Preliminary information

This manual covers the procedure for repairing the complete transmission.

Repairs to this transmission must be carried out by persons trained by ZF Getriebe GmbH.

All disassembly and re-assembly work should be carried out in the order described.

The photographs apply to various versions and have therefore been kept general. They are not binding in every case.

Important changes that are specific to particular applications and need to be taken into account when carrying out repair work are announced in *Service Bulletins* and training courses.
If this repair manual is given to a third party, it will not be covered by our alteration service.

The instructions and specifications given in the *Service Bulletins* must be followed when carrying out repairs.

Depending on the damage that has occurred, it may be possible to limit repair work to this damage.

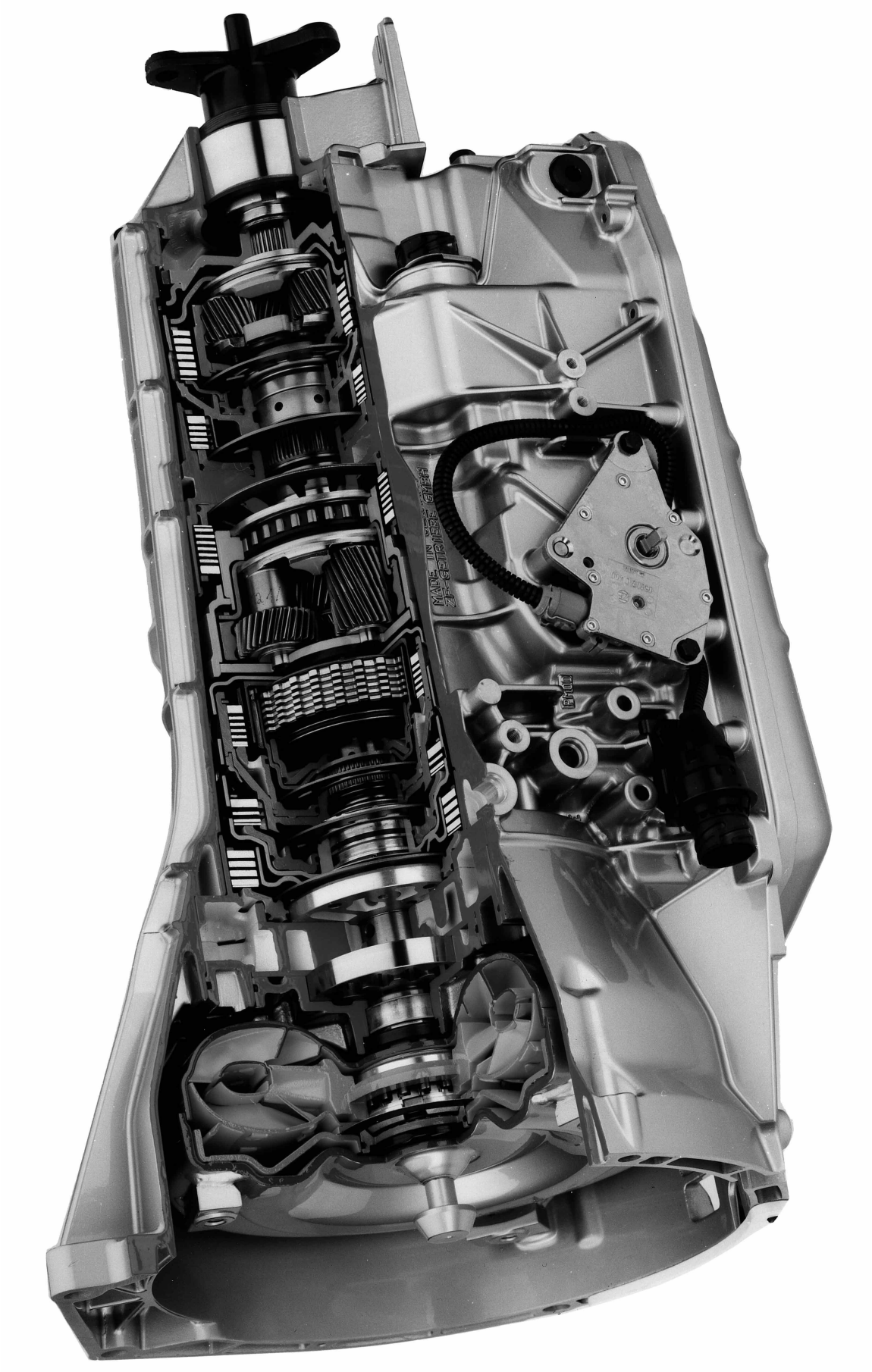
The following points should be noted:

- Seals, e.g. O-rings, shaft seals, gaskets and filters, should always be renewed.
- All O-rings, rectangular-section rings and other sealing rings should be smeared with white petroleum jelly before being fitted.
- All bearings must be fitted in a lightly oiled condition.
- All lined clutch discs and steel discs on high-mileage transmissions (> 80,000 km) must be replaced.
- Following damage to clutches/brakes, the converter, oil tubes and oil cooler must be thoroughly and adequately cleaned with a suitable cleaning agent.

Before carrying out repair work, make sure that:

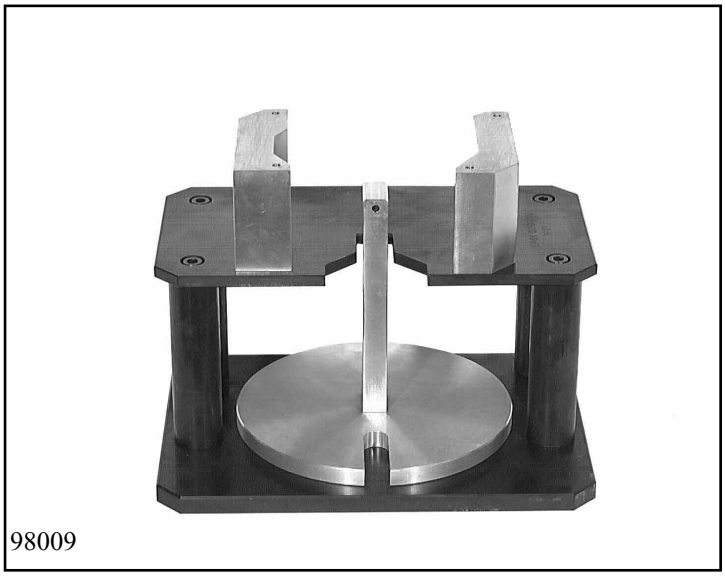
- All special tools required are readily available.
  The complete set of special tools is listed in Chapter 1.8.
- A suitable transmission test bench is available.
  See *Service Bulletins* for the required test values.

1. General information
1.1 Picture of the transmission



1.4 Making adjustments

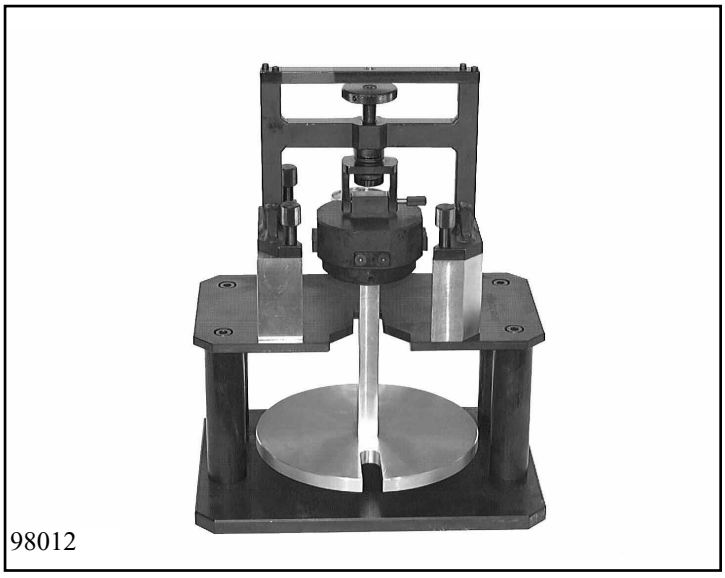
1.4.0 Measuring the clutch pack (procedure)


98009

Place the two intermediate pieces 5p01 000 329 at the marked positions on measuring fixture 5p01 000 330.


98011

Use knurled screw to turn adjusting device 5p01 001 458 to upper limit position.
Attach force-measuring unit 5p01 000 329 to adjusting device 5p01 001 458.


98012

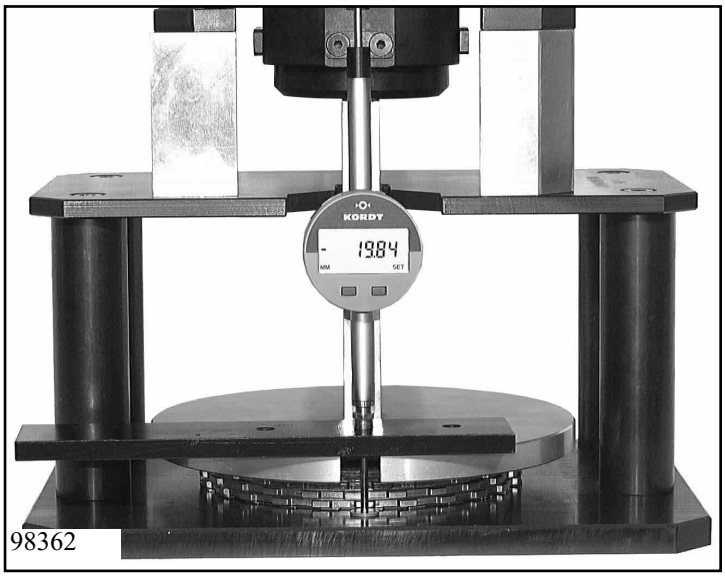
Fasten adjusting device with 4 knurled screws to the measuring fixture using the intermediate pieces.
Connect measuring plate 5p01 040 330 to force-measuring unit using fixing pin.

Use knurled screw to clamp the clutch pack to be measured (with corrugated steel clutch disc – if present – at the bottom) in device at 200 N.

1.4.7 Adjusting clearance of brake C (snap ring)

98361

Screw the cylinder to the oil supply using 2 M6 x 16 screws. (8 Nm)
Determine installation space $\mathbf{E_C}$ for brake C with measuring bar 5p01 000 330. To do this, put measuring bar 5p01 000 330 onto the edge of the cylinder for brake C. Put the measuring base on the highest point of the disc supporting surface on the piston and set the dial gauge to“0”. Pull the measuring sensor upwards, guide it into the snap-ring groove and press it there against the groove’s upper edge.
Repeat measurement twice, turning by 120°.
Average measurement values $\mathbf{C_1, C_2, C_3}$ ⇨ $\mathbf{W_C}$
Note:
Remove the screws afterwards.



98362

Determine thickness $\mathbf{M_C}$ of the brake C disc pack according to
Chapter 1.4.0: Measuring the disc pack.

⇨ $\mathbf{M_C}$

Installation space $\mathbf{E_C}$ is equal to $\mathbf{W_C}$ plus the thickness of the base **F**. ⇨ $\mathbf{E_C}$

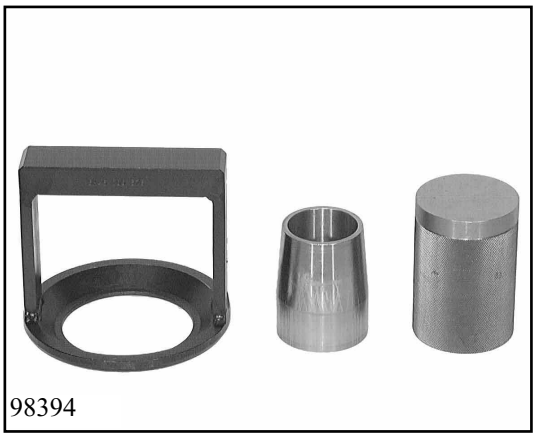
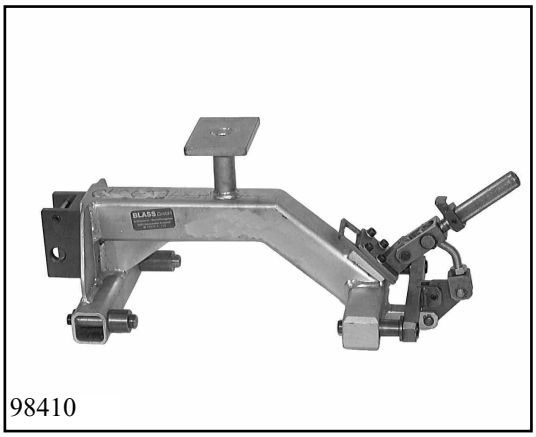
Test value $\mathbf{P_C}$ is equal to installation space $\mathbf{E_C}$ minus $\mathbf{M_C}$.

The $\mathbf{P_C}$ value should be between 2.51 - 3.70 mm
Test specification 1060 700 013
Version ***A***

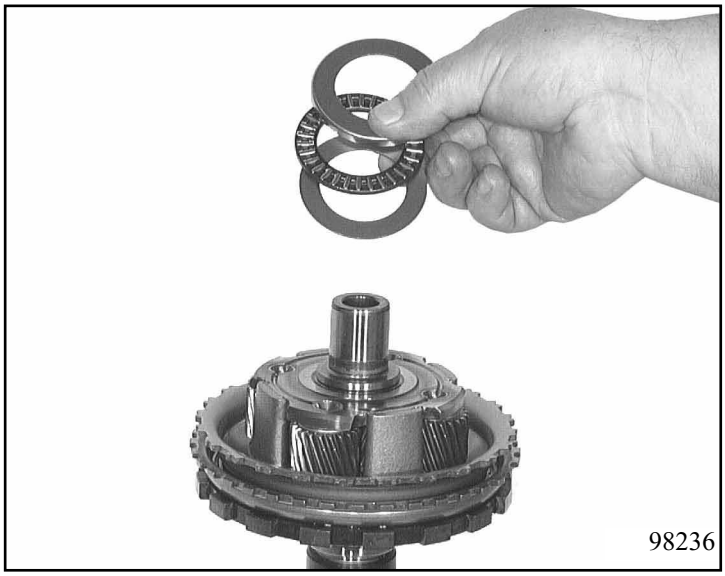
Use test value $\mathbf{P_C}$ to select snap ring $\mathbf{S_C}$.

Calculation:
$\mathbf{E_C = W_C + F}$
$\mathbf{P_C = E_C - M_C}$

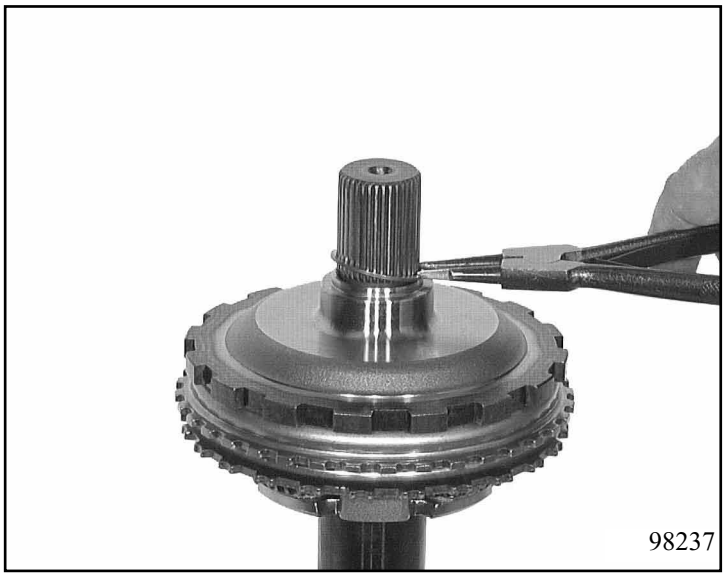
Clutch clearance $\mathbf{L_C}$ should be 1.30 - 1.60 mm with 3 lined clutch discs.

OBJECT	Order-No. / Application	Remarks
13  98394	5x46 000 576 - Assembly bracket, taper, thrust piece, brake C and G	identical 5 HP 18
14  98395	5x46 000 577 - Counter support	identical 5 HP 18
15  98410	5x46 000 620 - Assembly bracket, transmission, complete	identical 5 HP 18

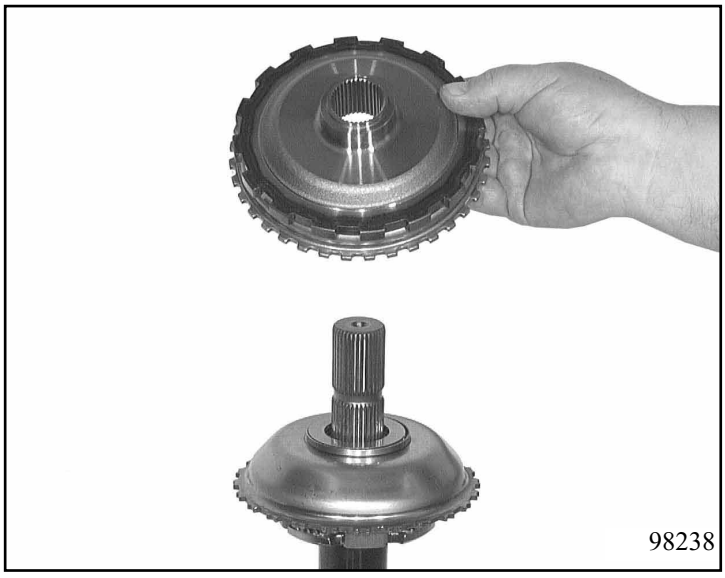
Remove the angle washer, needle cage and thrust washer from the planet carrier.



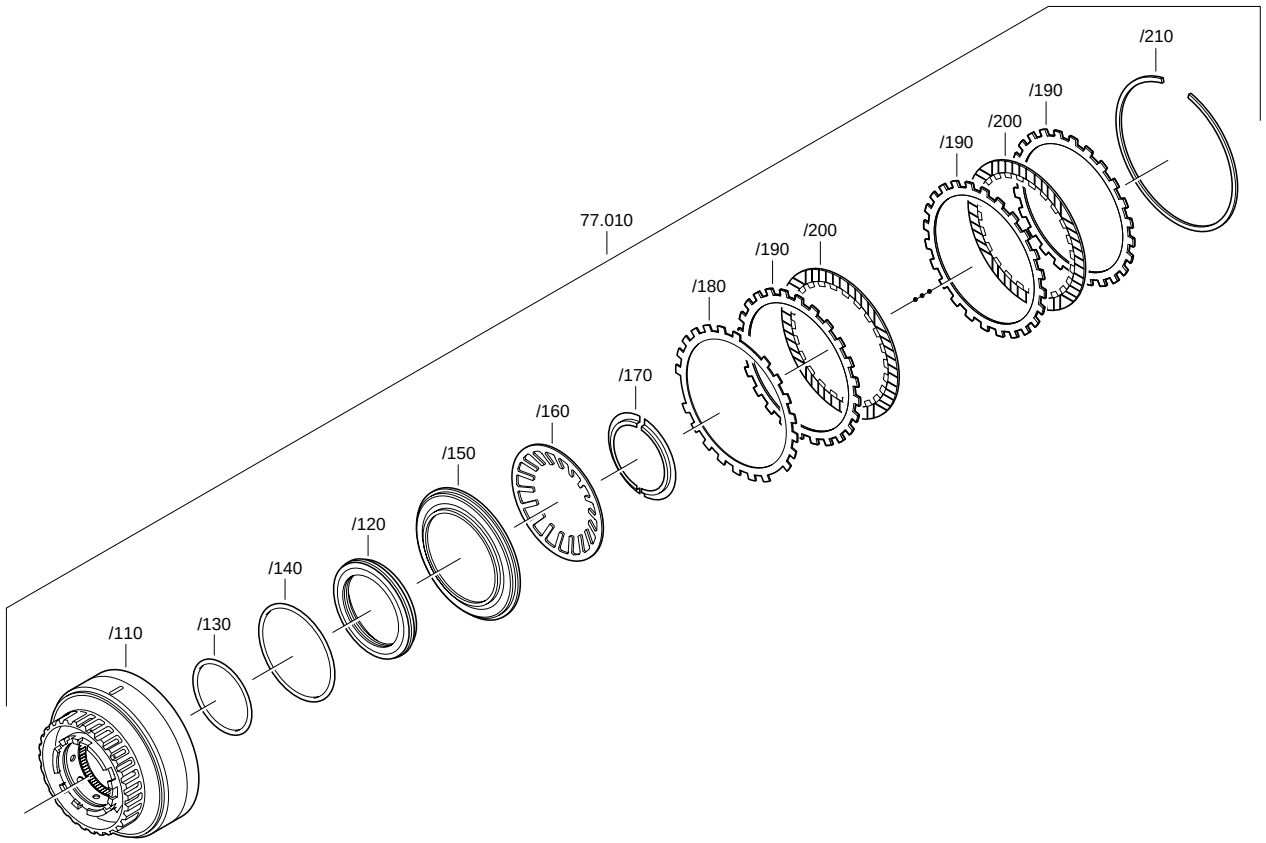
Turn the planet carrier through 180° and remove the snap ring from the shaft with suitable pliers.



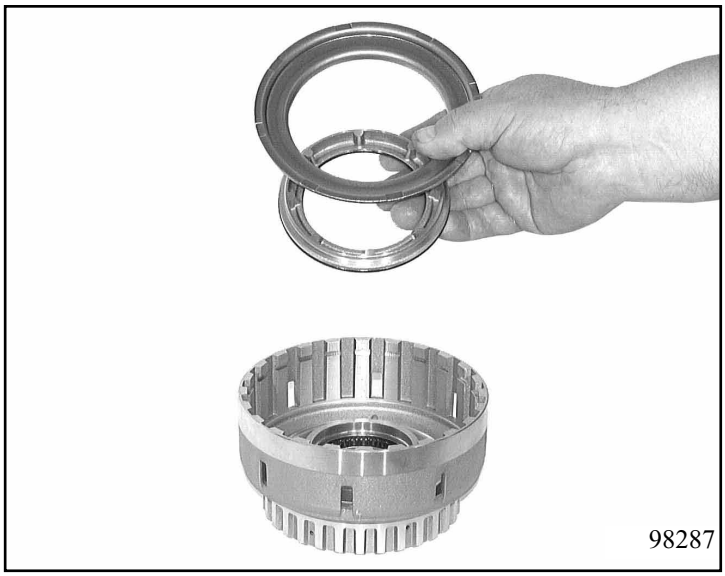
Remove the parking lock wheel. Remove the thrust washer, needle cage and angle washer from the sun wheel.



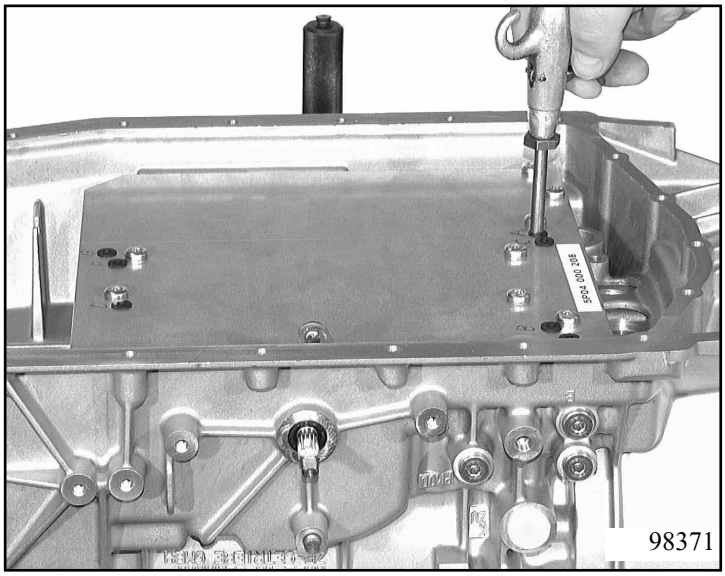
3.2.2 Clutch F



Press 2 new O-rings 77.010/130 and 77.010/140 onto piston 77.010/120 and press this into cylinder F 77.010/110. Place pressure plate 77.010/150 on piston.

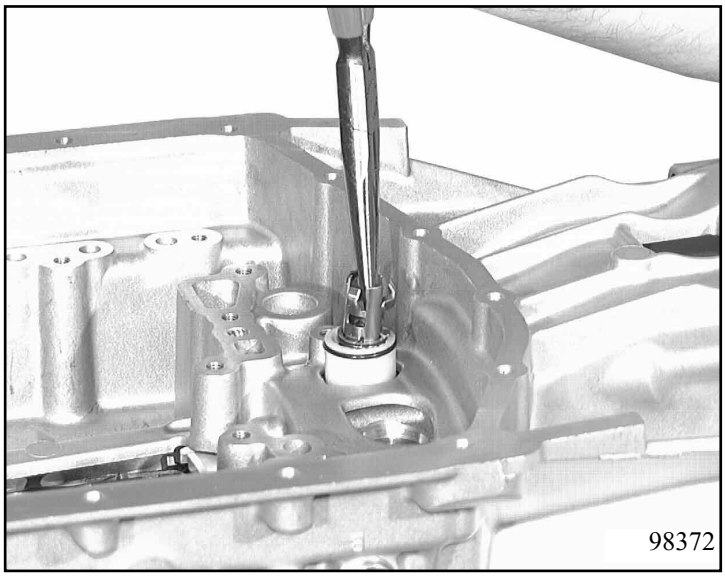


Check that all the clutches and brakes work using test plate 5p04 000 208 and compressed air.
Remove the test plate after testing.



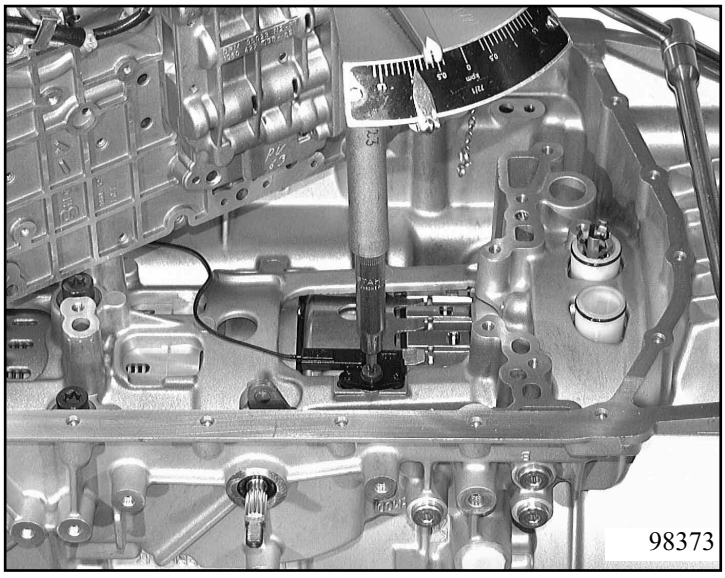
Important!
Screw the test-plate screws to the transmission housing at 8 Nm.

Insert piston 10.500 into bore of flow control valve.
Then fit new tube 10.550 with 2 new O-rings 10.540 into this bore. Press spring 10.510 with sleeve 10.520 into tube and twist until it locks.
Press in new tube 10.550 with 2 new O-rings 10.540 into the adjacent bore.



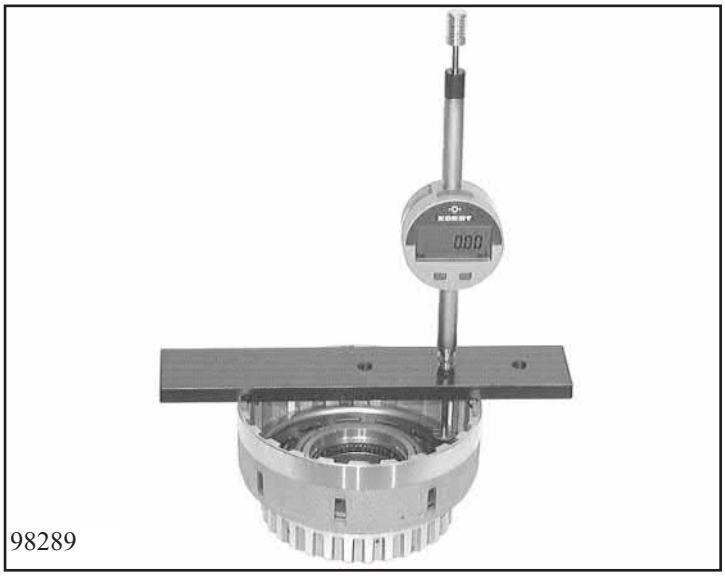
Please note:
On more recent transmissions (Transm. No. >7735), clip retaining clips for the cable 27.350 and 27.360 of the Hall-effect sensor to corresponding webs on the control unit.

Place the complete control unit on at an angle.
Fasten Hall-effect sensor 27.020 using screw 27.030 and clip connecting cable to housing web.



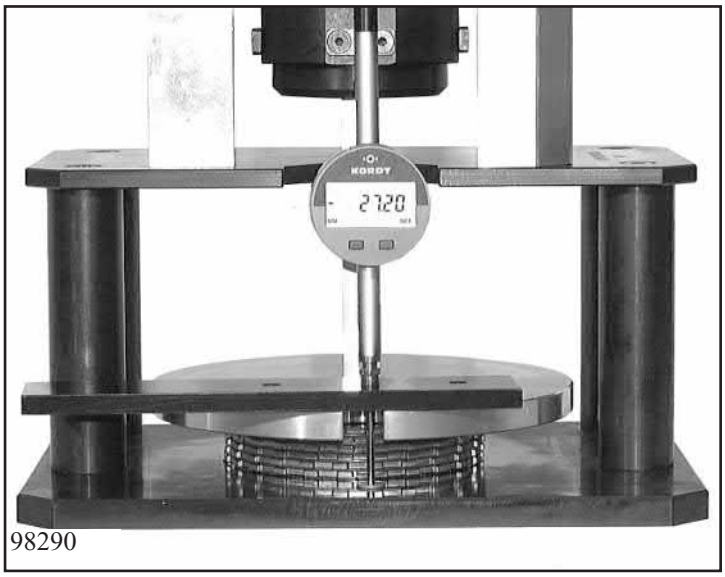
(For tightening torques, see Chapter 1.5)

1.4.1 Clearances
1.4.1.1 Clearance, clutch F (snap ring)



98289

Determine installation space $\mathbf{E_F}$ of brake F with measuring bar 5p01 000 330.
To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake F. Apply the measuring base of the dial gauge to the highest point on the disc contact surface at the pressure plate and set the dial gauge to "0".
Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove.
Repeat the measurement twice after turning through 120°.
Take an average of $\mathbf{F_1}$, $\mathbf{F_2}$, $\mathbf{F_3}$ ⇨ $\mathbf{W_F}$



98290

Determine thickness $\mathbf{M_F}$ of clutch F disc set as described in **Chapter 1.4.0 "Measuring the clutch packs"**.

⇨ $\mathbf{M_F}$

Installation space $\mathbf{E_F}$ is obtained from $\mathbf{W_F}$ plus thickness of base **F**. ⇨ $\mathbf{E_F}$

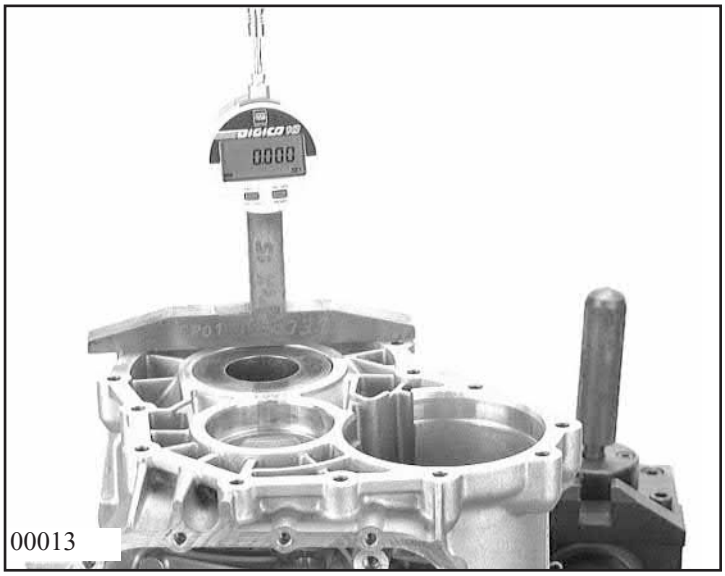
Test value $\mathbf{P_F}$ is then obtained from installation space $\mathbf{E_F}$ minus $\mathbf{M_F}$

Value $\mathbf{P_F}$ must be between 3.10 and 4.89 mm. **Test specification 1060 700 062** - version ***B***

Select snap ring $\mathbf{S_F}$ with test gauge $\mathbf{P_F}$.

Calculation:
$\mathbf{E_F = W_F + F}$
$\mathbf{P_F = E_F - M_F}$

Clearance $\mathbf{L_F}$ should be 1.9 - 2.2 mm with 5 lined discs.



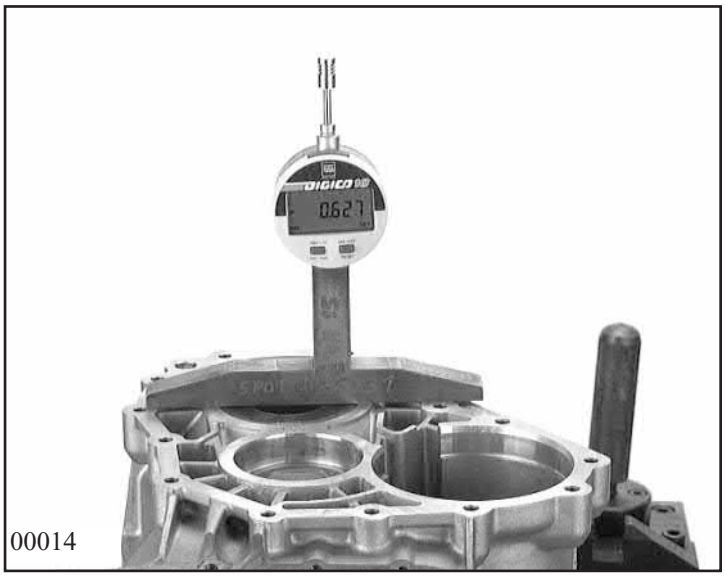
00013

1.4.6.3 Installation space, pinion

Place measuring ring 5p01 040 357 in pinion bearing hole.
Set the dial to “0” with measuring bar 5p01 150 331 against the transmission housing sealing face.

Note:
The measuring ring must be correctly seated in the bore.

Cleanliness is essential!



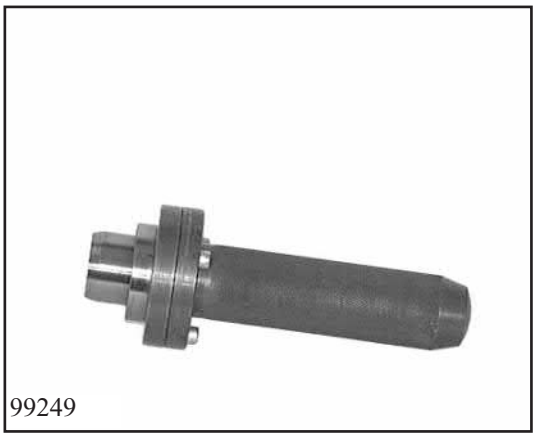
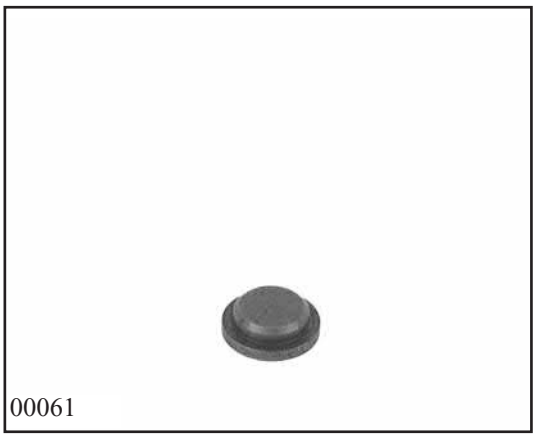
00014

Place the dial gauge centrally on the measuring ring and read off value M_{RR} ⇨ M_{RR}

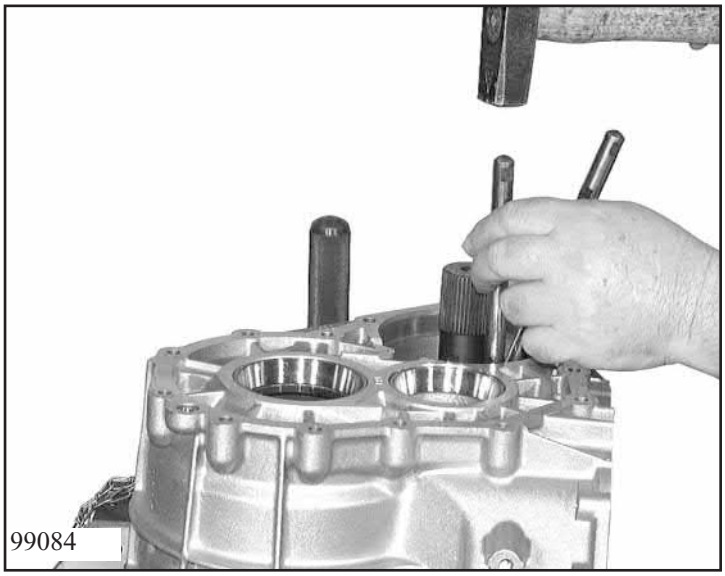
1.4.6.4 Installation space, intermediate gear

For the intermediate gear, follow the same procedure as for the pinion.
Determine value M_{RZ} ⇨ M_{RZ}

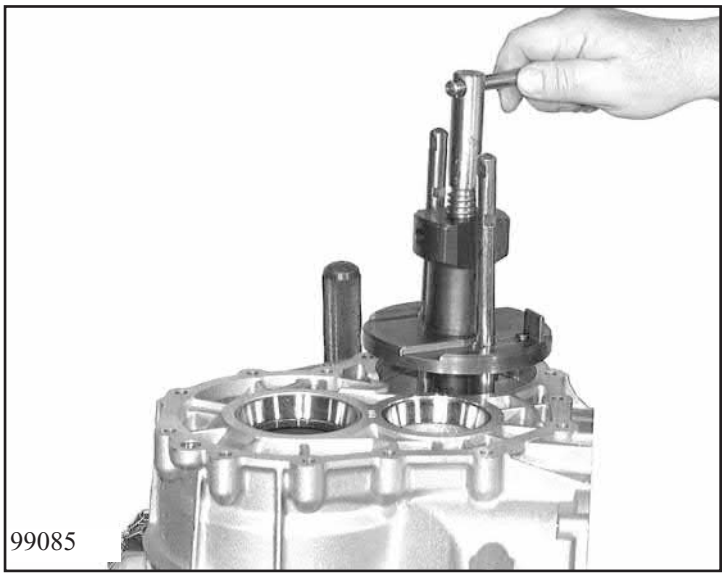
Note:
A different measuring ring, 5p01 050 357, is used.

OBJECT	Order-No. / Application	Remarks
67  00071	5x46 001 468 Drift, differential breather	
68  99249	5x46 002 246 Drift, differential shaft sealing ring	
69  00061	5x46 002 287 Core insert, roller bearing inner race, differential (housing end)	

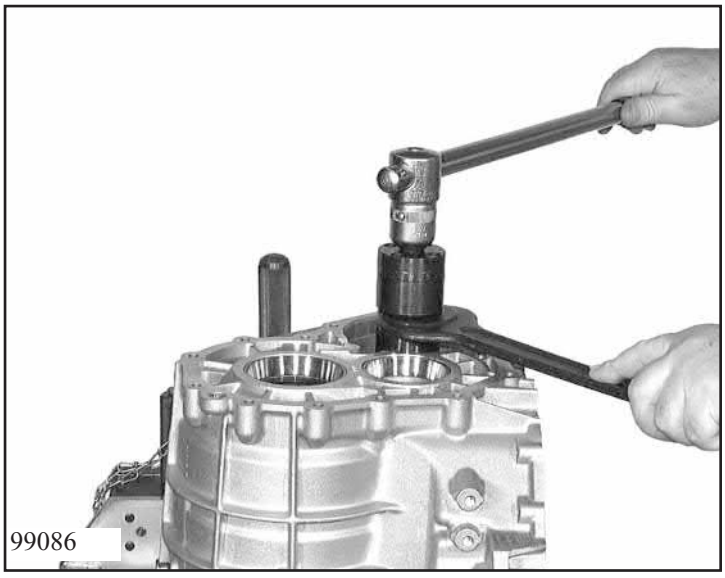
2.5 Removing pinion shaft



Turn the transmission through 180 degrees.
Using a suitable hammer, drive the tightening rods of tool 5x46 001 400 through the marks on the shaft sealing ring.



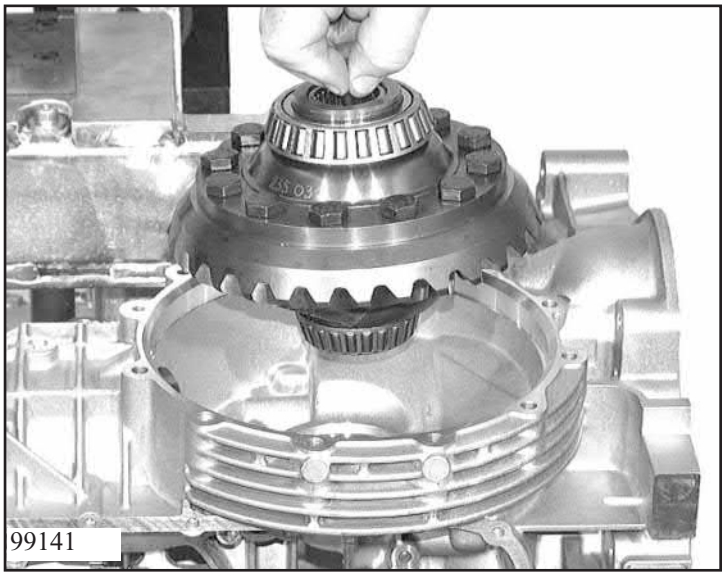
Mount the spindle plate on the tightening rods and secure in the second notch from the top.
Turn the spindle to pull out the shaft sealing ring.



Place wrench 5x46 001 422 on the nut.
Place the counter-holder on the shaft.
With a suitable lever and open-ended wrench, unscrew and remove the nut.

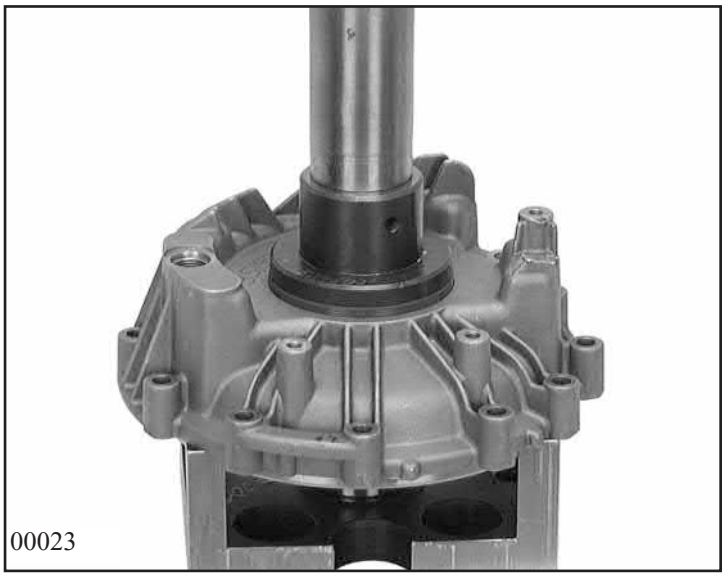
(Wrench size = 41 mm)

Note:
If necessary turn the screw in a suitable threaded hole of the gearbox housing in order to create a support for the open-end-wrench for the unscrew procedure.

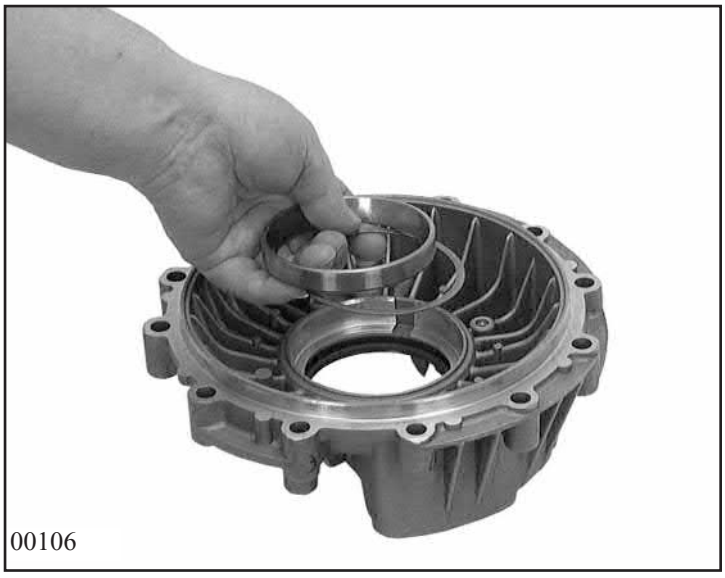

99141

Install the correct washer 35.080 with the outer bearing race in the transmission housing.
Insert the complete differential.

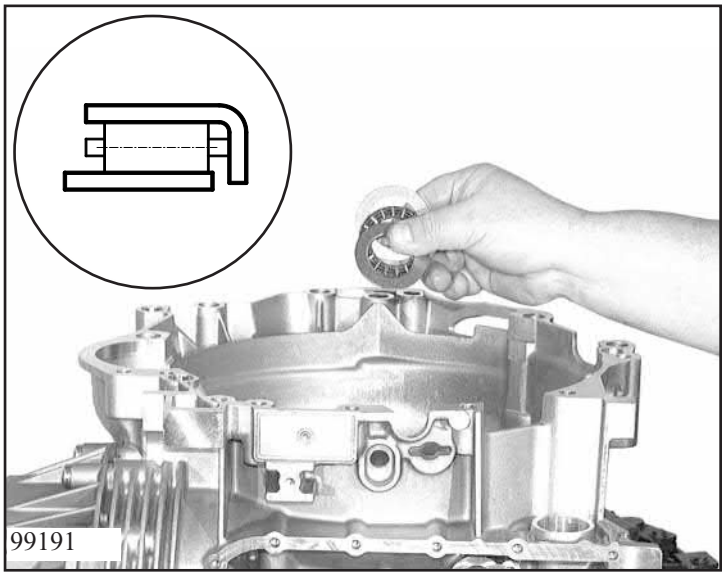
Important:
For adjusting work, see Chapter 1.4.3.3


00023

Place differential cover 35.150/110 on guide plate 5x46 001 255 and press shaft sealing ring 35.150/120 into the cover in the mandrel press, using drift 5x46 001 255.

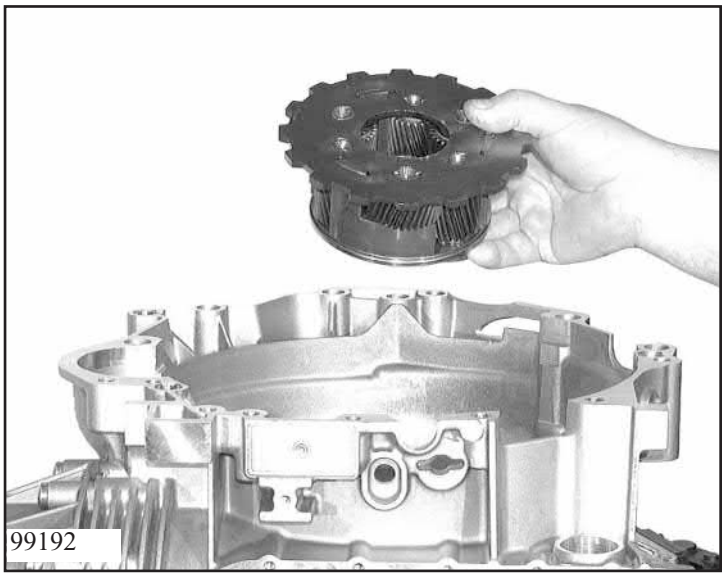

00106

Install the correct washer 35.120 with the outer bearing race in the differential cover.
Pull O-ring 35.146 on to differential cover.

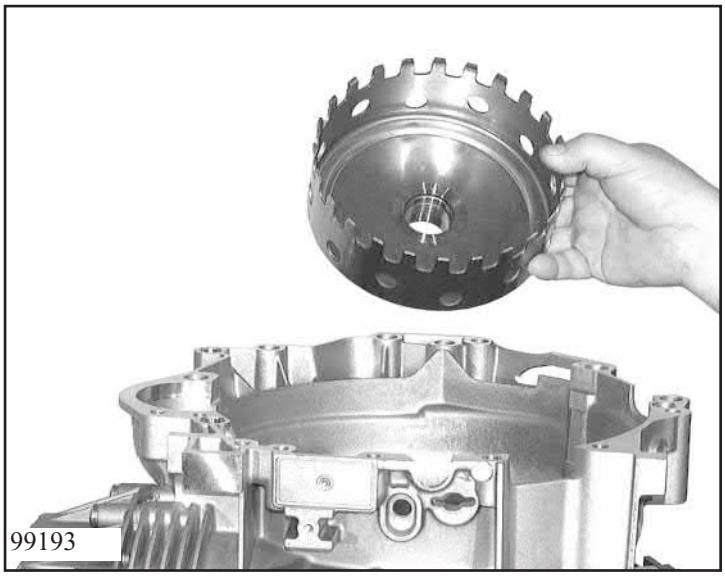


Insert thrust washer 32.060/110, needle roller thrust bearing cage 32.060/120 and angle washer 32.060/130.

Installed position (see picture)

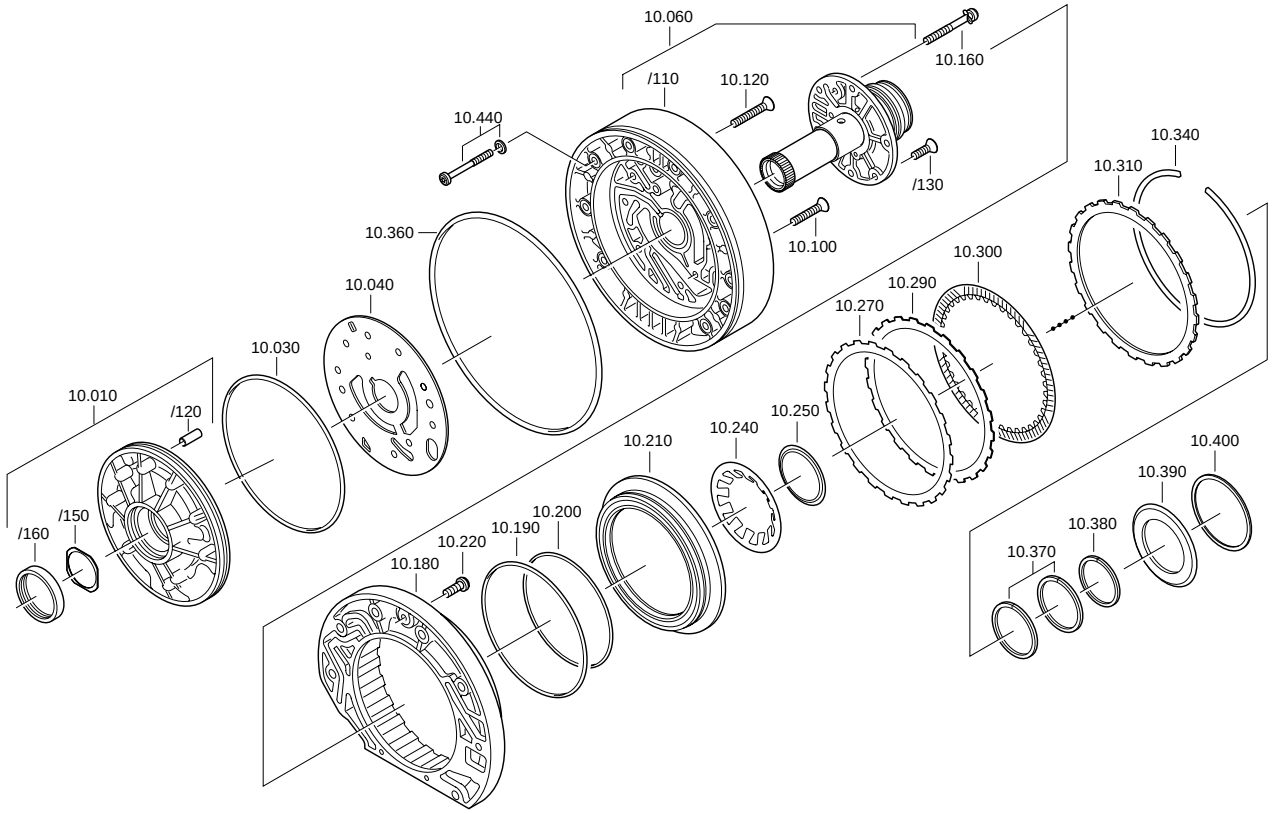


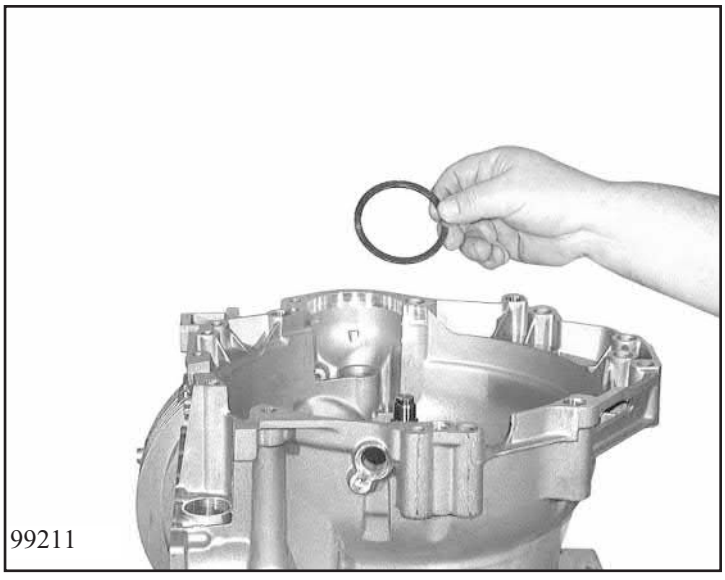
Insert planet carrier 32.080 into transmission housing.



Insert sun gear with spider 32.090 into planet carrier.

3.7 Oil supply and brake C and installing





Place shim washer 10.400 on cylinder B.

Important:
If adjustment is necessary, it is best to start with the thinnest washer from the OTK.

Install the correct shim washer after calculating its thickness.