

**Integriertes Heizgerät
Integrated Heater
Riscaldatore integrato**

**Einbauanweisung
Installation Instructions
Istruzioni di montaggio**

**DUAL TOP
RHA 100**

**(für Trinkwasser)
(for drinking water)
(per acqua potabile)**

03/2009

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GB Contents

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1 General

For installation and repair of a Webasto Dual Top RHA 100 integrated heater you will need technical documentation, a special training by Webasto, special tools and special equipment.

Installation and all other jobs carried out by not certified persons can harm you, the Dual Top and the vehicle. In that case, Webasto will refuse all liability.

Do NOT install or repair a Webasto Dual Top RHA 100 heater, if you have not successfully finished the training by Webasto for acquiring the necessary technical skills. Do NOT install or repair the product, if you do not have the necessary technical documentation, tools or equipment.

ALWAYS follow the Webasto installation and service instructions and mind all warning indications.

Only use genuine Webasto parts. See the Webasto air and water heaters accessory catalogue and Webasto camping catalogue.

Webasto does not take over any liabilities for defects or damages caused by for installation untrained personnel.



2 Statutory regulations governing installation

The Dual Top RHA 100 heater has been type-tested and approved in accordance with EC Directives 72/245/EEC (EMC) and 2001/56/EC (heater) with the following EC permit numbers:

e1 03 5000
e1 00 0195

Installation is governed above all by the provisions in Annex VII of Directive 2001/56/EC.

NOTE:

The provisions of these Directives are binding within the territory governed by EU Directive 70/156/EEC and should similarly be observed in countries without specific regulations.

See chapter 2.1, "Extract from Directive 2001/56/EC Annex VII"

The Dual Top complies with all applicable standards for this type of product.

When installing the Dual Top heater and related components, make sure to follow all local regulations (e.g. 98/83/EC, DIN 2001-2, DVGW W 291).

Make sure that during the installation the legal requirements for the permits of the vehicle are not violated, in particular for the heater fixation and the routing of the exhaust lines.

IMPORTANT

Failure to follow the installation instructions and the notes contained therein will lead to all liability being refused by Webasto. The same applies if repairs are carried out incorrectly or with the use of parts other than genuine spare parts. This will result in the invalidation of the type approval for the heater and therefore of its **homologation / EC type licence**.

NOTE:

For vehicles with an EU permit, no entry in accordance with § 19 Sub-Section 4 of Annex VIII b to the Road Traffic Act is required.

2.1. Extract from Directive 2001/56/EC Annex VII

Start of extract.

ANNEX VII

REQUIREMENTS FOR COMBUSTION HEATERS AND THEIR INSTALLATION

1. GENERAL REQUIREMENTS

1.7.1. A clearly visible tell-tale in the operator's field of view shall inform when the combustion heater is switched on or off.

2. VEHICLE INSTALLATION REQUIREMENTS

2.1. Scope

2.1.1. Subject to paragraph 2.1.2, combustion heaters shall be installed according to the requirements of this Annex.

2.1.2. Vehicles of category O having liquid fuel heaters are deemed to comply with the requirements of this Annex.

2.2. Positioning of heater

2.2.1. Body sections and any other components in the vicinity of the heater must be protected from excessive heat and the possibility of fuel or oil contamination.

2.2.2. The combustion heater shall not constitute a risk of fire, even in the case of overheating. This requirement shall be deemed to be fulfilled if the installation ensures an adequate distance to all parts and suitable ventilation, by the use of fire resistant materials or by the use of heat shields.

2.2.3. In the case of M2 and M3 vehicles, the heater must not be positioned in the passenger compartment. However, an installation in an effectively sealed envelope which also complies with the conditions in paragraph 2.2.2 may be used.

2.2.4. The label (see *chapter 7, "Identification plate"*) referred to in paragraph 1.4, or a duplicate, must be positioned so that it can be easily read when the heater is installed in the vehicle.

2.2.5. Every reasonable precaution should be taken in positioning the heater to minimise the risk of injury and damage to personal property.

2.3. Fuel supply

2.3.1. The fuel filler must not be situated in the passenger compartment and must be provided with an effective cap to prevent fuel spillage.

2.3.2. In the case of liquid fuel heaters, where a supply separate to that of the vehicle is provided, the type of fuel and its filler point must be clearly labelled.

2.3.3. A notice, indicating that the heater must be shut down before refuelling, must be affixed to the fuelling point. In addition a suitable instruction must be included in the manufacturer's operating manual.

2.4. Exhaust system

2.4.1. The exhaust outlet must be located so as to prevent emissions from entering the vehicle through ventilators, heated air inlets or opening windows.

2.5. Combustion air inlet

2.5.1. The air for the combustion chamber of the heater must not be drawn from the passenger compartment of the vehicle.

2.5.2. The air inlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

2.6. Heating air inlet

2.6.1. The heating air supply may be fresh or recirculated air and must be drawn from a clean area not likely to be contaminated by exhaust fumes emitted either by the propulsion engine, the combustion heater or any other vehicle source.

2.6.2. The inlet duct must be protected by mesh or other suitable means.

2.7. Heating air outlet

2.7.1. Any ducting used to route the hot air through the vehicle must be so positioned or protected that no injury or damage could be caused if it were to be touched.

2.7.2. The air outlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

End of extract.

3 Use of the integrated air / water heater

The Webasto Dual Top RHA 100 integrated air / water heater has been designed to heat and to provide hot water (drinking water) in motor homes and similar vehicles.

The heater operates independently of the engine and is connected to the fuel tank and the electrical system of the vehicle.

It is not designed for heating vehicles transporting hazardous substances.

4 Additional safety instructions

- If the Dual Top falls to the floor, it must be returned to Webasto for a safety inspection/repair.
- It is not allowed to paint or re-paint the Dual Top heater partly or completely.

5 Installation example

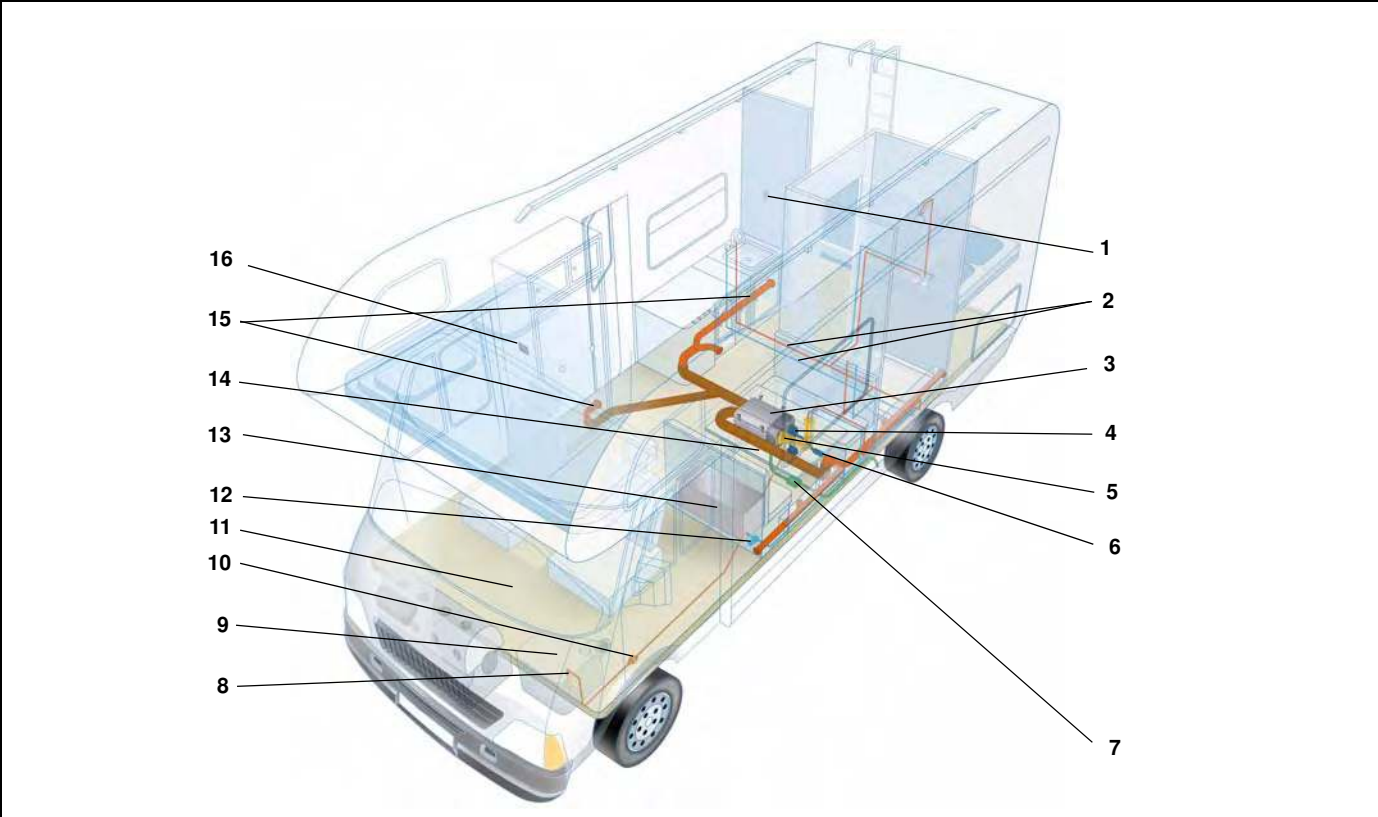


Fig. 1: Installation example for heater in camper

- 1 Interior temperature sensor
- 2 Water lines
- 3 Webasto Dual Top RHA 100 heater
- 4 Cooling air intake adapter
- 5 Webasto dual adapter
- 6 Combustion air intake silencer
- 7 Exhaust silencer
- 8 Fuel tank connector
- 9 Fuel tank
- 10 Fuel pump
- 11 LED dashboard
- 12 Water pump
- 13 Water tank
- 14 Cooling air outlet
- 15 Hot air distribution
- 16 Control Panel

6 Heater installation

6.1. General

IMPORTANT

The regulations specified in chapter 2, "Statutory regulations governing installation" must be adhered to.

NOTE:

Observe the installation details specified by the manufacturer of the relevant vehicle type.

6.2. Dual Top connections

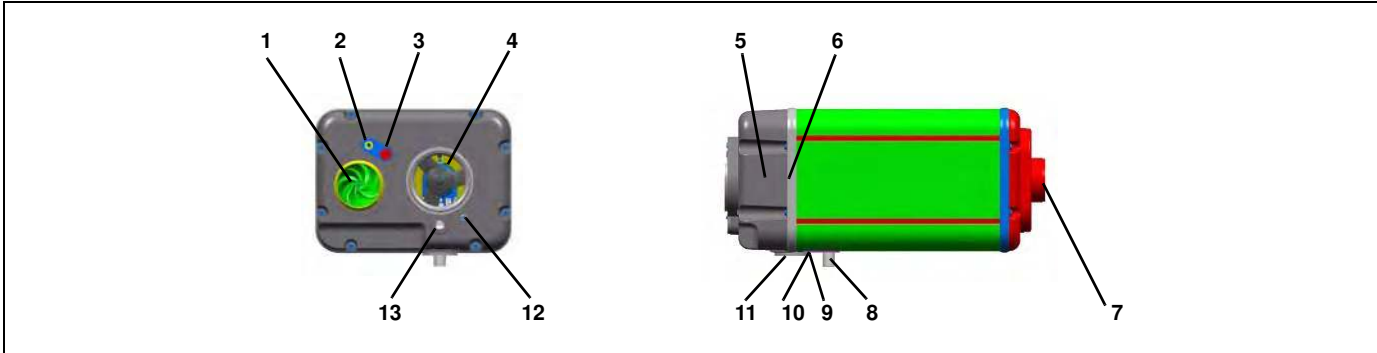


Fig. 2: Connections of the heater

- | | |
|------------------------------------------|-------------------------------|
| 1 Heating air inlet | 8 Exhaust outlet |
| 2 Water inlet (cold) | 9 Drain valve hose |
| 3 Water outlet (hot) | 10 Pressure relief valve hose |
| 4 Cooling air inlet | 11 Cooling air outlet |
| 5 Intake cap | 12 Fuel intake |
| 6 Wiring harness outlets, left and right | 13 Combustion air intake |
| 7 Outlet cap | |

6.3. Installation location

At all sides of the heater there should be at least 20 mm space.

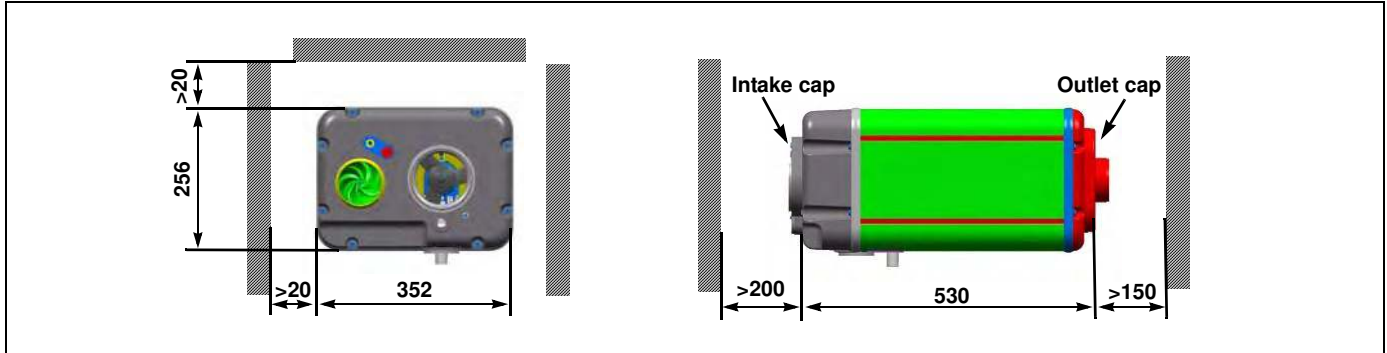


Fig. 3: Dimensions [mm] of the heater

- Space requirement for hot air outlet > 150 mm
- Length 530 mm
- Space requirement for air inlet > 200 mm
- Width 352 mm
- Height 256 mm
- Space requirement at sides > 20 mm
- Space above the heater > 20 mm

Find a suitable location for the heater.

Space for the heater:

- Make sure to have sufficient space at all sides of the heater.
See Fig. 3;
- Heater has to be fixed to elements of the vehicle that can withstand a weight of 35 kg;
- All parts above the water crossing level (specified for the vehicle);
- Possibility to remove the heater;
- Possibility to access and remove the intake cap of the heater.

The heater shall be fitted on the exterior of the vehicle. Ensure that the heater is fitted in a position where it is protected from splashing water.

Orientation of the heater:

The heater has to be mounted in a horizontal position (tolerance $\pm 5^\circ$), with exhaust outlet and cooling air outlet port pointing downwards.

See Fig. 4.

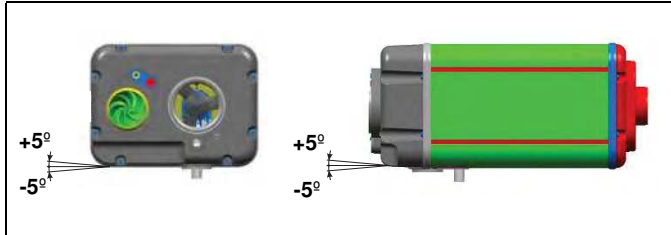


Fig. 4: Required installation position

IMPORTANT

Make sure that after installation the casing of the heater is not in contact with any parts of the vehicle body. Ensure that all moving parts can move easily. A failure to do this may result in the hot air fan, cooling air fan or another part blocking.

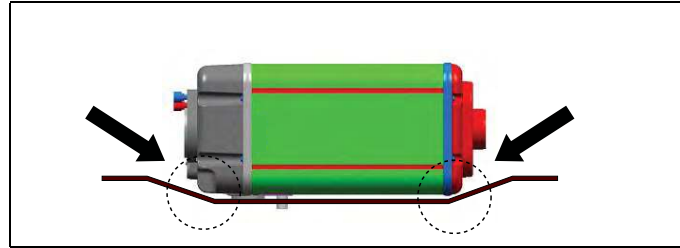


Fig. 5: Heater casing must not touch vehicle body

6.4. Connecting the wiring harness

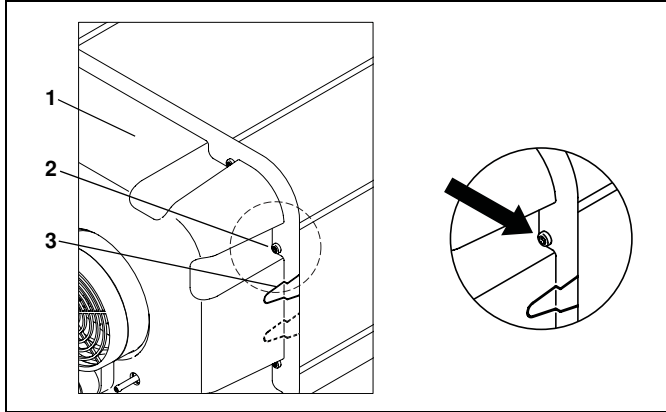


Fig. 6: Removal front cover

1. Intake cap
2. Intake cap fixing screws
3. Opening for wiring harness Dual Top.

Connect the wiring harness plug X11 (12 poles) to the matching connector of the heater.

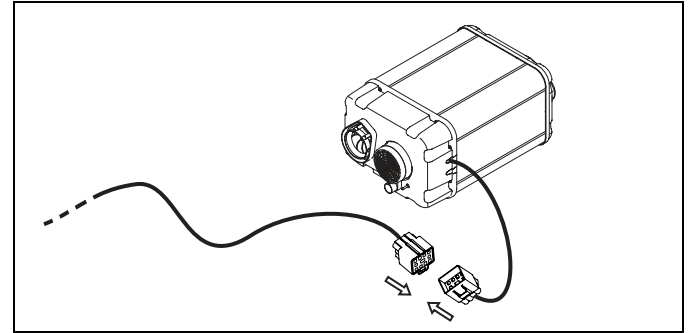


Fig. 7: Connection wiring harness

6.5. Installing the heater

- Mount the M8 hammerhead bolts in the guide rails of the heater and use brackets to attach the heater to supporting parts of vehicle chassis.
- Vibration dampers should be used. Tighten the M8 hammerhead bolts and nuts with a torque of 22 - 25 Nm.
- Mount heater, brackets and vibration dampers in such a way that dampers will be compressed by the weight of the heater.
- See Webasto camping catalogue for different kinds of fixation brackets.
- At least 4 fixation points.

- Fixation of the heater only on the top or on one of the sides is not sufficient.
- Install the heater in such a way that it will not fall from the vehicle in case the vibration dampers fail.

See Fig. 8

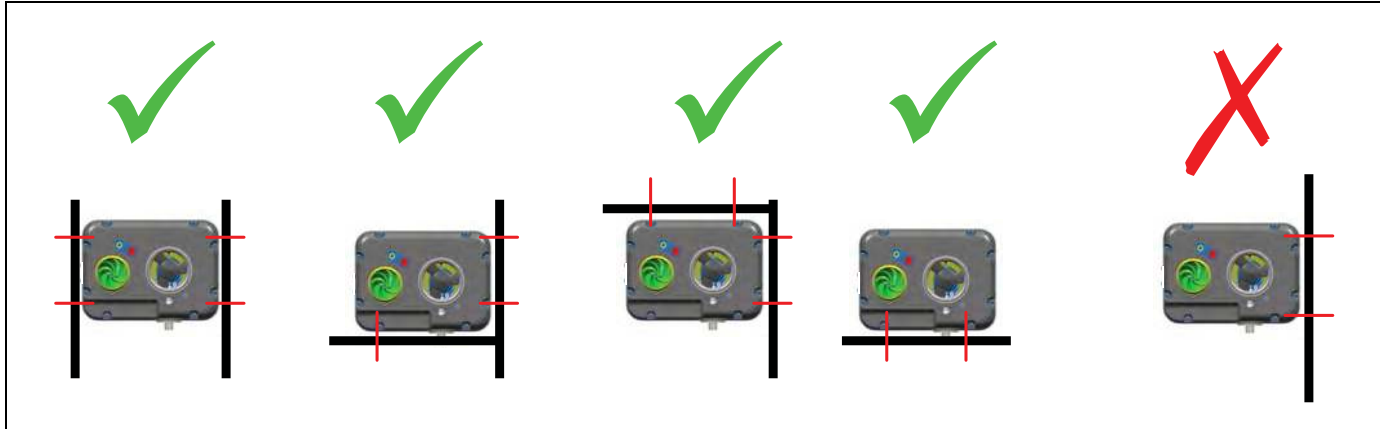


Fig. 8: Possible fixation methods (front view)

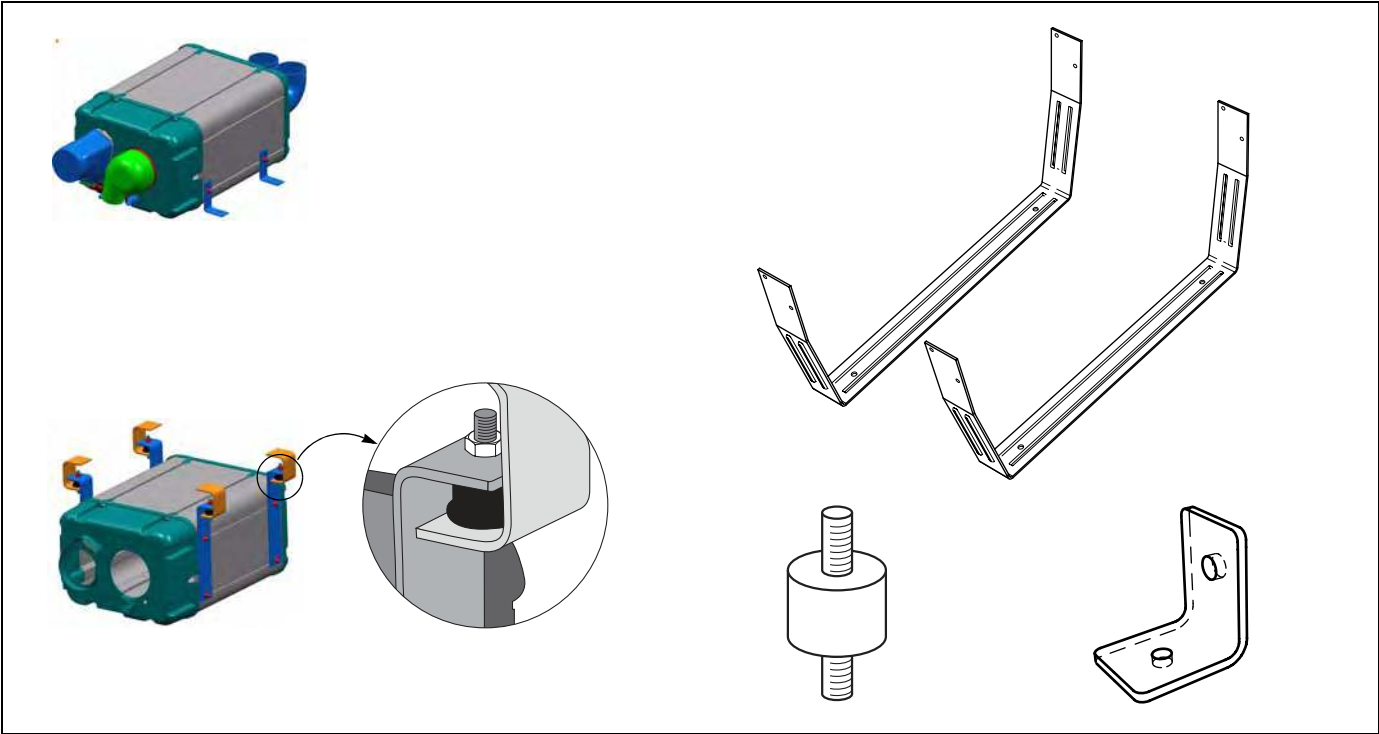


Fig. 9: Fixation brackets and vibrations dampers (examples)

7 Identification plate

The identification plate must be positioned so that it cannot be damaged and must be clearly legible when the heater is installed (otherwise a duplicate identification plate must be used).

Inapplicable years must be erased from the identification plate and the current year must be readable.

8 Hot water system

The Dual Top complies with all applicable standards for this type of product. When installing the Dual Top heater and related components, make sure to follow all local regulations (e.g. 98/83/EC, DIN 2001-2, DVGW W 291).

To connect water pipes or hoses to the Dual Top RHA 100 heater, use a standard 10 mm pipe connector (e.g. John Guest / ASP).

- Place a thermostatic mixing valve if required.
- If no quick connection system is used, secure the lines at all connection points in a way that they can withstand pressure and are watertight.
- Fasten the hoses in a way that they cannot be damaged (e.g. using hose clips).

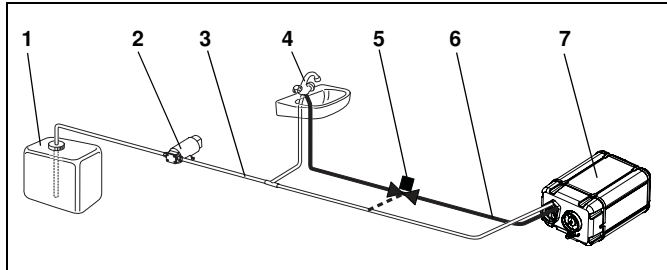


Fig. 10: Water system (scheme)

- 1 Vehicle's water tank
- 2 Water pump
- 3 Cold water line
- 4 Water outlets
- 5 Optional thermostatic mixing valve
- 6 Hot water line
- 7 Heater Dual Top RHA 100

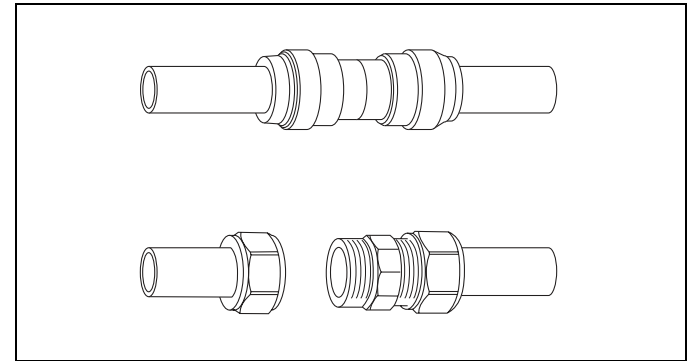


Fig. 11: Water line connection (examples)

NOTE:

The internal diameter of the hot water lines should be at least 8 mm.

Always use hoses, which are resistant to pressure (at least 4 bar) and hot water (90 °C).

For operating the heater it is possible to use all sanitary water pumps:

- creating a pressure up to 2.5 bar;
- closed when shut off;
- min. operating pressure 1 bar.

Please see separate instructions for the use of a submersible pump.

Avoid the flow of water from the heater back into the vehicle's fresh water tank. Use one-way valves if required.

If the hot water temperature at the water outlets needs to be limited, use a thermostatic mixing valve as an option (see Fig. 10).

When connecting to a central water supply (rural or city mains) or if using a more powerful pump, a pressure reduction valve must always be installed to prevent a pressure above 2.5 bar developing in the boiler.

Route water hoses as short as possible and free of kinks. All hose connections must be secured in a way that they can withstand pressure and are watertight (also cold water hoses)! The thermal expansion of the water can cause pressures of up to 4 bar before the overpressure valve reacts.

It's recommended to route all water pipes in such a way that they descend towards the vehicle water tank. Route intake and outlet pipes connected to the heater in such a way that there are no syphons. So, if you drain the boiler, you also drain the water lines.

The water lines must be routed inside the heating air intake hose. This will avoid frozen water lines as long as the heater is operating in a proper mode (see Operating Instructions).

Use Webasto dual adapter to connect the air intake hose to the heater and secure it with a clamp. See Fig. 12.

NOTE:

Do not secure the adapter with screws going through adapter and intake cap. This can block the ventilators.

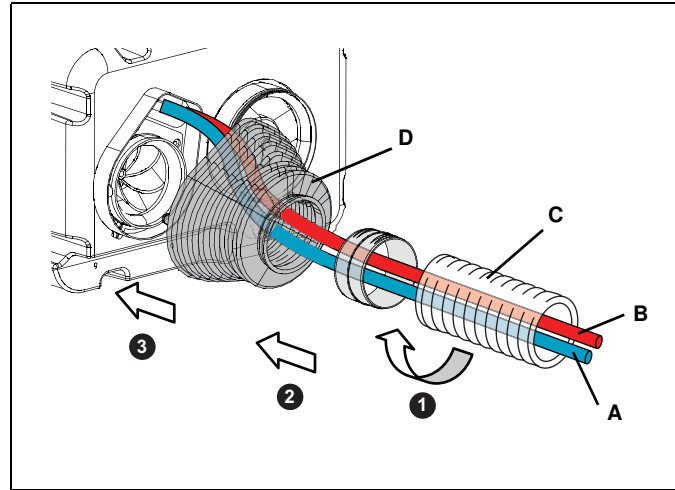


Fig. 12: Cold (A) and hot (B) water lines, air intake hose (C) and Webasto dual adapter (D)

9 Hot air system

NOTE:

The heater must not be integrated into the vehicle's front heating system.

Only recirculation air mode is possible, with the heating air intake from the interior.

Recirculation air mode ensures frost protection of water pipes in case of underfloor application. It also contributes to a high total efficiency and avoids fumes from the outside to be sucked inside.

The desired interior temperature can be adjusted at the Control Panel (5 ~ 35 °C). The device automatically modulates the heating power between 1,500 W and 6,000 W depending on the output requirement (calculated from difference between selected temperature and current interior temperature).

To ensure that the heater functions satisfactorily, the flow resistance of the connected hot air system has to be minimised. Maximum pressure drop between the inlet and outlet side of the hot air line: 3.0 hPa at maximum speed of heating air ventilator.

(1 hPa corresponds to 1 mbar corresponds to 10 mm water column).

The points table for air guide parts in the Webasto air and water heaters accessory catalogue can be used to design the hot air system.

The over all flow resistance of 3.0 hPa means that 190 points must not be exceeded. Ensure that the air flow (air velocity) does not differ more than factor two comparing the two hot air distribution channels.

If the resistance of the hot air distribution channels is too high, the temperature sensors inside the heater will detect a high air temperature. This results in a higher speed of the heating air ventilator, causing then more noise and power consumption. The hot air hoses (intake and output) must be secured with clamps or screws at their connection points.

NOTE:

The installation must be checked for:

- No air short circuit between the vehicle's heating system and the heater air inlet;
- No air short circuit between the heater's air inlet and the heater's air outlet (see Fig. 13);
- No air leakage where openings have been made to route the hoses into or outside the interior.

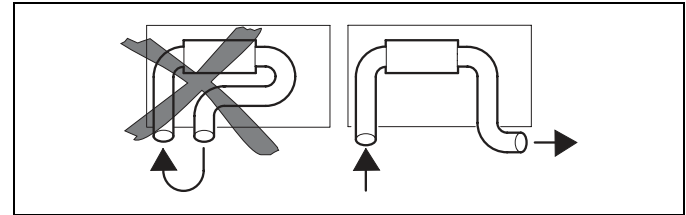


Fig. 13: Avoid short circuits

9.1. Heating air intake

9.1.1. General

NOTE:

The heating air has to be drawn from the interior.

Extracting heating air from an enclosure (e.g. bottom of bed or seat box) will reduce noise coming from the heating air ventilator.

Mounting the air intake in a central area will provide an even air circulation throughout the interior.

Do not position the heating air inlet at a too low position, because of the risk that dirt or small particles will fall or be sucked in. Mount an air grille on the heating air intake if necessary. It's recommended to extend the inlet above floor level.

Be careful that no fluids may be spilled into the air inlet.

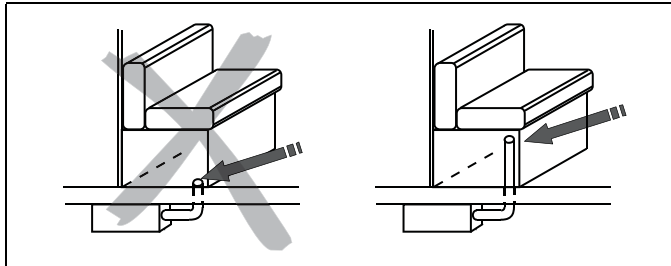


Fig. 14: Extended air inlet above floor level

The internal diameter of the air intake hose (when used) has to be 90 mm.

9.1.2. Installation

The length of air intake hose outside the interior shall be as short as possible, ideally less than 1 m.

This is to avoid heat losses and to protect the water pipes from freezing. For the same reason, thermal insulation of the air hose is required.

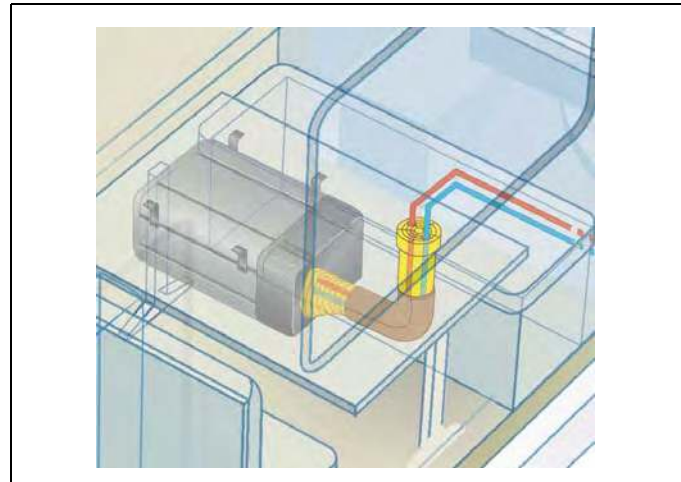


Fig. 15: Heating air intake

- Identify the position of a hole in the floor for the pass through of the air intake hose.
- Drill a hole in the floor with a diameter of 100 mm.
- Seal the gap between floor and hose.
- Insulate the air intake hose on the outside section of the vehicle, to protect the water pipes from freezing.
- Once inside the vehicle, guide the water pipes through the air intake hose.
- Fasten the hose to the wall or floor.

9.2. Hot air distribution

Design an air distribution system that allows an even distribution of heat into all heated sections of the vehicle. Design the system in such a way that the air flow through both heater outlets is quite similar.

See the Webasto air and water heaters accessory catalogue for branches, connecting pieces, Y-junctions, outlets, etc. made of high temperature resistant materials.

The heater's outlet cap (see Fig. 2) provides two hot air outlets, to which the hot air hoses have to be connected.

Both hot air outlets have to be used.

The internal diameter of the main section of the two hot air channels has to be 80 mm.

Guide the hot air with 80 mm hoses directly from the heater into the interior.

- Connect the 80 mm hoses to the outlet cap (see Fig. 2) of the heater.
- Connect the whole air distribution system using air dividers and reducers. Drill holes in furniture and floor where necessary. Through an appropriate selection of branches and diameters the air flow and thus the heat flow can be influenced.
- Seal the gap between floor and hose, in case the hose is going from the exterior to the interior of the vehicle.
- Mount Webasto air outlets at the end of each hose.
- Insulate hot air hoses routed outside the vehicle.
- In case hot air hoses inside the interior are NOT running through closed compartments or areas, cover them to prevent damaging the hose and accidental touching.

- Secure the hoses at all connection points with hose clamps.
- Fasten the hoses to the wall or floor using hose clips.

NOTE:

- The length of the hot air distribution hoses (each outlet of the heater) must be at least 0.80 m;
- To minimize thermal losses, the length of hot air distribution hoses running outside the interior should be as short as possible;
- Hose routing: as straight as possible, large curves;
- Avoid compressing or pinching the hot air hoses;
- Not more than 30% of the total number of outlets shall be closable;
- Arrange outlets in such a way that they do not get blocked;
- Free flow into the interior enables the best interior heating and air circulation;
- Position of the outlets close to the floor for best air circulation.

WARNING:

Risk of fire. Only use high temperature resistant Webasto hot air hoses. The hot air opening is to be positioned in such a way that the air is not blown on to any parts that cannot withstand the heat.

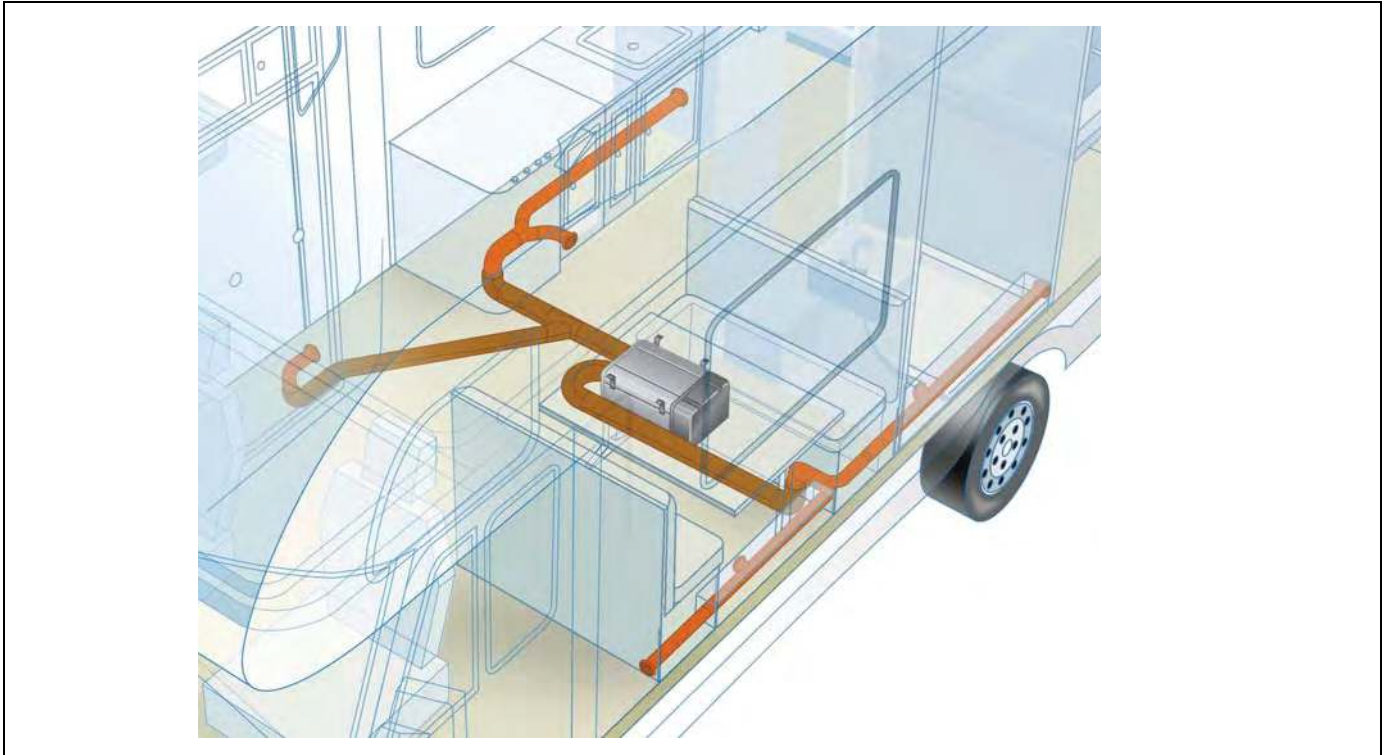


Fig. 16: Heating air distribution

Dark colour = below interior, insulated
Bright colour = inside interior

10 Cooling air system

Cooling air is required to protect the heaters' electronics and motor against overheating. Cooling air shall be taken from outside and not from inside the vehicle. The air has to be discharged outside the vehicle.

The heater is equipped with a motor and a ventilator to transport the cooling air. Besides this, it also provides the heater with combustion air. This motor works independently from the hot air system that has an own motor and ventilator.

10.1. Installation

Mount a grille on the cooling air inlet of the heater.
Also use a cooling air intake protector (optional item) depending on the installation position.

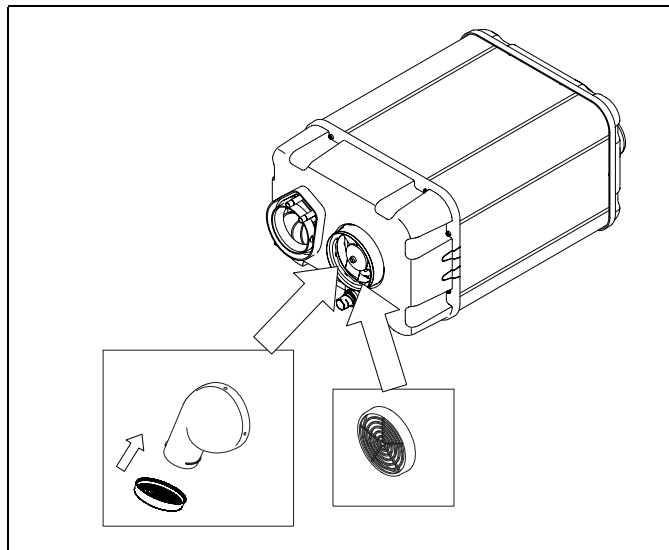


Fig. 17: Cooling air inlet on heater with
- protector and grille (left) or
- grille only (right)

11 Boiler drainage and pressure relief system

The heater is equipped with a

- 1 drainage system that drains the water contents automatically as a protection against frost (boiler water temperature below 6 °C).
It is also possible to drain the unit manually;
- 2 pressure relief system that prevents pressure above 4 bar inside the boiler.

In both cases, water escapes via hoses exiting at the bottom of the heater.
The water is discharged under the vehicle.

The hoses from the drain valve (Nr. 9, Fig. 2) and the pressure relief valve (Nr. 10, Fig. 2) shall be positioned and guided in such a way that water will run without obstructions out of the vehicle to the ground.

12 Fuel supply

12.1. General

The fuel is typically taken from the vehicle's own fuel tank. It may also be taken from a separate fuel tank (accessory). The permissible values for the maximum pressure at the fuel pump entry side are shown in Fig. 18.

NOTE

A sign must be affixed to the fuel filler neck warning that the heater must be switched off before refuelling.
A sticker is included.

Internal diameter, $i\varnothing$	= 2 mm
Length suction side, l_1	≤ 1.4 m
Length pressure side, l_2	≤ 6 m

Permissible fuel intake height H [m]	at max. pressure [bar] in fuel line
0.0	1
1.0	0.91
2.0	0.83

Maximum fuel intake height S [m]	at max. negative pressure [bar] in the fuel tank
0.0	-0.10
0.5	-0.06

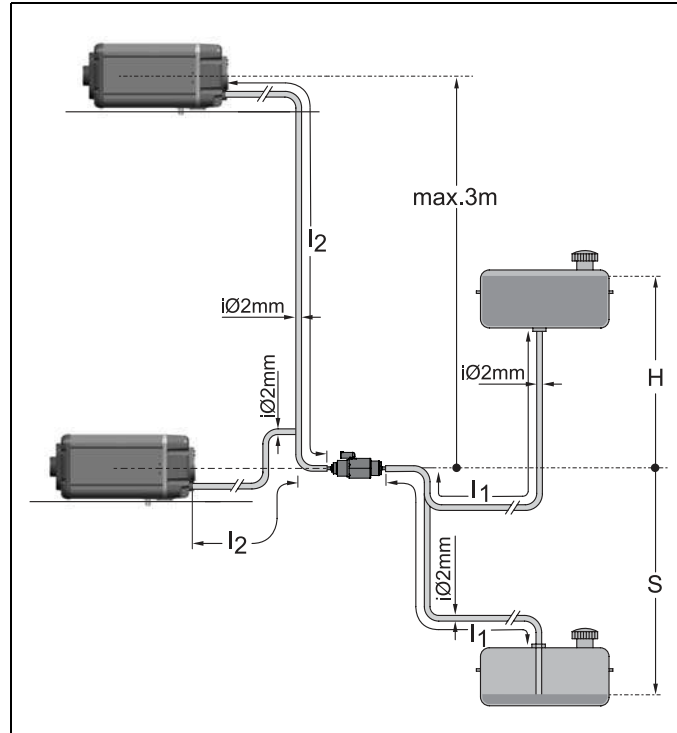


Fig. 18: Fuel supply

12.2. Fuel pump

The DP40 fuel pump is a combined delivery, metering and a shut-off system and is subject to certain installation criteria (see Fig. 18 and Fig. 20).

12.2.1. Installation location

The fuel pump and fuel lines must not be installed within the range of radiated heat from hot vehicle parts. A heat shield must be used if necessary.

The fuel pump must be mounted outside the vehicle.

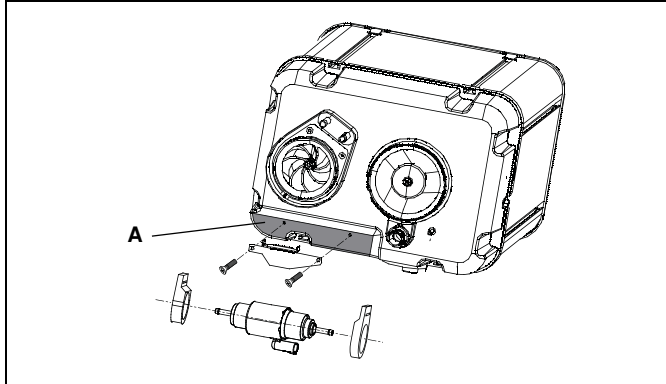


Fig. 19: Mounting location (A) for fuel pump on heater

Mounting the fuel pump on the heater (See Fig. 19, location marked with A) is only allowed if the length of the fuel line's suction side is not more than 1.4 m.

In case the length of the fuel line's suction side is more than 1.4 m, the fuel

pump has to be installed separate from the heater. In this case, extend the wiring harness for the fuel pump.

12.2.2. Installation and attachment

The fuel pump installation position is limited as shown in Fig. 20 in order to ensure effective automatic bleeding. The fuel pump has to be assembled in a horizontal position ($0 \sim 5^\circ$).

It should be mounted with a vibration-damping mounting for noise reduction.

Respect the direction of the fuel flow. The arrow on the pump needs to point towards the heater.

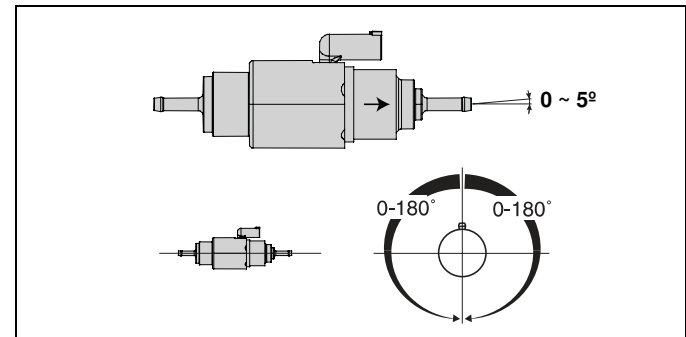


Fig. 20: Fuel pump DP 40 installation position

12.3. Fuel extraction.

For recommended fuel extraction solutions see Webasto camping catalogue.

- 1 Installation into the vehicle's fuel line.
 - a) T-off from the fuel line to the vehicle's engine if no feeding pump is installed inside the tank.
 - b) T-off from the fuel return line to the tank, if a feeding pump is installed in the tank.
 Make sure that the fuel return line inside the tank goes nearly to the bottom of the tank, otherwise the heater will receive no fuel if the tank's fuel level is low.

Note:

Both options are only feasible, if the fuel pressure at the connection point to the fuel line does not exceed the in chapter 12.1, "General" specified values.

The line from the T-junction towards the fuel pump should run downwards.

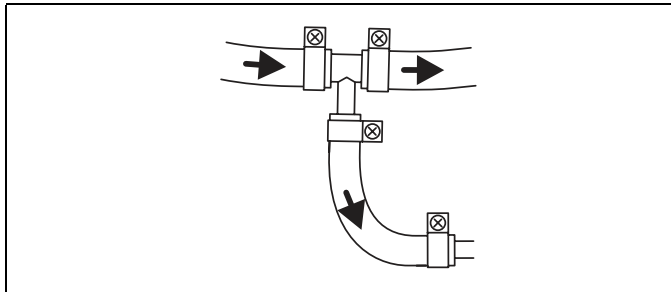


Fig. 21: Connection to vehicle's fuel line with a Webasto fuel connector

- 2 The fuel can be taken from the vehicle's own fuel tank or from a separate tank with a fuel extractor. See Fig. 22.
 Install the fuel extractor into the tank extracting device, which has to be dismantled first. When drilling the hole, make sure to use a plain and even surface for proper sealing.

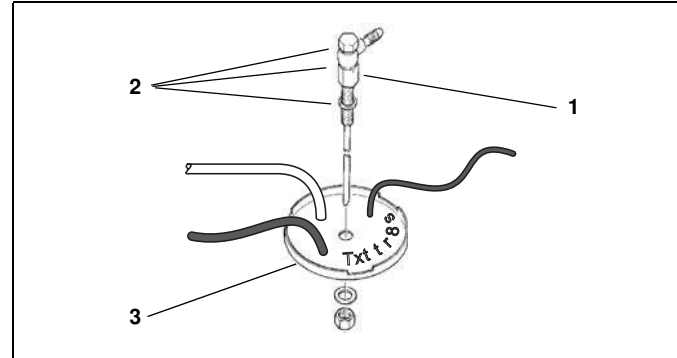


Fig. 22: Webasto fuel extractor

- 1 - fuel extractor
 - 2 - sealing ring
 - 3 - tank extracting device
- 3 Webasto fuel extractor.
See Fig. 23.

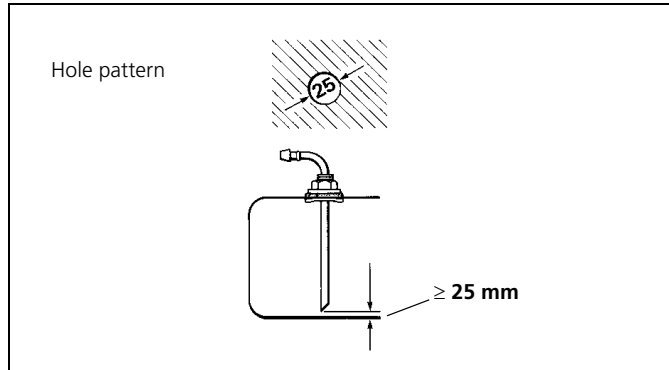


Fig. 23: Webasto fuel extractor

Take care of installation instructions of each type fuel extractor.

12.4. Fuel lines

Only steel, copper and plastic lines of plasticised, light and temperature-stabilized PA 11 or PA 12 (e.g. Mecanyl RWTL) pursuant to DIN 73378 may be used as fuel lines. Since the lines normally cannot be routed with a constant rising gradient, the internal diameter shall not exceed 2 mm. In larger fuel lines air or gas bubbles would accumulate and cause malfunctions.

12.4.1. Routing

The lines should be routed upwards from the fuel pump to the heater to facilitate automatic bleeding.

Avoid passing or crossing of hot areas (e.g. crossing of exhaust line) at a distance of less than 100 mm without using thermal shields.

Fuel lines must be tightened to the vehicle's chassis to prevent sagging. They must be installed in such a way that they cannot be damaged by flying road chippings or high temperatures (exhaust line). The fuel lines must be secured at the connections using hose clips to prevent slipping.

12.4.2. Connecting two pipes with a hose

The correct procedure for connecting fuel lines with hosing is shown in Fig. 24.

Ensure that there are no leaks.

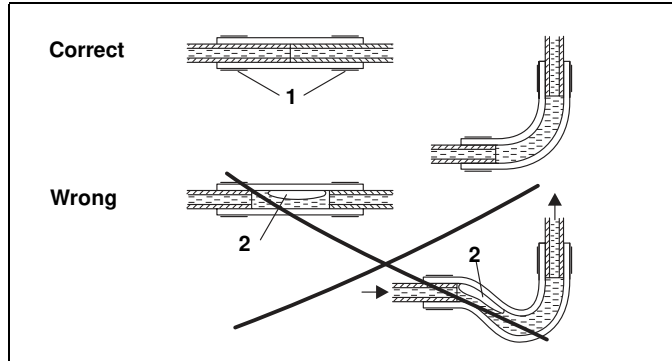


Fig. 24: Pipe / hose connection

1 = clip

2 = air or gas bubble

12.5. Fuel filter

Do not use a fuel filter in the heater's fuel system because humidity in the air bubbles may freeze in winter and block the fuel flow completely.

13 Combustion air supply

13.1. General

The combustion air always has to be taken from outside the vehicle; not from areas occupied by people. See chapter 2, "Statutory regulations governing installation", directive 2001/56/EU.

Length of the combustion air inlet line in total (with silencer):	max. 2.0 m
Internal diameter of the line:	22 mm
Minimum bending radius:	50 mm
Total bends combustion air line:	max. 270°

NOTE:

An intake silencer must be fitted to reduce noise levels.

The combustion air must be taken from a position that is as cool as possible and protected from splashing water.

13.2. Combustion air intake line

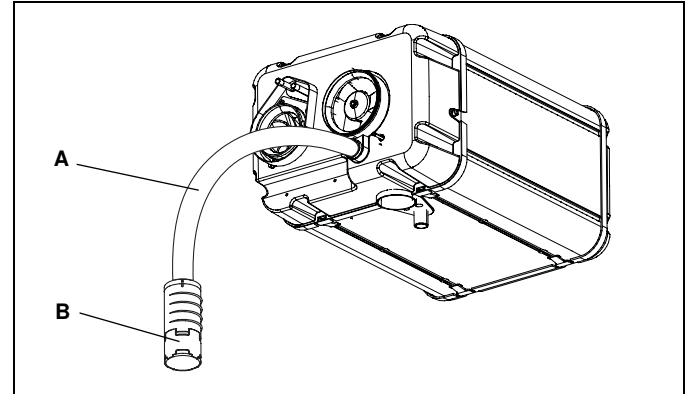


Fig. 25: Combustion air intake

A = connection to heater \varnothing 22 mm.

B = silencer

An intake line is required for combustion air.

NOTE:

Avoid compressing or pinching the air intake line.

NOTE

The intake opening for combustion air must be located so that it cannot become clogged with dirt or snow. See Fig. 26.

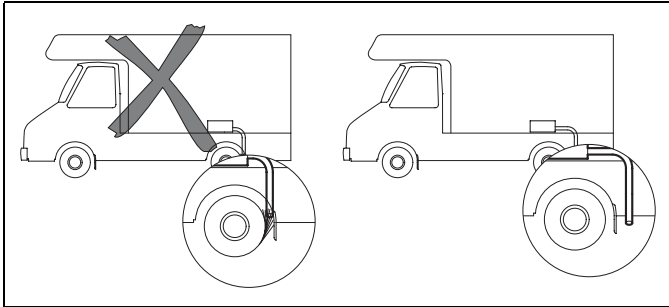


Fig. 26: Avoid the line becoming clogged with dirt

NOTE

The intake opening for combustion air must not point in the direction of travel. See Fig. 27.

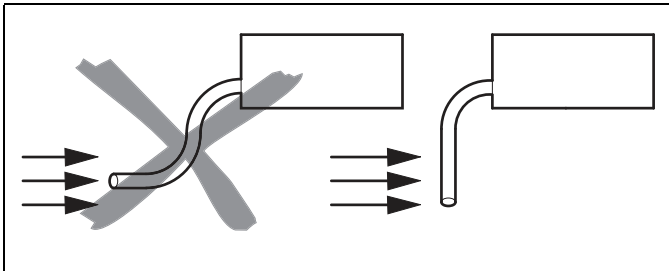


Fig. 27: The line must not end pointing towards the front of the vehicle

Combustion air intake hose should point downwards from the heater. If this is not possible, make a condensate drain hole with a diameter of 4 mm at its lowest point. See Fig. 28.

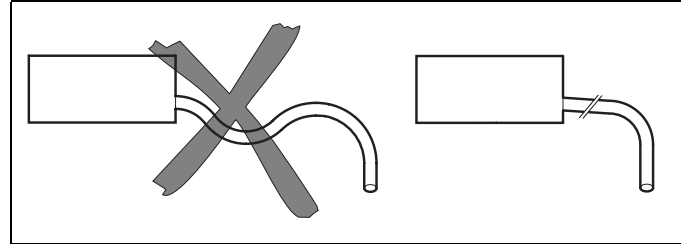


Fig. 28: Prevent the formation of condensate

14 Exhaust system

14.1. General

See chapter 2, "Statutory regulations governing installation" for requirements on exhaust system.

NOTE:

An exhaust silencer must be fitted to reduce the noise level.

The silencer should ideally be installed near the heater (not more than 0.20 m distance); followed by a long tail pipe (min. 1 m) for best noise level reduction.

The silencer may be mounted on the vehicle chassis. It may also be mounted on the heater (see Fig. 29).

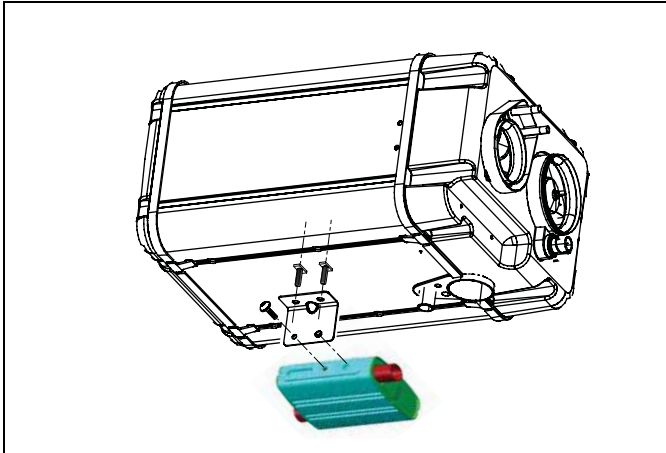


Fig. 29: Exhaust silencer mounted on heater

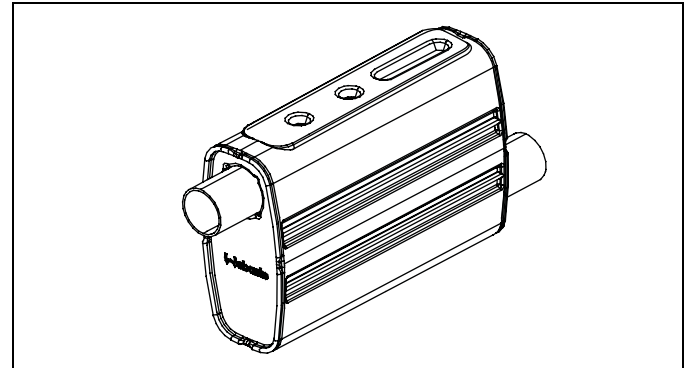


Fig. 30: Exhaust silencer (arbitrary flow direction)

14.2. Exhaust line

As exhaust lines use flexible piping of stainless steel or rigid pipes of stainless steel with a minimum wall thickness of 1.0 mm. The exhaust pipe has to be connected to the heater using a Webasto exhaust clamp. An exhaust assembly including a special bracket to mount the silencer on the heater can be used.

Length of the exhaust line in total (with silencer):	max. 3.0 m
Internal diameter of the line (stainless steel):	22 mm
Minimum bending radius:	50 mm
Total bends exhaust line:	max. 270°

- Max. one piece cast 90° elbow is allowed. Pipes with more than one 90° bends are allowed. See Fig. 31.
- The exhaust line should point from the heater downwards to let condensation water escape (see Fig. 32). If this is not possible, a condensate drain hole with a diameter of 4 mm must be drilled at its lowest point.
- The line must not point to the front of the vehicle. See Fig. 34.
- **Avoid the formation of an exhaust bag under the vehicle. See Fig. 34.**

- Discharge direction: 45 ~ 70°. A fixing bracket is required no further than 150 mm from the end of the exhaust pipe to ensure that the angle 45 ~ 70° is achieved.

IMPORTANT

If the exhaust pipe end is other than as shown, it will pose a fire risk. See Fig. 34.

- Assemble the line in such a way that it cannot set fire to anything.
- The line must be located so that it cannot become clogged with dirt or snow. See Fig. 33.
- Make sure that the exhaust outlet is not positioned directly below a door, window and other ventilation openings and that exhaust fumes will not be blown into a tent besides the vehicle.
- Exhaust outlet should be on the opposite side of the entrance door of the living cell.
- Avoid that the exhaust pipe can touch ground or pavement, including traffic calming measures.

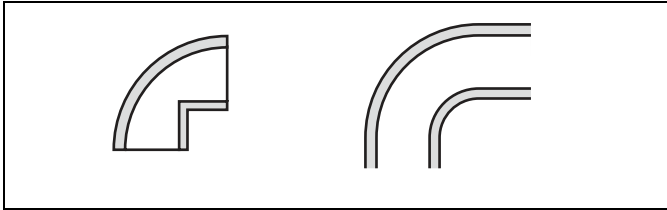


Fig. 31: Elbows, cast (left) and bent pipe (right)

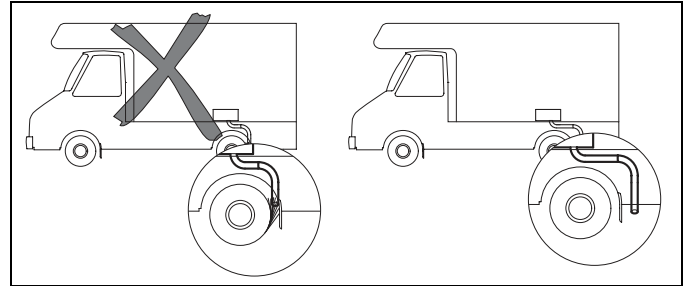


Fig. 33: Avoid the line becoming clogged with dirt

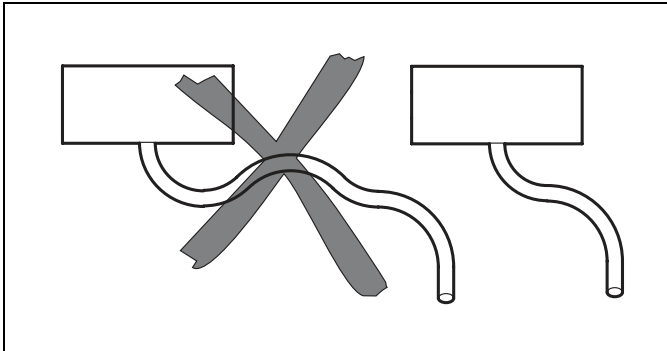


Fig. 32: Prevent the formation of condensate

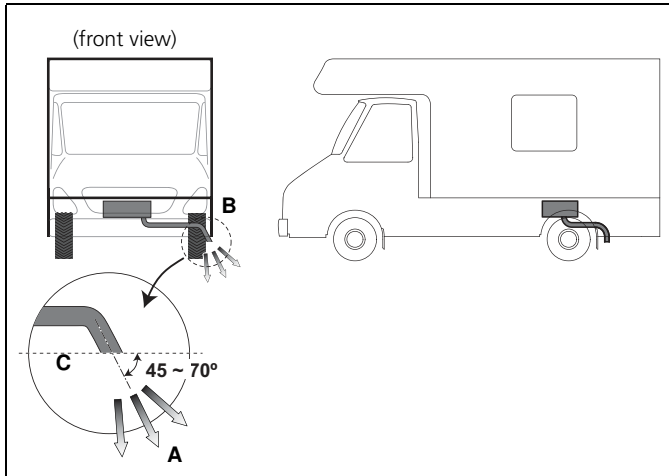


Fig. 34: Location and direction of exhaust

- A: Flow exhaust fumes 45 ~ 70° downwards and at side to avoid exhaust bag under vehicle
- B: End exhaust line nearly aligned with side of vehicle body
- C: End exhaust line cut horizontally to avoid that ambient wind can enter

15 Electrical connections

The electrical connection is made as shown in Fig. 35.

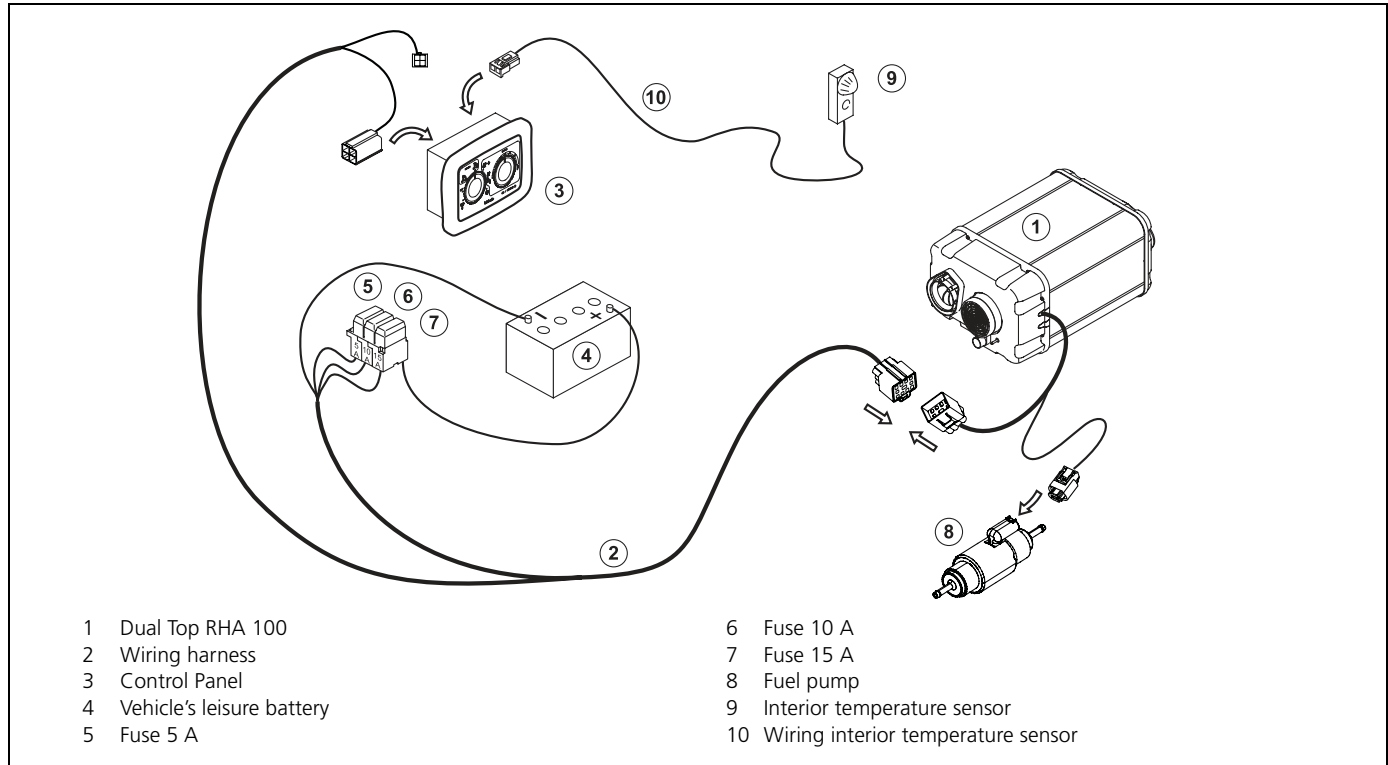


Fig. 35: Schematical electrical connection

15.1. Supply voltage connection

Use 12 V DC only.

Ensure that you take it directly from the vehicle's leisure battery.

Without any additional switches, so, just the Control Panel's switch.

Switching the heater on and off shall only be done with the Dual Top Control Panel.

The fuse holder may only be installed in the interior of the vehicle.

Use fuses:

- 15 A
- 10 A
- 5 A

Each fuse shall be connected to the correct cable (color).

5 A: red / blue cable

10 A: red / black cable

15 A: red cable.

Make sure that yellow part is pushed into each fuse holder after connecting cables. This prevents that cables may drop out when inserting or replacing a fuse.

See Fig. 37.

NOTE:

When you replace a fuse, make sure that the Dual Top is switched off.

WARNING:

In case of electrical deviations a fuse other than specified may cause fire.

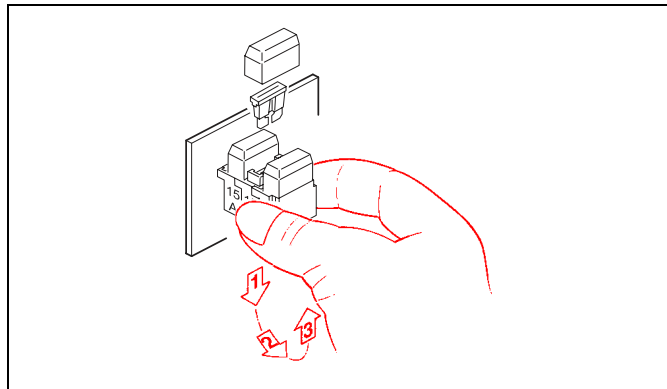


Fig. 36: Remove the fastening plate on the fuse holder

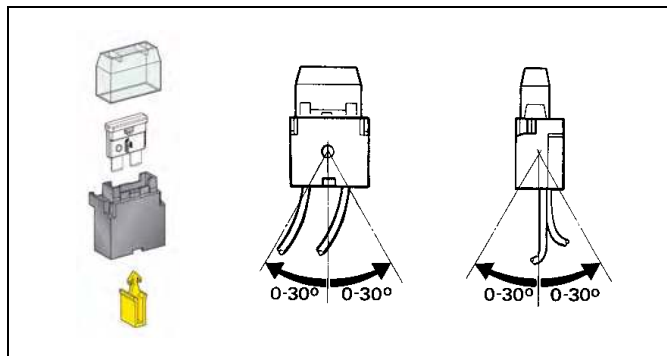


Fig. 37: Fuse holder, installation position

15.2. Interior temperature sensor

The remote interior temperature sensor must be installed at medium height in the interior on vertical surfaces.

Avoid that the interior temperature sensor is:

- in the direct current of hot air (from the vehicle's own heating system or the hot air heater);
- close to heat sources;
- placed in direct sunlight (for example on the dashboard);
- installed inside a locker;
- installed behind curtains or the like.

Make sure that cabin air can flow freely around the sensor.

Install the remote interior temperature sensor in the interior:

- Drill a 3 mm hole just below the position of the sensor.
- Lead the sensor cable through the hole.
- Fasten the sensor.
- Route the cable to the place of the Control Panel.
- Connect the plug to the cable.
- Fasten wires to the wall or floor.

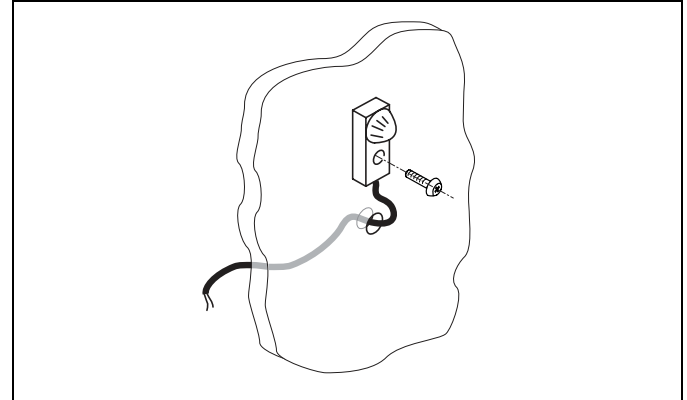


Fig. 38: Interior temperature sensor

15.3. Control Panel connection

- Determine the best position of the Control Panel.
The Control Panel must be located in the driver's field of view.
It should be visible and accesible for the operator.
Not accesible for children.
-15° < best viewing angle < 15°.
- Make sure that there is enough space behind the place where the Control Panel shall be placed.
- Make a hole where the Control Panel shall be placed.
- Connect plug X4 (4 poles) of the wiring harness to the Control Panel.
- Connect the plug X0 (2 poles) of the interior temperature sensor to the Control Panel.
- Attach the Control Panel with 4 screws.
- Click the cover onto the Control Panel.

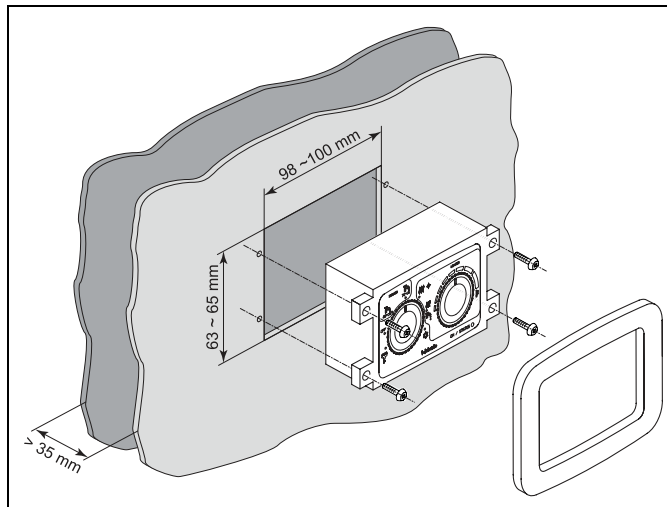


Fig. 39: Installation Control Panel

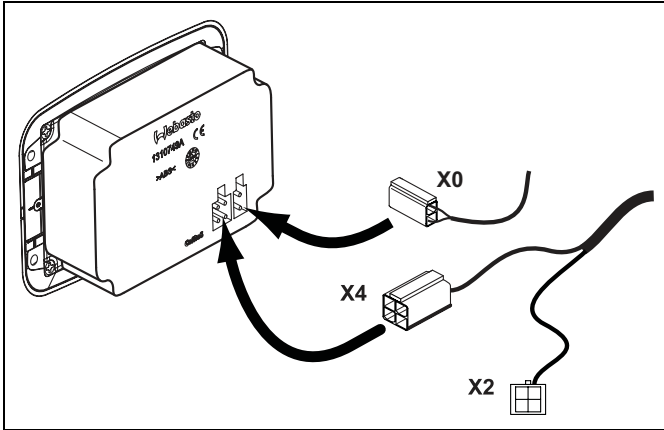


Fig. 40: Electrical connections Control Panel

NOTE:

See Fig. 40.

Connector X2 is for:

- Webasto Thermo Test PC-diagnosis and
- Webasto Telestart / Thermo Call
(for optional programmable Control Panel).

16 Circuit diagram

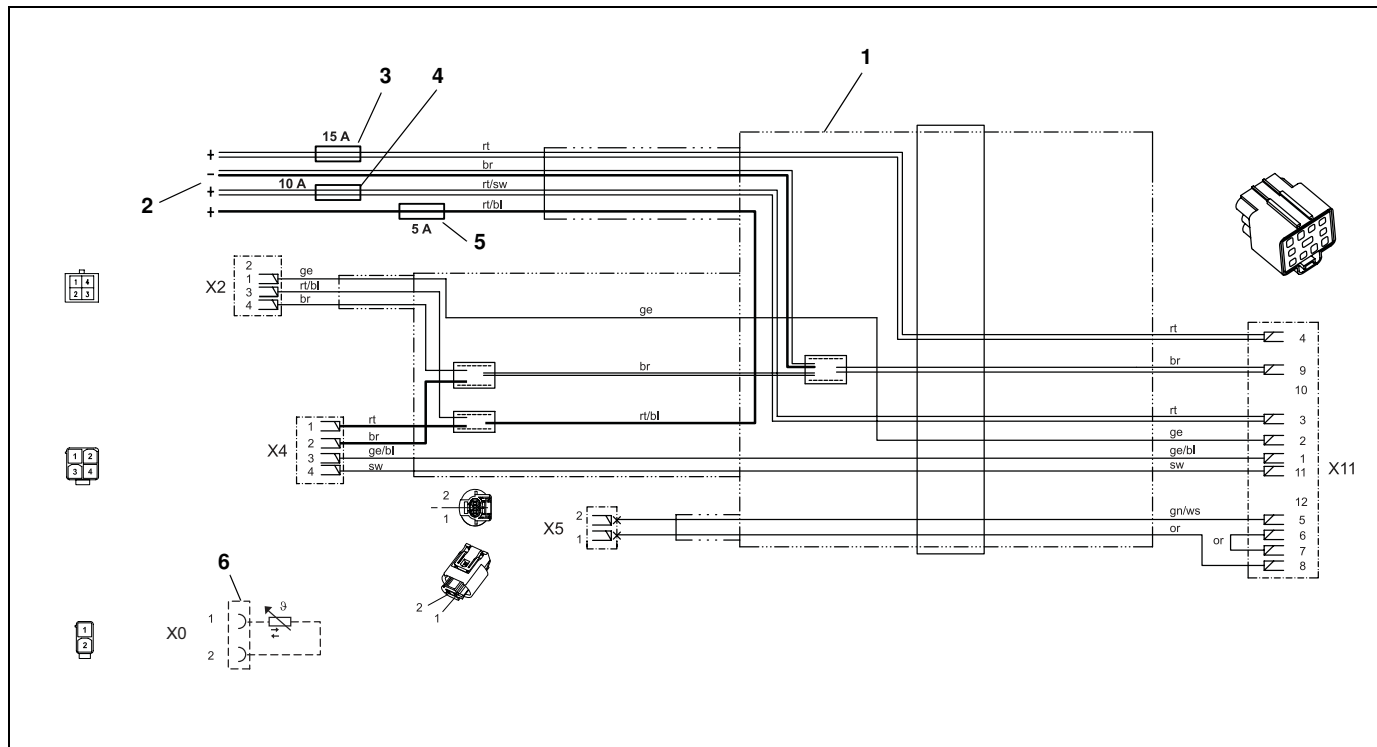







Fig. 41: Circuit diagram for Dual Top RHA 100

16.1. Legend for circuit diagram

- 1 Wiring harness
- 2 Vehicle's leisure battery
- 3 Fuse 15 A
- 4 Fuse 10 A
- 5 Fuse 5 A
- 6 Interior temperature sensor

Cable cross-sections		
	< 7.5 m	7,5 - 15 m
	0.75 mm ²	1.0 mm ²
	1.0 mm ²	1.5 mm ²
	1.5 mm ²	2.5 mm ²
	2.5 mm ²	4.0 mm ²
	4.0 mm ²	6.0 mm ²

Cable colours	
bl	blue
br	brown
ge	yellow
gn	green
gr	grey
or	orange
rt	red
sw	black
vi	violet
ws	white

Item	Description	Comment
X0	Plug connector, 2-pin	To Control Panel
X2	Plug connector, 4-pin	To PC-diagnosis / Telestart / Thermo Call
X4	Plug connector, 4-pin	To Control Panel
X5	Plug connector, 2-pin	To fuel pump
X11	Plug connector, 12-pin	To heater Dual Top RHA 100

17 Starting the heater for the first time

- After you have installed the heater, bleed the fuel supply line carefully.

NOTE:

Due to the low fuel consumption the heater may have to be switched on several times to fill the fuel line completely.

- **Disinfect and rinse the entire water supply system.**
See Operating Instructions, chapter Maintenance, how to disinfect the water supply system.
- Fill the water tank and water system.
Use drinking water only!
Use a clean hose, that is rinsed thoroughly (approx. 30 sec.)
Bleed the water lines.
- Perform a heater test to check all connections for leaks and to ensure that they are secured. If the heater suffers a fault during operation, the fault must be located and remedied.
See Operating Instructions.
- Check the manual drainage function with the Control Panel.

18 Fault lock-out

The heater is able to identify faults on individual components and during the operation.

The Control Panel gives out the fault code in a flashing mode.

After a series of 5 fast GREEN flashes, the fault code output will be a repeated sequence of long RED flashes. The meaning of the number of red flashes is shown in the following table.

After that, again there will be 5 fast GREEN flashes.

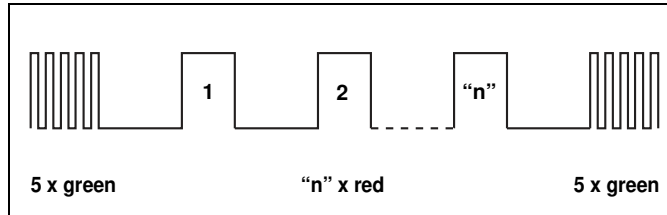


Fig. 42: Example of fault code

Rectify the cause of the fault.

To reset the fault, switch the heater off and on briefly (at least 5 seconds).

If serious malfunctions such as overheating or failure to start reoccur, the heater is locked and can be put back into service by deleting the failures.

Do this by disconnecting the power supply (e.g. by removing all 3 fuses) while the appliance is switched on (see Operating Instructions, mode selector knob in position 1, 2, 3, 4 or 5), but the heater is not running (to

be judged by the sound of the heater).

Deleting failures can also be done with the Webasto Thermo Test PC-Diagnosis.

If a fault occurs, the heater stops. In case of electrical safety/drain valve fault (17 red flashes), heating of the interior is still possible.

Number of RED flashes	Meaning	Remedy
00	No communication between Control Panel and heater, or error Control Panel	First, remove fuses 15A and 5A. Then put in fuse 15A, followed by fuse 5A. Check connections of Control Panel. Check fuse 15A. Check wiring harness. Contact Webasto.
01	No start (after 2 attempts to start)	Check fuel supply (enough fuel, at least 8 ltr.; check fuel connection and tubes), reset heater (by switching off for at least 30 sec.)
02	Flame failure Restart not successful	See fault code 01
03	Under voltage or over voltage	Charge battery or connect to another power source (12V DC), reset heater (by switching off for at least 5 sec.)
04	Fuel pump disconnection / short circuit / overheating	Check fuel pump cable and connectors, check for overheating (see faults 06 and 07), reset heater (by switching off for at least 5 sec.)
05	Hot air motor fault: disconnection / short circuit / fan speed out of range / fan blocked	Ensure that hot interior air fan can rotate freely, remove possible blocking objects, reset heater (by switching off for at least 5 sec.)
06	Overheating or exceeding gradient water temperature sensor	Check water level, reset heater (by switching off for at least 5 sec.) or select winter mode without hot water production
07	Overheating or exceeding gradient hot air temperature sensor	Ensure that hot air can flow freely, air intake and outlets are not blocked. Reset heater (by switching off for at least 5 sec.)
08	Overheating of heaters' control unit	Ensure that cooling air can flow freely, reset heater (by switching off for at least 5 sec.)
09	Combustion air motor fault: disconnection / short circuit / overload / blocked	Ensure that cooling fan can freely rotate, remove possible blocking objects. Check fuse 15A.
10	Control unit fault / heater locked	Put heater back into service (see above this table) and restart heater. Contact Webasto
11	Interior temperature sensor disconnection or short circuit	Check routing of cable, avoid that it is pinched or crushed, check the connector behind the control panel. Reset heater (by switching off for at least 5 sec.)
12	Hot air temperature sensor disconnection / short circuit	Reset heater (by pressing OK or switching off for at least 5 sec.). Contact Webasto
13	Water temperature sensor disconnection / short circuit	See fault code 12
14	Glow plug / flame detector disconnection / short circuit	See fault code 12

Number of RED flashes	Meaning	Remedy
15	Early flame detection	See fault code 12
17	Electrical safety/drain valve disconnection / short circuit	See fault code 12

19 Validation and commissioning

International service and warranty

All Dual Top installation/application releases shall be commissioned and validated by authorized and certified technician according Dual Top Commissioning & Validation (DCV) report and completely documented. In case of OEM installations this applies always but only for the first released representative applications. Installer shall deliver the documentation and send this to the subsidiary for registration into central intranet server and to support the quality of international service for the customer.

Dual Top systems being validated comply with International Webasto Warranty Terms & Conditions. This means that the application can be offered to the Webasto Recreational Vehicle Service Network worldwide and that repairs will be processed according the national warranty conditions.

Warranty Card / Dual Top Commissioning (DCV) Certificate

For this purpose there are 2 documents (A and B) that shall be supplied:

- **Warranty Card** (see booklet Operating Instructions)

Consists of 2 parts:

WARRANTY CERTIFICATE:

Should remain with customer (in booklet).

(A) CONTROL CARD:

To be sent by customer to Webasto Product International BV, The Netherlands.

Installer shall complete for customer with technical information, installation date and stamp.

Installers keeps a copy.

- **(B) DCV Certificate**

This certificate shall be completed / signed by validation authority and supplied to subsidiary. Blank DCV Certificates can be downloaded from Webasto Dealer Portal:

<http://dealers.webasto.com>

20 Technical data

Except where limit values are specified, the technical data refer to the usual heater tolerances of $\pm 10\%$ at an ambient temperature of $+20\text{ }^{\circ}\text{C}$ and at the rated voltage and in rated conditions.

20.1. Fuel for Dual Top RHA 100

The diesel fuel specified by the manufacturer must be used. Class EL heating oil, L heating oil or PME (bio-diesel) must not be used. Fuel additives have no negative influences on the heater. If fuel is extracted from the vehicle's tank, follow the additive instructions issued by the vehicle manufacturer.

After changing to low-temperature fuel, the heater must be operated for approx. 15 minutes so that the fuel system is filled with the new fuel.

20.2. Technical data

Heater	Operation	Dual Top RHA 100
Type approval heater: EMC:		e1 00 0195 e1 03 5000
Model		Air heater with evaporator burner
Heat output	Control range	1.5 - 6.0 kW
Fuel		Diesel, DIN/EN 590
Fuel consumption	Control range	0.17 - 0.65 l/h
Rated voltage		12 V
Operating voltage range		10.5 - 15 V
Current input at 12V	Summer mode Winter mode, heat and hot water Stand-by	< 1 A 0.5 ~ 7 A 0.001 A
Rated power consumption	Control range	15 - 65 W (EN 1646)
Max. ambient temperature: Heater: - Operation - Storage Control Panel: - Operation - Storage		-40 ~ +50 °C -40 ~ +85 °C -40 ~ +75 °C -40 ~ +85 °C
Max. altitude (guaranteed function)		2,200 m
Adjustment range for interior temperature	Control range	+5 ~ +35 °C
Delivery rate for hot air (free blowing without warm-air duct)	Maximum	> 200 m ³ /h
CO ₂ in exhaust gas (permitted function range)	2 kW 6 kW	5.0 ~ 8.0 9.0 ~ 13
Water contents		11 l
Water system pressure		max. 4 bar
Overpressure valve		4.0 bar
Pressure water pump, central water supply	Maximum	2.5 bar

Heater	Operation	Dual Top RHA 100
Heater dimensions		Length: 530 ± 2 mm Width: 352 ± 1 mm Height: 256 ± 1 mm
Weight (w/o water contents)		20 kg

In multilingual versions the German language is binding.

Bei mehrsprachiger Ausführung ist Deutsch verbindlich.

Nel caso di una versione plurilingue il tedesco è vincolante.

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