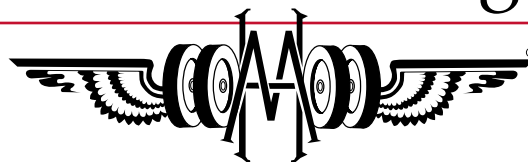


# Marmon-Herrington



## **MVG-750 Series**

### **Transfer Case**

### **Repair Manual**



# **REPAIR MANUAL**

## **TRANSFER CASE**

### **MVG 750**

#### **MARMON-HERRINGTON ALL-WHEEL DRIVE**

13001 Magisterial Drive • Louisville, KY 40223  
(502) 253-0277 • (800) 227-0727 • Fax (502) 253-0317  
E-mail: [info@marmon-herrington.com](mailto:info@marmon-herrington.com)

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The present document gives directions to the trained personnel to repair the

### **MARMON-HERRINGTON (M-H) Transfer Case MVG 750**

Customary tools and devices, which are workshop standard, are supposed to be available.

Disassembly and assembly of one version only is explained in this document. Differing working sequences of other possible versions can easily be recognized by the skilled professional. For such jobs see enclosed sectional and perspective views.

The repair of the component may require changed working sequences or/and differing adjustment or checking data, according to the technical development of the product over the years.

Therefore, we recommend rendering your M-H Product only to the hands of periodically trained personnel.

Damages caused by improperly or unprofessionally executed repair work through untrained personnel and the resulting consequences are excluded from any contractual liability.

This also applies when NON-ORIGINAL-PARTS are being used.



## GENERAL WORKING DIRECTIONS

---

The company repairing M-H Components is in any case responsible for all aspects of safety.

The valid safety regulations and legal directives have to be obeyed to avoid injury of persons and damage of the product during maintenance and repair.

The proper repair of the M-H Product requires adequately trained personnel. To undergo training is the obligation of the repairer.

Always assure professional and clean working conditions. Components shall always be cleaned before disassembly.

The use of indicated tools is a precondition.

After disassembly, all parts have to be cleaned. This applies in particular to corners, nooks and oil catchers in housings and covers.

Carefully remove old sealing compound.  
Clean surfaces thoroughly before sealing.

Lubrications bores, grooves and pipes are to be checked to be free from obstructions. They must be free from deposits, contamination and preservatives. The latter applies particularly for new parts.

Parts that are being damaged during disassembly are to be replaced by new ones. E.g.: radial oil seals, o-rings, groove-rings, seal cups, protection caps a. s. o.

Parts as bearings, thrust washers, synchromesh parts etc., which are liable to normal wear have to be checked by the skilled professional. He judges if a part can be reused or not.

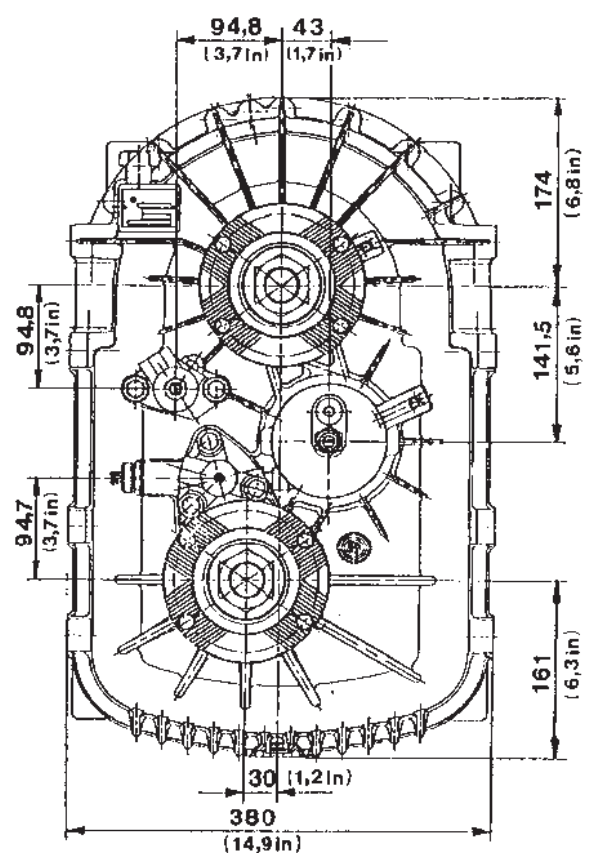
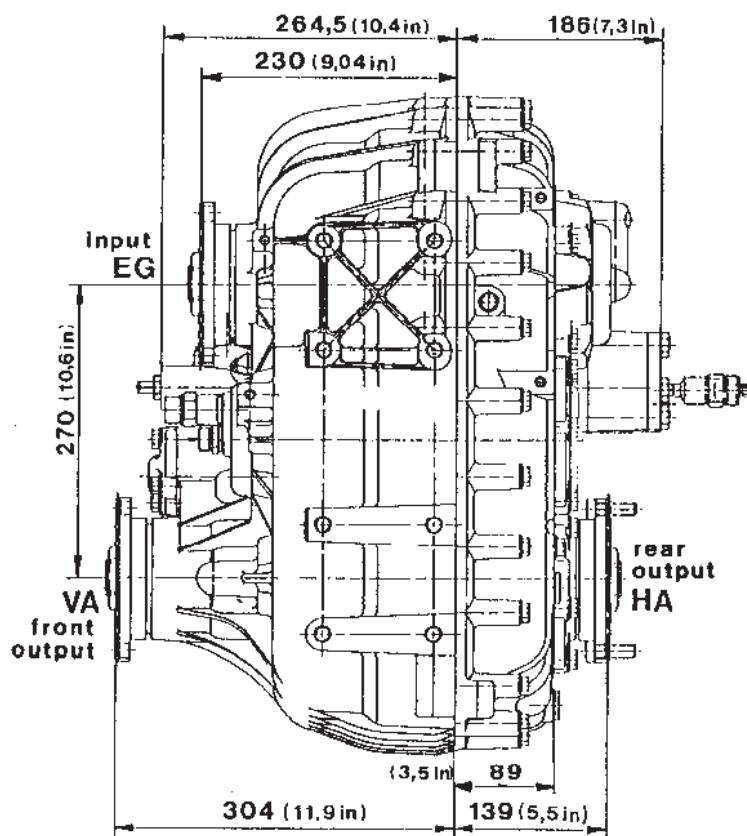
Parts, which have a shrink fit, must be driven to their end position after cooling down to assure perfect seating. Before pressing-in parts like shafts, bearings etc. both contact surfaces must be oiled.

On the assembly all given adjustment tolerances, check data and tightening torques have to be observed. M-H Components are to be filled with lubricant after the repair. Observe filling instructions and lubrication chart. After filling, the oil drain and oil level plugs must be tightened to correct torque.

Use Original M-H Parts only!



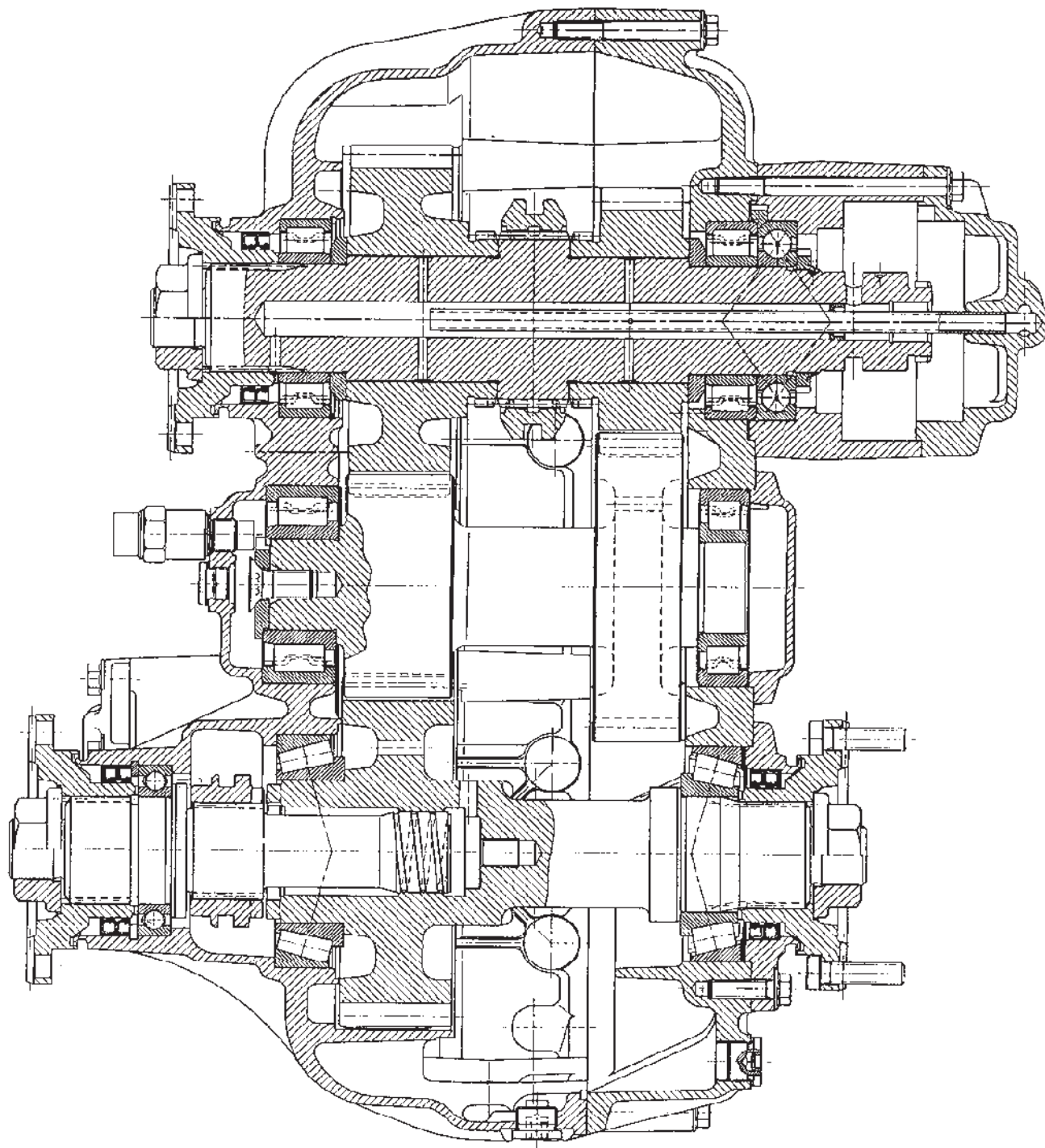
MVG-750	
max. input torque	8000 Nm
max. input speed	3500 U/min
ratios	high      low 1:1.00   1:2.00
weight including interaxle differential	ca. 125 kg
weight without interaxle differential	ca. 115 kg
amount of oil needed	with diff      5,5L without diff.   6,4L
oil quality	SAE 90 according to MIL-L-2105-API-GL 4
operating temperature	ca. 100°C





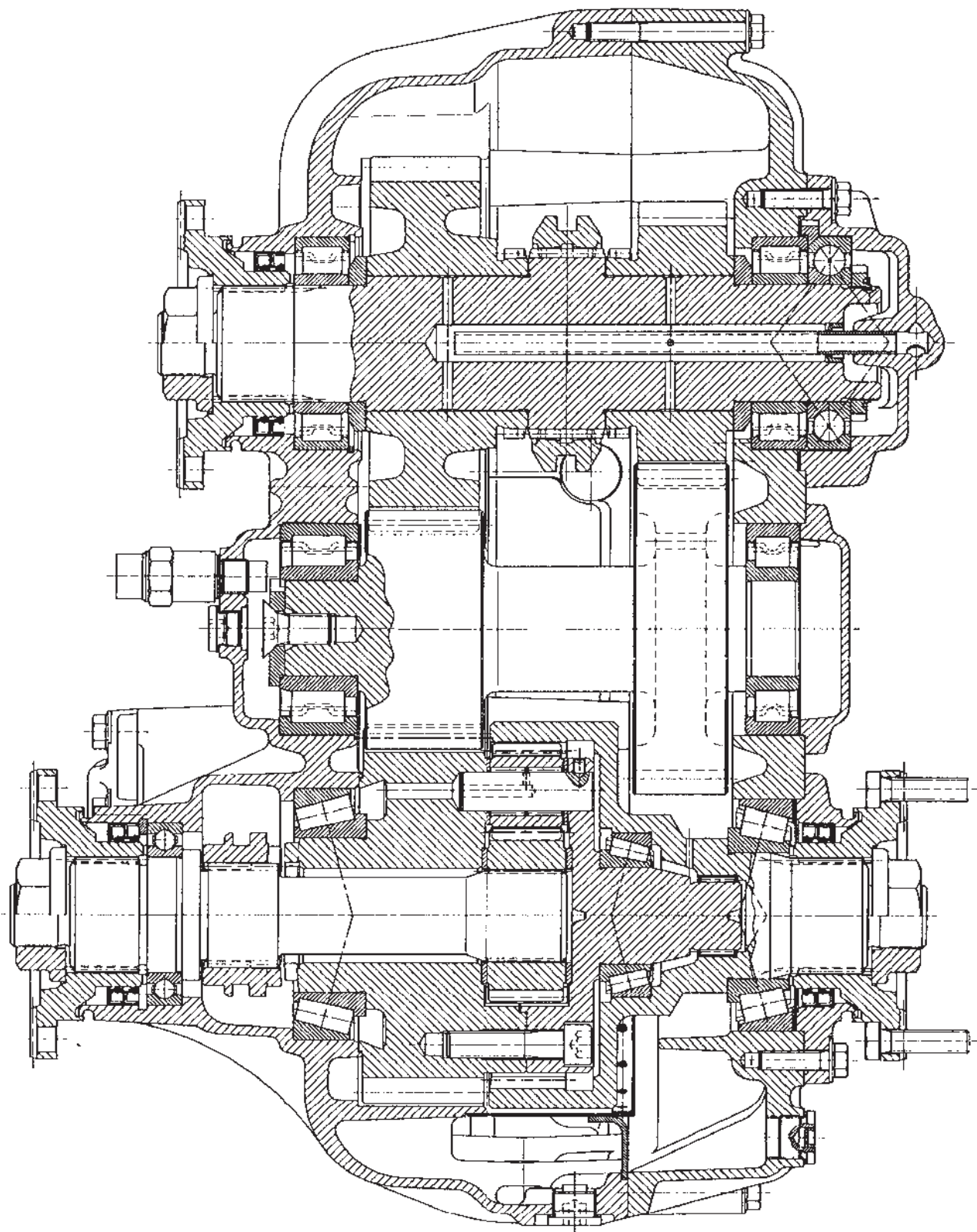
# CROSS SECTION VIEW MVG-750 without INTERAXLE DIFFERENTIAL

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A-TS 20/95/1

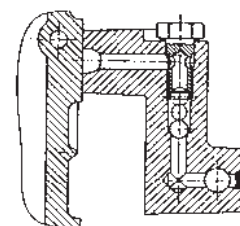
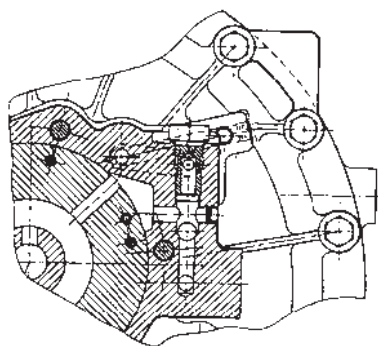
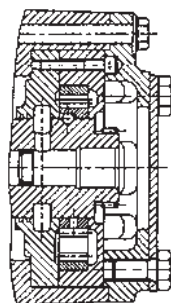
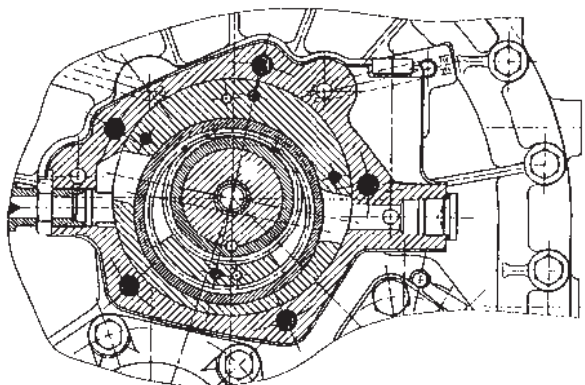
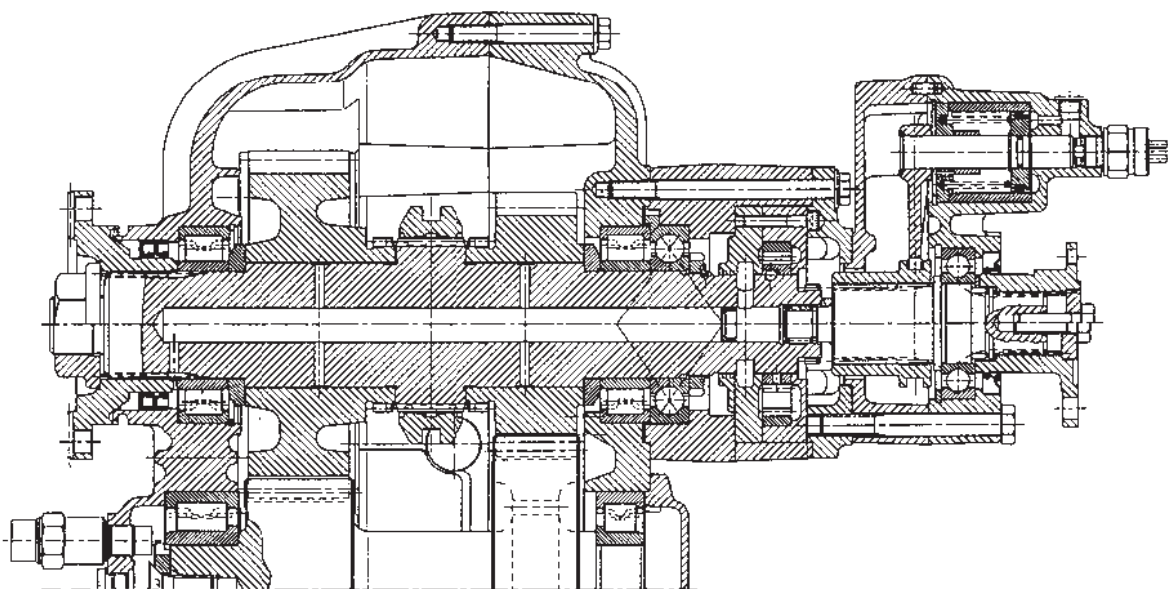
# CROSS SECTION VIEW MVG-750 with INTERAXLE DIFFERENTIAL



A-TS 20/95/2

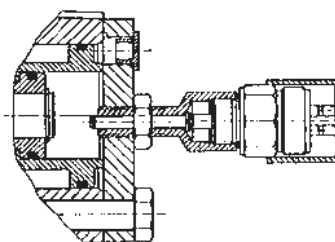
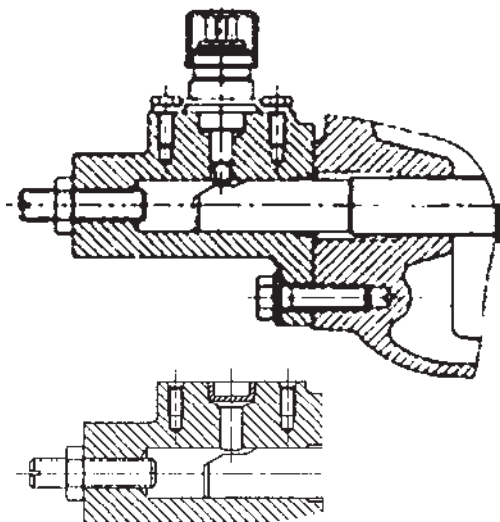
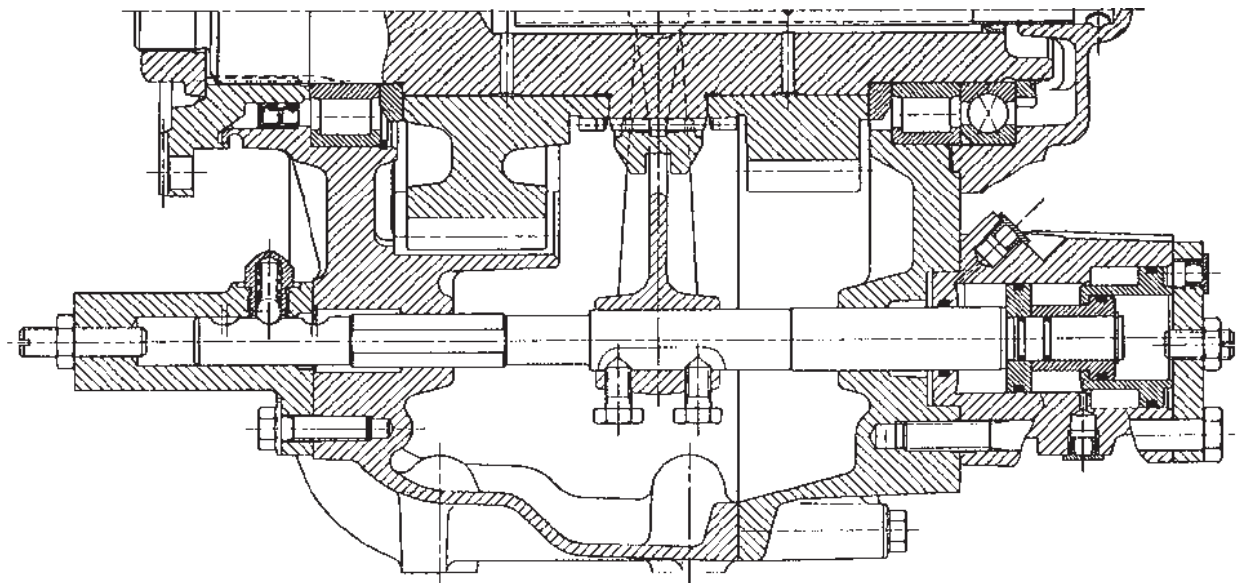


## CROSS SECTION VIEW MVG-750 with OIL PUMP and POWER TAKE-OFF



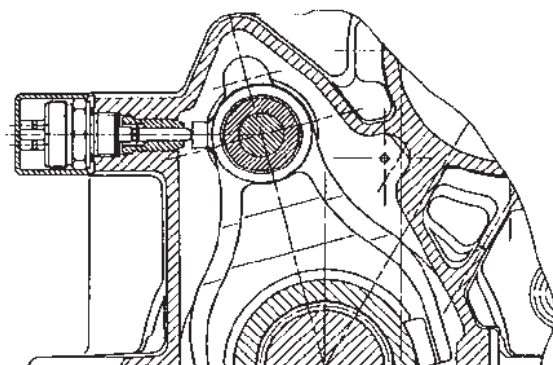
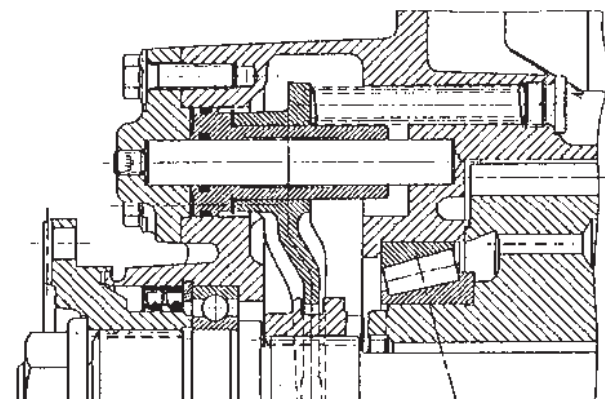
A-TS 20/95/3

## CROSS SECTION VIEW PNEUMATIC GEAR SHIFTING



A-TS 20/95/4

## CROSS SECTION PNEUMATIC DIFFERENTIAL LOCK SHIFTING



A-TS 20/94/5



## Consumables

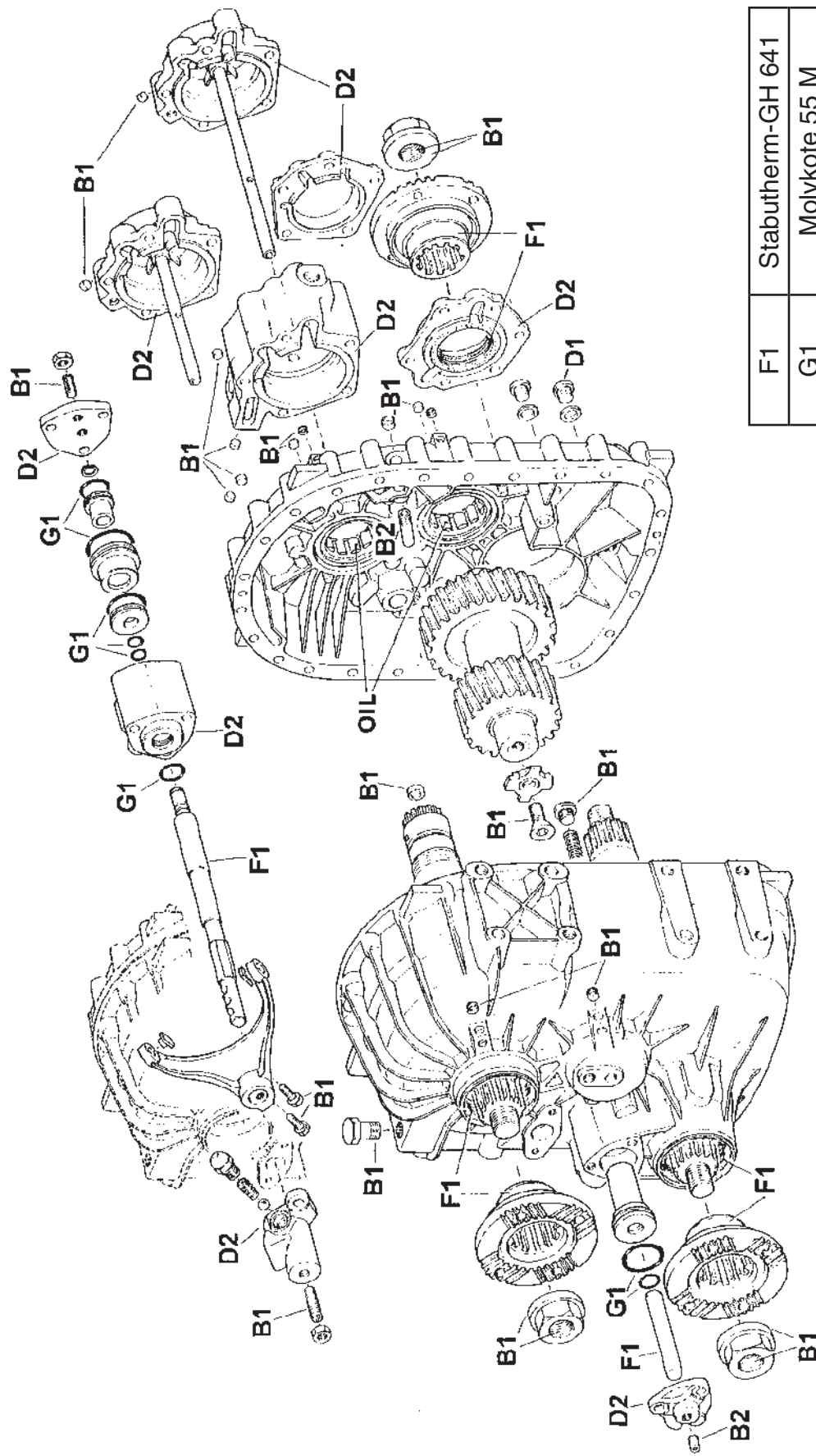
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Materials, auxiliaries, and preservatives are considered consumables required for vehicle repair.

Table of consumables for unit repair.

Symbol	Designation of compound	Product name
F1	Standard grease	STABUTHERM-GH 461
G1	Antiseize compound	Molykote
D1 D2	Sealing compound	DIRKO Loctite 518 (red)
B1 B2	Adhesive	Loctite 243 (blue) Loctite 638 (green)
OIL	Antiseize compound	SAE 90

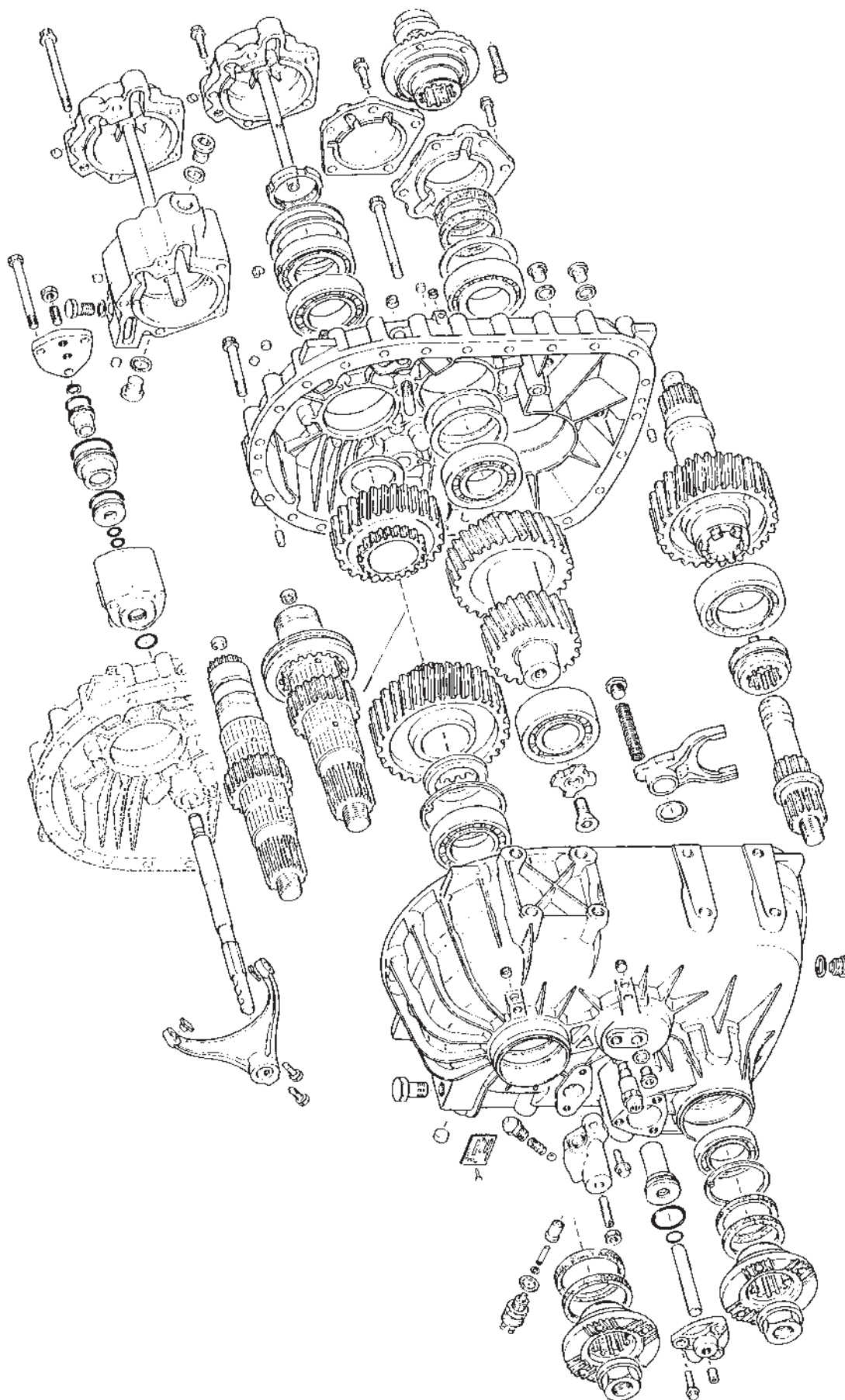
In the following diagram the greases, anti-seize agents, sealing compounds and adhesives are indicated with their symbol and point to the components to be treated.



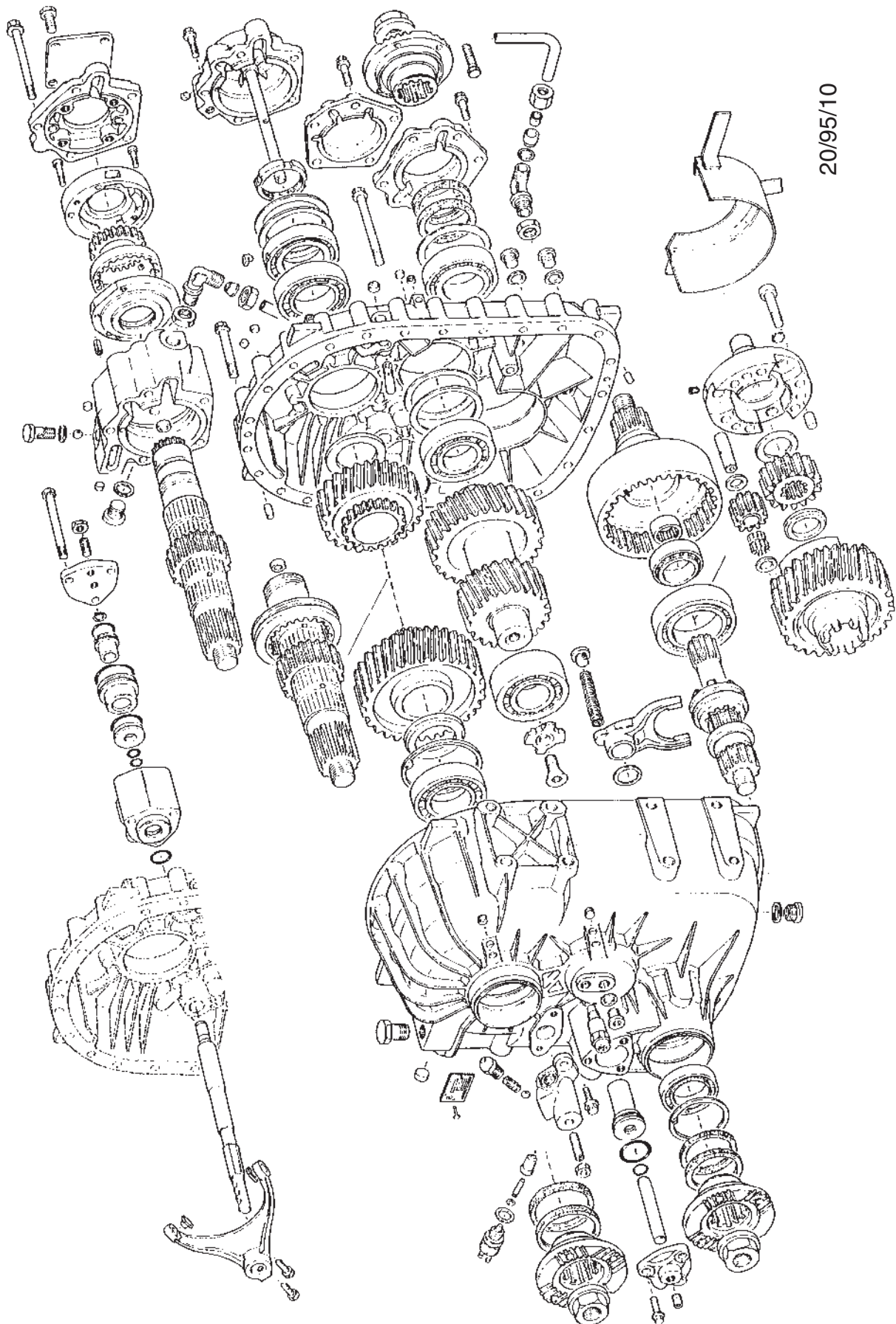
F1	Stabutherm-GH 641
G1	Molykote 55 M
D1	DIRKO
D2	Loctite 518 (red)
B1	Loctite 243 (blue)
B2	Loctite 638 (green)
OIL	SAE 90



## EXPLODED VIEW MVG 750 without INTERAXLE DIFFERENTIAL



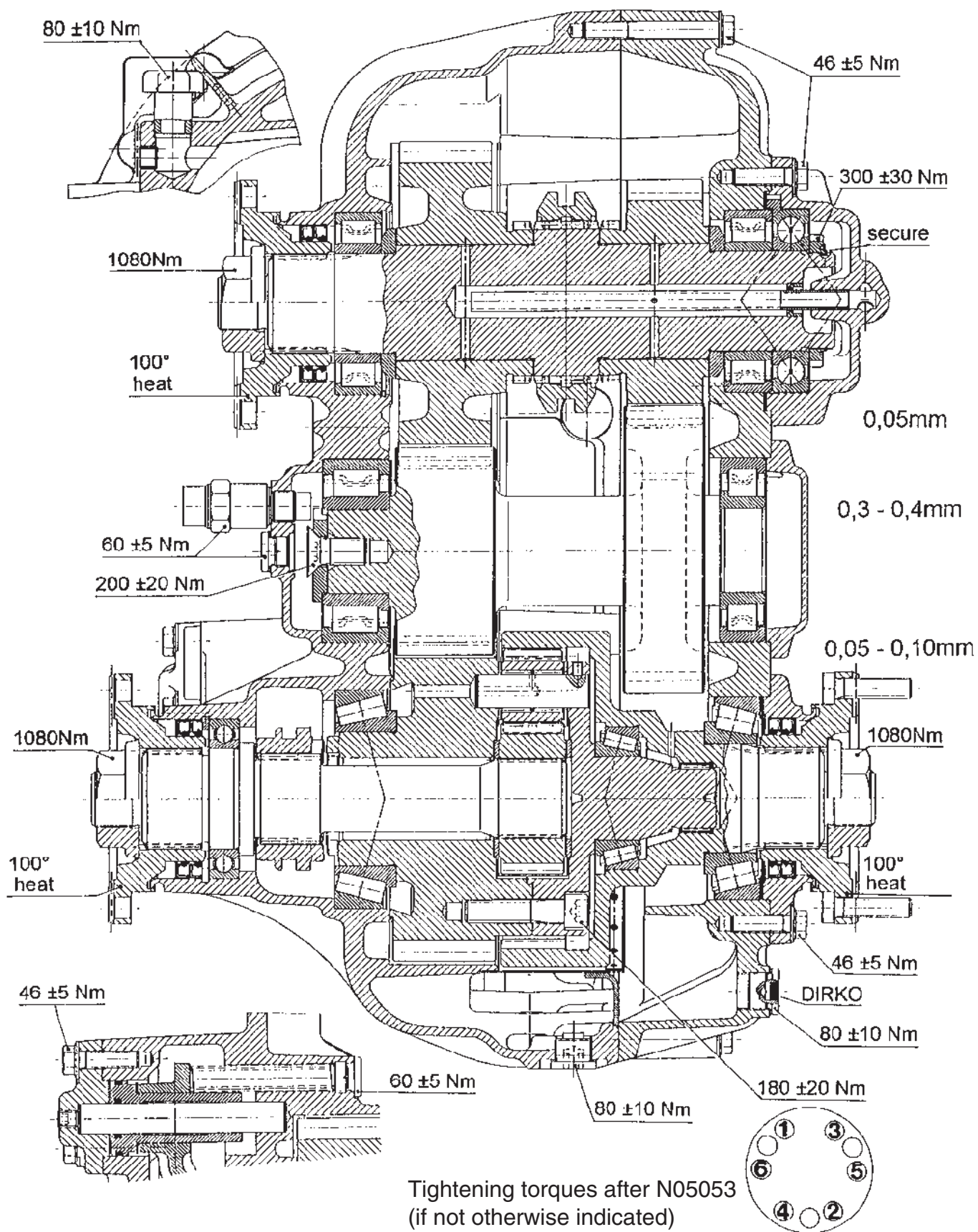
# EXPLODED VIEW MVG 750 with INTERAXLE DIFFERENTIAL and OIL PUMP



20/95/10

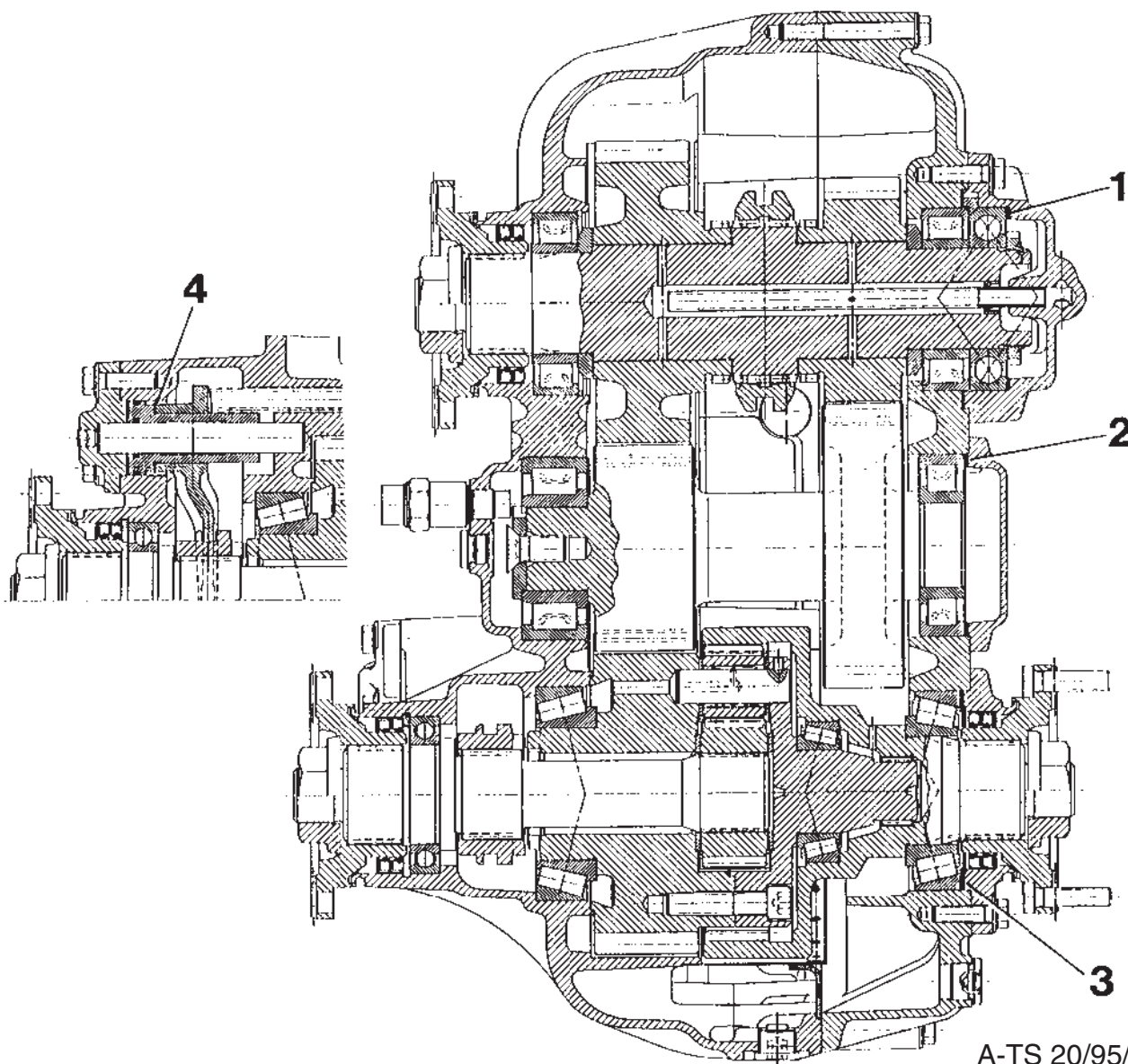


## Tightening Torques





Pos.	Designation	Dimensions	Remarks
1	preload of input shaft bearing	0-0,5 mm	to be adjusted with shims
2	axial clearance of double gear	0,30-0,40 mm	to be adjusted with shims
3	preload of output shaft bearings	0,5-0,10 mm	to be adjusted with shims
4	adjustment of front output shaft shifting	0,50-0,75 mm	to be adjusted with shims



A-TS 20/95/6



NOTE: This page left blank intentionally

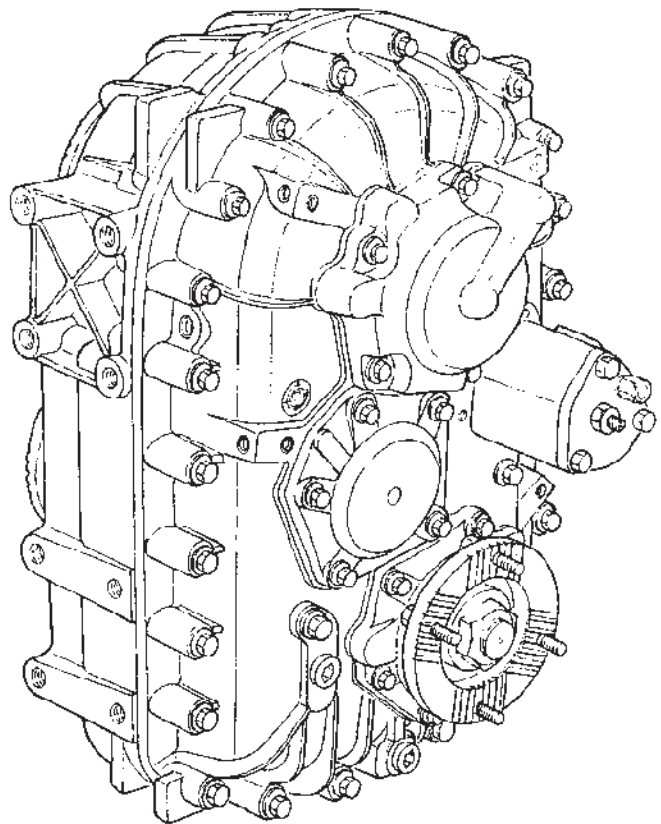
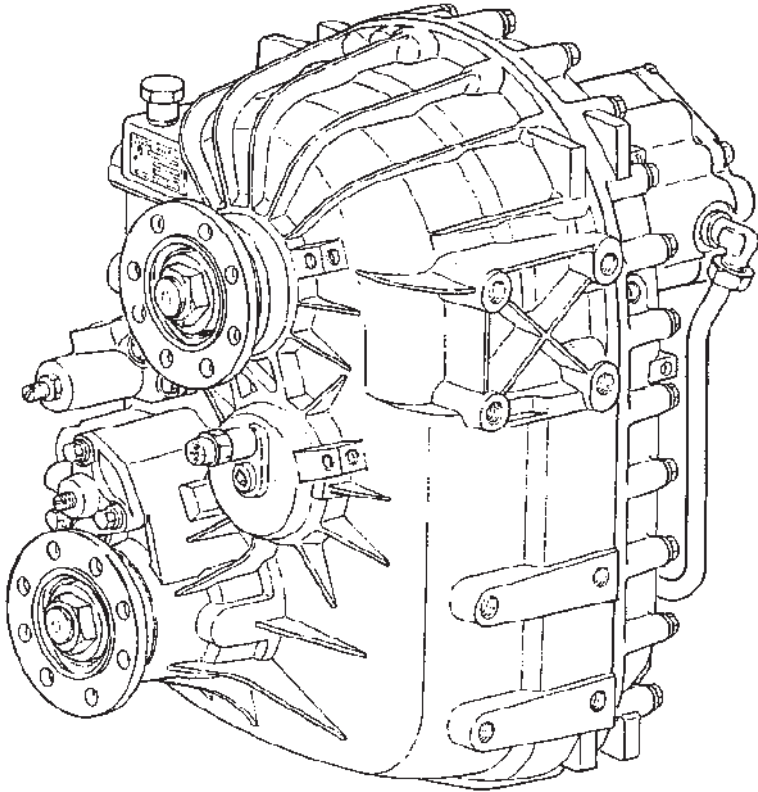
## Definitions



The terms used in the repair manual were chosen with the current standard in mind.

The application and definition of operations and work Instructions is explained here.

Designations	Explanations
Remove	Removal of a component from a component group or of a part from an assembly without first removing any other components.
Mount	To fit a part to an assembly or a component to a component group without any further components being involved.
Disconnect	To separate a detachable connection of wire, tubing, or hose.
Connect	To bring together a detachable connection of wire, tubing, or hose
Pull off	To remove a component that is press-fitted to another.
Push on	To join two components by press-fitting.
Unscrew	To open a rotary connection.
Screw down	To close a rotary connection.
Removing	Removal of a component from a component group or of a part from an assembly when other components must first be displaced.
Install	To attach a component to a component group or a part to an assembly, if for functional reasons, other component groups will be attached.
Loosen	Partial detachment of fixing elements in a component or a part.
Remove	To detach the fixing elements of a component or a part.
Tighten	To firmly attach the fixing elements of a component or part.
Disassembly	Dismantling of component groups into their constituent parts.
Assembly	The joining together of parts of a component group.
Set, Adjust	Correction of deviation with the help of the proper tools or equipment.
Fill	Adding or topping - up of fluids.
Renew	Replacement of an accessory material with a new one.
Replacement	Substitution of a machine, component group or part with a new or reconditioned one of the same type.
Measure	Determination of the current nominal condition by investigating physical size.
Checking	Comparison of the current nominal condition against a set standard.
Cleaning	Removal of foreign and auxiliary materials.
Service	Measures necessary to maintain proper functioning.



The work pages are divided into text and picture columns. Within each complete repair operation the picture series begins with "Pict.1".

In the work description the picture referred to is shown by a number placed in parentheses- (e.g: (3) = Pict. 3, (3.1) = Pict. 3, Code 1 in the picture).

Abb. 3

Abb. 3



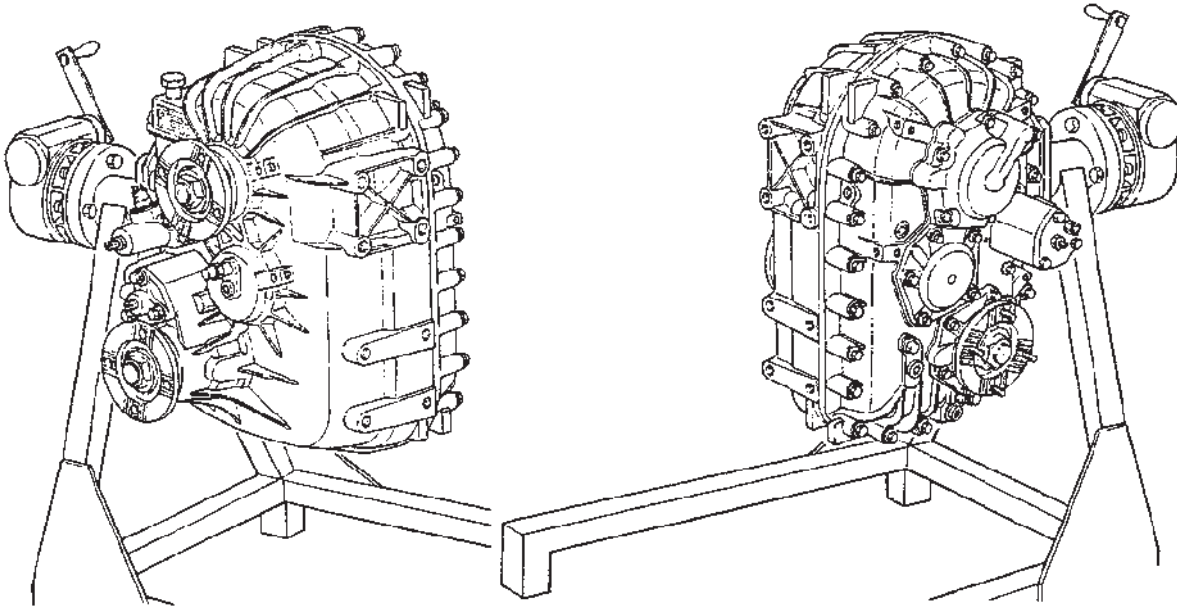
	Page
<b>1. Works on dismantled transfer case.....</b>	<b>20</b>
<b>1.1 Disassembly of transfer case.....</b>	<b>21</b>
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1.3.6 Input shaft bearing adjustment .....	53
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1.3.7 Complete pneumatic gear shifting and adjust stop positions .....	56
1.3.8 Install flanges.....	59
1.3.9 Install breather, and speedometer sending unit.....	61



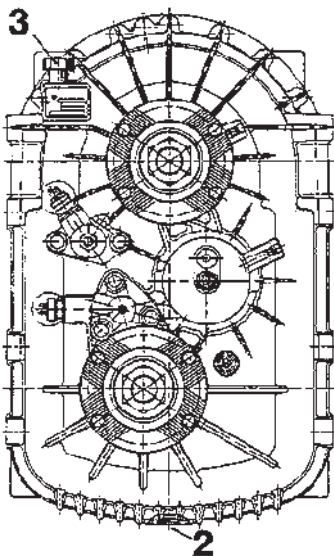
## 1. Works on dismounted transfer case

Contains: Mount transfer case A-VG 750 - 10 with clamping device on appropriate stand V-TS 220 W.

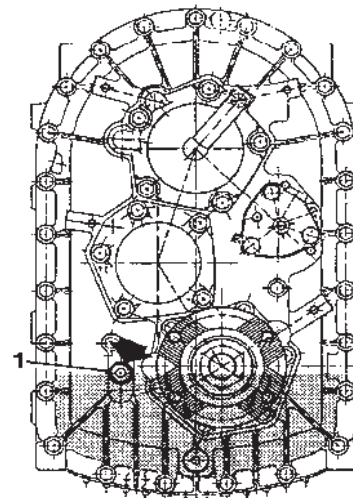
Dismantle and assemble transfer case.....1.1.....1.3.9



**ATTENTION:** Assure correct oil level. Low level causes lack of lubrication and reduces durability. Too high level causes excessive splashing and leads to overheating of transfer case.



- 1 oil filling plug oil level plug
- 2 oil drain plug
- 3 breather



### Oil CHANGE (recommended in warm condition)

- drain gear oil at drain plug (2)
- clean magnet of drain plug
- mount drain plug with new seal
- fill new gear oil at filling bore/level bore (1) until it flows over
- mount level plug (1) with new seal
- unscrew breather (3) clean it and mount it again

### Oil LEVEL CHECK

- open oil filling/level plug (1)
- oil level must reach edge of level bore if necessary top up
- mount level plug with new seal

## 1. Disassembly of transfer case

### 1.1.1 Removing of external transfer case parts, oil pump and shift cylinder

- 1 Remove switch (1/1) low/high indication.

Remove seal (1/2).

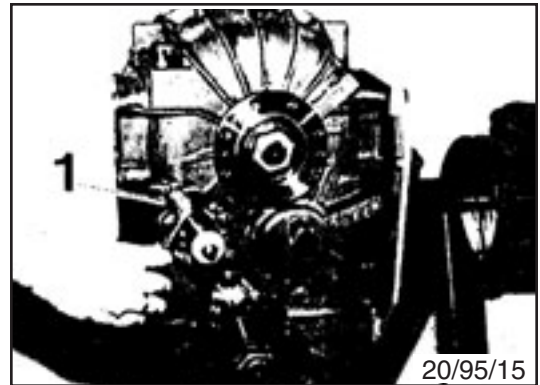


Abb. 1

- 2 Loosen all flange nuts by means of power tool (2/1) and appropriate tool **TS 215 W** (where available use torque multiplier).

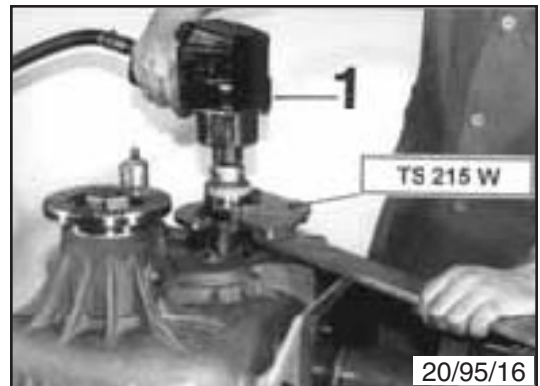
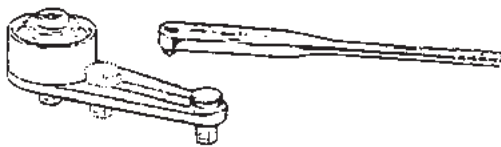


Abb. 2

- 3 Pull off rear output flange (3/1) by appropriate puller KUKKO 20-3.

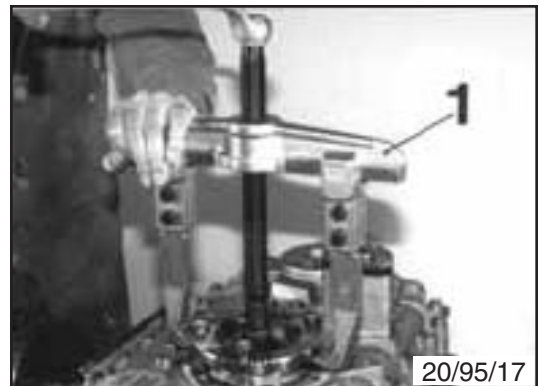


Abb. 3

- 4 Pull off input flange and front axle output flange by appropriate puller 20-3 (4/1).

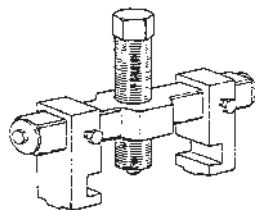
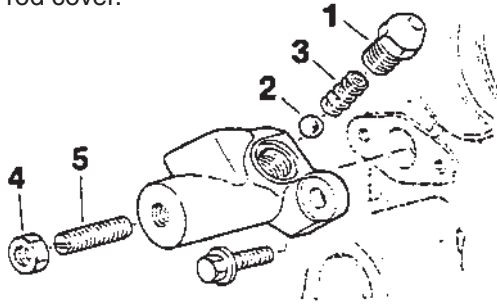


Abb. 4

**NOTE:** Appropriate tool A-VG 2000-05 is especially designed for heavy flange seats.



- 5 Unscrew ball guide (5/1) from shift rod cover.



ATTENTION: Spring (5/2) and ball (5/3).

- 6 Loosen lock nut (5/4) and adjusting screw (5/5).

**NOTE:** Use lock nut (6/6).



Abb. 5

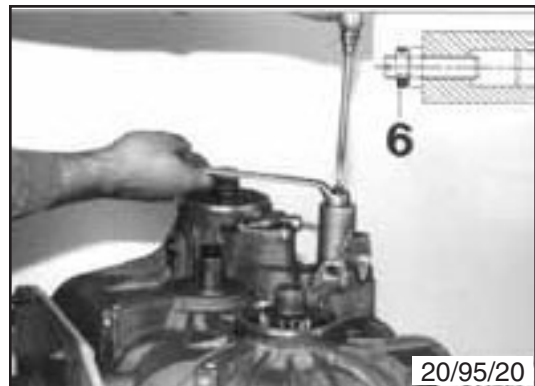


Abb. 6

- 7 Remove shift rod retainer (7/1).



Abb. 7

- 8 Remove speedometer sending unit (8/1).

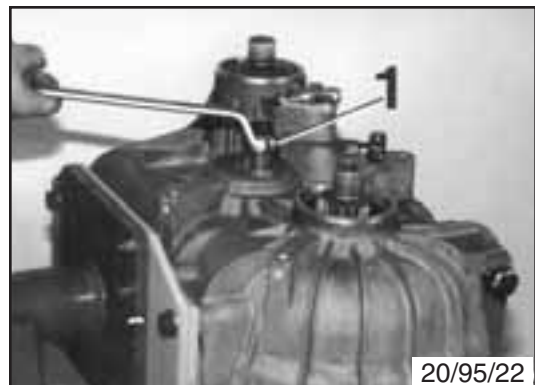
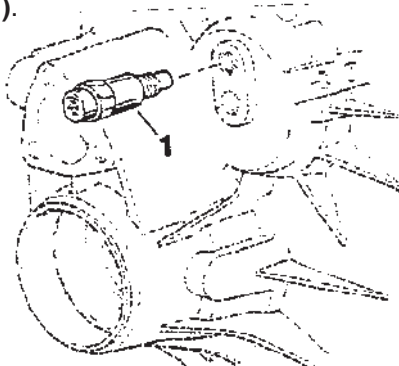


Abb. 8

- 9 Remove switch **(9/1)** (front axle drive indicator switch).

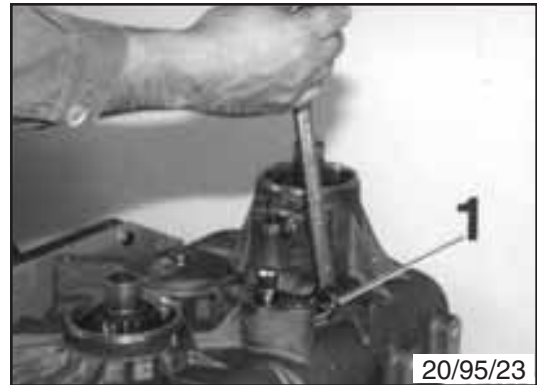
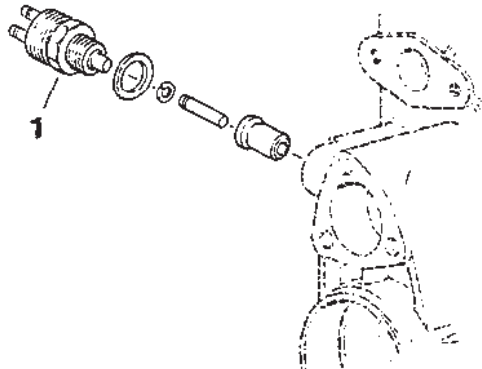


Abb. 9

- 10 Remove shift cylinder cover **(10/1)**.

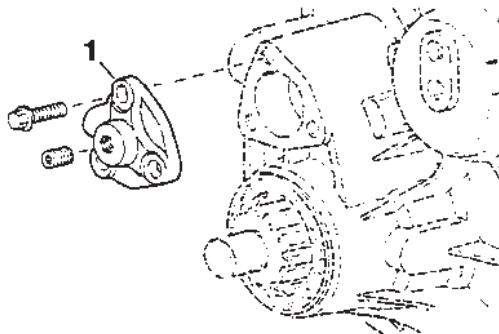


Abb. 10

- 11 Remove plug **(11/1)**.

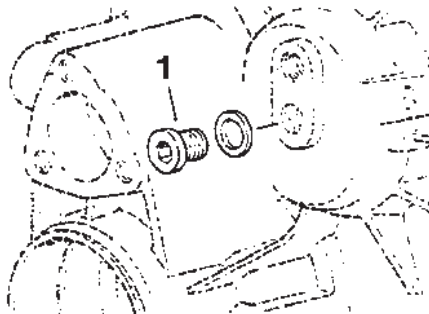
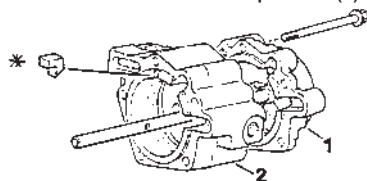


Abb. 11

- 12 Remove bearing cover input shaft **(12/1)**, bearing cover-intermediate shaft **(12/2)** and bearing cover-rear axle output shaft **(12/3)** Remove anti-rotation lock piece. (\*)



#### Version prepared for oil pump

Remove bearing cover **(1)**  
and bearing housing **(2)** from rear end  
of input shaft



Abb. 12



## Version with oil pump Remove oil pump

- 1 Remove oil pipe (13/1).

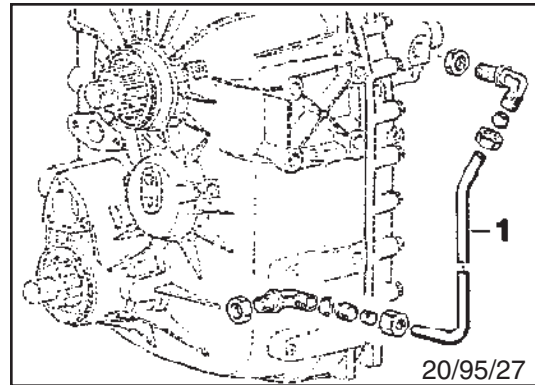


Abb. 13

- 2 Remove cover (14/2).  
Remove cover (14/1).

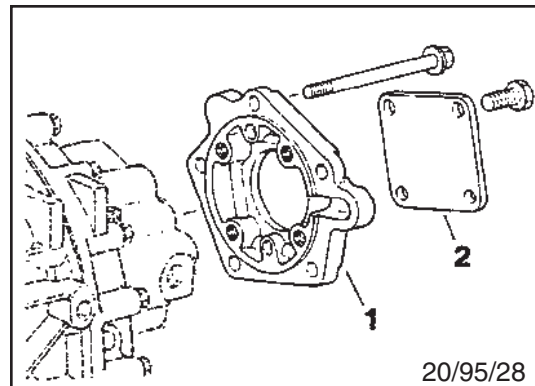


Abb. 14

- 3 Unscrew Allan screws  
M 6x35 (15/1)  
M 6x30 (15/2).

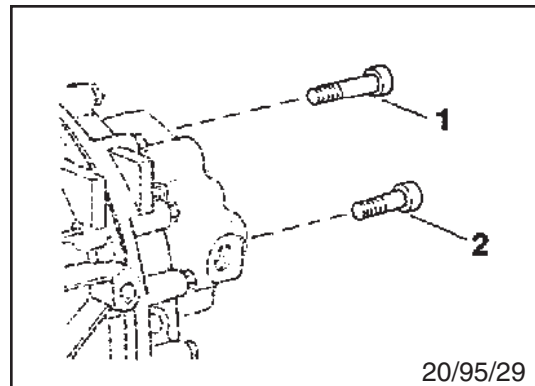


Abb. 15

- 4 Pull out oil pump housing (16/1)  
by means of appropriate puller **V-TS 86 W/1**.

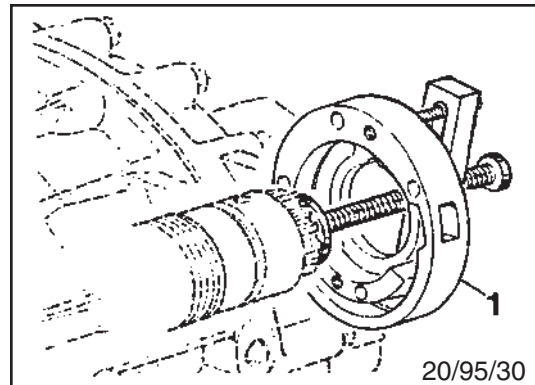
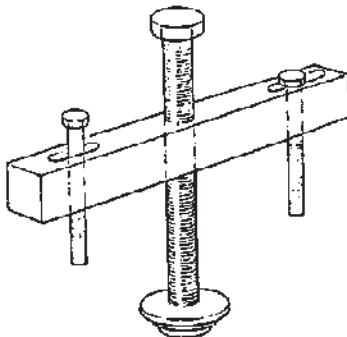


Abb. 16



- 5 Remove outer **(17/1)** and inner **(17/2)** oil pump gear.

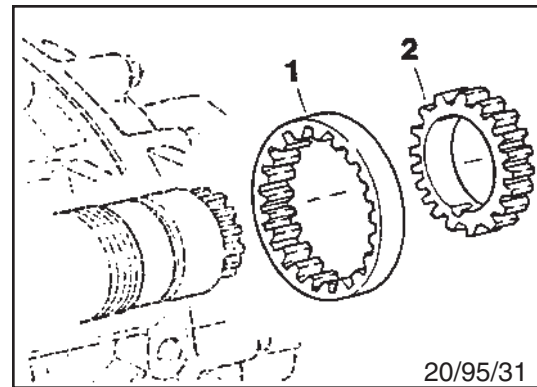


Abb. 17

- 6 Take out drive ball **(18/1)** by aid of a magnet **(18/2)**.

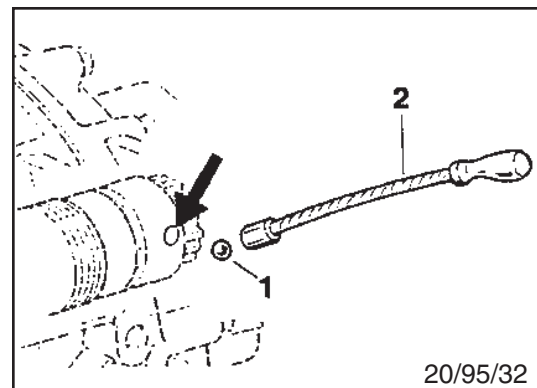


Abb. 18

- 7 Remove hollow screw **(19/2)**, ball **(19/3)**, and plug **(19/4)**.  
Remove bearing housing **(19/1)** from rear end of input shaft.

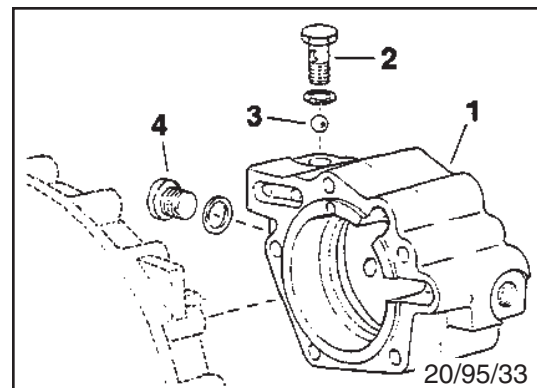


Abb. 19

- 8 Remove oil pump cover **(20/1)** from housing.  
Remove spring pin **(20/2)**.  
Remove anti rotation lock piece **(20/3)**.

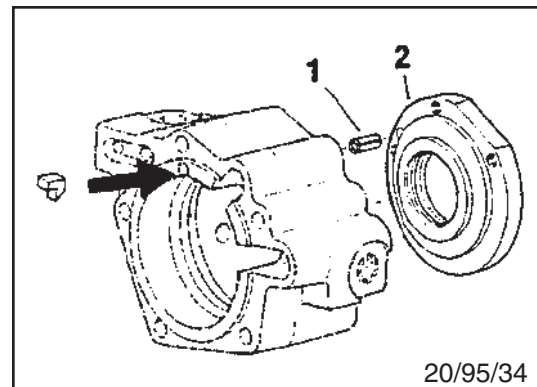


Abb. 20



- 9 Remove all adjusting shims (21/1).



Abb. 21

### Disassemble shift cylinder

- 1 Loosen lock nut (22/1) and remove adjusting screw (22/2). Use second nut with lock nut.

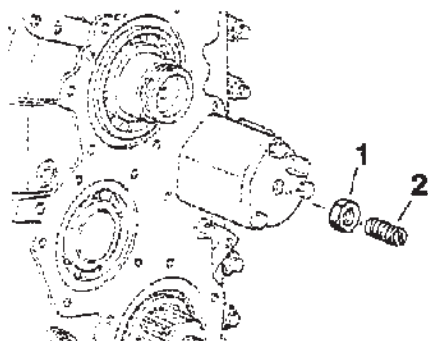


Abb. 22

- 2 Remove cover of shift cylinder (23/1).

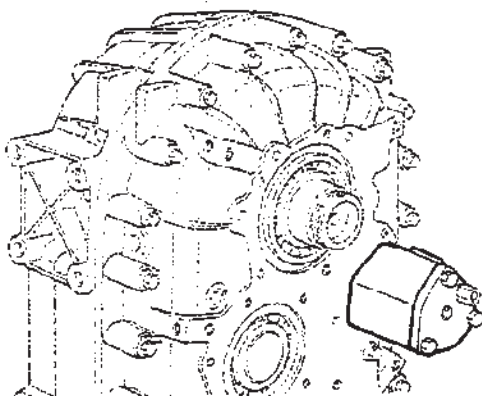


Abb. 23

- 3 Remove circlip (24/1) and pull off cylinder (24/2) and piston from shift rod (24/3).

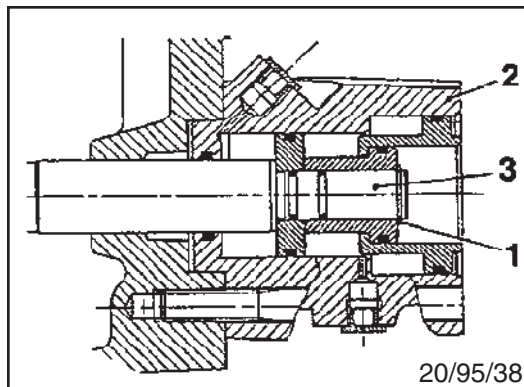
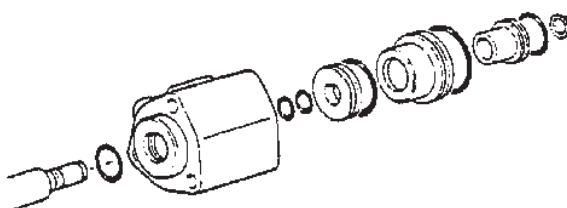


Abb. 24

- 4 Loosen grooved nut **(26/1)** with appropriate tool A-VG 750-09.  
(use power tool).

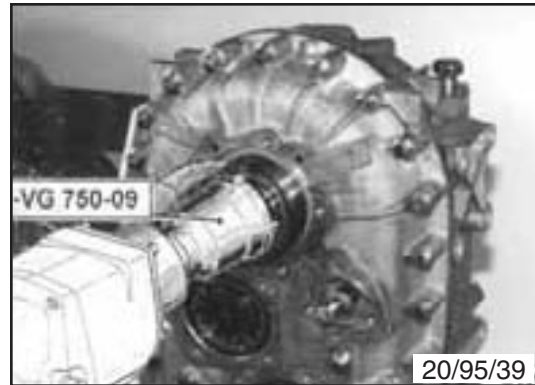
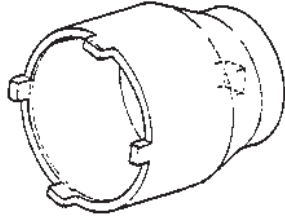


Abb. 25

- 5 Remove ball bearing **(26/2)** with both inner races from rear side of input shaft.

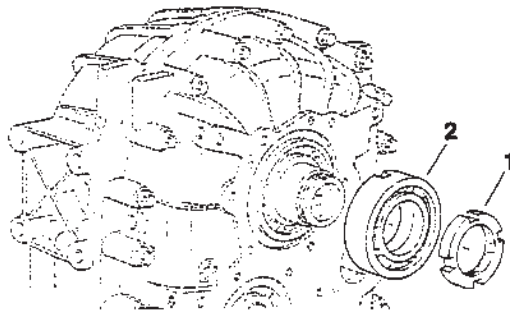


Abb. 26

### Disassemble rear housing

- 1 Loosen all fastening bolts **(27/1)**.

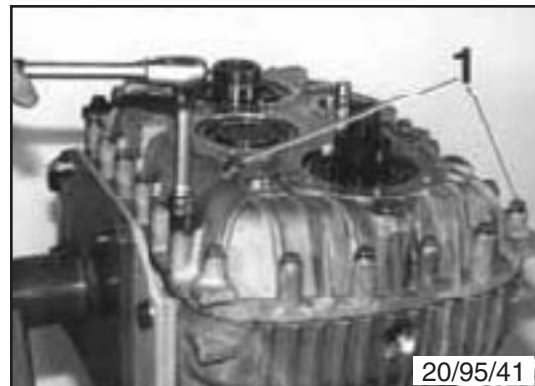


Abb. 27

- 2 Lift off rear housing **(28/1)**.



Abb. 28



### 1.1.2 Removal of input shaft, double gear, planetary gear resp. output shaft.

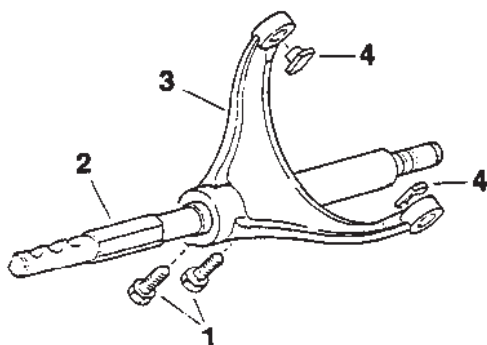
- 1 Remove oil guide (29/1).



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Abb. 29

- 2 Unscrew bolts at shift fork (30/1).



- 3 Remove shift rod (30/2) and take out shift fork (30/3).  
**ATTENTION:** care for sliders (30/4).



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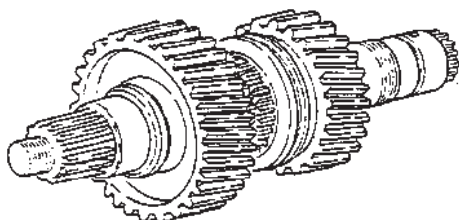
Abb. 30



20/95/45

Abb. 31

- 4 Lift out input shaft (32/1).



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Abb. 32

- 5 Lift out double gear (33/1) and planetary housing (32/2) together.

**ATTENTION:** When planetary housing is lifted out needles can fall out from bearing.

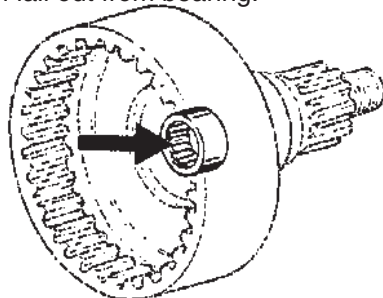


Abb. 33

- 6 Remove planet carrier (34/1).

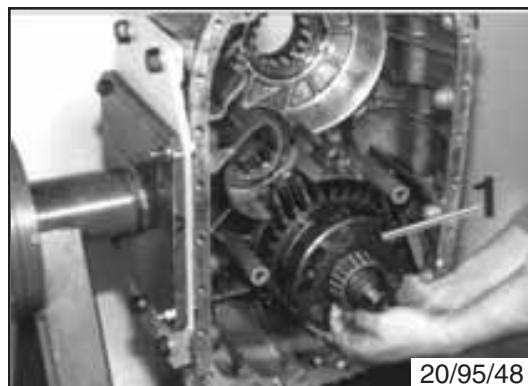


Abb. 34

- 7 Remove shaft seal rings (36/1) from front housing (35/1).

**NOTE:** When shaft seal rings are being removed they have to be replaced by new ones.

- 8 Remove circlip (36/2).

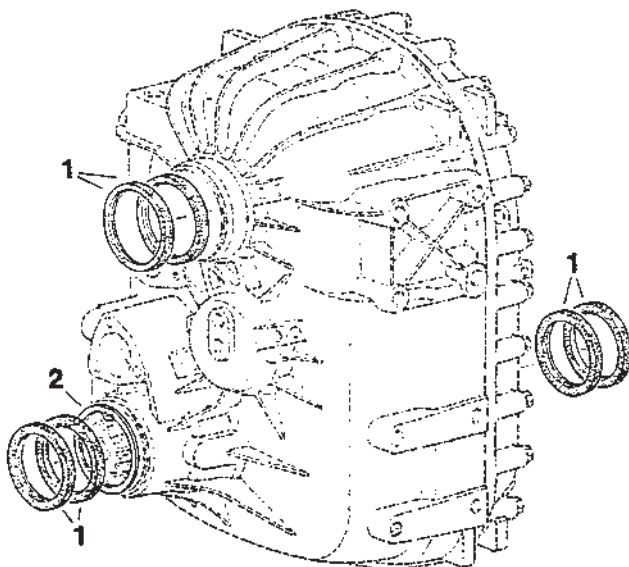


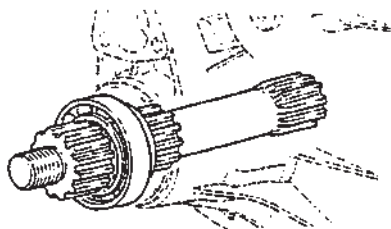
Abb. 35



Abb. 36

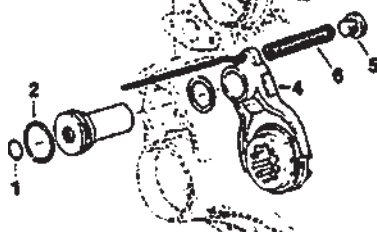


- 9 Drive out front output shaft (37/1) toward front, of housing.



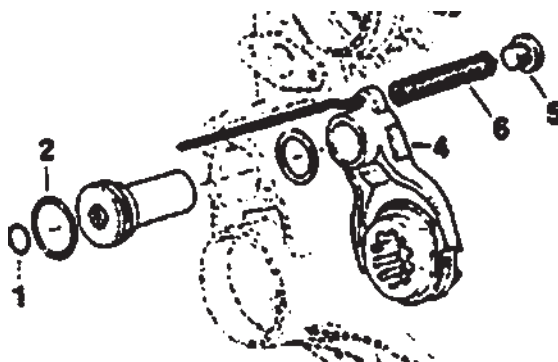
**ATTENTION:** Only when changing oil seats (38/1) and (38/2).

**NOTE:** Hold shift fork (38/4) against cocking.



- 10 Remove plug (38/5) and shift spring (38/6).

- 11 Remove shift rod (39/3) and piston (39/4).



- 12 Remove shift fork (40/5) and dog sleeve (40/6).

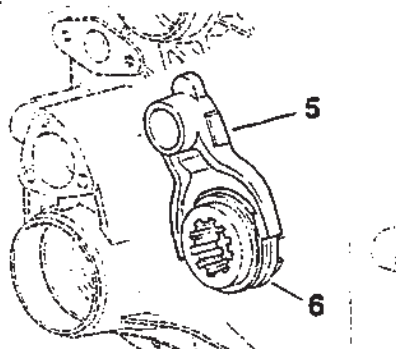


Abb. 37

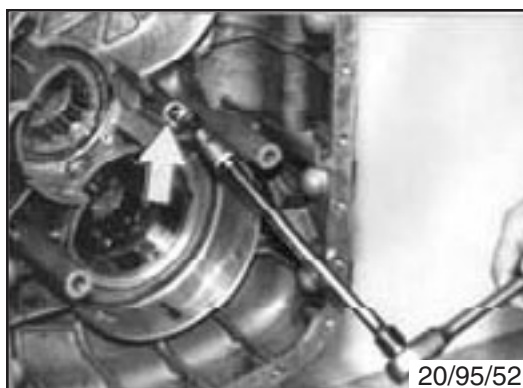


Abb. 38



Abb. 39



Abb. 40

- 13 Remove circlip **(41/1)** at input shaft bearing.

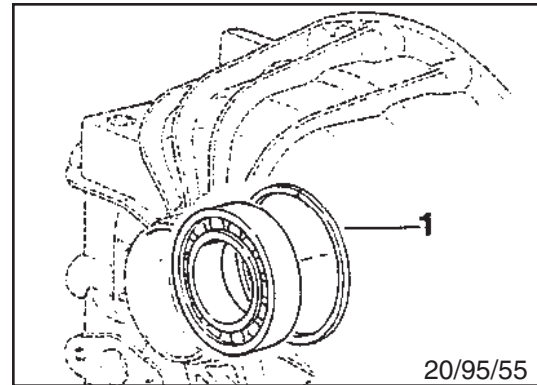


Abb. 41

- 14 Pull out bearings from front housing with appropriate tools.

A-VG 750-02 **(42/2)** input shaft  
A-VG 750-01 **(42/1)** double gear  
with tool A-VG 750-03 **(42/3)** and  
A-VG 750-04 **(42/4)**.

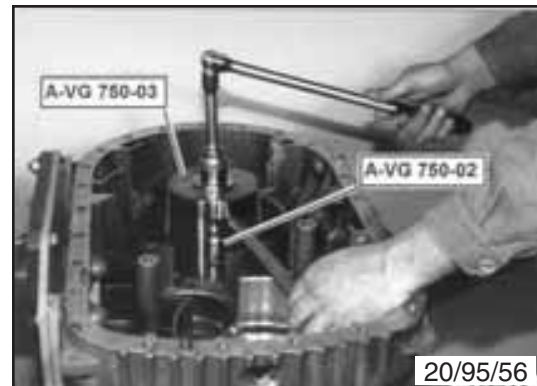
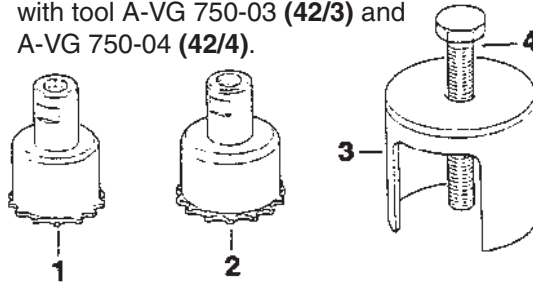


Abb. 42

- 15 Pull out input shaft bearing from rear housing with appropriate tools A-VG 750-02 **(42/2)**  
A-VG 750-03 **(42/3)**  
A-VG 750-04 **(42/4)**.

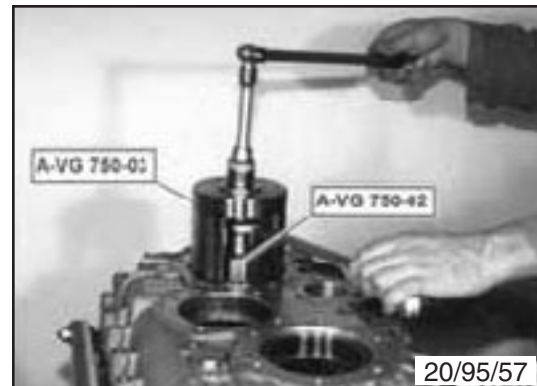


Abb. 43

- 16 Pull out double gear bearing from rear housing with appropriate tools A-VG 750-01 **(42/1)**  
A-VG 750-03 **(42/3)**  
A-VG 750-04 **(42/4)**.

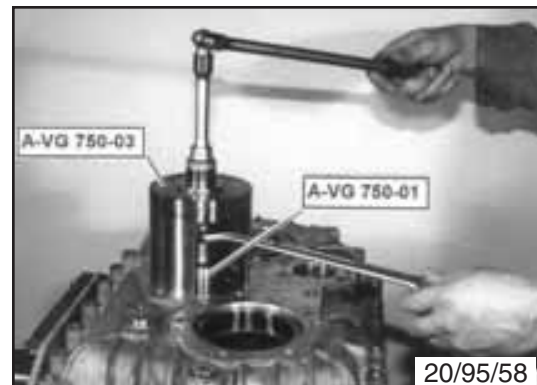


Abb. 44



- 17 Drive out outer bearing race **(1)** of rear output shaft bearing from rear housing by means of aluminium punch **(45/1)** (approx. 20mm  $\varnothing$ ).

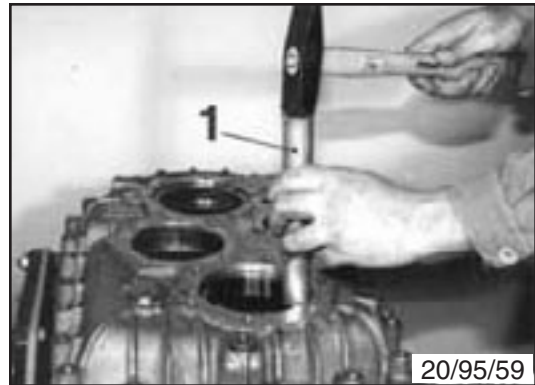
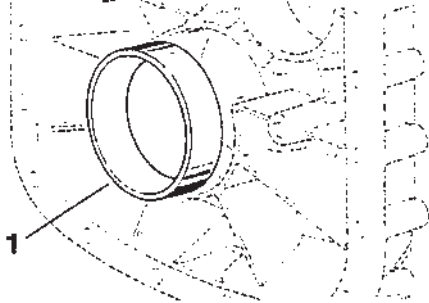


Abb. 45

- 18 Drive out outer bearing race (46/1) of output shaft bearing from front housing by means of aluminium punch (46/2).

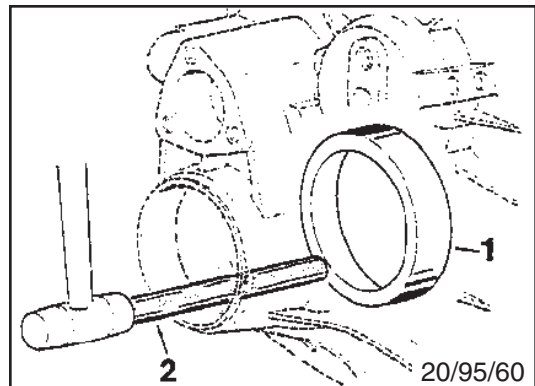


Abb. 46

- 19 Loosen oil pipe **(47/1)**.

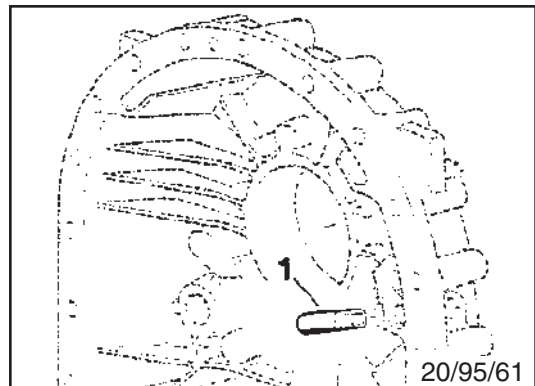


Abb. 47

- 20 Remove breather **(48/1)**.

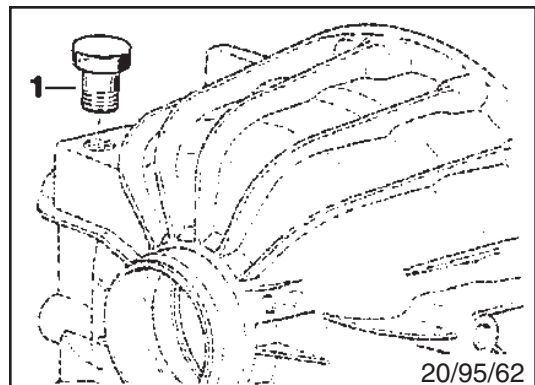


Abb. 48

### 1.1.3 Disassemble input shaft

- 1 Pull off gear  $z = 34$  (49/1) by two arm appropriate puller KUKKO 20-3 with washer (49/2), and inner bearing race (49/3). Remove shifting dog sleeve (49/4).

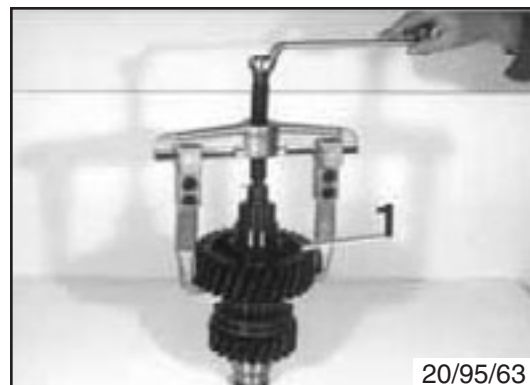
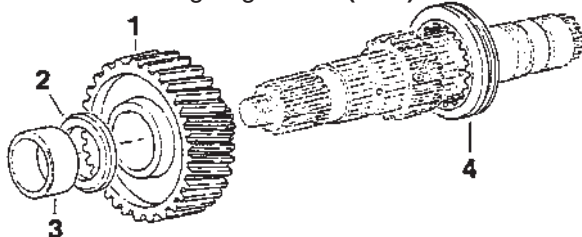


Abb. 49

- 2 Pull off gear  $z = 21$  (50/1) by two arm appropriate puller KUKKO 20-3 with washer (50/2) and inner bearing race (50/3).

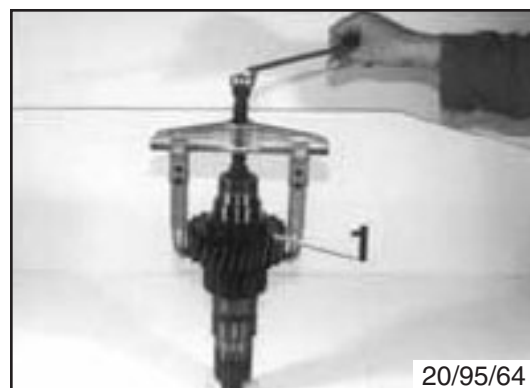
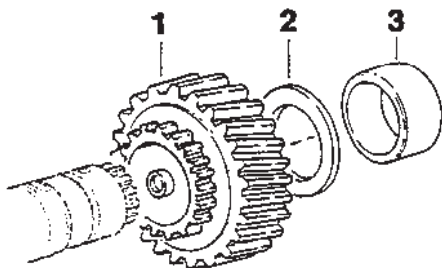


Abb. 50

### 1.1.4 Disassemble double gear

- 1 Loosen fastening screw (51/1) on pulse rotor (51/2).

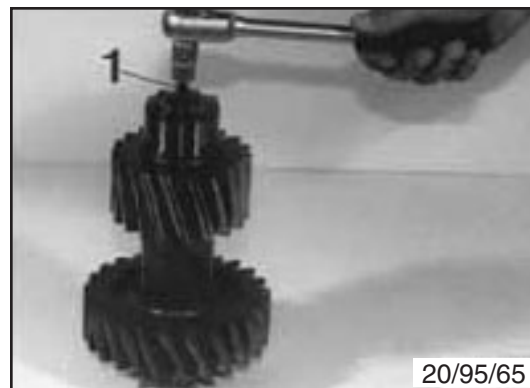
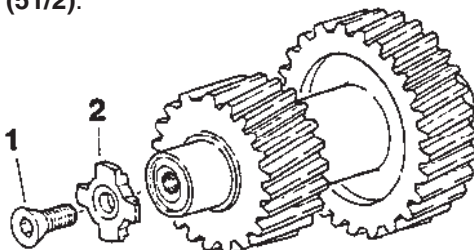


Abb. 51

- 2 Pull off inner bearing races (52/3) Abdruckvorrichtung KUKKO 18-2 (52/1) Trennvorrichtung KUKKO 17-2 (52/2) abziehen.

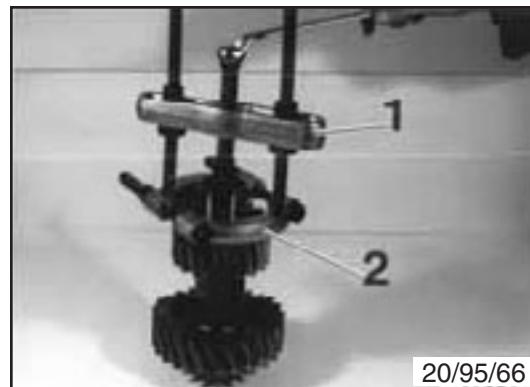
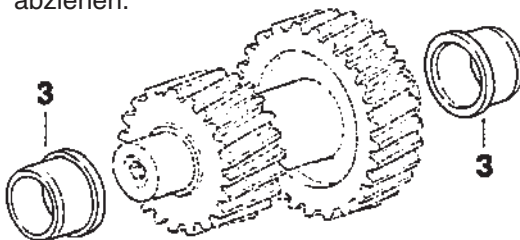


Abb. 52



### 1.1.5 Disassemble front output shaft

- 1 Pull off bearing **(53/1)** by two arm appropriate puller KUKKO 20-2.

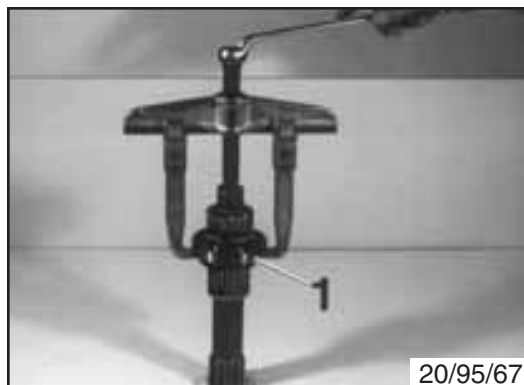
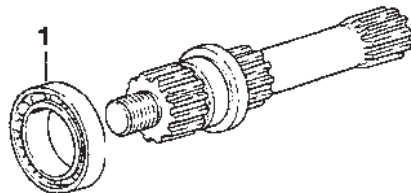


Abb. 53

### 1.1.6 Disassemble planetary carrier

- 1 Pull off front bearing **(55/1)** by appropriate puller KUKKO 18-2 **(54/1)** and clamping device KUKKO 17-2 **(54/2)**.  
Use tool A-VG 750-06 **(55/2)** with chamfered side of bore on top and tool TS 214W **(55/3)** for support.

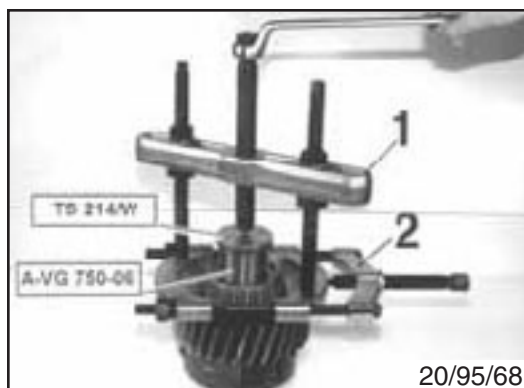
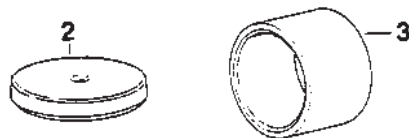


Abb. 54

- 2 Pull off rear bearing **(55/4)** by appropriate puller KUKKO 18-2 **(55/5)** and clamping device KUKKO 17-2 **(55/6)**.

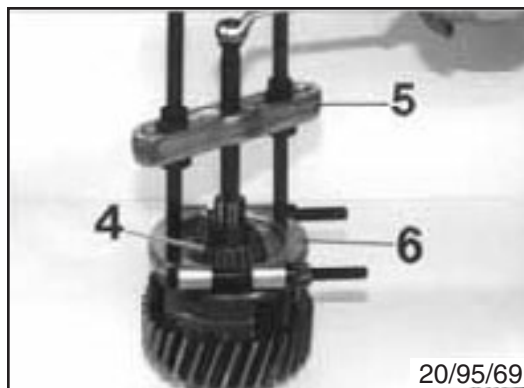
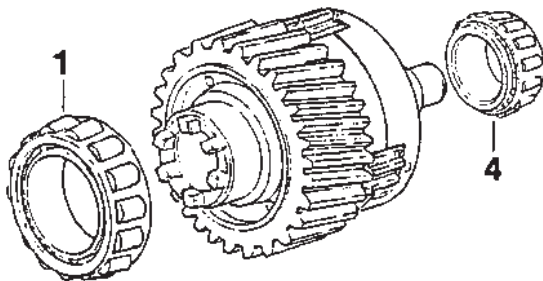


Abb. 55

- 3 Unscrew fastening bolts **(56/1)** of planetary carrier.

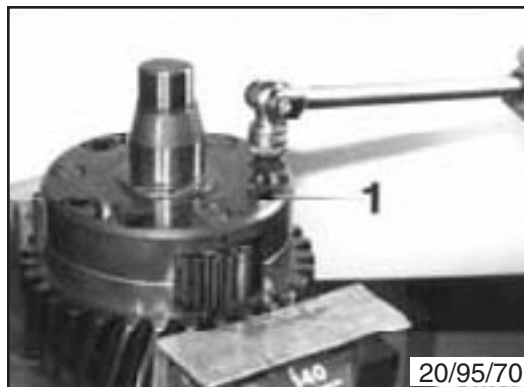
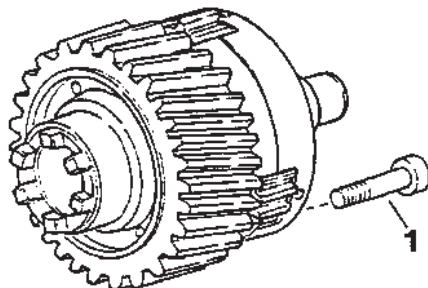


Abb. 56



- 4 Loosen worm screws (58/1) at planetary axes.

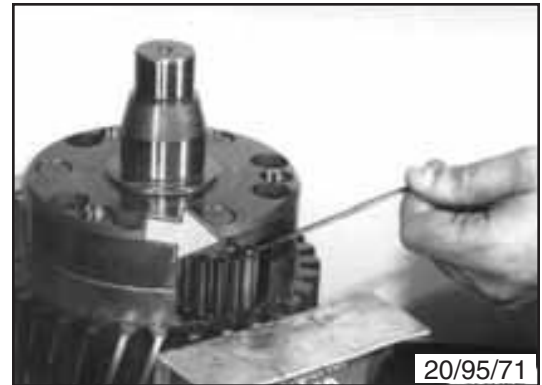


Abb. 57

- 5 Remove planetary gears (58/2) with axles (58/3) sun gear (58/4) and thrust washers (58/5).

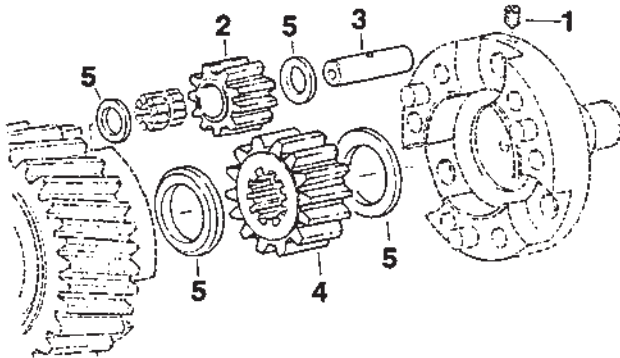


Abb. 58

**ATTENTION:** On disassembly the needle bearings (58/6) can disintegrate.

- 6 Remove dowel pins (59/1) and washers (59/2).

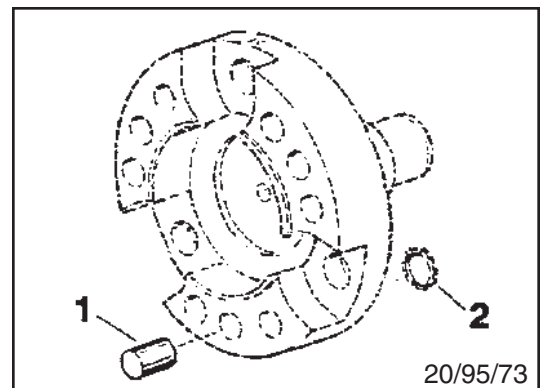


Abb. 59

- 7 After removal of needles pull out bearing (60/1) by inside appropriate puller KUKKO 21-6 and support device KUKKO 22-3. Pull out outer bearing race (60/2) by means of inside appropriate puller KUKKO 21-9 and support KUKKO 22-3.

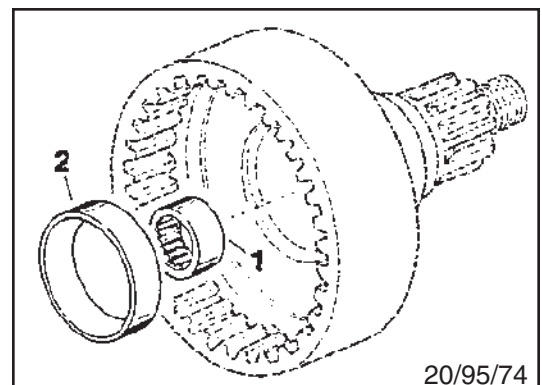
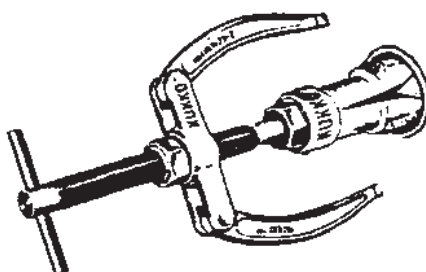
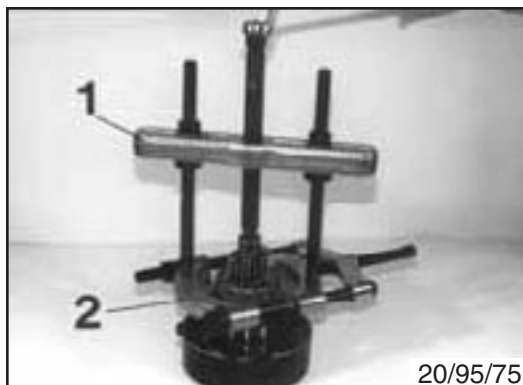
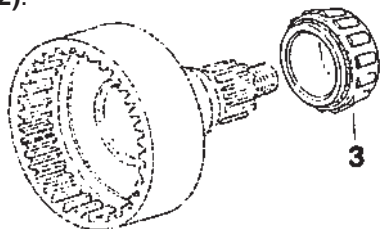


Abb. 60



- 8 Pull off bearing (61/3) from planetary housing by appropriate puller KUKKO 18-2 (61/1) and clamping device KUKKO 17-2 (61/2).



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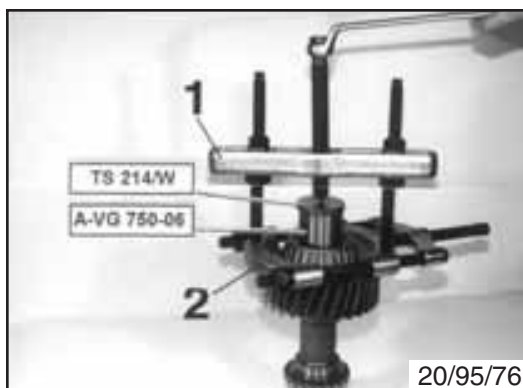
Abb. 61

### 1.1.7 Disassemble rear output shaft (version without planetary differential)

- 1 Pull off front bearing (64/1) by appropriate puller KUKKO 18-2 (62/1) and clamping device KUKKO 17-2 (62/2).  
Tool A-VG 750-06 (62/3) with chamfered edge on top and tool TS 214/W (62/4) for support.



- 2 Pull off rear bearing (64/2) by appropriate puller KUKKO 20-2 (63/1)

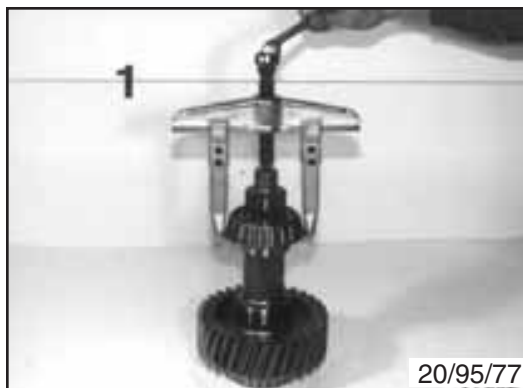
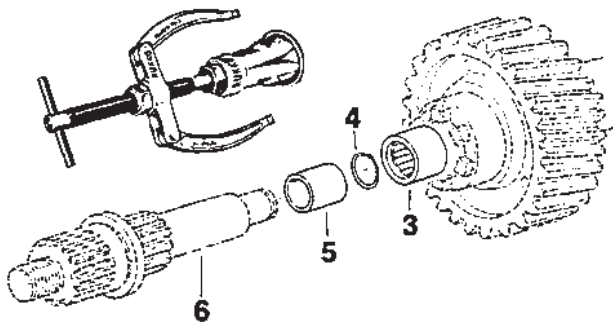


20/95/76

Abb. 62

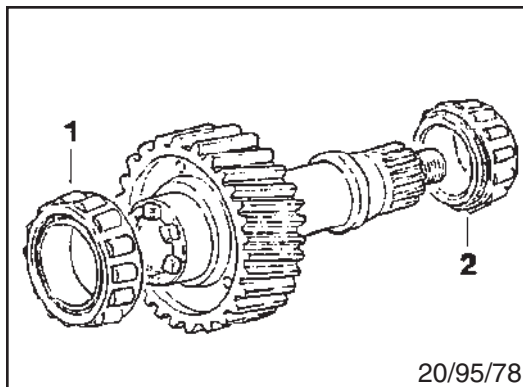
#### 1.1.7.1 Disassembly of rear output shaft Version 100% relative speed

- 1 Remove needles and pull out bearing (64/3) by appropriate puller KUKKO 21-6 and support device KUKKO 22-3.  
Remove snapping (64/4) and inner race (65/5) from front output shaft (64/6).



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Abb. 63



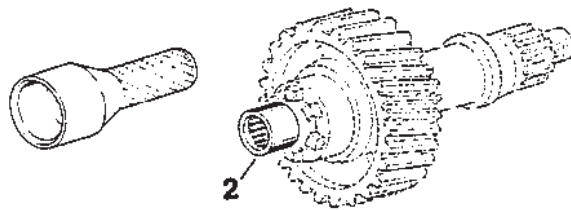
20/95/78

Abb. 64

## 1.2 Assemble shafts and planetary gear

### 1.2.1 Assemble rear output shaft (without planetary)

- 1 Heat rear bearing (65/1) to 90°C and slide it on shaft.  
**Variant 100% relative speed:**  
Install needle bearing (65/2) by means of tool A-VG 750-12.



- 2 Heat front bearing (66/1) to 90°C and slide is on shaft.



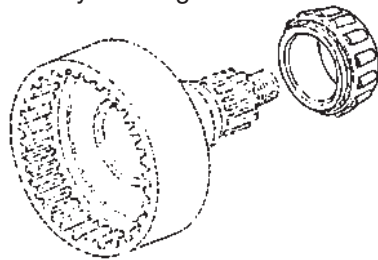
Abb. 65



Abb. 66

### 1.2.2 Assembly of planetary gear

- 1 Heat rear bearing (67/1) to 90°C and slide it on planetary housing.



- 2 Install outer bearing race (68/2) by copper punch (68/1). Install needle bearing by means of tool A-VG 750-12.
- ATTENTION:** do not tilt.

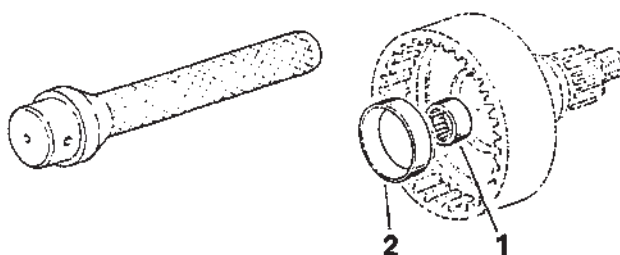


Abb. 67



Abb. 68



- 3 Install needle bearing with intermediate washer (69/1) in planetary gears (69/5) with the aid of grease. Slide in axles (69/2) with chamfer t on top, dowel pin (69/3) from inside and safety washer (69/4) until stop point.

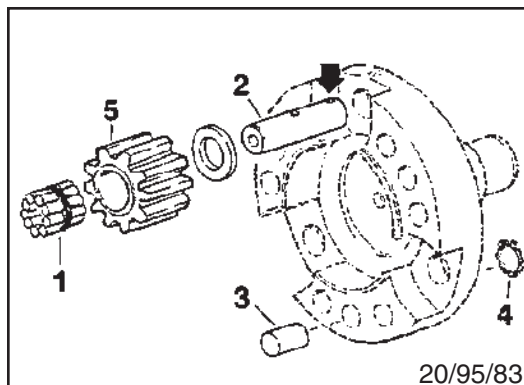


Abb. 69

- 4 Install planetary gears (70/1) with thrust washer (70/2) and sun gear (70/3) with thrust washers (70/4).

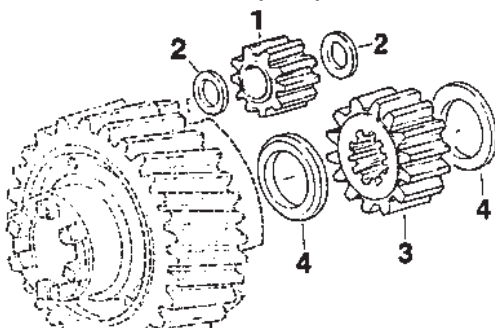


Abb. 70

- 5 Put on planetary cover (71/1). Make sure that position makers meet. Assure correct position of axles regarding notches.

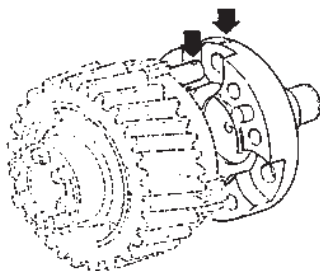


Abb. 71

- 6 Install fastening screws (72/1) in planetary carrier. Tighten to  $180 \pm 20 \text{ Nm}$  according to sequence (72/2).

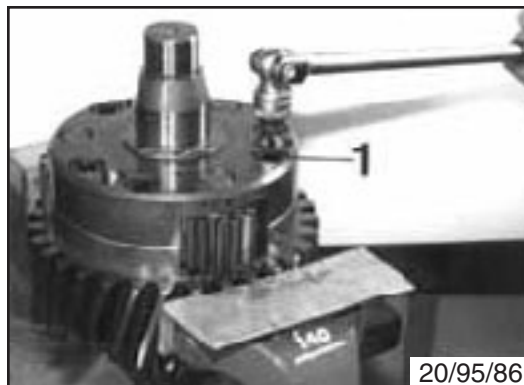
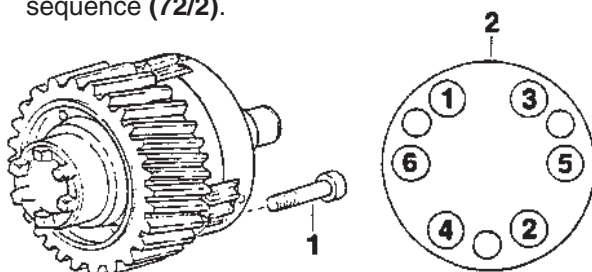


Abb. 72

- 7 Apply Loctite 243 to worm screws (73/1) and tighten.

**ATTENTION:** Assure position of axes.

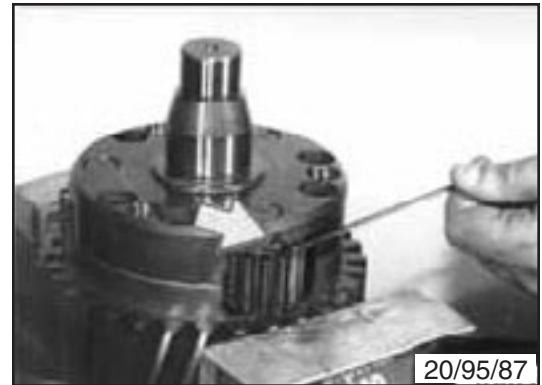
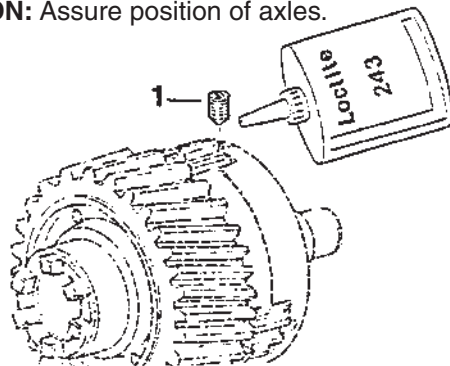


Abb. 73

- 8 Heat front bearing (75/1) to 90°C and slide it on.

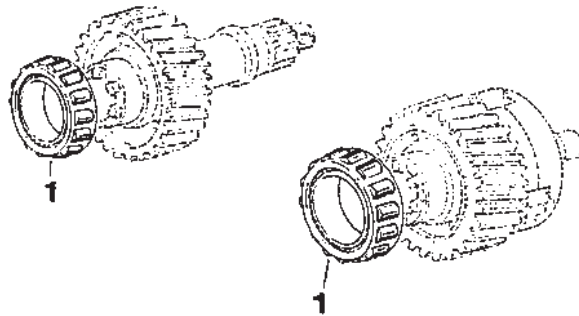


Abb. 74

- 9 Heat rear bearing to (75/2) to 90°C and slide it on.

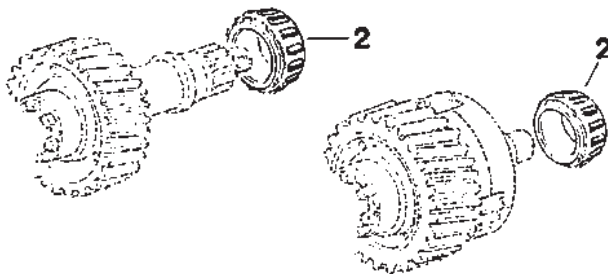
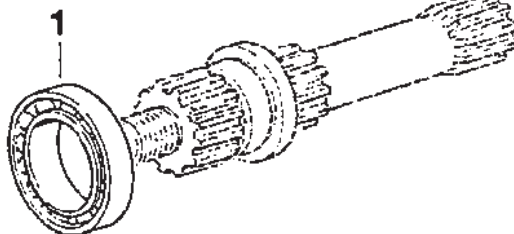


Abb. 75

### .2.3 Assemble front output shaft.

- 1 Heat ball bearing (76/1) to 90°C and slide it on shaft.



Install snapping 2 by means of tool A-VG 750-011.



Abb. 76



### 1.2.4 Assemble double gear

- 1 Heat inner bearing races (**77/1**) to 90°C and slide them on.

**NOTE:** Install pulse rotor after bearing adjustment.

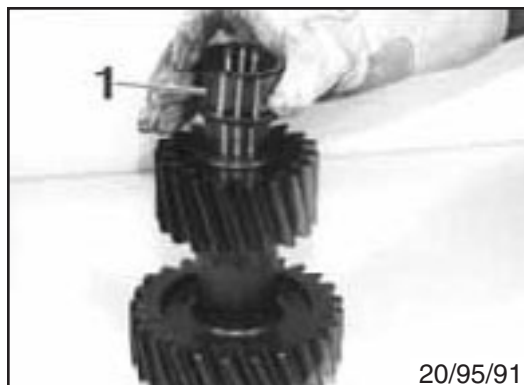


Abb. 77

### 1.2.5 Assemble input shaft

- 1 Glue oil baffle washer (**78/1**) into input shaft with Loctite 243.

**NOTE:** Installing of baffle washer is only required if shaft is damaged or being replaced as well as when the lubrication bore has to be cleaned.

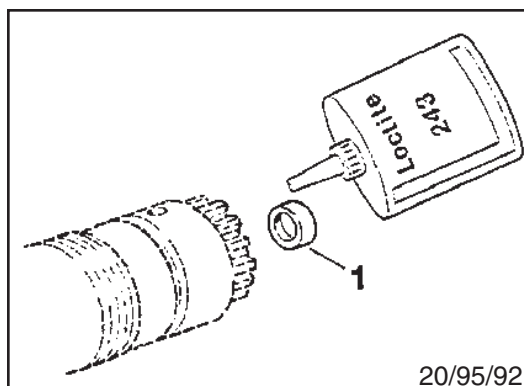


Abb. 78

- 2 Slide gear  $z = 21$  (**79/1**) on shaft (oil slide bearing). Slide on thrust washer (**79/2**) with chamfer on the outer side. Heat inner bearing ring (**80/3**) to 90°C and slide it on.

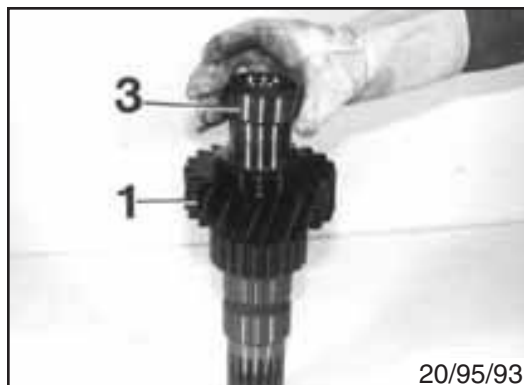
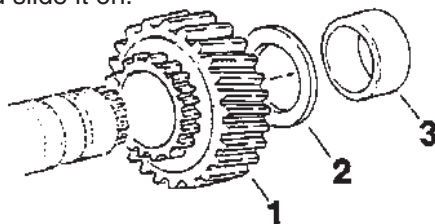


Abb. 79

- 3 Slide dog sleeve (**80/4**) on spline (oil spline). Slide gear  $z = 32$  (**80/5**) on shaft (oil slide bearing). Slide on thrust washer with chamfer on the outer side (**79/2**). Heat inner bearing race (**80/3**) to 90°C and slide it on.

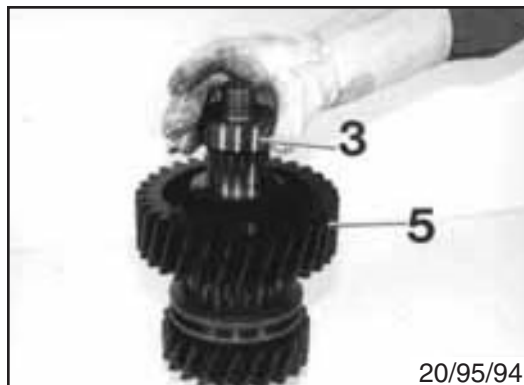
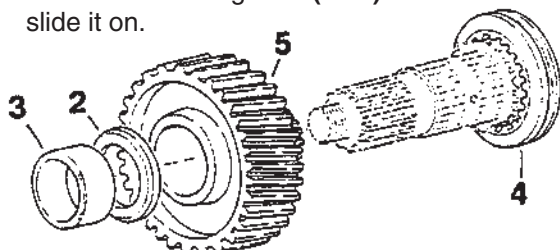


Abb. 30



## 1.3 Assemble transfer case

### 1.3.1 Prepare housing and install bearings.

- 1 Install oil pipe (**81/1**) with Loctite 638.  
Install all core plugs with Loctite 243.

Install upper and lower dowel pin (**81/2**) in front housing.

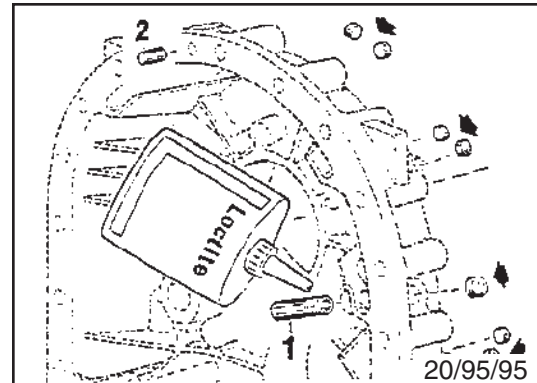


Abb. 81

- 2 Heat rear housing to 70°C and install input shaft bearing (**83/1**), double gear bearing (**83/2**) and output shaft outer bearing race (**83/3**).

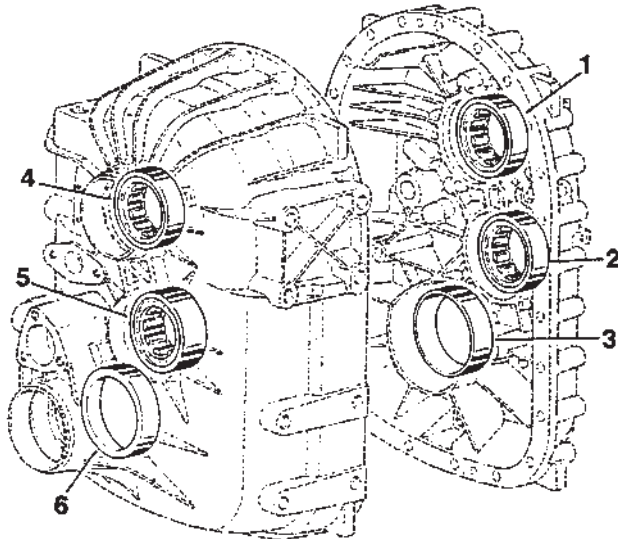


Abb. 82



Abb. 83

- 3 Heat front housing to 70°C and install input shaft bearing (**83/4**), double gear bearing (**83/5**) and output shaft outer bearing race (**83/6**)

**ATTENTION:** Install double gear bearing with riveted side of brass cage to the inside.



Abb. 84



- 4 Install circlip **(85/1)** at the input shaft bearing.

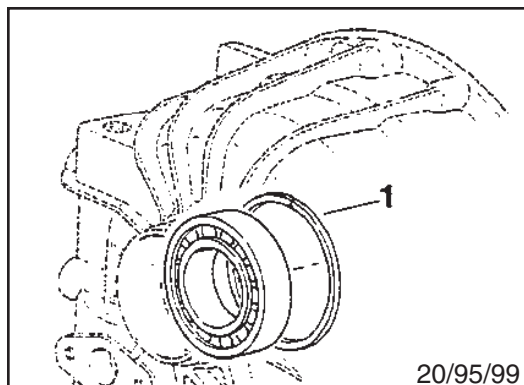


Abb. 85

- 5 Install shift fork **(86/1)** and dog sleeve **(86/2)** in housing.

Use tool A-VG-750-07 **(1)**.

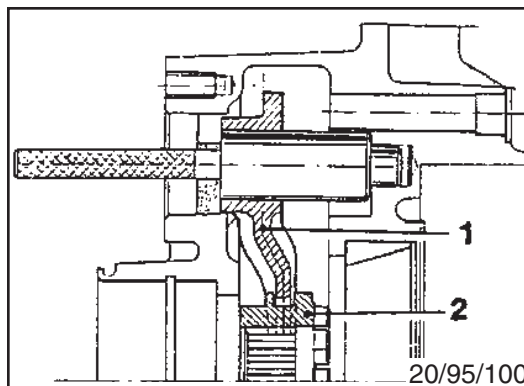
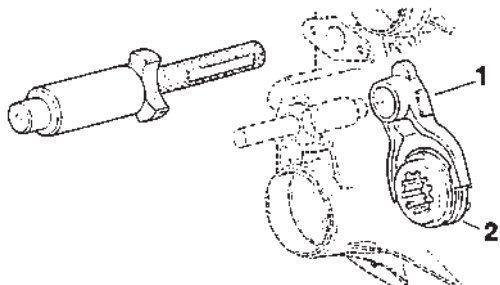


Abb. 86

- 6 Heat housing to 70°C and install front output shaft **(87/3)** from outside to inside through dog sleeve.

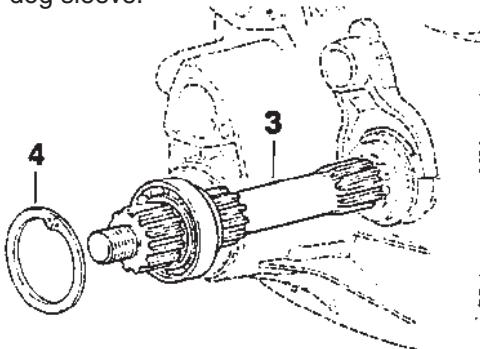


Abb. 87

- 7 Install circlip **(87/4)**.



Abb. 88

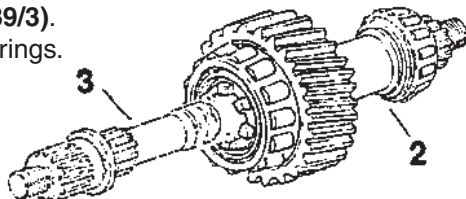
### 1.3.2 Install differential, rear output shaft and double gear.

- 1 Slide planetary differential (89/1) on front output shaft.

**Version without differential:**

Slide rear output shaft (89/2) on front output shaft (89/3).

Oil bearings.

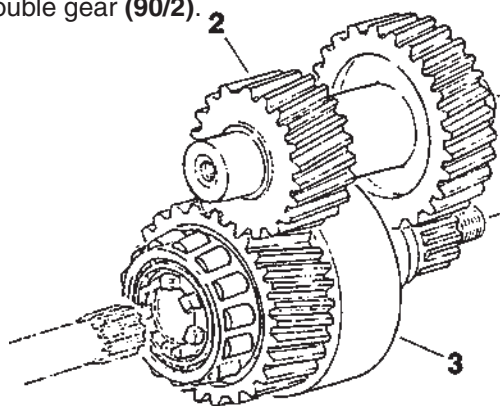


- 2 Install double gear (90/2) together with planetary housing (90/3).

**ATTENTION:** Needle bearing in planetary housing.

**Version without differential:**

Install rear output shaft (89/2) first and then double gear (90/2).



- 3 Mount rear housing provisionary with 6 bolts.

- 4 Drive outer bearing races of the rear output shaft (92/1) and double gear (92/2) to innermost position.

Use aluminium punch.

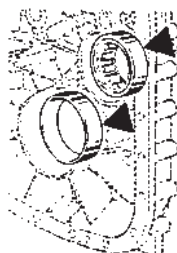


Abb. 89



Abb. 90



Abb. 91



Abb. 92



### 1.3.3 Adjust bearings of rear output shaft and double gear.

- 1 Slide tool A-VG 750-06 (93/1) on rear output shaft and tighten collar nut by means of power tool.

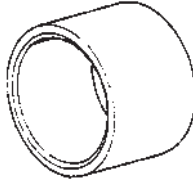


Abb. 93

- 2 Drive double gear (94/1) and rear output shaft (94/2) to front by means of aluminium punch.

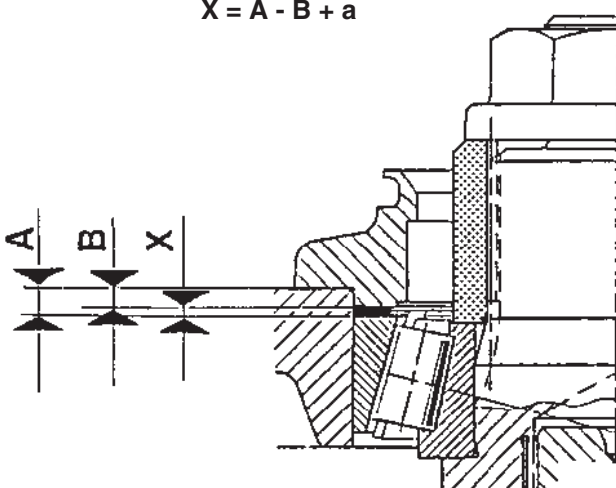


Abb. 94

- 3 Measure distance from rear output shaft bearing to housing surface = (A) (95/1)

- 4 Measure projection on bearing cover = (B) (96/2).

- 5 Calculate thickness of shims = X  
a = bearing preload 0,05-0,10 mm  
 $X = A - B + a$



Shims X	s = 0,10mm
	s = 0,15mm
	s = 0,20mm
	s = 0,40mm
	s = 0,60mm
	s = 0,80mm
	s = 1,00mm



Abb. 95

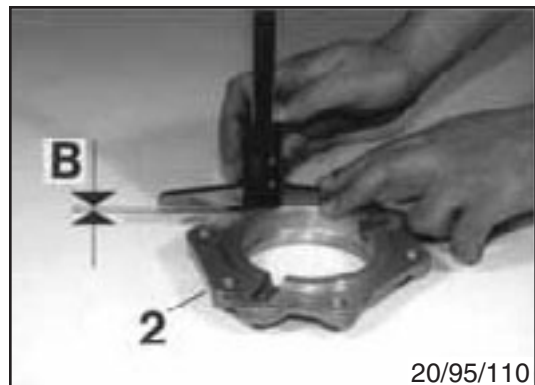
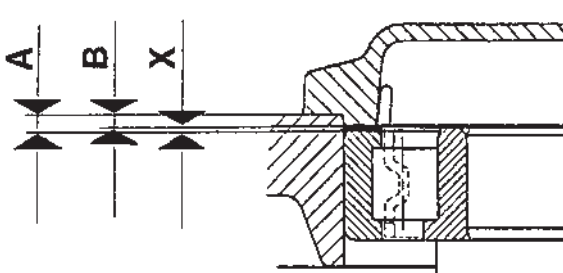


Abb. 96



- 6 Measure distance from rear housing to double gear bearing. **A**
- 7 Measure projection on bearing cover **B (98/1)**
- 8 Calculate thickness of shims = **X**  
**a** = bearing clearance 0,30 - 0,40mm

$$X = A - B - a$$



**Shims X**

s= 0,10mm  
s= 0,15mm  
s= 0,20mm  
s= 0.50mm



Abb. 97

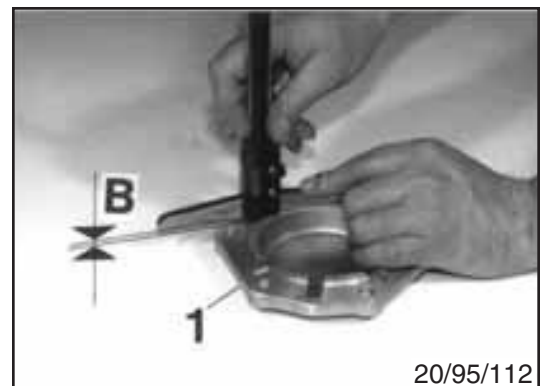


Abb. 98

- 9 Install bearing cover (**99/1**) of rear output shaft with determined shims (**3**).
- 10 Install bearing cover of double gear (**100/2**) with determined shims (**4**).

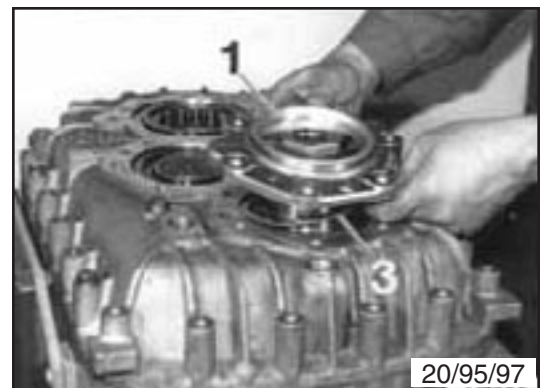
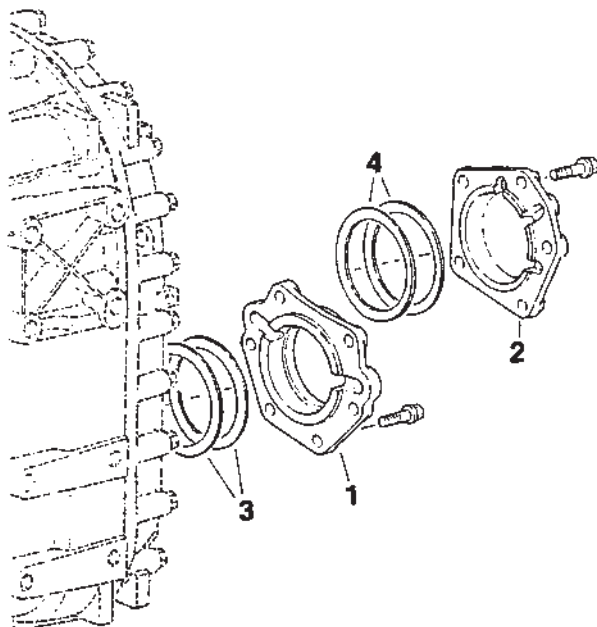


Abb. 99



Abb. 100



- 11 Check drag torque of rear output shaft by means of torque gauge (101/1)  
Drag torque = 10 - 15 cm/kg



Abb. 101

- 12 Measure axial bearing clearance of double gear. Install bolt M16x1,5x70 (102/1) in double gear.

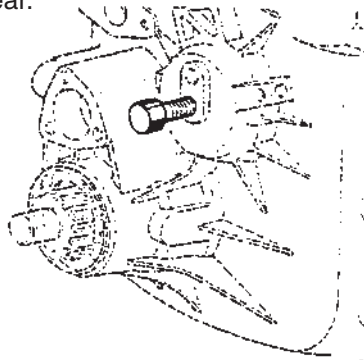


Abb. 102

- 13 Check axial clearance by means of dial gauge (103/1). Use tire lever.  
Axial clearance:  $a = 0,3 - 0,4\text{mm}$

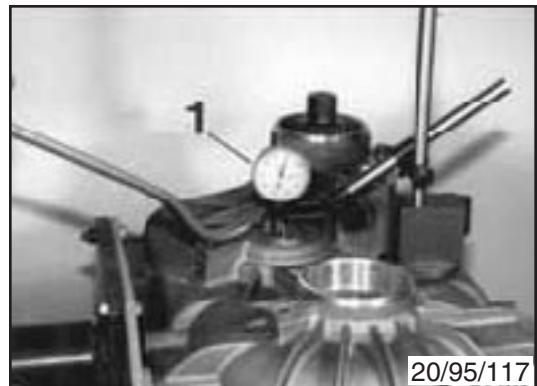


Abb. 103

#### 1.3.4 Adjust front axle shifting (diff. lock shifting) and assemble cylinder.

- 1 Slide in tool A-VG-750-07 (104/1) and set in to stop position.

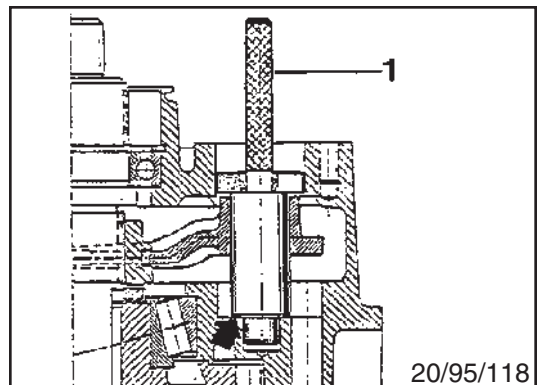
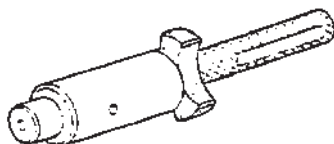
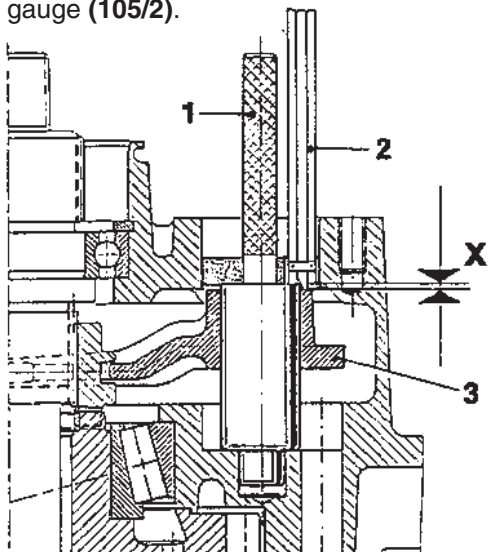


Abb. 104

- 2 Measure distance X from tool (1) to shift fork (3) by means of depth caliper gauge (105/2).



- 3 Neutralize distance X by shim (106/1)

Shim :  
 -30x42x0,1  
 -30x42x0,2  
 -30x42x0,5  
 -30x42x1,0



Abb. 105

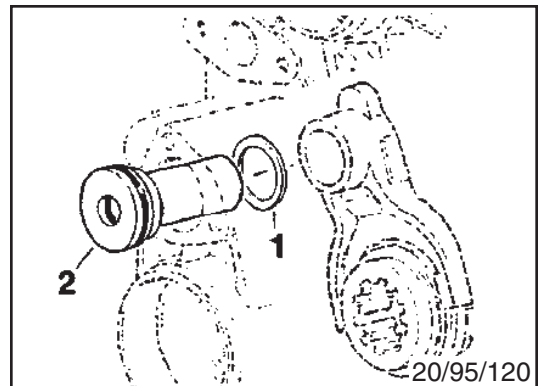
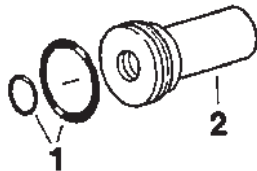


Abb. 106

- 4 Carefully install O-Rings (107/1) inside and outside of piston (107/2) and grease with Molycote M55.



Slide shim on piston (106/2).

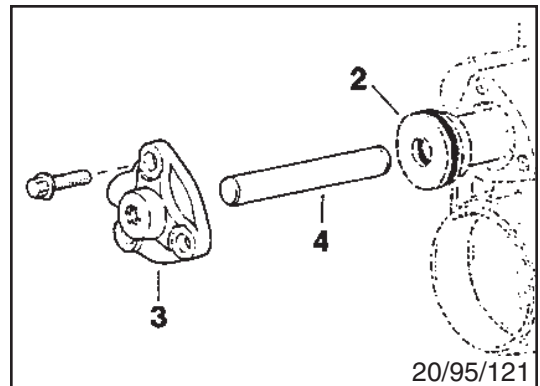


Abb. 107

- 5 Grease piston rod (107/4) and install with piston (107/2) and shim (106/1).

- 6 Install cover (107/3) with Loctite 518 sealant.

Torque:  $46 \pm 5$  Nm



Abb. 108



- 7 Remove rear output shaft bearing cover together with shims.



Abb. 109

- 8 Remove rear housing.



Abb. 110

- 9 Slide in shift spring (**112/1**).



Abb. 111

- 10 Install plug (**112/2**) with Loctite 243.  
Torque:  $60 \pm 5\text{Nm}$

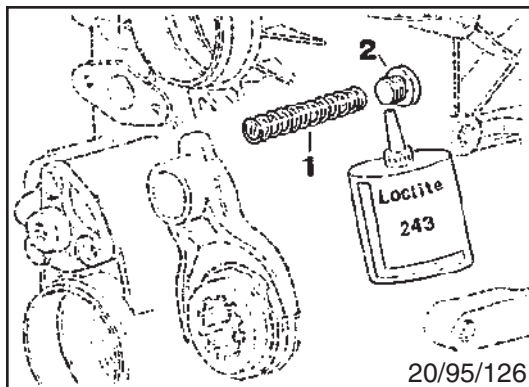


Abb. 112

### 1.3.4.1 Assemble double gear and install

- 1 Lift out double gear (113/1) together with differential (113/2)  
Version without differential: lift out double gear only (113/1).



Abb. 113

- 2 Apply Loctite 243 to screw (114/1) and mount pulse rotor (114/2).  
Torque:  $200 \pm 20 \text{ Nm}$

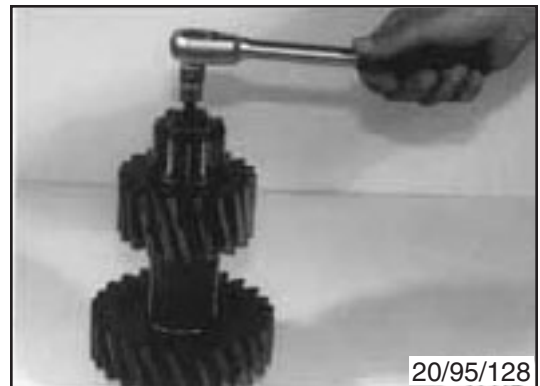
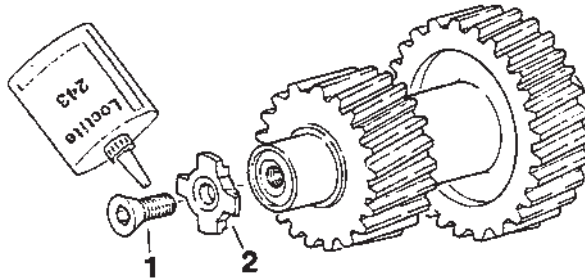


Abb. 114

- 3 Install double gear with planetary differential.  
**ATTENTION:** Needle bearing in differential housing

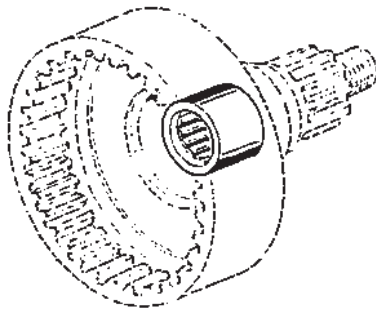


Abb. 115

- 4 Install oil guide (1).

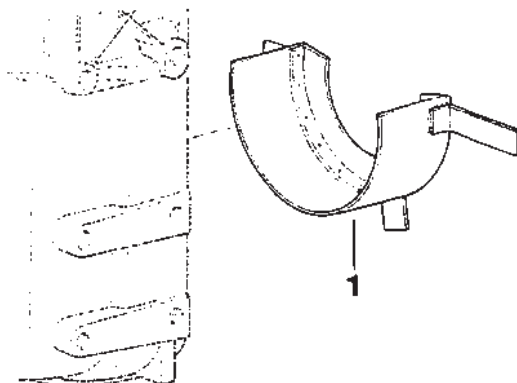


Abb. 116



### 1.3.5 Install input shaft-shift fork and shift rod.

- 1 Slide tool A-VG 750-05 (117/1) into front input shaft bearing.

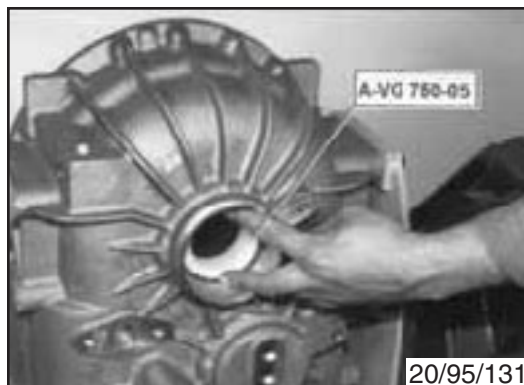
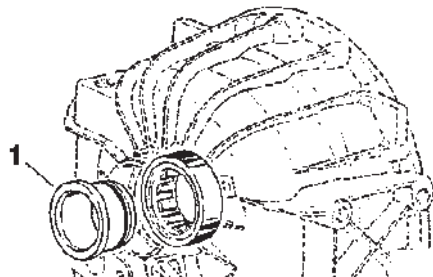


Abb. 117

- 2 Install input shaft (118/1). Counterhold tool A-V V 50-05 (117/1).

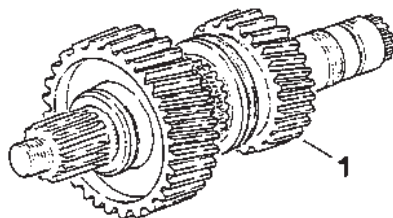


Abb. 118

- 3 Install shift fork (119/1) with sliders (119/2) on dog sleeve. (Numbers on shift fork to front)

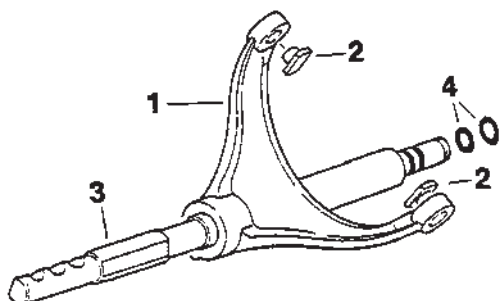


Abb. 119

- 4 Install shift rod (119/3) with O-rings (119/4).

**ATTENTION:** Position of notches for fastening screws (121/1) to match with thread bores of shift fork (119/1)..

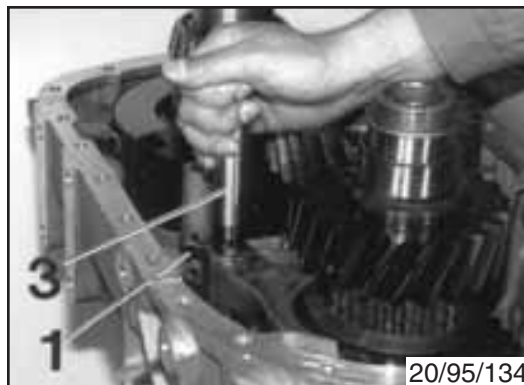


Abb. 120

- 5 Install fastening screws (121/1) with Loctite 243 and tighten fork.  
Torque:  $46 \pm 5\text{Nm}$

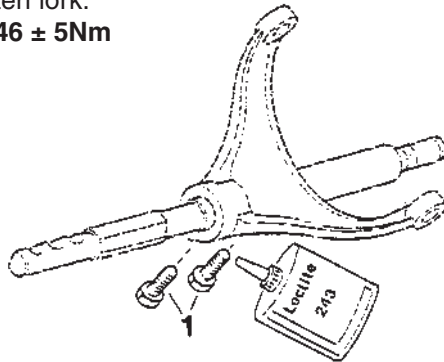


Abb. 121

ATTENTION: Clean sealing surface of housing and remove remainders of sealant.

- 6 Apply sealant Loctite 518 (122/1) on front housing.

(Use roller to spread Loctite 518 equally)

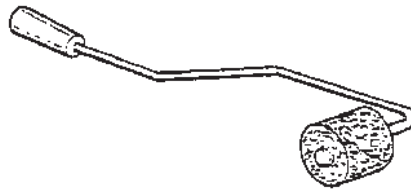


Abb. 122

- 7 Install rear housing.  
8 Tighten bolts (124/1) M 10x125 first and bolts (124/2) M 10x80 after.  
Torque:  $46 \pm 5\text{Nm}$

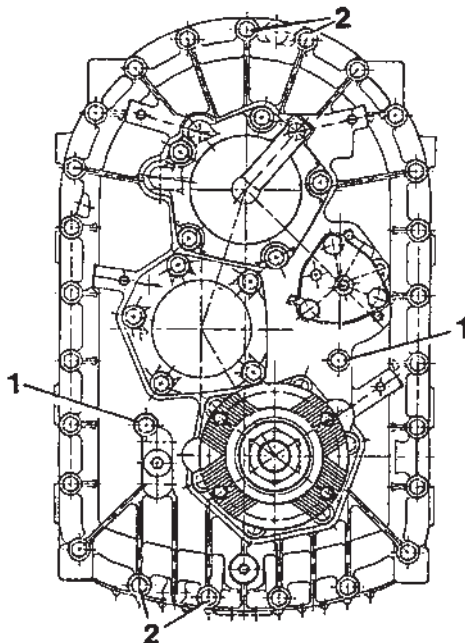


Abb. 123

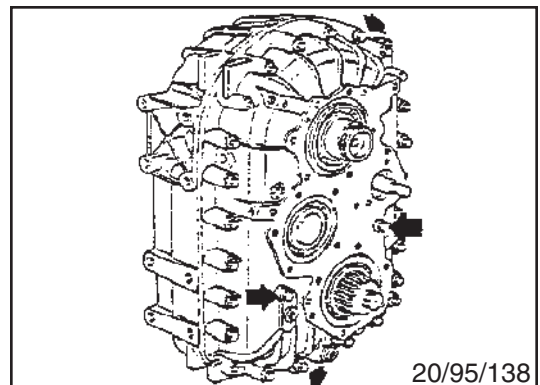


Abb. 124



- 9 Apply grease STABOTHERM GN 461 to sealing lips and install radial oil seal rings (125/1) by means of tool A-VG 750-08.

**ATTENTION:**

black outside  
brown inside

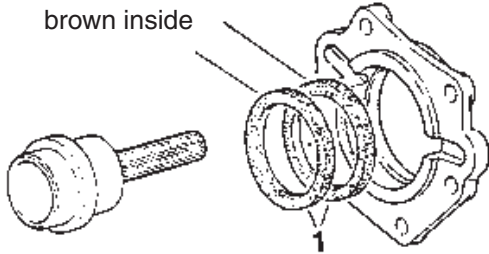


Abb. 125

ATTENTION: Clean sealing surfaces.

- 10 Apply Loctite 518 to sealing surface of double gear bearing cover (126/1) and rear output shaft bearing cover (126/2) and install them with determined shims.  
Torque:  $46 \pm 5 \text{ Nm}$

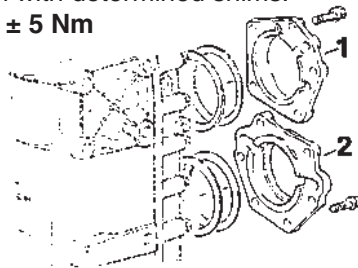


Abb. 126

- 11 Slide ball bearing (127/3) with groove to the inside on rear end of input shaft

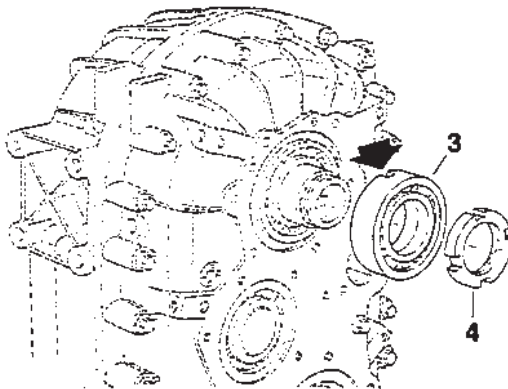


Abb. 127

- 12 Install grooved nut (128/4) with tool A-MVG 750-09 and power tool and lock.  
Torque:  $300 \pm 30 \text{ Nm}$

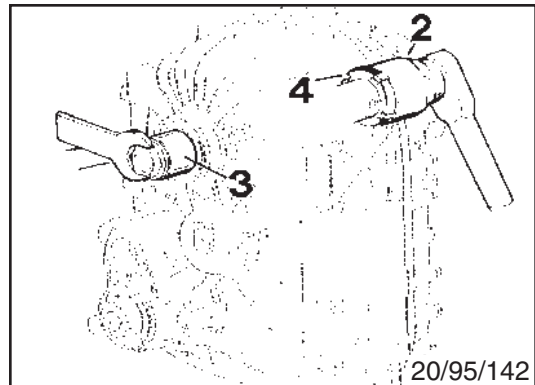


Abb. 128

### .3.6 Input shaft bearing adjustment

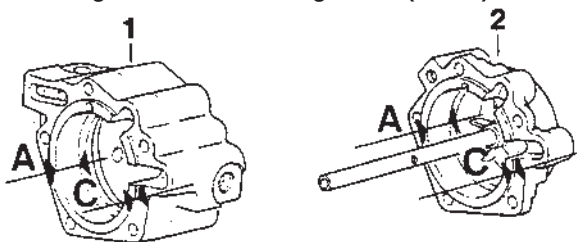
- 1 Measure distance from bearing to housing surface **B**.

#### Version without oil pump:

- 2 Measure distance **A** from outer cover surface into recess of bearing cover (130/2)
- 3 Measure distance **C** from outer cover surface to sealing surface of bearing cover (130/2).

#### Version with oil pump bearing:

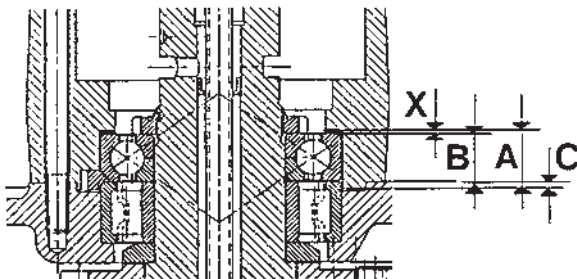
- 4 Measure distance **A** from outer cover surface into recess of oil pump bearing cover
- 5 Measure distance **C** from outer cover surface to sealing surface of bearing cover (130/1).



Thickness of shims: X

$$X = A - B - C + a$$

preload  $a = 0,05$  mm measure by feeler gauge (131/1)



Adjusting shims:  $s = 0,1$  mm  
(132/1)  $s = 0,15$  mm  
 $s = 0,2$  mm  
 $s = 0,5$  mm

#### Version without oil pump:

- 6 Apply Loctite 518 to bearing cover (132/3) and install together with shims and locking piece (132/4).

#### Version without oil pump bearing cover:

- 7 Apply Loctite 518 to bearing cover (132/3) and end cover (132/3) and install together with shims and locking piece (132/4).

Torque:  $80 \pm 5$  Nm



Abb. 129



Abb. 130

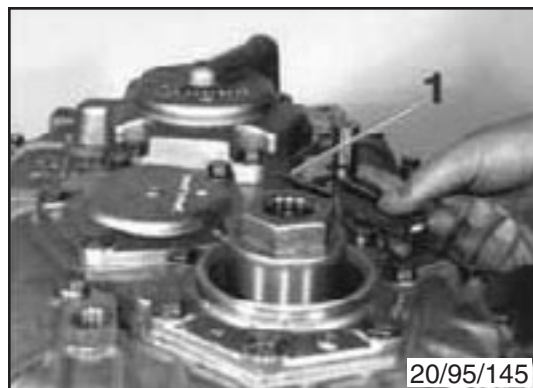


Abb. 131

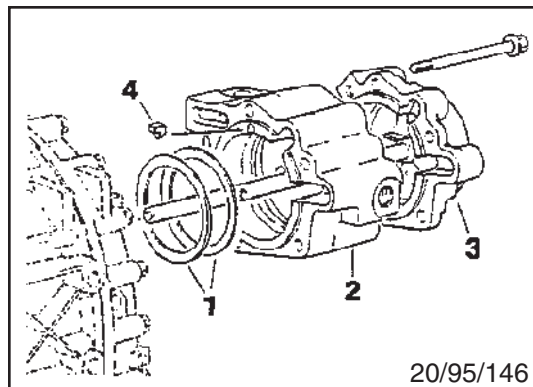


Abb. 132



### Version with oil pump provision

- 1 Install plugs (133/3) with copper seals  
Install core plugs (133/2) with  
Loctite 243.

Torque:  $60 \pm 5$  Nm

**ATTENTION:** Insert ball (133/1) before  
installing hollow screw with seal.

Torque: 30 Nm

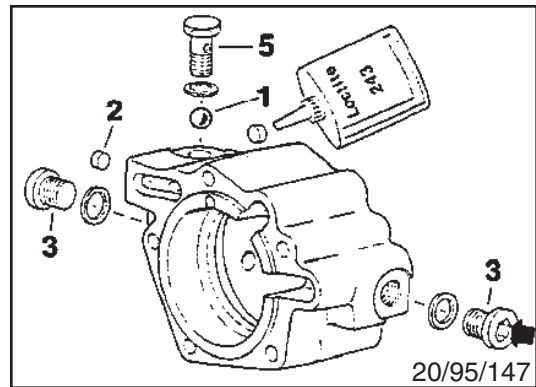


Abb. 133

### 1.3.6.1 Version with oil pump:

**ATTENTION:** Clean sealing surfaces.

- 1 Apply Loctite 518 to bearing cover  
(134/1) and install together with shims.

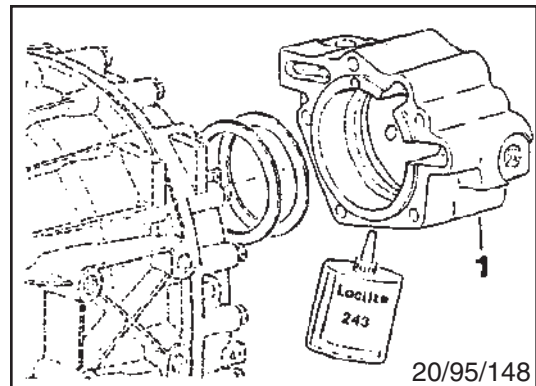


Abb. 134

- 2 Install inner oil pump cover (135/1)  
in bearing cover with spring pin into  
bore to lock against rotation (135/2).

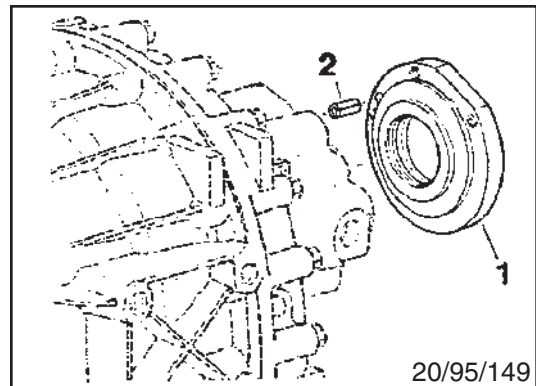
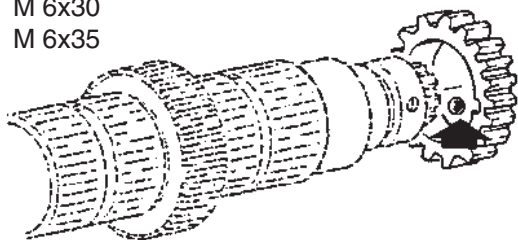


Abb. 135

- 3 Insert drive ball (136/1) into shaft bore  
(use some grease).  
Slide pump gear (136/2) on input shaft.  
Slide outer pump gear (136/3) into oil  
pump housing (136/4).  
Install oil pump into bearing cover and  
tighten with Allan screws (136/5).  
M 6x30  
M 6x35



**ATTENTION:** position of ball and groove  
must align.

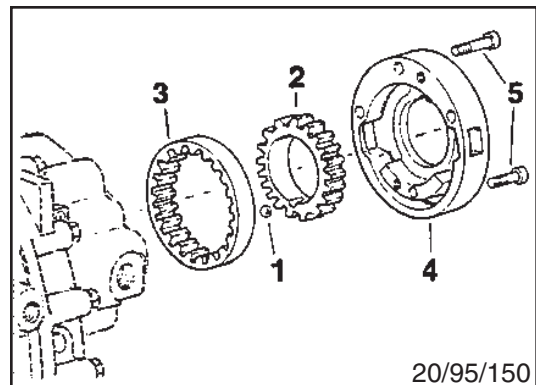


Abb. 136



- 4 Apply Loctite 518 to end cover (**137/1**) and P.T.O cover (**137/2**) and install.  
Torque: **60 ± 5 Nm**

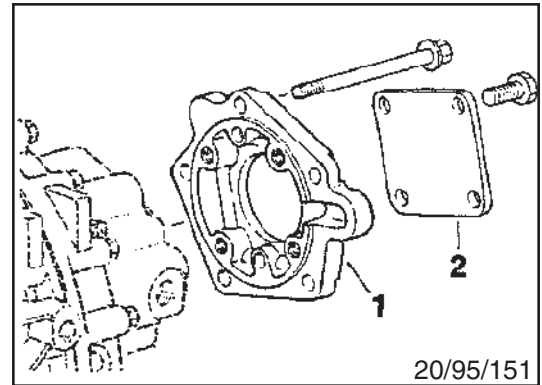


Abb. 137

- 5 Insert ball (**138/3**) into bearing cover and install hollow screws (**138/4**) with seal (**138/2**).  
Mount plug (**138/4**) with seal.  
Torque: **60 Nm**  
Install core plugs (**138/5**) with Loctite 243.  
Hollow screw torque: **30 Nm**

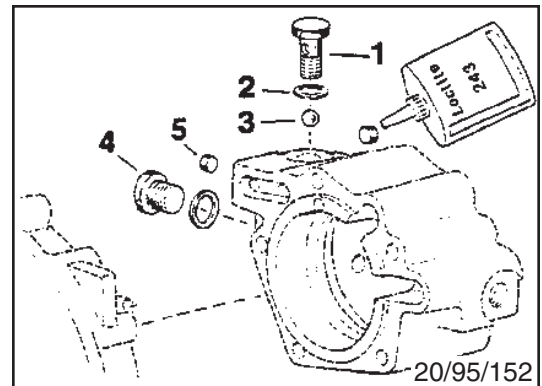


Abb. 138

- 6 Assemble oil pipe (**139/1**) with union pieces (**139/2**) and install on housing.

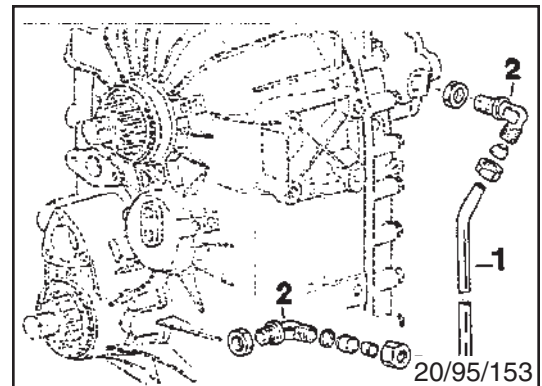


Abb. 139

- 7 Mount oil filler/level plug (**140/1**) and oil drain plug (**140/2**) with seals.  
Torque: **80 Nm**

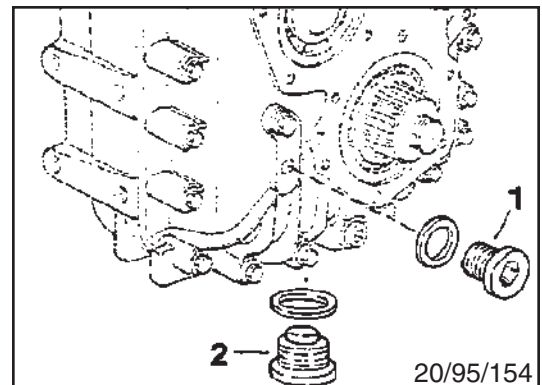
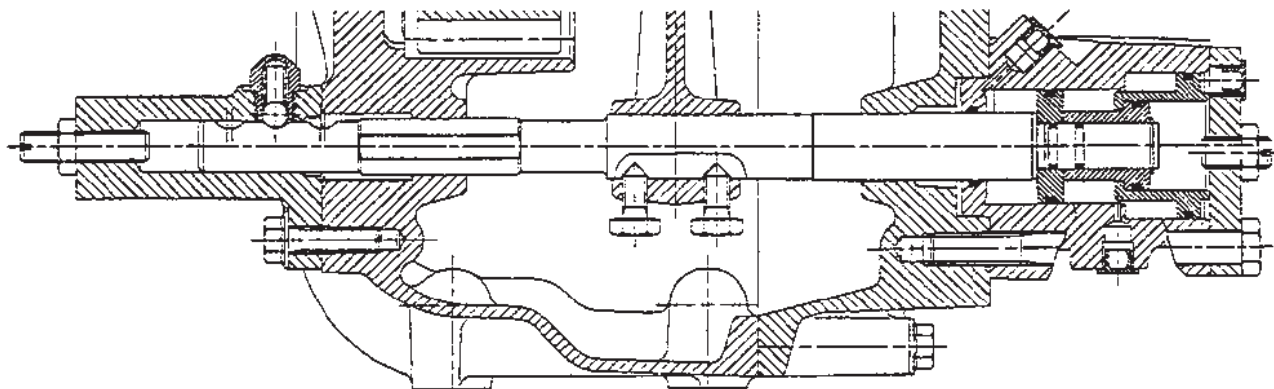


Abb. 140

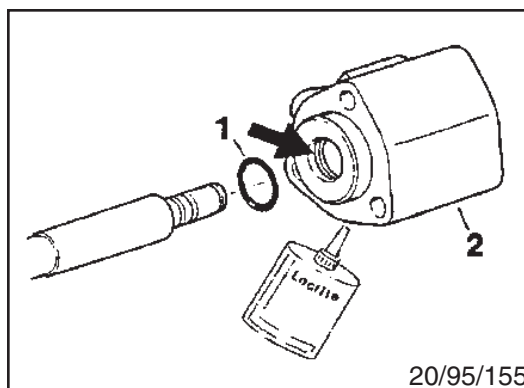
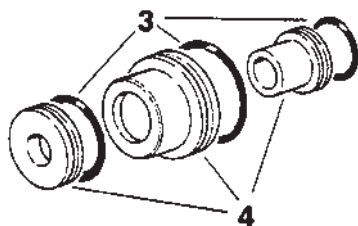


### 1.3.7 Complete pneumatic gear shifting and adjust stop positions



- 1 Insert O-ring (141/1) into groove of shift cylinder and grease lightly.

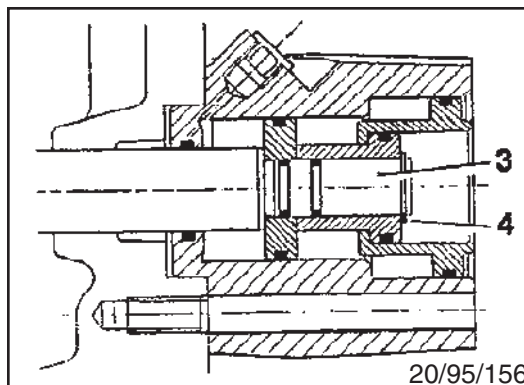
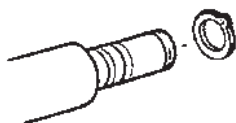
Insert O-rings (141/3) on pistons (141/4) and grease lightly.



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Abb. 141

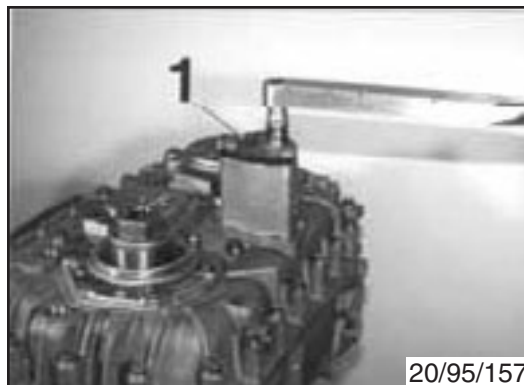
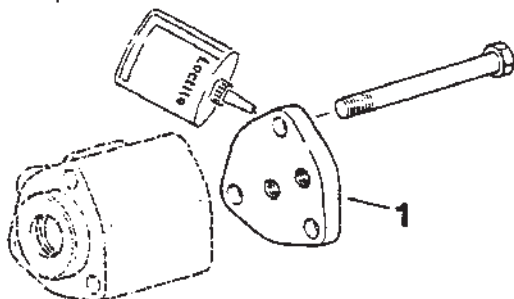
- 2 Apply Loctite 518 to sealing surface and slide shift cylinder (141/1) on shift rod. Slide piston seals into shift cylinder. Couterhold shift rod (142/3) and install circlip (142/4).



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Abb. 142

- 3 Apply Loctite 518 to sealing surface of cylinder cover (143/1) and install. Torque:  $46 \pm 5 \text{ Nm}$

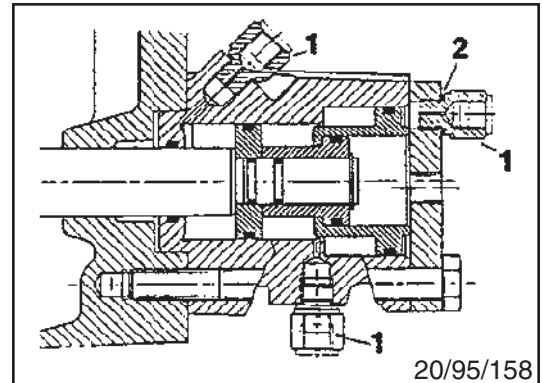


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Abb. 143



- 4 Install air connectors (144/1) with Loctite 243 and seals (144/2).

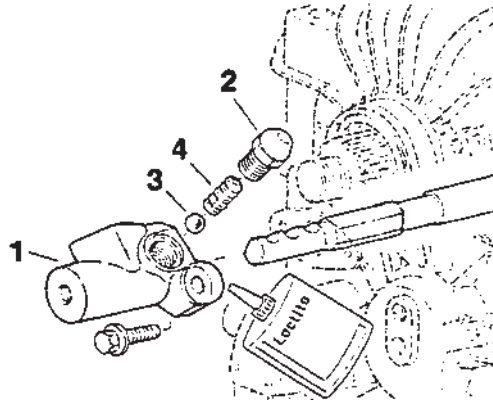


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**NOTE:** clean sealing surface.

Abb. 144

- 5 Install cover (145/1) with Loctite 518.



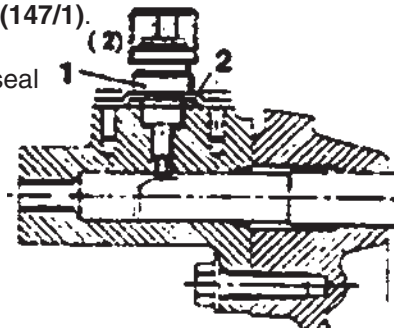
20/95/159

Abb. 145

- 6 Install ball guide (146/2) with ball (145/3) and spring (145/4).

- 7 Install switch (147/1).

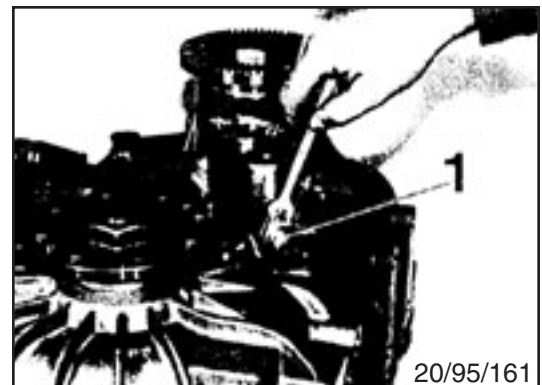
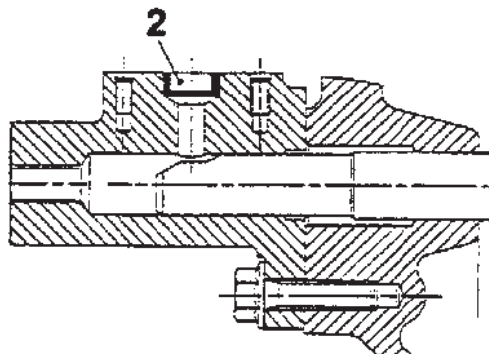
**ATTENTION:** of seal



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Abb. 146

- 8 On version without switch install core plug (147/2) with Loctite 243.



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Abb. 147



## Adjustment of shift stop positions

- 9 Remove old sealing remainders from threads. M12 x 1,5
- 10 Apply Loctite 243 to adjusting screws **-(148/1)-(151/1)** and lock nuts **(148/2)** **-(151/2)** and mount on shift cylinder resp. on front shift rod cover.

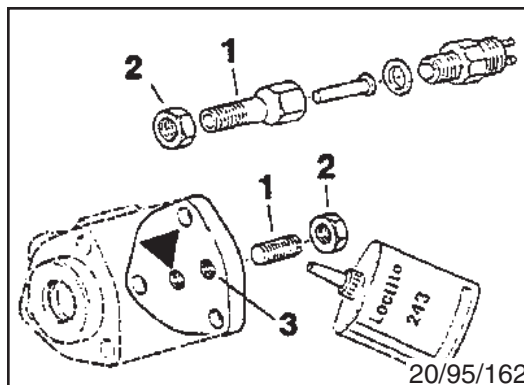


Abb. 148

## Adjustment LOW GEAR

- 11 Apply compressed air **P=6,5 bar** to connection **(149/A)** of shift cylinder **(149/3)** to engage low gear. Turn in adjusting screw into **(149/1)** until it touches the shift rod **(149/4)**. Turn adjusting screw further by 1/3 to 1/2 turn and lock with nut **(149/2)**.

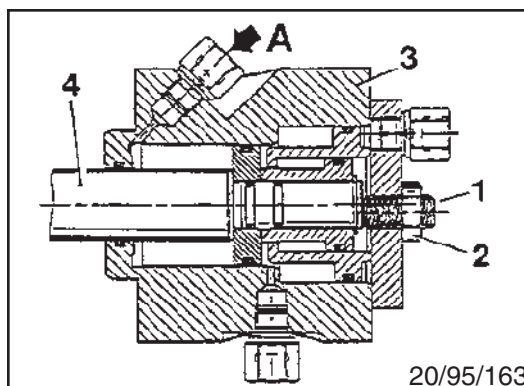


Abb. 149

## Adjustment HIGH GEAR

- 12 Apply compressed air (**P=6,5bar**) to connection **(150/B)** on shift cylinder cover **(150/1)** to engage high gear. Turn in adjusting screw into front shift rod cover until it touches the shift rod **(151/4)**. Turn adjusting screw further by 1/3 to 1/2 turn and lock with nut **(151/2)**.

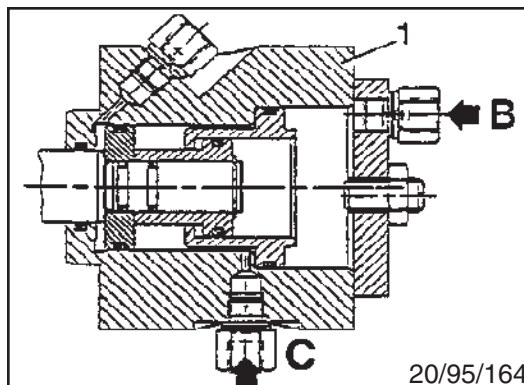


Abb. 150

**NOTE:** Version - 3 Position shifting:  
Neutral position is shifted on connection **(150/C)**.  
Version 2 Position shifting:  
Connection **(150/C)** is plugged.

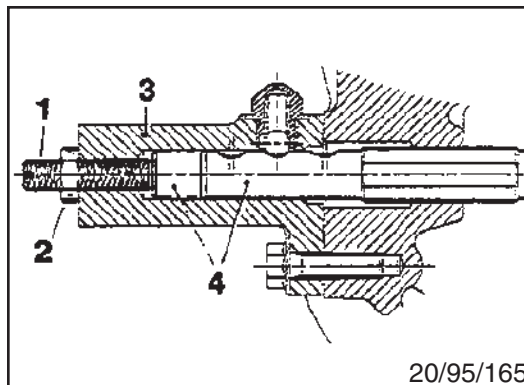
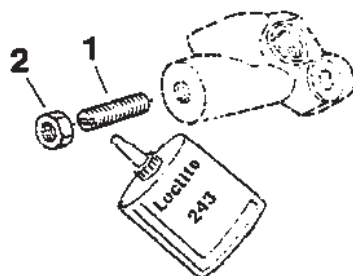


Abb. 161

### 1.3.8 Install flanges

- 1 Heat flange **(152/1)** to 100° and slide it on rear output flange together with bolts **(152/2)**. Secure bolts by suitable O-ring.

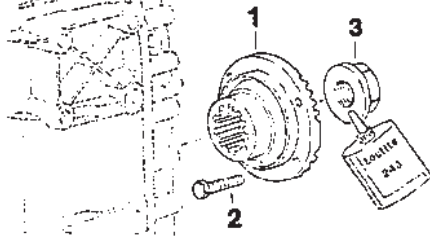


Abb. 152

- 2 Apply Loctite 243 to collar and thread of nut and tighten. Counterhold with tool **TS 215W**. If available use torque multiplier **(1)**. Torque: **1080 Nm**

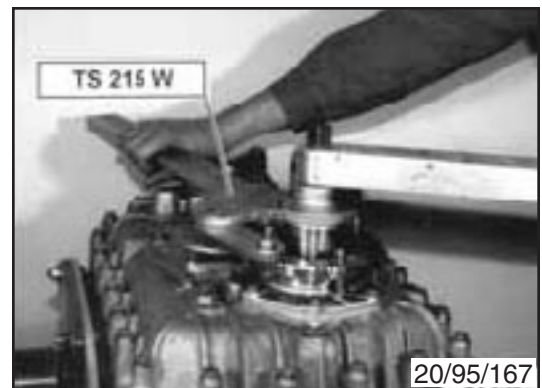
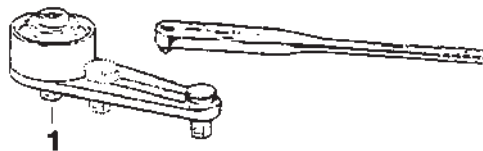


Abb. 153

- 3 Mount Allan screw M10 x 12 **(154/1)** on front axle shift cylinder with Loctite 636.
- 4 Install switch **(155/2)** with bushing **(3)**, pin **(4)**, snap ring **(5)** and seal **(6)**.
- 5 Check seal ness and function by applying air pressure **(6,5 bar)** on connection. **A**

**ATTENTION:** For engagement turn front output shaft.

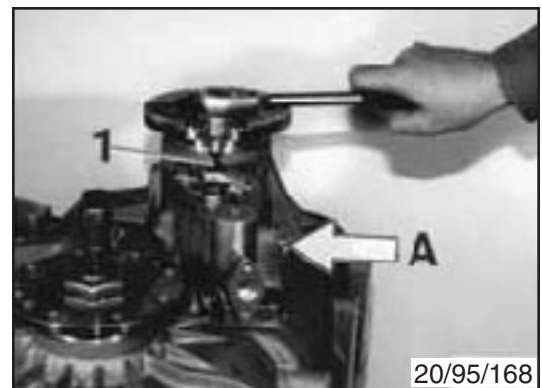
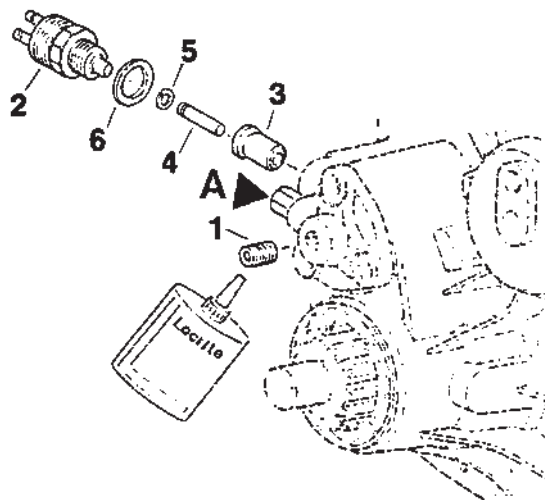


Abb. 154



Abb. 155



## Install flanges

- 1 Front output shaft.  
Apply grease - STABOTHERM GH 461 to lips of oil seals and install them with tool A-VG 750-08 (156/3).

Position of oil seals:

- (1) brown inside
- (2) black outside

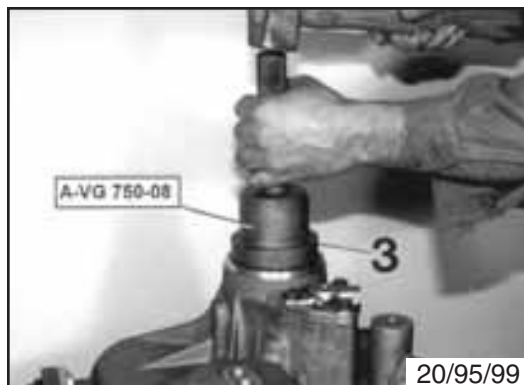
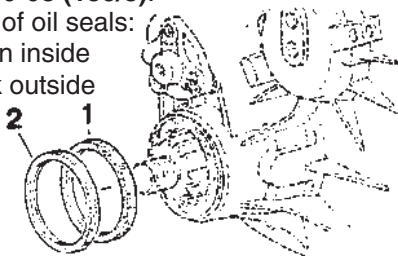


Abb. 156

- 2 Input shaft (157/4 / 157/5).  
Apply grease STABOTHERM GH 461 to lips oil seals and install them with tool A-VG 750-08 (156/3).

Position of oil seals:

- (3) brown inside
- (4) black outside

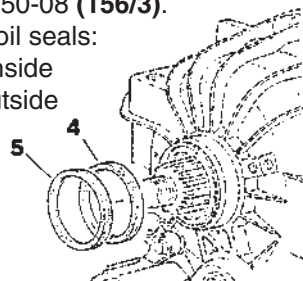


Abb. 157

- 3 Heat flange (158/1) to 100°C and slide it on input shaft.  
Apply Loctite 242 to thread and collar of nut and tighten counterhold with tool TS 21SW.  
If available use torque multiplier.

Torque: **1080 Nm**

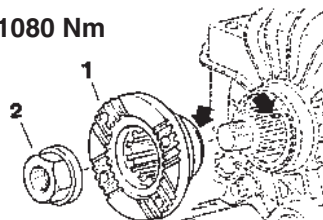


Abb. 158

- 4 Heat flange (159/1) to 100°C and slide it on front output shaft.  
Apply Loctite 243 to Thread and collar of nut and tighten.  
Counterhold with tool (TS 215W)  
If available use torque multiplier  
Torque: **1080 Nm**

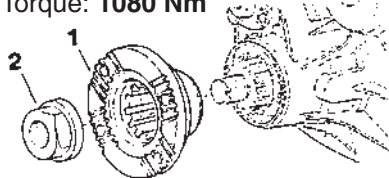


Abb. 159



### 1.3.9 Install breather and speedometer sending unit

- 1 Install breather (160/1) with Loctite 243
- 2 Install sending unit (161/2) and plug (161/3) with seals.

Torque:  $60 \pm 5$  Nm

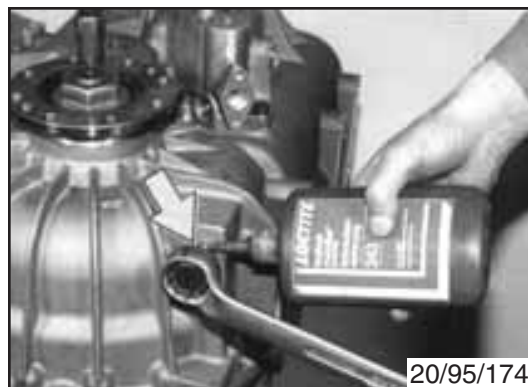
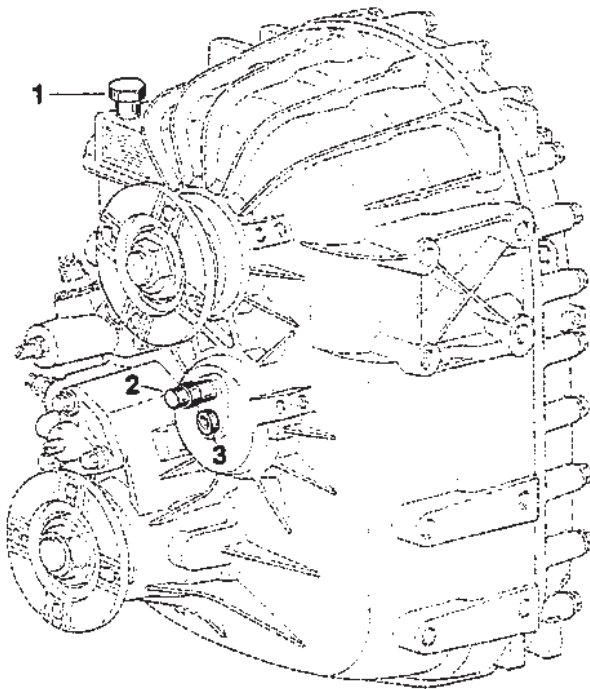


Abb. 160

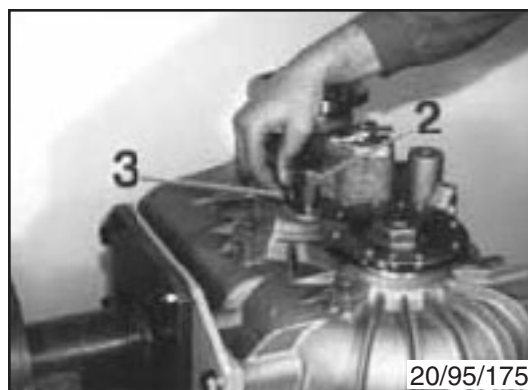


Abb. 151

**ATTENTION:** Before transfer case is taken into operation gear oil has be filled according to operation manual or instructions on page 20 Level plug (162/1).

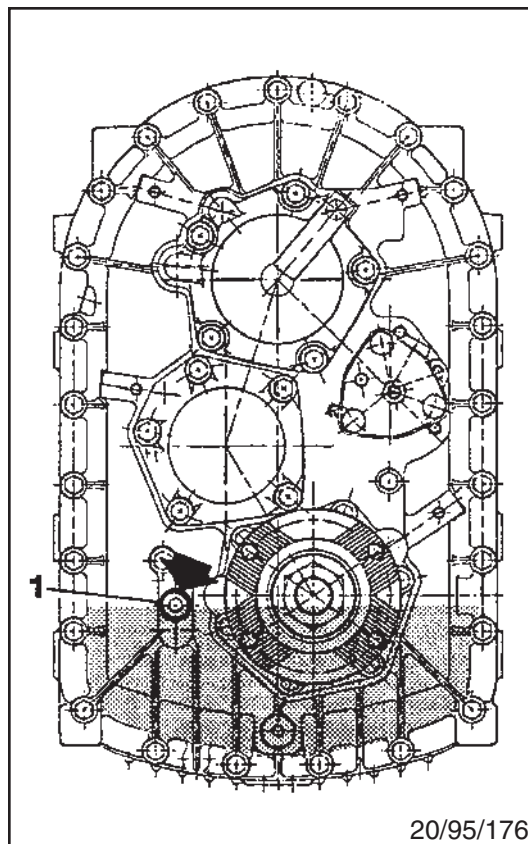


Abb. 162



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A detailed technical line drawing of an engine block, showing various ports, valves, and mounting points. The drawing is rendered in a light gray color against a solid red background. The engine block is oriented vertically, with the cylinder head at the top and the crankshaft area at the bottom. The drawing includes numerous circular and hexagonal features, some of which are marked with a plus sign (+).

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