REPAIR MANUAL

6 HP- 26 A61

ZF GETRIEBE GMBH SAARBRÜCKEN

Version 05/04/05
CD

subject to alterations

Printed in Germany

Contents List

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 ELCAT and/or TISK 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 ELCAT).

Tech. CS	Tech. Documentation	CS School
Bach	Reus	Schultz


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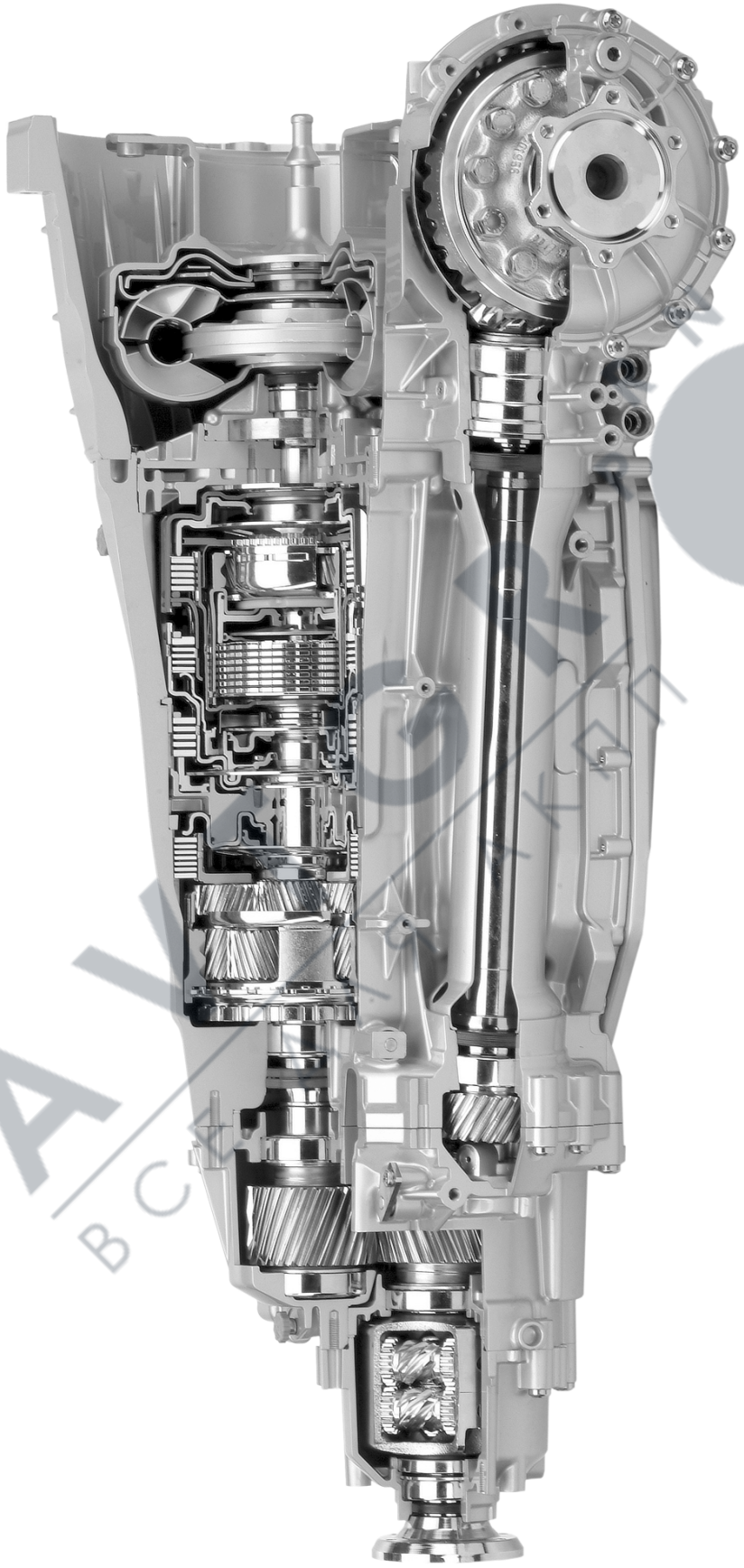
1. General
1.1 Illustration of transmission

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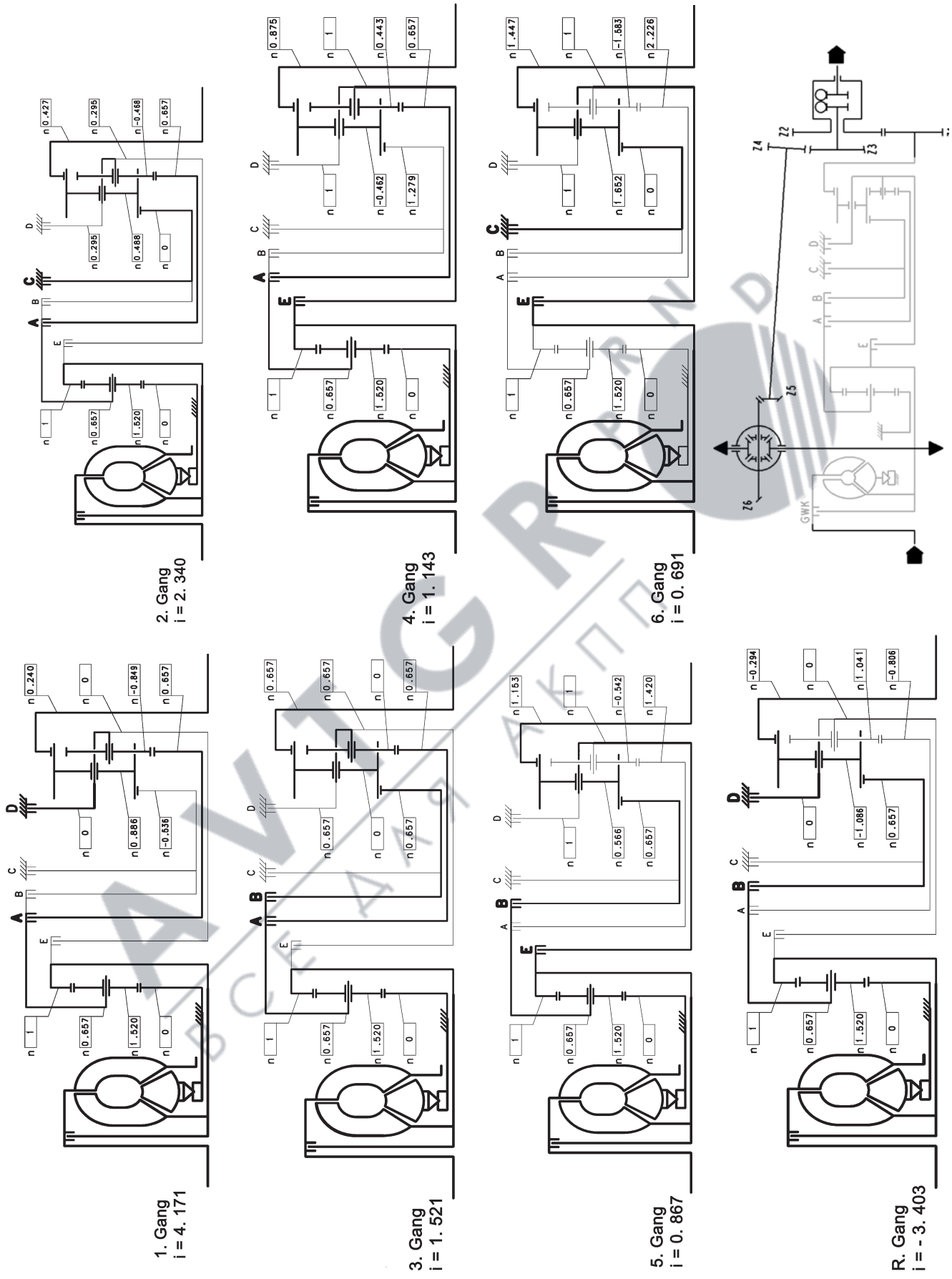
1.2 Power flow diagram

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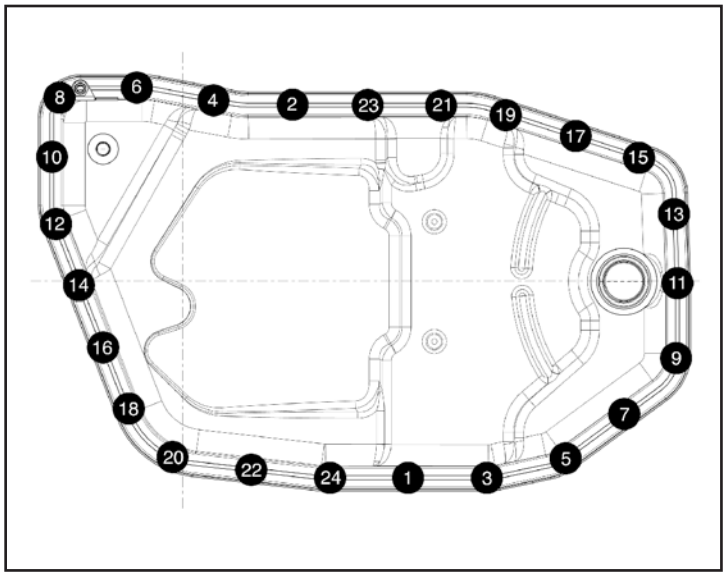
1.3 Instructions

1.3.1 Screw Connection Instructions

1.3.1.1 Oil Pan



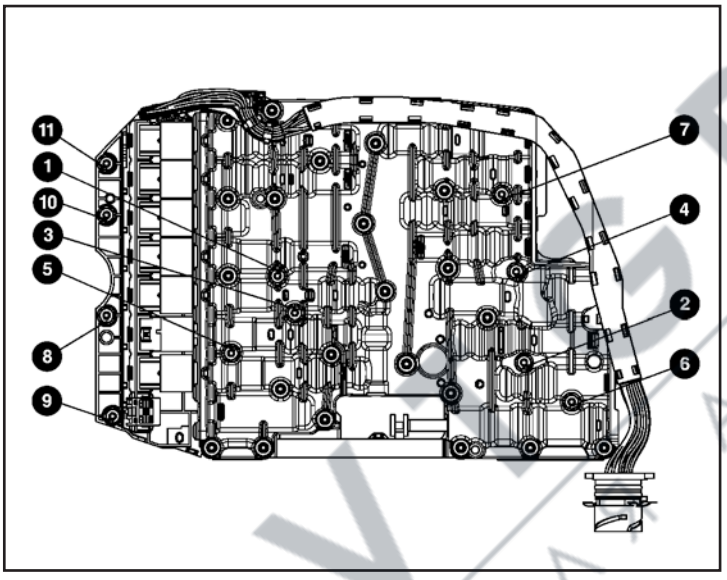
Tighten the oil pan torques according to the numbering:

1 ➪ 2 ➪ 3 ➪ ... ➪ 24

Important!

Instruction 1068 700 148
(Tightening torques, see Chapter 1.5)

1.3.1.2 Mechatronic



Tighten the mechatronic torques according to the numbering:

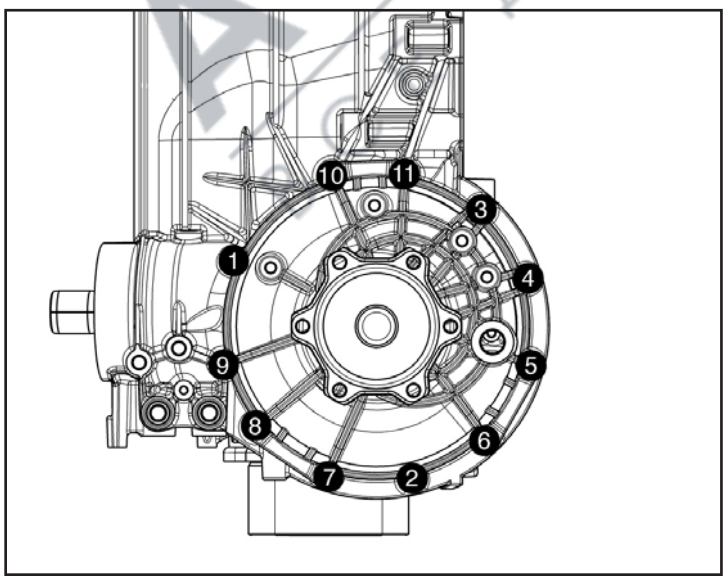
1 ➪ 2 ➪ 3 ➪ ... ➪ 11

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!

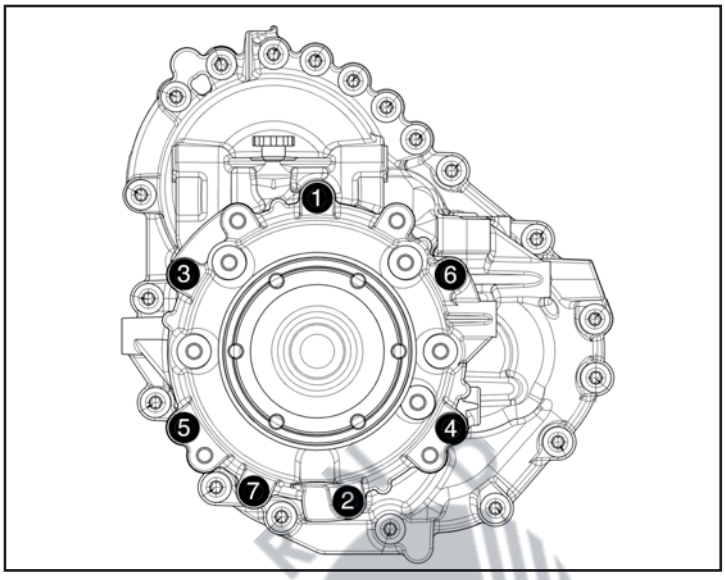
Instruction 1068 700 131

(Tightening torques, see Chapter 1.5)

1.3.1.4 Distributor Housing

Tighten the distributor housing torques according to the numbering:

1 ➪ 2 ➪ 3 ➪ ... ➪ 7



Important!

Instruction 1068 700 145

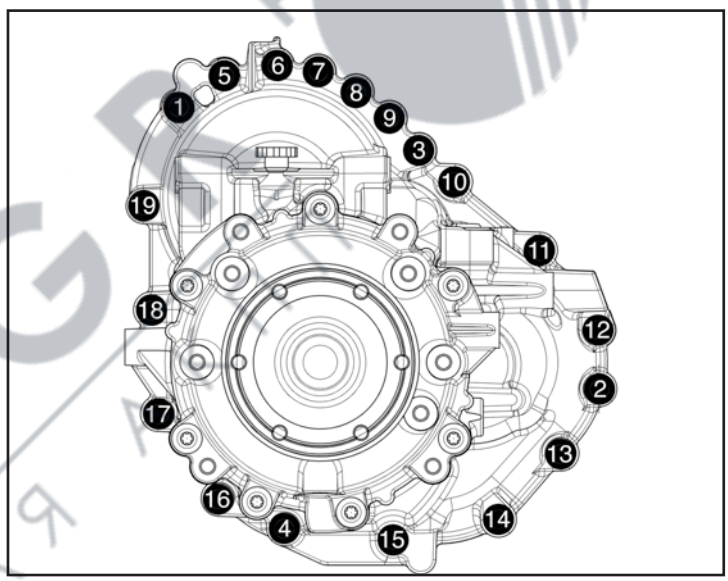
(Tightening torques, see Chapter 1.5)

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 ➪ ... ➪ 19
on final torque



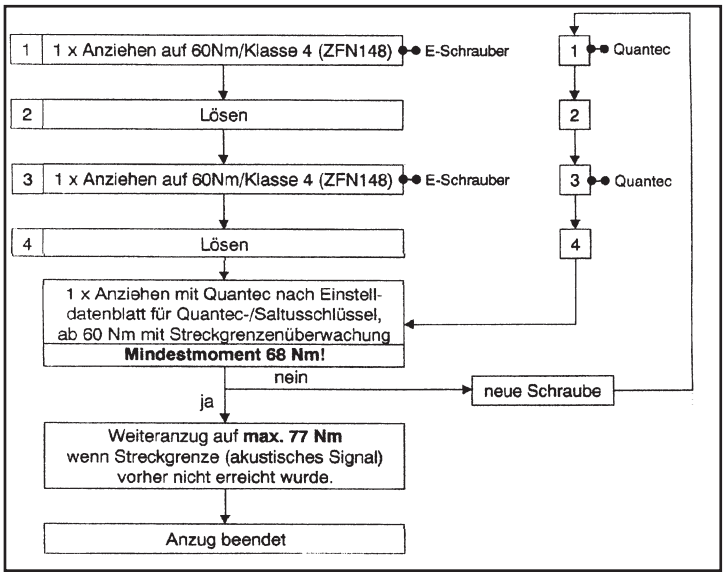
Important!

Instruction 1068 700 149

(Tightening torques, see Chapter 1.5)

1.3.1.6 Bolt with Waisted Shank for Drive Shaft

Tighten the bolt with waisted shank as shown in the diagram.



1.3.1.7 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	Upper limit torque =	160 Nm
Lower limit angle =	30°	Upper limit angle =	70°

Screwdriving conditions = hard

Tightening:
Tighten bolts crosswise.
Tighten all the bolts to the joining torque and then to the yield strength!

Please observe the limits!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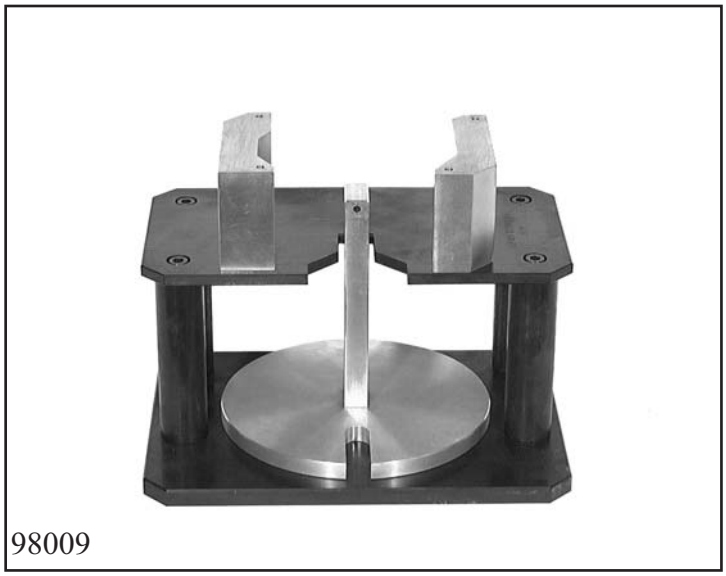
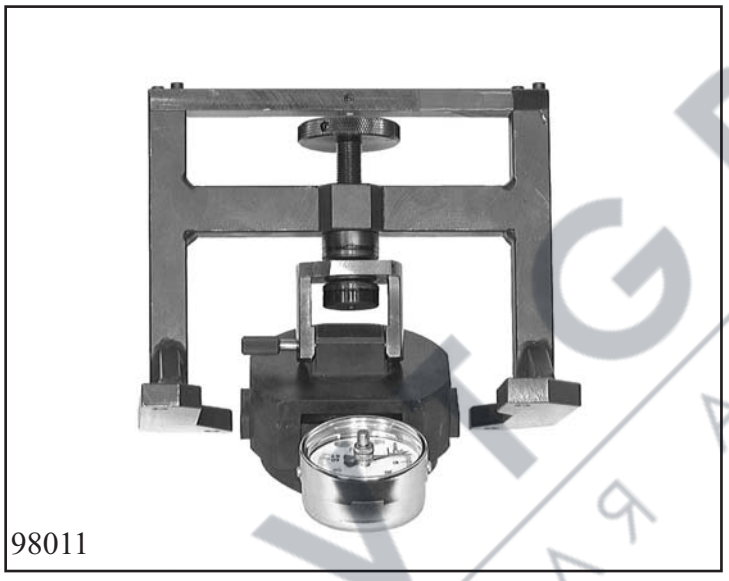
1.4 Adjustments
1.4.0 Measuring the Disc Sets (procedure)



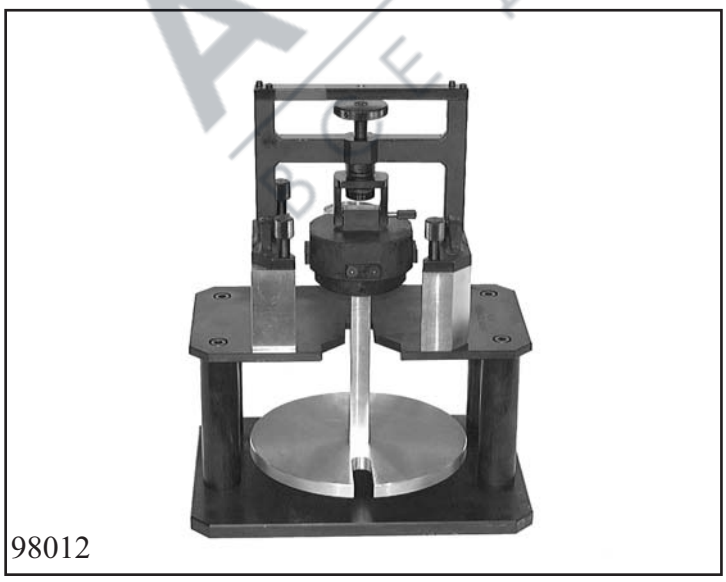
98009

Position the two connecting pieces 5p01 000 329 on the marked areas of the measuring device 5p01 000 330.



98011

Turn the adjustment device 5p01 001 458 to the upper stop position with the knurled screw. Hang the force measuring unit 5p01 000 329 into the adjustment device.

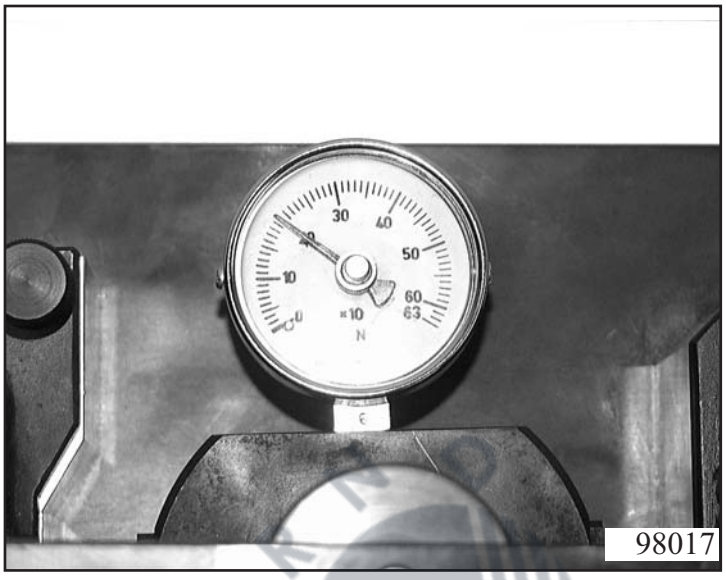


98012

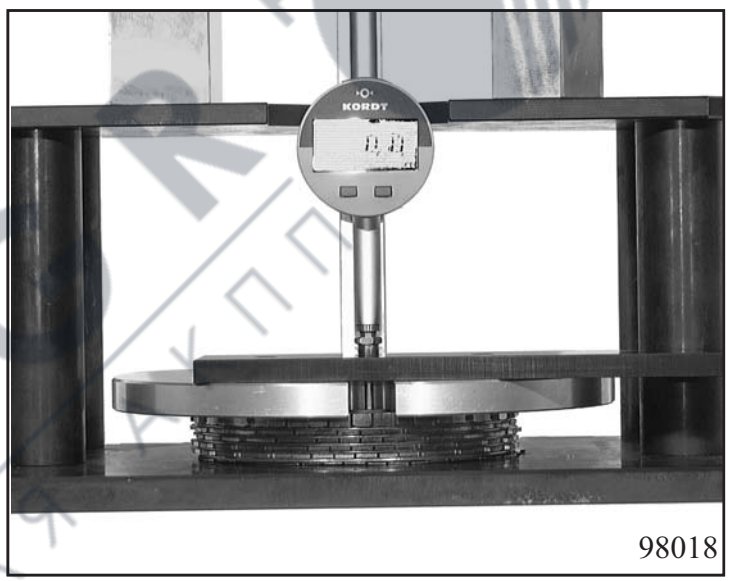
Bolt the adjustment device to the height measuring device via the connecting pieces with four knurled screws 5p01 000 329.
Connect the measuring plate 5p01 040 330 with the force measuring unit via a fixing pin.

Clamp the disc set (with the corrugated steel disc, if there is one, at the very bottom) to be measured into the device with knurled screw under 200 N.

Check the value displayed on the force measuring unit.



Then place the measuring bar 5p01 000 330 on the measuring plate. Lay the measuring base of the dial gauge in the measuring plate groove onto the disc set's uppermost disc and set dial to "0".



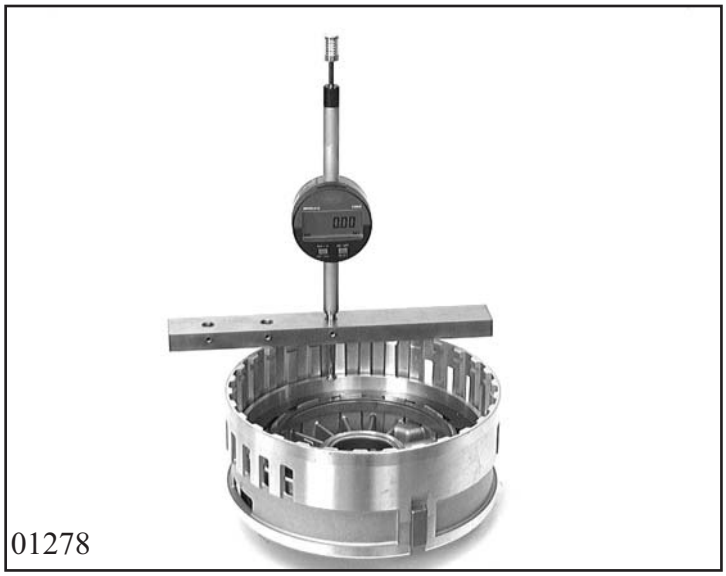
Measure down to the floor plate with the measuring bar.

Read the measured value ⇨ $\mathbf{M_X}$

Please note!
The index **X** in $\mathbf{M_X}$ stands for the disc sets inserted in the clutches/brakes. (A, B, C, D, E).

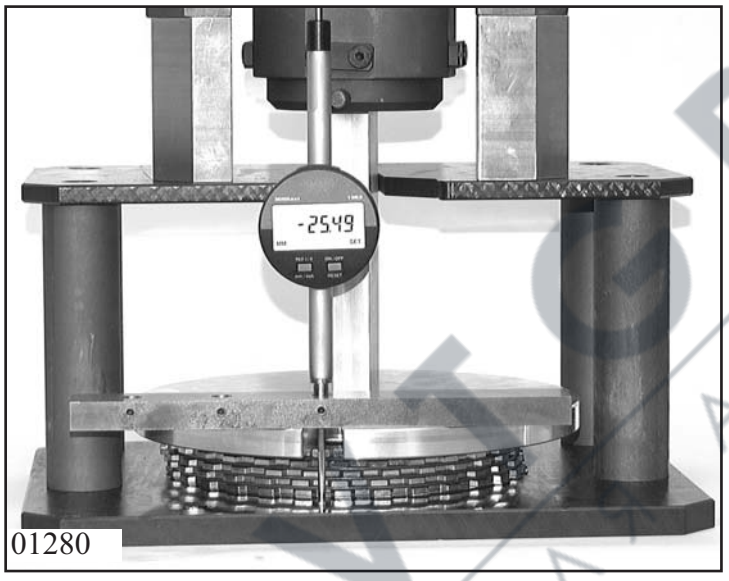
1.4.1 Clearance Play

1.4.1.1 Setting the Brake C Clearance Play (snap ring)


01278

Measure the brake C installation space $\mathbf{E_C}$ with the measuring bar 5p01 000 330. To do this, place the measuring bar 5p01 000 330 on the edge of brake C's cylinder. Place the measuring base on the highest area of the disc support surface at the piston and set dial to "0".
Pull the measuring sensor upward, insert in snap ring groove and press against the upper groove edge.

Read the measured value ⇨ $\mathbf{W_C}$ from the dial.



01280

Measure the thickness $\mathbf{M_C}$ of brake C disc set as described in **Chapter 1.4.0 Measuring the disc sets**.

⇨ $\mathbf{M_C}$

The installation space $\mathbf{E_C}$ is calculated from the measured value $\mathbf{W_C}$ plus the base thickness **F**. ⇨ $\mathbf{E_C}$

The measured value $\mathbf{P_C}$ is calculated from the installation space $\mathbf{E_C}$ minus $\mathbf{M_C}$.

The value $\mathbf{P_C}$ must be between 4.37 and 5.77 mm. **Test instruction 1068 700 099**. Version B

Select snap ring $\mathbf{S_C}$ with test measurement $\mathbf{P_C}$.

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

The clearance play $\mathbf{L_C}$ should be 1.38 – 1.83 mm with 5 lined discs.

Example (for 1.4.1.1):

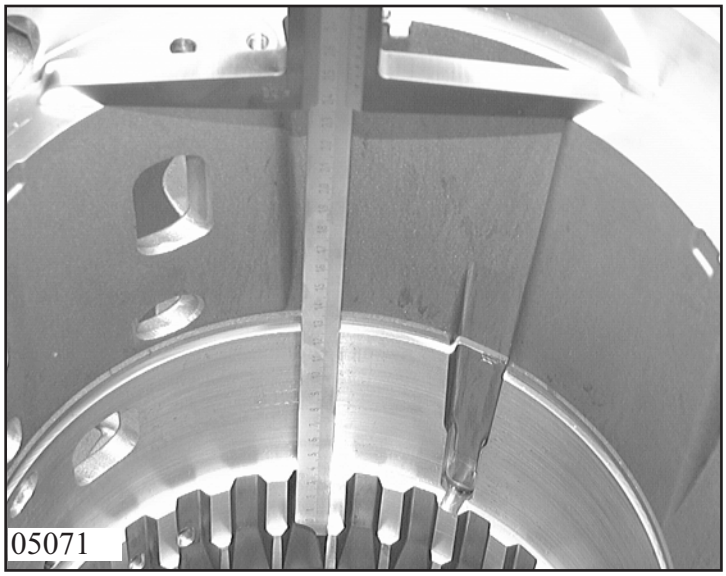
F = 1.48 mm (base thickness)
W_C = 29.05 mm
M_C = 25.49 mm

E_C = 29.05 + 1.48
= 30.53 mm
P_C = 30.53 – 25.49
= 5.04 mm

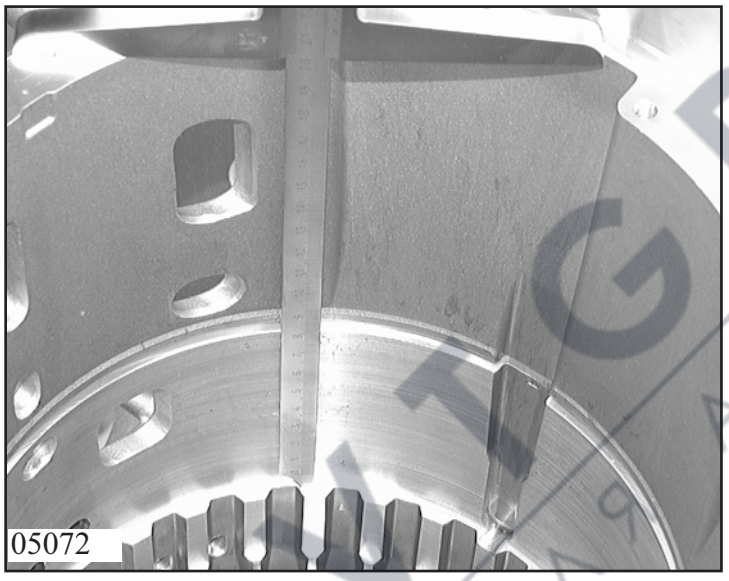
S_C = 3.36 mm

L_C = 5.04 – 3.36
⇨ L_C = 1.68 mm

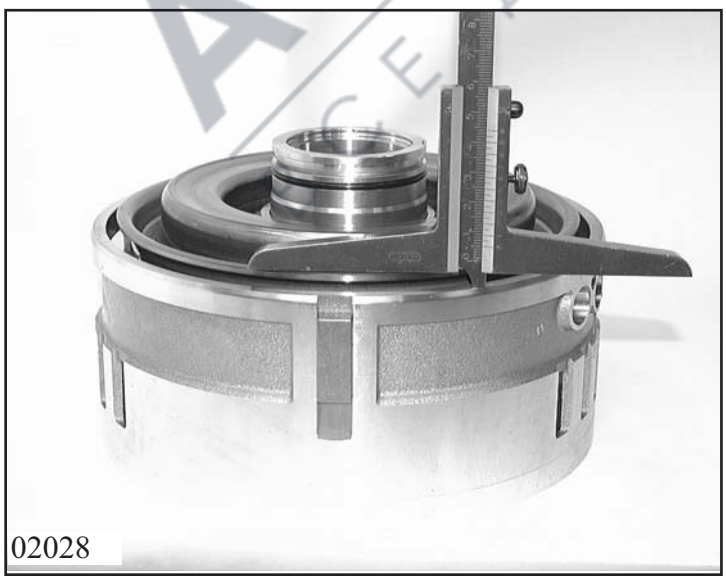
1.4.1.2 Setting the Brake D Clearance Play (End Disc)



Measure brake D installation space $\mathbf{E_D}$ with depth gauge.
To do this, place the depth gauge on the oil supply sealing surface.
Place the measuring base on the lowest point of the disc support surface and read the measured value. ⇨ $\mathbf{W_{DA}}$

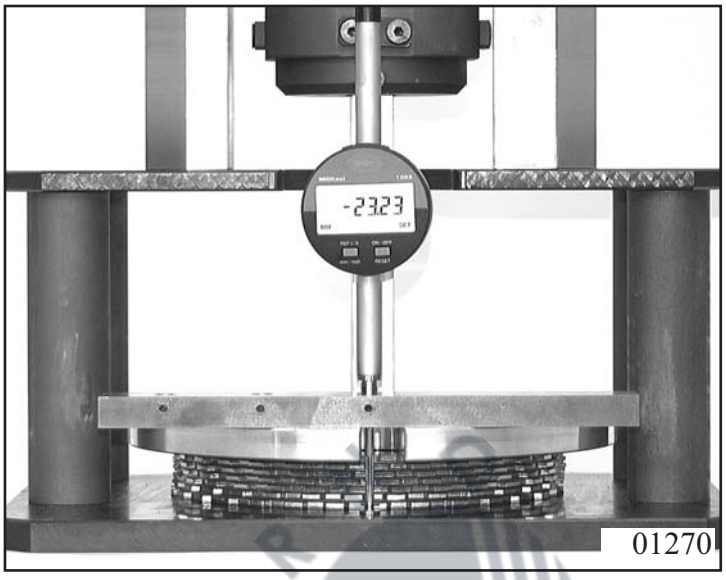


Place the measuring base on the CD cylinder support surface and read the measured value. ⇨ $\mathbf{W_{DB}}$



Measure down from the piston to the CD cylinder support surface and read the measured value. ⇨ $\mathbf{M_{DB}}$

Measure the thickness M_{DA} of the D disc set – excluding the end disc - as described in **Chapter 1.4.0 Measuring the Disc Sets**.
⇨ M_{DA}



The installation space E_D and disc set thickness/test measurement P_D are calculated as follows:

⇨ $E_D = W_{DA} - W_{DB}$
⇨ $P_D = M_{DA} + M_{DB}$

The value P_D must be between 26.85 and 28.65 mm. **Test instruction 1068 700 114**
Version B

Select the end disc S_D with test measurement P_D.

The clearance play L_D should be 2.11 – 2.75 mm with 6 lined discs.

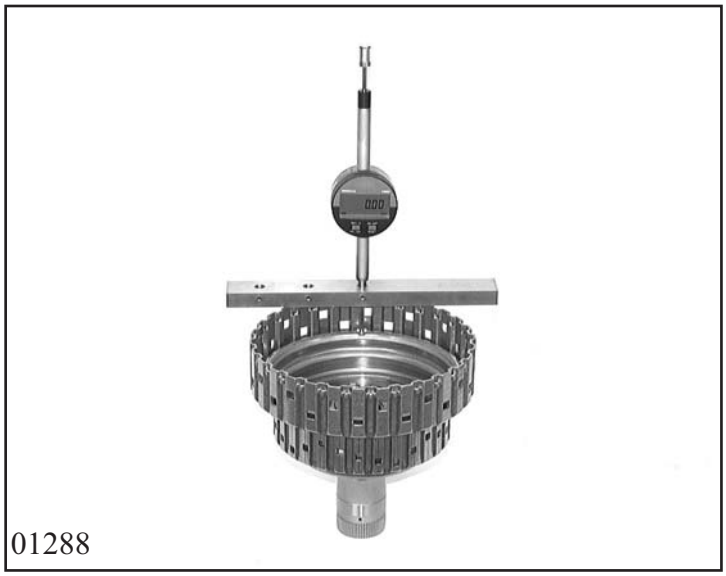
Example (for 1.4.1.2):

W_{DA} = 247.9 mm
W_{DB} = 214.5 mm
M_{DA} = 23.23 mm
M_{DB} = 4.3 mm

E_D = 247.9 – 214.5
= 33.2 mm
P_D = 23.23 + 4.3
= 27.53 mm

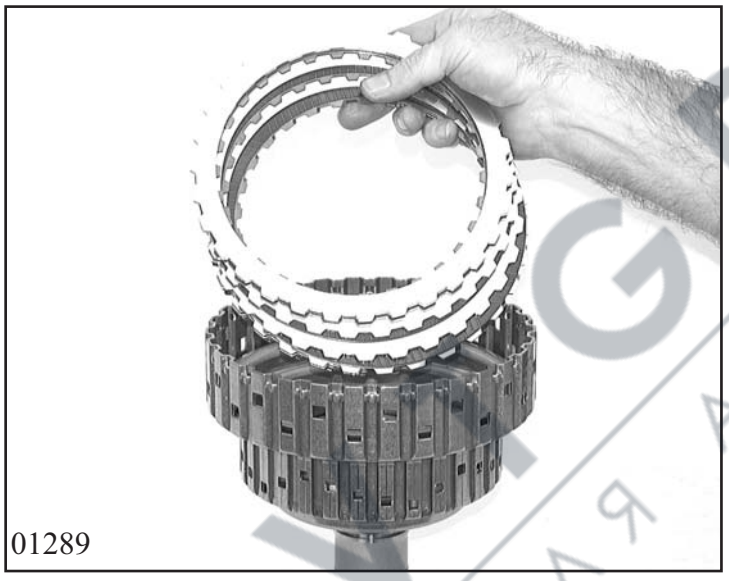
S_D = 3.3 mm
L_D = 33.2 – 27.53 - 3.3
⇨ **L_D = 2.37 mm**

1.4.1.3 Setting the Clutch B Clearance Play (snap ring)


01288

Measure the clutch B installation space $\mathbf{E_B}$ with measuring bar 5p01 000 330. To do this, place the measuring bar 5p01 000 330 on the edge of clutch B's cylinder. Place the measuring base on the highest area of the disc support surface at the piston and set dial to "0".
Pull the measuring sensor upwards, insert it into the snap ring groove and press against the upper groove edge.

Read the measured value from the dial.
⇨ $\mathbf{W_B}$


01289

Measure the thickness $\mathbf{M_B}$ of clutch B's disc set as described in **Chapter 1.4.0 Measuring the Disc Sets**.

⇨ $\mathbf{M_B}$

The installation space $\mathbf{E_B}$ is derived from the measuring value $\mathbf{W_B}$ plus the base thickness **F**. ⇨ $\mathbf{E_B}$

The test measurement $\mathbf{P_B}$ is derived from the installation space $\mathbf{E_B}$ minus $\mathbf{M_B}$

The value $\mathbf{P_B}$ should be between 4.4 and 6.2 mm. **Test instruction 1068 700 098** Version B

Select the snap ring $\mathbf{S_B}$ with the measuring value $\mathbf{P_B}$.

Calculation:
$\mathbf{E_B = W_B + F}$
$\mathbf{P_B = E_B - M_B}$

The clearance play $\mathbf{L_B}$ should be 1.41 – 1.86 mm with 4 lined discs.

Example (for 1.4.1.3):

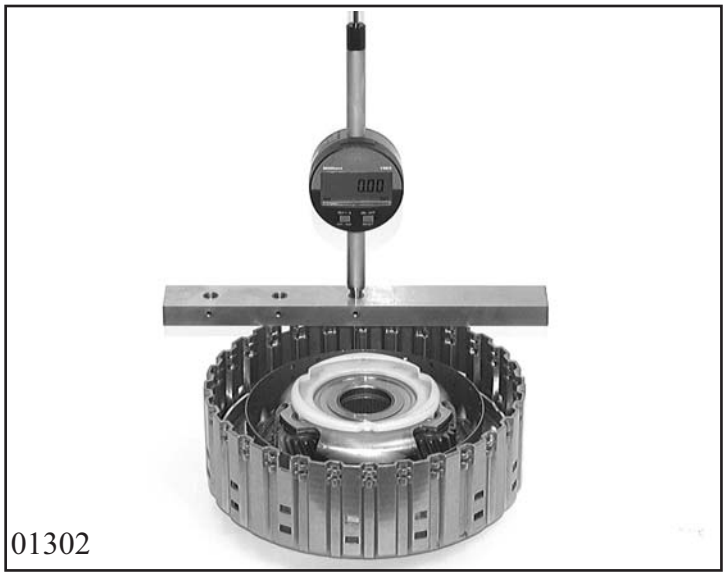
F = 1.48 mm (base thickness)
W_B = 25.8 mm
M_B = - 21.92 mm

E_B = 25.8 + 1.48
= 27.28 mm
P_B = 27.28 – 21.92
= 5.36 mm

S_B = 3.8 mm

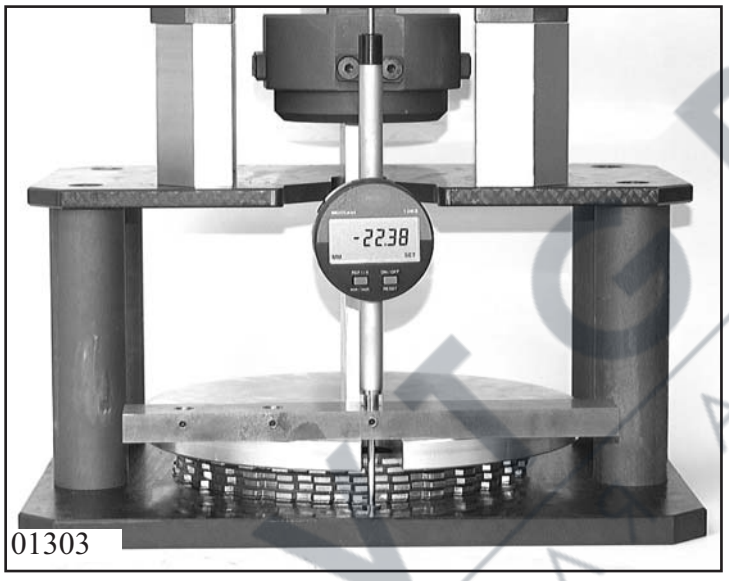
L_B = 5.36 mm – 3.8 mm
⇨ L_B = 1.56 mm

1.4.1.4 Setting the Clutch A Clearance Play (snap ring)


01302

Measure the clutch A installation space $\mathbf{E_A}$ with measuring bar 5p01 000 330. To do this, place the measuring bar 5p01 000 330 on the edge of clutch A's cylinder. Place the measuring base on the highest area of the disc support surface at the piston and set dial to "0".
Pull the measuring sensor upwards, insert it into the snap ring groove and press against the upper groove edge.

Read the measured value from the dial.
⇨ $\mathbf{W_A}$


01303

Measure the thickness $\mathbf{M_A}$ of clutch A's disc set as described in **Chapter 1.4.0 Measuring the Disc Sets**.

⇨ $\mathbf{M_A}$

The installation space $\mathbf{E_A}$ is derived from the measuring value $\mathbf{W_A}$ plus the base thickness **F**. ⇨ $\mathbf{E_A}$

The test measurement $\mathbf{P_A}$ is derived from the installation space $\mathbf{E_A}$ minus $\mathbf{M_A}$

The value $\mathbf{P_A}$ should be between 4.58 and 6.18 mm. **Test instruction 1068 700 084** Version B

Select the snap ring $\mathbf{S_A}$ with the measuring value $\mathbf{P_A}$.

Calculation:
$\mathbf{E_A = W_A + F}$
$\mathbf{P_A = E_A - M_A}$

The clearance play $\mathbf{L_A}$ should be 1,59 - 2,04 mm with 4 lined discs.

Example (for 1.4.1.4):

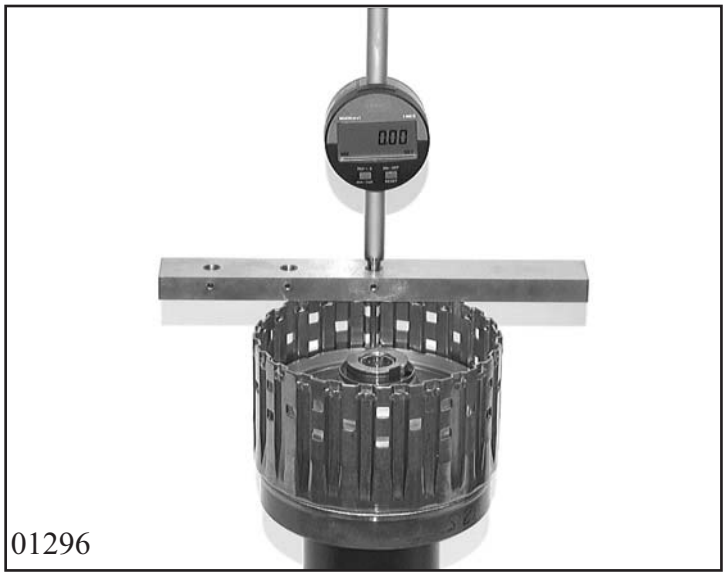
F = 1.48 mm (base thickness)
W_A = 26.15 mm
M_A = - 22.38 mm

E_A = 26.15 + 1.48
= 27.63 mm
P_A = 27.63 – 22.38
= 5.25 mm

S_A = 3.4 mm

L_A = 5.25 – 3.4
⇨ L_A = 1.85 mm

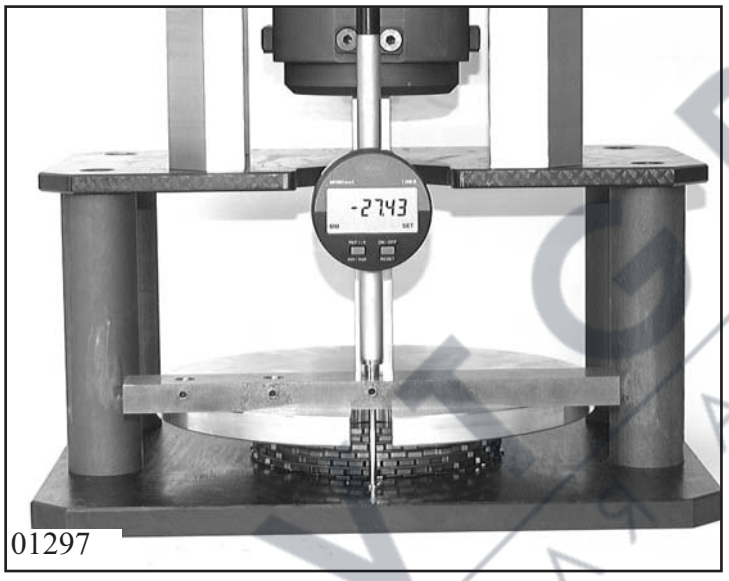
1.4.1.5 Setting the Clutch E Clearance Play (Snap Ring)



01296

Measure the clutch E installation space $\mathbf{E_E}$ with measuring bar 5p01 000 330. To do this, place the measuring bar 5p01 000 330 on the edge of clutch E's cylinder. Place the measuring base on the highest area of the disc support surface at the piston and set dial to "0".
Pull the measuring sensor upwards, insert it into the snap ring groove and press against the upper groove edge.

Read the measured value from the dial.
⇨ $\mathbf{W_E}$



01297

Measure the thickness $\mathbf{M_E}$ of clutch E's disc set as described in **Chapter 1.4.0 Measuring the Disc Sets**.

⇨ $\mathbf{M_E}$

The installation space $\mathbf{E_E}$ is derived from the measuring value $\mathbf{W_E}$ plus the base thickness **F**. ⇨ $\mathbf{E_E}$

The test measurement $\mathbf{P_E}$ is derived from the installation space $\mathbf{E_E}$ minus $\mathbf{M_E}$

The value $\mathbf{P_E}$ should be between 3.83 and 5.83 mm. **Test instruction 1068 700 048** Version B

Select the snap ring $\mathbf{S_E}$ with the measuring value $\mathbf{P_E}$.

Calculation:
$\mathbf{E_E = W_E + F}$
$\mathbf{P_E = E_E - M_E}$

The clearance play $\mathbf{L_E}$ should be 1.84 – 2.37 mm with 5 lined discs.

Example (for 1.4.1.5):

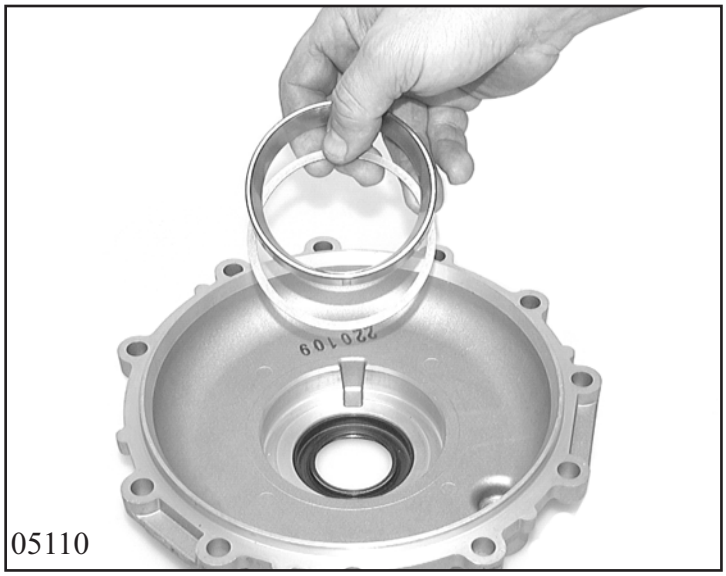
F = 1.48 mm (base thickness)
W_E = 30.27 mm
M_E = 27.43 mm

E_E = 30.27 + 1.48
= 31.75 mm
P_E = 31.75 – 27.43
= 4.32 mm

S_E = 2.4 mm

L_E = 4.32 – 2.4
⇨ L_E = 1.92 mm

1.4.2 Differential Preload (Disc)

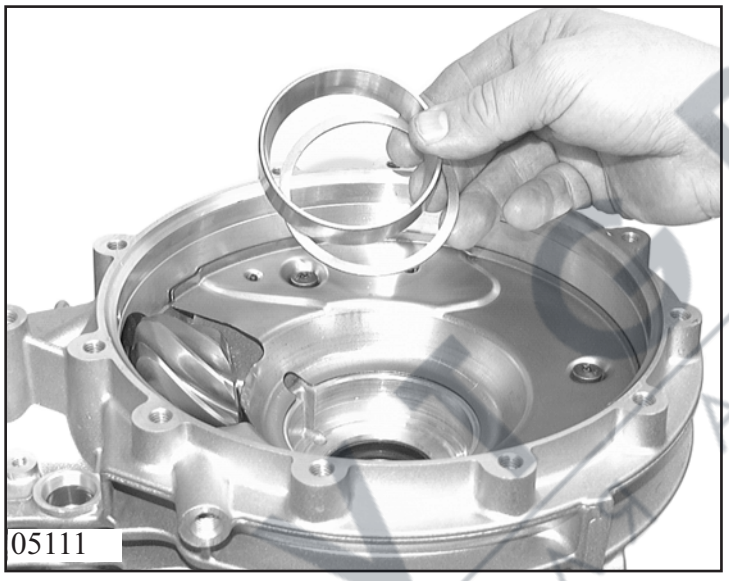


05110

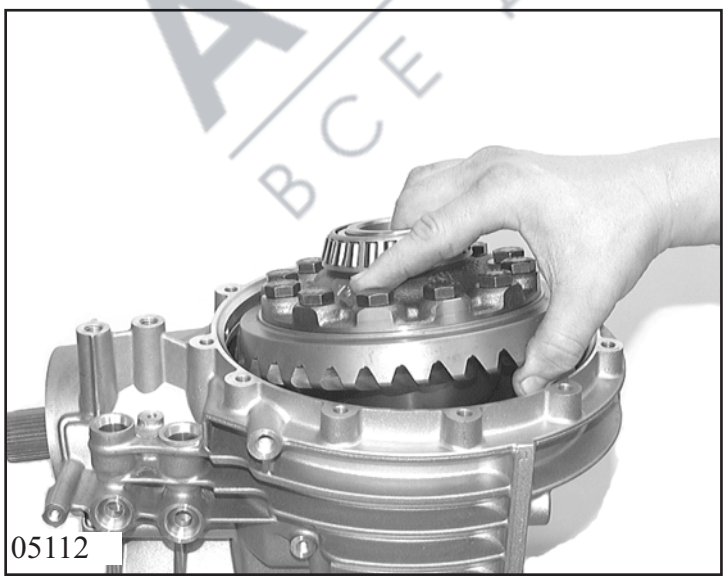
Determine the disc's overall thickness M_G by measuring the adjustment spacer thickness 35.080 and 35.110.➪ M_U, M_O
Insert the removed adjustment spacer 35.110 with the bearing ring 35.010/150 in the differential cover 35.150/110.

Calculation:
$M_G = M_U + M_O$

Note:
This can usually be done by hand. The bearing seat may have to be heated slightly with a hot air blower.


05111

Insert the removed adjustment spacer 35.080 with the bearing ring 35.010/120 in the differential housing. This can usually be done by hand. The bearing seat may have to be heated slightly with a hot-air blower.

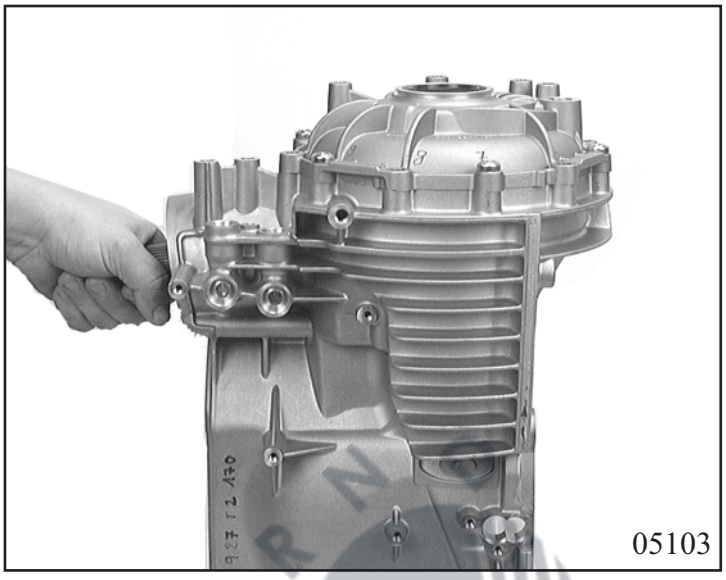

05112

Insert the differential in the gearbox housing. Put on the differential cover.
Attention!
A gap must be detectable with a feeler gauge (of approx. 0.1 – 0.3 mm) between the gearbox housing and the differential cover!
There is a danger of stress when the gap is too wide, e.g. 0.7 mm! ➪ tension is too high.
In this case, install the adjustment spacer, e.g. in the differential cover, thinner by 0.5 mm. The measurement takes place with the differential cover and without the shaft sealing ring and the O-ring.

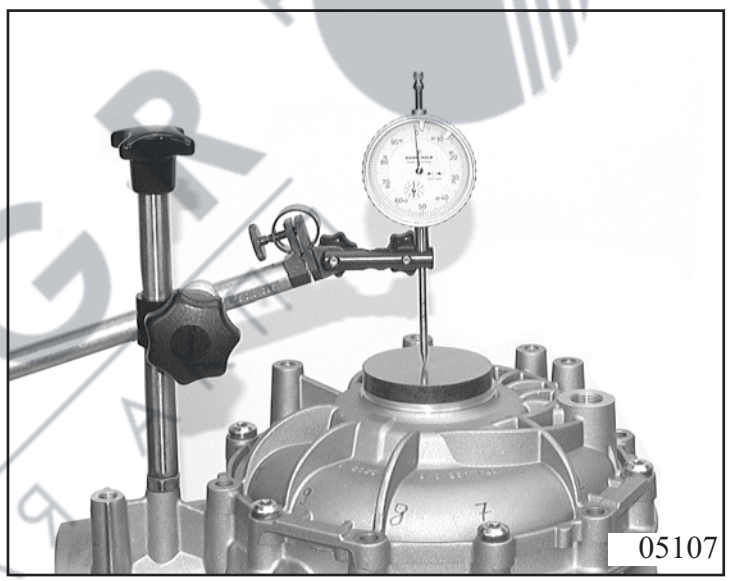
Tighten the differential cover with six offset screws 35.184.

Place the measuring plate 5p01 000 353 on the differential cover.

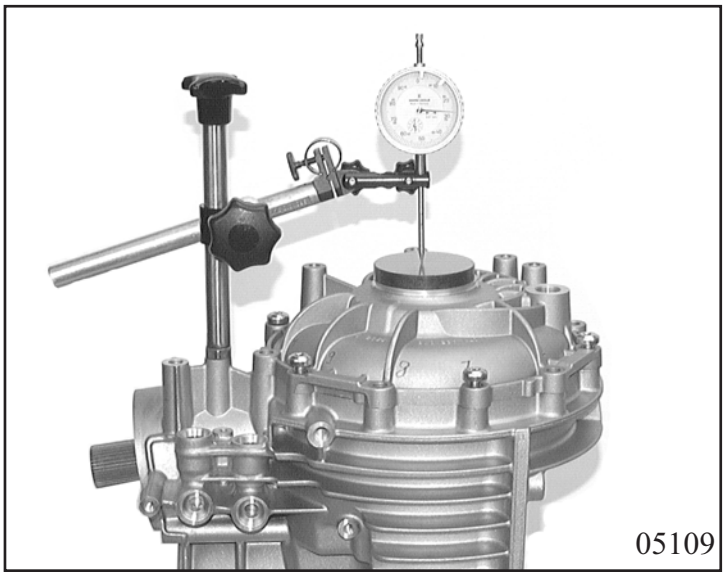
(Tightening torques see Chapter 1.5)



Screw in the measuring tripod's standing column with M10 in the compatible gearbox housing thread. Lock the transverse holder so that the dial sensor is aligned to the measuring plate centrally and in a right angle.
Set the dial to "0".



Undo the screws with half a turn in an offset manner until they are loose and the dial pointer does not move anymore.
➪ Read value $\mathbf{M_D}$.



Attention!
Do not touch the measuring tripod as doing so may affect the result.

According to the test instruction 1068 700 067, the measured value M_D must be between M_{Dmin}= 0.18mm and M_{Dmax}= 0.28 mm preload.
If there are any deviations, measure the right thickness and check again.

Calculation:
$D_D = M_D - [M_{Dmin} \text{ to } M_{Dmax}]$
$D_M = M_D - [M_{Dmax} + M_{Dmin}] / 2$

D_D (altering tolerance)
D_M (chosen average from DD)

Remove the measuring plate and tripod.
Remove the cover.
Take out the differential, bearing rings and adjustment spacers.

The adjustment spacers 35.080 and 35.110 are available in 0.025 mm steps. Change the adjustment spacers (M_{GV} test overall spacer thickness) in accordance with D_D average.

$D_M > 0$ => Reduce disc thickness
$D_M < 0$ => Increase disc thickness
$D_M = 0$ => Leave disc thickness unchanged

Example: (for 1.4.2)

M_D = 0.45 mm (preload)
M_U = 1.75 mm
M_O = 1.25 mm

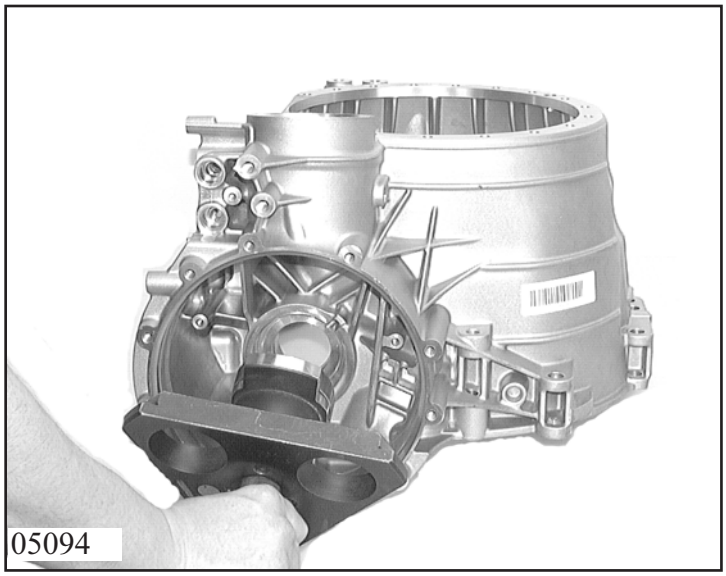
M_{GV} = 1.75 + 1.25 = 3.0 mm
D_D = 0.45 - [0.18 to 0.28]
= 0.17 to 0.27 mm
D_M = 0.45 - [0.28 + 0.18]/ 2
= 0.22 mm

Reduce M_{GV} by 0.2 mm
➪ M_{GA}= 2.8 mm
[measured overall disc thickness]

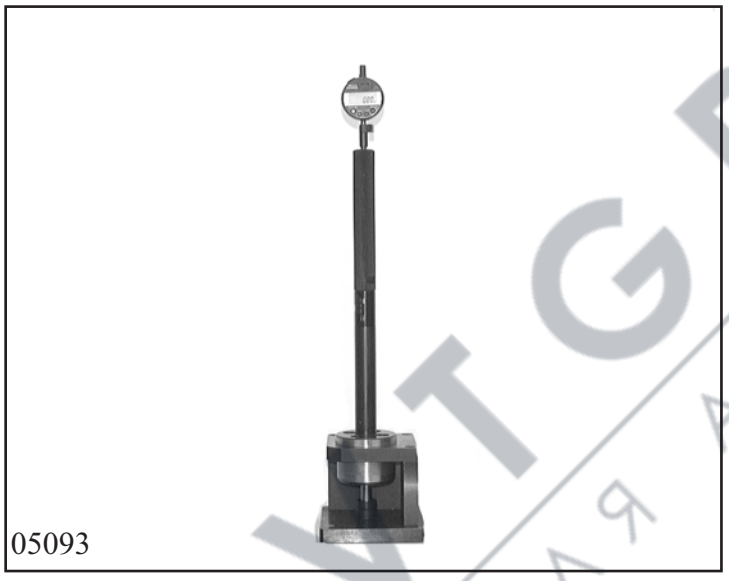
Repeat the measuring process with M_{GA}= 2.8 mm.

➪ M_D= 0.02 mm (preload)
➪ OK according to test instruction

1.4.3 Bevel Drive (Disc)
1.4.3.1 Pinion Position

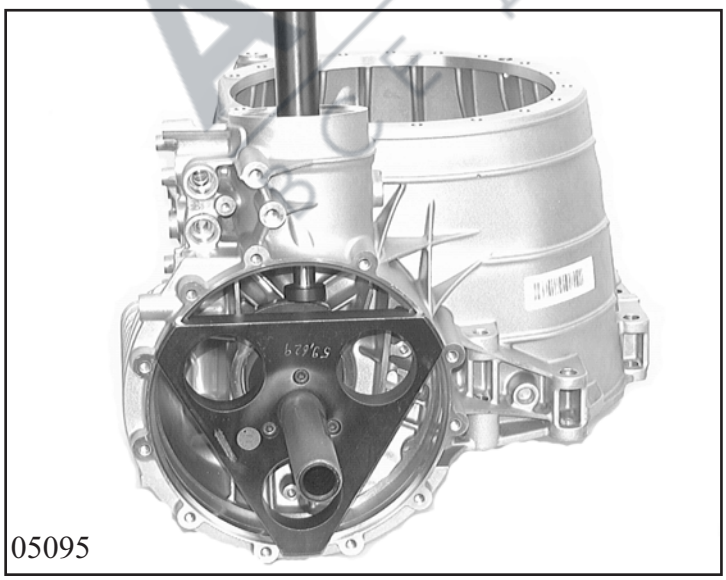

05094

Turn the converter bell by 90° (converter bell downwards).
Insert the fixture [5p01 002 604] in the differential housing with measuring radius to the pinion shaft.


05093

Set the measuring part 5p01 002 604 to zero in the calibrating equipment 5p89 004 524.
Reference dimension = 93.596 (calibrating equipment)

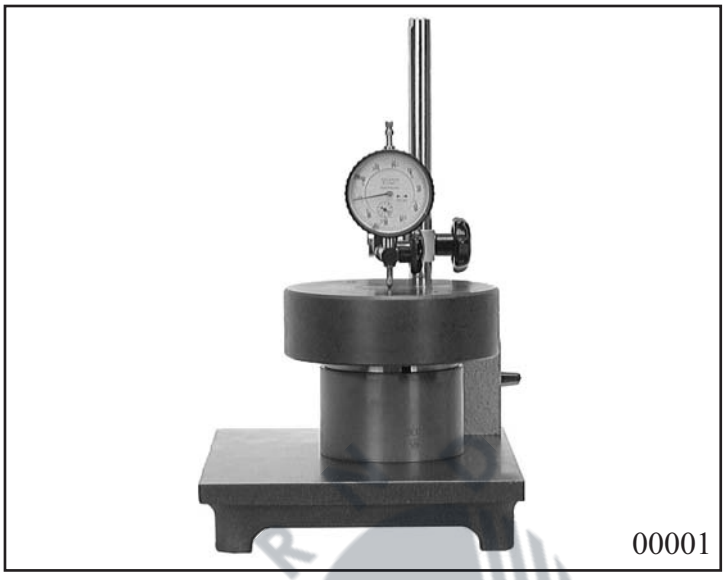
Adjustment Instruction 1068 700 067


05095

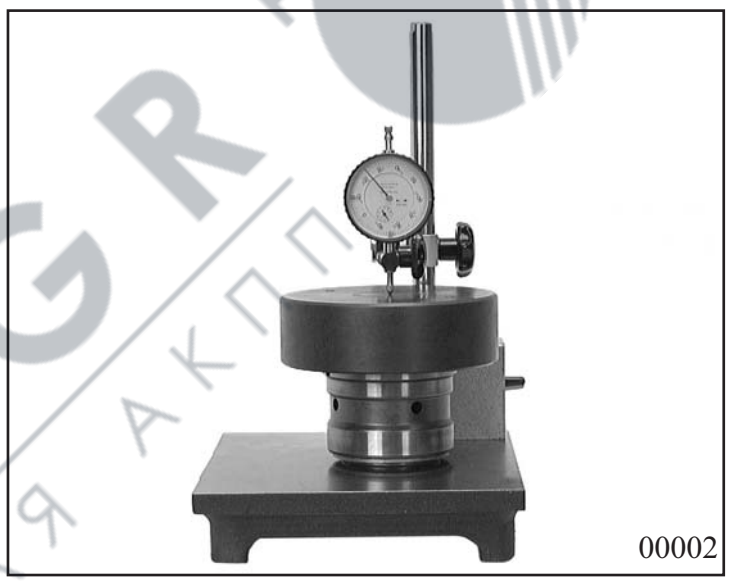
Insert the measuring part in the gearbox housing on the bearing support surface. Read the dimension M_R (plug gauge on measuring radius). Rotate the gearbox back by 90°.
The overall dimension G is derived from the calibrating equipment dimension M_{ER} plus measuring fixture M_{MR} plus the measured dimension M_R
Calculation:
$G = M_{ER} + M_{MR} + M_R$
Note!
M_R can be a negative value too. Pay attention to the direction the dial's pointer moves!

1.4.3.2 Pinion Shaft Bearing Installation Height

Place the differential side of the bearing inner ring on the measuring plate.
Insert the bearing outer ring in the measuring sleeve 5p01 030 355 and place on the bearing ring.
Place the weight 5p01 010 355 and place in the middle under the dial's measuring sensor.
Set the dial to "0".
Lift the measuring sensor and pull the measuring package forward.
Lift the weight and remove the bearing outer ring from the measuring sleeve.


00001

Place the differential side of the bearing inner ring on the measuring plate.
Place the bearing outer ring on the inner ring and load with weight 5p01 010 355.
Place the measuring package in the middle under the dial's measuring sensor.
Turn bearing several times and read measured value ⇨ M_L
The bearing installation height L is derived from the sleeve height H_H minus M_L


00002

Calculation:
$L = H_H - M_L$

1.4.3.3 Pinion Shaft Bearing Adjustment Spacer

Read dimension R from the pinion.
The adjustment spacer pinion position is derived as follows:

Calculation:
S = G - L - R

Example (for 1.4.3.3)

M_{ER} = 93.596 mm
M_{MR} = 60.964 mm
M_R = -3.02 mm
R = 94 mm

H_H = 57 mm
M_L = - 0.76 mm

G = 93.596 + 60.964 – 3.02
= 151.54 mm
L = 57 – 0.76
= 56.24 mm

S = 151.54 – 56.24 - 94
= 1.30 mm

Select the appropriate spacer.
The spacer may be up to 0.02 mm bigger D but must not be smaller D than the desired size.

⇨ S = 1.30 mm

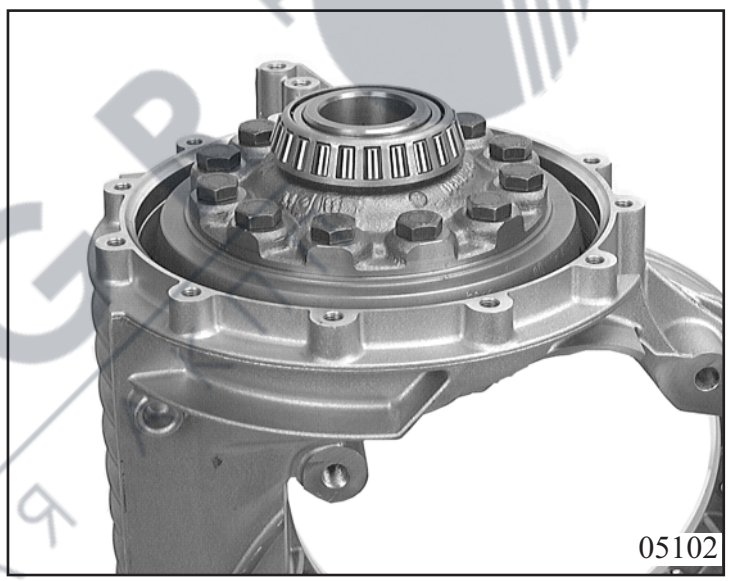
1.4.3.4 Flank Clearance/Crown Wheel Position

Note!
Experience shows that the disc in the differential cover is 0.2 – 0.5 mm thinner than the disc in the differential housing.

D_G = 0.2 – 0.5 mm

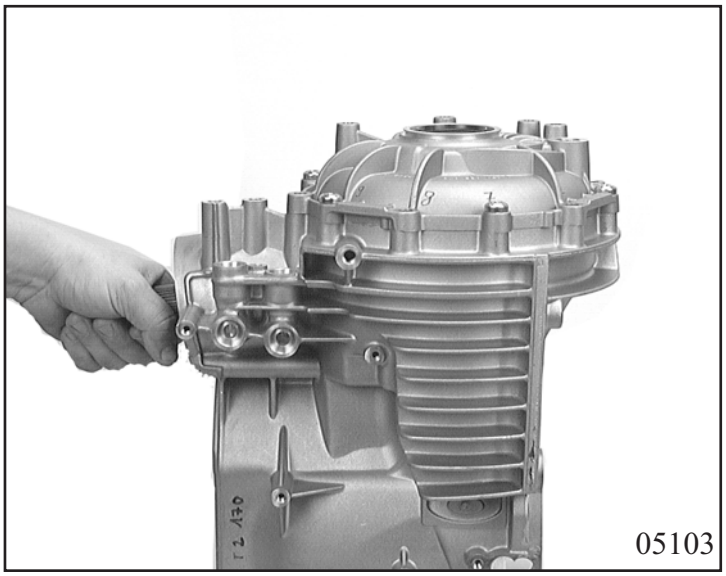
Calculation:
$M_U = (M_{GA} + D_G) / 2$
$M_O = M_{GA} - M_U$

Install the disc and bearing outer ring in the gearbox housing.
Install the differential in the gearbox housing.
Complete the cover with disc and bearing outer ring.

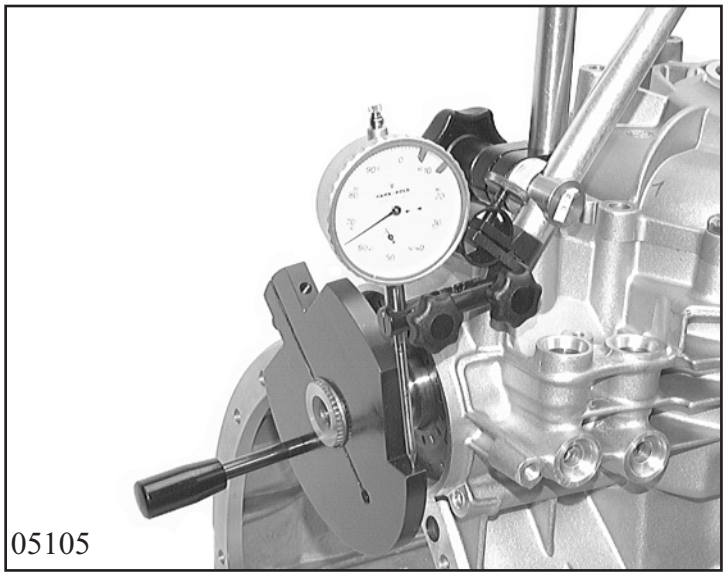

05102

Screw the cover to gearbox housing with 6 offset screws and ensure that some flank clearance remains.
The flank clearance is noticeable when turning the pinion shaft!
Turn the pinion shaft approx. 15 turns.

(Tightening torques see Chapter 1.5)

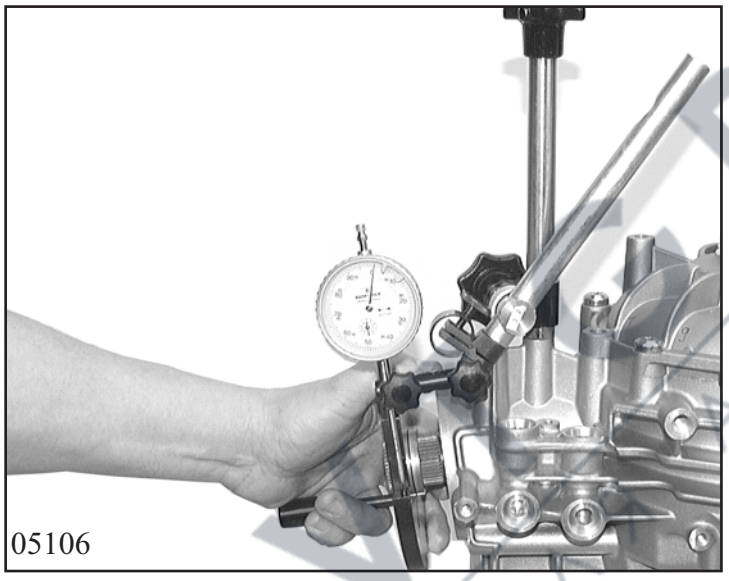

05103

Attention!
The measuring is done without the O-ring on the differential cover.



05105

Lock the flank clearance measuring disc 5x46 010 384 on the lateral shaft.
Screw the measuring tripod standing column 5x46 010 384 into the gearbox housing and lock the lateral holder 5x46 010 384 so that the measuring sensor stands on the marked measuring disc's measuring surface at a right angle.



05106

Turn the pinion shaft to one side to the pinion/bevel gear teeth stop. Set the dial to "0".
Carefully turn the pinion shaft to the stop in the contrary direction.
Repeat the process twice after turning the pinion shaft by 360° and average measuring values M_1, M_2, M3 as ⇨ M_F

According to instruction1068 700 067, flank clearance M_F must be between 0.26 and 0.39 mm (tooth relation 11/32) or 0.23 to 0.34 mm (tooth relation 12/31).

M_F > tolerance : M_U too thick
M_F < tolerance: M_U too thin

Attention!
If the value differs from the target flank clearance, measure the disc thickness again. The overall disc thickness must remain unchanged.

<u>Measure again.</u>

Remove the measuring tripod and disc again afterwards.
Screw off the differential cover and take it off.

Example. (for 1.4.3.4)

M_{GA} = 2.45 mm
D_G = 0.25 mm
(selected disc difference)

1st measurement:
M_U = (2.45 + 0.25) / 2
= 1.35 mm
M_O = 2.45 – 1.35
= 1.1 mm

Measured flank clearance:
M_F = 0.4 mm
⇨ not OK

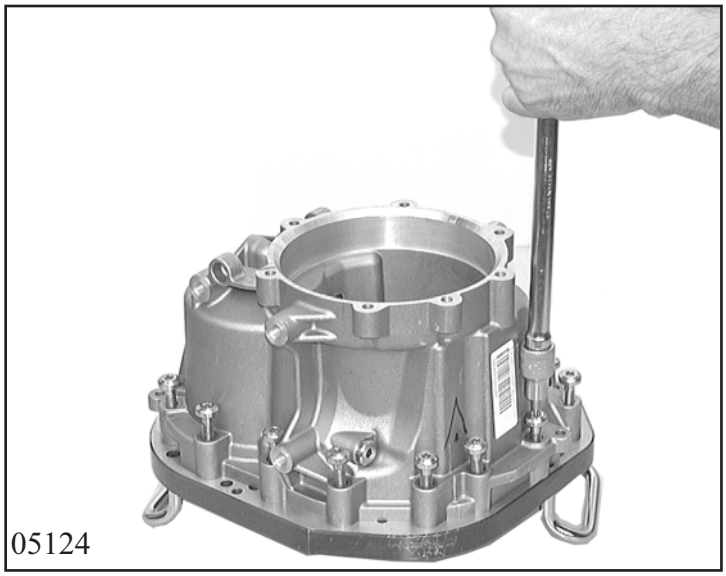
M_F > tolerance ⇨ MU decrease:

2nd measurement:
M_U = 1.25 mm
M_O = 2.45 – 1.25
= 1.20 mm

Measured flank clearance:
M_F = 0,25 mm
⇨ OK

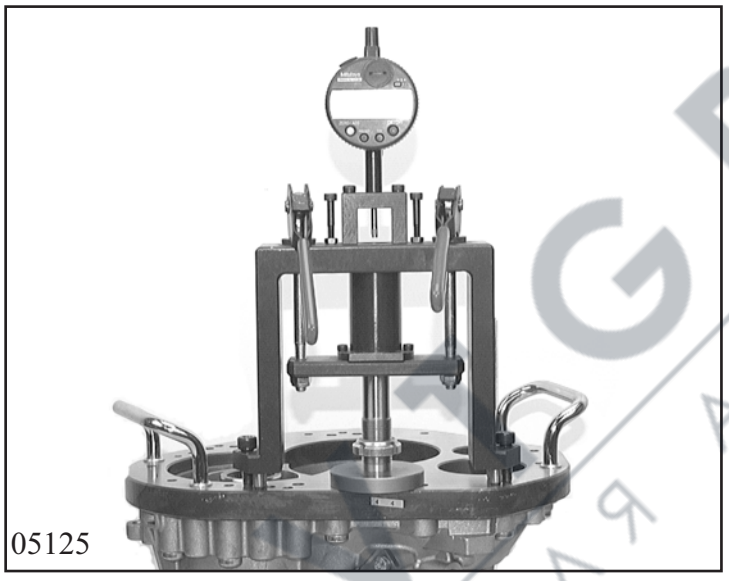
1.4.4 Axial Output (Disc)

1.4.4.0 Preparing the Intermediate Housing Measurement

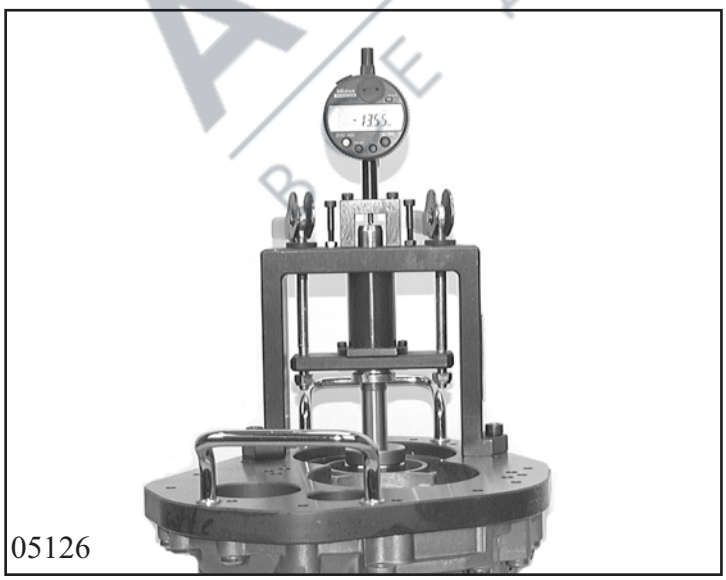

05124

Insert the input gear in the intermediate housing.
Place the bearing ring on the input gear and screw it on.
Place the measuring plate 5p01 003 115 on the intermediate housing.
Turn the package by 180° and bolt together with 14 screws.

1.4.4.1 Measuring the front axle shaft


05125

Turn the package by 180°.
Place the pressure stamp 5p01 053 115 on the plate and set the dial from the stirrup to the fixed value $\mathbf{M_{FA}}$ (= -7.61) engraved on the measuring stirrup.


05126

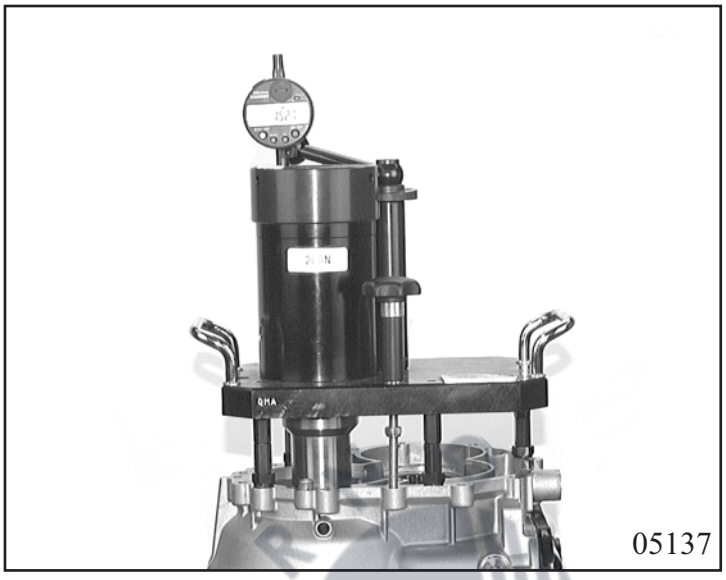
Place the stamp and stirrup on the input wheel and bolt on.
Brace the measuring device and turn round the drive gear several times.
Read measured value. ⇨ $\mathbf{M_{AA}}$.

Remove the fixture from the measuring plate.

1.4.4.2 Measuring the Axial Output Clearance Installation Space

Measure the values using the measuring equipment 5p01 003 117 and the calibration tool 5p89 005 823.

Read measured value ⇨ $\mathbf{M_{AB}}$



1.4.4.3 Calculating the Axial Output Clearance Adjusting Spacer

The adjusting spacer is calculated as follows

$$\mathbf{S_{AA} = M_{AB} + M_D + M_{AA}}$$

Adjustment values 0.068 to 0.432 mm according to **instruction 1068 700 065**

Calculation example: (for 1.4.4)

[M_{FA} = - 7.61 mm]
M_D = 0.37 mm

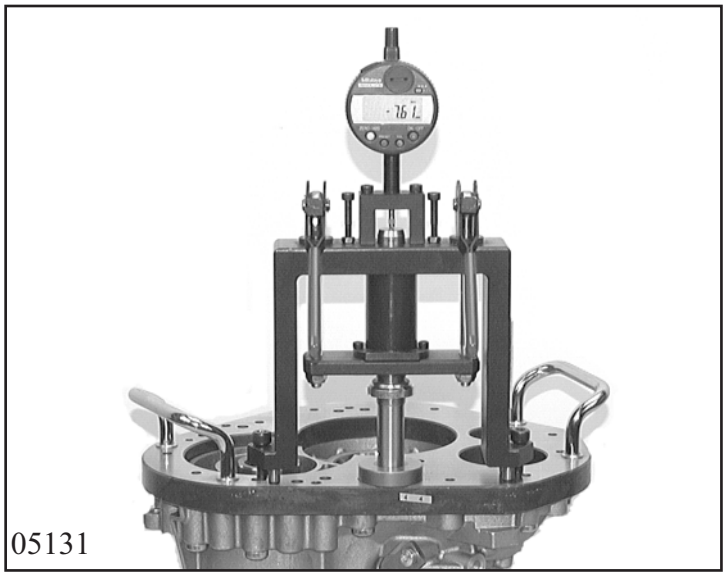
M_{AA} = - 13.55 mm
M_{AB} = - 15.27 mm

S_{AA} = 15.27 + 0.37 – 13.55
= 2.09 mm

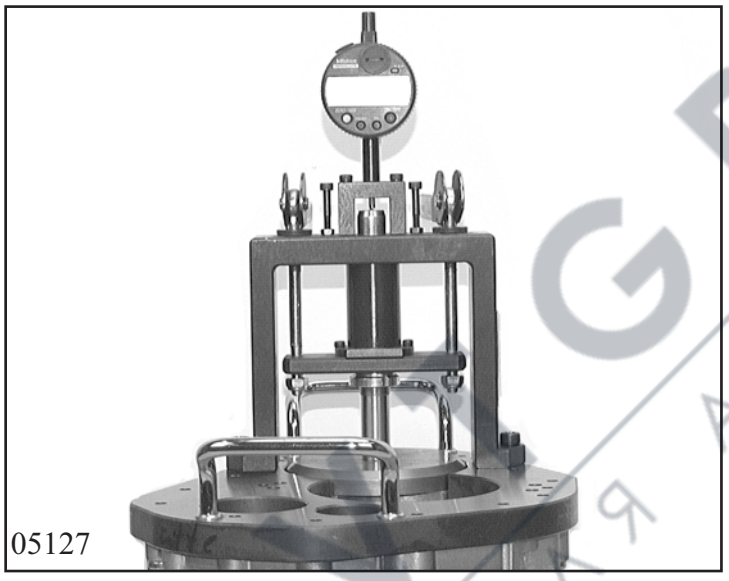
chosen:
⇨ S_{AA} = 2.0 mm

1.4.5 Drive gear (Disc)

1.4.5.1 Measuring the Drive Gear Installation Height

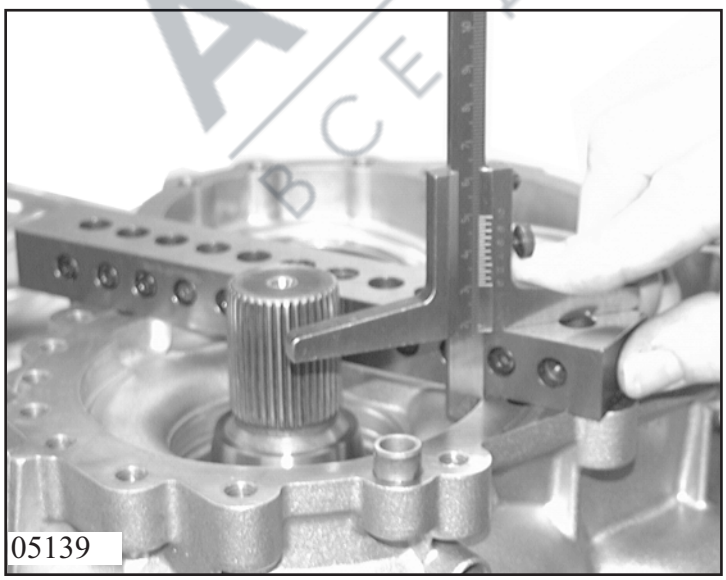


Place the pressure stamp 5p01 033 115 on the plate and set the dial from the stirrup to the fixed value $\mathbf{M_{FA}}$ (= -7.61) engraved on the measuring stirrup.



Place the pressure plunger on the bearing ring and screw on with the measuring stirrup. Turn the drive shaft several times. Read measured value ⇨ $\mathbf{M_{RB}}$

1.4.5.2 Measuring the Drive Gear Installation Space



Place the depth gauge on the intermediate housing/gearbox housing sealing surface and measure down 3 times offset by 120° to the input shaft bearing seat. Calculate the average of the measured values. Calculate the average of the measured values $\mathbf{M_1}$, $\mathbf{M_2}$, $\mathbf{M_3}$ ⇨ $\mathbf{M_{RA}}$

1.4.5.3 Calculating the Drive Gear Adjusting Spacer

The adjusting spacer is calculated as follows:

$S_{RA} = M_{RA} + M_D - M_{RB}$

Adjustment values –0.097 to 0.047 mm in accordance with the **instruction 1068 700 066**

Calculation example: (for 1.4.5)

[M_{FA} = -7.61 mm]
M_D = 0.37 mm

M_R = 8.89 mm

M_1 = 10.05 mm
M_2 = 10.00 mm
M_3 = 10.00 mm

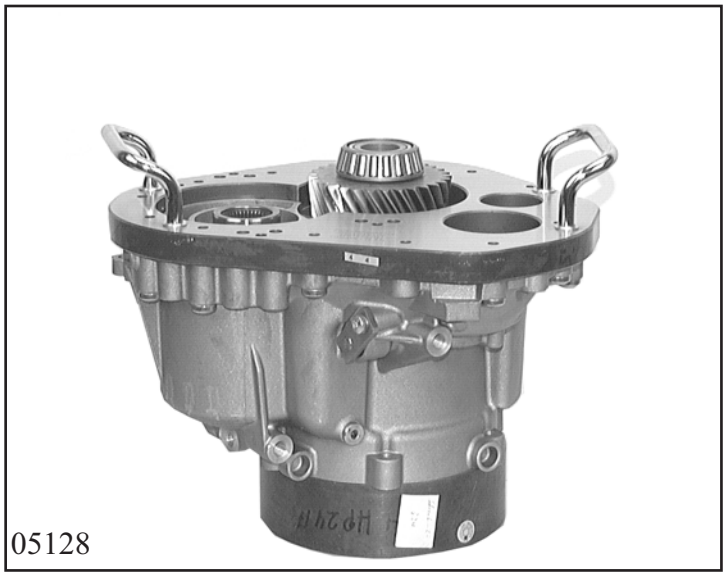
M_{RA} = (10.05 + 10 +10) / 3
= 10.02

S = 10.02 + 0.37 – 8.89
= 1.5

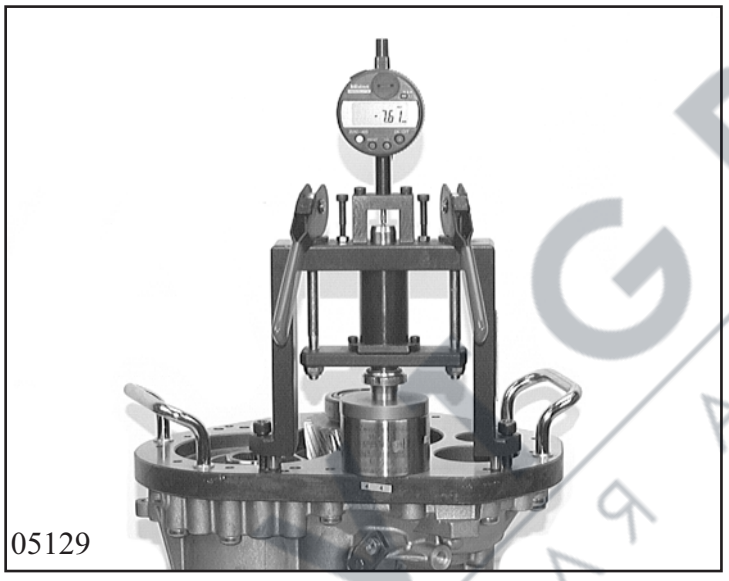
chosen:
⇨ S_{RA} = 1.5 mm

1.4.6 Front Axle Shaft (Disc)

1.4.6.1 Measuring the Front Axle Shaft Installation Height

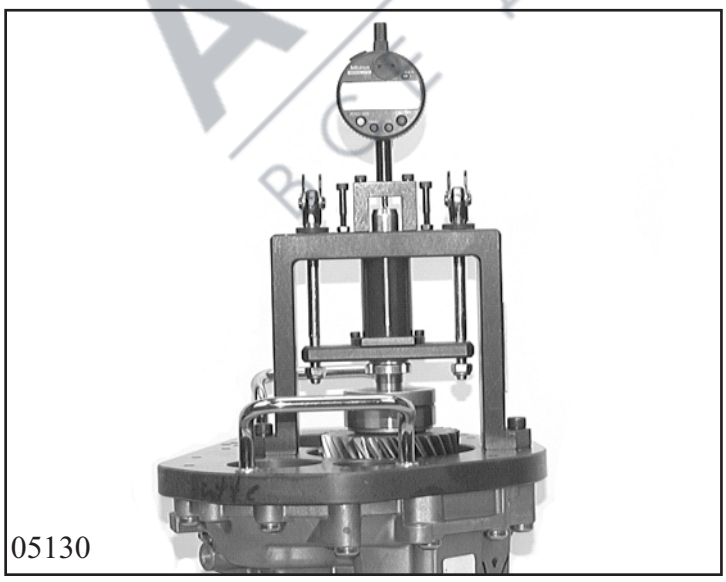

05128

Place the intermediate housing on the support block (> 40 mm).
Put the front axle shaft into the intermediate housing.


05129

Place the gauge 5p89 005 821 on the measuring plate. ⇨ **M_{RE} = 39.08**

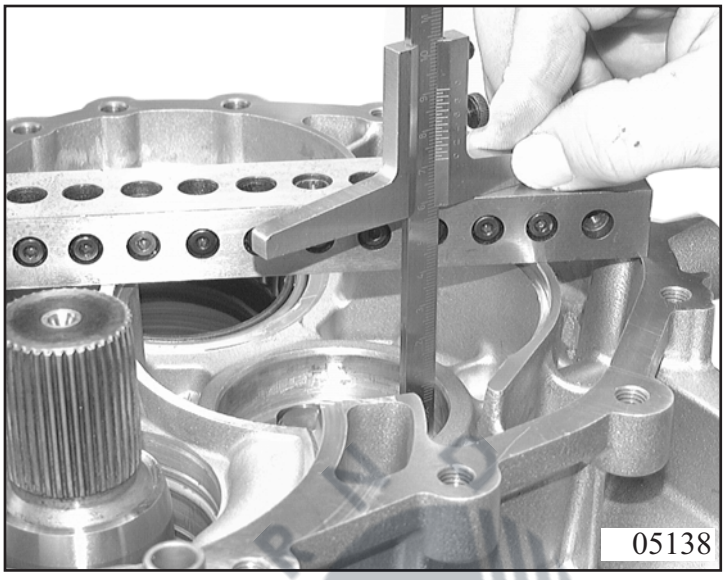
Place the pressure stamp 5p01 043 115 on the plate and set the dial from the stirrup to the fixed value **M_{FA}** (= -7.61) engraved on the measuring stirrup.


05130

Place the bearing cup on the front axle shaft.
Place the pressure stamp on the bearing cup and screw on with the measuring stirrup. Lock the measuring device and turn the front axle shaft several times.

Read measured value. ⇨ **M_{VA}**

1.4.6.2 Measuring the Front Axle Shaft Installation Space



Pull the guide bush out of the gearbox housing if necessary.
Place the depth gauge on the intermediate housing/gearbox housing sealing surface and measure down 3 times offset by 120° to the input shaft bearing seat.

Calculate the average of the measured values M_4, M_5, M_6.⇨ M_{VB}

1.4.6.3 Calculating the Drive Gear Adjusting Spacer

The spacer is calculated as follows:

$$S_{VA} = M_{VB} + M_D - M_{RE} - M_{VA}$$

Adjustment values –0.097 to 0.047 mm in accordance with the **instruction 1068 700 059**

Calculation example: (for 1.4.6)

M_D = 0.37 mm
M_{RE} = 39.08 mm

M_{VA} = - 11.16 mm

M_4 = 51.35 mm
M_5 = 51.40 mm
M_6 = 51.40 mm

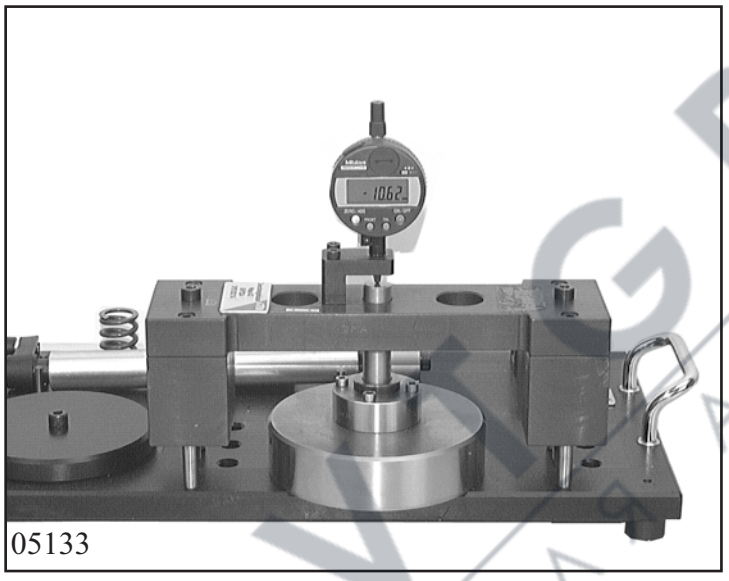
M_{VB} = (51.35 + 51.4 + 51.4) / 3
= 51.38 mm
S_{VA} = 51.38 + 0.37 – 39.08 – 11.16
= 1.48

chosen: ⇨ S_{VA} = 1.5 mm

1.4.7 Drive Gear (Disc)
1.4.7.1 Measuring the Drive Gear Installation Space

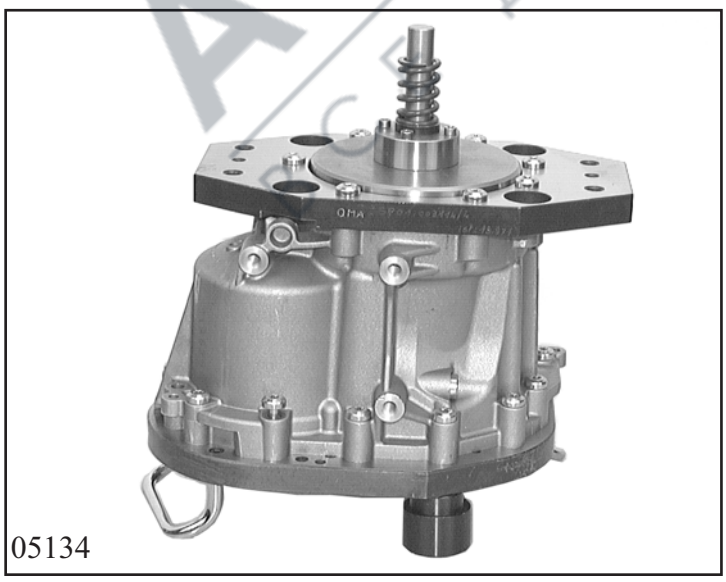

05132

Turn the housing by 180° and stabilise with appropriate little blocks.
Screw the plate 5p01 003 114 onto the intermediate housing sealing area with 7 screws.



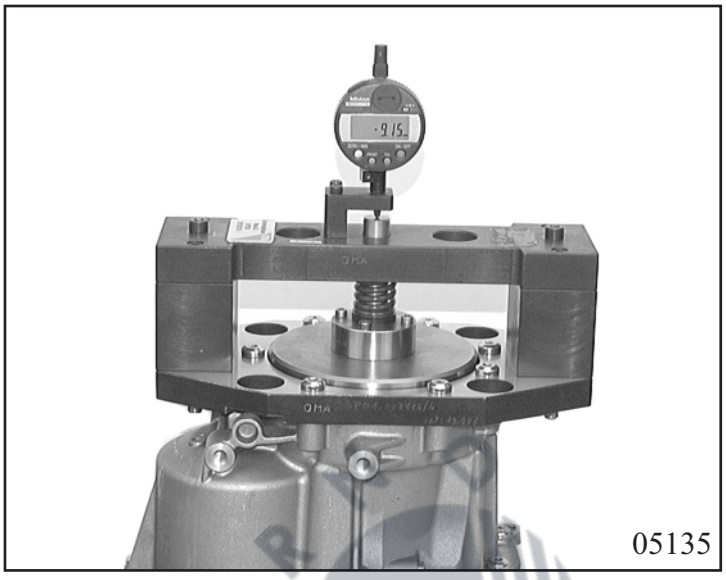
05133

Place the measuring bridge 5p01 003 114 on the pressure plate 5p01 043 114 and set the dial gauge to the engraved fixed measuring value $\mathbf{M_{FA}}$ (= -10.62) from the measuring bridge.


05134

Place the pressure plate with spring and ring on the bearing ring.

Place the measuring bridge over the pressure plate and screw plate on. Turn the drive gear several times using the drive shaft.
Read measured value. ⇨ $\mathbf{M_{BB}}$



1.4.7.2 Measuring the Drop Housing Installation Space

Place the measuring bar on the upper drop housing edge.
Measure down 3 times offset by 120° to the drop housing sealing surface with the depth gauge.

Calculate the average of the measured values $\mathbf{M_6}$, $\mathbf{M_7}$, $\mathbf{M_8}$ ⇨ $\mathbf{M_{BA}}$

1.4.7.3 Selecting the Drive Gear Adjusting Spacer

The spacer is calculated as follows:

$\mathbf{S = M_{BB} - M_{BA}}$

Adjustment values –0.097 to 0.047 mm in accordance with the **instruction 1068 700 058.**

Calculation example: (for 1.4.7)

M_{BB} = -9.15 mm

M_6 = 7.95 mm
M_7 = 7.95 mm
M_8 = 8.0 mm

M_{BA} = (7.95 + 7.95 + 8.0) / 3
= 7.97

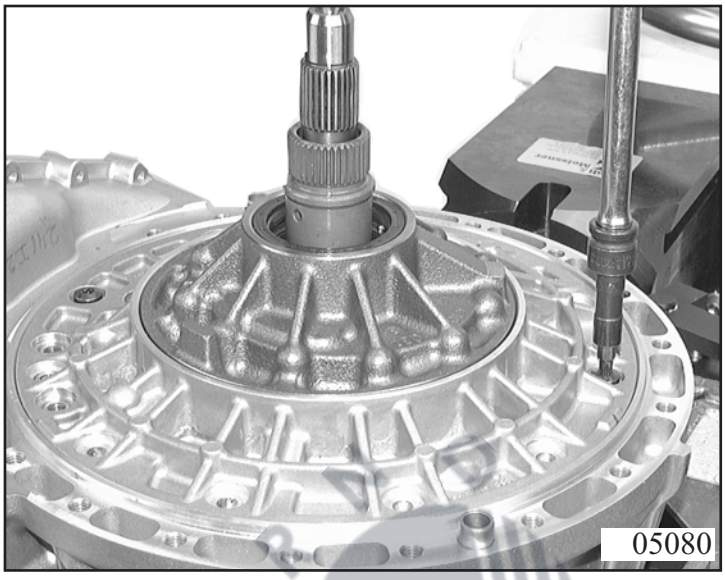
S = 9.15 – 7.97
= 1.18

chosen:
⇨ S = 1.20 mm

1.4.8 Axial Clearance (Disc)

Tighten the oil supply with 2 opposing cylinder screws 10.080 in the housing.

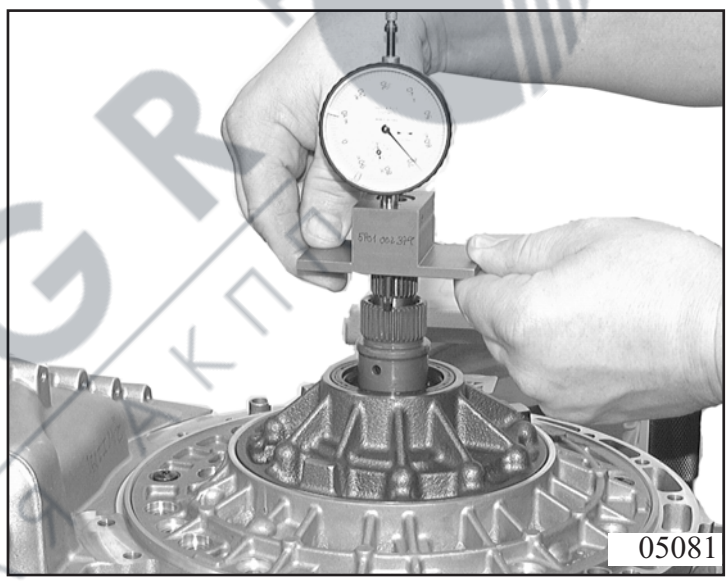
(Tightening torques see Chapter 1.5)



Precondition:
The shim 10.090 (thickness = 2.6 mm, thinnest according to WTB) must be placed.

Put the measuring device 5p01 002 379 over the drive shaft teeth and lock about 2 mm above the stator shaft with the set screw.

Set dial gauge to 0.

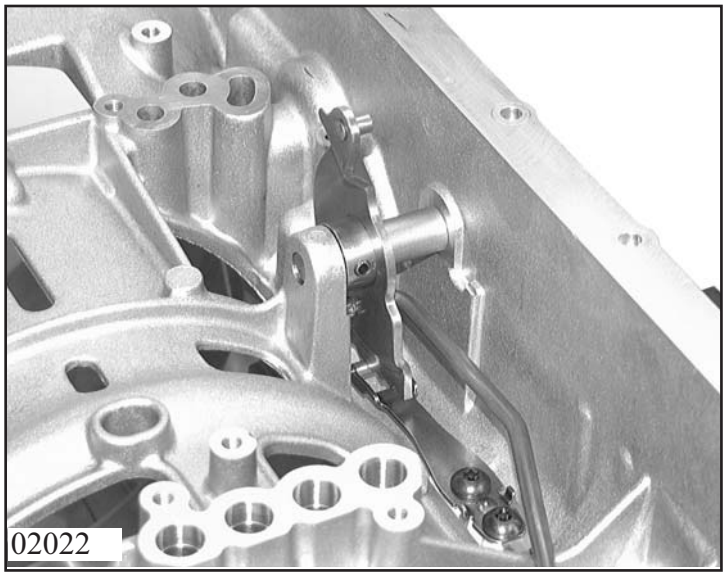


Measure the axial clearance by pressing and pulling the handle (repeat multiple times).

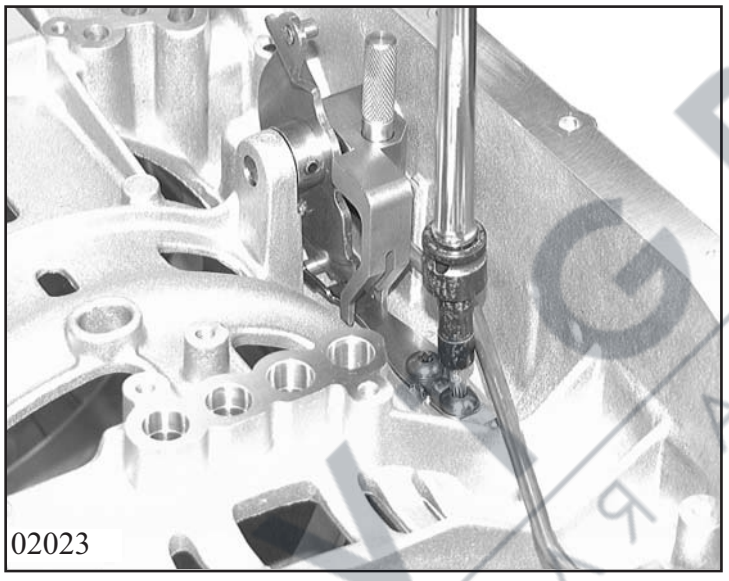
Axial clearance target value = 0.2 – 0.4 mm with a force of 200N (dry in accordance with **test instruction 1068 700 051)**

In case of deviations, insert a correspondingly thicker or thinner spacer 02.260.
Check axial clearance afterwards.

1.4.9 Setting the Switch (Interlock Spring)

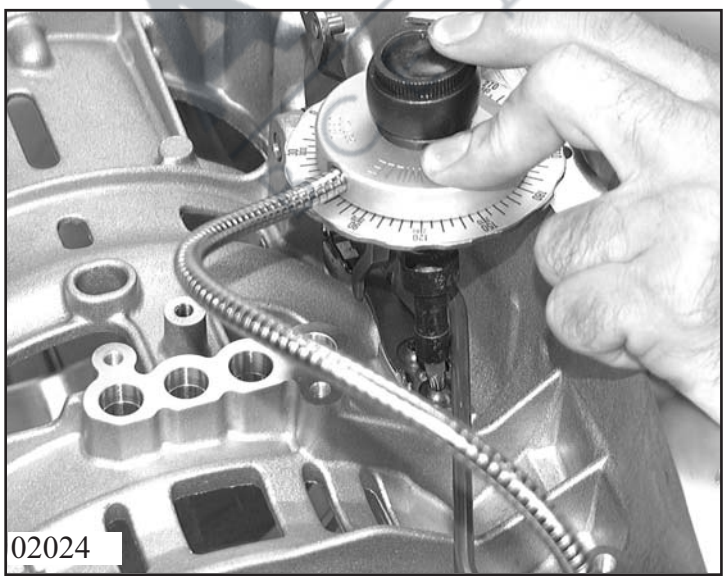


Set the stop plate to N (Neutral) position with a suitable tool or by hand.



Align interlock spring with centring device Align 5x46 002 292 and tighten the interlock spring in this position. Tighten the screw on the side first.

(Tightening torque see Chapter 1.5)



Then turn further by the turning angle with auxiliary tool 5w04 000 583. Remove the centring device. Switch the selector shaft through all positions and remove.

(Tightening torque see Chapter 1.5)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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	3.1/2	35 Nm (±3.5 Nm)
2	Screw plug M10x1 (gearbox housing)	01.100	Hexagon socket SW = 5 mm	3.1/3	12 Nm (±1.2Nm)
4	Cylindrical screw M6x13 (interlock spring)	06.094	TORX - TX 27 H	3.1/3	4 Nm + 17° (±0.3 Nm ± 2°)
5	Torx screw M6x20 (guiding plate)	24.120	TORX - TX 27	3.1/5	10 Nm (±1.0 Nm)
6	Torx screw M6x28 (stator shaft/intermediate plate)	10.040/150	TORX - TX 27	3.3/3	10 Nm (±1.0 Nm)
7	Torx screw M6X28 (intermediate plate/centring plate)	10.040/180	TORX - TX 27	3.3/3	15 Nm (±1.5 Nm)
8	Torx screw M6x46 (stator shaft/centring plate)	10.050	TORX - TX 27	3.3/3	15 Nm (±1.5 Nm)
9	Countersunk screw M6x50 (intermediate plate) M6x20	10.080 10.084	TORX - TX 27	3.3/4	10 Nm (±1.0 Nm)
10	Torx screw M6x59 (mechatronics) M6x20	27.450 27.500	TORX - TX 40	3.4/3	8 Nm (±0.8 Nm)
11	Torx screw M6x23 (oil pan)	03.020	TORX - TX 27	3.4/4	11.5 Nm (±1.15 Nm)
12	Screw plug M10x1 (oil pan)	03.010/120	Hexagon socket SW = 5 mm	3.4/4	12.0 Nm (±1.2 Nm)
13	Screw plug M30x1.5 (oil pan)	03.010/130	Hexagon socket SW = 8 mm	3.4/4	80.0 Nm (±8.0 Nm)
14	Hexagon screw (differential cage, see Chapter 1.3.1.7)	35.010/140	SW = 17 mm	3.5/2	
15	Locking nut (pinion shaft)	35.030	Special tool	3.5/3	120 Nm (±12.0 Nm)
16	Countersunk screw M6x20 (pinion shaft)	35.060	TORX - TX 30	3.5/3	10 Nm (±1.0 Nm)
17	Torx screw M6x14 (oil baffle plate)	22.130	TORX - TX 27	3.5/5	8.0 Nm (±0.8 Nm)

No.	Designation	Part List-Item-No.	Wrench size No.	Page	Tightening torque [Nm]
18	Torx screw M8x30 (differential cover)	35.210	TORX - TX 40	3.5/6	23 Nm (±2.3 Nm)
19	Torx screw M8x27 (converter bell)	22.300	TORX - TX 40	3.5/7	23 Nm (±2.3 Nm)
20	Torx screw M6x30 (intermediate housing pump)	38.390	TORX - TX 27	3.6/3	10 Nm (±1.0 Nm)
21	Tension bolt M10x240 (side shaft, see Chapter 1.3.1.6)	37.120	SW = 17 mm	3.6/4	
22	Torx screw M8x45 (intermediate housing)	38.550	TORX - TX 40	3.6/6	30 Nm (±3.0 Nm)
23	Screw plug M12x1.5 (intermediate housing)	38.190	Hexagon socket SW = 5 mm	3.6/6	20Nm (±2.0 Nm)
24	Torx screw M8x45 (drop housing)	36.140	TORX - TX 40	3.6/7	16 Nm (±1.6 Nm)
25	Torx screw M8x20 (vibration damper, use screw only once, self-locking)	36.110	TORX - TX 40	3.6/7	28 Nm (±2.8 Nm)
26	Torx screw M6x15 (oil cooler)	22.270	TORX - TX 27	3.7/2	10 Nm (±1.0 Nm)
27	Hexagon screw M12x70 and nut M12 (converter retaining bracket)	97.020	SW = 19 mm	3.7/2	15 Nm (±1.5 Nm)
28	Hexagon screw M10x14 (converter retaining bracket)	97.030	SW = 19 mm	3.7/2	15 Nm (±1.5 Nm)
29	Torx screw M8x30 (flange shaft)	35.430	TORX - TX 40	3.7/3	23 Nm (±2.3 Nm)
30	Cylindrical bolt M10x25 (gearbox support)	97.030	Hexagon socket SW = 8 mm	3.7/3	32 Nm (±3.2 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.

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.


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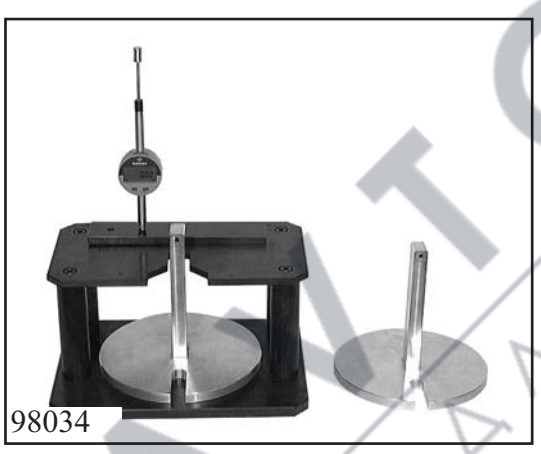
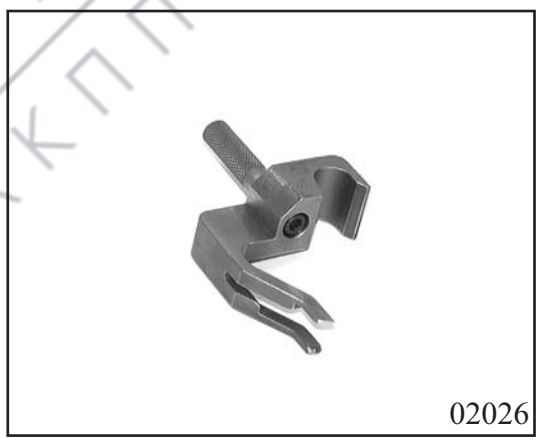
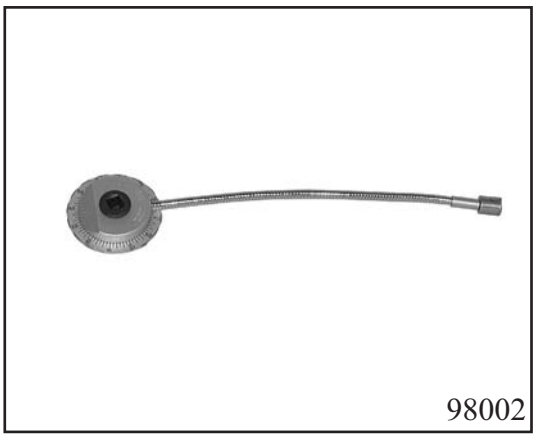
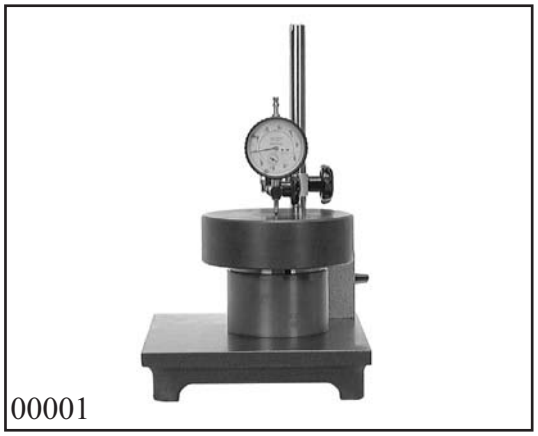
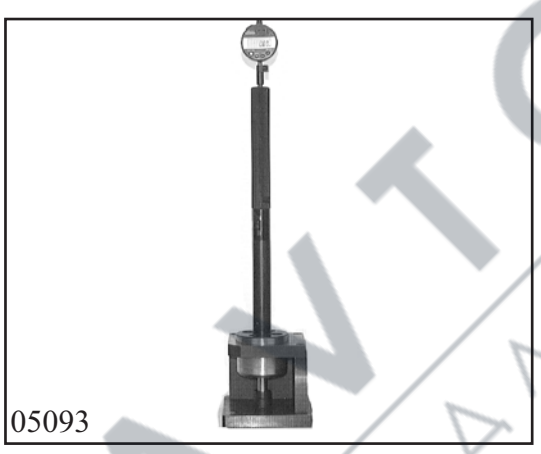
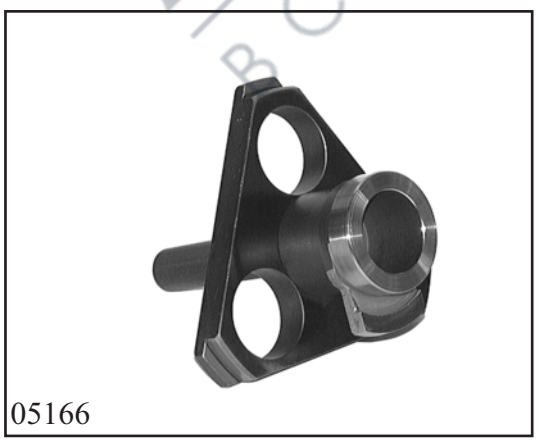
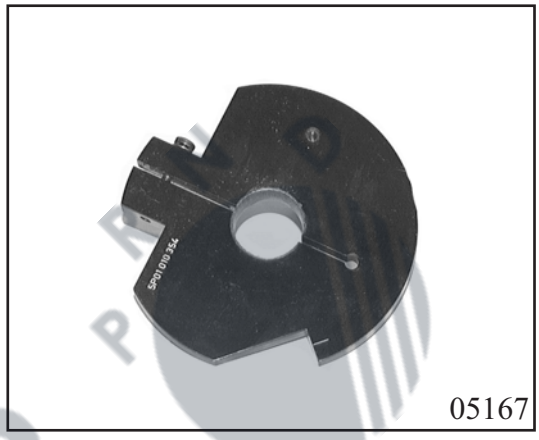
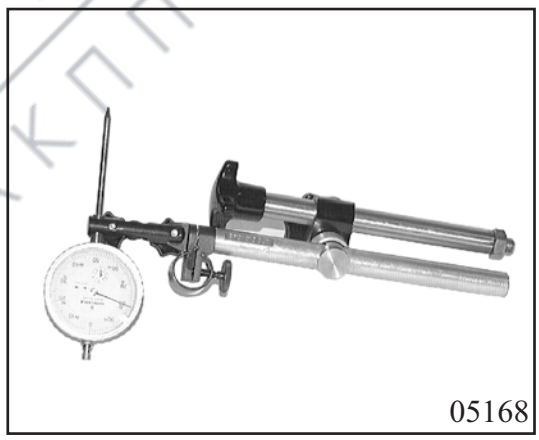
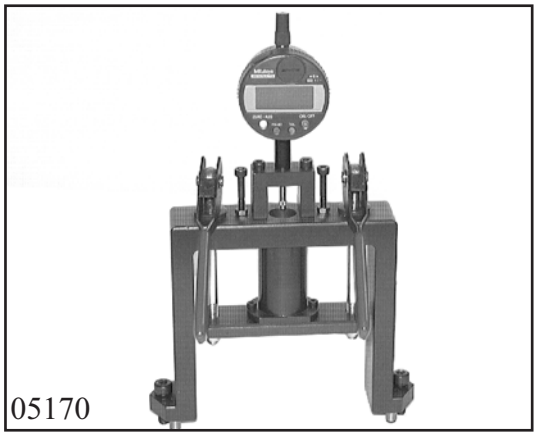
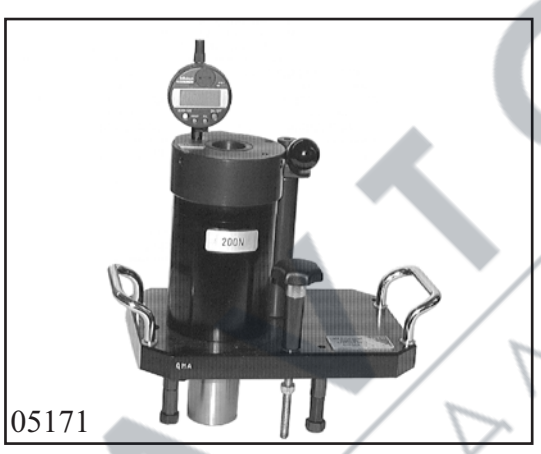
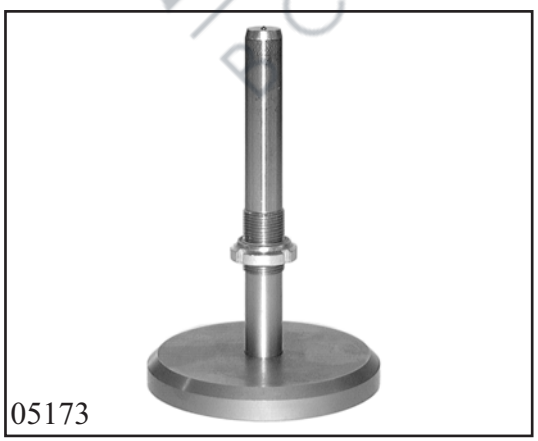
1.7 Special tools

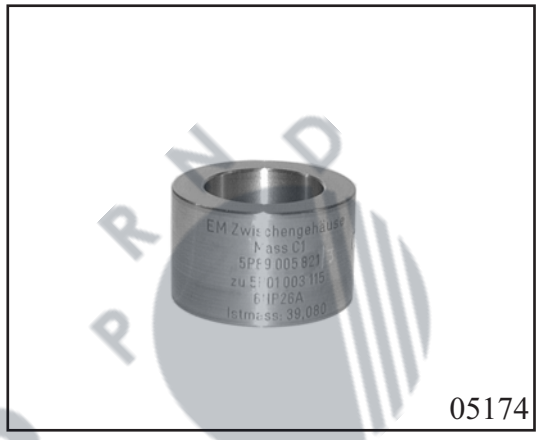
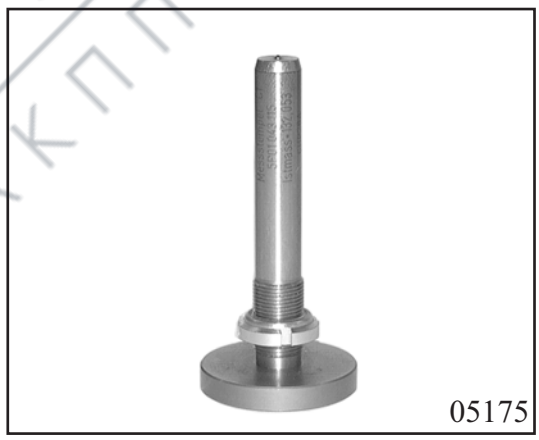
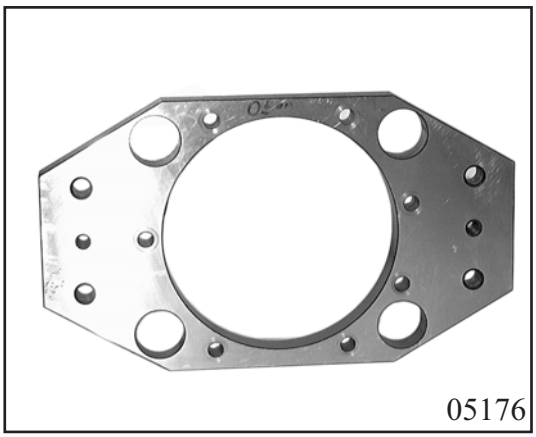
OBJECT	Order-No. / Application	Remarks
1  98008	5p01 000 329 Force measuring unit	identical 4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26
2  98034	5p01 000 330 Clutch play measuring device (Measuring plate: - short neck > 20 mm - long neck < 20 mm disc set thickness)	identical 4 HP 20 5 HP 19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

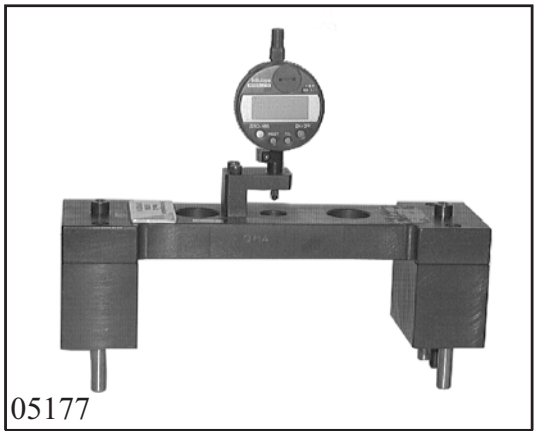
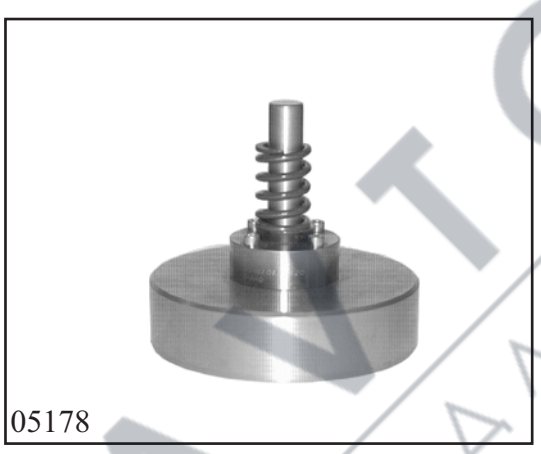
Remarks	Order-No. / Application	OBJECT
identical 6 HP 26	5p01 002 379 Axial clearance measuring device Drive shaft	4 
identical 6 HP 26	5x46 002 292 Centring device Interlock spring	5  02026
identical 5 HP 19 FL/A 5 HP 24 A 6 HP 26	5w04 000 583 Assembly turning device Interlock spring	6  98002

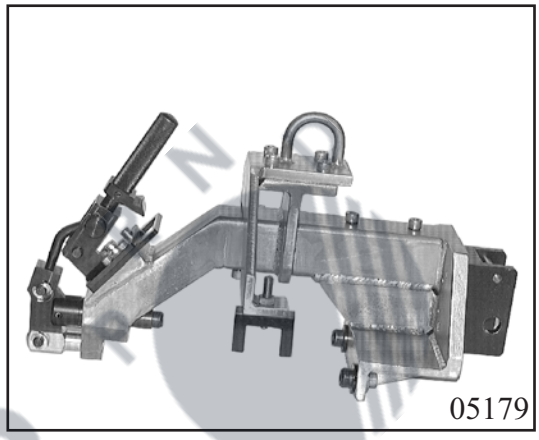
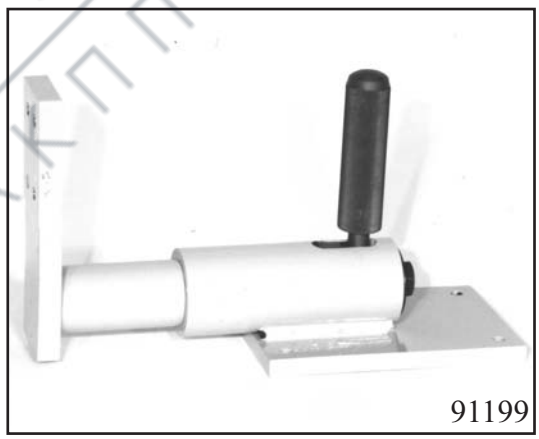
OBJECT	Order-No. / Application	Remarks
7  00001	5p01 000 355 Measuring device Pinion shaft bearing installation height	identical 5 HP 19 FL/A 5 HP 24 A
8  05093	5p01 002 604 Measuring device Pinion position	
9  05166	5p01 003 645 Measuring device (base plate) Pinion position together with: 5p01 003 646 Measuring extension *(6 HP 26 A61)*	identical 6 HP 19 A 6 HP 32 A

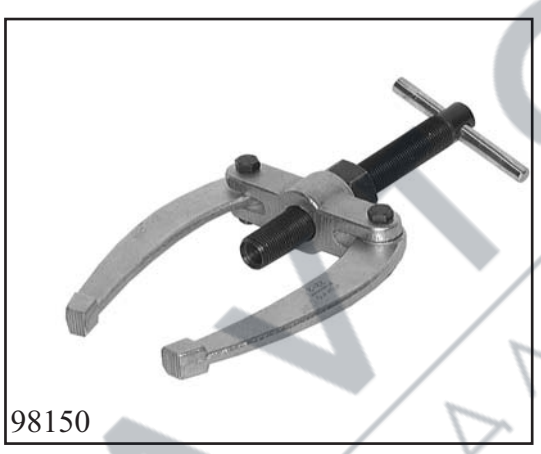
Remarks	Order-No. / Application	OBJECT
	5p01 010 354 Measuring disc Bevel gear flank clearance	10  05167
	5x46 010 384 Measuring tripod Bevel gear flank clearance	11  05168
	5p01 003 115 Measuring plate Intermediate housing	12  05169

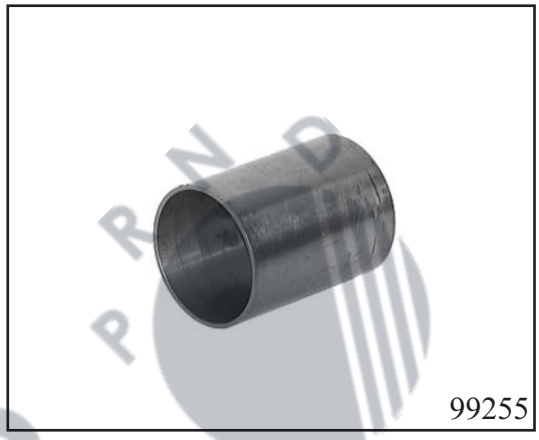
OBJECT	Order-No. / Application	Remarks
13  05170	5p01 053 115 Pressure stamp Intermediate housing	
14  05171	5p01 003 117 Measuring device Intermediate housing installation space	
15  05173	5p01 033 115 Pressure stamp Drive gear installation height	

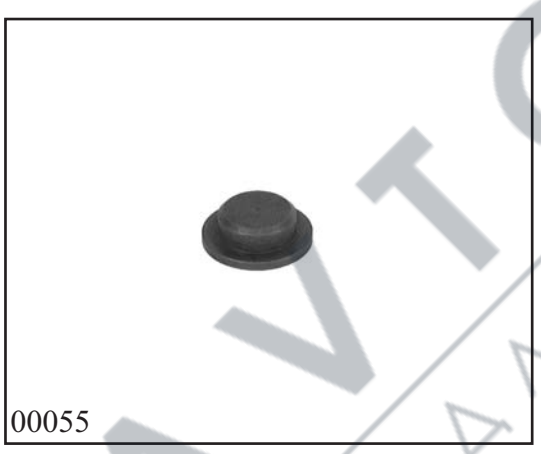
Remarks	Order-No. / Application	OBJECT
	5p89 005 821 Gauge Front axle shaft installation height	16  05174
	5p01 043 115 Pressure stamp Front axle shaft installation height	17  05175
	5p01 003 114 Measuring plate Drive gear installation space	18  05176

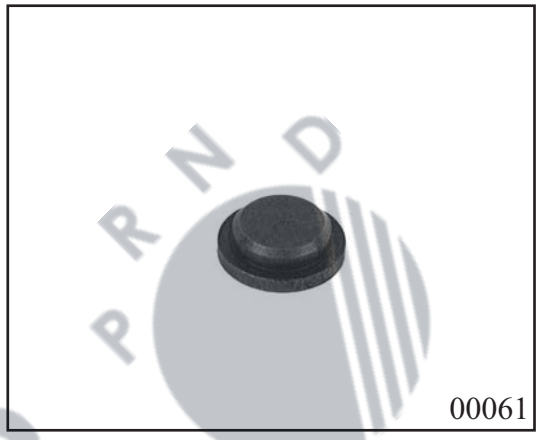
OBJECT	Order-No. / Application	Remarks
19  05177	5p01 003 114 Measuring bridge Drive gear installation space	
20  05178	5p01 043 114 Pressure plate Drive gear installation space	

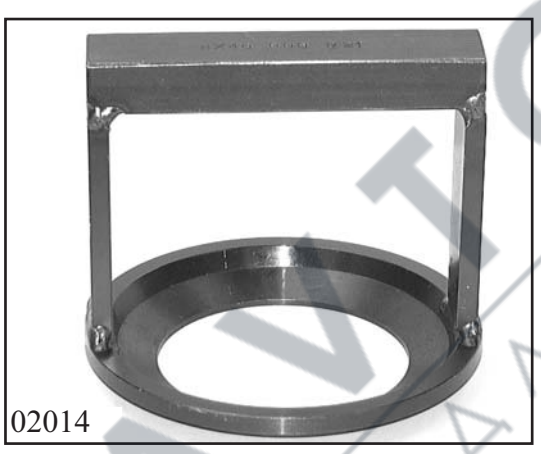
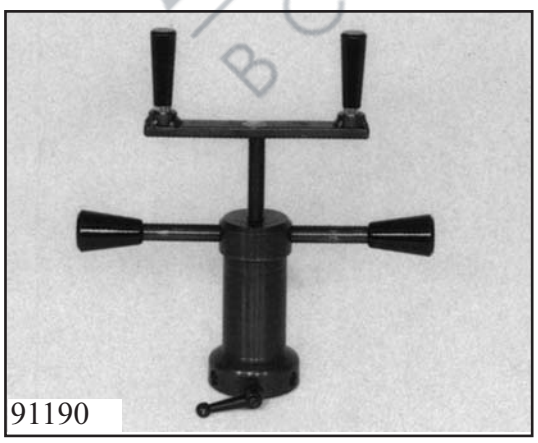
Remarks	Order-No. / Application	OBJECT
	5t66 000 128 Gearbox retaining bracket	21  05179
identical 5 HP 24 5 HP 25A 5 HP 30 6 HP 32	5x46 000 763 Workbench holder	22  91199
	5x 66 000 072 Adapter Side shaft tension bolt	23  05187

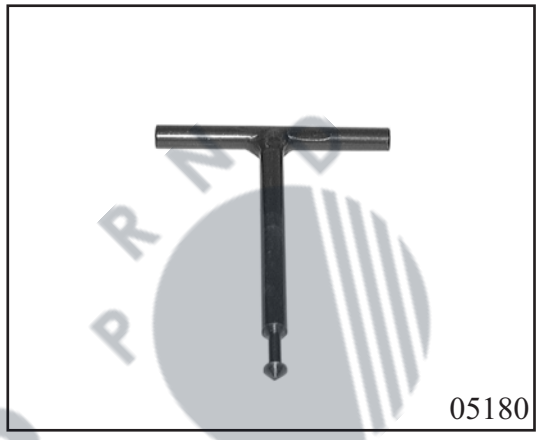
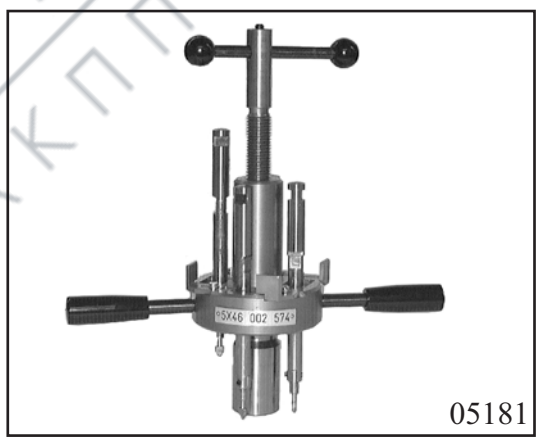
OBJECT	Order-No. / Application	Remarks
24  98149	5x46 021 007 Kukko extractor 21/7 or 5x46 021 008 Kukko extractor 21/8	identical 4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A 5 HP 24 A
25  98150	5x46 022 002 Kukko extractor 22-2 (basic device)	identical 4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A 5 HP 24 A
26  99275	5x66 000 030 Insert tool ring	identical 5 HP 19 FL/A 5 HP 24 A

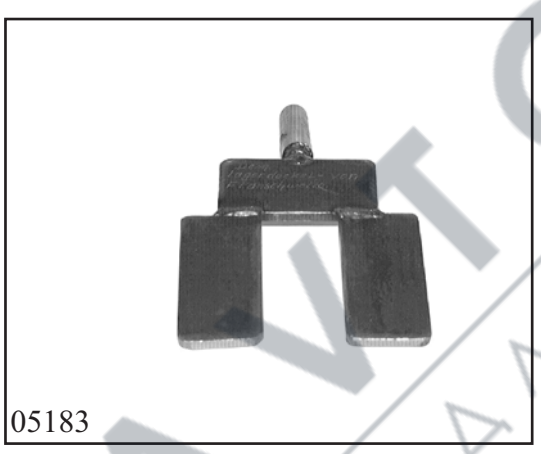
Remarks	Order-No. / Application	OBJECT
identical 4 HP 18 FL 5 HP 19 FL/A 5 HP 24 A	5x46 000 530 Double bearing disassembly sleeve Pinion shaft	27  99255
identical 4 HP 20 5 HP 19 FL/A 5 HP 24 A	5x46 032 010 Rollex extractor 32010X/1 (differential)	28  99155
identical 5 HP 19 FL/A 5 HP 24 A	5x46 806 649 Bearing inner ring extractor Rollex 806649	29  99270

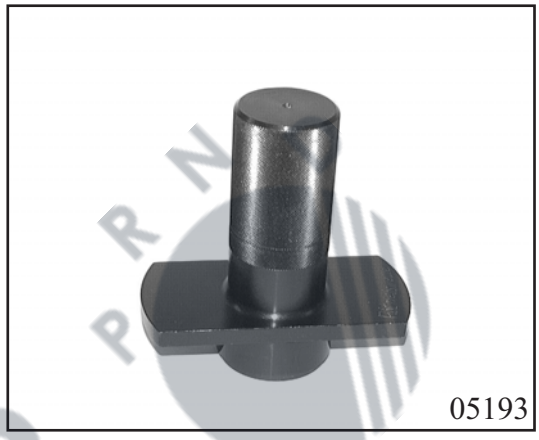
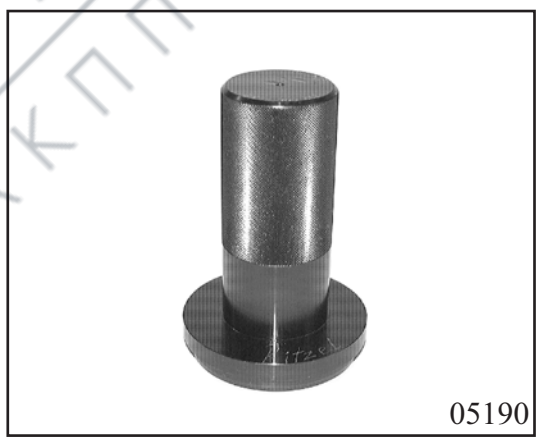
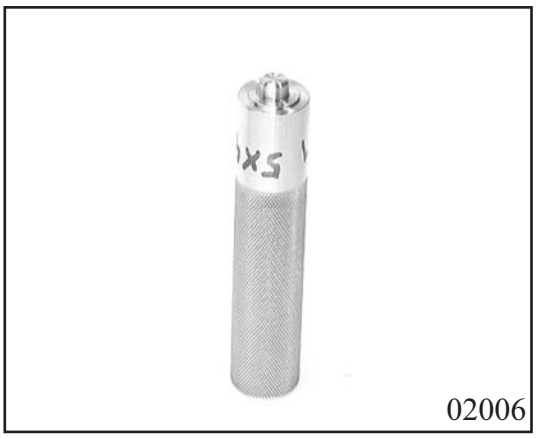
OBJECT	Order-No. / Application	Remarks
30  98152	5x46 010 011 Rollex extractor 1000/1 (basic device)	identical 3 HP 22 Q 4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A 5 HP 24 A
31  00055	5x46 002 159 Core Insert	identical 5 HP 19 FL/A 5 HP 24 A
32  99271	5x46 300 849 Bearing inner ring extractor Rollex 300849	identical 4 HP 18 Q 5 HP 19 FL/A 5 HP 24 A

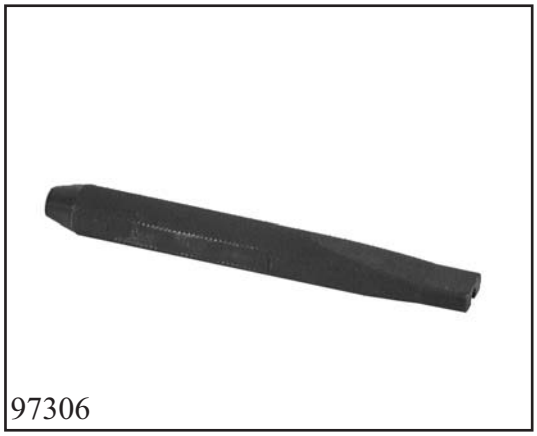
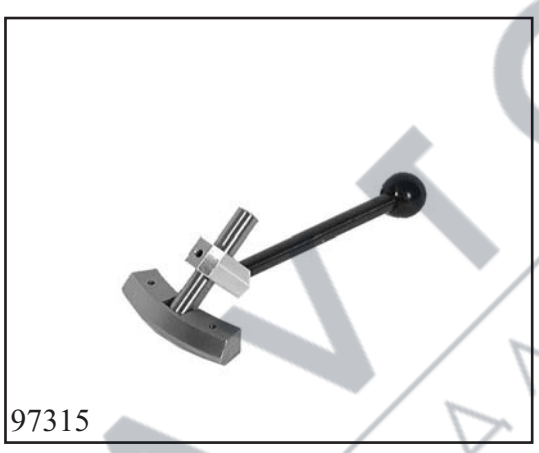
Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A 5 HP 24 A	5x46 002 287 Roller bearing inner ring core insert Differential housing side	33  00061
	5x53 000 004 Puller SSR drive shaft	34  05186
Identical 6 HP 26	5x46 002 566 Mounting bracket to clutch A, B, D, E	35  02008

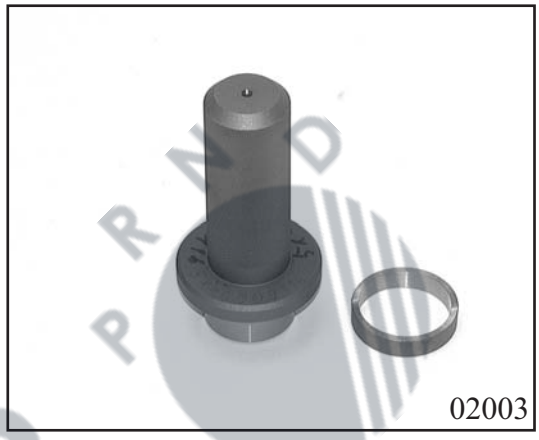
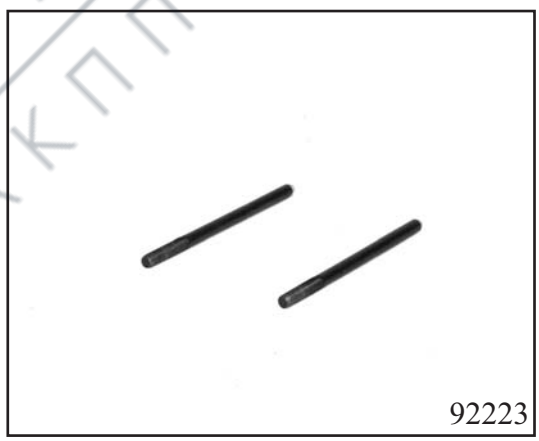
OBJECT	Order-No. / Application	Remarks
36  97312	5x46 001 501 Mounting bracket Brake C	Identical 5 HP 24 5 HP 24A 6 HP 26
37  02014	5x46 000 221 Mounting bracket brake C	Identical 5 HP 18 6 HP 26
38  91190	5x46 000 563 Oil supply lifting device	Identical 5 HP 18 5 HP 30 5 HP 24 A 6 HP 26

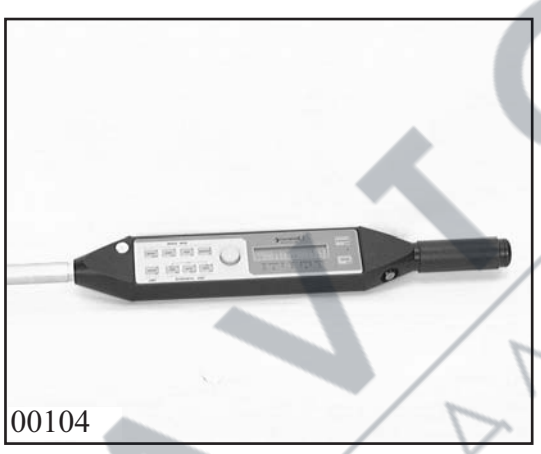
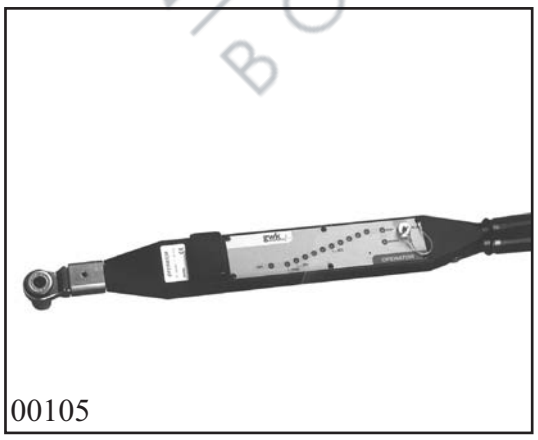
Remarks	Order-No. / Application	OBJECT
	5x95 000 410 Removal handle	39  05180
	5x46 002 574 Puller SSR pinion shaft	40  05181
	5x46 003 681 bracket and 5x46 003 680 tubular socket wrench Pinion shaft nut	41  05185

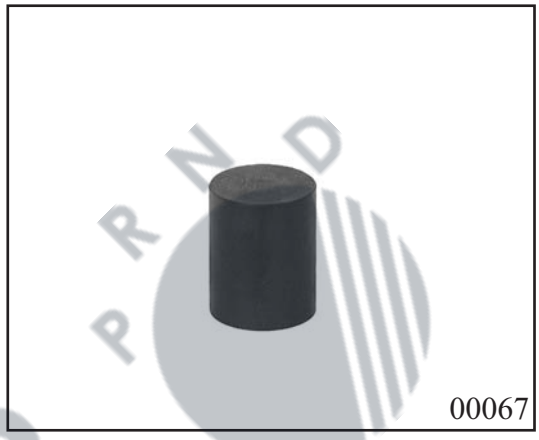
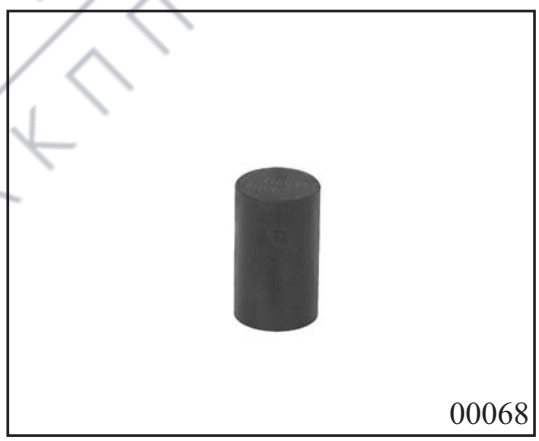
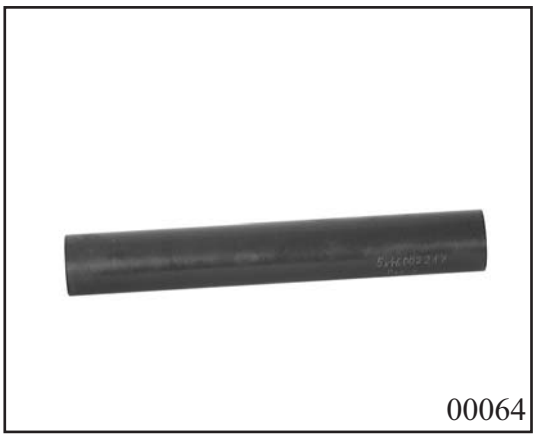
OBJECT	Order-No. / Application	Remarks
42  05182	5x46 909 305 Puller tool pinion shaft	
43  05183	5x46 003 632 Holding tool Flange shaft	
44  05194	5x46 002 852 Guide sleeve SSR drive shaft	

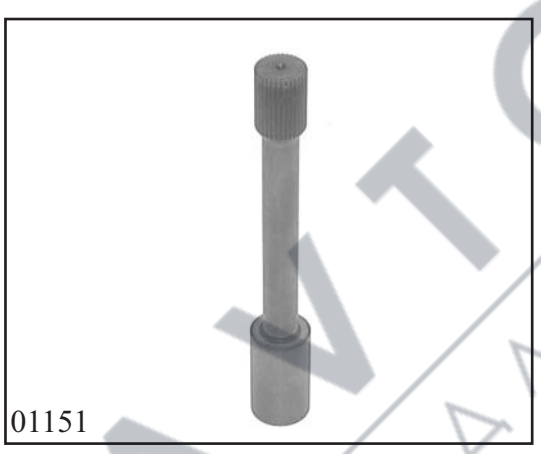
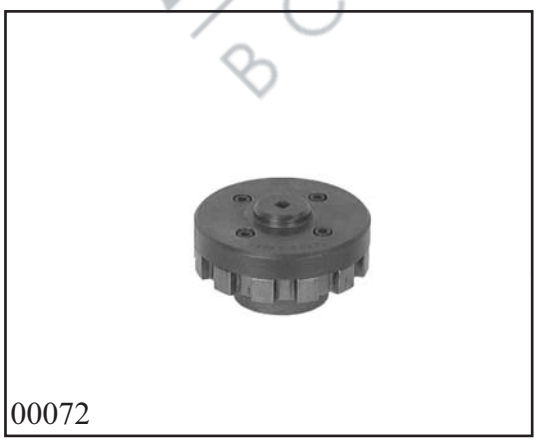
Remarks	Order-No. / Application	OBJECT
	5x46 909 268 Driving mandrel SSR output shaft	45  05193
	5x46 909 267 Driving mandrel SSR side shaft	46  05190
Identical 6 HP 26	5x46 002 561 Driving mandrel SSR selection shaft	47  02006

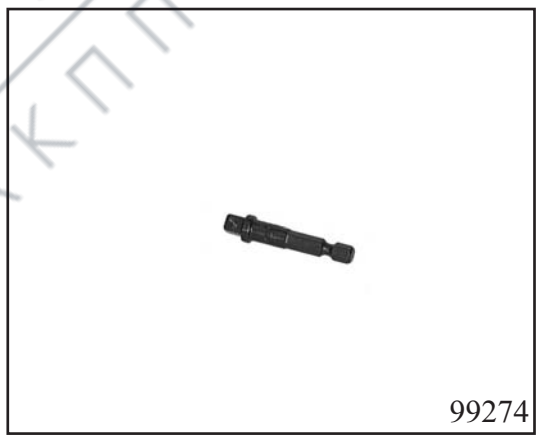
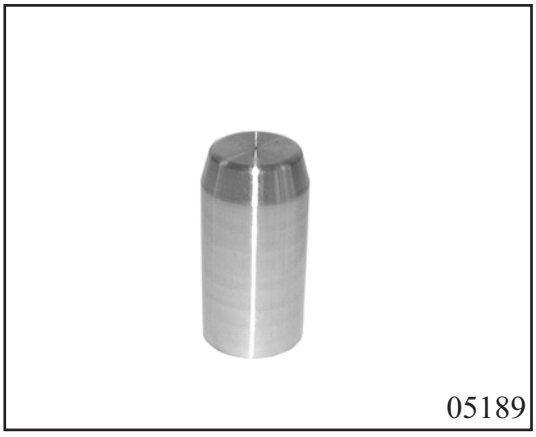
OBJECT	Order-No. / Application	Remarks
48  97306	5x46 000 291 Locking pin driving mandrel	Identical 4 HP 18 Q 5 HP 24 5 HP 24 A 6 HP 26
49  97315	5x46 001 930 Driving tool for snap ring in housing groove	Identical 5 HP 24A 6 HP 26
50  02012	5x46 002 571 Snap ring fitting aid Clutch E	Identical 6 HP 26

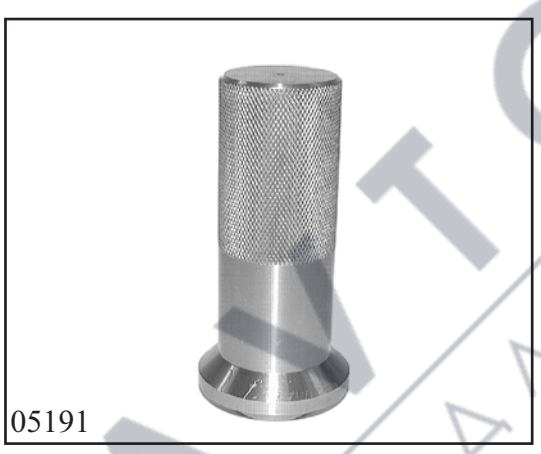
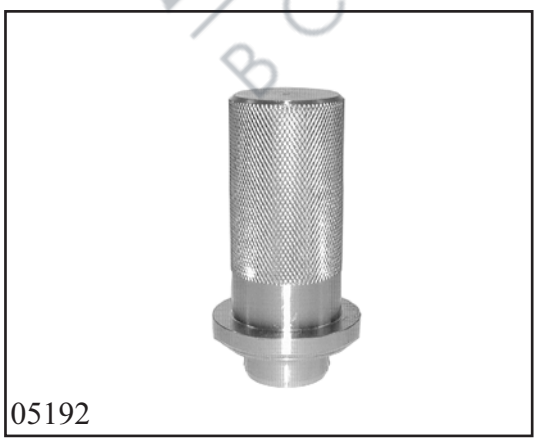
Remarks	Order-No. / Application	OBJECT
Identical 6 HP 26	5x46 002 558 Needle bearing driving mandrel and SSR pump	51  02003
Identical 5 HP 19 5 HP 19 FL/A 5 HP 24 5 HP 24 A 6 HP 26	5x46 001 007 Fixing bolt	52  92223
Identical 4 HP 18 Q 5 HP 19 6 HP 26	5x46 000 306 Sleeve for checking pump moment	53  98135

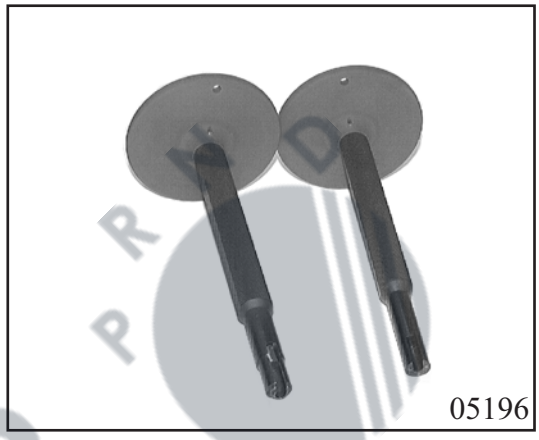
OBJECT	Order-No. / Application	Remarks
54  00060	5x46 002 167 Differential locking device	Identical 5 HP 19 FL/A 5 HP 24 A
55  00104	5x45 000 016 Extension limit controlled torque key (Type Quantec EMS 7086 ISI) or	Identical 5 HP 19 FL/A 5 HP 24 A
56  00105	5x45 000 017 Extension limit controlled torque key (Type operator five + software-packet for extension limit)	Identical 5 HP 19 FL/A 5 HP 24 A

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A 5 HP 24 A	5x46 002 220 Differential bearing mandrel large	57  00067
Identical 5 HP 19 FL/A 5 HP 24 A	5x46 002 221 Differential bearing mandrel small	58  00068
Identical 5 HP 19 FL/A 5 HP 24 A	5x46 002 217 Bearing inner ring pinion shaft mandrel	59  00064

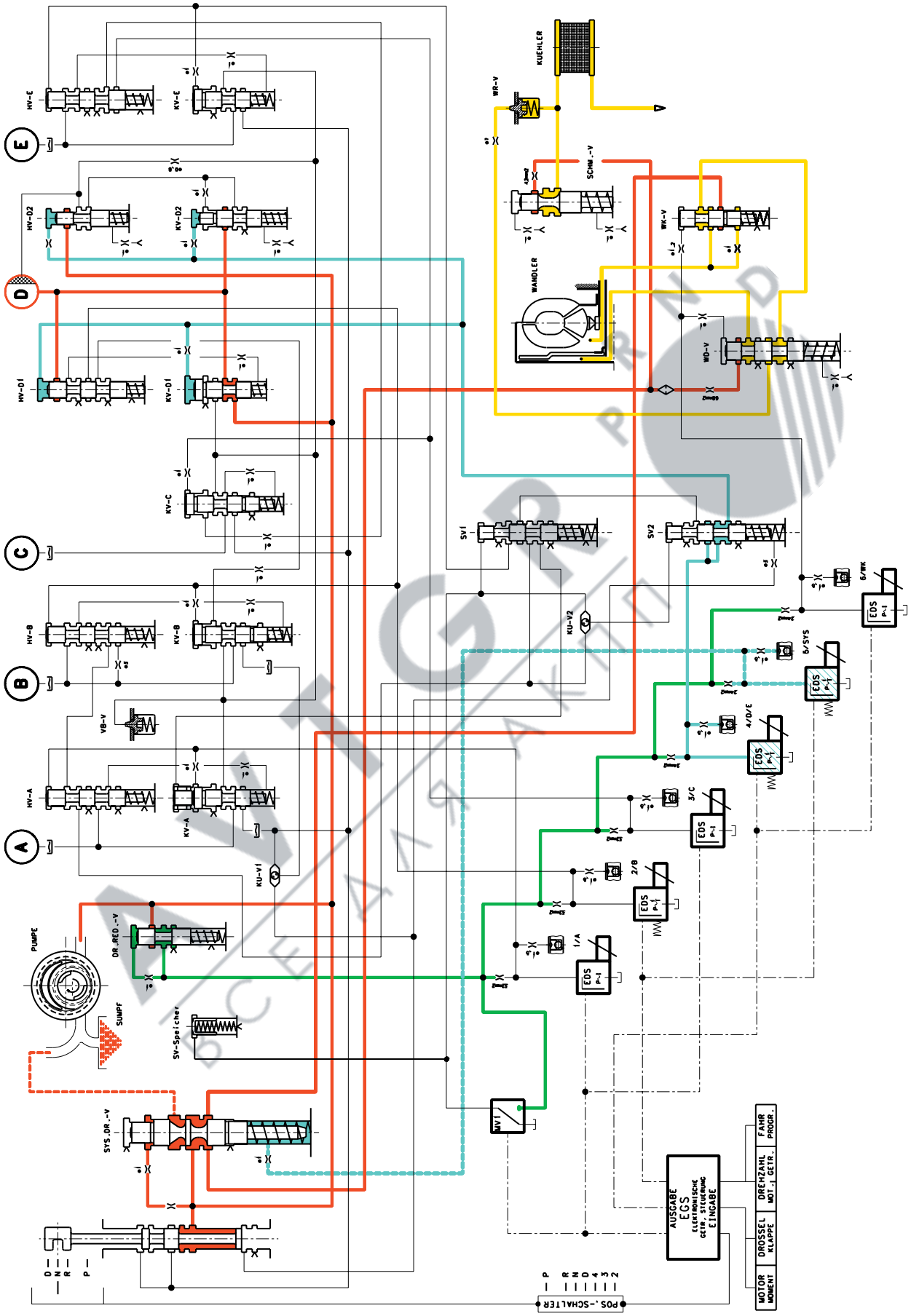
OBJECT	Order-No. / Application	Remarks
60  00058	5x46 002 174 Device Pinion shaft nut	Identical 5 HP 19 FL/A 5 HP 24 A
61  01151	5x46 002 461 Pinion shaft adapter	Identical 5 HP 24 A
62  00072	5x66 000 027 Measurement device Pinion shaft dragging moment	Identical 5 HP 19 FL/A 5 HP 24 A

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A 5 HP 24 A	5p66 000 059 Torsiometer size 50 Stahlwille 52205250	63  99273
Identical 5 HP 19 FL/A 5 HP 24 A	5x66 000 029 Connecting part 1/4” external hexagonal on 1/4” external square	64  99274
	5x46 909 344 Guide sleeve	65  05189

OBJECT	Order-No. / Application	Remarks
66  05190	5x46 909 269 Driving mandrel SSR pinion shaft	
67  05191	5x46 909 270 Insertion mandrel SSR Differential	
68  05192	5x46 909 271 Insertion mandrel SSR Differential cover	

Remarks	Order-No. / Application	OBJECT
	5x46 001 525 Driving tool Breather Wgl.	69  05196
	5x46 909 346 Insertion mandrel Bearing and SSR distributor housing	70  05197

1.8 Oilflow chart (Position N)

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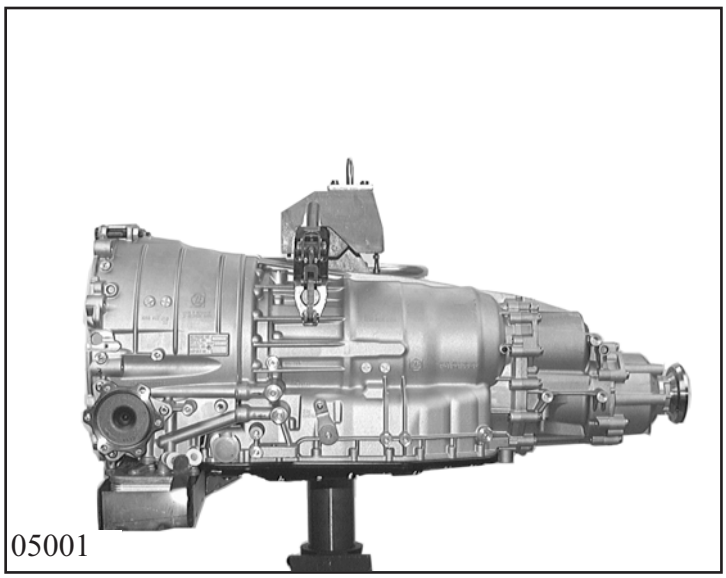
2. Dismantling

2.1 Distributor Housing and Intermediate Housing

2.1.1 Removing the Distributor Housing and Intermediate Housing


05001

Take up complete gearbox with oil pan downwards in retainers 5t66 000 128 and attach to assembly trolley or work bench holder 5x46 000 763.

Take off breather cover - possibly breather hose from differential, gearbox and transfer case.

Attention!
Gearbox has 3 oil systems.

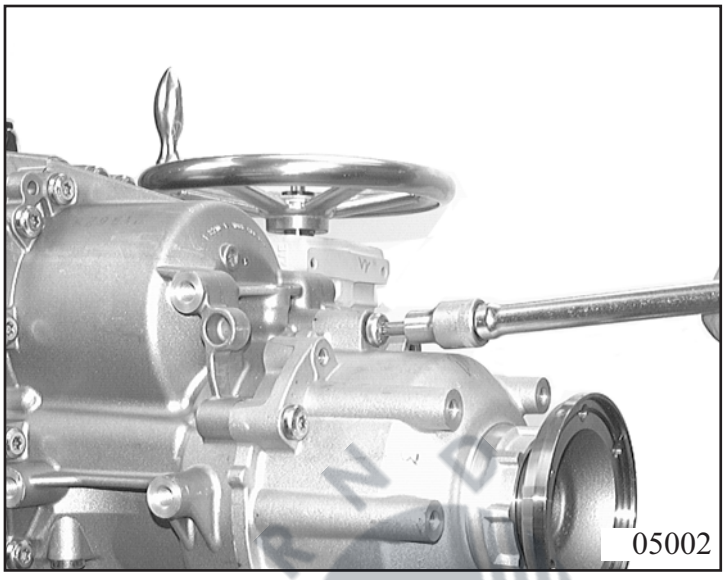
a) Discharge transmission oil by unscrewing the oil outlet and filler plug.(Internal hexagonal = 17 mm filler plug = 5 mm drain plug.)

b) Rotate gearbox downwards by 90° with converter bell and allow differential oil to drain off by unscrewing the filler plug.(SW internal hexagonal = 8 mm)

c) Rotate gearbox back and discharge oil by unscrewing the oil outlet and oil filler plug from the distributor housing. (SW = internal hexagonal 6 or 8 mm)

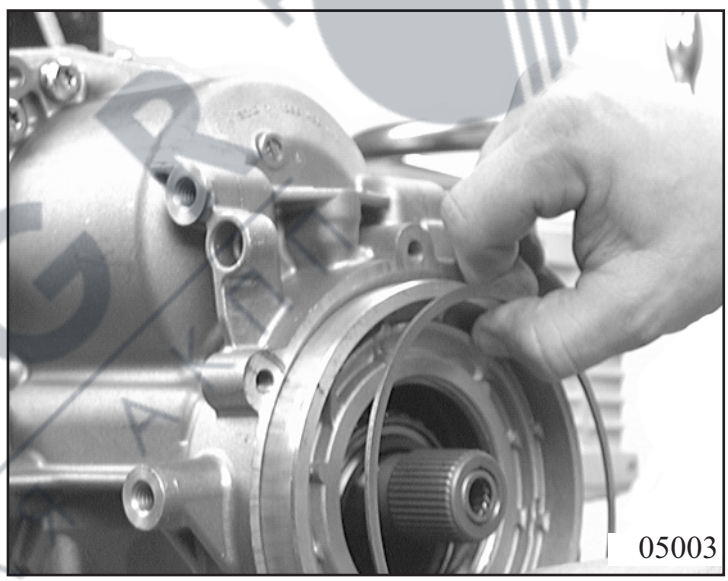
Note!
Bentley has only two oil systems. Converter bell and differential are a common oil system

Loosen the 7 screws of the distributor housing. Allow the remaining oil to drain out. Take off distributor housing with flange.
The cylindrical pins are to remain in the intermediate housing. Remove Torsen from output and front axle shaft and/or from distributor housing.
Remove O-ring from distributor housing.
(Key size = Torx TX-40)



Attention!
Torsen may fall down when taking off the distributor housing.

Take out bearing ring with setting shim.
Loosen 19 screws, release intermediate housing from gearbox housing with plastic hammer and allow oil to drain off.
Rotate gearbox by 90°.

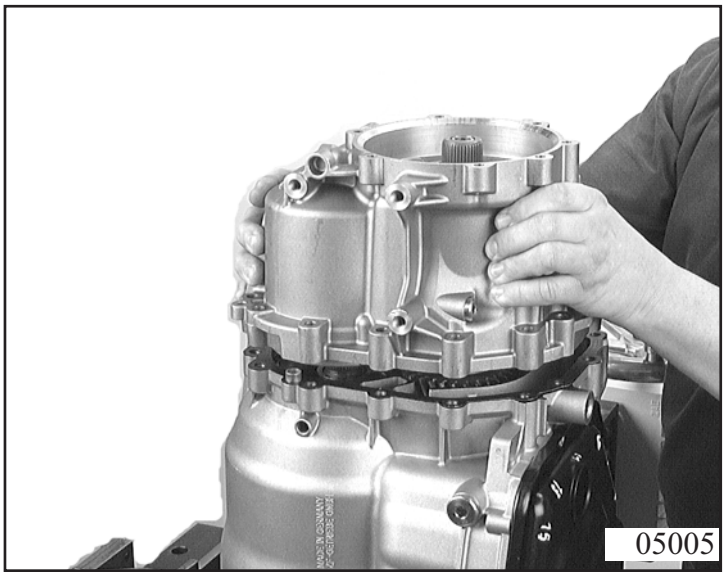


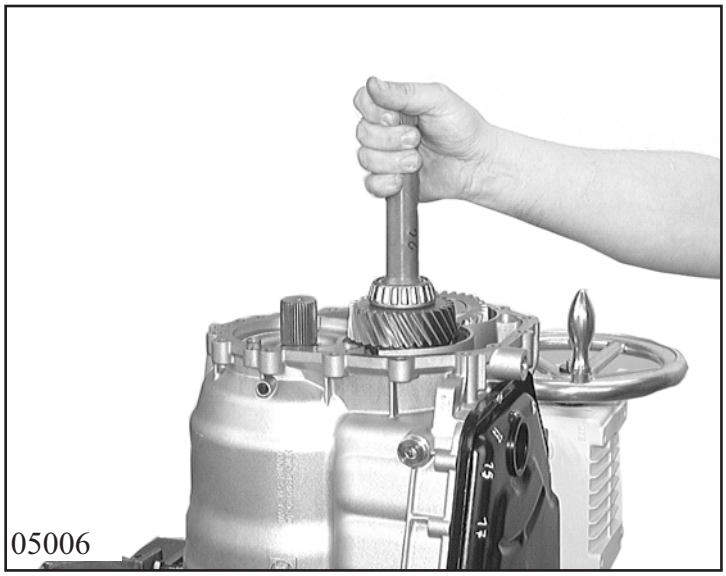
Remove intermediate housing from gearbox housing as well as output wheel.
Take magnet from intermediate housing.
(Seal sticks a little; therefore strike against the housing with a plastic hammer)

(Key size = Torx TX-40)

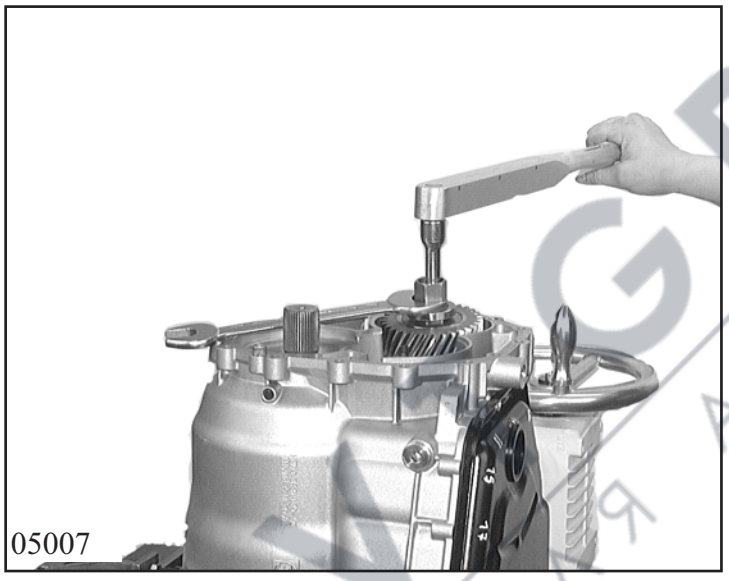
Note!

The cylinder pins should remain in the gearbox housing.





Remove seal from housing. Take out front axle shaft from gearbox housing. Remove setting shim from drive wheel and output shaft.

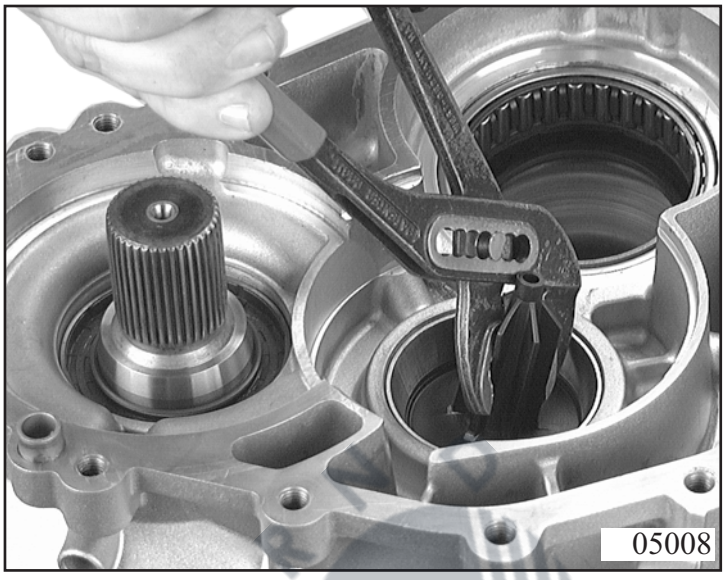


Secure pinion wheel against rotating with tool (hollow hexagonal SW 27, with inside diameter 23mm) and wrench, then unscrew necked-down bolt from side shaft with extension. Remove side shaft.

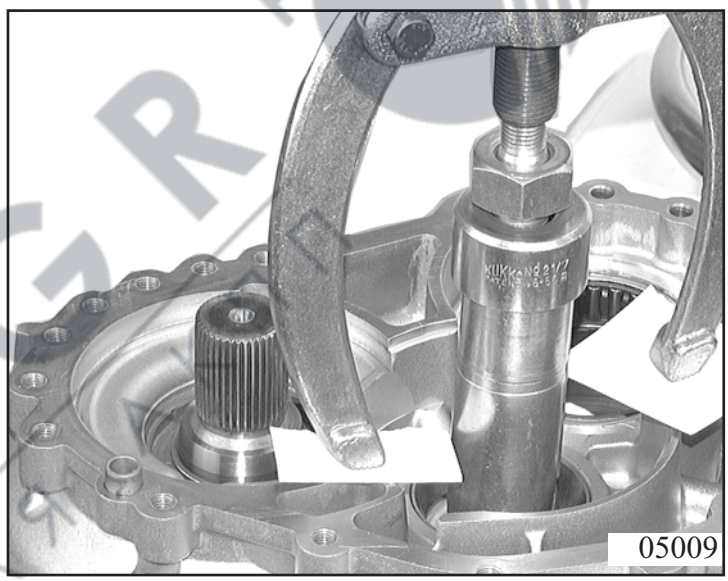
SW = 17 mm
SW = 27 mm

2.1.2 Dismantling the Gearbox Housing

Dismantle oil dispensers with pliers.



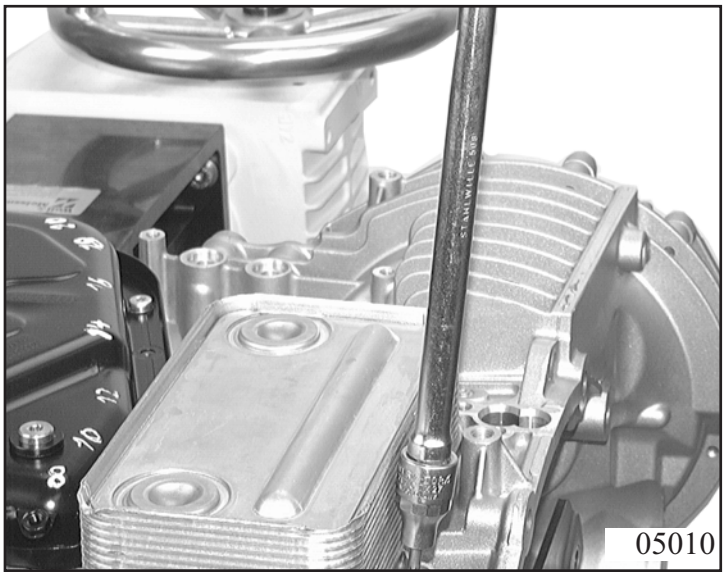
Remove outer bearing race tool with 5x46 021 007 and basic unit 5x46 022 002. Remove setting shim.



Attention!
Do not support tool on sealing surface.

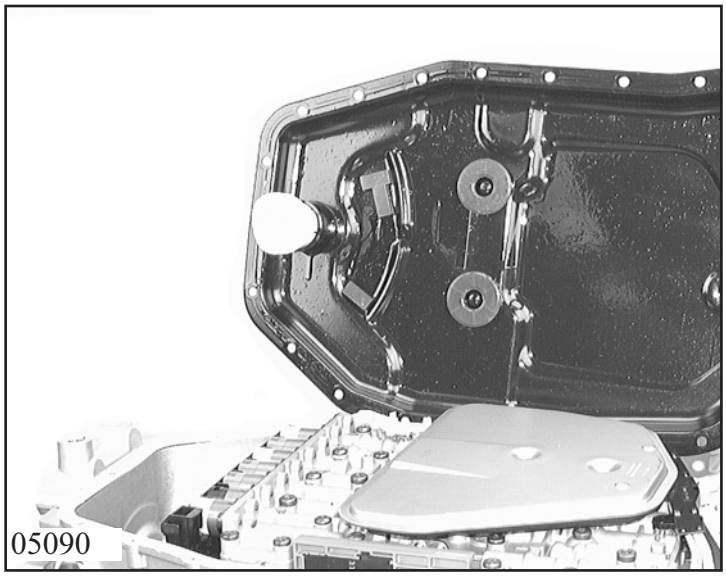
Rotate gearbox upwards by 90° with oil pan. Remove 2 screws from the gearbox support and remove support. Loosen 3 screws of oil cooler and remove oil cooler. Remove 2 sealing rings from oil cooler.

(Internal hexagonal 8 mm
Torx TX-27)



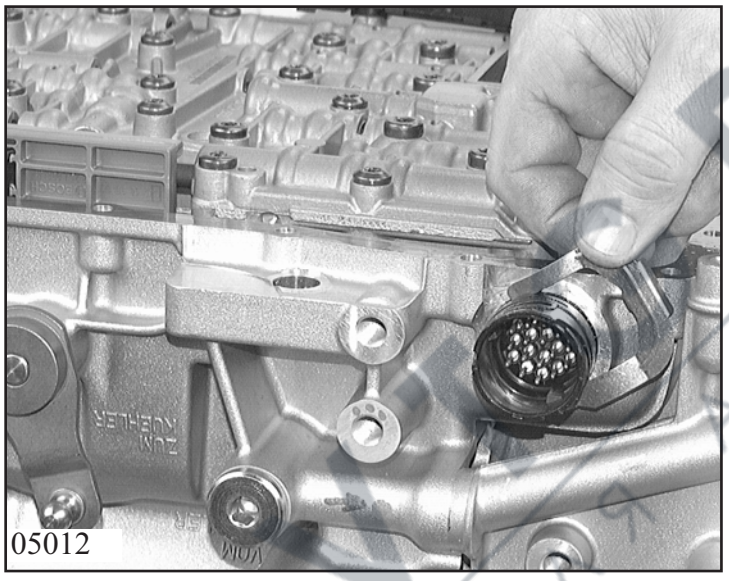
2.2 Removing the Mechatronic, Shifting and Parking Lock

2.2.1 Removing the Mechatronic

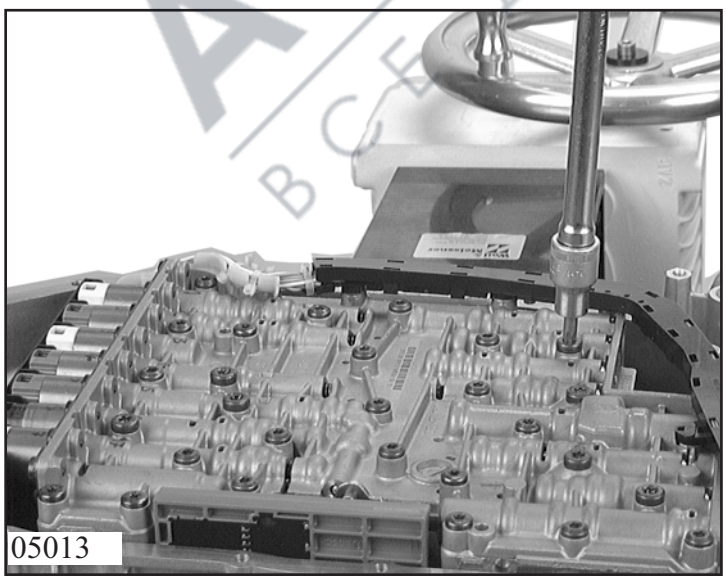

05090

Remove protective cap from wiring harness plug. Loosen 24 screws of oil pan and remove oil pan. Remove gearbox housing seal and remove oil filter. Remove 6 magnets from oil pan.

(Key size = Torx TX-27)


05012

Remove locking plate from the wiring harness plug.

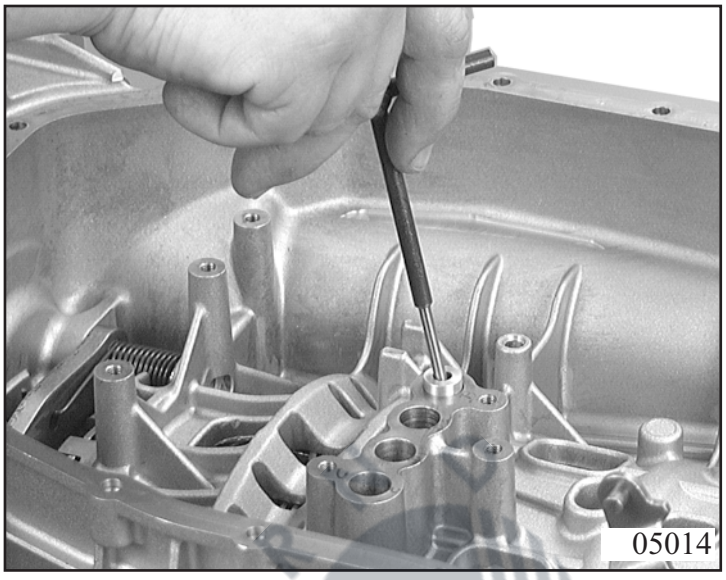

05013

Loosen 11 large head screws and remove the Mechatronic. Take off adapters. Remove wiring harness from Mechatronic.
(4x M6x20 + 7 x M6x59)

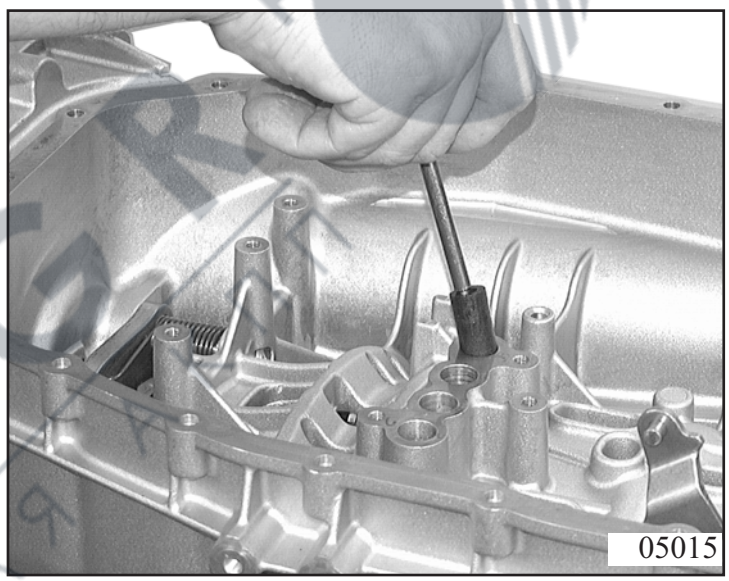
(Key size = Torx TX-40)

Note!
Mechatronic fault memory should be read out using SamTec Gearbox/PC.

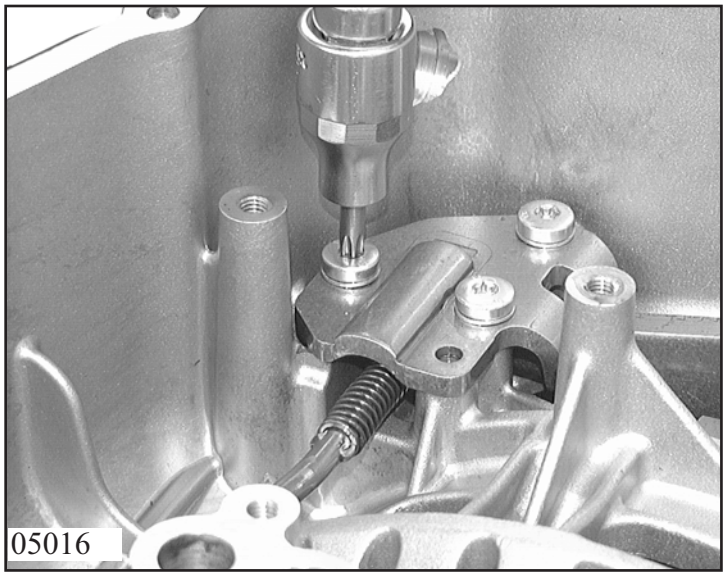
Remove 4 sockets.



With puller handle 5x95 000 410 pull out the 4 sealing sleeves sitting on the bottom of the bore.

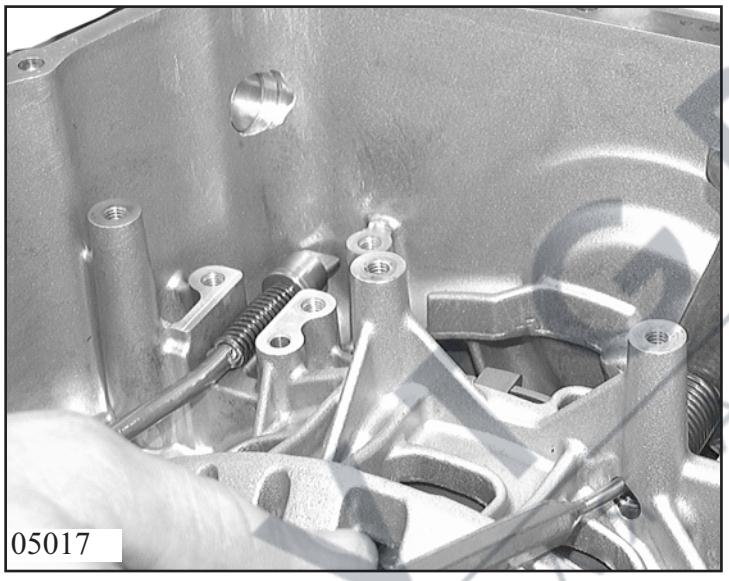


2.2.2 Removing the Shifting and Parking Lock Mechanism

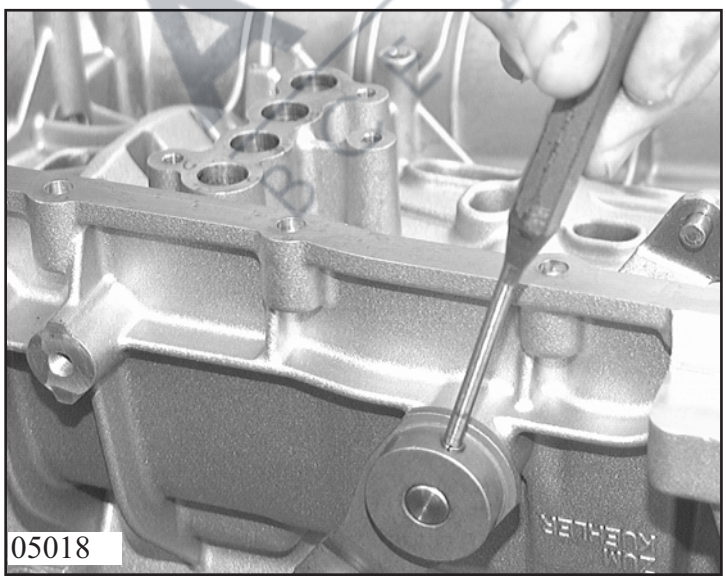


Loosen 3 screws of the guide plate and remove guide plate.

(Key plate = Torx TX-27)

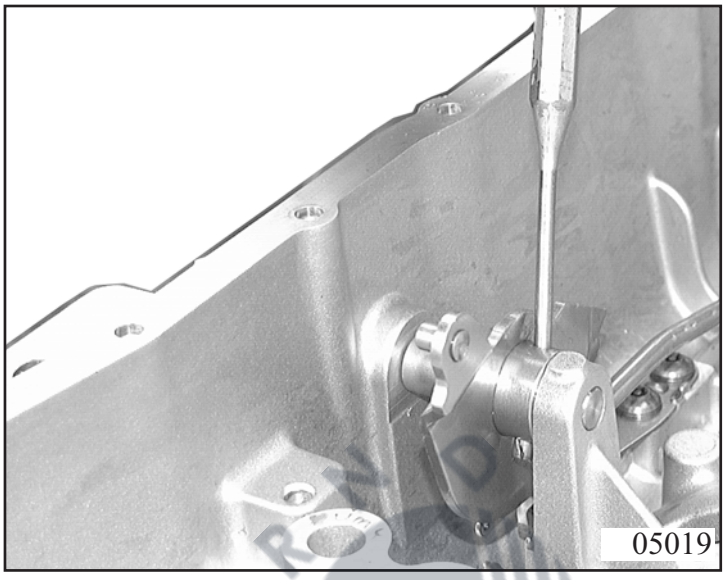


Press out parking lock pins to the rear. Remove pawl with spring.



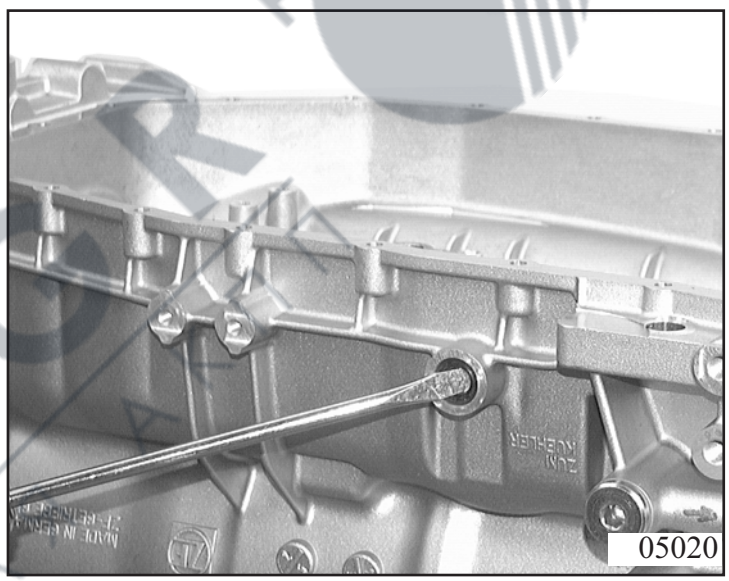
Drive out clamping sleeve from shift lever and remove shift lever.

Remove clamping sleeve from notched disc. Withdraw selection shaft. Remove detent disc with connecting rod.



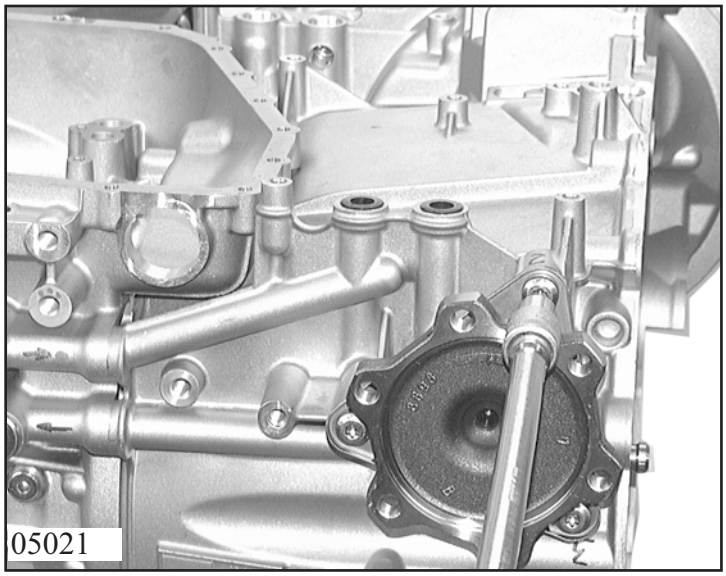
Note!
Detent spring remains fitted under normal conditions.

Remove shaft sealing ring with suitable tool.



2.3 Removing the Flange Shaft, Converter and Front Axle Differential

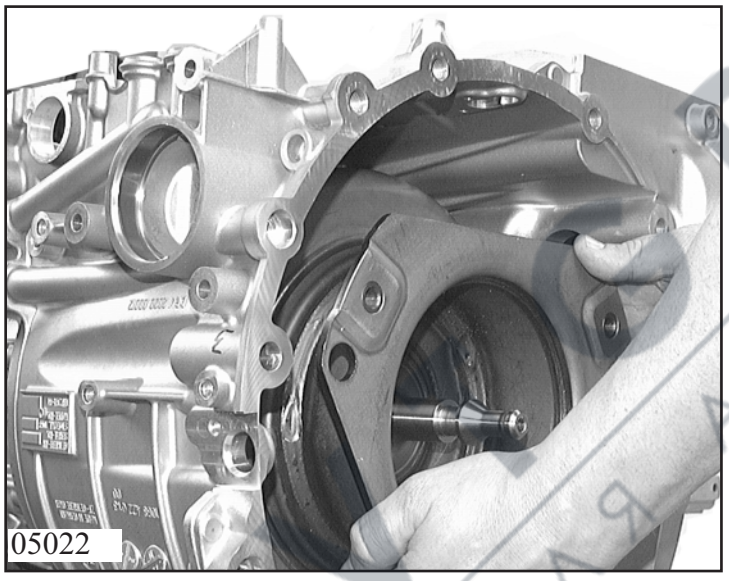
2.3.1 Removing the Flange Shaft


05021

Unscrew 3 screws from cover.
Remove flange shaft with cover.

Key size = Torx TX-40

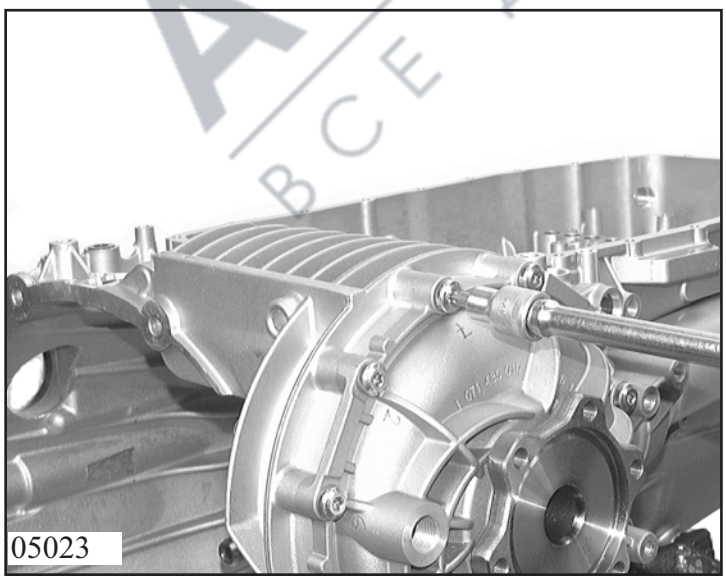
2.3.2 Removing the Converter


05022

Loosen 3 screws from converter mounting bracket and remove converter.

(SW = 19mm)

2.3.3 Removing the Front Axle Differential


05023

Unscrew 11 screws from differential cover.
Remove differential with cover and flange.
Pry off flange with suitable tool.
Remove differential from its cover.
(Key size = Torx TX-40)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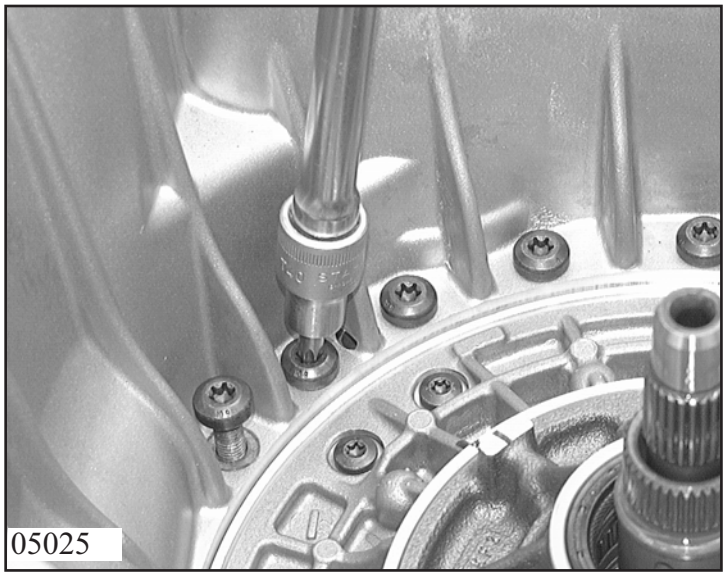
2.4 Removing the Converter Bell and Pinion Shaft

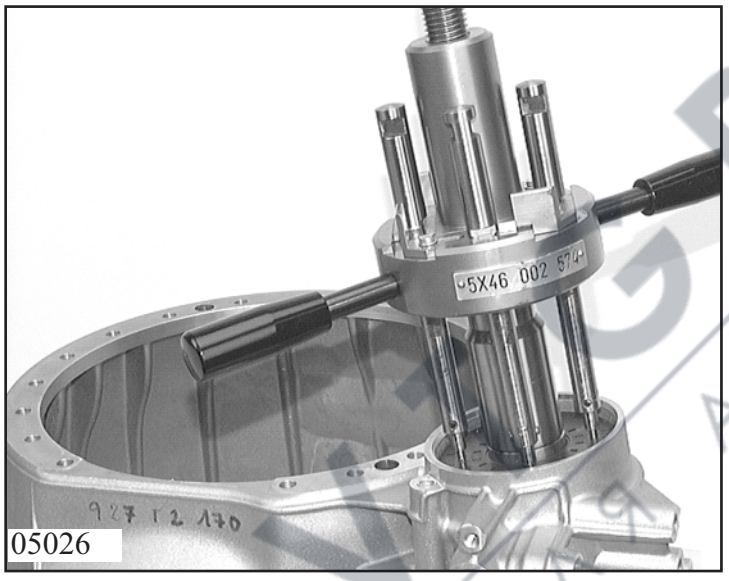
2.4.1 Removing the Converter Bell


05025

Rotate gearbox upwards with converter bell. Loosen 18 screws of converter bell and remove converter bell. Remove protective pipe from side shaft. Remove 2 seal sleeves from gearbox housing.

Attention!
The cone disc of the side shaft falls out.

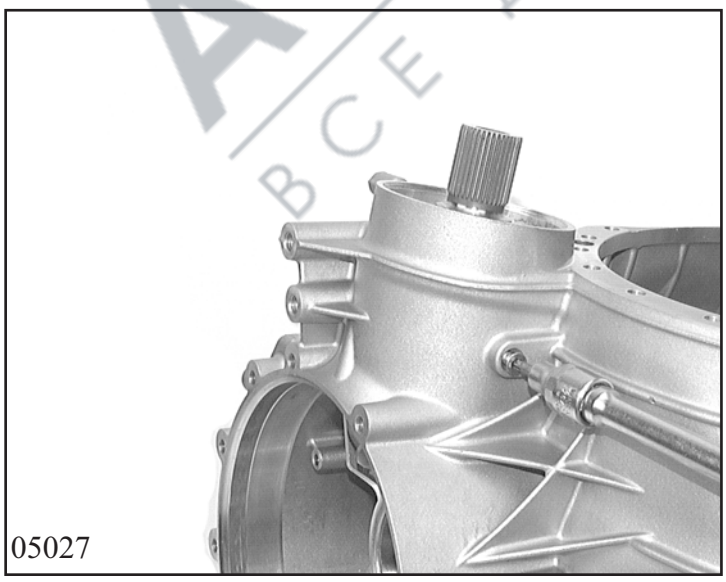
2.4.2 Removing the Pinion Shaft



05026

Place tool 5x46 002 574 on pinion shaft. Drive in the 4 extracting rods through shaft sealing ring driving-in markings and rotate by 90°. Withdraw the shaft sealing ring by turning the spindle.

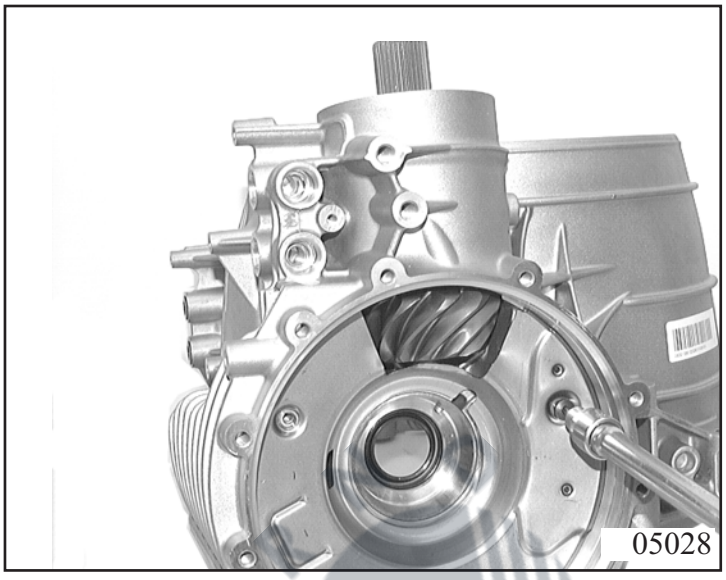
Note!
With Bentley there is no shaft sealing ring, since the side shaft is in a common oil system with the transfer case and the differential. Replace both O-rings of the protective pipe in this case.


05027

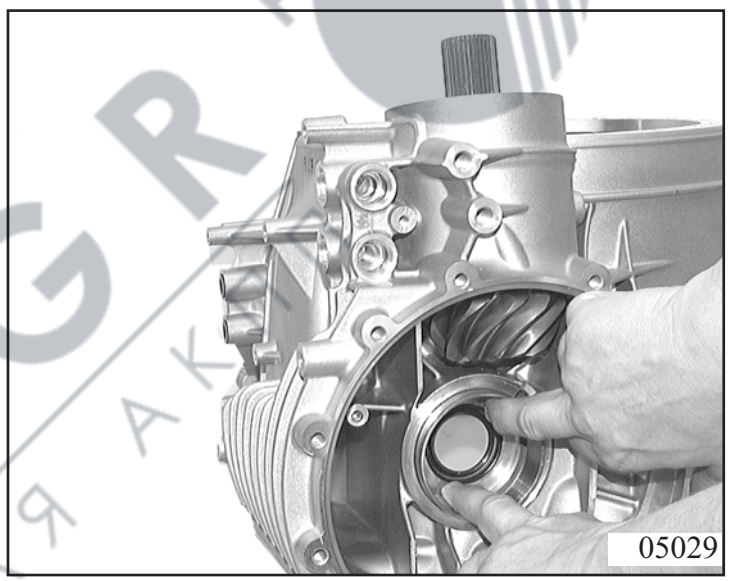
Loosen securing screw. Remove securing ring with pliers.

(Key size = Torx TX-30)

Loosen 3 screws of oil plate and remove plate.
Remove rubber seal and magnet from plate.

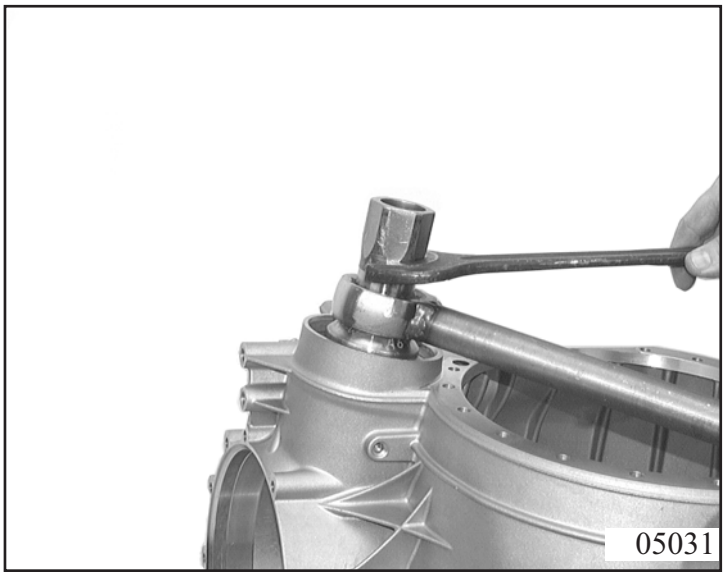


Remove external bearing cup with setting shim from converter bell.



Clamp converter bell in vice. Unscrew nut from pinion shaft with tool (5x46 001,143).

(Key width = 36 mm)



05033

Withdraw pinion shaft from converter bell with tool 5x46 909 305. Press out shaft sealing ring of the flanged shaft from the converter bell.

(Key width = 36 mm)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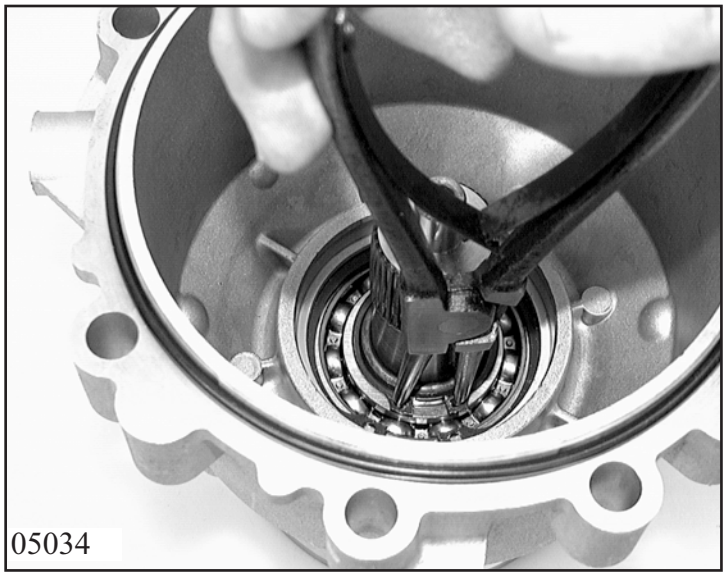
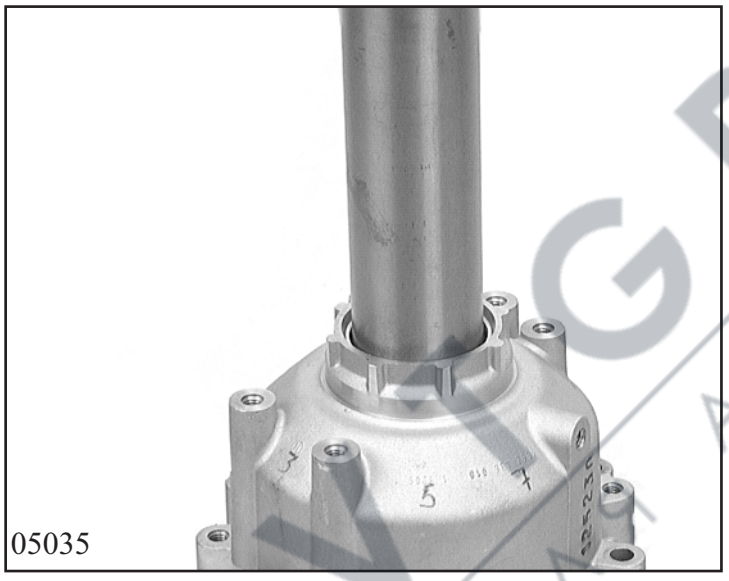
2.5 Dismantling the Distributor Housing, Intermediate Housing and Flanged Shaft


05034

2.5.1 Dismantling the Distributor Housing

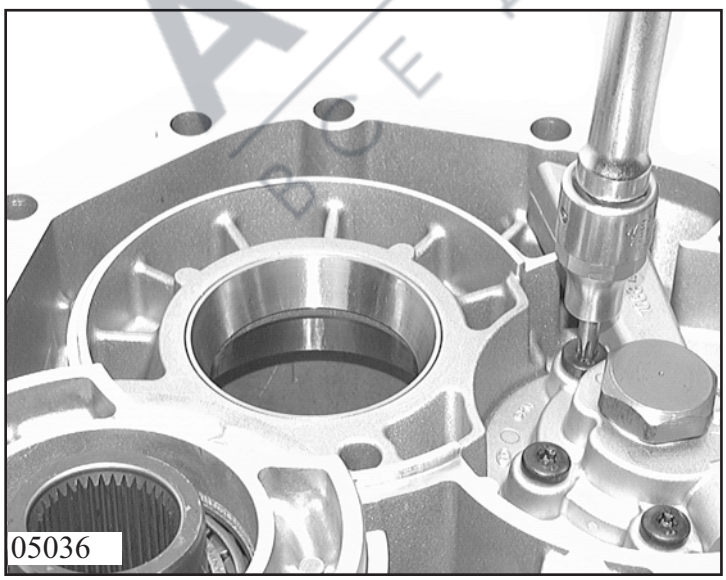
Remove O-ring type sealing ring from distributor housing. Remove snap ring with pliers. Press out flange from distributor housing under a mandrel press.

If necessary loosen 3 screws of vibration damper and remove vibration damper.


05035

Lever out shaft sealing ring. Remove snap ring using pliers. Press out ball bearings under a mandrel press.

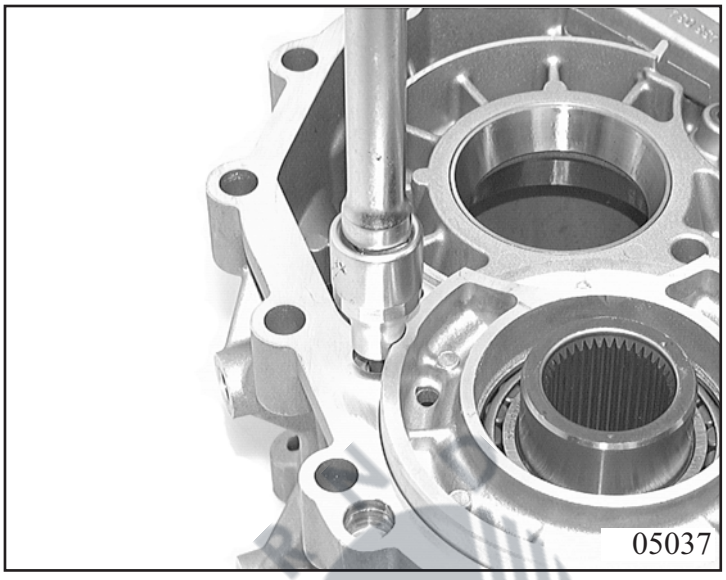
2.5.2 Dismantling the Intermediate Housing


05036

Remove output wheel and rotate intermediate housing. Loosen 4 screws of pump and remove pump.

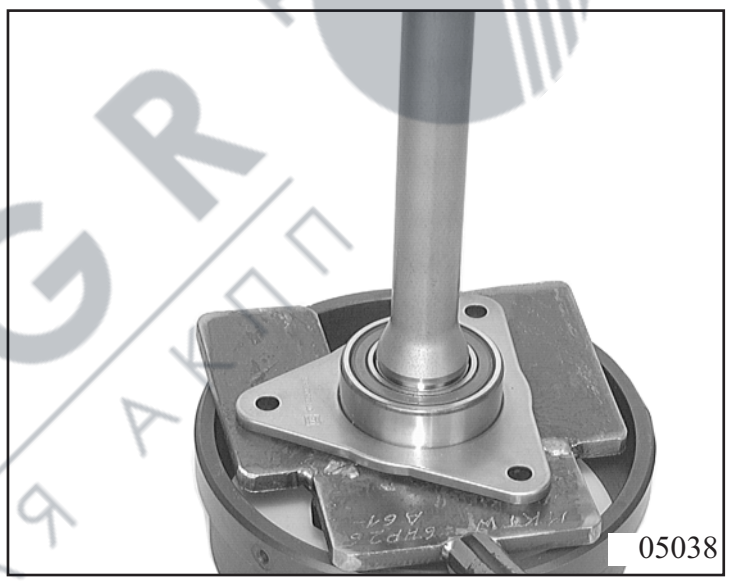
(Key size = Torx-TX-27)

Loosen screw of bearing race and remove bearing race from intermediate housing. Remove drive wheel from intermediate housing.



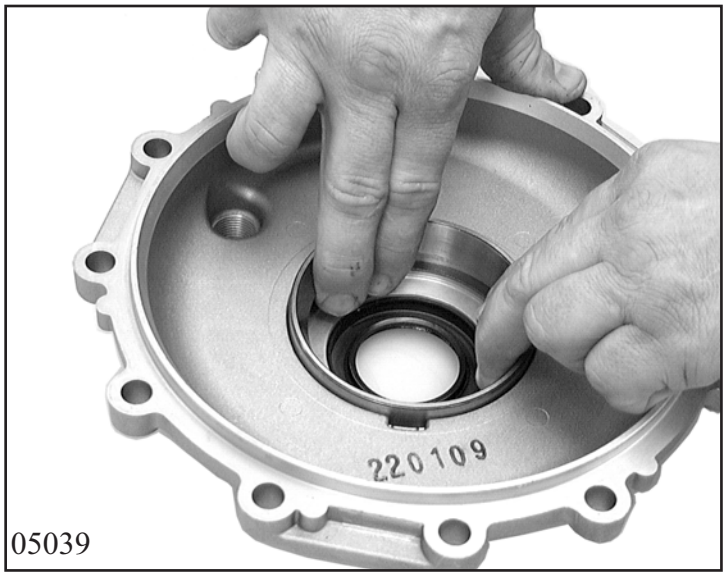
2.5.3 Dismantling the Flanged Shaft

Remove half moon ring with 2 screwdrivers. Press out the flanged shaft from cover under the mandrel press with dismantling device 5x46 003 632.



2.6 Dismantling the Bearing Shells, Bearing

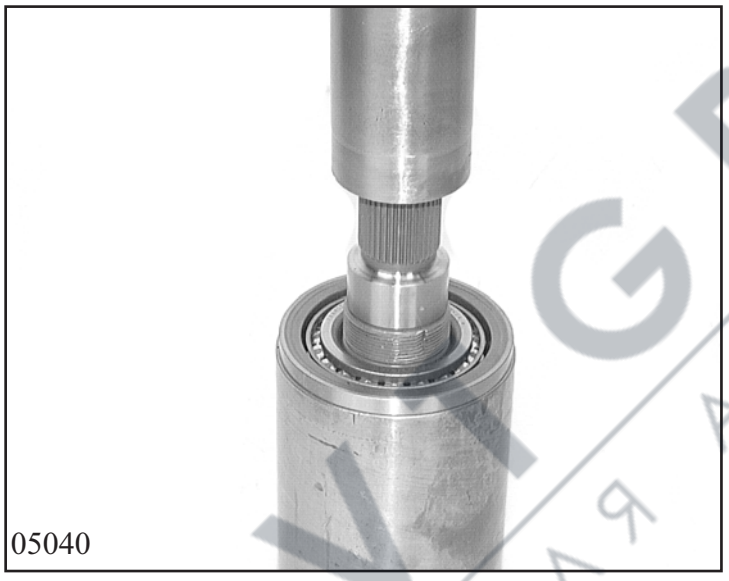
2.6.1 Differential Cover



05039

Remove round sealing ring.
Remove bearing shell and setting shim, usually by hand, if necessary using tool 5x46 022 002 combined with tool 5x46 021 008. Pry off shaft sealing ring with suitable tools.

2.6.2 Pinion Shaft


05040

Place pinion shaft in sleeve 5x46 000 530 and press out double bearing under mandrel press. Remove double bearing with inner race and shim.


01051

With puller 5x46 032,010 (Rollex 32010x1) as well as tool 5x46 000 530, press down the pinion shaft inner bearing race under the mandrel press. Remove setting shim.

2.6.3 Differential (Visual Check)

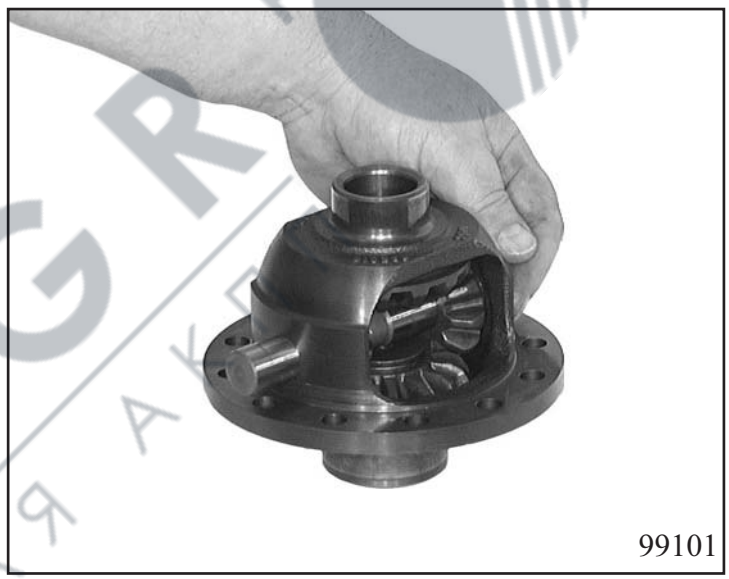
Remove inner bearing race on cover side from differential with puller 5x46 806 649 (Rollex 806649), with core insert 5x46 002 159 and basic unit 5x46 010 011 (Rollex 10001).
Remove other inner bearing race with puller 5x46 300 849 (Rollex 300849), core insert 5x46 002 287 5x46 010 011

(only if extension limit controlled torque key present!!!)


99100

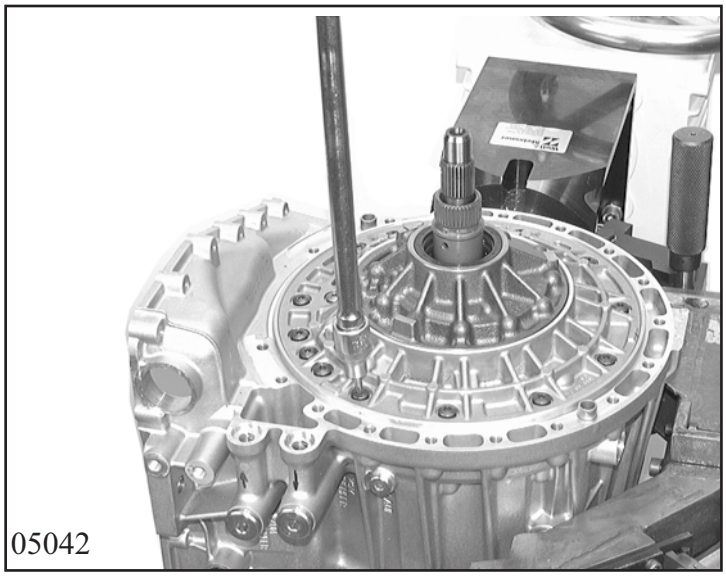
Loosen 12 screws of the crown wheel with device 5x46 002167 clamped in vice and separate crown wheel, possibly with plastic mandrel. Take differential out of device, rotate by 180° and push pins out.

Attention!
All parts must be fitted again exactly the same as they were fitted before dividing. Bevel gears with setting shims and planetary gears with thrust washers may not be interchanged.


99101

Rotate planetary gears through 90° around the differential axle and remove through viewing window with thrust washer.
Remove upper bevel gear with setting shim. Remove flange holding disc and lower bevel gear with setting shim.


99102

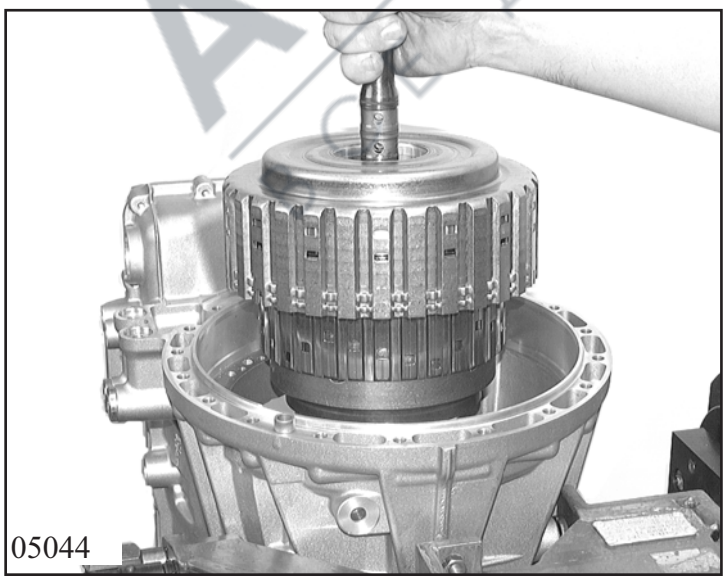

05042

Remove complete oil system. In addition loosen 14 Torx screws and remove with the usit rings.

(Key size = Torx - TX 27)

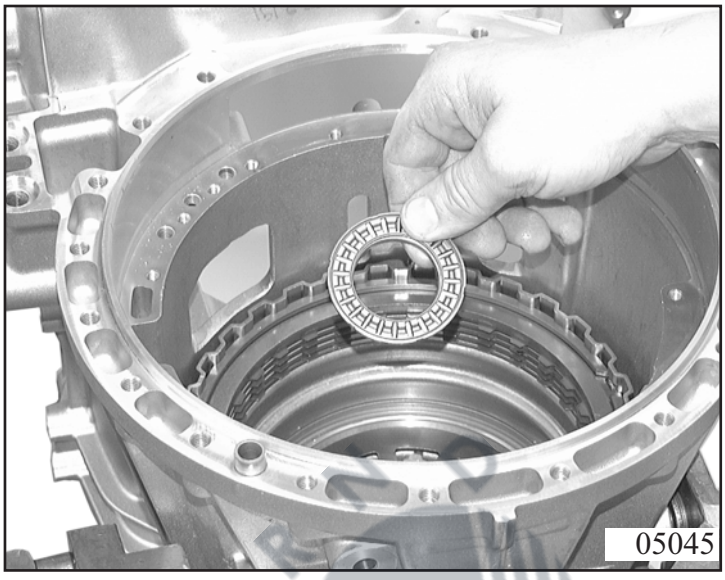

05043

Press out oil system with jack 5x46 000 563 and remove.


05044

Take out spacer. Lift out tower (drive with clutches A and E) by hand. Insert tower in holding device 5x46 000 917 and remove device.

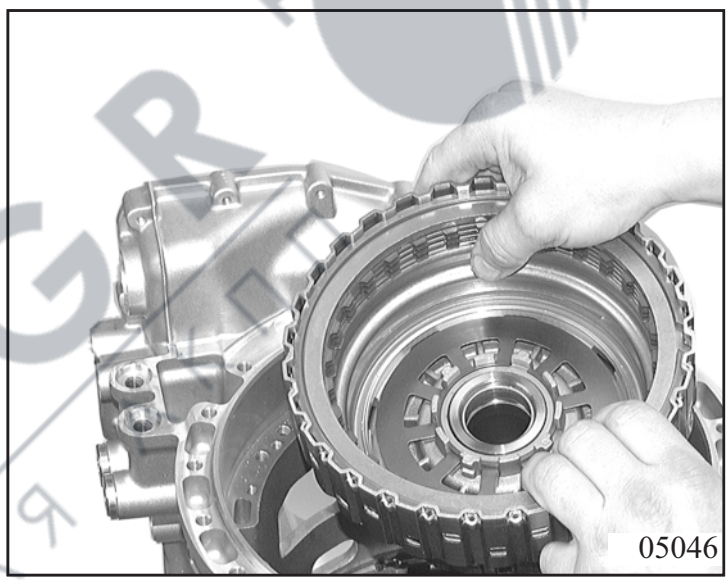
Remove axial needle cage from cylinder B hub.



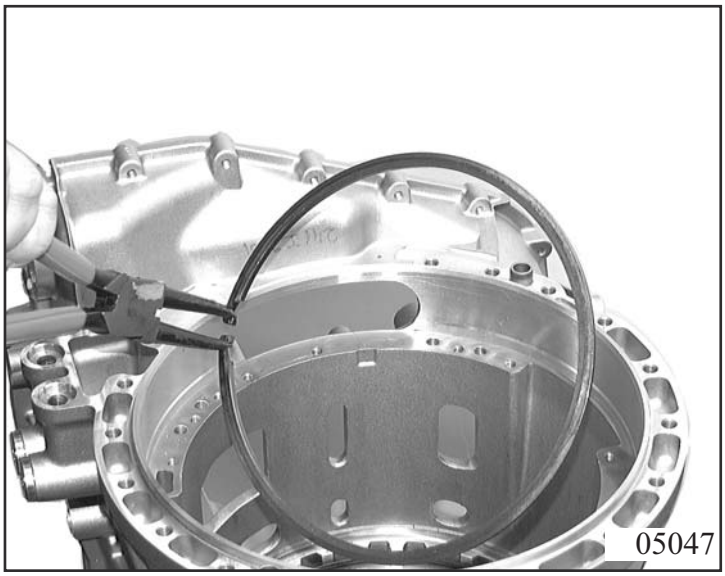
Attention!
Second angled thrust washer sits in hub interior disc carrier B and can possibly loosen during washing.

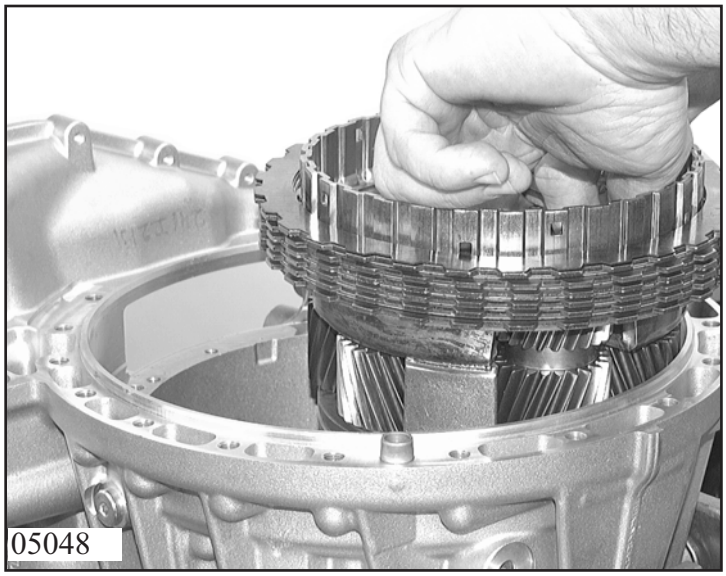
Danger of Loss !!!

Remove clutch B by hand.

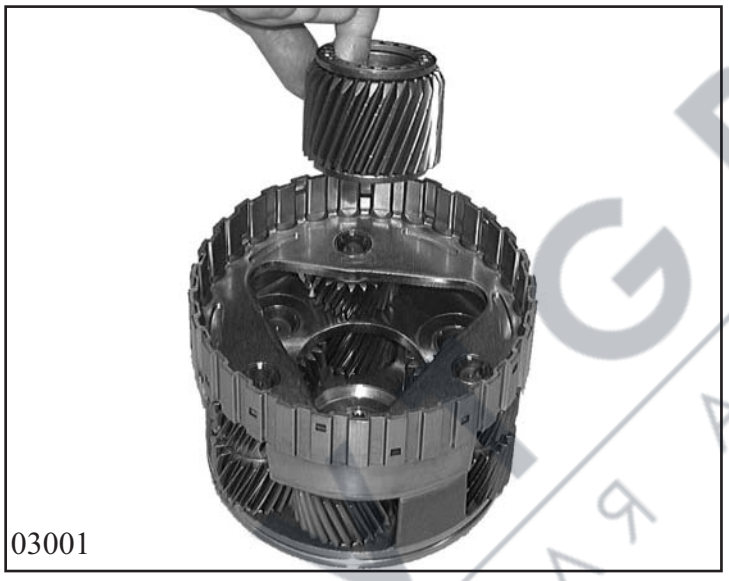


Lever out snap ring from housing with screwdriver or remove snap ring with pliers.
Lift out cylinder CD.

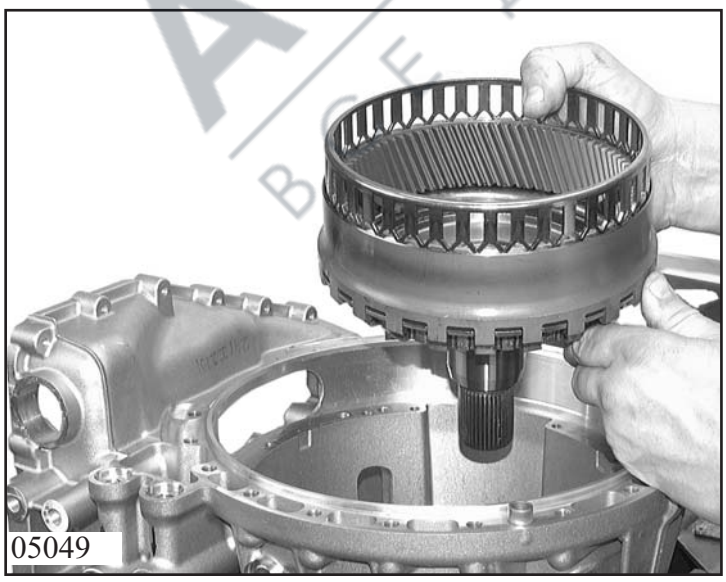




Remove angled plate and sun wheel.
Withdraw planetary carrier of clutch D with disc set.
Remove end disc from gearbox housing.
Remove discs from the planetary carrier.

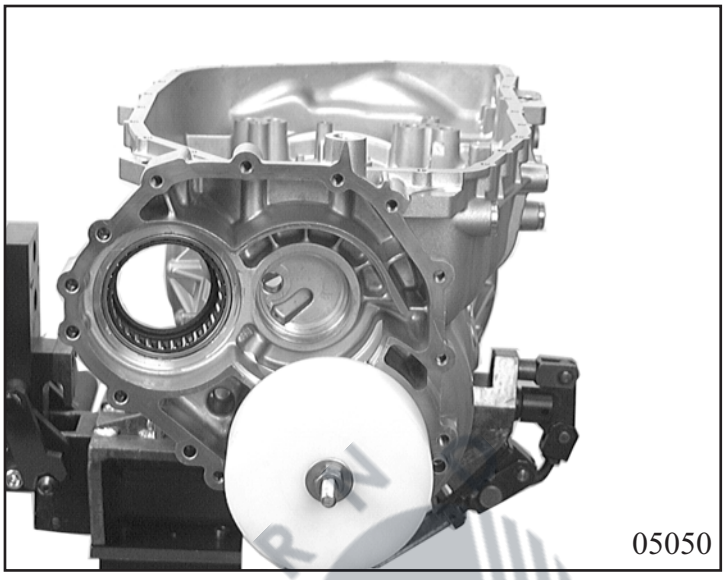


Remove bearing discs as well as sun wheels 2 + 3 from planetary carrier.
Unclip bearing from planetary carrier and sun wheel 3.

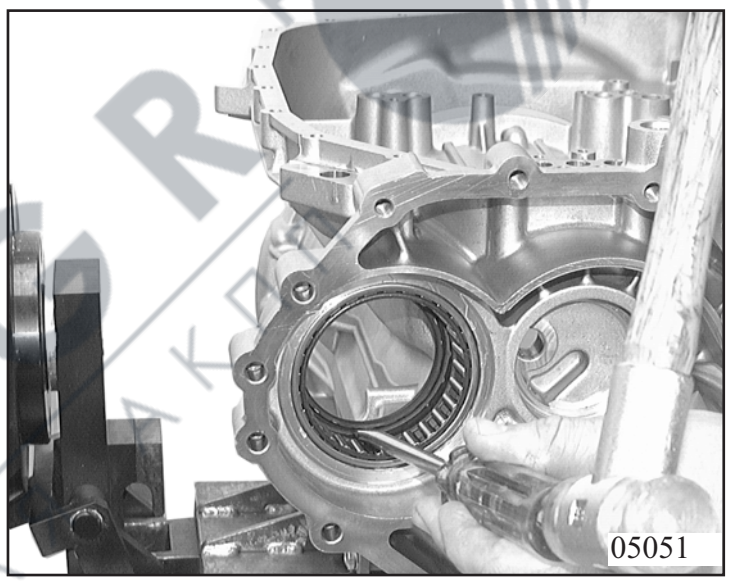


Remove thrust washer from hub planetary carrier. Remove internal wheel with output shaft.

Rotate gearbox by 90°.
Withdraw shaft sealing ring from gearbox housing with lever tool (Pos.35, page 1.7/12).

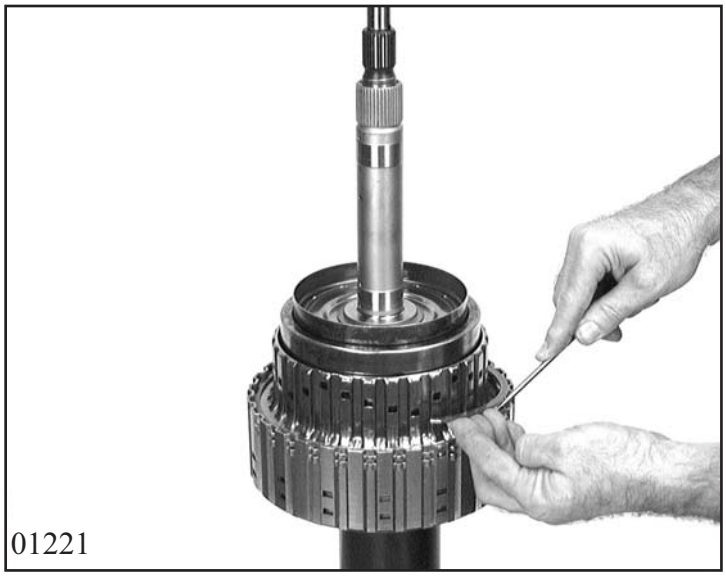


Press shaft sealing rings of side shaft out of gearbox housing.

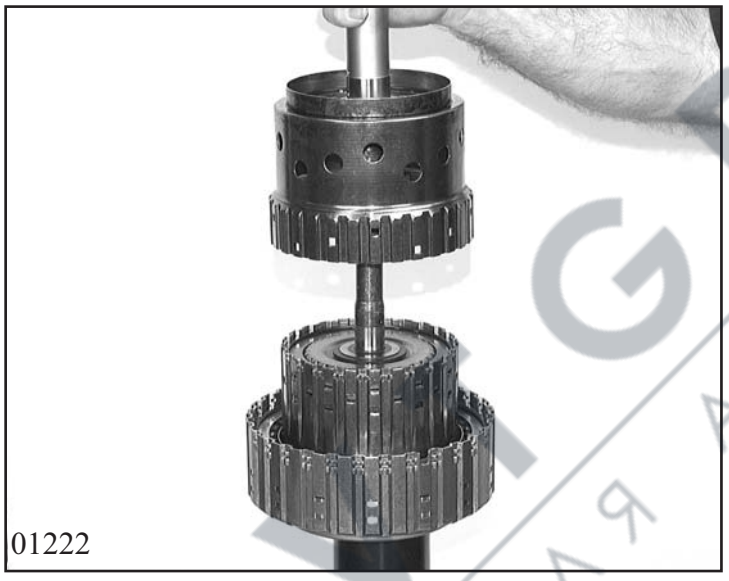


Note!
Bentley does not have this shaft sealing ring, since the side shaft is in a common oil system with the distributor gearbox and differential.

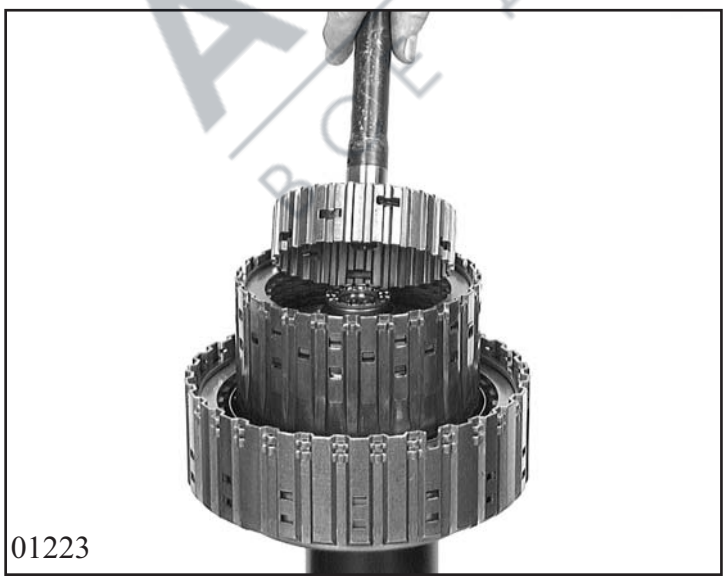
2.8 Dismantling the Clutches
2.8.1 Tower (with Clutches A and E)


01221

Place tower with drive shaft in device 5x46 000 917.
Unclip angled disc.
Release snap ring and remove inner disc carrier B.


01222

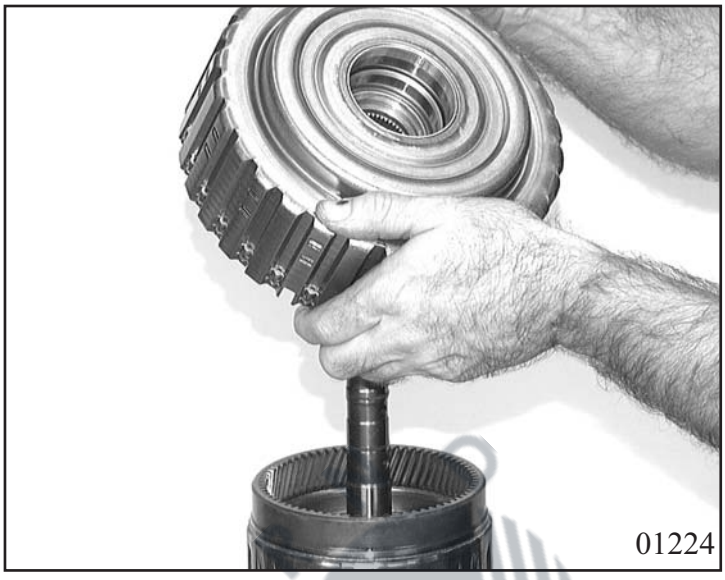
Remove inner disc carrier A and lever out axial needle bearing from intermediate shaft with long scriber.


01223

Lift off intermediate shaft with inner disc carrier E. Lever out axial needle bearing.

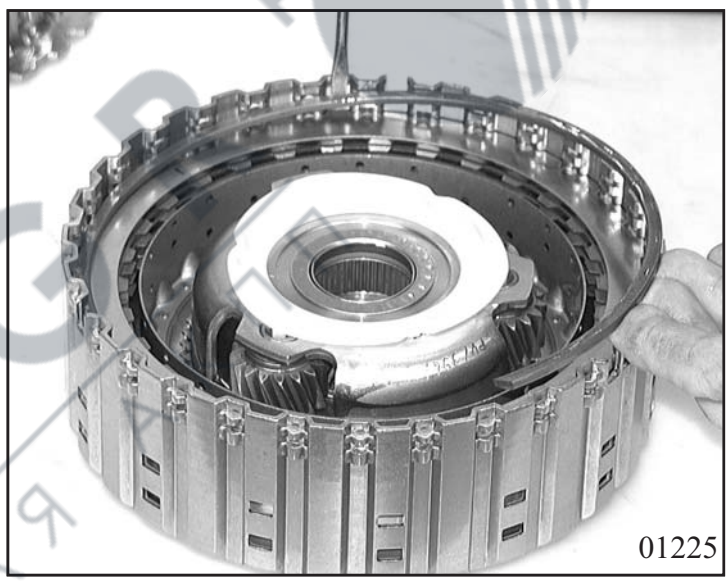
Now rotate package by 180° and again place in holding device

Pull off clutch A from clutch E / drive shaft.

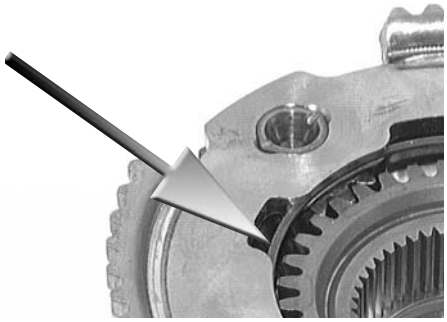


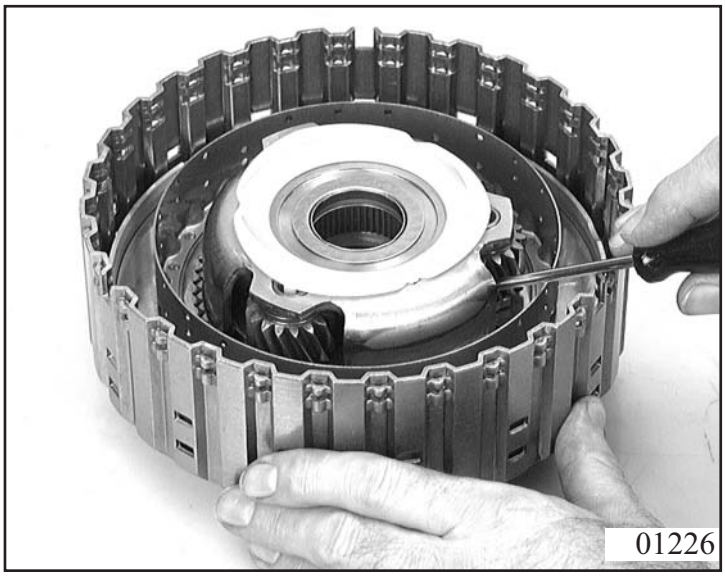
Note!
Drive shaft is meshed with Clutch E.

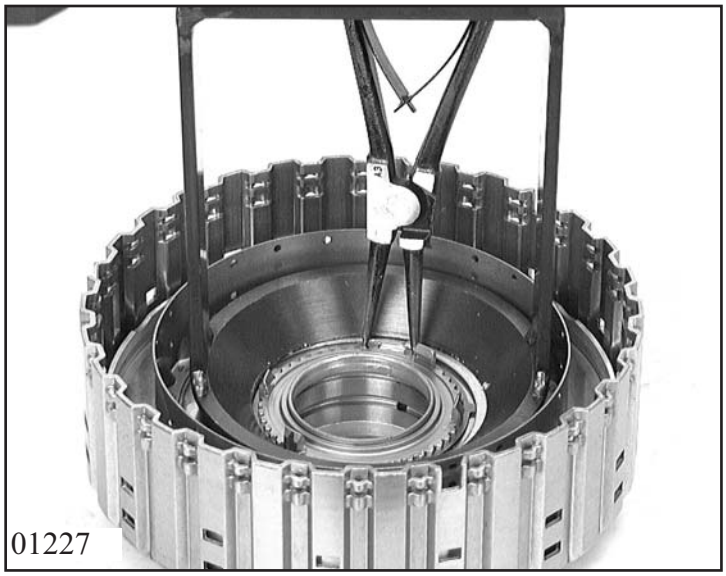
Release the snap ring of clutch A and take out the complete disc set.



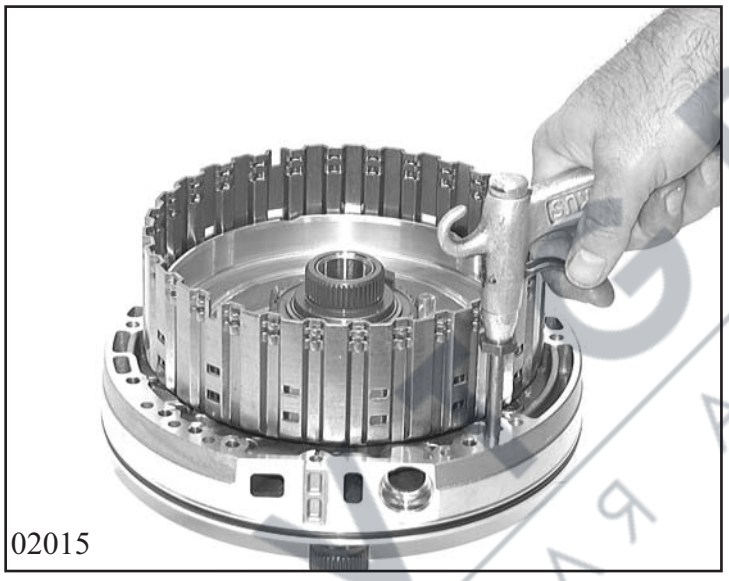
Lever out snap ring from planetary carrier and remove planetary carrier from cylinder A. Carefully unclip oil catch bowl. Remove snap ring and sun wheel from planetary carrier and lever out axial needle cage.



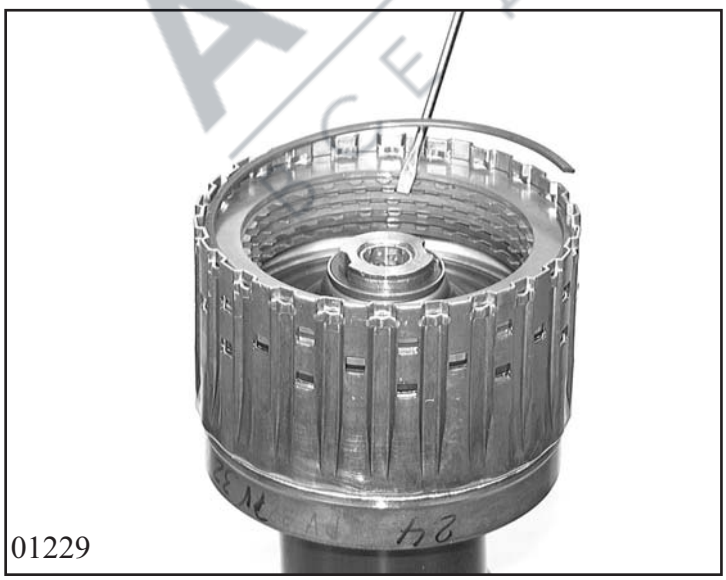



01227

Press out the cup spring downwards under the mandrel press with assembly bracket 5x46 002 566 ,remove snap ring with suitable pliers. Remove planetary carrier and diaphragm spring.
Take off O-ring type sealing ring from planetary carrier.

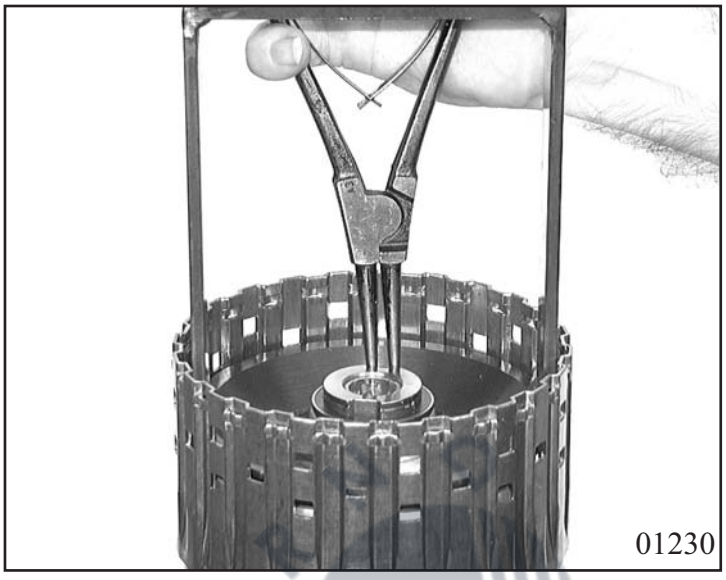

02015

Put cylinder A on oil ssupply and press out the piston with compressed air.
Remove 2 O-ring type sealing rings from piston A. Remove cylinder A from oil supply.

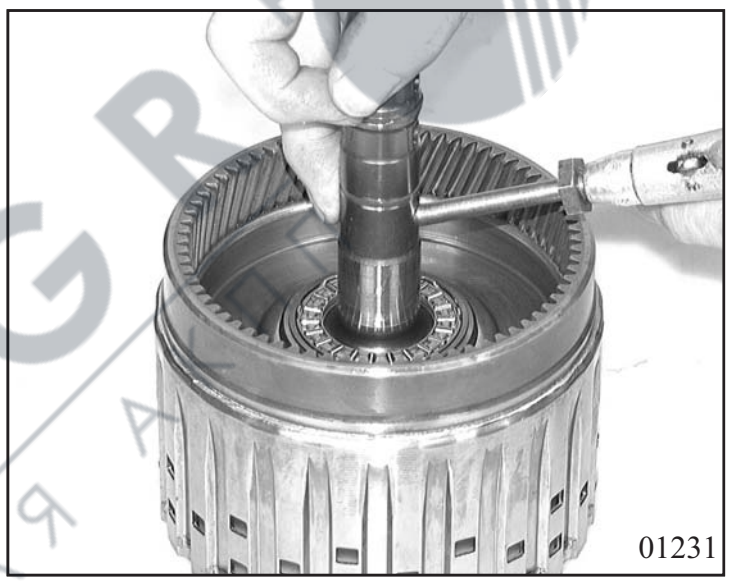

01229

Release the snap ring of Clutch E and remove the complete disc set of Clutch E.

Press baffle down with assembly bracket 5x46 002 566 and remove the snap ring with suitable pliers. Remove baffle and diaphragm spring and strip O-ring type sealing ring from oil dam.

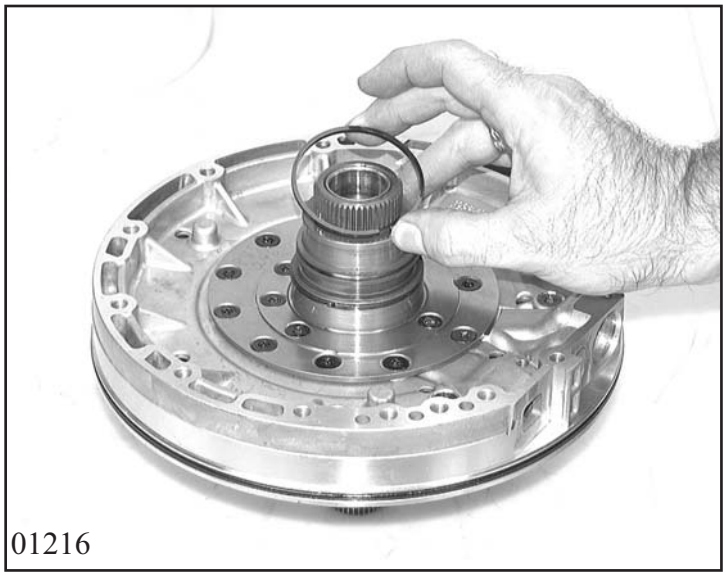


Cover one of the two oil supply bores and press out piston E with compressed air. Remove the two O-ring type sealing rings.

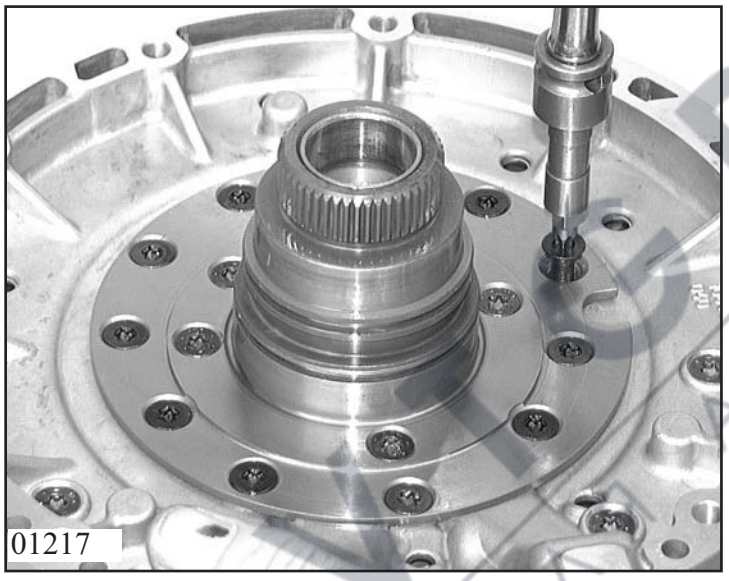


Strip O-ring type sealing ring and 3 rectangular rings from drive shaft.

Note!
If a needle bearing is defective unclip it

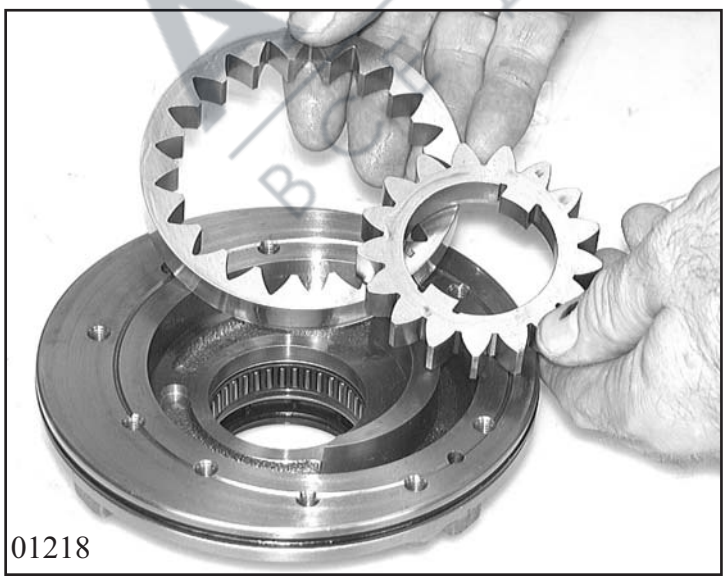

01216

Put complete oil system on suitable support. Strip 2 rectangular rings from idler wheel shaft.


01217

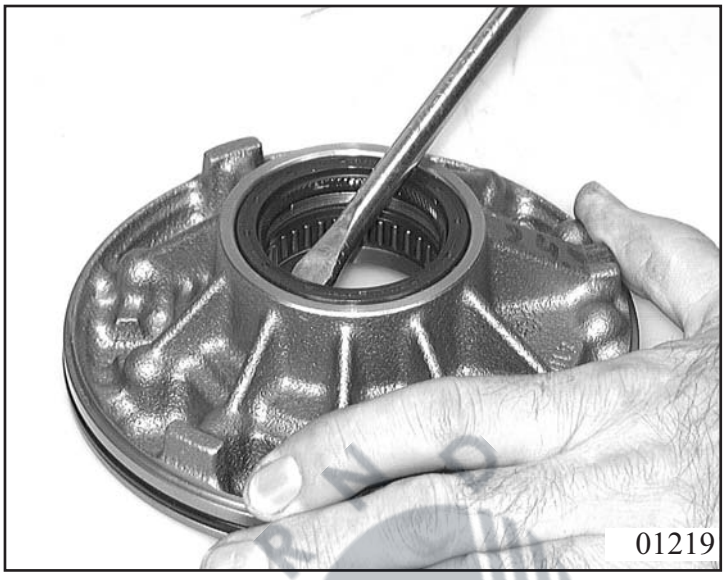
Loosen 11 off hexagon headscrews (countersunk head – outer ring idler wheel shaft), partially unscrew 2 off opposing cheese head screws. Drive out pump by carefully striking these screws with the plastic hammer.

(Key size = Torx - TX 30)


01218

Remove O-ring type sealing ring. The pump can be disassembled by removing the pump wheel and the internal geared wheel.

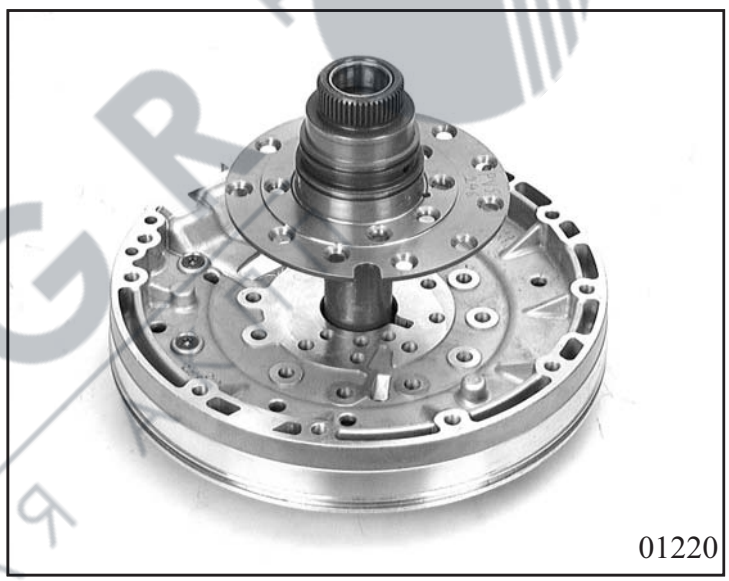
Lever out shaft sealing ring with a suitable screwdriver. Release snap ring. Press out sealing ring with needle bearing from pump impeller side if necessary with a suitable tool of the mandrel press. Rotate the pump housing for this. Diameter of the thrust bolt approx. (42) mm.


01219

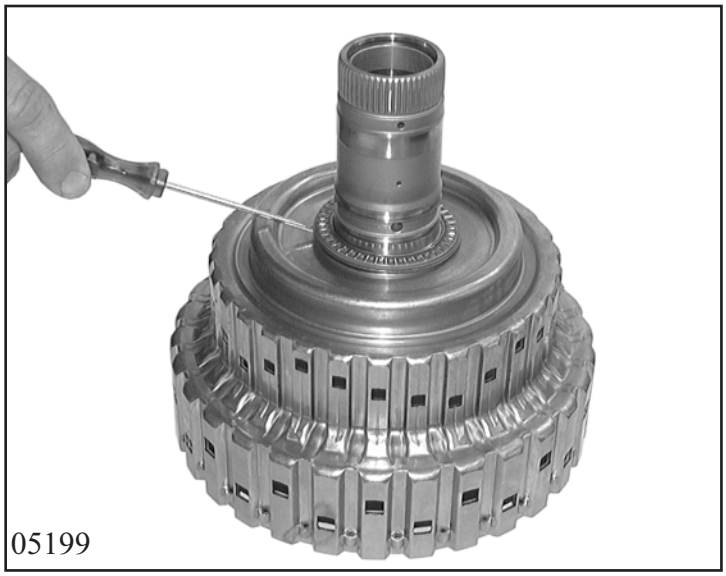
Note
The needle bearing is destroyed by this and must be renewed.

Loosen 6 off remaining countersunk screws, heat up housing around idler wheel shaft to approx. 70˚ C and drive out the idler wheel shaft from the intermediate plate with the plastic hammer. Unscrew 4 off countersunk screws from intermediate plate and remove this from the cover.

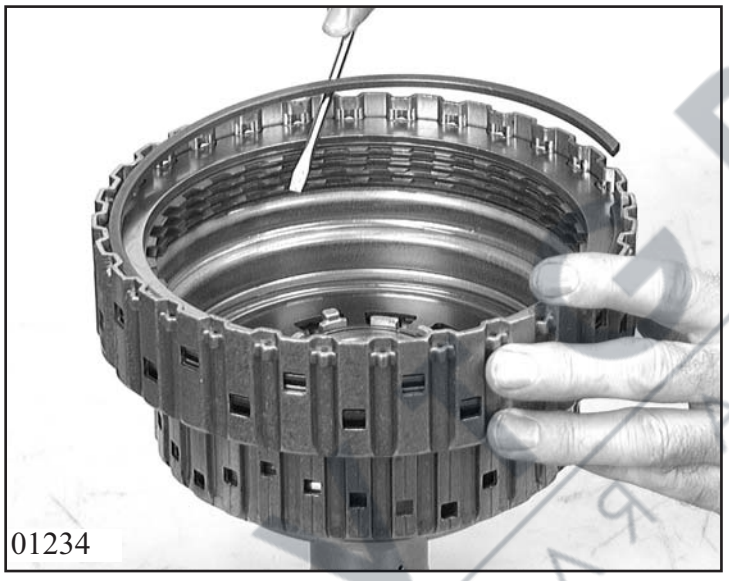
(Key size = Torx - TX 30)


01220

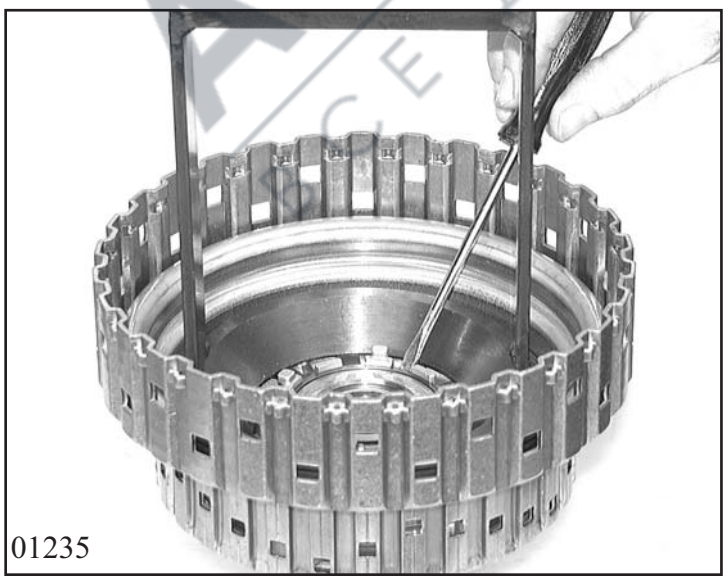
2.8.3 Clutch B


05199

Unclip needle bearing from clutch B carrier.

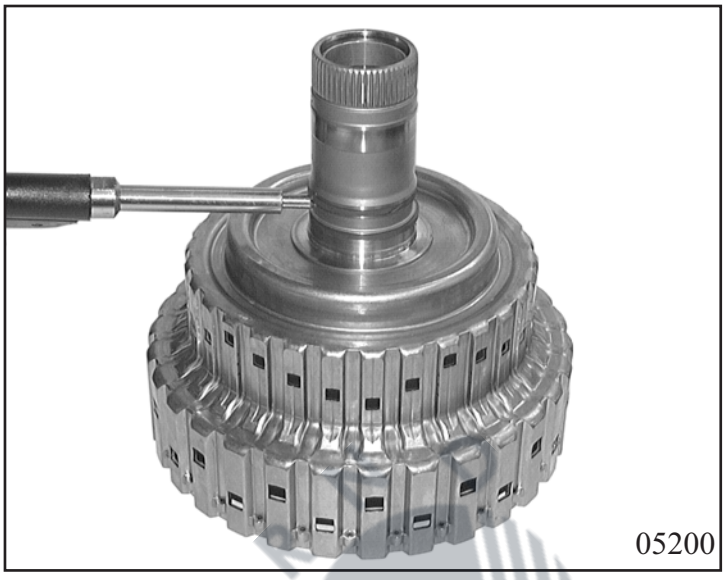

01234

Now rotate cylinder by 180° and release the snap ring of clutch B and remove the complete disc set.

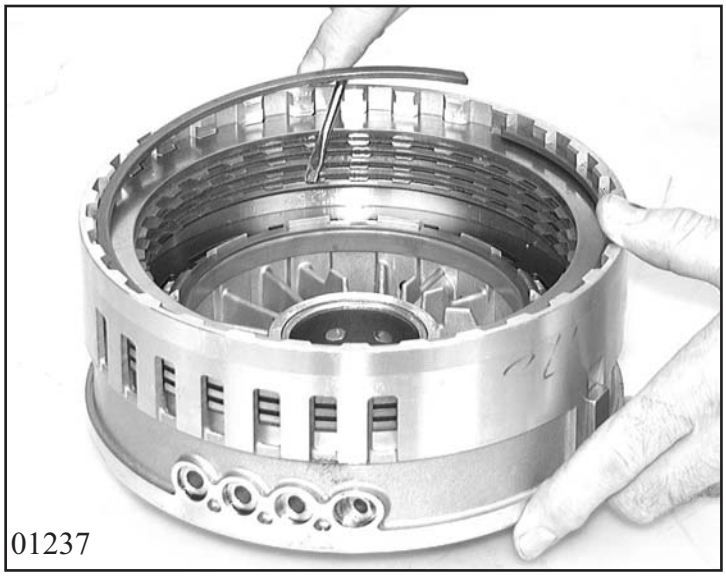

01235

Press down diaphragm spring B with assembly bracket 5x46 002 566 under the mandrel press, remove snap ring. Remove disc and cup spring.

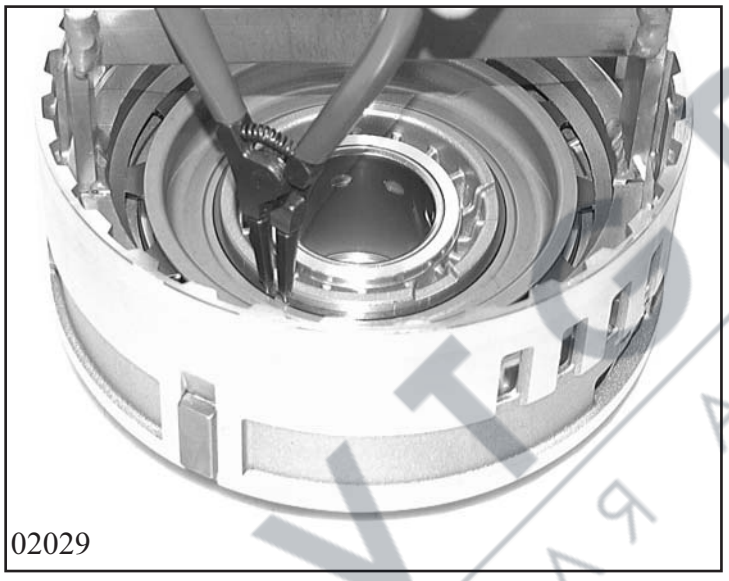
Release snap ring.
Cover one of the two oil supply bores and press out piston B with baffle by compressed air. Remove 1 O-ring type sealing ring from baffle as well as 2 O-ring type sealing rings from piston. Remove 2 rectangular rings from shaft.



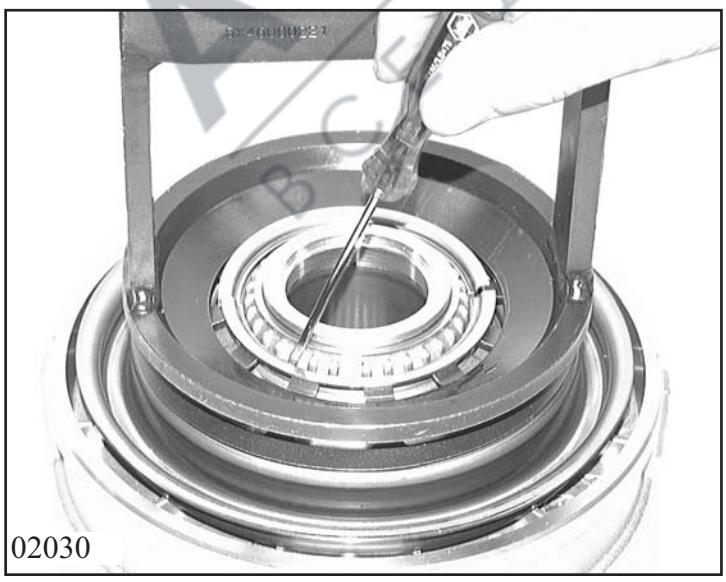
2.8.4 Brakes C and D


01237

Release brake C snap ring and remove complete disc set.

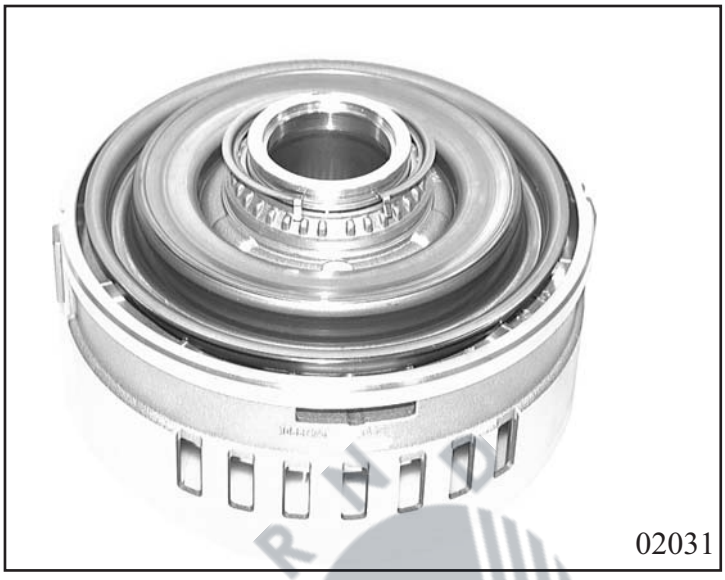

02029

Press down cup spring C with 5x46 001 501 assembly bracket under the mandrel press, pry off snap ring, remove holding disc and cup spring.

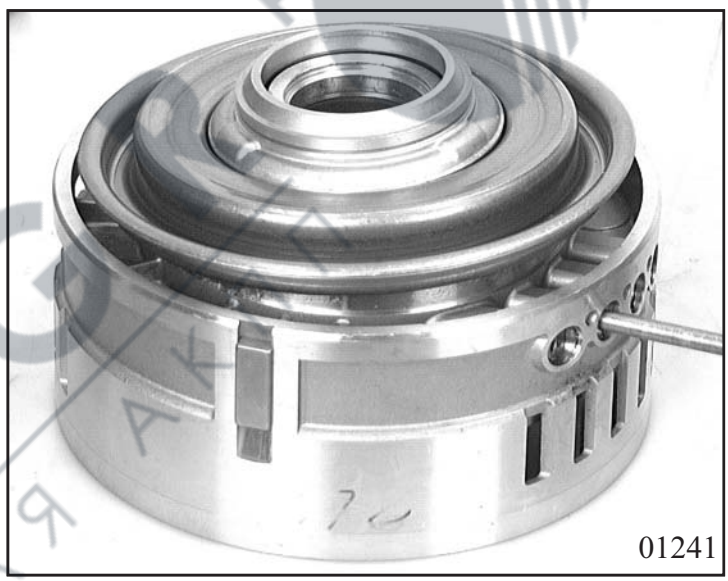

02030

Rotate cylinder and press down cup spring D with 5x46 000 221 assembly bracket under the mandrel press, withdraw divided guard ring and remove cup spring.

Press down baffle and remove divided holding disc.

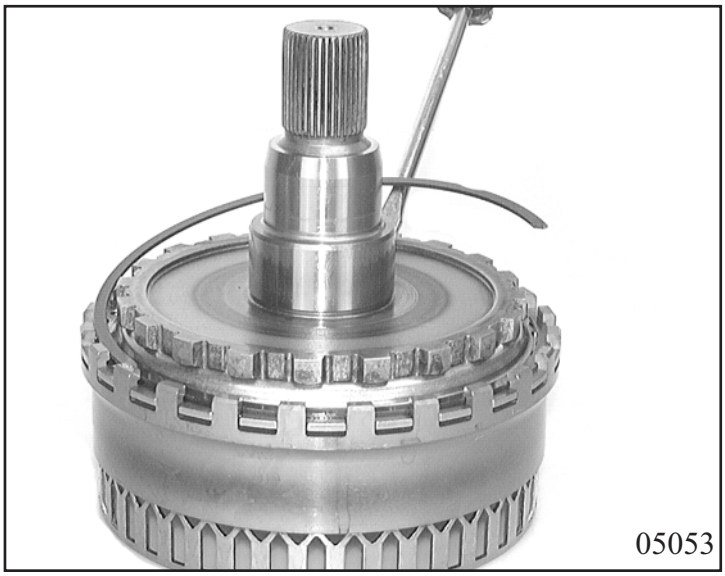


Carefully press out piston D via the oil supply bore with compressed air. Keep the two other bores closed during this. Remove 2 O-ring type sealing rings from cylinder D and 1 O-ring type sealing ring from the piston.

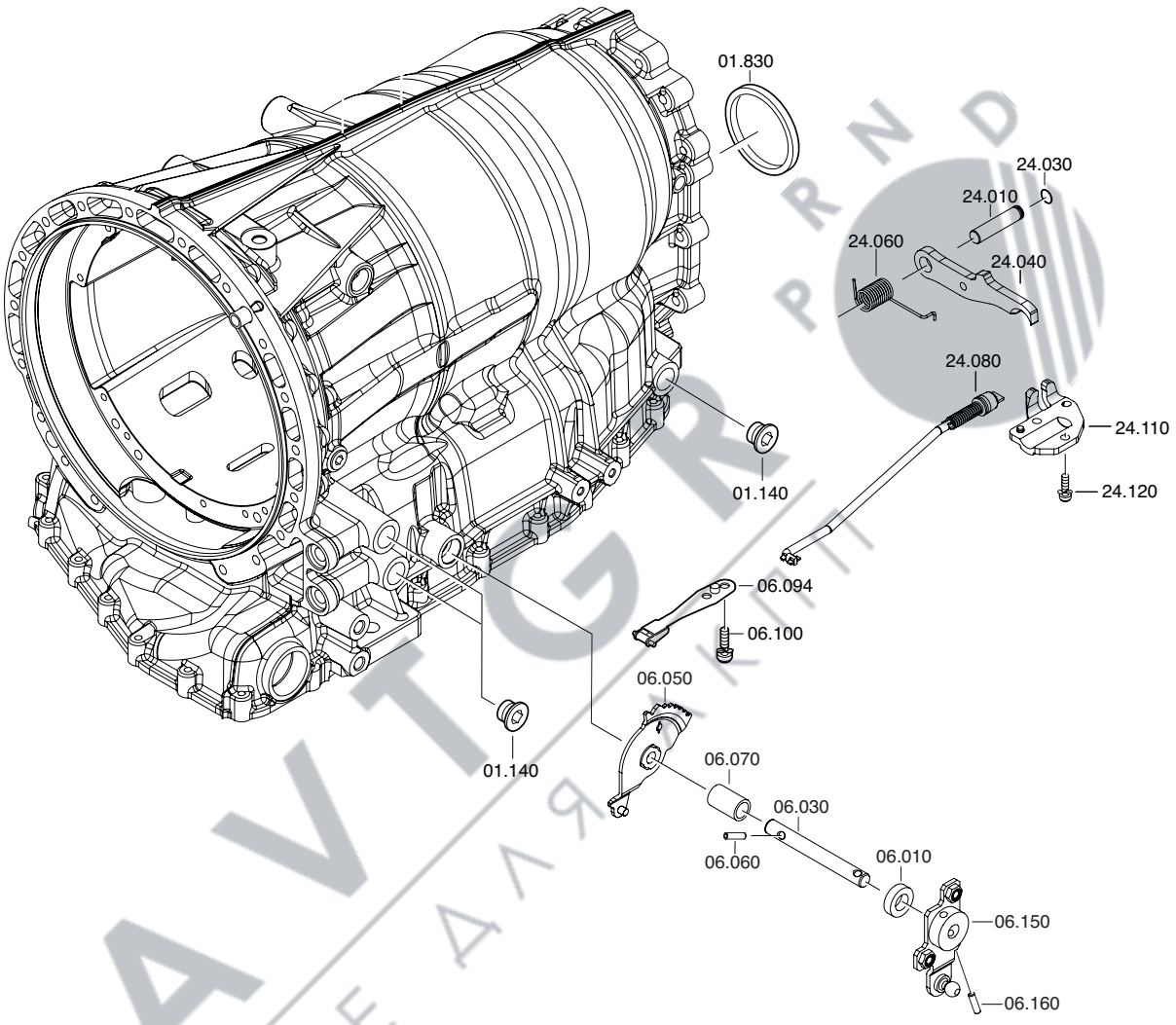


2.8.5 Output Shaft with Parking Lock

Separate output shaft from ring gear wheel by levering out the snap ring.



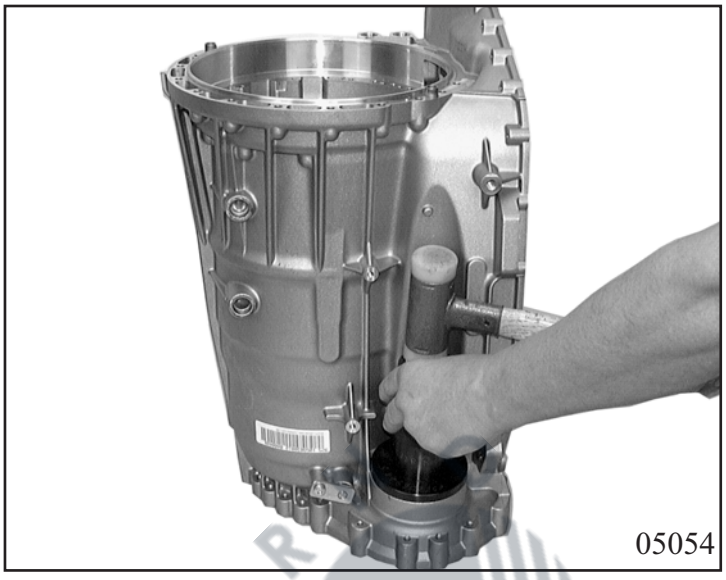
3. Assembly
3.1 Housing with Gearshift and Parking lock



Drive in shaft seal from side shaft 01.830 into gearbox housing with driving in tool 5x46 909 267.

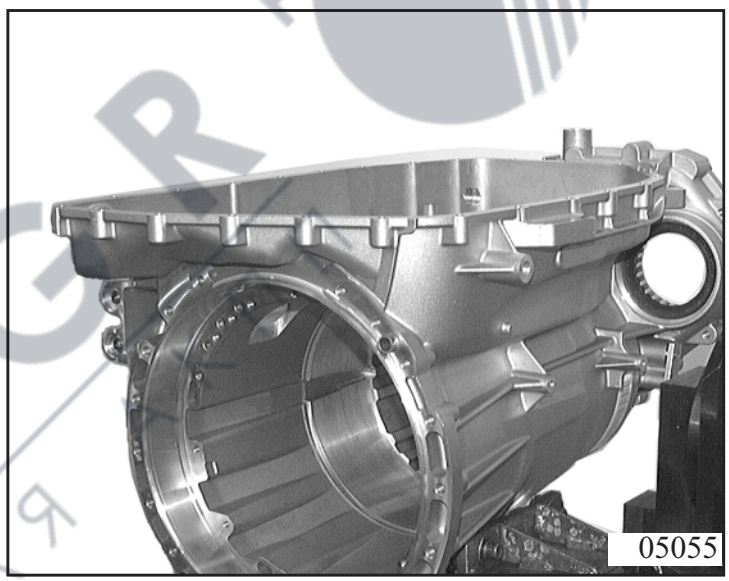
Comment:
In the event of bearing failure of the side shaft bearing, the gearbox housing (complete with new fitted bearings) is to be replaced

Note!
This shaft sealing ring is not present in the Bentley, since the side shaft is in a common oil system with the distributor housing and differential.


05054

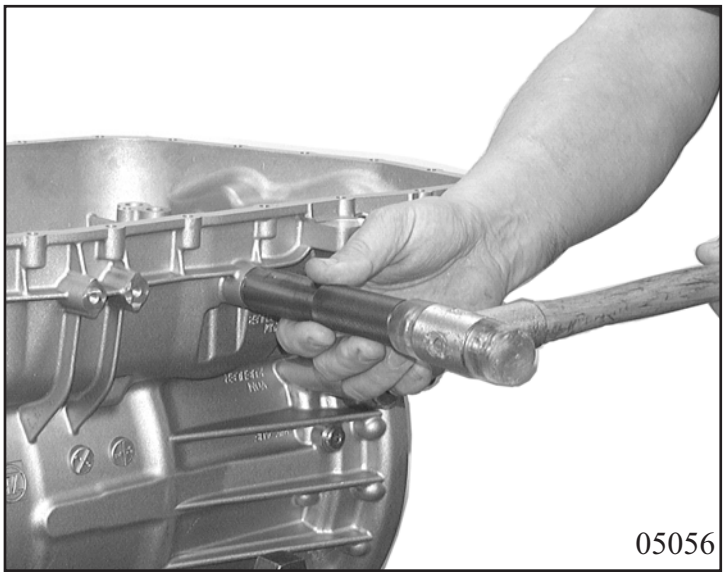
Take up gearbox housing in assembly bracket 5t66 000 128 and attach to assembly carriage or workbench holder 5x46 000 763.
Screw in 4 screw plugs 01.140.

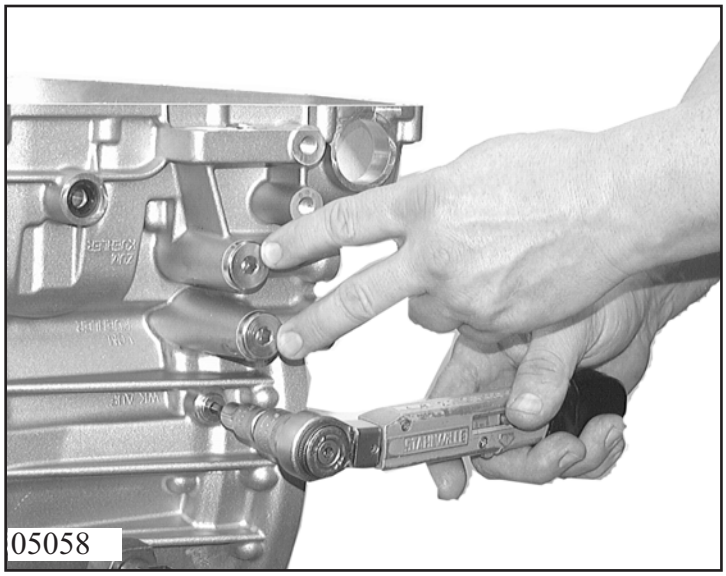
(For tightening torque see Chapter 1.5)


05055

Attention!
Only necessary with new gearbox housing!

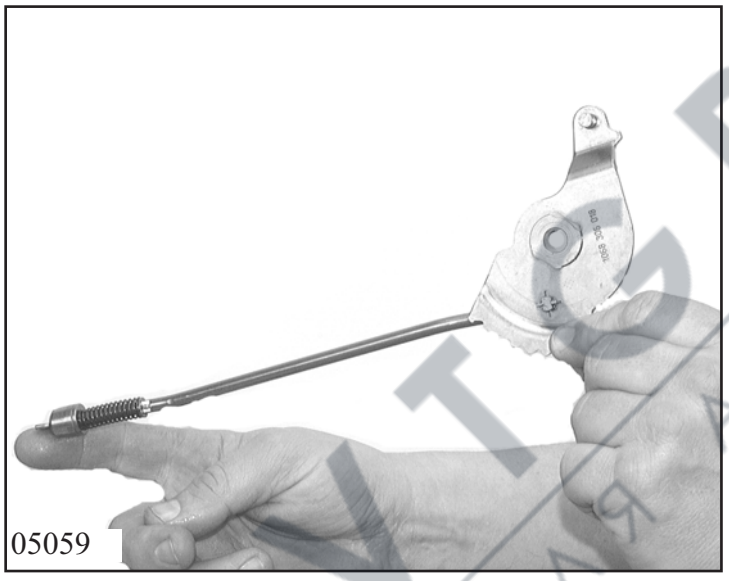
Fit shaft seal 06.010 in gearbox housing with press-in mandrel 5x46 002 561.


05056



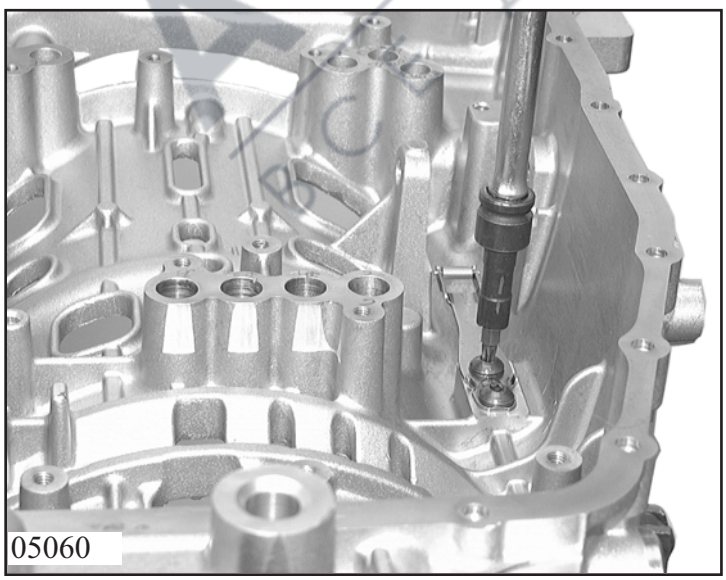
Screw in 2 new oil cooler screws into gearbox housing.
Screw in new screw plug 01.100.

(For tightening torque see Chapter 1.5)



Suspend connecting rod 24.080 in parking or latching disc 06.050 and rotate.

(Only for new housing)



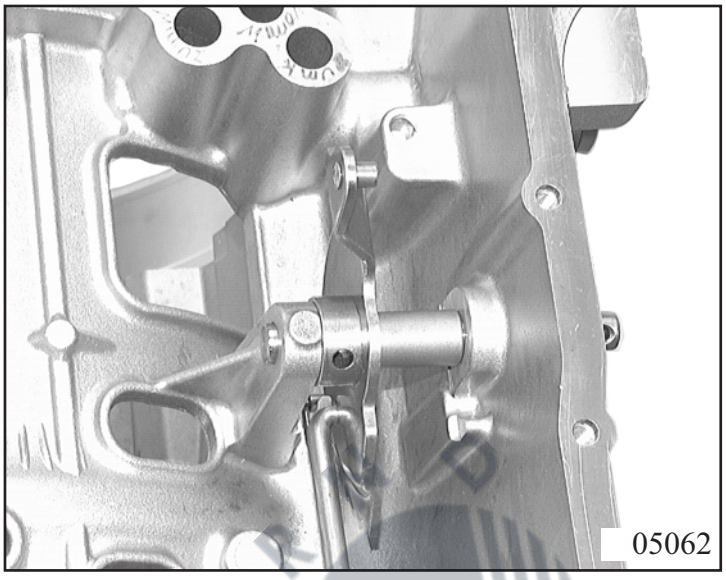
Tighten detent spring 06.094 with 2 Torx screws 06.100.

(For tightening torque see Chapter 1.5)

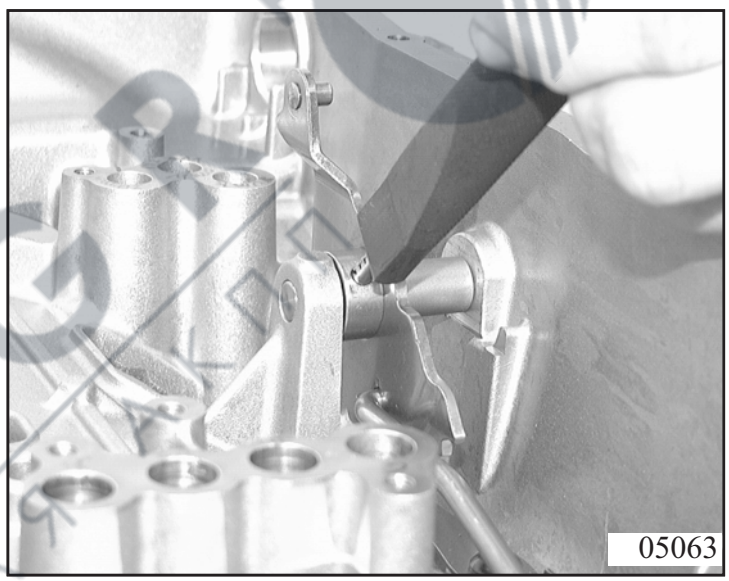
Knock 2 new guide bushes into the gearbox housing (converter side).

Attention!
If gearbox housing, catch spring, latching disc or selection shaft were renewed and/ or catch spring released, the switch (catch spring) must be adjusted again.
see **Chapter 1.4.9**

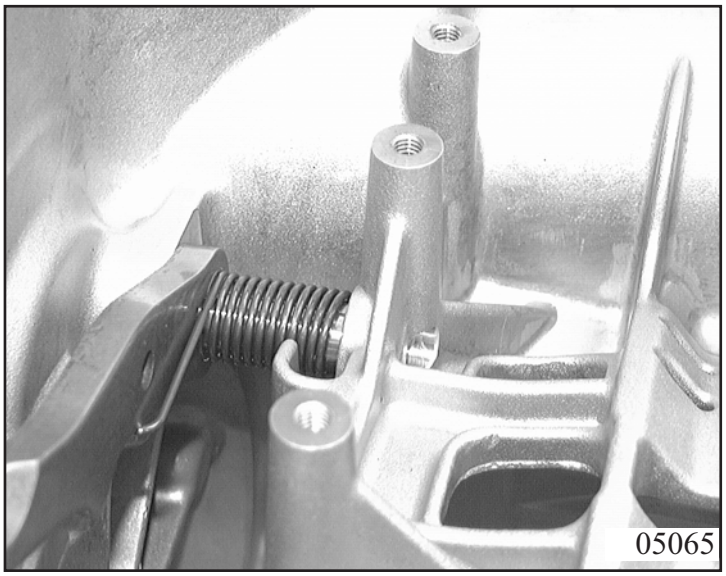
Insert detent disc with connecting rod in gearbox housing and push election shaft 06.030 sthrough sleeve 06.070 and latching disc.

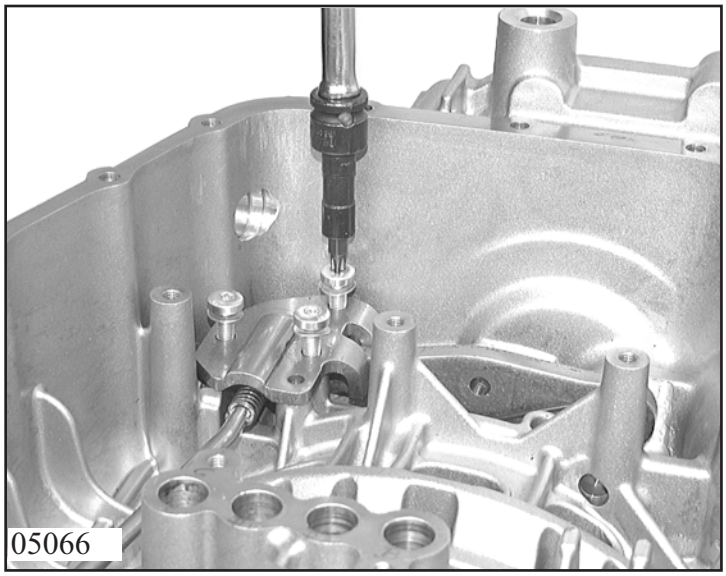


Drive in new locking pin 06.060 into position with driving in bolt 5x46 000 291 or a suitable mandrel.



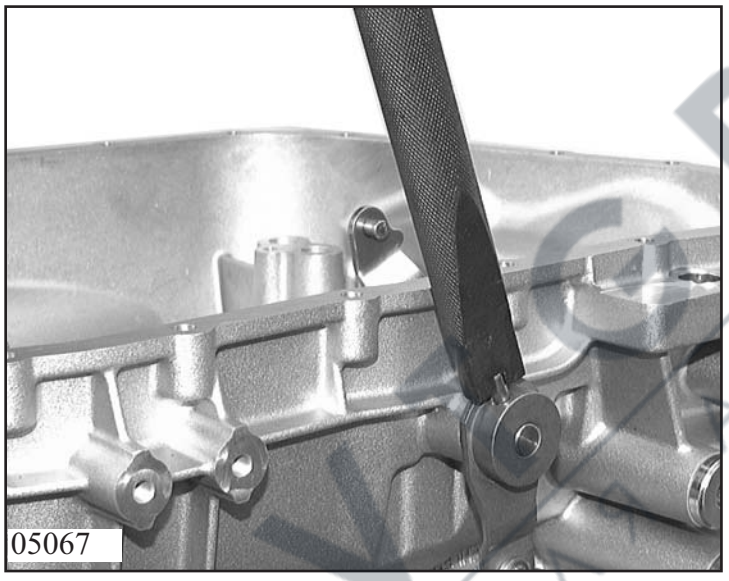
Insert pawl 24.040 in gearbox housing with spring clip 24.060 and fix by pressing in pin 24.010.





Press down pawl, and fasten guide plate 24.110 with 3 Torx screws 24.120 .

(For tightening torque see Chapter 1.5)



Attach shift lever to selection shaft and fix new clamping sleeve 06.160 in position shown with impact mandrel 5x46 000 291


AVTGR
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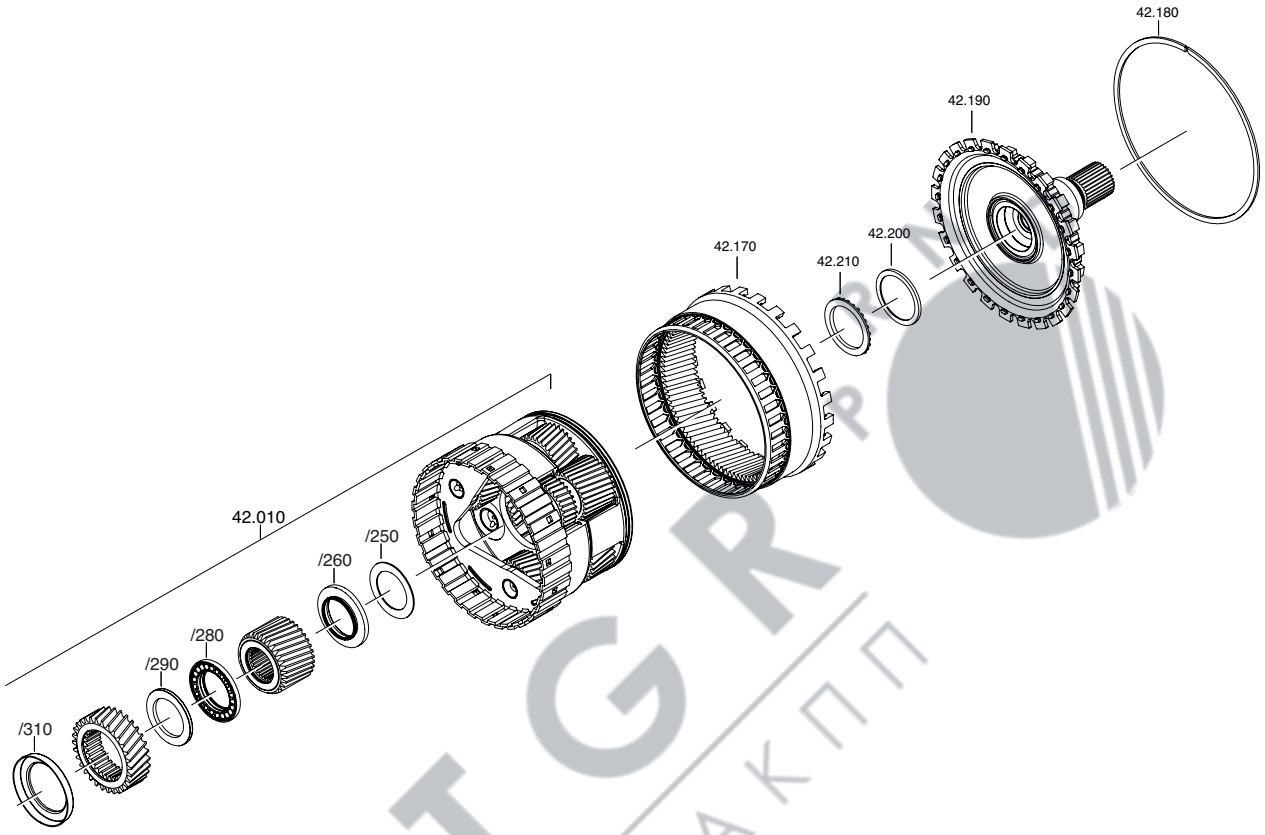
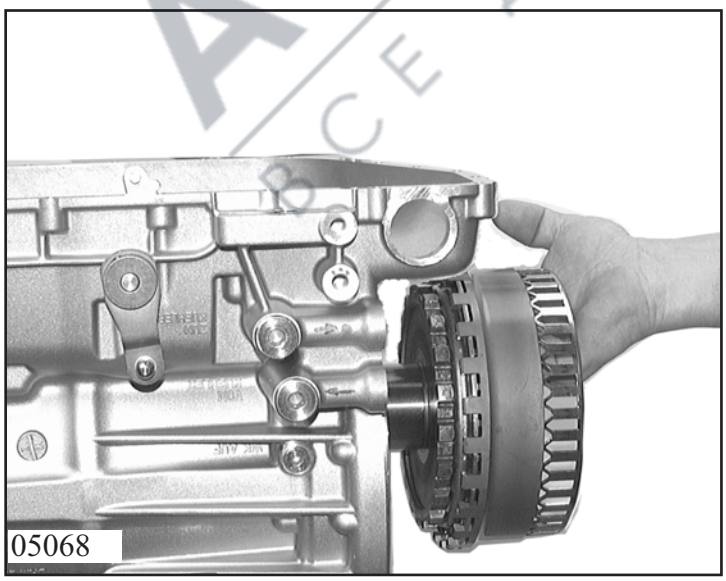
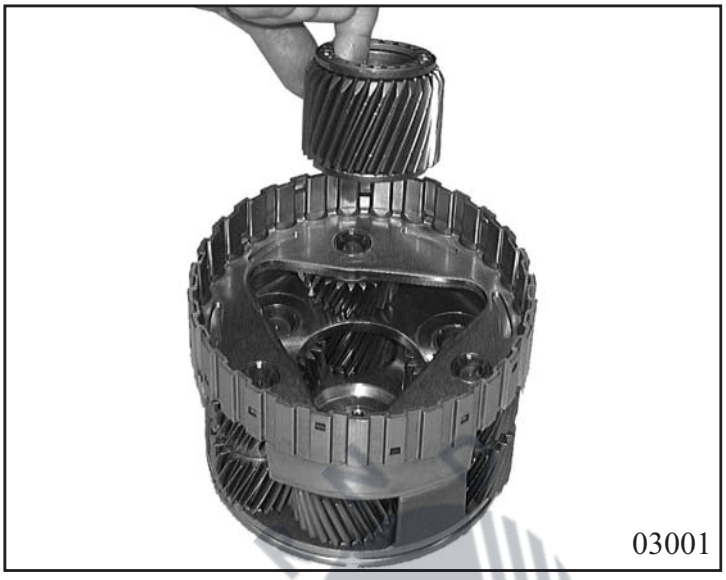
3.2 Rear Gearbox, Clutches and Planetary Wheel Set
3.2.1 Drive Shaft with Parking Lock and Planetary Wheel Set



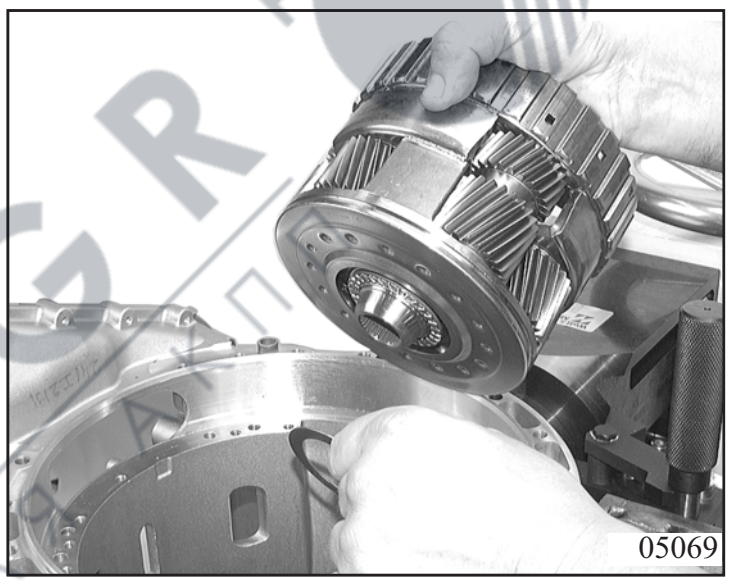


Fasten internal geared wheel 42.170 on output shaft 42.190 with snap ring 42.180. Insert output shaft in gearbox housing.

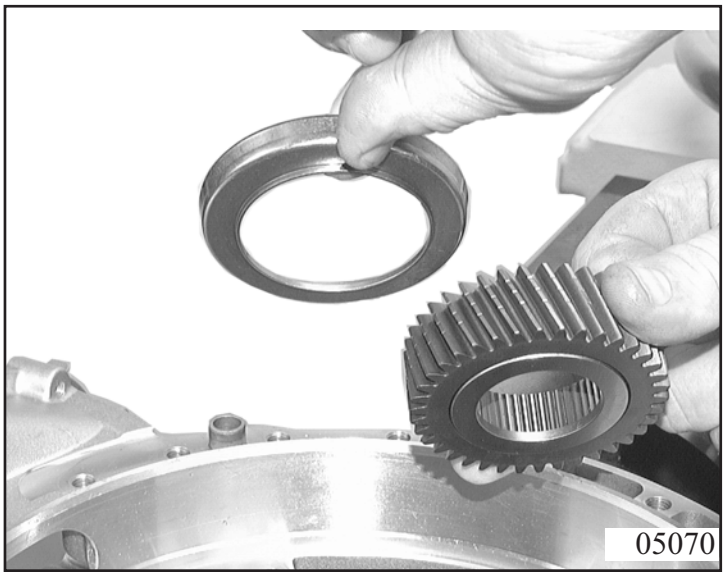
Insert bearing disc 42.010/250 in planetary carrier. Clip 2 axial thrust bearings 42.010/260 +/280 on sun wheel 3 (small) and insert into planetary carrier with phase upwards.



Rotate gearbox with converter bell side upwards. Clip bearing 42.210 in planetary gear set 42.010. Insert disc 42.200 and planetary gear set in gearbox housing.

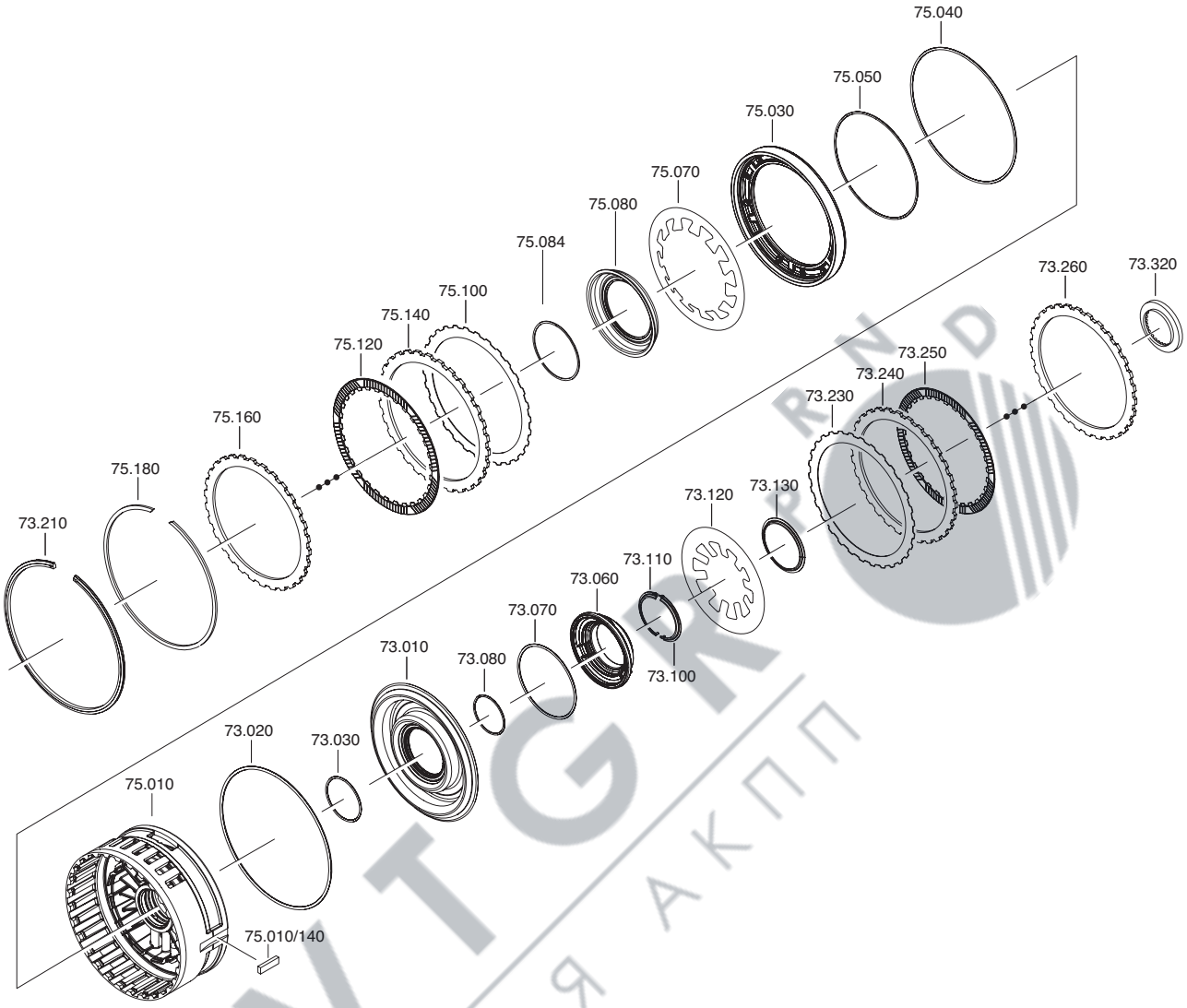


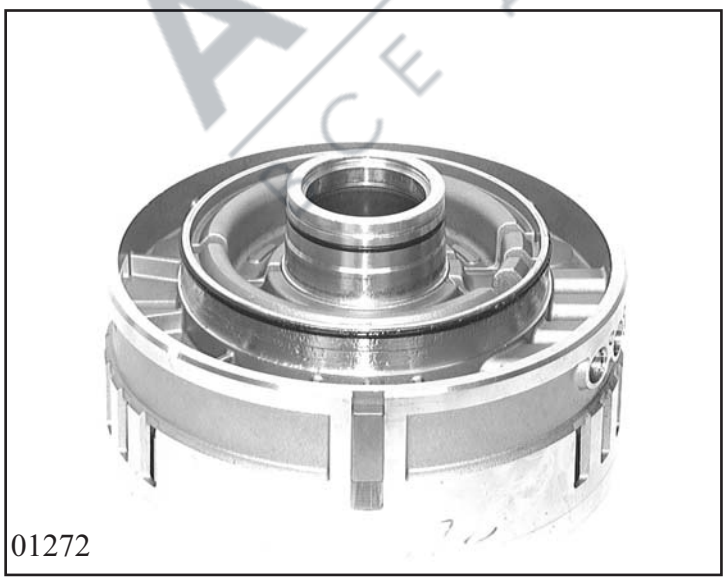
Press in bearing disc 42.010/290 into sun wheel 2. Insert Sun wheel 2 and bush 42.010/310 into planetary carrier.



Attention!
Insert sun wheel 2 with larger slot upwards.

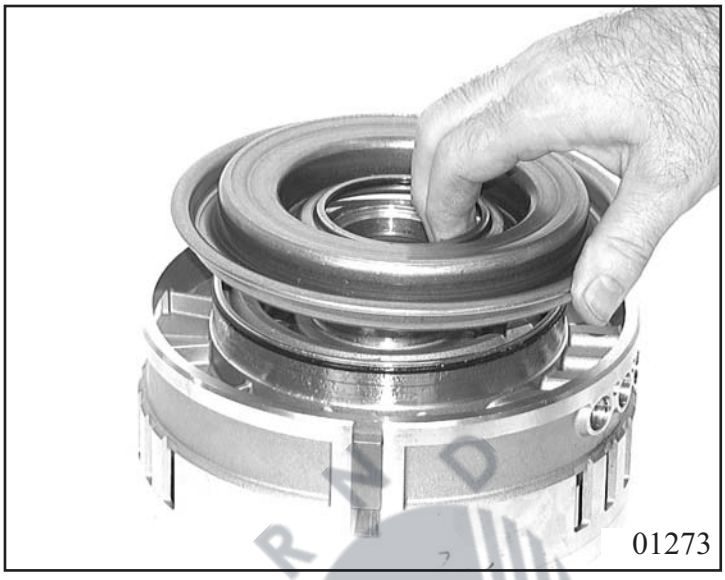
3.2.2 Brakes C and D



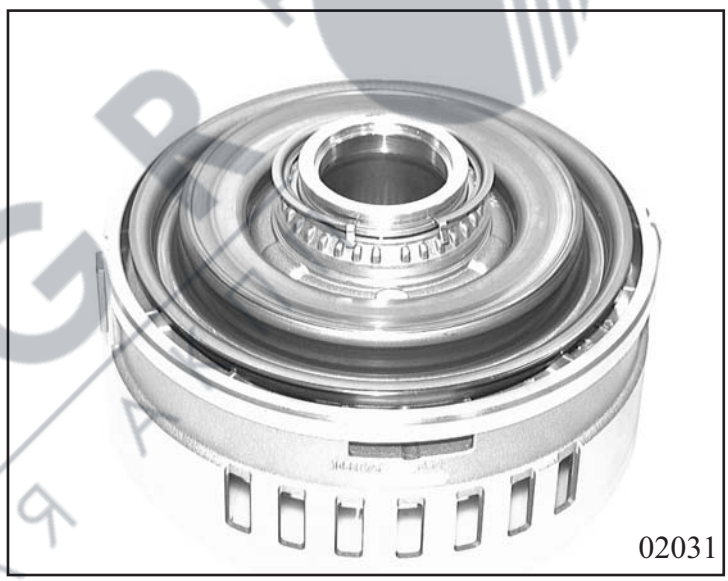


Knock in 2 adjusting springs 75.010/140 centrally at cylinder CD 75.010 with plastic hammer.
Pull on one O-ring type sealing ring 73.080 onto piston D 73.010 and 2 O-ring type sealing rings 73.020 + 73.030 onto cylinder CD 75.010.

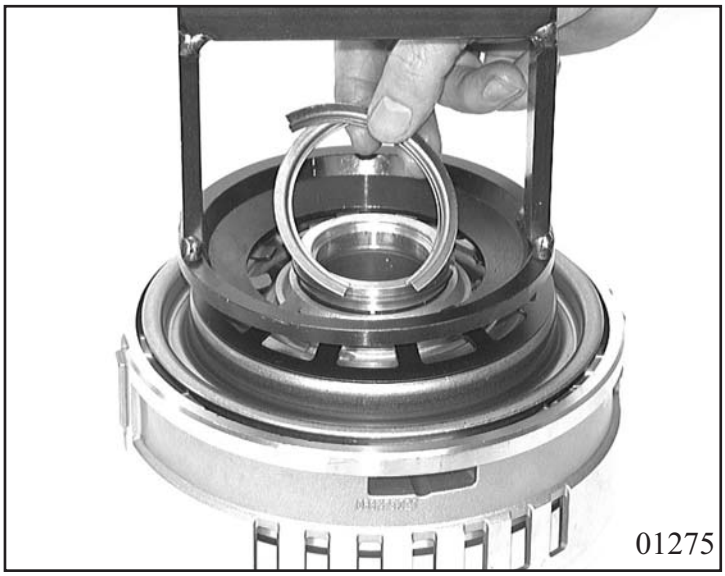
Press piston D into cylinder CD.

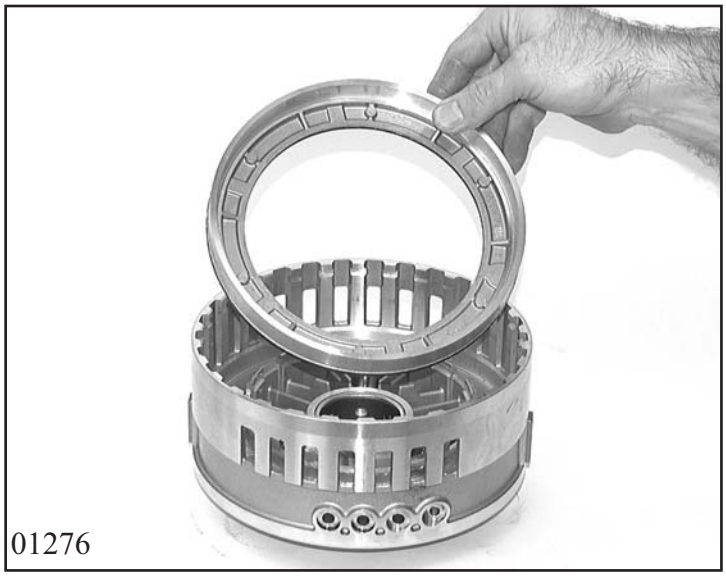


Pull on 1 round sealing ring 73.070 onto baffle D 73.060 and press this into piston D.
Press down baffle and secure with divided holding ring 73.100+73.110



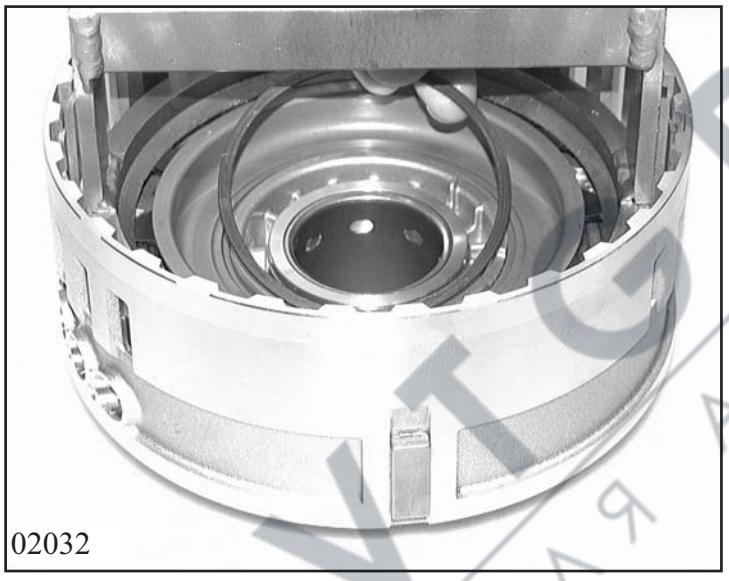
Insert cup spring 73.120 .
Press down the diaphragm spring under the mandrel press with assembly bracket 5x46 000 221 and secure with divided holding ring 73.130





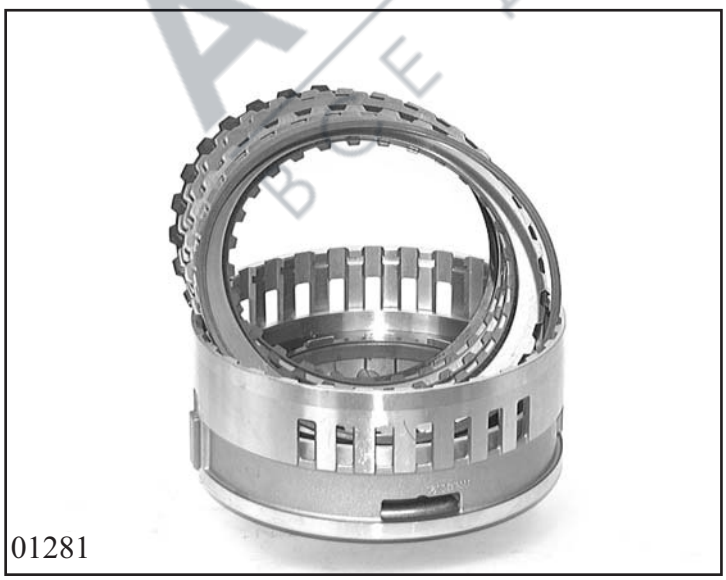
01276

Rotate cylinder CD by 180°. Pull on 2 round sealing rings 75.040 and 75.050 onto piston C 75.030 and press these into the cylinder.



02032

Insert cup spring C 75.070 and holding ring 75.080 .
Press down diaphragm spring C under the mandrel press with assembly bracket 5x46 001 501 and secure with snap ring 75.084.

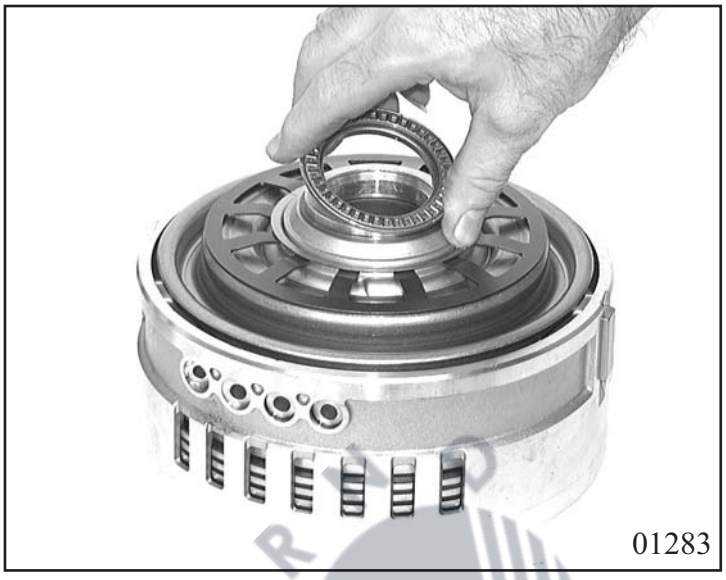


01281

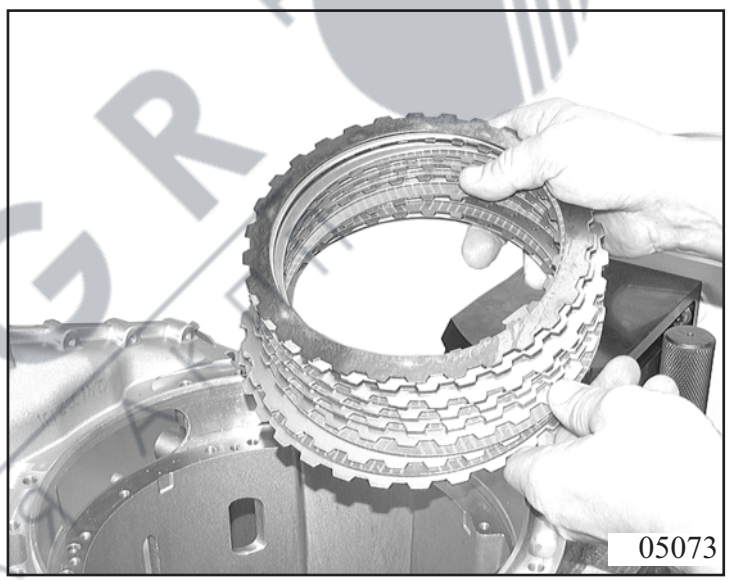
Insert complete disc set C in cylinder CD, starting with the spring disc 75.100. Then insert alternating external disc 75.140 and lining disc 75.120. Secure upper outer disc 75.160 with snap ring 73.180 .

Attention!
Adjustments **Chapter 1.4.1.1**

Turn cylinder CD and clip on axial needle bearing 73.240 onto the bar of the cylinder (Brake D side).

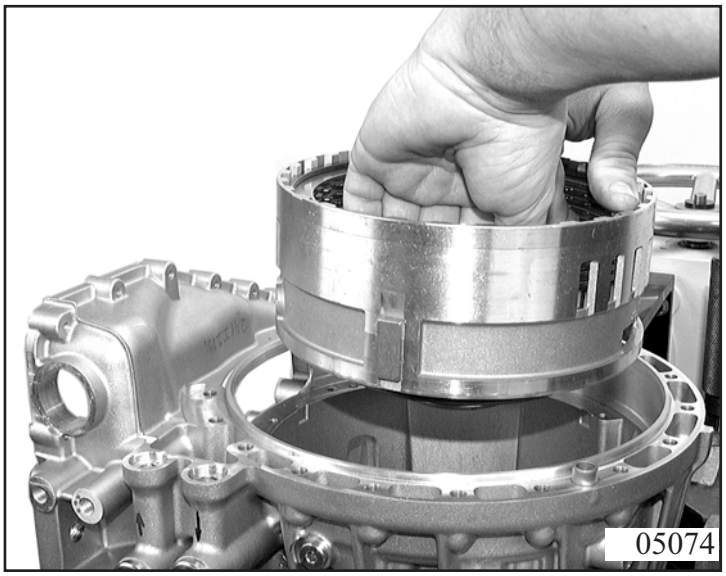


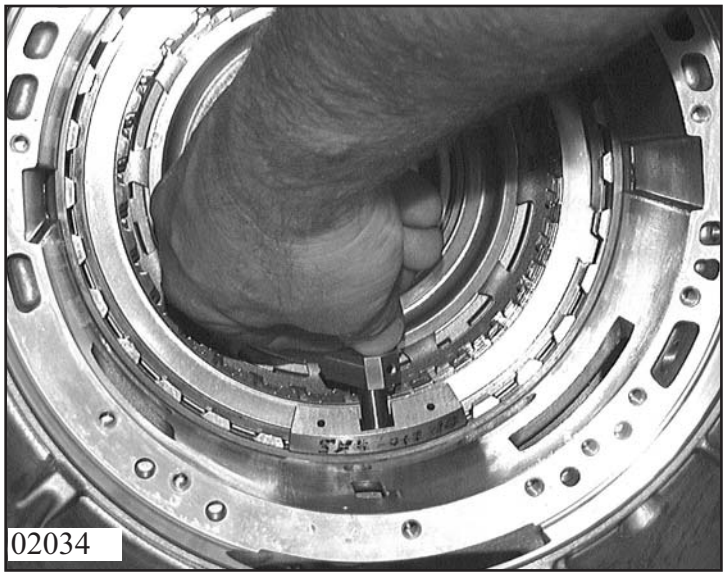
Insert complete disc set D into housing, starting with end disc 73.260 and then alternating lining disc 73.250 and outer disc 73.240 . Finish with spring disc 73.230.



Attention!
Adjustments **Chapter 1.4.1.2**

Insert complete cylinder CD in gearbox housing

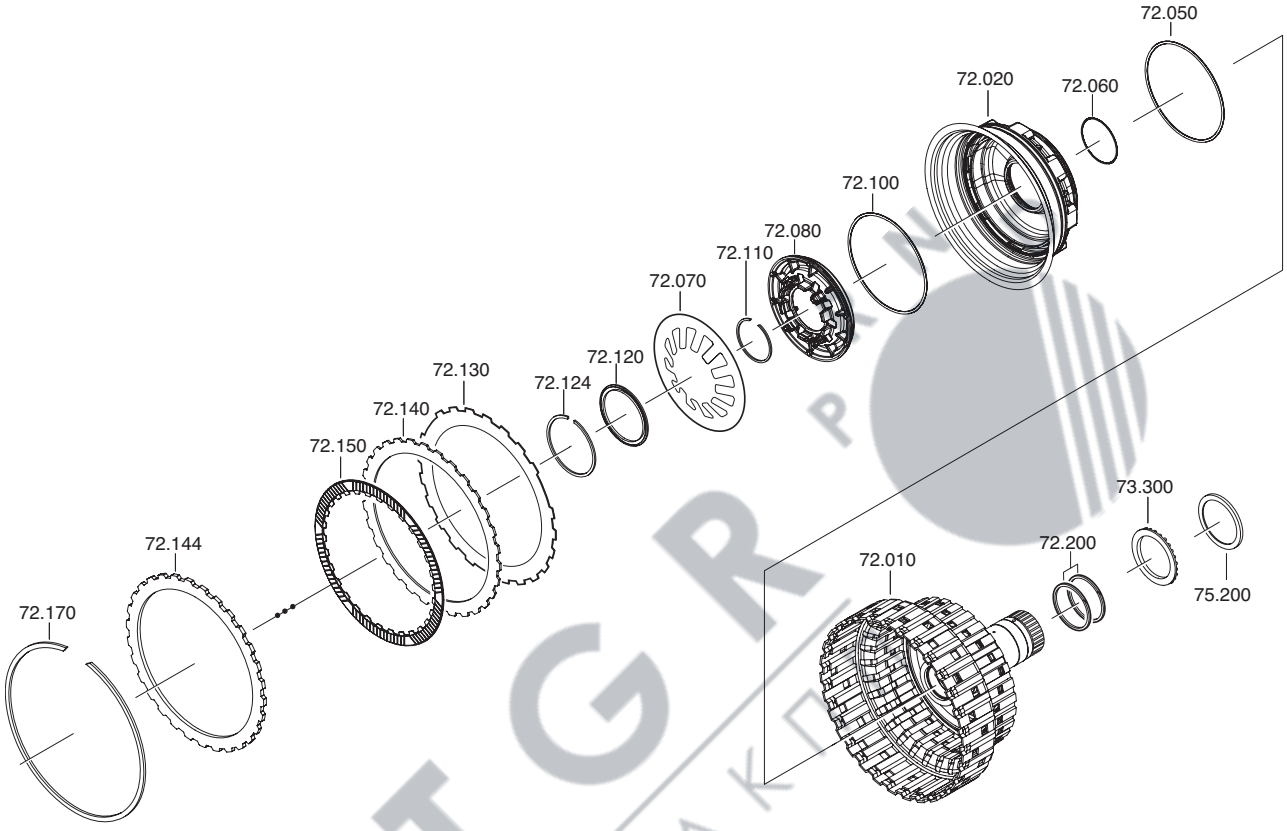




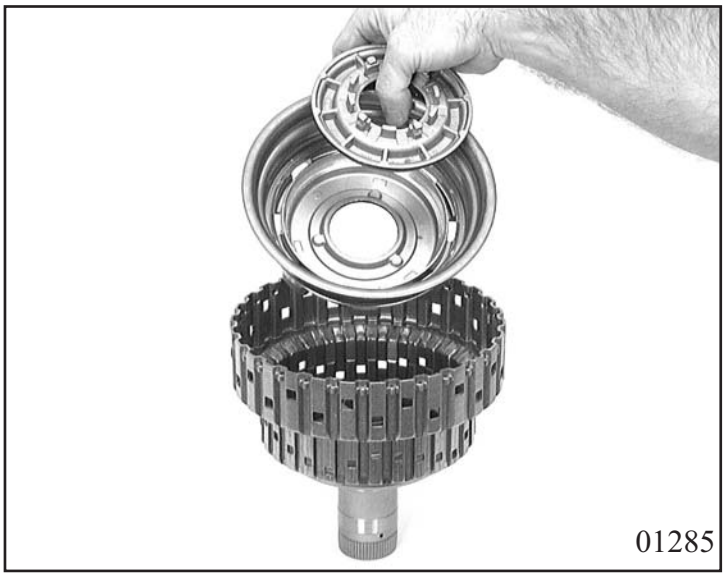
Secure in gearbox housing with snap ring 73.210 .
Knock snap ring into housing groove all around with impact tool 5x46 001 930 .

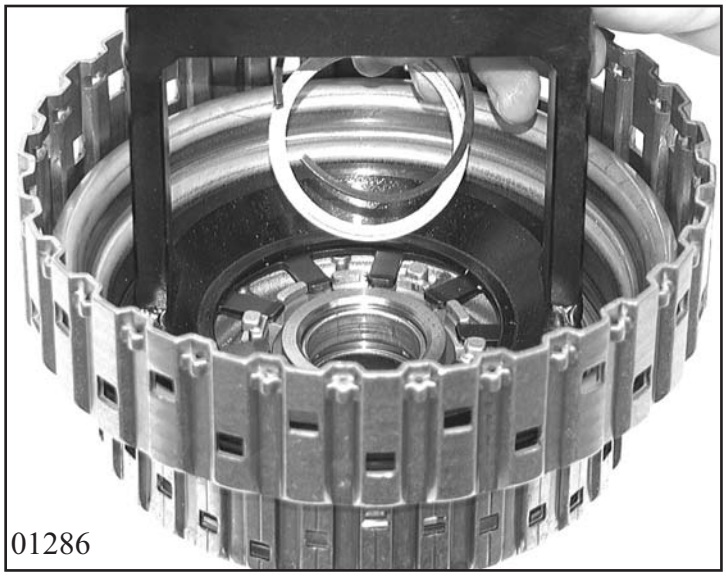
Note:
Remove the handle for better handling of the tool.

3.2.3 Clutch B



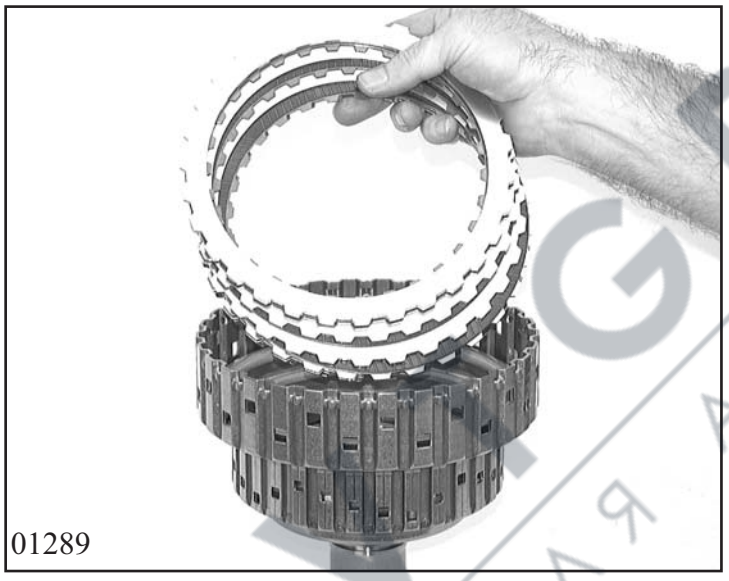
Fit new O-ring type sealing rings 72.050 and 72.060 onto piston B 72.020. Press the piston into cylinder B 72.010. Pull on O-ring type sealing ring 72.100 onto baffle 72.080 and press baffle into piston.





01286

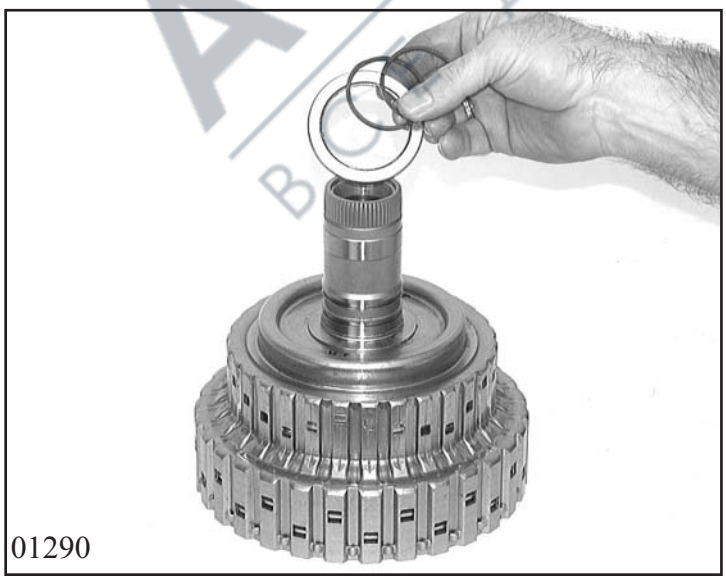
Press down baffle and secure with snap ring 72.110. Insert diaphragm spring B 72.070 and holding disc 72.120 with groove upwards and press down the diaphragm spring under the mandrel press with assembly bracket 5x46 002 566 and secure with snap ring 72.124.



01289

Insert complete disc set B, starting with spring disc 72.130. Then alternately insert outer disc 72.140 and lining disc 72.150. Secure upper outer disc 72.144 with snap ring 72.170.

Attention!
Adjustments **Chapter 1.4.1.3**

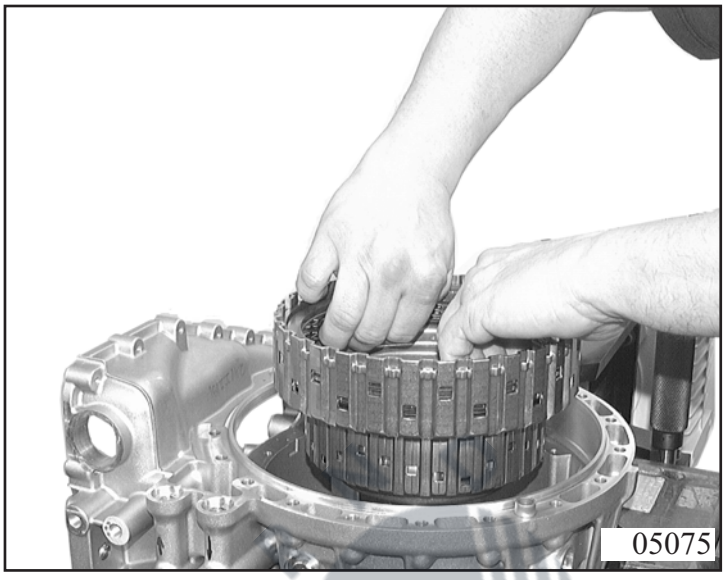


01290

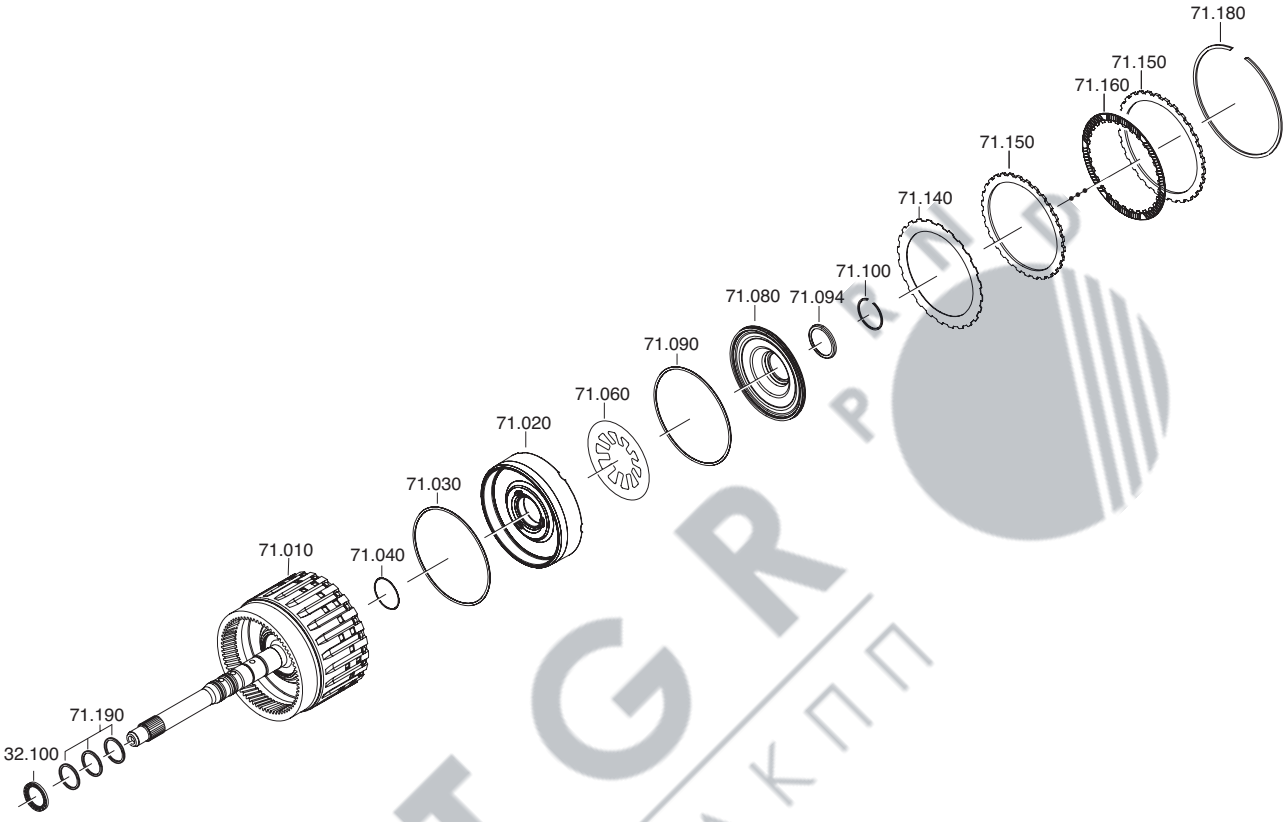
Rotate cylinder and pull on 2 rectangular rings 72.200 onto cylinder B.
Clip bearing 72.300 onto cylinder B.

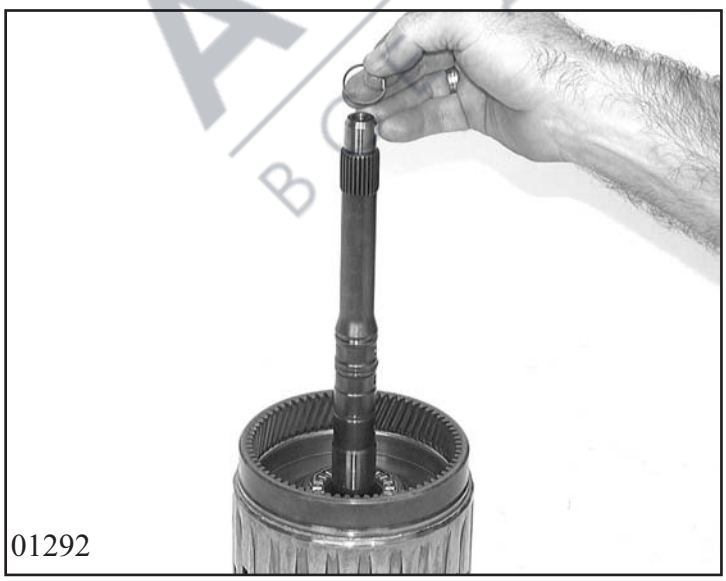
Attention!
For new rectangular rings stick these with some Vaseline in the groove.

Insert angled disc 75.200 in gearbox housing and insert complete clutch in gearbox housing.



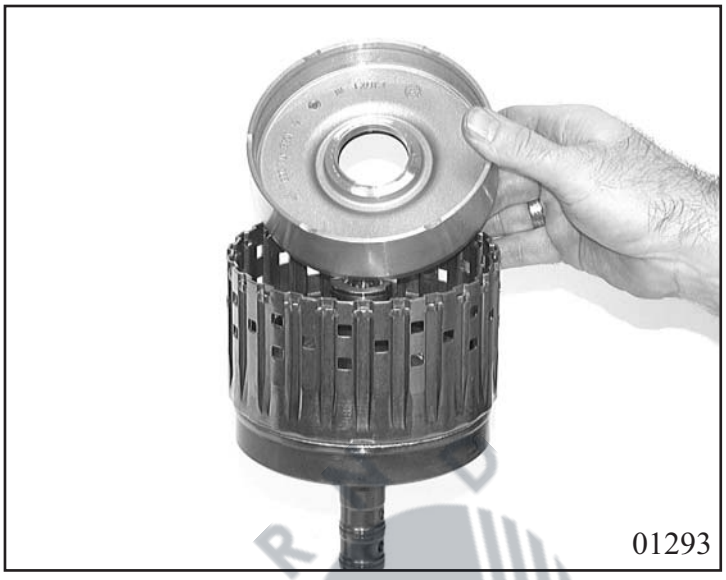
3.2.4 Tower (Drive with Clutches A and E)
3.2.4.1 Clutch E (Drive)



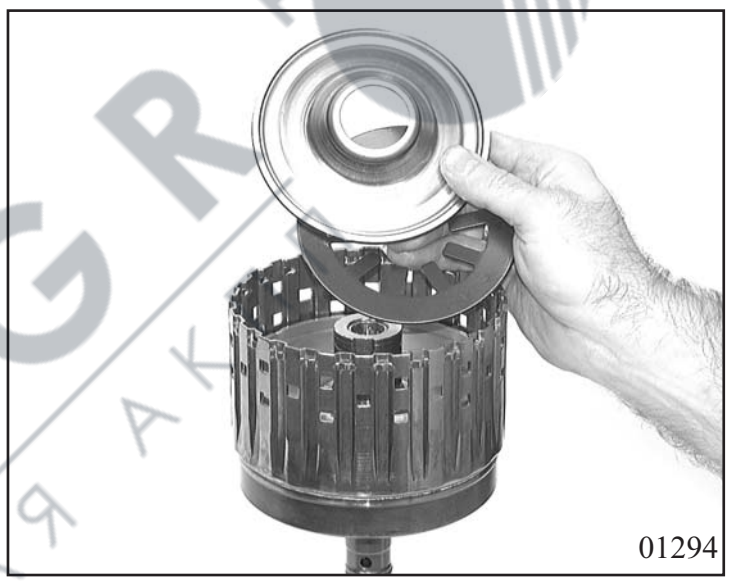


Pull on 3 new rectangular rings 71.190 onto cylinder E 71.010 with drive shaft. Clip in axial needle cage 32.100 into cylinder (internal geared wheel side).

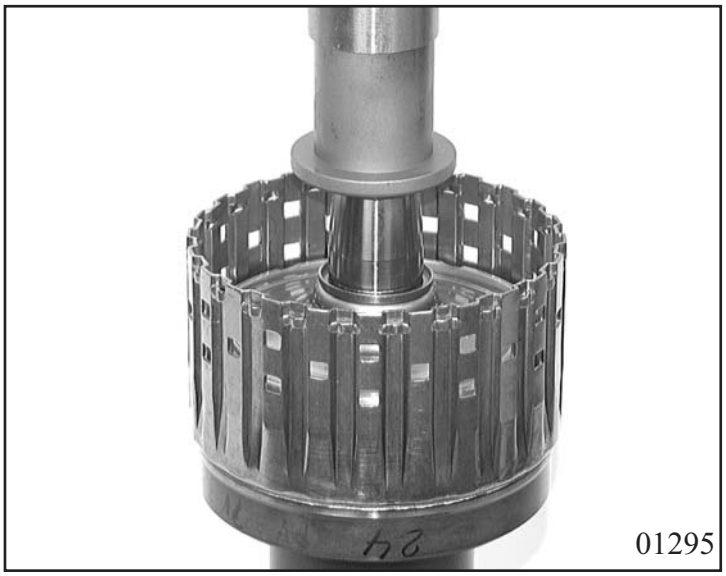
Pull on new sealing rings 71.030 and 71.040 onto piston E 71.020.
Press piston E into cylinder E.

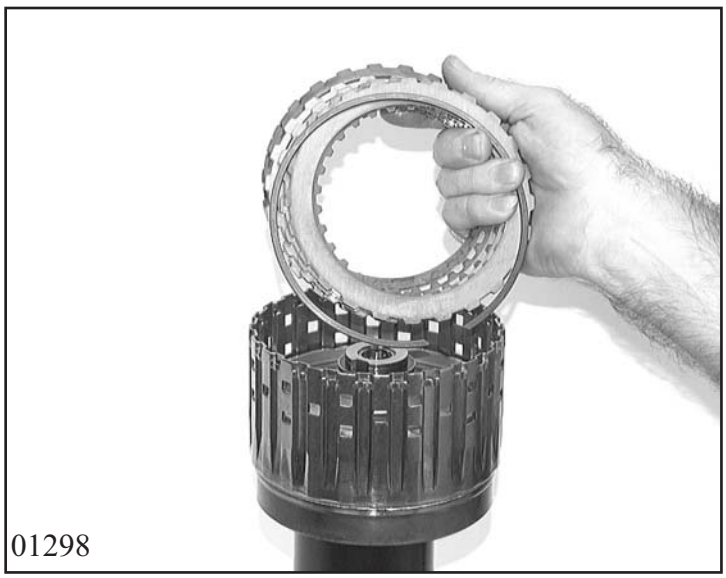


Pull on new round sealing ring 71.090 onto baffle 71.080. Insert cup spring 71.060 into cylinder E with protrusion downwards and press in baffle.



Insert holding plate 71.094 with groove upwards. Put on assembly aid 5x46 002 571, push on snap ring 71.100. Press down pipe 5x46 002 571 with snap ring and cup spring under mandrel press until snap ring engages in groove.



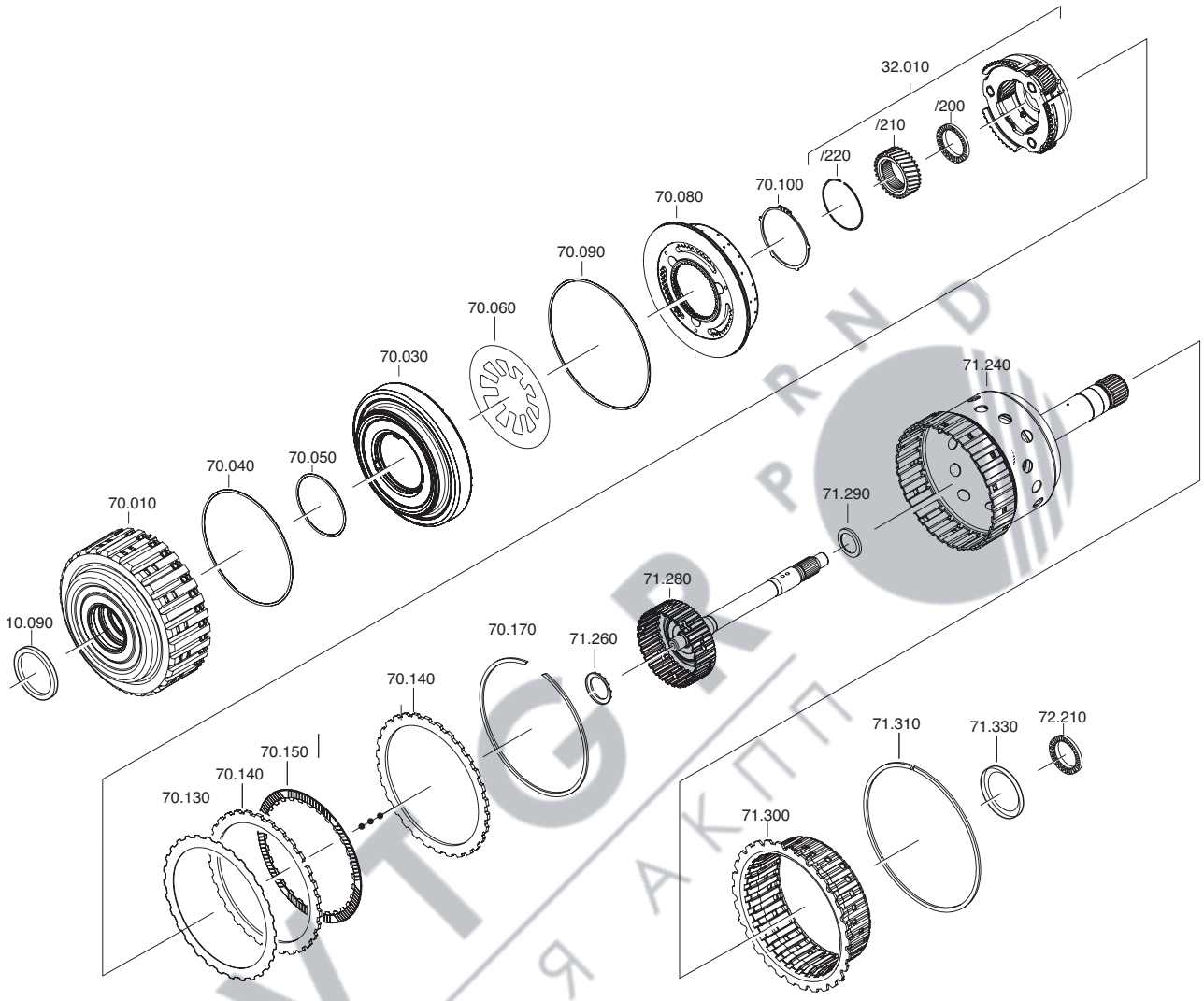


01298

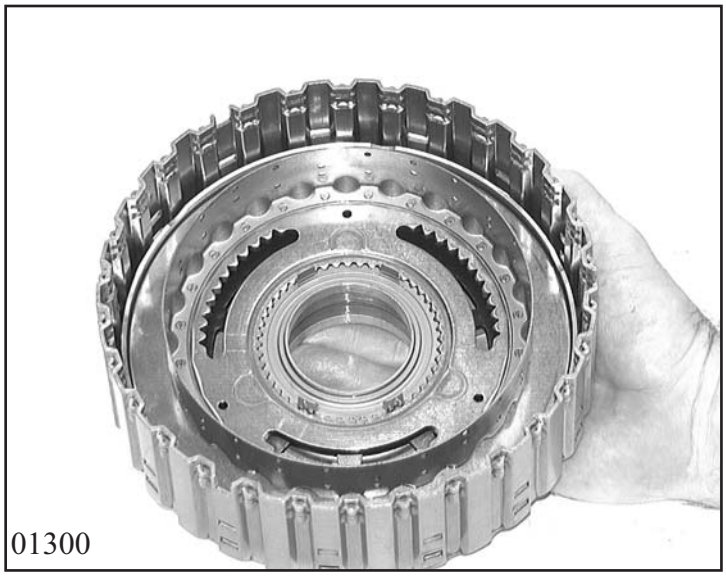
Insert complete disc set E. Starting with the spring disc 71.140, then alternately insert outer disc 71.150 and lining disc 71.160.
Insert end disc 71.150 and secure with snap ring 71.180.

Attention!
Adjustments **Chapter 1.4.1.5**

3.2.4.2 Clutch A (Drive)

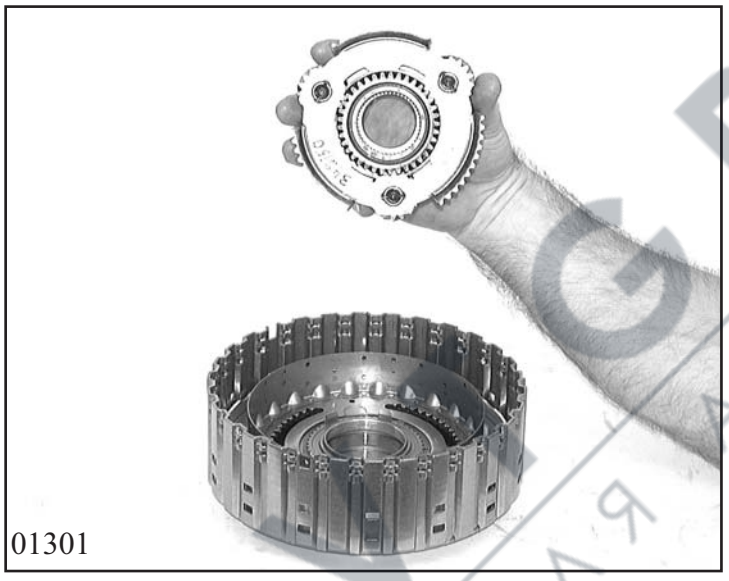


Pull on 2 round sealing rings 70.040 + 70.050 onto piston A 70.030.
Press piston A into cylinder A 70.010



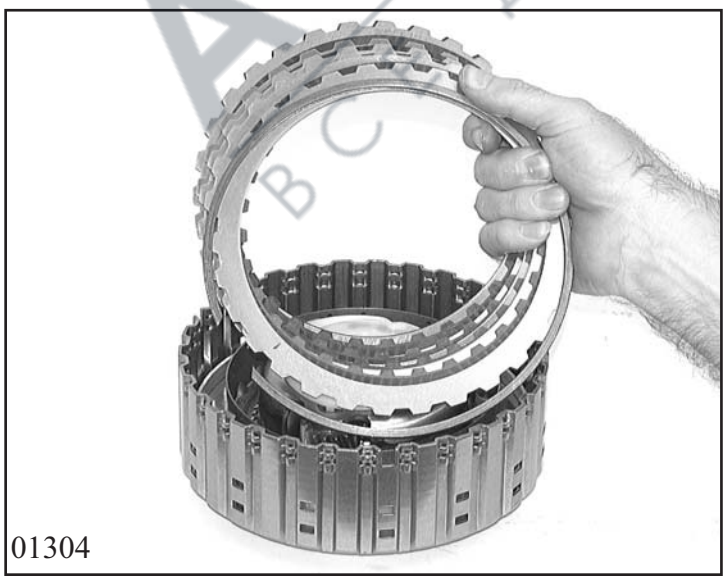
01300

Insert cup spring 70.060.
Pull on round sealing ring 70.090 onto baffle 70.080 and insert baffle into cylinder so that a drilled hole lies in the centre between a pair of protrusions of the cylinder.
Press down cup spring under mandrel press with assembly bracket 5x46 002 566 and secure with k-ring 70.100.



01301

Insert needle bearing 32.010/200 in sun wheel 32.010/210 and snap ring 32.010/220 into planetary gear set 32.010.
Clip on oil catch bowl 32.200 onto planetary carrier.
Engage complete planetary gear set on cylinder A.

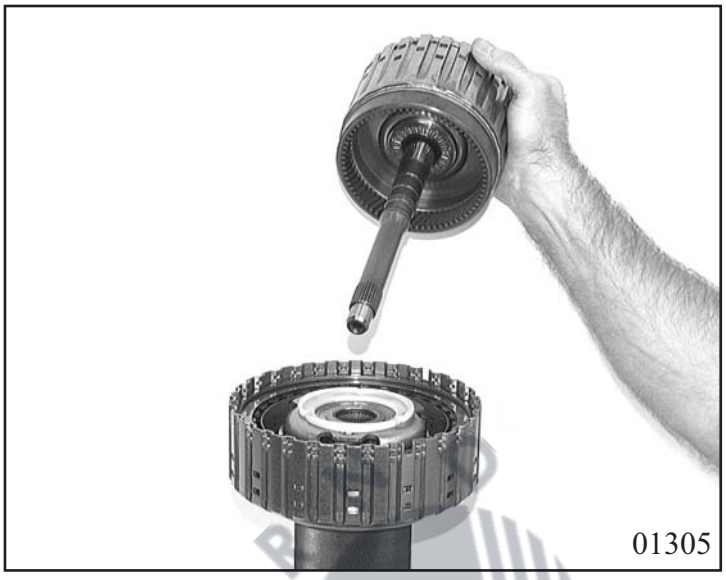


01304

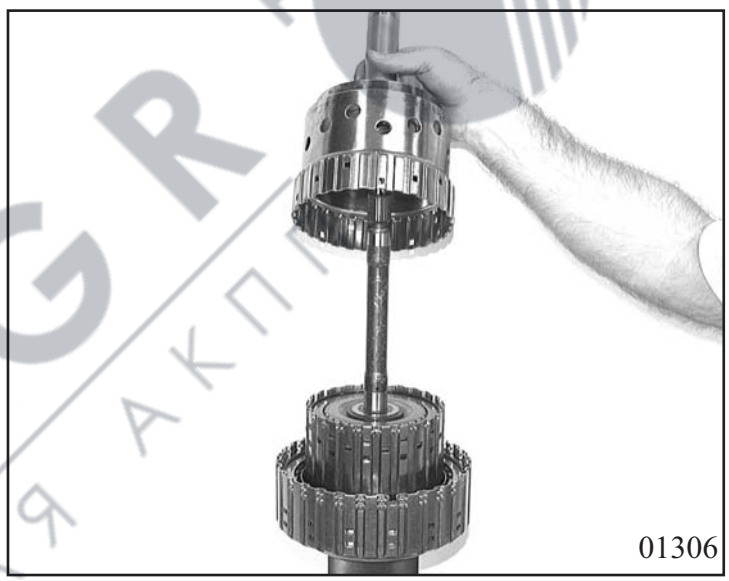
Insert complete disc set A. Starting with spring disc 70.130, then alternately insert outer disc 70.140 and lining disc 70.150.
Secure upper outer disc 70.140 with snap ring 70.170.

Attention!
Adjustments **Chapter 1.4.1.4**

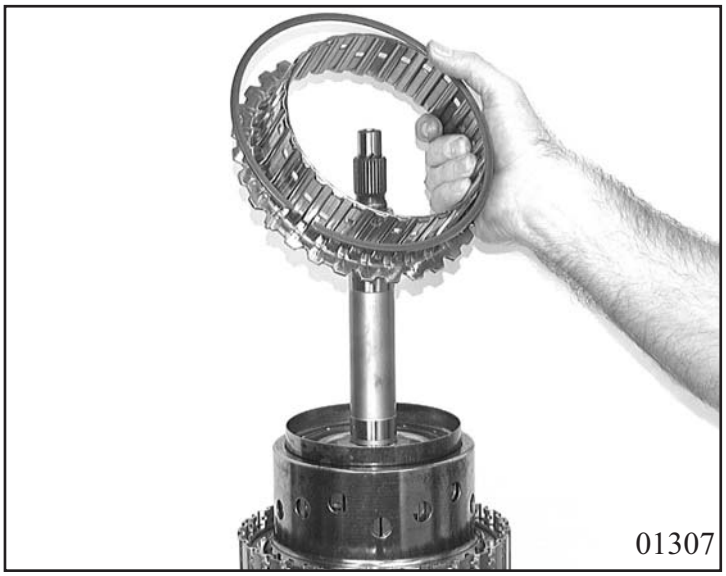
Insert complete clutch E into clutch A.
Clip on axial needle bearing 71.260 onto the hub of cylinder E.
For the installation position of the bearing, see picture.

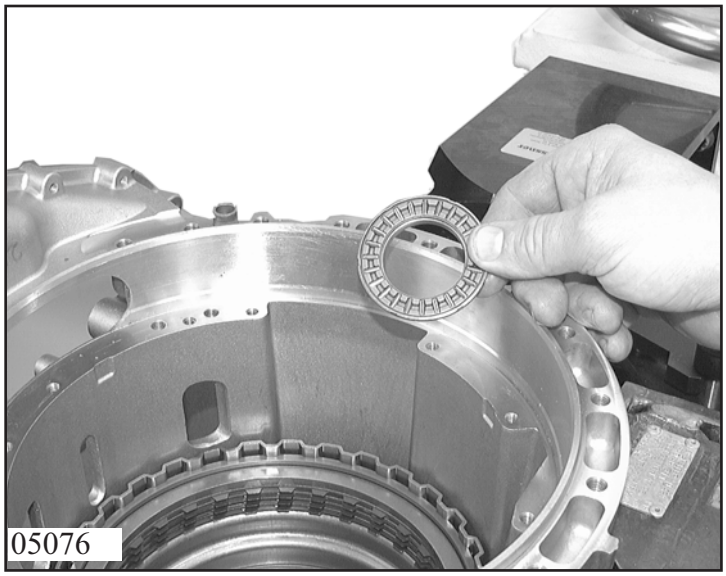


Align the discs of clutches A and E and insert intermediate shaft 71.280 while turning. Clip on axial needle bearing 71.290 onto the hub of the inner disc carrier E. Insert sun shaft 71.240 while turning.

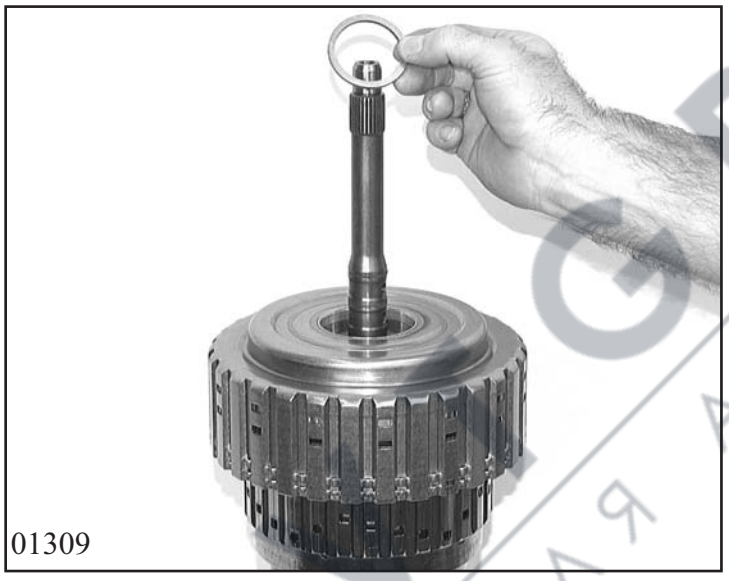


Insert inner disc carrier B 71.300 into cylinder A and secure with snap ring 71.310.
Clip on angled disc 71.330 onto sun shaft.

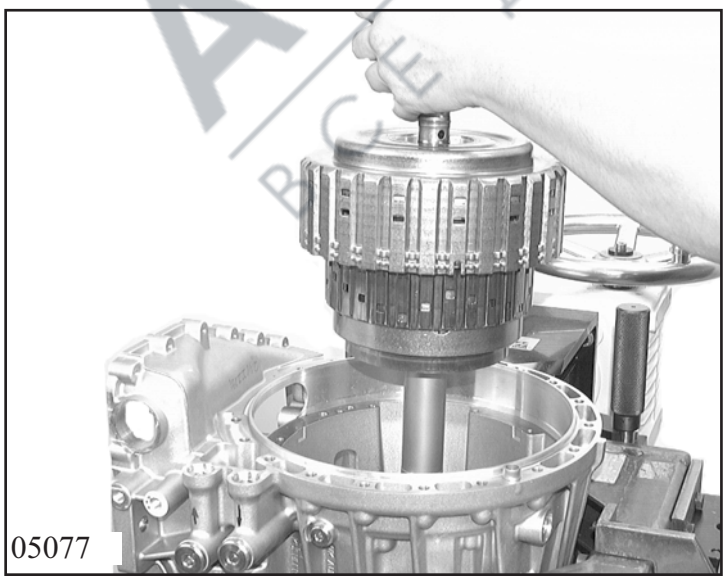




Present axial needle cage 72.210 to the hub of cylinder B. For installation position of the bearing, see picture.

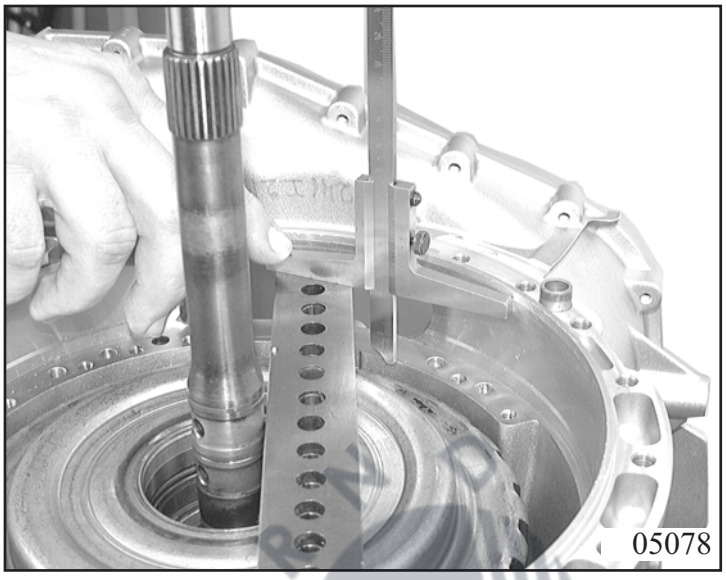


Rotate tower by 180° in the holding device.
Put removed spacer 10.090 over drive shaft onto cylinder A.

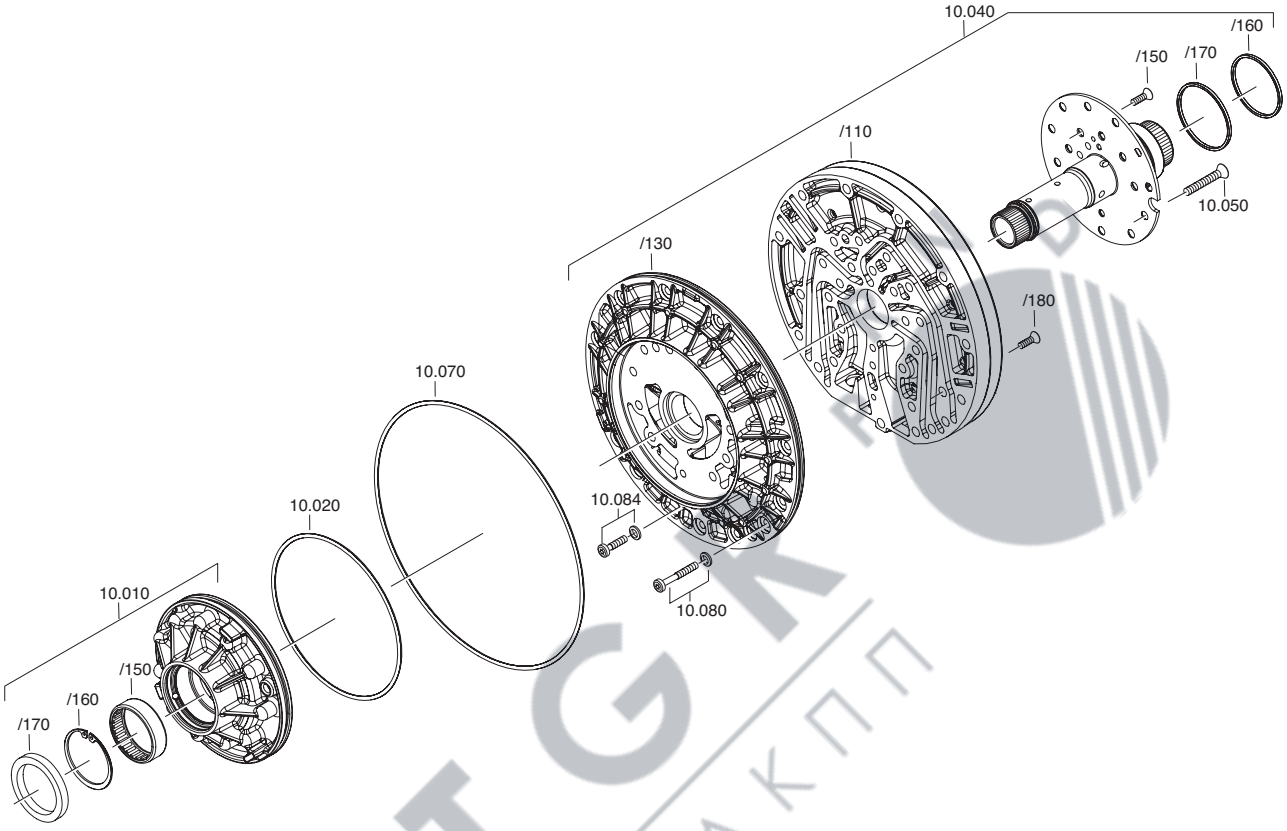


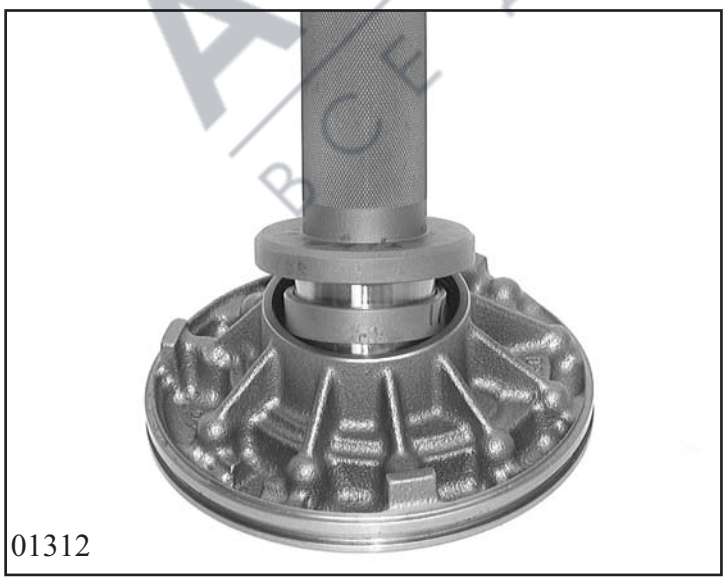
Align discs of clutch B and insert tower by hand and move while turning backwards and forwards until the discs engage fully in disc carrier B.

Inspection Dimension:
Upper edge of cylinder A to oil system sealing surface appr. 12 mm.



Comment:
Dimension is indicated without measurement bar thickness.

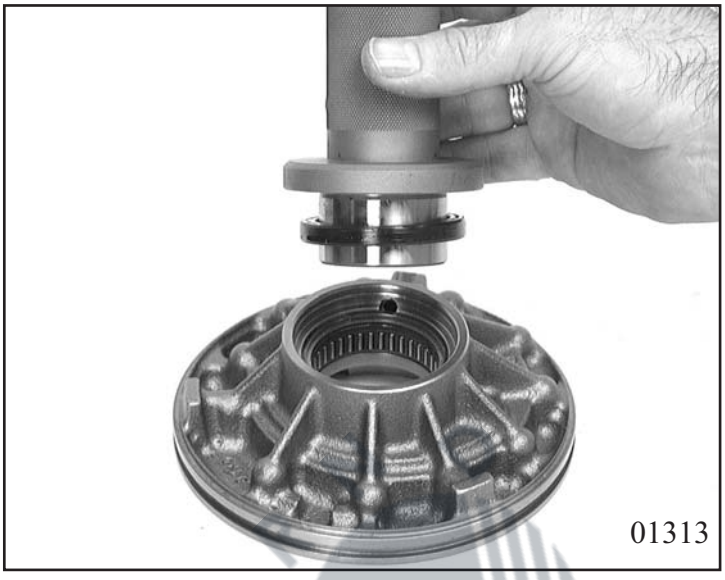



01312

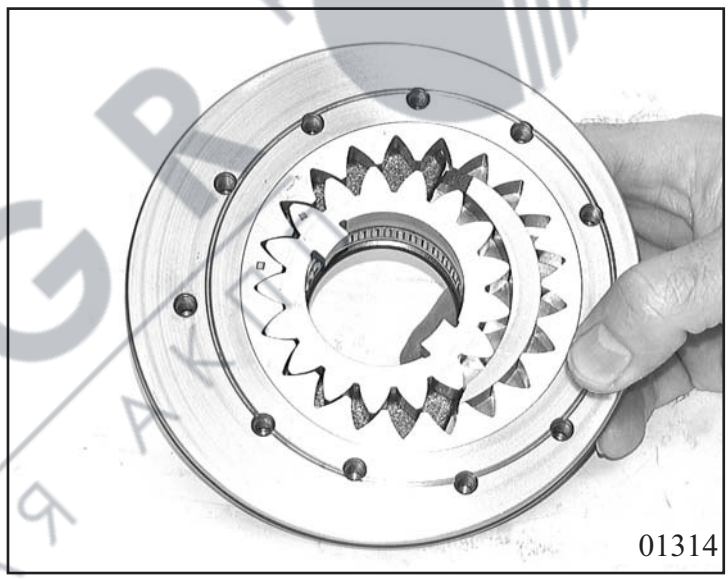
Complete pump 10.010.
Press in needle sleeve 10.010/150 with assembly mandrel 5x46 002 558 (with ring) under the mandrel press and secure with snap ring 10.010/160.

Attention!
Assembly needle sleeve with sealing lip on top upside.

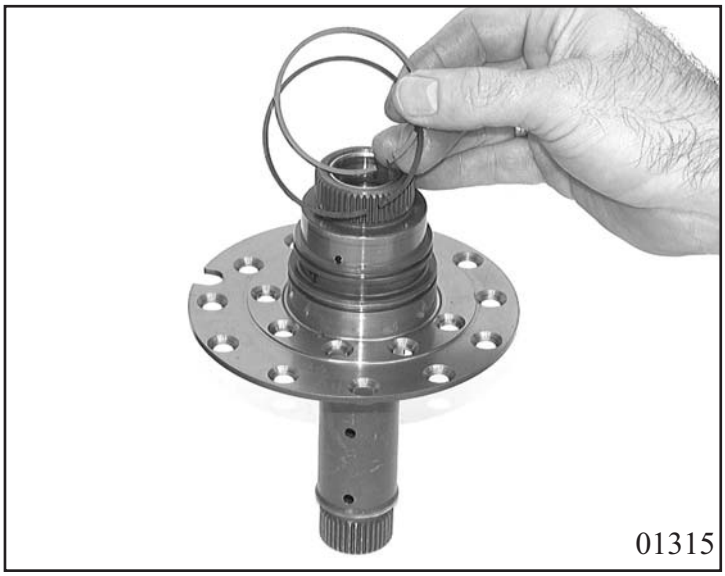
Then insert shaft sealing ring 10.010/170 into pump housing and press into pump with assembly mandrel 5x46 002 558 (without ring).



Pull on new O-ring type sealing ring 10.020.
Slightly lubricate pump impeller and internal geared wheel with oil before assembly. Then assemble pump in such a way that markings are visible at each of the pump impeller and internal geared wheel.

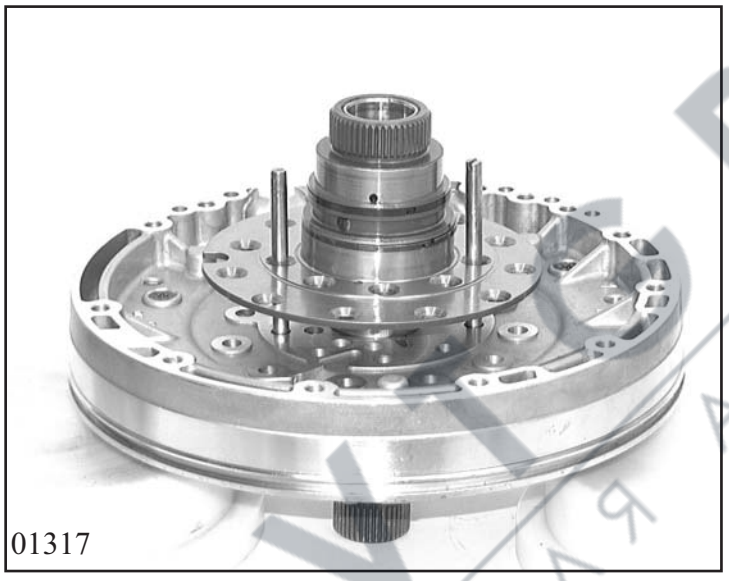


Pull on 2 rectangular rings 10.040/160 + /170 onto the idler wheel shaft. In order to be able to mount the idler wheel shaft on the intermediate plate these must be positioned relative to each other. For procedure see next page.



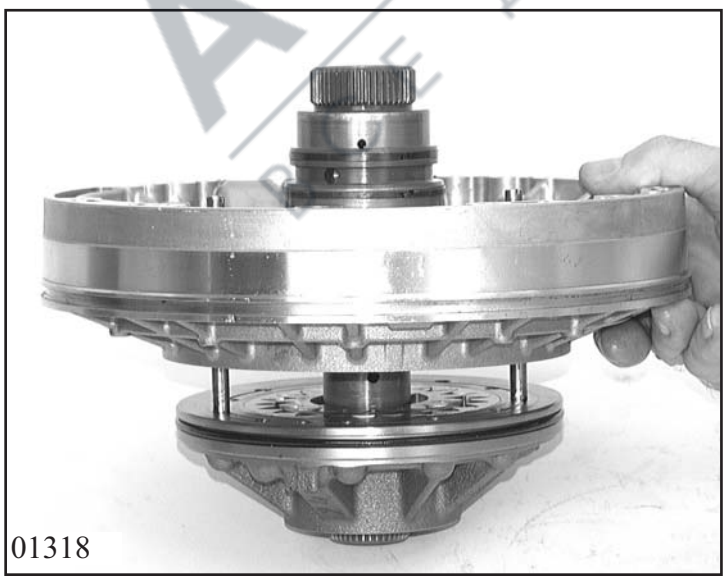

01316

Put intermediate plate 10.040/110 on centring plate 10.040/130 and loosely fix with 4 screws 10.040/180.


01317

Put the intermediate plate and the centring plate on a supporting device and heat up with a hot-air blower to approx. 70˚ C. Screw 2 fixing bolts 5x46 001 007 into centring plate. Introduce the idler wheel shaft over the fixing bolts and first fasten with 4 countersunk screws 10.040/150. Remove fixing bolts and screw in the remaining 2 countersunk screws and tighten the 4 loosely screwed in.

(For tightening torque see Chapter 1.5)

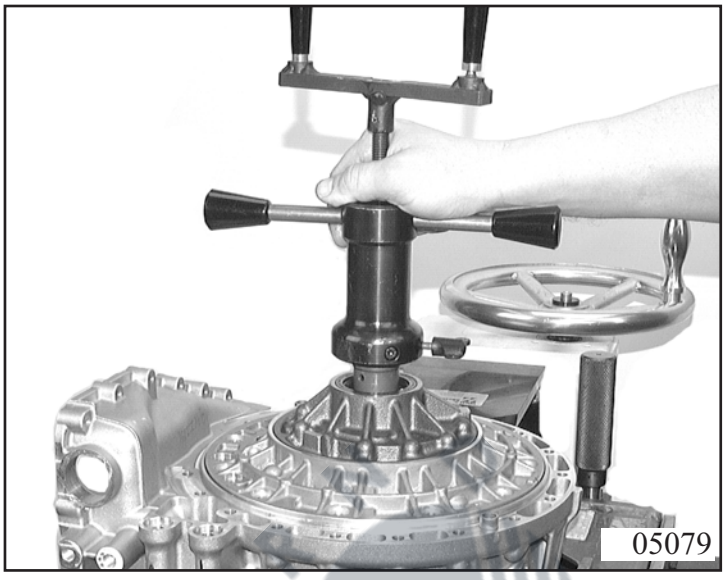

01318

Screw fixing bolt 5x46 001 007 into pump. Mount complete pump over the stator shaft, remove fixing bolt and bolt on with 11 cylinder screws 10.050

(For tightening torque see Chapter 1.5)

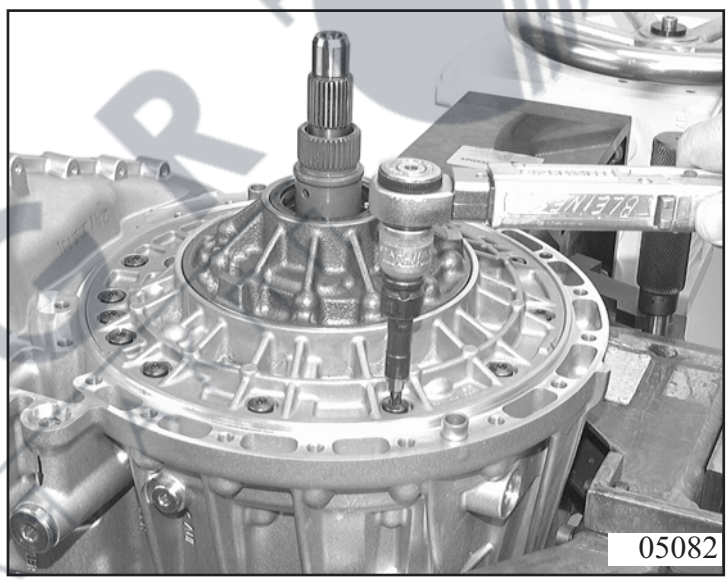
Comment!
Examine pump with sleeve 5x46 000 306 for freedom of movement. Pump impellers must be able to turn with low friction.

Pull on new O-ring type sealing ring 10.070. Coat rectangular rings at drive shaft with some Vaseline. Carefully place complete oil supply in gearbox housing with lifting device 5x46 000 563, align and press in.



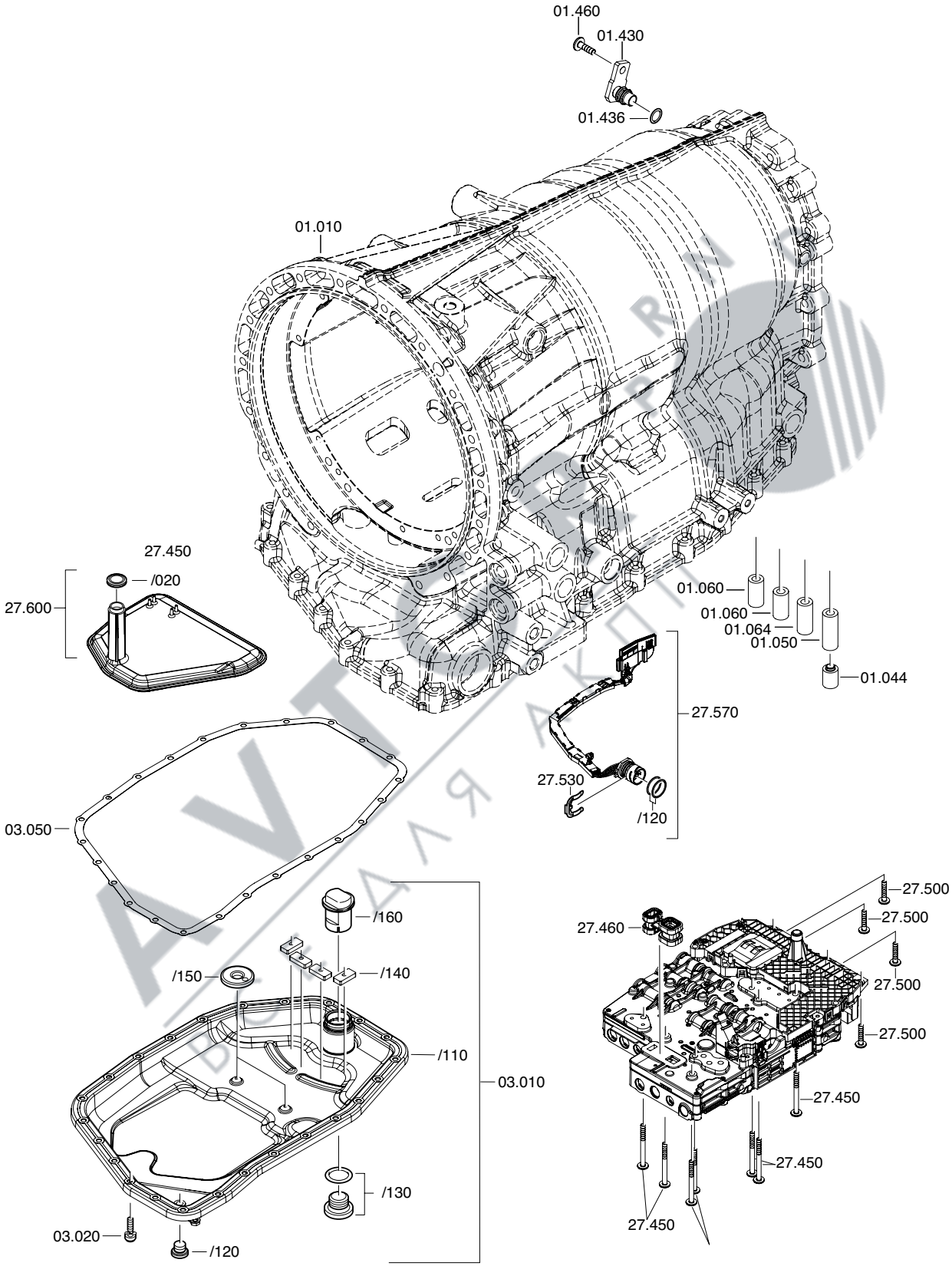
Screw in oil system with 14 Torx screws with new Usit rings as follows:
- 1 off - 10.084 (see Figure)
  20mm long
- 13 off - 10.080 (remaining screws)
  50mm long

(For tightening torque see Chapter 1.5)

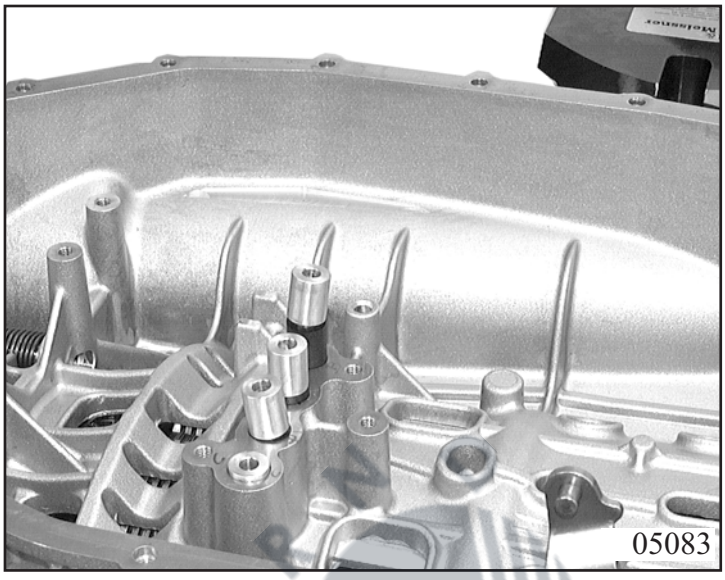


Attention!
Adjustments **Chapter 1.4.8**

3.4 Mechatronic and Oil Pan
(Complete Mechatronic, see Spare Parts List, Technical Cover Sheet, Pos. YO2)

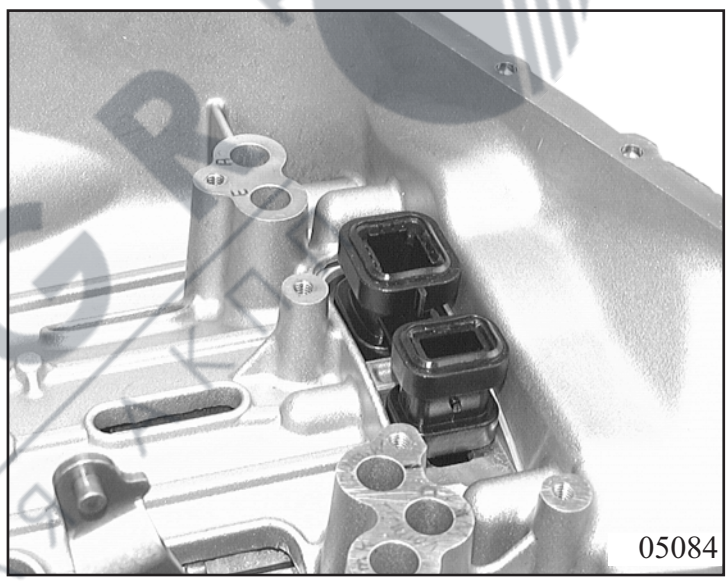


Rotate housing by 90°.
Drive in 4 seal sleeves (2x 01.060, 01.050, 01.064) between the gearbox housing and cylinder CD with a suitable tool. In each case place an aluminium sleeve on the rubber seal sleeve.

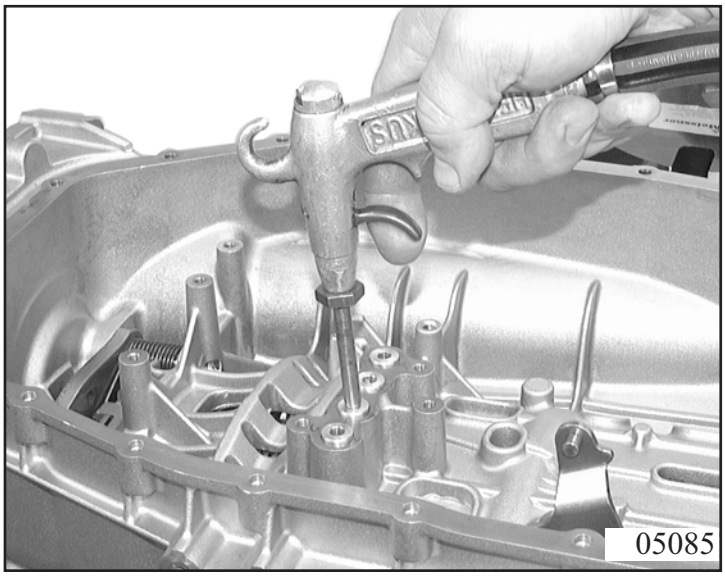


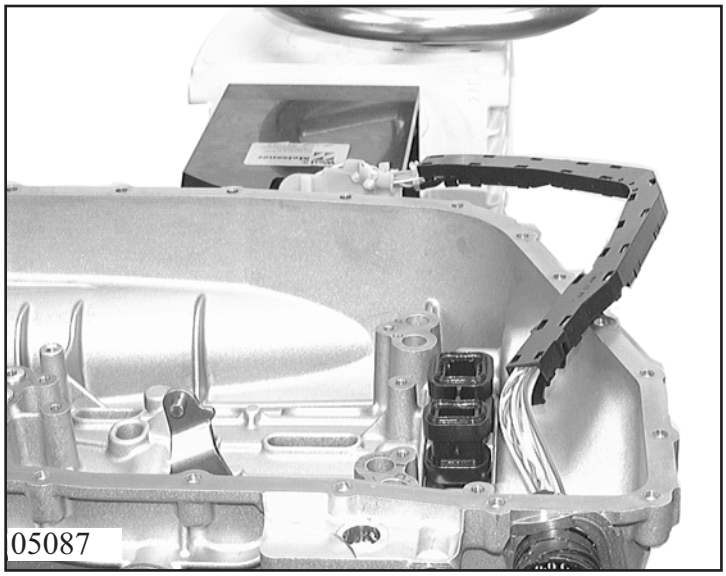
Attention!
Pay attention to the length of the seal sleeves. All must be able to be pressed in to about the same depth

Insert adapter 27.460 in gearbox housing.



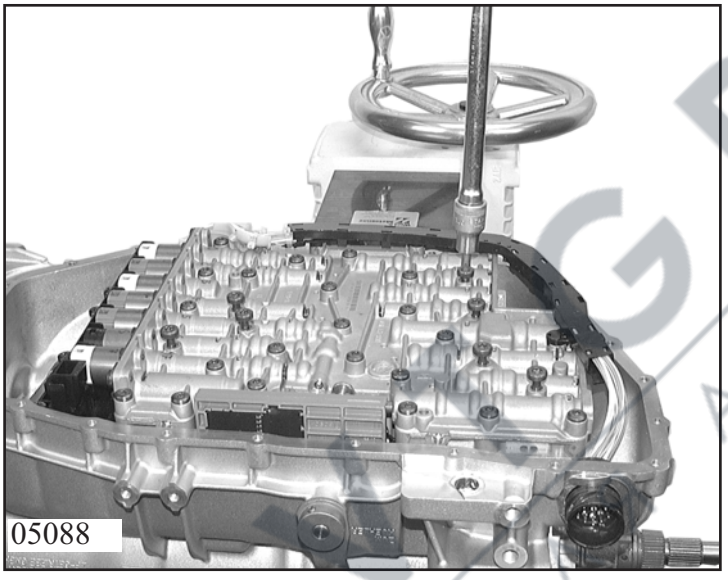
Check all clutches/brakes for function with compressed air in the marked bores.(see picture) Then put the Mechatronic on.




05087

Pull on 2 new O-ring type sealing rings onto cable plugs. Plug in the plugs of the wiring harness into the gearbox housing and fix with locking plate 27.530. Then put Mechatronic on, press connectors into Mechatronic and clip cable guide onto screw heads.

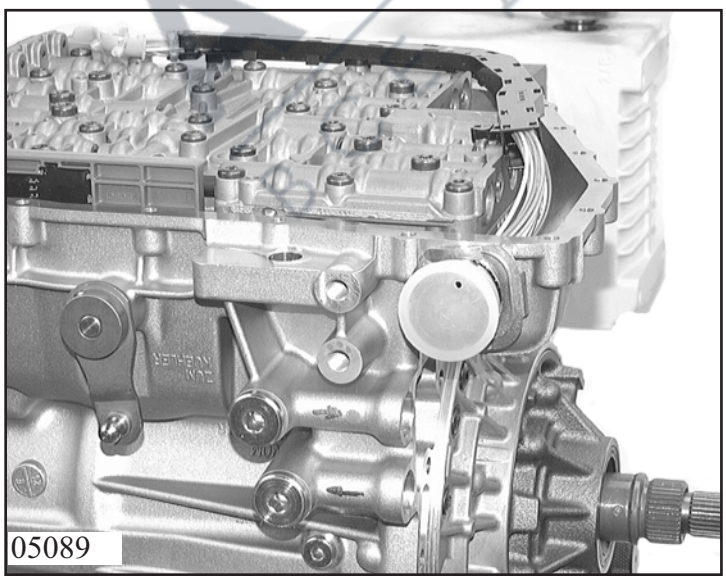
Attention!
Position connectors in such a way that inscription faces oil pan side.


05088

Suspend parking and/or latching disc in the groove of the piston rod.
Align Mechatronic, press in by hand and fasten with 7 cylinder screws 27.450, as well as 4 cylinder screws 27.500. Engage the plugs of the wiring harness in the Mechatronic and press in the cable guide clips.

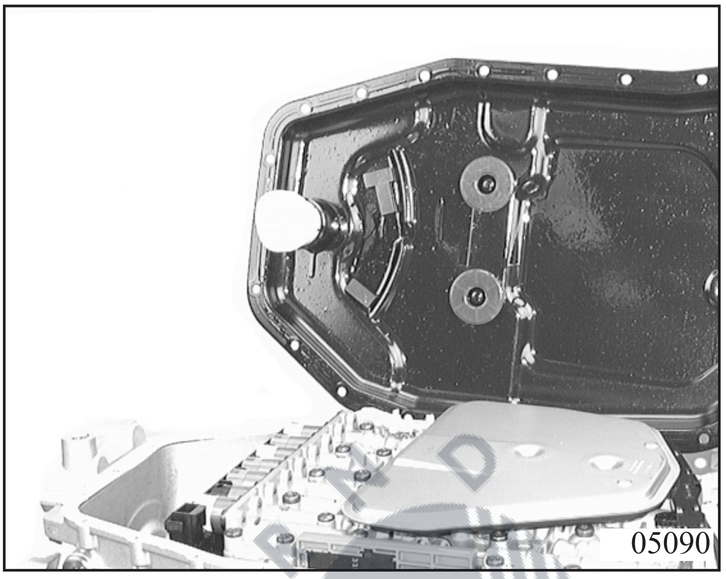
(For tightening torque see Chapter 1.5)

Attention!
Screw connection instructions **Chapter 1.3.1.2**


05089

Press in stopper for Mechatronic plug 27.700.

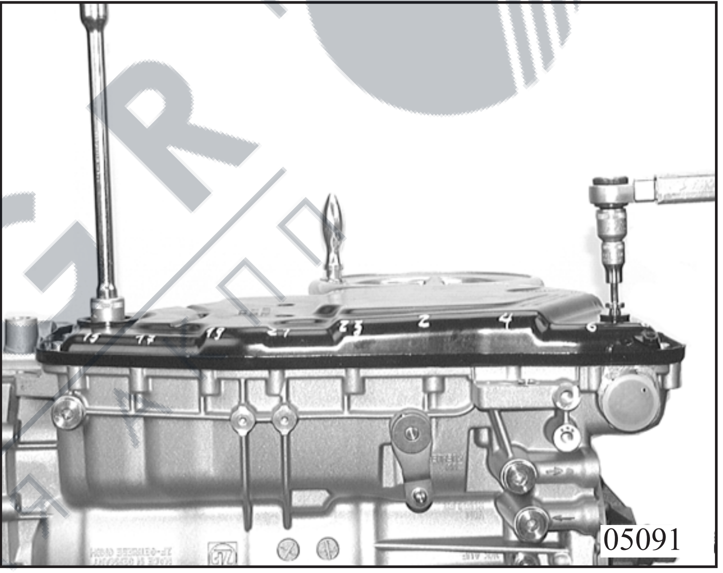
Insert new oil filter 27.600 in Mechatronic.
Stick seal 03.050 on gearbox housing with grease (Vaseline) and align. Insert 4 magnets 03.010/140 into the front corners as well as between the ribs of the oil pan and 2 round magnets 03.010/150 on markings. Put on oil pan 03.010/110 and bolt on with 24 cylinder screws 03.020


05090

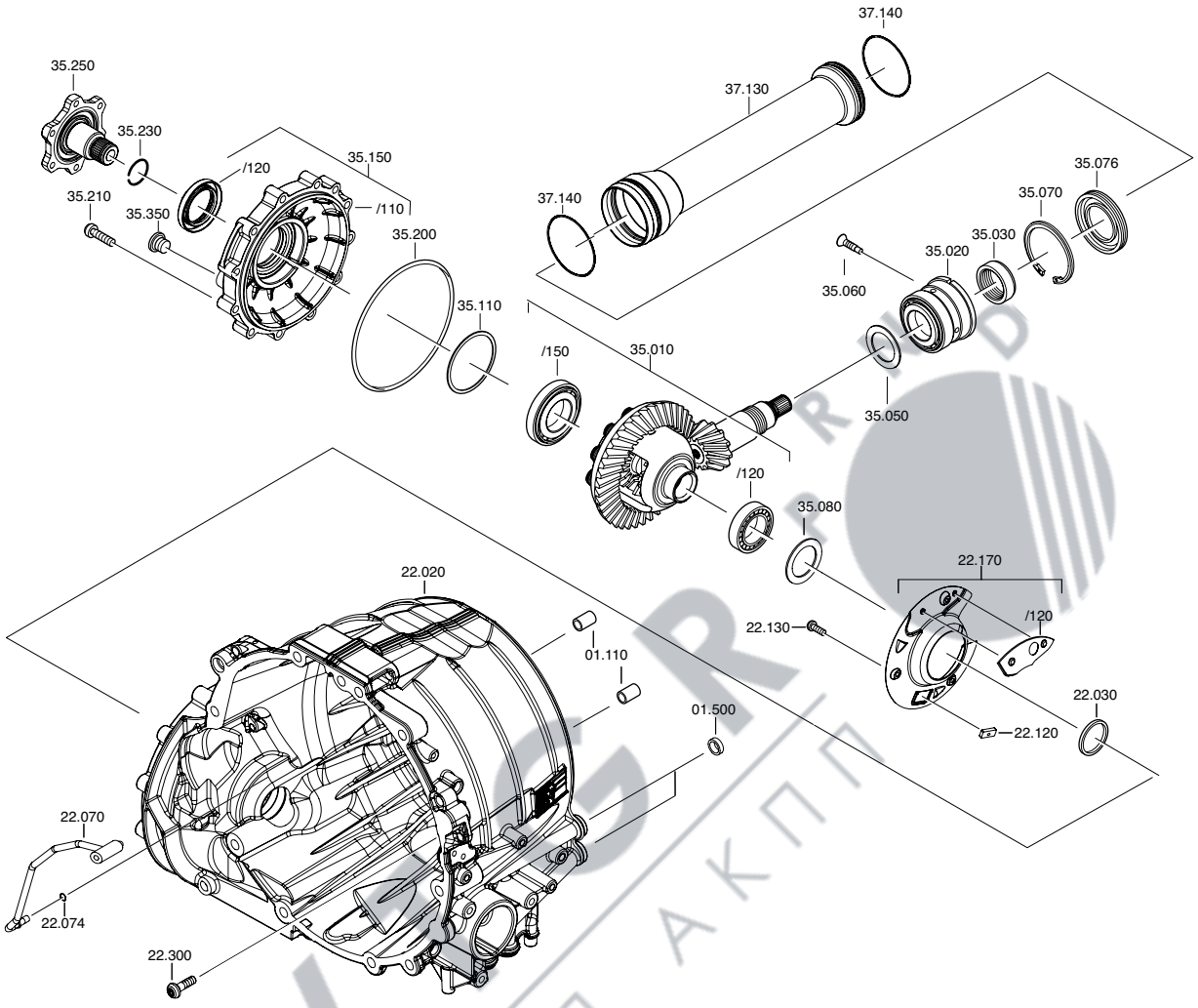
Attention!
Screw connection instructions **Chapter 1.3.1.1**

Screw in oil outlet 03.010/120 and filler screw 03.010/130 into oil pan. Screw in filler screw of differential 35.350 into differential housing.

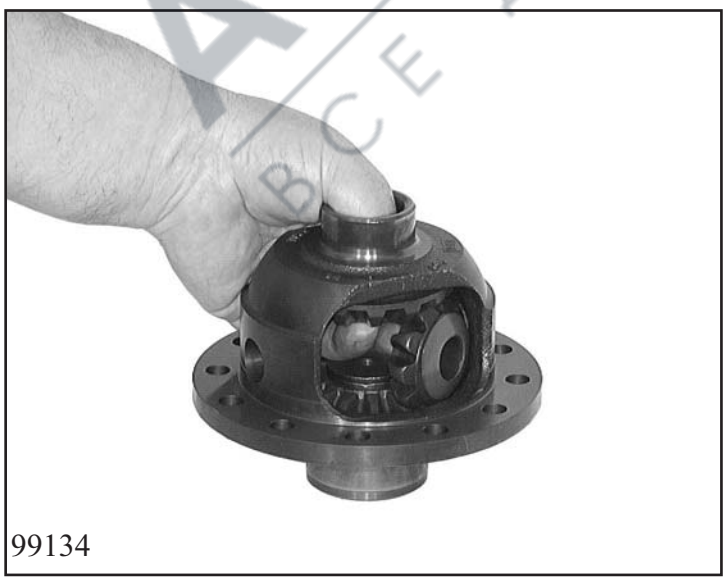
(For tightening torque see Chapter 1.5)


05091

3.5 Completing and Fitting the Converter Bell



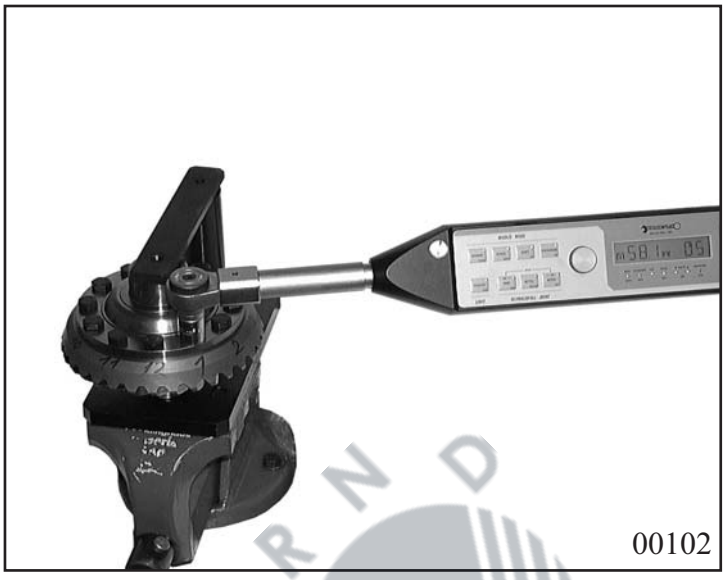
3.5.1 Complete Differential


99134

Insert lower bevel gear with flange holding disc and setting shim, as well as upper bevel gear with setting shim through viewing window into differential cage. Raise upper bevel gear and insert planetary gears with thrust washer through viewing window.
Turn planetary gears by 90° around the differential axle and fix with bolts.

Attention!
Bevel gears and planetary gears must be re-fitted paired with setting shims as when they were removed !!!

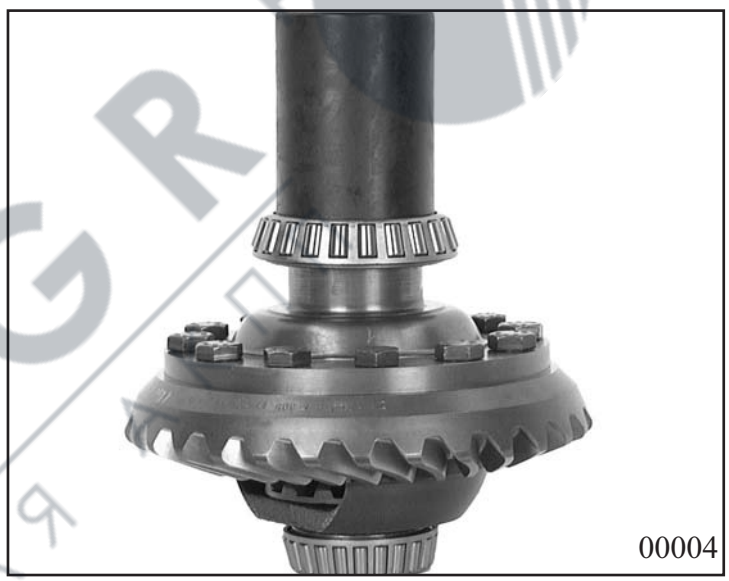
Clamp device 5x46 002 167 in vice, insert differential into device and tighten crown wheel with 12 screws 35.010/140 onto the differential cage 35.010/110 with extension limit-controlled Quantec key EMS ISI NR. 7086.


00102

Attention!
Screw connection instructions Chapter **1.3.1.7**

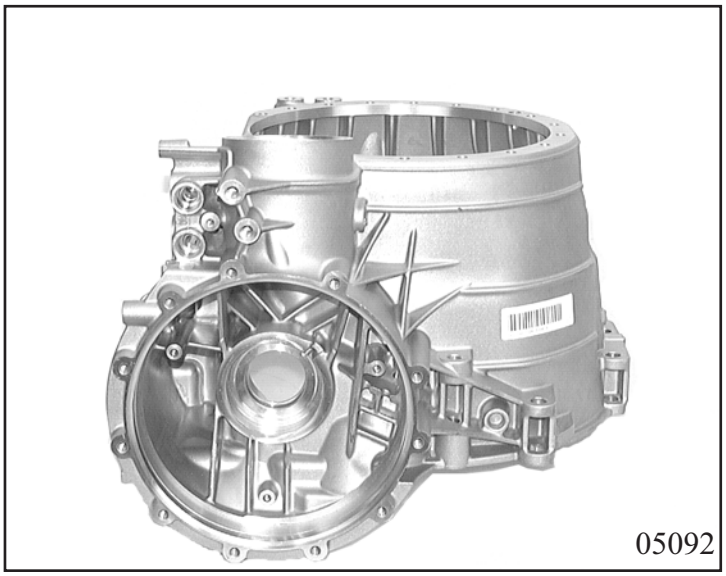
(Key operation requires an explanation, which is obtained through training.)

Mount taper roller bearings 35.010/120, 35.010/150 with sleeves 5x46 002 220/ 221 on differential under mandrel press.


00004

3.5.2 Complete Pinion Shaft

Place converter bell 22.020 on stable support with converter side downwards.

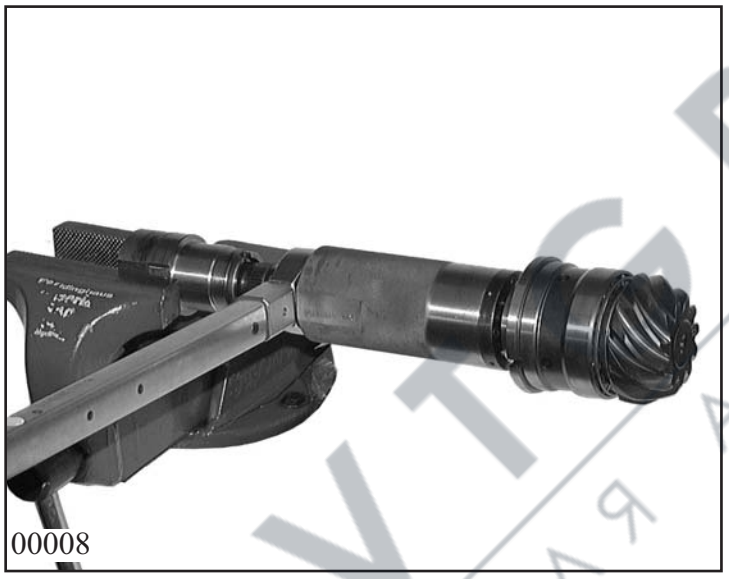

05092

Comment!:For a new converter bell the stopper 22.120 is to be driven in.


00007

Put Setting 35.050 shim on pinion shaft. Press on inner bearing 35.020 with insertion mandrel 5x46 002 217 onto pinion shaft with mandrel press. Put on bearing shim and outer bearing race. Press on other inner bearing race with insertion mandrel 5x46 002 217 on mandrel press.

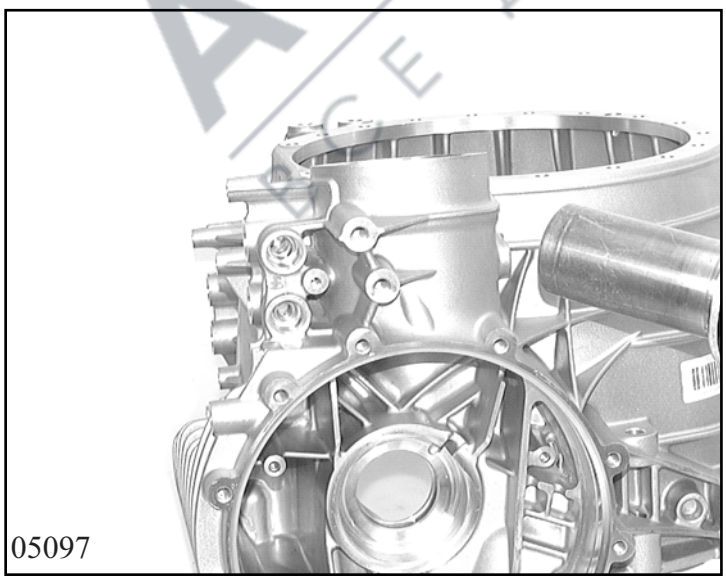
Attention !
For adjustability see Chapter 1.4.3


00008

Screw on locknut 35.030 with device 5x46 002 174 onto pinion shaft and caulk. In addition clamp 5x46 042 174 holding device horizontally in vice. Fit adapter part 5x46 002 461 to pinion shaft. Put key 5x46 012 174 on locknut via adaptor part. Feed plug-in tool 5x66 000 030 (connection: key with torque wrench) over the pinion shaft and now push the pinion shaft into the teeth of the holding device and tighten and secure locknut.

(For tightening torque see Chapter 1.5)

3.5.3 Fitting the Pinion Shaft

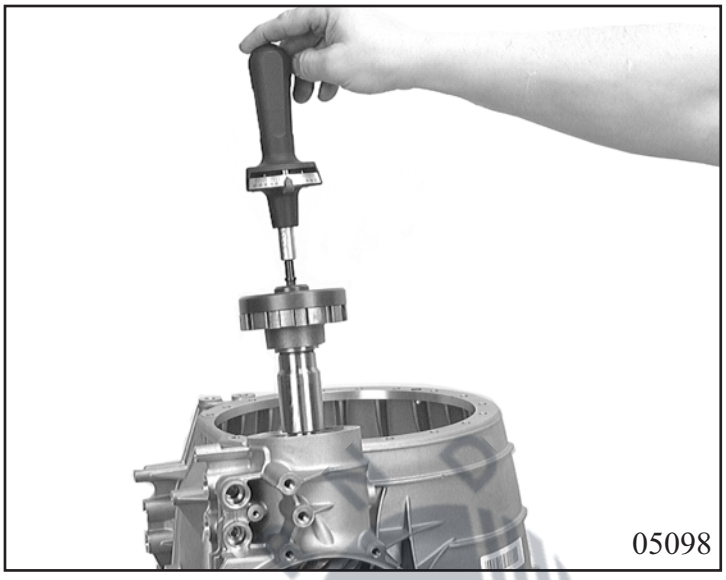

05097

Strongly heat converter bell at the pinion shaft bearing seat with hot-air blower. Insert complete pinion shaft in converter bell in such a way that one of the four holes coincides exactly with a lock screw in the converter bell. Fix pinion shaft with new countersunk screw 35.060.

(For tightening torque see Chapter 1.5)

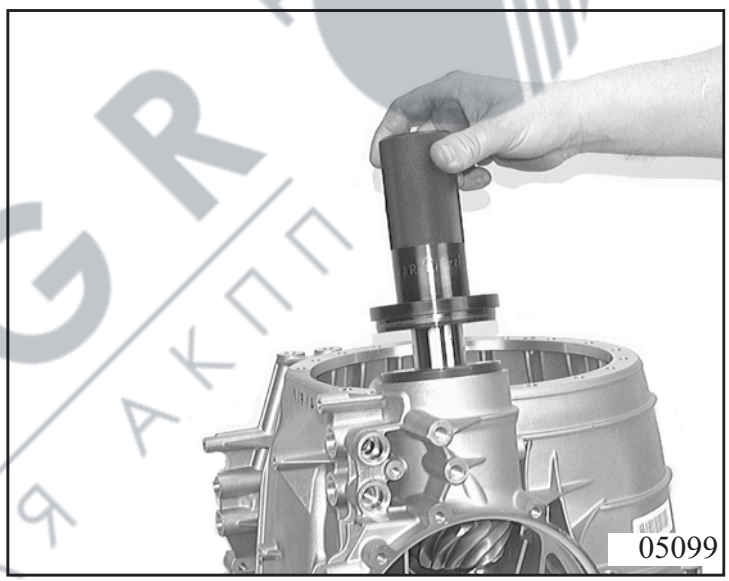
3.5.4 Checking the Pinion Torque

(without differential, without SSR, torque 2.5 Nm max. Bearing oiled.)
Put adaptor part 5x46 002 461 on pinion shaft, put adapter 5x66 000 027 on the drive toothing of the adaptor part and connect adapter to 5p66 000 059 (H&K 52 205 250) torsiometer via a 5x66 000 029 (H&K 52 205 300) connecting part. Turn torsiometer evenly and read off value from scale.


05098

Attention !
Housing must be cooled to room temperature.

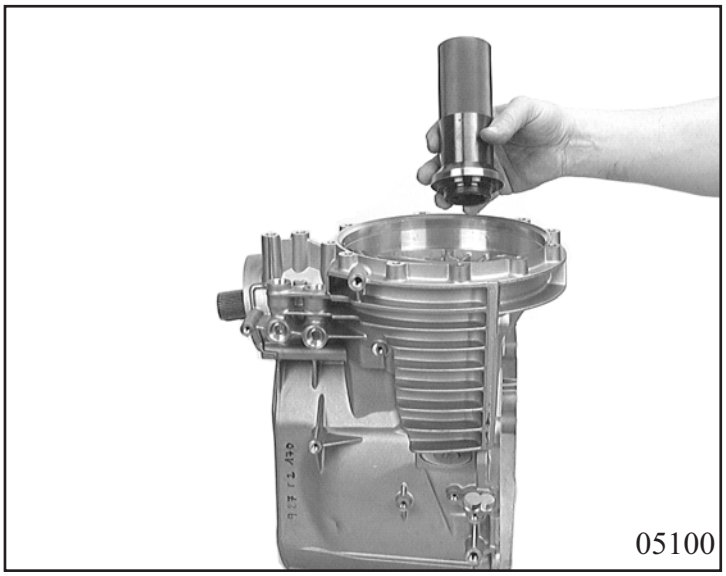
Insert snap ring 35.070 with pliers. Fit sleeve 5x46 909 344 onto pinion shaft. Push SSR 35.076 over sleeve and knock into converter bell with knock-in mandrel 5x46 909 269 up to stop.

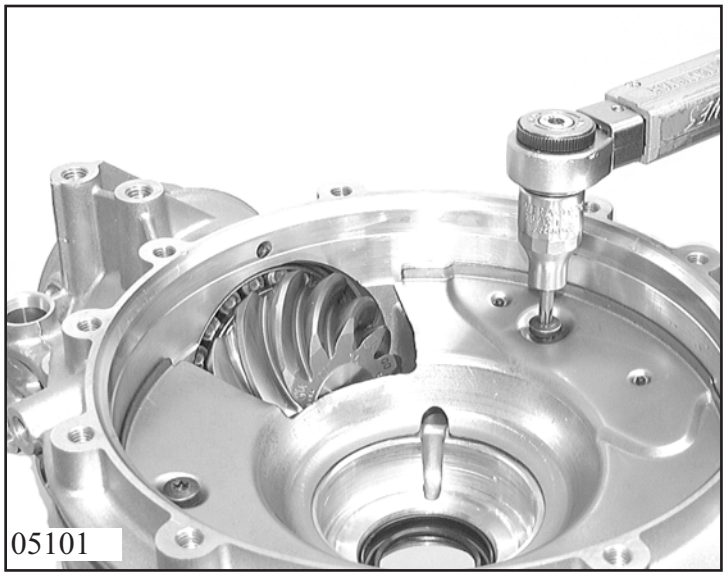

05099

Note!
This shaft sealing ring is not used by Bentley, since the side shaft is in a common oil system with the distributor gearbox and differential.

3.5.5 Fitting the Differential in the Converter Bell

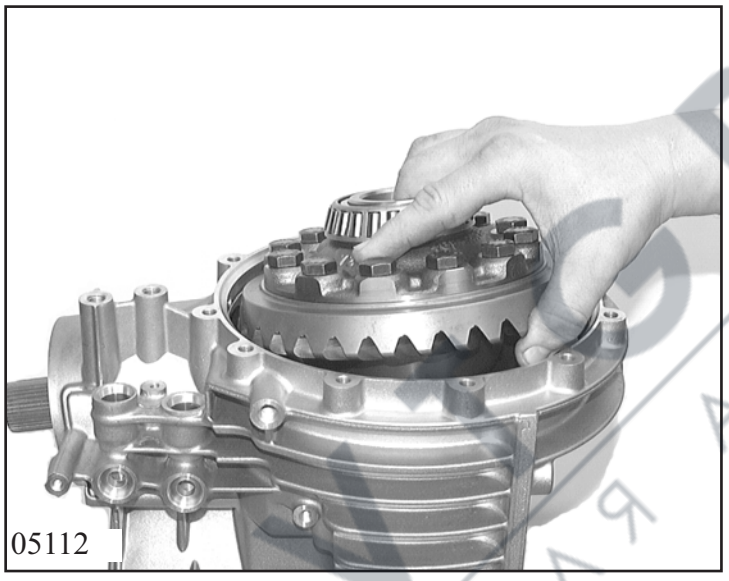
Screw M10 screw (approx. 40 mm in length) into transducer bell as supporting leg and adjust in such a way that the converter bell stands stable. Place converter bell on the work bench with differential opening upwards. Press in shaft sealing 22.030 ring with tool 5x46 909 270.


05100


05101

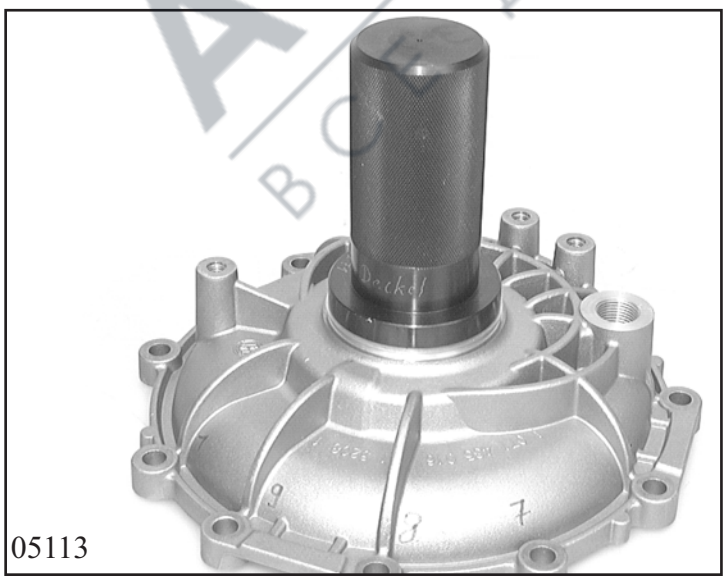
Place rubber seal 22.170/120 on plate 22.170.
Insert magnet 22.120 in plate recess.
Attach plate to converter bell with 3 screws 22.130 .

(For tightening torque see Chapter 1.5)


05112

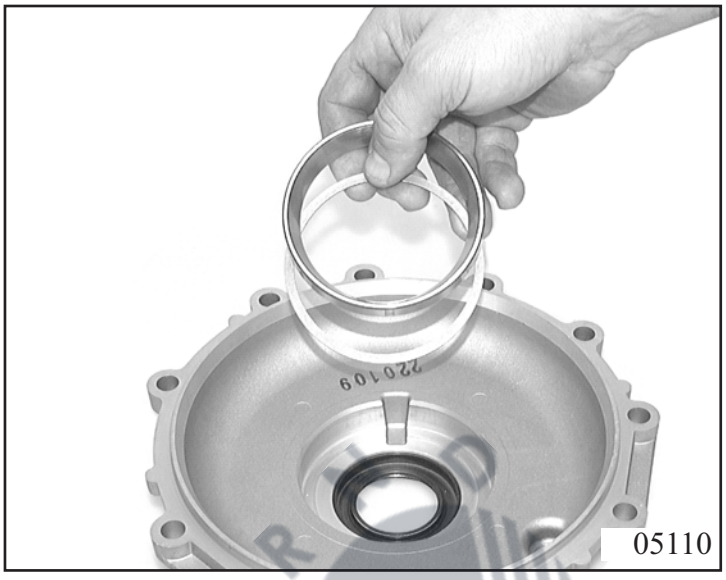
Fit suitable disc 35.080 with outer bearing race into converter bell. Insert complete differential.

Attention!
Adjustments Chapter 1.4.3


05113

Press the shaft sealing ring 35.150/120 into differential cover with mandrel 5x46 909 271.

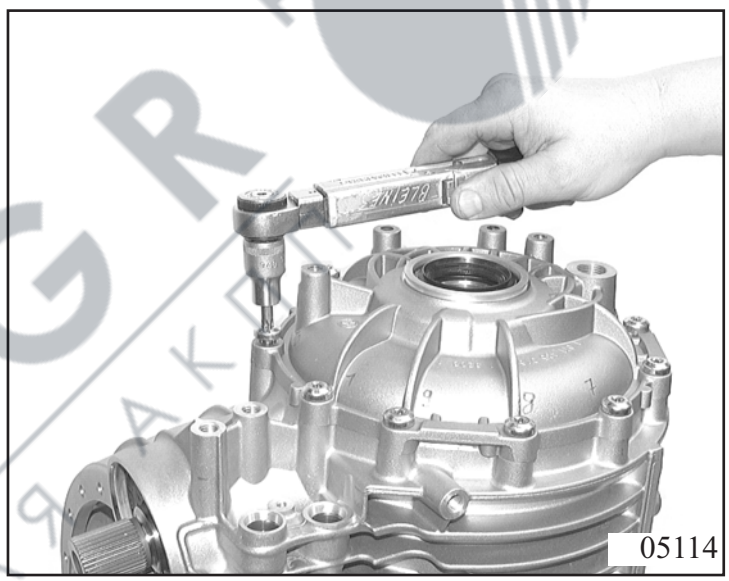
Fit suitable disc 35.110 with outer bearing race into differential cover. Pull on O-ring type sealing ring 35.200 onto differential cover.



05110

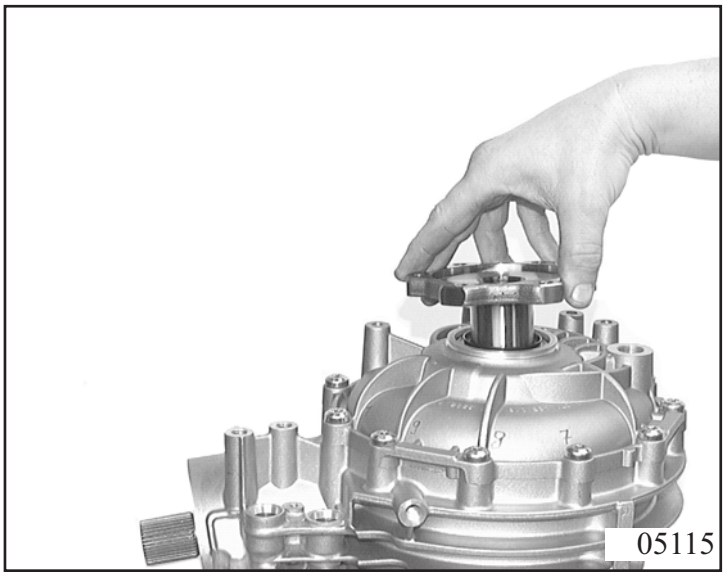
Tighten differential cover with 11 screws 35.210.

For tightening torque see Chapter 1.5)


05114

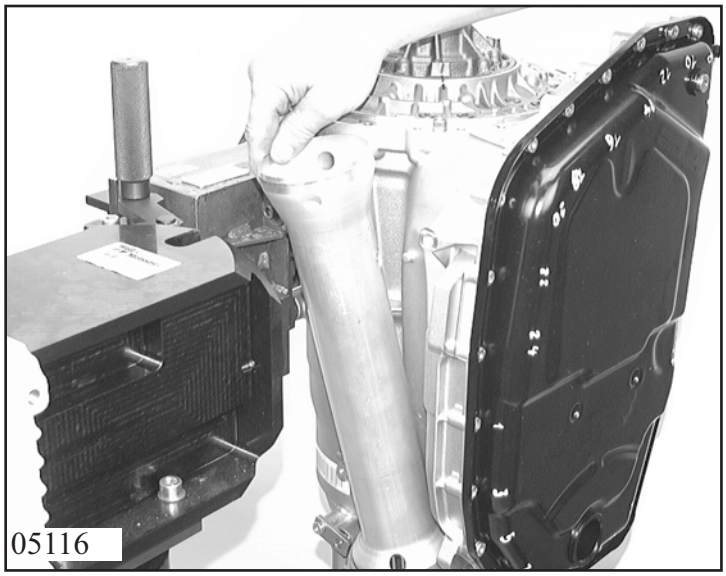
Attention!
Screw connection instructions Chapter 1.3.1.3

Put locking ring 35.230 onto differential flange 35.250. Press flange into differential.


05115

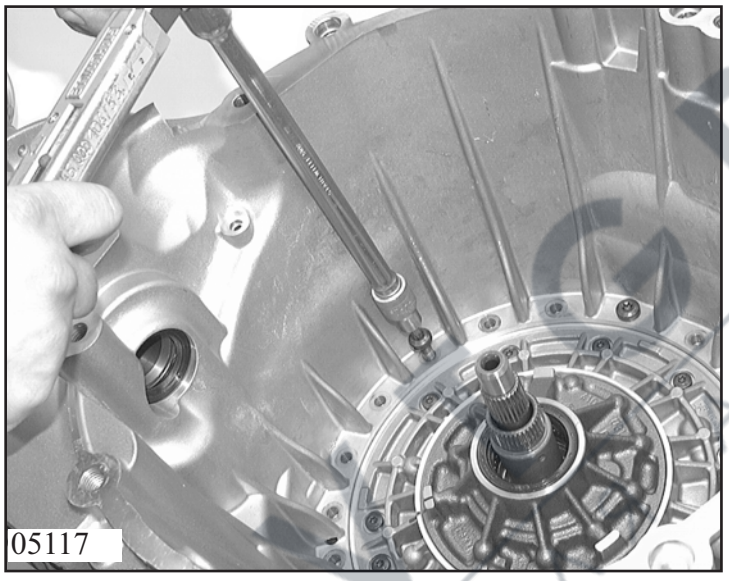
Attention!
Locking ring must always be replaced.

3.5.6 Assembling the Gearbox Housing with Converter Bell


05116

Rotate gearbox by 90°.
Mount protective pipe 37.130 on guide on the gearbox housing so that the hole in the protective pipe fits on the journals of the gearbox housing. Insert 2 radiator connection sealing rings 01.500 in gearbox housing.

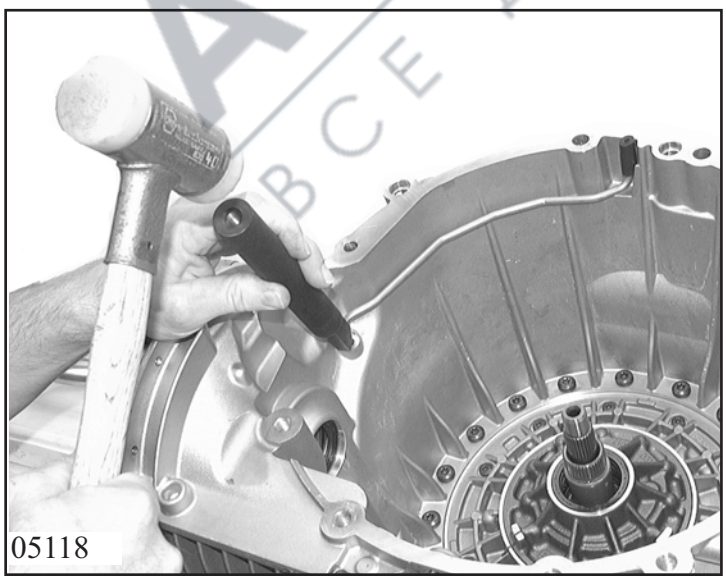
Note:
For a common oil system pull 2 O-ring type sealing rings 37.140 onto protective pipe.


05117

Mount converter bell on gearbox housing and fix with 18 screws 22.300.

(For tightening torque see Chapter 1.5)

(Only for a new converter bell)


05118

Pull O-ring type sealing ring 22.074 onto breather 22.070 and drive in with impact tool 5x46 001 525 or 5x46 001 411. If necessary, drive in 2 new guide bushes 01.110.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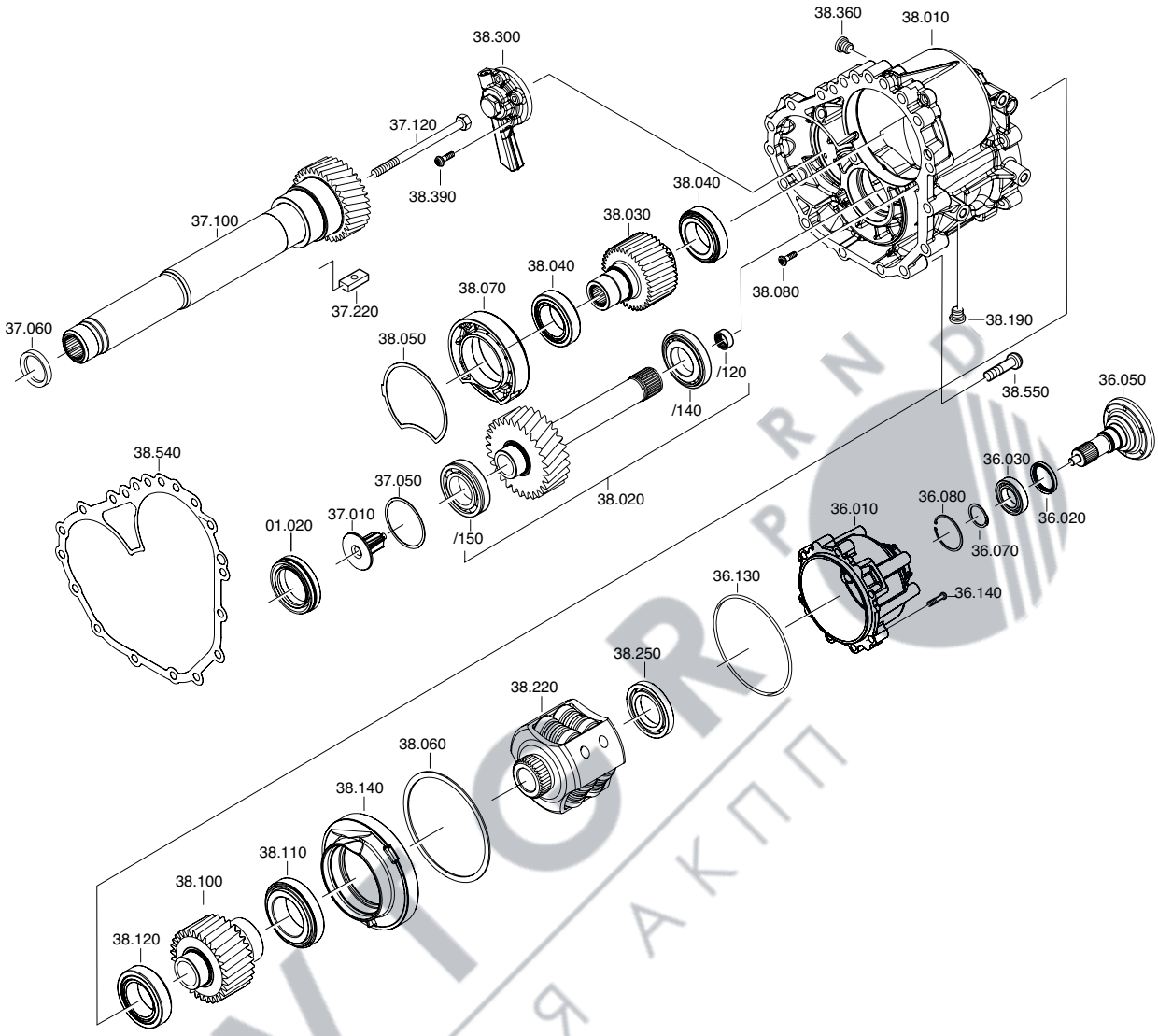
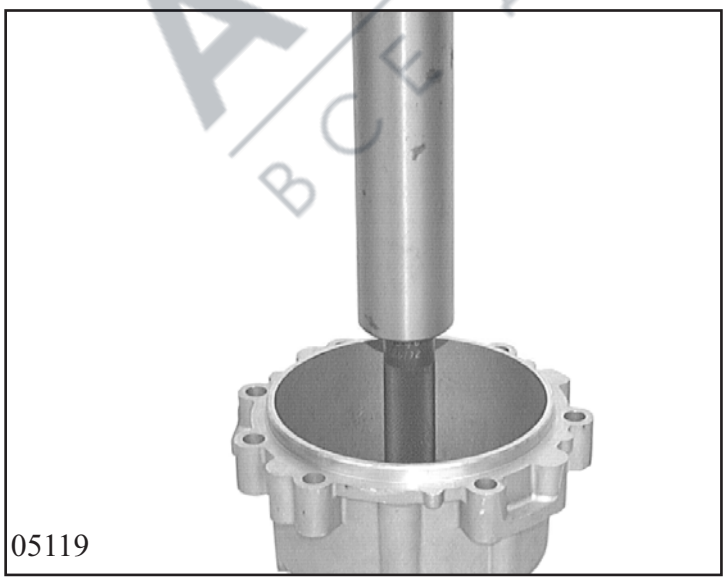
3.6 Installing Rear Axle Output

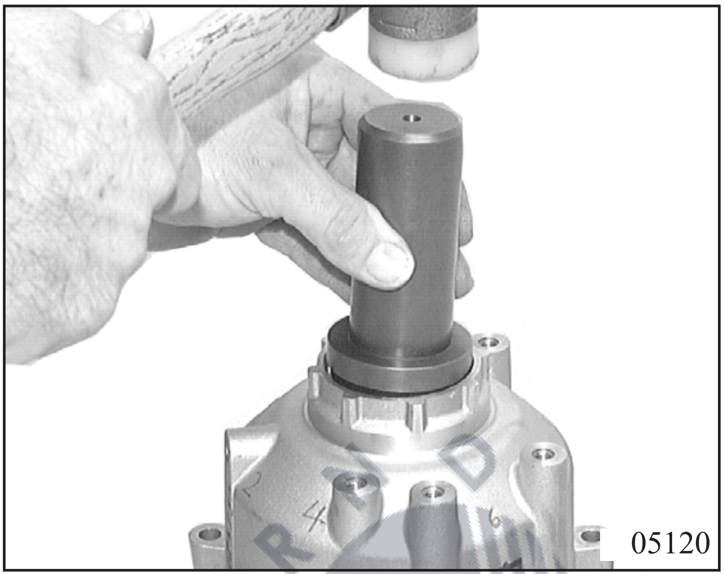
3.6.1 Preparing the Distributor Housing





Press ball bearings 36.030 into the distributor housing 36.010 under the mandrel press with assembly mandrel 5x46 909 346 and secure with snap ring.36.080

Press in shaft sealing ring 36.020 with impact tool 5x46 909 179.
Secure with snap ring 36.070.


05120

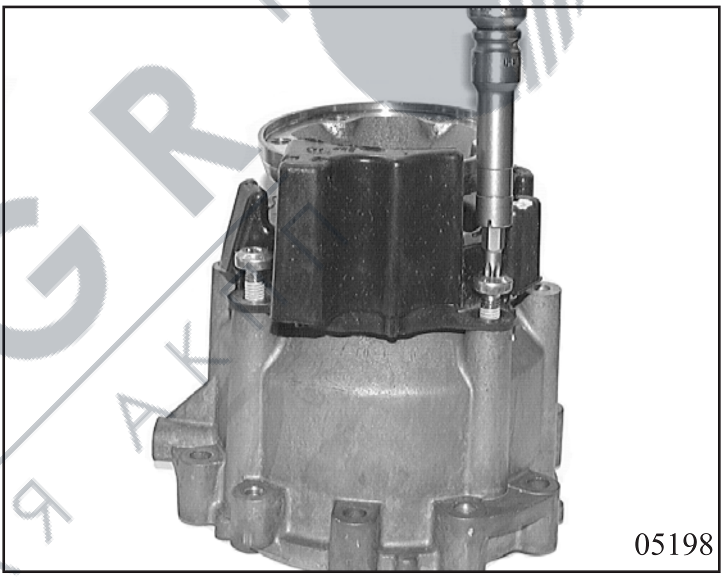
(Transmissions with vibration damper only)
Place vibration damper 36.100.

Press in flange 36.050 under mandrel press.

(Transmissions with vibration damper only)
Fasten vibration damper with 3 screws 36.110 at distributor housing.

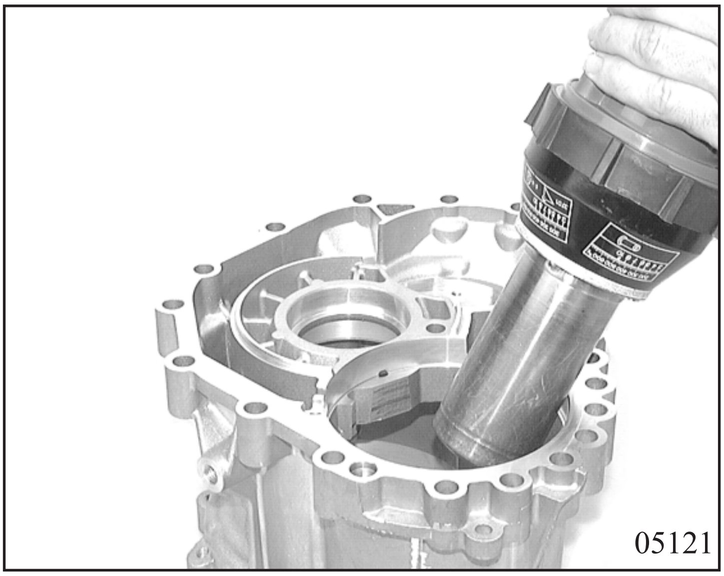
(Torque srew see chapter 1.5)

Attention!
These screws are self-locking and must always be replaced.


05198

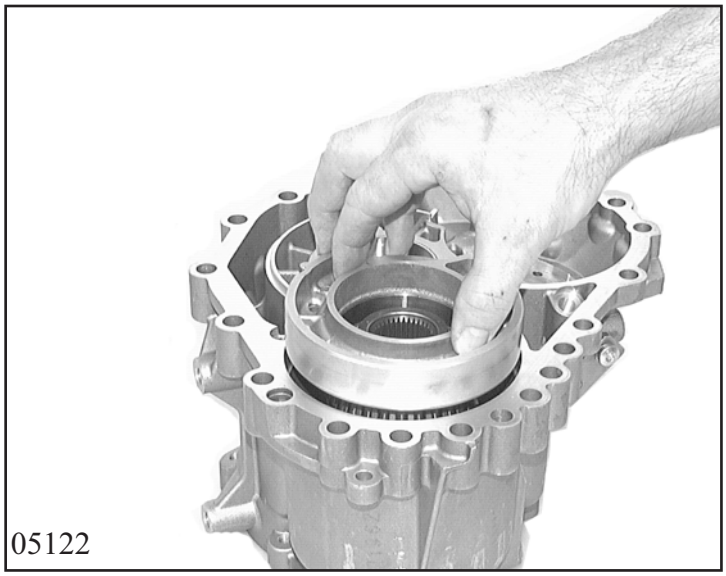
(only for a new intermediate housing)

Insert new bearing shells 38.020/140 and 38.040 in intermediate housing 38.010 by hand. Heat up the bearing seats with a hot-air blower for this.


05121

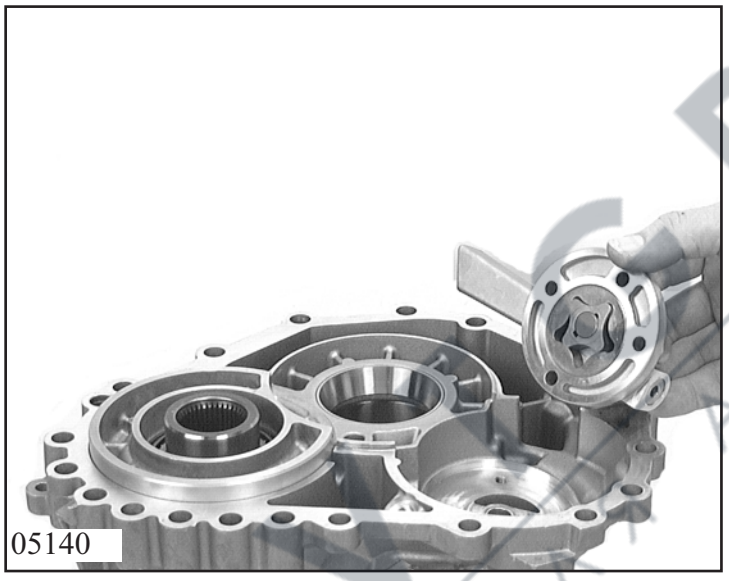
Attention!
Taper roller bearings on drive wheel and intermediate shaft must likewise be replaced.

3.6.2 Preparing the Intermediate Housing


05122

Insert drive wheel 38.030 in intermediate housing. Put on bearing ring 38.070 and fix with screw 38.080

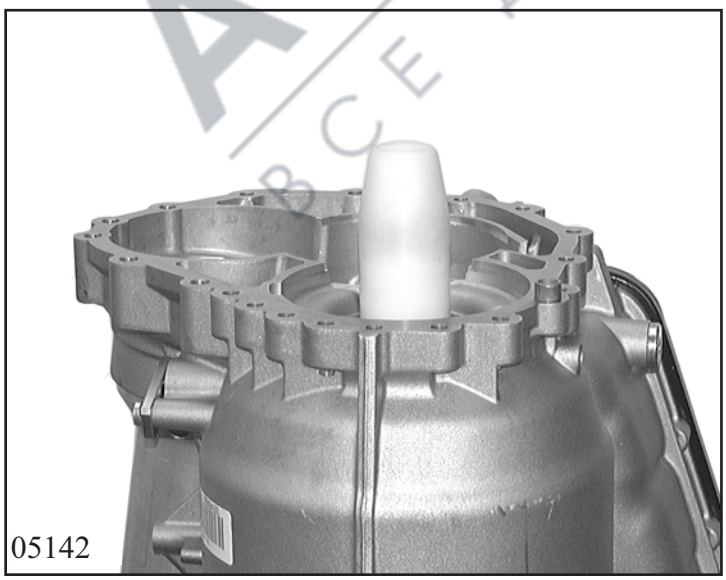
Attention!
Adjustments Chapter 1.4.4


05140

Insert pump internal geared wheel 38.300 in pump 38.300 and bolt pump in intermediate housing with 4 screws 38.390.

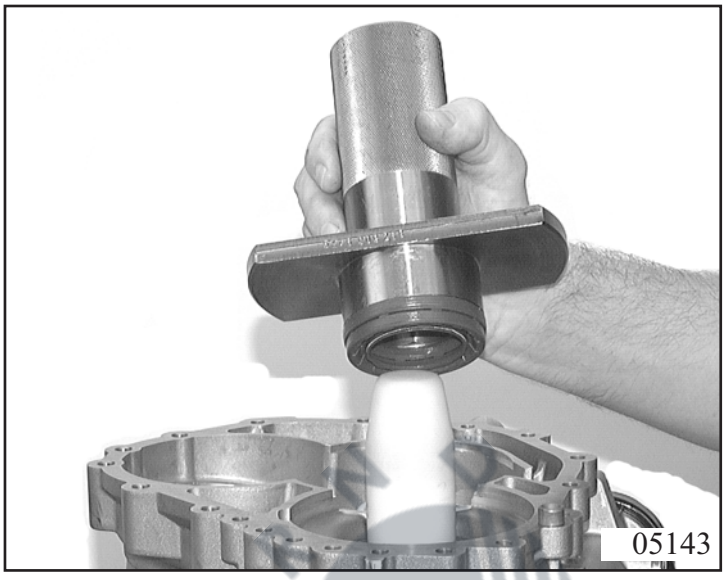
(For tightening torque see Chapter 1.5)

3.6.3 Preparing the Gearbox Housing


05142

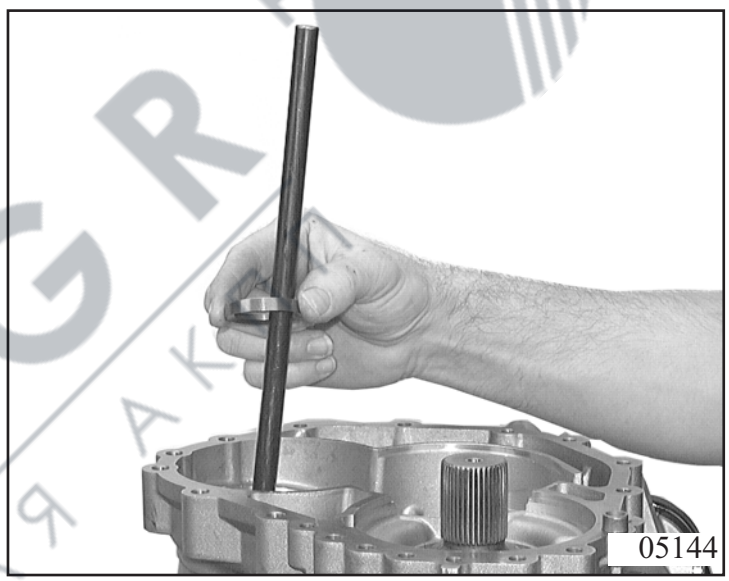
Fit guide sleeve 5x46 002 852 over shaft end of output shaft.

Attach double shaft sealing ring 01.020 to impact mandrel 5x46 909 268 and press into gearbox housing.

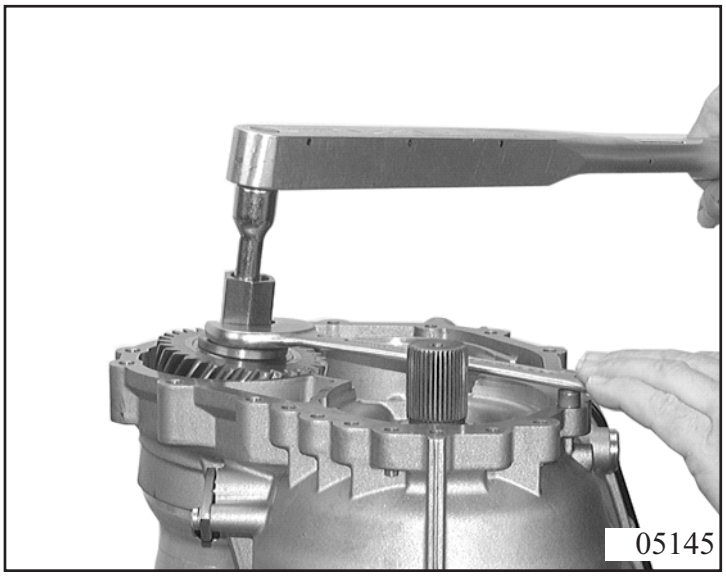


3.6.4 Installing the Side Shaft

Position cone disc 37.060 on pinion shaft with guidance aid.

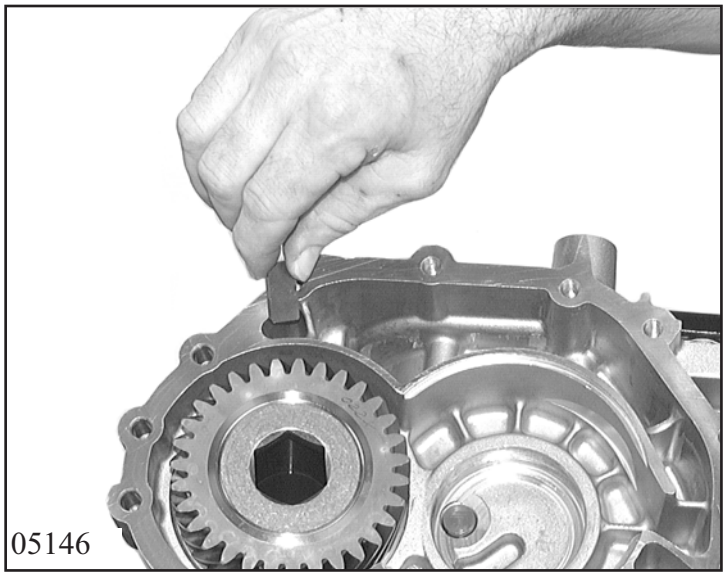


Insert side shaft 37.100 and tighten with new tension bolt 37.120.

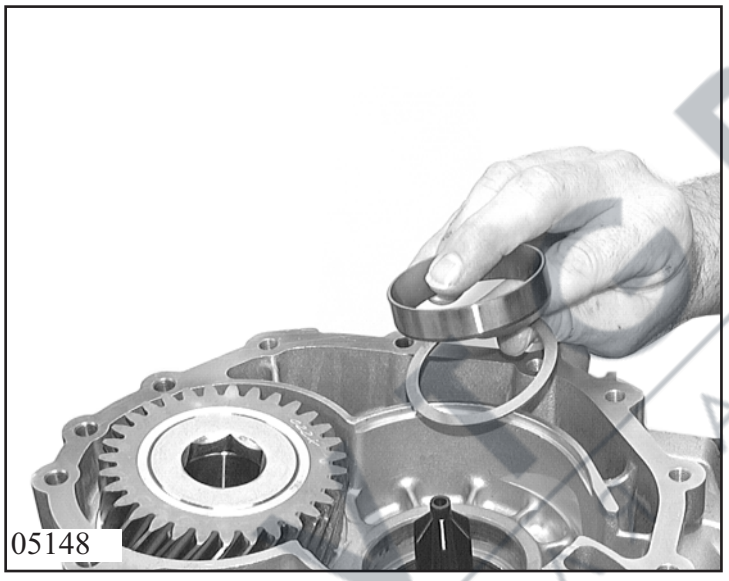


Attention!
Screw connection instructions Chapter 1.3.1.6

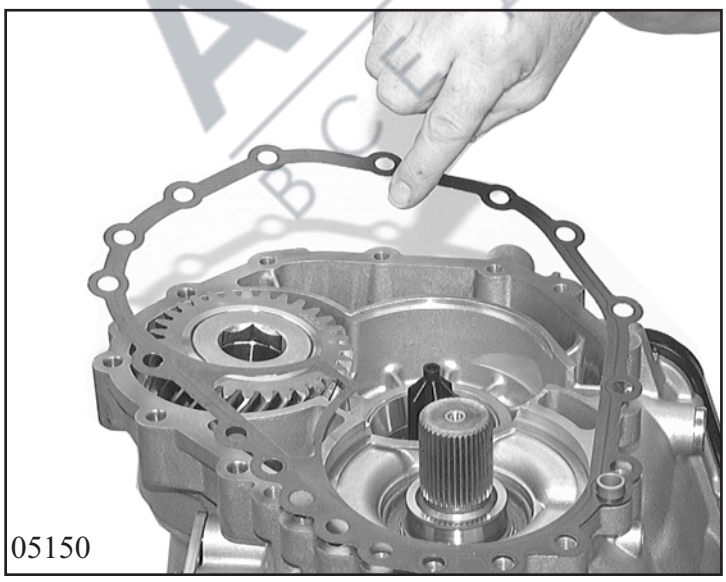
3.6.5 Installing the Intermediate Housing


05146

Insert magnet 37.220 in recess of gearbox housing.


05148

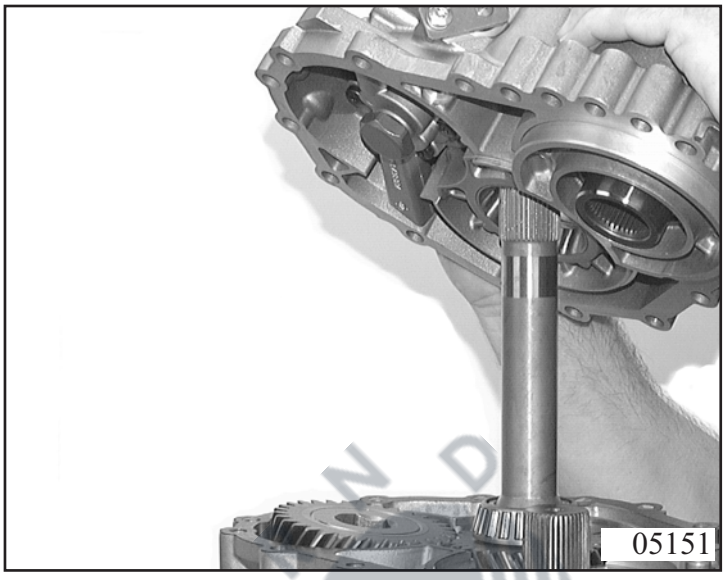
Heat up seat of bearing shell to approx. 70°C with hot-air blower. Press in new oil dispenser 37.010 into seat of front axle shaft. Insert setting shims for front axle shaft 37.050 and drive wheel 38.050 as well as bearing shells 38.020/150 in gearbox housing.


05150

Insert front axle shaft 38.020 in gearbox housing und fit new metal seal 38.540 to gearbox housing.

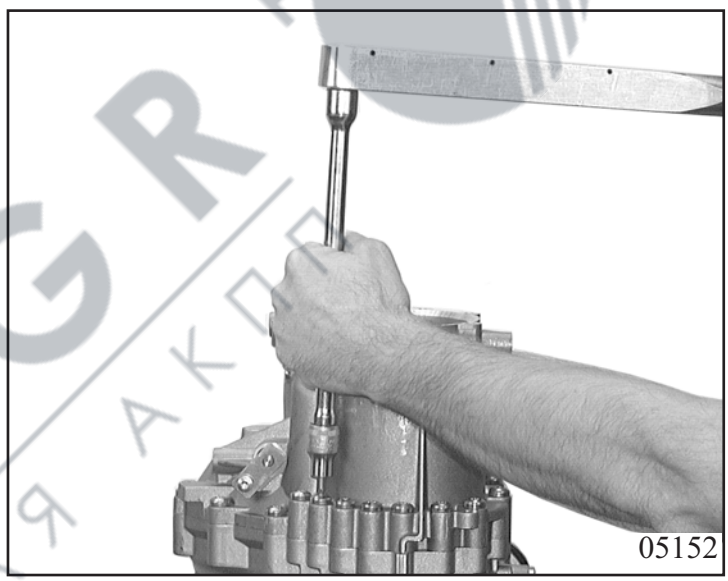
Attention:
Do not touch the sealing surface of the seal with your fingers.

Put intermediate housing on gearbox housing. Align the pump driver for this.



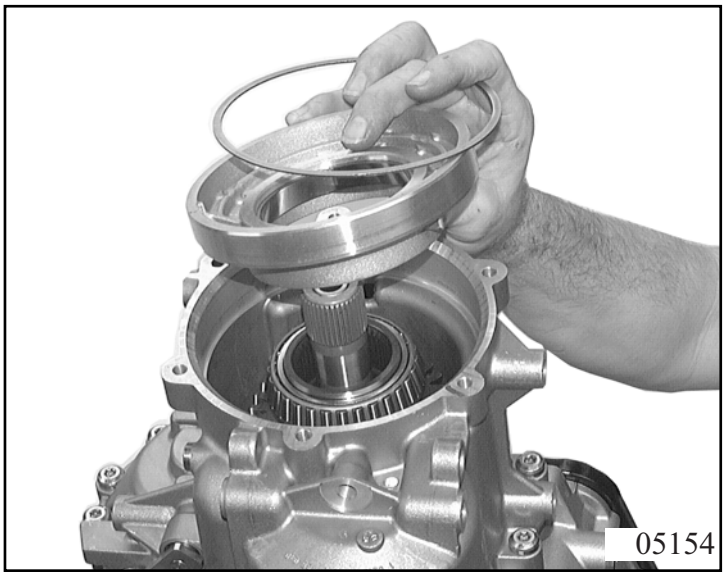
Insert output wheel 38.100 in intermediate housing. Fix intermediate housing to gearbox housing with 19 torx screws 38.550.

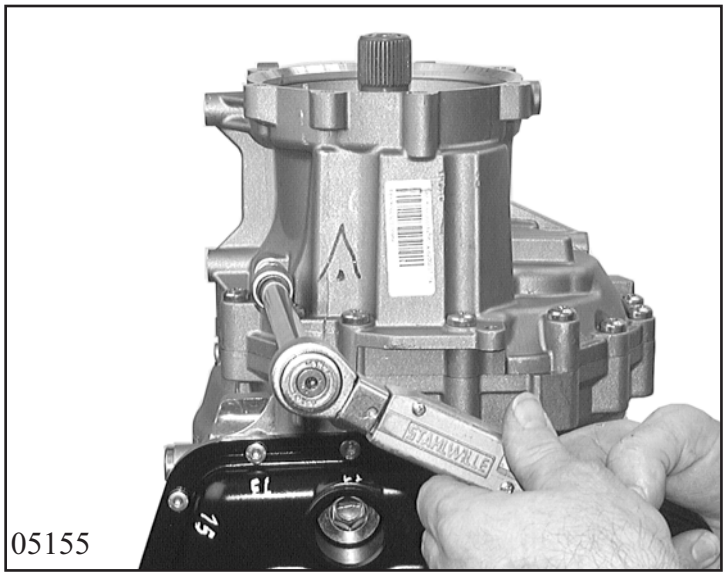
(For tightening torque see Chapter 1.5)



Attention!
For screw connection instructions see Chapter 1.3.1.5

Insert bearing ring 38.140 and spacer 38.060 in distributor housing.



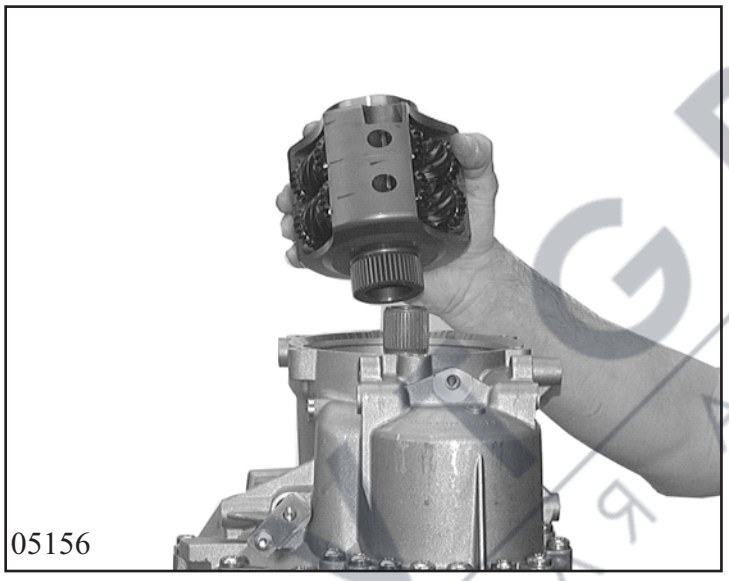


05155

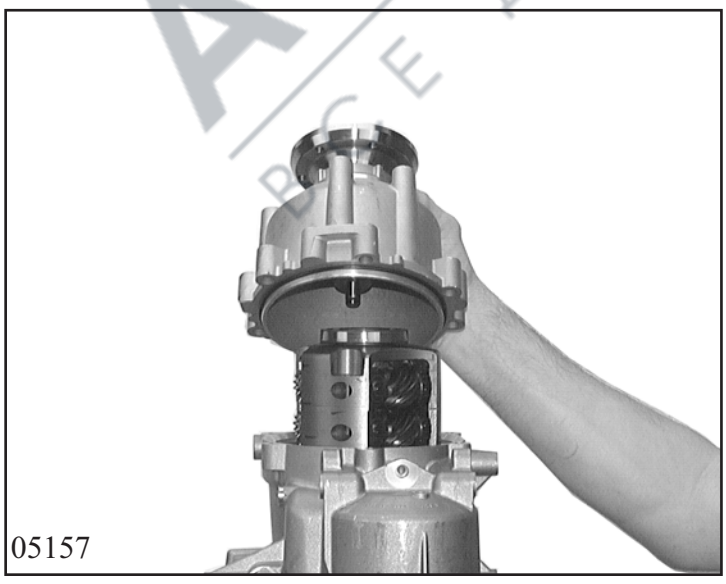
Screw in oil outlet screw 38.190.

(For tightening torque see Chapter 1.5)

3.6.6 Installing the Distributor Housing


05156

Insert Torsen 38.220.


05157

Pull O-ring type sealing ring 36.130 onto distributor housing 36.010 and put on intermediate housing. Bolt on distributor housing with 7 screws 36.140.

(For tightening torque see Chapter 1.5)

Attention!
Screw connection instructions Chapter 1.3.1.4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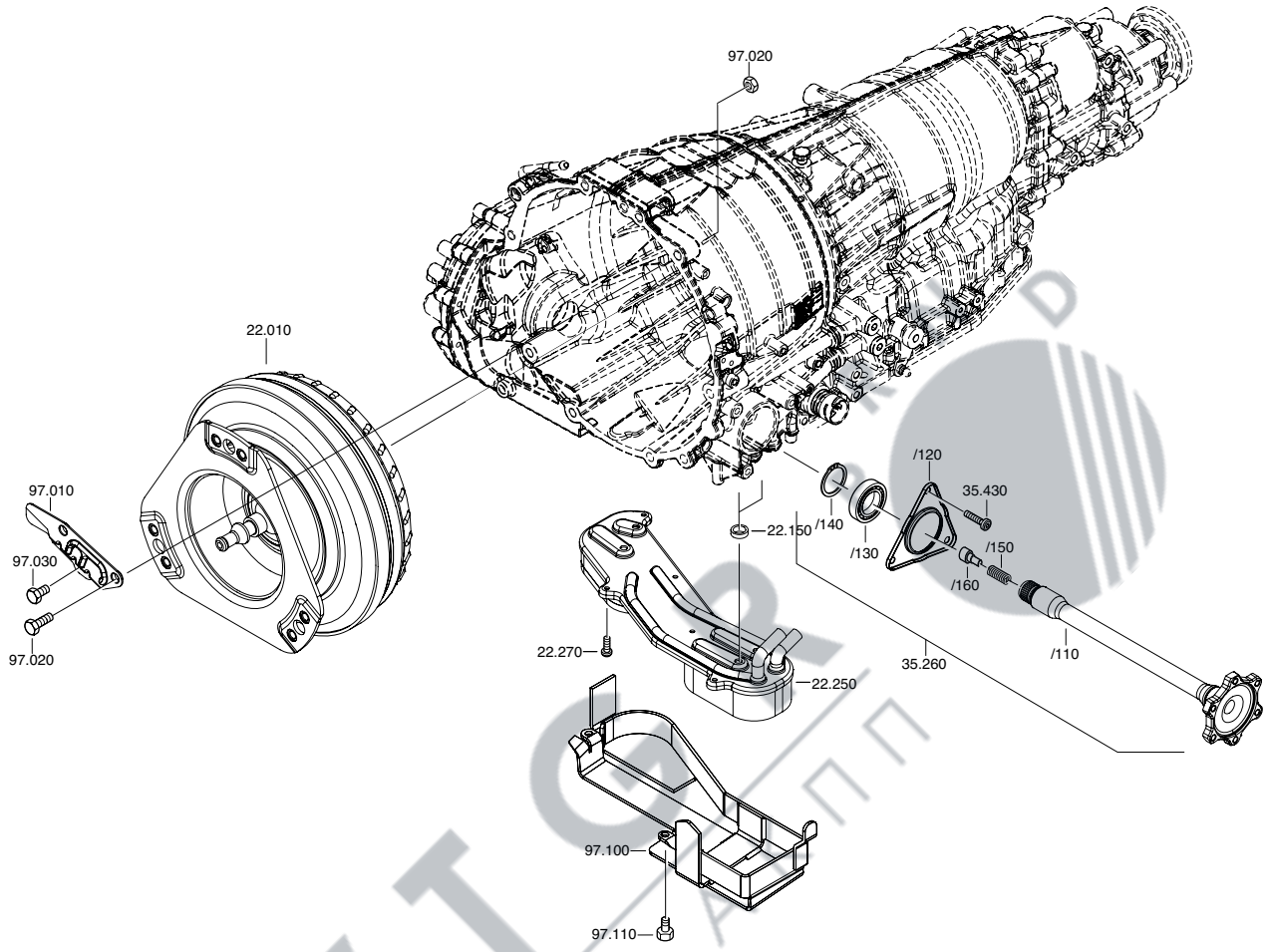
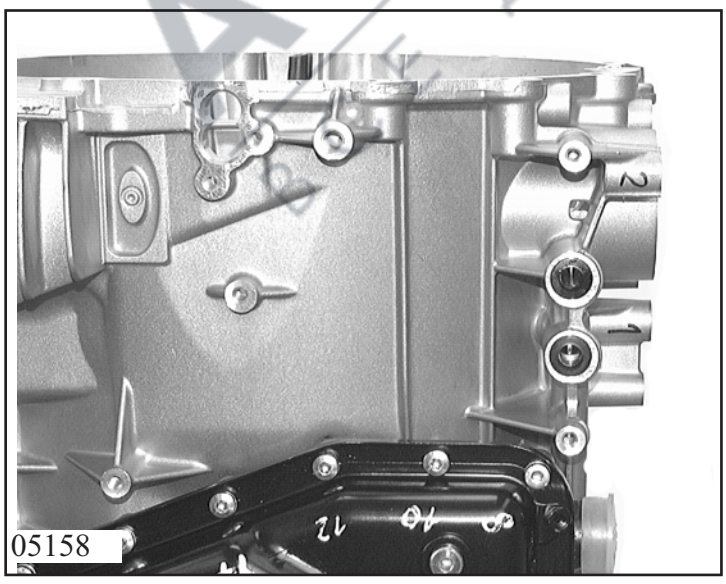
3.7 Installing the Converter, Oil Cooler and Flanged Shaft
3.7.1 Installing the Oil Cooler

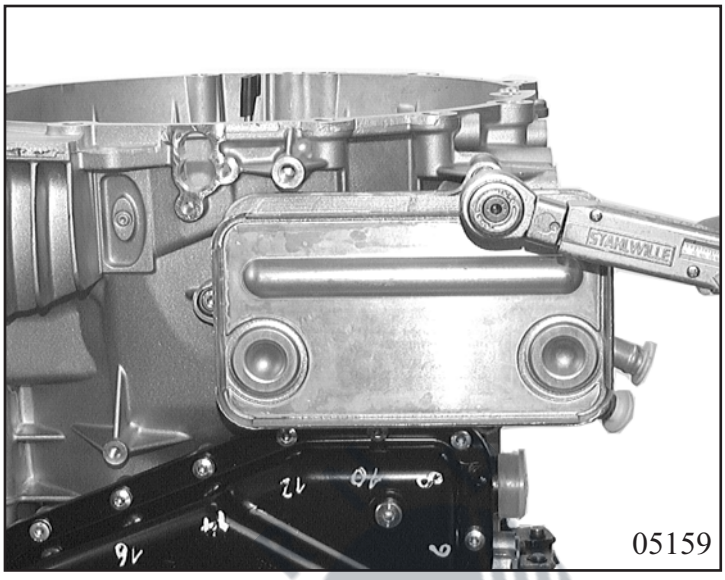




Rotate gearbox by 90°.
Press 2 sealing rings 22.150 into converter bell.

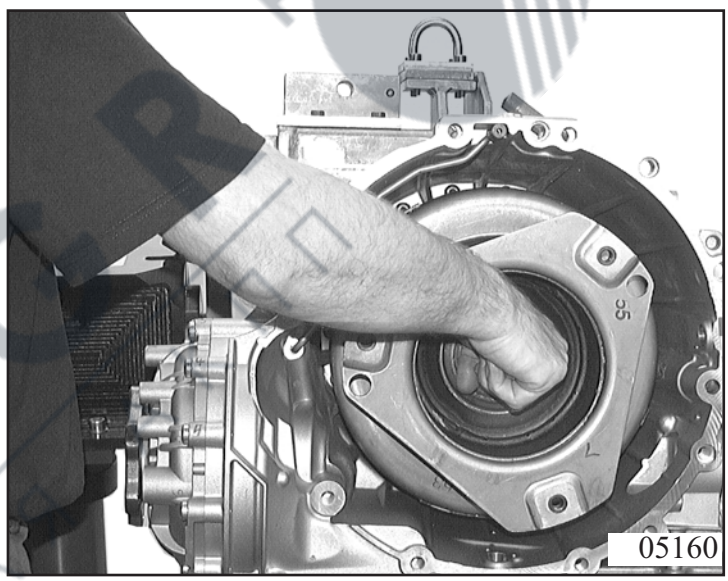
Place oil cooler 22.250 on converter bell and fix with 3 screws 22.270.

(For tightening torque see Chapter 1.5)



3.7.2 Installing the Converter

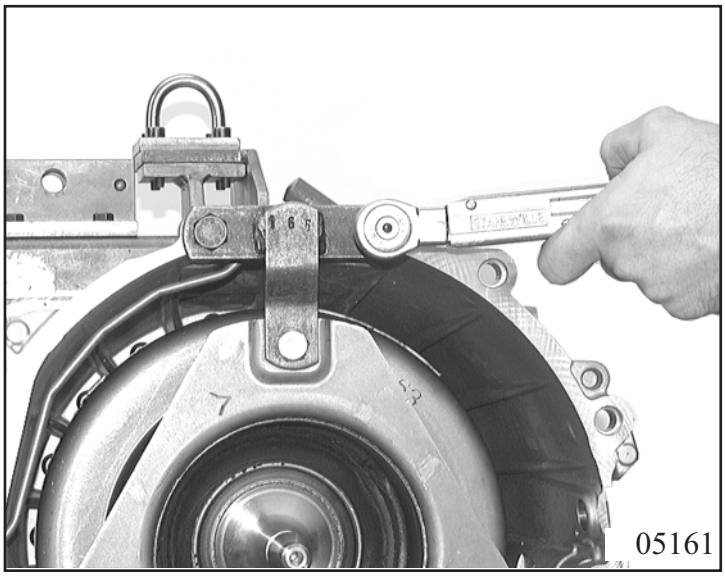
Rotate gearbox through 90°.
Carefully insert converter 22.010 by hand and rotate back and forth until pump driver journal engaged.



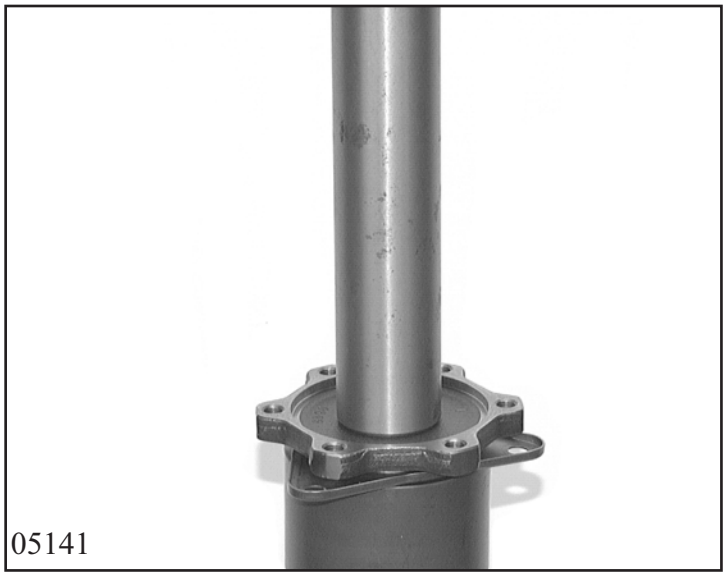
Attention!
When inserting, ensure that the drive journals are not damaged.

Screw on converter retainer 97.010 with 1 screw 97.020 and screw. 97.030.

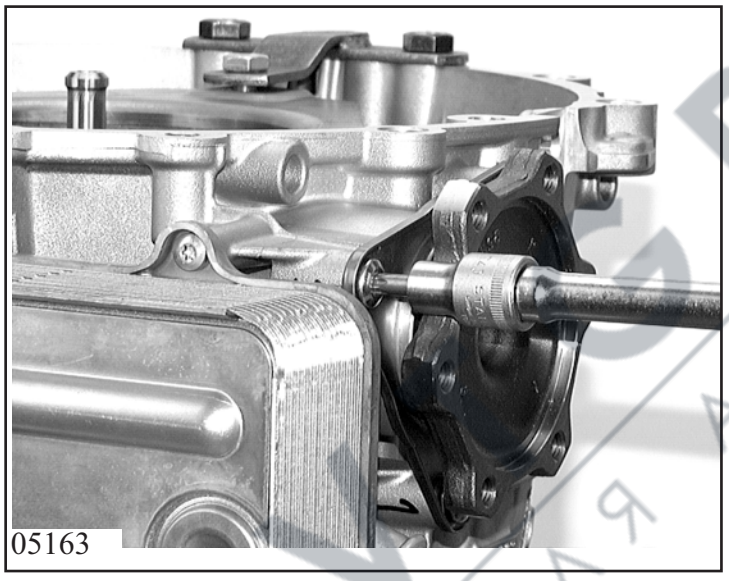
(For tightening torque see Chapter 1.5)



3.7.3 Installing the Flanged Shaft


05141

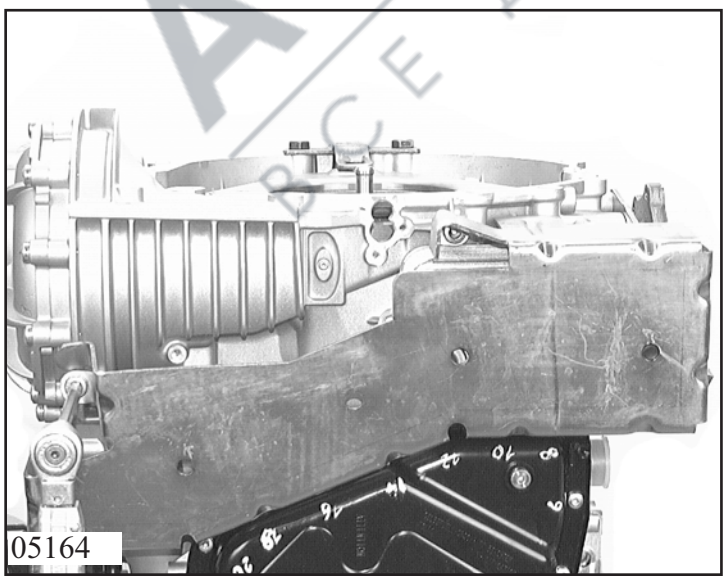
Press in flanged shaft 35.260/110 into the bearing 35.260/130 through the cover 35.260/120 under the mandrel press. Secure with half-moon ring 35.260/140. Use a suitable assembly tool for this.


05163

Rotate gearbox with converter upwards. Insert flanged shaft through converter bell into differential. Fasten cover with 3 screws 35.430.

(For tightening torque see Chapter 1.5)

Attention!
For some parts lists another hose breather must be fitted.


05164

Fasten transport locking plate to gearbox with 2 screws.

(For tightening torque see Chapter 1.5)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