness of circlips in mm		
2.00	2.60	3.20
2.20	2.80	
2.40	3.00	

– Check clearance again after inserting circlip.

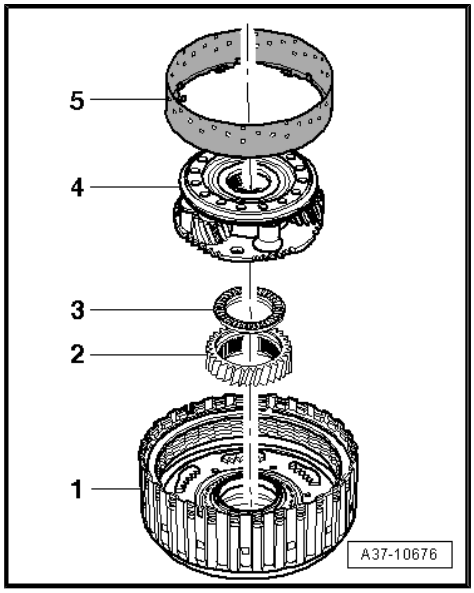
5.7 Assembling body „II“

– Clip axial needle bearing -3- into top of sun gear „I“ -item 2-.

• The closed side of the axial needle bearing faces towards sun gear „I“.

– Fit sun gear „I“ -item 2- in planet carrier „I“ -item 4-.

• The side with the axial needle bearing faces towards planet carrier „I“.



Note

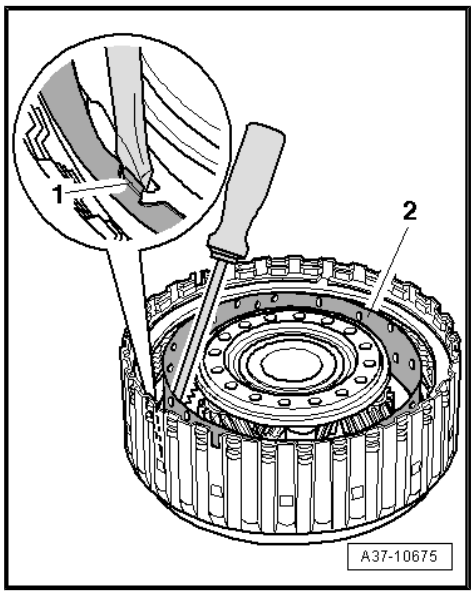
When fitting planet carrier „I“ -item 4- in clutch „A“ -item 1-, hold sun gear „I“ -item 2- in position so that it does not fall out.

– Insert planet carrier „I“ -item 4- into clutch „A“ -item 1-.

– Renew locking plate -5-.

– Insert locking plate -5- and secure it by turning anti-clockwise as far as stop.

– Bend down retaining tabs -1- on locking plate -2-.



Note

When bending down the retaining tabs, maintain a distance of approx. 2 mm between the tips of the tabs and the retaining plate; otherwise the parts may be difficult to remove later.

– Place clutch „A“ -item 1- with planet carrier „I“ on support - T10283- .

• The ATF pump end should face downwards.

– Clip axial needle bearing -2- onto clutch „E“ -item 3-.

• The closed side of the axial needle bearing faces towards clutch „E“.

– Place clutch „E“ -item 3- on planet carrier „I“ in clutch „A“ -item 1-.

– Clip axial needle bearing -4- onto clutch „E“.

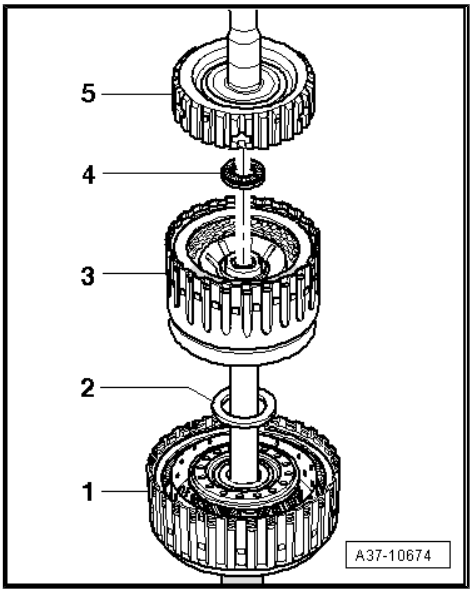
• The closed side of the axial needle bearing faces towards clutch „E“ -item 3-.

– Allow inner plate carrier „E“ -item 5- with intermediate shaft to engage in all plates of clutch „E“ -item 3- by lifting and turning slightly as required.

– Lift inner plate carrier „E“ -item 5- with intermediate shaft a few millimetres and then let it drop to check that all the plates have meshed.

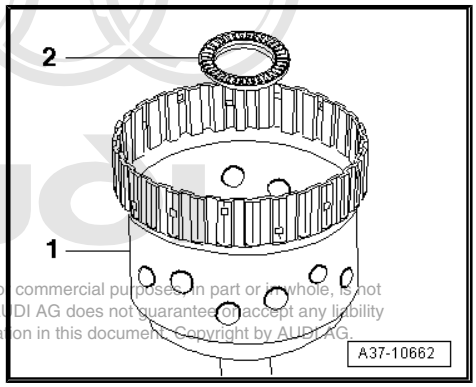
♦ If you hear a metallic sound, all the plates have meshed.

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



– Clip axial needle bearing -2- into inner plate carrier „A“ -item 1-.

• The closed side of the axial needle bearing faces towards inner plate carrier „A“.



– Turn inner plate carrier „A“ upside down.

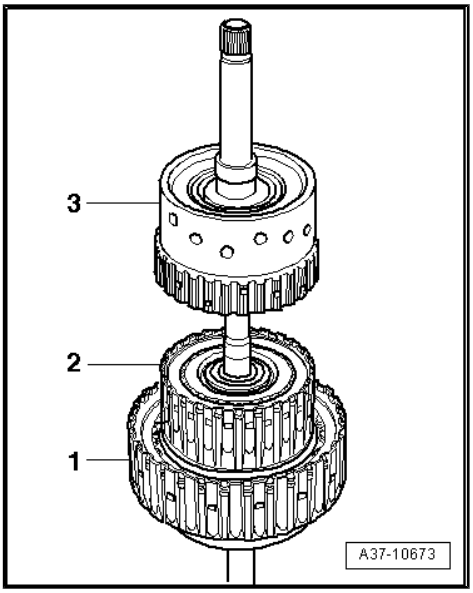
– Insert inner plate carrier „A“ -item 3- into clutch „A“ -item 1-, turning as required.

– Lift inner plate carrier „A“ -item 3- a few millimetres and then let it drop to check that all the plates have meshed.

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

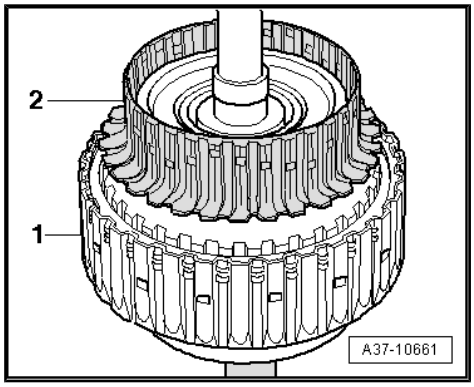
♦ If you only hear a muffled sound, some of the plates have not meshed.

2 - Clutch „E“



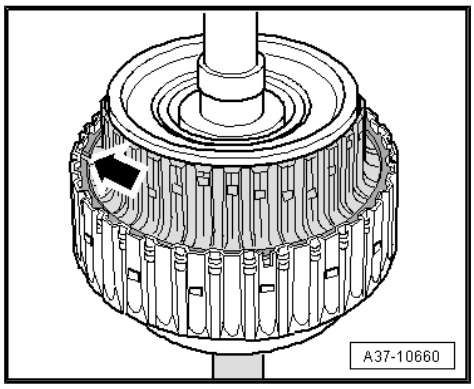
– Fit inner plate carrier „B“ -item 2- onto clutch „A“ -item 1-.

• The lugs on inner plate carrier „B“ -item 2- must locate in the slots in cylinder „A“.



– Insert circlip -arrow-.

– Make sure that circlip is seated securely all round in groove on cylinder „A“.



38 – Gears, control

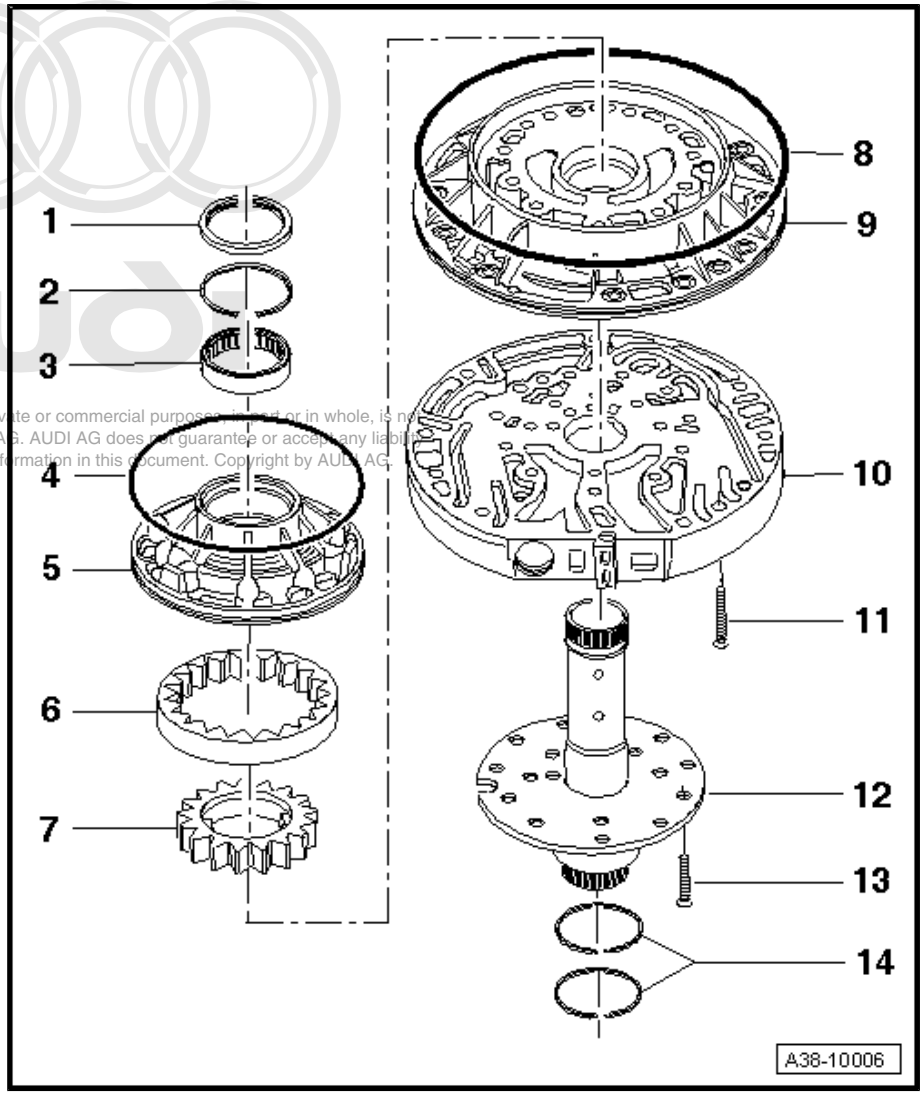
1 Dismantling and assembling ATF supply unit

Overview:

1.1 ATF supply unit - exploded view

Note

- *Some of the components shown are supplied as part of an assembly group and cannot be ordered as separate components ⇒ Electronic parts catalogue .*
- *Check the individual components of ATF supply unit for traces of wear and damage ⇒ page 129 .*



1 - Oil seal for torque converter
- ❑ Renewing ⇒ page 87

2 - Circlip

3 - Needle bearing for torque converter
- ❑ Removing and installing ⇒ page 99

4 - O-ring
- ❑ Renew

5 - ATF pump housing
- ❑ Removing and installing ⇒ page 97

6 - Annulus

7 - ATF pump gear

8 - O-ring

9 - ATF supply unit
- ❑ Housing (top section)
- ❑ Removing and installing ⇒ page 87

10 - ATF supply unit
- ❑ Housing (bottom section)
- ❑ Removing and installing ⇒ page 87

11 - Bolt
- ❑ 15 Nm

12 - Stator shaft
- ❑ Component part of ATF supply unit; cannot be renewed separately
- ❑ Removing and installing ⇒ „1.3 Removing and installing ATF supply unit“, page 87

13 - Bolt
- ❑ 15 Nm

14 - Rectangular section seals for ATF supply unit
- ❑ Renew

1.2 Renewing oil seal for torque converter

Procedure

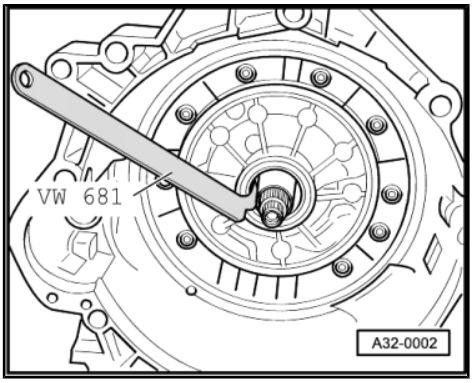
– Secure gearbox to assembly stand ⇒ page 17 .

– Carefully pull out torque converter.

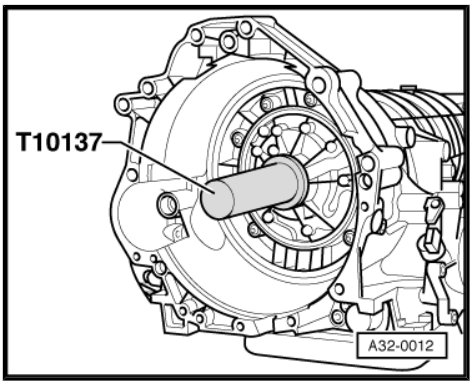
– Pry out oil seal for torque converter using oil seal extractor lever -VW 681- .

– Lightly lubricate outer circumference and sealing lips of oil seal with ATF.

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



– Drive in torque converter oil seal with thrust piece -T10137- until thrust piece reaches stop.



1.3 Removing and installing ATF supply unit

Removing

– Secure gearbox to assembly stand ⇒ page 17 .

• The gearbox must be horizontal with the ATF oil pan facing downwards.

– Remove torque converter.

– Extract ATF from torque converter ⇒ page 16 .

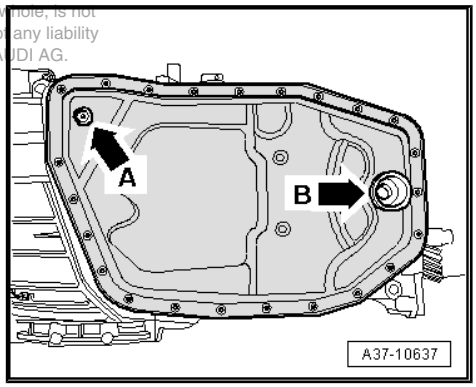
– Place used oil collection and extraction unit -V.A.G 1782- below gearbox.

– Remove ATF drain plug -arrow A- and allow ATF to drain off.

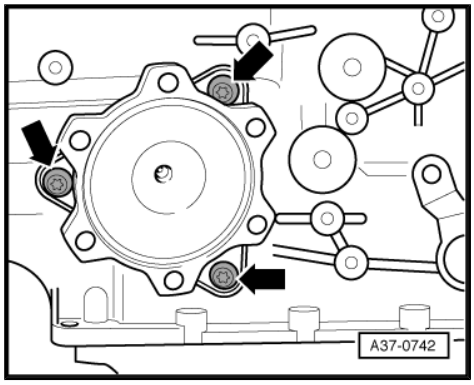
Note

♦ *Observe relevant disposal regulations.*

♦ *Some ATF always remains in the oil pan.*

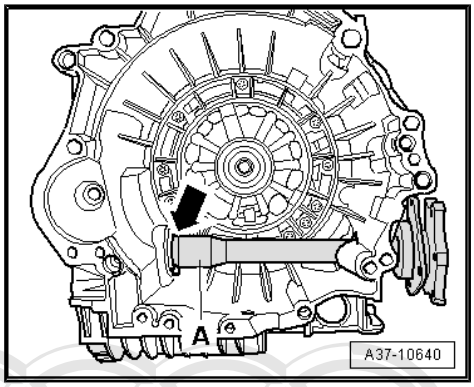


– Remove bolts -arrows- on mounting bracket for flange shaft (left-side).



Caution

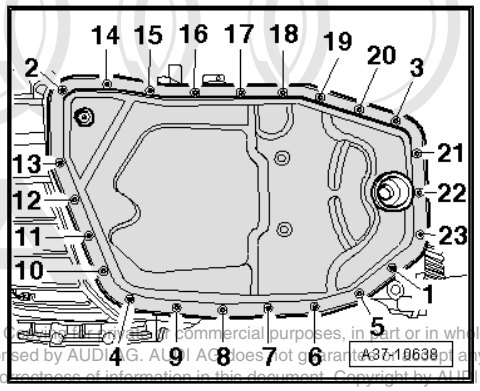
While pulling out the flange shaft (left-side), it must be held centrally to avoid damaging the oil seal between the final drive and the gearbox housing.



– Pull flange shaft -A- (left-side) out of gearbox, making sure that shaft remains centered in opening at differential -arrow-.
– Turn gearbox on assembly stand.
• The ATF oil pan should face upwards.

Oil pan version 1:

– Slacken bolts for ATF oil pan in the sequence -23 ... 1- and remove bolts.

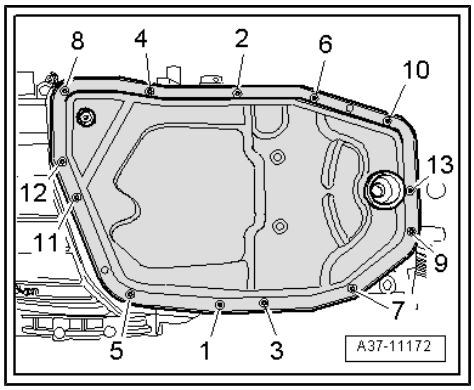


Oil pan version 2:

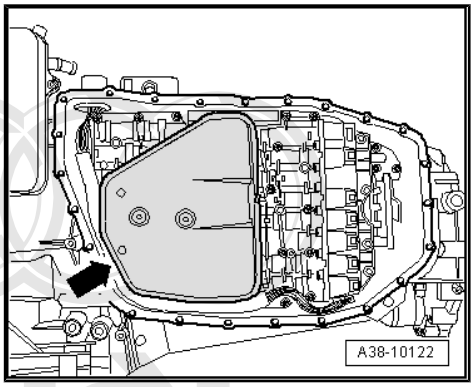
– Slacken bolts for ATF oil pan in the sequence -13 ... 1- and remove bolts.

Continued for all gearboxes:

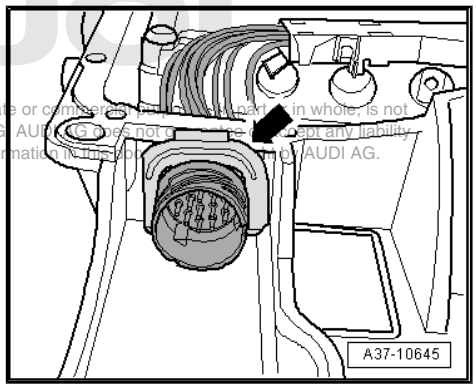
– Take off ATF oil pan and gasket.



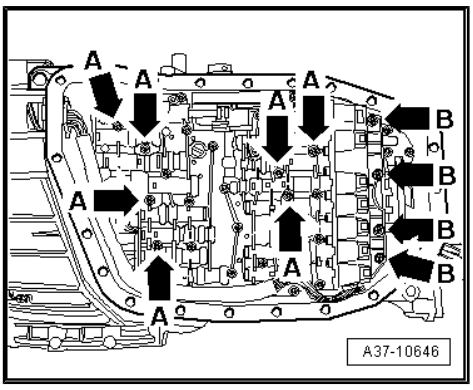
– Pull ATF strainer -arrow- off mechatronic unit.



– Detach retaining clip -arrow- for wiring harness connector and push connector inwards.



– Remove bolts -arrows A- and -arrows B-.



Caution

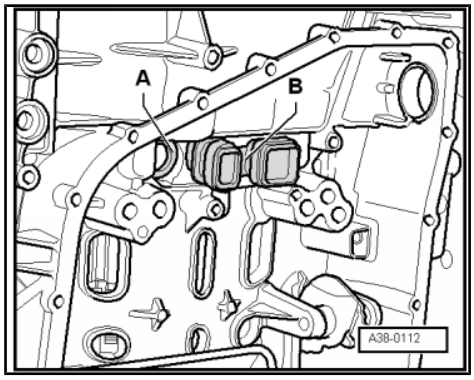
- *Loosen ONLY the bolts with the larger bolt heads -arrows A- and -arrows B-.*
- *If other bolts are loosened, this may affect the operation of the mechatronic unit or the mechatronic unit could come apart.*
- *Observe different bolt lengths.*

– Lift mechatronic unit slightly and pull wiring harness connector out of gearbox housing.

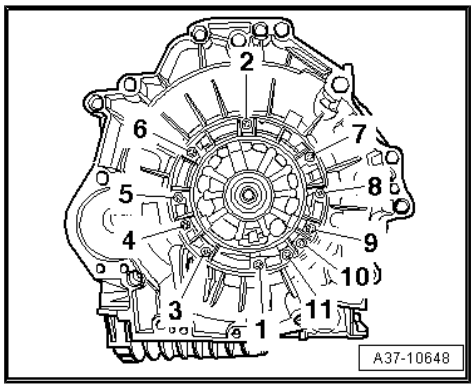
Caution

To avoid damaging the senders on the rear of the unit, always put down the mechatronic unit so that the side with the bolt heads faces downwards.

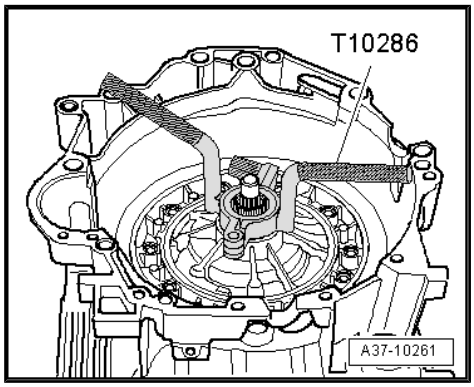
– Detach adapter -B- for mechatronic unit.
– Pull out gasket -A- for ATF strainer (if it has not already been removed together with the ATF strainer).



– Turn gearbox on assembly stand.
• The torque converter should face upwards.
– Slacken bolts for ATF supply unit in the sequence -11 ... 1- and remove bolts.
– Remove bolts with sealing washers.



– Attach puller for oil supply -T10286- to stator shaft and lift out ATF supply unit by pulling firmly.

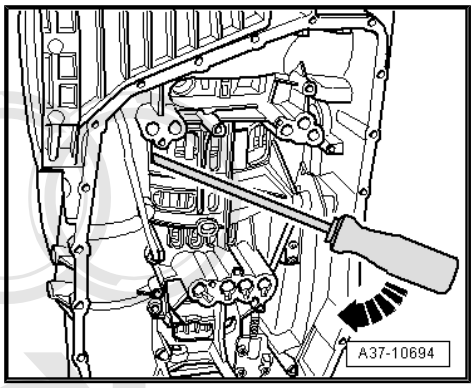


Note

If necessary, release ATF supply unit by tapping gently with a rubber-headed hammer.

If it is not possible to detach ATF supply unit:

– Insert a screwdriver below clutch „B“ on underside of gearbox and lever components located above clutch „B“ upwards -arrow-.
– Detach O-ring from ATF supply unit.



Installing

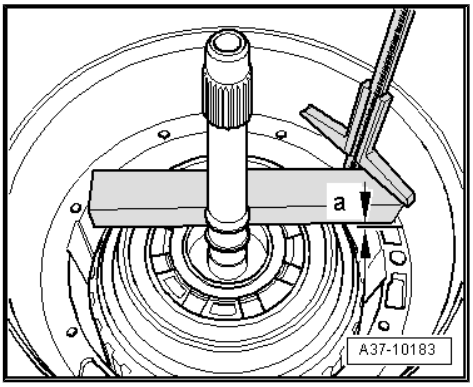
Make sure that body „II“ and clutch „B“ are still correctly installed.

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

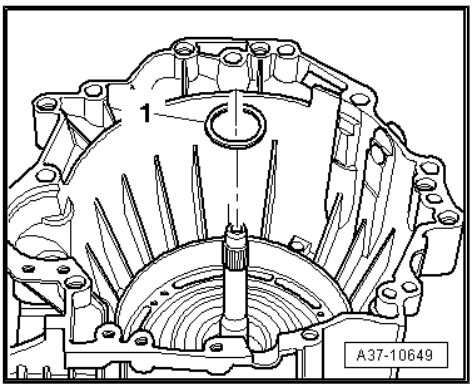
• Dimension -a- = approx. 15 mm

If dimension -a- is exceeded, body „II“ or clutch „B“ was pulled out of engagement with plates upon removal.

– Remove body „II“ and clutch „B“ and then install again ⇒ page 30 .



– Check whether the existing shim -1- is still fitted on clutch „A“.



Note

The shim may also remain attached to the ATF supply unit.

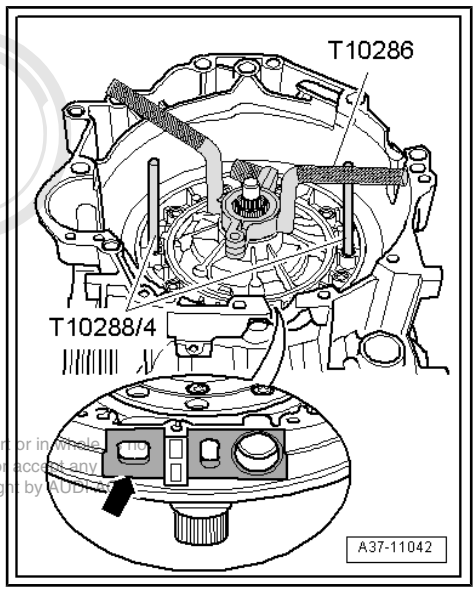
– Screw in guide pins M6 -T10288/4- .

– Apply puller for oil supply -T10286- to stator shaft.

– Fit ATF supply unit in gearbox housing without O-ring at this stage (turn ATF supply unit slightly in both directions).

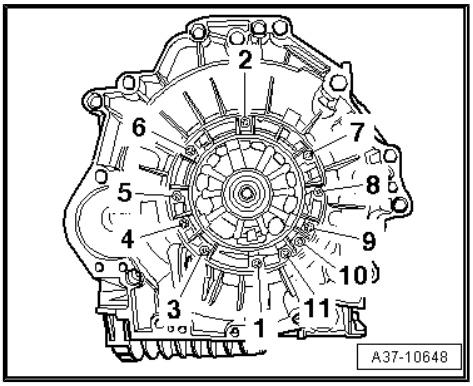
• The opening -arrow- on the housing of the ATF supply unit faces towards the ATF oil pan end.

– Remove puller for oil supply -T10286- .



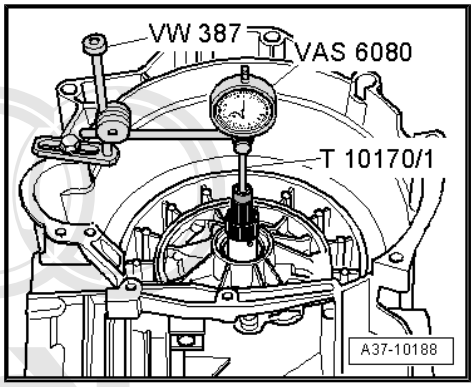
– Fit bolts -1, 2, 5, 8- for ATF supply unit with old sealing washers and tighten bolts.

• Tightening torque: 10 Nm



– Set up dial gauge -VAS 6080- with universal dial gauge bracket -VW 387- on gearbox flange.

– Apply dial gauge -VAS 6080- with universal dial gauge extension -T10170/1- to drilling in input shaft as shown in illustration.



– 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 from dial gauge.

• Specification: 0.20 ... 0.40 mm

– If result does not match specification:

– Select shim of required thickness from following table.

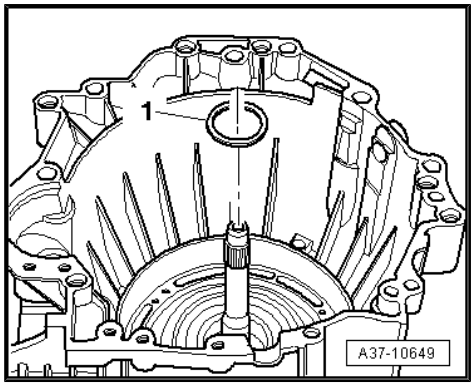
• Axial clearance too small: insert thinner shim of appropriate thickness.

• Axial clearance too large: insert thicker shim of appropriate thickness.

Available shims - thickness of shims in mm		
2.60	3.60	4.60
2.80	3.80	4.80
3.00	4.00	5.00
3.20	4.20	
3.40	4.40	

– Remove ATF supply unit again.

– Fit new shim of required thickness -1- (if applicable) onto clutch „A“.



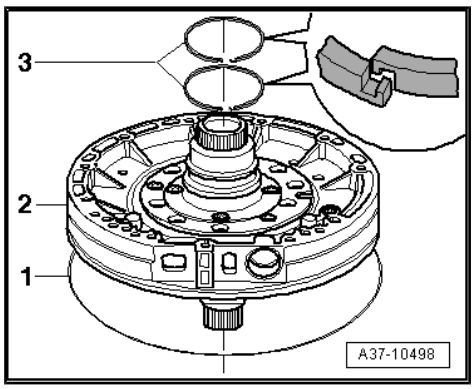
– Renew rectangular section seals -3- on stator shaft.

– Lightly lubricate the rectangular section seals with vaseline before fitting. Use vaseline only. Other types of lubricant will cause the gearbox hydraulics to malfunction.

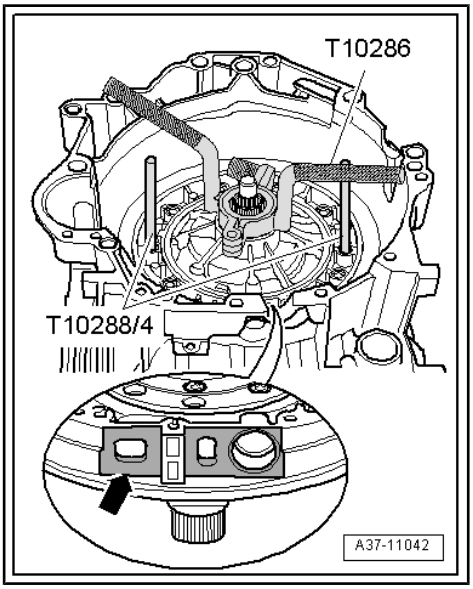
– Hook ends of rectangular section seals together.

– 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 -2-.



– Apply puller for oil supply -T10286- to stator shaft.
– Fit ATF supply unit in gearbox housing again (turn ATF supply unit slightly in both directions).
• The opening -arrow- on the housing of the ATF supply unit faces towards the ATF oil pan end.
– Remove puller for oil supply -T10286- .



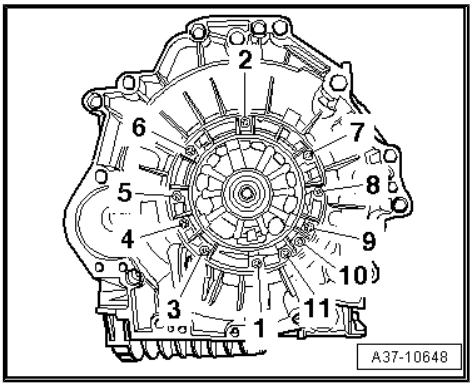
– Fit new sealing washers on bolts for ATF supply unit.
– Tighten bolts for ATF supply unit in sequence -1 ... 11-.
• Tightening torque: 10 Nm
– Check axial clearance of input shaft again ⇒ page 33 .

If reading again does not match specification:

– Repeat adjustment.

If result matches specification:

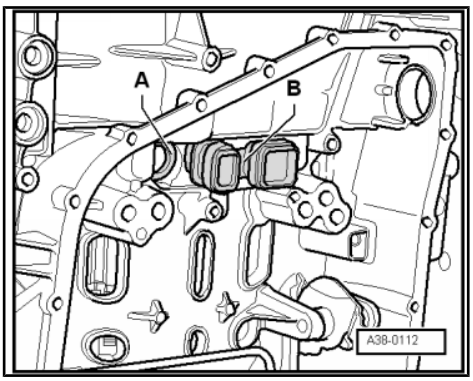
– Turn gearbox on assembly stand.
• The ATF oil pan should face upwards.



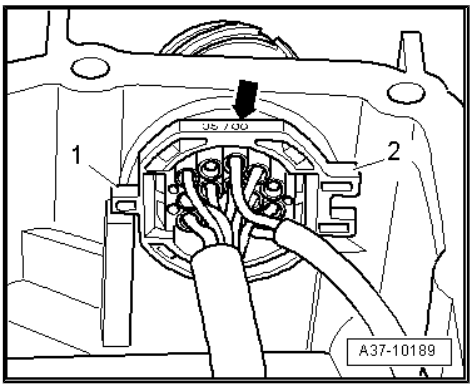
– Renew seals on adapter -B-.
– Install adapter for mechatronic unit.

Note

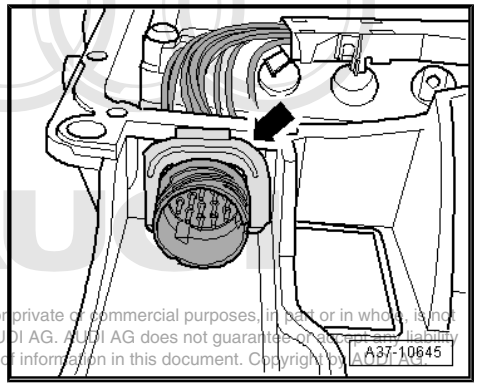
Item -A- can be disregarded.



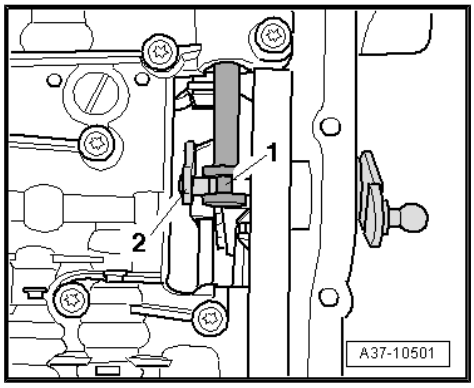
– Renew O-rings for wiring harness connector.
– Fit wiring harness connector in gearbox housing.
• Lugs -1- and -2- on collar are horizontal, flat section -arrow- of connector faces inside of gearbox.



– Fit retaining clip -arrow- for wiring harness connector.



– Place mechatronic unit in position on gearbox housing without using force. At the same time insert pin -2- of detent plate so that it engages in slot on selector slide -1-.

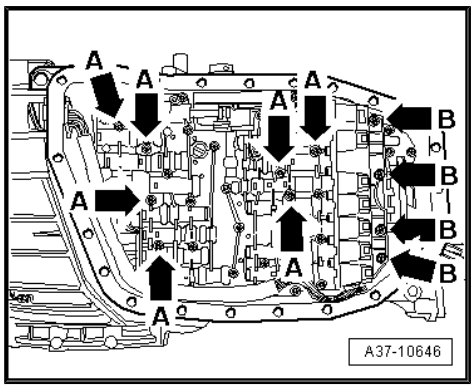


– Screw in bolts -arrows- hand-tight.

Note

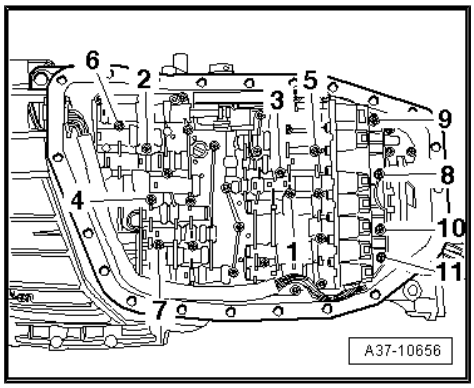
Note different bolt lengths. Allocation:

Location		Quantity	Bolt length
-Arrow A-	=	7	M6x50
-Arrow B-	=	4	M6x20

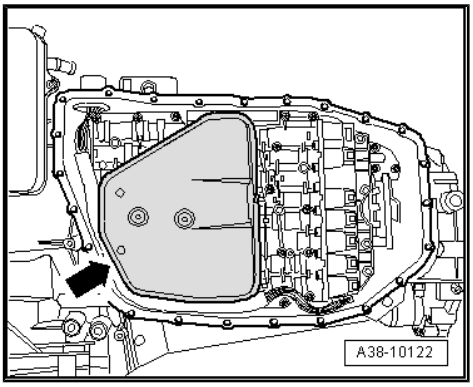


– Tighten bolts in sequence -1 … 11-.

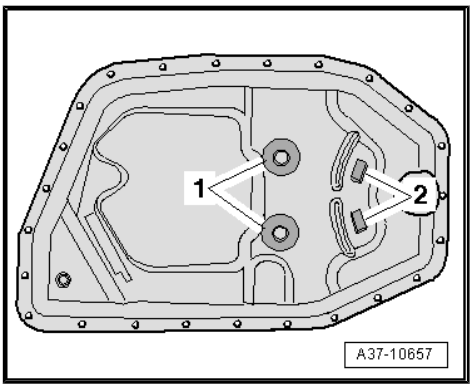
• Tightening torque: 8 Nm



– Renew ATF strainer -arrow-.
– Check whether seal is fitted on new ATF strainer.
– Fit ATF strainer on mechatronic unit.



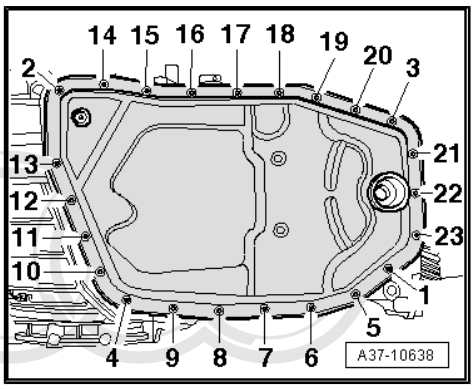
– Clean magnets -1- and -2- in ATF oil pan.
– Ensure that magnets make full contact with ATF oil pan.
– Fit ATF oil pan with new gasket.



Gearbox with 23 bolts on oil pan:

– Tighten bolts for ATF oil pan in sequence -1 ... 23-.

• Tightening torque: 12 Nm



Gearbox with 13 bolts on oil pan:

– Tighten bolts for ATF oil pan in sequence -1 ... 13-.

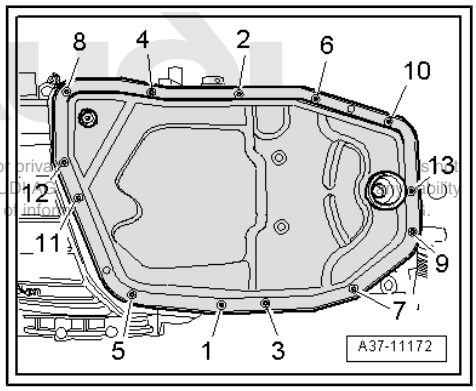
• Tightening torque: 12 Nm

Continued for all gearboxes:

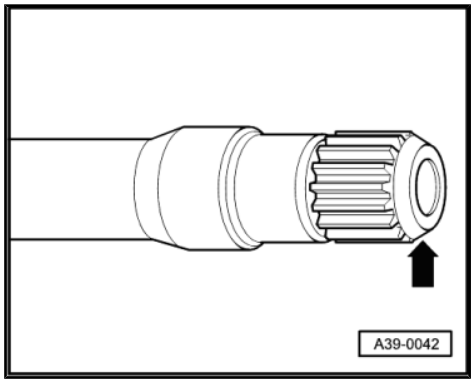
– Turn gearbox on assembly stand.

• The ATF oil pan should face downwards.

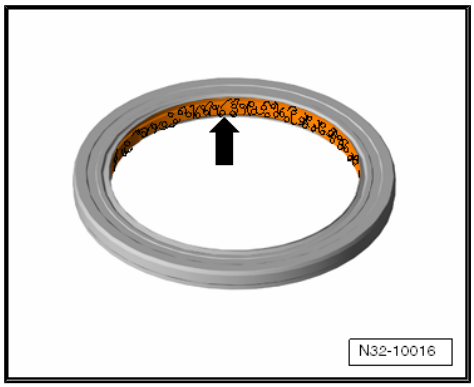
– If necessary, renew oil seal between final drive and gearbox housing ⇒ page 103 .



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

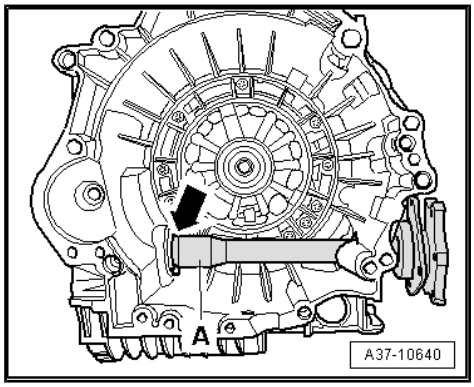


– Clean flange shaft (left-side) and oil seal between final drive and gearbox housing.
– Pack space between sealing lips -arrow- of oil seal half-full with sealing grease -G 052 128 A1- .



Caution

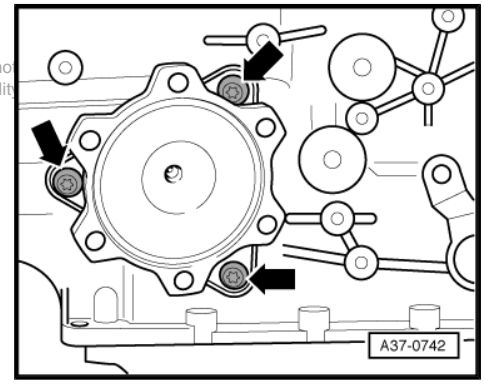
While inserting the flange shaft (left-side), it must be held centrally to avoid damaging the oil seal between the final drive and the gearbox housing.



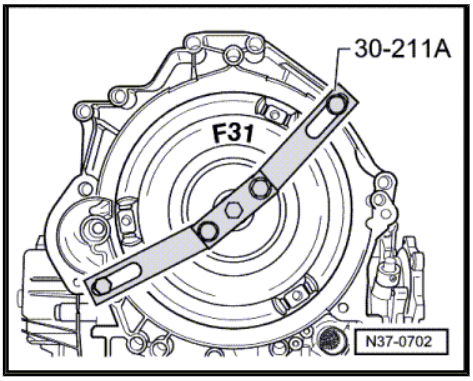
– Insert flange shaft -A- (left-side) into gearbox, guiding shaft centrally into oil seal between final drive and gearbox housing -arrow-.

– Tighten bolts -arrows- on mounting bracket for flange shaft (left-side).

- Tightening torque: 23 Nm



– Install torque converter ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 32 and secure against falling out using support bridge -30 - 211 A- .
– Check position of torque converter ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 32 .
– Detach gearbox from assembly stand.
– Fill up with ATF and check ATF level ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 37 .
– Fill up front final drive with gear oil and check oil level ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .



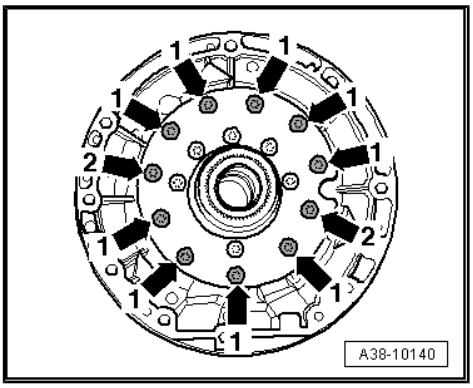
Tightening torques

Component	Nm
ATF supply unit to gearbox housing	10
Mechatronic unit to gearbox housing	8
ATF oil pan to gearbox housing	12
Mounting bracket for flange shaft (left-side) to gearbox	23

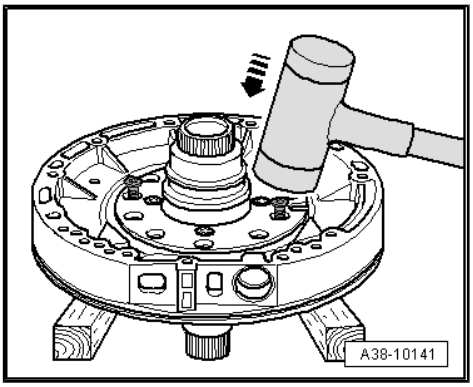
1.4 Removing and installing ATF pump in ATF supply unit

Removing

– Remove ATF supply unit ⇒ page 87 .
– Turn ATF supply unit upside down.
– 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.

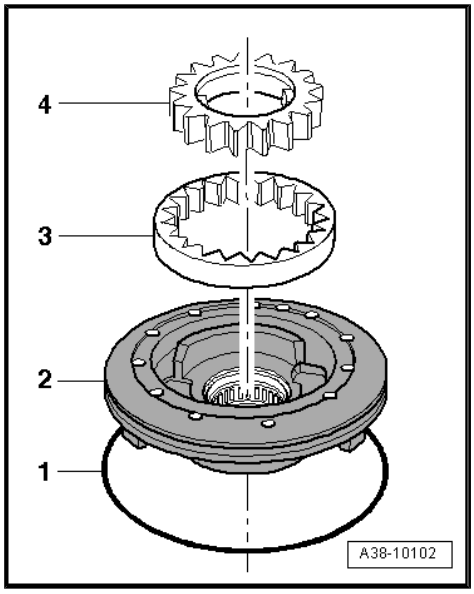


– Remove ATF pump gears -3- and -4- from ATF pump housing -2-.

1 - O-ring

Installing

> **Caution**
>
> ***Check the individual components of ATF supply unit for traces of wear and damage ⇒ page 129 .***



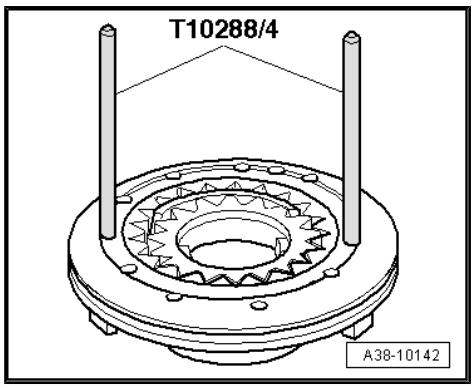
– Renew O-ring -1- on ATF pump housing.

– Insert ATF pump gears -3- and -4- into ATF pump housing -2-.

• The dots on the ATF pump gears face upwards.

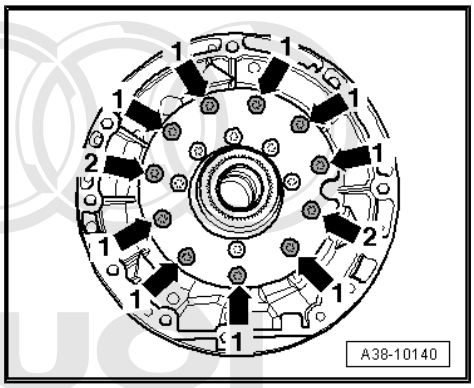
– Screw in guide pins M6 -T10288/4- .

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



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

• Tightening torque: 15 Nm

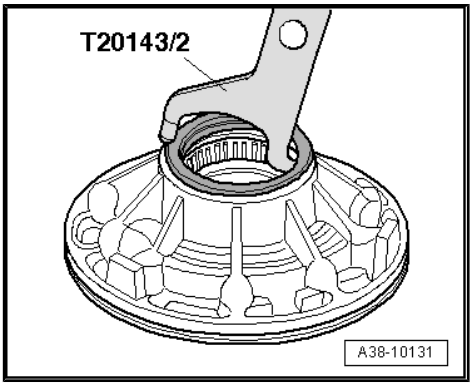


1.5 Removing and installing needle bearing for torque converter

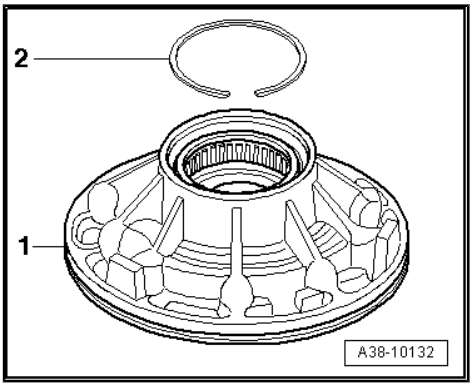
Removing

– Remove ATF pump ⇒ page 97 .

– Pry out torque converter oil seal using extractor tool - T20143/2- .



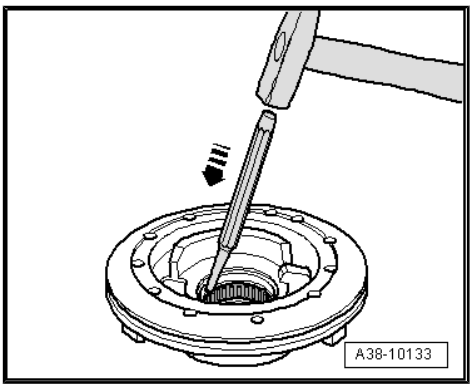
– Remove circlip -2- from ATF pump housing -1-.



Note

- *The needle bearing for the torque converter cannot be removed without being damaged.*
- *Take care not to damage the ATF pump housing when driving out the needle bearing.*

– Turn ATF pump housing upside down and drive out needle bearing for torque converter using a suitable punch -arrow-.



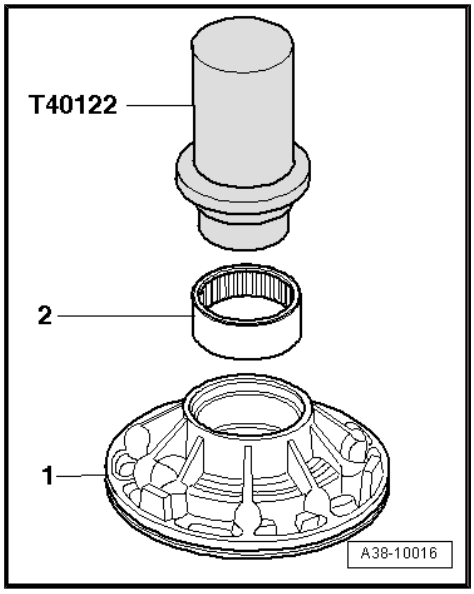
Installing

– Using thrust piece -T40122- , drive needle bearing -2- for torque converter into ATF pump housing -1- as far as stop.

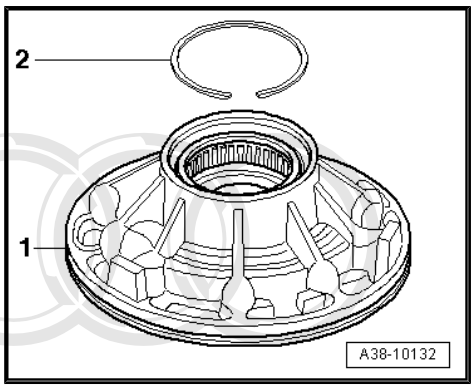
Caution

Risk of gearbox malfunction.

- *The wide collar on the needle cage faces towards thrust piece -T40122- .*



– Install circlip -2- in ATF pump housing -1-.

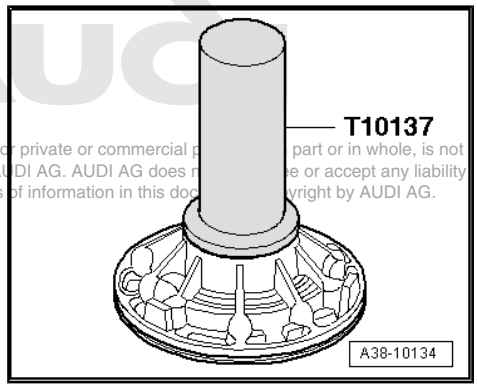


– Lightly lubricate outer circumference and sealing lips of torque converter oil seal with ATF.

• Open side of oil seal faces gearbox.

– Drive in torque converter oil seal with thrust piece -T10137- until thrust piece reaches stop.

– Assemble ATF supply unit .



39 – Final drive - front differential

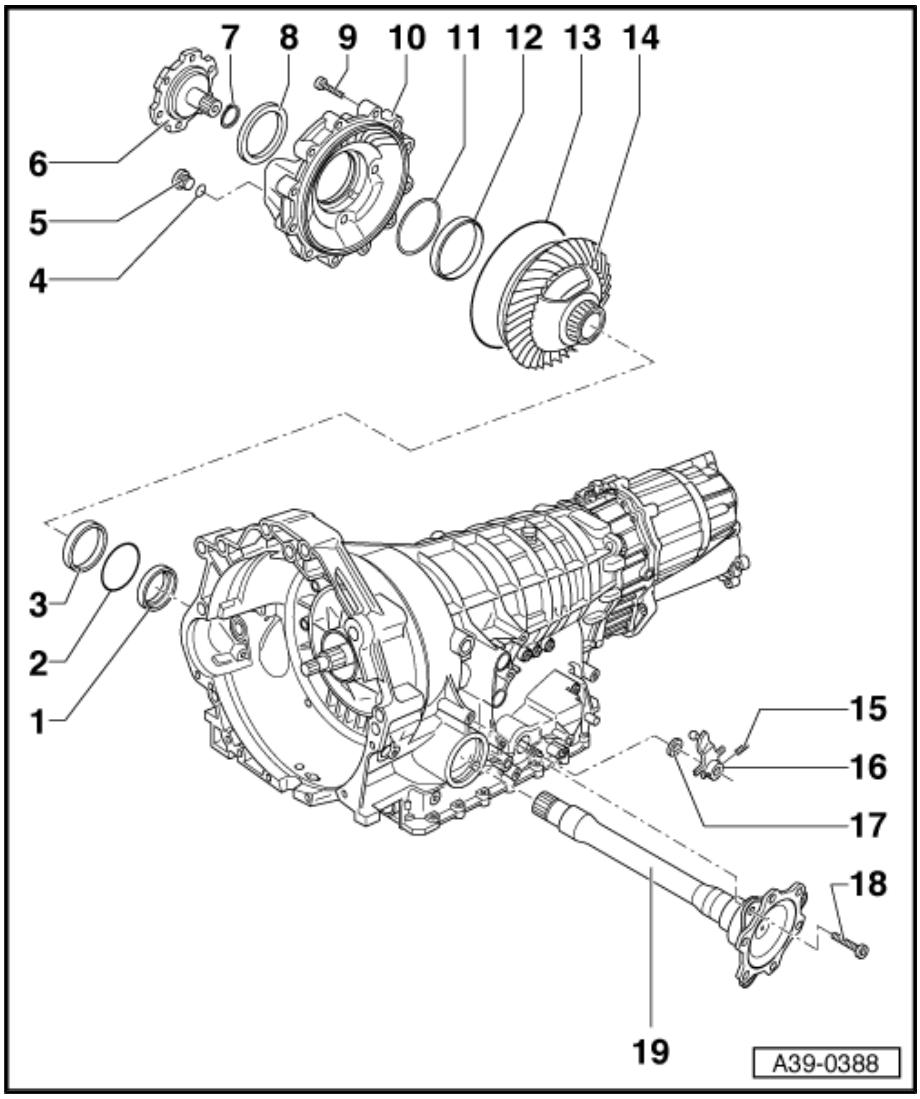
1 Servicing front final drive

Note

- *General repair instructions ⇒ page 1 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*

Overview:

1.1 Front final drive - exploded view



1 - Oil seal
- ❑ Between final drive and gearbox housing
- ❑ Renewing ⇒ page 103

2 - Shim
- ❑ Behind tapered roller bearing outer race

3 - Tapered roller bearing outer race

4 - O-ring
- ❑ Renew

5 - Screw plug
- ❑ Renew
- ❑ 35 Nm

6 - Flange shaft (right-side)
- ❑ Removing and installing ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39

7 - Circlip
- ❑ Renew

8 - Oil seal for flange shaft (right-side)
- ❑ Renewing ⇒ page 103

9 - Bolt
- ❑ 23 Nm
- ❑ Follow correct tightening sequence ⇒ page 106

10 - Cover for front final drive

11 - Shim
- ❑ Behind tapered roller bearing outer race

12 - Tapered roller bearing outer race

13 - O-ring for front final drive cover
- ❑ Renewing ⇒ page 106

14 - Differential

15 - Roll pin

16 - Gearbox selector lever

17 - Oil seal for selector shaft
- ❑ Renewing ⇒ page 107

18 - Bolt
- ❑ 23 Nm

19 - Flange shaft (left-side)
- ❑ Removing and installing ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39

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

Procedure

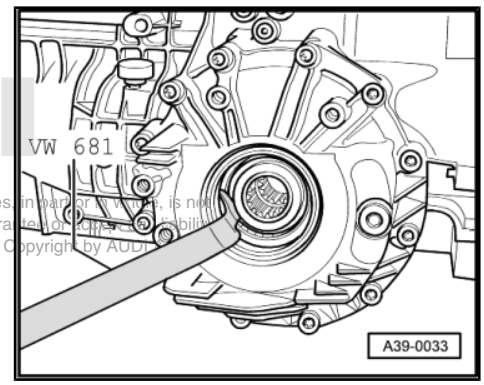
Note

- *General repair instructions* ⇒ page 1 .
- *Rules for cleanliness when working on the automatic gearbox* ⇒ page 11

– Remove flange shaft (right-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

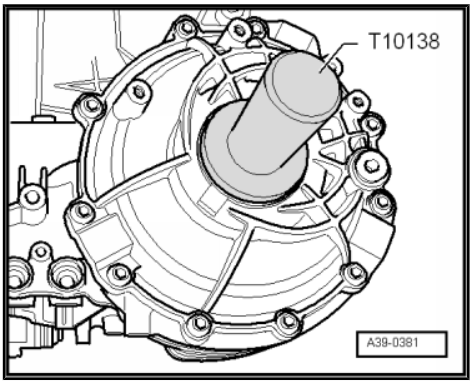
– Pull out flange shaft oil seal.

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



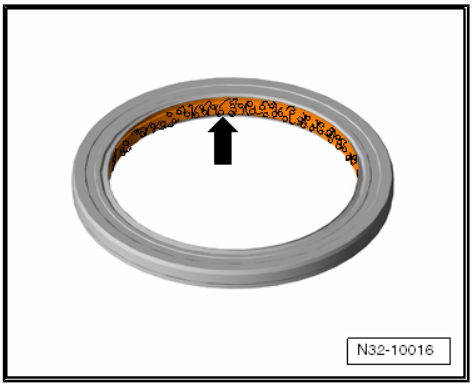
– Drive in new oil seal onto stop (take care to keep oil seal straight).

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



– Pack space between sealing lips -arrow- of oil seal half-full with sealing grease -G 052 128 A1- .

– Install flange shaft (right-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .



1.3 Renewing oil seal between final drive and gearbox housing

Requirements

- Gearbox secured to assembly stand ⇒ page 17 .

WARNING

The gearbox must not be placed down on ATF cooler or oil pan.

Procedure

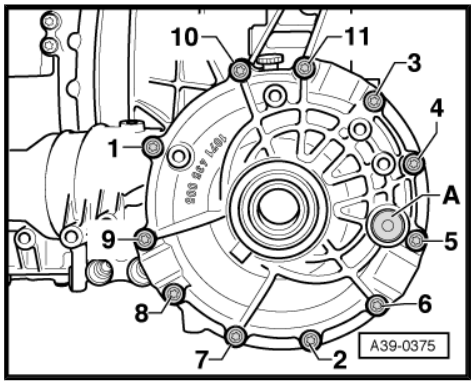
Note

- *A defective seal allows gear oil to enter the torque converter bellhousing.*
- *General repair instructions ⇒ page 1 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*

– Remove flange shaft (right-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

– Remove bolts in the sequence -11 ... 1-.

– Remove cover for front final drive together with outer race for tapered roller bearing and shim.

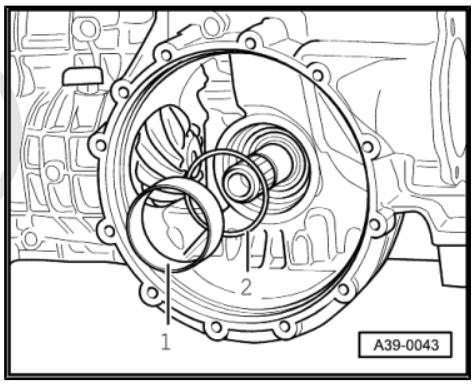


Note

The thickness of the shim has been measured to fit; the shim must not be replaced with another shim of different thickness.

– Remove differential.

– Remove tapered roller bearing outer race -1- for differential and shim -2- (behind outer race) from gearbox housing by hand.

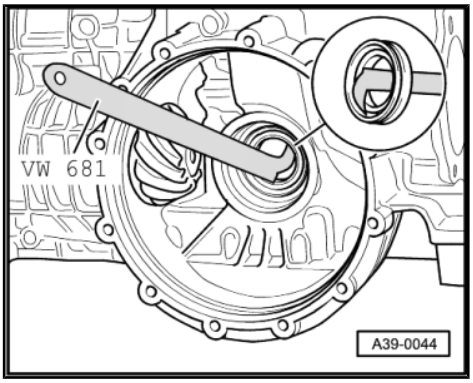


Note

The thickness of the shim has been measured to fit; the shim must not be replaced with another shim of different thickness.

– Remove flange shaft (left-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

– Pull out oil seal.



Note

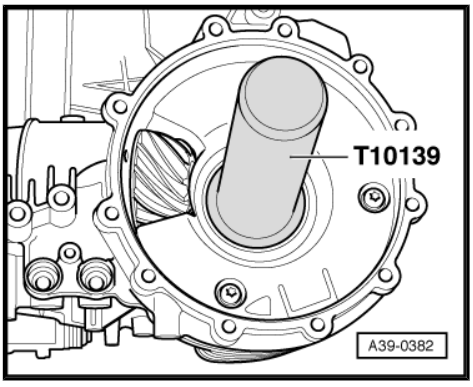
The oil seal extractor lever -VW 681- must be applied behind the two sealing lips of the oil seal. Do not position at outer circumference of oil seal as the contact surface in the gearbox housing could be damaged. Guide the lever carefully when removing the seal.

– Examine oil seal seat in gearbox housing for damage; reface surface if necessary.
– Lightly lubricate outer circumference and sealing lip of oil seal with gear oil.

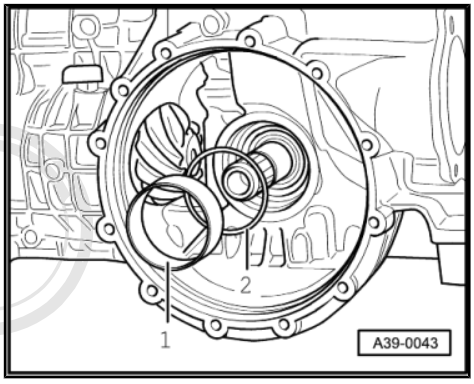
Note

Push oil seal onto thrust piece with the protruding sealing lip on the oil seal facing towards the tool.

– Drive in new oil seal as far as stop using thrust piece -T10139- .



– Insert shim -2- and tapered roller bearing outer race -1- for differential onto stop in gearbox housing by hand.



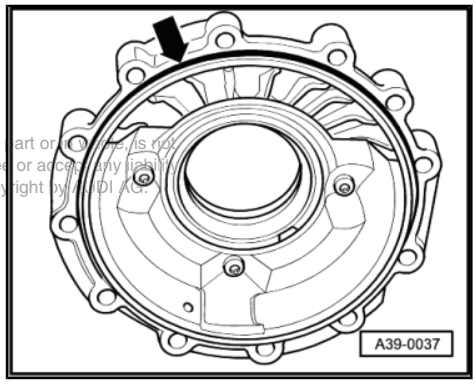
Note

Make sure that shim and outer race are kept straight when inserting.

– Renew O-ring -arrow-.
– Install differential in gearbox housing.

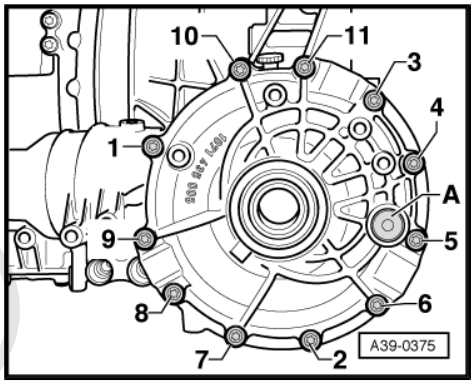
Note the following if the outer race for tapered roller bearing and the shim have dropped out of the front final drive cover:

– Lubricate shim and outer race for tapered roller bearing with gear oil and insert in cover for front final drive as far as stop.



– Tighten bolts of cover for front final drive as follows.

Stage	Tightening sequence
1	– Tighten bolts -1- and -2- to 3 Nm.
2	– Tighten bolts -1 ... 11- to 23 Nm in the sequence indicated.



– Install flange shafts (left and right) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

1.4 Renewing O-ring on cover for front final drive

Procedure

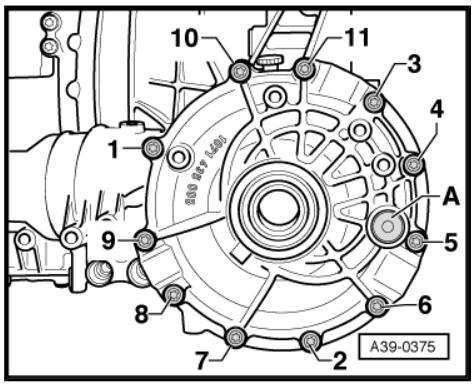
Note

- *General repair instructions ⇒ page 1*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*

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

– Remove flange shaft (right-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

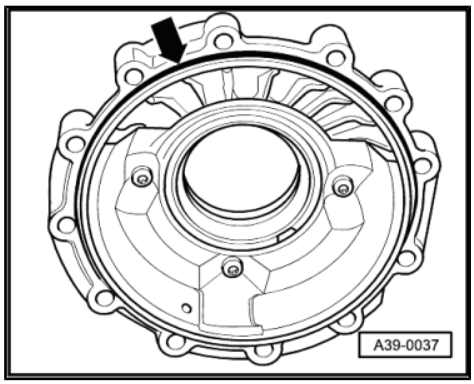
– Unscrew bolts in the sequence -11 ... 1- and remove cover for front final drive together with outer race for tapered roller bearing and shim.



Note

The thickness of the shim has been measured to fit; the shim must not be replaced with another shim of different thickness.

– Renew O-ring -arrow-.

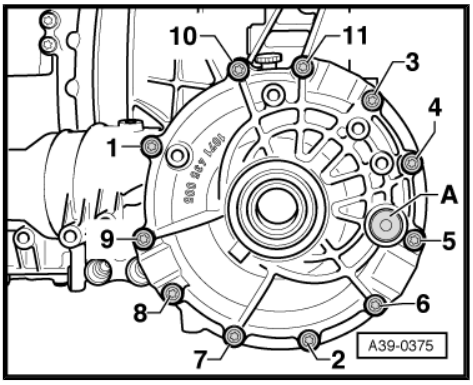


Note the following if the outer race for tapered roller bearing and the shim have dropped out of the front final drive cover:

– Lubricate shim and outer race for tapered roller bearing with gear oil and insert in cover for front final drive as far as stop.

– Tighten bolts of cover for front final drive as follows.

Stage	Tightening sequence
1	– Tighten bolts -1- and -2- to 3 Nm.
2	– Tighten bolts -1 ... 11- to 23 Nm in the sequence indicated.



– Install flange shaft (right-side) ⇒ Automatic gearbox 09L, four-wheel drive; Rep. gr. 39 .

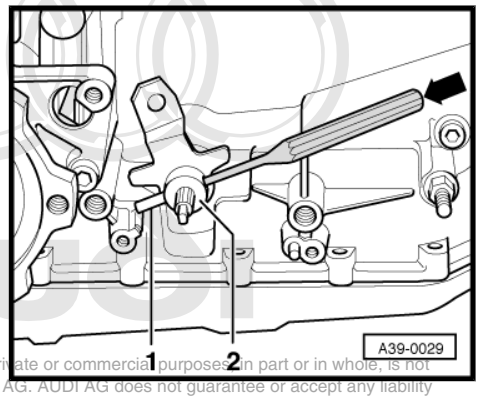
1.5 Renewing oil seal for selector shaft

Procedure

Note

- *General repair instructions ⇒ page 1 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*

– Drive out roll pin -1- at gearbox selector lever -2- -arrow- until it is possible to detach gearbox selector lever from selector shaft.

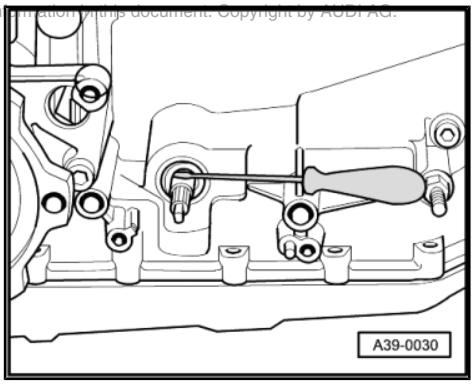


– Push a small screwdriver through the oil seal and pull it out.

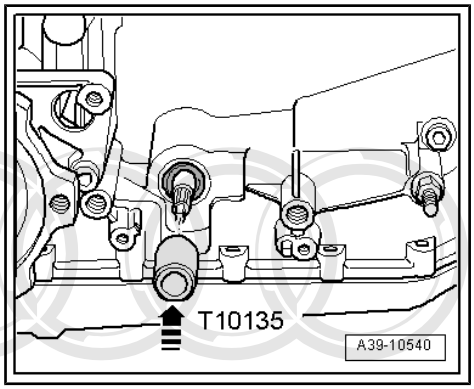
– Lubricate outer circumference and space between sealing lips of new oil seal with ATF.

– Fit oil seal onto selector shaft.

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



– Drive in oil seal onto stop using thrust piece -T10135- . Take care to keep seal straight when installing.
– Before installing gearbox selector lever, knock back roll pin through lever in opposite direction.
– Push gearbox selector lever onto selector shaft and drive in roll pin.



2 Servicing transfer box

Overview:

2.1 Removing and installing cover for self-locking centre differential

Removing

Note

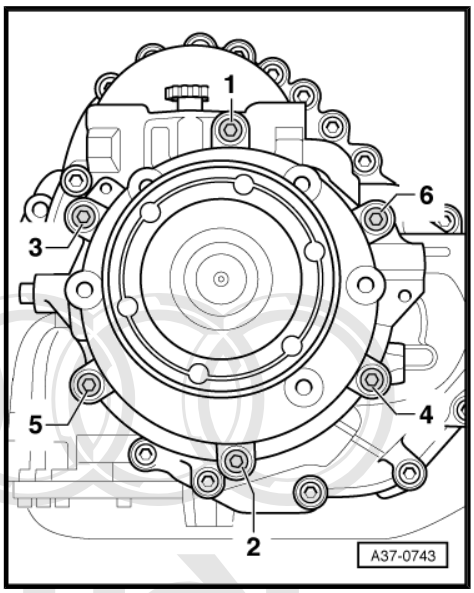
- *General repair instructions ⇒ page 1 .*
- *Rules for cleanliness when working on the automatic gearbox ⇒ page 11*

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

WARNING

Wear safety goggles.

– Slacken and remove securing bolts for cover for self-locking centre differential in the sequence -6 ... 1- and allow gear oil to drain out.



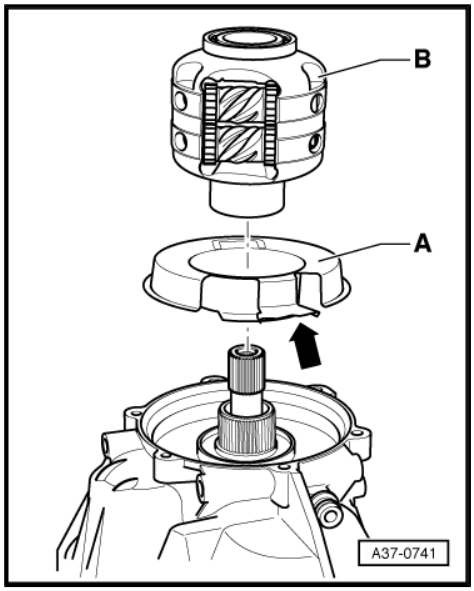
Note

The cover does not have a drain plug; gear oil can only be drained by removing the cover.

Caution

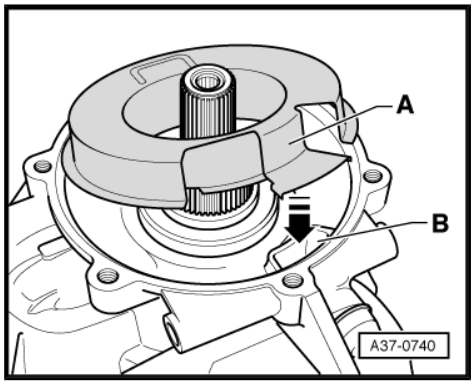
Pull the cover for the self-locking centre differential carefully towards the rear off the gearbox. Take care that self-locking centre differential does not drop out of gearbox.

– Secure self-locking centre differential -B- and baffle plate -A- to prevent them dropping out, or pull them off the output shaft towards the rear.



Installing

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



Note

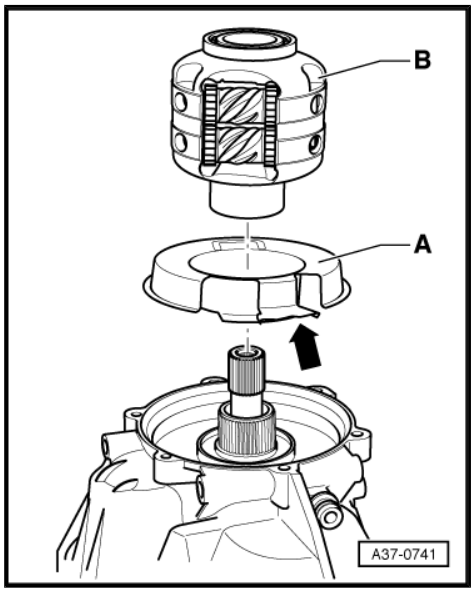
Renew O-ring on cover for transfer box.

Note the following if the self-locking centre differential -B- and the baffle plate -A- have been removed:

– Clean baffle plate, lubricate with gear oil and insert in gearbox.

• Installation position: tongue on baffle plate should be positioned on the gearbox so that the side lugs are located above opening -B- -arrow-.

– Fit self-locking centre differential -B- onto splines of output shaft (turn slightly at the same time).



Note

Check installation position of tongue on baffle plate -arrow- again.

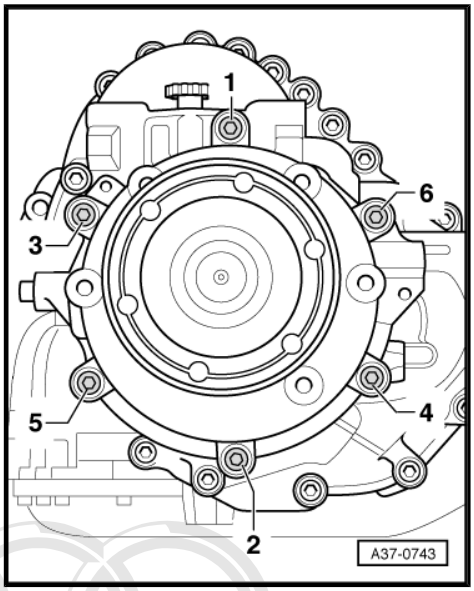
– Check that self-locking centre differential can be turned by hand when it is in position.

– Check whether the tongue -arrow- on the baffle plate is still located properly.

– Place cover onto self-locking centre differential with shaft installed; turn slightly if necessary.

– Tighten bolts of cover for self-locking centre differential as follows:

Stage	Tightening sequence
1	– Tighten bolts -1- and -2- to 3 Nm.
2	– Tighten bolts -1 ... 6- to 23 Nm in the sequence indicated.



2.2 Renewing ball bearing for self-locking centre differential

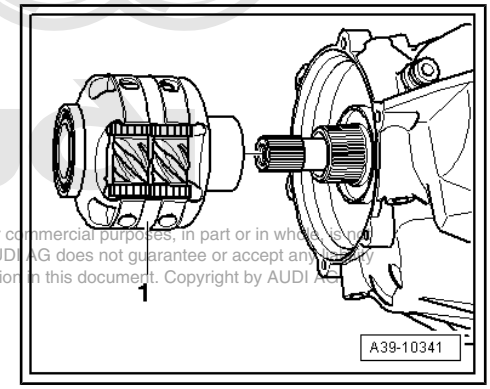
Procedure

– Remove cover for self-locking centre differential ⇒ page 109 .

– Pull centre differential -1- off output shaft.

Note

Different versions of centre differential -1- depending on equipment version.



– Press ball bearing off centre differential.

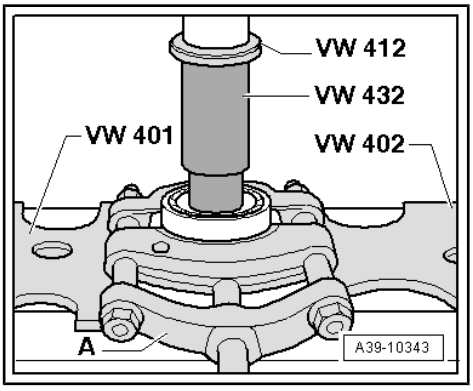
Caution

Risk of damage to the centre differential.

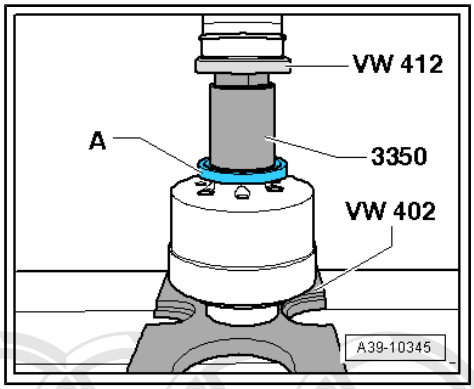
- *A second mechanic must hold the centre differential when pressing off the ball bearing.*

A - Splitter 22 ... 115 mm -Kukko 17/2-

- The collar of press tool -VW 432- points towards ball bearing.



– Press ball bearing onto centre differential.
– Press ball bearing -A- onto centre differential as far as stop using workshop press in conjunction with assembly tool -3350- .
– Install cover for self-locking centre differential ⇒ page 109 .



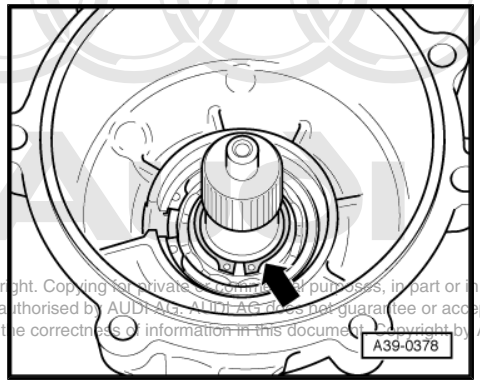
2.3 Renewing oil seal for flange shaft (rear)

Procedure

– Remove cover for self-locking centre differential ⇒ page 109 .
– Remove circlip -arrow- on inner side of cover.

Note

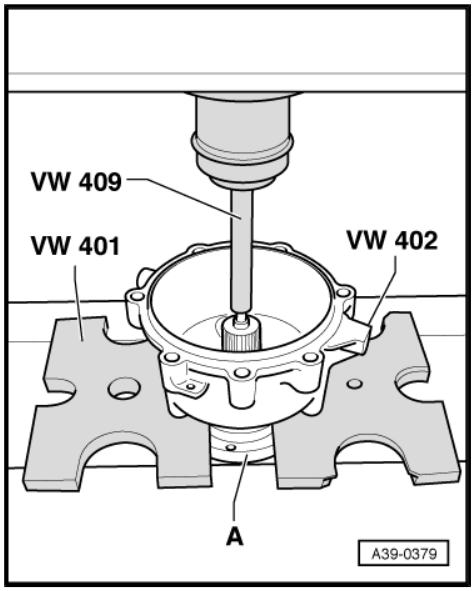
The circlip locates the flange shaft on the bearing in the cover.



– Using press tool -VW 409- , press flange shaft out of cover for self-locking centre differential; to do so, place cover on thrust plate -VW 401- and thrust plate -VW 402- .

Note

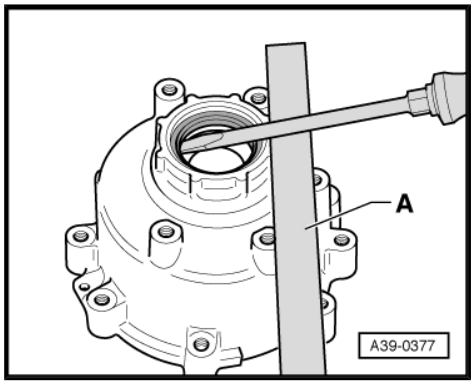
Hold flange shaft -A- with one hand to prevent if falling.



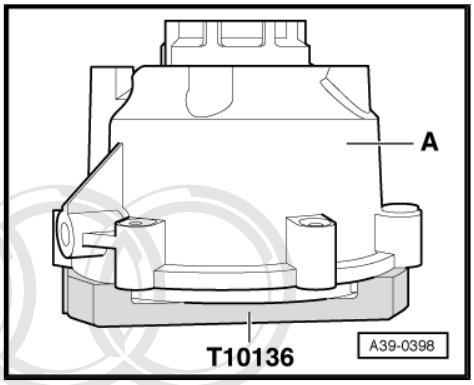
– Pry out oil seal.

Note

To prevent damage to the housing, place something underneath (e.g. metal bar -A-).



– Place cover -A- for self-locking centre differential on fitting tool -T10136- .



Note

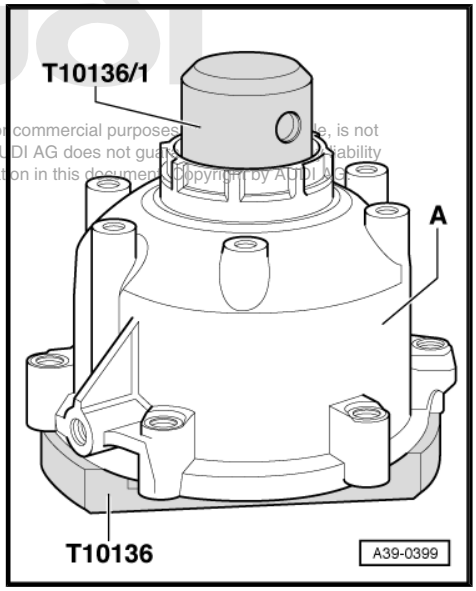
The peg in the middle of the tool is centered and faces upwards in the cover. It serves as a guide and stop for press tool -T10136/1- .

– Lubricate outer circumference of seal with gear oil.

– Push new oil seal onto press tool -T10136/1- .

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

– Insert press tool -T10136/1- with oil seal into cover from above.

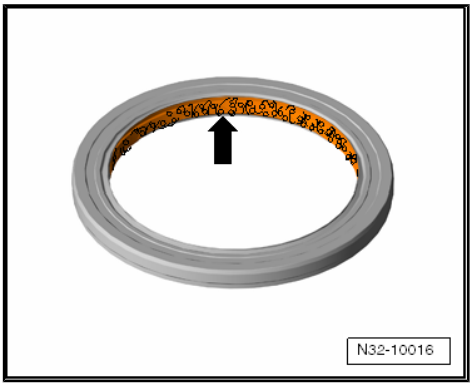


Note

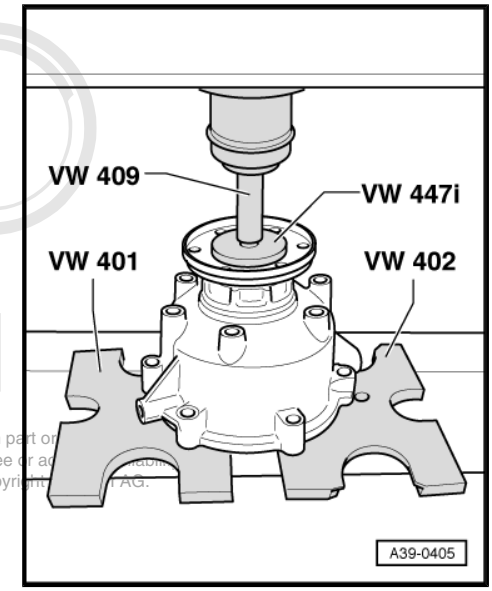
The peg of the thrust piece -T10136- serves as a guide from below and also as a stop for press tool -T10136/1- .

– Drive in new oil seal onto stop (take care to keep oil seal straight).

– Pack space between sealing lips -arrow- of oil seal half-full with sealing grease -G 052 128 A1- .



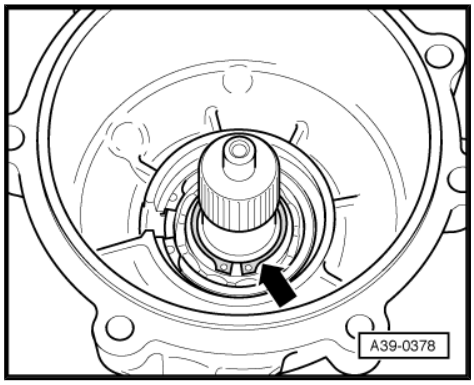
– Press flange shaft with press tool -VW 409- and thrust pad - VW 447 i- into cover for self-locking centre differential; to do so, place cover on thrust plate -VW 401- and thrust plate - VW 402- .



Note

Only insert flange shaft as far as necessary to install circlip.

– Install circlip -arrow- in groove of flange shaft on inner side of cover.



– Install cover for self-locking centre differential ⇒ page 109 .

3 Assessment of wear on gearbox components

Overview:

3.1 Assessment of wear by checking ATF for colour and contamination

Colour of ATF

- Colour yellow or blue: ATF is new.
- Colour brown: ATF is used (approx. 60,000 km upwards)
- Colour black: one of the gearbox components is defective (e.g. overheating of torque converter lock-up 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 ∅ and quantity is not more than 1 cm^3.
- Metal particles larger than 2.0 mm ∅ on magnet in oil pan or in ATF indicate abnormal wear or a mechanical fault in the gearbox.

Procedure if ATF is contaminated

ATF very contaminated (ATF black or metal particles in ATF ⇒ page 115):

- Dismantle and clean complete gearbox.
- Flush ATF galleries and blow through with compressed air.
- Dismantle and check all clutches.
- Renew torque converter (cannot be cleaned).
- Renew mechatronic unit (cannot be cleaned).
- Clean ATF lines and ATF cooler and renew ATF strainer.

3.2 Clutch „C“

3 - Friction plate

- ❑ Checking for wear ⇒ page 116

4 - Outer plate

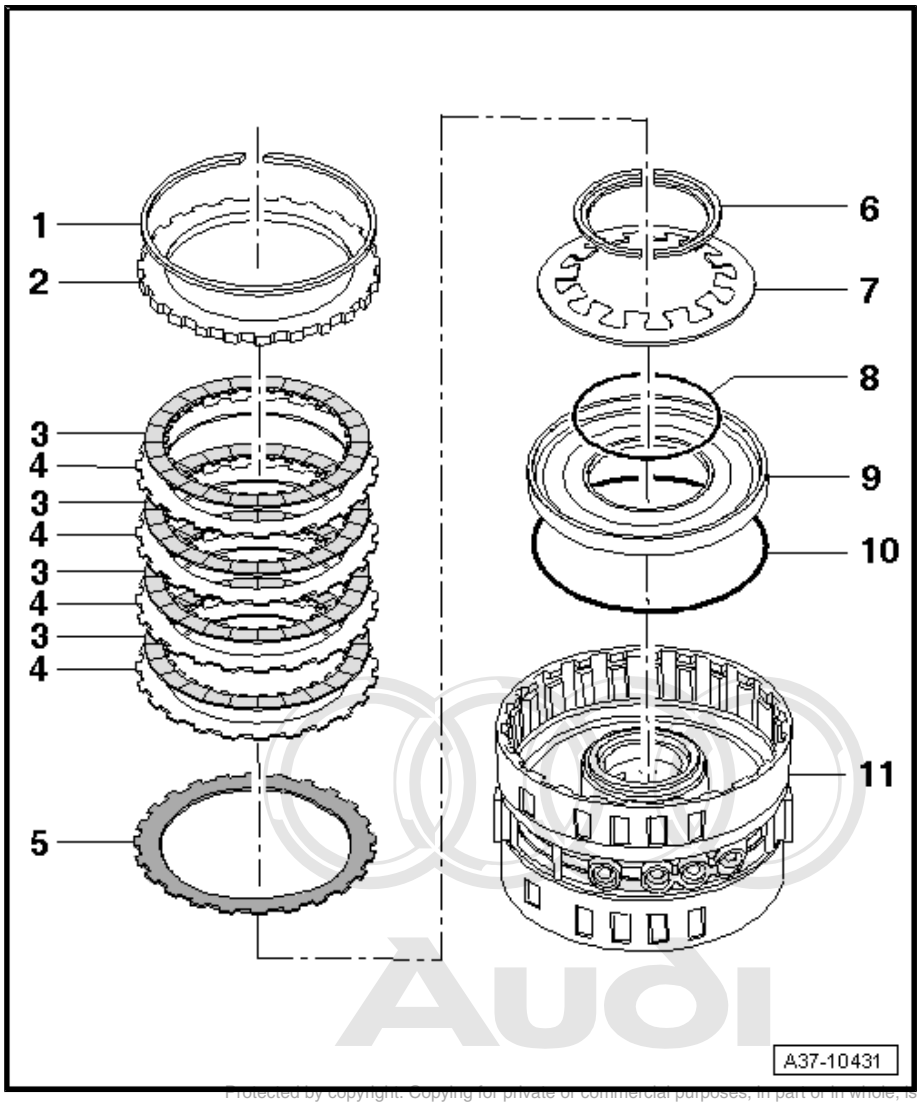
- ❑ Checking for wear ⇒ page 116

9 - Piston„C“

- ❑ Check for wear

11 - Cylinder „C/D“

- ❑ Check running surface of piston „C“ for scoring by friction plates ⇒ page 117
- ❑ Checking bearing bush for wear ⇒ page 117



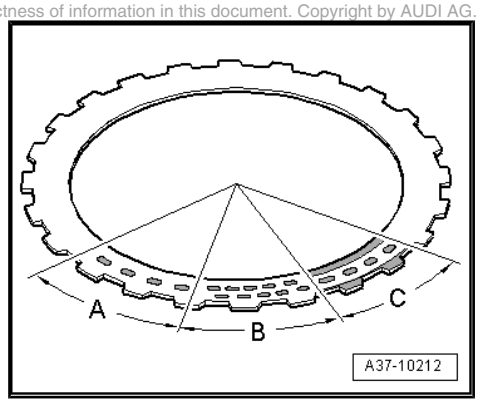
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

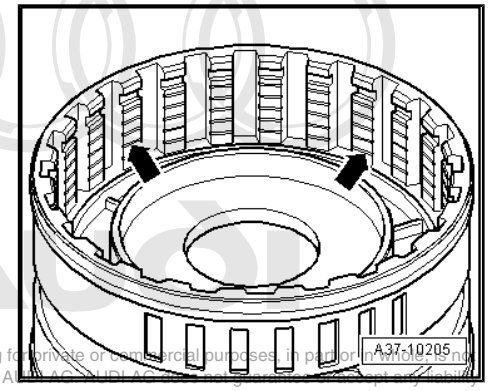
A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

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 inner surfaces of cylinder „C/D“ for traces of scoring by friction plates



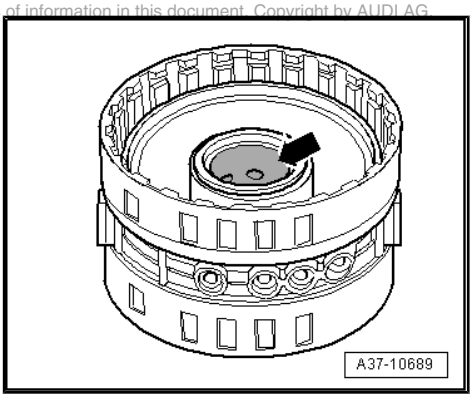
– Check inner surfaces of cylinder „C/D“ for scoring by friction plates.

• The friction plates must not catch in the scores.

If the scores caused by the friction plates are deeper than 0.5 mm:

– Renew cylinder „C/D“.

Checking bearing bush in cylinder „C/D“ for wear



– Check running surface of bearing bush -arrow- inside cylinder „C/D“ for wear.

• The running surface should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew cylinder „C/D“.

• Proceed as follows if the running surface has no blue discoloration 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.

If scoring is still present after this step:

– Renew cylinder „C/D“.

3.3 Clutch „D“

1 - Cylinder „C/D“

- ❑ Check running surface of piston „D“ for scoring by friction plates ⇒ page 119
- ❑ Checking bearing bush for wear ⇒ page 119

5 - Piston„D“

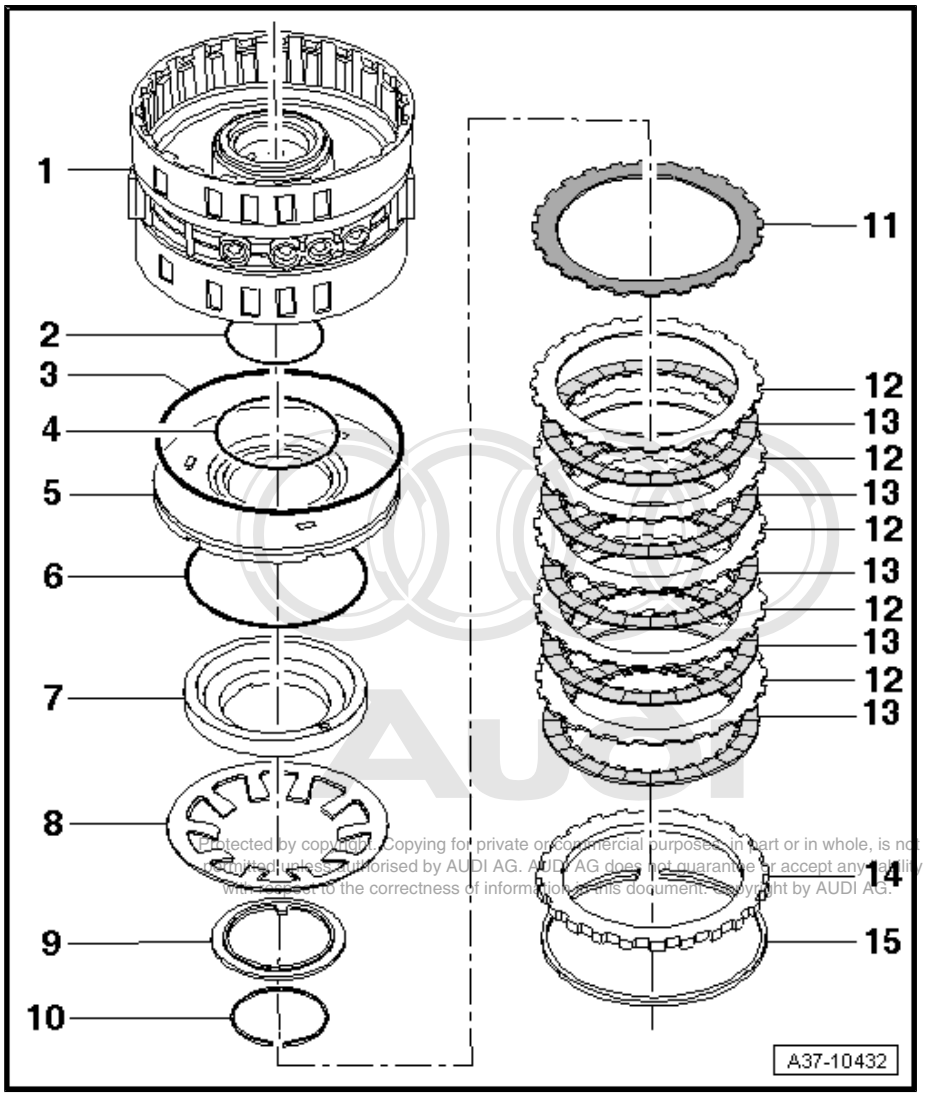
- ❑ Check for wear

12 - Outer plate

- ❑ Checking for wear ⇒ page 118

13 - Friction plate

- ❑ Checking for wear ⇒ page 118



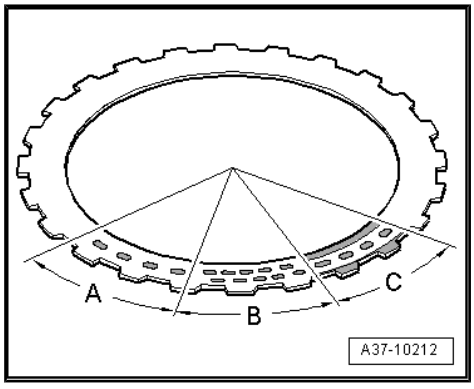
Checking friction plates and outer plates for wear

Signs of overheating on the outer plates indicate that the friction plates are worn. Assess the degree of wear as described below:

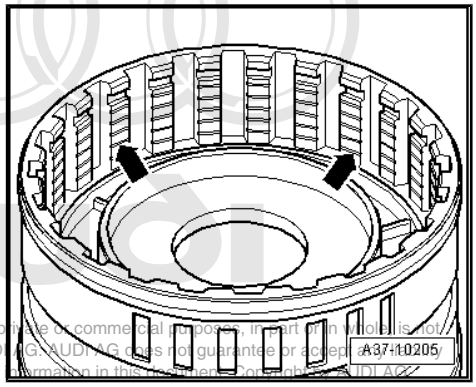
A - Heat discoloration spots at intervals of more than 20 mm: outer plates and friction plates are OK; they can be used again.

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 inner surfaces of cylinder „C/D“ for traces of scoring by friction plates



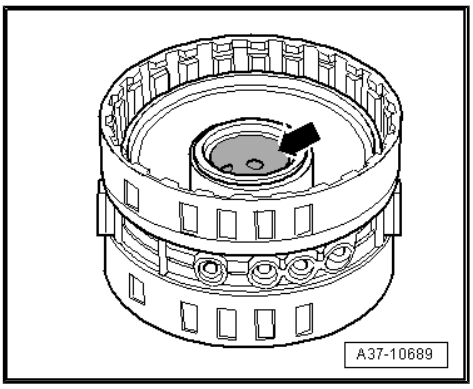
– Check inner surfaces of cylinder „C/D“ for scoring by friction plates.

• The friction plates must not catch in the scores.

If the scores caused by the friction plates are deeper than 0.5 mm:

– Renew cylinder „C/D“.

Checking bearing bush in cylinder „C/D“ for wear



– Check running surface of bearing bush -arrow- inside cylinder „C/D“ for wear.

• The running surface should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew cylinder „C/D“.

• Proceed as follows if the running surface has no blue discoloration and there are only slight scores:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

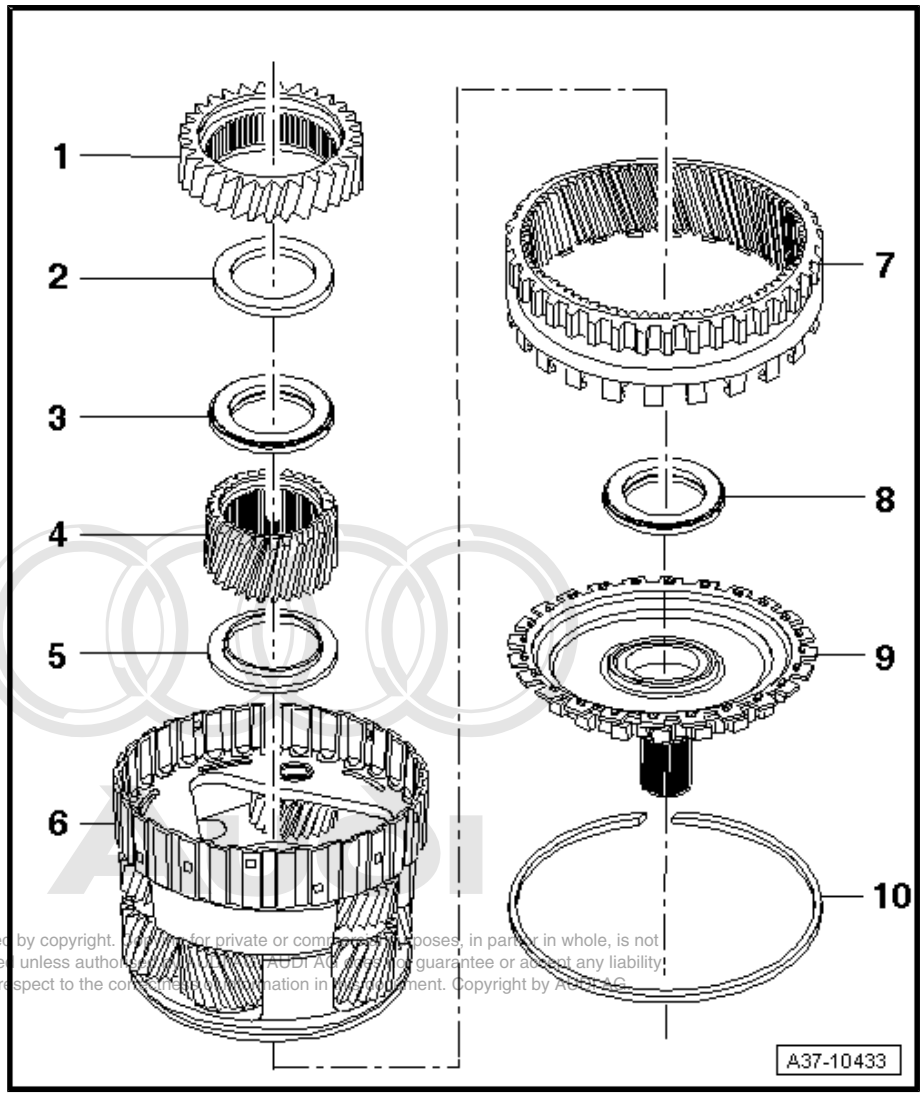
– Clean running surface thoroughly with clean cloth and check running surface.

• The running surface should now be in as-new condition.

If scoring is still present after this step:

– Renew cylinder „C/D“.

3.4 Planetary drive „II“ and „III“



1 - Sun gear „II“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

3 - Axial needle bearing

- ❑ Inspect visually for damage: axial needle bearing and contact surfaces of thrust washer -2- should be in as-new condition; renew both parts if necessary.

4 - Sun gear „III“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

5 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing should be in as-new condition; renew if necessary.

6 - Planet carrier „II“ and „III“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged
- ❑ Checking axial and radial clearance of planetary gears ⇒ page 121

7 - Annulus „III“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

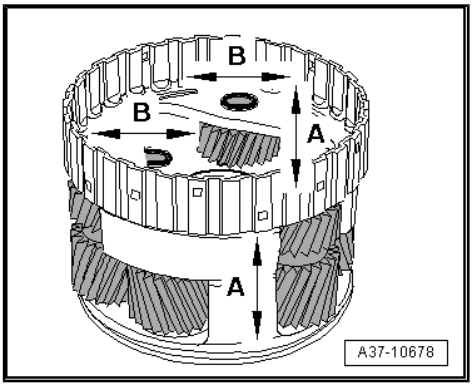
8 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing should be in as-new condition; renew if necessary.

9 - Output shaft

- ❑ Check running surface of output shaft for wear ⇒ page 121
- ❑ Check splines

Checking axial and radial clearance of planetary gears



– Check axial clearance of planetary gears -arrows A-.

• Wear limit (axial clearance): 0.4 mm

– Check planetary gears for radial clearance -arrow B-.

• The planetary gears must not have any noticeable radial clearance.

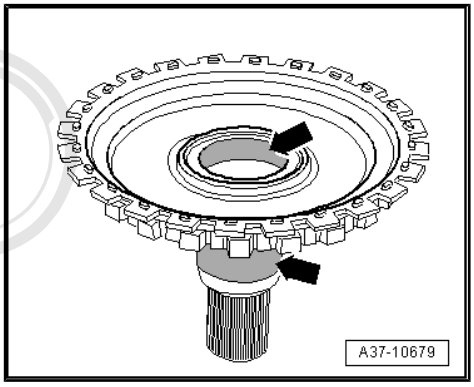
– Check shafts for planetary gears.

• Shafts must be properly secured (check peening)

• Make sure area around shafts has no blue discolouration.

– Renew planet carrier „II“ and „III“ if necessary.

Checking running surface of output shaft for wear



– Check running surfaces on inside and outside of output shaft -arrows- for wear.

• The running surface should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew output shaft.

Proceed as follows if the running surface has no blue discoloration 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.

If scoring is still present after this step:

– Renew output shaft.

3.5 Clutch „B“

3 - Friction plate

- ❑ Checking for wear ⇒ page 122

4 - Outer plate

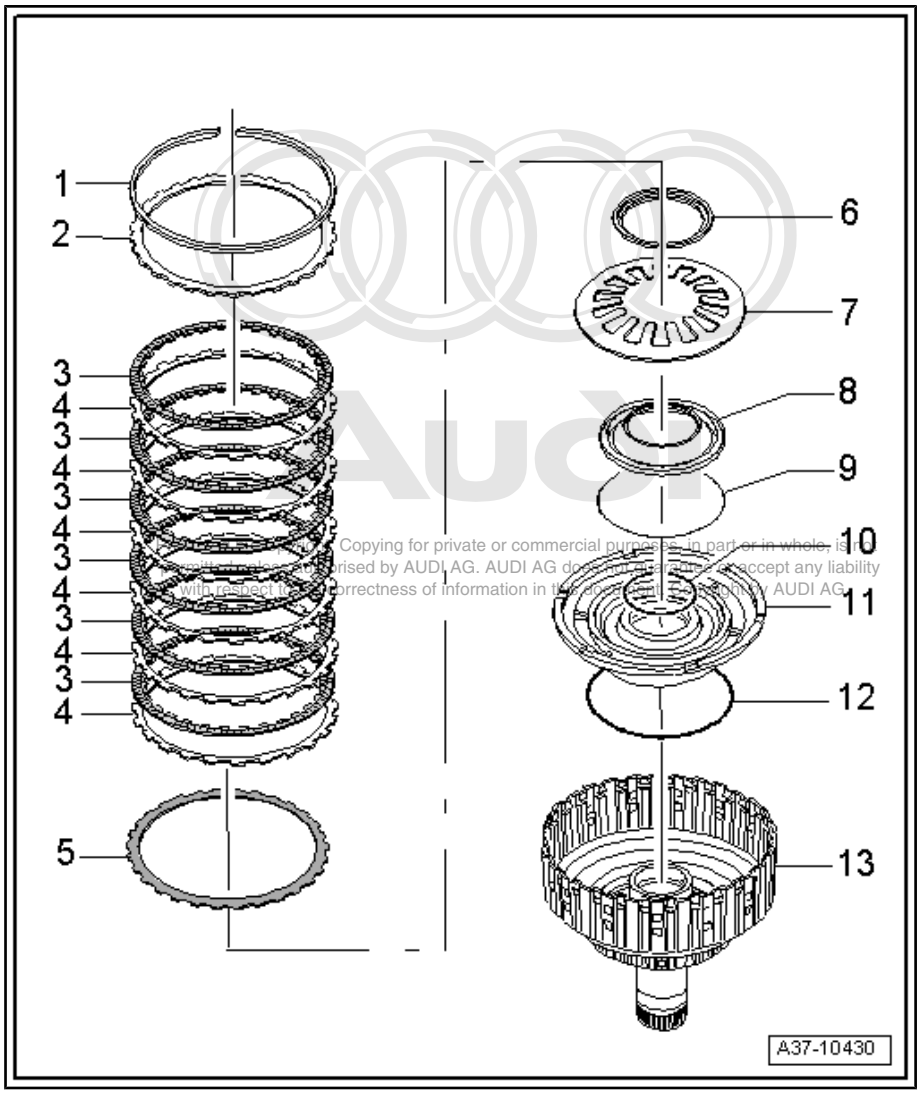
- ❑ Checking for wear ⇒ page 122

11 - Piston „B“

- ❑ Check for wear

13 - Cylinder „B“

- ❑ Checking running surface of shaft ⇒ page 123
- ❑ Check running surface for piston „B“ for traces of scoring by friction plates ⇒ page 123



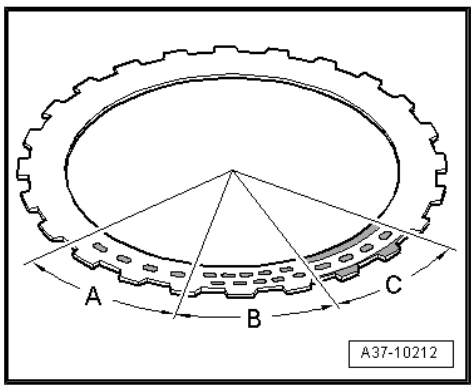
Checking friction plates and outer plates for wear

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 running surfaces of shaft of cylinder „B“ for wear

– Check running surfaces -arrows- of shaft for wear.

• The running surfaces should not have any deep scoring and/ or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew cylinder „B“.

Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

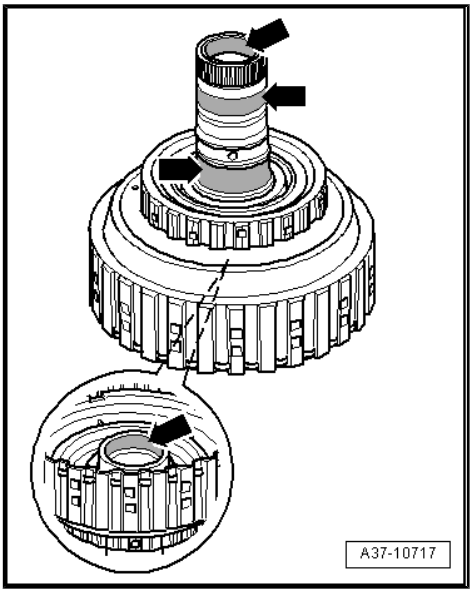
– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface.

• The running surfaces should now be in as-new condition.

If scoring is still present after this step:

– Renew cylinder „B“.



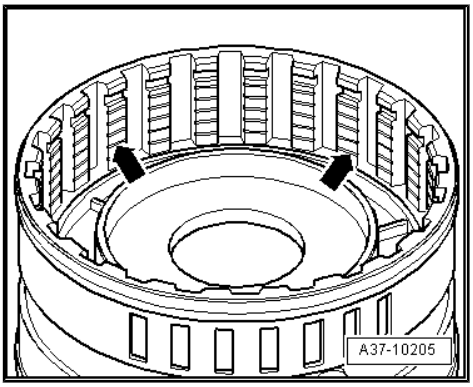
Checking inner surfaces of cylinder „B“ for traces of scoring by friction plates

– Check inner surfaces of cylinder „B“ for scoring by friction plates.

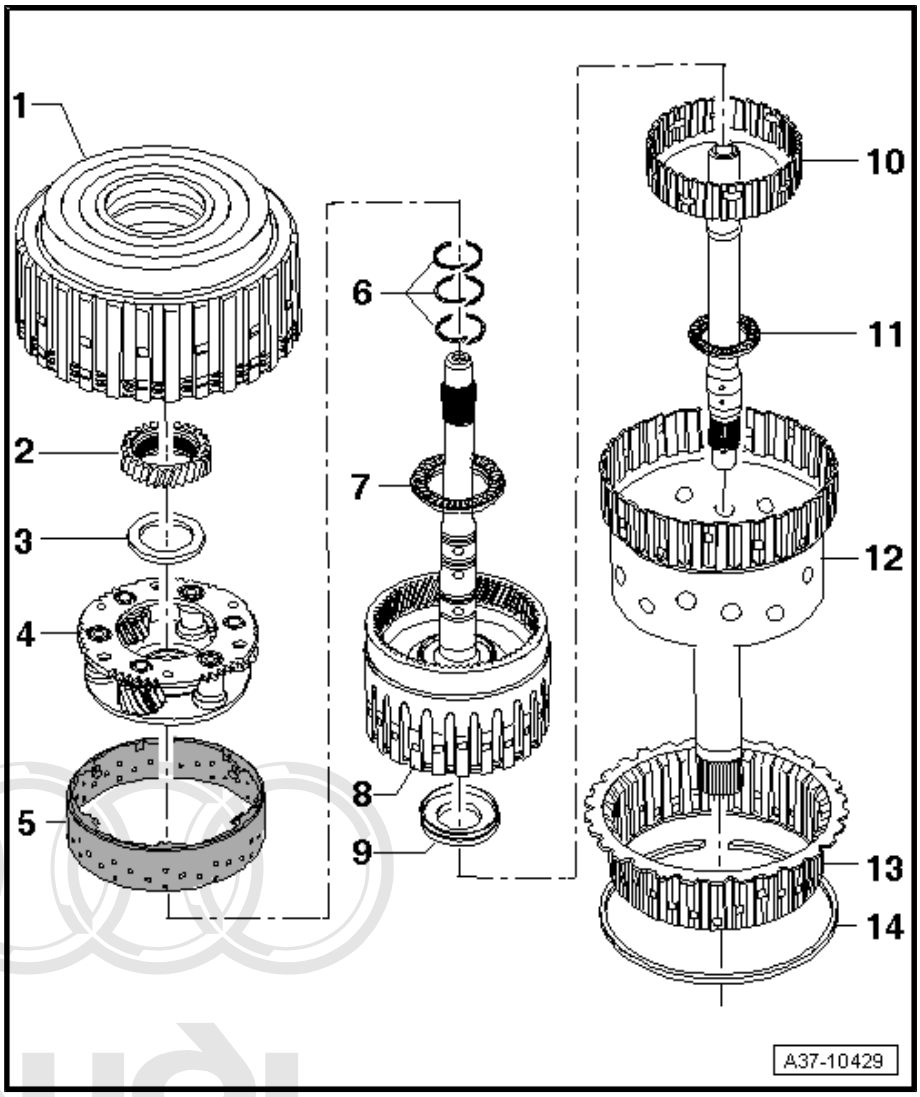
• The friction plates must not catch in the scores.

If the scores caused by the friction plates are deeper than 0.5 mm:

– Renew cylinder „B“.



3.6 Body „II“



1 - Clutch „A“

- ❑ Wear assessment ⇒ page 126

2 - Sun gear „I“

- ❑ Check teeth of planetary drive; renew planetary drive if teeth are damaged

3 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary

4 - Planet carrier „I“

- ❑ Check teeth of planetary drive; if teeth are damaged, renew planetary drive „I“ and clutch „E“ with annulus „I“
- ❑ Checking axial and radial clearance of planetary gears ⇒ page 125

6 - Rectangular section seals

- ❑ Checking for wear ⇒ page 125

7 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary

8 - Clutch „E“ with annulus „I“

- ❑ Wear assessment of clutch „E“ ⇒ page 128
- ❑ Check teeth of annulus „I“; if teeth are damaged, renew cylinder „E“ and planet carrier „I“
- ❑ Check inner bearing bushes for wear

9 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary

10 - Inner plate carrier „E“ with intermediate shaft

- ❑ Checking running surfaces for wear ⇒ page 125
- ❑ Check inner bearing bushes for wear

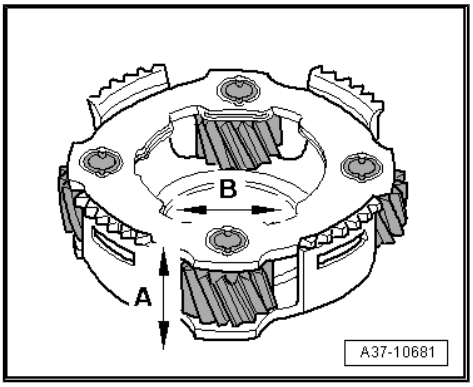
11 - Axial needle bearing

- ❑ Perform visual check for damage: axial needle bearing and contact surfaces should be in as-new condition; renew if necessary

12 - Inner plate carrier „A“

- ❑ Check running surfaces of shaft for wear ⇒ page 126
- ❑ Check inner bearing bushes for wear

Checking axial and radial clearance of planetary gears



– Check axial clearance of planetary gears -arrow A-.

• Wear limit (axial clearance): 0.4 mm

– Check planetary gears for radial clearance -arrow B-.

• The planetary gears must not have any noticeable radial clearance.

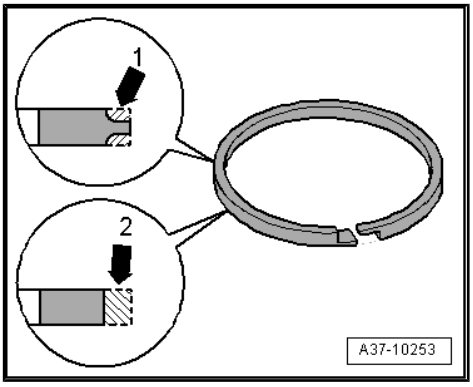
– Check shafts for planetary gears.

• Shafts must be properly secured (check peening)

• Make sure area around shafts has no blue discolouration.

– Renew planet carrier „I“ if necessary.

Checking rectangular section seals for wear



Note

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.

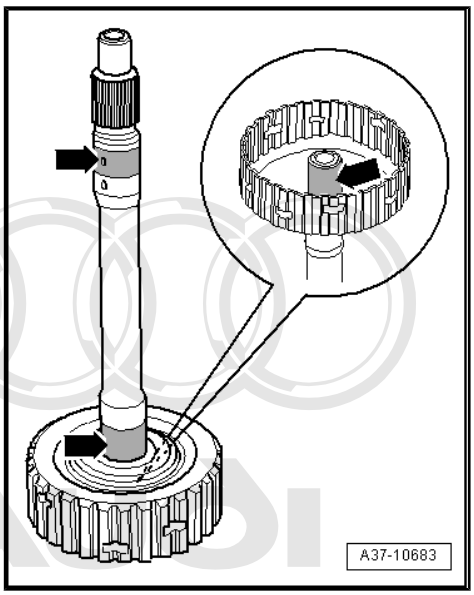
If the axial wear -arrow 1- on the rectangular section seals is excessive (slight wear on the outside corners is normal):

– Renew cylinder „E“ with annulus „I“ ⇒ Item 1 (page 128)

If the radial wear on the rectangular section seals exceeds 0.3 mm -arrow 2- (compare with thickness of new rectangular section seal):

– Renew ATF supply unit with stator shaft.

Checking running surfaces of shaft of inner plate carrier „E“ with intermediate shaft for wear



– Check running surfaces -arrows- of shaft for wear.

• The running surfaces should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew inner plate carrier „E“ with intermediate 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).

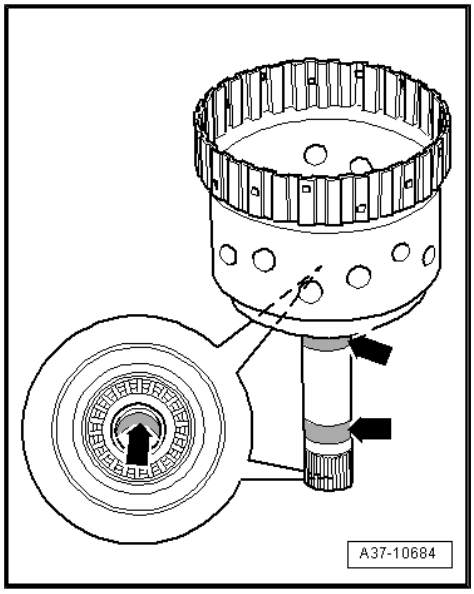
– Clean running surface thoroughly with clean cloth and check running surface.

• The running surfaces should now be in as-new condition.

If scoring is still present after this step:

– Renew inner plate carrier „E“ with intermediate shaft.

Checking running surfaces of inner plate carrier „A“ for wear.



– Check running surfaces on inside and outside of shaft -arrows- for wear.

• The running surfaces should not have any deep scoring and/ or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew inner plate carrier „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.

If scoring is still present after this step:

– Renew inner plate carrier „A“.

3.7 Clutch „A“

1 - Cylinder „A“

❑ Checking running surfaces for wear
⇒ page 127

4 - Piston „A“

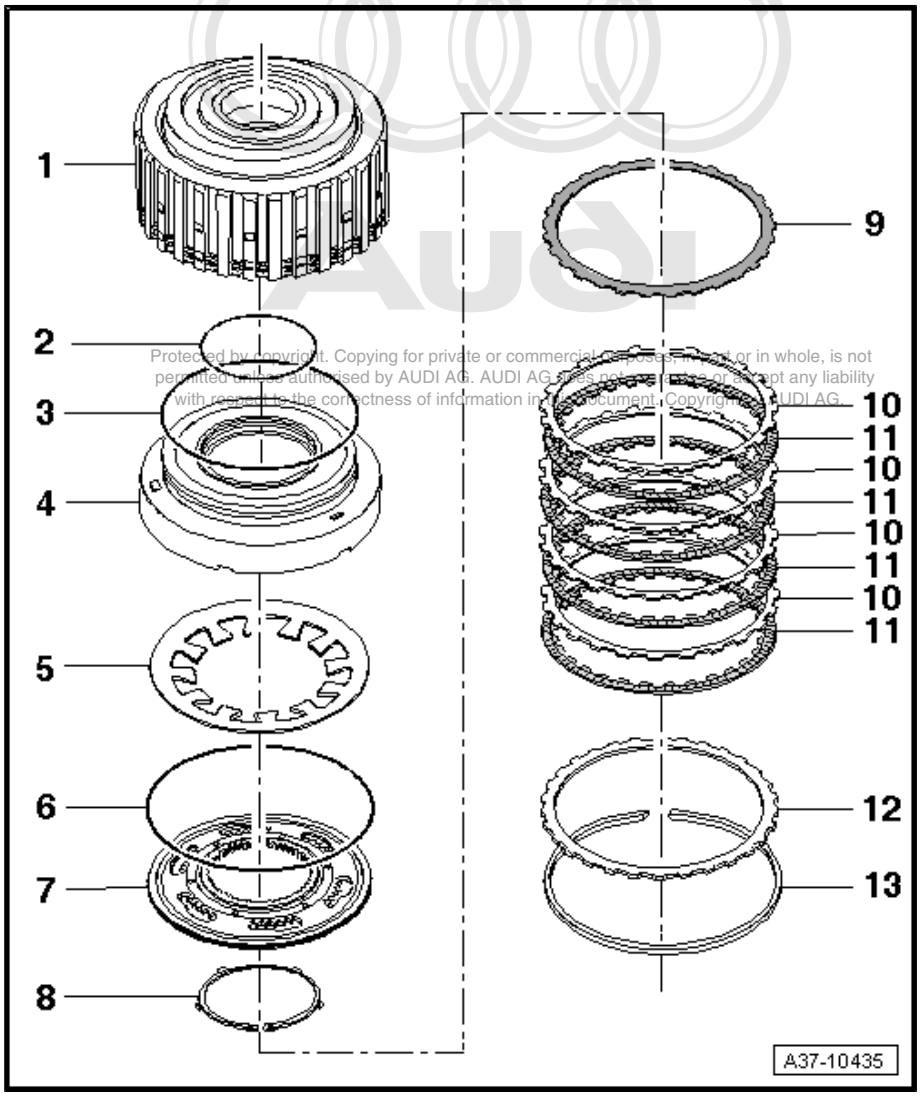
❑ Check for wear

10 - Outer plate

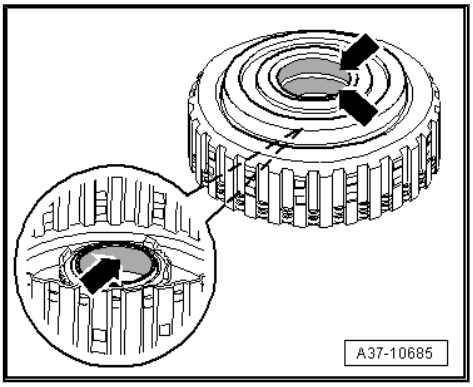
❑ Checking for wear
⇒ page 127

11 - Friction plate

❑ Checking for wear
⇒ page 127



Checking running surfaces for wear



– Check running surfaces -arrows- on inside of cylinder „A“ for wear.

• The running surface should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew cylinder „A“.

Proceed as follows if the running surface has no blue discoloration and there are only slight scores:

– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

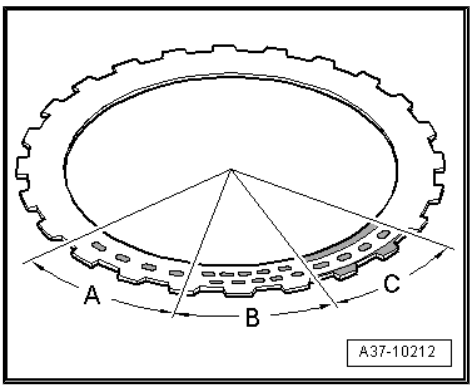
– Clean running surface thoroughly with clean cloth and check running surface.

• The running surface should now be in as-new condition.

If scoring is still present after this step:

– Renew cylinder „A“.

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.

3.8 Clutch „E“

1 - Cylinder „E“ with annulus „I“

- ❑ Checking running surfaces for wear
⇒ page 128

4 - Piston „E“

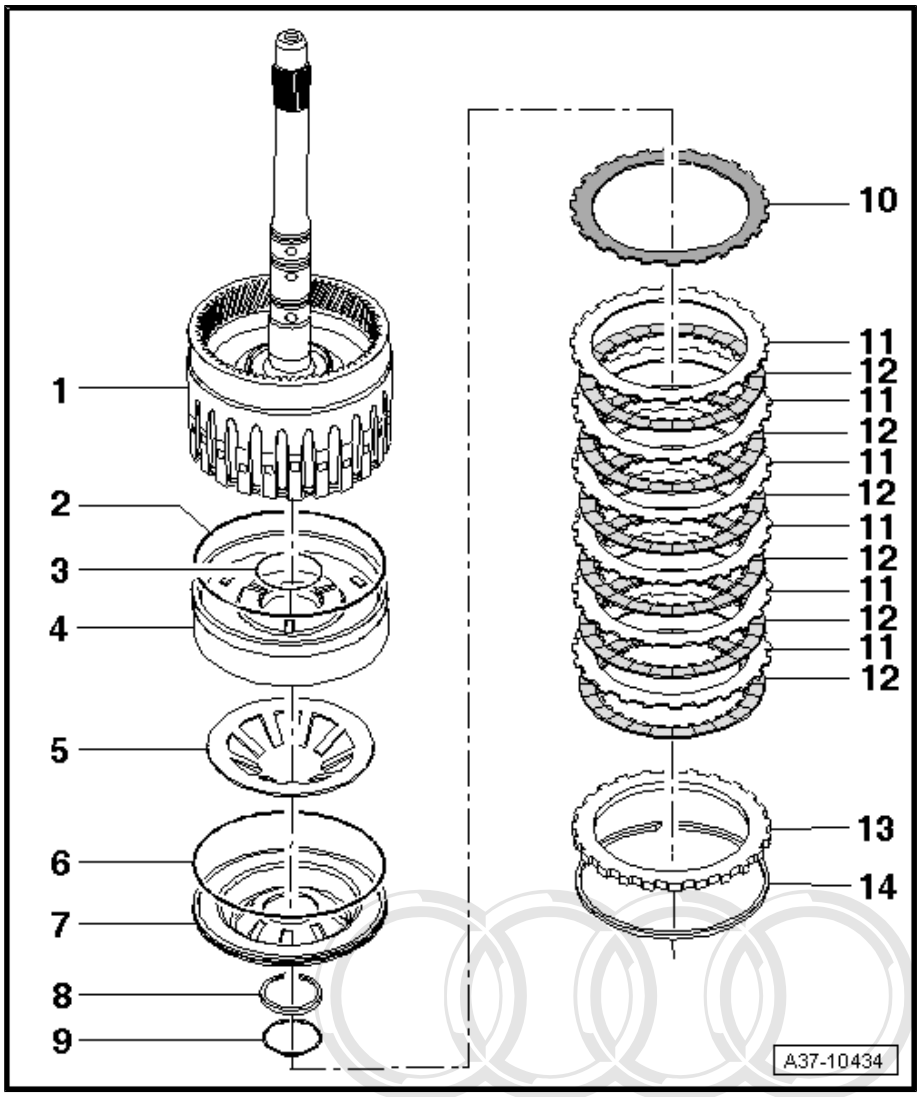
- ❑ Check for wear

11 - Outer plate

- ❑ Checking for wear
⇒ page 129

12 - Friction plate

- ❑ Checking for wear
⇒ page 129



Checking running surfaces of shaft of cylinder „E“ for wear

– Check running surfaces on inside and outside of shaft -arrows- for wear.

• The running surfaces should not have any deep scoring and/ or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew cylinder „E“ with annulus „I“.

Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

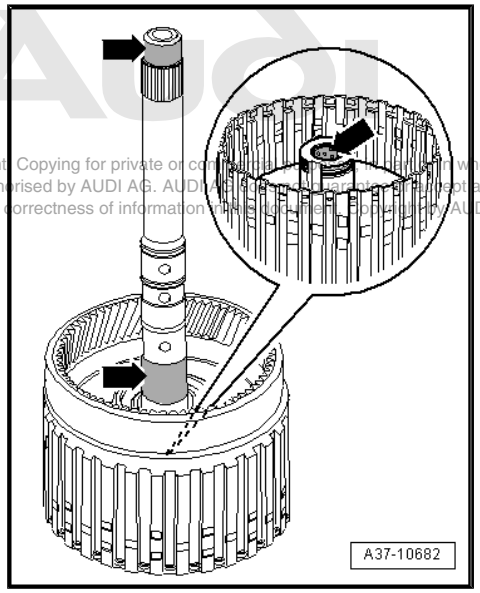
– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface.

• The running surfaces should now be in as-new condition.

If scoring is still present after this step:

– Renew cylinder „E“ with annulus „I“.



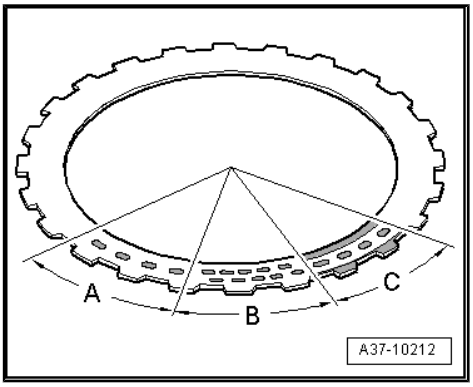
Checking friction plates and outer plates for wear

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.



3.9 ATF supply unit

3 - Needle bearing for torque converter

- ❑ Perform visual check for damage: needle bearing should be in as-new condition; renew if necessary

5 - ATF pump housing

- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 130

6 - Annulus

- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 130

7 - ATF pump gear

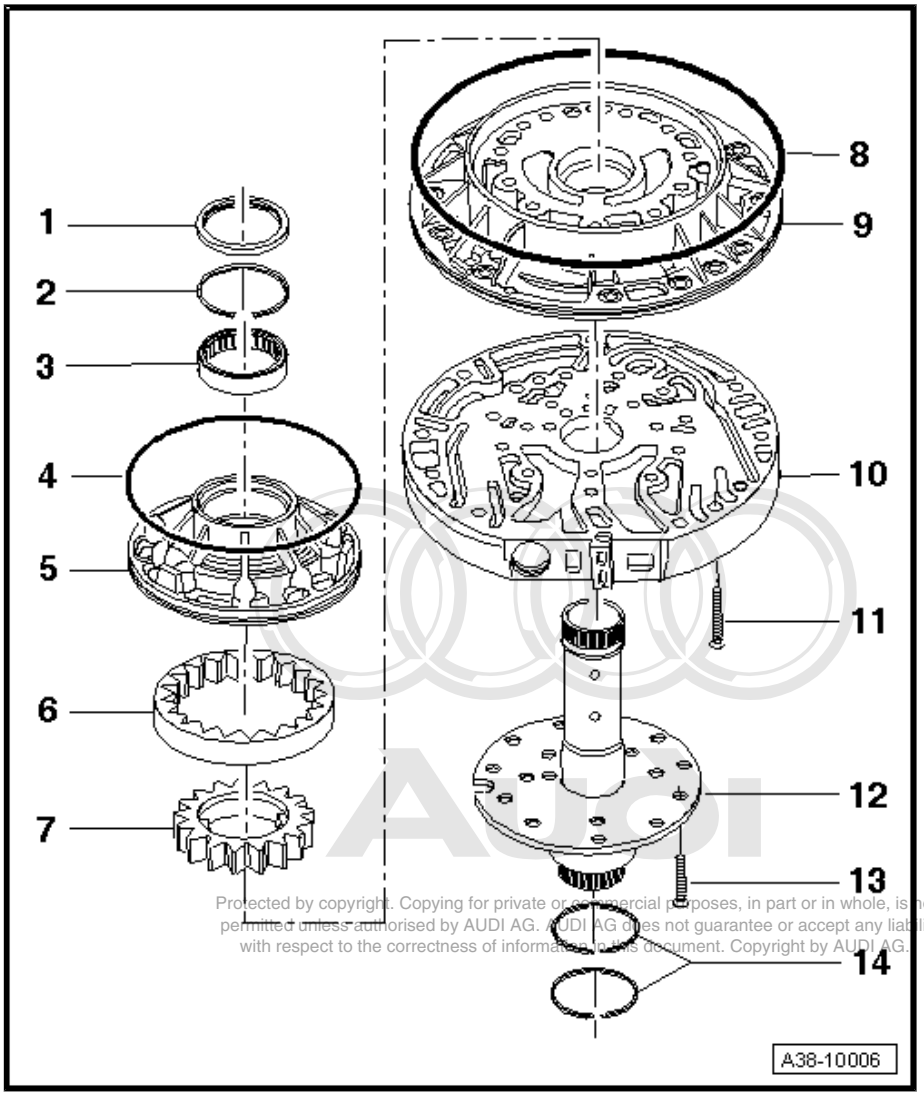
- ❑ Check running surfaces for scoring and signs of abnormal wear ⇒ page 130
- ❑ Check drive lugs in pump gear ⇒ page 130

12 - Stator shaft

- ❑ Check brass bush for wear ⇒ page 130
- ❑ Check splines for wear
- ❑ Component part of ATF supply unit; cannot be renewed separately

14 - Rectangular section seals

- ❑ Checking for wear ⇒ page 131



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

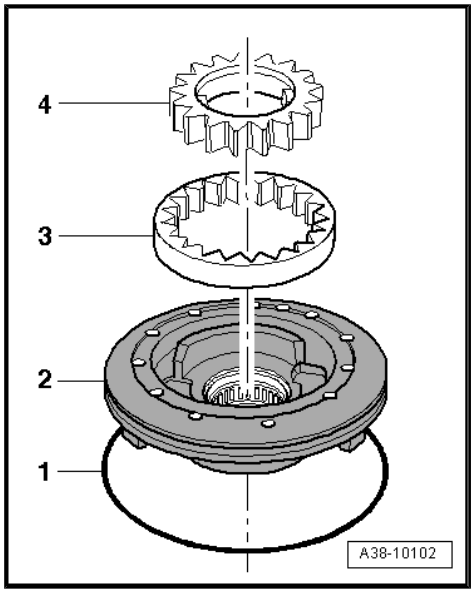
3 - Annulus

4 - ATF pump gear

• 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 ATF pump gear

– Check whether the drive lugs -arrows- on the ATF pump gear have broken off; renew ATF pump if necessary.

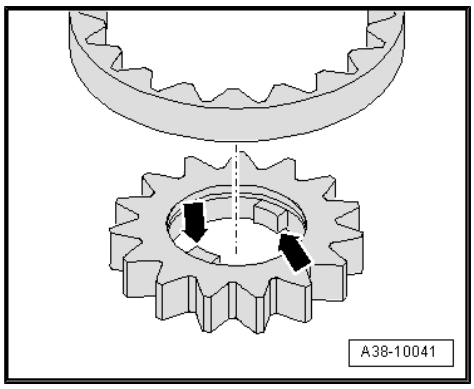
Possible causes of fault:

♦ A - Incorrect installation of torque converter

♦ B - Centring sleeve for torque converter not inserted in crankshaft

Caution

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



Checking brass bushes on stator shaft for wear.

– Check running surfaces of brass bushes -arrows- on inside of shaft for wear.

• The running surfaces should not have any deep scoring and/or blue discoloration.

If there are deep scores and/or blue discolouring:

– Renew ATF supply unit with stator shaft.

– Check rectangular section seals and input shaft of clutch „E“.

– Check clutch „A“.

• Proceed as follows if the running surfaces have no blue discoloration and there is only slight scoring:

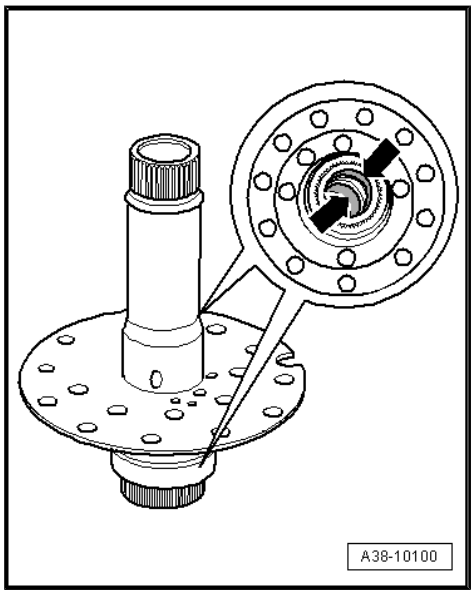
– Rub down running surface one or two times with abrasive paper and oil (grain size 600).

– Clean running surface thoroughly with clean cloth and check running surface.

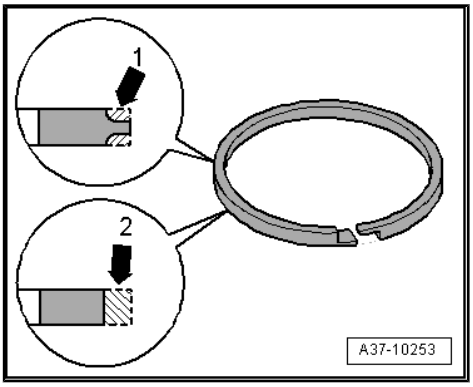
If scoring is still present after this step:

• The running surfaces should now be in as-new condition.

– Renew ATF supply unit with stator shaft.



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 ATF supply unit with stator shaft.

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 „A“ ⇒ Item 1 (page 126) .