

REPAIR MANUAL

5 HP- 24 A



ZF GETRIEBE GMBH SAARBRÜCKEN

Version 02/01/15
CD



subject to alterations

© Copyright 2001 all rights reserved and published by
ZF Getriebe GmbH, Saarbrücken, Department MKTD

No part of this manual may be reproduced or transmitted in any form or
by any means, electronic or mechanical, including photocopying and recording,
for any purpose without the express written permission of
ZF Getriebe GmbH, Saarbrücken

Printed in Germany

Contents

	Page II
Preliminary information	
1. General	1.1/1
1.1 Illustration of transmission	1.1/1
1.2 Power flow diagram	1.2/1
1.3 Specifications	1.3/1
1.3.1 Screw specifications	1.3/1
1.3.1.1 Differential cover	1.3/1
1.3.1.2 Oil supply	1.3/1
1.3.1.3 Control unit	1.3/1
1.3.1.4 Oil pan	1.3/2
1.3.1.5 Cylinder F	1.3/2
1.3.1.6 Output	1.3/3
1.3.1.7 Yield limit tightening, differential crown wheel	1.3/4
.4 Adjusting work	1.4/1
1.4.0 Measuring the disc sets (procedure)	1.4/1
1.4.1 Clearances (snap ring)	1.4/3
1.4.1.1 Clearance, clutch F (snap ring)	1.4/3
1.4.1.2 Clearance, brake D (snap ring)	1.4/5
1.4.1.3 Clearance, clutch E (snap ring)	1.4/7
1.4.1.4 Clearance, clutch A (snap ring)	1.4/9
1.4.1.5 Clearance, clutch B (snap ring)	1.4/11
1.4.1.6 Clearance, brake C (snap ring)	1.4/13
1.4.2 Preload, differential	1.4/15
1.4.3 Bevel gear drive	1.4/19
1.4.3.1 Pinion position	1.4/19
1.4.3.2 Installed pinion shaft bearing height	1.4/19
1.4.3.3 Backlash / crown wheel position <i>(only if no centring disc is installed)</i>	1.4/21
1.4.3.4 Side shaft runout adjustment	1.4/24
1.4.4 Switch detent spring	1.4/25
1.4.5 Endplay, output (washer)	1.4/26
1.4.6 Output gear bearing adjustment	1.4/27
1.4.6.0 Preparation for bearing adjustment (shim washers)	1.4/27
1.4.6.1 Projection, front axle shaft bearing	1.4/28
1.4.6.2 Installation space, front axle shaft	1.4/30
1.4.6.3 Determining shim, front axle shaft	1.4/31
1.4.7 Play at input (washer)	1.4/32
1.5 Tightening torques	1.5/1
1.6 Checking transmission (on test rig/in vehicle)	1.6/1
1.7 Special tools	1.7/1
1.8 Oil flow diagram (position N according to DIN diagram)	1.8/1
1.9 Functional checks	1.9/1
1.9.1 Checking torsional clearance, Torsen II (angle)	1.9/1

2.	Removal	2.1/1
2.1	Removing converter, front axle output, control unit and position switch	2.1/1
	2.1.1 Removing converter	2.1/1
	2.1.2 Removing output to front axle	2.1/3
	2.1.3 Dismantling work at the transmission housing	2.1/3
	2.1.4 Removing control unit	2.1/4
	2.1.5 Removing position switch	2.1/5
	2.1.6 Removing shifting and parking lock mechanism	2.1/5
	2.1.7 Removing oil pipes	2.1/7
2.2	Removing flange shaft and front axle differential	2.2/1
	2.2.1 Removing flange shaft	2.2/1
	2.2.2 Removing front axle differential	2.2/1
2.3	Removing pinion shaft	2.3/1
2.4	Removing oil supply	2.4/1
2.5	Removing input with tower	2.5/1
	2.5.1 Removing input	2.5/1
	Dismantling	2.6/1
2.6	Dismantling Torsen II, cover, intermediate and transfer box housing	2.6/1
	2.6.1 Torsen II	2.6/1
	2.6.2 Intermediate housing	2.6/3
	2.6.3 Cover	2.6/3
	2.6.4 Distributor housing	2.6/3
2.7	Dismantling bearing shells, bearings etc.	2.7/1
	2.7.1 Transmission housing	2.7/1
	2.7.2 Front axle shaft	2.7/1
	2.7.3 Rear axle shaft	2.7/2
	2.7.4 Output gear	2.7/2
	2.7.5 Differential cover	2.7/2
	2.7.6 Pinion shaft	2.7/3
	2.7.7 Differential (visual check)	2.7/3
	2.7.8 Flange shaft	2.7/4
2.8	Oil supply	2.8/1
2.9	Brake F, towers I + II	2.9/1
	2.9.1 Brake F (with 1st gear freewheel)	2.9/1
	2.9.2 Brake D, E and clutch C	2.9/3
	2.9.3 Planetary gear (III, II and I)	2.9/8
	2.9.4 Tower II	2.9/11

3.	Installation	3.1/1
	Adjustments	3.1/2
3.1	Installing pinion shaft and differential	3.1/3
	3.1.1 Differential	3.1/3
	3.1.2 Pinion shaft	3.1/4
	3.1.3 Installing pinion shaft	3.1/5
	3.1.4 Pinion shaft torque check	3.1/5
	3.1.5 Installing pinion shaft sealing ring and lateral shaft	3.1/6
	3.1.6 Installing differential in transmission housing	3.1/6
3.2	Installing shift and parking lock mechanism	3.2/1
3.3	Brake F (with 1st gear freewheel)	3.3/1
3.4	Planetary gear (I, II and III)	3.4/1
	3.4.1 Brakes (E and D)	3.4/4
	3.4.2 Clutch C	3.4/9
3.5	Tower II (input with clutches A and B)	3.5/1
	3.5.1 Clutch A (input)	3.5/1
	3.5.2 Clutch B (input)	3.5/3
3.6	Oil supply	3.6/1
3.7	Adding parts to intermediate / transfer box housings, installing output	3.7/1
	3.7.1 Torsen II	3.7/1
	3.7.2 Adding various parts to the intermediate housing	3.7/5
	3.7.3 Transfer box housing	3.7/6
	3.7.3.1 Output gear	3.7/6
	3.7.3.2 Rear axle shaft	3.7/6
	3.7.3.3 Vibration damper	3.7/6
	3.7.4 Front axle shaft	3.7/9
	3.7.5 Intermediate housing	3.7/9
	3.7.6 Installing intermediate gear and front axle shaft	3.7/9
	3.7.7 Installing intermediate housing on transmission housing	3.7/10
	3.7.8 Installing Torsen II	3.7/11
	3.7.9 Installing transfer box housing at intermediate housing	3.7/11
3.8	Adding parts to flange shaft and installing	3.8/1
3.9	Installing control unit, oil filter and oil pan, position switch and converter	3.9/1
	3.9.1 Installing control unit, oil filter and oil pan	3.9/1
	3.9.2 Installing position switch and converter	3.9/6
	3.9.2.1 Installing and checking position switch	3.9/6
	3.9.2.2 Installing converter	3.9/7
	3.9.3 Installing breather cover and protective transit caps	3.9/8

Preliminary information

This manual covers the procedure for repairing the complete transmission.

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

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

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

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

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

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

In this case you must observe the following:

- Seals (such as O-rings, shaft seals, gaskets, and filters) should always be renewed.
- All O-rings, rectangular-section rings, and other sealing rings must always be lubricated with petroleum jelly before installation.
- All bearings must always be oiled lightly when installed.
- For transmissions that have covered a large number of kilometers (> 80,000 km), all lined clutch discs and steel clutch discs should be replaced.
- After clutches/brakes have been damaged, the converter, oil tubes, and oil cooler, must be cleaned thoroughly with a suitable cleaning agent.
- Needle roller thrust bearings with double-angle races must be inserted so that the angled discs are against the face of the component.

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

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

Note:

This manual treats the valve body as a complete unit, which should not be disassembled without special knowledge; it should be exchanged as a complete unit.

A separate repair manual is planned for the valve body.

Important:

The transmission is filled with long-life oil.

The oil does not have to be changed until it has been in use for ten years.

The transmission, the differential and the transfer box housing must only be delivered with the oil quantity and type specified in the relevant item list (see Part List).

Technical Service

Technical Documentation

Training Center

Bach

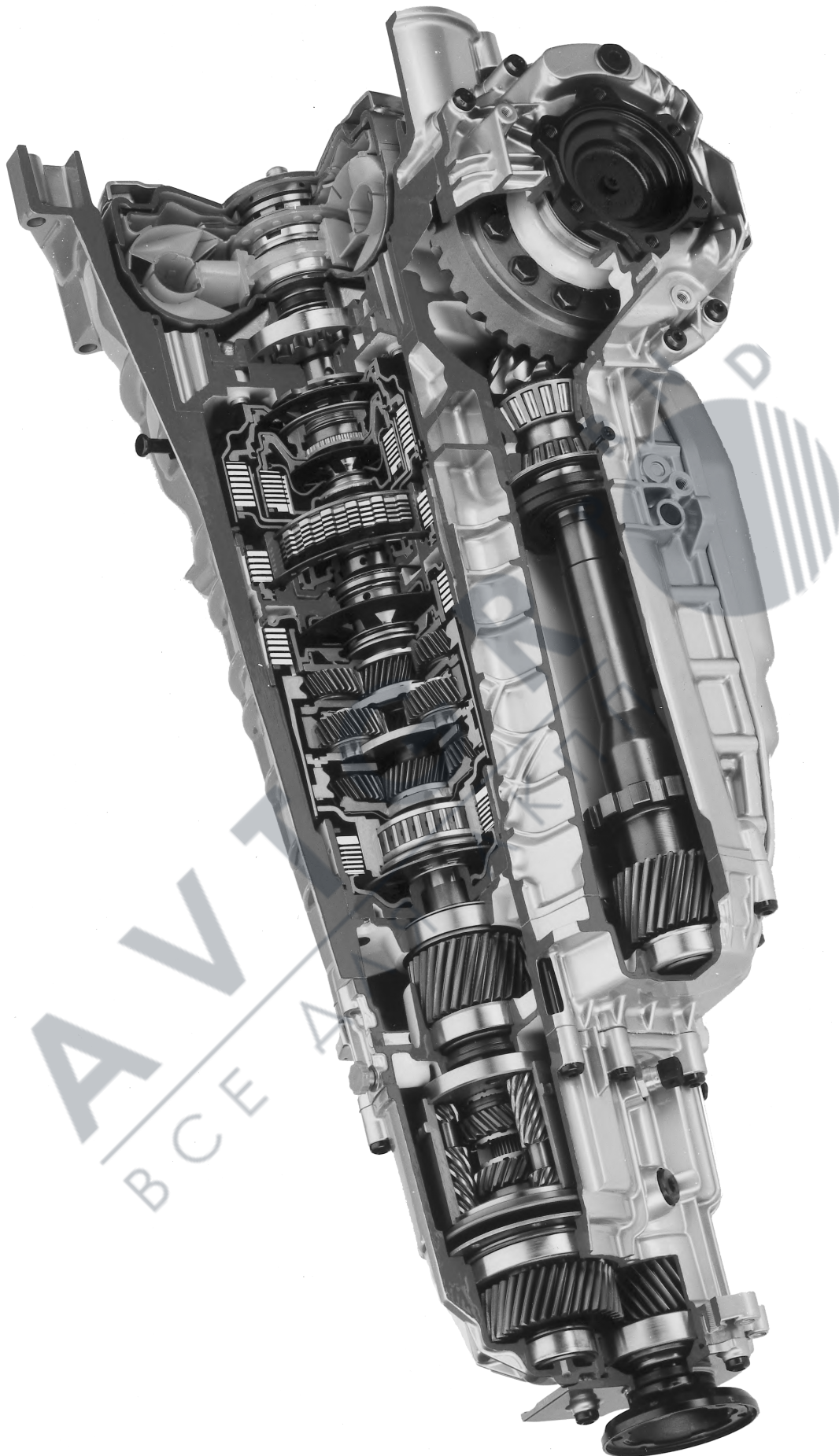
Reus

Schultz



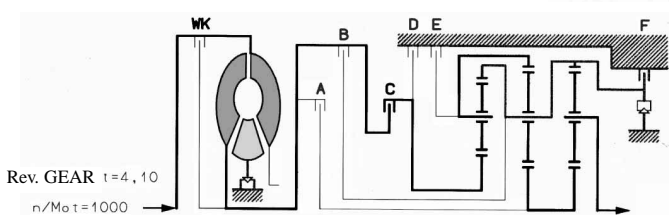
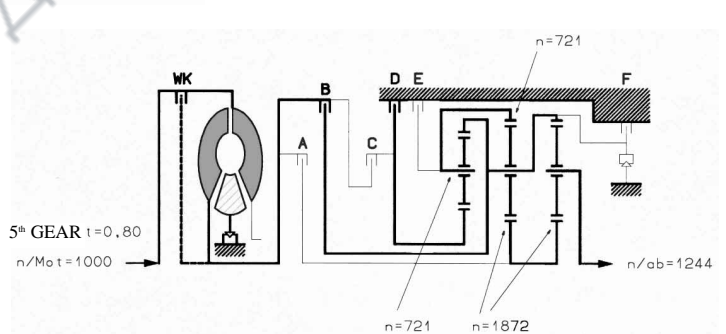
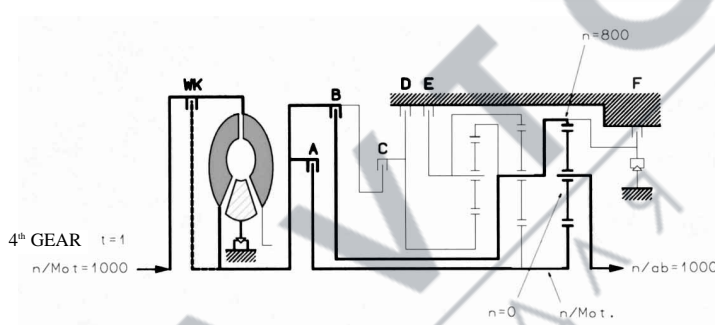
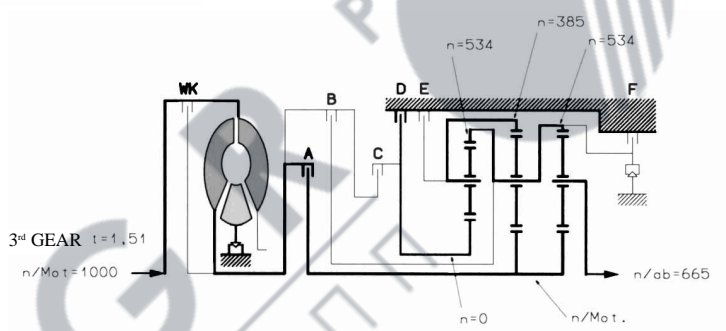
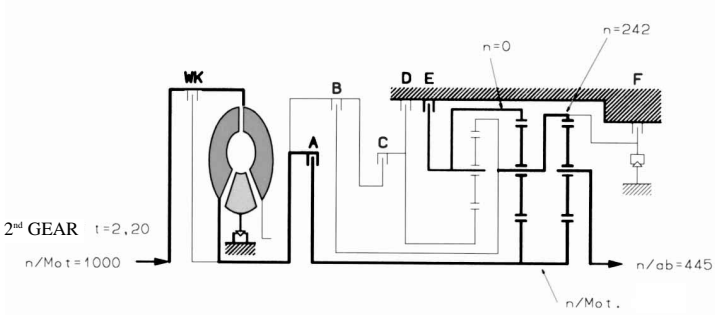
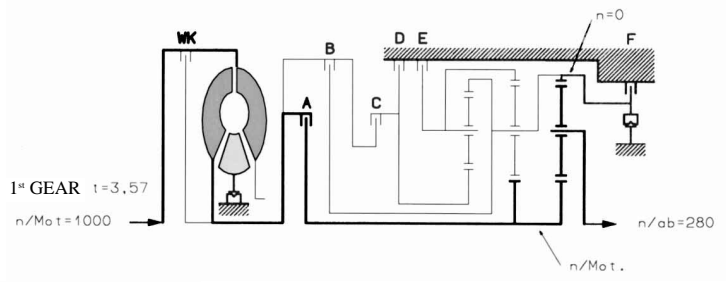
1. General information

1.1 Picture of the transmission





1.2 Power flow diagram





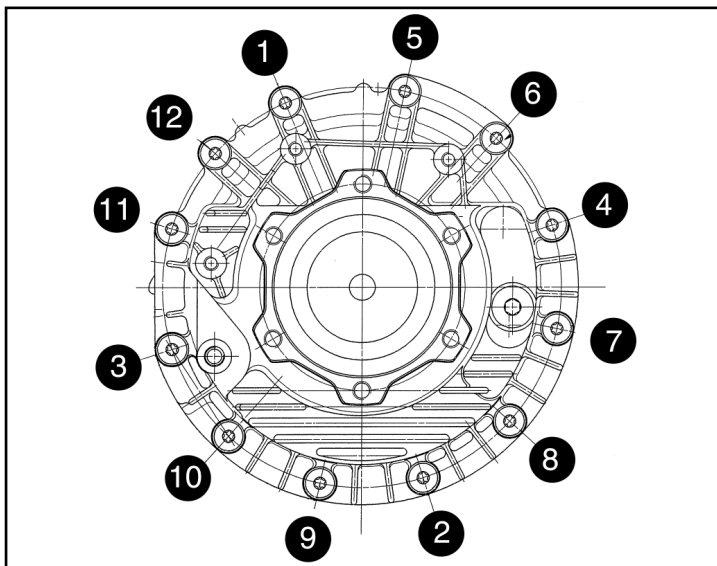
1.3 Specifications

1.3.1 Screw specifications

1.3.1.1 Differential cover

Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 12



Important!

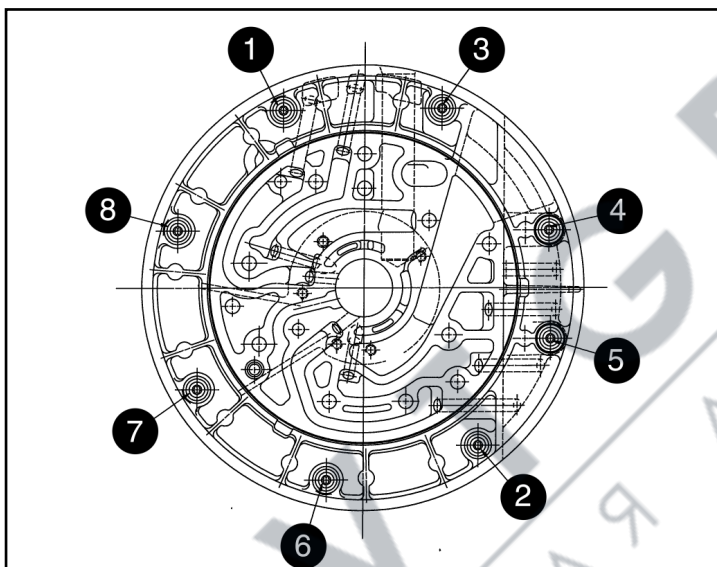
(Specification 1058 700 016)

(Tightening torques: see Chapter 1.5)

1.3.1.2 Oil supply

Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 8



Important!

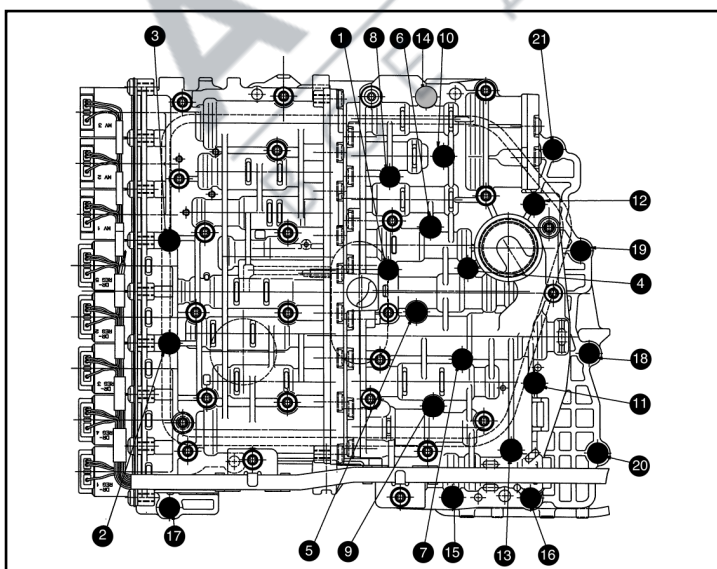
(Specification 1058 700 015)

(Tightening torques: see Chapter 1.5)

1.3.1.3 Control unit

Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 21



Important!

(Specification 1058 700 017)

(Tightening torques: see Chapter 1.5)

1.3.1.4 Oil pan

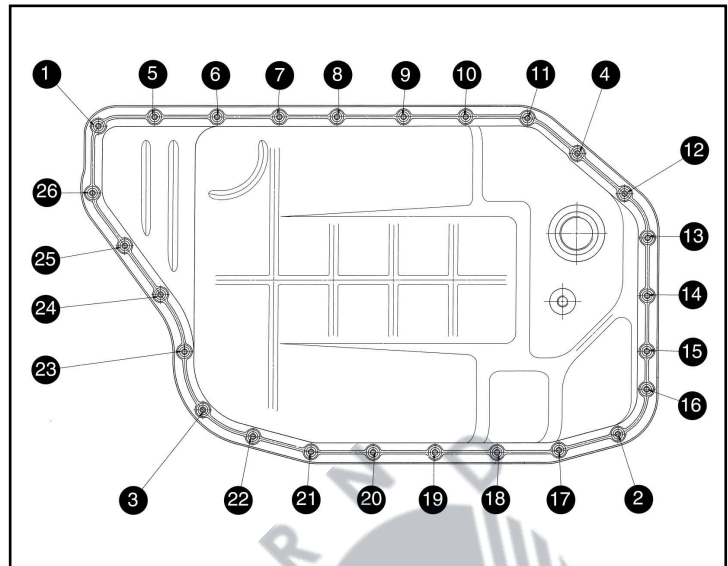
Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 26

Important!

(Specification 1058 700 019)

(Tightening torques: see Chapter 1.5)



1.3.1.5 Cylinder F

Pretighten screws in the order of the numbers (see diagram).

12 ⇨ 6

Tighten screws in the order of the numbers (see diagram)

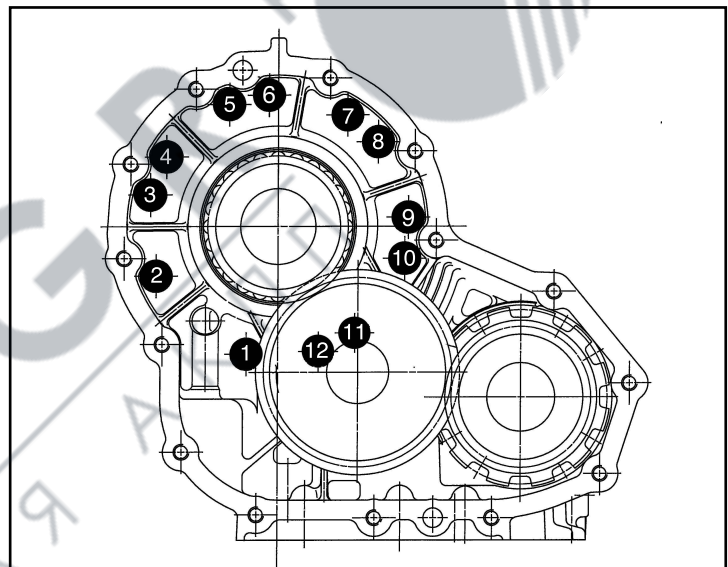
1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 12

Important!

Screws 1 - 12 free of grease and oil

(Specification 1058 700 169)

(Tightening torques: see Chapter 1.5)



(only for partlists 1058 020 003/004)

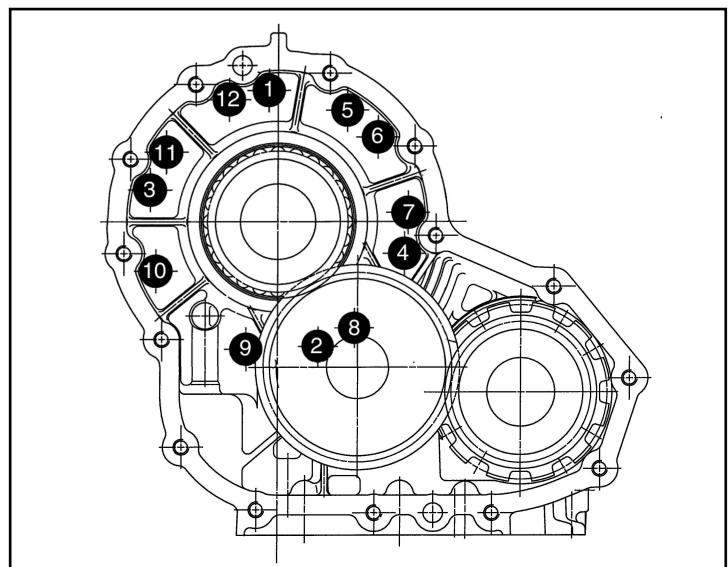
Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 12

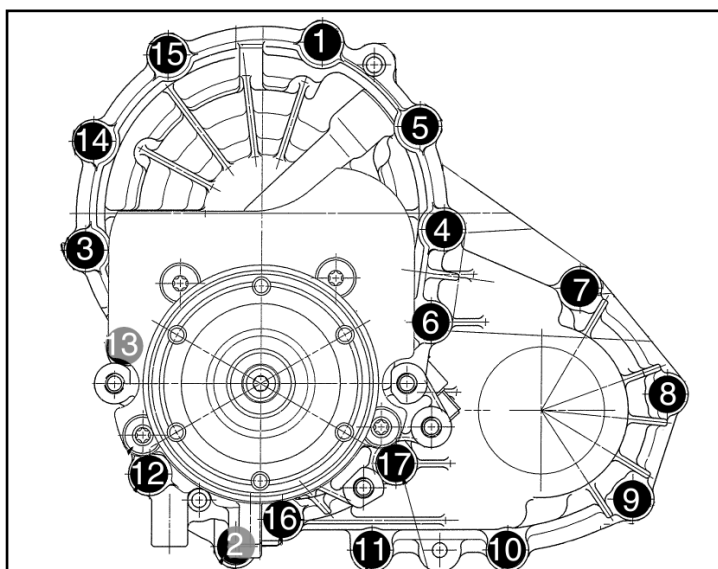
Important!

(Specification 1058 700 014)

(Tightening torques: see Chapter 1.5)



1.3.1.6 Output



Tighten screws in the order of the numbers (see diagram).

1 ⇨ 2 ⇨ 3 ⇨ ... ⇨ 17

Important!
(Specification 1058 700 018)

(Tightening torques: see Chapter 1.5)

During **bearing adjustment of the output gearwheels**, the screws numbered

4, 5, 6
are left out.

AVTGR
ВСЕ ДЛЯ АКПП

1.3.1.7 Yield limit tightening, crown wheel differential

Preconditions:

- The crown wheel, differential cage and screws have been washed and are dry.
- The parts are at room temperature.

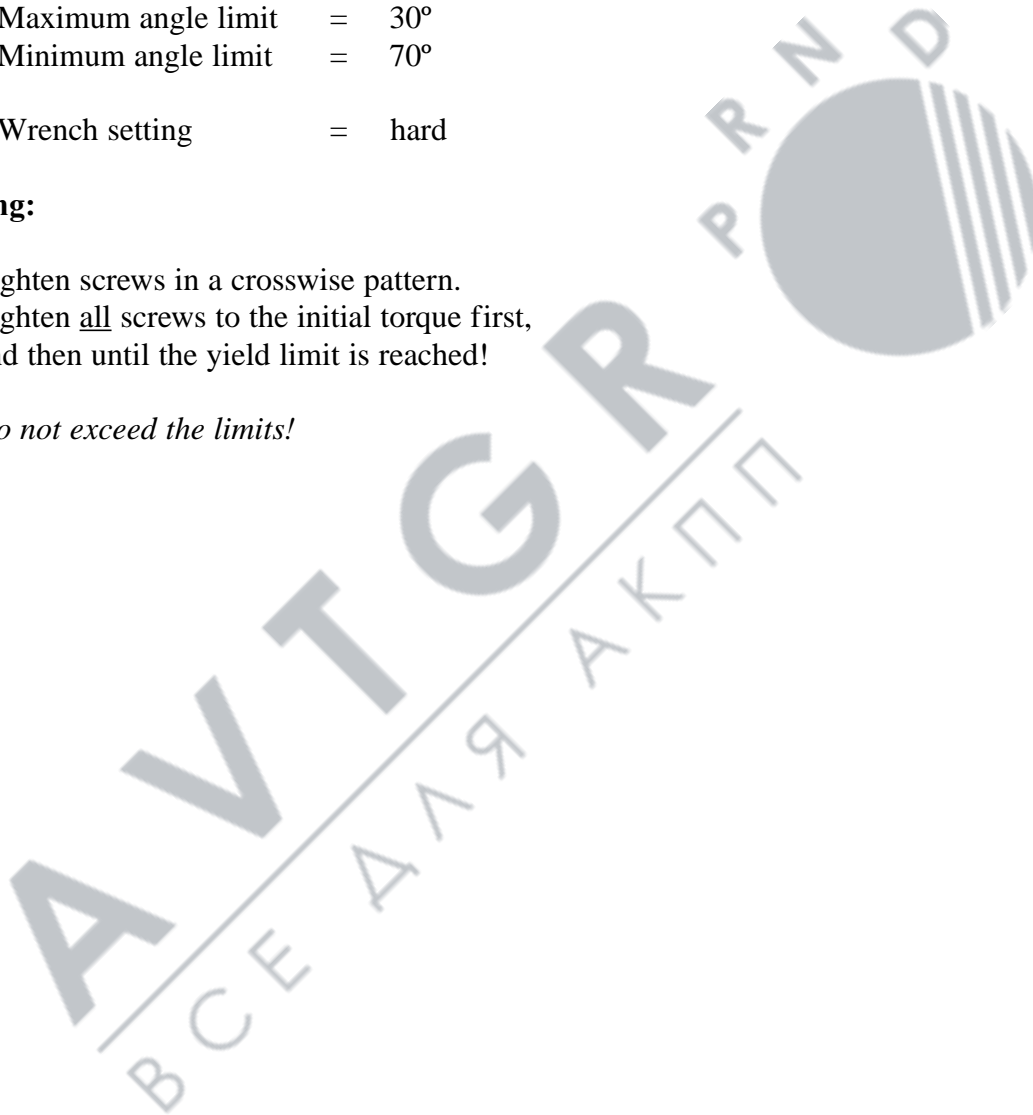
The following figures have to be entered on the wrench:

Initial torque	=	50 Nm
Lower torque limit	=	90 Nm
Upper torque limit	=	160 Nm
Maximum angle limit	=	30°
Minimum angle limit	=	70°
Wrench setting	=	hard

Tightening:

Tighten screws in a crosswise pattern.
Tighten all screws to the initial torque first,
and then until the yield limit is reached!

Do not exceed the limits!



1.4 Making adjustments

1.4.0 Measuring the clutch packs (procedure)

Place the two intermediate pieces 5p01 050 329/5p01 060 329 on the marked position on measuring fixture 5p01 000 330.



Using the knurled screw, turn adjusting device 5p01 001 458 to the upper limit.

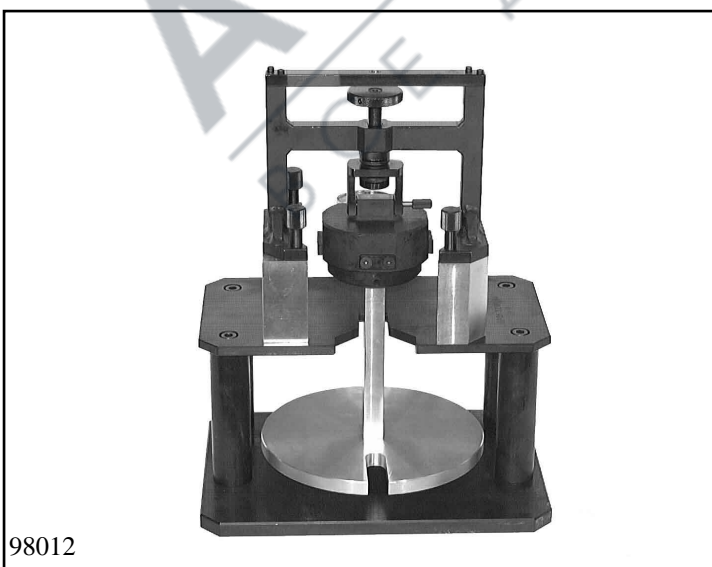
Attach force measuring unit 5p01 000 329 to adjusting device.



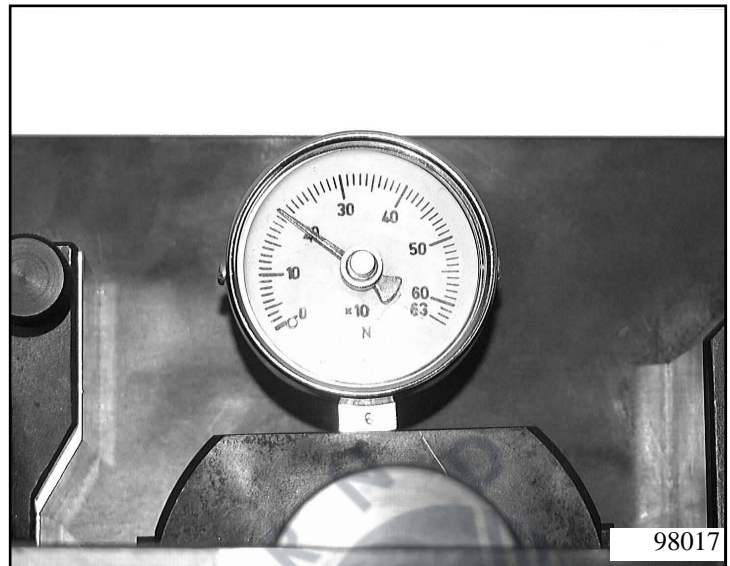
Fasten it with 4 knurled screws to the measuring fixture using the intermediate pieces.

Using a fixing pin, connect measuring plate 5p01 040 330 with the force measuring unit.

Using the knurled screw, clamp the clutch pack to be measured (with steel disc on the top and corrugated disc – if there is one – on the bottom) in the device at 200N.



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

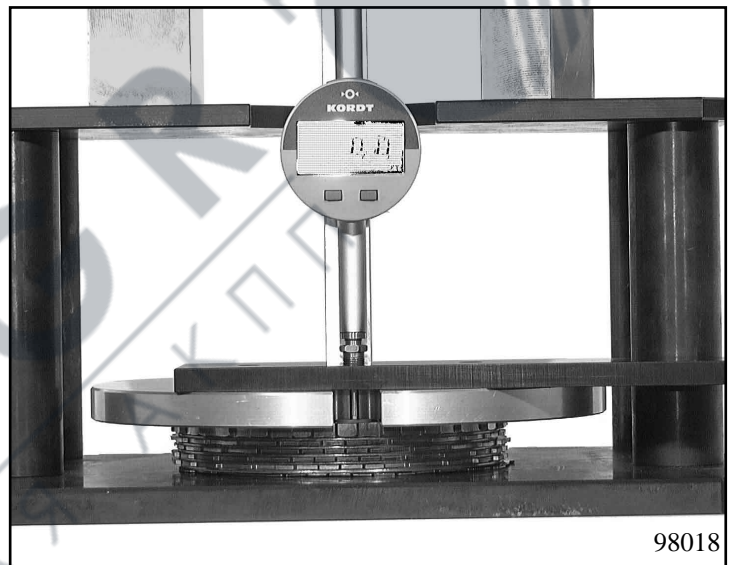


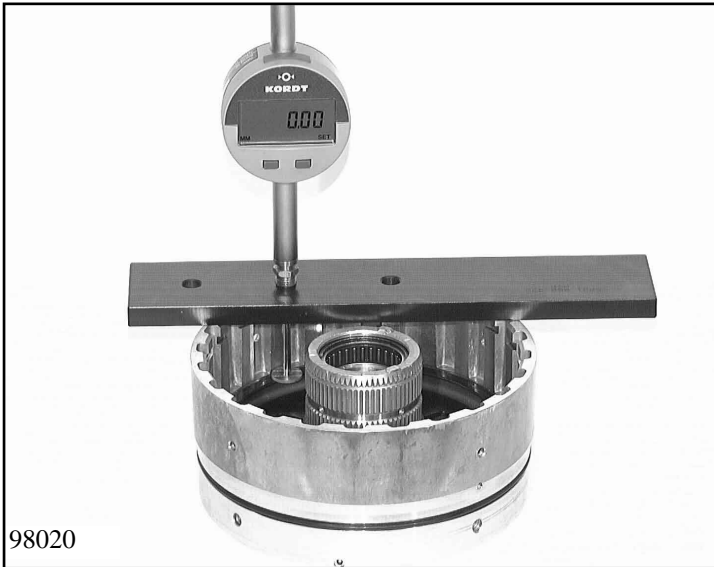
Then place measuring bar 5p01 060 330 on the measuring plate, put the dial gauge's measuring base in the measuring plate's groove on the top disc of the set, and set the dial gauge to 0. Now use the measuring bar to measure down to the base plate.

Read the measurement value $\Rightarrow M_X$

Note!

In each case, the **X** index in M_X stands for the brake/ clutch packs that are put in (A, B, C, D, E, F).





98020

1.4.1 Clearances

1.4.1.1 Clearance, clutch F (snap ring)

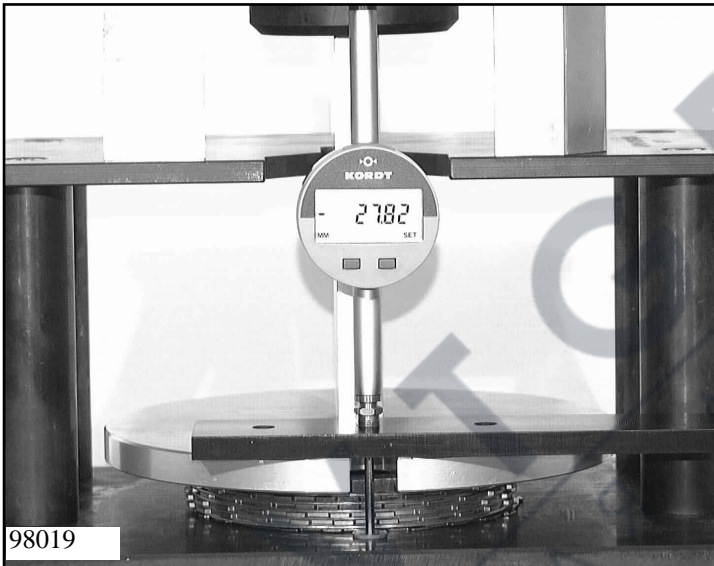
Determine installation space E_F of brake F with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake F. Apply the measuring base of the dial gauge to the highest point on the disc contact surface at the pressure plate and set the dial gauge to "0".

Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove.

Repeat the measurement twice after turning through 120° .

Take an average of $F_1, F_2, F_3 \Rightarrow W_F$



98019

Determine thickness M_F of clutch F disc set as described in Chapter 1.4.0 "Measuring the clutch packs".

$\Rightarrow M_F$

Installation space E_F is obtained from W_F plus thickness of base F. $\Rightarrow E_F$

Test value P_F is then obtained from installation space E_F minus M_F

Value P_F must be between 5.0 and 6.6 mm. **Test specification 1055 700 100** - (from STL 012 - 1058 700 100)

Select snap ring S_F with test gauge P_F .

Calculation:

$$E_F = W_F + F$$

$$P_F = E_F - M_F$$

Clearance L_F should be 2.4 - 2.9 mm with 6 lined discs.

Example (for 1.4.1.1):

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

$$F_1 = 32.30 \text{ mm}$$

$$F_2 = 32.31 \text{ mm}$$

$$F_3 = 32.35 \text{ mm}$$

$$W_F = (32.30 + 32.31 + 32.35)/3$$
$$= 32.32 \text{ mm}$$

$$M_F = 27.82 \text{ mm}$$

$$E_F = 32.32 + 1.48$$
$$= 33.8 \text{ mm}$$

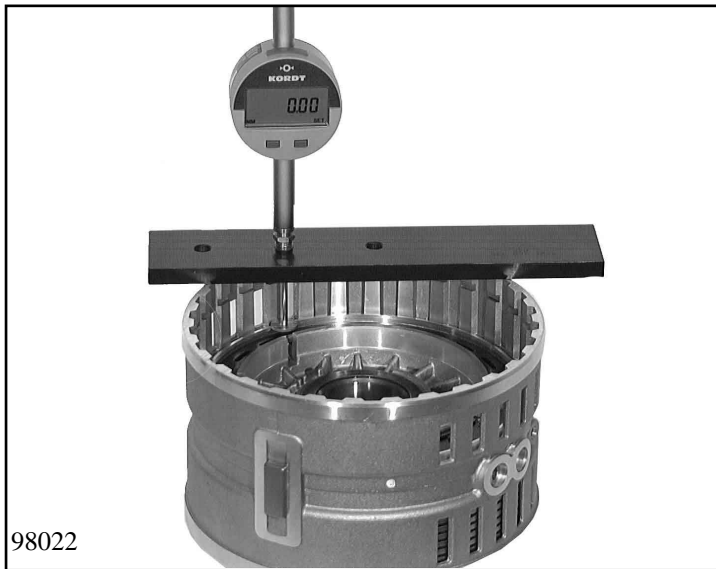
$$P_F = 33.8 - 27.82$$
$$= 5.98 \text{ mm}$$

$$S_F = 3.4 \text{ mm}$$

$$L_F = 5.98 - 3.4$$

$$\Rightarrow L_F = 2.58 \text{ mm}$$





98022

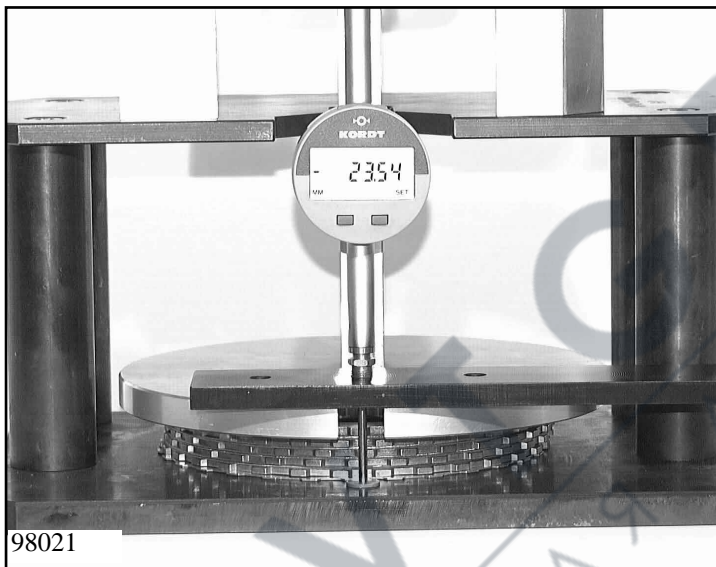
1.4.1.2 Clearance of brake D (snap ring)

Determine installation space E_D of brake D with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake D. Place the base of the dial gauge on the highest point on the disc contact surface of the piston and set the dial gauge to "0".

Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove. Repeat the measurement twice after turning through 120° .

Take the average of $D_1, D_2, D_3 \Rightarrow W_D$



98021

Measure thickness M_D of the disc set for brake D as described in Chapter 1.4.0 "Measuring the clutch packs".

$\Rightarrow M_D$

Installation space E_D is obtained from measured value W_D plus base thickness $F \Rightarrow E_D$

Test value P_D is then installation space E_D minus disc set thickness M_D

Value P_D must be between 3.72 and 5.52 mm. Test specification 1058 700 067 - Version B (from STL 012 - 1058 700 143)

Use test gauge P_D to select snap ring S_D .

Calculation:

$$E_D = W_D + F$$

$$P_D = E_D - M_D$$

Clearance L_D should be 1.35 - 1.65 mm with four lined discs.

(from STL 012 - 1.55 - 1.85 mm)

Example (for 1.4.1.2):

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

$$D_1 = 26.5 \text{ mm}$$

$$D_2 = 26.6 \text{ mm}$$

$$D_3 = 26.7 \text{ mm}$$

$$W_D = (26.5 + 26.6 + 26.7)/3 \\ = 26.6 \text{ mm}$$

$$M_D = 26.34 \text{ mm}$$

$$E_D = 26.6 + 1.48$$

$$= 28.08 \text{ mm}$$

$$P_D = 28.08 - 23.54$$

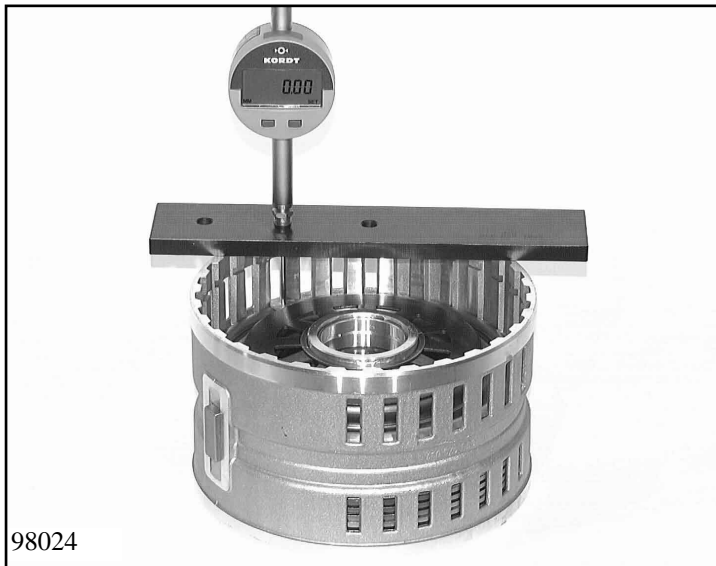
$$= 4.54 \text{ mm}$$

$$S_D = 3.0 \text{ mm}$$

$$L_D = 4.54 - 3.0$$

$$\Rightarrow L_D = 1.54 \text{ mm}$$





98024

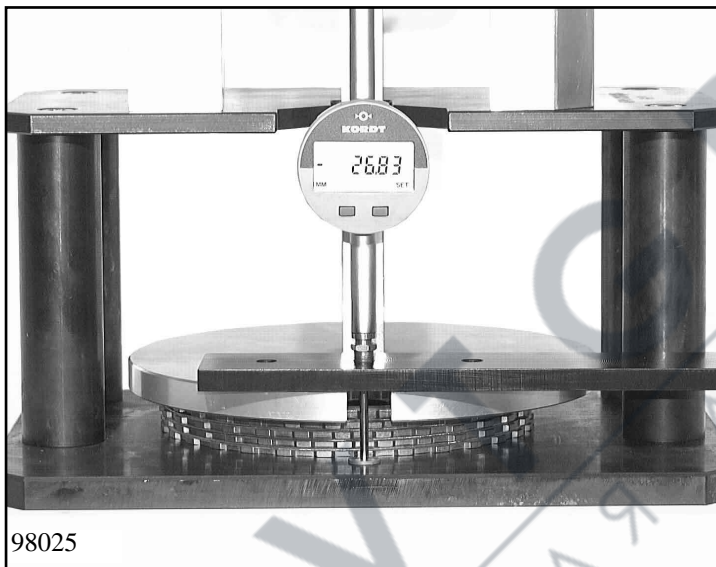
1.4.1.3 Clearance of clutch E (snap ring)

Determine installation space E_E of brake E with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of brake E. Place the base of the dial gauge on the highest point of the disc contact surface on the piston and set the dial gauge to "0".

Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove. Repeat the measurement twice after turning through 120° .

Take the average of $E_1, E_2, E_3 \Rightarrow W_E$



98025

Determine thickness M_E of the disc set for brake E as described in **Chapter 1.4.0 "Measuring the clutch packs"**.

$\Rightarrow M_E$

Installation space E_E is obtained from measured value W_E plus base thickness $F \Rightarrow E_E$

Test value P_E is then installation space E_E minus M_E

Value P_E should be between 3.8 and 5.4 mm. **Test specification 1058 700 029**

Version A

(from STL 011 - 1058 700 144)

Use test gauge P_E to select snap ring S_E .

Calculation:

$$E_E = W_E + F$$

$$P_E = E_E - M_E$$

Clearance L_E should be 1.4 - 1.7 mm with 5 lined discs.

(from STL 011 - 1.8 - 2.1 mm)

Example (for 1.4.1.3):

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

$$E_1 = 29.95 \text{ mm}$$

$$E_2 = 30.0 \text{ mm}$$

$$E_3 = 30.05 \text{ mm}$$

$$W_E = (29.95 + 30.0 + 30.05)/3 \\ = 30.0 \text{ mm}$$

$$M_E = 26.83 \text{ mm}$$

$$E_E = 30.0 + 1.48 \\ = 31.48 \text{ mm}$$

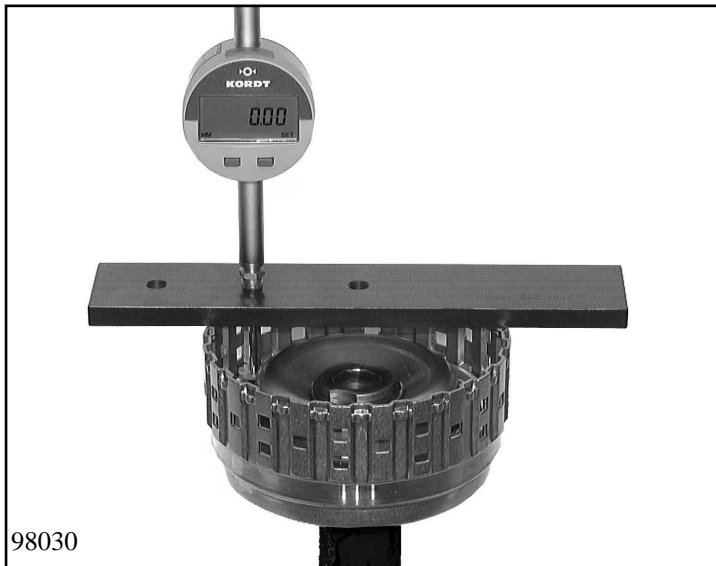
$$P_E = 31.48 - 26.83 \\ = 4.65 \text{ mm}$$

$$S_E = 3.2 \text{ mm}$$

$$L_E = 4.65 - 3.2$$

$$\Rightarrow L_E = 1.45 \text{ mm}$$





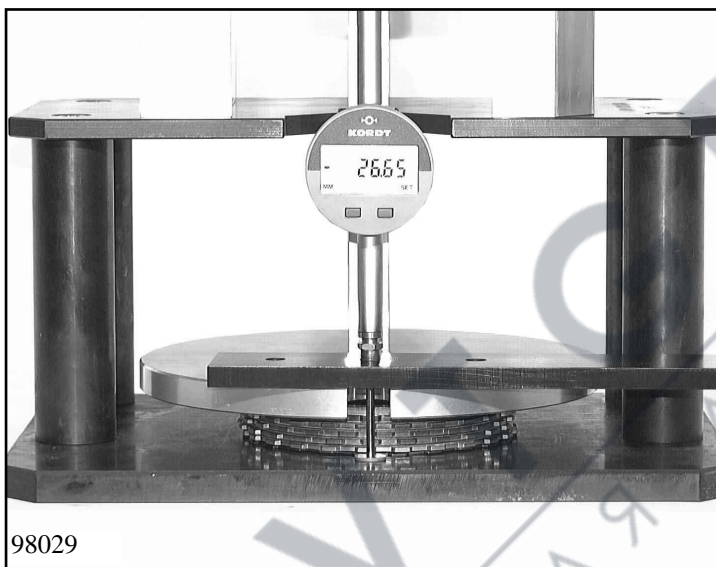
1.4.1.4 Clearance of clutch A (snap ring)

Determine clutch A installation space E_A with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch A. Place the base of the dial gauge on the highest point of the disc contact surface at the piston and set the dial gauge to "0".

Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove. Repeat the measurement twice, after turning through 120° .

Take the average of $A_1, A_2, A_3 \Rightarrow W_A$



Determine thickness M_A of the disc set for clutch A as described in **Chapter 1.4.0 "Measuring the clutch packs"**.

$\Rightarrow M_A$

Installation space E_A is obtained from measured value W_A plus base thickness F . $\Rightarrow E_A$

Important!

The final disc has a step.

When measuring the disc set thickness, measure the lower step of the final disc.

Value P_A is then installation space E_A minus M_A .

Value P_A must be between 3.75 and 5.75 mm. **Test specification 1058 700 021**
(from STL 012 - 1058 700 140)

Use test gauge P_A to select snap ring S_A .

Calculation:

$$E_A = W_A + F$$

$$P_A = E_A - M_A$$

Clearance L_A should be 1.95 - 2.25 mm with six lined discs.

Example (for 1.4.1.4):

F = 1.48 mm (base thickness)

A₁ = 30.24 mm

A₂ = 30.26 mm

A₃ = 30.28 mm

W_D = (30.24 + 30.26 + 30.28)/3

W_A = 30.26 mm

M_A = 26.65 mm

E_A = 30.26 + 1.48

= 31.74 mm

P_A = 31.74 - 26.65

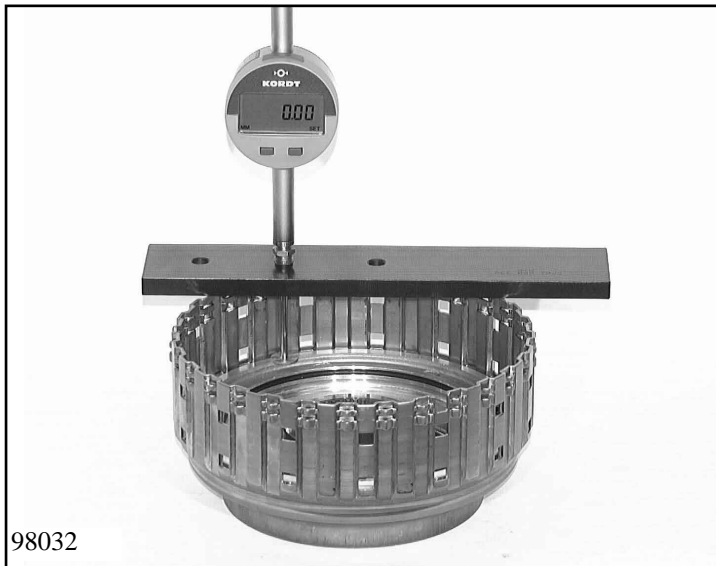
= 5.09 mm

S_A = 3.0 mm

L_A = 5.09 - 3.0

⇨ **L_A** = 2.09 mm





98032

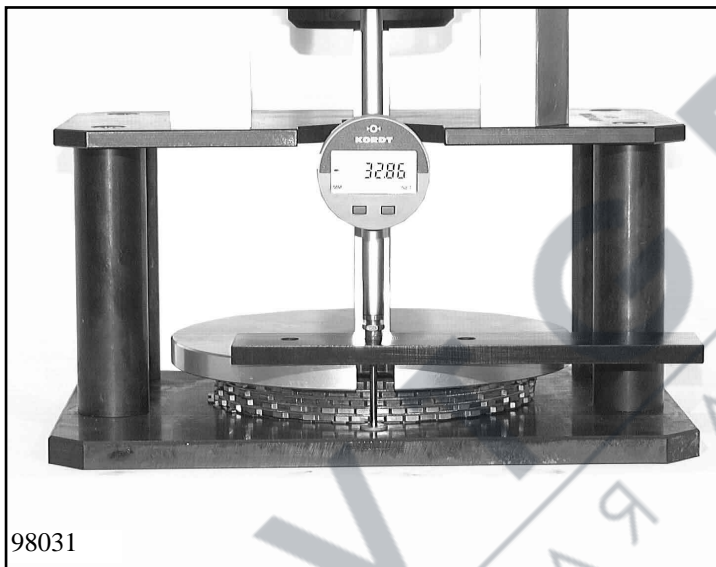
1.4.1.5 Adjusting Clearance of clutch B (snap ring)

Determine clutch B installation space E_B with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch B. Place the gage of the dial gauge against the highest point of the disc contact surface of the piston, and set the dial gauge to "0".

Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove. Repeat the measurement twice after turning by 120° .

Take the average of $B_1, B_2, B_3 \Rightarrow W_B$



98031

Determine the thickness M_B of the clutch B disc set as described in Chapter 1.4.0 "Measuring the clutch packs".

$\Rightarrow M_B$

Installation space E_C is obtained from measured value W_B plus base thickness $F \Rightarrow E_B$

Test value P_B is then installation space E_B minus M_B

Value P_B should be between 4.52 and 6.72 mm. Test specification 1058 700 065 (from STL 012 - 1058 700 141)

Use test gauge P_B to select snap ring S_B .

Calculation:

$$E_B = W_B + F$$

$$P_B = E_B - M_B$$

Clearance L_B should be 1.95 - 2.25 mm with 6 lined discs.

(from STL 012 - 2.15 - 2.45 mm)

Example (for 1.4.1.5):

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

$$B_1 = 36.63 \text{ mm}$$

$$B_2 = 36.64 \text{ mm}$$

$$B_3 = 36.65 \text{ mm}$$

$$W_B = (36.63 + 36.64 + 36.65)/3$$
$$= 36.64 \text{ mm}$$

$$M_B = 32.86 \text{ mm}$$

$$E_B = 36.64 + 1.48$$
$$= 38.12 \text{ mm}$$

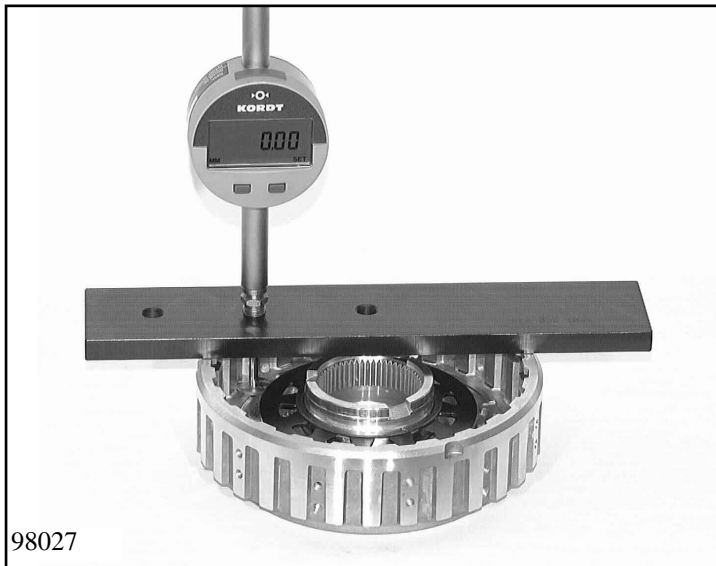
$$P_B = 38.12 - 32.86$$
$$= 5.26 \text{ mm}$$

$$S_B = 3.2 \text{ mm}$$

$$L_B = 5.26 \text{ mm} - 3.2 \text{ mm}$$

$$\square L_B = 2.06 \text{ mm}$$





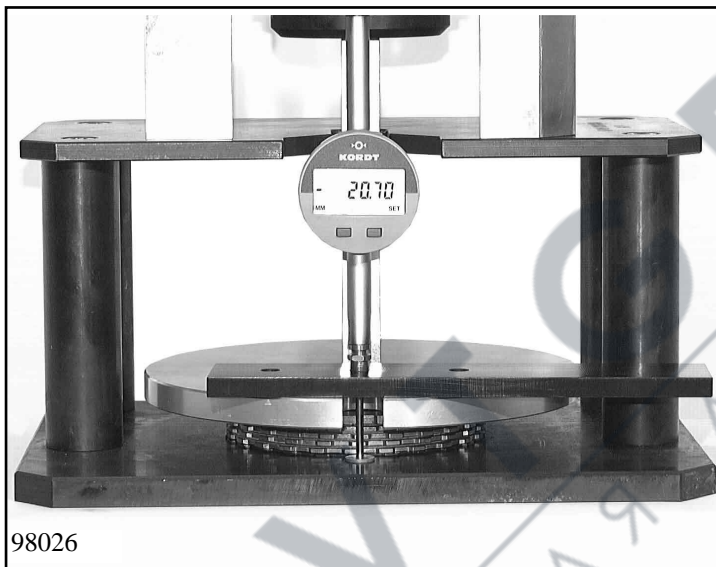
98027

1.4.1.6 Adjusting Clearance of brake C (snap ring)

Determine brake C installation space E_C with measuring bar 5p01 000 330.

To do this, place measuring bar 5p01 000 330 on the edge of the cylinder of clutch A. Place the base of the dial gauge on the highest point of the disc contact surface at the piston and set the dial gauge to "0". Pull the measuring sensor up, insert it into the snap ring groove and press it against the upper edge of the groove. Repeat the measurement twice after turning through 120° .

Take the average of $C_1, C_2, C_3 \Rightarrow W_C$



98026

Determine thickness M_C of the brake C disc set as described in **Chapter 1.4.0 "Measuring the clutch packs"**.

$\Rightarrow M_C$

Installation space E_C is obtained from measured value W_C plus base thickness F . $\Rightarrow E_C$

Test value P_C is then installation space E_C minus M_C

Value P_C should be between 3.55 and 4.195 mm. **Test specification 1058 700 087**

(from STL 012 - 1058 700 142)

Use test gauge P_C to select snap ring S_C .

Calculation:

$$E_C = W_C + F$$

$$P_C = E_C - M_C$$

Clearance L_C should be 1.35 - 1.65 mm with 4 lined discs.

Example: (for 1.4.1.6)

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

$$C_1 = 23.53 \text{ mm}$$

$$C_2 = 23.55 \text{ mm}$$

$$C_3 = 23.57 \text{ mm}$$

$$W_C = (23.53 + 23.55 + 23.57)/3 \\ = 23.55 \text{ mm}$$

$$M_C = 20.7 \text{ mm}$$

$$E_C = 23.55 + 1.48 \\ = 25.03 \text{ mm}$$

$$P_C = 25.03 - 20.7 \\ = 4.33 \text{ mm}$$

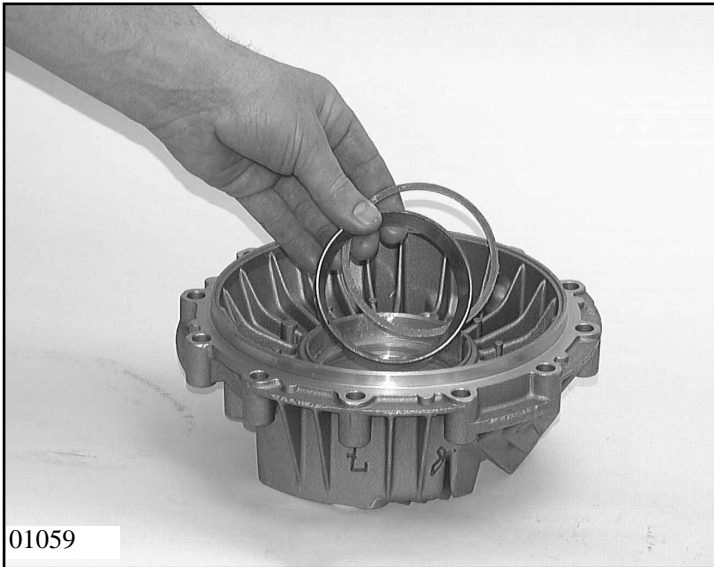
$$S_C = 2.8 \text{ mm}$$

$$L_C = 4.33 - 2.8$$

$$\Rightarrow L_C = 1.53 \text{ mm}$$



1.4.2 Preload, differential



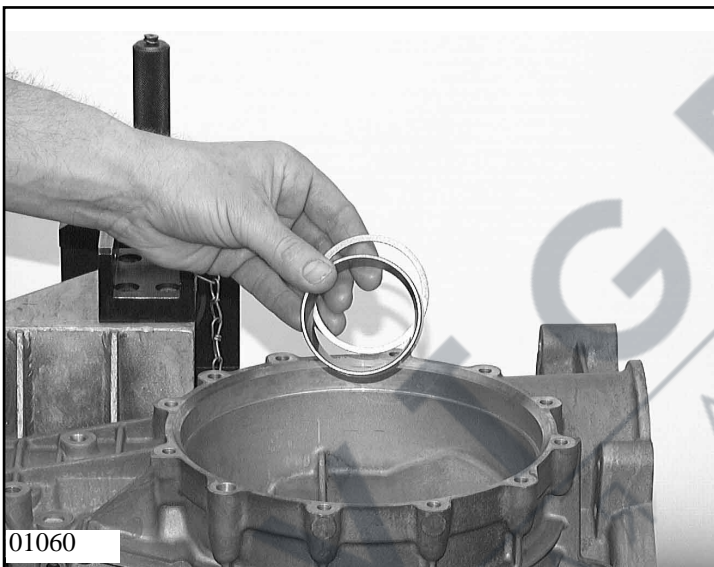
Determine total washer thickness M_G . To do this, measure shim thickness 35.080, and 35.120 $\Rightarrow M_U, M_O$

Insert the shim 35.120 previously removed into the differential cover with bearing race 35.150/110.

This can normally be done by hand, but if necessary heat the bearing seat lightly with a hot air blower.

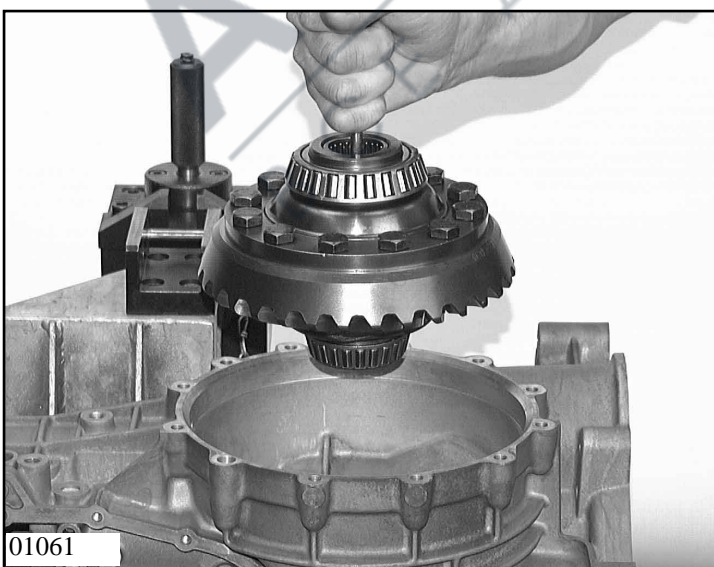
Calculation:

$$M_G = M_U + M_O$$



Insert the shim 35.080 previously removed into the transmission housing with the bearing race.

This can normally be done by hand, but if necessary heat the bearing seat lightly with a hot air blower.



Install the differential in the transmission housing and fit the differential cover.

Important !

There must be a gap (app. 0.1 - 0.3 mm) between the transmission housing and the differential cover. Check with a feeler gauge.

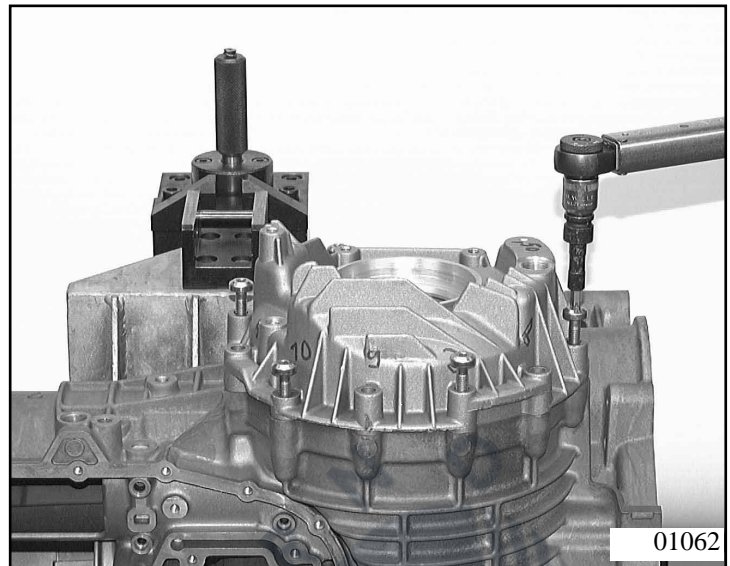
Note risk of distortion if the gap is too large, e.g. 0.7 mm. \Rightarrow preload too high. In this case, first reduce the thickness of the shim, e.g. in the differential cover, by 0.5 mm.

Measure with no shaft sealing ring and O-ring in the differential cover.

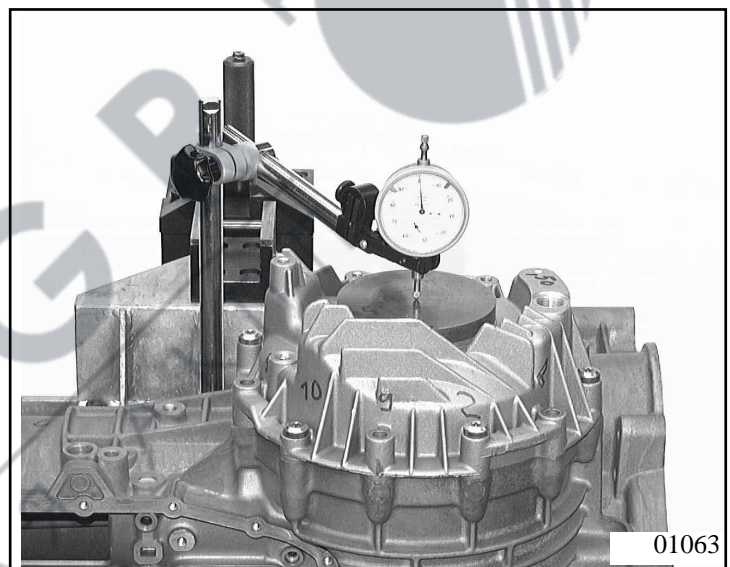
Tighten the differential cover with 6 screws 35.184 in a crosswise pattern.

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

(Tightening torques: see Chapter 1.5)



Screw post 5p01 020 347 of the measuring stand with M10 thread into the matching tapped hole in the transmission housing. Clamp cross-holder 5p01 010 347 so that the dial gauge sensor is central and at a right angle to the measuring plate. Set the dial gauge to "0".

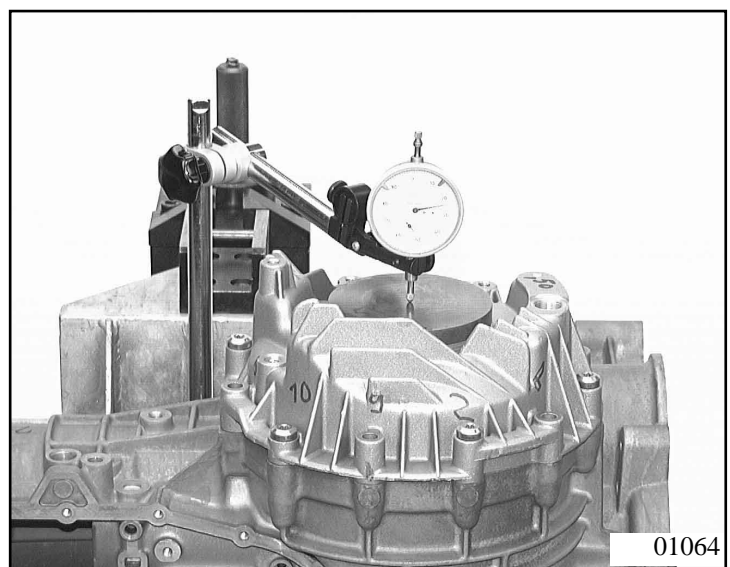


Slacken off the 6 screws by 1/2 turn each in a crosswise pattern until they are loose, but the dial gauge reading does not change.

⇒ Read off value M_D .

Important:

The measuring stand must not be touched or an incorrect reading will be obtained.



According to test specification 1058 700 137, measured value M_D must be between $M_{Dmin} = 0.18\text{mm}$ und $M_{Dmax} = 0.28\text{ mm}$ preload.

If the correct value is not obtained, determine the desired 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 (change limit)

D_M (chosen average value from D_D)

Remove the measuring stand and plate.

Take off the cover.

Remove the differential, bearing races and shims.

Adjusting shims 35.080 and 35.120 are available in thickness steps of 0.05 mm. Alter the shims (total shim thickness from check M_{GV}) according to the average D_D value.

$D_M > 0 \Rightarrow$ reduce shim thickness

$D_M < 0 \Rightarrow$ increase shim thickness

$D_M = 0 \Rightarrow$ leave shim thickness unchanged

Example: (for 1.4.2)

$$M_D = 0.45 \text{ mm (preload)}$$

$$M_U = 1.75 \text{ mm}$$

$$M_O = 1.25 \text{ mm}$$

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

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

$$= 0.17 \text{ to } 0.27 \text{ mm}$$

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

$$= 0.22 \text{ mm}$$

M_{GV} reduced by 0.2 mm

$$\Rightarrow M_{GA} = 2.8 \text{ mm}$$

[total measured shim thickness]

Repeat the measuring procedure with

$M_{GA} = 2.8 \text{ mm}$.

$$\Rightarrow M_D = 0.02 \text{ mm (preload)}$$

\Rightarrow correct according to test specification



1.4.3 Bevel gear drive

1.4.3.1 Pinion position



Turn the transmission through 90° (converter bell facing down).

Insert fixture 5p01 002 706 into differential housing with measuring radius facing bore in pinion shaft. Set measuring element 5p01 002 706 in calibrating device 5p89 004 524 to zero. Reference dimension = 93.6 mm (calibrating device)

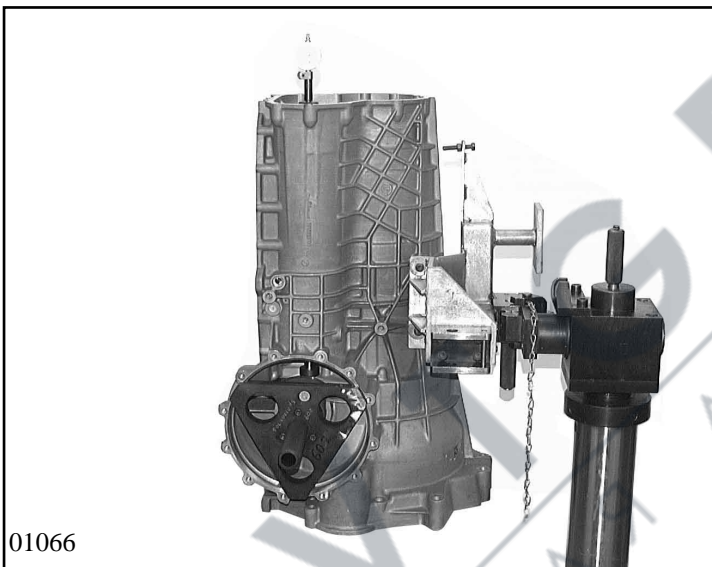
Adjust according to instruction

1058 700 137

[washer thickness steps = 0,03 mm]

1058 700 145

[washer thickness steps = 0,05 mm]



Place measuring element in transmission housing on the bearing contact surface.

Read off dimension M_R (measuring pin at measuring radius). Turn the transmission back through 90°.

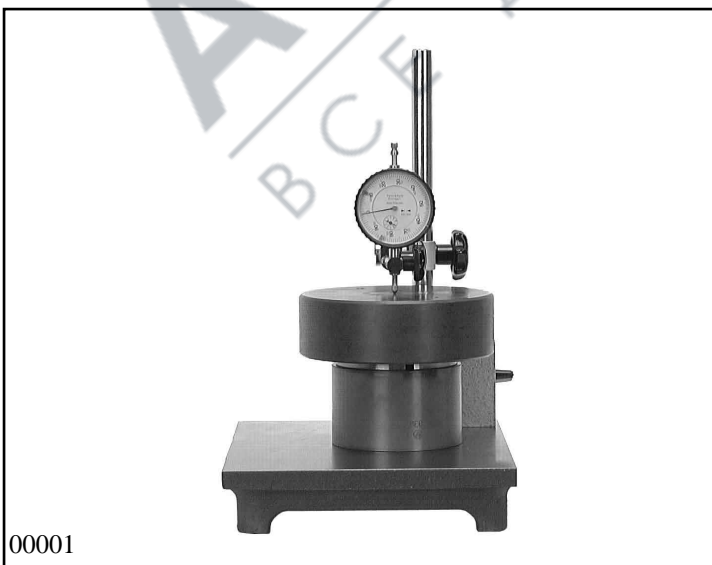
Overall dimension G is obtained from the calibrating device measurement M_{ER} plus the measuring radius M_{MR} and the measured dimension M_R .

Calculation:

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

Note: !

M_R can also be negative; note direction of dial gauge pointer movement.



1.4.3.2 Installed bearing height pinion shaft bearing

Place the differential-side inner bearing race on the measuring plate.

Insert the outer bearing race in measuring sleeve 5p01 030 355 and place it on the bearing race.

Attach weight 5p01 010 355 and place centrally under the dial gauge sensor.

Set the dial gauge to "0".

Raise the measuring sensor and pull the measured component set forwards.

Take off the weight and remove the outer bearing race from the measuring sleeve.

Place the differential-side inner bearing race on the measuring plate.

Place the outer bearing race on the inner race and apply weight 5p01 010 355.

Place the set of components to be measured centrally under the dial gauge sensor.

Rotate the bearing several times. Read off dimension $\varnothing M_L$

Installed bearing height L is sleeve height H_H minus M_L

Calculation:

$$L = H_H - M_L$$



Read off pinion dimension R.

The shim for adjusting pinion position S is obtained from

Calculation:

$$S = G - L - R$$

Example:

$$M_{ER} = 93.6 \text{ mm}$$

$$M_{MR} = 60 \text{ mm}$$

$$M_R = -0.03 \text{ mm}$$

$$R = 96 \text{ mm}$$

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

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

$$G = 93.6 + 60 - 0.03$$

$$= 153.57 \text{ mm}$$

$$L = 57 - 0.76$$

$$= 56.24 \text{ mm}$$

$$S = 153.57 - 56.24 - 96$$

$$= 1.33 \text{ mm}$$

Select the correct washer.
The washer may be max. 0.02 mm larger than the nominal dimension, but not smaller.

$$\varnothing S = 1,33 \text{ mm}$$

1.4.3.3 Determining backlash / crown wheel position

Note:

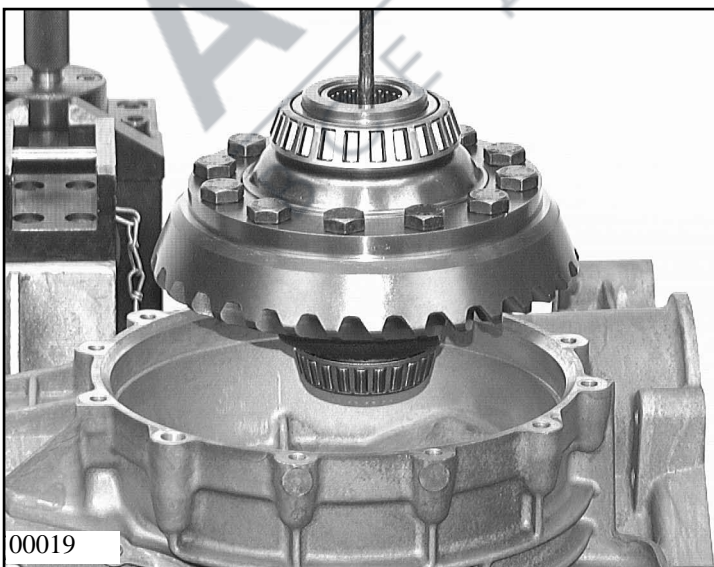
Experience has shown that the washer in the differential cover is 0.2 - 0.5 mm thinner than the washer in the differential housing.

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

Calculation:

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

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



Install the washer and the outer bearing race in the transmission housing.
Install the differential in the transmission housing.
Add the washer and outer bearing race to the cover.

Screw the cover to the transmission housing, using 6 screws in a crosswise pattern, making sure that backlash is not lost..

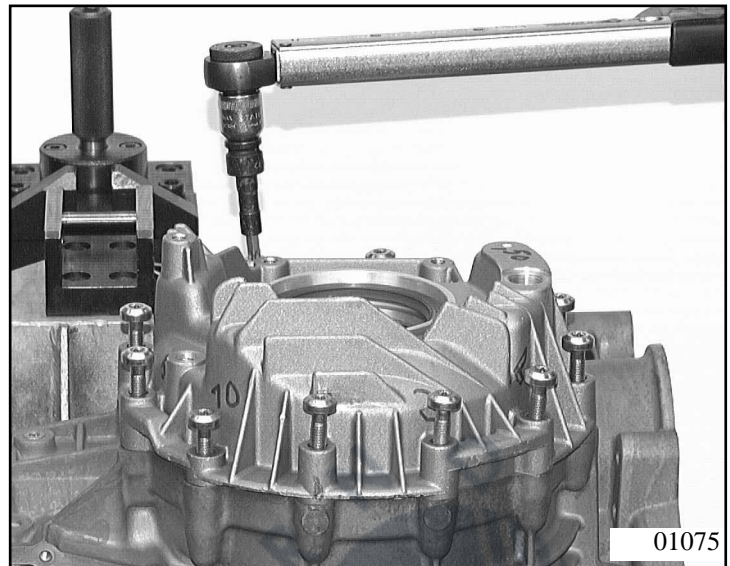
Backlash can be checked by turning the pinion shaft.

Rotate the pinion shaft by approx. 15 turns.

(Tightening torques: see Chapter 1.5)

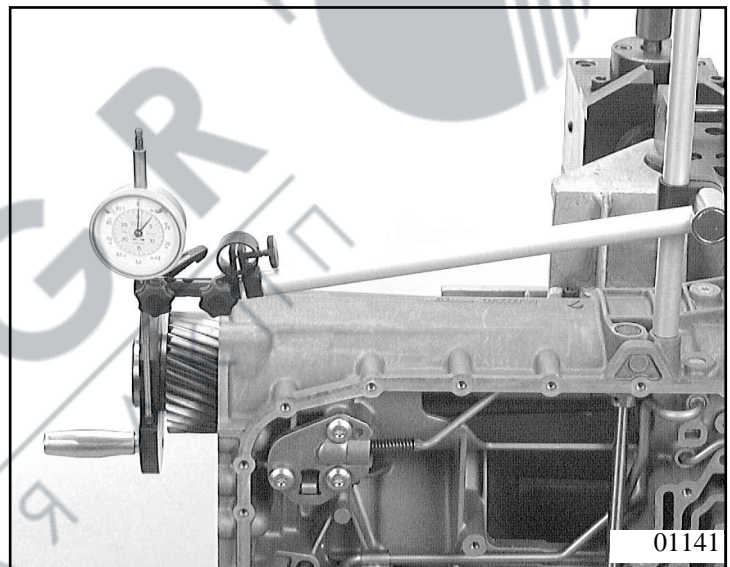
Important:

Measure without the O-ring seal on the differential cover



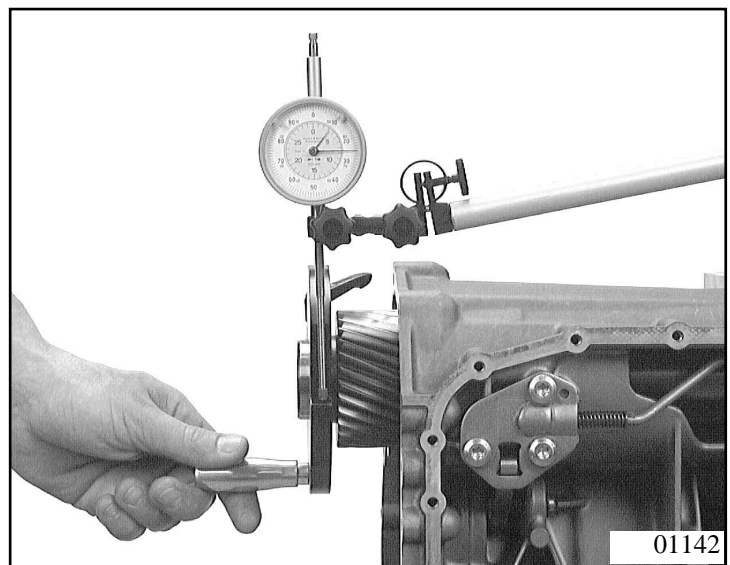
Clamp backlash measuring disc 5x46 002 325 to the pinion shaft.

Screw the column of measuring stand 5p01 020 347 into the transmission housing and clamp cross-holder 5p01 010 347 so that the measuring sensor is at a right angle on the marked measuring area of the measuring disc.



Turn the pinion shaft in one direction until the pinion/crown wheel teeth make contact. Set the dial gauge to "0". Turn the pinion carefully as far as possible in the opposite direction. Repeat the procedure twice after turning the pinion shaft through 360° and take the average value of the readings M_1 , M_2 and $M_3 \Rightarrow M_F$

Backlash M_F must be according to specification 1058 700 137 resp. 1058 700 145 between 0.14 and 0.27 mm.



$M_F >$ permitted value: M_F too thick
 $M_F <$ permitted value: M_F too thin

Warning!

If the nominal backlash value is not obtained, recalculate shim thickness, but do not alter the overall shim thickness.

Repeat the measurement.

Afterwards, remove the measuring stand and disc.

Unscrew and remove the differential cover.

Example:

$M_{GA} = 2.45$ mm
 $D_G = 0.25$ mm
(selected washer thickness difference)

1st measurement:

$M_U = (2.45 + 0.25) / 2$
 $= 1.35$ mm
 $M_O = 2.45 - 1.35$
 $= 1.1$ mm

Measured backlash:

$M_F = 0.4$ mm
⇨ **incorrect!**

$M_F >$ permitted value ⇨ reduce M_U :

2nd measurement:

$M_U = 1.20$ mm
 $M_O = 2.45 - 1.20$
 $= 1.25$ mm

Measured backlash:

$M_F = 0.25$ mm
⇨ **correct!**

(only if no centring disc is installed)

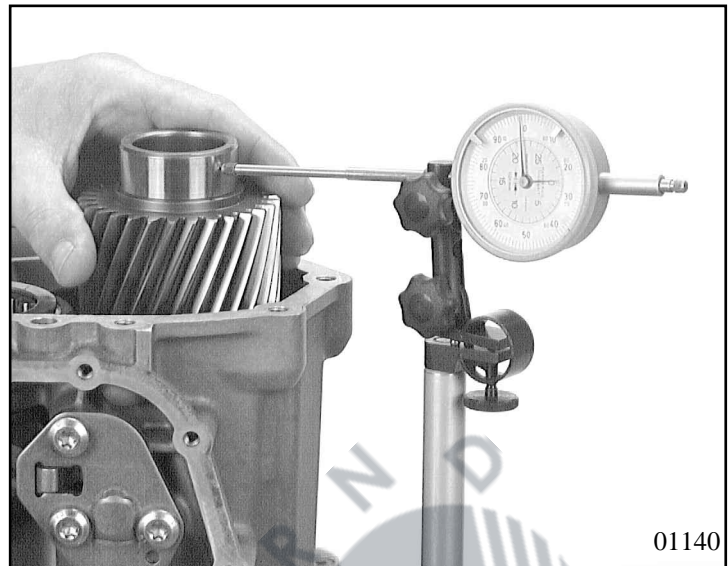
1.4.3.4 Side shaft runout adjustment

Attach the dial gauge holder at the bore in the transmission housing. Place the measuring sensor of the dial gauge on the shaft extension at the side shaft and turn several times. Read off value $\Rightarrow M_R$

Maximum value of runout deviation
 $M_{Rmax} = 0.18 \text{ mm}$

If value is exceeded ($M_R > M_{Rmax}$), undo the expansion bolt, re-insert the side shaft at 90° offset and tighten.

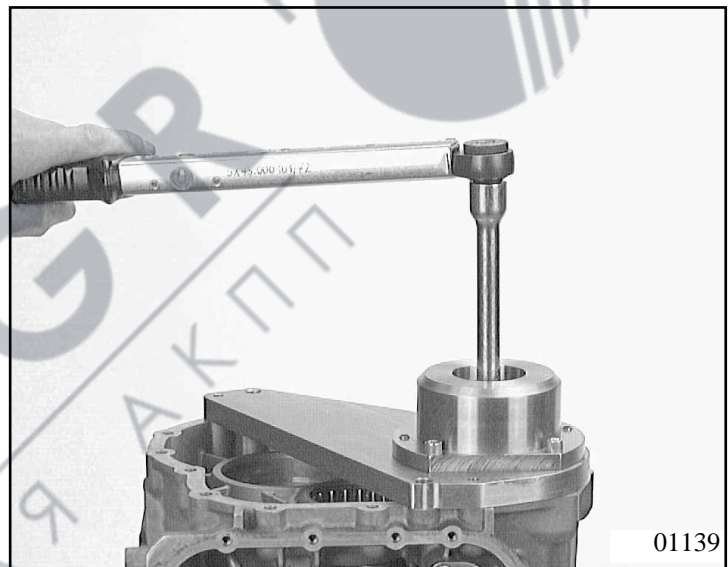
Re-check runout

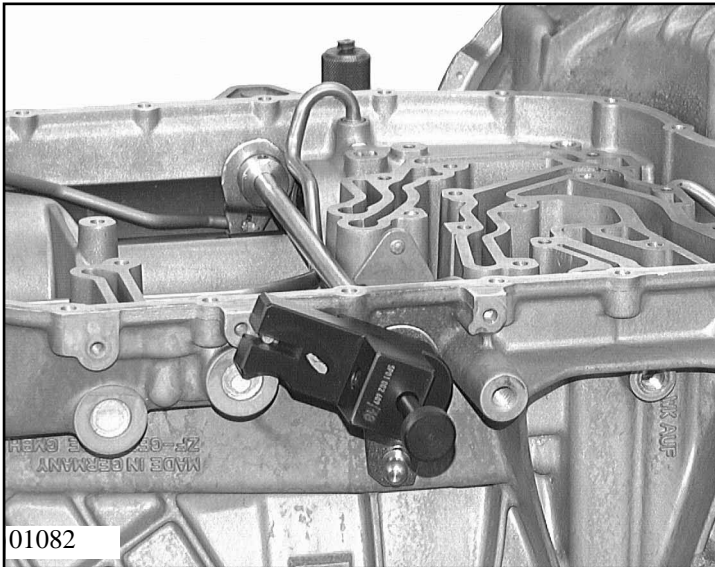


(only if centring disc is installed)

Place centring unit 5x66 000 032 on the transmission housing with the side shaft projecting through the hole, and screw tight.

Turn the side shaft completely several times, then tighten expansion bolt 37.020.

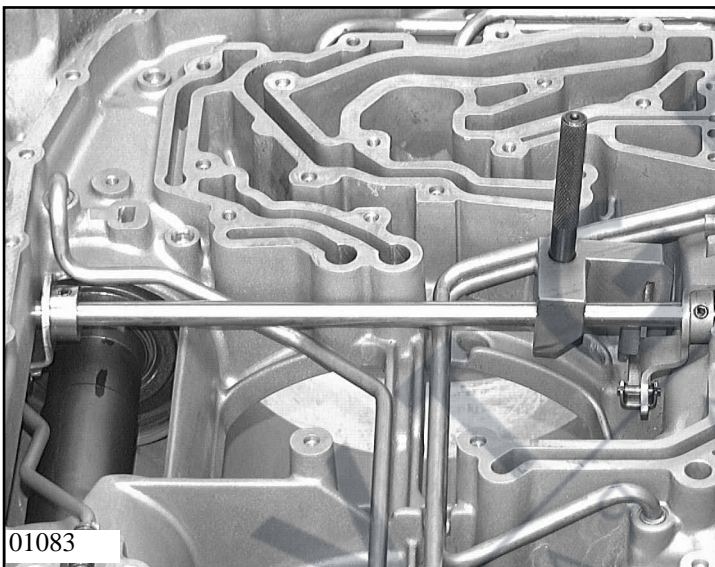




1.4.4 Detent spring switch

Using a suitable tool or by hand, set the detent disc to position N (Neutral).

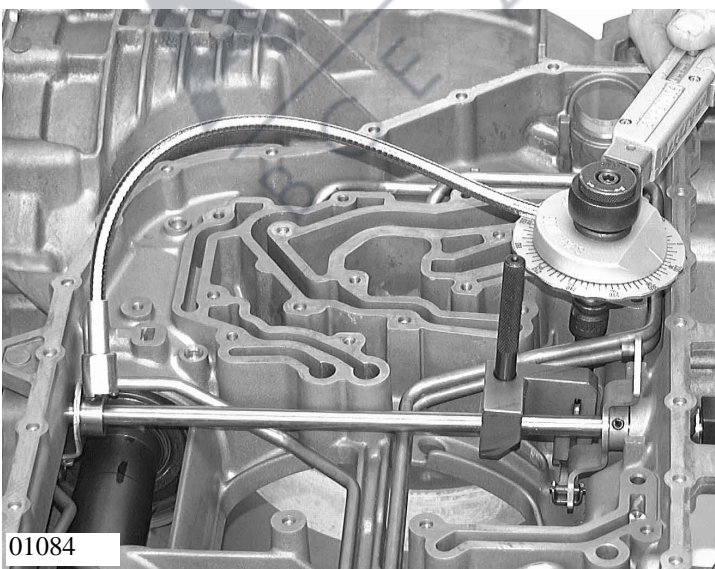
Mount position gauge 5p01 002 609 on the selector shaft and turn the gauge until the locating pin in the transmission housing engages in the gauge, then turn the knurled screw to eliminate play.



Align the detent spring with centring device 5x46 001 250 and in this position screw the spring down.

Tighten the screw at the output end first.

(Tightening torques: see Chapter 1.5)



With auxiliary tool 5w04 000 583 turn forward until distortion angle is reached. Unscrew the position gauge, move the selector shaft to all positions in turn and then move it back to position "N".

Note !

If assembly was correct, it should be easy to push the position gauge on to the selector shaft until it makes contact with the transmission housing.

1.4.5 Endplay, output (washer)

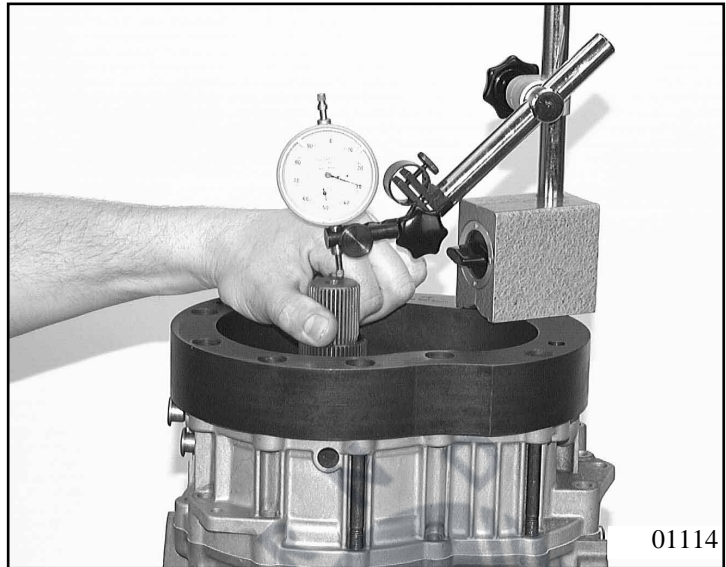
Output endplay according to the parts list is 0.25 to 0.45 mm.

Place baseplate 5p95 002 092 on the intermediate housing and screw tight with 4 lock screws (internal hexagon M8 x 110).

Put the magnetic standing column on the baseplate.

Place the dial gauge sensor on the drive shaft and set dial gauge to "0".

Pull the drive shaft until it stops. Read off value M_{TA} at the dial gauge. ⇨ M_{TA}



Important:

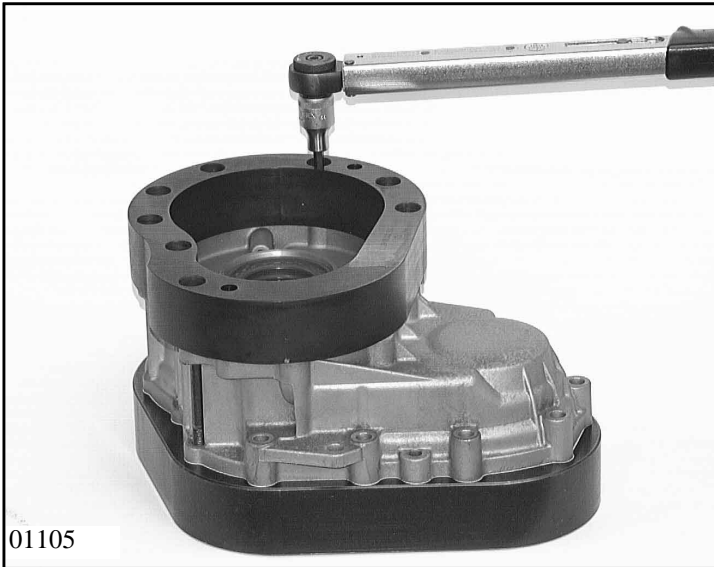
If the measured value is in the specified area, the disc is o.k. ⇨ $S_R = S_{Rist}$

If not, select a thinner one (for increased play) or a thicker one (for reduced play).

Remove measuring device, baseplate, intermediate housing, adjustment disc and the axial bearing.

1.4.6 Bearing adjustment, output gears

1.4.6.0 Preparation for bearing adjustment (shim washer)



Place intermediate housing with gasket on the measuring plate 5p01 002 889. Place baseplate 5p95 002 092 on the intermediate housing so that the cylinder pins fit into the corresponding holes in the baseplate.

(The bearing / outer ring is installed in the intermediate housing without the shaft sealing ring.)

Screw baseplate to measuring plate with 8 screws 36.290 (internal hexagon M8 x 110).



Turn the intermediate housing by 180°. Place the front axle shaft in the intermediate housing in the correct installation position.

In the measuring plate, place bearing shells on the front axle shaft.

Important:

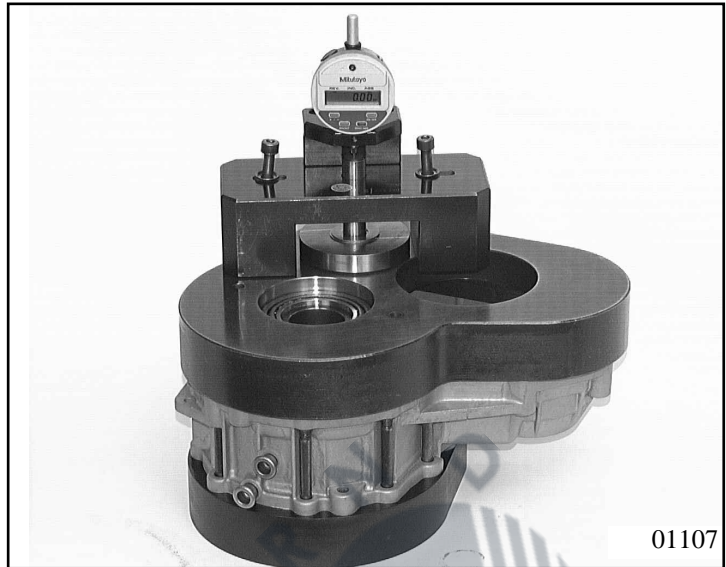
Tightening specifications Chapter 1.3.1

1.4.6.1 Front axle shaft bearing projection

Place thrust bell 5p01 002 889 on the measuring plate.

Place measuring bridge 5p01 002 889 without spring over the thrust bell.

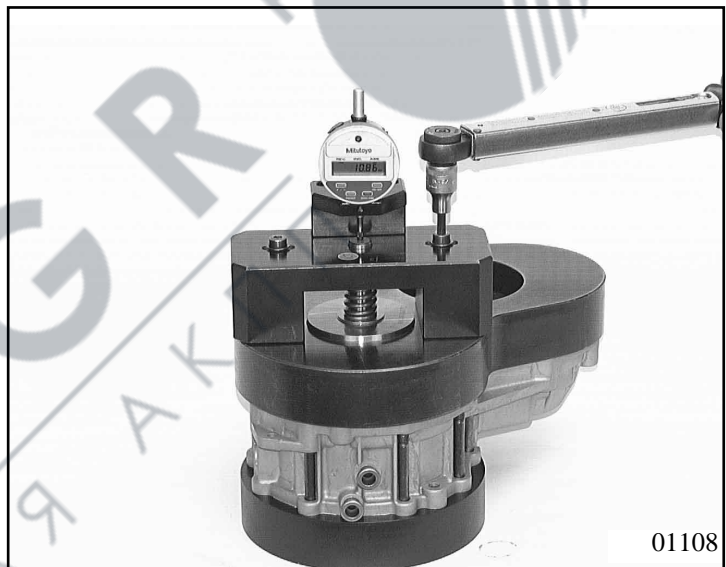
Set the dial on the thrust bell to "0".



Place thrust bell on the front axle shaft outer race.

Place spring over the thrust bell and tighten measuring bridge with two screws M8x80 with U-type discs in the tapped holes in the measuring plate.

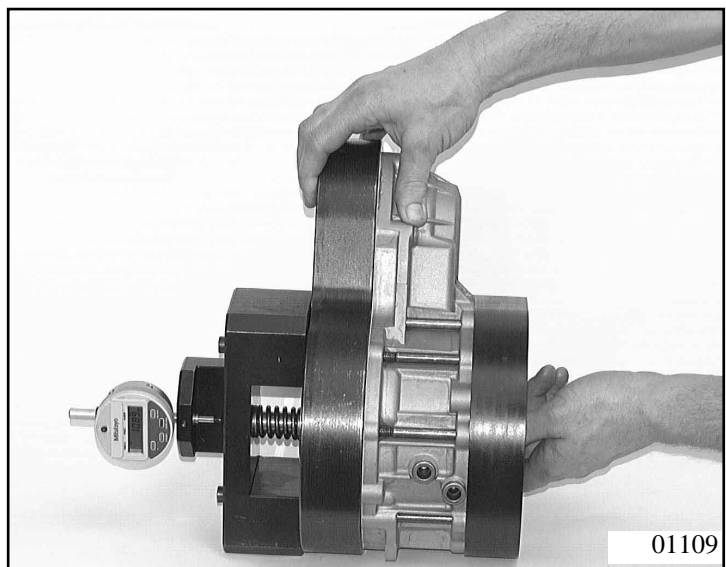
(Tightening torque 10 Nm)



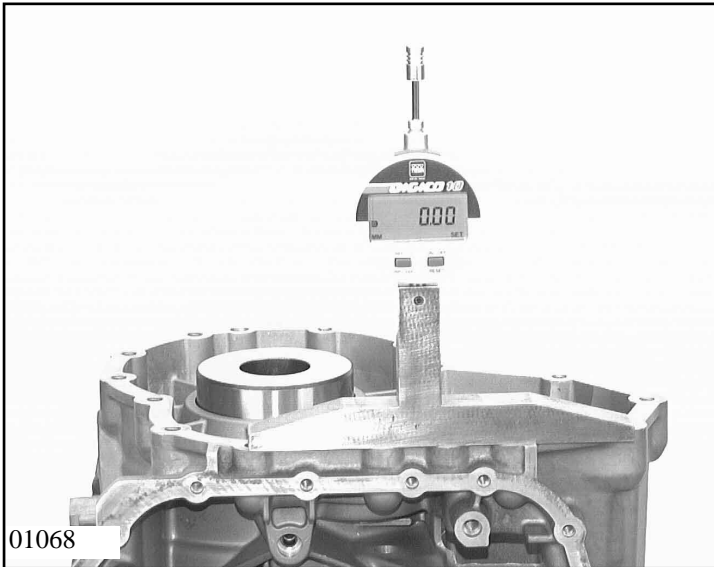
Turn package by 90°.

Turn the gearwheel.

Read off value M_{DV} .



1.4.6.2 Front axle shaft installation space

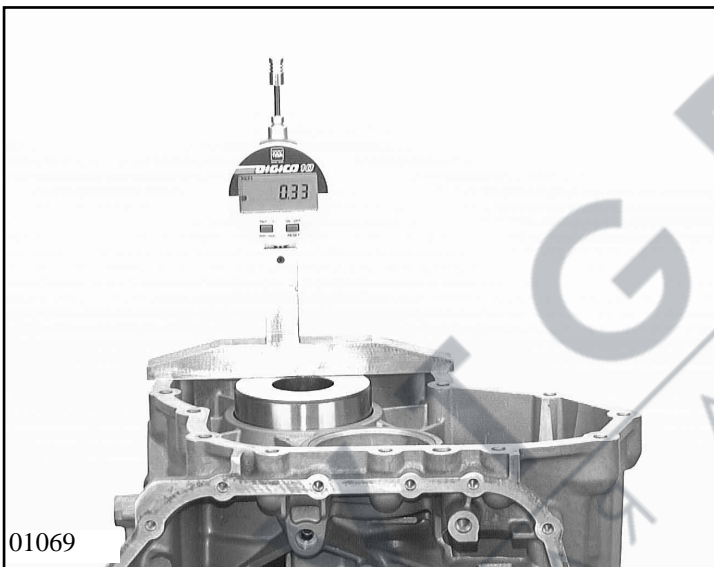


Insert measuring ring 5p01 002 889 in front axle shaft bearing hole.
Set the dial to "0" with measuring bar 5p01 150 331 against the transmission housing sealing face.

Note:

The measuring ring must be correctly seated in the bore.

*Cleanliness is essential!
Sealing face must be plane !*



Place the measuring bar on the transmission housing sealing face and the measuring dial on the measuring ring.
Read off value $M_{RV} \Rightarrow M_{RV}$.

Abbreviations:

K_{RV} = Measuring ring thickness
5p01 002 889

K_P = Measuring plate thickness
5p01 002 889

(Front axle shaft)

N_V = Zero line

B_V = Installation space

H_V = Projection

M_{RV} = Installation space measured value

M_{DV} = Projection measured value

S_V = Washer thickness

S_{PV} = Play

1.4.6.3 Determining shim thickness - front axle shaft

The washer thicknesses can be determined from the measured values.

Calculation:

$$B_V = K_{RV} - M_{RV}$$

$$H_V = K_P + M_{DV}$$

$$N_V = B_V - H_V$$

$$S_V = N_V - S_{PV}$$

Please note (important!):

The correction measurements of the measuring rings and measuring plates are engraved in the parts. Use the correction measurements of your measuring rings and plates.

Adjusting values (acc. to parts list)

Front axle shaft: (play) S_{PV}

Setting: 0 to 0.05 mm

Test value: -0.03 to 0.08 mm

Important:

Note the meaning of the +/- sign:

+ means play (clearance);

- means preload

Example: (for 1.4.6)

$$K_{RV} = 35.000 \text{ mm}$$

$$K_P = 45.025 \text{ mm}$$

$$M_{RV} = -0.33 \text{ mm}$$

$$M_{DV} = -10.89 \text{ mm}$$

$$S_{PV} = 0 \text{ bis } 0.5 \text{ mm}$$

$$B_V = 35.000 - (-0.33)$$

$$= 35.033 \text{ mm}$$

$$H_V = 45.025 + (-10.89)$$

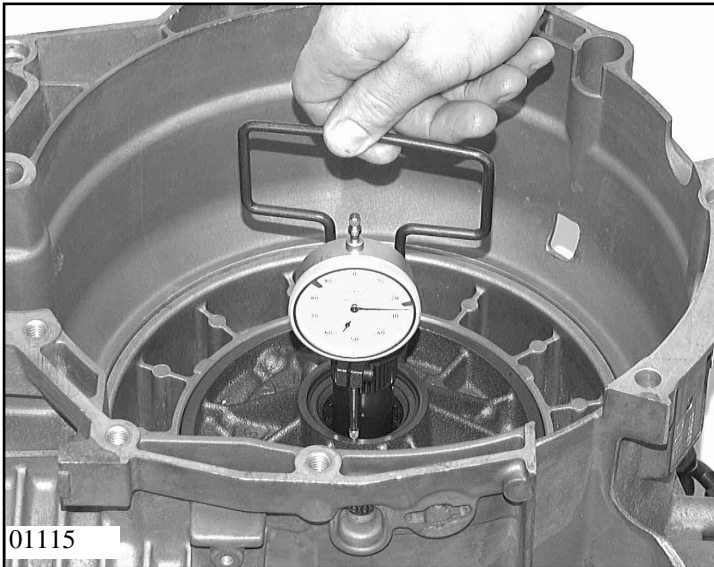
$$= 34.135 \text{ mm}$$

$$N_V = 35.033 - 34.135$$

$$= 1.195 \text{ mm}$$

$$S_V = 1.20 \text{ mm selected}$$

$$\Rightarrow S_{PV} = 0.005 \text{ mm (play)}$$



1.4.7 Play at input (washer)

Attach the oil supply with at least two machine screws in opposed positions.

(Tightening torques: see Chapter 1.5)

Clamp measuring fixture 5p01 001 415 on the input shaft about 2 mm above the stator shaft, so that no play is present. Set the dial to "0".

Initial requirement:

Needle thrust bearing 10.390 and the thinnest shim 10.400 ($S_D = 1$ mm) must be in position.

Determine endplay by pressing and pulling the handle (repeat the measurement).

Nominal endplay $D = 0.1 - 0.3$ mm acc. to **test specification 1058 700 124**.

Take measurements M_1 , M_2 and determine average value $\square M$

Calculation:

$$M = (M_1 + M_2) / 2$$

$$S = M + S_D - D$$

If there is a difference, install a correspondingly thicker shim washer 10.400.

To do this, *take off the oil supply and the input* and install the shim of determined thickness in place of the original shim.

Then re-install the components according to *3. Assembly of input with oil supply*. Check endplay again.

Example (for 1.4.7):

$$M_1 = 0.26 \text{ mm}$$

$$M_2 = 0.24 \text{ mm}$$

$$S_D = 1.8 \text{ mm}$$

$$D = 0.1 \text{ bis } 0.3 \text{ mm}$$

$$M = (0.26 + 0.24) / 2 = 0.25 \text{ mm}$$

$$S = 0.25 + 1.8 - (0.1 \text{ bis } 0.3)$$

$$= 2.05 - (0.1 \text{ bis } 0.3)$$

$$= 1.75 \text{ bis } 1.95 \text{ mm}$$

Selected:

$$\square S = 1.8 \text{ mm}$$

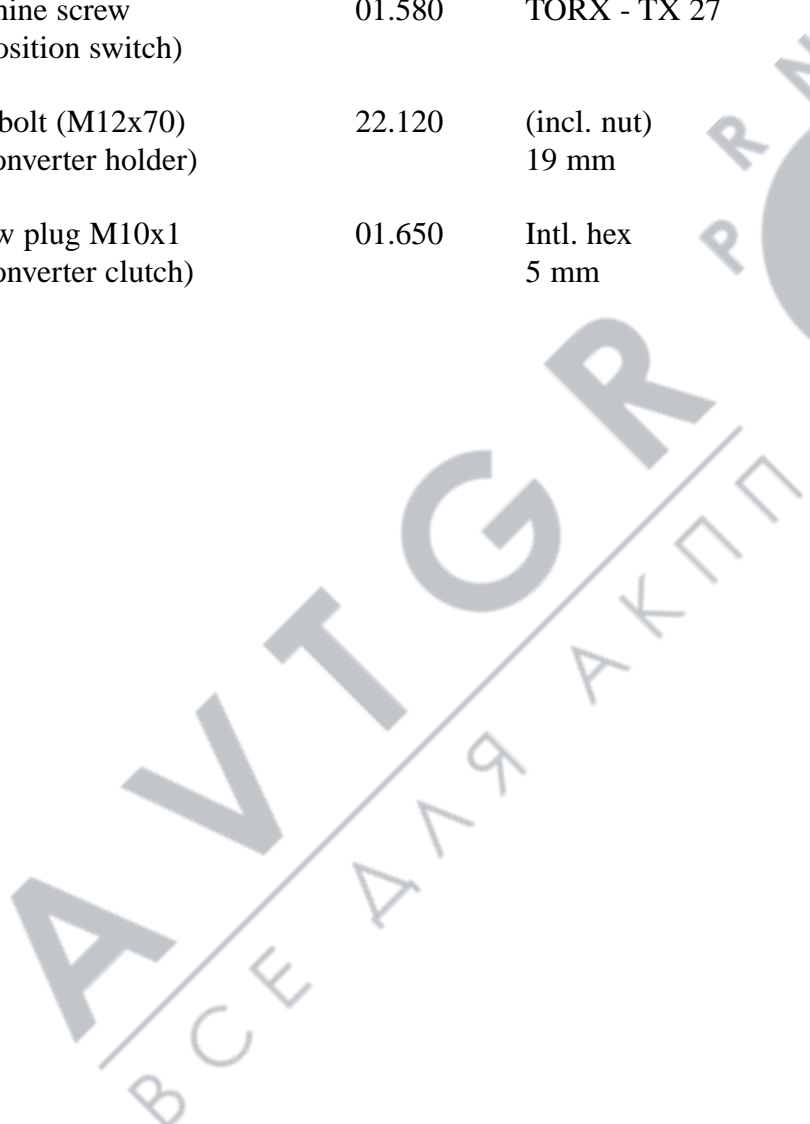


1.5 Tightening torques

No.	Designation	Part List- Item-No.	Wrench size No.	Page	Tightening torque [Nm]
1	Hex bolt (differential)	35.010/150	Hex, 17 mm	1.3/3 3.1/3	Yield limit!
2	Slotted nut (pinion shaft)	35.040	Wrench 5x46 002 174	3.1/5	120 Nm (± 12 Nm)
3	Countersunk screw (pinion shaft bearing)	01.440	TORX - TX 27	3.1/5	10 Nm (± 1 Nm)
4	Machine screw (magnet metal sheet)	35.150/150	TORX - TX 27	3.1/8	8 Nm (± 0.8 Nm)
5	Machine screw (differential)	35.184	TORX - TX 40	1.3/1 1.4/16 1.4/22 3.1/7	23 Nm (± 2.3 Nm)
6	Machine screw (detent spring)	01.770	TORX - TX 27 H	1.4/25 3.2/3	4 (+0.5) Nm + 15° (+5°)
7	Machine screw (guide plate)	24.160	TORX - TX 40	3.2/4	23 Nm (± 2.3 Nm)
8	Countersunk screw Machine screw (Pretightening cylinder F)	77.210 77.220	TORX - TX 40 TORX - TX 45 H	1.3/2 3.3/6	5 Nm (± 0,5 Nm)
	Countersunk screw	77.210	TORX - TX 40	1.3/2 3.3/6	23 Nm (± 2,3 Nm)
	Machine screw (Tightening cylinder F)	77.220	TORX - TX 45 H	1.3/2 3.3/6	13,2 (± 1,3)Nm 65° (± 5°)
9	Countersunk screw (stator shaft)	10.020/130	TORX - TX 27	3.6/3	10 Nm (± 1 Nm)
10	Machine screw (oil line)	10.020/200	TORX - TX 27	3.6/3	10 Nm (± 1 Nm)
11	Machine screw (oil supply)	10.070	TORX - TX 27	3.6/3	10 Nm (± 1 Nm)
12	Machine screw (oil supply)	10.074	TORX - TX 27	3.6/3	5 Nm (± 0.5 Nm)
13	Machine screw (oil supply)	10.350 10.360	TORX - TX 27	1.3/1 3.6/5	10 Nm (± 1 Nm)

No.	Designation	Part List- Item-No.	Wrench size No.	Page	Tightening torque [Nm]
14	Hex bolt (Torsen II)		Hex, 17 mm	3.7/4	62 Nm (± 7 Nm)
15	Machine screw (baffle plate)	36.120	TORX - TX 27	3.7/7	10 Nm (± 1 Nm)
16	Machine screw (cover)	36.250	TORX - TX 40	3.7/8	23 Nm (± 2.3 Nm)
17	Machine screw (intermediate housing)	36.290 36.300	TORX - TX 40	1.3/2 3.7/11	23 Nm (± 2.3 Nm)
18	machine screw (front axle housing)	37.270	TORX - TX 40	1.3/2 3.7/11	23 Nm (± 2.3 Nm)
19	Expansion bolt (output flange)	36.270	TORX - TX 40	3.7/12	25 Nm (± 2.5 Nm)
20	Drain plug M12x1.5 (transfer box housing)	36.340	Intl. hex 6 mm	3.7/12	20 Nm (± 2 Nm)
21	Filler plug M18x1.5 (transfer box housing)	36.350	Intl. hex 8 mm	3.7/12	35 Nm (± 3.5 Nm)
22	Inductive sensor	36.320	23 mm	3.7/11	30 Nm (± 3 Nm)
23	machine screw (flange shaft)	35.250	TORX - TX 40	3.8/3	23 Nm (± 2.3 Nm)
24	Expansion bolt (flange)	35.200	TORX - TX 40	3.8/3	25 Nm (± 2.5 Nm)
25	Machine screw (control unit)	27.400 27.404 27.410	TORX - TX 27	1.3/1 3.9/3	8 Nm (± 0.8 Nm)
26	machine screw (oil filter)	27.470	TORX - TX 27	3.9/4	5 Nm (± 0.5 Nm)
27	Machine screw (oil pan)	03.050	TORX - TX 27	1.3/2 3.9/4	10 Nm (± 1 Nm)
28	Drain plug M16x1.5 (oil pan)	03.010/120	Intl. hex 8 mm	3.9/4	12 Nm (± 1.2 Nm)

No.	Designation	Part List- Item-No.	Wrench size No.	Page	Tightening torque [Nm]
29	Filler plug M30x1.5 (oil pan)	03.010/130	Intl. hex 17 mm	3.9/4	80 Nm (± 8 Nm)
30	Filler plug M18x1.5 (differential)	35.300	Intl. hex 8 mm	3.9/4	35 Nm (± 3.5 Nm)
31	Machine screw (Position switch)	01.580	TORX - TX 27	3.9/5	8 Nm (± 0.8 Nm)
32	Hex bolt (M12x70) (converter holder)	22.120	(incl. nut) 19 mm	3.9/6	15 Nm (± 1.5 Nm)
33	Screw plug M10x1 (converter clutch)	01.650	Intl. hex 5 mm	3.9/6	12 Nm (± 1.2 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

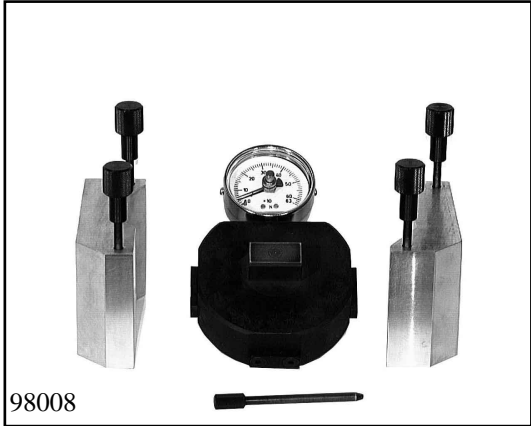
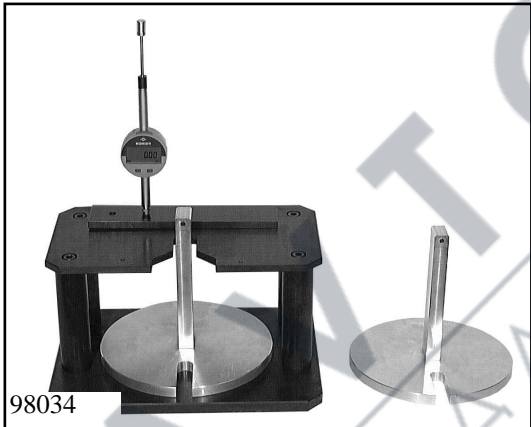
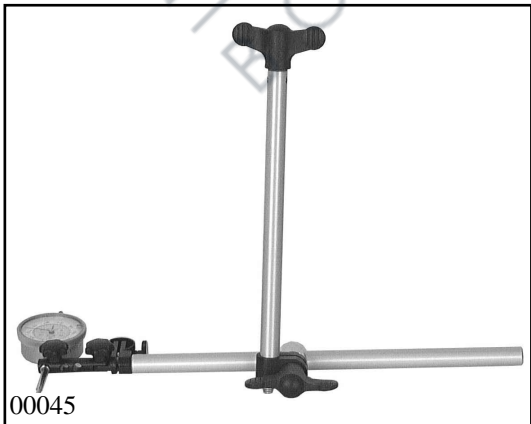
Correct idle speed; follow specifications from vehicle manufacturer.

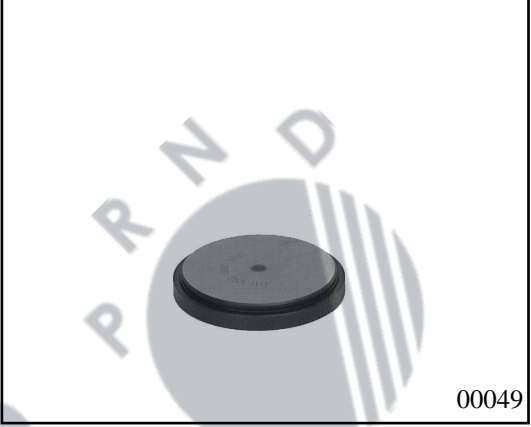
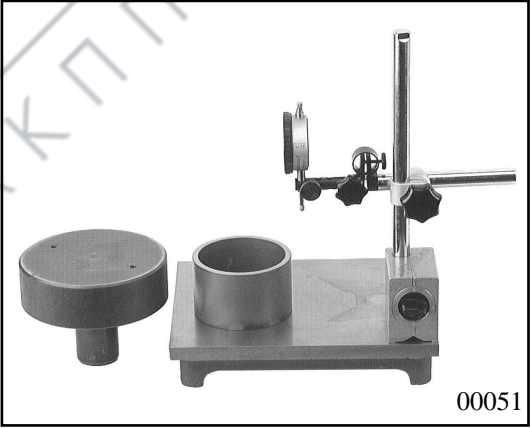

Power flow, forward and reverse

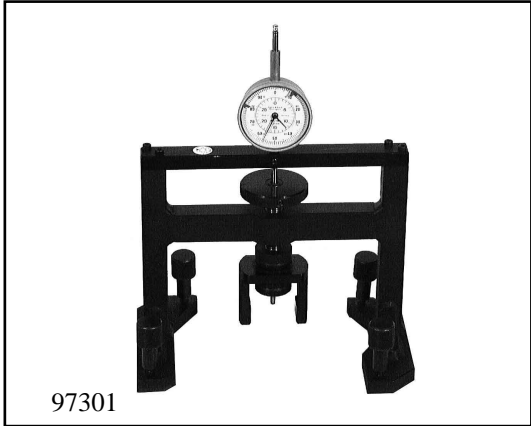


Correct adjustment of selector linkage or control cable; observe the vehicle manufacturer's specifications.

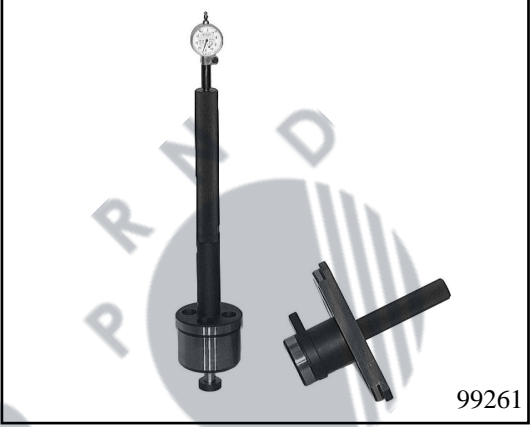
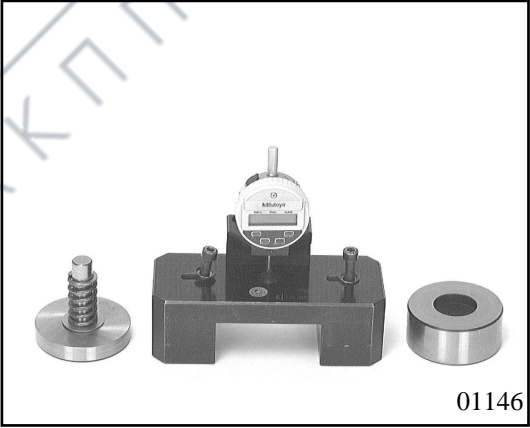






1.7 Special tools

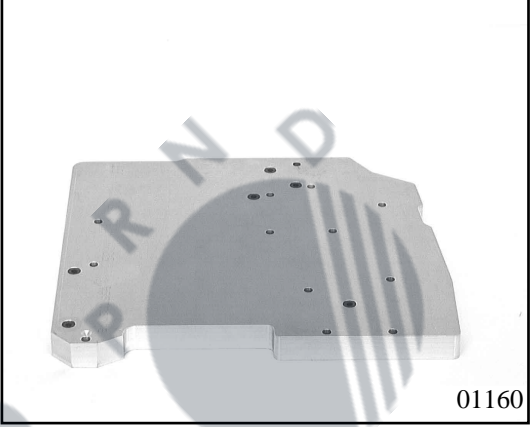

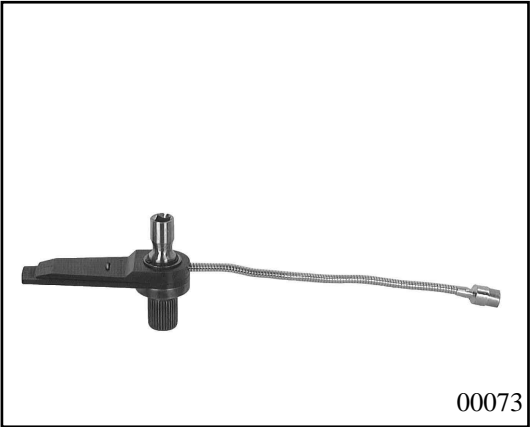
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">1</p>  <p>98008</p>	<p>5p01 000 329 -Force measuring unit</p>	<p>Identical</p> <p>4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24</p>
<p style="text-align: center;">2</p>  <p>98034</p>	<p>5p01 000 330 -Measuring fixture, clutch play</p> <p>(Measuring plate: - short neck >20 mm - long neck <20 mm clutch pack thickness)</p>	<p>Identical</p> <p>4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24</p>
<p style="text-align: center;">3</p>  <p>00045</p>	<p>5p01 000 331 -Height-measuring fixture, differential and side shaft</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>



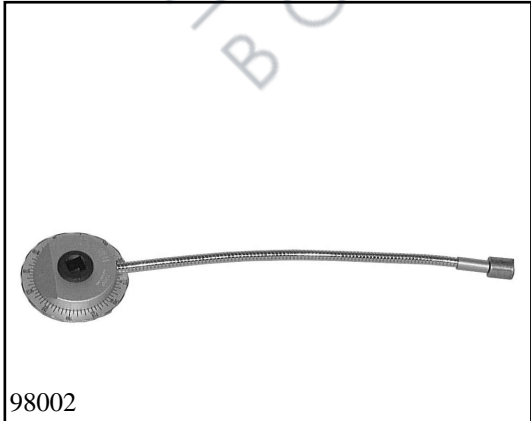
Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A	5p01 000 353 Preload measuring plate	<p style="text-align: center;">4</p>  <p style="text-align: right;">00049</p>
Identical 5 HP 19 FL/A	5p01 000 355 Measuring fixture for installed bearing height, pinion shaft	<p style="text-align: center;">5</p>  <p style="text-align: right;">00051</p>
Identical 4 HP 22 5 HP 18 5 HP 24 5 HP 30	5p01 001 415 Measurement device for axial play	<p style="text-align: center;">6</p>  <p style="text-align: right;">82183</p>

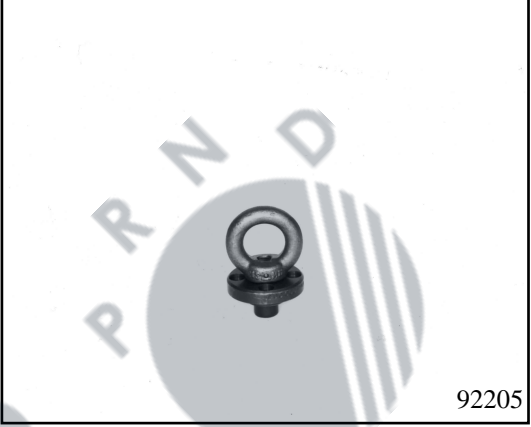
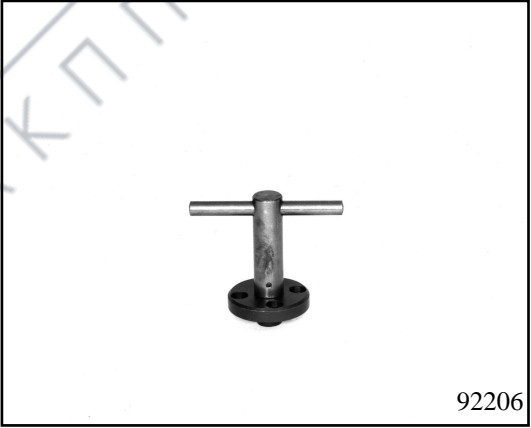

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">7</p>  <p>97301</p>	<p>5p01 001 458 -Adjusting device, preload</p>	<p>Identical</p> <p>4 HP 18 Q 4 HP 20 5 HP 19 5 HP 19 FL/A 5 HP 24</p>
<p style="text-align: center;">8</p>  <p>01143</p>	<p>5x46 002 325 Measuring disc backlash pinion shaft</p>	
<p style="text-align: center;">9</p>  <p>99263</p>	<p>5p01 002 609 Position gauge</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>

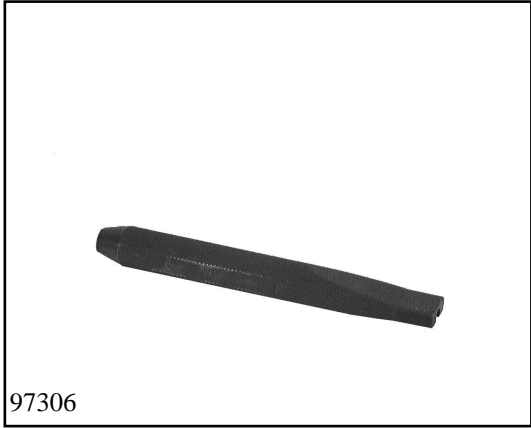
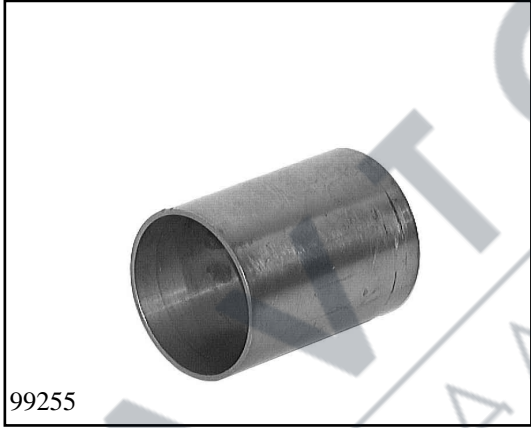
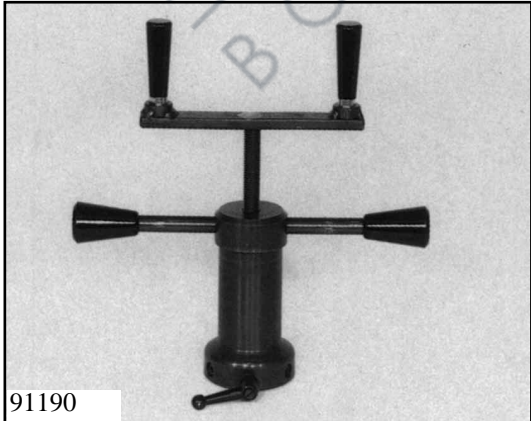
Remarks	Order-No. / Application	OBJECT
<p data-bbox="92 427 288 533">Identical 5 HP 19 FL/A</p>	<p data-bbox="379 427 831 533">5p01 002 706 Measuring device for washer, pinion drive and shaft</p>	<p data-bbox="1134 409 1171 439">10</p>  <p data-bbox="1345 864 1417 893">99261</p>
	<p data-bbox="379 987 788 1093">5p01 002 889 Measuring plate for gearwheel measurement</p>	<p data-bbox="1134 972 1171 1001">11</p>  <p data-bbox="1345 1424 1417 1453">01146</p>
	<p data-bbox="379 1547 783 1653">5p01 003 033 Measuring fixture, pump drag torque</p>	<p data-bbox="1134 1532 1171 1561">12</p>  <p data-bbox="1345 1984 1417 2013">99250</p>

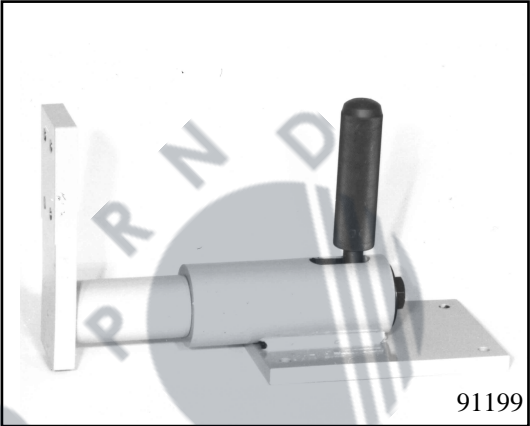


OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">13</p>  <p style="text-align: center;">14</p>  <p style="text-align: center;">15</p> 	<p>5p01 150 331 Measuring bar (part 15 from device 5p01 000 331)</p>	<p>Identical</p> <p>4 HP 20 5 HP 19 FL/A</p>
<p>5p66 000 058 Torsiometer, size 12, Stahlwille 52205212</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>	
<p>5p66 000 059 Torsiometer, size 50 Stahlwille 52205250</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>	


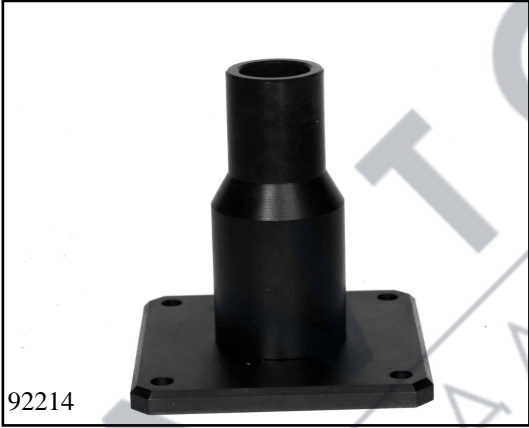

Remarks	Order-No. / Application	OBJECT
	5p81 000 459 - test plate for clutches A-F	<p style="text-align: center;">16</p>  <p style="text-align: right;">01160</p>
Identical 5 HP 19 FL/A	5p89 004 524 Calibration fixture for pinion shaft shim	<p style="text-align: center;">17</p>  <p style="text-align: right;">99262</p>
Identical 5 HP 19 FLA	5p95 000 603 Adapter with measuring disc for angle of rotation, Torsen II	<p style="text-align: center;">18</p>  <p style="text-align: right;">00073</p>

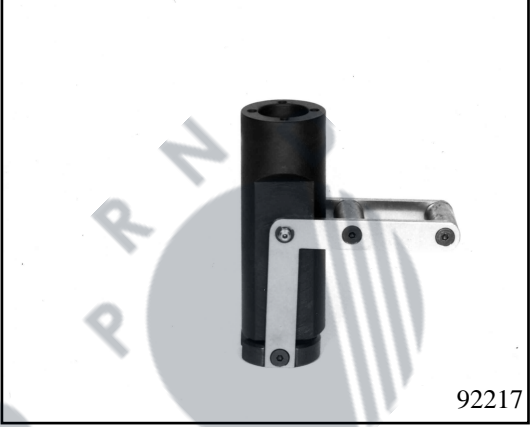
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">19</p>  <p>99279</p>	<p>5p95 002 092 Spacing ring support, intermediate housing</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">20</p>  <p>01145</p>	<p>5t66 000 108 Gearbox mounting bracket</p>	
<p style="text-align: center;">21</p>  <p>98002</p>	<p>5w04 000 583 Turning angle measuring disc</p>	<p>Identical 5 HP 19 5 HP 19 FL/A 5 HP 24</p>

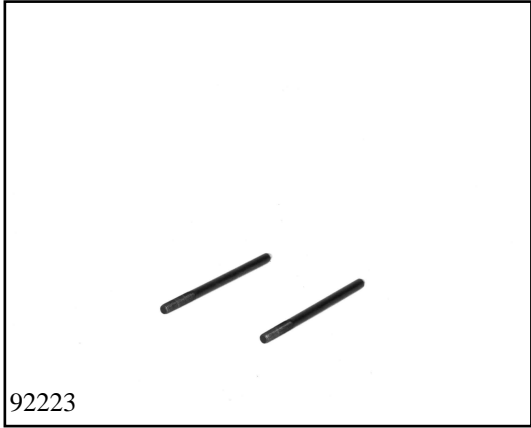


Remarks	Order-No. / Application	OBJECT
Identical 5 HP 24 5 HP 30	5w46 000 003 - Adapter piece for lifting device	<p style="text-align: center;">22</p>  <p style="text-align: right;">92205</p>
Identical 5 HP 24 5 HP 30 Alternative to 5w46 000 003	5w46 000 004 - Handle for lifting device	<p style="text-align: center;">23</p>  <p style="text-align: right;">92206</p>
Identical 4 HP 14 5 HP 19 FL/A	5x46 000 182 Assembly fixture for speedometer housing ball bearing	<p style="text-align: center;">24</p>  <p style="text-align: right;">99259</p>

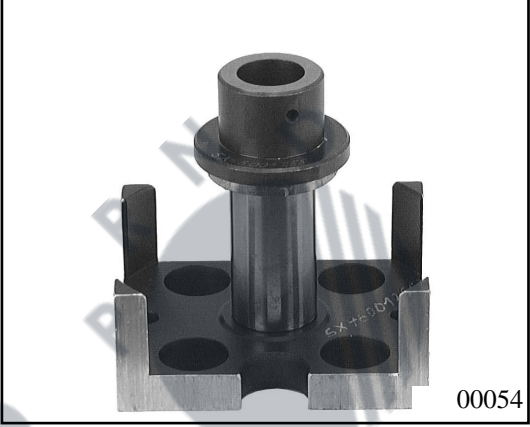
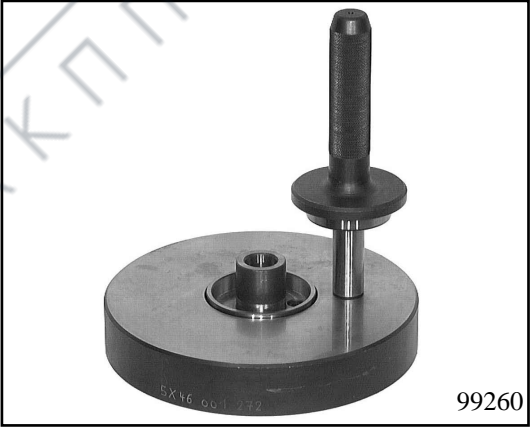

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">25</p>  <p>97306</p>	<p>5x46 000 291 Driving-in tool, clamping sleeve (selector shaft)</p>	<p>Identical</p> <p>4 HP 18 Q 5 HP 24</p>
<p style="text-align: center;">26</p>  <p>99255</p>	<p>5x46 000 530 Dismantling sleeve for double pinion-shaft bearing</p>	<p>Identical</p> <p>4 HP 18 FL 5 HP 19 FL/A</p>
<p style="text-align: center;">27</p>  <p>91190</p>	<p>5x46 000 563 - Assembly fixture, oil supply</p>	<p>Identical</p> <p>5 HP 18 5 HP 30</p>




Remarks	Order-No. / Application	OBJECT
Identical 4 HP 20 5 HP 18 5 HP 19 5 HP 24 5 HP 30	5x46 000 763 - Workbench holder	<p style="text-align: center;">28</p>  <p style="text-align: right;">91199</p>
Identical 5 HP 24 5 HP 30	5x46 000 831 Lifting device for cylinder F	<p style="text-align: center;">29</p>  <p style="text-align: right;">92209</p>
Identical 5 HP 24 5 HP 30	5x46 000 892 Mounting tool snap ring brake F	<p style="text-align: center;">30</p>  <p style="text-align: right;">01153</p>

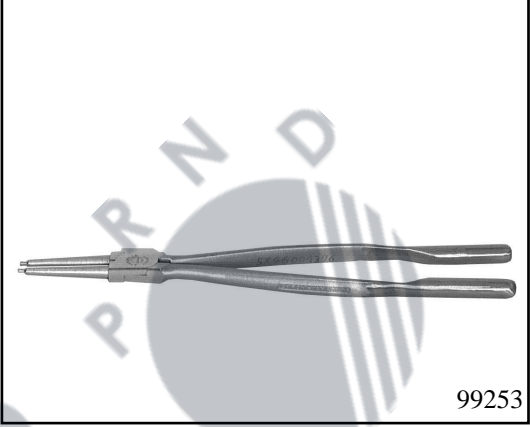
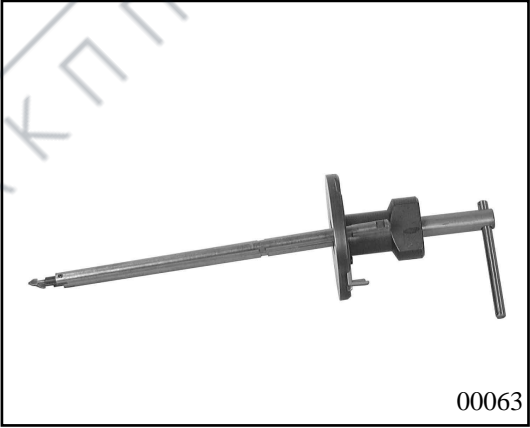

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">31</p>  <p>92213</p>	<p>5x46 000 916 - Mounting fixture for tower I</p>	<p>Identical</p> <p>5 HP 24 5 HP 30</p>
<p style="text-align: center;">32</p>  <p>92214</p>	<p>5x46 000 917 - Mounting fixture for tower II</p>	<p>Identical</p> <p>5 HP 24 5 HP 30</p>
<p style="text-align: center;">33</p>  <p>92216</p>	<p>5x46 000 931 Assembly bracket for pressing down cup spring F</p>	<p>Identical</p> <p>5 HP 24 5 HP 30</p>

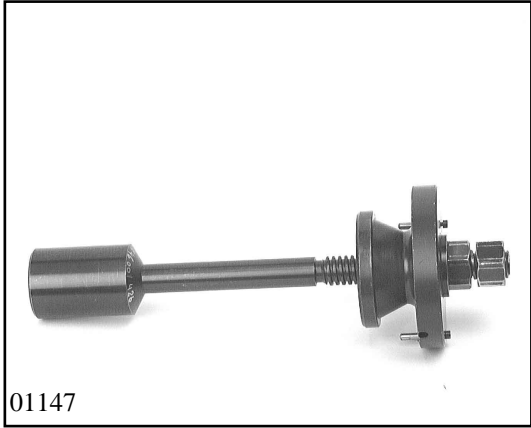


Remarks	Order-No. / Application	OBJECT
Identical 5 HP 24 5 HP 30	5x46 000 949 - Lifting fixture for tower II	<p style="text-align: center;">34</p>  <p style="text-align: right;">92217</p>
Identical 5 HP 24 5 HP 30	5x46 000 953 - Assembly pin for pump shaft sealing ring	<p style="text-align: center;">35</p>  <p style="text-align: right;">92219</p>
Identical 5 HP 24 5 HP 30	5x46 001 006 - Assembly pin for needle roller- bearing, cylinder F	<p style="text-align: center;">36</p>  <p style="text-align: right;">98395</p>




OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">37</p>  <p>92223</p>	<p>5x46 001 007 - Locating pin for oil supply (2)</p>	<p>Identical</p> <p>5 HP 19 5 HP 24 5 HP 30</p>
<p style="text-align: center;">38</p>  <p>98003</p>	<p>5x46 001 077 - Lifting device, tower I</p>	<p>Identical</p> <p>5 HP 24</p>
<p style="text-align: center;">39</p>  <p>99264</p>	<p>5x46 001 250 Detent spring centring device</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>


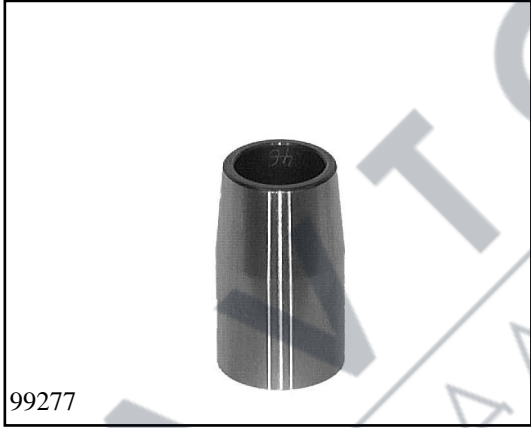

Remarks	Order-No. / Application	OBJECT
<p>Identical</p> <p>5 HP 19 FL/A</p>	<p>5x46 001 255</p> <p>Assembly fixture for shaft sealing ring, differential cover</p>	<p style="text-align: center;">40</p>  <p style="text-align: right;">00054</p>
<p>Identical</p> <p>5 HP 19 FL/A</p>	<p>5x46 001 272</p> <p>Assembly fixture for shaft sealing ring, speedometer housing</p>	<p style="text-align: center;">41</p>  <p style="text-align: right;">99260</p>
	<p>5x46 001 326</p> <p>Assembly fixture for shaft sealing ring, pinion shaft</p>	<p style="text-align: center;">42</p>  <p style="text-align: right;">01161</p>

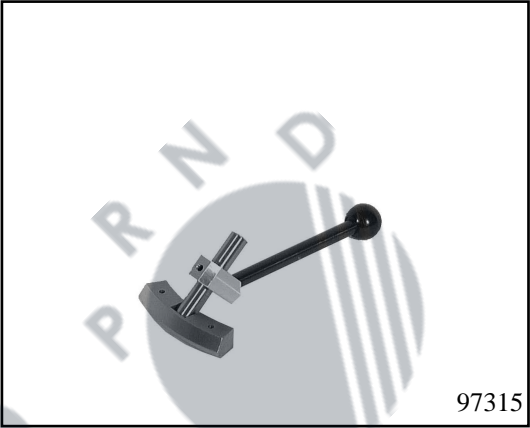


OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">43</p>  <p>99282</p>	<p>5x46 001 327 Drift, vibration damper shaft sealing ring</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">44</p>  <p>99278</p>	<p>5x46 001 333 Assembly fixture, front axle shaft sealing ring</p>	
<p style="text-align: center;">45</p>  <p>99276</p>	<p>5x46 001 339 Mounting sleeve, front axle shaft sealing ring</p>	<p>Identical 5 HP 19 FLA</p>

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A	5x46 001 376 Snap ring pliers, pinion shaft and transmission housing	<p style="text-align: center;">46</p>  <p style="text-align: right;">99253</p>
Identical 5 HP 19 FL/A	5x46 001 400 Dismantling fixture, pinion shaft sealing ring	<p style="text-align: center;">47</p>  <p style="text-align: right;">00063</p>
Identical 5 HP 19 FL/A	5x46 001 422 Wrench, pinion shaft nut	<p style="text-align: center;">48</p>  <p style="text-align: right;">99252</p>

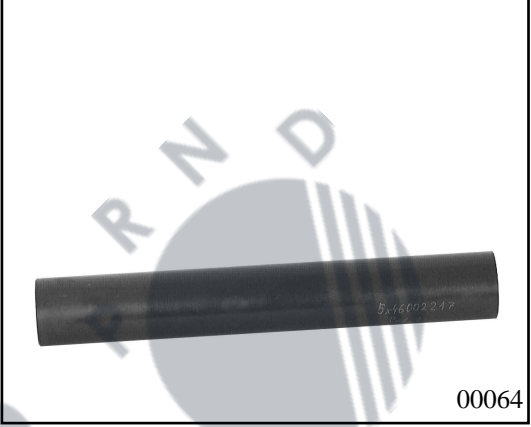
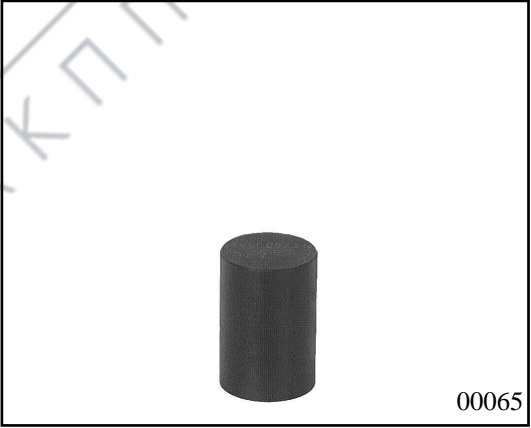
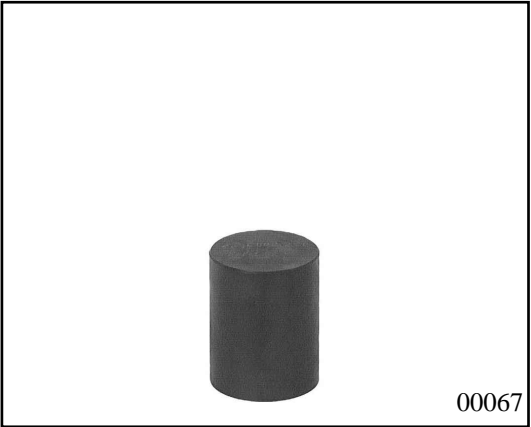
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">49</p> <div style="border: 1px solid black; padding: 5px;">  <p>01147</p> </div>	<p>5x46 001 426 Dismantling fixture, pinion shaft</p>	
<p style="text-align: center;">50</p> <div style="border: 1px solid black; padding: 5px;">  <p>01035</p> </div>	<p>5x46 001 429 Monkey wrench</p>	
<p style="text-align: center;">51</p> <div style="border: 1px solid black; padding: 5px;">  <p>97310</p> </div>	<p>5x46 001 499 - Assembly bracket for pressing down cup spring A</p>	<p>Identical 5 HP 24</p>




Remarks	Order-No. / Application	OBJECT
Identical 5 HP 24	5x46 001 500 - Assembly bracket for pressing down cup springs B	<p style="text-align: center;">52</p>  <p style="text-align: right;">97311</p>
Identical 5 HP 24	5x46 001 501 - Assembly bracket for pressing down cup springs D	<p style="text-align: center;">53</p>  <p style="text-align: right;">97312</p>
Identical 5 HP 24	5x46 001 502 - Assembly bracket for pressing down cup springs E	<p style="text-align: center;">54</p>  <p style="text-align: right;">97313</p>


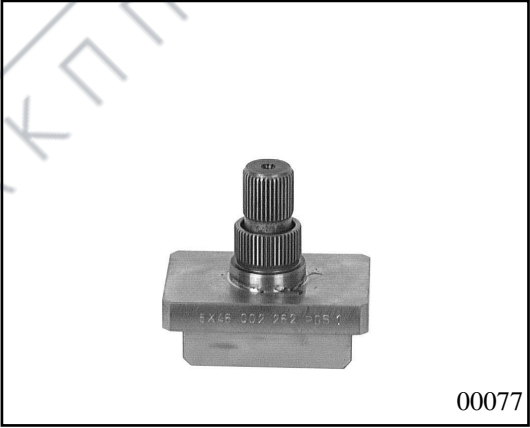
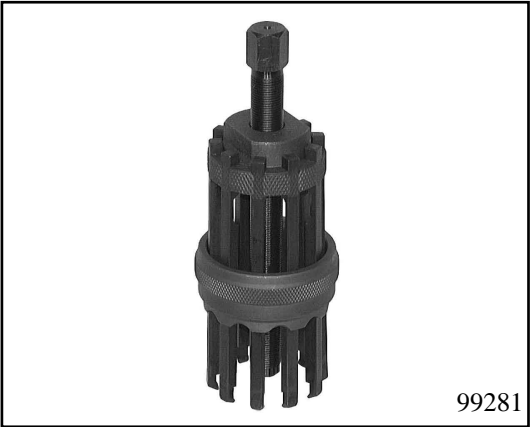
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">55</p> <div style="border: 1px solid black; padding: 5px;">  <p>97314</p> </div>	<p>5x46 001 534 Driving-in tool, oil pipe</p>	<p>Identical 5 HP 24</p>
<p style="text-align: center;">56</p> <div style="border: 1px solid black; padding: 5px;">  <p>99277</p> </div>	<p>5x46 001 535 Mounting sleeve, intermediate housing shaft sealing ring</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">57</p> <div style="border: 1px solid black; padding: 5px;">  <p>01148</p> </div>	<p>5x46 001 596 Driving-in tool, oil pipe</p>	

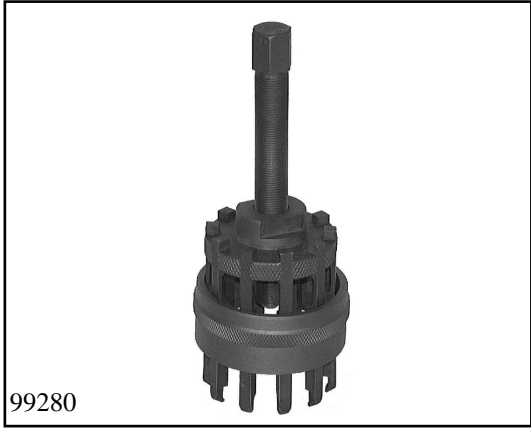
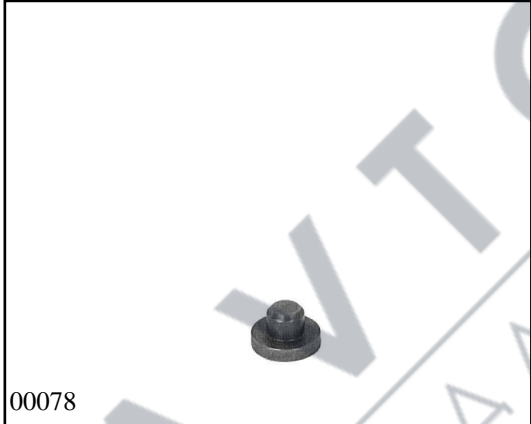
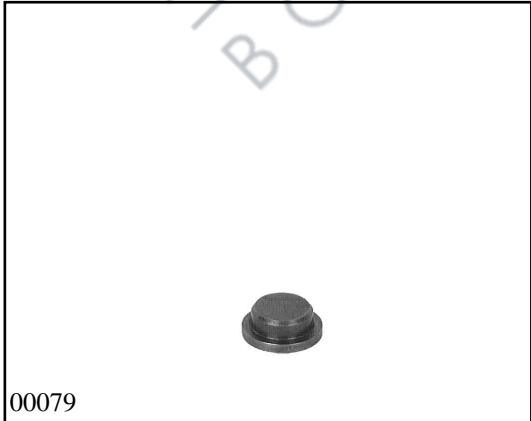
Remarks	Order-No. / Application	OBJECT
Identical 5 HP 24	5x46 001 930 Driving tool for snap ring in the groove of the housing	<p style="text-align: center;">58</p>  <p style="text-align: right;">97315</p>
Identical 4 HP 20 5 HP 19 FLA	5x46 002 000 Core insert for ROLLEX puller (front axle shaft)	<p style="text-align: center;">59</p>  <p style="text-align: right;">98169</p>
Identical 5 HP 19 FL/A	5x46 002 159 Core insert, roller bearing inner race, differential cover end	<p style="text-align: center;">60</p>  <p style="text-align: right;">00055</p>


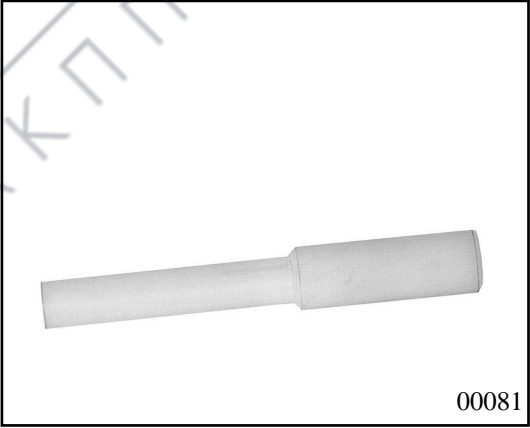

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">61</p>  <p>00059</p>	<p>5x46 002 166 2 converter pull-out handles</p>	<p>Identical 5 HP 19 FL/A</p>
<p style="text-align: center;">62</p>  <p>00060</p>	<p>5x46 002 167 Differential locking fixture</p>	<p>Identical 5 HP 19 FL/A</p>
<p style="text-align: center;">63</p>  <p>00058</p>	<p>5x46 002 174 Fixture for pinion shaft nut</p>	<p>Identical 5 HP 19 FLA</p>


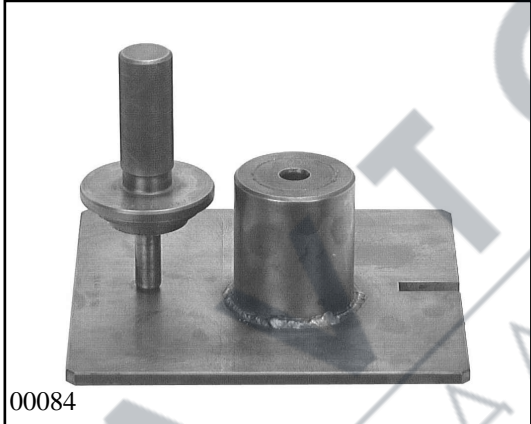
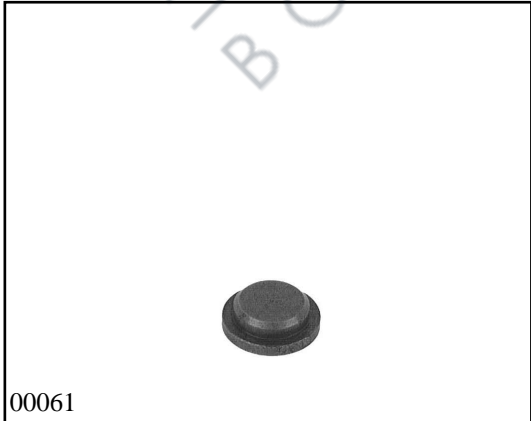
Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FLA	5x46 002 217 Drift, pinion shaft bearing inner race	<p style="text-align: center;">64</p>  <p style="text-align: right;">00064</p>
Identical 5 HP 19 FLA	5x46 002 218 Drift for inner bearing race, front axle shaft	<p style="text-align: center;">65</p>  <p style="text-align: right;">00065</p>
Identical 5 HP 19 FLA	5x46 002 220 Drift, differential bearing, large	<p style="text-align: center;">66</p>  <p style="text-align: right;">00067</p>

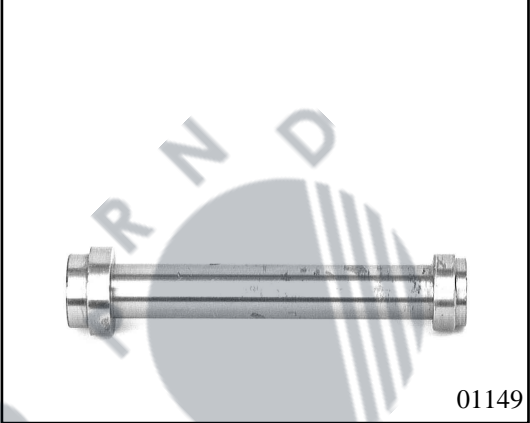
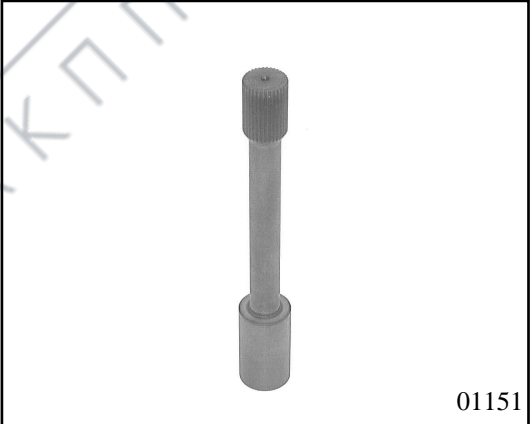

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">67</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>00068</p> </div>	<p>5x46 002 221 Drift, differential bearing, small</p>	<p>Identical 5 HP 19 FL/A</p>
<p style="text-align: center;">68</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>00069</p> </div>	<p>5x46 002 222 Drift, cylindrical pin for position switch</p>	<p>Identical 5 HP 19 FL/A</p>
<p style="text-align: center;">69</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>00075</p> </div>	<p>5x46 002 259 Drift for output gear needle roller sleeve, transfer box housing</p>	<p>Identical 5 HP 19 FLA</p>


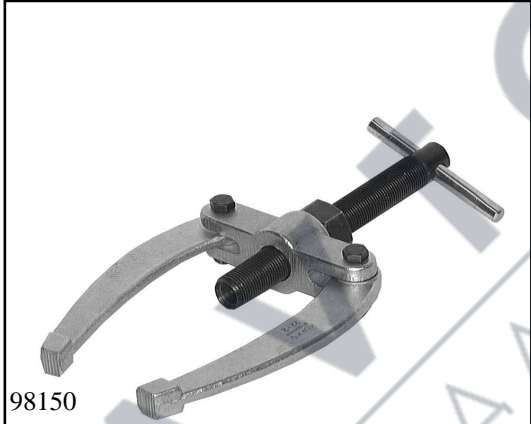

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FLA	5x46 002 261 Drift for rear axle shaft needle roller sleeve, transfer box housing	<p style="text-align: center;">70</p>  <p style="text-align: right;">00076</p>
Identical 5 HP 19 FLA	5x46 002 262 Retaining fixture, Torsen II	<p style="text-align: center;">71</p>  <p style="text-align: right;">00077</p>
Identical 5 HP 19 FLA	5x46 002 273 Puller for output gear ball bearing, Rillex 6210	<p style="text-align: center;">72</p>  <p style="text-align: right;">99281</p>



OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">73</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  <p>99280</p> </div>	<p>5x46 002 274 Puller for rear axle shaft ball bearing, Rillex 6211</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">74</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  <p>00078</p> </div>	<p>5x46 002 275 Core insert, rear axle shaft</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">75</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  <p>00079</p> </div>	<p>5x46 002 276 Core insert, output gear</p>	<p>Identical 5 HP 19 FLA</p>


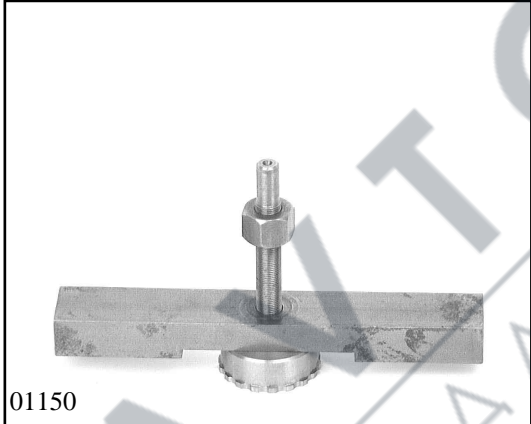

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FLA	5x46 002 277 Pressing-out drift, output gear, transfer box housing	<p style="text-align: center;">76</p> <div style="text-align: right;">00080</div> 
Identical 5 HP 19 FLA	5x46 002 278 Pressing-out drift, output gear nut	<p style="text-align: center;">77</p> <div style="text-align: right;">00081</div> 
Identical 5 HP 19 FLA	5x46 002 280 Sleeve for rear axle shaft ball bearing	<p style="text-align: center;">78</p> <div style="text-align: right;">00082</div> 

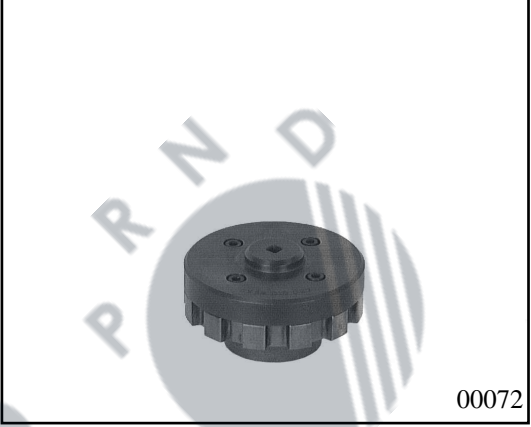
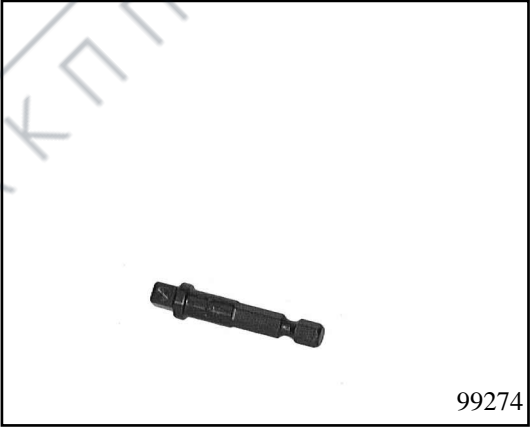

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">79</p>  <p>00083</p>	<p>5x46 002 281 Sleeve for output gear ball bearing</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">80</p>  <p>00084</p>	<p>5x46 002 282 Assembly fixture, intermediate housing shaft sealing ring</p>	<p>Identical 5 HP 19 FLA</p>
<p style="text-align: center;">81</p>  <p>00061</p>	<p>5x46 002 287 Core insert, roller bearing inner race, differential (housing end)</p>	<p>Identical 5 HP 19 FL/A</p>


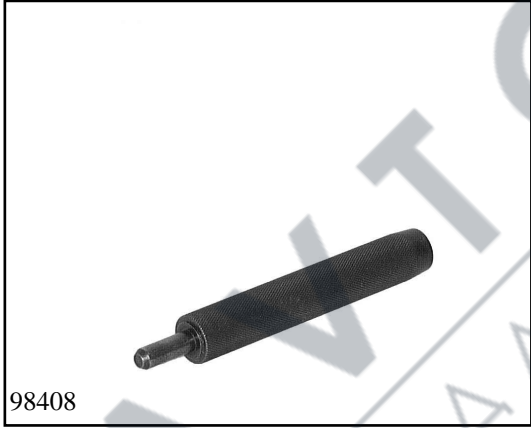

Remarks	Order-No. / Application	OBJECT
<p data-bbox="92 1547 209 1581">Identical</p> <p data-bbox="108 1626 296 1809"> 3 HP 22 Q 4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A </p>	<p data-bbox="379 427 770 539"> 5x46 002 460 Mounting / Unmounting tool pipe </p>	<p data-bbox="1134 412 1171 445">82</p>  <p data-bbox="1345 864 1417 891">01149</p>
	<p data-bbox="379 987 655 1059"> 5x46 002 461 Pinion shaft adapter </p>	<p data-bbox="1134 972 1171 1005">83</p>  <p data-bbox="1345 1424 1417 1451">01151</p>
	<p data-bbox="379 1547 815 1619"> 5x46 010 011 Rollex puller 1000/1 (basic unit) </p>	<p data-bbox="1134 1532 1171 1565">84</p>  <p data-bbox="1345 1984 1417 2011">98152</p>

OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">85</p>  <p>98149</p>	<p>5x46 021 007 Kukko puller 21/7</p> <p>or</p> <p>5x46 021 008 Kukko puller 21/8</p>	<p>Identical</p> <p>4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A</p>
<p style="text-align: center;">86</p>  <p>98150</p>	<p>5x46 022 002 Kukko puller 22-2 (basic unit)</p>	<p>Identical</p> <p>4 HP 14 Q 4 HP 18 Q 4 HP 20 5 HP 19 FL/A</p>
<p style="text-align: center;">87</p>  <p>97305</p>	<p>5x46 030 167 - Assembly bracket for pressing down cup spring C</p> <p>(equivalent to Item 3 of fixture 5x46 000 167)</p>	<p>Identical</p> <p>4 HP 14 Q 4 HP 18 Q 4 HP 20 4 HP 22 5 HP 18 5 HP 19 5 HP 19 FL/A 5 HP 24</p>




Remarks	Order-No. / Application	OBJECT
Identical 4 HP 20 5 HP 19 FL/A	5x46 032 010 Rollex puller 32010X/1 (differential)	<p style="text-align: center;">88</p>  <p style="text-align: right;">98155</p>
Identical 4 HP 18 Q 5 HP 19 FL/A	5x46 300 849 Rollex 300849 inner bearing race puller	<p style="text-align: center;">89</p>  <p style="text-align: right;">99271</p>
Identical 4 HP 18 Q 4 HP 20 5 HP 19 FL/A	5x46 503 491 Rollex puller, size IA (basic unit)	<p style="text-align: center;">90</p>  <p style="text-align: right;">98151</p>

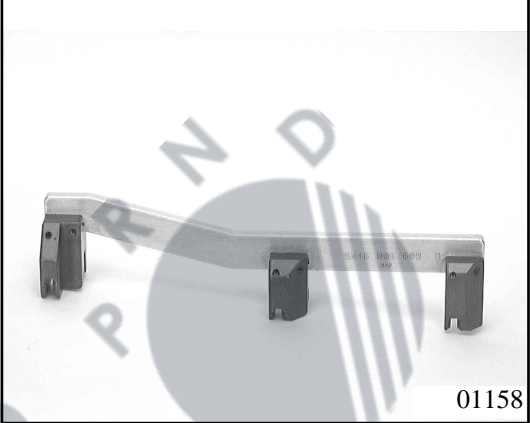
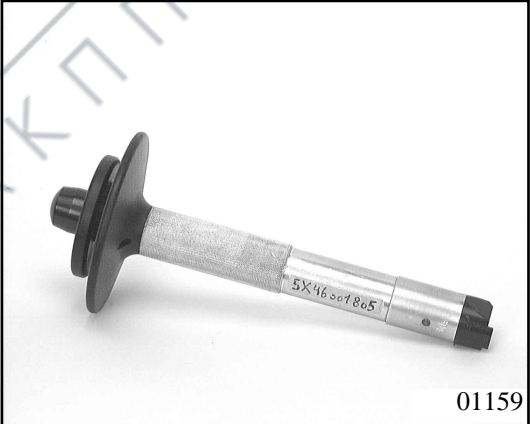
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">91</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>99270</p> </div>	<p>5x46 806 649 Rollex 806649 inner bearing race puller</p>	<p>Identical</p> <p>5 HP 19 FL/A</p>
<p style="text-align: center;">92</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>01150</p> </div>	<p>5x53 000 001 Unmounting tool roller sleeve</p>	
<p style="text-align: center;">93</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>76047</p> </div>	<p>5x56 000 021 Sleeve for pump test</p>	<p>Identical</p> <p>3 HP 22 4 HP 22 5 HP 18 5 HP 24 5 HP 30</p>

Remarks	Order-No. / Application	OBJECT
Identical 5 HP 19 FL/A	5x66 000 027 Drag torque measuring fixture, pinion shaft	<p style="text-align: center;">94</p> <div style="text-align: right;">00072</div> 
Identical 5 HP 19 FL/A	5x66 000 029 Connector, from 1/4" external hexagon to 1/4" external square	<p style="text-align: center;">95</p> <div style="text-align: right;">99274</div> 
Identical 5 HP 19 FL/A	5x66 000 030 Insert tool, ring	<p style="text-align: center;">96</p> <div style="text-align: right;">99275</div> 

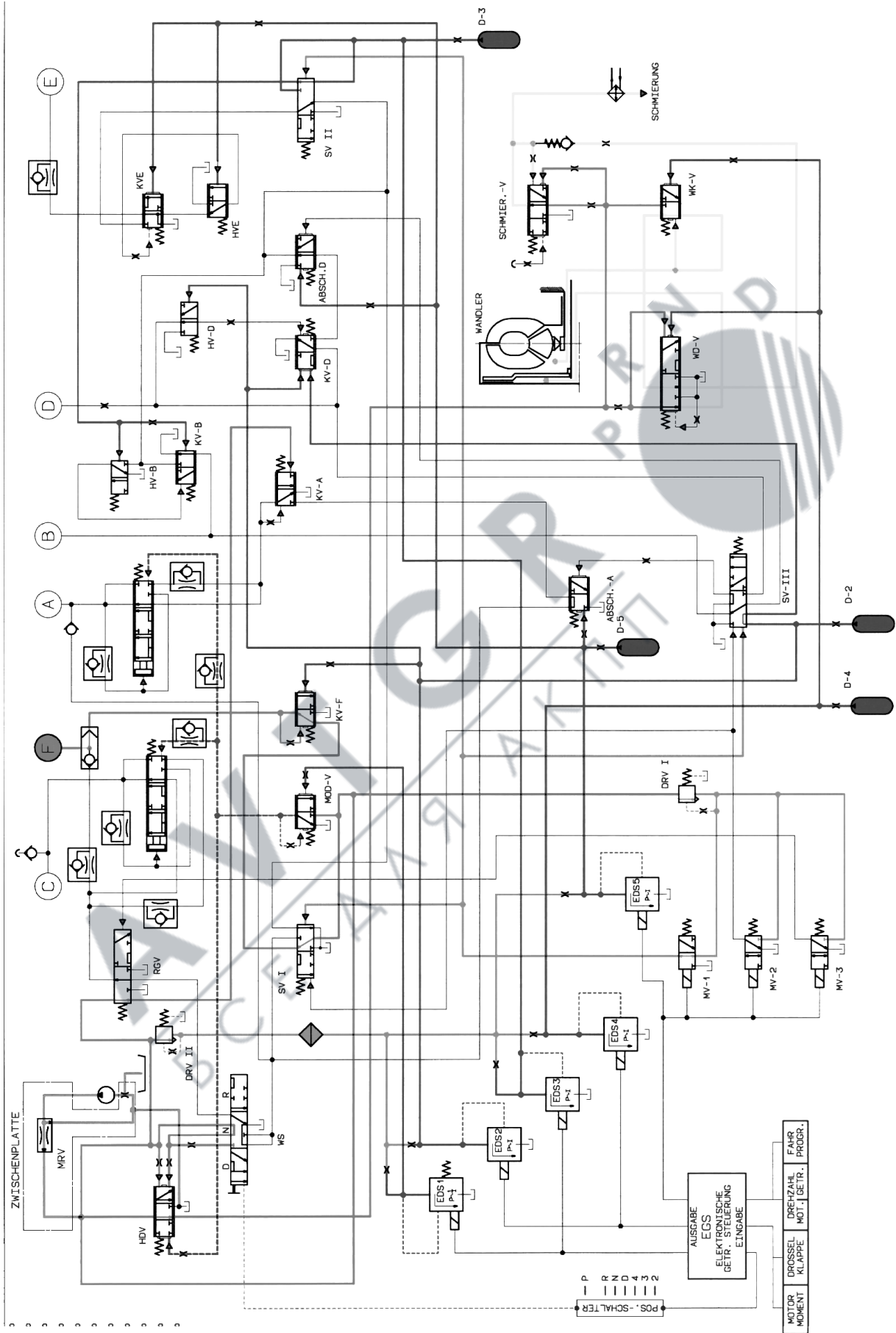
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">97</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>01144</p> </div>	<p>5x66 000 032 Centering fixture</p>	
<p style="text-align: center;">98</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>98408</p> </div>	<p>5x95 000 038 - Assembly drift for selector shaft sealing ring</p>	<p>Identical 5 HP 19</p>
<p style="text-align: center;">99</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>00062</p> </div>	<p>5x95 000 440 Pull-out handle, sealing sleevesaft seal, transmission housing, differ- ential</p>	<p>Identical 5 HP 19 FL/A</p>

Remarks	Order-No. / Application	OBJECT
<p>Identical</p> <p>5 HP 19 FL/A</p>	<p>5x45 000 016</p> <p>-Torque wrench with yield-limit control (Type Quantec EMS 7086 ISI)</p> <p style="text-align: center;">or</p>	<p style="text-align: center;">100</p> <div data-bbox="890 474 1420 900" data-label="Image"> <p style="text-align: right;">00140</p> </div>
<p>Identical</p> <p>5 HP 19 FL/A</p>	<p>5x45 000 017</p> <p>-Torque wrench with yield-limit control (Type Operator^{five} + software paket for yield resistance)</p>	<p style="text-align: center;">101</p> <div data-bbox="890 1034 1420 1460" data-label="Image"> <p style="text-align: right;">00105</p> </div>

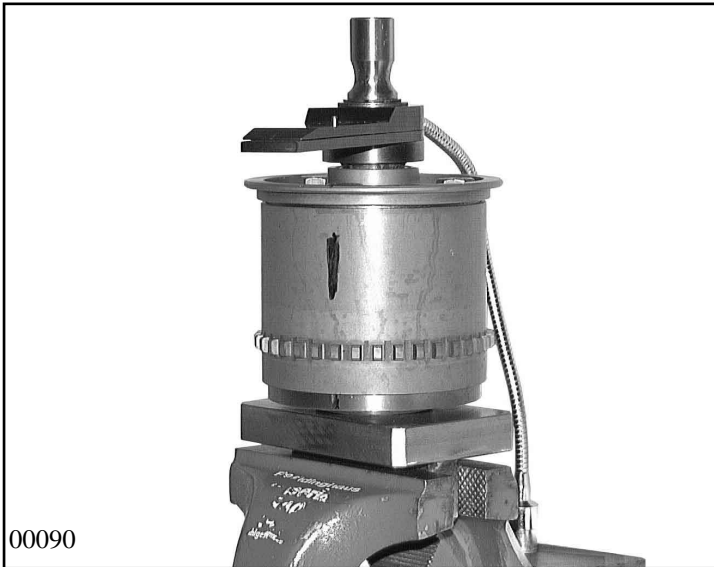
OBJECT	Order-No. / Application	Remarks
<p style="text-align: center;">102</p> 	<p>5x46 001 411 Drift, differential breather (if in pinion shaft tunnel)</p>	
<p style="text-align: center;">103</p> 	<p>5x46 001 525 Drift, transmission + differential breather</p>	
<p style="text-align: center;">104</p> 	<p>5x46 001 687 Drift hose breather, transmission</p>	

Remarks	Order-No. / Application	OBJECT
	<p>5x46 001 689 Positioning tool brackets hose breather, transmission</p>	<p style="text-align: center;">105</p>  <p style="text-align: right;">01158</p>
	<p>5x46 001 805 Drift, transfer box breather</p>	<p style="text-align: center;">106</p>  <p style="text-align: right;">01159</p>

**1.8 Oilflow chart
(position N according to DIN scheme)**







00090

1.9 Functional check

1.9.1 Checking backlash, Torsen II (angle)

Clamp retaining fixture 5x46 002 262 into the vice.

Position Torsen II in retaining fixture with screw heads upwards.

Insert adapted with angle washer 5p95 000 603 into the rear sun gear splines.



00089

Place the torque wrench on the adapter with angle measuring disc and set to "0" while pressing the wrench lightly against the stop in a clockwise direction.

Turn the torque wrench clockwise until a torque of 10 Nm is reached.

Read off the angle M_W at the scale on the angle measuring disc.

(Scale: 0.5° between markings)

Max. angle = 2.8° (bei 10 Nm).

If a higher angle reading is obtained, renew Torsen II.

Important:

Include play S_{PW} - if present - between the adapter and the torque wrench in the angle calculation. Determine S_{PW} by trial and error.

Calculation:

$$M_{WR} = M_W - S_{PW}$$

Example:

$$S_{PW} = 0.2^\circ$$

$$M_W = 1.75^\circ \text{ (angle reading)}$$

$$\begin{aligned} M_{WR} &= 1.75^\circ - 0.2^\circ \\ &= 1.55^\circ \end{aligned}$$

Actual angle:

$$M_{WR} = 1.55^\circ$$

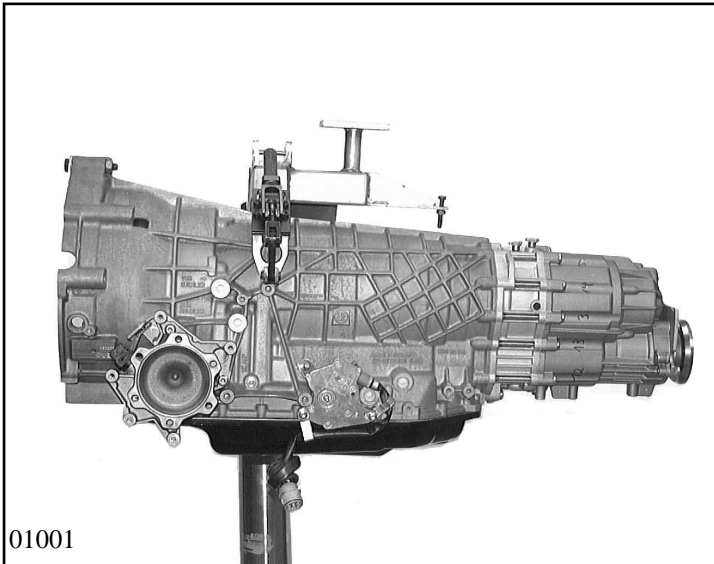


2. Removal

2.1 Removing converter, front axle output, valve body and position switch

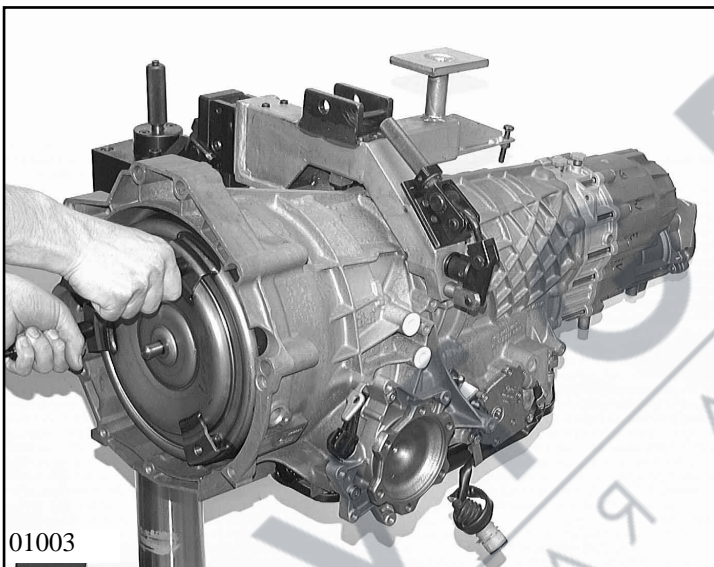
2.1.1 Removing converter

Mount the complete transmission with oil pan facing down in assembly bracket 5t66 000 108 and attach to assembly truck or workbench holder 5x46 000 763.



Remove the converter retaining bracket and lift out the converter with 2 handles 5x46 002 166.

(Wrench size = 19 mm)

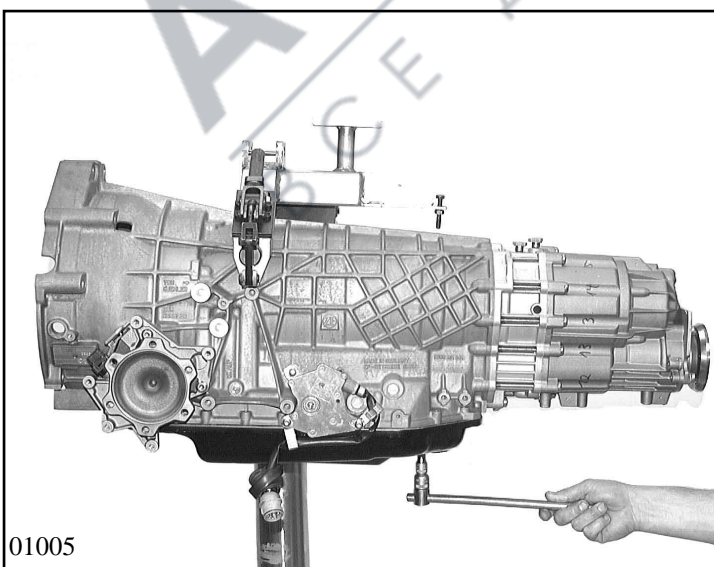


Pull the breather covers, and the breather hoses if necessary, off the differential, the transmission and transfer case.

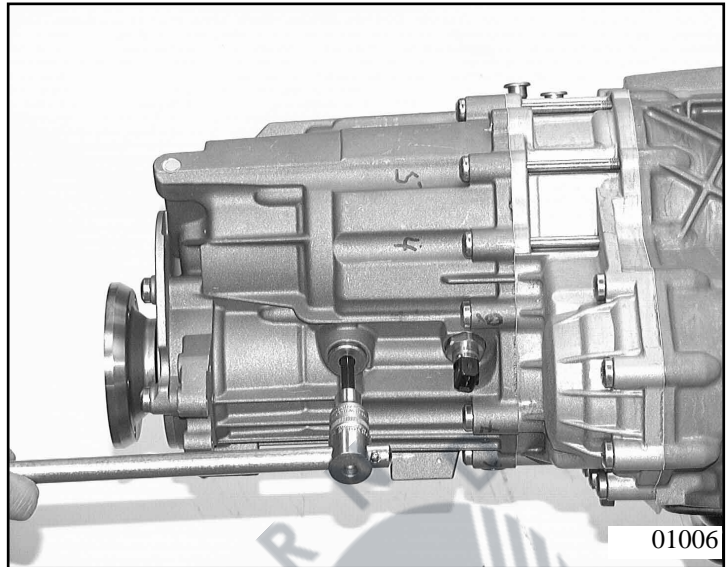
Important:

The transmission has three oil contents.

- Drain transmission oil by removing the drain and filler plugs.
(Intl. hex = 17 mm filler plug
= 5 mm drain plug)
- Turn the transmission through 90° with the converter bell downwards and drain out the differential oil by unscrewing the filler plug.
(Intl. hex = 8 mm)

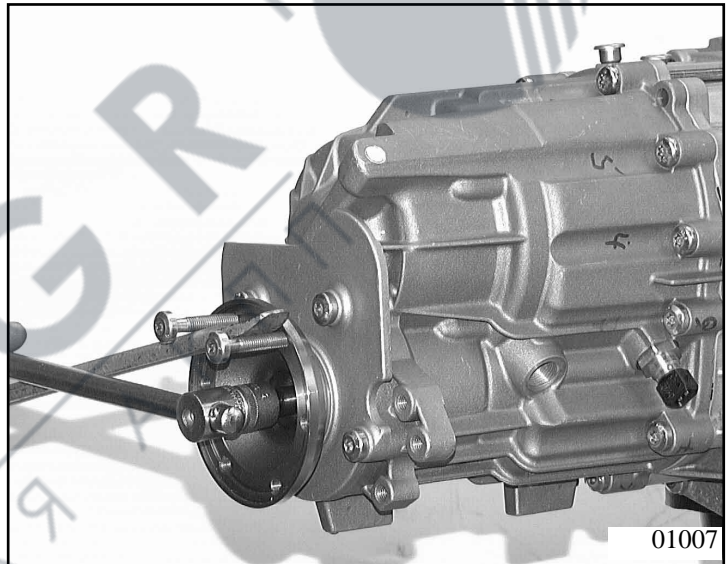


- c) Turn the transmission back and drain oil by unscrewing and removing the oil drain and oil filler plugs from the transfer box housing.
(Wrench size = Intl. hex 6 or. 8 mm)



Lock the output flange so it cannot turn and unscrew the expansion bolt. Take off the output flange. Undo the 4 screws for the cover and take off the cover. Turn the transmission by 90° (transfer box housing upwards).

(Wrench size = Torx TX-40)



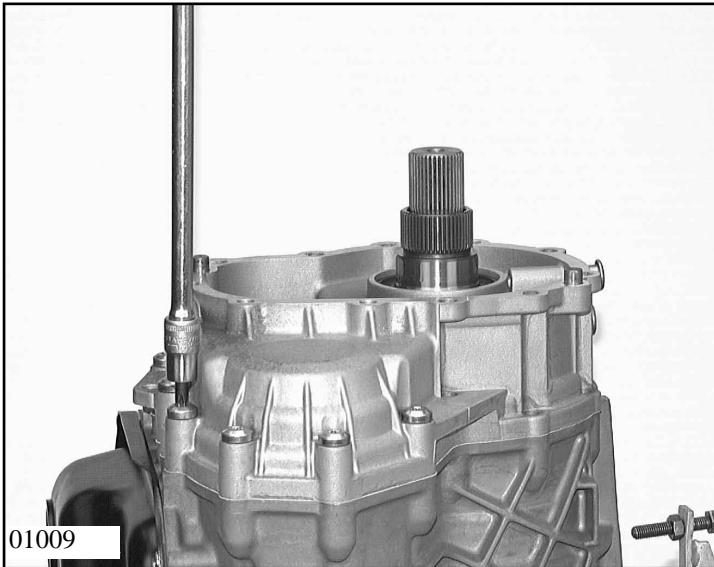
Unscrew the inductive sensor from the transfer box housing. Undo the 11 screws for the transfer box housing. Lift off the cover and the transfer box housing. (The housing tends to stick, therefore strike the plastic housing with a plastic-faced hammer.) Take the gasket off the housing. The pins remain in the intermediate housing. Lift Torsen II off the output and front axle shaft.

(Wrench size = 23 mm
Wrench size = Torx TX-40)

Warning:

Risk of oil flowing out of the Torsen II.



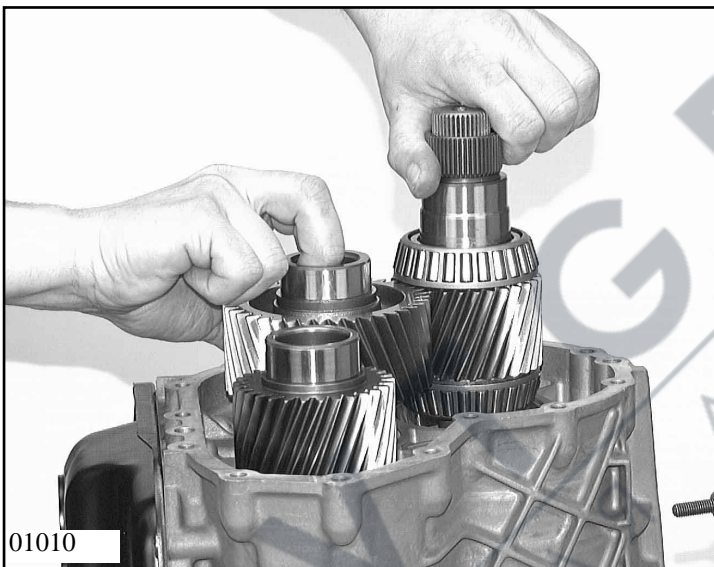


2.1.2 Removing output to front axle

Take the magnet out of the intermediate housing. Undo 6 screws and lift intermediate housing off the transmission housing.

(The housing tends to stick, therefore strike the plastic housing with a plastic-headed hammer) The fitting sleeve should remain in the intermediate housing.

(Wrench size = Torx TX-40)

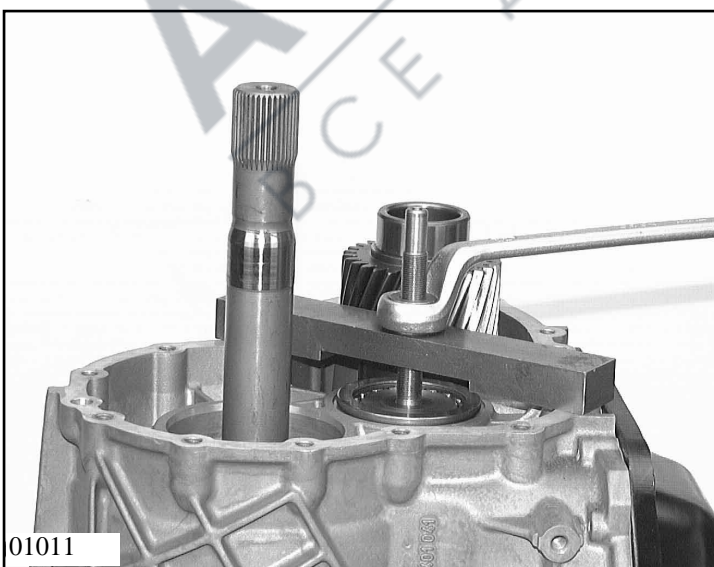


Take the gasket off the housing. Lift the intermediate gear and the front axle shaft off the transmission housing together.

Take the shim washer off the output shaft.

Important:

If the inscription on the intermediate gear should point downwards (towards the transmission housing), install it immediately when assembling; otherwise noise may occur



2.1.3 Dismantling work at the transmission housing

Take off the thrust bearing.

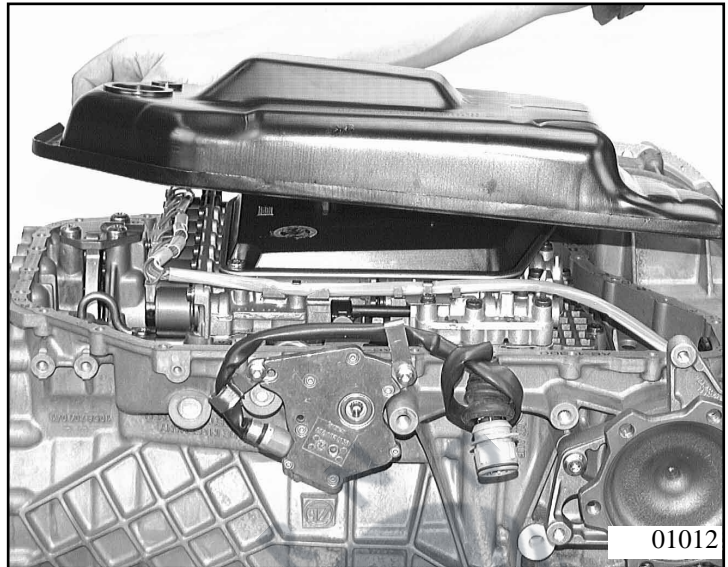
Remove the bearing outer race from the transmission housing by hand.

Remove the roller sleeve with tool 5x53 000 001.

2.1.4 Removing the control unit

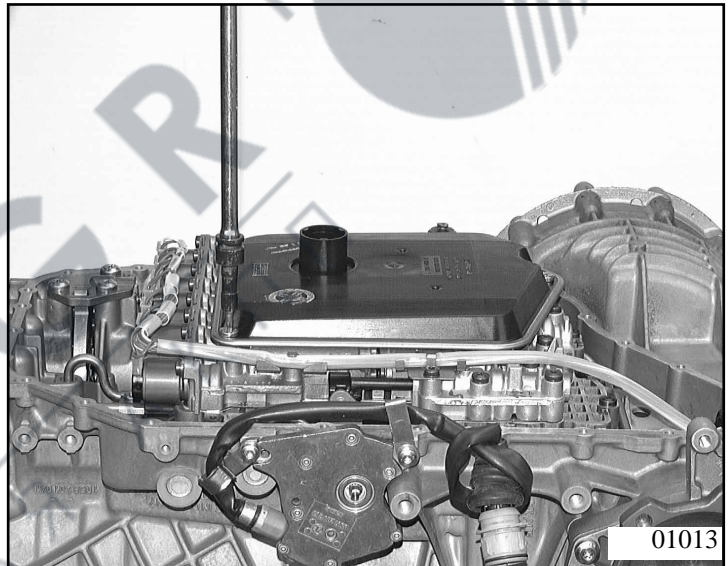
Turn the transmission through 90° with the oil pan at the top.
Detach the keeper plate from the wiring harness plug.
Take out the 26 screws from the oil pan and remove it.
Remove the gasket from the transmission housing.
Remove the 4 magnets from the oil pan.

(Wrench size = Torx TX-27)

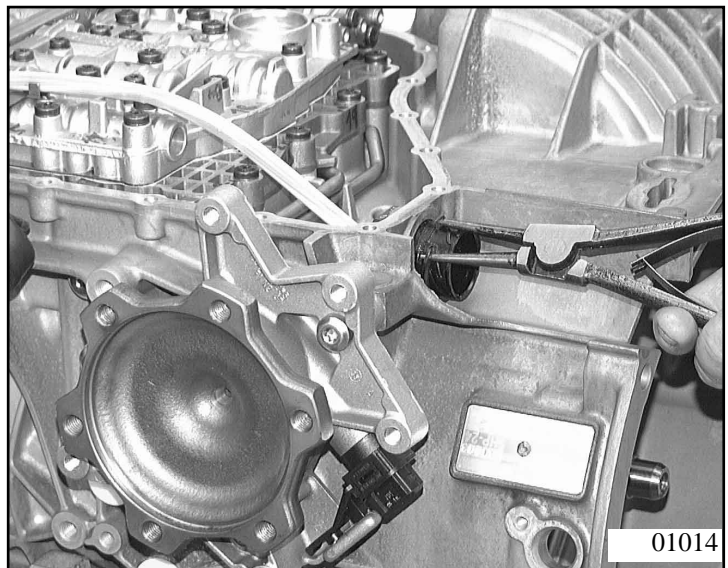


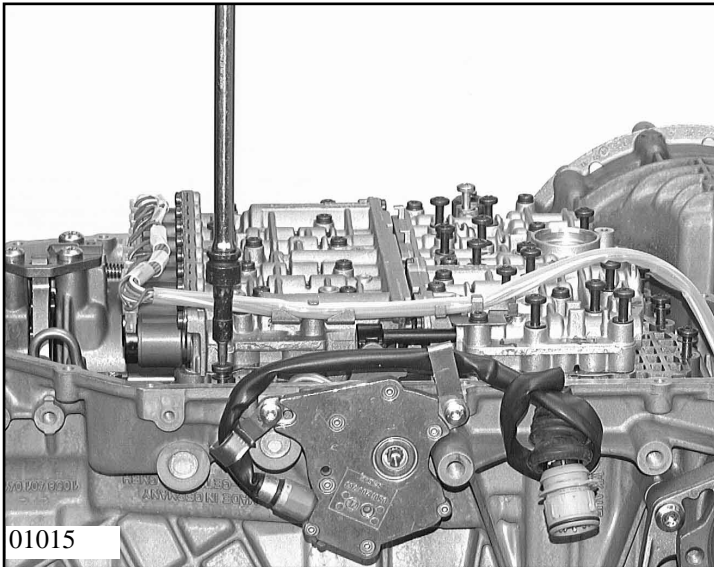
Take out the 2 screws and remove the oil filter.
Remove the seal from the oil filter connection or from the bore in the control unit.

(Wrench size = Torx TX-27)



Remove the protective cap from the wiring harness plug and press the plug into the transmission.

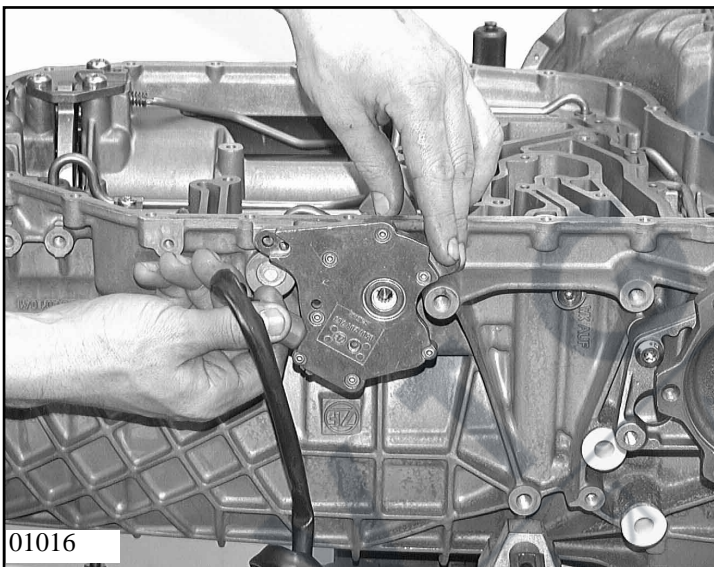




Unscrew the 21 large-headed screws and lift out the control unit.

5 M6x30
15 M6x60
1 M6x55]

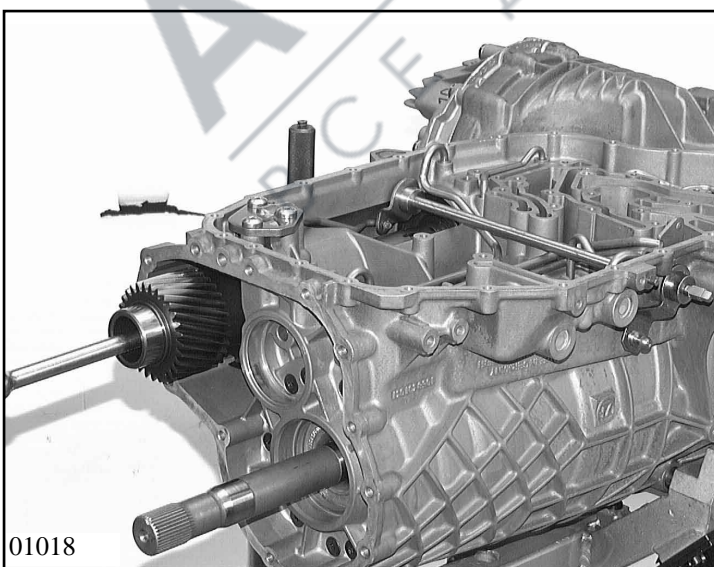
(Wrench size = Torx TX-27)



2.1.5 Removing the position switch

Set the selector shaft to position "N". Remove the position switch screws with the cable retaining clips and take off the position switch.

(Wrench size = Torx TX-27)

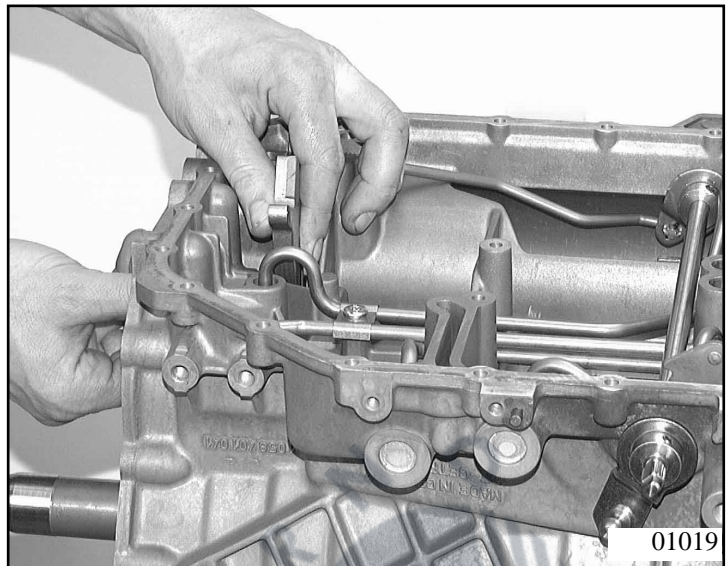


2.1.6 Removing the shift and parking lock mechanism

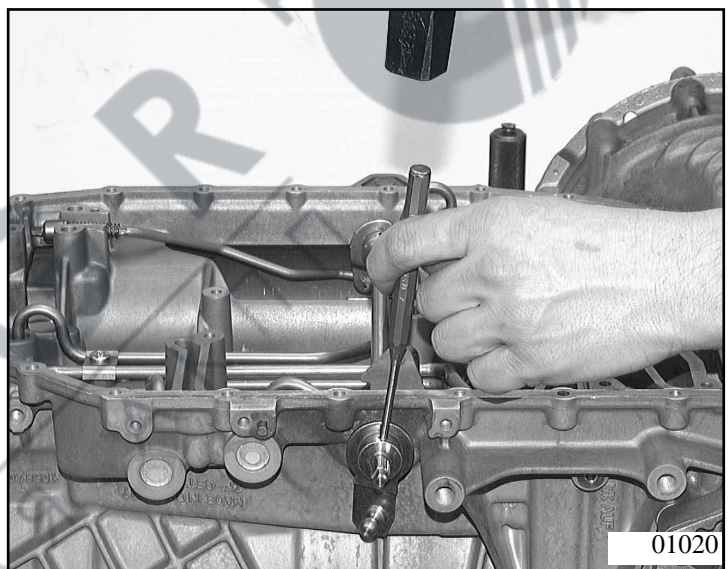
Move the detent disc to position "P" and remove the expansion bolt from the side shaft. Undo the 3 screws of the guiding plate and remove it.

(Wrench size = 17 mm
Wrench size = Torx TX-40)

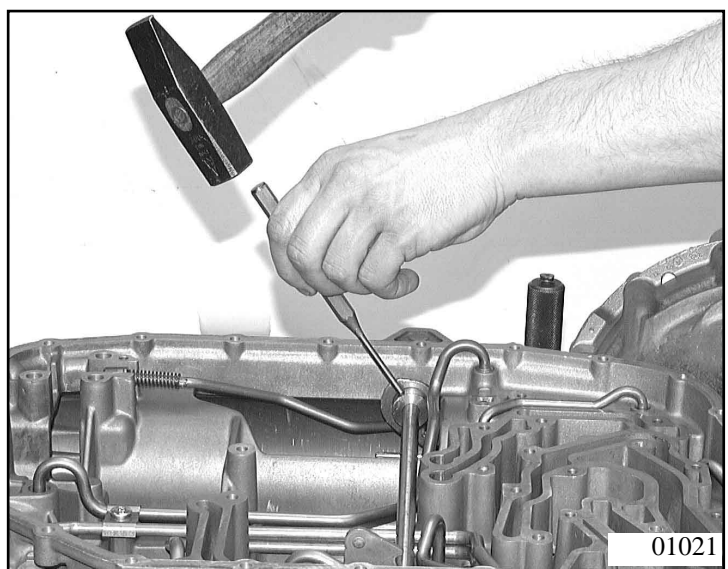
Pull the keeper off the parking lock pin.
Press the parking lock pin out to the rear.
Remove the pawl with spring and shim washer (if fitted).

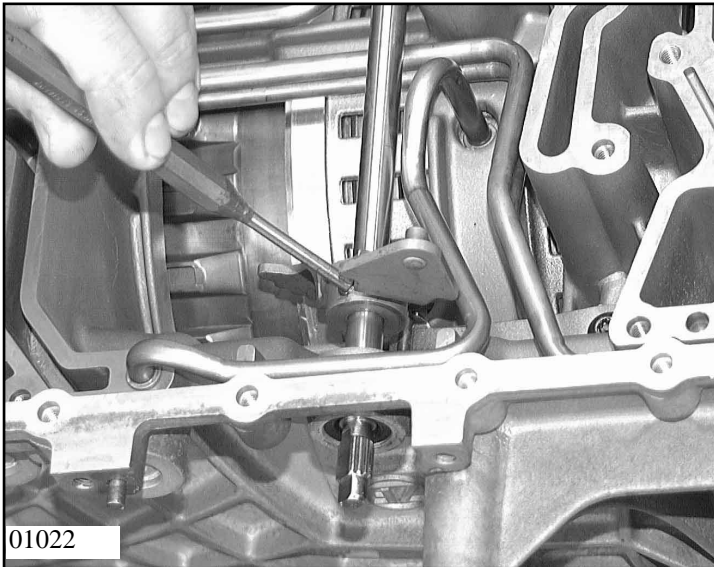


Drive the clamping sleeve out of the
selector lever and take off the selector
lever.



Set the detent disc to position "1".
Drive the clamping sleeve out of the
driver with a suitable drift.

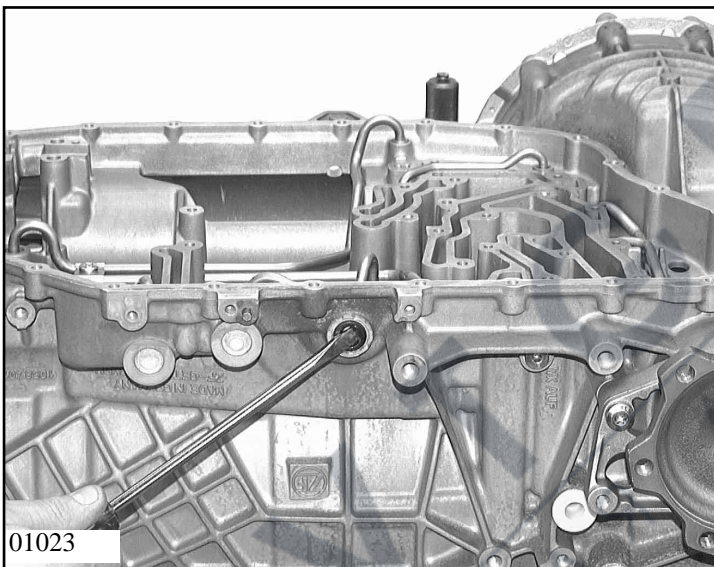




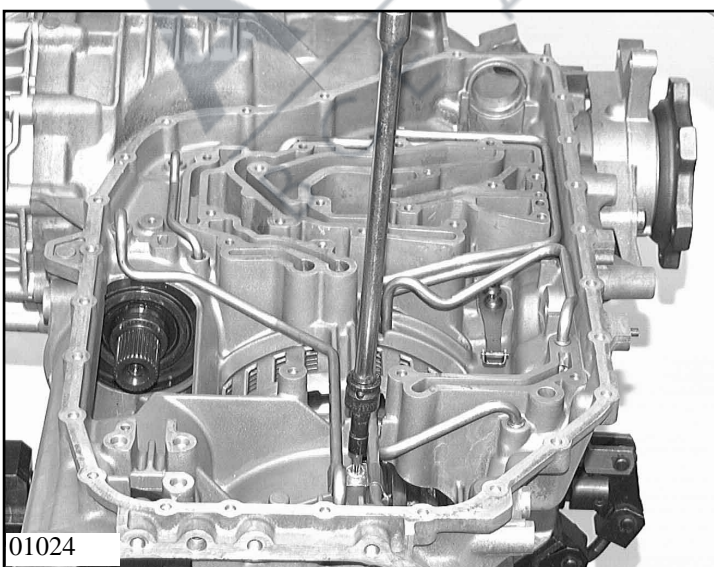
Press down the detent spring, drive the selector shaft as far as possible into the transmission housing with a plastic-faced hammer and drive the clamping sleeve out of the detent disc.

Pull out the selector shaft and the driver with the connecting bar and the detent disc.

Note:
The detent spring normally remains installed.



Remove the shaft sealing ring with a suitable tool.



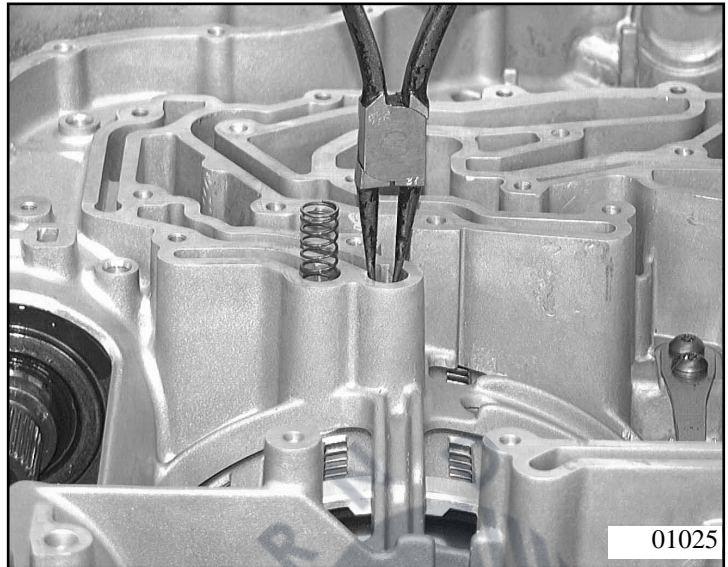
2.1.7 Removing oil pipes

Undo the fastening screw of the oil pipe holder and remove oil pipes. Always remove oil pipe of brake E with suitable tool.

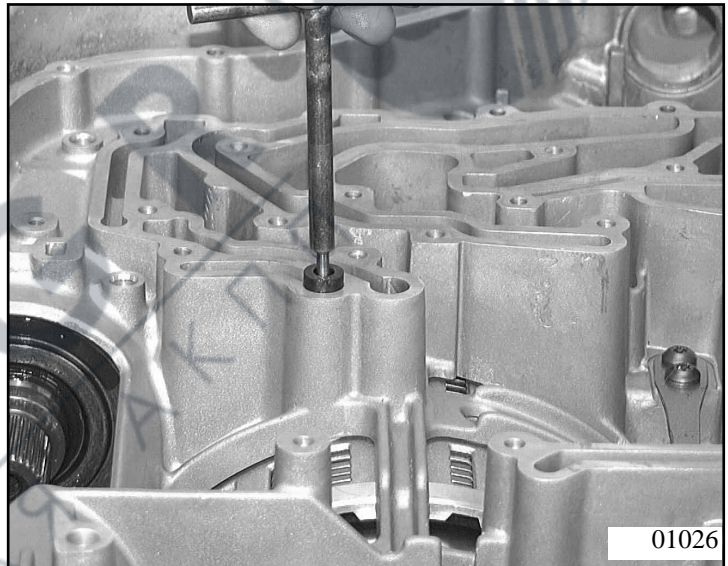
(Wrench size = Torx - TX 27)

Note:
Since the risk of their blocked with dirt is high, we recommend replacing all oil pipes.

Undo the two circlips holding the coil springs and take both out.



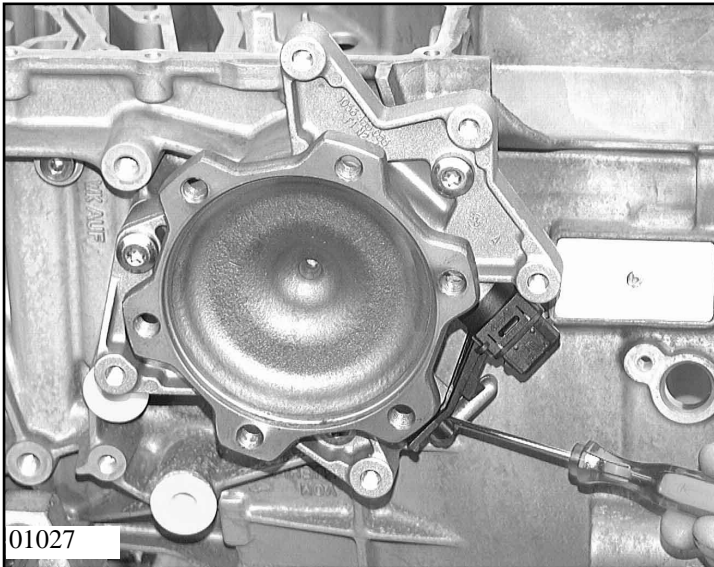
Pull out the two sealing sleeves at the bottom of the holes with pull-out handle 5x95 000 410.



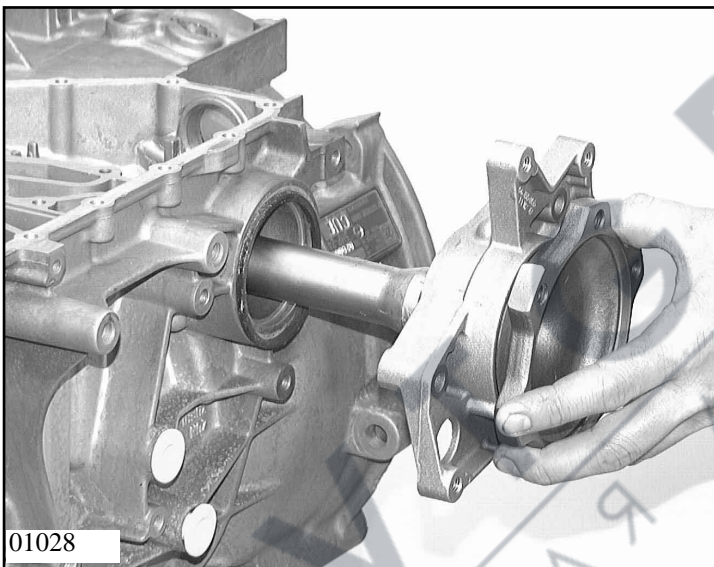
2.2 Removing the flange shaft and the front axle differential

2.2.1 Removing the flange shaft

Release the speedometer and pull it out.



Unscrew the 3 speedometer housing screws. Carefully remove the flange shaft with the speedometer housing. Remove the O-ring.



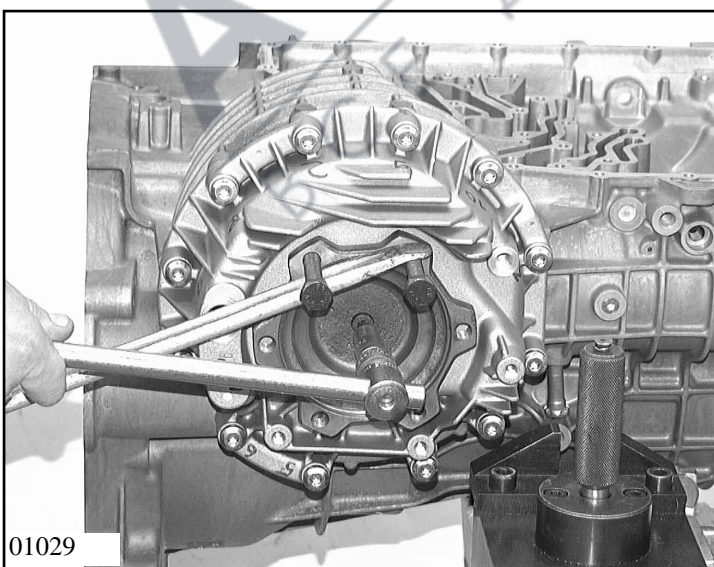
(Wrench size = Torx TX-40)

2.2.2 Removing the differential

Remove the expansion bolt from the flange, at the same time preventing the flange from turning. Take out the flange.

(depending on which version is installed)

(Wrench size = Torx TX-40)

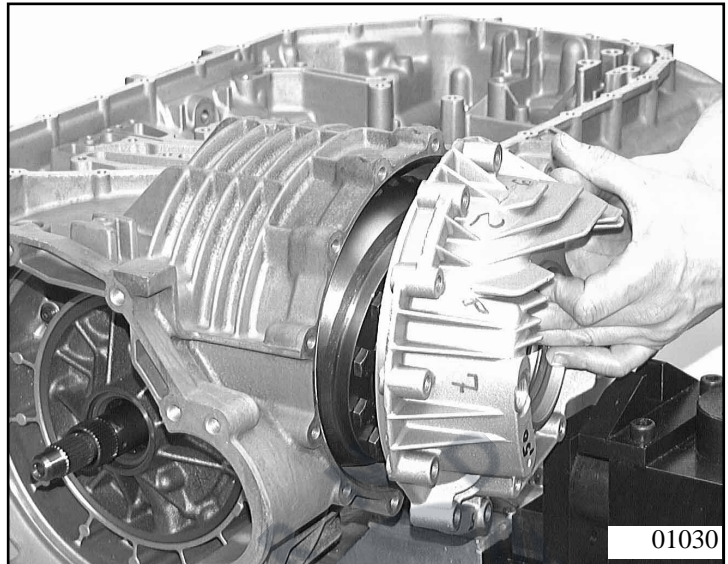


Remove the 12 differential cover screws.
Take off the cover and pull out the differential.
Take the O-ring off the cover.

(Wrench size = Torx TX-40)

Warning:

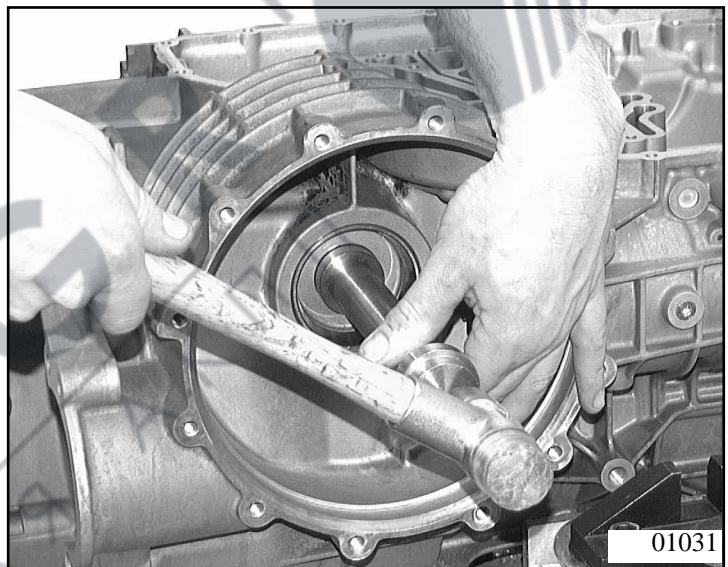
The differential could fall out.



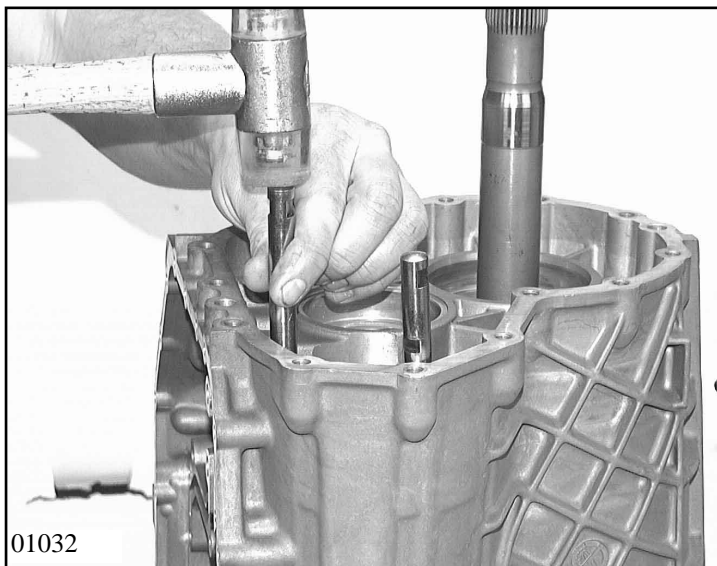
Take the snap ring off the pipe and drive the pipe out of the transmission housing with pin 5x46 002 460.
Take the O-ring off the pipe and the differential housing.

Note:

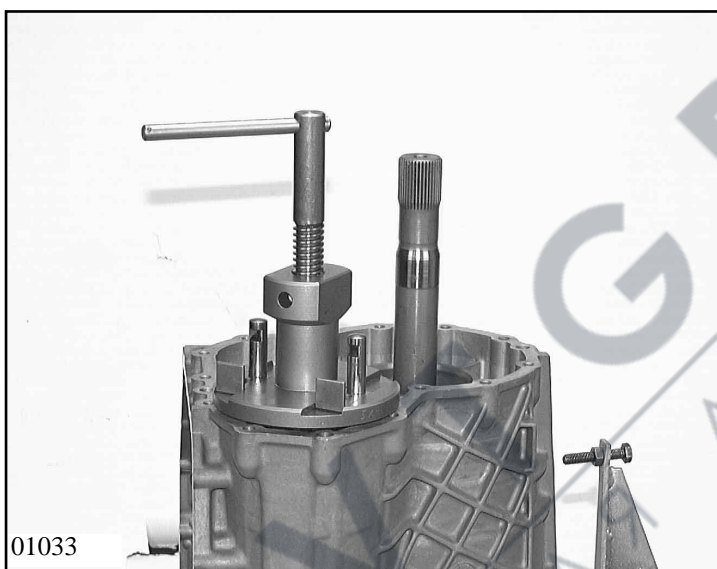
With newer transmissions, it may be necessary to screw the metal sheet off the breather labyrinth and remove it.



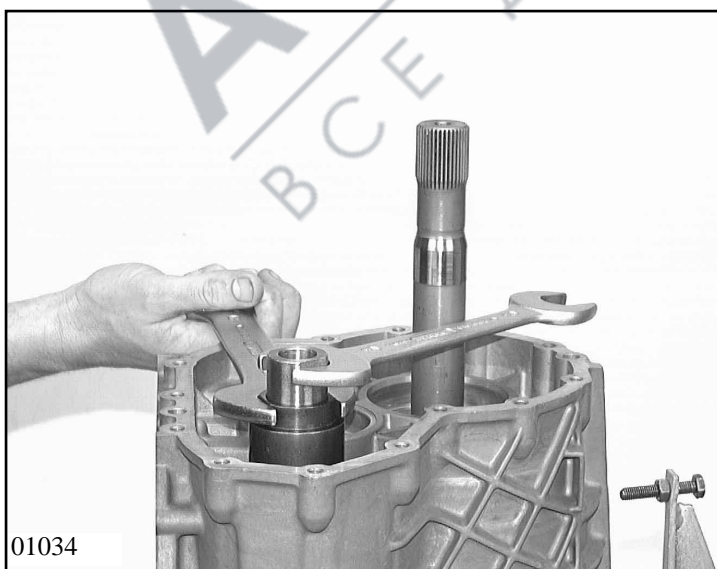
2.3 Removing the pinion and side shafts



Turn the transmission through 90°. Unscrew the expansion bolt from the side shaft and remove the side shaft. Remove the conical disc, the deflector plate or oil tank with spring, if fitted. Using a suitable hammer, drive the puller rods of tool 5x46 001 400 through the marks on the shaft sealing ring.



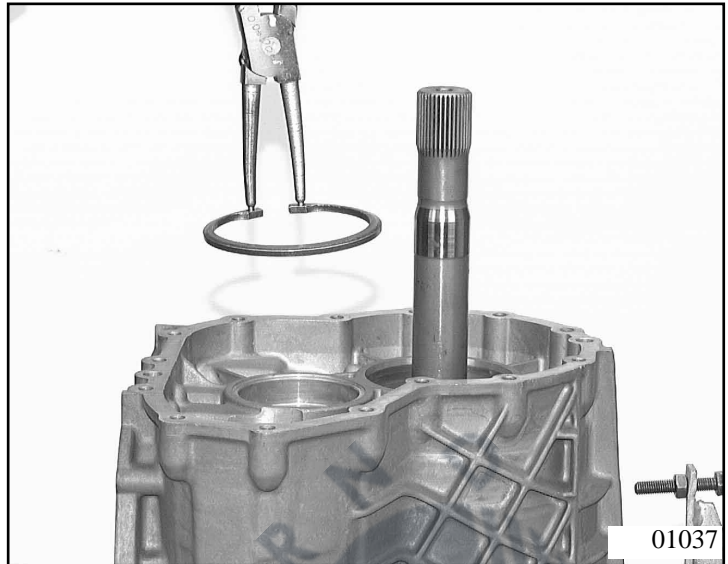
Place extension 5x46 001 400 on the pinion shaft. Mount spindle plate 5x46 001 400 on the puller rods and secure in the second notch from the top. Turn the spindle to pull out the shaft sealing ring.



Place counterholder 5x46 001 429 on the splines of the pinion shaft. Place wrench 5x46 001 422 with extension 5x46 001 429 on the nut. With a suitable lever and open-ended wrench, unscrew and remove the nut.

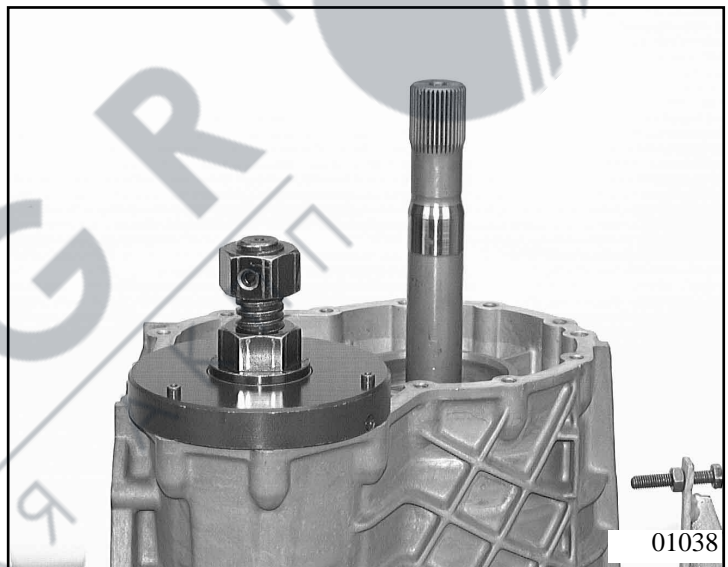
(Wrench width = 27 mm
= 36 mm)

Use pliers 5x46 001 376 to remove the snap ring from the transmission housing.



Using fixture 5x46 001 426, remove the pinion shaft from the transmission housing.

Screw the threaded bracket of the fixture into the thread on the pinion shaft (if necessary hold the pinion shaft with one hand at the pinion).



Insert the pin of the fixture bell into a tapped hole in the housing.

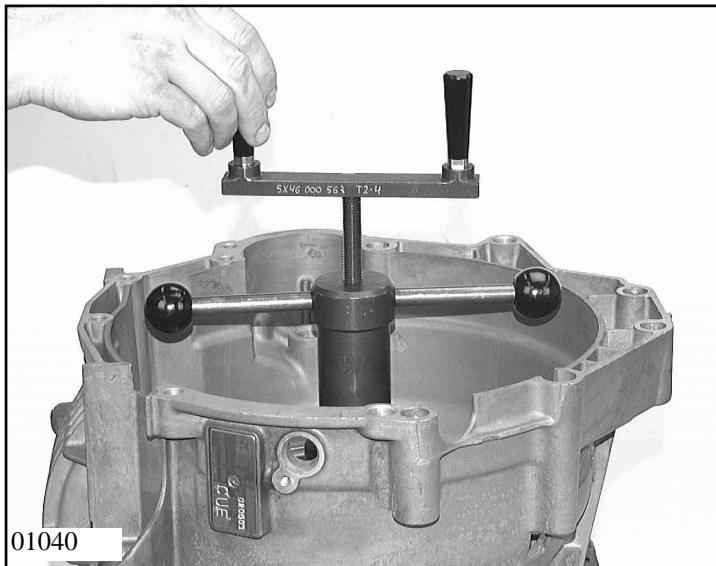
To pull out the pinion shaft, turn the nut above the bell and hold the nut on the spindle.

Remove the countersunk screw for locating the pinion shaft bearing from the transmission housing.

(Wrench width = 36 mm
Wrench size = Torx - TX 30)



2.4 Removing the oil supply unit



Turn the transmission through 180°.
Press the caps out of the oil supply unit with suitable tools.
Remove the 8 screws holding the oil supply unit. Clamp fixture 5x46 000 563 on to the stator shaft.
Turn the spindle of the fixture downwards and lift out the complete oil supply unit. Remove the screws. Remove the shim washer for endplay adjustment and the needle roller cage.

(Wrench size = Torx TX-27)



2.5 Dismantling input with tower

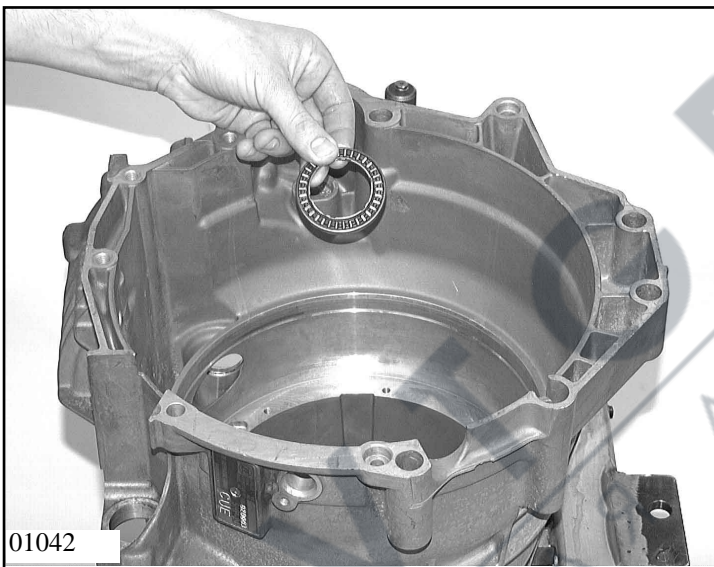
2.5.1 Removing input



Remove tower II (input with clutches A and B).

To do this, lock the lifting fixture 5x46 000 949 (screwed to adapter 5w46 000 004) on to the input shaft. Take the complete unit out by hand and remove the fixture.

Turn tower II through 180° and place in locating fixture 5x46 000 917.



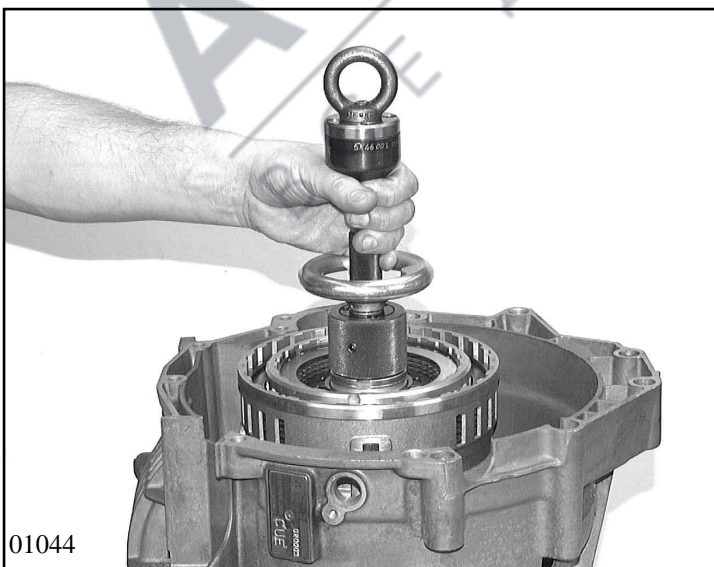
Remove the snap ring from the housing with a screwdriver.

Take the needle thrust bearing off the hub of cylinder C.

Warning:

The second angle thrust washer is positioned in the inner disc carrier B and could come off during washing.

Make sure that it is not lost.



Screw the lifting fixture 5x46 001 077 (bolted to adapter 5w46 000 003) into the planetary gear of the tower and lift out the entire unit with a crane. Place tower I in the locating fixture 5x46 000 916. Remove the lifting fixture.

Turn the transmission through 90° and take out the 12 countersunk screws holding the cylinder F.

(Wrench size = Torx - TX 40)

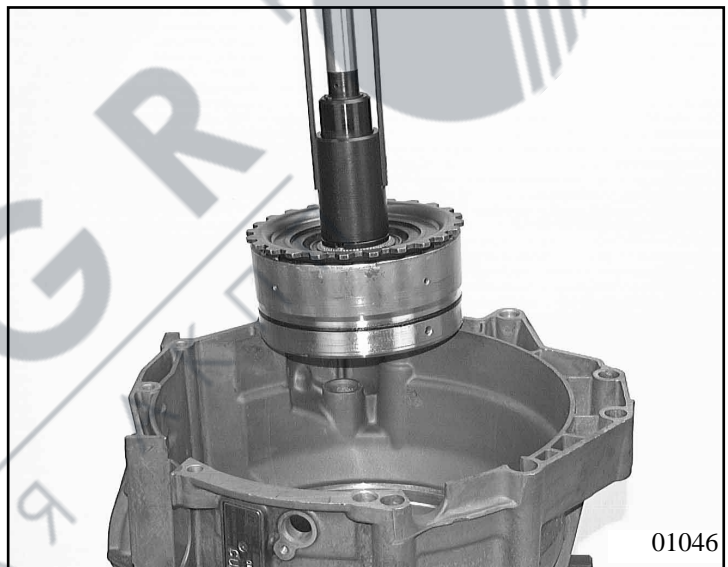


Turn the transmission through 90° and insert lifting fixture 5x46 000 831 into cylinder F by lifting the bracket handle. Releasing the bracket handle locks the fixture.

Turn the fixture until it engages.

Important:

Do not lift it by the bracket handle. Lift cylinder F out by the hand grip.



All screw plugs have to be removed before cleaning the transmission housing.

Disassemble the

- 1 Screw plug for converter clutch open (Wrench size = 5 mm intl. hex),
- 1 Countersunk screw pinion shaft bearing (Wrench size = Torx TX-30) and
- 2 plastic screw plugs at the oil cooler input and output.

Dismantling

2.6 Dismantling Torsen II, covers, intermediate and transfer box housings

2.6.1 Dismantling Torsen II

Check Torsen II for backlash before dismantling.

(see functional check, Chapter 1.8)

Important:

The Torsen II must be assembled exactly as it was before it was dismantled.

All parts have to be assembled at the same positions.

Danger!

Noises, loss of locking action.



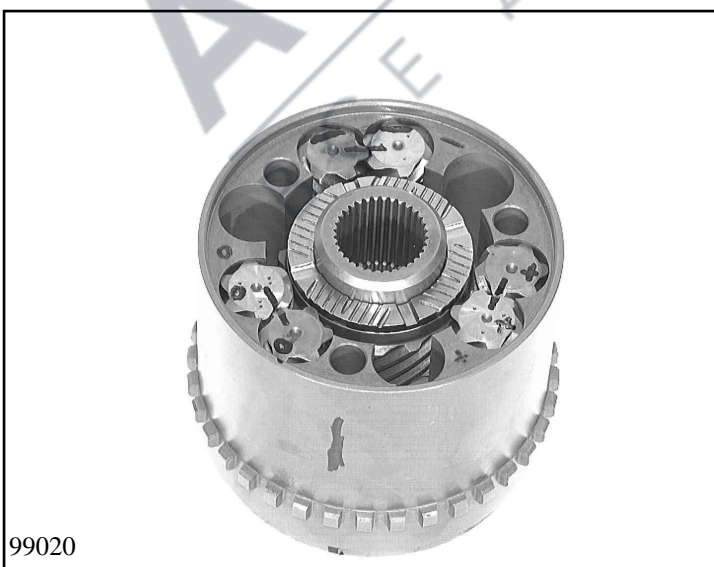
Clamp retaining fixture 5x46 002 262 into a vice.

Place the Torsen II in the retaining fixture with the screw heads at the top.

Identify the position of the parts by marking on the covers and the housing with an electric scribe. Take out the three screws and remove the cover by striking the edge of the cover lightly with a plastic-faced hammer.

Then lift the Torsen II out of the retaining fixture.

(Wrench size = 17 mm)



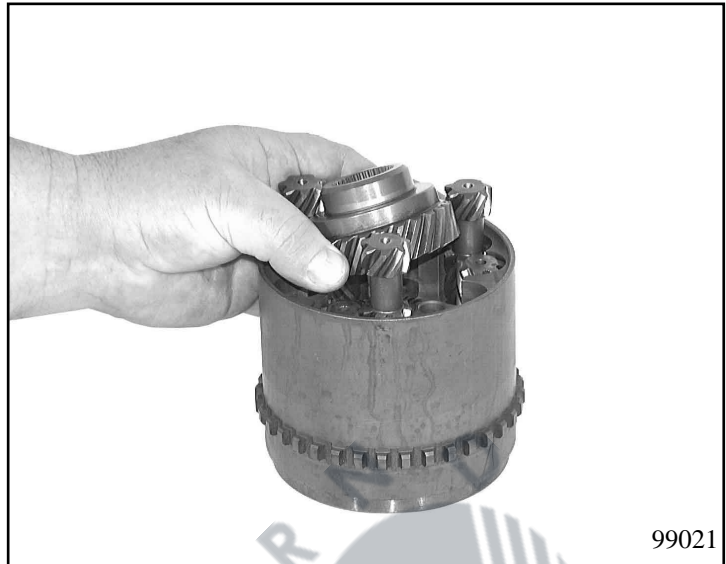
Mark planetary gear pairs, e.g. draw suitable circles, crosses or lines on the front with an electric scribe. Mark the teeth and tooth gaps of the planetary gears that are in engagement with a line.

Apply the same sign to the driver pockets on the outside of the housing.

Remove the thrust washer.
Lift the rear sunwheel with one of each pair of planetary gears. Tilt the sunwheel until it is clear of the planetary gears and can be removed.
Remove the first planetary gear of each pair, working clockwise. These gears have a tooth gap on top. Take out the thrust washer.

Note:

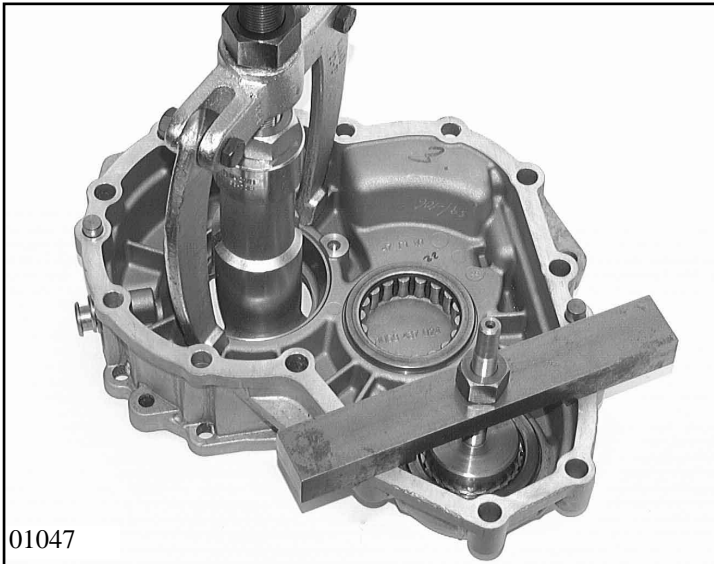
One narrow and 3 identical, wide thrust washers are fitted.



Screw in three screws at least 5 threads through the housing into the lower cover. Place the housing vertically on the workbench. Drive the cover out of the housing by striking the screw heads lightly with a plastic-faced hammer.
Remove the 3 screws from the cover.
Take out the cover, thrust washer, front sunwheel the remaining three planetary gears and the thrust washer.



2.6.2 Intermediate housing



If fitted, undo the oil thrower sheet and take it off. Drive the shaft sealing ring out of the intermediate housing with a suitable tool.

Use tools 5x46 022 002 (Kukko 22-2) and 5x46 021 008 (Kukko 21-8) to remove the outer bearing race.

Use tool 5x53 000 001 to pull both roller sleeves out of the intermediate housing.

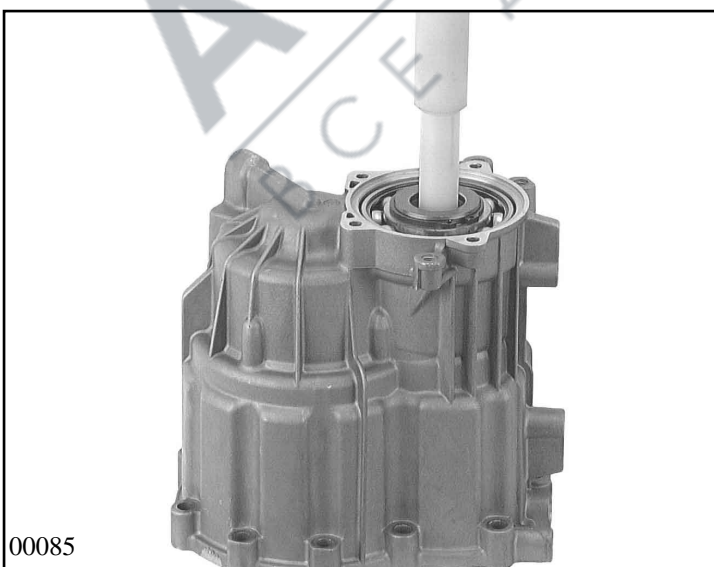
Important: *Do not confuse these items.* Allocate the outer bearing races to the corresponding bearings, or else noise problems will result. Protect sealing areas from damage by placing plastic layers in between. The breathers remain in the housing unless they are damaged.

2.6.3 Cover



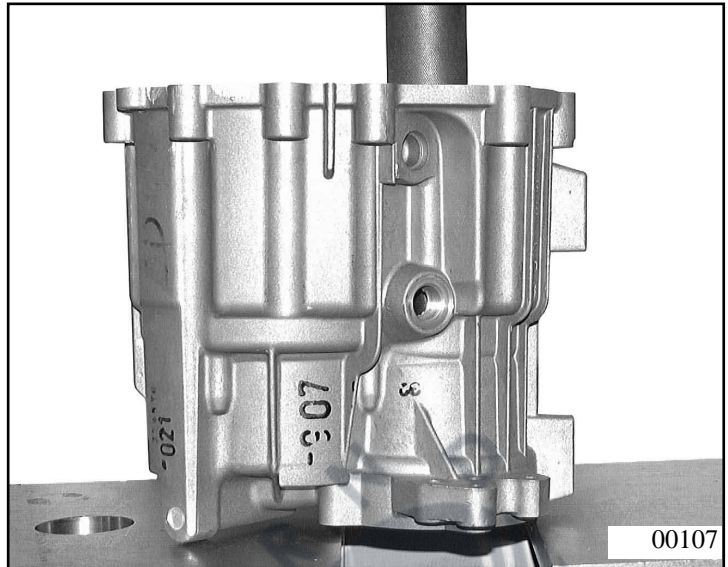
Drive out the shaft sealing ring with a suitable tool and take off sealing ring.

2.6.4 Transfer box housing



Use drift 5x46 002 278 to press the nut for the expansion bolt out of the output gearwheel in the mandrel press.

Use drift 5x46 002 277 to force the output gearwheel out in the press.

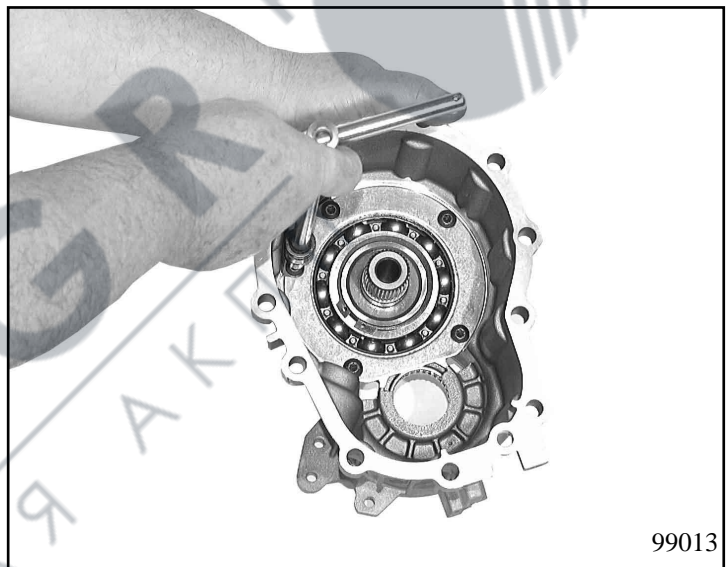


Important:

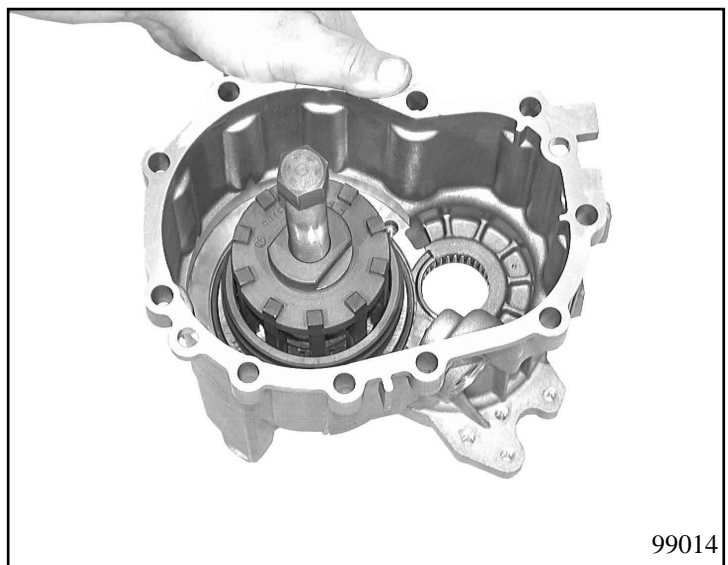
Do not drop the output gearwheel.

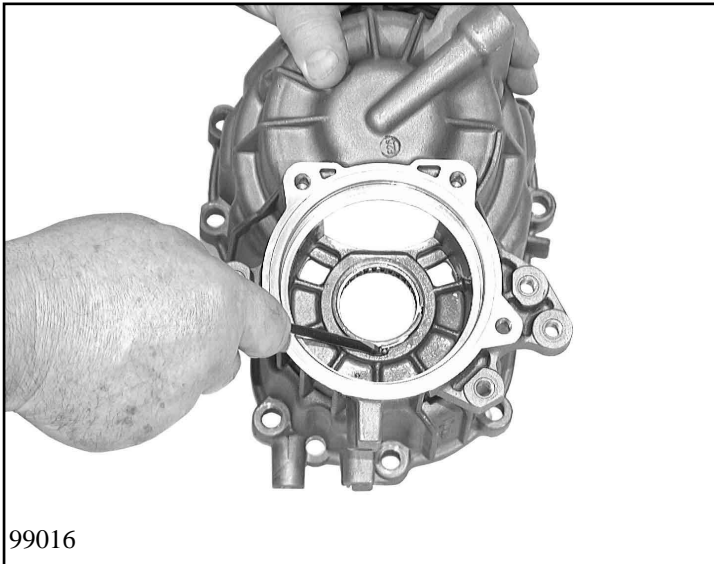
Remove the 2 screws from the oil dam and take it off.
Remove the 3 remaining screws from the disc and take it off.

(Wrench size = Torx TX-27)



Mount ball bearing puller 5x46 002 274 on the rear axle shaft ball bearing. Tighten the puller spindle firmly until the rear axle shaft moves out.





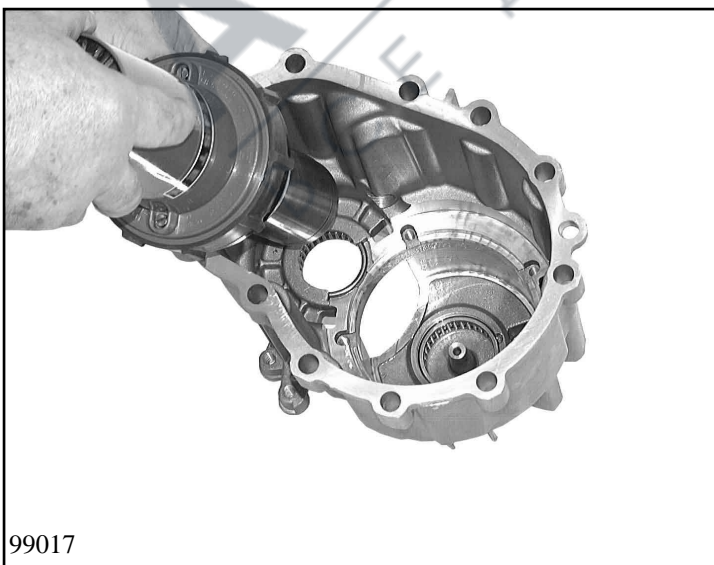
Disengage the snap rings with a screwdriver.

Note:

The snap rings may be difficult to remove if there is no recess.

To avoid this difficulty, the **following procedure** can be adopted:

- 1) Mill away the groove at the snap ring seat in order to be able to insert a screwdriver blade behind the snap ring. (**Warning:** metal swarf)
- 2) Renew the transfer box housing (order a housing with cutouts at the snap ring seats).



Heat the transfer box housing at the needle roller sleeve seats with a hot air blower and pull the needle roller sleeves out with a suitably bent and pointed piece of welding rod. (If the surrounding area is heated correctly, the sleeves will fall out easily.)



2.7 Dismantling bearing shells, bearings etc.

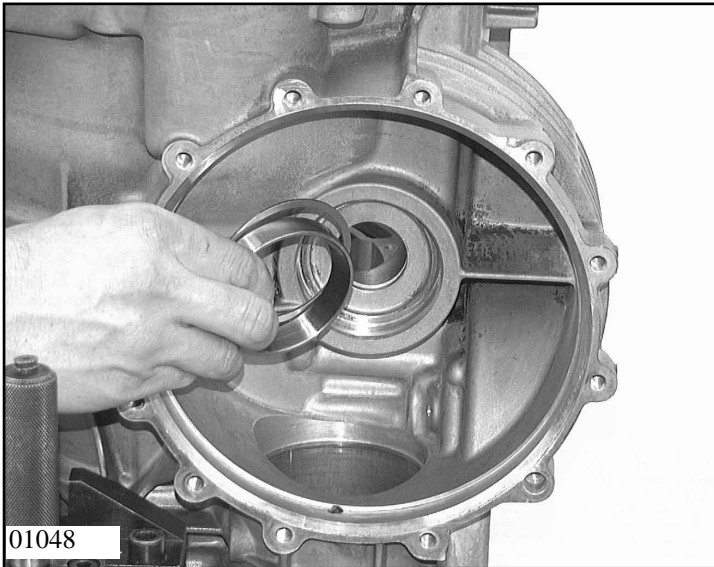
2.7.1 Transmission housing

The differential bearing shell is usually removed from the transmission housing by hand; use tools 5x46 022 002 and 5x46 021 007 if required.

Take out the shim washer.

Note:

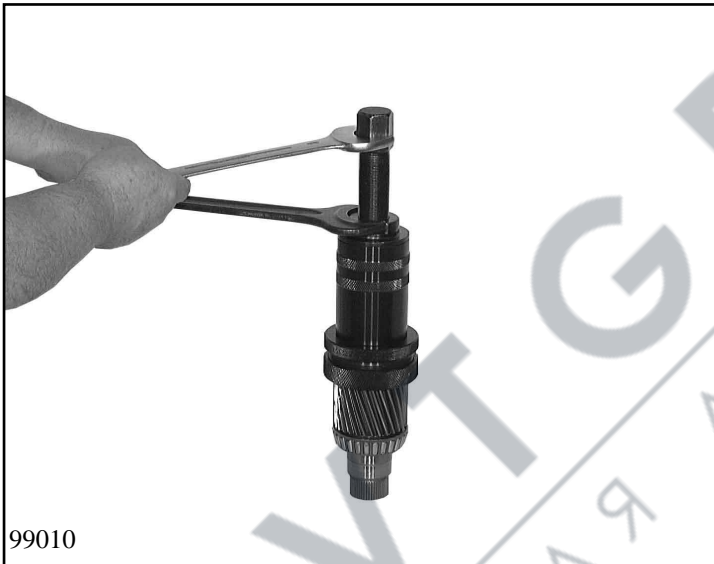
Breathers are not removed unless damaged or if they malfunction.



2.7.2 Front axle shaft

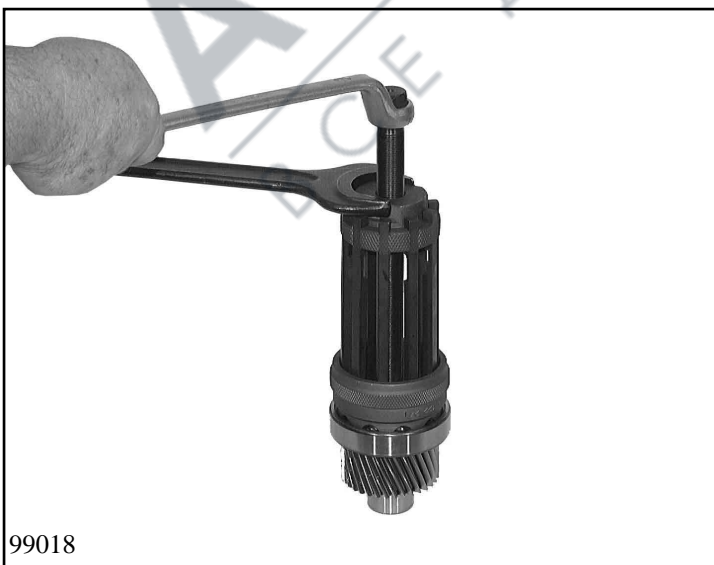
Drive the shaft sealing ring out of the front axle shaft with a suitable tool.

Pull off the bearing inner races with puller 5x46 032 010 (Rollex 32010x1), core insert 5x46 002 000 and basic tool 5x46 503 491 (Rollex 1A).



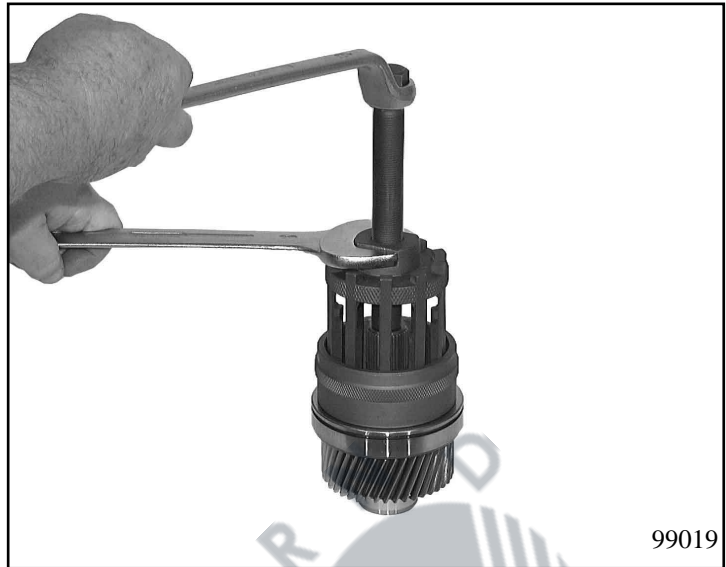
2.7.3 Rear axle shaft

Disengage the circlip with suitable pliers. Remove the snap ring with suitable pliers. Pull off the ball bearing with puller 5x46 002 274 and core insert 5x46 002 275.



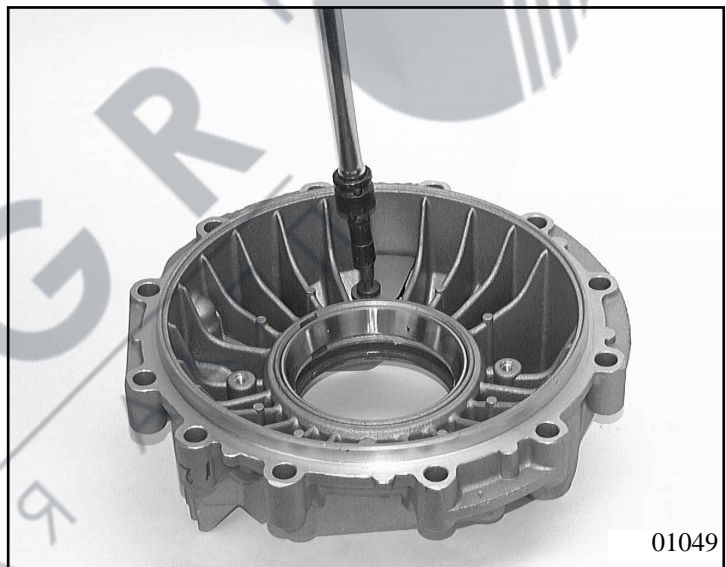
2.7.4 Output gearwheel

Disengage the circlip with suitable pliers.
Take off the ball bearing with puller
5x46 002 273 and core insert
5x46 002 276.



2.7.5 Differential cover

Pull off the ring seal.
Remove 1 screw of the magnetic plate
from the differential cover.
Take out the magnetic plate and the
magnet.
Remove the bearing wheel and adjusting
spacer manually or with tools
5x46 022 002 and 5x46 021 008.
Lever out the shaft sealing ring with a
suitable tool.



2.7.6 Pinion shaft

Place the pinion shaft in sleeve
5x46 000 530 and press out the double
bearing in the hydraulic press.
Lift off the double bearing with the bear-
ing inner race and the spacer disc.





Use the puller 5x46 032 010 (Rollex 32010x1), tool 5x46 000 530 and the hydraulic press to press the bearing inner race off the pinion shaft.
Remove the shim washer.

01051

2.7.7 Differential (visual check)



Pull the cover side bearing inner race off the differential with puller 5x46 806 649 (Rollex 806649), core insert 5x46 002 159 and basic unit 5x46 010 011 (Rollex 10001).

Pull off the other bearing inner race with puller 5x46 300 849. (Rollex 300849) core insert 5x46 002 162 and basic unit 5x46 010 011.

99100

(Only if a torque wrench with a yield-limit control is available:)



Clamp fixture 5x46 002 167 into a vice, remove the 12 crownwheel screws and take off the crownwheel, if necessary dislodging it with a plastic drift.

Remove the differential from the fixture, turn through 180° and push out the pin.

Important:

All parts must be installed exactly as they were originally located. The bevel gears with shim washers and the planetary gears with thrust washers must not be accidentally confused.

99101

Turn the planet wheels through 90° around the differential shaft and remove them with the thrust washer through the inspection aperture.

Remove the upper bevel gear with shim washer.

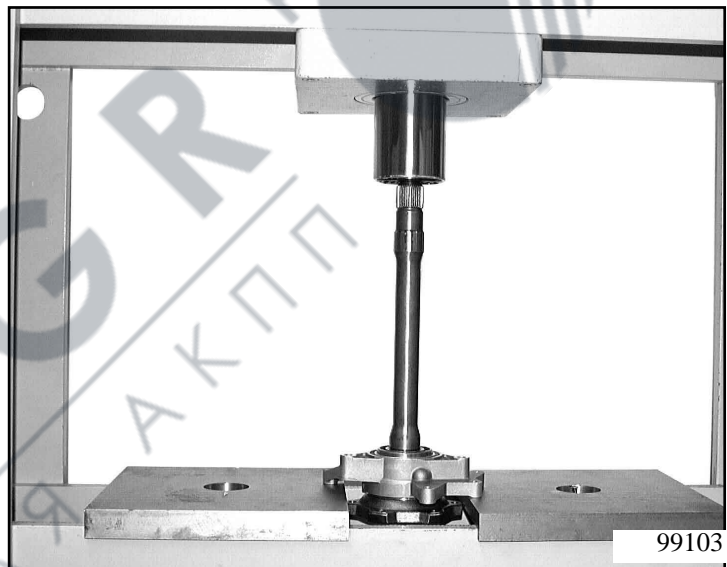
Remove the flange retaining washer and the lower bevel gear with shim washer.



2.7.8 Flange shaft

Lift the sealing ring off the flange shaft. Using suitable pliers, extract the snap ring from the groove in the flange shaft. Separate the flange shaft from the speedometer housing, using the hydraulic press.

Lift off the speedometer housing and the magnetic ring.



Lever the shaft sealing ring out of the speedometer housing.

Heat the speedometer housing slightly and take out the ball bearing.



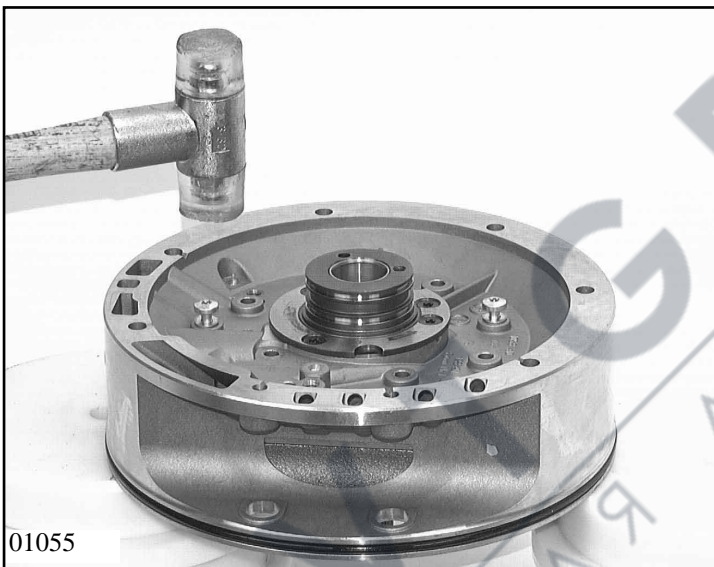
2.8 Oil supply unit



Place the entire oil supply unit on a suitable surface. Take the 2 rectangular-section rings off the stator shaft. Slacken off the 2 screws from the oil retaining plate and remove them with the plate. Using a suitable tool, lever out the oil pipe.

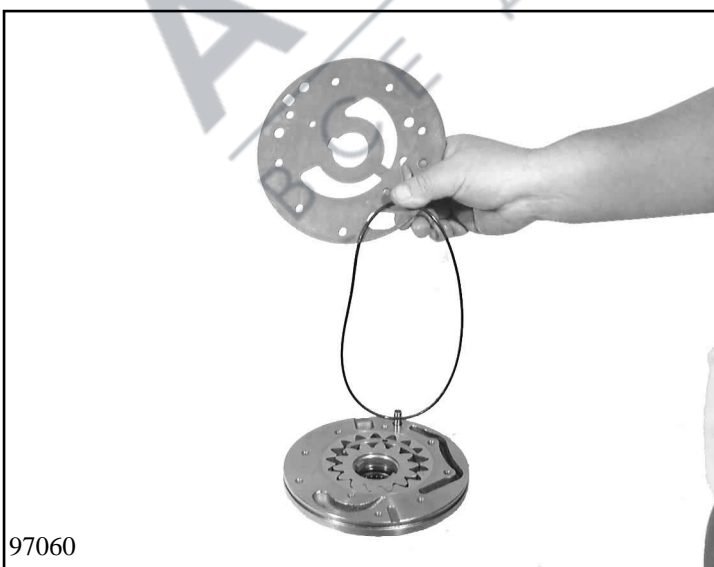
Important:

Up to transmission No. 7903, the oil supply unit must be replaced. (see ELCAT)



Undo the 11 machine screws but do not remove 2 machine screws on opposite sides completely. Drive out the pump by carefully striking these two screws with a plastic-faced hammer. Remove O-ring from oil supply unit.

(Wrench size = Torx - TX 27)

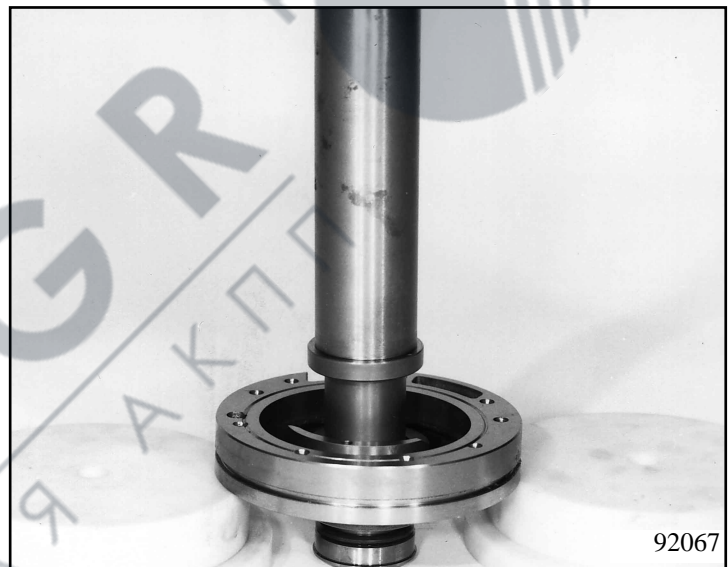


Pull off intermediate plate and the sealing ring from pump. The pump can be dismantled by taking out the pump wheel and the ring gear. Pull out the sleeve (positioning pin).

Disengage the snap ring and lever off the shaft sealing ring with a suitable screwdriver. Take out the shaft disc.



Press out the sealing ring with the needle roller bearing in the mandrel press. The diameter of the pressure pin is 42 mm.



Undo 5 countersunk screws, heat the housing of the stator shaft to approx. 70° C and drive the stator shaft out of the intermediate plate with a plastic-faced hammer.

(Wrench size = Torx - TX 30)

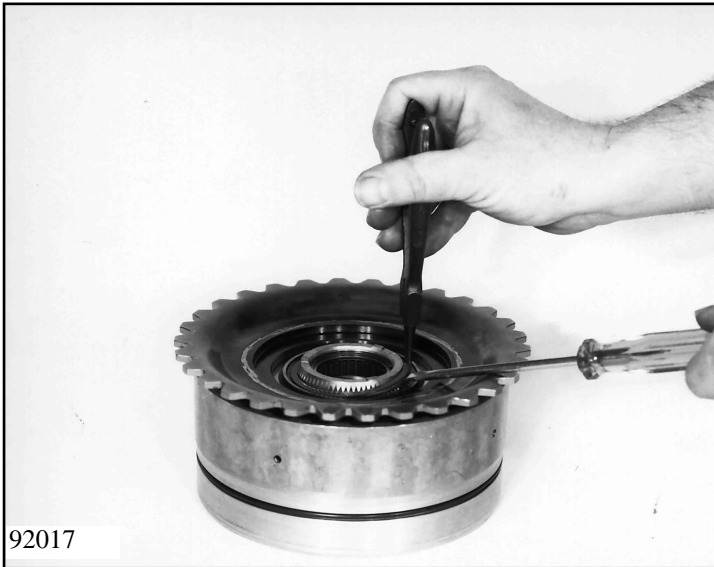
Important:

Do not remove the volume control valve. Check the volume control valve visually for score marks and the spring for free play with pointed pliers.



2.9 Brake F, tower I + II

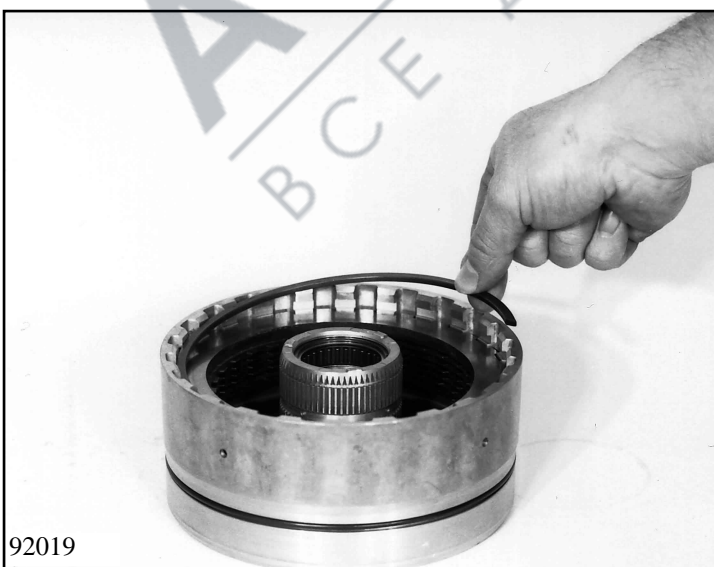
2.9.1 Brake F (with 1st gear freewheel)



The complete freewheel can be separated from cylinder F. To do this, take out the snap ring with suitable tongs and a screwdriver and remove the freewheel completely.

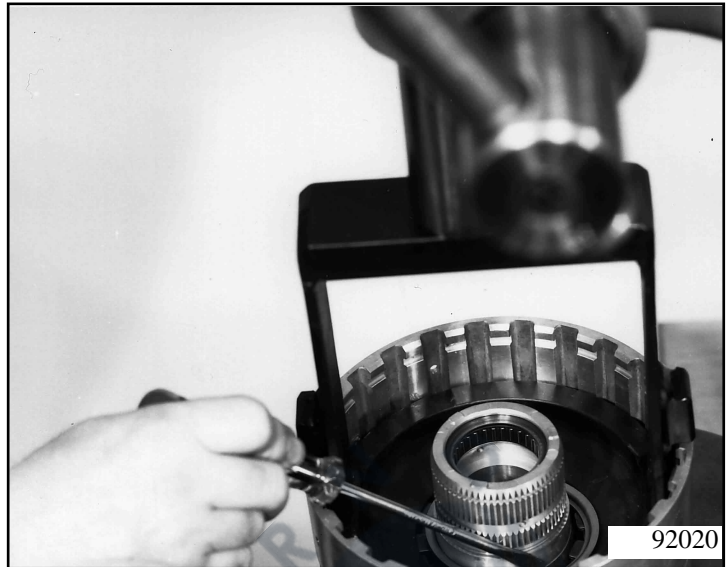


Disengage the snap ring and dismantle the complete freewheel into: retaining disc, inner freewheel race, cover disc, freewheel cage, cover disc and external freewheel race.



Disengage the snap ring and remove the entire disc set of brake F

Pull the O-ring off cylinder F, press down the cup spring in the mandrel press with installation hoop 5x46 000 931 and remove the divided ring. Remove the cup spring.



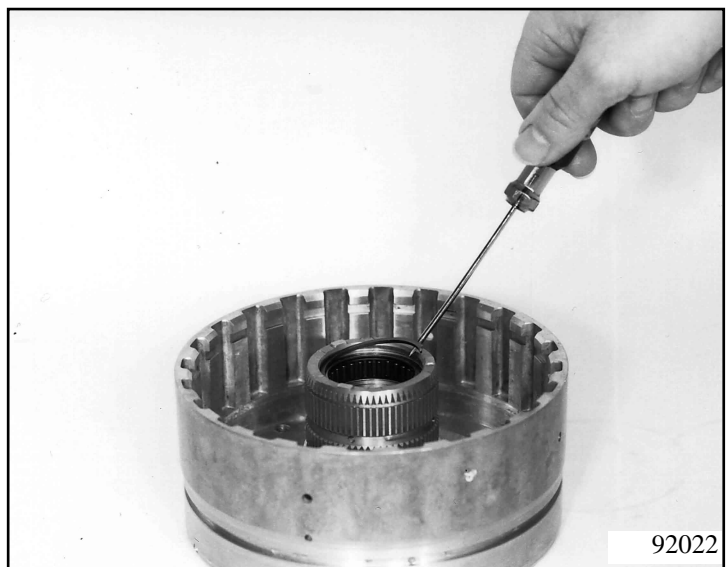
Press the piston out of cylinder F with the aid of two plastic drifts.



Important:

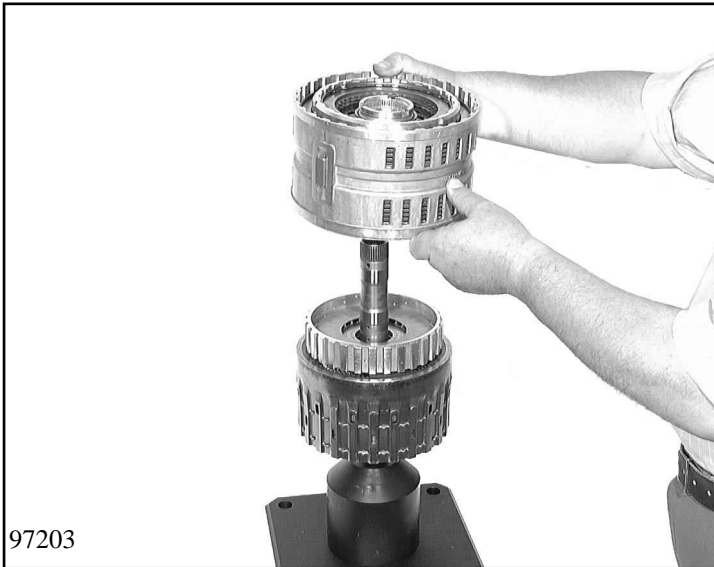
Store the pistons in a way that the sealing lips cannot fold over or be damaged.

Disengage the snap ring and drive the needle roller bearing out of the cylinder hub with a suitable drift. Use installation hoop 5x46 000 931 as a support surface if necessary.

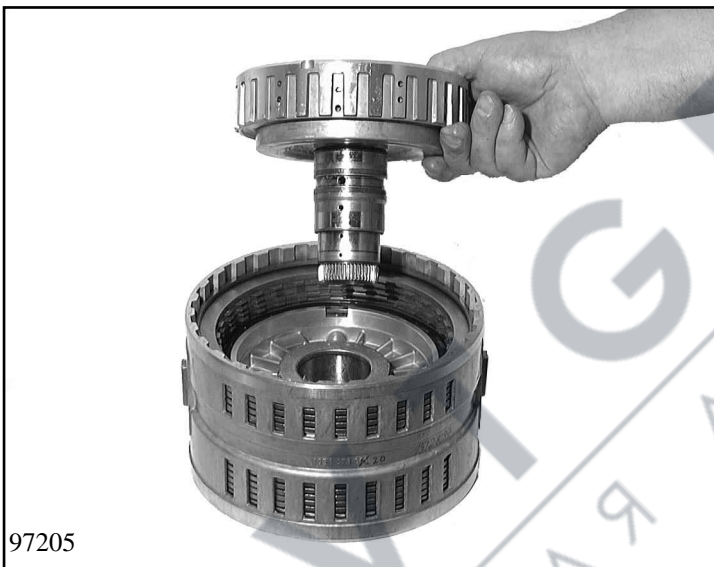


2.9.2 Brakes D, E and clutch C

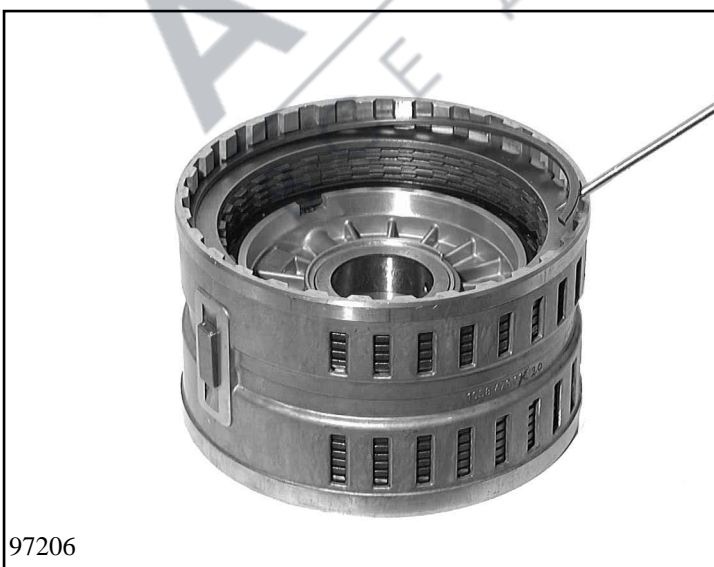
Lift off brakes D/E with complete clutch C.



Take out clutch C with sun gear shaft.
Take the axial needle roller bearing off the hub of cylinder D.



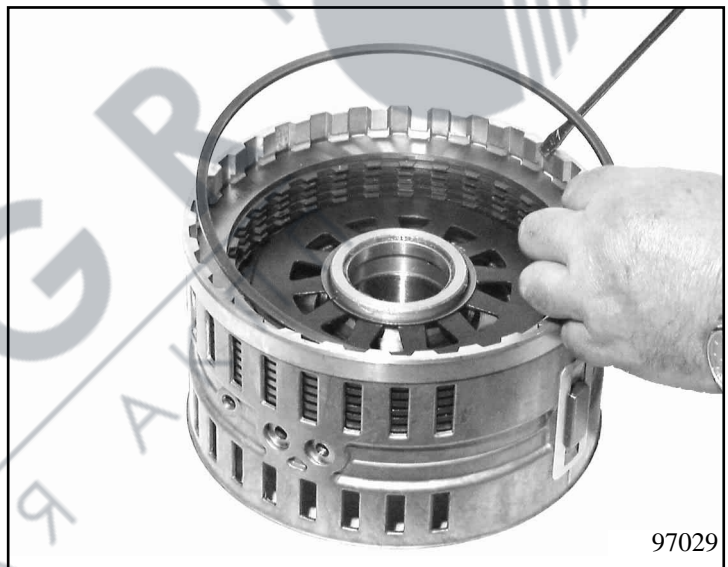
Disengage the snap ring for brake D and take out the entire disc set.



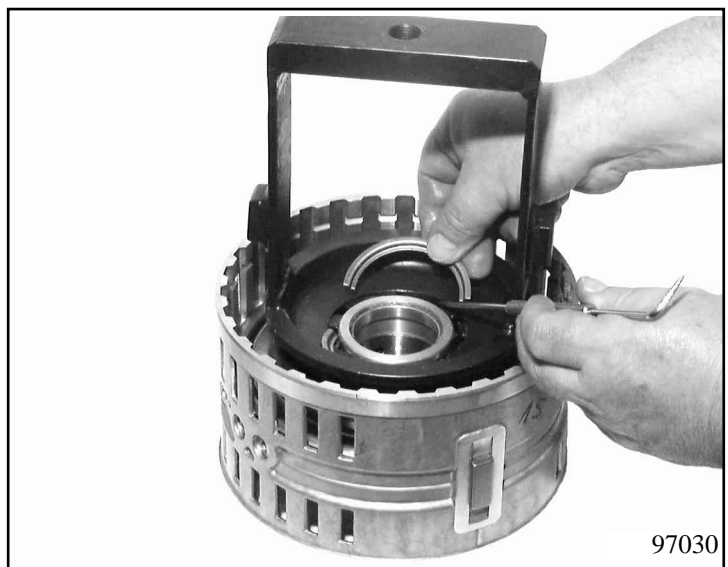
Using installation hoop 5x46 001 501, press down the cup spring C in the drift press, take out the snap ring and remove the cup spring.

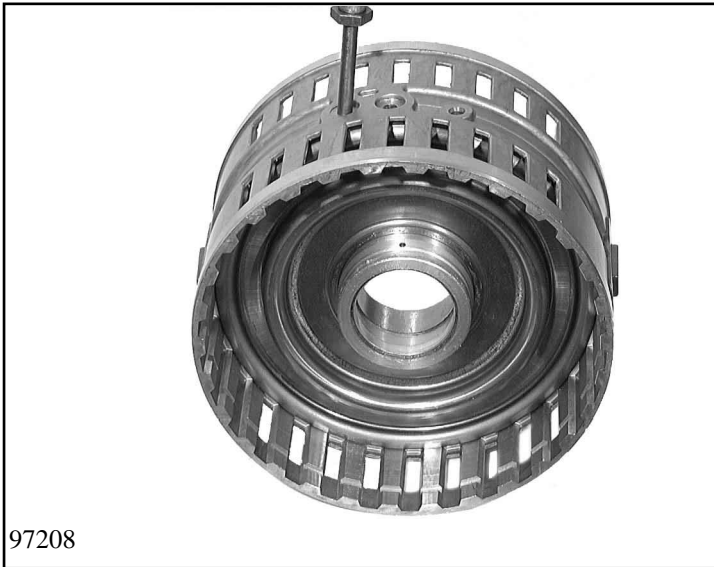


Turn cylinder D/E around, disengage the snap ring of brake E and remove the complete disc set.



Using installation bracket 5x46 001 502, press down the cup spring E in the drift press, take out the divided retaining ring and remove the cup spring





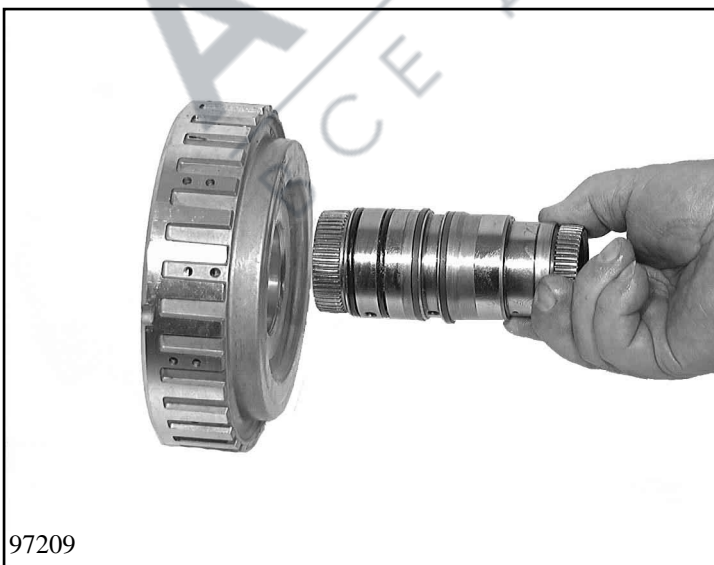
Apply the compressed air gun to the oil feed bore and press out pistons D and E with compressed air. Remove the O-ring from the cylinder and from piston E and the two O-rings from piston D.

97208



Drive the sleeve out of cylinder D/E. Pull the two O-rings off the sleeve.

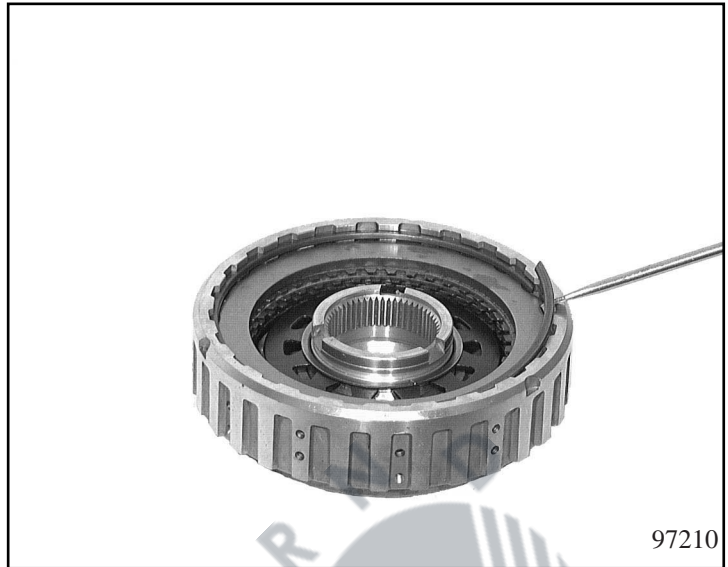
97032



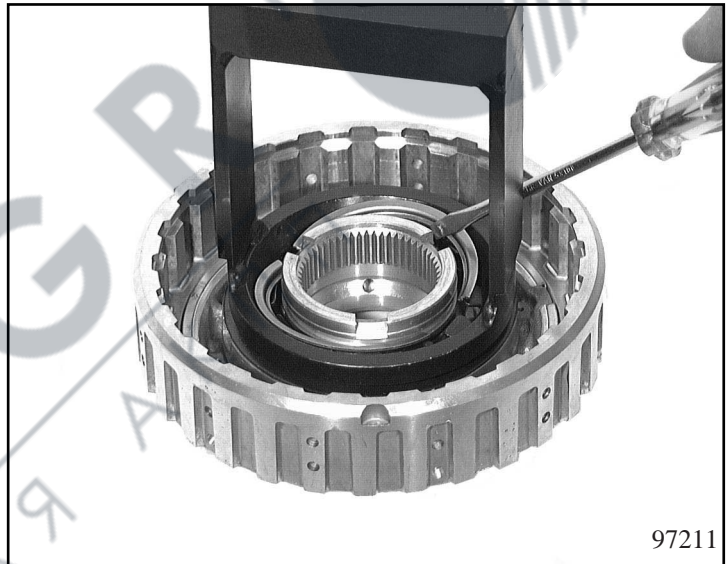
Press the sun wheel shaft out of cylinder C with a suitable drift. Remove the two O-rings and two rectangular-section rings from the shaft.

97209

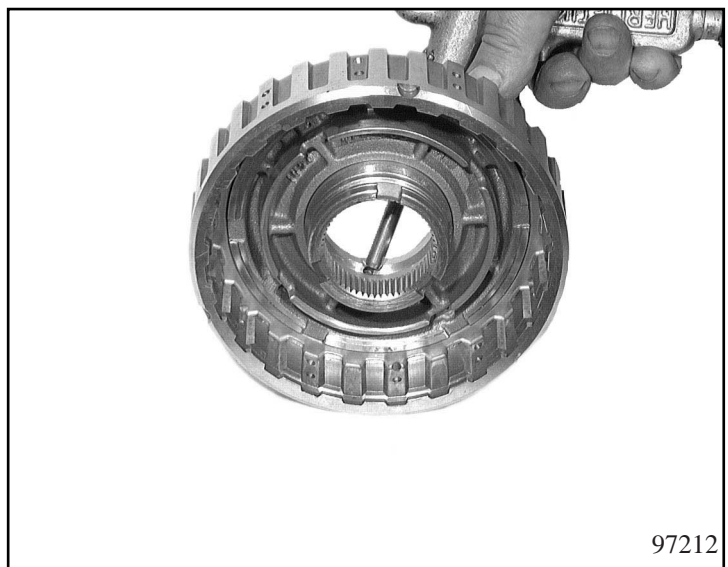
Disengage the snap ring of clutch C and take out the entire disc set.



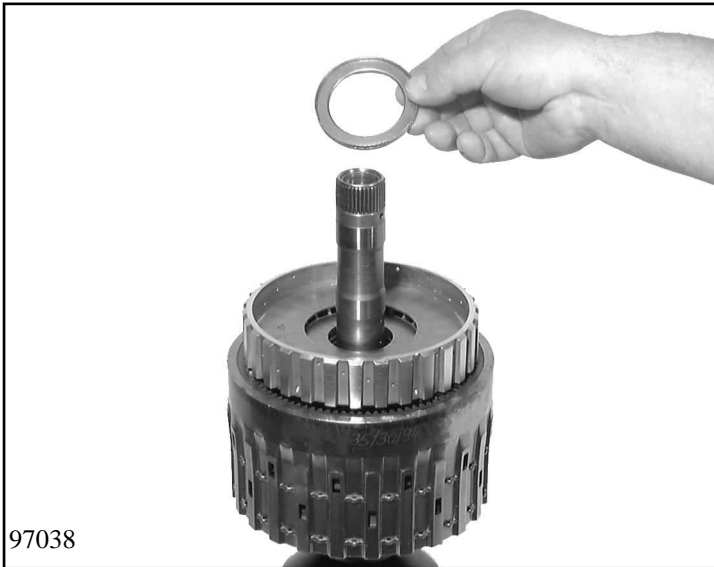
Using installation bracket 5x46 030 167, press down cup spring C in the drift press, take out the divided retaining ring and remove the cup spring.



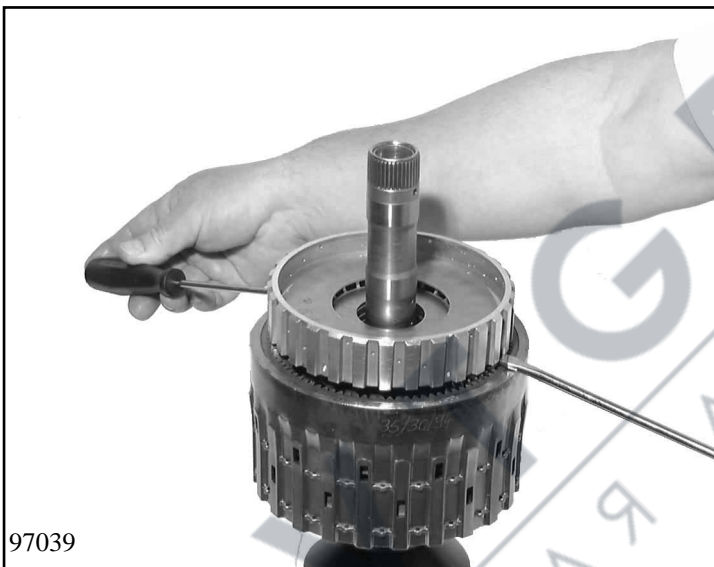
Press out piston C carefully by applying compressed air to the oil feed bore. Block the other bores while doing this.



Important:
Pull the two O-rings off the piston.



Lift off the axial needle roller bearing.



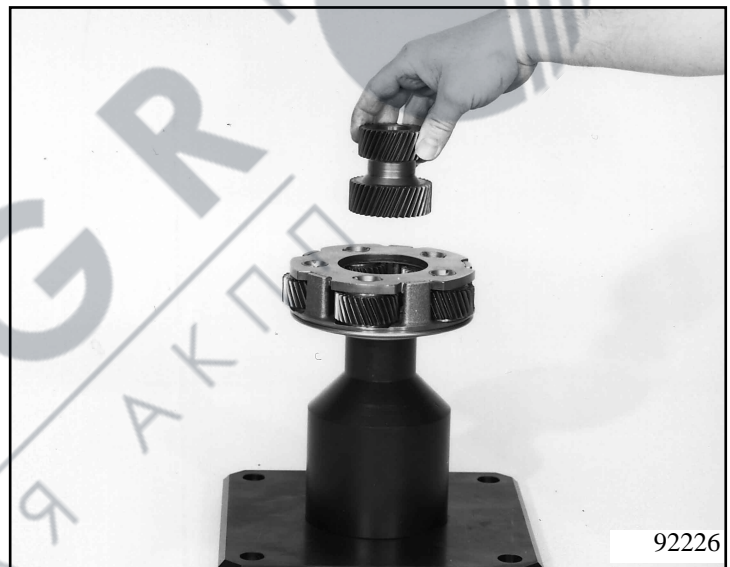
Using two screwdrivers, take off planetary carrier E and thrust ring.

2.9.3 Planetary gear sets (III, II and I)

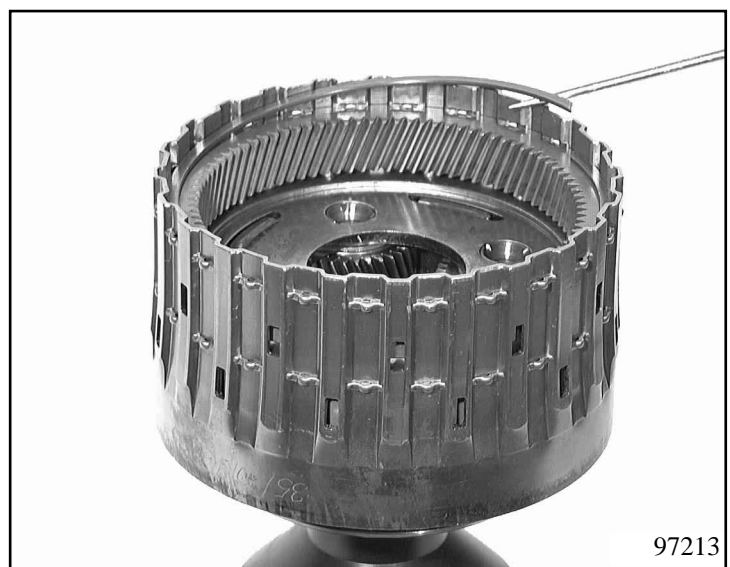
Lift planetary gear set I + II off planetary gear set III.

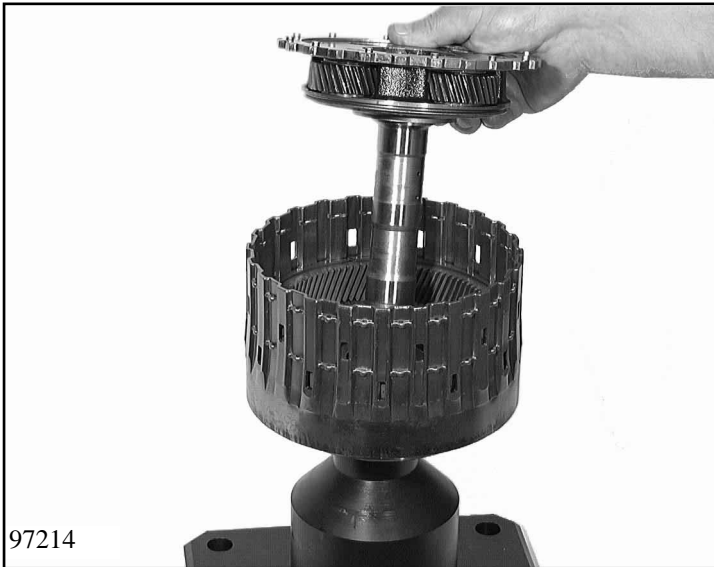


Dismantle planetary gear set III by taking the sunwheel out of planetary gear set III.

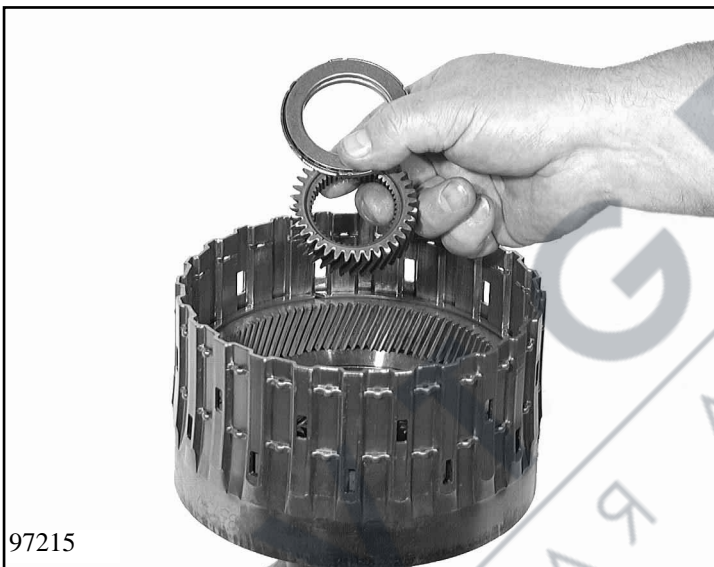


Place planetary gear set I + II in fixture 5x46 000 916. Disengage the snap ring and take out ring gear III.





Lift out planet carrier II.



Take out the axial needle roller bearing and the sunwheel.



Disengage the snap ring and the divided planet carrier I from ring gear I with ring gear II.

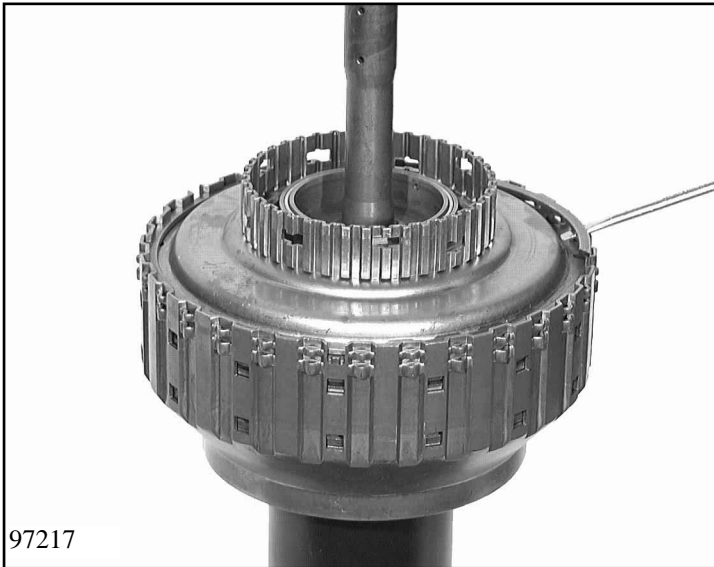
Ring gear II can be separated from planetary carrier I by disengaging the snap ring. Pull the O-ring off planet carrier I.



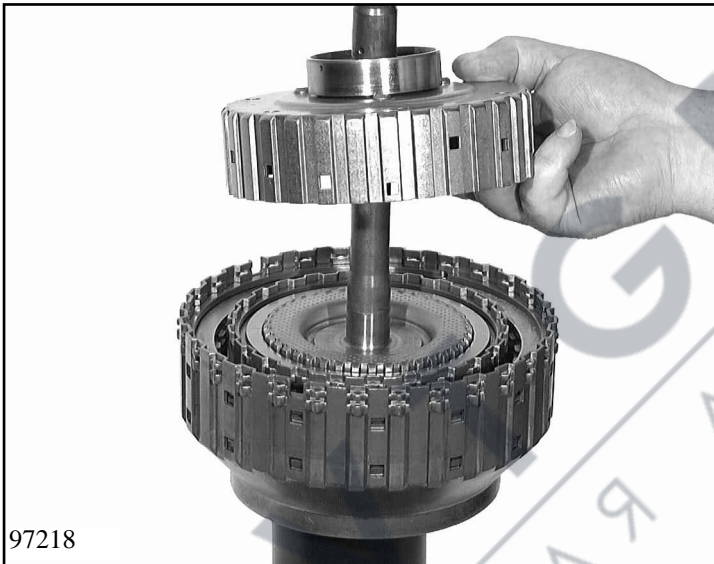
AVTGR
ВСЕ ДЛЯ АКПП

2.9.4 Tower II

Disengage the snap ring and remove inner disc carrier C.

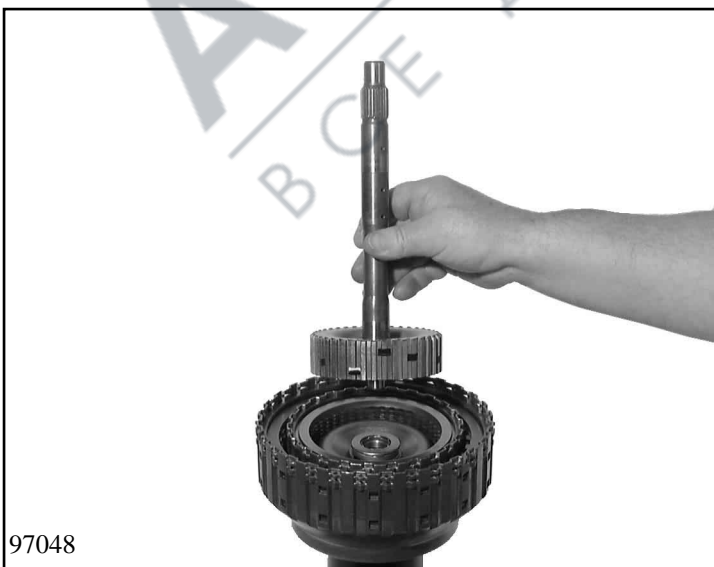


Take out inner disc carrier B and lift axial needle roller bearing off intermediate shaft.

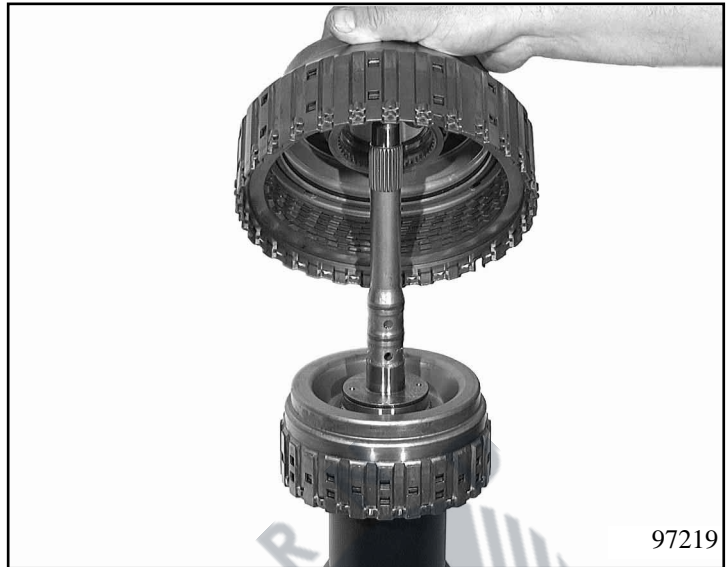


Lift off intermediate shaft with inner disc carrier A. Remove axial needle roller bearing.

Turn the disc set through 180° and re-insert in the installation fixture.



Pull clutch B off clutch A / input shaft.



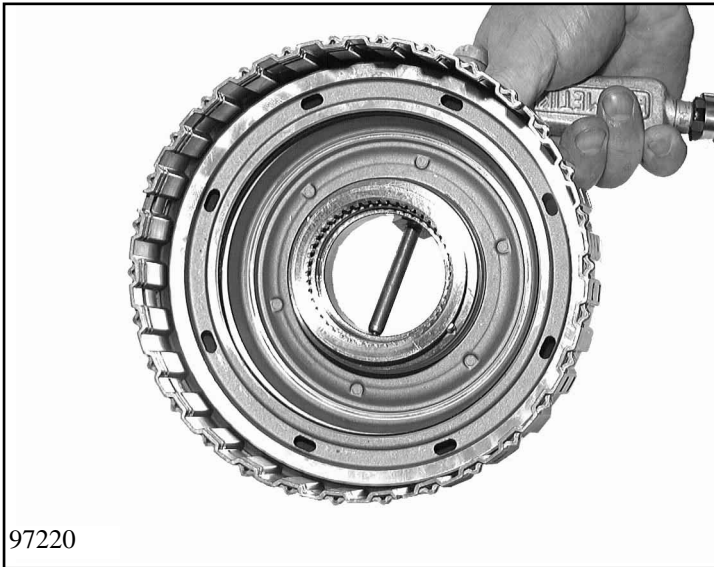
Note:
The input shaft is splined to clutch B.

Disengage snap ring for clutch B and take out the complete disc set.



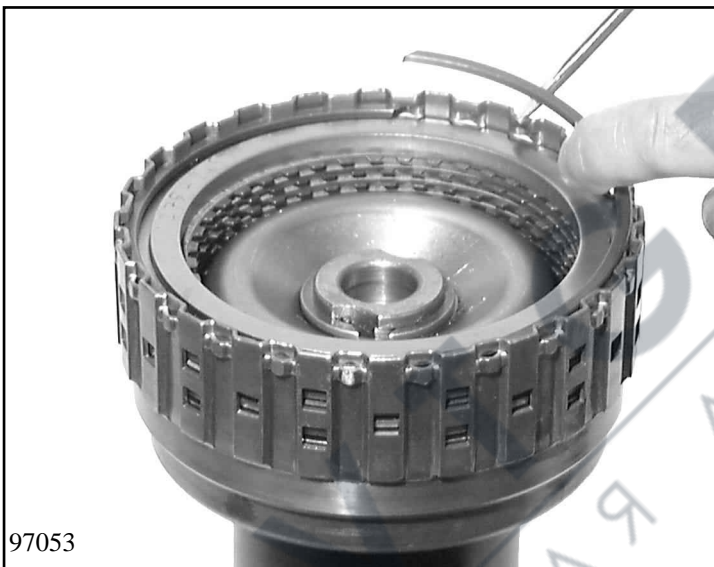
Using the installation bracket 5x46 001 500, press down the cup spring in the mandrel press and remove the snap ring with suitable pliers. Takeout retaining disc and cup spring.





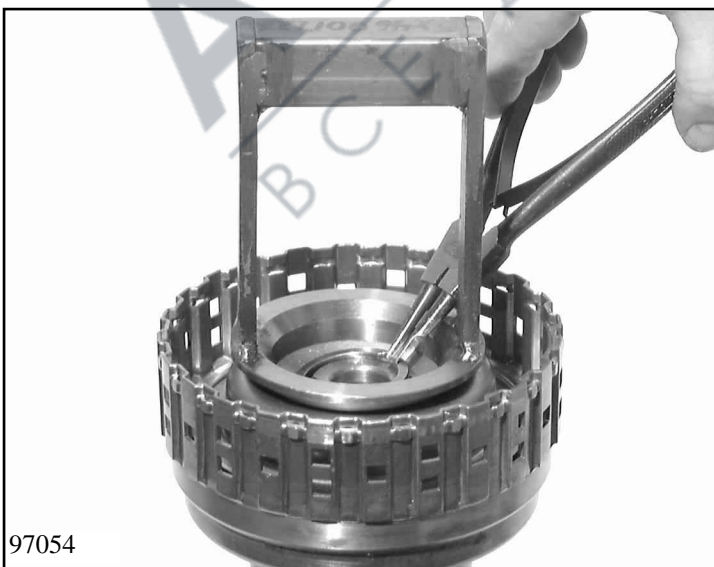
Cover one of the two oil feed bores and press out the piston with compressed air. Pull the three O-rings off piston B.

97220



Disengage snap ring for clutch A and take out the complete clutch A disc set.

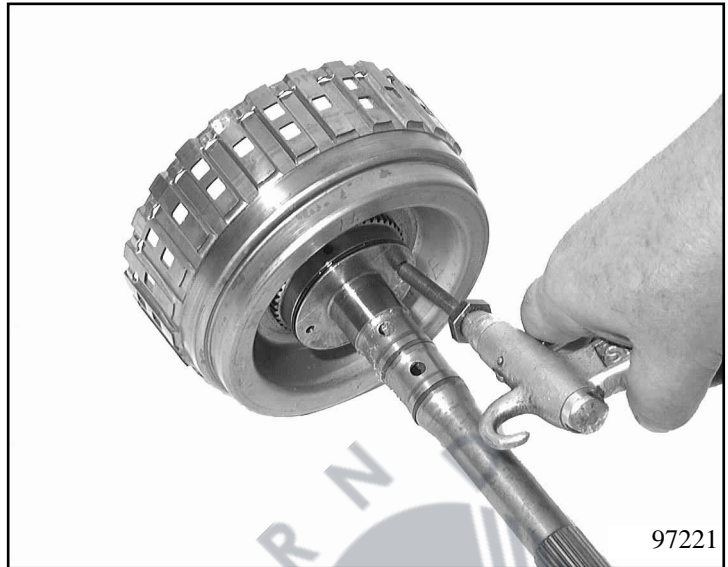
97053



Using installation bracket 5x46 001 499, press the baffle plate down and remove snap ring with suitable pliers. Take out baffle plate and cup spring and remove O-ring from baffle plate.

97054

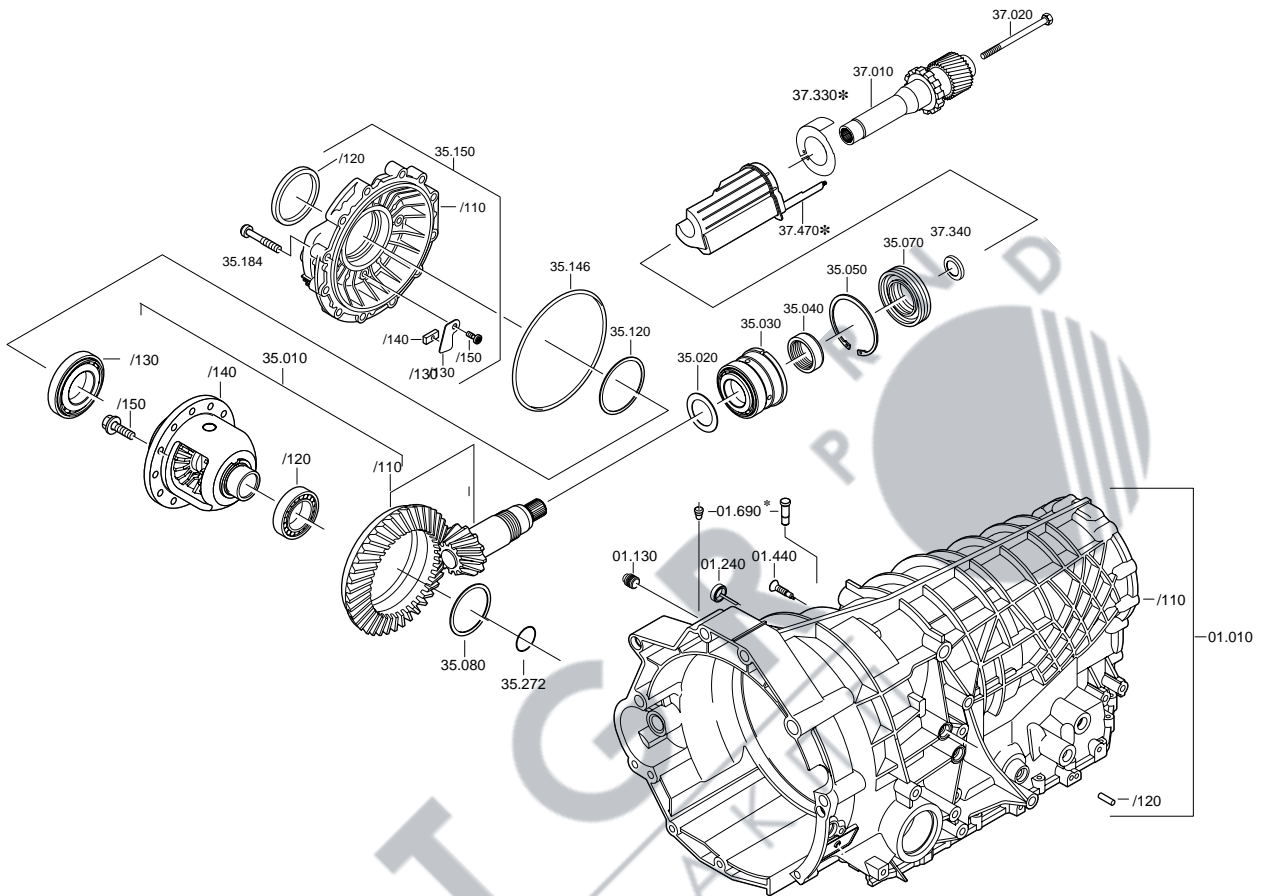
Cover one of the two oil feed bores and press out piston A with compressed air. Take off the two O-rings.



Remove the O-ring and the two rectangular-section rings from the input shaft.



3. Installation

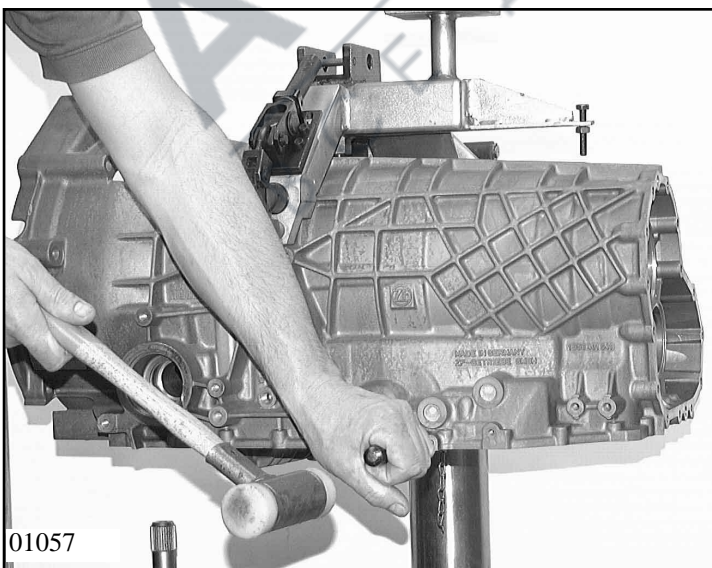


(With new transmission housing only)

Drive Differential breather 01.690 using drift 5x46 001 525 - or 5x46 001 411 if in the pinion shaft tunnel - into transmission housing 10.010/110.

Mount the transmission housing in assembly bracket 5t66 000 108 and attach to assembly truck or workbench holder 5x46 000 763.

Drive in position switch pin 01.010/120 using drift 5x46 002 222.



If there is a tube breather, then align clips 37.640 with positioning tool 5x46 001 689 and drive in.

Subsequent drive in tube breather 37.600 using drift 5x46 001 687 into drop housing.

Drive in otherwise 2 respectively .subsequent 1 breather 37.550 into drop housing using drift 5x46 001 525 resp. 5x46 001 805.

Adjustment overview

Note:

During transmission assembly work the bevel drive (pinion shaft, crownwheel and differential) does not have to be re-adjusted unless components that directly affect its settings were renewed. To avoid unnecessary adjustment work, note the following table:

Components renewed:

Transmission housing: A+B+C
Differential cover: A+ C
Pinion shaft taper roller bearing: B+C
Differential taper roller bearing: A+C
Pinion shaft bevel gear set: A+B+C
+ crownwheel

Components to be adjusted:

A ⇔ Differential S_{ges} ($= S_1 + S_2$)
B ⇔ Pinion shaft S_3
C ⇔ Backlash 0.27 – 0.37mm
(up from MPL 015: 0.14-0.27 mm)

3.1 Installing pinion shaft and differential

3.1.1 Adding parts to differential



Install lower bevel gear with flange retaining and shim washers and upper bevel gear with shim washer into differential cage through inspection hole. Raise the upper bevel gear and insert the planetary gears with thrust washer through the inspection aperture. Turn the planetary gears through 90° round the differential axis and locate in position with the pin.

Important:

The bevel and planetary gears must be paired with their shim washers and installed exactly as they were previously removed.



Clamp fixture 5x46 002 167 into the vice, insert differential into fixture and secure crown wheel 35.010/ 110/020 with 12 screws 35.010/150 to differential cage 35.010/140, using Quantec EMS ISI No. 7086 yield-limit controlled wrench.

Important:

Note threaded connection specification, Chapter 1.3.7

(Wrench operation is explained during training.)



Install inner bearing races 35.010/130, 35.010/120 with sleeves 5x46 002 220/221 on the differential in the mandrel press.

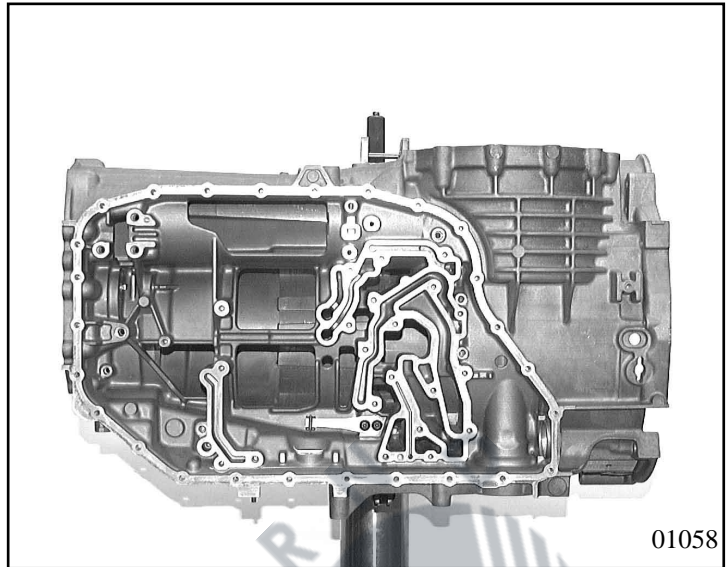
3.1.2 Adding parts to the pinion shaft

Turn the transmission housing with the differential opening upwards.

To do this, screw the eyebolt with the M8 thread into the tapped hole in the housing. Use a crane to suspend the holder in the assembly trolley or work-bench mounting and secure or fasten it there.

Important:

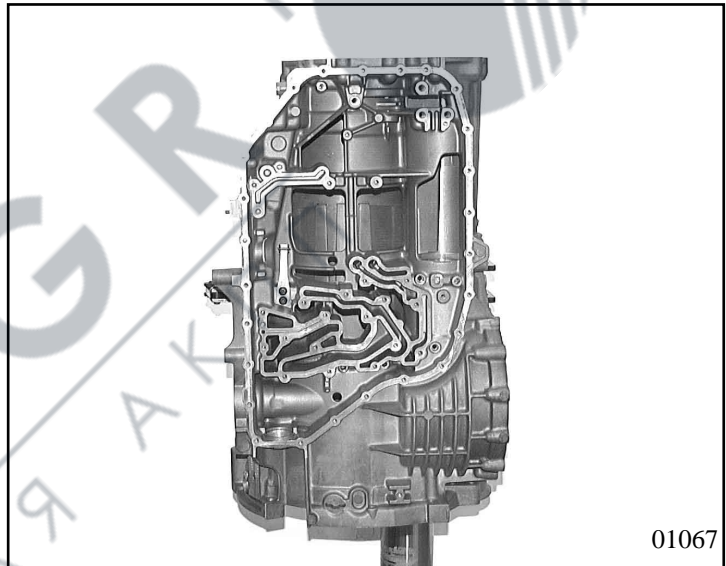
For adjusting work, see Chapter 1.4.2



Turn the housing through 90° with the converter bell downwards.

Important:

For adjusting work, see Chapter 1.4.6.2



Place shim washer 35.040 on pinion shaft 35.010/130.

Install inner bearing race 35.020 on the pinion shaft in the mandrel press, using drift 5x46 002 217. Install the bearing spacing washer and outer bearing race. Install the other inner bearing race in the mandrel press, using drift 5x46 002 217.

Important:

For adjusting work, see Chapter 1.4.3.1





00008

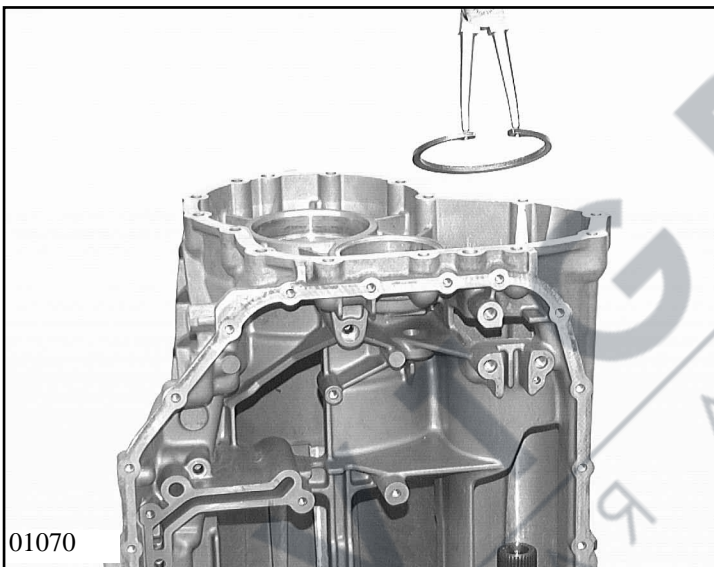
Screw locknut 35.040 with fixture 5x46 002 174 on to the pinion shaft and caulk into position.

To do this, clamp retaining fixture 5x46 042 174 horizontally into the vice.

Place the adapter piece 5x46 002 461 on the pinion shaft. Place wrench 5x46 012 174 on the pinion shaft locknut. Also pass insertion tool 5x66 000 030 (wrench connected to torque wrench) over the pinion shaft, then push the pinion shaft into the splines of the retaining fixture, tighten and fix the locknut.

(Tightening torques see Chapter 1.5)

3.1.3 Installing the pinion shaft



01070

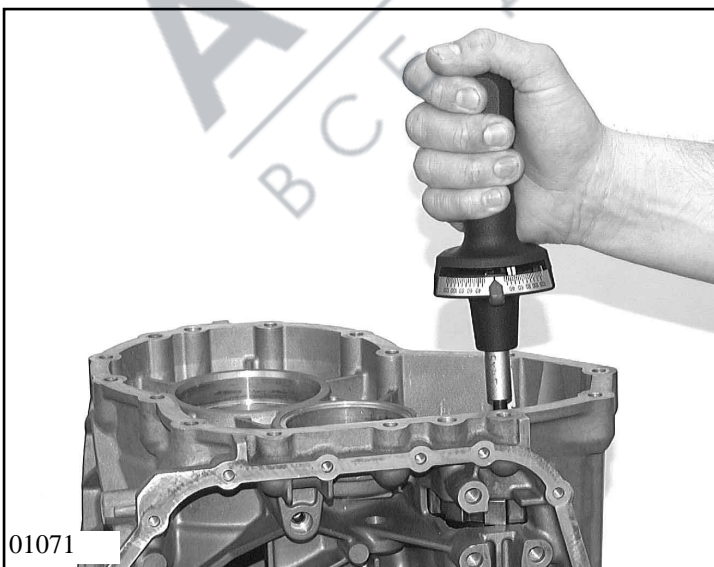
Insert a new countersunk screw 01.440 into the transmission housing.

Heat the transmission housing strongly at the pinion shaft bearing seat with a hot-air blower. Insert an expansion bolt into the pinion shaft and place the complete pinion shaft in the transmission housing so that the groove in the outer bearing race precisely engages with the countersunk screw in the transmission housing. Remove the expansion bolt again. Secure with snap ring 35.050 (tapered face upwards). (Tightening torque see Chapter 1.5)

Important:

For adjusting work, see Chapter 1.4.3.2

3.1.4 Checking pinion moment



01071

(without differential, shaft sealing ring, pinion moment max. 2.5 Nm, bearing oiled. Place adapter 5x46 002 461 on pinion shaft and adapter 5x66 000 027 on the drive splines of the adapter. Use connector 5x66 000 029 (H&K 52 205 300) to link adapter with torsionmeter 5p66 000 059 (H&K 52 205 250). Turn the torsionmeter uniformly and read off the scale value.

Important:

The housing must first have cooled down to room temperature.

3.1.5 Installing pinion shaft sealing ring and lateral shaft

Place shaft sealing ring 35.070 on pressing-in fixture 5x46 001 326 and drive it fully into the transmission housing over the pinion shaft.

If present, place plate 37.330 or oil tank 37.470 in the transmission housing above the pinion shaft. Insert side shaft over the pinion shaft and tighten with new expansion bolt 37.020. Prevent the parking lock from moving with a screwdriver.

Important:

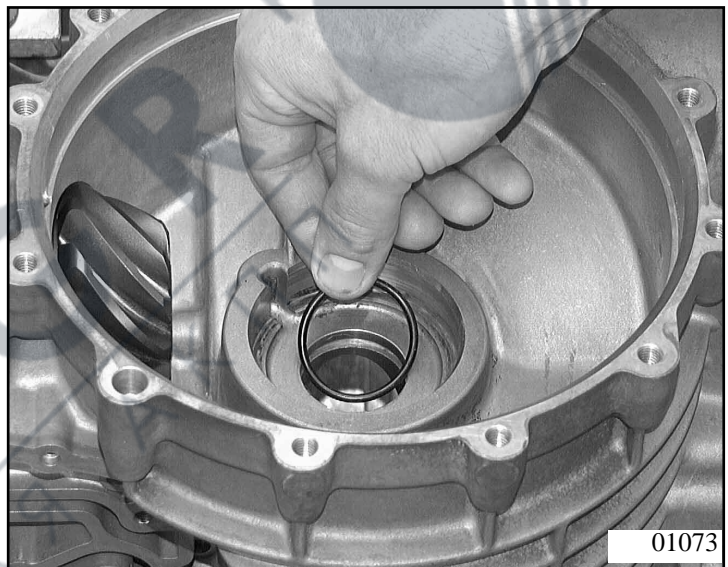
On new versions place conical disc over pinion shaft in front of lateral shaft. For adjusting work, see Chapter 1.4.3.3.



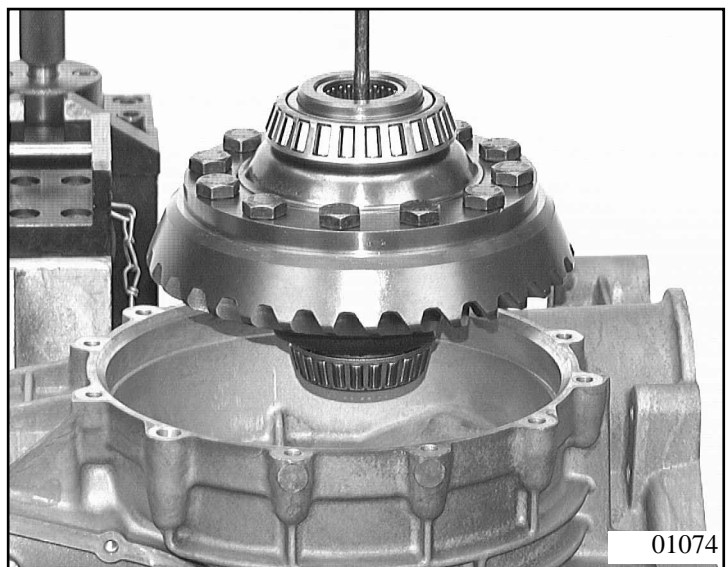
3.1.6 Installing differential in transmission housing

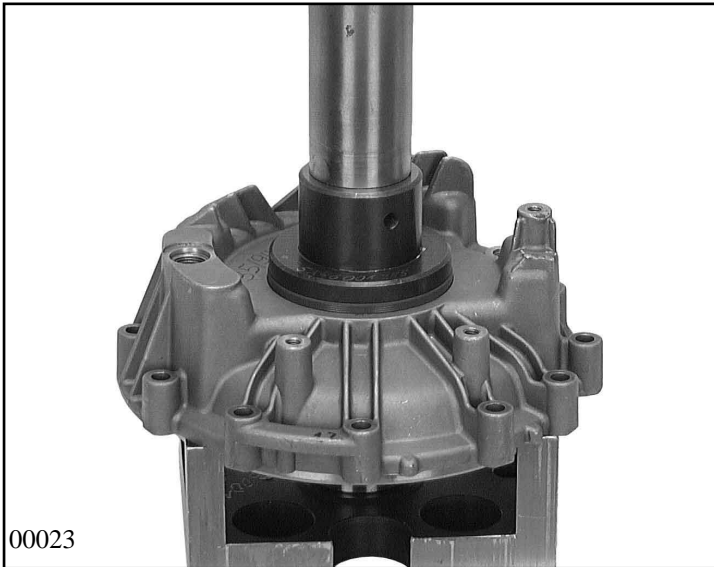
Turn housing through 90° with the differential opening facing up.

Insert O-ring 35.272 into the transmission housing.



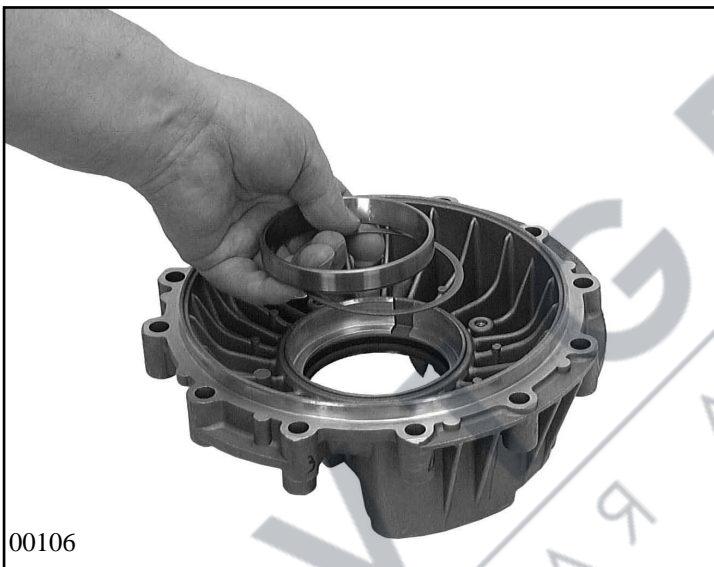
Install the correct shim washer 35.080 in the transmission housing with the outer bearing race. Insert the complete differential.





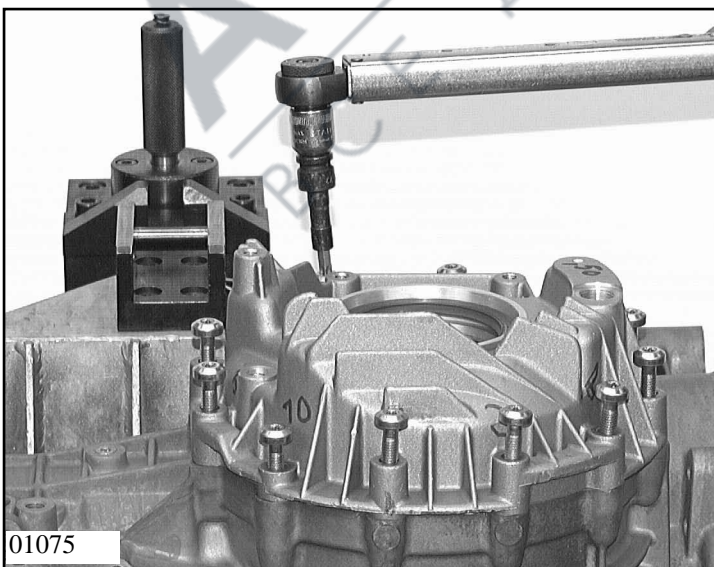
Place differential cover 35.150/110 on guide plate 5x46 001 255 and press shaft sealing ring 35.150/120 into the differential cover in the mandrel press, using drift 5x46 001 255.

00023



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

00106



Attach magnet 35.150/140 to retaining plate 35.150/130 (towards the cover). Secure the retaining plate to the middle bore of the differential cover with screw 35.150/150. Secure the differential cover with 12 screws 35.184. Drive the selector shaft cover 01.240 into the transmission housing.

(Tightening torques see Chapter 1.5)

Important:

For threaded connection specifications, see Chapter 1.3.1.1

01075

Change the suspended position of the transmission housing by inserting the eyebolt with M8 thread into the thread hole of the housing.

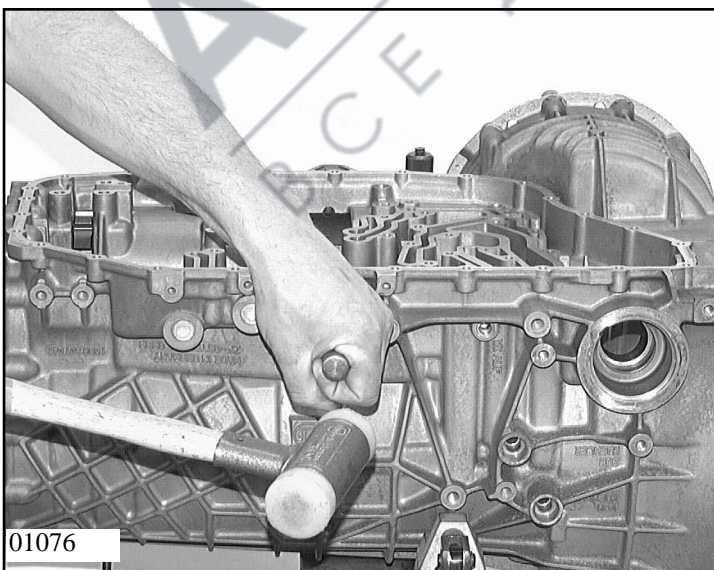
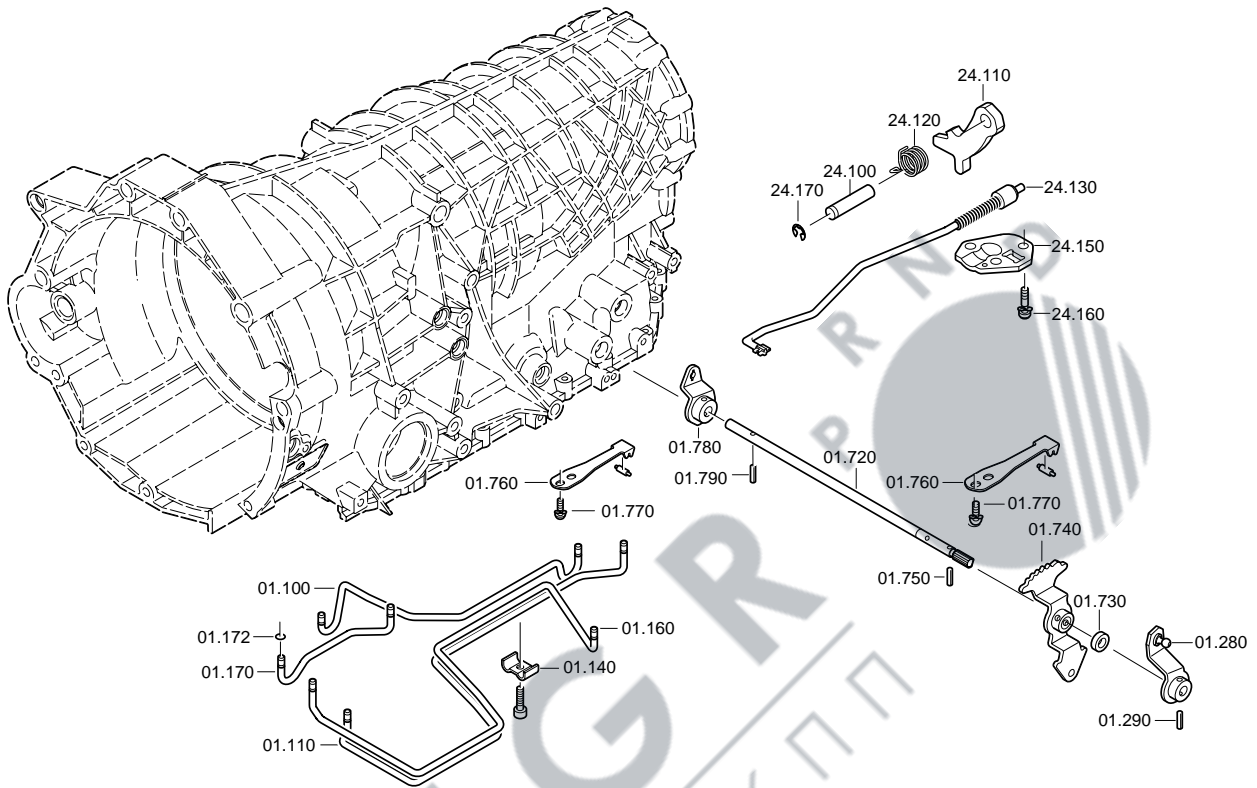
Connect the crane hook to the eyebolt.

Apply slight tension at the crane and pull the safety locking pin out of the assembly trolley and assembly bracket.

Raise the transmission with the crane, turn it through 90° round its longitudinal axis, replace it in the assembly bracket in the assembly trolley and secure with the pin. Detach the crane hook from the eyebolt and unscrew the eyebolt.



3.2 Installing shift and parking lock mechanism

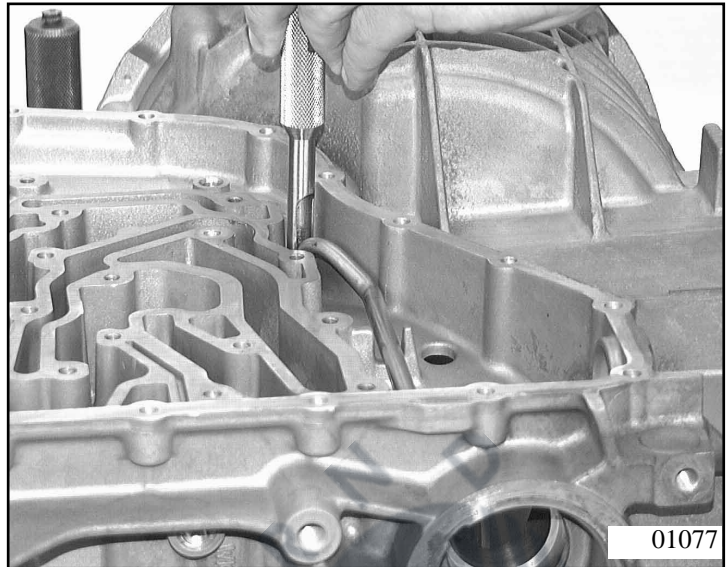


Drive selector shaft sealing ring 01.730 into transmission housing with driving-in tool 5x95 000 038.

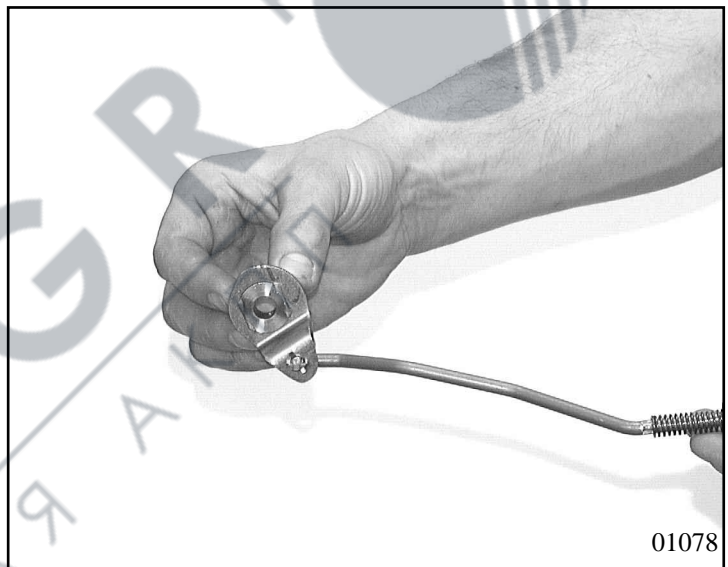
Important:

Only if the detent spring or transmission housing was defective: attach detent spring 01.180 loosely with 2 screws 01.200.

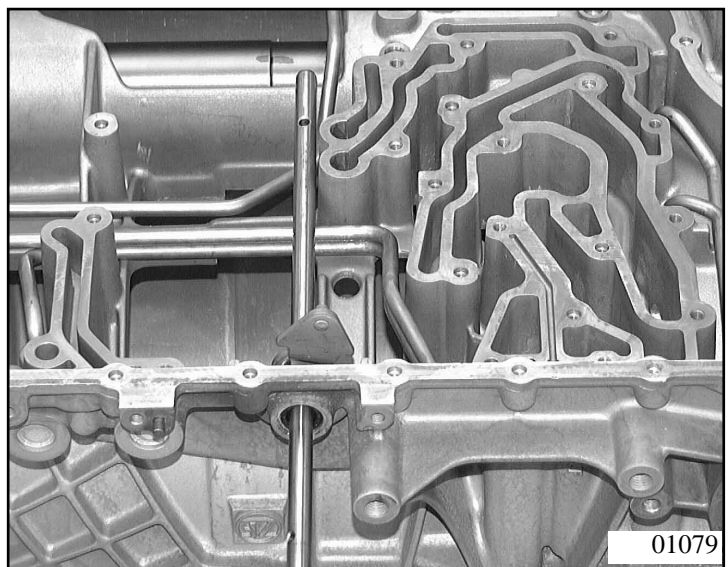
First press the oil pipe 01.160 (for clutch B) in with driving-in tool 5x46 001 534 and then oil pipe 01.100 and 01.110. Secure oil pipe holder 01.140 with a screw.

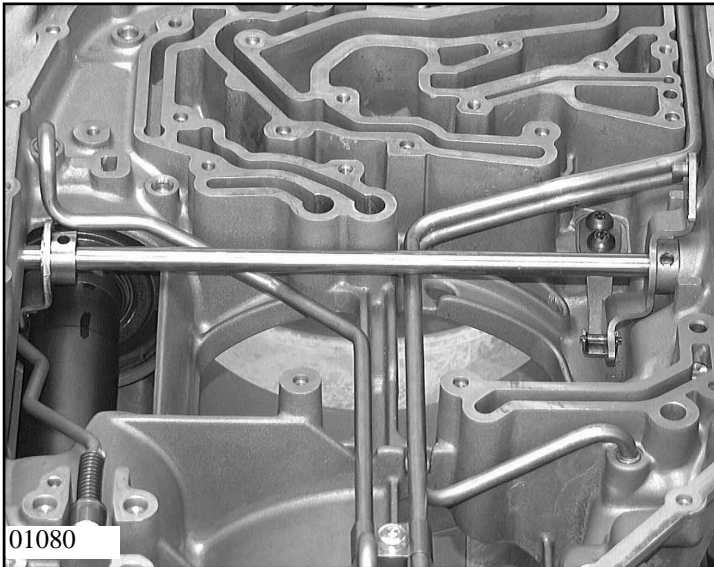


Attach connecting rod 24.130 to driver 01.780 and turn it.



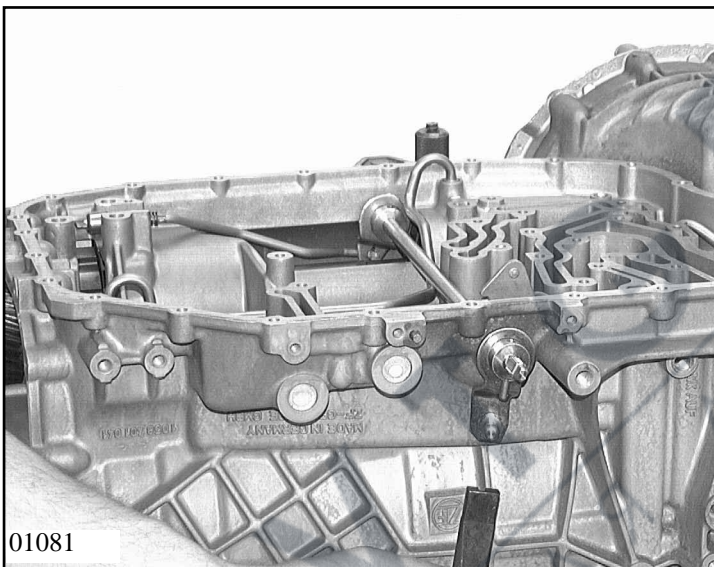
Insert the selector shaft into the transmission housing so that the flat side of the selector shaft faces the centring pin switch. Push detent disc 01.740 over the selector shaft so that the drive pin for the shift valve faces the control unit.





Push the driver with the connecting rod over the selector shaft and insert the selector shaft in the guide in the transmission housing. Press the detent spring down and move the detent disc to the correct position.

01080



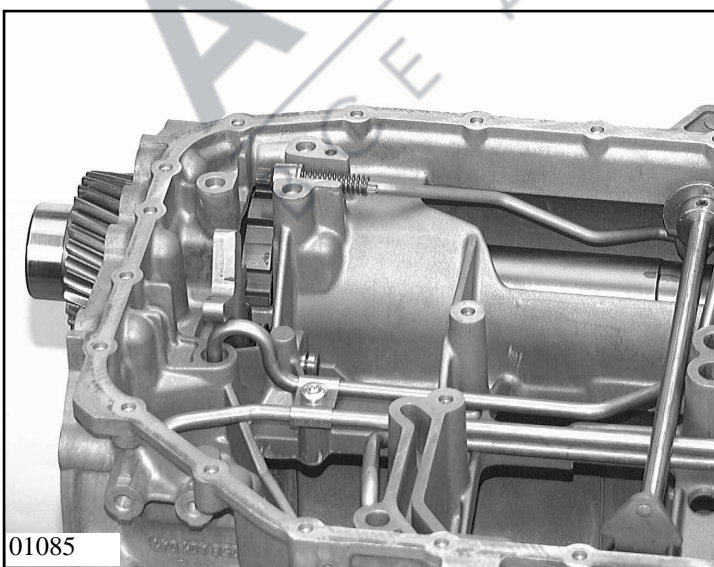
Using drift 5x46 000 291, drive clamping sleeve 01.750 through the detent disc and clamping sleeve 01.790 through the selector lever into the selector shaft. Secure selector shaft 01.280 with clamping pin 01.290, with the ball facing away from the transmission.

01081

Important:

If transmission housing, detent disc or selector shaft has been renewed or the detent spring detached, the detent spring must be re-adjusted.

For adjusting work, see Chapter 1.4.4

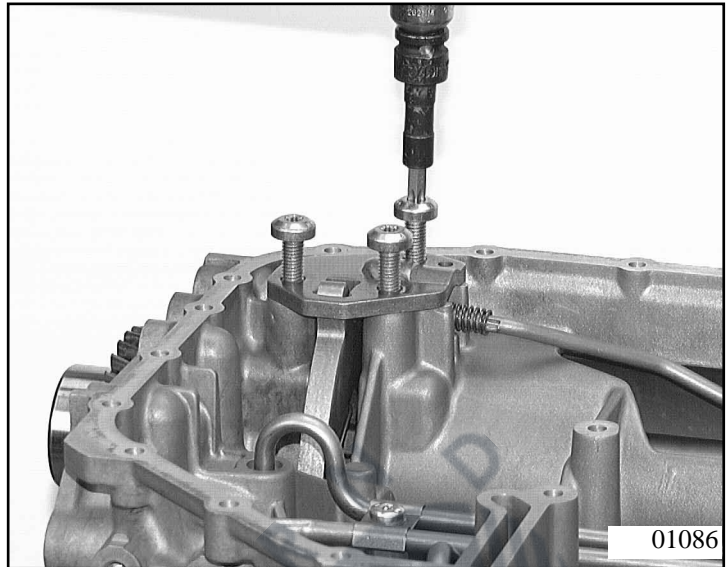


Insert pawl 24.110 with torsion spring 24.120 – and the shim washer if previously removed – into the transmission housing and locate with the ring groove towards the converter bell by pressing in pin 24.100. Secure the pin with circlip 24.170.

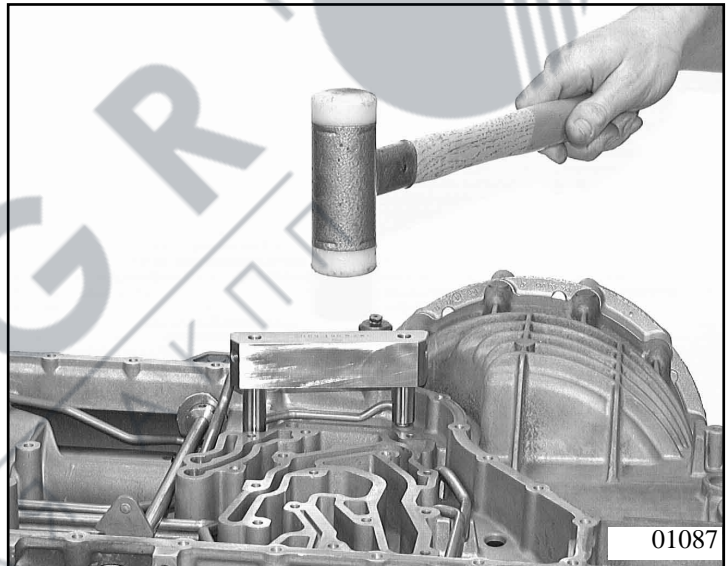
01085

Press the pawl down and attach guide plate 24.150 by means of the 3 machine screws 24.160.

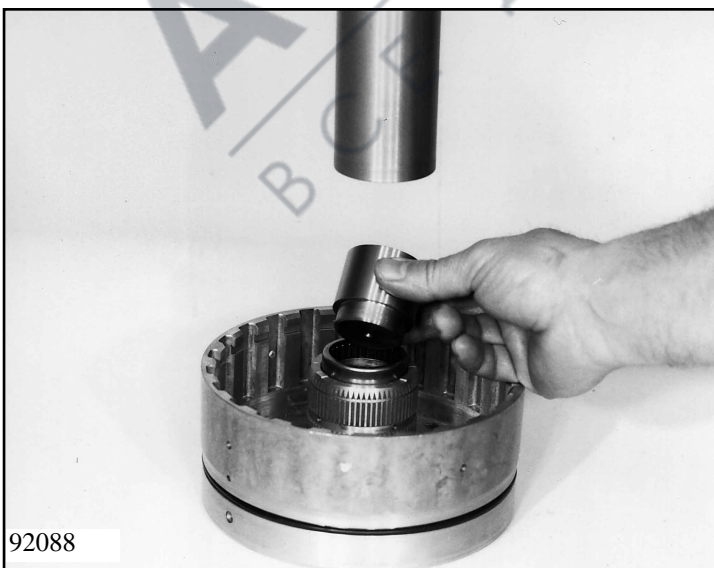
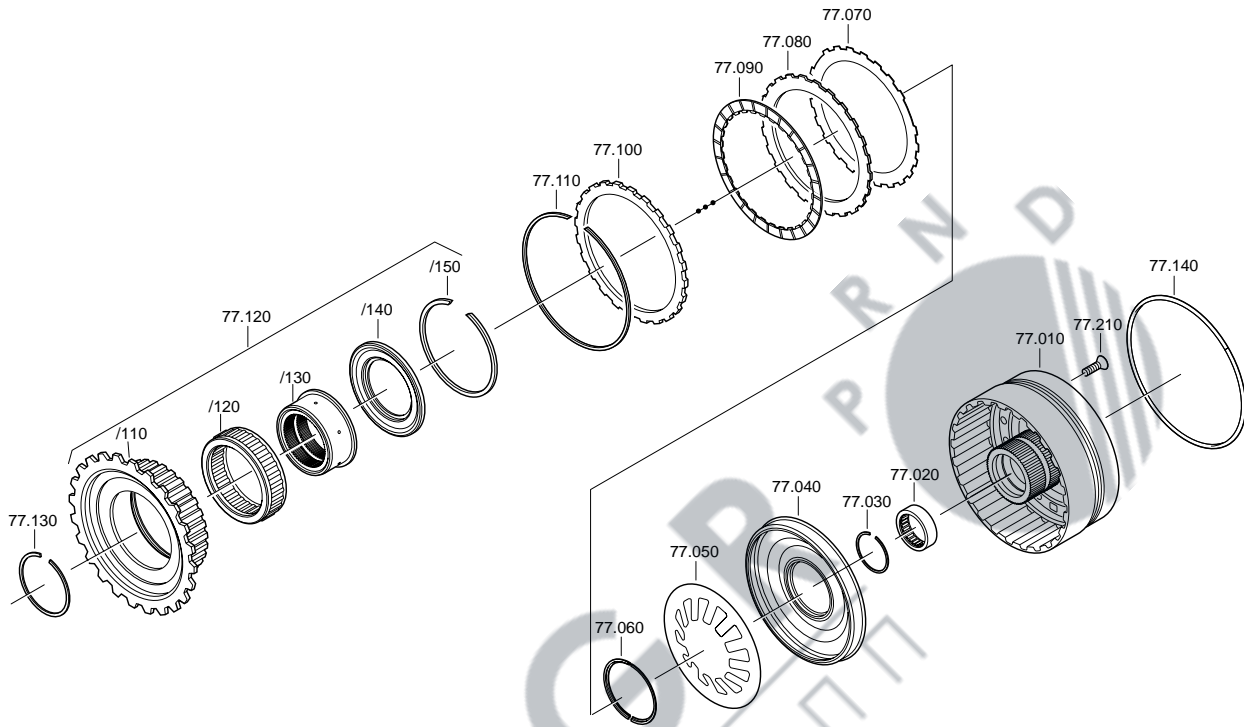
(Tightening torques: see Chapter 1.5)



Pull two new O-rings 01.172 over the new oil pipe 01.170 and press the oil pipe in with driving-in tool 5x46 001 596.



3.3 Brake F (with 1st gear freewheel)



Pull O-ring 75.140 on to cylinder F 75.010.

Press needle roller bearing 75.020 with press-in fixture 5x46 001 006 in the mandrel press into cylinder F and secure with snap ring 75.030.

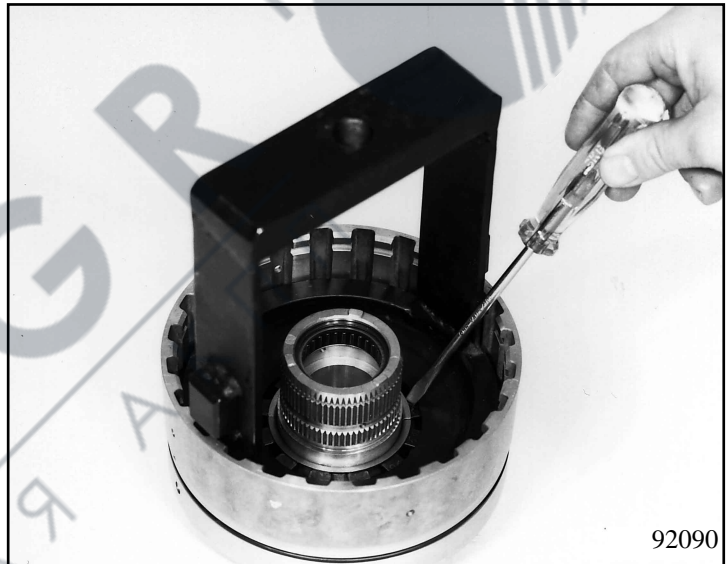
Apply a small amount of grease (Vaseline) to piston F 75.040 at the sealing lips and press into cylinder F.

Important:

The piston must not jam; therefore do not fold the sealing lips over.



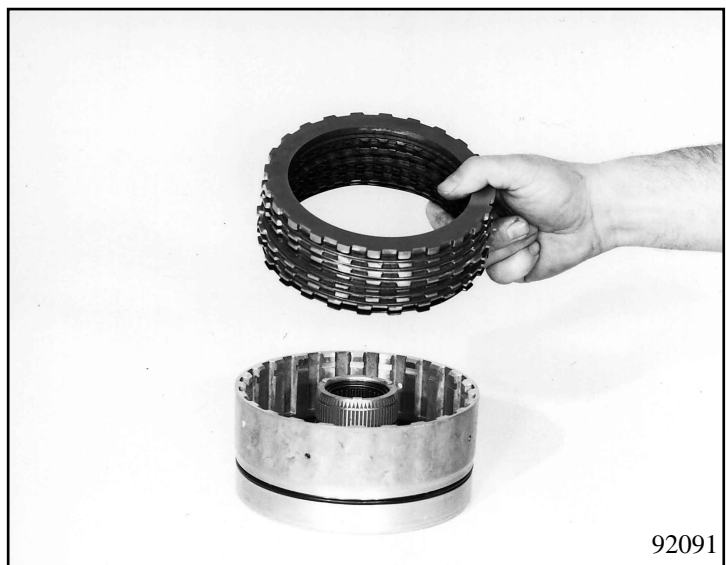
Insert cup spring 75.050, press down in the mandrel press with installation bracket 5x46 000 931 and install divided stop ring 77.060.



Insert the complete disc set, starting with spring clutch disc 77.070. Then install the outer clutch disc 77.080 and the lining clutch disc 77.090. Secure the outer clutch disc 77.100 with snap ring 77.110.

Important:

For adjusting work, see **Chapter 1.4.1**





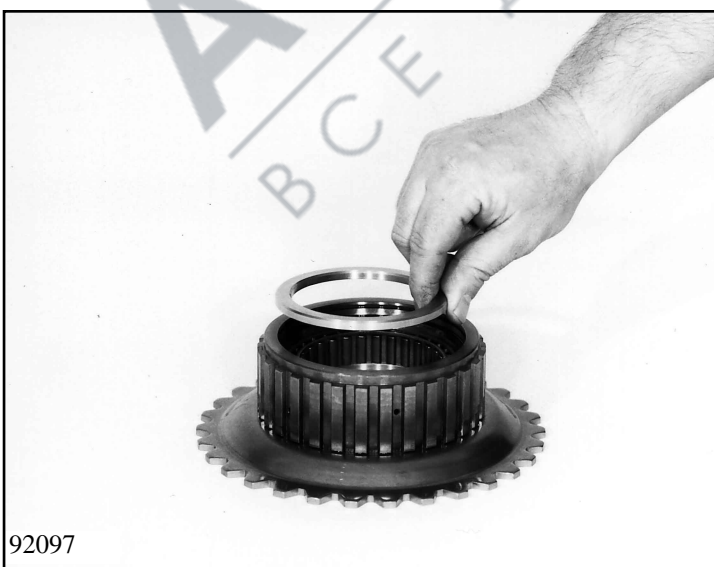
Start adding parts to 1st gear freewheel 77.120 by pressing in one of the two cover plates 77.120/120 for the complete freewheel into freewheel ring F.



Insert freewheel cage 77.120/120 into the freewheel outer ring with the collar upwards.

Important:

If installation is done in the reverse order, the freewheel's locking direction will be incorrect.



Apply the freewheel cover disc and press in.

Insert freewheel inner ring 77.120/130 by turning clockwise.

Important:

Functional check:

The freewheel inner ring must rotate freely clockwise when the outer ring is held tight.

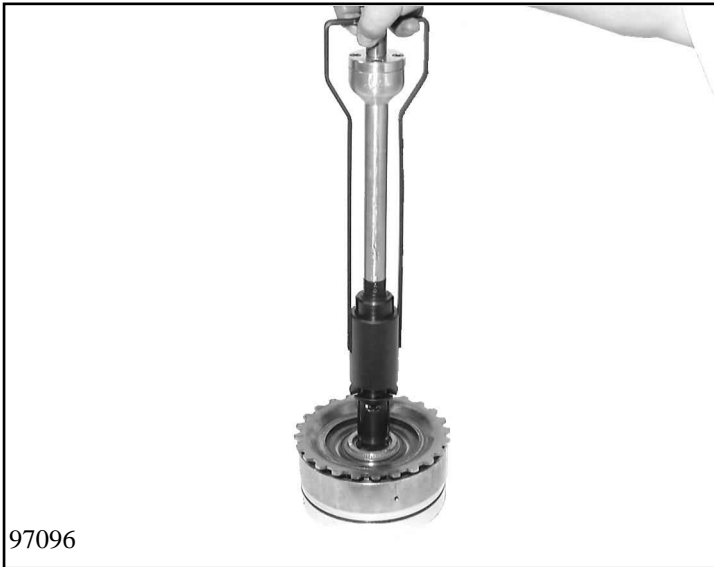


Press in stop disc 77.120/140 and secure with snap ring 77.120/150.



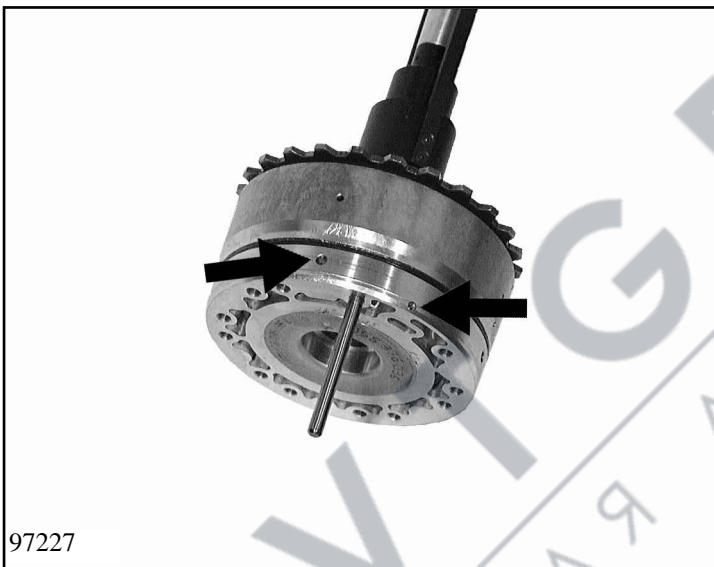
Insert the entire freewheel into brake F while turning it. Then engage snap ring 77.130 with installation tool 5x46 000 892 or by hand.





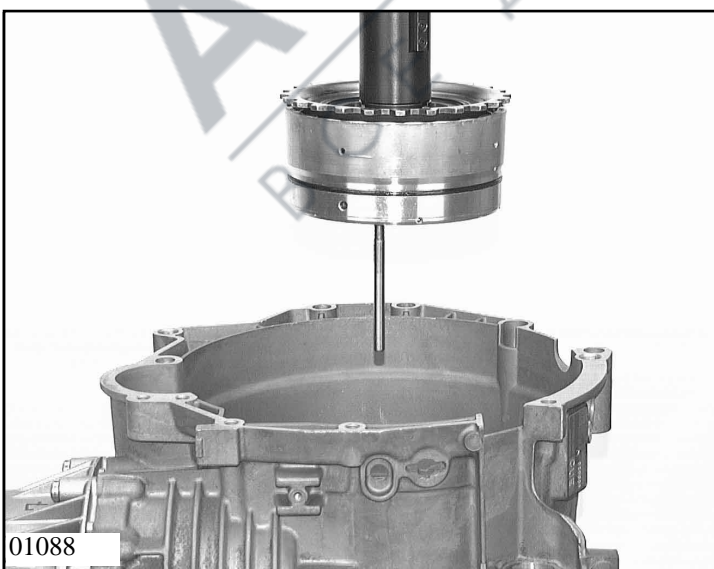
Insert lifting fixture 5x46 000 831 into brake F so that the three recesses at the collar of the lifting fixture engage with the three raised areas on the cylinder hub.

97096



Screw in the fitting pin (M8 screw with the head cut off) into a thread hole between oil feed and lubricant feed.

97227



Turn transmission housing through 90°. Insert the complete unit so that the fitting pin can be inserted into the upper hole in the middle of the transmission housing.

01088

Note:

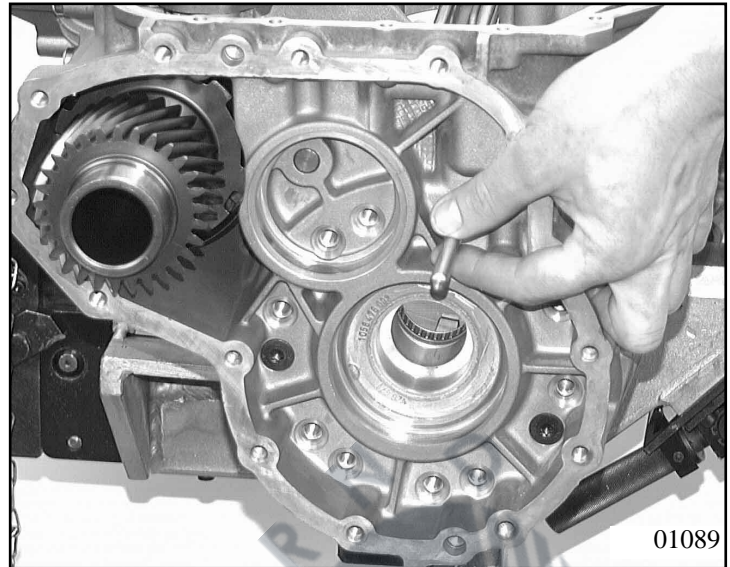
This is important because the channel in the transmission housing must be aligned with the filling bore of brake F.

Move the housing to a horizontal position. Hold cylinder F with 2 screws 77.210 or 77.220.

Remove fitting pin and insert the remaining 10 screws 77.210 / 77.220.

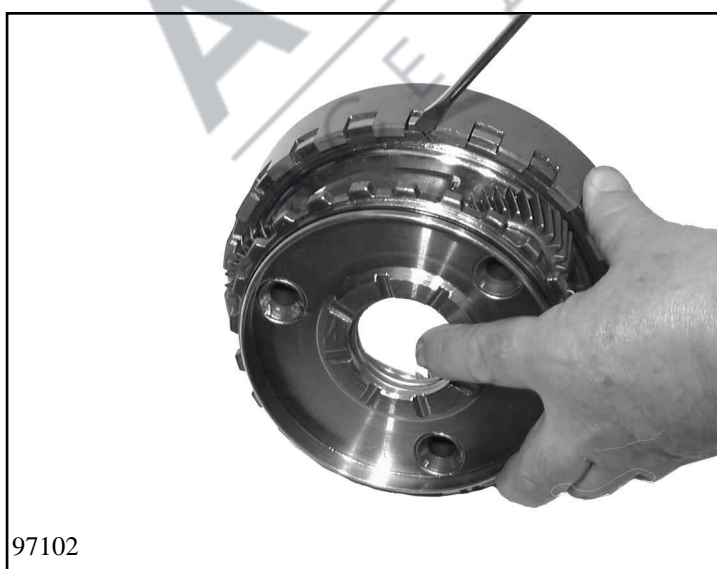
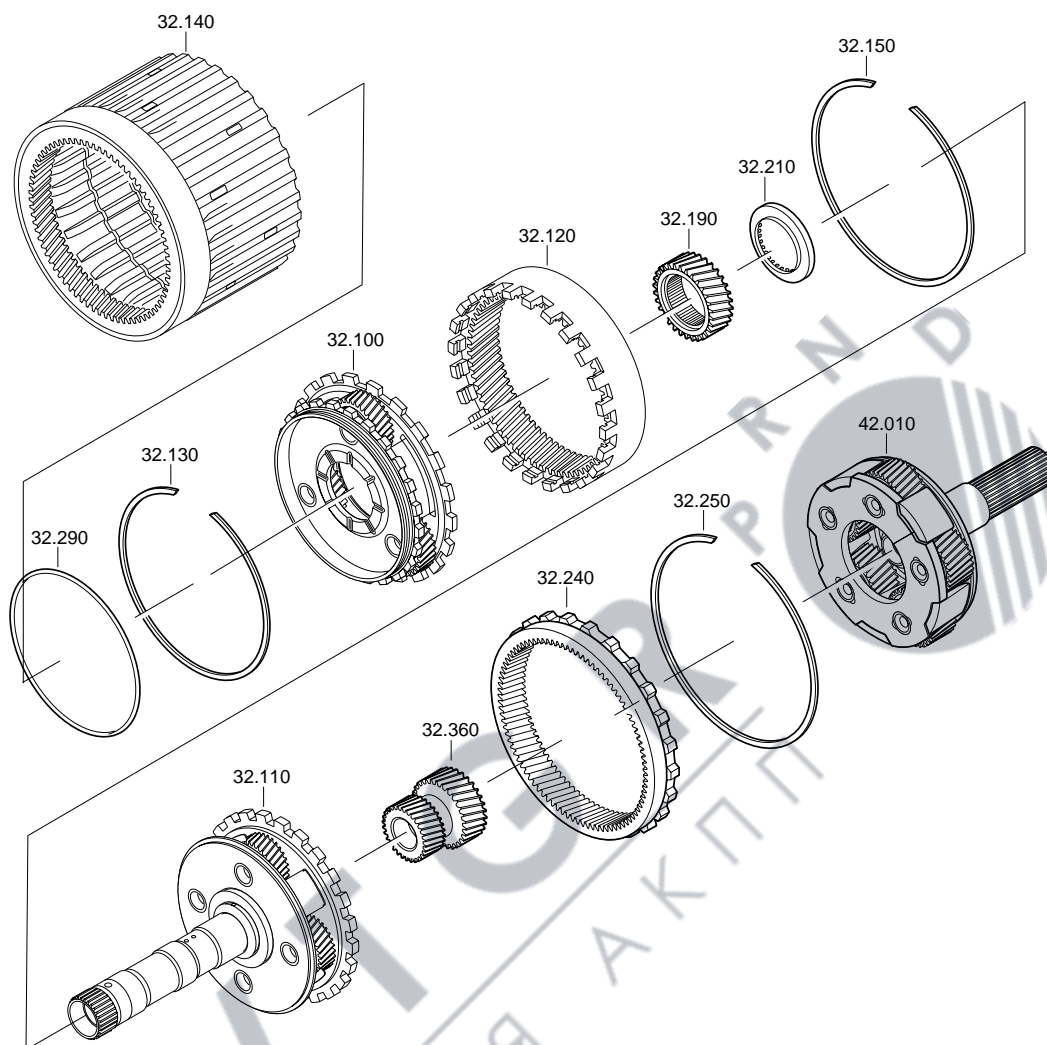
Remove lifting fixture 5x46 000 831.

(Tightening specification see Chapter 1.3.1.5)



AVTGR
ВСЕ ДЛЯ АКПП

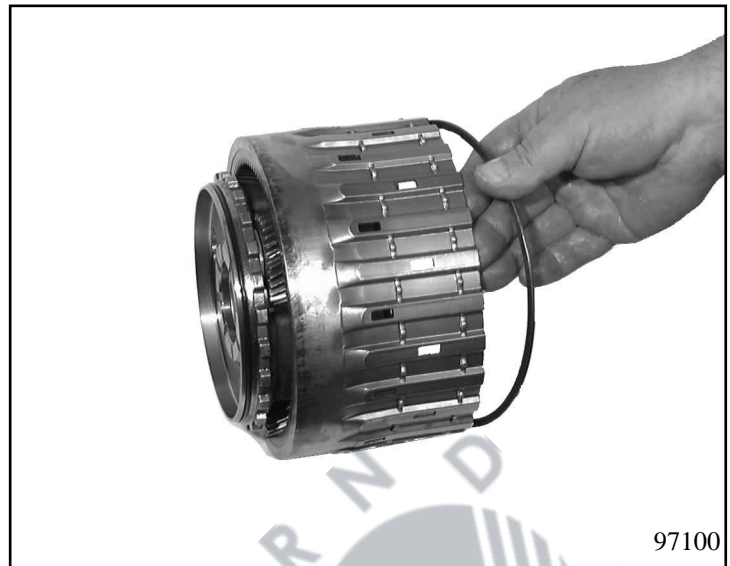
3.4 Planetary gear set (I, II and III)



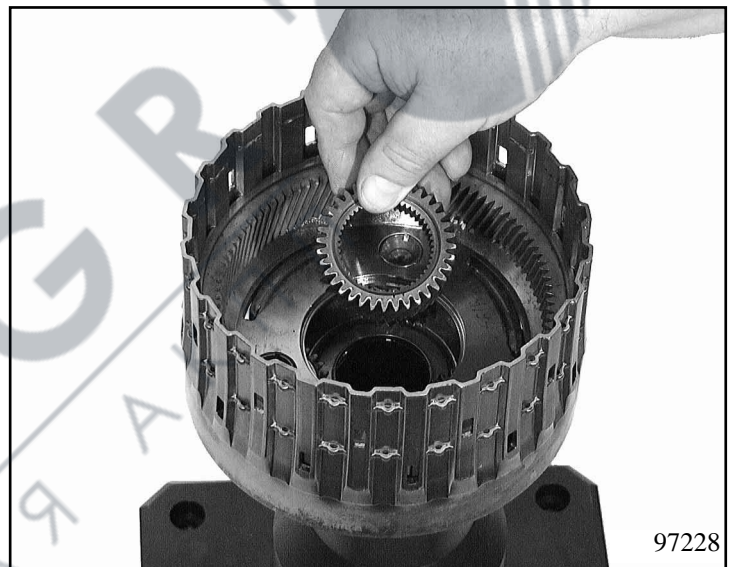
Pull new O-ring 32.290 on to planet carrier I 32.100. Insert planet carrier into ring gear II 32.120 and secure with snap ring 32.130.

97102

Insert entire unit into ring gear I 32.140 and engage with snap ring 32.150.
To do this, place ring gear on a suitable surface.



Insert sun wheel I 32.190 with the notch on the tooth tip downwards.
(towards the input side, for gear noise optimisation)
Insert axial needle roller bearing 32.210.



Insert planet carrier II 32.110 into ring gear I.
To simplify installation, place on the installation fixture for tower I 5x46 000 916.

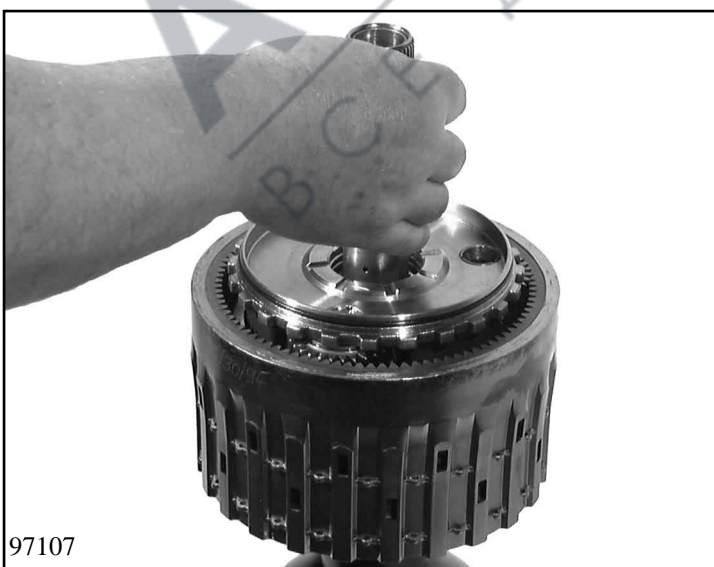




Insert ring gear III 32.240 with the outer driving splines upwards and secure with snap ring 32.250. Raise ring gear I slightly for snap ring installation.

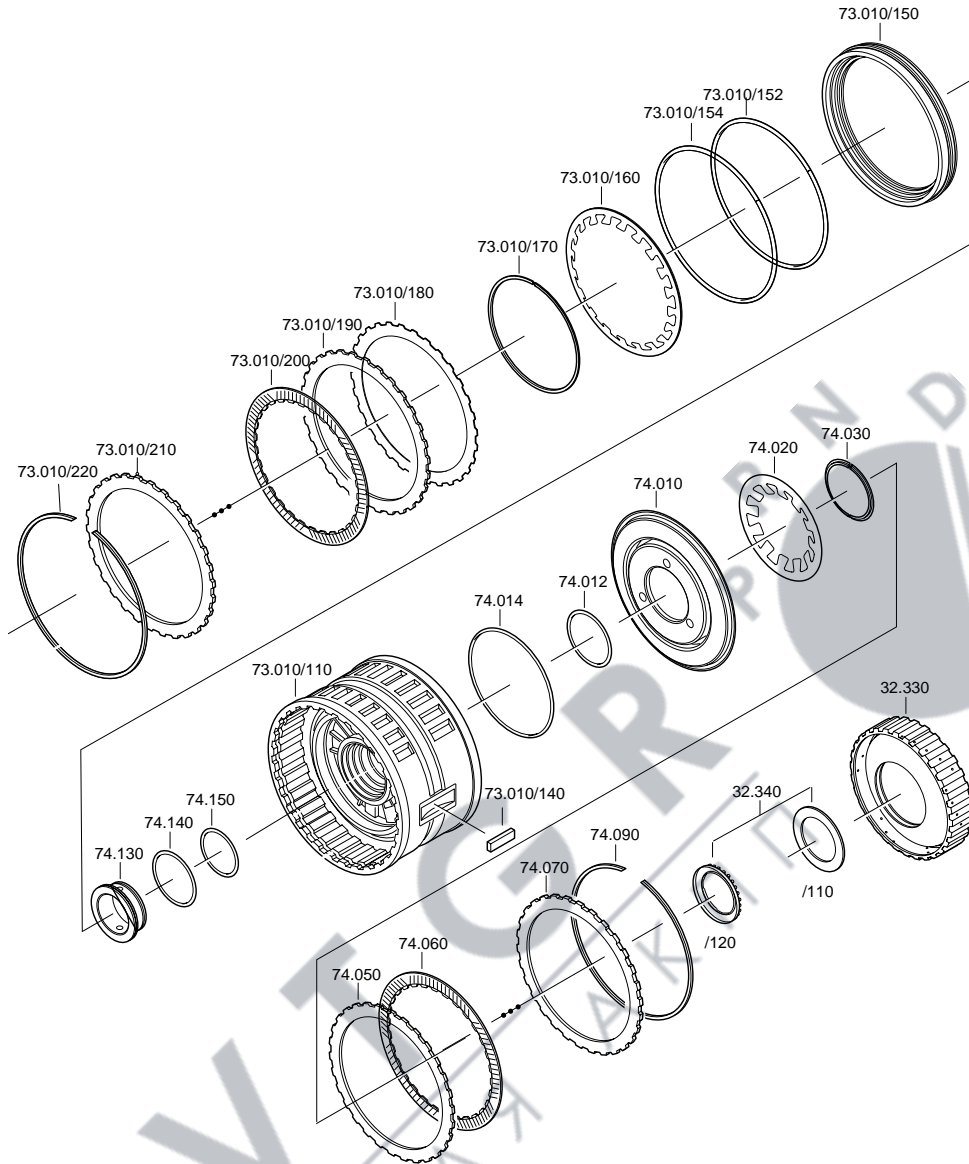


Lift planetary gear set (I and II with ring gear III) away from the fixture. Place planet carrier III 42.010 on the fixture and insert sun wheel 32.360.



Place planetary gear carrier on the planet carrier while turning it.

3.4.1 Brakes (E and D)



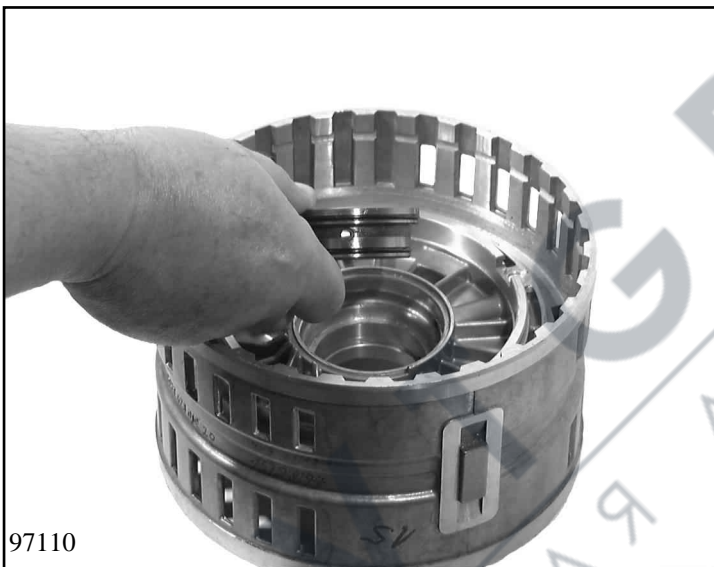
Press disc carrier E 32.330 onto planetary gear set





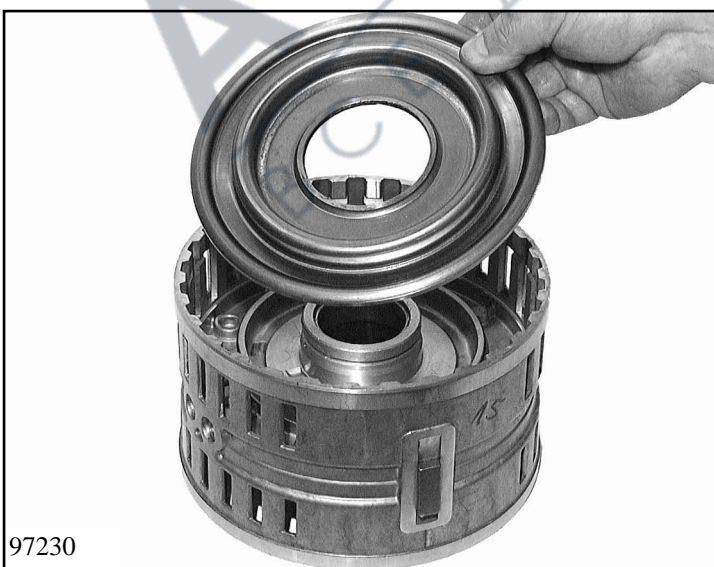
Install axial disc 32.340/110.

97109



Add parts to cylinder DE 73.010/110.
Pull two O-rings 74.010/140 and 74.010/150 on to sleeve 74.010/130 and press into cylinder DE.
Drive in two fitting keys 73.010/140 centrally at cylinder DE, using a plastic-faced hammer.

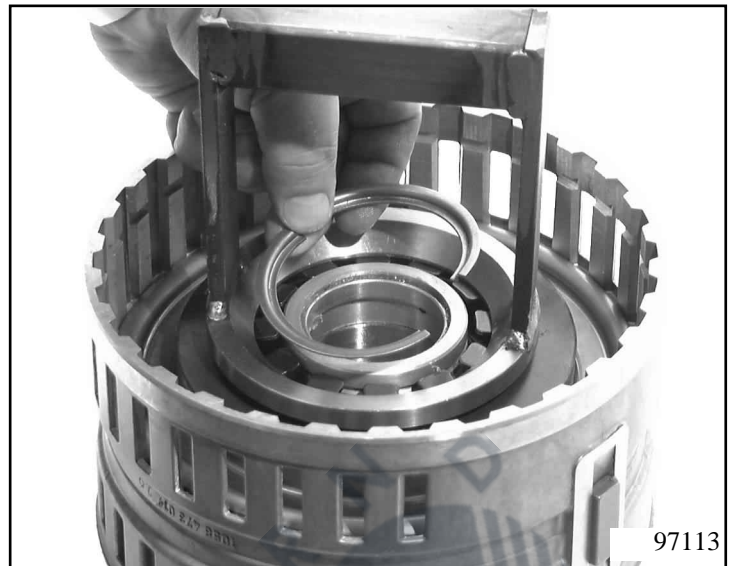
97110



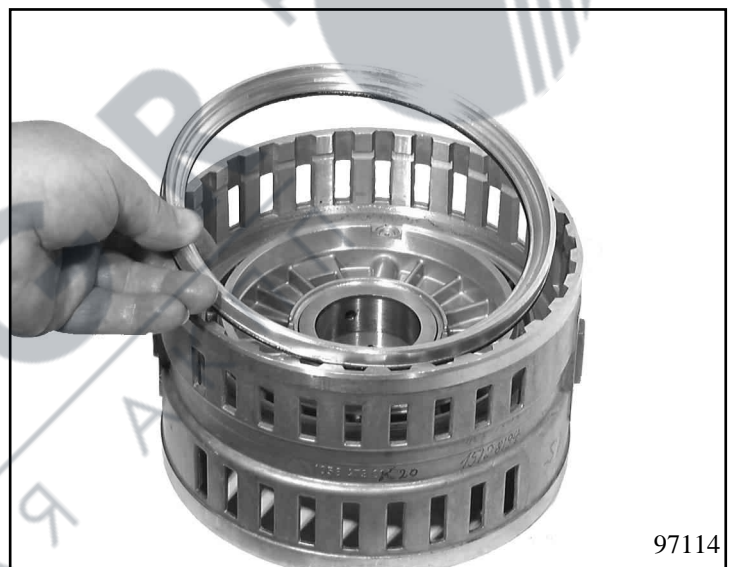
Turn cylinder DE around.
Pull an O-ring 74.012 onto piston E 74.010 and an O-ring 74.014 on to cylinder E.
Press piston E into cylinder DE.

97230

Insert disc spring 74.020.
Press disc spring down with installation
bracket 5x46 001 502 in the mandrel
press and secure with divided stop ring
74.030.

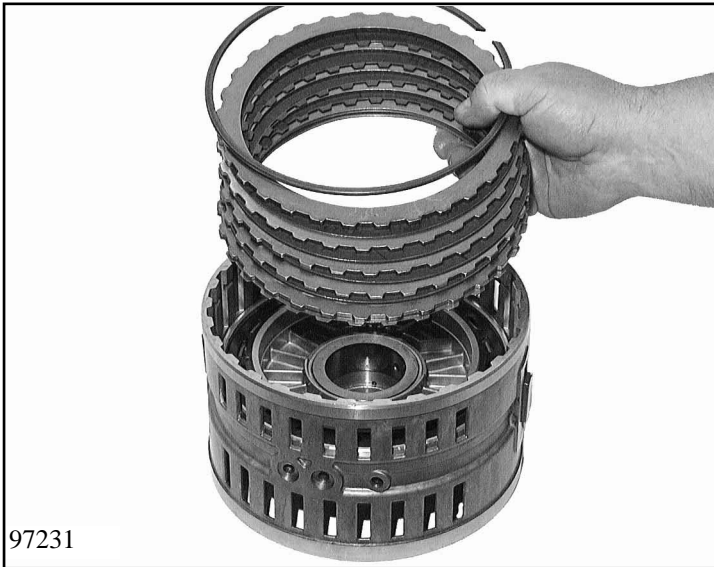


Turn cylinder DE through 180°. Pull two
O-rings 73.010/152 and 73.010/154 on to
piston D 73.010/150 and press the piston
into the cylinder.



Insert disc spring D 73.010/160.
Using installation bracket 5x46 001 501,
press disc spring D down in the mandrel
press and secure with snap ring
73.101/170 with the flat side upwards.





97231

Insert complete disc set D starting with spring clutch disc 73.010/180 and followed alternately by outer clutch disc 73.010/190 and lined clutch disc 73.010/200.

Secure upper outer disc 73.010/210 with snap ring 73.010/220.

Important:

For adjusting work, see **Chapter 1.4.2**

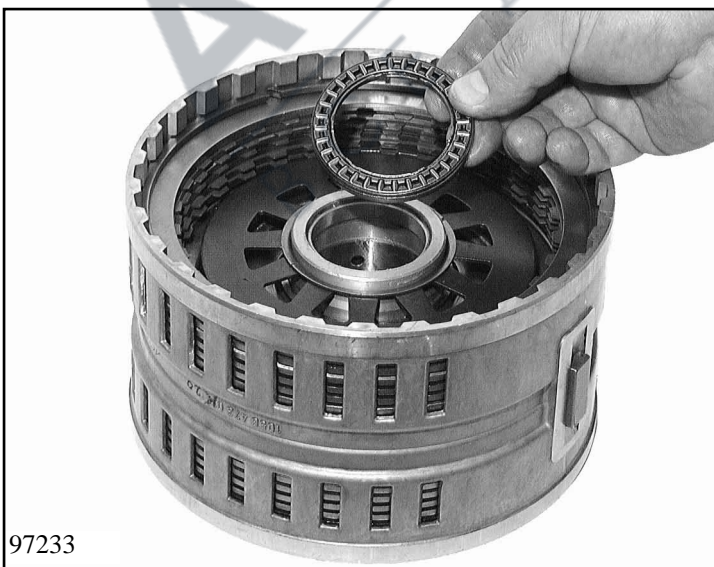


97232

Turn cylinder DE around and insert complete disc set D, starting with - if fitted spring clutch disc 74.040 and - outer clutch disc 74.050 followed alternately by the lined clutch disc 74.060 and the outer clutch disc. Secure upper outer clutch disc 74.070 with snap ring 74.090.

Important:

For adjusting work, see **Chapter 1.4.3**

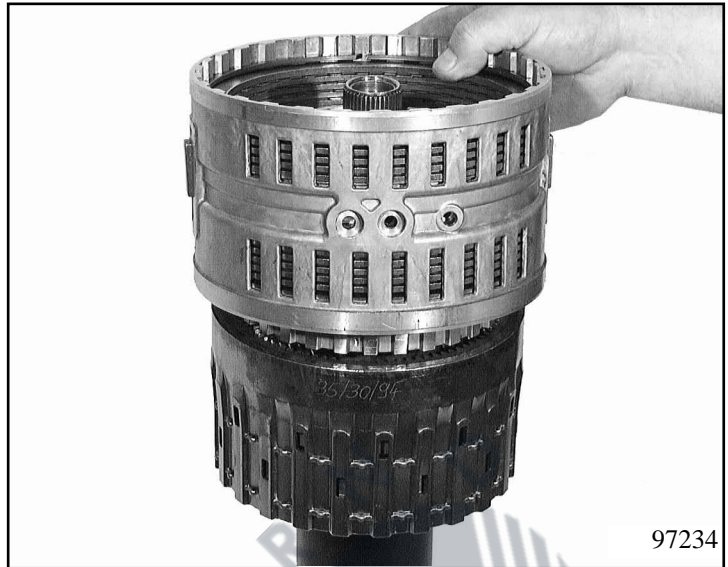


97233

Grease axial needle roller bearing 32.340/120 with Vaseline and attach to the spider of cylinder 73.010/110 (on the side of brake E).

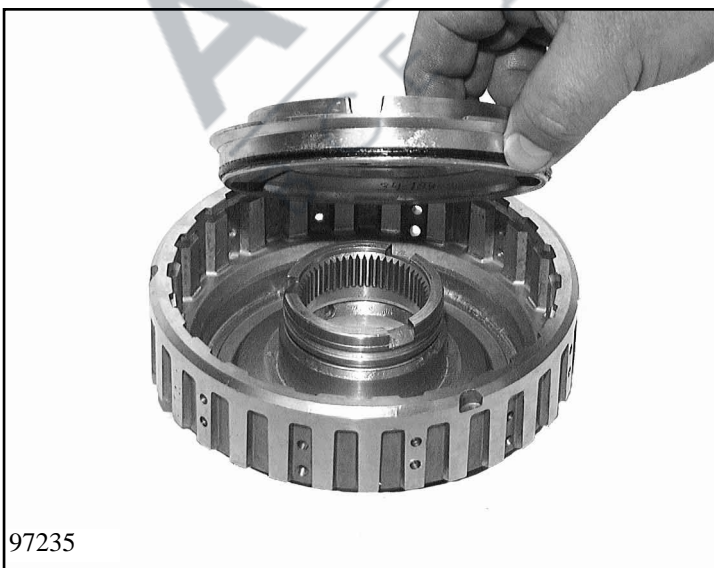
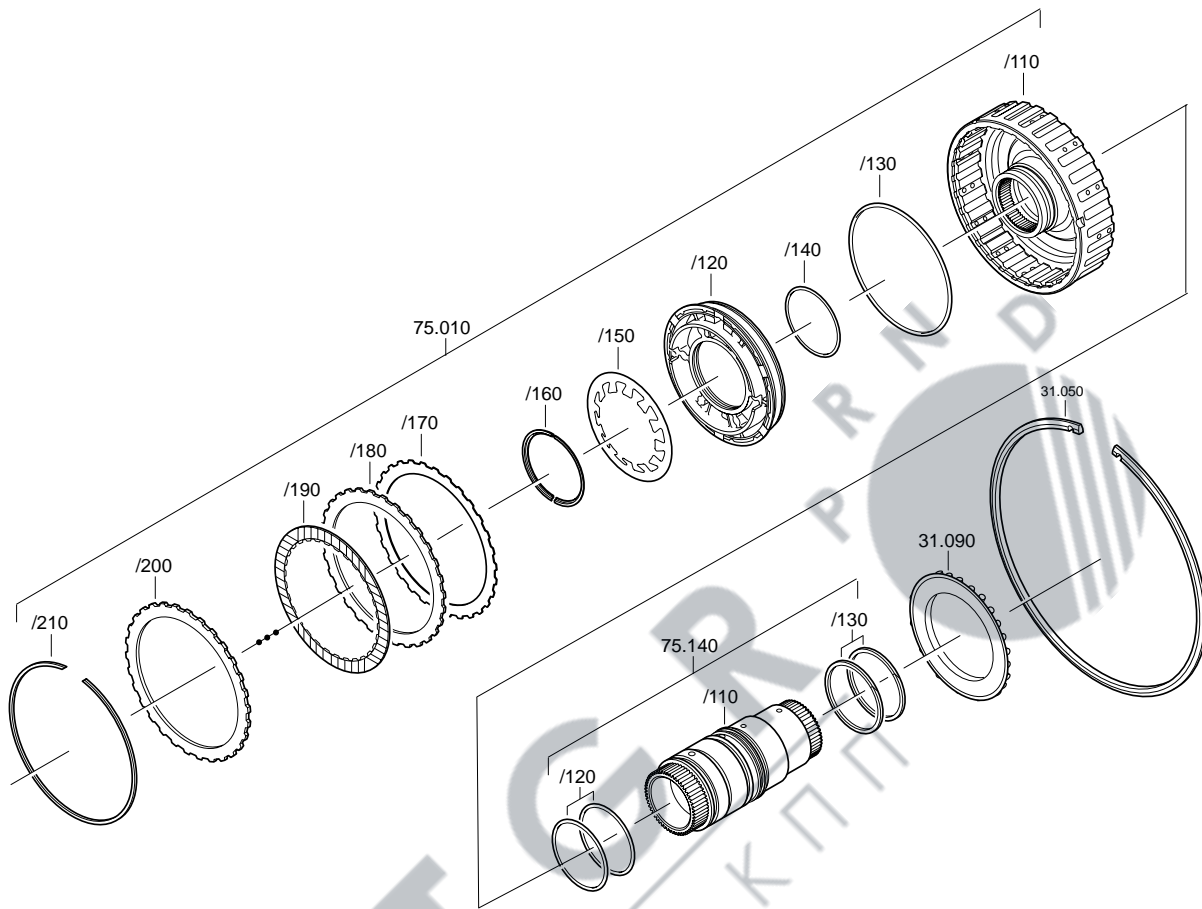
Place brakes E and D on the planetary gear set, turning to and fro until the disc sets engage in the splines completely.

Check measurement: shaft (planet spider) to sleeve (cylinder DE) app. 63.5 mm.



AVTGR
ВСЕ ДЛЯ АКПП

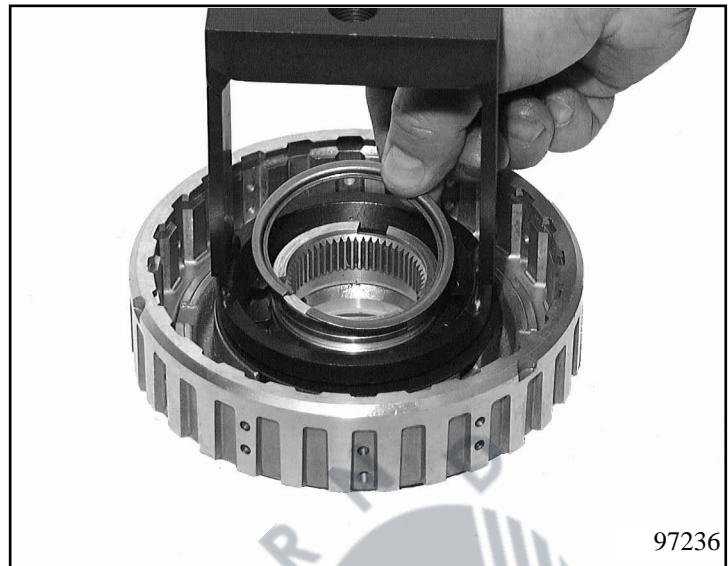
3.4.2 Clutch C



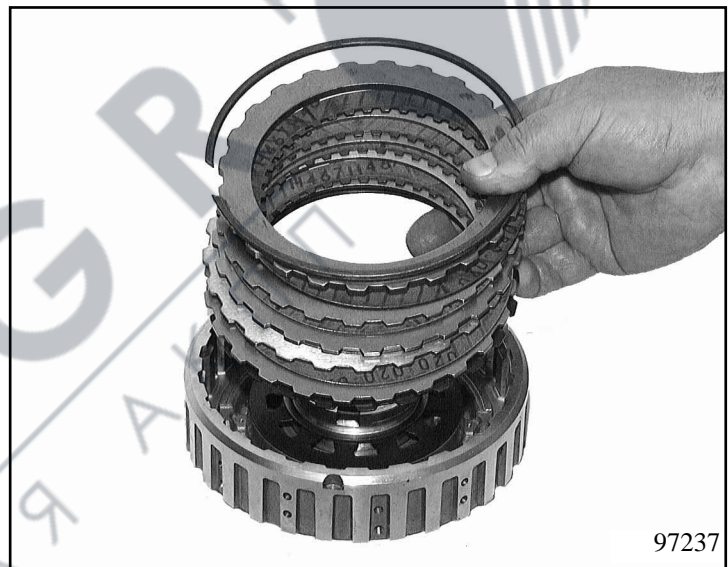
Install new O-rings 75.010/130 and 75.010/140 on piston C 75.010/120. Press piston into cylinder C 75.010/110.

97235

Insert disc spring C 75.010/150 and use installation bracket 5x46 030 167 to press it down in the mandrel press; secure with divided stop ring 75.010/160.



Insert complete disc set C starting with spring disc 75.010/170 followed by outer clutch disc 75.010/180 and lined clutch disc 75.010/190. Secure upper outer clutch disc 75.010/200 with snap ring 75.010/210.

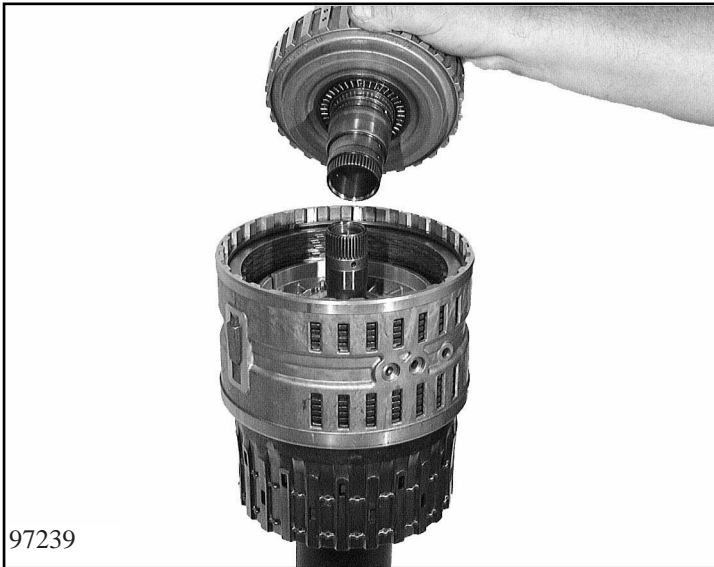


Important:
For adjusting work, see **Chapter 1.4.4**

Pull two O-rings 75.140/120 and 2 sealing rings 75.140/130 on to sun wheel shaft 75.140/110. Insert sun wheel shaft at cylinder C by hand.



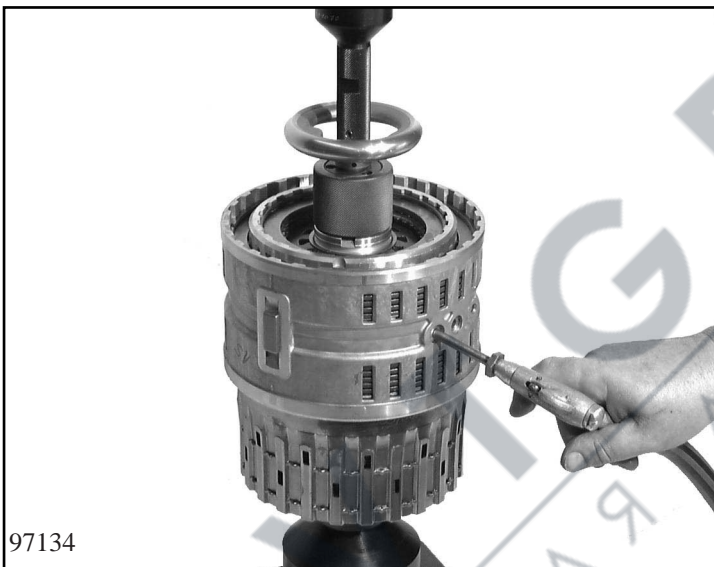
Important:
If using new rectangular-section rings, stick them to the groove with a small amount of Vaseline.



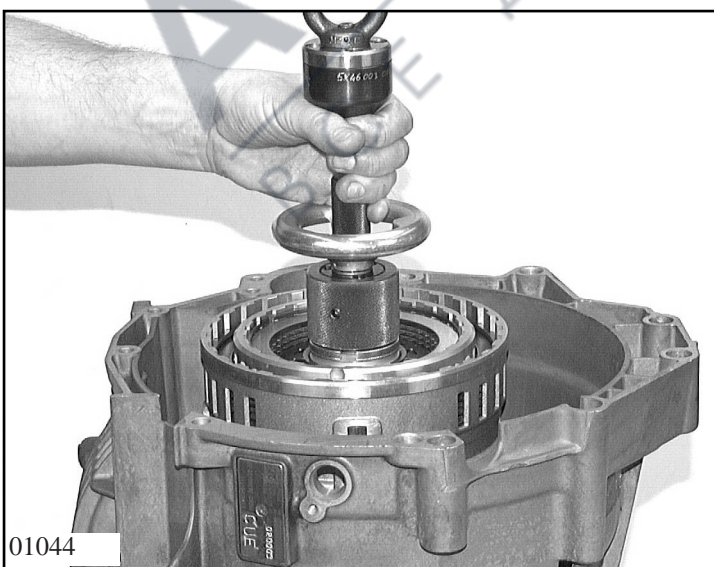
Stick axial bearing 31.090 to cylinder C on the sun wheel shaft side with Vaseline. Insert clutch C in brake D and turn to left and right until the disc sets engage in the splines completely.

Note:

Check measurement: shaft (planet spider to cylinder spider C app. 22 mm)



Screw lifting fixture 5x46 001 077 (bolted to adapter 5w46 000 003) into tower I. Check operation of clutch C / brakes D/E with compressed air via the bores.



Turn transmission with converter bell upwards. Align bores for oil pipes. Insert tower I into the transmission housing carefully with a crane.

Remove lifting fixture.
Insert snap ring 31.050.
Use driving-in tool 5x46 001 930 to drive
the snap ring into the housing groove all
round.

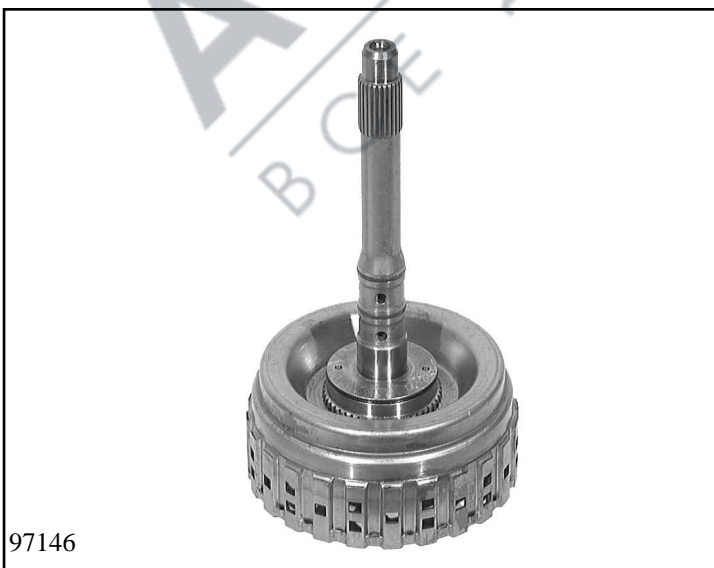
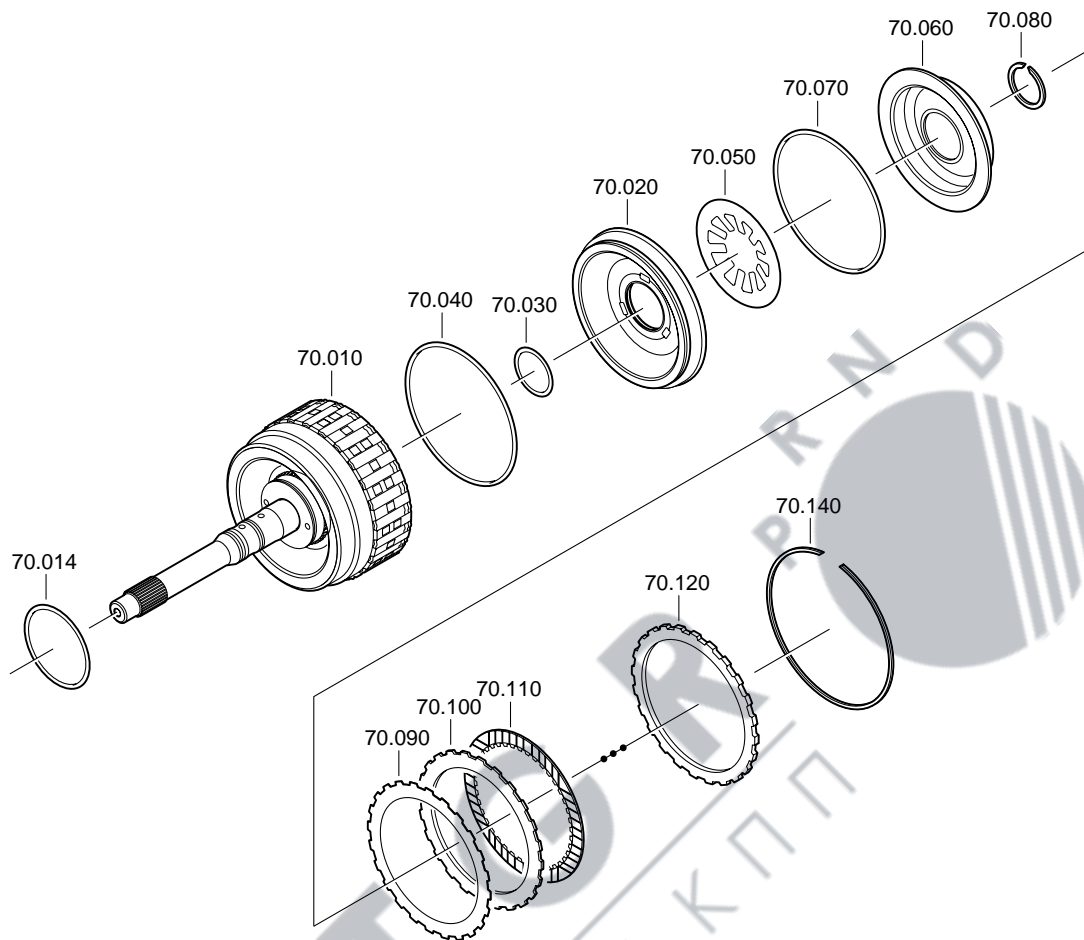
Important:
The lifting fixture prevents clutch C from
falling out.



AVTGR
ВСЕ ДЛЯ АКПП

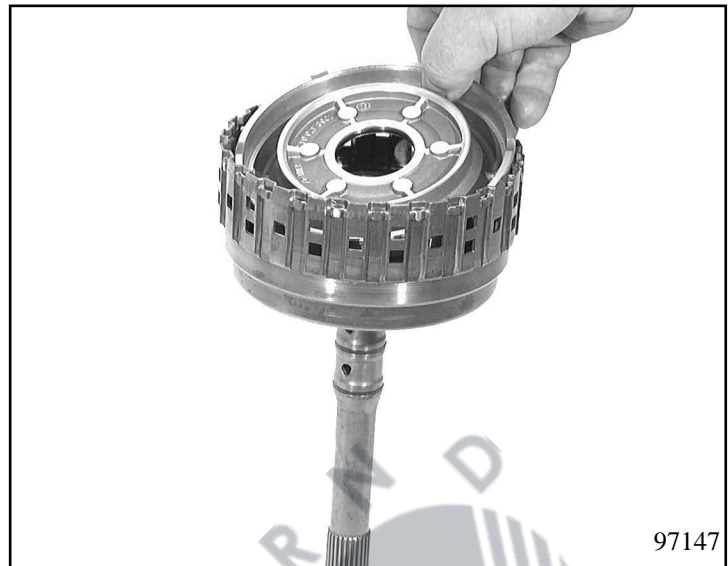
3.5 Tower II (input at clutches A and B)

3.5.1 Clutch A (input)

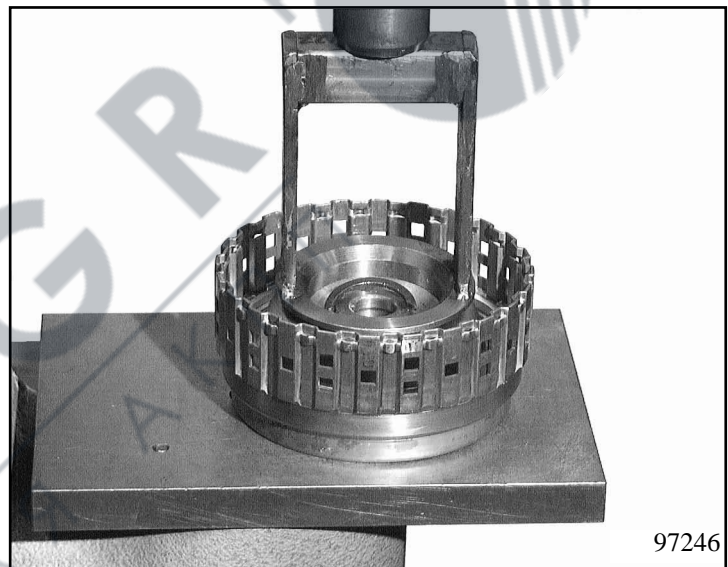


Pull new O-ring 70.014 and two rectangular-section rings 72.140 on to cylinder A 70.010 with input shaft.

Pull new sealing rings 70.030 and 70.040 on to piston 70.020.
Press piston into cylinder A.



Pull new O-ring 70.070 on to baffle plate 70.060. Insert cup spring 70.050 into cylinder A and press in baffle plate. Using installation bracket 5x46 001 499, press the baffle plate down in the mandrel press and secure with snap ring 70.080.

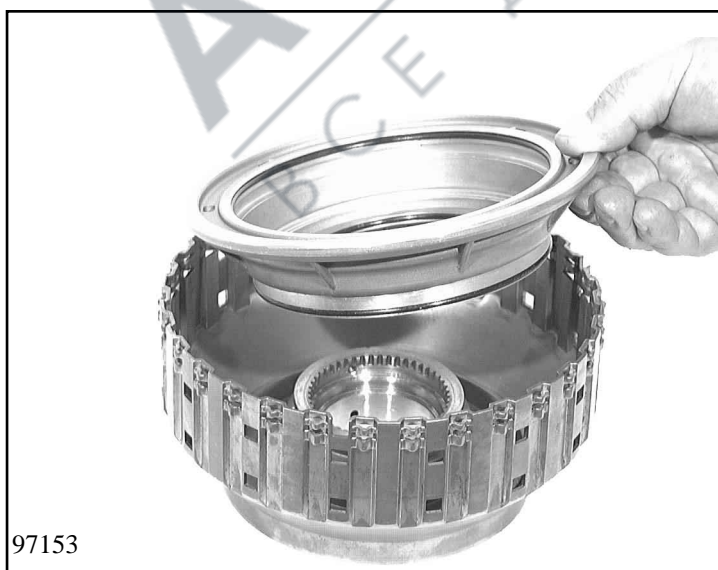
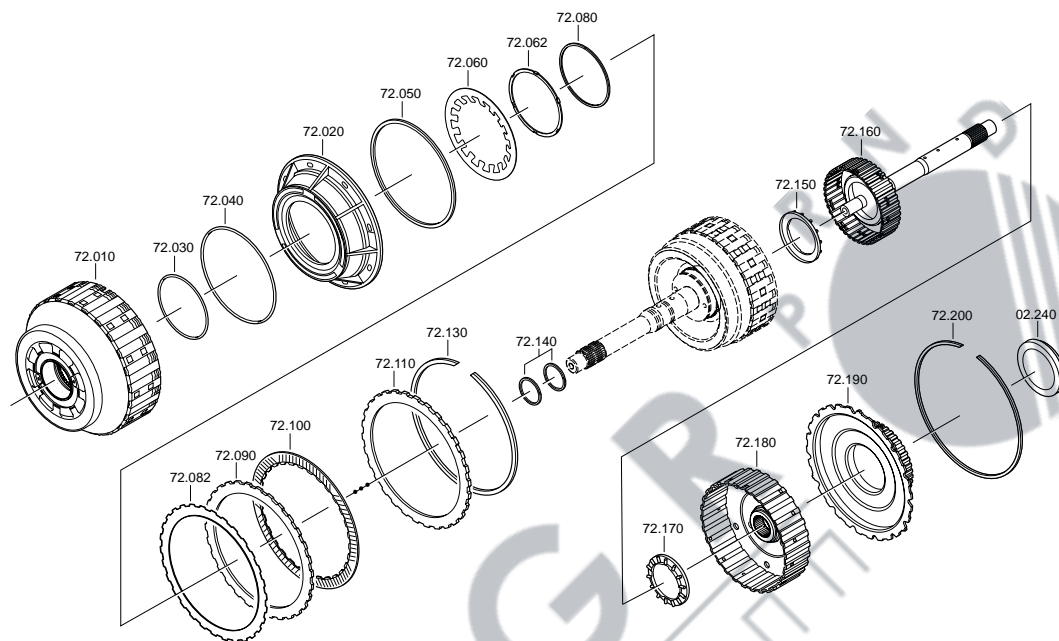


Insert complete disc set A starting with spring disc 70.090 and followed alternately by outer clutch disc 70.100 and lined clutch disc 70.110. Insert final disc 70.120 and secure with snap ring 70.140.



Important:
For adjusting work, see **Chapter 1.4.7**

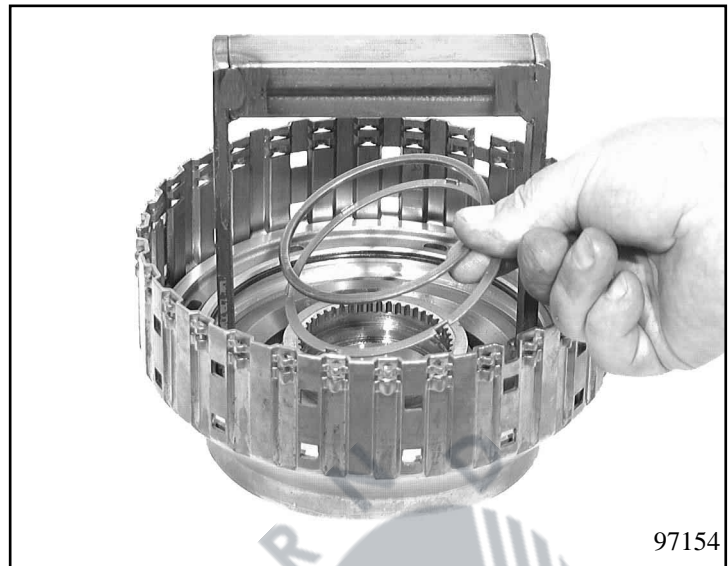
3.5.2 Clutch B (input)



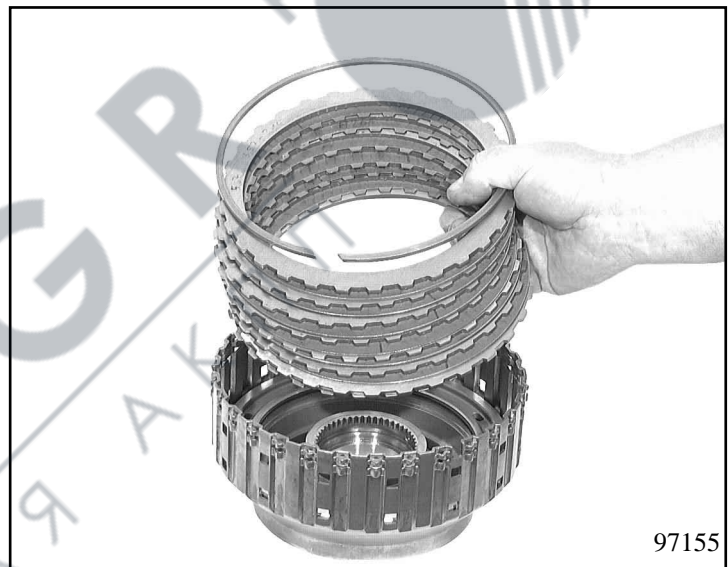
Pull two O-rings 72.030, 72.040 and sealing ring 72.050 on to piston B 72.020.
Press piston B into cylinder B.

97153

Insert cup spring 72.060 and use installation bracket 5x46 001 500 to press cup spring down in the mandrel press; insert circlip 72.062 and secure with circlip 72.080.



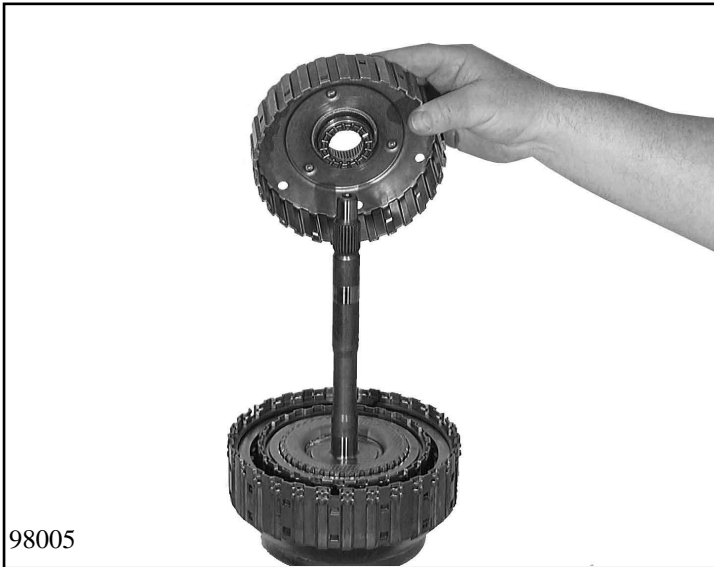
Insert complete disc set B starting with spring clutch disc 72.082 and followed alternately by outer clutch disc 72.090 and lined clutch disc 72.100. Secure upper outer clutch disc 72.110 with snap ring 72.130.



Important:
For adjusting work, see **Chapter 1.4.8**

Insert complete clutch A into clutch B. Place axial needle roller bearing 72.150 on hub of cylinder A. For installed position of the bearing, see picture at right.





Align discs of clutches A and B and insert intermediate shaft 72.160 while turning it.
 Stick axial needle roller bearing 72.170 to the groove of the inner disc carrier B with Vaseline.
 Insert inner disc carrier B 72.180 while turning it.

98005



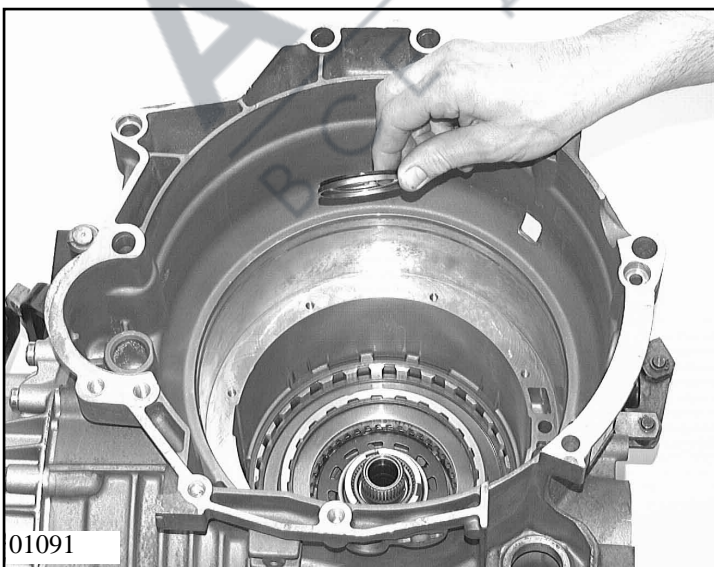
Insert inner disc carrier C 72.190 in cylinder B and secure with snap ring 72.200.

97161

Important:

The snap ring should be 2.6 mm thick.

Please make sure that the angled thrust washer of the axial needle roller bearing is pressed into the inner disc carrier hub.

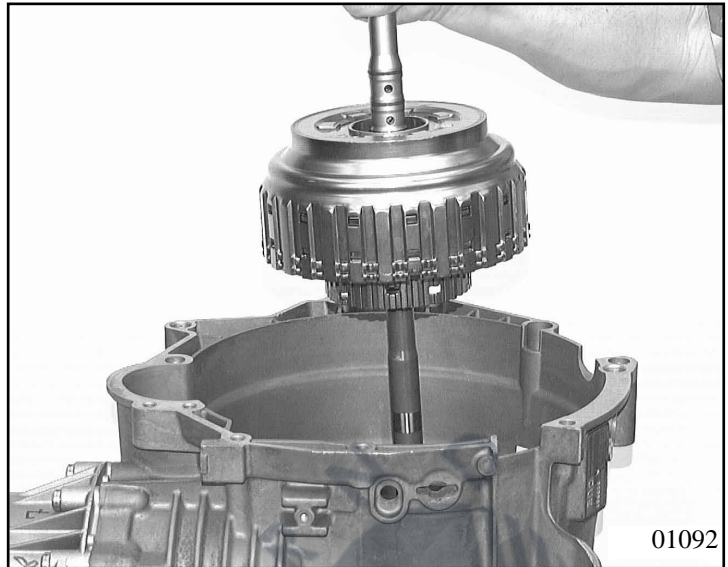


Place axial needle roller bearing 02.240 on tower I.
 For installation of the bearing, see picture at left.

01091

Turn tower II through 180° in the installation fixture.

Align discs for brake C, insert tower II by hand and turn to left and right until the discs engage in disc carrier C completely.

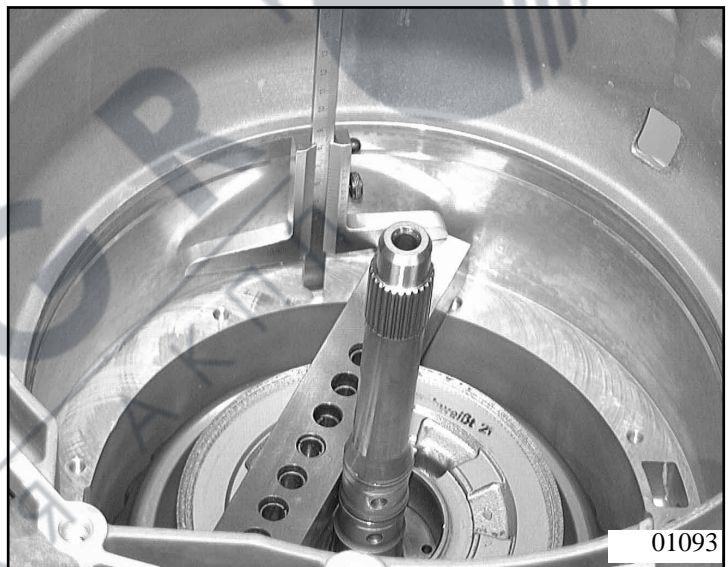


Check measurement:

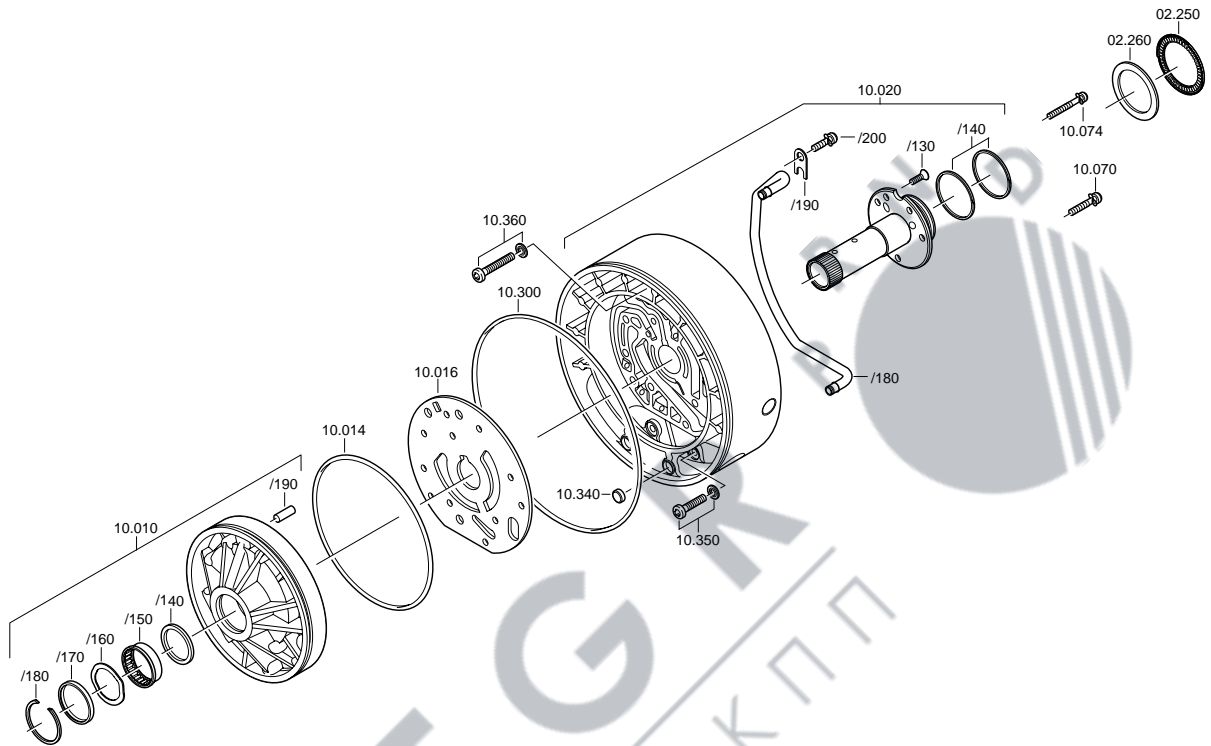
From cylinder B to oil supply unit support surface app. 8 mm.

Note:

Dimension does not include thickness of measuring bar.



3.6 Oil supply



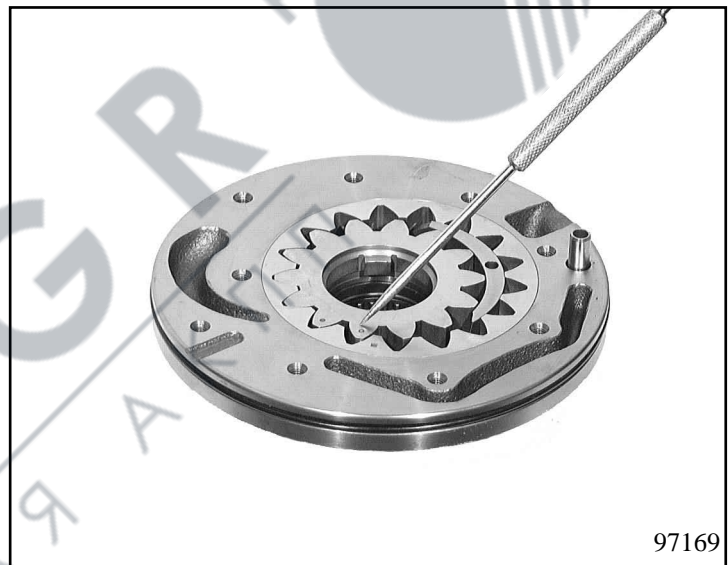
Add parts to pump 10.010; first insert sealing ring 10.010/140 into the pump housing, then press down needle roller bearing 10.010/150 in the mandrel press with installation drift 5x46 000 954.

97165

Insert shaft disc 10.010/160; install the shaft sealing ring 10.010/170 in the pump housing using installation sleeve 5x46 000 953 and secure with snap ring 10.010/180.



Press in sleeve 10.010/190.
Pull on new O-ring 10.014.
Lightly grease the pump gear and pump ring gear before assembly.
After that, assemble pump such that one mark is visible at the pump ring gear and one/two at the pump gear.



Pull 2 pinion rings 10.020/140 on to guide wheel shaft 10.020/120. In order to be able to install the guide wheel shaft on the intermediate plate, they have to be aligned. See next page for correct procedure.





01094

Heat intermediate plate 10.020/110 to app. 70° C with a hot-air blower.
Screw 2 locating pins 5x46 001 007 into intermediate plate.
Insert stator shaft over fixing bolts and secure with 3 countersunk screws 10.020/130. Remove locating pins and insert the 2 remaining countersunk screws.

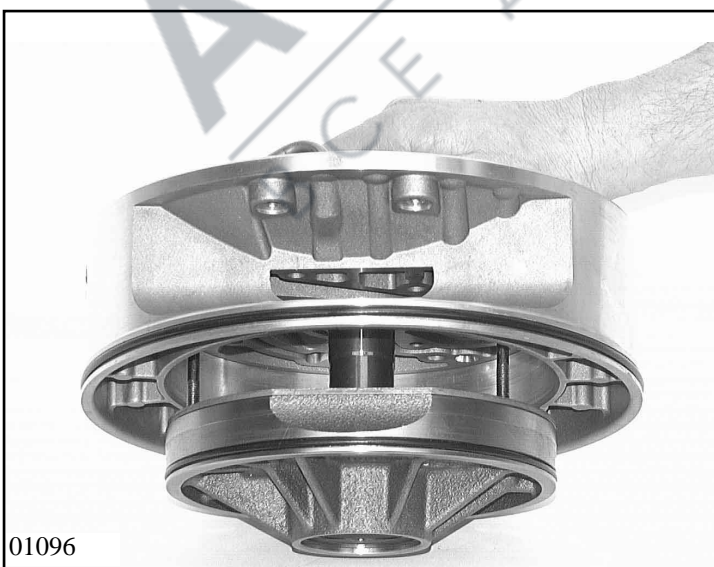
(Tightening torque see Chapter 1.5)



01095

Pull new O-ring 10.300 on to intermediate plate.
Mount oil pipe 10.020/180 with drive-in tool 5x46 001 534 into intermediate housing and fasten at the intermediate plate with one stop plate 10.020/190 and screw 10.020/200 on each side.

(Tightening torque see Chapter 1.5)



01096

Screw locating pins 5x46 001 007 into the pump. Install complete pump with intermediate plate 10.016 over the stator shaft, remove locating pins and tighten down with 10 machine screws 10.070 and 1 machine screw 10.074.

(Tightening torque see Chapter 1.5)

Please note:

Check pump with sleeve 5x56 000 021 for free play. The pump wheels must turn easily.

Stick spacer 02.260 to stator shaft with Vaseline.



Place axial needle roller bearing 02.250 over the input shaft on clutch B.



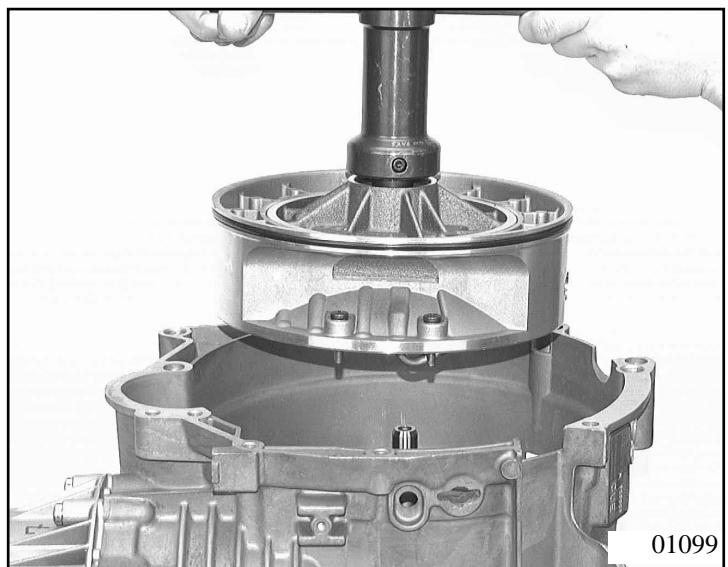
Apply a quantity of Vaseline to the rectangular-section rings on the input shaft. Mount fixture 5x46 000 563 on stator shaft.

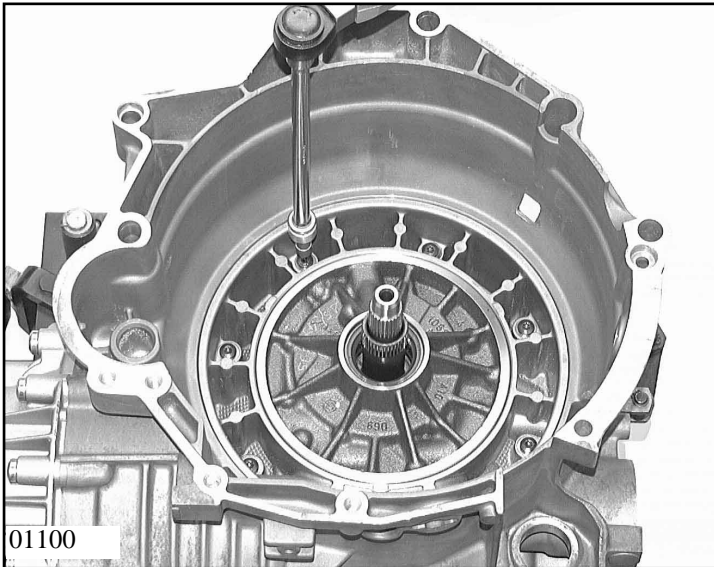
Insert 2 short screws 10.350 into the recessed bores with Usit ring.

Align intermediate plate, carefully insert into transmission housing and press in.

Note:

Insert screws before inserting into transmission housing, as this would be too difficult later (see Items 1+3 in threaded connection specification)





Remove fixture.

Fix intermediate plate with 8 Torx screws and new Usit rings. To do this, insert 6 long Torx screws 10.360 in the normal screw holes additionally.

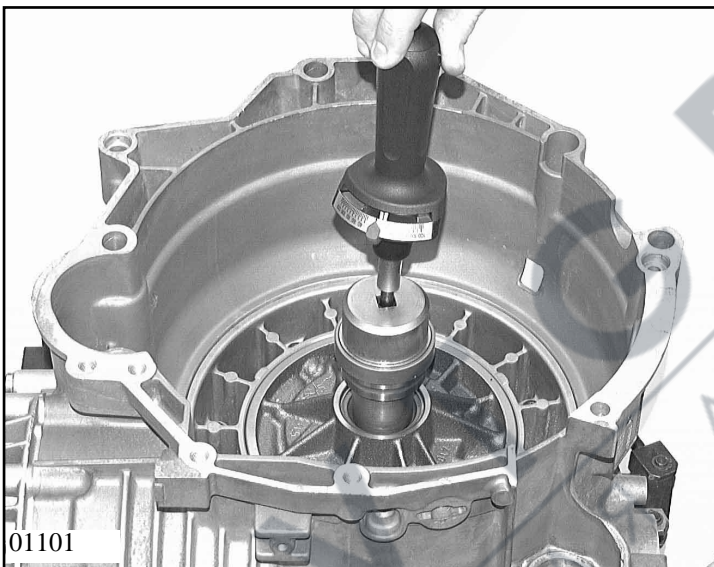
Close recessed bores by pressing in protection caps 10.340.

(Tightening torque see Chapter 1.5)

Important:

For screw specifications, see Chapter 1.3.1.2

For adjusting work, see Chapter 1.4.7



Checking the pump drag torque (oiled)

Max. drag torque 0.8 Nm.

Insert pump gear measuring fixture 5p01 003 033 into driver. Connect torsionmeter 5p66 000 058 (H&K 52 205 212) to the measuring fixture using connector 5x66 000 029 (H&K 52 205 300) .

Turn the torsionmeter evenly while reading off the figure from the scale.

If the value is higher than the maximum permitted value, the pump has to be dismantled again. (gearwheel runout, dirt etc.)

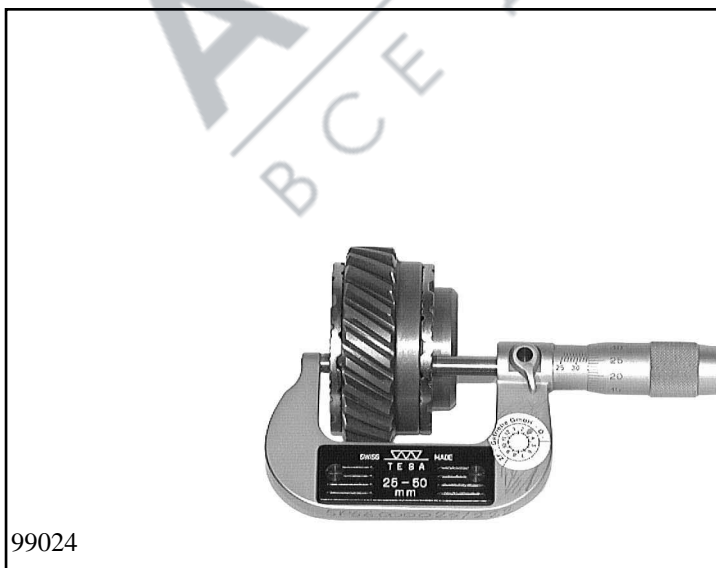


3.7 Adding parts to intermediate and transfer box housing and installing output

3.7.1 Torsen II



99023



99024

Before installing the sunwheels, measure height of the stack comprising the friction disc, sun wheel and friction disc.

Important:

This dimension must be 33.255 mm \pm 0.025 mm; failing this, renew the Torsen II unit.

Place the cover with the larger needle roller sleeve on the workbench with the outside facing down.

Place a narrow thrust washer around the cover bore.

Place the front sunwheel on the thrust washer and guide it into the bore in the cover.

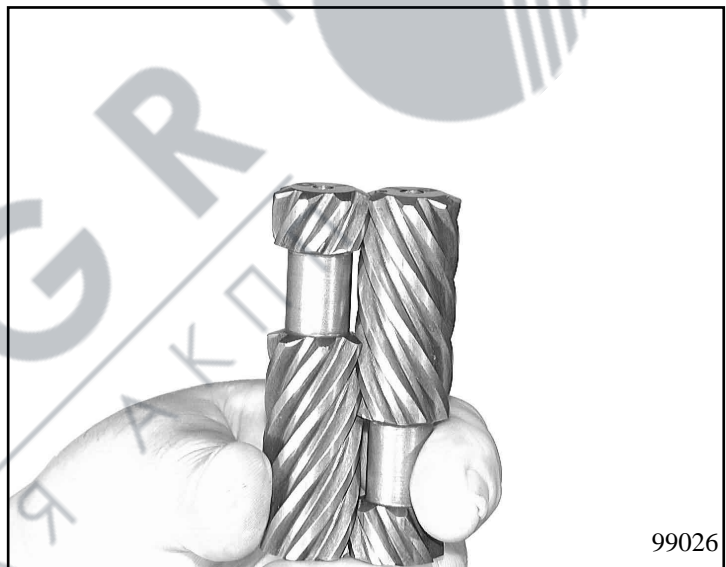
Place a broad thrust washer on the sunwheel. Place the three pairs of planet wheels on the running marks in the cover as indicated by their markings and engage them with the sunwheel.



When looking clockwise, the first planet wheel of each pair has the tooth gap at the top. Mesh the planet wheels together and with the front sunwheel.

Important:

Looking outwards from the longitudinal axis of the Torsen II unit and towards the pairs of planet wheels, their teeth taper towards the top in a manner similar in appearance to a fir tree.



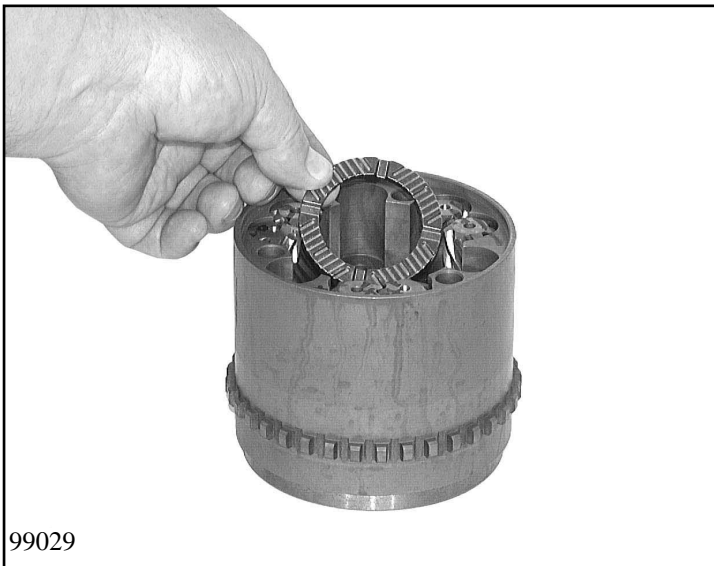
Place the housing over the planet wheels in accordance with the markings and position the front sun wheel on the cover.

Note:

To check whether the cover and housing are accurately located, insert screws from the top through the housing into the cover.

(They must screw in easily by hand.)



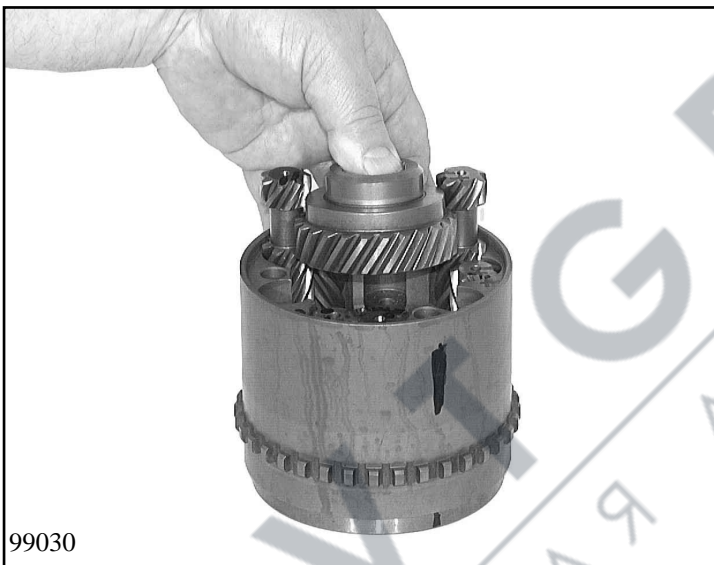


99029

Move the housing up evenly until it is in contact with the cover, and drive it in with light blows of a plastic-faced hammer.

Take out the screws. Turn the planet wheels several times.

Insert a wide thrust washer into the housing.



99030

Install the rear sunwheel.

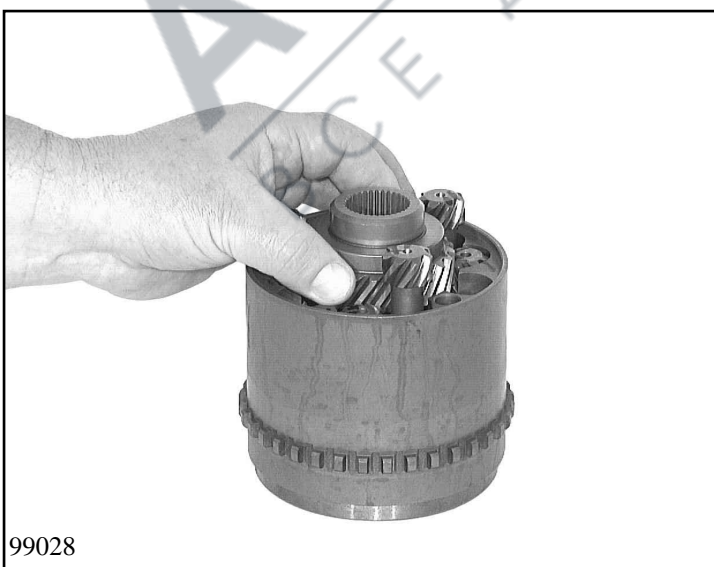
Note:

This is rather difficult at first and calls for skilled manipulation with the fingers. The remaining insertion process is then easier.

Looking clockwise, pull the two front planet wheels (those with the tooth gap at the top) upwards out of the housing by about 40 mm.

Engage the sunwheel teeth in the planet wheel tooth gaps.

Tilt the sunwheel upwards, away from the third pair of planet wheels.



99028

Pull the third planet wheel (with the tooth gap at the top) out of the housing.

Tilt the sunwheel back so that the sunwheel teeth mesh with the teeth gaps in the planet wheels.

Guide the sunwheel with planet wheels slowly downwards.

By turning the sunwheel in either direction, its teeth can be meshed with those of the planet wheels that were not raised. After this has been done, the three raised planet wheels will also engage easily with the teeth of the front planet wheel. Check that the markings on the planet wheels are matched. Place a wide thrust washer on the rear sunwheel. Place the cover on the housing as indicated by the markings

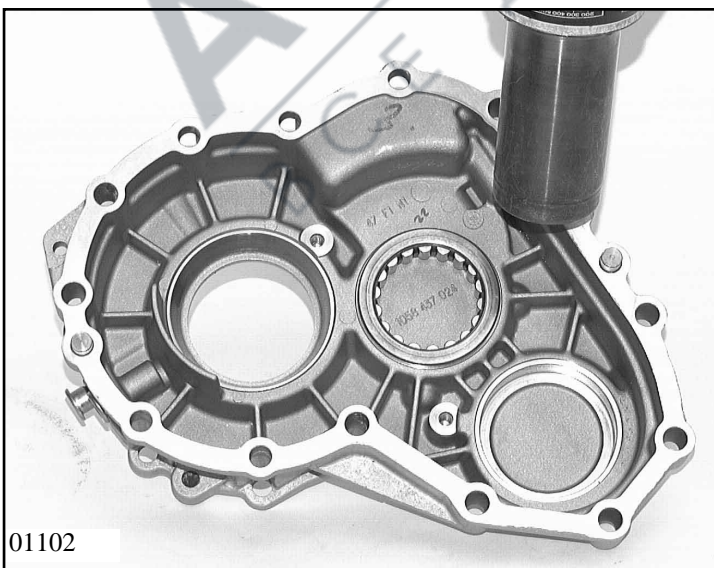
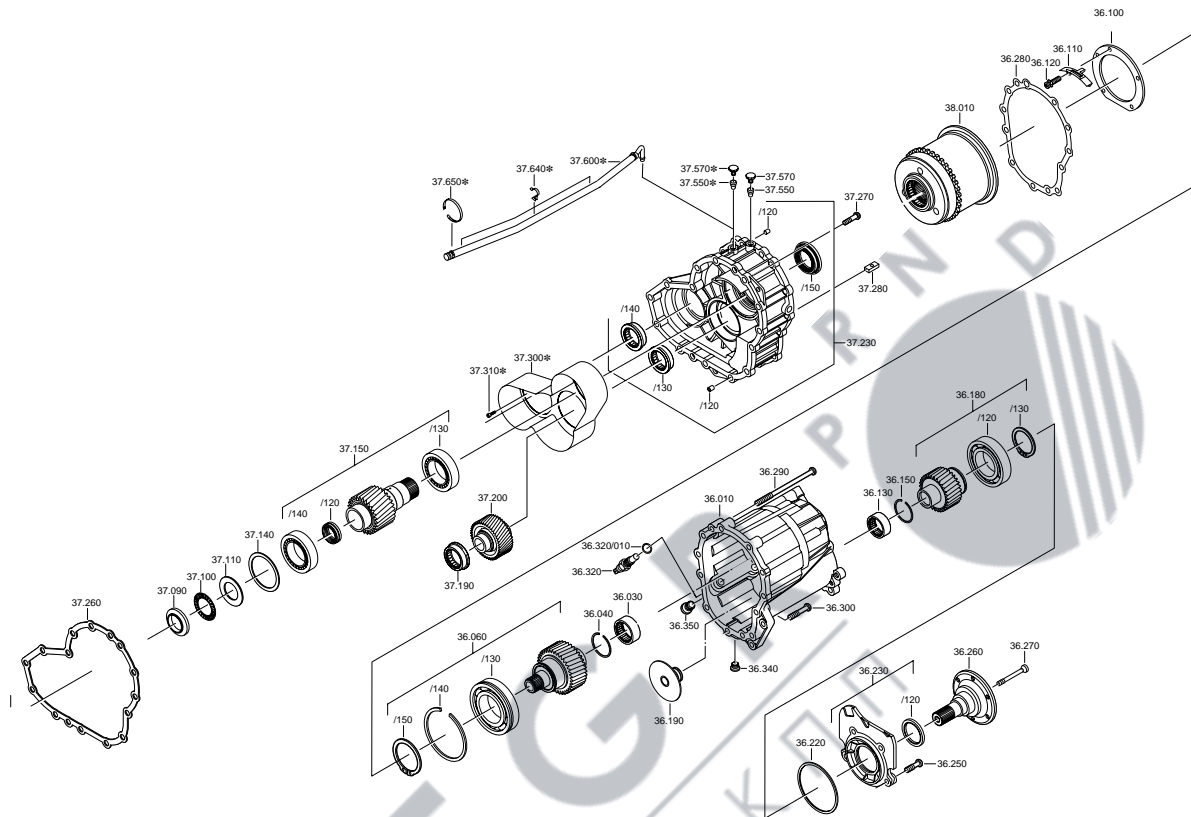


Insert three screws and tighten them initially by hand. Clamp retaining fixture 5x46 002 262 into the vice. Place the Torsen II unit in the retaining fixture with the screw heads uppermost. Tighten screws uniformly so that the covers do not tilt. Remove Torsen II unit from the retaining fixture. Check the Torsen II unit for free rotation by turning the front or rear axle shaft.

(Tightening torques: see Chapter 1.5)



3.7.2 Adding various parts to intermediate housing



Heat the outer bearing race seats with a hot-air blower and install the bearing for the lateral shaft 37.230/140, the intermediate gear 37.230/130 and the front axle shaft outer bearing race 37.150/130 in their correct seats.

If unmounted fix screen sheet 37.300 with 2 screws 37.310.

01102

3.7.3 Transfer box housing

3.7.3.1 Output gear

Using sleeve 5x46 002 281 in the mandrel press, force ball bearing 36.180/120 on to the output gear and secure it with circlip 36.180/130.

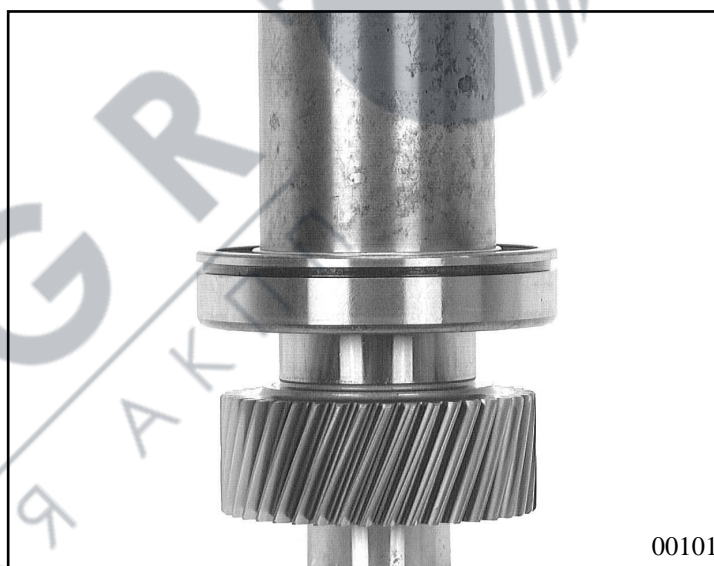


3.7.3.2 Rear axle shaft

Using sleeve 5x46 002 280 in the mandrel press, force ball bearing 36.060/130 with the snap ring groove on top on to the rear axle shaft.

Install circlip 36.060/150 with suitable pliers.

Insert snap ring 36.060/140 into the groove on the ball bearing with suitable pliers.

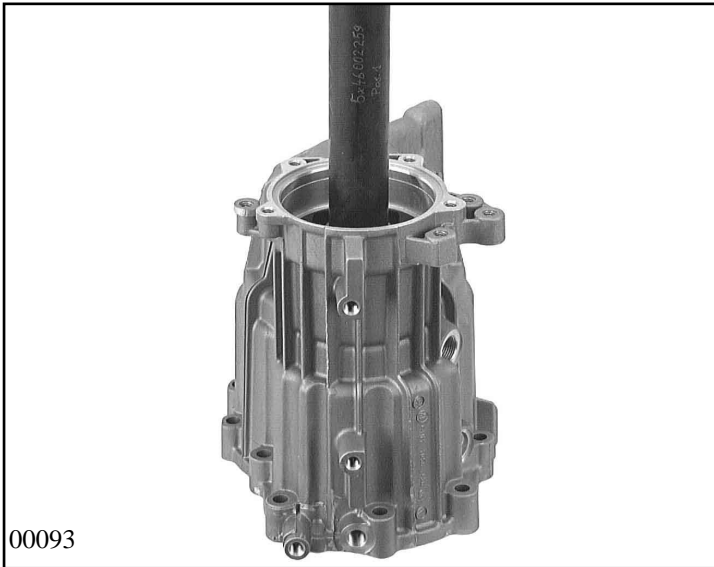


3.7.3.3 Cover

Using drift 5x46 001 327, install shaft sealing ring 36.230/120 in the mandrel press.

Install sealing ring 36.220 on cover 36.230.

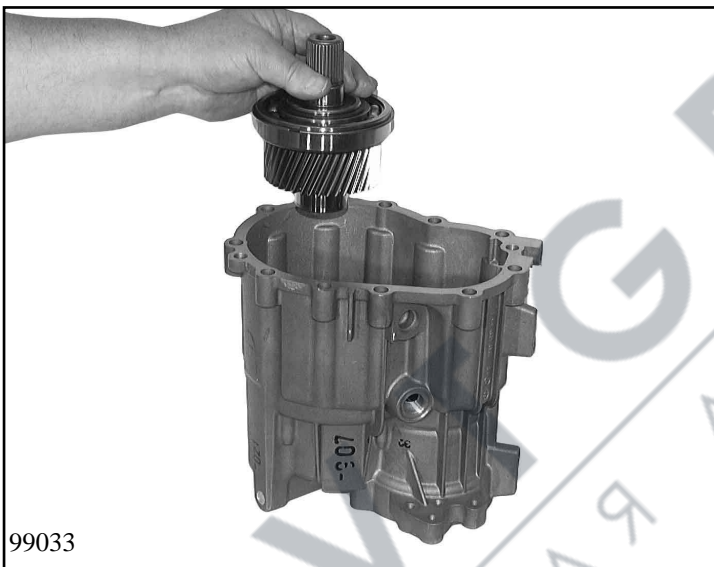




00093

Using drift 5x46 002 259 in the mandrel press, force needle roller sleeve 36.130 into the transfer box housing 36.010 and secure with snap ring 36.150.

Using drift 5x46 002 261 in the mandrel press, force needle roller sleeve 36.130 36.030 into the transfer box housing and secure with snap ring 36.040.

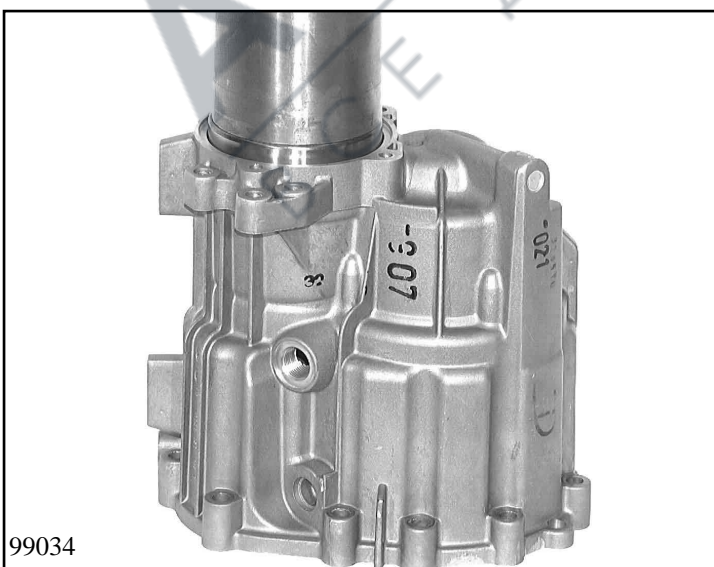


99033

Insert rear axle shaft 36.060 into the transfer box housing, pressing in if necessary with a suitable drift in the mandrel press.

Install disc 36.100 with 3 screws 36.120 and the oil dam 36.110 with 2 screws 36.120 in the transfer box housing.

(Tightening torques: see Chapter 1.5)

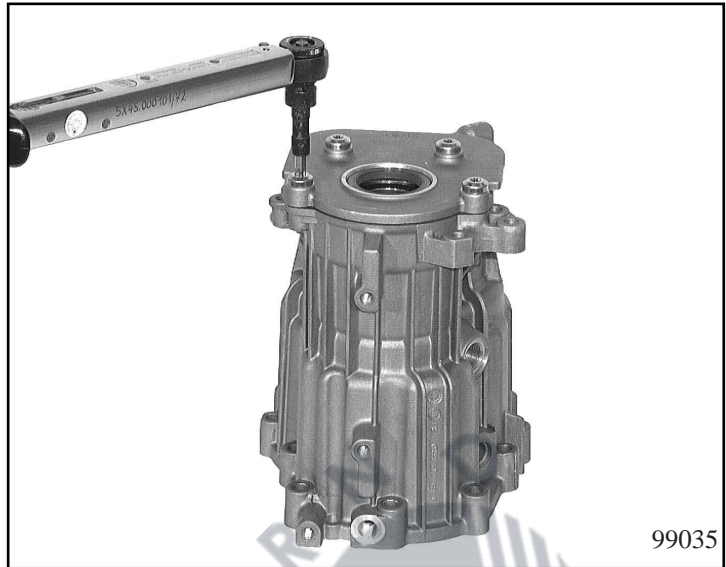


99034

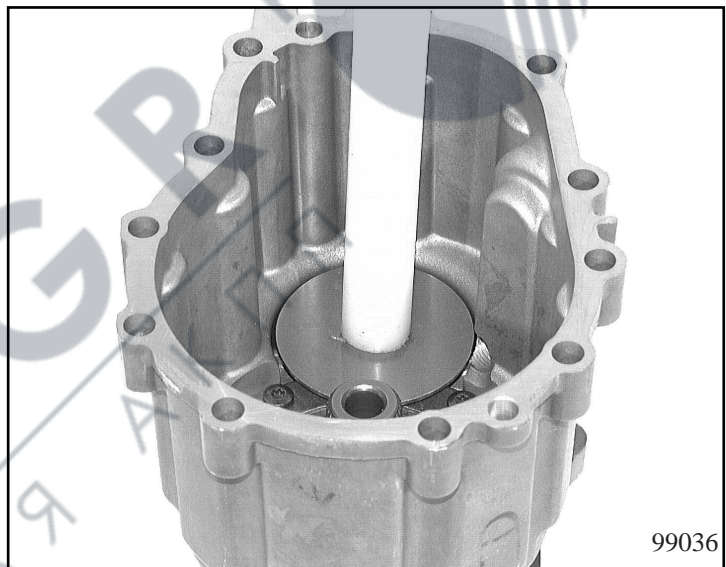
Insert output gear into the needle roller sleeve in the transfer box housing and press in, using a suitable drift in the mandrel press.

Install cover 36.230 on the transfer box housing using 4 screws 36.250.

(Tightening torques: see Chapter 1.5)

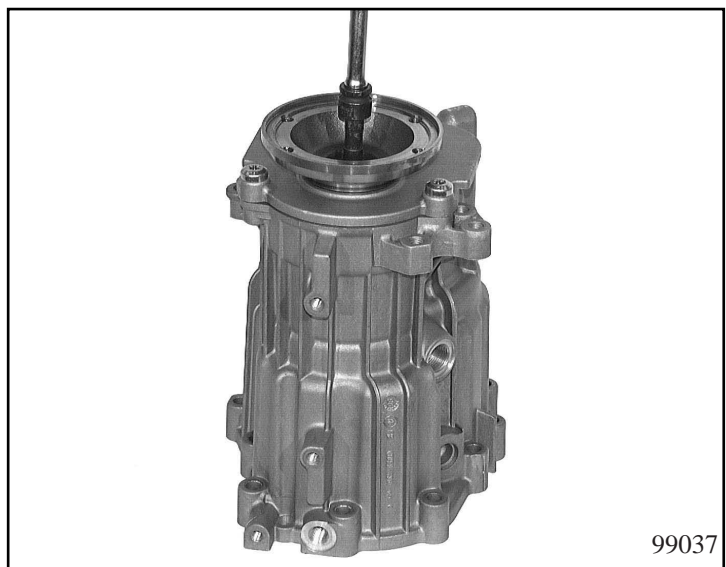


Press the journal of nut 36.190 into the output gear, using a suitable drift in the mandrel press.



Note:
Do not tilt the nut or this will cause problems with the expansion bolt.

Push flange 36.260 into the output gear and secure with expansion bolt 36.270, but without tightening the bolt fully as yet.



Important:
The expansion bolt is tightened fully later.

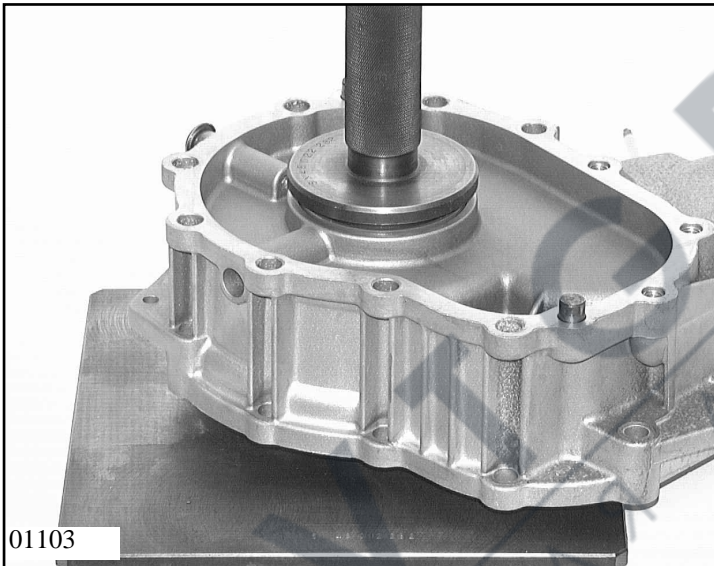


99040

3.7.4 Front axle shaft

Using sleeves 5x46 002 218, press in roller bearings 37.150/130, 37.150/140 in the mandrel press.

Using fixture 5x46 001 333 press in shaft sealing ring 37.150/120 fully in the mandrel press.



01103

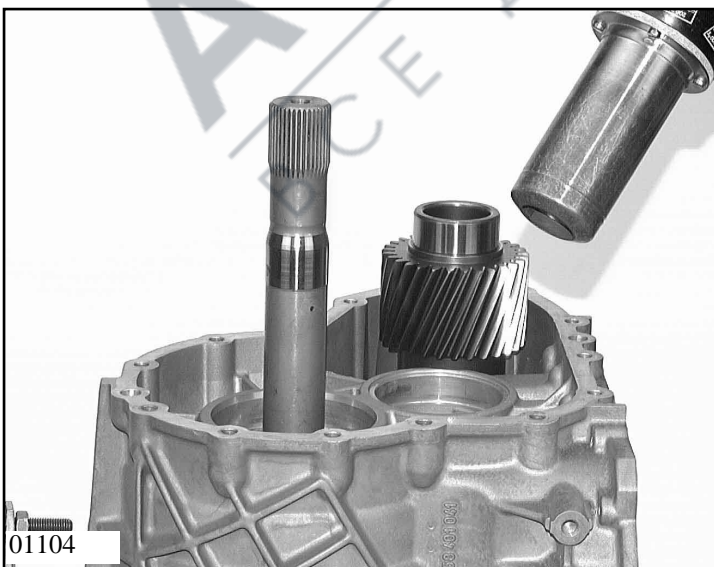
3.7.5 Front axle shaft

Using fixture 5x46 002 282 press in shaft sealing ring 37.240 fully in the mandrel press.

4 cylinder pins 37.230/120 and a breather have to be installed in the housing.

Note:

Two breathers of the same type (=37.550) or a single (=37.550) and a hose-type breather (= 37.600) can be installed. The bushing must be pressed in to 10 ± 0.5 mm.



01104

3.7.6 Installing the intermediate gear and the front axle shaft

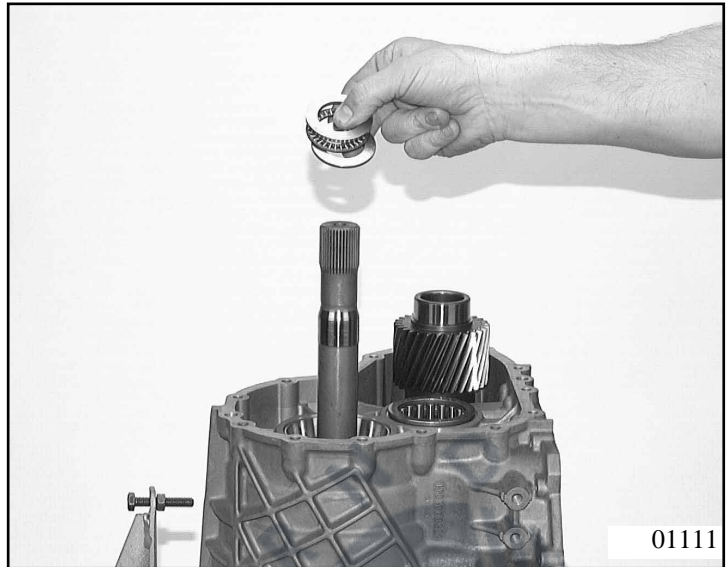
Insert the adjusting washer for the front axle shaft 37.140 into the bearing seat.

Using a hot-air blower, heat the intermediate gear bearing seat thoroughly.

Insert the intermediate gear roller race 37.190 and the front axle shaft bearing outer race 37.150/140 into the bearing seats.

For adjusting work, see **Chapter 1.4.3**

Place support shim 37.090, axial needle cage 37.100 and shim 37.110 over the input shaft.
Install guide sleeve 5x46 001 339 for the shaft sealing ring on the output shaft.

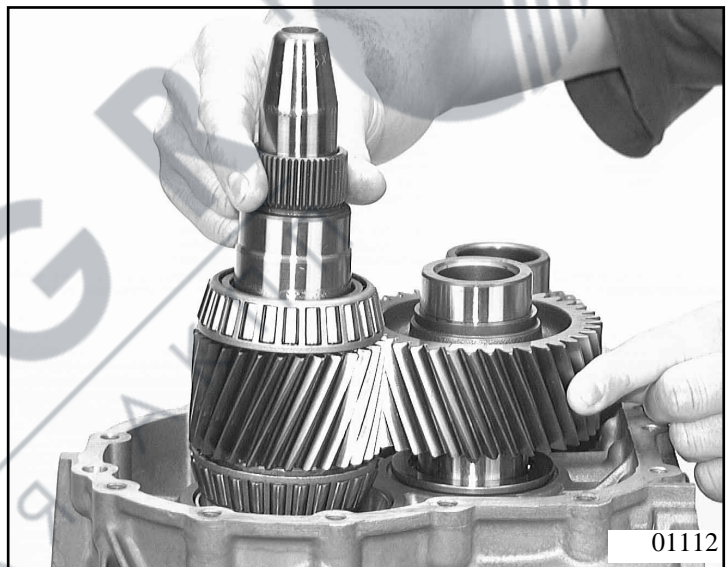


Install the front axle shaft and the intermediate gear together in the transmission housing.
Remove the shaft sealing ring guide sleeve.

Important:

The numbers stamped on the gearwheels must face up (away from the transmission housing).
(Exception, see unmounting chapter 2.1.2)

Do not raise the front axle shaft again after this, or the sealing ring may be damaged.



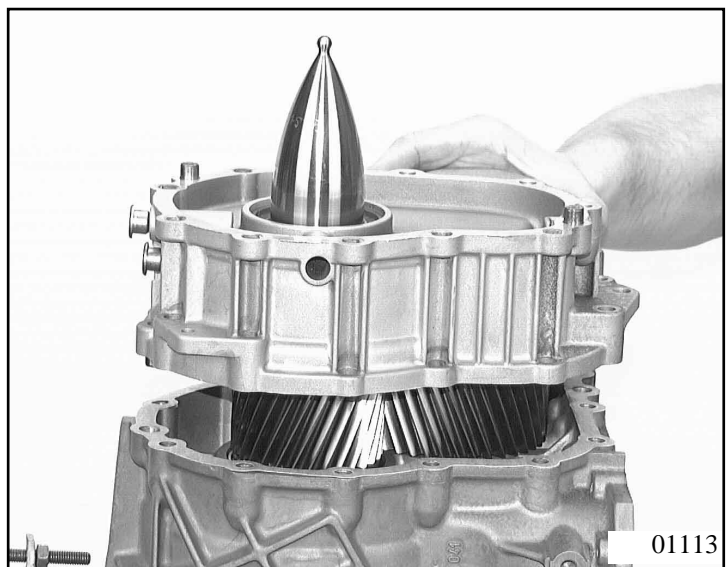
3.7.7 Installing intermediate housing on transmission housing

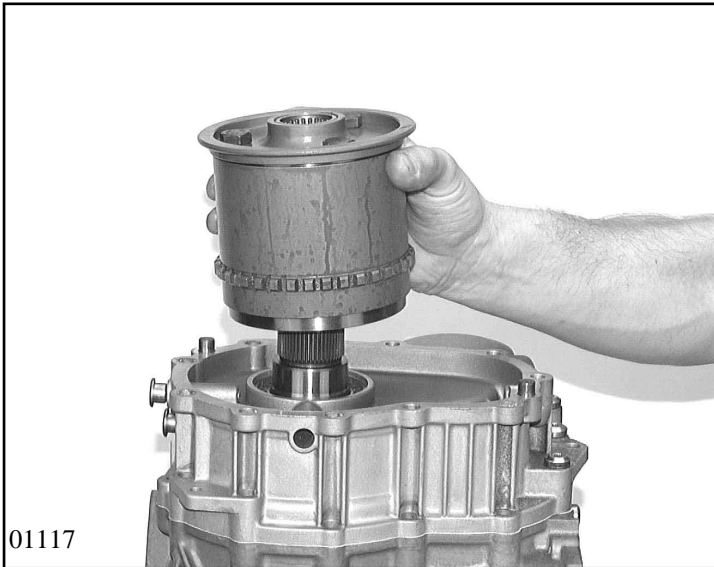
Install guide sleeve 5x46 001 535 for the shaft sealing ring on the output shaft.
Place gasket 37.010 on the transmission housing. Place the intermediate housing over the output shaft and the guide sleeve and on to the transmission housing so that the locating sleeve enters the transmission housing.

Take off the shaft sealing ring locating sleeve. Insert the 6 screws 37.220 through the intermediate housing into the transmission housing without tightening them.

Important:

For endplay adjustment, see Chapter 1.4.5





01117

3.7.8 Installing Torsen II

Install the Torsen II unit in the output and front axle shaft splines.

Add 34 cc of oil (Sturaco FM 1992 - KS) to the Torsen II through the hole for the rear axle shaft.

Insert magnet 37.280 into intermediate housing.

Important:

Do not raise the Torsen II unit again after this, or oil will be lost.

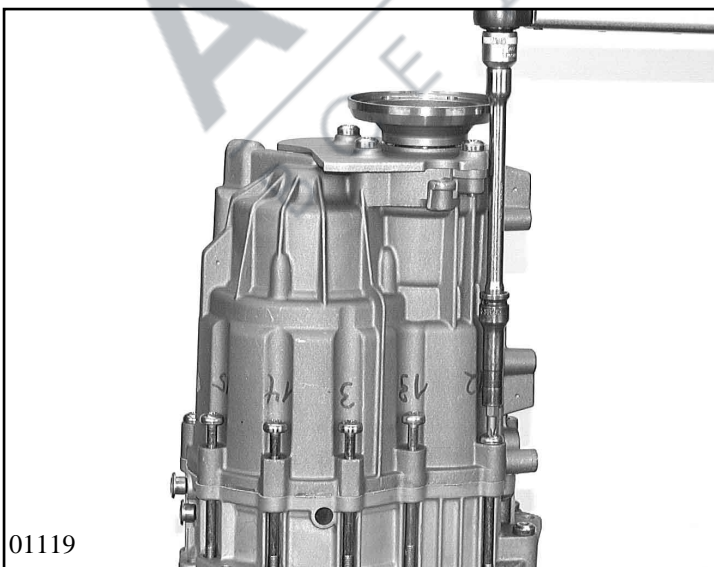


01118

3.7.9 Installing transfer box housing on intermediate housing

Place gasekt 36.280 on the intermediate housing.

Place the transfer box housing over the Torsen II unit on to the intermediate housing so that the rear axle shaft enters the Torsen II and the two cylindrical pins in the intermediate housing enter the transfer box housing.



01119

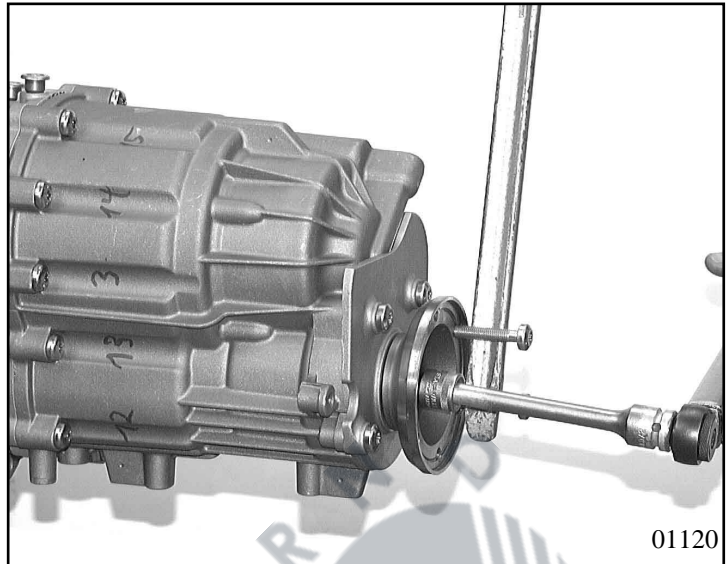
Secure the transfer box housing with 8 screws 36.290 to the transmission housing and with 3 screws 36.300 to the intermediate housing, and the intermediate housing with 6 screws 37.270 to the transmission housing.

Important:

Tightening procedure: see Chapter 1.3.1.6

Turn the transmission so that the oil pan faces down. Prevent the flange from turning and tighten the expansion bolt fully.

(Tightening torques: see Chapter 1.5)

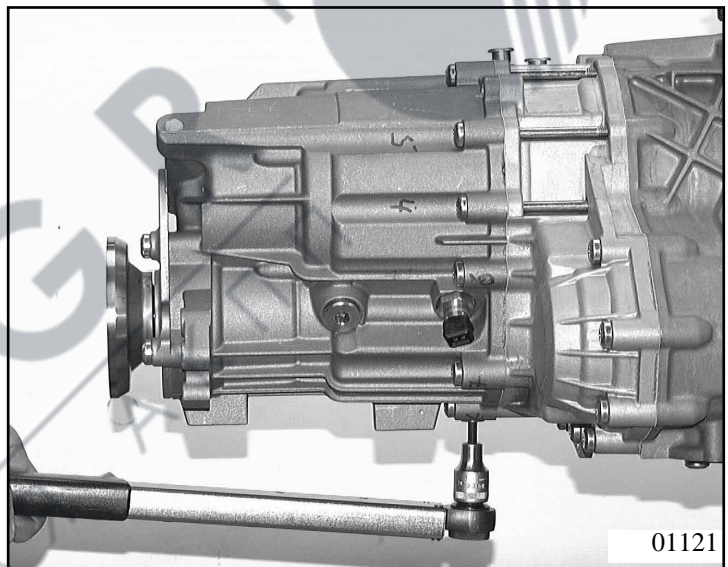


Pull a new O-ring 36.320/010 on to the inductive sensor 36.320 and screw it into the transfer box housing .

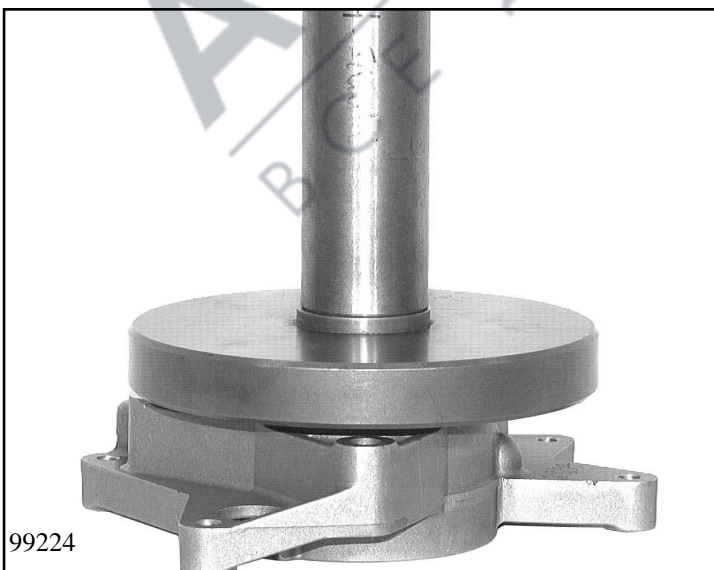
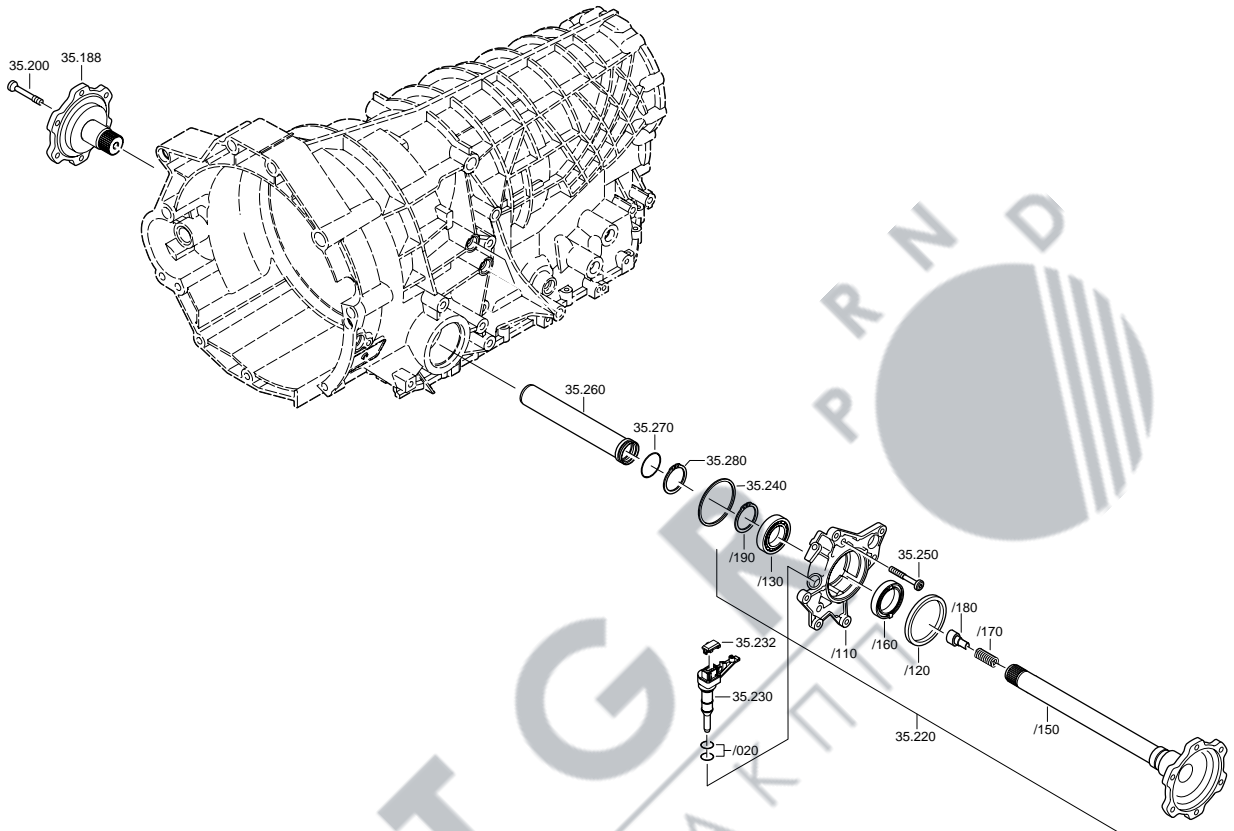
Screw a new oil drain plug 36.340 and a new oil filler plug 36.350 into the transmission housing.

Press 1 or 2 breather covers 37.640 on to the breather(s).

(Tightening torques: see Chapter 1.5)

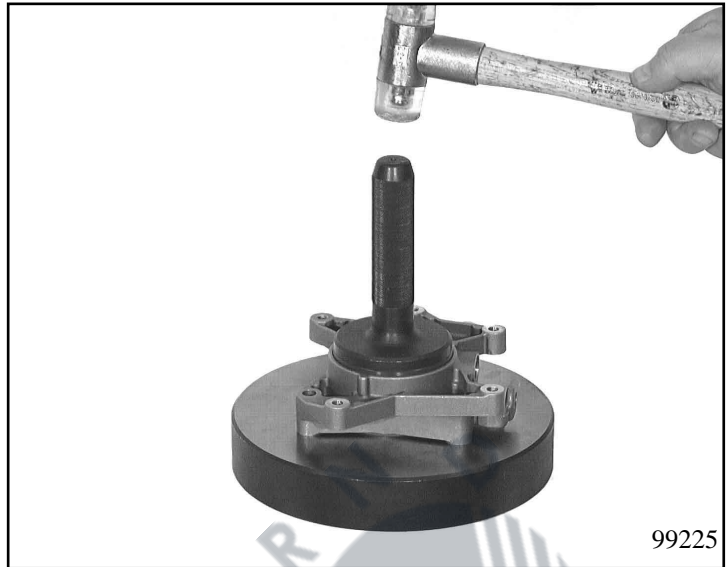


3.8 Adding parts to flange shaft and installing

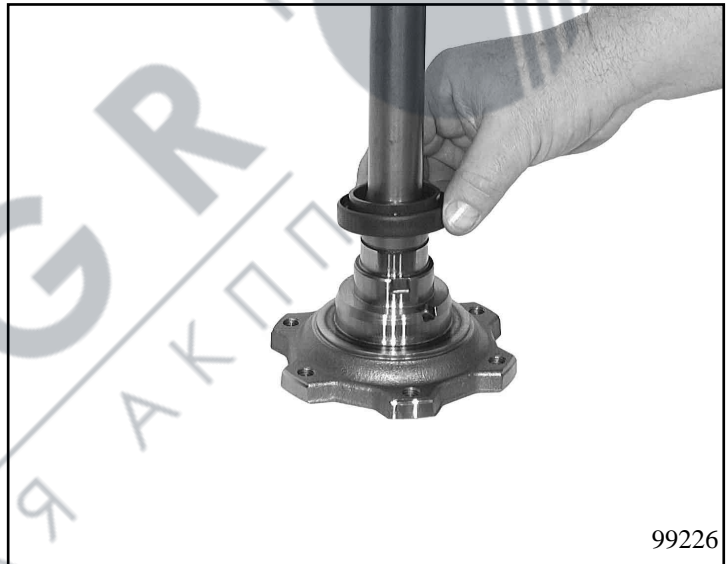


Using fixture 5x46 000 182 in the mandrel press, press bearing 35.220/130 fully into speedometer housing 35.220/110.

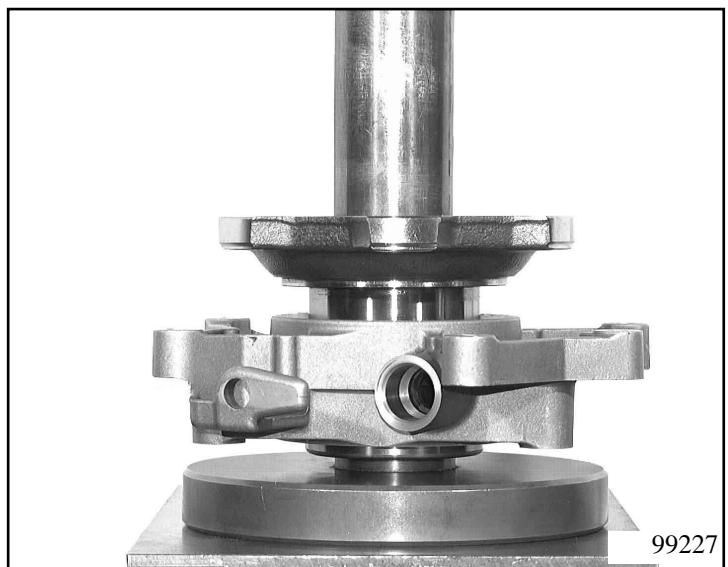
Insert speedometer housing with bearing into fixture 5x46 001 272. Using a mandrel press and pressing-in drift 5x46 001 272, press shaft sealing ring 35.220/120 fully into the speedometer housing.



Insert magnet ring 35.220/160 with the journal into the slot in flange shaft 35.220/150.

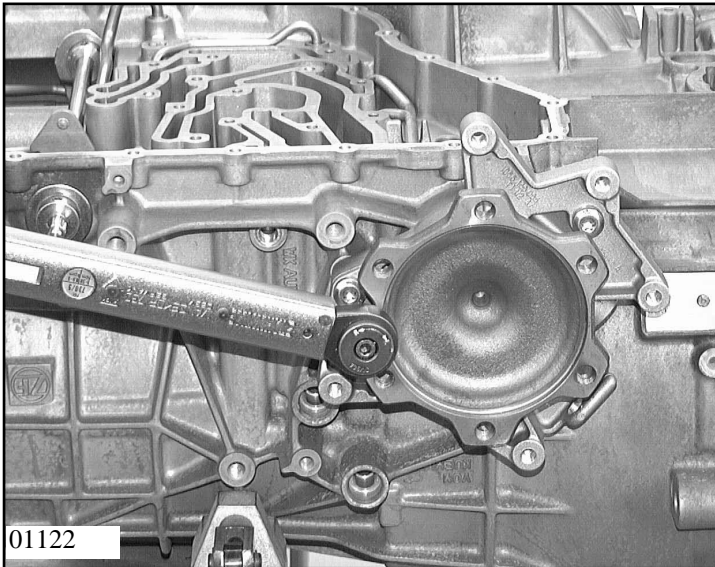


Using assembly fixture 5x46 000 182, press the flange shaft into the speedometer housing in the mandrel press and secure it with the circlip. Insert sealing ring 35.240 into the speedometer housing.



Important:

Grease bearing with 8g grease type C029 Alvania (Shell)

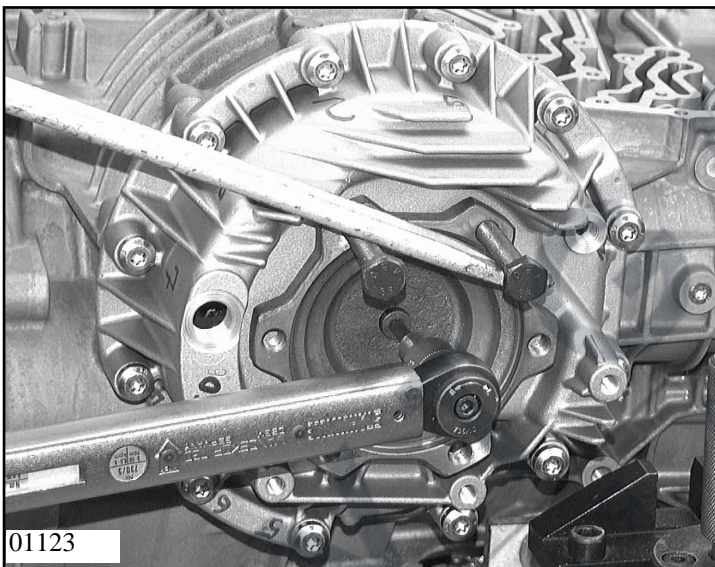


Turn the transmission so that the oil pan faces upwards.

Pull the O-ring 35.270 on to tube 35.260, press in with tool 5x46 002 460 in the transmission housing and secure with snap ring 35.280.

Install complete flange shaft in transmission housing and secure with 3 screws 35.250.

(Tightening torques: see Chapter 1.5)



Insert flange 35.188 into the differential. Prevent the flange from turning and secure with expansion bolt 35.200.

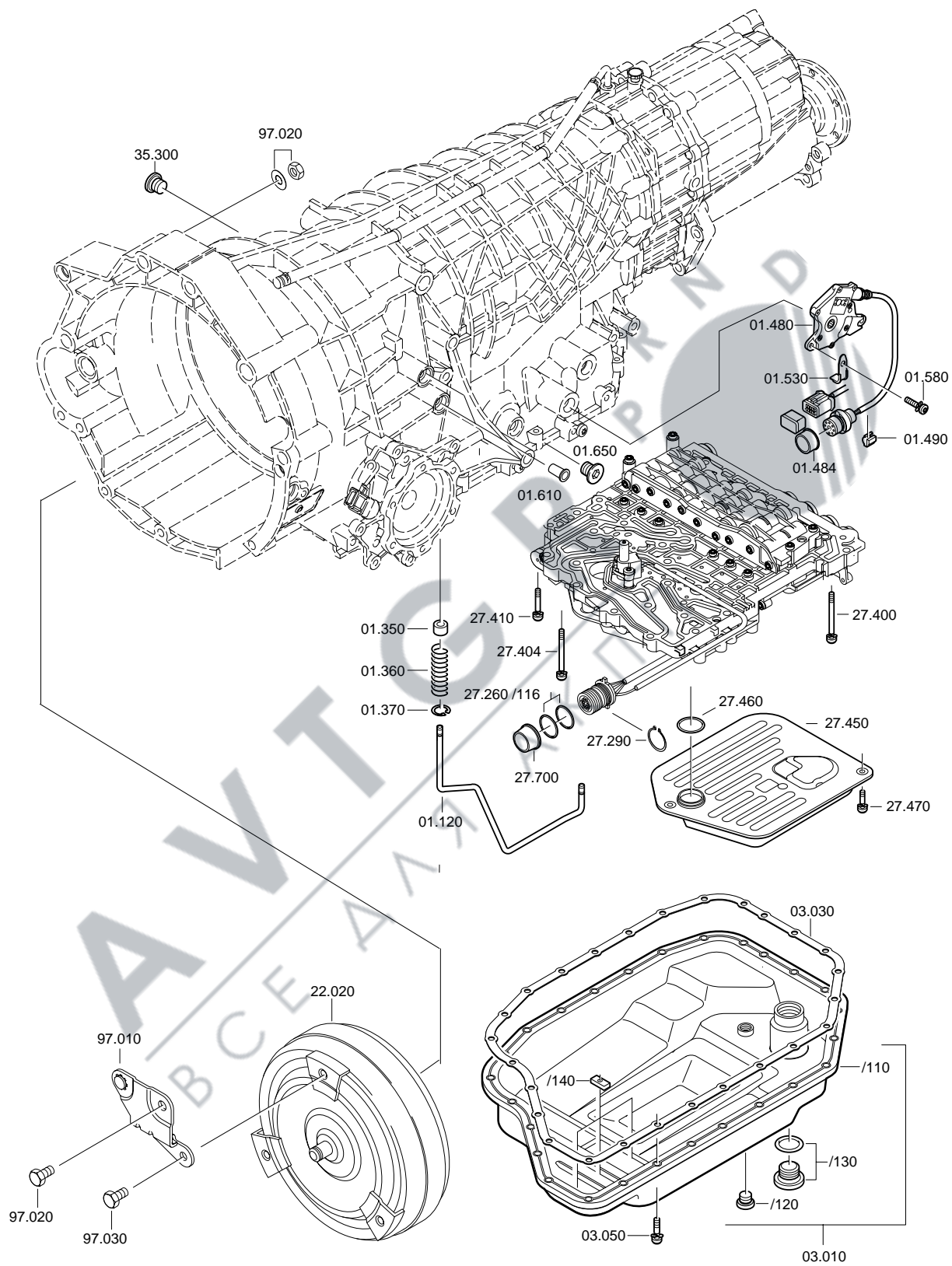
(Tightening torques: see Chapter 1.5)



Pull two new O-rings 35.230/020 on to speedometer sensor 35.230 and press this into the speedometer housing so that the arm engages in the housing.

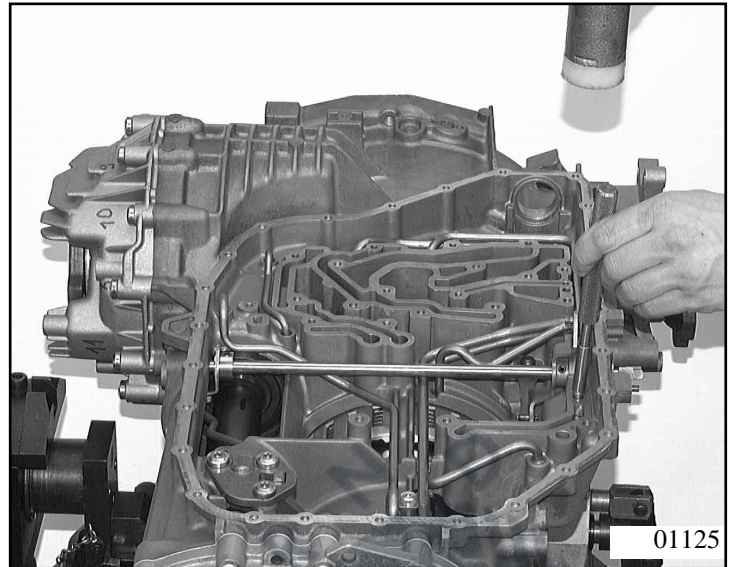


3.9 Control unit, oil filter, oil pan and converter
(Complete control unit, see spare parts list, technical cover sheet, Item YO2)

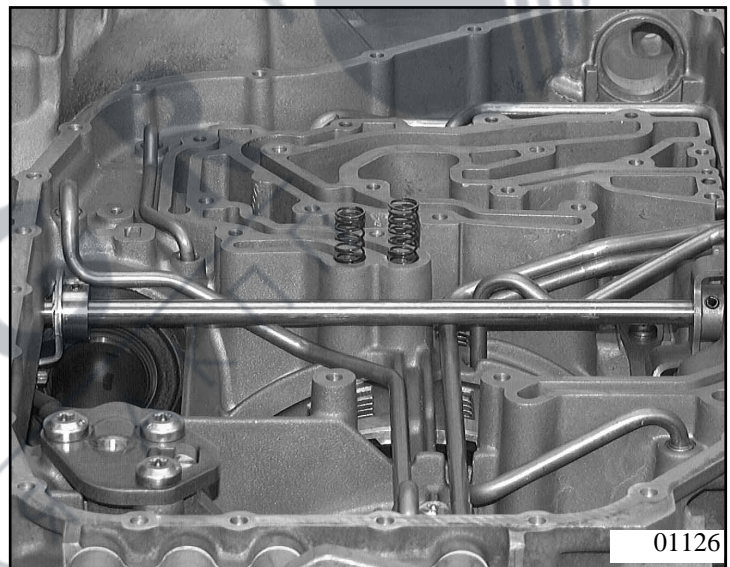


Install the remaining oil pipe 01.120 in the cylinder E bore and transmission housing with driving-in tool 5x46 001 534.

(Tightening torque see Chapter 1.5)



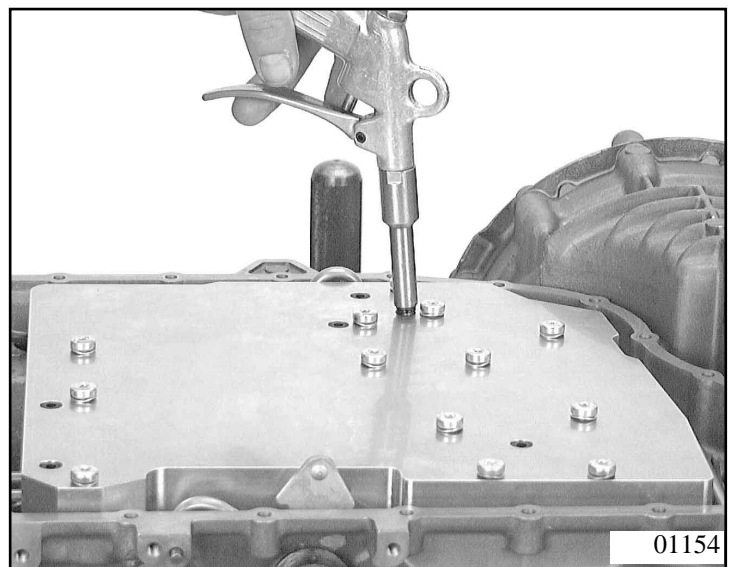
Using a suitable tool, drive in two sealing sleeves 01.350 between the transmission housing and cylinder DE. Insert one coil spring 01.360 per sealing sleeve and secure with circlip 01.370.

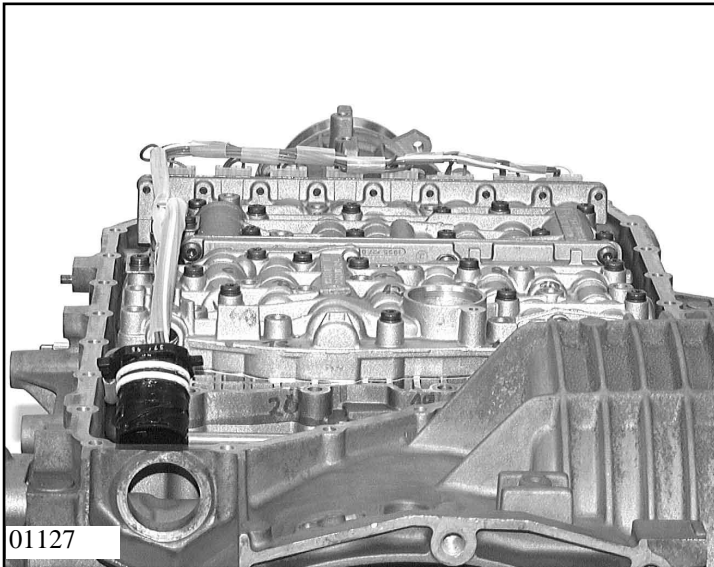


Secure test plate 5p81 000 459 at the control unit connection at the housing and check function of all clutches/brakes by applying compressed air to the marked bores. Remove fixture afterwards.

Important:

Tighten test plate screws at the transmission housing with 8 Nm torque.

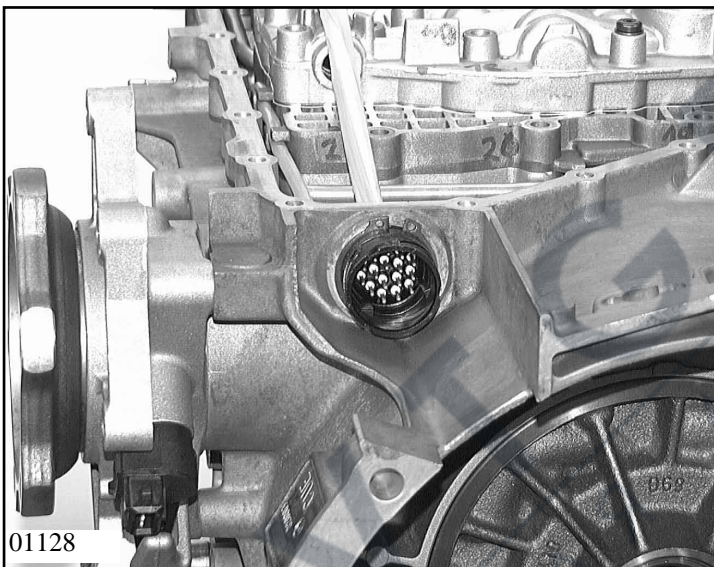




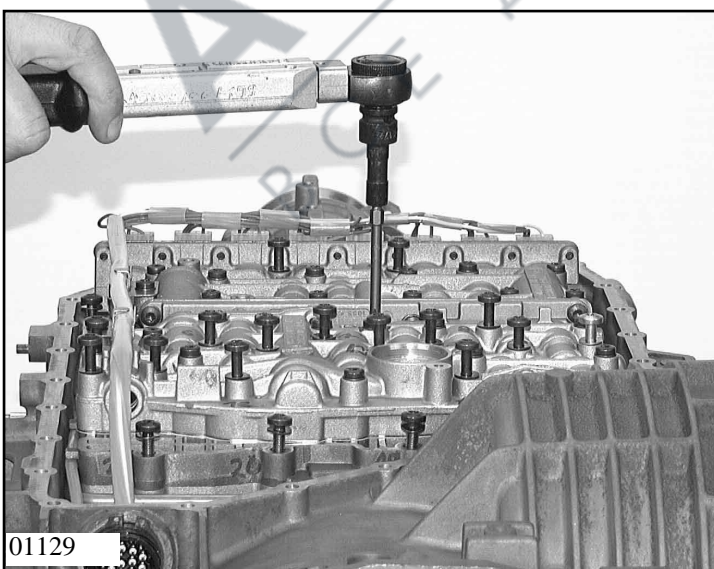
Place the control unit loosely in position.
Set the detent disc to the neutral position.
Align the control unit and press into position by hand.
Pull two new O-ring 27.260/116 on to the power plug of the cable tree.

Important:

The inductive sensor cable path is critical: please check that the cable is not trapped.



Align power socket so that the flat side points towards the oil pan. Press in power socket and secure with retaining snap ring 27.290.



Secure control unit with 15 machine screws 27.400, 1 machine screw 27.404 (silver) and 5 machine screws 27.410.

(Tightening torques: see Chapter 1.5)

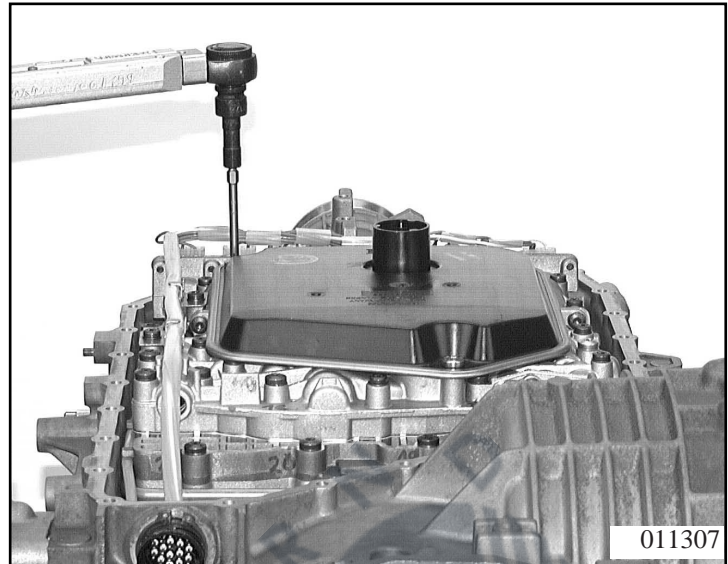
Important:

Selector shift valve groove must engage in pins of detent disc.

Tightening specifications: Chapter 1.3.1.3

Pull O-ring 27.460 on to the filter neck 27.450. Secure filter with 2 machine screws 27.470.

(Tightening torques: see Chapter 1.5)

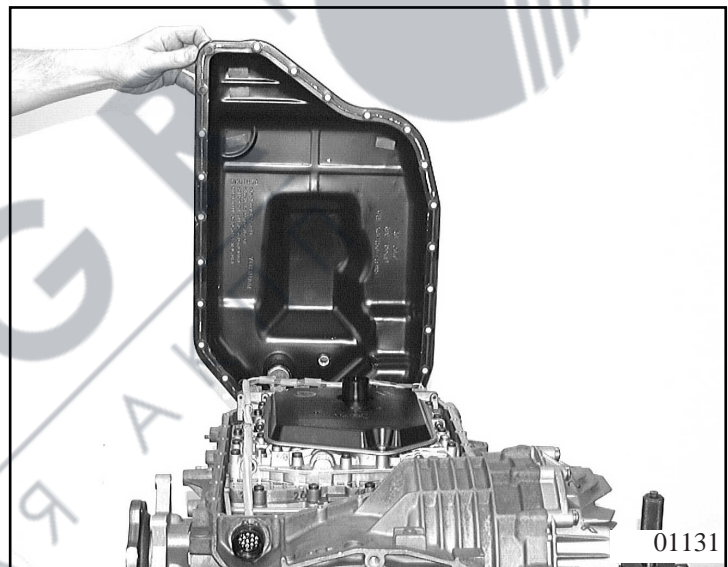


Stick gasket 03.030 on to transmission housing with grease (Vaseline) and align. Insert 4 magnets 03.010/140 into the front corners and between the ribs of the oil pan. Place oil pan 03.010/110 on top and secure with 26 machine screws 03.050.

(Tightening torques: see Chapter 1.5)

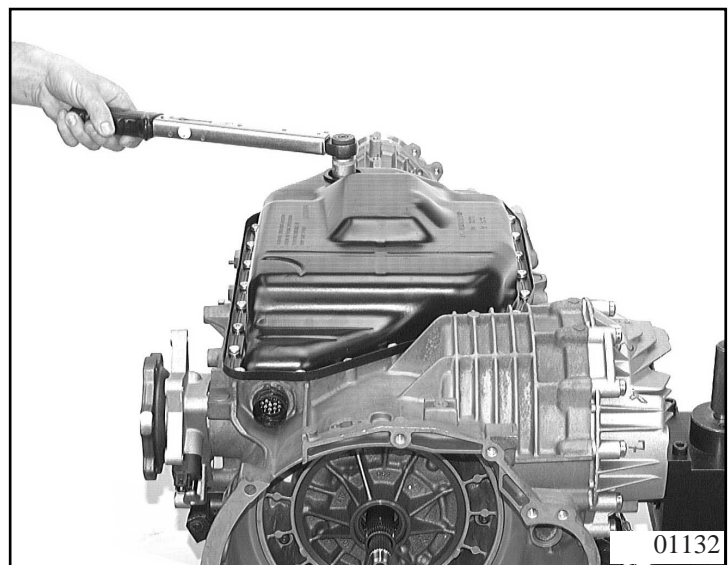
Important:

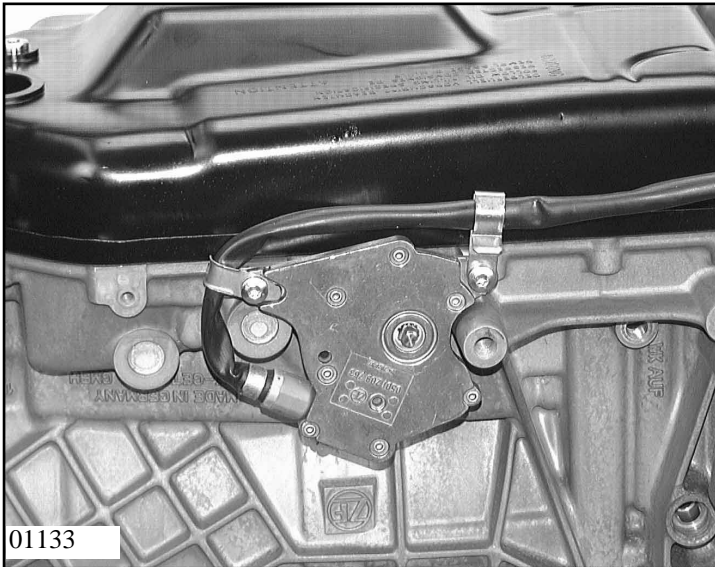
Tightening specifications: Chapter 1.3.1



Screw the oil drain 03.010/120 and filler plugs 03.010/130 into the oil pan. Screw the differential filler plug 35.300 into the differential housing.

(Tightening torques: see Chapter 1.5)

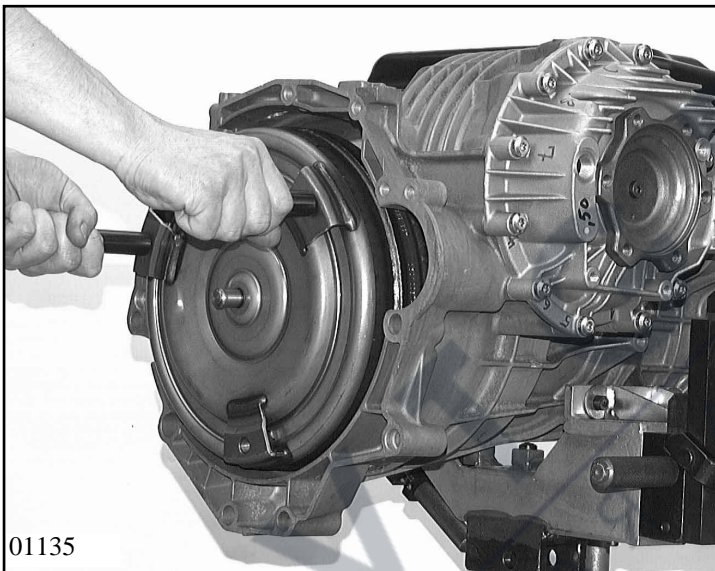




Place position switch 01.480 and secure at the transmission housing with cable clamps 01.490 + 01.530 and Torx screw 01.580 to the transmission housing.

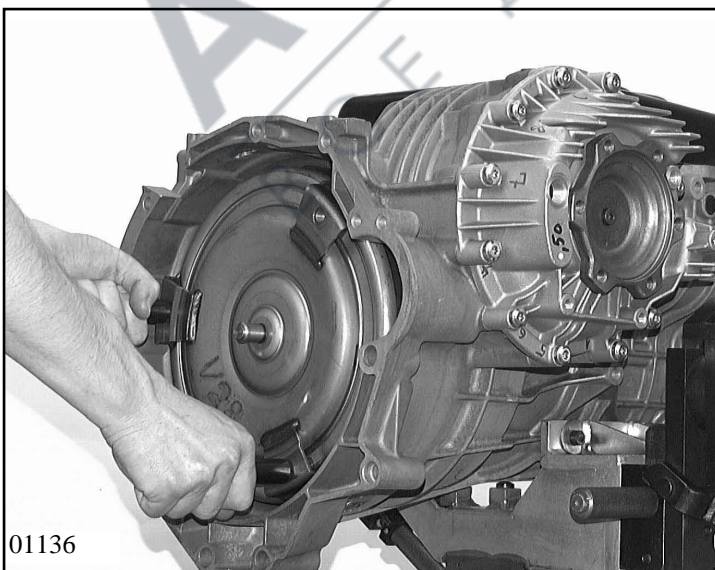
(Tightening torques: see Chapter 1.5)

01133



Screw in both converter handles 5x46 002 166 and insert converter 22.020 carefully.

01135



Turn converter left and right until the pump drive pins engage.

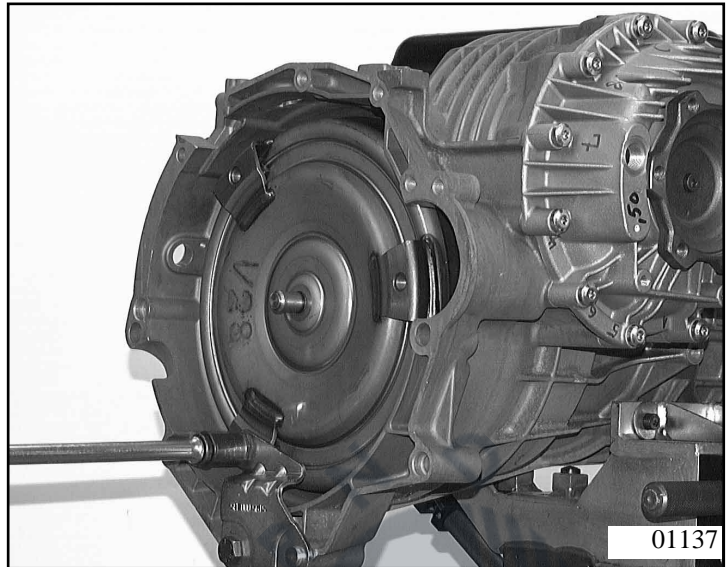
01136

Important:

When installing, make sure the drive pins are not damaged.

Remove converter handles.
 Fasten converter retaining bracket 97.010
 with 2 screws 97.020 and 97.030.

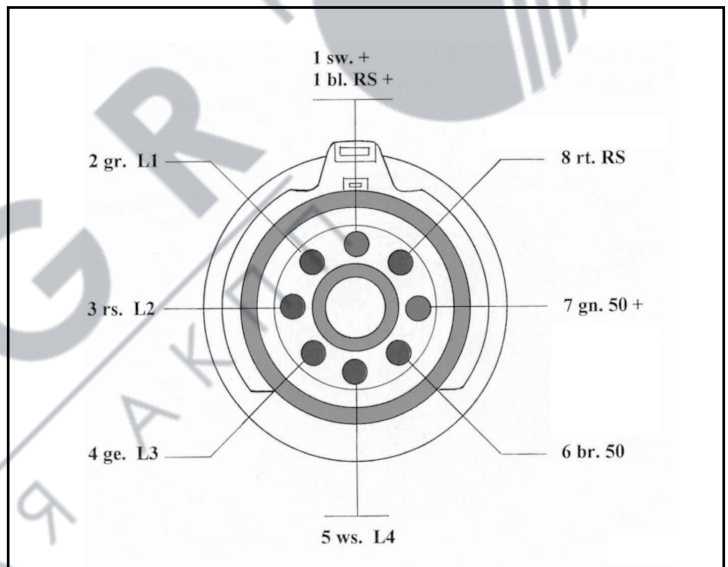
(Tightening torques: see Chapter 1.5)



Check the switch resistance values in
 ohms with the multimeter by reference to
 the function table.

Codiertabelle

	P	Z1	R	Z1	N	Z2	D	Z3	4	Z4	3	Z4	2
L1	1	1	0	1	1	1	1	1	0	0	0	0	0
L2	0	1	1	1	1	0	0	1	1	0	0	0	0
L3	0	0	0	0	1	1	1	1	1	1	0	1	1
L4	0	0	0	0	0	0	1	1	1	1	1	1	0
AS	1	0	0	0	1	0	0	0	0	0	0	0	0
RS	0	0	1	0	0	0	0	0	0	0	0	0	0



Attach all plugs:

- 1 screw plug 27.700 at EGS cable loom
 - 27.260/118
- 1 screw plug at position switch cable
 loom
- 2 screw plug for cooler connection
 01.610
- 1 screw plug 01.650 into the transmis-
 sion housing

(Tightening torques: see Chapter 1.5)

