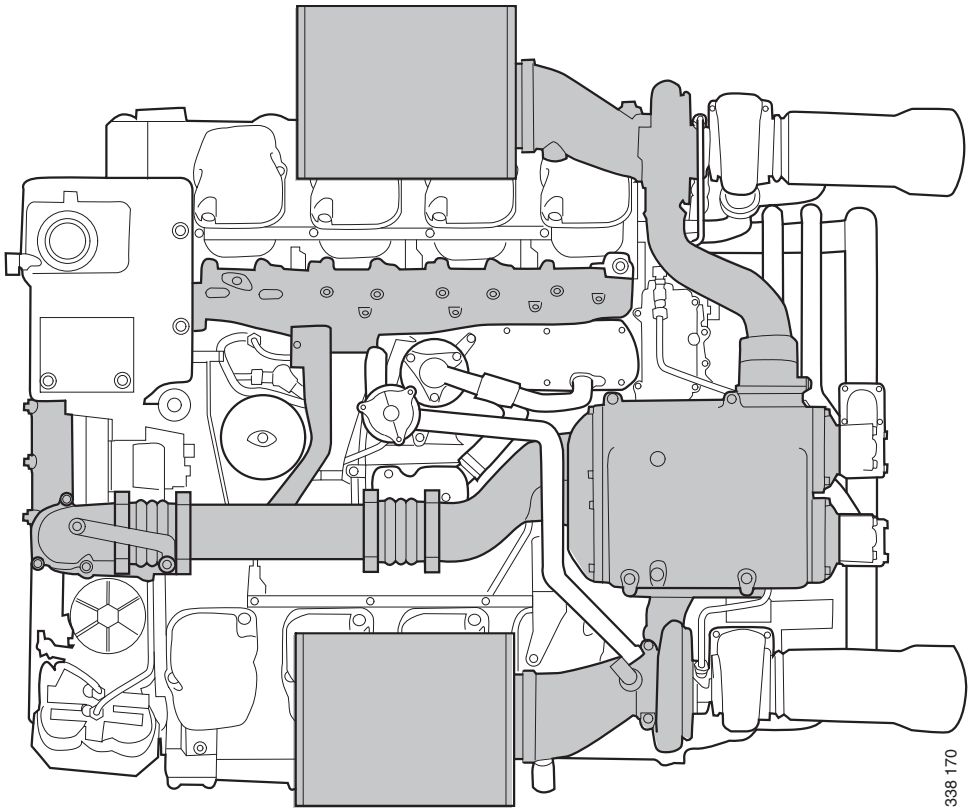
Intake system and ventilation

Marine engines
DI09, DI13, DI16



Changes from the previous issue

The changes made in this document compared with the previous issue are marked with a line in the left-hand margin. The changes are also described below.

- Information about the safety cartridge for the air cleaner with precleaner has been removed, as a safety cartridge is no longer included. See Air cleaner.
- Clearances for Air cleaners with precleaner and Air cleaners without precleaner have been corrected.

Intake air

If the intake line is located close to exhaust pipes or other hot parts, radiation protection should be used to limit unnecessary heating of the intake air.

REQUIREMENT!

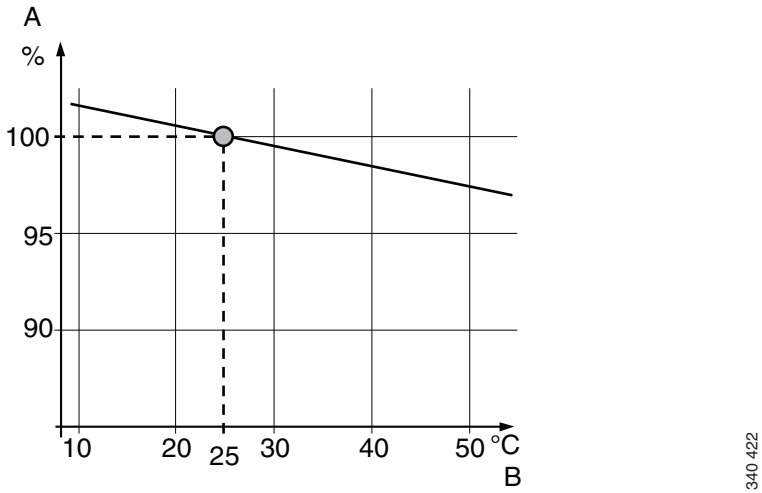
The intake air temperature upstream of the turbocharger must be below 30°C.

Measure the temperature when the installation is complete. Refer to *02:08 Measuring instructions for installation inspection*.

If the intake air temperature upstream of the turbocharger continuously exceeds 30°C, then engine power may drop. If the engine is enclosed in some manner, make sure that there is an adequate flow of intake air.

The dependence of the engine power on intake air temperature is shown in the chart on the right. 100% engine power is shown under actual test conditions at the factory.

The engine air consumption in kg/min at full power and at different engine speeds is indicated in the tables showing the air consumption and radiated heat for the relevant engine type in *02:06 Technical data*.



Engine power dependence on intake air temperature. 100 % at 25°C, 1,000 mbar, engine power setting not corrected.
A = Engine power.
B = Intake air temperature.

Intake air taken from outside engine room

In engine systems where the engine intake air comes from outside the engine room and is led via a fresh air line to the engine, the vacuum for the intake system should be measured.

The air intake should be located so that the intake air is as clean as possible and so that neither the engine exhaust gases nor heated air from the engine room can mix with the intake air. The air intake should be designed to exclude water, snow and contamination.

The intake air must not contain chemical pollutants, such as CFCs.

REQUIREMENT!

The maximum permissible vacuum in the intake system is 30 mbar. This value includes the vacuum in the new air filter, connected coarse filter and in the fresh air line.

Measure the vacuum when the installation is complete. Refer to *02:08 Measuring instructions for installation inspection.*

The following applies to the fresh air line:

- The fresh air line must not be routed with any sharp bends.
- The inside of the fresh air line must be flat and even.
- If a hose is used as a fresh air line, it must be reinforced so that it does not collapse onto itself.

It is not necessary to check the vacuum in the following cases:

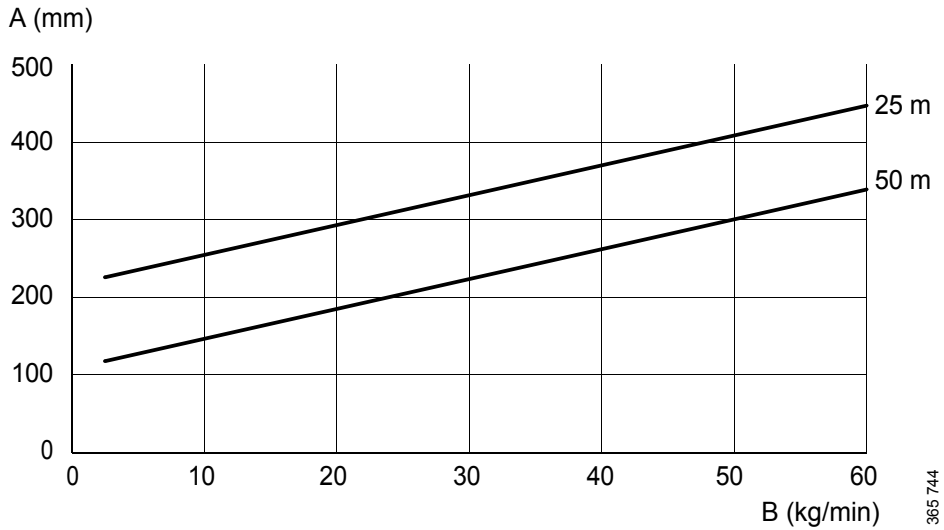
- If the intake system is comprised of air hoses and air pipes from Scania's standard range.
- If the fresh air line is a maximum of 5 m and has an inner diameter of a minimum of 210 mm.

If the planned fresh air line is longer than 5 m, the required diameter must be calculated as illustrated. The vacuum upstream of the turbocharger must then be measured. Refer to *02:08 Measuring instructions for installation inspection*.

REQUIREMENT!

The total vacuum in the intake system with a blocked air filter must not exceed 65 mbar.

Engine damage will not occur up to 100 mbar, but fuel consumption and smoke will increase. Above 100 mbar there is a risk that the air volume to the engine will be inadequate, resulting in breakdowns.



Calculation of minimum diameter of the intake line.
A = Intake line diameter.
B = Air consumption.

Ventilation of the engine room with fresh air line to the engine

If the intake air to the engine is taken from outside the engine room, it is important to check that the temperature in the engine room does not get too high.

REQUIREMENT!

The temperature in the engine compartment must not exceed 60°C.

Measure the temperature when the installation is complete. Refer to *01:08 Measuring instructions for installation inspection*.

If the temperature exceeds 60°C, there is a risk of malfunction in the engine electrical components and engine control unit. If there is a risk that the temperature will exceed this value, the engine room must be ventilated.

When dimensioning the engine room ventilation, other air consumers in the engine room must also be considered. The amount of radiated heat emitted by the various engines is indicated in *02:06 Technical data*.

The exhaust pipes should be insulated to reduce the radiated heat in the engine room. See *02:04 Exhaust system*.

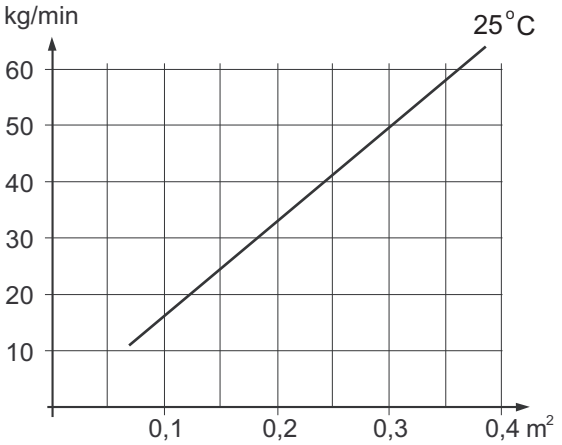
Intake air taken from engine room

When the engine intake air is taken from the engine room, the air intake must be located in the engine room. The opening area should be large enough to ensure that no vacuum arises in the engine room. The air intake should also be designed and positioned so that it cannot be closed or accidentally blocked by water, snow or contaminants.

The air intake should be located so that the intake air is as clean as possible and so that neither the engine exhaust gases nor heated air from the engine room can mix with the intake air to the engine.

In the chart on the right-hand side, the recommended minimum area for the air intake can be read from the engine air consumption.

If several engines or other air consumers are located in the same engine room, the diameter should be increased correspondingly.



Calculation of minimum air intake area.

REQUIREMENT!

The vacuum in the engine compartment must not exceed 2 mbar.

Measure the vacuum when the installation is complete. Refer to *01:08 Measuring instructions for installation inspection*.

For installations where the engine draws the intake air directly from the engine room, the engine room must normally be equipped with a ventilation system. This system should extract the air heated by radiation etc. in order for the requirement of a low intake air temperature to be met.

If there is a refrigerator compressor in the engine room, it is important that any leakage of refrigerant does not contaminate the intake air.

The radiated heat from the engine exhaust pipe downstream of the engine must also be taken into account. The heat radiation depends on how much of the line is inside the engine room and how much of it is insulated.

There is also additional heat due to efficiency losses in driven units located in the engine room.

The amount of radiated heat emitted by the engine is indicated in the tables showing the radiated heat for the relevant engine type in *02:06 Technical data* .

Air cleaner

The engines can be supplied with a turbo-mounted air filter or with an air filter mounted separately. The air cleaner is available with or without integrated self-cleaning precleaner.

Bear in mind the following when installing the air cleaner:

- The air cleaner must be fitted so that it is easily accessible for cleaning and filter renewal.
- The vacuum indicator must be positioned so that it can be read easily.
- In order to be able to remove the filter element, clearance in the air cleaner extension is required. Refer to the subsequent page.
- The intake line between the air cleaner and the turbocharger must be sealed so that no unfiltered air can be drawn into the engine. The intake line must be designed in such a way that it cannot collapse onto itself as a result of a large pressure drop. The intake line should be able to withstand a vacuum of 200 mbar before it collapses onto itself.
- The material and composition of the intake line between the air filter and turbocharger must be such that it cannot release rust or objects that could damage the engine.

It is also important to make sure that any insulation in the engine room and around the exhaust pipes cannot come loose and be drawn into the intake line.

If a non-Scania air filter is used, engine air consumption and filter element pore size must be considered.

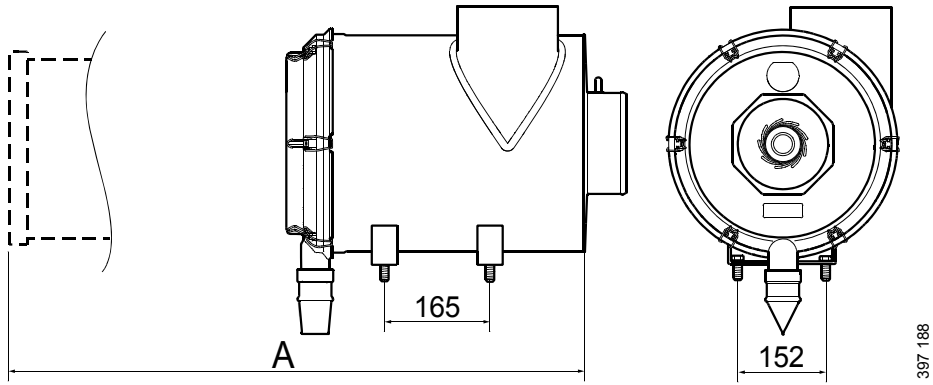
Air cleaners with precleaner

IMPORTANT!

Air cleaners with precleaners must be fitted horizontally with the drain pipe pointing downwards.

Air cleaners with precleaners are available for all engines. Available sizes are 15 inches for DI09 and DI13 and 2 x 13 inches for DI16.

A = free space required for prefilter renewal (mm).	
15 inches	1,010
13 inches	900

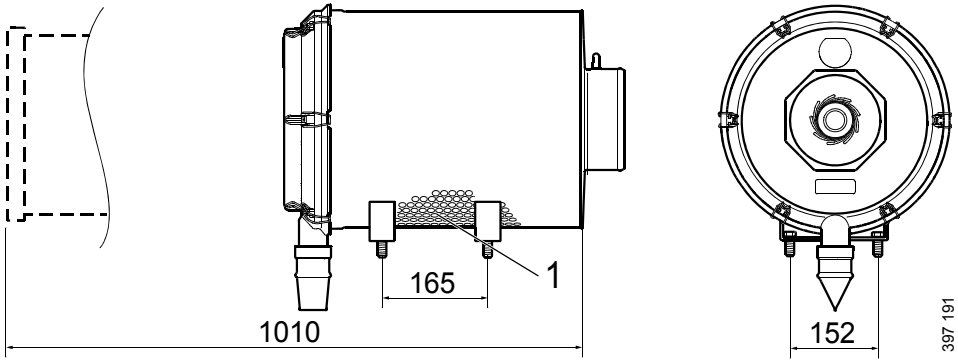


Air cleaners without precleaner

IMPORTANT!

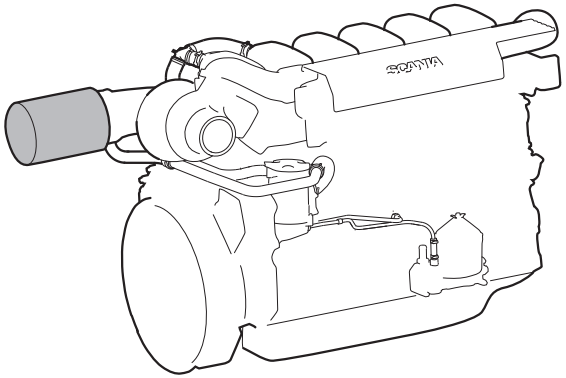
Air cleaners without precleaners must be fitted horizontally with the air intake (1) pointing downwards. The air cleaner may also be fitted vertically, but only if it is fitted indoors or in such a way that water cannot get into the air filter. The cover should then face downwards.

A 15 inch air cleaner without precleaner is available for DI09 and DI13. The amount of free space required for prefilter renewal is shown in the illustration.



Turbo-mounted filter

The engines can also be supplied with a simpler 8 inch light duty unit filter.



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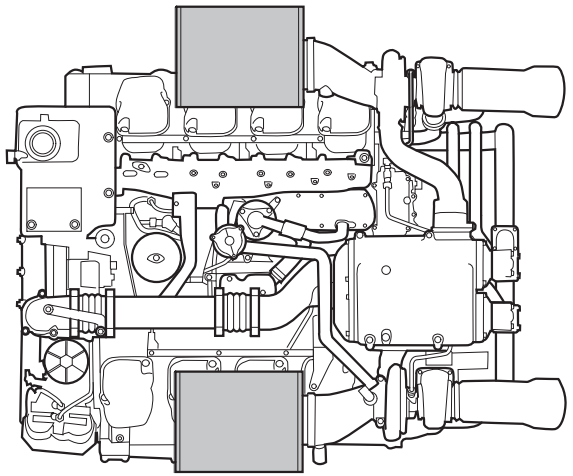
Turbo-mounted filter for DI09 and DI13.

Clean air

Air cleaners without precleaner and turbo-mounted filters clean efficiently but may have an unacceptably short service life if the intake air to the engine compartment is not sufficiently clean.

Therefore, Scania recommends that these type of filters are not used in the following engine installations:

- Boats used in harbours, canals and near coasts where traffic, wind or any type of industrial activity can stir up dust.
- Boats which load and unload dusty goods.
- Boats which travel through areas where the soot content of the air is high due to traffic or industrial combustion.
- Engine installations where insulation in the engine compartment or around the exhaust pipe is in a condition where fibres can shake loose.
- Engine installations where crankcase gases or exhaust gases can be drawn into the air filter.



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Turbo-mounted filter for DI16.

Air pressure

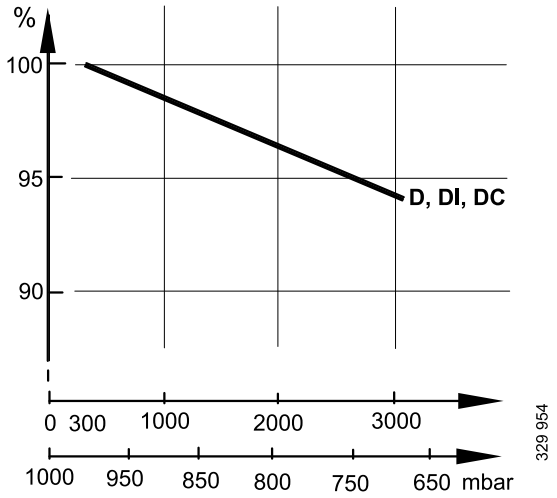
On delivery, the engine control unit is set so that the maximum fuel injection quantity provides 100% engine power when the intake air is at a pressure of 1,000 mbar.

Contact a Scania distributor to check the engine power if the engine is to be used at heights. If the engine power is set incorrectly, this will cause abnormal smoke levels and result in high thermal stress.

The turbocharger may also be damaged by the raised exhaust temperature due to engine overspeed.

In cases of continuous operation at air pressures below 1,000 mbar, it may therefore be necessary to reduce engine power. Available engine power is reduced as shown in the illustration on the right.

The lowest air pressure which is permissible for short periods without adjusting the engine power setting is 750 mbar, which corresponds to 2,500 metres above sea level.



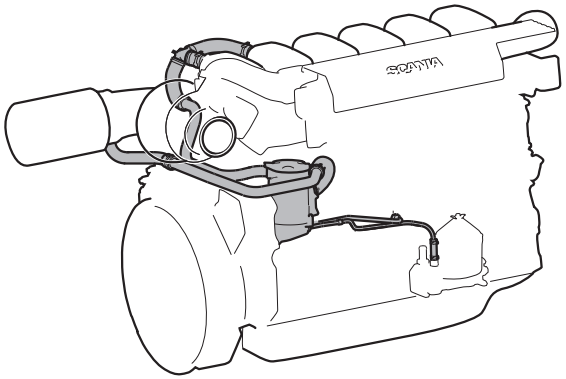
Engine output dependence on air pressure.

Crankcase ventilation

Scania offers closed crankcase ventilation systems. In a closed crankcase ventilation system, the crankcase gases are routed to the intake line between the air filter and the turbocharger via a centrifugal oil cleaner.

Note:

It is not permissible to lead the crankcase gases to the intake upstream of the engine air filter.



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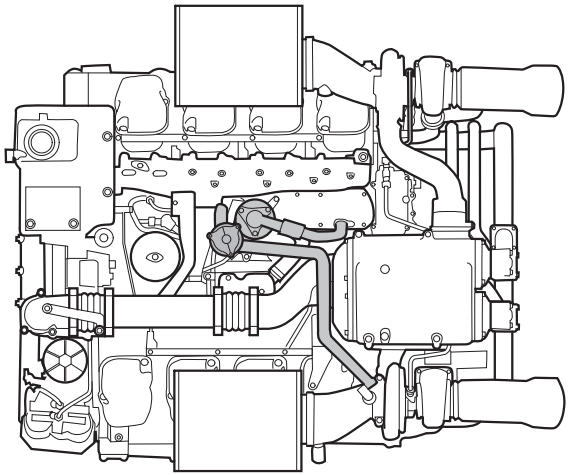
Closed crankcase ventilation for DI09 and DI13.



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Closed crankcase ventilation for DI16.

Important data

Max. recommended temperature for engine intake air	30 °C
Requirements which must be met for the fresh air line so that the vacuum does not need to be checked	Length: max. 5 m Inner diameter: at least 210 mm.
Maximum permissible vacuum in the intake system with cleaned or new filter	30 mbar
Maximum permissible vacuum in the intake system with blocked filter	65 mbar
Maximum temperature in the engine compartment when the intake air is taken from outside the engine compartment	60 °C
Max. permissible vacuum in engine compartment (pressure difference)	2 mbar