

# REPAIR MANUAL

**6 HP-19 A**



ZF GETRIEBE GMBH SAARBRÜCKEN

Version 06/06/01  
CD



subject to alterations

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# Advance Information

These instructions contain the procedure for the repair of the complete gearbox.

The workshop manual is sufficiently understandable only in connection with ZFS training. Disregarding this could lead to faulty installation.

All disassembly and assembly works are specified in chronological order.

The photographic illustrations were regarded as general for the different applications and are not obligatory in every case.

We communicate important and application-specific changes, which are to be considered during repairs, in technical circulars and training courses.

For repairs the instructions of and data from SDM and/or Serviceline-specification must be considered.

The following is to be considered here:

- Seals, e.g. O-rings, shaft sealing rings, seals and filters are in principle to be renewed.
- All O-rings, rectangular rings and other sealing rings are in principle to be inserted greased with Vaseline during assembly (excepting metallic seals which must be dry and grease-free).
- All bearings are in principle to be fitted in a lightly oiled condition.
- For gearboxes with higher mileages, various wearing parts are to be replaced:
  - > 80,000 km, all lining discs
  - > 100,000 km, converter with converter clutch
  - > 150,000 km, all axial-thrust bearings
- Following damage to clutches/brakes converters, oil tubes as well as oil coolers must be cleaned thoroughly and sufficiently with a suitable cleaning agent.

The following conditions are to be met before starting repairs:

- Presence of the necessary special tools, otherwise incorrect assembly is possible.  
The complete set of special tools is specified under Chapter 1.7.
- Presence of a suitable gearbox test stand.  
The necessary test values can be inferred from the *Technical Circulars*.

**Note:**

The control unit is treated as a complete unit in the instructions and should not be disassembled without special knowledge, but replaced in its entirety.

Dedicated instructions are planned for the control unit gear.

When assembling the control unit do not touch the contact area of the mechatronic and the cable plug (ESD direction).

**Attention:**

The gearbox is filled with life span oil.

Replacing the oil is not necessary before 160,000 km or 10 years.

The gearbox may only be delivered with the quantity and the type of oil indicated in the respective parts list document (see SDM).

Tech. CS

Tech. Documentation

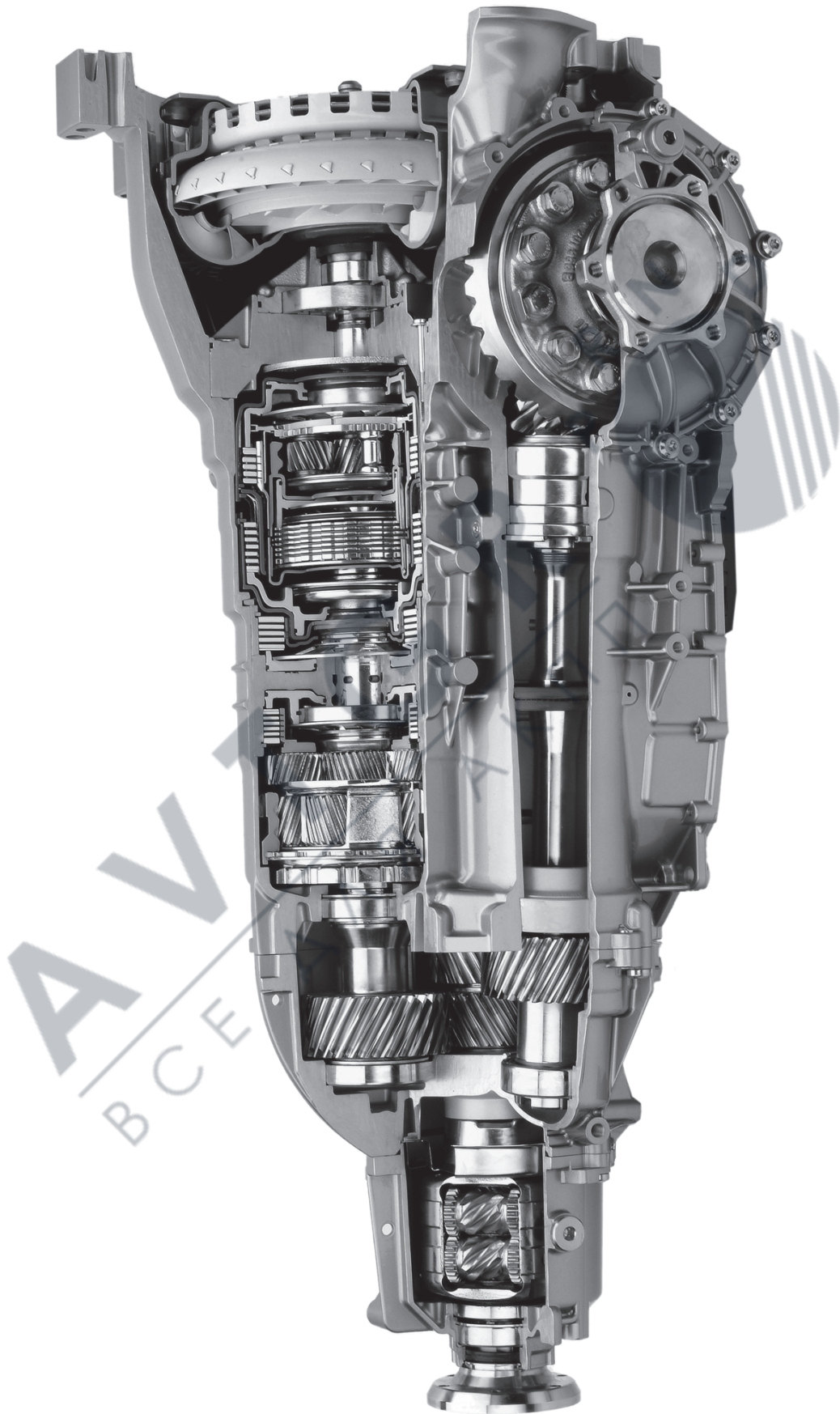
CS School

Bach

Reus

Schultz

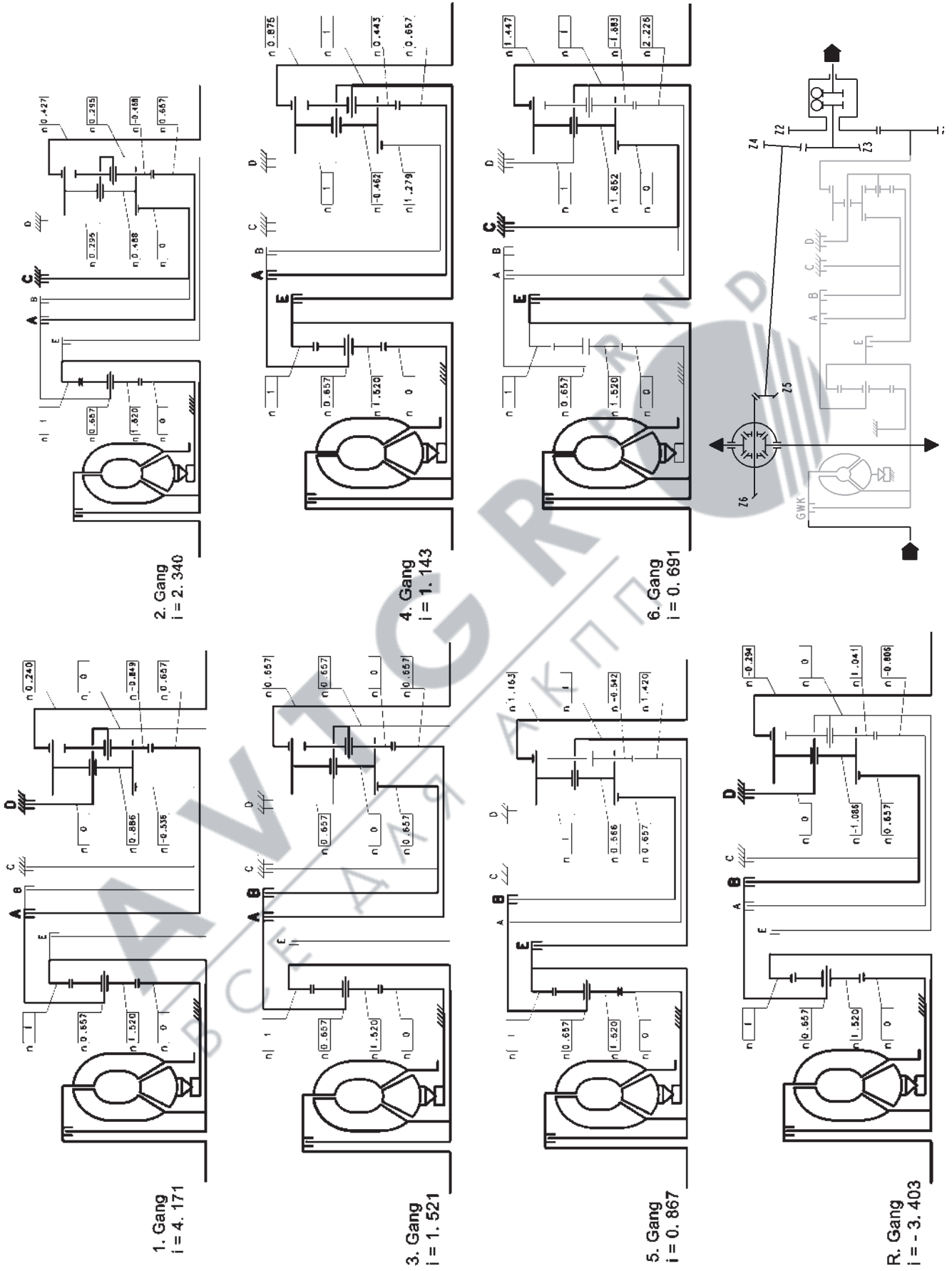
1. General  
1.1 Illustration of transmission







## 1.2 Power flow diagram

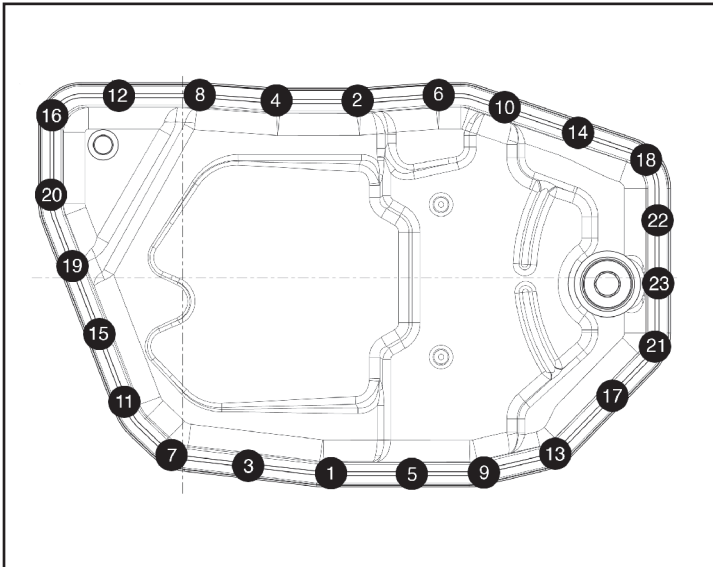




### 1.3 Instructions

#### 1.3.1 Screw Connection Instructions

##### 1.3.1.1 Oil Pan



Tighten the 23 oil pan torques according to the numbering:

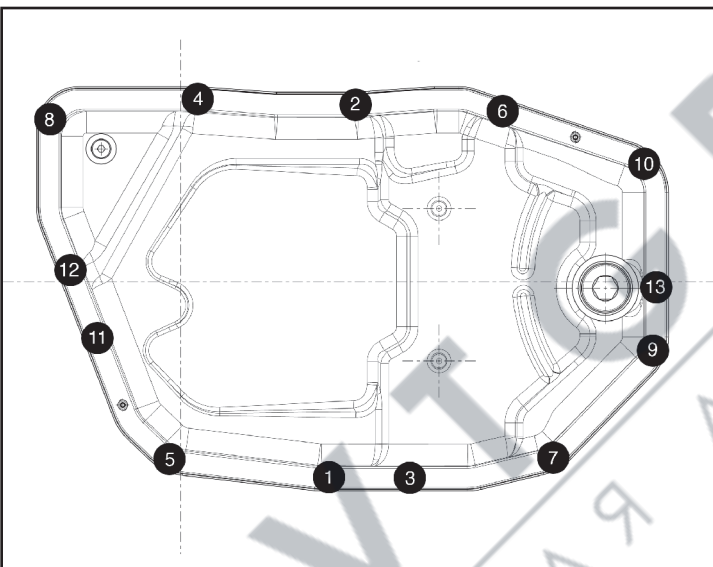
1 ⇔ 2 ⇔ 3 ⇔ ... ⇔ 23

Important!

Instruction 1071 700 083

(Tightening torques, see Chapter 1.5)

or if new oilpan



Tighten the 13 oil pan torques according to the numbering:

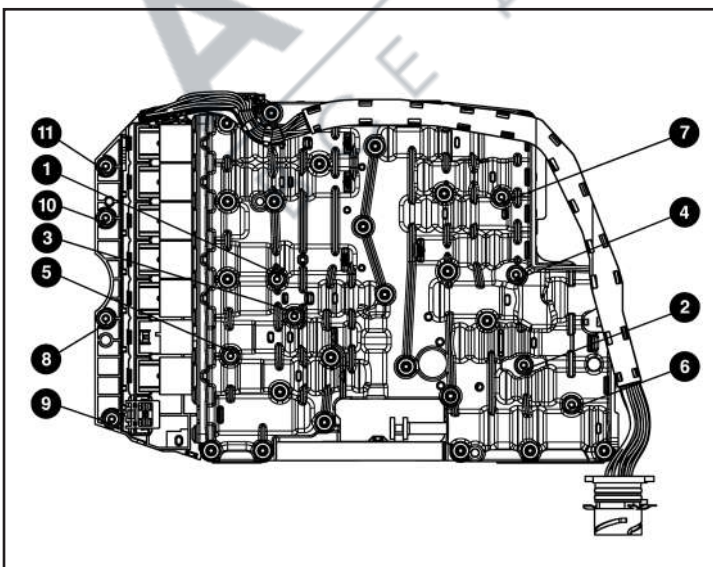
1 ⇔ 2 ⇔ 3 ⇔ ... ⇔ 13

Important!

Instruction 1071 700 089

(Tightening torques, see Chapter 1.5)

##### 1.3.1.2 Mechatronic



Tighten the mechatronic torques according to the numbering:

1 ⇔ 2 ⇔ 3 ⇔ ... ⇔ 11

Important!

Instruction 1068 700 152

(Tightening torques, see Chapter 1.5)

### 1.3.1.3 Differential Cover

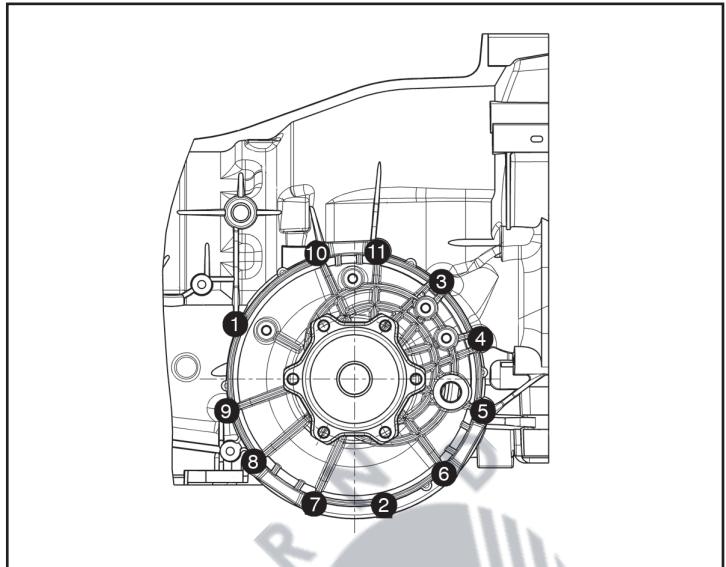
Tighten the differential cover torques according to the numbering:

1 ⇄ 2 ⇄ 3 ⇄ ... ⇄ 11

Important!

Instruction 1071 700 070

(Tightening torques, see Chapter 1.5)



### 1.3.1.4 Distributor Housing

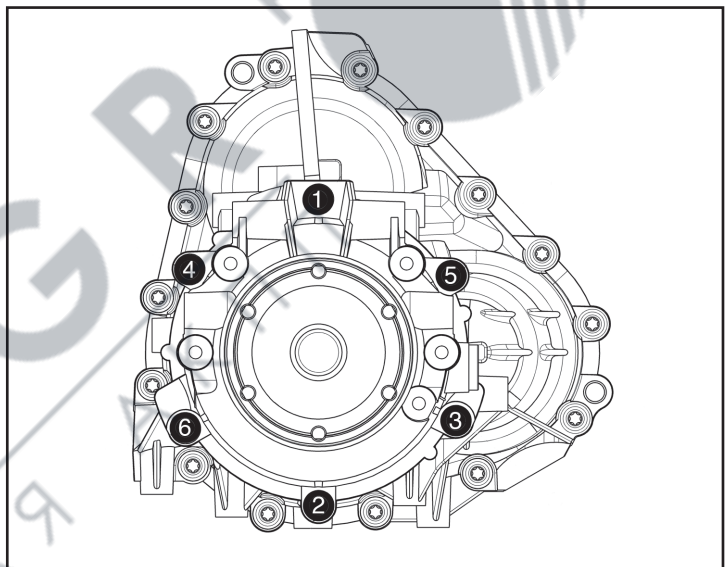
Tighten the distributor housing torques according to the numbering:

1 ⇄ 2 ⇄ 3 ⇄ ... ⇄ 6

Important!

Instruction 1071 700 082

(Tightening torques, see Chapter 1.5)



### 1.3.1.5 Intermediate Housing

The intermediate housing bolts must be tightened in two steps:

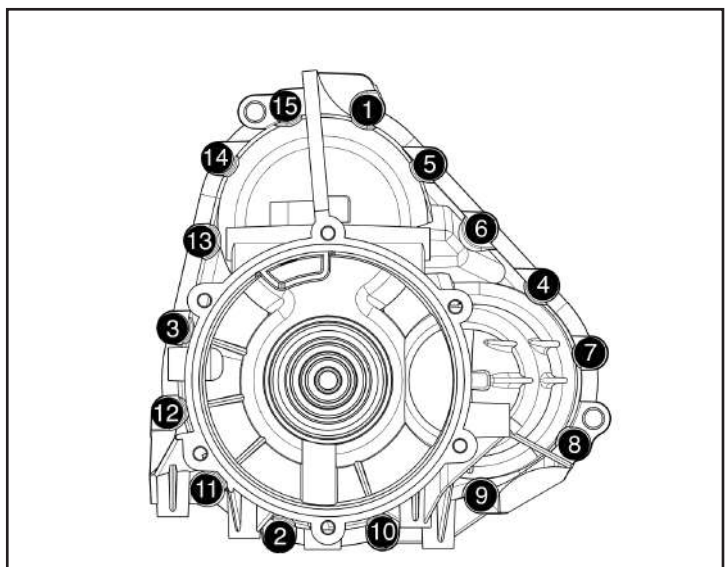
1 ⇄ 2 ⇄ 3 ⇄ 4  
on pre-tightening torque

1 ⇄ 2 ⇄ 3 ⇄ ... ⇄ 15  
on final torque

Important!

Instruction 1071 700 081

(Tightening torques, see Chapter 1.5)



### 1.3.1.6 Differential Ring Gear Yield Strength Tightening

#### Preconditions:

- The ring gear, differential cage and bolts have been washed and dried.
- The parts must have room temperature.

#### These are the values to be entered into the legend:

Joining torque = 50 Nm

Lower limit torque = 90 Nm

Lower limit angle = 30°

Screwdriving conditions = hard

Upper limit torque =

160 Nm

Upper limit angle =

70°

#### Tightening:

Tighten bolts crosswise.

Tighten all the bolts to the joining torque and then to the yield strength!

*Please observe the limits!*

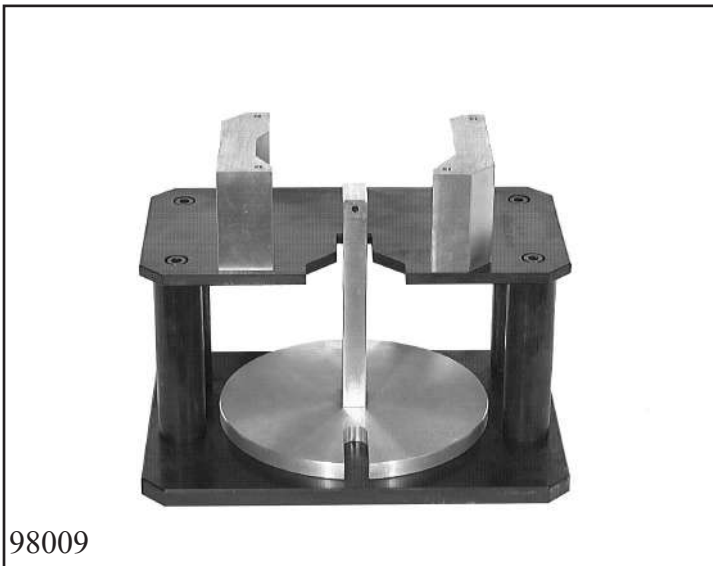




## 1.4 Adjustments

### 1.4.0 Measuring the Disc Sets (procedure)

Place the two spacers 5p01 000 329 on the marked points of measuring fixture 5p01 000 330.



98009

Use the knurled screw to turn adjusting fixture 5p01 001 458 to the upper limit position. Attach strain gauge 5p01 000 329 in the adjusting fixture.

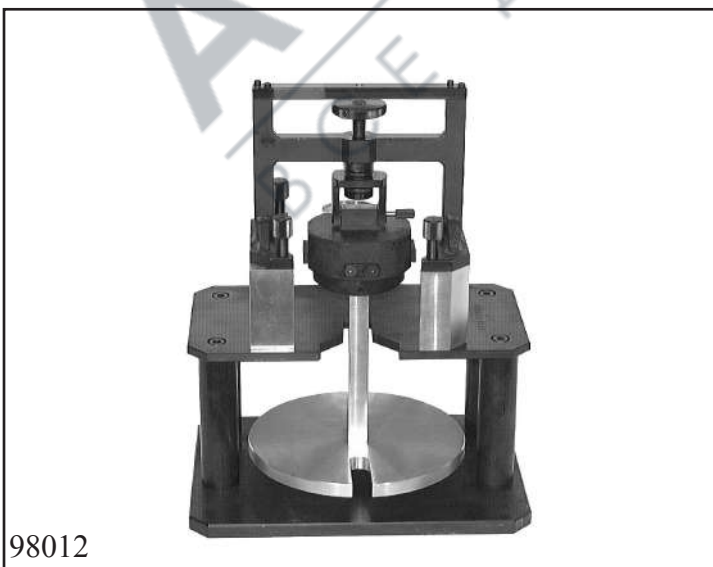


98011

Tighten the 4 knurled screws 5p01 000 329 to secure the adjusting fixture firmly with the height measuring fixtures by way of the spacers.

Connect measuring plate 5p01 040 330 to the strain gauge with the locating pin.

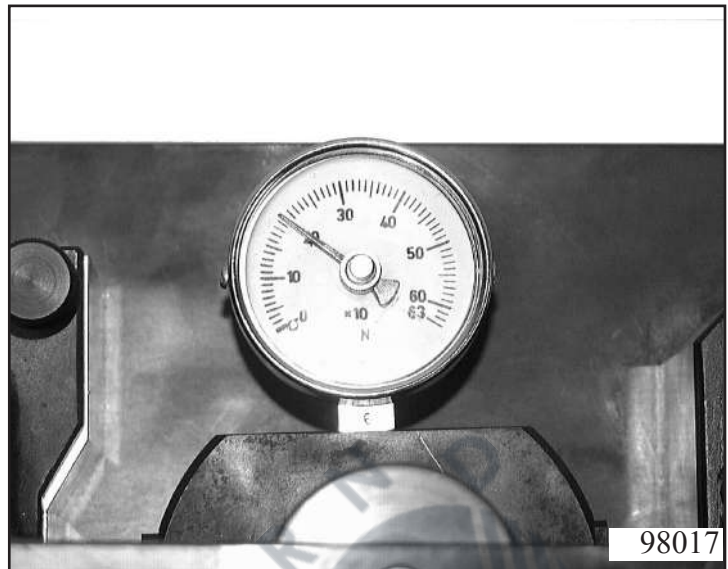
Clamp the disk cluster to be measured into the fixture at a tightening torque of 200 Nm, using the knurled screw (the corrugated steel disk, if present, must be at the bottom).



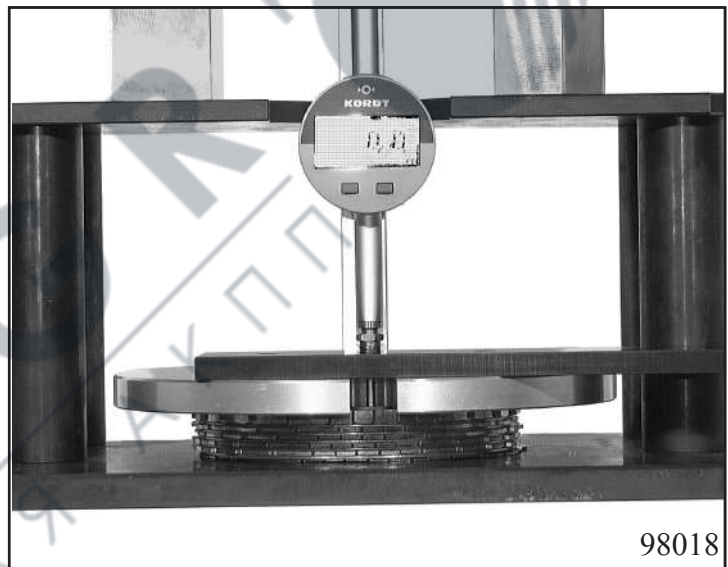
98012



Check the value shown on the strain gauge.



Next, place measuring bar 5p01 000 330 on the measuring plate, place the measuring foot of the dial gauge in the groove of the measuring plate on the upper disk of the disk cluster, and set the dial gauge to "0".



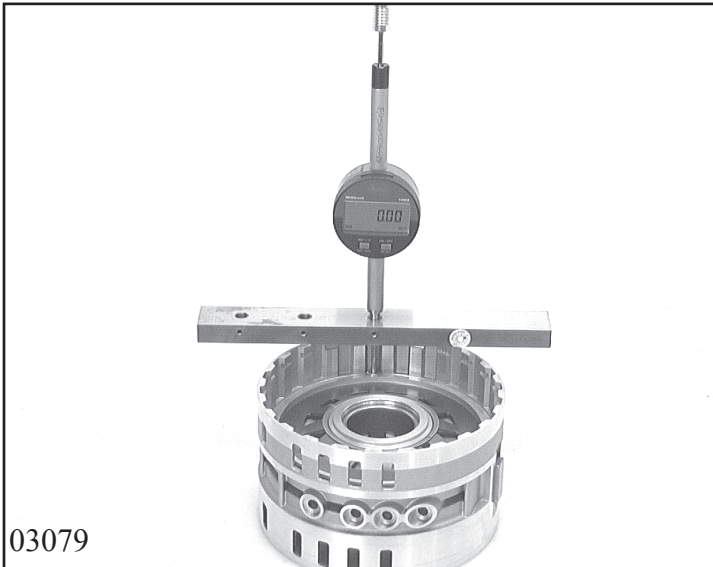
Measure down to the baseplate with the measuring bar.

Take the reading  $\Rightarrow M_X$

**Note:**

The index **X** in  $M_X$  stands for the clutch brake cluster that has been inserted (A, B, C, D, E).





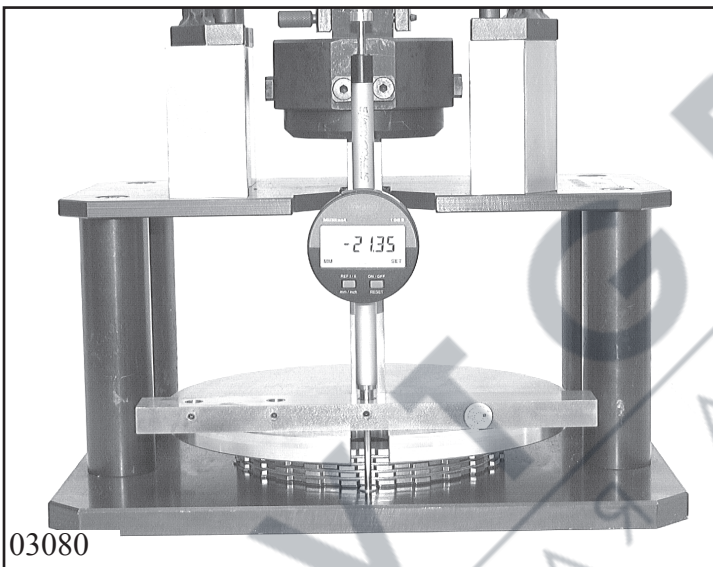
03079

## 1.4.1 Clearance Play

### 1.4.1.1 Setting the Brake C Clearance Play (snap ring)

Determine installed space  $E_C$  for brake C with measuring bar 5p01 000 330. To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake C. Place the dial gauge foot on the highest point of the disk contact face at the piston, and set the dial gauge to "0". Pull the measuring sensor up insert into snap-ring groove and press against upper edge of the groove.

Take the dial gauge reading  $\Rightarrow W_C$



03080

Determine thickness  $M_C$  of the brake C disk cluster as described in Chapter 1.4.0 "Measuring the disk clusters".

$\Rightarrow M_C$

Installed space  $E_C$  is obtained from measured value  $W_C$  plus foot thickness  $F$ .  $\Rightarrow E_C$

Text value  $P_C$  is then obtained from installed space  $E_C$  minus  $M_C$

Value  $P_C$  must be between 3.60 – 4.74 mm. Test directive 1071 700 064.

Version A

Use test gauge  $P_C$  to select snap ring  $S_C$ .

#### Calculation:

$$E_C = W_C + F$$

$$P_C = E_C - M_C$$

With 4 lined disks, released clearance  $L_C$  should be 1.38 – 1.67 mm

Example (for 1.4.1.1):

$$F = 1.48 \text{ mm (thickness of foot)}$$

$$W_C = 23.78 \text{ mm}$$

$$M_C = 21.35 \text{ mm}$$

$$E_C = 23.78 + 1.48$$

$$= 25.26 \text{ mm}$$

$$P_C = 25.26 - 21.35$$

$$= 3.91 \text{ mm}$$

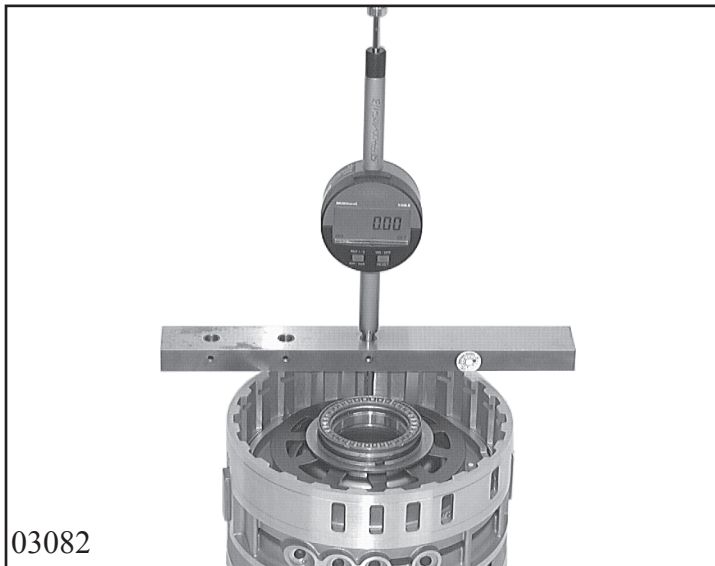
$$S_C = 2.40 \text{ mm}$$

$$L_C = 3.91 - 2.40$$

$$L_C = 1.51 \text{ mm}$$

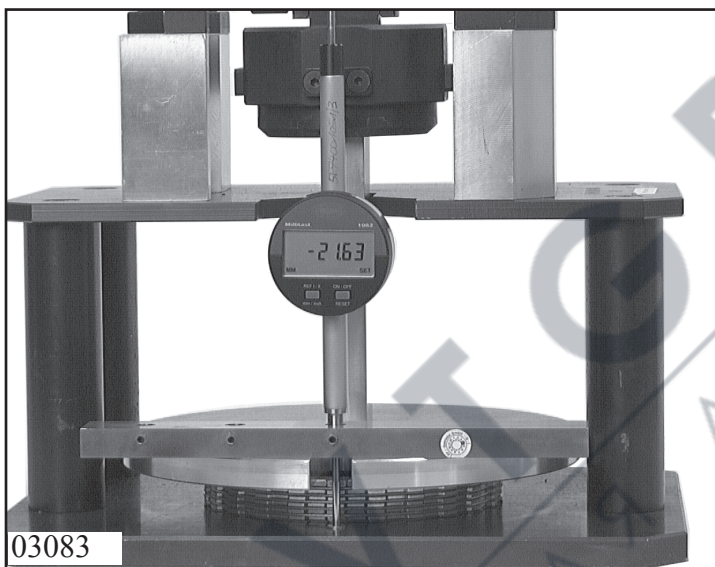


#### 1.4.1.2 Adjusting released clearance, brake D (end disk)



Determine installed space  $E_D$  for brake D with measuring bar 5p01 000 330. To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake D. Place the measuring foot on the highest point of the disk contact surface of the piston, and set the dial gauge to "0". Pull the measuring sensor up, insert it into the snap ring groove and while doing so, press it against the upper edge of the groove.

Take the dial gauge reading  $\Rightarrow W_D$



Determine thickness  $M_D$  of the brake D disc cluster as described in Chapter 1.4.0 "Measuring the disk clusters".

$\Rightarrow M_D$

Installed space  $E_D$  is obtained from  $W_D$  plus foot thickness  $F$ .  $\Rightarrow E_D$

Text value  $P_D$  is then installed space  $E_D$  minus  $M_D$ .

Value  $P_D$  must be between 3.40 – 4.85 mm, Test directive 1071 700 065  
Version A

Use text gauge  $P_D$  to select end disk  $S_D$ .

Released clearance  $L_D$  with 5 lined disks should be 1.59 – 1.88 mm.

Example (for 1.4.1.2):

$$W_D = 24.32 \text{ mm}$$

$$M_D = 21.63 \text{ mm}$$

$$E_D = 24.32 + 1.48$$

$$= 25.80 \text{ mm}$$

$$P_D = 25.80 - 21.63$$

$$= 4.17 \text{ mm}$$

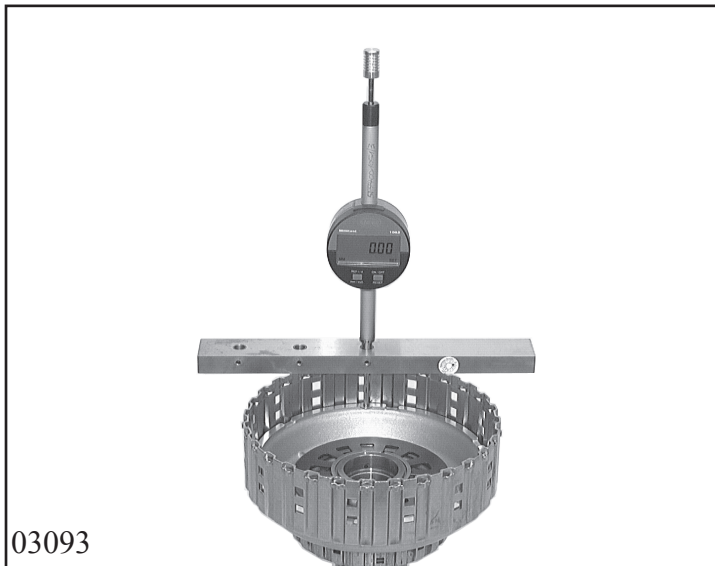
$$S_D = 2.40 \text{ mm}$$

$$L_D = 4.17 - 2.40$$

$$L_D = 1.77 \text{ mm}$$

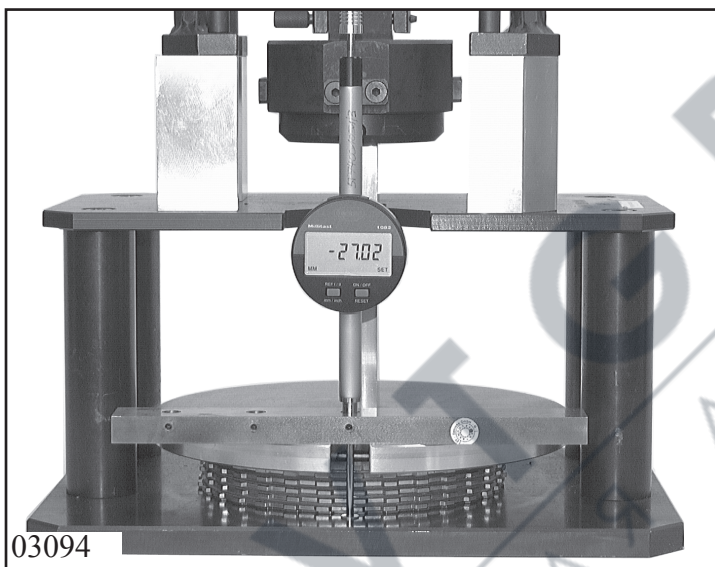


### 1.4.1.3 Adjusting released clearance, clutch B (snap ring)



Determine installed space  $E_B$  for clutch B with measuring bar 5p01 000 330. To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch B. Place the measuring foot on the highest point of the disk contact face and set the dial gauge to "0". Pull up the measuring sensor, insert it into the snap ring groove and press it against the upper edge of the groove.

Take the dial gauge reading  $\Rightarrow W_B$



Determine thickness  $M_B$  of the clutch B disk cluster as described in Chapter 1.4.0 "Measuring the disk clusters".

$\Rightarrow M_B$

Installed space  $E_C$  is obtained from measured value  $W_B$  plus foot thickness  $F$ .  $\Rightarrow E_B$

Text value  $P_B$  is then obtained from installed space  $E_B$  minus  $M_B$ .

Value  $P_B$  should be between 3,29 – 4,6 mm. Test directive 1071 700 067  
Version B

Use test gauge  $P_B$  to select snap ring  $S_B$ .

#### Calculation:

$$E_B = W_B + F$$

$$P_B = E_B - M_B$$

Released clearance  $L_B$  with 5 lined disks should be 1,74 – 2,03 mm.

Example (for 1.4.1.3)

$$F = 1.48 \text{ mm (foot thickness)}$$

$$W_B = 29.52 \text{ mm}$$

$$M_B = -27.02 \text{ mm}$$

$$E_B = 29.52 + 1.48$$

$$= 31.00 \text{ mm}$$

$$P_B = 31.00 - 27.02$$

$$= 3.98 \text{ mm}$$

$$S_B = 2.20 \text{ mm}$$

$$L_B = 3.98 \text{ mm} - 2.20 \text{ mm}$$

$$L_B = 1.78 \text{ mm}$$

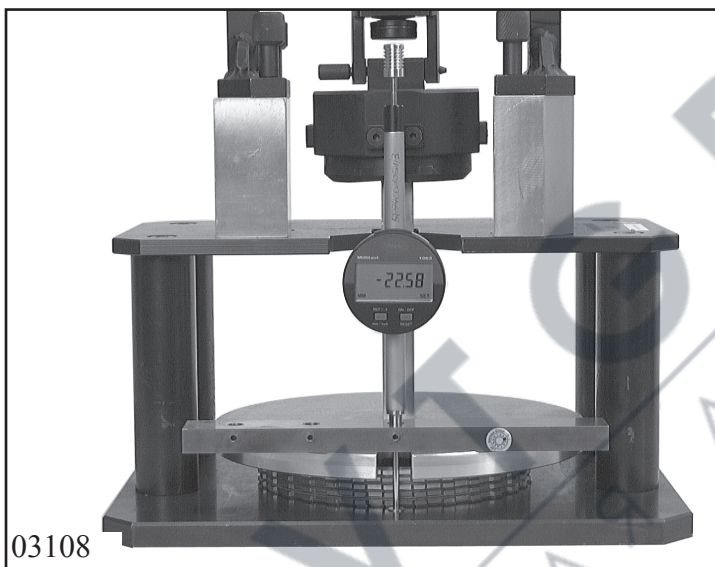


#### 1.4.1.4 Adjusting released clearance, clutch A (snap ring)



Determine installed space  $E_A$  for clutch A with measuring bar 5p01 000 330. To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch A. Place the measuring foot on the highest point of the disk contact face of the piston and set the dial gauge to “0”. Pull the measuring sensor up, guide it into the lower snap ring groove and press it against the upper edge of the groove.

Take the dial gauge reading  $\Rightarrow W_A$



Determine thickness  $M_A$  of the clutch A disk cluster as described in Chapter 1.4.0 “Measuring the disk clusters”.

$\Rightarrow M_A$

Installed space  $E_A$  is obtained from measured value  $W_A$  plus foot thickness  $F$ .  $\Rightarrow E_A$

Text value  $P_A$  is then obtained from installed space  $E_A$  minus  $M_A$ .

Value  $P_A$  should be between 3.51 – 4.71 mm. **Test directive 1071 700 063**  
Version **B**

Use test gauge  $P_A$  to select snap ring  $S_A$ .

#### Calculation:

$$E_A = W_A + F$$

$$P_A = E_A - M_A$$

Release clearance  $L_A$  with 4 lined disks should be 1.52 – 1.81 mm.



Example (for 1.4.1.4):

$$F = 1.48 \text{ mm (foot thickness)}$$

$$W_A = 25.44 \text{ mm}$$

$$M_A = -22.58 \text{ mm}$$

$$E_A = 25.44 + 1.48$$

$$= 26.92 \text{ mm}$$

$$P_A = 26.92 - 22.58$$

$$= 4.34 \text{ mm}$$

$$S_A = 2.60 \text{ mm}$$

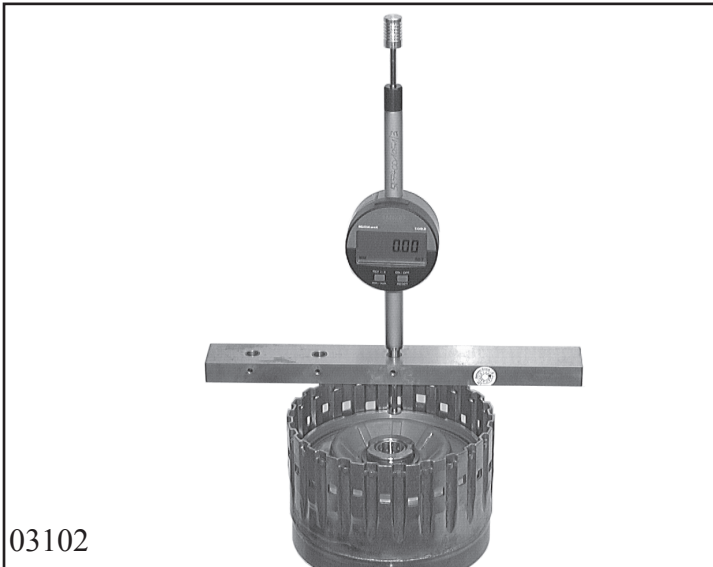
$$L_A = 4.34 - 2.60$$

$$L_A = 1.74 \text{ mm}$$



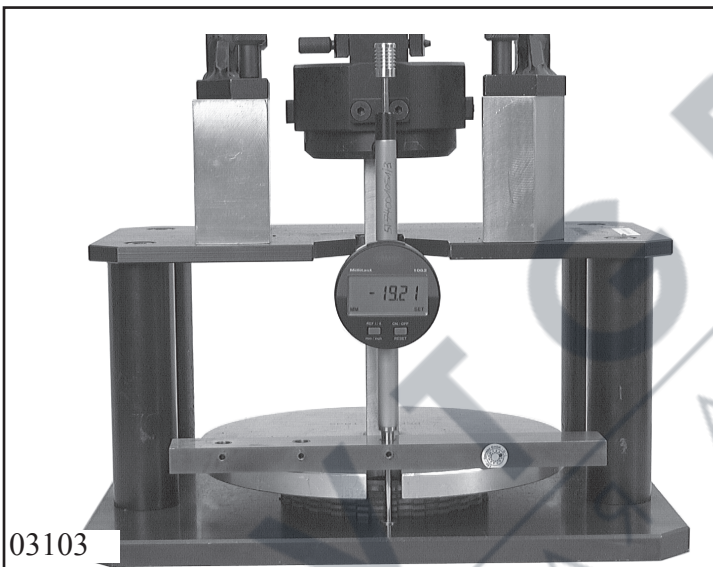


#### 1.4.1.5 Release clearance, clutch E (snap ring)



Determine installed space  $E_E$  for clutch E with measuring bar 5p01 000 330. To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch E. Place the measuring foot on the highest point of the disk contact face on the piston, and set the dial gauge to "0". Pull up the measuring sensor, insert it into the snap ring groove and press it against the upper edge of the groove.

Take the reading at the dial gauge  $\Rightarrow W_E$



Determining the thickness  $M_E$  of the clutch E disk cluster as described in Chapter 1.4.0 "Measuring the disk clusters".

$\Rightarrow M_E$

Installed space  $E_E$  is obtained from measured value  $W_E$  plus foot thickness  $F$ .  
 $E_E$

Text value  $P_E$  is then obtained from installed space  $E_E$  minus  $M_E$ .

Value  $P_E$  should be between 3.77 – 5.19 mm. Test directive 1071 700 058  
Version A.

Use test gauge  $P_E$  to select snap ring  $S_E$ .

#### Calculation:

$$E_E = W_E + F$$

$$P_E = E_E - M_E$$

Released clearance  $L_E$  should be 2.00 – 2.29 mm with 6 lined disks.

Example (for 1.4.1.5):

$$F = 1.48 \text{ mm (foot thickness)}$$

$$W_E = 21.58 \text{ mm}$$

$$M_E = 19.21 \text{ mm}$$

$$E_E = 21.58 + 1.48$$

$$= 23.06 \text{ mm}$$

$$P_E = 23.06 - 19.21$$

$$= 3.85 \text{ mm}$$

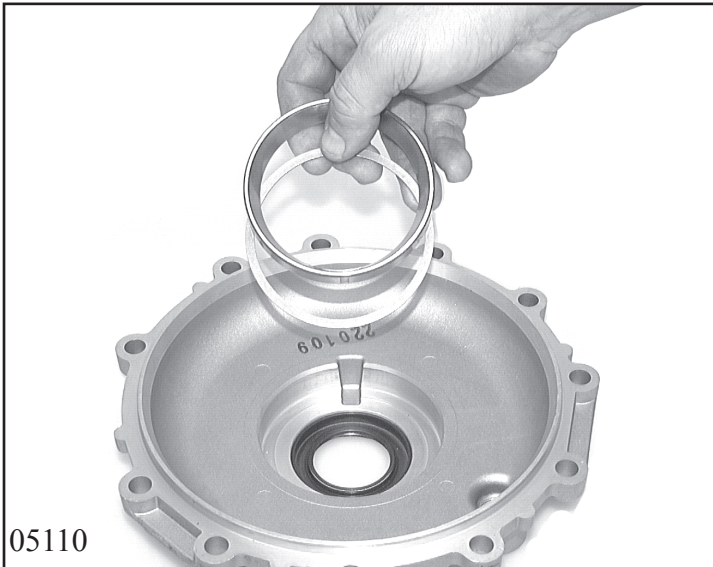
$$S_E = 1.80 \text{ mm}$$

$$L_E = 3.85 - 1.80$$

$$L_E = 2.05 \text{ mm}$$



#### 1.4.2 Prestressing the differential (shim)



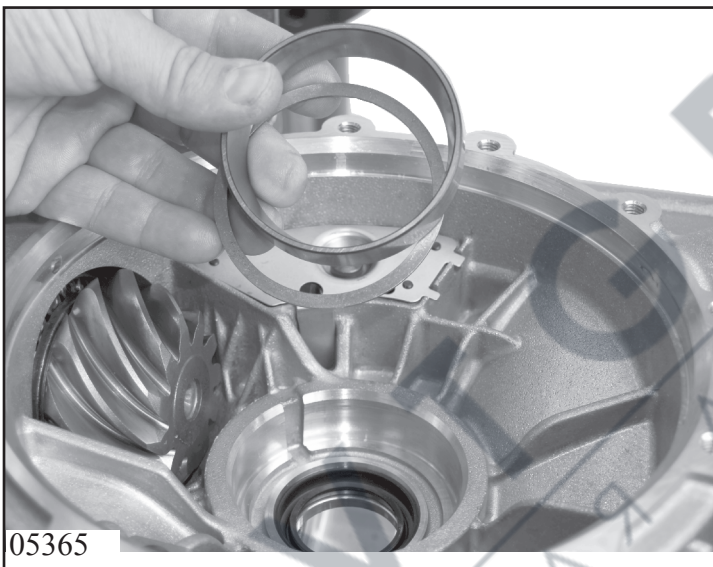
Determine maximum shim thickness  $M_G$ . To do this, measure shim washer thickness 35.080 and 35.110."  $M_U, M_O$   
Fit the removed shim washer 35.110 with bearing 35.010/150 in differential cover 35.150/110.

Calculation:

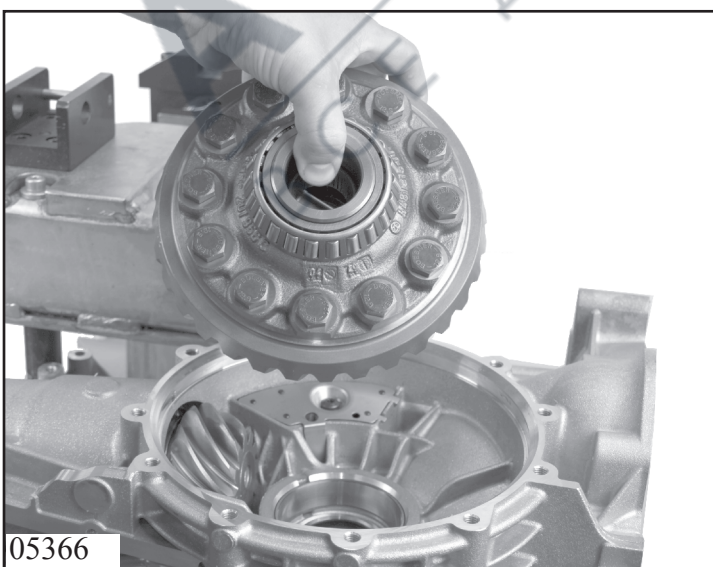
$$M_G = M_U + M_O$$

**Note:**

Normally possible by hand. If necessary, heat bearing seat gently with a hot air dryer.



Fit the removed shim washer 35.080 with bearing 35.010/120 in transmission housing. Normally possible by hand. If necessary, heat bearing seat gently with a hot air dryer.



Fit differential in transmission housing.  
Fit differential cover.

Caution!

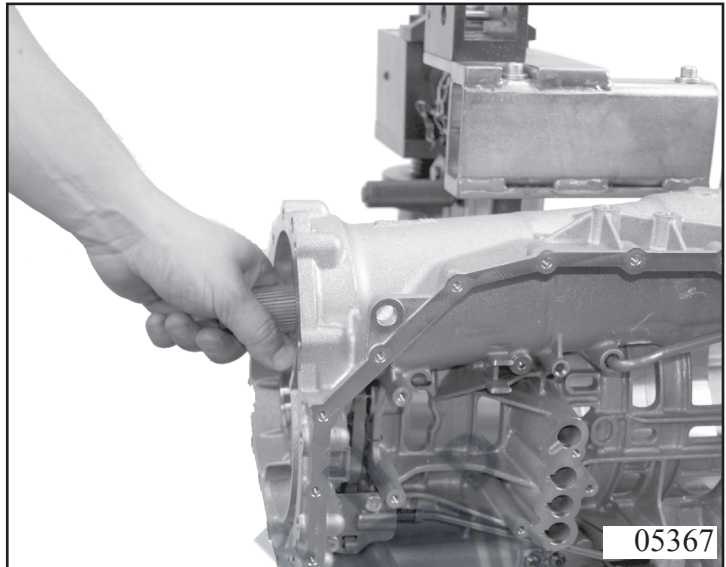
It must be possible to measure a gap (ca. 0.1 - 0.3 mm) between the transmission housing and the differential cover with a feeler gauge.

There is a risk of distortion if the gap is too large e.g. 0.7 mm. ⇨ Pre-stress too high. In this case, first fit a shim washer in the differential cover that is 0.5 mm thinner, for example. Measurement is made with the differential cover without shaft sealing ring and O-ring seal.

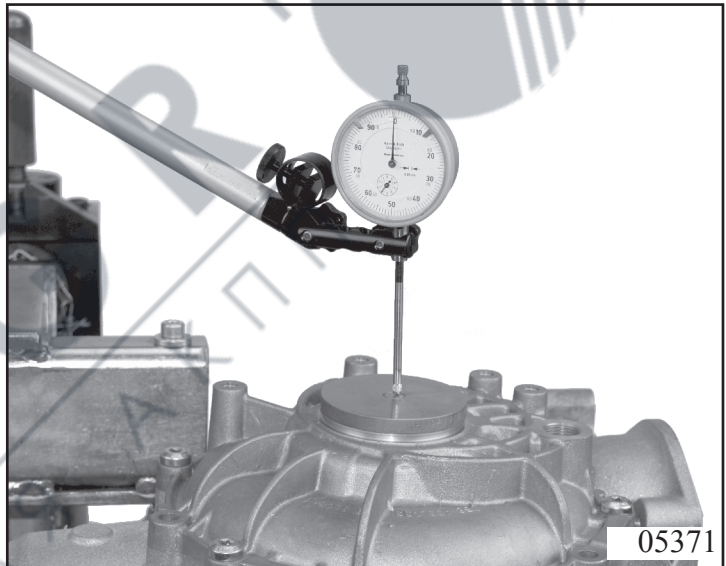
Tighten differential cover with 6 offset screws 35.184.

Place measuring plate 5p01 000 353 on differential cover.

(For tightening torques, see Chapter 1.5)

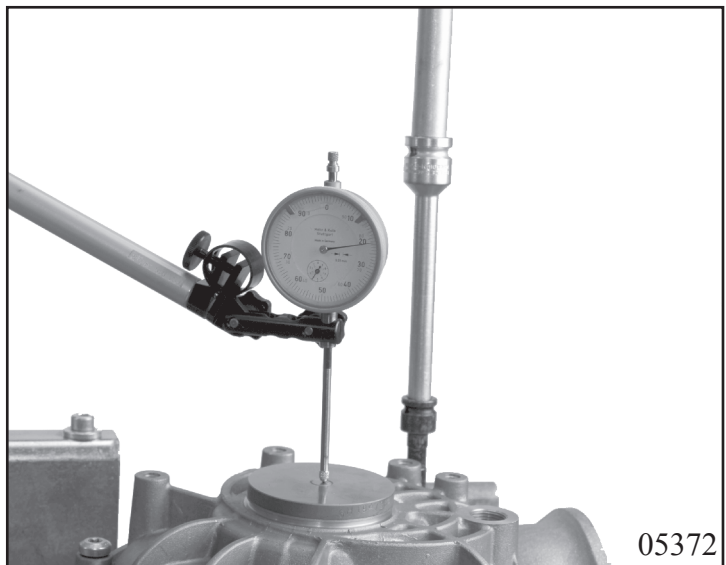


Screw measuring tripod stand 5x46 010 384 with M10 thread in corresponding thread in transmission housing. Clamp cross retainer so that clock gauge probe is aligned centrally and perpendicular to measuring plate.  
Set clock gauge to „0“.



Undo 6 offset screws by 1/2 turn each until screws are loose and clock gauge pointer no longer moves.  
⇒ Read off value  $M_D$ .

**Caution!**  
Do not touch the measuring tripod as this could falsify the measurement.



According to test specification 1071 700 067, the measured value of  $M_D$  must lie between a pre-stress of  $M_{Dmin} = 0.18$  mm and  $M_{Dmax} = 0.28$  mm.

If this deviates, determine the appropriate thickness and recheck.

Calculation:

$$D_D = M_D - [M_{Dmin} \text{ to } M_{Dmax}]$$

$$D_M = M_D - [M_{Dmax} + M_{Dmin}] / 2$$

$D_D$  (adjustment play)

$D_M$  (selected mean value of  $D_D$ )

Remove measuring plate and measuring tripod.

Remove cover.

Remove differential, bearing rings and shim washers

Shim washers 35.080 and 35.110 are available in steps of 0.025 mm.

Change shim washers (total shim thickness Test  $M_{GV}$ ) according to mean value of  $D_D$ .

$D_M > 0 \Rightarrow$  Reduce shim thickness

$D_M < 0 \Rightarrow$  Increase shim thickness.

$D_M = 0 \Rightarrow$  Leave shim thickness as it is



Example: (for 1.4.2)

$M_D = 0.45$  mm (pre-stress)

$M_U = 1.75$  mm

$M_O = 1.25$  mm

$M_{GV} = 1.75 + 1.25 = 3.0$  mm

$D_D = 0.45 - [0.18 \text{ to } 0.28]$

$= 0.17 \text{ to } 0.27$  mm

$D_M = 0.45 - [0.28 + 0.18] / 2$

$= 0.22$  mm

Reduce  $M_{GV}$  by 0.2 mm

⇒  $M_{GA} = 2.8$  mm

[Measured total shim thickness]

Repeat measurement procedure with

$M_{GA} = 2.8$  mm.

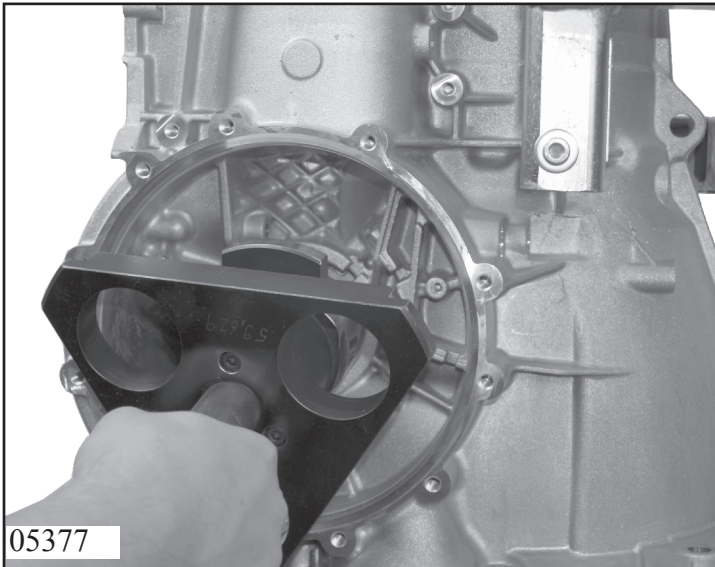
⇒  $M_D = 0.02$  mm (pre-stress)

⇒ OK according to test specification

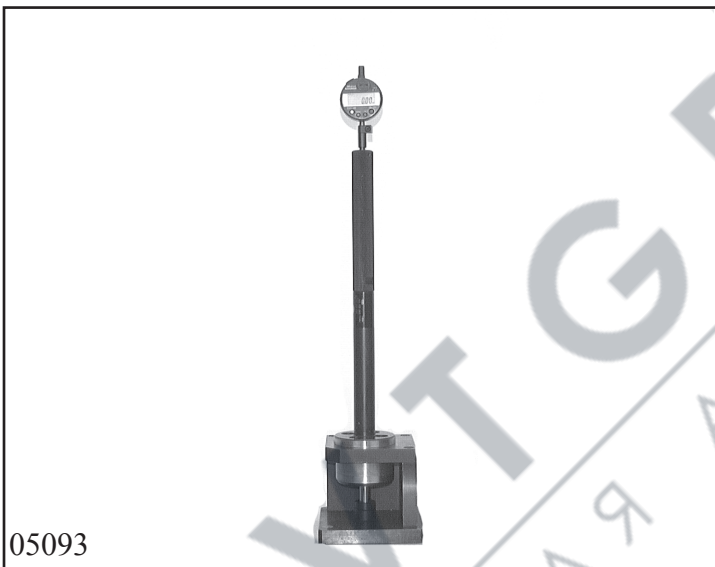


### 1.4.3 Bevel gear (shim)

#### 1.4.3.1 Pinion position

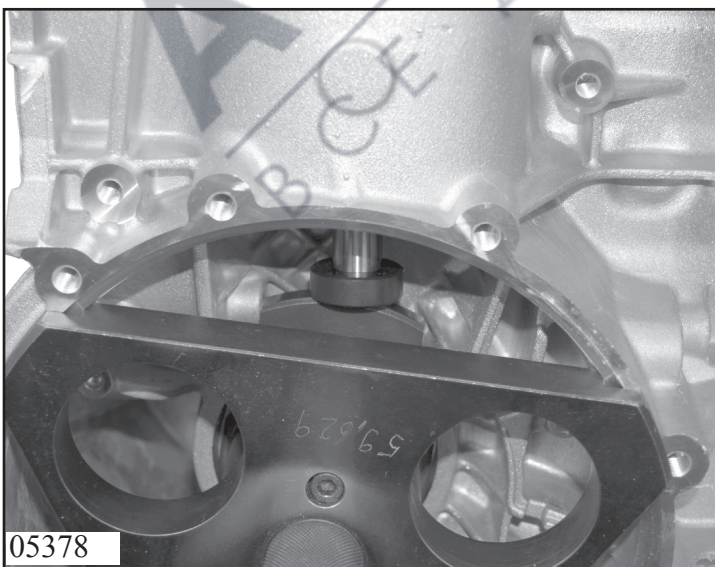


Turn transmission housing through 90° (torque converter bell downwards). Insert the fixture 5p01 003 645 with adapter 5p01 003 648 in differential housing with measuring radius facing hole in pinion shaft.



Set measuring unit 5p01 002 604 in calibration device 5p89 004 524 to zero. Reference dimension = 93.603 ( $M_{ER}$ ) (calibration device)

Adjustment specification 1068 700 067



Fit measuring unit in transmission housing on bearing mounting surface. Read off dimension  $M_R$  (measuring rod on measuring radius). Turn transmission unit back through 90°. The total dimension  $G$  is given by the dimension of the calibration device  $M_{ER}$  plus measuring unit  $M_{MR}$  plus measured dimension  $M_R$

Calculation:

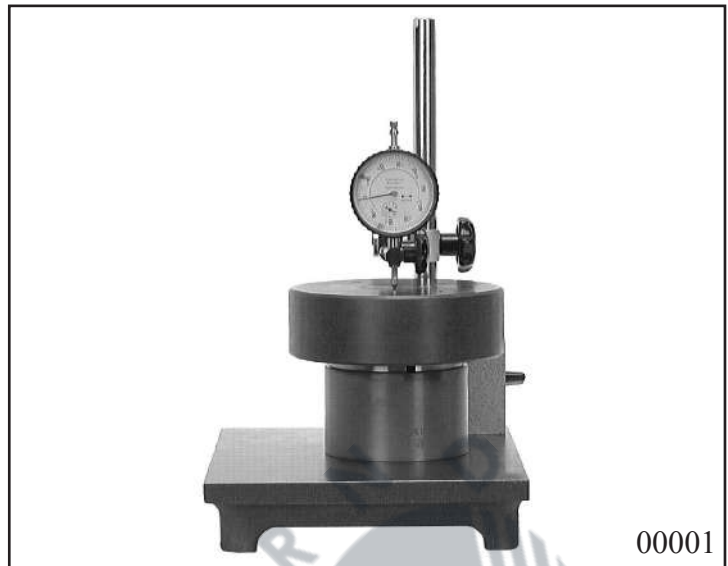
$$G = M_{ER} + M_{MR} + M_R$$

**Note:**

$M_R$  can also be negative. Look at the direction in which the gauge pointer moves.

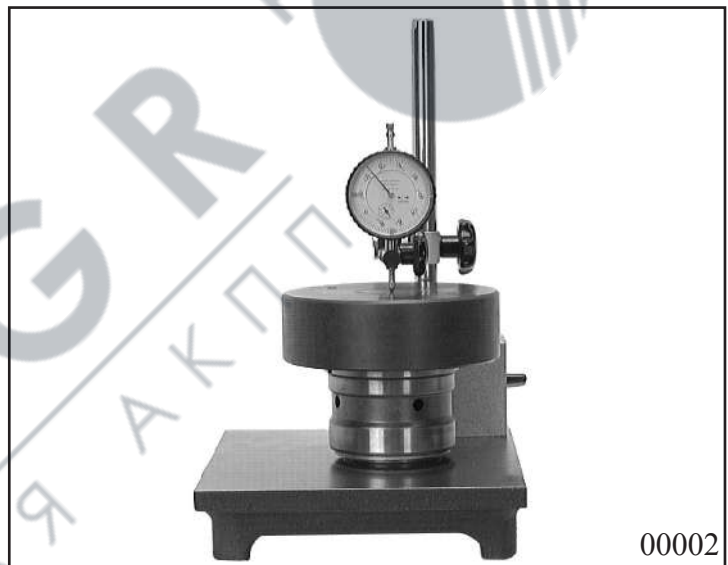
### 1.4.3.2 Height of fitted pinion shaft bearing

Place differential-side inner bearing ring on measuring plate.  
Fit outer bearing ring in measuring sleeve 5p01 030 355 and position on bearing ring.  
Apply weight 5p01 010 355 and position centrally under measuring probe of clock gauge.  
Set clock gauge to „0“.  
Raise measuring probe and pull measuring package forwards.  
Remove weight. Remove outer bearing ring from measuring sleeve.



Place differential-side inner bearing ring on measuring plate.  
Place outer bearing ring on inner ring and load with weight 5p01 010 355.  
Position measuring package centrally under measuring probe of clock gauge.  
Rotate bearing several times. Read off dimension  $\varnothing M_L$   
Bearing height  $L$  is given by sleeve height  $H_H$  minus  $M_L$

Calculation:  
 $L = H_H - M_L$



### 1.4.3.3 Shim washer, pinion shaft bearing

Read off dimension  $R$  from pinion.  
Pinion position shim washer  $S$  is given by

Calculation:  
 $S = G - L - R$



Example: (for 1.4.3.3)

$$M_{ER} = 93.603 \text{ mm}$$

$$M_{MR} = 59.629 \text{ mm}$$

$$M_R = -1,63 \text{ mm}$$

$$R = 94 \text{ mm}$$

$$H_H = 57 \text{ mm}$$

$$M_L = -0.76 \text{ mm}$$

$$G = 93,603 + 59,629 - 1,63 \\ = 151.6 \text{ mm}$$

$$L = 57 - 0,76 \\ = 56.24 \text{ mm}$$

$$S = 151,6 - 56,24 - 94 \\ = 1.36 \text{ mm}$$

Select appropriate shim.

Shim may be a maximum of 0.02 mm larger - but not smaller - than the desired size.

$$\Rightarrow S = 1.36 \text{ mm}$$

AVTGR  
ВСЕ ДЛЯ АКТИВНОГО

#### 1.4.3.4 Backlash / Crown gear position

**Note:**

From experience, the shim in the differential cover is 0.2 - 0.5 mm thinner than the shim in the differential housing.

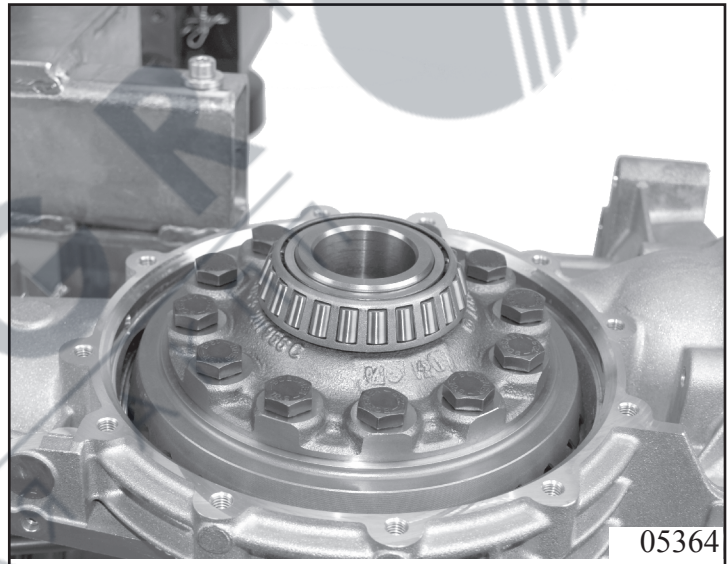
$$D_G = 0.2 - 0.5 \text{ mm}$$

Calculation:

$$M_U = (M_{GA} + D_G) / 2$$

$$M_O = M_{GA} - M_U$$

Fit shim and outer bearing ring in transmission housing.  
Fit differential in transmission housing.  
Complete cover with shim and outer bearing ring.

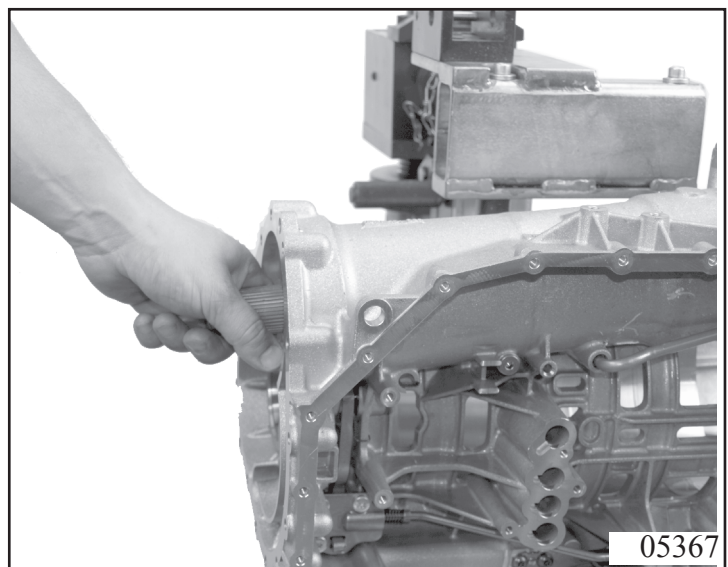


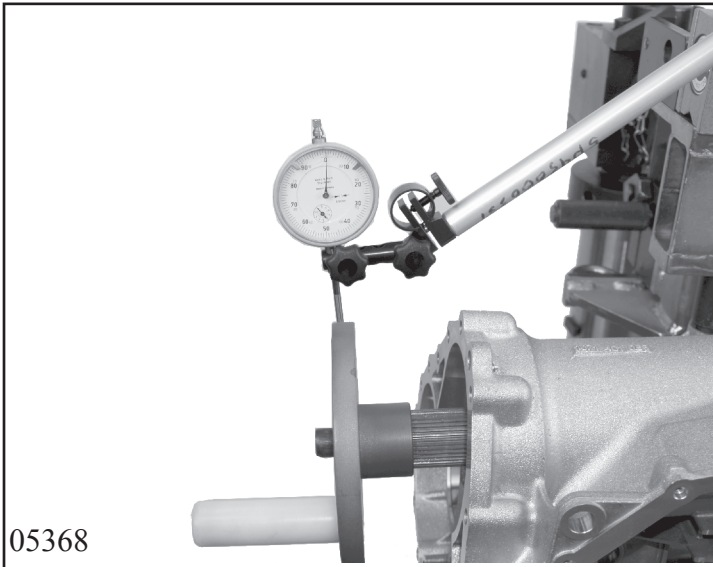
Screw cover to transmission housing with 6 offset screws making sure that backlash is always present.  
Backlash can be detected by rotating the pinion shaft.  
Turn pinion shaft through ca. 15 revolutions.

(For tightening torques, see Chapter 1.5)

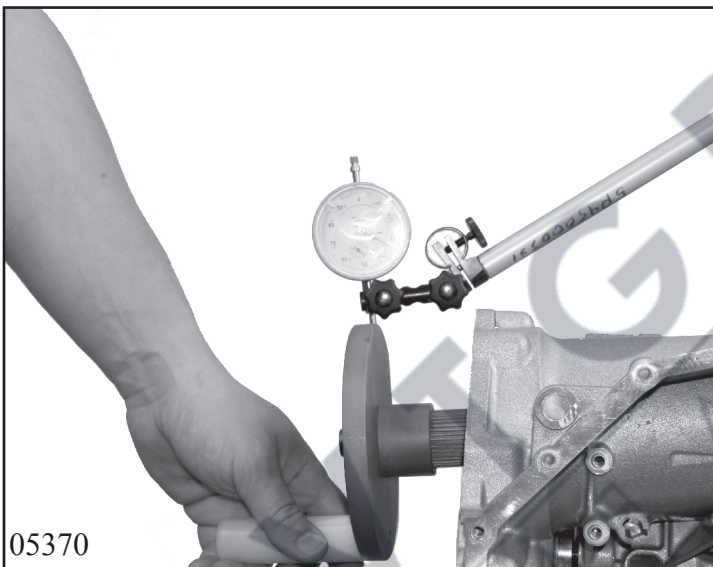
**Caution!**

Measurements are made without O-ring seal on differential cover.





Clamp backlash reference disc 5p01 909 112 to side shaft.  
Screw measuring tripod stand 5x46 010 384 into transmission housing, and clamp cross retainer 5x46 000 384 so that measuring probe is perpendicular to marked measuring surface of reference disc.



Turn pinion shaft to one side as far as the pinion/crown gear stop. Set gauge to „0“. Turn pinion shaft carefully in the opposite direction as far as the stop.  
Determine measurement  $\Rightarrow M_F$

According to specification 1071 700 055, backlash  $M_F$  must lie between 0.27 and 0.40 mm (tooth ratio 11/32) or 0.3 to 0.5 mm (tooth ratio 9/30) or 0.29 to 0.44 mm (tooth ratio 13/43)

$M_F >$  permissible:  $M_U$  too thick  
 $M_F <$  permissible:  $M_U$  too thin

Caution!

If backlash deviates from desired value, re-determine the shim thicknesses. The total shim thickness must not be changed, however.

Repeat measurement.

Subsequently remove measuring tripod and reference disc.

Unscrew and remove differential cover.

Example: (for 1.4.3.4)

$$\begin{aligned}M_{GA} &= 3.15 \text{ mm} \\D_G &= 0.25 \text{ mm} \\&\text{(selected shim difference)}\end{aligned}$$

1st measurement:

$$\begin{aligned}M_U &= (3.15 + 0.25) / 2 \\&= 1.7 \text{ mm} \\M_O &= 3.15 - 1.7 \\&= 1.45 \text{ mm}\end{aligned}$$

measured backlash:

$$\begin{aligned}M_F &= 0.4 \text{ mm} \\&\Rightarrow \text{NOK}\end{aligned}$$

$M_F > \text{permissible}$  ” reduce  $M_U$ :

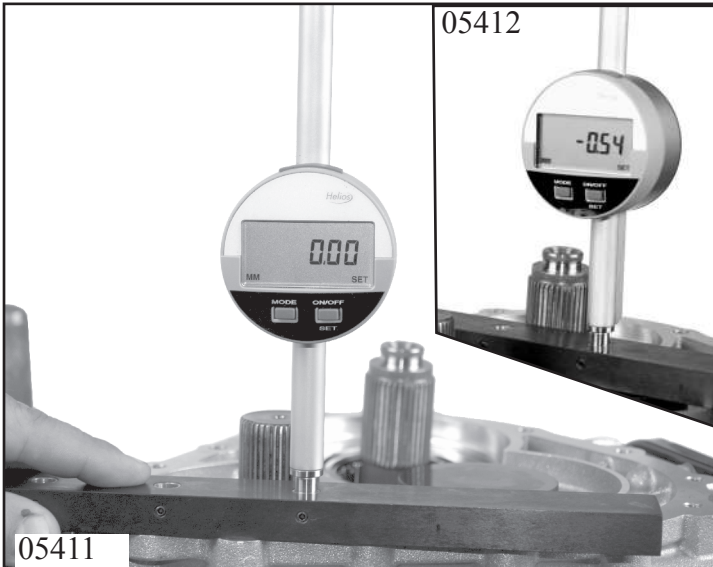
2nd measurement:

$$\begin{aligned}M_U &= 1.6 \text{ mm} \\M_O &= 3.15 - 1.6 \\&= 1.55 \text{ mm}\end{aligned}$$

measured backlash:

$$\begin{aligned}M_F &= 0.34 \text{ mm} \\&\Rightarrow \text{OK}\end{aligned}$$





#### 1.4.4 Axial output drive (shim)

##### 1.4.4.1 Measuring space for fitting VA shaft

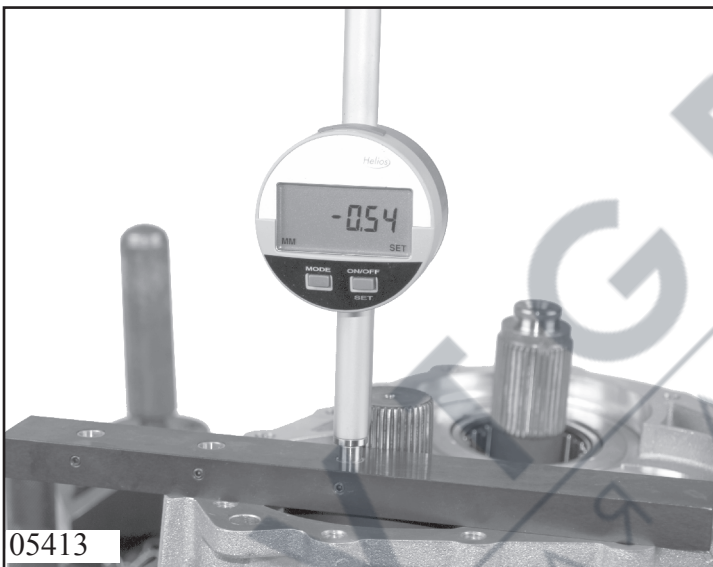
Place measuring plate 5p89 909 011 ( $M_{PV}$ ) on bearing seat of VA shaft and measuring bridge 5p01 000 330 on sealing surface of transmission housing, and determine measurement  $\Rightarrow M_{W1}$

##### Calculation:

$$M_{BV} = M_{PV} - M_{W1}$$

##### Note!

Sea adjustment specification 1071 700 025



##### 1.4.4.2 Measuring space for fitting input drive wheel

Place measuring plate 5p89 909 012 ( $M_{PA}$ ) on bearing seat of input drive wheel and place with measuring bridge 5p01 000 330 on sealing surface of transmission housing, and determine measurement.  $\Rightarrow M_{W2}$

##### Calculation:

$$M_{BA} = M_{PA} - M_{W2}$$

##### Note!

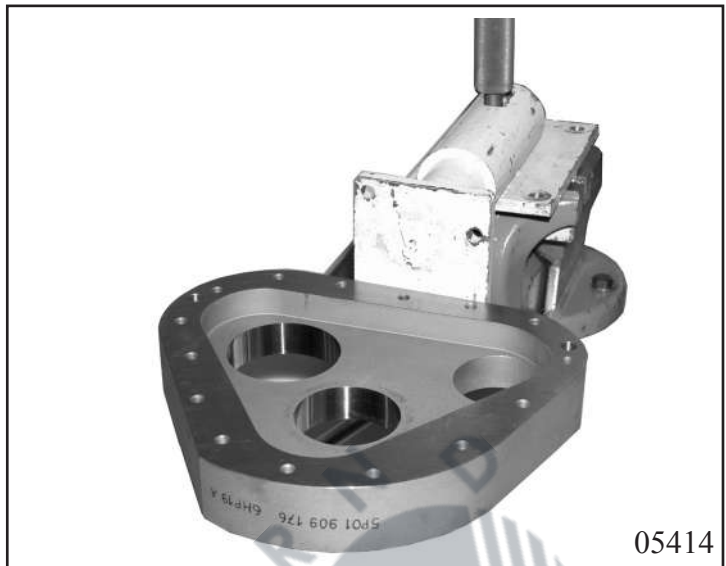
See adjustment specification 1071 700 024

### 1.4.4.3 Preparing measurement of space VA shaft and input drive wheel

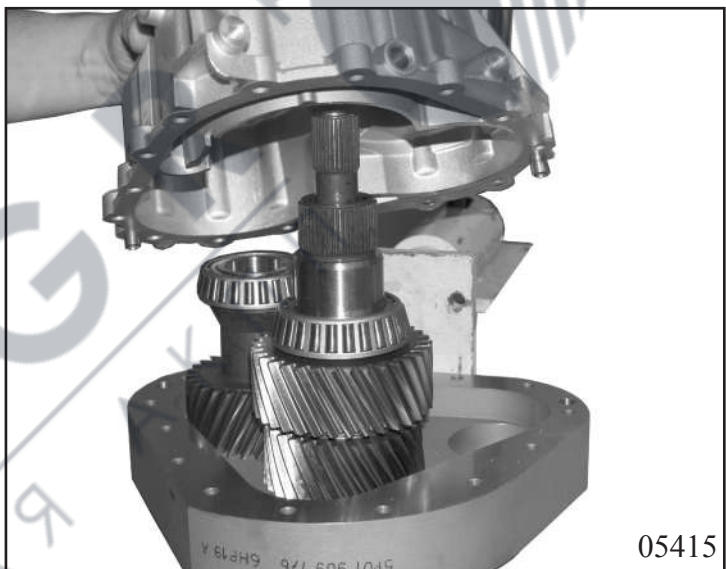
Clamp measuring plate 5p01 909 176  
(Mp) in vice.

**Note!**

See adjustment specification 1071 700 025

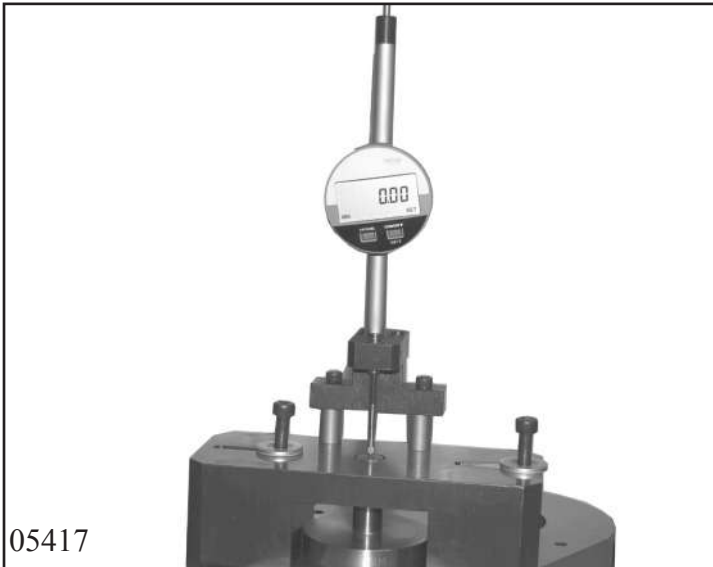


Place input drive wheel and VA shaft on  
measuring plate.  
Screw intermediate housing with seal to  
measuring plate.  
Turn through 180°.

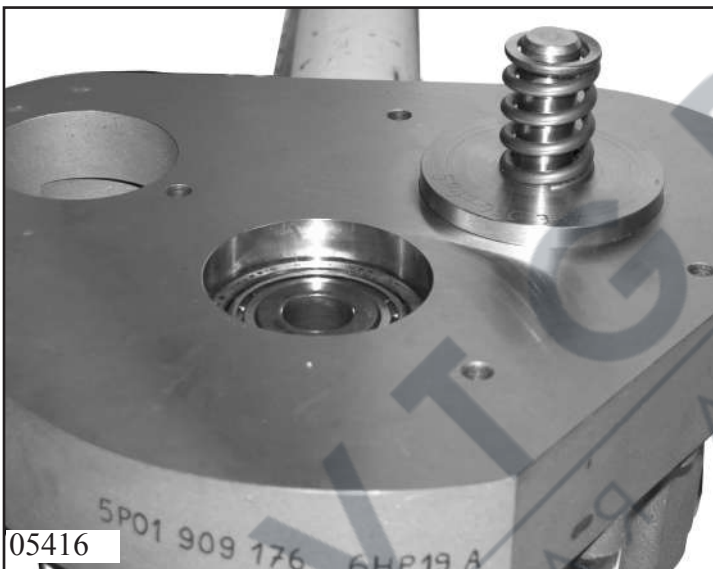




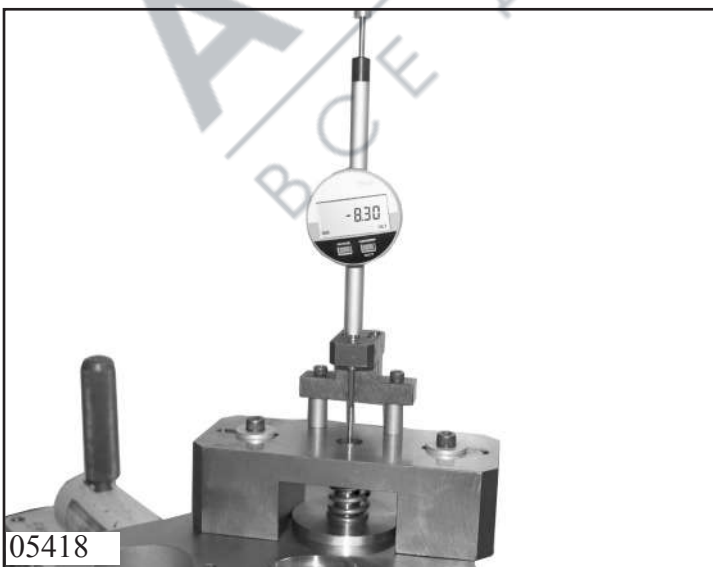
#### 1.4.4.4 Measuring input drive wheel



Position measuring bridge 5p01 000 357 with clock gauge above pressure pad. Set gauge to „0“.



Place thrust pad 5p01 030 357 and spring 5p01 000 357 on input drive shaft.



Screw measuring bridge in place above pressure pad. Turn shaft until clock gauge settles.

Read off dimension from clock gauge  
 $\square M_A$

Shim thickness is calculated from:

**Calculation:**

$$S_A = M_{BA} - M_P - M_A - K_5$$

( $K_5 = 0,06 \text{ mm}$ )



**Example (1.4.4.4)**

$$\begin{aligned}M_{PA} &= 37.0 \text{ mm} \\M_P &= 44.50 \text{ mm}\end{aligned}$$

$$\begin{aligned}M_{W2} &= -0.54 \text{ mm} \\M_A &= -8.3 \text{ mm}\end{aligned}$$

$$\begin{aligned}M_{BA} &= 37.0 \text{ mm} - (-0.54 \text{ mm}) \\M_{BA} &= 37.54 \text{ mm}\end{aligned}$$

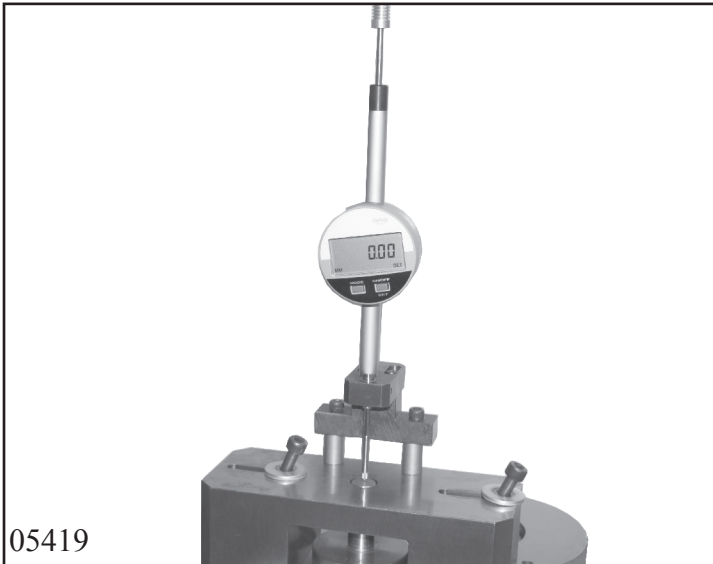
$$\begin{aligned}S_A &= 37.54 \text{ mm} - 44.5 + (-8.3) - 0.06 \\&= 1.28 \text{ mm}\end{aligned}$$

**Selected shim thickness:**

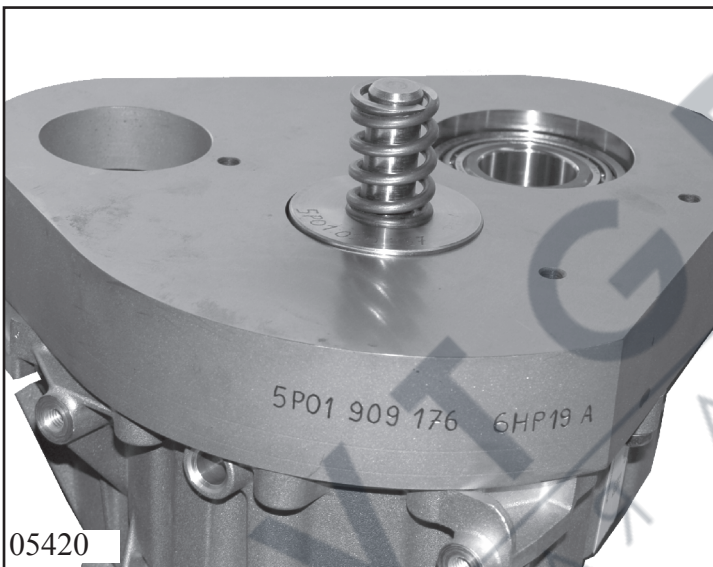
$$\square S_A = 1.30 \text{ mm}$$



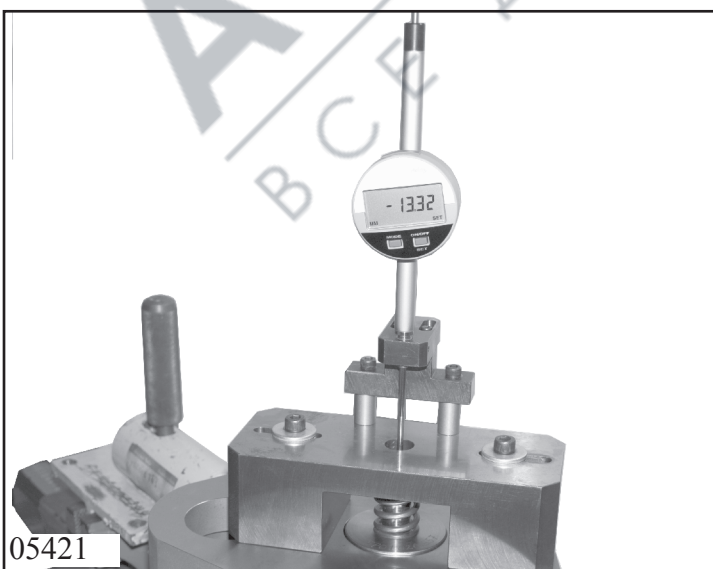
#### 1.4.4.5 Measuring VA shaft



Position measuring bridge 5p01 000 357 with clock gauge above pressure pad 5p01 020 357. Set gauge to „0“.



Place pressure pad and spring on VA shaft.



Screw measuring bridge in place above pressure pad. Turn shaft until clock gauge settles.

Read off dimension from clock gauge  
⇨  $M_V$

Shim thickness is calculated from

**Calculation:**

$$S_V = M_{BV} - M_P - M_V - K_4$$

( $K_4 = 0,08 \text{ mm}$ )

**Example: (1.4.4.5)**

$$\begin{aligned} M_{pV} &= 33.0 \text{ mm} \\ M_p &= 44.50 \text{ mm} \end{aligned}$$

$$\begin{aligned} M_{W1} &= -0.54 \text{ mm} \\ M_V &= -13.32 \text{ mm} \end{aligned}$$

$$\begin{aligned} M_{BV} &= 33.0 - (-0.54) \\ M_{BV} &= 33.54 \text{ mm} \end{aligned}$$

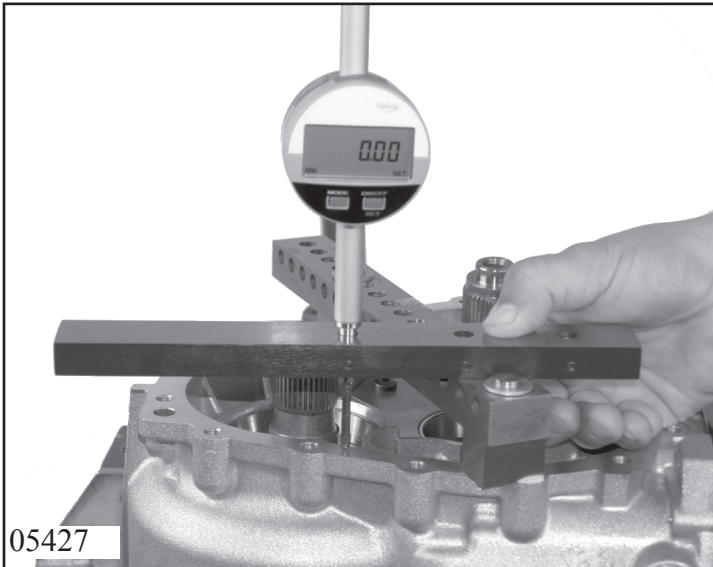
$$\begin{aligned} S_V &= 33.54 - 44.5 - (-13.32) - 0,08 \\ &= 2,28 \text{ mm} \end{aligned}$$

**Selected shim thickness:**

$$\square S_V = 2.30 \text{ mm}$$



### 1.4.5 Determining shim washer for output drive axial play



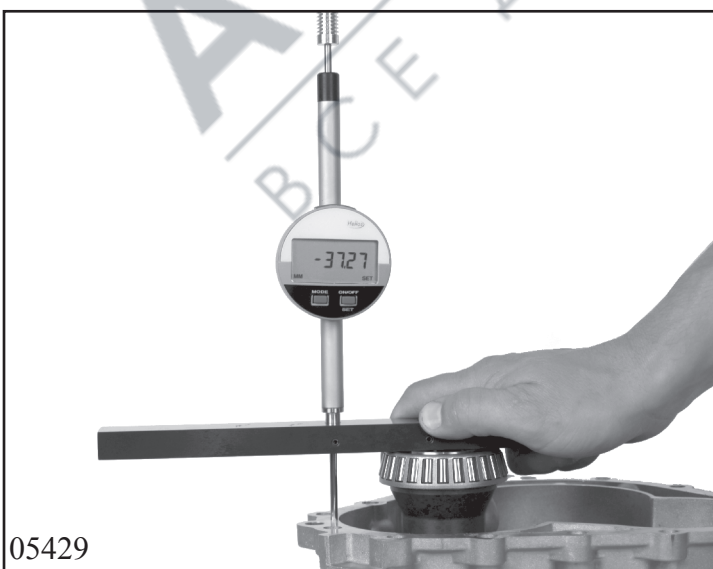
Place measuring beam on sealing surface of intermediate housing, and with measuring bridge position the integral clock gauge on sealing surface. Set clock gauge to „0“.

Bear down on output drive shaft by hand, and measure on machined surface of drive shaft with measuring bridge.

Read off dimension  $\Rightarrow M_S$



Place measuring beam on intermediate housing and set gauge to „0“.



Place measuring beam on input drive wheel and measure on sealing surface

Read off dimension  $\Rightarrow M_R$

Shim thickness is calculated from

**Calculation:**

$$M_{AS} = M_S + M_R + M_D$$

**Note!**

$M_D$  = Thickness of seal

**Example (1.4.5)**

$$M_D = 0.27 \text{ mm}$$

$$M = 39.6 \text{ mm}$$

$$M_R = -37.27 \text{ mm}$$

$$M_{AS} = 39.6 \text{ mm} + (-37.27) + 0.27$$

$$M_{AS} = 2.6 \text{ mm}$$

**Output drive play should be between 0.15 and 0.35 mm.**

**Determine shim thickness**

$$S_{AS} = 2.6 - (0.15 : 0.35) \text{ mm}$$

$$S_{AS} = 2.25 : 2.45 \text{ mm}$$

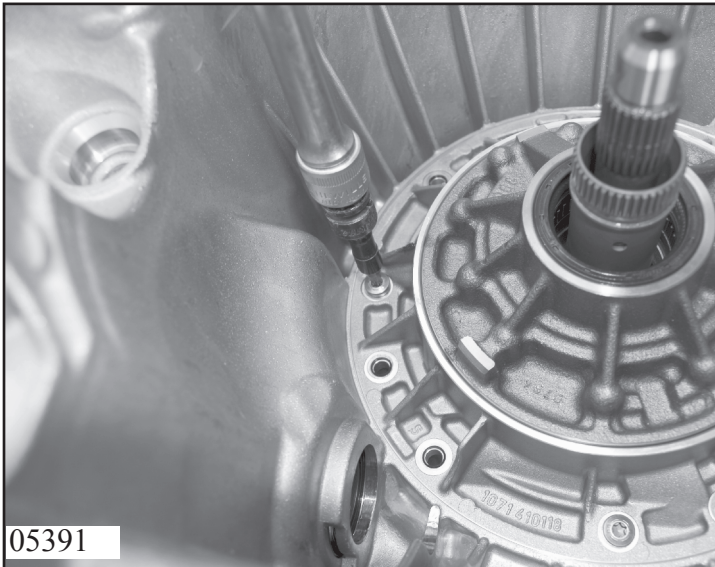
**Selected :**

$$\square S_{AS} = 2.4 \text{ mm}$$



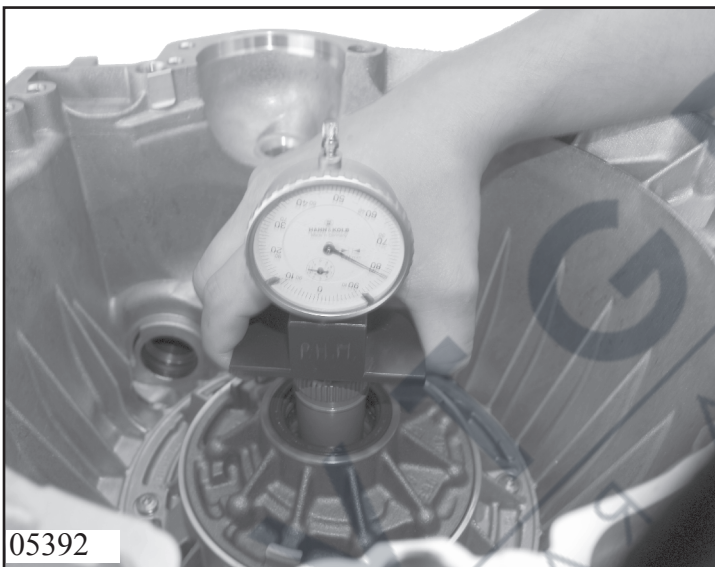
#### 1.4.6 Determining shim washer for input drive axial play

Tighten oil supply in housing with 4 opposing Torx screws 10.080.



(For tightening torque, see Chapter 1.5)

Prerequisite:  
Compensating shim 10.090 (thickness = 2.6 mm, thinnest according to WTB) is fitted



Fit measuring device 5p01 002 379 over teeth of input drive shaft and clamp approximately 2 mm above stator shaft using the clamping screw.

Set gauge to „0“.

Determine axial play by pushing and pulling on the handle (repeat measurement several times).

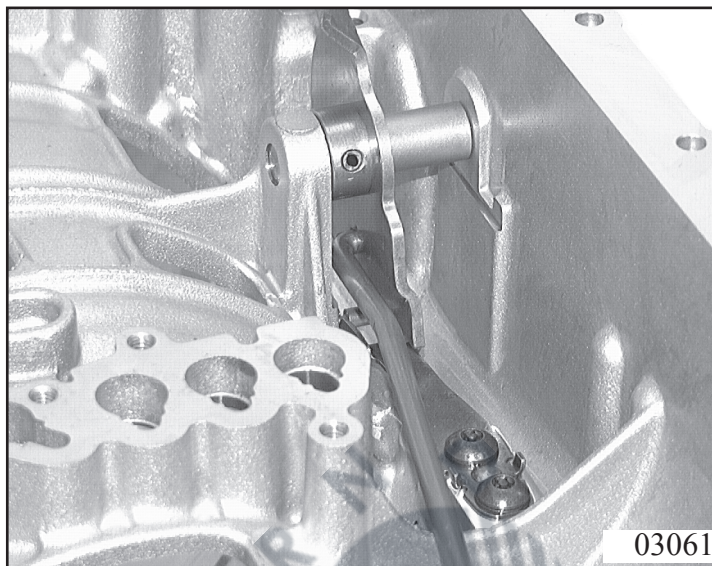
Desired axial play = 0.15 - 0.45 mm with a force of 200N (dry in accordance with test specification 1068 700 051)

If this deviates, fit a correspondingly thicker or thinner shim 02.260.  
Subsequently re-check axial play.

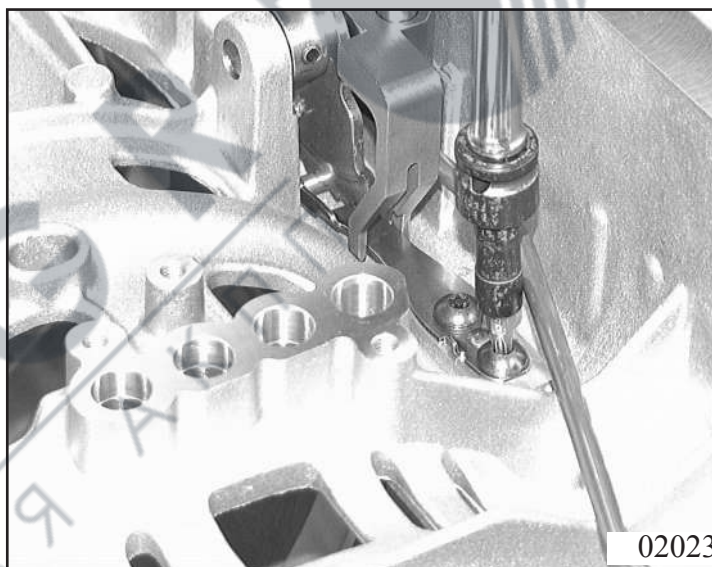


#### 1.4.7 Switch setting (latching spring)

Move slotted disc to Position N (Neutral) with a suitable tool.

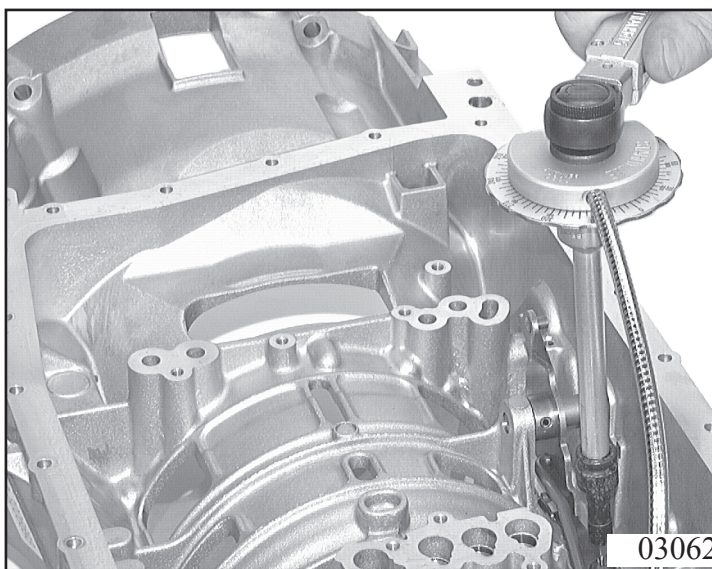


Align latching spring with centring device 5x46 002 292 and tighten latching spring in this position.  
Tighten output drive side screw first.



(For tightening torque, see Chapter 1.5)

Then continue to turn through the angle of torsion using auxiliary tool 5w04 000 583.  
Remove centring device.  
Move selector shaft to all positions and remove once more.



(For tightening torque, see Chapter 1.5)



## 1.5 Tightening torques

No.	Designation	Part List-Item-No.	Wrench size No.	Page	Tightening torque [Nm]
1	Screw plugs M18x1.5 (gearbox housing)	01.140	Hexagon socket SW = 8 mm	3.1/1	35 Nm (±3.5 Nm)
2	Screw plug M10x1 (gearbox housing)	01.100	Hexagon socket SW = 5 mm	3.1/1	12 Nm (±1.2Nm)
3	Cylindrical screw M6x13 (interlock spring)	06.100	TORX - TX 27 H	3.1/2	4 Nm + 17° (±0.3 Nm ± 2°)
4	Torx screw M6x20 (guiding plate)	24.120	TORX - TX 27	3.1/4	10 Nm (±1.0 Nm)
5	Locking nut (pinion shaft)	35.030	Special tool	3.2/2	120 Nm (±12.0 Nm)
6	Countersunk screw M6x20 (pinion shaft)	35.024	TORX - TX 30	3.2/2	10 Nm (±1.0 Nm)
7	Hexagon screw (differential cage, see Chapter 1.3.1.8)	35.010/140	SW = 17 mm	3.3/3	
8	Torx screw M8x30 (differential cover)	35.210	TORX - TX 40	3.3/4	23 Nm (±2.3 Nm)
9	Torx screw M6x28 (stator shaft/intermediate plate)	10.040/150	TORX - TX 27	3.4/23	15 Nm (±1.5 Nm)
10	Torx screw M6x52 (pump/intermediate plate)	10.050	TORX - TX 27	3.4/23	15 Nm (±1.5 Nm)
11	Countersunk screw M6x55 (intermediate plate/gearbox-housing)	10.080	TORX - TX 27	3.4/24	10 Nm (±1.0 Nm)
12	Torx screw M6x59 (mechatronics) M6x20	27.450 27.500	TORX - TX 40	3.5/3	8 Nm (±0.8 Nm)
13	Torx screw M6x23 (oil pan)	03.020	TORX - TX 27	3.5/4	12,0 Nm (±1.2 Nm)
14	Screw plug M10x1 (oil pan)	03.010/140	Hexagon socket SW = 5 mm	3.5/4	12.0 Nm (±1.2 Nm)
15	Screw plug M30x1.5 (oil pan)	03.010/130	Hexagon socket SW = 8 mm	3.5/4	80.0 Nm (±8.0 Nm)

No.	Designation	Part List- Item-No.	Wrench size No.	Page	Tightening torque [Nm]
16	Torx screw M8x30 (flange shaft)	35.430	TORX - TX 40	3.6/2	23 Nm (±2.3 Nm)
17	Hexagon screw M12x70 and nut M12 (converter retaining bracket)	97.020	SW = 19 mm	3.6/2	15 Nm (±1.5 Nm)
18	Hexagon screw M10x14 (converter retaining bracket)	97.030	SW = 19 mm	3.6/2	15 Nm (±1.5 Nm)
19	Torx screw M6x16 (bearing plate from intermediate housing)	37.076	TORX - TX 27	3.7/3	8,0 Nm (±0.8 Nm)
20	Kombi screw M10x45 (side shaft)	37.120	TORX - E 12	3.7/4	68 Nm (±6.8 Nm)
21	Torx screw M8x30 (intermediate housing)	37.160	TORX - TX 40	3.7/6	23 Nm (±2.3 Nm)
22	Torx screw M8x20 (vibration damper, use screw only once, self-locking)	36.130	TORX - TX 40	3.7/7	28 Nm (±2.8 Nm)
23	Torx screw M8x30 (drop housing)	36.140	TORX - TX 40	3.7/8	23 Nm (±2.3 Nm)
24	Screw plug M18x1.5 (drop housing)	36.180	Hexagon socket SW = 5 mm	3.7/8	35 Nm

## 1.6 Transmission test (test bench)

The following points must be checked:

Correct oil level

Proper oil level; observe the vehicle manufacturer's specifications and part list.

Oil level too low

This can result in:

- Engine over-revving or no power flow in curves or when starting from a stop
- Valve chatter due to air pockets in the oil
- General malfunctions

Among other things, burned clutches can be the result.

1.5/1

Oil level too high

Danger of loss due to splashing, formation of foam, strong increases in temperature at high road speeds. Loss of oil via breather; among other things, burned clutches and shifting problems can result.

Proper engine settings

Correct idle speed; follow specifications from vehicle manufacturer.

Power flow, forward and reverse


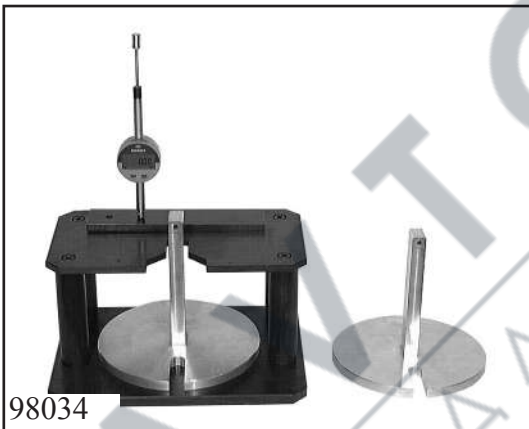

Correct adjustment of selector linkage or control cable; observe the vehicle manufacturer's specifications.



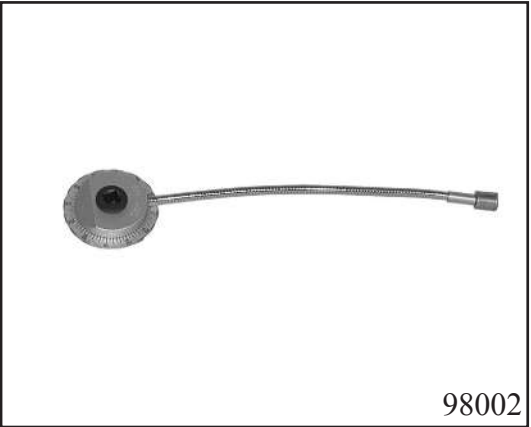
Cooler bypass or cooling connection on the test bench

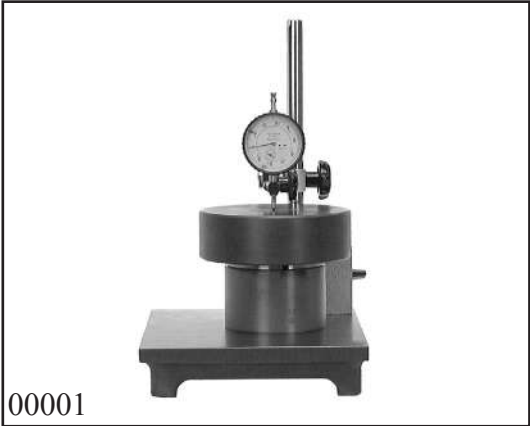
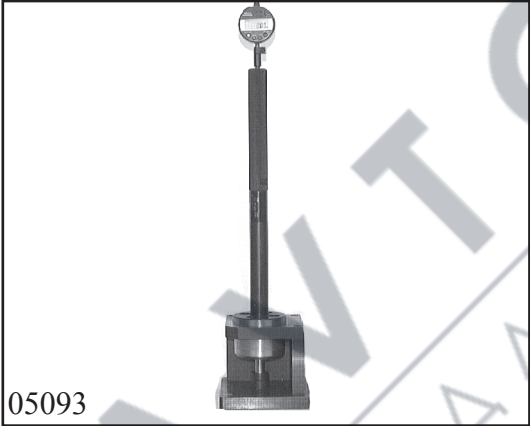

Do not overheat transmission, 120° C max.



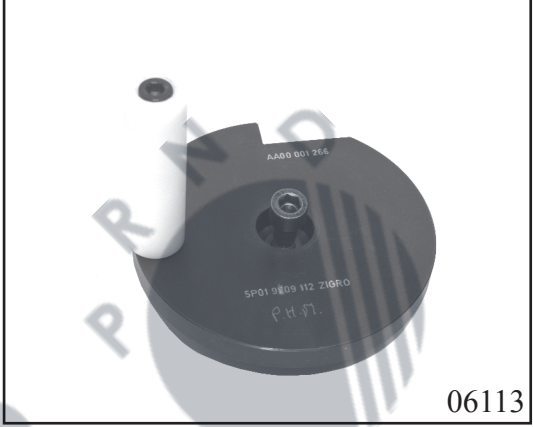
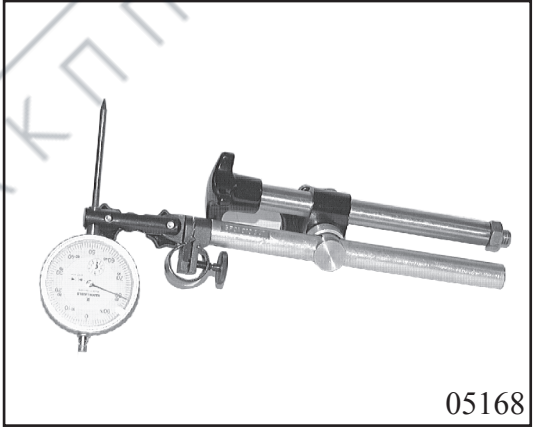

## 1.7 Special tools

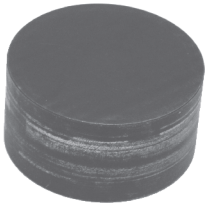
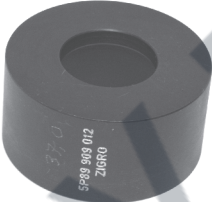
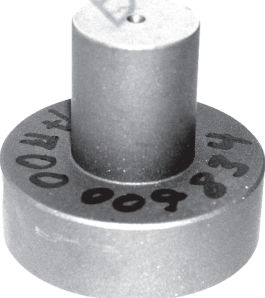
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">1</p>  <p>98008</p>	<p>5p01 000 329 Force measuring unit</p>	<p>identical</p> <p>4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32</p>
<p style="text-align: center;">2</p>  <p>98034</p>	<p>5p01 000 330 Clutch play measuring device</p> <p>(Measuring plate: - short neck &gt; 20 mm - long neck &lt; 20 mm disc set thickness)</p>	<p>identical</p> <p>4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32</p>
<p style="text-align: center;">3</p> 	<p>5p01 001 458 Pre-load adjustment device</p>	<p>identical</p> <p>4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32</p>

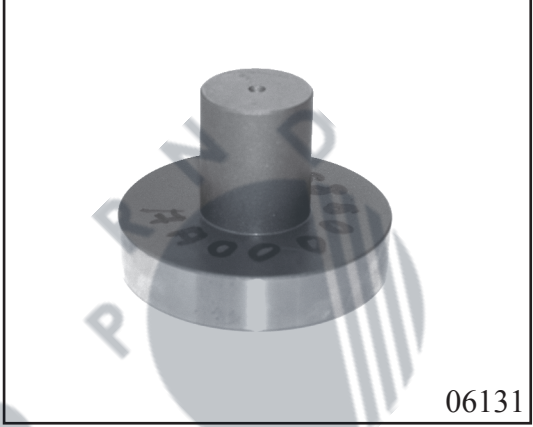

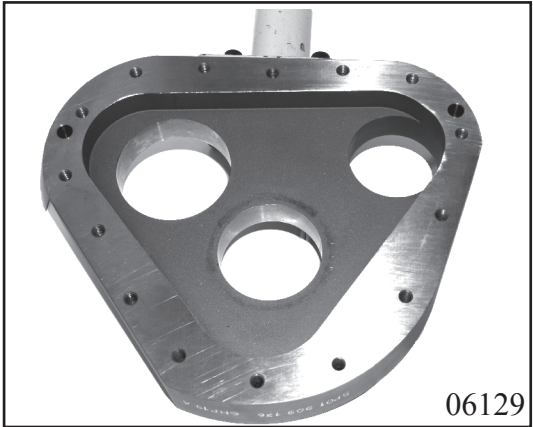
Remarks	Order-No. / Application	OBJECT
identical  6 HP 26 6 HP 19 6 HP 32	5p01 002 379 Axial clearance measuring device Drive shaft	4   02025
identical  6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32	5x46 002 292 Centring device Interlock spring	5   02026
identical  5 HP 19 FL/A 5 HP 24 A 6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32	5w04 000 583 Assembly turning device Interlock spring	6   98002

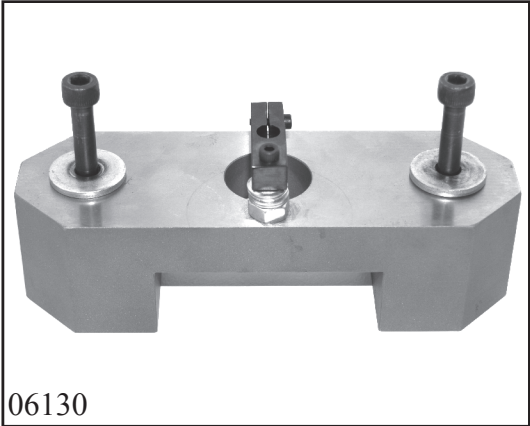
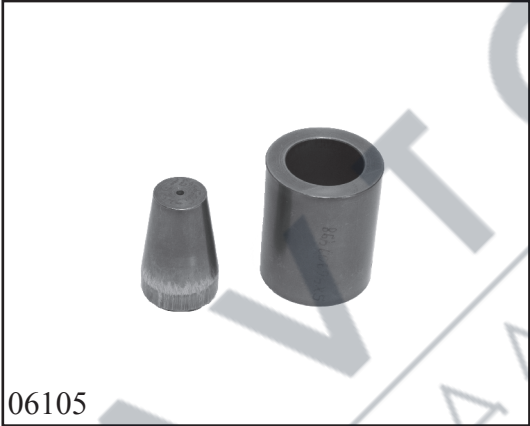
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">7</p>  <p>00001</p>	<p>5p01 000 355 Measuring device Pinion shaft bearing installation height</p>	<p>identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>
<p style="text-align: center;">8</p>  <p>05093</p>	<p>5p01 002 604 Measuring device Pinion position and</p> <p>5p89 004 524 calibrat. equip.</p>	<p>identical</p> <p>6 HP 26 A 61</p>
<p style="text-align: center;">9</p>  <p>05166</p>	<p>5p01 003 645 Measuring device (base plate) Pinion position</p> <p>together with:</p> <p>5p01 003 648 Measuring extension (6 HP 19 A)</p>	<p>identical</p> <p>6 HP 26 A 61 6 HP 32 A</p>

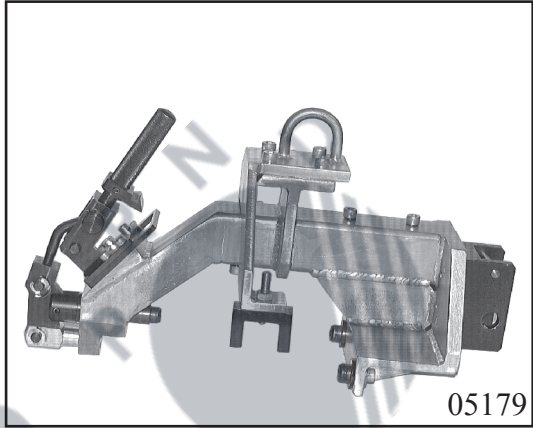
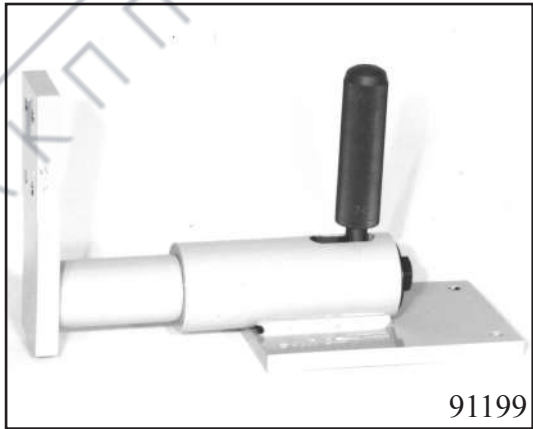






Remarks	Order-No. / Application	OBJECT
	5p01 909 112 Measuring disc Bevel gear flank clearance	10  06113
	5x46 000 384 Measuring tripod Bevel gear flank clearance	11  05168
	5p01 000 353 Measuring plate Differential cover	12  06112

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">13</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>06114</p> </div>	<p>5p89 909 011 Measuring plate axiale clearance - output</p>	
<p style="text-align: center;">14</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>06115</p> </div>	<p>5p89 909 012 Measuring plate axiale clearance - output</p>	
<p style="text-align: center;">15</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>06135</p> </div>	<p>5p89 020 357 Pressure stamp Front axle shaft</p>	

Remarks	Order-No. / Application	OBJECT
	5p89 030 357 Pressure stamp Input shaft	<p style="text-align: center;">16</p>  <p style="text-align: right;">06131</p>
	5p01 000 357 Spring	<p style="text-align: center;">17</p>  <p style="text-align: right;">06133</p>
	5p01 909 176 Measuring plate Rear axle output	<p style="text-align: center;">18</p>  <p style="text-align: right;">06129</p>




OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">19</p>  <p>06130</p>	<p>5p01 000 357 Measuring bridge Rear axle output</p>	
<p style="text-align: center;">20</p>  <p>06105</p>	<p>5x46 003 343 Snap ring fitting aid Clutch E</p>	<p>identical 6 HP 19 6 HP 26 6 HP 26 A 61</p>


Remarks	Order-No. / Application	OBJECT
	5x46 002 165 Gearbox retaining bracket	21  05179
identical  5 HP 24 5 HP 25A 5 HP 30  6 HP 32	5x46 000 763 Workbench holder	22  91199
	5x 46 802 048 Puller Bearing-pinion shaft	23  06122


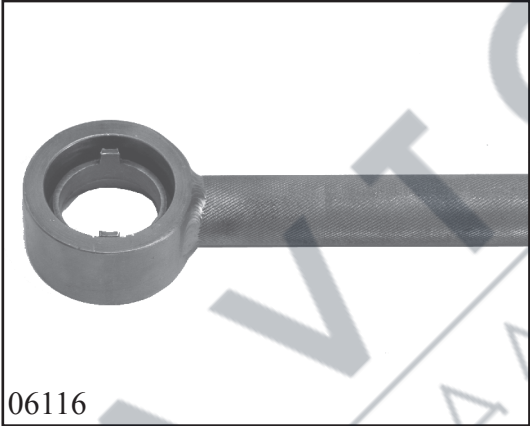
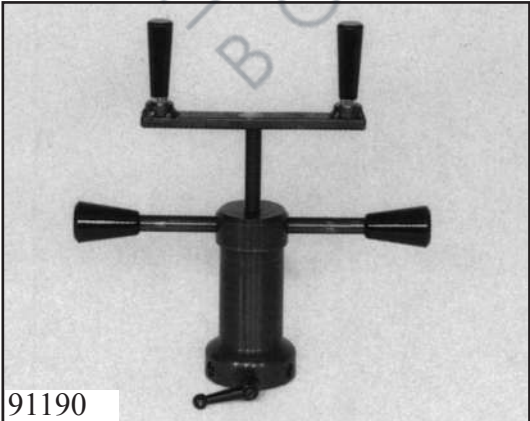
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">24</p>  <p>98149</p>	<p>5x46 021 007 Kukko extractor 21/7</p> <p>or</p> <p>5x46 021 008 Kukko extractor 21/8</p>	<p>identical</p> <p>4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>
<p style="text-align: center;">25</p>  <p>98150</p>	<p>5x46 021 007 Kukko extractor 21-7 (basic device)</p>	<p>identical</p> <p>4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>
<p style="text-align: center;">26</p>  <p>06121</p>	<p>5x46 909 082 Slotted nut wrench</p>	<p>identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>

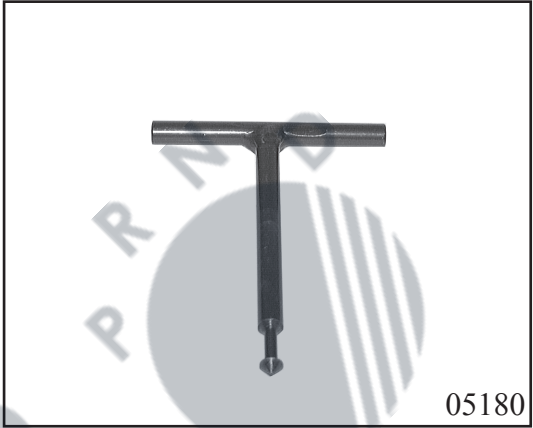
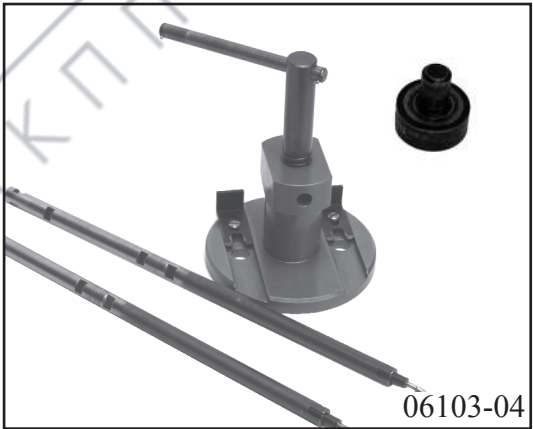

Remarks	Order-No. / Application	OBJECT
identical  6 HP 19	5x46 909 539 Assembly tool circlip cylinder CD	27  06103
identical  4 HP 20 5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61	5x46 032 010 Rollex extractor 32010X/1 (differential)	28  99155
identical  5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61	5x46 806 649 Bearing inner ring extractor Rollex 806649	29  99270


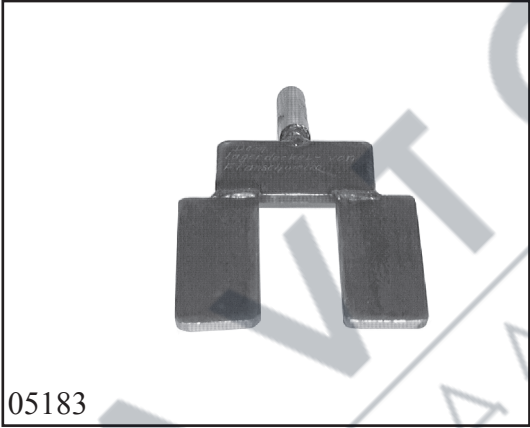



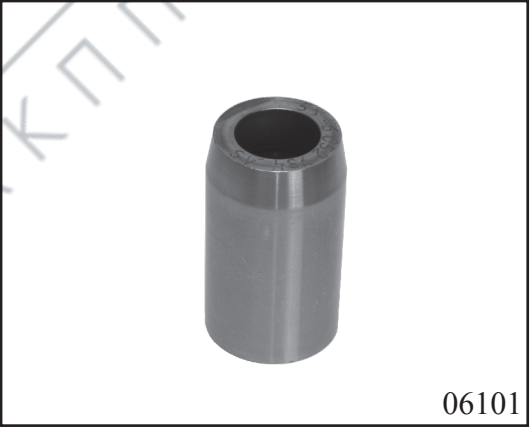

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">30</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>98152</p>	<p>5x46 010 011            Rollex extractor 1000/1            (basic device)</p>	<p>identical</p> <p>3 HP 22 Q            4 HP 14 Q            4 HP 18 Q            4 HP 20            5 HP 19 FL/A            5 HP 24 A            6 HP 26 A 61</p>
<p style="text-align: center;">31</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>00055</p>	<p>5x46 002 159            Core Insert</p>	<p>identical</p> <p>5 HP 19 FL/A            5 HP 24 A            6 HP 26 A 61</p>
<p style="text-align: center;">32</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p>99271</p>	<p>5x46 300 849            Bearing inner ring extractor            Rollex 300849</p>	<p>identical</p> <p>4 HP 18 Q            5 HP 19 FL/A            5 HP 24 A            6 HP 26 A 61</p>

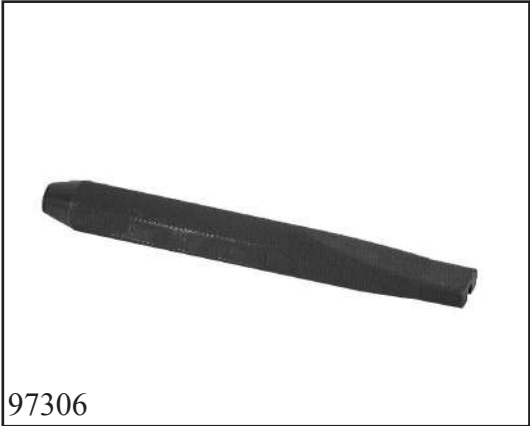

Remarks	Order-No. / Application	OBJECT
<p>Identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>	<p>5x46 002 287 Roller bearing inner ring core insert Differential housing side</p>	<p>33</p>  <p>00061</p>
	<p>5x46 002 516 Puller bearing plate</p>	<p>34</p>  <p>06117</p>
<p>Identical</p> <p>6 HP 19</p>	<p>5x46 909 247 Mounting bracket to clutch A, C, E</p>	<p>35</p>  <p>03139</p>

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">36</p>  <p>03138</p>	<p>5x46 909 248 Mounting bracket Brake B</p>	<p>Identical  6 HP 19</p>
<p style="text-align: center;">37</p>  <p>06116</p>	<p>5x46 002 765 Retaining device for side shaft</p>	
<p style="text-align: center;">38</p>  <p>91190</p>	<p>5x46 000 563 Oil supply lifting device</p>	<p>Identical  5 HP 19 5 HP 19 FL/A 6 HP 19</p>

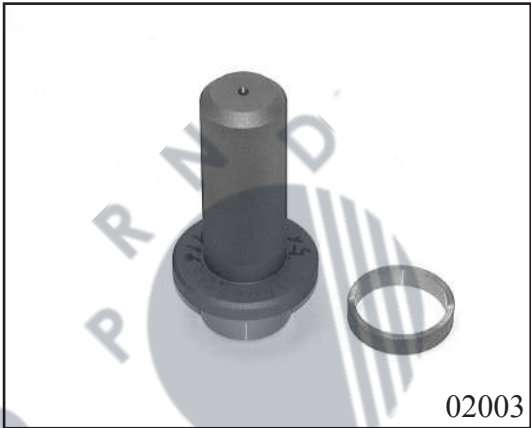
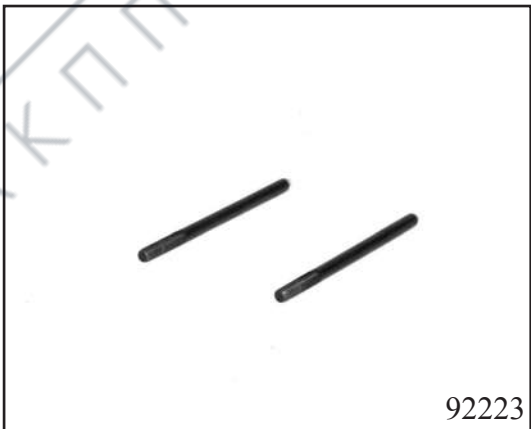

Remarks	Order-No. / Application	OBJECT
	<p>5x95 000 410 Removal handle</p> <p>5x46 011 400 Puller SSR pinion shaft and 5x46 909 326 Spacer</p> <p>5x46 002 734 Drive in tool WDR Pinion shaft</p>	<p>39</p>  <p>05180</p> <p>40</p>  <p>06103-04</p> <p>41</p>  <p>06102</p>


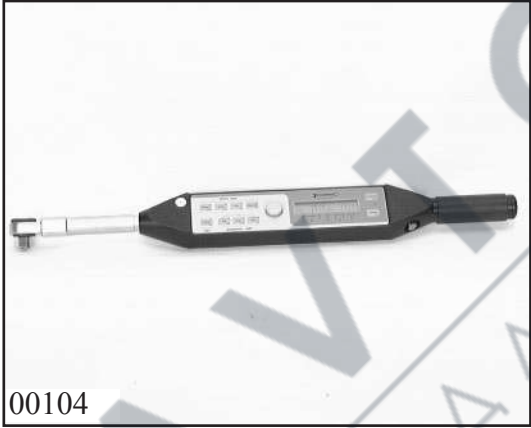
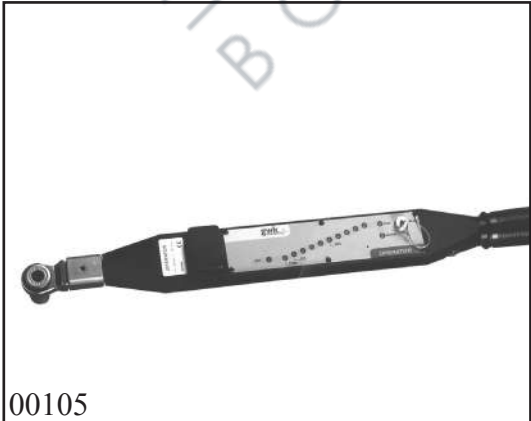
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">42</p> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center; justify-content: center;">  </div> <p>05182</p>	<p>5x46 012 735 Puller tool pinion shaft</p>	
<p style="text-align: center;">43</p> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center; justify-content: center;">  </div> <p>05183</p>	<p>5x46 003 632 Holding tool Flange shaft</p>	<p>Identical 6 HP 26 A 61</p>

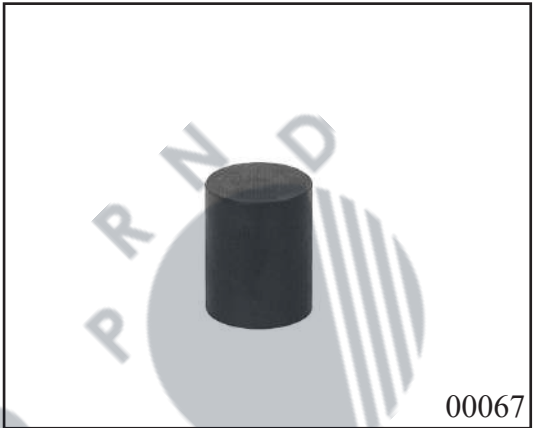

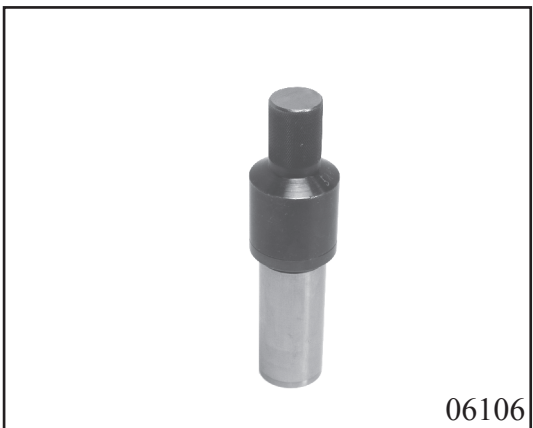
Remarks	Order-No. / Application	OBJECT
	5x46 909 503 Holding device Pinion shaft	44  06120
	5x46 052 734 Sleeve WDR pinion shaft	45  06101
Identical .... 6 HP 26	5x46 909 321 Driving mandrel SSR selection shaft	46  02006

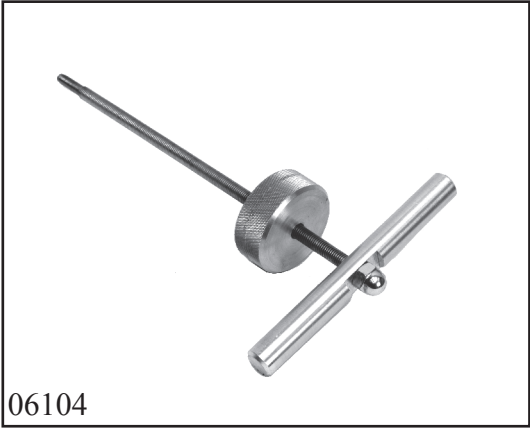
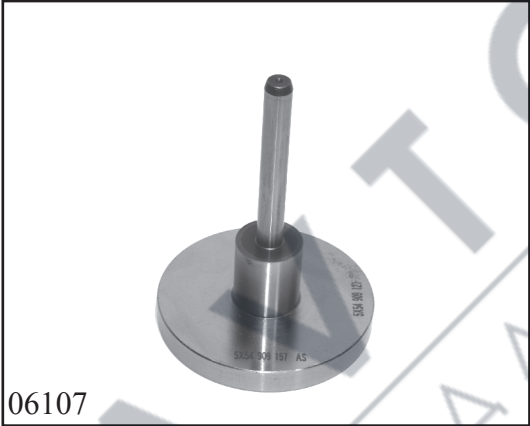

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">47</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">  <p style="margin-top: 5px;">97306</p> </div>	<p>5x46 000 291 Locking pin driving mandrel</p>	<p>Identical</p> <p>4 HP 18 Q 5 HP 24 5 HP 24 A 6 HP 26</p>
<p style="text-align: center;">48</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">  <p style="margin-top: 5px;">92214</p> </div>	<p>5x46 000 917 Locating fixture for tower</p>	<p>Identical</p> <p>5 HP 24 5 HP 24 A 5 HP 30 6 HP 26 6 HP 26 A 61 6 HP 19 6 HP 32</p>

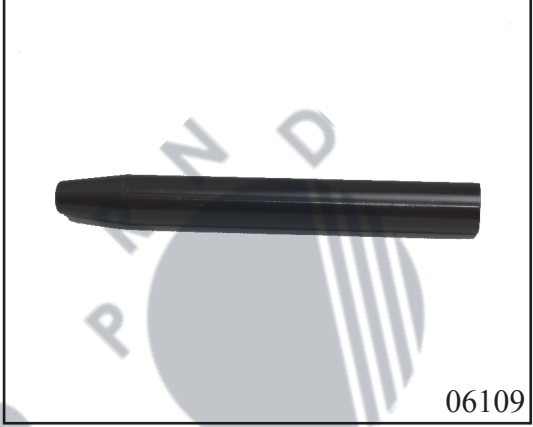
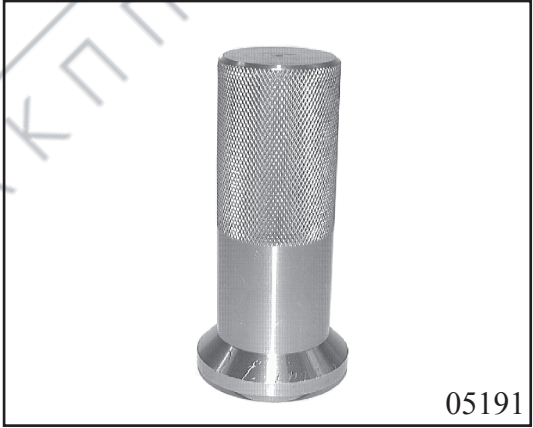






Remarks	Order-No. / Application	OBJECT
Identical  6 HP 26 6 HP 26 A 61	5x46 002 558 Needle bearing driving mandrel and SSR pump	50  02003
Identical  5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26 6 HP 19 6 HP 32	5x46 001 007 Fixing bolt	51  92223
Identical  4 HP 18 Q 5 HP 19 6 HP 26	5x46 000 306 Sleeve for checking pump moment	52  98135

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">53</p>  <p>00060</p>	<p>5x46 002 167 Differential locking device</p>	<p>Identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>
<p style="text-align: center;">54</p>  <p>00104</p>	<p>5x45 000 016 Extension limit controlled torque key (Type Quantec EMS 7086 ISI)</p> <p>or</p>	<p>Identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>
<p style="text-align: center;">55</p>  <p>00105</p>	<p>5x45 000 017 Extension limit controlled torque key (Type operator five + software- packet for extension limit)</p>	<p>Identical</p> <p>5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61</p>

Remarks	Order-No. / Application	OBJECT
Identical  5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61	5x46 002 220 Differential bearing mandrel large	56  00067
Identical  5 HP 19 FL/A 5 HP 24 A 6 HP 26 A 61	5x46 002 221 Differential bearing mandrel small	57  00068
	5x46 001 333 Assembly tool WDR output gear	58  06106

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">59</p>  <p>06104</p>	<p>5x46 909 533 Lifting device Tower CD</p>	
<p style="text-align: center;">60</p>  <p>06107</p>	<p>5x54 909 157 Plate output gear</p>	
<p style="text-align: center;">61</p>  <p>06108</p>	<p>5x54 909 160 Assembly tool Needle bearing output shaft</p>	

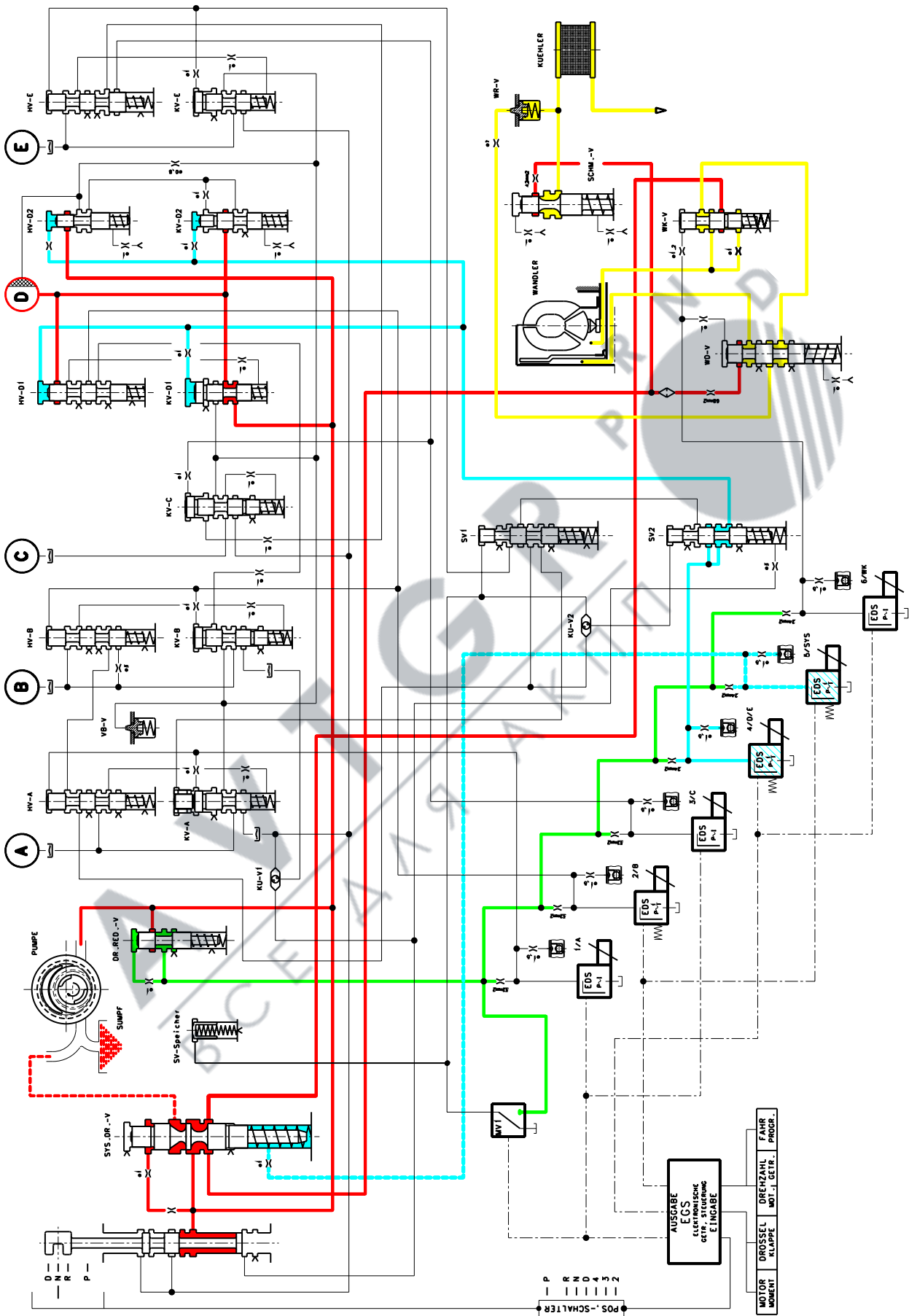
Remarks	Order-No. / Application	OBJECT
	5x46 000 628 Guide sleeve Front axle shaft	62  06109
identical  6 HP 26 A 61	5x46 909 270 Assembly tool SSR differential	63  05191
identical  6 HP 26 A 61	5x46 909 271 Assembly tool SSR differential cover	64  05191

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">65</p> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center; justify-content: center;">  </div> <p>06110</p>	<p>5x46 909 315 Assembly tool SSR intermediate housing</p>	
<p style="text-align: center;">66</p> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center; justify-content: center;">  </div> <p>05197</p>	<p>5x46 909 122 Assembly tool SSR and bearing drop housing</p>	<p>identical 6 HP 26 A 61</p>
<p style="text-align: center;">67</p> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center; justify-content: center;">  </div> <p>06111</p>	<p>5x46 001 535 Guide sleeve Output gear</p>	

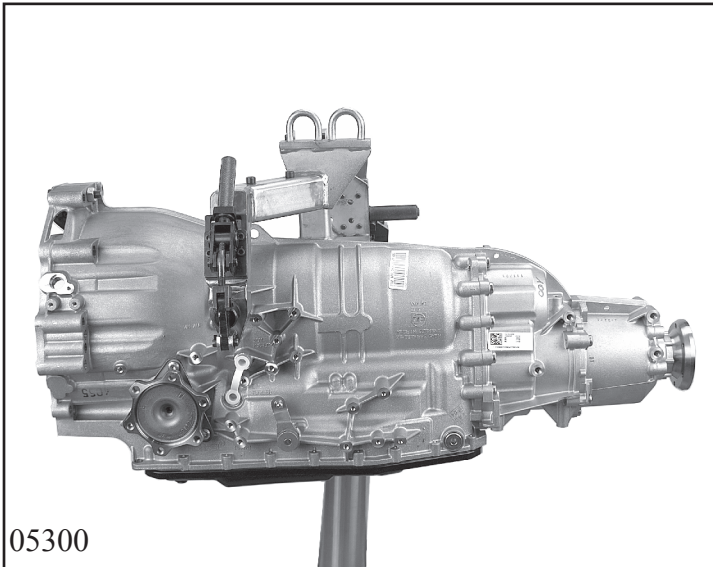




# 1.8 Oilflow chart (Position N)







## 2. Dismantling

### 2.1 Removing the converter, transfer gearbox housing and intermediate housing

#### 2.1.1 Removing the converter

Remove complete transmission in retaining bracket 5x46 002 165 with oil sump from below, and place on assembly carriage or workbench retainer 5x46 000 763.

Remove 2 breather covers and 2 breathers and 1 breather tube.

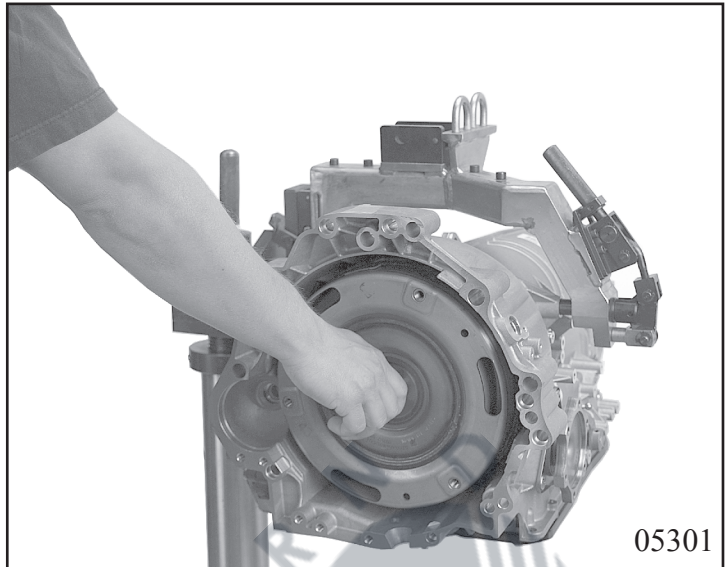
Caution!

Transmission has 3 oil systems.

- a) Drain gear oil by removing the oil drain and filler plug. (Allen key = 17 mm filler plug = 5 mm drain plug)
- b) Turn transmission unit through 90° with torque converter bell downwards and drain differential oil by removing filler plug. (Allen key = 8 mm AF)
- c) Turn transmission unit back and drain oil by removing the oil drain and oil filler plug from the transfer gearbox housing. (Allen key = 8 mm AF)

Remove 1 screw and 1 screw with nut from converter retaining bracket, and remove converter by hand.

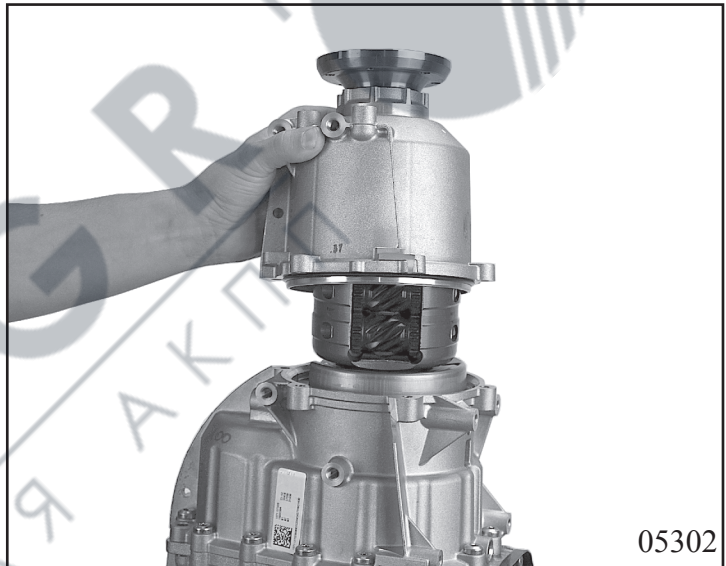
(Spanner size = 19 mm AF)



### 2.1.2 Removing the transfer gearbox housing

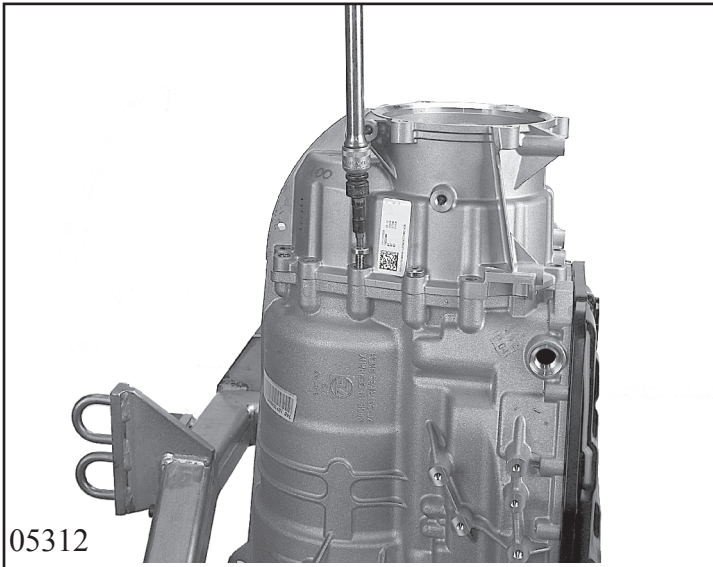
Turn transmission unit with transfer gearbox housing upwards.  
Remove the 6 transfer gearbox housing screws. Drain remaining oil. Lift off transfer gearbox housing with flange.  
Remove Torsen from output drive shaft and transfer gearbox housing.  
Remove O-ring from transfer gearbox housing.

(Spanner size = Torx TX-40)



Remove oil catch plate and remove magnet from oil catch plate.



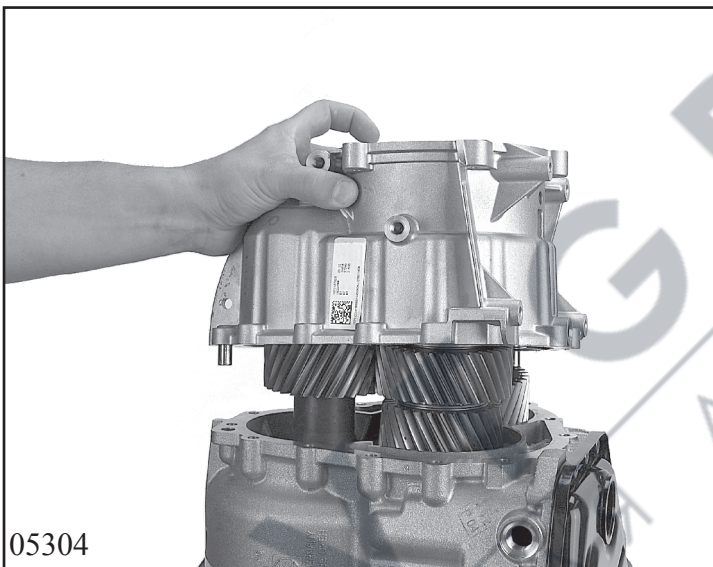


### 2.1.3 Removing the intermediate housing

Remove 15 screws from intermediate housing, and release intermediate housing from transmission housing using a plastic hammer.

Drain remaining oil.

(Spanner size = Torx TX-40)



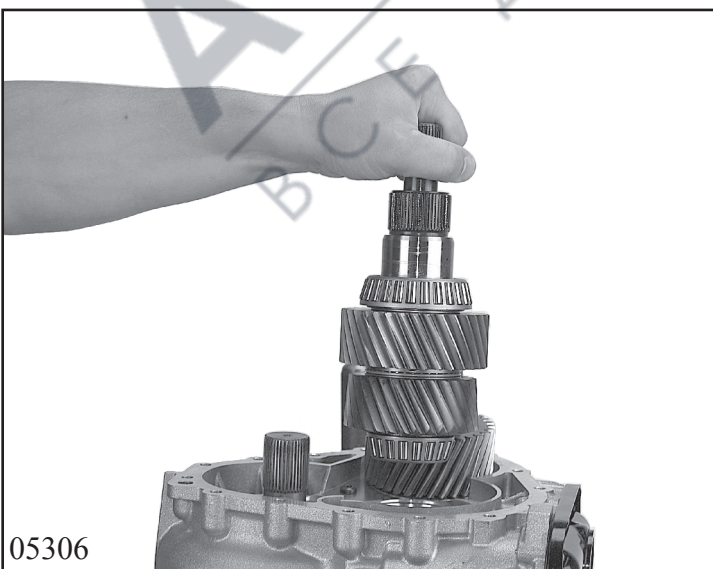
Remove intermediate housing from transmission housing.

Remove seal.

(Spanner size = Torx TX-40)

**Note:**

The grub screws should be left in the transmission housing

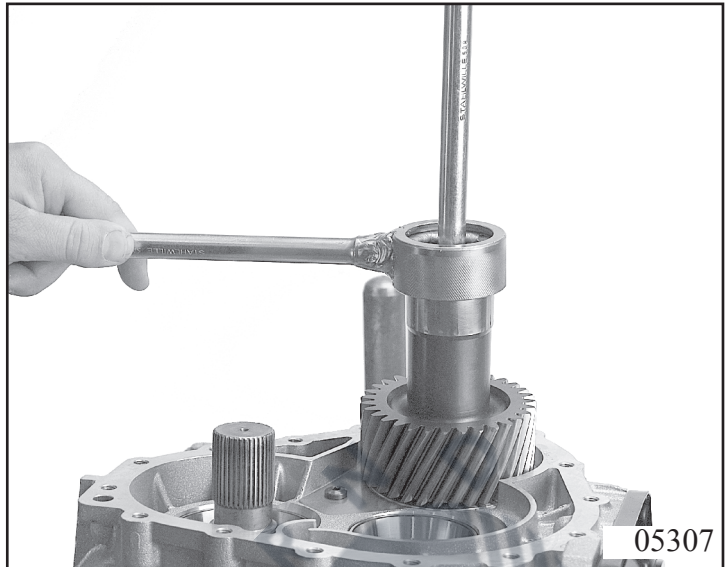


Remove input drive wheel and front axle shaft with output drive wheel.

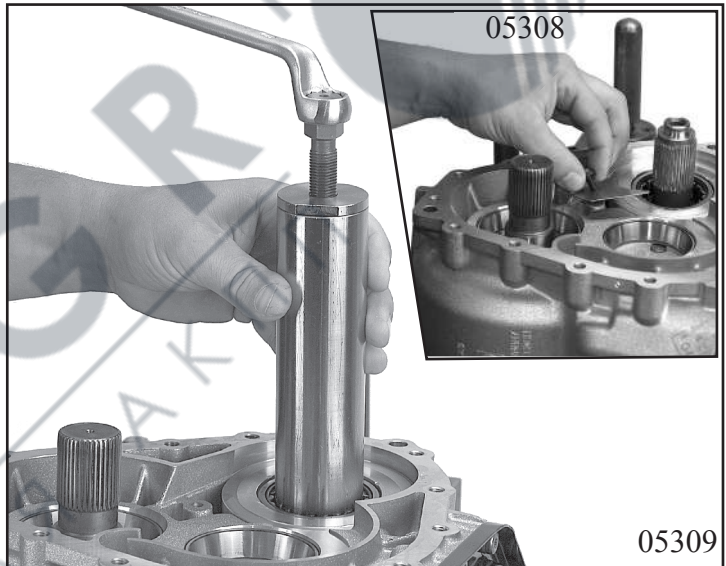


Slide retaining tool 5x46 002 765 over side shaft and provide counter support when unscrewing the combi screw. Remove side shaft.

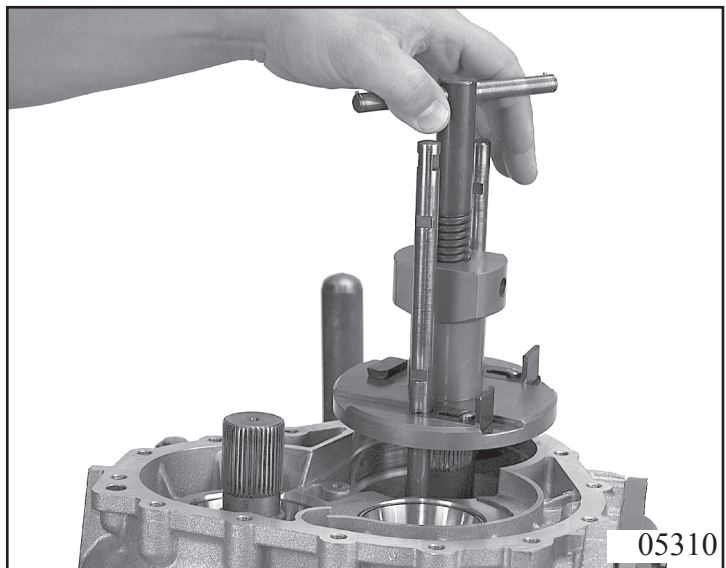
(Spanner size = Torx E12)



Remove screw from plate and remove plate.  
Remove bearing plate and bearing with extractor tool 5x46 002 516.

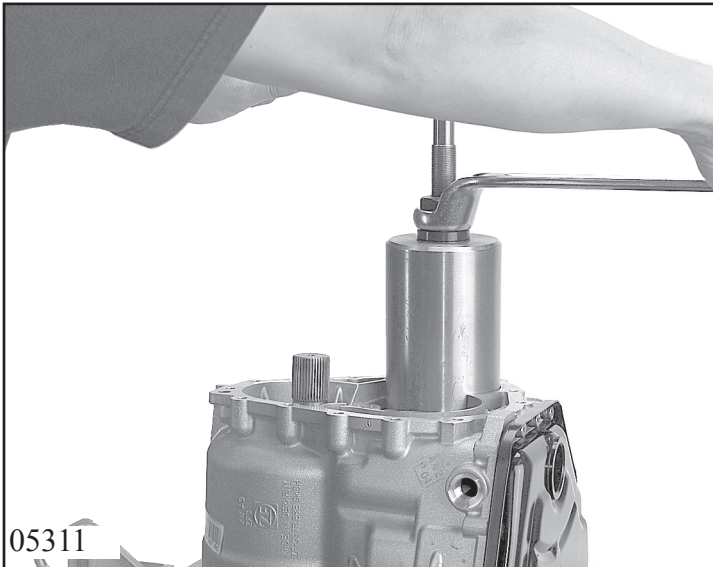


Remove pinion shaft sealing ring with extractor tool 5x46 011 400 and spacer 5x46 909 326.



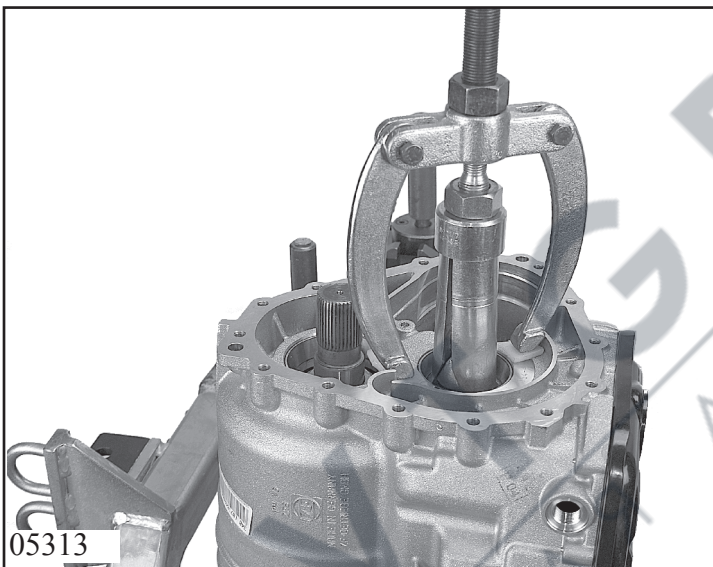
**Note:**

Engage the two extractor claws in the indentations of the shaft sealing ring, twist, and latch in top part of extractor.



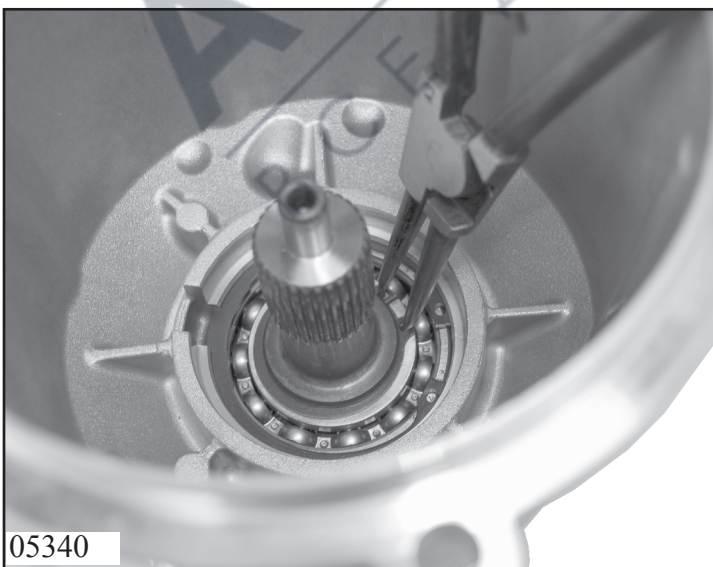
Remove circlip from pinion shaft.  
Remove fixing screw from pinion shaft.  
Unscrew pinion shaft with extractor tool  
5x46 012 735.

(Spanner size 36 AF)



Remove bearing shell from front axle  
shaft with extractor 5x46 021 007 (Kukko  
21-7) and remove shim washer.

#### 2.1.4 Dismantling the transfer gearbox housing



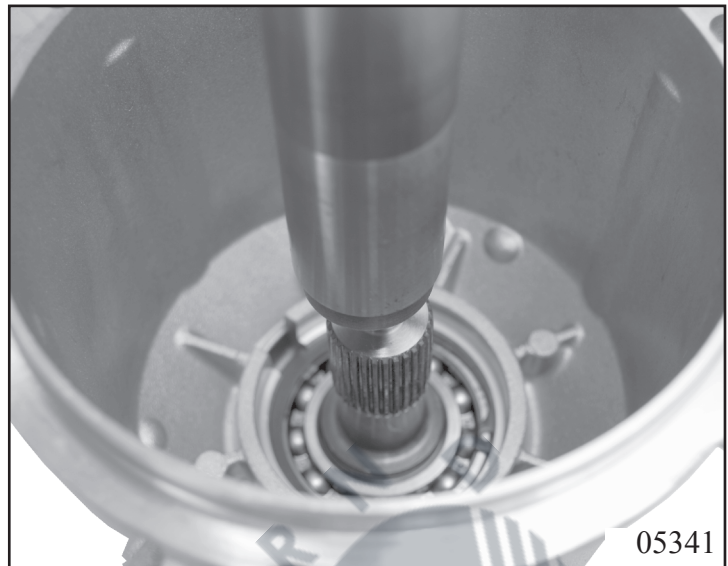
Remove circlip from output drive flange.



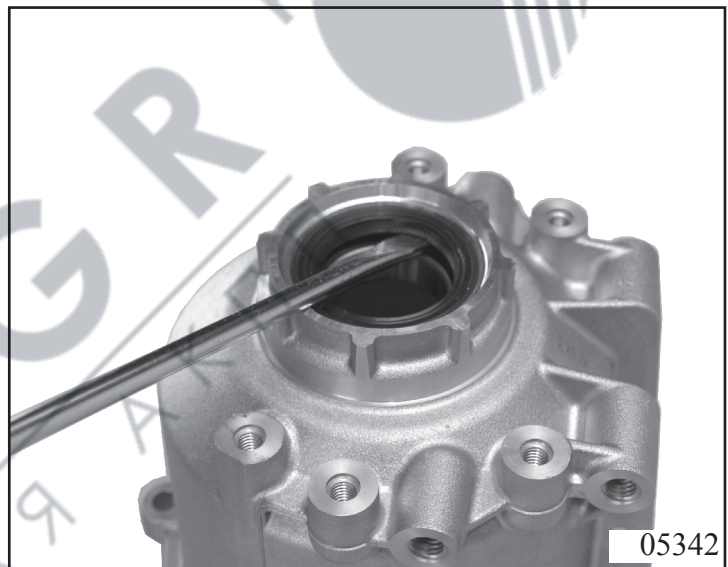
Press out output drive flange using a mandrel press.

**Note:**

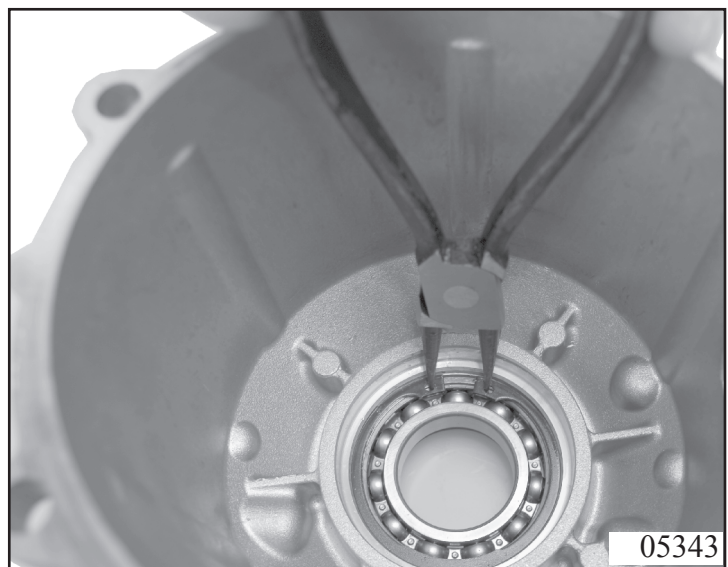
In the case of gear units with vibration dampers, remove 3 screws from vibration damper and remove damper.



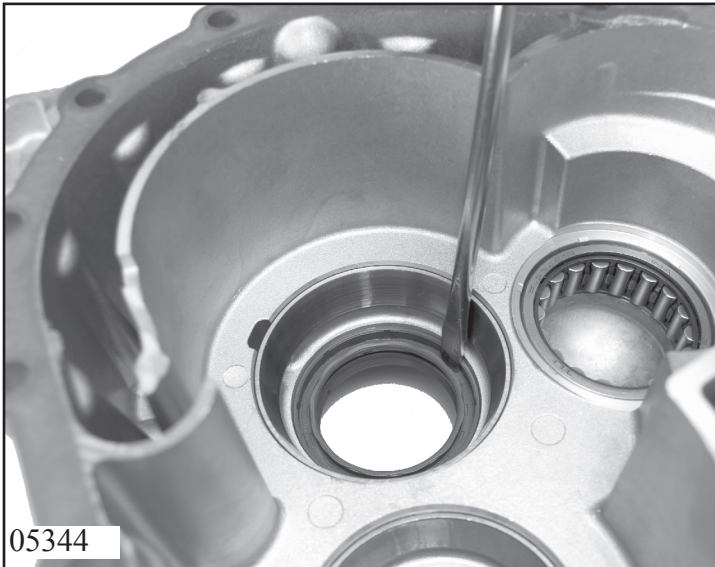
Remove shaft sealing ring from transfer gearbox housing.



Remove circlip.  
Press ball bearing out of transfer gearbox housing.



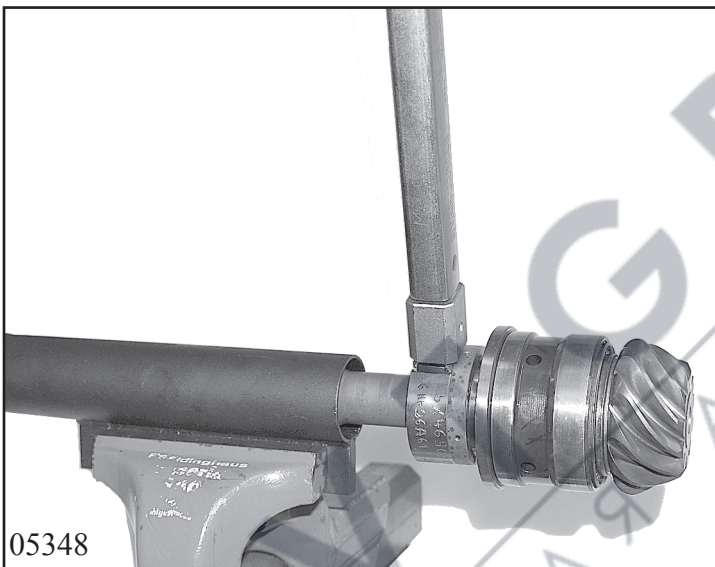
### 2.1.5 Dismantling the intermediate housing



Remove shaft sealing ring from intermediate housing.

05344

### 2.1.6 Dismantling the pinion shaft



Clamp pinion shaft in vice with fitting 5x46 909 503.  
Unscrew pinion nut with tool 5x46 909 082.

05348



Press pinion shaft out of top bearing using a mandrel press.

99095

Press out bottom bearing with tool 5x46 802 048 using a mandrel press, and remove compensating shim.

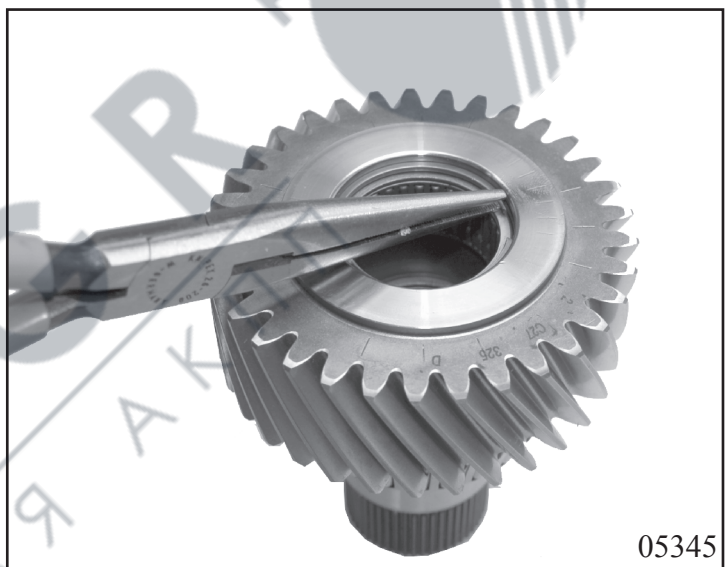


### 2.1.7 Removing the shaft sealing ring from output drive wheel.

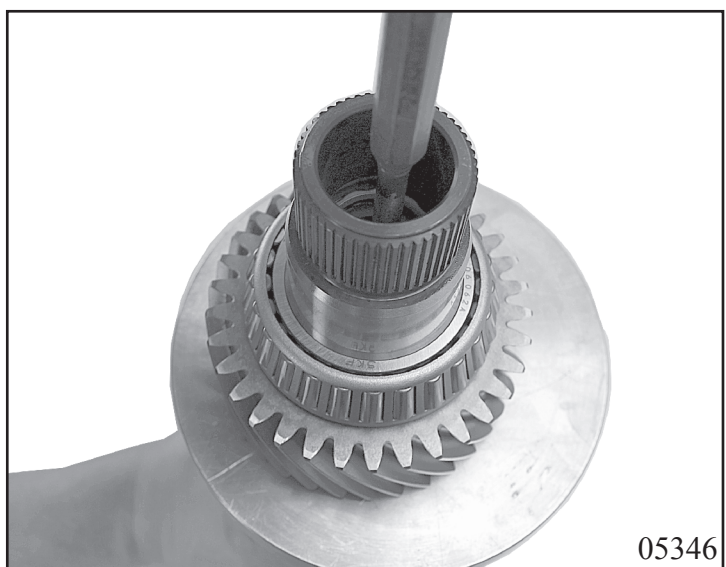
Remove circlip with suitable tool.

**Note:**

Removing the circlip requires a great deal of patience, strong nerves, and a suitable tool (e.g. flat-ground long-nosed pliers). In order to provide a working surface for the pliers, the surface of the top bearing should be indented with a punch.



Drive out top and bottom needle bearings with a suitable tool.  
(e.g. Facom U 49 P7, 30-38)





Remove shaft seal from output drive wheel.







## 2.2 Removing the Mechatronic, gearshift and park interlock

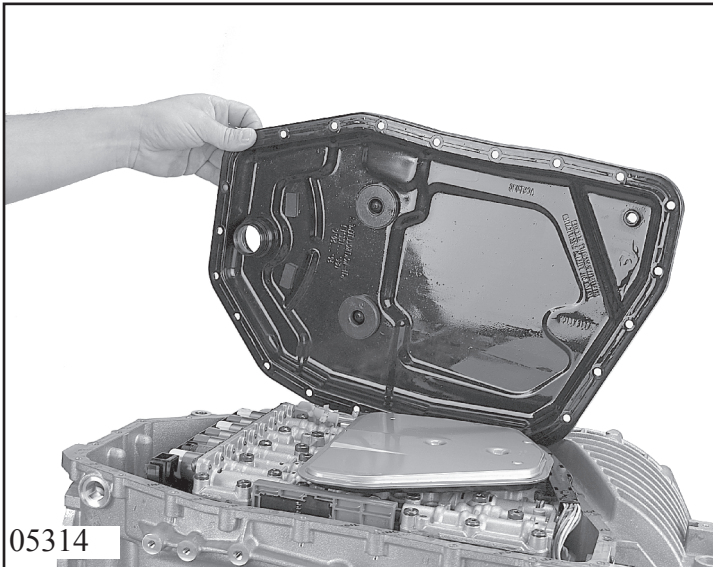
### 2.2.1 Removing the Mechatronic

Turn transmission unit with oil sump upwards. Remove protective cap from cable loom plug.

Remove 23 or 13 screws respectively from oil sump and remove oil sump. Remove seal from transmission housing and remove oil filter.

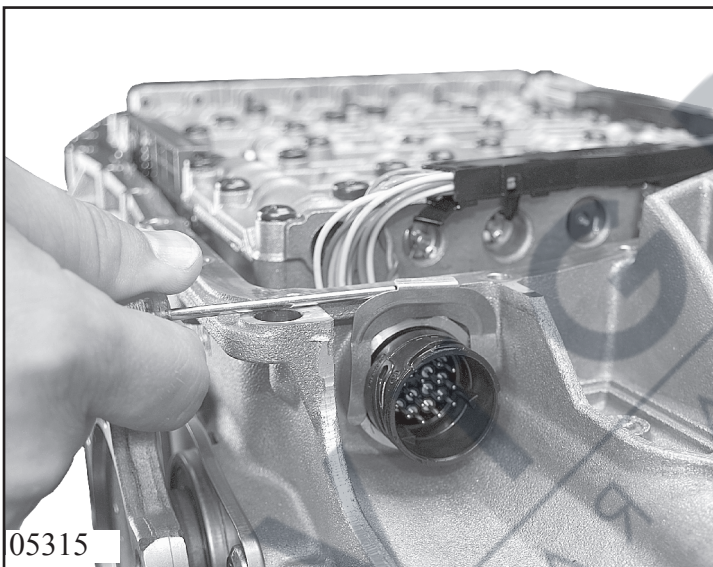
Remove 4 magnets from oil sump.

(Spanner size = Torx TX-27)



Remove tab washer from cable loom plug.

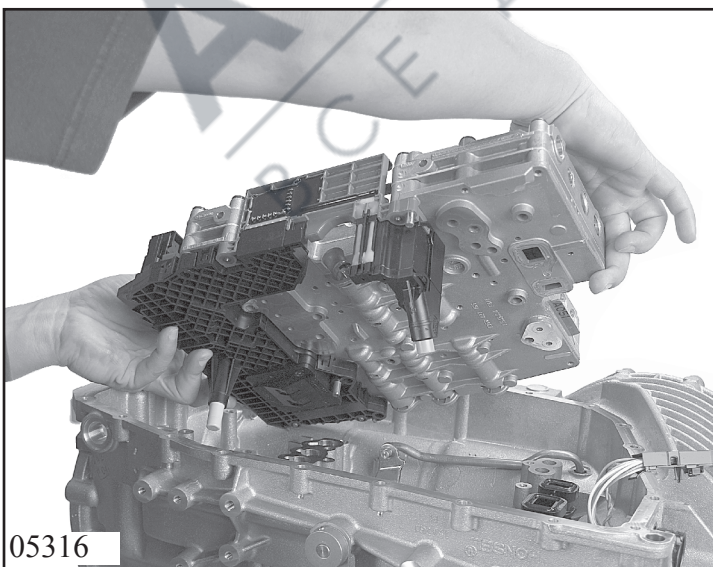
Remove cable plug from Mechatronic. In the case of transmissions with PN switch, remove cable from switch.



Remove 11 large-headed screws and remove Mechatronic (4x M6x20 + 7x M6x59).

Remove cable loom and take off adapter.

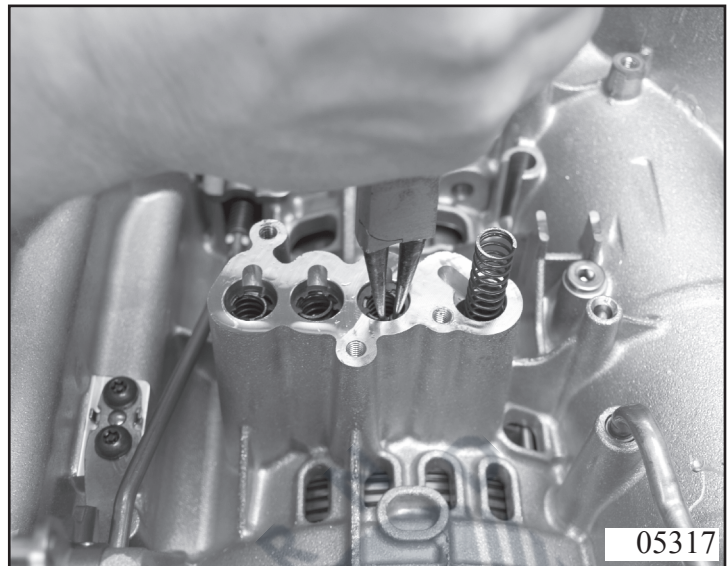
(Spanner size = Torx TX-40)



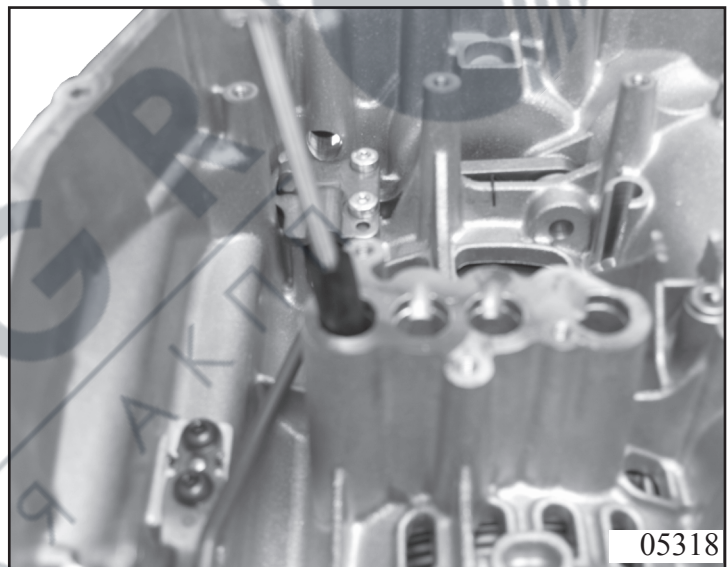
#### **Note:**

Mechatronic fault memory should be read out with SamTec Gearbox/PC.

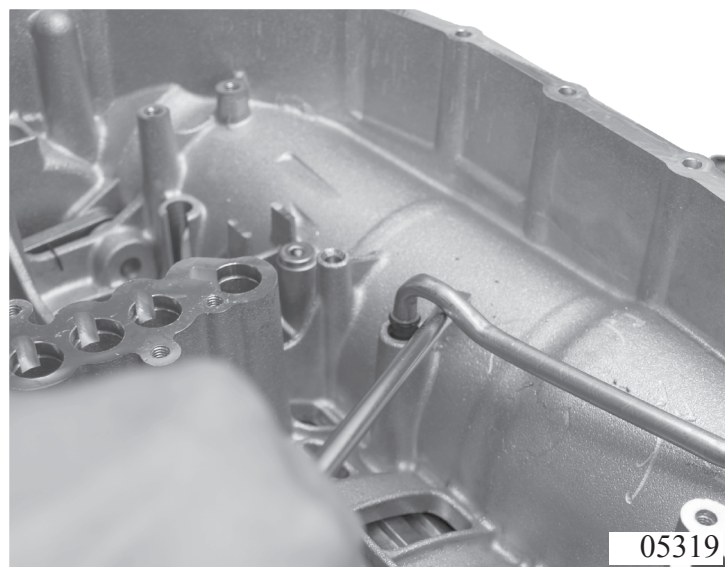
Remove 4 circlips and springs.



Remove the 4 sealing sleeves at the bottom of the hole with extractor 5x95 000 410.



Lever out oil pipe with suitable tool.  
Remove both O-rings.  
Unscrew screw plug from gearbox housing.

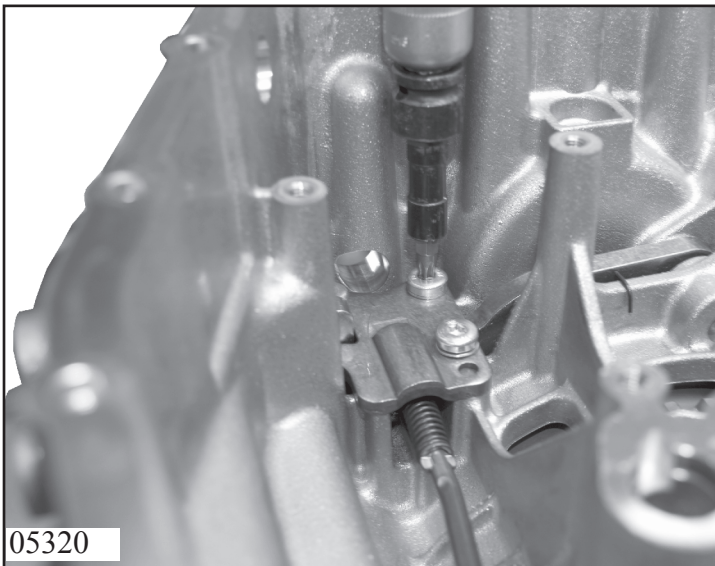




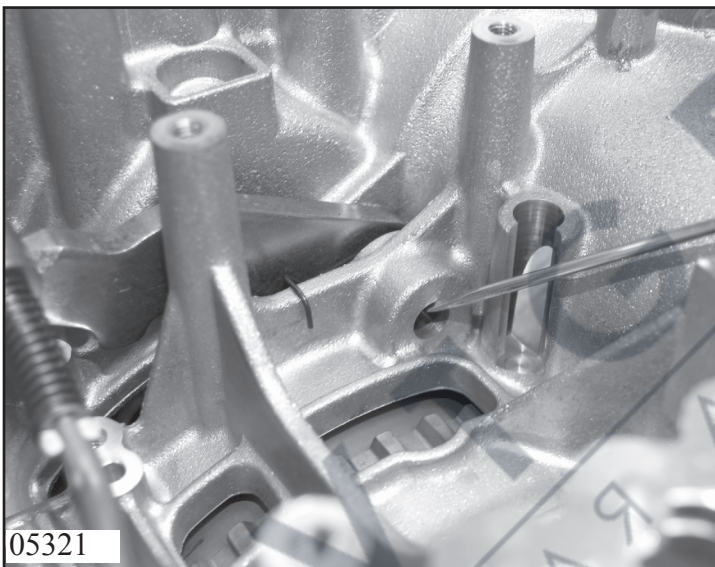
## 2.2.2 Removing the gearshift and park interlock mechanism

Remove 3 guide plate screws and remove guide plate.

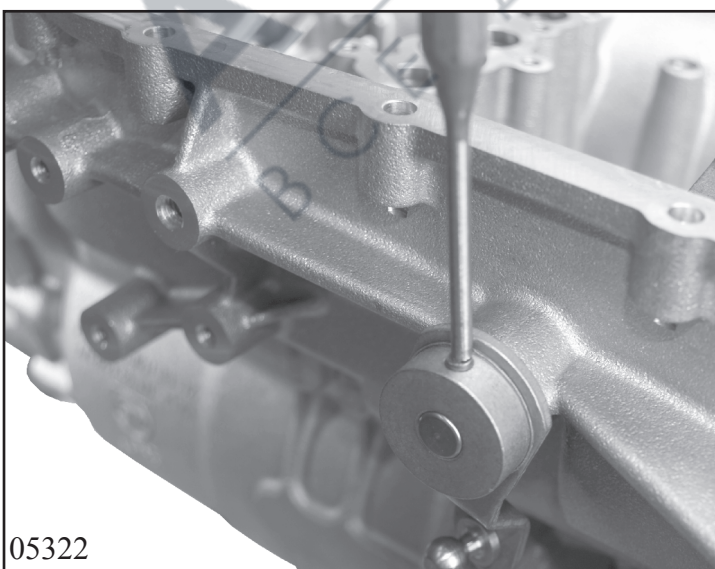
(Spanner size = Torx TX-27)



Press out park interlock bolt to the rear. Remove latch with spring.

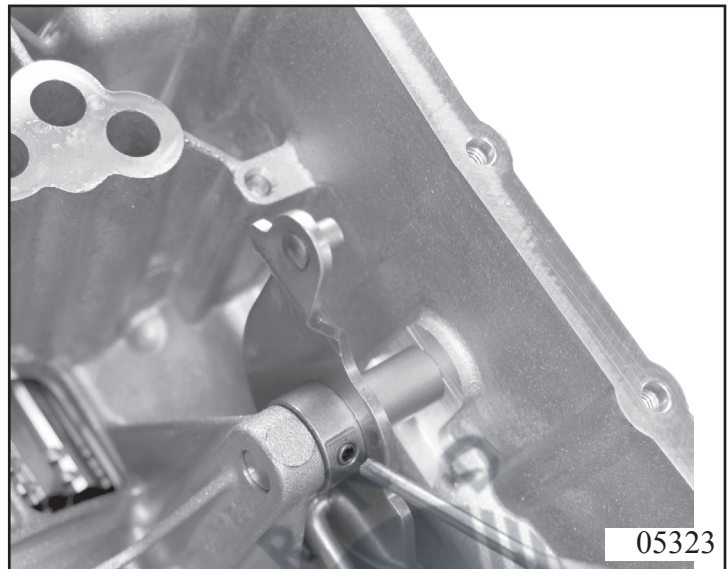


Drive clamping sleeve out of gearshift lever and remove gearshift lever.

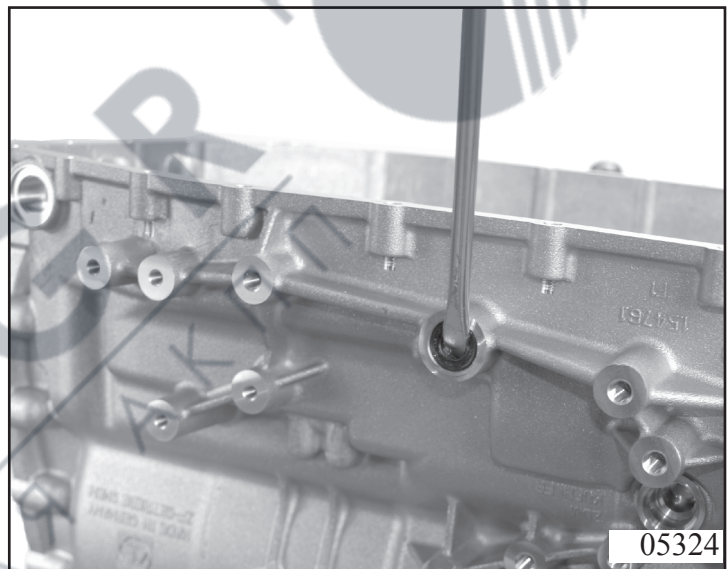




Drive clamping sleeve out of slotted disc.  
Withdraw selector shaft. Remove slotted  
disc with connecting rod.

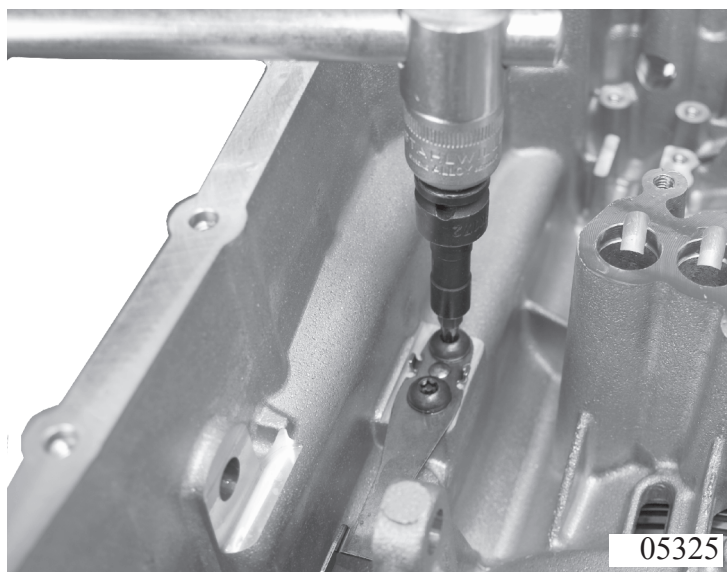


Remove shaft sealing ring with suitable  
tool.



*(only necessary with new transmission  
 housings)*

Release and remove latching spring.



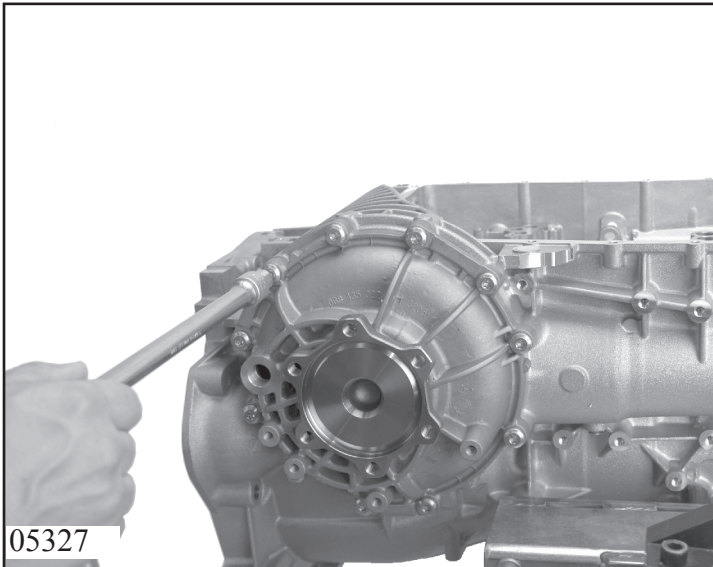
## 2.3 Removing VA differential and stub shaft

### 2.3.1 Removing VA differential

Remove 11 screws from differential cover.

Remove differential cover with differential and output-flange.

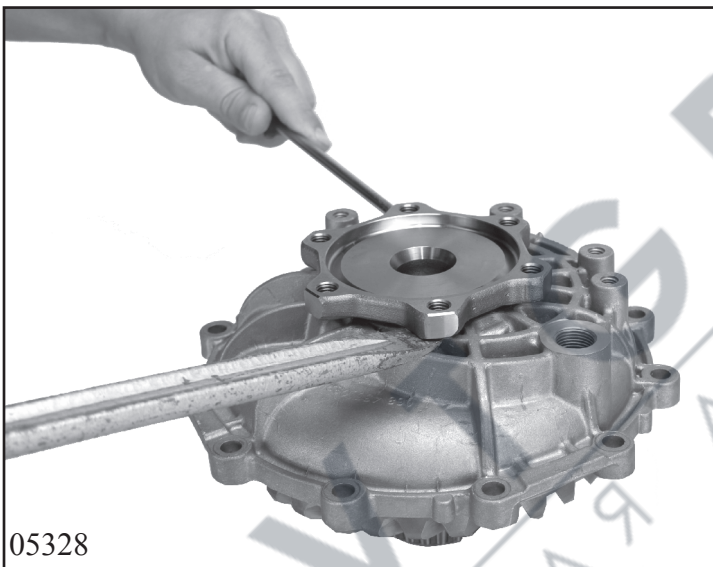
(Spanner size = Torx TX-40)



Lever out flange with suitable tool.  
Remove differential from cover.

Remove O-ring from differential cover.  
Remove bearing shell and shim washer from cover.

Remove shaft sealing ring.

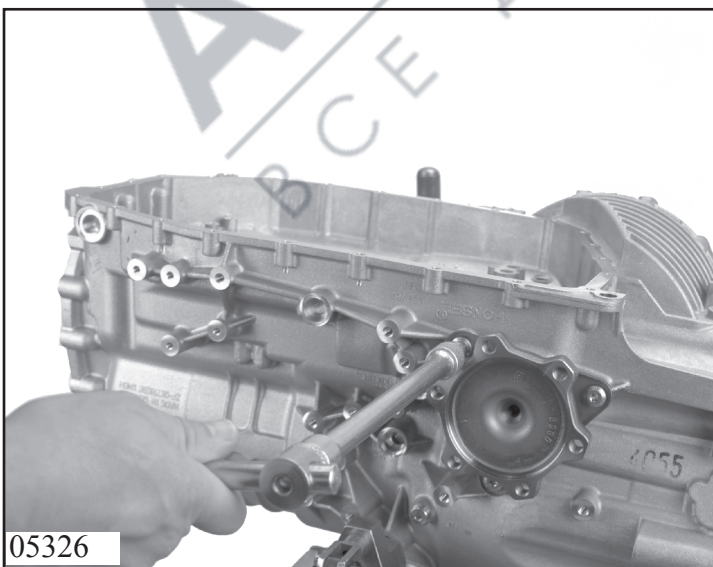


### 2.3.2 Removing stub shaft

Remove 3 screws from cover.

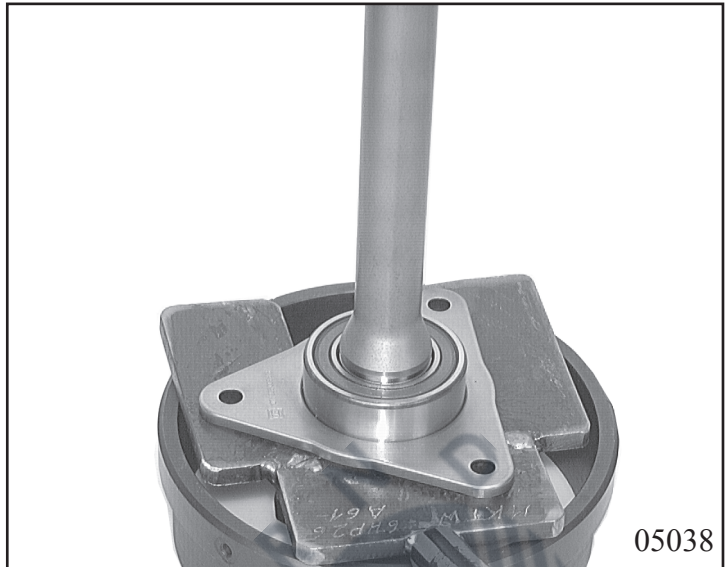
Remove stub shaft with cover.

Spanner size = Torx TX-40

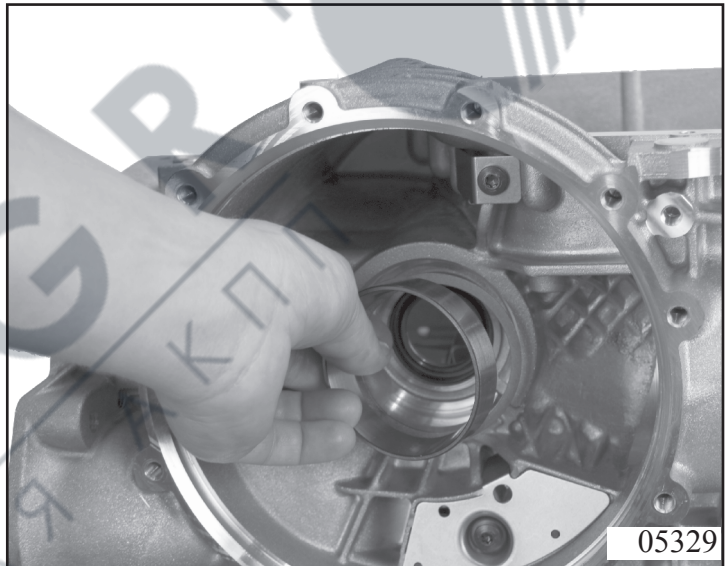


Remove circlip from stub shaft with suitable tool.  
Press stub shaft out of cover with retaining tool 5x46 003 632 using the mandrel press.

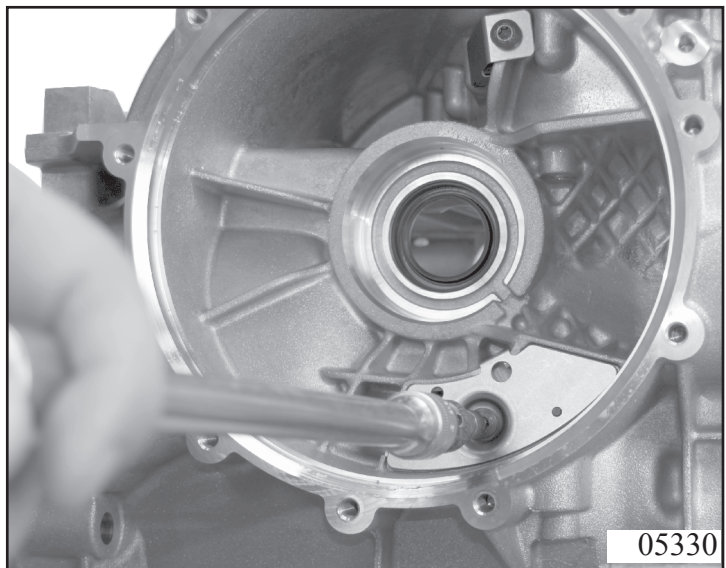
**Note:** (some part lists)  
Take out tappet and spring from flange shaft



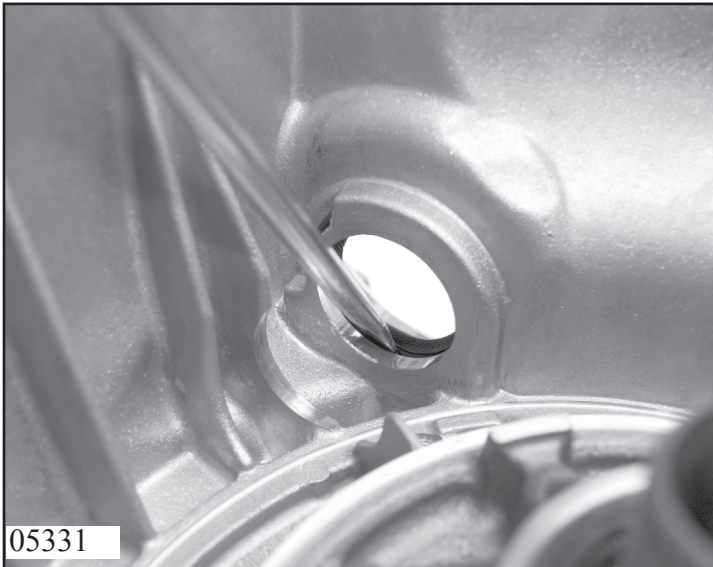
Remove bearing shell and shim washer from transmission housing.



Remove screw from plate with rubber seal and further screw from second plate, and remove plates. Remove magnet.







Turn transmission unit through 90° with torque converter bell upwards.  
Remove differential shaft sealing ring.

**Note:**

Output drive shaft shim washer may fall out.

**2.3.3 Differential (visual inspection)**



Remove cover-side inner bearing ring from differential with extractor 5x46 806 649 (Rollex 806649), with core insert 5x46 002 159 and base unit 5x46 010 011 (Rollex 10001).

Remove other inner bearing ring from differential with extractor 5x46 300 849 (Rollex 300849), core insert 5x46 002 287 and base unit 5x46 010 011.

*(only if torque wrench with yield strength control available!!!)*



With fitting 5x46 002 167 clamped in vice, remove 12 crown gear screws and separate crown gear using plastic drift if necessary.

Remove differential from fitting, turn through 180°, and push out bolts.

**Caution!**

All parts must be refitted exactly as they were before dismantling. Bevel gears with shim washers and planet gears with thrust washers must not be interchanged.

Turn planet gears through 90° about the differential axis and remove through inspection window together with thrust washer.

Remove top bevel gear with shim washer.  
Remove flange retaining washer and bottom bevel gear with shim washer.

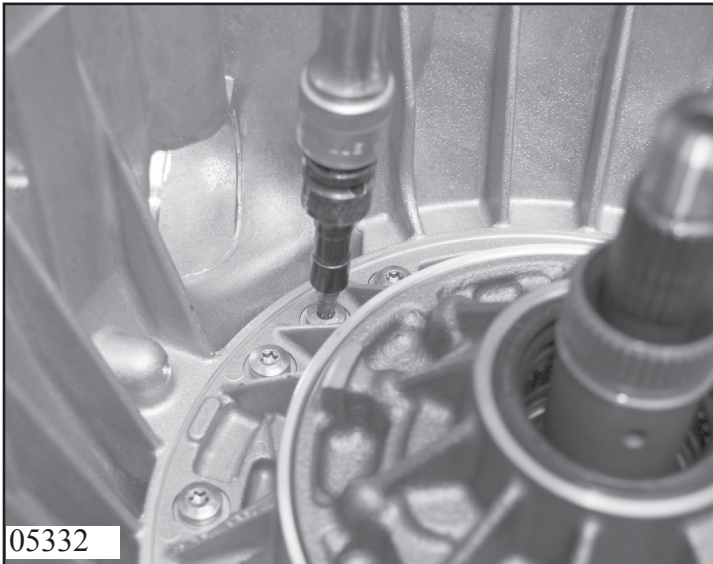


## 2.4 Removing the internal transmission parts

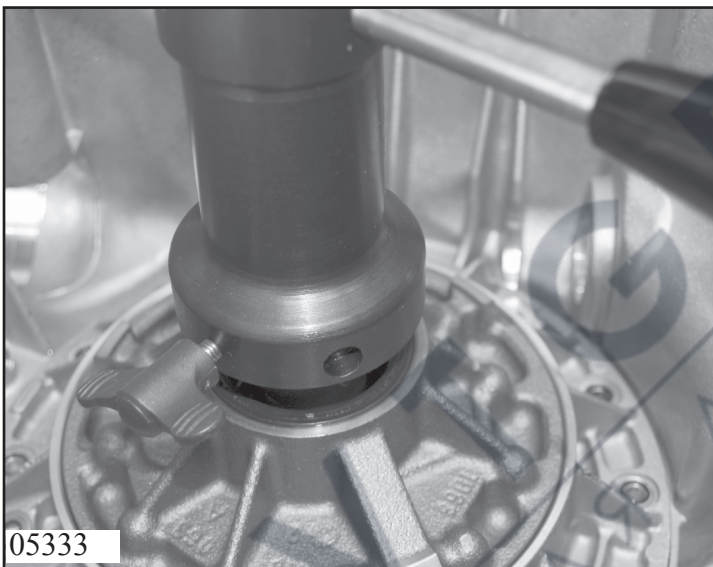
### 2.4.1 Removing the oil supply unit

Remove oil supply unit complete.  
To do this, undo 11 Torx screws and re-  
move together with Usit rings.

(Spanner size = Torx - TX 27)

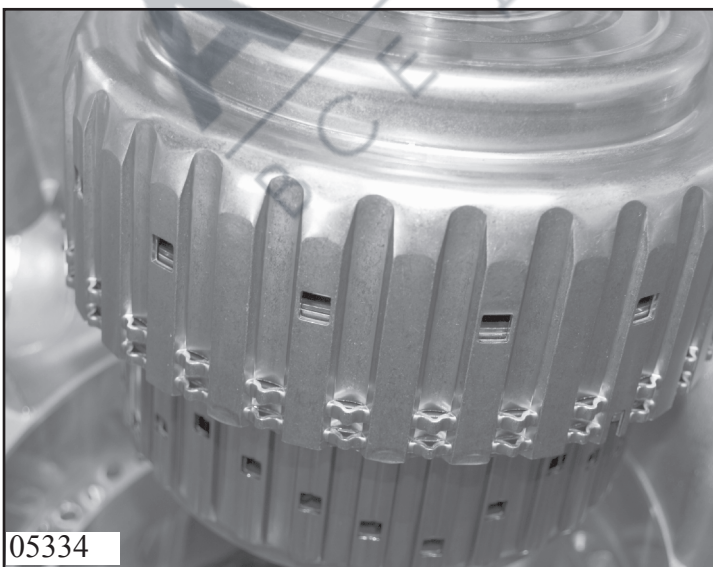


Press out oil supply unit with jacking de-  
vice 5x46 000 563 and remove.



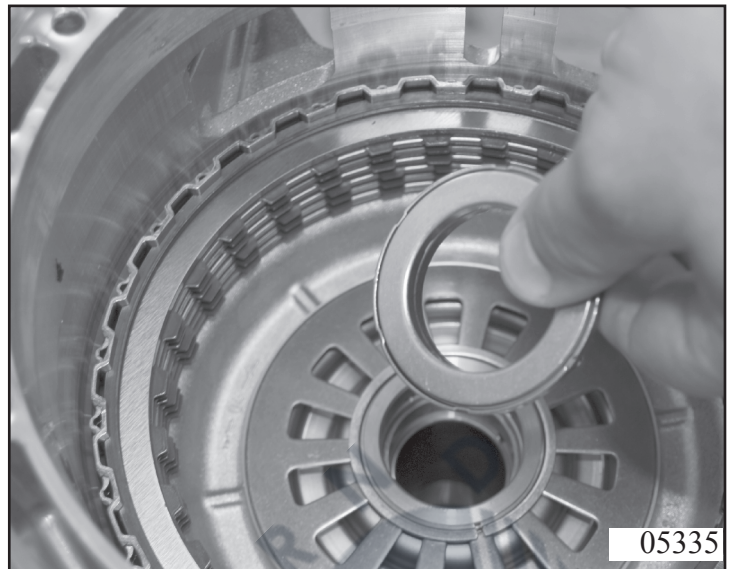
### 2.4.2 Removing the clutches

Remove compensating shim.  
Take out tower (drive with clutches A  
and E) by hand.  
Place tower in mounting device 5x46 000  
917 and remove lifting tool.





Remove axial needle cage from hub of cylinder B.

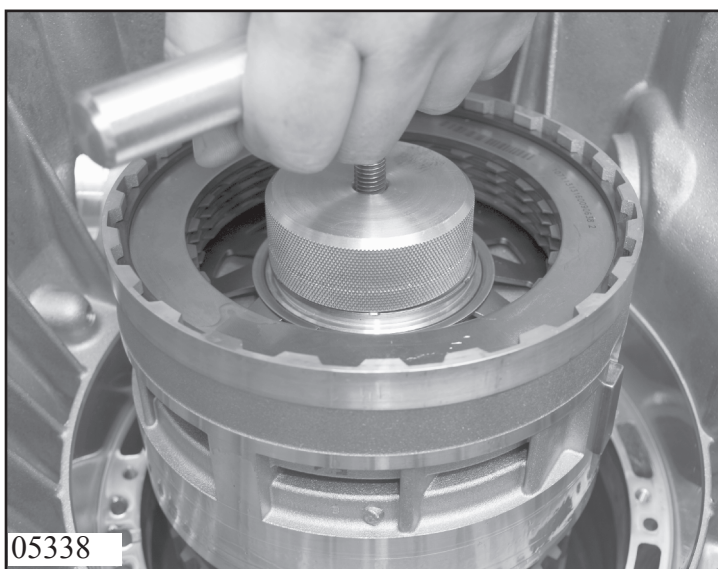


Remove clutch B by hand.



Lever circlip out of housing with screwdriver or circlip pliers.





Place lifting device 5x46 909 533 in position and screw to output drive shaft. Remove complete unit and place in mounting device.



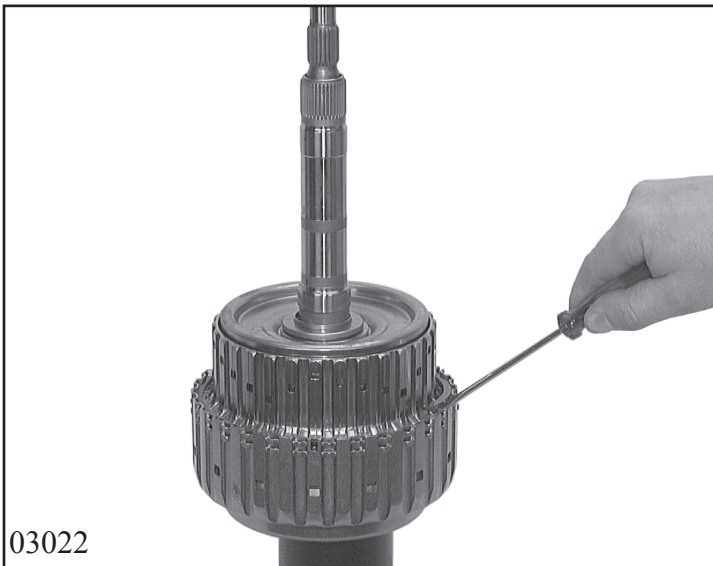




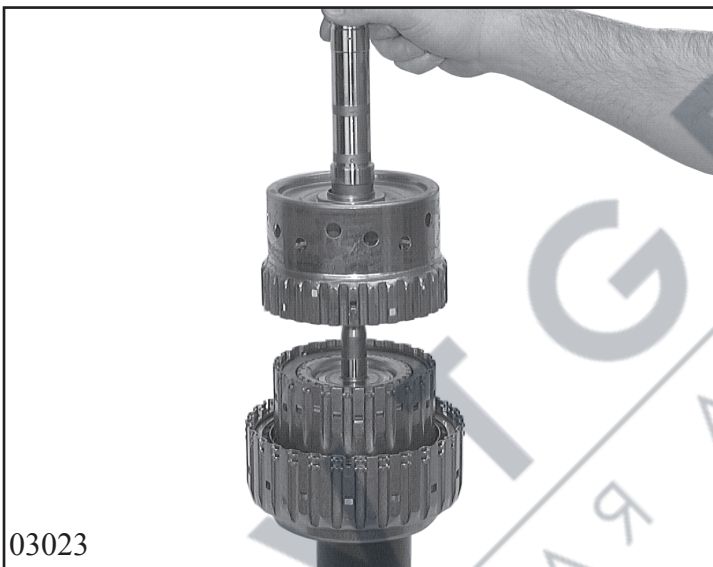
## 2.5 Disassembly clutches

### 2.5.1 Turret (with clutches A and E)

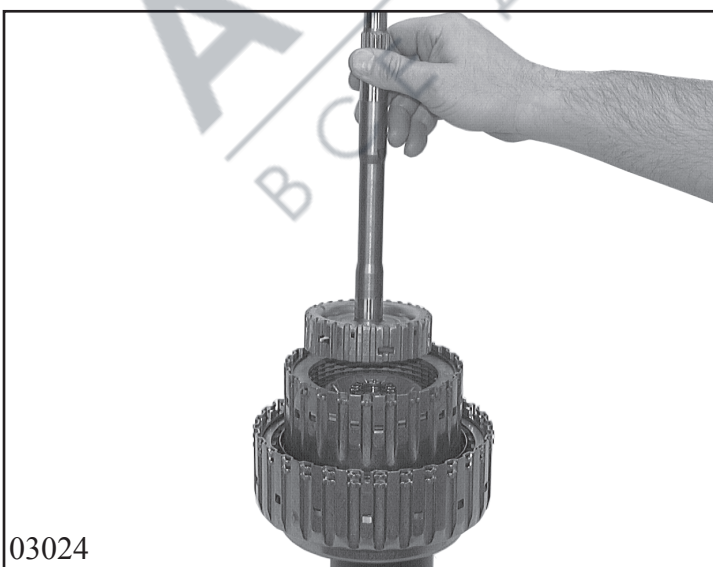
Place the turret with the input shaft in fixture 5x46 000 917.  
Take out the snap ring and remove inner disk carrier B.



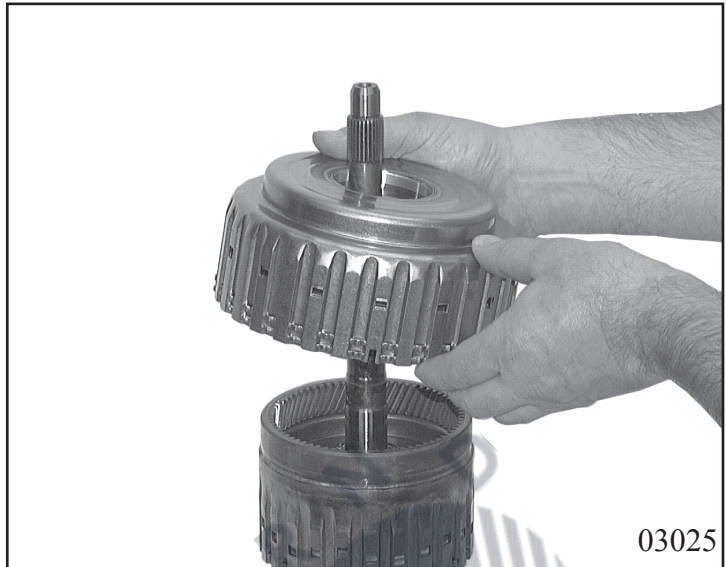
Take out inner disk carrier A and lever the needle roller thrust bearing out of the intermediate shaft, using a long scriber as a tool.



Lift off the intermediate shaft with inner disk carrier B. Lever out the needle roller thrust bearing.

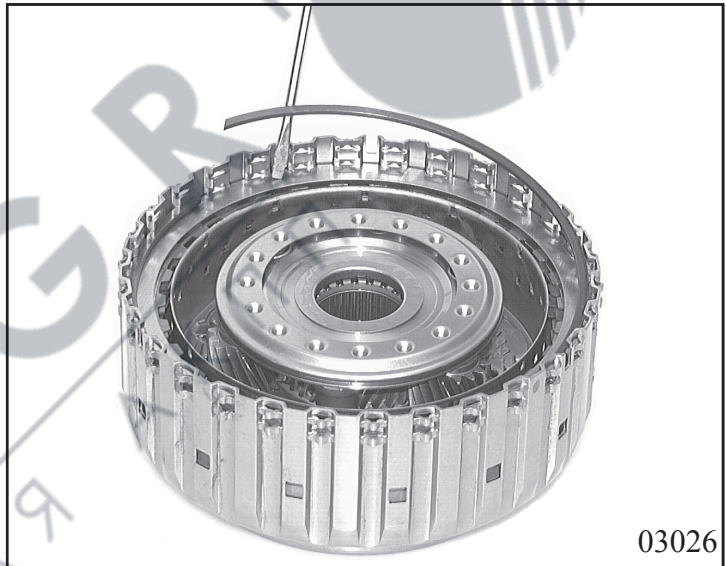


Take out clutch E (input shaft) from clutch A.

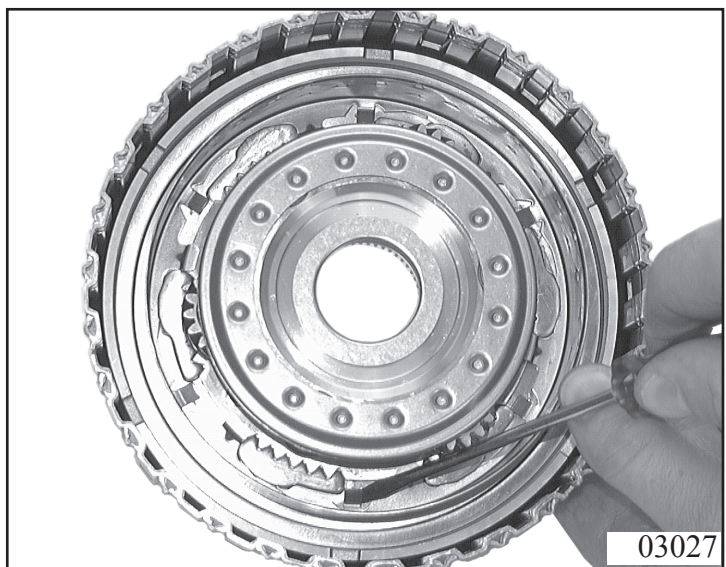


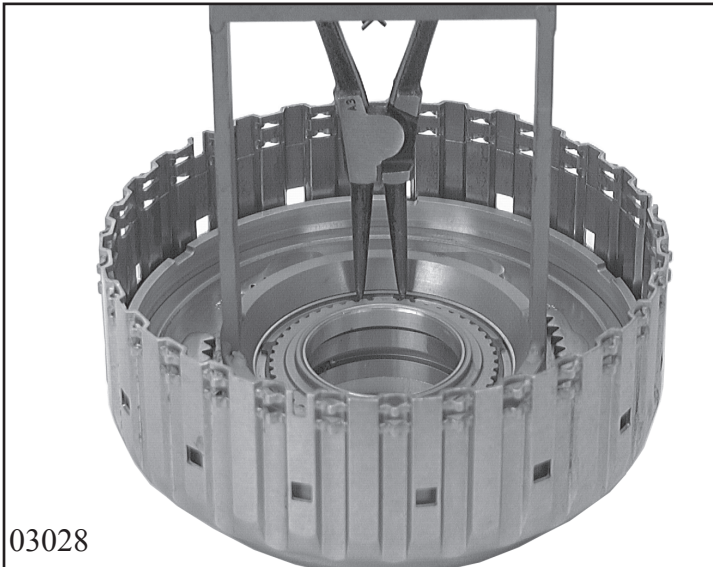
**Caution:**  
Input shaft is splined to clutch E.

Take out the snap ring at clutch A and take out the complete set of disks.

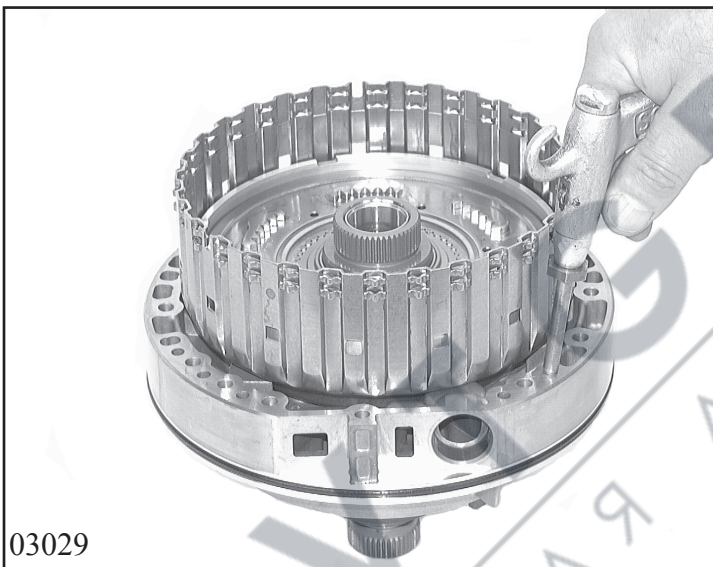


Bend up the lugs on the oilpan trap plate, turn the oil trap clockwise and take it out. Remove the sun wheel from the planet wheel carrier and lever out the needle roller thrust bearing cage.

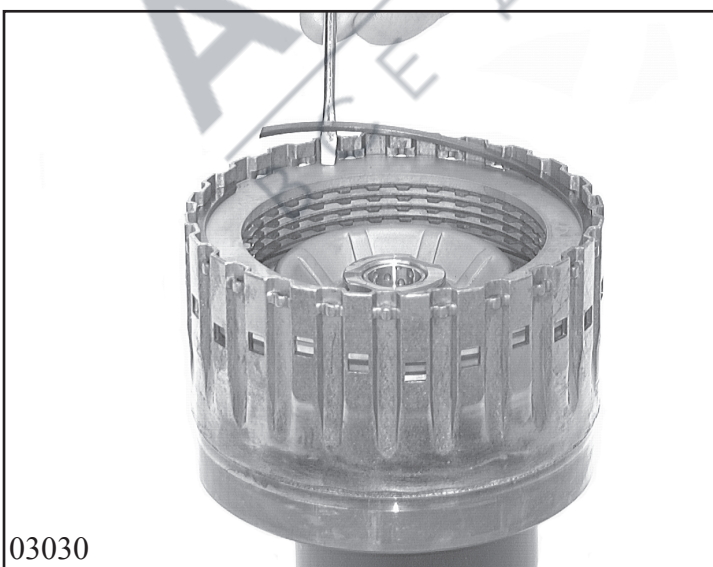




Using assembly hoop 5x46 909 247, press the cup spring down in the arbor press and remove the snap ring, using suitable pliers.



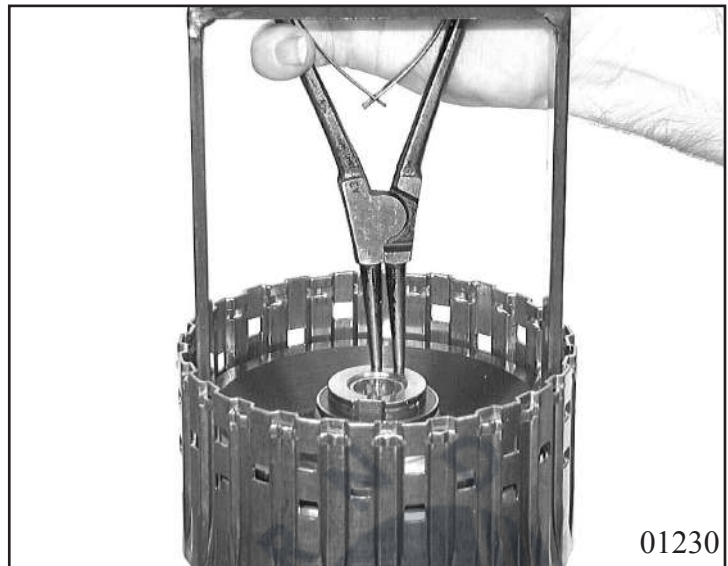
Mount cylinder A on the oil supply unit and force the complete cluster out with compressed air. Take out baffle plate and cup spring. Pull the O-ring seal off the baffle plate. Take out the piston and pull 1 O-ring seal and 1 special-section sealing ring off piston A. Lift cylinder A away from the oil supply unit.



Take out the snap ring for clutch E and remove the complete clutch E disk set.



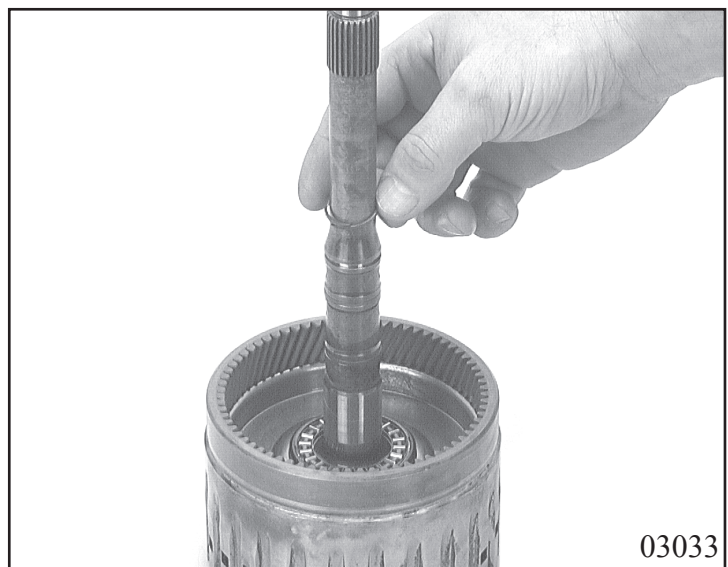
Using assembly hoop 5x46 909 247, press the baffle plate down and remove the snap ring with suitable pliers. Remove the bracket and retaining washer and cup spring and pull the O-ring seal off the baffle plate.



Plug one of the two oil feed holes and force piston E out with compressed air. Pull off the two O-ring seals.

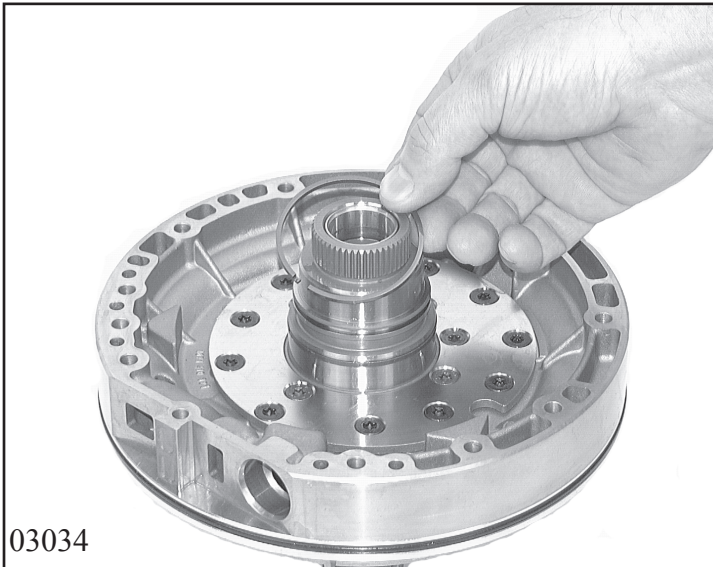


Pull the three rectangular-section rings off the input shaft.

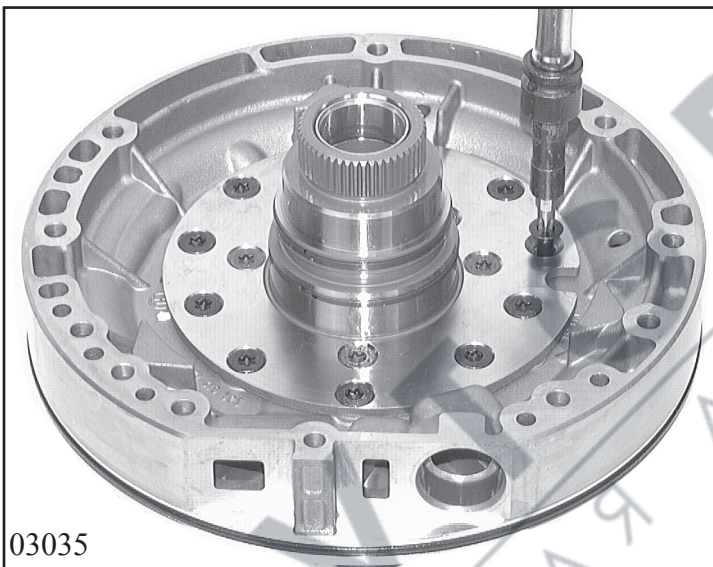


**Note:**  
Unclip and remove the needle roller bearing if this is faulty

## 2.5.2 Oil supply

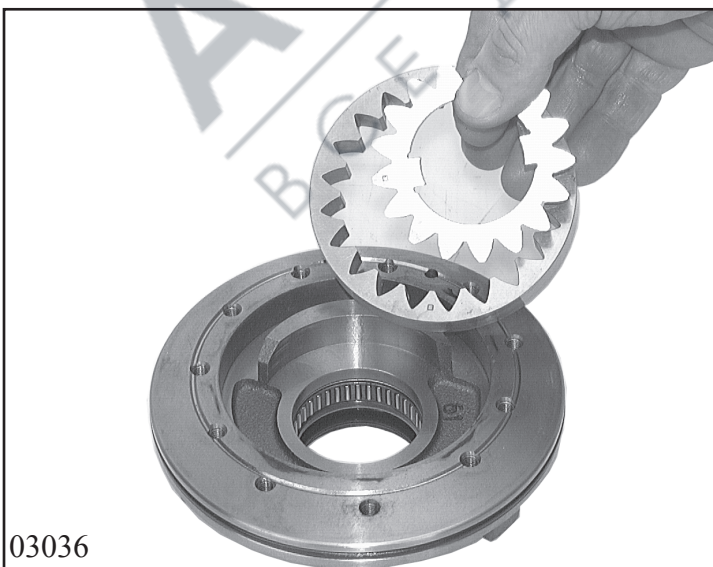


Place the complete oil supply unit on a suitable working surface. Pull the 2 rectangular-section rings off the stator shaft.



Unscrew the 11 countersunk-head machine screws (at the outer ring of the stator shaft) and remove them except for two on opposite sides. Strike the pump carefully with a plastic-faced hammer to drive it out on to these screws.

(Wrench size = Torx TX 30)



Pull off the O-ring seal. The pump can be disassembled by taking out the impeller and the ring gear.

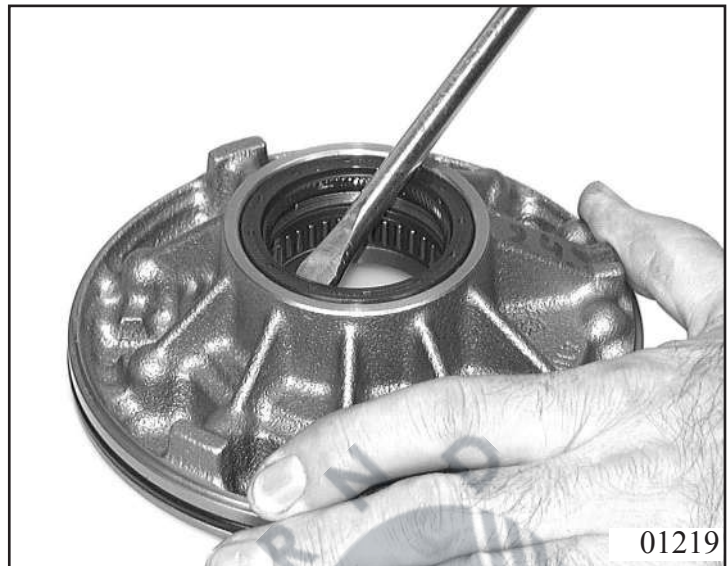
Lever out the shaft sealing ring with a suitable screwdriver. Take out the snap ring. If necessary, press the sealing ring with needle roller bearing out from the impeller side in the arbor press, using a suitable tool.

To do this, the pump casing must be turned around.

Diameter of pressure pin = app. 42 mm.

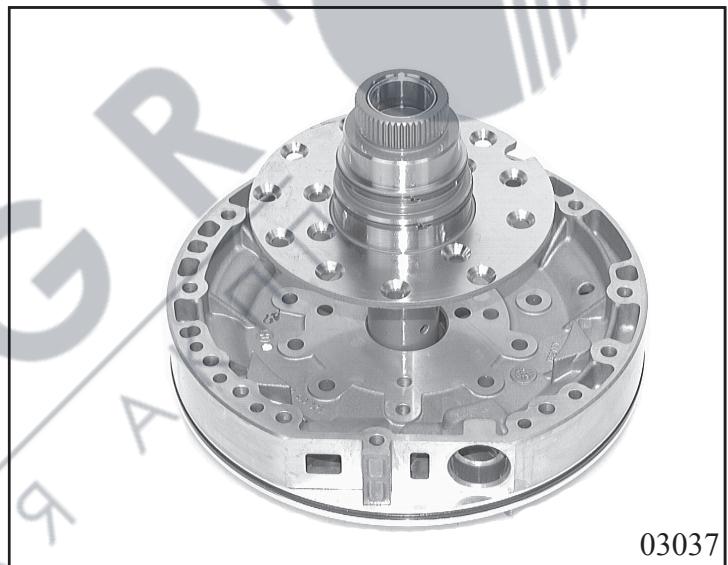
**Note:**

This work will damage the needle roller bearing, which must not be re-used.



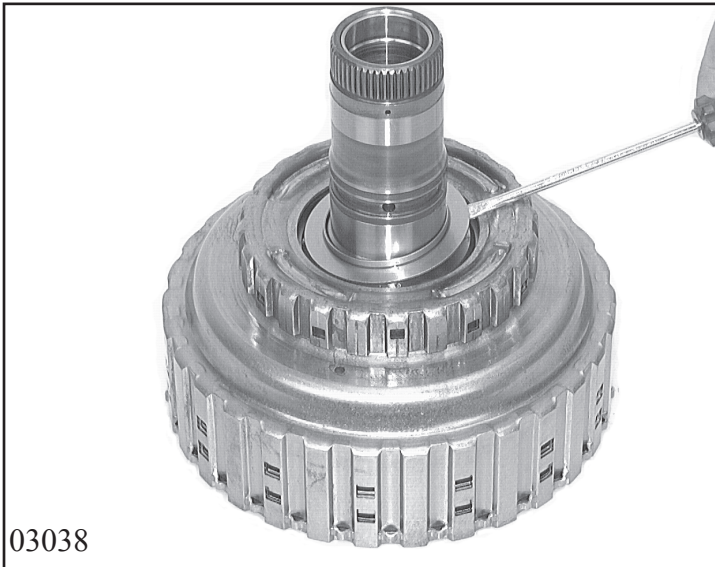
Unscrew the remaining 6 countersunk-head screws, heat the casing to approx. 70°C around the stator shaft and drive the stator shaft out of the intermediate plate with a plastic-faced hammer.

(Wrench size = Torx TX 30)

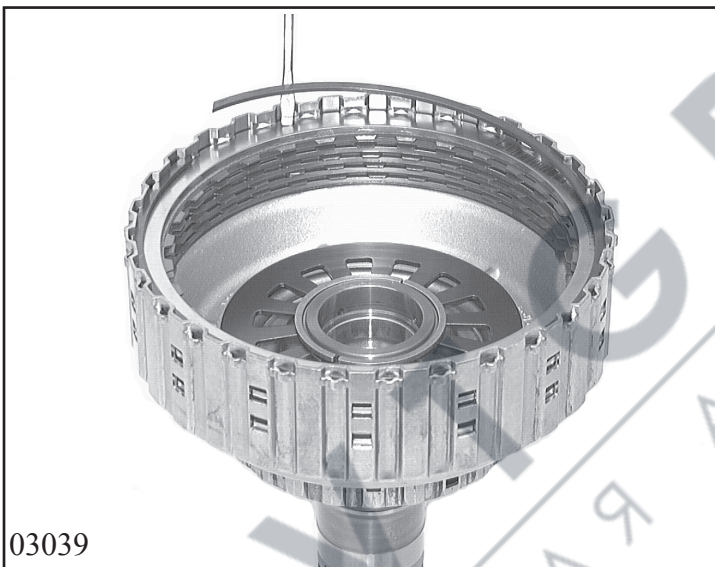




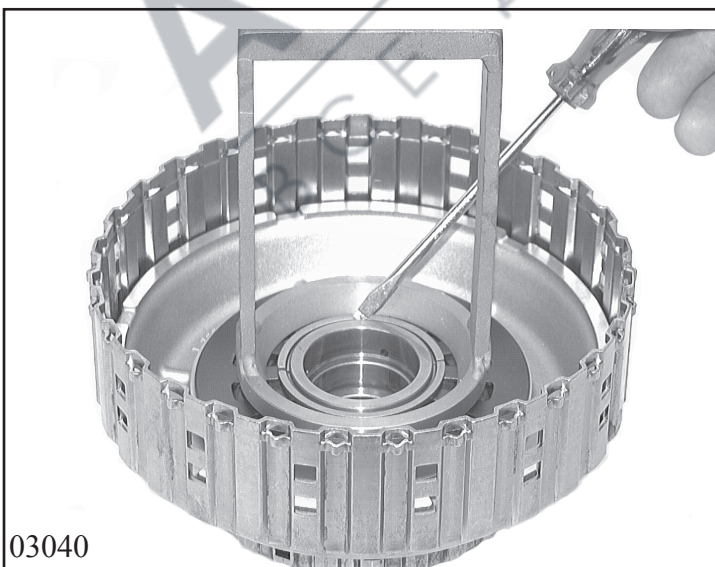
### 2.5.3 Clutch B



Unclip the angled washer from the clutch B carrier.



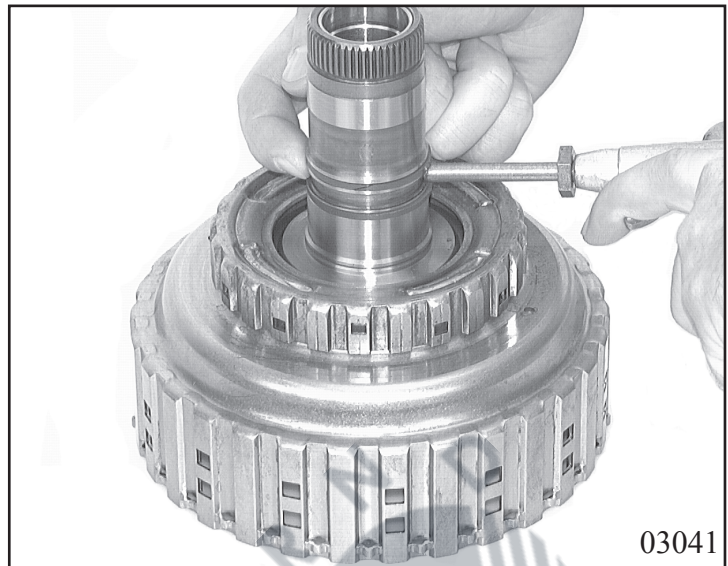
Next, turn the cylinder by 180 degrees, remove the snap ring at clutch B and take out the complete disk cluster.



Using assembly hoop 5x46 909 248, press cup spring B out in the arbor press. Remove the split retaining ring and take out the divided cup spring.

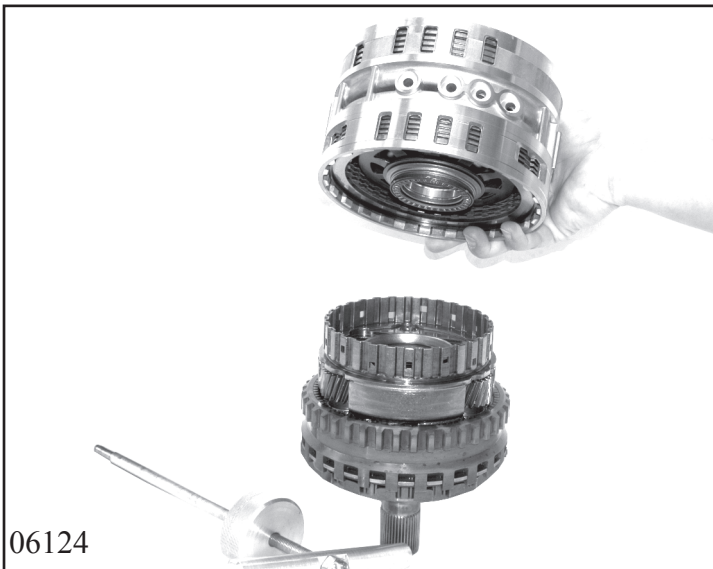


Plug one of the two oil feed holes and force piston B with retaining washer out with compressed air.  
Pull off 1 O-ring from the retaining washer and 2 O-rings from the piston.  
Pull the two rectangular-section rings off the shaft.

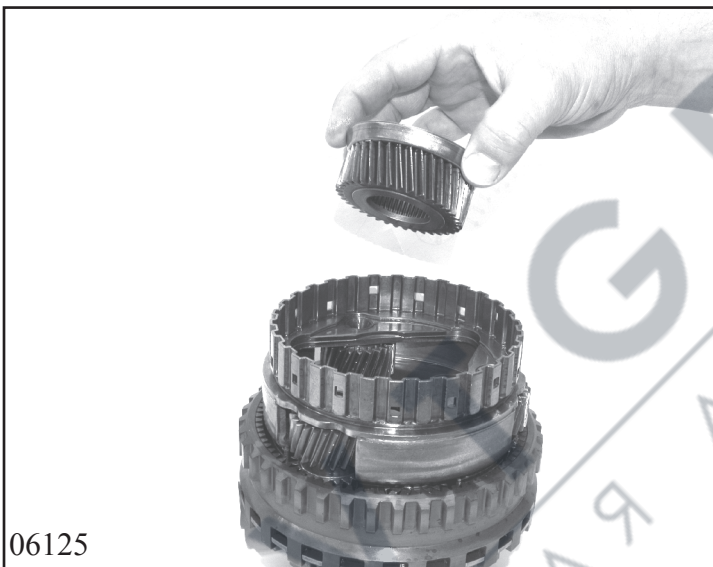


## 2.5.4 Tower (cylinder CD and output drive shaft)

Unscrew lifting device from tower and remove cylinder CD.



Remove angle plate and sun gear.  
Remove planet gear carrier from output drive shaft.



Remove bearing disc and sun gear 2 from planet gear carrier.  
Unclip bearing and sun gear 3 from planet gear carrier.

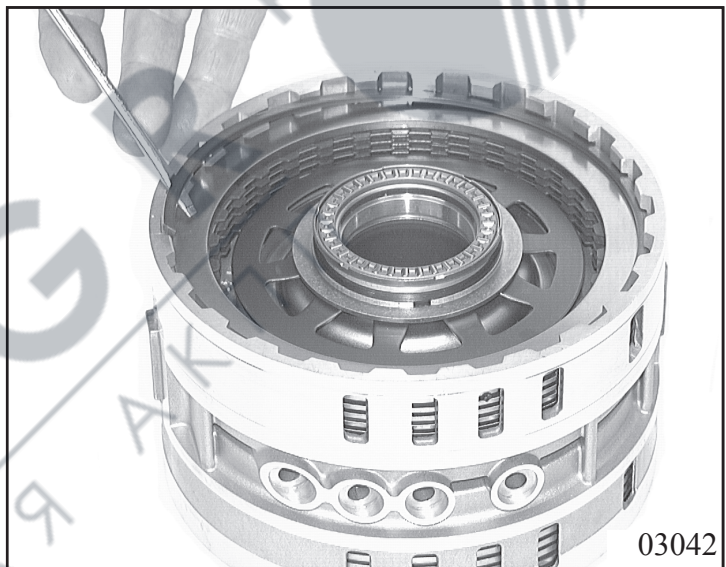


Remove thrust washer from hub of planet gear carrier.

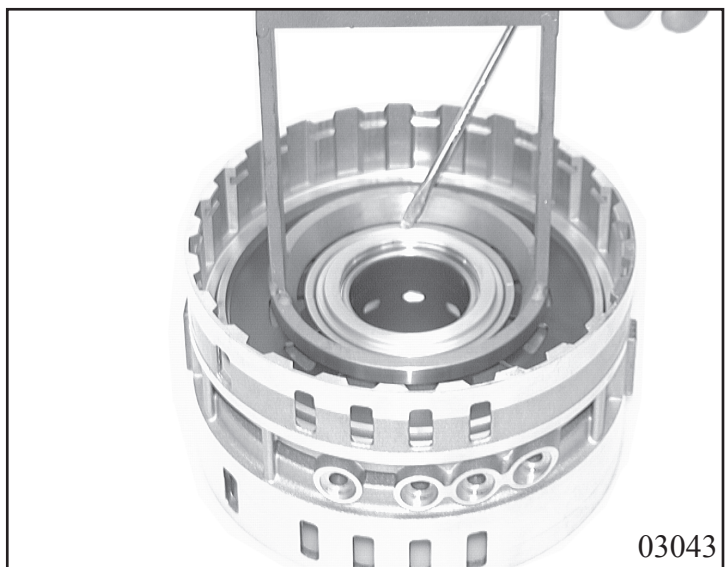


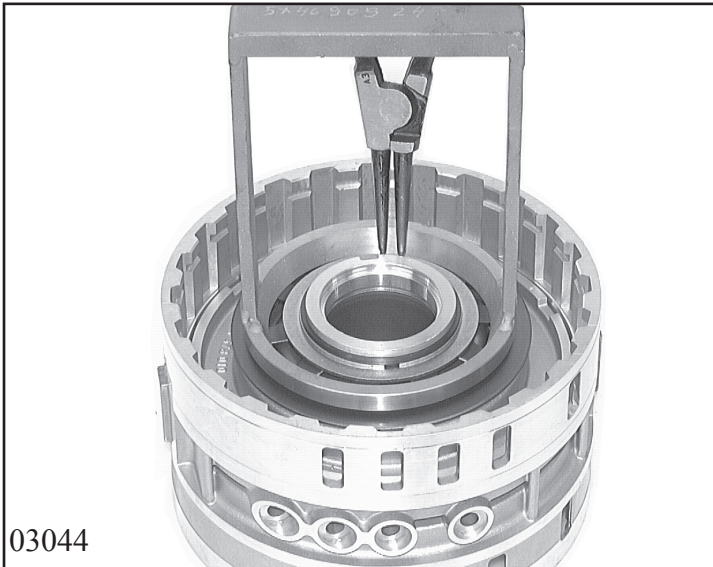
### 2.5.5 Brakes C and D

Take out the snap ring at brake D and remove the complete disk cluster.  
Unclip the needle roller thrust bearing cage.  
Turn the cylinder around.  
Unclip the needle roller thrust bearing cage.  
Take out the snap ring at brake C and remove the complete disk cluster.



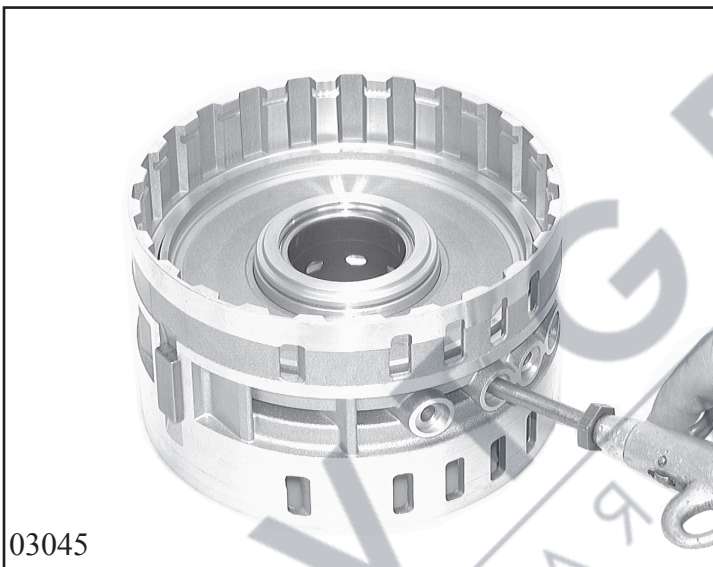
Using assembly hoop 5x46 909 247, press cup spring C out in the arbor press; take out the split retaining ring. Remove the divided cup spring.





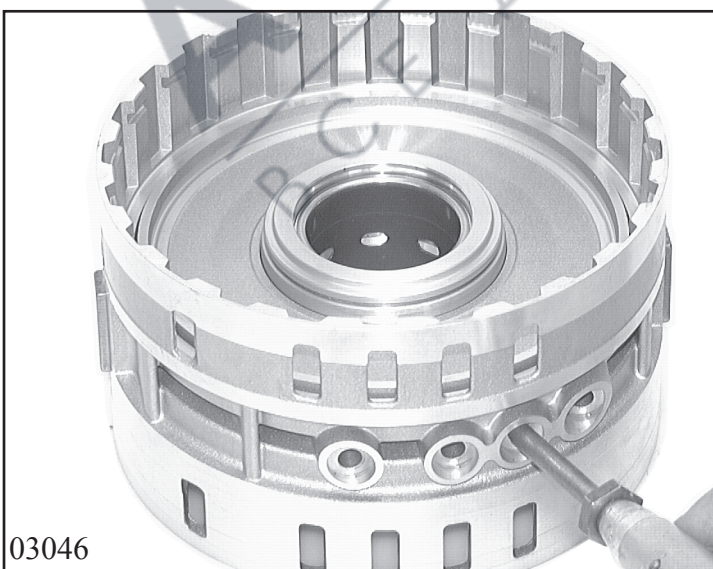
03044

Turn the cylinder around and use assembly hoop 5x46 909 247 to compress cup spring D in the arbor press. Lever out the snap ring and remove the retaining washer and cup spring.



03045

Use compressed air to force retaining washer D out of cylinder bore D.



03046

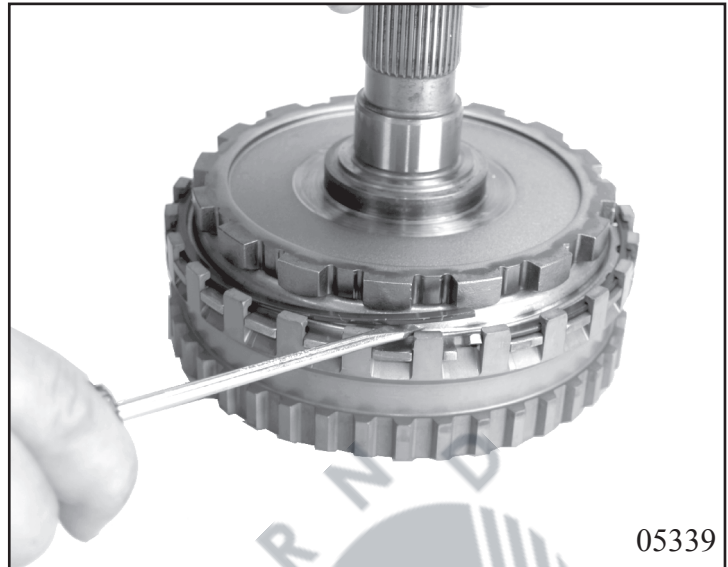
Apply compressed air carefully to the oil feed hole and force out piston D. Pull off 1 O-ring seal from cylinder D and 3 O-ring seals from the piston.

Turn the cylinder around and apply compressed air carefully to the oil feed hole to force out piston C. Pull the 2 O-ring seals off piston C



### 2.5.6 Output shaft with parking lock

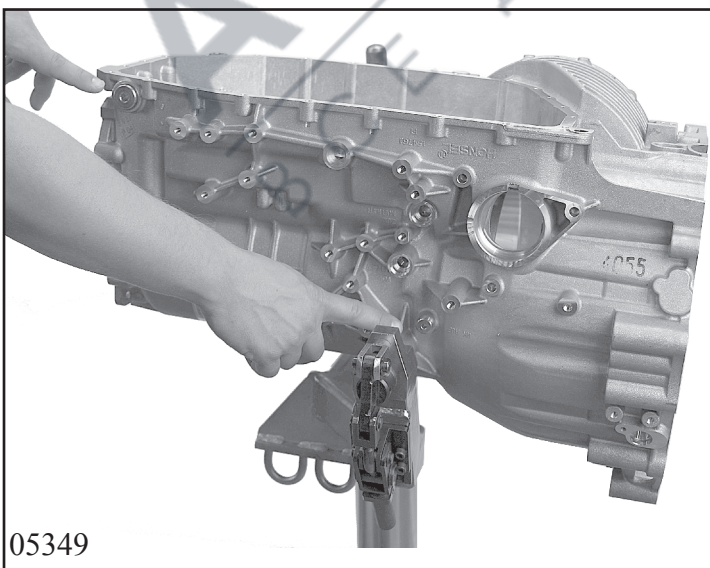
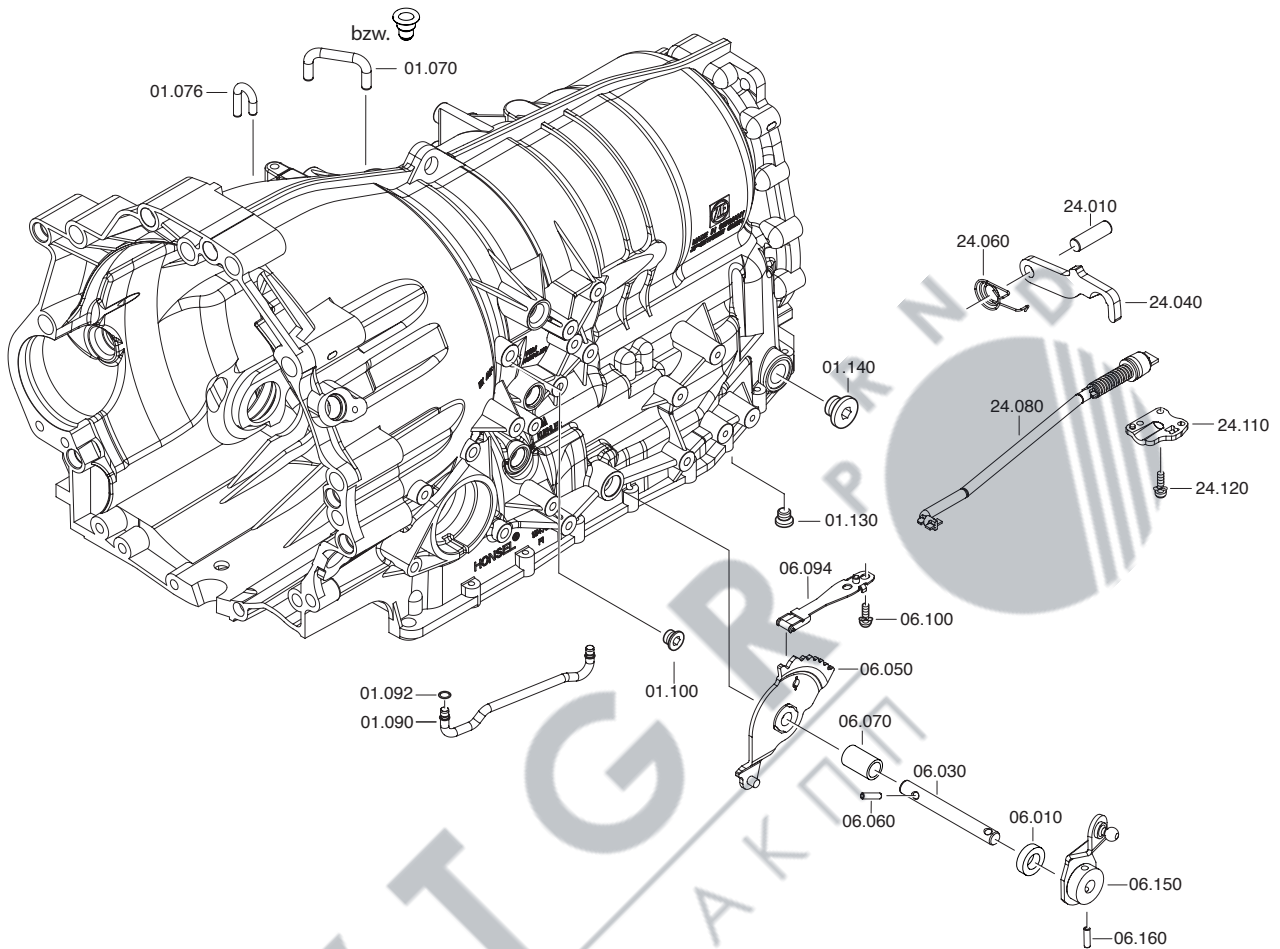
Take out the circlip from output shaft and internal gear. Take out the output shaft.



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### 3. Assembly

#### 3.1 Housing with gearshift and park interlock



Mount transmission housing in assembly bracket 5x46 002 165 and place on assembly carriage or workbench retainer 5x46 000 763.

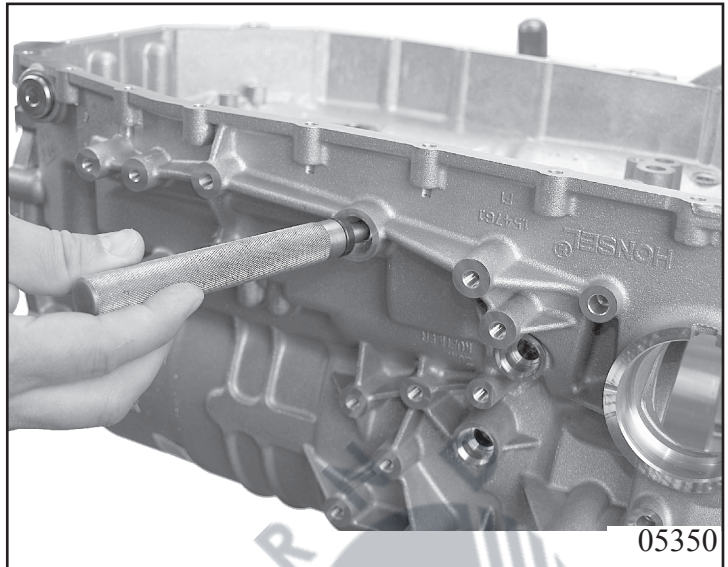
Fit 2 blanking screws 01.100 and 01.140. Apply locking varnish to screw 01.100 before fitting.

(For tightening torque, see Chapter 1.5)

#### **Note!**

Only necessary with new transmission housings. Drive-in breather tube 01.070 + 01.076.

Fit shaft sealing ring 06.010 into transmission housing with press-fit mandrel 5x46 909 321.

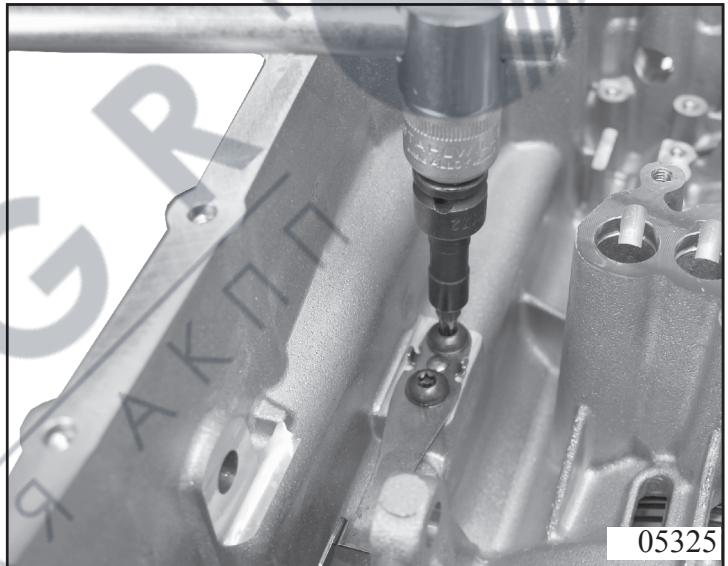


Tighten latching spring 06.094 with 2 Torx screws 06.100.

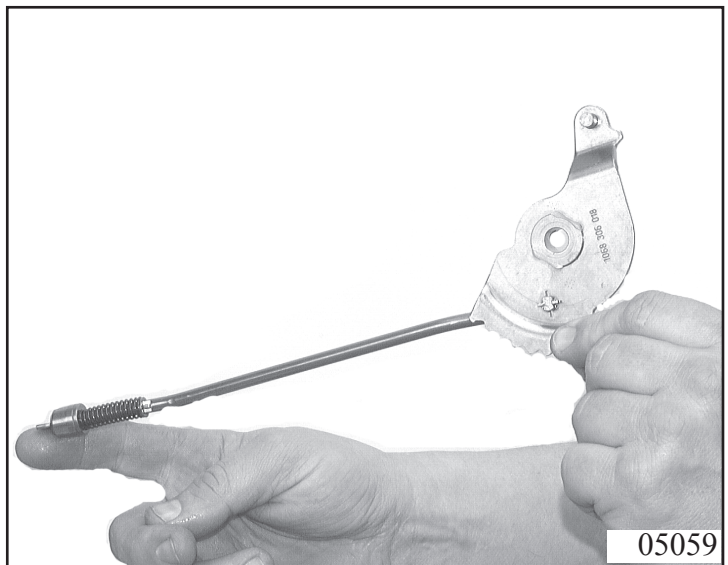
(For tightening torque, see Chapter 1.5)

**Note!**

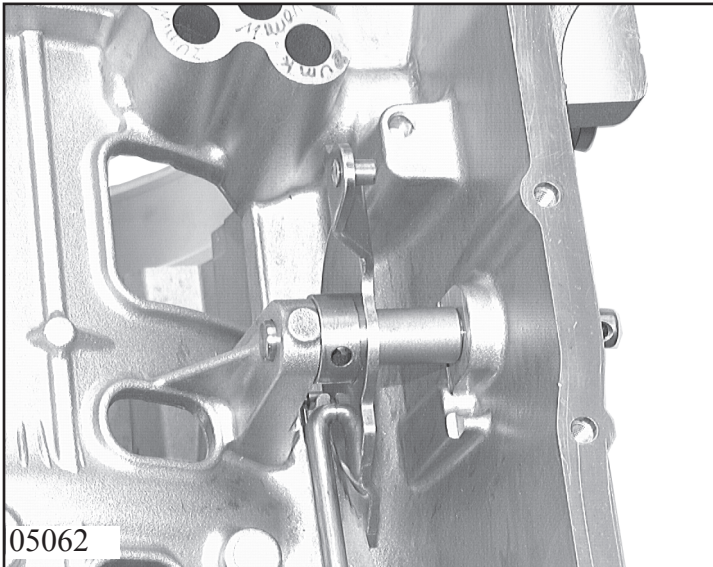
If the transmission housing, latching spring, slotted disc or selector shaft have been replaced or if the latching spring has been removed, the shift mechanism (latching spring) must be readjusted. See Chapter 1.4.7



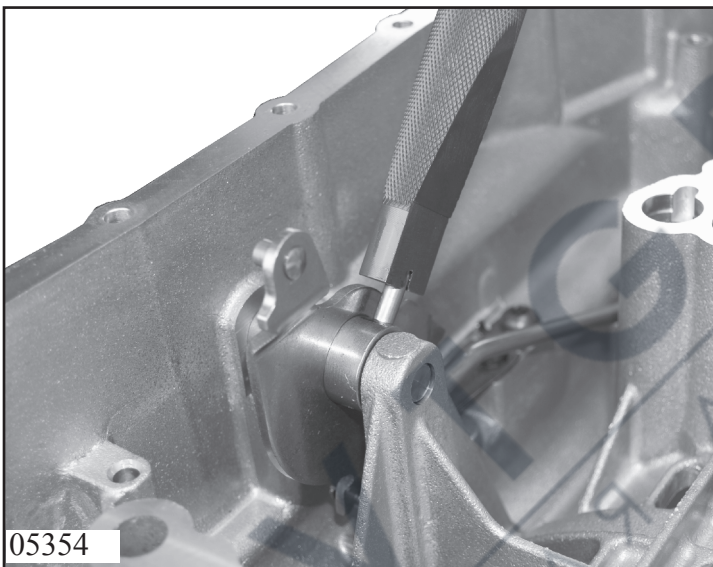
Hang connecting rod 24.080 in park or slotted disc 06.050 and twist.



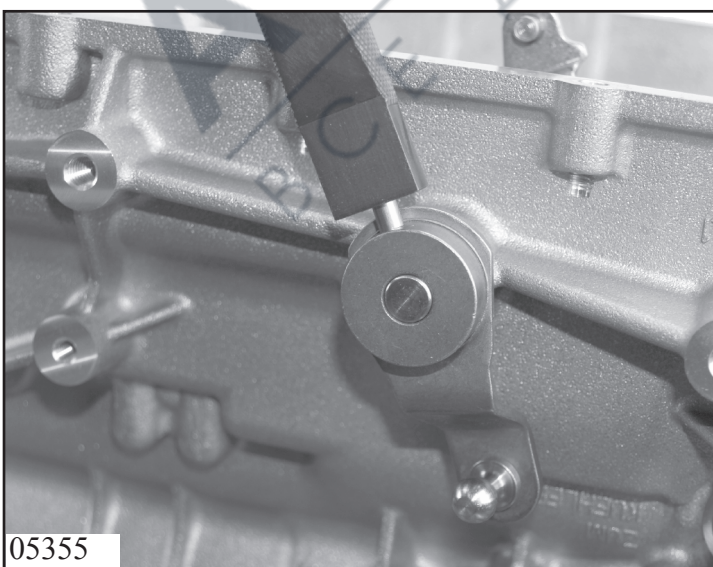




Fit slotted disc with connecting rod into transmission housing, and slide selector shaft 06.030 through sleeve 06.070 and slotted disc.



Drive new dowel pin 06.060 into place with impact bolt 5x46 000 291 or a suitable drift.

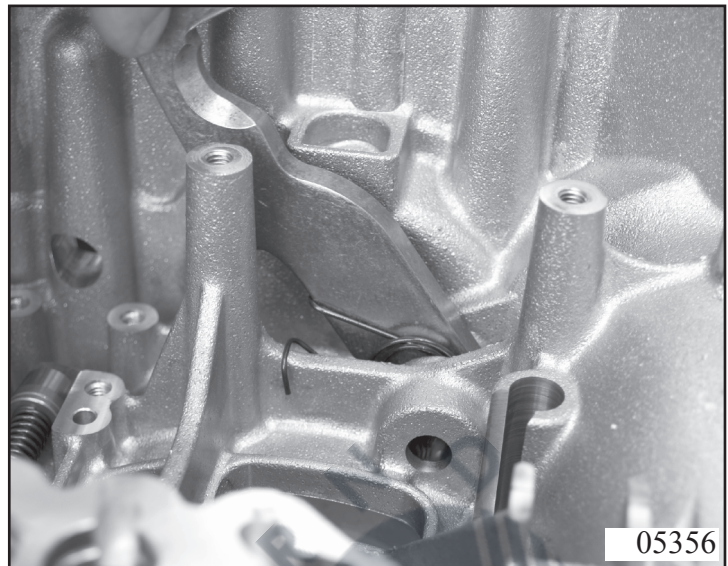


Place gearshift lever 06.150 with spherical cap on the selector shaft tilted away from the oil sump side, and fix new clamping sleeve 06.160 in the position shown with drift 5x46 000 291.

**Note!**

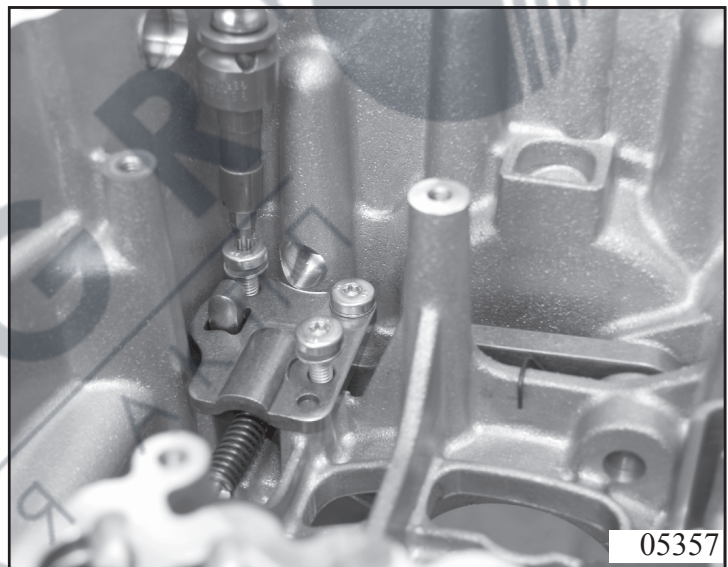
In parts list 1071 040 019 and 036, the gearshift lever is fitted with spherical cap facing the oil sump side.

Fit latch 24.040 with leg spring 24.060 into transmission housing, and fix by pressing in bolt 24.010.



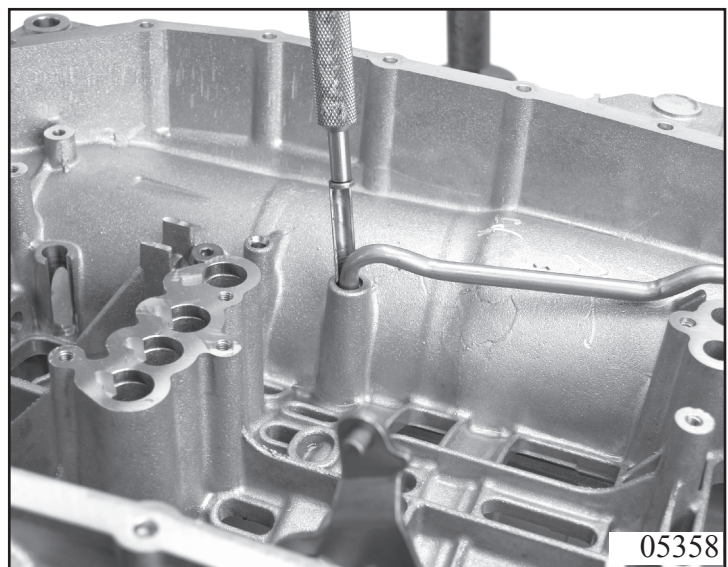
Depress latch, fit connecting rod and fix guide plate 24.110 with 3 Torx screws 24.120.

(For tightening torque, see Chapter 1.5)



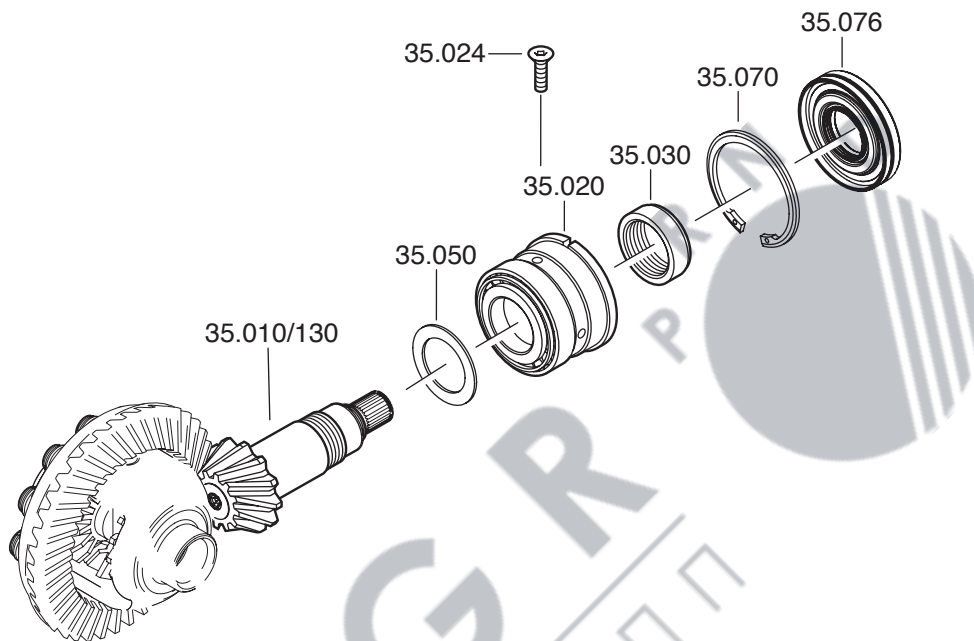
Drive in oil pipe 01.090 with two new O-rings 01.092 carefully into gearbox housing with plastik hammer or apt drive-in-tool.  
Srew in srew plug 01.130 in gearbox housing.

(For tightening torque, see Chapter 1.5)



## 3.2 Completing and installing the pinion shaft

### 3.2.1 Completing the pinion shaft



Fit shim washer 35.050 on pinion shaft 35.010/130 {part of complete bevel gear (paired)}.

Press taper roller bearing 35.020 onto pinion shaft with press-fit mandrel, using a mandrel press.

Fit outer bearing ring with press-fit mandrel, using a mandrel press.

**Note:**

For adjustment, see Chapter 1.4.3



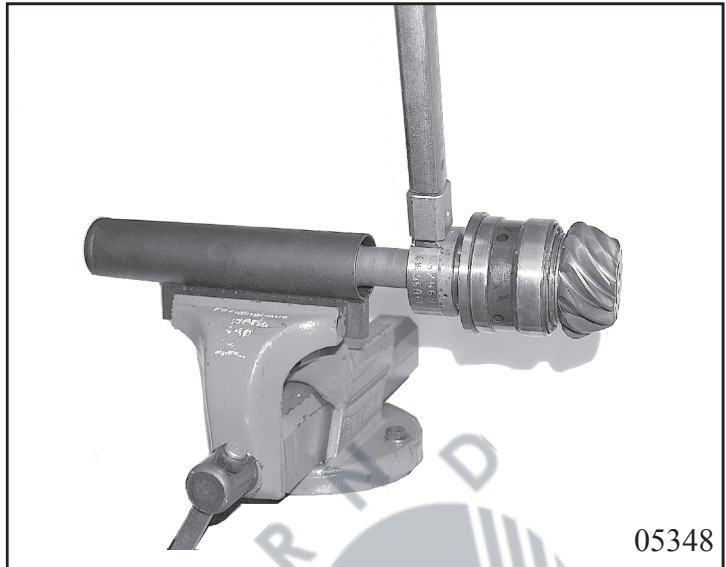
Screw lock nut 35.030 by hand onto pinion shaft. Place spanner 5x46 909 082 on pinion shaft.

Clamp holding device 5x46 909 503 horizontally in vice and plug pinion shaft into tothing.

Plug torque spanner onto spanner and tighten lock nut firmly.

Take pinion shaft out of holding device and caulk lock nut with suitable tool.

(For tightening torque, see Chapter 1.5)



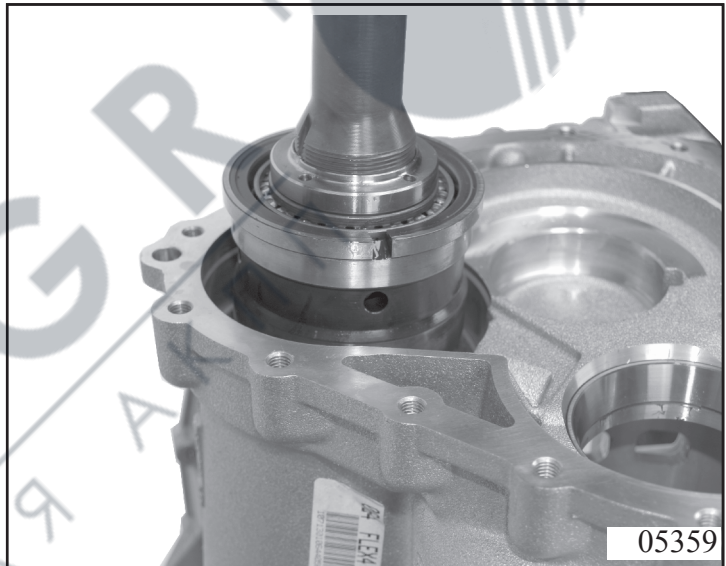
### 3.2.2 Fitting the pinion shaft

Reposition transmission unit with holder so that differential opening is accessible. Turn transmission unit with converter bell side downwards.

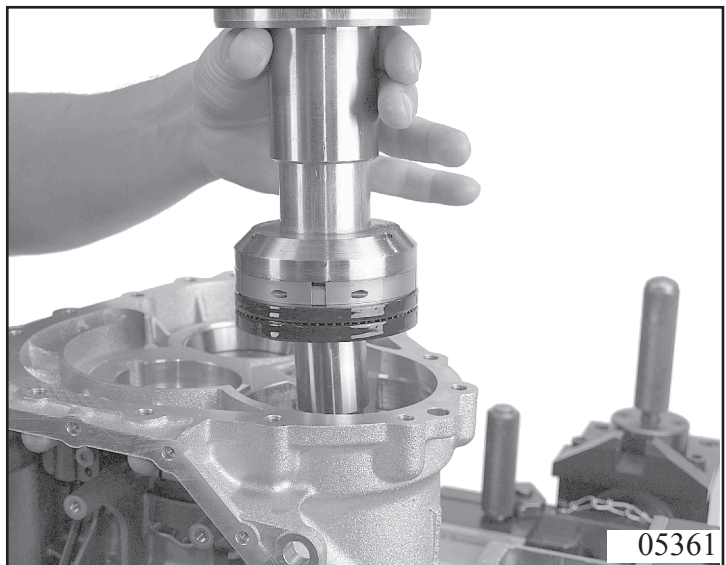
Heat up transmission housing with hot-air dryer. Screw in fixing screw 35.024 so that it protrudes slightly into the tunnel. Insert pinion shaft so that the bearing groove in the pinion shaft is positioned by the fixing screw hole.

Secure the bearing against turning with the fixing screw.

(For tightening torque, see Chapter 1.5)

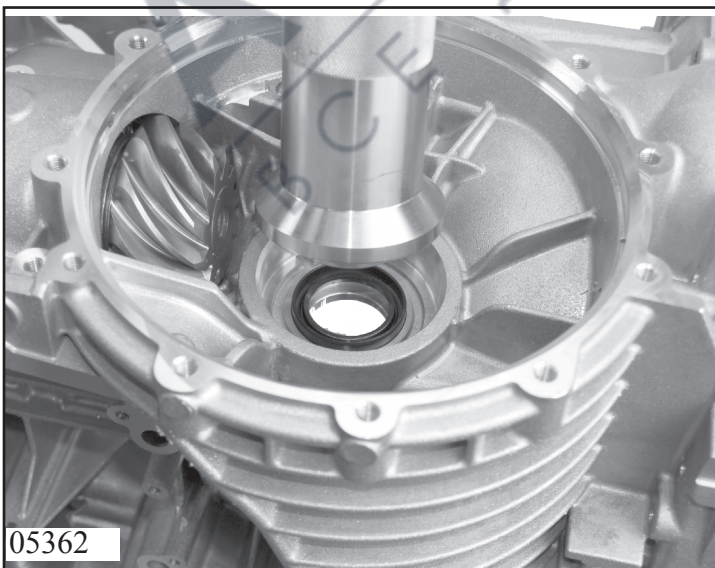
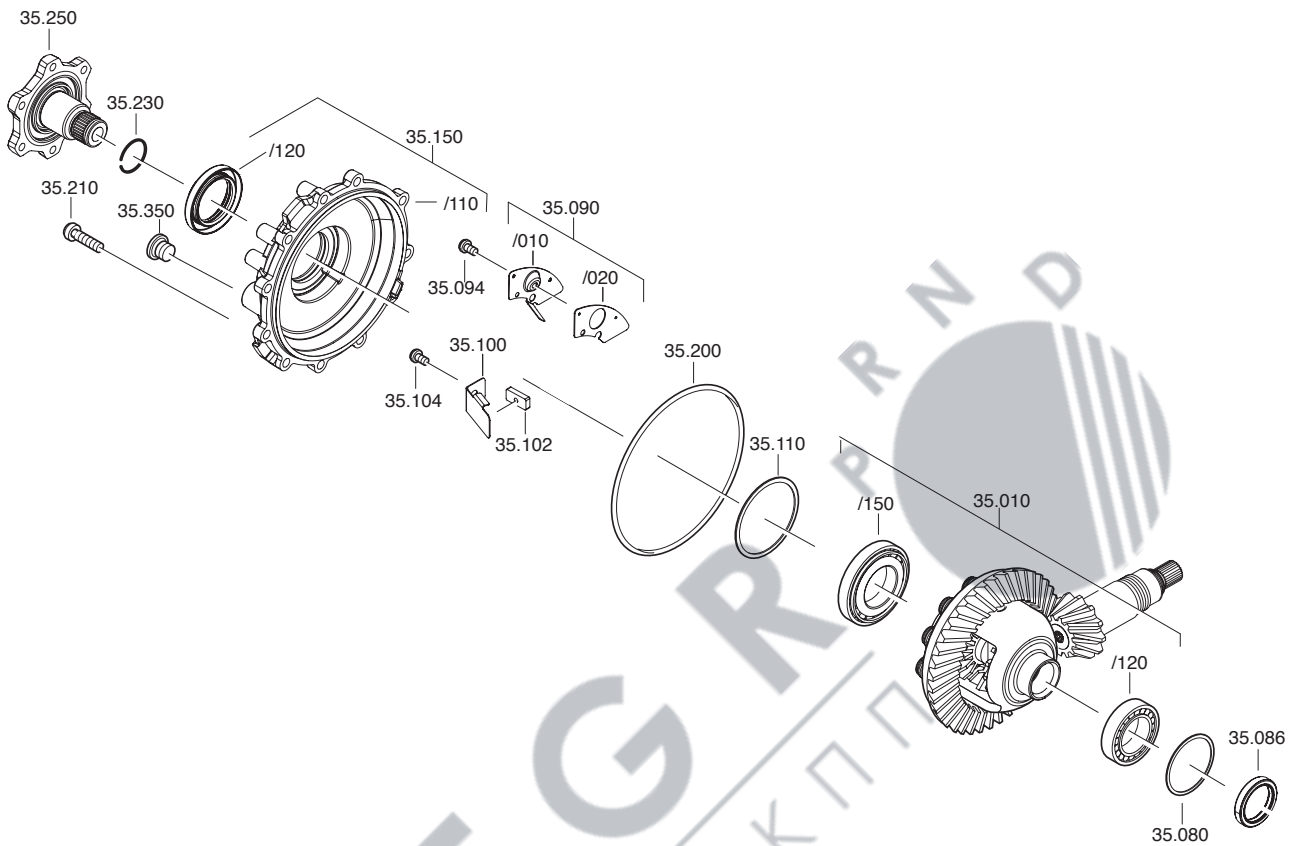


Secure pinion shaft with circlip 35.070. Place guide sleeve 5x46 052 734 over pinion shaft. Fit shaft sealing ring 35.076 with press-fit tool 5x46 002 734.



### 3.3 Completing and installing the differential

#### 3.3.1 Assembly of the transmission housing

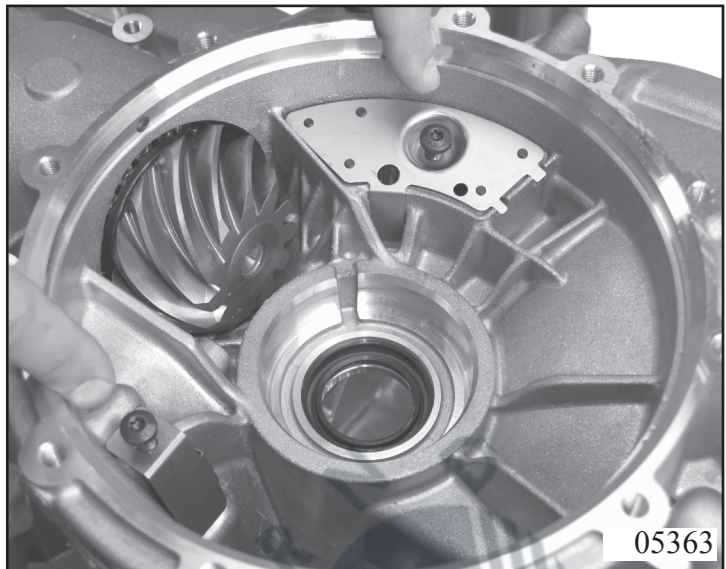


Turn transmission housing with differential opening upwards.

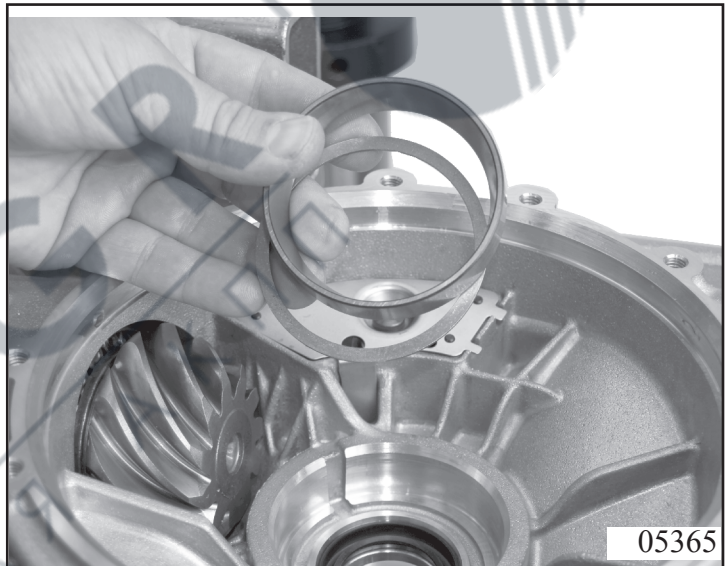
Fit shaft sealing ring 35.086 into transmission housing with press-fit tool 5x46 909 270.

05362

Fit new cover plate 35.090 (complete with rubber seal) and fix with machine screw 35.094.  
Place magnet 35.102 on holder 35.100 at the position marked, and fix holder with machine screw 35.104.



Fit the removed compensating shim 35.080 and bearing shell 35.010/120.



### 3.3.2 Completing the differential

Fit bottom bevel gear with flange retaining washer and shim washer, and top bevel gear with shim washer through viewing window in differential cage.  
Raise top bevel gear and fit planet gears with thrust washer through viewing window.  
Turn planet gears through 90° about the differential axis and fix with bolt.

**Note:**

Bevel gears and planet gears must be refitted paired with shim washers, as they were when they were removed!!!







Clamp fitting 5x46 002 167 in vice, place differential in fitting, and screw crown gear to differential cage 35.010/110 with 12 new screws 35.010/140 using torque wrench with yield strength control, Quantec EMS ISI No. 7086.

**Note:**

Specification for screw fittings, see Chapter 1.3.1.6

(The use of the wrench needs clarification, which is provided in a training course).

00102

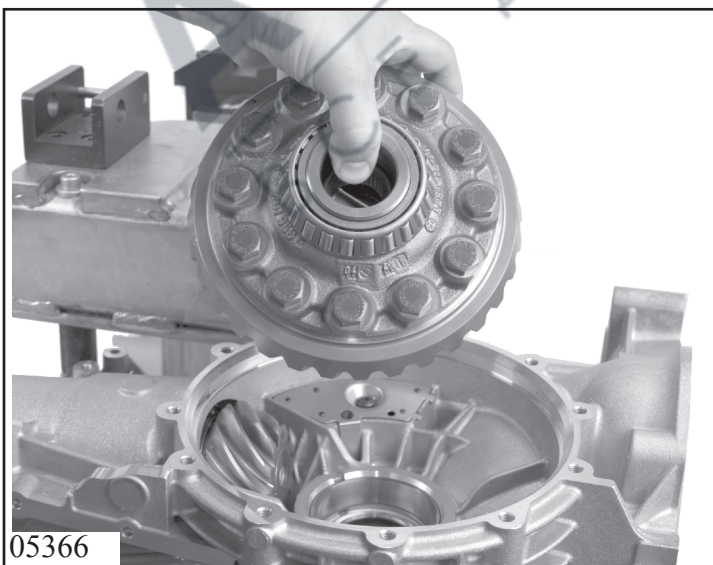


Fit bearing inner ring 35.010/120, 35.010/150 with bearing mandrel to differential, using a mandrel press.

00004

### 3.3.3 Fitting the differential in the transmission housing

Fit differential in transmission housing.

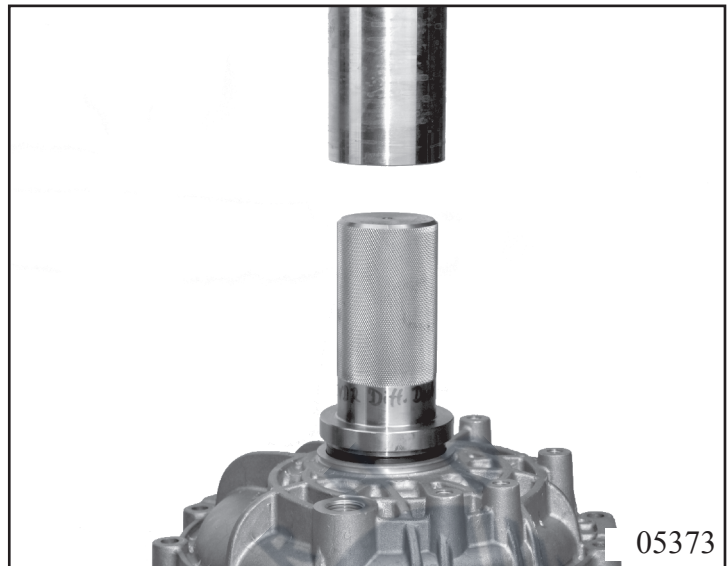


05366

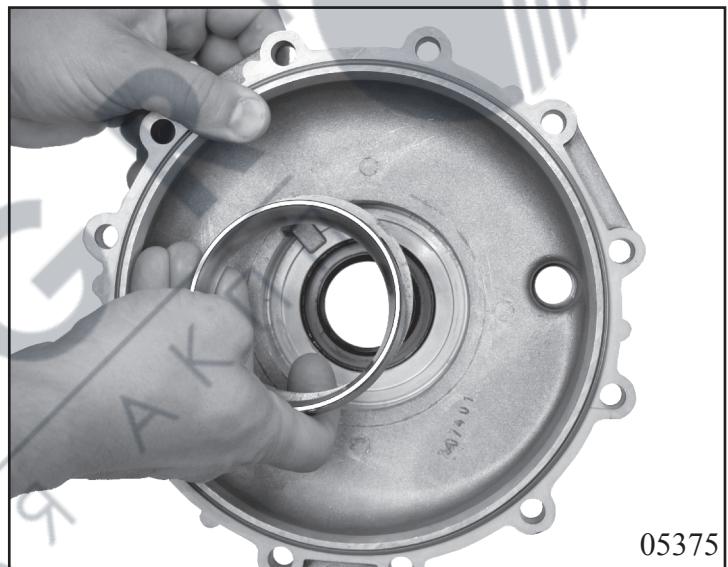
**Note:**

For adjustment, see Chapter 1.4.2

Press shaft sealing ring 35.150/120 into differential cover 35.150/110 with press-fit tool 5x46 909 271 using a mandrel press.



Fit shim washer 35.110 and bearing shell 35.010/150 in differential cover.  
Fit O-ring 35.200 on differential cover.

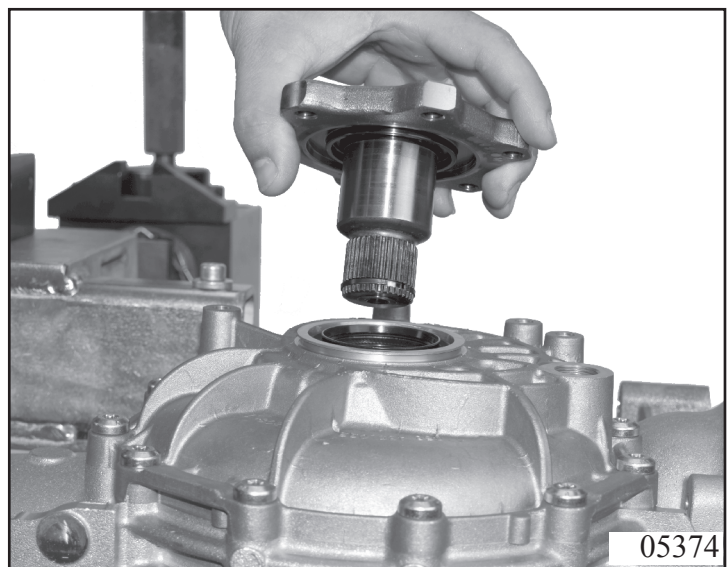


Tighten differential cover with 11 screws 35.210.  
Fit blanking screw 35.350 in differential cover.  
Fit output drive flange 35.250 with new circlip 35.230.

(For tightening torque, see Chapter 1.5)

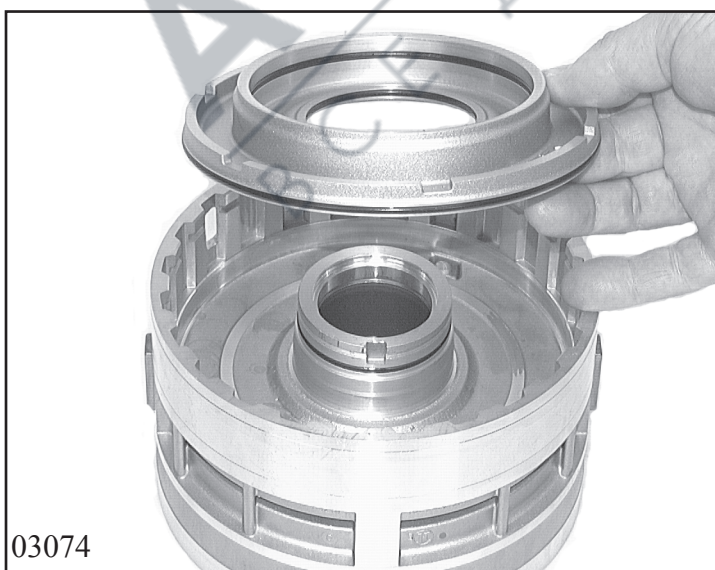
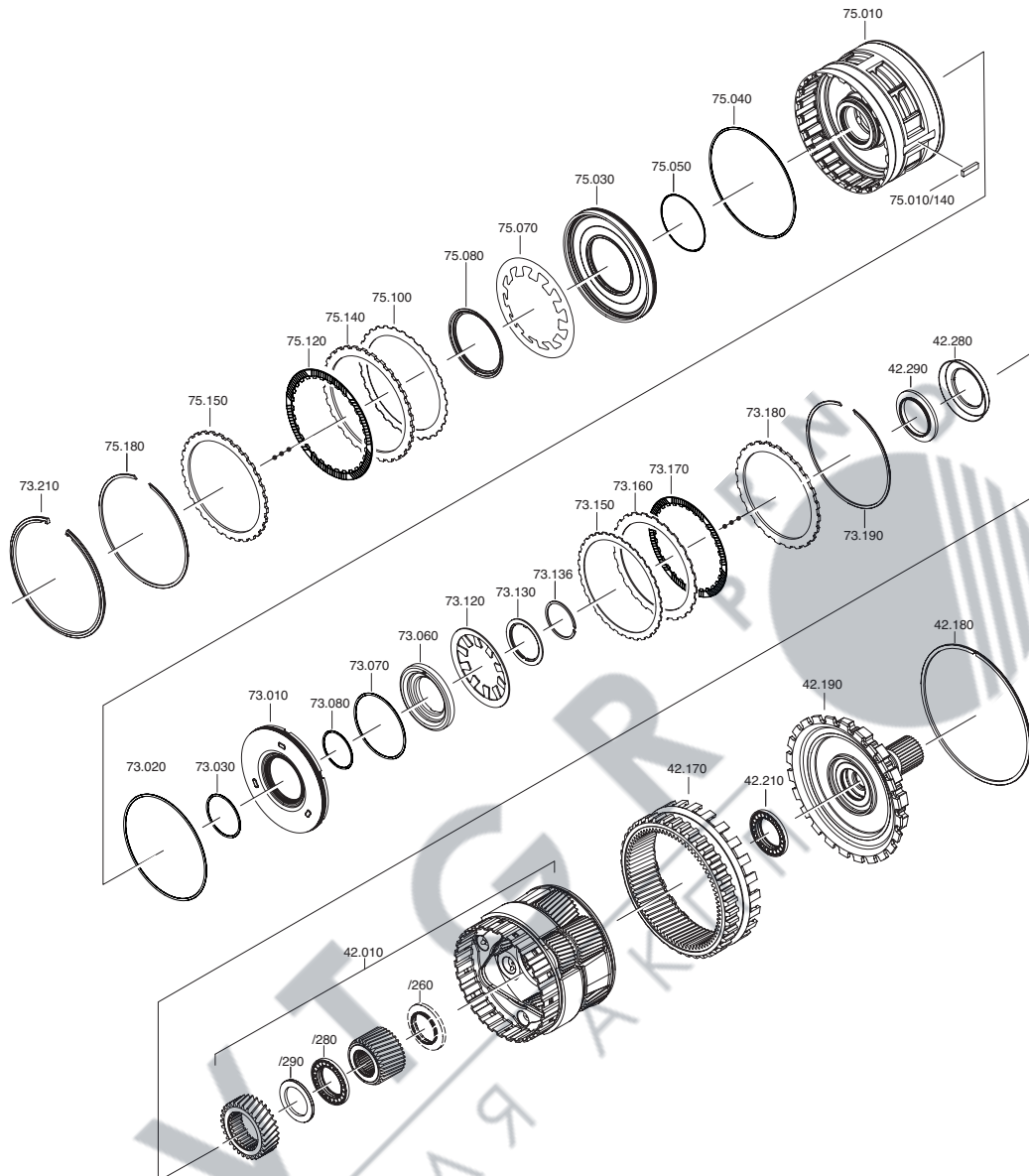
**Note:**

See specification for screw fittings 1.3.1.3



### 3.4 Clutches and planet gear set

#### 3.4.1 Brakes C and D



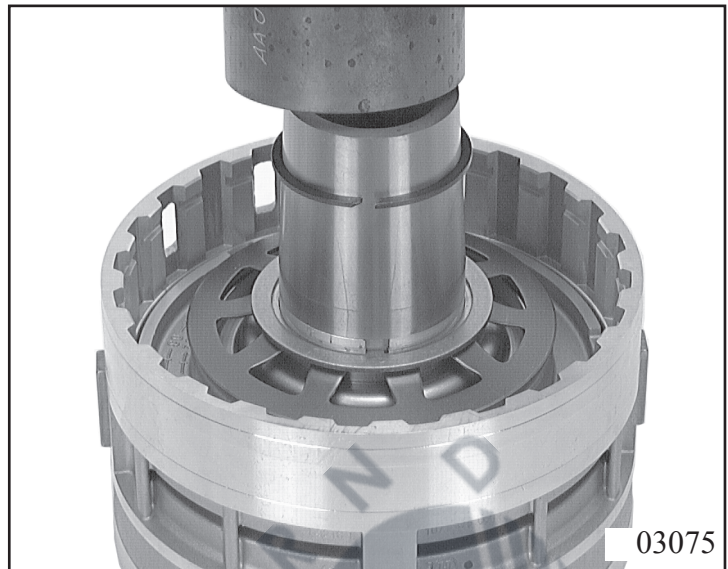
Drive 2 shaft keys 75.010/140 in centrally at cylinder CD 75.010, using a plastic hammer.

Put 3 new O-ring seals 73.020, 73.030 and 73.070 onto piston D 73.100 and 1 O-ring seal 73.080 onto cylinder CD 75.010.

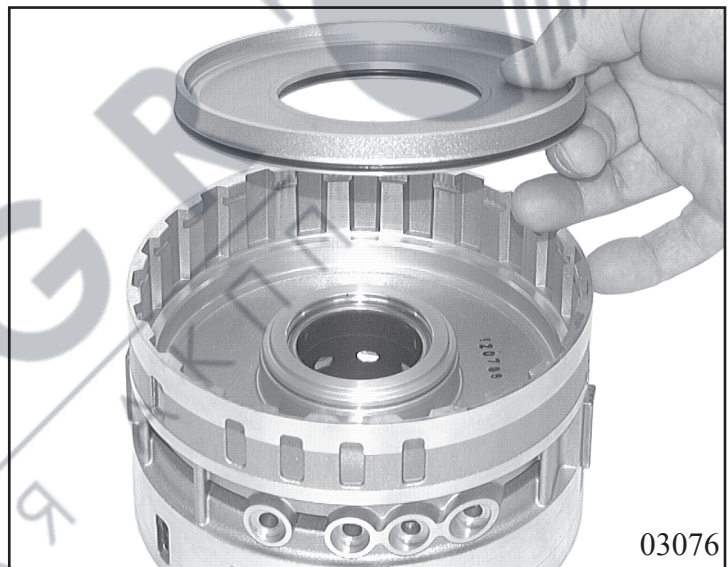
Press piston D into cylinder CD



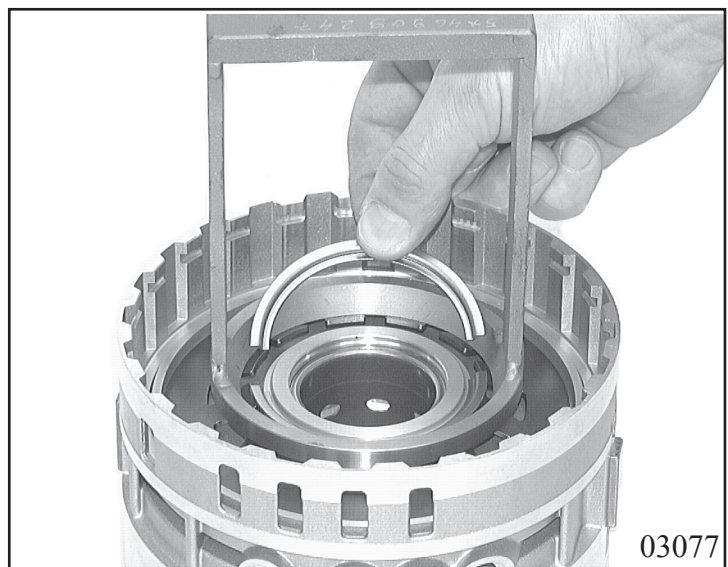
Pull baffle plate into piston D.  
Insert cup spring 73.120 and fixing washer with ridge on top.  
Put assembly mandrel 5x46 909 539 on hub cylinder D. Put snap ring 73.136 on top and press with assembly sleeve 5x46 909 539 under mandrell press until snap ring is locked.

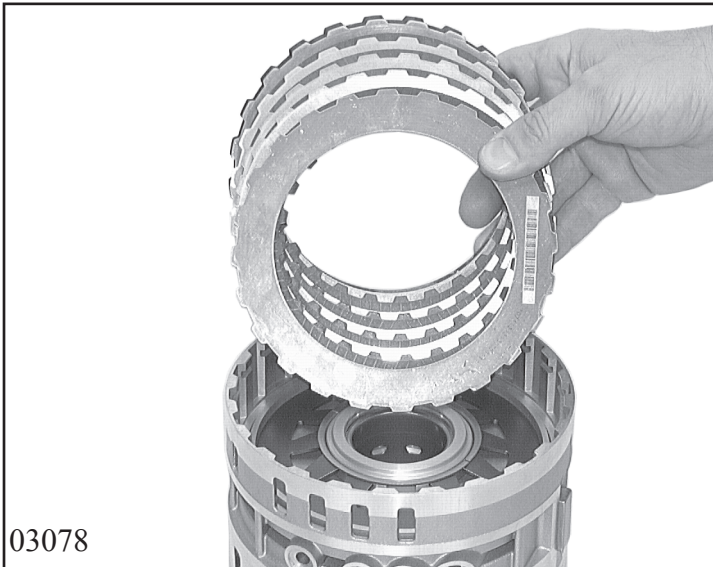


Turn cylinder CD by 180°.  
Put 2 O-ring seals 75.040 and 75.050 onto piston C 75.030 and press it into the cylinder.



Insert cup spring C 75.070.  
Press down cup spring C in the mandrel press with assembly bracket 5x46 909 247 and secure with divided snap ring 75.080.





03078

Insert complete clutch pack C into cylinder CD, starting with spring disk 75.100. Then insert an outer disk 75.140 and a lined disk 75.120 alternately. Secure the top outer disk 75.150 with snap ring 75.180.

**Note:**

For adjusting work, see Chapter 1.4.1.1

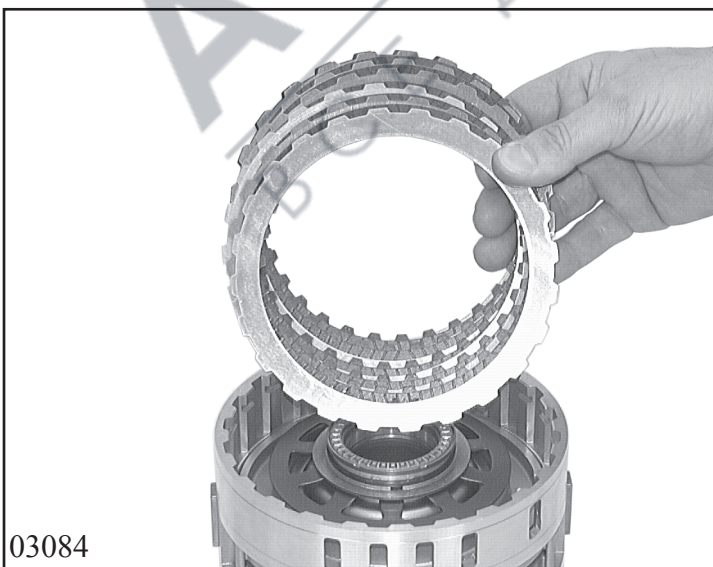


07003

Turn cylinder CD, fit securing ring 73.260 and clip axial needle bearing 42.290 into position at the cylinder web.

**Note!**

In old Gears the security ring 73260 is missing, it should be added by assembling.



03084

Insert complete clutch pack D into cylinder CD, starting with spring clutch disk 73.150 and then insert lined disk 73.170 and external disk 73.216 alternately. Secure final disk 73.180 with snap ring 73.190.

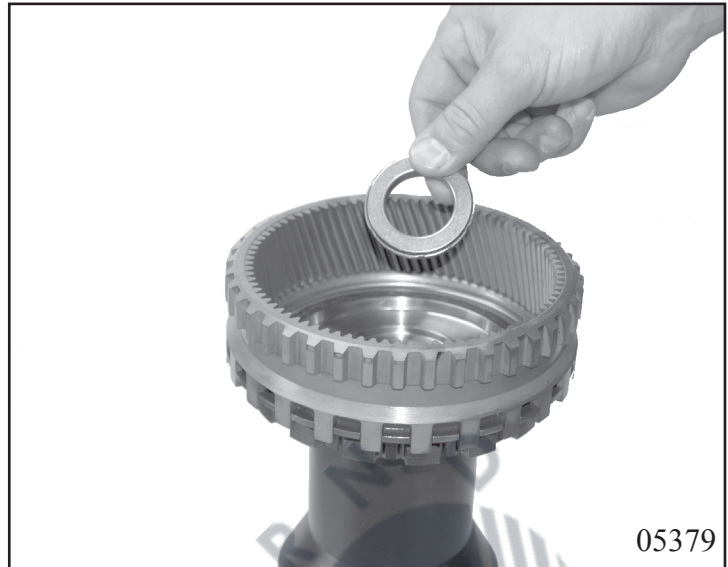
**Note:**

For adjusting work, see Chapter 1.4.1.2

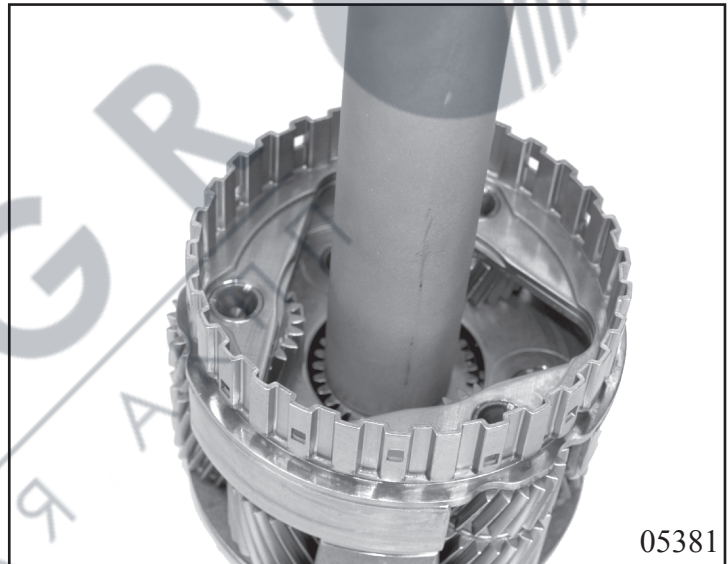


### 3.4.2 Assembling and installing the tower

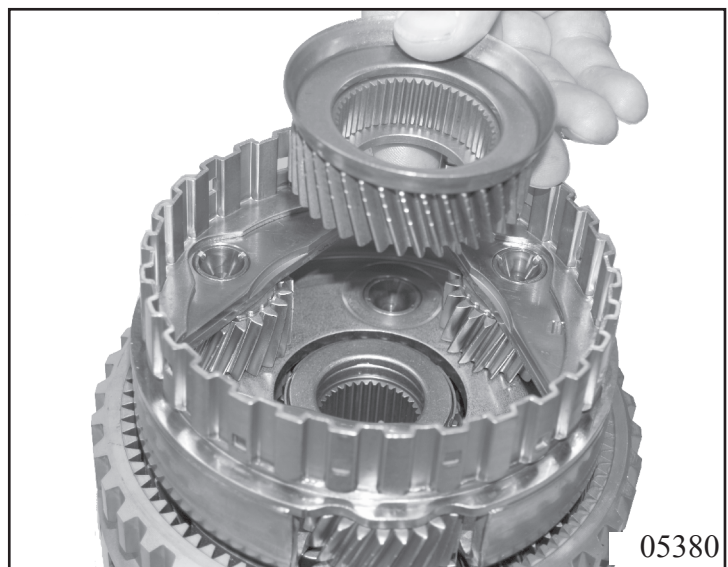
Fix internal ring gear 42.170 on output drive shaft 42.190 with circlip 42.180. Place output drive shaft in mounting device. Fit axial bearing 42.210 to drive shaft.

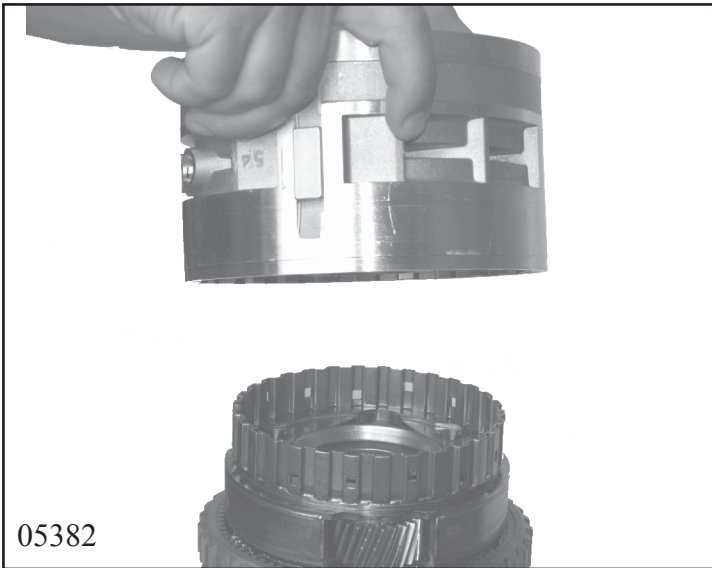


Fit sun gear 42.010/270 in planet gear carrier and press into bottom bearing using the mandrel press. Fit axial washer 42.010/290 in planet gear carrier 42.010.



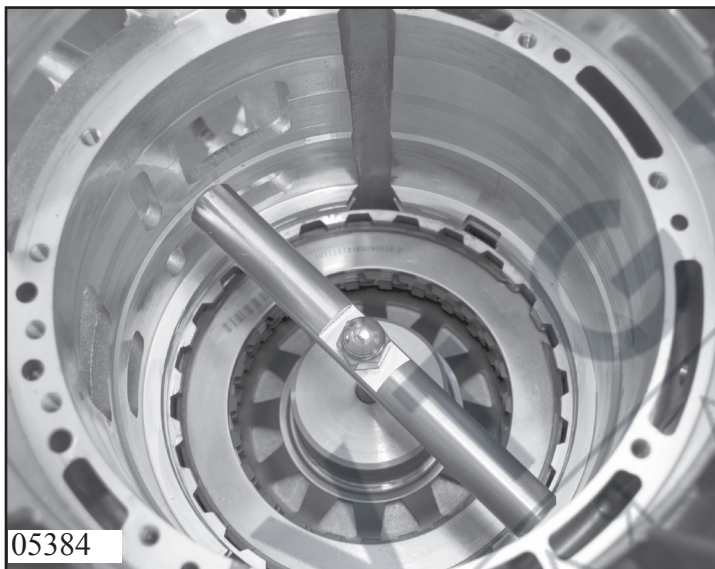
Fit planet gear carrier 42.010 to output drive shaft. Clip angle disc 42.280 onto sun gear 42.010/300 and fit sun gear in planet gear carrier.





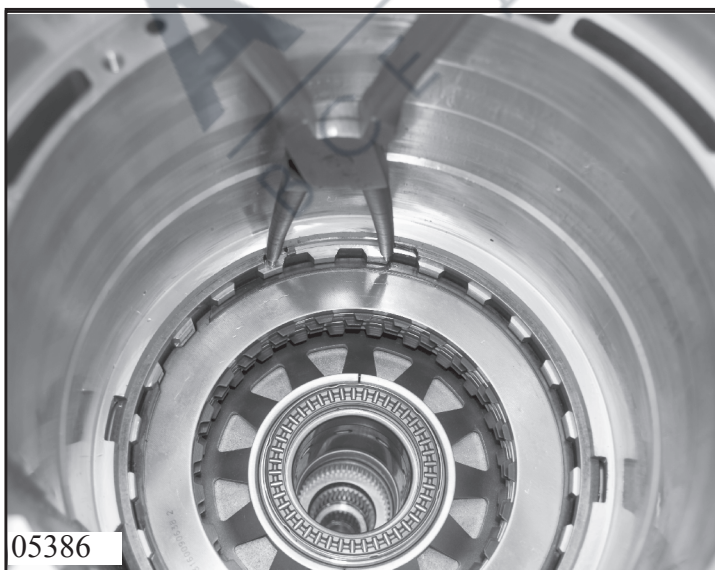
Fit complete cylinder CD on planet gear carrier.  
Screw lifting tool 5x46 909 553 into output drive shaft.

05382



Fit complete tower in transmission housing.

05384

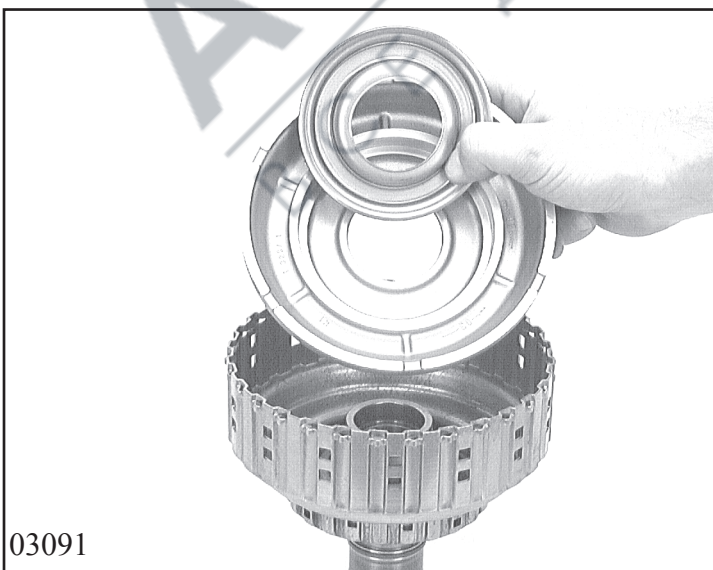
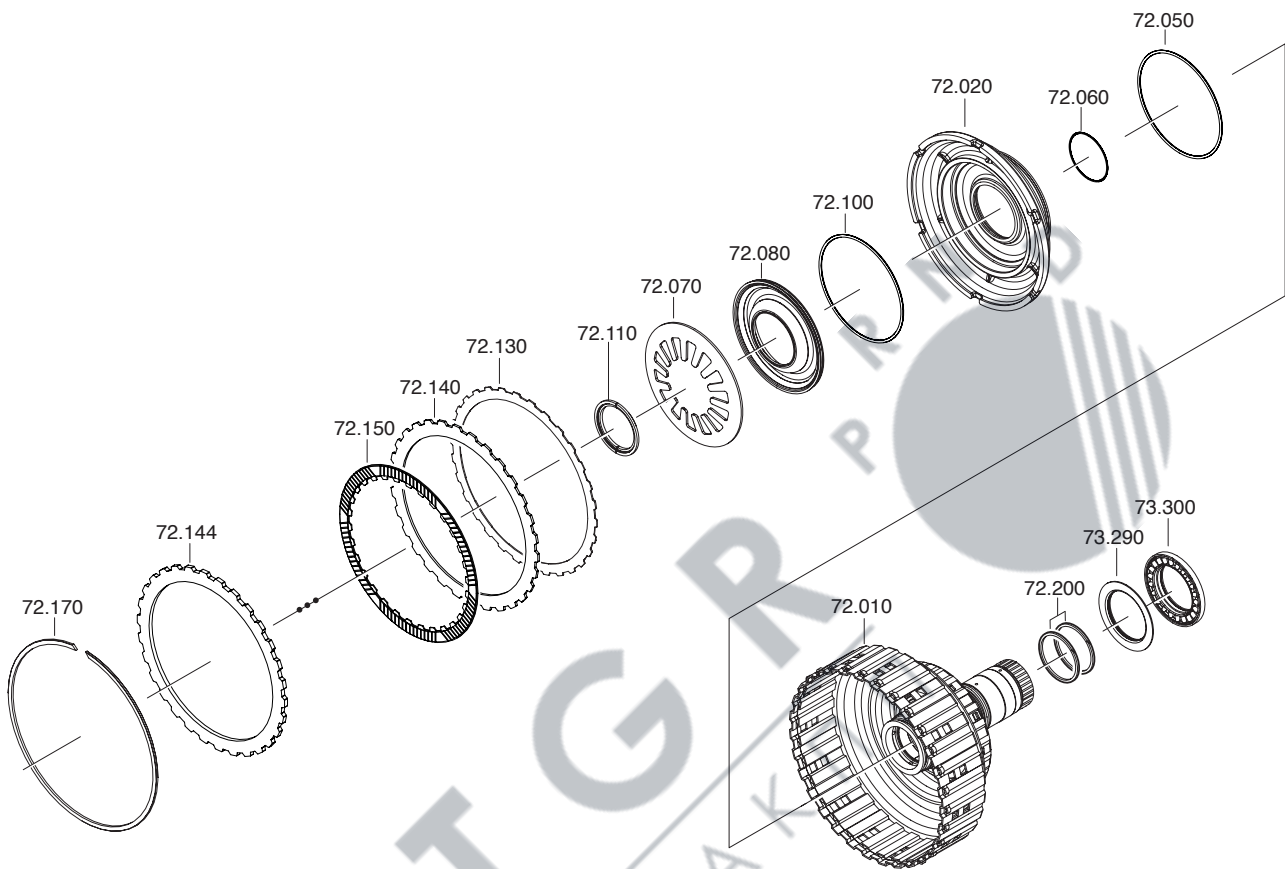


Secure tower in transmission housing with circlip 73.210, and press circlip into groove by expanding with circlip pliers.

05386



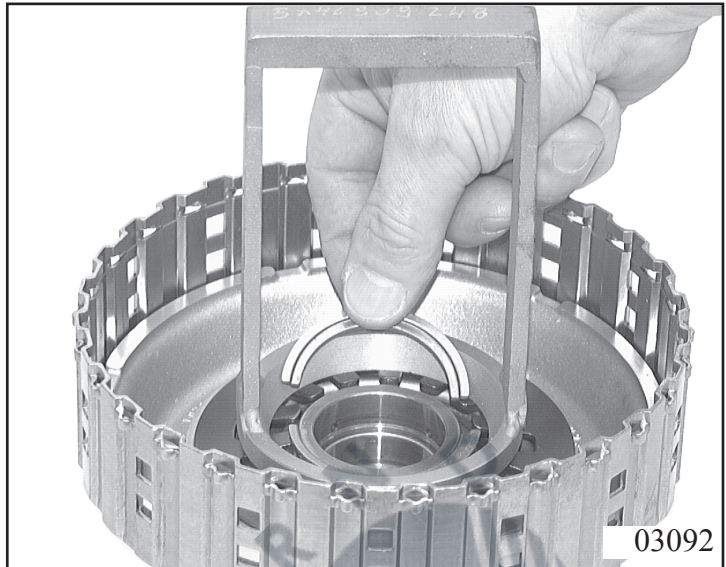
### 3.4.3 Clutch B



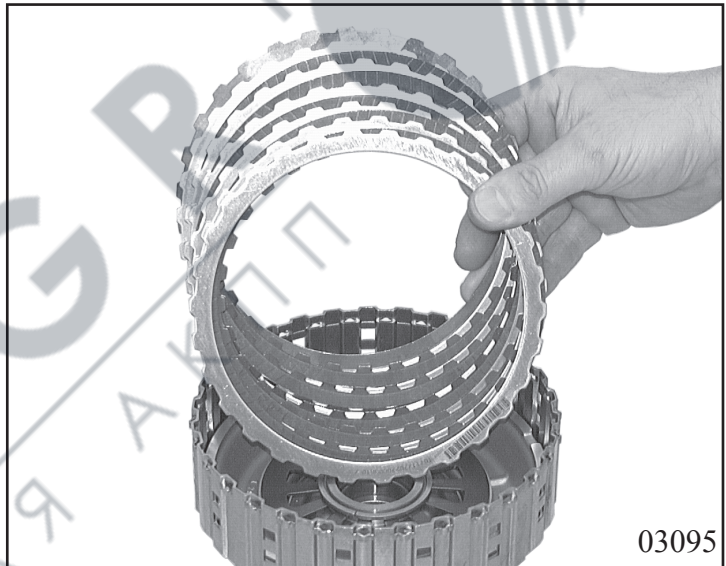
Install new O-ring seals 72.050 and 72.060 on piston B 72.020.  
Press piston into cylinder B 72.010.  
Pull O-ring seal 72.100 onto baffle plate 72.080 and press this into the piston.



Insert cup spring B 72.070. Press cup spring down with assembly bracket 5x46 909 248 in the madrel press and secure with divided stop ring 72.110.



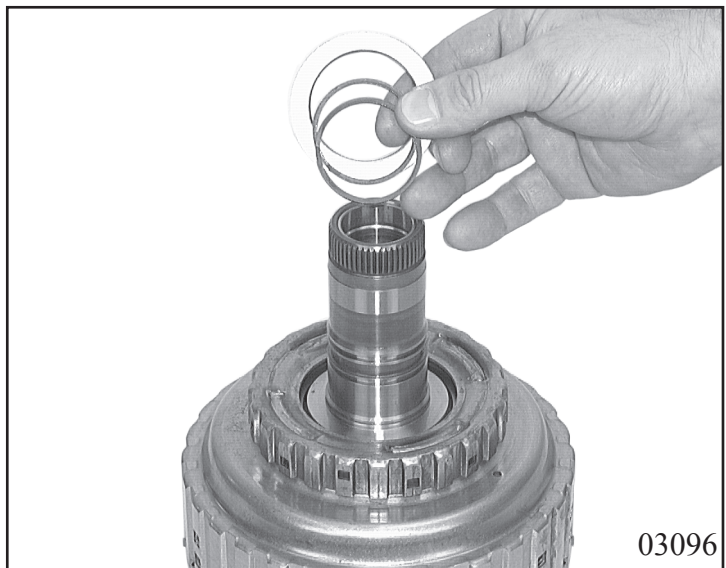
Insert complete clutch pack B, starting with spring disk 72.130. Then insert outer disk 72.140 and lined disk 72.150 alternately. Secure the last outer disk 72.144 with snap ring 72.170.



**Important:**

For adjusting work, see Chapter 1.4.1.3

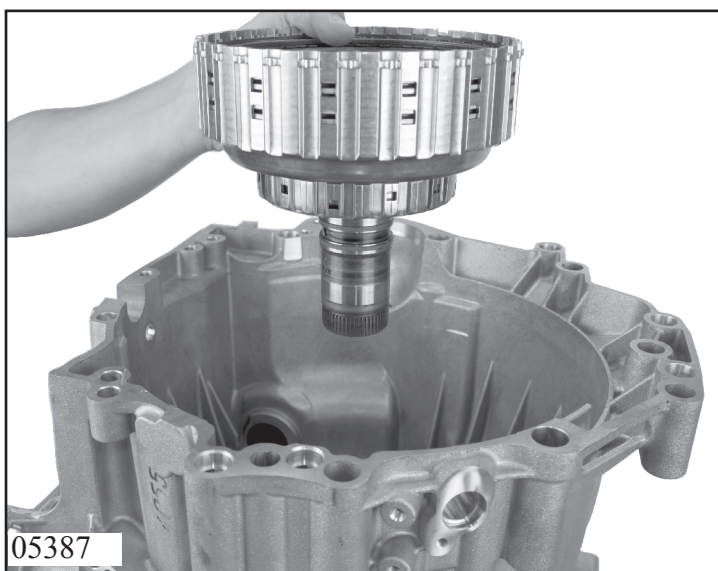
Turn the cylinder and pull 2 rectangular-section rings 72.200 onto cylinder B. Clip angle disk 73.300 onto cylinder B.



**Important:**

Secure new rectangular-section rings in the groove with Vaseline.





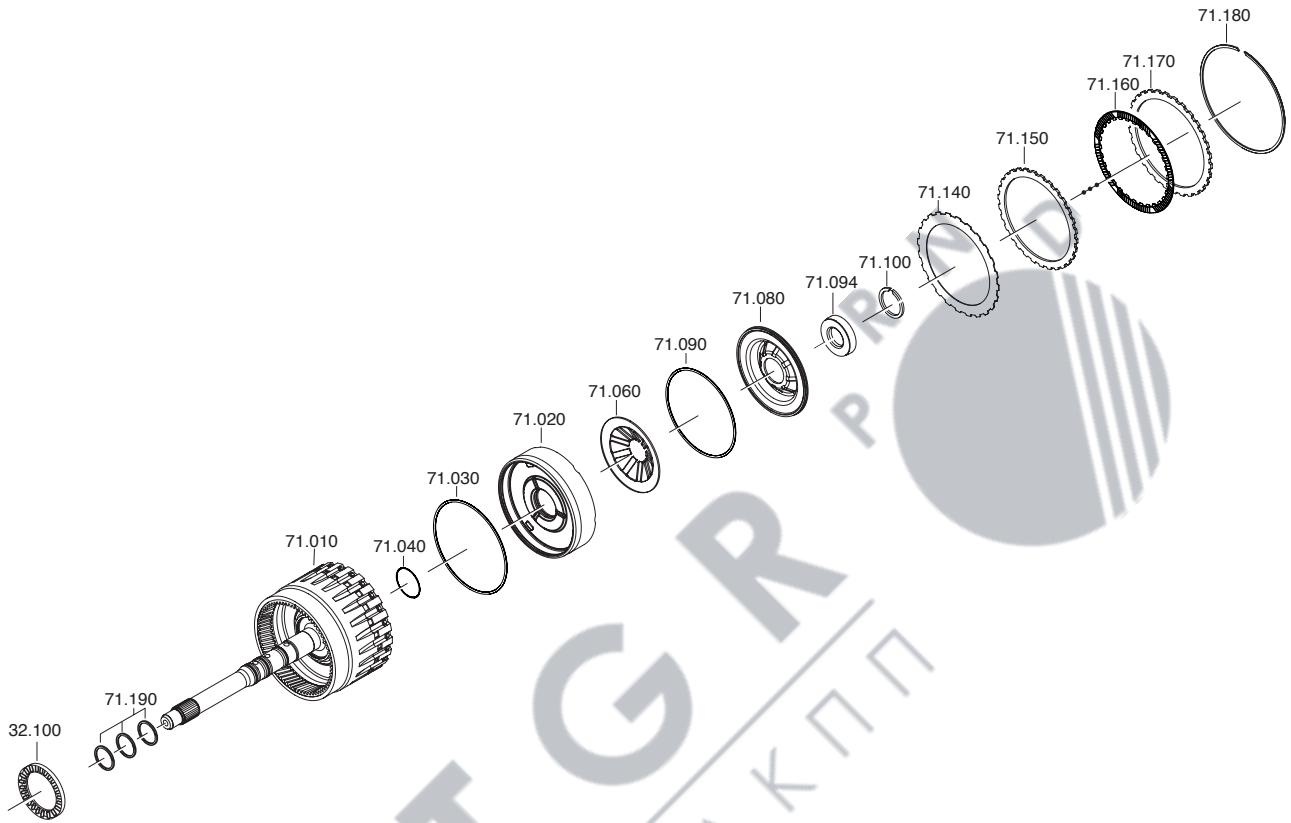
Insert complete clutch B into transmission housing.





### 3.4.4 Turret (drive with clutches A and E)

#### 3.4.4.1 Clutch E (drive)

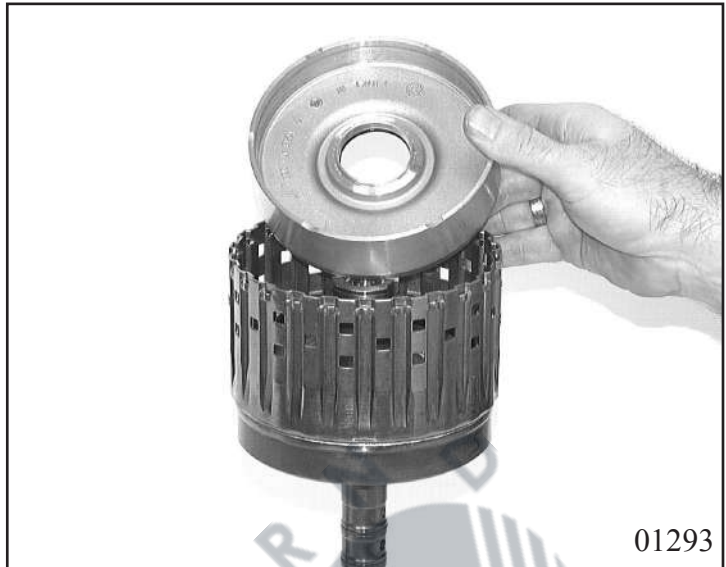


Put 3 new rectangular-section rings 71.190 onto cylinder E 71.010 with input shaft.

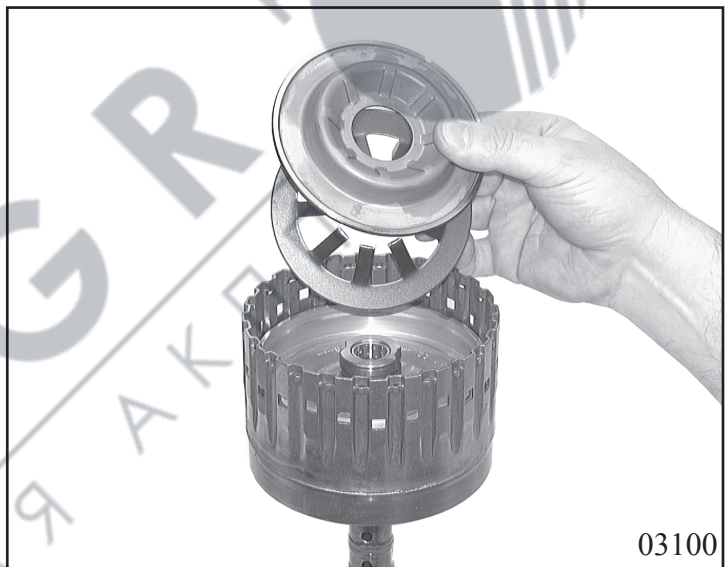
**Note:**

When dismantled, clip axial needle roller bearing cage 32.100 into cylinder (ring gear side).

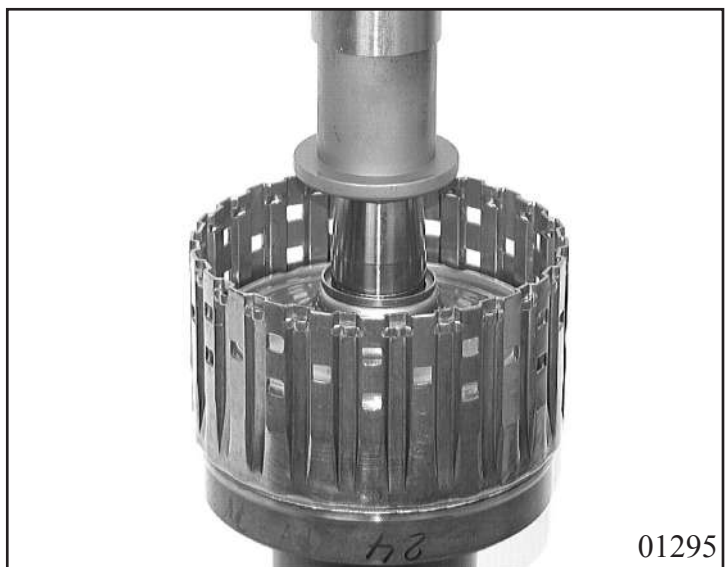
Put new seal rings 71.030 and 71.040 onto piston E 71.020.  
Press piston E into cylinder E.

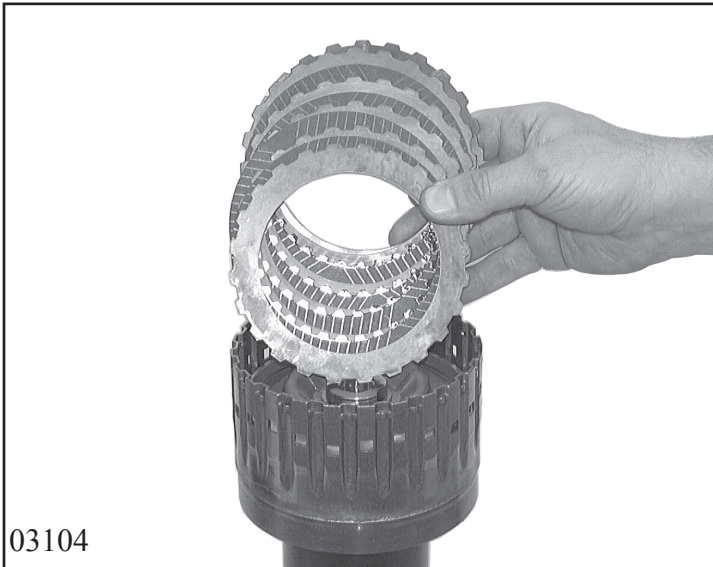


Put new O-ring seal 71.090 onto baffle plate 71.080. Insert cup spring 71.060 into cylinder E with the projections facing upwards and press in the baffle plate.  
Insert bracket 71.094.



Insert assembly adapter 5x46 003 343.  
Put new snap ring 71.100 on top.  
Press pipe with snap ring and cup spring down in the mandrel press until the snap ring engages in the slot.





Insert complete clutch pack E. Start with spring disk 71.140, then insert outer disk 71.150 and lined disk 71.160 alternately. Insert final disk 71.150 and secure with snap ring 71.180.

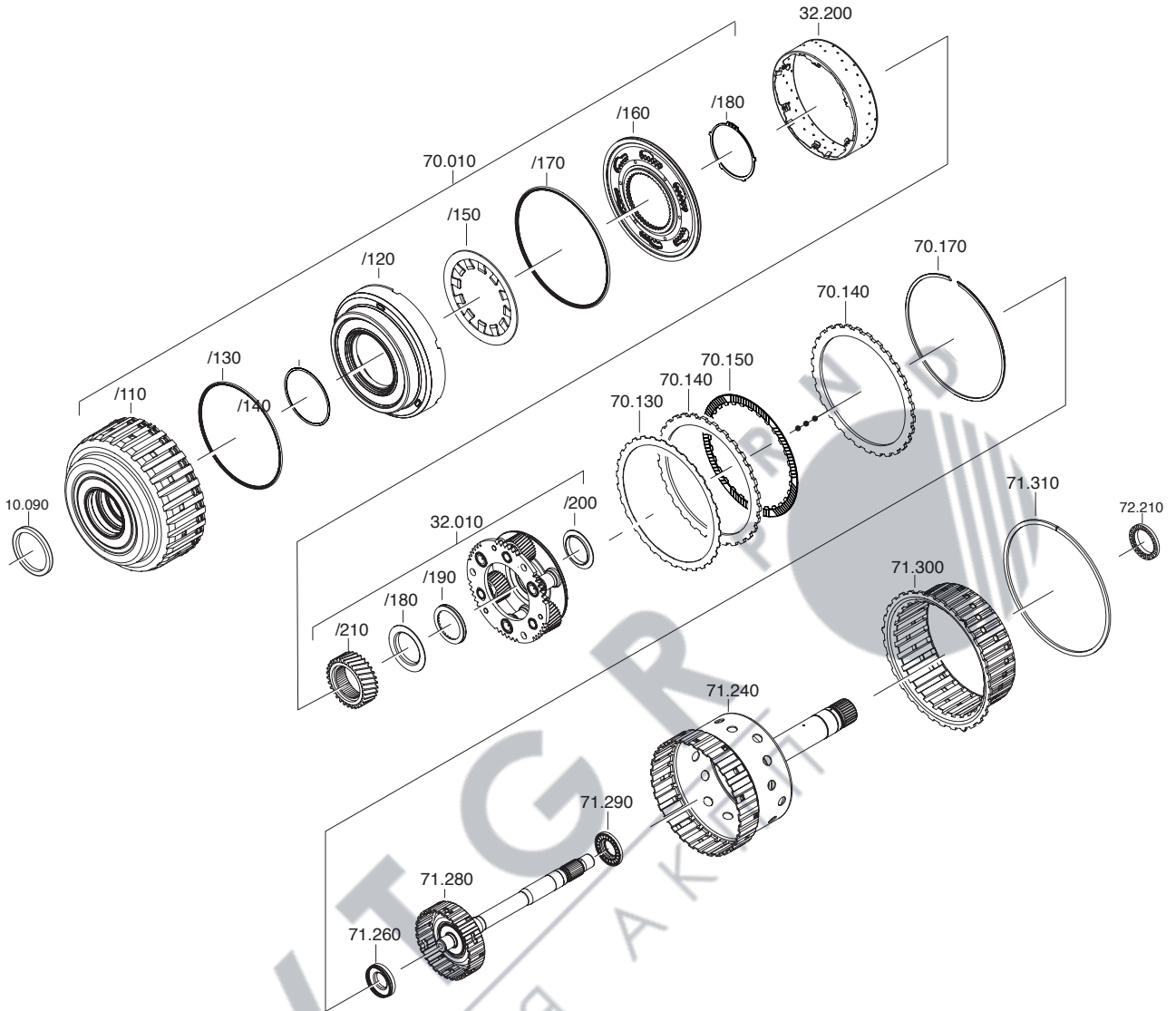
**Note:**

For adjusting work, see Chapter 1.4.1.5

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### 3.4.4.2 Clutch A (input)



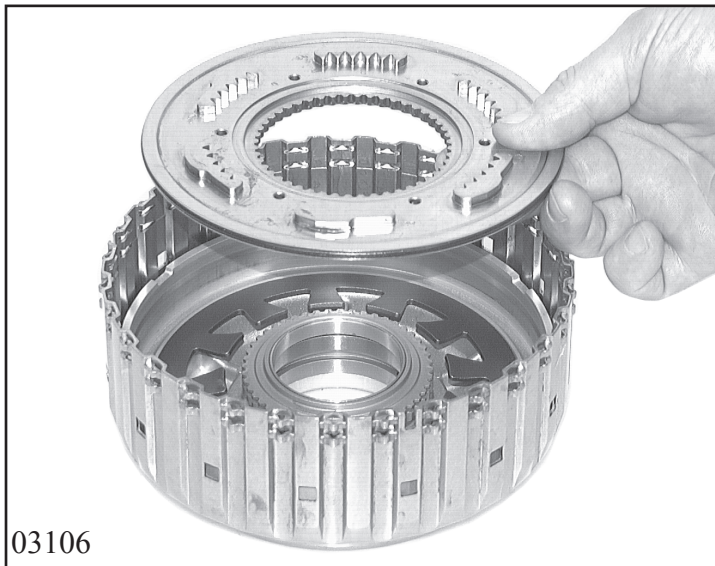
Put 1 new prof. seal ring 70.010/130 and 1 new O-ring seal 70.010/140 onto piston A 70.010/120.  
Press piston A into cylinder A 70.010/110.

**Note:**

If 2 prof.seal rings are already built in the second prof. seal ring is to be exchanged with an O-ring seal. Both cylinder and piston have to be exchanged too.

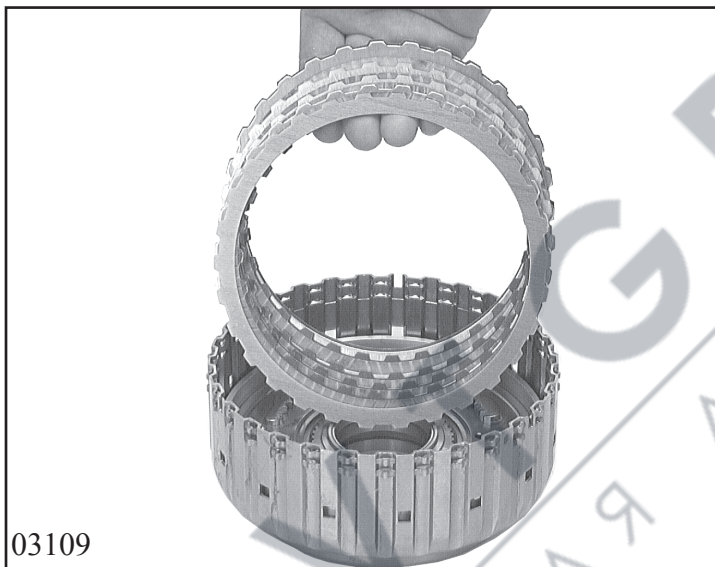


03105



03106

Insert cup spring 70.010/150.  
Put prof. seal ring 70.010/170 onto baffle plate 70.010/160 and insert the baffle plate into the cylinder.  
Press the cup spring down in the mandrel press with assembly bracket 5x46 909 247 and secure with K-ring 70.010/180.

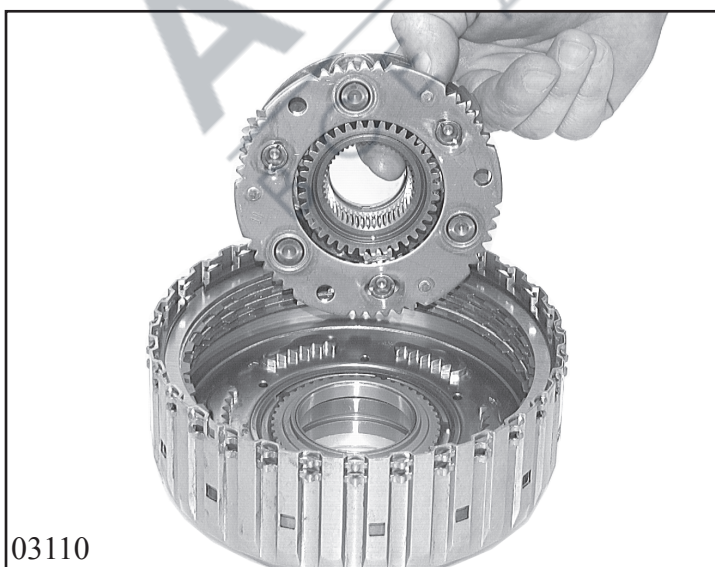


03109

Insert complete clutch pack A. Start with spring disk 70.130, then insert outer disk 70.140 and lined disk 70.150 alternately.  
Secure the top outer disk 70.140 with snap ring 70.170.

**Note:**

For adjusting work, see Chapter 1.4.1.4



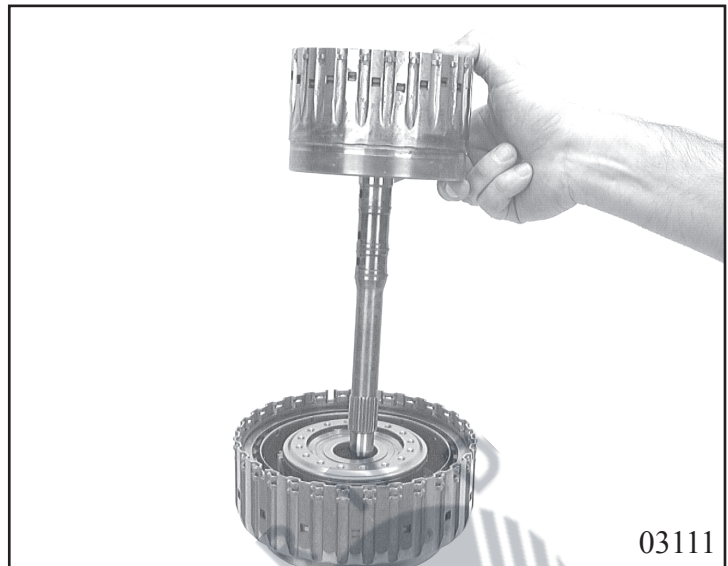
03110

Insert sun wheel 32.010/210 with axial needle cage facing the inside of the planet gear set 32.010.

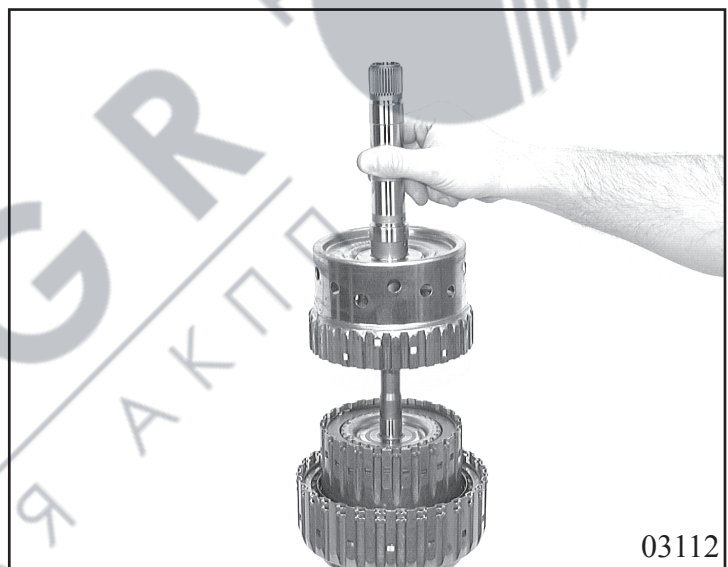
Insert complete planet gear set into cylinder A.

Insert new oil drip pan into cylinder A, turn left till stop. To secure push projections down with screw driver.

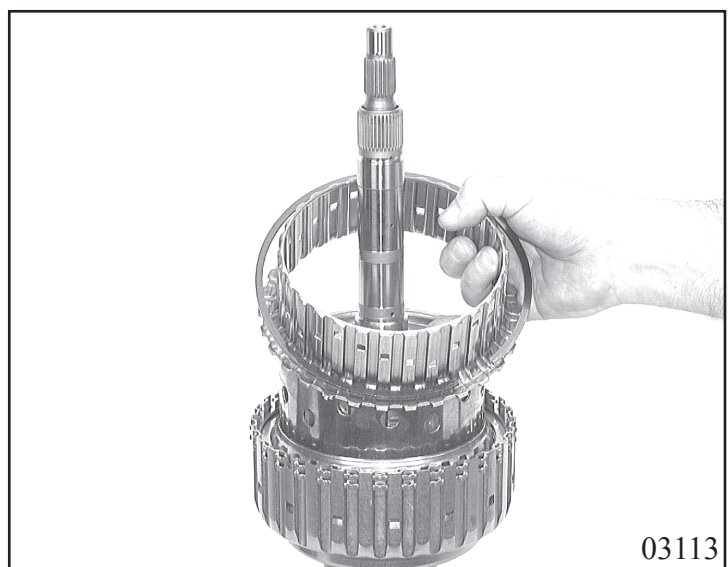
Insert complete clutch E into clutch A.  
Clip axial needle roller bearing 71.260  
onto hub of cylinder E.



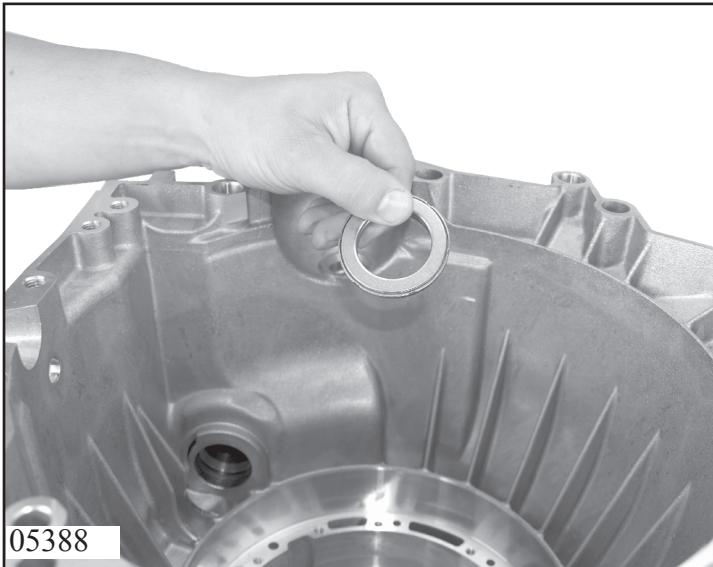
Align discs of clutches A and E and insert  
intermediate shaft 71.280 by turning  
slightly.  
Clip axial needle roller bearing 71.290  
onto hub of inner disc carrier A. Insert  
sun gear shaft 71.240 by turning.



Insert inner disk carrier B 71.300 into  
cylinder A and secure with snap ring  
71.310.

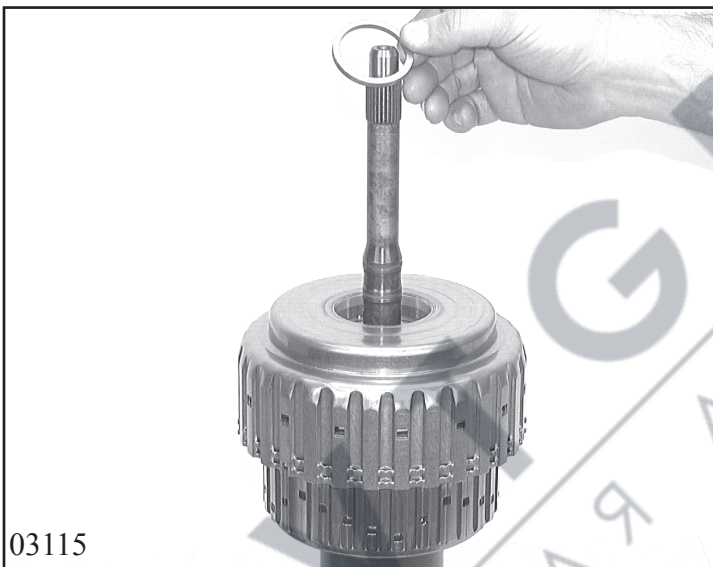






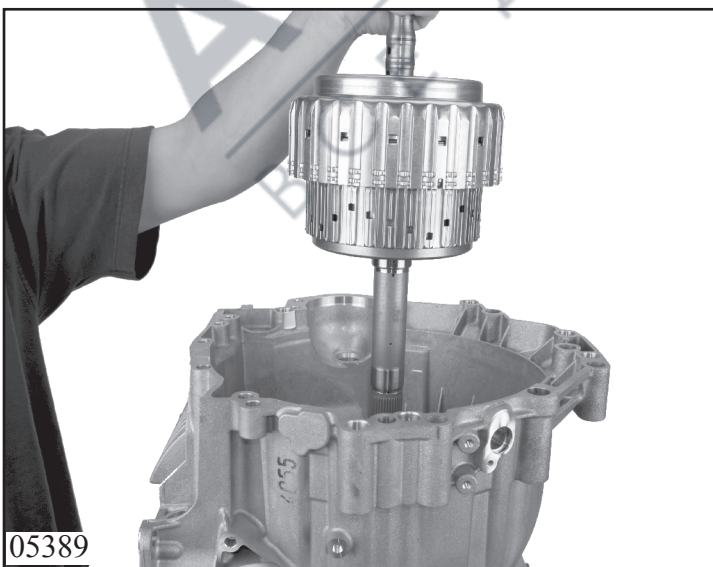
Place axial needle roller cage 72.210 with angle disk facing down on the hub of cylinder B.

05388



Turn the turret by 180° in the fixture. Place compensating washer 10.090 (previously removed) over the input shaft and onto cylinder A.

03115



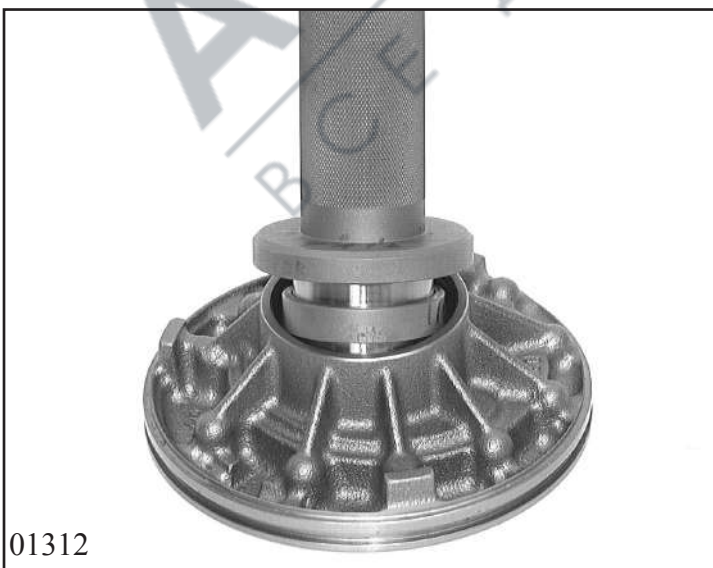
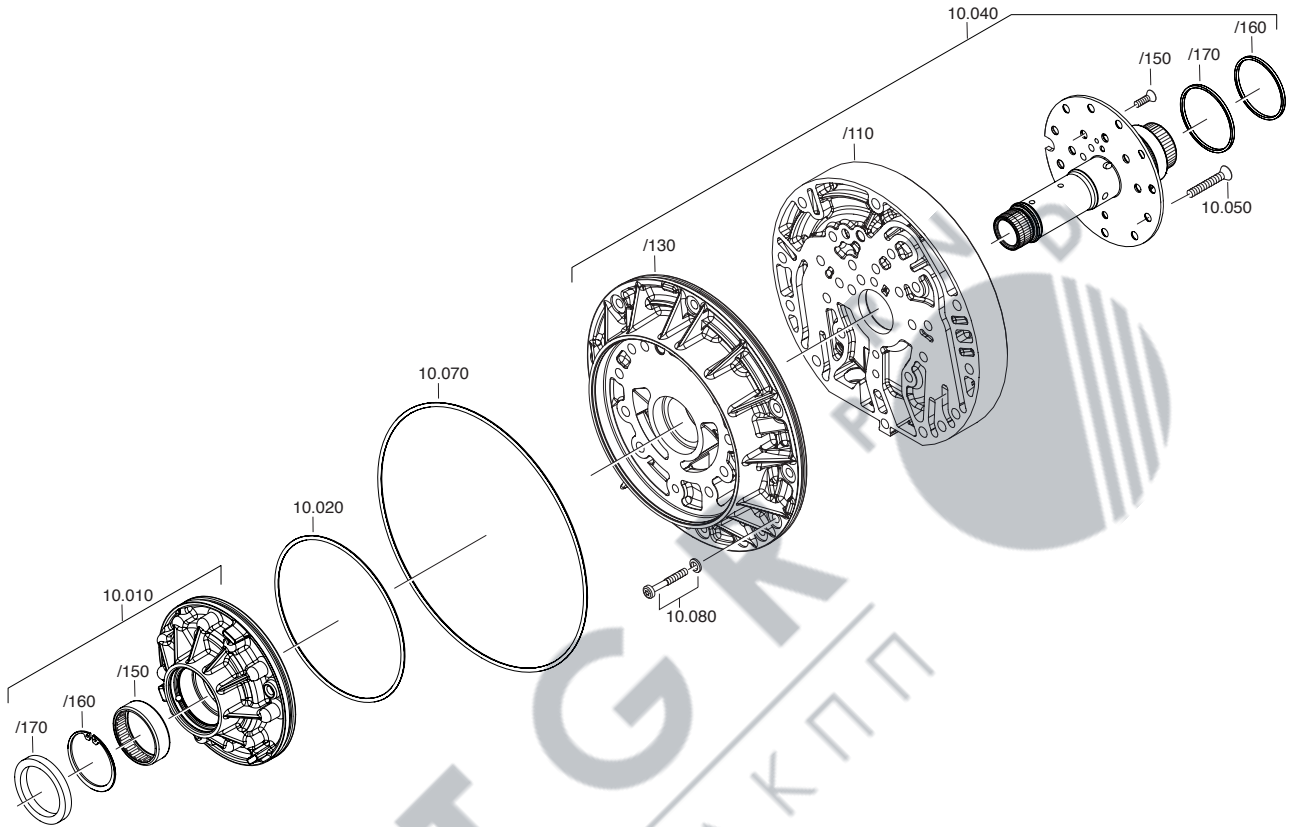
Align discs of clutch B, insert turret by hand and turn it in both directions until the discs engage fully in disc carrier B..

05389





### 3.4.5 Oil supply



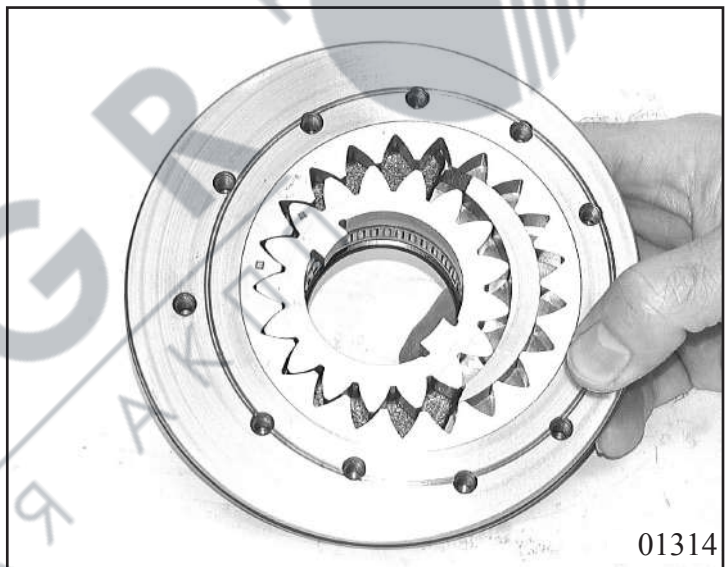
Attach all components to pump 10.010 again.

Press in needle roller bearing 10.010/150 using assembly mandrel 5x46 002 558 (with ring) in the mandrel press and secure with snap ring 10.010/160.

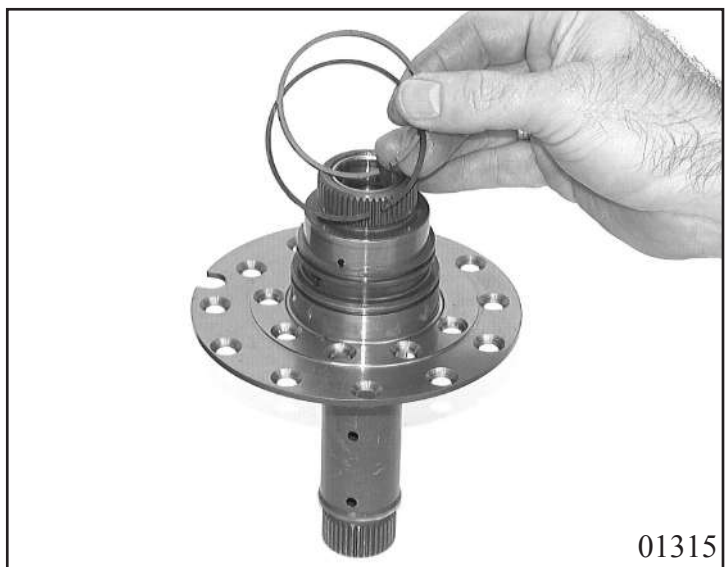
Then fit shaft sealing ring 10.010/170 into the pump housing and press into the pump using assembly mandrel 5x46 002 558 (without ring).

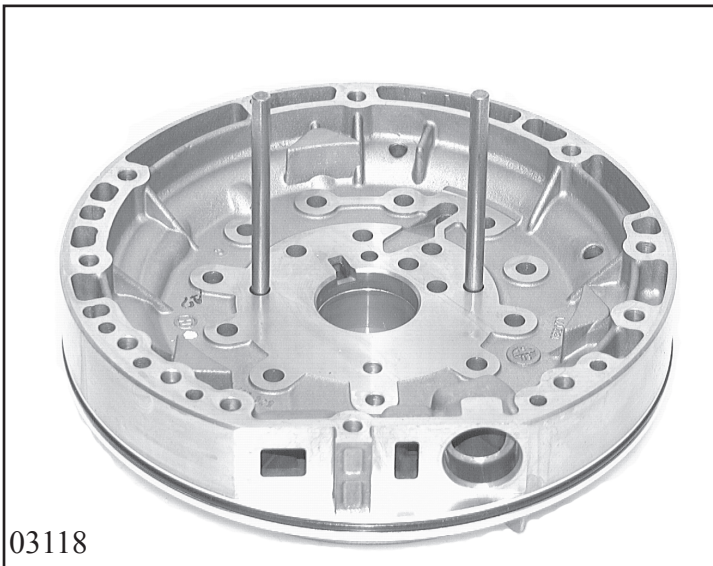


Put on new O-ring seal 10.020. Lubricate the pump wheel and internal ring gear slightly before assembly. Then assemble the pump in such a way that one marking is visible on the pump wheel and the internal ring gear each.



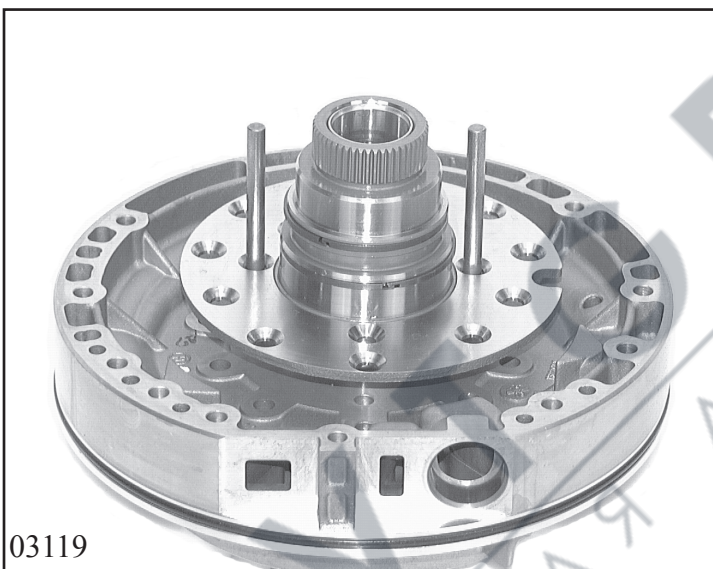
Put 2 rectangular rings 10.040/160 + /170 onto the stator shaft 10.040/120. In order to mount the stator shaft on the intermediate plate, these must be positioned towards each other. Follow the procedure stated on the next page.





Place intermediate plate 10.040/110 onto centering plate 10.040/130 and position. Srew 2 locating pins 5x46 001 007 into centering plate.

03118



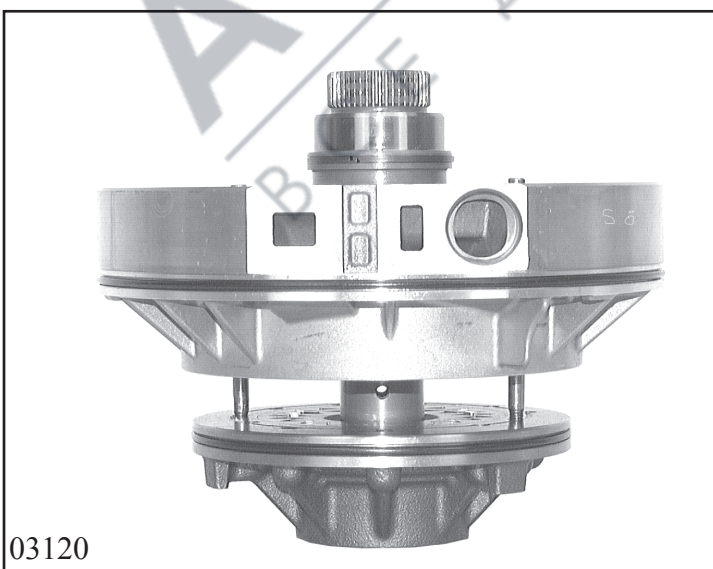
Put the intermediate and centering plates on a supporting fixture and heat up with a hot-air blower to approx. 70 °C.

Insert the stator shaft over the locating pins and fasten first with 4 countersunk screws 10.040/150.

Remove the locating pins, insert the remaining 2 countersunk screws and also tighten the 4 screws previously screwed in.

(For tightening torque, see Chapter 1.5)

03119



Screw locating pins 5x46 001 007 into pump. Mount complete pump over stator shaft, remove locating pins and tighten with 11 machine screws 10.050.

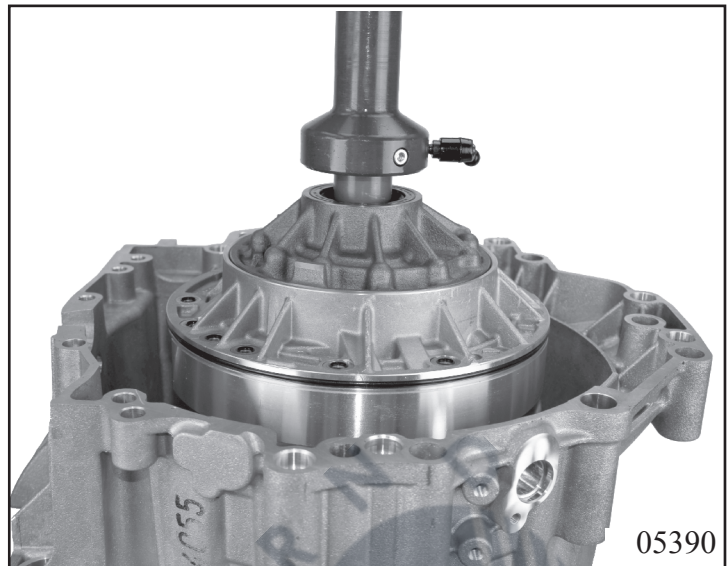
(For tightening torque, see Chapter 1.5)

**Note:**

Check pump with sleeve 5x46 000 306 for free running. Pump wheels must rotate easily when turned.

03120

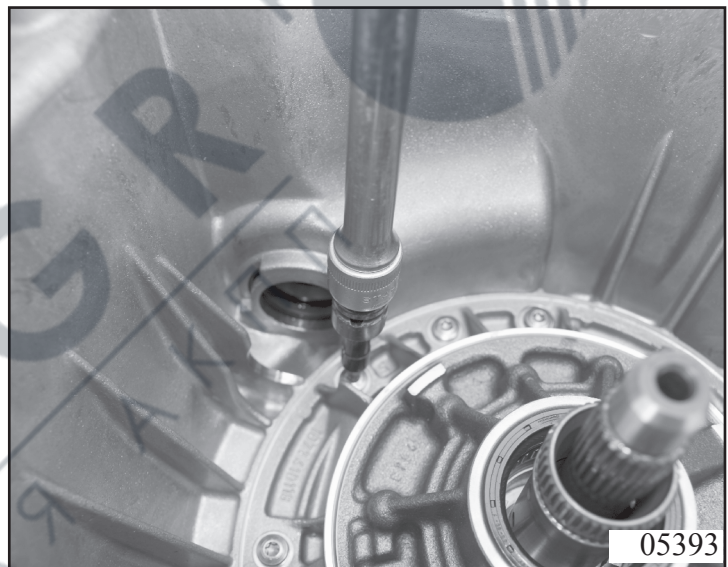
Put on new O-ring seal 10.070.  
Apply a small amount of Vaseline to the rectangular-section rings on the input shaft.  
Carefully place the complete oil supply unit in the transmission casing using lifting device 5x46 000 563, align and press in.



Tighten down the oil supply with 11 Torx screws 10.080 and new Usit rings as follows:

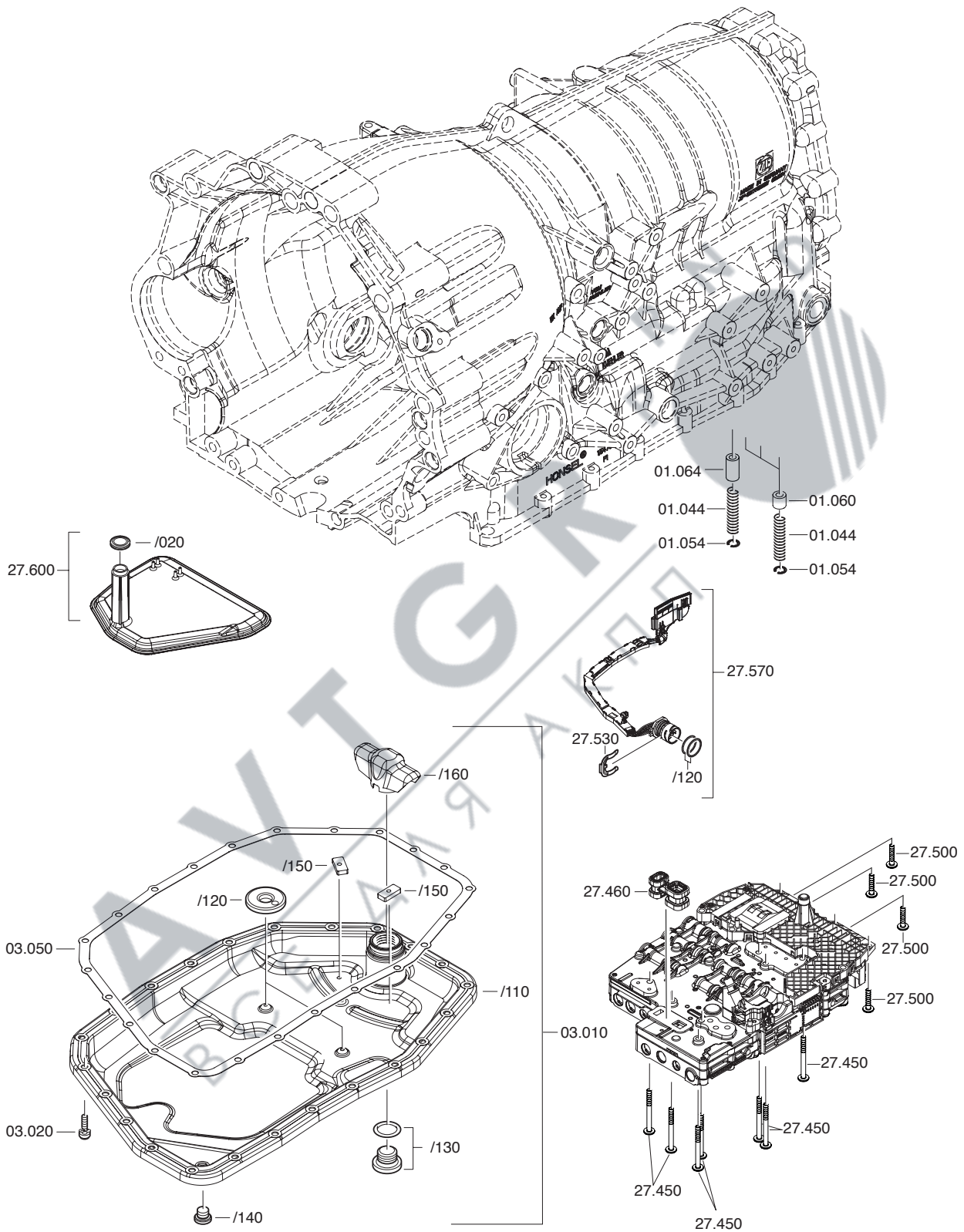
(For tightening torque, see Chapter 1.5)

**Note:**  
For adjusting work, see Chapter 1.4.6





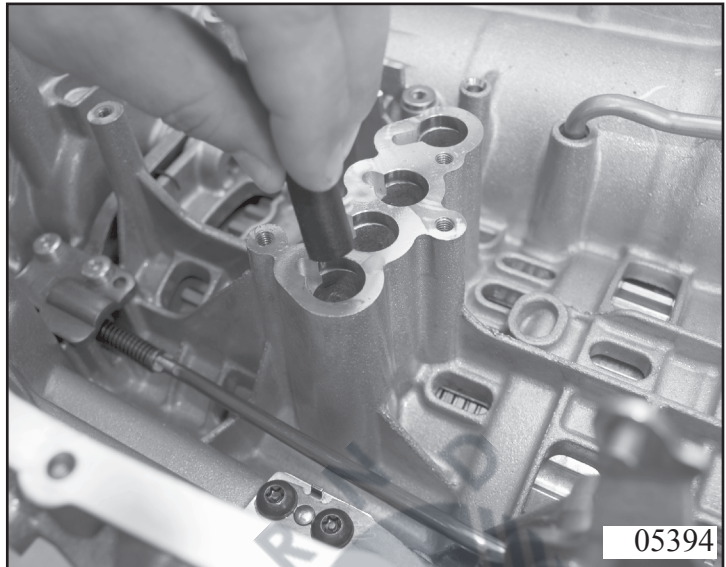
**3.5 Mechatronic and oil sump**  
**(For complete Mechatronic, see spare parts list, technical cover sheet, Item YO2)**



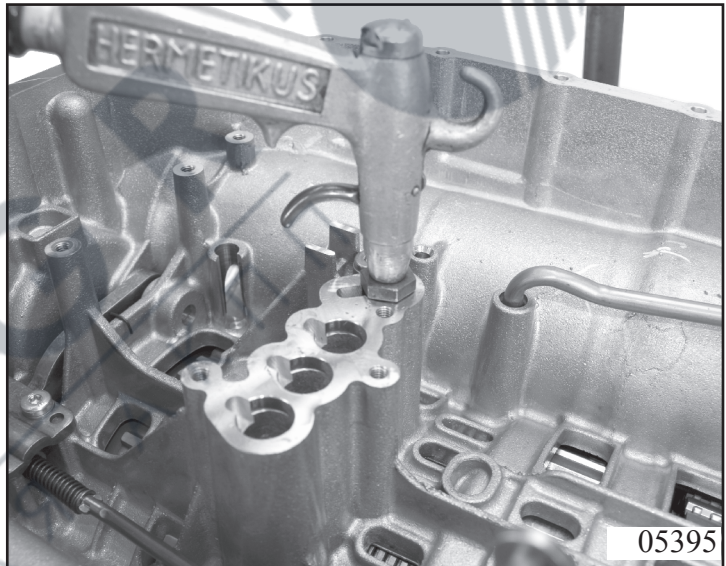


Turn housing through 90°.  
With a suitable tool, drive 4 sealing sleeves (3x 01.060, 01.064) between transmission housing and cylinder CD.

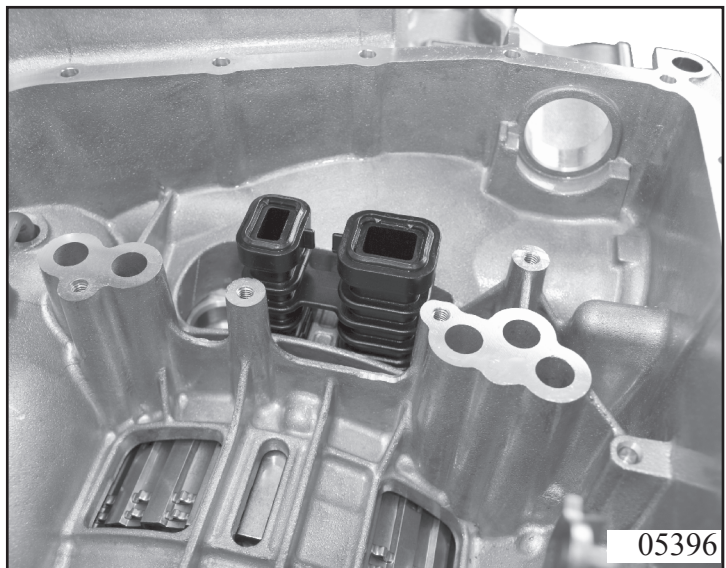
**Note:**  
Pay attention to the length of the sealing sleeves. It must be possible to press them all in to approximately the same depth.

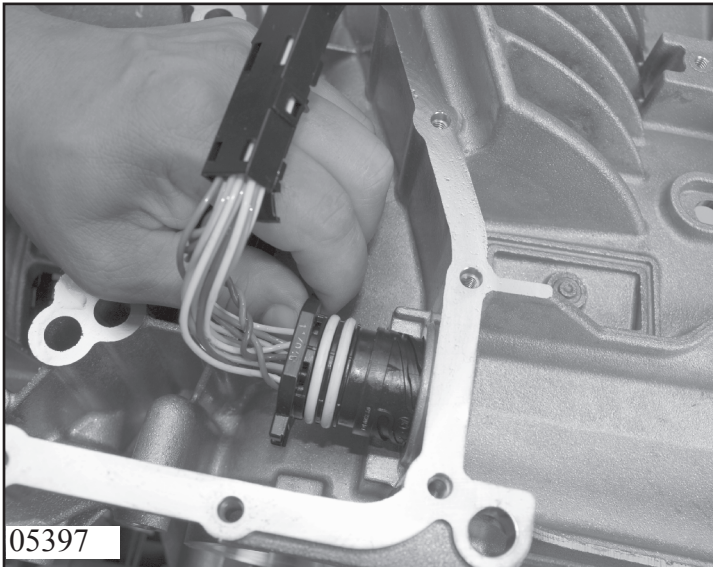


Check operation of all clutches/brakes using compressed air in the marked holes.  
(see adjacent illustration)  
Then fit 4 springs 01.044 in the holes in the sealing sleeves and secure with circlip 01.054.



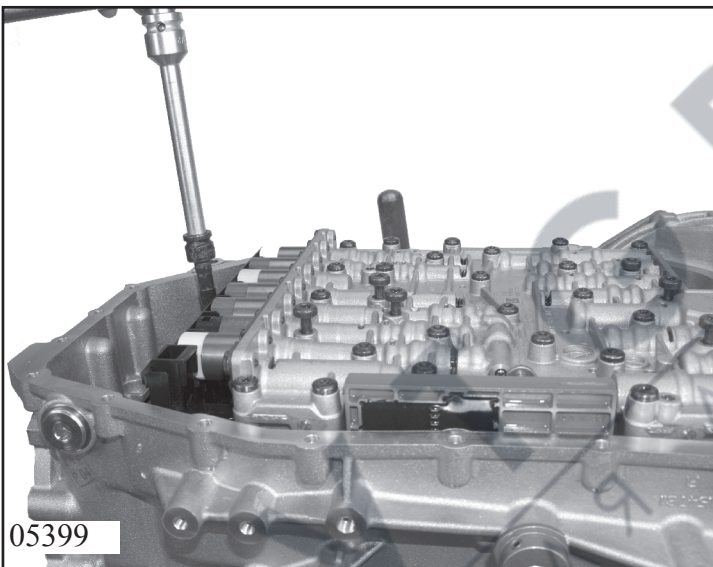
Fit adapter 27.460 in transmission housing.





Fit 2 new O-ring seals 27.570/120 to cable plug.  
 Connect plug on cable loom to transmission housing, and fix with retaining clamp 27.530.  
 Then fit Mechatronic.

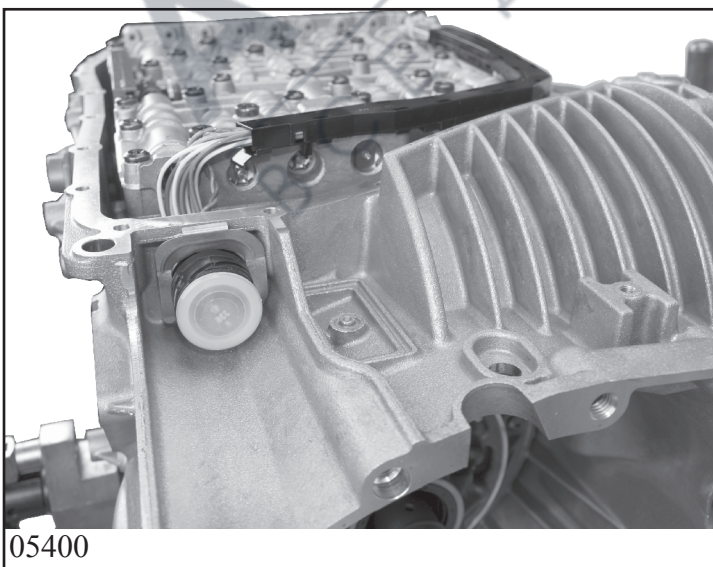
**Note:**  
 Position cable plug so that flat side faces side of oil sump.



Hang park or slotted disc in slot in piston rod.  
 Align Mechatronic, hold in place by hand, and fix with 7-off machine screws 27.450 and 4-off machine screws 27.500.  
 Plug cable loom into Mechatronic and, if appropriate, PN switch, and push in the cable guide clips.

(For tightening torque, see Chapter 1.5)

**Note:**  
 Specification for screw fittings, see Chapter 1.3.1.2



Press in blanking plug for Mechatronic plug 27.700.

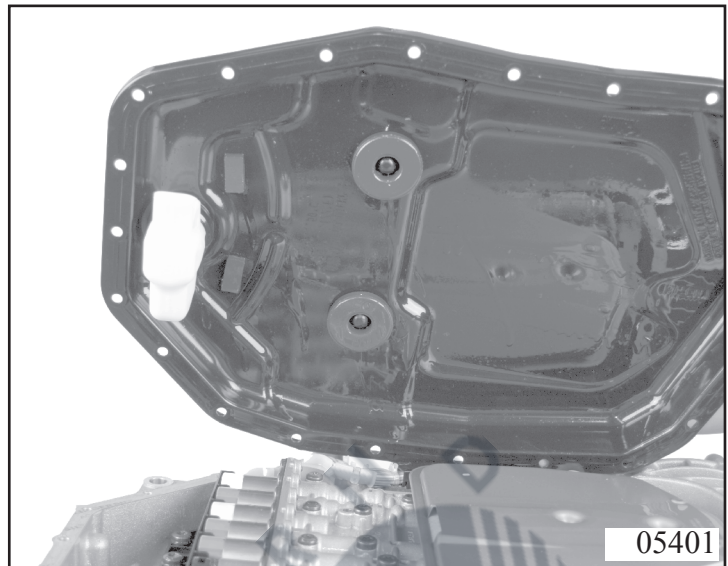


Fit new oil filter 27.600 to Mechatronic Stick seal 03.050 to transmission housing with grease (Vaseline) and align. Fit 2 magnets 03.010/150 in the front corners of the oil sump, and 2 round magnets 03.010/120 on the marks.

Clip plastic cap 03.010/160 into place. Fit oil sump 03.010/110 and secure with 23 or 13 machine screws 03.020 respectively.

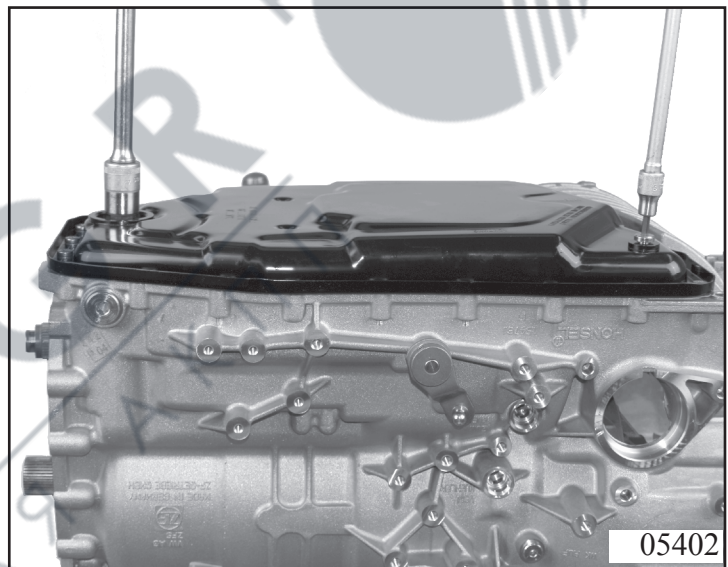
**Note:**

Specification for screw fittings, see Chapter 1.3.1.1.



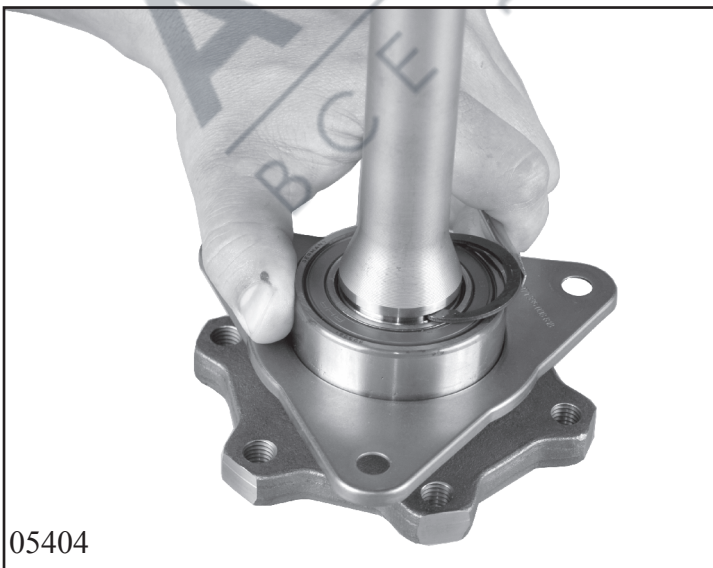
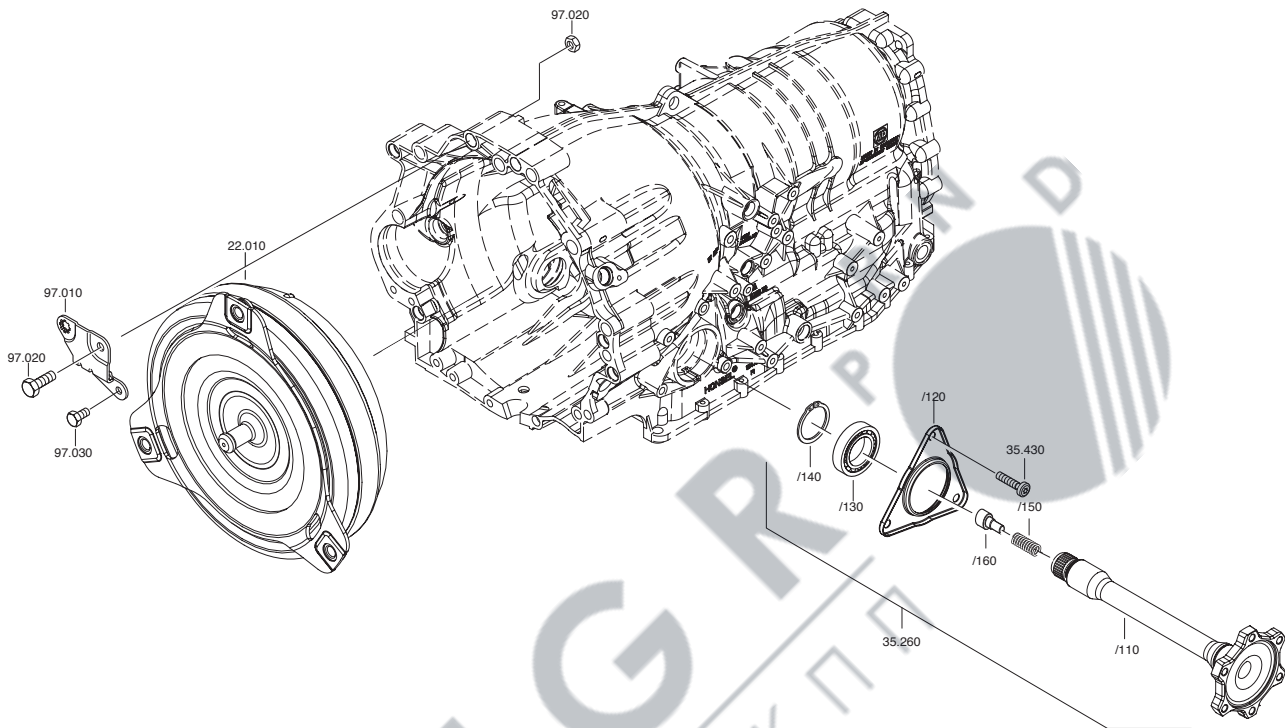
Screw oil drain screw 03.010/140 and oil filler screw 03.010/130 with new O-ring into oil sump.

(For tightening torque, see Chapter 1.5)



### 3.6 Fitting the side shaft and VA differential

#### 3.6.1 Fitting the side shaft

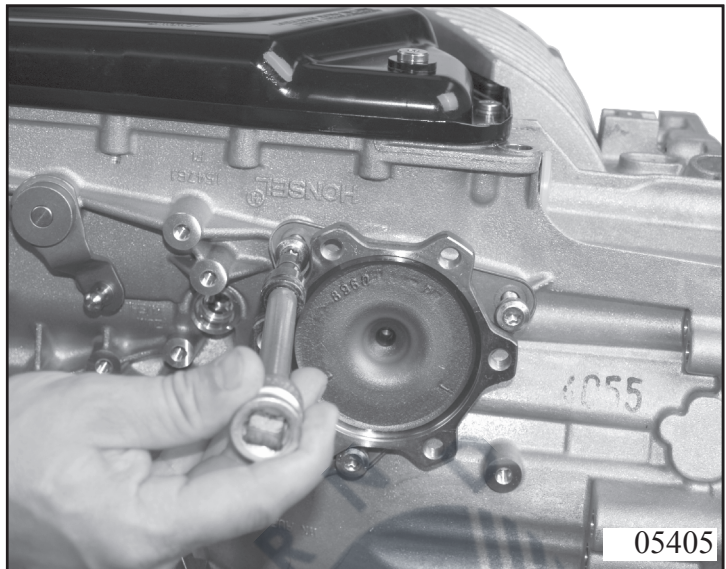


Fit bearing 35.260/130 in cover  
35.260/120 and press onto side shaft  
35.260/110 using the mandrel press.  
Secure with crescent ring 35.260/140.

**Note:** (some part lists)  
Fit spring 35.260/150 and tappet  
32.260/160 in flange shaft

Fit side shaft and secure with 3 screws 35.430.

(For tightening torque, see Chapter 1.5)

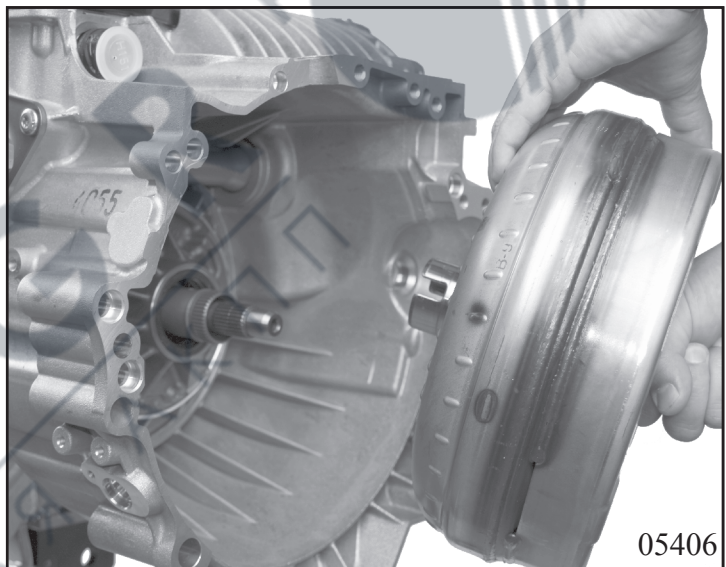


### 3.6.2 Fitting the converter

Fit converter 22.010 carefully by hand and turn backwards and forwards until pump driving dogs are engaged. Turn transmission unit upwards through 90°.

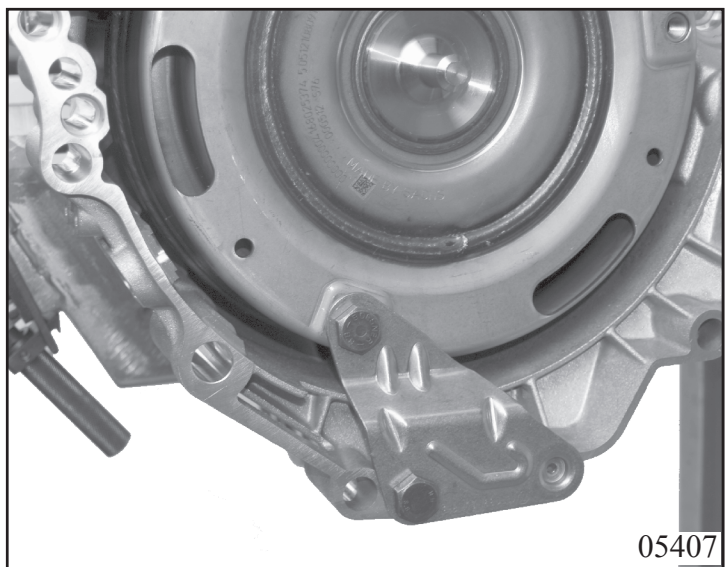
**Note:**

When fitting, make sure that the driving dogs are not damaged.



Fix converter retaining bracket 97.010 with screw 97.030, and fix screw with nut 97.020.

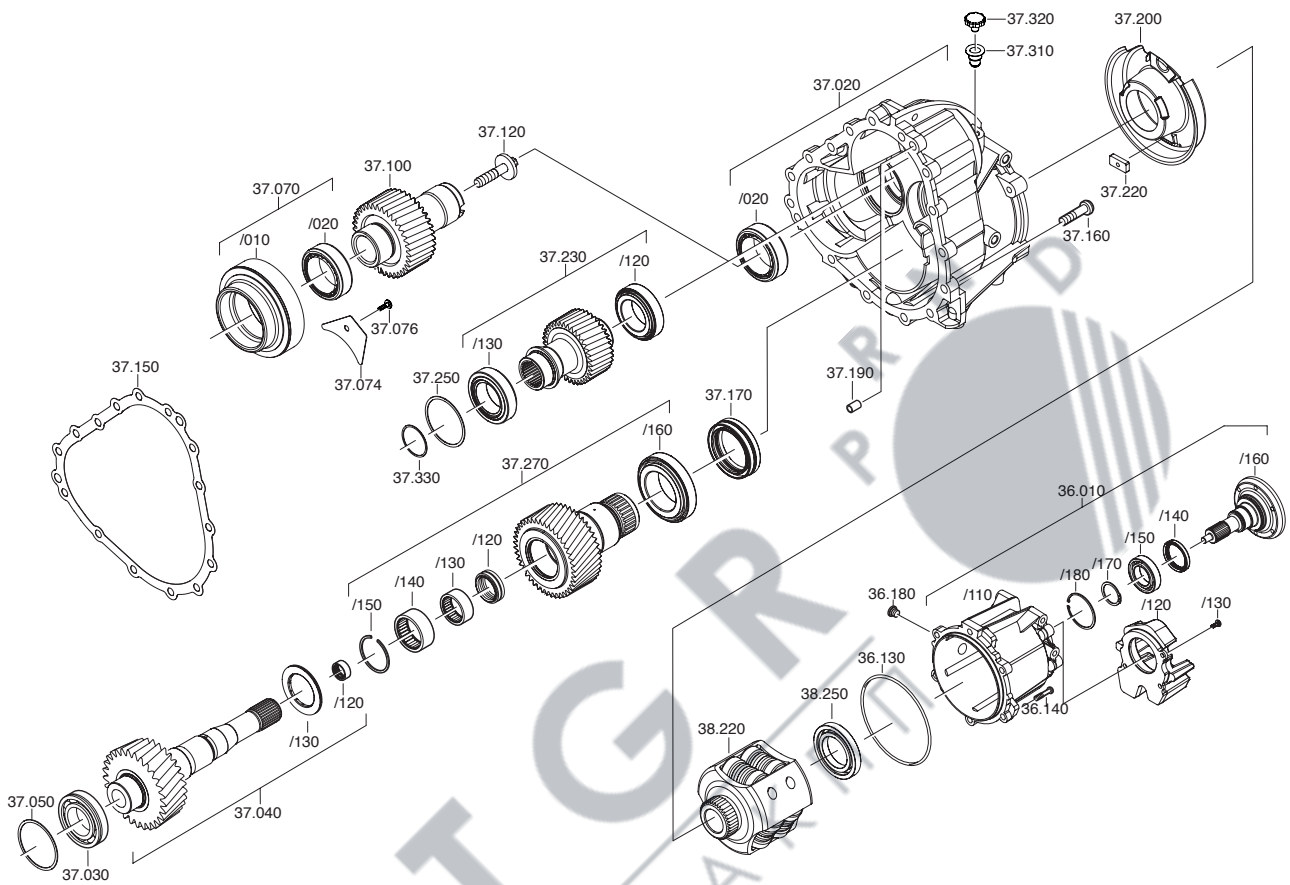
(For tightening torque, see Chapter 1.5)





### 3.7 Fitting the rear axle drive

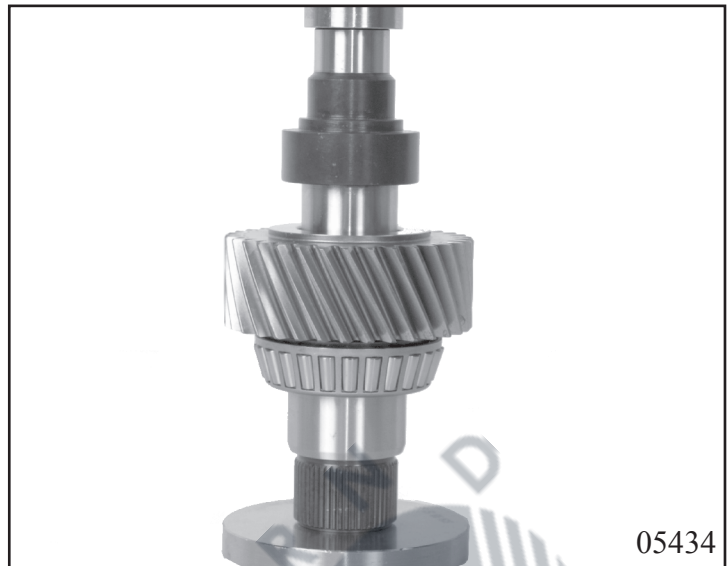
#### 3.7.1 Completing the output drive wheel



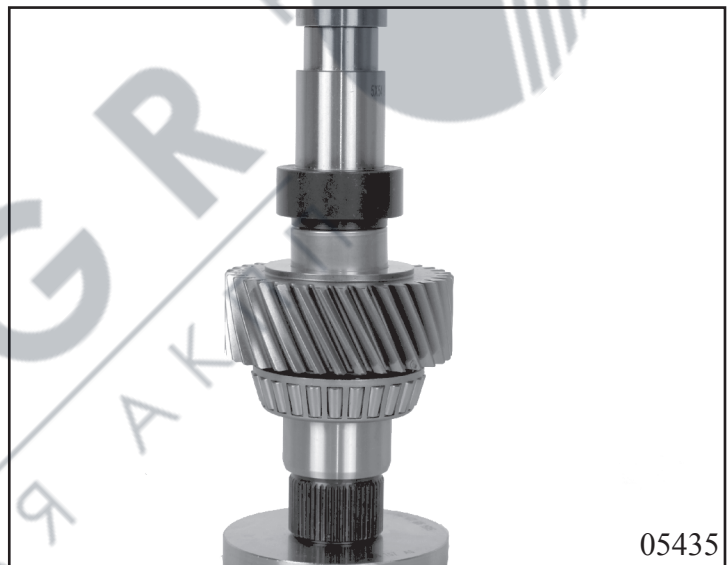
Press shaft sealing ring 37.270/120 into output drive wheel 37.270/110 with press-fit tool 5x46 001 333 using a mandrel press.

Place output drive wheel on plate 5x54 909 157.

Press in bottom needle bearing 37.270/130 with tool 5x54 909 160, with inscribed side upwards, using the mandrel press.

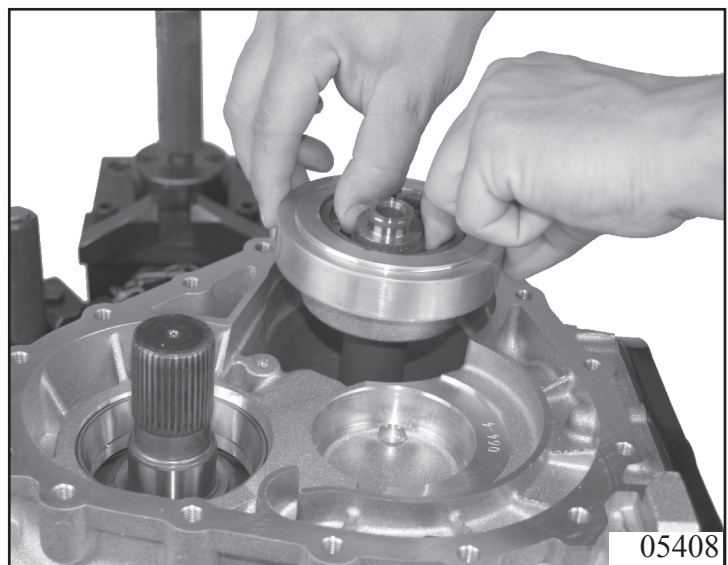


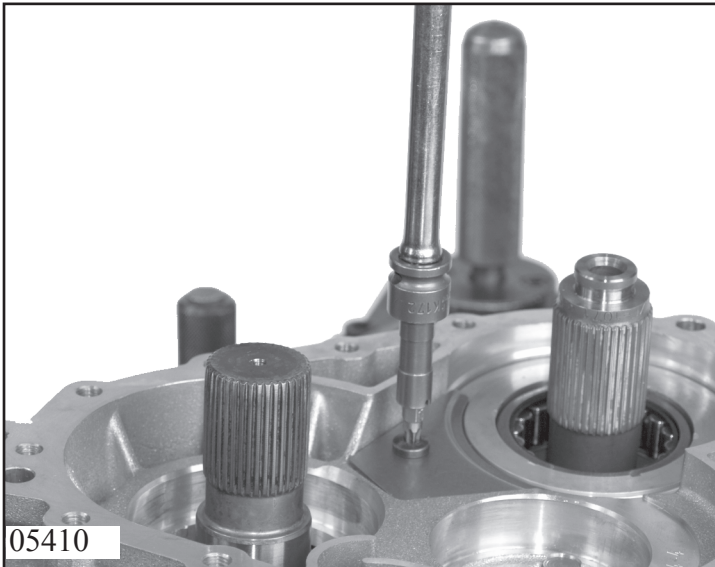
Press in top needle bearing 37.270/140 with tool 5x54 909 160, with inscribed side upwards, using the mandrel press. Secure with circlip 37.270/150.



### 3.7.2 Pre-assembling the rear axle drive

Turn transmission unit through 180°. Heat transmission housing around pinion shaft with hot-air dryer. Fit bearing plate 37.070/010 with bearing 37.010/020.

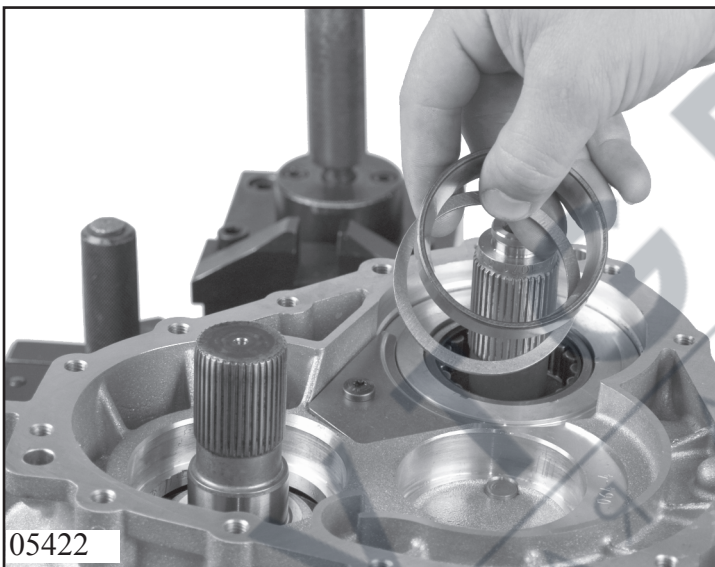




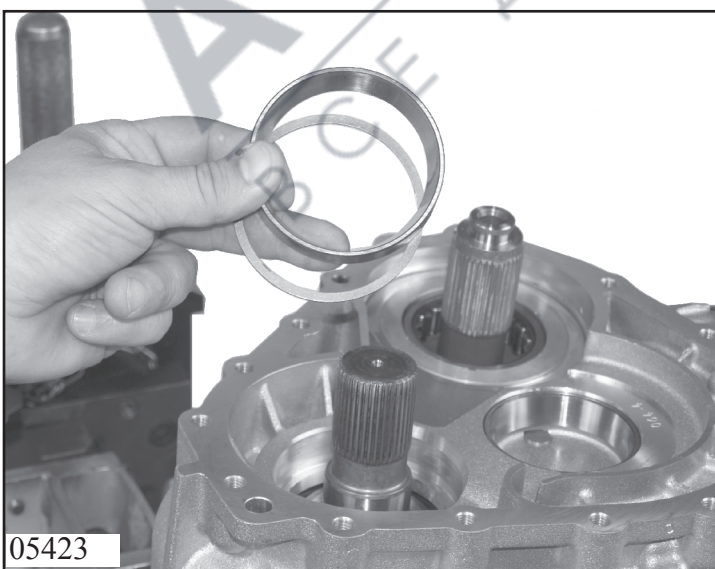
Fix bearing plate with plate 37.074 and screw 37.076.

(For tightening torque, see Chapter 1.5)

**Note:**  
For adjustment, see Chapter 1.4.4

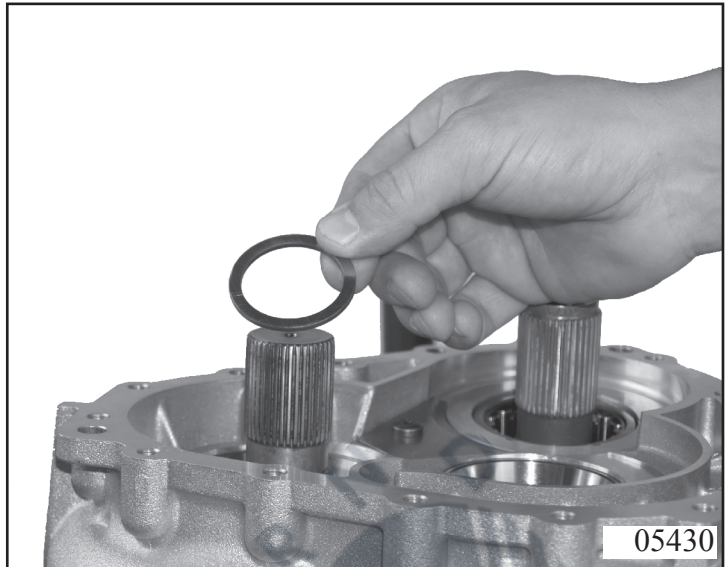


Heat transmission housing adequately around bearing seat with hot-air dryer. Fit VA shaft compensating shim 37.050 and bearing shell 37.030.



Fit input drive wheel compensating shim 37.250 and bearing shell 37.230/130.

Place axial washer of drive 37.330 over input drive shaft.



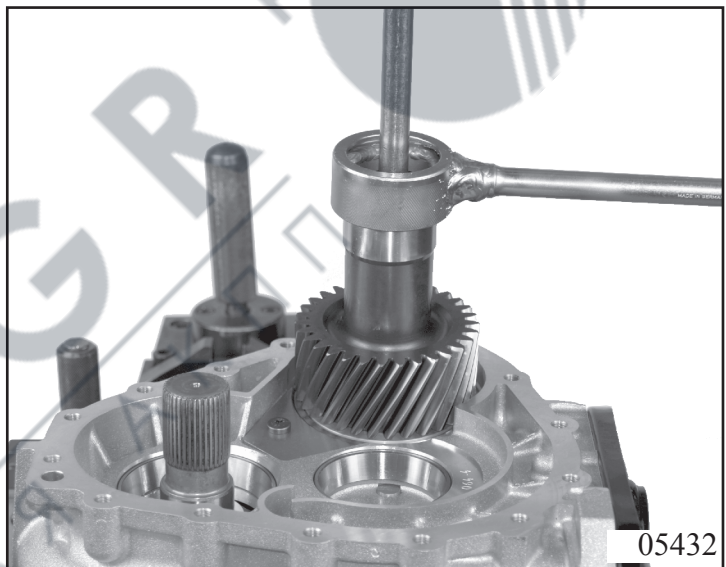
**Note:**

For adjustment, see Chapter 1.4.5

### 3.7.3 Fitting the side shaft

Fit side shaft 37.100 and secure with new combi screw 37.120.  
To do this, hold side shaft still with retaining tool 5x46 002 765.

(For tightening torque, see Chapter 1.5)

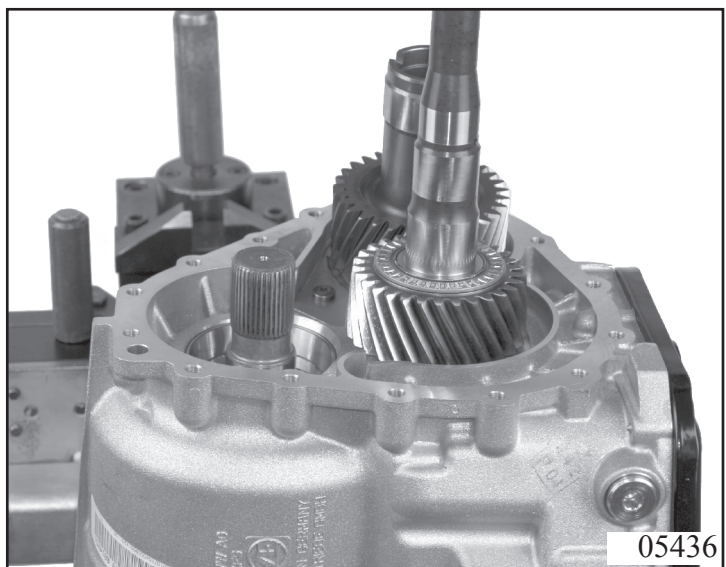


**Note:**

Lubricate pinion shaft on SAE gear with grease.

### 3.7.4 Fitting the intermediate housing

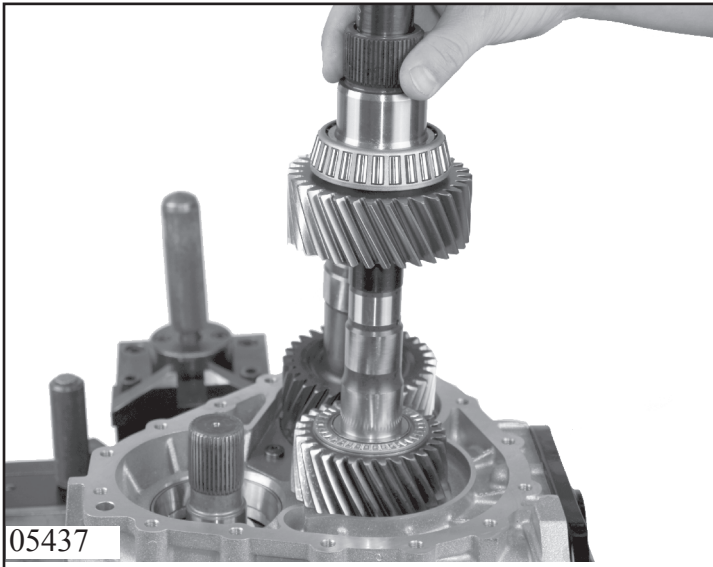
Fit VA shaft 37.040/110 with needle bearing 37.040/130.



**Note:**

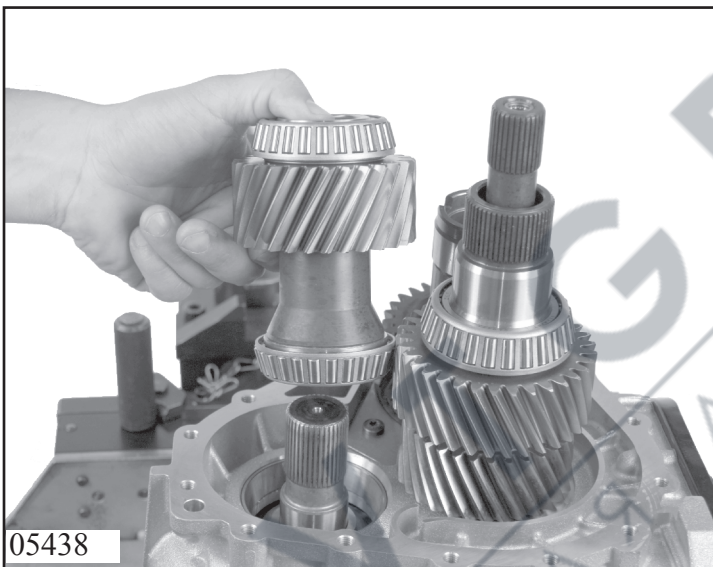
Lubricate needle bearing slightly with a little gear oil





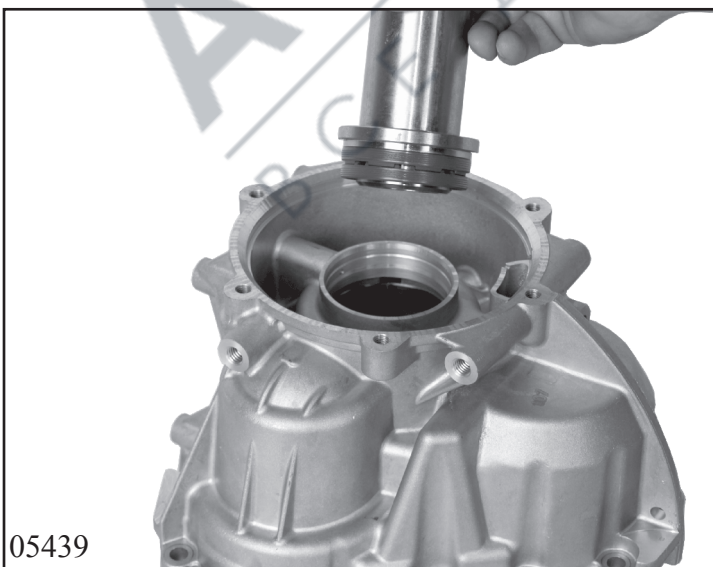
Place guide 5x46 000 628 over VA shaft, and fit output drive wheel over VA shaft.

05437



Fit input drive wheel 37.230

05438



Fit shaft sealing ring 37.170 in intermediate housing with press-fit tool 5x46 909 315 using a mandrel press.

05439



Place guide sleeve 5x46 001 535 over output drive wheel.  
Fit new seal 37.150 with Vaseline to transmission housing and align.

Fit intermediate housing 37.020 and secure with 15 screws 37.160.

(For tightening torque, see Chapter 1.5)

**Note:**

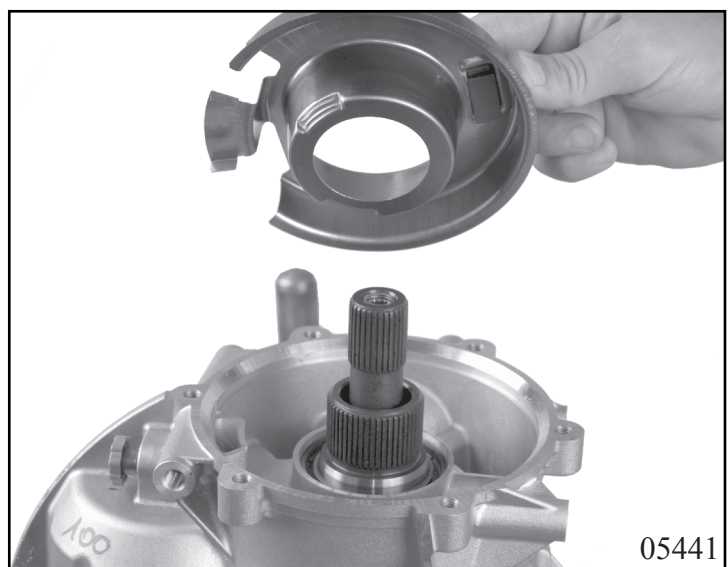
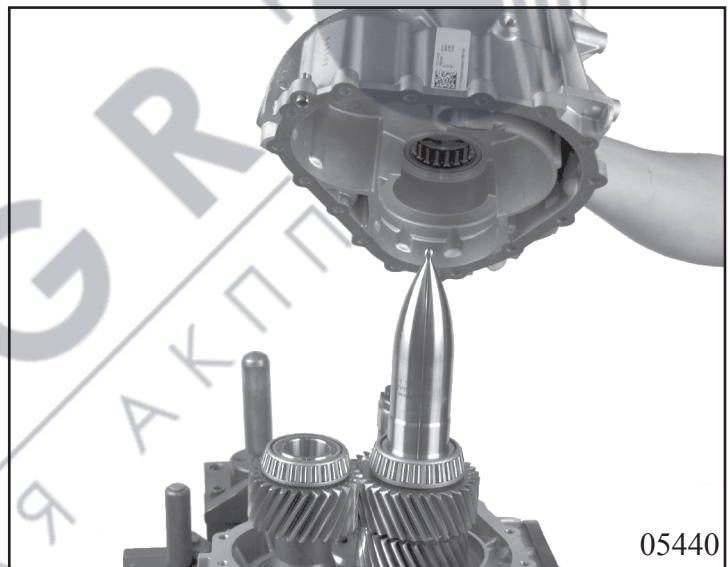
See specification for screw fittings 1.3.1.5

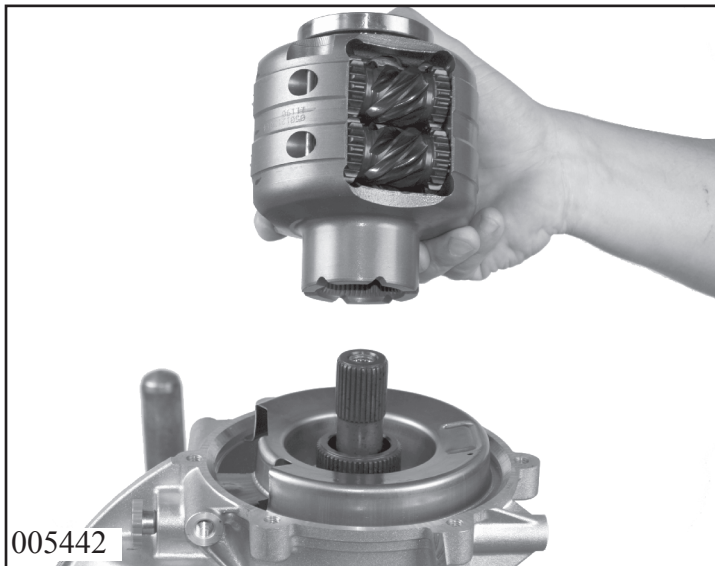
**Note:**

In the case of a new intermediate housing, fit breather tube 37.310 and breather cover 37.320.

**3.7.5 Fitting the transfer gearbox housing**

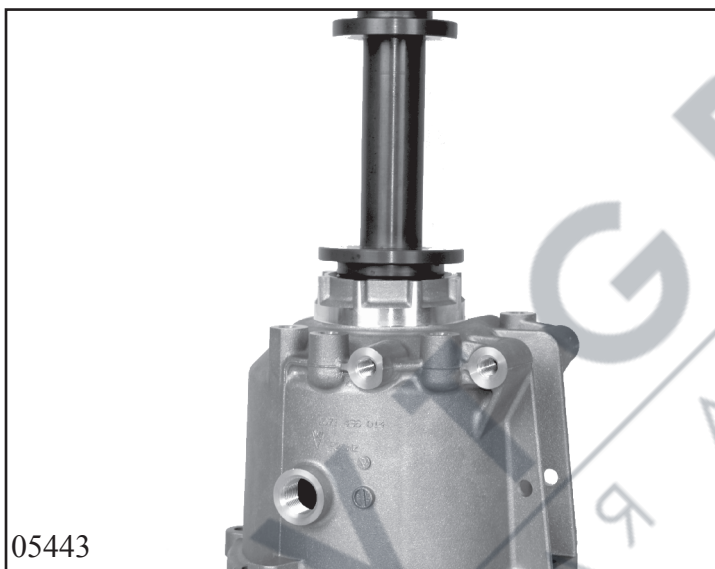
Place magnet 37.220 in oil baffle plate 37.200 on the rectangular area.  
Fit oil baffle plate in intermediate housing with the nose between the two grooves.





Fit Torsen 38.220 with ball bearing 38.250 and fill with Sturako oil to the top edge in the middle of the Torsen.

005442



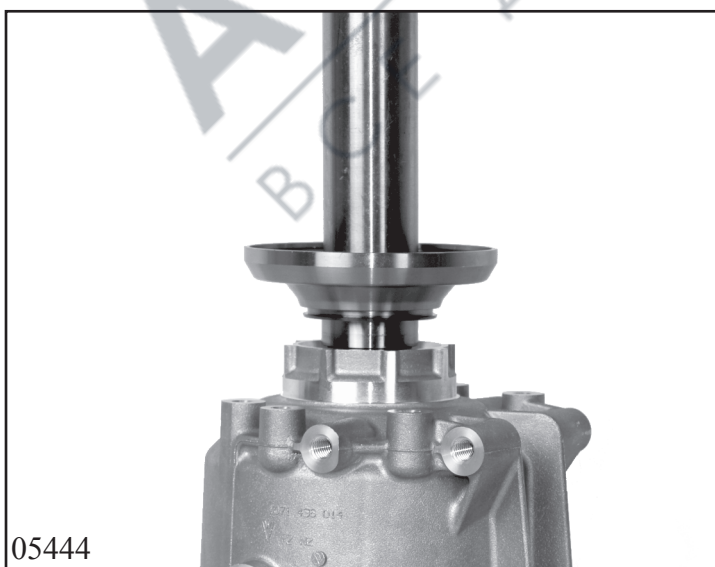
Press ball bearing 36.010/150 into transfer gearbox housing 36.010/110 with press-fit tool 5x54 909 122 using the mandrel press, and secure with circlip 36.010/180. Fit shaft sealing ring 36.010/140 with press-fit tool 5x54 909 122.

(For tightening torque, see Chapter 1.5)

**Note:**

In the case of gear units with vibration dampers, fit vibration damper 36.120 to transfer gearbox housing, and fix with 3 new screws 36.130 (self-locking).

05443



Press output drive flange 36.010/160 into transfer gearbox housing using the mandrel press, and secure with circlip 36.010/170.

**Note:** (Gearbox for VW TDI)

Srew in Damper 36.010/120 with screw 36.010/130 in drop housing then press in output flange

(For tightening torque, see Chapter 1.5)

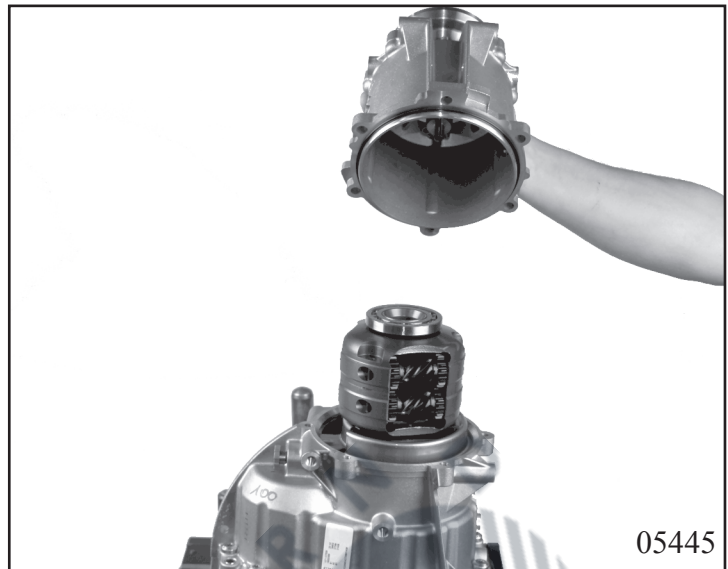
05444

Fit new O-ring 36.130 to transfer gearbox housing, and fix transfer gearbox housing with 6 screws 36.140. Screw blanking screw 36.180 into transfer gearbox housing.

(For tightening torque, see Chapter 1.5)

**Note:**

See specification for screw fittings  
1.3.1.4



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