SCHEER

Water Heater

selection

Installation instructions

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Legal regulations for the installation of the heater

For installation, the provisions of Annex 7 of the ECE regulation must be observed first and foremost.

Note:
The provisions are binding within the scope of the ECE regulations and should also be observed in countries where there are no special regulations!
Extract from ECE regulation R122 - Appendix 7:

- When installed, the heater must bear a manufacturer's plate with the name of the manufacturer, the model number and the type designation as well as the rated heating output in kilowatts. The operating voltage and electrical power must also be indicated.
- A clearly visible indicator light in the operator's field of vision must show whether the heater is switched on or off.

Extract from ECE regulation R122 - Part I

5.3.2 Arrangement of the heater.
5.3.2.1 Parts of the bodywork and other components on the vehicle in the vicinity of the heater must be protected from excessive heating and possible contamination by fuel or oil.
5.3.2.2 The heater must not present a fire hazard even when overheated. This regulation is deemed to have been complied with if an appropriate distance to all parts was maintained during installation and adequate ventilation was provided or fire-resistant materials or heat shields were used**.**
5.3.2.3. in the case of vehicles of categories M2 and M3, the heater shall not be located in the passenger compartment. However, installation in the passenger compartment is permitted if it is located in an effectively sealed housing which also complies with the requirements of paragraph 5.3.2.2.
5.3.2.4 The plate referred to in paragraph 4 of Annex 7 or a duplicate shall be affixed in such a way that it is still easily legible when the heater is installed in the vehicle.
5.3.2.5 The location of the heater shall be such as to minimize the risk of injury to persons and damage to property carried.

Disposal of old appliances
The disused appliance must be disposed of at the end of its service life in accordance with national regulations. We recommend that you contact a company specializing in waste disposal or contact the waste disposal department of your local authority.

WARNING!
To prevent misuse and the associated risks, make your old appliance unusable before disposing of it. To do this, disconnect the appliance from the mains supply and remove the mains connection cable from the appliance. When disposing of the appliance, observe the regulations applicable in your country and municipality.

WARNING!
The procedure for installing the heating system contained in this document is a manufacturer's recommendation that may not be suitable for the local conditions in each case. The installation must be carried out by qualified personnel and **the individual steps may need to be adapted to the local conditions**.

WARNING!
Danger from electric current!

The heater may only be operated on properly installed individual sockets with earthing contact.
Do not pull the mains connection cable out of the socket by the cable, always hold it by the mains plug housing.
The burner elements and connections have 230 V voltage.
The heater must be secured on the vehicle with an earthing contact plug. The power supply must meet the requirements of the heater.

WARNING!
Switching on the heating without heating water can destroy the heating system.

DANGER:
Death or serious injury due to improper installation or repair!
Improper installation or improper repair of the heater can cause a fire or lead to the escape of lethal carbon monoxide. This can result in serious or fatal injuries.
Only have installation or repairs carried out by personnel trained by the manufacturer.
Follow all installation and repair instructions.
Observe all warnings.
All necessary technical documentation, tools and equipment must be available in the vehicle.

ATTENTION!
Malfunctions or appliance damage possible due to frost!
If the fresh water in the heating circuit freezes, the appliance may be damaged.
If there is a risk of frost, the fresh water must be drained from a heating system with a plate heat exchanger. The heating system must never be operated without a glycol mixture!

ATTENTION!
Failure to observe the following installation conditions will result in the loss of warranty and liability claims.
The statutory regulations for installation must be complied with.
If the heater is to be operated in a separately installed mobile heating system, an installation plan must always be submitted to SCHEER for approval beforehand. **If this is not available, installation is not permitted.**

ATTENTION!
Pay attention to the installation conditions of the respective vehicle type.
The heater should be installed as low as possible to ensure automatic venting of the heater and circulation pump. This applies in particular to circulation pumps that are not self-priming.
The heater can also be installed in a storage compartment. The storage compartment must be sufficiently ventilated from the outside so that a maximum temperature of 85 °C is not exceeded in the installation box.
During installation, the space required for maintenance accessibility (e.g. removal of the burner) should be taken into account.

ATTENTION!
SCHEER accepts no liability for defects and damage caused by installation by untrained personnel.

General information before installation

In preparation for the installation of the heating system, the most important instructions are described below to ensure the smooth installation and operation of the heating system.
It is recommended that you follow the steps below before installing the heater.

All SCHEER heaters for mobile applications can be operated with closed, pressurized or open, unpressurized heating circuit installations. The closed, pressurized installations are advantageous because they eliminate the need to constantly check the heating fluid at the expansion tank. The antifreeze cannot evaporate and venting the system is very simple.

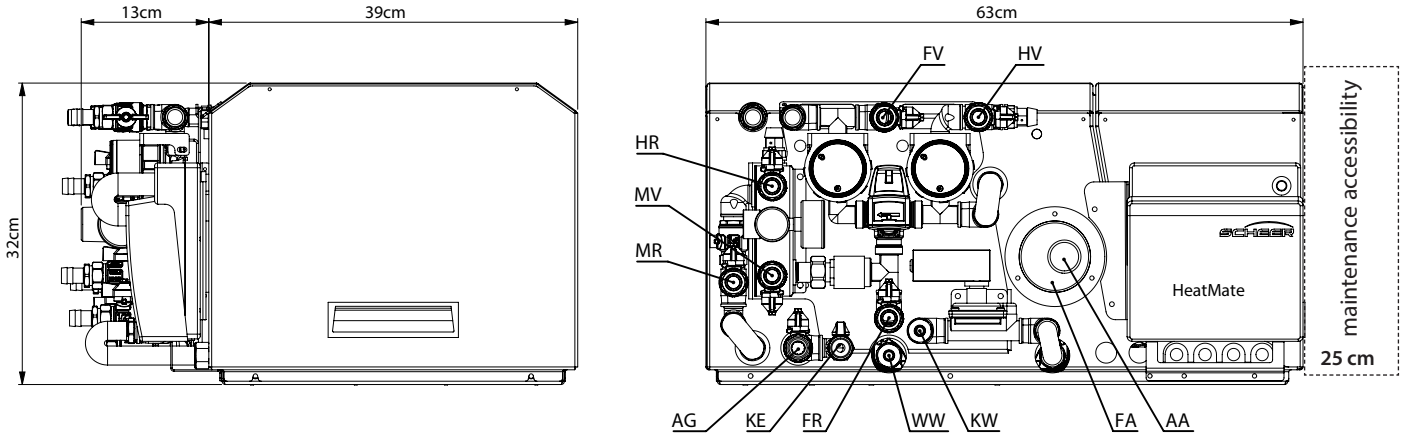
Accessibility

In general, ensure that the side connections and the maintenance cover of the burner (front side) are sufficiently accessible. At least 25 cm of free space is required in front of the appliance in order to be able to remove the burner of the heater for maintenance (see illustration).

Good accessibility to the burner is achieved if the heater is positioned facing the storage compartment flap. This allows the burner to be removed to the front without hindrance.

The flue gas and the fresh air intake run pipe-in-pipe and are connected at the side. The minimum bending radius is 12 cm.

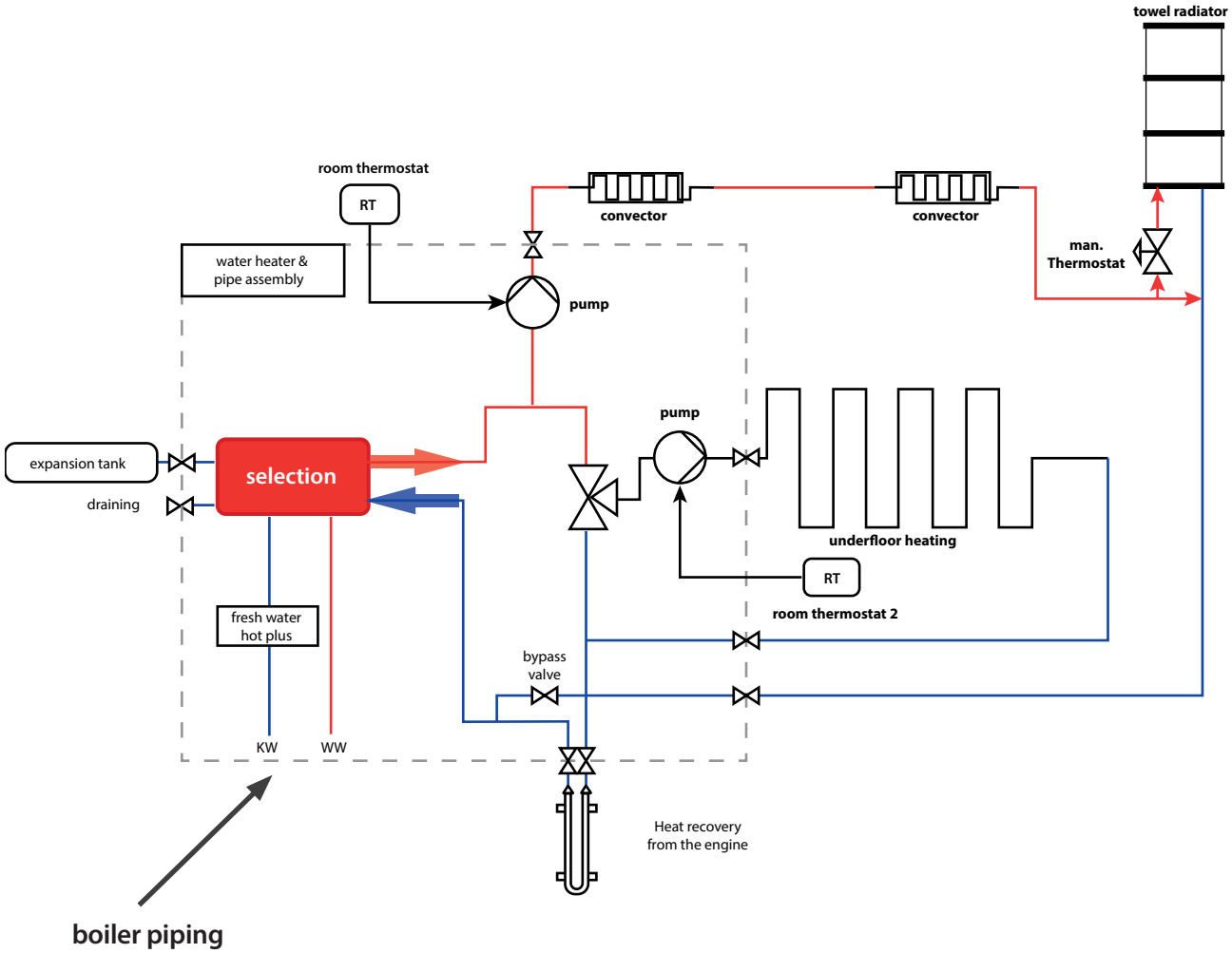
Dimensions



Abbreviation	Description	Connection
HV	Heating water – supply	G1/2" female thread
HR	Heating water – return	G1/2" female thread
FV	underfloor heating circuit flow	G1/2" female thread
FR	underfloor heating circuit return	G1/2" female thread
KW	Fresh water – inlet	G1/2" female thread
WW	Fresh water – outlet	G1/2" female thread
MV*	engine heat supply (flow)	G1/2" female thread
MR*	engine heat supply (return)	G1/2" female thread
AG	Expansion Vessel Connection	G1/2" female thread
KE	boiler water drain	G1/2" female thread
AA	Exhaust connection	Ø35mm
FA	Combustion fresh - air inlet	Ø75mm

**connection prepared; optionally with plate heat exchanger, item no.: 0790013*

Hydraulic diagrams



Installation

A pipe system approved for heating systems can be used for the installation of the heating system, e.g. plastic composite pipes: Plastic composite pipes, aluminum composite pipes, copper or stainless steel pipes and EPDM hoses. Please observe the installation instructions of the respective pipe system manufacturer (e.g. bending radii, material compatibility with glycol, etc.).

Plastic hose nozzles tend to be brittle and should be avoided!

For easy filling, a double-T connection with shut-off options should be provided in the heating circuit flow (directly on the heater). Good accessibility is a prerequisite for rapid filling of the heating system.

Vibration damper

In order to dampen the vibrations to which the heater is exposed in the vehicle, installation on vibration-damping components is recommended, e.g. a damping mat (not included in the scope of delivery).

Positioning the flue gas system

The positioning of the exhaust system must be considered before installation. If the exhaust gas is to be installed underneath the vehicle, make sure there is sufficient space (see section “Accessibility”).

Fuel supply

A diesel fuel line must be routed from the tank to the heater with an internal diameter of at least 4 mm. Fuel must never be drawn below the vehicle's reserve level. If applicable, observe the installation of tank sensors, etc. The fuel line intended for the heating system should be flexible and must be approved for diesel fuel. The maximum length of the diesel line must not exceed 10 m. No additional fuel pump is required.

At the fuel filter (3/8" female thread), a fitting suitable for the fuel line used must be installed (not included in the scope of supply). An internal diameter of 4 mm is recommended for the fuel line.

The heater requires a separate, direct fuel extraction from the tank. Integration into supply lines of other consumers is not permitted in order to ensure operational reliability. A 4 mm hose barb is included in the scope of supply.

	Art.-No.
fuel filter	0405200
filter cartridge	040104

power supply

- The components of the burner require 230 V alternating current. A suitable inverter (at least 300 W) is required for this. The "HeatMate®" heater control unit is supplied with 9 / 36 VDC.
- All SCHEER heaters for mobile applications are equipped with a 3kW heating cartridge (230V) and can be operated in hybrid mode (diesel and / or electric). The heating element must be fused with 16 A.
- Equipotential bonding to earth from the vehicle must be provided

Installation steps

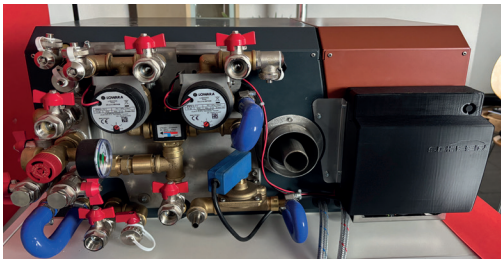
The following installation instructions for the heater serve as general recommendations from the manufacturer. Installation may only be carried out by qualified specialists. In the event of deviating installation steps due to specific local conditions, careful adaptation to the respective framework conditions by qualified specialists is required.

The exhaust gas installation described in step 7 is shown as an example for exhaust gas routing underneath the vehicle and with a silencer for external installation and exhaust pipe end piece.

Step 1: Preparing the Exhaust Floor Penetration

A 75 mm through-hole must be made through the floor or mounting surface. When positioning the hole, ensure that the minimum bending radius of the exhaust and fresh air hoses is maintained in accordance with the manufacturer's specifications. The hole must be placed precisely based on the installation location and the positions of the exhaust and fresh air connections on the unit.

Step 2: Install the fittings (before piping) with the unit removed

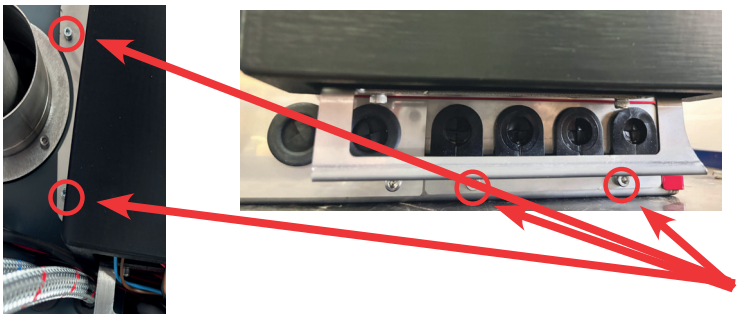


Screw in and seal the installation fittings on the heating system. (Fittings depend on the selected piping system)

Step 3: Remove the HeatMate® controller (if necessary)

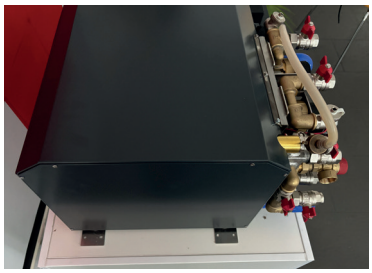
The HeatMate® can be removed if this facilitates installation or if separate placement of the HeatMate® is required.

To do this, disconnect the HeatMate® electrical connectors from the heater. Then remove the mounting screws securing the HeatMate® to the heater.



Remove the screws

Step 4: Position and secure the heater



Place the heater at the designated installation location with vibration isolation (see section “General notes before installation”).

Then secure the heater using the supplied mounting brackets.

The mounting brackets can be flexibly attached to suitable screw points on the housing. Ensure that the heater is properly secured with at least three mounting brackets to guarantee a stable installation.

Step 5: Protective bonding (equipotential bonding) on the heater

Attach the equipotential bonding to a screw connection on the unit. This not only ensures safety but also extends the service life of your heating system by reducing electrochemical corrosion.

Step 6: Exhaust floor penetration

Note: insert (exhaust routed downward)
Guide the exhaust floor penetration (item no. 0186150) through the prepared hole in the floor, ensuring that the grille is oriented downward.

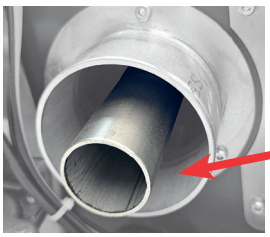
Then securely screw the penetration to the floor using the designated mounting holes.

Step 7: Slip the fresh-air hose over the exhaust pipe

Route the exhaust pipe (item no. 14-N000) through the fresh-air hose (item no. 014120). Slide the hose clamps (item no. 014250) over the fresh-air hose. This cannot be done after the exhaust pipe has been connected.

A tailpipe end piece (item no. 0754695) is recommended to prevent small animals from entering the system. When installing a silencer as an intermediate piece, use an exhaust pipe approximately 10 cm in length.

Step 8: Apply silicone to the exhaust pipe

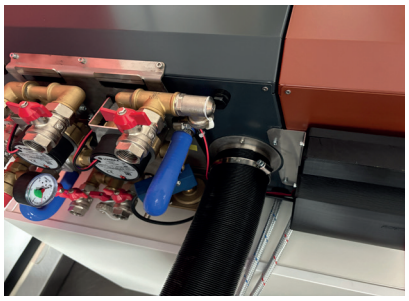


Reapply the red high-temperature silicone, tube 32 ml (item no. 091007), all around the exhaust pipe selection (item no. 018628). This ensures the exhaust system is optimally sealed.

Step 9: Connect the exhaust pipe to the heater

Attach the exhaust pipe to the heater using a hinged pin clamp (item no. 014244). For improved sealing, the additional use of high-temperature silicone is recommended.

Step 10: Connect the fresh-air hose to the heater



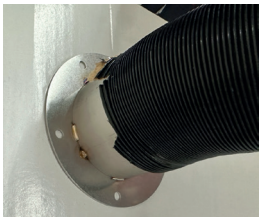
Slide the fresh-air hose over the connection on the heater and secure it with a hose clamp.

For installing a silencer inside the vehicle, connect the exhaust pipe and the fresh-air hose to the silencer inside the vehicle first. The special silencer uses a pipe-in-pipe design, allowing easy integration into the exhaust duct within the vehicle. Afterwards, connect the fresh-air hose to the floor penetration and route the exhaust pipe to the outside.

Step 11: Insert the exhaust pipe through the floor penetration

Guide the exhaust pipe centrally through the floor penetration.

Step 12: Connect the fresh-air hose to the floor penetration



Slide the fresh-air hose over the outer pipe of the exhaust floor penetration and secure it with the hose clamp (from Step 7).

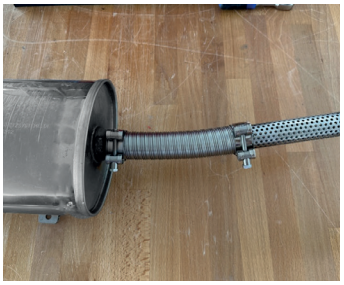
Step 13: Install the silencer under the vehicle

Mount the silencer (item no. 070592) to the chassis or another suitable location under the vehicle using the mounting tabs, and secure it firmly.

Step 14: Connect the exhaust pipe to one end of the silencer

Slide the exhaust pipe onto one port of the silencer and then securely fasten it with the previously positioned hinged pin clamp.

Step 15: Attach the tailpipe end piece



Slide the exhaust pipe section removed in Step 7 onto the free end of the silencer and secure it with a hinged pin clamp. Insert the tailpipe end piece into the exhaust pipe with its pipe side first until it reaches the perforated section, then fasten it with a hinged pin clamp.

Depending on the chosen distance between the silencer and the tailpipe end piece, it is recommended to additionally secure the tailpipe end piece to the chassis to prevent it from falling off due to vibrations.

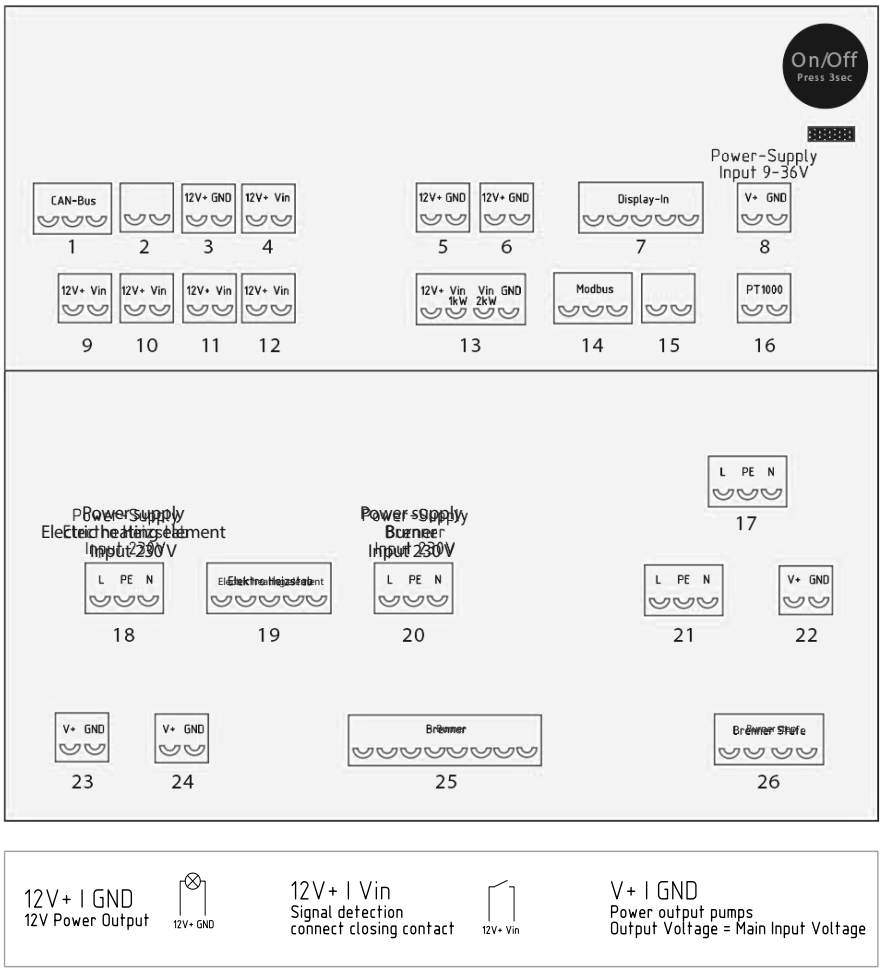
Step 16: Connect the lines

Connect the heating circuit lines, fresh water lines, and the fuel line to the heater or to the pre-installed fittings.
If not already done in Step 3, install the air vent at this stage. Either an automatic or a manual air vent may be used.

Description	Art.-No.
Exhaust Pipe	14-N000
Exhaust Pipe End Piece	0754695
Exhaust Floor Penetration	0186150
Fresh Air Hose	014120
Hose Clamp	014250
Hinged Bolt Clamp	014244
Muffler	070592

Step 17: Installing the HeatMate® control unit

If the HeatMate® was previously removed, it must be reattached to the heater in this step.
The electrical connectors must be connected to the connections on the heater. Follow the installation instructions in the illustration. Make sure that all connectors engage correctly to ensure a reliable electrical connection.



1. CAN bus
2. not assigned
3. Thermal stop
4. On/Off potential-free (close 3sec=on/off)
5. Inverter wake-up
6. Fault message
7. Display
8. DC power supply
9. Fresh water warm plus
10. Auto tank control
11. Room thermostat 1
12. Room thermostat 2
13. Electric heating on/off (close Vin(1kW) for 1kW, close Vin(2kW) for 2kW, both close for 3kW)
14. Modbus
15. not assigned
16. Boiler temperature
17. Burner preheating
18. AC-In electric heating element
19. Output electric heating element
20. AC-In burner
21. Safety temperature limiter
22. Circulation pump
23. Pump heating circuit 2
24. Pump heating circuit 1
25. Burner
26. Burner stage

Step 18: Connecting the power supply

The heater is equipped with two separate 230 V power supplies, which are labeled “Mains” and “Electric heater”. The electric heater can therefore be operated independently of the burner and control unit from a separate voltage source. This configuration is particularly advantageous if the battery capacity is limited, as in this case the electric heater can only be supplied from outside the vehicle.
A 6A fuse is required for “Mains”, while the “E-heater” must be fused with 16A, as loads of up to 3kW are drawn here.

In addition to the control unit, the circulation pump (not included in the scope of delivery) and an internal circulation pump are also supplied via the 9-36 VDC supply. The necessary fuse protection must therefore be designed for 40 W plus the power of the pumps used.

Filling & venting the system

Antifreeze

The heating system must be filled with a water-antifreeze mixture to prevent system components from freezing. Commercially available antifreezes, which are produced on the basis of crude oil, are generally labeled as “harmful and irritating”. We therefore recommend the use of climate and environmentally friendly plant-based antifreezes (art. no. 190094), which have been specially developed for heating systems. These antifreezes are not hazardous to health and pose no danger to the user or the environment.

To determine the amount of antifreeze required, roughly calculate the volume of the heating system itself as well as the volume of the installed pipes and the consumers used (e.g. towel dryer, water-air heat exchanger, convectors). Also allow for a reserve of at least 10 % to compensate for leaking quantities and residual quantities in the storage tank. In an open, unpressurized system, this is an expansion tank; in a closed, pressurized system, it is an expansion tank.

Flushing unit

The use of a flushing device is recommended to fill the system. This contains a powerful pump and a storage tank for filling with heating fluid. This type of flushing device is also known as a “solar flushing device” or “filling station”.
Fill the antifreeze into the storage tank of the flushing device according to the manufacturer‘s instructions. If a pressurized system is being filled, the normal operating pressure is 1.5 bar.

Step 1: Connect the cables

Connect the two lines of the flushing device to the double T connection on the heating system. Make sure that the line of the flushing pump is connected in the direction of the heating circuit and the line that leads back to the storage tank is connected to the connection in the direction of the heating appliance. This ensures that the liquid first circulates through the installation via the flow pipe and finally through the boiler.

Step 2: Instructions for flushing the system

Preparation:
Make sure that all valves in the heating circuit are fully open and that there are no blockages or obstructions. In systems with two heating circuits, it is possible to flush only one heating circuit first, while the other is excluded from the flushing process by shutting it off. The second heating circuit can then be flushed separately.

Before you start the circulation, you must shut off the expansion vessel in open (unpressurized) systems to prevent overflow!

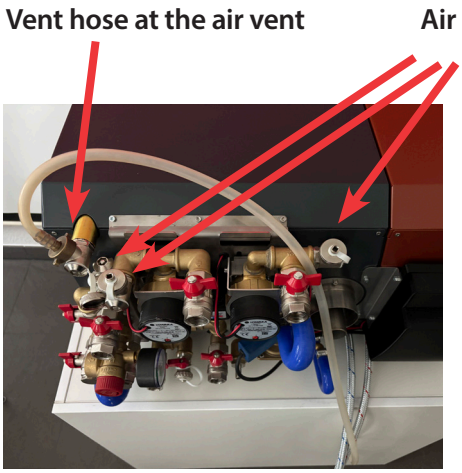
1. **Commissioning the flush:**
   Start the flush pump and slowly open the shut-off valves on the double T-piece to the heating circuit to avoid sudden pressure peaks in the heating pipes. Ensure that the maximum operating pressure of the system is not exceeded during this process.
2. **Flushing duration and observation:**
   Flushing takes time. As soon as the liquid has flowed through the entire heating circuit, returned to the storage tank and all air has been flushed out, allow the flushing to run continuously for around 30 to 60 minutes. Make sure that no more air bubbles are visible in the storage tank of the flushing device.
   This procedure ensures thorough flushing of the heating circuits and optimizes the functionality of the system.
3. **Ending the flushing process:**
   If no more air bubbles are visible in the return line, stop the circulation pump and at the same time shut off the lines leading from the flushing device and the lines leading to the flushing device in the double T-piece. This will prevent the static pressure from causing heating fluid to run back into the storage tank and air to be drawn into the system.
   Disconnect the connection to the flushing device.

Step 3: Bleeding the system

First, let the heater sit for a few minutes so that air bubbles can collect and settle at the vent points. Then start bleeding at the lowest point, usually at the heater. If an automatic air vent is installed here, wait until no more air is released and the hissing sound stops. Continue by opening all remaining vent points in the system one after another and releasing the air.

After the first bleed, it is advisable to perform at least one or two additional passes to ensure all air bubbles are removed. If air remains in the system, it may help to move the vehicle during the process so that any remaining air bubbles are guided to the vent points. Once there is no more air in the system, the line to the expansion vessel can be opened.

The bleeding process requires patience, but a well-bled system ensures proper circulation and prevents issues such as the expansion vessel overflowing or insufficient heating performance.



The air vents mounted on the piping system can be connected using suitable transparent tubes/hoses (not included in the scope of supply) to facilitate easy bleeding.

Step 4a: Establishing Operating Pressure (for closed systems only)

Close the return connection to the flushing unit and slowly build up pressure in the system with the pump turned on. Always monitor the pressure gauge during this process. The normal operating pressure is 1.5 bar.

Step 4b: Establishing Expansion Tank Fill Level (for open systems only)

Fill antifreeze into the expansion tank until the liquid reaches the lower edge of the tank. Avoid overfilling, as the volume of the heating fluid expands when heated during operation. Additionally, small remaining air bubbles in the system may still be present and could also lead to overflow.

During operation, the fluid level in the heated system should not exceed two-thirds of the expansion tank to ensure proper function and sufficient pressure compensation.

Step 5: Start Circulation and Repeat Bleeding

Start the heating circuit pump to begin operation of the heating system. If a SCHEER pump is installed and you notice that the pump starts briefly but then immediately stops, this indicates that there is still air trapped in the pump housing. In this case, the pump's built-in dry-run protection is activated to prevent damage due to insufficient fluid supply.

This behavior suggests that the system may not have been flushed thoroughly. Check the bleeding process and ensure that all air has been removed from the heating circuits before restarting the pump.

Commissioning

Ensure there is sufficient fuel in the tank so that fuel can be drawn at the heater's pickup point.

Operating the heater without heating fluid can destroy the unit. Make sure the heater is completely filled before proceeding with commissioning.

Open all valves in the fuel line.

Step 1: Starting the heater

Switch on the heater using the main switch. The current boiler temperature will be shown on the display. During initial commissioning, the error message "Check AC burner" may appear. Refer to the "Troubleshooting" section for details.

Step 2: Starting the Burner

If the boiler temperature is below 50 °C, a 60-second preheating phase will begin automatically. After this, the burner will start automatically.

The fan will start, and at the same time the diesel pump will begin drawing in fuel. Check the vacuum gauge on the fuel filter. A slight fluctuation is normal, but the needle must not enter the red zone.

Note: If the gauge moves into the red zone, there is either a blockage in the fuel line or the line's diameter is too small, causing excessive suction resistance.

After about 10 seconds, the burner enters the ignition phase.
If insufficient fuel has been drawn in at this point, the burner will switch to fault mode. This will be indicated on the HeatMate® display.

The message "Preheating" will appear on the HeatMate® display until the setpoint temperature is reached for the first time.

To reset the burner and restart the ignition process, press the reset button. Once the fault is cleared, the red light will turn off and the start sequence will begin again.

Important: Do not press the reset button for longer than 2 seconds!

Repeat this process several times until the fuel filter is sufficiently filled.
With very long diesel lines, air bubbles in the line can hinder fuel suction, making frequent resets necessary.

The lower filter bowl with the filter element must be completely filled.
In the upper sight glass, a fill level of approximately 3 cm must be reached.

Note: No bubbles or foam should form in the filter during the suction process. During initial commissioning, some bubble formation may occur at first. However, if this does not disappear within 60 seconds, the fuel line must be checked for leaks.

Once the fuel filter is filled, the burner start-up process begins.
The first burner start may be somewhat uneven due to initially irregular fuel supply. However, from the second start onward, the burner should start smoothly and promptly.

Step 3: Heating the System

Begin by heating only the boiler and continuously monitor the fill level of the expansion tank. Then open the valves for circulation through the heating circuits. Observe that the fill level in the expansion tank rises gradually. A sudden and sharp increase indicates the presence of air bubbles in the system.

Ensure that all areas of the system are heating evenly. If a pipe remains cold beyond a certain point, it may indicate a blockage or trapped air in the line. In such cases, additional bleeding is required. Refer to “Filling and Bleeding the System” -> Steps 3–5.

Step 4: Testing Domestic Hot Water Heating

Draw hot water from a tap or outlet point.

Troubleshooting

	Maintenance Interval
Burner does not start despite frequent resets, diesel filter is empty or insufficiently filled	• Does the vacuum gauge on the filter enter the red zone when starting the burner? -> Fuel line may be blocked; pump cannot draw fuel • Do bubbles or foam appear in the oil filter when starting the burner? -> Check diesel supply lines for leaks
Domestic hot water is not or not sufficiently heated, and boiler temperature does not drop / burner switches off despite hot water being drawn	• Bleed the heating system. In pressureless, open systems, move the vehicle. • Check potable water system for leaks
Domestic hot water is not sufficiently heated	• Check flow rate of fresh water -> If necessary, reduce flow (water temperature should be approx. 50 °C)
HeatMate® has reached target temperature, heating circuit remains cold	• Bleed the system; air bubbles in the lines are preventing circulation • If necessary, flush the system again
Expansion vessel overflows (in open, pressureless systems)	• Check whether the volume of the expansion vessel is sufficient (expansion of 50/50 glycol-water mix approx. 4%) • Bleed the system (sudden expansion of air bubbles can cause overflow)
Electric heater does not heat	• Check power supply (check automatic shutdown of battery management system) • Check plug connections • Check activation on the control unit • If the system was operated without heating fluid, the electric heater may be damaged due to high temperatures. Contact the manufacturer
Heater produces soot / strong odor	• Is the fuel supply in the filter free of bubbles/foam? If not: check fuel line for leaks Is the fresh air supply interrupted or insufficient? Does exhaust enter the fresh air intake? YES: Seal the exhaust system • Check exhaust values, if necessary adjust burner settings
Diesel smell near the heating system	• Guide the vent hose of the diesel filter back into the housing of the heater (transparent silicone hose on the fuel filter).
HeatMate® displays the error "Check AC polarity" after switching on	• Check whether the 230V power supply is correct (phase to phase) • Rotate the Schuko plug and wait 30 seconds • Check whether the inverter provides a clean 230V potential between L and PE. If necessary, create a bridge between N and PE or make the appropriate setting in the inverter configuration (follow the inverter manufacturer's instructions).
Device will not switch on	• Check whether 9–36 V supply is present at the HeatMate (terminal 8) (observe polarity). • After a short circuit in the DC supply, a miniature fuse located inside the housing must be replaced. Contact the manufacturer for this. Unauthorized opening of the controller housing will void the warranty.

Troubleshooting

Heating circuit pumps do not operate	• The heating circuit pumps are supplied with the HeatMate® input voltage (vehicle supply voltage). • Ensure the pump input voltage matches the vehicle supply voltage. • Is the pumps' dry-run protection engaging (repeated starting and stopping)? • -> Bleed the system. • Are the heating circuits enabled on the HeatMate® control panel (LED above the button is illuminated)? • Are the connected thermostats closing the demand/contact input? • Ensure that the contact at terminal 9 is not closed (unplug the connector).

Water heater selection
Installation instructions

SCHEER
Heizsysteme & Produktionstechnik GmbH
Chausseestr. 16
D-25797 Wöhrden
Tel.: + 49 (0) 4839 / 905-0
info@scheer-heizsysteme.de
www.scheer-heizsysteme.de

06/2025