

TECHNICAL DATA	0
DIAGNOSTICS	1
MECHANICAL GEARBOX CONTROL	2
PNEUMATIC GEARBOX CONTROL	3
ZF S5-42 GEARBOX	4
ZF 6S-850 GEARBOX	5
EATON FS/6309A GEARBOX	6
ALLISON 1000 & 2000 AUTOMATIC GEARBOXES	7
ALLISON MD 3060 AUTOMATIC GEARBOX	8
CLUTCH	9
PROP SHAFTS	10

CONTENTS

	Page	Date
1. MECHANICAL GEARBOX CONTROL	1-1	200508
1.1 General ..	1-1	200508
1.2 Tightening torques	1-2	200508
2. PNEUMATIC GEARBOX CONTROL	2-1	200508
2.1 General ..	2-1	200508
2.2 Tightening torques	2-2	200508
3. ZF S5-42 GEARBOX	3-1	200508
3.1 General ..	3-1	200508
3.2 Tightening torques	3-2	200508
3.3 Filling capacities	3-3	200508
4. ZF 6S-850 GEARBOX	4-1	200508
4.1 General ..	4-1	200508
4.2 Tightening torques	4-2	200508
4.3 Filling capacities	4-3	200508
5. EATON FS/6309A GEARBOX	5-1	200508
5.1 General ..	5-1	200508
5.2 Tightening torques	5-2	200508
5.3 Filling capacities	5-3	200508
6. ALLISON 1000 & 2000 AUTOMATIC GEARBOXES	6-1	200508
6.1 General ..	6-1	200508
6.2 Tightening torques	6-2	200508
6.3 Filling capacities	6-3	200508
7. ALLISON MD3060 AUTOMATIC GEARBOX	7-1	200508
7.1 General ..	7-1	200508
7.2 Tightening torques	7-2	200508
7.3 Filling capacities	7-4	200508
8. CLUTCH	8-1	200508
8.1 General ..	8-1	200508
8.2 Tightening torques	8-2	200508
8.3 Filling capacities	8-3	200508
9. PROP SHAFTS	9-1	200508
9.1 General ..	9-1	200508
9.2 Tightening torques	9-2	200508

1. MECHANICAL GEARBOX CONTROL

1.1 GENERAL

Switch button

Locking compound

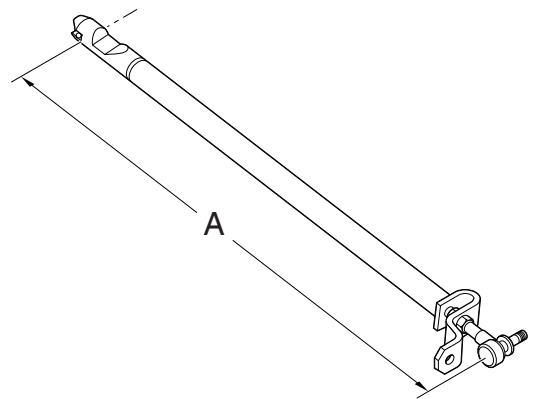
Loctite 243

Control rod

Lubricant

Molykote BR2S or BR2 plus

Control rod underneath the cab

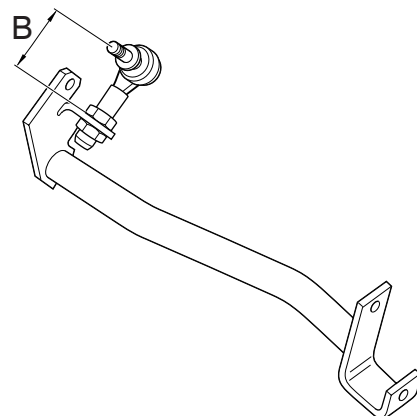


V3 00 563

Length A

Engine	Gearbox	Cab suspension	Class	Length A [mm]
CE engine	ZF 6S850	steel	1	669
CE engine	ZF 6S850	rubber	1	664
CE engine	ZF 6S850	steel	2 + 3	674
CE engine	ZF 6S850	rubber	2 + 3	669
CE engine	FS6309A	steel	2 + 3	674
CE engine	FS6309A	rubber	2 + 3	669

Control rod behind the cab



V3 00 564

Length B

60 - 62 mm

1.2 TIGHTENING TORQUES

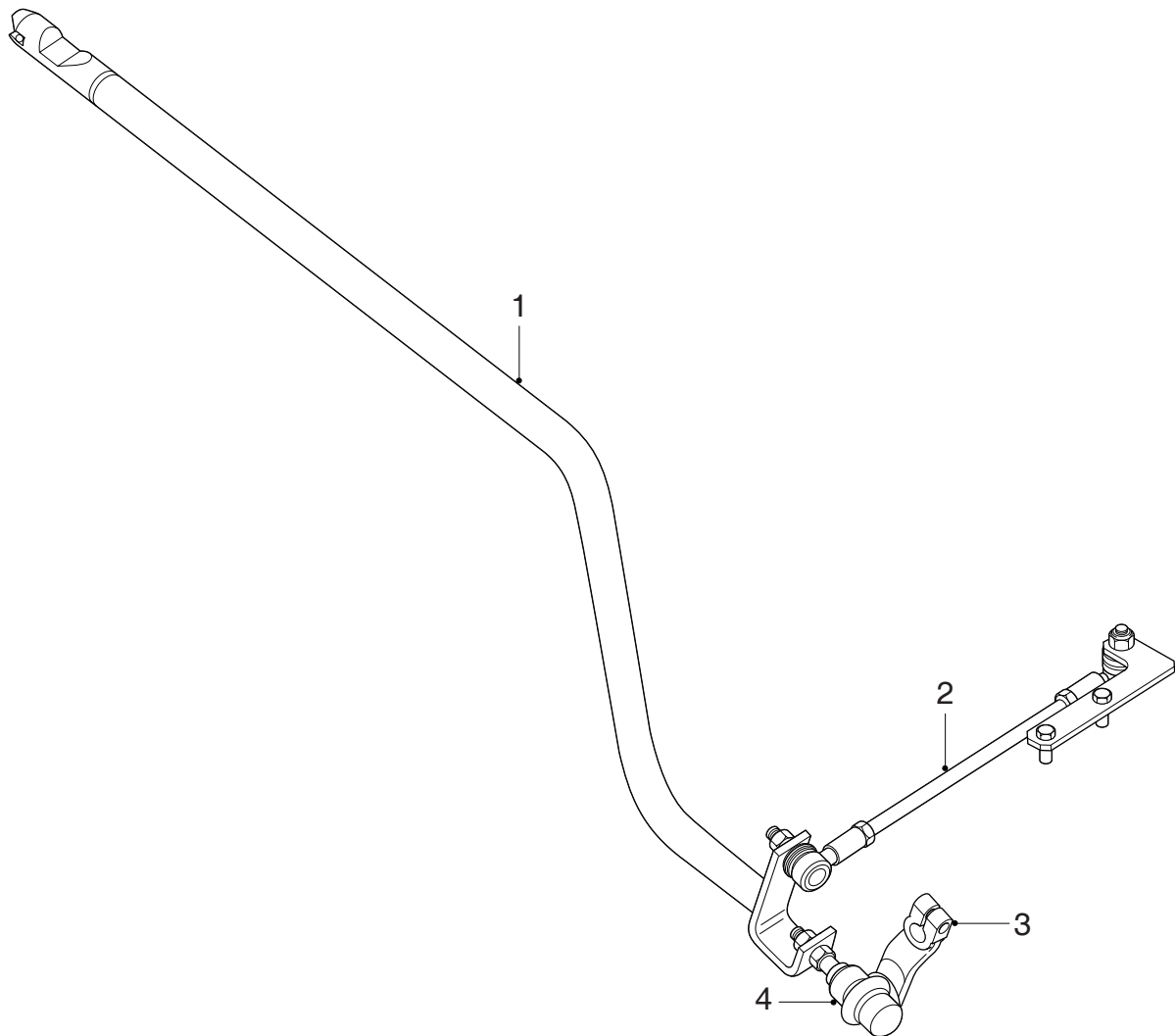
The tightening torques stated in this paragraph are different from the standard tightening torques stated in the overview of the standard tightening torques.

The other threaded connections not specified must therefore be tightened to the torque mentioned in the overview of standard tightening torques.

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Operating mechanism,
2 adjustment options

0



V3 00 567

Control rod (1)

Lubricant

Molykote BR2S or BR2 plus

Torque rod (2)

Attachment nuts

48 Nm

Lock nuts

28 Nm

Ball joint (4)

Attachment nut

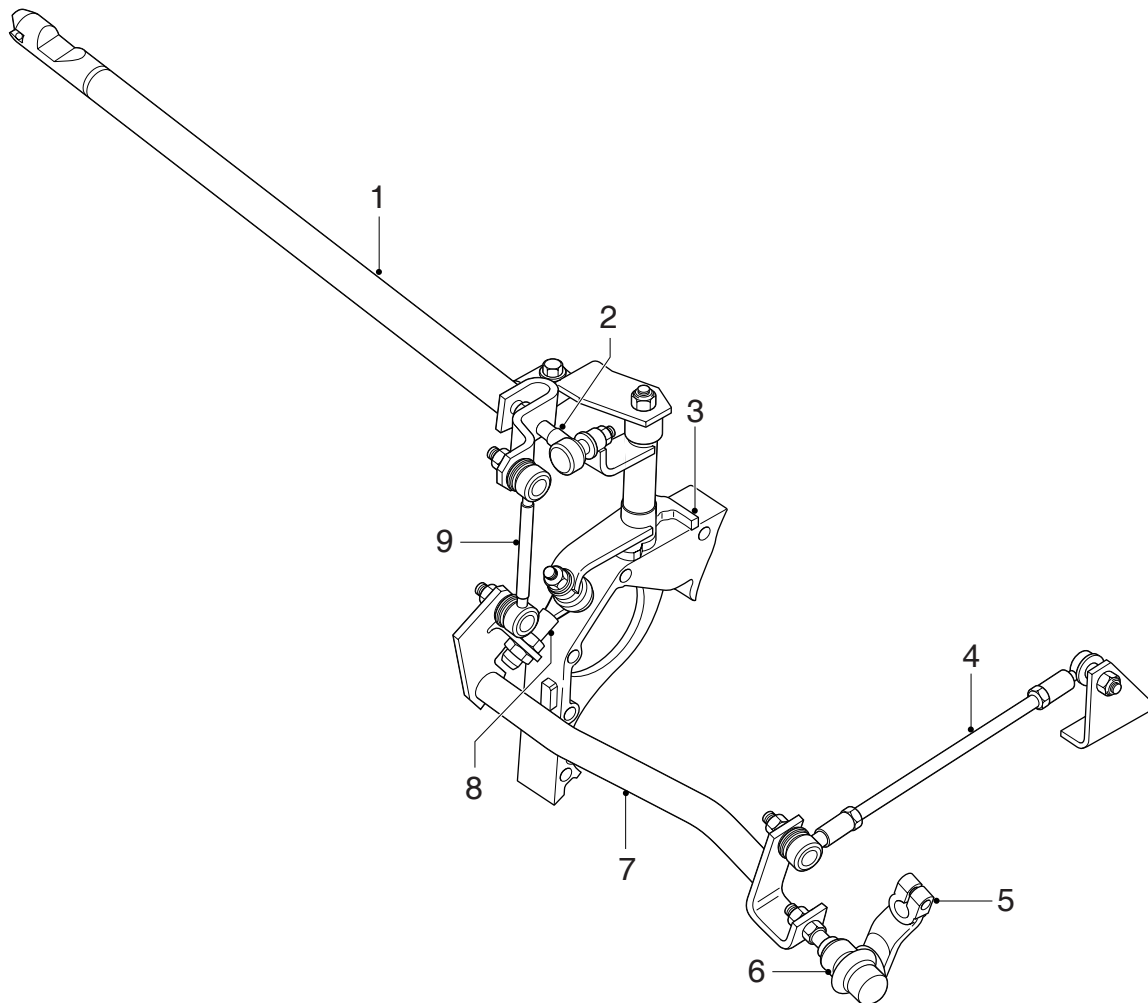
48 Nm

Lock nuts

45 Nm

0

Operating mechanism,
4 adjustment options



V3 00 566

Control rod (1)
Lubricant

Molykote BR2S or BR2 plus

Ball joint (2)
Attachment nut
Lock nuts

48 Nm
48 Nm

Torque rod (4)
Attachment nuts
Lock nuts

48 Nm
28 Nm

Ball joint (6)
Attachment nut
Lock nuts

48 Nm
48 Nm

Ball joint (8)
Attachment nuts
Lock nuts

48 Nm
48 Nm

Torque rod (9)
Attachment nuts

48 Nm

Gear lever unit
Attachment bolts

18 Nm ⁽¹⁾

Eaton switch button
Attachment nut

70 Nm ⁽¹⁾

(1) Use Loctite 243

2. PNEUMATIC GEARBOX CONTROL

2.1 GENERAL

Filter/governor

Governed pressure

5.34 - 5.69 bar

0

2.2 TIGHTENING TORQUES

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Filter/governor

M6 attachment bolts	13 Nm
Cover	25 Nm

Selector valve single-H

M6 attachment bolts	22 Nm
M16 discharge valve attachment bolts	19 Nm
M8 cover plate attachment bolts	22 Nm

Range-change cylinder

M8 cover attachment bolts	17 Nm
M16 nut on piston	105 Nm

Bleed valve

Attachment	19 Nm
------------	-------

Eaton switch button

Attachment nut	70 Nm ⁽¹⁾
----------------	----------------------

(1) Use Loctite 243

3. ZF S5-42 GEARBOX

3.1 GENERAL

Input shaft

Pre-tension

0.02 - 0.09 mm

Secondary shaft

Pre-tension

0.02 - 0.09 mm

3.2 TIGHTENING TORQUES

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Gearbox

Attachment bolts 60 Nm

Drive flange

'Direct drive' attachment nut 400 Nm ⁽¹⁾

Overdrive attachment nut 330 Nm ⁽²⁾

Gearbox front cover

Attachment bolts 23 Nm

Selector shaft housing

Selector shaft housing attachment bolts 23 Nm

Shifting arm lock nut 46 Nm

Gearbox control attachment nut 52 Nm

Bleeder 10 Nm

Plugs

Oil level check/filler plug 50 Nm

Drain plug 50 Nm

(1) Fit new nut and apply Loctite 270 to it

(2) Fit new nut and apply Loctite 262 to it

3.3 FILLING CAPACITIES

Gearbox	Capacity
S5-42	3.5 litres

4. ZF 6S-850 GEARBOX

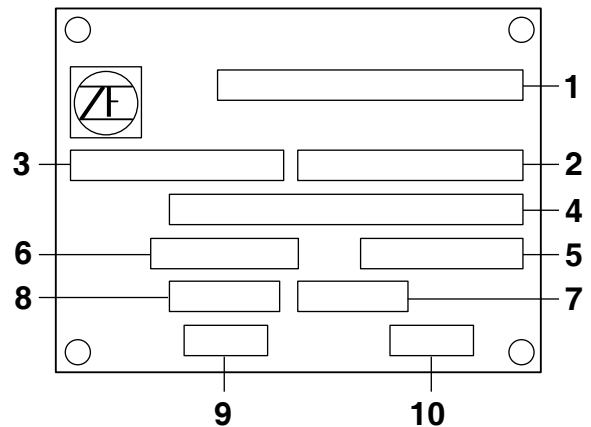
4.1 GENERAL

Gearbox type

Each gearbox has a type plate attached to it, indicating the type of gearbox. This data can also be found on the vehicle identity card for the vehicle concerned.

ZF gearbox type plate

1. Type of gearbox
2. Serial no. (ZF)
3. Parts list (ZF)
4. Specification no.
5. Pulse generator ratio
6. Gearbox ratio
7. Engine speed using PTO
8. PTO speed
9. Gearbox oil capacity
10. Oil specification



V300049

Output shaft bearing axial play

Output shaft bearing axial play 0.00 - 0.10 mm

Bearing axial play, main and input shafts

Bearing axial play, main and input shafts 0.00 - 0.10 mm

Secondary shaft bearing axial play

Secondary shaft bearing axial play 0.00 - 0.10 mm

4.2 TIGHTENING TORQUES

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Gearbox

Attachment bolts 60 Nm

Drive flange

Drive flange Ø 120 mm attachment bolt 120 Nm

Drive flange Ø 150 mm attachment bolt 140 Nm

Gearbox front cover

Attachment bolts 23 Nm

Selector shaft housing

Selector housing attachment bolts 23 Nm

Shifting arm lock nut 46 Nm

Gearbox control attachment nut 52 Nm

Bleeder 10 Nm

Plugs

Oil level check/filler plug 50 Nm

Drain plug 50 Nm

4.3 FILLING CAPACITIES

Gearbox type	Filling amounts at oil change (litres)	First filling, e.g. on repair (litres)
ZF 6S-850	7.5	7.5

0

5. EATON FS/6309A GEARBOX

5.1 GENERAL

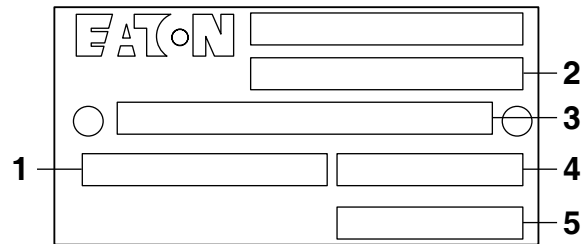
Gearbox type

Each gearbox has a type plate attached to it, indicating the type of gearbox. You can also find this data on the identity card for the vehicle concerned.

Eaton gearbox type plate

1. Type of gearbox
2. Specification no. Eaton
3. DAF article Eaton code
4. Serial no. Eaton
5. Production date code

The Eaton specification number is unique to each customer and gives detailed information on the development level of the gearbox. The number must be quoted whenever replacement parts are ordered.



V300378

Input shaft play of adjusting rings:

- 3.70 mm
- 3.75 mm
- 3.80 mm
- 3.85 mm
- 3.90 mm
- 3.95 mm

Colour coding:

- Red, green, white
- Yellow, green, blue
- Blue, green, white
- Red, green, yellow
- Green, green, white
- Red, green, red

Secondary shaft pre-load

- New bearings
- Original bearings

- 0.075 - 0.125 mm
- 0.000 - 0.050 mm

Sealant

Gearbox housing front cover contact surfaces

Loctite 518

Input shaft

Lithium-based grease, class NLGI 3

Filter/governor

Governed pressure

5.3 - 5.7 bar

5.2 TIGHTENING TORQUES

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Gearbox

Attachment bolts 60 Nm

Drive flange

M39 attachment nut 650 Nm⁽¹⁾

Drive flange oil seal housing attachment bolts 37 Nm

Gearbox front cover

Attachment bolts 37 Nm

Selector shaft housing

Selector shaft housing attachment bolts 37 Nm⁽²⁾

M8 retaining cover attachment bolts 22 Nm

M8 shifting arm lock nut 25 Nm

M10 shifting arm lock nut 37 Nm

End cover attachment bolts 22 Nm

Bleeder 19 Nm

Bleed valve 22 Nm

Filter/governor

M6 attachment bolts 13 Nm

Cover 25 Nm

Plugs

Oil level check/filler plug 35 Nm

Drain plug 44 Nm

(1) Use new nut

(2) Use Loctite 243

5.3 FILLING CAPACITIES

Gearbox	Contents
Eaton FS/6309A	8.5 litres

LF45/55 series

Allison 1000 & 2000 automatic gearboxes

6. ALLISON 1000 & 2000 AUTOMATIC GEARBOXES

6.1 GENERAL

Torque converter pilot bearing

Lubricant on installation

Molykote BR2S or BR2 plus

6.2 TIGHTENING TORQUES

The tightening torques stated in this paragraph are different from the standard tightening torques stated in the overview of the standard tightening torques.

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Gearbox

Attachment bolts	60 Nm
Hydraulic pipes to oil cooler	25 Nm
Bolts attaching gearbox to flywheel housing	34 Nm

Flexplates

Flexplate adapter attachment bolts	64 Nm
Crankshaft attachment bolts	30 Nm + 60° angular displacement

Selector switch

Attachment bolts	27 Nm
Attachment nut	24 Nm

Speed sensor

Attachment bolt	12 Nm
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Oil sump

Attachment bolts	27 Nm
------------------	-------

PTO cover

Attachment bolts	43 Nm
------------------	-------

Plugs

Gearbox drain plug	35 Nm
Oil cooler drain plug	28 Nm
Oil cooler air bleed plug	28 Nm

Hydraulic lines

Attachment to gearbox	25 Nm
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Drive flange

Attachment bolt	122 Nm
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LF45/55 series

Allison 1000 & 2000 automatic gearboxes

6.3 FILLING CAPACITIES

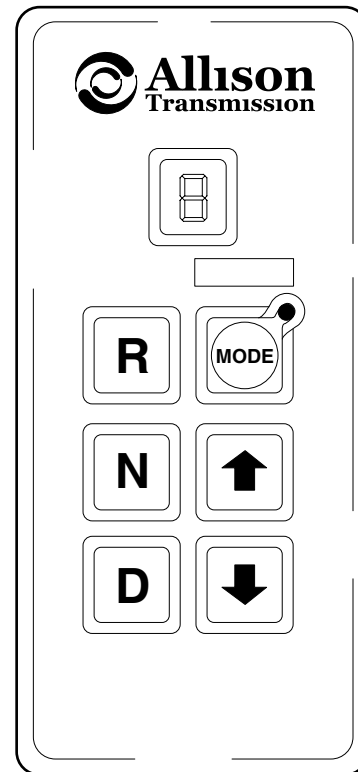
Gearbox	Capacity
Allison 1000 & 2000 series	Approx. 10 litre

0

7. ALLISON MD3060 AUTOMATIC GEARBOX

7.1 GENERAL

The Allison MD3060 automatic gearbox is electronically controlled and has a diagnostics system that can record possible faults in the memory of the ECU (Electronic Control Unit). The faults can be read at a later date. The system is operated and the faults are read via the selector keypad. This selector keypad has a display and is located next to the driver's seat; it replaces the gear lever with manual gearboxes.



V300392

Torque converter pilot bearing
Lubricant on installation

Molykote BR2S or BR2 Plus

0

7.2 TIGHTENING TORQUES

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Gearbox

Attachment bolts	60 Nm
Bleeder	14 Nm
Main connector	2.5 Nm
Coolant pipes	55 Nm
Rear mounting bracket	100 Nm
PTO bracket	55 Nm
Flywheel housing adapter, M10 x 1.5	55 Nm

Drive flange

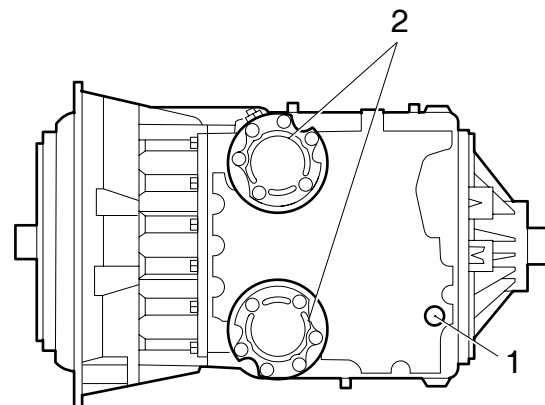
Attachment bolt	75 Nm
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Flexplates

Flexplate adapter attachment bolts	36 Nm
Torque converter attachment bolts	36 Nm

Oil cooler

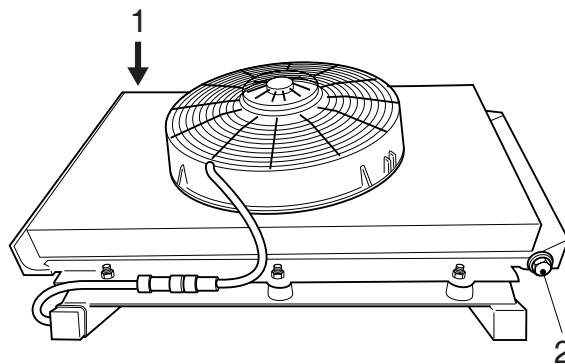
Hydraulic lines	60 Nm
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V300371

Plugs

Oil drain plug (1)	28 Nm
Oil filter cover attachment bolts (2)	55 Nm



V3 00 883

Oil cooler air bleed plug (1)
Oil cooler drain plug (2)

28 Nm
28 Nm

0

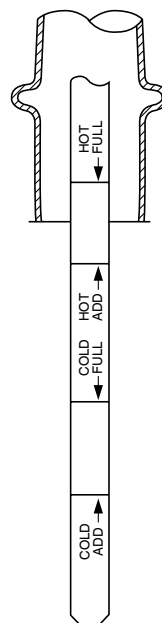
7.3 FILLING CAPACITIES

Allison automatic gearbox oil capacities

Type of gearbox	Capacity at first filling	Capacity at second filling
MD 3060P 4" oil sump	27 litres	20 litres

The oil level when cold must be on the "Cold full" mark.

- "Cold add" add when cold
- "Cold full" full when cold
- "Hot add" add when hot
- "Hot full" full when hot



W 3 03 099

8. CLUTCH**8.1 GENERAL****0**

Gearbox	Clutch release assembly	Clutch plate
ZF S5-42	MF 362	WGTZ (1 1/2")
ZF S6-850	MF 395	WGTZ (1 1/2")
Eaton FS/6309A	MF 395	WGTZ (1 1/4")

0

8.2 TIGHTENING TORQUES

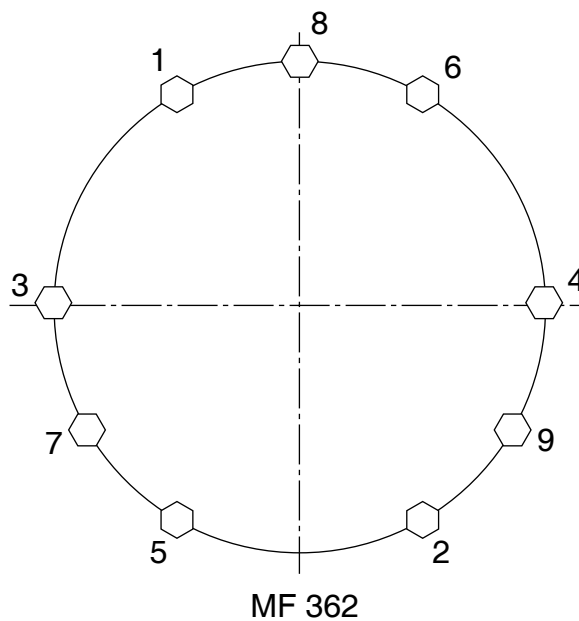
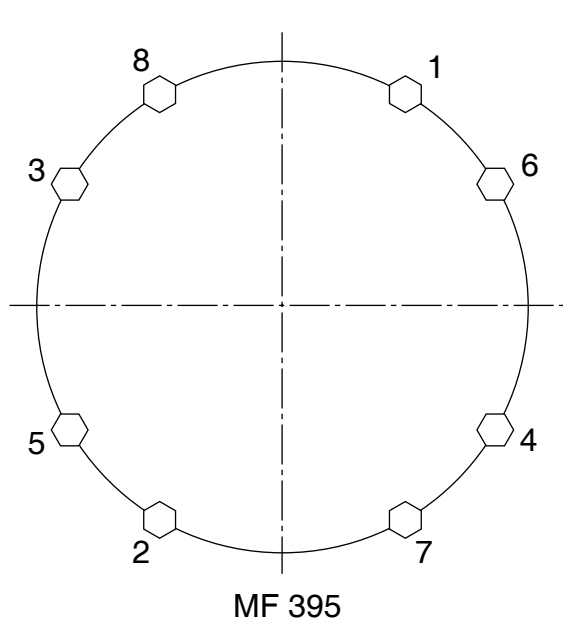
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Clutch release assembly

MF 362 clutch release assembly attachment bolts 40 Nm
 MF 395 clutch release assembly attachment bolts 80 Nm
 Tighten attachment bolts as illustrated



V3 00 414

8.3 FILLING CAPACITIES

Clutch
First filling

approx. 0.4 litres



9. PROP SHAFTS

9.1 GENERAL

0

Spicer

LF 45	LF 55 (12 - 15 ton)	LF 55 (17 - 19 ton)
SPL 39	-	-
SPL 55	SPL 55	-
SPL 70	SPL 70	SPL 70
SPL 100	SPL 100	SPL 100
-	-	SPL 140

Monotron

		PEP 5
		PEP 6
		C2040

9.2 TIGHTENING TORQUES

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Drive flange

M10 attachment bolts	60 Nm
M12 attachment bolts	105 Nm

Spicer intermediate bearing

SPL 39 and SPL 55 central nuts	400 Nm
SPL 70, SPL 100 and SPL 140 central nuts	685 Nm

Spicer universal joint

⁵ / ₁₆ " attachment bolts, UNF clamping bow, prop shaft - universal joint	38 Nm
³ / ₈ " attachment bolts, UNF clamping bow, prop shaft - universal joint	70 Nm
M8 attachment bolts, clamping piece, universal joint circlip SPL 140	38 Nm

Spicer suspension bearing

Bracket attachment bolts	110 Nm + 30° angular displacement
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Monotron suspension bearing

M10 bracket attachment bolts	60 Nm
M12 bracket attachment bolts	105 Nm

CONTENTS

	Page	Date
1. MECHANICAL GEARBOX CONTROL	1-1	200508
1.1 Fault-finding table	1-1	200508
2. PNEUMATIC GEARBOX CONTROL	2-1	200508
2.1 Fault-finding table	2-1	200508
3. MECHANICAL GEARBOX	3-1	200508
3.1 Fault-finding table	3-1	200508
4. AUTOMATIC GEARBOX	4-1	200508
4.1 Reading/deleting Allison MD 3060 fault codes	4-1	200508
4.2 Allison MD 3060 table of fault codes	4-3	200508
5. CLUTCH	5-1	200508
5.1 Fault-finding table	5-1	200508
6. PROP SHAFTS	6-1	200508
6.1 Fault-finding table	6-1	200508

1. MECHANICAL GEARBOX CONTROL

1.1 FAULT-FINDING TABLE

COMPLAINT: GEAR LEVER VIBRATES	
Possible cause	Remedy
Excessive play at control hinge points	Check/repair all points in the control

COMPLAINT: ENGAGING GEARS IS HEAVY	
Possible cause	Remedy
Gearbox control pivot and hinge points dry or compressed	Check/repair all points in the control
Incorrect adjustment of control	Check/adjust all points in the control
Mechanical problem in gearbox	See "Mechanical gearbox" fault-finding table

COMPLAINT: GEARS CANNOT BE ENGAGED	
Possible cause	Remedy
Gearbox control pivot and hinge points dry or compressed	Check/repair all points in the control
Incorrect adjustment of control	Check/adjust all points in the control
Mechanical problem in gearbox	See "Mechanical gearbox" fault-finding table

COMPLAINT: GEARBOX JUMPS OUT OF GEAR	
Possible cause	Remedy
Incorrect adjustment of control	Check/adjust all points in the control
Mechanical problem in gearbox	See "Mechanical gearbox" fault-finding table

1

2. PNEUMATIC GEARBOX CONTROL

2.1 FAULT-FINDING TABLE

COMPLAINT: NOT POSSIBLE TO ENGAGE HIGH OR LOW RANGE	
Possible cause	Remedy
Air pressure too low	Check air supply of circuit 4
Neutral position valve defective or incorrectly connected	Connect valve properly or replace
Faulty downshift protection valve	Replace valve
Defective high/low range engaging cylinder	Check cylinder and replace if necessary

COMPLAINT: HIGH/LOW RANGE ENGAGING CYLINDER ENGAGES LOW AT TOO HIGH A SPEED	
Possible cause	Remedy
Incorrect VIC frequency value	Adjust value

COMPLAINT: HIGH OR LOW RANGE ENGAGING IS SLOW	
Possible cause	Remedy
Air pressure too low	Check air supply of circuit 4
Piping blocked	Check piping and clean, if necessary
Defective neutral position valve	Replace valve

COMPLAINT: HIGH/LOW RANGE ENGAGING CYLINDER WORKS THE WRONG WAY ROUND	
Possible cause	Remedy
Air pipes on the high/low range engaging cylinder are incorrectly connected	Connect engaging cylinder air pipes correctly

COMPLAINT: NOT POSSIBLE TO ENGAGE LOW RANGE	
Possible cause	Remedy
VIC defective	Check VIC and replace, if necessary
Incorrect vehicle speed signal	Check vehicle speed signal

1

3. MECHANICAL GEARBOX

3.1 FAULT-FINDING TABLE

COMPLAINT: ENGAGING GEARS IS HEAVY	
Possible cause	Remedy
Gearbox oil level too low	Top up oil level
Oil with incorrect specification in the gearbox	Fill gearbox with oil of correct specification
Problem in mechanical gearbox control	See "Mechanical gearbox control" fault-finding table
Clutch plate is not released	See "Clutch" fault-finding table

COMPLAINT: GEARS CANNOT BE ENGAGED	
Possible cause	Remedy
Retaining element fitted too deep	Check/repair retaining elements
Problem in mechanical gearbox control	See "Mechanical gearbox control" fault-finding table
Range-change switch does not work properly	See "Pneumatic section of gearbox control" fault-finding table

COMPLAINT: GEARBOX JUMPS OUT OF GEAR	
Possible cause	Remedy
Adjustment of gearshift cover on gearbox	Mount gearshift cover on gearbox without any play
Defective retaining element or wrong type of retaining element fitted in gearshift cover	Replace retaining element or fit other type of retaining element
Problem in mechanical gearbox control	See "Mechanical gearbox control" fault-finding table

COMPLAINT: SINGLE H BECOMES DOUBLE H	
Possible cause	Remedy
Locking plate in control cover not positioned correctly	Check assembly of control cover

1

4. AUTOMATIC GEARBOX

4.1 READING/DELETING ALLISON MD 3060 FAULT CODES

Fault code read function

To enter the fault code reading mode, briefly press the two arrow keys **twice simultaneously**. "D-1" appears on the display, followed by "-". This means that at that point there are no faults (active faults) in the system. It also means that no faults have been registered that were earlier temporarily present and have now been cleared (inactive faults). The fault code reading function can be left by pressing "D", "N", or "R" or the arrow keys.

If the red lamp lights up while reading a fault code, this means that there is an active fault in the gearbox.

No message during reading means that the fault is inactive.

The ECU can save five active/inactive fault codes in its memory and show them on the display. Fault codes consist of two sets of two digits (main codes and sub-codes). To read the codes consecutively, the **"MODE"** button must be pressed each time.

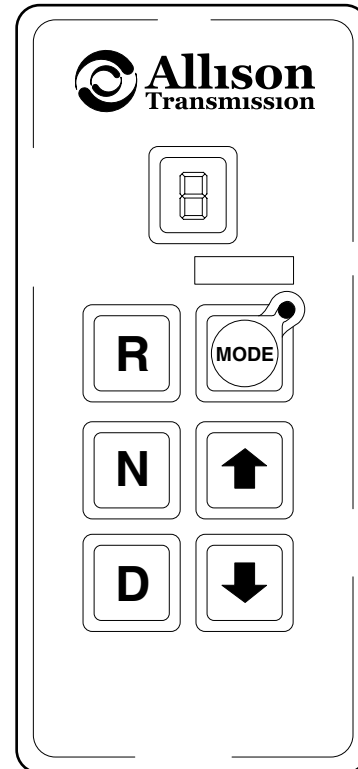
The letters and digits appear one at a time on the display.

Example:

D1	25 - 22
D2	21 - 12
D3	24 - 12
D4	-

The hyphen after D4 means that there are no further faults and that it is therefore not necessary to look at level D5.

As the ECU can only contain the five most important codes, the five most important codes will be seen on D1 to D5. Only when one of the faults has been remedied will the ECU be in a position to show a less important fault.



V300392

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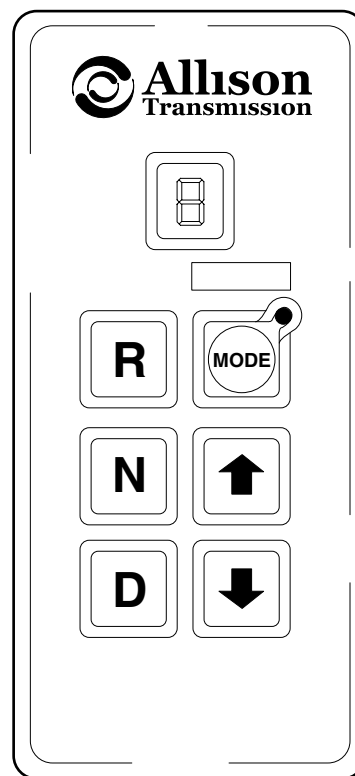
Deleting fault codes

After faults have been remedied, the ECU memory must be deleted. This is done as follows. Press the arrow keys twice simultaneously. This is the fault code reading mode. Press the "MODE" key and hold it down until the red lamp flashes three times (the first flash will be after approx. three seconds, the second after approx. 10 seconds). All codes, active or inactive, have now been deleted. Codes which return following deleting and can therefore no longer be deleted are active. Both types of fault need their causes tracing and remedying as quickly as possible. After the fault codes have been deleted the ignition must be switched off and re-started; otherwise it will not be possible to drive. This can be seen from the flashing of the gear lever position.

Inactive faults are automatically deleted by the ECU if the fault no longer occurs after the vehicle ignition has been switched off and on 25 times.

It is not possible to remedy all fault codes. Fault codes that cannot be found in the "Table of Fault Codes" can best be remedied by an Allison dealer.

He has test and diagnostic apparatus at his disposal that can be connected to a special diagnostic socket in the central box (next to the DAVIE connector).



V300392

4.2 ALLISON MD 3060 TABLE OF FAULT CODES

Main code	Sub-code	RECOMMENDED PROCEDURES
Electronic control unit (ECU) supply		
13	12 Low 23 High	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. earth and positive battery cables connected, firmly attached and clean. 2. batteries are charged. 3. vehicle loading system fails to load or loads too little or too much. 4. VIM fuse (Vehicle Interface Module). 5. VIM connections are firmly attached, clean and undamaged. 6. the correct wiring is used. 7. ECU connections are firmly attached, clean and undamaged. <p>If all these points are in order, contact your Allison dealer.</p>
Accelerator pedal sensor		
21	12 23	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. Accelerator pedal sensor connector is properly connected. 2. no interruptions or short circuits between wires or earth in wiring harness to accelerator pedal sensor. <p>Replace the accelerator pedal sensor if necessary. If all these points are in order, contact your Allison dealer.</p>

Main code	Sub-code	RECOMMENDED PROCEDURES
Speed sensors		
22	14 15 16	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. connectors are firmly attached, clean and undamaged. 2. the speed sensor attachment bolt is tightened to the specified torque. 3. no interruptions or short circuits between wires or earth in wiring harness to sensor. <p>If all these points are in order, contact your Allison dealer.</p>
Selector keypad		
23	12 13 14 15 23 24	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. ECU connections - connectors are connected and clamped. 2. selector keypad is connected and the wire loop has been cut through. 3. no interruptions or short circuits between wires or earth in wiring harness to selector. <p>Replace the selector if possible. If all these points are in order, contact your Allison dealer.</p>
Temperature in the gearbox sump too low		
24	12	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. temperature is lower than -6°C. <ol style="list-style-type: none"> 1. If this is the case, it is a normal response to the ambient temperature. 2. If not, check whether the main gearbox is firmly connected and that the connectors are undamaged. <p>If all these points are in order, contact your Allison dealer.</p>

1

Main code	Sub-code	RECOMMENDED PROCEDURES
Temperature in the gearbox sump is too high		
24	23	<ol style="list-style-type: none"> 1. Run the engine at idling speed. 2. Ensure that the vehicle is entirely horizontal. 3. Check whether the correct dip stick has been installed. 4. Check the oil level. 5. If necessary, correct the oil level. 6. If the oil level is in order, check whether the engine system has overheated, causing the gearbox to overheat. 7. Check that the ECU and gearbox connectors are correctly connected, firmly attached and undamaged. <p>If all these points are in order, contact your Allison dealer.</p>
Output shaft speed sensor		
25	00 11 22 33 44 55 66 77	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. connector is connected. 2. sensor bolt is firmly attached. 3. ECU is firmly attached with no damaged connectors. 4. oil level. 5. no interruptions or short circuits between wires or earth in wiring harness to sensor. <p>If all these points are in order, contact your Allison dealer.</p>
Coupling 3 pressure switch open		
32	00 33 55 77	<ol style="list-style-type: none"> 1. Let the engine idle while the vehicle's parking brake is applied. Check the following points: <ol style="list-style-type: none"> 1. specified dip stick. 2. correct oil level. 2. Check the following points: <ol style="list-style-type: none"> 1. gearbox main connector is connected, is firmly attached, is clean and undamaged. 2. ECU connector is connected, is firmly attached, is clean and undamaged. 3. no interruptions or short circuits between wires or earth in wiring harness. <p>If all these points are in order, contact your Allison dealer.</p>

Main code	Sub-code	RECOMMENDED PROCEDURES
Sensor fault in gearbox oil sump		
33	12 23	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. gearbox main connector is connected, is firmly attached, is clean and undamaged. 2. ECU connector is connected, is firmly attached, is clean and undamaged. 3. no interruptions or short circuits between wires or earth in wiring harness. <p>If all these points are in order, contact your Allison dealer.</p>

Main code	Sub-code	RECOMMENDED PROCEDURES
EEPROM fault		
34	12 13 14 15 16	<ol style="list-style-type: none"> 1. Re-calibrate if necessary. 2. If re-calibration is impossible, replace the ECU. 3. If ECU replacement is impossible, contact your Allison dealer.
EEPROM writing error as a result of loss of power supply		
35	00 16	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. ECU is firmly attached, clean and undamaged. 2. VIM (Vehicle Interface Module) is firmly attached, clean and undamaged. 3. the vehicle manufacturer has used the specified wiring for power supply and earth connection. 4. battery positive pole. 5. battery earth connection. 6. specified connections for vehicle ignition. <p>If all these points are in order, contact your Allison dealer.</p>
Hardware/software not compatible		
36	00	<ol style="list-style-type: none"> 1. Replace ECU if possible. 2. Re-program ECU if possible. 3. If replacement or re-programming is not possible, contact your Allison dealer.

Main code	Sub-code	RECOMMENDED PROCEDURES
Interruption or short circuit in electromagnetic valve circuit		
41	12 13 14 15 16 20 22 23 24 25 26	<p>Check the following points:</p> <ol style="list-style-type: none"> 1. gearbox main connector is connected, is firmly attached, is clean and undamaged. 2. ECU connector is connected, is firmly attached, is clean and undamaged. 3. visual inspection of the wiring harness: no damage, chafed or too taut wires, no screws through the wiring harness. 4. no interruptions or short circuits between wires or earth in wiring harness. Replace wiring harness if necessary. <p>If all these points are in order, contact your Allison dealer.</p>

1

Main code	Sub-code	RECOMMENDED PROCEDURES
Short circuit in the electromagnetic valve circuit to the battery		
42	12 13 14 15 16 21 22 23 24 25 26	Check the following points: <ol style="list-style-type: none"> 1. gearbox main connector is connected, is firmly attached, is clean and undamaged. 2. ECU connector is connected, is firmly attached, is clean and undamaged. 3. visual inspection of the wiring harness: no damage, chafed or too taut wires, no screws through the wiring harness. 4. no interruptions or short circuits between wires or earth in wiring harness. 5. Replace wiring harness if necessary. 6. incompetent repairs. If all these points are in order, contact your Allison dealer.
ECU circuits		
43	21 25 26	<ol style="list-style-type: none"> 1. replace the ECU. 2. Contact your Allison dealer.

Main code	Sub-code	RECOMMENDED PROCEDURES
Transmission ration test on the gear to be changed from (during shifting)		
51	01 10 12 21 23 45 65	Check the following points: <ol style="list-style-type: none"> 1. engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. 2. no interruptions or short circuits between wires or earth in sensor wiring. 3. let the engine idle in neutral while the vehicle is on the brake. Check the following points: <ol style="list-style-type: none"> 1. specified dip stick. 2. oil level. If all these points are in order, contact your Allison dealer.
Coupling 3 pressure switch fails to register pressure drop during shifting		
52	01 08 32 34 54 56 71 78 79 99	Check the following points: <ol style="list-style-type: none"> 1. engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. 2. no interruptions or short circuits between wires or earth in sensor wiring. 3. let the engine idle while the vehicle is on the brake. Check the following points: <ol style="list-style-type: none"> 1. specified dip stick. 2. oil level. <ol style="list-style-type: none"> 4. check that there is no interruption or short circuit between wires or earth connection in the main wiring harness to the gearbox. If all these points are in order, contact your Allison dealer.

Main code	Sub-code	RECOMMENDED PROCEDURES
Engine and turbine rev test when engaging neutral		
53	08 18 28 29 38 39 48 49 58 59 68 69 78 99	<p>Check the following points:</p> <ol style="list-style-type: none"> engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. no interruptions or short circuits between wires or earth in sensor wiring. let the engine idle in neutral while the vehicle is on the brake. <p>Check the following points:</p> <ol style="list-style-type: none"> specified dip stick. oil level. <p>If all these points are in order, contact your Allison dealer.</p>
Transmission ratio test immediately after changing gear		
54	01,07 10,12 17,21 23,32 34,43 45,54 56,65 70,71 80,81 83,85 86,92 93,95 96,97	<p>Check the following points:</p> <ol style="list-style-type: none"> engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. no interruptions or short circuits between wires or earth in sensor wiring. let the engine idle in neutral while the vehicle is on the brake. <p>Check the following points:</p> <ol style="list-style-type: none"> specified dip stick. oil level. <p>If all these points are in order, contact your Allison dealer.</p>

Main code	Sub-code	RECOMMENDED PROCEDURES
Pressure in coupling 3 immediately after changing gear		
55	17 87 97	<p>Check the following points:</p> <ol style="list-style-type: none"> engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. no interruptions or short circuits between wires or earth in sensor wiring. let the engine idle in neutral while the vehicle is on the brake. <p>Check the following points:</p> <ol style="list-style-type: none"> specified dip stick. oil level. <ol style="list-style-type: none"> check that there is no interruption or short circuit between the wiring or earth connection in the coupling 3 pressure switch wiring. Check the following points: <ol style="list-style-type: none"> main connector is properly connected, clean and undamaged. ECU connector is properly connected, clean and undamaged. rev sensor is properly connected, clean and undamaged. <p>If all these points are in order, contact your Allison dealer.</p>

1

Main code	Sub-code	RECOMMENDED PROCEDURES
Range test		
56	00 11 22 33 44 55 66 77	<p>Check the following points:</p> <ol style="list-style-type: none"> engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. no interruptions or short circuits between wires or earth in sensor wiring. let the engine idle in neutral while the vehicle is on the brake. <p>Check the following points:</p> <ol style="list-style-type: none"> specified dip stick. oil level. <p>If all these points are in order, contact your Allison dealer.</p>

Main code	Sub-code	RECOMMENDED PROCEDURES
Range test when using coupling C3		
57	11 22 44 66 88 99	<p>Check the following points:</p> <ol style="list-style-type: none"> engine speed sensor and output shaft speed sensor are connected. The connectors are undamaged and clean. no interruptions or short circuits between wires or earth in sensor wiring. let the engine idle in neutral while the vehicle is on the brake. <p>Check the following points:</p> <ol style="list-style-type: none"> specified dip stick. oil level. <ol style="list-style-type: none"> check that there is no interruption or short circuit between the wiring or earth connection in the coupling 3 pressure switch wiring. Check the following points: <ol style="list-style-type: none"> main connector is properly connected, clean and undamaged. ECU connector is properly connected, clean and undamaged. rev sensor is properly connected, clean and undamaged. <p>If all these points are in order, contact your Allison dealer.</p>
Fault in ECU		
69	12,13 14,15 16,21 22,23 24,25 26,32 33,34 35,36	<ol style="list-style-type: none"> Delete the fault codes and try to re-start the vehicle. If the fault re-occurs, replace the ECU. If the fault has not been cleared, contact your Allison dealer.

5. CLUTCH

5.1 FAULT-FINDING TABLE

SYMPTOM: CLUTCH PEDAL FAILS TO RETURN	
Possible cause	Remedy
Broken pedal return spring	Replace spring
Worn clutch pedal bearings	Check bearings and replace if necessary
Dirt in hydraulic system	Clean system and fill with fresh fluid
Incorrect fluid in hydraulic system	Replace with fluid of correct specification
Air in hydraulic system	Bleed the system

SYMPTOM: CLUTCH PEDAL STICKS WHEN PRESSED	
Possible cause	Remedy
Leak in hydraulic system	Check system
Air in hydraulic system	Bleed hydraulic system
Release bearing incorrectly fitted	Fit the release bearing correctly
Fork hinge points or fork itself worn	Check hinge points and fork; replace if necessary
Defective clutch servo	Repair and/or replace clutch servo
Gearbox front cover worn or broken	Check, replace gearbox front cover

SYMPTOM: PEDAL FORCE TOO HIGH	
Possible cause	Remedy
No or insufficient pressure in circuit 4 of the brake system	Check circuit 4 of the brake system
Kinked air pipe	Check pipe and replace if necessary
Kinked hydraulic pipe	Check pipe and replace if necessary
Worn clutch pedal bearings	Check bearings and replace if necessary
Defective clutch servo and/or main cylinder	Repair or replace clutch servo and/or main cylinder Note: In the case of a swollen seal, clean the system and re-fill with new fluid

SYMPTOM: RESIDUAL PRESSURE IN CLUTCH SYSTEM	
Possible cause	Remedy
Bleed vent in reservoir cap closed off	Check bleed vent in cap
Compensation bore in main cylinder closed off by swollen seal or insufficient free thrust pin travel.	Check free thrust pin travel or repair/replace main cylinder Note: In the case of a swollen seal, clean the system and re-fill with new fluid

1

SYMPTOM: FLUID LEAK VIA VENT OPENING	
Possible cause	Remedy
Leak through piston seal in clutch servo	Repair or replace clutch servo Note: A drop of oil in the vent opening is a normal situation and is not a reason to repair/replace the clutch servo

SYMPTOM: CLUTCH PLATE SLIPS	
Possible cause	Remedy
Worn lining	Replace lining
Oil on lining	Replace linings and check engine and gearbox sealing rings
Dirt on clutch plate and flywheel	Clean plate and surrounding area
Burnt clutch plate	Check entire clutch and replace if necessary
Clamping force of clutch release assembly too low or absent	Check clutch release assembly and replace if necessary
Clutch release assembly is not released	Check clutch release assembly

SYMPTOM: CLUTCH RELEASE ASSEMBLY FAILS TO RELEASE	
Possible cause	Remedy
Fluid level in hydraulic system too low	Top up fluid
Incorrect pedal setting	Check setting and adjust if necessary
Air in hydraulic system	Bleed hydraulic system
Leak in hydraulic system	Check hydraulic system
Fingers of clutch release assembly broken	Replace clutch release assembly
Wrong clutch release assembly has been fitted	Fit correct clutch release assembly
Clutch fork is broken	Replace fork
Clutch release assembly badly soiled	Clean entire clutch
Defective clutch servo	Check clutch servo and replace if necessary
Thrust bearing incorrectly fitted	Fit thrust bearing correctly
Clutch housing disconnected from gearbox	Tighten the clutch housing bolts to the correct torque

6. PROP SHAFTS

6.1 FAULT-FINDING TABLE

SYMPTOM: VIBRATION IN DRIVE LINE AT LOW SPEED	
Possible cause	Remedy
Universal joint angle too large, caused for example by excessive caster	Check universal joint angle
Play in universal joints	Replace universal joint
Play in suspension bearing	Replace suspension bearing
Play in slide coupling	Replace prop shaft
Forks not in line	Align forks

SYMPTOM: VIBRATION IN DRIVE LINE AT HIGH SPEED	
Possible cause	Remedy
Prop shaft imbalance	Balance prop shafts or replace if necessary

1

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 Description of mechanical gearbox control	1-1	200508
1.2 Overview drawing, operating mechanism, 2 adjustment options	1-2	200508
1.3 Overview drawing, operating mechanism, 4 adjustment options	1-3	200508
1.4 Overview drawing, gear lever unit	1-4	200508
1.5 Overview drawing, ZF gearbox gear lever	1-5	200508
1.6 Overview drawing, Eaton gear lever	1-6	200508
2. INSPECTION AND ADJUSTMENT	2-1	200508
2.1 Inspecting and adjusting operating mechanism, 2 adjustment options ...	2-1	200508
2.2 Inspecting and adjusting operating mechanism, 4 adjustment options ...	2-4	200508
3. REMOVAL AND INSTALLATION	3-1	200508
3.1 Removing and installing switch button	3-1	200508
3.2 Removing and installing gaiter	3-2	200508
3.3 Removing and installing gear lever unit	3-3	200508
3.4 Removing and installing control rod underneath the cab	3-4	200508
3.5 Removing and installing rear control rod	3-6	200508

1. GENERAL

1.1 DESCRIPTION OF MECHANICAL GEARBOX CONTROL

Mechanical gearbox control

As a result of the use of different engines, gearboxes and cabs there are many different versions of the operating mechanisms of the mechanical gearboxes.

The operating mechanism must be adjusted in such a way that the gearbox does not jump out of gear and engaging gears is not too heavy. The operating mechanism must not touch any other vehicle parts during operation.

The various types of operating mechanism can be classified on the basis of the number of adjustable points:

- 2 adjustment options
- 4 adjustment options

Before carrying out the adjustment, the gear lever must be fixed in the neutral position. This is done using the special tool. The operating mechanism is then adjusted so that everything can be fitted without tension.

The versions with 4 adjustment options have two adjustable control rods that must be of a specified length. The versions with two adjustment options must be adjusted in such a way that everything can be fitted without tension.

Operating mechanism, RHD

For 5, 6 and 9-gear boxes in combination with a 4 or 6-cylinder engine the operating mechanism is the same. Small differences in length and/or shape are possible, however.

All operating mechanisms used have 2 adjustment options.

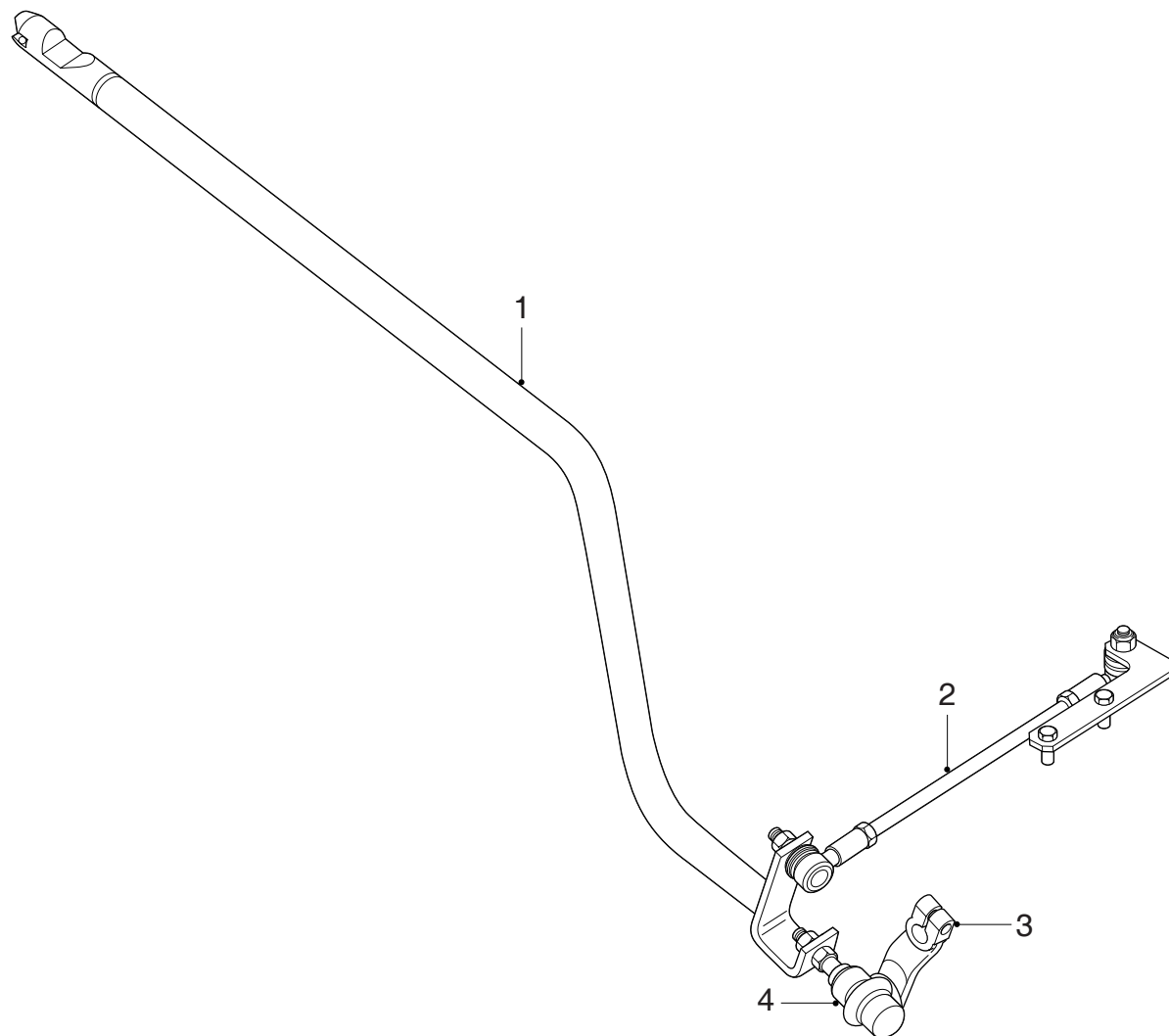
Operating mechanism, LHD

For 5 and 6-gear boxes in combination with a 4-cylinder engine the operating mechanism has 2 adjustment options.

For 6 and 9-gear boxes in combination with a 6-cylinder engine the operating mechanism has 4 adjustment options.

1.2 OVERVIEW DRAWING, OPERATING MECHANISM, 2 ADJUSTMENT OPTIONS

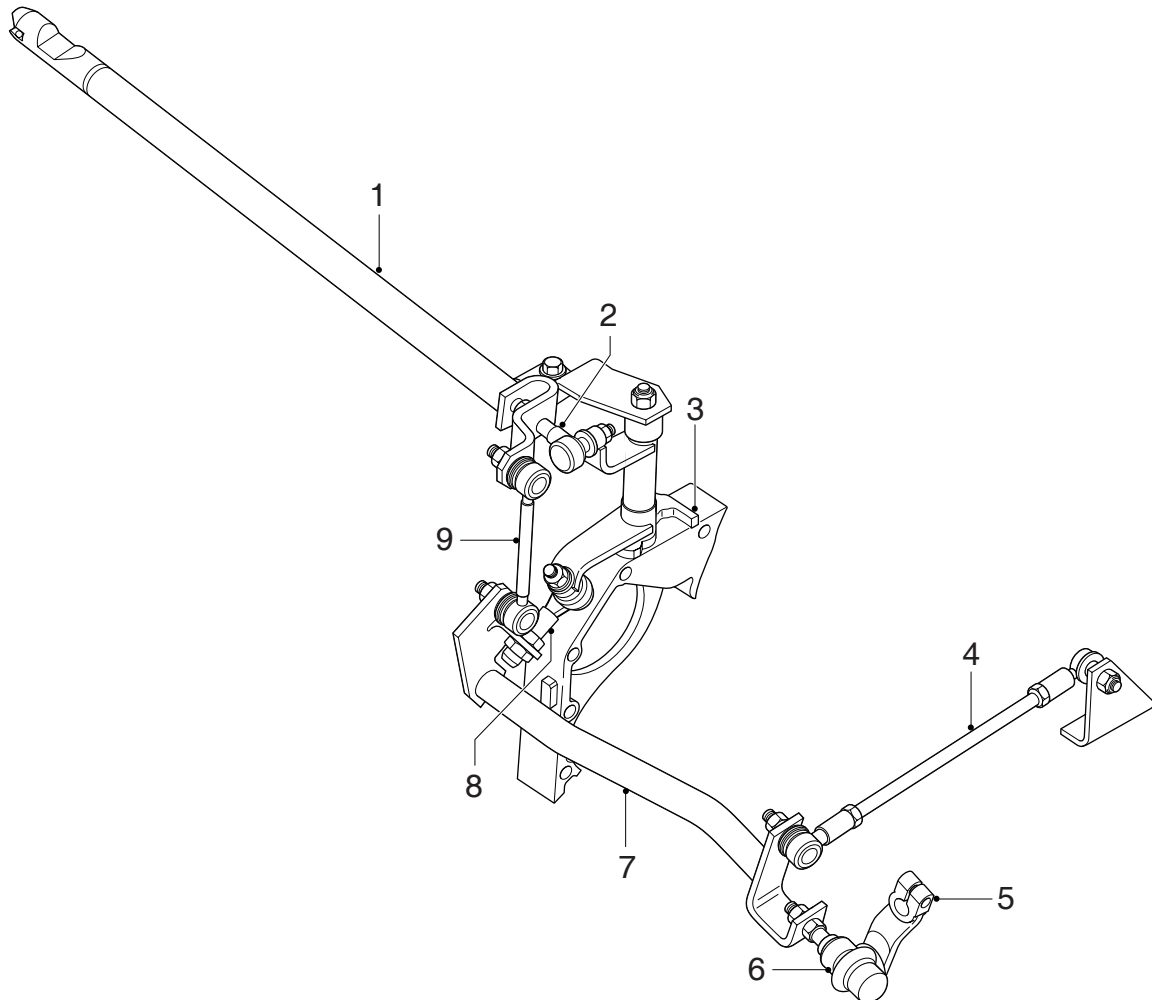
2



- 1. Control rod
- 2. Torque rod
- 3. Gearbox lever
- 4. Ball joint

V3 00 567

1.3 OVERVIEW DRAWING, OPERATING MECHANISM, 4 ADJUSTMENT OPTIONS

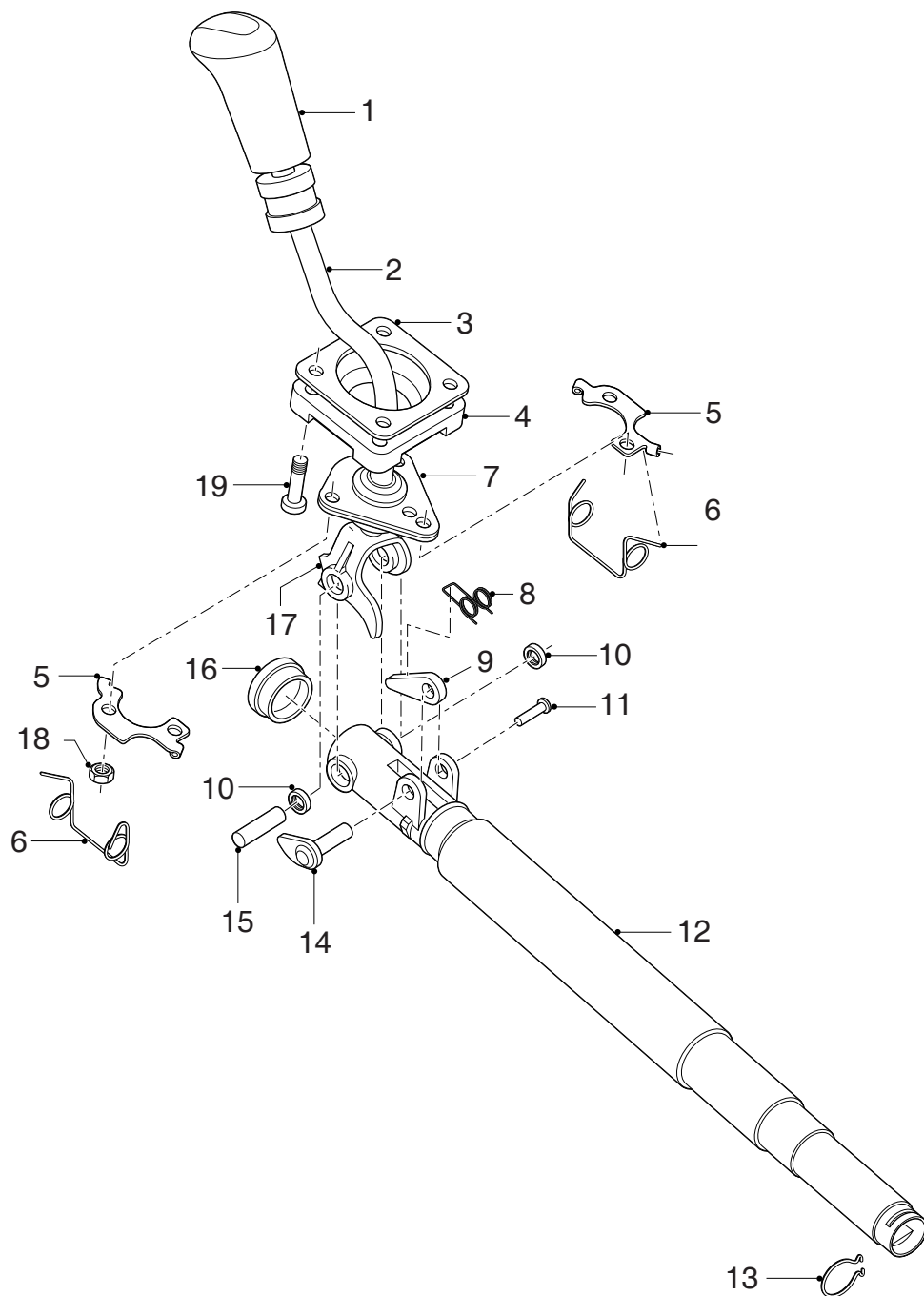


1. Control rod underneath the cab
2. Ball joint
3. Bracket
4. Torque rod
5. Gearbox lever
6. Ball joint
7. Control rod behind the cab
8. Ball joint
9. Torque rod

V3 00 566

1.4 OVERVIEW DRAWING, GEAR LEVER UNIT

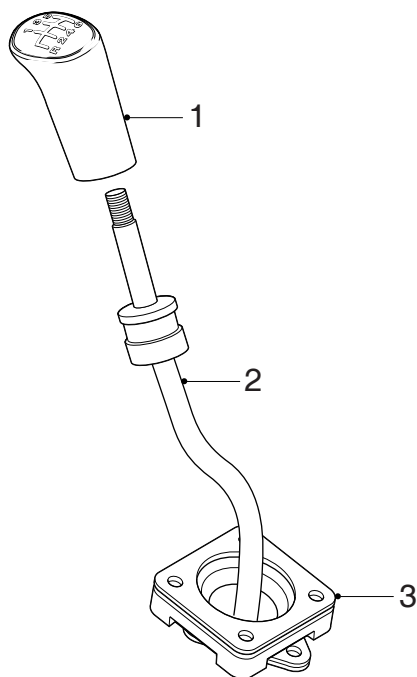
2



V3 00 568

- | | | | |
|-----|------------------|-----|------------------------|
| 1. | Switch button | 11. | Clamping pin |
| 2. | Gear lever | 12. | Telescopic control rod |
| 3. | Attachment plate | 13. | Retainer clip |
| 4. | Vibration damper | 14. | Pawl |
| 5. | Spring holder | 15. | Axle |
| 6. | Centring spring | 16. | Plug |
| 7. | Bearing housing | 17. | Gear lever pawl |
| 8. | Spring | 18. | Attachment nut |
| 9. | Control rod pawl | 19. | Attachment bolt |
| 10. | Needle bearing | | |

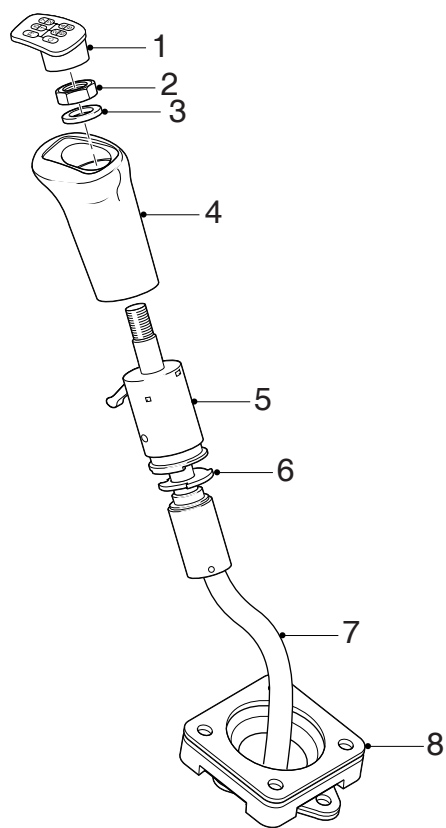
1.5 OVERVIEW DRAWING, ZF GEARBOX GEAR LEVER



V3 00 569

1. Switch button
2. Gear lever
3. Bearing housing

1.6 OVERVIEW DRAWING, EATON GEAR LEVER



V3 00 572

1. Cover plate
2. Attachment nut
3. O-ring
4. Switch button
5. Range group operating switch
6. Clamping plate
7. Gear lever
8. Bearing housing

2. INSPECTION AND ADJUSTMENT

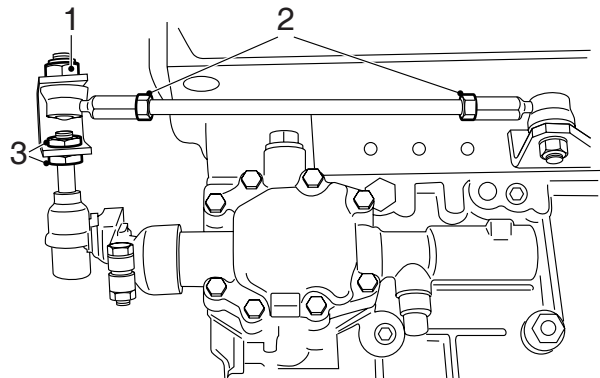
2.1 INSPECTING AND ADJUSTING OPERATING MECHANISM, 2 ADJUSTMENT OPTIONS

Inspecting operating mechanism, 2 adjustment options

1. Push the control against the spring pressure to check whether it can move freely in neutral.
2. Check that all gears can be engaged without parts coming into contact with each other.
3. During a test drive, check that the gear remains engaged under changing conditions.

Adjusting the gearbox control, 2 adjustment options

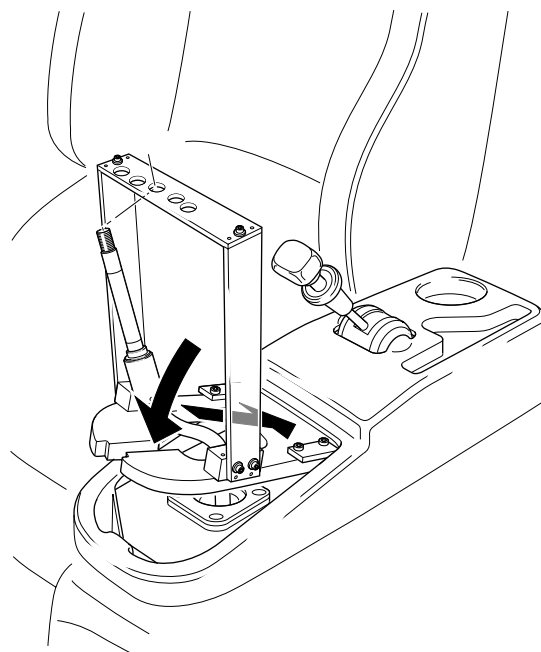
1. Remove the switch button (see "Removal and installation").
2. Remove the gaiter (see "Removal and installation").
3. Loosen the lock nuts (3) of the gearbox lever.
4. Loosen the lock nuts (2) of the torque rod on both sides.
5. Remove attachment nut (1) from the torque rod on control rod side.



V3 00 575

2

6. Fix the gear lever by fitting the special tool (DAF no. 1329488) over the gear lever and inserting the end of the gear lever through the appropriate opening.

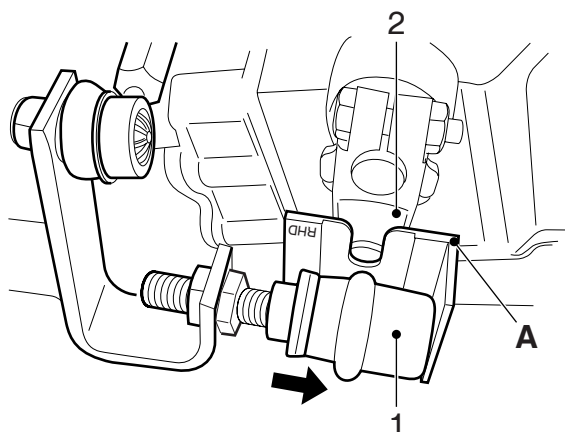


V3 00 580

7. Fit the special tool (DAF no. 1453143) between the ball joint (1) and the arm (2). Centre the ball joint (1) by pressing it against the shoulder of the special tool (A).

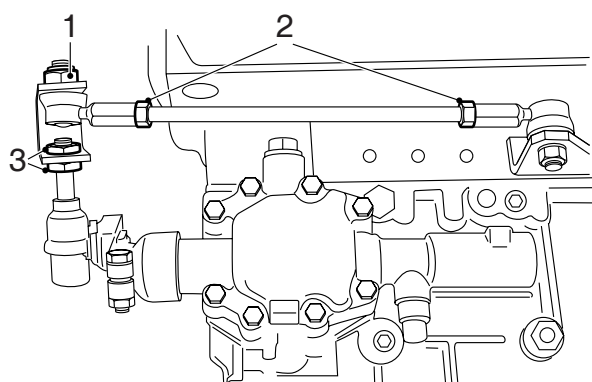
Note:

On the special tool (A) (DAF no. 1453143) it is shown which side of the tool must be used for LHD vehicles and which side for RHD vehicles.



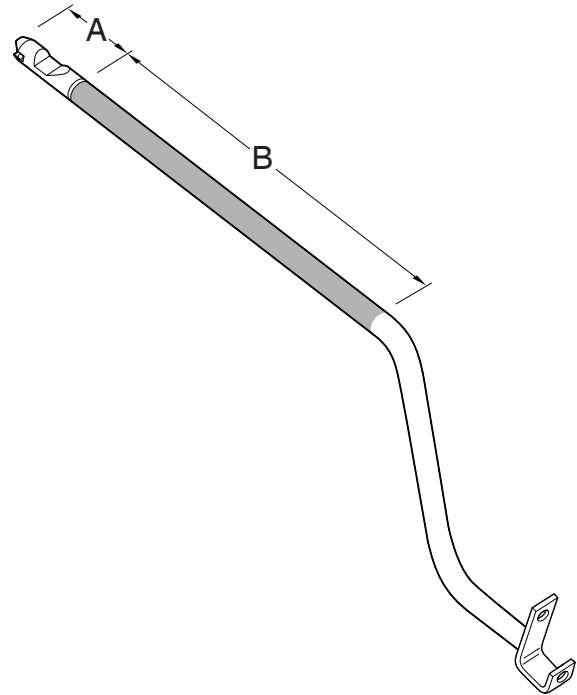
V3 00 840

8. Hand-tighten the lock nuts (3) of the gearbox lever without moving the control rod.
9. Tighten the lock nuts (3) on the gearbox lever to the specified torque without moving the control rod. See "Technical data".
10. Adjust the length of the torque rod in such a way that it can be positioned in the control rod without tension. Tighten the attachment nut (1) to the specified torque. See "Technical data".



V3 00 575

11. Tighten the lock nuts (2) on the torque rod to the specified torque without moving the torque rod. See "Technical data".
12. Remove the special tool from the ball joint.
13. Clean part (A) of the control rod and remove any grease.
14. Apply the specified lubricant lightly to section (B) of the control rod. See "Technical data".
15. Remove the special tool and fit the gaiter. See "Removal and installation".
16. Fit the switch button. See "Removal and installation".



V3 00 746

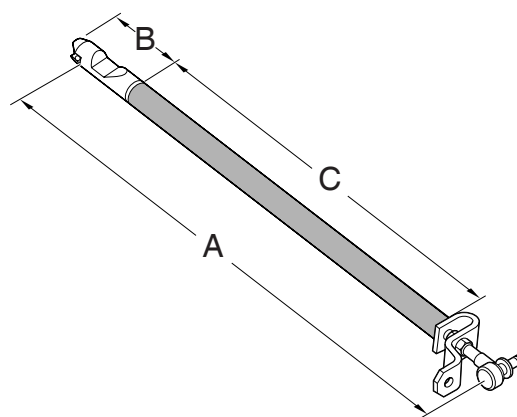
2.2 INSPECTING AND ADJUSTING OPERATING MECHANISM, 4 ADJUSTMENT OPTIONS

Inspecting operating mechanism, 4 adjustment options

1. Push the control against the spring pressure to check whether it can move freely in neutral.
2. Check that all gears can be engaged without parts coming into contact with each other.
3. During a test drive, check that the gear remains engaged under changing conditions.

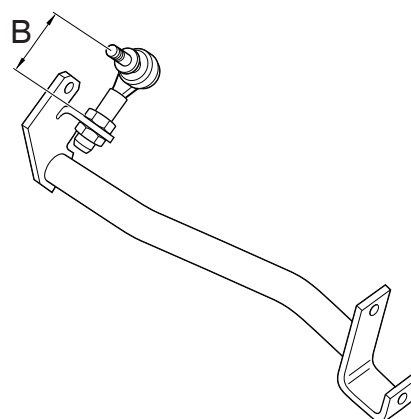
Adjusting the gearbox control, 4 adjustment options

1. Remove the retaining clip and disassemble the control rods underneath the cab.
2. Measure the length of the control rod and compare the measured reading (A) with the specified reading. See "Technical data".
3. If necessary, adjust the length.
4. Clean part (B) of the control rod and remove any grease.
5. Apply the specified lubricant lightly to section (C) of the control rod. See "Technical data".



V3 00 745

6. Measure the length (B) of the control rod ball joint behind the cab and compare the measured reading with the specified reading. See "Technical data".
7. If necessary, adjust the length of the ball joint.
8. Remove the switch button (see "Removal and installation").
9. Remove the gaiter (see "Removal and installation").



V3 00 564

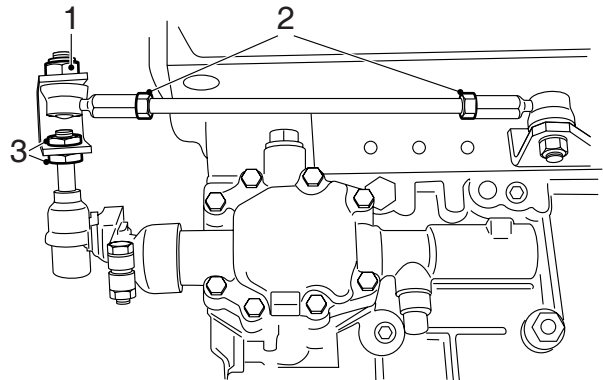
3

MECHANICAL GEARBOX CONTROL

LF45/55 series

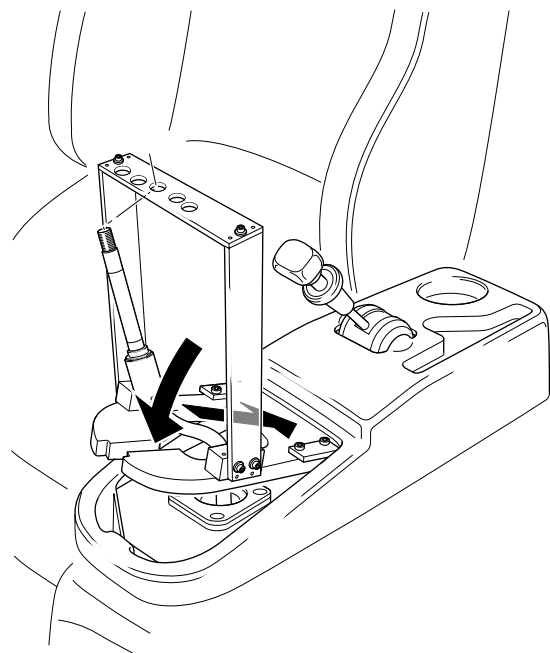
Inspection and adjustment

10. Loosen the lock nuts (3) of the gearbox lever.
11. Loosen the lock nuts (2) of the torque rod on both sides.
12. Remove attachment nut (1) from the torque rod on control rod side.



V3 00 575

13. Fix the gear lever by fitting the special tool (DAF no. 1329488) over the gear lever and inserting the end of the gear lever through the appropriate opening.

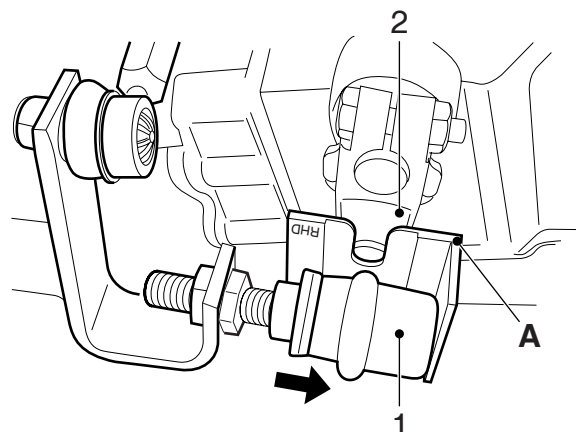


V3 00 580

14. Fit the special tool (DAF no. 1453143) between the ball joint (1) and the arm (2). Centre the ball joint (1) by pressing it against the shoulder of the special tool (A).

Note:

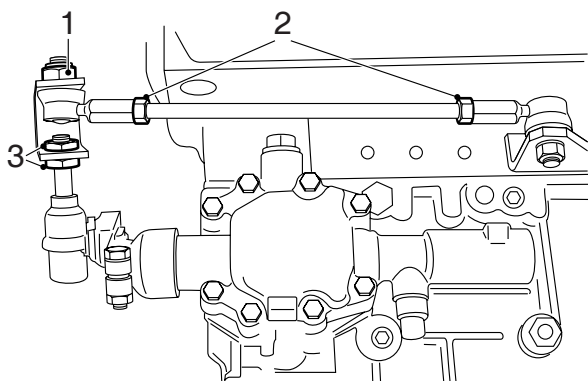
On the special tool (A) (DAF no. 1453143) it is shown which side of the tool must be used for LHD vehicles and which side for RHD vehicles.



V3 00 840

2

15. Hand-tighten the lock nuts (3) of the gearbox lever without moving the control rod.
16. Tighten the lock nuts (3) on the gearbox lever to the specified torque without moving the control rod. See "Technical data".
17. Adjust the length of the torque rod in such a way that it can be positioned in the control rod without tension. Tighten the attachment nut (1) to the specified torque. See "Technical data".
18. Tighten the lock nuts (2) on the torque rod to the specified torque without moving the torque rod. See "Technical data".
19. Remove the special tool from the ball joint.
20. Remove the special tool and fit the gaiter. See "Removal and installation".
21. Fit the switch button. See "Removal and installation".



V3 00 575

3. REMOVAL AND INSTALLATION

3.1 REMOVING AND INSTALLING SWITCH BUTTON

Removing ZF gearbox switch button

1. Turn the switch button anti-clockwise away from the gear lever.

Installing ZF gearbox gear lever

1. Apply locking compound to the gear lever wire. See "Technical data".
2. Turn the switch button clockwise onto the gear lever.
3. Position the switch button so that it corresponds to the gear-shift movement.

Removing Eaton gearbox switch button

1. Remove the cover plate and the gear-change pattern from the top of the switch button.
2. Remove the attachment nut from the switch button.
3. Remove the switch button.
4. Remove the gaiter.
5. Position the gear lever as far forward as possible and remove the range-change switch.

Installing Eaton gearbox switch button

1. Position the gear lever as far forward as possible and fit the range-change switch over the gear lever.
2. Position the air pipes so that they cannot get trapped between the gear lever and the cab.
3. Fit the gaiter.
4. Apply locking compound to the gear lever wire. See "Technical data".
5. Fit the switch button onto the gear lever and tighten the attachment nut to the specified torque. See "Technical data".
6. Fit the cover plate.

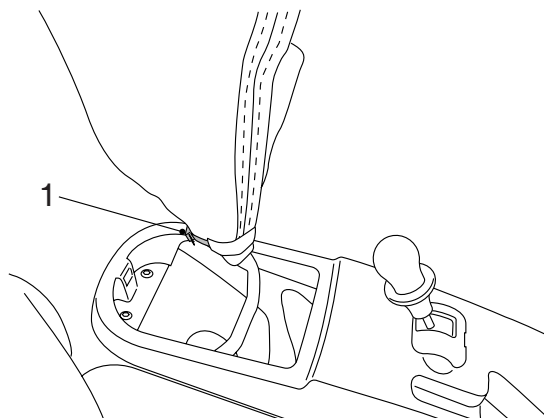
3.2 REMOVING AND INSTALLING GAITER

Removing gaiter

1. Remove the switch button.
2. Disconnect the underside of the gaiter.
3. Pull the gaiter over the switch button and remove the clamping strap (1).
4. Remove the gaiter.

Installing gaiter

1. Fit a new clamping strap on the inside of the gaiter.
2. Fit the top of the gaiter inside out over the gear lever and tighten the clamping strap (1).
3. Pull the entire gaiter over the gear lever.
4. Tighten the underside of the gaiter.



V3 00 578

3.3 REMOVING AND INSTALLING GEAR LEVER UNIT

Removing gear lever unit

1. Remove the switch button.
2. Remove the gaiter.
3. Remove the retainer clip from the telescopic control rod underneath the cab and remove the gear lever unit.
4. Remove the attachment bolts of the gear lever on the bottom of the cab.

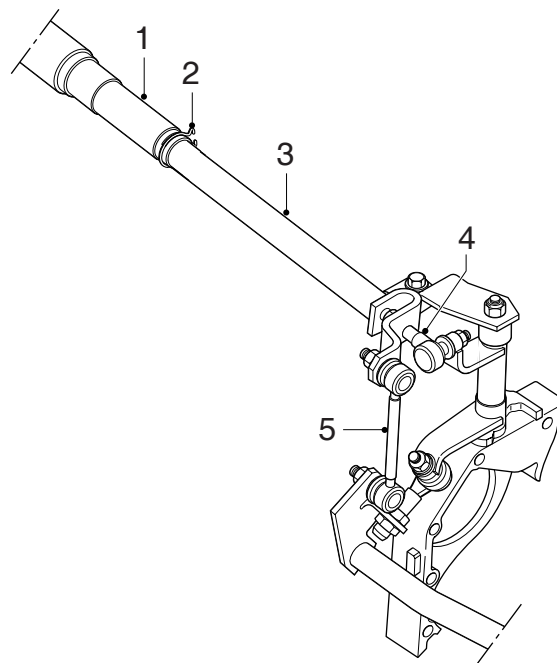
Installing gear lever unit

1. Slide the gear lever unit and the telescopic control rod onto the gearbox control and fit the retainer clip.
2. Install the gear lever in the cab via the feed-through.
3. Fit the gear lever attachment bolts and tighten them to the specified torque. See "Technical data".
4. Fit the gaiter.
5. Fit the switch button.
6. Check that the operating mechanism does not touch any vehicle parts during shifting.

3.4 REMOVING AND INSTALLING CONTROL ROD UNDERNEATH THE CAB

Removing control rod underneath the cab

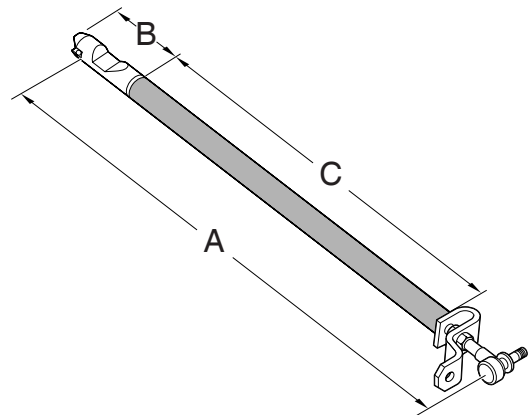
1. Remove the retainer clip (2) of the telescopic control rod (1).
2. Remove the attachment nuts from the ball joint (4) and torque rod (5).



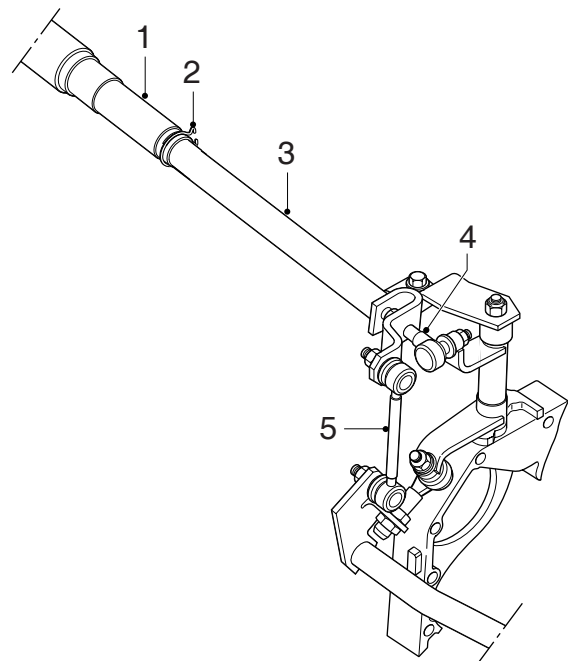
V3 00 573

Installing control rod underneath the cab

1. Adjust the length (A) of the control rod (3).
See "Technical data".
2. Clean part (B) of the control rod and remove any grease.
3. Apply the specified lubricant lightly to section (C) of the control rod. See "Technical data".
4. Fit the control rod (3) into the telescopic control rod (1) and fit the retainer clip (2).
5. Tighten the attachment nuts of the ball joint (4) and the torque rod to the specified torque. See "Technical data".
6. Check the functioning of the operating mechanism. See "Inspection and adjustment".



V3 00 745



V3 00 573

3.5 REMOVING AND INSTALLING REAR CONTROL ROD

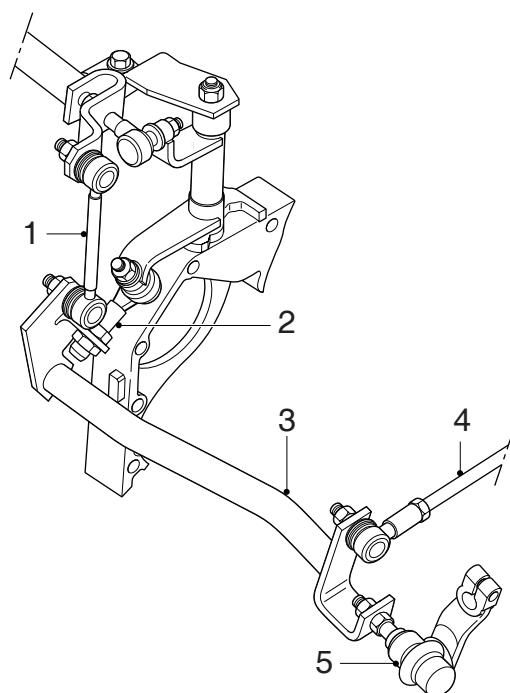
Removing control rod behind the cab

1. Remove the attachment nut from the ball joint (2).
2. Remove the attachment nut from torque rods (1) and (4).
3. Remove the lock nut from the ball joint (5).

Note:

Make sure that the rearmost lock nut on the ball joint (5) is not moved.

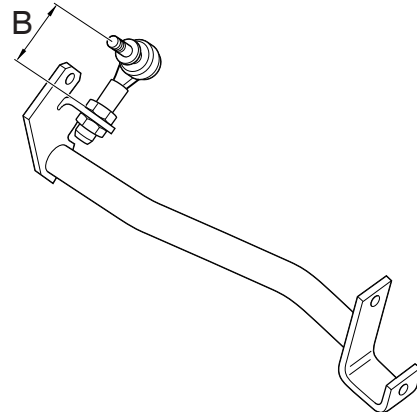
4. Remove the control rod (3).



V3 00 574

Installing control rod behind the cab

1. Adjust the length (B) of the control rod (3).
See "Technical data".



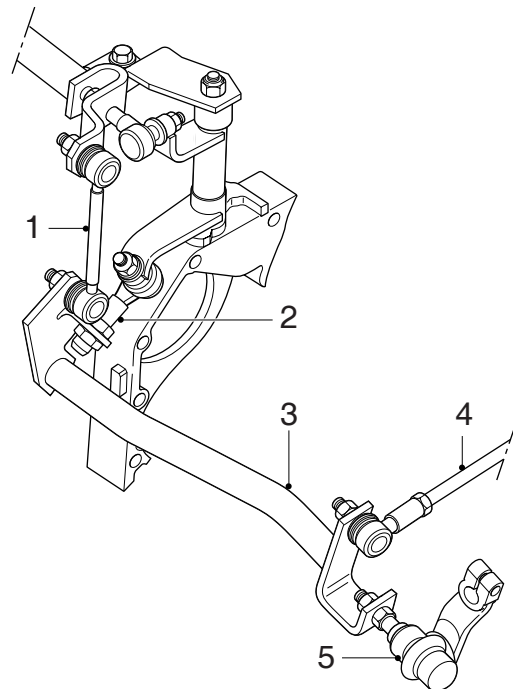
V3 00 564

2. Fit the control rod (3) and fit and hand-tighten all attachment nuts.
3. Tighten all attachment and lock nuts to the specified torque. See "Technical data".

Note:

Make sure that the control rod does not turn while the attachment and lock nuts are being tightened.

4. Check the functioning of the operating mechanism. See "Inspection and adjustment".



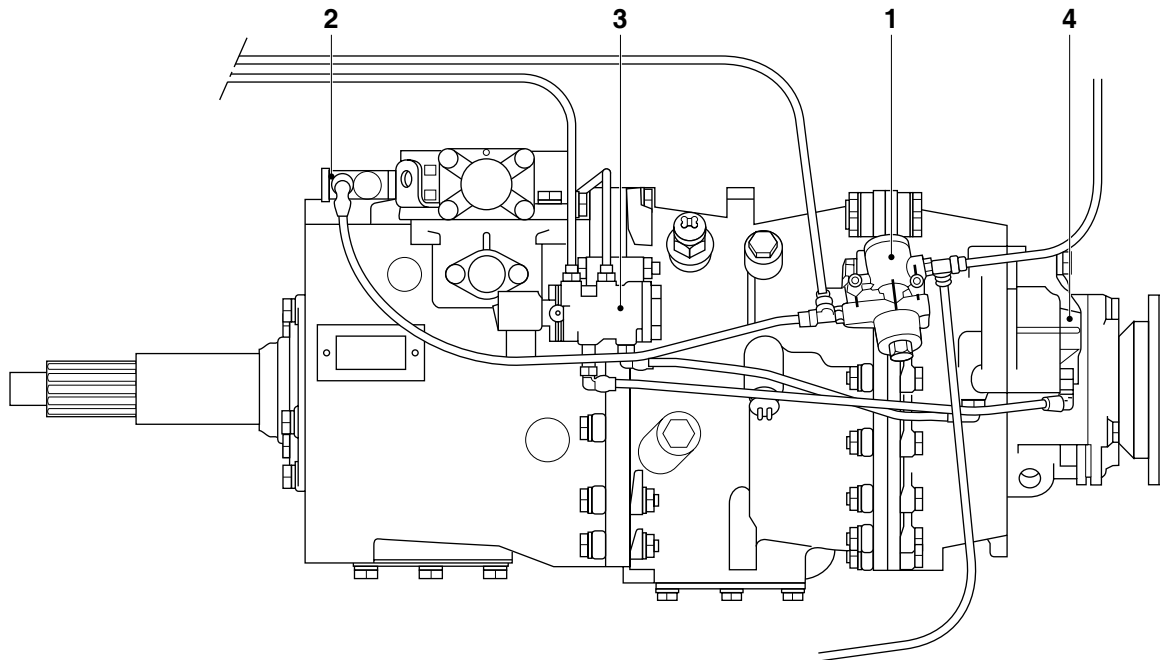
V3 00 574

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 Location of components in pneumatic section of gearbox control	1-1	200508
1.2 Pneumatic diagram, gearbox control	1-2	200508
1.3 System description, pneumatic section of gearbox control	1-3	200508
2. DESCRIPTION OF COMPONENTS	2-1	200508
2.1 Filter/governor	2-1	200508
2.2 Gear lever selector valve	2-3	200508
2.3 Electropneumatic downshift protection valve	2-4	200508
2.4 Neutral position valve	2-5	200508
2.5 Range group engaging cylinder	2-6	200508
3. INSPECTION AND ADJUSTMENT	3-1	200508
3.1 Programming parameters using DAVIE	3-1	200508
3.2 Simulating speed signal	3-2	200508
3.3 Inspection, downshift protection valve	3-3	200508
3.4 Inspection, filter/governor	3-5	200508
4. REMOVAL AND INSTALLATION	4-1	200508
4.1 Removal and installation, filter/governor	4-1	200508
4.2 Removing and installing range group operating switch	4-2	200508
5. CLEANING	5-1	200508
5.1 Cleaning filter/governor	5-1	200508

1. GENERAL

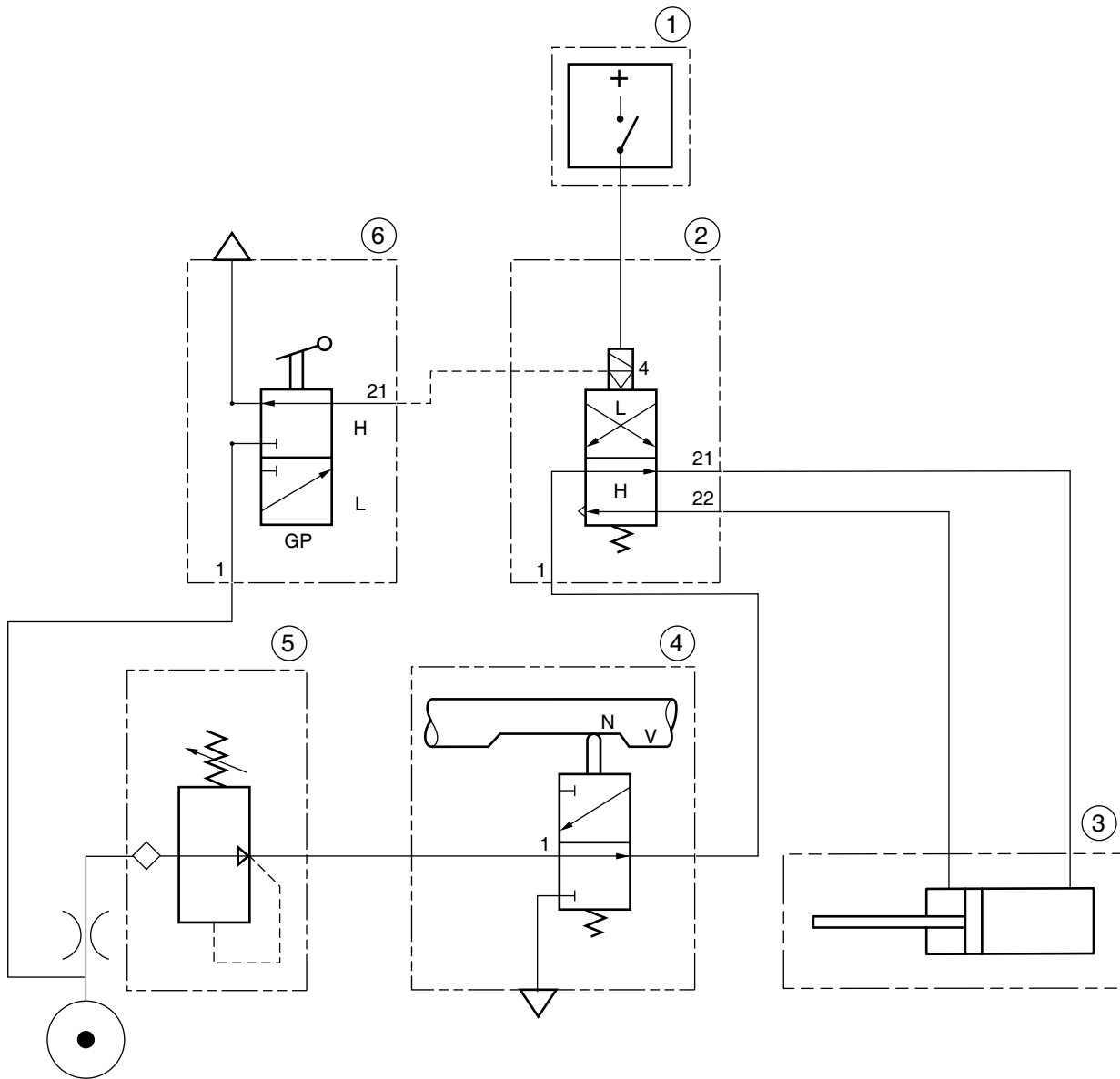
1.1 LOCATION OF COMPONENTS IN PNEUMATIC SECTION OF GEARBOX CONTROL



V3 00 360

1. Filter/governor
2. Neutral position valve
3. Electropneumatic downshift protection valve
4. Range group engaging cylinder

1.2 PNEUMATIC DIAGRAM, GEARBOX CONTROL

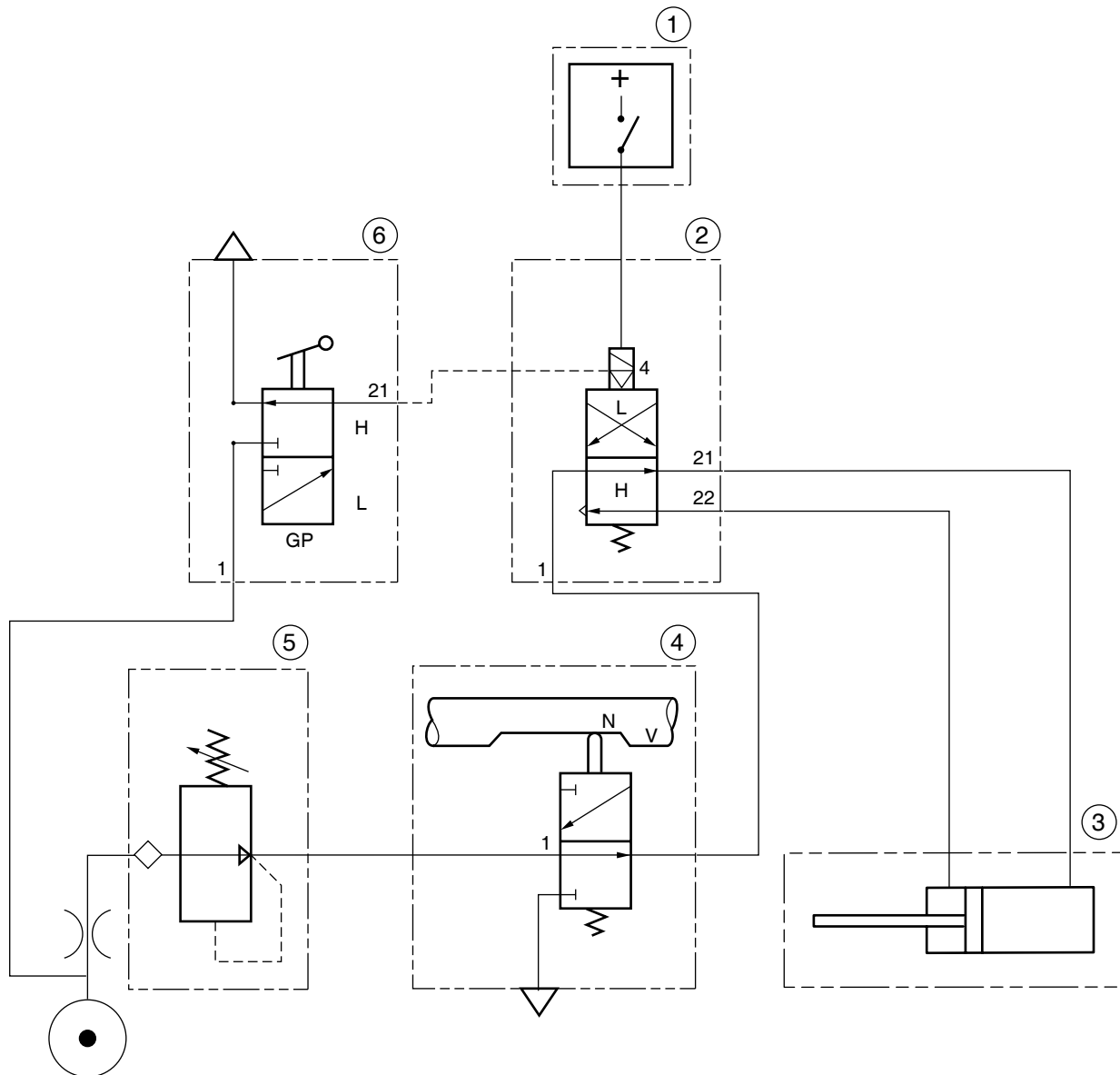


1. VIC electronic unit
2. Electropneumatic downshift protection valve
3. Range group engaging cylinder
4. Neutral position valve
5. Filter/governor
6. Range group operating switch

- L Position "low"
- H Position "high"
- N Gearbox selector shaft in neutral
- V Gearbox selector shaft engaged

V3 00 359

1.3 SYSTEM DESCRIPTION, PNEUMATIC SECTION OF GEARBOX CONTROL



V3 00 359

The pressure in the pneumatic section of the gearbox control is filtered and reduced in the filter/governor (5). From the filter/governor the system pressure goes to the neutral position valve (4) and the range group operating switch (6) located on the ball of the gear lever.

When the range group operating switch is activated a pneumatic command will be sent to the electropneumatic downshift protection valve (2).

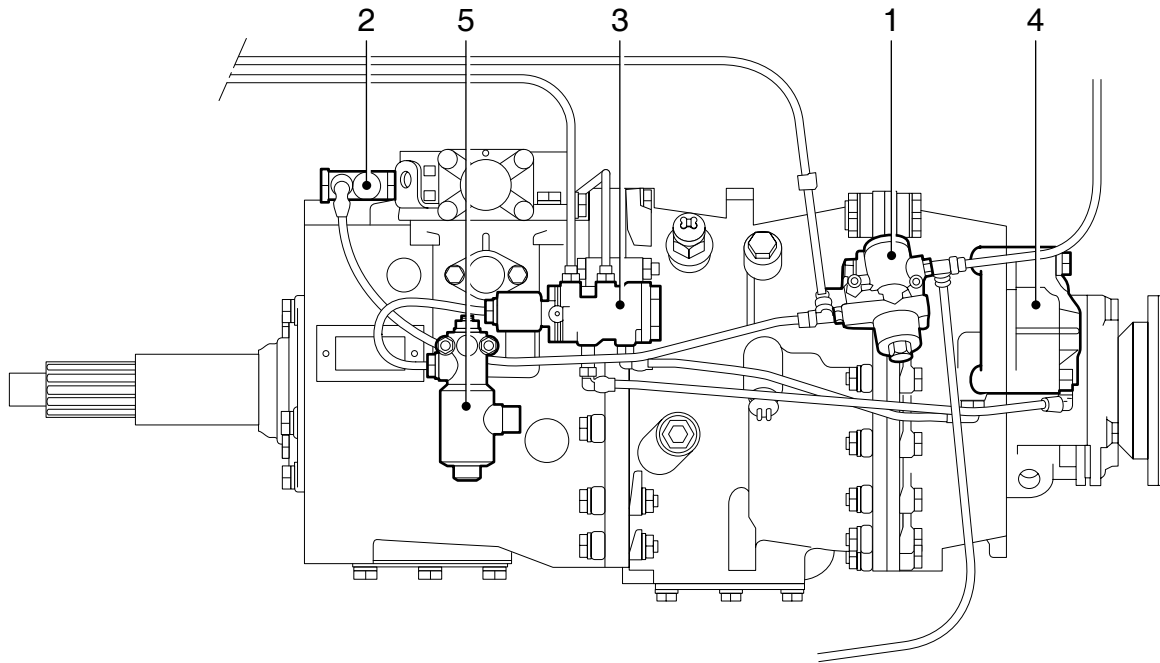
The electropneumatic downshift protection valve can only be activated when the vehicle speed is below a certain value. This is so as to prevent damage to the drive line. When the vehicle speed is low enough, the electropneumatic downshift protection valve is activated and the system pressure goes from the neutral position valve to the range group engaging cylinder.

The neutral position valve is activated when the gear lever is moved through the neutral position.

2. DESCRIPTION OF COMPONENTS

2.1 FILTER/GOVERNOR

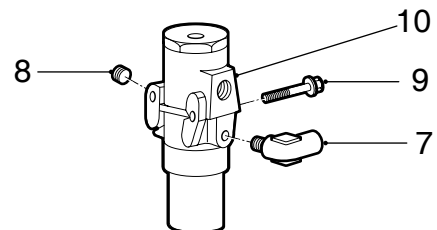
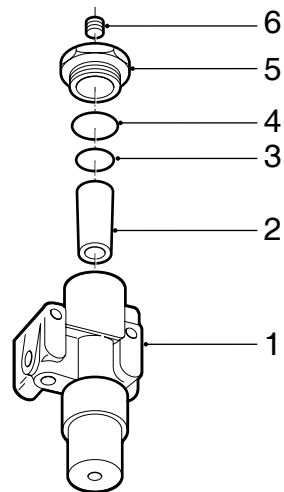
Filter/governor (1) on gearbox



V300558-2

Overview drawing, filter/governor

- 1. Filter/governor
- 2. Filter element
- 3. Seal
- 4. O-ring
- 5. Cover
- 6. Plug
- 7. Output
- 8. Selector valve output plug
- 9. Attachment bolt
- 10. Supply pressure input



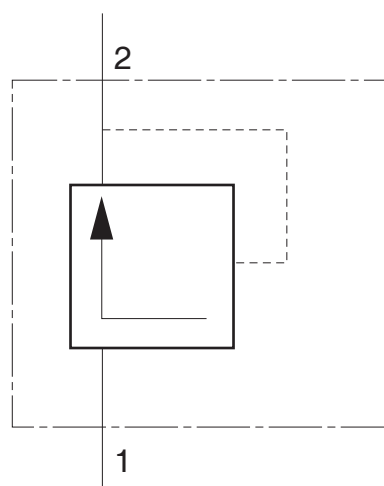
V300430

The full vehicle supply pressure from circuit four of the brake system must pass through the air filter.

The supply pressure goes through the bore (1) in the valve and will force the piston down against the spring pressure.

The spring cannot be adjusted.

The system pressure (see "Technical data") goes via connection point (2) to the range group operating switch and the neutral position valve.



V302003

2.2 GEAR LEVER SELECTOR VALVE

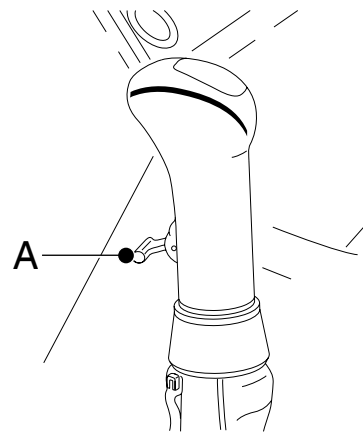
Changing to the low or high speed range is done with switch (A) on the ball of the gear lever.

When the switch is facing down it means that the low speed range has been or is being engaged.

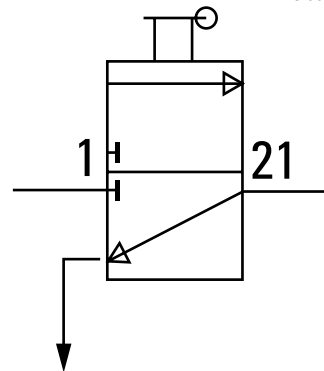
When the switch is facing up the high speed range has been or is being engaged.

Pre-selection is possible. A particular range is switched only when the gear lever is moved through the neutral position.

The pressure on connection 1 is the system pressure. When the switch is operated a pneumatic command will be sent from connection 21 to the electropneumatic downshift protection valve.



V3 00 562



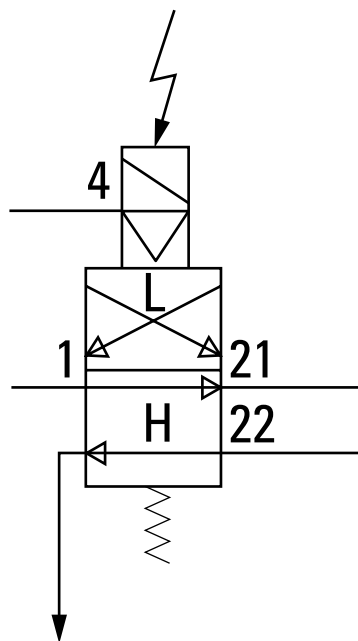
V3 00 477

2.3 ELECTROPNEUMATIC DOWNSHIFT PROTECTION VALVE

The electropneumatic downshift protection valve receives a certain frequency value relating to the vehicle speed from the VIC.

If this value is too high, the connection between the electropneumatic downshift protection valve and earth will be broken. Despite the pneumatic command from the range group operating switch to connection point (4) on the electropneumatic downshift valve, it is not now possible to switch to the low range.

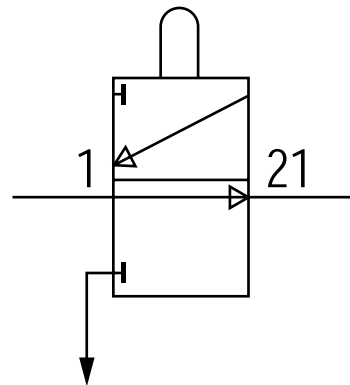
The system pressure to connection point (1) on the electropneumatic downshift protection valve is only available when the gear lever, and hence also the neutral position valve, is in the neutral position.



V3 00 478

2.4 NEUTRAL POSITION VALVE

The neutral position valve is mounted on the selector shaft housing. Inside the selector shaft is a slot that corresponds to the neutral position of the selector shaft. The neutral position valve pawl drops into this slot. When a gear is engaged, the neutral position valve pawl moves out of the slot, thereby switching the valve. In the neutral position the system pressure is sent to the electropneumatic downshift protection valve. In the event of a gear change, the gear lever and the neutral position valve will be moved through the neutral position. At that moment the neutral position valve sends the system pressure from connection (21) to the electropneumatic downshift protection valve.

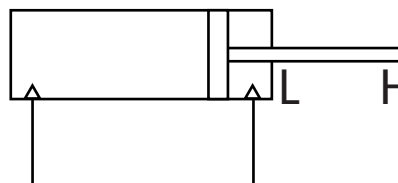


V3 00 476

2.5 RANGE GROUP ENGAGING CYLINDER

The range group engaging cylinder is mounted on the rear of the gearbox.

The engaging cylinder is supplied from the electropneumatic downshift protection valve.



V3 00 479

3. INSPECTION AND ADJUSTMENT

3.1 PROGRAMMING PARAMETERS USING DAVIE

After a gearbox has been replaced by a gearbox that uses a different reduction rate, it will be necessary to reprogram the VIC by means of DAVIE XD.

This is to ensure that the downshift protection valve is enabled and disabled at the correct vehicle speeds.

It is not possible to adjust the frequencies of the gate protection and the range-change protection with the standard program of DAVIE XD. If the vehicle configuration is changed, this should always be reported.

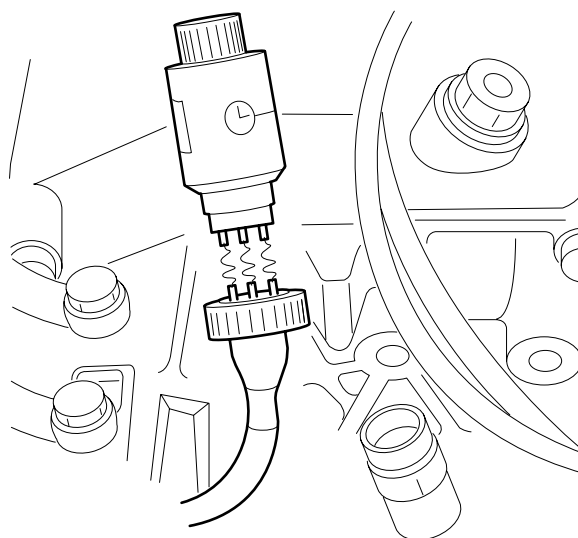
3.2 SIMULATING SPEED SIGNAL

The speed signal can be simulated with DELSI (DAF no. 0694941). DELSI must be connected to the speed sensor connector.

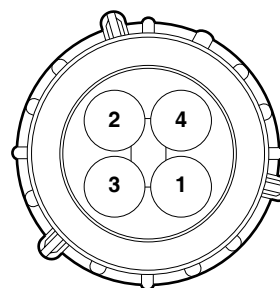
Before connecting DELSI to the speed sensor connector, an adapter cable must be made. The adapter cable must consist of the following wiring:

- Pin 1: speed sensor, power supply
- Pin 2: speed sensor, earth
- Pin 3: speed sensor, "real-time" speed/distance signal
- Pin 4: not in use

When the speed sensor connector is disconnected, a fault is stored in the tachograph. This fault can be deleted using DAVIE XD.



V300425c



K100873

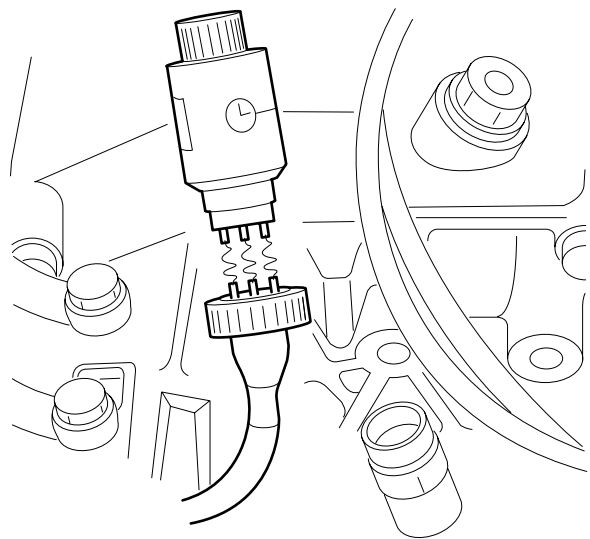
3.3 INSPECTION, DOWNSHIFT PROTECTION VALVE

Inspection without vehicle speed signal

1. Make sure there is sufficient air pressure in the brake system.
2. Position the gear lever in neutral.
3. Switch the vehicle ignition on.
4. Use the range group operating switch on the ball of the gear lever to select the lower range. The range group should now switch to the lower range.
5. Switch the vehicle ignition off. The range group should now automatically switch to the higher range.

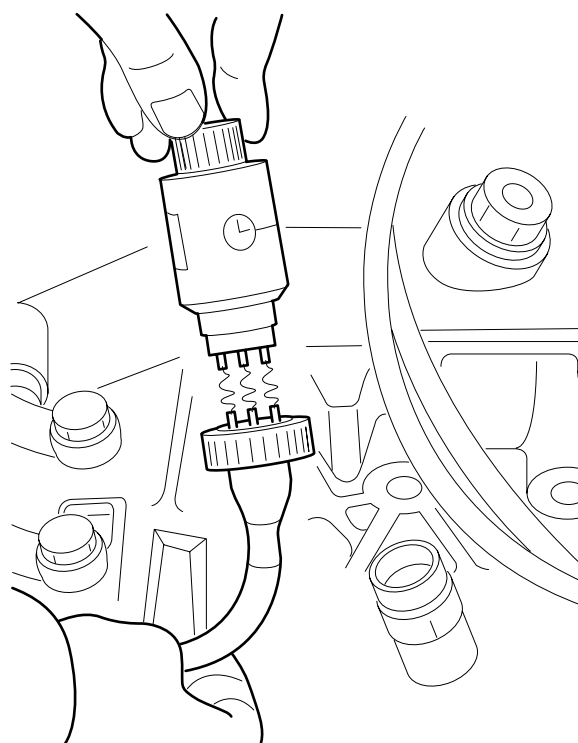
Inspection with the vehicle speed signal

1. Make sure there is sufficient air pressure in the brake system.
2. Connect special tool DELSI (DAF no. 0694941).
3. Position the gear lever in neutral.
4. Switch the vehicle ignition on.
5. Use the range group operating switch on the ball of the gear lever to select the lower range. The range group should now switch to the lower range.



V300425c

6. Use DELSI to raise the simulated vehicle speed slowly to approximately 40 km/h. As the vehicle speed increases, the range group should automatically switch to the higher range.
7. Use DELSI to decrease the simulated vehicle speed slowly to approximately 0 km/h. As the vehicle speed decreases, the range group should automatically switch to the lower range.

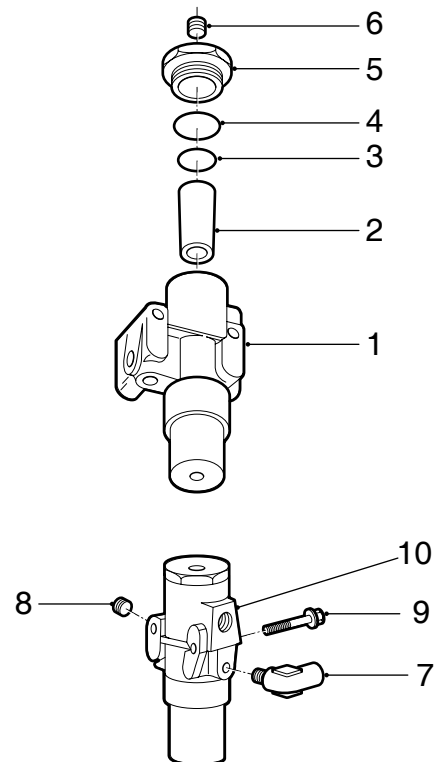


V300426

3.4 INSPECTION, FILTER/GOVERNOR

Inspection, filter/governor

1. Remove the plug from the extra outlet (9) and install a pressure gauge.
2. Check the service pressure. See "Technical data".



V300430

4. REMOVAL AND INSTALLATION

4.1 REMOVAL AND INSTALLATION, FILTER/GOVERNOR

Removal, filter/governor

1. Blow off the air reservoirs.
2. Unscrew the air pipes.
3. Remove the two attachment bolts from the filter/governor and remove the filter/governor.

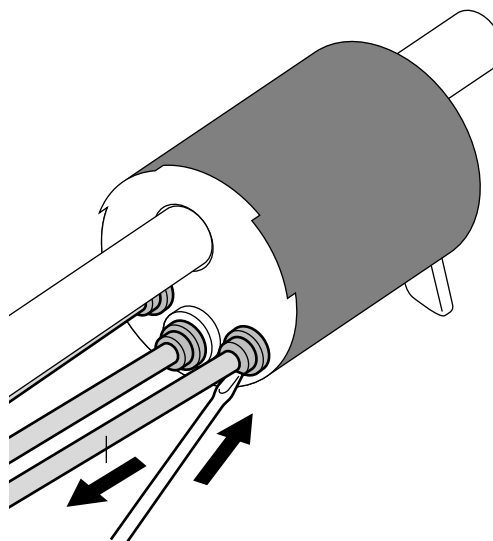
Installation, filter/governor

1. Install the filter/governor on the attachment bracket. Tighten the attachment bolts to the specified torque. See "Technical data".
2. Fit the air pipes.
3. Pressurise the system.
4. Check the system for air leakage.
5. Check the operation of the valve. See "Inspection and adjustment".

4.2 REMOVING AND INSTALLING RANGE GROUP OPERATING SWITCH

Removing range group operating switch

1. Blow off the air reservoirs.
2. Detach the bottom of the gaiter and partially pull the gaiter over the gear lever knob.
3. Remove the clamping strap on the inside of the gaiter.
4. Remove the cover cap with the gear-change pattern on the top of the gear lever.
5. Remove the attachment nut on the top of the gear lever and remove the gear lever knob.
6. Remove the gaiter.
7. Mark the various air pipes and disconnect them from the range-change switch using a small screwdriver.
8. Remove the range-change switch and the clamping piece.



V3 00 429

Installing range group operating switch

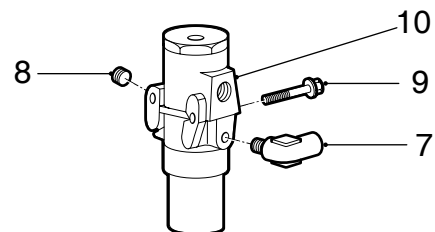
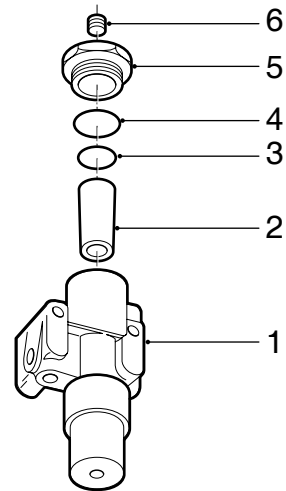
1. Install the clamping piece on the gear lever.
2. Connect the various air pipes to the range-change switch as indicated by the markings.
3. Install the range-change switch on the gear lever. Ensure that the clamping piece is properly mounted on the range-change switch.
4. Slide the gaiter over the gear lever.
5. Fit the switch button onto the gear lever and tighten the attachment nut to the specified torque. See "Technical data".
6. Install a clamping strap on the inside of the gaiter.
7. Pressurise the system.
8. Check the system for air leakage.
9. Check the operation of the range group operating switch.

5. CLEANING

5.1 CLEANING FILTER/GOVERNOR

Cleaning filter/governor

1. Remove the cover (5).
2. Remove the filter element (2) from the housing (1).
3. Clean the filter element (2) with cold water and soap, or replace if necessary.
4. Blow-clean the filter element (2) and the housing (1) from the inside with compressed air.
5. Replace the O-ring (4) and the sealing ring (3), if necessary.
6. Fit the cover (5) and tighten it to the specified torque. See "Technical data".
7. Pressurise the system.
8. Check the system for air leakage.



V300430

CONTENTS

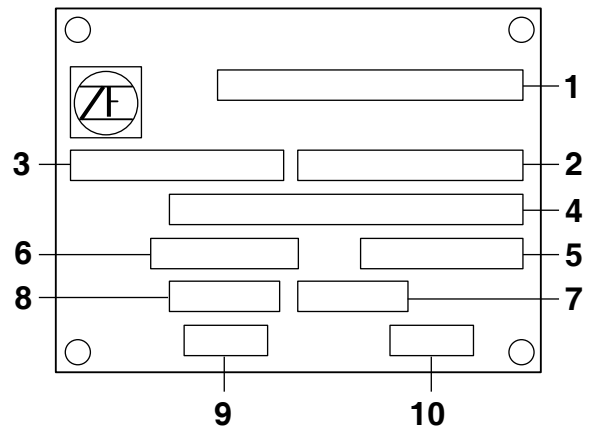
	Page	Date
1. GENERAL	1-1	200508
1.1 ZF gearbox type	1-1	200508
1.2 System description, gearbox	1-2	200508
2. DESCRIPTION OF COMPONENTS	2-1	200508
2.1 Synchroniser	2-1	200508
3. INSPECTION AND ADJUSTMENT	3-1	200508
3.1 Checking gearbox oil level	3-1	200508
3.2 Inspecting and adjusting input shaft pre-load	3-2	200508
4. REMOVAL AND INSTALLATION	4-1	200508
4.1 Removing and installing the gearbox	4-1	200508
4.2 Removing and installing drive flange	4-3	200508
4.3 Removing and installing output shaft oil seal	4-4	200508
4.4 Removing and installing gearbox front cover oil seal	4-5	200508
4.5 Removing and installing selector shaft oil seal	4-6	200508
5. DRAINING AND FILLING	5-1	200508
5.1 Draining and filling gearbox	5-1	200508

1. GENERAL

1.1 ZF GEARBOX TYPE

Each gearbox has a type plate attached to it, indicating the type of gearbox. This data can also be found on the vehicle identity card for the vehicle concerned.

1. Type of gearbox
2. ZF serial number
3. Parts list (ZF)
4. Specification number
5. Pulse generator ratio
6. Gearbox ratio
7. Engine speed using PTO
8. PTO speed
9. Gearbox oil capacity
10. Oil specification



V300049

1.2 SYSTEM DESCRIPTION, GEARBOX

The gearbox consists of five synchromesh forward gears and one non-synchromesh reverse gear. The fifth gear is "close ratio" or "wide ratio", depending upon the model.

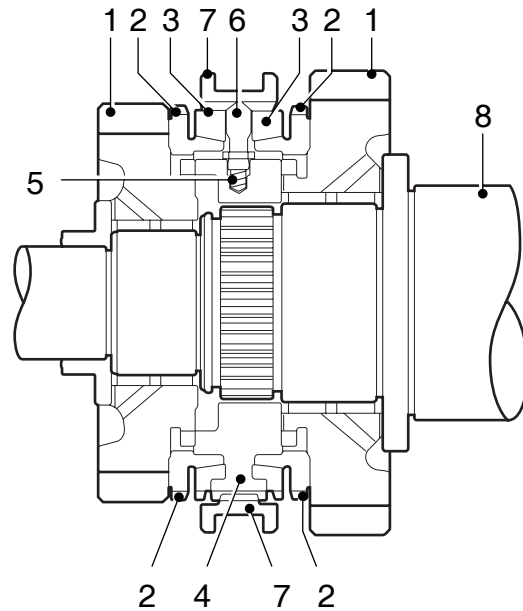
2. DESCRIPTION OF COMPONENTS

2.1 SYNCHRONISER

B-lock synchronisation

1. gear wheel
2. selector ring
3. synchromesh ring
4. selector sleeve
5. pressure spring
6. thrust piece
7. selector sleeve
8. main shaft

The synchroniser consists of the following parts:



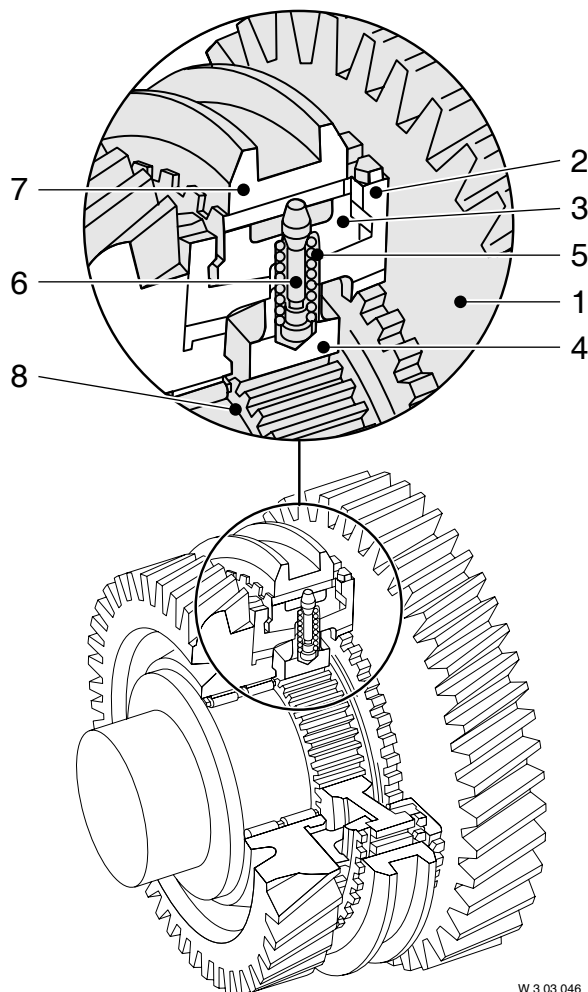
In neutral, the selector sleeve (7) is in the centre position.

Pressure springs (5) push the thrust pieces (6) into a wedge-shaped recess in the selector sleeve (7).

The gear wheels (1) and corresponding selector rings (2) move freely around the main shaft (8).

If the selector sleeve (7) is shifted to the right from the neutral position, the synchronesh ring (3) is pushed against the friction cone of the selector ring (2) by the thrust pieces (6).

The difference in speed immediately turns the synchronesh ring (3) as far as a stop on the selector sleeve support (4), which is not in the figure, and thus prevents further movement of selector sleeve (7).

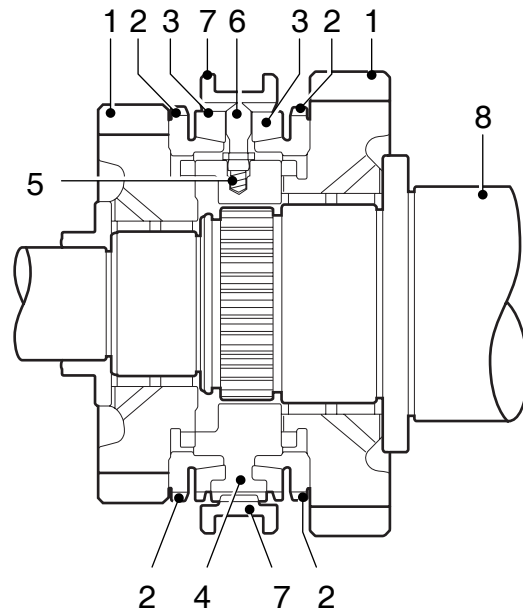


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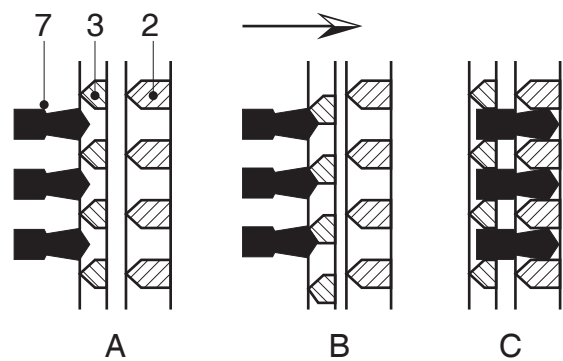
As a result of continued pressure on selector sleeve (7) (friction), the speed of the gear (1) to be shifted with selector ring (2) matches the speed of the main shaft (8).

The bevelled sides of the teeth on the synchronesh ring (3) and selector sleeve (7) cause synchronesh ring (3) to be turned back slightly after synchronisation.

This releases the lock and allows selector sleeve (7) to be moved into the teeth of selector ring (2). As a result, the relevant gear is engaged.



- A. Not connected
- B. Synchronise
- C. Connected



V301005

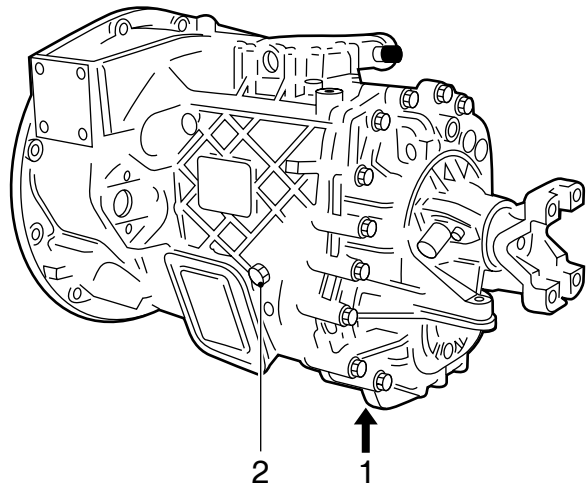
3. INSPECTION AND ADJUSTMENT

3.1 CHECKING GEARBOX OIL LEVEL



To prevent skin injury, avoid unnecessary contact with the drained oil.

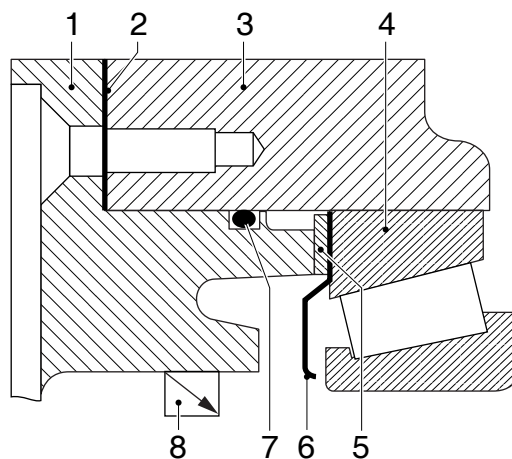
1. Place the vehicle on a flat and level surface.
2. Wait for some minutes to allow the oil to flow back.
3. Remove the level check/filler plug (2) and check the oil level.
4. The oil level must reach the rim of the level check/filler opening.
5. After checking the oil level, tighten the level check plug to the specified torque. See "Technical data".



V3 00 403

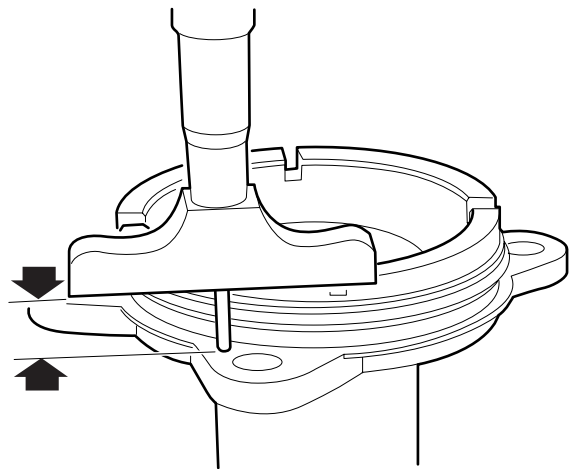
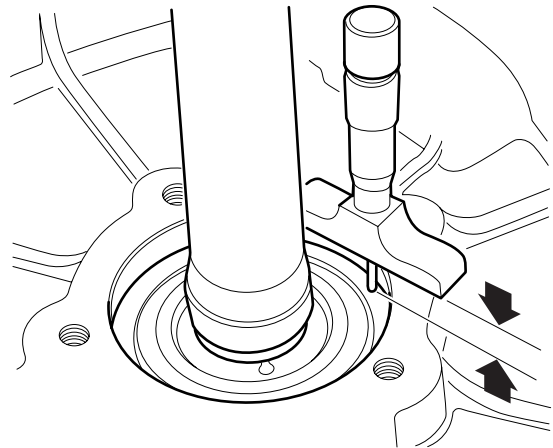
3.2 INSPECTING AND ADJUSTING INPUT SHAFT PRE-LOAD**Inspecting and adjusting input shaft pre-load**

1. Remove the gearbox. See "Removal and installation".
2. Remove the gearbox front cover from the input shaft. See "Removal and installation".
3. Uniformly press the outer bearing race (4), so that the bearing is free of play. Constantly rotate the input shaft while applying pressure so that the bearing is set.



V3 00 413

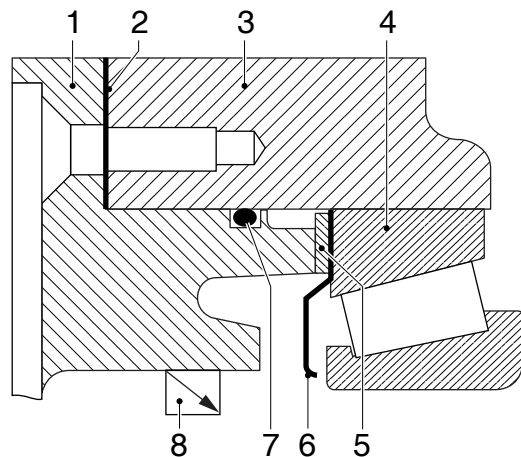
4. Use a depth gauge to measure the depth from the front of the housing down to the outer bearing race, distance A.
5. Use a depth gauge to determine the height the ball bearing protrudes from the gearbox front cover to the attachment surface, distance B.



V301011

6. For the pre-load tolerance, see "Technical data".
7. Using a micrometer, measure the thickness of the oil baffle (6).
8. Calculate the thickness of the adjusting ring (5) according to the following example:

Distance A	17.5 mm
Distance B	15.7 mm
Thickness of oil baffle	0.3 mm
Pre-load tolerance	+ 0.5 mm
<hr/>	
Adjusting ring thickness	1.55 mm
9. Compare the value of the adjusting ring with the calculated value and replace the ring if necessary.
10. Fit a new gasket (2) in the gearbox front cover (1) and fit it on the gearbox. See "Removal and installation".
11. Fit the gearbox. See "Removal and installation".



V3 00 413

4. REMOVAL AND INSTALLATION

4.1 REMOVING AND INSTALLING THE GEARBOX

Removing the gearbox

1. Disconnect the earth lead from the battery terminal.
2. Remove the silencer cap above the clutch.
3. Remove the attachment bolts of the prop shaft flange and remove the prop shaft.
4. Remove the intermediate bearing, if fitted.
5. Remove the attachment bolt from the exhaust bracket on the gearbox.
6. Remove the clamping strip from the exhaust pipe.
7. Remove the attachment bolt of the rubber suspension point on the end of the exhaust.
8. Twist the end-pipe of the exhaust loose and remove it.
9. Remove the attachment bolts from the clutch cylinder and remove it.
10. Remove all electrical connectors.
11. Remove the compressor pipe bracket.
12. Remove the torque rod of the selector rod.
13. Remove the elbow of the selector rod on the selector shaft fork.
14. Support the gearbox and remove the attachment bolts around it.
15. Manoeuvre the gearbox to the rear until it is free and then remove it.

Installing the gearbox

1. Engage the highest gear in order to align the keys of the input shaft with the clutch plate.
2. Fit the gearbox onto the engine. If necessary, rotate the drive flange in order to align the keys.
3. Fit the gearbox attachment bolts all around and tighten them to the specified torque. See "Technical data".
4. Install the torque rod and secure it by means of new self-locking nuts.
5. Install the elbow of the gearbox control on the selector finger. Use a new self-locking nut.
6. Fit the exhaust bracket.
7. Install the compressor pipe bracket.
8. Fit the electrical connectors onto the gearbox.
9. Fit the clutch cylinder.
10. Install the exhaust pipe, fasten it with the clamping strap and fit the attachment bolt of the suspension rubber.
11. Fit the prop shaft flange onto the gearbox.
12. Fit the intermediate bearing, if present.
13. Check the oil level. See "Inspection and adjustment".
14. Fit the silencer cap.
15. Fit the earth lead to the battery terminal.

4.2 REMOVING AND INSTALLING DRIVE FLANGE

Removing drive flange

1. Disconnect the earth cable from the batteries.
2. Make a reference mark on the prop shaft in relation to the gearbox drive flange.
3. Remove the nuts and bolts, if any, with which the intermediate bearing of the prop shaft is fixed to the cross member of the chassis.
4. Disconnect the prop shaft from the gearbox drive flange. Support the shafts at a suitable point on the chassis.
5. Fit the special tool (DAF no. 0484977) onto the drive flange.
6. Remove the lock nut. Remove the special tool from the drive flange.

Note:

Do NOT use the old lock nut again.

7. Using special tool (DAF no. 0484978), remove the drive flange from the main shaft.

Installing drive flange

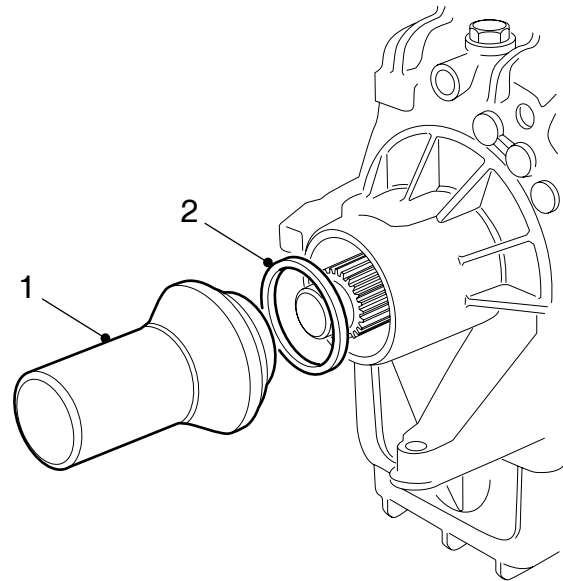
1. Heat the drive flange to a temperature of 70°C and place it on the main shaft.
2. Fit special tool (DAF no. 0484977) onto the drive flange.
3. Apply locking compound to the screw thread. See "Technical data".
4. Tighten the new lock nut to the specified torque. See "Technical data".
5. Fit the prop shaft to the gearbox drive flange. Ensure that the reference markings are placed opposite each other. Fix the intermediate bearing onto the cross member of the chassis. Tighten the bolts to the specified torque. See "Technical data".
6. Connect the earth clamp to the batteries.

4.3 REMOVING AND INSTALLING OUTPUT SHAFT OIL SEAL**Removing output shaft oil seal**

1. Remove the drive flange.
2. Prise the seal (2) out of the rear housing of the gearbox.

Installing output shaft oil seal

1. Using special tool (DAF no. 0694816) (1), fit the new seal in the rear housing.
2. Fit the drive flange.



V301012

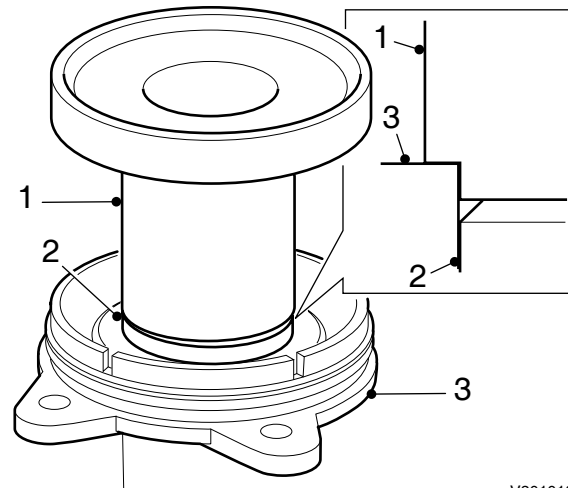
4.4 REMOVING AND INSTALLING GEARBOX FRONT COVER OIL SEAL

Removing gearbox front cover oil seal

1. Remove the gearbox.
2. Remove the release mechanism.
3. Remove the gearbox front cover (3).
4. Prise the oil seal (2) out of the gearbox front cover. Inspect the O-ring. If it is damaged, replace the O-ring.

Installing gearbox front cover oil seal

1. Fit the oil seal using special tool (DAF no. 1240498) (1) at the right depth in the gearbox front cover (3).
2. Install the gearbox front cover (3) with the O-ring on the gearbox. Tighten the attachment bolts to the specified torque. See "Technical data".
3. Fit the release mechanism.
4. Fit the gearbox.

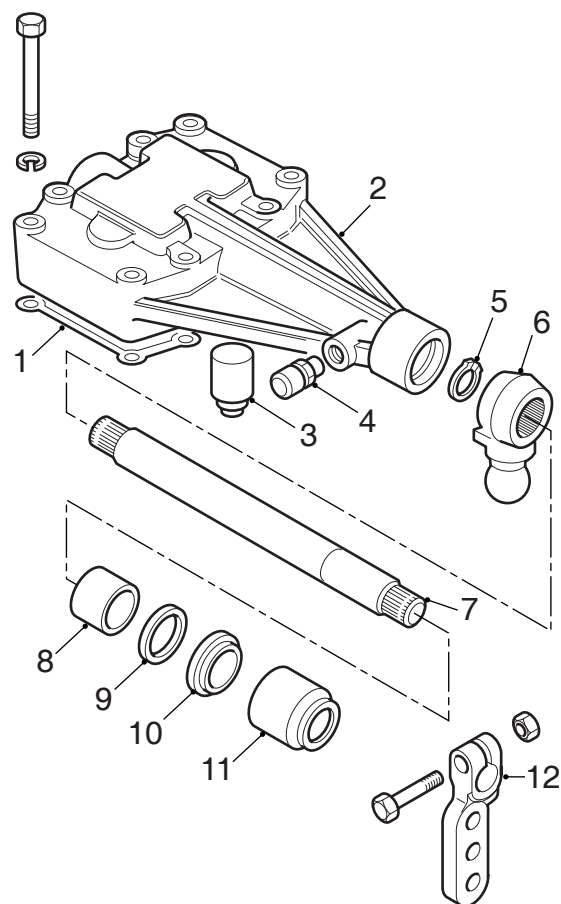


V301013

4.5 REMOVING AND INSTALLING SELECTOR SHAFT OIL SEAL

Removing selector shaft oil seal

1. Make a reference marking on the shifting arm (12) and the selector finger (6) in relation to the selector shaft (7).
2. Loosen the locking bolt. Take the shifting arm (12) and the protective cover (11) off the selector shaft.
3. Remove the spring washer (5). Drive the selector shaft (7) out of the selector finger and the housing.
4. Remove the retainer (3) from the housing.
5. Remove the oil seal (9) and the wiper seal (10) from the housing.
6. Use the special tools (DAF no. 0535790) and (DAF no. 0535817) to remove the selector shaft bush (8) from the housing (2).
7. Remove the bleeder (4).



V301014

Installing selector shaft oil seal

1. Fit the selector shaft bush (8) using the special tool (DAF no. 0192545). Heat the housing (2), if necessary, in order to facilitate assembly.
2. Lubricate the circumference of the seal (9) with a soap solution. Fit the seal with special tool (DAF no. 0535659) in the housing, with the sealing lip on top.
3. Fit the wiper seal (10).
4. Place the special tool (DAF no. 0192546) on the selector shaft (7). Fit the selector shaft.
5. Heat the selector finger (6) to a max. of 100°C. Install the selector shaft (7) in the old position according to the markings made.
6. Fit the spring washer (5).
7. Install the retainer (3). To ease fitting, the housing (2) around the bore can be heated to 120°C.
8. Fit the protective cap (11).
9. Install the shifting arm (12) in the old position in accordance with the markings made. Tighten the shifting arm locking bolt to the specified torque. See "Technical data".
10. Tighten the bleeder (4) to the specified torque. See "Technical data".

5. DRAINING AND FILLING

5.1 DRAINING AND FILLING GEARBOX



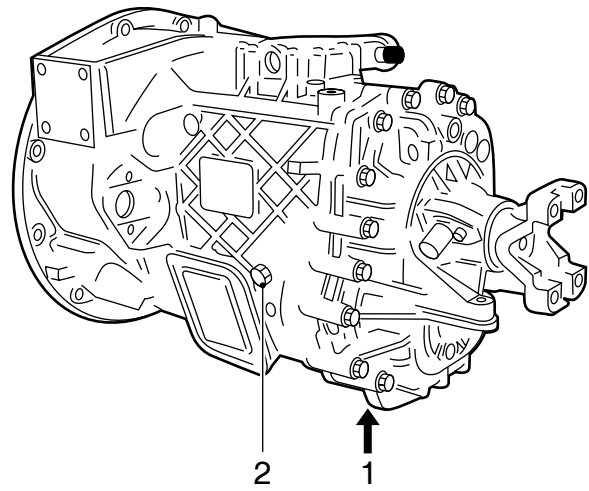
To prevent skin injury, avoid unnecessary contact with the drained oil.

Draining gearbox

1. Place the vehicle on a flat and level surface.
2. Drain the gearbox at operating temperature using drain plug (1).

Filling gearbox

1. Clean the drain plug and fit it, tightening to the specified torque; see "Technical data".
2. Fill the oil through level check/filler opening (2) until the oil reaches the rim of the filling opening.
3. After filling the gearbox, tighten the level check plug to the specified tightening torque. See "Technical data".



V3 00 403

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 General	1-1	200508
1.2 System description, ZF 6S-850 gearbox	1-2	200508
2. DESCRIPTION OF COMPONENTS	2-1	200508
2.1 Synchroniser	2-1	200508
3. INSPECTION AND ADJUSTMENT	3-1	200508
3.1 Checking gearbox oil level	3-1	200508
3.2 Inspection and adjustment, input shaft bearing axial play	3-2	200508
3.3 Inspection and adjustment, secondary shaft axial play	3-3	200508
4. REMOVAL AND INSTALLATION	4-1	200508
4.1 Removing and installing gearbox, BE engine	4-1	200508
4.2 Removing and installing gearbox, CE engine	4-3	200508
4.3 Removal and installation, drive flange	4-5	200508
4.4 Removal and installation, output shaft oil seal	4-6	200508
4.5 Removal and installation, gearbox front cover oil seal	4-7	200508
4.6 Removal and installation, selector shaft oil seal	4-8	200508
5. DRAINING AND FILLING	5-1	200508
5.1 Draining and filling gearbox	5-1	200508

1. GENERAL

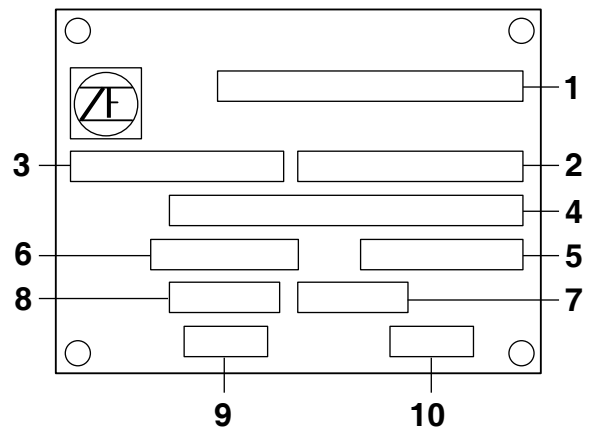
1.1 GENERAL

Gearbox type

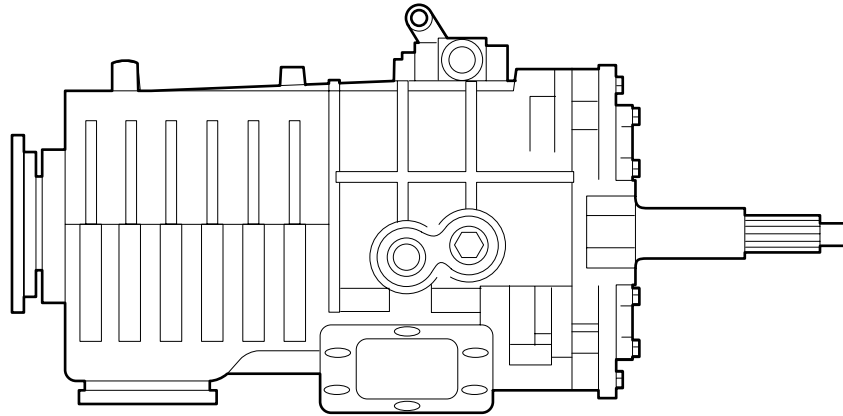
Each gearbox has a type plate attached to it, indicating the type of gearbox. You can also find this data on the identity card for the vehicle concerned.

ZF gearbox type plate

1. Type of gearbox
2. Serial no. (ZF)
3. Parts list (ZF)
4. Specification no.
5. Pulse generator ratio
6. Gearbox ratio
7. Engine speed using PTO
8. PTO speed
9. Gearbox oil capacity
10. Oil specification



V300049

1.2 SYSTEM DESCRIPTION, ZF 6S-850 GEARBOX

V300466

The gearbox consists of six synchromesh forward gears and one non-synchromesh reverse gear. The first and second gears have double-cone synchronisation. The sixth gear is a direct drive or an overdrive, depending upon the model.

5

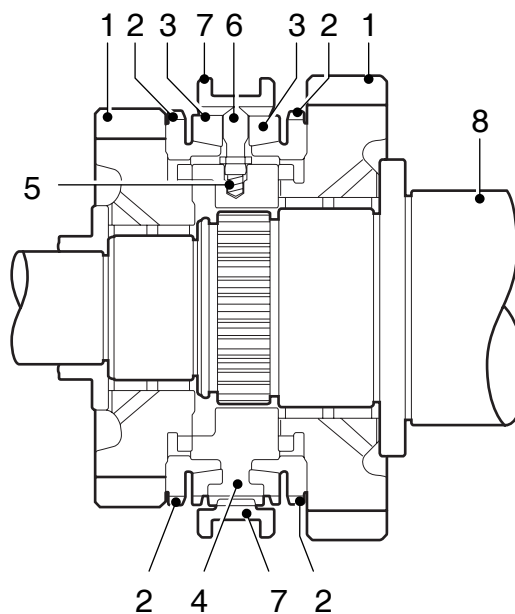
2. DESCRIPTION OF COMPONENTS

2.1 SYNCHRONISER

B-lock synchronisation

1. gear wheel
2. selector ring
3. synchromesh ring
4. selector sleeve
5. pressure spring
6. thrust piece
7. selector sleeve
8. main shaft

The synchroniser consists of the following parts:



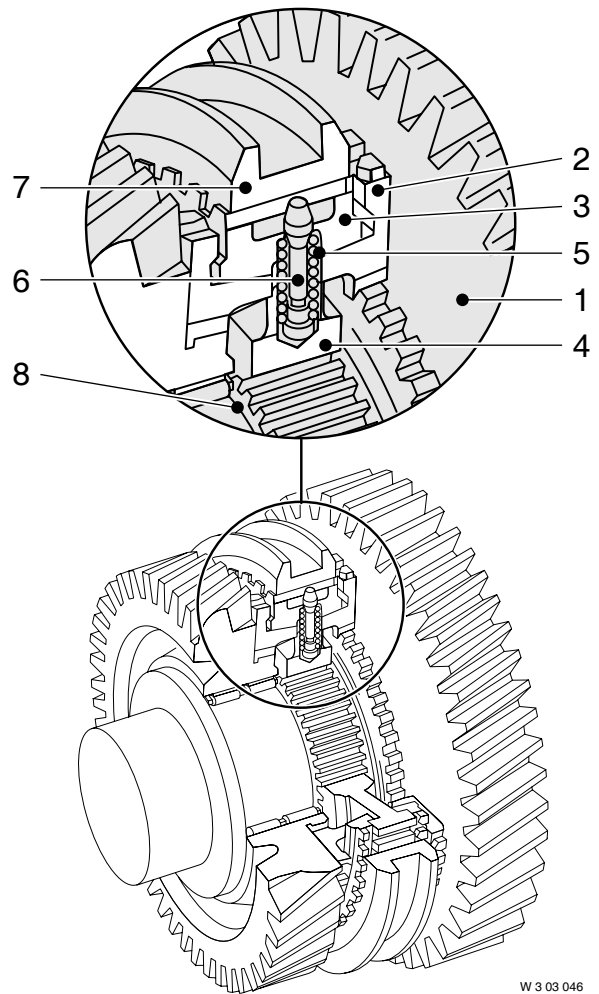
In neutral, the selector sleeve (7) is in the centre position.

Pressure springs (5) push the thrust pieces (6) into a wedge-shaped recess in the selector sleeve (7).

The gear wheels (1) and corresponding selector rings (2) move freely around the main shaft (8).

If the selector sleeve (7) is shifted to the right from the neutral position, the synchronmesh ring (3) is pushed against the friction cone of the selector ring (2) by the thrust pieces (6).

The difference in speed immediately turns the synchronmesh ring (3) as far as a stop on the selector sleeve support (4), which is not in the figure, and thus prevents further movement of selector sleeve (7).

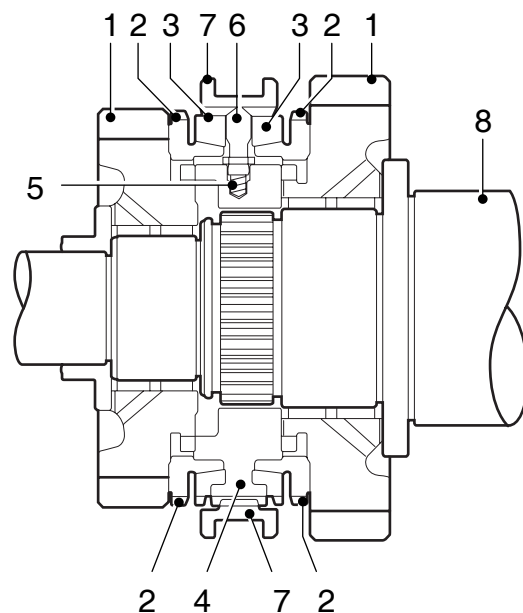


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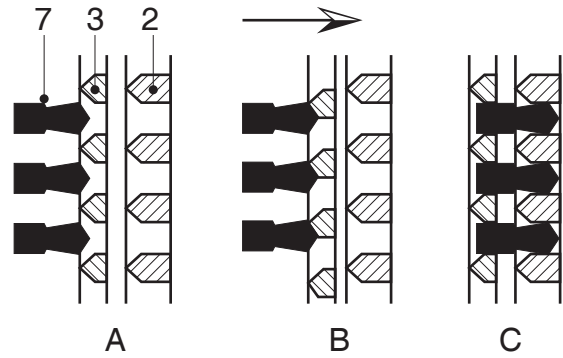
As a result of continued pressure on selector sleeve (7) (friction), the speed of the gear (1) to be shifted with selector ring (2) matches the speed of the main shaft (8).

The bevelled sides of the teeth on the synchronmesh ring (3) and selector sleeve (7) cause synchronmesh ring (3) to be turned back slightly after synchronisation.

This releases the lock and allows selector sleeve (7) to be moved into the teeth of selector ring (2). As a result, the relevant gear is engaged.



- A. Not connected
- B. Synchronise
- C. Connected



V301005

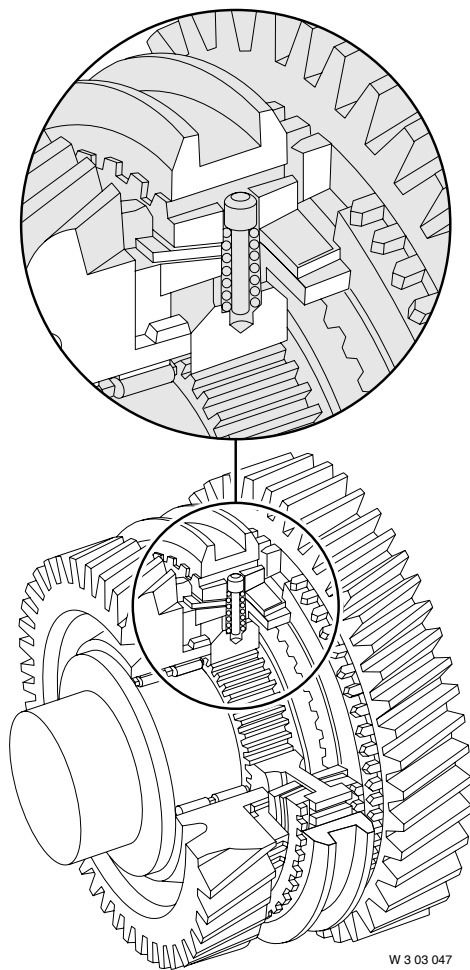
Double-cone synchronisation

As a result of the speed difference to be eliminated in the lower gears, the synchronisation forces may be considerable. In order to achieve effective synchronisation, a synchroniser with a double cone is used.

This synchroniser consists of an outer and an inner ring (synchromesh rings) connected to the main shaft of the gearbox by means of the selector sleeve support.

The ring between the two synchromesh rings is connected to the gear wheel by means of the selector ring.

When the selector sleeve moves into the selector ring, two synchronisation surfaces are active.



W 3 03 047

3. INSPECTION AND ADJUSTMENT

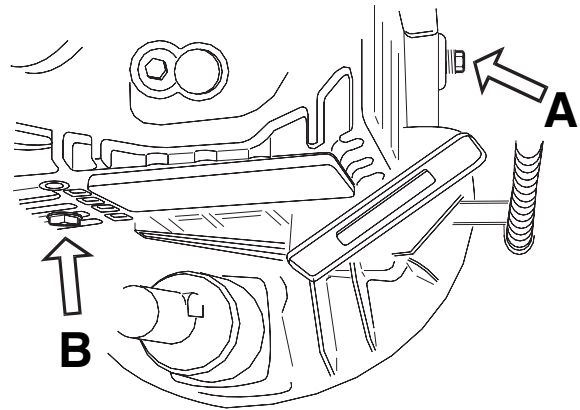
3.1 CHECKING GEARBOX OIL LEVEL



To prevent skin injury, avoid unnecessary contact with the drained oil.

ZF 6S-850 gearbox

1. Position the vehicle on a level surface.
2. Wait for some minutes to allow the oil to flow back.
3. Remove the level check plug and check the oil level.
4. The oil level must reach the rim of the level check/filler opening (A).
5. After checking the oil level, tighten the level check plug to the specified torque. See "Technical data".



M3038

3.2 INSPECTION AND ADJUSTMENT, INPUT SHAFT BEARING AXIAL PLAY

ZF 6S-850 gearbox

1. Remove the gearbox. See "Removal and installation".
2. Remove the gearbox front cover from the input shaft. See "Removal and installation".
3. Press the outermost bearing race uniformly so that the bearing is free of play. Constantly rotate the input shaft while applying pressure so that the bearing is set.

4. Use a depth gauge to determine the depth of the chamber in the gearbox front cover, distance A.

5. Install a new gasket in the gearbox housing. Use a depth gauge to determine the height the ball bearing protrudes above the gearbox housing, distance B.

6. Calculate the play as follows. See the table below.

Distance A	8.05 mm
Distance B	- 7.90 mm
Play	0.15 mm

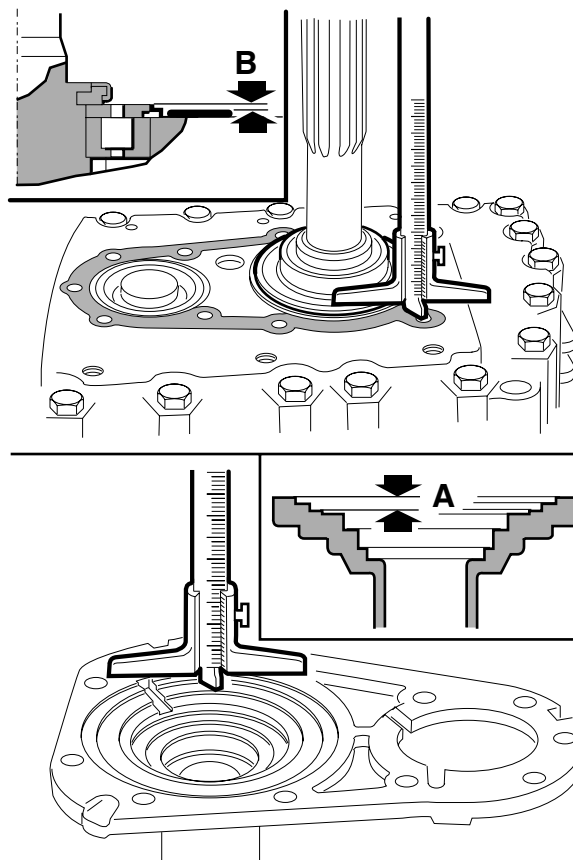
7. Compare the calculated value with the maximum permissible axial play. See "Technical data".

8. If necessary, adjust the axial play by means of another adjusting ring.

9. Fit a new gasket in the gearbox front cover and fit it on the gearbox. See "Removal and installation".

10. Fit the attachment bolts. Tighten the bolts to the specified torque. See "Technical data".

11. Fit the gearbox. See "Removal and installation".



V3 00 435

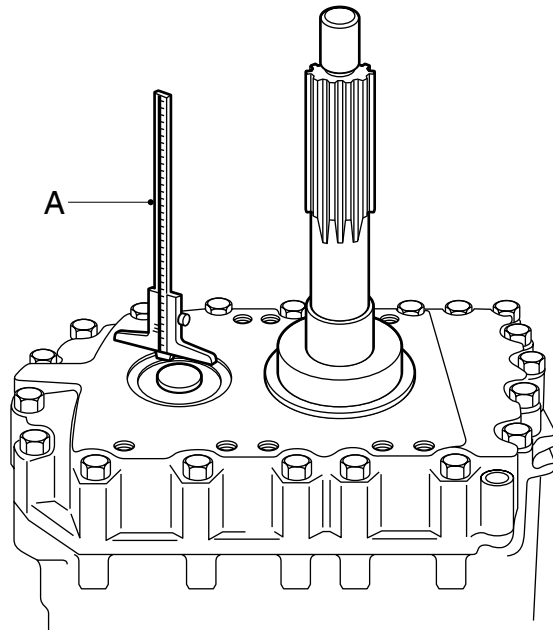
5

3.3 INSPECTION AND ADJUSTMENT, SECONDARY SHAFT AXIAL PLAY

Inspection and adjustment, secondary shaft axial play

1. Press the outermost bearing race uniformly so that the bearing is free of play. Rotate the secondary shaft constantly while pressing, so that the bearing gets set.
2. Use a depth gauge to determine the distance between the outer bearing race and the gearbox housing (A).
3. Compare the measured value with the specified permissible value. See "Technical data".
4. If necessary, adjust the axial play by means of another adjusting ring.
5. Calculate the play for the correct size of the adjusting ring as follows:

Distance A	2.95 mm
Gasket thickness	+0.40 mm
Play	(0 - 0.1) - 0.05 mm
<hr/>	
Required adjusting ring =	3.30 ± 0.05 mm



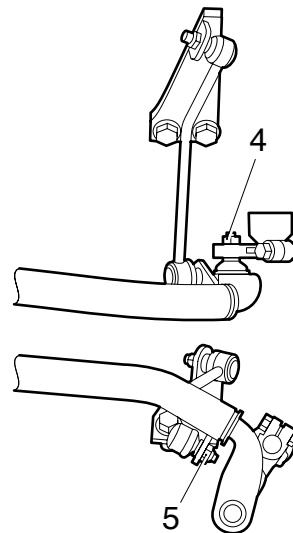
V3 00 402

4. REMOVAL AND INSTALLATION

4.1 REMOVING AND INSTALLING GEARBOX, BE ENGINE

Removing gearbox assembly

1. Make sure there are no loose items in the cab. Tilt the cab.
2. Disconnect the negative clamp of the battery.
3. Remove the gearbox cable harness and secure it.
4. Loosen the tachometer connection.
5. Remove the shift control by loosening the torque rod bracket and the lever on the selector shaft.
6. Remove the prop shaft and secure it so that it does not interfere with further operations.
7. Remove the exhaust pipe between the engine brake and the silencer.
8. Remove the clutch servo. No air or hydraulic pipes need be removed. Secure the servo and ensure that no one in the cab can operate the clutch pedal as long as the servo is not fitted.
9. Place a jack under the gearbox and remove the bolts around the clutch housing.
10. Use the jack to pull the gearbox away from the engine and remove the gearbox.



V300407

Installing gearbox assembly

1. Before positioning the gearbox, one gear should be engaged in order to allow the input shaft to slide into the clutch plate during installation. Also, apply a small amount of the specified grease to the input shaft.
2. Fit the thrust bearing.
3. Use the jack to move the gearbox towards the engine and fit the attachment bolts around the gearbox.
4. Install the clutch servo and tighten the attachment bolts.
5. Fit the exhaust pipe between the engine brake and the silencer.
6. Fit the drive flange.
7. Fit the shift control.
8. Fit the cable harness and tachometer connection.
9. Connect the negative clamp of the battery.
10. Inspect the shift control.
11. Check the oil level after the gearbox has been installed.
12. If a gearbox of a different type is mounted, or a gearbox with a different reduction, this should be reported. If the correct data are present, they can be input into the VIC using DAVIE XD.

4.2 REMOVING AND INSTALLING GEARBOX, CE ENGINE

Removing gearbox, CE engine

1. Disconnect the earth lead from the battery terminal.
2. Remove the attachment bolts of the prop shaft flange and remove the prop shaft.
3. If present, remove the attachment bolts from the intermediate bearing.
4. Remove the attachment bolt from the exhaust bracket on the gearbox.
5. Remove the clamping strip from the exhaust pipe.
6. Remove the attachment bolt of the rubber suspension point on the end of the exhaust.
7. Twist the end-pipe of the exhaust loose and remove it.
8. Remove the attachment bolts from the clutch cylinder and remove it.
9. Mark all the electrical connectors and remove them.
10. Remove the compressor pipe bracket.
11. Remove the selector rod from the adjusting mechanism in such a manner that the settings are not changed.
12. Support the gearbox and remove the attachment bolts around it.
13. Manoeuvre the gearbox to the rear until it is free and then remove it.

Installing gearbox, CE engine

1. Engage the highest gear in order to align the keys of the input shaft with the clutch plate.
2. Fit the gearbox onto the engine. If necessary, rotate the prop shaft flange in order to align the keys.
3. Fit the gearbox attachment bolts all around and tighten them to the specified torque. See "Technical data".
4. Install the selector rod on the adjusting mechanism. Use new self-locking nuts.
5. Fit the exhaust bracket.
6. Install the compressor pipe bracket.
7. Fit the electronic connectors onto the gearbox.
8. Fit the clutch cylinder.
9. Install the exhaust pipe, fasten it with the clamping strap and fit the attachment bolt of the suspension rubber.
10. Install the prop shaft intermediate bearing, if it has been removed, and tighten the bolts by hand.
11. Fit the prop shaft flange onto the gearbox. Tighten the attachment bolts to the specified torque. See "Technical data".
12. Tighten the intermediate bearing attachment bolts to the specified torque. See "Technical data".
13. Check the oil level. See "Inspection and adjustment".
14. Fit the silencer cap.
15. Fit the earth lead to the battery terminal.

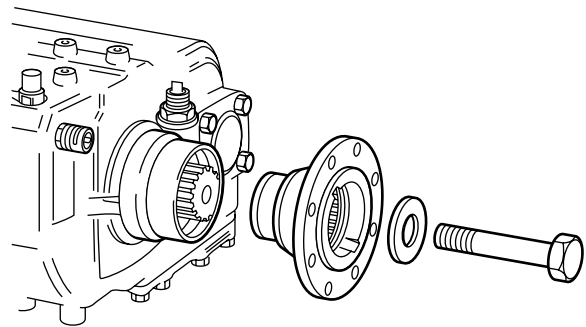
Note:

If a gearbox of a different type is mounted, or a gearbox with a different reduction, this should be reported. If the correct data are present, they can be input into the VIC using DAVIE XD.

4.3 REMOVAL AND INSTALLATION, DRIVE FLANGE

Removing the drive flange

1. Make a reference mark on the prop shaft and flange.
2. Detach the prop shaft from the flange and secure it.
3. Fit special tool (DAF no. 0484977) to hold the flange in place.
4. Remove the attachment bolt and washer.
5. Using special tool (DAF no. 0484978), remove the drive flange from the shaft.



V3 00 416

Installing the drive flange

1. Heat the drive flange to a temperature of max. 120°C.
2. Oil the output shaft lightly and slide the drive flange over the shaft in its correct position.
3. Fit the special tool (DAF no. 0484977) onto the drive flange.
4. Tighten the attachment bolt to the specified torque. See "Technical data".
5. Fit the prop shaft. Tighten the attachment bolts to the specified torque. See "Technical data".

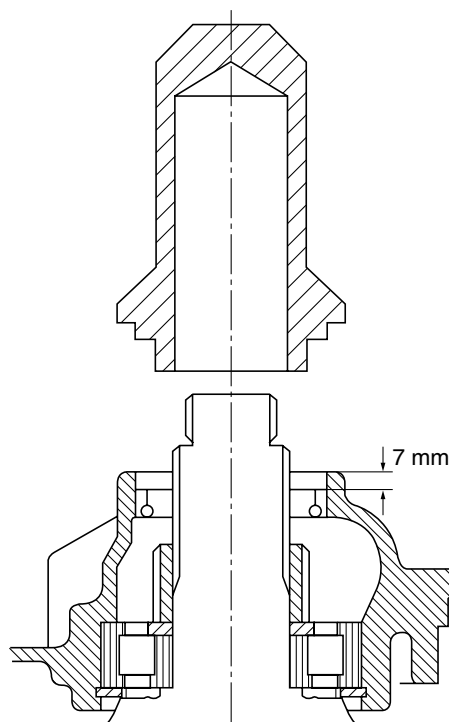
4.4 REMOVAL AND INSTALLATION, OUTPUT SHAFT OIL SEAL

Removing output shaft oil seal

1. Remove the drive flange.
2. Pull the oil seal from the gearbox housing using special tool (DAF no. 0484899).

Installing output shaft oil seal

1. Check the axial play of the output shaft. See "Technical data".
2. Around the oil seal, clean the gearbox housing without letting dirt into the gearbox.
3. Apply a small amount of liquid gasket to the outside of oil seals fitted with a steel cover. Apply a small amount of green soap to the outside of oil seals fitted with a rubber cover.
4. Fit the oil seal in the gearbox housing using special tool (DAF no. 0694816). The tool will position the oil seal at the correct depth in the housing.
5. Fit the drive flange.



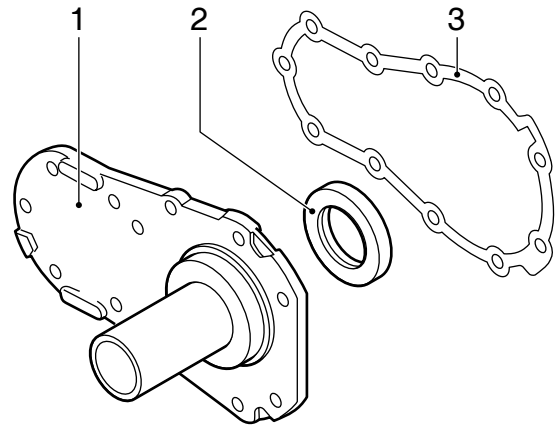
4.5 REMOVAL AND INSTALLATION, GEARBOX FRONT COVER OIL SEAL

Removing gearbox front cover oil seal

1. Remove the gearbox.
2. Remove the release mechanism assembly with fork and thrust bearing.
3. Remove the attachment bolts from the gearbox front cover (1). Remove the gearbox front cover from the input shaft. Keep the filler plates of the input shaft and the secondary shaft.
4. Remove the oil seal (2) from the gearbox front cover.

Installing the gearbox front cover oil seal

1. Apply a small amount of sealant to the outside of oil seals fitted with a steel cover. Apply a small amount of green soap to the outside of oil seals fitted with a rubber cover.
2. Fit the oil seal (2) to the gearbox front cover using special tools (DAF no. 0499809) and (DAF no. 0535409). Fit a new gasket (3).
3. Check the input shaft axial play. See "Inspection and adjustment".
4. Install the gearbox front cover (1). Tighten the bolts to the specified torque. See "Technical data".
5. Install the release mechanism on the gearbox. Tighten the bolts to the specified torque. See "Technical data".
6. Fit the gearbox.



V3 00 401

4.6 REMOVAL AND INSTALLATION, SELECTOR SHAFT OIL SEAL

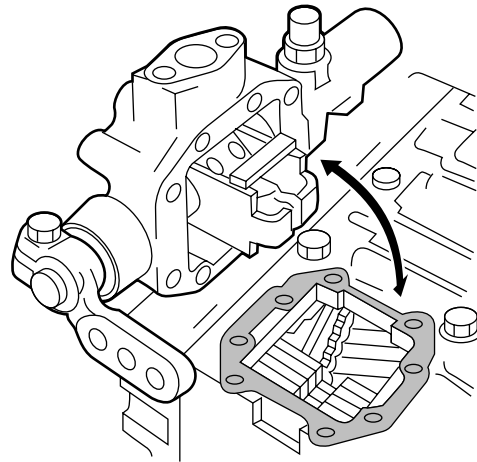
LHD model

Removing selector shaft oil seal

1. Mark the gearbox lever relative to the selector shaft and remove the control lever with the gearbox control. If necessary, disconnect the torque rod.
2. Remove the selector shaft housing attachment bolts and remove the selector shaft housing assembly from the gearbox.

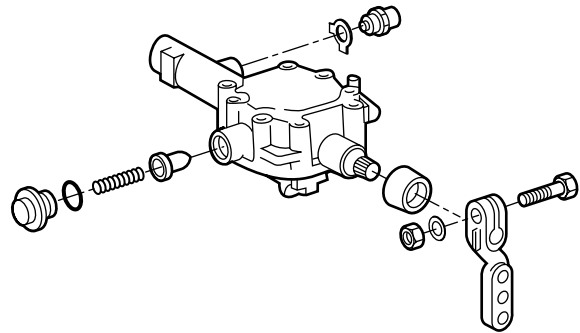


Seal the gearbox opening, so that no dirt can enter.



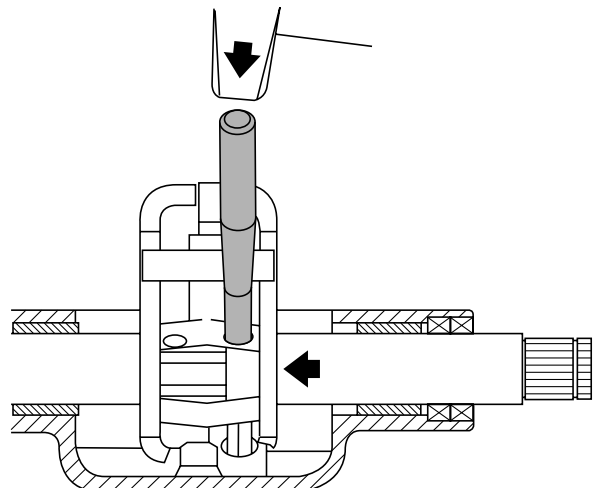
V3 00 398

3. Remove the locking pin and control stop from the selector shaft housing.



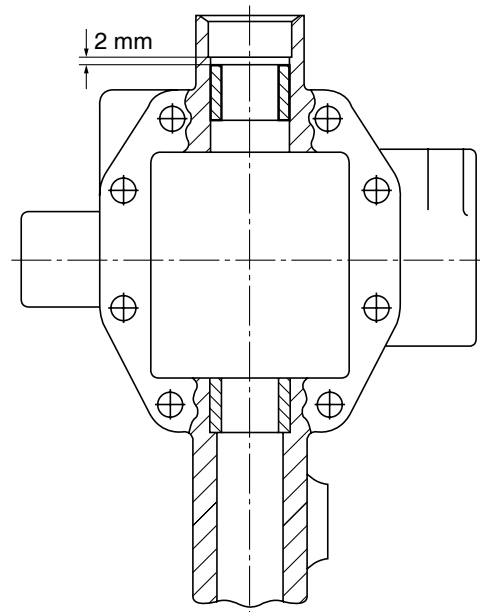
V3 00 399

4. Drive the two spring pins out of the selector fingers. Turn the selector fingers so that the spring pins can be driven into a slot in the cover.
5. Remove the circlip and the springs from the rear of the cover. Then remove the shaft and the selector fingers from the cover.



W 3 03 052

6. Drive the oil seal and dust seal out of the selector shaft housing. If necessary, the selector shaft bearing bushes can now also be replaced with special tool (DAF no. 0694818). Press the bearing bush on the control side 2 mm under the edge.



W 3 03 050

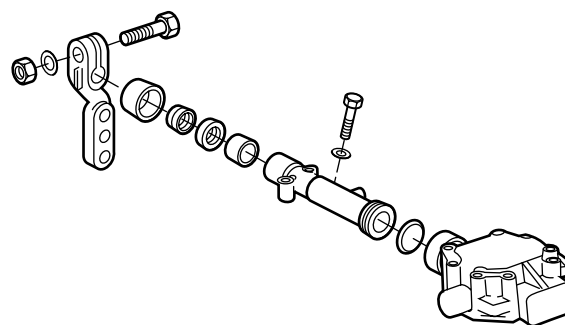
LHD model

Installing selector shaft oil seal

1. Sparingly apply a liquid gasket to the oil seal and fit it in the control cover using special tool (DAF no. 0535659). Now fit the dust seal in the control cover using special tool (DAF no. 0535659). Apply grease to the oil seal lips.
2. Fit the special tool ((DAF no. 0694817)), a guide sleeve, over the selector shaft and fit the selector fingers and the gear lever lock into the selector housing. Fit the selector shaft. Watch the control stop slot.
3. First fit the control stop before fitting the spring pins.
4. Fit the spring pins and the locking pin.
5. Apply a small amount of sealant to the sealing cap. Install the springs, rings, and the sealing cap. Fit the circlip.
6. Put the gearbox into neutral, install a new gasket in the selector shaft housing and fit it onto the gearbox housing. Tighten the bolts to the specified torque. See "Technical data".
7. Fit the shift control and check that all gear changes function properly.

RHD model**Removing selector shaft oil seal**

1. Mark the gearbox lever relative to the selector shaft and remove the control lever with the gearbox control. If necessary, disconnect the torque rod.
2. Remove the bearing housing attachment bolts and slide it off the selector shaft.
3. Drive the dust and oil seals out of the bearing housing. If necessary, the selector shaft bearing bush can now also be replaced with special tool (DAF no. 0694818). Press the bearing bush on the spring side 2 mm under the edge.



V3 00 400

Installing selector shaft oil seal

1. Apply a small amount of liquid gasket to the oil seal and fit it in the bearing housing using special tool (DAF no. 0535659). Now fit the dust seal in the bearing housing using special tool (DAF no. 0535659).
2. Apply grease to the oil seal lips. Fit a new O-ring to the selector shaft housing. Fit the selector shaft housing over the selector shaft.
3. Fit the attachment bolts and the gearbox control. Tighten the bolts to the specified torque. See "Technical data". Check that all gear changes function properly.

5

5. DRAINING AND FILLING

5.1 DRAINING AND FILLING GEARBOX



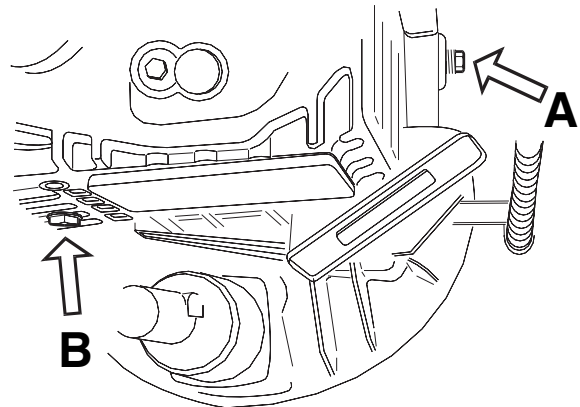
To prevent skin injury, avoid unnecessary contact with the drained oil.

Draining the gearbox

1. Place the vehicle on a level and horizontal surface.
2. Drain the gearbox at operating temperature using plug (B).

Filling the gearbox

1. Clean the drain plug and fit it, tightening to the specified torque; see "Technical data".
2. Top up oil through the level check/filling opening (A) until the oil reaches the rim of the filling opening.
3. After filling the gearbox, tighten the level check plug to the specified torque; see "Technical data".



M3038

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 General ..	1-1	200508
1.2 System description	1-2	200508
2. INSPECTION AND ADJUSTMENT	2-1	200508
2.1 Checking gearbox oil level	2-1	200508
2.2 Inspection and adjustment, input shaft bearing axial play	2-2	200508
3. REMOVAL AND INSTALLATION	3-1	200508
3.1 Removal and installation, gearbox assembly	3-1	200508
3.2 Removal and installation, drive flange	3-3	200508
3.3 Removal and installation, output shaft oil seal	3-4	200508
3.4 Removal and installation, gearbox front cover oil seal	3-5	200508
3.5 Removal and installation, selector shaft oil seal	3-6	200508
4. DRAINING AND FILLING	4-1	200508
4.1 Draining and filling gearbox	4-1	200508

1. GENERAL

1.1 GENERAL

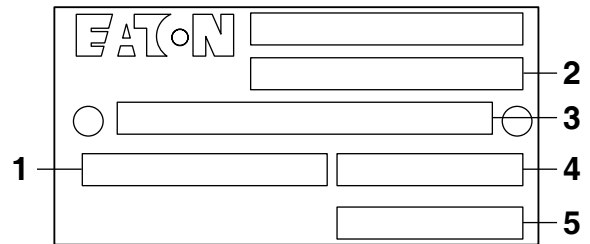
Gearbox type

Each gearbox has a type plate attached to it, indicating the type of gearbox. This data can also be found on the vehicle identity card for the vehicle concerned.

Eaton gearbox type plate

1. Type of gearbox
2. Specification no. Eaton
3. DAF article Eaton code
4. Serial no. Eaton
5. Production date code

The Eaton specification number is unique to each customer and gives detailed information on the development level of the gearbox. The number must be quoted whenever replacement parts are ordered.



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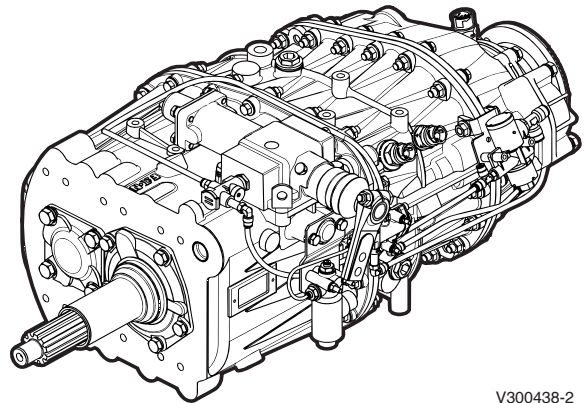
1.2 SYSTEM DESCRIPTION

The gearbox consists of a main gearbox with four synchronesh forward gears, a non-synchronesh crawler gear, and one non-synchronesh reverse gear. Between the main gearbox and the output shaft there is a set of planetary range gears with pneumatic synchronisation.

In the low range (planetary system engaged), the crawler gear and gears 1, 2, 3 and 4 can be engaged.

In the high range (planetary system disengaged), gears 5, 6, 7 and 8 can be engaged.

The switching system is in a "single-H" pattern. Use of the "single-H" system means that the low or high range must be selected by means of a button on the ball of the gear lever prior to engaging gear. The group is changed as soon as the selector shaft passes through the neutral position.



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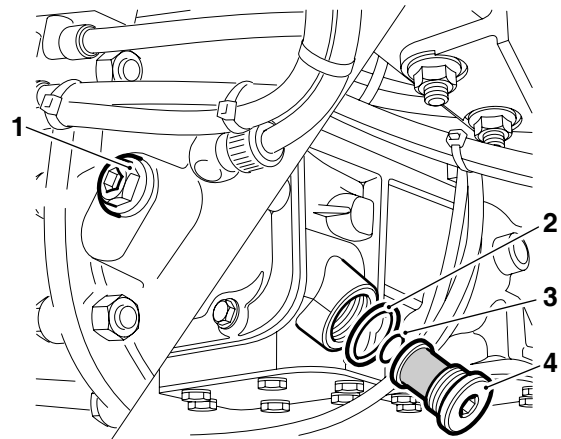
2. INSPECTION AND ADJUSTMENT

2.1 CHECKING GEARBOX OIL LEVEL



To prevent skin injury, avoid unnecessary contact with the drained oil.

1. Position the vehicle on a level surface.
2. Wait for some minutes to allow the oil to flow back.
3. Remove the level check/filler plug (1) and check the oil level.
4. The oil level must reach the rim of the level check/filler opening (1).
5. After checking the oil level, tighten the level check plug to the specified torque. See "Technical data".



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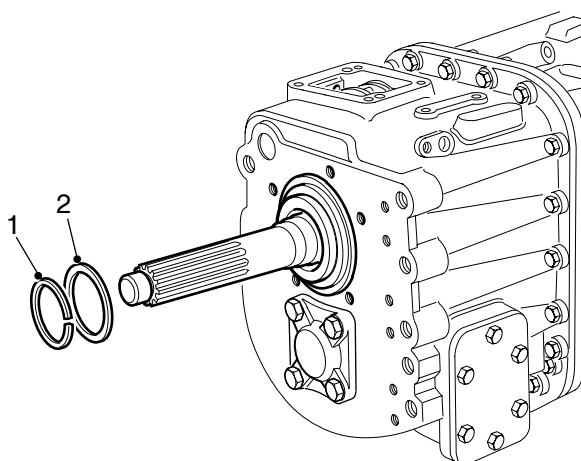
2.2 INSPECTION AND ADJUSTMENT, INPUT SHAFT BEARING AXIAL PLAY

Inspection, input shaft bearing axial play

1. Remove the gearbox. See "Removal and installation".
2. Remove the gearbox front cover from the input shaft. See "Removal and installation".
3. Check whether the circlip (1) is flush in the groove. Check at various places around the shaft.
4. If necessary, adjust the axial play by means of a thicker or thinner adjusting ring (2).

Adjustment, input shaft bearing axial play

1. Remove the circlip (1) of the input shaft bearing.
2. Remove the adjusting ring (2).
3. Place an adjusting ring (2) of the correct thickness between the input shaft bearing and the circlip. See "Technical data".
4. Fit the circlip (1) without any play into the groove. Check at various places around the shaft.
5. Fit a new gasket in the gearbox front cover and install the gearbox front cover. See "Removal and installation".
6. Fit the gearbox. See "Removal and installation".



V3 00 415

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, GEARBOX ASSEMBLY

Removing gearbox assembly

1. Disconnect the earth lead from the battery terminal.
2. Remove the attachment bolts of the prop shaft flange and remove the prop shaft.
3. Remove the attachment bolts from the intermediate bearing.
4. Remove the attachment bolt from the exhaust bracket on the gearbox.
5. Remove the clamping straps of the intermediate pipe and remove it.
6. Remove the end of the exhaust by removing the clamping strap and the attachment bolt of the rubber suspension point at the end of the exhaust.
7. Remove the attachment bolts from the clutch cylinder and remove it.
8. Mark all the electrical connectors and remove them.
9. Remove the compressor pipe bracket.
10. Mark the various air pipes and remove them.
11. Remove the selector rod from the adjusting mechanism in such a manner that the settings are not changed.
12. Support the gearbox and remove the attachment bolts around it.
13. Manoeuvre the gearbox to the rear until it is free, and then remove it.

Installing gearbox assembly

1. Engage the highest gear in order to align the keys of the input shaft with the clutch plate.
2. Fit the gearbox onto the engine. If necessary, rotate the drive flange in order to align the keys.
3. Fit the gearbox attachment bolts all around and tighten them to the specified torque. See "Technical data".
4. Install the selector rod on the adjusting mechanism. Use new self-locking nuts.
5. Fit the exhaust intermediate pipe.
6. Fit the exhaust end pipe.
7. Install the compressor pipe bracket.
8. Install the electronic connectors on the gearbox.
9. Fit the clutch cylinder.
10. Fit the air pipes.
11. Install the intermediate bearing of the prop shaft and tighten the bolts by hand.
12. Fit the prop shaft flange onto the gearbox. Tighten the attachment bolts to the specified torque. See "Technical data".
13. Tighten the intermediate bearing attachment bolts to the specified torque. See "Technical data".
14. Check the oil level. See "Inspection and adjustment".
15. Fit the earth lead to the battery terminal.

Note:

If a gearbox of a different type is mounted, or a gearbox with a different reduction, this should be reported. If the correct data are present, they can be input into the VIC using DAVIE XD.

3.2 REMOVAL AND INSTALLATION, DRIVE FLANGE

Removing drive flange

1. Place a reference mark on the prop shaft in relation to the flange.
2. Remove the bolts that attach the prop shaft to the flange.
3. Support the prop shaft from a suitable location on the chassis.
4. Support the prop shaft from a suitable location on the chassis.
5. Fit special tool (DAF no. 0484977) to hold the flange in place. Remove the lock nut and washer.
6. Remove the flange with a suitable puller.

Note:

In order to prevent the synchroniser for the high/low transmission ratios from coming loose, the output shaft must not slide out of the bearing.

Installing drive flange

1. Place the flange on the output shaft.
2. Place a shim between the flange and the lock nut and turn the flange in the oil seal. Remove the lock nut and shim.
3. Fit special tool (DAF no. 0484977) to the flange. Fit a new lock nut. Tighten the lock nut to the specified torque. See "Technical data".
4. Align the markings. Fit the prop shaft onto the flange. Tighten the bolts to the specified torque. See "Technical data".

3.3 REMOVAL AND INSTALLATION, OUTPUT SHAFT OIL SEAL**Removing output shaft oil seal**

1. Remove the drive flange.
2. Remove the attachment bolts from the oil seal housing. Remove the oil seal housing. Remove the oil seal.
3. Clean the contact surfaces of the oil seal and the seal housing.

Installing output shaft oil seal

1. Press the oil seal into the oil seal housing using special tool (DAF no. 1329358).
2. Apply sealant to the contact surface of the seal housing. See "Technical data".
3. Fit the seal housing and tighten the bolts to the specified torque. See "Technical data".
4. Apply grease to the sealing lip of the oil seal.
5. Fit the drive flange.
6. If necessary, top up the gearbox. See "Inspection and adjustment".

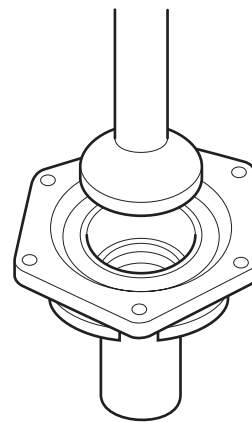
3.4 REMOVAL AND INSTALLATION, GEARBOX FRONT COVER OIL SEAL

Removing gearbox front cover oil seal

1. Remove the gearbox.
2. Remove the attachment bolts from the gearbox front cover. Remove the gearbox front cover. Clean the contact surfaces of the gearbox front cover and the gearbox housing.
3. Remove the oil seal from the gearbox front cover.

Installing gearbox front cover oil seal

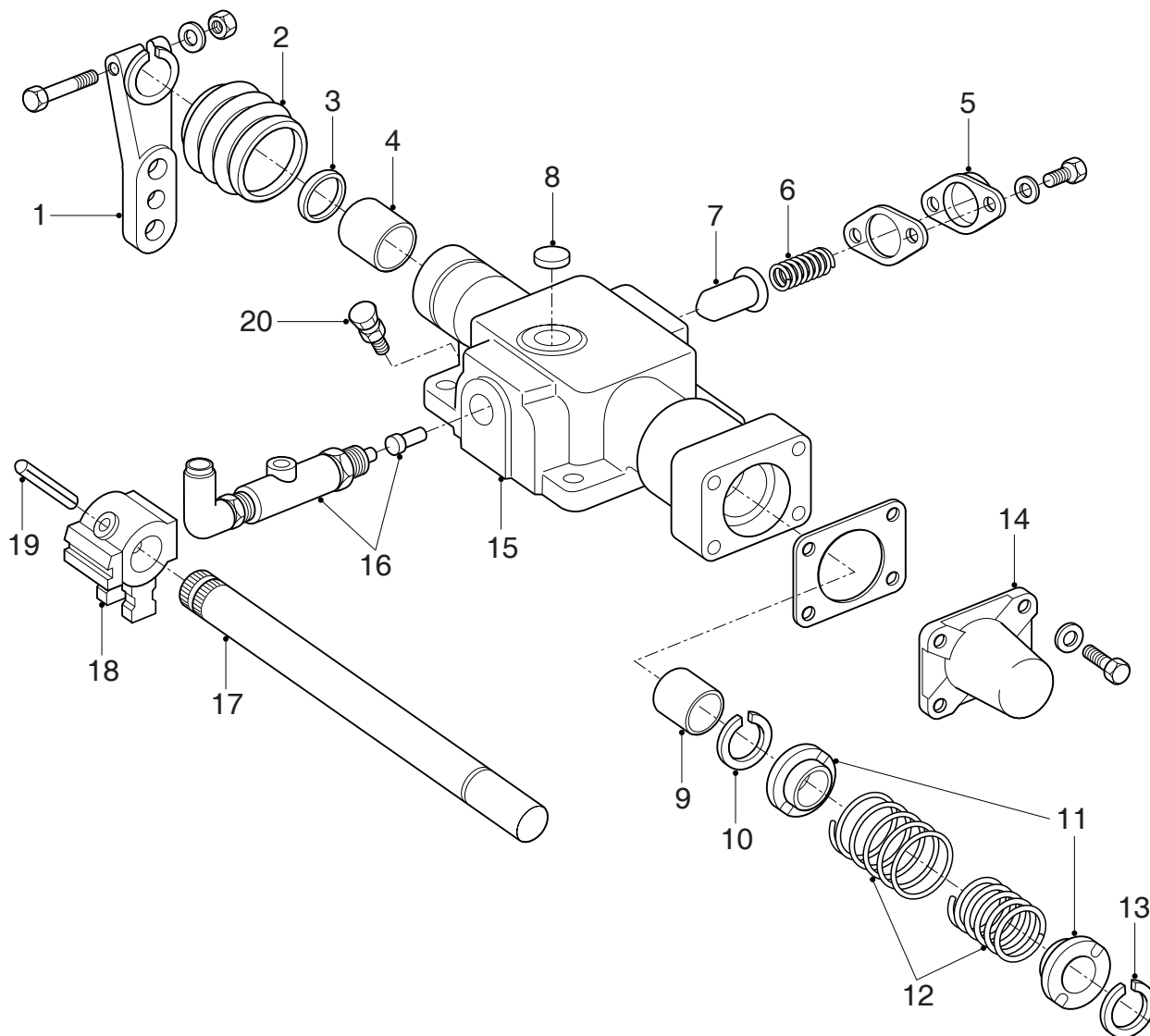
1. Fit the seal in the gearbox front cover using special tool (DAF no. 1329354).
2. Apply sealant to the contact surface of the gearbox front cover. Fit the gearbox front cover. Tighten the bolts to the specified torque. See "Technical data".
3. Fit the gearbox.



V301006

3.5 REMOVAL AND INSTALLATION, SELECTOR SHAFT OIL SEAL

Removing selector shaft oil seal

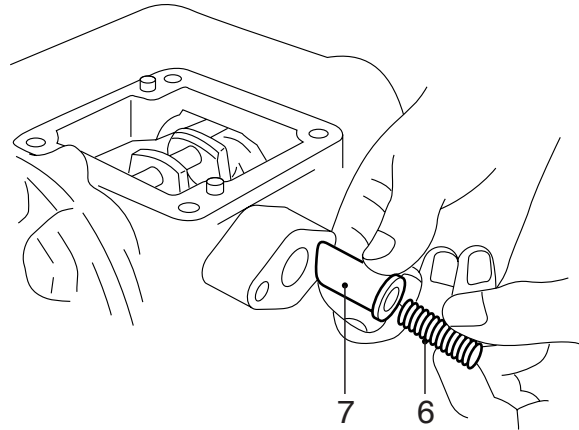


V3 00 475

1. Mark the position of the shifting arm (1) relative to the selector shaft (17).
2. Remove the selector shaft lever with the gearbox control attached to it. If necessary, disconnect the torque rod.
3. Remove the rubber sleeve (2).
4. Drain the air reservoirs and remove the air connection from the selector shaft housing.
5. Remove the bleed control valve and pin (16).

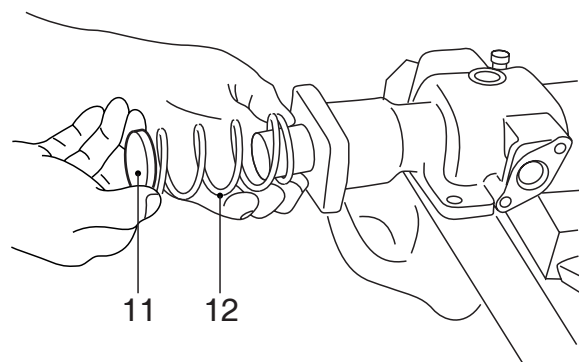
6

6. Remove the attachment bolts from the selector shaft housing (15) and remove it.
7. Place the housing in a soft-jawed vice.
8. Remove the retaining cover (5) and pull out the retaining spring (6) and pin (7).
9. Remove the bleeder (20).
10. Remove the end cover (14) and the spring clip (13).



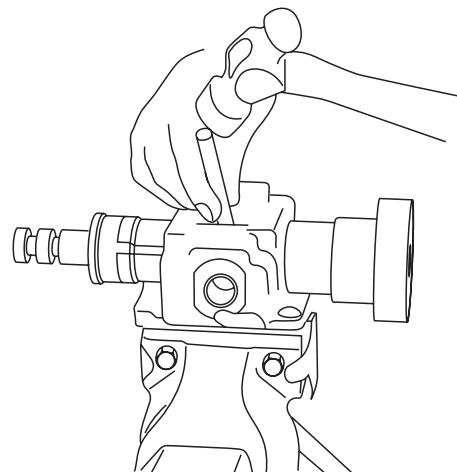
V3 00 547

11. Remove the spring holders (11), the springs (12) and the spring clip (10).



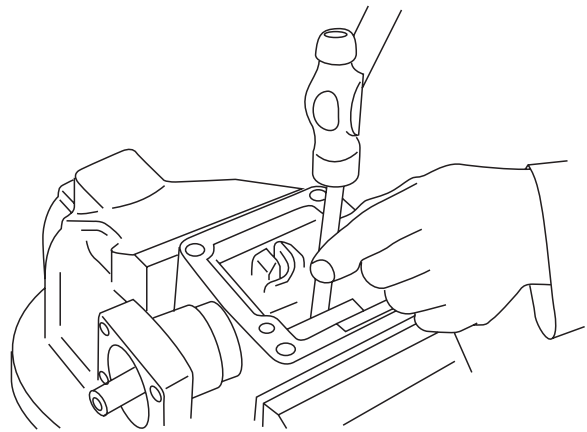
V3 00:506

12. Turn the selector shaft housing over and drive the plug (8) out of the housing.



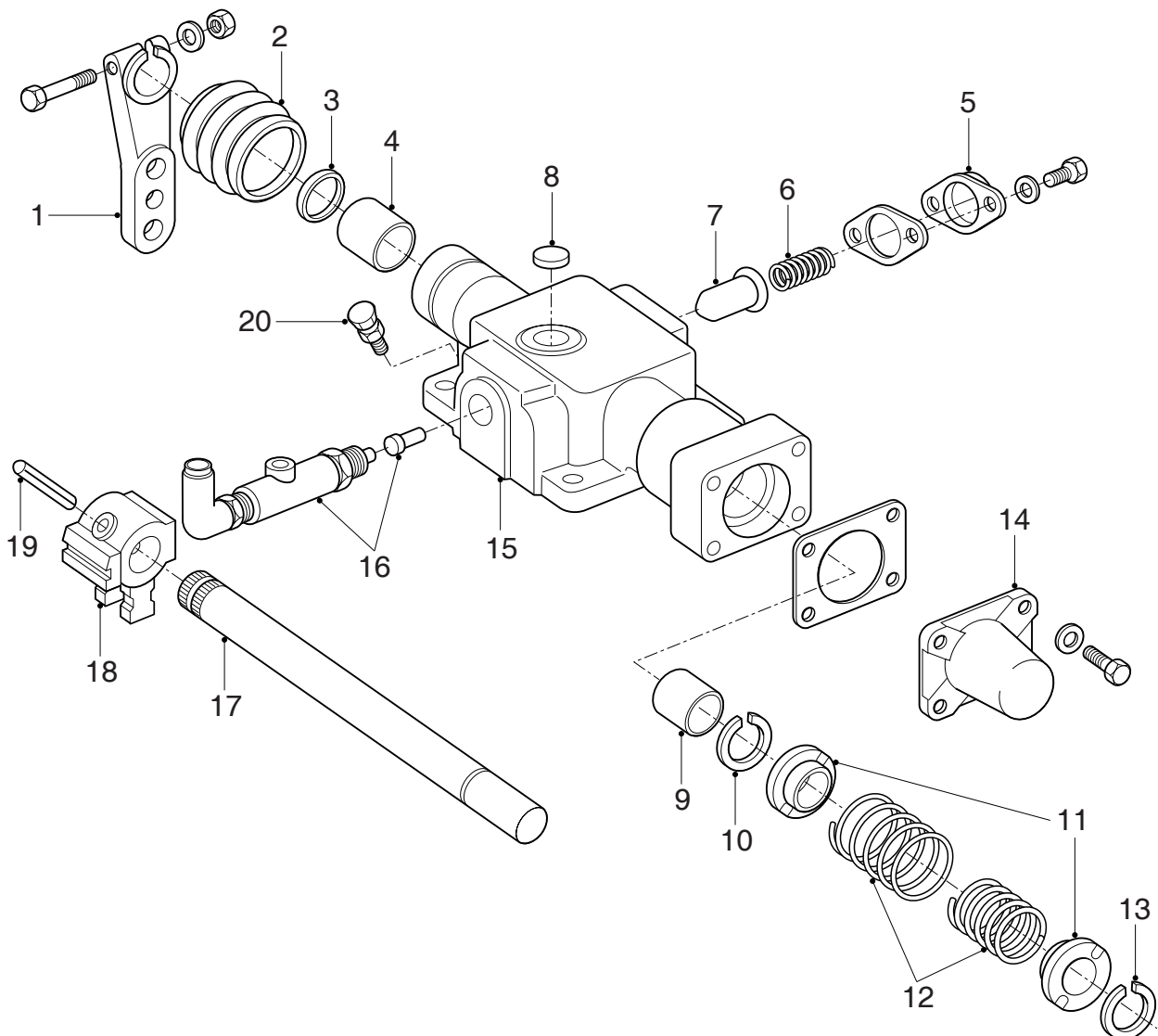
V3 00:497

13. Turn the selector shaft housing over and drive the pin (19) out of the selector finger (18) and selector shaft (17) via the plug opening. Remove the selector finger and the selector shaft.
14. Remove the oil seal (3) from the selector shaft housing. If necessary, the selector shaft bearing bushes (4) and (9) can now also be removed using a suitable puller.



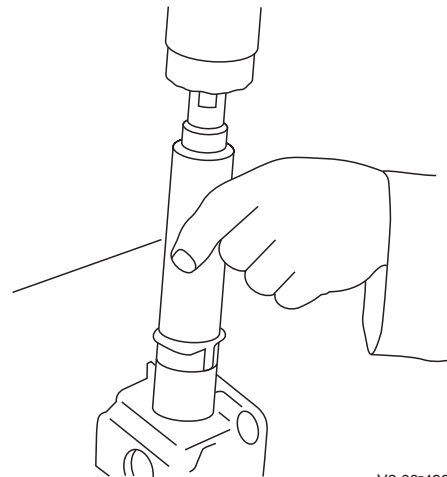
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Installing selector shaft oil seal



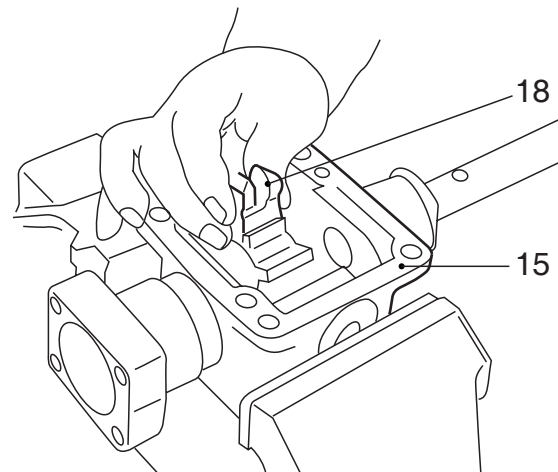
V3 00 475

1. Fit a new oil seal ring and, if necessary, new bushes (4) and (9) using special tool (DAF no. 1329352).
2. Place the selector finger (18) in the selector shaft housing (15) with the long groove and the hole for the pin (19) pointing towards the rear.



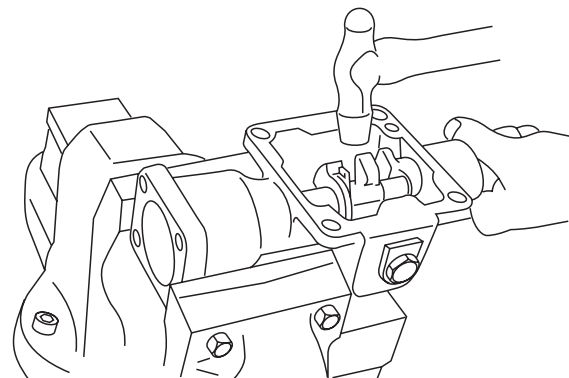
V3 00:498

3. Fit the selector shaft (17) into the selector shaft housing.



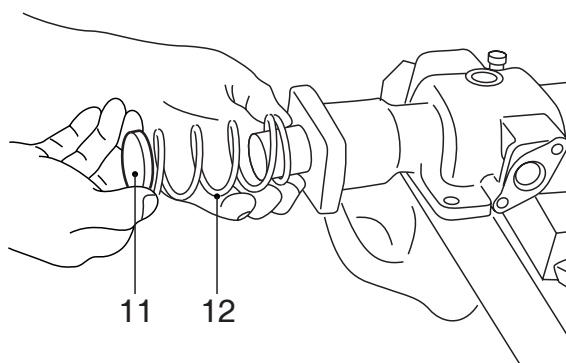
V3 00:501

4. Make sure that the holes in the selector finger and the selector shaft are aligned and fit a new pin (19).
5. Fit the spring clip (10) and a spring holder (11) onto the selector shaft.



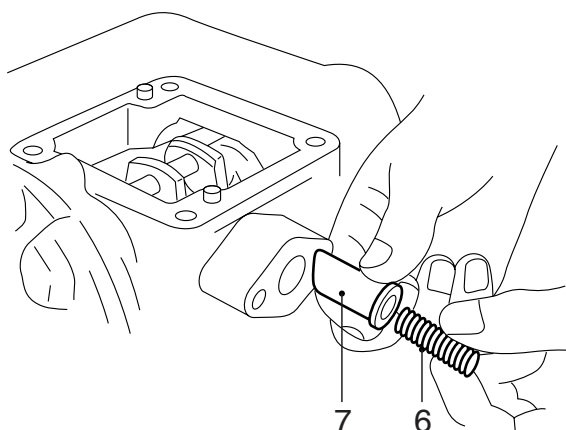
V3 00:514

6. Fit the springs (12), a spring holder (11) and the spring clip (10) onto the selector shaft.
7. Put a new gasket in the end cover (14) and attach the cover. Tighten the attachment bolts to the specified torque. See "Technical data".



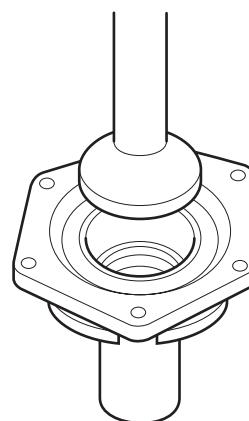
V3 00:506

8. Fit the retaining pin (6) and the retaining spring (7) and put a new gasket in the retaining cover (5) before fitting that as well. Tighten the attachment bolts to the specified torque. See "Technical data".
9. Fit the rubber sleeve (2).
10. Tighten the bleeder (20) to the specified torque. See "Technical data".
11. Fit the bleed control valve and pin (16) and tighten to the specified torque. See "Technical data".



V3 00 547

12. Fit the selector shaft housing onto the gearbox using the specified locking compound and tighten the attachment bolts to the specified torque. See "Technical data".
13. Install the shifting arm in the correct position on the selector shaft and tighten the lock nut to the specified tightening torque. See "Technical data".



V301006

4. DRAINING AND FILLING

4.1 DRAINING AND FILLING GEARBOX



To prevent skin injury, avoid unnecessary contact with the drained oil.

Draining gearbox

1. Place the vehicle on a level and horizontal surface.

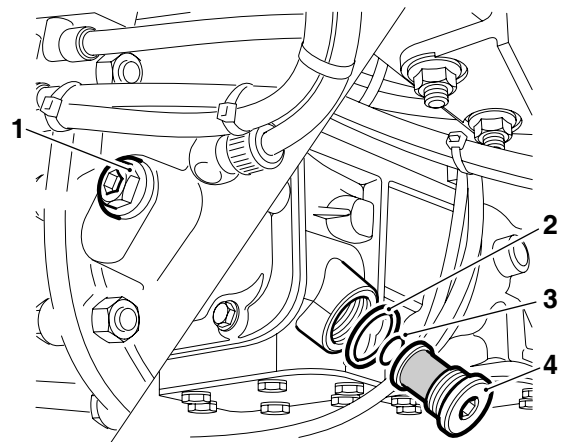
Note:

Drain the gearbox at operating temperature.

2. Remove the combined drain plug/oil strainer (4) and level check/filler plug (1) and drain the oil.
3. Clean the oil strainer (4) in a suitable solvent and dry thoroughly.

Filling gearbox

1. Check and replace the O-ring (3) and the sealing ring (2) if necessary.
2. Fit the combined drain plug/oil strainer, tightening it to the specified torque; see "Technical data".
3. Fill the oil through level check/filler opening (1) until the oil reaches the rim of the level check/filler opening.
4. Fit the level check/filler plug, tightening it to the specified torque; see "Technical data".



V3 00 376

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 System description	1-1	200508
2. DESCRIPTION OF COMPONENTS	2-1	200508
2.1 Selector lever	2-1	200508
2.2 Selector switch	2-2	200508
3. INSPECTION AND ADJUSTMENT	3-1	200508
3.1 Checking oil level	3-1	200508
3.2 Inspecting and adjusting selector cable	3-3	200508
4. REMOVAL AND INSTALLATION	4-1	200508
4.1 Removing and installing entire gearbox	4-1	200508
4.2 Removing and installing selector switch	4-3	200508
4.3 Removing and installing output shaft oil seal	4-5	200508
4.4 Removing and fitting selector shaft oil seal	4-6	200508
4.5 Removing and installing oil filters	4-8	200508
5. DRAINING AND FILLING	5-1	200508
5.1 Draining and filling gearbox	5-1	200508

1. GENERAL

1.1 SYSTEM DESCRIPTION

The Allison 1000 and 2000 series of automatic gearboxes are completely automatic, electronically controlled gearboxes. The automatic gearboxes have five forward gears and one reverse gear.

Design

The different gears are engaged by using three planetary systems and five lamella clutches driven by the electronic unit.

The electronic unit receives signals from the push-button selector block, the selector switch, the accelerator pedal and several speed sensors. On the basis of these signals the electronic unit computes the ideal switching moment.

The torque converter in the automatic gearbox is fitted with a "lock-up". Under certain circumstances the "lock-up" provides a rigid link between the pump and the turbine. As a result, slip losses from the torque converter are overcome. This results in lower fuel consumption.

Starting

To start the vehicle, the gearbox must be in the neutral position. If the gearbox is in a forward gear or in reverse, the vehicle cannot be started.

Faults

If the electronic unit in the automatic gearbox registers a fault, a warning will be activated.

If the vehicle is started during an active warning, the electronic unit will lock the automatic gearbox in the neutral position. The automatic gearbox will no longer respond to gear-lever movements from the neutral position.

If a fault occurs while driving, a warning is activated. The electronic unit decides whether the automatic gearbox:

- is locked in the gear in which the fault occurred;
- is restricted as regards changing up and down;
- ceases to respond to changes from the selector lever;
- ceases to respond to changes from the selector lever from the neutral position.

During a fault changes of direction may no longer be possible.

During a fault the vehicle can be brought to a halt in a safe place. When the ignition is switched off, the automatic gearbox is locked in the neutral position.

7

Towing

To tow a vehicle, the prop shaft must be detached at the rear axle. It is also possible to remove the axle shafts. As oil can be lost in this process, it must be avoided as much as possible owing to environmental concerns.



Towing the vehicle without taking the above into consideration may lead to serious damage to the gearbox.

2. DESCRIPTION OF COMPONENTS

2.1 SELECTOR LEVER

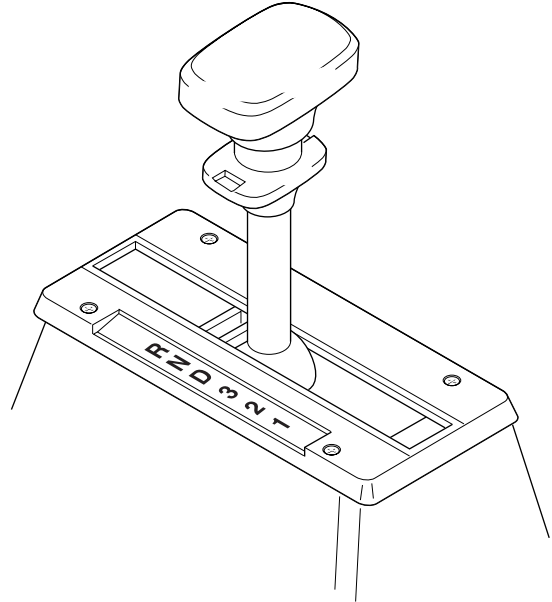
The various gears of the automatic gearbox are selected using the selector lever. The selector lever has four positions for the forward gears (1, 2, 3 and D), a neutral position (N) and a reverse position (R).

The neutral position (N) is the usual position for starting and stopping the engine and for longer stationary periods when the engine is idling. The gearbox must not be put in the neutral position when driving.

In the drive position (D) the gearbox automatically changes up and down in all forward gears.

In positions (1), (2) and (3) the gearbox changes up as far as the selected gear. These positions can be used to keep the engine in the correct rev band or to obtain maximum engine brake performance.

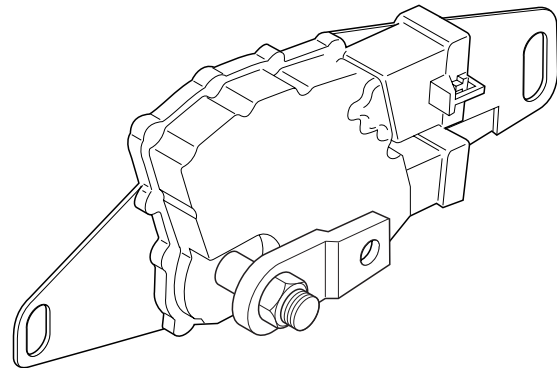
To reverse, the selector lever must be in the (R) position. A warning signal is also activated when reversing.



V3 00 593

2.2 SELECTOR SWITCH

The selector switch is mounted on the gearbox housing. The selector switch communicates the selector shaft angular displacement to the ECU. Before the vehicle can be started, the electronic unit must receive a signal from the selector switch confirming that the automatic gearbox is in neutral.



V3 00 557

3. INSPECTION AND ADJUSTMENT

3.1 CHECKING OIL LEVEL

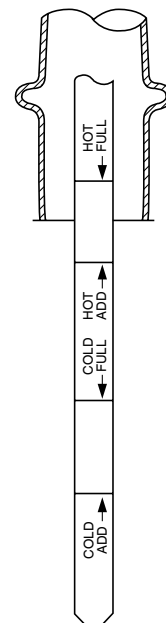
Checking cold oil level

1. Place the vehicle on a flat and level surface and apply the parking brake.
2. Make sure the gearbox is in neutral and allow the engine to idle for several minutes.
3. Apply the service brake, switch the gearbox to **D**, then to **N** and finally switch the gearbox to **R**. The purpose of this is to fill the hydraulic system.
4. Switch the gearbox to the neutral position and release the service brake.
5. Remove the dipstick when the engine is idling and wipe it clean with a lint-free cloth.

Note:

To take the dipstick out of the holder, the sealing cap must be held while the dipstick is turned anti-clockwise.

6. Put the dipstick back.
7. Remove the dipstick and check the oil level. The oil level should be between the "Cold add" and "Cold full" marks.
8. Clean the dipstick with a lint-free cloth and put it back.
9. Remove the dipstick and check the oil level again.
10. Oil needs to be added when the oil level is below the "Cold add" mark.
11. Check the oil level in the gearbox at operating temperature.



W 3 03 099

Checking hot oil level

1. Bring the gearbox up to operating temperature (approx. 71°C - 93°C).
2. Remove the dipstick when the engine is idling and wipe it clean with a lint-free cloth.

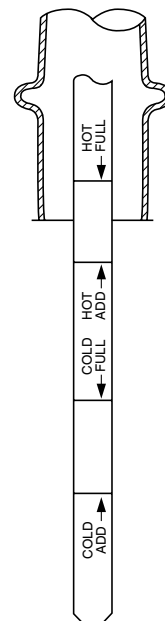
Note:

To take the dipstick out of the holder, the sealing cap must be held while the dipstick is turned anti-clockwise.

3. Put the dipstick back.
4. Remove the dipstick and check the oil level.
5. Remove the dipstick and check the oil level. The oil level should be between the "Hot add" and "Hot full" marks.
6. Clean the dipstick with a lint-free cloth and put it back.
7. Remove the dipstick and check the oil level again.
8. Oil needs to be added when the oil level is below the "Hot add" mark.
9. Oil needs to be drained when the oil level is above the "Hot full" mark.

Note:

The oil level must be checked at least twice. When there are differences between the measurements, check the bleeder for clogging.



W 3 03 099

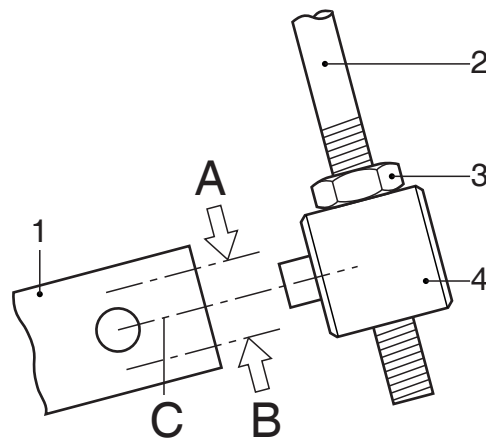
3.2 INSPECTING AND ADJUSTING SELECTOR CABLE

Inspecting selector cable

1. Check that the selector cable has been fitted to the selector arm so that the connecting pin can move freely in every gear. If necessary, adjust the selector cable.

Adjusting selector cable

1. Chock the wheels so that the vehicle cannot roll.
2. Position the selector lever in neutral.
3. Remove the selector cable (2) from the selector arm (1), if applicable.
4. Unscrew the lock nut (3) from the connecting pin (4).
5. Determine the central position (C) of the connecting pin by first pushing the selector cable in (A) and then pulling it out (B). Mark the limit positions of the connecting pin.
6. Move the connecting pin so that when in the central position (C) it is level with the bore in the selector arm.
7. Tighten the lock nut of the connecting pin.
8. Install the connecting pin in the selector arm bore and tighten the lock nut to the specified torque. See "Technical data".
9. Check in every gear that the positions of the selector lever in the cab correspond precisely to the selected gear.



V3 00 483

4. REMOVAL AND INSTALLATION

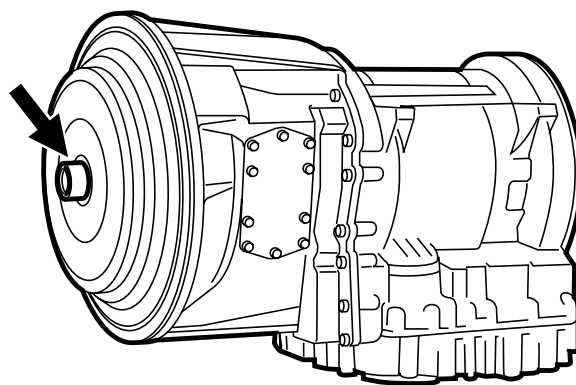
4.1 REMOVING AND INSTALLING ENTIRE GEARBOX

Removing gearbox assembly

1. Drain the gearbox. See "Draining and filling".
2. If necessary, remove the oil filler pipe to avoid damage.
3. Remove the oil pipes from and to the oil cooler.
4. Plug the external oil pipes after removing and/or detaching them to prevent dirt entering the oil system.
5. Disconnect the gearbox wiring harness connectors and secure the wiring harness. Plug the openings.
6. Remove the selector cable.
7. Remove the prop shaft.
8. See what is best for gearboxes with PTO: remove the PTO from the gearbox, disconnect the hydraulic pipes from the pump or remove the prop shaft, if fitted.
9. Remove the gearbox from the engine.

Installing gearbox assembly

1. When installing the gearbox, apply a small amount of grease to the nose of the torque converter to prevent noise after fitting. See "Technical data".
2. If necessary, fit the PTO.
3. Fit the prop shaft.
4. Fit the wiring harness connectors.
5. Fit the oil pipes from and to the oil cooler.
6. Fit and adjust the selector cable. See "Inspection and adjustment".
7. If necessary, fit the oil filler pipe.
8. Fill the gearbox; see "Draining and filling".



4.2 REMOVING AND INSTALLING SELECTOR SWITCH

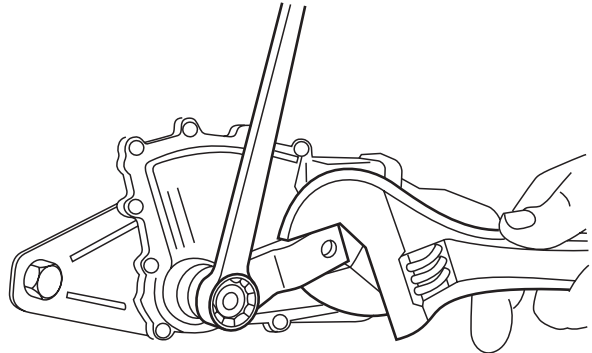
Removing selector switch

1. Remove the selector cable from the selector arm.
2. Remove the attachment nut from the selector shaft.



The selector shaft must not be turned while the attachment nut is being loosened or tightened. While loosening or tightening the attachment nut, lock the selector shaft using the selector arm and an appropriate tool.

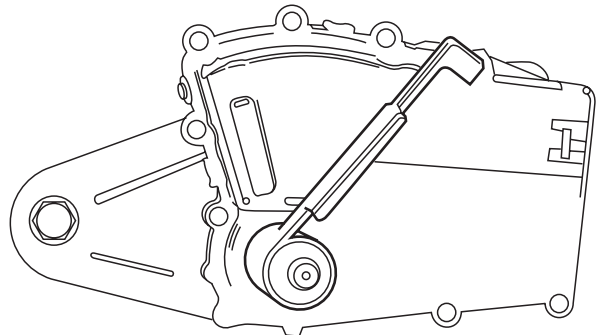
3. Remove the selector arm.
4. Remove the connectors from the selector switch.
5. Take the attachment bolts out of the selector switch and remove it.



V3 00 482

Fitting selector switch

1. Put the selector shaft in the neutral position. See the marks on the gearbox housing.
2. Put the selector switch in the neutral position using special tool (DAF no. 1451992).
3. Fit the selector switch, together with the special tool, over the selector shaft and onto the gearbox housing.
4. Install the selector switch attachment bolts and tighten them to the specified torque. See "Technical data".
5. Fit the selector arm onto the selector shaft and tighten the attachment nut to the specified torque. See "Technical data".



V3 00 481

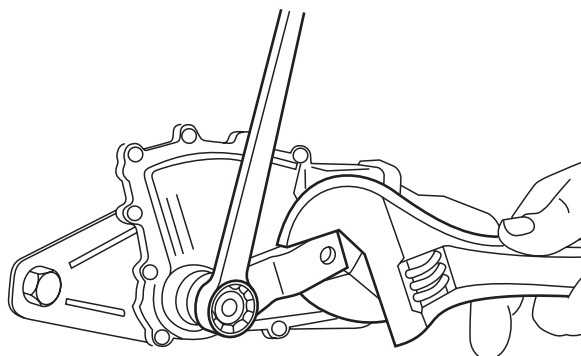


The selector shaft must not be turned while the attachment nut is being loosened or tightened. While loosening or tightening the attachment nut, lock the selector shaft using the selector arm and an appropriate tool.

6. Fit the selector cable into the selector arm.

Note:

The attachment of the selector cable must be fitted so that the connecting pin can move freely in every gear.



V3 00 482

4.3 REMOVING AND INSTALLING OUTPUT SHAFT OIL SEAL

Removing output shaft oil seal

1. Chock the wheels so that the vehicle cannot roll.
2. Loosen the prop shaft and hang the shaft so that it does not interfere with the operations.
3. Take the attachment bolt out of the drive flange and remove the drive flange.
4. Drill two holes in the external cover of the oil seal and turn special tool (DAF no. 0484899) into the oil seal. Pull the oil seal out of the gearbox housing using special tool (DAF no. 0694928).

Installing output shaft oil seal

1. Fit the new oil seal as far as possible into the gearbox housing using special tool (DAF no. 1240037).
2. Check the prop shaft at the level of the oil seal for irregularities and wear.

Note:

Slight irregularities can be smoothed using fine sandpaper.

3. Lightly lubricate the prop shaft at the level of the oil seal with clean gearbox oil.
4. Fit the prop shaft and tighten the attachment bolt to the specified torque. See "Technical data".

4.4 REMOVING AND FITTING SELECTOR SHAFT OIL SEAL

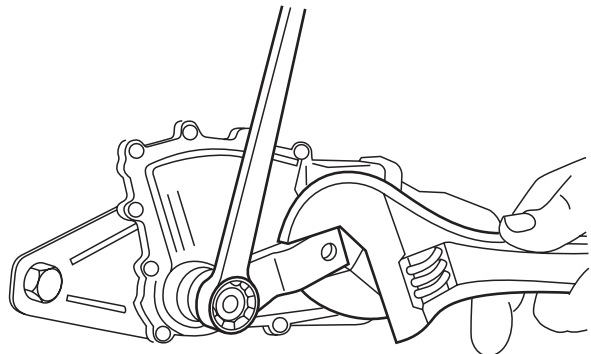
Removing selector shaft oil seal

1. Put the gearbox selector lever in the neutral position.
2. Remove the selector cable from the selector switch.
3. Remove the attachment nut from the selector shaft.



The selector shaft must not be turned while the attachment nut is being loosened or tightened. While loosening or tightening the attachment nut, lock the selector shaft using the selector arm and an appropriate tool.

4. Remove the selector switch.

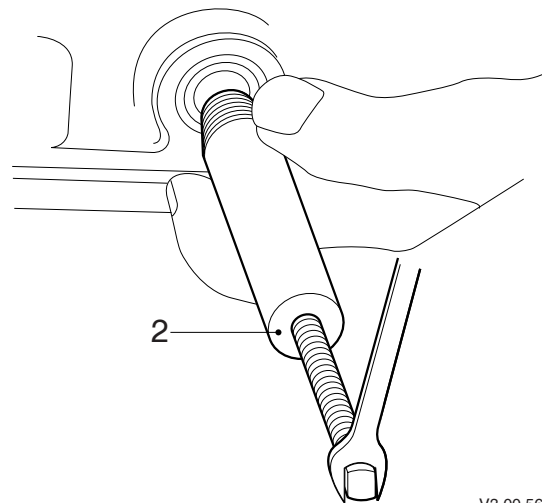


V3 00 482

5. Fit special tool (DAF no. 1453124) over the selector shaft and turn it into the oil seal.
6. Tighten the nut on the special tool (2) and remove the oil seal from the selector shaft bush.
7. Check the selector shaft bush and the selector shaft for irregularities and wear.

Note:

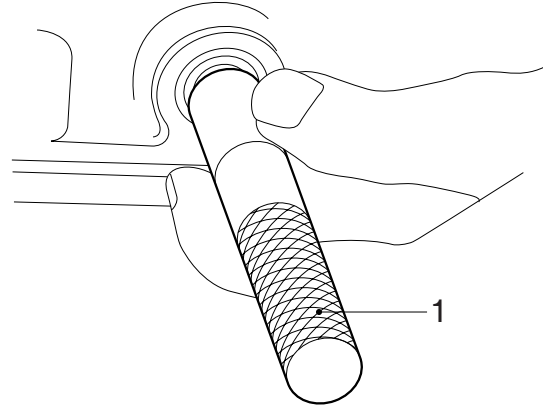
Slight irregularities can be smoothed using fine sandpaper.



V3 00 560

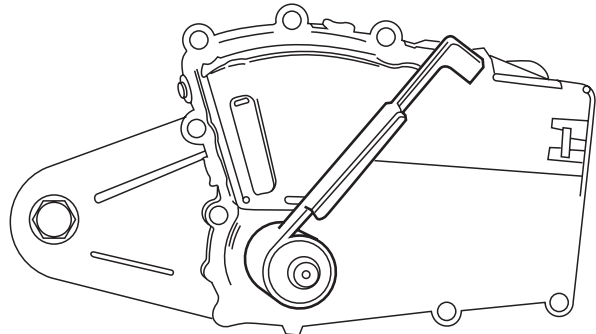
Fitting the selector shaft oil seal

1. Lightly lubricate lip of the oil seal with clean gearbox oil.
2. Fit the oil seal on the special tool (DAF no. 1453125).
3. Fit the oil seal as far as possible into the gearbox housing and remove the special tool (1).



V3 00 561

4. Fit the selector switch using special tool (DAF no. 1451992).



V3 00 481

5. Fit the selector arm onto the selector shaft and tighten the attachment nut to the specified torque. See "Technical data".

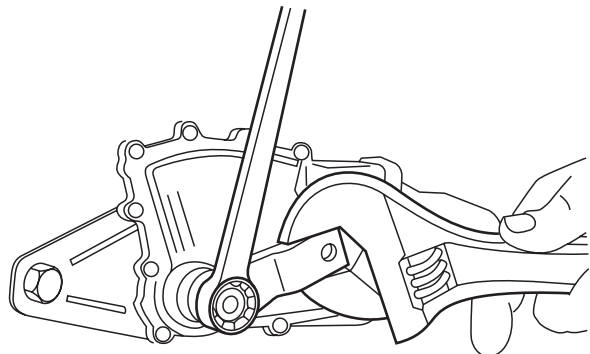


The selector shaft must not be turned while the attachment nut is being loosened or tightened. While loosening or tightening the attachment nut, lock the selector shaft using the selector arm and an appropriate tool.

6. Fit the selector cable into the selector arm.

Note:

The attachment of the selector cable must be fitted so that the connecting pin can move freely in every gear.



V3 00 482

4.5 REMOVING AND INSTALLING OIL FILTERS

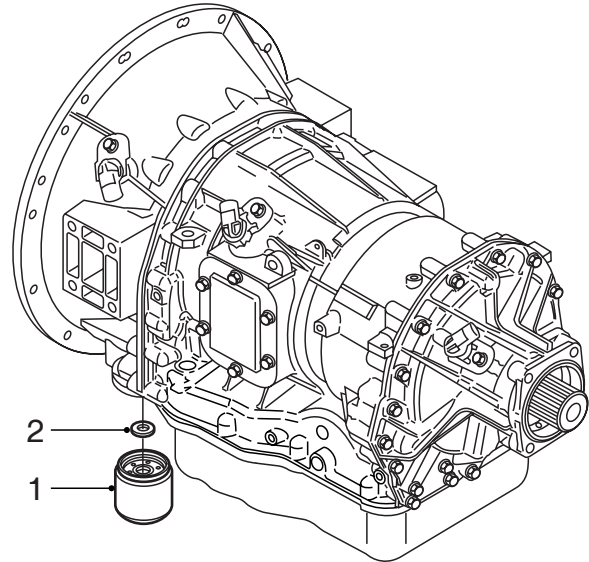
Removing oil filters

1. Clean the oil filters (1) and (5) and the surrounding area.
2. Loosen the oil filters on the gearbox and the heat exchanger.
3. Remove the magnetic rings (2) and (4) and check them for wear particles.

Note:

If there are large wear particles in the wear swarf, this indicates excessive wear in the gearbox and the cause must be ascertained.

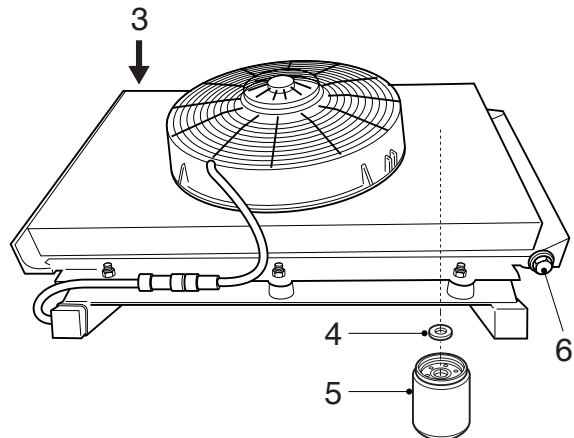
4. Clean the magnetic rings and the contact surfaces on the gearbox housing and the heat exchanger.



V3 00 480

Installing oil filters

1. Fit the magnetic rings (2) and (4) on the gearbox housing and the heat exchanger.
2. Lightly lubricate the new oil filters (1) and (5) with clean gearbox oil and place the oil filters on the gearbox and heat exchanger.
3. Tighten the oil filters until they touch the contact surface. Manually tighten the oil filters another 360°.
4. Check the oil level. See "Inspection and adjustment".



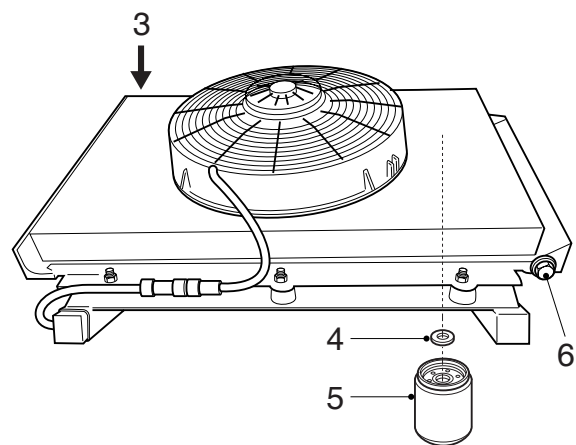
V3 00 556

5. DRAINING AND FILLING

5.1 DRAINING AND FILLING GEARBOX

Draining gearbox

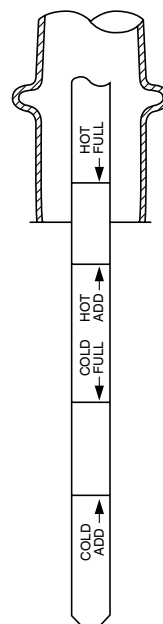
1. Bring the gearbox to operating temperature (approx. 71°C - 93°C) so that the oil can be drained more quickly and more completely.
2. Place the vehicle on a level and horizontal surface.
3. Remove the drain plug from the gearbox oil sump.
4. Remove the drain plug (6) from the heat exchanger and loosen the bleed screw (3).
5. Remove the oil filters. See "Removal and installation".



V3 00 556

Filling gearbox

1. Clean the drain plugs, provide them with new sealing rings and fit them, tightening to the specified torque. See "Technical data".
2. Fill the gearbox through the dipstick holder with the specified quantity of oil; see "Technical data".
3. Start the engine and run it at idling speed.
4. If only gearbox oil escapes, tighten the bleed screw (3) to the specified torque. See "Technical data".
5. While the engine is idling, add gearbox oil until the oil level is between the "Cold add" mark and the "Cold full" mark.
6. Check the oil level. See "Inspection and adjustment".



W 3 03 099

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 General ..	1-1	200508
1.2 System description	1-2	200508
2. DESCRIPTION OF COMPONENTS	2-1	200508
2.1 Automatic gearbox selector keypad	2-1	200508
3. INSPECTION AND ADJUSTMENT	3-1	200508
3.1 Checking automatic gearbox oil level	3-1	200508
3.2 Checking oil level with selector keypad	3-3	200508
4. REMOVAL AND INSTALLATION	4-1	200508
4.1 Removal and installation, gearbox assembly	4-1	200508
4.2 Removing and installing output shaft oil seal	4-3	200508
4.3 Removal and installation, oil filters	4-5	200508
5. DRAINING AND FILLING	5-1	200508
5.1 Draining and filling gearbox	5-1	200508

1. GENERAL

1.1 GENERAL

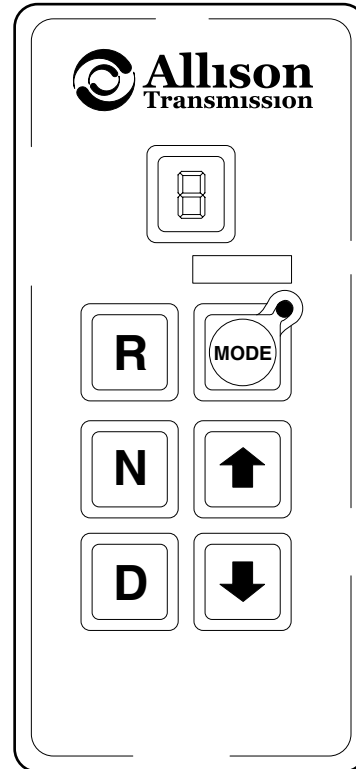
The Allison transmission is electronically controlled and has a diagnostics system that can record any faults in the memory of the ECU (Electronic Control Unit). The faults can be read at a later date. The system is operated and the faults are read via the selector keypad.

This selector has a display and is located immediately next to the driver's seat. The selector replaces the gear lever with manually operated gearboxes.

Type designation:

Example MD3060 P

MD	Medium Duty
3	Gearbox series
0	Transmission ratios occurring in quick succession
6	Number of gears possible
0	Modification number
P	PTO version



V300392

1.2 SYSTEM DESCRIPTION

"Gearbox" warning symbol

When the vehicle ignition is switched on, the "gearbox" warning symbol will not appear on the DIP display.

If the gearbox symbol in the main display lights up, there is a fault in the gearbox (changing gear) or the temperature of the gearbox oil is too high. The "gearbox" warning symbol in the DIP will then be displayed in yellow. The selector keypad LED will also flash three times. The accompanying fault code can be read on the selector display.



The ECU will block the functions of the selector and the gearbox will select a "safe gear" for the gearbox. It is important to drive the vehicle to a safe place as soon as possible and switch the ignition off. It will no longer be possible to shift the gearbox to neutral. The ECU will prevent this.

After approximately 30 seconds start the engine again and shift the gearbox. If the fault is one whereby the gearbox must in no circumstances be shifted, the ECU will no longer shift the gearbox.

The warning symbol in the display of the DIP will then appear in red. The "STOP" warning indicator will also light up.

Driving is therefore no longer possible!

If the fault is one whereby the gearbox may still be shifted, the warning in the main display will disappear. The ECU will have recorded the fault as an inactive fault.

It is now possible to drive the vehicle again, though the fault will still need to be remedied. In this situation, however, it is no longer possible to shift gears.

Gearbox oil temperature

If when driving the gearbox warning lamp lights up in the main display, this may mean that the gearbox oil has reached the maximum temperature of 121°C.

In this situation, the ECU limits gearbox shifting to the first four gears.

It is important to drive to a safe place as soon as possible and let the engine idle in neutral at an increased idling speed.

As a result, the cooling system of the engine will try to cool the gearbox oil.

If after approximately two minutes the warning in the master display has not disappeared, the engine must be turned off and contact made with the nearest DAF dealer.

Use of the engine brake

When the engine brake is operated in third or a higher gear, the ECU will change down to second gear as soon as the engine speed permits so as to get the maximum braking effect from the engine brake.

On the selector display, the second gear selected by the ECU is displayed.

Towing the vehicle

To tow the vehicle, the prop shaft must be detached at the rear axle.

It is also possible to remove the axle shafts. As oil can be lost in this process, it must be avoided as much as possible owing to environmental concerns.



Towing the vehicle without taking the above into consideration may lead to serious damage to the gearbox.

2. DESCRIPTION OF COMPONENTS

2.1 AUTOMATIC GEARBOX SELECTOR KEYPAD

The selector has the following functions:

- activating and deactivating the gearbox
- choosing a shift program
- reading the oil level
- reading and deleting fault codes

The selector has the following six keys:

Neutral	Neutral position
Drive	Automatic forward drive
Reverse	Reverse
MODE	Shift program selection
↓	Shifting up
↑	Shifting down

Display shows "N"

Highest gear

Display shows "R"

Normal or economy (LED on) program

Display shows the gear selected

Display shows the gear selected

Neutral position

No gear is activated in the "N" position. The vehicle is **not** locked in this position and can therefore roll.

Use the parking brake to lock the vehicle.

"N" appears on the display.

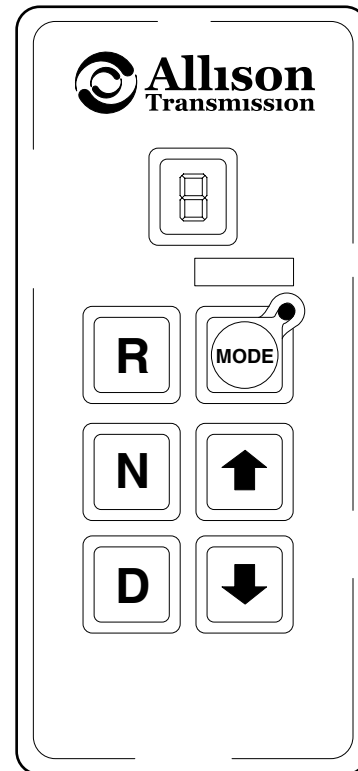
Automatic forward drive

If the "D" position is selected, the vehicle will immediately begin to move (if the brake system is at pressure and the vehicle is not on the parking brake). It is therefore advisable to depress the brake pedal before selecting position "D". In this position, the gearbox can automatically change up to the highest gear.

The highest gear that the gearbox can change up to is shown on the display.

Reverse

If position "R" is chosen, the vehicle will also be immediately set in motion. First depress the brake pedal and then select position "R". "R" appears on the display.



V300392

Shift program selection

By pressing the "MODE" key briefly once, another shift program can be selected from a stationary as well as a driving position. Two selections are possible:

Normal program

This program is chosen automatically when the vehicle ignition has been switched off. No report is displayed. This program allows the gearbox to shift gears as and when necessary so that driving at higher speeds is possible. This can be desirable on unpaved terrain.

Economy program

The LED lights up on the selector display. This program will in general change gear at somewhat lower engine speeds. This results in more economical fuel consumption.

↓ Shifting down

After selecting the "D" key and when the vehicle is driving, this key can be used to keep the gearbox in a lower gear. The selected gear is shown in the display. The gearbox will not change up further until the "↑" or "D" key is pressed. The number of gears that can be used will appear in the display.

↑ Shifting up

This key is used to change up to a higher gear. However, this is only possible after previously selecting to stay in a low gear.

Faults

If the oil level indicator cannot give the correct oil level, one of the following codes will appear in the display.

OL - 50	Engine speed too low
OL - 59	Engine speed too high
OL - 65	Gearbox is not in neutral
OL - 70	Gearbox oil temperature too low
OL - 79	Gearbox oil temperature too high
OL - 89	Output shaft is not stationary (handbrake)
OL - 95	Oil level indicator is defective

The oil level reading function can be left by pressing "D", "N", or "R".

Note: the function cannot be left by pressing the arrow keys again, as this prompts the diagnostic code reading function. All diagnostic codes are preceded by the letter D followed by a number between 1 and 5. In this function, important fault codes could be deleted from the memory by an unqualified user.

3. INSPECTION AND ADJUSTMENT

3.1 CHECKING AUTOMATIC GEARBOX OIL LEVEL

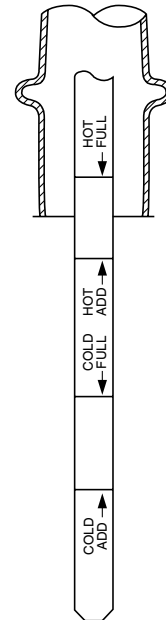
Checking cold oil level

1. Place the vehicle on a flat and level surface.
2. Make sure that the gearbox is in neutral and allow the engine to run for several minutes.
3. Apply the service brake, switch the gearbox to **D**, then to **N** and finally switch the gearbox to **R**. The purpose of this is to fill the hydraulic system.
4. Switch the gearbox to the parking position and release the service brake.
5. Remove the dipstick when the engine is idling and wipe it clean with a lint-free cloth.

Note:

To take the dipstick out of the holder, the sealing cap must be held while the dipstick is turned anti-clockwise.

6. Put the dipstick back.
7. Remove the dipstick and check the oil level. The oil level should be between the "Cold add" and "Cold full" marks.
8. Clean the dipstick with a lint-free cloth and put it back.
9. Remove the dipstick and check the oil level again.
10. Oil needs to be added when the oil level is below the "Cold add" mark.
11. Check the oil level in the gearbox at operating temperature.



W 3 03 099

Checking hot oil level

1. Bring the gearbox up to operating temperature (approx. 71°C - 93°C).
2. Remove the dipstick when the engine is idling and wipe it clean with a lint-free cloth.

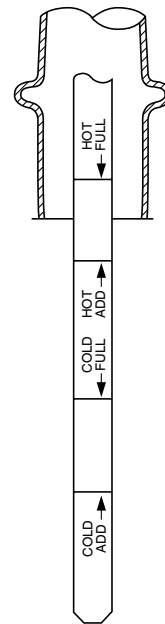
Note:

To take the dipstick out of the holder, the sealing cap must be held while the dipstick is turned anti-clockwise.

3. Put the dipstick back.
4. Remove the dipstick and check the oil level.
5. The oil level should be between the "Hot add" and "Hot full" marks.
6. Clean the dipstick with a lint-free cloth and put it back.
7. Remove the dipstick and check the oil level again.
8. Oil needs to be added when the oil level is below the "Hot add" mark.
9. Oil needs to be drained when the oil level is above the "Hot full" mark.

Note:

The oil level must be checked at least twice. When there are differences between the measurements, check the bleeder for clogging.



W 3 03 099

3.2 CHECKING OIL LEVEL WITH SELECTOR KEYPAD

Checking oil level with selector keypad

1. Place the vehicle on a flat and level surface and apply the parking brake.
2. Put the gearbox in the neutral position and bring the gearbox to operating temperature (approx. 71° - 93°C).
3. Run the engine at idling speed for 2 minutes.
4. Press both arrow keys on the selector keypad simultaneously. The display now shows the letters **O** and **L**.

Note:

O and **L** stand for **Oil Level**

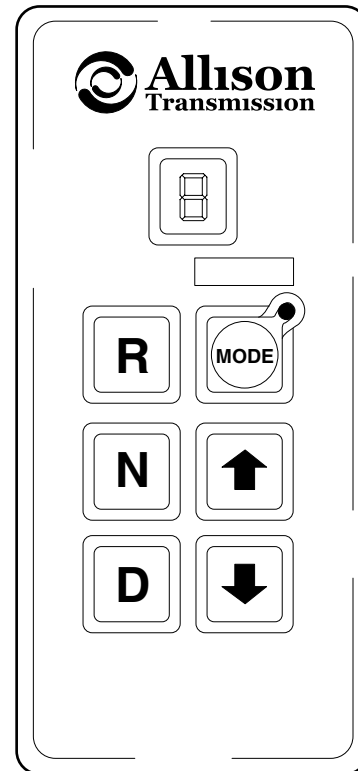
5. When the oil level is correct, the letters **O - K** appear on the display.
When the oil level is too high, this is indicated by **HI** followed by the number of litres in excess.
When the oil level is too low, this is indicated by **LO** followed by the number of litres lacking.

Example

LO-02 means that two litres have to be added.

HI-03 means that three litres have to be drained.

6. Press the **N** key to exit the system.



V300392

4. REMOVAL AND INSTALLATION

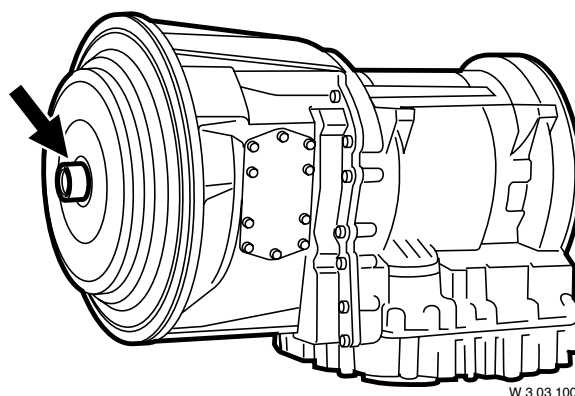
4.1 REMOVAL AND INSTALLATION, GEARBOX ASSEMBLY

Removing gearbox assembly

1. **Note:**
Before the gearbox can be removed, the gearbox oil must be drained.
2. If necessary, remove the oil filler pipe to avoid damage.
3. Plug the external oil pipes after removing and/or detaching them to prevent dirt entering the oil system.
4. Disconnect the gearbox wiring harness connectors and secure the wiring harness. Plug the openings.
5. Remove the prop shaft.
6. See what is best for gearboxes with PTO: remove the PTO from the gearbox, disconnect the hydraulic pipes from the pump or remove the prop shaft, if fitted.
7. Remove the gearbox from the engine.

Installing gearbox assembly

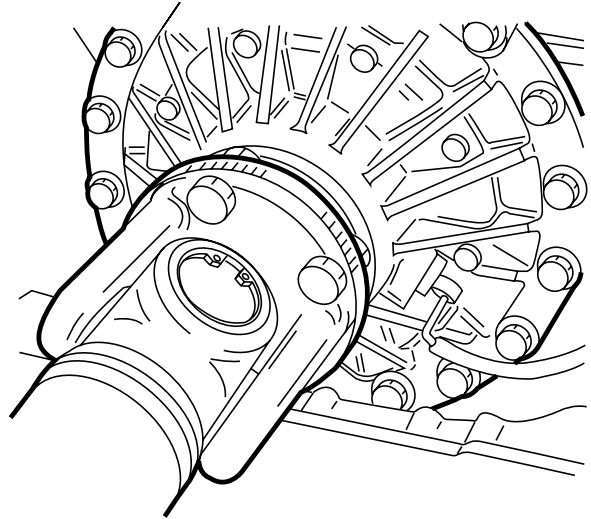
1. When installing the gearbox, apply a small amount of grease to the nose of the torque converter to prevent noise after fitting. See "Technical data".
2. Fit the gearbox attachment bolts all around. Tighten the attachment bolts to the specified torque. See "Technical data".
3. Install the PTO. Tighten the attachment bolts to the specified torque. See "Technical data".
4. If necessary, fit the hydraulic pipes and/or prop shaft. Tighten the attachment bolts to the specified torque. See "Technical data".
5. Fit the prop shaft.
6. Fit the wiring harness connectors.
7. Fit the external oil pipes. Tighten the pipes to the specified torque; see "Technical data".
8. If necessary, fit the oil filler pipe.
9. Fill the gearbox with oil and check the oil level.



4.2 REMOVING AND INSTALLING OUTPUT SHAFT OIL SEAL

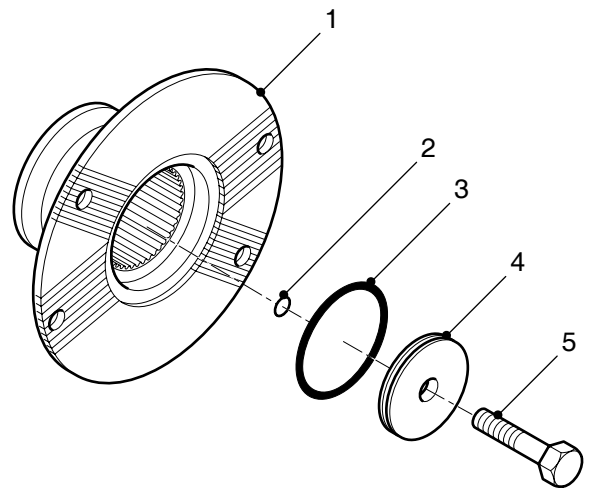
Removing output shaft oil seal

1. Remove the prop shaft and secure it so that it does not interfere with further operations.



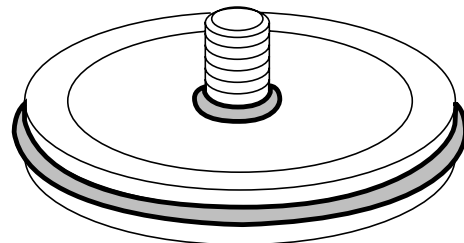
W 3 03 061

2. Unscrew the attachment bolt (5) of the flange without removing it from the locking plate.



V300529

3. Remove the bolt and locking plate from the flange.
Pay attention to the sealing rings on the outer circumference and on the inside of the locking plate.



V300559

4. Slide the flange off the output shaft or, if necessary, use a tripod puller to pull it off the shaft.
5. Drill two holes in the external cover of the oil seal and turn special tool (DAF no. 0484899) into the oil seal. Pull the oil seal out of the gearbox housing using special tool (DAF no. 0694928).

Installing output shaft oil seal

1. Apply a small amount of liquid gasket to the outside of oil seals fitted with a steel cover. Apply a small amount of green soap to the outside of oil seals fitted with a rubber cover.
2. Fit the oil seal in the gearbox housing using special tool (DAF no. 1240037).
3. Apply a small amount of grease to the oil seal lips and slide the flange over the output shaft until it abuts.
4. Fit new sealing rings (2, 3) to the locking plate and fit it with the attachment bolt to the flange (apply a small amount of grease to the sealing rings).

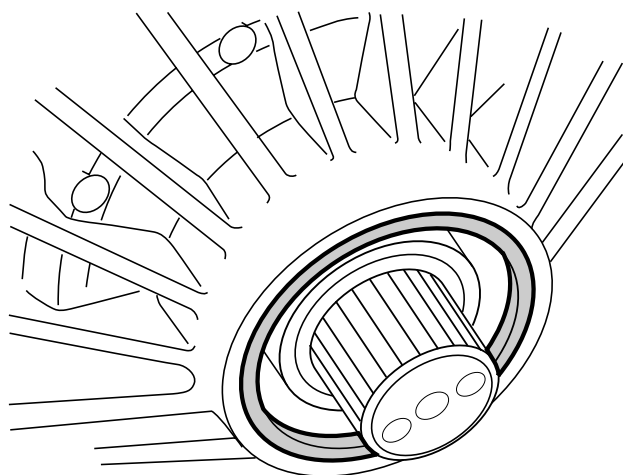
Note:

The attachment bolts on the new gearboxes are no longer secured by a locking plate, but by the self-locking screw thread in the output shaft.

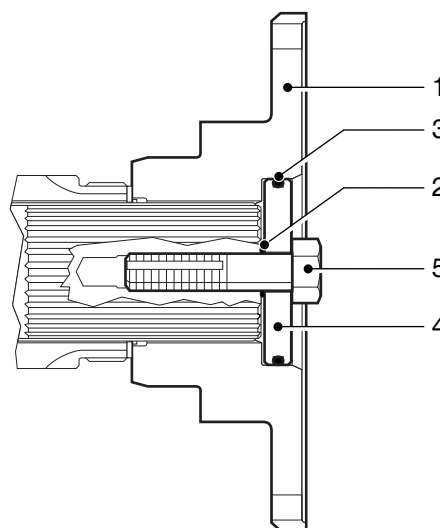
5. Hold the prop shaft flange in place with the special tool (DAF no. 0484977).
6. Tighten the attachment bolt (5) to the specified torque. See "Technical data".



If the locking plate is not tightened to the specified torque, there is a risk of it getting bent during fitting, which could lead to serious oil leakage.



W 3 03 062



V300530

4.3 REMOVAL AND INSTALLATION, OIL FILTERS



To prevent skin injury, avoid unnecessary contact with the drained oil.

Allison MD 3060 automatic gearbox

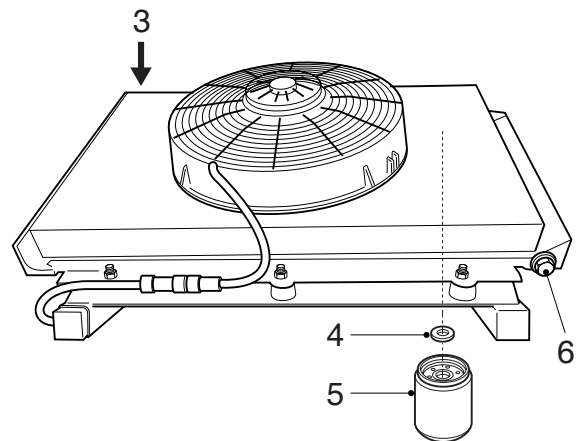
Removing oil cooler oil filter

1. Clean the oil filter (5), if fitted, and the surrounding area.
2. Loosen the oil filter on the heat exchanger. Collect the oil that comes out.
3. Remove the magnetic ring (4) and check it for wear particles.

Note:

If there are large wear particles in the wear swarf, this indicates excessive wear in the gearbox and the cause must be ascertained.

4. Clean the magnetic ring and the contact surfaces on the heat exchanger.



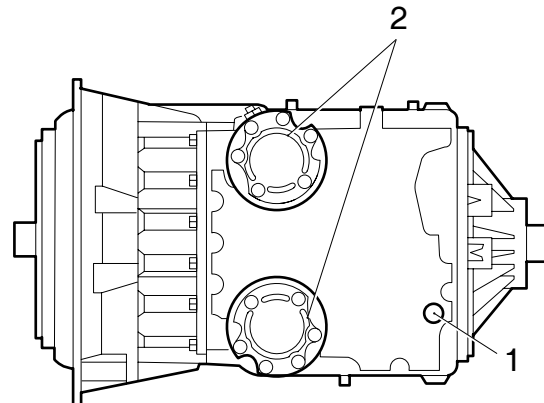
V3 00 556

Fitting oil cooler oil filter

1. Fit the magnetic ring (4) on the heat exchanger.
2. If applicable, lightly lubricate the new oil filter (5) with clean gearbox oil and fit it on the heat exchanger.
3. Tighten the oil filter until it touches the contact surface. Manually tighten the oil filter another 360°.
4. Check the oil level. See "Inspection and adjustment".

Removing oil filters

1. Remove the attachment bolts from the filter covers (2) and remove the filter covers. Collect the oil that comes out.
2. Remove the oil filters from the oil sump.
3. Remove the various O-rings and the gasket from the filter covers.
4. Remove any gasket remains from the filter covers and the contact surfaces.



V300371

Installing oil filters

1. Lubricate the new O-rings with clean gearbox oil and fit the various O-rings on the filter covers.

Note:

Compare the new O-rings to the old ones to ensure that the correct O-rings are used.

2. Fit a new gasket on the filter covers.
3. Lubricate the rubber inner ring of the oil filters with clean gearbox oil and fit the oil filters on the filter covers.
4. Fit the filter covers together with the oil filters on the gearbox and tighten the attachment bolts to the specified torque. See "Technical data".
5. Check the oil level. See "Inspection and adjustment".

5. DRAINING AND FILLING

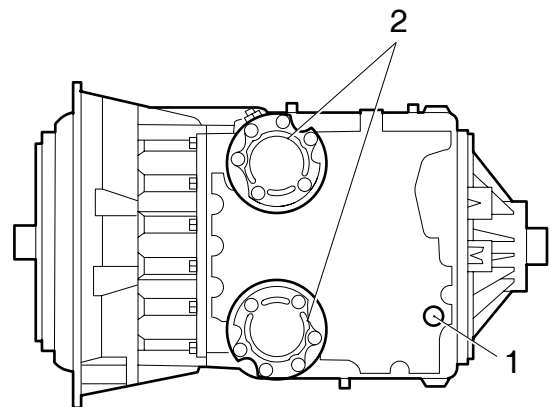
5.1 DRAINING AND FILLING GEARBOX



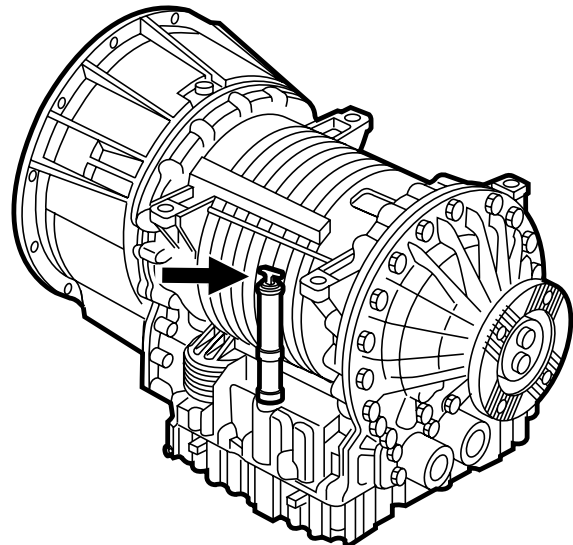
To prevent skin injury, avoid unnecessary contact with the drained oil.

Draining gearbox

1. Bring the gearbox to operating temperature (approx. 71°C - 93°C) before the oil is drained, so that the oil can be drained more quickly and more completely.
2. Place the vehicle on a level and horizontal surface.
3. Remove the drain plug (1) from the gearbox oil sump.
4. Remove the oil filters (2). See "Removal and installation".



V300371



W 3 03 098

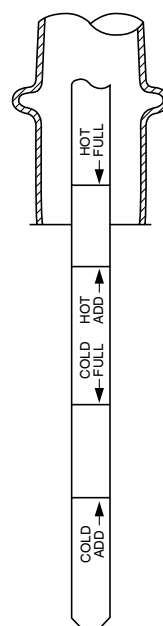
Filling gearbox

1. Clean the drain plug (1), fit a new sealing ring and tighten the plug to the specified torque; see "Technical data".
2. Fit the oil filters (2). See "Removal and installation".
3. Fill the gearbox through the dipstick holder with the specified quantity of oil; see "Technical data".
4. Check that the oil level reaches the "Cold full" mark.

Note:

To take the dipstick out of the holder, the sealing cap must be held while the dipstick is turned anti-clockwise.

5. Check the oil level using the selector keypad. See "Inspection and adjustment".



W 3 03 099

CONTENTS

	Page	Date
1. SAFETY INSTRUCTIONS	1-1	200508
1.1 Safety instructions	1-1	200508
2. GENERAL	2-1	200508
2.1 System description, clutch	2-1	200508
2.2 Overview drawing, clutch servo	2-2	200508
2.3 Overview drawing, clutch lever attachment to clutch housing	2-3	200508
3. DESCRIPTION OF COMPONENTS	3-1	200508
3.1 Clutch servo	3-1	200508
3.2 Wear indicator	3-3	200508
3.3 Thrust bearing	3-4	200508
4. INSPECTION AND ADJUSTMENT	4-1	200508
4.1 Inspecting clutch servo	4-1	200508
4.2 Checking clutch fluid level	4-4	200508
5. REMOVAL AND INSTALLATION	5-1	200508
5.1 Removal and installation, clutch servo	5-1	200508
5.2 Removal and installation, thrust bearing	5-2	200508
5.3 Removal and installation, clutch lever	5-3	200508
5.4 Removal and installation, clutch release assembly / clutch plate	5-4	200508
5.5 Removal and installation, pilot bearing	5-5	200508
5.6 Removing and installing clutch cylinder	5-7	200508
6. DRAINING AND FILLING	6-1	200508
6.1 Draining and filling clutch system	6-1	200508
6.2 Bleeding clutch system	6-2	200508

1. SAFETY INSTRUCTIONS

1.1 SAFETY INSTRUCTIONS



Hydraulic fluid is toxic and can therefore have a damaging effect on your health. Any direct or indirect physical contact should therefore be avoided.



As hydraulic fluid is also corrosive it may damage the paintwork of the vehicle. Any contact between hydraulic fluid and paintwork should therefore be avoided.



Always use new and clean hydraulic fluid which has been kept in a sealed container that meets the specifications. Hydraulic fluid which has absorbed water (from the ambient air) may have an adverse effect on the operation of the clutch system. Avoid any contact with mineral oil. Even one drop of mineral oil in the system will damage the seals.

2. GENERAL

2.1 SYSTEM DESCRIPTION, CLUTCH

The clutch is a single dry-plate clutch which is hydraulically operated and pneumatically assisted.

The clutch consists of:

- flywheel
- clutch plate
- clutch release assembly

By clamping the clutch plate between the flywheel and the clutch release assembly, a torque can be transferred (by means of friction). The extent of the torque that can be transferred by the clutch is determined by multiplying the maximum engine torque by a safety factor (usually 1.3).

To clamp the clutch plate, a diaphragm (pressure) spring is used in the clutch release assembly.

A diaphragm spring constitutes a simple, strong and cost-effective construction.

Another advantage of the diaphragm spring is that the pressure exerted on a new clutch plate almost equals the pressure exerted on a worn clutch plate.

A diaphragm spring requires a self-centring thrust bearing.

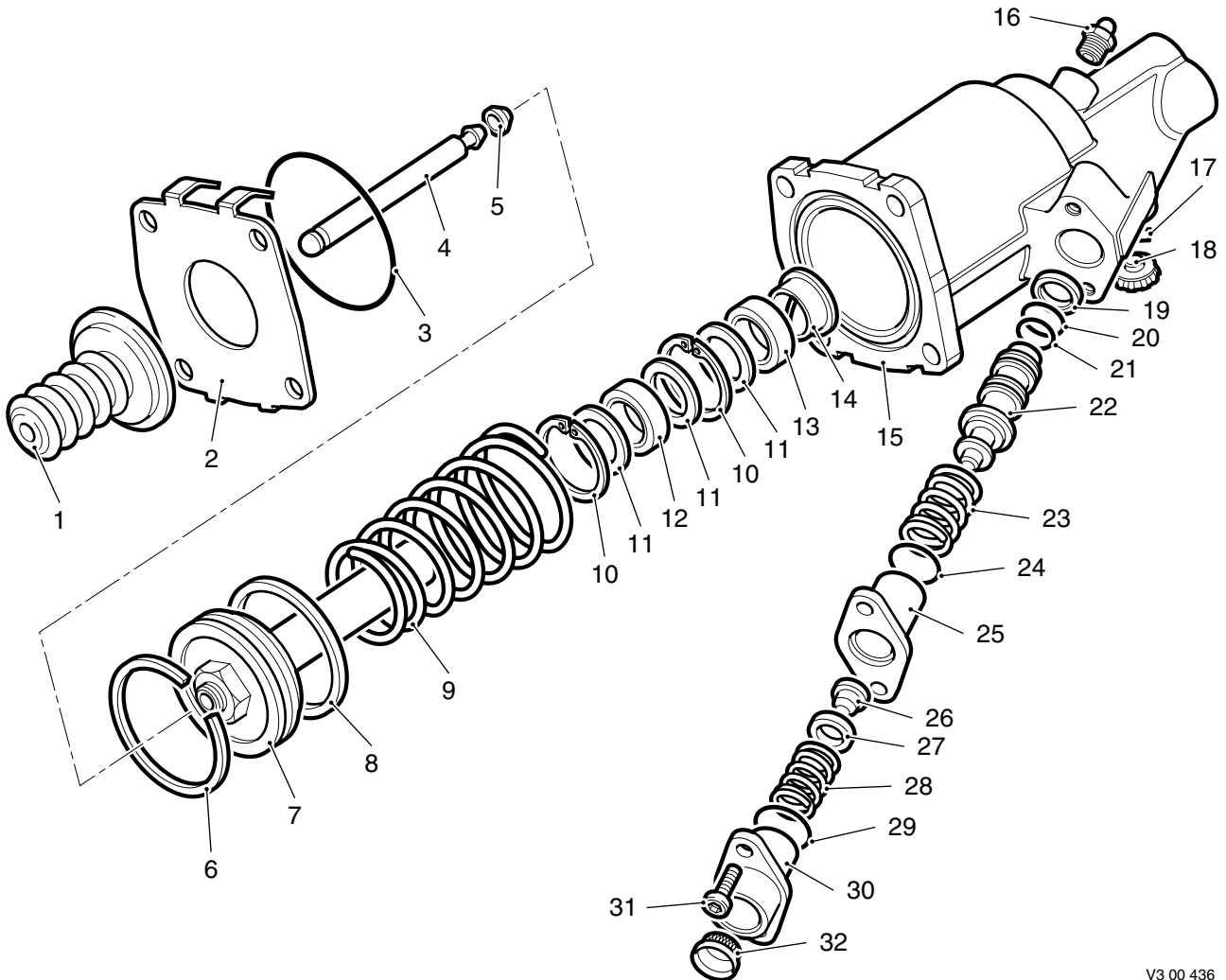
The type of clutch plate used depends on the following factors.

The size of the clutch plate lining must correspond to the desired service life.

The character of the engine (the engine vibrations to be damped) determines the version of the vibration damper design in the hub.

For the clutch plate to engage smoothly the lining material must abut the flywheel and clutch release assembly evenly at all places when engaging.

2.2 OVERVIEW DRAWING, CLUTCH SERVO

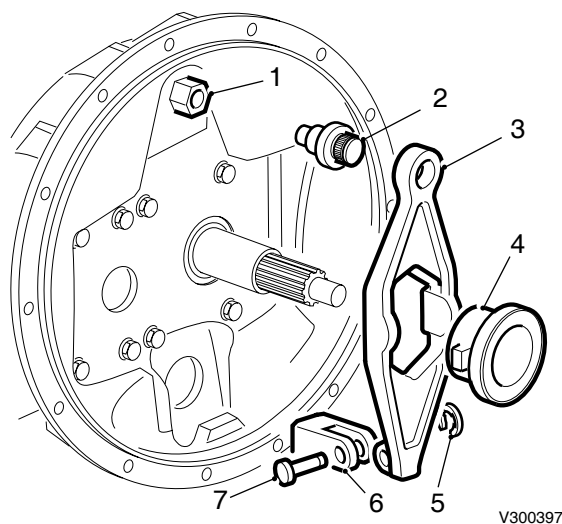


9

V3 00 436

- | | | | |
|-----|------------------------------|-----|---------------------|
| 1. | Rubber protective bellows | 17. | Vent opening |
| 2. | End-plate | 18. | Blow-off nipple |
| 3. | O-ring | 19. | Piston seal |
| 4. | Push rod | 20. | O-ring |
| 5. | Attachment ring for push rod | 21. | O-ring |
| 6. | Split seal | 22. | Piston |
| 7. | Piston | 23. | Pressure spring |
| 8. | Piston seal | 24. | O-ring |
| 9. | Conical spring | 25. | Spring seat housing |
| 10. | Circlip | 26. | Inlet valve |
| 11. | Washer | 27. | Spring seat |
| 12. | Seal, hydraulic part, front | 28. | Reset spring |
| 13. | Seal, hydraulic part, rear | 29. | O-ring |
| 14. | Split bearing | 30. | Connector housing |
| 15. | Booster housing | 31. | Allen screw |
| 16. | Bleed nipple | 32. | Air filter |

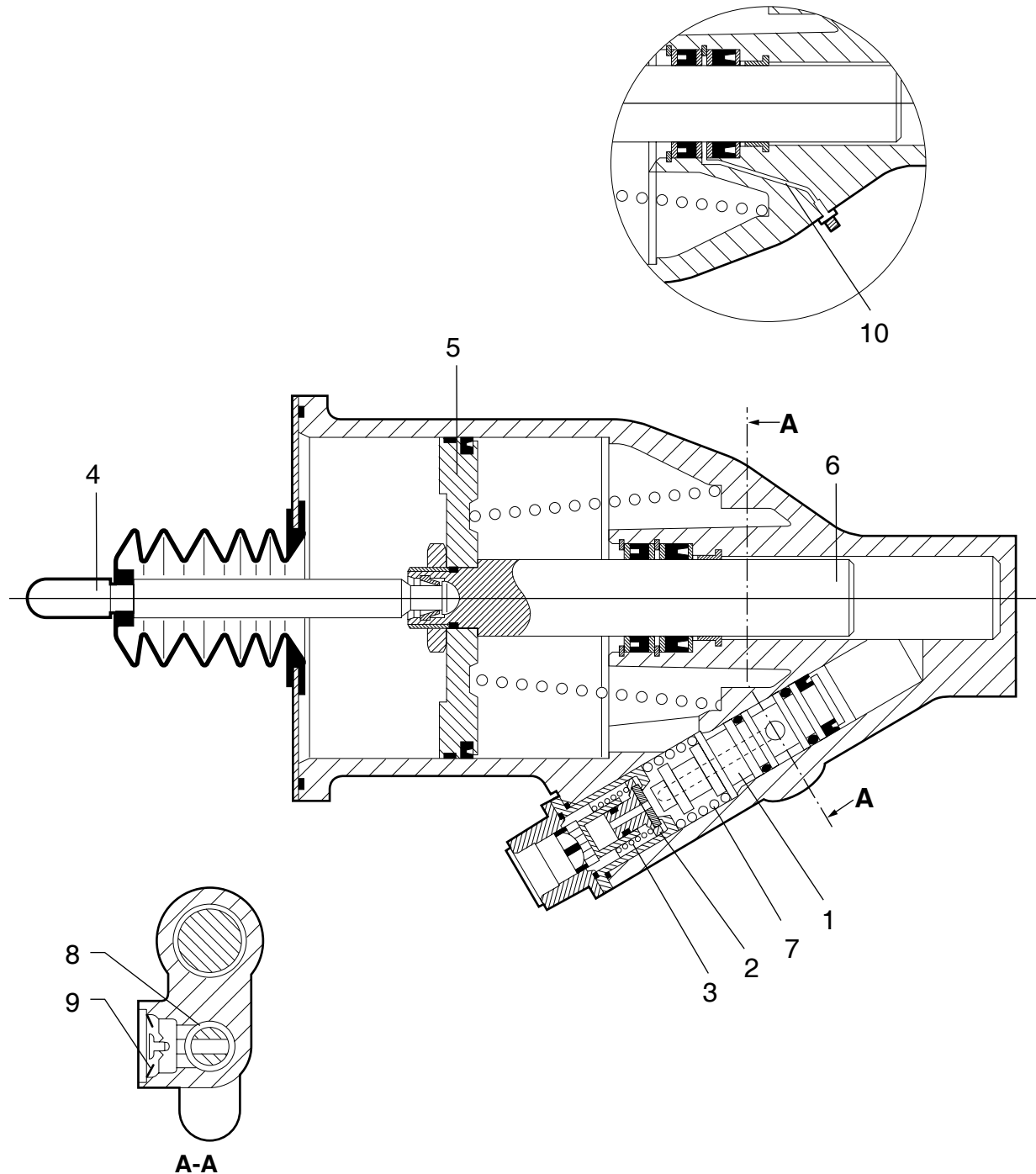
2.3 OVERVIEW DRAWING, CLUTCH LEVER ATTACHMENT TO CLUTCH HOUSING



1. Screw adapter
2. Ball joint
3. Clutch lever
4. Thrust bearing
5. Clip
6. Claw
7. Yoke pin

3. DESCRIPTION OF COMPONENTS

3.1 CLUTCH SERVO



V300352-2

Declutching

Depressing the clutch pedal results in a build-up of hydraulic pressure.

This causes the servo piston (1) to push the air valve (2) away from the valve seat, against the force of the springs (3) and (7).

Air pressure now flows into the cylinder.

The pressure pin (4) is pushed forward by the air pressure building up on air piston (5) and the hydraulic pressure on fluid piston (6).

The pressure pin (4) pushes against the clutch lever, which results in declutching.

State of equilibrium

When the hydraulic pressure and pneumatic support push the pressure pin (4) forwards, a state of equilibrium is achieved between the air pressure and the hydraulic pressure (status when the clutch pedal is not depressed any further).

The servo piston (1) again seals off against the valve seat, closing the air supply and stopping the build-up of pneumatic pressure.

Clutching

When the clutch pedal is released, there is no longer any hydraulic pressure and the servo piston (1) will be pushed back into its original position by pressure spring (7) and any remaining pneumatic support.

As a result, the bleed bore (8) in the servo piston (1) is no longer closed, and venting takes place via bleed vent (9).

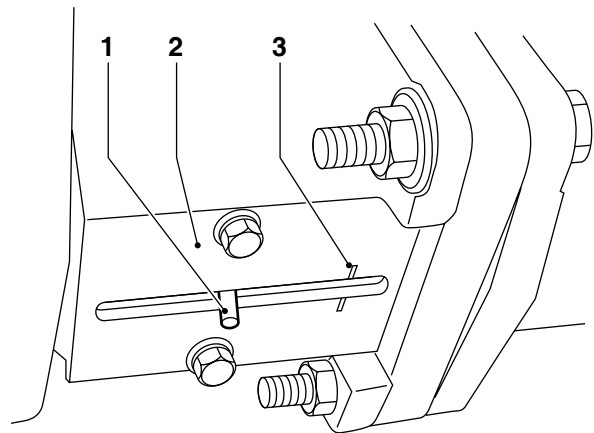
Vent opening

The function of the vent opening (10) is to prevent a build up of pressure between both piston seals.

3.2 WEAR INDICATOR

An indicator (1) is mounted on the push rod of the clutch servo. The end of the indicator can be seen in the groove of the indicator cover (2).

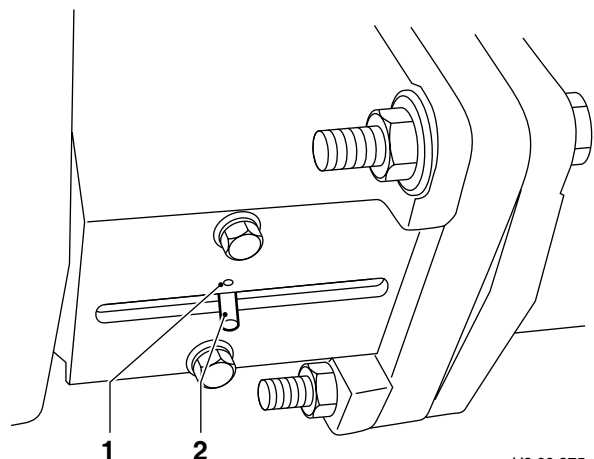
As the clutch plate wears, the indicator (1) will move towards the end mark (3). When the indicator (1) reaches the end mark (3), it may be assumed that the clutch plate is due to be replaced.



V3 00 381

Automatically adjusting clutch release assembly

Check that the wear indicator (2) on the clutch servo is directly opposite the mark (1) on the cover. If the wear indicator is no longer level with the mark on the clutch servo, replace the clutch plate.



V3 00 375

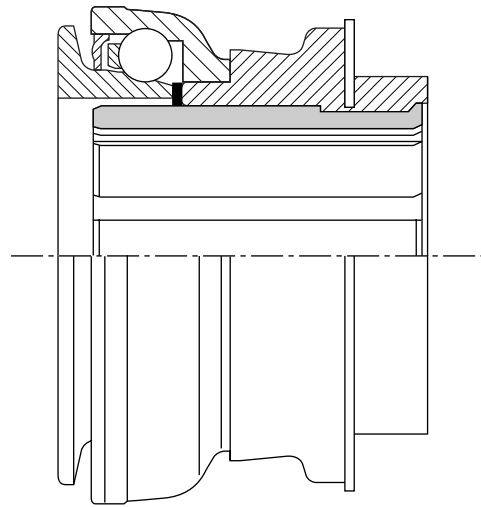
3.3 THRUST BEARING

The thrust bearing is of the pressed type and is maintenance-free.

When mounting the thrust bearing, do not use any grease. The gearbox front cover must be thoroughly cleaned before the thrust bearing is mounted.

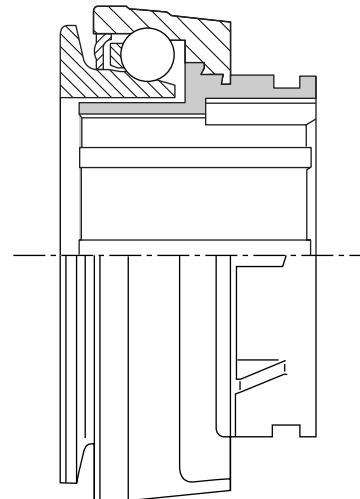
The grease will attack the plastic coating and shorten the service life of the thrust bearing.

LF 45 thrust bearing with ZF S5-42 gearbox



V3 00 387

Thrust bearing, other LF versions



V3 00 388

4. INSPECTION AND ADJUSTMENT

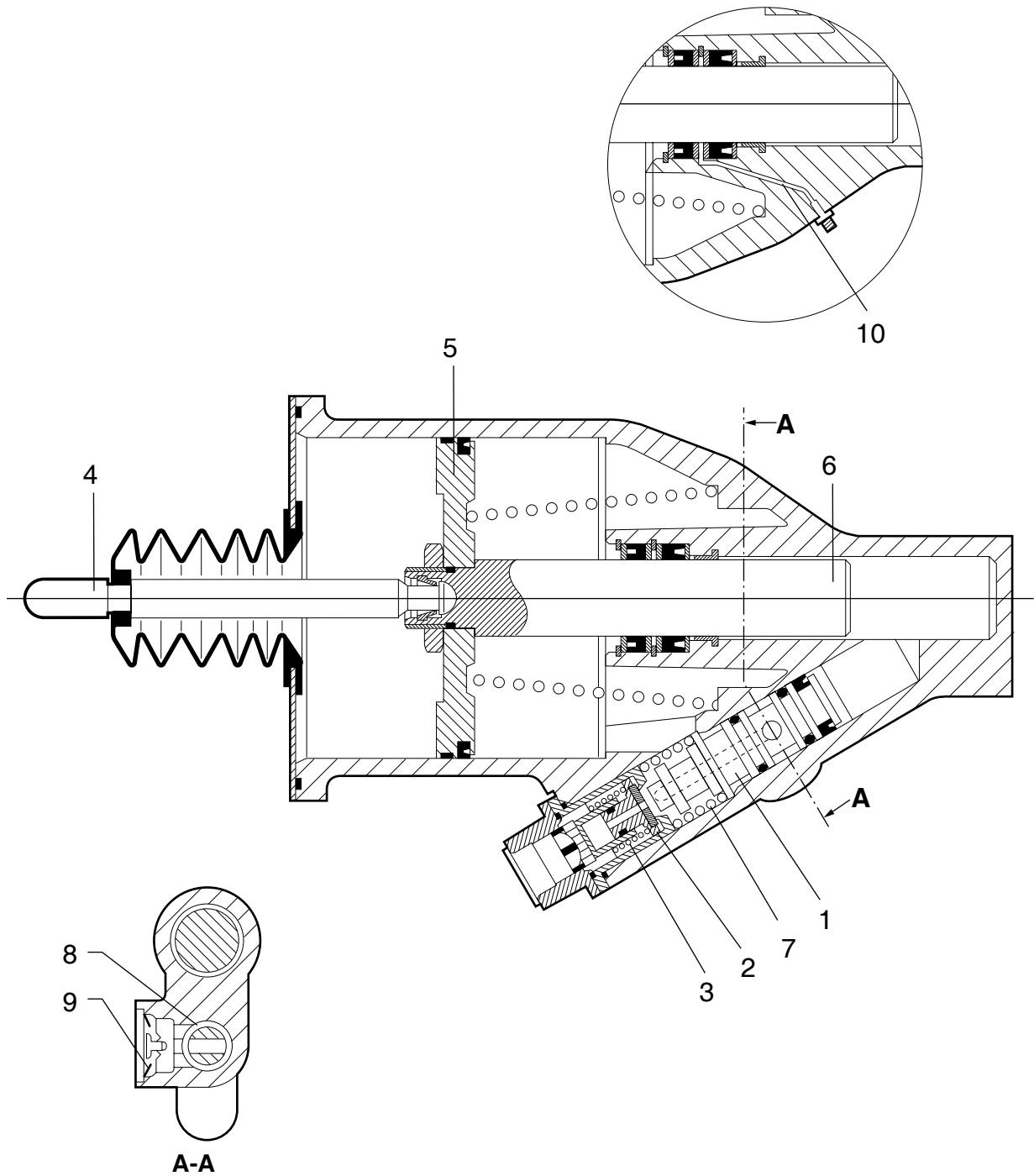
4.1 INSPECTING CLUTCH SERVO



Hydraulic fluid is toxic and can therefore have a damaging effect on your health. Any direct or indirect physical contact should therefore be avoided. As hydraulic fluid is also corrosive it may damage the paintwork of the vehicle. Any contact between hydraulic fluid and paintwork should therefore be avoided.



Always use new and clean hydraulic fluid which has been kept in a sealed container that meets the specifications. Hydraulic fluid which has absorbed water (from the ambient air) may have an adverse effect on the operation of the clutch system. Avoid any contact with mineral oil. Even one drop of mineral oil in the system will damage the seals.



9

1. Pressurise the air system.
2. Check for any air leakage via the clutch servo bleed vent.
3. Depress the clutch pedal and check whether there is any leakage via the clutch servo bleed vent.

V300352-2

Note:

While releasing the clutch pedal, the clutch servo should bleed itself via this bleed vent.

4. Depress the clutch pedal and check that there is no leakage via the clutch servo bleed vent.
5. Check that there is no oil leakage via the vent opening (10).

Note:

A drop of oil on the vent opening (10) is normal and is not a reason to replace the clutch servo. If there is constant leakage, the clutch servo must be repaired or replaced. If in doubt as to whether the clutch servo situation is normal or whether there is a leak, inspect the fluid level in the clutch reservoir.

6. Depress the clutch pedal and check whether there is an air leak via the vent opening (10).

4.2 CHECKING CLUTCH FLUID LEVEL

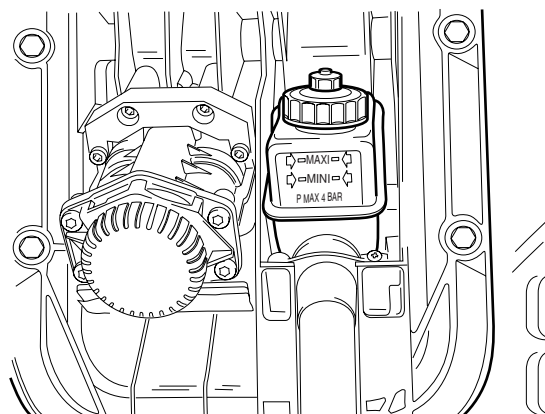


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1. Check whether the fluid level is between the MINI and MAXI marks when the cab is in the driving position.



GO 00 213

5. REMOVAL AND INSTALLATION

5.1 REMOVAL AND INSTALLATION, CLUTCH SERVO



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Always use new and clean hydraulic fluid which has been kept in a sealed container that meets the specifications. Hydraulic fluid which has absorbed water (from the ambient air) may have an adverse effect on the operation of the clutch system. Avoid any contact with mineral oil. Even one drop of mineral oil in the system will damage the seals.

Removing clutch servo

1. Remove the air pipe from the clutch servo.
2. Place a container beneath the clutch servo and remove the fluid pipe. Then plug the pipe.

Note:

The clutch servo is mounted against the clutch housing under pre-tension.

3. Remove the attachment nuts from the clutch servo.

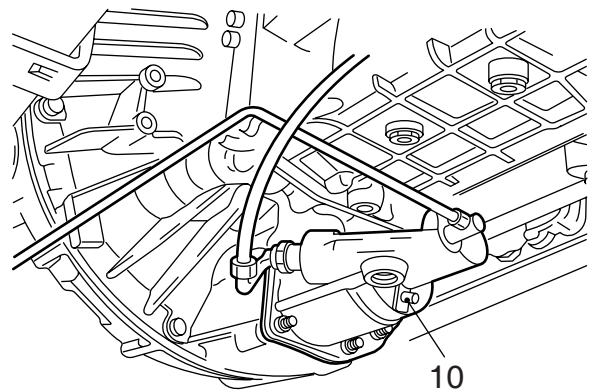
Fitting clutch servo

1. Fit the clutch servo.

Note:

Make sure that the push rod falls into the cup-shaped recess in the wear indicator. Then tighten the attachment nuts evenly.

2. Tighten the attachment nuts evenly.
3. Connect the air and fluid pipes.
4. Fill and bleed the clutch system.



V300289

5.2 REMOVAL AND INSTALLATION, THRUST BEARING

Removing thrust bearing

1. Remove the gearbox.
2. Remove the thrust bearing from the gearbox front cover in the clutch housing.

Installation, thrust bearing



In the case of thrust bearings with a plastic coating, no grease should be used on the gearbox front cover. The grease will attack the plastic coating and shorten the service life of the thrust bearing.

1. Check the clutch lever for wear.
2. Check the pressure fingers of the diaphragm spring for wear.
3. Apply a little grease to all pressure surfaces of the clutch lever.
4. Ensure that the gearbox front cover is free of grease and dirt.
5. Install the thrust bearing on the gearbox front cover. **No grease is permitted.**
6. Fit the gearbox.

5.3 REMOVAL AND INSTALLATION, CLUTCH LEVER

Removing clutch lever

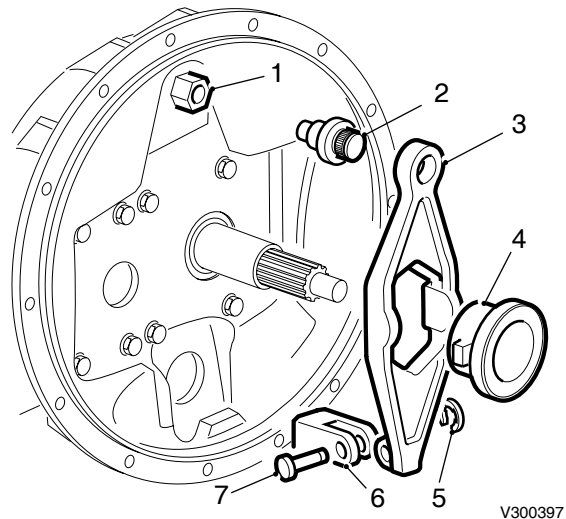
1. Remove the gearbox.
2. Remove the thrust bearing (4).
3. Remove the clip (5) and the yoke pin (7).
4. Force the ball joint (2) which is installed in the clutch lever (3) out of the attachment point in the clutch housing.

Note:

It may be possible to remove the complete support point (1) by turning the attachment point out of the clutch housing.

Fitting clutch lever

1. Apply a little grease to the moving parts of the clutch lever.
2. Lock the support point (1) in the clutch housing with a suitable locking compound.
3. Install the ball joint (2) in the clutch lever (3) and install the clutch lever in the clutch housing.
4. Install the yoke pin (7) in the claw (6) and put on the clip (5).
5. Install the thrust bearing (4).
6. Fit the gearbox.

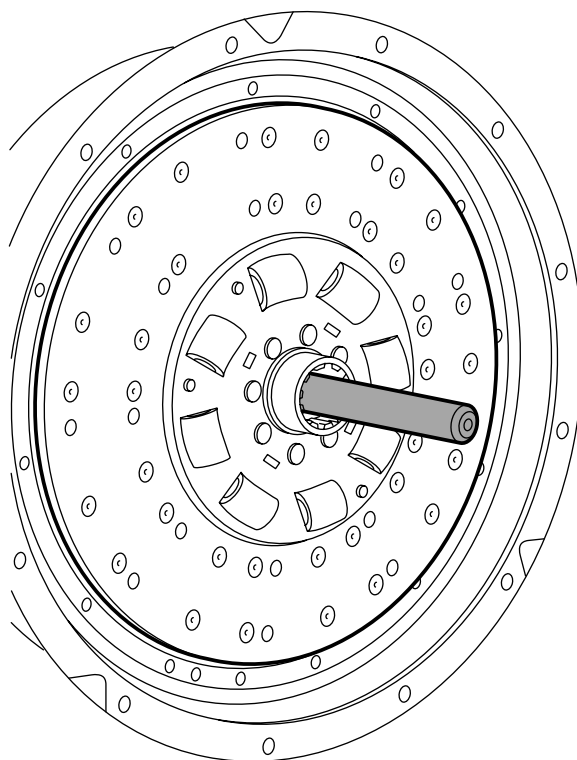


5.4 REMOVAL AND INSTALLATION, CLUTCH RELEASE ASSEMBLY / CLUTCH PLATE**Removing clutch release assembly/clutch plate**

1. Remove the gearbox.
2. Insert a dummy input shaft through the hub of the clutch plate in the flywheel pilot bearing.
3. Remove four attachment bolts from around the circumference of the clutch release assembly. Replace them with studs.
4. Remove the remaining attachment bolts of the clutch release assembly evenly.
5. Remove the clutch release assembly by sliding it off the four studs.
6. Remove the clutch plate with the dummy input shaft.

Installing clutch release assembly/clutch plate

1. Check the free movement of the clutch plate on the splines of the gearbox input shaft.
2. Lightly lubricate the end of the dummy input shaft with grease. This will lubricate the hub of the clutch plate.
3. Use a dummy input shaft to position the clutch plate against the flywheel.
4. Install four studs in the flywheel, distributed evenly around the circumference.
5. Support the clutch release assembly and slide it onto the four studs.
6. Fit the attachment bolts and tighten them crosswise to the specified torque. See "Technical data".
7. Fit the gearbox.

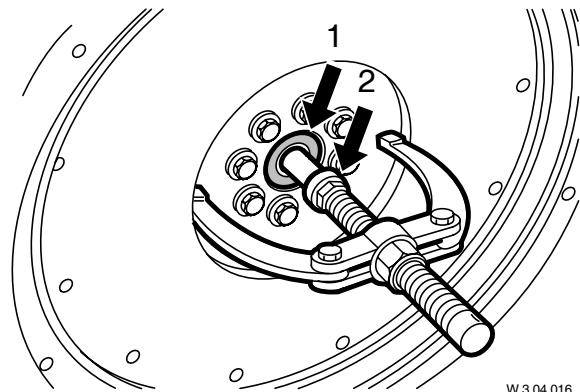


V300124

5.5 REMOVAL AND INSTALLATION, PILOT BEARING

Removing pilot bearing

1. Remove the gearbox.
2. Remove the clutch release assembly and the clutch plate.
3. Use an internal puller (2) to remove the pilot bearing (1) from the flywheel.



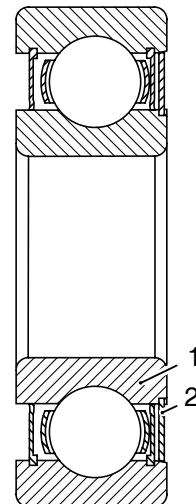
W 3 04 016

Fitting pilot bearing

1. Check the flywheel bore for dirt and damage.

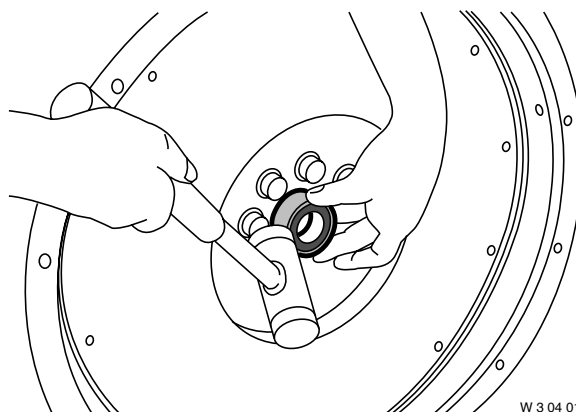
Note:

The pilot bearing (1) has a grease and dust seal (2) on one side only. When the pilot bearing is installed, the grease and dust seal must be on the clutch plate side.



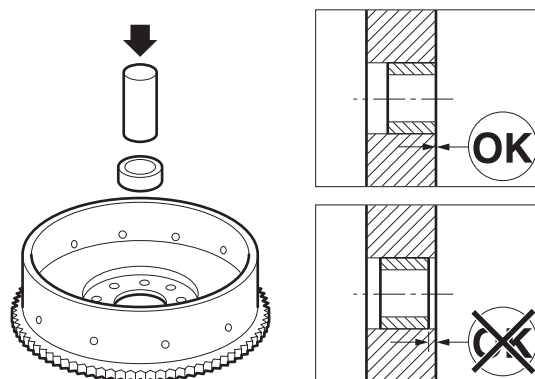
W 3 04 019

2. Use a plastic mallet to install the bearing in the flywheel.



W 3 04 017

3. Fit the clutch release assembly and clutch plate.
4. Fit the gearbox.

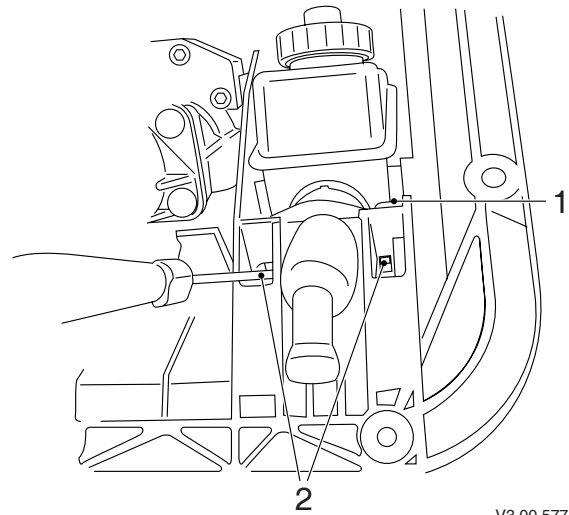


V300989

5.6 REMOVING AND INSTALLING CLUTCH CYLINDER

Removing the clutch cylinder

1. Drain the clutch system; see "Draining and filling".
2. Remove the retainer clip and the hydraulic pipe.
3. Remove the attachment screw from the fastening bridge (1).
4. Using a screwdriver, press the lock levers (2) back and remove the fastening bridge (1).

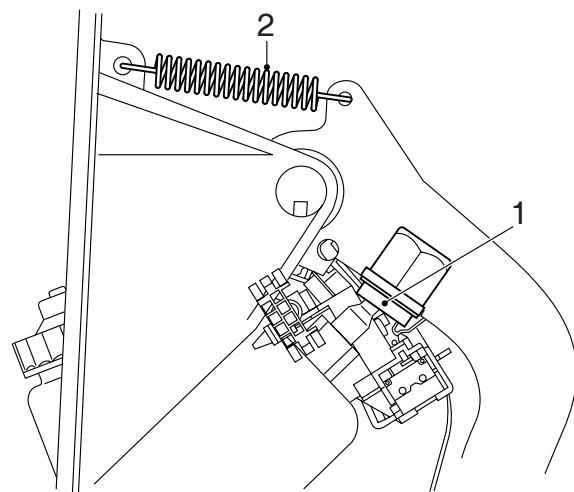


V3 00 577

5. Screw the plastic fastening jig (1) out of the clutch pedal. If necessary, detach the spring (2).
6. Remove the clutch cylinder.

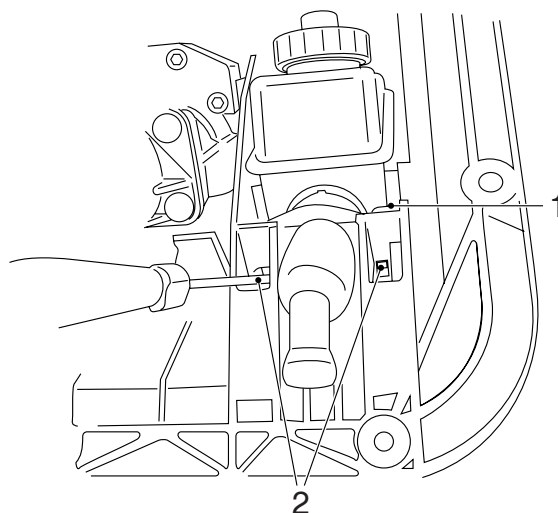
Fitting clutch cylinder

1. Reposition the clutch cylinder in the holder.



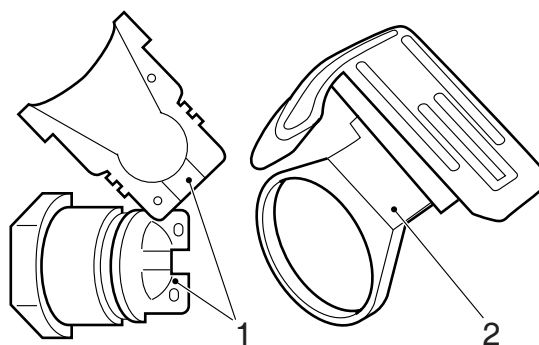
V3 00 579

2. Fit the fastening bridge (1) and tighten the attachment screw.



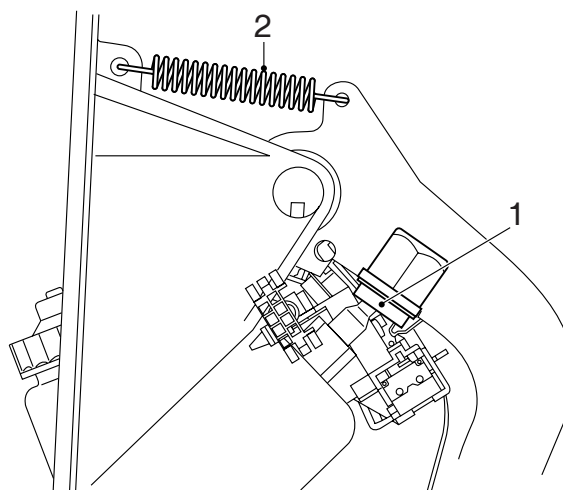
V3 00 577

3. Clip the plastic fastening jig (1) around the clutch cylinder push rod and fit the switch control (2) over the jig.



V3 00 576

4. Screw the plastic fastening jig (1) into the pedal.
5. Fit the spring (2) if it has been removed.
6. Fill the clutch system; see "Draining and filling".



V3 00 579

6. DRAINING AND FILLING

6.1 DRAINING AND FILLING CLUTCH SYSTEM



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Always use new and clean hydraulic fluid which has been kept in a sealed container that meets the specifications. Hydraulic fluid which has absorbed water (from the ambient air) may have an adverse effect on the operation of the clutch system. Avoid any contact with mineral oil. Even one drop of mineral oil in the system will damage the seals.

Draining clutch system

1. Place a container beneath the clutch servo.
2. Disconnect the supply pipe from the clutch servo and drain the oil from the reservoir by moving the pedal up and down.
3. Reinstall the supply pipe.

Filling clutch system

1. Fill the reservoir with the specified fluid and bleed the system.

6.2 BLEEDING CLUTCH SYSTEM



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Always use new and clean hydraulic fluid which has been kept in a sealed container that meets the specifications. Hydraulic fluid which has absorbed water (from the ambient air) may have an adverse effect on the operation of the clutch system. Avoid any contact with mineral oil. Even one drop of mineral oil in the system will damage the seals.

Bleeding the clutch system using the "servo" bleed tank

1. Connect the "servo" bleed tank to the reservoir.

Note:

Filling too quickly causes foaming, which makes bleeding virtually impossible.

2. Fill the system via the "servo" bleed tank.
3. Connect a transparent pipe to the clutch servo's bleed nipple. Ensure that the hydraulic fluid is collected.
4. Open the bleed nipple two full turns.
5. As soon as no more air bubbles escape from the transparent pipe, the bleed nipple can be closed again.
6. Check the fluid level. See "Inspection and adjustment".

Bleeding the clutch system by operating the clutch pedal

1. Connect a transparent pipe to the clutch servo's bleed nipple. Insert the pipe into a jar filled with the specified fluid. Ensure that the pipe cannot suck in any air.
2. Open the bleed nipple.
3. Gradually depress the clutch pedal and close the bleed nipple. Gradually release the clutch pedal. Repeat this operation. Always top up the clutch fluid reservoir.
4. Pump the clutch pedal again and top up the fluid until no more air bubbles escape through the transparent pipe.
5. Check the fluid level in the reservoir. See "Inspection and adjustment".

Bleeding the clutch system via the clutch servo**Note:**

Sometimes it may be difficult to bleed the clutch system. In such cases, the clutch system can also be bled using a priming pump and the bleed nipple on the clutch servo.

Ensure that the priming pump is thoroughly cleaned inside.

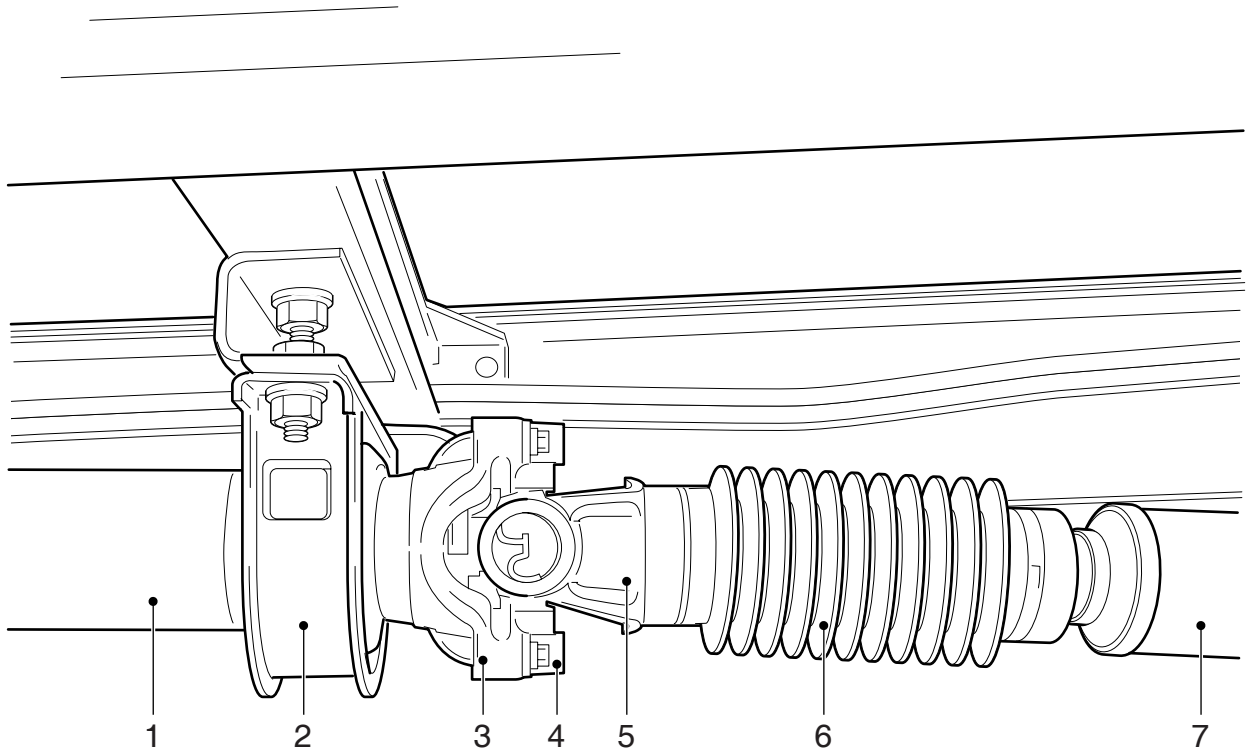
1. Connect a transparent pipe to a priming pump (e.g. oil can) and fill the pump with the specified fluid.
2. Continue pumping until fluid without air bubbles flows from the pipe.
3. Connect the pipe to the bleed nipple of the clutch servo and open the bleed nipple.
4. Pump the fluid into the system with the priming pump.
In doing so, observe the following:
 - do not depress the clutch pedal.
 - make sure that no air bubbles are introduced into the system.
 - monitor the fluid level in the priming pump.
 - monitor the fluid level in the clutch reservoir.

CONTENTS

	Page	Date
1. GENERAL	1-1	200508
1.1 Overview drawing, Spicer prop shaft	1-1	200508
1.2 Overview drawing, Monotron prop shaft	1-2	200508
2. INSPECTION AND ADJUSTMENT	2-1	200508
2.1 Inspection, prop shaft	2-1	200508
3. REMOVAL AND INSTALLATION	3-1	200508
3.1 Removing and installing Spicer prop shaft/intermediate shaft assembly ..	3-1	200508
3.2 Removal and installation, prop shaft/intermediate shaft assembly	3-2	200508
4. DEMOUNTING AND MOUNTING	4-1	200508
4.1 Demounting and mounting universal joint	4-1	200508
4.2 Disassembly and assembly, universal joint	4-5	200508

1. GENERAL

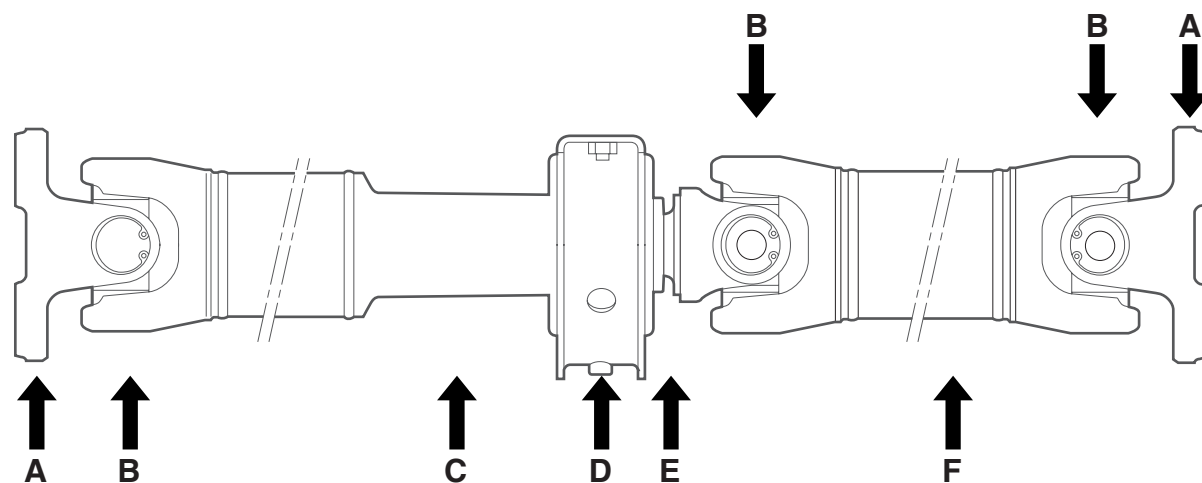
1.1 OVERVIEW DRAWING, SPICER PROP SHAFT



V3 00 747

1. Intermediate shaft
2. Suspension bearing
3. Prop shaft
4. Clamping piece
5. Fork
6. Slider
7. Prop shaft

1.2 OVERVIEW DRAWING, MONOTRON PROP SHAFT



V300999

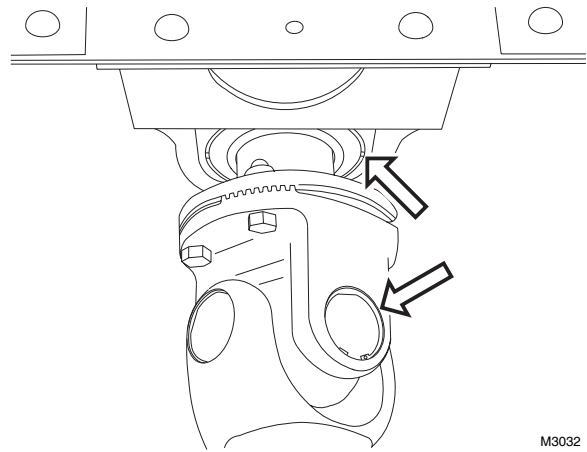
- A Drive flange
- B Fork
- C Intermediate shaft
- D Suspension bearing
- E Slider
- F Prop shaft

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION, PROP SHAFT

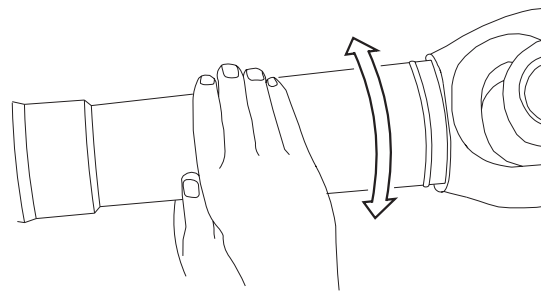
Inspection, prop shaft

1. Check the universal joints and suspension bearing for play and damage.



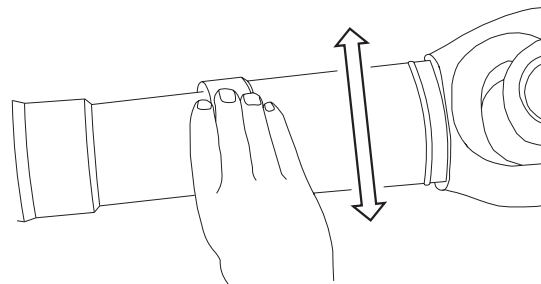
M3032

2. Check the slide coupling for radial play.



M3019

3. There must be no clearly perceptible play on universal joints and suspension bearing.



M3020

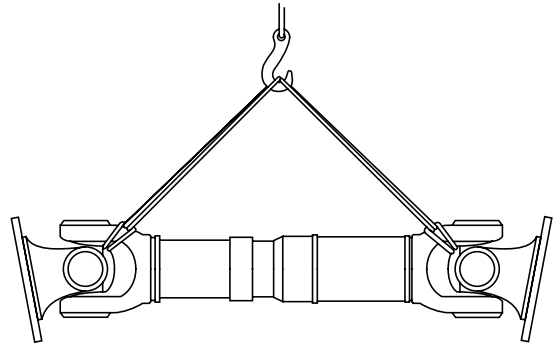
3. REMOVAL AND INSTALLATION

3.1 REMOVING AND INSTALLING SPICER PROP SHAFT/INTERMEDIATE SHAFT ASSEMBLY

Removing prop shaft/intermediate shaft assembly

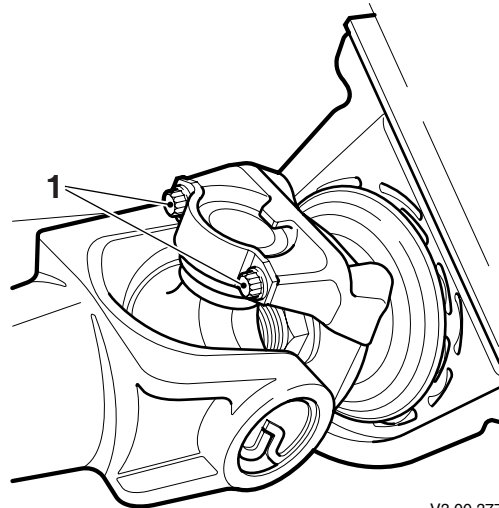
Note:

When removing one of the shafts in vehicles with multiple shafts (prop shaft and intermediate shafts), the other shaft must be tied to the chassis or intermediate beam in such a way that it does not obstruct the various operations. Always transport and store shafts horizontally to avoid damage and subsequent imbalance. Support the shaft in at least two places. If possible, hang the shaft in a hoist, using two sturdy ropes.



W 3 06 016

1. Remove the attachment bolts from the flanges and/or clamping pieces (1), and carefully lower the shaft to the ground.
2. Now remove the shaft from under the vehicle.

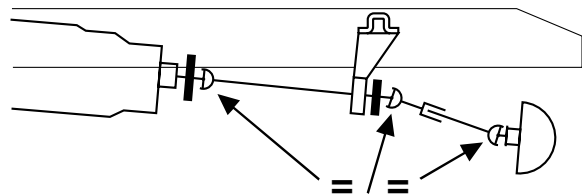


V3 00 377

Installing prop shaft/intermediate shaft assembly

Note:

After repairs have been carried out or a shaft has been replaced, the forks of all shafts must be aligned.



W 3 06 019

1. Fit the shaft under the vehicle. Use a hoist if possible.
2. Fit the attachment bolts. Tighten the attachment bolts to the specified torque. See "Technical data".

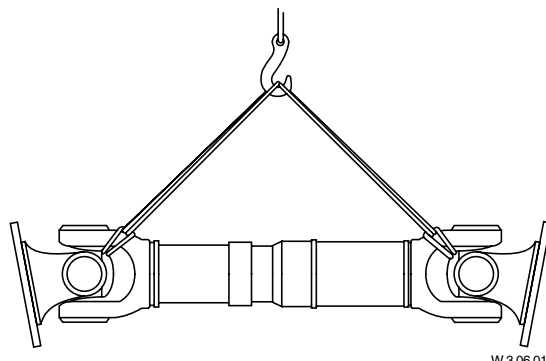
3.2 REMOVAL AND INSTALLATION, PROP SHAFT/INTERMEDIATE SHAFT ASSEMBLY

Removing prop shaft/intermediate shaft assembly

1. When removing one of the shafts in vehicles with multiple shafts (prop shaft and intermediate shafts), the other shaft must be tied to the chassis or intermediate beam in such a way that it does not obstruct the various activities.

Note:

Always transport and store shafts horizontally to avoid damage and subsequent imbalance. Support the shaft in at least two places. If possible, hang the shaft in a hoist, using two sturdy ropes.



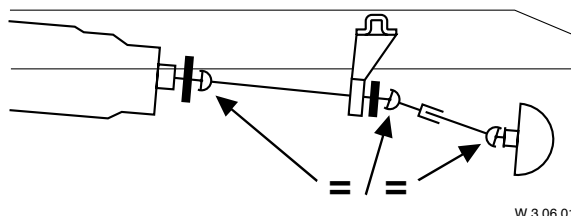
2. Remove the attachment bolts from the flanges and carefully lower the shaft to the ground. Now remove the shaft from under the vehicle.

Installing prop shaft/intermediate shaft assembly

Note:

After repairs have been carried out or a shaft has been replaced, the marks on the shafts must be opposite each other.

1. Fit the shaft under the vehicle. Use a hoist if possible.
2. Tighten the attachment bolts to the specified torque. See "Technical data".

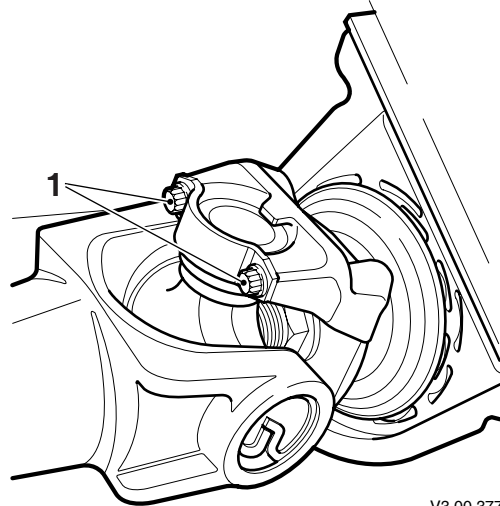


4. DEMOUNTING AND MOUNTING

4.1 DEMOUNTING AND MOUNTING UNIVERSAL JOINT

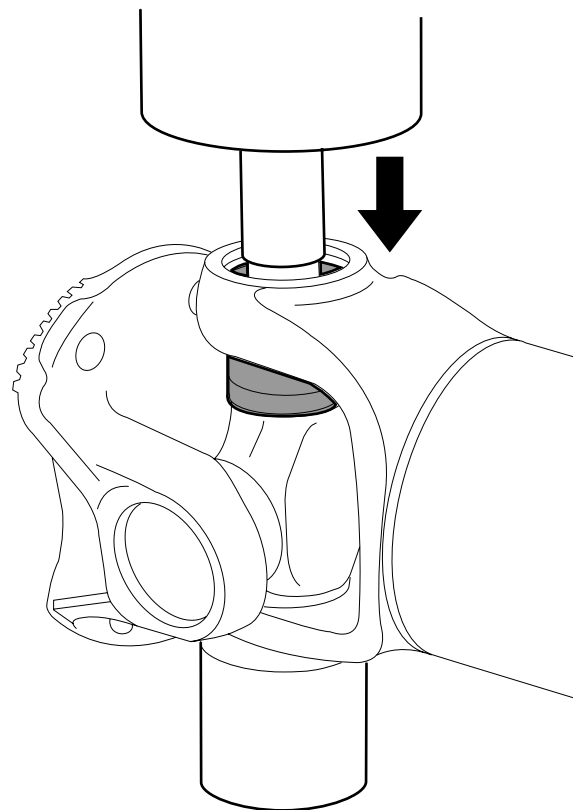
Demounting universal joint

1. Remove the prop shaft and/or intermediate shaft assembly.
2. Remove the circlips and the attachment bolts of the clamping pieces (1) of the spider to be replaced.



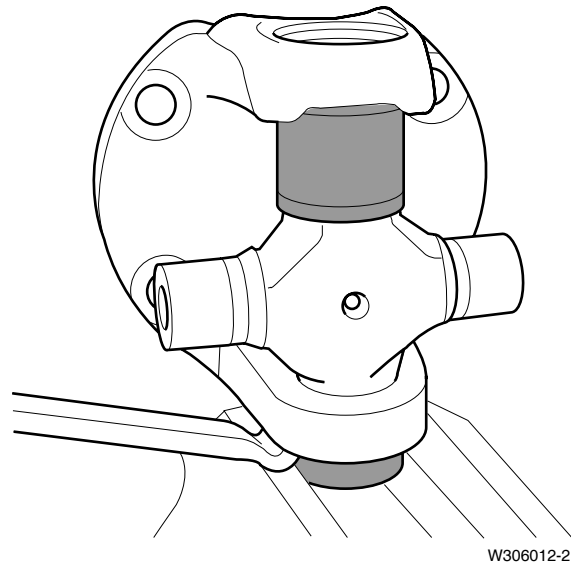
V3 00 377

3. Place the shaft on a bush underneath a press, as shown, and press the entire spider including bearings and drive flange down until the spider touches the fork of the shaft.

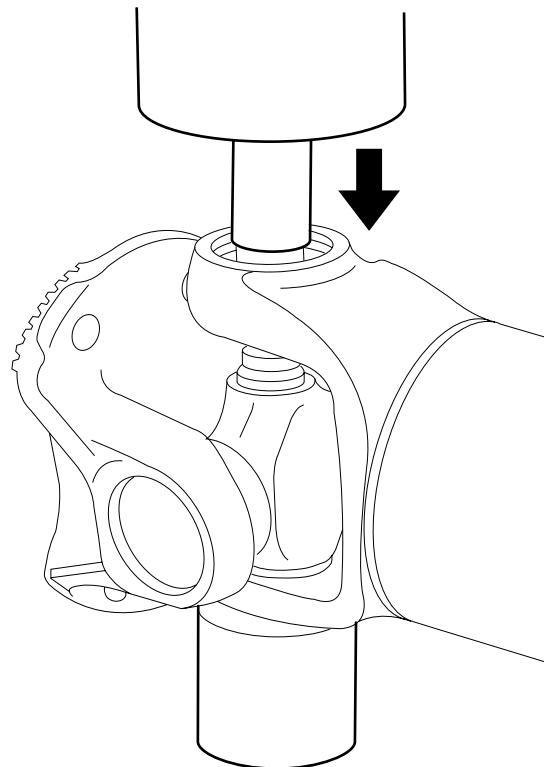


W306010-2

4. Rotate the shaft 180° and remove the bearing that has just been pressed out. If the first bearing to be removed fails to come out of the fork entirely, it can be clamped to enable the fork to be pushed up by means of a lever. Place the shaft back on the bush.



5. Push the spider down again in the direction of the shaft fork. Again, continue until the spider touches the fork.
6. The spider and the drive flange can now be tipped out of the shaft fork.
7. Place the drive flange on a bush underneath a press and press the entire spider including bearings and drive flange down until the spider touches the fork of the drive flange.
8. Rotate the drive flange 180° and remove the bearing that has just been pressed out. Place the drive flange back on the bush.
9. Push the spider down again in the direction of the shaft fork. Again, continue until the spider touches the fork.
10. The spider can now be tipped out of the drive flange fork.



Note:

When spiders are being replaced, always replace them including their bearings.

11. Check the components to be reused for any cracks and/or damage.

Mounting universal joint

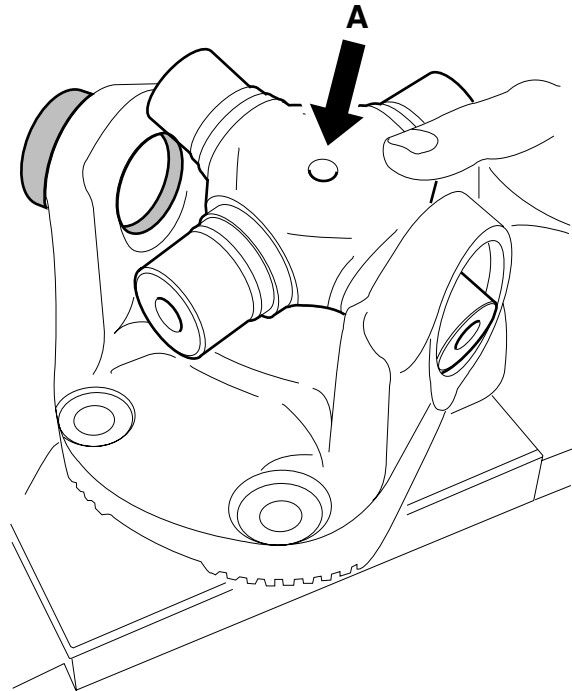
Note:

After mounting, it must be possible to move the drive flanges and spiders by hand. When mounting the spider, Seeger rings of the same thickness must be used.

1. Fit the sealing rings in their proper positions on the bearings and lubricate them lightly so that the needles remain in place.
2. Press one bearing partly into the drive flange.
3. Tip the spider into the drive flange.

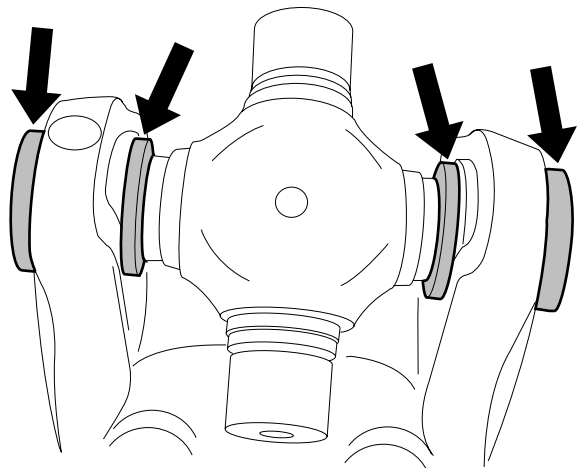
Note:

Maintenance-free spiders do not have a mounting direction. In the case of spiders fitted with lubricating nipples, hole A for the lubricating nipple must point towards the shaft.



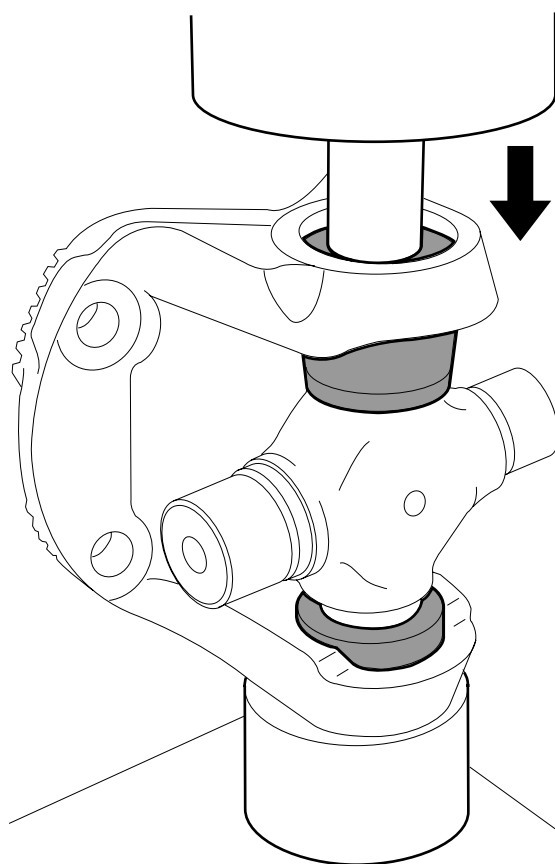
W306014-2

4. Slide the spider a little into the fitted bearing and place everything on a bush underneath a press. The opposite bearing can now be pressed into the fork, the spider serving as a guide. During the pressing action, the spider must be able to move freely.



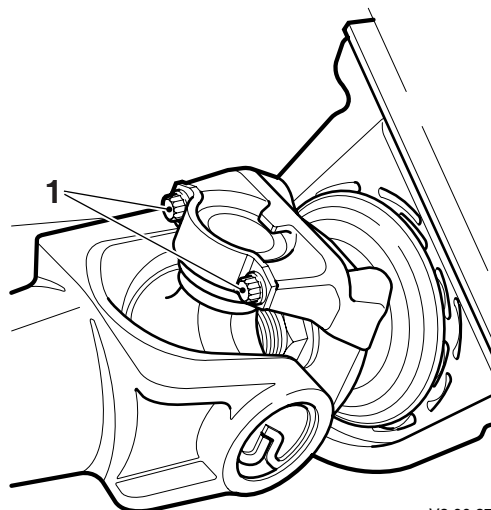
W306017-2

5. Continue to press the bearing until a Seeger ring can be fitted on the side being pressed. Fit the Seeger ring and press the opposite bearing further into the fork. Again, the Seeger ring can now be fitted.
6. Fit the sealing rings in their proper positions on the prop shaft bearings and lubricate them lightly so that the needles remain in place.
7. Press one bearing partly into the prop shaft.
8. Slide the spider a little into the fitted bearing and place everything on a bush underneath a press. The opposite bearing can now be pressed into the fork, the spider serving as a guide. During the pressing action, the spider must be able to move freely.
9. Continue to press the bearing until a Seeger ring can be fitted on the side being pressed. Fit the Seeger ring and press the opposite bearing further into the fork. Again, the Seeger ring can now be fitted.



W306013-2

10. Fit the circlips and the attachment bolts of the clamping pieces (1).
11. Install the prop shaft and/or intermediate shaft.

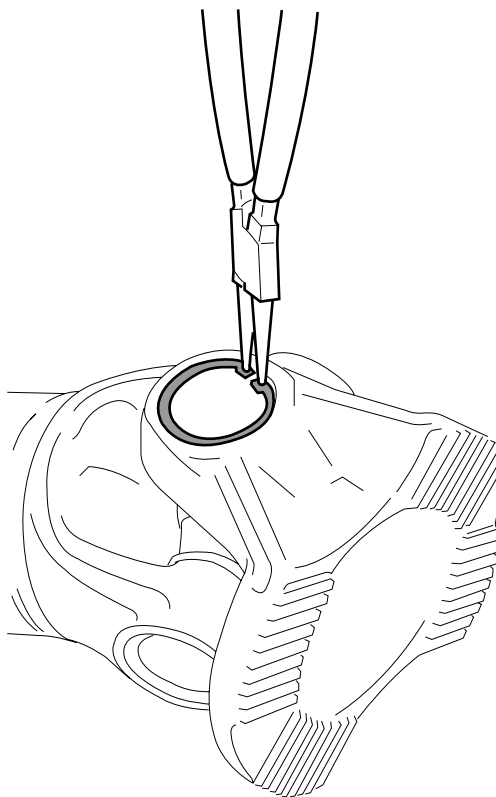


V3 00 377

4.2 DISASSEMBLY AND ASSEMBLY, UNIVERSAL JOINT

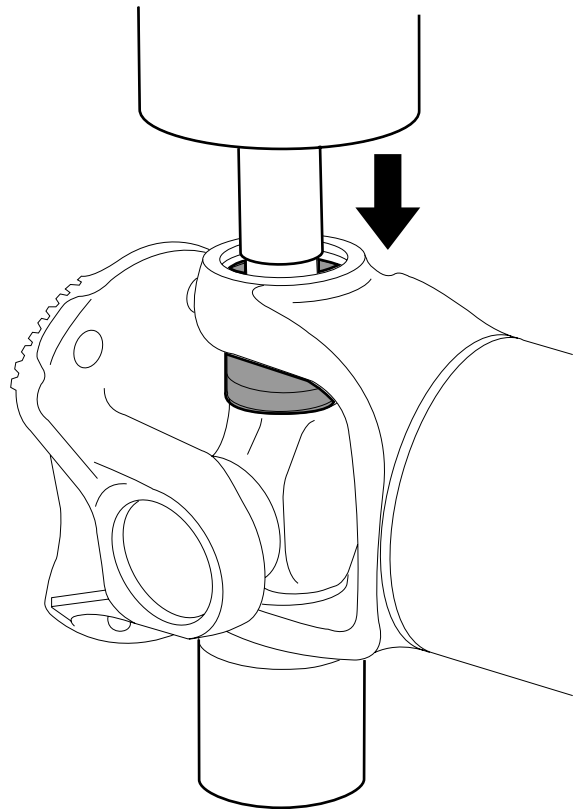
Disassembly, universal joint

1. Remove the prop shaft and/or intermediate shaft assembly.
2. If fitted, remove the lubricating nipple and all Seeger rings from the spider to be replaced.



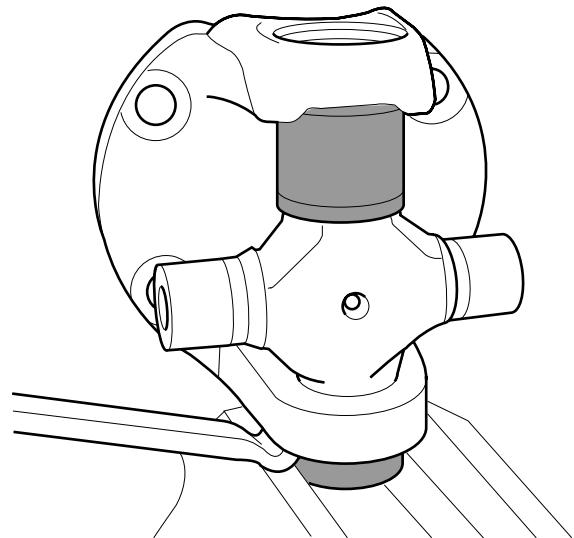
W306009-2

3. Place the shaft on a bush underneath a press, as shown, and press the entire spider including bearings and drive flange down until the spider touches the fork of the shaft.



W306010-2

4. Rotate the shaft 180° and remove the bearing that has just been pressed out. If the first bearing to be removed fails to come out of the fork entirely, the bearing can be clamped to enable the fork to be pushed up by means of a lever. Place the shaft back on the bush.



W306012-2

5. Push the spider down again in the direction of the shaft fork. Again, continue until the spider touches the fork.
6. The spider and the drive flange can now be tipped out of the shaft fork.
7. Place the drive flange on a bush underneath a press and press the entire spider including bearings and drive flange down, until the spider touches the fork of the drive flange.
8. Rotate the drive flange 180° and remove the bearing that has just been pressed out. Place the drive flange back on the bush.
9. Push the spider down again in the direction of the shaft fork. Again, continue until the spider touches the fork.
10. The spider can now be tipped out of the drive flange fork.

Note:

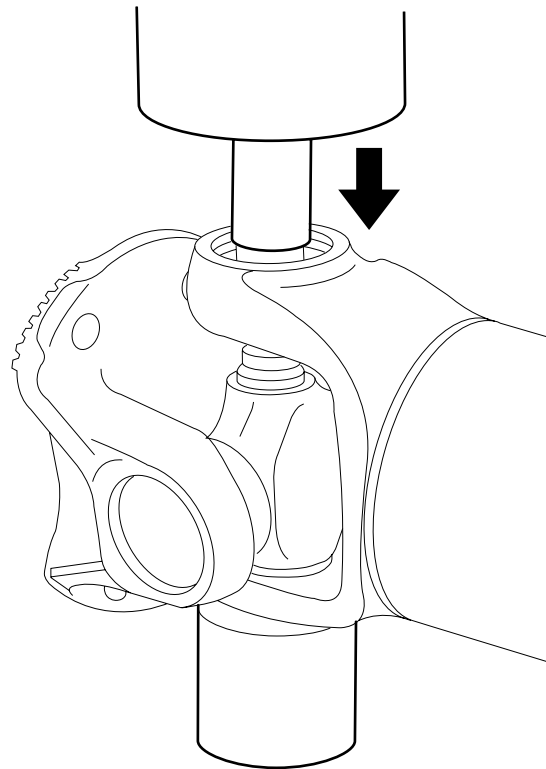
When spiders are being replaced, always replace them including their bearings.

11. Check the components to be reused for any cracks and/or damage.

Assembly, universal joint**Note:**

After assembly, it must be possible to move the drive flanges and spiders by hand. When mounting the spider, Seeger rings of the same thickness must be used.

1. Install the sealing rings in their proper positions on the bearings and lubricate them lightly so that the needles remain in place.
2. Press one bearing partly into the drive flange.

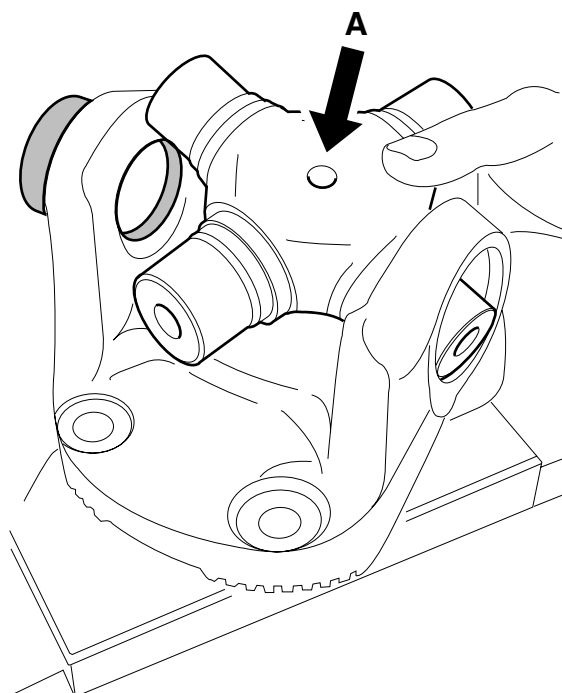


W306011-2

3. Tip the spider into the drive flange.

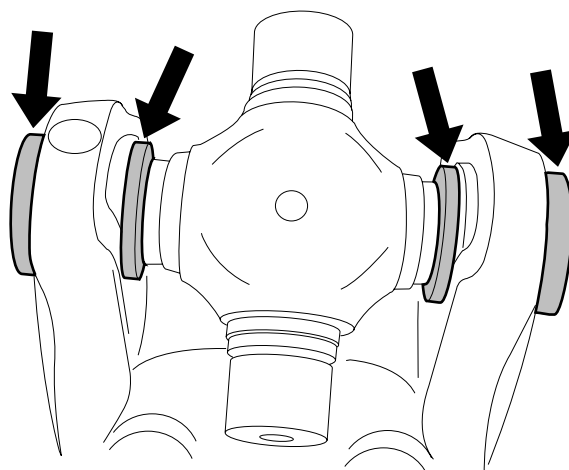
Note:

Maintenance-free spiders do not have an assembly direction. In the case of spiders fitted with lubricating nipples, hole A for the lubricating nipple must point towards the shaft.



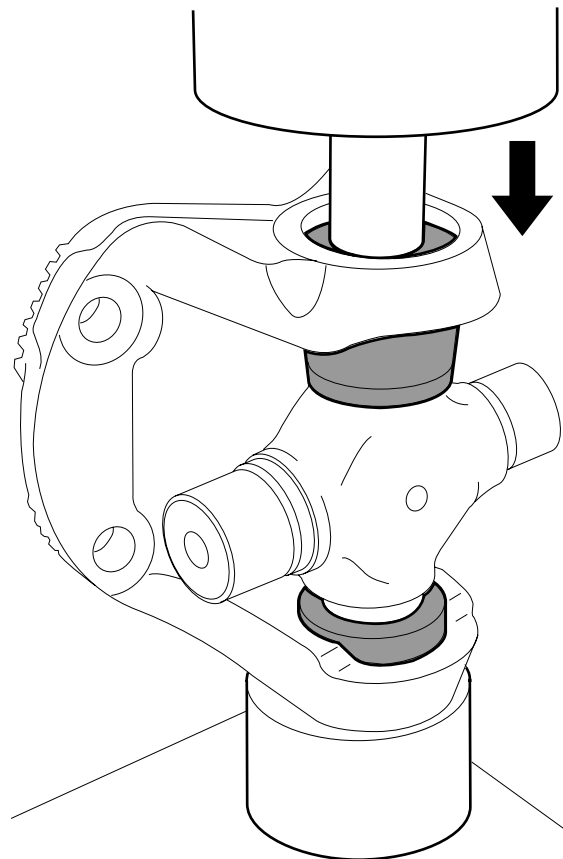
W306014-2

4. Slide the spider a little into the installed bearing and place everything on a bush underneath a press. The opposite bearing can now be pressed into the fork, the spider serving as a guide. During the pressing action, the spider must be able to move freely.

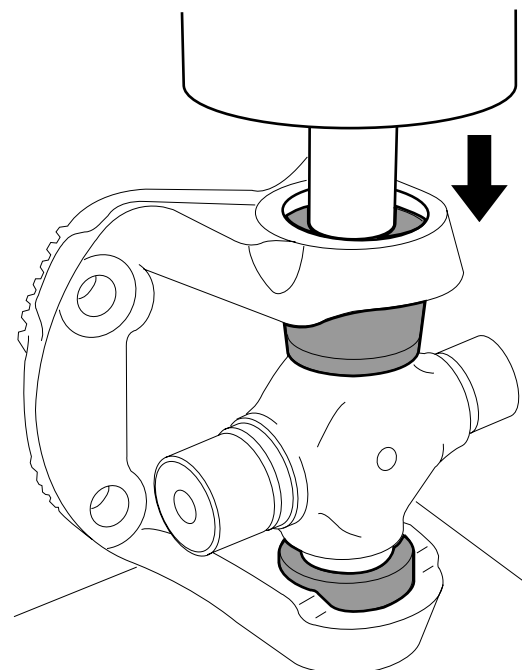


W306017-2

5. Continue to press the bearing until a Seeger ring can be installed on the side being pressed. Install the Seeger ring and press the opposite bearing further into the fork. Again, the Seeger ring can now be installed.
6. Install the sealing rings in their proper positions on the prop shaft bearings and lubricate them lightly so that the needles remain in place.
7. Press one bearing partly into the prop shaft.
8. Slide the spider a little into the installed bearing and place everything on a bush underneath a press. The opposite bearing can now be pressed into the fork, the spider serving as a guide. During the pressing action, the spider must be able to move freely.
9. Continue to press the bearing until a Seeger ring can be installed on the side being pressed. Install the Seeger ring and press the opposite bearing further into the fork. Again, the Seeger ring can now be installed.
10. If fitted, install the lubricating nipple and lubricate the spider.
11. Install the prop shaft and/or intermediate shaft.



W306013-2



W306015-2

