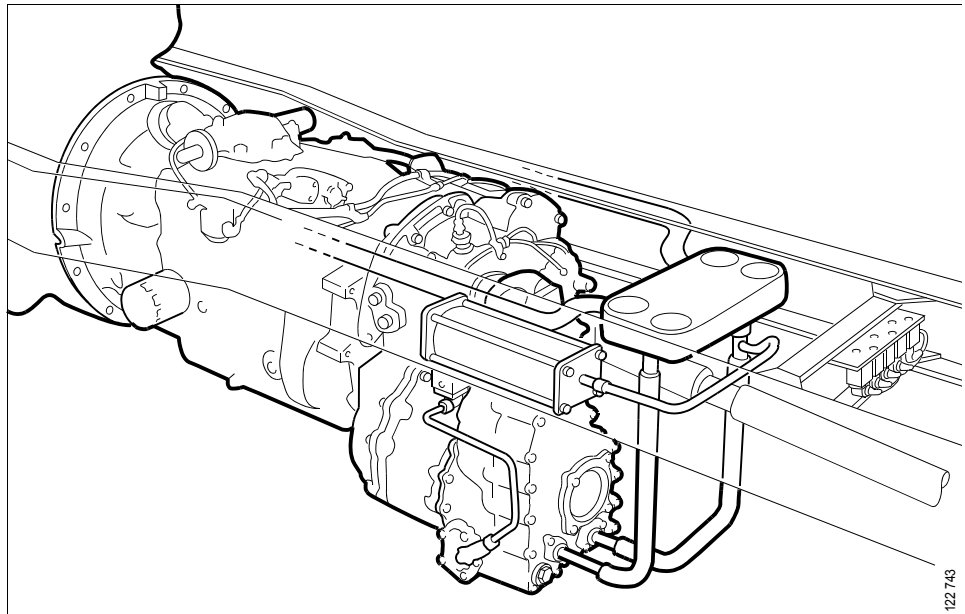


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Issue 4 en

Manual gearbox, removing and fitting



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General information

General

The work description is general and applies to all versions of the manual gearbox.

The work description is based on a manual gearbox with retarder. There are minor differences in working methods between the different versions depending on whether the gearbox is combined with:

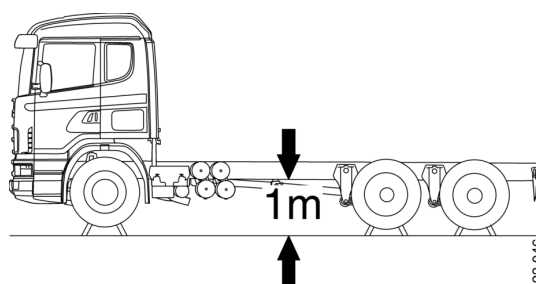
- Torque converter
- All-wheel drive
- Opticruise
- Power take-off EK 630/640
- or if the gearbox does not have a retarder

The extent to which any extra equipment such as power take-off, crankshaft damper, etc. have to be removed, has to be determined from case to case.

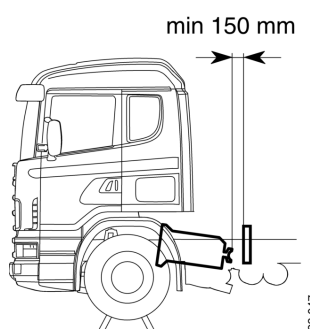
The different gearboxes covered by the work description are:

- GR 801
- GR 900
- GRS 890
- GRS 900
- GRS 920

Note: Minimum height between chassis and floor in which to remove the gearbox is approx. 1 m.



Note: Minimum distance behind gearbox in which to remove it is approx. 150 mm.



Safety precautions



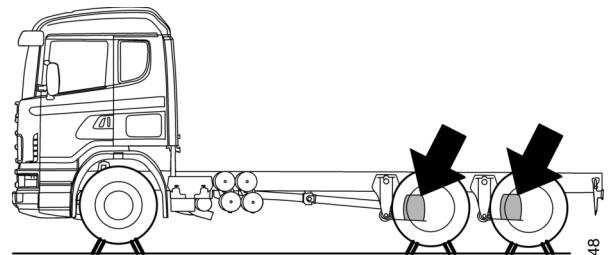
WARNING!

Never work under a vehicle supported by jacks only. Use axle stands.



WARNING!

If the truck has air suspension, the air bellows should be emptied before starting the work.



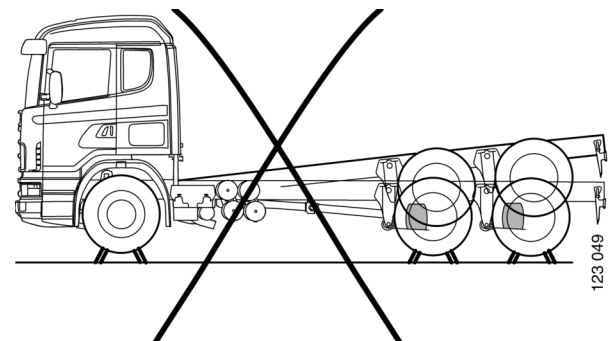
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Never alter the height between the frame and the axles, e.g. by filling the air bellows, when the truck is supported on stands.



WARNING!

Fluids, oil and greases which are detrimental to health can cause personal injury if they come into contact with the skin or eyes.



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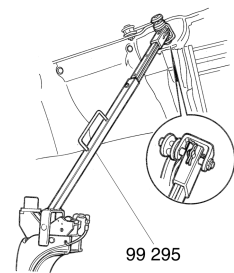
Tilting the cab



WARNING!

Do not work under a cab tilted to the intermediate position. Always tilt the cab fully. Do not stand in front of or behind the cab during tilting.

IMPORTANT! During all work under a cab, the cab should be secured with cab support 99 295.



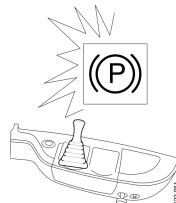
Check that there are no loose objects in the cab when tilting it.

IMPORTANT! When tilting the cab, ensure that:

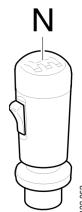
1 The engine is switched off.



2 The parking brake is applied.



3 The gearbox is in neutral.



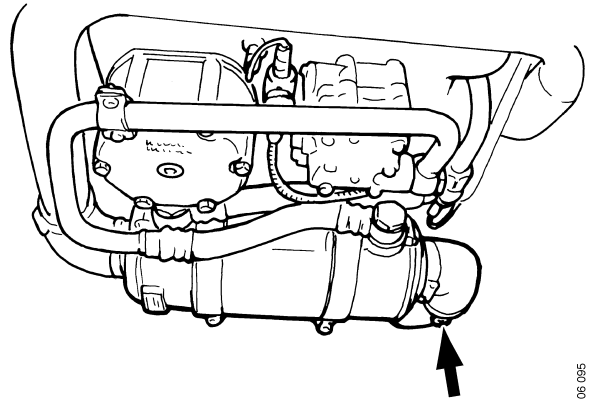
Note: Check that the gearbox is still in neutral after tilting. There is a risk that a gear could be engaged when tilting the cab.

Difference in working methods

Gearbox with torque converter

For draining and refilling the torque converter with coolant, refer to group 02 in the Workshop Manual.

For draining the remaining coolant, see illustration.



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Location of draining nipple on vehicles with torque converter.

For draining and refilling the torque converter with oil, refer to group 04 in the Workshop Manual.

For removing and fitting the torque converter oil cooler, refer to group 04 in the Workshop Manual.

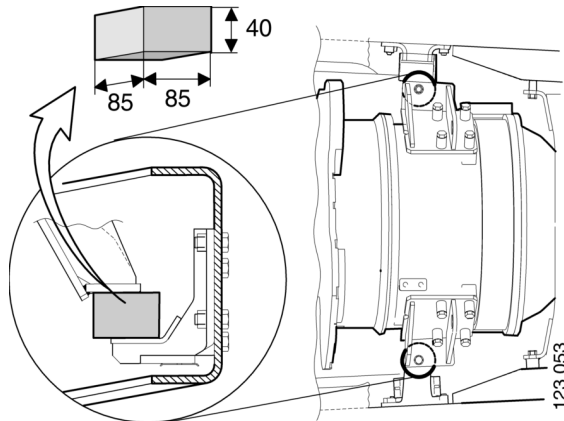
Supporting the torque converter

The engine does not need to be supported in vehicles with torque converter.

The torque converter should be supported in connection with raising the powertrain, refer to position 13 in **Removal**.

when supporting.

For supporting the torque converter on vehicles, see illustration.



Replace the rubber cushions on the torque converter with 85x85x40 mm wooden blocks

When the gearbox brackets are being fitted, refer to position 14 in **Fitting**, the torque converter support should be removed.

Note: Refit the rubber cushions. Tightening torque 70 Nm.

For other procedures, follow the instructions for removing and fitting a manual gearbox with retarder.

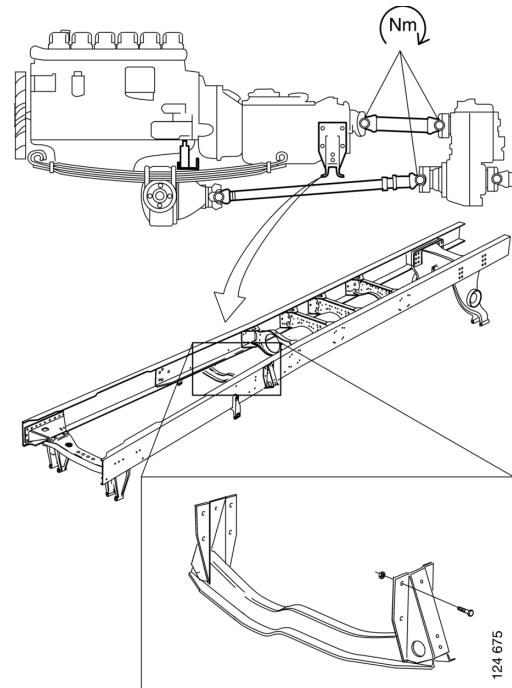
Vehicles with all-wheel drive

Remove the propeller shafts between the gearbox and transfer gearbox and between the transfer gearbox and front axle. This is carried out after position 4 in **Removal**.

Remove the underslung crossmember.
Note: Batteries must be removed.

On certain models the hydraulic pipes to the cab tilt cylinder must also be removed so that the underslung crossmember can be removed.

Note: On vehicles with all-wheel drive, the speed sensor cable does not need to be removed.



Fit the underslung crossmember. Tightening torque 135 Nm.

Fit the propeller shaft between the gearbox and transfer gearbox and between the transfer gearbox and front axle. This is carried out after position 3 in **Removal**.

Tightening torques

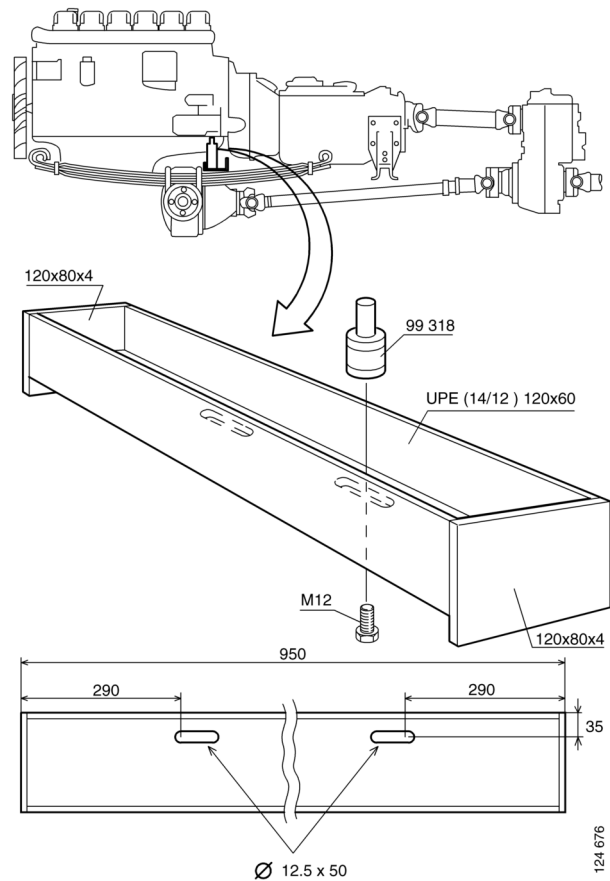
P460 (to driven front axle)	105 Nm
P540 (between gearbox and GTD800)	105 Nm
P640 (between gearbox and GTD900)	170 Nm

If the hydraulic pipes have been dismantled;

- Fill the cab tilt pump with oil.
- Tilt the cab up and down, two to three times. **Important!** Read the safety precautions with regard to tilting the cab.
- Check the oil level each time the cab is tilted down. Top up if necessary.
- Check that there are no oil leaks where the pipes have been dismantled.

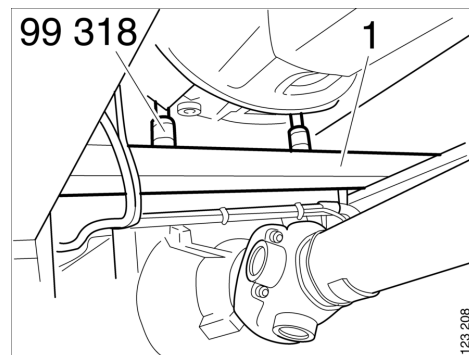
Making a U-beam

To support the engine, a 120 x 60 U-beam must be produced, as illustrated.



Supporting the engine on vehicles with all-wheel drive.

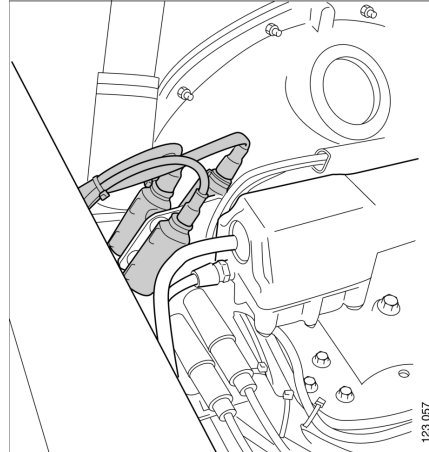
Use a 120 x 60 U-beam 1 and engine support 99 318 or 2 377 964 between leaf spring and oil sump, see illustration. Support the engine as described in Support the engine.



For other procedures, follow the instructions for removing and fitting a manual gearbox with retarder.

Gearbox with Opticruise

Separate and mark the three multiple connectors, as illustrated. Refer to position 8 in **Removal**.



Fit the three multiple connectors as marked. Refer to position 8 in **Fitting**.

For other procedures, follow the instructions for removing and fitting a manual gearbox with retarder.

Gearbox without retarder

Do not carry out the procedure at positions 2 and 5, refer to **Removal**, with regard to detaching the hose from the proportional valve and detaching the oil hose.

Do not carry out the procedure at positions 2 and 5, refer to **Fitting**, with regard to fitting the hose to the proportional valve and fitting the oil hose.

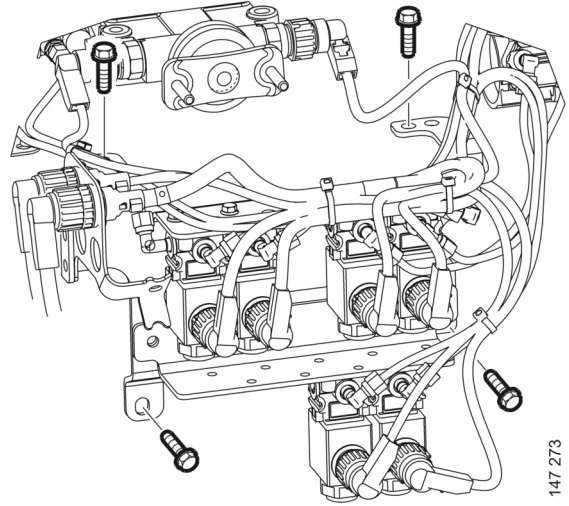
Note: The manual gearbox without retarder does not have a coolant pipe.

For other procedures, follow the instructions for removing and fitting a manual gearbox with retarder.

Gearbox with power take-off EK 630/640

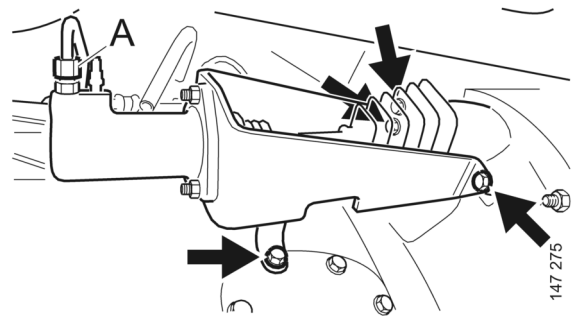
Additional work when removing the gearbox.

- 1 Detach and place the valve assembly to one side.



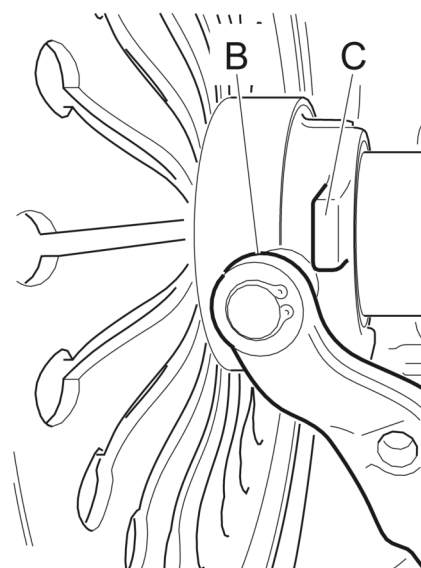
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- 2 Detach connection **A** for the slave cylinder and plug the connection. Detach and remove the slave cylinder and its bracket.



147 275

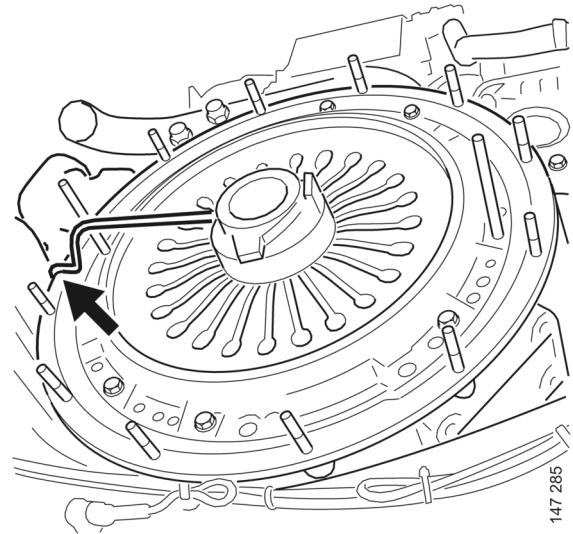
- 3 When the gearbox is removed from the engine, make sure that the bell crank pressure rollers **B** are free of the release bearing lugs **C**. The release bearing does is not locked.



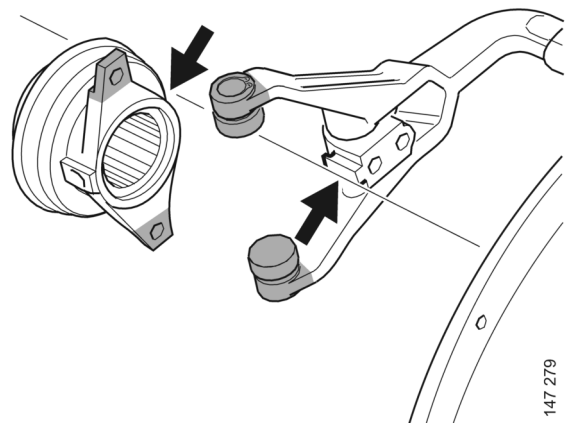
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Additional work when removing the gearbox.

- 1 Check that the release bearing guide is in position in the recess on the flywheel housing.



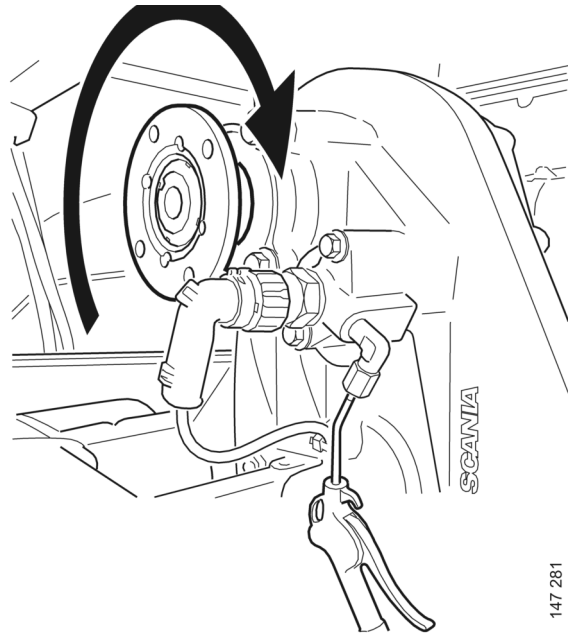
- 2 When the gearbox is assembled with the engine, check that the groove on the bell crank bearing retainer engages in the release bearing groove as shown by the arrows in the illustrations. At the same time place the bell crank pressure rollers under the release bearing lugs (parts marked in grey in illustration).



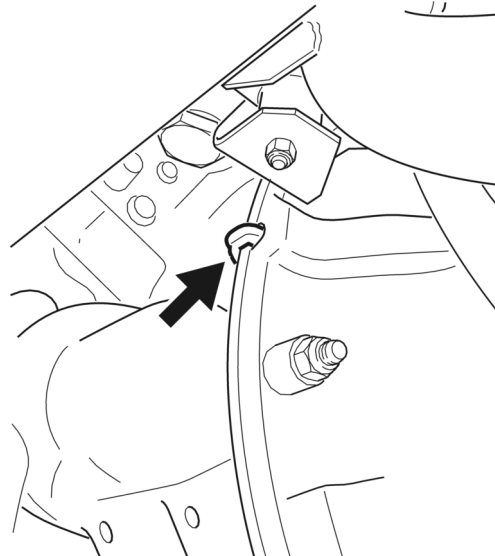
- 3 Engage a gear and press the gearbox forwards while turning the gearbox driver. When the splines on the gearbox input shaft engage in the clutch disc, the driver can no longer be turned. Press the gearbox in towards the engine until it stops.

- 4 Detach the pipe for the power take-off operation unit and activate the power take-off by pressurising the operation unit. Turn the power take-off driver while pressing the gearbox forwards towards the engine.

When the drive sleeve splines engage in the clutch cover, the power take-off driver can no longer be turned. Then press in the gearbox towards the engine until it is in position.



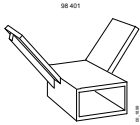
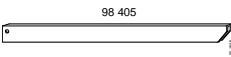
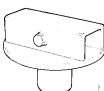

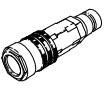
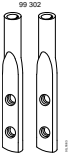
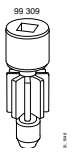
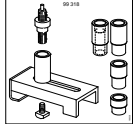
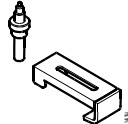
- 5 Check that the release bearing guide is in position in the recess on the flywheel housing.



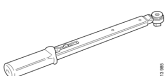
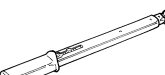
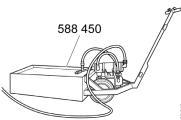
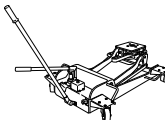
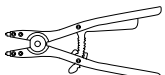
Work description

Tools

Special tools

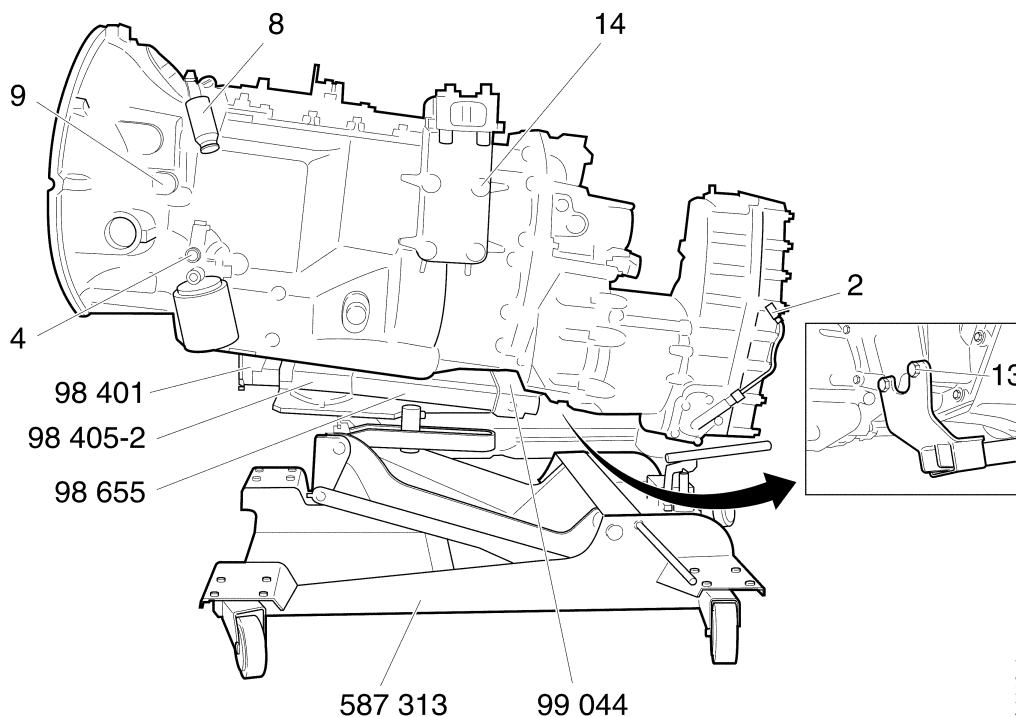
Number	Designation	Illustration	Tool board
98 401	V block		F1 (Included in 98 400)
98 405-1 or 98 655	Fixture beam		(Included in 98 400)
98 405-2	Fixture bracket		(Included in 98 400)
99 044	Rear gearbox support		F1 (Included in 98 400)
99 301	Adapter		D5
99 302	Tips for retaining ring pliers 587 585		D5/G4
99 309	Turning tool		D5
99 318	Engine support		D5 (normal version)
2 377 964	Completing kit for engine support kit		D5

Other tools

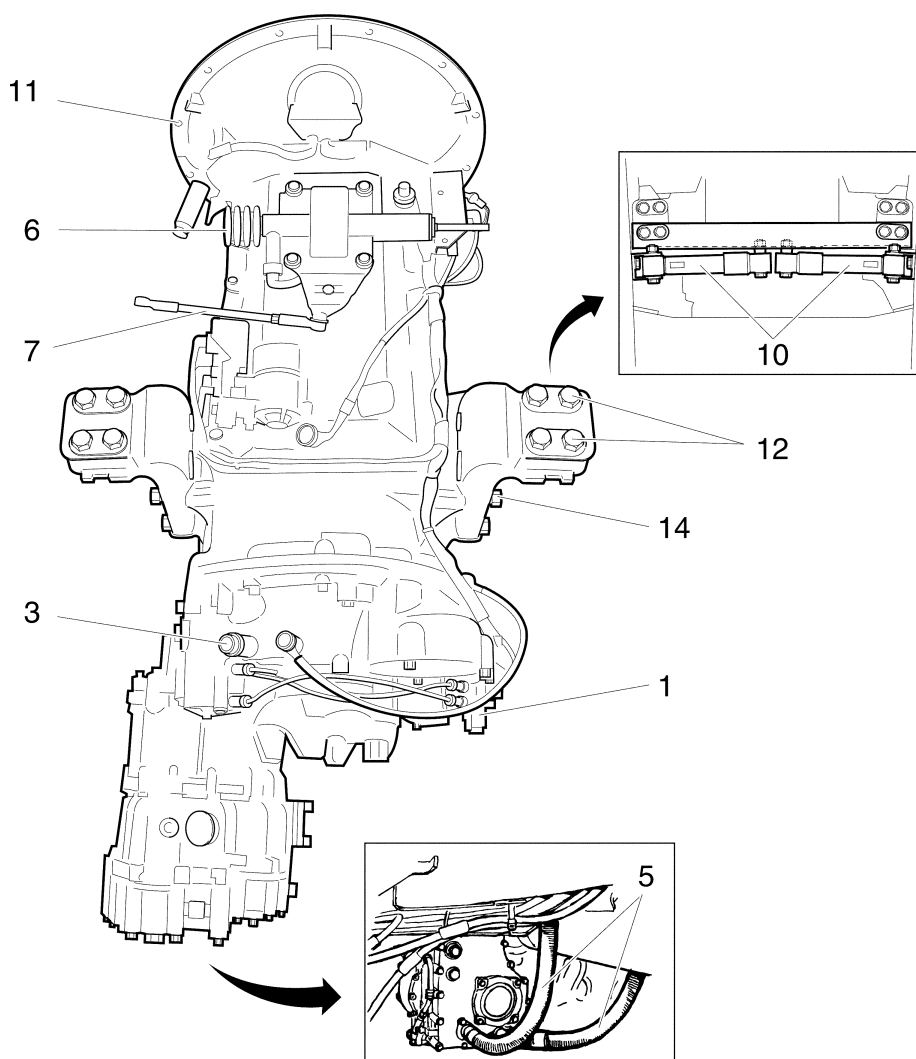
Number	Designation	Illustration	Tool board
587 054	Torque socket 75-400 Nm		XB3
587 071	Torque socket 20-100 Nm		-
588 450	Coolant tank		-
587 313	Gearbox jack		-
587 585	Snap ring pliers		G4

Removal

Pos.	Designation	Comments
-		Drain the retarder, refer to Drain the retarder.
-		Drain the gearbox oil if necessary.
5	Oil hoses	Detach and mark. IMPORTANT! Do not mix up the oil hoses.
-		Detach and remove the retarder coolant pipe which is fitted in the gearbox.
4	Oil filter pipe	Detach, mark and plug. Note: Applies to gearbox with oil cooler.
-		Remove the propeller shaft and exhaust pipe.
1	Air pipe	Detach the air pipe between the solenoid valve and pressure limiting valve.
2	Retarder hose	Detach the hose from the proportional valve.
3	Cable (speedometer sensor)	Remove.
6	Gear control	Loosen and fold to one side.
7	Torque rod	Loosen and fold to one side.
8	Multiple connector	Separate.
9	Clutch servo hose	Detach and plug.
10	Shock absorber	Remove any shock absorbers.
-		Remove the accumulator and other parts which can hinder the work or become damaged when removing the gearbox. Note all removed and detached parts.
-		Support the engine, refer to Support the engine.
13	Rear gearbox support	Fit the gearbox into the rear support with bolts 10 mm longer than normal. Fit the jack underneath.
12	Vibration insulators	Screw up by approx. 10 mm.
-		Raise the powertrain to relieve the pressure on the gearbox brackets.
14	Gearbox brackets	Undo.
-		Lower the powertrain so that the engine is positioned on the engine supports.
11	Clutch housing	Remove the clutch housing nuts.
-		Detach the clutch retaining ring, refer to Detach the clutch retaining ring.
-		Remove the gearbox.



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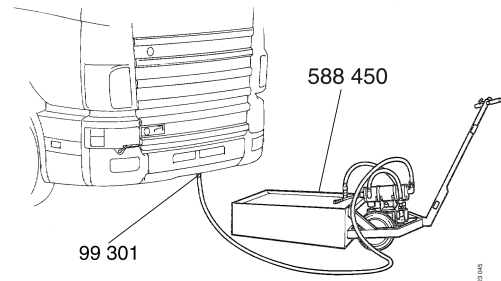
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Drain the retarder

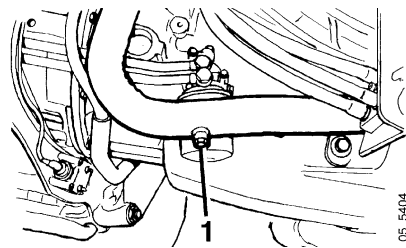
Lower the air suspension to its lowest point.

Tilt the cab.

- 1 Drain cooling system using adapter 99 301 and coolant tank 588 450.



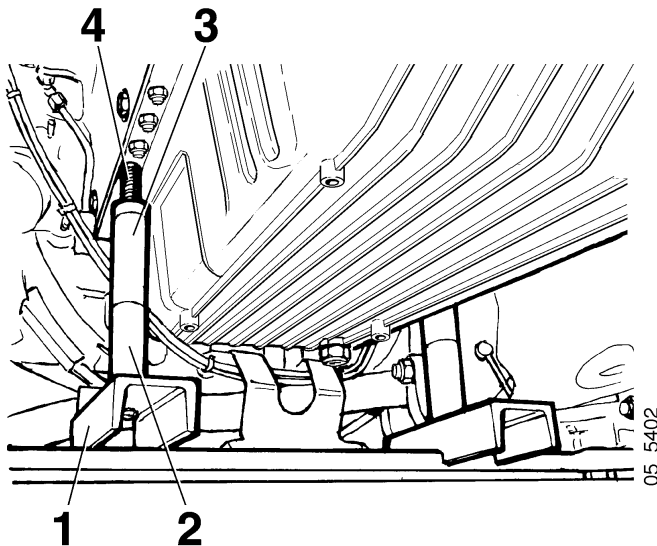
- 2 Drain the remaining coolant through drain plug 1 on the retarder's left coolant pipe by the clutch housing.
- 3 Drain the oil from the retarder oil cooler. See Main group 0, Maintenance instructions part 2, group 10.



Support the engine

When working on removing and fitting a gearbox, the engine in the vehicle should be supported.

IMPORTANT! Never alter the distance between the front axle beam and frame, e.g. by raising the air suspension. There is a risk that the engine will drop.

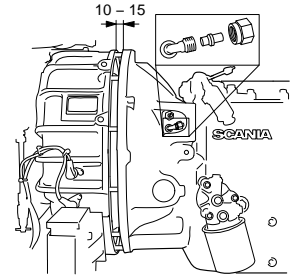


Pos.	Designation	Comments
1	Engine support	Secure engine support 99 318 or 2 377 964 on the front axle beam. On vehicles with all-wheel drive a U-beam manufactured in-house must be used. See the section Differences in working methods, Vehicles with all-wheel drive for a description of the method of production. Make sure that the protruding parts of the beam side pieces end up on the outside of the leaf springs.
2	Lower spacing sleeve	Screw on the lowest spacing sleeve if necessary. On vehicles with all-wheel drive the lower spacing sleeves should be used on both sides.
-		Unscrew two bolts on the oil sump. Select the bolts so that the intermediate sleeve ends up behind the centre of the front axle. On vehicles with all-wheel drive the two bolts should be at the very back on the sides of the oil sump.

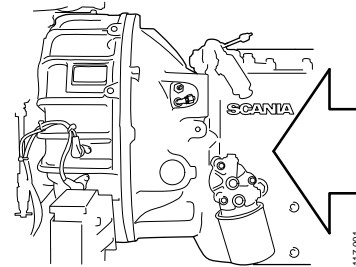
Pos.	Designation	Comments
3	Intermediate sleeve	Adjust with intermediate sleeves so that the threaded adjusting device dowels can be fitted into the bolt holes. On vehicles with all-wheel drive, the oil sump design means that on the right-hand side there is only room for the shortest intermediate sleeve and the adjusting device must be screwed out further. On the left-hand side there is room for a longer intermediate sleeve.
-		Adjust the position of the sleeves so that they are as straight as possible and tighten the nuts on the lowest spacing sleeve.
4	Adjusting device	Screw up the adjusting device so that the support reaches the bottom of the oil sump.

Detach the clutch retaining ring

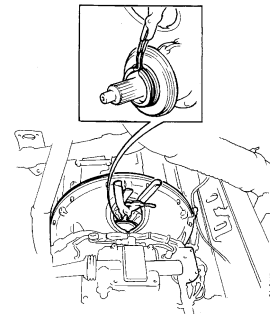
- 1 Pull the gearbox backwards 10-15 mm.
- 2 Plug the slave cylinder. Use plug 813 876 and union nut 812 888.



- 3 Carefully push the gearbox back towards the clutch flange, so that the retaining ring is relieved of pressure.

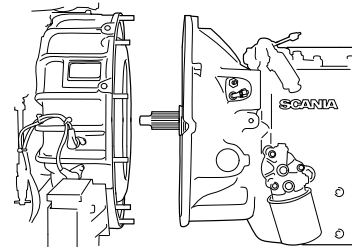


- 4 Compress the retaining ring wire ends until the end of the slave cylinder is released from the diaphragm spring joint. Allow the pliers to remain in place. Use pliers 587 585 with tips 99 302.



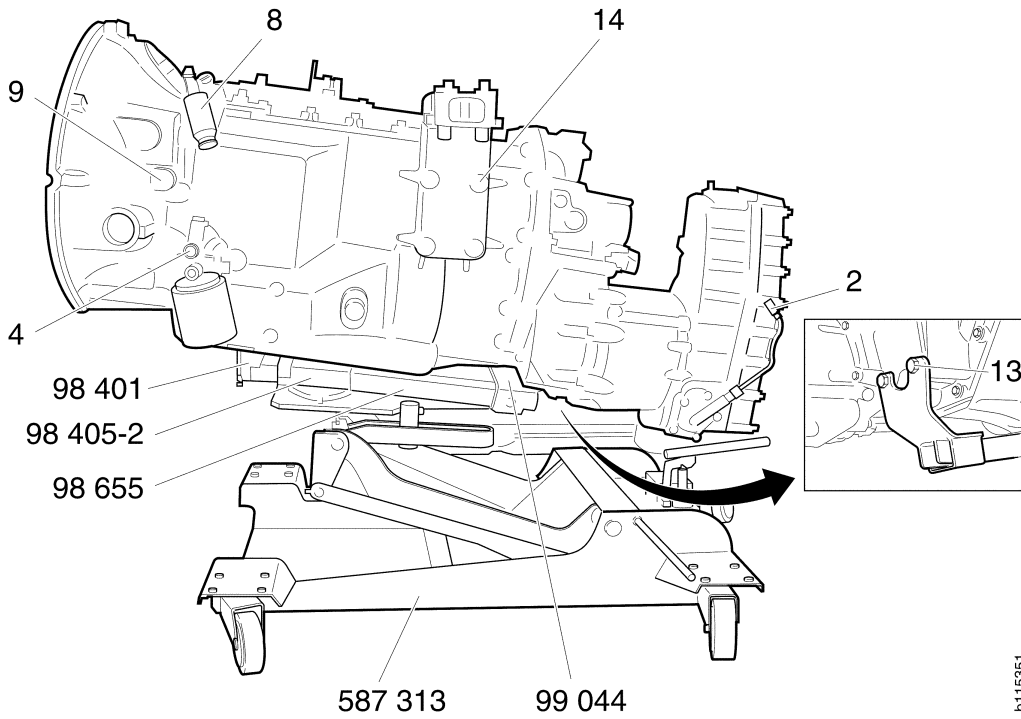
Tip: to hold the ends of the retaining ring together, a strap may be used instead of the pliers.

Note: The retaining ring must be renewed.

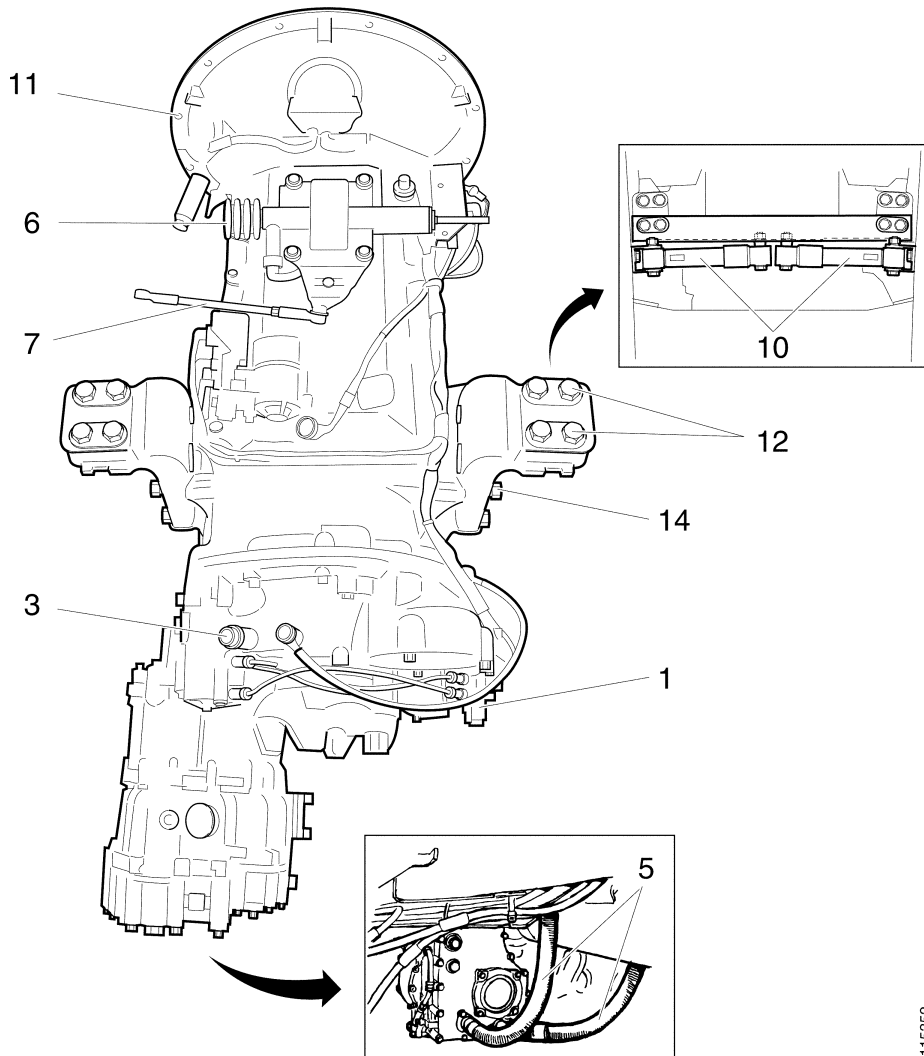


Fitting

Pos.	Designation	Comments
-		Push in the end of the slave cylinder, refer to Adjust the end of the slave cylinder.
-		Align the gearbox and push it into position until a click is heard. Pull the gearbox backwards and check that the slave cylinder is secured in the diaphragm spring.
11	Clutch housing	Fit the clutch housing nuts, tightening torque 47 Nm.
-		Fit the retarder coolant pipe and its hose.
-		Raise the power train and remove the engine supports.
14	Gearbox brackets	Fit, tightening torque 180 Nm.
13	Rear gearbox support	Lower and remove the gearbox jack. Fit the bolts onto the rear end plate of the gearbox.
12	Vibration insulators	Fit, tightening torque 180 Nm.
10	Shock absorber	Fit. The thick end towards the centre and the mark facing upwards.
-		Fit the bolts which were removed from the oil sump, tightening torque 50 Nm (M10), 30 Nm (M8).
-		Fit the parts which have been secured or removed because of the risk of damage.
6	Gear control	Fit.
7	Torque rod	Fit.
8	Multiple connector	Assemble.
9	Clutch servo hose	Fit.
3	Cable (speedometer sensor)	Fit.
-		Fit the propeller shaft and exhaust pipe.
2	Retarder hose	Fit.
1	Air pipe	Fit the air pipe between the solenoid valve and pressure limiting valve.
4	Oil filter pipe	Fit according to the mark.
5	Oil hoses	Fit according to the mark, tightening torque 20 Nm.
-		Refill the gearbox with oil, tightening torque 80 Nm.
-		Refill retarder with oil and coolant, refer to Fill the retarder.
-		Refill and bleed the clutch, refer to group 04 in Workshop Manual Clutch and clutch control.



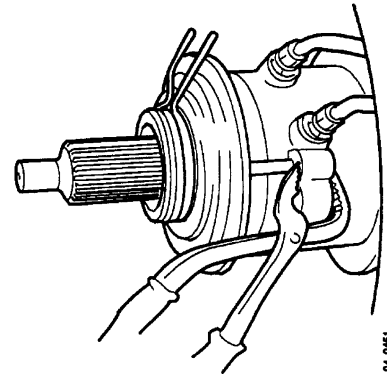
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Adjust the end of the slave cylinder

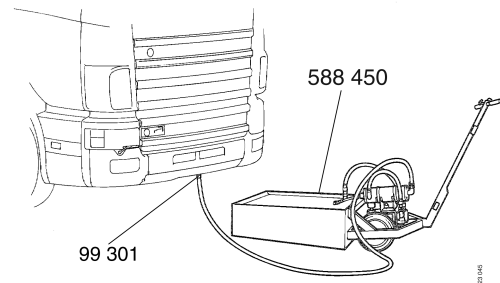
- 1 Engage a gear.
- 2 Oil the spring pins with anticorrosive oil.
- 3 Push in the end of the slave cylinder until the spring pin is level with the rear edge of the heel. Use polygrip pliers.
- 4 Check that the retaining ring is positioned correctly.
- 5 Check that the puller ring and its securing ring are intact and are correctly seated.



Fill the retarder

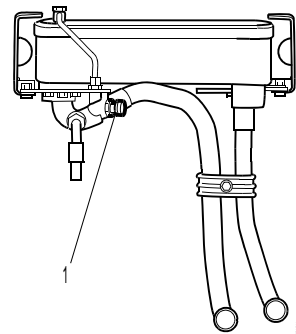
Tilt the cab back.

- 1 Refill retarder with oil. See Main group 0, Maintenance instructions part 2, group 10.
- 2 Refill the cooling system with coolant using coolant tank 588 450 and adapter 99 301 connected to the drain tap.
- 3 Connect the return hose to the expansion tank filler pipe.
- 4 When the cooling system is full: Start the engine, leave it running for a while, top up.



The retarder radiator is equipped with a bleeder nipple 1.

- Connect adapter 99 301, preferably with a hose, to the bleed nipple on the retarder radiator.
- Refill with coolant, as described above, until coolant flows out evenly at the retarder radiator.
- Remove the adapter from the retarder radiator and refill the remainder of the cooling system as described above.



IMPORTANT! Use only the dipstick intended for the retarder when checking the retarder oil level.

Specifications

Tightening torques

Clutch housing	47 Nm
Bracket, torque converter	70 Nm
Bracket, gearbox suspension to insulator.	180 Nm
Bracket, gearbox suspension to gearbox.	180 Nm
Torque rod bracket	47 Nm
Oil sump	30 Nm (M8) 50 Nm (M10)
Retarder oil hose	20 Nm
Gearbox level and drain plug	80 Nm
Retarder level plug	26 Nm
Retarder drain plug	40 Nm
Torque converter drain plug	20 Nm
Fastening bolts for underslung crossmember, all-wheel drive	135 Nm
Propeller shaft bolts for bearing retainer and end yoke:	
P600, P610	170 Nm (M14)
P300, P400, P500, P310, P410, P510	105 Nm (M12)

Note: For other tightening torques, refer to Service data or general tightening torques.

Volumes

For oil volumes and volumes in the cooling system, refer to Workshop Manual 00:03-09.