

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.

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



WARNING!

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

Operator's manual

DC13 XPI Industrial engine

en-GB 3 244 148

Issue 1.0



IMPORTANT!

The owner is responsible for making sure that maintenance is carried out on time and in accordance with the instructions.

The owner must entrust the maintenance, renewal and repair of emission-related components and systems to a qualified workshop or person.



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.

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Start of warranty

The more we know about you, your company and your equipment, the more effectively we can adapt our services to you. If you have started to use a new Scania engine, it is very important that you send in the warranty start report to us immediately. Quite simply, we need to register all the details on engine ownership etc., so we can monitor it for you.

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

Telephone number

E-mail address

Address

Postcode

Postal town

State/County

Country

Scania Power Solutions engine warranty for industrial engines

Emission control systems warranty for USA



IMPORTANT!

Only applicable to engines used in the U.S.A.

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Emission control system warranty statement

General warranty provisions

The emission control systems of your new Scania Engines ("Scania") industrial 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 industrial diesel engine ("You") that the 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, for their full useful life and designed, built and equipped so as to conform with all applicable regulations adopted by the California Air Resources Board pursuant to its authority under Chapters 1 and 2, Part 5, Division 26 of the California Health and Safety Code, 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 or otherwise cause the failure of a warranted part to be identical in all material respects to the part as described

in the engine manufacturer's application for certification.

Where a warrantable condition exists, Scania will repair your heavy-duty off-road engine at no cost to You including diagnosis, parts, and labor.

Warranty period

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

- 3,000 hours of operation as determined by a device to measure hours of use, or
- Five years

Each engine is equipped with a device to measure hours of use. If that device fails to account for hours of use due to defects in materials or workmanship, the engine shall be warranted for a period of five years. The warranty period shall begin on the date the engine is delivered to the first ultimate purchaser who, in good faith, purchases the engine for purposes other than imminent resale.

The Warranty on emission-related parts shall be interpreted as follows:

1. Any warranted part which is not scheduled for replacement as required maintenance in Scania's written instructions for maintenance and use of the engine by owner shall be warranted for the warranty period defined above. If any such part fails during the period of warranty coverage, it shall be repaired or replaced by the engine manufacturer according to Subsection (4) below. Any such part repaired or replaced under the Warranty shall be warranted for the remaining warranty period.
2. Any warranted part which is scheduled only for regular inspection in Scania's written instructions for maintenance and use of the engine by owner shall be warranted for the warranty period defined above. A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period.

3. Any warranted part which is scheduled for replacement as required maintenance in Scania's written instructions for maintenance and use of the engine by owner shall be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by the engine manufacturer according to Subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remainder of the period prior to the first scheduled replacement point for the part.
4. Repair or replacement of any warranted part under the warranty provisions of this article shall be performed at no charge to the owner at a warranty station.
5. Notwithstanding the provisions of Subsection (4) above, warranty services or repairs shall be provided at all manufacturer distribution centers that are franchised to serve the subject engines.
6. The owner shall not be charged for diagnostic labor that leads to the determination that a warranted part is in fact defective, provided that such diagnostic work is performed at a warranty station.
7. The engine manufacturer shall be liable for damages to other engine components proximately caused by a failure under warranty of any warranted part.
8. Throughout the engine's warranty period defined above, the engine manufacturer shall maintain a supply of warranted parts sufficient to meet the expected demand for such parts.
9. Any replacement part, as defined in Section 1900(b), Title 13 of the California Code of Regulations, may be used in the performance of any maintenance or repairs and must be provided without charge to the owner. It is not necessary for replacement parts to be the same brand or by the same manufacturer as the original part sold with the engine. Such use shall not reduce the warranty obligations of the engine manufacturer.
10. Add-on or modified parts, as defined in Section 1900(b), Title 13 of the California Code of Regulations, that are not exempted by the California Air Resources Board may not be used. The use of any non-exempted add-on or modified parts shall be grounds for disallowing a warranty claim made in accordance with this article. The engine manufacturer

shall not be liable under this article to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part.

11. The Executive Officer of the California Air Resources Board may request, and in such case, the engine manufacturer shall provide, any documents which describe that manufacturer's warranty procedures or policies.

Parts covered by the Warranty

The following is a list of parts considered to be part of the Emission Control Systems covered by the Emission Warranty for Scania industrial engines which were built to conform to federal and California emission control regulations:

1. Fuel injection system.
2. Air induction system.
3. Exhaust manifold system.
4. Smoke puff limiter (included in ECU).
5. Oil filler cap.
6. EGR system (when applicable):
 - a) Cooler.
 - b) EGR valve.
7. Exhaust brake (when applicable).
8. NOx sensors:
 - a) NOx sensor, engine out.
 - b) NOx sensor, tail pipe.
9. DOC (when applicable).
10. SCR system:
 - a) DEF tank.
 - b) DEF tank level, temperature and quality sensors.
 - c) DEF hose.
 - d) DEF injector.
 - e) DEF injector pressure and temperature sensors.
 - f) Evaporator.
 - g) SCR catalyst inlet temperature sensor.
 - h) SCR catalyst including the ammonia-slip catalyst.
 - i) SCR control unit (EEC3).

11. Miscellaneous items used in the above system:

- a) Electronic control unit (ECU), sensors, wiring harnesses.
- b) Hoses, belts, connectors, assemblies, clamps, fittings tubing, sealing gaskets or devices and mounting hardware.
- c) Pulleys, belts and idlers.
- d) Emission control information label.



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.
- Emission related parts scheduled for inspection and replacement only as necessary are not considered expendable and if repaired or replaced under warranty shall be warranted for the remaining warranty period.

See Specific Warranty Exclusions below.

General warranty limitations

To retain the dependability of the exhaust emission control originally built into your Scania industrial diesel engine, it is essential that the engine is installed according to Scania installation instructions and emission certificates. Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with state or federal emissions requirements. The use of alternative fuels shall not void the warranties on any engine certified to use such fuel.

In addition, as the engine owner, You are responsible for the performance of all scheduled maintenance listed in your owner's manual, and all necessary repairs, on your new Scania industrial diesel engine. Scania may deny a warranty claim if the engine or part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

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 engine with the emission warranted engine. Scania cannot, however, deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

The Warranty covers the cost of diagnosis, 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.

You are responsible for initiating the warranty process. The California Air Resources Board suggests that You present your heavy-duty off-road engine to an authorized Scania dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.



IMPORTANT!

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.
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.
6. Inconvenience, loss of use of the engine or commercial loss.
7. Any engine on which the actual use cannot be accurately determined due to a failure of the device to track hours of use unrelated to defects in materials or workmanship.
8. Any engine 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

California customers shall also be furnished a copy of the California Emission Control Warranty Statement applicable to each new Scania engine purchased.

Emission control warranty statement for California, USA

Your warranty rights and obligations

The California Air Resources Board is pleased to explain the emission control system warranty on your 2024 engine. In California, new heavy-duty off-road engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Scania CV AB must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, Scania CV AB will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts and labor.

Manufacturer's warranty coverage

The 2024 heavy-duty off-road engines are warranted for a period of five years or 3,000 hours, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by Scania CV AB.

Owner's warranty responsibilities

- As the off-road engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Scania CV AB recommends that you retain all receipts covering maintenance on your off-road engine, but Scania CV AB cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.
- As the off-road engine owner, you should however be aware that Scania CV AB may deny you warranty coverage if your off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
- Your engine is designed to operate on ultra low-sulfur diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.
- You are responsible for initiating the warranty process. The ARB suggests that you present your off-road engine to a Scania CV AB dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact Scania U.S.A. Inc +1-210-403-0007.

SCR catalytic converter



WARNING!

The SCR catalytic converter contains vanadium pentoxide, a chemical known to the State of California to cause cancer.

The SCR catalytic converter is fitted in the silencer and does not constitute a health hazard during normal use and handling.

When carrying out work on the SCR catalytic converter which may result in exposure to dust, safety precautions must be taken. Such work includes, for example, opening the silencer machining and scrapping the SCR catalytic converter.

Safety precautions when working on the SCR system.

- Inhalation: If dust is inhaled, the person should be provided with fresh air immediately. Seek medical attention.
- Eye contact: Rinse eyes with water immediately. If irritation persists, seek medical attention.
- Skin contact: Wash with water and soap. Remove contaminated clothes.
- Ingestion: If large amounts have been ingested, drink plenty of water and induce vomiting. Seek medical attention.

Environmental hazards

- Vanadium pentoxide is toxic to water organisms and can cause detrimental long term effects to water environment.

Environmental protection measures

- The SCR catalytic converter is a manufactured article that contains vanadium pentoxide, a hazardous substance. Before disposing of, or scrapping, a spent SCR catalytic converter, it should be tested for any hazardous characteristics (ignitability, corrosivity, reactivity, acute hazardousness, and toxicity), as those categories are described in 22 CCR § 66261.30. If the spent SCR catalytic converter exhibits hazardous characteristics and is being disposed of, it will be considered by the State of California to be a hazardous waste subject to Title 22, California Code of Regulations. Before disposing of hazardous waste, review and follow all pertinent federal and California requirements.
- Vanadium pentoxide is a listed commercial chemical product - P120 - pursuant to 22 CCR § 66261.33(e). According to the State of California, commercial chemical products that are discarded or intended to be discarded are hazardous wastes and are subject to all provisions of Title 22, California Code of Regulations. Before disposing of vanadium pentoxide, review and follow all pertinent federal and California requirements.
- If the SCR catalytic converter is opened for maintenance, any dust spillages from the catalyst should be collected and tested for the presence of vanadium pentoxide prior to proper disposal. Dust spillages should also be tested for any hazardous characteristics (ignitability, corrosivity, reactivity, acute hazardousness, and toxicity), as those categories are described in 22 CCR § 66261.30, prior to proper disposal. If the dust contains either vanadium pentoxide or exhibits hazardous characteristics and is being disposed of, it will be considered by the State of California to be a hazardous waste subject to Title 22, California Code of Regulations. Before disposing of hazardous waste, review and follow all pertinent federal and California requirements.

- Do not dispose of the spent SCR catalytic converter or its constituent parts into any waterways, storm drains or sanitary sewers.

**WARNING!**

The SCR catalytic converter contains vanadium pentoxide, a chemical known to the State of California to cause cancer.

Additional considerations when working on the SCR system

- Carry out work on the SCR catalytic converter in all well ventilated area. Use protective goggles and gloves if there is any risk of splashing or spraying of reductant or coolant.
 - When engine is running, the exhaust system parts can reach such high temperatures that there is a risk of personal injury. Make sure that the exhaust system temperature has decreased to a suitable level before starting to work.
 - The SCR system is heated by water from the engine cooling system. The cooling system runs at overpressure and when the engine is hot the coolant is hot. Do not open any hoses without first stopping the coolant flow in the hose.
 - A P3 type respirator/filter mask or a type FFP3 fine dust mask, protective goggles and gloves should be used for any work where there is a risk of exposure to dust from the SCR catalytic converter.
 - Use a disposable overall and dispose of it properly after machining.
 - Eating, drinking or smoking while working is not permitted.
- Any dust from the SCR catalytic converter should be removed using a vacuum cleaner with microfilter to minimise exposure.
 - Make sure that the work surface is cleaned after completed work; Vacuum first then swab.
 - Make sure you clean your hands after working with SCR catalytic converter to avoid ingestion.
 - Work done on the SCR catalytic converter may generate waste considered by the State of California to be a hazardous waste subject to Title 22, California Code of Regulations. Before disposing of hazardous waste, review and follow all pertinent federal and California requirements.

Introduction

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

The engines are direct-injection, liquid-cooled, four-stroke diesel engines with turbochargers. Certain engines are also equipped with exhaust gas aftertreatment management systems.

The engines are available with different output and engine speed settings. Engine power for the engine ordered is indicated on a plate located on the flywheel housing.

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.

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.

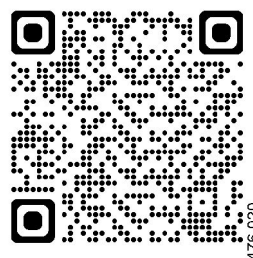
Select language for download

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

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

Power classes

Scania supplies engines in 4 different power classes:

ICFN, Continuous service: Intended for continuous operation and an unlimited number of operating hours per year at a total load factor of 100% provided that the engine speed is at a minimum of 85% of the nominal value of the engine. 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 rotational speed.

IFN, Intermittent service: Intended for periodic use, where the rated power is available for 1 hour per 6-hour period. The total load factor must not exceed 80% of the rated power. Unlimited number of operational hours per year.

PRP, Prime Power: Intended for continuous use and an unlimited number of operational hours with varying loads. For continuous operation and unlimited annual operating time with varying loads. Max. average load factor of 70% of rated power during 24 hours of operation. Permissible overload of max. 110% for maximum of 1 hour in 12-hour period. Max. 25 hours accumulated service time over 100% load per year. This power class applies to single-speed engines.

COP, Continuous power: Intended for continual use with a non-varying load and an unlimited number of operational hours.

The engine serial numbers and power 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

PRP, Prime power

COP, Continuous Power

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 vehicles.

<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.

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.

Other symbols

For more information, see section *Maintenance*.



Dirt warning. Risk of engine breakdown.



Clean, remove dirt, lubricant or stains.

Warnings and advisories

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 [Quality requirements for fuel](#) 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 or AUS 32) is used 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 in contact with the skin: Wash with soap and plenty of water.
- If reductant splashes in the 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 with 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



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.



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.



WARNING!

Respiratory protective equipment/filter mask of the P3 type, eye protection and gloves should be used for any work where there is a risk of exposure to hazardous particles from the particulate filter. Safety clearance for unprotected people is 3 m.

Any particles must be removed with a vacuum cleaner to minimise exposure. The vacuum cleaner must be equipped with a HEPA filter that can filter out particles down to a particle size of 0.3 µm.

To avoid ingestion, do not eat, drink or smoke while work is in progress. Make sure you clean your hands after working on the particulate filter.



Environment

The oxidation catalytic converter, the particulate filter and the SCR catalytic converter contain precious metals and must be processed in compliance with local 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.

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



Environment

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

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.

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!

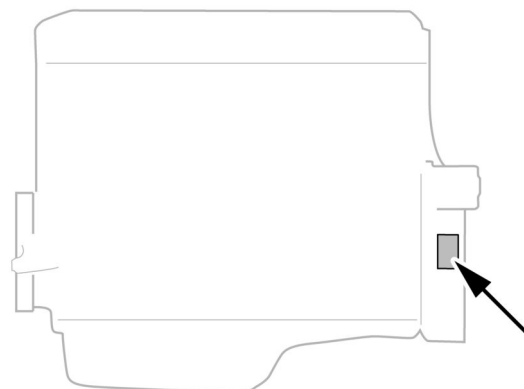
The machine manufacturer is responsible for ensuring that all engine management communication is protected against all forms of cyber attack.

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

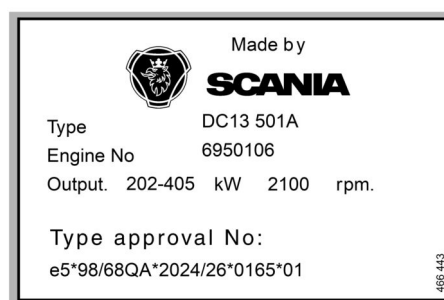
The engine power is indicated on a plate located on the left-hand side of the flywheel housing. The engine serial number is stamped onto the top of the cylinder block at the front right.



466 144

Example: DC13 501A

DC	Turbocharged diesel engine with air-cooled charge air cooler.
13	Displacement in whole dm ³ .
501	Performance and certification code. The code indicates, together with the application code, the normal gross engine output.
A	Code for application. A means for general industrial use.



466 443

Starting and driving

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.

See also [Maintenance intervals](#).

IMPORTANT!

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

Reductant tank

Reductant tanks come in 5 different sizes. The volumes indicated for each tank are filling volumes.

1. 38 litres (10 US gallons).
2. 60 litres (15.8 US gallons).
3. 45 litres (11.9 US gallons).
4. 63 litres (16.6 US gallons).
5. 70 litres (18.5 US gallons).

A filler filter with magnet is fitted in the reductant tank to prevent the reductant from becoming contaminated when filling. It is used when refuelling at a filling station. A filler filter without a magnet is also supplied for use when filling manually.

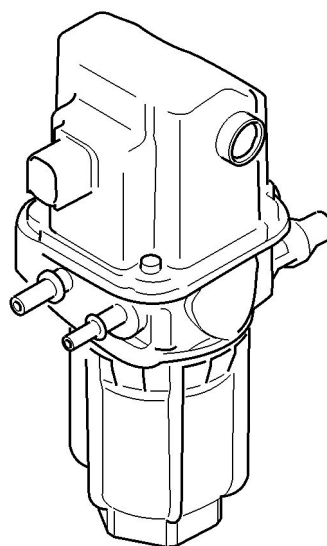
Reductant pump

The reduction 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 driving

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

Starting the engine



WARNING!

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

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



IMPORTANT!

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

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

1. Open any fuel cock.
2. Disengage the engine.
3. If the engine has a battery master switch:
Connect the power using the battery master switch.
4. 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 and at high altitudes

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) or at an altitude of more than 2,000 metres.

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.

Electric feed pump

Occurs with the ignition on. The sound is a low buzzing sound.

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 975 rpm.

A slightly higher engine speed than the nominal engine speed may occur at low or negative load.

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.

Note:

Driving at an altitude higher than 5,000 metres above sea level is only permitted if it has first been approved by Scania.

Change of rotational speed for single-speed engines

When changing the rotational speed of a single-speed engine, the engine must be stopped completely before the rotational speed is changed.



IMPORTANT!

The engine must not be driven at other rotational speeds than those approved by Scania.

Emission control

The system provides a warning if there are faults in the SCR system or if the level of reductant in the reductant tank is too low. In the case of some faults, for example if doser cooling is not working, the torque is reduced.

EMS malfunction warning

The machine interface shows indications for faults in the engine management system.

A yellow warning lamp indicates that the operator should contact a workshop as soon as possible. It is activated in the event of emission-related faults and other faults which may need to be rectified.

Below are some examples of typical faults which illuminate the yellow warning lamp:

- Signal for sensor or actuator lost.
- Engine or exhaust gas aftertreatment system temperature close to hardware limitations.
- System battery voltage outside the normal range.
- Diagnostic trouble code for e.g.:
 - NOx sensor
 - Pressure outside the reference range
 - Adaptation outside limit values

The red warning lamp indicates an emergency request for an immediate controlled shutdown due to a serious risk of personal injury or engine damage.

The operator should contact a workshop before starting the engine again.

Below are some examples of typical faults which illuminate the red warning lamp:

- Long-term loss of oil pressure.
- Internal EMS software failure.
- Battery voltage too high.
- Severe engine overspeed.
- Serious fuel system fault

Reaction to low reductant level – US Tier 4f

Reductant level	Warning lamp	Torque reduction
20%	Constant light	
10%	Flashing	Torque is reduced by 1% per minute to 70 % of the highest torque.
0%	Flashing	Torque is reduced to 0% (low idling) within 2-10 minutes.

The engine resumes normal torque after reductant has been filled to a level of at least 20%.

Reaction to low reductant level – EU Stage V/China IV/Korea Tier 5

Note:

Its behaviour and the symbol depend on the installation of the engine in the machine. The Scania recommendation will lead to the behaviour and symbol described here, but this may differ between different machines.



Symbol for low reductant level.



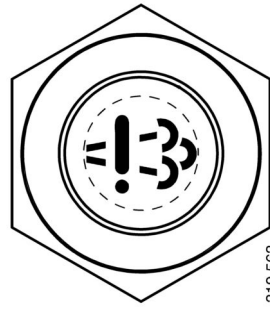
Symbol for low reductant level.

Level	Warning lamp	Torque and speed control
10%	Constant light	-
2.5%	Flashing	Torque is reduced by 1% per minute to 75 % of the highest torque.
0%	Flashing	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.

The engine resumes normal torque after reductant has been filled to a level of at least 10%.

Reaction to fault in SCR system – US Tier 4f

Time	Warning lamp	Torque reduction
Fault detected	Constant light	
After 30 minutes	Flashing	Torque is reduced by 1% per minute to 70 % of the highest torque.
After 4 hours	Flashing	Torque is reduced to 0% (low idling) within 2-10 minutes.



319 563

Symbol for fault in SCR system.

Once the fault has been remedied and the engine control unit has received an indication that it is working, torque returns to the normal level.

If a new fault occurs within 40 hours of operation since the first fault, the warning lamp will come on. After 30 minutes of operation, the warning lamp will flash rapidly and torque will be reduced to 0% (low idling) within 30 minutes.



IMPORTANT!

If the torque has been reduced to 0% (low idling), the control unit does not detect that the SCR system is functioning again. A service technician must then reset the system so that the torque returns to the normal level.

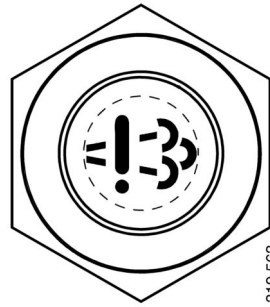
Note:

The torque reduction only applies to engines certified according to US Tier 4. Some emergency vehicles do not have torque reduction.

Reaction to fault in the exhaust gas after-treatment management system – EU Stage V/China IV/Korea Tier 5

Note:

The symbol and behaviour of the warning lamp depend on the installation of the engine in the machine. The Scania recommendation will lead to the behaviour and symbol described here, but this may differ between different machines.



Symbol for faults in the exhaust gas aftertreatment system.

Warning lamp	Torque and speed control
Constant light	None
Flashing	Torque is reduced by 1% per minute to 75 % of the highest torque.
Flashing	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.

Once the fault has been remedied and the engine management system has received an indication that the exhaust gas aftertreatment system is operational, i.e. when the fault code has been acknowledged in SDP3, torque returns to the normal level.

Regeneration of the particulate filter

The particulate filter is regenerated, i.e. cleaned, automatically. If a certain amount of soot is accumulated, the engine enters a periodic and automatic program to reduce the amount of soot. The engine can be used without any impact on operation.

However, if the particulate filter becomes full, it must be regenerated manually. The engine cannot be used for approximately 40-70 minutes while manual regeneration is carried out. The *Particulate filter symbol* is used to indicate that the particulate filter is full and needs to be regenerated manually.

Note:

During manual regeneration, the engine speed can rise to 1,500 rpm for all-speed engines. For engines configured as single-speed, all regeneration occurs at the selected rotational speed.



WARNING!

The components in the exhaust system may become hot.

Make sure that there is no combustible material near the exhaust pipe.



IMPORTANT!

It is the operator's responsibility to ensure that the machine is in a safe location and safe condition when performing manual regeneration.

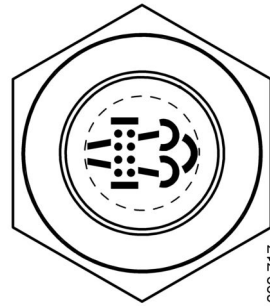
Examples of actions include:

- Applying the parking brake.
 - Disengaging the generator set.
-

Note:

The symbol and behaviour of the warning lamp depend on the installation of the engine in the machine. The Scania recommendation will lead to the behaviour and symbol described here, but this may differ between different machines.

Warning lamp	Description
Constant light	The particulate filter is starting to become full. Increase the load to improve automatic regeneration or regenerate the particulate filter manually.
Flashes slowly (½ Hz)	Carry out manual regeneration as soon as possible.
Flashes rapidly (2 Hz)	Yellow warning. The particulate filter is overfull (130-160% soot particles). Power is reduced to 70%. Manual regeneration cannot be carried out. Book a mechanic to clean the filter.
Flashes rapidly (2 Hz)	Red warning. More than 160% soot particles. Can no longer regenerate with SDP3, Torque reduction remains as above. Stop the machine and renew the particulate filter.



399 717

Symbol for particulate filter regeneration

Coolant temperature



IMPORTANT!

An excessive coolant temperature can cause engine damage.

Normal coolant temperature during operation is 90 to 95°C (194 to 203°F).

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

- Alarm and torque reduction at the lowest limit value.

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

- Alarm only.
- Alarm 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 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 0.7 bar (10.2 psi).

The engine management system issues an alarm at the following levels:

- At an engine speed below 500 rpm and an oil pressure below 0.7 bar (10.2 psi).
- At an engine speed above 1,600 rpm and an oil pressure below 1.45 bar (21 psi).
- At an engine speed above 2,400 rpm and an oil pressure below 2.5 bar (36.3 psi) for longer than 3 seconds.

The following function is standard as alarm for incorrect oil pressure:

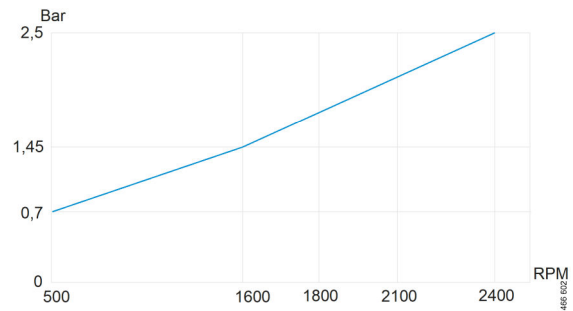
- Alarm and torque reduction by 30%.

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.

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 belts.

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.

Raised idling speed for engines with an SCR system

If the engine is run without load for an extended period of time, the SCR system needs to be heated by raising the idling speed. The function is called periodic hydrocarbon evaporation and is used to avoid damaging the SCR catalytic converter.

Periodic hydrocarbon evaporation functions differently depending on how the engine is fitted. A warning is output for all engines if the engine needs to be warmed up. The warning is output after approx. 8 hours if the engine is idling without load and the ambient temperature is 20°C (68°F). The time is reduced as the ambient temperature becomes colder. The warning is delivered more quickly at a higher idling speed.

For some engines, a request for automatic raising of the idling speed is also output after the warning. If the request is confirmed, the idling speed is raised automatically. The function is active for 45 minutes or less and is deactivated automatically. If the request is not confirmed, the engine is switched off after approx. 45 minutes, if the engine has been configured with engine shutdown. Otherwise, a red warning lamp will come on.

Note:

During hydrocarbon evaporation, the engine speed can rise to 1,500 rpm for all-speed engines. For engines configured as single-speed, all hydrocarbon evaporation occurs at the selected rotational speed.

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:

The battery voltage must remain on for around 20 seconds after the 15-voltage is switched off so that the control units can store the values and switch to sleep mode.

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 driving



WARNING!

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

There is always a risk of sustaining burns when an engine is hot. Particularly hot parts are 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 equipped with an SCR system: Top up 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!

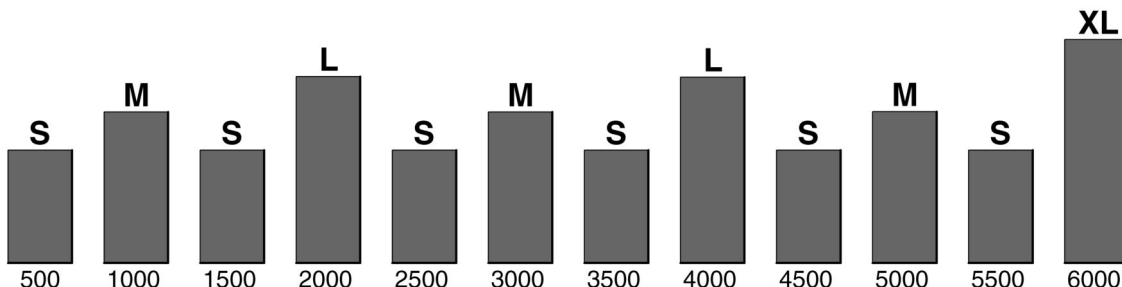
Block the starting device when working on the engine. If the engine starts unexpectedly, there is a serious risk of injury.

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

The maintenance programme includes the following:

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

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



IMPORTANT!

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

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

Cleaning the engine



WARNING!

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



Environment

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

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

Engines with few hours of operation



IMPORTANT!

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

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

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

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

Maintenance 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	X	X	X		
Renewing the oil filter			X	(X) ²	X	X	X	X		
Air cleaner										
Reading the vacuum indicator	X		X	X	X	X	X			
Renewing the filter element						X	X		X	
Renewing the safety cartridge						X	X		X	
Cooling system										
Checking the coolant level	X	X	X	X	X	X	X			
Checking the coolant's anti-freeze and corrosion protection		X				X	X	X		
Changing the coolant and cleaning the cooling system							X		X	
Fuel system										
Checking the fuel level	X	X								
Renewing the fuel filter					X	X	X		X	
Fuel tank venting filter						X		(X) ³		
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	
Checking/renewing the particulate filter									4500 hours ⁴	

1. The change interval is dependent on the average load and type of engine oil. See section Oil Change Intervals.
2. The change interval is dependent on the average load and type of engine oil. See section Oil Change Intervals.
3. Applies every other year.
4. The change interval is dependent on the average load and type of application. See section Particulate filter maintenance intervals.

Oil change interval



IMPORTANT!

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

This oil grade can be used in all ambient temperatures. Oil grade LDF-5 also provides a long interval between oil changes.

Type of sump: Aluminium 38 litres			
Fuel consumption litres/hour	<31	<36	>36
Oil grade: LDF-5	1,000 h	750 h	500 h
Other approved oil grade	750 h	500 h	400 h

Type of sump: Aluminium 43 litres			
Fuel consumption litres/hour	<34	<38	>38
Oil grade: LDF-5	1,000 h	750 h	500 h
Other approved oil grade	750 h	500 h	400 h

Type of sump: Aluminium 48 litres			
Fuel consumption litres/hour	<36	<40	>40
Oil grade: LDF-5	1,000 h	750 h	500 h
Other approved oil grade	750 h	500 h	400 h

Type of sump: Aluminium 64 litres			
Fuel consumption litres/hour	<41	<46	>46
Oil grade: LDF-5	1,000 h	750 h	500 h
Other approved oil grade	750 h	500 h	400 h

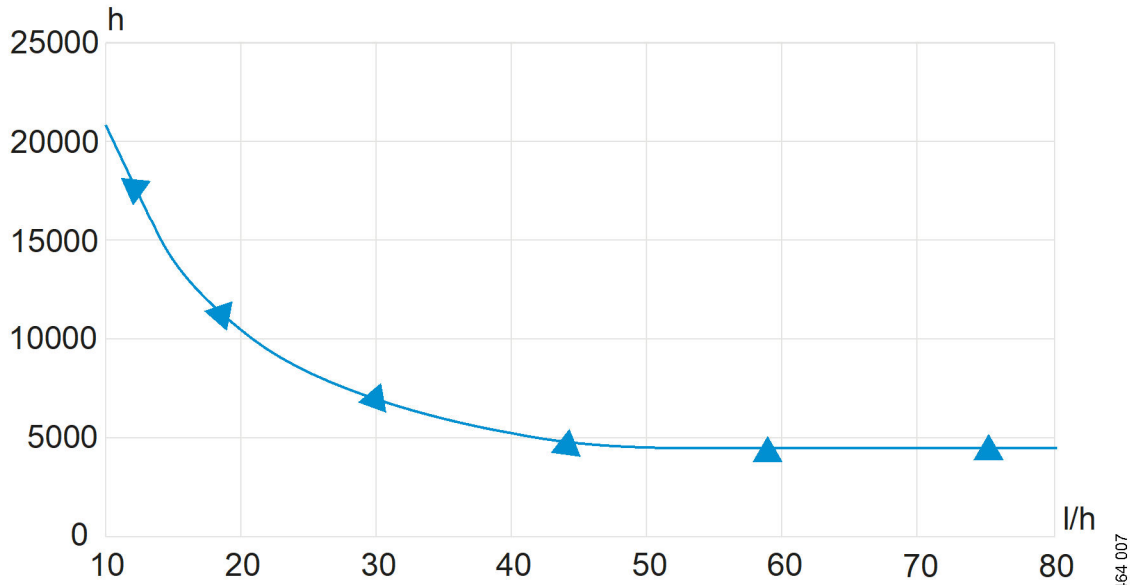
Type of sump: Aluminium 80 litres				
Fuel consumption litres/hour	<40	40-50	50-72	>72
Oil grade: LDF-5	1,500 h	1,000 h	750 h	500 h
Other approved oil grade	1,000 h	750 h	500 h	400 h

Particulate filter maintenance intervals



IMPORTANT!

Scania recommends using Scania LDF-5 engine oil. The graph can only be used if this requirement is satisfied.



The graphs in the diagram show calculated driving time before particulate filter renewal.

Note:

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

Lubrication system

Oil grade

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

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



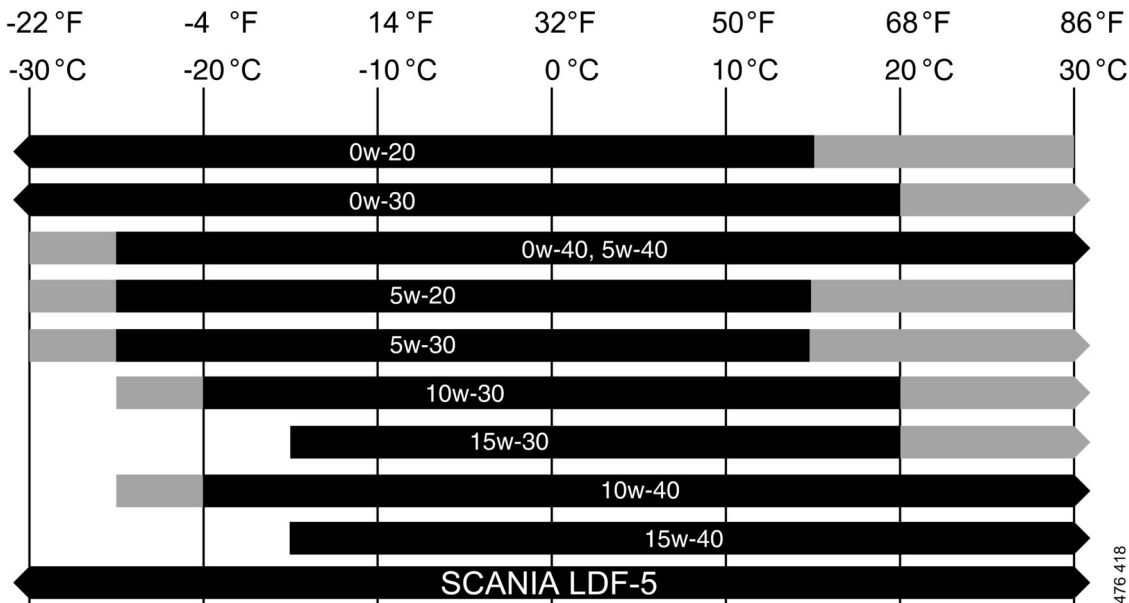
IMPORTANT!

Regarding particulate filters, the information in this document is not valid if an engine oil other than Scania LDF-5 is used.

Particulate filter	Oil grade
No	Scania LDF-3 ACEA E4, E7 API CI-4
Yes	Scania LDF-5, LDF-4 ACEA E6, ACEA E8, ACEA E11 API CK-4/FA-4 with ash content < 1%

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

If Scania LDF-5 is not used, the oil must be of a viscosity class suitable for the outdoor temperature in the area where the engine is used.



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

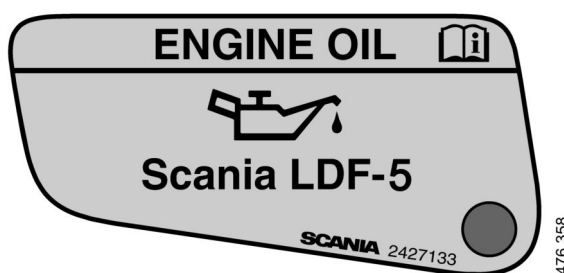
- 352 436 = The temperature range which the market-approved oil grades, for example ACEA Exx and API Cxx, can handle.

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

Filled engine oil grade label

When changing oil it is important to use the correct engine oil grade. The oil filler cover must be clearly marked with a label showing the filled oil grade. However, there are only labels for oils from Scania and oil grade ACEA E9.

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



Label for oil filling.

Oil analysis

To be able to extend the oil change intervals using an oil analysis, Scania LDF-5 oils must be used. Certain laboratories offer engine oil analysis.

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

- Viscosity at 100°C (212°F): max. $\pm 20\%$ of original value of the fresh oil.
- TBN (in accordance with ASTM D4739): > 3.5 .
- TBN (in accordance with ASTM D4739): $>$ TAN (in accordance with ASTM D664).
- Oil oxidation (in accordance with DIN 51453) < 10 .

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-5 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

Cooling system

Coolant



IMPORTANT!

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

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

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

Note:

The coolant should be changed when the cooling system is cleaned: every 6,000 hours or at least every 5 years.

See *Changing the coolant and cleaning the cooling system*, which can be found in your engine-specific version of this manual.

See section [The OPM portal, engine-specific manuals](#) for access.

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 cool-

ing 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.



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) using a refractometer in accordance with the instructions in the section *Checking the coolant's antifreeze and corrosion protection*, which can be found in your engine-specific version of this manual.

See section [The OPM portal, engine-specific manuals](#) for access.

Risk of freezing



IMPORTANT!

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

As the coolant starts to freeze, the water in the coolant starts to crystallise and the percentage of

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

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

Antifreeze and corrosion protection concentration table, litres

Freezing point (°C)	-21	-24	-30	-38	-50	Cooling system volume
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	

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.

Quality requirements for fuel

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)	0.77-0.87 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.

Important to use low sulphur diesel

For engines with an SCR system, it is important to use sulphur-free or ultra-low-sulphur diesel to ensure that the engine works correctly. If diesel with an excessive sulphur content is used, it can cause damage to the engine and the SCR system.

From January 2011 legislation in the USA and Europe requires all diesel engines not used on the road to be run on sulphur-free or ultra-low sulphur diesel.

**REQUIREMENT!**

In Europe, diesel must be sulphur-free in accordance with the standard EN 590. This means that the sulphur content must not exceed 10 ppm.

In the USA, the diesel must be ultra-low sulphur in accordance with the ASTM D975 standard. This means that the sulphur content must not exceed 15 ppm.

Permitted sulphur content in diesel

Engine type	Max. sulphur content	Note
Engines without SCR system	4,000 ppm (0.4%)	If the sulphur content is higher than 2,000 ppm, the oil change intervals must be halved. A higher sulphur content than 4,000 ppm is not permitted, since this will result in engine damage.
Engines with SCR system only	500 ppm (0.05%)	A higher sulphur content than 10 ppm for Europe or 15 ppm for the USA may only be used where EU Stage III or less restrictive emission legislation applies.
Engines with DPF system	15 ppm (0.0015%)	If higher sulphur content is used, problems with exhaust gas aftertreatment may arise. This can in turn lead to a shortened service life of the engine and DPF system.

Diesel with a higher sulphur content than 500 ppm for engines with an SCR system

If diesel with a higher sulphur content than permitted is used on a short-term basis, this will not cause permanent damage to the SCR catalytic converter. The SCR catalytic converter may, however, require diesel with a low sulphur content for some time after this to regain its normal efficiency.

If diesel with too high a sulphur content is used for a prolonged period, there is a risk that the SCR catalytic converter will not operate correctly, which will result in a reduction in engine torque.

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.

Also see the section *Preservative fuel*, which can be found in your engine-specific version of this manual.

See section [The OPM portal, engine-specific manuals](#) for access.

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.

Reductant with SCR



IMPORTANT!

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

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.



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 or 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 ($12-86^{\circ}\text{F}$).

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.

Technical data

General data

Number of cylinders and configuration	6, straight
Working principle	4-stroke engine
Cylinder diameter (mm/in)	130/5.12
Piston stroke (mm/in)	160/6.30
Displacement (dm ³ /in ³)	12.7/775.0
Firing order	1 - 5 - 3 - 6 - 2 - 4
Compression ratio	22.8:1
DC 501/502/503/504/541/544	22.8:1
DC 505/506/507	19:1
Engine direction of rotation viewed from rear	Anticlockwise
Fan direction of rotation viewed from front	Clockwise
Cooling	Coolant
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)	500-975
Maximum full-load speed (rpm)	1,800/2,100
Fuel	Diesel
Approximate weight, without coolant and oil (kg/lb)	1,050/2,315

Lubrication system

Oil volume	See Maintenance
Oil cooler	Coolant cooled, full flow
Oil filter	Paper filter from Scania
Interval between oil changes (h)	500 ¹
Oil pressure (bar/psi)	
Normal with the engine at operating temperature, operating speed	3-6/43.5-87
Minimum permitted at idling speed	2.8
Crankcase pressure with closed crankcase ventilation (mbar/psi)	-5.4 to 2.0/-0.08 to 0.03

1. The change interval is dependent on the average load and type of engine oil. See section Oil Change Intervals.

Intake system

Permissible pressure drop in the intake system with cleaned or new filter (mbar/psi)	30/0.44
Permissible pressure drop in the intake system with blocked (dirty) filter (mbar/psi)	65/0.94

Cooling system

Coolant	See the chapter Cooling system.
Coolant volume, excluding radiator (dm ³ /US gallons)	25 / 6.6
Coolant volume including 1.1 m ² radiator (dm ³ /US gallons)	41 / 10.8
Coolant volume including 1.2 m ² radiator (dm ³ /US gallons)	48 / 12.7
Coolant temperature (°C/°F)	90-95/194-203
Number of thermostats	1
Thermostat opening temperature (°C/°F)	80/176 and 87/189

Fuel system

Injection system	XPI (Extra High Pressure Injection)
Engine management system	EMS
Fuel filter	Paper filter from Scania
Water separating prefilter	Paper filter from Scania
Filter for tank venting	Paper filter from Scania

Electrical system

Type	1-pin, 24 V, DC
Starter motor, standard equipment	1-pin, 24 V, 5.5 kW
Alternator, standard equipment	1-pin, 28 V, 100 A

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.