



SCANIA
Scania Engines

Important information

Serious risk of injury

When working on the engine, for example when adjusting drive belts and the clutch, or when changing the oil, it is important not to start the engine. The engine could be damaged, but more importantly there is a serious risk of injury.

For this reason, always secure the starting device or disconnect a battery cable before working on the engine. This is especially important if the engine has a remote starter or automatic starting.



WARNING!

This warning symbol and text can be found next to those maintenance items where it is particularly important to bear in mind the risk of injury.

Operator's manual

DI13

PDE

Marine engine

en-GB 2 453 210



Issue 4.0

Start-up Report – Warranty

The warranty starts when the start-up report has been filled in and sent to Scania. The normal warranty period is 1 year, but other conditions can apply.

Fill in the particulars from the start-up report below as well. This can make things easier if you need to contact a workshop, for example.

Engine serial number

Date of entry into service

User's name and address

Signature

Engine type

Variant

Engine type and variant are indicated on the engine data plate.

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Introduction

This Operator's manual describes the operation and maintenance of Scania marine engines.

The engines are direct-injection, liquid-cooled, four-stroke turbocharged diesel engines.

The engines are available with different output and speed settings. The engine power of the engine ordered is indicated on the engine data plate.

Note:

Only standard components are described in the operator's manual. Information about special equipment is contained in instructions from the various manufacturers.

To ensure the maximum performance and the longest service life for the engine remember the following:

- Read through the Operator's Manual before starting to use the engine. Even regular users of Scania engines will get new information from the Operator's manual.
- Always follow the maintenance instructions.
- Read the section on safety carefully.
- Get to know your engine so that you know what it can do and how it works.
- Always contact an authorised Scania workshop for maintenance and repairs.

The information in this Operator's manual was correct at the time of going to press. Scania reserves the right to make alterations without prior notice.

Note:

Always use Scania spare parts for maintenance and repair.

Power classes

Scania supplies engines in 4 different power classes:

ICFN – continuous operation: Intended for unlimited number of operational hours per year at a total load factor of 100%.

IFN – periodic operation: Intended for periodic operation, where full power is available 1 h/3 h. The accumulated load factor must not exceed 80% of the calculated load. Unlimited number of hours per year.

Patrol Craft Long: Intended for periodic operation, where full power is available 1 h/6 h. In between periods of operation at full load, the engine speed must be reduced by at least 10% of the maximum engine speed attained. The maximum accumulated operating time must be 2,000 hours per year.

Patrol Craft Short: Intended for periodic operation where the calculated power is available 1h/12h. In between periods of operation at full load, the engine speed must be reduced by at least 10% of the maximum engine speed attained. The maximum accumulated operating time must be 1,200 hours per year.

The engine serial numbers and power classes for the engines that are used in this installation should be listed below:

Engine serial number:

Engine type:

Engine power:

kW at

rpm

Indicate below the type of operation, and enter it on page 1.

☐

ICFN – continuous operation

☐

IFN – periodic operation

☐

Patrol Craft Long

☐

Patrol Craft Short

Environment and safety

Environmental responsibility

Scania develops and produces engines that are as environmentally-friendly as possible. Scania has made major investments in the reduction of harmful exhaust emissions in order to fulfil the environmental requirements in force in almost every market.

At the same time, we have been able to maintain a high level of performance and operating economy for Scania marine engines. To maintain these throughout the entire service life of the engine, it is important for the user to follow the instructions on running, maintenance and fuel and lubricating oil as outlined in the Operator's manual.

Other green initiatives taken include ensuring that, following maintenance and repair, waste that is harmful to the environment (for example oil, fuel, coolant, filters and batteries) is disposed of accordance with the applicable environmental requirements.

Safety

The following pages contain a summary of the safety precautions to be complied with when operating and maintaining Scania engines. The equivalent text can also be found under the relevant maintenance item.

To prevent damage to the engine and to ensure that it runs optimally, follow the instructions in the warnings and advisories.

If the instructions are not followed, the warranty can cease to apply.

Different types of advisory

Warning!

All advisories preceded by Warning! are very important. They warn of serious faults and incorrect operation that could lead to personal injury. Example:



WARNING!

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

Important!

Advisories preceded by Important! warn of faults and incorrect operation that could lead to equipment being damaged. Example:



IMPORTANT!

An excessively high coolant temperature can damage the engine.

Note:

Advisories preceded by Note: refer to information important to ensure the best possible operation and functionality. Example:

Note:

Leave the engine off for at least 1 minute before you check the oil level.

Environment

This Operator's Manual contains specially highlighted text with instructions to help protect the environment during maintenance. Example:

**Environment**

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

Warnings and advisories**Smoking****WARNING!**

Smoking is prohibited

- in the vicinity of flammable or explosive material, e.g. fuel, oils, batteries, chemicals
- when refuelling and in the vicinity of the filling station
- when working on the fuel system

Safety precautions for running the engine**Daily maintenance**

Always carry out a visual inspection of the engine and engine compartment before starting the engine or when the engine has been switched off after operation.

This inspection should be done to detect fuel, oil or coolant leaks, or anything else that may require corrective action.

Fuel**WARNING!**

The wrong fuel grade can cause breakdowns or stoppages by causing the injection system to malfunction. This can cause damage to the engine and, possibly, personal injury.

**IMPORTANT!**

The operator is responsible for using the correct type of fuel to ensure that local laws and regulations are complied with.

For further information on fuel, see the section [Composition of the fuel](#).

Refuelling



WARNING!

During refuelling there is a risk of fire and explosion. The engine must be switched off and smoking is prohibited.

Never overfill the tank as the fuel needs space to expand. Make sure that the filler cap is fully closed.

Hazardous gases



WARNING!

Only start the engine in a well ventilated area. The exhaust gases contain carbon monoxide and nitrogen oxides, which are toxic.

If it is run in an enclosed space, there should be an effective device to extract exhaust gases and crankcase gases.

Starter lock



IMPORTANT!

If the instrument panel is not fitted with a starter lock, the engine compartment should be locked to prevent unauthorised personnel from starting the engine. Alternatively, a lockable master switch or battery master switch can be used.

Starter gas



WARNING!

Never use starter gas or similar agents to help start the engine. This can cause an explosion in the intake manifold and possible injury.

Running**WARNING!**

The engine must not be run in environments where there is a risk of explosion, as all of the electrical or mechanical components can generate sparks.

Approaching a running engine always poses a safety risk. Parts of the body, clothes or dropped tools can get caught in rotating parts such as the fan and cause injury. For personal safety all rotating parts and hot surfaces must be fitted with guards.

Batteries**WARNING!**

The batteries contain and form oxyhydrogen gas, particularly during charging. Oxyhydrogen gas is flammable and highly explosive.

There must be no smoking, naked flames or sparks near the batteries or the battery compartment. Incorrect connection of a battery cable or jump lead can cause a spark, which can cause the battery to explode.

Safety precautions for handling materials**Fuel and lubricating oil****WARNING!**

All fuels and lubricants as well as many chemicals are flammable. Always follow the instructions on the relevant packaging.

The work must be carried out on a cold engine. Fuel leaks and spillage on hot surfaces can cause fire.

Store used rags and other flammable materials safely so as to avoid spontaneous combustion.

Chemicals**WARNING!**

Most chemicals such as glycol, anti-corrosive agents, preservative oils and degreasing agents, are hazardous to health.

Some chemicals, such as preservative oil, are also flammable.

Always follow the safety precautions on the relevant packaging.

Store chemicals and other materials which are hazardous to health in approved and clearly marked containers, where they are inaccessible to unauthorised persons.

**Environment**

Always hand in leftover and used chemicals to an authorised waste disposal contractor.

Safety precautions for maintenance and repair

Switch off the engine



WARNING!

Working with a running engine always poses a safety risk. Parts of the body, clothes or dropped tools can get caught in rotating parts and cause injury.

Always switch off the engine before carrying out maintenance and repairs, unless otherwise indicated.

Make it impossible to start the engine: Remove any starter key, or cut the power using the main power switch or battery master switch and lock them.

Fix a warning plate somewhere appropriate, showing that work is being carried out on the engine.

Hot surfaces and fluids



WARNING!

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

Lifting the engine



WARNING!

Never work underneath a suspended engine!

Always use the engine lifting eyes. Always check that lifting accessories are in good condition and are designed to lift the weight.

Optional equipment on the engine can change the centre of gravity. This means that it may be necessary to use additional lifting devices to balance the engine correctly and lift it safely.

Batteries



WARNING!

The batteries contain highly corrosive sulphuric acid. Take care to protect your eyes, skin and clothes when charging or handling batteries. Wear protective gloves and goggles.

If sulphuric acid comes in contact with the skin: Wash with soap and plenty of water. If it gets in your eyes: Rinse immediately with plenty of water and seek medical attention.



Environment

Always hand in used batteries to an authorised waste disposal contractor.

Electrical system



IMPORTANT!

Always use Scania spare parts for the fuel and electrical systems. Scania spare parts are designed to minimise the risk of fire and explosion.

The engine must be switched off and the power disconnected using the master switch or battery master switch before working on the electrical system. External power supplies to extra equipment on the engine must also be disconnected.

Electric welding



IMPORTANT!

When carrying out welding work on and near the engine, disconnect the battery and alternator leads. Pull out the multi-pin connector for the engine control unit as well.

Connect the welding clamp close to the component to be welded. The welding clamp must not be connected to the engine, or so that the current can cross a bearing.

When welding is finished:

1. Connect the alternator and engine control unit cables first.
2. Then connect the batteries.

Lubrication system



WARNING!

Hot oil can cause burns and skin irritation. Wear protective gloves and goggles when changing hot oil.

Make sure that there is no pressure in the lubrication system before starting work on it.

The oil filler cap must always be in place when starting and running the engine to prevent oil being ejected.



Environment

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

Cooling system**WARNING!**

Never open the coolant filler cap when the engine is hot. Hot coolant and steam may spray out and cause burns.

If the cap has to be opened do it slowly and carefully to release the pressure before removing the cap. Wear gloves as the coolant is still very hot.

**Environment**

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

Fuel system**WARNING!**

Maintenance and repairs of injection equipment are to be carried out by an authorised Scania workshop.

Always use Scania spare parts for the fuel and electrical systems. Scania spare parts are designed to minimise the risk of fire and explosion.

**Environment**

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

Before starting**WARNING!**

Never start the engine without the air filter being in place. If you do, this could cause injury and severe engine damage.

Ensure that all guards are in place before starting the engine. Ensure that no tools or other objects have been left on the engine.

Certification



IMPORTANT!

For Scania to guarantee that the engine corresponds to its certified configuration, and take responsibility for any damage and injuries that occur, maintenance must be carried out in accordance with the instructions in this Operator's manual.

An emissions certified engine fulfils the emissions requirements for a particular range of application.

On each emissions certified engine there is a label which shows which requirements the engine fulfils. Scania guarantees that each such engine fulfils the emissions requirements for the range of application for which it is certified.

The following are required for the certified engine to fulfil the emissions requirements once it has been taken into service:

- Maintenance is to be carried out in accordance with the instructions in this Operator's manual.
- Maintenance and repairs of injection equipment are to be carried out by an authorised Scania workshop.
- The engine may only be modified with equipment that has been approved by Scania.
- Seals may be broken and setting data edited only once approval has been granted by Scania. Modifications may be made by authorised personnel only.
- Modifications affecting the exhaust and intake systems must be approved by Scania.

Otherwise, the instructions in the Operator's manual for the running and maintenance of the engine shall apply. Follow the safety precautions on the previous pages.

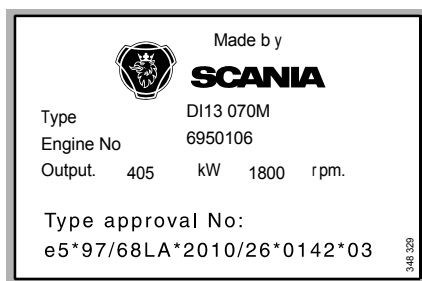
Engine data plate

The engine data plate indicates, in the form of a code, the engine type, its size and applications. It also indicates the engine power and operating speed. The engine EU type approval for exhaust emissions is indicated under *Output*.

The engine serial number is stamped onto the top of the cylinder block at the front right.

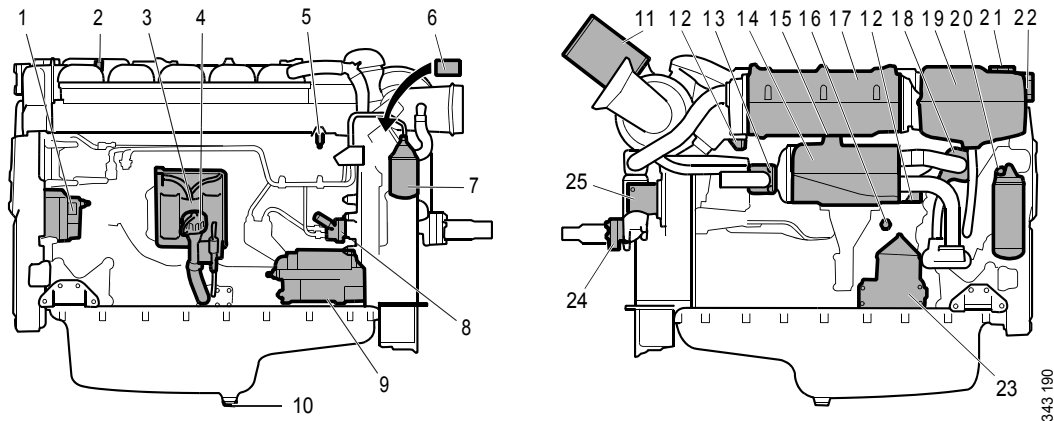
Example: DI13 070M

- DI Supercharged diesel engine with water-cooled charge air cooler.
- 13 Displacement in whole dm³.
- 070 Performance and certification code. The code indicates, together with the application code, the normal gross engine output.
- M Code for application. M means for marine use.



Example of an engine data plate

Component identification



The illustration shows a normal version of a DI13 engine with heat exchanger. The engine ordered may have different equipment.

- | | |
|-------------------------------|--|
| 1. Alternator | 14. Heat exchanger |
| 2. Oil filler cap | 15. Holes for draining condensation in charge air cooler |
| 3. Engine control unit | 16. Valve for draining coolant |
| 4. Oil dipstick | 17. Charge air cooler |
| 5. Fuel manifold bleed nipple | 18. Thermostat |
| 6. Engine data plate | 19. Expansion tank |
| 7. Fuel filter | 20. Oil filter |
| 8. Fuel pump with hand pump | 21. Filling coolant |
| 9. Starter motor | 22. Level glass for checking coolant level |
| 10. Oil plug | 23. Centrifugal oil cleaner |
| 11. Air filter | 24. Sea water intake |
| 12. Sacrificial anodes (2) | 25. Sea water pump |
| 13. Sea water outlet | |

Starting and running

Checks before first start

Before the engine is started for the first time, carry out the maintenance items listed under First start in the maintenance schedule. The following must be checked:

- Oil level
- Coolant
- Fuel level
- Fluid level in batteries
- State of battery charge
- Condition of the drive belt

See also [Maintenance intervals](#).

Checks before running

Carry out daily maintenance as described in the maintenance schedule prior to operation. See [Maintenance intervals](#).

Starting the engine



WARNING!

Never use starter gas or similar agents to help start the engine. This can cause an explosion in the intake manifold and possible injury.

Only start the engine in a well ventilated area. When the engine is run in an enclosed space, there must be effective devices to extract exhaust gases and crankcase gases.



IMPORTANT!

The starter motor must only be cranked twice for 30 seconds at a time. After that, it must rest for at least 5 minutes before the next attempt to start it.

For environmental reasons the Scania engine has been developed to be started with a low fuel feed. Using unnecessarily large amounts of fuel when starting the engine always results in emissions of unburnt fuel.

1. Open the fuel cock if fitted.
2. Disengage the engine.
3. If the engine has a battery master switch:
Switch on the power by means of the battery master switch.
4. Start the engine.

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 section [Bleeding the fuel system using a hand pump](#) or [Bleeding the fuel system using a suction tool](#).

Starting at low temperatures

Take the local environmental requirements into account. Use a fuel heater and engine heater to avoid starting problems and white smoke.

Scania recommends that an engine heater should be used if the engine will be used at temperatures below -10°C.

A low engine speed and a moderate load on a cold engine limits white smoke, gives better combustion and warms up the engine more quickly than warming it up with no load.

Avoid running it longer than necessary at idling speed.

Running

Check instruments and warning lamps at regular intervals.

Engine speed range

The engine operating speed range is between low idling and the nominal engine speed. The nominal engine speed is indicated on the engine data plate. Low idling can be set between 500 and 1,050 rpm.

Limp home mode

If there is a fault in the normal throttle opening or if CAN communication is interrupted, the following emergency operation option is provided:

A CAN fault or throttle opening fault in an all-speed engine (both signal and idling switch):

- The throttle opening value is 0% and the engine is running at normal idling speed.
- The throttle opening value is 0% and the engine is running at raised idling speed (750 rpm) if this function is activated.

Throttle opening fault, but the idling switch is working:

- The throttle opening value can be increased slowly between 0 and 50% by using the idling switch.

CAN fault:

- The engine is switched off if the shutdown function is activated.

Driving at high altitude

When driving at high altitudes engine power is reduced automatically due to the lower oxygen content in the air. It is then not possible to run the engine at maximum power.

- ICFN and PRP engines may be used at an altitude of up to 2,000 metres.
- IFN, Patrol Craft Long and Patrol Craft Short engines must not be used at an altitude of more than 1,000 metres.
- Contact Scania if the operating conditions deviate from these.

Coolant temperature



IMPORTANT!

An excessively high coolant temperature can damage the engine.

Normal coolant temperature during operation is approximately 94°C/200°F.

The alarm levels are set in the engine control unit. The default setting for the lowest and highest limit values for high coolant temperature are 95°C/203°F and 105°C/221°F respectively.

The high coolant temperature alarm has the following functions:

- Alarm only.
- Alarm and torque reduction at the lowest limit value.
- Alarm at the lowest limit value and engine shutdown at the highest limit value.
- Alarm, torque reduction at the lowest limit value and engine shutdown at the highest limit value.
- Alarm at the lowest limit value and engine shutdown at the highest limit value with the possibility of engine shutdown override control.
- Alarm, torque reduction at the lowest limit value and engine shutdown at the highest limit value, with the possibility of engine shutdown override control.

If run for extended periods under an extremely light load, the engine may have difficulty in maintaining the coolant temperature. At an increased load the coolant temperature rises to the normal value.

Oil pressure

Information about the normal oil pressure and lowest permitted oil pressure is contained in the [Lubrication system](#) section in the Technical Data chapter.

The engine management system has the following alarm levels:

- At an engine speed below 1,000 rpm and an oil pressure below 0.7 bar/10.2 psi.
- At an engine speed above 1,000 rpm and an oil pressure below 2.5 bar/36.3 psi for longer than 3 seconds.

The incorrect oil pressure alarm has the following functions:

- Alarm only.
- Alarm and torque reduction by 30%.
- Alarm and engine shutdown.
- Alarm and engine shutdown override control.

Note:

High oil pressure (above 6 bar/87 psi) is normal when starting a cold engine.

Charging indicator lamp

If the lamp comes on during operation:

- Check and adjust the drive belt according to the section [Checking the drive belt](#).

If the charging indicator lamp is still on, this could be due to an alternator fault or a fault in the electrical system.

Belt transmission

When the belt transmission is new, it may make a squeaking noise when running. The noise is normal and disappears after 50-100 hours of operation. The noise does not affect the service life of the belt transmission.

Engine shutdown



IMPORTANT!

There is risk of post boiling and of damage to the turbocharger if the engine is switched off without cooling. The power must not be switched off before the engine has stopped.

Note:

The battery voltage must remain on for a few seconds after the 15 voltage is switched off so that the control units can store the values and switch to standby mode.

10 prohibited engine shutdowns will cause a torque reduction (70% of fuel quantity). Reset the engine by switching it off correctly once.

1. Run the engine without a load for a few minutes if it has been run continuously with a heavy load.
2. Switch off the engine.

Checks after running



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 turbochargers, oil sumps, hot coolant and oil in pipes and hoses.



IMPORTANT!

Check the coolant level following the first start. Top up with coolant as necessary.

1. Check that the power supply has been cut.
2. Fill the fuel tank. Make sure that the filler cap and the area round the filler opening are clean to avoid contamination of the fuel.
3. If there is a risk of freezing, the cooling system must contain enough glycol. See the section [Coolant resistance to cold](#).
4. If the temperature is below 0°C/32°F: Prepare for the next start by connecting the engine heater (if fitted).

Maintenance

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

- Lubrication system
- Cooling system
- Air cleaner
- 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 turbochargers, oil sumps, hot coolant and oil in pipes and hoses.



IMPORTANT!

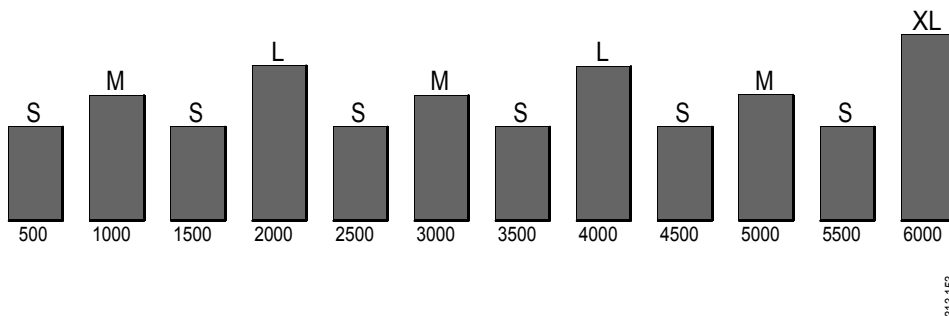
On delivery a Scania engine is optimised for its application. However, regular maintenance is necessary to

- 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.

The maintenance programme includes the following:

- S maintenance: Minimum basic maintenance.
- M maintenance: More extensive maintenance.
- L maintenance: Includes nearly all maintenance items.
- XL maintenance: Includes all maintenance items.

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



Maintenance intervals

	Daily	First time at		Interval (hours)					At least	
		first start	500	500	1,000	2,000	6,000	annually	every 5 years	
			R	S	M	L	XL			
Lubrication system										
Checking oil level	X	X								
Changing the oil			X	X	X	X	X	X		
Cleaning the centrifugal oil cleaner			X	X	X	X	X	X		
Renewing the oil filter			X	X	X	X	X	X		
Cooling system										
Checking coolant level	X	X	X	X	X	X	X			
Checking coolant antifreeze and corrosion protection		X				X	X	X		
Checking sacrificial anodes			X	X	X	X	X	X		
Checking the sea water pump impeller				X	X	X	X	X		
Changing the coolant and cleaning the cooling system							X		X	
Air cleaner										
Reading the air cleaner vacuum indicator	X		X	X	X	X	X			
Renewing the air cleaner filter element						X	X		X	
Renewing the air cleaner safety cartridge						X	X		X	
Renewing an air filter with a non-renewable element						X	X		X	
Fuel system										
Checking fuel level	X	X								
Renewing the fuel filters					X	X	X		X	
Miscellaneous										
Checking the drive belt		X			X	X	X	X		
Checking for leaks	X			X	X	X	X			
Checking and adjusting the valve clearance			X			X	X			

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 quality engine oils available on the market.

Recommended oil
Scania Oil LDF-3
Scania Oil LDF-2
Scania Oil LDF
Scania Oil E7

The engine oil must fulfil the following quality requirements:

- ACEA E5/API CI-4.
- ACEA E7/API CI-4 +.
- For engines not run on low-sulphur fuel, the TBN (Total Base Number) should be at least 12 (ASTM D2896).
- Oils with a low ash content (ACEA E9/API CJ4) are not recommended.

Check with your oil supplier that the oil meets these requirements.

If the engine is used in areas of the world where lubricating 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.

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

Viscosity class	Outdoor temperature	
SAE 20W-30	-15°C (5°F)	- +30°C (86°F)
SAE 30	-10°C (14°F)	- +30°C (86°F)
SAE 40	-5°C (23°F)	- > +45°C (113°F)
SAE 50	0°C (32°F)	- > +45°C (113°F)
SAE 5W-30	< -40°C (-40°F)	- +30°C (86°F)
SAE 10W-30	-25°C (-13°F)	- +30°C (86°F)
SAE 15W-40	-20°C (-4°F)	- > +45°C (113°F)

Oil analysis

To be able to extend the oil change intervals using an oil analysis, Scania LDF-2 and LDF-3 oils must be used. Oil companies can offer analysis of the engine oil.

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 (in accordance with DIN 51452): < 3%.

Such analysis measures the oil's TBN (Total Base 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.

Checking oil level

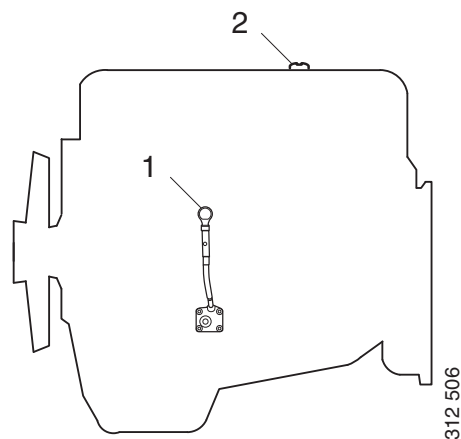
Checking the oil level with the engine switched off

Note:

Leave the engine off for at least 1 minute before you check the oil level.

1. Remove the oil dipstick (1) and check the oil level. The correct level is between the minimum and maximum marks on the oil dipstick.
2. Top up with more oil via the oil filler (2) when the oil level is at or below the minimum mark.

For information on the correct oil type, see the section [Oil grade](#).



Changing the oil



WARNING!

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

Note:

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

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).



Environment

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

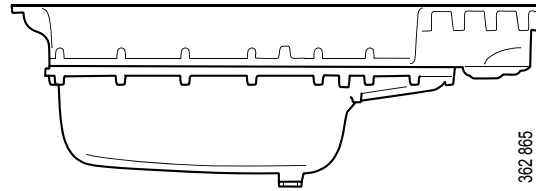
1. Unscrew the oil plug and drain the oil when the engine is hot. In certain engines the oil is pumped out by means of a bilge pump.

When draining with the valve, the oil should be hot. Alternatively, use a pump. This so that draining occurs more quickly.

2. Clean the magnet on the oil plug.
3. Refit the oil plug.
4. Top up with oil.
5. Check the level on the oil dipstick.

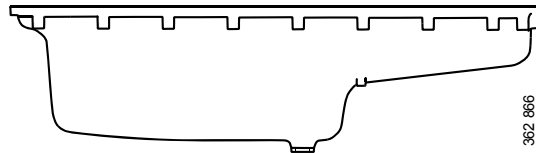
Maximum angles of inclination during operation

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



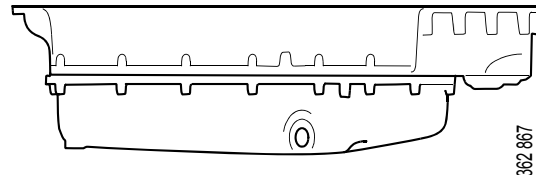
Max. 45 litres (11.9 US gallons).

Min. 39 litres (10.3 US gallons).



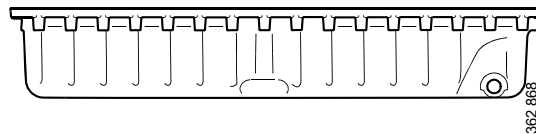
Max. 36 litres (9.5 US gallons).

Min. 30 litres (7.9 US gallons).



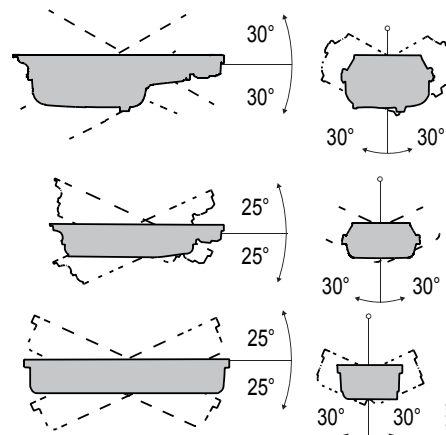
Max. 34 litres (9.0 US gallons).

Min. 28 litres (7.4 US gallons).



Max. 30 litres (7.9 US gallons).

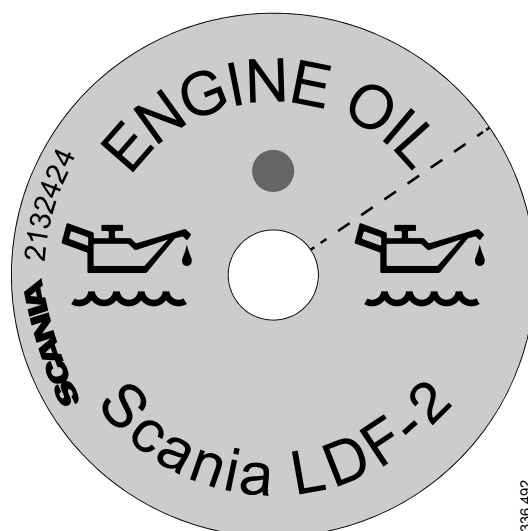
Min. 25 litres (6.6 US gallons).



Oil grade labels

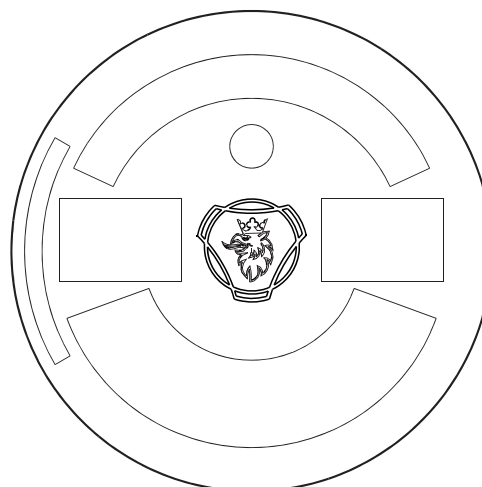
When changing oil it is important to use the correct engine oil grade.

The oil filler cap must therefore be clearly marked with a label for the oil grade that is required. If the label is missing or if the engine oil grade is changed, a new label must be fitted.



336 492

Filling label in the cylinder block.



353 114

Filling label in the rocker cover.

Parts

Oil grade	Colour	Part No.	Part No.
		Label for cylinder block	Label for rocker cover
Scania LDF-2	Blue	2 132 424	2 296 064
Scania LDF-3	Red	2 132 426	2 296 066
Scania LDF	Grey	2 269 345	2 296 071
ACEA E7	White	2 132 425	2 296 065
Scania Low Ash	Green	2 132 427	2 296 067
Scania Bioethanol	Black	2 132 428	2 296 068
Scania BEO-2	Orange	2 258 841	2 296 070
ACEA E9	-	2 132 429	2 296 069

Cleaning the centrifugal oil cleaner



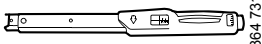
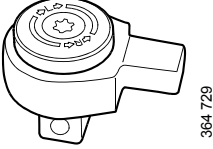
WARNING!

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

Note:

Always use genuine Scania parts during maintenance of the centrifugal oil cleaner. This will ensure that the centrifugal oil cleaner continues to function.

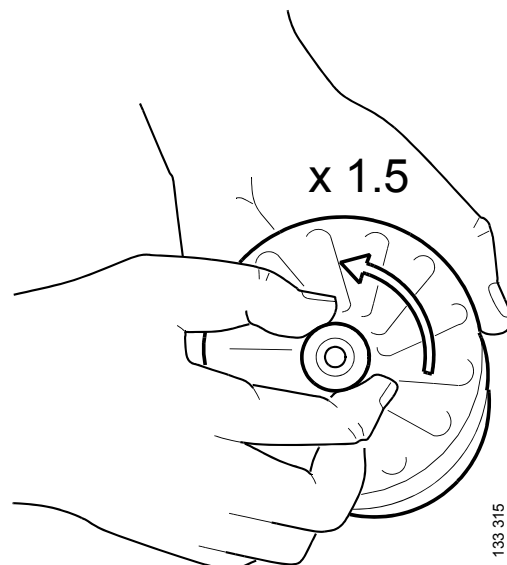
Tools

Designation	Illustration
Torque wrench	
Ratchet head	

When the centrifugal oil cleaner is cleaned, there should be some dirt deposits in the rotor cover. This indicates that the rotor is working. If the rotor cover is clean, in other words the rotor is not working, the cause must be established immediately.

If the dirt deposit exceeds 28 mm at the recommended maintenance intervals, the rotor cover should be cleaned more often.

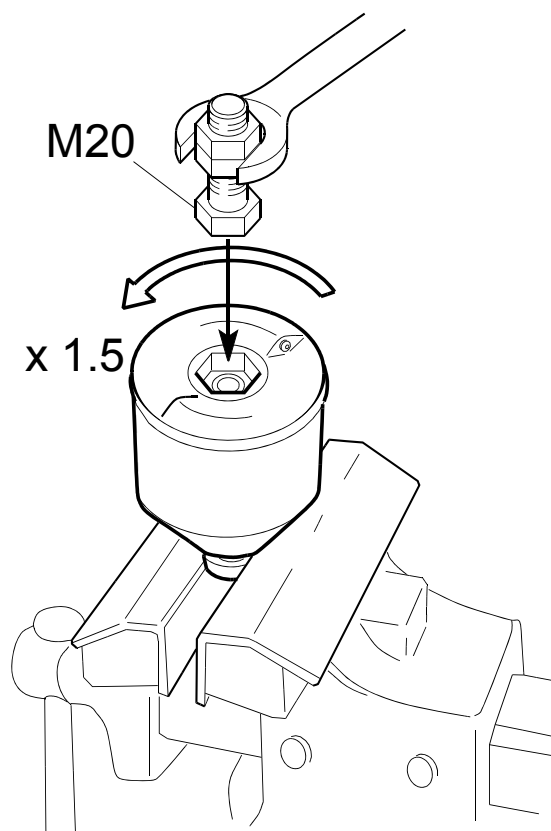
1. Clean the cover. Unscrew the nut securing the outer cover.
2. Let the oil run out from the rotor.
3. Lift out the rotor. Wipe off the outside. Undo the rotor nut and unscrew it about 1.5 turns to protect the bearing.



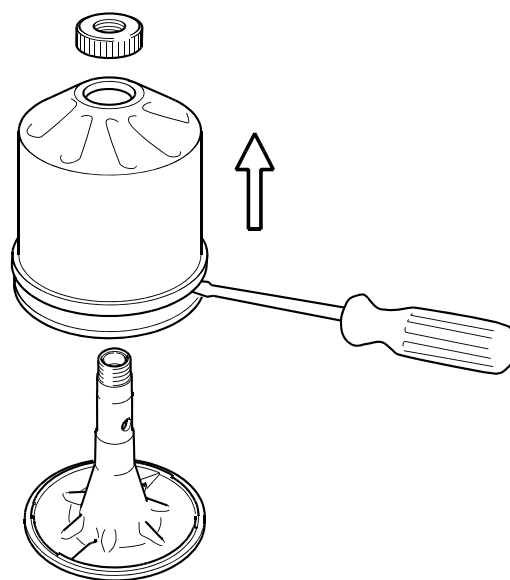
4. If the rotor nut is difficult to get loose, turn the rotor upside down and fasten the rotor nut in a vice. Turn the rotor anti-clockwise 1.5 turns by hand or use an M20 nut, see illustration.

**IMPORTANT!**

The rotor must not be put in a vice. Never strike the rotor cover. This may cause damage resulting in imbalance.

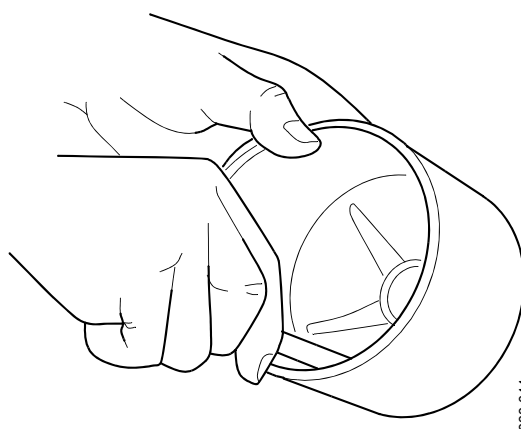


5. Remove the rotor cover by holding the rotor in both hands and tapping the rotor nut against the table. Never strike the rotor directly as this may damage its bearings.



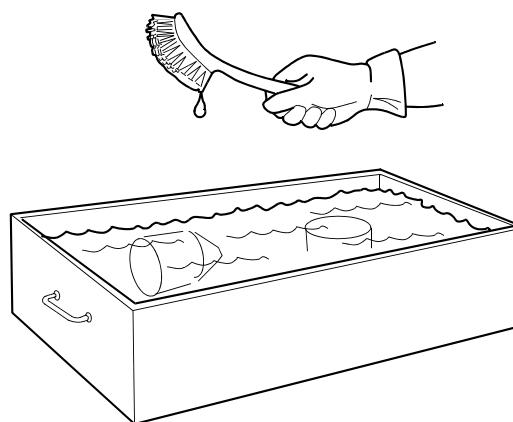
6. Remove the strainer from the rotor cover. If the strainer is stuck, insert a screwdriver between the rotor cover and strainer and carefully prise them apart.

7. Remove the paper insert and scrape away any remaining dirt deposits inside the rotor cover. If the deposits are thicker than 28 mm, the centrifugal oil cleaner must be cleaned more often.



333 044

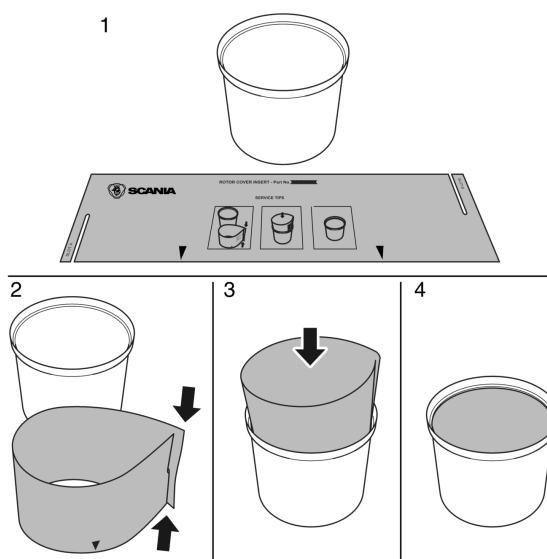
8. Wash the parts.



333 037

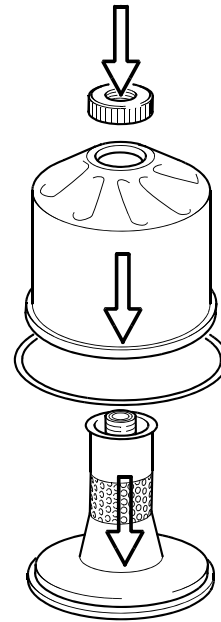
9. Inspect the 2 nozzles on the rotor. Ensure that they are not blocked or damaged. Renew any damaged nozzles.
10. Check that the bearings are undamaged. Renew damaged bearings.

11. Fit a new paper insert inside the rotor cover.

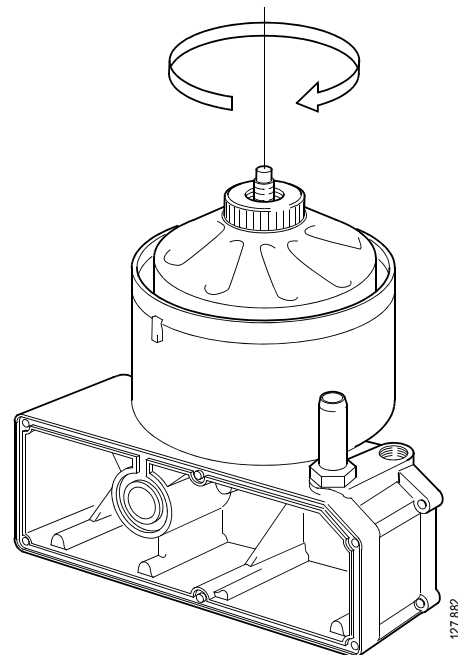


337 178

12. Fit the strainer onto the rotor.
13. Fit a new O-ring by sliding it over the strainer.
14. Refit the rotor cover. Ensure that the O-ring is not outside the edges.
15. Tighten the rotor nut by hand.
16. Check that the rotor shaft is not damaged or loose.



17. Refit the rotor and rotate it by hand to check that it rotates easily.



18. Fit a new O-ring in the cover. Refit the cover and tighten the lock nut.

**IMPORTANT!**

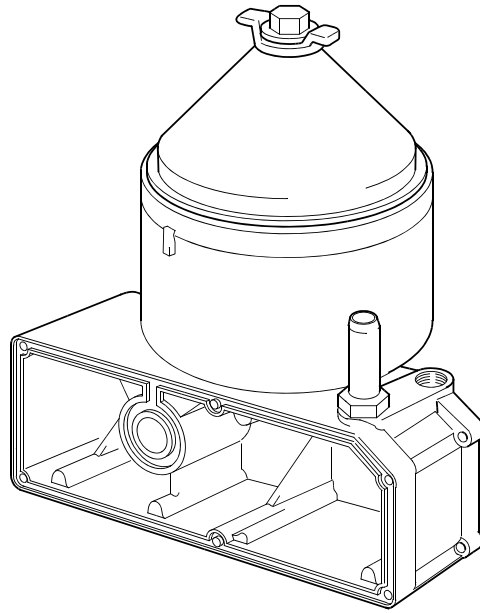
To reduce the risk of oil leakage it is important to tighten the cover to the correct tightening torque.

From engine serial number 6 841 928:

Tightening torque 20 Nm.

Older engine serial number:

Tightening torque 15 Nm.

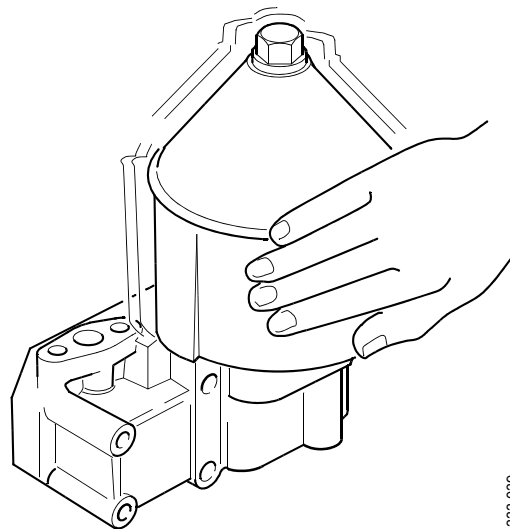


Operational testing

Operational testing need only be carried out if it is suspected that the centrifugal oil cleaner is malfunctioning. For example, if the dirt deposit is abnormally small given the distance driven.

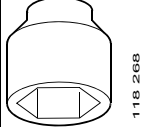
The rotor rotates very fast and should continue to turn when the engine has stopped.

1. Run the engine until it reaches normal operating temperature.
2. Turn off the engine and listen for the sound from the rotor. Use your hand to feel if the filter housing is vibrating.
3. If the filter housing is not vibrating, dismantle and check the centrifugal oil cleaner.



Renewing the oil filter

Tools

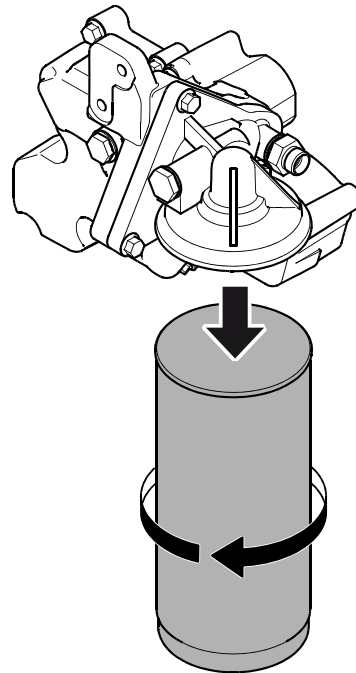
Designation	Illustration
Hexagon socket, drive 1/2", 36 mm	



IMPORTANT!

Clean the centrifugal oil cleaner at the same time as you change the oil filter. Otherwise, the oil filter will be blocked and resistance in the filter will increase. If this happens, an overflow valve in the filter retainer opens and lets the oil pass without being filtered.

1. Remove the old filter.
2. Oil the rubber gasket on the new filter.
3. Tighten the filter by hand. Never use tools because the filter could sustain damage, obstructing circulation.
4. Start the engine and check for leaks.

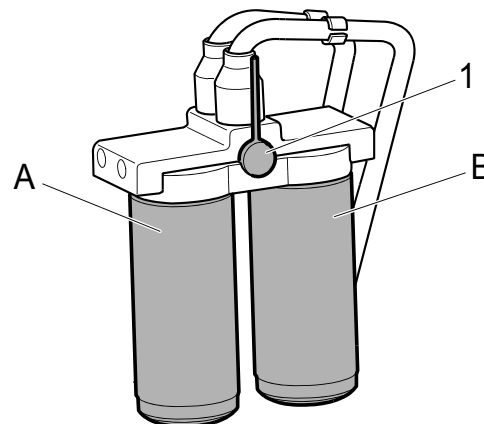


325 164

Renewing the double, commutative oil filter

During operation, the rotary control (1) should point 90° towards the filter being used.

1. Turn the rotary control 90° to the right so that it points towards filter B. The oil then flows through the filter.
2. Clean filter A with a cloth.
3. Unscrew filter A.
4. Apply oil to the gasket on the new filter.
5. Fill the filter with engine oil.
6. Screw filter A into place by hand until it makes contact.
7. Turn screw a further half turn by hand.
8. Turn the rotary control 90° to the left so that the rotary control points towards filter A. Fil-



346 953

ter B can then be renewed in the same way as filter A.

Cooling system

Coolant



WARNING!

Ethylene glycol can be fatal if ingested and can cause skin irritation and eye damage.

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 has several characteristics which are important for the operation of the cooling system:

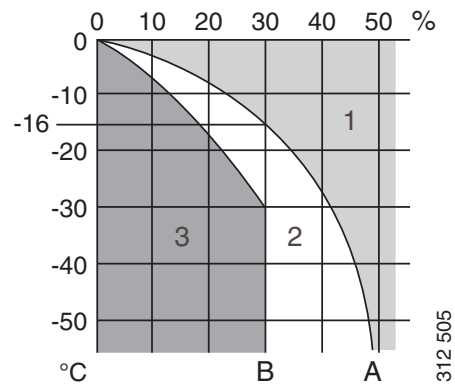
- Corrosion protection
- Antifreeze
- Increases the boiling point

Scania recommends that the coolant used is a mixture of water with antifreeze and corrosion inhibitor (ethylene glycol). The coolant should always contain 35-55% by volume of antifreeze and corrosion inhibitor so that the coolant has the correct properties for the cooling system to work.

Coolant resistance to cold

The following example shows coolant properties with 30 percent by volume of antifreeze and corrosion inhibitor:

- Ice slush starts to form at -16°C (3°F).
- At -30°C (-22°F), there is a risk of cooling system malfunction.
- There is no risk of damage by freezing with a minimum antifreeze and corrosion inhibitor content of 35 percent by volume.



The chart depicts coolant properties at different percents of antifreeze and corrosion inhibitor concentration by volume.

Curve A: Ice formation starts (ice slush)

Curve B: Damage by freezing occurs

Area 1: Safe area

Area 2: Malfunctions may occur (ice slush)

Area 3: Risk of damage by freezing

Antifreeze and corrosion inhibitor concentration table

35% by volume of Scania antifreeze provides sufficient protection against corrosion.

Example:

- The total volume of the cooling system is 40 litres.
- The measured concentration of ethylene glycol is 35% by volume (freezing point -21°C). According to the table there are 14 litres of ethylene glycol in the cooling system.
- The required concentration of ethylene glycol is 45% by volume (freezing point -30°C). According to the table, 18 litres of ethylene glycol are required in the cooling system.
- Since there are already 14 litres in the cooling system, 4 litres of ethylene glycol must be added to the cooling system (18 - 14 = 4 litres).

	For calculation			Adequate protection against corrosion					
Volume of ethylene glycol (%)	20	25	30	35	40	45	50	60	Cooling system volume (litres)
Ice slush forms (°C)	-6	-9	-12	-21	-24	-30	-38	-50	
Volume of ethylene glycol (litres)	5	6	8	11	12	14	15	18	30
	6	8	10	14	16	18	20	24	40
	8	10	13	18	20	23	25	30	50
	9	12	15	21	24	27	30	36	60
	11	14	18	25	28	32	35	42	70
	12	16	20	28	32	36	40	48	80
	14	18	23	32	36	41	45	54	90
	15	20	25	35	40	45	50	60	100
	17	22	28	39	44	50	55	66	110
	18	24	30	42	48	54	60	72	120
	20	26	33	46	52	59	65	78	130
	21	28	35	49	56	63	70	84	140
	23	30	38	53	60	68	75	90	150
	24	32	40	56	64	72	80	96	160
	26	34	43	60	68	77	85	102	170
	27	36	45	63	72	81	90	108	180
	29	38	48	67	76	86	95	114	190
	30	40	50	70	80	90	100	120	200

Antifreeze and corrosion inhibitor concentration table

35% by volume of Scania antifreeze provides sufficient protection against corrosion.

Example:

- The total volume of the cooling system is 10.6 US gallons.
- The measured concentration of ethylene glycol is 35% by volume (freezing point -6°F). According to the table there are 3.7 US gallons of ethylene glycol in the cooling system.
- The required concentration of ethylene glycol is 45% by volume (freezing point -22°F). According to the table, 4.8 US gallons of ethylene glycol are required in the cooling system.
- Since the cooling system already contains 3.7 US gallons, fill another 1.1 US gallons of ethylene glycol in the cooling system (4.8 - 3.7 = 1.1 US gallons).

	For calculation			Adequate protection against corrosion					
Volume of ethylene glycol (%)	20	25	30	35	40	45	50	60	Cooling system volume (US gallons)
Ice slush forms (°F)	21	16	10	-6	-11	-22	-36	-58	
Volume of ethylene glycol (US gallons)	1.3	1.6	2.1	2.9	3.2	3.7	4	4.8	7.9
	1.6	2.1	2.6	3.7	4.2	4.8	5.3	6.3	10.6
	2.1	2.6	3.4	4.8	5.3	6.1	6.6	7.9	13.2
	2.4	3.2	4	5.5	6.3	7.1	7.9	9.5	15.9
	2.9	3.7	4.8	6.6	7.4	8.5	9.2	11.1	18.5
	3.2	4.2	5.3	7.4	8.5	9.5	10.6	12.7	21.1
	3.7	4.8	6.1	8.5	9.5	10.8	11.9	14.3	23.8
	4	5.3	6.6	9.2	10.6	11.9	13.2	15.9	26.4
	4.5	5.8	7.4	10.3	11.6	13.2	14.5	17.4	29.1
	4.8	6.3	7.9	11.1	12.7	14.3	15.9	19	31.7
	5.3	6.9	8.7	12.2	13.7	15.6	17.2	20.6	34.3
	5.5	7.4	9.2	12.9	14.8	16.6	18.5	22.2	37
	6.1	7.9	10	14	15.9	18	19.8	23.8	39.6
	6.3	8.5	10.6	14.8	16.9	19	21.1	25.4	42.3
	6.9	9	11.4	15.9	18	20.3	22.5	26.9	44.9
	7.1	9.5	11.9	16.6	19	21.4	23.8	28.5	47.6
	7.7	10	12.7	17.7	20.1	22.7	25.1	30.1	50.2
	7.9	10.6	13.2	18.5	21.1	23.8	26.4	31.7	52.8

Antifreeze and corrosion protection products

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

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

Below is a list of Scania antifreeze and corrosion protection products.

Scania concentrate

Coolant with antifreeze and corrosion inhibitor 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

Scania Ready Mix

Coolant with antifreeze and corrosion inhibitor Ready Mix 50/50.

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

Checking 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 and carefully to release the pressure before removing the cap. Wear gloves as the coolant is still very hot.



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. damage to the coolant pump shaft seal. If a large amount of coolant must be added, follow the instructions in the section [Filling coolant](#).

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

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.

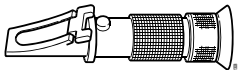
1. Check the coolant level through the sight glass on the expansion tank.
2. Top up with coolant as necessary.

Checking coolant antifreeze and corrosion protection

Note:

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

Tools

Designation	Illustration
Refractometer	
	

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 content with a refractometer.

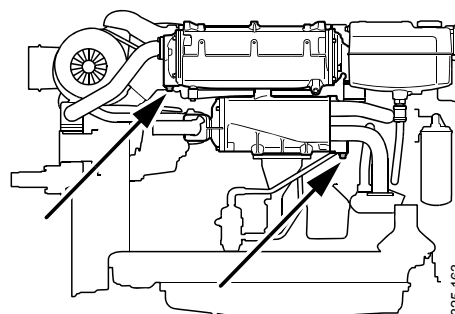
The following rules apply to ethylene glycol-based coolant:

- The antifreeze and corrosion inhibitor content must be minimum 35 percent by volume for corrosion protection to be sufficient.
- An antifreeze and corrosion inhibitor 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.

Checking sacrificial anodes

1. Drain the sea water circuit as described in [Draining the sea water circuit](#).
2. Check the sacrificial anodes and scrape off all loose material from them.
3. Renew the sacrificial anode if less than half of it is left. A new sacrificial anode is 60 mm long with a diameter of 17 mm.
4. Renew the gasket when fitting.

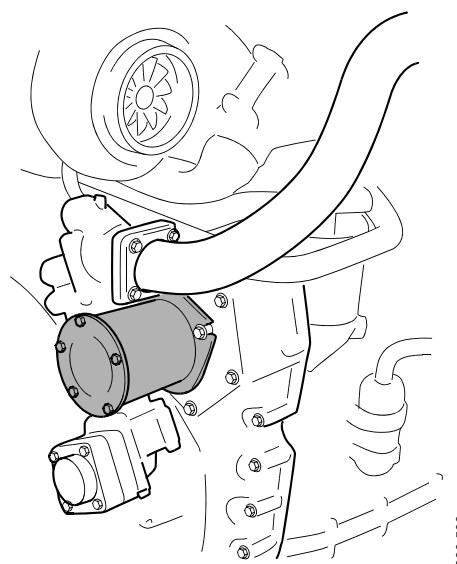
If the sacrificial anodes are very corroded, the inspection intervals must be reduced.



Position of sacrificial anodes.

Checking the sea water pump impeller

1. Drain the sea water circuit as described in [Draining the sea water circuit](#).
2. Check that the vanes of the impeller are not heavily splintered or damaged.



Sea water pump cover.

Renewing the sea water pump impeller

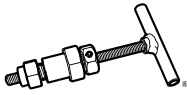
Note:

If the impeller must be renewed frequently, the cleaning of the sea water needs to be improved.

There should be a spare impeller on board.

The impeller can be deformed during extended periods of inactivity. Renew the impeller before starting or remove the impeller before longer periods of stoppage. See also the section [Preparations for storage](#).

Special tools

Number	Designation	Illustration
98 482	Puller	

1. Pull out the impeller using the puller.

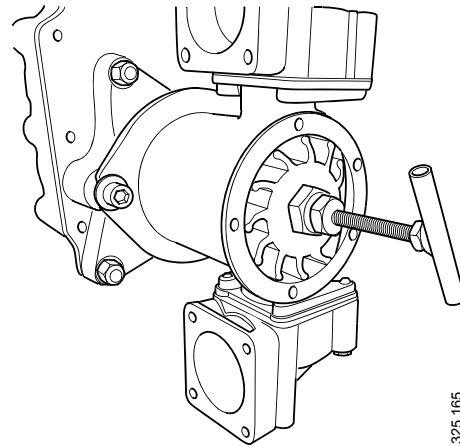
Note:

Note the direction of rotation of the impeller vanes.

2. Fit a new impeller and then the cover for the sea water pump. Check that the cap seal is not hard or damaged.

Note:

When fitting the new impeller, bend the vanes in the same direction as on the old one.



325 165

Changing the coolant and cleaning the cooling system

Draining coolant



WARNING!

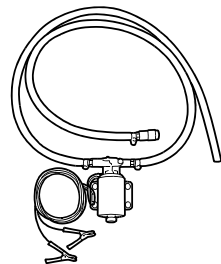
Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



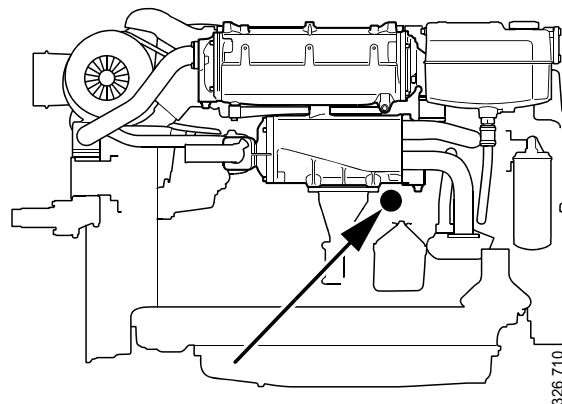
Environment

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

Special tools

Number	Designation	Illustration
2 443 679	Coolant pump	 360 625

1. Connect the coolant pump to the lowest drain valve in the cooling system. The location of the lowest drain valve for the engine may differ depending on engine application.
2. Place the other hose from the pump into an empty container.
3. 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.



Example of a drain valve.

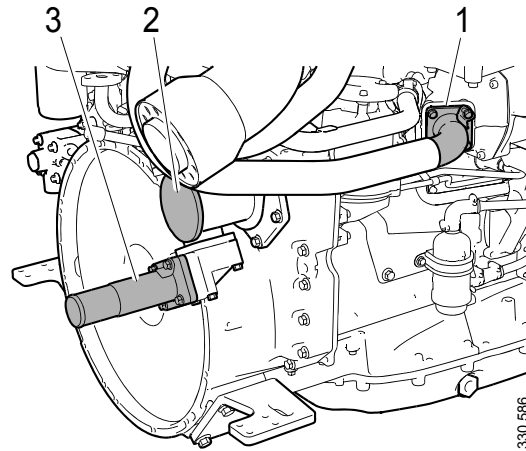
Draining the sea water circuit

1. Close the bottom valve on the sea water inlet and remove the connection pipe on the outlet from the heat exchanger.
2. Remove the cover from the sea water pump to empty the pump completely.
3. The lowest point in the sea water circuit may be at different points, but it is usually in the sea water pump intake.



IMPORTANT!

Plug the connections to prevent dirt ingress into the engine.



Removing the charge air cooler

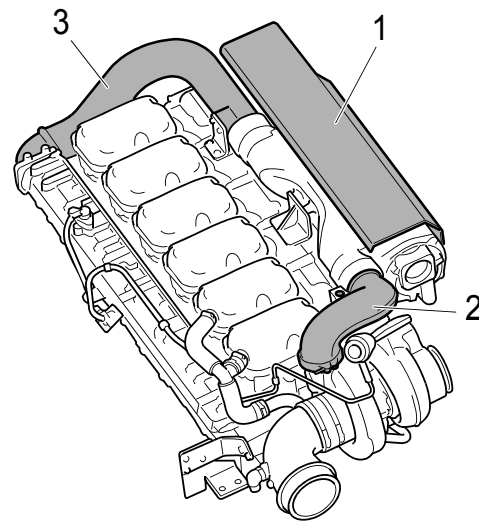
When the cooler core of the charge air cooler needs cleaning, the charge air cooler must be removed if there is no space behind it to take out the cooler core.

Before starting work: Make sure that the cooling system is empty as described earlier.

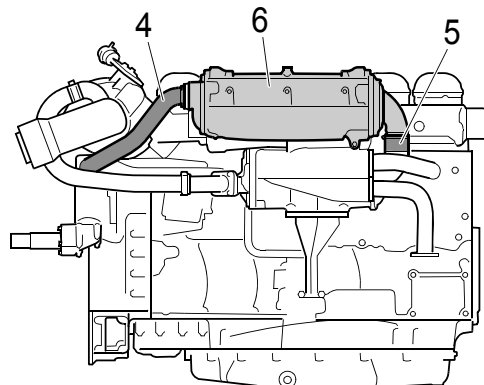
1. Remove the protective plate on the charge air cooler.
2. Remove the charge air pipe between the charge air cooler and the turbocharger. Twist the pipe to facilitate removal.

If the turbocharger has a wastegate valve and the charge air pipe must be removed, the pipe bracket must be removed and the pipe must be turned 90° upwards before the hose and the pipe are removed.

3. Remove the charge air pipe between the charge air cooler and the inlet pipe.



4. Remove the sea water pipe between the sea water pump and charge air cooler.
5. Release the hose clamp and remove the sea water hose between the charge air cooler and the heat exchanger.
6. Remove the charge air cooler.



Cleaning the charge air cooler

The charge air cooler must be removed if there is no space behind it to take out the cooler core. See previous section.

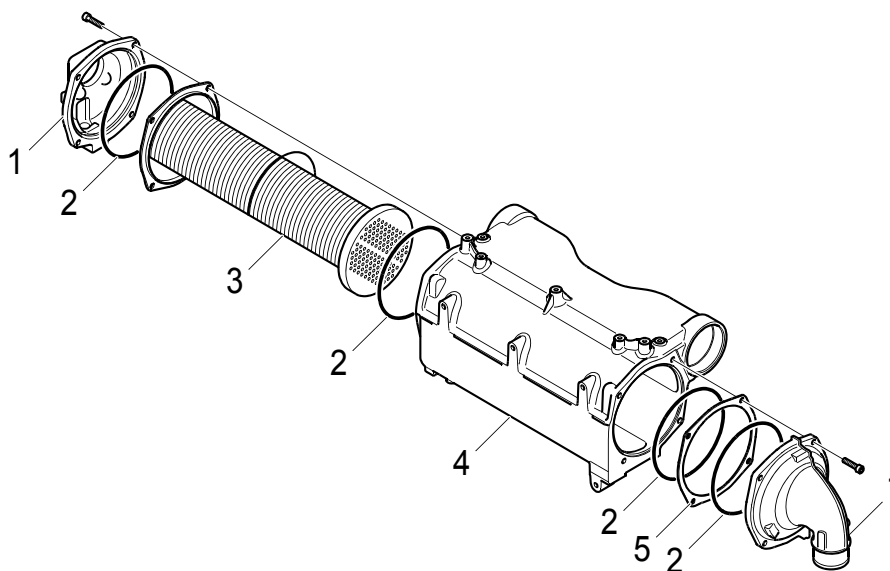
1. Remove the cover (1) of the charge air cooler.
2. Press in the cooler core (3) slightly on one side and pull it out from the other side.
3. Clean the cooler core on the outside with paraffin-based engine detergent. Remove any internal deposits using a round rod. Renew the cooler core if it is damaged.



IMPORTANT!

Do not use caustic soda as this could damage the aluminium.

4. Renew damaged or hard O-rings (2).
5. Assemble the charge air cooler. Tighten the M8 screws on the covers to 15 Nm.



1. Cover.
2. O-rings.
3. Cooler core.
4. Charge air cooler housing.
5. Spacer.

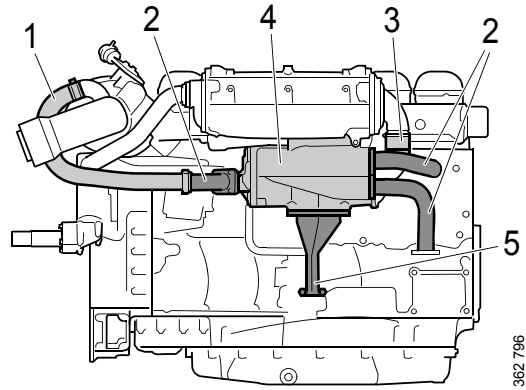
362 798

Removing the heat exchanger

When the cooler core of the heat exchanger needs cleaning, the heat exchanger must be removed.

Before starting work: Make sure that the cooling system is empty as described earlier.

1. Undo the V-clamp for the hose between the heat exchanger and the water-cooled exhaust pipe bend, if the engine has one. Bend the hose to one side.
2. Remove the inlet and outlet coolant pipes and the sea water pipe from the heat exchanger.
3. Release the hose clamp and remove the sea water hose between the charge air cooler and the heat exchanger.
4. Remove the screws holding the heat exchanger in the two brackets.
5. Slacken the screws holding the heat exchanger bracket in the cylinder block sufficiently to allow the heat exchanger to be removed.



Cleaning the heat exchanger

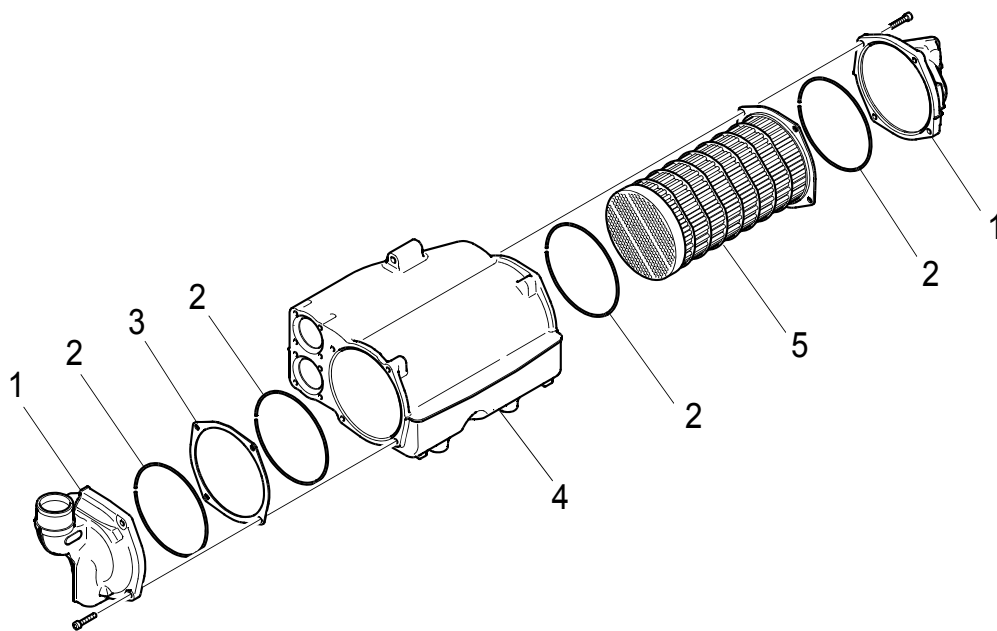
1. Remove the cover (1) of the heat exchanger.
2. Press in the cooler core (5) slightly on one side and pull it out from the other side.
3. Clean the cooler core on the outside with paraffin-based engine detergent. Remove any internal deposits using a round rod. Renew the cooler core if it is damaged.



IMPORTANT!

Do not use caustic soda as this could damage the aluminium.

4. Renew damaged or hard O-rings (2).
5. Assemble the heat exchanger. Tighten the M8 screws on the covers to 15 Nm.



1. Cover.
2. O-rings.
3. Spacer.
4. Heat exchanger housing.
5. Cooler core.

364 555

Fitting the heat exchanger



IMPORTANT!

There is a risk that the joint will crack if these installation instructions are not followed.

Tightening torques

M6	10 Nm
M8	26 Nm
M10	50 Nm

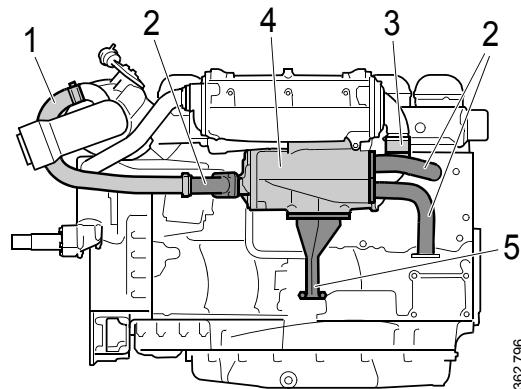
1. Fit the heat exchanger (4) in place against the brackets.
2. Fit the sea water hose (3) between the heat exchanger and charge air cooler (use vaseline if necessary) and tighten the hose clamp.



IMPORTANT!

To prevent leakage, a hose clamp with a safety ring can be used.

3. Fit the screws (5 off) securing the heat exchanger without tightening them.
4. Tighten the screws securing the heat exchanger bracket (5) in the cylinder block.
5. First tighten the screw on the charge air cooler bracket and then the 4 screws on the heat exchanger bracket.
6. Fit the inlet and outlet coolant pipes and the sea water pipe from the heat exchanger (2).
7. Fit the hose (1) between the heat exchanger and the water-cooled exhaust pipe bend, if the engine has one and tighten the V-clamp.

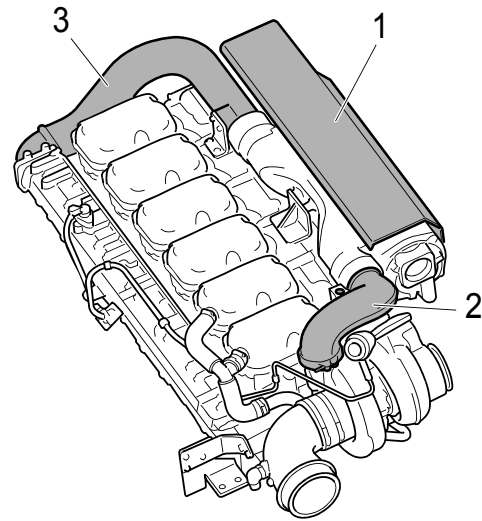
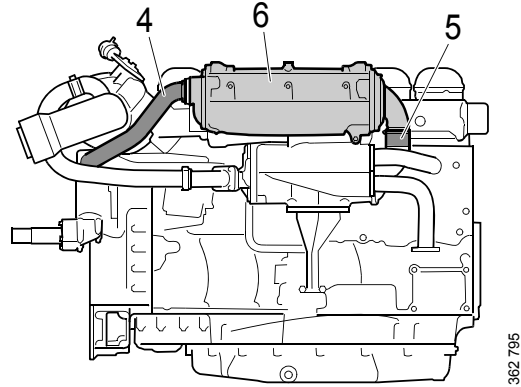


Fitting the charge air cooler

Tightening torques

M6	10 Nm
M8	26 Nm
M10	50 Nm

1. Fit the charge air cooler (6) in place against the brackets.
2. Fit the sea water hose (5) between the charge air cooler and heat exchanger (use vaseline if necessary) and tighten the hose clamp.
3. Fit the screws for the charge air cooler brackets and tighten them.
4. Fit the sea water pipe (4) between the sea water pump and the charge air cooler.
5. Fit the charge air pipe (3) between the intake manifold and charge air cooler. To facilitate fitting, lubricate the O-ring and the inside of the connection in the charge air cooler with vaseline. Press the charge air pipe straight towards the charge air cooler while carefully twisting the pipe to the right and left. Check that the charge air pipe is properly fitted.
6. Fit the charge air pipe (2) between the charge air cooler and turbocharger. To facilitate fitting, lubricate the O-ring and the inside of the connection in the charge air cooler with vaseline. Press the charge air pipe straight towards the charge air cooler while carefully twisting the pipe to the right and left. Check that the charge air pipe is properly fitted.
7. Fit the protective plate (1) on the charge air cooler.



Internal: Removing oil and grease



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 and then drain the cooling system. See the section [Draining coolant](#).
2. Remove the thermostats.
3. Fill the cooling system with clean, hot water mixed with liquid dishwasher detergent for household machines. Concentration 1% (0.1/10 litres).
4. Run the engine until it has reached operating temperature 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. Drain the water from the cooling system.
8. Refit the thermostats.
9. Fill the cooling system with new coolant as described in the section [Filling coolant](#).

Internal: Removing deposits



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 and then drain the cooling system. See the section [Draining coolant](#).
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 section [Filling coolant](#).

Filling coolant

This procedure applies when the cooling system has been drained and needs to be filled with a large amount of coolant.



IMPORTANT!

It is not permissible to fill 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 damage to the coolant pump shaft seal for example.

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

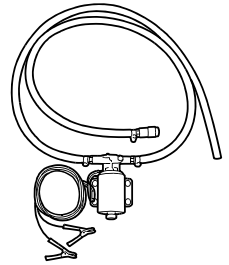
Fill the cooling system only with ready-mixed coolant.

Do not start the engine until the correct coolant level has been obtained. If the engine is started with a coolant level that is too low, the coolant pump shaft seal may be damaged, which can result in leaks.

Finishing work

1. Open the bottom valve on the sea water inlet.
2. Start the engine and check that no leakage occurs.
3. Check the coolant level and top up the coolant via the expansion tank if necessary.

Special tools

Number	Designation	Illustration
2 443 679	Coolant pump	

1. Connect the coolant pump to the lowest drain valve in the cooling system. The location of the lowest drain valve for the engine may differ depending on engine application.
2. 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.

Air cleaner

Reading the air cleaner vacuum indicator

If the indicator's red plunger is fully visible, renew the air cleaner filter element following the instructions below.

Renewing the air cleaner filter element

This procedure applies if the engine is fitted with a Scania air cleaner.



WARNING!

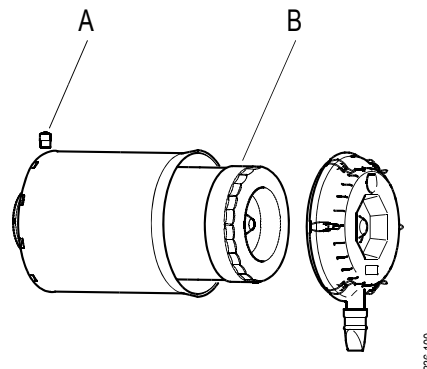
Never start the engine without the air filter being in place. If you do, this could cause injury and severe engine damage.

Note:

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

There is always a risk that the filter element will be damaged when it is cleaned.

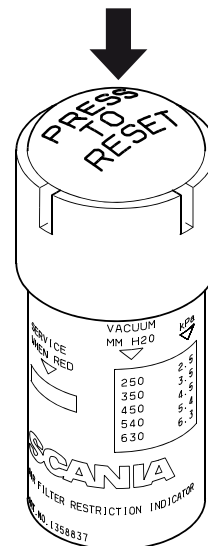
The filter element must not be cleaned in water or be blown clean with compressed air.



A Vacuum indicator.

B Filter element.

1. Remove the cover from the air cleaner.
2. Renew the filter element.
3. Insert a torch into the element and check from the outside that there are no holes or cracks in the filter paper.
4. Assemble the air cleaner.
5. Reset the vacuum indicator by pressing the button.



Resetting the vacuum indicator.

Renewing the air cleaner safety cartridge

This procedure applies if the engine has an air cleaner with a safety cartridge from Scania.



WARNING!

Never start the engine without the air filter being in place. If you do, this could cause injury and severe engine damage.



IMPORTANT!

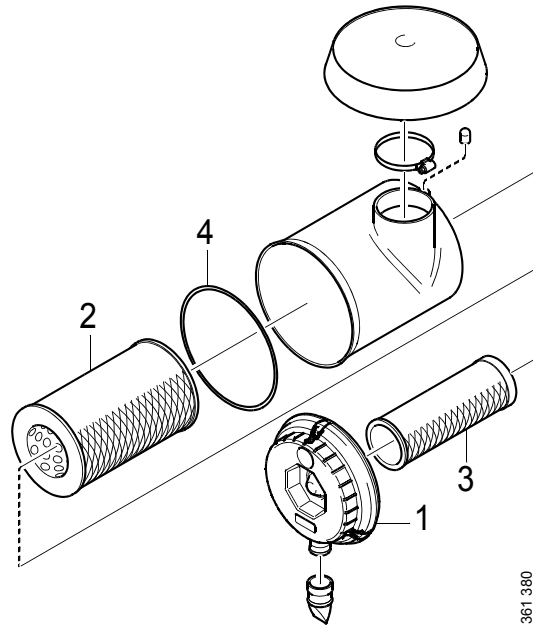
When you renew the safety cartridge, take great care to ensure that no dirt or other impurities get into the engine. Do not remove the safety cartridge unnecessarily.

1. Remove the cover from the air cleaner.
2. Remove the filter element.
3. Remove the safety cartridge.
4. Fit a new safety cartridge from Scania.
5. Renew or clean the filter element.
6. Check the condition of the O-ring. Renew the O-ring if it is damaged or hard.
7. Assemble the air cleaner. Ensure that the O-ring is not outside the edges.

Renewing an air filter with a non-renewable element

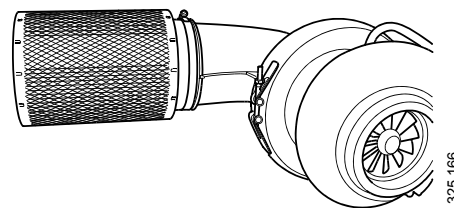
Note:

If the engine has an air filter with a non-renewable Scania element, it should be renewed instead of cleaned.



Air cleaner

1. Cover.
2. Filter element.
3. Safety cartridge.
4. O-ring.



Air filter with a non-renewable element.

Fuel system



IMPORTANT!

The whole fuel system is very sensitive to dirt and even 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. Before starting work on the fuel system, the engine must be washed. If possible, a hot water wash 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 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 fuel level

Check the fuel level and top up 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 section [Bleeding the fuel system using a hand pump](#) or [Preparations for storage](#).

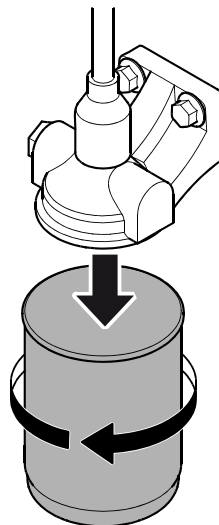
Renewing the fuel filter



Environment

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

1. Clean the exterior of the filter with a damp cloth.
2. Unscrew the filter.
3. Apply oil to the gasket on the new filter.
4. Screw the filter into place by hand until it makes contact.
5. Screw a further half turn by hand.
6. Bleed the fuel system according to the instructions in the section [Bleeding the fuel system using a hand pump](#) or [Bleeding the fuel system using a suction tool](#).



325 167

Renewing and bleeding double, commutative fuel filters

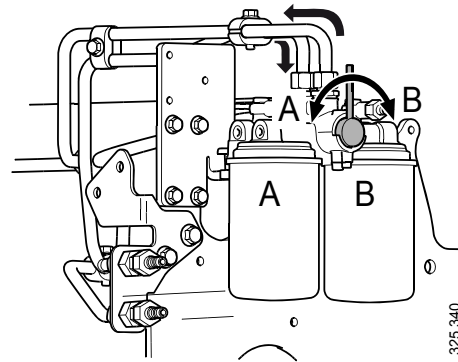


Environment

Since the engine may be running during filter renewal, fuel spillages may occur. Use a suitable container. Used fuel must be disposed of as specified in national and international law.

During operation, the rotary control should point 90° towards the filter being used.

1. Turn the rotary control 90° to the right so that it points towards filter B. The fuel then flows through the filter.
2. Connect a transparent plastic hose to the bleed nipple located above filter A. Place the other end in a container with a capacity of at least 3 litres (1 US gallon).
3. Open the bleed nipple on side A. The remaining pressure is released.
4. Clean the exterior of the filter with a cloth.
5. Unscrew the filter.
6. Apply oil to the gasket on the new filter.
7. Screw the fuel filter into place by hand until it makes contact. Turn screw a further half turn by hand.
8. Turn the rotary control 90° to the left so that the rotary control points straight up. Both filters now run simultaneously.
9. When fuel without air bubbles comes out: Close the bleed nipple. Because the engine is running, a lot of fuel will come through the hose.
10. Turn the rotary control 90° to the left so that the rotary control points towards filter A. Filter B can now be renewed in the same way as filter A.



Renewing the water separating fuel filter



IMPORTANT!

The sensor cable is sensitive. Handle it carefully.

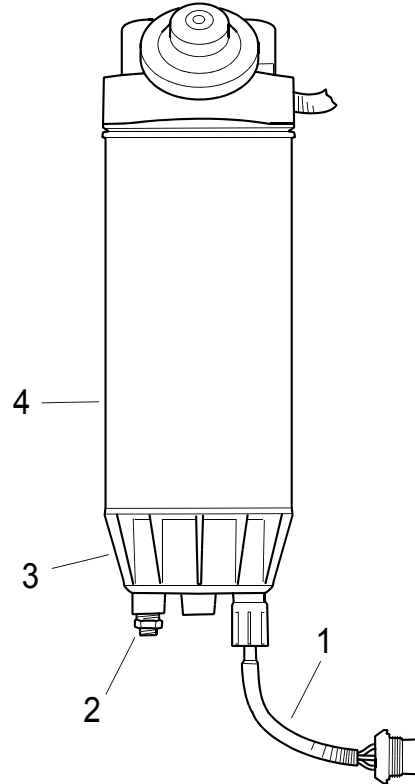


Environment

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

Before starting work: Close the shut-off cock in the fuel pipe and position a container under the filter.

1. Undo the sensor cable from the connector on the filter bracket.
2. Open the drain tap in the filter cover and let the fluid run down into the container.
3. Unscrew the filter cover.
4. Unscrew the filter from the filter head.
5. Discard the old filter and use a new filter.
6. Lubricate the O-ring in the filter cover with engine oil.
7. Screw the filter cover onto the new filter by hand. Make sure that the drain tap is fully closed.
8. Lubricate the O-ring on the filter with engine oil.
9. Fill the width of the filter with clean fuel.
10. Screw the filter into position until the O-ring rests against the filter head. Tighten the filter another 1/2 to 3/4 turn by hand.
11. Open the shut-off cock in the fuel pipe and check that the fuel system is sealed.
12. Screw the sensor cable in the contact housing onto the filter bracket.
13. Bleed the fuel system according to the instructions in the section [Bleeding the fuel system using a hand pump](#) or [Bleeding the fuel system using a suction tool](#).



1. Sensor cable.
2. Drain tap.
3. Filter cover.
4. Filter.

336 101

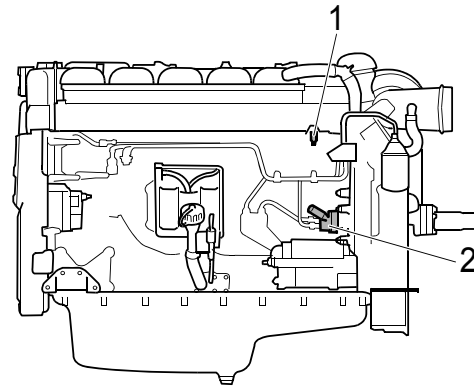
Bleeding the fuel system using a hand pump



Environment

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

1. Attach a transparent plastic hose to the bleed nipple on the fuel manifold (1). Place the end of the plastic hose in a container that holds at least 3 litres (1 US gallon).
2. Open the bleed nipple and pump with the hand pump (2) until fuel comes out of the hose. If the fuel system is empty, it is necessary to pump approximately 200 strokes in order to draw up the fuel. Depending on the installation, a significantly greater number of pump strokes may be required before fuel comes out.
3. Pump until fuel without air bubbles comes out, approximately 20 strokes.
4. Close the bleed nipple and remove the plastic hose.
5. Pump approximately 20 strokes with the hand pump until the overflow valve opens. A hissing sound should be heard.
6. Start the engine. The engine should be easy to start.
7. If the fuel filter has been renewed, check that no fuel is leaking from the filter. If there is leakage, tighten the filter more.



362 800

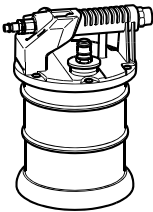
Bleeding the fuel system using a suction tool



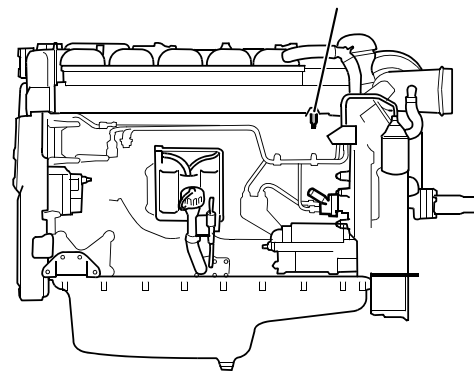
Environment

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

Tools

Designation	Illustration
Suction tool for fuel system	 337 297

1. Attach a transparent plastic hose to the bleed nipple on the fuel manifold (see illustration). Place the end of the plastic hose in a container that holds at least 3 litres (1 US gallon).
2. Connect the suction tool.
3. Connect compressed air to the suction tool. Turn the rotary control to create a vacuum.
4. Open the bleed nipple.
5. Hold the suction tool straight and draw out the fuel. Once the fuel coming out of the plastic hose is free of air bubbles, then bleeding is complete.
6. Close the bleed nipple. Remove the plastic hose and suction tool.
7. Start the engine and check that no leakage occurs.



365 197

Miscellaneous

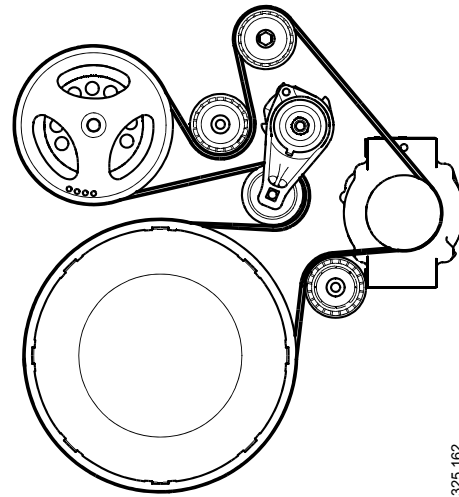
Checking the drive belt



IMPORTANT!

Refit the drive belt with the same direction of rotation as it had before removal.

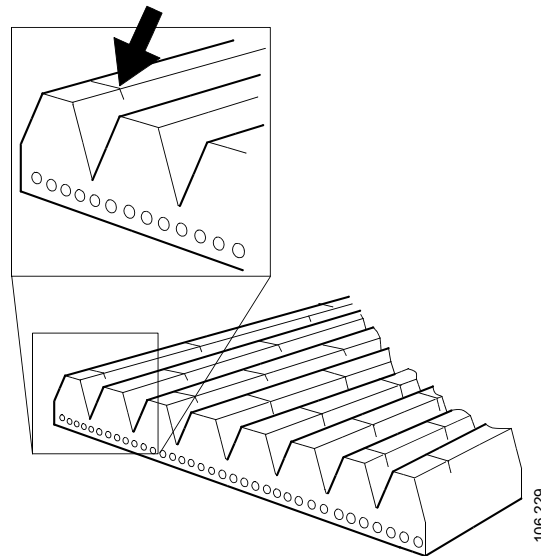
1. Check the drive belt thoroughly, particularly at the idler rollers.



325 162

Example of a drive belt.

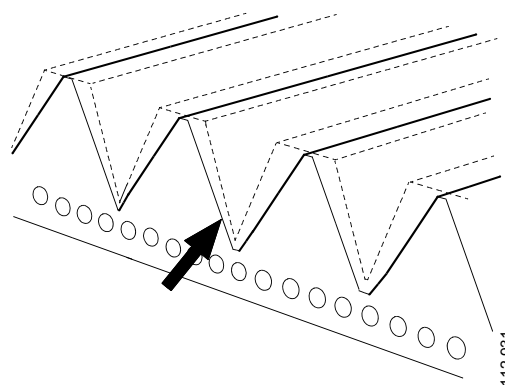
2. Check the drive belt for cracks. Renew the drive belt if cracks have formed.



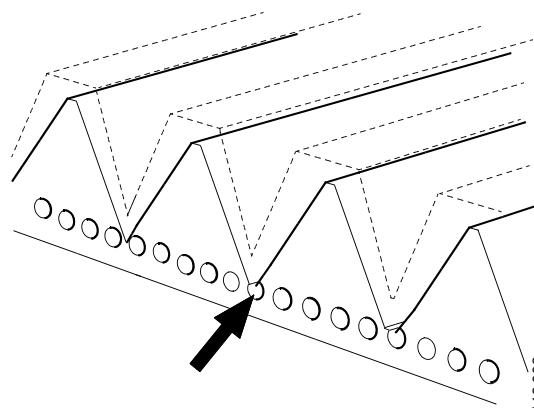
106 229

Example of a crack in the drive belt.

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



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 leaks



IMPORTANT!

If serious leakage occurs, contact your nearest Scania workshop.

1. Start the engine.
2. Check for leaks in the lubrication, coolant, fuel, intake or exhaust system.
3. Tighten or renew leaking connections. Check the overflow holes which show whether the O-rings between the cylinder liners and crankcase are leaking.

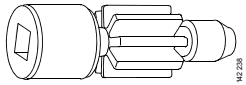
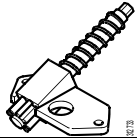
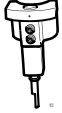
Checking and adjusting the valve clearance



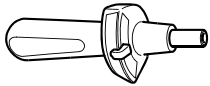
WARNING!

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

Special tools

Number	Designation	Illustration
99 309	Turning tool for rotating the flywheel from below.	
99 109	Turning tool for rotating the flywheel from above.	
99 442	Setting tool.	

Tools

Designation	Illustration
Torque screwdriver.	

Checking and adjusting the valve clearance

Note:

Checking and adjusting valve clearances should also be carried out one more time after the first 500 hours of operation. Then the normal interval will follow (every 2,000 hours).

Valve transition occurs when the cylinder switches from exhaust stroke to intake stroke. The exhaust valve is closing while the intake valve is opening.

Carry out the adjustment on a cold engine.

Specifications	
Valve clearance, intake valve	0.45 mm (0.018 in)
Valve clearance, exhaust valve	0.70 mm (0.028 in)

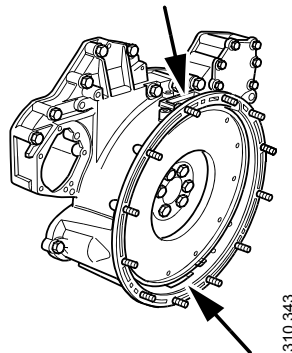
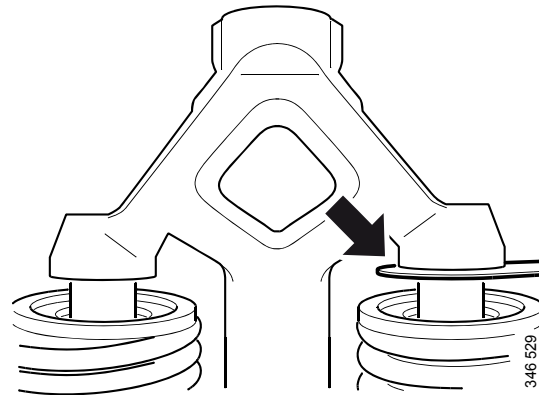
Max. clearance between two valves under the same valve bridge is 0.2 mm.

Tightening torques	
Lock nut for valves	35 Nm (26 lbf/ft)

1. Read the mark on the flywheel in one of the following ways:

- Rotate the flywheel in the normal direction of rotation using turning tool 99 309. Read the mark on the flywheel visible in the lower window of the flywheel housing.
- Engines fitted with flywheels marked TDC UP: Fit turning tool 99 109 in flywheel housing holes of the upper window. Press the pinion into the external ring gear and turn the flywheel with a ratchet handle and a 14 mm socket. Read the mark in the upper window of the flywheel housing.

2. Adjust the valves according to [Table for adjusting valves and unit injectors](#). It is a good idea to mark the rocker arm with a pen after adjustment to keep track of what has already been adjusted.



Window for reading the valve clearance.



IMPORTANT!

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

Checking and adjusting the unit injector



WARNING!

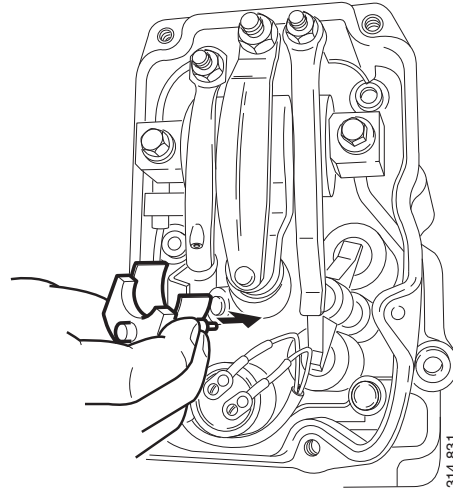
When a unit injector is being checked and the measurement is outside the setting dimension by ± 0.5 mm, it is necessary to be very careful when handling this unit injector. The spring is pre-tensioned and can come loose, causing personal injury.

Carry out the adjustment on a cold engine.

Tightening torque

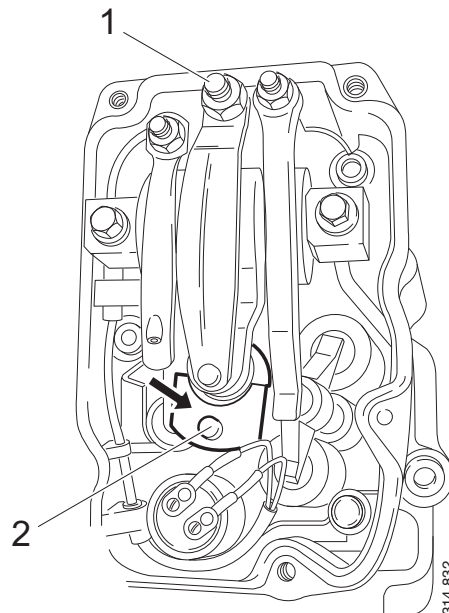
Lock nut for unit injectors	39 Nm (29 lbf/ft)
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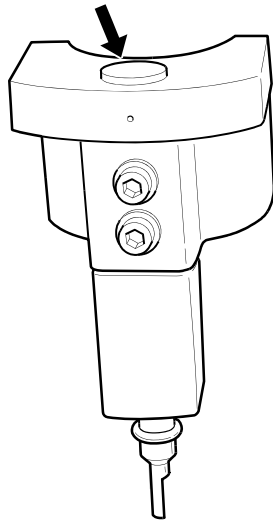
1. Fit setting tool 99 442 with the metal plate around the unit injector.



2. Adjust the unit injectors as described in [Table for adjusting valves and unit injectors](#).

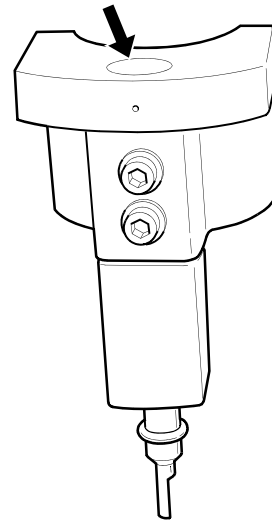
When adjusting, loosen the lock nut and adjust the unit injector with the adjusting screw (1). The unit injector is correctly set when the small piston (2) is level with the flat upper surface of the tool. Use a finger to check. Differences measured in tenths of millimetres can be felt. The setting dimension is 69.9 ± 0.1 .





The setting tool piston is above or below the flat upper surface of the tool. Adjust the unit injector.

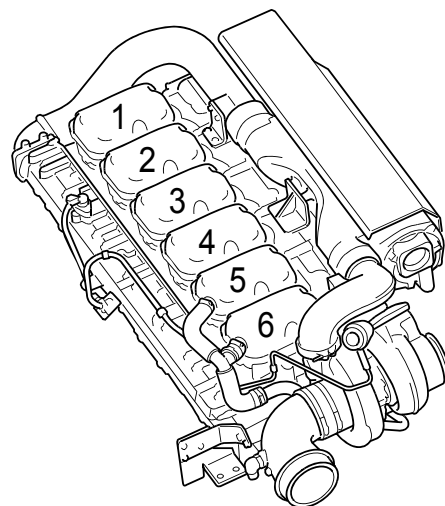
3. Tighten the lock nut after adjustment.
4. Remove the setting tool.



The setting tool piston is level with the flat upper surface of the tool. The unit injector is correctly adjusted.

Table for adjusting valves and unit injectors

Adjust valves and injectors according to the table below. Follow the respective column depending on whether you are reading the mark on the fly-wheel in the lower or the upper window. Start adjustment at the top of the table.



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Cylinder location.

Reading in the lower window	Valve transition on cylinder	Adjust valves on cylinder	Adjust injector	Reading in the upper window
TDC DOWN	1	6	2	TDC UP
120	5	2	4	300
240	3	4	1	60
TDC DOWN	6	1	5	TDC UP
120	2	5	3	300
240	4	3	6	60

Diesel

Composition of the fuel

The composition of the fuel is extremely important for the operation and service life of the engine and injection system. The engine output and exhaust gases are also dependent on the fuel grade.

The requirements and testing standards for the most important characteristics are described in the Workshop Manual which can be ordered from Scania dealers or directly from Scania.

The fuel must conform to EU standard EN590.

The table shows some of the key properties.

Property	Requirement
Viscosity at 40°C (104°F)	2.0-4.5 cSt
Density at 15°C (59°F)	0.82-0.86 cSt
Ignitability (CET rating)	minimum 49
Flashpoint	56°C (132°F)

Sulphur content of fuel



IMPORTANT!

The machine operator is responsible for using the correct type of fuel to ensure that local laws are complied with.

- A sulphur content of 0-2,000 ppm in the fuel (0.2%) gives an oil change interval of up to 500 hours.
- With a sulphur content of 2,000-4,000 ppm in the fuel, the oil change interval is halved to max. 250 hours.
- Maximum permitted sulphur content in the fuel is 4,000 ppm.

Using DMX and DMA fuels in marine engines

DMX and DMA fuels normally cause increased wear on the injection system. As a result of the high sulphur content in these fuels the engine oil is also affected. The engine oil must have as high a Total Base Number (TBN) as possible.



REQUIREMENT!

For engines running on DMX and DMA fuels the engine oil must have a TBN of at least 12.

When the engine is taken into operation the engine oil must be analysed every 50 hours to determine the correct oil change interval. The oil analysis must be carried out according to the Oil analysis section in this Operator's manual.

Bear in mind that the emission limit for the current engine type may limit the maximum permitted sulphur content of the fuel.

Temperature dependency of the fuel



IMPORTANT!

Mixing kerosene or other paraffins with the fuel is prohibited. The injectors may be damaged.

Mixing petrol with the fuel is prohibited. In the long term petrol can cause wear in the injectors and engine.

At temperatures lower than those specified for the fuel, paraffin wax may precipitate from the fuel and block filters and pipes. The engine can then lose power or stop.

The fuel is adapted for use in the specific climate of each country. If a vessel is to be operated in a temperature zone with a temperature lower than normal, first identify the temperature properties of that particular fuel.

The properties of the fuel when cold can be improved by adopting one of the following measures before the temperature drops:

- Install an electric fuel heater if this particular fuel is not suitable for the expected temperature and no fuel is available with the correct temperature properties.
- Add 0.5-2% alcohol (isopropanol) to prevent any water in the fuel from freezing and forming plugs of ice. Drain fuel tanks and drain or renew fuel filters regularly.

Biodiesel (FAME)

Scania uses the term biodiesel according to the EN 14214 standard to refer to renewable diesel made from greases or oils and methanol. The biodiesel should conform to the requirements of European standard EN 14214. For biodiesel in accordance with EN 14214 the generic term FAME is frequently used.

All Scania engines are approved for diesel according to the EN 590 standard. EN 590 contains up to 7% biodiesel in accordance with EN 14214. PDE engines may use up to 100% EN 14214 biodiesel.

Maintenance intervals

With a greater mixture of biodiesel than EN 590, the renewal intervals for the following are halved:

- Fuel filter.
- Oil filter.
- Oil.

The oil viscosity must be xW-40.

Preparing the engine for storage

If the engine is not being used for an extended period its cooling system, fuel system and combustion chamber and outside must be protected against rust.

An alternative to preparing the engine for long-term storage is to start the engine and warm it up every 6 months.

Handling the engine

The engine can normally stand idle for up to 6 months without preparation. For longer periods of downtime, the following measures should be taken. These measures provide protection for approximately 4 years.

Preparations for storage:

- Thoroughly clean the engine.
- Run the engine for a specific period using special preservative fuel, oil and coolant.
- Otherwise prepare the engine for storage (filter renewal, lubrication, etc.).

Preservative coolant

If the engine is to be stored with a full cooling system, use coolant containing 50 percent glycol by volume. Glycol without nitrite-based inhibitor should be used. Example: BASF G48 or BASF D542.



WARNING!

Ethylene glycol can be fatal if ingested. Avoid contact with the skin.

Preservative fuel

Use diesel mixed with Lubrizol 560H or the equivalent. Mix 1 cm³ (ml)/0.06 in³ Lubrizol 560H in 10 dm³/2.3 US gallons of fuel.



WARNING!

Lubrizol 560H contains aromatic hydrocarbons which are hazardous to health.

- Use spot extractors where there is a danger of vapour build-up.
- Wear protective goggles and gloves when handling the fuel.
- Do not use contaminated clothing.
- If it gets in your eyes: Flush with a gentle jet of water for at least 15 minutes and contact a doctor.
- If it gets on your skin: Wash with soap and water.
- If you inhale it: Fresh air, rest and warmth.
- Store in well-sealed containers in a dry, cool, place out of the reach of children.

Lubrizol is flammable and has a 2A fire rating. The flashpoint is +27°C/81°F. In case of fire: Extinguish with carbon dioxide, powder or foam.

Preservative oil

Suitable preservative oils are supplied by most oil companies. Example: Dinitrol 40 or equivalent.

Preparations for storage



Environment

Use a container to avoid spills when draining the oil and coolant. Dispose of used fluids through an authorised waste disposal contractor.

Note:

Do not remove the injectors.

1. Drain and flush the cooling system.
2. Top up with preservative coolant.
3. Warm up the engine on normal fuel. Stop the engine and drain the oil.
4. Renew the fuel filter.
5. Fill the engine with preservative oil up to the minimum level on the oil dipstick.
6. Mix preservative fuel in a can. Detach the fuel pipe at the feed pump suction line and connect a hose from the can.
7. Detach the fuel pipe at the overflow valve and connect a return hose to the can.
8. Start the engine and run it at about 1,000 rpm for 20-25 minutes.
9. Stop the engine, remove the hoses and connect the normal fuel pipes.
10. Remove the rocker covers and lubricate the valve mechanisms with plenty of preservative oil. Refit the rocker covers.

11. Drain the preservative oil from the engine. Fill with new engine oil immediately or when the engine is to be reused.
12. Drain the coolant if the engine is not to be stored with coolant in the system. Plug and tape all coolant connections if the engine is to be stored without coolant in the cooling system.
13. Remove the sea water pump impeller if the engine has a sea water pump.
14. Air cleaner: Clean or renew the filter element.
15. Cover air intakes and exhaust pipes.
16. Alternator and starter motor: Spray with water-repellent anti-corrosive oil, CRC 226, LPS1 or the equivalent.
17. Spray the outside of bright engine parts, first with penetrating preservative oil such as Dinitrol 25B and then with Dinitrol 112 or the equivalent.

Clearly mark the engine with the storage preparation date, and state that the engine must not be started or cranked.

Batteries



WARNING!

Wear gloves and protective goggles when charging and handling batteries. The batteries contain a highly corrosive acid.

Remove the batteries and trickle charge them at the battery charging station. This does not apply to batteries specified as maintenance-free by the manufacturer.

The same applies to short-term storage, even if the engine has not been prepared for storage as above.

Storage

After the preparations, the engine should be stored in a dry and warm place (room temperature).

When the engine is to be taken into operation again

1. Remove plugs and tape from coolant connections, air intakes and exhaust pipes.
2. Fill the cooling system with coolant.
3. Fit the sea water pump impeller if the engine has a sea water pump.
4. Check the oil level in the engine or top up with fresh engine oil.
5. Lubricate the valve mechanisms and their pushrods and valve tappets as well as the injector mechanisms with plenty of oil.
6. Drain the preservative fuel from the fuel manifold and fuel filter.
7. Connect and bleed the fuel system.
8. Wash off any preservative oil on the outside using white spirit.

EC declaration of conformity

This declaration of conformity according to EC legislation applies to DI13 072M, 077M and 078M. The declaration guarantees that these types of engine are classified for use in leisure boats according to the specified directives.

DECLARATION OF CONFORMITY

With requirements of council Directive 97/68/EC as amended by 2004/26/EC and Directive 94/25/EC as amended by 2003/44/EC and 89/336/EC.

ENGINE MANUFACTURER	SCANIA CV AB
ADDRESS	151 87 SÖDERTÄLJE
COUNTRY	SWEDEN
NOTIFIED BODY	GERMANISCHER LLOYD SE
ADDRESS	BROOKTORKAI 18, D-20457 HAMBURG
COUNTRY	GERMANY
CERTIFICATE	e1*97/68VC/2004/26*0045*00
ENGINE TYPE	SCANIA MARINE INBOARD ENGINE, 4-STROKE
FUELTYPE	DIESEL

The following engine(s) meet the exhaust emission requirements of Council Directive 97/68/EC as amended by 2004/26/EC, when installed in a recreational craft, in accordance with Scania CV supplied instructions.

DESCRIPTION OF REQUIREMENTS

REQUIREMENTS	TECHNICAL FILE	HARMONIZED STANDARDS
Engine power measurement		ECE R120
Emission requirements		ISO 8178-4
Inboard diesel engines		EN ISO 16147:2002
Electromagnetic compatibility	105-0374	EN 55012:2002

COVERED ENGINES

TYPE DESIGNATION	CERTIFICATE NUMBER	CERTIFICATE NUMBER EMC
SCANIA DI13 072M	e1*97/68VC/2004/26*0045*00	E014 – TR 050117
SCANIA DI13 077M	e1*97/68VC/2004/26*0045*00	E014 – TR 050117
SCANIA DI13 078M	e1*97/68VC/2004/26*0045*00	E014 – TR 050117
SCANIA DI16 072M	e1*97/68VC/2004/26*0045*00	E014 – TR 050117
SCANIA DI16 077M	e1*97/68VC/2004/26*0045*00	E014 – TR 050117

Scania Engines hereby declare that the engine(s) listed above conforms to the European union Directives, standards and Normative documents identified in this declaration.

Name: Joel Granath

Senior vice president

(Person empowered to sign on behalf of the manufacturer)

Date (Year / Month / day)

Signature:



2015-07-10

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Technical data

General data

Number of cylinders and configuration	6, straight
Working principle	4-stroke engine
Cylinder diameter (mm/in)	130/5.12
Piston stroke (mm/in)	160/6.3
Displacement (dm ³ /in ³)	12.7/775.0
Firing order	1 - 5 - 3 - 6 - 2 - 4
Compression ratio	
DI13 070/071/072/073/077/078M	16.3:1
DI13 080/081/082/083/085/086M	17.3:1
Engine direction of rotation viewed from rear	Anti-clockwise
Fan direction of rotation viewed from front	Clockwise
Cooling	Coolant
Valve clearances, cold engine	
Intake valve (mm/in)	0.45/0.018
Exhaust valve (mm/in)	0.70/0.028
Number of teeth on the flywheel	158
Low idling speed (rpm)	600-750
Maximum full-load speed (rpm)	2,300
Fuel	Diesel
Approximate weight, without coolant and oil (kg/lb)	
With heat exchanger	1,285/2,833
With keel cooling	1,180/2,601
Without heat exchanger and liquid-cooled charge air cooler	1,123/2,476

Lubrication system

Oil volume	See Maintenance
Oil cleaning	Centrifugal oil cleaning
Oil cooler	Coolant cooled, full flow
Oil filter	Paper filter, full flow
Interval between oil changes (h)	500
Oil grade Engines run on low-sulphur fuel Engines not run on low-sulphur fuel	ACEA E5 or E7 Total Base Number (TBN) > 12 (ASTM D2896)
Oil pressure (bar) Normal with the engine at operating temperature, operating speed Minimum permitted at idling speed	3-6 0.7
Crankcase pressure with closed crankcase ventilation (mbar)	-5.4 to 2.0

Injection system

Type	PDE (unit injector)
Control system	EMS
Fuel filter	Paper filter from Scania
Fuel filter with water separator	Paper filter from Scania

Cooling system

Coolant volume, excluding radiator (dm ³ /US gallons)	
With heat exchanger	40/10.6
With keel cooling, 1 coolant circuit	24/6.3
With keel cooling, 2 coolant circuits	20/5.3
Without heat exchanger and liquid-cooled charge air cooler	20/5.3
Coolant temperature (°C/°F)	
With heat exchanger	90-95/194-203
With keel cooling	83-88/181-190
Without heat exchanger and liquid-cooled charge air cooler	83-88/181-190
Number of thermostats	1
Thermostat opening temperature (°C/°F)	
With heat exchanger	80/176 and 87/187
With keel cooling	75/167
Without heat exchanger and liquid-cooled charge air cooler	75/167

Intake system

Permissible pressure drop in the intake system with cleaned or new filter (mbar)	30
Permissible pressure drop in the intake system with blocked (dirty) filter (mbar)	65

Electrical system

Type	2-pin, 24 V, DC
Starter motor, standard equipment	2-pin, 24 V, 7.0 kW
Alternator, standard equipment	2-pin, 28 V, 100 A

Material content

The values indicate an approximate percentage for the different materials that make up the engine.

Material	% by weight
Steel	40
Cast iron (30% recycled)	46
Aluminium	8
Copper, bronze, brass, zinc	1.5
Lead	< 0.1
Plastic	< 1
Rubber	< 1
Glass	0
Paints	< 1
Oils and greases	3

Recycling

Type of material	Recommended recycling method
Metal	Recycling.
Plastic	Recycling, incineration.
Chemicals and oils	Re-use if possible; otherwise hand in to an authorised waste disposal contractor.
Fuel filter and oil filter	Hand in to an authorised waste disposal contractor.
Paint	No known recycling methods.
Electronics	Hand in to an authorised waste disposal contractor.

Scania Assistance

Wherever you are, you can always get assistance from the Scania service organisation, Scania Assistance, all day, every day of the year.

Always call the contact for your country.

AR	0800 999 722 642	LU	+32 226 400 000
AT	+43 1 256 44 11	MA	+32 2264 0000
AU	1300 SCANIA 1300 722 642	ME	+381 60 8484 122
BA	+387 61 225 917	MW	+27 11 2265005
BE	+32 2 264 00 00	MY	1800 08 8500 +603 55909077
BG	+359 886 660 001	MX	01 800 4SCANIA
BR	0800 019 42 24	NA	+27 11 226 5005
BW	+27 11 226 5005	NL	+31 76 52 54 111
CA	+1-800-2-SCANIA	NO	+47 223 217 00
CH	+41 800 55 24 00	PE	0800 51 727
CL	188 800 722 642	PL	+48 22 331 22 33
CZ	+420 225 020 225	PT	+34 91 678 9237
DE	+49 261 887 8888	RO	+40 723 27 27 26
DK	+45 333 270 44	RS	+381 60 8484 122
EE	+372 5153 388 (Tallinn) +372 5126 333 (Tartu) +372 5071 477 (Pärnu) +372 5047 655 (Rakvere)	SE	+46 42 100 100
ES	+34 91 678 80 58	SG	(65) 6591 7180 +65 6861 9181
FI	+358 10 555 24	SI	+386 1 2427 606
FR	+33 2 41 41 32 32	SK	+421 903 722 048
GB	0 800 800 660 +44 1274 301 260	TR	+90 444 72 44
GR	+30 6944 420 410	TZ	+27 11 226 5005
HU	+36 209 727 197	US	1-800-2-SCANIA
IE	+353 71 963 4000	UY	0800 8351
IT	+39 0461 996 222	ZA	0800 005 798 +27 11 226 5005
KR	+82 1588 6575	ZM	+27 11 2265005
		ZW	+27 11 2265005

Other countries: +46 8 52 24 24 24

Note:

Calls will be recorded for training purposes.