

Important information

Serious risk of injury

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

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 maintenance items where it is particularly important to bear in mind the risk of injury.

Operator's manual

DI13 XPI Marine engine

en-GB 3 447 696



Issue 2.0



WARNING: This engine can expose you to chemicals including diesel engine exhaust which is known to the State of California to cause cancer and birth defects or other reproductive harm.

For exposures to diesel engine exhaust:

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65Warnings.ca.gov.

Start of warranty	3		
Scania Engines engine warranty for marine engines	4		
Emission control systems warranty	4		
Emission control system warranty statement .	4		
Introduction	7		
The OPM portal, engine-specific manuals ...	7		
Certification	8		
Partly Completed Machinery	9		
Output classes	10		
Environment and safety	11		
Environmental liability	11		
Information on parts with particularly hazardous substances	11		
Safety	11		
Warnings and advisories	12		
Cybersecurity	17		
Engine data plate	18		
Component identification	19		
Engine	19		
Exhaust gas aftertreatment	20		
Starting and running	21		
Checks before first start	21		
Checks before running	23		
Starting the engine	23		
Sound from the engine	23		
Driving	24		
Engine shutdown	27		
Checks after running	27		
Transporting engines	27		
Maintenance	28		
Cleanliness	29		
Maintenance intervals	31		
Oil change intervals	32		
Lubrication system	33		
Oil grade	33		
Oil analysis	36		
Checking the oil level	37		
Changing the oil	38		
Renewing the oil filter	41		
Air cleaner	45		
Changing engine-mounted air filter	45		
Reading the vacuum indicator	46		
Renewing the air cleaner filter element and safety cartridge	47		
Cooling system	48		
Coolant	48		
Checking the coolant level	52		
Checking the coolant's antifreeze and corrosion protection	53		
Checking the sacrificial anodes	54		
Checking the sea water pump impeller	55		
Renewing the sea water pump impeller	56		
		Changing the coolant and cleaning the cooling system	62
		Draining and cleaning the sea water circuit .	68
		Fuel system	69
		Cleanliness requirements	69
		Checking the fuel level	70
		Renewing the fuel filter	71
		Draining and renewing an engine-mounted water separating prefilter	72
		Venting the fuel system	73
		Other	76
		Checking the drive belt	76
		Checking for leakage	78
		Removing and fitting rocker cover	79
		Checking and adjusting the valve clearance .	83
		Renewing the reductant filter	88
		Cleaning the reductant tank filler filter	89
		Checking venting functionality	89
		Renewing the venting filter	90
		Fuel quality requirements	91
		Diesel	91
		Biodiesel (FAME)	92
		Renewable diesel (HVO)	92
		Gas-to-liquids (GTL)	92
		DMX and DMA diesel	92
		Reductant for SCR	93
		Evaporation of hydrocarbons (HCEC)	93
		Engine preservation	94
		Preservative products	94
		Preparations for storage	96
		Technical data	98
		General data	98
		Intake system	98
		Fuel system	98
		Lubrication system	99
		Cooling system	99
		Electrical system	99
		Tightening torque for screw joints	100
		Screws and nuts	100
		Hose clamps	102
		Scania Assistance	103

Start of warranty

The more we know about you, your company and your machinery, the better we can support you. If you have put a new Scania engine, hybrid or fully electric power system into operation, it is important that you immediately report the start date for the warranty and provide your contact details. If the warranty start date is not reported, it means that the power system will not be covered by any applicable Scania warranties.

You can report the start of the warranty on the Scania website: www.scania.com.

Note:

If you do not send in the warranty report, the engine is not covered by the accompanying Scania warranty.

Also fill in below the details you enter in the warranty report. These details can facilitate contact with a workshop, for example. The engine serial number is on the engine data plate and is also engraved on the cylinder block.

Engine serial number (e.g. 1111111)

Ship ID (for example MMSI 111111111 or IMO 1111111)

Start date (yyyy-mm-dd)

Company name

Contact person

Phone number

Email address

Address

Postal code

Post town

State/County

Country

Scania Engines engine warranty for marine engines

Emission control systems warranty



IMPORTANT!

This section is only applicable to engines used in the U.S.A, and to engines without exhaust gas aftertreatment system (SCR system).

This section is not applicable to incorrectly installed or non-Scania low pressure fuel system components.

Table of Contents	
General warranty provisions	4
Warranty period	4
Parts covered by the Warranty	5
General warranty limitations	5
Specific warranty exclusions	6
Customer support	6

Emission control system warranty statement

General warranty provisions

The emission control systems of your new Scania Power Solutions ("Scania") marine diesel engine were designed, built and tested using genuine parts, and were certified as being in conformity with federal emission control regulations. Scania warrants to the original owner, and to each subsequent owner, of a new Scania marine diesel engine ("You") that the emission control system of your engine:

1. Was designed, built and equipped so as to conform at the time of sale with all applicable regulations under Section 213 of the Clean Air Act, 42 U.S.C. § 7547, and
2. Is free from defects in material and workmanship which would cause such engine to fail to conform to applicable regulations for its warranty period.

Warranty period

This warranty shall apply for one of the following periods, whichever occurs first:

- A period of operating hours equal to at least 50 percent of the engine's useful life in operating hours, or
- A period of years equal to at least 50 percent of the engine's useful life in years;
- Except that the warranty period shall apply for a period not less than any mechanical warranties provided by Scania to the owner.

The warranty period shall begin:

- On the date the marine vessel is delivered to the first retail purchaser, or
- If the marine vessel is placed in service for demonstration purposes prior to sale at retail, on the date the engine is first placed in service.

The emission-related warranty is valid for:

- 500 hours or 5 years for recreational engines, whichever comes first.
- 5000 hours or 5 years for commercial engines, whichever comes first.

Parts covered by the Warranty

The following is a list of parts considered a part of the Emission Control Systems and is covered by the Emission Warranty for engines which were built to conform to applicable U.S. Environmental Protection Agency regulations:

1. Fuel system
2. Air-induction system
 - a) Intake manifold
 - b) Turbocharger system
 - c) Charge air cooler system
3. Exhaust manifold
4. Combustion chamber
 - a) Piston
 - b) Cylinder head
5. Crankcase ventilation
6. Sensors
 - a) Engine speed sensors
 - b) Oil pressure sensor
 - c) Coolant temperature sensor
 - d) Coolant level sensor
 - e) Charge air pressure sensor
 - f) Charge air temperature sensor
 - g) Ambient air pressure sensor
 - h) Ambient air temperature sensor
 - i) Common rail pressure and temperature sensor
7. Electronic control unit
8. Components used in the above mentioned systems



IMPORTANT!

This list does not include all expendable maintenance parts. Expendable emission related parts requiring scheduled maintenance are warranted until their first scheduled replacement point. See Specific warranty exclusions below.

General warranty limitations

To retain the dependability of the exhaust emission control originally built into your Scania marine diesel engine, it is essential that the engine is installed according to Scania installation instructions and emission certificates.

In addition, You are responsible for the performance of all scheduled maintenance or repairs on your new Scania marine diesel engine. Scania may deny a warranty claim if your failure to perform maintenance resulted in the failure of the warranted part.

Receipts covering the performance of regular maintenance should be retained in the event questions arise concerning maintenance. The receipts should be transferred to each subsequent owner of the marine vessel with the emission warranted engine.

The Warranty covers the cost of repair and replacement parts and services of warranted components and systems performed by an authorized Scania distributor or dealer using genuine Scania parts. You may elect to have maintenance, replacement or repair of these components and systems performed by any repair establishment or individual without invalidating the Warranty.

The use of other than Scania replacement parts also does not invalidate the warranty on other components unless such parts cause damage to warranted parts. However, the cost of such services or parts will not be covered by the Warranty.

If you install the engine in a way that makes the engine's emission control information label hard to read during normal engine maintenance, you must place a duplicate label on the vessel, as described in 40 CFR 1068.105.



WARNING!

Use of replacement parts which are not of equivalent quality may impair the effectiveness of emission control systems. Accordingly, it is recommended that only Scania repair or replacement parts be used for maintenance, repair or replacement of emission control systems.

If other than Scania parts are used for maintenance, repair or replacement, the owner should obtain assurance that such parts are warranted by their manufacturer to be equivalent to genuine Scania parts.

Specific warranty exclusions

This warranty does not cover:

1. Malfunctions in any part caused by any of the following: misuse, abuse, improper adjustments, modifications, alteration, tampering, disconnection, improper or inadequate maintenance, or use of fuels not recommended for the engine as described in the Operator's Manual.
2. Engine installation, including cooling system, intake system and exhaust system installation, that is not completed in accordance with the Scania installation instructions and emissions certificate for this engine type, unless engine installation is the engine manufacturer's fault or responsibility.
3. Damage resulting from accidents, acts of nature or other events beyond the control of Scania.
4. The replacement of expendable maintenance items such as filters, hoses, belts, oil, thermostat, exhaust system and coolant made in connection with scheduled maintenance services once these parts have been replaced.
5. Replacement items which are not genuine Scania parts or not authorized by Scania as of equal quality to the original parts.
6. Inconvenience, loss of use of the marine vessel or commercial loss.
7. Any marine vessel on which the actual use cannot be accurately determined.
8. Any marine vessel operating outside the United States.

Customer support

In the event that You do not receive the warranty service to which You believe You are entitled under the Warranty, or if You need additional support or information concerning the Warranty, please contact:

Scania USA, Inc.

Address: 121 Interpark Blvd, suite 1002, 78216, San Antonio, Texas

Mailing address: 121 Interpark Blvd, suite 1002, 78216, San Antonio, Texas

Telephone: +1 210 403 0007

Fax: +1 210 403 0211

E-mail: na.contact@scania.com

Introduction

This Operator's manual describes the operation and maintenance of Scania marine engines. The engines are direct-injection, liquid-cooled, four-stroke diesel engines with turbochargers. Certain engines are also equipped with exhaust gas after-treatment management systems.

The engines are available with different output and engine 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.
- Read the section on cleanliness carefully.
- Get to know your engine so that you know what it can do and how it works.
- Always contact a workshop with qualified personnel for maintenance and repair.

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:

Scania recommends that Scania spare parts are used for maintenance and repairs.

The OPM portal, engine-specific manuals

Download your manual

The OPM portal gives you access to your manuals in your mobile phone or computer. The portal makes it possible to download and read your manual in the language you prefer.

The content is adapted to your engine and the manuals are available offline after downloading.

You can download several different manuals to your mobile phone. You therefore have access to them in one place. When your manual is downloaded, you can read it without an internet connection.

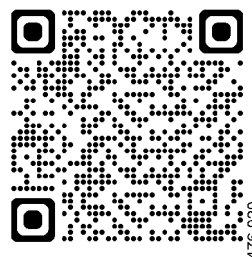
Select language for download

You can choose the language that suits you best. Download different manuals in the same language or the same manual in different languages.

Find the portal

Quick and easy navigation. Navigate to your manuals via the homepage

opm.scania.com



Inside a manual, you can see its table of contents and easily navigate to the section you want to read more about.

Give us feedback

If you have comments on the app and its content, you can easily send feedback in the portal.

Scania applies an active strategy for product development and improvement. For this reason, we reserve the right to change the specifications without prior notice.

The appearance, functions and contents of the portal may be changed.

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.
- The maintenance and repair of injection equipment are to be carried out by a workshop with qualified personnel.
- 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 following pages.

Partly Completed Machinery



SCANIA

3310124

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY IN ACCORDANCE WITH EC DIRECTIVE 2006/42 EC

SCANIA declares that engines referenced below are manufactured as Partly completed machinery in accordance with Machinery directive 2006/42/EC.

This partly completed machinery shall not be put into service in the European Community until the final machinery, into which it is to be incorporated, has been declared in conformity with the provisions of Directive 2006/42/EC and all applicable EC Directives.

The engines within any of the following generic engine family names comply with this declaration.

DC09 A, DI09 M

DC13 A, DI13 M

DC16 A, DI16 M

OC16 A, DC11 A

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Södertälje, 5 March 2025
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489 643

Output classes

Scania supplies engines in 5 different output classes:

ICFN, Continuous service: Intended for continuous use and an unlimited number of operational hours per year at a total load factor of 100% provided that the engine rotational speed is at least 85% of the engine nominal value. If the engine speed is below 85% of the nominal value, the rated power is available for 1 hour in a 6-hour period and the average load must not exceed 80% of the power at the current engine speed.

IFN, Intermittent service: Intended for periodic use, where the rated power is available for one hour per three-hour period. The total load factor must not exceed 80 % of the rated power. Unlimited number of operational hours per year.

Patrol craft long: Intended for periodic use, where the rated power is available for one hour per six-hour period. 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 total operating time must not exceed 2,000 hours per year.

Patrol craft short: Intended for periodic use, where the rated power is available for one hour per 12-hour period. 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 total operating time must not exceed 1,200 hours per year.

Pleasure craft: Intended for periodic use, where the rated power is available for 1 hour per 20-hour period. The total load factor must not exceed 50% of the rated power. The total operating time must not exceed 500 hours per year. Engines marked for recreation are only suitable for this power class.

The engine serial numbers and output classes for the engines that are used in this installation should be listed below: You can find the power class of your engine in the engine type data sheet on the Scania website, www.scania.com.

Engine serial number:

Motor type:

Engine power:

 kW at

 rpm

☐

ICFN, Continuous service

☐

IFN, Intermittent service

☐

Patrol craft long

☐

Patrol craft short

☐

Pleasure craft (for recreational engine)

Environment and safety

Environmental liability

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 quality and operating economy for Scania engines. To maintain these throughout the entire service life of the engine, it is important for the user to follow the instructions on driving, maintenance and fuel, lubricating oil and coolant 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.

Information on parts with particularly hazardous substances

Note:

A number of component parts on the engine contain materials with particularly hazardous substances.

The substances have properties that can have a serious and lasting effect on human health and the environment.

If a part or component parts contain more than 0.1% by weight of a substance listed on the REACH candidate list, the supplier must provide information about the substance.

The requirement is defined in Article 33 of the REACH Regulation (EC 2006/1907) and applies within the EU, Liechtenstein, Norway and Iceland.

<https://echa.europa.eu/candidate-list-table>.

A list of engine parts containing substances in the candidate list is provided by Scania.

<https://sure.scania.com/reach>.

According to Article 9 of the EU Waste Framework Directive ((EU) 2018/851), manufacturers of parts containing more than 0.1% by weight of a particular hazardous substance must communicate this to the EU Chemicals Agency (ECHA).

Scania supplies individual notification numbers in SCIP for affected engines.

<https://sure.scania.com/>

The notification number can be used to search the ECHA SCIP database.

<https://echa.europa.eu/scip-database>

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.

Warnings and advisories

Use only fuel which fulfils the requirements in the section *Fuel quality requirements*.

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:

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:**

An excessive coolant temperature can cause engine damage.

Note:

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

Leave the engine off for at least 7 minutes 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:**

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



REQUIREMENT!

Advisories preceded by Requirements! indicate mandatory actions or conditions that must be fulfilled. If these are not followed, there is a risk of malfunctions, damage to equipment or that the terms of the warranty will not apply. **Example:**

Safety precautions for driving

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.



REQUIREMENT!

Use only fuel which fulfils the requirements in the [Fuel quality requirements](#) section.

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.

When the engine is run in an enclosed space, there must 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.

Driving



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.

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 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 spillages on hot surfaces can cause fire.

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

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.

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 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

Excess and used chemicals must be disposed of as specified in national and international laws and regulations.

Reductant

Reductant (AdBlue®, DEF, ARLA 32 eller AUS 32) is recommended in the reductant tank for engines fitted with an SCR system.

The reductant is not toxic, but it is still important to observe the following when working on the reductant circuit:

- If reductant comes into contact with your skin: Wash it off with soap and plenty of water.
- If reductant splashes in your eyes: Rinse immediately using an eye bath and then seek medical attention.
- Change out of clothes which have spills on.



REQUIREMENT!

Use only reductant which fulfils the requirements in the [Reductant for SCR](#) section.

Safety precautions for maintenance

Switch off the engine



WARNING!

Working on 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, 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 branch pipes, turbochargers, oil sumps, and hot coolant and oil in pipes and hoses.

Lubrication system



WARNING!

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

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

Make sure that the oil filler cover is fitted when starting and driving in order to avoid oil escaping.



Environment

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 cover has to be opened do it slowly to release the pressure before removing the cover. Wear protective gloves as the coolant is still very hot.

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

Ethylene glycol can be fatal if ingested.



Environment

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

Exhaust gas aftertreatment



WARNING!

When the engine is running, the exhaust system parts can reach such high temperatures that there is a risk of personal injury. Make sure that the temperature has fallen to a suitable level before starting work.

**IMPORTANT!**

Cleanliness is very important when working on the reductant circuit. Clean thoroughly around all parts to be dismantled to prevent dirt from entering the system.

When working on the exhaust gas aftertreatment management system, the reductant connections may only be lubricated with an aqueous soft soap solution or with distilled water with a 3% urea mixture. Any other types of lubricants may block and damage the components in the exhaust gas aftertreatment management system.

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

**Environment**

The SCR catalytic converter contains precious metals and must be processed in compliance with local regulations.

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.
2. Connect the batteries.

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 eye protection.

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

**Environment**

Used batteries must be disposed of as specified in national and international laws and regulations.

Electrical system**WARNING!**

Switch off the engine and switch off the power by disconnecting the electrical cables to the battery. External power supplies to extra equipment in the engine must also be disconnected.

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

A/C compressor**WARNING!**

The A/C compressor on the engine can be adapted for the new refrigerant R1234yf. The refrigerant is flammable and can be ignited by hot engine components. Check the type of refrigerant in the vehicle and make sure that the engine has cooled down before starting work on the A/C system.

Electric welding**WARNING!**

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

Before starting**WARNING!**

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

The air filter must be fitted before starting the engine. Otherwise there is a risk of objects being

sucked into the compressor impeller or of injury if you come into contact with the impeller.

Cybersecurity



IMPORTANT!

The machine manufacturer is responsible for ensuring that all engine management communication is protected against all forms of cyber attack.

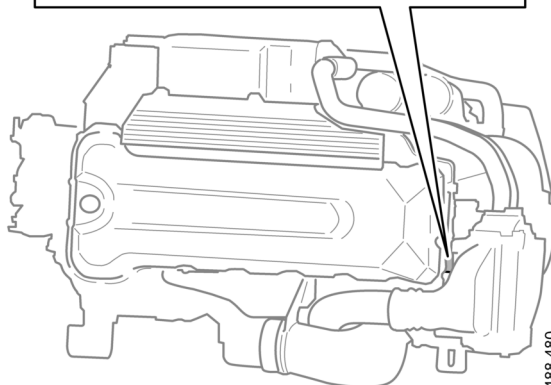
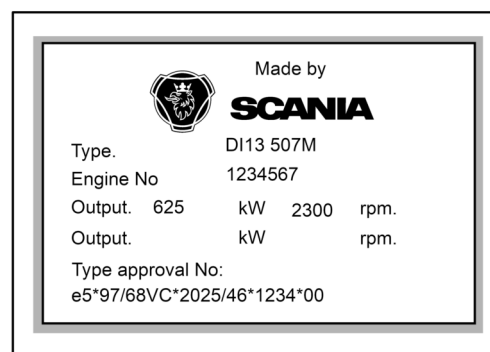
The machine manufacturer is also responsible for ensuring the engine can be operated safely in all conditions, including the option of shutting off the engine in the event of disruption to communications with or without engine control.

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 the nominal engine speed. The engine's EU type approval for exhaust emissions is indicated under *Output*, where applicable.

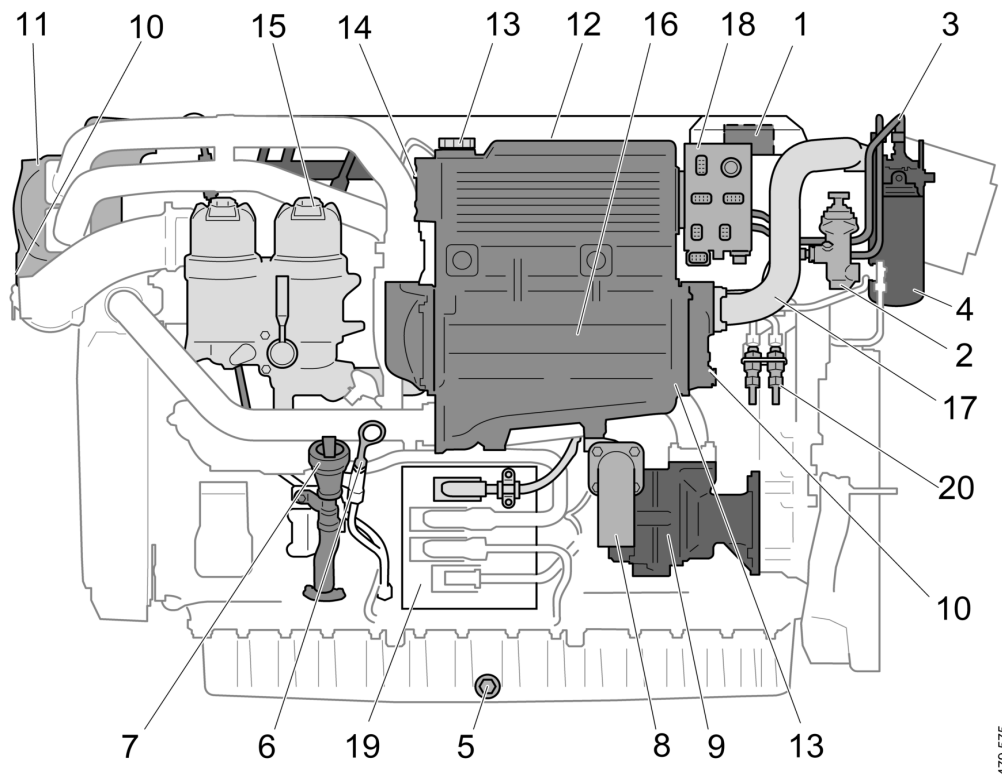
The engine serial number is stamped onto the top of the cylinder block at the front right.

Example: DI13 507M	
DI	Supercharged diesel engine with water-cooled charge air cooler.
13	Displacement in whole dm ³ .
507	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.



Component identification

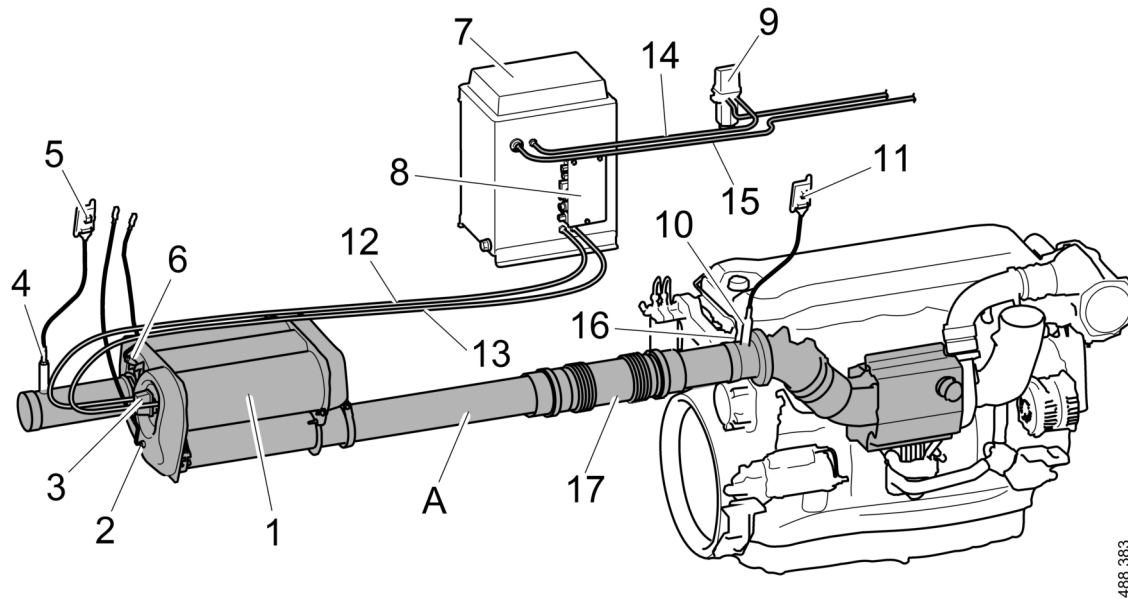
Engine



479 575

- | | |
|---|--|
| 1. Oil filler in rocker cover | 11. Charge air cooler |
| 2. Hand pump for fuel | 12. Expansion tank |
| 3. Bleed nipples on fuel filter (2 pcs) | 13. Filling coolant |
| 4. Fuel filter | 14. Sight glass for checking coolant level |
| 5. Oil plug | 15. Oil filter |
| 6. Oil dipstick | 16. Heat exchanger |
| 7. Oil filler in cylinder block. | 17. Sea water outlet |
| 8. Sea water intake | 18. Customer interface, electrical |
| 9. Sea water pump | 19. Engine control unit |
| 10. Sacrificial anodes (2) | 20. Fuel connections |

Exhaust gas aftertreatment



- | | |
|---|--|
| 1. SCR catalytic converter | 10. NO _x -sensor before catalytic converter |
| 2. Exhaust gas temperature sensor upstream of catalytic converter | 11. Control unit for NO _x sensor |
| 3. Reductant doser | 12. Reductant, from tank |
| 4. NO _x -sensor after catalytic converter | 13. Reductant, return to tank |
| 5. Control unit for NO _x sensor | 14. Reductant from main tank |
| 6. Exhaust temperature sensor after catalytic converter | 15. Reductant, return to main tank |
| 7. Reductant tank ¹ | 16. Exhaust gas pressure sensor (not illustrated) |
| 8. Control unit | 17. Compensator |
| 9. Reductant pump | |

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. Check the following:

- Oil level.
- Coolant.
- Fuel level.
- Fluid level in batteries.
- Battery state of charge.
- Condition of the drive belt.
- Level in the reductant tank, if the engine is fitted with an SCR system.
- The bottom valve on the seawater inlet is open.

See also [Maintenance intervals](#).



IMPORTANT!

Running the engine without reductant in the reductant tank violates emissions legislation and will damage the SCR system.

Only applies to engines fitted with exhaust gas aftertreatment systems intended for emission class IMO Tier III:

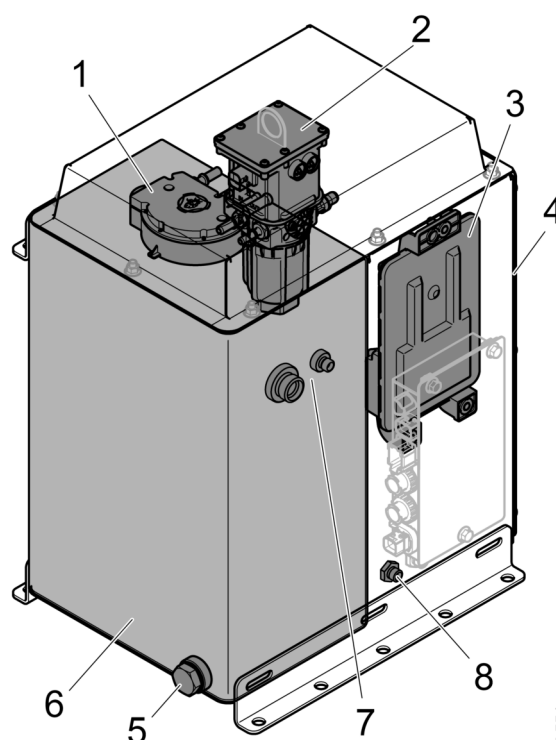
Reductant tank

The illustration shows the component parts of the reductant tank.

Open the inspection hatch (4) on the right-hand side of the tank to access the reductant pump.

Volume of the tank:

1. Total volume: 30 litres (7.9 US gallons).
2. Fill volume: 16 litres (4.2 US gallons).



487 554

Reductant tank:

1. Reductant pick-up unit
2. Reductant pump
3. Control unit AMS2
4. Inspection hatch
5. Drain plug
6. Reductant tank
7. Connections to main tank
8. Connection to SCR unit

Reductant pump

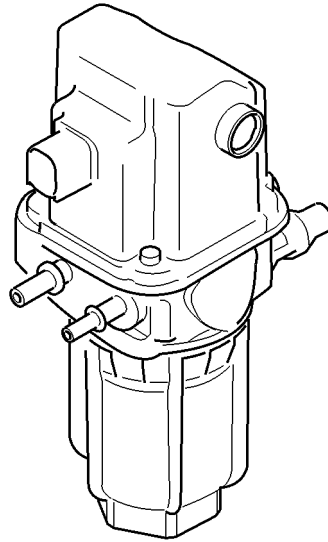
The reductant pump is equipped with electronic overflow protection.

When the reductant pump is new, the check valves may need to be slackened.



IMPORTANT!

Start the reductant pump immediately after the reductant tank has been filled for the first time.



402 020

Checks before running

Carry out daily maintenance as described in the maintenance schedule prior to operation. See the section [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 any fuel cock.
2. Open the seacock.
 - The seawater pump can be damaged if it is run dry for a long period.
 - If the pump has a metal impeller: Fill the pump with water before starting.
3. Disengage the engine.
4. If the engine has a battery master switch: Connect the power using the battery master switch.
5. Start the motor.

If the fuel tank has been run dry or if the engine has not been used for a long time, bleed the fuel system.

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 (14°F).

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.

Sound from the engine

Micro-pulsations

Occurs with the ignition on. Most noticeable if the engine is not cranked. Sounds like a high-frequency buzzer.

Caused by a very short activation of injectors, which allows fuel to bypass the injectors without injecting fuel into the combustion chamber.

Used to reduce the fuel pressure when starting to ensure that the engine's starting behaviour is consistent.

Adapting an active fuel inlet metering valve (AIC)

Occurs when the active fuel inlet metering valve is being adapted. This mostly occurs with a new engine. After this, minor adaptation takes place continuously.

Short intervals of diesel knocking are heard when adaptation takes place.

Belt transmission

When the belt transmission is new, it may make a squeaking noise when driving. This noise is normal and disappears after 50-100 hours of operation.

The noise does not affect the service life of the belt transmission.

Driving

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 operation

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 runs at fixed raised idling speed (800 rpm) if this function is activated.

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 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 excessive coolant temperature can cause engine damage.

Normal coolant temperature during operation is 81 to 90 °C (194 to 203 °F) for engines with a heat exchanger and 62 to 70 °C (144 to 158 °F) for engines with keel cooling.

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 following function is standard as alarm for high coolant temperature:

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 driven 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

Normal oil pressure during operation is 3-6 bar (43.5-87 psi). The lowest permitted oil pressure when idling is 1.8 bar (26.1 psi).

The engine management system issues an alarm when the oil pressure has been under the limit value for over 15 seconds, at the following limit values:

- At an engine speed below 400 rpm and an oil pressure below 0.9 bar (13.1 psi).
- At an engine speed below 900 rpm and an oil pressure below 1.3 bar (18.9 psi).
- At an engine speed above 1,600 rpm and an oil pressure below 1.6 bar (23.2 psi).
- At an engine speed above 2,400 rpm and an oil pressure below 2.9 bar (42.1 psi).
- At an engine speed above 2,500 rpm and an oil pressure below 3.0 bar (43.5 psi).

With engine speeds between these limits, the engine management system issues a low oil pressure alarm at an interpolated value of the two closest engine speeds above.

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 if the engine is cold when started.

Charging indicator lamp

If the lamp comes on during operation: Check and adjust the alternator drive belt according to the instructions in 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.

Water in fuel



IMPORTANT!

Water in the fuel can cause serious engine problems.

The engine is fitted with a sensor that detects the amount of water in the water-separating prefilter.

The following function is standard as an alarm when too much water has collected in the prefilter:

- Alarm and torque reduction by 30%.

Depending on the engine configuration, the following alarm functions may also be available:

- Alarm only.
- Alarm and engine shutdown.
- Alarm and engine shutdown override control.

Belt transmission

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

Accumulation of hydrocarbons in the SCR system

When there is a risk that an excessive amount of hydrocarbons (HC) has accumulated in the SCR system, a warning is displayed, see [Evaporation of hydrocarbons \(HCEC\)](#).

If this warning appears, the exhaust system should be gently heated to evaporate the accumulated hydrocarbons.

- Run the engine for 60 minutes with a gradual increase in load.
- If exhaust gas temperature is displayed on the instrument panel, stabilise the temperature at approximately 350 °C (662 °F) at the SCR inlet.
- If exhaust gas temperature is not displayed, the engine will run at approximately 40% engine load during this time.
- Avoid rapid load increases while the warning is active.

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.

If the engine is fitted with a battery master switch and an SCR system, the SCR system must run for a while after the engine has been switched off to allow it to cool down.

In extreme conditions, the SCR system may need up to 30 minutes to cool down the reductant doser.

During this period the power must not be cut using the battery master switch.

Note:

In order for the control units to store values and enter standby mode, the battery voltage must remain on for at least 10 seconds after the 15 voltage is switched off.

If the engine is switched off incorrectly ten times in a row, torque reduction is activated (fuel supply is limited to 70%). Reset the engine by switching off the engine 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!

Secure the starting device or disconnect a battery cable before 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 branch pipes, turbochargers, oil sumps, and 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. Top up 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 the engine is fitted with an SCR system: Fill the reductant tank. Make sure that the filler cap and the area round the filler opening are clean to avoid contamination of the reductant.
4. If there is a risk of freezing, the cooling system must contain enough glycol. See the section [Risk of freezing](#).
5. If the temperature is below 0°C (32°F): Prepare for the next start by connecting the engine heater, if fitted.

Transporting engines



IMPORTANT!

When transporting engines or machines, the exhaust outlet must be protected from water and debris. The exhaust gas aftertreatment may be damaged if there is water or debris intrusion.

Ensure that the transport protection is in place and remains there throughout the transport.

Maintenance

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

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



WARNING!

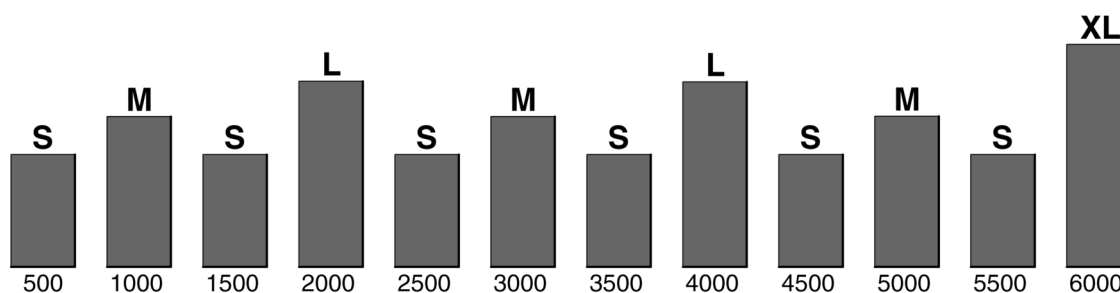
Secure the starting device or disconnect a battery cable before working on the engine. If the engine starts unexpectedly, there is a serious risk of injury.

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

The maintenance programme includes the following:

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

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



IMPORTANT!

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

- prevents unplanned stops.
- extends engine service life.
- maximises the long-term emission performance of the engine.
- give the best possible operating economy.

Cleanliness

Scania's 13-litre engine with cylinder block generation 3 is one of the world's most efficient engines of its type. Lead-free frame and connecting rod bearings are used to withstand higher combustion pressure in order to provide these high levels of energy efficiency.

Important to know

- This type of bearing is particularly sensitive to foreign particles.
- This means that this generation of engines requires more thorough cleaning before servicing.
- To maintain Scania's renowned low down-time, it is important to follow these more stringent cleanliness requirements when carrying out repairs and maintenance.
- The extra cleaning is not very time-consuming in many cases.

What is cleanliness?

Cleanliness means that there must not be any dirt that can contaminate the systems on or around components.

This does not mean that components should be as clean as when they are new, but any dirt that could enter the system must be removed before a component is opened or removed.

Dirt warning

Cleanliness is particularly important when this warning symbol is displayed in work descriptions.



Dirt warning. Risk of engine breakdown

The presence of dirt during maintenance poses a significant risk of breakdowns or operational disruptions.

When working on the engine, there is always a risk of dirt and foreign particles entering, which can lead to serious operational disruptions or bearing failures

Even very small particles can cause serious damage, so you should always follow our recommended methods and use our tools.

All relevant methods contain information on how specific components should be handled regarding cleanliness, but they assume that the general recommendations in this section are followed.

Particularly sensitive areas

The entire engine is sensitive to foreign particles or dirt, but the particularly sensitive areas are:

- The entire fuel system.
- The lubricating oil system on the cleaned side of the oil filter.
- The engine intake.

Before working on the engine

Certain requirements must be met before work is carried out on the engine:

- If the engine needs to be opened for repair, it is recommended to lift it out and transport it to a workshop if possible, to ensure a clean working environment.
- The engine must be well cleaned in and around the surfaces where the work is to be carried out.
- The work must be carried out in a clean place.
- No other work that may cause dust or dirt to fall in and over the engine may be completed in the vicinity.
- Always wear clean lint- and dust-free clothes and single-use gloves.
- Use correct and clean shoes. If necessary, use shoe protectors
- Do not eat, drink or smoke while working on the engine.
- Clean your tools before use. Do not use worn or chrome-plated tools as particles or chrome may flake off.

Cleaning the engine



WARNING!

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

Note:

The engine and engine compartment are cleaned using hot water. Use high-pressure jets with cau-

tion. Avoid spraying electrical components such as the starter motor, alternator, etc.



Environment

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

Before starting work on the vehicle, the components must be clean.

- A complete engine wash must be completed on extremely dirty engines.
- On engines with a normal amount of dirt, local cleaning must be completed as a minimum. This usually involves initial cleaning with a thicker brush and an industrial vacuum cleaner, followed by swabbing on and around the component. If this is not deemed sufficient, the engine should be cleaned with degreasing agent and a hot water wash.
- If high pressure cleaning equipment is used, the following sensitive components must be handled with care.
 - Harness-to-component connector on A/C compressor
 - Harness-to-component connector on high pressure pump
 - Exhaust gas pressure sensor, T125
 - Fuel combined sensor, high pressure, T199
 - Fuel combined sensor, low pressure, T91
 - Electric throttle
 - Alternator
 - Combined sensor for coolant temperature and pressure, T225
 - Charge air temperature sensor, T121
 - Charge air pressure sensor, T122
 - Engine control unit, EMS
 - Oil level sensor, T110
 - Turbo speed sensor, T120
 - Rotational speed sensor, T75

Maintenance and repair



WARNING!

Do not carry out any checks in the field where there is a risk of particles entering the engine. This is particularly important in environments and workplaces where dust and dirt are prevalent. Particles can easily enter the engine and cause severe damage. Whenever possible, ensure that all inspections and maintenance are carried

out in a clean and controlled environment to avoid these risks.



IMPORTANT!

Contamination will shorten the service life of the engine significantly.

Increased risks when opening the engine:

- If a casing or cover is to be removed, always make sure that the area around and above the sealing surfaces has been cleaned and that the casing or cover has been cleaned. If this is not done, there is a risk that loose dirt will fall off when the cover or casing is lifted off.
- Make sure that, for example, the cylinder head gasket was removed from the cylinder head immediately after dismantling started. A gasket which comes loose when it is still under tension can cause dirt to be thrown down into the oil ducts. Take extra care if a gasket or gasket material needs to be cut loose, never poke a tool in far enough for dirt to enter any oil ducts.
- Immediately plug exposed oil ducts
- Use 2 654 580 *Protection plug kit* to immediately plug exposed parts of the fuel system.
- Openings on the engine that arise due to component removal must be covered with 588 879 *Lint free cloth*, e.g., when removing the high pressure pump or removing the rocker cover.
- When taking long breaks from the work, we recommend, for example, covering the valve mechanism with the carefully cleaned valve cover.

Place removed components on a thoroughly cleaned, dust-free surface. Scania recommends 2 403 296 *Stainless steel worktop*. Cover the components with 588 879 *Lint free cloth* or insert 2 541 586 *Plastic bag*.

New components

New components must not be removed from their original packaging until immediately before use.

Maintenance intervals

	Daily	First time at		Interval (hours)					Minimum	
		first start	500	500	1,000	2,000	6,000	annually	every 5 years	
			R	S	M	L	XL			
Lubrication system										
Checking the oil level	X	X								
Changing the oil			X	(X) ¹	(X) ¹	(X) ¹	(X) ¹	X		
Renewing the oil filter			X	(X) ¹	(X) ¹	(X) ¹	(X) ¹	X		
Air cleaner										
Reading the vacuum indicator	X		X	X	X	X	X			
Renewing the filter element						X	X		X	
Renewing the safety cartridge						X	X		X	
Cooling system										
Checking the coolant level	X	X	X	X	X	X	X			
Checking the coolant's anti-freeze and corrosion protection		X				X	X	X		
Checking the sacrificial anodes			(X) ²	X	X	X	X	(X) ³		
Checking the sea water pump impeller			X	X	X	X	X	X		
Changing the coolant and cleaning the cooling system							X		X	
Fuel system										
Checking the fuel level	X	X								
Renewing the fuel filter					X	X	X		X	
Fuel tank venting filter						X		(X) ⁴		
Other										
Checking the drive belt		X			X	X	X	X		
Checking for leakage	X			X	X	X	X			
Checking and adjusting the valve clearance						X	X			
Renewing the reductant filter						X	X	X		
Cleaning the reductant tank filler filter				X	X	X	X			
Checking and cleaning the reductant tank venting			X	X	X	X	X			
Renewing the reductant tank plastic/brass venting filter							X		X	

1. The change interval depends on the average load and type of engine oil. See the "Oil change intervals" section.

2. The first instance at 200 hours.

3. Corrosion of the sacrificial anodes depends on the operating environment. Therefore, check the sacrificial anodes every month during the first year of use or due to change in operating environment.

4. Applies every other year.

Oil change intervals



IMPORTANT!

For all types of uses, it is recommended to use oil grade LDF-3, viscosity 5W-20.

This oil grade can be used in all ambient temperatures. Oil grade LDF-3 also provides a long interval between oil changes.

Note:

The values in the table below apply when oil has been topped up to max. on the oil dipstick.

Shallow oil sump (Oil volume at oil change: 48 litres (12.7 US gallons)).			
Fuel consumption litres (gal)/hour	<50 (13.2)	50–80 (13.2–21.1)	>80 (21.1)
Oil grade: LDF-3	700 h	500 h	400 h
Other approved oil grade	600 h	400 h	400 h

Deep oil sump (Oil volume during oil change: 64 litres (16.9 US gallons)).			
Fuel consumption litres (gal)/hour	<55 (14.5)	55–80 (14.5–21.1)	>80 (21.1)
Oil grade: LDF-3	850 h	700 h	500 h
Other approved oil grade	700 h	600 h	500 h

The intervals only apply when using fuel with a maximum of 1,000 ppm sulphur. If the fuel contains more sulphur, adjust the intervals as follows:

Sulphur content	Note	Example
0–1,000 ppm (< 0.1%)	Normal oil change interval.	The engine runs on fuel containing about 1,500 ppm of sulphur. The oil is classified according to ACEA E4, the engine has a deep oil sump, and the average consumption is 50 litres per hour. Standard interval: 700 hours. Reduction factor: 80%. Estimated interval: 560 hours.
1,000–2,000 ppm (0.1–0.2%)	Oil change intervals must be reduced to 80% of the regular interval.	
2,000–4,000 ppm (0.2–0.4%)	Oil change intervals must be reduced to 60% of the regular interval.	
Over 4,000 ppm (> 0.4%)	Fuels with a sulphur content above 4,000 ppm (> 0.4%) may not be used.	

Lubrication system

Oil grade

For engines that run on fuel with a sulphur content above 500 ppm, it is strongly recommended that you use:

- Scania LDF-3
- API CI-4+
- ACEA E4

Scania LDF stands for the Scania Long Drain Field test standard. Scania's LDF oils have been selected through extensive testing and meet very high demands on performance, service life and engine protection. The approval is only granted to the highest grade engine oils available on the market.

The engine oil must satisfy at least the following quality requirements:

- ACEA E4 or E7
- API CK-4, CJ-4 or CI-4

Note:

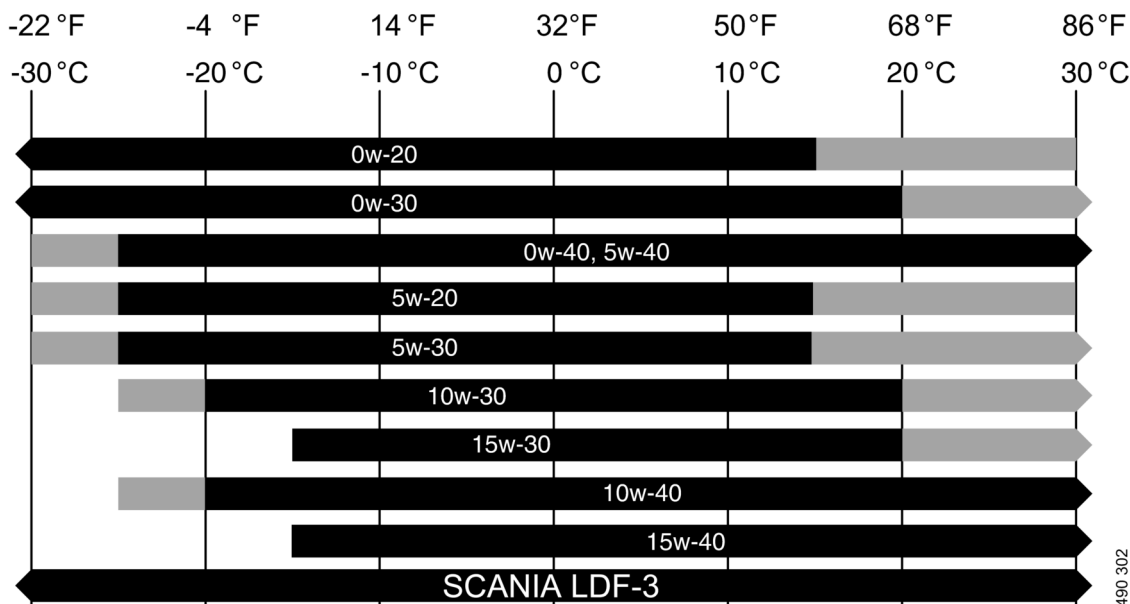
An annual oil change is mandatory, even in cases of low load or few operating hours.

Scania does not recommend using low-ash oils (e.g. ACEA E9 or API CJ-4) for this engine type, as they do not provide sufficient protection against wear and deposits.

Always check with the oil supplier that the oil meets the specified specifications.

If the engine is used in regions where ACEA or API rated oil is not available, oil properties must be checked through actual operation. Contact your nearest authorised Scania workshop for guidance.

If Scania LDF-3 is not used, the oil must be of a viscosity class suitable for the outdoor temperature in the region where the engine is used.



The illustration describes which ambient temperature in °C the viscosity class can handle for Scania-approved and market-approved oil grades.

Note that the Scania-approved oil grades have a greater temperature range than market approved oil grades.

-
- 352 436 = The temperature range which the market-approved oil grades, for example ACEA Exx and API Cxx, can handle.
- 352 437 = The temperature range that the Scania-approved oil grades, for example the Scania LDF oils and Scania Low Ash, can handle exceeding that which the market-approved oil grades can handle.

Oil grade labels

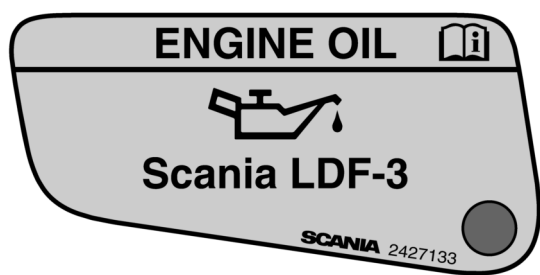
When changing the oil it is important to use the correct engine oil grade. The oil filler cover must therefore be clearly marked with a label for the oil grade that is required.

If the label is missing or if the engine oil grade is changed, a new label must be fitted.



391 050

Filling label in the cylinder block.



364 191

Filling label in the rocker cover.

Oil grade	Colour	Part no.	Part no.
		Filling in the cylinder block	Filling in the rocker cover
Scania LDF-3	Red	2 132 426	2 427 133

Oil analysis

To be able to extend the oil change intervals using an oil analysis, Scania LDF-3 oils must be used.

The following requirements must remain satisfied when the oil is changed:

- Viscosity at 100°C (212°F): max. $\pm 20\%$ of the 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).
- Oil oxidation (in accordance with DIN 51453) < 18 .

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

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

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

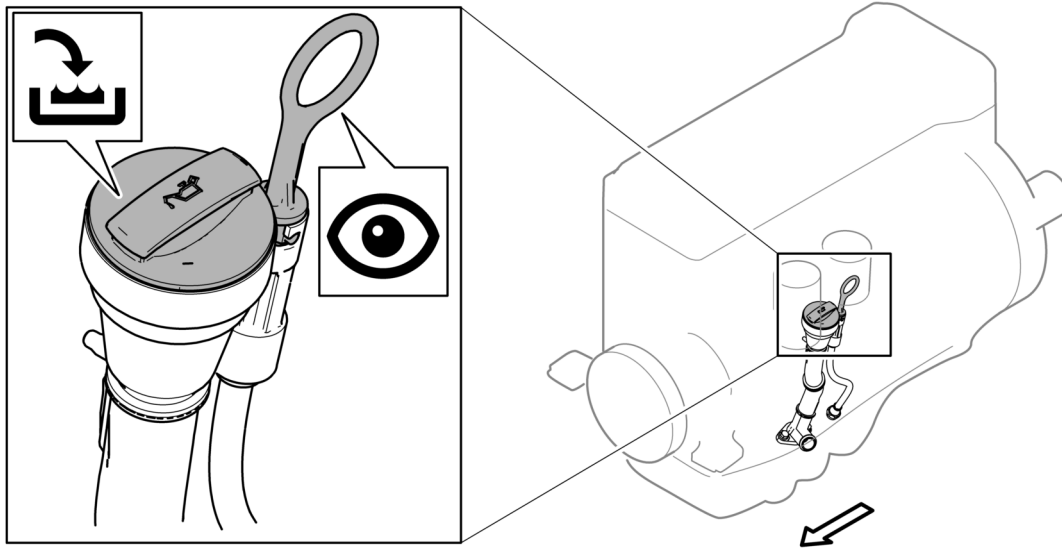


REQUIREMENT!

Only Scania LDF-3 oils may be used in conjunction with oil analysis and a possible extended oil change interval.

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

Checking the oil level



481 9/15



IMPORTANT!

Oil filling is a risky procedure during which dirt can get into the engine's lubrication system.

It is important always to ensure that the oil dipstick, oil dipstick tube, oil filler cap and oil filler tube have been cleaned before changing the oil.

Oil filling must not be carried out except through the intended connection and never through the filter housing after the filter has been removed.



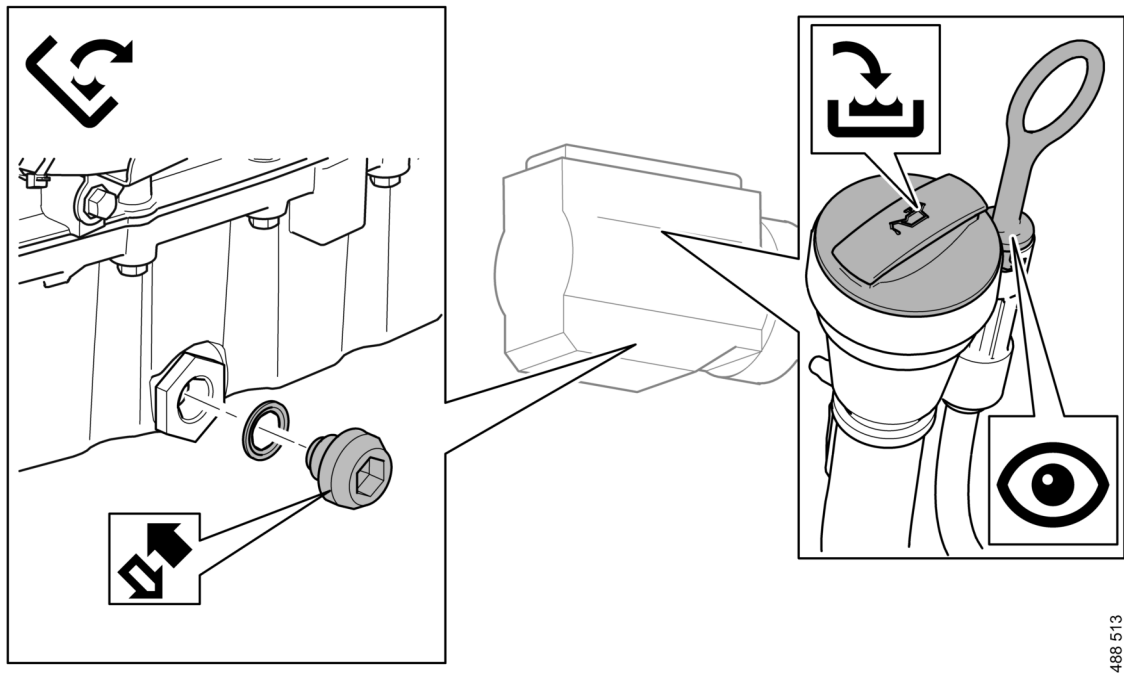
REQUIREMENT!

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

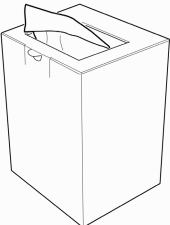
1. Pull out the oil dipstick and check the oil level. The correct level is between the minimum and maximum marks on the oil dipstick
2. Top up with more oil via the oil filler if the oil level is at or below the minimum mark.

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

Changing the oil



Tool

Designation	Illustration
588 879 Lint free cloth	

Tightening torque	
Oil plug, aluminium oil sump	60 Nm (44 lb-ft)

Information on cleanliness requirements

Cleanliness has always been important during maintenance of engines. With new engines with lead-free bearings, cleanliness has become even more critical. The smallest particle entering the lubrication system can cause serious damage.

Procedure



WARNING!

Hot oil can cause burns and skin irritation. Use protective gloves and eye protection when renewing hot oil.

Make sure that there is no pressure in the lubrication system before changing the oil. The oil filler cover must always be in place when starting and running the engine to prevent oil being ejected.



WARNING!

Do not loosen the oil filter cover before draining the oil. Undo the oil filler cover instead. When the oil is drained, a vacuum is formed in the lubrication system.

If the filter cover is detached, vacuum in dirty environments can lead to particles being sucked into the oil ducts.



IMPORTANT!

Oil filling is a risky procedure during which dirt can get into the engine's lubrication system.

It is important always to ensure that the oil dipstick, oil dipstick tube, oil filler cap and oil filler tube have been cleaned before changing the oil.

Oil filling must not be carried out except through the intended connection and never through the filter housing after the filter has been removed.

Note:

Change the oil more often if the engine is operated in particularly demanding conditions, e.g. in a dusty environment.

Renew the oil filter when changing the oil.

Remember always to clean the oil filler nozzle before refilling.



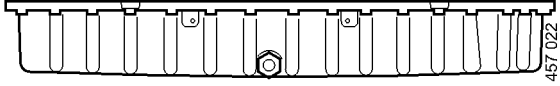
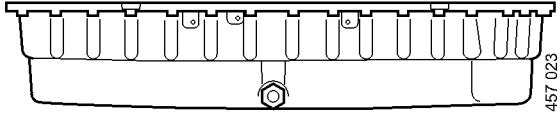
Environment

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

1. Drain the oil when the engine is hot by unscrewing the oil plug. On some engine types, a bilge pump is used to pump out the oil.
2. If the engine type has drain via valve, make sure the oil is hot or use a pump to speed up draining.
3. Check that the new oil plug has a gasket.
4. Fit the new oil plug.
 - Tighten the drain plug in an aluminium oil sump with a tightening torque of 60 Nm.
5. Fill with the amount of oil specified for the oil sump.
6. Start the engine and run it for a couple of minutes.
7. Switch off the engine again. Wait at least 7 minutes.
8. Check the oil level with the oil dipstick.

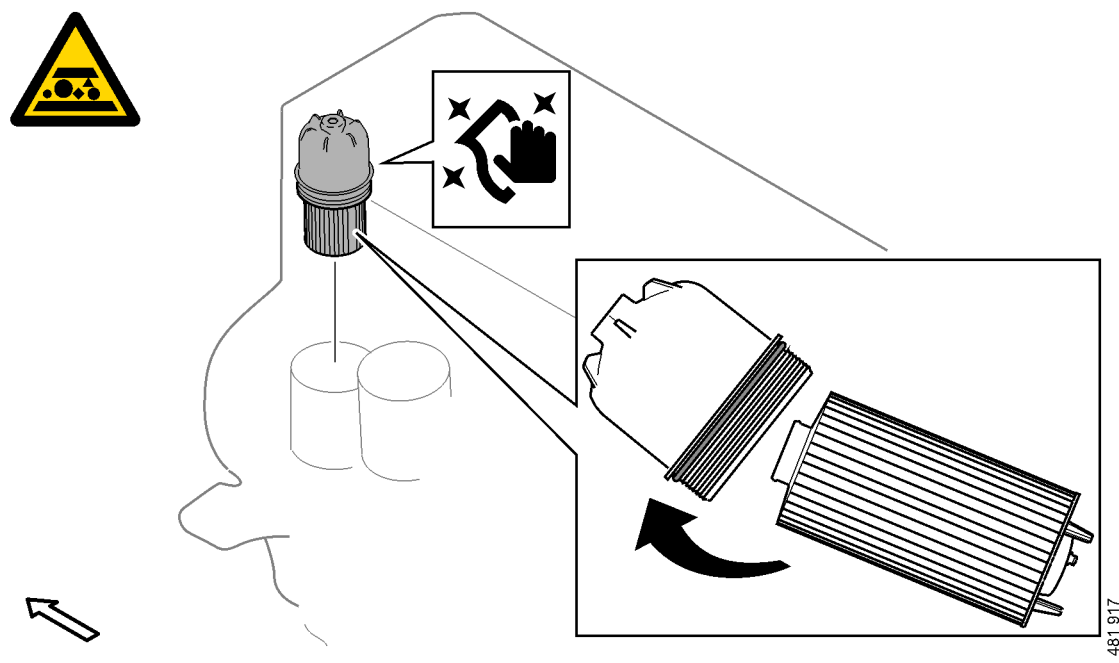
Oil volume

Maximum permitted angles of inclination during operation are 35° in all directions.

Oil sump	Oil volume
Shallow oil sump. 	When changing oil: 48 litres (12.7 gal)
Deep oil sump. 	When changing oil: 64 litres (16.9 gal)

Renewing the oil filter

Renewal, cartridge filter



Tool

Designation	Illustration
36 mm, Socket, 6-sided, 1/2"	
588 879 Lint free cloth	

WARNING!

This working method exposes oil ducts on the clean side of the lubricating oil filter. Engines with lead-free bearings are particularly sensitive to dirt.

There is a high risk of bearing seizure if foreign particles reach the lead-free frame or crankshaft bearings.

**WARNING!**

Beware of hot oil. Wear protective gloves and eye protection.

**WARNING!**

Oil must only be refilled through the intended connection and never through the filter housing after the filter has been removed.

**IMPORTANT!**

The packaging must not be broken before fitting.

**IMPORTANT!**

Only use original Scania filters as the wrong filter can cause damage to the filter and the centre tube. Renew the oil filter according to Scania's maintenance instructions.

Procedure

1. Read the instructions in the section [Cleanliness](#).
2. Carry out local cleaning on the work area if pressure washer is not available.
3. Working on the components will allow dirt to be released onto the work surface. Therefore, clean the area thoroughly before dismantling.
4. Clean the cover and upper part of the oil filter housing before removal. Brush off any loose dirt. Collect the dirt using a heavy-duty vacuum cleaner. Then clean with aqueous soft soap solution and dry with a lint-free cloth.

**IMPORTANT!**

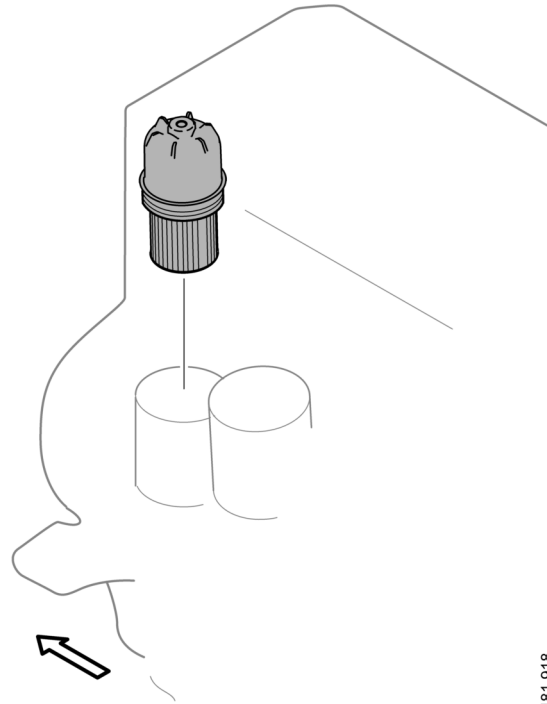
Also wipe down hidden surfaces on the parts. Even small particles can cause problems.

Note:

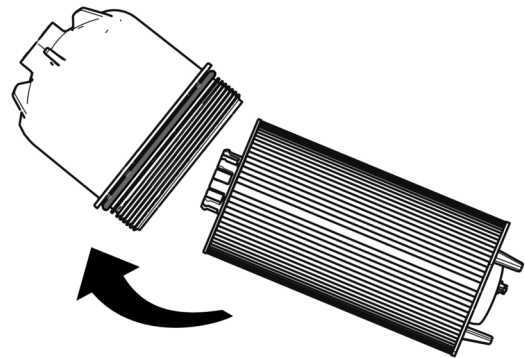
Use the right tools to avoid damage.

Removal

1. Unscrew the filter cover. Use 588 475, 36 mm, *Socket, hexagon, 1/2"*.
2. Prepare a plastic bag and place the oil filter inside to prevent spillage.
3. Lift out the filter housing cover together with the filter. The filter housing will drain automatically when the filter is removed.
4. Detach the oil filter from the cover. Carefully loosen the filter from the cover or by gently tapping it against a hard surface. Be prepared for hot oil to splash.
5. Protect the oil filtration system. Cover the open container with a lint-free cloth.

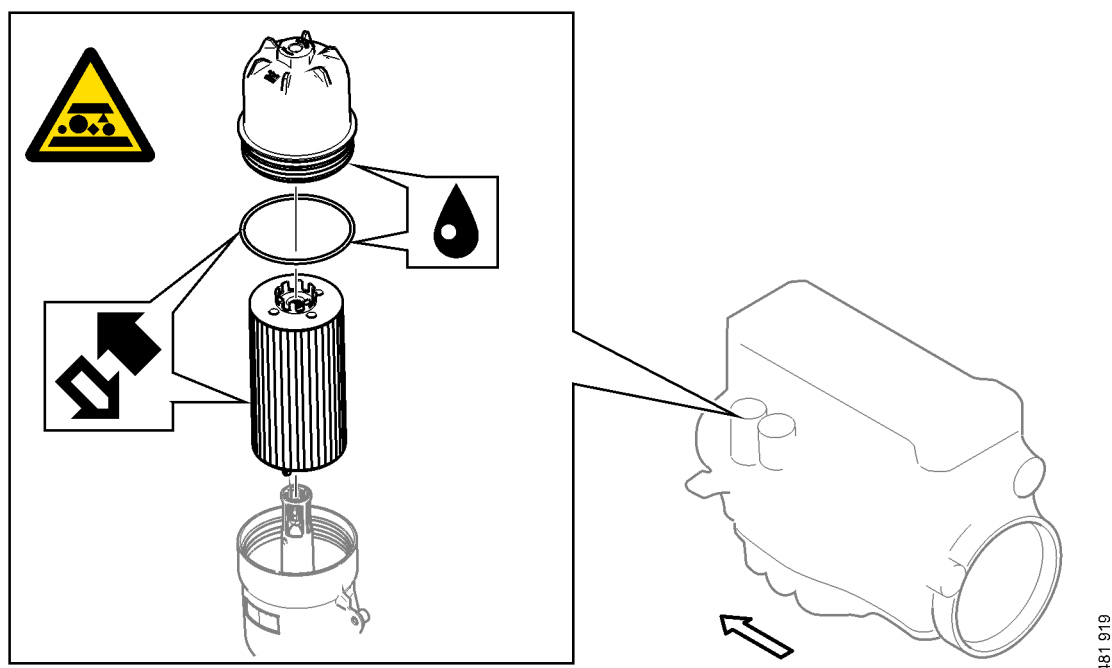


481 918



428 094

Fitting



Tightening torque

Oil filter, cover	35 Nm (26 lb-ft)
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1. Fit a new O-ring in the cover. Lubricate the cover's thread and O-ring with engine oil.

IMPORTANT!

Use Scania original filters. The wrong filter can cause damage to the filter and the centre tube. Renew the oil filter according to Scania's maintenance instructions.

2. Press a new filter into the snap fastener on the cover.
3. Fit the filter and the cover. Tighten to 35 Nm.
4. Start the engine and check for leaks.
5. Check the oil level and fill as necessary.

Air cleaner



WARNING!

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

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



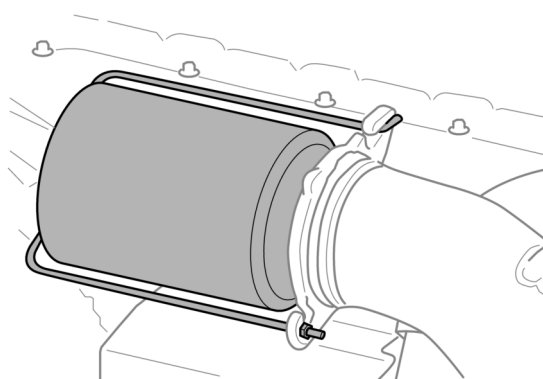
IMPORTANT!

Renew the filter element before the maintenance interval if the vacuum indicator shows red or emits a signal.

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

Changing engine-mounted air filter

1. Loosen the nut that holds the brace and unhook the brace.
2. Remove the air filter.
3. Fit a new filter. Push it in until it bottoms out.
4. Replace the brace. Tighten the nut by hand until it engages with the bracket. Tighten the nut another 3 turns.



479 598

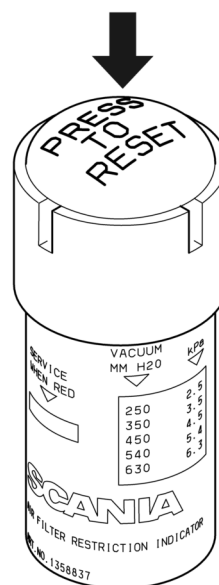
Reading the vacuum indicator

Mechanical vacuum indicator

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

Electric vacuum indicator

The engine may also be fitted with an electric vacuum indicator. It is connected to the machine interface and indicates with a warning lamp or another signal when the air cleaner filter element needs to be renewed. Renew the air cleaner filter element as per the following section.

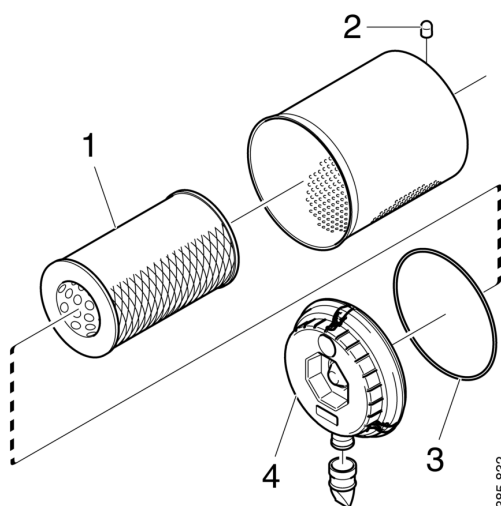


326 671

Mechanical vacuum indicator with reset button.

Renewing the air cleaner filter element and safety cartridge

1. Remove the cover from the air cleaner.
2. Renew the filter element.
3. Slide a hand lamp into the filter insert. Check that the filter paper is intact and free of cracks.
4. Renew the O-ring if it is damaged or hard.
5. Assemble the air cleaner.
6. Check that the O-ring is not outside the edges.
7. Reset the vacuum indicator:
 - On engines with a mechanical indicator: press the button.
 - On engines with an electric indicator: reset occurs automatically after filter change.



Air cleaner without safety cartridge:

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

385 832

Cooling system

Coolant



IMPORTANT!

Only Scania coolant or other products tested and approved as antifreeze and corrosion protection for Scania may be used in Scania engines.

Products that do not satisfy the requirements for use in a Scania engine may result in faults in and damage to the cooling system. This may lead to the invalidation of Scania's warranty for faults and damage caused by the use of unsuitable coolant.

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

Note:

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

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

- Corrosion protection
- Antifreeze
- Increases the boiling point

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

Note:

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

Hot climates

In order to retain the corrosion protection and the higher boiling point, it is essential to use coolant

consisting of water mixed with antifreeze and corrosion protection (ethylene glycol). This also applies in countries where the temperature never drops below 0°C (32°F).

Antifreeze and corrosion protection

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

Water

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

Recommended Scania products

Scania Ready Mix 50/50

Scania Ready Mix 50/50 is a ready-mixed coolant containing 50% antifreeze (ethylene glycol) and corrosion protection and 50% water. It should be used in cold countries where there is a risk of freezing in the cooling system.

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

Scania concentrate

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

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

Topping up

Coolant must only be topped up with pre-mixed coolant. The pre-mixed coolant can either be concentrate mixed with clean freshwater or pre-mixed coolant from the factory. Use only pure

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

For example, the auxiliary heater may not work for up to 1 hour after the engine has been started.



IMPORTANT!

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

Note:

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

Addition of antifreeze and corrosion protection to water

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

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

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

Risk of freezing



IMPORTANT!

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

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

Minimal ice formation in the coolant sometimes causes disruptions without any risk of damage.

Antifreeze and corrosion protection concentration table, litres

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

Antifreeze and corrosion protection concentration table, US gallons

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

Checking the coolant level



WARNING!

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

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



IMPORTANT!

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

Only pour pre-mixed coolant into the cooling system.

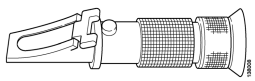
Procedure

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 the coolant's anti-freeze and corrosion protection

Tool

Designation	Illustration
Refractometer	
	

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

Procedure



WARNING!

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

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



IMPORTANT!

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

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

The following rules apply to ethylene glycol-based coolant:

- The antifreeze and corrosion protection content must be a minimum of 35 per cent by volume for corrosion protection to be sufficient.

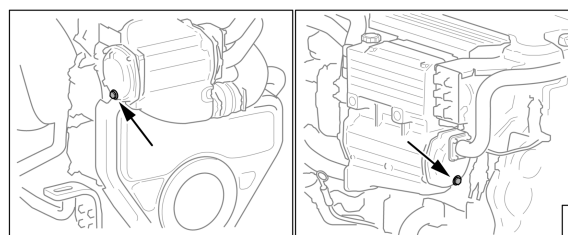
Checking the sacrificial anodes

Procedure



IMPORTANT!

Corrosion of the sacrificial anodes depends on the operating environment. Therefore, check the sacrificial anodes every month during the first year of use or due to change in operating environment.

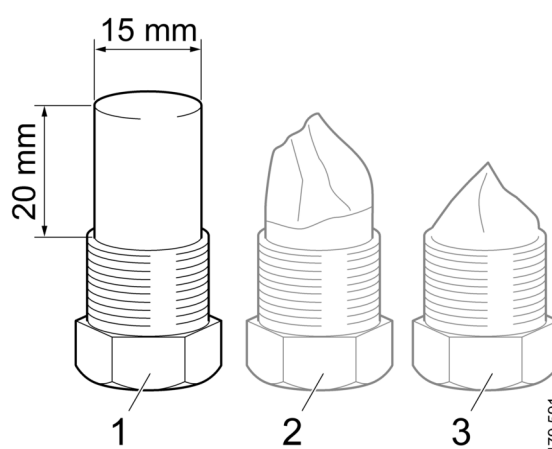


Position of sacrificial anodes.

Tightening torque

Sacrificial anode	30 Nm (22 lb-ft)
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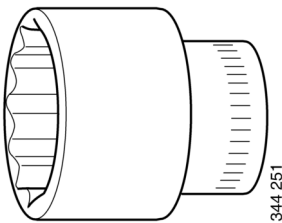
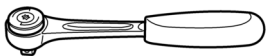
1. Drain the sea water circuit. See the section [Draining and cleaning the sea water circuit](#).
2. Remove all sacrificial anodes.
3. Check all sacrificial anodes:
 - Scrape off all loose material and check the degree of corrosion.
 - Replace all sacrificial anodes if less than 3/4 of the material remains (2).
 - If the sacrificial anodes are heavily corroded (3), halve the check interval.
 - If the sacrificial anodes are very corroded, there is a risk that they will come loose entirely.
4. Always renew the gasket when fitting.



- *New sacrificial anode*
- *Approx. 3/4 remains*
- *Approx. 1/4 remains*

Checking the sea water pump impeller

Tool

Number	Designation	Illustration
2 281 500	Socket 13 mm	
2 288 889	Ratchet handle	

Note:

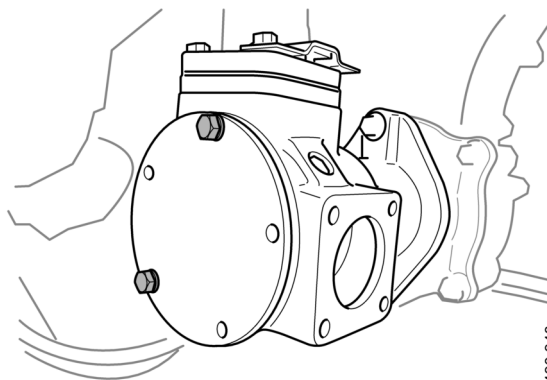
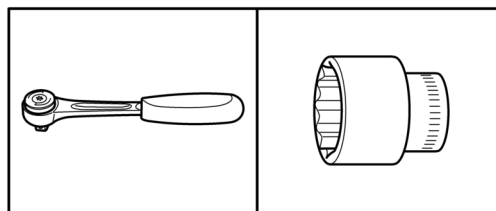
If the impeller must be renewed frequently, sea water cleaning needs to be improved.

Always keep spare impellers and necessary tools 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.

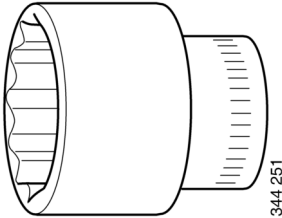
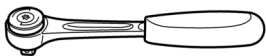
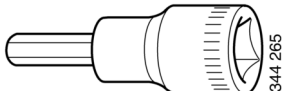
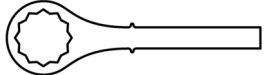
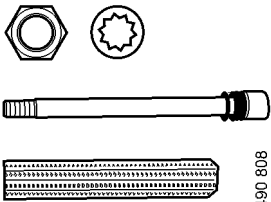
Procedure

1. Drain the sea water circuit. See the section [Draining and cleaning the sea water circuit](#).
2. Remove the sea water pump cover. See illustration.
3. Check that the vanes of the impeller are intact and not splintered or damaged.



Renewing the sea water pump impeller

Tool

Number	Designation	Illustration
2 281 500	Socket 13 mm	
2 288 889	Ratchet handle	
2 443 680	Dismantling kit for impeller	
2 288 898	Socket 6 mm, Internal hexagon, 3/8"	
2 427 787	Ring spanner 36 mm	
3 355 919	Tool kit	

Note:

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

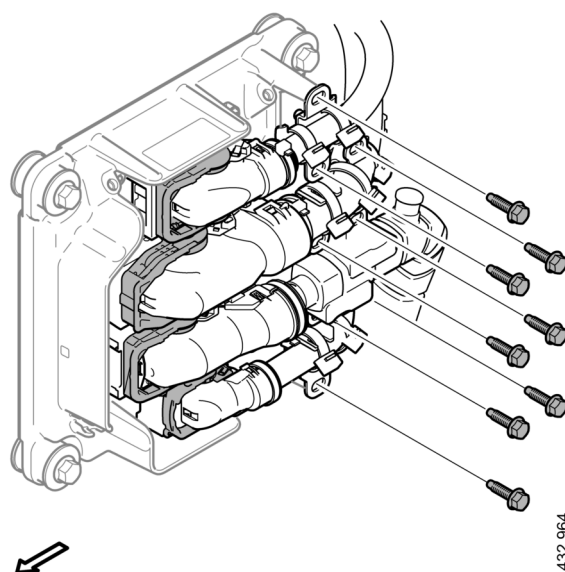
Always keep spare impellers and necessary tools on board.

The impeller can be deformed during extended periods of inactivity. Renew the impeller before starting or remove the impeller before longer periods of stoppage.

Preparatory operations

1. Switch off the power.

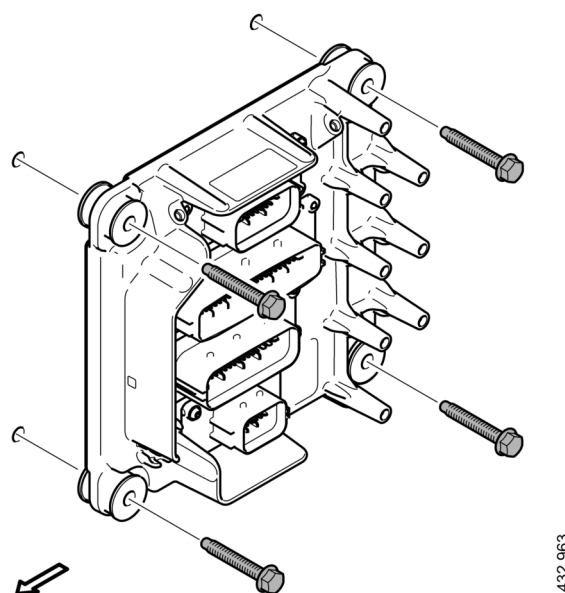
2. Clean the engine.
3. Drain the sea water circuit.
4. Loosen the cable brackets on the engine control unit and disconnect the connectors.
 - Unscrew the brackets with the connectors still attached – **do not cut the cable ties.**



5. Remove the engine control unit.

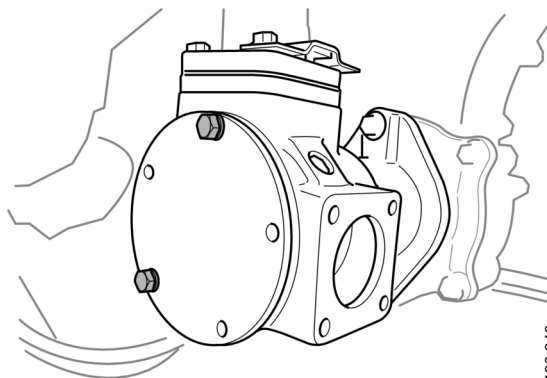
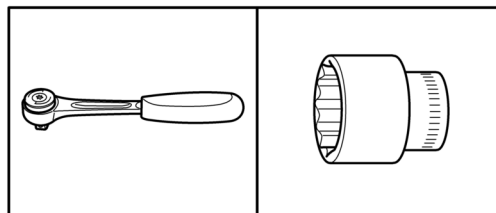
**IMPORTANT!**

Incorrect handling may result in damage to the pins in the engine control unit during fitting.

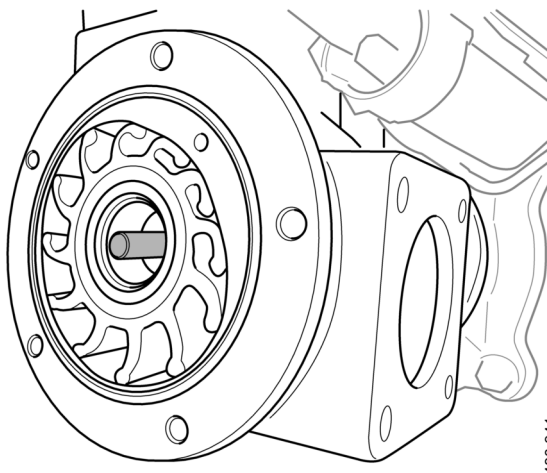
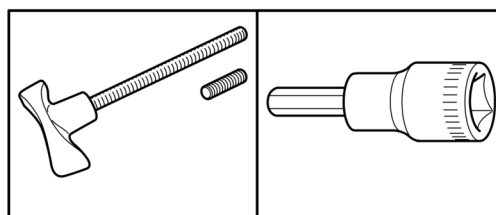


Removal

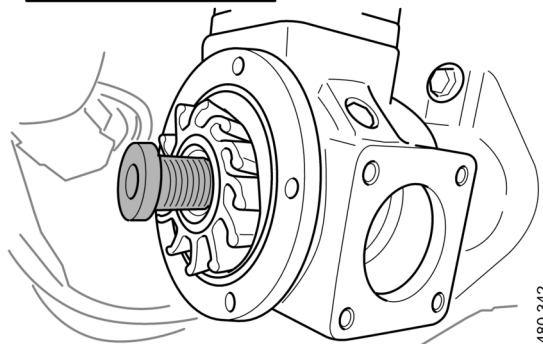
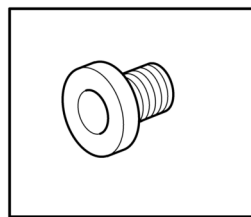
1. Fold away the cabling.
2. Remove the cover. Use tool 2 281 500 *Socket 13 mm* and 2 288 889 *Ratchet handle*.



3. Remove the O-ring.
4. Screw the threaded rod from *Tool kit 2 443 680* into the shaft. Use 2 288 898 *Socket 6 mm, internal hexagon, 3/8"*.



5. Screw 3 355 920 *puller screw* into the impeller.

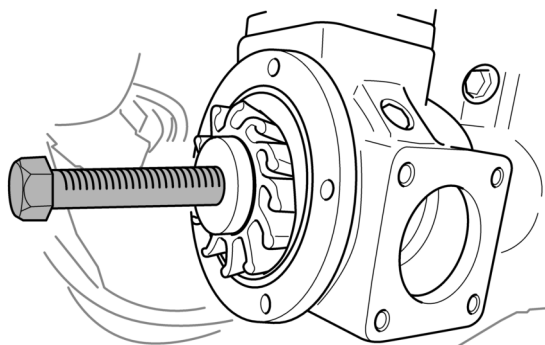


480 342

6. Screw an M16 screw (at least 50 mm long) into the thread of the puller screw.

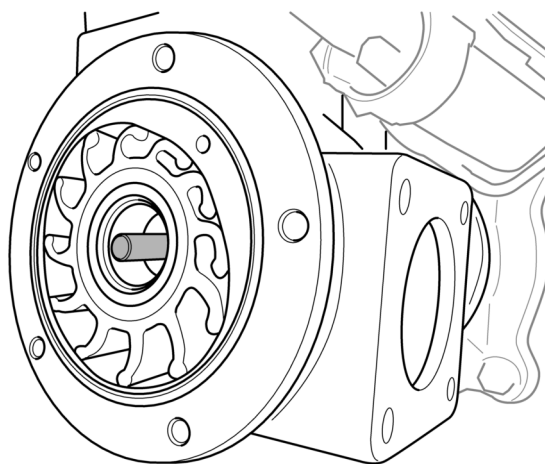
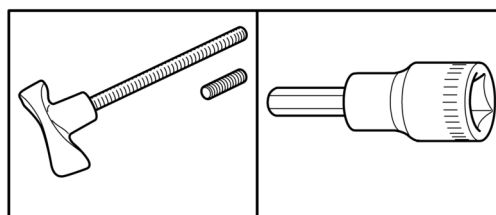
Example: screw 802 077

Turn the screw until the impeller begins to move outward.



490 834

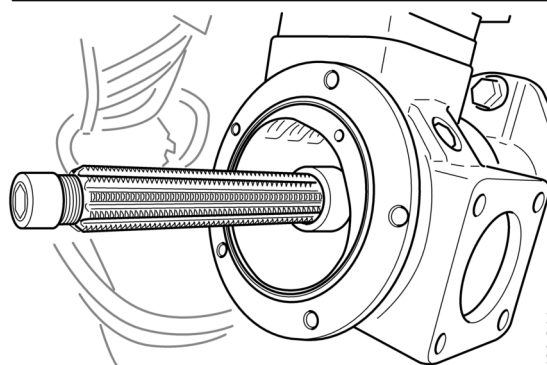
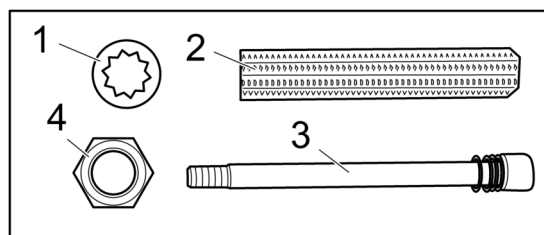
7. Remove the threaded rod. Use 2 288 898 *Socket 6 mm, internal hexagon, 3/8"*.
8. Clean the pump housing internally.
9. Check the pump housing for damage or abnormal wear.



480 341

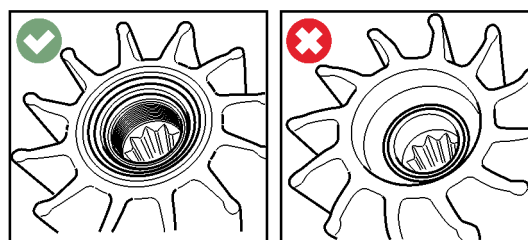
Fitting

1. Use 3 355 919 *Tool Kit*.
2. Fit the spliced tool (2) so that the splice fits against the pump shaft.
 - Use the washer (1) to position the tool.
 - Lock the threaded rod with the long M12 screw (3).
 - Check that the washer can be pulled off. Adjust and tighten the screw if necessary.
 - Make sure that the screw head has a diameter smaller than the opening in the washer/impeller. Use 2 288 902 *Internal hexagon 10 mm*.
3. Remove the washer (1).
4. Lubricate the impeller including the vanes with the grease provided.



480 344

5. Fit the impeller to the threaded rod with the threads facing outwards.

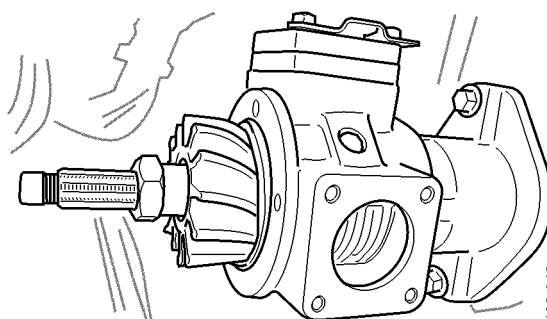
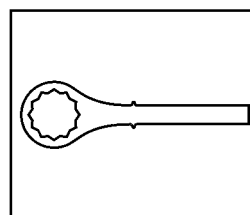


480 345

6. Fit the nut and tighten so that the impeller is pressed into the housing. For example, use 2 427 787 *Ring spanner 36 mm*.

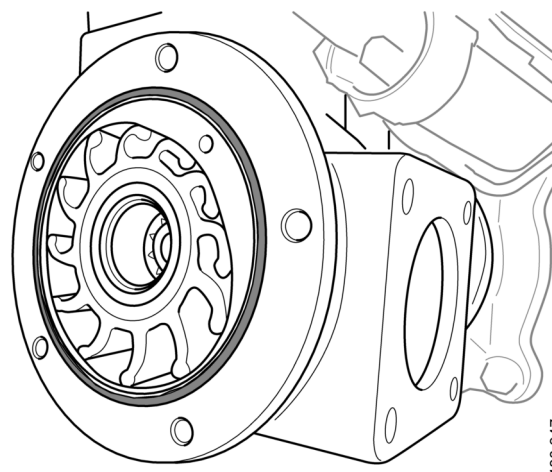
Note:

Use a washer between the nut and the impeller, for example 807 314



480 346

7. Fit a new O-ring.



480 347

8. Fit the cover.

Finishing operations

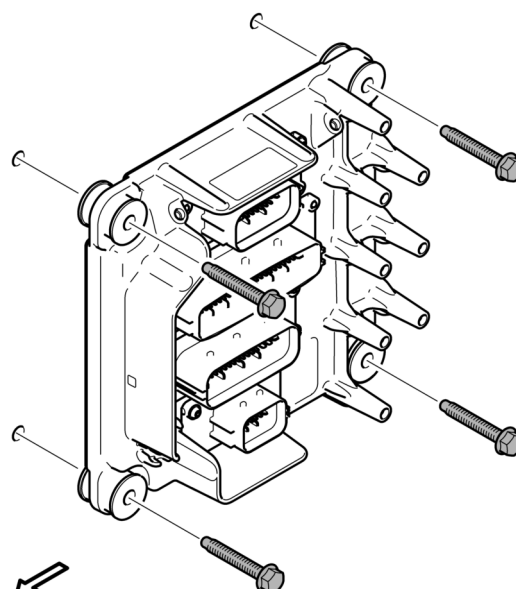


IMPORTANT!

Fit the brackets with the connectors attached.

Incorrect fitting can damage the pins in the engine control unit.

1. Fit the engine control unit.



432 963

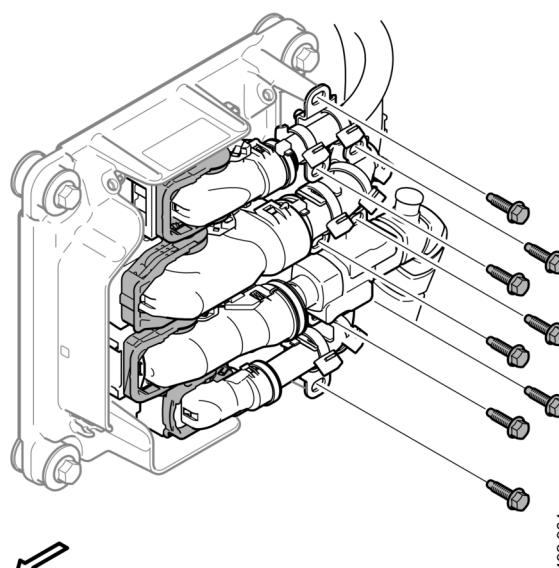
2. Fit the connectors and the cable brackets.

- Fit the brackets on the engine control unit with the connectors already installed in the brackets.

3. Connect power (Fit the negative terminal on the batteries or set the battery master switch to the ON position).

4. Open the seawater valve.

5. Test start and check for leaks or noise.



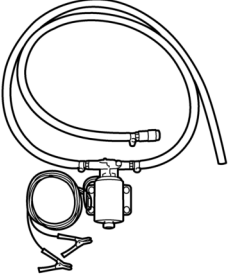
432 964

Changing the coolant and cleaning the cooling system

lowest drainage point on the engine may differ depending on engine application.

Draining coolant

Tool

Number, designation	Illustration
2 443 679, coolant pump	 360 625



WARNING!

Open the expansion tank cover only when the engine is cold. Hot coolant and steam can cause burns. Open the cover slowly to relieve the excess pressure.



WARNING!

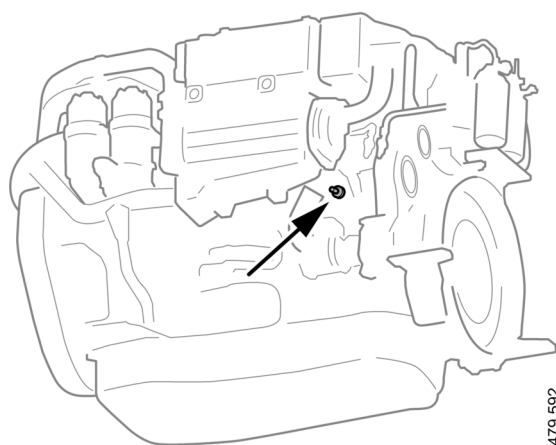
Wear protective gloves. Skin contact with coolant can cause skin irritation.



Environment

Collect the coolant in a container. Used coolant must be disposed of in accordance with applicable laws and regulations.

1. Open the expansion tank cover.
2. Place the hose from the coolant pump in an empty container.
3. Connect the pump to the draining nipple in the cylinder block. See illustration.
4. Connect the pump's 2 cable terminals to the battery's negative and positive terminal.
 - Change the cable terminals around if draining does not start.
5. Repeat the procedure at the cooling system's lowest drainage point. The location of the



Bleed nipple in the cylinder block

Internal cleaning: Removing oil and grease in the cooling system



Environment

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

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

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

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

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

1. Run the engine until it has reached operating temperature if possible and then drain the cooling system following the previous description.
2. Lock the thermostat in the open position. See section [Thermostat, locked in the open position](#).

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

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

4. Warm up the engine for approximately 20-30 minutes. Remember to switch on the cab heating system, if one is installed.
5. Drain the cooling system.
6. Fill the cooling system with clean, hot water and run the engine for about 20-30 minutes.
7. Repeat steps 3-6 if the cooling system is not clean.
8. Drain the water from the cooling system.
9. If necessary, clean the expansion tank by detaching all hoses and rinsing and cleaning with a degreasing agent.
10. Fit a new thermostat.
11. Fill the cooling system with new coolant as described in the next section.

Note:

Always add coolant via the filler nipple in the engine block.

12. Check again whether further dirt or oil has collected in the expansion tank. Decide whether it is necessary to carry out another full cleaning or whether only rinsing or cleaning of the expansion tank will suffice.

Internal cleaning: Removing deposits in the cooling system



Environment

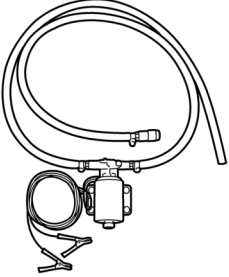
Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

1. Run the engine until it has reached operating temperature if possible and then drain the cooling system following the previous description.
2. Lock the thermostat in the open position. See section [Thermostat, locked in the open position](#).
3. Fill the cooling system with clean hot water mixed with a radiator detergent that is based on sulfamic 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. Fit a new thermostat.
9. Fill the cooling system with new coolant as described in the next section.

Filling coolant

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

Tool

Number, designation	Illustration
2 443 679, coolant pump	 360 625



WARNING!

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



IMPORTANT!

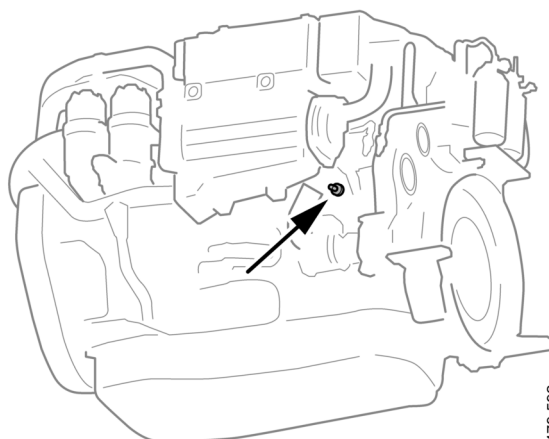
Mix the coolant as specified in the section headed [Coolant](#).

It is not permissible to top up large amounts of coolant via the expansion tank. Filling via the expansion tank leads to air pockets in the cooling system which can lead to e.g. damage to the coolant pump shaft seal.

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

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

1. Open the expansion tank cover.
2. Connect 2 443 679, *coolant pump* to the filler nipple in the cylinder block.
3. Connect the pump's 2 cable terminals to the battery's negative and positive terminal.
Make sure that the filling starts. If the filling does not start: Change the position of the cable terminals.
4. Open the bottom valve on the sea water inlet.
5. Fit the cover on the expansion tank.
6. Start the engine and run it at idling for 15 minutes.
7. Check that there are no leaks.



IMPORTANT!

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

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

Air pockets may still be left in the cooling system. These will disappear after the engine has been operated for a period of time.

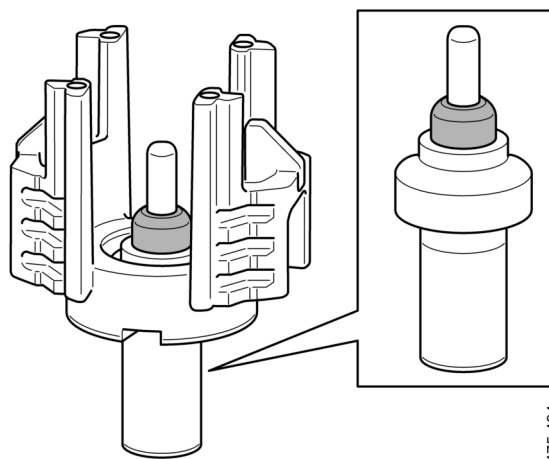
Therefore, the coolant may need topping up at a later stage.

Finishing operations

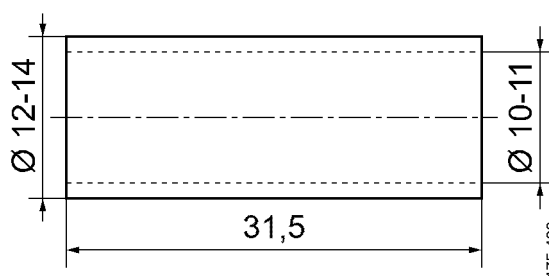
1. Check the coolant level and top up if necessary via the expansion tank.
2. Check that the expansion tank cover is in place.

Thermostat, locked in the open position

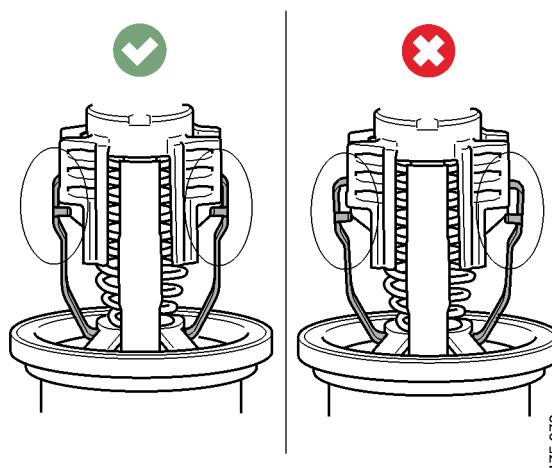
1. Position the thermostat so that the bottom part can protrude, for example in a vice.
2. Compress the coil spring in the centre of the thermostat and unhook the spring holders.
3. Remove the upper part and the rubber plug.



4. Prepare a pipe with an inner diameter that fits the centre axle.
5. Thread the tube onto the centre axle to keep the thermostat in the open position.



6. Assemble the thermostat.
7. Compress the thermostat and hook the spring holders into place.



8. Replace the thermostat in the thermostat housing.

Draining and cleaning the sea water circuit

Procedure

Tightening torque	
Charge air cooler, screw (M8)	16 Nm (11.8 lb-ft)
Heat exchanger, screw (M8x35)	18 Nm (13.3 lb-ft)

Identify the lowest point in the sea water circuit. It is usually located in the intake of the sea water pump (3).

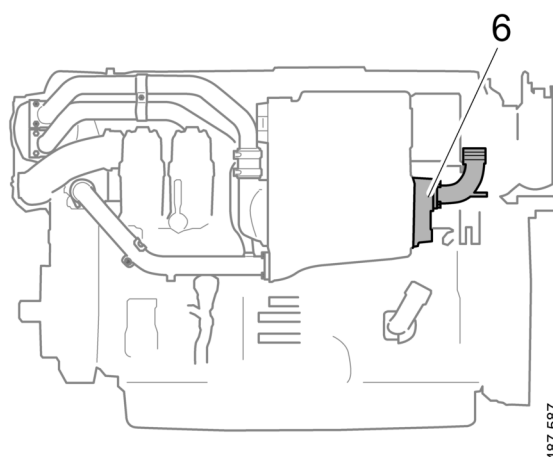
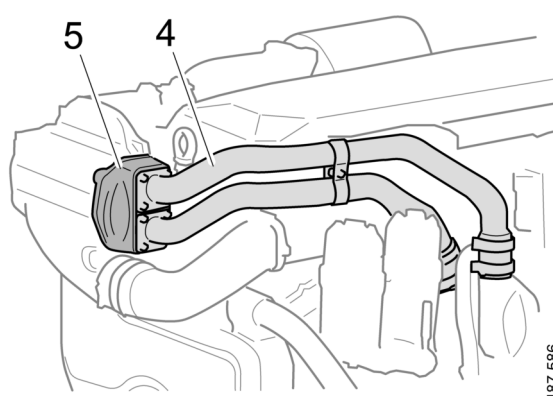
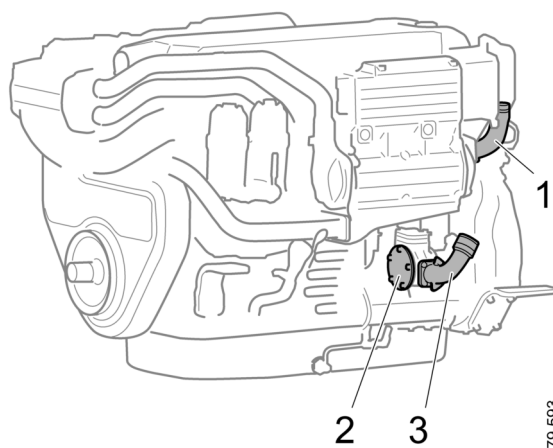


IMPORTANT!

Plug the connections to prevent dirt ingress into the engine.

1. Close the bottom valve on the sea water inlet.
2. Remove the connecting pipe (1) on the outlet from the heat exchanger.
3. Empty the sea water pump by removing the cover (2).
4. Remove the pipes to the charge air cooler (4).
5. Then remove the cover on the charge air cooler (5) to drain the remaining water.
6. Clean the inlet of the charge air cooler element.
 - If the entire radiator element or the housing of the charge air cooler needs to be cleaned, the charge air cooler should be removed.
 - Contact a Scania workshop for removal of the charge air cooler.
7. Fit the cover on the charge air cooler. Tighten at 16 Nm (11.8 lb-ft).
8. Remove the heat exchanger cover to drain the remaining water (6).
9. Clean the intake of the heat exchanger cooler core.
 - If the entire cooler core needs to be cleaned, the heat exchanger should be removed.
 - Contact a Scania workshop for removal of the heat exchanger.
10. Fit the cover on the heat exchanger. Tighten to 18 Nm (13.3 lb-ft)

11. Fit the sea water pipes.
12. Fit the cover on the sea water pump.
13. Open the bottom valve on the sea water inlet.
14. If the pump has metal impellers: fill the pump with water before starting.
15. Start the engine and check that there are no leaks.



Fuel system

Cleanliness requirements



IMPORTANT!

The whole fuel system is very sensitive to dirt and also very small particles. Foreign particles in the system can cause serious malfunctions. It is therefore very important that everything is as clean as possible when work is carried out on the fuel system. Clean the engine before carrying out repair work. If possible, a hot 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 disposable gloves when working on the fuel system. Scania recommends using Tegera 848 gloves.

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

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

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

Checking the fuel level

Check the fuel level and fill with fuel as necessary.

Note:

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

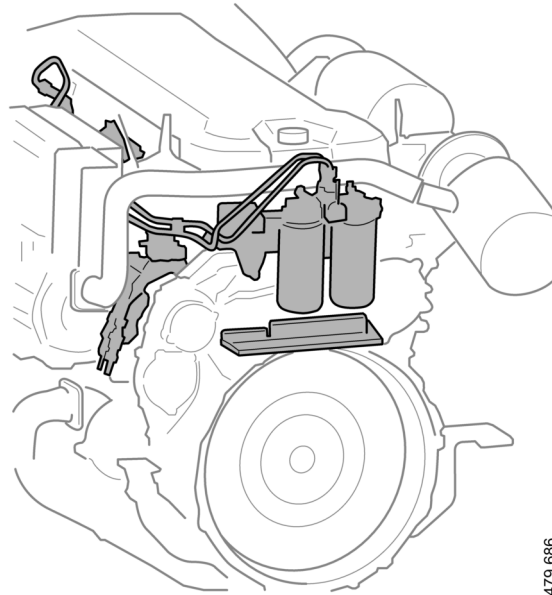
Renewing the fuel filter



Environment

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

1. Wipe the exterior of the fuel filter with a damp cleaning cloth.
2. Position a container under the filter.
3. Unscrew the filter.
4. Lubricate the seal on the new oil filter. Use fresh oil.
5. Screw the filter into place by hand until the gasket rests against the housing.
6. Tighten the filter another 1/2 to 3/4 turns by hand.
7. Bleed the fuel system. See the section [Venting the fuel system](#).
8. Check for leakage. Screw the filter further if necessary.



479 686

Draining and renewing an engine-mounted water separating prefilter

Tightening torque	
Water in fuel sensor	4 Nm (3 lb-ft)
Drain plug in filter	4 Nm (3 lb-ft)



IMPORTANT!

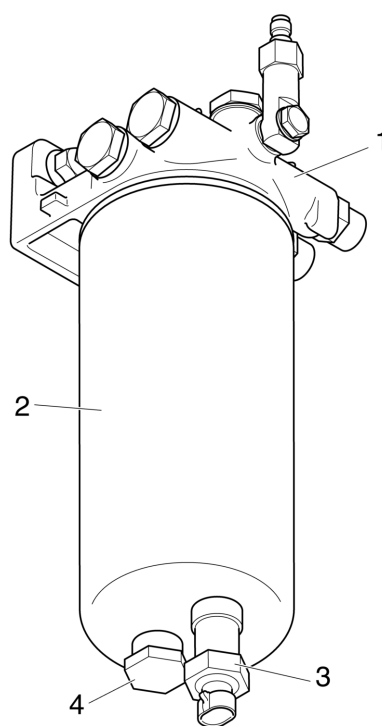
The sensor cable is sensitive. Handle it carefully.



Environment

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

1. Close the shut-off cock on the fuel pipe. Position a container under the filter.
2. Loosen the sensor cable from the contact housing on the filter.
3. Open the filter drain plug. Allow the liquid to drain into the collection container.
4. Unscrew the filter (3) from the filter head (4).
5. Unpack the new filter. Discard the old filter.
6. Move the sensor (3) to the new filter. Tighten to 4 Nm.
7. Move the plug (4) to the new filter. Tighten to 4 Nm.
8. Lubricate the O-ring on the new filter with new oil.
9. Fill the filter with clean fuel.
10. Screw the filter into position until the O-ring rests against the filter head.
11. Tighten the filter a further half turn by hand.
12. Open the shut-off cock on the fuel pipe. Make sure the fuel system is not leaking.
13. Connect the sensor cable to the contact housing on the filter.
14. Bleed the fuel system. See the section [Venting the fuel system](#).
15. Check for leaks. Tighten the filter further if necessary.



387 433

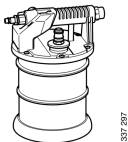
Single water separating prefilter.

1. Filter head
2. Filter
3. Water in fuel sensor.
4. Drain plug

Venting the fuel system

Venting the fuel system using a suction tool

Tool

Designation	Illustration
Suction tool for fuel system	

Note:

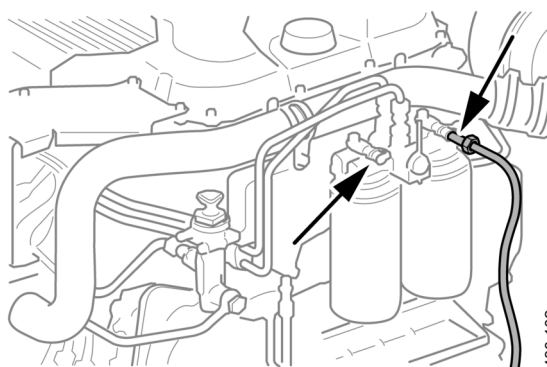
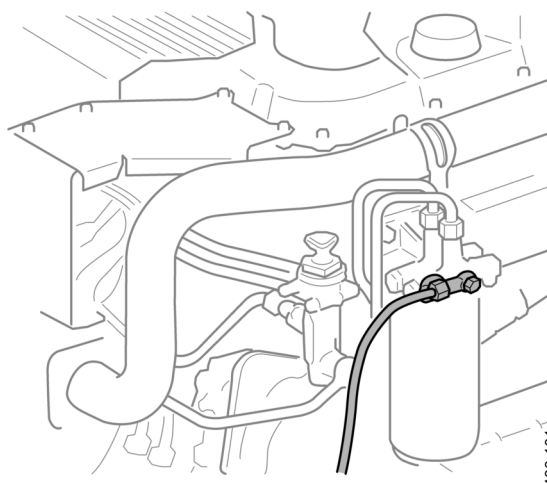
Scania recommends venting the fuel system using suction tools rather than with a hand pump. This is a quicker and simpler method, which ensures a complete venting.



Environment

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

1. Open the ventilating valve on the fuel filter head and connect the suction tool to it. See illustration. Start by wiping off the ventilating valve.
2. Hold the suction tool straight and draw out at least a full container of fuel.
3. Once the fuel coming out of the hose is free of air bubbles, then venting is complete.
4. Close the ventilating valve on the fuel filter head. Remove the hose and suction tool.
5. Start the engine and check that there are no leaks.



Venting the fuel system using a hand pump

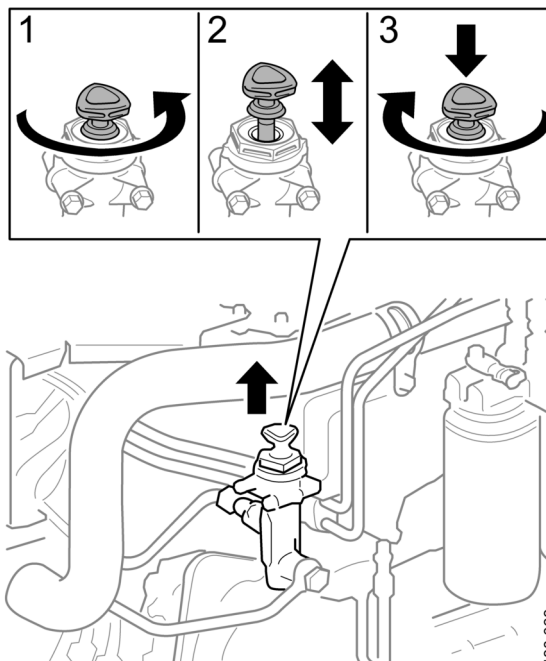


Environment

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

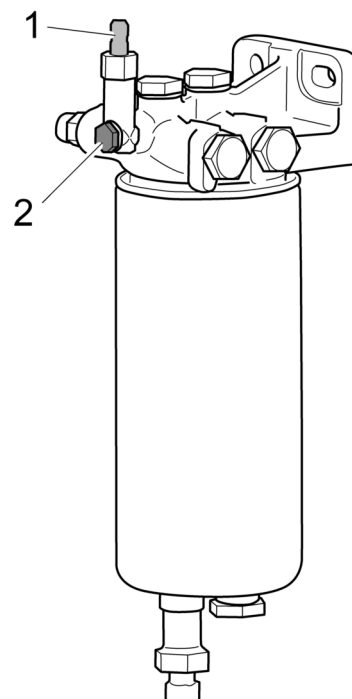
Venting via suction filter

1. Unscrew the hand pump handle.



480 068

2. Attach a clear plastic hose to the bleed nipple (1) on the fuel filter head of the fuel suction filter.
3. Place the other end of the hose in a container that holds at least 5 litres (1.3 US gallons).
4. Open the ventilating valve (2).
5. Pump with the hand pump until fuel without air bubbles comes out.
6. Close the ventilating valve.



488 319

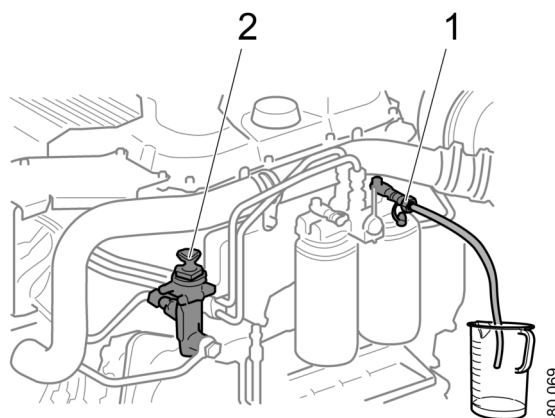
Tightening torque

Ventilating valve nipple	9 Nm (7 lb-ft)
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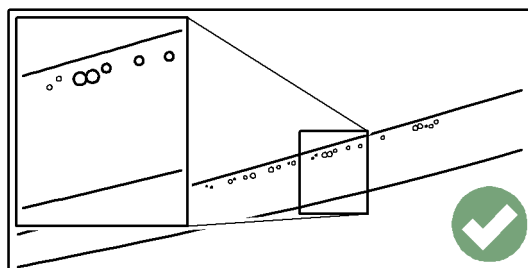
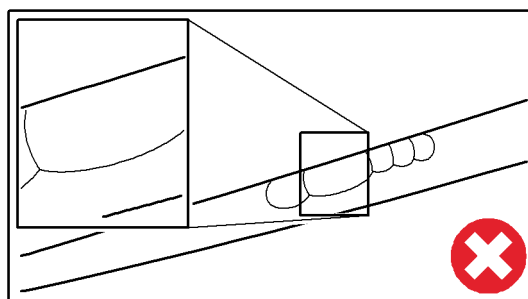
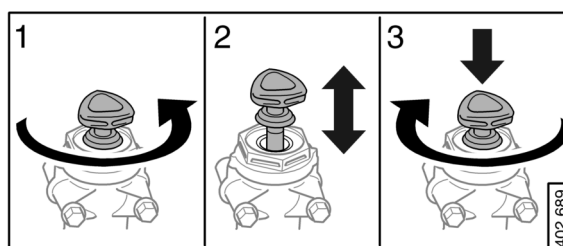
Venting via pressure filter

The engine can be equipped with dual filters. In this case, only one filter should be vented at a time. Turn the handle so that the fuel passes through one filter at a time

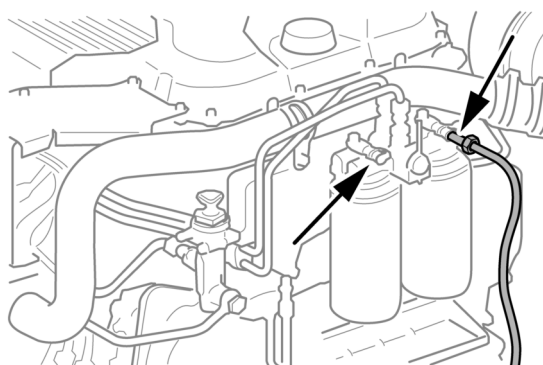
1. Attach a clear plastic hose to the bleed nipple on the fuel filter head (1) of the fuel suction filter.
2. Place the other end of the plastic hose in a container that holds at least 5 litres (1.3 US gallons).
3. Open the ventilating valve.



4. Pump with the hand pump (2) until fuel without air bubbles flows out of the hose.



5. Close the ventilating valve.
6. If the engine has dual filters: Move the hose to the ventilating valve above the second filter. Turn the handle so that the fuel passes through the second filter. Repeat steps 1 to 5.
7. Close the ventilating valve and screw the hand pump handle downwards.
8. Start the motor. It should start without difficulty.



Other

Checking the drive belt



IMPORTANT!

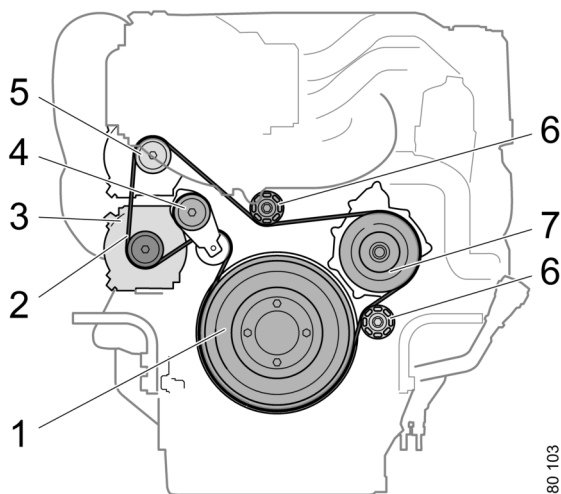
Note how the drive belt is positioned before dismantling. Refit in the same direction of rotation.

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

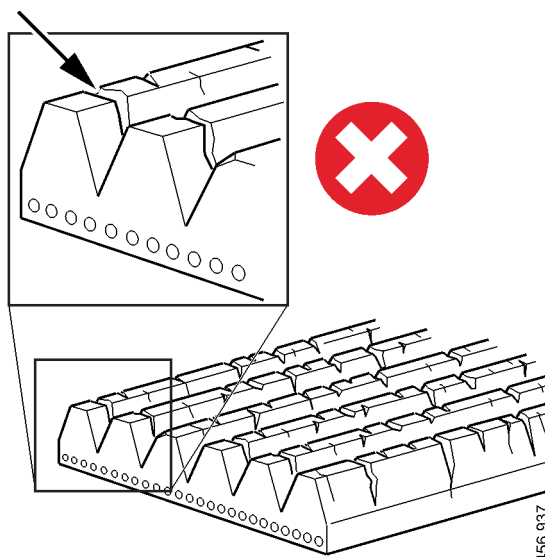
Note:

Small and shallow cracks are normal and appear after only a few hours of operation. They do not need to be changed.

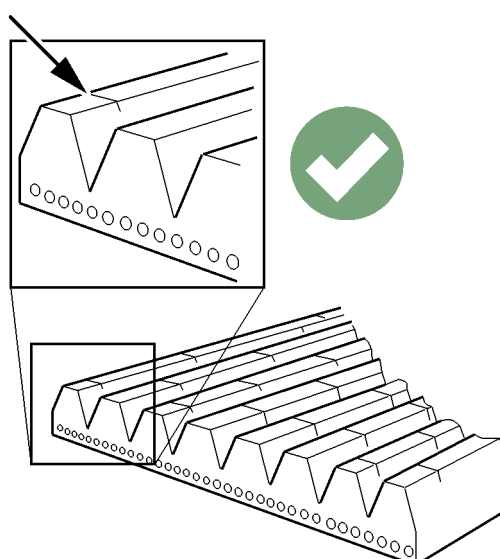
Replace the drive belt if it has many deep cracks or if parts of the belt come loose.



480 103

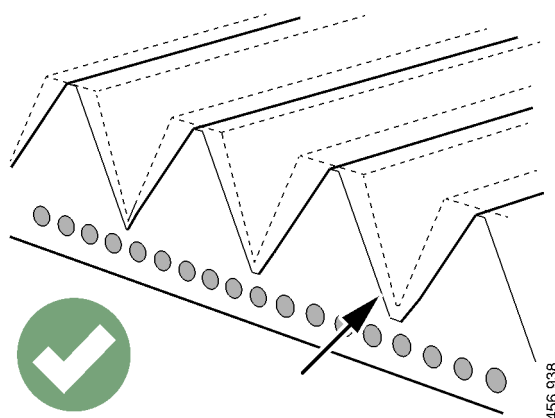
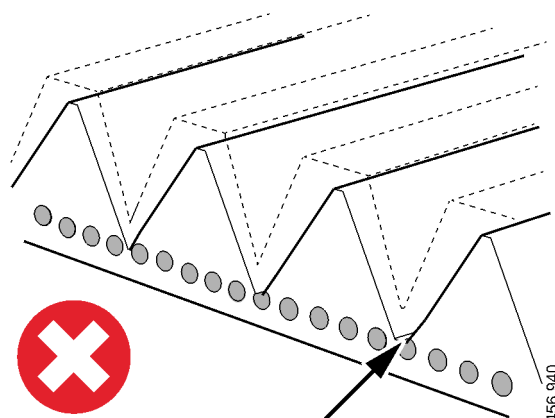


456 937



456 936

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



Checking for leakage



IMPORTANT!

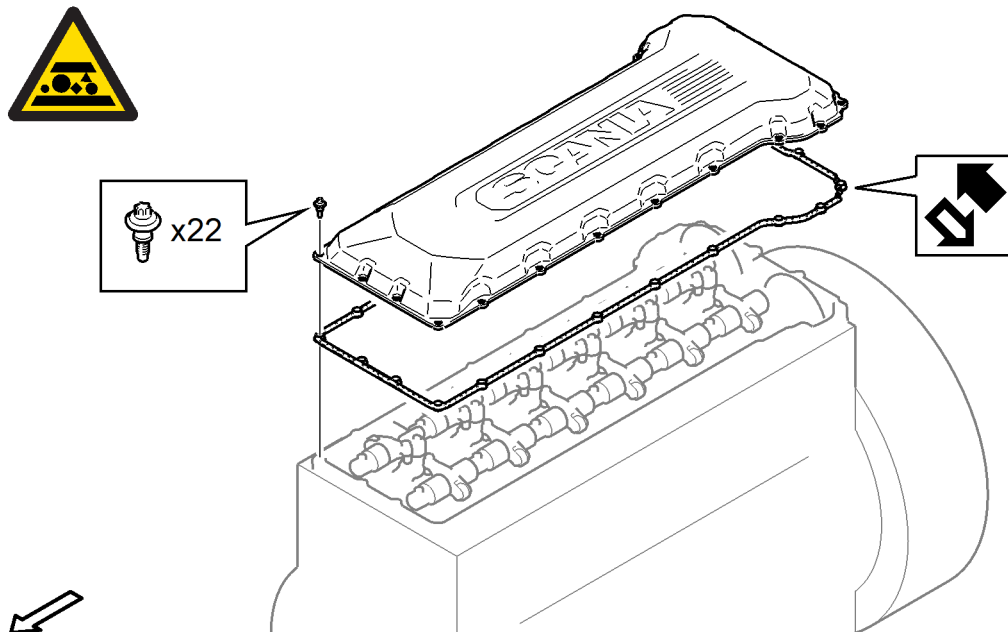
If serious leakage occurs, contact your nearest workshop.

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

Note:

The drain hole is hidden behind the pump pulley and is not visible from the front. Check the lower part of the pump to find the hole.

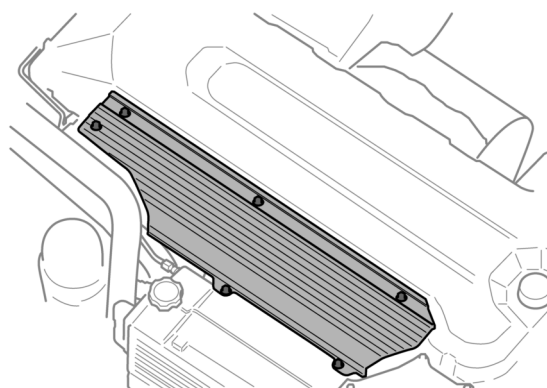
Removing and fitting rocker cover



429 193

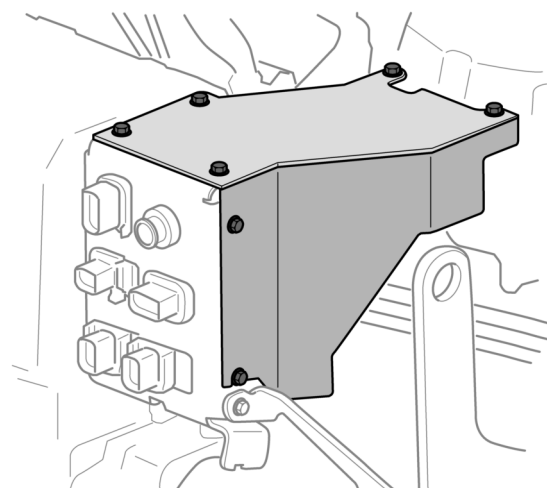
Removal

1. Wash the upper part of the engine. See the section [Cleanliness](#).
2. Remove the catwalk.



479 610

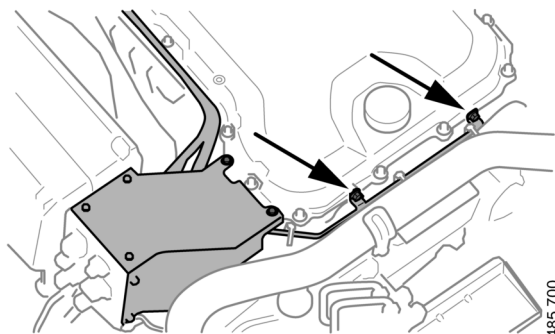
3. Remove the protective plate around the customer interface.



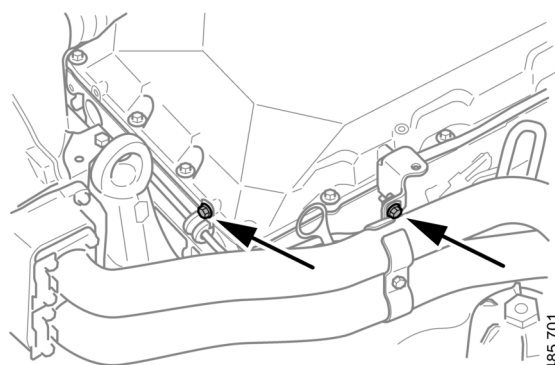
479 660

4. Loosen the cable duct above the flywheel housing.

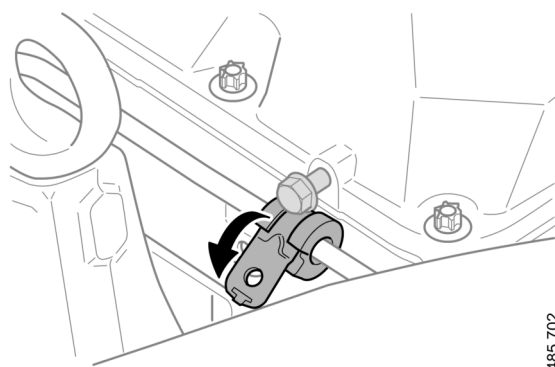
Pry away the cable duct. Insert a screw at each end of the rocker cover to facilitate lifting.



5. Remove the screws for the bleed pipe at the front edge.

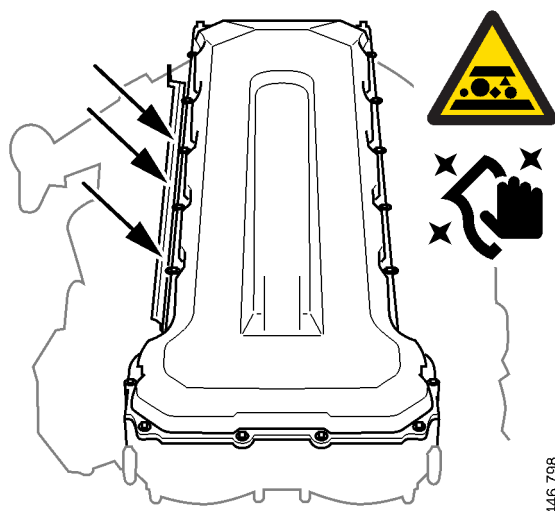


6. Place the bracket to one side. Replace the screw to provide better grip.

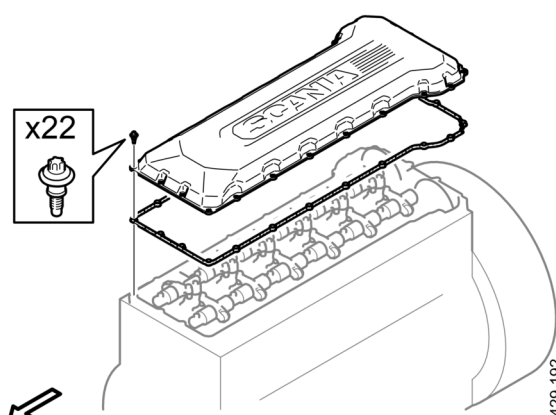


7. Clean the parting plane between the rocker cover and camshaft frame.

Pay particular attention to the area between the cable duct and the rocker cover along the long left-hand side.

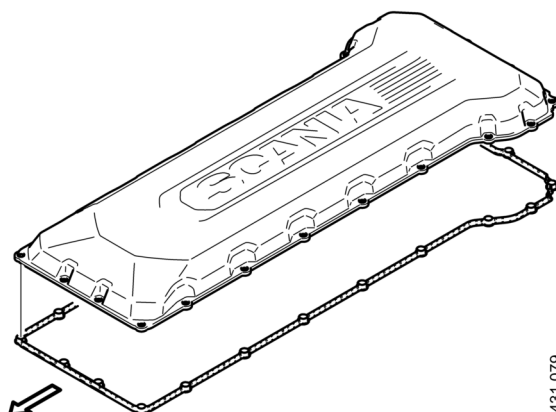


8. Remove the rocker cover.
9. Clean the rocker cover.
10. Place the rocker cover with the sealing surface facing down on a clean workshop bench.
11. Use the rocker cover as protection against dirt in the camshaft frame when taking a break during the work.

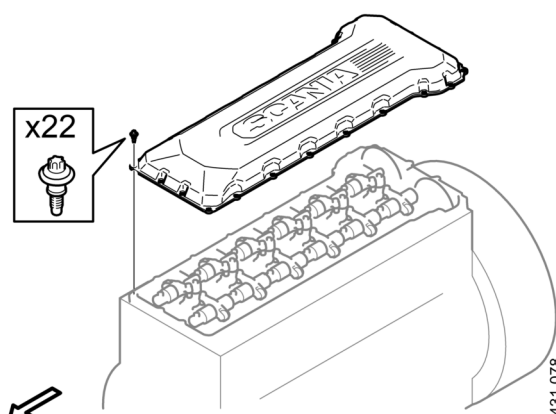


Fitting

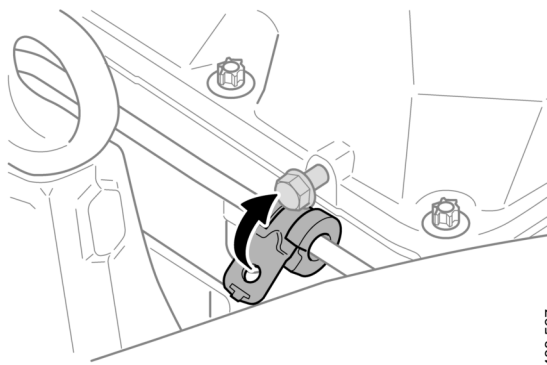
1. Check that the camshaft frame and rocker cover are free of damage.
2. Clean the contact surfaces on the rocker cover and camshaft frame.
3. Install two screws at the ends of the cover for ease of handling.
4. Fit a new gasket in the rocker cover.



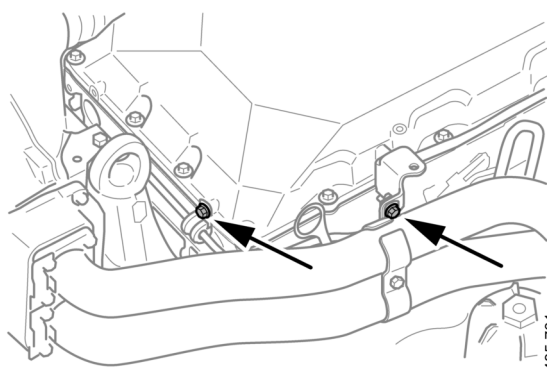
5. Lower the cover straight from the top. Avoid moving the cover sideways.
6. Ensure the gasket is correctly positioned inside the rocker cover.
7. Tighten the aluminium rocker cover to 24 Nm.



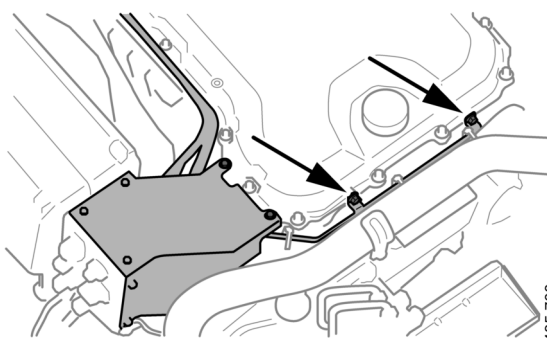
8. Fit the bracket.



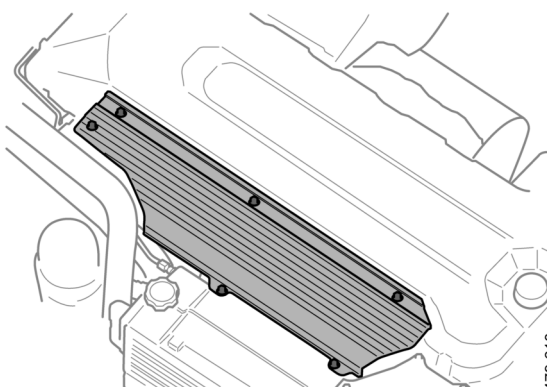
9. Fit the bleed pipe at the front. Switch to shorter screws (M8x15) for the catwalk bracket if necessary.



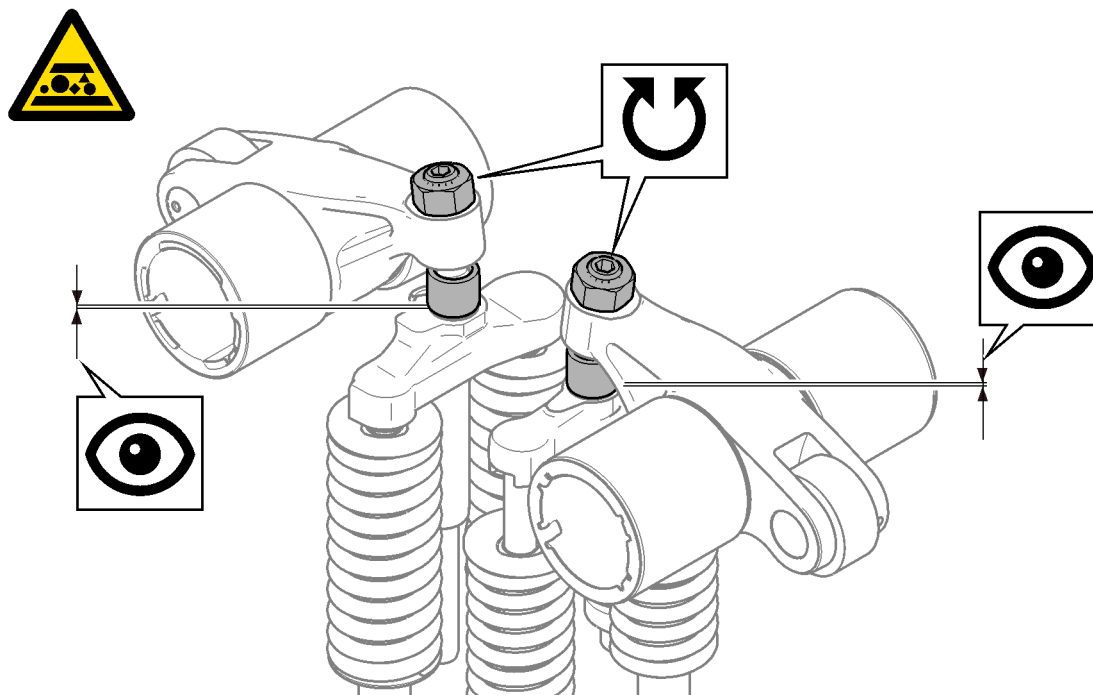
10. Install the cable tray above the flywheel cover and the CAN interface protection plate. Use greyed screws.



11. Fit the catwalk.

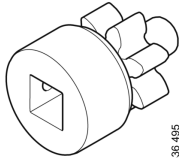
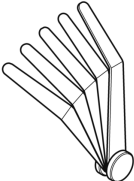
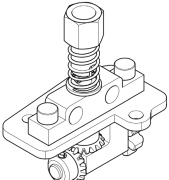


Checking and adjusting the valve clearance



485 697

Tool

Number	Designation	Illustration
2 976 504	Turning tool	
3 027 706	Feeler gauge, valve adjustment 0.35-0.45-0.70-0.80-1.5 mm	
2 794 606	Turning tool for the top side of the flywheel housing	

Tightening torque	
Adjusting screw nut on rocker arm for intake and exhaust valves	35 Nm (26 lb-ft)
Aluminium rocker cover	24 Nm (18 lb-ft)

Valve adjustment



WARNING!

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



WARNING!

This method exposes the cams and there is a increased risk of damage to bearing surfaces. Make sure that no dirt or foreign particles end up in areas covered by the rocker cover.

The rocker cover and the parting plane against the camshaft frame must be cleaned before the rocker cover can be removed.



IMPORTANT!

Check and adjust the valve clearance when the engine temperature falls below 60°C.

Note:

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

Carry out the check and adjustment of the valve clearance at the normal interval, which is every 2,000 operating hours.

1. Read the instructions in the section [Cleanliness](#). If a high-pressure washer is not available, the specific areas you will be working on must be cleaned locally.
2. Remove the lower blanking piece (2).
3. Remove the rubber plug (3).
4. Fit 2 976 504 *Turning tool* if turning is carried out from the bottom, or 3 235 881 *Turning tool for flywheel housings* on the top side if turning is carried out from the top of the flywheel housing.



IMPORTANT!

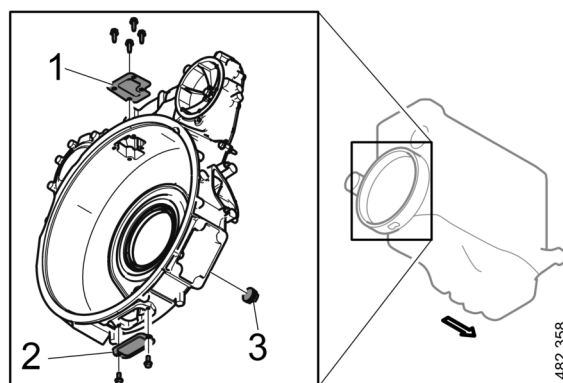
Remember to remove the turning tool from the flywheel following adjustment.



IMPORTANT!

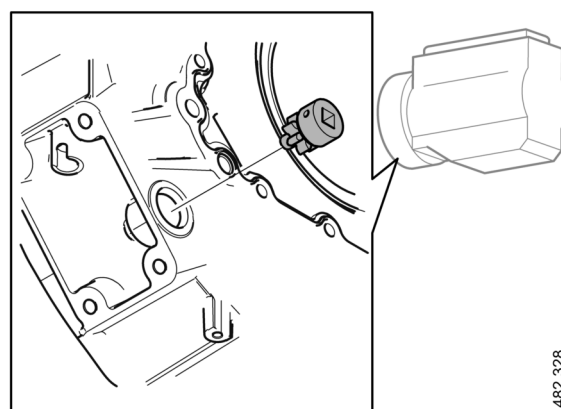
Only hand tools may be used.

5. Remove the rocker cover, see section [Removing and fitting rocker cover](#).



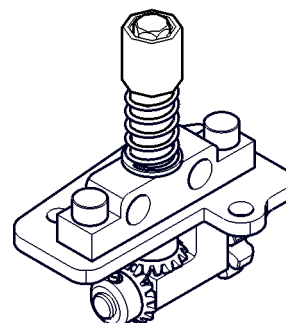
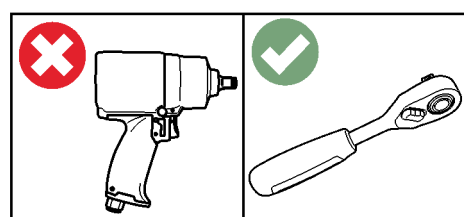
482 358

1. Upper blanking piece
2. Lower blanking piece
3. Rubber plug



482 328

2 976 504 *Turning tool*



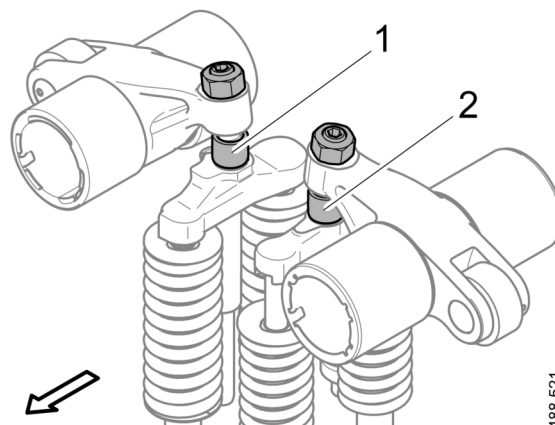
479 688

3 235 881 *Turning tool for the top side of the flywheel housing*

6. Stick the feeler gauge under the pressure pad of the rocker arm.

Adjust the valves using 3 027 706 *Feeler gauge*, valve adjustment 0.35-0.45-0.70-0.80-1.5 mm.

7. Loosen the lock nut.
8. Adjust.
9. Tighten the lock nut.
10. When moving to another cylinder, push aside the protective cover to expose the working area and cover the area you are not working on.



488 521

Tightening torque	
Adjusting screw nut on rocker arm for intake and exhaust valves	35 Nm (26 lb-ft)

Valve clearance	
Intake valve	0.45 mm
Exhaust valve	0.70 mm

11. After moving the rocker cover to a clean workbench, remove the old gasket and wipe off any excess oil from the sealing surface. Use cable ties and fold a paper towel around the top to reach hard-to-reach areas. Wipe the inside of the valve cover clean to avoid spillage during assembly. Clean the crank-case ventilation duct to ensure good sealing.

Valve adjustment procedure

The engine must be cold when the valve clearance is adjusted. Make sure that the clearance between the teeth in the transmission timing gear wheel is behind and not in front of the teeth in the direction of rotation by carrying out the following steps:

1. Turn the flywheel until the mark is in the TDC position.
2. Turn the engine about 20° in the opposite direction of rotation.
3. Rotate the flywheel according to the table below.
4. Adjust the valve clearance.

Adjust all valves in the same cylinders for the same angle.

	Mark on flywheel – lower window	Mark on flywheel – upper window	Cylinder
1 rotation	350±2°	170±2°	1
	110±2°	290±2°	5
	230±2°	50±2°	3
2 rotations	350±2°	170±2°	6
	110±2°	290±2°	2
	230±2°	50±2°	4

5. Adjust the valve clearance.

Make sure that the tip points towards the edge of the flywheel teeth, see illustration.

Adjust all valves of a cylinder to the same angle.

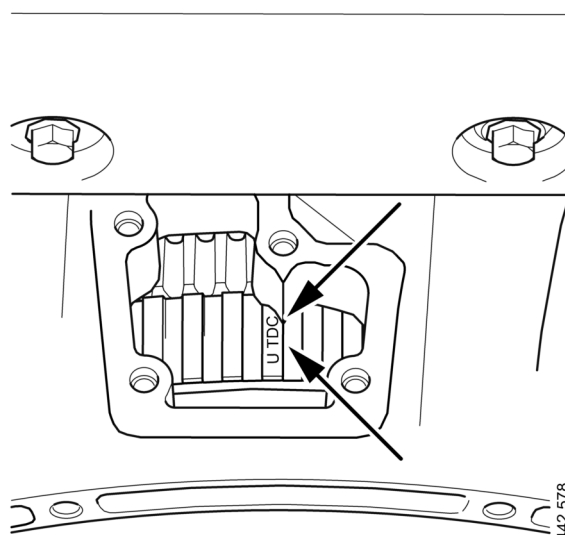
Continue in the direction of engine rotation.

6. Fit the rocker cover, see section [Removing and fitting rocker cover](#)
7. Remove the turning tool.
8. Fit the rubber plug and blanking piece.



WARNING!

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



Renewing the reductant filter

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



WARNING!

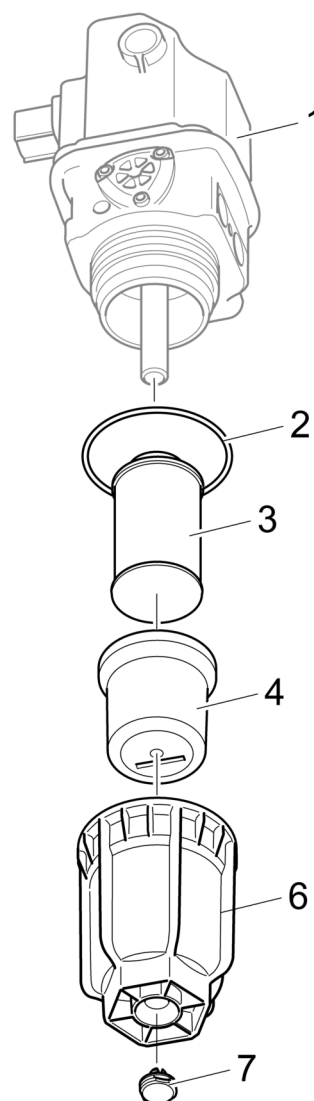
There may be a lot of reductant in the filter housing and it may spill out. Wear protective gloves.



IMPORTANT!

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

3. Remove the sealing diaphragm.
 4. Remove the old reductant filter and fit a new one.
 5. If the frost protection device in the filter housing comes loose, wipe both the frost protection device and filter housing thoroughly so that they are completely dry before they are assembled again.
 6. Wipe the sealing diaphragm and fit it over the filter.
- Ensure that the edge of the diaphragm is sitting in the groove.
7. Lubricate the sealing diaphragm and threads with the accompanying spray.
 8. Renew the O-ring. Place the new O-ring in the filter housing.
 9. Refit the filter housing. Use a 46 mm socket. Tighten to 80 Nm (59 lb-ft).

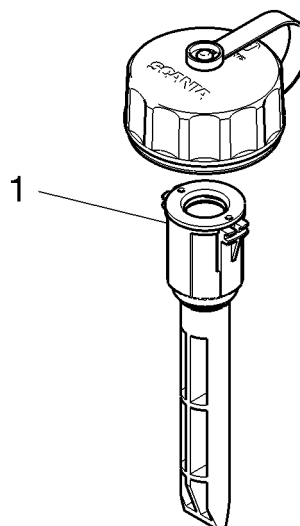


1. Pump
2. O-ring
3. Filter
4. Sealing diaphragm
5. Antifreeze (not illustrated)
6. Filter housing
7. Ventilation cap

457 496

Cleaning the reductant tank filler filter

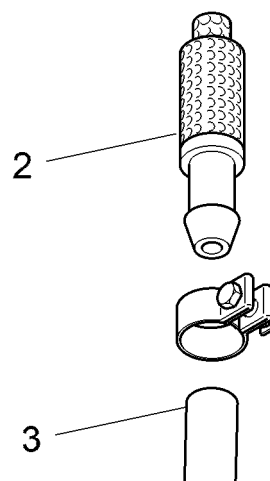
Make sure that the filler filter (1) is clean. If it is dirty: Clean the filler filter with clean water and refit it.



350 114

Checking venting functionality

1. Open the tank filler cover.
2. Remove the ventilation filter (2).
3. Blow air into the hose (3) and check that air passes along the hose and comes out through the filler. If not: Detach the bleed hose and check it and examine the vent opening in the tank. Clean with clean water if necessary.
4. Refit the filler cover.
5. Blow the filter clean; clean it with clean water.
6. Refit the filter.



352 009

Renewing the venting filter

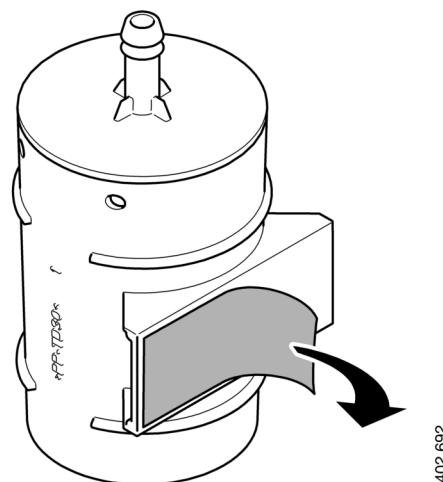
The tank is supplied with a brass filter or with a plastic filter, depending on the variant selected. The plastic filter cannot be cleaned and needs to be renewed regularly.

1. Clean around the bleed hose connection on the tank.
2. Remove the hose and the old filter.
3. Clean the rubber hose.
4. Clean the surface where the filter is to be fitted.
 - Use water and detergent for coarse dirt.
 - Use a degreasing agent for grease and oil.
 - Use chemically clean petrol for adhesive residue.
5. Adjust the venting connection to the correct position.
6. Allow the detergent to evaporate.
7. Fit the filter on the hose.
8. Remove the protective tape from the fuel filter.
9. Fit the filter vertically and hold it for at least 5 seconds.
10. Refit the hose to the tank bleed connection.

Note:

Avoid folding, over stretching or chafing the hose. The ideal fitting temperature is 21°C - 38°C.

The ambient temperature of the filter must not exceed 90°C.



Protective tape on venting filter.

Fuel quality requirements

Quality requirements and testing standards for the most important properties of different types of fuel are described in the Workshop Manual. This can be ordered from Scania dealers or directly from Scania.

Diesel

Characteristics

The quality of the diesel is very important for the operation and service life of the engine and the fuel system, and also for the engine performance.



REQUIREMENT!

The diesel should comply with the requirements of European standards EN590 or EN15940.

However, Scania accepts larger tolerances of certain properties. Please see the table below.

Characteristic	Requirements
Viscosity at 40°C (104°F)	1.4-4.5 cSt
Density at 15°C (59°F)	0.79-0.87 kg/dm ³
Ignitability (CET rating)	minimum 49
Lowest flashpoint	56°C (132°F)
Particulate contamination level	Classification 22/20/17 according to ISO 4406

Sulphur content



IMPORTANT!

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

Sulphur content	Note
0–1,000 ppm ($< 0.1\%$)	Normal oil change interval.
1,000–2,000 ppm ($0.1\text{--}0.2\%$)	Oil change intervals must be reduced to 80% of the regular interval.
2,000–4,000 ppm ($0.2\text{--}0.4\%$)	Oil change intervals must be reduced to 60% of the regular interval.
Over 4,000 ppm ($> 0.4\%$)	Fuels with a sulphur content over 4,000 ppm ($> 0.4\%$) must not be used

Temperature dependence of diesel



IMPORTANT!

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

It is not permissible to mix petrol with diesel. In the long term petrol can cause wear in the injectors and engine.

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

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

Biodiesel (FAME)

Use of biodiesel



IMPORTANT!

For engines with SCR systems, a maximum of 20% mixture of biodiesel should be used.

Scania uses the term biodiesel to refer to a renewable diesel made from greases or oils and methanol. The biodiesel should conform to the requirements of European standard EN 14214 or Brazilian standard ANP-45. For biodiesel in accordance with EN 14214 or ANP-45, the generic term FAME is frequently used.

Normal diesel in accordance with EN 590 can contain up to 7% biodiesel from the diesel supplier. There are grades of diesel that comply with EN 590 but contain a higher mixture of biodiesel.

Storage of biodiesel



IMPORTANT!

Biodiesel must not be stored for more than 6 months.

Biodiesel has a maximum storage life of 6 months from the date of production to the expiry date. Biodiesel is affected by light, temperature, water, etc. during storage, which affects the characteristics and durability of the biodiesel.

Biodiesel also has lower stability against oxidation than diesel. This can result in a thickening of the biodiesel and blocking of parts of the fuel system, e.g. the fuel filter. Bacterial growth can occur when biodiesel is stored in a tank in unfavourable conditions. Avoid storage in barrels or auxiliary tanks, except when fuel turnover rates are high. Check tank cleanliness whenever refuelling takes place.

If the engine has been refuelled with biodiesel, and is stationary for a long period, condensation water can form in the fuel tank resulting in bacterial growth.

See also the section [Preservative fuel](#).

Renewable diesel (HVO)

HVO is a synthetic diesel which is manufactured through the hydrogenation of plants and animal fats. To the user, HVO is reminiscent of diesel in accordance with EN590, apart from HVO having a somewhat lower density.

Scania approves the use of up to 100% HVO for all engines in accordance with the European standard EN 15940.

Gas-to-liquids (GTL)

GTL is a synthetic fuel that is often refined from natural gas. To the user, GTL is reminiscent of diesel in accordance with EN590, apart from GTL having a somewhat lower density and less odour.

Scania approves the use of up to 100% GTL in accordance with the European standard EN 15940.

DMX and DMA diesel

DMX diesel is a distilled diesel intended for marine emergency power supplies. DMA diesel (also called marine gas oil, MGO) is a distilled diesel intended for general marine use.

Scania approves the use of DMX and DMA fuels that comply with ISO 8217.

DMX and DMA diesels normally cause increased wear on the injection system. As a result of the high sulphur content in these types of diesel, 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 diesels, 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 instructions in 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 diesel.

Reductant for SCR



IMPORTANT!

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



REQUIREMENT!

In order for the emission control to meet the emission requirements set by the public authorities, the reductant should be specified in accordance with ISO 22241.

Reductant is a solution consisting of urea and water, and is usually called AdBlue®, DEF, ARLA 32 eller AUS 32 depending on the market. If the engine is fitted with an SCR system, the reductant is added to the exhaust gases upstream of the catalytic converter. This reduces nitrogen oxide emissions.

Reductant in accordance with ISO 22241 contains 32.5% by weight of urea and freezes at approximately -11°C (12°F). When the solution freezes, ice and urea always maintain the same concentration. Always store reductant at a temperature between -11°C and 30°C (12-86°F).

Rec. % by weight of urea	Limit values according to ISO 22241
32.5%	31.8-33.2%

Reductant is normally colourless if no dye has been added. It is not harmful to the skin. Nor is it toxic in small quantities, but it tastes very unpleasant.

Reductant is highly corrosive. Therefore, rinse any reductant spillage from connections and other details using lukewarm water. Water works very well for cleaning purposes. Please use hot water. If reductant seeps into electrical connections or electrical cables, these must be renewed.

Reductant has a low surface tension and rapidly spreads over large areas, which then become very slippery.

Reductant can dry out and form white or greyish brown crystals or deposits that can be washed away with warm water.

The risk of crystal formation increases with low outdoor temperatures. When the outdoor temperature is below -20°C (-4°F), reductant dosing is switched off to avoid the risk of crystals forming in the SCR system.

Evaporation of hydrocarbons (HCEC)

In long-term operation with low engine load or low exhaust gas temperature, unburned hydrocarbons (HC) can accumulate in the SCR system.

If a high amount of accumulated hydrocarbons is detected, the engine control system issues a warning to inform the operator that controlled evaporation of hydrocarbons is required.

A gradual heating of the exhaust system reduces the risk of uncontrolled temperature increase in the exhaust gas after-treatment management system.

For more information, see section [Driving, Accumulation of hydrocarbons in the SCR system](#)

Engine preservation

Note:

The engine should be stored indoors, in a temperature-controlled room with constant (or near constant) temperature, protected from dirt and dust.



WARNING!

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

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.

On delivery, the engine is protected by so-called VCI plastic. Provided that the VCI bag is intact and has not been removed, the engine can be stored for 3 years without any action required. After 3 years, the engine must be preserved again and the battery must be renewed.

The interval between each new Preparing for storage is then 24 months and the bag is renewed.

The VCI bag must be inspected at least once a year. If the plastic is missing or broken, it must be replaced with a new one immediately.

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

Preparation means that the following measures are taken:

- The engine is cleaned thoroughly.
- 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 products

Preservative oil

Use a normal engine oil that meets the requirements in the [Oil grade](#) section.

Preservative coolant

Use coolant containing 50% by volume of glycol. Example: BASF MPG Glyscorr P113 and Valvoline Zerex P113 FP.

Preservative fuel

Preservative fuel must not contain biodiesel. Even small amounts of 5-10% biodiesel can have adverse effects on the engine when in long-term storage.

Long-term storage of diesel, where the diesel comes into contact with water, may lead to the growth of micro organisms (bacteria and fungus).

In order to minimise the growth of micro-organisms, preservative fuel should contain the following additives. The additives should be selected and added by the fuel supplier.

Preservative fuel should comply with the following requirements:

- 0% biodiesel.
- Max. sulphur content 50 ppm.
- Max. water content 200 ppm.
- The fuel must contain additives to stop the growth of micro-organisms.

Reductant

Over time, the water in the reductant evaporates and there is only urea left. The reductant then begins to crystallise. The reductant tank is not sensitive to crystals, but the ball valves in the reductant pump may become clogged. However, note that corrosion or other particles can also clog the ball valves.

All connections in the SCR system must be sealed before storage, so that the water in the reductant does not evaporate. The SCR system should then be stored in a cool location and not in direct sunlight. If the reductant tank has never been filled with reductant, it can be stored when empty for an unlimited time.

When the engine is taken into operation again, all reductant must be drained and changed. If old reductant is used, the SCR system will not work.

Preparations for storage



Environment

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

Note:

Do not remove the injectors.

1. Remove plugs and tape from the coolant connections, air intake and exhaust pipe.
2. Drain the oil.
3. Renew the oil filter and fuel filter.
4. Fill with engine oil to the minimum level on the oil dipstick.
5. Drain and flush the cooling system of any old coolant.
6. Top up with preservative coolant.
7. Mix preservative fuel in a can. Detach the fuel pipe at the feed pump suction pipe and connect a hose from the can.
8. Detach the fuel pipe at the overflow valve and connect a return hose to a separate can.
9. Connect and bleed the fuel system.
10. Start the engine and run it at about 1,100 rpm for 20 minutes.
If the engine has an SCR system and the reductant tank is empty, it is possible to run the engine for this limited time without damaging the components of the SCR system. This applies if the engine is run without load.
11. If the engine has an SCR system and the reductant tank is full of reductant: Seal all connections in the SCR system.
12. Remove the rocker cover and lubricate the valve mechanisms, camshafts, roller tappets and gear transmission with plenty of preservative oil. Refit the rocker cover.
13. 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.
14. Renew the filter element in the air cleaner.
15. Cover the air intake and exhaust pipe.
16. Spray the alternator and starter motor with water-repellent anti-corrosive oil: CRC 226, LPS1 or the equivalent.
17. Spray the outside of smooth engine parts, first with penetrating preservative oil such as Dinitrol 25B and then with Dinitrol 112 or equivalent.
18. Clearly mark the engine with the storage preparation date, and state that the engine must not be started or cranked.

Batteries



WARNING!

Wear protective gloves and eye protection 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 preparation, the engine should be stored indoors in a dry location at room temperature. The engine must be packed in packaging made of VCI plastic to protect against dust, dirt and moisture.

When the engine is to be taken into operation again

1. If the engine is fitted with an SCR system:
Drain and clean the reductant tank and fill with new reductant.
2. Remove plugs and tape from the coolant connections, air intake and exhaust pipe.
3. Fill the cooling system with coolant.
4. Drain the preservative oil.
5. Renew the oil filter and fuel filter.
6. Fill with new engine oil.
7. Remove the rocker cover and lubricate the valve mechanisms, camshafts, roller tappets and gear transmission with plenty of preservative oil. Refit the rocker cover.
8. Drain the preservative fuel from the fuel manifold.
9. Connect and bleed the fuel system.
10. Wash off any preservative oil on the outside using white spirit.

Technical data

General data

Number of cylinders and configuration	6, straight
Working principle	4-stroke engine
Displacement (dm ³ /in ³)	12.7/775.0
Approximate weight, without coolant and oil (kg/lb)	
With heat exchanger	1 295/2 855
With keel cooling	1 240/2 734
Cylinder diameter (mm/in)	130/5.12
Piston stroke (mm/in)	160/6.3
Compression ratio	
504M/505M/506M/507M	19:1
Firing order	1 - 5 - 3 - 6 - 2 - 4
Camshaft	Double overhead (DOHC)
Engine direction of rotation viewed from rear	Anticlockwise
Fan direction of rotation viewed from front	Clockwise
Valve clearances, cold engine	
Intake valve (mm/in)	0.45/0.018
Outlet valve (mm/in)	0.70/0.028
Number of teeth on the flywheel	152
Low idling (rpm)	600
Maximum full-load speed (rpm)	2,100
Fuel	Diesel

Intake system

Permissible pressure drop in the intake system with cleaned or new filter (mbar/psi)	32/0,46
Permissible pressure drop in the intake system with blocked (dirty) filter (mbar/psi)	65/0.94

Fuel system

Injection system	XPI
Control system	EMS S10 (CEM1)
Fuel filter	Scania polymer filter
Fuel filter with water separator	Scania polymer filter

Lubrication system

Oil consumption (g per kWh/lb per hph)	<0.2/<0.0003
Oil pressure (bar/psi)	
Normal with hot engine and nominal engine speed	3-6/43.5-87
Minimum permitted at idling speed	1.8/26.11
Oil thermostat opening temperature (°C/°F)	93/199
Normal oil temperature (°C/°F)	90–110/194-230
Oil cooler	Cooled with coolant, full flow

Cooling system

Coolant	See chapter Coolant
Charge air cooler	Sea water cooled
Coolant volume (dm ³ /US gallons)	
With heat exchanger	50/13.2
With keel cooling	35/9.3
Coolant temperature (°C/°F)	
With heat exchanger	85–95/185–203
With keel cooling	70–85/158–185
Number of thermostats	1
Thermostat opening temperature (°C/°F)	
With heat exchanger	80/176
With keel cooling	70/158

Electrical system

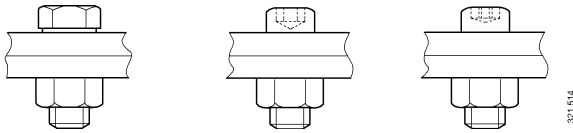
Type	2-pin, 24 V, DC
Starter motor, standard equipment	2-pin, 24 V, 7.0 kW
Alternator, standard equipment	2-pin, 24 V, 100 A

Tightening torque for screw joints

Screws and nuts

Hexagon screws, hexagon socket screws, Torx screws, hexagon nuts

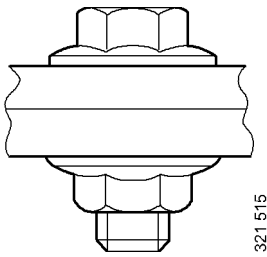
Metric thread. Strength class 8.8/8.



Thread	Tightening torque	
	Nm	Lb-ft
M4	2.9	21
M5	6	4
M6	9	7
M8	21	18
M10	42	35
M12	72	62
M14	135	100
M16	210	155
M18	290	214
M20	420	310
M22	580	428
M24	730	538

Flange screws with hexagonal head and hexagonal flange nuts

Metric thread. Strength class 8.8/8.

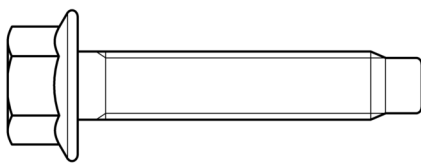


Thread	Tightening torque	
	Nm	Lb-ft
M5	6.7	5
M6	10.2	8
M8	26	19
M10	50	37
M12	92	38
M14	149	110
M16	184	136

Self-tapping flange screws with hexagon head, MPoint

Only use Mpoint in joints intended for this type of screw.

Metric thread, coarse pitch.



Thread	Tightening torque Class 8.8		Tightening torque Class 10.9	
	Nm	Lb-ft	Nm	Lb-ft
M5	5.5	4.1	7.5	5.5
M6	9.5	7	13	9.6
M8	23	17	30	22.1
M10	45	33.2	60	44.3
M12	80	59	105	77.4
M14	125	92.2	180	132.8
M16	195	143.8	275	202.8
M20	380	280.3	550	405.7

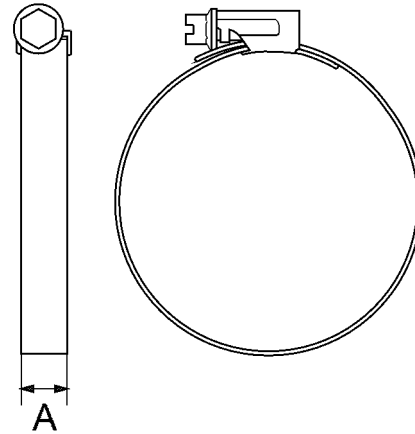
Hose clamps

Specifications in the tables show tightening torque when tightening by hand.

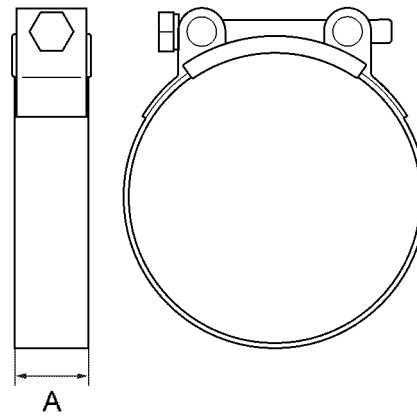
Note:

The maximum tightening torque for a new unfitted hose clamp is 1 Nm (0.7 lb-ft).

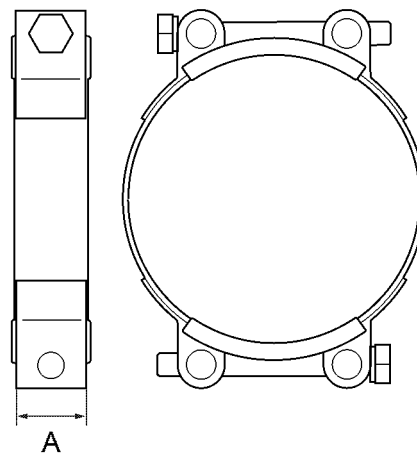
A = width (mm)	Tightening torque	
	Nm	Lb-ft
7.5-9	1.5	1
12	5	4
20	10	7
25	20	15



456 919



456 920



456 921

Scania Assistance

Wherever you are, you can always get assistance from Scania's service organisation, Scania Assistance, 24 hours a day, every day of the year.

Always call the contact for your country.

Country	Tel.	Country	Tel.
Austria	+43 1 256 44 11	Latvia	+371 29 44 24 24
America	+1 (0) 800 272 2642	Lithuania	+46 8 52 24 24 24
America	1 800 272 2642	Luxembourg	+32 2 264 00 00
Argentina	800,999,722,642	Malaysia	1800 08 8500
Australia	611300722642	Malaysia	6035590907
Belgium	+32 2 264 00 00	Mexico	543327451092
Botswana	+267 72 102 591	Morocco	3222640000
Brazil	8000194224	Namibia	264634461352
Bulgaria	+359 88 666 0001	Netherlands	+31 76 52 54 111
Chile	188,800,722,642	Norway	+47 223 217 00
Colombia	1800184548	Peru	0800-51-727
Czech Republic	+420 225 020 225	Peru	(01)512-1877
Denmark	+45 333 270 44	Poland	+48 22 331 22 33
Estonia	Tallinn: +372 5153 388	Portugal	+34 91 678 9247
Estonia	Tartu: +372 5126 333	Romania	+40 723 27 27 26
Estonia	Pämu: +372 5071 477	Russia	+7(495) 925 77 75
Estonia	Rakvere: +372 5074 655	Singapore	6565917180
Finland	+358 10 555 24	Slovakia	+421,903,722,048
France	+33 2 414 132 32	South Africa	0 800 005 798
Germany	+49 261 887 8888	South Africa	+27 11 226 5005
Great Britain	0 800 800 660	Spain	+34 91 678 80 58
Great Britain	441274301260	Sweden	+46 42 100 100
Hungary	+36,209,727,197	Switzerland	+41 800 55 24 00
Ireland	+353 71 963 4000	Thailand	66819397525
Italy	+39046 1996222	Thailand	+1800 019 88
Latvia	+46 8 52 24 24 24	Uruguay	0 800 835 1

Other countries: +46 8 52 24 24 24

Note:

Calls will be recorded for training purposes.