Workshop Manual

Dual Top ST 6 / 8

English

Table of Contents

1 Introduction

1.1 About this document

1.1.1 Purpose of the document

This workshop manual is designed to assist trained personnel with maintenance of the Dual Top ST.

The document is part of the product and contains all the information, settings and instructions necessary to maintain the product.

1.1.2 Using this document

Before working on the device, you must:

- Read and understand this workshop manual before repairing the product.
- Read and observe important safety instructions.
- Read and observe Operating instructions.
- Read and observe Installation instructions.

1.1.3 Use of symbols and highlighting

DANGER

This signal word denotes a hazard with a high degree of risk which, if not avoided, may lead to death or serious injury.

CAUTION

This signal word denotes a hazard with a low degree of risk which, if not avoided, may lead to minor or moderate injury.

NOTE

This symbol denotes a special technical feature, or (if not observed) potential damage to the product.

This symbol refers to separate documents which may be enclosed or can be requested from Webasto.

1.2 Using the Integrated Air and Water Heater

The Dual Top ST integrated air / water heaters are designed to heat and to provide hot water in motor homes and similar vehicles.

The heaters operate independently of the vehicle engine and are connected to the fuel tank and the service battery of the vehicle in each case.

The heaters are not designed for heating vehicles transporting hazardous substances.

1.3 Additional documentation to be used

This workshop manual contains most of the information and instructions required for repairing the Dual Top ST integrated heaters.

However, it is necessary to heed additional documentation.

The operating and installation instructions and the installation suggestion for the specific vehicle (if available) shall also be used.

2 Safety

The general accident prevention regulations and valid operational safety instructions must be observed. "General safety requirements" that extend beyond the framework of these regulations are specified in the following. The special safety requirements that pertain to this workshop manual are highlighted in the individual chapters and procedural descriptions.

2.1 Statutary regulations governing installation

Dual Top ST 6 / 8 heaters have been type-tested and approved in accordance with the regulations ECE-R 10 (EMC) and ECE-R 122 (heaters).

For permit numbers see chapter 11, "Technical Data."

Installation is governed by the provisions in points 5 (Part 1) and Annex 7 of Regulation ECE-R 122 over any other.

NOTE

The provisions of these regulations are binding within the scope of EU Regulation 2018/858 and should also be observed in countries where there are no special regulations!

See also:

Excerpt from the regulations ECE-R 122 points 5 (Part I) and Annex 7 for the installation of heaters

Installation of the Dual Top ST 8 heater and related components must be in accordance with IEC 60364 (“Electrical installations in caravan parks and caravans”).

WARNING

Maintainance work on electrical systems with a voltage of 230 V must only be carried out by appropriately qualified experts.

CAUTION

Failure to observe 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 Webasto service parts. This will result in the invalidation of the type approval for the heater and therefore of its homologation / type license.

2.2 Qualification of workshop personnel

The workshop personnel must have the following qualifications:

- Successful completion of the appropriate Webasto training.
- Corresponding qualification for working on technical systems.

DANGER

Any work on the Dual Top ST must be carried out by electricians qualified to carry out electrotechnical work on high-voltage systems in vehicles.

2.3 Working on the heater

NOTE

Before dismantling the heater, disconnect the heater’s power supply from the vehicle battery, or remove fuses **F1** and **F3**.

NOTE

Always carry out a visual inspection before starting repair work:

- Check the coolant system and fuel system for leaks.
- Check the combustion air and exhaust pipe for damage and ensure they are clear.

NOTE

- Collect the coolant running out of the system in a suitable container.
- Block or disconnect coolant hoses.
- Dispose of coolants in an environmentally friendly way.

You must not disconnect the main battery power as long as the heater is operating or after running, due the risk of the heater overheating and consequently tripping the overheating safeguard.

After the heater and all coolant-carrying components have been installed, fill the entire coolant system according to the vehicle manufacturer's specifications.

Bleed the system according to the vehicle manufacturer's specifications and check for leaks with the default system pressure of the vehicle.

NOTE

Replace component:

Within the warranty period, send in only the defective component (not the entire heater) to Webasto.

NOTE

When on-board power supply is applied, never disconnect the connector from the heater.

2.4 Working on the vehicle

The temperature of the heater must not be over 85 °C when switched off. See chapter 11, "Technical Data" on page 37.

2.5 Heater Test Run

DANGER

Do not operate the heater in enclosed spaces (such as garages) due to the risk of poisoning and asphyxiation.

2.6 Checks

Webasto recommends to carry out the following servicing jobs before and after each heating period:

1. Read out the fault code memory.
2. Clean heater exterior (make sure no water gets in).
3. Check the electrical connections for contact corrosion and firm seating.
4. Check exhaust gas and combustion air line for damage and ensure that they are clear.
5. Check the fuel line and filters for leaks.
6. Check the coolant circuit and coolant pump.
7. Check hoses for cracks.
8. If fitted and necessary, change the fuel filter.
9. Commission the heater.

2.7 General safety information

Follow the safety information described in the additional documentation thoroughly.

Route the opening of the exhaust pipe upward, to the side or, with exhaust gas routing under the vehicle floor, up to the proximity of the side or rear limitation of the cab or the vehicle.

Parts important for vehicle operation must not be impaired from functioning. Condensate or water must not collect in the exhaust pipe. Drain holes are allowed.

Position the electrical lines, switches and control units of the heater in the vehicle so that their proper operation cannot be impaired under normal operating conditions.

For the routing of fuel lines and the installation of additional fuel tanks, refer to the detailed descriptions in the installation instructions.

The main points are:

- Design the fuel lines so that twisting of the vehicle, movements of the engine, etc. have no negative effect on the service life. Protect the fuel lines against mechanical damage.
- Protect fuel-carrying parts against heat that could interfere with operation. Position fuel-carrying parts so that dripping or evaporating fuel can neither collect on hot parts nor ignite on electrical devices.

The heat exchanger on Dual Top ST heaters is exposed to very high thermal stress and must be replaced by genuine Webasto spare parts ten years after these are used for the first time. The heater must then be provided with a sign which bears the date of sale and the word "Original spare part".

When replacing the heat exchanger, you must also replace the overheating protection element (temperature sensor) in order to prevent possible faults when using the old temperature sensor.

If installed inside, the Dual Top ST heaters are prepared for installation and sealing directly on the cab floor. Webasto accessories do not allow detachable connections of the combustion air and exhaust lines inside the vehicle. You must install a seal between the heater mounting and the vehicle floor to prevent harmful emissions entering the vehicle.

Position the cold air, cooling air, and combustion air intake openings so that no water can penetrate during a water crossing permissible for the respective vehicle. You must switch off the heater at filling stations and tank farms (fuel storage areas) due to the risk of explosion.

DANGER

Danger of explosion!

- ▶ Do not operate the heater in locations where highly flammable gases or dust may form, or in locations where highly flammable liquids of solid materials are stored, such as fuel, coal and wood dust, grain warehouses, cardboard, paper, dry grass and leaves.

DANGER

Do not operate the heater in enclosed spaces (such as garages) due to the risk of poisoning and asphyxiation.

In case of longer lasting smoke emission, unusual combustion noises or fuel odours, shut down the heater by removing the fuse. You must not return the heater to operation again until it has been checked. Claims can only be made if it can be verified that the claimant has complied with the servicing and safety instructions.

Installation specification for Webasto fuel tank for the fuel supply of heaters in vehicles:

- You must not install the heater in the passenger or driver's compartment of motor coaches.

- You must not locate the fuel filler neck within the passenger or driver's compartment on the vehicle.

The fuel lines (Mecanyl hose) must not be in direct contact with the exhaust pipe and must be thermally insulated if necessary, to avoid the risk of fire.

Connect all fuel-carrying lines leak-tight. Fuel-carrying lines must not be damaged and must be inspected regularly (at least at the same interval as the vehicle inspection).

NOTE

If damage or leaks are determined in the fuel line, you must not operate the heater until the damage has been repaired.

▶ Switch off the heater by removing the fuse.

Overheating

CAUTION

The air flow through the heater must not be restricted or blocked by highly flammable substances or materials such as rags, cleaning wool, etc.

1. After a switch-off due to overheating, check the air routing for free passage, make sure that any materials which impair the flow of air are removed, and repair any damage to the air routing.
2. Eliminate the heater lock-out by switching the heater off and then on again.

- The air outlet nozzles or air outlets with adjustable flaps must always be opened in such a way that an air flow through the heater is not completely blocked. At least 30 % of the air outlets must be non-closable.
- If you install the heater in a stowage space, make sure that no flammable substances are stored in this space and that the air supply to the heater is not restricted by other materials.
- Secure the air lines firmly on the heater and at all other connection points, such as air outlets using pipe clamps.

ATTENTION

Note the following:

- Do not stand on the heater.
- Do not place heavy items on the heater.
- Do not throw items at the heater.
- Do not place any items, such as clothing, textiles or similar materials over the heater, in front of the hot air inlet or hot air ducts.
- Do not restrict or block the hot air stream from the heater with any flammable substances or materials, such as rags, cleaning wool.
- Do not place flammable or explosive substances and gasses near the heater, nor bring these in contact with the heater, the hot air line, the hot air flow or the exhaust pipe.
- Do not clean the heater with a high-pressure washer.
- Do not switch off the heater with the battery main switch or the battery disconnection switch. This can lead to damage or may negatively affect the function of the heater.

Read the operating instructions before operating the heater.

3 General description

The integrated Dual Top ST 6 and 8 heaters have been designed according to the evaporator principle and mainly consist of:

- the heating air blower assembly (PWM module and motor with heating air blower).
- the combustion and cooling air blower (motor with combustion and cooling air blower).
- the heat exchanger.
- the combustion pipe.
- the control unit.
- the glow plug/flame monitor.
- the boiler.
- the electrical heating elements (not with Dual Top ST 6).
- the housing.

The following parts are located in the heater for control and monitoring:

- a control unit with a temperature sensor and a speed sensor for the cooling air blower (Hall sensor).
- a speed sensor (Hall sensor) for the heating air blower.
- an air temperature sensor.
- an air temperature switch.
- a temperature switch for the heat exchanger.
- a water temperature switch.
- a water temperature sensor.

The fuel supply is ensured externally via a fuel pump

The heater is controlled with an external room temperature sensor.

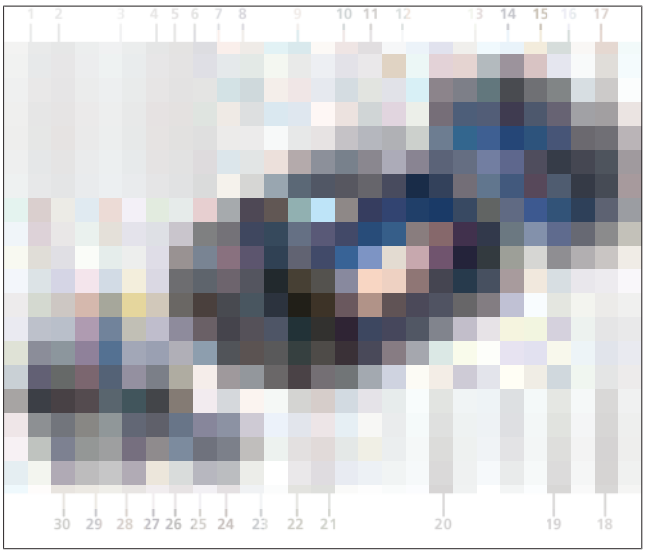


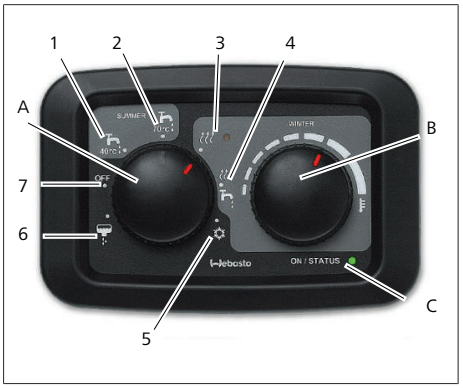
Fig. 1

1	Housing cover with inlet interfaces
2	Solenoid valve
3	Ventilation / overpressure valve
4	Combustion air blower
5	Metal fibre evaporator
6	Heating air blower
7	Water inlet (cold)
8	Water outlet (hot)
9	Boiler
10	Insulating element
11	Heater housing
12	Heat exchanger
13	Combustion pipe
14	Water temperature switch
15	Water temperature sensor
16	Housing cover with hot air outlet
17	Air temperature sensor
18	Air temperature switch
19	Temperature switch for the heat exchanger
20	Electrical heating elements
21	Cooling air outlet
22	Motor for combustion and cooling air blower
23	Combustion air intake
24	Cooling air blower
25	Glow plug/flame monitor
26	Exhaust outlet
27	Control unit
28	Drain hose
29	Fuel line
30	Fuel pump

4 Functional description

The Webasto Dual Top ST integrated heater combines the benefits of an interior heater with a water boiler and contributes to a gas-free motorhome. The Dual Top ST 6 runs with an integrated fuel operated heater. The Dual Top ST 8 can also use electricity as a power source.

Example of the Dual Top ST 6 manual control panel:



Pos.	Description
A	Mode selector knob
B	Interior temperature selector knob
C	Power indicator / fault message display
1	Summer operation mode, water temperature 40 °C
2	Summer operation mode, water temperature 70 °C
3	Winter operation mode, heating **without** hot water production
4	Winter operation mode, heating **with** hot water production
5	Frost protection mode
6	Drainage boiler
7	OFF

Example of the Dual Top ST 6 or 8 programmable control panel:

1	Up - button ▲
2	Down - button ▼
3	Start / Stop / Ok – button
4	Menu / Back / Cancel - button
5	On / Off – button
6	Power indicator / fault indicator (green / red)

Due to its outside installation and its operation with diesel fuel, the Dual Top ST saves valuable stowage space in the cab.

The Dual Top ST modulates the temperature steplessly and precisely for a consistent temperature.

The boiler can be drained simply and directly via the control panel.

Two different frost protection functions protect the Dual Top ST and the vehicle against frost during winter holidays.

The heater detects the difference between the set temperature and the inside temperature and automatically adjusts the required heating capacity.

The programmable control panel enables you to select from a large number of modes for your convenience (see chapter 4, "Operating Instructions" in the document “Operating Instructions”).

Depending on which function you want, hot water **in summer mode**, just heat, or heat and hot water **in winter mode**, several options are available.

4.1 Summer mode

The heater provides hot water. The water is heated up to, and kept at 40 °C or 70 °C / 104 °F or 158 °F.

The heat is produced by a diesel powered burner (Dual Top ST 6 and 8) or an electric heater (Dual Top ST 8). If the combustion burner is selected as the heat source, the device automatically selects the burner setting. Water can also be heated by electricity, 230 V, from an external power supply (Dual Top ST 8).

Dual Top ST 8: low-power = 1,000 W*

A water temperature sensor controls the water temperature. Due to variable operating and environmental influences, small water temperature deviations are possible.

The hot air fan for heating the interior is not activated.

* *The high-power option with 2,000 W cannot be used in summer mode (*Dual Top ST *8).*

4.2 Winter mode (heating without hot water production)

In this mode the heater provides hot air.

Heat is produced by a diesel powered burner (Dual Top ST 6 and 8), an electric heater, or a combination of both (Dual Top ST 8).

For Dual Top ST with a manual control panel:
The desired interior temperature can be adjusted with the interior temperature selector (5 to 35 °C).

For Dual Top ST with a programmable control panel:
To adjust the desired interior temperature, push button (1) ▲ or (2) ▼ (5 to 35 °C).

If the combustion burner is selected as heat source, then the device automatically selects the burner setting, modulating between 1,500 W and 6,000 W, depending on the output requirement (calculated from difference between selected temperature and current interior temperature).

The amount of heat is regulated to reach the preselected interior temperature quickly. After which only a limited amount of power is needed to maintain the interior temperature.

If electricity is used as source of energy, the electric heater heats the air and water at low or high power, depending on the selection. Electricity is taken from an external power supply. (Dual Top ST 8).

If the burner and the electric heater provide the heat, priority is given to the electric heater. This means that the electric heater runs at low or high power (depending on the selection) and the burner provides the rest of the heat if necessary. (Dual Top ST 8).

You can heat the interior with or without water in the boiler.

4.3 Winter mode (heating with hot water production)

In this mode the heater heats the interior and produces hot water.

Heat is produced by a diesel powered burner (Dual Top ST 6 and 8), an electric heater, or a combination of both (Dual Top ST 8).

For Dual Top ST heaters with a manual control panel:
The desired interior temperature can be adjusted with the interior temperature selector (5 to 35 °C).

For Dual Top ST heaters with a programmable control panel:
To adjust the desired interior temperature, push button (1) ▲ or (2) ▼ (5 to 35 °C).

If the combustion burner is selected as heat source, then the device automatically selects the burner setting, modulating between 1,500 W and 6,000 W (Dual Top ST 6) or 1,500 W and 8,000 W (Dual Top ST 8), depending on the output requirement (calculated from difference between selected temperature and current interior temperature).

The amount of heat is regulated to reach the pre-selected interior temperature quickly. After which only a limited amount of power is needed to maintain the interior temperature.

A water temperature sensor controls the water temperature, while an interior temperature sensor controls the interior temperature.

Due to variable operating and environmental influences, small water temperature deviations are possible.

Only for Dual Top ST 8: If you use electricity as source of energy, the electric heater heats the air and water at low or high power, depending on the selection. Electricity is taken from an external power supply.

If the burner and the electric heater provide the heat, priority is given to the electric heater. This means that the electric heater runs at low or high power (depending on the selection) and the burner provides the rest of the heat if necessary.

4.4 Advanced functions

- Menu driven user guidance in six languages.
- Programmable timer: The device has two freely programmable heating programs, 24/7.
  See Programming timer in the Operating Instructions.
- Remote control by Webasto Telestart (optional control).
  See Remote control in the Operating Instructions.
- Boiler drainage: possibility to drain the boiler manually from the control panel or automatically for frost protection.
  See Frost in the Operating Instructions.
- Frost protection mode: protects the boiler against frost.
  See Frost protection in the Operating Instructions.
- Textual fault information: when a fault occurs, the control panel displays a fault message with a fault number and brief description to inform the user about the kind of fault.
  See Fault Message output in the Operating Instructions.

5 Troubleshooting

Many faults are caused by improper installation. Always check if the cause of a fault is improper installation, or if this cause can be excluded. See chapter , "Table 401: Faults due to improper installation" on the following page.

Cause	Result
Heater lifted by heating air blower	Heater warped, noise
Heater installed without vibration damper	Noise
Water lines connected with incorrect hose connectors	Leakage
Unfavourable position of cold air inlet chosen	Noise, overheating, low efficiency
Heater installed unprotected	Blockage in cooling air blower
Hot air hoses fastened with clamps without screws	Hot air hoses pulled off
Not insulated outside installed hot air ducts	Heat loss and low efficiency
Electrical cables damaged	Malfunction
Unfavourable position of external room temperature sensor chosen	Poor temperature control
Screws contact heating air blower	Malfunction
Fuel pump touches vehicle part	Noise
The exhaust line is not directed downward away from the heater everywhere and no condensate drain hole is provided at the lowest point	Malfunction due to condensed water
Too many hot air outlets (> 9)	Overheating, low efficiency

5.1 Fault code output

NOTE

Troubleshooting is generally restricted to locating faulty heater components.

The following fault causes are not taken into account and should always be checked or a fault should be excluded for the following reasons:

- Corrosion on connector.
- Loose connection on connector.
- Crimping error on connector.
- Corrosion on lines and fuses.
- Corrosion on battery terminals.

If individual components are checked, then the electrical connectrions on the control element must be disconnected

Carry out a function check in the vehicle after rectifying each fault.

This chapter describes the fault codes given out by programmable and manual control panels.

Replacement of parts, dismantling and assembly (e.g. for inspection and cleaning) is described in chapter 8, "Repair."

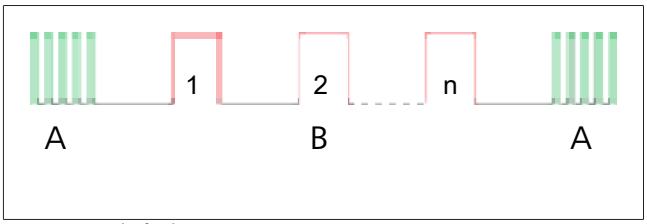
5.1.1 Manual control panel

L	Fault message output LED

Fig. 2

The manual control panel is used for Dual Top ST 6 heaters only.
The heater is able to identify faults on individual components during the operation.
The control panel displays fault messages by flashing pulses.
After a series of 5 fast GREEN flashes, the fault code output will be a repeated sequence of long RED flashes. This procedure repeats until the heater is switched off. The meaning of the number of red flashes is shown in the table titled "Manual control panel" that begins on the following page.
After that, again there will be 5 fast GREEN flashing pulses.

- Rectify the cause of the fault.



A	5 x green
B	“n” x red

Fig. 3 Example fault message

To reset the fault, switch the heater off (at least 5 seconds) and then turn back on.
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.
Unlocking:

1. Switch on manual control panel and heater and leave "ON" (control panel in any "ON" operating mode)
2. Disconnect heater from battery and restore connection.

Or:

1. Switch on manual control panel and heater and leave "ON" (control panel in any "ON" operating mode).
2. Remove 15 A fuse (red wire, thermo unit).
3. Remove 5 A fuse (control panel).
4. Install 15 A fuse (red wire, thermo unit).
5. Install 5 A fuse (control panel).

Or:

1. Switch on heater on control panel.
2. Heater does not react, F10 is indicated (10 red flashing pulses).
3. Remove 5 A fuse (control panel).
4. Remove 15 A fuse (10 A) (red/black wire, PWM module).
5. Remove 15 A fuse (red wire, thermo unit).
6. Switch off heater on control panel.
7. Replace 10 A fuse with 15 A.
8. Install 15 A fuse (red/black wire, PWM module).

9. Install 15 A fuse (red wire, thermo unit).
10. Install 5 A fuse (control panel).
11. Switch on heater on control panel.

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.

Fault message output Dual Top ST 6 with manual control panel

Numbers of RED flashing pulses	Meaning	Code from the control unit to control panel [hex]	Remedy
00	No communication between control panel and heater, or control panel error	51	1. Check battery charge. 2. Check connections of control panel. 3. Check fuse 15 A (red cable, thermo unit). 4. Check wiring harness. 5. Replace control panel (see Service Work). 6. Replace control unit.
01	No start (after 2 attempts to start)	02	1. Check fuel supply (enough fuel, at least 8 litre). 2. Check fuel connection and tubes). 3. Reset heater (by switching off for at least **30** sec). 4. Check feed rate of fuel pump. 5. Clean burner insert.
02	Flame failure Restart not successful	03, 83	See fault message 01.
03	Undervoltage	84	1. Charge battery or connect to another power source (12 V DC). 2. Reset heater (by switching off for at least 5 sec).
	Overvoltage	04	
04	Fuel pump disconnection / short circuit / overheating	88, 08	1. Check fuel pump cable and connectors. 2. Check internal wiring harness connections Y9, Y10.
05	Hot air motor fault: disconnection / short circuit / fan speed out of range / fan blocked	53	1. Let the heater cool down. Check power supply: fuse correct (fuse not damaged, 15A fuse used for PWM module, red / black wire) and functioning. 2. Start blower: component test in diagnostic mode. Run blower 5 minutes at 80 %. Listen if there is any unusual noise (grinding, etc.). Restart the heater. 3. Dismount application parts until the blower on the heating air blower is visible. Check whether dirt, screws, objects or deformations are blocking the heating air blower. Check clearance of heating air blower with your finger (do not exert pressure!). Remove all objects that block the heating air blower. Restart the heater. 4. Remove housing cover with inlet interfaces. Check all electrical connectors. Moisture in connectors (2-pin connector and 4-pin connector)? Moisture in connectors or PWM module? PWM module dark or burned? 12 V power supply permanently available at PWM module? (measure voltage between brown and red/blue cable contacts of 4-pin connector) If not, check external wiring harness: routing wiring harness and pins of 12 pin connector. In case there is a bad connector, bad wiring harness or defect PWM module: Replace defective part.
	No connection between amplifier of heating air blower and heater air control unit	54	

			5. If heating air blower assembly and wiring harness have been checked and Dual Top ST still doesn't run: Replace the complete Dual Top ST .
06	Overheating water temperature sensor	57	1. Check water level. 2. Reset heater (by switching off for at least 5 sec.) or select winter mode, heating **without** hot water production. 3. Check fuel pump cable and connectors. 4. Check whether hot and cold water pipes have been connected correctly. 5. Check internal wiring harness connections Y9, Y10.
	Exceeding gradient water temperature sensor	58	
07	Overheating hot air temperature sensor	06	1. Ensure that hot air can flow freely, air intake and outlets are not blocked. 2. Reset heater (by switching off for at least 5 sec.) 3. Check fuel pump cable and connectors. 4. Check internal wiring harness connections Y9, Y10. 5. Check air temperature sensor for correct installation.
	Hot air temperature sensor has exceeded value	5A	
08	Overheating of heater control unit	5B	1. Ensure that cooling air can flow freely. 2. Reset heater (by switching off for at least 5 sec.)
09	Combustion air motor fault: disconnection / short circuit / overload / blocked	09	1. Ensure that the cooling fan can freely rotate, remove possible blocking objects. 2. Check fuse 15 A (red cable). 3. Check connector Y1 at control unit. 4. Change Drive Assy.
	Open circuit in motor for combustion and cooling air blower	89	
10	Control unit fault / heater locked	01, 81	1. Put heater back into service (see beginning of paragraph). 2. Restart heater. 3. Replace the heater
11	Interior temperature sensor disconnection or short circuit	5D	1. Check the routing of the cable. Make sure that it is not pinched or crushed. 2. Check the connector behind the control panel. 3. Reset heater (by switching off for at least 5 sec.). 4. Replace external room temperature sensor.
12	Open circuit in air temperature sensor in heater	AB	1. Check the routing of the cable, ensure that it is not pinched or crushed, check the connectors. 2. Check resistance of the air temperature sensor. 3. Reset heater (by switching off for at least **5** sec.). 4. Replace sensor wiring harness.
	Short circuit in air temperature sensor in heater	1B	
13	Water temperature sensor disconnection	55	1. Check the routing of the cable, ensure that it is not pinched or crushed, check the connectors. 2. Check the resistance of the water temperature sensor. 3. Reset heater (by switching off for at least **5** sec.). 4. Replace the sensor wiring harness.
	Water temperature sensor short circuit	56	
14	Glow plug / flame detector disconnection	8A	1. Check routing of cable, ensure that it is not pinched or crushed, check the connectors. 2. Check glow plug resistance. 3. Reset the heater (by switching off for at least **5** sec.). 4. Replace burner (including glow plug and evaporator housing assembly).
	Glow plug / flame detector short circuit	0A	
15	Premature flame detection	05	See fault message 14.
16	n/a	n/a	n/a
17	Electrical safety / drain valve disconnection	90	1. Check routing of cable, ensure that it is not pinched or crushed, check the connectors.

	Electrical safety / drain valve short circuit	10	2. Check function of solenoid valve with separate 12 V DC power supply. 3. Reset heater (by switching off for at least **5** sec.) 4. Replace solenoid valve.

5.1.2 Programmable control panel

Fig. 4

The programmable control panel is used for Dual Top ST 6 and 8 heaters.
The heater can identify faults on individual components during the operation.
The control panel gives out the fault message.

1. Rectify the cause of the fault.
2. Press OK to confirm the message, in order to reset the fault.
3. Or switch off the Dual Top ST for at least 5 seconds.

If serious malfunctions such as overheating or failure to start reoccur, the heater is locked. You can put the heater back into service by deleting the failures.
Delete the failures by disconnecting the power supply:
Ensure that the heater/blower is not running (to be established by the sound of the heater operating).
If necessary wait until the blowers stop running.
Unlocking:

1. Switch on programmable control panel and heater and leave "ON" (control panel in any "ON" operating mode).
2. Remove 15 A fuse (red wire, thermo unit).
3. Install 15 A fuse (red wire, thermo unit).

Or:

1. Switch on heater on control panel.
2. Message 17 is displayed.
3. Heater does not react.
4. Remove 5 A fuse (control panel).
5. Remove 15 A fuse (10 A) (red/black wire, PWM module).
6. Remove 15 A fuse (red wire, thermo unit).
7. Replace 10 A fuse with 15 A.
8. Install 15 A fuse (red/black wire, PWM module).
9. Install 15 A fuse (red/black wire, PWM module).
10. – Install 5 A fuse (control panel).
11. – Switch on heater on control panel.

Now the heater is reset.
You can also delete failures by using the Webasto Thermo Test (WTT) PC-Diagnosis.

Fault message output on Dual Top ST 6 and 8 with programmable control panel

Message	Meaning	Code from control unit to control panel [hex]	Remedy
Message 00, 01 No data connection	No communication between control panel and heater, or control panel error.	51	1. Check battery charge. 2. Check control panel connections. 3. Check 15 A fuse (red wire). 4. Check wiring harness. 5. Replace control panel (see Servicing work). 6. Replace control unit.
Message 02 No start of combustion	No start (after 2 attempts to start).	02	1. Check fuel supply (enough fuel, at least 8 liter). 2. Reset heater (by pressing OK or switching off for at least **30** sec.). 3. Clean the burner insert.
Message 03 Combustion interrupted	Flame failure. Restart not successful.	03, 83	See message 02.
Message 04 High battery voltage	Operation voltage is above permitted value.	04	Reset heater (by pressing OK or switching off for at least 5 sec.).
Message 05 Low battery voltage	Operation voltage is below permitted value.	84	1. Charge battery or connect to main power supply (230 V). 2. Reset heater (by pressing OK or switching off for at least 5 sec.).
Message 06 Fuel pump disconnected or system overheated	Fuel pump disconnection / one of the three overheating switches detects too high temperature OR relay box, cable or connection relay box is defective.	88	1. Check fuel pump cable and connectors. 2. Check internal wiring harness connections Y9 and Y10. For Dual Top ST 8: 1. Check wiring harness from the relay box to the heater. 2. Check relay box and connections relay box.
Message 07 Fuel pump short circuit	Fuel pump short circuit to ground OR relay box, cable or connection relay box is defective.	08	See message 06.
Message 08 Failure hot air fan	Hot air motor fault: disconnection/short circuit/fan speed out of range / fan blocked.	53	1. Check power supply: Fuse correct (fuse not damaged, 15 A fuse used for PWM module, red/black wire) and functioning. All contacts are correct (no corrosion). Voltage correct (>12 V). Restart heater. 2. Start blower: component test in diagnostic mode. Run the blower 5 minutes at 80 %. Listen if there is any unusual noise (grinding, etc.). Restart the heater. 3. Dismount application parts until the blower on the heating air blower is visible. Check whether dirt, screws, objects or deformations are blocking the heating air blower. Check clearance of heating air blower with your finger (do not exert pressure!). Remove all objects that block the heating air blower. Restart the heater. 4. Remove housing cover with inlet interfaces. Check all electrical connectors. Moisture in connectors (2-pin connector and 4-pin connector)? Moisture in connectors or PWM module? PWM module dark or burned? 12 V power supply permanently available at PWM module? (measure voltage between brown and red/blue cable contacts of

			4-pin connector) If not, check external wiring harness: routing wiring harness and pins of 12 pin connector. In case there is a bad connector, bad wiring harness or defect PWM module: Replace defective part. 5. If heating air blower assembly and wiring harness have been checked and still doesn't run: Replace complete Dual Top ST .
Message 09 Failure fan amplifier	No communication between amplifier of hot air fan and heater control unit.	54	1. Check internal cable routing (4-pins) from control unit to PWM module. 2. Replace heating air blower. 3. Replace thermo unit.
Message 10 High temperature sanitary water	Overheating water temperature sensor.	57	1. Check water level. 2. Reset heater (by pressing OK or switching off for at least 5 sec.) or select winter mode, heating **without** hot water production. 3. Check fuel pump cable and connectors. 4. Check internal wiring harness connections Y9, Y10.
Message 11 High temperature sanitary water	Exceeding gradient water temperature sensor.	58	1. See message 10. 2. Check whether hot and cold water pipes have been connected correctly.
Message 12 High temperature heating air	Overheating hot air temperature sensor.	06	1. Make sure that hot air can flow freely, air intake and outlets are not blocked. 2. Reset heater (by pressing OK or switching off for at least 5 sec.). 3. Check fuel pump cable and connectors. 4. Check internal wiring harness connections Y9, Y10. 5. Check air temperature sensor for correct installation.
Message 13 High temperature heating air	Exceeding gradient hot air temperature sensor.	5A	See message 12.
Message 14 Failure cooling air ventilation	Overheating of heaters' control unit.	5B	1. Make sure that cooling air can flow freely, 2. Reset heater (by pressing OK or switching off for at least 5 sec.)
Message 15 Failure combustion air motor	Combustion air motor interrupted.	89	1. Make sure that the cooling fan can freely rotate. 2. Remove possible blocking objects. 3. Check fuse 15 A (red cable). 4. Check connector Y1 at control unit. 5. Change the Drive Assy.
Message 16 Failure combustion air motor	Combustion air motor fault: disconnection / short circuit / overload / blocked.	09	See message 15.
Message 17 Failure control unit	Control unit (heater) fault / heater locked.	01, 81	1. Put the heater back into service (see above this table). 2. Restart the heater. 3. Replace control unit.
Message 18 Failure cabin temperature sensor	Interior temperature sensor disconnection/ short circuit.	5D	1. Check the routing of the cable. Avoid that the cable is pinched or crushed. 2. Check the connector behind the control panel. 3. Reset heater (by pressing OK or switching off for at least 5 sec.). 4. Replace external room temperature sensor.
Message 19	n/a	n/a	n/a
Message 20 Failure heating air temperature sensor	Hot air temperature sensor disconnection.	AB	1. Check the routing of the cable. Avoid that the cable is pinched or crushed. Check the connectors. 2. Check resistance of air temperature sensor. 3. Reset heater (by switching off for at least 5 sec.). 4. Replace sensor wiring harness.

Message 21 Failure heating air temperature sensor	Hot air temperature sensor short circuit.	1B	See message 20.
Message 22 Failure sanitary water temperature sensor	Water temperature sensor disconnection.	55	1. Check the routing of the cable. Avoid that the cable is pinched or crushed. Check the connectors. 2. Check resistance of water temperature sensor. 3. Reset heater (by pressing OK or switching off for at least 5 sec.) 4. Replace sensor wiring harness
Message 23 Failure sanitary water temperature sensor	Water temperature sensor short circuit.	56	See message 22.
Message 24 Failure glow plug	Glow plug / Flame monitor disconnection.	8A	1. Check the routing of the cable.Avoid that the cable is pinched or crushed. Check the connectors. 2. Check glow plug resistance. 3. Reset heater (by pressing OK or switching off for at least 5 sec.). 4. Replace burner (including glow plug and evaporator housing assembly).
Message 25 Failure glow plug	Glow plug / Flame monitor short circuit.	0A	See message 24.
Message 26 Failure flame detection	Premature flame detection	05	See message 24.
Message 27 Failure relay box	Short circuit of 230 V indication signal from relay box to heater	42	1. Check wiring harness relay box to heater. 2. Check relay box and connections relay box. 3. Check control panel and connections control panel. 4. Check internal wiring harness connections Y9, Y10.
Message 28 Failure drain valve	Electrical safety / drainage valve disconnection	90	1. Check routing of cable. Avoid that the cable is pinched or crushed. Check the connectors. 2. Check function of solenoid valve with separate 12 V DC power supply. 3. Reset heater (by pressing OK or switching off for at least 5 sec.) 4. Replace solenoid valve.
Message 29 Failure drain valve	Electrical safety / drainage valve short circuit	10	See message 28.
Message 30 Failure relay	230 V high or low power relay circuit interrupted / short circuit	45	See message 27.
Message 31, 32, 33	n/a	n/a	n/a
Message 34 System overheated or relay circuit disconnected	One of the three overheating switches detects too high temperatures / overheating relay circuit interrupted	43	For Dual Top ST 8: 1. Check wiring harness relay box to heater. 2. Check relay box and connections relay box. 3. Check control panel and connectrions on control panel. 4. Check internal wiring harness connections Y9, Y10. For Dual Top ST 6 and 8: 1. Check for overheating (see messages 10, 11, 12, 13 and 14). 2. Reset heater (by pressing OK or switching off for at least 5 sec.)
Message 35 Failure relay box	230 V overheating relay short circuit	44	See message 27.
Message	n/a	n/a	n/a

36, 37, 38, 39, 40, 41			
Message 42 Failure 230 V heating element (Only Dual Top ST 8)	Electric heater (230 V) defect No relevant temperature increase detected.	4B	1. Check water system related for a permanent open hot water tap OR heavy leakages. 2. Check cable 230 V from relay box to heater and corresponding connectors. 3. Check electrical heating elements.

n/a = not available

6 Function tests

6.1 General

This section describes the tests that you must conduct on the heater when it is installed and not installed to verify that it is in working order.

DANGER

Do not operate the heater in enclosed spaces (such as garages) due to the risk of poisoning and asphyxiation.

6.2 Repair shop level testing

ATTENTION

For function tests always disconnect the connection between the control unit and the component to be tested.

Resistance measurement of eletrical heating elements

During the test the electrical heating elements (each Dual Top ST 8 has 2 electrical heating elements) are to have the following values:

Dual Top ST 8, resistance at 20 °C: 53 Ω

Test current: < 5 mA

Glow plug resistance test

NOTE

The resistance test must be carried out with an ohm-meter suitable for small resistance values or Webasto Thermo Test PC Diagnosis.

A resistance test with a simple digital multimeter is too inaccurate to find the precise values. A new glow plug can be measured to act as a reference.

The glow plug should have the following values in the test:

Glow plug: 12 V (red)

Resistance at 25 °C: 0.190 to 0.250 Ω V

Test current: < 5 mA

Air temperature resistance test

If you conduct this test with a digital multimeter, the air temperature sensor (see Fig. 7 on the following page) must have the values shown in the fol-lowing diagram:

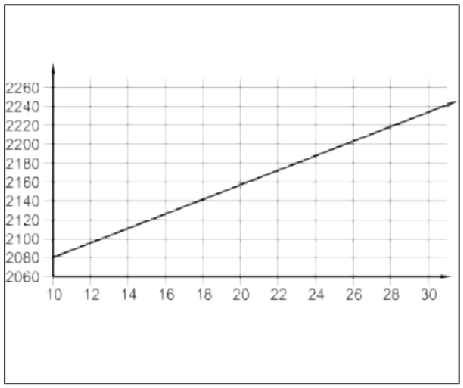


Fig. 5 Characteristic resistance values of a PT 2000 overheating sensor within a temperature range of 10 °C to 30 °C.

Water temperature sensor resistance test

A: Resistance in kΩ

B: Temperature of water temperature sensor -G18- (see Fig. 7 on the following page) in °C

C: Resistance as a function of temperature

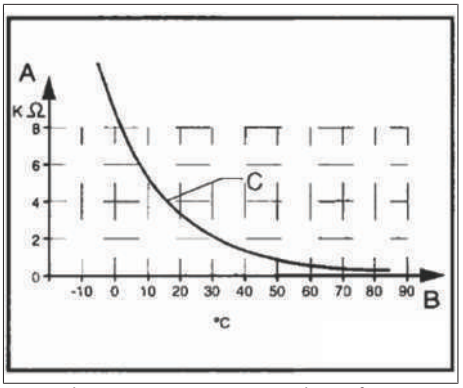


Fig. 6 Characteristic resistance values of water temperature sensor

Table 501: Technical data water temperature sensor

Temperature [°C]	Resistance nominal [Ohm]	Resistance min. [Ohm]	Resistance max. [Ohm]
-10	14,939.00	14,351.00	15,528.00
-5	11,425.00	10,991.00	11,859.00
0	8,816.00	8,493.00	9,138.00
5	6,855.00	6,613.00	7,097.00
10	5,373.00	5,190.00	5,556.00
15	4,241.00	4,102.00	4,379.00
20	3,372.00	3,266.00	3,479.00
25	2,700.00	2,619.00	2,781.00
30	2,175.00	2,107.00	2,244.00
35	1,763.00	1,706.00	1,821.00
40	1,438.00	1,390.00	1,487.00
45	1,180.00	1,139.00	1,220.00
50	972.80	938.10	1,008.00
55	806.30	776.80	835.80
60	671.80	646.60	697.00
65	562.40	540.80	584.00
70	473.00	454.50	491.60
75	400.00	383.90	416.00
80	339.70	325.80	353.60
85	289.50	277.50	301.60
90	247.80	237.30	258.30

Air temperature switch

The air temperature switch (see Fig. 7 on the following page) opens at 145 ± 5 °C. **Water temperature switch**

The water temperature switch (see Fig. 7 on the following page) opens at 90 ± 5 °C. **Overheating protector**

The overheating protector (temperature switch heat exchanger, see Fig. 7 on the following page) opens at 352 ± 15 °C and closes at 240 °C.

Fuel pump

Fuel pump test:

Pumping quantity 40 ml ± 10 % for operation at 7 Hz for 180 seconds.

6.3 Resistance measurement for external room temperature sensor

Table 502: Technical data of external room temperature sensor

Temperature [°C]	Resistance [kohms]
-50	1,215 ± 0.5
-45	844 ± 0.5
-40	419 ± 0.5
-35	299 ± 0.5
-30	216 ± 0.5
-25	156 ± 0.5
-20	115 ± 0.5
-15	84.5 ± 0.5
-10	62.9 ± 0.5
-5	47.1 ± 0.5
0	35.6 ± 0.5
5	27.1 ± 0.5
10	20.8 ± 0.5
12,5	18.5 ± 0.5
15	16.2 ± 0.5
17,5	14.5 ± 0.5
20	12.7 ± 0.5
22,5	11.4 ± 0.5
25	10 ± 0.5
27,5	9.0 ± 0.5
30	7.9 ± 0.5
35	6.3 ± 0.5
40	5.1 ± 0.5
45	4.1 ± 0.5
50	3.3 ± 0.5
55	2.7 ± 0.5
60	2.2 ± 0.5
65	1.9 ± 0.5
70	1.5 ± 0.5
75	1.3 ± 0.5
80	1.1 ± 0.5
85	0.9 ± 0.5

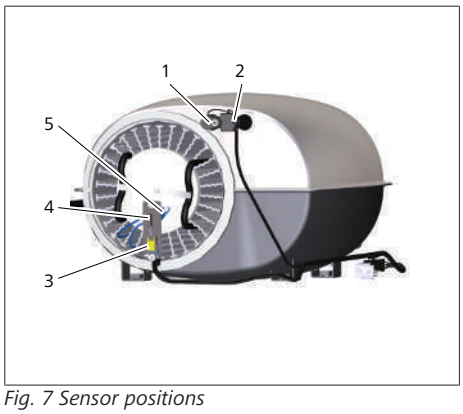


Fig. 7 Sensor positions

Pos.	Description
1	Water temperature sensor: Is only monitored by the control unit when hot water is provided and for frost protection.
2	Water temperature switch: Also interrupts the plus line of the fuel pump when triggered
3	Air temperature switch: Also interrupts the plus line of the fuel pump when triggered
4	Air temperature sensor: Is only monitored by the control unit in the winter mode (heating with and without providing hot water)
5	Overheating protection (temperature switch of heat exchanger): Is monitored by the control panel in every operating mode. Also interrupts the plus line of the fuel pump when triggered.

7 Servicing

7.1 General

This section describes the allowed servicing work on the installed heater.

CAUTION
There is a potential danger of burns as the heater and its components may be very hot.

7.2 Working on the heater

Disconnect the main power cable from the service battery before carrying out any work on the heater. You must not disconnect the battery power while the heater is operating or while it is slowing down as a result of the risk of the heater overheating and the overheating guard being tripped as a result. If you must carry out extensive repair work on the heater, it is preferable to remove the heater completely.

Refer to the relevant Installation Instructions for repairs that make it necessary to change the installation position.

7.3 Working on vehicles

NOTE
A temperatre of 85 °C must not be exceeded in the vicinity ot the heater in any cirumstances (for example when competing painting work on the vehicle).

7.4 Heater test run

DANGER
Do not operate the heater in enclosed spaces (such as garages) due to the risk of poisoning and asphyxiation.

7.5 CO2 setting

NOTE
After repairing the heater and replacing the fuel pump, check the CO_2 setting.

This also applies on replacement of the control unit.

The CO_2 setting is carried out with Webasto Thermo Test PC Diagnostics.

The heater is optimally set to a CO_2 value at the factory for operation at altitudes up to 2,200 m above sea level.

Continuous operation above 2,200 m above sea level can result in heavy smoke and soot.

NOTE

The CO_2 value is corrected with the Webasto Thermo Test PC Diagnostics. The CO_2 measurement and setting must be carried out at the maximum heating capacity. The measurement of the CO_2 value is carried out approx. 20 mm in front of the end of the exhaust outlet inside the exhaust pipe with a CO_2 tester (e.g. from MSI).

The measured CO_2 value at an ambient temperature of 20 °C must be 5.0 to 8.0 % vol. under partial load (2 kW).

At full load (6 kW) it should be 9.0 to 13.0 % vol. after setting the CO_2 value.

7.6 Servicing work

To ensure functional reliability of the heater the following servicing must be performed in regular intervals:

- You must switch the heater to "OFF" before cleaning.
- Clean the outside of the heater (do not use high-pressure water or air hoses to prevent water ingress).
- Disinfect the water supply system.
  See Operating Instructions.
- Descale the water supply system.
  See Operating Instructions.
- Examine electrical connections for corrosion of contacts, and to make sure that the contacts are secure.
- Examine the following lines for signs of damage to make sure that the lines are safe and clear:
  - Exhaust lines
  - Combustion air lines
  - Cooling air lines
  - Cold air intake lines
  - Hot air distribution lines

NOTE

Some parts of the system, especially the exhaust, may have a shorter life than the heater itself.

Especially if the vehicle is used in areas with salty conditions, like near seas and oceans. Check these parts especially carefully and replace them if necessary.

- Inspect fuel lines for leaks.
- Check cold and hot water lines for signs of damage and to make sure that they are secure.
- Inspect hoses for cracks.
- Check the manual drainage function with the control panel.

7.6.1 Frost

There are several features that protect the water supply system against frost.

- Drain water contents manually when there is risk of frost and when storing the vehicle for a longer period. See "Draining the boiler manually."
- The boiler is drained automatically in case you forget to drain it manually. See "Draining the boiler automatically."

For sections 7.6.2, 7.6.3 and 7.6.4, see the illustration of controls on page 45.

7.6.2 Draining the boiler manually

Drain water contents manually when there is risk of frost and when storing the vehicle for a longer period.

Both manual and programmable control panel:

1. Interrupt power for vehicle system water pump (main switch or pump switch, depending on instructions of the vehicle manufacturer).
2. Open hot water taps in kitchen, bathroom, shower, etc. (set preselecting mixing taps or single-lever valves to **"hot"**).

If you have manual control panel, then continue with following steps:

1. The electrical safety/drain valve is opened by turning and holding the mode selector knob (A) against the spring force in the position drain boiler (6) for at least 5 seconds.
2. Then, release the knob. The electrical safety/drainage valve will be open for approx. 90 minutes.
3. During drainage, all green icons on the control panel, as well as the red indicator on the mode selector knob (A), are blinking.

The boiler content is now discharged to the outside through the electrical safety/drainage valve.

Place a container beneath the outlet to check whether the water in the boiler has completely drained away (approx. 9 litres!).

If you have programmable control panel, then continue with the following steps:

1. Make sure the device is switched on.
2. Press **MENU**.
3. Press ▲ and ▼ to select "**Draining Boiler**".
4. Press **OK**. The display shows: "**Press OK to confirm boiler drainage**"
5. Press **OK**. The display shows:
   "**Draining... Press MENU to select heating operation**"
   and
   "**Press STOP to abort drainage**" "" (9)

NOTE

Any kind of heater operation will be stopped when manually starting boiler drainage.

NOTE

To stop drainage see chapter 4.7.2, "How to stop draining the boiler" on the following page.

- ▶ The boiler content is now discharged to the outside through the electrical safety/ drainage valve.
- ▶ Place a container beneath the outlet to check whether the water in the boiler has completely drained away (approx. 9 litres!).
- ▶ After approx. 90 min, the message "**Drainage completed**" is shown.

1. Press **OK** to end manual drainage.

NOTE

Any kind of water from the vehicle has to be discharged at an appropriate disposal facility.

NOTE

Avoid the formation of micro-organisms in the lines and in the boiler during storage and make sure that the water supply system is completely drained. To do this, open all water valves, connect an air pressure of approx. 2 bar to the hot water line and leave it connected until the residual water is completely drained off.

7.6.3 How to stop draining the boiler

For heaters with a manual control panel, you can stop drainage by moving mode selector knob (A) to drainage mode (6) for at least 5 seconds and than releasing the knob.

In case of a programmable control panel, you can stop boiler drainage, if needed.

1. Make sure the device is switched on.
2. Press **MENU**.
3. Press ▲ and ▼ to select "**Draining Boiler**".
4. Press **OK**.
5. The display shows "**Press OK to confirm boiler drainage**". Press **OK**.
   The display shows:
   "**Drainage... Press MENU to select heating operation**"
   "**Press STOP to abort drainage**" " " (9).
6. Press **STOP**.
   The display shows: "**Drainage aborted**".
7. Press **OK**.

7.6.4 Draining the boiler automatically

The electrical safety/drainage valve is opened electrically.

If the water temperature at the electrical safety/drainage valve is less than 43 °F (6 °C) for 30 minutes, the boiler water contents may drain automatically.

This function is active when:

- the device is switched "OFF";
- in winter mode (heating **without** hot water production) during a period when there is no heating action in the heater (e.g.: selected interior temperature is reached, low outside temperature);
- if battery power is too low (below 10V for 30 minutes;
- there is a failure!

NOTE

Note that the electrical safety/drainage valve only works when a 12 V power supply is available!

With a manual control panel, during drainage, all green icons, as well as the red indicator on the mode selector knob (A), are blinking.

With a programmable control panel, during drainage " " (9) appears on display.

After approx. 90 min, the electrical safety/drainage valve will be closed again.

The drainage outlet of the electrical safety/drainage valve must always be kept clear (free from dirt, ice, leaves etc.)!

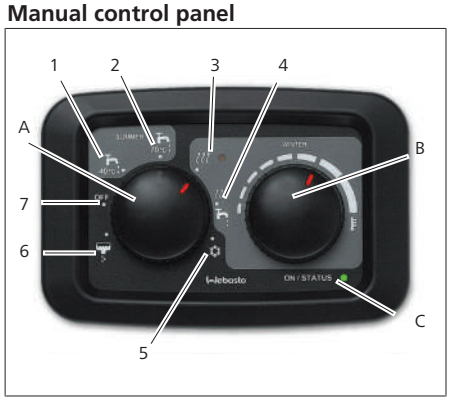
NOTE

Draining the boiler as well as the frost protection mode protect the heater and boiler against frost. Not all water lines in the vehicle can be protected against freezing due to installation variations.

When storing the vehicle, either choose a place that is well protected against low temperatures or drain the whole water system, including all lines and tubes (e.g. with air pressure, see the note in chapter 4.7.1, "Draining the boiler manually."

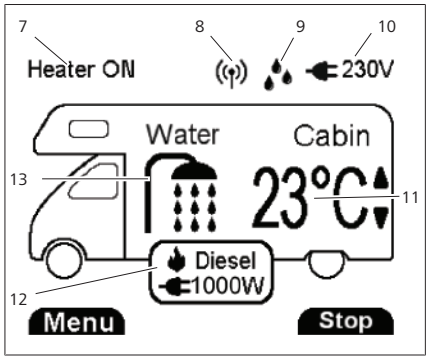
Warranty claims for damage caused by frost will not be honoured!

Manual control panel



A -- Model selector switch
B -- Interior temperature selector knob
C -- Power indicator / fault message display
1 -- Summer operation mode 104 °F (40 °C)
2 -- Summer operation mode 158 °F (70 °C)
3 -- Winter operation mode, heating **without** hot water production
4 -- Winter operation mode, heating **with** hot water production
5 -- Frost protection mode
6 -- Drainage boiler
7 -- OFF

Programmable control panel



1 -- Up button
2 -- Down button
3 -- Start / Stop / OK
4 -- Menu / Back / Cancel
5 -- ON / OFF
6 -- Power indicator
7 -- Heater ON / Heater OFF
8 -- Remote indicator
9 -- Drainage indicator
10 -- 230 V indicator (Dual Top ST 8)
11 -- Interior heating temp indicator
12 -- Active heat source (only diesel Dual Top ST 6 / diesel and electricity 1000 W / 20000 W Dual Top ST 8)
13 -- Water heating temp indicator

7.7 Visual inspection

Check if the entire system has been installed in accordance with the Installation Instructions.

7.8 Removal and installation

7.8.1 Heater: removal and installation

Heater removal

1. Drain the water contents.
2. Disconnect the battery.
3. Disconnect the wiring harness plug X11.
4. Disconnect the cable to the fuel pump at plug X3.
5. Disconnect the following from the heater:
   - Hot air hoses
   - Exhaust pipe
   - Combustion air line
   - Cooling air hose/cooling air intake cover
   - Cold air intake line/rubber bellows
   - Fuel line (seal off with suitable sealing plug, etc.)
   - Hot and cold water lines
6. Remove four M8 nuts from the hammerhead bolt
7. Remove the heater

Installation

See Installation instructions.

7.8.2 Control panel: removal and installation

Disassembly manual control panel (Dual Top ST 6)

1. Disconnect the battery.
2. Remove the control panel as shown (see Fig. 8).
3. Disconnect the wiring harness plug X11.
4. Disconnect plug X0 from the room temperature sensor.

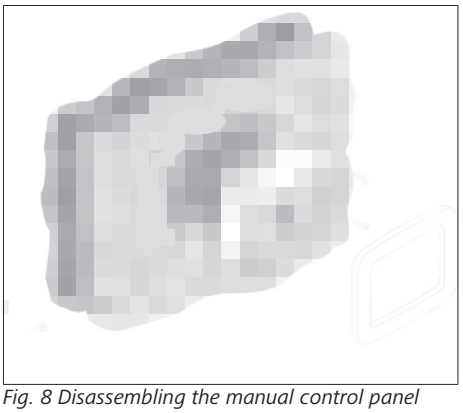


Fig. 8 Disassembling the manual control panel

Disassembly programmable control panel (for Dual Top ST 6 and 8)

1. Disconnect the battery.
2. To remove the control panel, place one or two suction cups on the control panel. Alternatively, slide some flat, smooth material (such as a plastic card) under the control panel on the left and on the right.
3. Pull to remove the control panel from the adapter. Take care not to damage the control panel or the furniture. See chapter "Control panel: removal and installation" listed above.
4. Disconnect wiring harness plugs X4 and X5.
5. Disconnect plug X0 from the room temperature sensor.

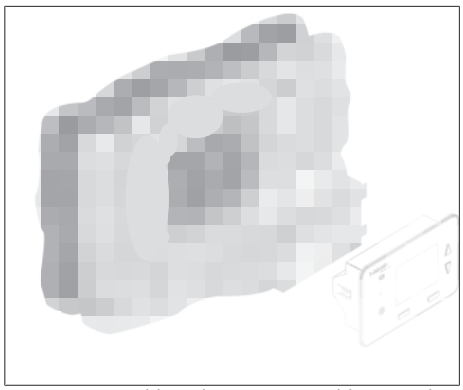


Fig. 9 Disassembling the programmable control panel

Installation

See Installation instructions.

7.9 Start up

After each heater disassembly, follow the procedure "Starting the heater for the first time", as described in the Installation Instructions.

8 Repair

8.1 General

This section describes the repair work that may be carried out on the Dual Top heater after removal from the vehicle.

Any further disassembly will void the warranty.

Only use parts from the appropriate spare parts kits for assembling the heater.

You must perform a functional test after repairs.

8.2 Working on dismantled components

ATTENTION

IMPORTANT

All sealing elements between the stripped down components and the seal on the exhaust outlet shall always be discarded and replaced.

Cleaning

- Clean all disassembled components.
- Sealing compound on component must be carefully and completely removed using suitable means.

Visual inspection

- Inspect all components for damage (cracks, deformation, wear, etc.) and replace if necessary.
- Inspect the plugs and cables for corrosion, loose contacts, crimping faults, etc. and repair them if necessary.
- Check plug strips for signs of corrosion and contacts to ensure they are secure. Repair them if necessary.

8.3 Dismantling heaters

To check or replace a component of the Dual Top ST heater, dismantle the heater until you have reached the part concerned.

Follow the instruction in this chapter for dismantling and assembly.

8.3.1 Removing the housing cover

1. Loosen two T20 screws below hot and cold water connectors 1 to 2 turns (just enough to move the cover of the heating air blower).

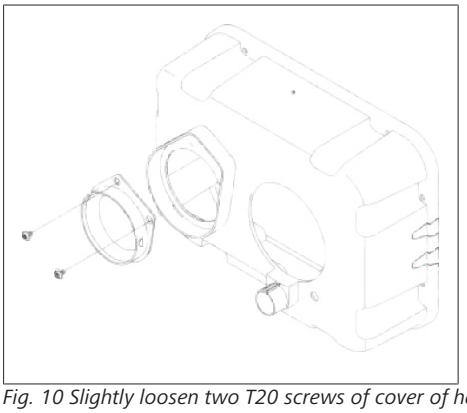


Fig. 10 Slightly loosen two T20 screws of cover of heating air blower

2. Loosen 8 screws T25, then remove the housing cover inlet interfaces.

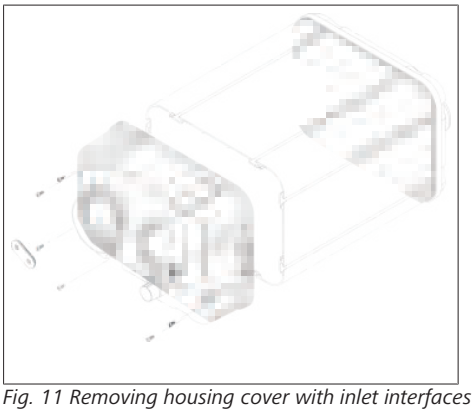


Fig. 11 Removing housing cover with inlet interfaces

Only Dual Top ST immersion pump version:

3. Guide the ventilation hose of Dual Top ST through the housing cover with inlet interfaces.

In case of the normal version: continue at step 4.

NOTE

When removing housing cover with inlet interfaces, friction is caused by the grommet on the water supply and drain pipes.

4. Remove cooling shell foam gasket and air intake grill.

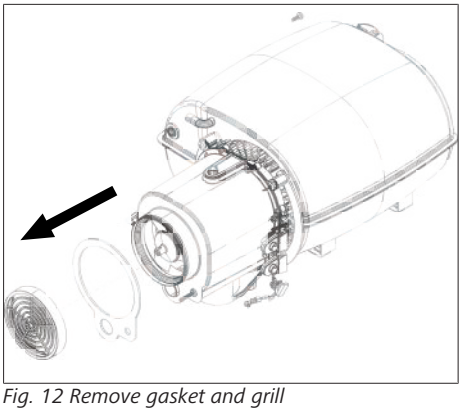


Fig. 12 Remove gasket and grill

5. Loosen 8 screws T25, then remove housing cover with hot air outlet incl. boiler gasket.

NOTE

Loosen 2 screws T20 that hold the metal plate (with air temperature sensor and air temperature switch) of the sensor wiring harness on the housing cover.

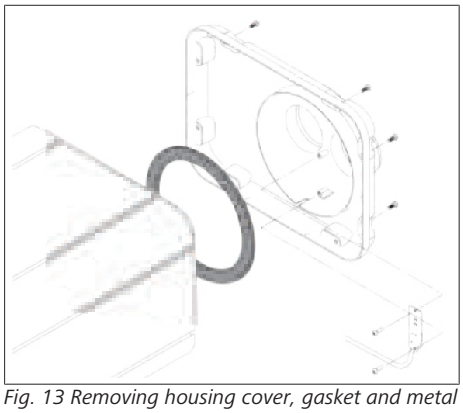


Fig. 13 Removing housing cover, gasket and metal retaining plate

8.3.2 Removing the heater air blower assembly

1. Loosen 2 screws T30 of heating air blower assembly with PWM module.
2. Pull 4-pin plug of wiring harness out of PWM module (at side of motor of heating air blower assembly).
3. Remove heating air blower assembly.

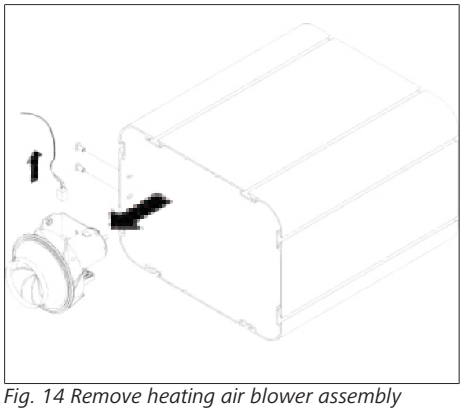


Fig. 14 Remove heating air blower assembly

NOTE

Do not dismantle the heating air blower assembly/ PWM module!

If disassembled, the distance between speed sensor and magnet on blower cannot be

guaranteed.

The heating air blower assembly is only available as a complete unit.

Only for Dual Top ST 8:

- Loosen screw T30 and hex nut SW 10 mm to remove green/ yellow ground wire from housing.

8.3.3 Removing the housing and insulating elements

1. Loosen 4 T30 screws on bottom of Dual Top.
2. Pull boiler including insulating elements out of housing.
3. Remove both insulation elements.

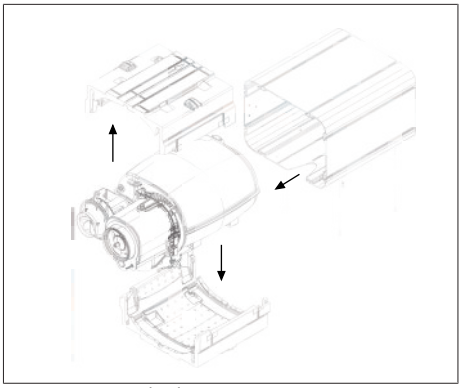


Fig. 15 Remove boiler

8.3.4 Removing the ventilation / overpressure valve and solenoid valve

1. Remove the drain hose from the ventilation / overpressure valve, solenoid valve and the cooling air outlet.

Only Dual Top ST immersion pump version:

2. Pull the ventilation hose of Dual Top ST off the ventilation / overpressure valve.

If you have a normal version: continue at step 3.

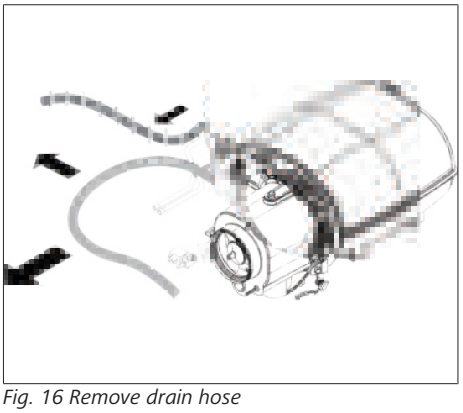


Fig. 16 Remove drain hose

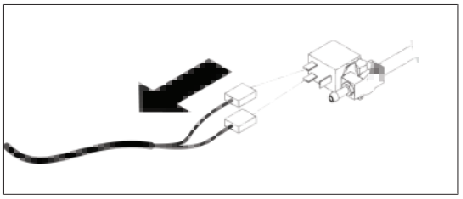


Fig. 17 Remove connector

3. Pull 2 1-pin plugs out of solenoid valve.

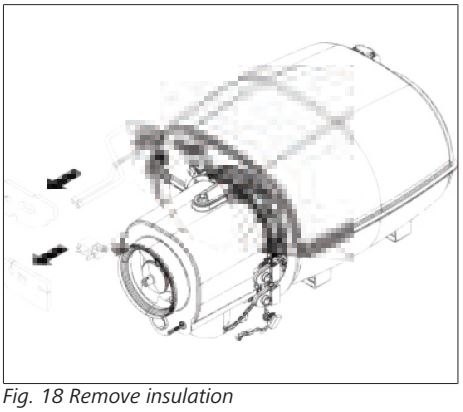


Fig. 18 Remove insulation

4. Remove insulation from ventilation/overpressure valve (top) and solenoid valve (bottom).

NOTE
Avoid that the screwdriver makes scratches on the tube. Scratches will cause leakage.
▶ Alternative: use a plastic tool.

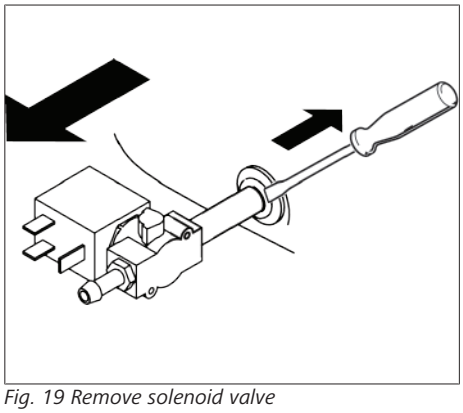


Fig. 19 Remove solenoid valve

5. Use flat (-) screwdriver to push down ring of connector hot and cold water pipes and pull pipes up to remove them from boiler.

6. In the same way, remove air ventilation/overpressure valve.

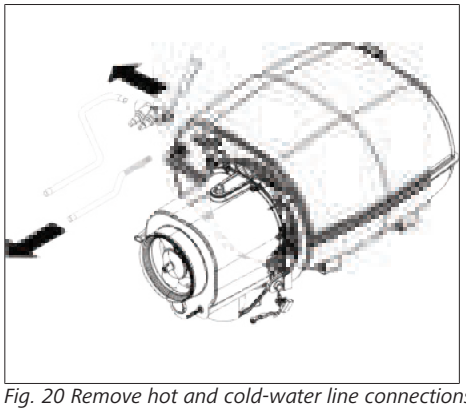


Fig. 20 Remove hot and cold-water line connections and ventilation / overpressure valve

8.3.5 Removing the thermo unit, sensors and sensor wiring harness

1. Loosen 4 T30 screws that attach thermo unit to boiler.
2. Pull out thermo unit including heat exchanger.

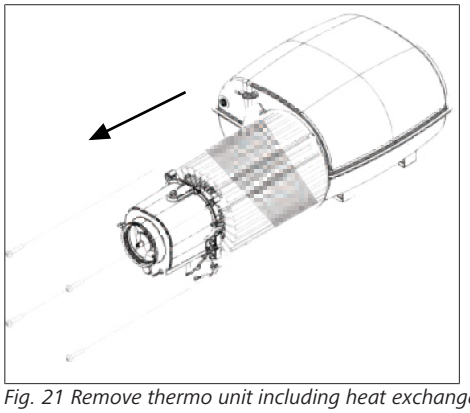


Fig. 21 Remove thermo unit including heat exchanger

Back boiler:

3. Loosen 7 mm hex nut that attaches water temperature switch and water temperature sensor of sensor wiring harness to back of boiler.

4. Remove sensor wiring harness and pink-coloured silicone guard.

5. Disconnect 8-pin plug of sensor wiring harness from internal wiring harness.

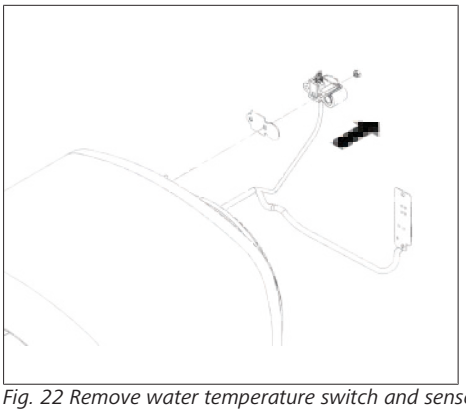


Fig. 22 Remove water temperature switch and sensor

6. Remove 4 springs form back of heat exchanger.

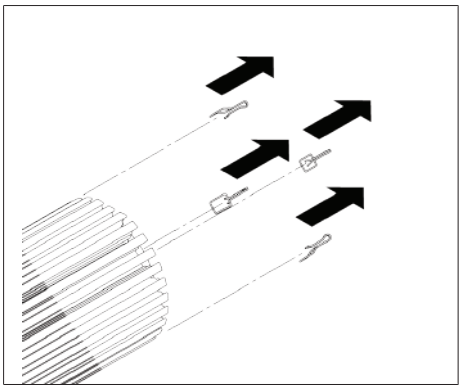


Fig. 23 Remove 4 springs

NOTE
Older heaters (Ident. No. 9015314A, see type label on heater) have guide pads (silicone) instead of springs.
After the heat exchanger is removed, the guide pads must be replaced with springs.
Due to a different heat conductivity, the control unit must also be replaced.

7. Loosen 2 T10 screws that hold overheat switch to backside heat exchanger.

8. Remove wires and cable fasteners from the ribs on the heat exchanger.

9. Disconnect plug 2-pin of wiring overheating protector from internal wiring harness.

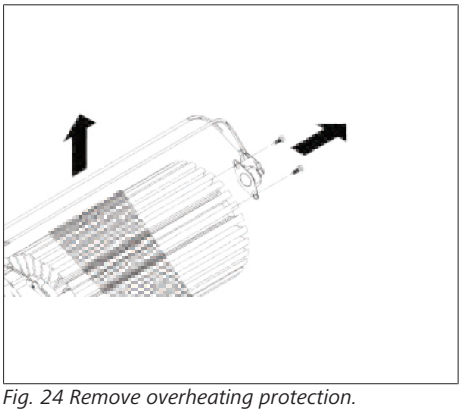


Fig. 24 Remove overheating protection.

8.3.6 Removing the electrical heating element

This subchapter only applies on Dual Top ST 8.

1. Disconnect the two X1 plugs (2-pin, 1x grey/black, 1 x brown/blue) that are on the cable between the relay box and the electrical heating elements.
2. Loosen T10 screw on the back of heat exchanger to remove the holding plate of the electrical heating element.
3. Pull the electrical heating element backward to remove it from the heat exchanger.

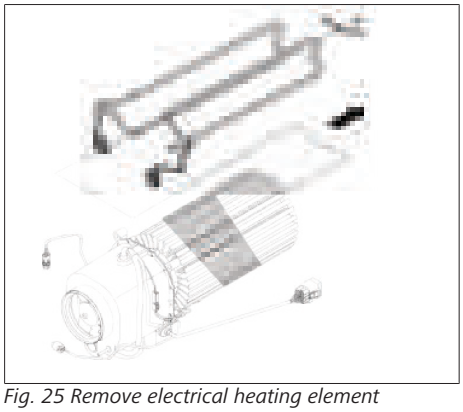


Fig. 25 Remove electrical heating element

8.3.7 Removing the control unit and internal wiring harness

1. Remove exhaust gasket from exhaust and cooling air outlet.

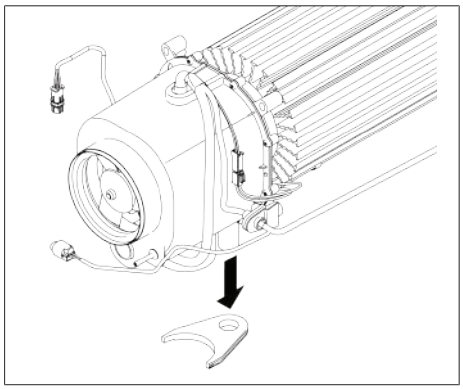


Fig. 26 Remove exhaust gasket

2. Loosen 8 screws T20 to remove cooling shell.

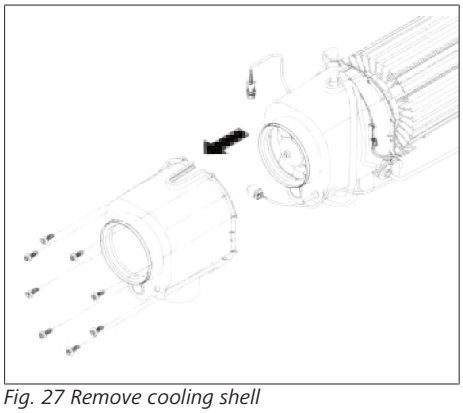


Fig. 27 Remove cooling shell

NOTE

- Small rubber grommet: Fuel line
- Large rubber grommet: Wiring harness

3. Disconnect the five plugs of the internal wiring harness from control unit.
4. Loosen screw T20 that attaches the brown wire to the control unit.
5. Remove the internal wiring harness.
6. Disconnect the two remaining 2-pin plugs, loosen the second T20 screw, then remove the control unit from the thermo unit.

Control unit:

(1) = Temperature sensor control unit

(2) = Hall sensor for speed of combustion and cooling air blower

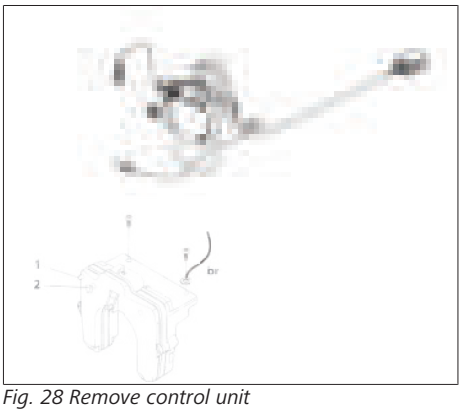


Fig. 28 Remove control unit

7. Remove cooling shell gasket.

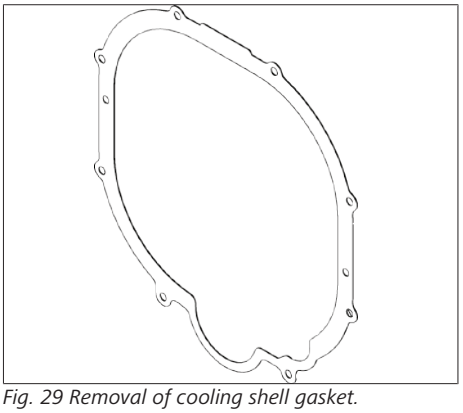


Fig. 29 Removal of cooling shell gasket.

8.3.8 Removing the drive

1. Loosen 8 screws T20 to remove drive assembly from heat exchanger.
2. Remove flat gasket heat exchanger.

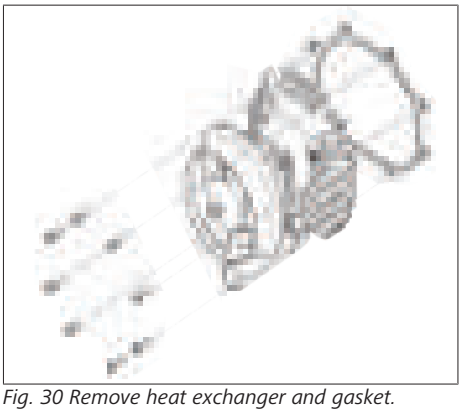


Fig. 30 Remove heat exchanger and gasket.

3. Loosen 3 T20 screws to remove combustion air intake incl. connection gasket from drive assembly.

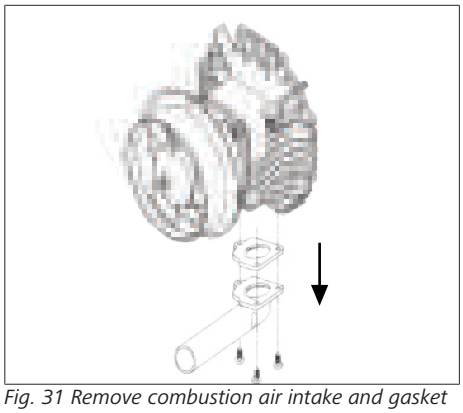


Fig. 31 Remove combustion air intake and gasket

8.3.9 Removing the evaporator housing assembly, glow plug and combustion pipe assembly

1. Loosen 2 T20 screws to remove clamping yoke from heat exchanger.

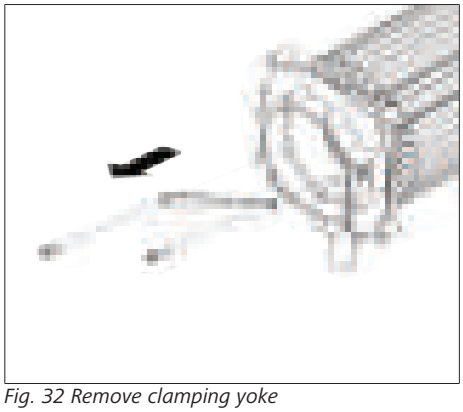


Fig. 32 Remove clamping yoke

2. Press the grommet on the glow plug wire inwards and guide the plug through the hole in the heat exchanger.

3. Press the grommet of fuel line inwards.

4. Remove evaporator housing assembly with fuel line and glow plug from the heat exchanger.

5. Pull the holding spring of the glow plug to remove glow plug from evaporator housing assembly.

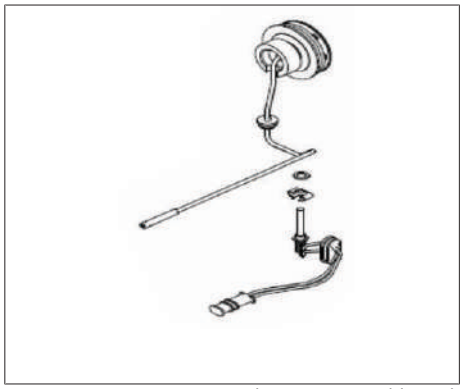


Fig. 33 Remove evaporator housing assembly and glow plug

6. Loosen 2 T20 screws to remove combustion pipe assembly and metal crimp sealing from heat exchanger.

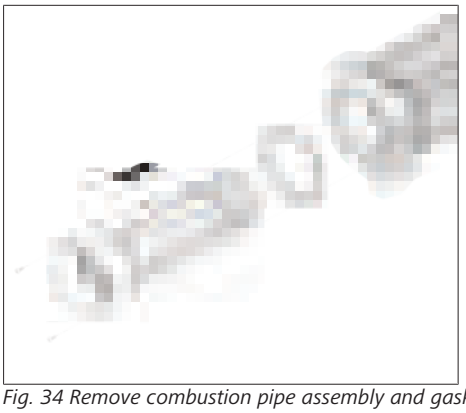


Fig. 34 Remove combustion pipe assembly and gasket

8.4 Assembling

8.4.1 Installing the evaporator housing assembly, glow plug and combustion pipe assembly

1. Align straight sides of combustion pipe assembly and metal crimp sealing with bottom of heat exchanger.
2. Fix with 2 screws T20.

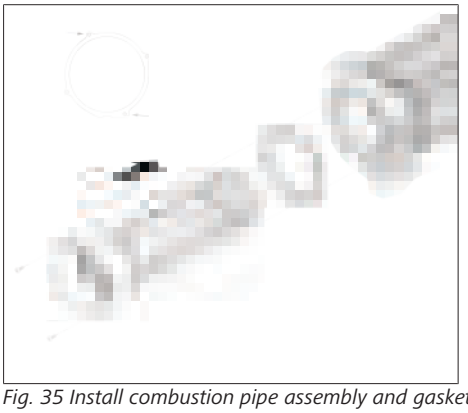


Fig. 35 Install combustion pipe assembly and gasket

NOTE

- Position screws: see drawing.
- Gaskets must always be replaced with new ones.

3. Guide the glow plug into the evaporator housing assembly and fasten with retaining spring.

4. Guide the fuel line from inside to outside through the large hole in the base of heat exchanger.

5. Position the evaporator housing assembly in combustion pipe assembly.

6. Press the fuel line grommet into the hole of the heat exchanger.

7. Guide wiring glow plug from inside to outside through the small hole in the side of the heat exchanger.

8. Press the grommet on glow plug wire through the hole in the heat exchanger.

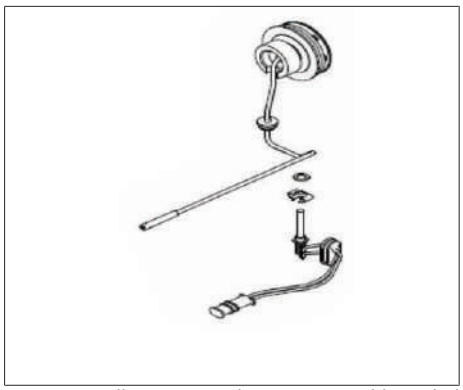


Fig. 36 Install evaporator housing assembly and glow plug

9. Fix evaporator housing assembly to heat exchanger with clamping yoke and 2 screws T20.

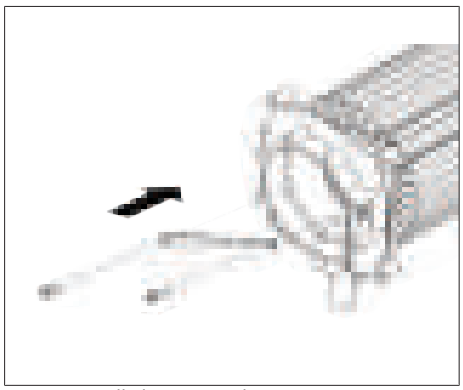


Fig. 37 Install clamping yoke

8.4.2 Installing the drive

1. Fix combustion air intake incl. connection gasket to drive assembly with 3 screws T20.

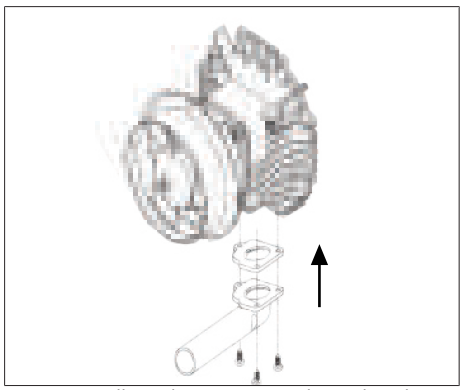


Fig. 38 Install combustion air intake and gasket

2. Attach the flat gasket heat exchanger and the drive assembly to the heat exchanger and fix with 8 screws T20.

NOTE

Allign 2 holes in gasket with protrusions on the heat exchanger.

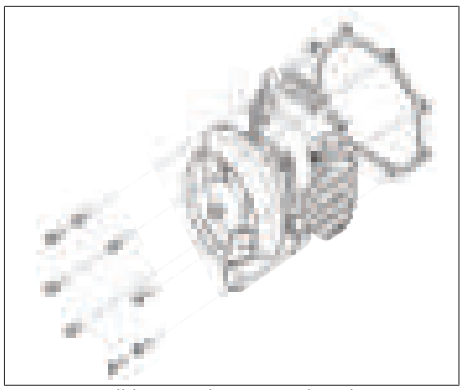


Fig. 30 Install heat exchanger and gasket

NOTE

When assembling, leave out the cooling shell gasket and do not use any other gaskets or sealants.

8.4.3 Installing the control unit and the internal wiring harness

1. Connect 2 plugs from the thermo unit (Y1 and Y2, see Fig. 62) and 5 plugs from the internal wiring harness (Y3, Y4, Y5, Y6 and Y7, see Fig. 62) to the control unit.
2. Put control unit on drive assembly and fix with 2 screw T20.
3. Use 1 of these screws to fix the brown wire.

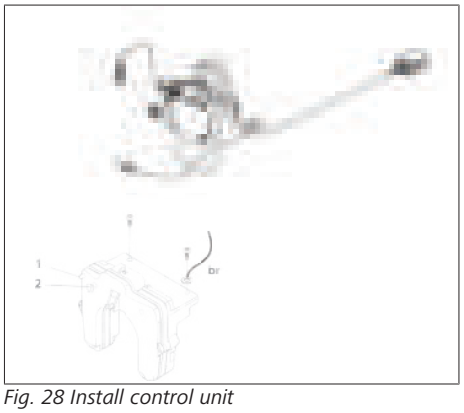


Fig. 28 Install control unit

4. Attach cooling shell to heat exchanger with 8 screws T20.

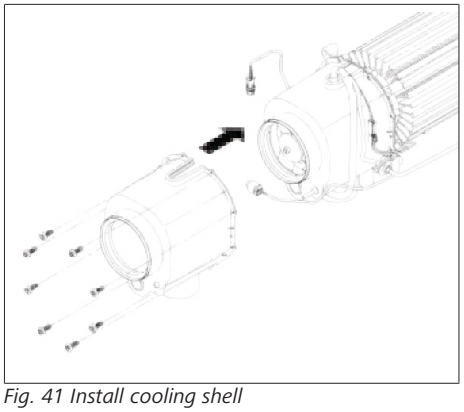


Fig. 41 Install cooling shell

NOTE

- Small rubber grommet between cooling shell and fuel line.
- Large rubber grommet between cooling shell and wiring harness.

5. Put the exhaust gasket on the exhaust and cooling air outlet.

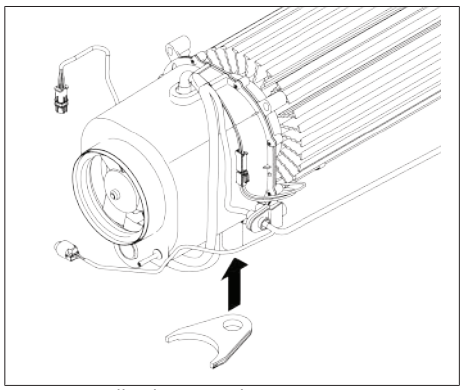


Fig. 42 Install exhaust gasket

8.4.4 Installing the electrical heating elements

Only for Dual Top ST 8

1. Slide electrical heating element from backside into the heat exchanger.

NOTE

Observe the correct position of the electrical heating elements.

2. Fix electrical heating elements to heat exchanger with securing plate and T10 screw.

3. Connect 2 plugs X1 (2-pin, 1x grey and black, 1x brown and blue) of wiring elements to wiring from relay box.

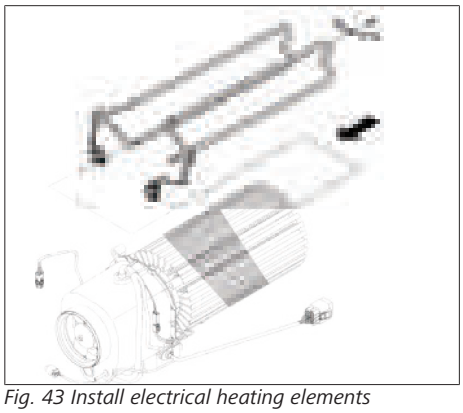


Fig. 43 Install electrical heating elements

8.4.5 Installing the thermo unit, sensors and sensor wiring harness

1. Fix overheating protector to backside heat exchanger with 2 screws T10.
2. Connect 2-pin plug of wiring overheating protector to internal wiring harness.
3. Fix wires to ribs of heat exchanger using cable ties.

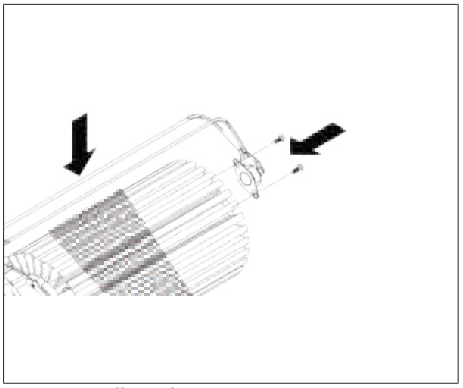


Fig. 44 Install overheating protection

4. Fit 4 springs on heat exchanger.

5. Select a uniform positioning of the springs so that the thermo unit is positioned at an equal distance from the boiler on all sides.

NOTE

Older heaters (Ident. No. 9015314A, see type label on heater) have guide pads (silicone) instead of springs.

After the heat exchanger is removed, the guide pads must be replaced with springs.

Due to a different heat conductivity, the control unit must also be replaced.

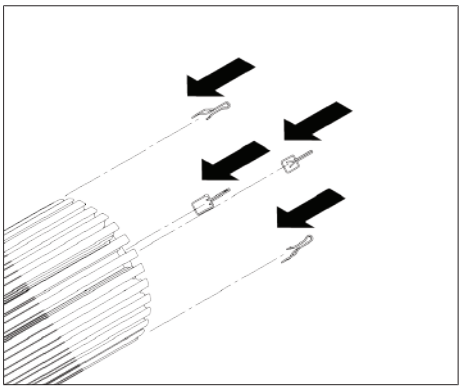


Fig. 45 Install 4 springs

6. Connect plug 8 poles of sensor wiring harness to internal wiring harness.

7. Put pink coloured silicon pad on 2 threaded studs M4 at backside boiler and fix water temperature switch and water temperature sensor of sensor wiring harness with 7 mm hex nut.

NOTE

Always replace the pink-coloured silicone guard after changing the sensor wiring harness. This is important for good heat conduction.

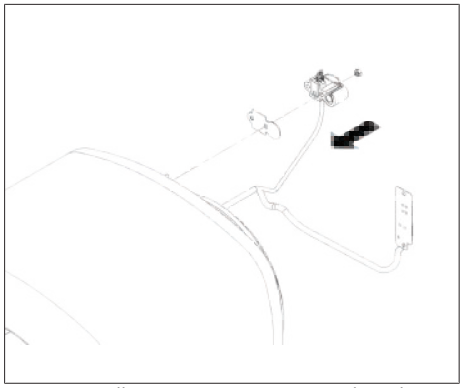


Fig. 46 Install water temperature switch and sensor

8. Put thermo unit into boiler and fix with 4 screws T30.

NOTE

Make sure that clearance between heat exchanger and boiler is spread evenly. This can be ensured with the large holes in the thermo unit.

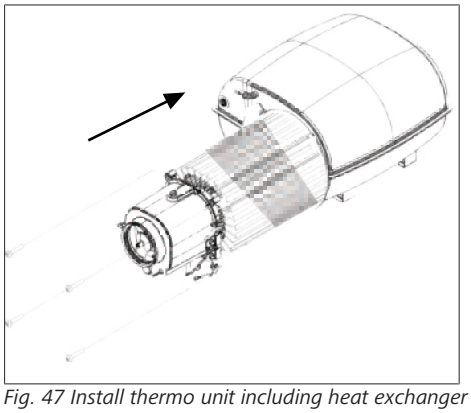


Fig. 47 Install thermo unit including heat exchanger

8.4.6 Installing the ventilation / overpressure valve and solenoid valve

1. Push the air ventilation / overpressure valve as far as possible onto the connection of boiler.
2. Push the hot water pipe as far as posible into the air ventilation / overpressure valve and the cold water pipe into the connection of boiler.

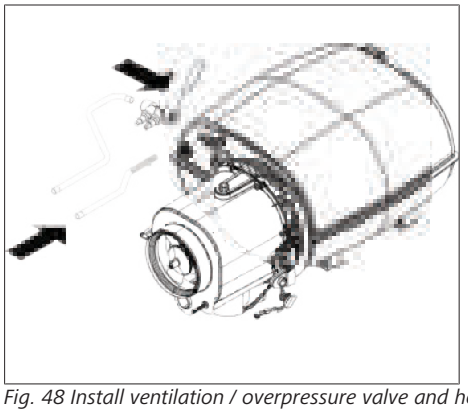


Fig. 48 Install ventilation / overpressure valve and hot and cold-water line connection.

3. Push the solenoid valve as far as possible into the connection of the boiler.

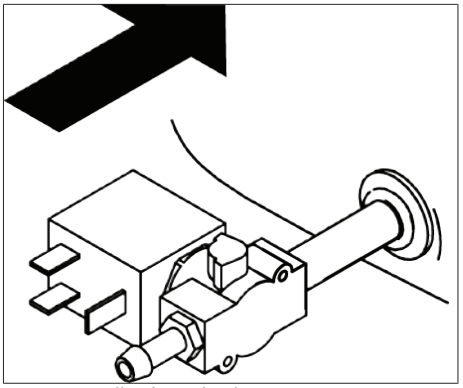


Fig. 49 Install solenoid valve

4. Attach the self-adhesive insulation ventilation / overpressure valve (top) and solenoid valve (bottom).

NOTE

Make sure that it is possible to connect drain tube and wiring to valves.

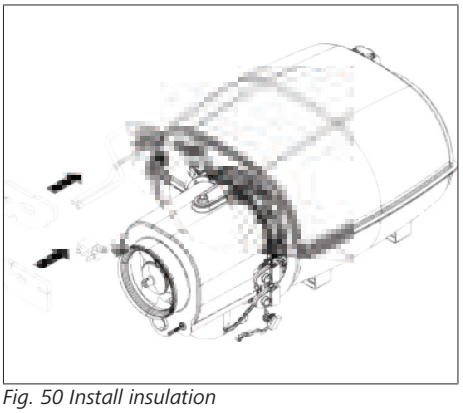


Fig. 50 Install insulation

5. Connect 2 1-pin plugs with solenoid valve.
6. Use 2 parallel pins of valve.

It is not important which wire colour is connected to which pin (upper or lower).

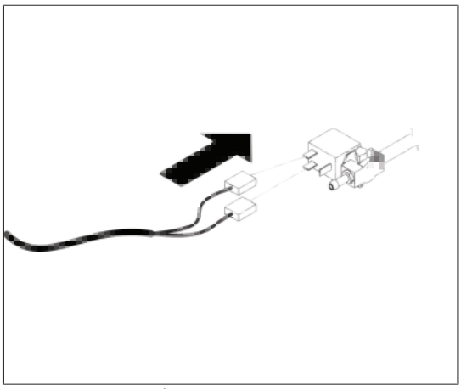


Fig. 51 Connect plugs

Dual Top ST standard version:

1. Connect drain hose to 2 openings on ventilation/overpressure valve (A, D) and to 1 opening on solenoid valve (B). See Fig. 52 on the following page.
2. Position open end in cooling air outlet (C).

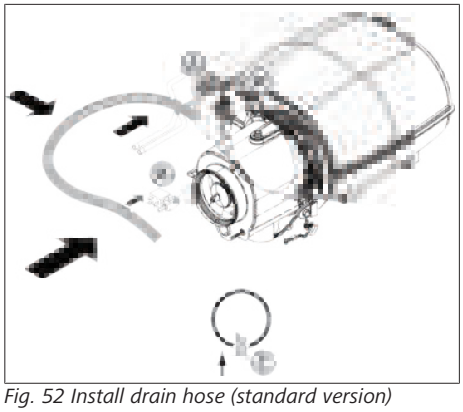


Fig. 52 Install drain hose (standard version)

Dual Top ST immersion pump version:

1. Connect drain hose to 1 opening on ventilation/overpressure valve (A) and to 1 opening on solenoid valve (B).
2. Position open end in cooling air outlet (C).
3. Connect ventilation hose of Dual Top to ventilation/overpressure valve (D).

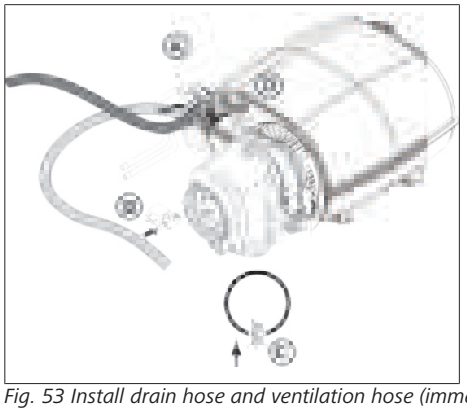


Fig. 53 Install drain hose and ventilation hose (immersion pump version)

8.4.7 Installing the housing and insulation elements

1. Fit 2 insulation elements on top and bottom of unit (parts are identical).

NOTE

- ▶ Arrows on insulation elements must face toward rear.
- ▶ Position sensor wiring between bottom of boiler and lower part insulation (groove in insulation element.)

2. Carefully slide Dual Top including insulation elements into housing.

NOTE

The Dual Top ST housing must fit into the groove of the exhaust gasket

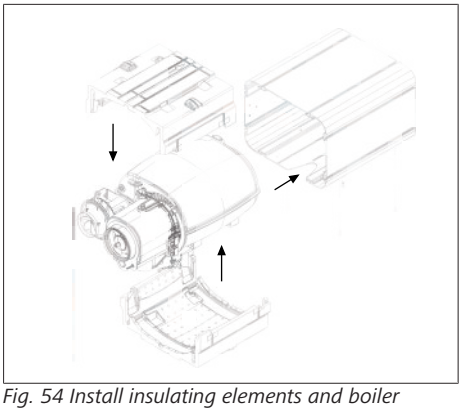


Fig. 54 Install insulating elements and boiler

Only for Dual Top ST 8:

- ■ Fix the green/yellow ground wire to the housing using screw T30 and hex nut SW10. Tightening torque: 9 ± 0.9 Nm.

8.4.8 Installing the heating air blower assembly

1. Connect 4-pin plug of internal wiring harness to PWM module.
2. Attach heating air blower assembly to Dual Top ST housing with 2 screws T30.

NOTE

- ▶ Make sure that the cable connection is correct, otherwise the heating air blower will rotate in the wrong direction!
- ▶ If spacers are present and a new heating air blower assembly is installed beginning with production in January 2013, the spacers must be removed.
- ▶ Position heating air blower assembly with 2 screws in centre of oval holes in Dual Top ST housing.
- ▶ Do not tighten screws completely yet!
- ▶ Make sure that wires don't touch rotating parts.

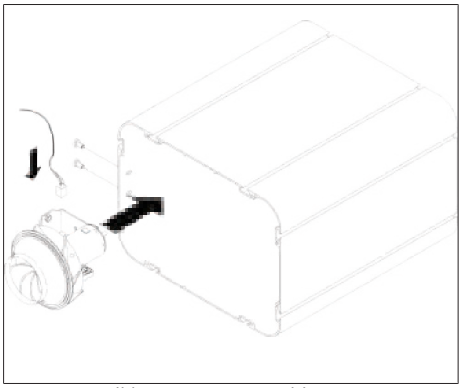


Fig. 55 Install heating air assembly

Make sure that the green and the brown wire of the 4-pin plug are connected in the direction of the boiler and that the grey and the red/blue wire of the 4-pin plug are connected in the direction of the fan.

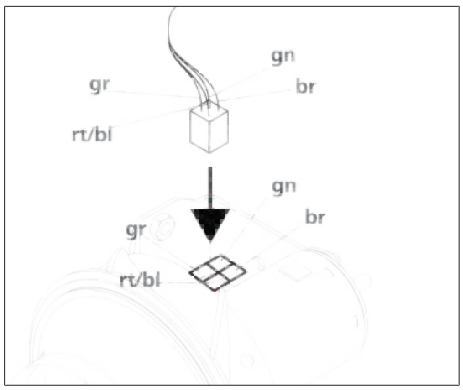


Fig. 56

	Description
br	Brown
gn	Green
gr	Grey
rt /bl	Red /blue

8.4.9 Installing the housing cover

1. Fix the metal hold plate (with air temperature sensor and air temperature switch) of sensor wiring harness to the housing cover with hot air outlet with 2 screws T20.

NOTE

- Sensor and switch shall face towards housing cover with hot air outlet (not towards heat exchanger).
- Overheating protector on heat exchanger shall not touch metal plate (with air temperature sensor and air temperature switch) of sensor wiring harness. Distance ≥ 2 mm.
- Put seal end cap around flange at backside of boiler. Seal end cap is important to avoid air leakages. Position this part exactly and make sure that it is not deformed and does not slip during installation!

2. Attach the housing cover with the hot air outlet to the Dual Top ST housing with eight T25 screws.
3. Torque setting: 6 Nm.

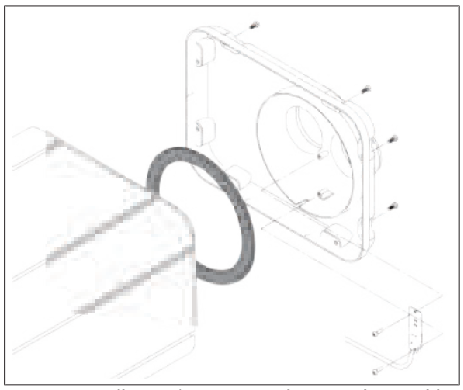


Fig. 13 Install metal retaining plate, gasket and housing cover with hot air inlet

4. Install air intake grill and cooling shell foam gasket.

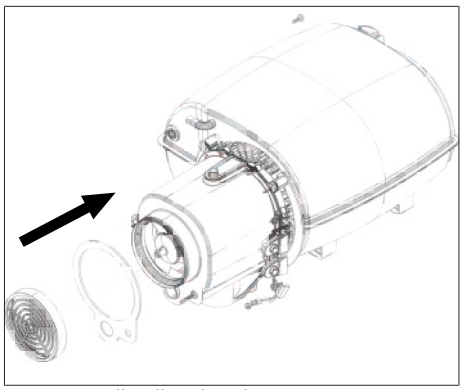


Fig. 58 Install grill and gasket

5. Slide grommet water in- and outlet into housing cover with inlet interfaces.
6. Housing cover must be inserted into groove of grommet.
7. Guide connectors water pipes through rubber gasket.

Only Dual Top ST immersion pump version:

1.Guide ventilation hose of the Dual Top ST through the housing cover with inlet interfaces.

2. Attach the housing cover with the hot air outlet to the Dual Top ST housing with eight T25 screws.
3. Torque setting: 6 Nm.

NOTE

Housing cover with inlet interfaces must fit into respective groove of grommets for wiring harnesses (1 pc. for Dual Top ST 6).

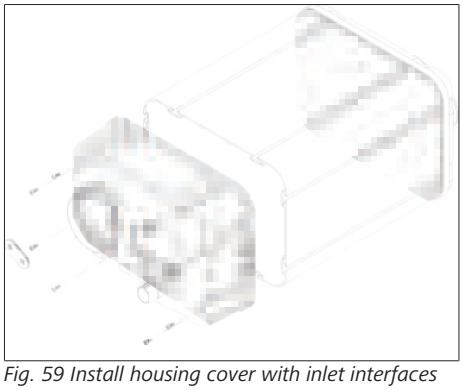


Fig. 59 Install housing cover with inlet interfaces

1. Position cover heating air blower and heating air blower assembly in such a way that heating air blower can rotate freely.
2. Then tighten 2 T20 screws (2 Nm) of cover of heating air blower and 2 T30 screws (9 Nm) that fix heating air blower assembly to Dual Top ST housing.

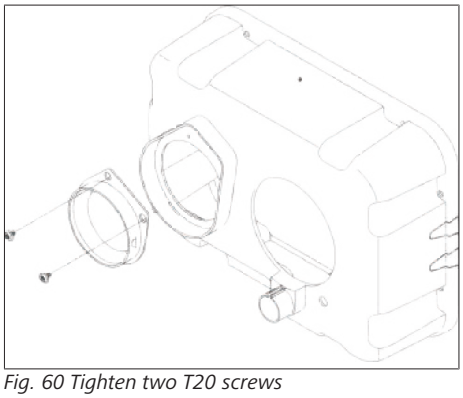


Fig. 60 Tighten two T20 screws

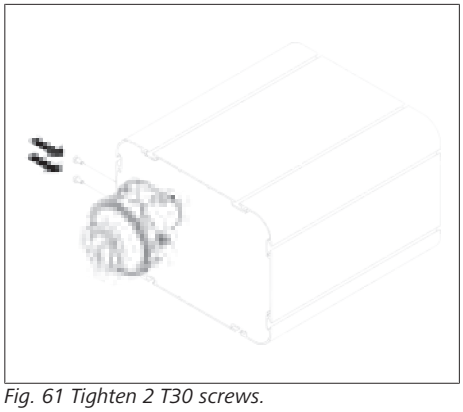


Fig. 61 Tighten 2 T30 screws.

NOTE

- Make sure that heating air blower can rotate freely before placing heater back into vehicle.
- Use Webasto Thermo Test's component test to run heating air blower at 30, 60 and 90%. When doing so, allow the blower to run for at least 30 seconds on each level.

8.5 Replacing the aluminium boiler

Webasto recommends the following procedure to replace the aluminium boiler. The Dual Top Evo with aluminium boiler can be upgraded to a stainless steel boiler with the upgrade kit 1328311A01.

The kit contains the following parts:

Item nr.	Name
9040685C05	BOILER stainless steel
9040686C04	TUBE TO DRAIN OFF DUAL TOP DIVING PUMP
9041205C04	TUBE TO DRAIN OFF COMPONENT
9041048C03	INSULATION COMBI-VALVE
9041053C03	INSULATION MAGNETIC-VALVE
1328310B02	BAG WATER PIPES Dual Top ST
9040682A02	INSULATION Dual Top BOILER
1314880A03	SP-BAG SCREWS BOILER
1328461A01	End cap
9015331C04	Heat conduction pad

To start with the boiler upgrade procedure please uninstall the Dual Top according to the procedure for removal and installation in chapter 7.8, "Removal and installation" on page 21:

1. Remove the housing cover: chapter 8.3.1, "Removing the housing cover" on page 22.
2. Remove the heating air blower assembly: chapter 8.3.2, "Removing the heater air blower assembly" on page 21.
3. Remove the housing and insulating elements: chapter 8.3.3, "Removing the housing and insulating elements" on page 23
4. Remove the ventilation / overpressure valve and solenoid valve: chapter 8.3.4, "Removing the ventilation / overpressure valve and solenoid valve" on page 23.
5. Remove the thermo unit, sensors and the sensor of the wiring harness: chapter 8.3.5, "Removing the thermo unit, sensors and sensor wiring harness" on page 24.

NOTE

Do not remove the thermo unit sensor.

You must only remove the sensor and the sensor wiring from the boiler.

For the assembling procedure, use the stainless steel boiler 9040685A03 and continue with the following steps:

1. Install the thermo unit, sensors and the sensor wiring harness: chapter 8.4.5, "Installing the thermo unit, sensors and sensor wiring harness" on page 28. Use the new heat conductive pad 9015331C and install the sensor on the stainless steel boiler 9040685A03.
2. Install the ventilation / overpressure valve and solenoid valve: chapter 8.4.6, "Installing the ventilation / overpressure valve and solenoid valve" on page 29.

Use the following parts for this step:

Item nr.	Name
9041048C03	INSULATION COMBI-VALVE
9041053C03	INSULATION MAGNETIC-VALVE
1328310B02	BAG WATER PIPES Dual Top ST
9015331C04	HEAT CONDUCTANCE PAD KU-TCS100
9040686C04	TUBE TO DRAIN OFF DUAL TOP DIVING PUMP
9041205C04	TUBE TO DRAIN OFF COMPONENT

3. Install the housing and insulating elements: chapter 8.4.7, "Installing the housing and insulation elements" on page 30. Use the Insulation component 9040682A01 for this step.
4. Install the heating air blower assembly: chapter 8.4.8, "Installing the heating air blower assembly" on page 30.
5. Install the housing cover: chapter 8.4.9, "Installing the housing cover" on page 31. Use the End cap 1328461A01 for this step.
6. Install the Dual Top ST according to chapter 7.8, "Removal and installation" on page 21.

9 Packaging/storage and shipping

9.1 General

You must clean and package the heater or its components which are sent to Webasto for testing, so that they are protected against damage when handled, transported and stored.

For storage, the ambient temperature must be between + 85 °C and – 40 °C.

ATTENTION

Fully drain a complete heater before sending it back.

Make sure that no fuel or other liquid can leak out during packing and/or shipment.

Seal the ports with dummy plugs.

10 Circuit diagramms

10.1 General

Fig. 62 shows the heater control unit.
How the electrical connections are to be made:
Dual Top ST 6: Fig. 63
Dual Top ST 8: Fig. 64
Electrical connections control panel:
Manual: Fig. 65
Programmable: Fig. 66
Circuit diagrams:
Dual Top ST 6: Fig. 67
Dual Top ST 8: Fig. 68

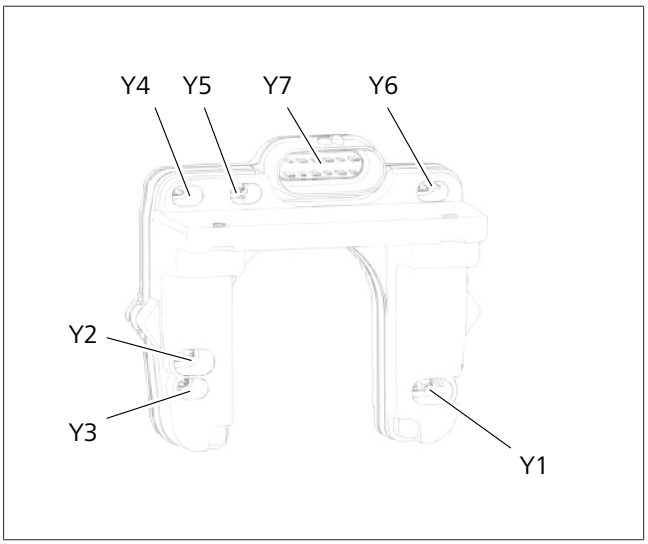


Fig. 62 Heater control unit Dual Top ST

Con-nection	Description
Y1	Combustion and cooling air blower connection
Y2	Glow plug connection
Y3	Air temperature connection
Y4	Fuel pump connection
Y5	Water temperature switch connection
Y6	Status PWM (D+) connection
Y7	Heater wiring harness connection

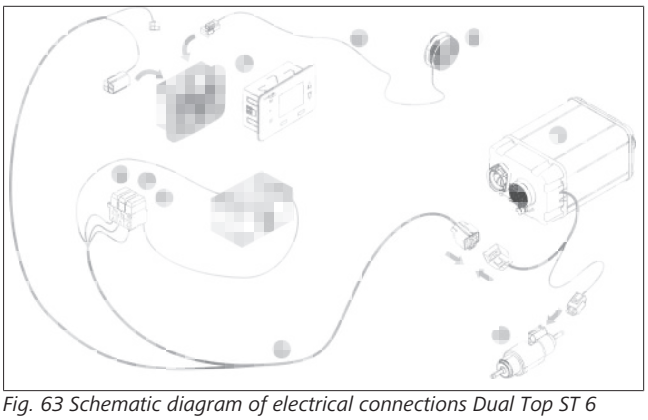


Fig. 63 Schematic diagram of electrical connections Dual Top ST 6

Num-ber	Description
1	Dual Top ST 6
2	Wiring harness
3	Manual or programmable control panel
4	Vehicle’s service battery
5	Fuse 5 A
6	Fuse 15 A
7	Fuse 15 A
8	Fuel pump
9	Interior temperature sensor
10	Wiring interior temperature sensor

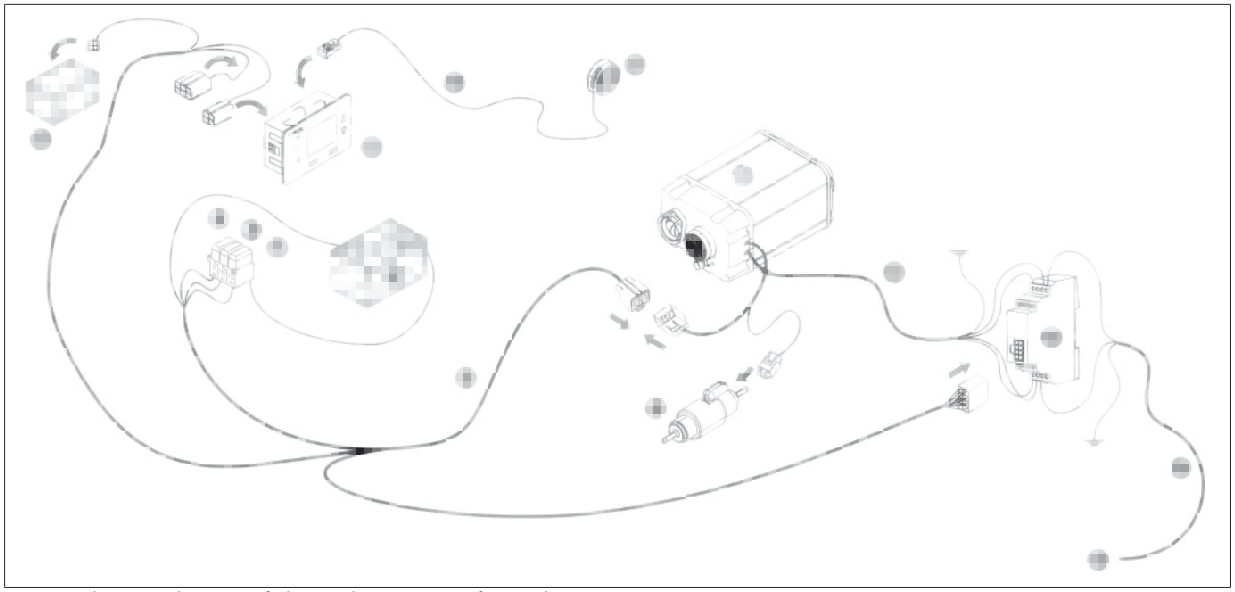


Fig. 64 Schematic diagram of electrical connections for Dual Top ST 8

Number	Description
1	Dual Top ST 8
2	Wiring harness (external)
3	Programmable control panel
4	Vehicle's service battery
5	Fuse 5 A
6	Fuse 15 A
7	Fuse 15 A
8	Fuel pump
9	Interior temperature sensor
10	Wiring interior sensor
11	Receiver Telestart
12	Relay box
13	Wiring harness of the electric heater (integrated)
14	Wiring 230 V
15	230 V power supply

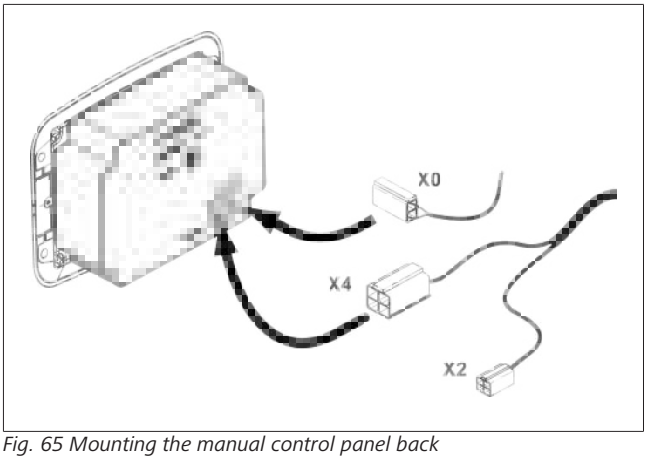
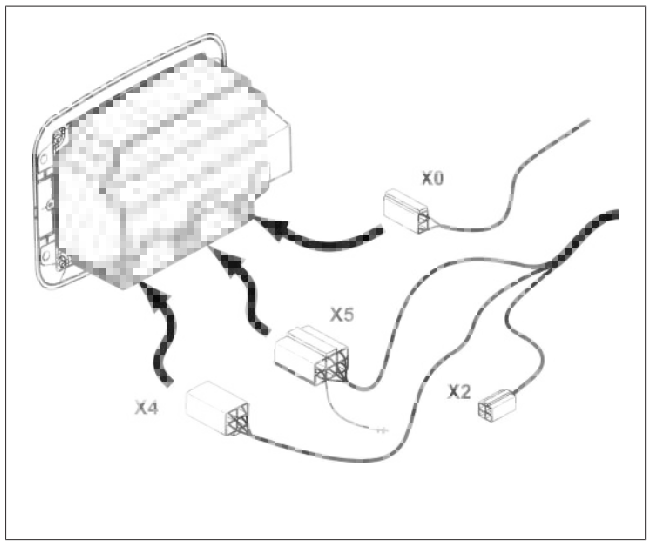


Fig. 65 Mounting the manual control panel back

X0 (2-pin)	Of room temperature sensor to control panel
X2	Webasto Thermo Test PC-diagnosis and Webasto Telestart / Thermo Call (For optional programmable control panel)
X4 (4-pin)	Of wiring harness to control panel



X0 (2-pin)	Of room temperature sensor to control panel
X2	For Webasto Thermo Test PC-diagnosis and Webasto Telestart / ThermoCall
X4 (4-pin)	Of wiring harness to control panel
X6 (6-pin)	Of wiring harness to control panel

Fig. 66 Electrical connections of the programmable control panel

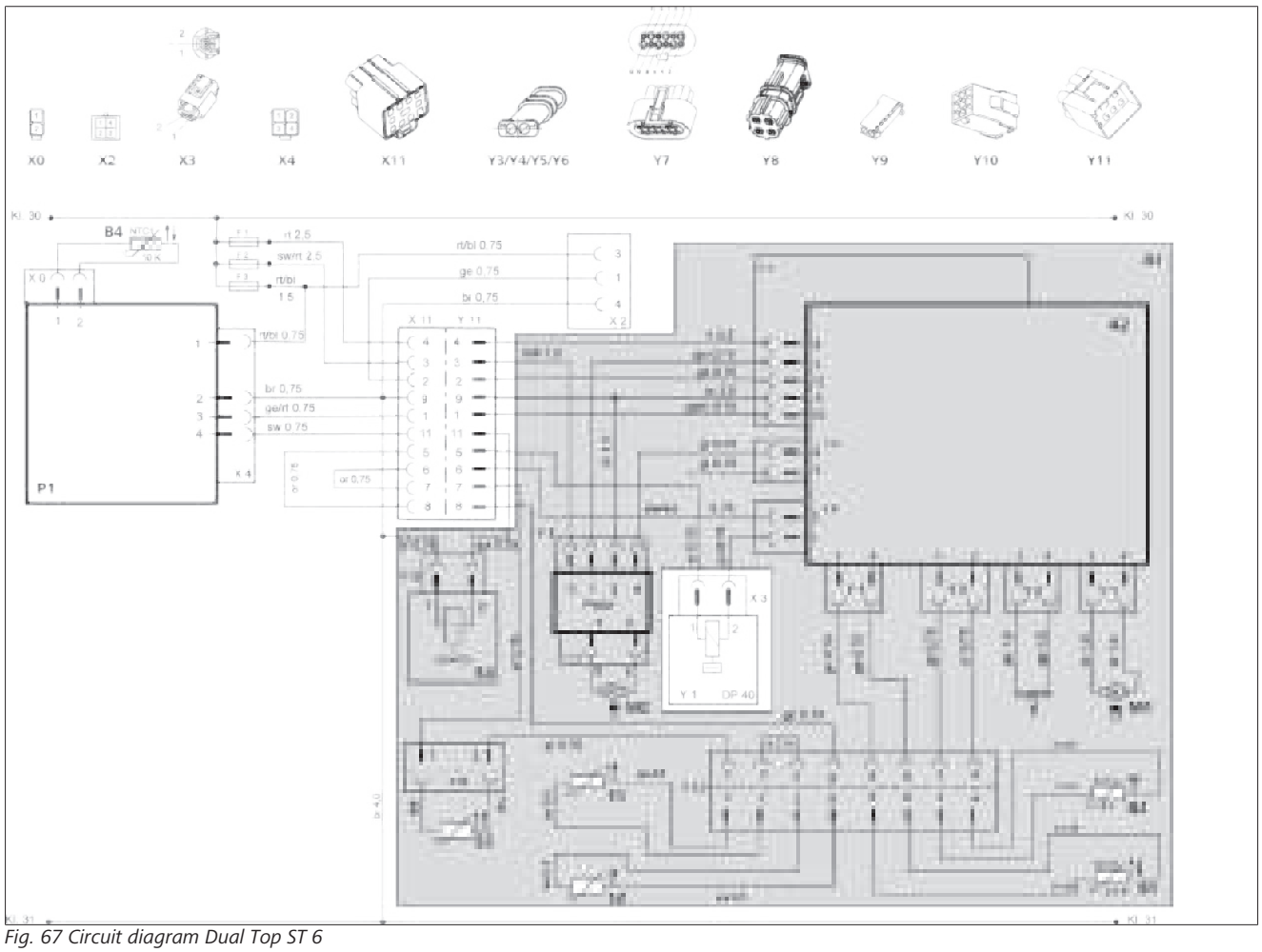


Fig. 67 Circuit diagram Dual Top ST 6

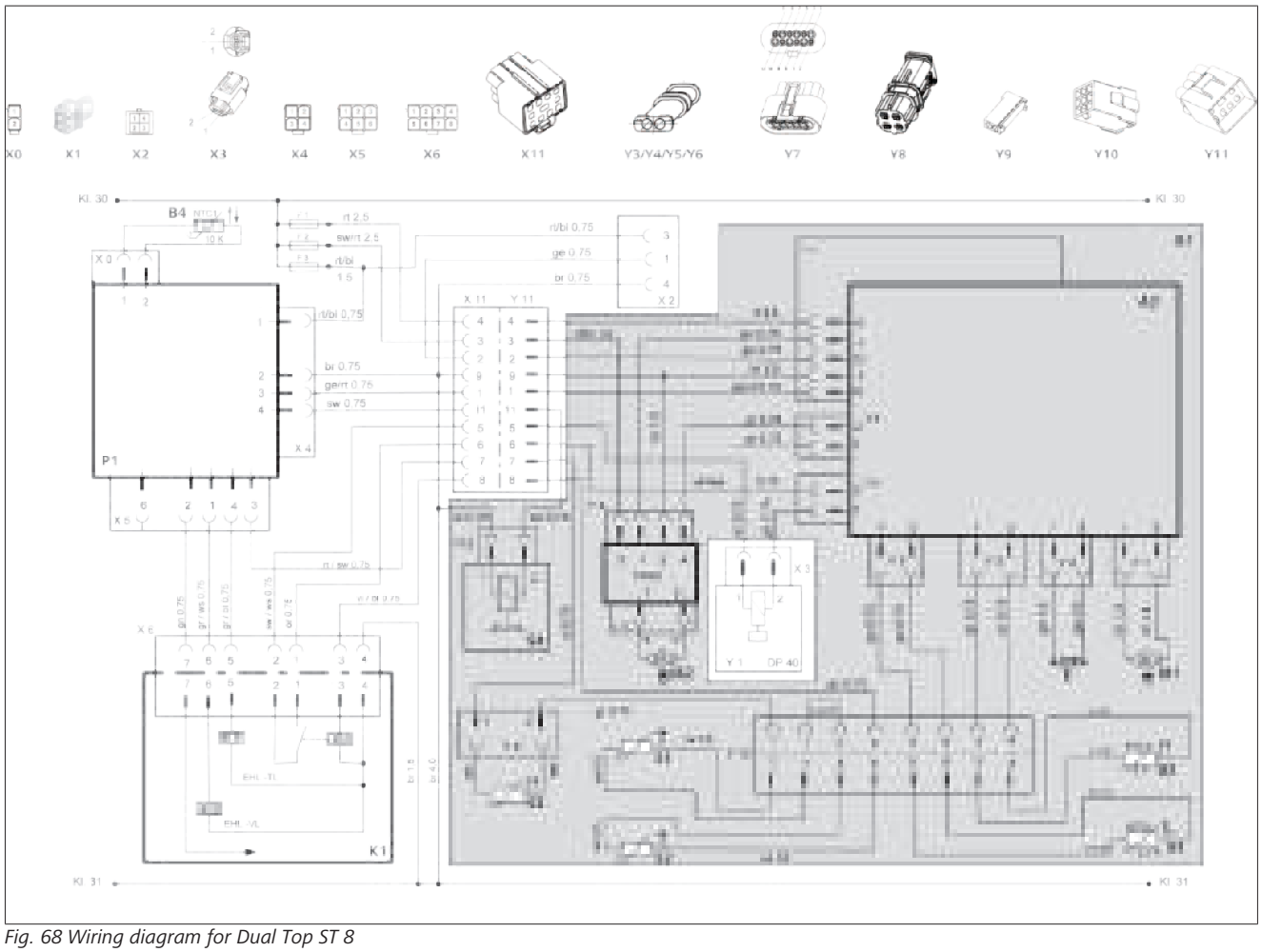


Fig. 68 Wiring diagram for Dual Top ST 8

10.2 Legend for circuit diagrams

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

Item	**Description**	**Comment**
A2	Control unit	Pin 1 not assigned (loose end also tied in)
B1	Water temperature sensor	
B2	Air temperature sensor	
B4	External room temperature sensor	
E	Glow plug / flame monitor	
F1	Fuse 15A	For thermo unit
F2	Fuse 15A	For PWM module
F3	Fuse 5A	For control panel
K4	Relay box	Pin 7: feedback for 230 V AC power supply

M1	Motor	Combustion and cooling air blower
M2	Motor	Heating air blower
P1	Manual control panel	
P2	Programmable control panel	
S1	Water temperature switch	
S2	Air temperature switch	
S3	Temperature switch for the heat exchanger	Overheating protector
S4	Solenoid valve	Electrical safety / drain valve for draining the boiler
X0	Plug connector, 2-pin	to control panel
X1	Plug connector, 2-pin	2X, to electric heater in Dual Top ST 8
X2	Plug connector, 4-pin	to PC-diagnosis / Telestart
X3	Plug connector, 2-pin	to fuel pump
X4	Plug connector, 4-pin	to control panel
X5	Plug connector, 6-pin	to control panel
X6	Plug connector, 8-pin	to relay box (for Dual Top ST 8 only)
X11	Plug connector, 12-pin	to Dual Top ST 6 / 8 heater
X12	Wire end	4X to relay box, 1 to earth (for Dual Top ST 8 only)
Y1	Fuel pump	DP 40
	Plug connector, 2-pin	On internal wiring harness; motor, combustion and cooling air blower; to control unit
Y2	Plug connector, 2-pin	On internal wiring harness; glow plug/flame monitor; to control unit
Y3	Plug connector, 2-pin	On internal wiring harness; air temperature sensor; to control unit; marking “A” (blue)
Y4	Plug connector, 2-pin	On internal wiring harness; fuel pump; to control unit; marking “C”
Y5	Plug connector, 2-pin	On internal wiring harness; water temperature sensor; to control unit; marking “B”
Y6	Plug connector, 2-pin	On internal wiring harness; connection status PWM (D+); to control unit; marking “A”
Y7	Plug connector, 12-pin	On internal wiring harness; to control unit
Y8	Plug connector, 4-pin	On internal wiring harness; to PWM module (motor of heating air blower)
Y9	Plug connector, 1-pin	On internal wiring harness; to temperature switch of heat exchanger S3
Y10	Plug connector, 9-pin	On internal wiring harness; to water temperature switch, air temperature switch, water temperature sensor, air temperature sensor
Y11	Plug connector, 12-pin	On internal wiring harness; to external wiring harness
Y12	Plug connector, 1-pin	2 pc., on internal wiring harness; to solenoid valve S4

11 Technical Data

Except where limit values are specified, the technical data refer to the usual heater tolerances of ± 10 % at an ambient temperature of + 20 °C and at the rated voltage and in rated conditions.

11.1 Fuel for the Dual Top ST

You must use diesel according to DIN EN 590, as specified by the manufacturer.

You must **not** use EL heating oil, L heating oil or PME (biodiesel).

Fuel additives have no negative effects on the heater. If fuel is extracted from the vehicle's tank, follow the instructions on additives as issued by the vehicle manufacturer.

After changing to low-temperature fuel, you must operate the heater for approximately 15 minutes for the fuel system to be filled with the new fuel.

11.2 Technical data

Heater	**Operation**	Dual Top ST **6**	Dual Top ST **8**
Type approval heater: EMC:		E1 10R-06 5000 E1 122R-00 0195	
Model		Air heater with evaporator burner	Air heater with evaporator burner and electric heater
Heat output diesel electric	Control range	1.5 to 6.0 kW -	1.5 to 6.0 kW 1.0 / 2.0 kW
Fuel		Diesel, DIN EN 590	
Fuel consumption	Control range	0.17 to 0.65 l/h	
Rated voltage		12 V	
Operating voltage range		10.5 to 15 V	
Current input at 12 V	Summer operation	< 1 A	
	Winter operation, heating and hot water	0.5 to 7 A	
	Stand-by	0.001 A	
Rated power consumption	Control range	15 to 65 W (EN 1646)	
Max. ambient temperature heater:			
Operation		-30 to +50 °C	-30 to +50 °C
Storage		-40 to +85 °C	-40 to 85 °C
Control Panel			
Operation		-30 to +75 °C	-30 to +75 °C
Storage		-40 to +85 °C	-40 to + 85 °C
Max. altitude (guaranteed function)		2,200 m	
Adjustment range for interior temperature	Control range	+5 to +35 °C	
Delivery rate for hot air (free blowing without hot air routing system)	Maximum	> 230 m^3/h	
CO2 in exhaust gas (permitted function range)	2 kW	5.0 to 8.0	
	6 kW	9.0 to 13	
Water content		9.8 l	
Water system pressure		max. 3.5 bar	
Overpressure valve		4.0 bar	
Pressure water pump, central water supply	Maximum	2.5 bar	
Heater dimensions		Length: 530 ± 2 mm Width: 352 ± 1 mm Height: 256 ± 1 mm	
Weight (w/o water contents)		23 kg	24 kg

This page left intentionally blank.

This page left intentionally blank.

This page left intentionally blank.

These are the original instructions. The English language is binding.
You can request your language if it is missing. The telephone number of each country can be found in the Webasto service centre leaflet or the website of the respective Webasto representative of your country.

Webasto Thermo & Comfort SE
Postfach 1410
82199 Gilching
Germany

Company address:
Friedrichshafener Str. 9
82205 Gilching
Germany

9019782C

www.webasto.com