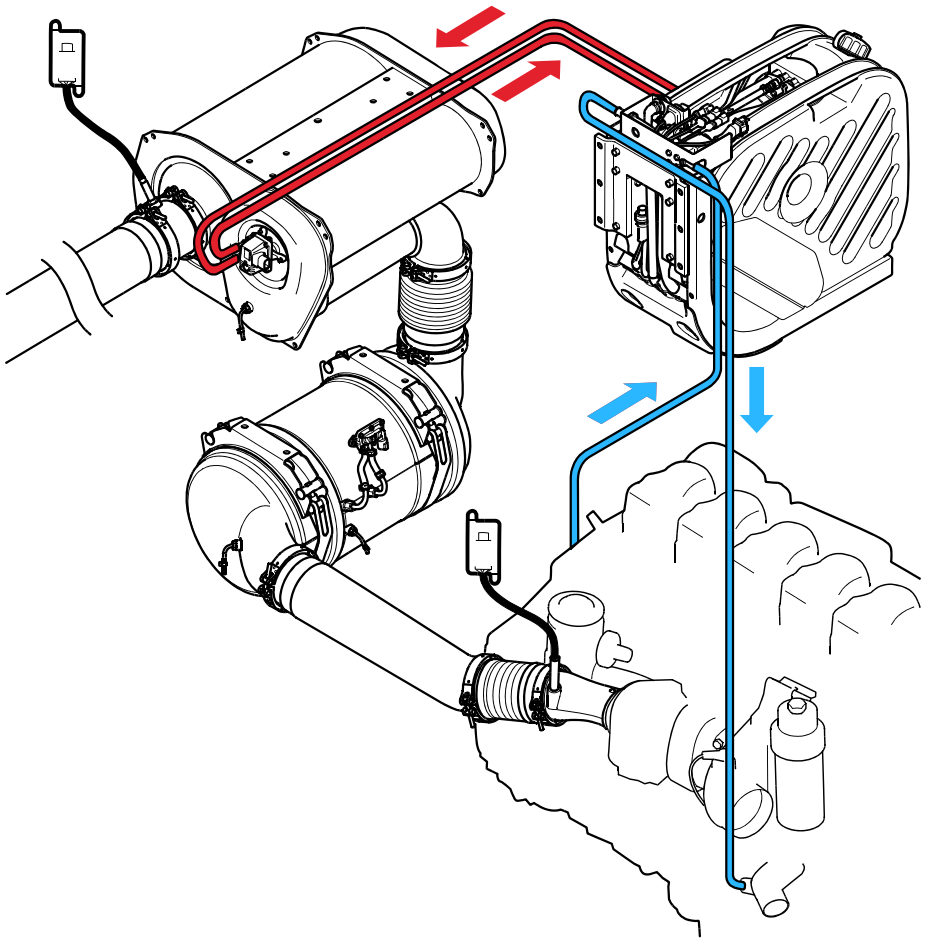
Exhaust gas aftertreatment

Industrial engines
DC09, DC13, DC16



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 Stage V engines has been added.
- The illustration in section Drain hole for the reductant tank has been corrected.
- The illustration in section Connection of reductant doser for Stage IV/Tier 4f and Stage III B/Tier 4i has been corrected.

SCR and reductant

SCR (Selective Catalytic Reduction) is a system in which reductant is added to the exhaust gases in order to reduce the nitrogen oxide (NO_x) content. This document describes SCR system components and how they should be connected.

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

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

IMPORTANT!

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

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

IMPORTANT!

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

When working on the SCR system, the reductant connections may only be lubricated with soapy water or with distilled water with a 3% urea mixture. Any other types of lubricants may block and damage the components in the SCR system.

Reductant is highly corrosive. For this reason, only pipes and couplings resistant to urea may be used in the SCR system. Always rinse away reductant spillage on connections and other parts with lukewarm water to prevent corrosion. If reductant seeps into electrical connections or electrical cables, these must be renewed.

Vibration limits

The components in the SCR system, including the oxidation catalytic converter, evaporator, hydrolysis catalytic converter, SCR catalytic converter and reductant tank, may not be exposed to vibration levels above 3.0 g in the frequency range 8-500 Hz, if they are not engine-mounted.

The installation contractor must install the SCR components in such a way that they are exposed to as little vibration from the surroundings as possible. This applies to e.g. vibrations caused by the firing order, timing gear or road. Resonant frequencies under 300 Hz must be avoided. Scania refers to ISO standard 16750 for more information on vibrations.

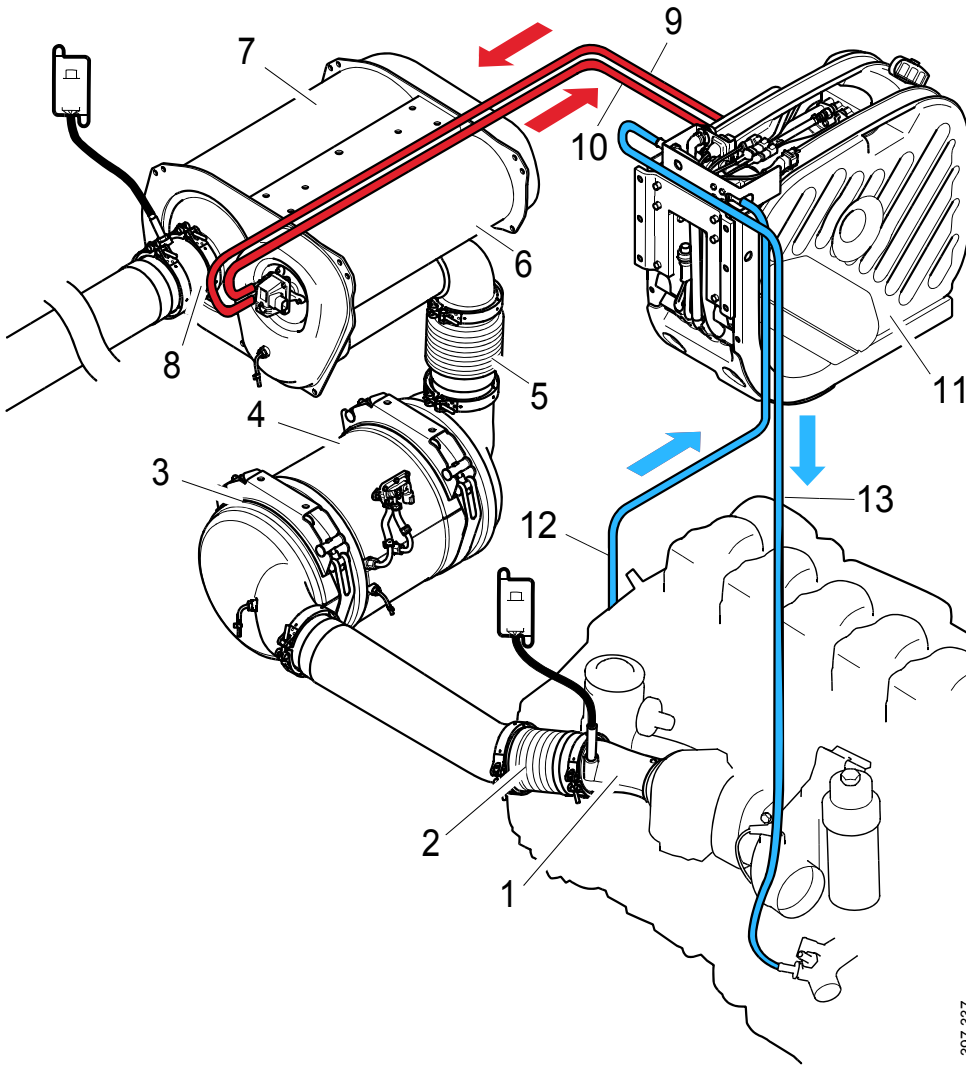
System overview – Stage V

System overview of mechanics

X = the component is always supplied from the factory. O = the component may be supplied from the factory as an option.

	Component	Supplied from the factory
1.	Exhaust pipe bend with connection for NO_x sensor T131.	X[1]
2.	Exhaust bellows.	O
3.	Oxidation catalytic converter.	X
4.	Particulate filter.	X
5.	Exhaust bellows.	O
6.	Evaporator.	X
7.	SCR catalytic converter.	X
8.	Adapter with connection for NO_x sensor T115	X
9.	Pressure hose for reductant.	X
10.	Reductant return hose.	X
11.	Reductant tank.	X
12.	Coolant hose for heating the reductant tank and pump.	-
13.	Coolant hose, return from heating the reductant tank and reductant pump.	-

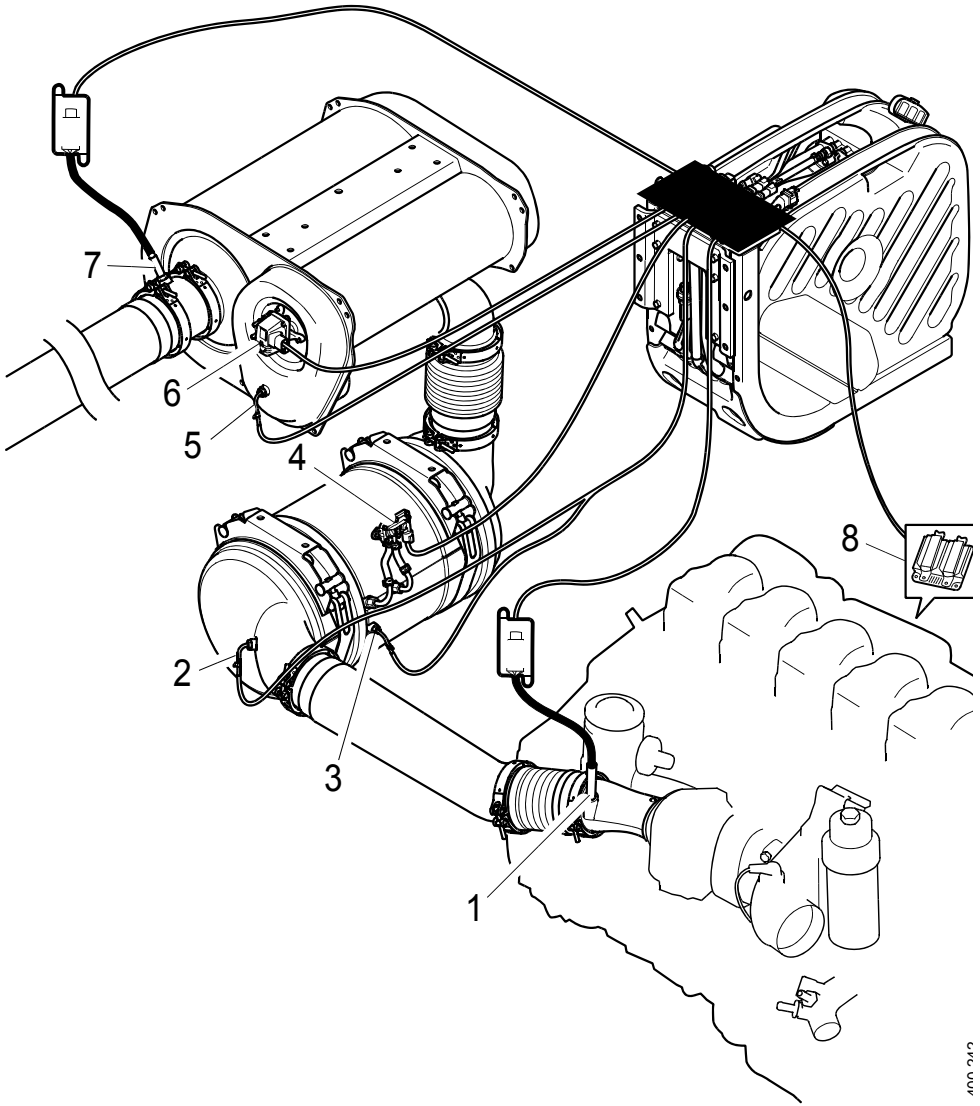
1. 90° exhaust pipe bend and exhaust brake is available as an option.



System overview of electrics

Connection of harness-to-harness connectors on the reductant tank is described in section Connecting the reductant tank. Connection to the engine control unit is described in *03:01 Electrical system*.

	Component
1.	NO_x sensor T131 with control unit.
2.	Exhaust gas temperature sensor T4012.
3.	Exhaust gas temperature sensor T4010.
4.	Differential pressure sensor T141.
5.	Exhaust gas temperature sensor T113.
6.	Reductant doser V117.
7.	NO_x sensor T115 with control unit.
8.	Engine control unit.

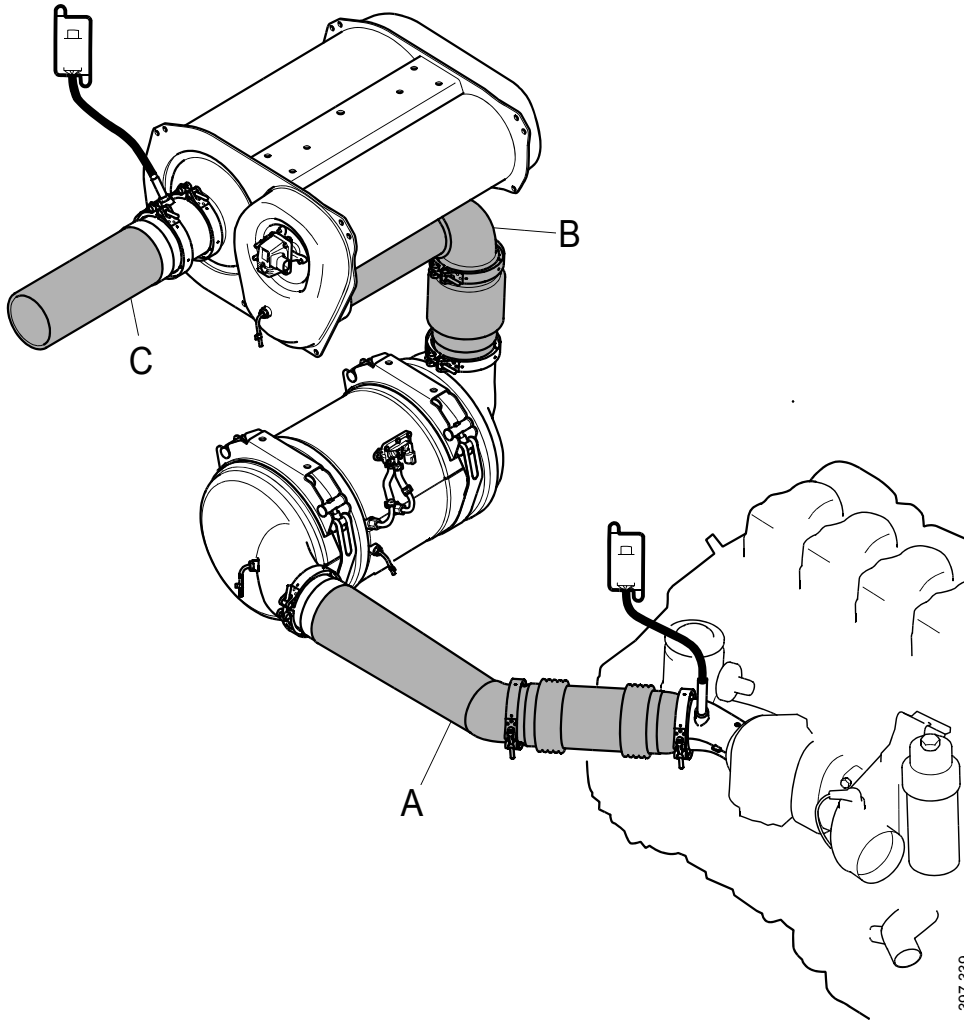


Exhaust pipe

Pipe lengths

Pipe section	Description	Pipe length (mm)
A	From the adapter for NO_x sensor T131 to the oxidation catalytic converter inlet.	Max. 1,700.
A+B	Total length from the adapter for NO_x sensor T131 to the evaporator intake, excluding the particulate filter unit (oxidation catalytic converter and particulate filter).	Max. 2,700.
C	From the adapter for NO_x sensor T115 to the exhaust outlet.	At least 500 mm.

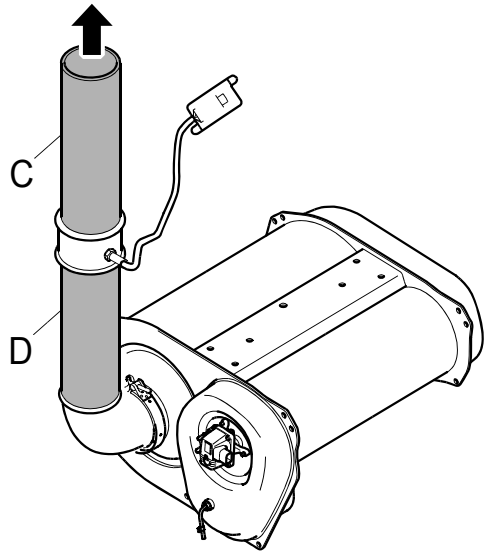
The exhaust gas temperature may drop excessively in the system if the total length between the NO_x sensor adapter outlet and the evaporator inlet exceeds 2,700 mm. There is then a great risk that the engine will go into heating mode, which can increase fuel consumption. The maximum permitted exhaust gas temperature reduction is indicated in *01:04 Exhaust system*.



Pipe section	Description	Pipe length (mm)
D	Straight pipe section upstream of the adapter for NO_x sensor T115.	At least 200 mm.

Note:

The requirement for pipe length D applies only if a 90° pipe bend is connected directly downstream of the SCR unit.



Pipe material

Scania recommends that the exhaust pipe between the particulate filter unit and SCR unit be made from stainless metal type 1.4301 or 1.4509, US grade 316L or equivalent.

Other instructions on exhaust system shape and fitting are available in *01:04 Exhaust system*.

Other requirements

There must always be a flexible connection between the turbocharger and particulate filter unit. Scania also recommends a flexible connection between the particulate filter unit and SCR unit due to tolerances and heat expansion. Also see *01:04 Exhaust system*.

Tightening torque for V-clamps

The tightening torque for all V-clamps in the exhaust gas aftertreatment system is 20 Nm.

IMPORTANT!

Scania recommends that the V-clamps in the exhaust gas aftertreatment system be retightened when the engine has reached the operating temperature for the first time. Carry out the retightening when the engine has cooled down again.

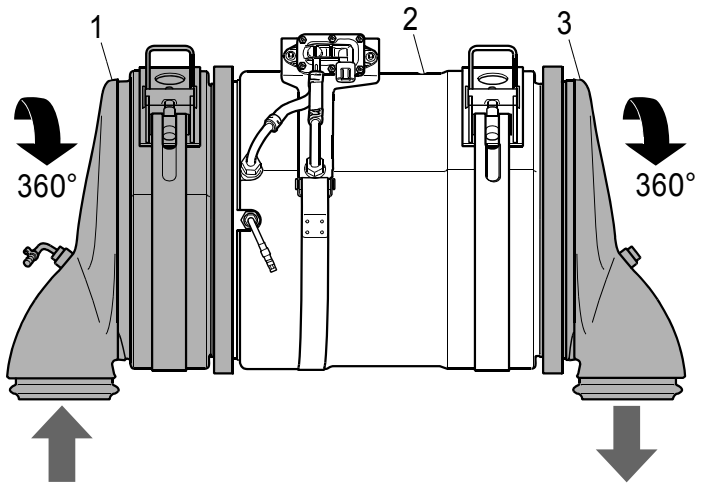
Components – Stage V

Particulate filter unit

The particulate filter unit consists of an intake with oxidation catalytic converter, a particulate filter and an outlet. The inlet with oxidation catalytic converter and outlet can be rotated 360°. The arrows show the exhaust gas direction through the particulate filter unit.

IMPORTANT!

There is a gasket between the oxidation catalytic converter and particulate filter, and between the particulate filter and outlet. If the components are rotated: Detach the V-clamps only so much that it is possible to rotate the components and be careful not to damage the gaskets. Tightening torque: 20 Nm +-3 Nm.

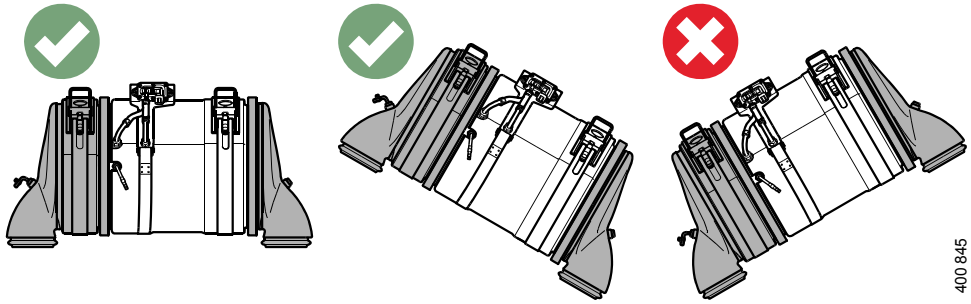


Particulate filter unit.
1. *Intake and oxidation catalytic converter.*
2. *Particulate filter.*
3. *Outlet.*

IMPORTANT!

The particulate filter unit must not be positioned so that the oxidation catalytic converter is lower than the particulate filter. There is a channel to the differential pressure sensor inside the particulate filter where condensation may accumulate if the oxidation catalytic converter is positioned lower than the particulate filter.

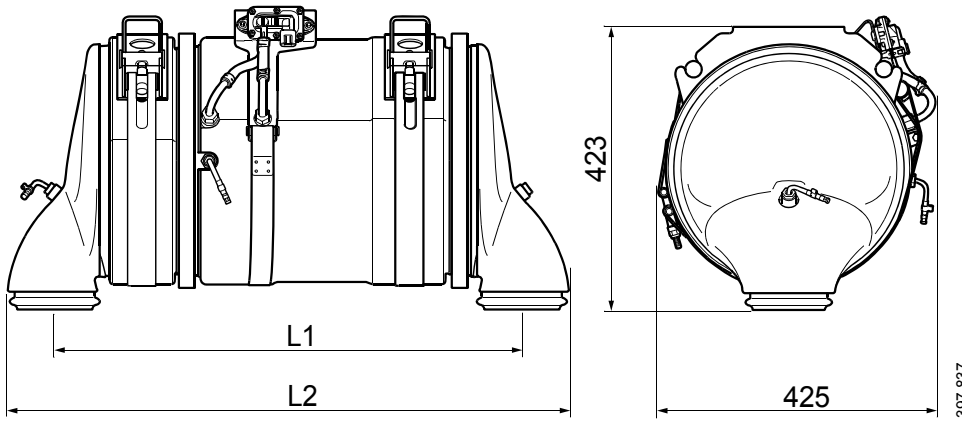
The positioning of the particulate filter unit is also limited by the inclination of the differential pressure sensor. See Differential pressure sensor.



Dimensions and attachment

The particulate filter unit is available in 2 versions. See the illustrations on the right and below.

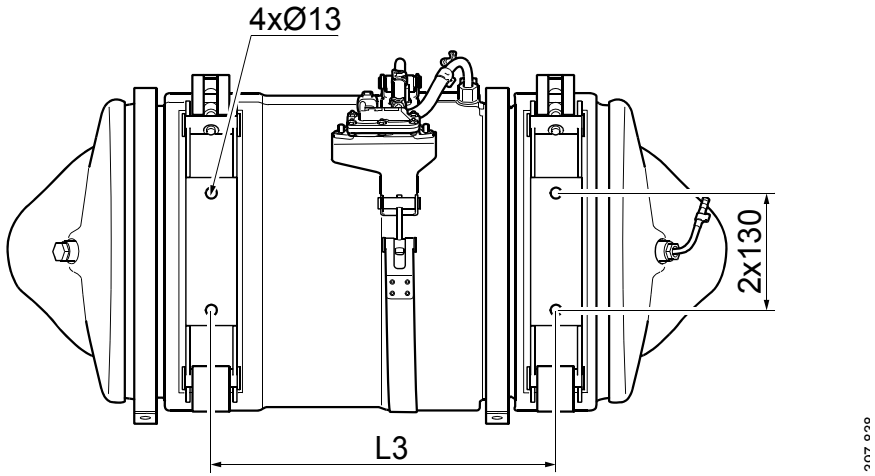
Engine	L1 (mm)	L2 (mm)	L3 (mm)
DC09	603	747	305
DC13	679	823	380



The particulate filter unit is supplied with 2 retaining straps with brackets. Attach the brackets with flange screw M12 or a common screw of a suitable length. Use an M12 flange nut if necessary.

Tightening torques

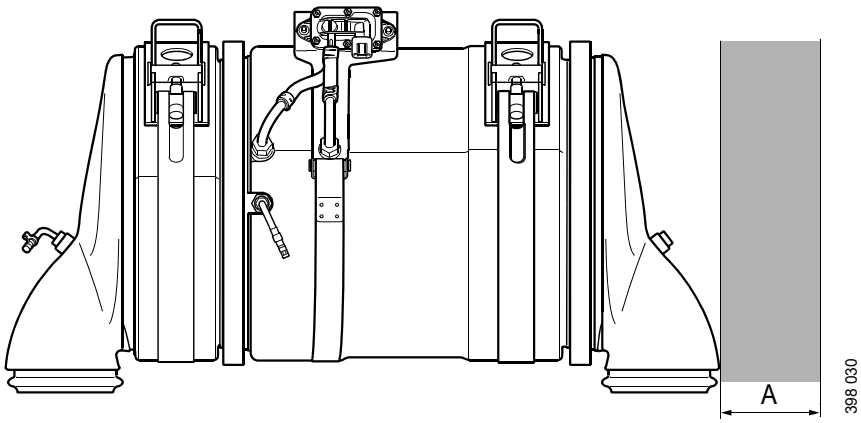
M12	70 Nm
Retaining strap	39 Nm

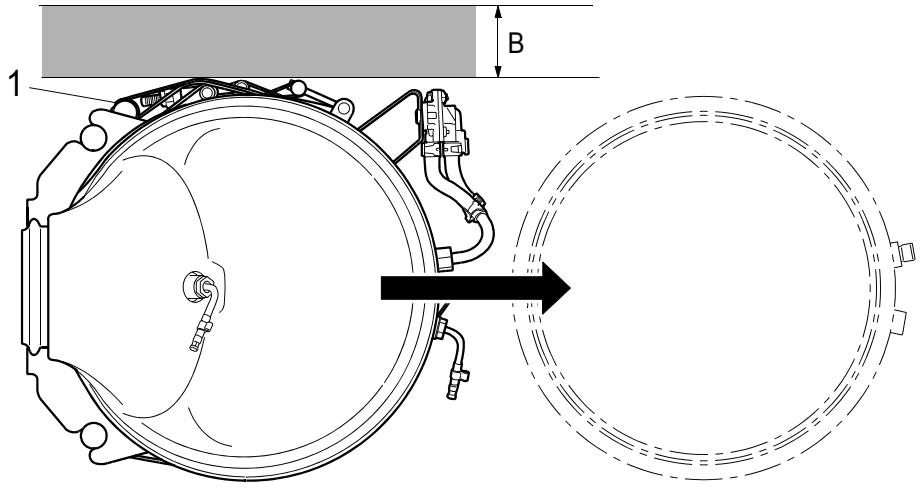


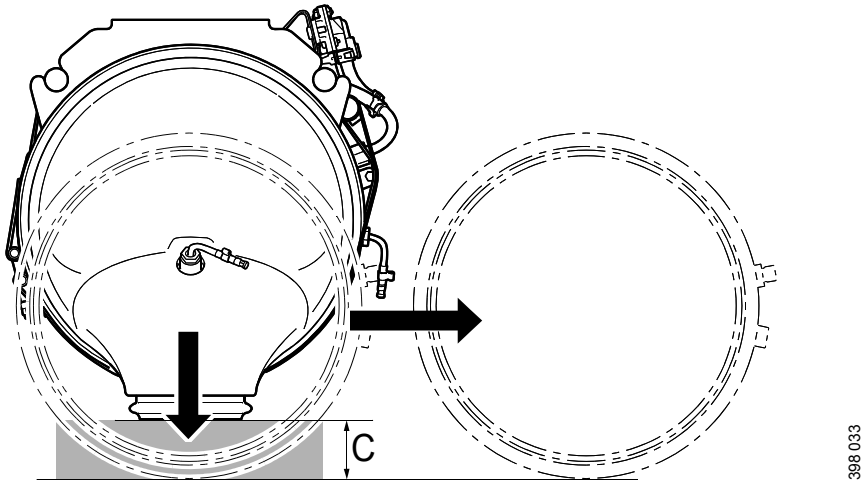
Clearances

When the particulate filter unit is installed, the clearances below should be observed so that the particulate filter unit can be maintained and repaired in a simple way. The clearances depend on how the particulate filter unit is installed. Dimension A, however, always applies.

	mm	Purpose
A	100	Renewing particulate filter.
B	140	Renew particulate filter with vertically installed bracket. In order to renew the particulate filter, screw 1 must be undone.
C	100	Renew particulate filter with horizontally installed bracket.





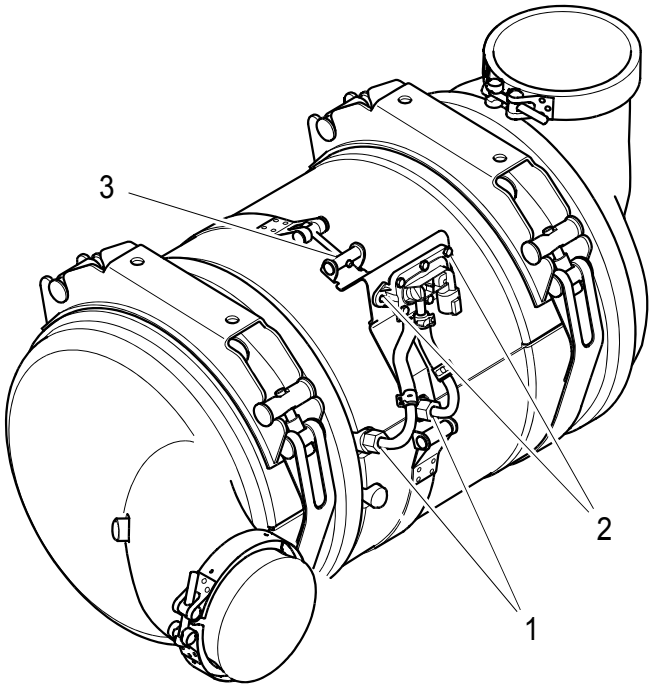


Differential pressure sensor

A differential pressure sensor must be fitted on the particulate filter.

Tightening torques

1.	Union nut	40 Nm
2.	Nut M6	8 Nm
3.	Hexagon socket screw M6	8 Nm



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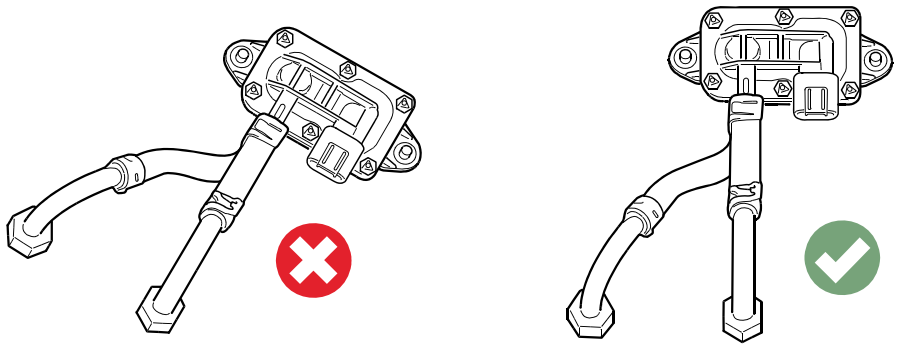
The differential pressure sensor must be fitted so that there is no risk of it coming into contact with water, as it is damaged by moisture.

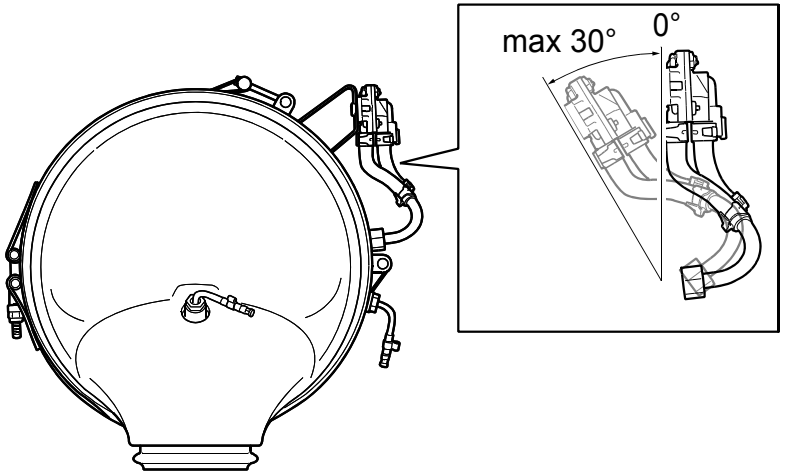
IMPORTANT!

The differential pressure sensor must not be inclined when compared to the horizontal plane. There must be a continuous inclination in pipes and hoses in order to prevent water from collecting in them and freezing.



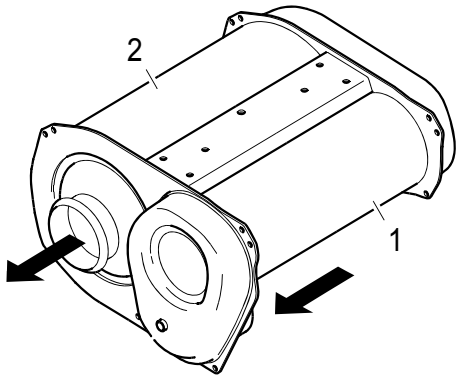
IMPORTANT!

The differential pressure sensor must be slightly inclined when compared to the vertical plane, so that condensation can run off it. Maximum installation angle is 30° relative to the vertical plane.



SCR unit

The SCR unit consists of an evaporator and an SCR catalytic converter. The arrows show the direction of exhaust gases into and out from the SCR unit.



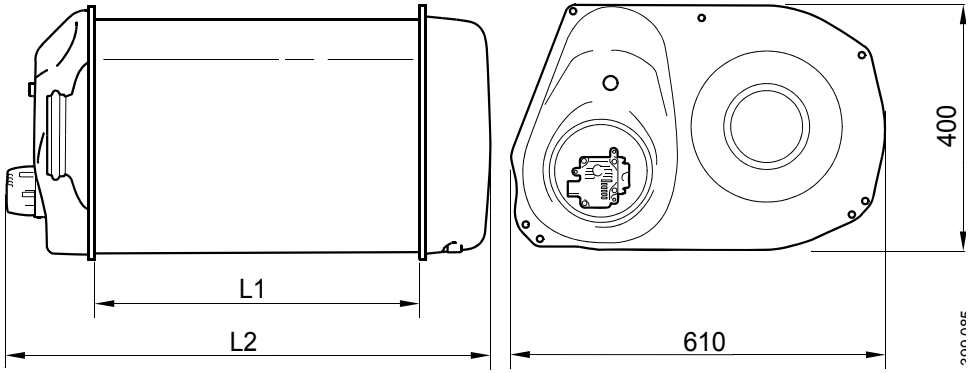
SCR unit.
1. *Evaporator.*
2. *SCR catalytic converter.*

Dimensions

The SCR unit is available in 2 versions.

Engine	L1 (mm)	L2 (mm)
DC09 and DC13 up to 331 kW	518	763.5
DC13 over 331 kW	595	840.5

The tolerance for dimension L1 is ±3 mm.



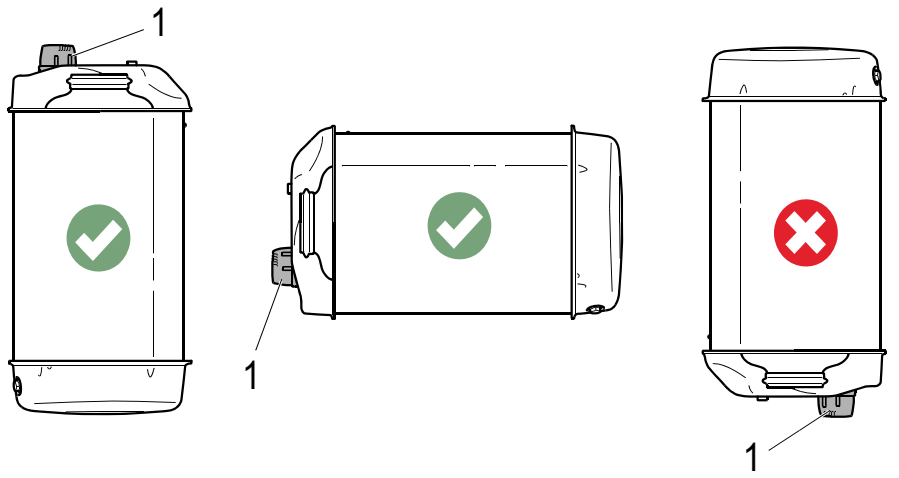
Position

The SCR unit must be installed so that the reductant doser (1) meters downwards or to one side. See illustration.

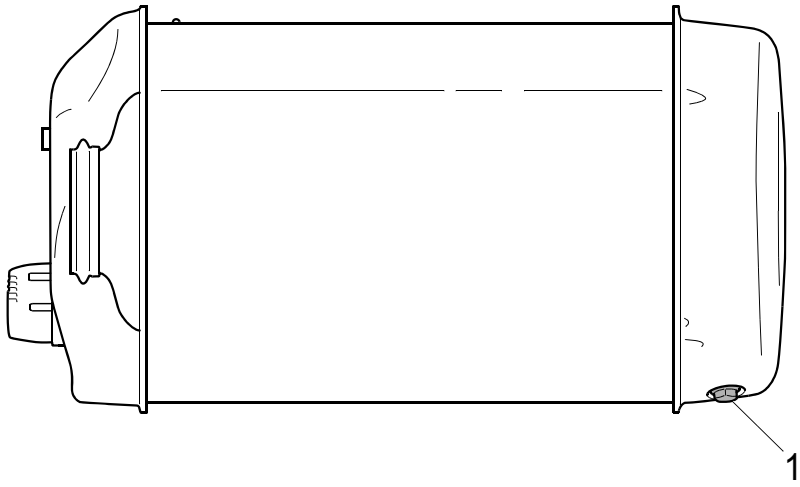
The SCR unit reductant doser should be positioned in a space where the ventilation is as good as possible.

IMPORTANT!

Maximum permitted ambient temperature at the reductant doser is 115°C.

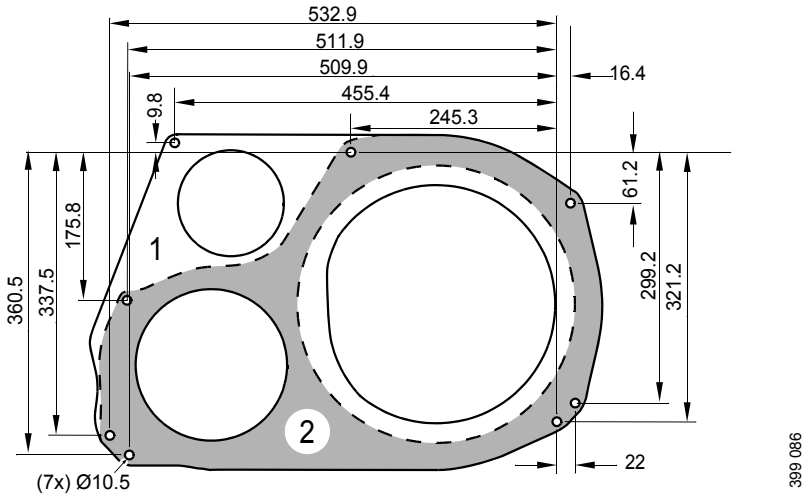


On the SCR unit, there is a drain hole for emptying flush water (1). Scania recommends that the SCR unit is positioned with the drain hole facing down.



Mounting

The SCR unit is fitted using the 7 holes on the front (1) and rear (2) bracket. Use at least 3 of the holes on each end plate when mounting. The bracket thickness is 6 mm.

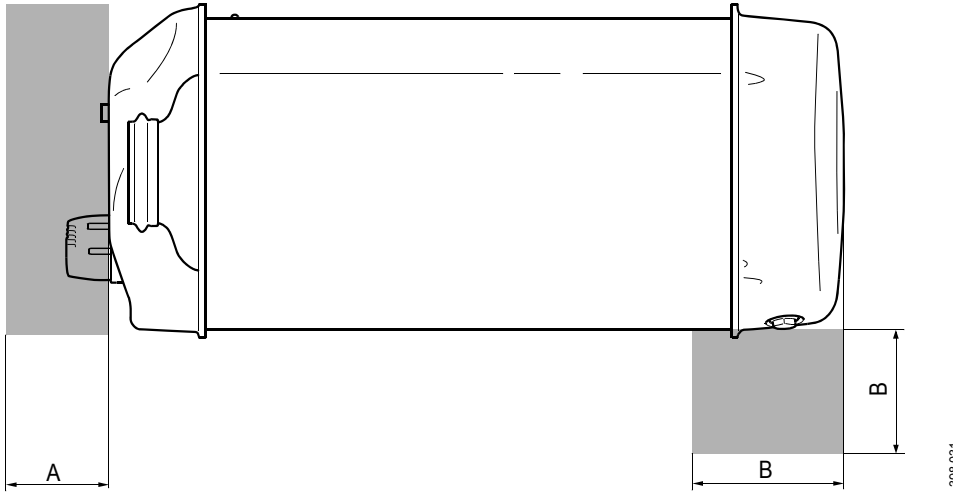


1. *Front bracket on SCR unit.*
2. *Rear bracket on SCR unit.*

Clearances

When the SCR unit is installed, the clearances below should be observed so that the SCR unit can be maintained and repaired in a simple way.

	mm	Purpose
A	140	Gaining access to the reductant doser and exhaust gas temperature sensor, flushing clean the evaporator.
B	200	Checking the SCR catalytic converter using an endoscope, draining flush water.



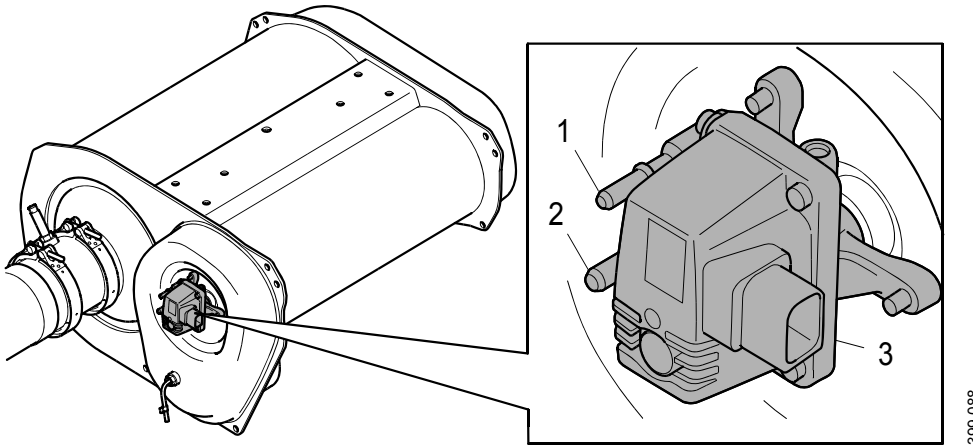
Fitting and connection of reductant doser

The reductant doser is fitted on the evaporator with 3 nuts.

Tightening torques

Nuts M6 10 Nm

	Connection	Remark
1.	Reductant pressure pipe.	Ø 8 mm
2.	Reductant return pipe.	Ø 10 mm
3.	Electrical cable to reductant tank.	V117



Note:

To ensure sufficient flow, hoses must not have any sharp bends and there must be no spots where they are at risk of being pinched. The maximum bend radius for the hoses is 50 mm.

Exhaust gas temperature sensor

The exhaust gas aftertreatment system is supplied with 3 exhaust gas temperature sensors that must be fitted in the oxidation catalytic converter, particulate filter and evaporator as illustrated. The sensors are connected to the EEC3 control unit in the reductant tank. See Connecting the reductant tank. T4012 and T4010 have a common cable harness which can be ordered in different lengths.

Note:

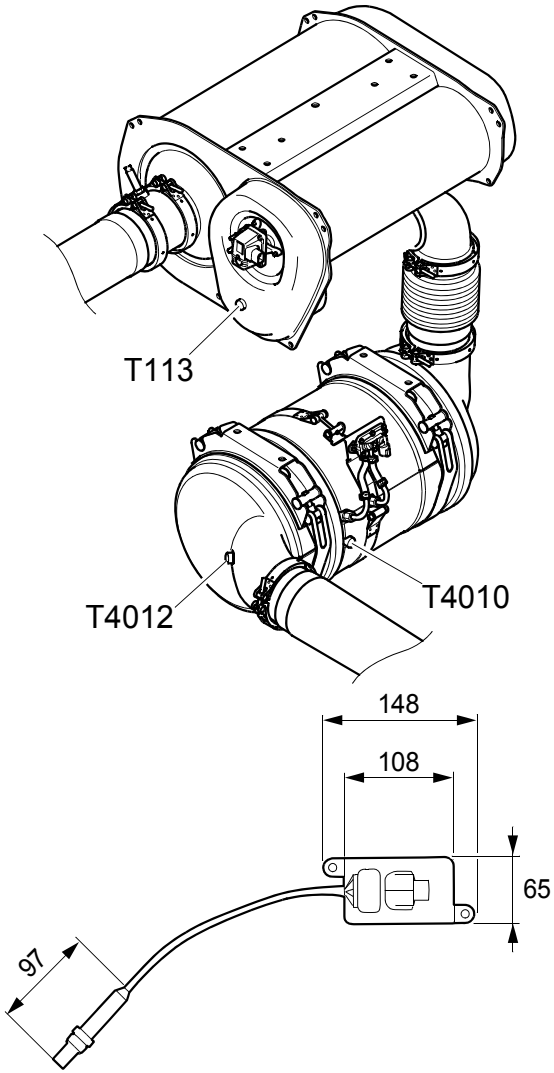
Make sure to position the sensors in the correct connection. The sensor body is 70 mm long for T4010 and 50 mm long for T4012.

NO_x sensor

The exhaust gas aftertreatment system is supplied with 2 NO_x sensors with one control unit each:

- T131, which is located in the exhaust pipe bend or exhaust brake downstream of the turbocharger.
- T115, which must be fitted in the supplied NO_x adapter on the SCR unit outlet side.

Length of the electrical cable between NO_x sensor and control unit	Tightening torques
910 mm	50 ±10 Nm



NOx sensor.

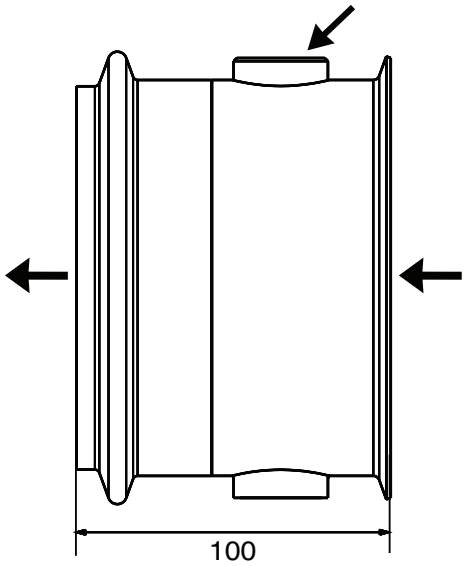
The adapter for NO_x sensor T115 is available with different inside diameters for connection of different pipe diameters downstream of the SCR system.

The sensor control units are connected to the EEC3 control unit in the reductant tank. See Connecting the reductant tank. The control units should be fitted on the frame so that they are shielded from radiated heat and knocks. The attachment holes have a diameter of 8.3 mm. The electrical cables between the sensors and the control units must not be spliced. The NO_x sensors and control units must not be painted.

If the ambient temperature at the NO_x sensor control units is too high, the control units may be damaged.

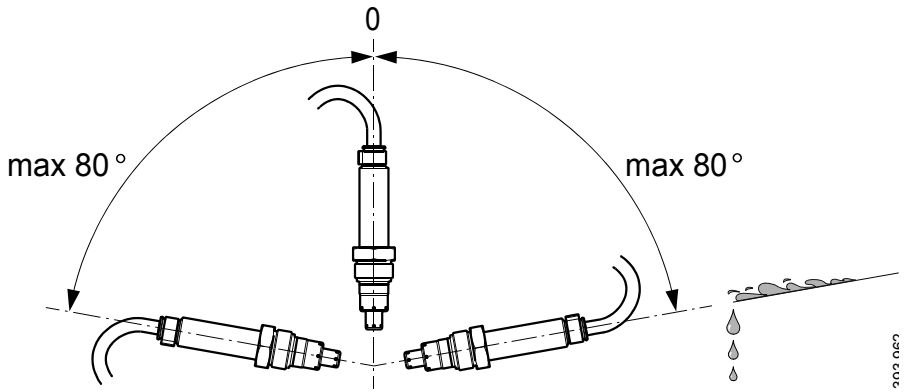
REQUIREMENT!

Maximum permitted ambient temperature at the NO_x sensor control units is 90 C. Measure the ambient temperature when installation is complete. Refer to *01:08 Measuring instructions for installation inspection*.



IMPORTANT!

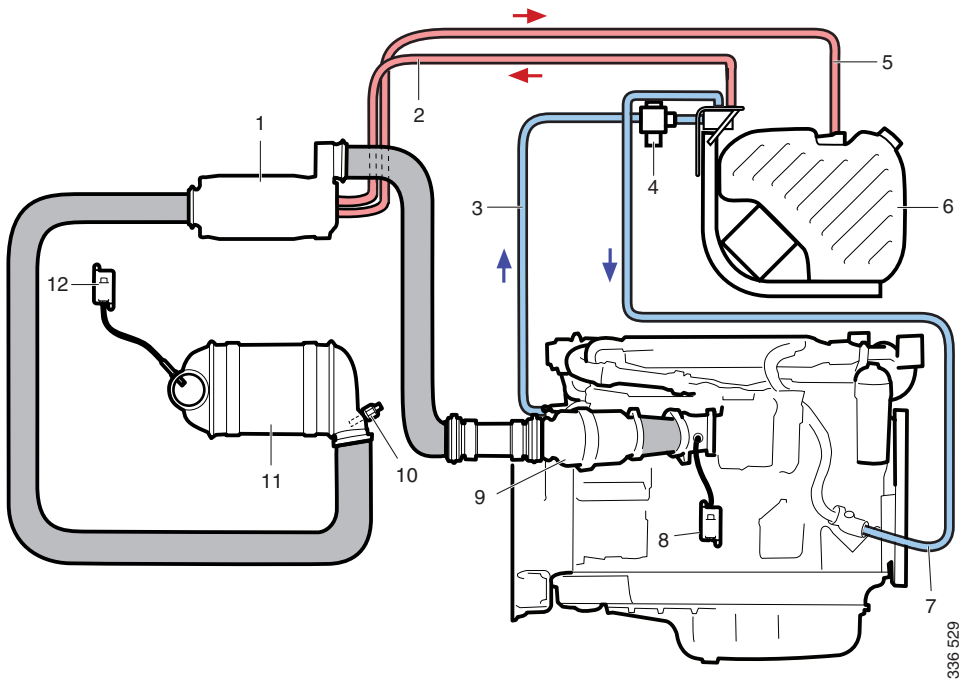
NO_x sensor T115 must be fitted so that there is no risk of it coming into contact with water, as it is damaged by moisture. The NO_x sensor must be slightly inclined so that condensation can drain from it. Maximum installation angle is 80° relative to the vertical plane. This applies regardless of whether the exhaust pipe is installed horizontally or vertically.



System overview – Stage IV/Tier 4f and Stage III B/Tier 4i

System overview of mechanics

Pos.	Component	Supplied from the factory	Fitted by fitter
1	Evaporator with reductant doser[1]	X	X
2	Pressure hose for reductant	X	X
3	Coolant hose for heating the reductant tank and pump	-	X
4	Coolant valve	X	-
5	Reductant return hose	X	X
6	Reductant tank	X	X
7	Coolant hose, return from heating the tank and pump	-	X
8	NO_x sensor downstream of the turbocharger with control unit[2]	X	-
9	Oxidation catalytic converter[3]	X	X[4]
10	Exhaust gas temperature sensor	X	X
11	SCR catalytic converter	X	X
12	NO_x sensor on the SCR catalytic converter outlet side with control unit	X	X



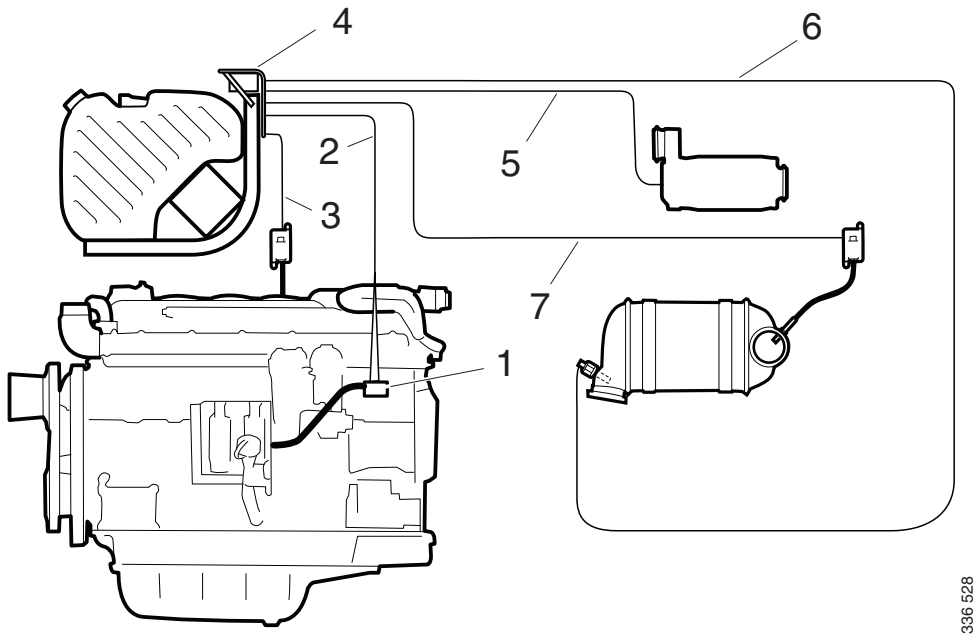
1. Hydrolysis catalytic converter is used for DC16 Stage III B/Tier 4i.
2. Only Stage IV/Tier 4f.
3. Stage IV/Tier 4f only. Not DC13 085A and DC16.
4. Customer option.

System overview of electrics

Connection of harness-to-harness connectors on the reductant tank is described in section Connecting the reductant tank. Connection to the engine control unit is described in *03:01 Electrical system*.

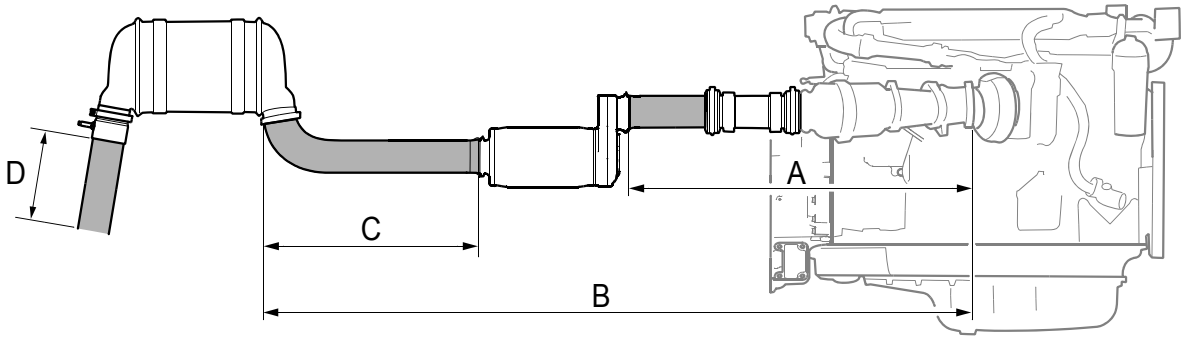
	Component	Fitted by fitter
1	Engine interface for SCR system	-
2	Cable harness between engine and EEC3 control unit	x
3	Electrical cable for NO_x sensor downstream of the turbocharger[1]	x
4	Electrical connection to SCR system	-
5	Electrical cable for reductant doser	x
6	Electrical cable for exhaust gas temperature sensor	x
7	Electrical cable for NO_x sensor on the outlet side of the SCR catalytic converter	x

1. Only Stage IV/Tier 4f.



Exhaust pipe

Pipe lengths

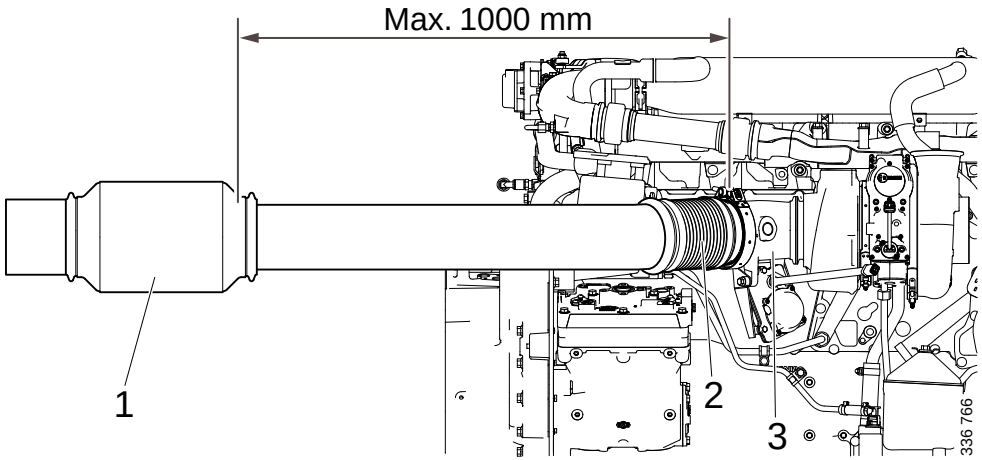


	From	To	Pipe length (mm)	Remarks
A	Turbocharger	Evaporator or hydrolysis catalytic converter intake	500-1,500	
B	Turbocharger	SCR catalytic converter intake	Max. 3,500	Only applies to Stage IV/Tier 4f engines.
C	Evaporator or hydrolysis catalytic converter outlet	SCR catalytic converter intake	700-3,000	
D	NO_x adapter	Exhaust outlet	Min.500	In order for the measurement of NO_x content to be correct.

Dimension B: For Stage IV/Tier 4f engines, the exhaust gas temperature may drop too much in the system if the total length between the turbocharger and SCR catalytic converter intake exceeds 3.5 metres. There is then a great risk that the engine will go into heating mode, which can increase fuel consumption. The maximum permitted exhaust gas temperature reduction is indicated in *01:04 Exhaust system*.

Maximum pipe length to the oxidation catalytic converter

Maximum pipe length between the exhaust brake and the oxidation catalytic converter intake is 1,000 mm.



1. *Oxidation catalytic converter.*
2. *Exhaust bellows.*
3. *Exhaust brake.*

Pipe material

The exhaust pipe between the evaporator or hydrolysis catalytic converter and the SCR catalytic converter must be made from stainless metal type 1.4301 or 1.4509, US grade 316L or equivalent. Scania also recommends that this material is used for other exhaust pipes downstream of the SCR catalytic converter.

Other instructions on exhaust system shape and fitting are available in *01:04 Exhaust system*.

Other requirements

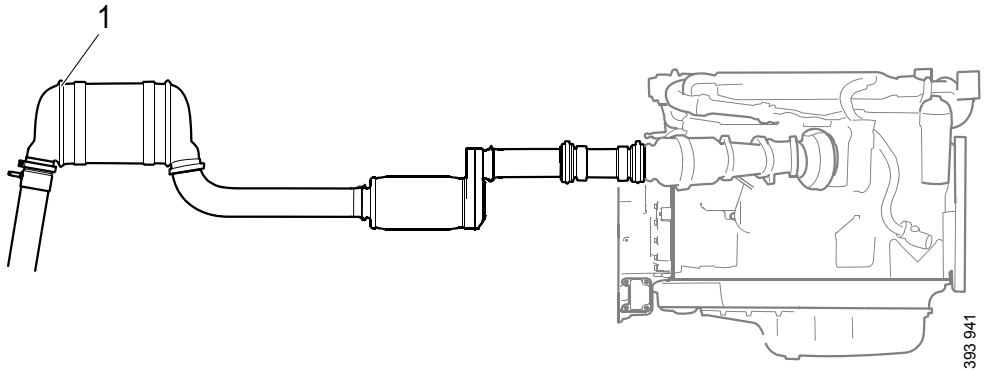
There must always be a flexible connection between the turbocharger and evaporator or hydrolysis catalytic converter. See *01:04 Exhaust system*.

Tightening torque for V-clamps

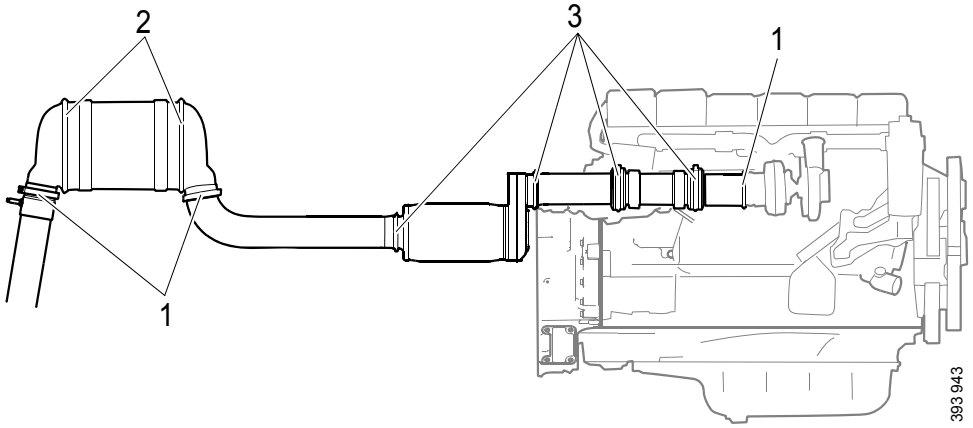
The tightening torques for the V-clamps in the SCR system are indicated in the illustrations to the right.

IMPORTANT!

Scania recommends that the V-clamps in the SCR system are retightened after the engine has reached operating temperature for the first time. Carry out the retightening when the engine has cooled down again.



Stage IV/Tier 4f.
1. 22 Nm.
Other V-clamps: 20 Nm.



Stage III B/Tier 4i.
1. *20 Nm.*
2. *22 Nm.*
3. *10 Nm.*

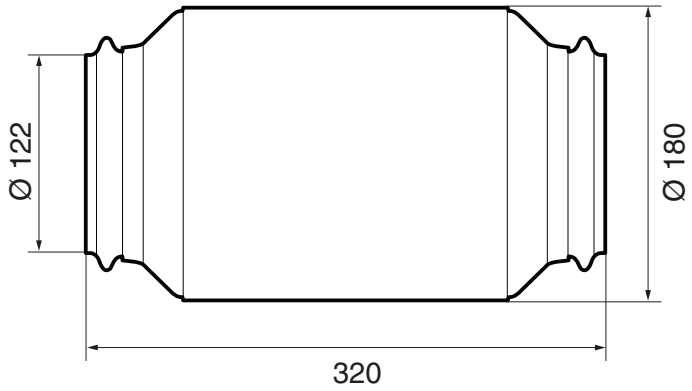
Components – Stage IV/Tier 4f and Stage III B/Tier 4i

Oxidation catalytic converter

The oxidation catalytic converter is found on all Stage IV/Tier 4f engines, apart from DC13 085A and DC16.

Dimensions

The illustration shows the dimensions of the oxidation catalytic converter.



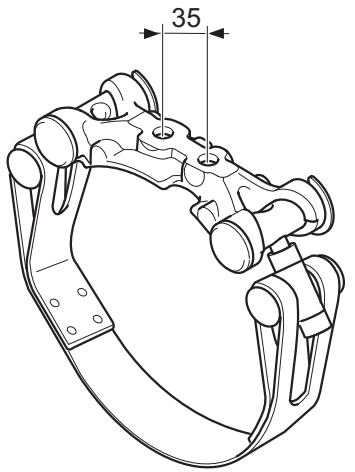
336 527

Position

An oxidation catalytic converter that is not engine-mounted should be positioned between the exhaust brake and evaporator. Maximum distance between the exhaust brake and oxidation catalytic converter intake is shown in section Maximum pipe length to the oxidation catalytic converter.

Mounting

The oxidation catalytic converter is supplied with 2 retaining straps with brackets. The attachment holes have a diameter of 11 mm. Attach the brackets with M10 hexagon socket screws.



340 431

Tightening torques

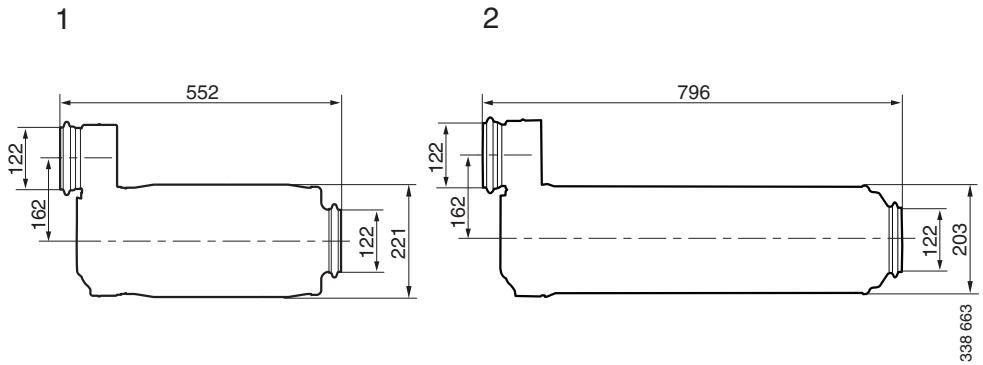
M10	39 Nm
Retaining strap	20 Nm

Evaporator

Dimensions

Stage IV/Tier 4f

The illustration shows the dimensions of the evaporator.

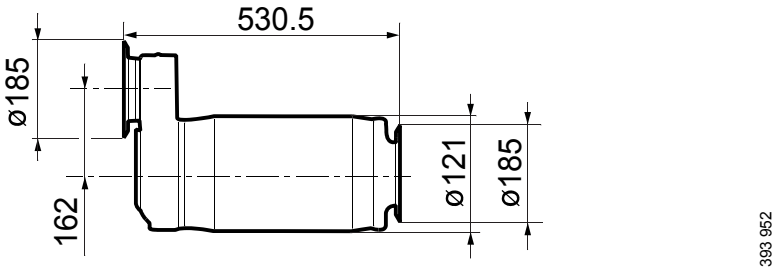


Stage IV/Tier 4f: Evaporator for
1. *DC09 and DC13.*
2. *DC16.*

Stage IIIB/Tier 4i

For engines certified according to Stage III B/Tier 4i, an evaporator is used for DC09 and DC13. For DC16, see Hydrolysis catalytic converter.

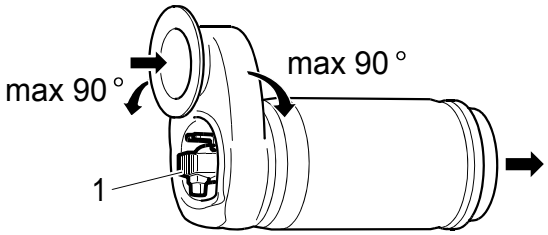
The illustration shows the dimensions of the evaporator.



Stage III B/Tier 4i: Evaporator for DC09 and DC13.

Position

The evaporator must be fitted in the direction of the exhaust gases as illustrated. The evaporator should be positioned in a space where the ventilation is as good as possible.



IMPORTANT!

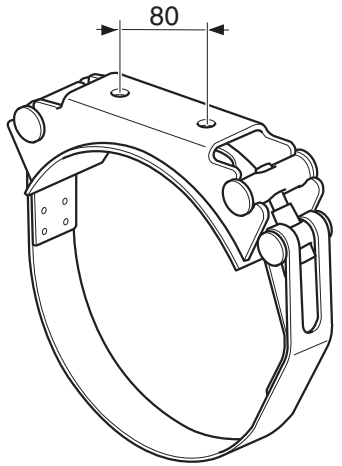
Maximum permitted ambient temperature at the evaporator is 115°C.

The evaporator must not be rotated so that the intake is positioned below the reductant doser (1). Maximum permitted rotation 90°.

The evaporator must be fitted horizontally.

Mounting

The evaporator is supplied with two retaining straps with brackets. The attachment holes have a diameter of 13 mm. Attach the brackets with flange screw M12 or a common screw of a suitable length. Use an M12 flange nut if necessary.



340 432

Tightening torques

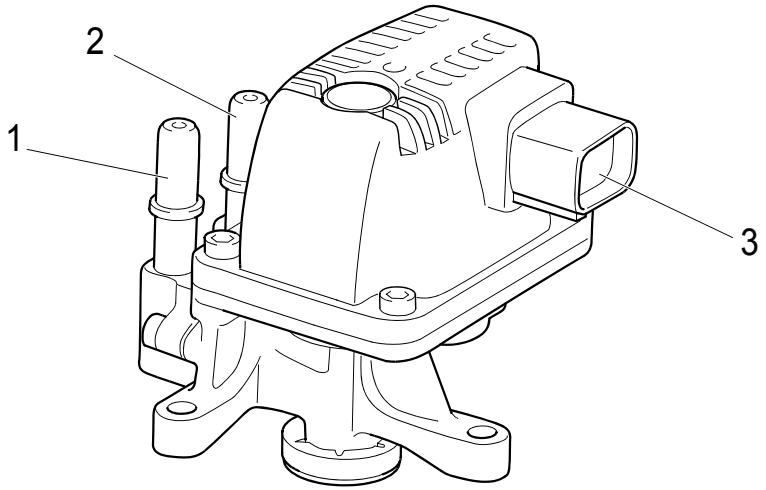
M12	70 Nm
Retaining strap	39 Nm

Connection of reductant doser

	Connection	Remark
1.	Reductant return hose.	Ø 10 mm
2.	Pressure hose for reductant.	Ø 8 mm
3.	Electrical cable to reductant tank.	V117

Note:

To ensure sufficient flow, hoses must not have any sharp bends and there must be no spots where they are at risk of being pinched. The maximum bend radius for the hoses is 50 mm.



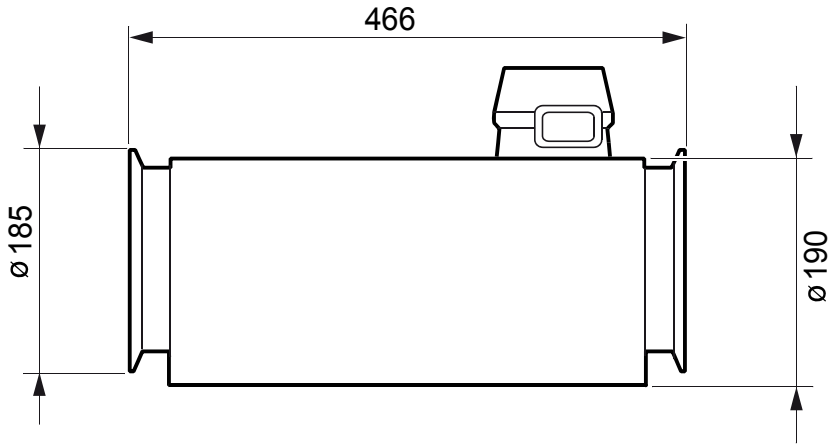
Reductant doser.

Hydrolysis catalytic converter

For DC16 Stage III B/Tier 4i, a hydrolysis catalytic converter is used.

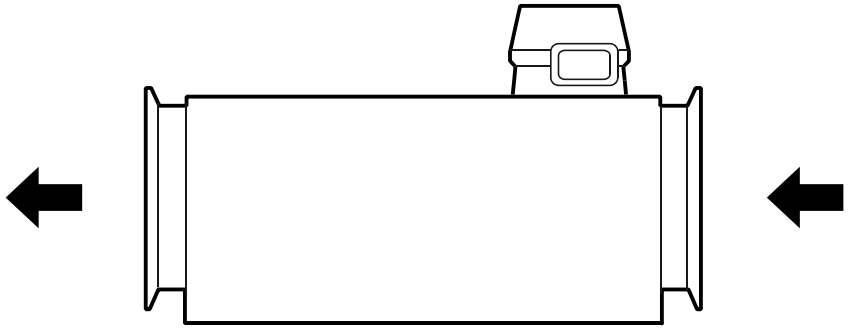
Dimensions

The illustration shows the dimensions of the hydrolysis catalytic converter.



Position

The hydrolysis catalytic converter must be fitted in the direction of the exhaust gases as illustrated. The hydrolysis catalytic converter should be positioned in a space where the ventilation is as good as possible. Maximum permitted ambient temperature 115°C.

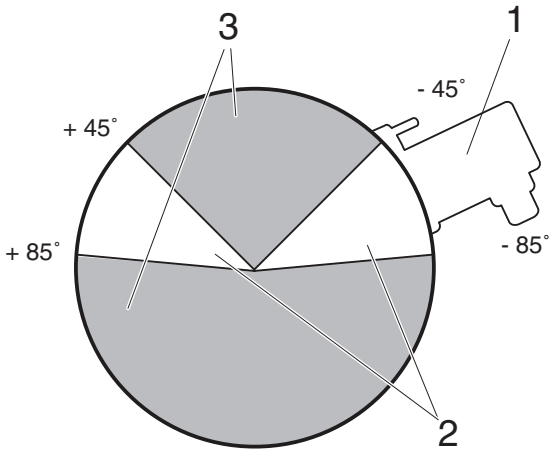


The hydrolysis catalytic converter must be rotated so that the reductant doser (1) is positioned in area 2.

IMPORTANT!

The hydrolysis catalytic converter must not be rotated so that the reductant doser (1) is positioned in area 3.

Connection of the reductant doser is described in section Connection of reductant doser.



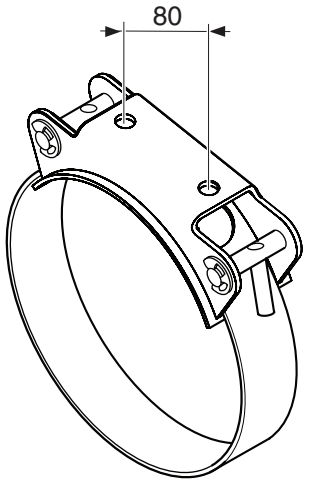
340 439

Mounting

The hydrolysis catalytic converter is supplied with 1 retaining strap with bracket. The attachment holes have a diameter of 13 mm. Attach the bracket with flange screw M12 or a common screw of a suitable length. Use an M12 flange nut if necessary.

Tightening torques

M12	70 Nm
Retaining strap	39 Nm



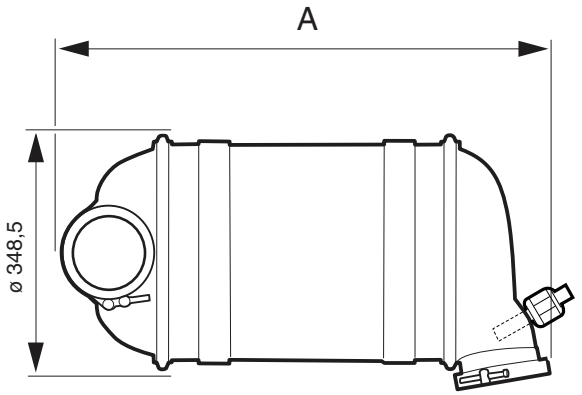
337 276

SCR catalytic converter

Dimensions

Emission class, Stage IV/Tier 4f		
Engine	**Engine power (hp)**	**Dimension A (mm)**
DC09 84/85/87/89A	275-350	786
DC09 86A	375-400	900
DC13 84/87/89A	350-450	900
DC13 85A	500-550	970
DC16	550-770	970

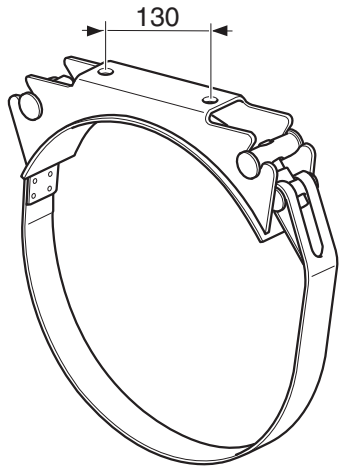
Emission class, Stage IIIB/Tier 4i		
Engine	**Engine power (hp)**	**Dimension A (mm)**
DC09	200-400	786
DC13	350-550	858
DC16	550-700	1,060



335 259

Mounting

The SCR catalytic converter is supplied with two retaining straps with brackets. The attachment holes have a diameter of 13 mm. Attach the brackets with flange screw M12 or a common screw of a suitable length. Use an M12 flange nut if necessary.



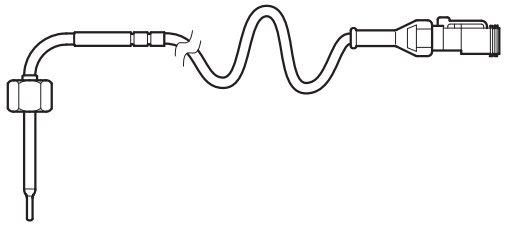
340 434

Tightening torques

M12	70 Nm
Retaining strap	39 Nm

Exhaust gas temperature sensor

An exhaust gas temperature sensor must be fitted on the inlet side of the SCR catalytic converter. The tightening torque for the exhaust temperature sensor is 35-40 Nm.



340 440

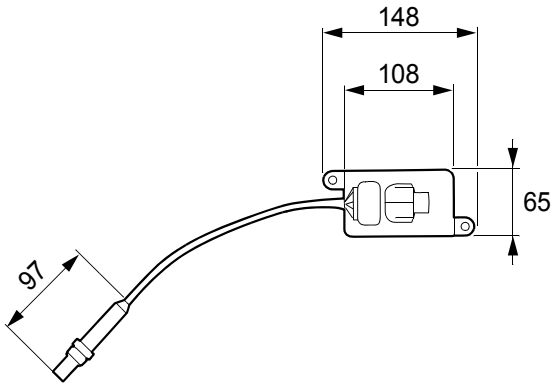
Exhaust gas temperature sensor.

NO_x sensor

The exhaust gas aftertreatment system is supplied with 1 or 2 NO_x sensors with control unit.

- SCR systems according to Stage IV/Tier 4f have 2 NO_x sensors: T131, which is located in the exhaust brake housing, and T115, which is fitted according to the description on the following page.
- SCR systems according to Stage IIIB/Tier 4i have 1 NO_x sensor: T115, which is fitted as described on the following page.

Electrical cable length (mm)	Tightening torque (Nm)
910	50 ±10



336 867

NOx sensor T131 and T115.

The sensor control units are connected to the EEC3 control unit in the reductant tank. See Connecting the reductant tank. The control units should be fitted on the frame so that they are shielded from radiated heat and knocks. The attachment holes have a diameter of 8.3 mm. The electrical cables between the sensors and the control units must not be spliced. The NO_x sensors and control units must not be painted.

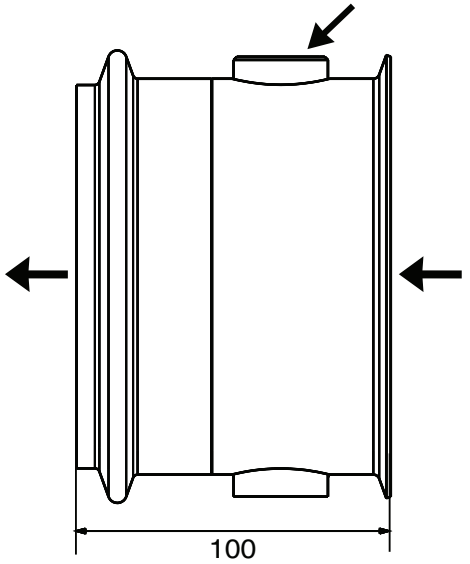
If the ambient temperature at the NO_x sensor control units is too high, the control units may be damaged.

REQUIREMENT!

Maximum permitted ambient temperature at the NO_x sensor control units is 90 C. Measure the ambient temperature when installation is complete. Refer to *01:08 Measuring instructions for installation inspection*.

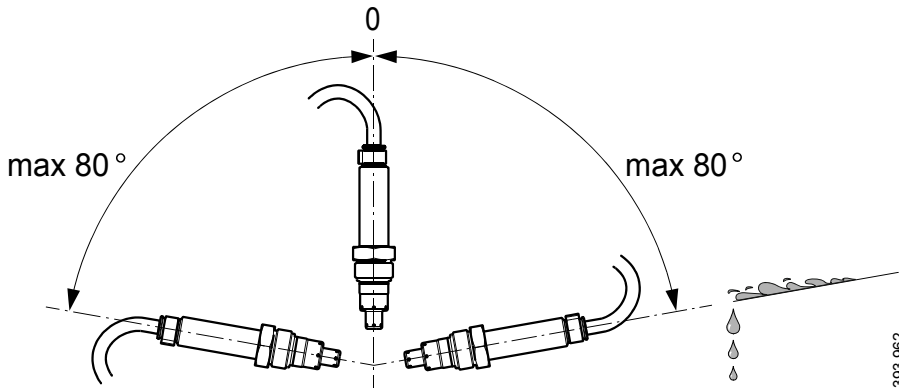
Position

Fit the supplied NO_x adapter on the outlet side of the SCR catalytic converter. The adapter has a connection for NO_x sensor T115 (black electrical cable). The NO_x adapter is available with different inside diameters for connection of different pipe diameters downstream of the SCR system. The tightening torque for the V-clamp between the SCR catalytic converter outlet and the NO_x adapter is 20 Nm.

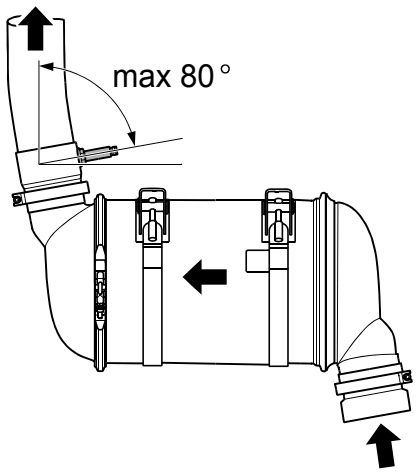


IMPORTANT!

The NO_x sensor must be fitted so that there is no risk of it coming into contact with water, as it is damaged by moisture. The NO_x sensor must be slightly inclined so that condensation can drain from it. Maximum installation angle is 80° relative to the vertical plane. This applies regardless of whether the exhaust pipe is installed horizontally or vertically.



The illustration shows an example of NO_x sensor installation in a vertical exhaust pipe.



Reductant tank

Reductant tanks come in 5 different sizes. The volumes specified below the illustration refer to fill volumes.

The reductant pump and EEC3 control unit are located on the reductant tank. The reductant tank is heated via the engine cooling system.

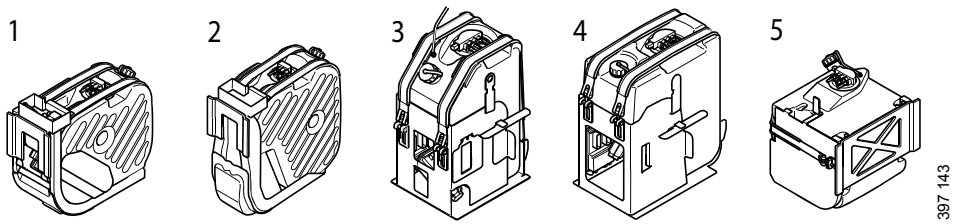
Scania advises against manufacturing your own reductant tank.

The reductant tank and reductant pick-up unit are designed to withstand freezing. The logics for e.g. heating are also adapted for a special tank design.

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

IMPORTANT!

In order to allow the reductant to expand when it freezes, the reductant tank must not be filled to its full capacity. Refer to the next page.



1. *38 litres.*
2. *60 litres.*
3. *45 litres.*
4. *63 litres.*
5. *70 litres.*

Tank volumes

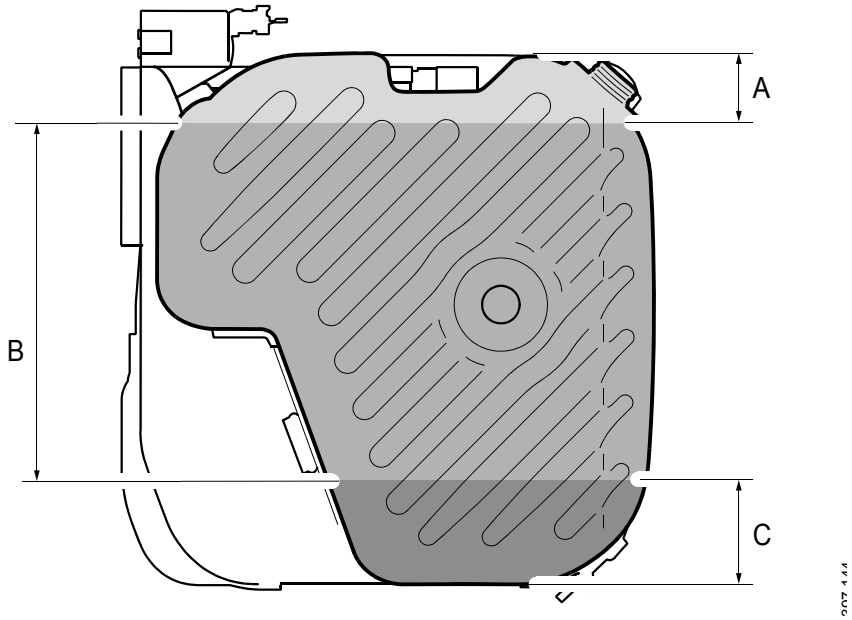
The tank volumes specified in the table below are defined as follows:

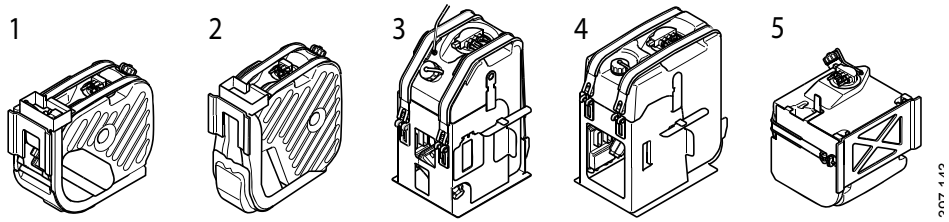
- Total volume: The sum of fill volume, expansion volume and reserve volume.
- Expansion volume (A): The space required for the reductant to expand if it freezes. The reductant expands by 7% when freezing, and the freezing point is -11°C.
- Fill volume (B): Volume available for metering.
- Reserve volume (C): The volume required to prevent air from entering the system, and to cool the reductant doser. The system automatically stops metering reductant when the level has dropped to the reserve volume.

IMPORTANT!

The reductant doser is cooled using the reductant. If the reductant doser is not cooled, it breaks after a few minutes under normal exhaust gas temperature. Therefore, there must always be at least a reserve volume in the tank.

	Reductant tank	**1**	**2**	**3**	**4**	**5**
A	Expansion volume (l)	5	8	7.5	10	7
B	Fill volume (l)	38	60	45	63	70
C	Reserve volume (l)	7	7	7.5	7	13
	Total volume (l)	50	75	60	80	90
	Volume for first filling	45	67	52.5	70	83

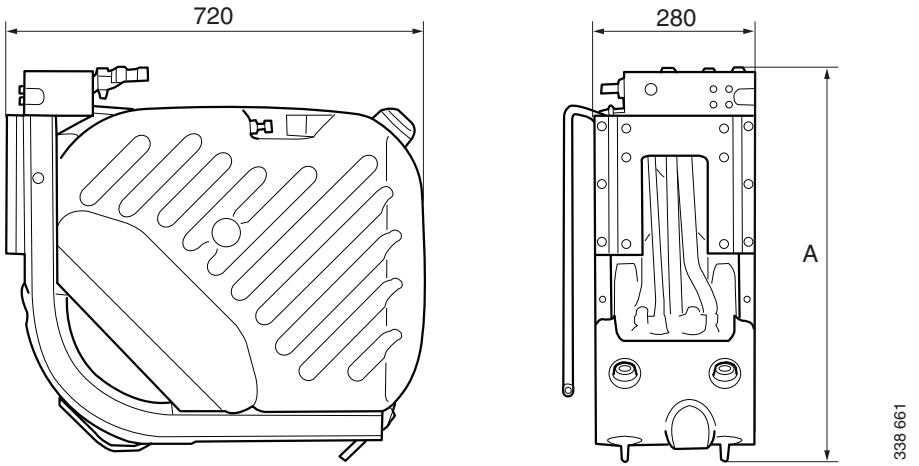




Dimensions

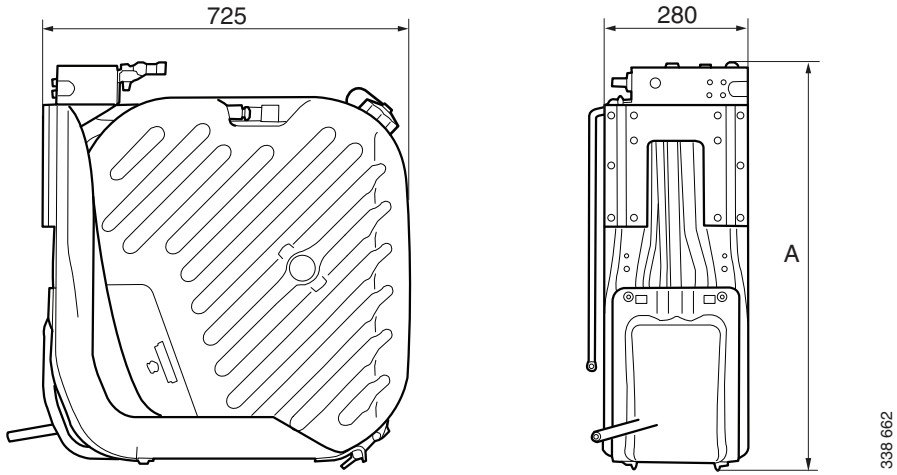
Dimensions for 38 litre reductant tank

Emission class	Dimension A (mm)
Stage V/Stage IV/Tier 4f	671
Stage III B/Tier 4i	680

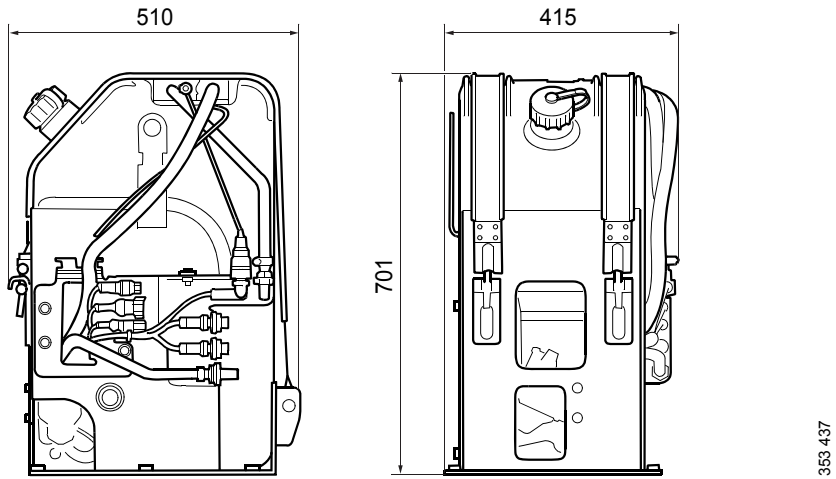


Dimensions for 60 litre reductant tank

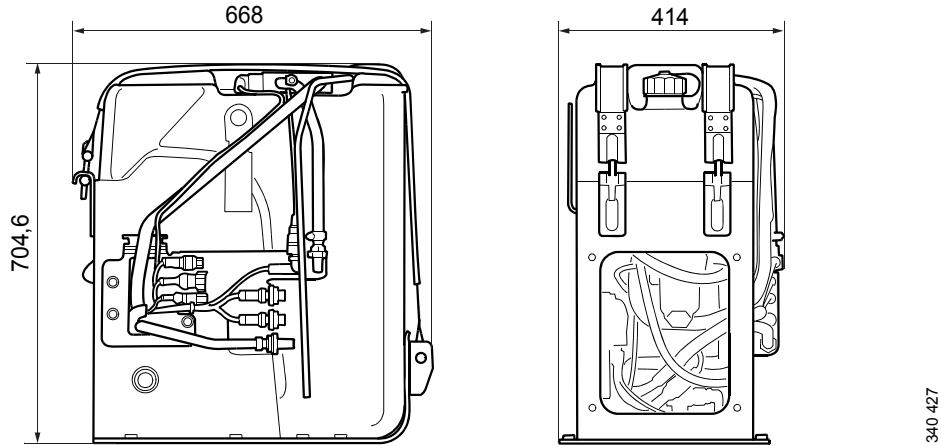
Emission class	Dimension A (mm)
Stage V/Stage IV/Tier 4f	788.3
Stage III B/Tier 4i	803



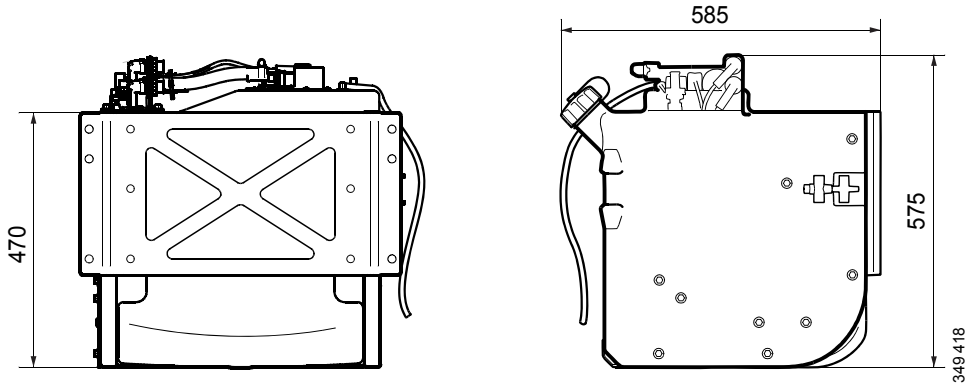
Dimensions for 45 litre reductant tank



Dimensions for 63 litre reductant tank



Dimensions for 70 litre reductant tank



Position

In order to renew the reductant filter in a simple way, the reductant tank must be positioned so that clearance A is at least 200 mm for the 38, 60 and 70 litre tanks and 300 mm for the 45 and 63 litre tanks. If the tank has a casing, it must be easily accessible.

When carrying out repair work on the pump and control unit, the reductant tank should be removed.

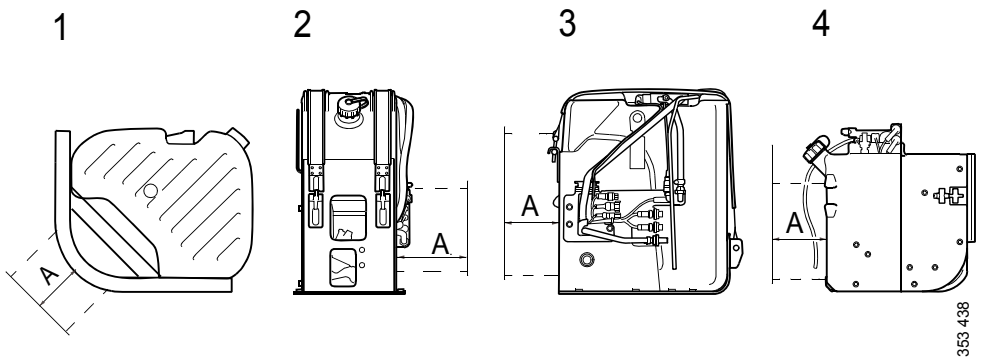
If the reductant is exposed to high temperatures, there is a risk that it separates. The reductant then cannot reduce the amount of nitrogen oxide in the exhaust gases as it should, which leads to the engine installation not meeting emissions requirements.

REQUIREMENT!

The reductant tank must not be positioned close to the exhaust system or any sources of heat which may cause the reductant to be heated to more than 55°C. Measure the temperature in the reductant tank space when installation is complete. Refer to *01:08 Measuring instructions for installation inspection*.

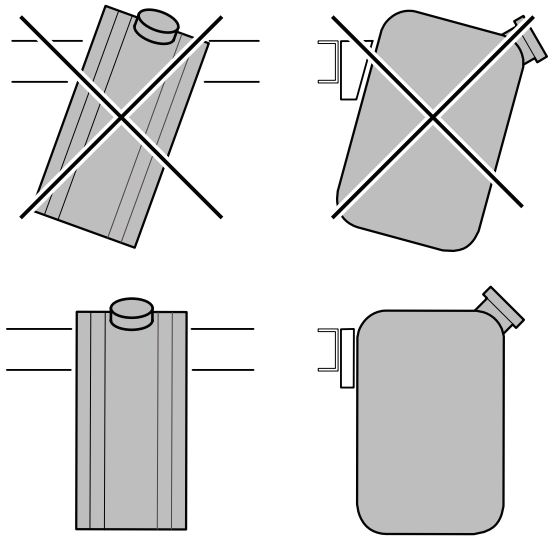
IMPORTANT!

The reductant tank must not be twisted or tipped in relation to the lode line when it is installed.



A = Free space required for prefilter renewal.

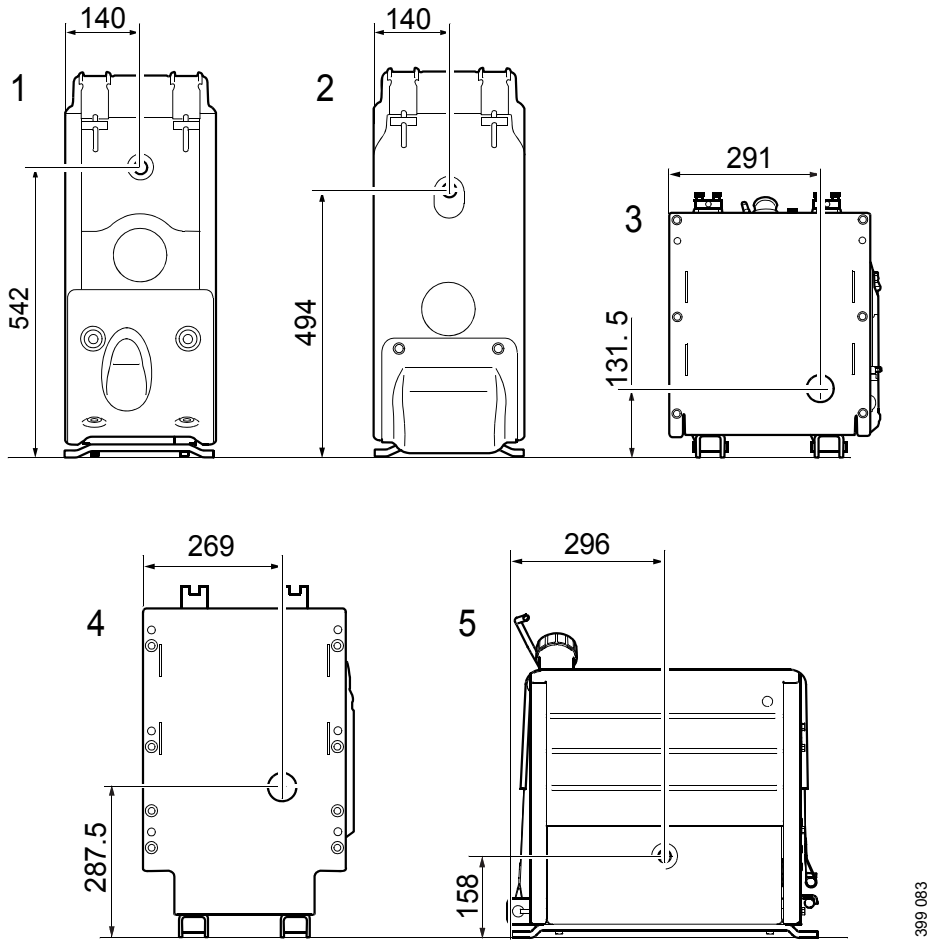
1. *A = 200 mm (38 and 60 litre tanks).*
2. *A = 300 mm (45 litre tank).*
3. *A = 300 mm (63 litre tank).*
4. *A = 200 mm (70 litre tank).*



Drain hole

At the bottom of the reductant tank, there is a drain hole for emptying reductant. Scania recommends that enough free space is left around the drain hole so that it is possible to access the drain hole and drain the reductant tank.

The location of the drain hole for different reductant tanks is shown in the illustrations. The tanks are shown from below. The holes have M18 threads.

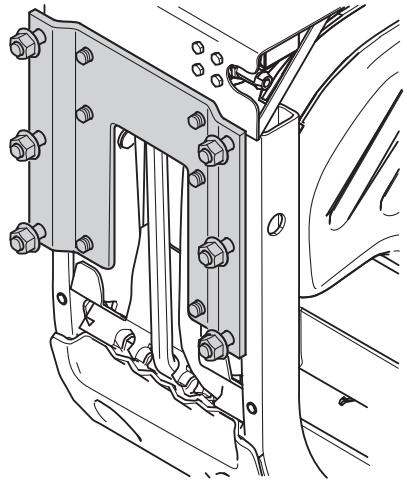


1. *38 litre tank.*
2. *60 litre tank.*
3. *45 litre tank.*
4. *63 litre tank.*
5. *70 litre tank.*

Mounting

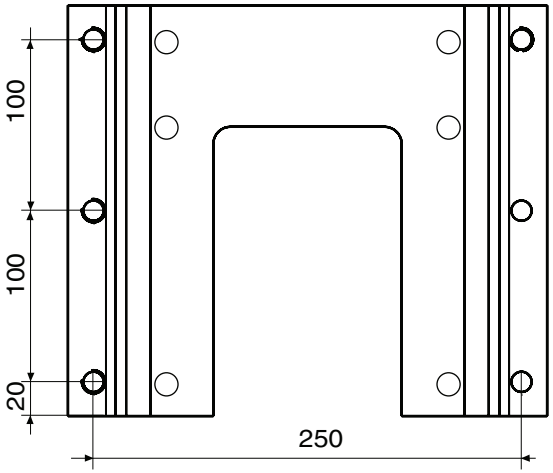
Attaching the 38 and 60 litre tanks

The reductant tanks with a capacity of 38 and 60 litres are fitted using six M14 studs. The bracket is threaded so that screws without nuts can be used if the studs are removed.



340 437

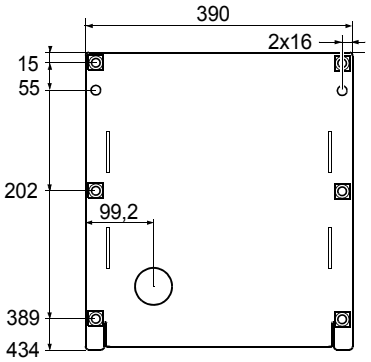
Bracket for the 38 and 60 litre reductant tanks.



340 438

Attaching the 45 litre tank

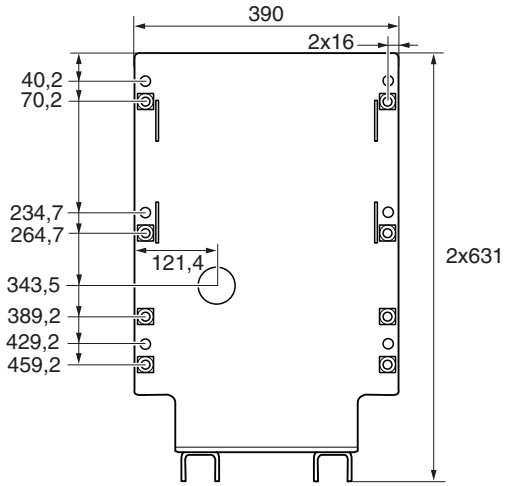
The 45 litre tank is fitted by means of a bracket at the bottom of the tank. There are 2 methods of fitting the bracket. Either screw on the bracket by screwing M14 screws into the threaded nuts, or fit the bracket using the 2 holes with a diameter of 14 mm.



353 440

Attaching the 63 litre tank

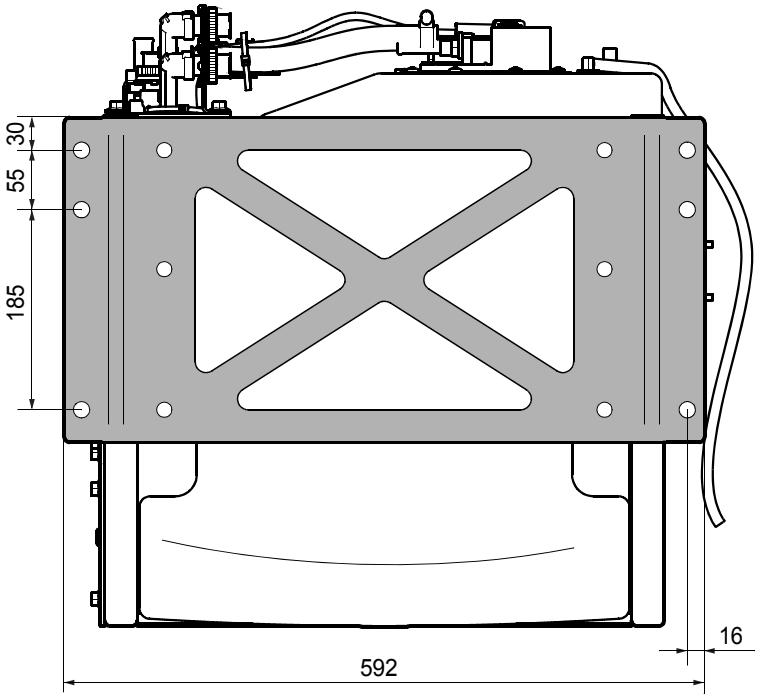
The 63 litre tank is fitted by means of a bracket at the bottom of the tank. There are 2 methods of fitting the bracket. Either screw on the bracket by screwing M14 screws into the threaded nuts. In this case use at least six of the eight nuts. It also is possible to fit the bracket using 6 holes with a diameter of 14 mm.



340 430

Attaching the 70 litre tank

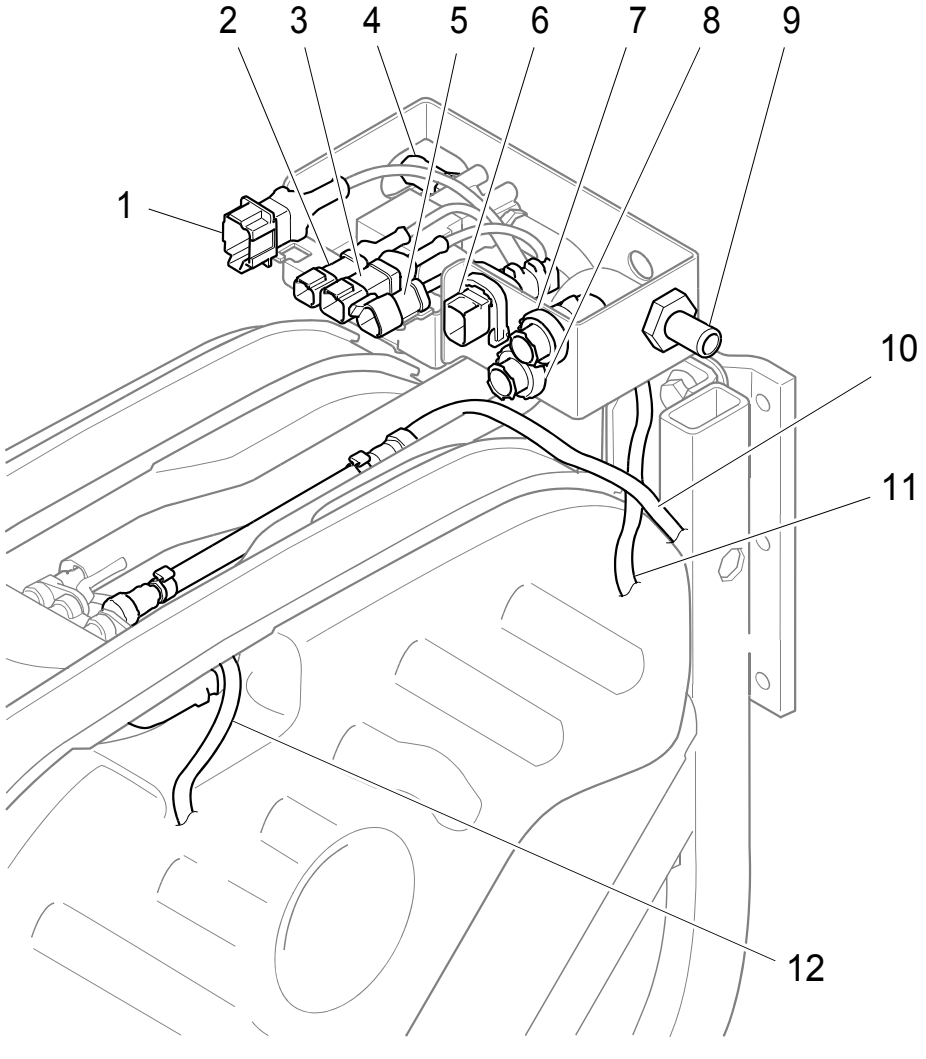
The reductant tank with a volume of 70 litres is fitted using the 6 holes with a diameter of 15 mm.



Connecting the reductant tank

Connecting the 38 and 60 litre reductant tanks

	Connection	Description
1.	C316	Reductant doser (V117).
2.	C4012	Exhaust gas temperature sensor up-stream of catalytic converter (T113).
3.	C4132	The exhaust gas temperature sensor upstream of the oxidation catalytic converter (T4012) and downstream of the oxidation catalytic converter (T4010). **Note: Only applies to Stage V.**
4.	Coolant from engine	Union, Ø 16 mm
5.	C4131	Differential pressure sensor (T141). **Note: Only applies to Stage V.**
6.	C7	Voltage supply from the engine, CAN-connection.
7.	C4011	NO_x sensor downstream of catalytic converter (T115).
8.	C4051	NO_x sensor upstream of the catalytic converter (T131). **Note: Only applies to Stage IV/ Tier 4f and Stage V.**
9.	Coolant return to engine	Union, Ø 16 mm
10.	Pressure hose for reductant to reductant doser	SAE J2044, Ø 6.30 mm.
11.	Return hose for reductant to reductant tank	SAE J2044, Ø 7.89 mm.

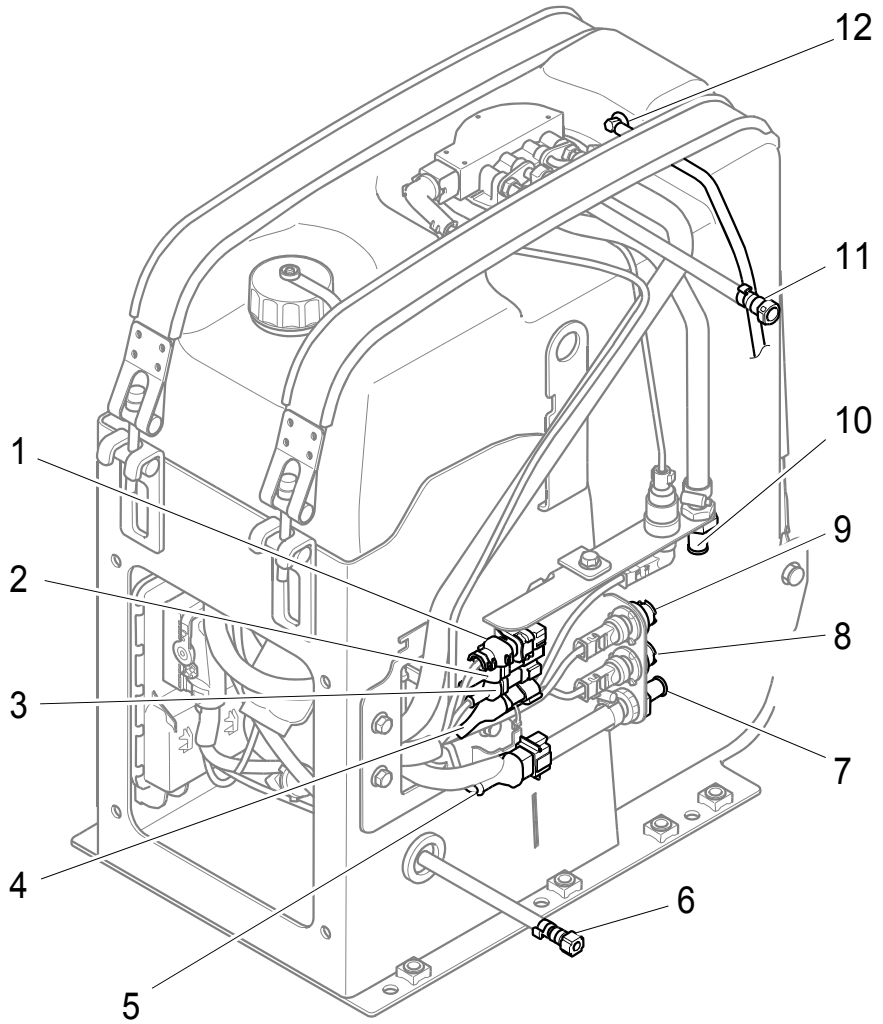


	Connection	Description
12.	Ventilation hose.	-

Connecting the 45 and 63 litre reductant tanks

The illustration shows a 63 litre tank, but the connection is the same on the 45 litre tank.

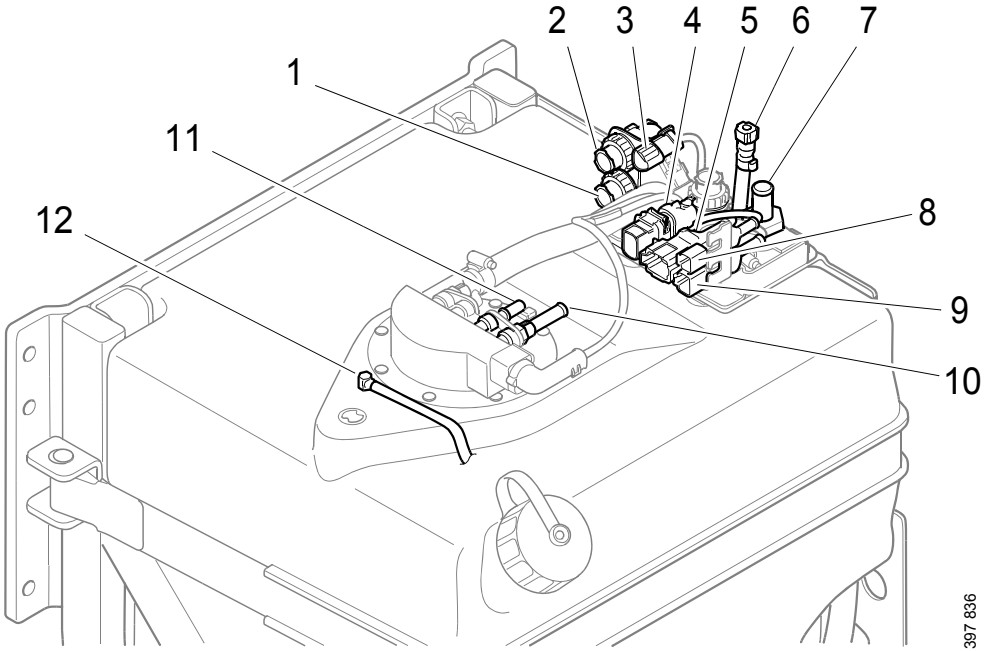
	Connection	Description
1.	C7	Voltage supply from the engine, CAN-connection.
2.	C4132	The exhaust gas temperature sensor upstream of the oxidation catalytic converter (T4012) and downstream of the oxidation catalytic converter (T4010). **Note: Only applies to Stage V.**
3.	C4012	Exhaust gas temperature sensor upstream of catalytic converter (T113).
4.	C4131	Differential pressure sensor (T141). **Note: Only applies to Stage V.**
5.	C316	Reductant doser (V117).
6.	Pressure hose for reductant to reductant doser	SAE J2044, Ø 6.30 mm.
7.	Coolant from engine	Union, Ø 16 mm
8.	C4051	NO_x sensor upstream of the catalytic converter (T131). **Note: Only applies to Stage IV/ Tier 4f and Stage V.**



	Connection	Description
9.	C4011	NO_x sensor downstream of catalytic converter (T115).
10.	Coolant return to engine	Union, Ø 16 mm
11.	Return hose for reductant to reductant tank	SAE J2044, Ø 7.89 mm.
12.	Ventilation hose.	-

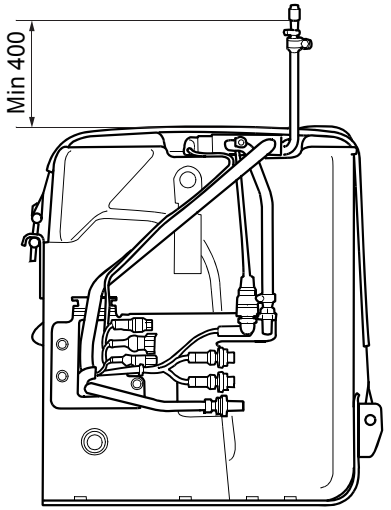
Connecting the 70 litre reductant tank

	Connection	Description
1.	C4011	NO_x sensor downstream of catalytic converter (T115).
2.	C4051	NO_x sensor upstream of the catalytic converter (T131). **Note: Only applies to Stage IV/ Tier 4f and Stage V.**
3.	C4131	Differential pressure sensor (T141). **Note: Only applies to Stage V.**
4.	C7	Voltage supply from the engine, CAN-connection.
5.	C316	Reductant doser (V117).
6.	Pressure hose for reductant to reductant doser	SAE J2044, Ø 6.30 mm.
7.	Coolant from the engine.	Union, Ø 16 mm
8.	C4012	Exhaust gas temperature sensor upstream of catalytic converter (T113).
7.	C4132	The exhaust gas temperature sensor upstream of the oxidation catalytic converter (T4012) and downstream of the oxidation catalytic converter (T4010). **Note: Only applies to Stage V.**
10.	Coolant return to engine	Union, Ø 16 mm
11.	Return hose for reductant to reductant tank	SAE J2044, Ø 7.89 mm.
12.	Ventilation hose	



Ventilation

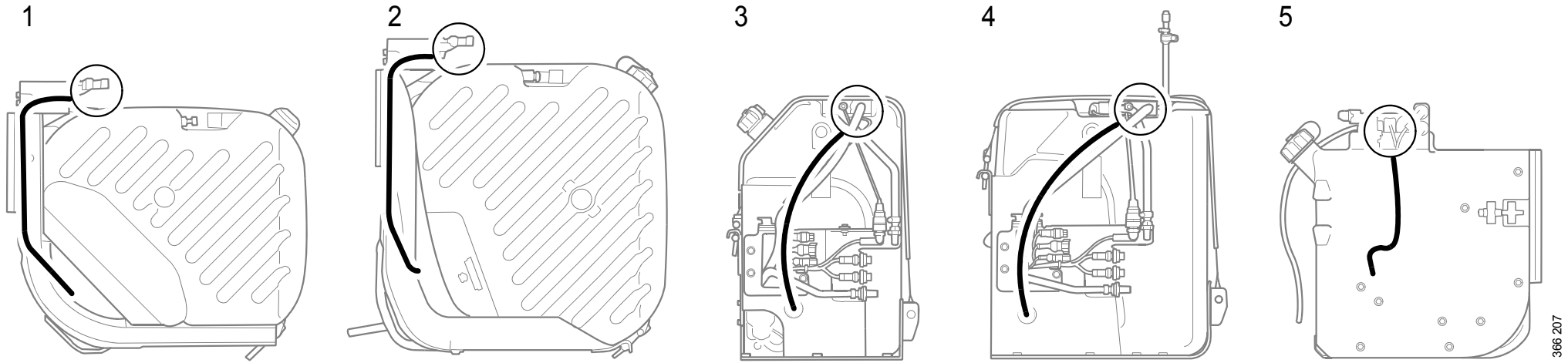
The reductant tank is supplied with a hose with ventilation filter. The filter must be positioned high enough that the reductant cannot come into contact with the filter. The filter should be positioned as high as possible, but at least 400 mm above the reductant tank. The filter should be positioned so that it is protected from rain.



353 441

Available lengths of reductant hoses

You can order reductant hoses with the total length 2.5 m, 4 m, 5 m or 6.5 m. Below you can see how much of the reductant hose length from the reductant pump is not available for installation. The value is the longest measurement which is unavailable, no matter whether it is a pressure hose or return hose.



Hose length which is unavailable for installation, between the reductant pump and the marking.

1. *38 litre tank: 0.8 m.*
2. *60 litre tank: 0.9 m.*
3. *45 litre tank: 0.7 m.*
4. *63 litre tank: 1.1 m.*
5. *70 litre tank: 0.8 m.*

Coolant connections on the engine

The illustrations show coolant connections on each engine type for heating the reductant tank.

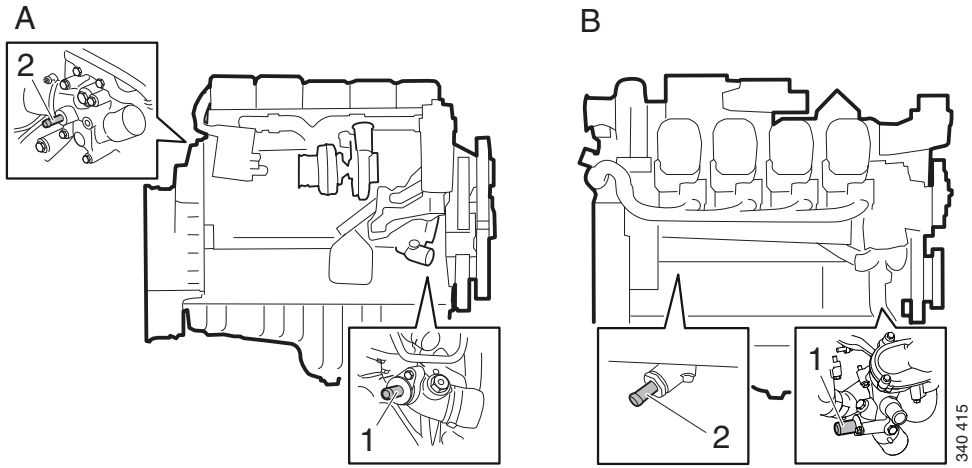
1. Return fluid to engine
2. Coolant from engine

Use a hose with an inside diameter of 16 mm for connection to the nipples.

The hose material should be resistant to refrigerant. The material must be type EPDM or similar, and must be able to withstand a working pressure of at least 3.5 bar.

Note:

To ensure sufficient flow, hoses must not have any sharp bends and there must be no spots where they are at risk of being pinched.



A. DC09 and DC13.
B. DC16.

Warnings and torque reduction for Stage V

The system warns via CAN messages in the following cases

- emission-related faults,
- faults in the exhaust gas aftertreatment system,
- low reductant level in the reductant tank,
- the particulate filter needs to be regenerated.

REQUIREMENT!

There must be visual warnings in the instrument panel indicating emission-related faults, faults in the exhaust gas aftertreatment system and low reductant level in the reductant tank.

Emission-related faults should be indicated using the warning lamp in accordance with ISO 7000 - 0640 (see illustration). For more information on connection, see the message *Malfunction Indicator* in section *DLN7* in *03:05 CAN interface*.

Warning lamp for emission-related faults.

There are no specific requirements for how other warnings should be displayed. However, Scania recommends that the warning lamps described on the following pages are used.

For all warnings, a fault code is generated via *DM1* which describes in detail the component affected by the fault and the type of fault.

Reaction at low reductant level

The system reacts to a low reductant level via the CAN message *DLN8*. For further information on connection, see *03:05 CAN interface*.

To indicate low reductant level, Scania recommends that the warning lamp according to ISO 7000 - 2946 is used in accordance with the strategy below.

Level	Warning lamp	Status DLN8	Torque and speed control
20%	Constant light	Low Urea Level	-
2.5%	Flashes slowly (½ Hz)	Fill Up Urea	Torque is reduced by 1% per minute to 75% of the highest torque.
0%	Flashes rapidly (2 Hz)	Urea Tank Empty	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.

340 445

Symbol for low reductant level.

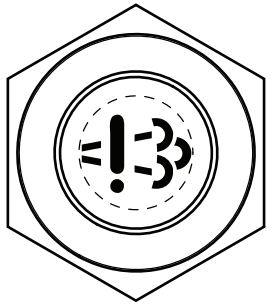
Reaction to faults in the exhaust gas aftertreatment system.

The system reacts to faults in the exhaust gas aftertreatment system via the CAN message *DLN8*. For further information on connection, see *03:05 CAN interface*.

To indicate faults in the exhaust gas aftertreatment system, Scania recommends that the warning lamp according to ISO 7000 - 2596 is used in accordance with the strategy below.

Status DLN8	**Time**	**Torque reduction**	**Time**	**Torque and speed control**
Urea Quality	After 10 hours	Torque is reduced by 1% per minute to 75% of the highest torque.	After 20 hours	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.
Dosing Error	After 10 hours		After 20 hours	
Monitor Failure	After 36 hours		After 100 hours	
Lamp: Constant light	Lamp: Flashes slowly (½ Hz)		Lamp: Flashes rapidly (2 Hz)	

Once the fault has been remedied and the engine control unit has received an indication that the SCR system is operating i.e. when the fault code has been acknowledged in SDP3, torque returns to the normal level.



340 423

Symbol for faults in the exhaust gas aftertreatment system.

Regeneration of the particulate filter

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

However, if the particulate filter becomes full, it must be regenerated manually. The engine cannot be used for approximately 45 minutes while manual regeneration is carried out. To indicate that the particulate filter is full and needs to be regenerated manually, the CAN message *DPFC1* is used. See *03:05 CAN interface*.

In order to indicate that the particulate filter needs to be regenerated manually, Scania recommends that the symbol for particulate filter regeneration according to ISO 7000 - 2433 is used.

Warning lamp	DPF Status	Description
Constant light	Lowest level	The particulate filter is starting to become full. Increase the load to improve automatic regeneration or regenerate the particulate filter manually.
Flashes slowly (½ Hz)	Moderate level	Carry out manual regeneration as soon as possible.
Flashes rapidly (2 Hz)	Highest level	The particulate filter is overfull. Manual regeneration can only be carried out using SDP3.

Other CAN messages related to the particulate filter are:

- *DLN2*: Shows current status for automatic and manual regeneration.
- *DLN8*: Shows remaining time for manual regeneration.
- *AT1S1*: Shows the level of soot and ash as a percentage.
- *ADC*: Acknowledgement for safe start of manual particulate filter regeneration.
- *CM1*: Starting and stopping manual particulate filter regeneration.

Symbol for particulate filter regeneration

Warnings and torque reduction for Stage IIIB/IV/Tier 4i/Tier 4f

The system provides a warning via warning lamps if there are SCR system faults or if the level of reductant in the reductant tank is too low.

REQUIREMENT!

Engines which are certified according to Tier 4 are required by law to have these warning lamps. They must be installed correctly in the vehicle or machine. The warning lamps can be ordered via Scania and also accompany the Scania EMS display. If the installer uses neither Scania warning lamps nor the Scania EMS display, then the lamps used must have the same functionality and symbols.

More information about connection is available in section *DLN8* in *03:05 CAN interface*.

Reaction at low reductant level

Reductant level	Warning lamp	Torque reduction[1]
20%	Constant light	
10%	Flashes slowly (½ Hz)	Torque is reduced by 1% per minute to 70% of the highest torque
0%	Flashes rapidly (2 Hz)	Torque is reduced to 0% (low idling) within 2-10 minutes

1. Applies only to engines that are certified according to Tier 4.

The engine resumes normal torque after reductant has been topped up so that the level in the reductant tank is at least 20%.

340 445

Symbol for low reductant level, ISO 7000 - 2596.

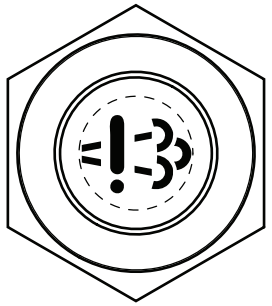
Reaction to fault in SCR system

Time	Warning lamp	Torque reduction[1]
Fault detected	Constant light	
After 30 minutes	Flashes slowly (½ Hz)	Torque is reduced by 1% per minute to 70% of the highest torque.
After 4 hours	Flashes rapidly (2 Hz)	Torque is reduced to 0% (low idling) within 2-10 minutes.

1. Applies only to engines that are certified according to Tier 4.

Once the fault has been remedied and the engine control unit has received an indication that the SCR system is operating i.e. when the fault code has been acknowledged in SDP3, torque returns to the normal level.

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



340 423

Symbol for fault in the exhaust gas aftertreatment system, ISO 7000 - 2596.

Periodic hydrocarbon evaporation for Stage IV/V/Tier 4f engines

Periodic hydrocarbon evaporation is a function that raises the engine speed temporarily in order to prevent an excessive accumulation of hydrocarbons (HC) in the SCR catalytic converter when exhaust gas temperatures are low.

The SCR catalytic converter accumulates hydrocarbons when the SCR system is cold, i.e. if the exhaust gas temperature falls below 200°C. If the vehicle has been idling for a long time and is then subjected to heavy loads, the temperature in the SCR catalytic converter may become excessive. The hydrocarbons will not have time to evaporate and may start burning, which can damage the SCR catalytic converter.

When the allowed amount of accumulated hydrocarbons has been reached, a warning is output indicating that the engine must be warmed up. If the engine is idling without load and the outdoor temperature is 20°C (68°F), the warning is output after approx. eight hours. The time is reduced as the outdoor temperature becomes colder.

The warning is sent as a CAN message. More information about connection is available in sections *ADC (Aftertreatment Desorption Control)* and *ADS (Aftertreatment Desorption Status)* in *03:05 CAN interface*.

Periodic hydrocarbon evaporation can be selected with two different settings:

- Only warning.
- Warning and engine shutdown. Scania recommends that this setting is used for unmanned applications.

If the engine is started again after an engine shutdown due to accumulated hydrocarbons, and is idling without load, the engine is switched off again after five minutes.

The measures during periodic hydrocarbon evaporation are different depending on whether the engine is equipped with an exhaust brake or not.

Engines without exhaust brake

If the engine is not equipped with an exhaust brake, the following occurs:

1. A warning indicating that the engine should be warmed up is sent via CAN from the control unit to the coordinator.
2. If the engine is not warmed up and has been configured with engine shutdown, the engine is switched off.

Engines with exhaust brake

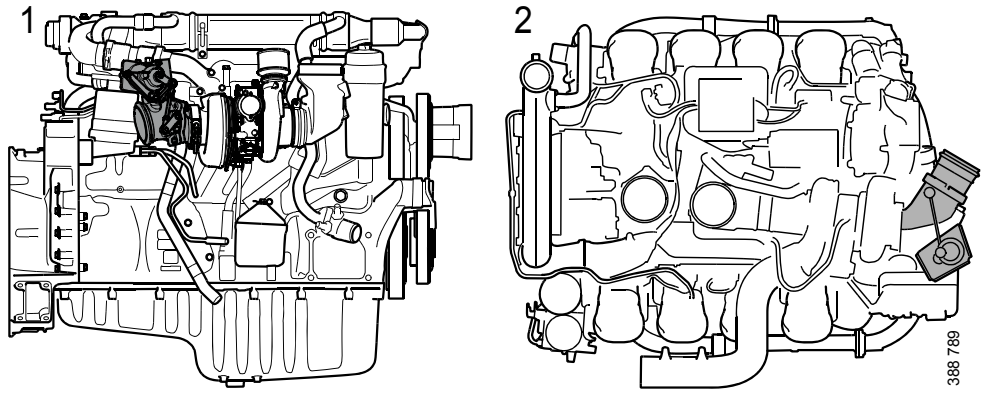
1. DC09 and DC13.
2. DC16.

If the engine is equipped with an exhaust brake, the following occurs:

1. A warning indicating that the engine should be warmed up is sent via CAN from the control unit to the coordinator.
2. A request for activation of periodic hydrocarbon evaporation, i.e. automatic increase of the engine speed, is sent via CAN from the control unit to the coordinator.
   - The function is activated if a confirmation for allowed activation of the function is sent via CAN from the coordinator to the control unit. The engine speed is raised and the exhaust gas temperature increases so that hydrocarbons are evaporated. The raised engine speed is active for a maximum of 45 minutes. The function is interrupted when the throttle is actuated or if the engine is under load.
   - If the activation request for the function is not confirmed, and the engine has been configured with engine shutdown, the engine is switched off.

Conditions for when automatic hydrocarbon evaporation activation is allowed are specified by the fitter. Below are some examples of conditions:

- Gearbox in neutral position to prevent the vehicle from moving.
- There are no active bodywork systems or power take-offs.
- Controlled environment.



Location of the exhaust brake.
1. DC09 and DC13.
2. DC16.

Important data

Highest permitted reductant temperature	55°C
Maximum permitted ambient temperature at the SCR unit, evaporator or hydrolysis catalytic converter	115°C
Maximum permitted ambient temperature at the NO_x sensor control units	90°C