DEZEMBRO 1994

START-UP REPORT WARRANTY

In the following there is a start-up report which constitutes an important part in increasing service stand-by.
Fill in the information, tear off the page, fold it, tape it, stamp it and send it to Scania. The address is already printed. Or send it by telefax: +46 8 55 38 31 80.
To be covered by the Scania warranty it is you, the engine user, who has to report when the engine starts to operate.
Normally the warranty is valid for one year from the date of start-up.
If the start-up report is not submitted to us, the warranty period will be regarded as having started on the date of delivery from Scania.

SCANIA

INDUSTRIAL AND MARINE ENGINES

Operator's manual

DS11 DSC11 DSI11

Industrial engine **Program 93**

3328 EN **1 588 012**

1994-12

RUTHZIL TRATOR COMERCIAL DE PEÇAS LTDA 11 97083-6812 ROLANDO CITRANGULO

START-UP REPORT

Engine No. .....

Start-up date .....

Name and address of end user .....

.....

.....

.....

Signature .....

FOR VALID WARRANTY; Tear off, fill in, send in

For
stamp

Scania CV AB
Industrial and Marine Engines
After Sales Services
S-151 87 SÖDERTÄLJE
Sweden

IMPORTANT INFORMATION

When working on the engine, such as adjusting drive belts, changing oil or adjusting the clutch it is important that the engine is not started. There is a risk that the engine is damaged but, above all, there is

A GREAT RISK OF INJURY

Therefore, block the starting device or remove a battery cable when working on the engine. This is especially important if the engine has remote control start or automatic start.
The warning text below is placed at every maintenance item where this is of extreme importance.



WARNING
Block starting device when working *on* the engine.
If the engine starts,there is a great RISK OF INJURY.

Operator's manual
DS11 DSC11 DSI11

Industrial engine **Program 93**

3328 EN **1 588 012**

1994-12

START-UP REPORT - WARRANTY

When the start-up report has been filled in and sent to Scania you have a 1-year warranty from the date of start-up. Also fill in the information below. Such information makes matters easier when contacting a service workshop, for instance.

Engine No. .....

Start-up date .....

Name and address of end user .....

.....

.....

.....

Signature .....

Engine type .....

Variant .....

Engine type and variant are found on the engine type plate

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PREFACE

This manual describes the operation and maintenance of Scania's DS11, DSC11 och DSI11 Industrial engines. The instructions are valid for engines of engine program 93 from engine No. 5 331 482.

The engines are six-cylinder (in-line) four-stroke water-cooled diesels with direct fuel injection and are available with or without turbocharging and charge-cooling. See also page 4.

Typical areas of application are as agricultural and forestry machines, contractor's machinery, generator sets and as power-packs for irrigation purposes.

The engines may have different output settings. The engine output setting (performance code) appears on the type plate, see page 4.

Note! Only standard components are described in the operator's manual.
For special equipment, etc., we refer to the manufacturer's instructions.

For maximum benefit and a long service life, please consider the following directions:

- Read through the operator's manual before you start using the engine. Even though you may have previous experience of Scania engines, you are likely to find new facts in this manual.

- Adhere to the maintenance instructions and you will extend the service life of the engine.

- Get to know your engine, its performance and how it works.

- Always consult an authorized Scania workshop when the engine needs attention. They have access to the special tools and genuine parts needed, as well as trained staff with practical experience of Scania engines.

The facts in this manual are valid at the time of printing, but we reserve the right to make alterations without notice.

Södertälje in December, 1994

Scania Industrial and Marine Engines
S-151 87 Södertälje

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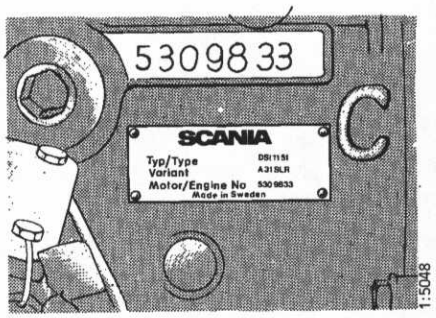
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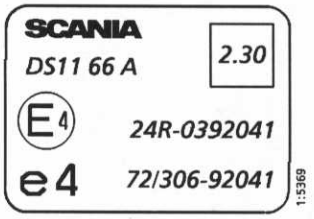
TYPE DESIGNATIONS

The engine type designation states, in the form of a code, the engine type, size, application area, etc.

Type designation and engine number appear on a plate on the right side of the engine. Furthermore, the engine number is stamped in the surface of the cylinder block besides the type plate.

Engines that are certified for smoke and emission levels are equipped with a plate that specifies the documents according to which they are certified.The plate is located on the front valve cover behind the oil filling.





Certication plate

DS 11 66 A 31 S

Engine type

DS	turbocharged diesel engine
DSC	as DS and with air-cooled inter-cooler
DSI	as DS and with liquid-cooled inter-cooler

Swept volume in units of dm^3

Performance and certificate code

Together with the application code, this code states the nominal gross output. The actual engine out-put is stated on the engine record card.

Application

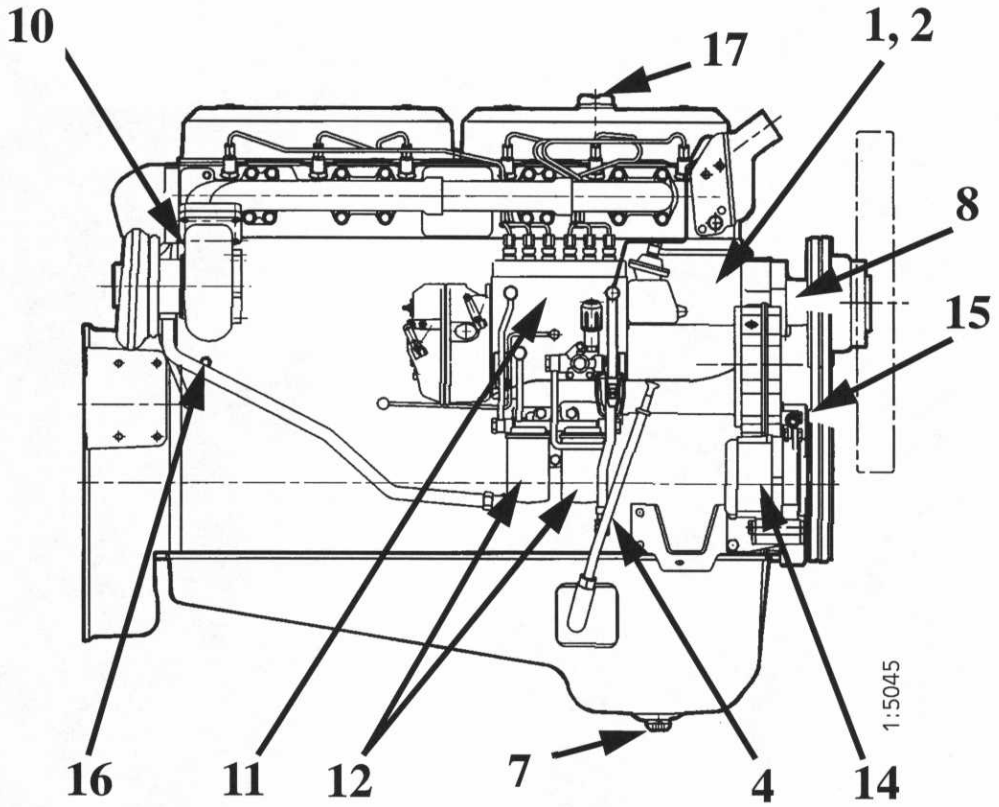
A	For general application

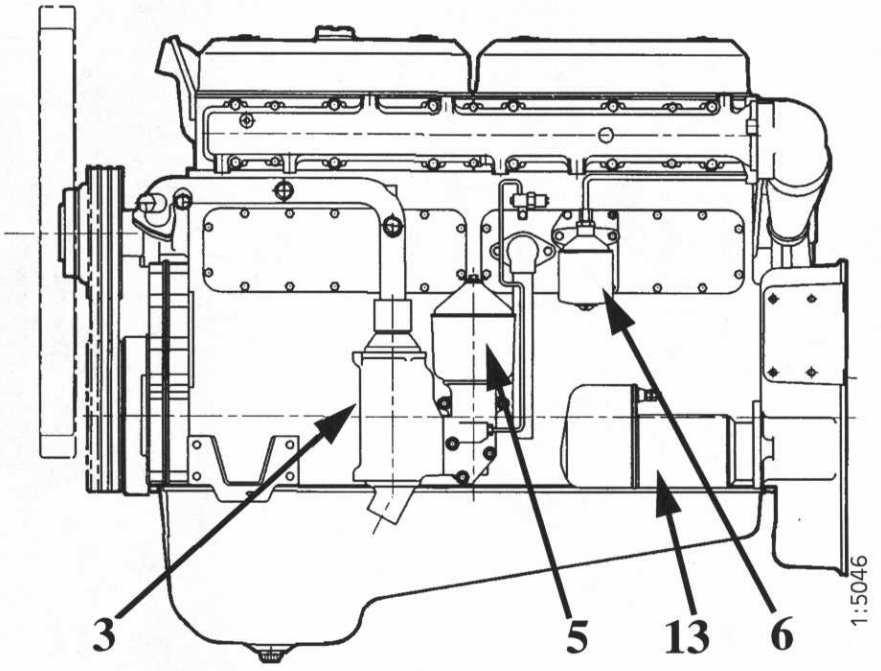
Variant 01-99

Governor type

D	Electronic governor
S	RSV, all-speed governor
T	RQ, single-speed governor
U	RQV-E, all-speed governor, 400 - 1900 r/min
V	RQV-E, all-speed governor, 400 - 2200 r/min

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These pictures show a normal execution of DS11 engines.
Your engine may have equipment which is not shown in this picture.
E. g. DSC11 and DSI11 engines are equipped with charge coolers.

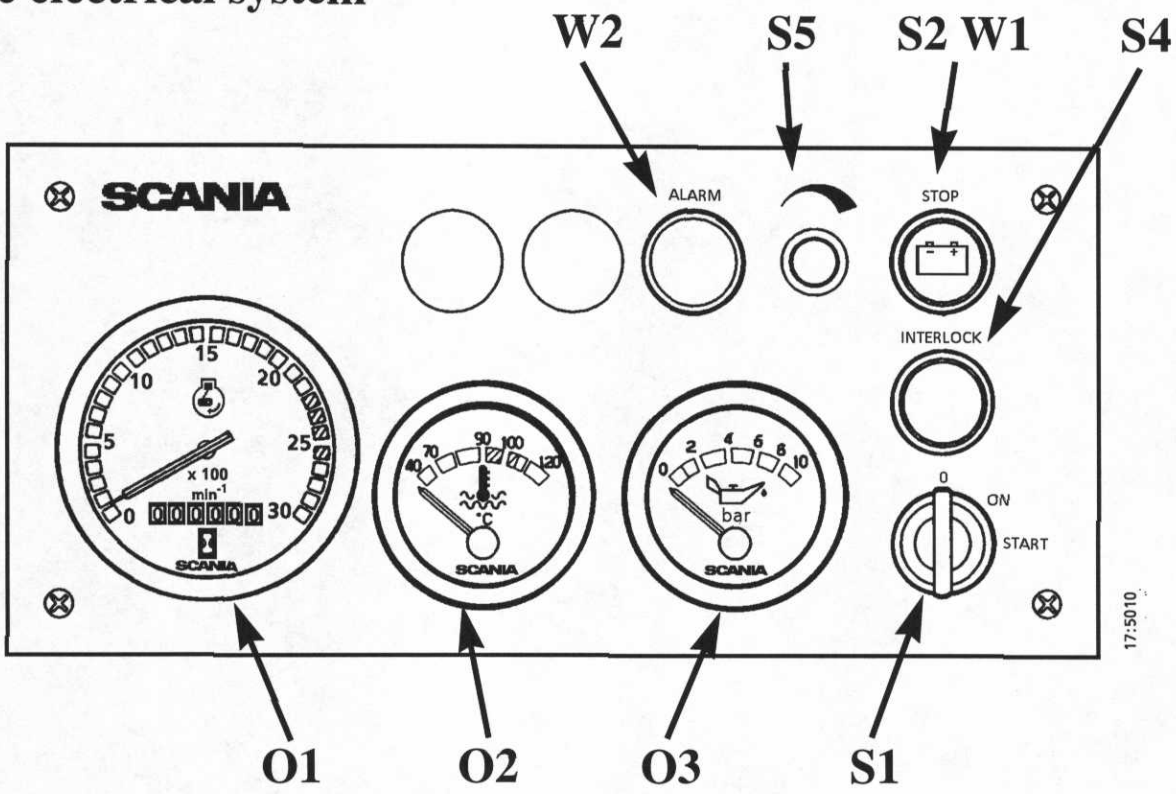
1. *Type designation plate*
2. *Engine number, stamped in in the cylinder block*
3. *Oljekylare*
4. *Oljemätsticka*
5. *Oljerenare*
7. *Draining, engine oil*
8. *Coolant pump*
9. *Charge cooler*
10. *Turbocharger*
11. *Injection pump*
12. *Fuel filter*
13. *Starter*
14. *Alternator*
15. *Fan belt, adjusting*
16. *Drain cock, coolant*
17. *Oil filling*

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6.Turbofilter INSTRUMENT AND CONTROLS

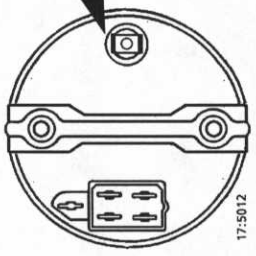
For other instrumentations not described here, please refer to the supplier's instructions.

1-pole electrical system

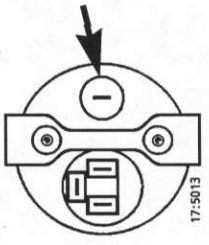


O1 **Tachometer** The gauge indicates the engine speed in r/min and the total operating time in hours (h). The instrument light bulb can be replaced from the back, see illustration.	The tachometer has the the following colour zones: 0-500 r/min Red 500-700 r/min Yellow 700-2200 r/min Green 2200-2600 r/min Striped yellow/green 2600-3000 r/min Red
O2 **Temperature gauge** The gauge indicates the engine coolant temperature in degrees C. The instrument light bulb can be replaced from the back, see illustration.	The gauge has the following colour zones: 40-70 °C Yellow 70-90 °C Green 90-105 °C Red/green 105-120 °C Red
O3 **Oil pressure gauge** The gauge indicates the engine lubrication oil pressure in bar. The instrument light bulb can be replaced from the back, see illustration.	The gauge has the following colour zones: 0-1 bar (kg/cm2) Red 1-6 bar (kg/cm2) Green 6-10 bar (kg/cm2) Yellow

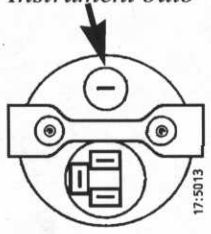
Instrument bulb



Instrument bulb



Instrument bulb

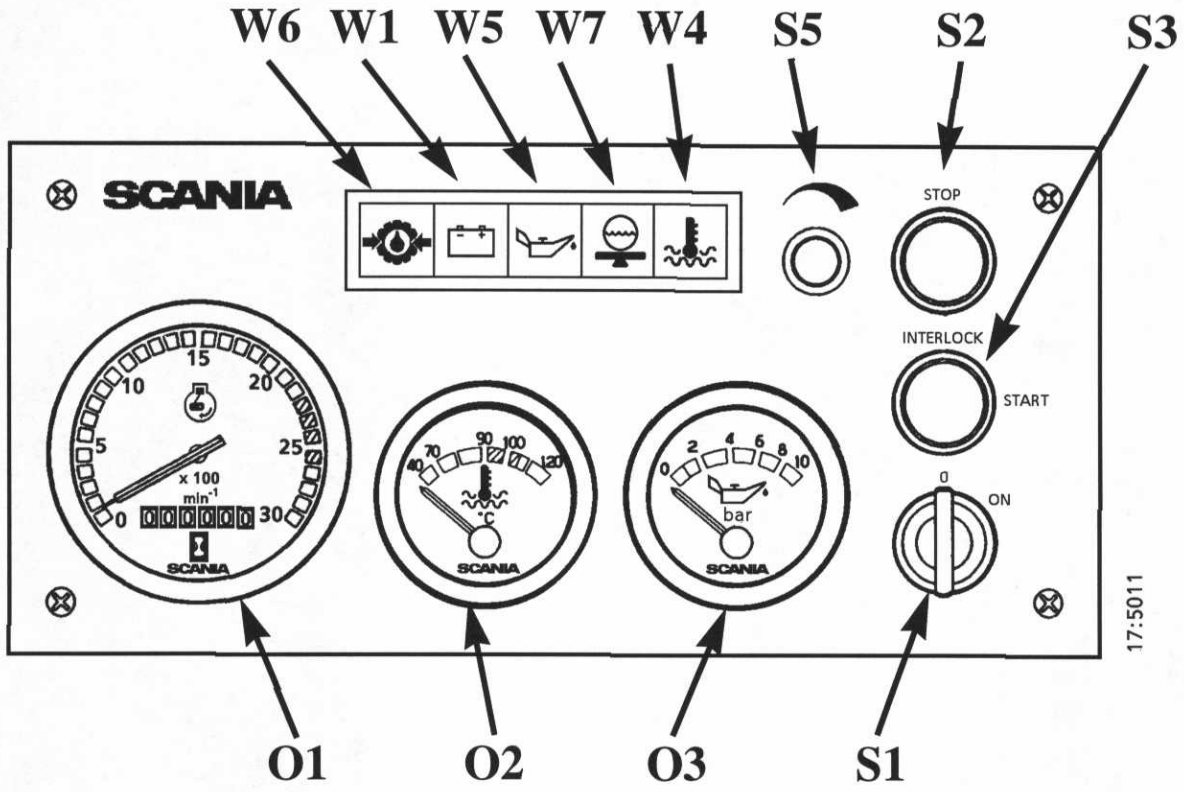


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S1 **Control switch**	The control switch has three positions and is key operated: **0** All connections powered off **ON** Operating position. Power available for lights, instruments, relays and buzzer. **START** Starting position. The starter is engaged.	**The interlock switch must be pushed during the starting procedure.** **The key must be returned to 0 for another attempt to start.**
S2 **Stop switch**	The engine is stopped with this switch.	
S4 **Interlock switch**	"INTERLOCK" The interlock switch should be pushed in during starting to override the oil pressure monitor, which will otherwise activate the stop solenoid. **Note** **The start switch also bypasses the function of the temperature monitor.**	
S5 **Rheostat for instrument lighting**	The instrument lighting is regulated by turning the knob.	
W1 **Charge warning light**	Red warning light which should go out as soon as the engine catches.	
W2 **Master warning light**	Red warning light which lights up at the same time as the buzzer is heard if coolant temperature is too high or oil pressure is too low.	
Buzzer	The buzzer is located at the back of the tachometer.The buzzer will sound at low oil pressure, excessive coolant temperature and if the coolant level drops too low. The buzzer comes on when the control switch S1 is set to position ON and should go out as soon as the engine has been started or switch S4 pushed in.	

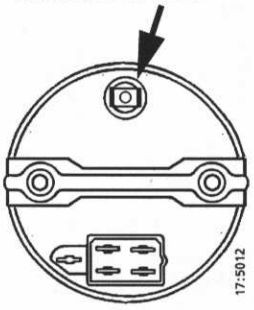
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2-pole electrical system

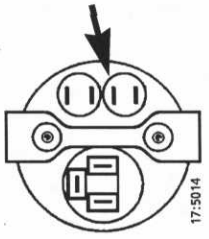


O1 **Tachometer** The gauge indicates the engine speed in r/min and the total operating time in hours (h). The instrument light bulb can be replaced from the back, see illustration	The tachometer has the following colour zones: 0-500 r/min Red 500-700 r/min Yellow 700-2200 r/min Green 2200-2600 r/min Striped yellow/green 2600-3000 r/min Red
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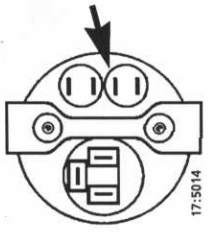
Instrument bulb



Instrument bulb



Instrument bulb



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S1 **Control switch**	The switch has two positions and is key operated: **0** All connections powered off **ON** Operating position. Power available for lights, instruments, relays and buzzer.	
S2 **Stop switch**	The engine is stopped with this switch.	
S3 **Starter switch**	To be pushed when starting. Engages the starter motor and prevents the stop solenoid from stopping the engine before the oil pressure has built up. **Note! The starter switch also bypasses the function of the temperature monitor.**	
S5 **Rheostat for instrument lighting**	The instrument lighting is regulated by turning the knob.	
W1 **Charge warning light**	Red warning light which should go out as soon as the engine catches.	
W4 **Coolant temperature warning light**	Red warning light which lights up if the temperature becomes non-permissibly high. At the same time the buzzer will sound.	
W5 **Oil pressure warning light**	Red warning light which lights up if the oil pressure drops too low. At the same time the buzzer will sound.	
W6 **Hydraulic pressure warning light**	Red warning light which lights up if the hydraulic pressure drops too low. At the same time the buzzer will sound. The sensors and wiring are options.	
W7 **Coolant level warning light**	Red warning light which lights up if the coolant level drops too low. At the same time the buzzer will sound. The sensors and wiring are options.	
Buzzer	The buzzer is located at the back of the tachometer. The buzzer will sound at low oil pressure, excessive coolant temperature and if the coolant level drops too low. The buzzer comes on when the control switch **S1** is set to position **ON** and should go out as soon as the engine has been started.	

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START AND RUNNING

First start

Before starting the engine for the first time, maintenance should be carried out acc to "First start" in the maintenance chart on page 15.

Since these items are crucial to the proper functioning of the engine from the very start, they are also listed below.

1. Checking the oil level (see page 17).
6. Checking the coolant (see page 21).

   The coolant must contain some type of anti-corrosive in order for the cooling system not to be exposed to attack.

   The anti-corrosive should be *Scania Anti-corrosive* and/or glycol. The glycols we recommend contain nitrite-based anti-corrosive.

   -In a cooling system ***without*** glycol, use water and 3-4 % by volume of *Scania Anti-corrosive*.

   -In a cooling system ***with*** glycol but ***without*** *Scania Anti-corrosive* use water and 30-40 % by volume of glycol.

   - At a glycol content exceeding 40 % by volume ***no*** *Scania Anti-corrosive* may be added.

   Note. A glycol content exceeding 50% will not increase the anti-freeze properties.

   - In a cooling system with 10-30 % by volume of glycol, also *Scania Anti-corrosive* should be added to obtain adequate corrosion protection.

   IMPORTANT! Do not top up using water only or glycol only. Should the glycol or anti freeze content decrease, the freezing and corrosion protection will diminish. Always top up using pre-mixed coolant.

   We recommend glycol with nitrite-based anti-corrosive, having the following supplier designations:

   BASF 9313

   Shell AF 402

   Shell AF 511

   Dow 82 413 FS
   or similar.

12. Checking the fuel level (see page 27).
15. Checking the battery fluid level (see page 34).
16. Checking the battery charge (see page 34)
18. Checking the coolant level monitor (see page 35).
19. Checking the temperature monitor (see page 36).
20. Checking the oil pressure monitor (see page 37).
21. Checking the stop function (see page 37).
22. Checking the tension of the V-belts (see page 39).

Composition of the coolant:

Water
+
3-4 volume% anti-corrosive

(*Scania Anti-corrosive* and/or glycol)

When the engine is stopped after running for the first time coolant should be topped up.



WARNING
Block starting device when working on the engine. If the engine starts, there is a great RISK OF INJURY.

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Checks before running

Carry out "Daily maintenance" according to the maintenance diagram on page 15 before running.

Starting the engine

If the fuel tank has been run empty or if the engine has been out-of-use for a long time, bleed the fuel system (see page 27).

- Engines with a mechanical stop control: Put the stop control in operating position.
- Open the fuel tap, if fitted.
- Disengage the coupling (does not apply for engines with a fixed coupling, e.g. generating sets).
- Engines with a battery master switch: Switch on the power with the battery master switch.
- Set the speed control to full speed. (Does not apply to generating sets.)
- Start the engine.

At temperatures below 0 °C:

Note Use only start aids that are recommended by Scania.

- The starter may not be used for more than 30 seconds at a time. It must then be left to rest for 2 minutes.

If engine is equipped with flame start:

- Operation of flame start ***without time relay***: Depress the control button which also functions as pre-heating button (max. 45 s) . The plugs continue to glow as long as this control button is kept depressed after that the engine has started. Maximum time is 5 minutes.
- Operation of flame start ***with time relay***: Depress the pre-heating button (max. 45 s). Release the pre-heating button when the engine is started. The time relay keeps the glow plugs connected for 5 minutes. If shorter time for connection is desired, depress the cancellation button. The key must be put into neutral (0) if the start attempt fails.

Note If the engine is equipped with INTERLOCK button , it must be pushed until the engine has reached sufficient oil pressure. Otherwise the engine will be stopped.

- Generating sets should be loaded as soon as possible after start in order to eliminate the risk for white smoke.
- Set the speed control to a suitable low idling speed before the engine reaches 1 000 r/min (does not apply for generating sets).
- Warm up the engine at moderate load. A moderate load on a cold engine will give better combustion and more rapid warm-up than running the engine unloaded.

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Running

Regularly check the instruments and warning lights.

Engine speeds

0 - 500 r/min	red sector:	non-permissible speed, passed when starting and stopping.
500 - 700 r/min	yellow sector:	low idling speed.
700 - 2200 r/min	green sector:	normal operating speed.
		Max. torque and min. fuel consumption in the speed range 1 200 - 1 600 r/min. There is less wear and tear on the engine at low operating speeds.
2200 - 2600 r/min	stripe yellow/green:	unsuitable operating speed.
2600 - 3000 r/min	red sector:	non-permissible engine speed.

Coolant temperature

The correct coolant temperature in operation is:

70 - 93 °C for systems working at atmospheric pressure.

70 - approx. 100 °C for pressurized systems.

Too high a coolant temperature will lead to engine damage. Reduce the load to cool the engine. Unless the temperature drops, stop the engine and examine the fault.

In long-term operation at idling speed or at very low power utilization the engine temperature may not reach 70 °C, although the temperature will rise at greater loading.

Cooling system with Scania radiator and expansion tank of plastic material must not have a pressurized system i. e. pressure cap may not be used on the expansion tank.

Oil pressure

Maximum oil pressure:	
with warmed-up engine.above 800 r/min	6 bar
Normal oil pressure:	
with warmed-up engine at operating temperature	3 - 6 bar
Minimum oil pressure:	
with warmed-up engine at 800 r/min	0,7 bar

At engine speeds below 800 r/min, too low oil pressure may be indicated without danger.

Oil pressures below 0,7 bar at engine speeds above 800 r/min will lead to engine damage. The engine must be stopped at once.

A high oil pressure (in excess of 6 bar) is normal when starting from cold.

Charge warning light

If the warning light illuminates at operation:

Check / adjust the alternator drive belts, maintenance item 22, page 39. If the charge warning light remains on, the alternator or electrical system may be defective.

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STOPPING THE ENGINE

1. Allow the engine to run unloaded for a few minutes in case it has been run at a high continuous load.
2. Stop the engine with the stop control. Engines with a stop solenoid are stopped with the stop button. Keep the stop button pushed in until the engine is has come to a stand-still.
3. Engines with battery master switch: Switch off the power supply with the battery master switch. (Does not apply to stand-by gen sets).
4. Set the starter switch to "0". (Does not apply to stand-by gen sets).

There is a risk of turbocharger damage and after-boiling if the engine is stopped at once.

The power supply must not be cut before the engine has stopped.

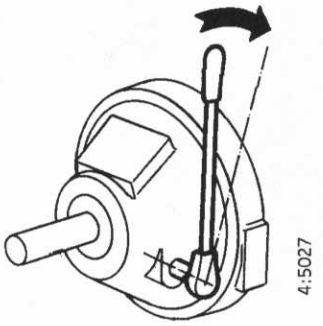
Emergency stop

There is a handle marked "STOP" in the solenoid linkage system. Pull the stop solenoid linkage system manually to the stop position if engine cannot be stopped with the stop solenoid.

CLUTCH

Engagement

- The engine speed should not exceed 800 r/min and the time for engagement must be less than 3 seconds.
- Push the lever forward (towards the engine) to the inner end position stop with as little disc slippage as possible.
- When the lever reaches the self-retaining position, a slight snatch is felt.
- Adjust the clutch if it slips.

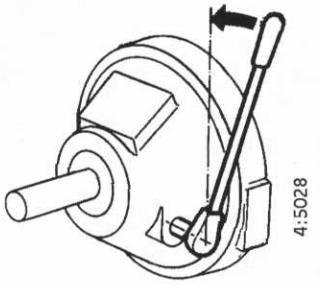


Engagement

IMPORTANT! Clutch slip raises the temperature and damages the linings. It is therefore vital for the operating torque to be within specified limits. Se tillverkarens anvisningar.

Disengagement

- The engine speed must not exceed 800 r/min.
- Pull back the lever (away from the engine) to the inner end position stop with as little disc slippage as possible.
- When the lever leaves the self-retaining position, a slight snatch is felt.



Disengagement

WARNING If the output shaft of the clutch turns (e.g. in a multi-engine installation with other engines running) the clutch might be pulled into engaged position on its own.
THIS CAN LEAD TO INJURY and engine damage.
Therefore, always block the clutch in declutched position if there is a risk that the output shaft starts to turn.

The end position of the clutch lever must not be obstructed by control arrangements.

CHECKS AFTER RUNNING

- Check that the power supply has been cut with the battery master switch and that the starter switch is set to "0".
- Top up the fuel tank. Ensure that the filler cap and the areaaround it is clean so that the fuel is not polluted
- Unless the cooling system contains glycol, it must be drained if there is a risk of freezing, see page 22.
- At temperatures below 0 °C: Prepare for the next start by connecting engine heater (if any).

WARNING
Always block the clutch in declutched position, if there is a risk that the output shaft can begin to turn. If the engine starts, there is a great RISK OF INJURY.

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MAINTENANCE

The maintenance program comprises 25 items, divided into the following main groups:

Lubrication system.....page 16
Cooling system.....page 21
Air cleaner.....page 25
Fuel system.....page 27
Electrical system, monitors, batteries, etc.....page 28
Miscellaneous.....page 38

The maintenance is split into the following intervals:

Daily maintenance

Maintenance before the first start

Maintenance after the first 50 hours of operation

Maintenance after the first 600 hours of operation

Periodical maintenance every 50 hours of operation (carried out at 50, 100, 150, 200 h, etc.)

Periodical maintenance every 200 hours of operation (carried out at 200, 400, 600, 800 h, etc.)

Periodical maintenance every 400 hours of operation (carried out at 400, 800, 1200, 1600 h, etc.)

Periodical maintenance every 1200 hours of operation (carried out at 1200, 2400, 3600 h, etc.)

Periodical maintenance every 2400 hours of operation (carried out at 12400, 4800 h, etc.)

Periodical maintenance every 4800 hours of operation (carried out at 4800, 9600 h, etc.)

Maintenance every year

Maintenance every 2nd year

Maintenance every 5th year

ENGINES WITH FEW OPERATING HOURS

Standby gen-sets and similar that are not used regularly should be test run and checked in accordance with the unit manufacturer's instructions

The engine is first run up to operating temperature and then the following maintenance items should be performed:

1. Checking the oil level.
5. Checking the coolant level.
8. Checking the vacuum indicator.
12. Checking the fuel level.
15. Checking the battery fluid level.
16. Checking the battery charge.
17. Cleaning the batteries.
23. Search for leakage, remedy if required.

For engines with few operating hours which are not subjected to periodical maintenance according to the chart in page 15, maintenance must be carried out according to "Every year" "Every 2nd year" "Every 5th year"

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MAINTENANCE DIAGRAM

	Daily	First time at			Interval						At least		
		First start	50 h	600 h	50 h	200 h	400 h	1200 h	2400 h	4800 h	Every year	Every 2nd year	Every 5th year
LUBRICATION OIL SYSTEM, page 17													
1. Checking the oil level	●	●											
2. Engine oil change						●1							●
3. Cleaning the oil cleaner						●1							●
4. Changing the turbo filter						●1							●
COOLING SYSTEM, page 20													
5. Checking the coolant level	●												
6. Checking the coolant.		●						●			●		
7. Cleaning the cooling system										●1			●
AIR CLEANER, page 25													
8. Check reading the vacuum indicator	●												
9. Cleaning the pre-filter							●1						●
10. Cleaning or changing the filter element								●3					●
11. Changing the safety cartridge									●				●
FUEL SYSTEM, page 27													
12. Checking the fuel level	●	●											
13. Cleaning the prefilter and changing the main filter								●1					●
14. Checking the injectors									●		●		
ELECTRICAL SYSTEM, page 34													
15. Checking the fluid level in the batteries		●				●2					●		
16. Checking the battery charge		●				●2					●		
17. Cleaning the batteries						●2					●		
18. Checking the coolant level monitor		●						●			●		
19. Checking the temperature monitor		●						●			●		
20. Checking the oil pressure monitor		●						●			●		
21. Checking the stop function		●					●				●		
MISCELLANEOUS, page 38													
22. Checking the V-belts		●				●					●		
23. Checking tightness, adjusting if needed	●												
24. Checking/adjusting the valve clearances				●				●					
25. Changing (or cleaning) the valve for closed crankcase ventilation										●			

1. More frequently if needed.
2. For engines with few hours of operation, see page 14.
3. Sooner if the vacuum indicator alerts (is red).

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LUBRICATION OIL GRADE

The oil should **at least** meet the requirements of one of the following classifications of oil:

- **Service CE according to API**
- **CCMC - D4 or D5**

- Check with your local oil supplier that the oil forfills these demands.
- Stated oil change intervals apply unless the sulphur content of the fuel exceeds 0.7 % by weight.
- Viscosity according to the figure.
- At very low ambient temperatures: Consult your Scania workshop to avoid starting difficulties.

Oil analysis

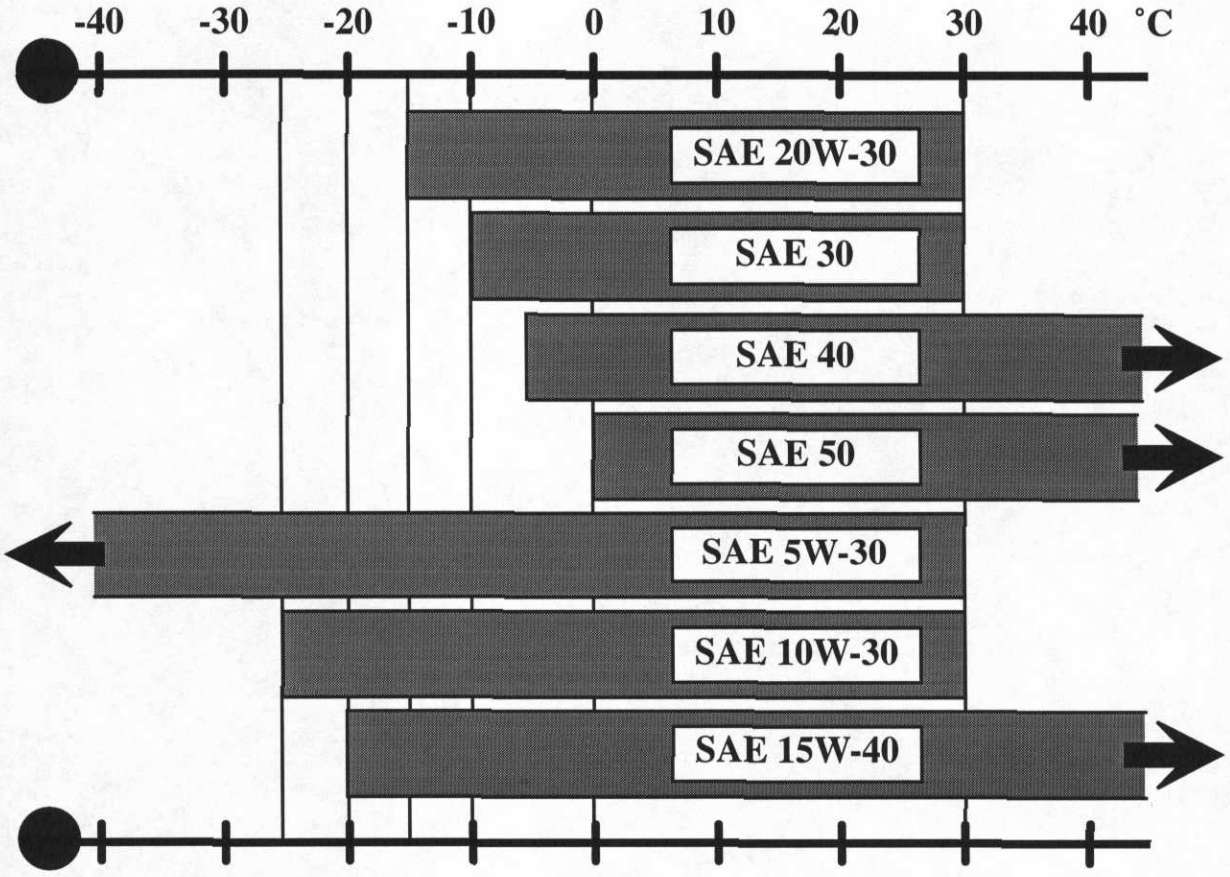
Some oil companies can perform an engine oil analysis. During this analysis, the total base number (TBN), total acid number (TAN), fuel dilution, water content and viscosity are measured, as well as the amount of wear particles and soot in the oil.

The result of a number of analyses forms the basis of arriving at a suitable oil change interval.

With changed conditions a new oil analysis program has to be carried out to establish new change interval.

Additives must not be used.

The oil should be suitable for all temperature variations until the next oil change.

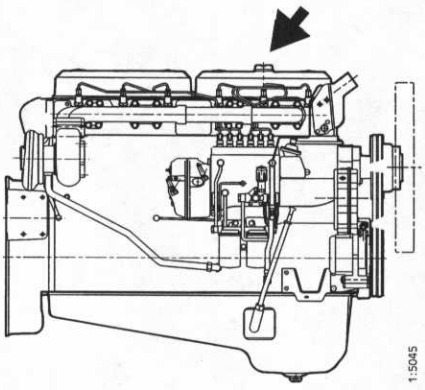


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1. Daily: CHECK OIL LEVEL

Before checking the oil level: Allow the engine to be stopped for at least 5 minutes.

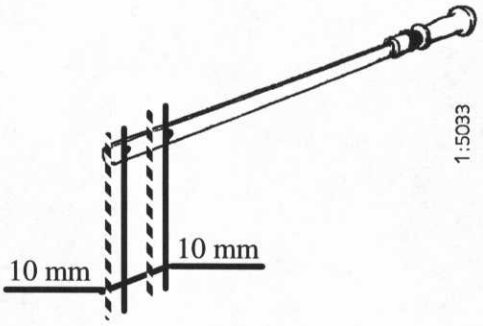
- Correct level is between the marks on the dipstick. Top up when the oil level drops to the lower mark.
- Correct grade, see "Lubrication oil grade" (page 16).



Checking the oil level with the engine running

On some engines, the oil level can be checked with the unit running:

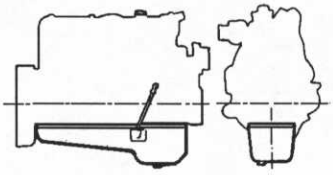
- Remove the oil filler cap to depressurise the crankcase.
- Check the level on the dipstick. Correct level: ***10 mm under min or max mark***.



2. Every 200 hours: OIL CHANGE

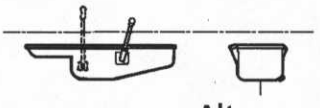
If the engine is running in particularly dusty conditions - change oil more frequently.

- Remove the plug and drain the oil while it is warm.
- Some engines are equipped with a drain pump for the oil.
- Clean the magnet on the plug.
- Put back the plug
- Top up with oil.
- Check the level on the dipstick..



Max 30 dm³
Min 22 dm³

WARNING
Oil may be hot.
Use protective gloves and goggles.



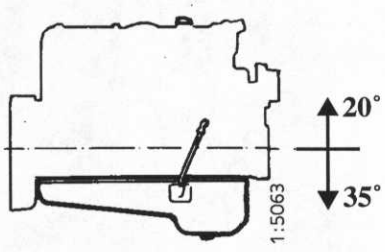
	Alt
Max 23 dm³	27 dm³
Min 17 dm³	21 dm³

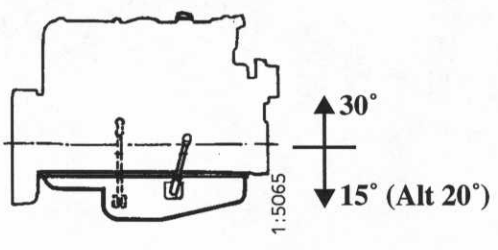
1:5049

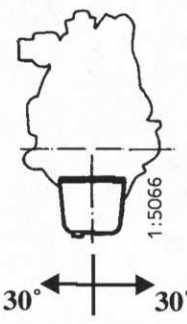
1 dm³ = 1 liter

Maximum inclination angles at operation

Maximum allowable inclination angles at continues operation depend on the type of oil sump being used. See figure.







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3. Every 200 hours: CLEANING THE OIL CLEANER (together with oil change)

WARNING
Remove cover with caution!
The oil may be hot.

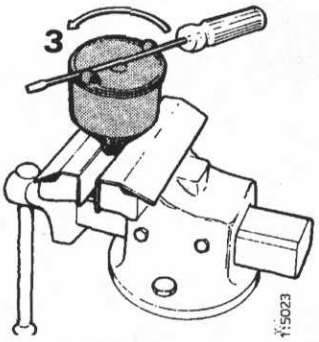
- Undo the nut and remove the cover.



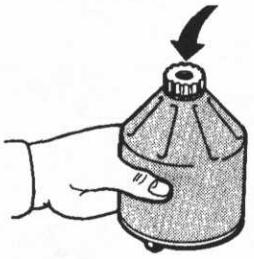
- Lift out the rotor and undo the nut for the rotor cover 3 turns.



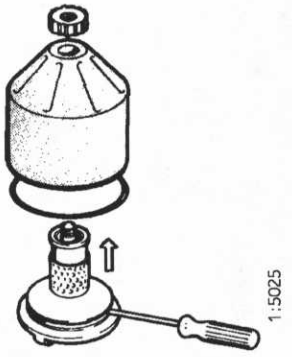
- If the nut sticks:
  Clamp the nut (***absolutely not the rotor***) in a vice and turn the rotor 3 turns by hand or using a screwdriver.



- Tap the nut with the hand or with a plastic mallet to separate the rotor from the bottom plate.



- Loosen the nut and lift off the rotor cover.
- Carefully pry the strainer loose from the bottom plate.



- Scrape off the deposits on the inside of the rotor cover. Lack of deposits means that the cleaner is not functioning.
- ***Clean more often if they are thicker than 20 mm.***

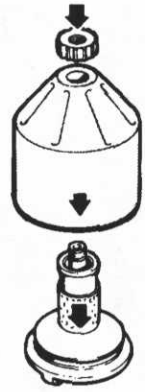


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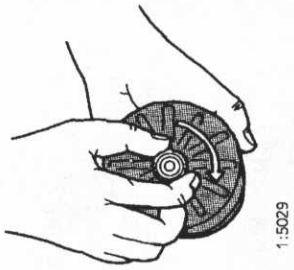
- Clean all parts in diesel fuel.



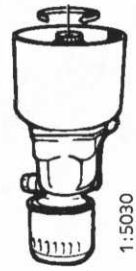
- Place the O-ring in the rotor cover. ***It must be undamaged.*** Replace it if necessary.



- Assemble the rotor.



- Tighten the rotor nut hard by hand.



- Put back the rotor.
- Check that it rotates easily.



- Check that the O-ring in the cover is undamaged. Hard or damaged O-ring must be changed.
- Tighten the cover hard by hand

If the nut is tightened with a tool, either the rotor shaft, the cover or the nut may be damaged.

Functional check



The rotor rotates very fast and should carry on rotating after the engine is stopped.

- Stop the engine when it is warm.
- Listen for the hum of the rotor or try to feel the cleaner housing vibrating.

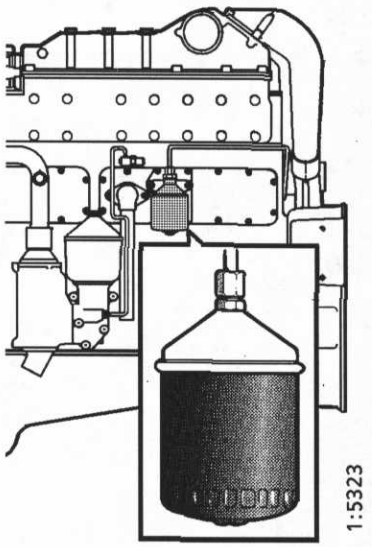
The rotor ***normally rotates 30-60 s*** after the engine has been stopped.

- ***If not, dismantle and check.***

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4. Every 200 hours: CHANGE THE TURBO FILTER

(together with oil change)



- Remove and discard the old filter.
- Oil the rubber gasket and fit a new Scania genuine filter.
- Tighten the filter by hand.

  Never use a tool. The filter may be damaged and the circulation hampered.
- Start the engine and check the tightness.

5. Daily: CHECKING THE COOLANT LEVEL

- Open the cap of the expansion tank and check the coolant level.
- Correct level: (Scania expansion tank)
- Warm engine: The coolant should reach the lower edge of the filler neck.
- Cold engine: The level should be 10 - 20 mm below the lower edge of the filler neck.
- For other makes of expansion tank, follow the manufacturer's instructions.
- Top up if necessary, see item 6.

Note When filling large amounts of coolant:
Never fill cold coolant when the engine is warm.
This may cause cracks in the engine.

WARNING
Open the cap cautiously! Water and steam may escape.

Always fill premixed coolant.

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6. Every 1200 hours: CHECKING THE COOLANT

Check the coolant according to the following procedure:

a) Check that the coolant is clean and transparent.
b) Check the anti-corrosive content.
c) In case there is a risk of freezing: Check the glycol content.

Composition of the coolant:

Water
+
3-4 % anti-corrosive by volume

(*Scania Anti-corrosive* and/or glycol)

For further specification of the coolant composition, see **"Start and running"**.

a) Checking that the coolant is clean and tansparent

Collect some coolant in a vessel and check that it is clean and transparent.

If the coolant is polluted or cloudy, consider a change of coolant.

The water used in the coolant must be free from dirt, calcium and salts. Use drinking water with a pH value of 6-9.

WARNING
***Scania Anti-corrosive* is lethal to consume.**

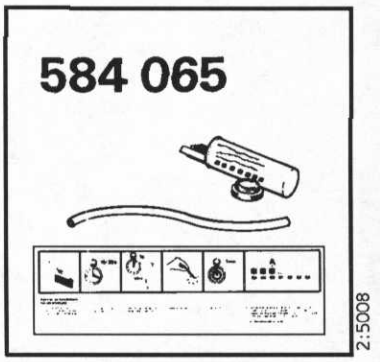
b) Checking the anti-corrosive content

A sufficiant content of anti-corrosive (inhibitor) in the coolant is essential to obtain sufficiant protection against corrosion in the cooling system.

The correct anti-corrosive content is 3-4 % by volume. The anti-corrosive protection should be *Scania Anti-corrosive* and/or glycol anti-freeze. The content of anti-corrosive should be calculated in acc. with the formula:

$$\frac{\text{Glycol content}}{10} \text{ vol.\% + } \textit{Scania Korrosionsskydd} \text{ vol.\% = } \mathbf{3\text{-}4\ vol.\%}$$

A check of the anti-corrosive content is simple to carry out by using an analysis kit available from every Scania workshop. For part No., see fig.



If the content proves to be too low:

- Fill *Scania Anti-corrosive* according to the description on the analysis kit or fill with glycol.

The analysis kit only works when the glycol has a nitrite-based inhibitor.

The analysis kit can only be used for nitrate-based glycols

Only *Scania Anti-corrosive* must be used in our engines.

If the analysis kit for measuring the inhibitor content is not available, 1.0 % by volume of Scania Anti-corrosive should be added every 1200 hours of operation.

Premixed coolant should be used when topping up the cooling system.

Never fill just water, Anti-corrosive or glycol separately.

Tightness check

Scania Anti-corrosive is fluorescent if illuminated by ultrviolet light. Leaks can easily be spotted then.

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c) Checking the glycol content

In case there is a risk of freezing, check the glycol content of the coolant.

- In a cooling system ***with*** glycol but ***without*** *Scania Anti-corrosive* use water and 30-40 % by volume of glycol to obtain adequate corrosion protection.
- In a cooling system with 10-30 % by volume of glycol, also *Scania Anti-corrosive* should be added to obtain adequate corrosion protection.
- 30 % glycol provides anti-freeze protection down to -18 °C. In case further protection is needed, consult the table below for the protection offered by different glycol contents.

We recommend anti-freeze glycol with a nitrite-based inhibitor, having the following supplier designations:

BASF 9313
Shell AF 402
Shell AF 511
Dow 82 413 FS or similar.

Note Always top up with glycol if the glycol content is less than 30 % by volume, corresponding to a freezing temperature of -18 °C.

Use the table below to calculate the correct amount of glycol.

More glycol than 50 % by volume does not improve the protection.

The table states when ice begins to form. Solid freezing commences at considerably lower temperatures, see figure.

When ice has started to form in the coolant, disturbances will often occur without there being a risk of damage.

The engine must not be loaded hard when ice has started form.

Example (see figure):

The coolant contains 30 % glycol by volume.

Ice starts to form at -18 °C.

At -30 °C there is a risk of damage.

A

Freezing point °C % glycol	-7 15	-10 20	-14 25	-18 30	-24 35	-30 40	-38 45	-46 50	Coolant capacity in dm^3
Coolant capacity in dm^3 (litres)	5	6	8	9	11	12	14	15	30
	6	8	10	12	14	16	18	20	40
	8	10	13	15	18	20	23	25	50
	9	12	15	18	21	24	27	30	60
	11	14	18	21	25	28	32	35	70
	12	16	20	24	28	32	36	40	80
	14	18	23	27	32	36	41	45	90
	15	20	25	30	35	40	45	50	100
	17	22	28	33	39	44	50	55	110
	18	24	30	36	42	48	54	60	120
	20	26	33	39	46	52	59	65	130
	21	28	35	42	49	56	63	70	140
	23	30	38	45	53	60	68	75	150
	24	32	40	48	56	64	72	80	160
	26	34	43	51	60	68	77	85	170
	27	36	45	54	63	72	81	90	180
	29	38	48	57	67	76	86	95	190
	30	40	50	60	70	80	90	100	200

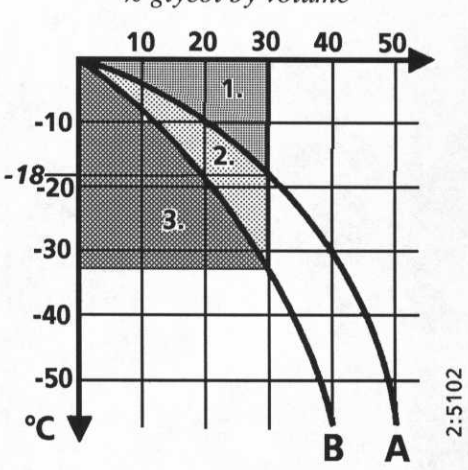
A= Area to be avoided. Only used to calculate the quantity of glycol.

Freezing points of the coolant at different glycol contents

WARNING
Ethylene glycol is lethal to consume.

Avoid glycol coming into contact with hte skin.

Do not mix different makes of glycol.



Properties of glycol

Example with 0-30 % glycol by volume

Curve A: Freezing starts
Curve B: Solid freezing starts

1. *Safe area*
2. *Disturbances may occure (ice formations)*
3. *Coolant frozen*

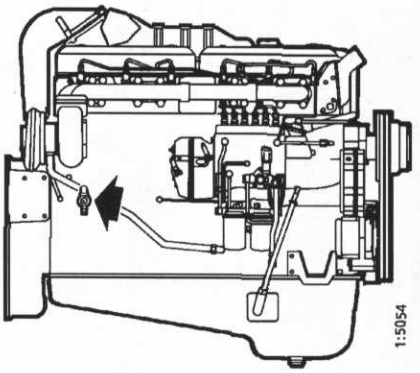
Premixed coolant should be used when topping up the cooling system.

Never fill just water, anti-corrosive or glycol separately.

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Changing the coolant

1. Remove the filler cap on the expansion tank.
2. The coolant is drained off at two points:
   - The "lowest point" of the cylinder block, see figure.
   - The "lowest point" of the cooling system.
3. Close the taps.
4. Always fill coolant through the filler neck of the expansion tank.
   Mix the coolant according to instructions in page 21.



7. Every 4800 hours:CLEANING THE COOLING SYSTEM

Note If necessary the cooling system should be cleaned more often.

External cleaning

Check that the cooler is not contaminated and that the fins are not damaged.

Scrape very carefully on the cooler pipes to remove deposits. If necessary, an engine cleansing agent with kerosene base can be used.

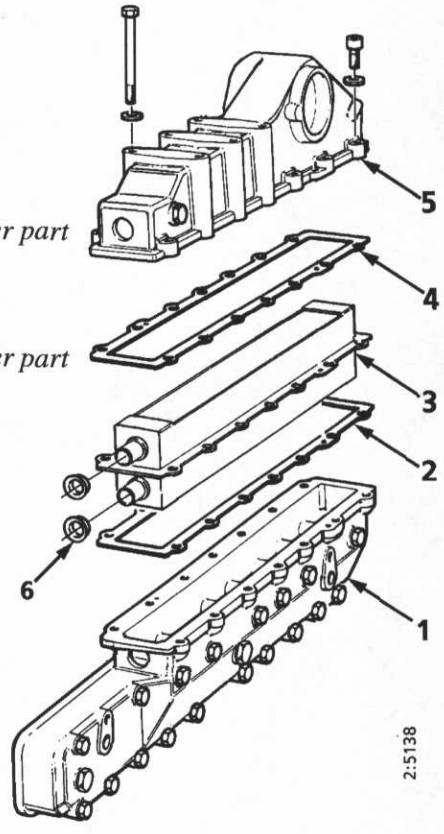
Bent fins can be straightened by using a wire brush very carefully.

The cooling system must absolutely not be cleaned using sodium hydroxide.

There is a risk of damage to aluminium parts.

Charge cooler

1. Drain the engine cooling system. See "Changing the coolant"..
2. Loosen the intake air pipe.
3. Remove the hose and pipe connections to the charge cooler.
4. Disassemble the charge cooler according to the figure.
   Be careful - do not cause damage to the water connections.
5. Clean the outside of the element. Use a kerosene-based cleansing agent.
6. Assemble the charge cooler. Replace damaged seals.
7. Fit the hose and pipe connections.
8. Top up with coolant.



1. *Inlet manifold, lower part*
2. *Gasket*
3. *Element*
4. *Gasket*
5. *Inlet manifold, upper part*
6. *V ring seal*

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Internal cleaning

To remove oil and grease

- If possible, run the engine warm and drain the cooling system afterwards.
- Remove the thermostats.
- Fill the system with a solution of liquid dish washing machine detergent and clean warm water. Mixture proportion 1% (0,1/10 l).
- Run the engine warm for approx.20-30 min. Remember the cab heating system, if any.
- Drain the cooling system.
- Fill the cooling system again with clean, warm water and run the engine warm for approx. 20-30 min.
- Drain all the water from the system.
- Put back the thermosatat.
- Fill up with coolant as per specification in page 21.

WARNING

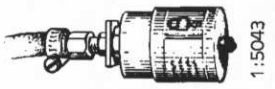
When handling cleaning agents for cooling systems:
Study any warning text on package.

To remove deposits

- If possible, run the engine warm and drain the cooling system afterwards.
- Remove the thermostats.
- Fill the system with warm water mixed with one of the radiator cleaning fluids on the market based on sulphamine acid and containing dispersant additive. Follow the instructions from the manufacturer regarding mixture proportion and time for cleaning.
- Run engine for the prescribed time and then drain the cooling system.
- Fill the cooling system again with clean, warm water and run the engine warm for approx. 20-30 min.
- Drain all the water from the system.
- Put back the thermostats.
- Fill up with coolant as per specification in page 21.

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8. Daily: CHECKING THE VACUUM INDICATOR



If the red plunger of the vacuum indicator is fully visible, change or clean the filter element of the air cleaner, see item 10.

9. Every 200 hours: CLEANING THE AIR CLEANER PREFILTER

1. Undo the overcentre catches and remove the prefilter.
2. Remove the plastic cover of the prefilter and clean the parts.
3. Check that the plastic cover is undamaged and that it seals against the air cleaner housing when fitted.
4. Assemble the air cleaner.

Make certain the "TOP" marking on the prefilter is located correctly.

10. Every 1200 hours: CLEANING OR CHANGING THE FILTER ELEMENT

Note Earlier if the vacuum indicator is red (plunger visible).

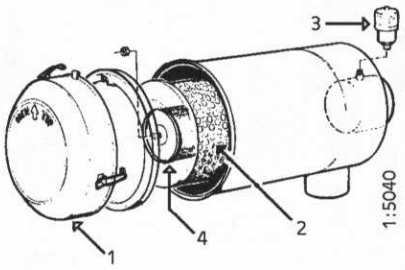
Filters with a replaceable filter element:

Disassembly

1. Remove and clean the prefilter according to item 9.
2. Remove the retaining nut and lift out the filter element.
3. Change or clean the filter element.

Note Cleaning the element always incurs a risk of damage. The element may be cleaned up to four times. After cleaning, the dust collecting capacity is not as good as for a new element.

4. Put a mark on the filter element each time it is cleaned.



1. Prefilter with cover
2. Filter insert
3. Low pressure indicator
4. Safety cartridge

Air cleaner with prefilter

Only use Scania genuine air filters.

Cleaning the filter element

- Blow clean the element carefully from the inside using dry compressed air.

Note This filter element may not be cleaned using water.

Change a damaged filter element. There is a great risk of engine damage if the filter element is defective.

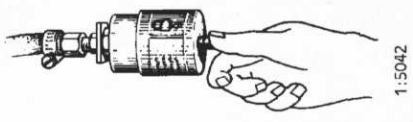
Checking

- Insert an inspection lamp into the filter element and check from the outside that there are no holes or cracks in the filter paper.
- Change the filter element even if it is only slightly damaged. Otherwise there is a great risk of engine damage.

Do not remove the safety cartridge unnecessarily.

Assembly

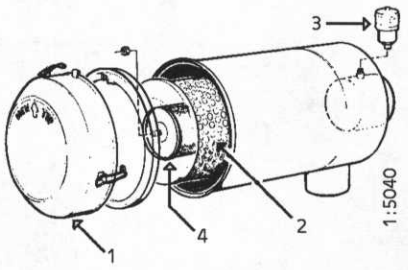
1. Assemble the air cleaner in the reverse order.
2. Reset the red plunger of the vacuum indicator by pressing the button.



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11. Every 2400 hours: CHANGING THE SAFETY CARTRIDGE

1. Remove the prefilter and clean it, see item 9
2. Remove the retaining nut and lift out the filter element.
3. Change or clean the filter element, see item 10.
4. Remove the retaining nut and lift out the safety cartridge.
5. Fit a new Scania genuine safety cartridge
6. Assemble the air cleaner in the reverse order.tätning



1. Prefilter with cover
2. Filter insert
3. Low pressure indicator
4. Safety cartridge

Air cleaner with prefilter

Never clean the safety cartridge.

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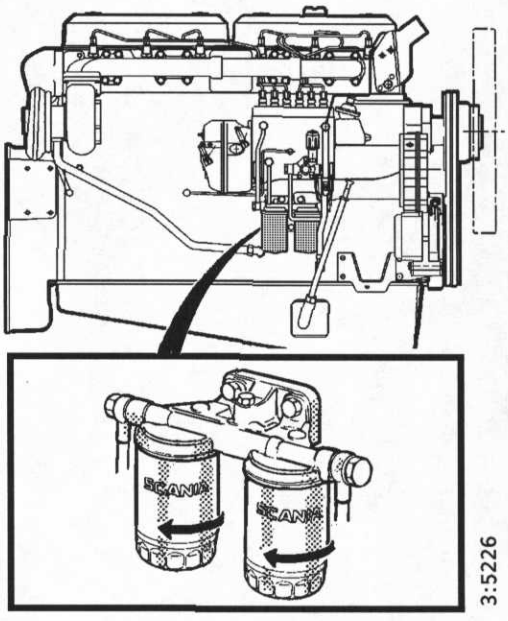
12. Daily: CHECKING THE FUEL LEVEL

- Top up if needed.
- If the tank has been run empty, bleed the fuel system, see item 13.

Observe extreme cleanliness when working on the fuel system

Otherwise breakdowns may occur and the injection system be damaged.

13. Every 1200 hours: CHANGING THF MAIN FILTER



Fuel tanks

Drain off water from the fuel tanks.

Main fuel filter

The main filter consists of two filter units connected in parallel.

- Wash the filters on the outside and undo them.
- Tighten the new filters ***by hand.***

Never use tools to tighten the filters. The cartridges may be damaged and the fuel flow hampered.

- Bleed the fuel system as described below.
- Start the engine and check the tightness.

Bleeding the fuel system

Använd endast Scania original bränslefilter

- Open the bleeder screw **1** on the main filter unit.
- Pump with the hand pump **2** until bubble-free fuel flows from the bleeder screw.
- Tighten the bleeder screw. Pump another few strokes with the handle

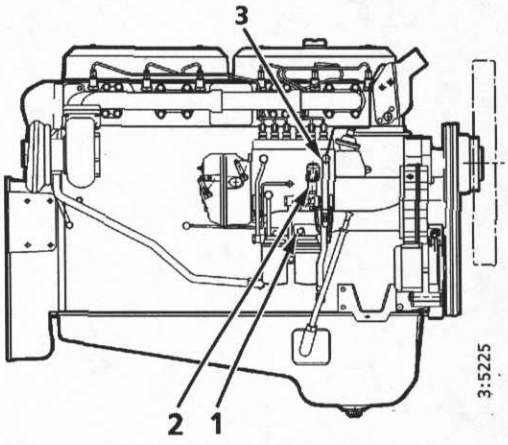
If there are starting difficulties after the bleeding . . .

- Loosen the overe-flow valve **3** on the injection pump (at the arrow) h turn and make another attempt to start.

If the engine still does not start. . . .

- Pump with the hand-pump until bubble-free fuel flows at the overflov valve.

Tighten the over-flow valve when the engine has started.



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14. Every 2400 hours: CHECKING THE INJECTORS

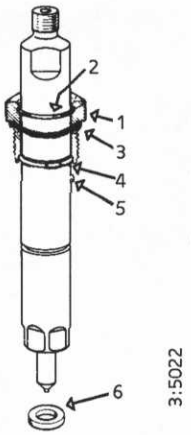
The injectors should be reconditioned by trained personnel with access to the necessary equipment at least once a year or every 2400 operating hours.

Removal

1. Clean the area around the injector and the connections including clamps and brackets.
2. Remove the delivery pipe bundle and the fuel return lines.
3. Remove the injector.
4. Fit protective plugs to injector and delivery pipe.
5. Lift out the seal washer from the bottom of the injector seat if it does not come out with the injector.
6. Fit a protective plug to the injector seat in the cylinder head.

Clean the injector and check/adjust in a nozzle tester.

Correct opening pressure, see Technical data, page 46.



1. Cap nut
2. O-ring
3. O-ring
4. Stop ring
5. Dowel
6. Sealing washer

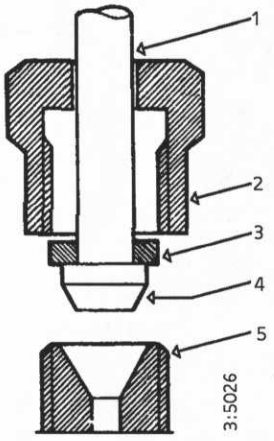
The delivery pipes may not be bent.

All clamps must be refitted

Assembly

1. Check that no old seal washer remains and fit a new seal washer in the bottom of the injector seat.
2. Fit a new O-ring to the sleeve nut and a new seal ring under the sleeve nut.
3. Fit the injector.
4. Tighten the sleeve nut with 70 Nm (7.0 kgf m).
5. Fit the delivery pipe and tighten its cap nut with 20 Nm (2.0 kgf m). Fit the clamps and brackets.

   Ensure that the delivery pipes are fitted without any tension and that the cone is aligned in the union.
6. Attach the fuel return lines. Tighten screws with 11 Nm (1.1 kgf m).



1. Pressure pipe
2. Cap nut
3. Washer
4. Sleeve
5. Connection on injector or injection pump

Pressure pipe connection

ELECTRICAL SYSTEM

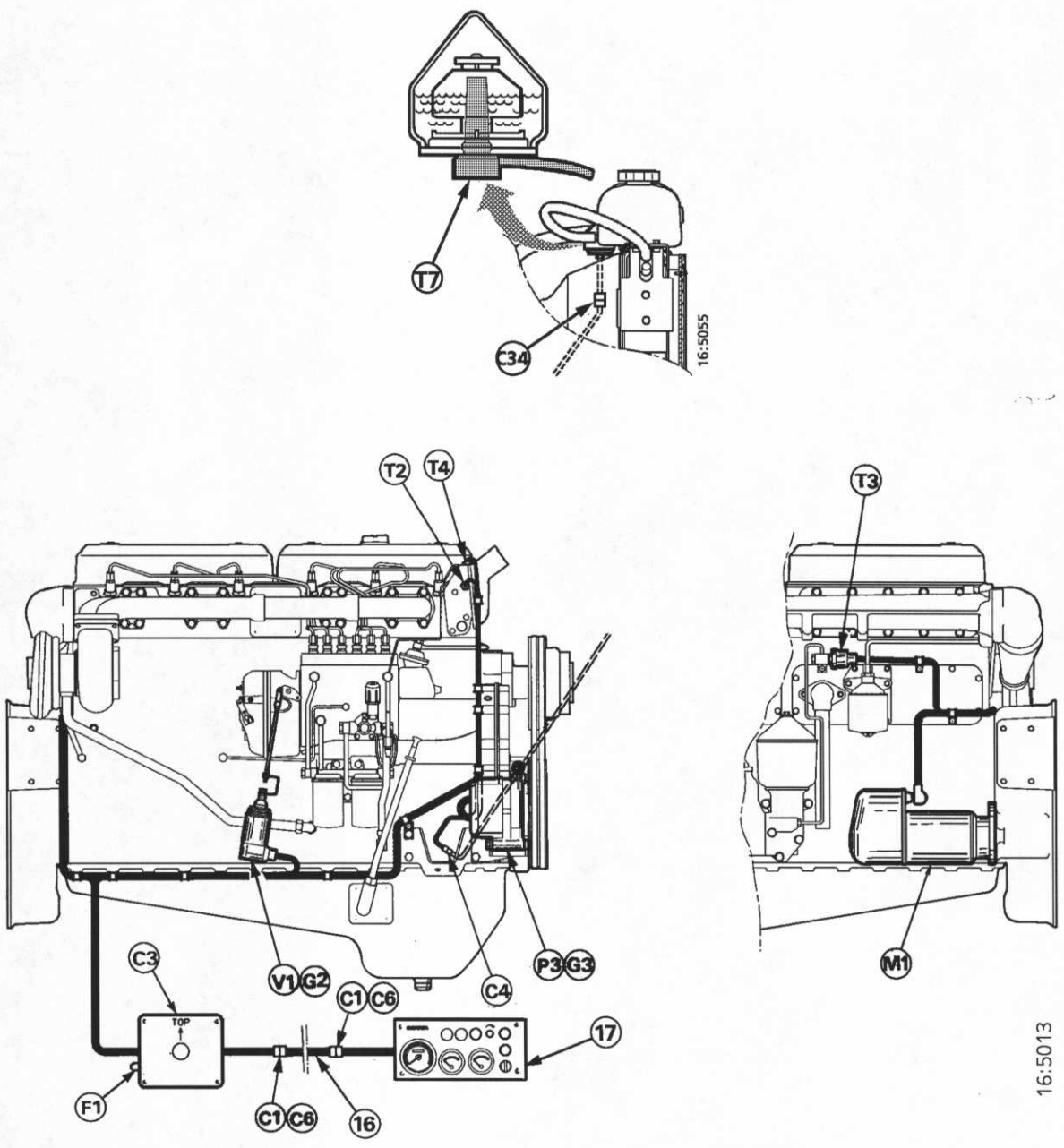
We here describe the Scania standard electrical systems.

The electrical system consists of alternator, starter motor, stop solenoid, sensors/monitors, junction box with relays and automatic fuse, extension cable and instrument panel.

The locations appear in the figure below.

Note The locations of the instrument panel, junction box and batteries (not illustrated) vary depending on the installation.

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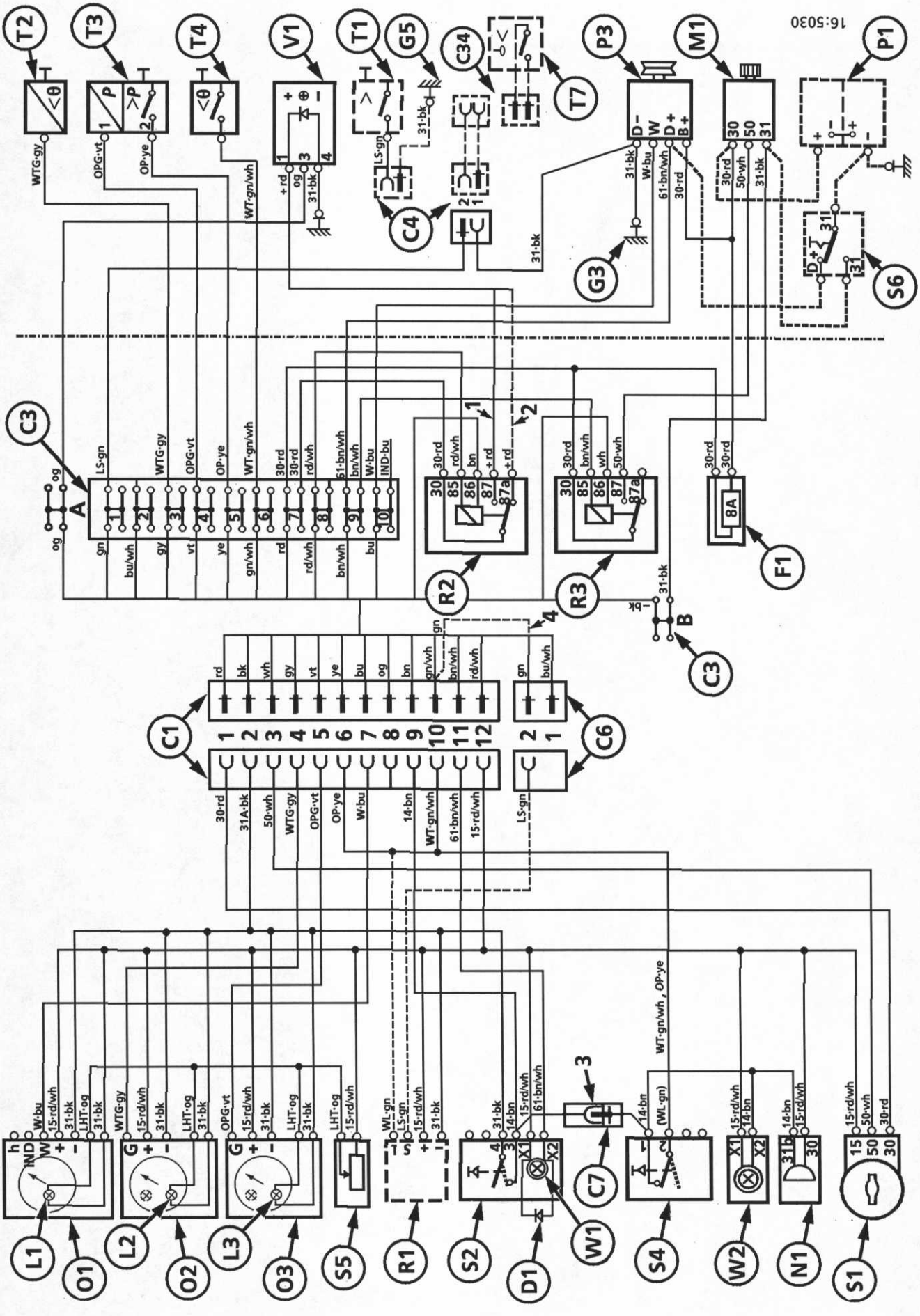


C1. Connector
C3. Junction box
C4. Connector
C6. Connector
C34. Connector
F1. Automatic fuse
*G2. Earth connection**
*G3. Earth connection**
M1. Starter
P3. Alternator
T2. Temperature sensor
T3. Oil pressure sensor / monitor
T4. Temperature monitor
*T7. Coolant level monitor***
V1. Stop solenoid
16. Extension cable
17. Instrument panel

* *1 pole electrical system*
** *2 pole*

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WIRING DIAGRAM, 1 POLE ELECTRICAL SYSTEM



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Pos.	Component	
C1	Connector	12 pole
C3	Junction box	12 pole
C4	Connector	2 pole
C5		2 pole
C7		1 pole
C34		2 pole
D1	Diode	
F1	Automatic fuse	8 A
G1	Earth connection in engine	Batteries
G2		Stop solenoid
G3		Alternator
G5	Earth connection in radiator	Coolant level monitor (only 1 pole monitor)
L1	Instrument lighting	Tachometer (BA7s-24V-3W)
L2		Temp. gauge (BA9s-24V-2W)
L3		Oil pressure gauge (BA9s-24V-2W)
M1	Starter	
N1	Buzzer	
O1	Instrument	Tachometer with time recorder
O2		Temperature gauge
O3		Oil pressure gauge
P1	Battery	2x12 V
P3	Alternator	28 V, 55 A

Pos.	Component	
R1*	Relay	Coolant level
R2	Relay	Stop solenoid
R3		Starter
S1	Switch	Key, off-on-start
S2		Stop
S4		Interlock
S5	Rheostat	Instrument lighting
S6	Battery master switch	Option
T1	Monitor, 1 pole	Coolant level
T2	Sensor	Coolant temperature
T3	Sensor / monitor	Oil pressure
T4	Monitor	Coolant temperature
T7	Monitor, 2 pole	Coolant level
V1	Stop solenoid	
W1	Warning light	Charge (BA9s-24V-2W)
W2		Master (BA9s-24V-2W)

*) 1 pole monitor only

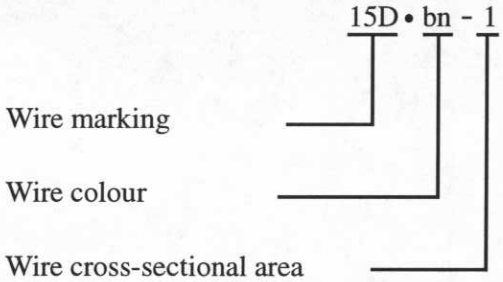
1 Stop solenoid "pulled to stop"

2 Stop solenoid "pulled for operation"

3 For automatic shut-off at fault, connect connector C7

Optional equipment and accessories are dashed in the diagram.

Wire designation

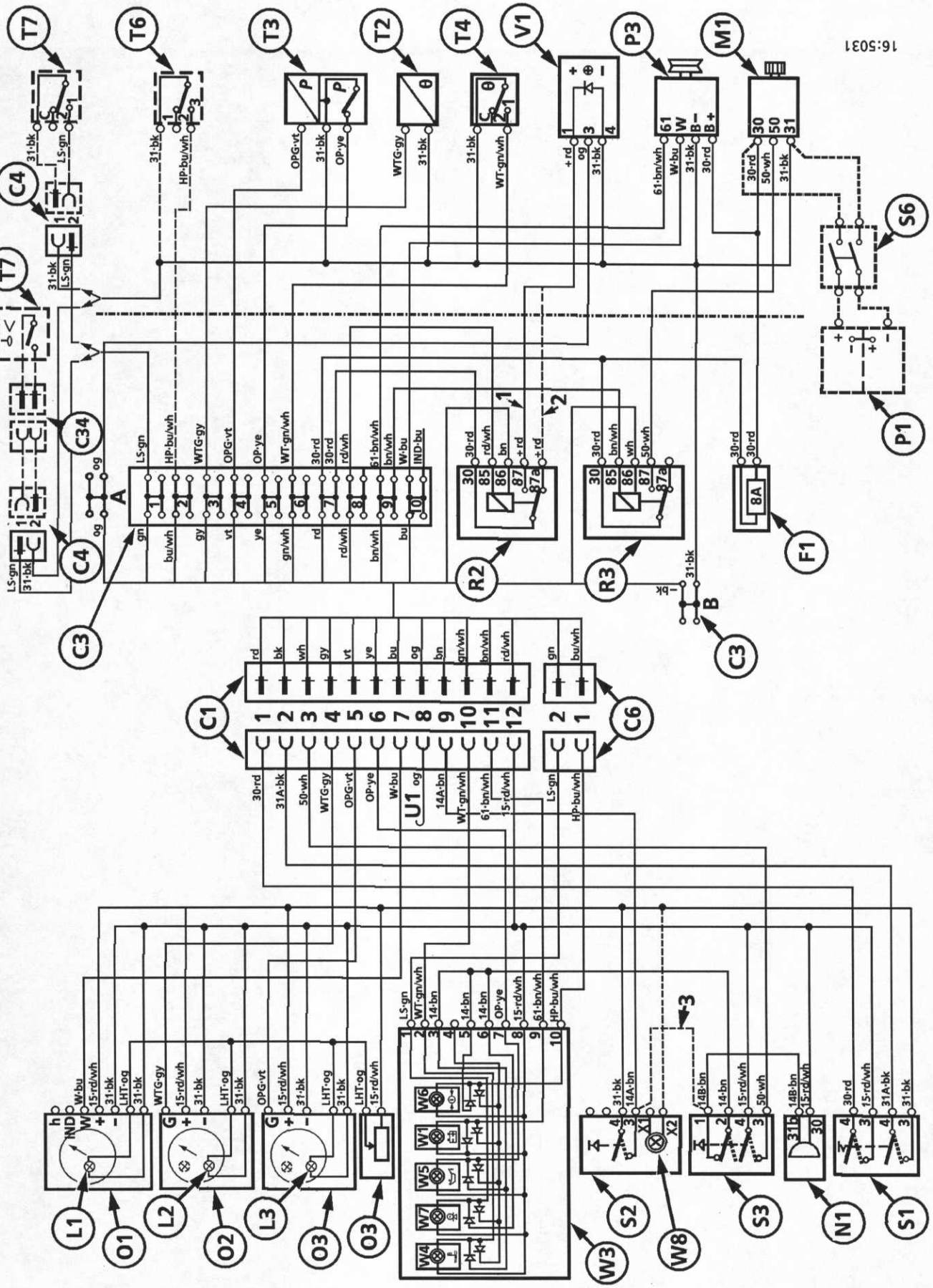


Unless otherwise stated, the wire cross-sectional area is 0.75 mm^2

Colour codes for wires	
Code	**Colour**
bk	Black
bn	Brown
bu	Blue
gn	Green
gy	Grey
og	Orange
pk	Pink
rd	Red
vt	Violet
wh	White
ye	Yellow

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WIRING DIAGRAM, 2 POLE ELECTRICAL SYSTEM



© Scania Industrial and Marine Engines

Pos.	Component	
C1	Connector	12 pole
C3	Junction box	12 pole
C4	Connector	2 pole
C6		2 pole
C34		2 pole
F1	Automatic fuse	8 A
L1	Instrument lighting	Tachometer (BA7s-24V-3W)
L2		Temp. gauge (BA9s-24V-2W)
L3		Oil pressure gauge (BA9s-24V-2W)
M1	Starter	
N1	Buzzer	
O1	Instrument	Tachometer with time recorder
O2		Temperature gauge
O3		Oil pressure gauge
P1	Battery	2x12 V
P3	Alternator	28 V, 55 A
R2	Relay	Stop solenoid
R3		Starter
S1	Switch	Key, off-on-start
S2		Stop
S3		Start
S5	Rheostat	Instrument lighting
S6*	Battery master switch	Optional

Pos.	Component	
T2	Sensor	Coolant temperature
T3	Sensor / monitor	Oil pressure
T4	Monitor	Coolant temperature
T6*		Hydraulic pressure
T7*		Coolant level
U1	Spare line	
V1	Stop solenoid	
W3	Warning light panel	
W1	Warning light	Charge (24V-1.2W)
W4		Coolant temp. (24V-1.2W)
W5		Oil pressure (24V-1.2W)
W6		Hydraulic pressure (24V-1.2W)
W7		Coolant level (24V-1.2W)
W8*		Extra equipment

* optional

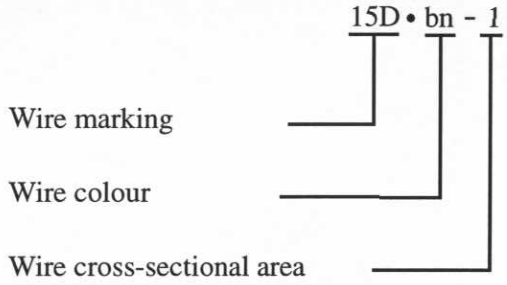
1 Stop solenoid "pulled to stop"

2 Stop solenoid "pulled for operation"

3 For automatic shut-off at fault, connect connector C7

Optional equipment and accessories are dashed in the diagram.

Wire designation



Unless otherwise stated, the wire cross-sectional area is 0.75 mm^2

Colour codes for wires	
Code	**Colour**
bk	Black
bn	Brown
bu	Blue
gn	Green
gy	Grey
og	Orange
pk	Pink
rd	Red
vt	Violet
wh	White
ye	Yellow

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15. Every 200 hours: CHECKING THE BATTERY FLUID LEVEL

1. Remove all the filler plugs and check the fluid level in all cells.
2. Top up with distilled water to 10 - 15 mm above the plates.

16. Every 200 hours: CHECKING THE BATTERY CHARGE

Note! Every 200 hours applies for generating sets and equivalent. Other installations every 1200 hours.

- Check the density with a hydrometer.

The density of a fully charged battery should be:

1.280 at +20°C

1.294 at 0°

1.308 at -20°C

- If the density is lower than 1.20, the battery must be recharged. A discharged battery will freeze at -5 °C.

Avoid crash charging. The battery will become damaged in the long run.

17. Every 200 hours: CLEANING THE BATTERIES

Note! Every 200 hours applies for generating sets and equivalent. Other installations every 1200 hours.

1. Clean batteries, cables and terminals.
2. Check that all terminals are tight.
3. Smear poles and terminals with vaseline.

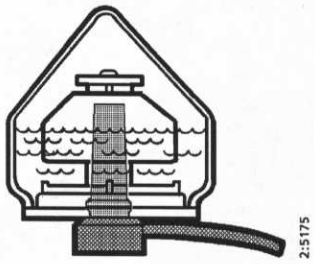
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18. Every 1200 hours: CHECKING THE COOLANT LEVEL MONITOR (optional)

Alternative 1

1. Start the engine.
2. Reduce the coolant level.
3. ***Automatic shut-off at fault***: The engine will stop and the buzzer will sound if level monitor is faultless.

   Not automatic shut-off at fault: The buzzer will sound if level monitor is faultless.
4. Fill coolant up to the correct level, see page 21.



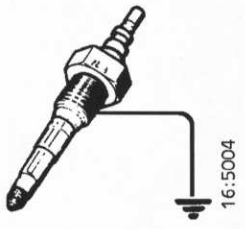
2-pole level monitor

Alternative 2

1-pole monitor

1. Remove the wire from the monitor.
2. Remove the monitor. **The coolant may be hot.**
3. Fit a plug M12x1 in the hole for the monitor.
4. Clean point of monitor if it is oxidized.
5. Re-fit the wire to the monitor.
6. Start the engine.
7. Fit a wire between the monitor and earth..
8. ***Automatic shut-off at fault***: The engine will stop and the buzzer will sound if level monitor is faultless.

   Not automatic shut-off at fault: The buzzer will sound if level monitor is faultless.



1-pole level monitor

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19. Every 1200 hours: CHECKING THE TEMPERATURE MONITOR

1. Drain off enough coolant to enable the temperature monitor to be removed.
2. Remove the wires of the temperature monitor.
3. Remove the monitor.
4. Put back the wires on the monitor.

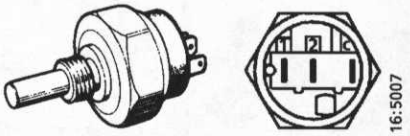
   - 1-pole monitor: connect a cable between earth and monitor.
5. Hold the sensing body of the monitor in water and heat the water slowly (approx. 1° per minute) e.g with an immersion heater.
6. Set the starter switch to "ON". Check with a thermometer that the warning lamp comes on or that the alert is given at the right temperature.

Correct temperature is stamped into the hexagon of the monitor.

Tolerance is ± 3° for 1 pole and 2 pole monitor.



1-pole temperature monitor



C = Common connection
1 = Connection C - 1 makes at stamped temperature
2 = Connection C - 2 breakes at stamped temperature

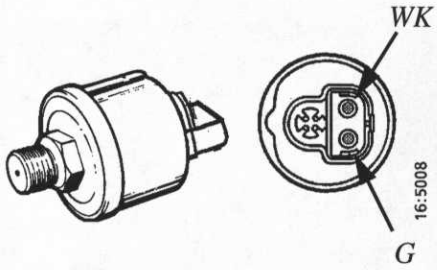
2-pole temperature monitor

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20. Every 1200 hours: CHECKING THE OIL PRESSURE MONITOR

Alternative 1

Connect an ohmmeter to the oil pressure monitor and check when starting and stopping the engine that the monitor breaks/makes at the correct pressure.



G = Connection for sensor
WK = Connection for monitor

1-pole combined sensor / monitor for oil pressure

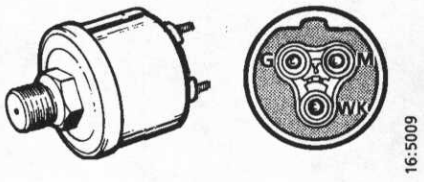
Alternative 2

Monitor connected for automatic shut-off at fault:

1. Start the engine.
2. Check on the oil pressure meter that the oil pressure rises.
3. Stop the engine manually (use the emergency stop).
4. Check on the oil pressure gauge at what oil pressure the stop solenoid pulls. Correct pressure: ***0.7 bar for 1 and 2 pole monitor and 1.0 bar for 2 pole combined sensor/monitor.***

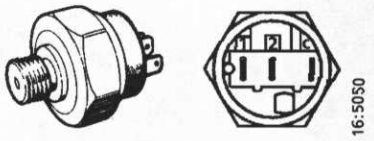
Monitor connected to the warning light/buzzer:

1. Set the starter switch to "ON" and check that the buzzer / warning light comes on.
2. Check with the engine running that the buzzer / warning light goes out when the oil pressure är over ***0.7 bar for 1 and 2 pole monitor and 1.0 bar for 2 pole combined sensor/monitor.***



M = Earth connection
G = Connection for sensor
WK = Connection for monitor

2-pole combined sensor / monitor for oil pressure



C = Common connection
1 = Connection C - 1 makes at stamped pressure
2 = Connection C - 2 breakes at stamped pressure

2-pole pressure monitor

21. Every 400 hours: CHECKING THE STOP FUNCTION

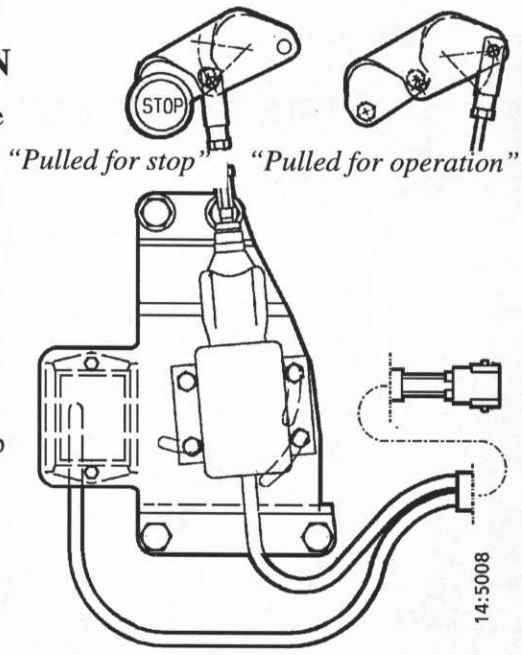
Make certain the stop solenoid is activated and stops the engine both at a stop signal from the stop button and by the temperature, coolant level and oil pressure monitors if these are wired for automatic shut-off at fault.

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Miscellaneous

CHECKING THE STOP SOLENOID STOP POSITION

At replacement of the stop solenoid or if stop function is not satisfactory, the following should be checked (the figures illustrate the stop control with the engine in the stop position):



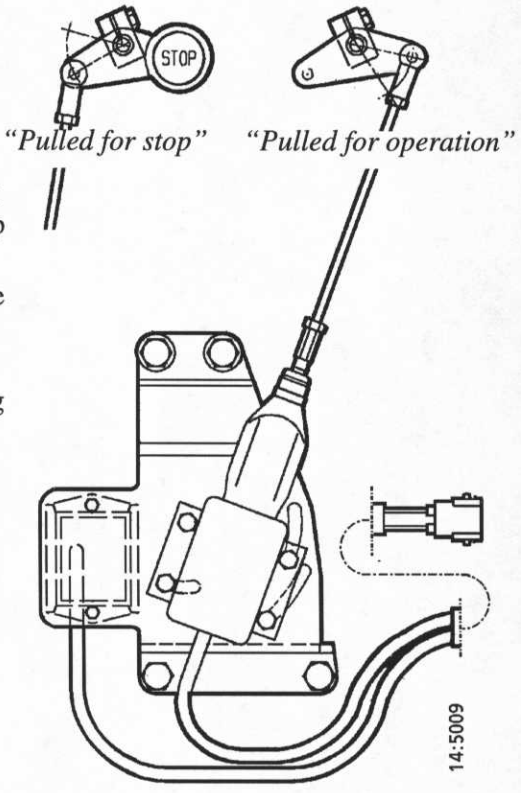
Installation on 11 engine with RQ/RQV-E governor

Stop position at "Pulled for stop".

- Engage the stop solenoid by electrical means, red at + and black at -, and activate it so that it is pulled fully without installing the link yoke in the stop lever bracket. **Note At polarity reversal the timer module will be damaged.**
- Turn the stop control to the stop position and adjust the length of the link until the hole in the link yoke aligns with the hole in the bracket on the stop lever.
- Put the link bolt into position and check that there is a small clearance when the stop lever is in the stop position and with the stop solenoid activated.
- Tighten the lock nuts securely against the link yokes. Also check the position of the stop solenoid on the bracket so that the centre lines of the stop solenoid and the link coincide.
- Check the function by starting the engine and then stopping it by activating the stop solenoid.

Stop position at "Pulled for operation".

- Engage the stop solenoid by electrical means, red at + and black at -, and activate it so that it is pulled fully without installing the link yoke in the stop lever bracket. **Note At polarity reversal the timer module will be damaged.**
- With the stop lever in the operation position: Adjust the length of the link until the hole in the link yoke aligns with the hole in the bracket on the stop lever.
- Put the link bolt into position and tighten the lock nuts securely against the link yokes. Also check the position of the stop solenoid on the bracket so that the centre lines of the stop solenoid and the link coincide.
- Check the function by starting the engine and then stopping it by breaking the power supply to the stop solenoid.



Installation on 11 engine with RSV governor

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CHANGING A BATTERY

Removal

1. Remove the minus cable (-) from the battery (cable to earth connection).
2. Remove the plus cable (+) from the battery (cable to starter motor).

Fitting

1. Attach the plus cable (+) to the battery (cable from starter motor).
2. Attach the minus cable (-) to the battery (cable from earth connection).

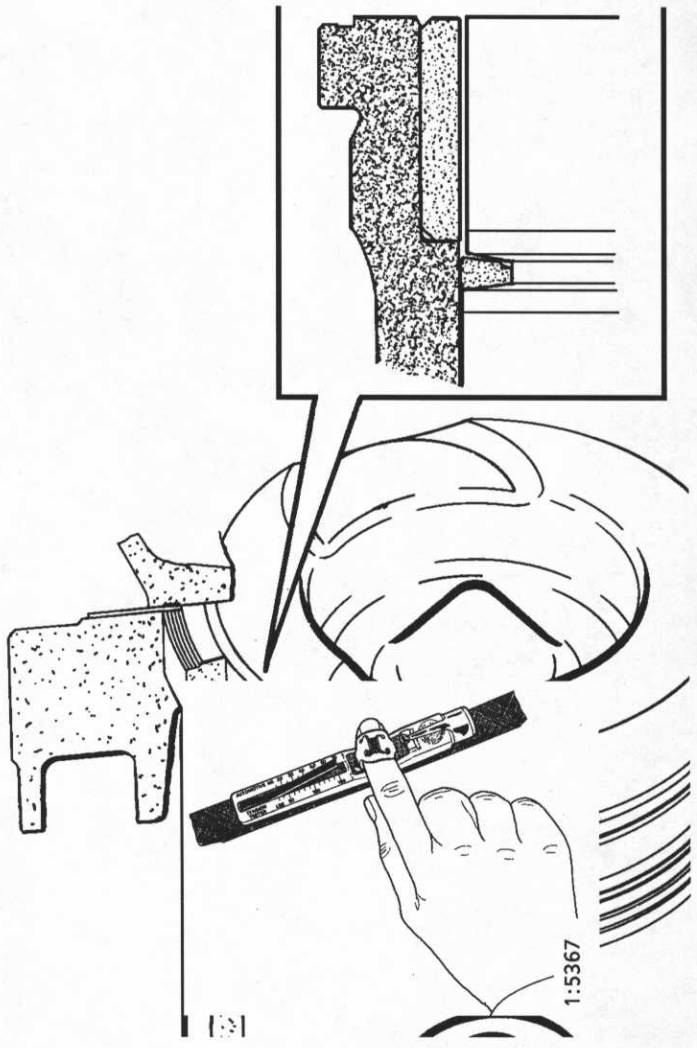
22. Every 200 hours: CHECKING/ TENSIONING THE V-BELTS

Correctly tensioned V-belts can be deflected about 10 mm with a pressure of 35-50 N (depending of the free length of the belt) when pressing on one belt.

Change worn or damaged belts

1. Undo the mounting bolts.
2. Set the right tension with the adjusting bolt.

   Do not overtighten.



Measuring with belt tension gauge Krikit (Part No. 587 495)

1. Reset gauge by pressing in measuring arm.
2. Place gauge on drive belt halfway between two pulleys
3. Press until gauge clicks.
4. Read off indication.

Recommended tension on Scania genuine drive belts when checking is ***300 N***.

At replacement of belts a somewhat higher (10-15%) tension should be used.

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23. Daily: CHECKING FOR TIGHTNESS, REMEDIES

- Start the engine.
- Check tightness of lubrication, coolant, sea-water, fuel, air and exhaust systems.
- Tighten or change defective connections. Check tell-tale holes **1** which indicate if the O-ring between cylinder liners and crankcase are leaking, see figure.

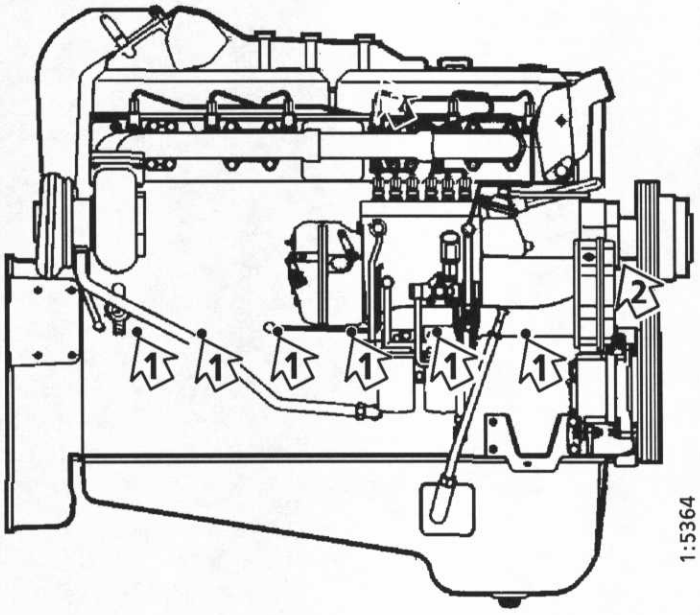
  a) If coolant is leaking, the two top O-rings are defective.

  b) If lubrication oil is leaking, the bottom O-ring is leaking.
- Check that drain hole **2** in the coolant pump is not clogged, see figure. If coolant is leaking, change the pump seal.

A slight leakage during the running-in period is normal (seals and O-rings are lubricated with soap or oil when fitted).

Such leakage disappears after a while.

If the leakage is major, consult the nearest Scania workshop.



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24. Every 1200 hours: CHECKING/ ADJUSTING THE VALVE CLEARANCES

WARNING
Block starting device when working on the engine. If the engine starts, there is a great RISK OF INJURY

Checking and adjusting of the valve clearances should also be carried out after the first 600 hours of operation.

The valve clearances should be adjusted on a cold engine, at the earliest 30 minutes after the engine has been stopped.

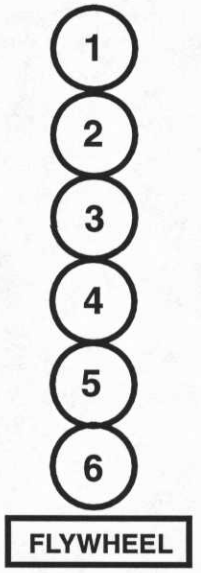
Alternative 1

- Set the 1st cylinder to TDC by turning the engine manually in the direction of rotation until both valves are closed.
- Adjust both valves. The correct clearance is given on the instruction plate on one of the rocker covers:

Cylinder 1	Intake and exhaust
2	In
3	Ex
4	In
5	Ex

- Set 6th cylinder to TDC by turning the engine manually one turn in the direction of rotation.
- Adjust following valves:

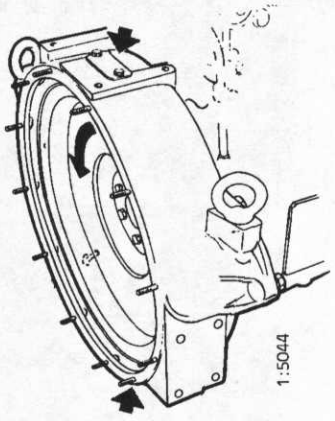
Cylinder 2	Ex
3	In
4	Ex
5	In
6	In and ex



Cylinder numbering

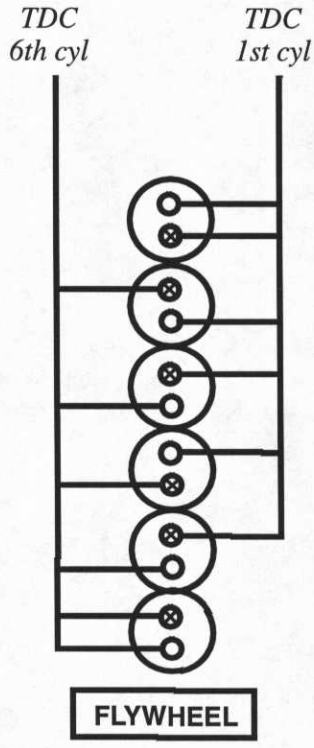
Alternative 2

- Set 1st cylinder to TDC by turning the engine manually in the direction of rotation until both valves are closed.
- Adjust both valves for 1st cylinder. The correct clearance is given on the instruction plate on one of the rocker covers.
- Continue in the same manner with the other cylinders in the order 5 - 3 - 6 - 2 - 4 (firing order) by turning the engine 1/3 of a turn in its direction of rotation for each adjustment.



Covers for reading through the flywheel housing

Note
The upper opening for reading does not exist on silumin housings.



○ *Intake valve*
⊗ *Exhaust valve*

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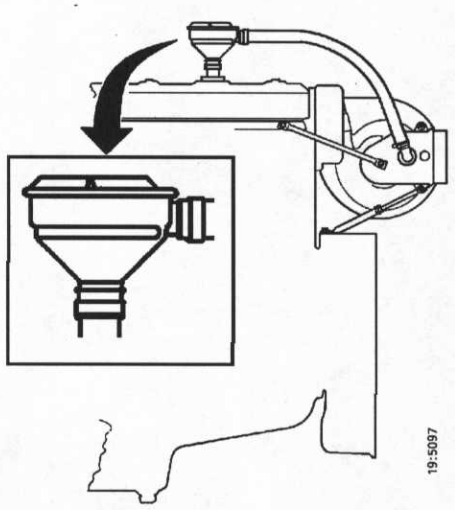
25. Every 4800:e hours: CHANGING (or CLEANING) THE VALVE FOR CLOSED CRANKCASE VENTILATION.

Alternative 1:

Change the valve at the prescribed interval.

Alternative 2:

- Remove the valve at the prescribed interval.
- Clean the valve by putting it in a bath of diesel fuel over night. Then rinse it a few times in diesel fuel and let the diesel run out.
- Reinstall the valve.
- A cleaned valve may be run for ***max. 2400 hours*** and should then be replaced or cleaned again.
- The valve may be re-used (cleaned) a ***maximum*** of ***two times (4800 hours)*** after the first 4800 h.



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LONG-TERM STORAGE

If the engine is not to be used for a long period, special measures must be taken to prevent corrosion in the cooling system, in the fuel system, in the combustion chamber and exterior attacks of corrosion.

Normally, the engine can be left for up to six months without damage. If stationary longer, the procedure described below should be followed, giving a protection that lasts about four years.
The preparations for storage imply:

- Thorough engine cleaning.
- Running the engine for a while on special fuel, with special lubricating oil and special coolant to obtain the preservatory effect.
- General preparation of the engine for storage (filters changed, lubrication, etc.).

Preservative coolant

If the engine is stored with a full cooling system, the coolant should contain 50 % glycol by volume. If the engine is stored with a drained cooling system, a glycol without a nitrate-based inhibitor should be used, e.g. BASF G 105, BASIN 43-43.

Note! Only glycol, no water.

Note! After the cooling system has been drained, nitrate-based inhibitors give off ammonium gas which may damage brass components, e.g. monitors and sensors.

Preservative fuel

Use diesel fuel mixed with Lubrizol 560A or equivalent. Mix 1 cm^3 (ml) of Lubrizol 560A into 10 dm^3 (litres) of fuel.

HANDLING OF LUBRIZOL 560A

Dangerous

Contains aromatic hydrocarbons

Use evacuation if there is a risk of gas forming.
Use protective goggles and gloves when handling. Do not wear soaked clothes.

After splashes in the eyes	Rinse with a soft water jet (at least 15 min). Get in touch with a doctor.
After skin contact:	Wash with soap and water
After inhaling:	Fresh air, rest and warmth
Flammable:	Plash point + 27 °C. In case of fire: Extinguish using carbon dioxide, powder or foam.
Storage:	In well sealed vessels in a cool and dry place. **Keep out of reach of children!**

Preservative oil

A suitable preservative oil can be obtained from most oil companies.
Example: Dinitrol 40 or equivalent.

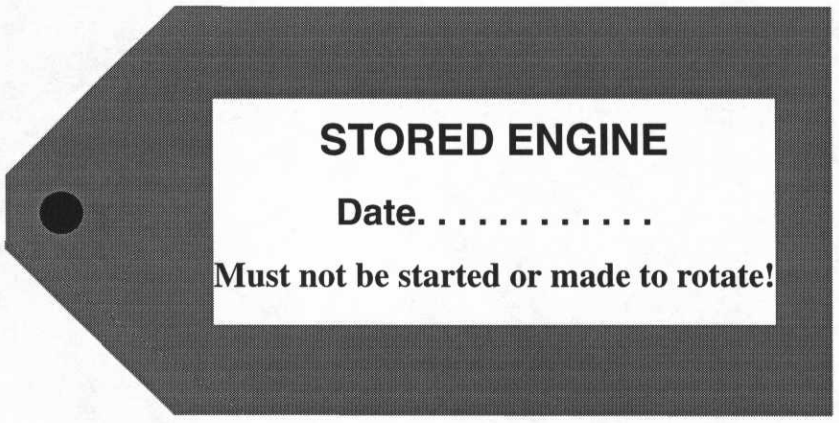
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Preparations for storage

- Drain and flush the cooling system. Fill with preservative coolant.
- Warm up the engine with the ordinary fuel. Stop the engine and drain the lubrication oil.
- Change fuel filters and turbo filter, if fitted.
- Fill preservative oil in the engine to the minimum mark on the dipstick.
- Mix the preservative fuel in a can. Loosen the fuel line from the suction line of the feed pump and connect a hose from the can.
- Loosen the fuel line at the overflow valve and connect a return hose to the can.
- Start the engine and run it at about 1000 r/min for 20 - 25 minutes (does not apply to single-speed engines).
- Stop the engine, remove the hoses and connect the ordinary fuel lines.
- Lubricate the valve mechanism genereously with preservative oil.
- Remove the injectors and mist lubricate by spraying preservative oil into each cylinder, ***not more than 30 cm^3 (ml)***.
  Run the engine a few turns with the starter motor. Spray a ***little*** more into each cylinder.
  The engine must then not be turned. Fit the injectors.
- Drain the preservative oil from the engine. New lubricating oil can be fitted right away or when the storage is terminated.
- Drain off the coolant, unless the engine is to be stored with a filled cooling system. Plug and tape all open coolant connections (unless the system is fully assembled).
- Air cleaner: Clean or change the filter element.
- Cover the air intake and the exhaust outlet.
- Alternator and starter motor:

  Mist lubricate with water-expelling anti-corrosive oil, CRC 226, LPS1, or equivalent.
- Mist lubricate bare metal exterior engine parts, first with penetrating preservative oil, e.g. Dinitrol 25B, then with Dinitrol 112 or equivalent.
- ***Put a clear sign on the engine stating the date of preservation and that the engine must not be started or made to rotate.***

WARNING
The oil mist is dangerous to inhale



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Batteries

Remove the batteries for preservative charge at a charging station (does not apply to batteries which, according to the manufacturer, do not require charging during the storage). The same applies also during storage of shorter duration, even though the engine is not preserved as described above.

Storage

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

The engine is to be stored in a dry and warm place (room temperature)

The engine prepared for storage must not be started or made to rotate.

De-storing the engine

(measures to be taken when engine is put into operation)

- Remove the plugs and the tape from the cooling system connections, air intake and exhaust oulet.
- Fill coolant in the system, see page 10.
- Check the oil level in the engine or, alternatively, fill new engine oil.
- Turn the engine a few turns with the injectors removed. At the same time, generously lubricate the valve mechanism with push rods and tappets.

NOTE! **The engine must turned with the injectors removed so that excessive preservative oil can be pressed out of the cylinders.**

- Fit the injectors.
- Drain the preservative fuel from the main fuel filter.
- Bleed the fuel system.
- Wash off all preservative oil applied externally with washing liquid.

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TECHNICAL DATA

GENERAL		DS11	DSC11	DSI11
Number of cylinders			6 in line	
Bore	mm		127	
Stroke	mm		145	
Swept volume	dm^3 (liter)		11,02	
Number of main bearings			7	
Firing order			1 - 5 - 3 - 6 - 2 - 4	
Compression ratio			15:1	
Direction of rotation of the engine, seen from rear			Anti-clockwise	
Direction of rotation of the fan, seen from front			Anti-clockwise	
Cooling			Liquid	
Valve clearance, cold engine intake valve exhaust valve	 mm mm		 0.45 0.80	
Weight, without coolant and oil	kg	930	1020	965
Output			see "Engine record card"	

LUBRICATION SYSTEM		
Max. oil pressure (warm engine at speeds over 800 r/min	bar (kp/cm^2)	6
Normal oil pressure (warm engine at operating speed)	bar (kp/cm^2)	3 - 6
Min. oil pressure (warm engine at a speed of 800 r/min	bar (kp/cm^2)	0.7
Oil capacity		see page 17

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FUEL SYSTEM		DS11	DSC11	DSI11
Injection pump setting before TDC		See sign on the rocker cover		
Injector, opening pressure	bar (kp/cm^2)	300		
Low idling speed:				
with RQ/RQV-E governor	r/min	500		
with RSV governor	r/min	700		
Maximum full load speed		See engine record card		
Fuel		Diesel fuel[1]		
[1] see page 50				

COOLING SYSTEM				
Number of thermostats		2		
Thermostat, opening temperature	°C	79		
Operating temperature:				
system working at atmospheric pressure	°C	70 - 93		
pressurized system	°C	70 - ca 100		
Volume, includes radiator, engine, expansion tank and for DSI11 charge -cooler				
with 0,75 m^2 radiator	dm^3 (liter)	53	-	55
with 1,00 m^2 radiator	dm^3 (liter)	58	58	60

ELECTRIAL SYSTEM				
System voltage	V	24		
Alternator, max amperage	A	55		
Starter output	kW (hp)	6,6 (9,0)		
Monitor settings:				
Oil pressure monitor	bar (kp/cm^2)	1-pol: 0,7 ± 0,15		2-pol: 1,0± 0,15
Temperature monitor	°C	Stamped into the hexagon		

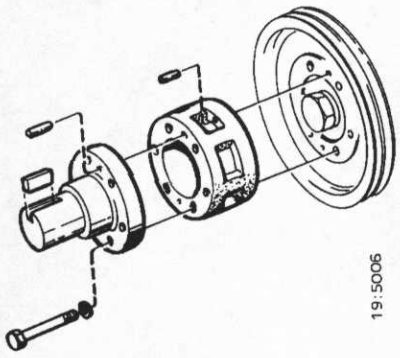
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POWER TAKE-OFF

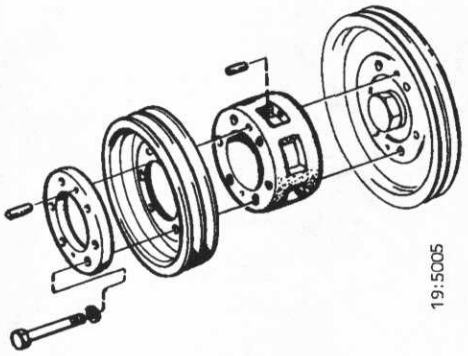
Front-mounted power take-off

A front-mounted power take-off is driven off the engine crankshaft. A clamp-cone joint is standard equipment. Optional is a polygon joint.

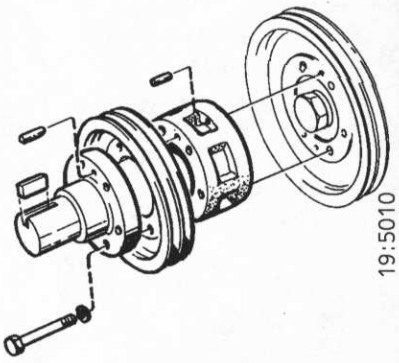
Alternative mountings according to the figure.



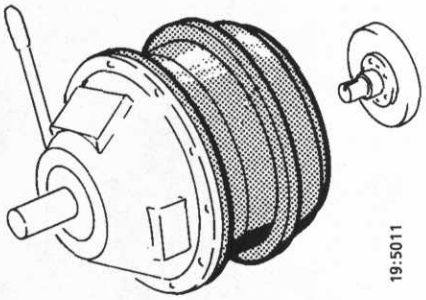
Stub shaft



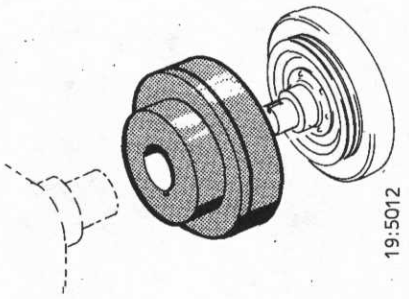
Pulley (max 2 extra tracks)



Stub shaft and pulley



*Flanged housing SAE3 for fitting industrial clutch**



Shaft stub or flanged driver for flexible coupling, type Centa A (size 30 or 50)*

** Max. permissible torque utilization 400 Nm*

Speed	Same as engine speed
Direction of rotation seen from the front	clockwise
Max permissible torque utilization:	
Clamp-cone joint . . . . . Nm (kpm)	490 (50)
Polygon joint . . . . . Nm (kpm)	635 (65)
Polygon joint with reinforced . . . . . Nm (kpm)	1000 (100)

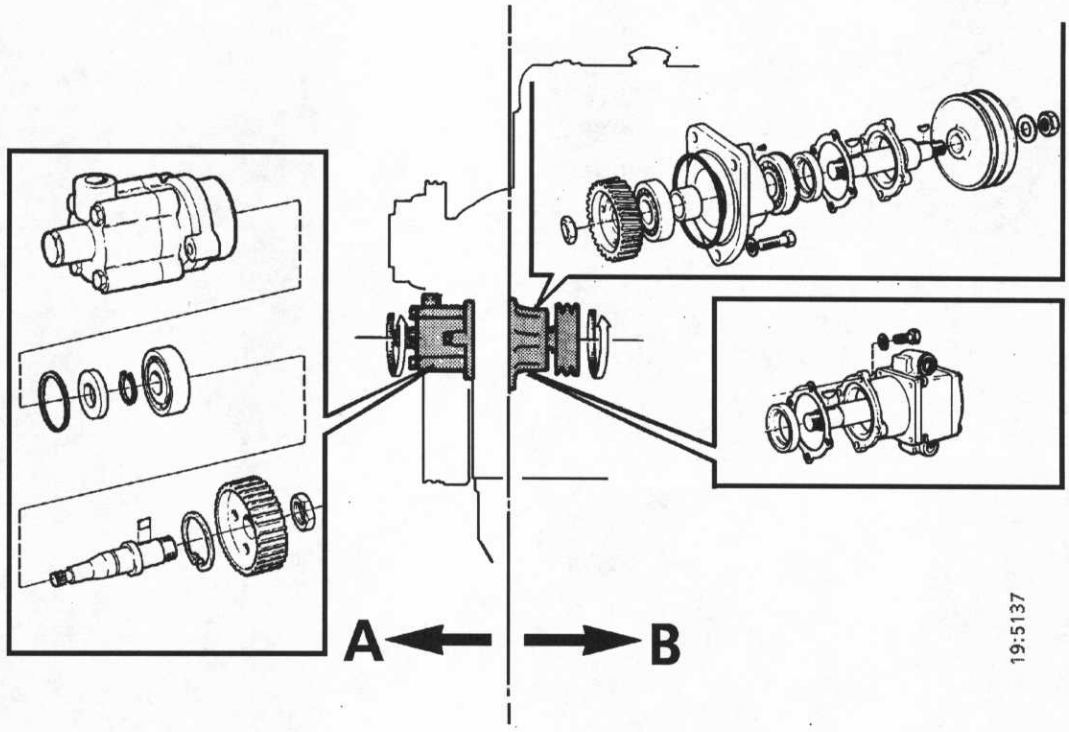
Note! The values given refer to driven units with an even torque and may only be regarded as guide values.
The maximum permissible torque is limited by the transmission capacity of the V-belts/ couplings, but can never exceed the permissible torque of 490 Nm (50 kgf m), 650 Nm (65 kgf m) or 1000 Nm (100 kgf m) of the standard joints.
See also Installation Instructions.

We recommend that a torsional vibration calculation is carried out if a front-mounted power take-off is to be used.

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Side-mounted power take-off

A side-mounted power take-off is driven by the timing gears of the engine.
Alternative solutions according to the figure.



Speed, rearward	0.865 x engine speed
Speed, forward	1.6 x engine speed
Direction of rotation (engine seen from the rear)	Clockwise

Max. permissible torque utilization:

A= Facing forward	Continously	max. 70 Nm
	Intermittently	max. 100 Nm
B= Facing rearward	Continously	max. 100 Nm
	Intermittently	max. 150 Nm

Note! The values given refer to driven units with an even torque and may only be regarded as guide values. See also Installation Instructions.

Note! Intermittent torque loading implies occasional torque peaks with a duration of max. 2 minutes. The total duration of the higher loading must not exceed 1/6 of the time the power take-off is operated.

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Diesel fuel oil

The composition of the diesel fuel is very important for the proper functioning and service life of the engine and the injection pump. Also the engine output and the exhaust emissions depend on the fuel quality.The requirements and test standards for the most important properties are described in the service manual in a booklet that can be ordered at your Scania dealer or directly from Scania. The address to Scania is found on the cover.

In the table below you will find some of the most important properties:

Properties	Requirements
Viscosity at 40 °C	2.0 - 4.5 mm^2/s (cSt)
Density at 15 °C	0.80 - 0.86 kg/dm3
Sulphur (mass content)	max. 0,3 %
Cetane number	min. 49
Flash point	56 °C

Low-sulphur fuel

There are three different classes of low-sulphur fuels. Class 1 is free from sulphur and Class 2 has a very low content of sulphur. Compared to Class 3 (standard fuel) these fuels have lower density which condition will result in lower output. Only Class 1 fuel should be used together with a catalytic convertor.

Additives

At low ambient temperatures paraffins may form in the fuel (waxing) and clog the fuel lines and filters. The engine may then loose power or stop.

Usually winter fuel is available in cold climates. If needed, these properties can be improved ***before*** driving at low temperatures. Very low temperatures may still cause problems.

The cold weather properties can be improved if any of the following actions are taken ***before the temperature drops:***

1. **Lamp oil or kerosene:** Max. 50 % may be added. Fill the additive first so that the fuel is mixed properly. In some countries, running on these fuels is prohibited.
2. **Petrol:** Only in an emergency and then no more than 30 %. Petrol reduces the cetane number of the fuel, which may lead to starting difficulties. Blue smoke is also emitted and the fuel consumption rises. Even very small quantities of petrol lower the flash point which also means a greater fire hazard.
3. **Alcohol:** 0.5 - 2 % to prevent the water in the fuel from freezing.
4. **Light diesel:** May be used for Scania engines in pure form or in the same manner as lamp oil to improve the cold starting properties of the fuel. Light diesel is a paraffin grade with a suitable cetane number and with a lubricating additive. Without the latter, the injection pump would seize.

Drain the fuel tanks and main fuel filters, clean the prefilter and change the main filters regularly.

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