EBERSPACHER HYDRONIC S3 D4E CS INSTALLATION MANUAL

The technical description and installation instructions are valid for these engine-independent water heaters:

Heaters for petrol	**Order No.**	**→ 05/2020**	**05/2020 →**
B 4 E – 12 V CS		20.2007.05.0000	20.2050.05.0000
B 5 E – 12 V CS		20.2008.05.0000	20.2051.05.0000
Heaters for diesel			
D 4 E – 12 V CS		25.2933.05.0000	25.2992.05.0000
D 5 E – 12 V CS		25.2934.05.0000	25.2993.05.0000
Heaters for diesel			
with inlet pressure resistant metering pump			
D 4 E – 12 V CS VDP		25.2943.05.0000	25.2995.05.0000
D 5 E – 12 V CS VDP		25.2942.05.0000	25.2994.05.0000

Official Eberspacher technical documentation for the Hydronic S3 D4E CS. Includes complete installation instructions, water circuit diagrams with thermostat integration, and technical specifications for the Commercial (Standard) water heater.

A WORLD OF COMFORT

Eberspächer

3 Installation

3.1 Heater installation positions

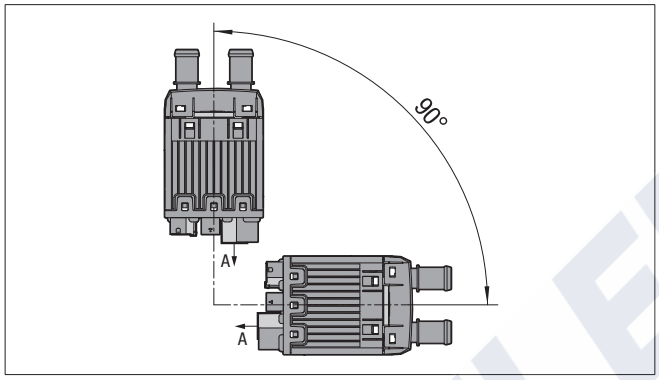
Install the heater preferably in the normal position. Depending on the installation conditions, the heater can be installed within the allowable swivel ranges.

Note

In heating mode, the normal and maximum installation positions shown can differ by up to +15° in all directions for a short time. These differences, caused by tilted positions of the vehicle, do not have any negative effects on the heater's function.

3.1.1 Installation position – heater upright / on its side

Allowable: The normal position (upright) with swivel range up to the horizontal installation position. All installation positions between 0° and 90° are permitted, see Picture 1.



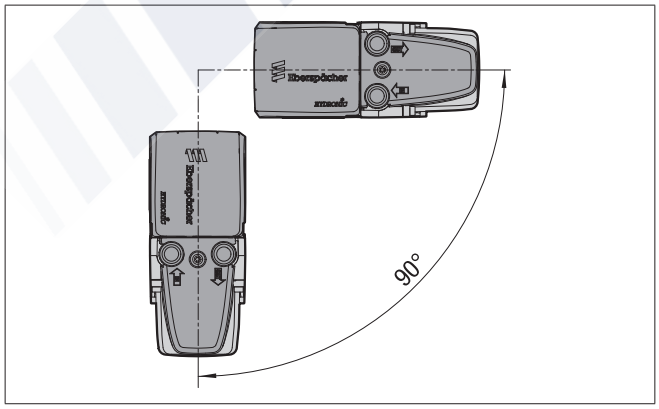
Picture 1

Note

In case of deviations from the normal position, **always** position the exhaust connection (A) of the heater at the bottom.

3.1.2 Installation position – heater horizontal / vertical

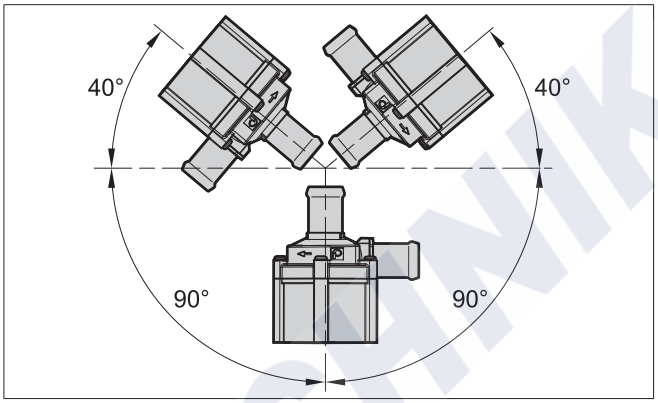
Allowable: Horizontal installation position with swivel range up into the vertical installation position. All installation positions between 0° and 90° are permitted, see Picture 2.



Picture 2

3.2 Water pump installation position

Depending on the installation conditions, the water pump can be installed within the allowable swivel ranges, see Picture 3.



Picture 3

Note

- The water pump is not self-priming. The water inlet must therefore be arranged so that it is always completely filled with coolant liquid.
- Installation of the water pump with the pump head facing downwards is not allowed.
- Do not mount the water pump at the lowest point of the coolant liquid circuit, as otherwise the particles in the coolant liquid circuit settle in the water pump.

3.3 Installation location

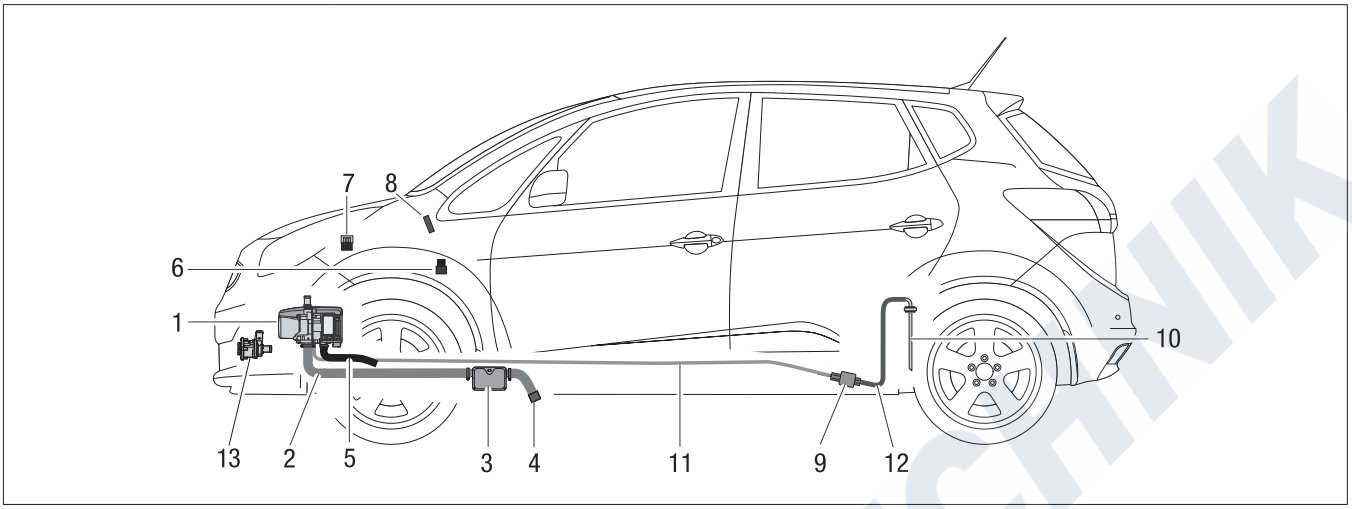
The heater and the water pump are installed in the engine compartment.

The heater and the water pump must be mounted below the minimum allowable coolant liquid level (header tank, radiator, vehicle's heat exchanger) so that the heat exchanger of the heater and the water pump can vent automatically.

Note

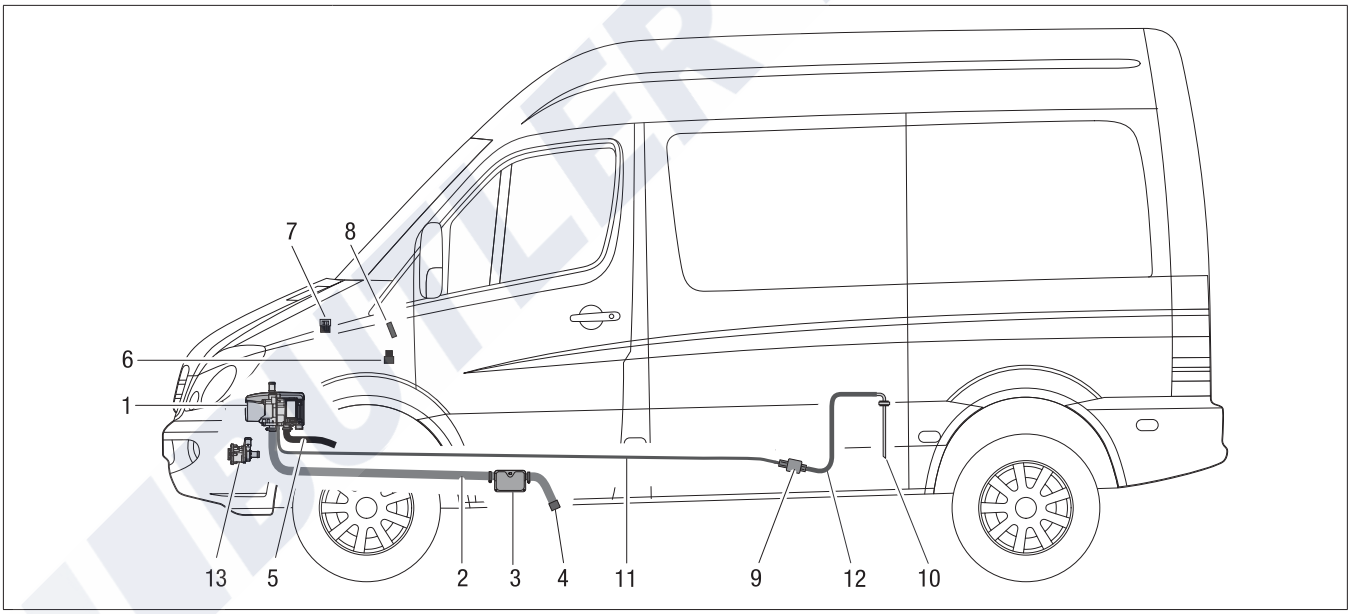
- In a truck the water heater is preferably fixed onto the chassis beam underneath the driver's cab in the area of the vehicle's engine.
- Note and follow the relevant regulations and safety instructions from page 15.
- The installation suggestions made in the installation instructions are examples. Other installation locations are acceptable if they comply with the installation requirements stated in these installation instructions.
- Note the operating and storage temperatures.
- Further installation information (e.g. for boats and ships) is available from the manufacturer on request.
- Ensure adequate distance from hot vehicle parts.

3.3.1 Installation example: Petrol heater in a car



1	Heater	5	Combustion air hose	8	Control unit	11	Pressure line
2	Exhaust pipe	6	Fan relay	9	Metering pump	12	Intake line
3	Exhaust silencer	7	Fuse bracket	10	Tank connection	13	Water pump
4	Exhaust pipe end						

3.3.2 Installation example: Diesel heater in a transporter (van)



1	Heater	5	Combustion air hose	8	Control unit	11	Pressure line
2	Exhaust pipe	6	Fan relay	9	Metering pump	12	Intake line
3	Exhaust silencer	7	Fuse bracket	10	Tank connection	13	Water pump
4	Exhaust pipe end						

3.4 Mounting the heater

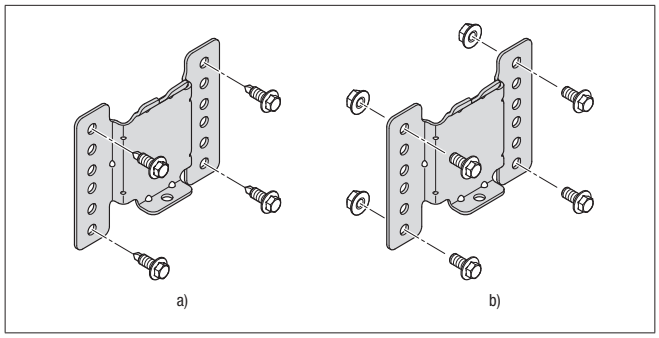
Use the bracket included in the installation kit to fix the heater in a suitable position on the vehicle.

3.4.1 Installation steps

- Use 4 hexagon screws M6 x 12 and 4 hexagon nuts M6 or 4 self-tapping screws 6.3 x 19 to fix the bracket (tightening torque: 9+1 Nm), see Picture 4.

Note

Mounting using self-tapping screws requires the fixing bracket to have sheet metal thickness 2 – 6 mm.



Picture 4

a) Mounting using 4 self-tapping screws 6.3 x 19
b) Mounting with 4 hexagon screws M6 x 12 and 4 hexagon nuts M6

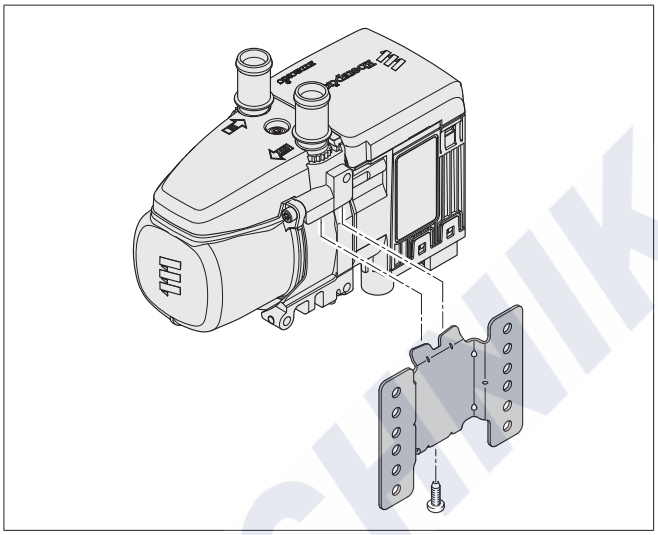
Note

Preferably use the top and bottom fixing holes, see Picture 4. If using the other holes, ensure a minimum distance between the fastening screws.

- Insert the heater in the bracket and use screw M6 x 16, SW T30 to fix onto the bracket (tightening torque: 10+1 Nm), see Picture 5.

Note

- A thread-forming screw is used to fix the heater onto the standard bracket. It is not necessary to pre-cut a thread. The thread is formed by the screw on screwing it into the tapping hole.
- When installing in the vehicle, always ensure that after fixing the heater, adjacent components do apply any force on the heater, neither under static nor under dynamic loading. Ideally, after installation a distance from adjacent components in the vehicle remains.



Picture 5

3.4.2 Mounting instructions for thread-forming screws

- Position screw by hand and screw in.
  – Always keep to the given tightening torque.
- When screwing for the second time also position by hand and do not cut a new thread.
- The thread-forming screw is suitable for max. 6 installation attempts.
- In case of repair (removal of heater) a metric screw (M6 x 16) can be used as an alternative.

Note

If using a vehicle-specific bracket, note and follow the points below:

- Use the additional enclosed thread-forming screws – tightening torque: 10^{+1} Nm)
- When fixing, ensure that no forces are exerted on adjacent components, especially not on the plastic cover of the blower/ control box.

3.5 Mounting the water pump

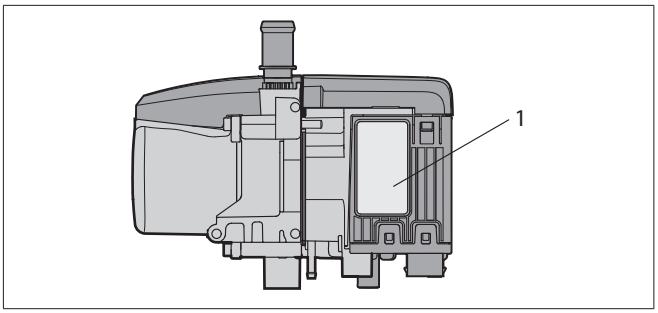
Use the water pump bracket included in the installation kit to fix the water pump in a suitable position on the vehicle. Then insert the water pump in the rubber element and press in until the water pump has latched into position.

Note

Use the hose and spring band clamps to connect the water pump to the water sockets of the heater. Clamping range 26 – 28 mm. If using the vehicle's own hose, check the diameter of the hose before installing.

3.6 Fix the nameplate

The nameplate (1) is fastened to the side of the heater. The second nameplate (duplicate) is enclosed with the heater and must be glued on in a clearly visible position in the vehicle, see Picture 6.



Picture 6

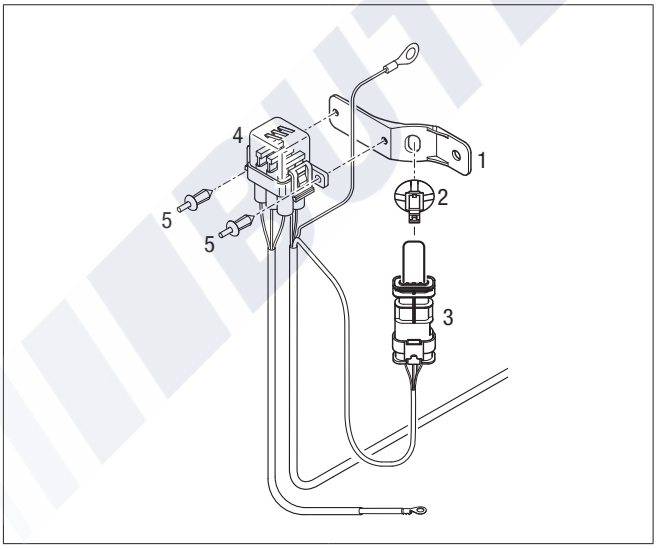
1 Nameplate

Note

Follow the regulations on page 8.

3.7 Fix the fuse holder and diagnostics connector

- Use screw M6 to fix the combination bracket (1) in a suitable, easily accessed position in the engine compartment of fix on a stud bolt.
- Clip the diagnostics connector holder (2) into the elongated hole of the plastic bottle, see Picture 7
- Push the diagnostics connector (3) into the bracket retainer until it audibly latches into position.
- Use 2 split rivets (5) to fix the fuse holder (4). To do this, press in both bolts until the holder sits securely on the plastic bottle.

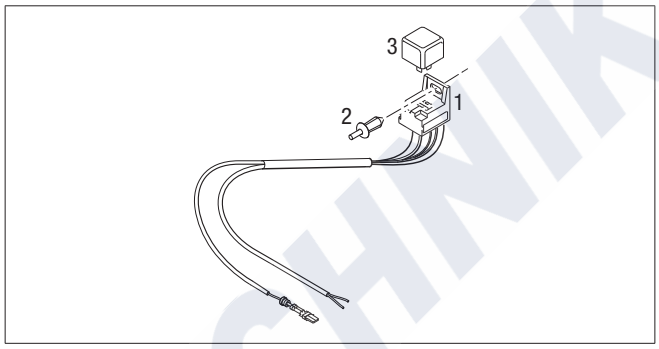


Picture 7

1 Combined bracket
2 Retainer clip
3 Diagnostics connector
4 Fuse bracket
5 Split rivet

3.8 Fixing the fan relay block

- Use cable tape or split rivet (2) to fix the fan relay block (1) in a suitable accessible place. To do this, press in the bolt of the split rivet 5.5 x 12, until the relay block sits securely, see Picture 8.
- Place the cover (3) on the relay block.



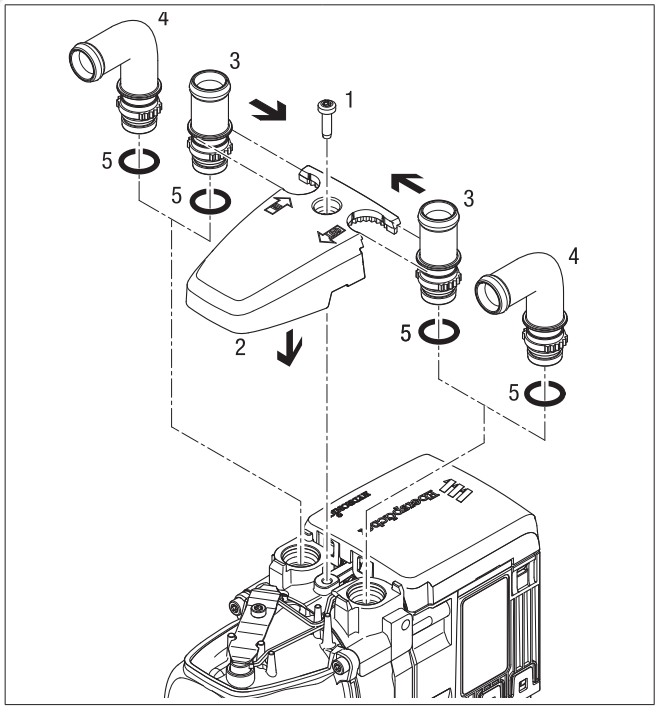
Picture 8

1 Fan relay block
2 Split rivet
3 Relay block cover

3.9 Mounting the water socket

- Heater scope of supply: two straight water sockets
- Installation kit scope of supply: two angled water sockets

Depending on the installation conditions, mount the straight water connection sockets (3) or the angled water connection sockets (4) together with the sensor cover, see Picture 9.



Picture 9

1 Screw M5 x 18
2 Sensor cover
3 Connection socket, straight
4 Connection socket, angled
5 O-ring

3.9.1 Installation steps

- Insert the O-rings (5) in the groove of the socket.
- Insert connection sockets (3 or 4) in the recesses of the sensor cover (2). The collar of the support is above the cover.
- Position the connection socket with teething in the sensor cover.
- Place the sensor cover with positioned socket on the heater.
- Push the connection socket completely into the connection holes in the heat exchanger.
- Adjust the direction for the angled connection sockets:
- Lift the sensor cover up to the collar of the connection sockets
- Turn connection socket in the required direction
- Push sensor cover downwards and adjust the connection socket position until the teething intermesh once again
- Use screw M5 x 18 to fix the sensor cover (tightening torque 6.5+0.5 Nm).

Note

A thread-forming screw is used to fix the sensor cover. It is not necessary to pre-cut a thread. The thread is formed by the screw on screwing it into the tapping hole.

3.9.2 Installation instructions

- Position screw by hand and screw in.
  – Always keep to the given tightening torque.
- When screwing for the second time also position by hand, do not cut a new thread.
- The screw is suitable for max. 6 installation attempts.
- In case of repair (removal of heater) a metric screw (M5 x 18) can be used as an alternative.

3.10 Connection to the coolant liquid circuit

Warning!

Risk of injury, scalding and burns

The high temperatures of the coolant liquid and the coolant liquid circuit components can cause injuries, scalds and burns.

→ Before working on the coolant liquid circuit, wait until all components have cooled, wear safety gloves if necessary.

→ Lay and fix parts carrying coolant liquid in such a way that they pose no temperature risk to man, animals or material sensitive to temperature due to radiation / direct contact.

The heater is integrated in the coolant liquid circuit in the water flow hose from the vehicle engine to the heat exchanger. There are various installation options for this. These are described from page 20.

Note

- When installing the heater, note the flow direction of the coolant liquid in the circuit.
- Fill the heater and water hose with coolant liquid before connecting to the coolant liquid circuit.
- Lay the water hoses without any kinks, and as far as possible in a rising position.
- When laying the water hoses, maintain sufficient distance from hot vehicle parts and sharp edges.
- Protect all water hoses / water pipes from chafing and from extreme temperatures.
- Connection of the water pump to the water socket of the heater: Use enclosed hose and spring band clamps. Clamping range 26 – 28 mm. For direct connection of the vehicle's own water hose to the water pump or water socket: Check the diameter and use screw clamps if necessary
- Use screw clamps to secure other hose connections (Tightening torque: $3^{+0.5}$ Nm).
- After the vehicle has been operating for 2 hours or travelled 100 km, retighten the screw clamps.
- The minimum water flow rate is ensured if, at cooling water temperature > 60 °C, the temperature difference in the heating medium between the water inlet and water outlet does not exceed 10 K.
- Only overpressure valves with an opening pressure of min. 0.4 – max. 2 bar may be used in the coolant liquid circuit.
- The coolant liquid circuit must contain at least 10 % antifreeze all year round as corrosion protection.
- During cold periods the coolant liquid circuit must contain sufficient antifreeze. Follow the vehicle manufacturer's instructions regarding the mix ratio.
- Before initial commissioning of the heater or after changing the coolant liquid, the entire coolant liquid circuit including heater must be vented free of bubbles according to the instructions issued by the vehicle manufacturer.
- Only use the anti-freeze approved by the vehicle manufacturer in the allowable mix ratio (anti-freeze / water).
- Fix water hoses / water pipes securely to prevent damage and / or odour emissions due to vibrations.
  Recommendation: Fix outgoing water hoses / water pipes from the heater at a distance of approx. 20 cm using hose clips, pipe clips or cable ties.

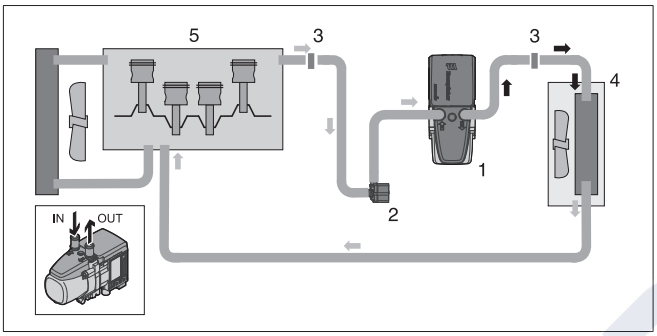
3.10.1 Coolant liquid circuit “inline integration”

- Cut the water flow hose from the vehicle engine to the vehicle's heat exchanger.
- Use connectors and water hoses to connect the heater and the water pump to the water flow hose.
- Lay a water hose from the discharge end of the water pump to the water inlet socket of the heater and connect.

Heating characteristics

If the heater is switched on, the heat is initially fed via the heater's own heat exchanger to the vehicle's engine only.

If the coolant liquid temperature has reached approx. 30 °C, the vehicle fan starts and the heat is also routed to the passenger compartment, see Picture 10.



Picture 10

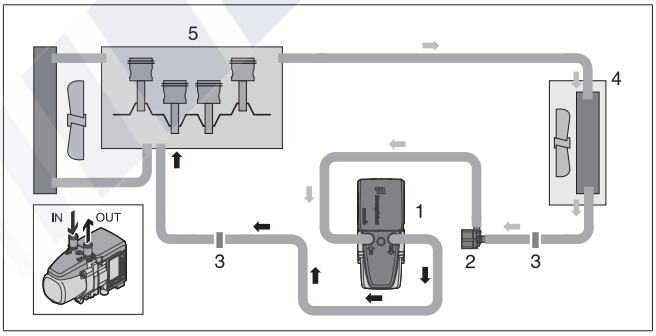
1	Heater	4	Heat exchanger
2	Water pump	5	Vehicle engine
3	Connector		

3.10.2 Coolant liquid circuit “inline – engine preheating only”

- Disconnect the water return hose from the heat exchanger to the vehicle engine.
- Use connectors and water hoses to connect the heater and the water pump.

Heating characteristics

For engine pre-heating only, set the temperature controller to “cold” and switch off the fan. There is thus no heat discharge into the interior of the vehicle, see Picture 11.



Picture 11

1	Heater	4	Heat exchanger
2	Water pump	5	Vehicle engine
3	Connector		

3.10.3 Cooling liquid circuit with non-return valve and thermostat

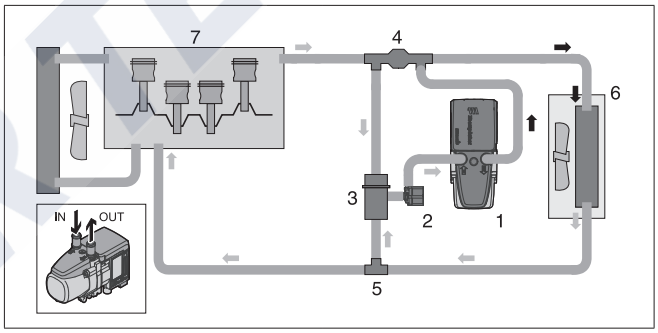
- Cut the water flow hose from the vehicle engine to the vehicle's heat exchanger and insert the non-return valve.
- Cut the water return hose from the vehicle's heat exchanger to the vehicle engine and insert the T-piece.
- Use water hoses to connect the heater and water pump to the thermostat, the non-return valve and T-piece – as shown in the sketch.

Heating characteristics – small cooling water circuit

Up to a cooling water temperature of approx. 70 °C, the heater's heat is fed first to the vehicle's heat exchanger only – fast heating of the inside of the vehicle, see Picture 12.

Heating characteristics – large cooling water circuit

If the cooling water temperature continues to rise, the thermostat slowly switches over to the large circuit (full switchover is reached at approx. 75 °C) – heating of the inside of the vehicle and additional engine pre-heating, see Picture 12.



Picture 12

1	Heater	5	T-piece
2	Water pump	6	Heat exchanger
3	Thermostat	7	Vehicle engine
4	Non-return valve		

Note

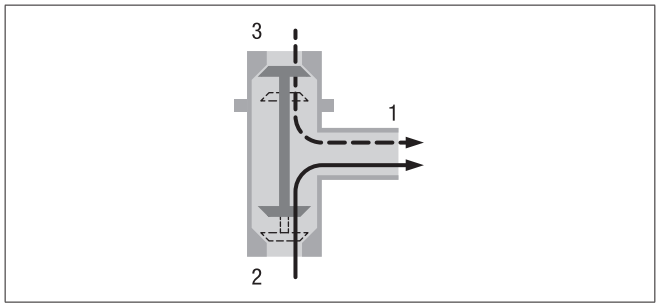
The thermostat, non-return valve and T-piece must be ordered separately, please refer to the “Product information” document for the Order No.

Thermostat function

- Coolant liquid water temperature < 70 °C – small cooling water circuit:
  - Socket 1 – open (to the heater)
  - Socket 2 – open (to the T-piece)
  - Socket 3 – closed (to the non-return valve)
- Coolant liquid water temperature > 75 °C – large cooling water circuit:
  - Socket 1 – open (to the heater)
  - Socket 2 – closed (to the T-piece)
  - Socket 3 – open (to the non-return valve)

Note

Use the connections Item (1), (2) and (3) to integrate the thermostat into the cooling liquid circuit, see Picture 13.



Picture 13

1 Connection socket to the heater
2 Connection socket to the T-piece
3 Connection socket to the non-return valve

3.10.4 Coolant liquid circuit with combination valve

Using the combination valve with 5 connections

If the water flow line and water return line from the vehicle engine to the vehicle's heat exchanger are laid separately in the engine compartment, the combination valve with 5 connections and an additional T-piece must be used.

Using the combination valve with 6 connections

If the water flow line and water return line from the vehicle engine to the vehicle's heat exchanger are laid in parallel in the engine compartment, the combination valve with 6 connections (without T-piece) must be used.

Heating characteristic in pre-heater mode – small cooling water circuit

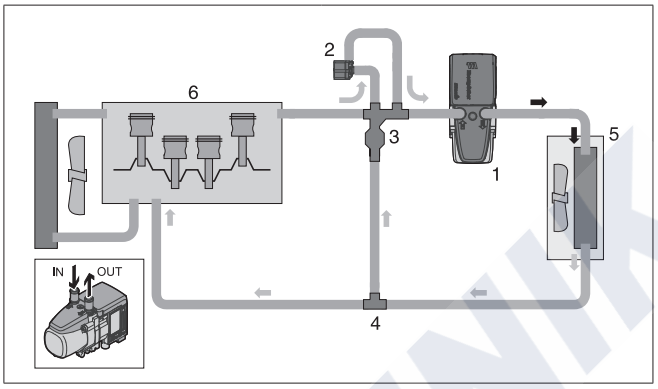
- Up to a cooling water temperature of approx. 67 °C, the heater's heat is fed first to the vehicle's heat exchanger only – fast heating of the inside of the vehicle.
- From a cooling water temperature of approx. 67 °C, part of the heater's heat is passed to the vehicle's engine. This causes additional engine pre-heating, without rapid cooling of the “small cooling water circuit” for interior heating.

Heating characteristic in auxiliary heater mode – large cooling water circuit

While the vehicle's engine is running the heat is distributed between the vehicle's heat exchanger and the vehicle engine – further shortening of the heating up phase and heating of the inside of the vehicle, see Picture 14.

Install combination valve with 5 connections

- Cut the water flow hose from the vehicle engine to the vehicle's heat exchanger and insert the combination valve.
- Cut the water return hose from the vehicle's heat exchanger to the vehicle engine and insert the T-piece.
- Use water hoses to connect the heater and water pump to the combination valve and T-piece (as shown in the sketch).

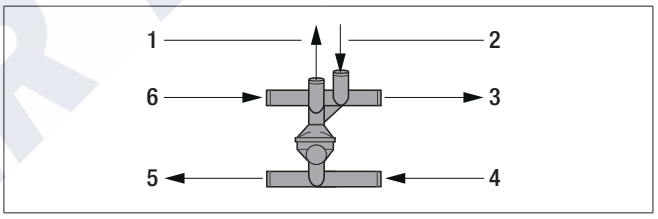


Picture 14

1 Heater
2 Water pump
3 combination valve (5 connections)
4 T-piece
5 Vehicle heat exchanger
6 Vehicle engine

Install combination valve with 6 connections

- Cut the water flow hose and the water return hose from the vehicle engine to the vehicle's heat exchanger and insert the combination valve.
- Use water hoses to connect the heater and water pump to the combination valve, see Picture 15.



Picture 15

1 To the water pump
2 From the water pump
3 To the heater
4 From the vehicle's heat exchanger
5 To the vehicle engine
6 From the vehicle engine

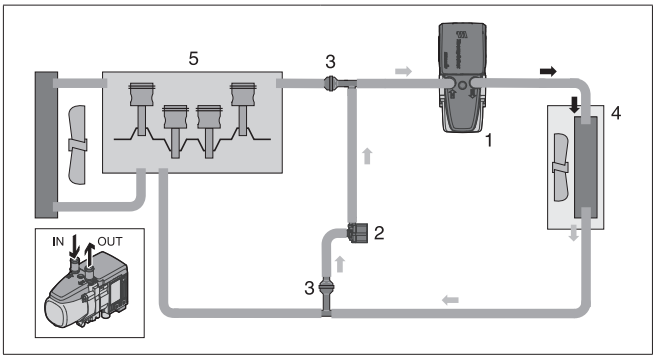
Coolant liquid with 2 non-return valves

- Preheat the vehicle interior only (vehicle engine uncoupled)
- Cut the water flow hose and the water return hose from the vehicle engine to the vehicle's heat exchanger and insert one non-return valve in each.
- Insert the heater between the non-return valve and the vehicle's heat exchanger in the water flow hose.

Use water hoses to connect the water pump to the non-return valves.

Heating characteristics

If the heater is switched on, the heat is only fed to the vehicle's own heat exchanger. If the coolant liquid temperature has reached approx. 30 °C, the vehicle fan starts and the heat is routed to the passenger compartment, see Picture 16.



Picture 16

1 Heater
2 Water pump
3 T-piece with non-return valve
4 Vehicle heat exchanger
5 Vehicle engine

3.11 Exhaust system

Danger!

Risk of injuries and burns!

During combustion, high temperatures and toxic exhaust fumes are produced. This is why the exhaust system must always be routed as described in these installation instructions.

→ Do not perform any work on the exhaust system while the heater is working.

→ Before working on the exhaust system, switch off the heater first and wait until all the parts have completely cooled down, wear safety gloves if necessary.

→ Do not inhale exhaust fumes.

Warning!

Risk of burns!

The entire exhaust system is very hot while the heater is running and immediately afterwards. This is why the exhaust system must always be routed as described in these installation instructions.

→ The exhaust pipe must end in the open air.

→ The exhaust pipe may not protrude beyond the lateral limits of the vehicle.

→ Lay the exhaust pipe sloping slightly downwards. If applicable, attach a drain hole for condensate discharge at the lowest point (Ø approx. 5 mm).

→ Important functional parts of the vehicle may not be impaired (maintain sufficient clearance).

→ Mount the exhaust pipe with sufficient clearance to heat-sensitive parts. Pay particular attention to fuel lines (made of plastic or metal), electrical cables and brake hoses, etc!

→ Exhaust pipes must be securely fixed (Recommendation: at distance of approx. 50 cm) to avoid damage due to vibrations.

→ Do not lay exhaust pipes in the vehicle interior or route them through the vehicle interior.

→ The exhaust outlet mouth must end at a minimum height of 20 cm above the floor. Particular caution is required during installation in areas where readily flammable materials could exist in the area of the exhaust outlet mouth during heater operation, e.g. in forestry machines above dry grass, leaves or similar.

→ Lay the exhaust system so
– that outflowing exhaust gases cannot be drawn into the fresh air intake of the vehicle or heater.
– that outflowing exhaust gases cannot be drawn in as combustion air.

→ The mouth of the exhaust pipe must not become clogged with dirt and snow. In particular for machines and trucks in the construction sector and agricultural machines, ensure that dust, sand or similar cannot penetrate the exhaust system or the mouth of the exhaust pipe. In case of marine applications, ensure that water cannot penetrate the exhaust system or the mouth of the exhaust pipe.

→ Do not mount the mouth of the exhaust pipe in the direction of travel.

→ Always fix the exhaust silencer to the vehicle.

→ Lay the exhaust system so that the exhaust fumes do not flow directly onto heat-sensitive components.

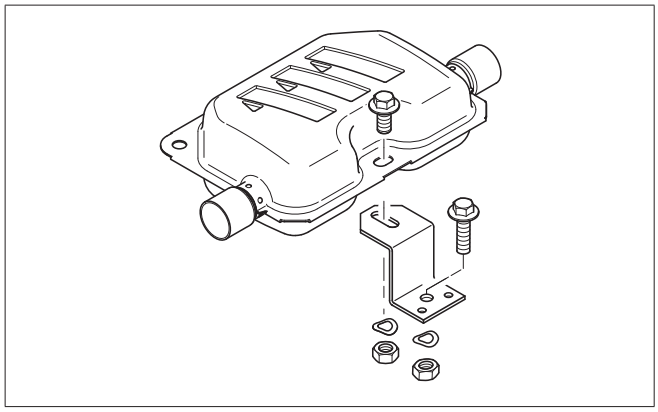
Note

- Follow the regulations and safety instructions for this chapter from page 8.
- The exhaust pipe end should be much shorter than the flexible exhaust pipe from the heater to the exhaust silencer.
- To avoid contact corrosion, the clips for fixing the exhaust pipe must be made of stainless steel. For the Order No. of the fixing clips, refer to the “Product Information” document.

The exhaust system consists of a flexible exhaust pipe (di 24 mm), 900 mm long, a flexible exhaust end pipe with end sleeve (di 24 mm), 300 mm long and an exhaust silencer. All parts for the exhaust system including the fixing parts are included in the installation kit (for allowable line lengths, see sketch on page 24).

3.11.1 Installing the exhaust system

- Use a bracket to fix the exhaust silencer onto a suitable place on the vehicle, see Picture 17.
- Lay the flexible exhaust pipe from the heater to the exhaust silencer and fasten with pipe clips (tightening torque: 6+0.5 Nm), adjust the length if necessary.
- If necessary, shorten the exhaust end pipe with end sleeve, push onto the exhaust silencer and fix with a pipe clip (tightening torque: 6+0.5 Nm).
- If necessary, use pipe clips to fasten the flexible exhaust pipe and the exhaust end pipe in suitable positions in the vehicle (Recommendation: at approx. 50 cm spacings).
- If necessary attach spacer rings on the flexible exhaust pipe and onto the exhaust pipe end, to ensure a safe distance from heat-sensitive parts of the vehicle. If applicable, use additional exhaust pipe insulation (see product information).



Picture 17

3.12 Combustion air system

Note

Instructions for the combustion air system

- The combustion air opening must remain free at all times.
- Lay the combustion air inlet so
  - that exhaust gases cannot be drawn in as combustion air.
  - that fuel fumes that may occur cannot be drawn into the fresh air intake of the vehicle or heater.
- Do not direct the combustion air intake against the vehicle's air stream.
- The combustion air inlet must not become clogged with dirt and snow. In particular for machines and trucks in the construction sector and agricultural machines, ensure that dust, sand or similar cannot penetrate the combustion air system or inlet. In case of marine applications, ensure that water cannot penetrate the combustion air system or inlet.
- Lay the combustion air system sloping slightly downwards. If necessary, make a drain hole of approx. Ø 5 mm at the lowest point to drain off condensation.
- If necessary, use fastening clips or cable ties to fix the flexible combustion air hose to the vehicle in suitable places.

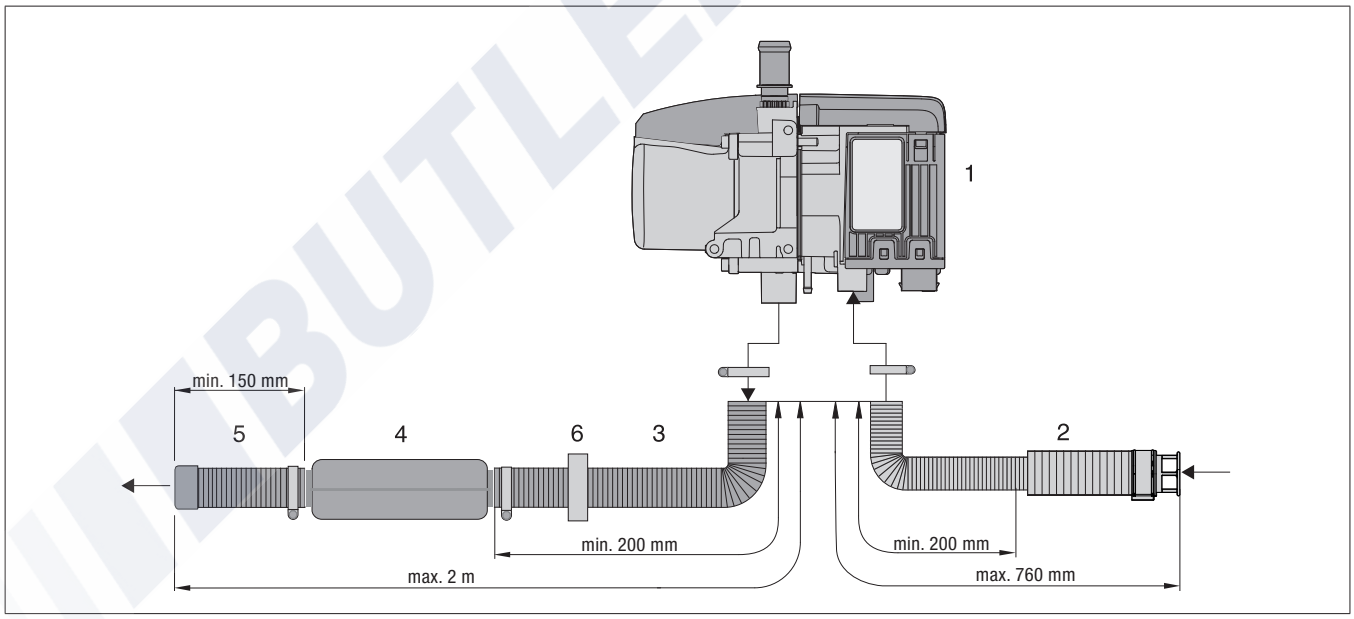
3.12.1 Mounting the combustion air system

A combustion air intake silencer with a flexible pipe (di 20 mm), 760 mm long, is included in the installation kit.

- Push the flexible pipe from the combustion air intake silencer onto the combustion air connection socket of the heater and fix with a screw clamp (tightening torque $3^{+0.5}$ Nm), see Picture 18.
- If necessary, shorten the flexible pipe from the combustion air intake silencer according to the installation conditions. Ensure a clean cut edge. Small cut-offs could block the combustion air fan.

Note

Note and follow the regulations and safety instructions for this chapter from page 8.



Picture 18

1 Heater
2 Combustion air intake silencer
3 Flexible exhaust pipe
4 Exhaust silencer
5 Exhaust pipe end with end sleeve
6 Spacer ring

3.13 Fuel supply

Danger!

Risk of fire, explosion, poisoning and injury!

Caution when handling fuel.

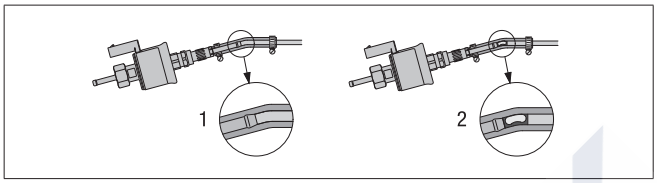
- → Switch off the vehicle engine and the heater before refuelling and before working on the fuel supply.
- → No naked flames.
- → Do not smoke.
- → Do not inhale petrol fumes.
- → Avoid any contact with the skin.

3.13.1 Installing the metering pump

Caution!

Always note and follow these safety instructions when installing the metering pump and when laying the fuel lines. Deviations from the instructions are not allowed. Failure to comply can result in malfunctions.

- → To install the fuel hose at the heater, moisten it and push it carefully onto the fuel connection socket.
- → Cut the fuel hoses and pipes to length at right-angles and burr-free. The cut places must not be pressed in.
- → Wherever possible, lay the fuel lines from the metering pump to the heater with a continuous rise.
- → Fix fuel lines securely to avoid damage and / or noise due to vibrations (Recommendation: fixing points at spacing of approx. 50 cm). Especially in electric vehicles, fix the fuel lines so that sound transfer to the vehicle is prevented.
- → Protect the fuel lines against mechanical damage.
- → Lay the fuel lines so that any twisting of the vehicle, engine movements, etc. do not have a disadvantageous effect on their durability.
- → Do not lay fuel lines in the vehicle interior or route them through the vehicle interior.
- → Parts carrying fuel must be protected from interfering heat.
- → Use screw clamps to secure all hose connections of the fuel supply.
- → Protect parts carrying fuel from interfering heat.
- → Never route or fasten the fuel lines along the exhaust systems of the heater or vehicle engine.
- → Where fuel lines cross the exhaust system, always ensure sufficient thermal clearance, if necessary attach heat deflection plates.
- → Dripping or evaporating fuel must never be allowed to collect on hot parts or ignite on electric equipment.
- → When connecting fuel lines to a fuel hose, always install the fuel lines with a butt joint to prevent any bubbles from forming, see Picture 19.



Picture 19

1 correctly laid lines

2 incorrectly laid lines – bubbles form

Caution!

Safety instructions for fuel lines and fuel tanks in buses and coaches!

- → Fuel lines and fuel tanks must not be located in the passenger compartment or driver's cab.
- → Mount the fuel tank in the vehicle so that the normal passenger exits and emergency exits are not at risk in the event of a fire.

Note

- The installation kit contains all parts required for the fuel supply.
- Follow the regulations and safety instructions for this chapter from page 8.
- Sound insulation and abrasion protection: Sponge rubber hose for fuel lines available separately as an accessory (see product information).

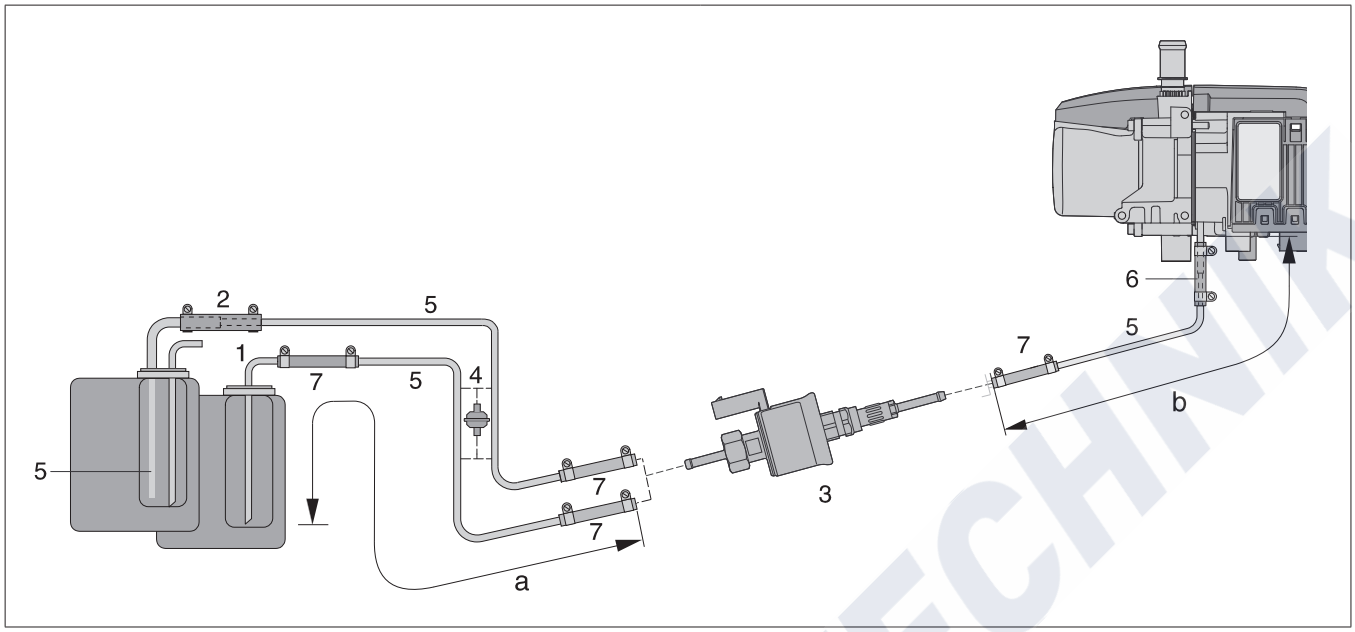
3.13.2 Preferred fuel extraction with tank connector or adapter (diesel, petrol)

Caution!

Fuel supply safety instructions!

The fuel must not be conveyed by means of gravity or overpressure in the fuel tank.

- → The fuel may only be pumped by the metering pump included in the scope of supply and approved by the manufacturer.



Picture 20

1 Tank connection (di = Ø 2 mm, da = Ø 4 mm) – installed in the vehicle's own tank fitting
2 Adapter (Ø 7.5 / 3.5 mm) – connected to the vehicle's own tank fitting, at a socket Ø 8 mm, used to pass through the intake line (fuel pipe 4 x 1) up to just before the bottom of the tank.
3 Metering pump
4 Fuel filter – only required for contaminated fuel
5 Fuel pipe, 4 x 1 (di Ø 2 mm)
6 Adapter (Ø 4.5 / 3.5 mm)
7 Fuel hose, 3.5 x 3 (di Ø 3.5 mm), approx. 50 mm long

Permissible line lengths

Intake side: a = max. 2 m
Pressure side: b = max. 6 m

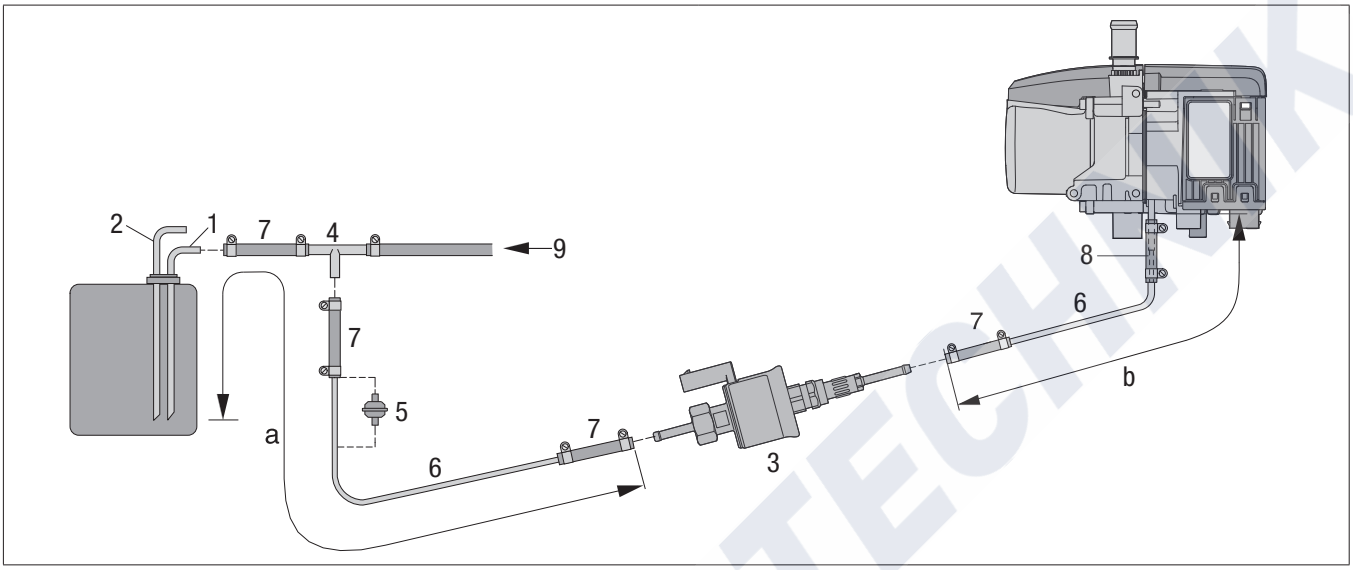
Note

Fuel supply mounting instructions, see Picture 20

- Items 4 and 5 are not included in the “Universal installation kit” scope of supply. Order No. see page 11.
- Connect fuel pipe (Item 5) to the heater using adapter (Item 6). The adapter (Item 6) with diameter 4.5 mm fits on the fuel sockets of the heater. The smaller diameter 3.5 mm fits on the fuel pipe.
- Use two screw clamps Ø 11 to secure the adapter Ø 7.5 / 3.5 mm (Item 2) (tightening torque: $1^{+0.2}$ Nm).
- Installation of a fuel filter (Item 4) requires two adapters Ø 5 / 3.5, Order No. see page 11.
- When installing tank connection (Item 1), maintain a minimum distance of $5^{\pm 2}$ mm from the end of the riser to the bottom of the tank.

3.13.3 Fuel extraction for heaters with inlet pressure resistant metering pump up to 2.0 bar (diesel)

Fuel extraction using T piece from the fuel return line laid between the vehicle engine to the tank fitting



Picture 21

1 Fuel return line from the vehicle's tank fitting
2 Fuel flow line from the vehicle's tank fitting
3 Metering pump (inlet pressure resistant up to 2.0 bar) marked with a green nameplate
4 T-piece
5 Fuel filter – only required for contaminated fuel
6 Fuel pipe, 4 x 1 (di = Ø 2 mm, blue)
7 Fuel hose, 3.5 x 3 (di Ø 3.5 mm), approx. 50 mm long
8 Adapter (Ø 4.5 / 3.5 mm)
9 from the vehicle engine to the tank fitting

Permissible line lengths

Intake side: a = max. 2 m
Pressure side: b = max. 6 m

Note

- Items 4 and 5 are not included in the “Universal installation kit” scope of supply. Order No. see page 11.
- Connect fuel pipe (Item 6) to the heater using adapter (Item 8). The adapter (Item 8) with diameter 4.5 mm fits on the fuel sockets of the heater. The smaller diameter 3.5 mm fits on the fuel pipe.
- Installation of a fuel filter (Item 5) requires two adapters Ø 5 / 3.5, Order No. see page 11.
- When installing tank connection (Item 1), maintain a minimum distance of $5^{\pm 2}$ mm from the end of the riser to the bottom of the tank.
- Check pressure in the fuel return line before installing. Allowable pressures:

→ for standard metering pump: max. 0.2 bar
→ for inlet pressure-compatible metering pump: max. 2.0 bar

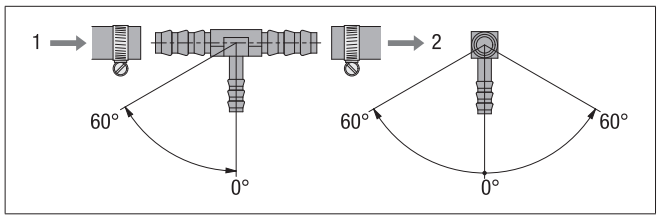
Warning!

Safety instructions for fuel supply!

- It is not permitted to extract fuel downstream of the vehicle's own fuel pump.
- If using a T-piece in a plastic pipe, always insert support sleeves in the plastic pipe.
- Always insert the T-piece in the fuel return line.
- Connect the T-piece and the plastic pipe with the relevant fuel hoses and secure with hose clips.
- If the pressure in the fuel line is higher than 2.0 bar up to max. 4.0 bar, use a pressure reducer (Order No. 22 1000 20 08 00) or a separate tank connection.
- If the pressure in the fuel line is above 4.0 bar or if there is a non-return valve in the return line (in the tank), a separate tank connection must be used.
- The vehicle must be delivered with an almost empty vehicle tank.
- After cutting the fuel return line, with the vehicle engine switched off, use suction to check whether fuel extraction from the vehicle tank without air bubbles is ensured. This ensures that the fuel return line ends just above the bottom of the tank and no non-return valve is installed. If this is not applicable, a separate tank connection must be made or the fuel extraction must be established using an adapter.

3.13.4 Installation position of the T-piece

Keep to the installation positions shown when inserting a T-piece, see Picture 22.



Picture 22

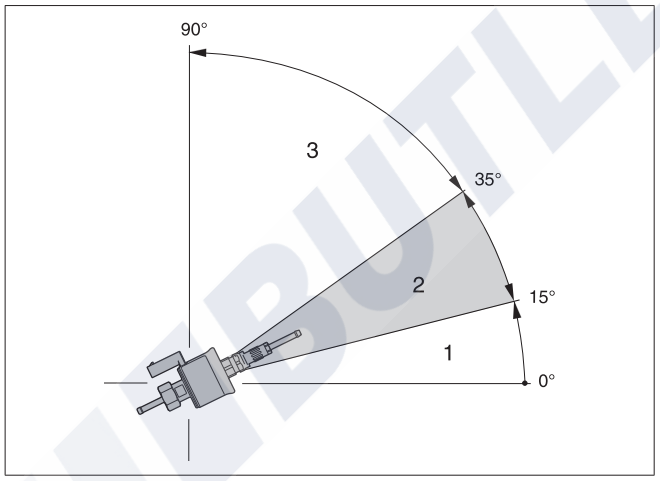
1 Direction of flow – to the fuel tank
2 Direction of flow – from the vehicle engine

3.14 Installing the metering pump

Note

Metering pump installation instructions!

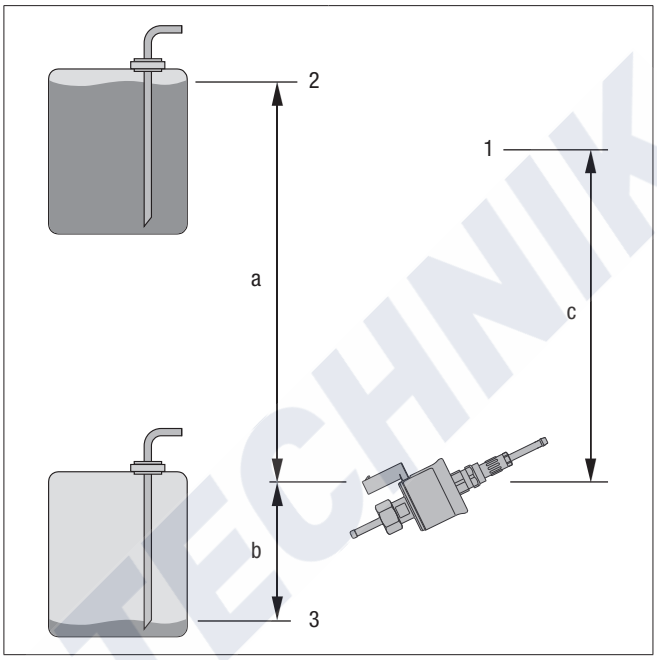
- Always install the metering pump with the delivery side rising upwards – minimum angle 15°.
- Do not install the metering pump and filter near silencers and exhaust pipes and therefore protect against unacceptable heating (petrol max. 20 °C, diesel max. 50 °C).
- Always install the metering pump with the delivery side rising upwards. Any installation position between 15° and 90° is allowed.
- Preferred installation position: between 15° and 35°, see Picture 21.



Picture 23

1 Installation position between 0° – 15° is not allowed
2 Preferred installation position within the range 15° – 35°
3 Installation position within the range 35° to 90° is allowed

3.14.1 Allowable suction and pressure head of the metering pump



Picture 24

1 Connection at the heater
2 max. fuel level
3 min. fuel level

Pressure head from vehicle tank to metering pump:
a = max. 3000 mm

Suction head in pressure-less vehicle tank:
b = max. 500 mm for petrol
b = max. 1000 mm for diesel

Suction head in a vehicle tank in which negative pressure occurs during extraction (valve with 0.03 bar in the tank cap):
b = max. 150 mm for petrol
b = max. 400 mm for diesel

Pressure head from the metering pump to the heater:
c = max. 2000 mm

Note

After mounting the metering pump, check tank ventilation.

3.15 Fuel quality for petrol heaters

The heater runs problem-free on standard commercial quality fuel, which you use to run your vehicle engine. Commercially available, maximum blending of ethanol to DIN 51600 and EN 228.

Note

The heaters B 4 E and B 5 E are **not** approved for operation with ethanol fuel E85 to DIN 15293.