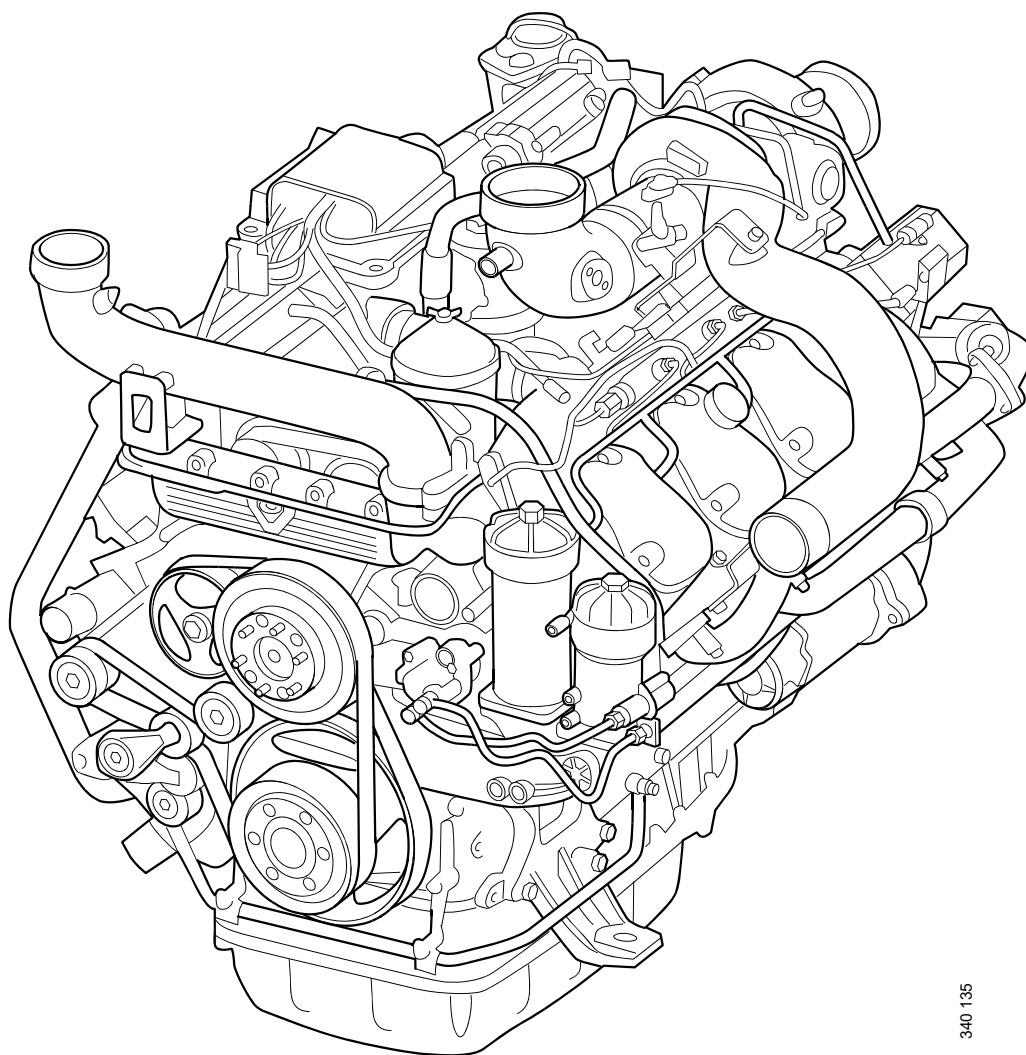


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Issue 13 en-GB

Maintenance instructions for industrial engine DC16 with XPI

E2011



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Maintenance

The maintenance programme covers a number of points that are divided into the following sections:

- Lubrication system.
- Air cleaner.
- Cooling system.
- Fuel system.
- Miscellaneous.



WARNING!

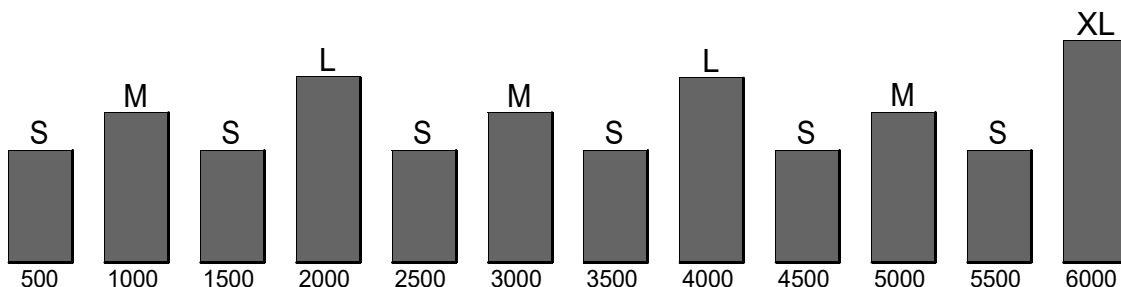
Block the starting device when working on the engine. If the engine starts unexpectedly, there is a serious risk of injury.

There is always a risk of sustaining burns when an engine is hot. Particularly hot parts are engine manifolds, turbochargers, oil sumps, as well as hot coolant and oil in pipes and hoses.

The maintenance programme includes the following:

- R maintenance: One event when taken into service.
- S maintenance: Minimum basic maintenance.
- M maintenance: More extensive maintenance.
- L maintenance: Includes nearly all maintenance items in the form.
- XL maintenance: Includes all maintenance items in the form.

During a period, the sequence is S-M-S-L-S-M-S-L-S-M-S-XL.



313 153



IMPORTANT!

On delivery a Scania engine is optimised for its application. However, regular maintenance is necessary to:

- prevent unplanned stops
- extend the service life of the engine
- maximise the long-term emission performance of the engine
- give the best possible operating economy.

Cleaning the engine



WARNING!

Beware of hot washing water. Wear eye protection, protective clothes and protective gloves.



Environment

Dispose of the washing water in compliance with relevant national or local regulations.

The engine and engine compartment are cleaned using hot water. Use high-pressure jets with caution. Avoid spraying electrical components such as the starter motor, alternator, etc.

Engines with few hours of operation



IMPORTANT!

On engines with few hours of operation, maintenance must be carried out annually or every 5 years.

Stand-by generator sets and similar items that are not used regularly should be test run and checked in accordance with the manufacturer's instructions.

The following maintenance items must be carried out once the engine has been warmed up to operating temperature.

1. Checking the oil level.
2. Checking the coolant level.
3. Checking the vacuum indicator.
4. Checking the fuel level.
5. Checking for engine leakage.

Maintenance interval

	Daily	First time at first start	Interval (hours)					Minimum		
			500 R	500 A	1,000 M	2,000 L	6,000 XL	annu- ally	every 2 years	every 5 years
Lubrication system										
Checking the oil level	X	X								
Changing the oil ¹			X	X	X	X	X	X		
Cleaning the centrifugal oil cleaner					X ²	X ³	X	X		
Renewing the oil filter			X	X	X	X	X	X		
Air cleaner										
Reading the vacuum indicator	X		X	X	X	X	X			
Renewing the filter element						X	X			X
Renewing the safety cartridge						X	X			X
Cooling system										
Checking the coolant level	X	X	X	X	X	X	X			
Checking the coolant's anti-freeze and corrosion protection		X				X	X	X		
Changing the coolant and cleaning the cooling system							X			X
Fuel system										
Checking the fuel level	X	X								
Renewing the fuel filters				X ⁴	X	X	X			X
Renewing the fuel tank venting filter						X			X	
Miscellaneous										
Checking the drive belt		X			X	X	X	X		
Checking for leakage	X		X	X	X	X	X			
Checking and adjusting the valve clearance			X			X	X			
Renewing the reductant filter					X	X	X	X		
Cleaning the reductant tank filler filter			X	X	X	X	X			
Cleaning the reductant tank ventilation filter					X	X	X			
Checking/renewing the particulate filter	4,500 hours ⁵									

1. For engines which comply with Stage V, see Table Stage V.

2. XPI engines where Stage 3/Tier 3 or lower emissions legislation applies.

3. XPI engines where Stage 4/Tier 4 or lower emissions legislation applies.

4. Applies only to DC16 072.

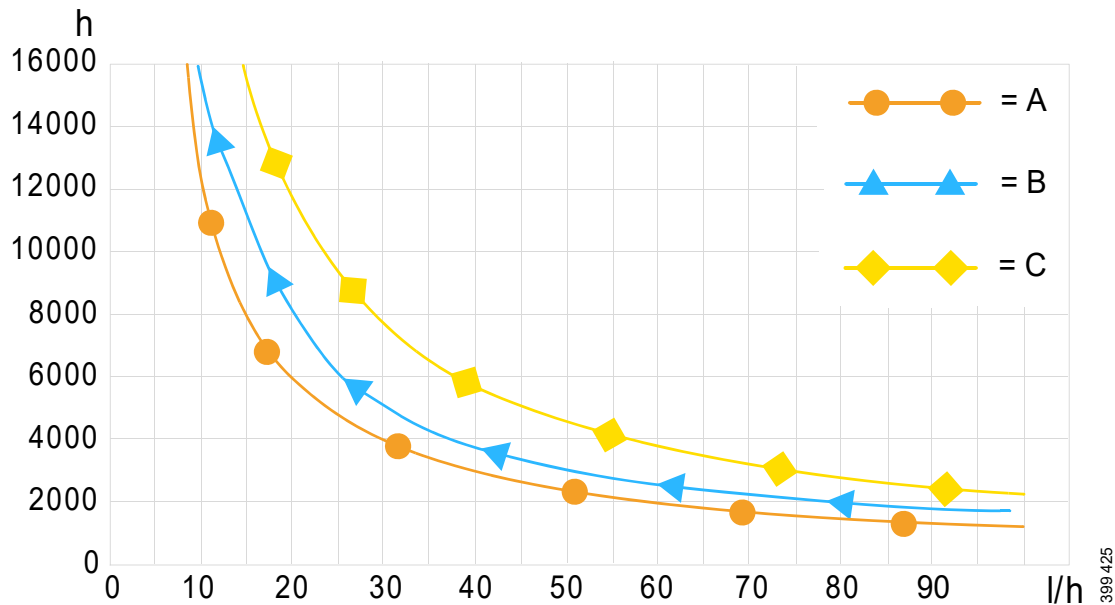
5. The change interval very much depends on the average load and application type. See the Maintenance interval, particulate filter section on the next page.

Particulate filter maintenance intervals



IMPORTANT!

Scania recommends using Scania LDF-4 engine oil. The graph can only be used if this condition is met.



The diagram shows calculated driving time before particulate filter renewal must be carried out on engines with the following 3 types of dynamic load:

- A = High dynamic load, for example excavator and wheel loader.
- B = Semi-dynamic load, for example stone crushing plant and dumper truck.
- C = Low dynamic load, for example generator set.

Note:

The Y axis shows the driving time and the X axis shows the average fuel consumption.

Lubrication system

Oil grade

Scania LDF stands for the Scania Long Drain Field test standard. Scania LDF oils have been carefully selected after extensive testing. The approval is only granted to the highest grade engine oils available on the market.

Recommended engine oils: Scania's LDF and Scania E7 oils.



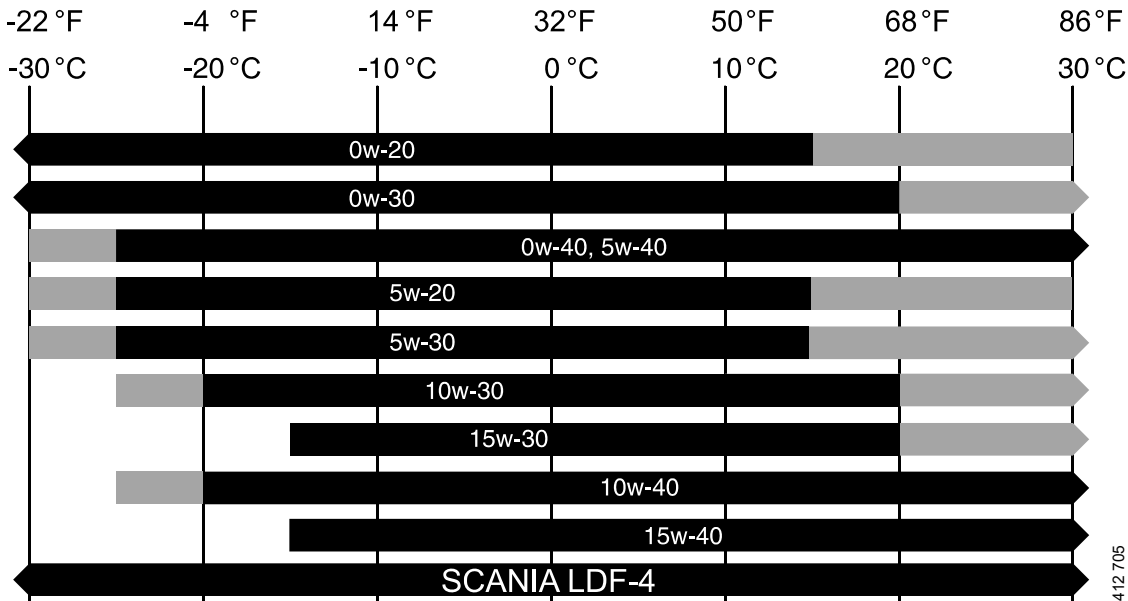
IMPORTANT!

Regarding particulate filters, the information in this document is not valid if an engine oil other than Scania LDF-4 is used.

Particulate filter	Oil grade
No	LDF-3 LDF-2 LDF Scania Oil E7 ACEA E7/API CI-4 ACEA E5/API CI-4+
Yes	LDF-4 ACEA E6 ACEA E9 API CK-4 with ash content < 1%

For fuels with a high sulphur content, the Total Base Number (TBN) must be at least 12.

If Scania LDF-4 is not used, the oil must be of a viscosity class suitable for the outdoor temperature in the area where the engine is used.



The illustration describes which ambient temperature in °C the viscosity class can handle for Scania-approved and market approved oil grades. Note that the Scania-approved oil grades have a greater temperature range than market approved oil grades.

- 352 436

= The temperature range which the market-approved oil grades, for example ACEA Exx and API Cxx, can handle.
- 352 437

= The temperature range that the Scania-approved oil grades, for example the Scania LDF oils and Scania Low Ash, can handle exceeding that which the market-approved oil grades can handle.

Table Stage V

Table for oil change interval for engines that comply with stage 5. For other engines, a 500 h service interval applies.

Oil	Oil change intervals		
	Medium load (l/h)		
	< 41	< 43	> 43
LDF-4	750 h	500 h	500 h
Other	500 h	500 h	400 h

The table does not apply for engines that:

- occasionally have much higher consumption
- have an idling percentage > 15%
- are used at high coolant temperatures
- If the engine is used with fuels that do not comply with the EN950/EN15940/MK1 standard

For operation at extremely low outdoor temperatures: Consult your nearest Scania workshop on how to avoid starting difficulties.

If the engine is used in areas of the world where engine oil with ACEA or API classification is not available, the oil grade must be measured in actual operation. In this case contact the nearest Scania workshop.

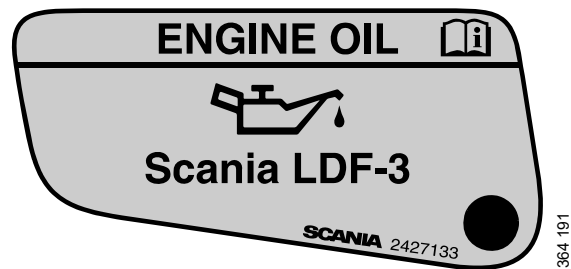
Labels for filled engine oil grade

When changing oil it is important to use the correct engine oil grade. The oil filler should therefore be clearly marked with a label for the filled oil grade. However, there are only labels for oils with Scania LDF approval and oil grade ACEA E7.

Stick on a new label if the oil type or oil grade is changed in favour of any of the oil types above. Replace the label if it is missing.



Filling label in the cylinder block.



Filling label in the rocker cover.

If the oil grades below are used, you can order oil filler labels from Scania.

Oil grade	Colour	Part no.	
		Filling in the cylinder block	Filling in the rocker cover
Scania LDF-3	Red	2 132 426	2 427 133
Scania LDF-2	Blue	2 132 424	-
Scania LDF	Grey	2 269 345	-
ACEA E7	White	2 132 425	2 427 132

Oil analysis

To extend the oil change intervals using oil analysis, Scania LDF-3 and LDF-2 oils must be used. Certain laboratories offer engine oil analysis.

The following conditions must remain fulfilled when the oil is changed:

- Viscosity at 100°C (212°F): max. $\pm 20\%$ of original value of the fresh oil.
- TBN (in accordance with ASTM D4739): > 3.5.
- TBN (in accordance with ASTM D4739): > TAN (in accordance with ASTM D664).
- Soot (DIN 51452): < 3%.

Such analysis measures the oil's total base number, TBN (Total Base Number), total acidic number, TAN (Total Acid Number), fuel dilution, water content, viscosity and the quantity of particles and soot in the oil.

The result of a series of analyses is used as the basis for establishing a suitable oil change interval.

If the conditions are changed, a new oil analysis programme must be carried out to establish new oil change intervals. Work out the new oil change interval for the engine in conjunction with the workshop.



REQUIREMENT!

Only Scania LDF oils may be used in conjunction with oil analysis and a possible extended oil change interval.

Depending on the market, the warranty conditions may also change if the oil change intervals differ from the recommended Scania timetable.

Checking the oil level



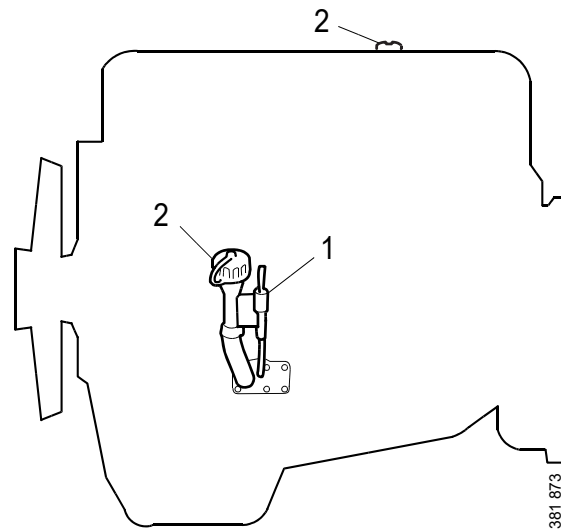
REQUIREMENT!

Leave the engine off for at least 7 minutes before you check the oil level.

If the oil level exceeds the maximum level, the oil must be changed. Check the cause if the oil level exceeds the maximum level and contact your nearest workshop if you suspect a fault.

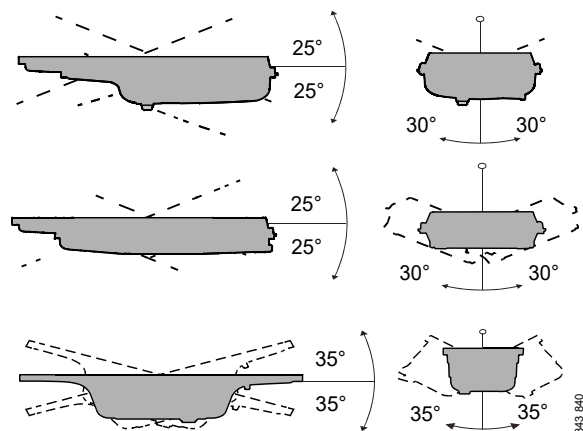
1. Pull out the oil dipstick (1) and check the oil level. The correct level is between the minimum and maximum marks on the oil dipstick.
2. Fill with more oil at point 2 in the illustration when the oil level is at or below the lower mark.

You can find more information on the correct oil grade under the heading [Oil grade](#).



Maximum angles of inclination during operation

Maximum permissible angles of inclination during operation vary, depending on the type of oil sump. See illustration.



Changing the oil



WARNING!

Hot oil can cause burns and skin irritation. Wear protective gloves and eye protection when changing hot oil. Make sure that there is no pressure in the lubrication system before changing the oil. The oil filler cap must always be in place when starting and running the engine to prevent oil being ejected.

Note:

Change oil more often if the engine is subjected to particularly demanding operation, such as a dusty environment, or if deposits in the centrifugal oil cleaner are thicker than 28 mm (1.1 in).

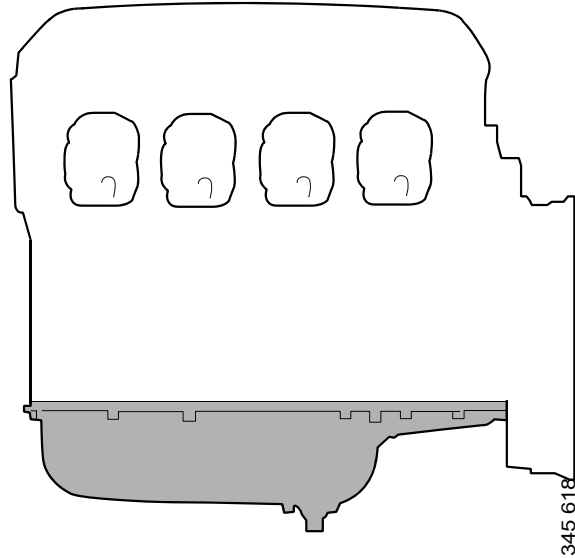
Renew the oil filter and clean the centrifugal oil cleaner when changing oil.



Environment

Use a suitable container. Used oil must be disposed of as specified in national and international laws and regulations.

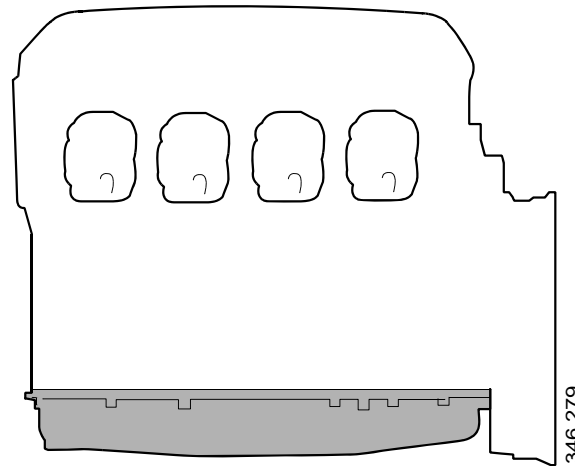
1. Unscrew the oil plug and drain the oil when the engine is hot. In certain engine types the oil is pumped out by means of a bilge pump. If the engine is drained via the valve, the oil should be hot. Alternatively, use a pump. This is so that draining occurs more quickly.
2. Wipe off the magnet on the oil plug.
3. Renew the gasket on the oil plug.
4. Refit the oil plug.
5. Fill with the amount of oil specified for the oil sump.
6. Wait at least 7 minutes.
7. Check the level on the oil dipstick.



Oil volume for oil sump with deep front:

Min. 40 litres (10.5 US gallons).

Max. 48 litres (12.6 US gallons).



Oil capacity for low oil sump:

Min. 29 litres (7.6 US gallons).

Max. 37 litres (9.7 US gallons).

Cleaning the centrifugal oil cleaner



WARNING!

The oil may be hot. Carefully remove the cover from the centrifugal oil cleaner.

Wear eye protection and protective gloves when working on the centrifugal oil cleaner.

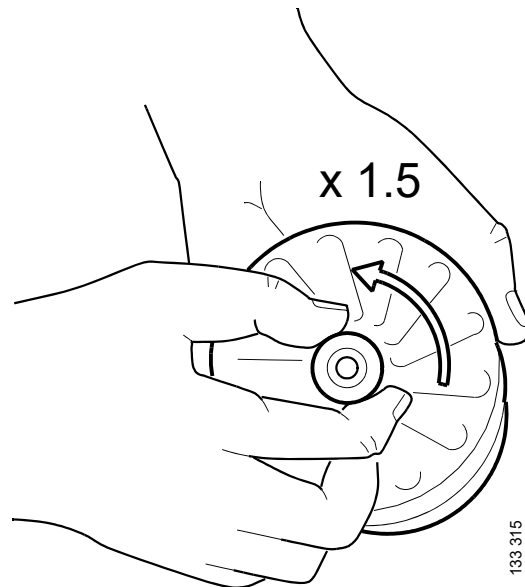
When the centrifugal oil cleaner is cleaned, there should be some dirt deposits on the paper in the rotor cover. If the paper is clean, the equipment is not working as it should. If this is the case, investigate the cause of this.

Renew the paper more frequently if the dirt deposits are thicker than 28 mm (1.1 inches) during a scheduled oil change.

1. Clean the cover.
2. Unscrew the nut securing the outer cover.
3. Let the oil run out from the rotor.
4. Lift out the rotor. Wipe off the outside.
5. Loosen the rotor nut and unscrew it about 1.5 turns.

Note:

Take care not to damage the rotor shaft.

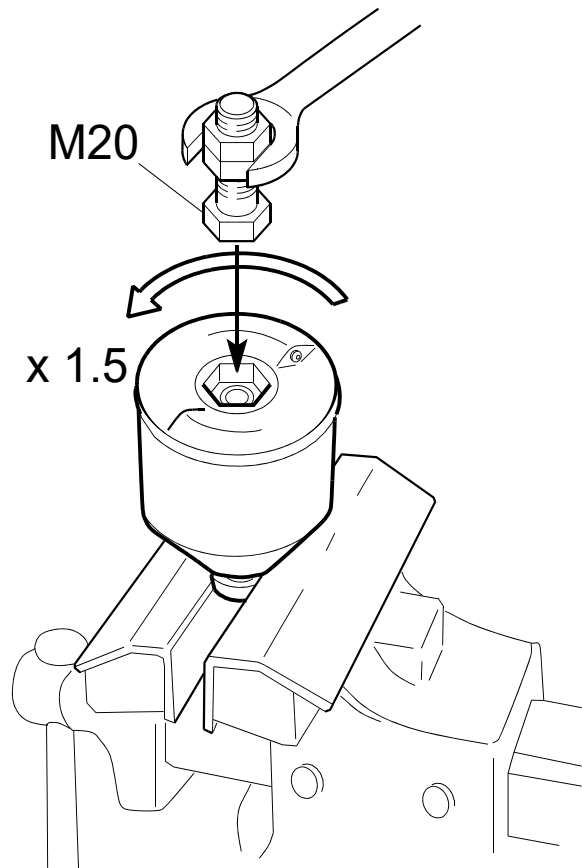


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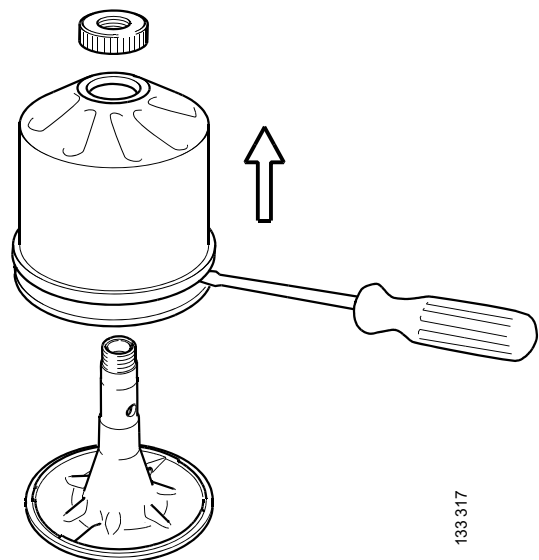
6. If the rotor nut is jammed: Turn the rotor upside down and fasten the rotor nut in a vice. See illustration.
7. Use protective jaws so as not to damage the grooves of the rotor nut.
8. Turn the rotor 1.5 turns anti-clockwise by hand.
9. If this does not work: Screw 2 nuts together with an M20 screw.
10. Position the screw head at the bottom of the rotor.
11. Position a ring spanner on the lower nut and turn the rotor 1.5 turns anti-clockwise.

! IMPORTANT!

Do not attach the rotor directly to the vice. Never strike the rotor cover.

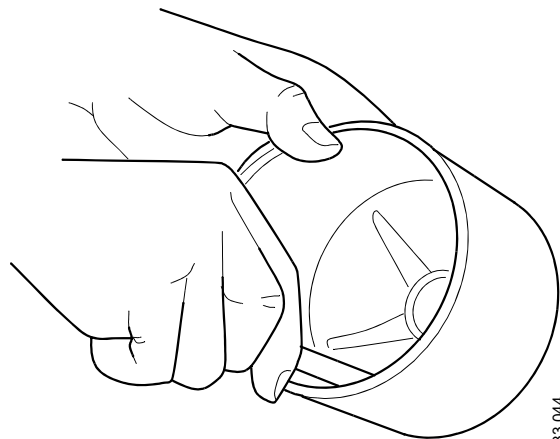


12. Remove the rotor cover by holding the rotor in both hands and tapping the rotor nut against the table. Never strike the rotor directly as this may damage its bearings.
13. Remove the strainer from the rotor cover. If the strainer is stuck, insert a screwdriver between the rotor cover and strainer and carefully prise them apart.



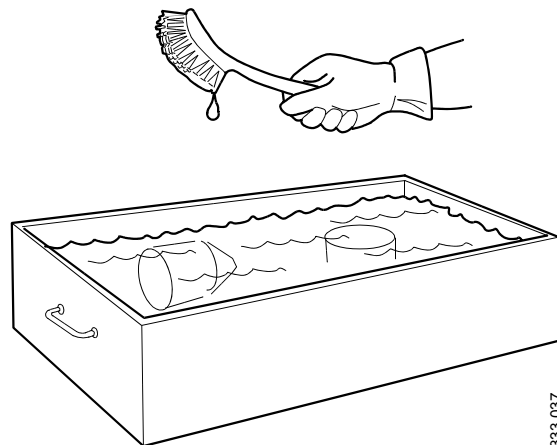
133 317

14. Remove the paper insert.
15. Scrape off any remaining dirt deposits from the inside of the rotor cover. If the deposits on the paper are thicker than 28 mm (1.1 in), the centrifugal oil cleaner must be cleaned more often.



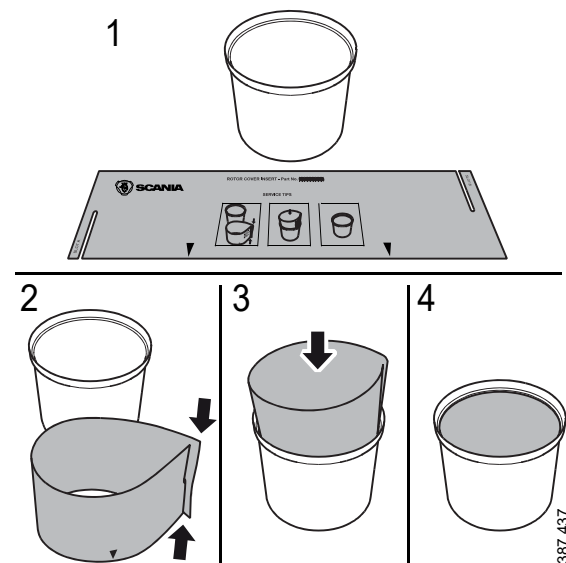
333 044

16. Wash the parts according to the applicable industrial method.
17. Check the 2 nozzles on the rotor. Ensure that they are not blocked or damaged.
Renew any damaged nozzles.
18. Check that the bearings are undamaged.
Renew damaged bearings.



333 037

19. Fold and fit a new paper insert on the inside of the rotor cover as illustrated.



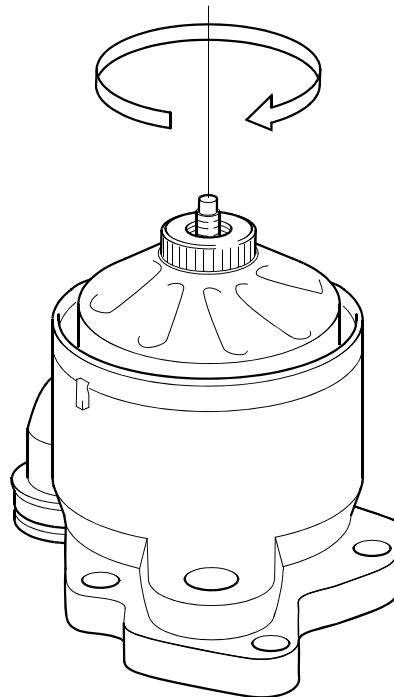
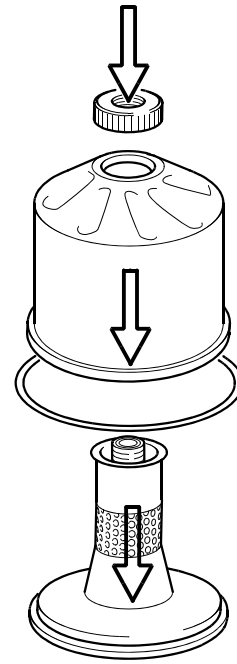
387 437

20. Fit the strainer onto the rotor.
21. Fit a new O-ring to the foot of the centrifugal oil cleaner.
22. Refit the rotor cover. Ensure that the O-ring is not outside the edges, but is in the groove.
23. Screw the rotor nut back on by hand.
24. Check that the shaft is not damaged or loose.
Contact a workshop with qualified personnel if the rotor shaft needs to be renewed.

Note:

Take care not to damage the rotor shaft.

25. Refit the rotor and rotate it by hand to make sure it rotates easily.

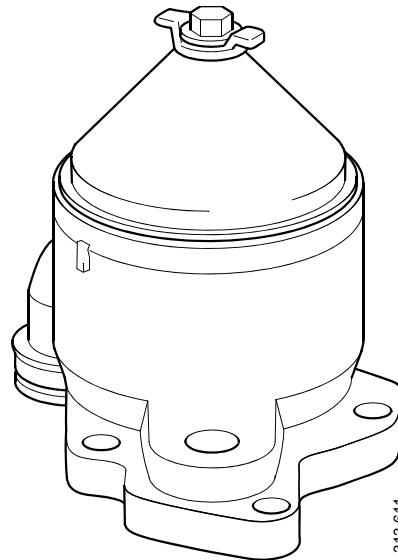


313 612

26. Fit a new O-ring in the cover.
27. Refit the cover and tighten the lock nut.
Tightening torque 20 Nm (15 lb/ft).

! **IMPORTANT!**

To reduce the risk of oil leakage it is important to tighten the cover to the correct tightening torque.

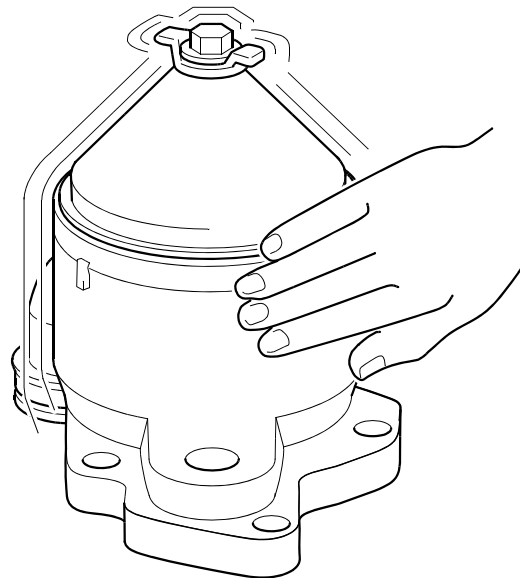


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Operational testing of the centrifugal oil cleaner

Operational testing need only be carried out if it is suspected that the centrifugal oil cleaner is malfunctioning. For example, if there are unusually few deposits given the distance driven.

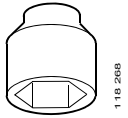
1. Run the engine until it reaches normal operating temperature.
2. Turn off the engine and listen for the sound from the rotor. It should continue rotating for a time, even when the engine has stopped.
3. Use your hand to feel if the filter housing is vibrating.
4. If the filter housing is not vibrating, dismantle and check the centrifugal oil cleaner.



369 844

Renewing the oil filter

Tool

Designation	Illustration
Hexagon socket, 1/2", 36 mm	



IMPORTANT!

The engine must not be run without a filter element in the oil filter. There is a risk of engine damage caused by particles and by the oil pressure being too low.

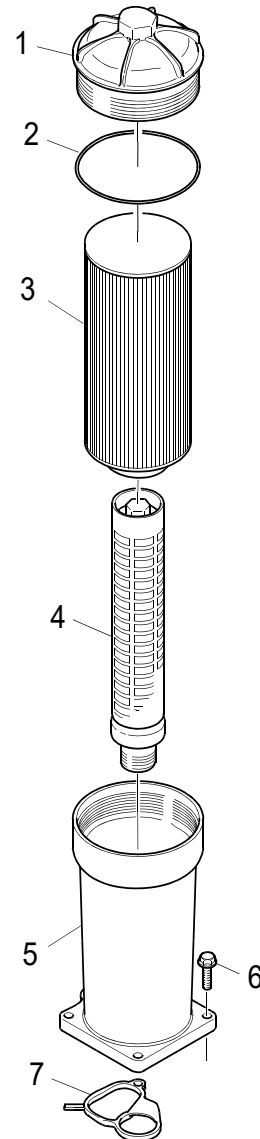
1. Unscrew the filter cover using the socket.



IMPORTANT!

Do not use an adjustable spanner or other open tool, as there is a risk of damaging the filter cover.

2. Lift out the filter housing cover with filter element. The filter housing will drain automatically once the filter has been removed.
3. Undo the old filter from the cover by carefully bending it to one side.
4. Fit a new O-ring on the cover. Lubricate the O-ring with engine oil.
5. Press a new filter into the snap fastener in the cover and tighten the filter cover to 25 Nm (18 lbf/ft).
6. Make sure the oil filter drain has emptied the oil from the filter housing. Screw on the filter cover firmly with the socket.
7. Start the engine and inspect the filter housing for leaks.



1. Cover.
2. O-ring.
3. Filter element.
4. Pipe.
5. Filter housing.
6. Flange screw.
7. Gasket.

381 921

Air cleaner



WARNING!

Never start the engine without the air filter in position. Without the air filter, there is a risk of dirt being sucked into the engine.

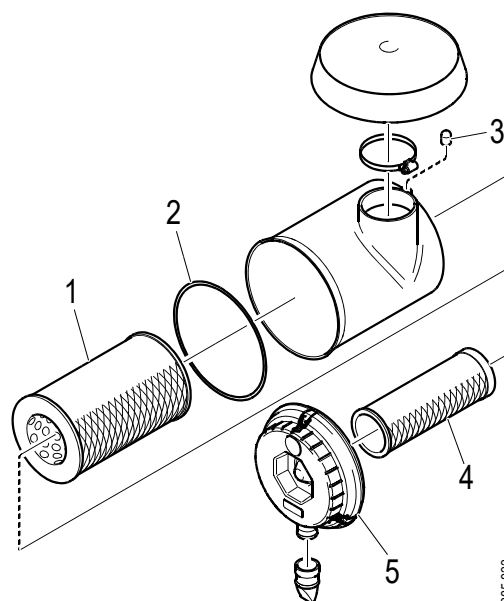
The engine turbocharger will continue to rotate and take in air for a time, even after the engine has stopped. Therefore, wait for a few minutes before opening the air cleaner.



IMPORTANT!

Renew the filter element earlier than the maintenance interval if the vacuum indicator shows red.

The filter element must not be cleaned in water or be blown clean with compressed air. There is always a risk that the filter element will be damaged when it is cleaned.

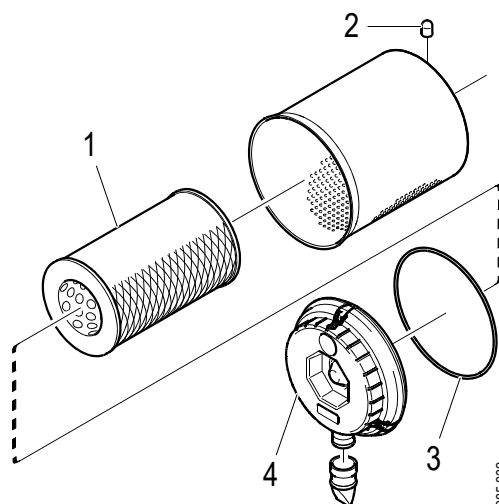


Air cleaner with safety cartridge

1. Filter housing.
2. O-ring.
3. Vacuum indicator.
4. Safety cartridge.
5. Cover.

Reading the vacuum indicator

If the vacuum indicator's red plunger is fully visible, renew the air cleaner filter element in accordance with the following section.

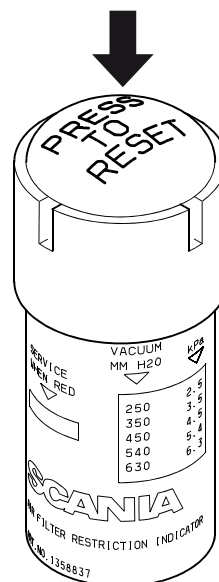


Air cleaner without safety cartridge.

1. Filter element.
2. Vacuum indicator.
3. O-ring.
4. Cover.

Renewing the air cleaner filter element and safety cartridge

1. Remove the cover from the air cleaner.
2. Renew the filter element.
3. If the air cleaner has a safety cartridge: Remove the safety cartridge and fit a new one.
4. Insert a torch into the filter element and check that the filter paper is free of holes and cracks.
5. Renew the O-ring if it is damaged or hard.
6. Assemble the air cleaner.
7. Ensure that the O-ring is not outside the edges.
8. Reset the vacuum indicator by pressing in the button marked in the illustration.



326 671

Cooling system

Coolant

Note:

The coolant should be changed when the cooling system is cleaned: every 6,000 hours or at least every 5 years. See [Changing the coolant and cleaning the cooling system](#).

The coolant recommended by Scania is a mixture of water with antifreeze (ethylene glycol) and corrosion protection. The coolant has several characteristics which are important for the operation of the cooling system:

- Corrosion protection
- Antifreeze protection
- Increases the boiling point

The coolant should always contain 35-55 per cent by volume of antifreeze and corrosion protection so that the coolant properties ensure that the coolant works correctly.

Note:

Too high a dose of antifreeze and corrosion protection will increase the amount of sludge and blockages accumulating in the radiator. Too low a concentration can lead to corrosion of the cooling system and ice formation at low temperatures.

Hot climates

In order to retain the corrosion protection and the higher boiling point, it is essential to use coolant consisting of water mixed with antifreeze and corrosion protection (ethylene glycol). This also applies in countries where the temperature never drops below 0°C (32°F).

The coolant should always contain 35-55% anti-freeze and corrosion protection by volume so that the coolant properties ensure that the coolant works correctly.

Antifreeze and corrosion protection

The antifreeze and corrosion protection used in Scania engines should be of the antifreeze (ethylene glycol) and corrosion protection type.

Only the product Scania coolant, or other products tested as antifreeze and corrosion protection for Scania, may be used in Scania engines. Products that do not satisfy the requirements for use in a Scania engine may result in faults in and damage to the cooling system. This may lead to the invalidation of Scania's warranty for faults and damage caused by the use of unsuitable coolant.

Scania Ready Mix coolant is a pre-mixed coolant consisting of water, antifreeze (ethylene glycol) and corrosion protection.

Water

Use only pure fresh water that is free from particles, sludge and other impurities. If there is uncertainty about the quality of the water, Scania recommends use of Scania ready-mixed coolants. See the section [Recommended Scania products](#).

Recommended Scania products

Scania Ready Mix 50/50

Scania Ready Mix 50/50 is a ready-mixed coolant containing 50% antifreeze (ethylene glycol) and corrosion protection and 50% water.

Part no.	Volume litres	Volume US gallons
1 921 955	5	1.3
1 921 956	20	5.3
1 921 957	210	55
1 896 695	1,000	264

Scania concentrate

Scania also produces coolant with antifreeze and corrosion protection in the form of a concentrate.

Part no.	Volume litres	Volume US gallons
1 894 323	5	1.3
1 894 324	20	5.3
1 894 325	210	55
1 894 326	1,000	264

Topping up

Coolant must only be topped up with pre-mixed coolant. The pre-mixed coolant can either be concentrate mixed with clean freshwater or pre-mixed coolant from the factory. Use only pure fresh water that is free from particles, sludge and other impurities.



IMPORTANT!

Containers used for mixing coolant must be intended for the purpose and free from any dirt or contaminants. When the containers not in use they must be kept closed to avoid collecting dirt and dust.

Note:

Within the coolant change interval, coolant may only be reused if it has been cleaned of dirt, sludge and particles. If the coolant is contaminated with oil or fuel, it must not be reused.

Addition of antifreeze and corrosion protection to water

The coolant should contain 35-55% by volume antifreeze (ethylene glycol) and corrosion protection. The percentage varies depending on the need for antifreeze.

A minimum of 35% by volume of Scania antifreeze and corrosion protection is needed to provide sufficient corrosion protection.

Measure the ethylene glycol content (antifreeze and corrosion protection) with a refractometer following the instructions in the [Checking the coolant's antifreeze and corrosion protection](#) section.

Risk of freezing



IMPORTANT!

The engine should not be subjected to heavy loads when ice starts to build up in the cooling system.

As the coolant starts to freeze, the water in the coolant starts to crystallise and the percentage of ethylene glycol in the coolant therefore rises. If freezing produces a great increase in the amount of ice, circulation problems could arise. There is no risk of damage by freezing if the content of Scania antifreeze and corrosion protection, or an equivalent mixture of a similar product, is at least 35% by volume.

Minimal ice formation in the coolant sometimes causes disruptions without any risk of damage. For example, the auxiliary heater may not work for up to 1 hour after the engine has been started.

Antifreeze and corrosion protection concentration table, litres

Freezing point (°C)	-21	-24	-30	-38	-50	Cooling system volume (litres)
Ethylene glycol (vol. %)	35	40	45	50	60	
Ethylene glycol (litres)	11	12	14	15	18	30
	14	16	18	20	24	40
	18	20	23	25	30	50
	21	24	27	30	36	60
	25	28	32	35	42	70
	28	32	36	40	48	80
	32	36	41	45	54	90
	35	40	45	50	60	100
	39	44	50	55	66	110
	42	48	54	60	72	120
	46	52	59	65	78	130
	49	56	63	70	84	140
	53	60	68	75	90	150
	56	64	72	80	96	160
	60	68	77	85	102	170
	63	72	81	90	108	180
67	76	86	95	114	190	
70	80	90	100	120	200	

Antifreeze and corrosion protection concentration table, US gallons

Freezing point (°F)	-6	-11	-22	-36	-58	Cooling system volume (US gallons)
Volume of ethylene glycol (%)	35	40	45	50	60	
Volume of ethylene glycol (US gallons)	2.9	3.2	3.7	4	4.8	7.9
	3.7	4.2	4.8	5.3	6.3	10.6
	4.8	5.3	6.1	6.6	7.9	13.2
	5.5	6.3	7.1	7.9	9.5	15.9
	6.6	7.4	8.5	9.2	11.1	18.5
	7.4	8.5	9.5	10.6	12.7	21.1
	8.5	9.5	10.8	11.9	14.3	23.8
	9.2	10.6	11.9	13.2	15.9	26.4
	10.3	11.6	13.2	14.5	17.4	29.1
	11.1	12.7	14.3	15.9	19	31.7
	12.2	13.7	15.6	17.2	20.6	34.3
	12.9	14.8	16.6	18.5	22.2	37
	14	15.9	18	19.8	23.8	39.6
	14.8	16.9	19	21.1	25.4	42.3
	15.9	18	20.3	22.5	26.9	44.9
	16.6	19	21.4	23.8	28.5	47.6
	17.7	20.1	22.7	25.1	30.1	50.2
18.5	21.1	23.8	26.4	31.7	52.8	

Checking the coolant level



WARNING!

Do not open the coolant filler cap in the expansion tank if the engine is hot. Hot coolant and steam may spray out and cause burns. If the cap has to be opened do it slowly to release the pressure before removing the cap.

Use protective gloves as coolant can cause irritation if it comes in contact with the skin.



IMPORTANT!

It is not permissible to top up large amounts of coolant via the expansion tank. Filling via the expansion tank leads to air locks in the cooling system which can lead to e.g. cavitation damage to the coolant pump shaft seal. If a large amount of coolant needs to be added, follow the instructions in the section [Filling coolant](#).


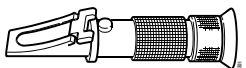
Only pour pre-mixed coolant into the cooling system.

The following instructions apply to Scania expansion tanks. For other types of expansion tanks, follow the manufacturer's instructions.

1. Open the expansion tank cover and check the coolant level.
 - The right coolant level on a cold engine is at the height of the lower edge of the filler neck.
 - The right coolant level on a hot engine is approximately 25 mm (1 in) over the lower edge of the filler neck.
2. Top up with coolant as necessary.

Checking the coolant's anti-freeze and corrosion protection

Tool

Designation	Illustration
Refractometer	
	



WARNING!

Avoid skin contact with coolant as this may cause irritation to the skin. Wear eye protection and gloves when handling coolant.



IMPORTANT!

Use only pure fresh water that is free from particles, sludge and other impurities.

The following rules apply to ethylene glycol-based coolant:

- The antifreeze and corrosion protection content must be a minimum of 35 per cent by volume for corrosion protection to be sufficient.
- An antifreeze and corrosion protection content greater than 55 percent by volume impairs the ability to protect against frost.
- If ice forms in the coolant, there are disruptions initially, but there is no immediate risk of damage. The engine should not be subjected to heavy loads when ice starts to form.

1. Pour a small amount of coolant into a container and check that the coolant is pure and clear.
2. Change the coolant if it is contaminated or cloudy.
3. Measure the antifreeze and corrosion protection content with the refractometer.

Changing the coolant and cleaning the cooling system

Draining coolant



WARNING!

Do not open the coolant filler cap in the expansion tank if the engine is hot. Hot coolant and steam may spray out and cause burns. If the cap has to be opened do it slowly to release the pressure before removing the cap.

Use protective gloves as coolant can cause irritation if it comes in contact with the skin.



Environment

Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

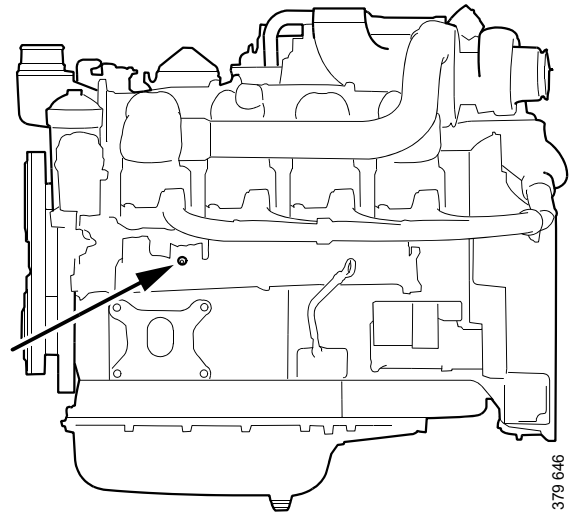
Draining coolant with coolant pump

Special tool

Number, designation	Illustration
2 443 679, coolant pump	

1. Open the expansion tank cover.

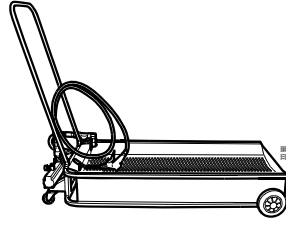
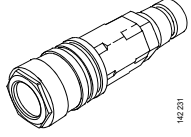
2. Place the hose from the coolant pump in an empty container.
3. Connect the pump to the draining nipple in the cylinder block. See illustration.



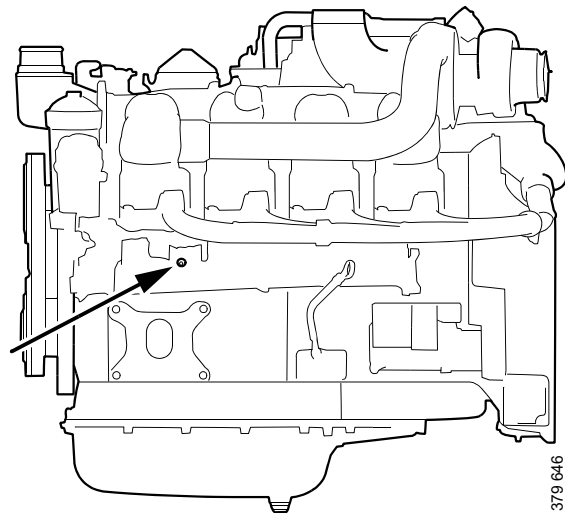
4. Connect the pump's 2 cable terminals to the battery's negative and positive terminal. Make sure that the drainage starts. If the drainage does not start: Change the position of the cable terminals.
5. Repeat the procedure at the cooling system's lowest drainage point. The location of the lowest drainage point on the engine may differ depending on engine application.

Draining coolant with coolant trolley

Tool

Designation	Illustration
588 540 Coolant trolley	
99 301 Adapter	

1. Open the expansion tank cover.
2. Position the hose from the coolant trolley in an empty container.
3. Connect the trolley to the draining nipple in the cylinder block. See illustration. An adapter must be used when using a trolley.
4. Drain the coolant.
5. Repeat the procedure at the cooling system's lowest drainage point. The location of the lowest drainage point on the engine may differ depending on engine application.



379 646

Cleaning the cooling system

Note:

Clean the cooling system more often than specified in the maintenance interval if necessary.

External cleaning: Cleaning the radiator and charge air cooler



IMPORTANT!

Do not use caustic soda or other alkaline detergent as this could damage the aluminium.

Read the warning text on the detergent packaging.

1. Check that the radiator and the charge air cooler are not clogged on the air side and that the discs are not damaged.
2. Carefully scrape away any deposits from the radiator discs. Use a paraffin-based engine cleaner if necessary.
3. Carefully straighten bent discs using a steel brush or similar.

Internal cleaning: Removing oil and grease in the cooling system



Environment

Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

Always fit a new thermostat and a new cover to the expansion tank after cleaning, as the oil in the cooling system destroys the seals. If the engine is equipped with a coolant filter, also renew this filter.

It may be necessary to wash it multiple times if the cooling system is very dirty. One cause of contamination can be that oil is lying on top of the coolant and collecting high up in the cooling system. If several rinses are needed, this is not necessarily because work has been carried out incorrectly. Oil residues often need to be rinsed repeatedly from the expansion tank and the external heating system to be completely clean.

Repeated washing is more effective and preferable to using higher concentrations of detergent (max. 10%) or cleaning for a longer period (max 30 minutes).

If only a small amount of dirt has collected in the expansion tank after cleaning, one extra rinse and clean of the expansion tank only is usually sufficient. There is no need to clean the whole cooling system again.

1. Run the engine until it has reached operating temperature if possible and then drain the cooling system following the previous description.
2. Remove the thermostat.

3. Fill the cooling system with clean hot water mixed with detergent 2 479 017. Detergent 2 479 017 must make up 5-10% (depending on the degree of dirt) of the total coolant volume.

If detergent 2 479 017 is not available, use a dishwashing detergent for domestic appliances that does not foam. Concentration 1%.

4. Warm up the engine for approximately 20-30 minutes. Remember to switch on the cab heating system, if one is installed.
5. Drain the cooling system.
6. Fill the cooling system with clean, hot water and run the engine for about 20-30 minutes.
7. Repeat steps 3-6 if the cooling system is not clean.
8. Drain the water from the cooling system.
9. If necessary, clean the expansion tank by detaching all hoses and rinsing and cleaning with a degreasing agent and a dish brush.
Alternatively, dismantle the expansion tank and clean it with water with 10% of detergent 2 479 017. Fill the expansion tank with the mixture, shake it and drain it. Renew the cover of the expansion tank.
10. Fit a new thermostat.
11. Fill the cooling system with new coolant as described in the next section.
12. Check again whether further dirt or oil has collected in the expansion tank. Decide whether it is necessary to carry out another full cleaning or whether only rinsing or cleaning of the expansion tank will suffice.

Internal cleaning: Removing deposits in the cooling system



Environment

Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

1. Run the engine until it has reached operating temperature if possible and then drain the cooling system following the previous description.
2. Remove the thermostats.
3. Fill the cooling system with clean, hot water mixed with radiator detergent which is based on sulphamic acid and contains dispersing agents. Follow the manufacturer's instructions for the concentration and cleaning period.
4. Run the engine for the specified time. Remember to switch on the cab heating system, if one is installed.
5. Drain the cooling system.
6. Fill the cooling system with clean, hot water and run the engine for about 20-30 minutes.
7. Drain the water from the cooling system.
8. Refit the thermostats.
9. Fill the cooling system with new coolant as described in the next section.

Filling coolant

These procedures apply when the cooling system has been drained and needs to be filled with a large amount of coolant.



WARNING!

Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



IMPORTANT!

Mix the coolant as specified in the section headed [Coolant](#).

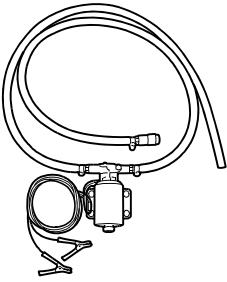
It is not permissible to top up large amounts of coolant via the expansion tank. Filling via the expansion tank leads to air pockets in the cooling system which can lead to e.g. damage to the coolant pump shaft seal. If a large amount of coolant needs to be added, follow the instructions in the section [Filling coolant](#).

Never fill a hot engine with a large amount of cold coolant. There is a high risk of cracks forming in the cylinder block and cylinder heads

Do not start the engine until the correct coolant level has been obtained. If the engine is started with an insufficient coolant level, it can damage the coolant pump shaft seal, which leads to coolant leakage.

Filling coolant with coolant pump

Special tool

Number, designation	Illustration
2 443 679, coolant pump	 <p style="text-align: right; font-size: small;">360 625</p>

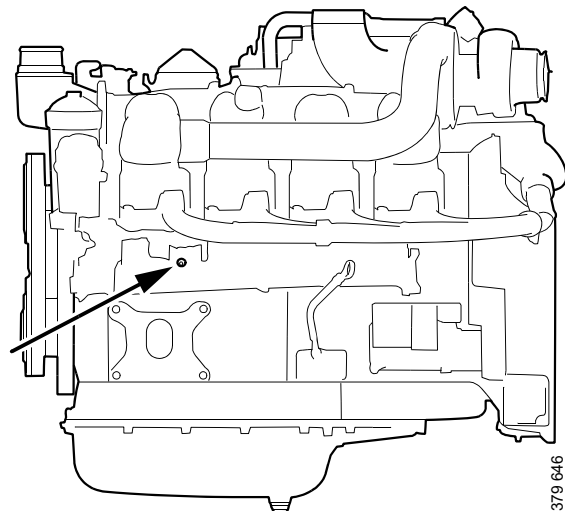
1. Open the expansion tank cover.
2. Connect the coolant pump to the filler nipple in the cylinder block. See illustration.
3. Connect the pump's 2 cable terminals to the battery's negative and positive terminal. Make sure that the filling starts. If the filling does not start: Change the position of the cable terminals.
4. Start the engine and run it at idling for 15 minutes.

IMPORTANT!

It is very important that the engine is idling. Engine overspeed could damage the coolant pump shaft seal, which leads to coolant leakage.

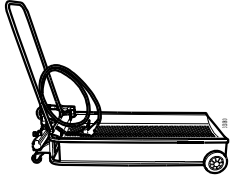
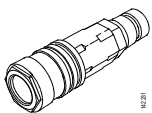
5. Switch off the engine and fill with coolant to the maximum level through the expansion tank.

Air pockets may still be left in the cooling system. These will disappear after the engine has been operated for a period of time. Therefore, the coolant may need topping up at a later stage.



Refilling coolant with coolant trolley

Tool

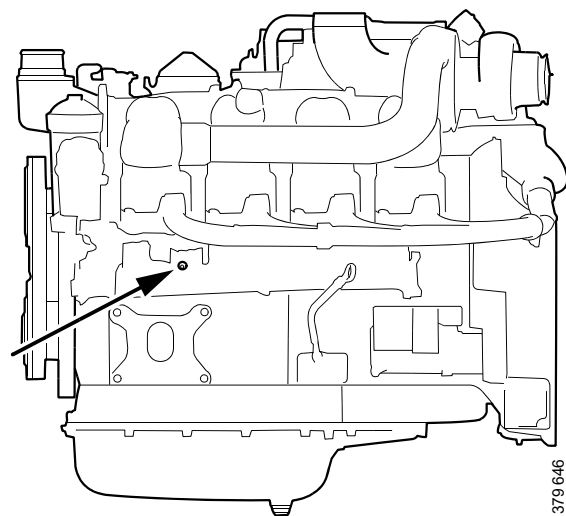
Designation	Illustration
588 540 Coolant trolley	
99 301 Adapter	

1. Open the expansion tank cover.
2. Connect the coolant trolley to the filler nipple in the cylinder block. See illustration. An adapter must be used when using a trolley.
3. Fill with coolant using coolant trolley to pump up to the maximum level of the expansion tank.
4. Disconnect the coolant trolley.
5. Start the engine and run it at idling for 15 minutes.



IMPORTANT!

It is very important that the engine is idling. Engine overspeed could damage the coolant pump shaft seal, which leads to coolant leakage.



6. Switch off the engine and fill with coolant to the maximum level through the expansion tank.

Air pockets may still be left in the cooling system. These will disappear after the engine has been operated for a period of time. Therefore, the coolant may need topping up at a later stage.

After filling, it may be good to start the engine and check that no coolant leakage occurs.

Fuel system

Cleanliness requirements



IMPORTANT!

The whole fuel system is very sensitive to dirt and also very small particles. Foreign particles in the system can cause serious malfunctions. It is therefore very important that everything is as clean as possible when work is carried out on the fuel system. Clean the engine before carrying out repair work. If possible, a hot clean should be used.

It is strictly forbidden to carry out any machining work or work with compressed air near an open fuel system.

Be extra careful and always use clean, lint-free and dust-free clothes and disposable gloves when working on the fuel system. Scania recommends using Tegera 848 gloves.

Clean tools before they are used and do not use any worn or chrome-plated tools. Material and flakes of chrome may come off.

Clean connections and the surrounding area before removal. When cleaning, cloths or paper which shed fibres must not be used. Use clean and lint free cloths, part number 588 879.

Plug or cover the connections during removal. Also clean the connections before the components are fitted. Place removed components on a thoroughly cleaned, dust-free surface. Scania recommends using a stainless steel bench top, part number 2 403 296. Cover the components with a lint-free cloth.

Checking the fuel level


Check the fuel level and fill with fuel as necessary.

Note:

If the fuel tank has been run dry or if the engine has not been used for a long time, bleed the fuel system. See the section [Bleeding the fuel system](#).

Renewing the fuel filters

Tool

Designation	Illustration
Hexagon socket, 1/2", 36 mm	



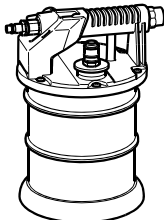
Environment

Use a suitable container. The fuel collected must be disposed of as specified in national and international laws and regulations.

If the fuel tank is positioned higher than the fuel filter housing, the shut-off valve between the fuel tank and the fuel filter housing must be closed. This is to prevent fuel running into the fuel filter housing.

Removing the fuel filters using a suction tool

Tool

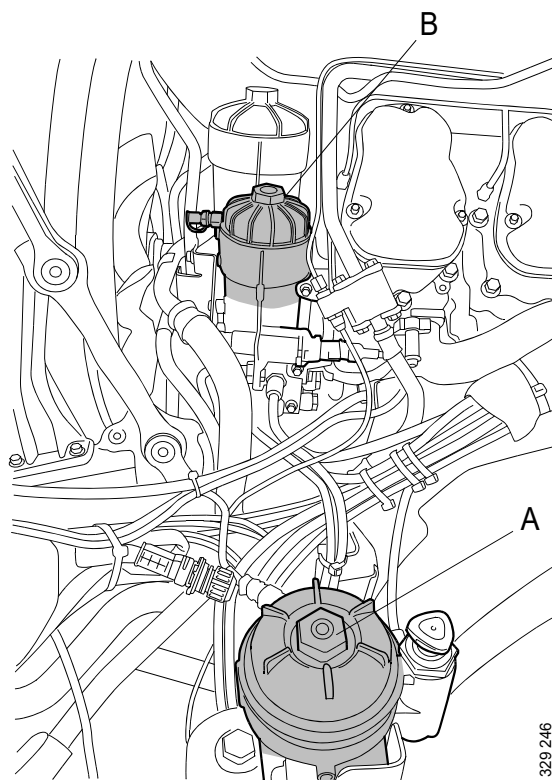
Designation	Illustration
Suction tool	

To ensure that the filter housings are drained properly, the filter covers must be removed as follows:



IMPORTANT!

Start with the water separating prefilter (A). Do not open the main filter cover (B) until the filter housing for the water separating prefilter is completely drained.



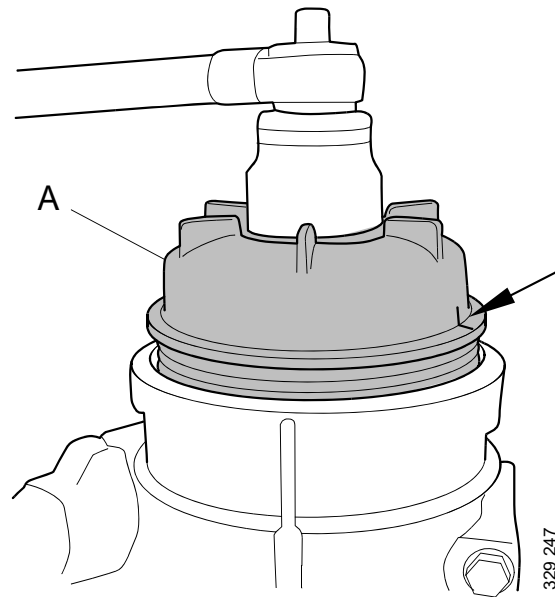
329 246

1. Make a mark on the water separating prefilter cover (A). Unscrew the cover 3 to 4 turns with the socket.

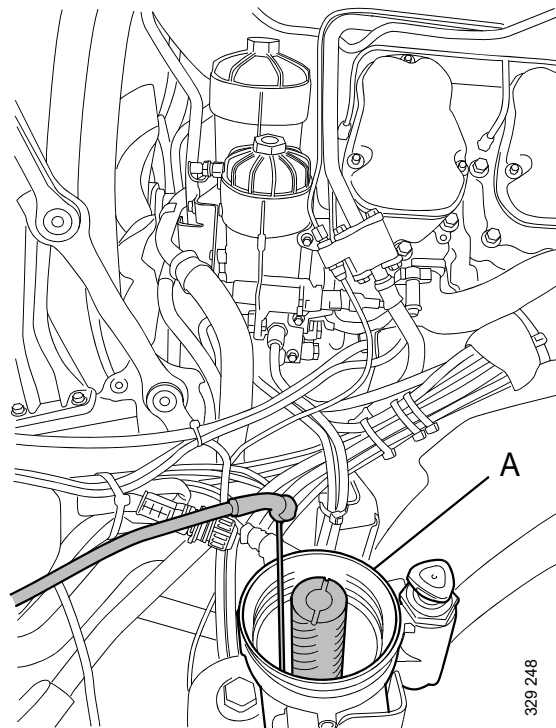
! **IMPORTANT!**

Do not use an adjustable spanner or other open tool to remove the filter covers, as the filter covers may then get damaged.

Wait for at least 2 minutes to allow as much of the fuel as possible to drain out of the filter housing.



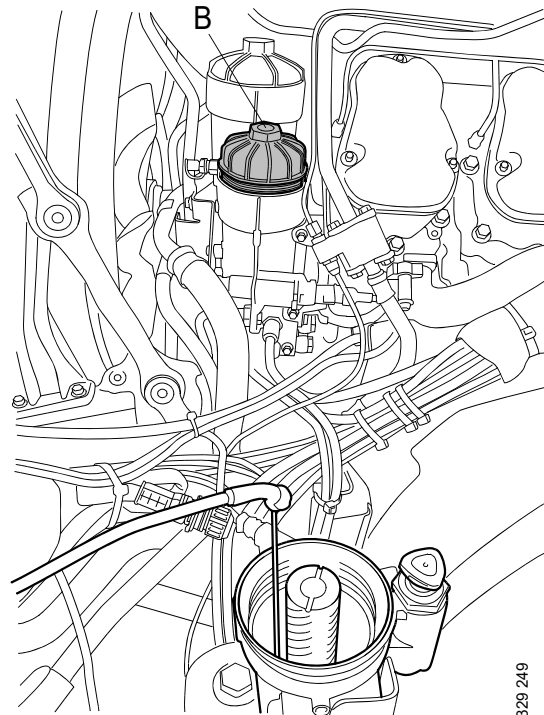
2. Unscrew the filter cover (A) and lift it up slowly with the filter element.
3. Make sure the suction tool is completely drained before starting work. Draw out remaining fuel and any particles using the suction tool or a similar tool.
4. Keep the suction tool hose in the filter housing for the water separating prefilter (A).



5. Make a mark on the main filter cover (B).
Unscrew the cover 3 to 4 turns with the socket. Draw out fuel which may drain into the water separating prefilter housing when the main filter is detached.

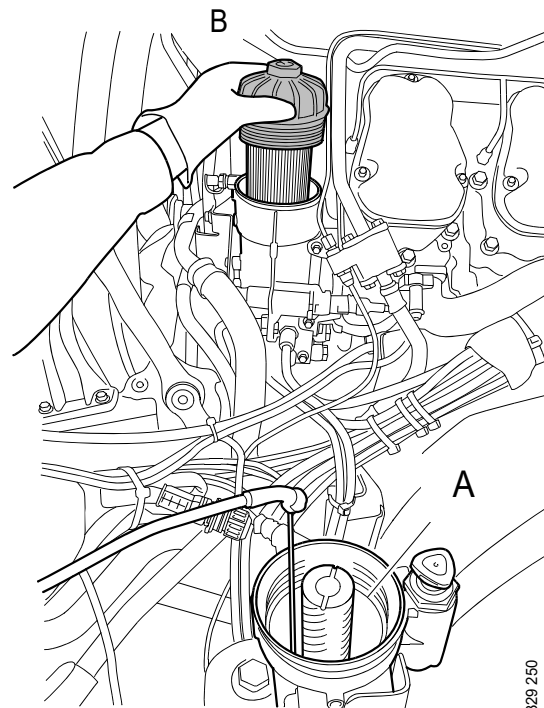
**IMPORTANT!**

Wait for at least 2 minutes to allow as much of the fuel as possible to drain out of the filter housing.



329 249

6. Unscrew the main filter cover (B) and lift it up slowly with the filter element.
7. Fuel from the main filter housing (B) will flow into the water separating prefilter housing (A). Leave the suction tool in the water separating prefilter housing until it is completely drained of fuel.



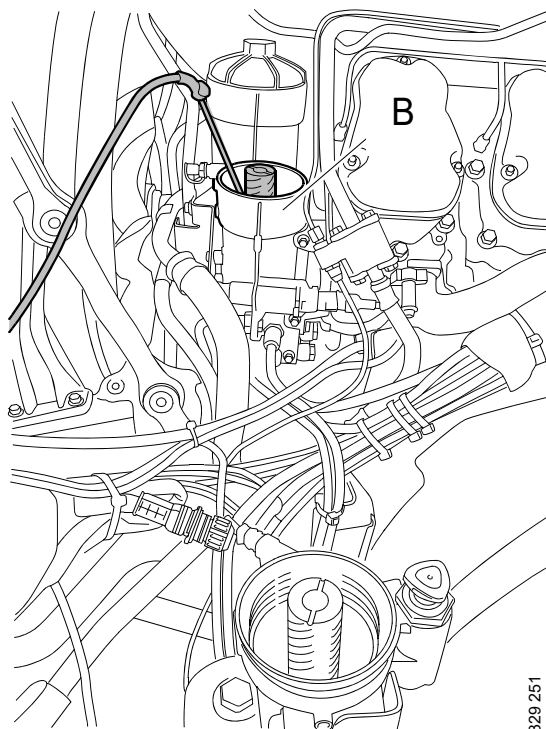
329 250

8. Move the suction tool to the main filter housing (B). Draw out remaining fuel and particles.

! **IMPORTANT!**

It is important to remove remaining fuel and particles from the filter housings to prevent fuel system contamination.

9. Undo the old filter elements from the covers by carefully bending them to one side.



Removing the fuel filter if there is no suction tool

1. Open the bleed nipple on the fuel filter housing to release any remaining pressure. It may be difficult to unscrew the filter cover if the fuel pressure has not fallen sufficiently.

! **IMPORTANT!**

Do not use an adjustable spanner or other open tool to remove the filter covers, as the filter covers may then get damaged.

To ensure that the filter housings are drained properly, the filter covers must be removed as follows:

2. On the main filter (B): Make a mark on the cover. Unscrew the cover 3 to 4 turns with the socket.
3. Repeat the procedure with the water separating prefilter (A).
4. Wait at least 2 minutes to ensure the filter housings have drained properly.
5. On the main filter: Unscrew the filter cover and lift it up slowly with the filter element.
6. On the water separating prefilter: Unscrew the filter cover and lift it up slowly with the filter element.

Remaining fuel will drain out of the fuel filter housings automatically when the filter elements are lifted out.

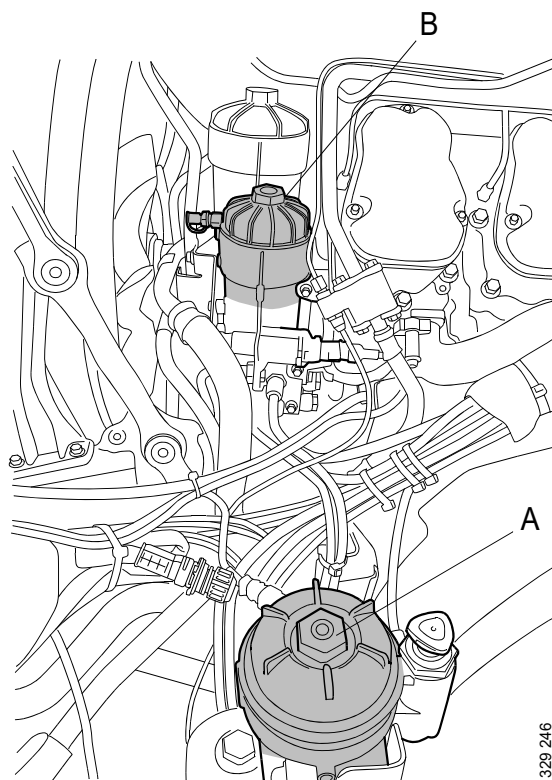
7. Check that no fuel or particles remain in the bottom of the filter housings. Draw off remaining fuel and any particles.



IMPORTANT!

It is important to remove remaining fuel and particles from the filter housings to prevent fuel system contamination.

8. Undo the old filter element from the cover by carefully bending it to one side.



329 246

Fitting the fuel filters



IMPORTANT!

Check that there is no remaining packaging material stuck to the new filter elements. Secure the filter elements in the filter covers before positioning them in the fuel filter housings. Otherwise, the filter elements may break.

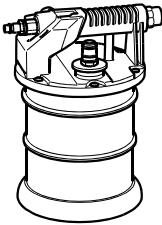
In order to prevent back pressure in the filter housings when the filter elements are screwed on, the bleed nipple should be open.

-
1. Fit a new O-ring on the cover. Lubricate the O-ring with O-ring grease.
 2. Press the filter elements into the snap fasteners on the covers.
 3. Check that the filter housing is clean before fitting. Use lint free cloths.
 4. Press down the filter elements into the fuel filter housings with the filter covers.
 5. Screw down the filter covers until the cover seals are in contact with the filter housings. Use the socket.
 6. Tighten the filter housings to 25 Nm (18 lb/ft).
 7. Bleed the fuel system as per the following section.
 8. Start the engine and check that there is no fuel leakage between the filter covers and filter housings. If there is leakage, undo the filter covers and start again from step 4.

Bleeding the fuel system

Venting the fuel system using a suction tool

Tool

Designation	Illustration
Suction tool	 337 287

Note:

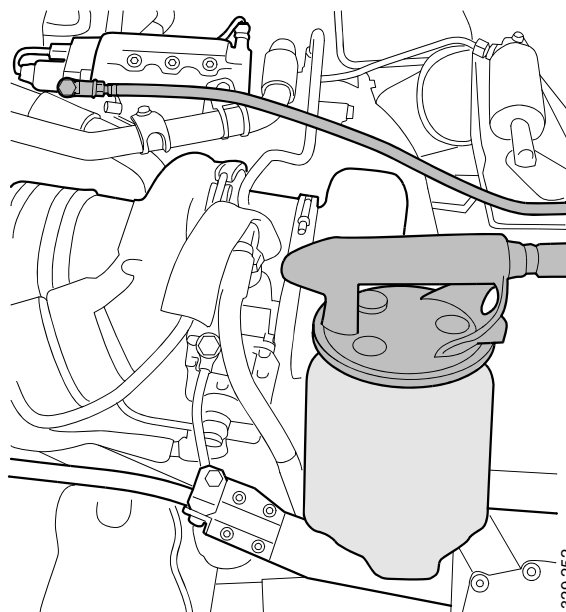
Scania recommends venting the fuel system using suction tools rather than with a hand pump. This is a quicker and simpler method, which ensures a complete venting.



Environment

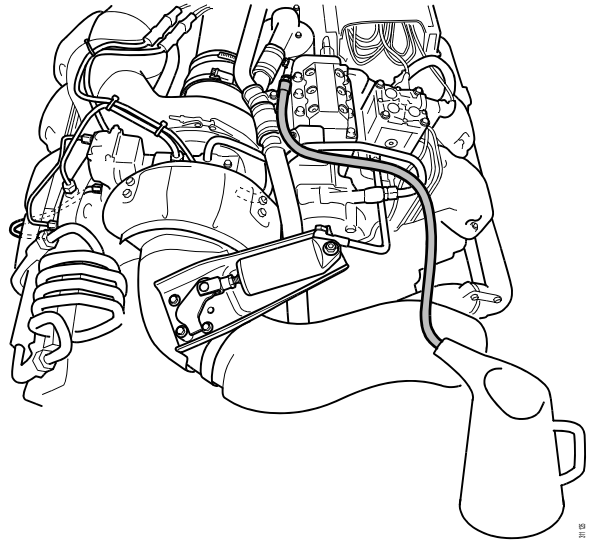
Use a suitable container. The fuel collected must be disposed of as specified in national and international laws and regulations.

1. Open the bleed nipple on the high pressure pump and connect the suction tool.
2. Hold the suction tool straight and draw out at least a full container of fuel.
3. Once the fuel coming out of the hose is free of air bubbles, then venting is complete.
4. Close the bleed nipple on the high pressure pump. Remove the hose and suction tool.
5. Start the engine and check that there are no leaks.



Venting the fuel system using a hand pump

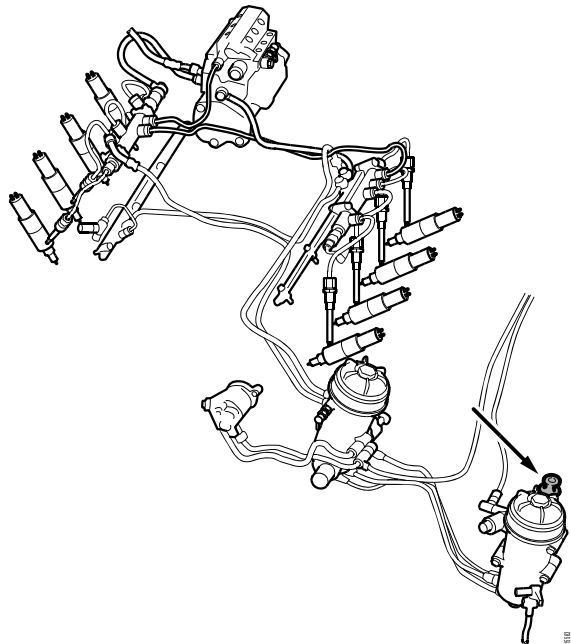
1. Attach a clear plastic hose to the bleed nipple on the fuel filter housing. Let the plastic hose drop into a container that holds at least 5 litres (1.3 US gallons).



2. Unscrew the hand pump handle on the water separating prefilter.
3. Open the bleed nipple on the fuel filter housing and pump until fuel runs out, which will take around 150 pump strokes. Close the bleed nipple on the fuel pump and screw down the hand pump handle.

The main filter has built in venting in the form of a 0.2 mm restriction valve in which the fuel continuously flows on to the return pipe and takes with it any air in the circuit.

4. Start the engine and check that there are no leaks.



Renewing the fuel tank venting filter

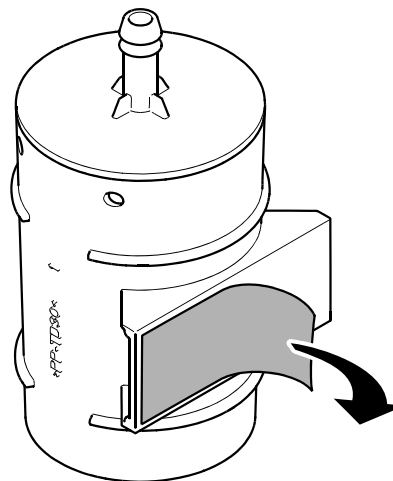
Note:

The tank ventilation filter must be positioned vertically in order to function correctly.

Ensure that there are no kinks in the hose or any chafing or over-extension.

The ideal fitting temperature of the component parts is 21°C-38°C.

1. Clean around the tank pick-up unit and along the rubber hose.
2. Remove the old filter.
3. Clean the tank:
 - Clean the surface of the tank in the area where the filter will be attached.
 - Clean off heavy dirt with water and detergent.
 - If necessary, remove any grease and oil residues with a degreasing agent.
 - Remove any adhesive residue from the previous filter using solvent naphtha or similar.
4. Adjust the tank ventilation connection to the correct position.
5. Fit the filter to the hose.
6. Press the fuel filter onto the fuel tank:
 - Before fitting the filter: Wait until the detergent has evaporated.
 - Remove the protective tape from the fuel filter.
 - Push the filter vertically into position in the shaded area and keep the pressure for 5 seconds or more.



402 692

Other

Checking the drive belt



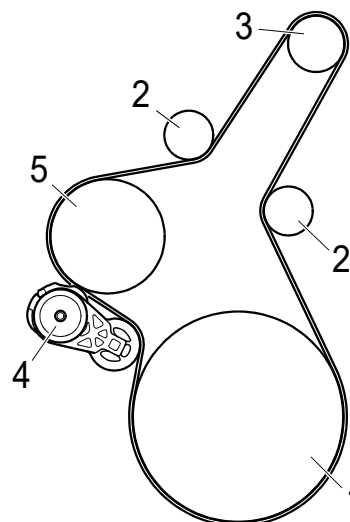
IMPORTANT!

Before starting, make a note of how the drive belt is fitted. Refit the drive belt with the same direction of rotation as it had before removal.

1. Check the drive belt thoroughly, particularly at the idler rollers.
2. Check the drive belt for cracks. Renew the drive belt if deep cracks have formed.

Note:

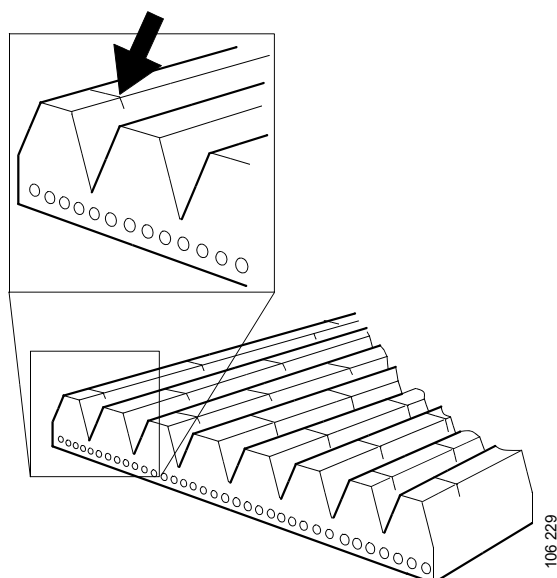
Small and shallow cracks are normal and form after only a few hours of operation. They do not mean that the drive belt needs to be renewed. If there are many deep cracks, or if parts of the drive belt have started to come off, the drive belt must then be renewed.



388 001

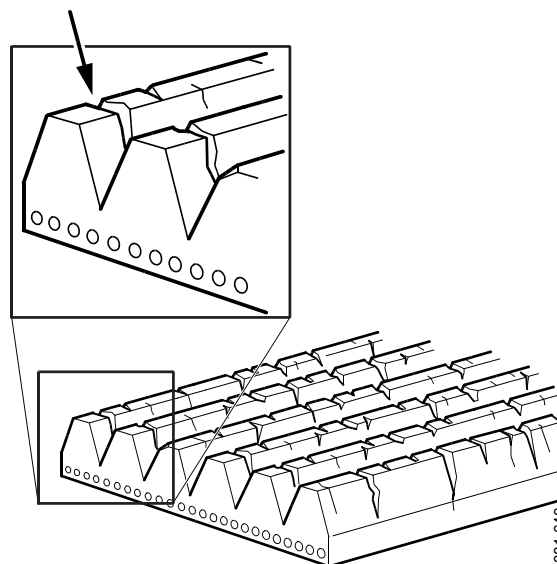
Example of a drive belt.

1. Crankshaft.
2. Idler roller.
3. Alternator.
4. Belt tensioner.
5. Coolant pump.



106 229

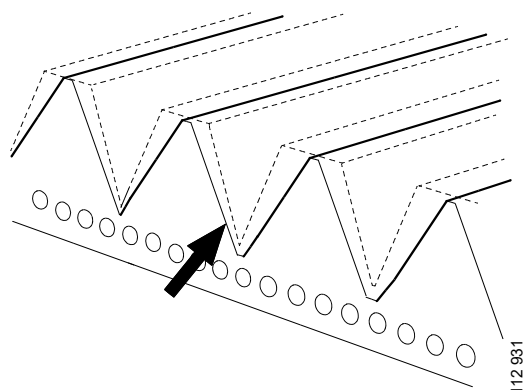
Example of a minor crack in the drive belt. The drive belt can be refitted.



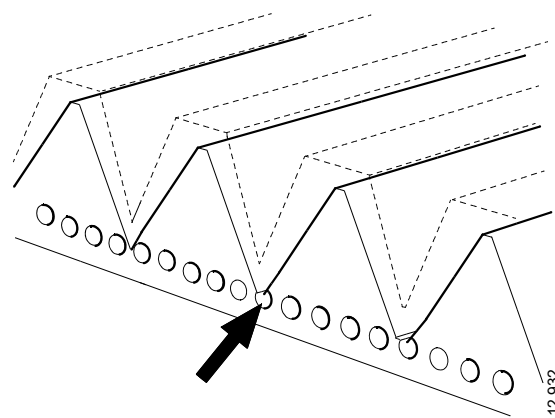
381 640

The drive belt has deep cracks and must be renewed.

3. Check drive belt wear. Renew the drive belt if it is too worn.



The drive belt is starting to become worn, but can be refitted.



The belt is worn down to the cord. The drive belt must be renewed.

Checking for leakage

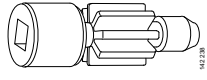
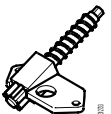


If serious leakage occurs, contact your nearest workshop.

1. Start the engine.
2. Check for oil, coolant, fuel, air or exhaust leakage.
3. Tighten or renew leaking connections. Check the overflow holes which show whether the O-rings between the cylinder liners and crankcase are leaking.
4. Check whether the drain hole on the coolant pump is blocked. If there is leakage, renew the seal in the pump or the complete coolant pump assembly.

Checking and adjusting the valve clearance

Special tool

Number	Designation	Illustration
99 309	Turning tool for rotating the flywheel from below	
2 402 509	Turning tool for rotating the flywheel from above	

Other tools
Torque wrench, 0-50 Nm
Waterproof felt-tip pen
0.45 and 0.70 mm feeler gauges
Flash light
Mirror



WARNING!

Block the starting device. If the engine starts unexpectedly, there is a serious risk of injury.



IMPORTANT!

The engine must be cold when the work is carried out.

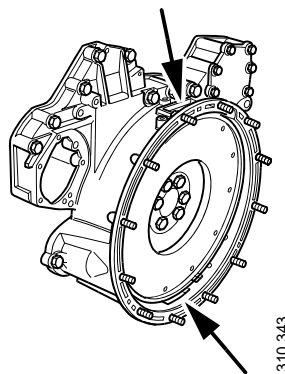
Remember to remove the turning tool from the flywheel after adjustment.

Note:

Carry out the working without pausing, so that no step is overlooked.

Carry out a check and adjustment of the valve clearances one more time after the first 500 hours of operation. After this, adjustment according to the regular interval takes place, which is every 2,000 operational hours.

The reference information UP TDC,DOWN TDC and the angle indications listed in the table below are engraved on the flywheel. Depending on the engine installation and type of flywheel housing, this information is visible in one of the windows, either furthest up or furthest down on the flywheel. See illustration.



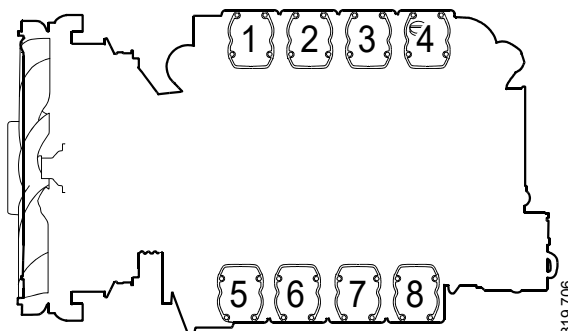
Upper and lower window to read engraving on the flywheel.

Valve clearance, specifications	
Intake valve	0.45 mm (0.018 in)
Exhaust valve	0.70 mm (0.028 in)

Tightening torque	
Lock nut for valves	35 Nm (26 lb/ft)

Adjust the valves according to the table below. Follow the respective column depending on whether you are reading the engraving on the flywheel in the lower or the upper window. Start adjustment at the top of the table.

Reading in the lower window	Valve transition on cylinder	Adjust intake valve on cylinder	Adjust exhaust valve on cylinder	Reading in the upper window
DOWN TDC (0°)	6	7 and 8	4 and 5	UP TDC (180°)
UP TDC (180°)	7	1 and 5	2 and 6	DOWN TDC (0°)
DOWN TDC (360°)	1	2 and 4	3 and 7	UP TDC (540°)
UP TDC (540°)	4	3 and 6	1 and 8	DOWN TDC (360°)



Order of cylinders.

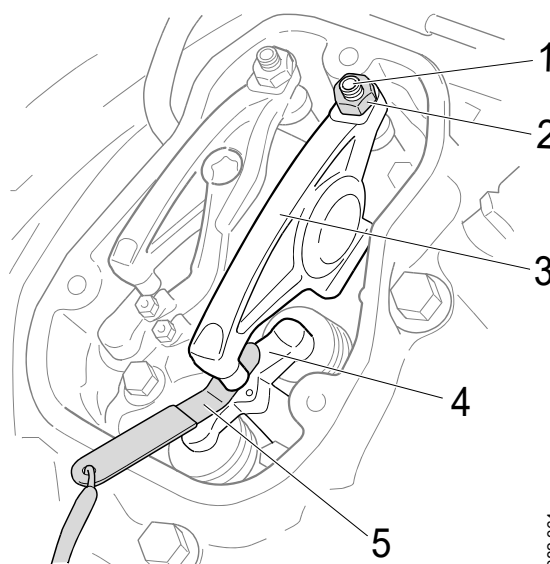
1. Clean the rocker covers and the area around them.
2. Remove the rocker covers.
3. Use the turning tool appropriate to the installation of the engine. Tool 99 309 is used to rotate the flywheel from the underside of the engine and tool 2 402 509 is used from the top side.
4. Start adjusting one cylinder according to the table. Rotate the flywheel until the correct engraving can be read on the flywheel. It may be necessary to rotate it more than 1 revolution.

Rotate the flywheel in the rotational direction of the engine, which is clockwise viewed from the front of the engine and anti-clockwise viewed from the back of the engine.

During a valve transition, the exhaust valve (the long arm) is closing at the same time as the intake valve is opening.

The UP TDC engraving on the flywheel is now visible in the window furthest up on the flywheel. The DOWN TDC engraving is visible in the lower window.

5. Read the table on the previous page to see which valve to adjust.
6. Stick the feeler gauge under the pressure pad of the rocker arm and check the valve clearance.
7. If necessary, adjust the valve clearance by
 - a) loosening the lock nut on the end of the rocker arm
 - b) adjusting the valve clearance with the adjusting screw
 - c) tightening the lock nut.
8. Mark the rocker arm with the felt-tip pen and then continue with the next cylinder according to the table.



382 364

1. *Adjusting screw.*
2. *Lock nut.*
3. *Rocker arm.*
4. *Valve bridge.*
5. *Feeler gauge.*

Renewing the reductant filter

1. Wipe clean around the filter housing to prevent impurities from penetrating it.
2. Remove the filter housing. Use a 46 mm socket.



WARNING!

There may be a lot of reductant in the filter housing and it may spill out. Wear protective gloves.

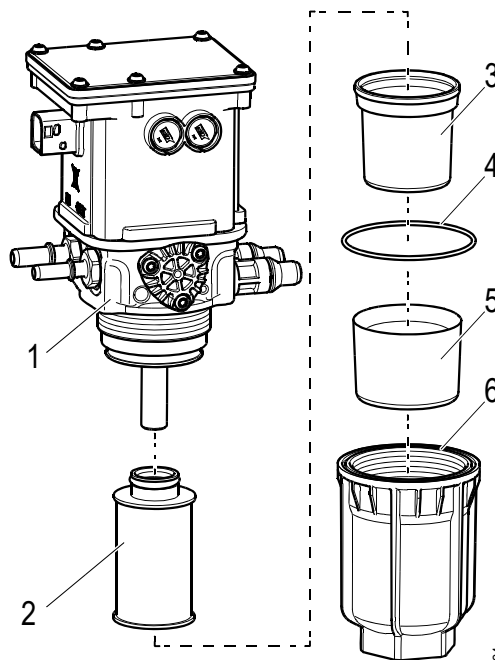


IMPORTANT!

Always rinse away reductant spillage on connections and other parts with lukewarm water to prevent corrosion. If reductant seeps into electrical connections or electrical cables, these must be renewed.

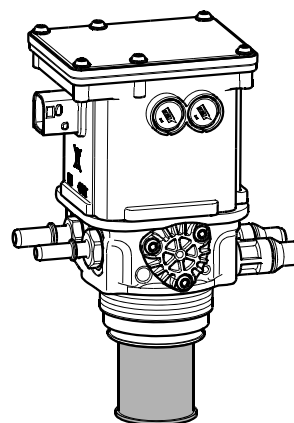
3. Remove the sealing diaphragm.

4. Remove the old reductant filter and fit a new one.



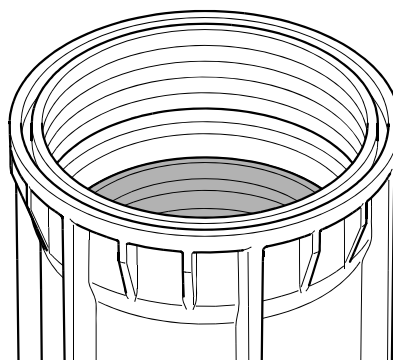
372 124

1. Pump.
2. Filter.
3. Sealing diaphragm.
4. O-ring.
5. Antifreeze.
6. Filter housing.



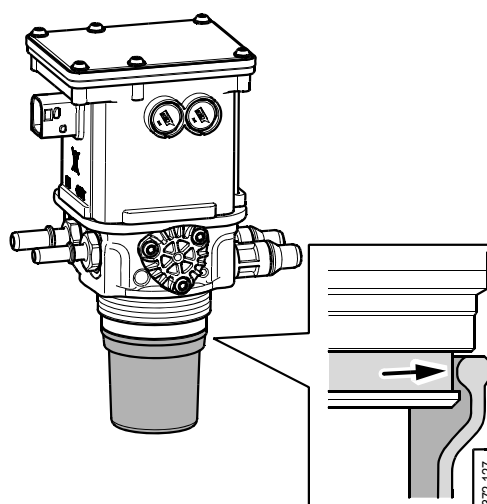
372 126

5. If the frost protection device in the filter housing comes loose, wipe both the frost protection device and filter housing thoroughly so that they are completely dry before they are assembled again.



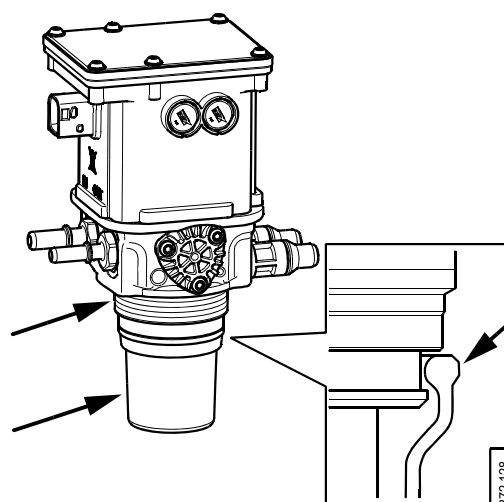
372 130

6. Wipe the sealing diaphragm and fit it over the filter.
Ensure that the edge of the diaphragm is sitting in the groove.



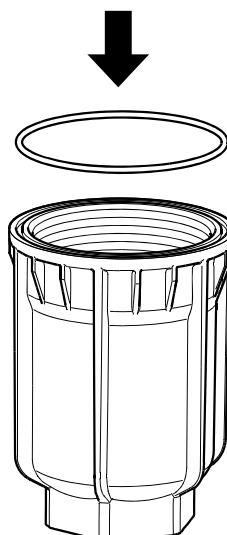
372 127

7. Lubricate the sealing diaphragm and threads with the accompanying spray.



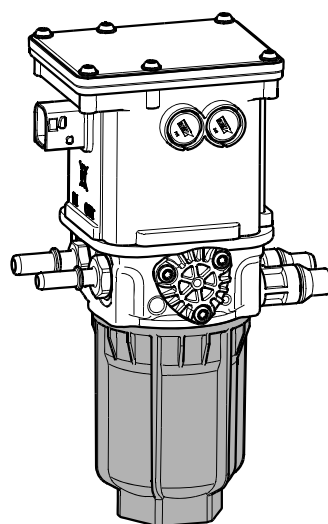
372 128

8. Renew the O-ring. Place the new O-ring in the filter housing.



372 129

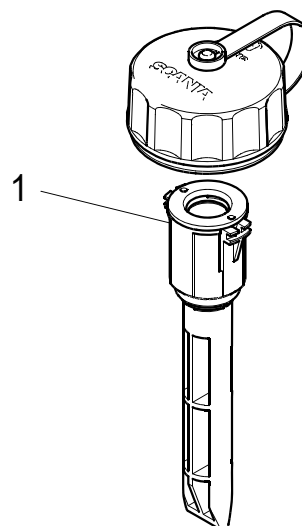
9. Refit the filter housing. Use a 46 mm socket. Tighten to 80 Nm (59 lb-ft).



372 125

Cleaning the reductant tank filler filter

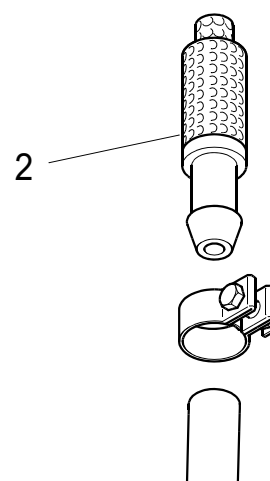
Make sure that the filler filter (1) is clean. If it is dirty: Clean the filler filter with clean water and refit it.



350 114

Cleaning the reductant tank ventilation filter

Make sure that the ventilation filter (2) is clean. If it is dirty: Clean the ventilation filter with clean water and refit it.



352 009

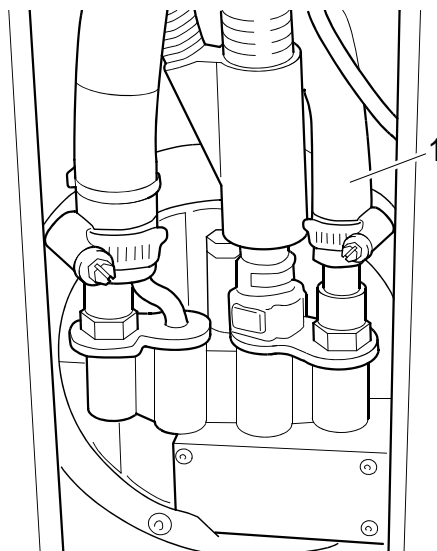
Cleaning the reductant tank

1. If necessary, empty the reductant tank by sucking out the fluid or opening the drain plug.
2. Detach all connections to the reductant tank.
3. Clamp the coolant hoses (1) using pliers to stop the coolant flow.



WARNING!

The coolant hoses contains coolant from the engine. Open the coolant filler cap first to relieve any pressure.



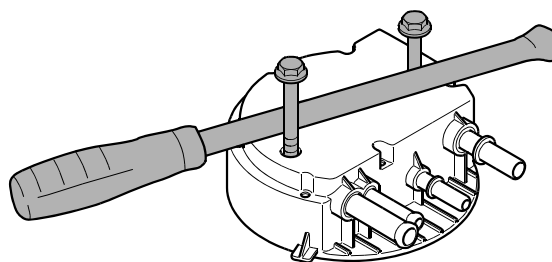
Example of coolant hose.

4. Pull out the coolant hoses. These connections may be tight.

Note:

Plug the connections and reductant hoses again when they are detached so that no contamination enters the reductant circuit.

5. Remove the reductant tank.
6. Fit 2 M10 screws in the holes on the reductant pick-up unit. Detach the reductant pick-up unit by turning it anti-clockwise with a handle, see illustration.
7. Rinse the reductant tank clean with hot water.
8. Fit the reductant tank.

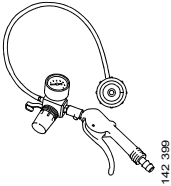
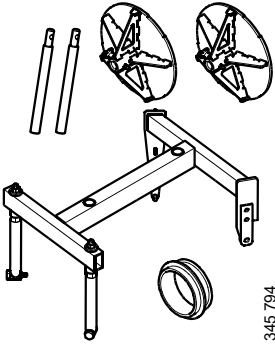
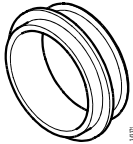
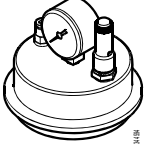



368 748

Renewing the particulate filter

Stage V, compact aftertreatment system

Tool

Number	Designation	Illustration	Tool board
99 405	Clutch bleeder	 <p>142 399</p>	D6
2 263 984	Tool kit for silencer with 2 particulate filters	 <p>345 794</p>	MB6
2 264 805	Adapter	 <p>805</p>	MB6
2 284 630	Pressure testing cover	 <p>630</p>	MB5
2 587 638	Guide for particulate filter	 <p>638</p>	MB6

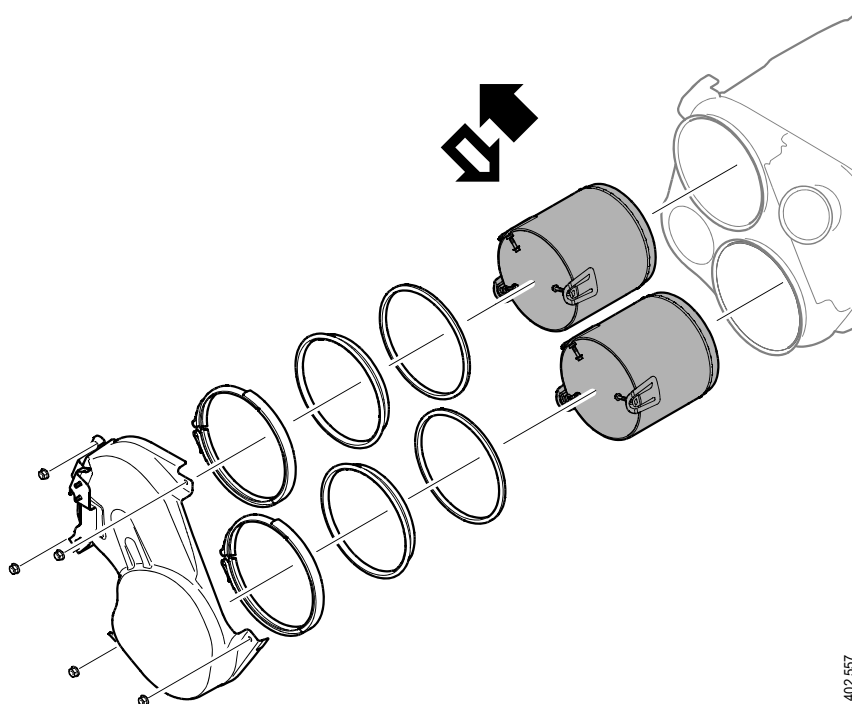
**WARNING!**

P3 type respiratory protective equipment/filter mask, eye protection and gloves should be worn for any work where there is a risk of exposure to dust from the particulate filter. A face mask, gloves and eye protection must be worn when cleaning the filter unit. Use protective equipment from the time the filter unit is exposed until the time cleaning is complete. Safety clearance for unprotected people is 3 m.

Do not eat, drink or smoke while work is in progress.

Any dust from the particulate filter should be removed using a vacuum cleaner with a HEPA filter that can filter out particles down to a particle size of 0.3 microns, in order to reduce exposure.

Wash your hands thoroughly after work on the particle filter.

Removing the particulate filter

402 557

1. When renewing the particulate filter, enter the new ID number for the particulate filter in SDP3.

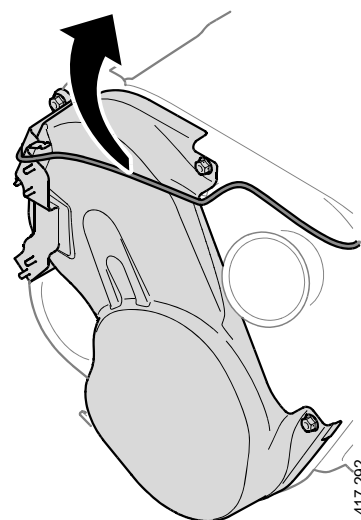
Connect the vehicle to SDP3 with 99 654 VCI3 and follow the instructions in the wizard to enter a new ID number. In the wizard, data for soot and ash are also reset. See *SDP3 > Checks and adjustments > Functions > Calibration > Powertrain > Engine > Emission control > Exhaust gas aftertreatment > New ID number upon renewal of the particulate filter and silencer.*

2. Remove the end plate.

Release the end plate from the electrical cables and any reductant hoses so that the end plate can be removed.



375 328

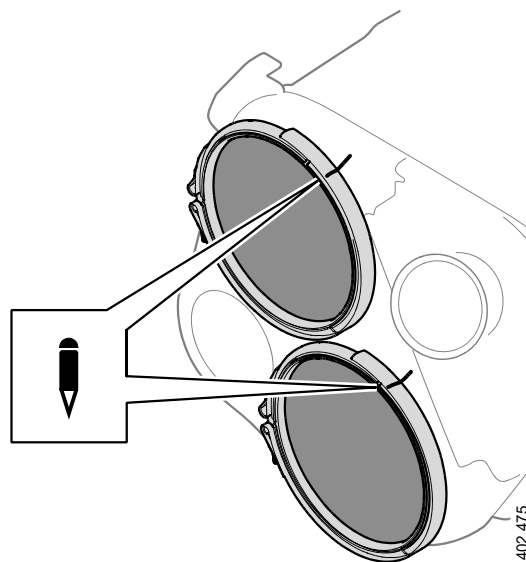


417 292

Note:

The marking is important as the V-clamps must be positioned in precisely the same location to allow the end plate to be refitted.

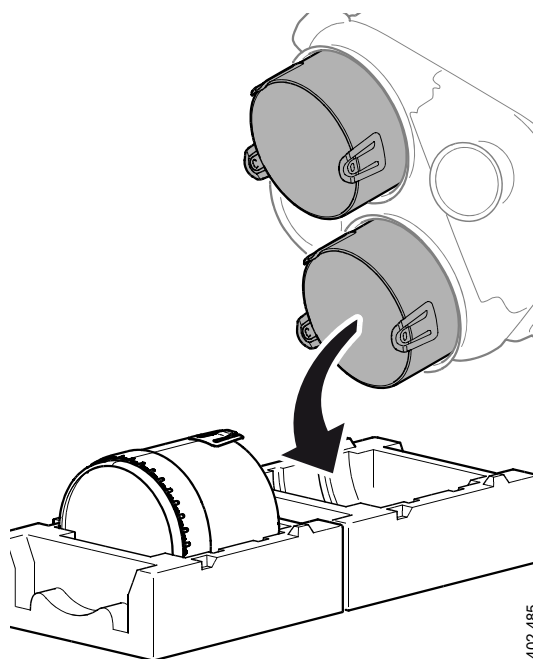
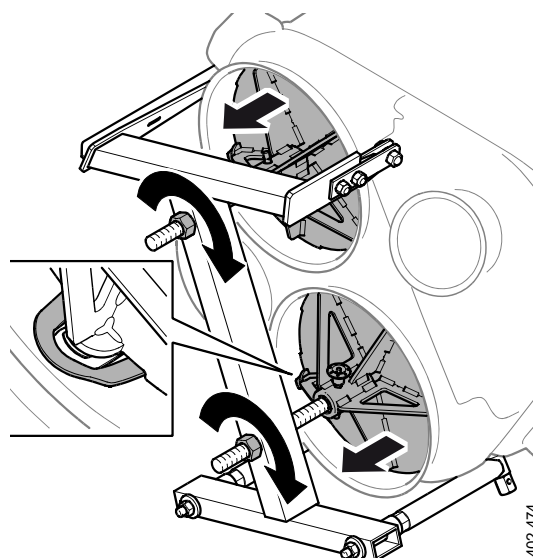
3. Remove the cover plates.



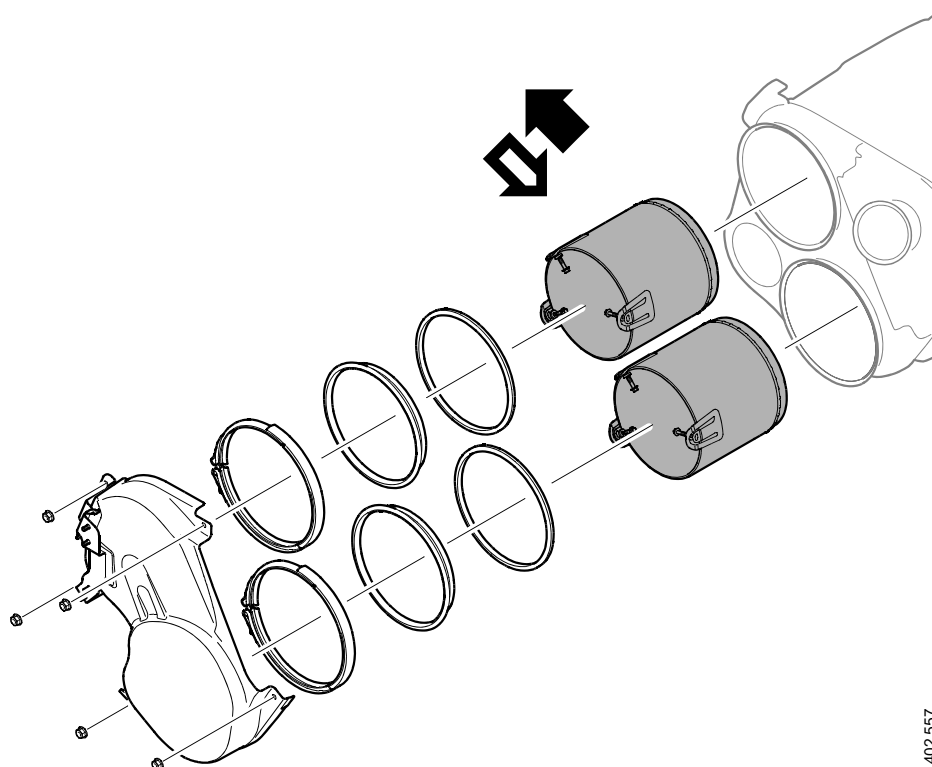
402 475

4. Remove the particulate filters.

- Fit 2 263 984 *Tool kit for silencer with 2 particulate filters*.
- If necessary, bend the particulate filter brackets inwards with a screwdriver.
- Unscrew the particulate filter using a 30 mm ring spanner with ratchet mechanism.



Fitting the particulate filter



402 557

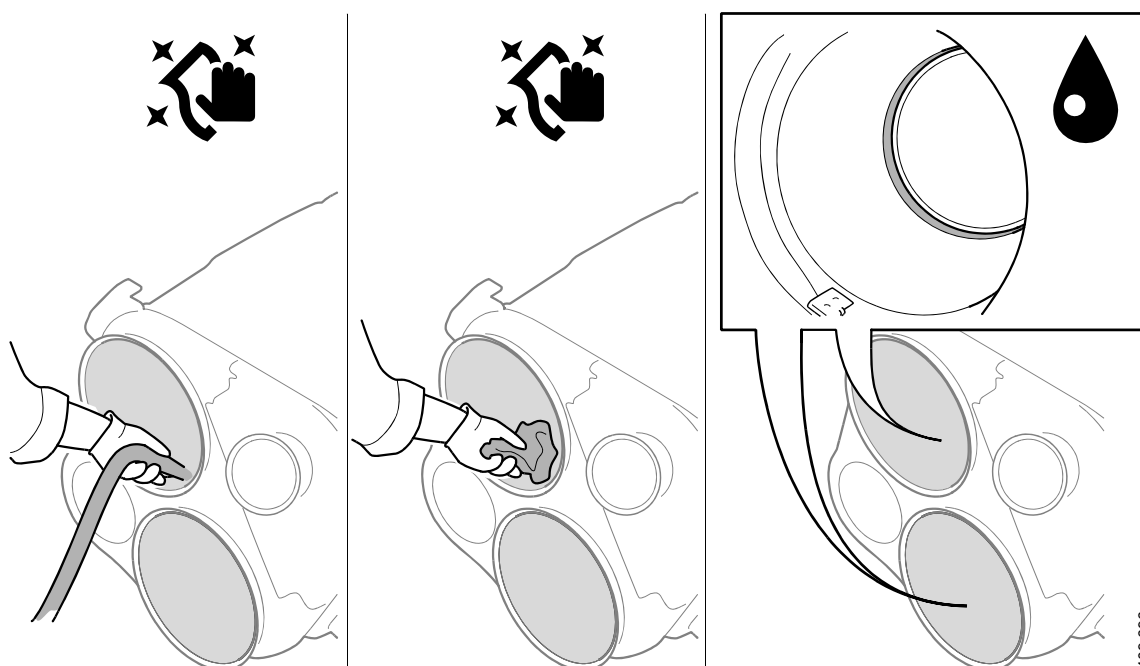
! IMPORTANT!

The graphite paste must not contain silicone, lead, phosphorus, calcium, zinc, magnesium or sulphur. The silencer will be damaged if the wrong graphite paste is used.

1. Clean the areas in the silencer and lubricate the silencer with the graphite paste supplied.

Part number 2 164 585.

Instead of lubricating the gasket seats on the silencer, the graphite gasket's contact surfaces can be lubricated.



! **IMPORTANT!**

If the surface of the particulate filter is damaged in any way, the particulate filter must be renewed.

Note:

The gasket cannot be reused. If the particulate filter is removed from the silencer, a new gasket must be fitted.

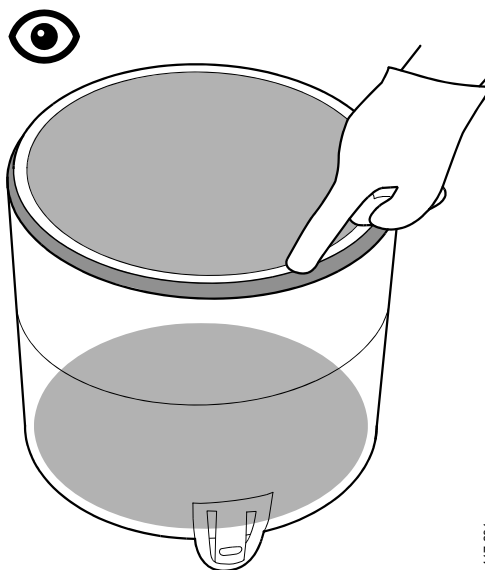
2. Check that the new particulate filters and gaskets are not damaged.

The chamfer of the gaskets should face the silencer.

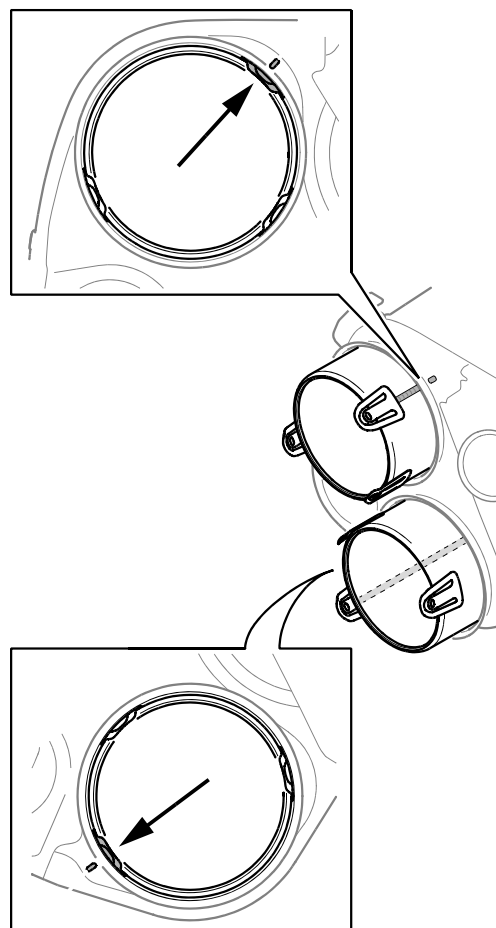
Note:

When inserting the particulate filter into the silencer, try to press it in with a constant inward movement. Otherwise, the graphite gasket could come loose from its position.

3. Align the particulate filters in the silencer and press them in by hand as far as possible.



417 291



402 562

Note:

Take care not to press the particulate filter in too far. It is not possible to pull the particulate filter out a bit to get it into the correct position; this would detach the gasket resulting in leakage. If the particulate filter is pressed in too far it must be pulled out completely and the gasket must be renewed before the particulate filter can be pressed into the correct position.

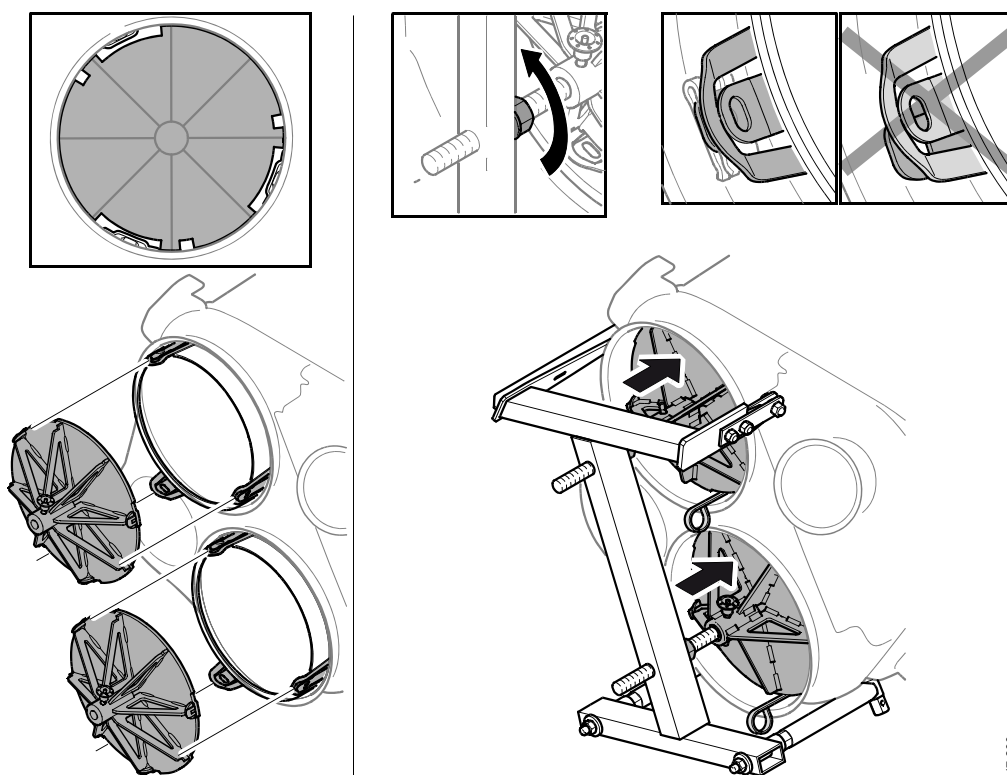
4. Screw in the particulate filters.

Fit 2 263 984 *Tool kit for silencer with 2 particulate filters.*

Screw the press plates onto the particulate filters by hand as far as possible.

Fit 2 587 638 *Guide for particulate filters* so that the particulate filters are centred.

Press in the particulate filter using a 30 mm ring spanner with ratchet mechanism. Check that a bracket on each particulate filter is in line with a corresponding bracket on the silencer.



417 280

Check that the particulate filters are sufficiently pressed in. There is a risk of leakage if the brackets on the particulate filters are sufficiently pressed in. There is a risk of leakages if the brackets on the particulate filters protrude so that the cover plates, which are fitted later, do not completely seal with the silencer.

Do not remove the tool until after pressure testing, when the particulate filters are screwed into place.

5. Carry out a leak test of the particulate filters.

Pressurise the silencer with compressed air. Read the pressure on the pressure testing cover. When the pressure is 0.2 bar, stop adding compressed air. After 15 seconds the pressure must not drop below 0.1 bar.

Fit: 2 284 630 *Pressure testing equipment* with 2 264 805 *Adapter* on the exhaust inlet.

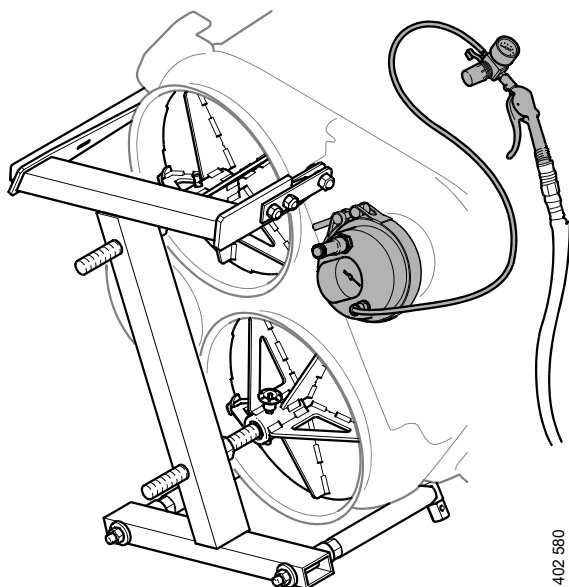
The adapter is included in 2 263 984 *Tool kit for silencer with 2 particulate filters*.

Connect 99 405 *Clutch bleeder* to the pressure testing equipment.

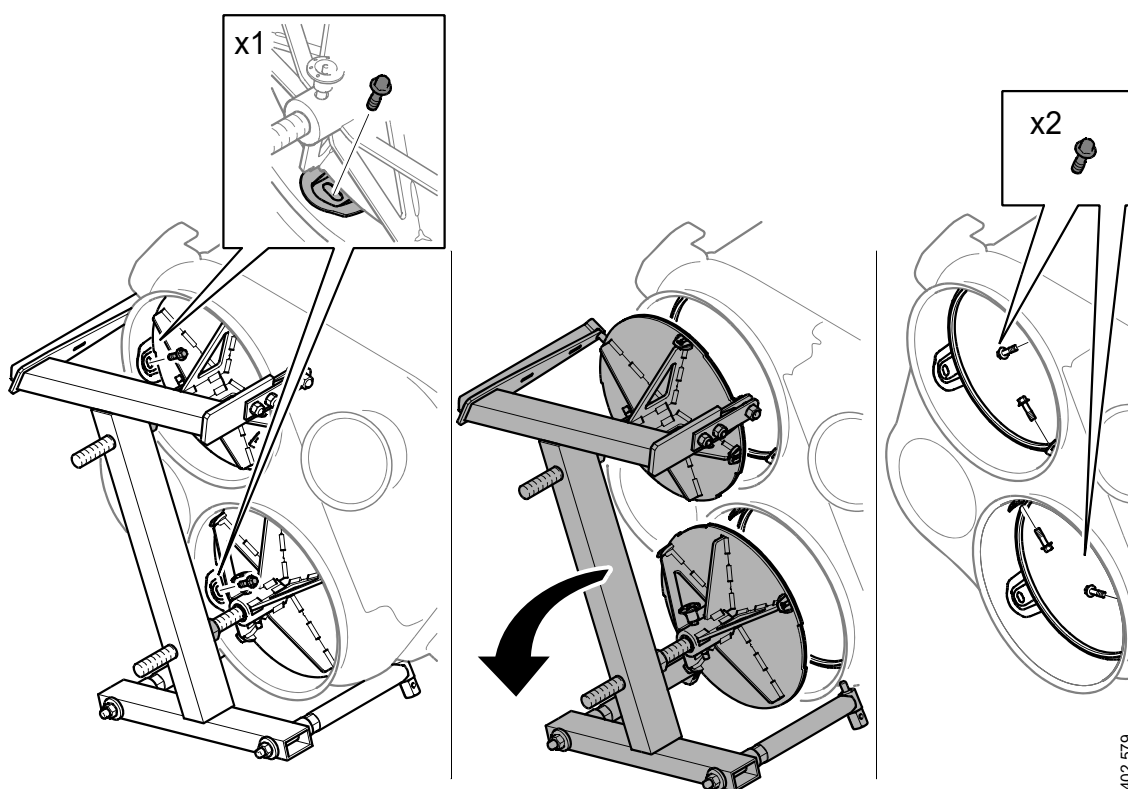
If the pressure cannot be maintained for a sufficient amount of time, use leak detection spray to check that air is not leaking out at:

- the press plates that are pressed against the particulate filters during pressure testing.
- the pressure testing equipment.
- NOx sensor and temperature sensor on the inlet side of the silencer.
- differential pressure sensor and temperature sensor between the oxidation catalytic converter (DOC) and the particulate filters.
- if the pressure still cannot be maintained: Try to press in the particulate filters a little bit, but make sure that the screws can still be fitted.

If the points above are sealed, the particulate filter gasket is damaged or missing altogether. In that case the particulate filter must be pulled out completely and the gasket renewed.



6. Fit the particulate filters and remove the tools.

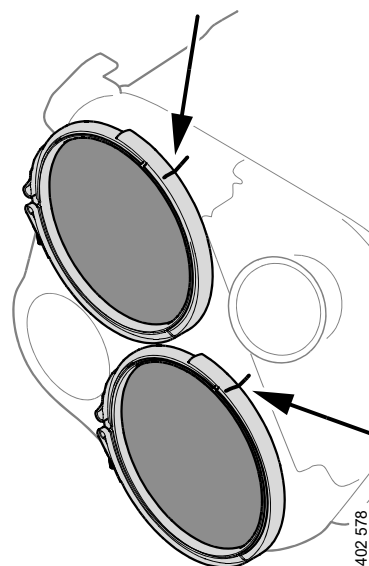


Particulate filter, screw x3 32 Nm.

Note:

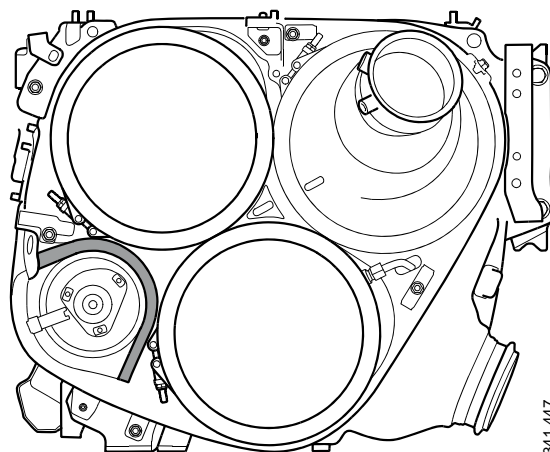
Check that the particulate filter brackets are not in the way of the cover plates when they are fitted. There is a risk of leakages if the cover plates do not seal completely against the silencer.

7. Fit the cover plates with new sealing rings.
Fit and tighten the V-clamps in their original positions.



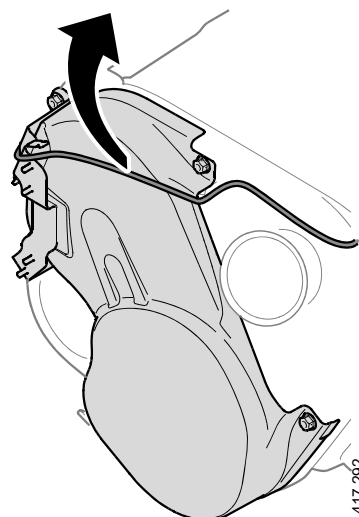
V-clamp 20 Nm.

8. Check that the seal protecting the reductant doser from radiated heat is undamaged and is in place.




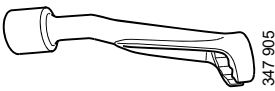
9. Fit the end plate.

- Fit the end plate.
- Secure electrical cables and any reductant hoses with heat-resistance cable ties.



Stage V, distributed system

Tool

Number	Designation	Illustration	Tool board
99 405	Clutch bleeder		D6
99 654	VCI3		N/A
2 290 856	17 mm, Special socket, slotted, 1/2"		N/A



WARNING!

P3 type respiratory protective equipment/filter mask, eye protection and gloves should be worn for any work where there is a risk of exposure to dust from the particulate filter. A face mask, gloves and eye protection must be worn when cleaning the filter unit. Use protective equipment from the time the filter unit is exposed until the time cleaning is complete. Safety clearance for unprotected people is 3 m.

Do not eat, drink or smoke while work is in progress.

Any dust from the particulate filter should be removed using a vacuum cleaner with a HEPA filter that can filter out particles down to a particle size of 0.3 microns, in order to reduce exposure.

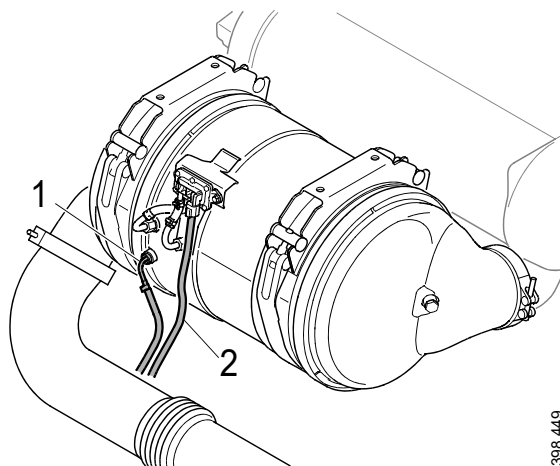
Wash your hands thoroughly after work on the particle filter.



IMPORTANT!

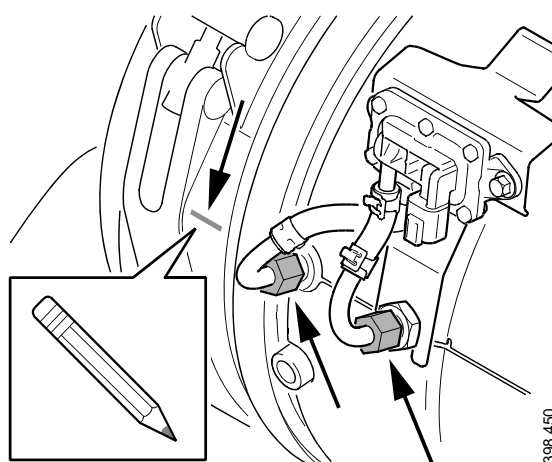
Be careful when handling the sensor body. It is sensitive and must not be bent or straightened. Renew the sensor if it is bent.

1. Remove exhaust gas temperature sensor (1).
Use 2 290 856 17 mm, Special sleeve, slotted, 1/2" if necessary.
2. Loosen the differential pressure sensor's harness-to-component connector (2).



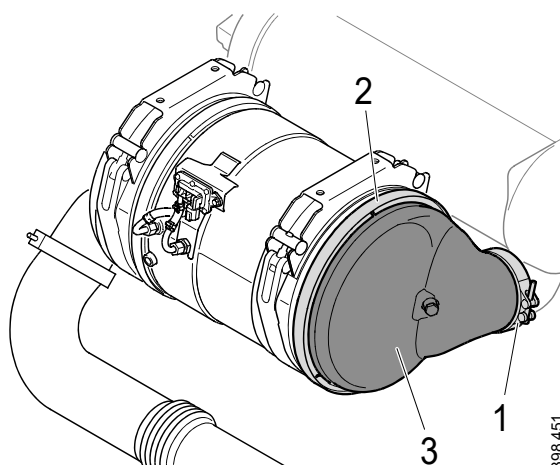
398 449

3. To facilitate fitting, use a marker pen to mark the position of the particulate filter. Make a mark on the oxidation catalytic converter in line with the particulate filter connections for the differential pressure sensor.



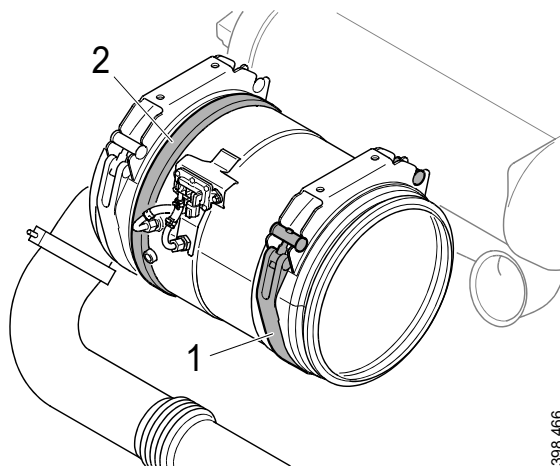
398 450

4. Remove the V-clamp at the particulate filter outlet (1) and the V-clamp holding the end plate (2). Remove the end plate (3).
5. Support the particulate filter with a jack or similar.



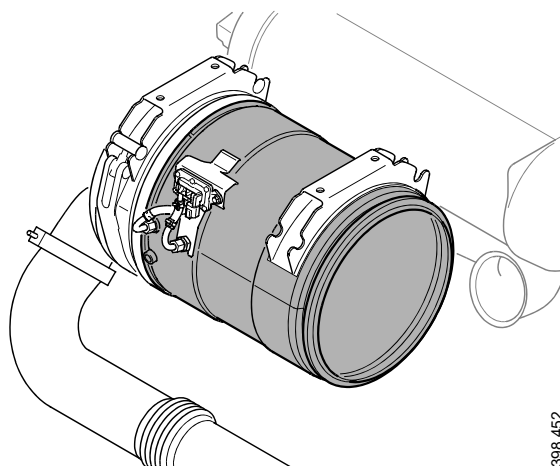
398 451

6. Remove the V-clamp (2) and the band clamp around the particulate filter (1).



308 466

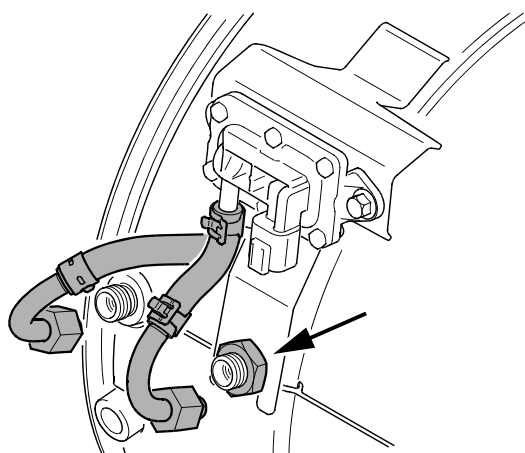
7. Lift off the particulate filter carefully.



308 452

8. Connect the engine to SDP3 with 99 654 VCI3 and follow the instructions in the wizard to enter a new ID number. In the wizard, data for soot and ash are also reset. See *SDP3 > Checks and adjustments > Functions > Calibration > Emission control > Exhaust gas aftertreatment > New ID number upon renewal of the particulate filter or silencer.*

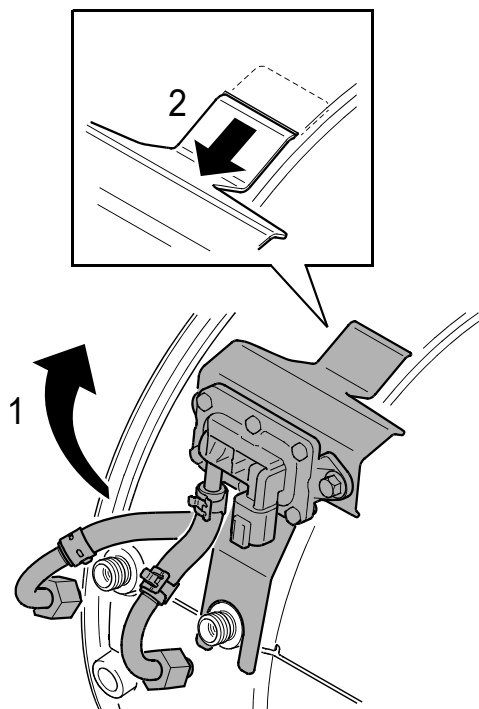
9. Detach the differential pressure sensor connections and remove the nut from the bracket.



308 454

10. Remove the differential pressure sensor and its bracket from the old particulate filter as described below:

- a) Tilt up the bracket and the differential pressure sensor (1).
- b) Pull off the bracket from the slot in the particulate filter (2).



398 455

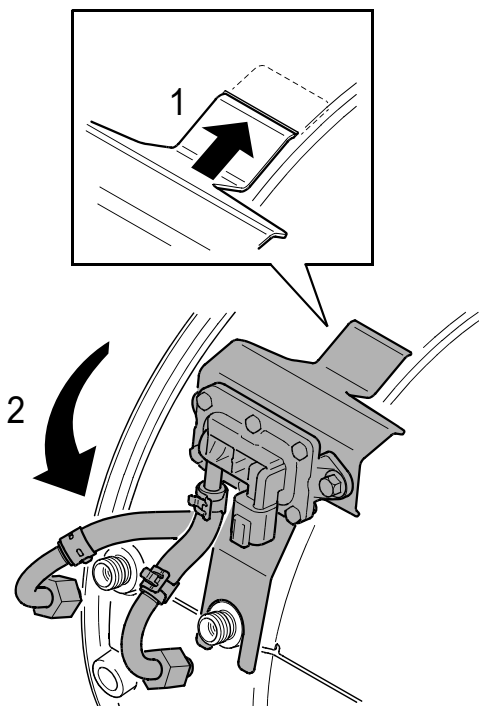
11. Remove one hose with accompanying pressure pipe from the differential pressure sensor and blow them clean using compressed air and 99 405 Clutch bleeder. Refit the hose and pressure pipe before removing the next one for cleaning with compressed air.

Note:

Make sure that the hoses are not mixed up when they are fitted on the differential pressure sensor.

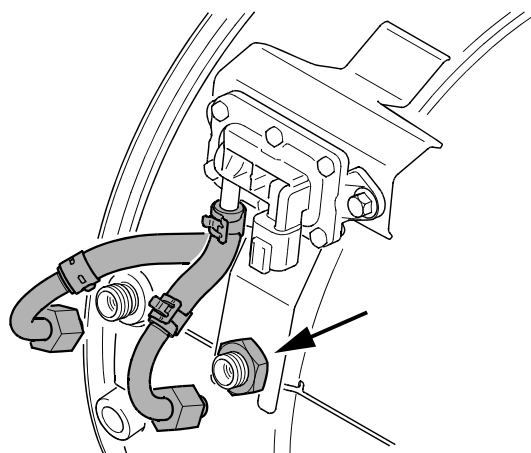
12. Refit the differential pressure sensor and its bracket on the new particulate filter as described below:

- a) Push in the bracket into the slot (1).
- b) Tilt in the bracket and the differential pressure sensor against the particulate filter (2).



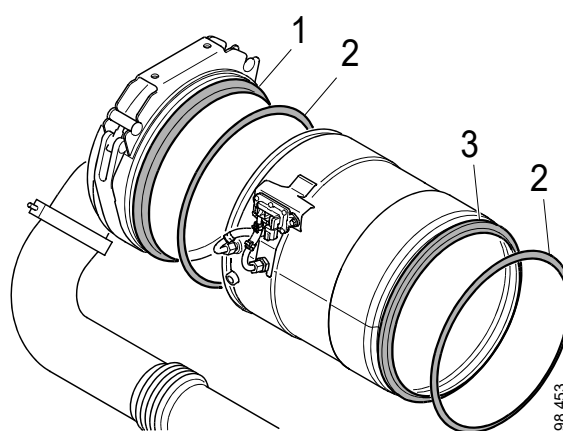
398 456

13. Fit the bracket nut and differential pressure sensor connections.



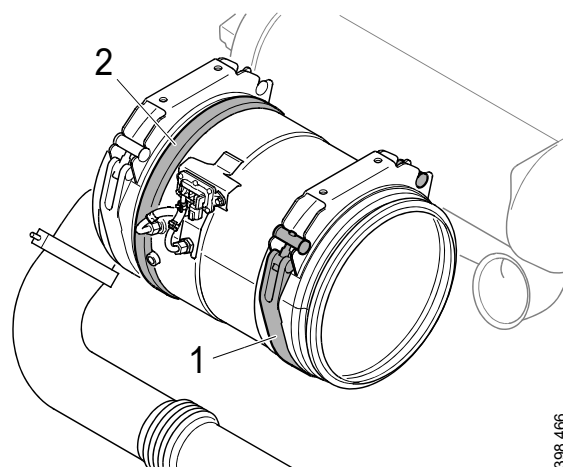
398 454

14. Clean the sealing surface of the oxidation catalytic converter (1). The surface should be free of gasket residue.
15. Fit new gaskets (2) to the sealing surfaces on the particulate filter (3) and the oxidation catalytic converter (1).
16. Fit the new particulate filter. Use a jack or similar to support the particulate filter.



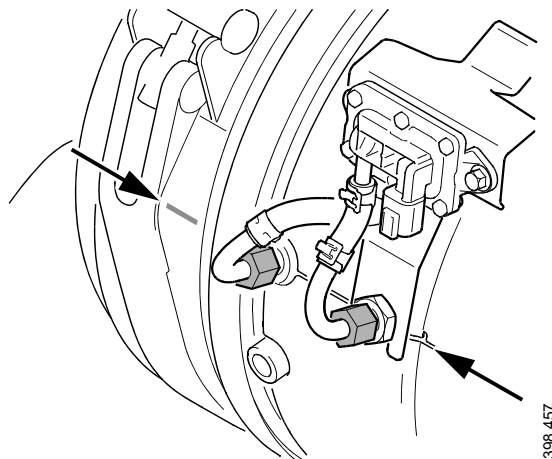
398 453

17. Fit the V-clamp (2) and the band clamp (1) loosely around the particulate filter.



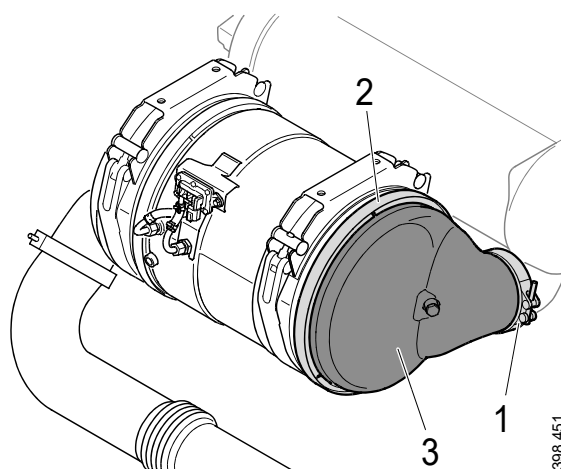
398 466

18. Align the particulate filter outlet for the differential pressure sensor with the mark. Tighten the V-clamp and the band clamp around the particulate filter. Tightening torque, V-clamp, 20 Nm.



398 457

19. Clean the sealing surface on the end plate (3). The surface should be free of gasket residue.
20. Fit the end plate and V-clamp (2) which hold the end plate in place. Tightening torque, V-clamp, 20 Nm.
21. Fit the V-clamp at the particulate filter outlet (1). Tightening torque, V-clamp, 20 Nm.

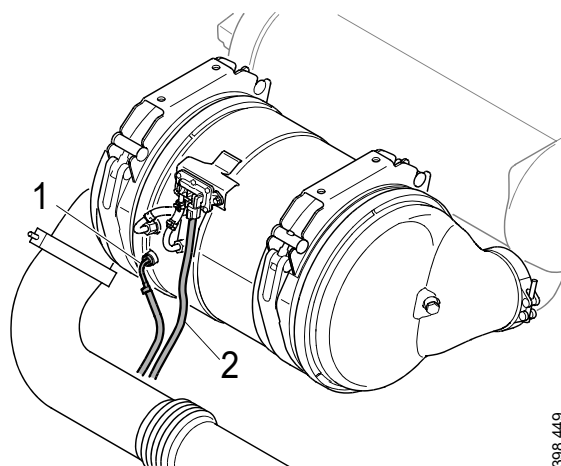


398 451

22. Fit the exhaust gas temperature sensor (1). Use 2 290 856 17 mm, Special sleeve, slotted, 1/2" if necessary. Tightening torque, Exhaust gas temperature sensor, T4010, 30 Nm.
23. Connect the differential pressure sensor connector (2).

**IMPORTANT!**

Be careful when handling the sensor body. It is sensitive and must not be bent or straightened. Renew the sensor if it is bent.



398 449