

Preliminary information

This manual covers the procedure for repairing the complete transmission.

The repairing of this transmission is only allowed to persons with specific training from ZF Getriebe GmbH.

The entire disassembly and assembly procedure is described in chronological order.

The photographs were kept general in nature so that they can be used with various applications; they are not binding in every case.

We use *Service Bulletins* and training to announce important information and application-specific changes that must be taken into consideration in maintenance work. If this repair manual is given to a third party, there will be no modification service.

The *Service Bulletins* regulations and specifications must be followed when making repairs.

Depending on the type of damage that has occurred, the repair work can be limited to that which is necessary to repair the damage.

In this case you must observe the following:

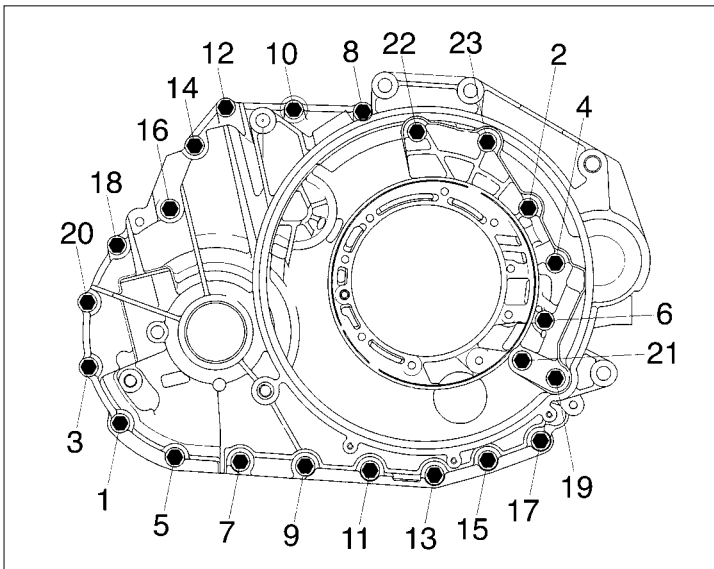
- Seals (such as O-rings, shaft seals, gaskets, and filters) must always be renewed.
- All O-rings, rectangular-section rings, and other sealing rings must always be lubricated with petroleum jelly before installation.
- All bearings must always be oiled lightly when installed.
- For transmissions that have covered a large number of kilometers (> 80,000 km), all lined clutch discs and steel clutch discs must be replaced.
- After clutches/brakes have been damaged, the converter, oil tubes, and oil cooler, must be cleaned thoroughly with a suitable cleaning agent.
- If brakes C or D has been damaged, or if a considerable distance has been covered (> 80,000 km), pistons C and D must be replaced.

The following requirements should be met before the repair work is started:

- The required special tools should be available.
(The complete set of special tools is listed in Chapter 1.7)
- A suitable transmission testing rig should be available.
The required testing values can be found in the *Service Bulletins*.

1. General information
- 1.1 Picture of the transmission





1.3 Specifications

1.3.1 Screw torque specifications

1.3.1.1 Converter bell housing (PSA)

First pre-tighten the screws in the following order:

19 ⇨ 14 ⇨ 9 ⇨ 8 ⇨ 3 ⇨ 4

Then, in numerical order, tighten the screws all the way (see diagram).

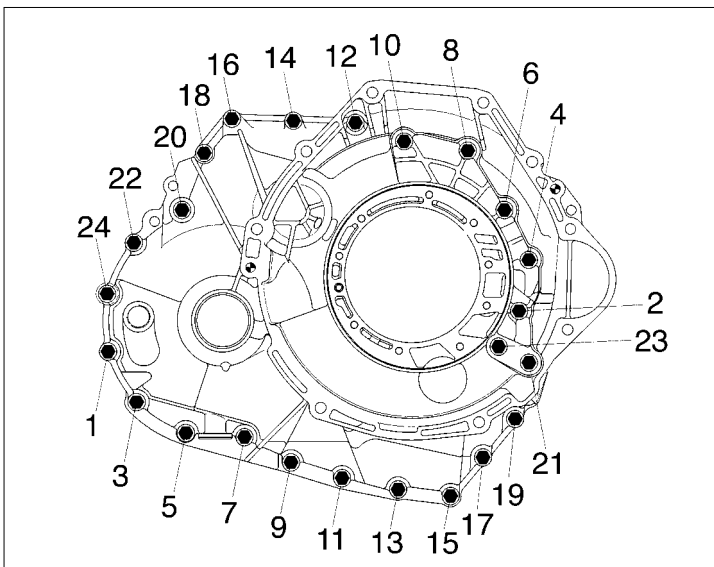
1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 23

Important!

The numbers correspond to the *actual* sequence for final tightening.

(Assessment, Specification 1019 700 137)

(See Chapter 1.5 for tightening torque)



1.3.1.2 Converter bell housing (MB)

First pre-tighten the screws in the following order:

21 ⇨ 20 ⇨ 11 ⇨ 8 ⇨ 3 ⇨ 4

Then, in numerical order, tighten the screws all the way (see diagram).

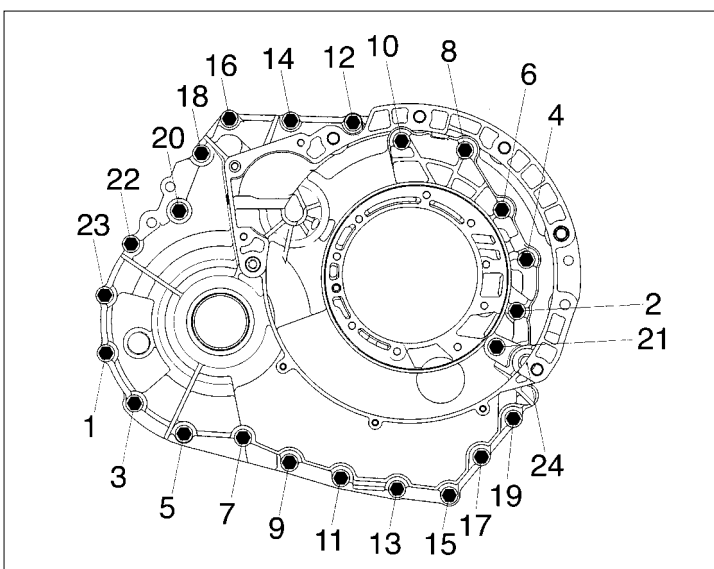
1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 24

Important!

The numbers correspond to the *actual* sequence for final tightening

(Assessment, Specification 1019 700 138)

(See Chapter 1.5 for tightening torque)



1.3.1.3 Converter bell housing (FIAT)

First pre-tighten the screws in the following order.

19 ⇨ 20 ⇨ 11 ⇨ 8 ⇨ 3 ⇨ 6

Then, in numerical order, tighten the screws all the way (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 24

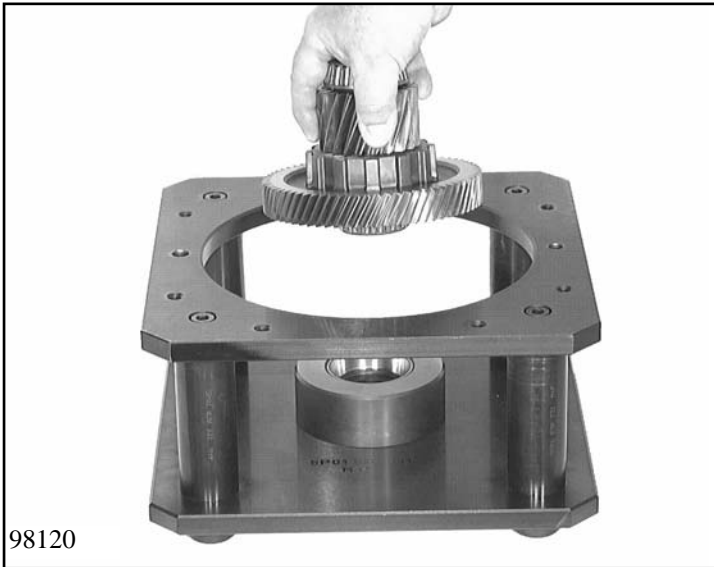
Important!

The numbers correspond to the *actual* sequence for final tightening

(Assessment, Specification 1019 700 088)

(See Chapter 1.5 for tightening torque)

1.4.1.2 Determining side shaft installation height



Fix bush 5p01 120 331 in basic tool for height measuring device 5p01 000 331 with 3 screws (M6x16) and in measuring plate 5p01 040 331 bush 5p01 110 331 with 4 screws (M6x12). Insert outer bearing shell in bush 5p01 120 331. Insert the side shaft into the basic tool of height-measuring fixture 5p01 000 331. Fasten measuring plate 5p01 040 331 onto the basic tool with eight screws (M10x30).

Important!

Strictly cleanliness !

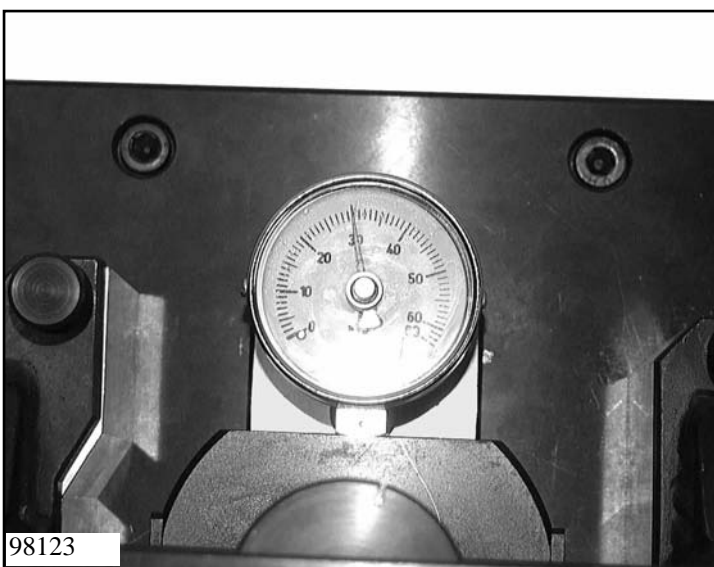
(See Chapter 1.5 for tightening torques)



Put outer bearing shell on side shaft and measuring bell 5p01 130 331 on the bearing outer ring.

Set intermediate pieces 5p01 000 329 on the positions marked on the measuring plate.

Use the knurled screw to turn adjusting device 5p01 001 458 to the upper limit. Hang force measuring unit 5p01 000 329 in adjusting device 5p01 001 458 and screw it together with the height-measuring fixture using the intermediate pieces. Connect the measuring bell to the force measuring unit using a fixing pin.

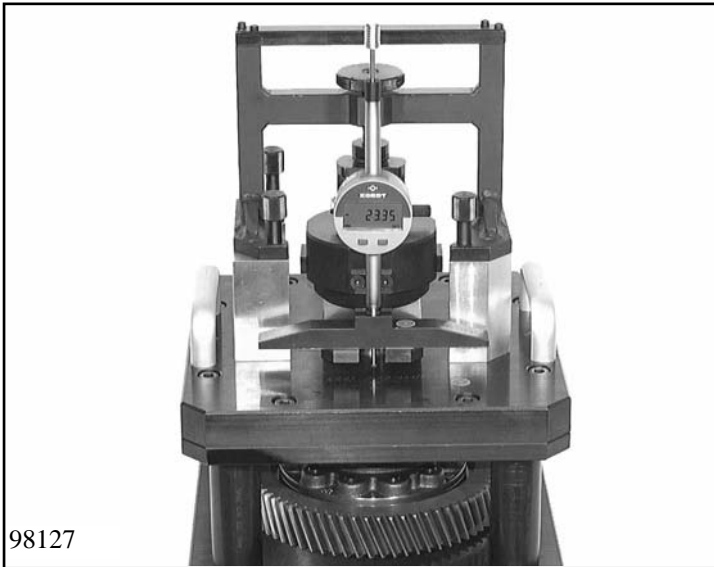


Use the knurled screw to clamp the side shaft into the device at 300 N.

Check the value on the force measuring unit's display.

Turn the side shaft for several complete turns.

Using the measuring bar, measure the excess height from the measuring bell tongues to the measuring plate.



98127

To do this, place the measuring bar on the measuring bell's tongue, set to **0**, and then measure down to the measuring plate. Do the measurement procedure on both tongues.

Average the M_3 , M_4 measurement values
 $\Rightarrow M_D$

The height of the differential H_D is equal to the averaged measurement value M_D plus the constant dimension for the height measurement device K_D minus the constant dimension for the trust bell K_G

Calculation:

$$H_D = K_S + M_D - K_G$$

Example: (for 1.4.1.5)

$$K_D = 151.242 \text{ mm}$$

$$K_G = 30.013 \text{ mm}$$

$$M_3 = 23.35 \text{ mm}$$

$$M_4 = 23.51 \text{ mm}$$

$$M_D = (23.35 + 23.51)/2$$

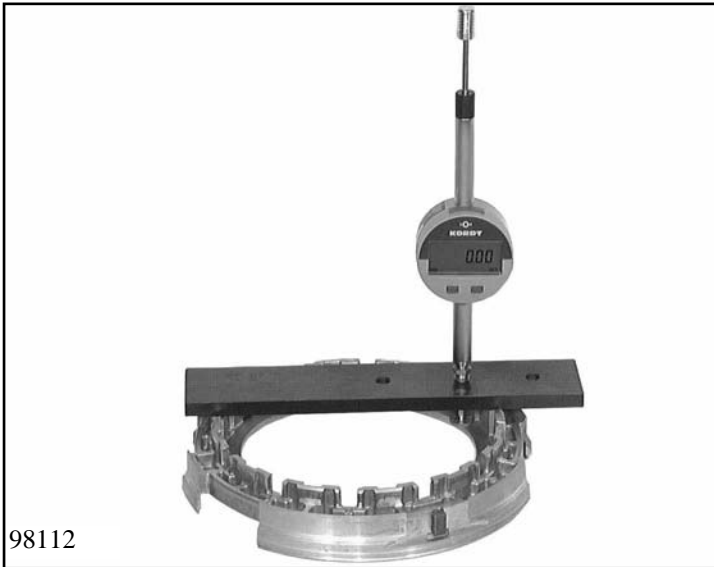
$$= 23.43 \text{ mm}$$

$$H_S = 151.242 + 23.43 - 30.013$$

$$= 144.659 \text{ mm}$$

1.4.3 Adjusting brakes C and D

1.4.3.1 Adjusting clearance of brake D (adjustment disc)

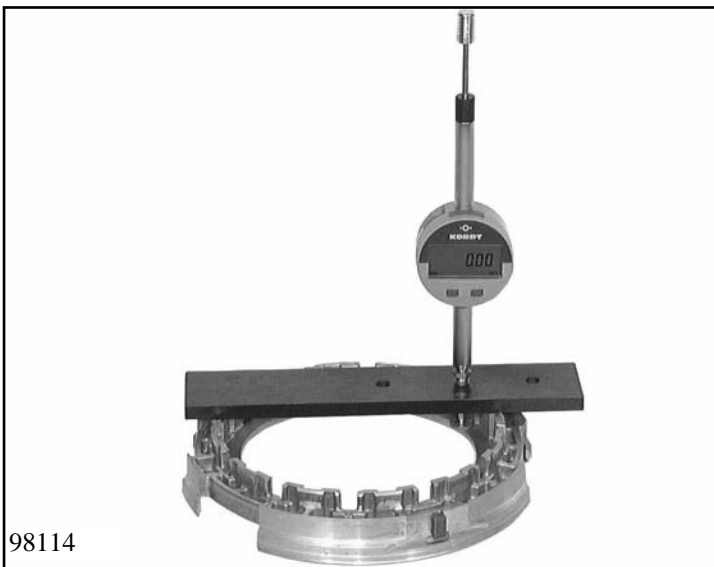


Determine brake D installation space E_D with measuring bar 5p01 060 330.

To do this set measuring bar on the edge of the brake D disc carrier. Put measuring base on highest point of disc supporting surface on ridge and set the dial gauge to 0.

Pull the measuring sensor upwards, insert it into the snap ring groove and press it against the groove's upper edge.

Read off measured value on dial gauge $\Rightarrow W_D$



Determine thickness M_D of clutch pack for brake D (without adjustment disc) according to **Chapter 1.4.0: Measuring the clutch packs.**

$\Rightarrow M_D$

Installation space E_D is equal to measured value W_D plus base thickness $F \Rightarrow E_D$.

Test value P_D is then derived from installation space E_D minus M_D .

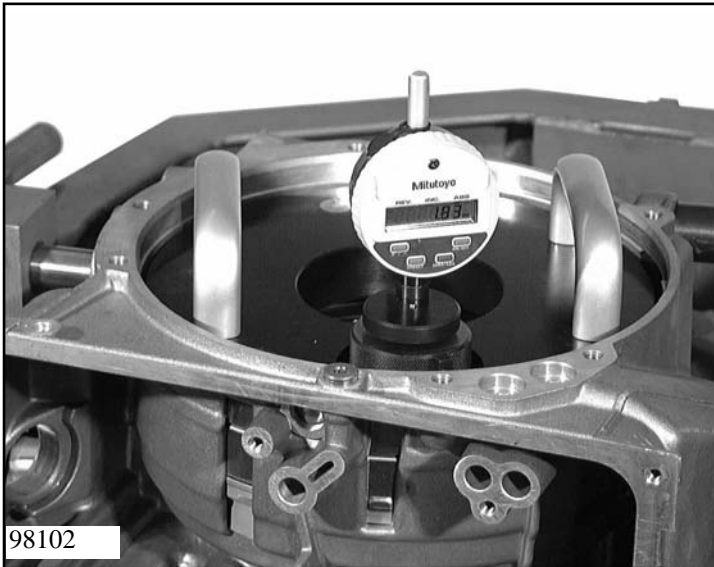
Value P_D must lie between 4.46 and 5.73 mm. **Test specification 1019 700 108**

Use test dimension P_D to select adjustment disc L_D .

Calculation:

$$E_D = W_D + F + S_D$$

$$P_D = E_D - M_D$$



1.4.4 Adjusting clearance of cylinder C (snap ring)

Put measuring fixture 5p01 002 925 on cylinder C.

Press the measuring base down on the top edge of the cylinder and set the dial gauge to 0.

Release the measuring base and swivel it into the snap ring groove so that it touches the upper edge of the groove. Repeat measurement twice, turning by 120°.

Average measurement values M_1 , M_2 , $M_3 \Rightarrow M$. Adding D to M then gives you test dimension P .

Test dimension P should lie between 3.10 and 3.90 mm. **Specification 1019 700 201**

Use test dimension P to select snap ring S .

Release play should be between 0.05 and 0.25 mm. (200 N)

Calculation:

$$P = M + D$$

Example (for 1.4.4):

$$D = 1.48 \text{ mm}$$

$$M_1 = 1.93 \text{ mm}$$

$$M_2 = 1.88 \text{ mm}$$

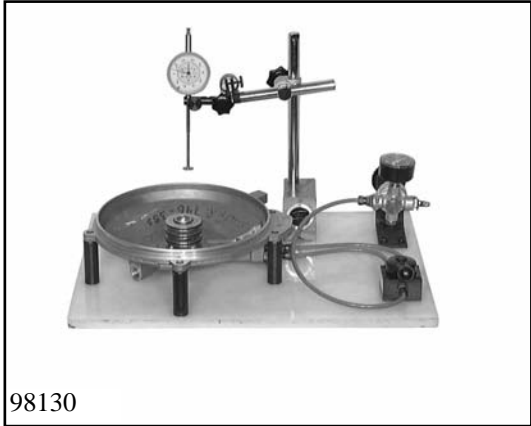


$$M_3 = 1.83 \text{ mm}$$




$$M = (1.93 + 1.88 + 1.83) / 3 = 1.88 \text{ mm}$$




$$P = 1.88 + 1.48 = 3.36 \text{ mm}$$

$$\Rightarrow S = 3.2 \text{ mm}$$

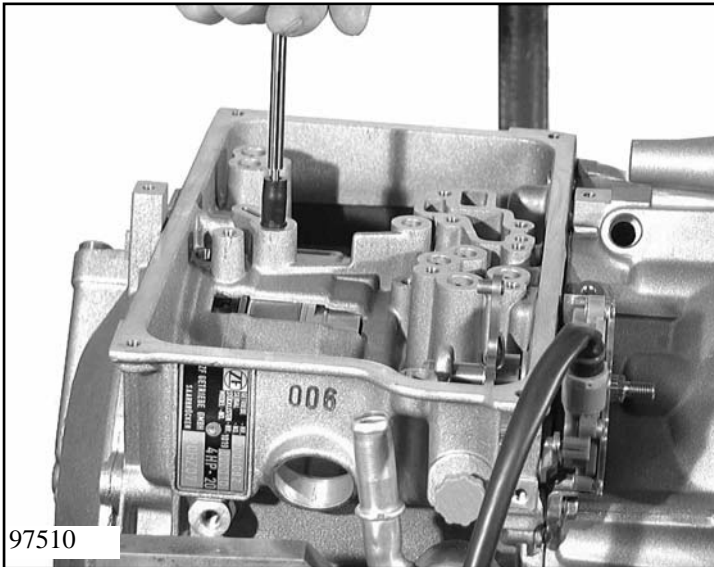
No.	Designation	Part List- Item-No.	Wrench size No.	Page	Tightening torque [Nm]
14	Machine screw (converter bell housing/pump)	10.020	TORX - TX 27	3.8/3	10 ± 1
15	Machine screw (converter bell housing/pump)	10.010/150	TORX - TX 27	3.8/3	10 ± 1
16	Hexagon screw (oil tank)	22.270	Hexagonal SAF = 10 mm	3.8/4	10 ± 1
17	Hexagon screw (oil filter)	22.180	Hexagonal SAF = 10 mm	3.8/4	10 ± 1
18	Hexagon screw (converter bell housing/retaining strap)	22.130	Hexagonal SAF = 13 mm	3.8/5	26 ± 2.6
19	Machine screw (converter bell housing)	22.132	TORX - TX 40	3.8/5	26 ± 2.6
20	Hexagon screw (converter bell housing)	22.134 22.120	SAF = 13 mm	3.8/5	26 ± 2.6
21	Union screw (oil tube)	01.290	Hexagonal SAF = 13 mm	3.8/5	25 ± 2.5
22	Machine screw (oil tube)	01.286	Hexagonal SAF = 13 mm	3.8/6	23 ± 2.3
23	Screw plug, M10x1 (transmission housing/cover)	01.260	Internal hexagon SAF = 5 mm	3.8/6	20 ± 2
24	Machine screw (inductive transmitter)	01.130	TORX - TX 27	3.8/7	8 ± 0.8
25	Machine screw (control unit)	27.300	TORX - TX 27	3.8/8	8 ± 0.8
26	Machine screw (inductive transmitter)	27.230	TORX - TX 27	3.8/8	8 ± 0.8
27	Hexagon screw (oil pan)	03.050	SAF = 10 mm	3.8/8	6 ± 0.6
28	Screw plug, M12x1,5 (transmission housing/cover)	01.020/150	Internal hexagon SAF = 6 mm	3.8/8	20 ± 2

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">7</p>  <p>98130</p>	<p>5p01 002 984 -Measuring fixture, installation space and snap ring play, clutches B/E</p>	
<p style="text-align: center;">8</p>  <p>98107</p>	<p>5p89 004 177 -Plug gauge installation space, converter bell housing, side shaft</p>	
<p style="text-align: center;">9</p>  <p>98106</p>	<p>5p89 004 178 -Plug gauge, installation space, transmission housing, side shaft</p>	

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">37</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>98151</p>	<p>5x46 503 491 Rollex extractor Size IA (basic tool)</p>	<p>Identical 4 HP 18 Q</p>
<p style="text-align: center;">38</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>98152</p>	<p>5x46 010 011 Rollex extractor 1000/1 (basic tool)</p>	<p>Identical 3 HP 22 4 HP 14 Q 4 HP 18 Q</p>
<p style="text-align: center;">39</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>98153</p>	<p>5x46 013 011 Rollex extractor 13000/1 (spur gear, bearing plate)</p>	

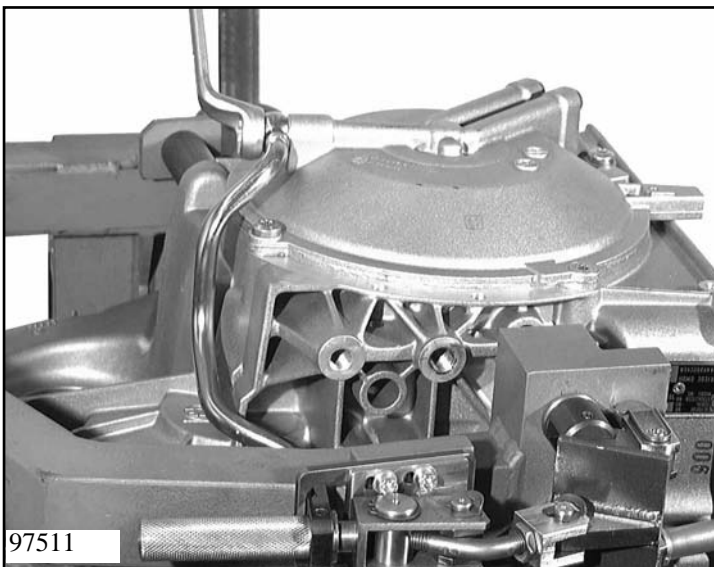
Remarks	Order-No. / Application	OBJECT
MB only	5p89 004 767 -Plug gauge, installation space, converter bell housing differential	<p style="text-align: center;">49</p>  <p style="text-align: right;">98110</p>
MB only	5p89 004 768 -Plug gauge, installation space, transmission housing, differential	<p style="text-align: center;">50</p>  <p style="text-align: right;">98111</p>
MB only	5x46 001 308 -Fixture for disassembly/ assembly, cup spring, brake F	<p style="text-align: center;">51</p>  <p style="text-align: right;">98160</p>

2.2 Removing clutch B/E



Pull out sealing sleeves (brake C) with extracting tool 5x95 000 415.
Turn transmission by 90°.

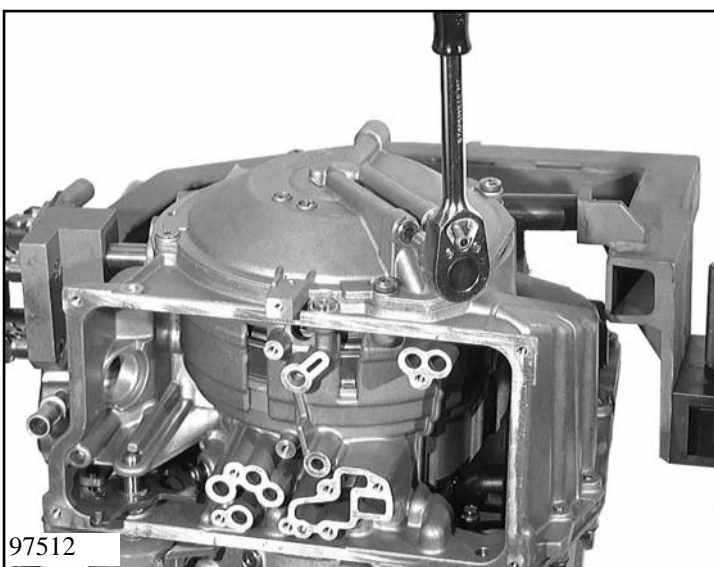
97510



Unscrew the oil tube and remove the retaining plate, screws and oil tube.
Take the O-ring and sealing rings off the oil tube.

(Wrench size = 19 mm
Wrench size = 13 mm)

97511



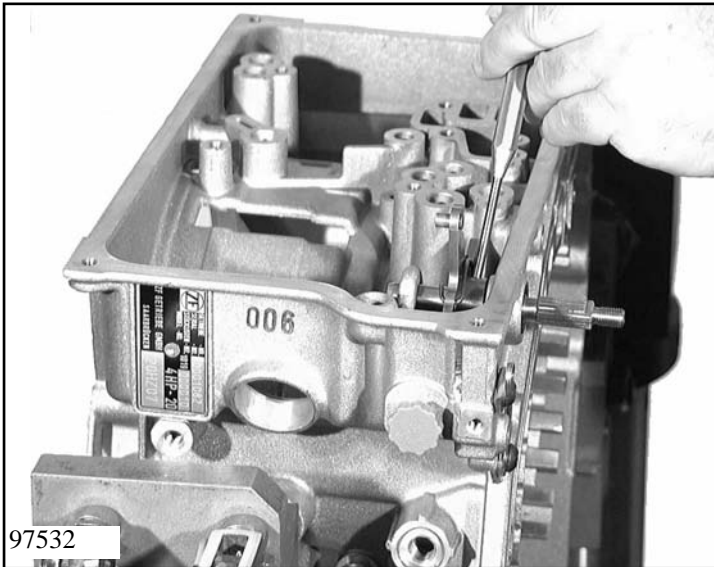
Unscrew the two plugs from the cover and remove the screw plug from the transmission housing.
Loosen the five Torx screws on the cover and remove the cover.

(Wrench size = Internal hexagon, 6 mm
Wrench size = Internal hexagon, 5 mm)

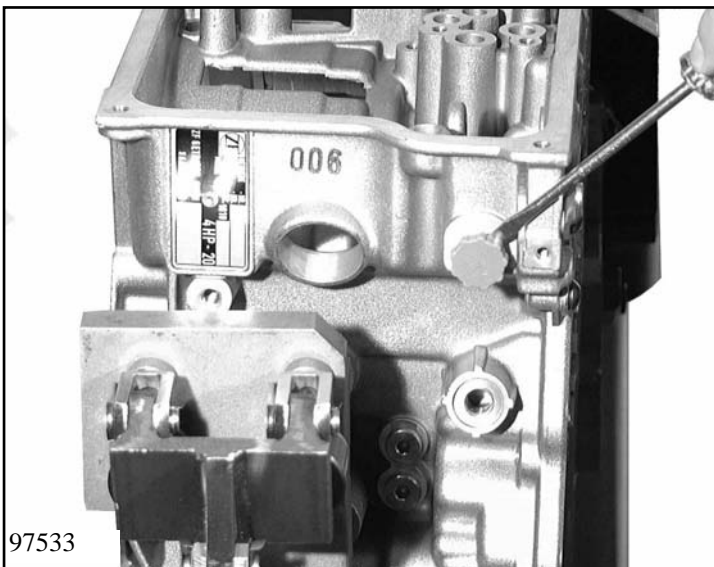
(Wrench size = Torx TX-40)

97512

2.5 Removing shifting mechanism and ancillaries

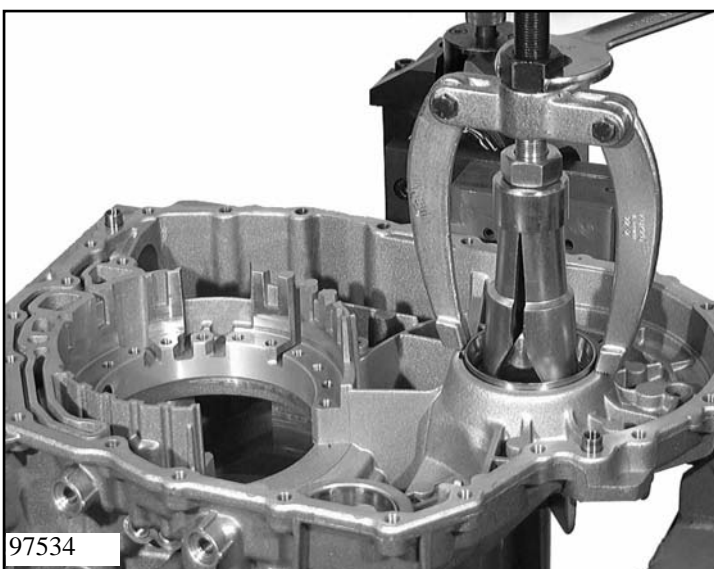


Turn the transmission by 90°.
Drive out slotted pin.
Take out selector shaft and detent disc with locking cams and disassemble into the individual parts.
Then remove the stop bush and sealing ring.



Use a screwdriver to remove the breather cover and unscrew the rest of the plugs.
Drive out the differential shaft seal.

(Wrench size = Internal hexagon, 5 mm)



Turn the by transmission 90° and remove the two bearing shells with the Kukko extractor. Remove the bearing shim.

(Kukko extractor 5x46 021 007 or 5x46 021 008 combined with basic tool 5x46 022 002).

Note!

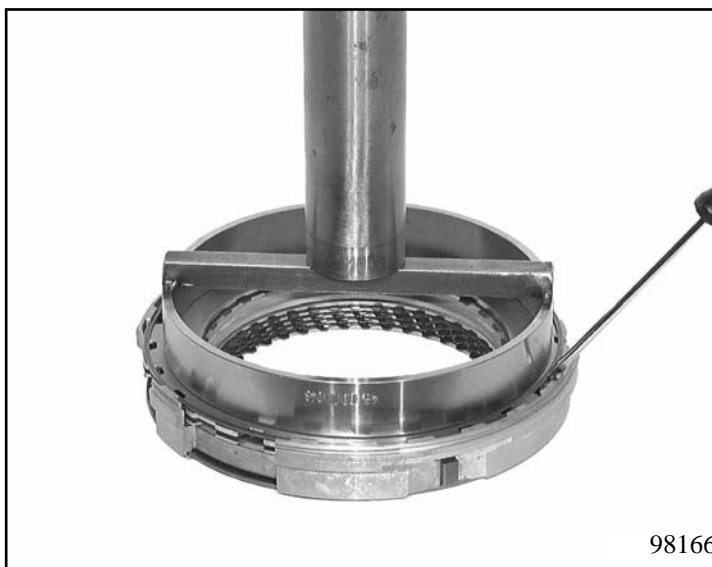
The two centering bushes, the position switch adjusting plate and the breather normally remain installed.

2.7.2 Dismantling brake C/D

Press piston C out of cylinder C.



Hold down cup spring (brake C) with assembly fixture 5x46 001 046 and remove snap ring. Then take out the final disc, cup spring, and clutch pack.



Turn over disc carrier C/D and remove snap ring (brake D) with assembly fixture 5x46 001 046 by pressing down the cup spring. Then remove the clutch pack and cup spring.

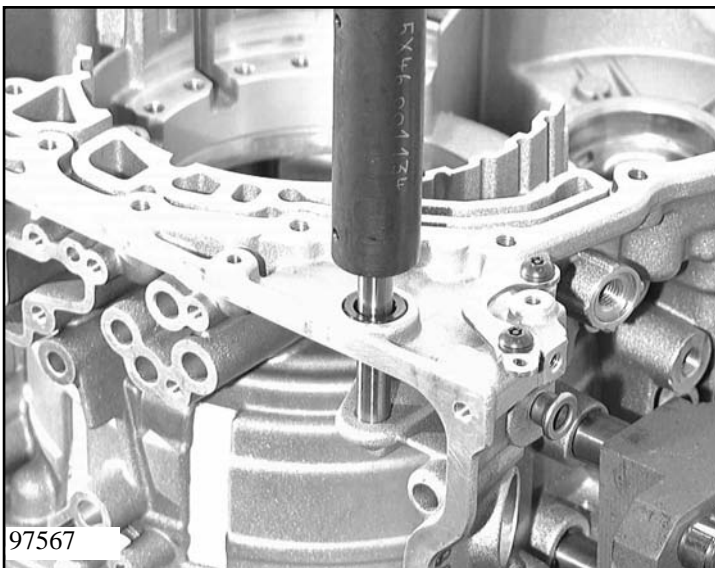
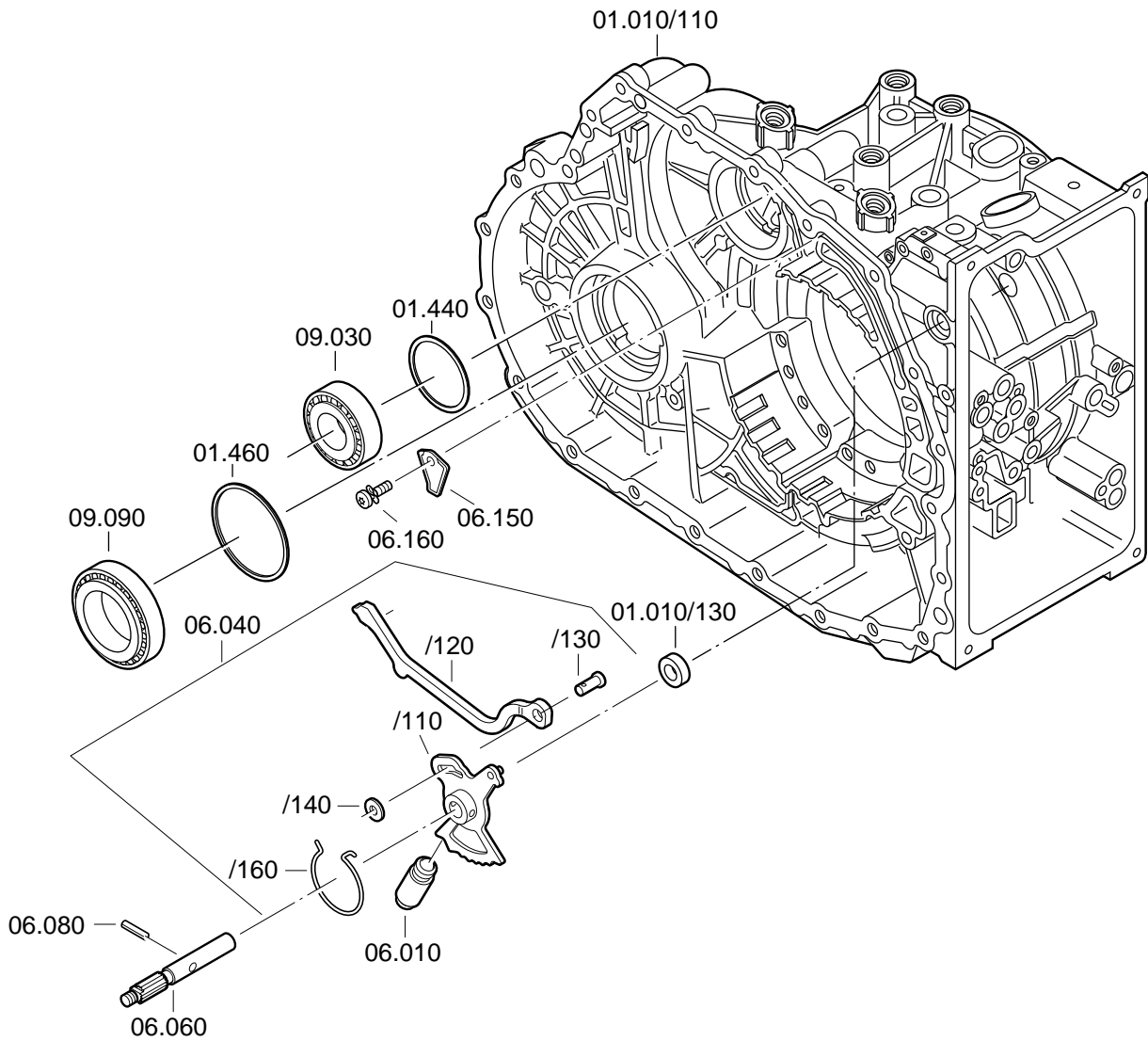


Note !

If the fitting keys are not loose, leave them on the disc carrier.

3.2 Installing the parking lock mechanism and bearing shells in the housing

3.2.1 Installing the parking lock mechanism in the housing



Using drift 5x46 001 134, drive shaft seal 01.010/130 into transmission housing 01.010.
Turn the transmission by 90°.