

**Integrated Heater**

**Workshop Manual**

**Dual Top Evo 6 / 7 / 8**





Improper installation or repair of Webasto heating and cooling systems can cause fire or the leakage of deadly carbon monoxide leading to serious injury or death. To install and repair Webasto heating and cooling systems you need to have completed a Webasto training course and have the appropriate technical documentation, special tools and special equipment.



Only genuine Webasto parts may be used. See also Webasto air and water heaters accessories catalogue.

NEVER try to install or repair Webasto heating or cooling systems if you have not completed a Webasto training course, you do not have the necessary technical skills and you do not have the technical documentation, tools and equipment available to ensure that you can complete the installation and repair work properly.

ALWAYS carefully follow Webasto installation and repair instructions and heed all WARNINGS. Webasto rejects any liability for problems and damage caused by the system being installed by untrained personnel.

This liability exclusion particularly applies to improper installations and repairs, installations and repairs by untrained persons or in the case of a failure to use genuine spare parts.

The liability due to culpable disregard to life, limb or health and due to damage or injuries caused by a wilful or reckless breach of duty remain unaffected, as does the obligatory product liability.

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## 1 Introduction

### 1.1 Contents and purpose

This workshop manual is designed to assist trained personnel with repairing the Dual Top integrated heaters.

#### 1.1.1 Use of the integrated heaters

The Webasto Dual Top 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 tanks and the service battery of the vehicle.

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

### 1.2 Meaning of signal words

Throughout this manual, the signal words CAUTION, IMPORTANT and NOTE have the following meanings:

#### CAUTION

This heading is used to highlight operating instructions or procedures which, if not or not correctly followed, may result in personal injury or fatal accidents.

#### IMPORTANT

This heading is used to highlight operating instructions or procedures which, if not or not correctly followed, may result in damage to the equipment or its components.

#### NOTE

This heading is used to direct your attention to a special feature deemed essential to highlight.

### 1.3 Additional documentation to be used

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

However, it is necessary to heed additional documentation. The operating / installation instructions and the installation suggestion for the specific vehicle (if available) shall also be used.

### 1.4 Statutory regulations and safety instructions

In principle, the general accident prevention regulations and current works safety instructions are applicable. The "General safety regulations" that go beyond the scope of the above regulations are stated below.

Any special safety regulations relevant to this instruction manual will be highlighted in the relevant sections or text passages of the procedures.

#### 1.4.1 Statutory regulations governing installation

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

e1 00 0195  
e1 03 5000

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



#### NOTE:

The provisions of these Directives are binding within the territory governed by EU Directive 70/156/EEC and/or 2007/46/EC should similarly be observed in countries without specific regulations.

Installation of the Dual Top Evo 7/8 heater and related components must be in accordance with IEC 60364 ("Electrical installations in caravan parks and caravans").



#### IMPORTANT:

Dual Top Evo 7/8: you have to be certified to work on 230 V electric systems. Installation and all other jobs carried out by none certified persons can cause personal injury to you, the Dual Top and the vehicle. In that case, Webasto will refuse all liability.



#### IMPORTANT:

Failure to follow the installation instructions and the notes contained therein will lead to all liability being refused by Webasto. The same applies if repairs are carried out incorrectly or with the use of parts other than genuine spare parts. This will result in the heater's type approval being voided, and therefore also of the General Homologation/ ECE Type Approval.



#### NOTE:

Country-specific registration regulations must be complied with.

## 1.4.2 General safety information

Follow all the safety informations described in the additional documentation thoroughly.

The opening of the exhaust pipe is to be routed 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.

The function of parts important for vehicle operation may not be impaired. It must not be possible for condensate or water to collect in the exhaust pipe. Drain holes are allowed.

Electrical lines, switching and control units of the heater must be positioned 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 please refer to the detailed descriptions in the installation instructions.

The main points are:

- Fuel lines must be designed so that twisting of the vehicle, movements of the engine, etc. have no negative effect on the service life. They must be protected against mechanical damage.
- Fuel-carrying parts must be protected against heat that could interfere with operation and positioned so that dripping or evaporating fuel can neither collect on hot parts nor ignite on electrical devices.

**The heat exchanger and water boiler on Dual Top Evo heaters are 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, it is also mandatory to replace the overheating protection element (temperature sensor) in order to prevent possible faults when using the old temperature sensor.

When installed in the interior, the Dual Top heaters are prepared for installation and sealing directly on the cab floor. With the accessories available from Webasto, detachable connections of the combustion air and exhaust lines are not permitted in the vehicle interior. The seal between the heater mounting and the vehicle floor must always be installed, otherwise harmful emissions may get into the interior of the vehicle.

Cold and cooling and combustion air intake openings must be positioned so that no water can penetrate during a water crossing permissible for the respective vehicle.

The heater must be switched off at filling stations and tank farms as a result of the risk of explosion.

Wherever inflammable vapours or dust may form (for example in the vicinity of fuel, carbon, wood dust or cereal stores or the like), the heater must be switched off as a result of the risk of explosion.

The heater must not be operated in enclosed areas such as garages and workshops without an emissions extraction system, even if you use the timer, because of the risk of asphyxiation and poisoning.

In case of longer lasting smoke emission, unusual combustion noises or fuel odours, the heater must be shut down by removing the fuse and may not be returned to operation again until after 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:

- In motor coaches, installation in the passenger or driver's compartment is not permissible.
- The fuel filler neck may not be located within the passenger or driver's compartment on any vehicle.

The fuel lines (mecanyl hose) must not make direct contact to the exhaust pipe and must be thermally insulated if necessary, as otherwise there is a fire danger.

All fuel-carrying lines must be connected leak-tight, 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, the heater must not be operated until the damage has been repaired.

Put the heater out of action by removing the fuse.

### Overheating

Keep the cold air inlet and hot air outlet free of dirt and objects. Soiled, blocked air lines can result in an overheating switch-off.

After an overheating switch-off, the air routing must be checked for free passage and all materials which impair the flow of air must be removed or damage to the air routing must be repaired.

Then the heater lock-out must be eliminated 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 the heater is installed in a stowage space, it must be ensured that no flammable substances are stored in this space and that the air supply to the heater is not restricted by other material.

Air lines must be firmly secured on the heater and at all other connection points (e.g. air outlets) (e.g. with pipe clamps).

**IMPORTANT:**

The faults described in the following must always be avoided:

- Do not stand on the heater and do not place any heavy items on the heater or throw items at the heater.
- Do not place any items like clothing, textiles or similar materials over the heater or in front of the cold air inlet and the hot air outlet.
- The stream of hot air of the heater may not be restricted or blocked by highly flammable substances or materials, such as rags, cleaning wool, etc.
- Inflammable or explosive substances and gases must not be placed near or in contact with the heater, the hot air line, the hot air flow or the exhaust pipe.
- The heater must not be cleaned with a high pressure cleaner.
- Do not switch off the heater with the battery main switch or battery disconnection switch, as otherwise long-term damage is possible in case of frequent switching off with the battery disconnection switch. This can in turn result in damage and negatively effect the function of the heater.

Be sure to read the operating instructions before putting the heater into operation.

## 2 General description

The integrated Dual Top Evo 6, 7 and 8 heaters designed according to the evaporator principle mainly consists 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 Evo 6)
- the housing

The following 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.



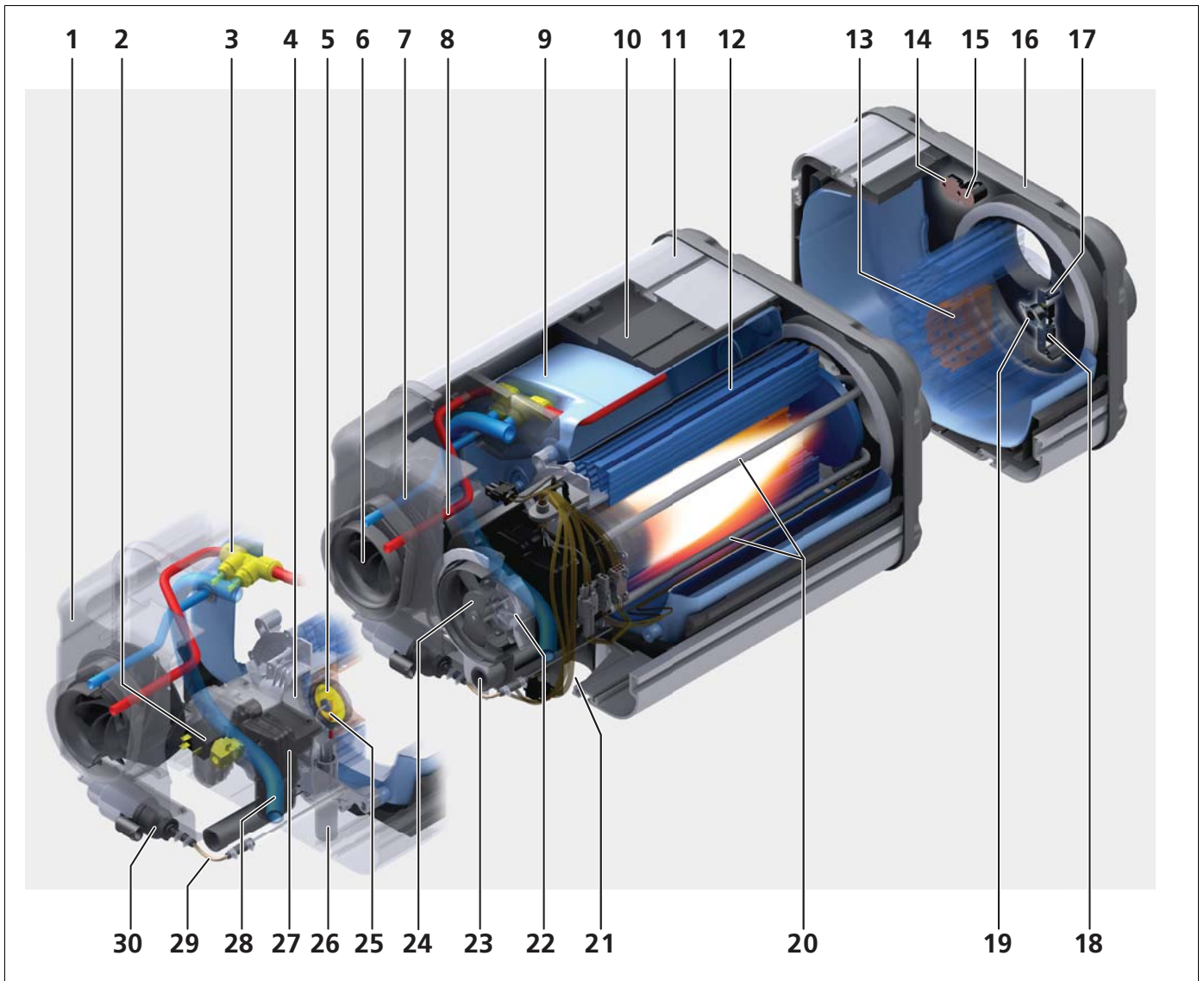


Fig. 201 Dual Top Evo Heater

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

## 3 Technical data

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

**Fuel for Dual Top**

The diesel fuel DIN EN 590 specified by the manufacturer must be used. Class EL heating oil, L heating oil or PME (bio-diesel) must not be used.

Fuel additives have no negative influences on the heater.

If fuel is extracted from the vehicle's tank, follow the additive instructions issued by the vehicle manufacturer.

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

**Table 301 Technical Data - Dual Top Evo 6**

Heater	Operation	Dual Top Evo 6
Type approval heater: EMC:		e1 00 0195 e1 03 5000
Model		Air heater with evaporator burner
Heat output diesel electric	Control range	1.5 to 6.0 kW -
Fuel		Diesel, DIN EN 590
Fuel consumption	Control range	0.19 to 0.66 l/h
Rated voltage		12 V
Operating voltage range		10.5 to 15 V
Current input at 12 V	Summer mode Winter mode, heating and hot water Stand-by	< 1 A 0.5 to 7 A 0.001 A
Rated power consumption	Control range	15 to 65 W (EN 1646)
Max. ambient temperature: Heater: - Operation - Storage control panel: - Operation - Storage		-30 to +50 °C -40 to +85 °C -30 to +75 °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 cold and hot air ducting)	Maximum	> 230 m <sup>3</sup> /h
CO <sub>2</sub> in exhaust gas (permitted function range)	2 kW 6 kW	5.0 to 8.0 9.0 to 13
Water capacity		11 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)		20 kg

Table 302 Technical Data - Dual Top Evo 7/8

Heater	Operation	Dual Top Evo 7	Dual Top Evo 8
Type approval heater: EMC:		e1 00 0195 e1 03 5000	
Model		Air heater with evaporator burner and electric heater	
Heat output diesel electric	Control range	1.5 to 6.0 kW 0.6 / 1.2 kW	1.5 to 6.0 kW 1.0 / 2.0 kW
Fuel		Diesel, DIN EN 590	
Fuel consumption	Control range	0.19 to 0.66 l/h	
Rated voltage		12 V	
Operating voltage range		10.5 to 15 V	
Current input at 12 V	Summer mode Winter mode, heating and hot water Stand-by	< 1 A 0.5 to 7 A 0,001 A	
Rated power consumption	Control range	15 to 65 W (EN 1646)	
Max. ambient temperature: Heater: - Operation - Storage control panel: - Operation - Storage		-30 to +50 °C -40 to +85 °C -30 to +75 °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 cold and hot air ducting)	Maximum	> 230 m <sup>3</sup> /h	
CO <sub>2</sub> in exhaust gas (permitted function range)	2 kW 6 kW	5.0 to 8.0 9.0 to 13	
Water capacity		11 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)		21 kg	

## 4 Troubleshooting

### 4.1 General information

Many faults are caused by improper installation. Installation errors should always be corrected or a fault of the system would occur. See Table 401 "Faults due to improper installation".

**Table 401**      **Faults due to improper installation**

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

### 4.2 Fault code output

#### IMPORTANT

Troubleshooting is generally limited to the localisation of the defective 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 connections on the control unit must be disconnected.

Carry out a functional check in the vehicle each time a fault is eliminated.



#### NOTE:

This chapter describes the fault codes given out by the manual and programmable control panels. Replacement of parts, dismantling and assembly (e.g. for inspection and cleaning) is described in chapter 8: "Repair".

## 4.2.1 Manual control panel



Fig. 401 Manual control panel

The manual control panel is used for Dual Top Evo 6 heaters only.

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

The control panel gives out the fault code in a flashing mode.

After a series of 5 fast GREEN flashes, the fault code output will be a repeated sequence of long RED flashes. This procedure is repeated until the heater is switched off. The meaning of the number of red flashes is shown in: Table 402 "Fault messages manual control panel". After that, again there will be 5 fast GREEN flashing pulses.

Rectify the cause of the fault.

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:

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

Or:

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

Or:

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

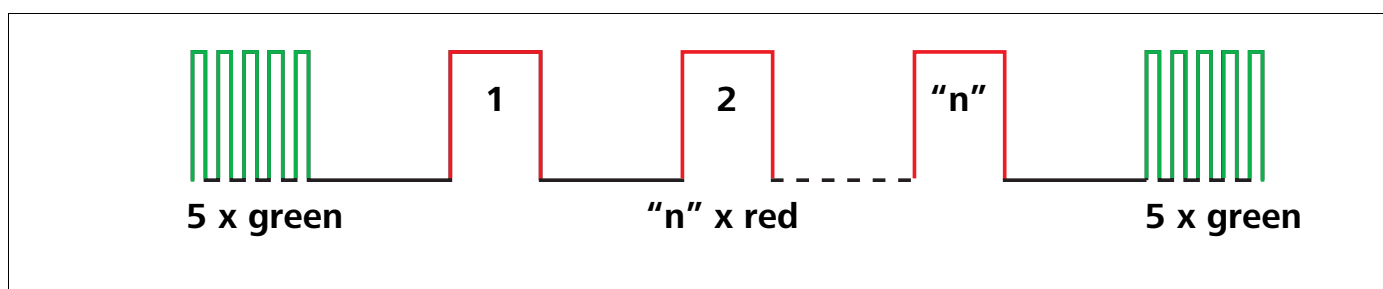


Fig. 402 Example of fault code

Table 402 Fault messages manual control panel

Number of RED flashes	Meaning	Code from control unit to control panel [hex]	Remedy
00	No communication between control panel and heater, or a control panel error	51	<ol style="list-style-type: none"> <li>1 Check battery charge.</li> <li>2 Check control panel connections.</li> <li>3 Check 15 A fuse (red wire, thermo unit).</li> <li>4 Check wiring harness.</li> <li>5 Replace control panel (see chapter 7: "Servicing work").</li> <li>6 Replace control unit.</li> </ol>
01	No start (after 2 starting attempts)	02	<ol style="list-style-type: none"> <li>1 Check fuel supply (enough fuel, at least 8 ltr.; check fuel connection and tubes), reset heater (by switching off for at least <b>30</b> sec.).</li> <li>2 Check feed rate of fuel pump</li> <li>3 Clean burner insert.</li> </ol>
02	Flame failure (at least > 3)	03, 83	See fault message 01.
03	Overvoltage	04	Charge battery or connect to another power source (DC, 12 V or charger 230 V), reset heater (by switching off for at least 5 sec.)
	Undervoltage	84	
04	Open circuit in fuel pump/overheating	88	<ol style="list-style-type: none"> <li>1 Check fuel pump cable and connectors.</li> <li>2 Check internal wiring harness connections Y9, Y10.</li> </ol>
	Short circuit in fuel pump	08	
05	Fault in motor of heating air blower: Disconnection / short circuit / blower speed out of range / heating air blower blocked	53	<ol style="list-style-type: none"> <li>1 Let heater cool down. 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 (&gt;12 V). Restart heater.</li> <li>2 Start blower: component test in diagnostic mode. Run blower 5 minutes at 80%. Listen if there is any unusual noise (grinding, etc.). Restart heater.</li> <li>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 heater.</li> <li>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 on 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.</li> <li>5 If heating air blower assembly and wiring harness have been checked and Dual Top still doesn't run: Replace complete Dual Top.</li> </ol>
	No communication between amplifier of heating air blower and heater control unit	54	
06	Overheating water temperature sensor	57	<ol style="list-style-type: none"> <li>1 Check water level, reset heater (by switching off for at least 5 sec.) or select winter mode without hot water production.</li> <li>2 Check fuel pump cable and connectors.</li> <li>3 Check whether hot and cold water pipes have been connected correctly.</li> <li>4 Check internal wiring harness connections Y9, Y10.</li> </ol>
	Exceeding gradient water temperature sensor	58	

Table 402 Fault messages manual control panel

Number of RED flashes	Meaning	Code from control unit to control panel [hex]	Remedy
07	Overheating of air temperature sensor in heater	06	<ol style="list-style-type: none"> <li>1 Ensure that cold and hot air can flow freely, air intake and outlets are not blocked. Reset heater (by switching off for at least 5 sec.)</li> <li>2 Check fuel pump cable and connectors.</li> <li>3 Check internal wiring harness connections Y9, Y10.</li> <li>4 Check air temperature sensor for correct installation.</li> </ol>
	Air temperature sensor in heater has exceeded value	5A	
08	Overheating of heater control unit	5B	Ensure that cooling air can flow freely, reset heater (by switching off for at least 5 sec.)
09	Open circuit in motor for combustion and cooling air blower	89	<ol style="list-style-type: none"> <li>1 Ensure that cooling air blower can freely rotate and remove possible blocking objects.</li> <li>2 Check 15 A fuse (red wire).</li> <li>3 Check connector Y1 at control unit.</li> <li>4 Change Drive Assy.</li> </ol>
	Fault in motor for combustion and cooling air blower disconnection / short circuit / overload / blocked	09	
10	Fault in control unit/heater locked	01, 81	<ol style="list-style-type: none"> <li>1 Put heater back into service (see beginning of this section) and restart heater.</li> <li>2 Replace control unit.</li> </ol>
11	Open or short circuit in external room temperature sensor	5D	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connector behind the control panel. Reset heater (by switching off for at least 5 sec.)</li> <li>2 Replace external room temperature sensor.</li> </ol>
12	Open circuit in air temperature sensor in heater	AB	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check resistance of air temperature sensor.</li> <li>3 Reset heater (by switching off for at least 5 sec.)</li> <li>4 Replace sensor wiring harness.</li> </ol>
	Short circuit in air temperature sensor in heater	1B	
13	Water temperature sensor disconnection	55	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check resistance of water temperature sensor.</li> <li>3 Reset heater (by switching off for at least 5 sec.)</li> <li>4 Replace sensor wiring harness.</li> </ol>
	Water temperature sensor short circuit	56	
14	Glow plug / flame detector disconnection	8A	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check glow plug resistance.</li> <li>3 Reset heater (by switching off for at least 5 sec.)</li> <li>4 Replace burner (including glow plug and evaporator housing assembly).</li> </ol>
	Glow plug / flame detector short circuit	0A	
15	Early flame detection	05	See fault message 14.
16	n/a	n/a	n/a
17	Electrical safety/drainage valve disconnection	90	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check function of solenoid valve with separate 12V DC power supply.</li> <li>3 Reset heater (by switching off for at least 5 sec.)</li> <li>4 Replace solenoid valve.</li> </ol>
	Electrical safety/drainage valve short circuit	10	

NOTE:

n/a = not available

## 4.2.2 Programmable control panel



Fig. 403 Programmable control panel

If a fault occurs, the heater stops. Failure of drainage valve (message 28 and 29) will not abort heater operation and will not be shown during heater operation.

The programmable control panel can be used with all types of Dual Top heaters.

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

The control panel gives out the fault message.

Rectify the cause of the fault.

To reset the fault, confirm message by pressing OK (if provided) or switch off the Dual Top for at least 5 seconds.

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

Do this by disconnecting the power supply:

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:

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

Or:

- Switch on heater on control panel
- Message 17 is displayed
- Heater does not react
- Remove 5 A fuse (control panel)
- Remove 15 A fuse (10 A) (red/black wire, PWM module)
- Remove 15 A fuse (red wire, thermo unit)
- Replace 10 A fuse with 15 A
- Install 15 A fuse (red/black wire, PWM module)
- Install 15 A fuse (red/black wire, PWM module)
- Install 5 A fuse (control panel)
- Switch on heater on control panel

Now the heater is reset.

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



Table 403 Fault messages programmable control panel

Message	Meaning	Code from control unit to control panel [hex]	Remedy
Message 01 No data connection	No communication between control panel and heater, or faulty control panel.	51	<ol style="list-style-type: none"> <li>1 Check battery charge.</li> <li>2 Check control panel connections.</li> <li>3 Check 15 A fuse (red wire).</li> <li>4 Check wiring harness.</li> <li>5 Replace control panel (see chapter 7: "Servicing work").</li> <li>6 Replace control unit.</li> </ol>
Message 02 No start of combustion	No start (after 2 starting attempts)	02	<ol style="list-style-type: none"> <li>1 Check fuel supply (enough fuel, at least 8 ltr.; check fuel connection and tubes), reset heater (by switching off for at least <b>30</b> sec.).</li> <li>2 Check feed rate of fuel pump</li> <li>3 Clean burner insert.</li> </ol>
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	Charge battery or connect to main power supply (230 V), 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	<ol style="list-style-type: none"> <li>1 Check fuel pump cable and connectors.</li> <li>2 Check internal wiring harness connections Y9, Y10.</li> </ol> For Dual Top Evo 7/8, also: <ol style="list-style-type: none"> <li>1 Check wiring harness relay box to heater.</li> <li>2 Check relay box and connections relay box.</li> </ol>
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.

Table 403 Fault messages programmable control panel

Message	Meaning	Code from control unit to control panel [hex]	Remedy
Message 08 Failure hot air blower	Fault in motor of heating air blower: Disconnection / short circuit / blower speed out of range / heating air blower blocked	53	<ol style="list-style-type: none"> <li>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 (&gt;12 V). Restart heater.</li> <li>2 Start blower: component test in diagnostic mode. Run blower 5 minutes at 80%. Listen if there is any unusual noise (grinding, etc.). Restart heater.</li> <li>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 heater.</li> <li>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 on 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.</li> <li>5 If heating air blower assembly and wiring harness have been checked and Dual Top still doesn't run: Replace complete Dual Top.</li> </ol>
Message 09 Failure fan amplifier	No communication between amplifier of heating air blower and heater control unit	54	<ol style="list-style-type: none"> <li>1 Check internal cable routing (4-pins) from control unit to PWM module.</li> <li>2 Replace heating air blower assembly.</li> <li>3 Replace thermo unit.</li> </ol>
Message 10 High temperature sanitary water	Overheating water temperature sensor	57	<ol style="list-style-type: none"> <li>1 Check water level, reset heater (by pressing OK or switching off for at least 5 sec.) or select winter mode without hot water production.</li> <li>2 Check fuel pump cable and connectors.</li> <li>3 Check internal wiring harness connections Y9, Y10.</li> </ol>
Message 11 High temperature sanitary water	Exceeding gradient water temperature sensor	58	<ol style="list-style-type: none"> <li>1 See message 10.</li> <li>2 Check whether hot and cold water pipes have been connected correctly.</li> </ol>
Message 12 High temperature heating air	Overheating of air temperature sensor in heater	06	<ol style="list-style-type: none"> <li>1 Ensure that cold and hot air can flow freely and that air intakes and outlets are not blocked. Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>2 Check fuel pump cable and connectors.</li> <li>3 Check internal wiring harness connections Y9, Y10.</li> <li>4 Check air temperature sensor for correct installation.</li> </ol>
Message 13 High temperature heating air	Exceeding gradient of air temperature sensor in heater	5A	See message 12.

Table 403 Fault messages programmable control panel

Message	Meaning	Code from control unit to control panel [hex]	Remedy
Message 14 Failure cooling air ventilation	Overheating of heater control unit	5B	Ensure that cooling air can flow freely, reset heater (by pressing OK or switching off for at least 5 sec.)
Message 15 Failure combustion air motor	Open circuit in motor for combustion and cooling air blower	89	<ol style="list-style-type: none"> <li>1 Ensure that cooling air blower can freely rotate and remove possible blocking objects.</li> <li>2 Check 15 A fuse (red wire).</li> <li>3 Check connector Y1 at control unit.</li> <li>4 Change Drive Assy.</li> </ol>
Message 16 Failure combustion air motor	Fault in motor for combustion and cooling air blower: disconnection / short circuit / overload / blocked	09	See message 15.
Message 17 Failure control unit	Control unit (heater) fault / heater locked	01, 81	<ol style="list-style-type: none"> <li>1 Put heater back into service (see above this table) and restart heater.</li> <li>2 Replace control unit.</li> </ol>
Message 18 Failure cabin temperature sensor	Open or short circuit in external room temperature sensor	5D	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connector behind the control panel. Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>2 Replace external room temperature sensor.</li> </ol>
Message 19	n/a	n/a	n/a
Message 20 Failure heating air temperature sensor	Open circuit in air temperature sensor in heater	AB	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check resistance of air temperature sensor.</li> <li>3 Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>4 Replace sensor wiring harness.</li> </ol>
Message 21 Failure heating air temperature sensor	Short circuit in air temperature sensor in heater	1B	See message 20.
Message 22 Failure sanitary water temperature sensor	Water temperature sensor disconnection	55	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check resistance of water temperature sensor.</li> <li>3 Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>4 Replace sensor wiring harness.</li> </ol>
Message 23 Failure sanitary water temperature sensor	Water temperature sensor short circuit	56	See message 22.
Message 24 Failure glow plug	Glow plug / flame detector disconnection	8A	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check glow plug resistance.</li> <li>3 Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>4 Replace burner (including glow plug and evaporator housing assembly).</li> </ol>
Message 25 Failure glow plug	Glow plug / flame detector short circuit	0A	See message 24.
Message 26 Failure flame detection	Early flame detection	05	See message 24.

Table 403 Fault messages programmable control panel

Message	Meaning	Code from control unit to control panel [hex]	Remedy
Message 27 Failure relay box	Short circuit of 230 V indication signal from relay box to heater	42	<ol style="list-style-type: none"> <li>1 Check wiring harness relay box to heater.</li> <li>2 Check relay box and connections relay box.</li> <li>3 Check control panel and connections control panel.</li> <li>4 Check internal wiring harness connections Y9, Y10.</li> </ol>
Message 28 Failure drain valve	Electrical drainage valve disconnection	90	<ol style="list-style-type: none"> <li>1 Check routing of cable, ensure that it is not pinched or crushed, check the connectors.</li> <li>2 Check function of valve with separate 12 V DC power supply.</li> <li>3 Reset heater (by pressing OK or switching off for at least 5 sec.)</li> <li>4 Replace solenoid valve.</li> </ol>
Message 29 Failure drain valve	Electrical drainage valve short circuit	10	See message 28.
Message 30 Failure relay	230 V high or low power relay circuit interrupted or 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	Dual Top Evo 7/8 <ol style="list-style-type: none"> <li>1 Check wiring harness relay box to heater.</li> <li>2 Check relay box and connections relay box.</li> <li>3 Check control panel and connections on control panel.</li> <li>4 Check internal wiring harness connections Y9, Y10.</li> </ol> All: <ol style="list-style-type: none"> <li>1 Check for overheating (see messages 10, 11, 12, 13 and 14).</li> <li>2 Reset heater (by pressing OK or switching off for at least 5 sec.)</li> </ol>
Message 35 Failure relay box	230 V overheating relay short circuit	44	See message 27.
Message 36, 37, 38, 39, 40, 41	n/a	n/a	n/a
Message 42 Failure 230V heating element	Electric heater (230 V) defect. No relevant temperature increase detected.	4B	<ol style="list-style-type: none"> <li>1 Check water system for a permanent open hot water tap OR heavy leakages.</li> <li>2 Check cable 230 V from relay box to heater and corresponding connectors.</li> <li>3 Check electrical heating elements.</li> </ol>

NOTE:

n/a = not available

## 5 Function tests

### 5.1 General

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



**CAUTION:**

The heater must not be operated in enclosed areas such as garages and workshops without an emissions extraction system.

### 5.2 Repair Shop Level Testing

#### 5.2.1 Testing individual components



**IMPORTANT:**

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

##### 5.2.1.1 Resistance measurement of electrical heating elements

During the test the electrical heating elements (each Dual Top Evo 7/8 has 2 electrical heating elements) are to have the following values:

Dual Top Evo 7, resistance at 20 °C:	88 Ω
Dual Top Evo 8, resistance at 20 °C:	53 Ω
Test current:	< 5 mA

##### 5.2.1.2 Glowplug resistance test



**NOTE:**

The resistance test must be carried out with an ohmmeter 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

##### 5.2.1.3 Air temperature sensor resistance test

If you conduct this test with a digital multimeter, the air temperature sensor (see Fig. 503) must have the values shown in the following diagram:

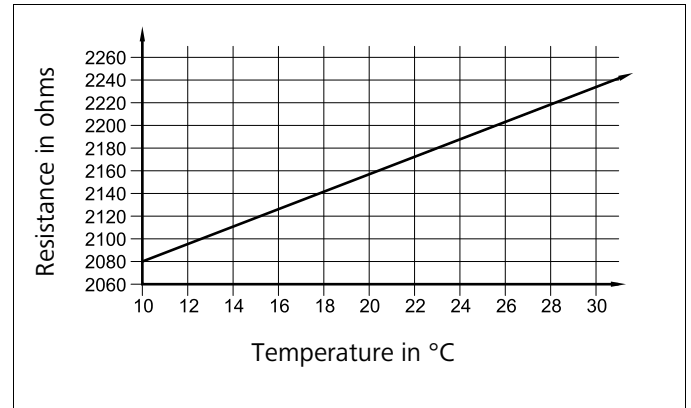


Fig. 501 Characteristic resistance values of a PT 2000 overheating sensor within a temperature range of 10 °C to 30 °C.

##### 5.2.1.4 Water temperature sensor resistance test

- A: Resistance in kΩ
- B: Temperature of water temperature sensor -G18- (see Fig. 503) in °C
- C: Resistance as a function of temperature

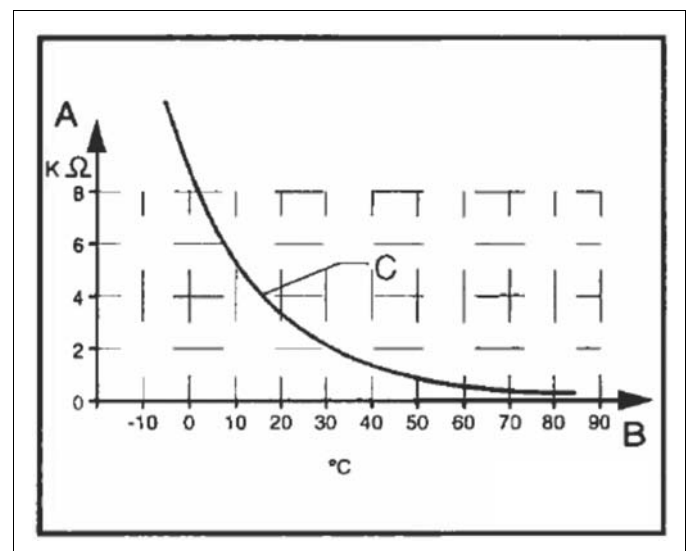


Fig. 502 Characteristic resistance values of water temperature sensor

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

### 5.2.1.5 Air temperature switch

The air temperature switch (see Fig. 503) opens at  $145 \pm 5$  °C.

### 5.2.1.6 Water temperature switch

The water temperature switch (see Fig. 503) opens at  $90 \pm 5$  °C.

### 5.2.1.7 Overheating protector

The overheating protector (temperature switch heat exchanger, see Fig. 503) opens at  $352 \pm 15$  °C and closes at 240 °C.

### 5.2.1.8 Fuel pump

Fuel pump test:

Pumping quantity  $40 \text{ ml} \pm 10 \%$  for operation at 7 Hz for 180 seconds.

### 5.2.1.9 Resistance measurement for external room temperature sensor

Table 502 Technical data of external room temperature sensor

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

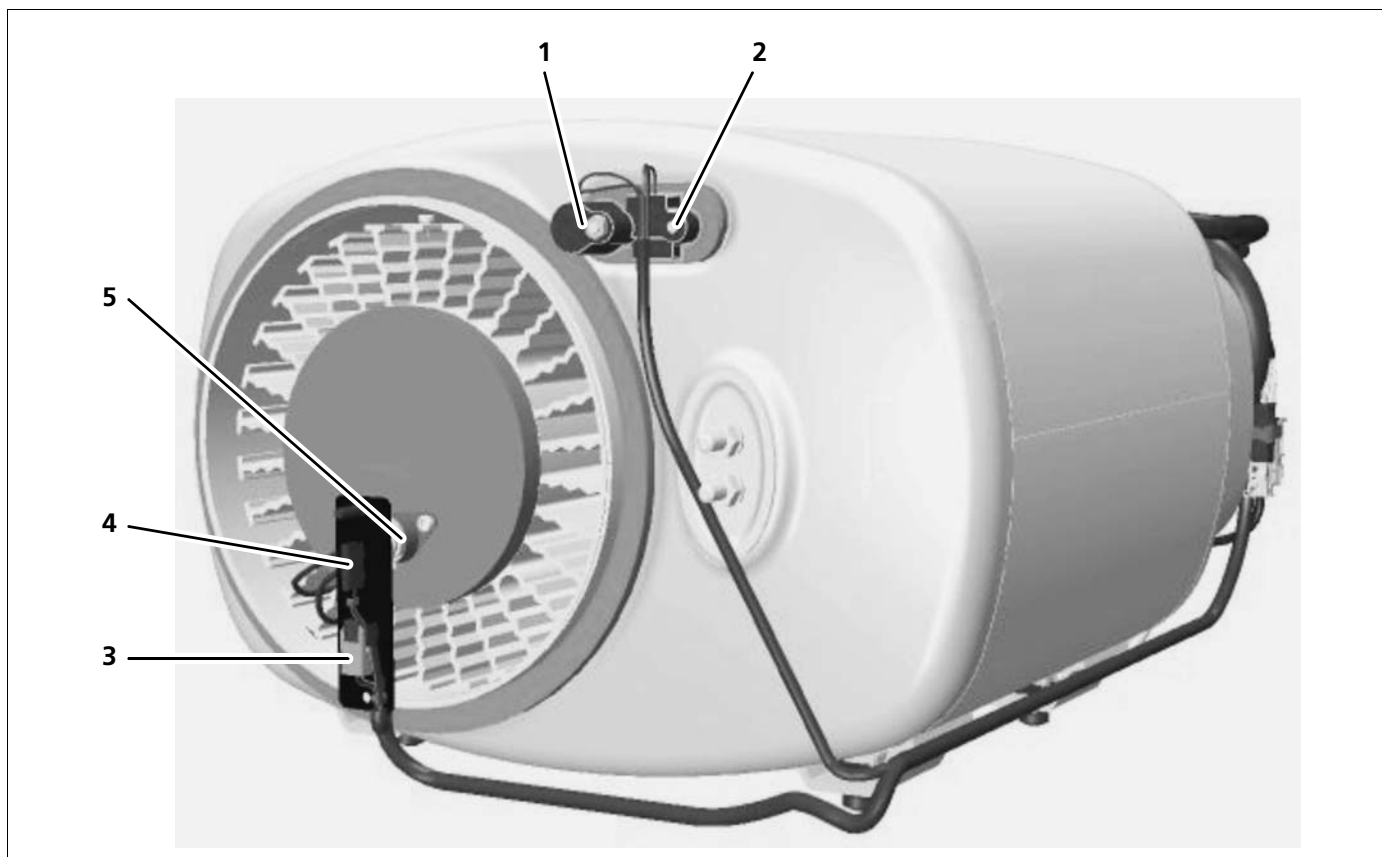


Fig. 503 Sensor positions

- 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 unit in every operating mode  
Also interrupts the plus line of the fuel pump when triggered

## 6 Circuit diagrams

## 6.1 General

Fig. 601 shows the heater control unit.

How the electrical connections are to be made:

Fig. 602 for Dual Top Evo 6,

Fig. 603 for Dual Top Evo 7/8.

Electrical connections control panel:

Fig. 604 for manual version,

Fig. 605 for programmable version.

Circuit diagrams:

Fig. 606 for wiring harness of RHA 100 (wiring harness connector inside, older version),

Fig. 607 for Dual Top RHA 100 (wiring harness connector outside, newer version) and Dual Top Evo 6,

Fig. 608 for Dual Top Evo 7/8.

See Paragraph 6.2 for the legend of the circuit diagrams.

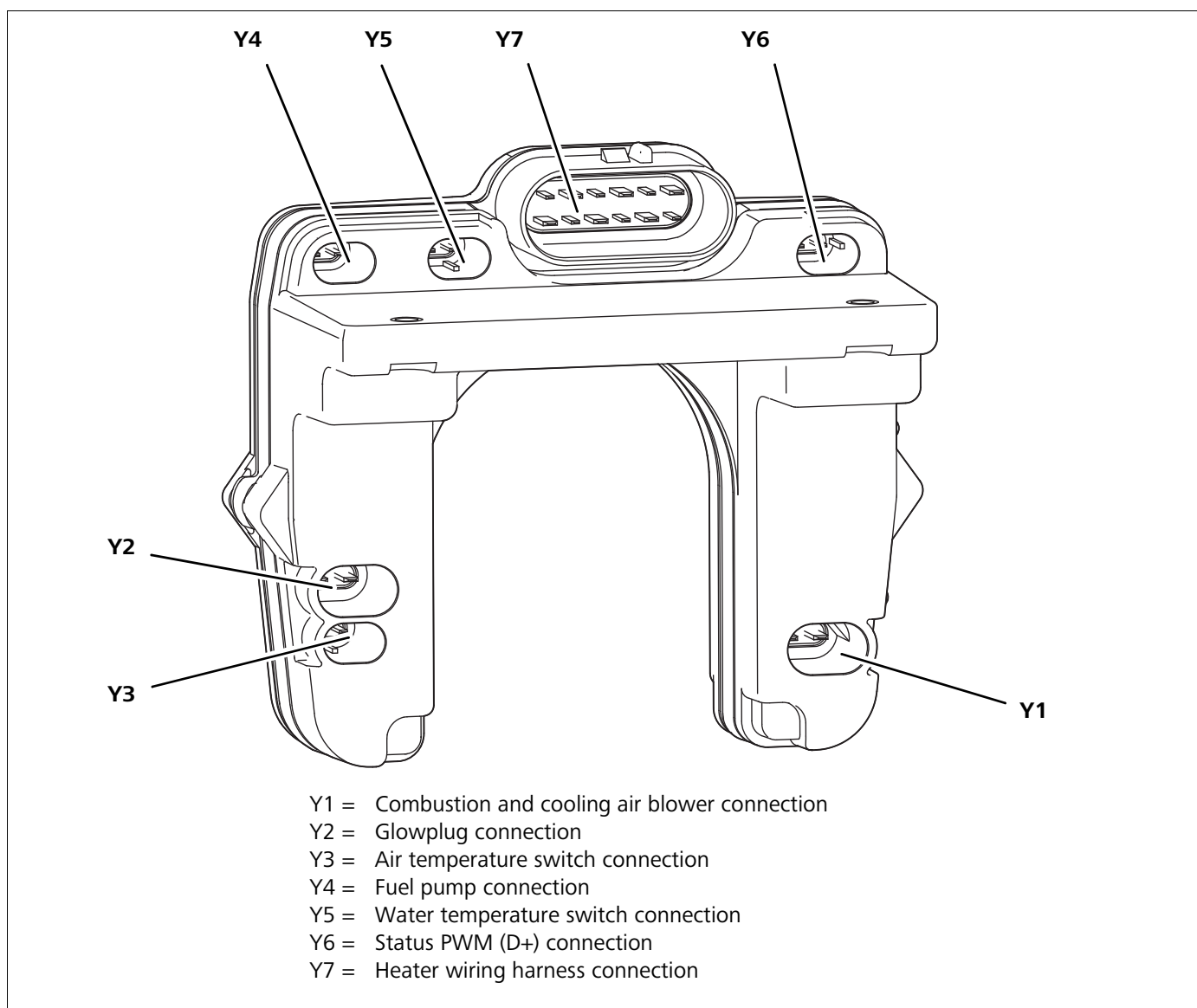


Fig. 601 Control unit Dual Top



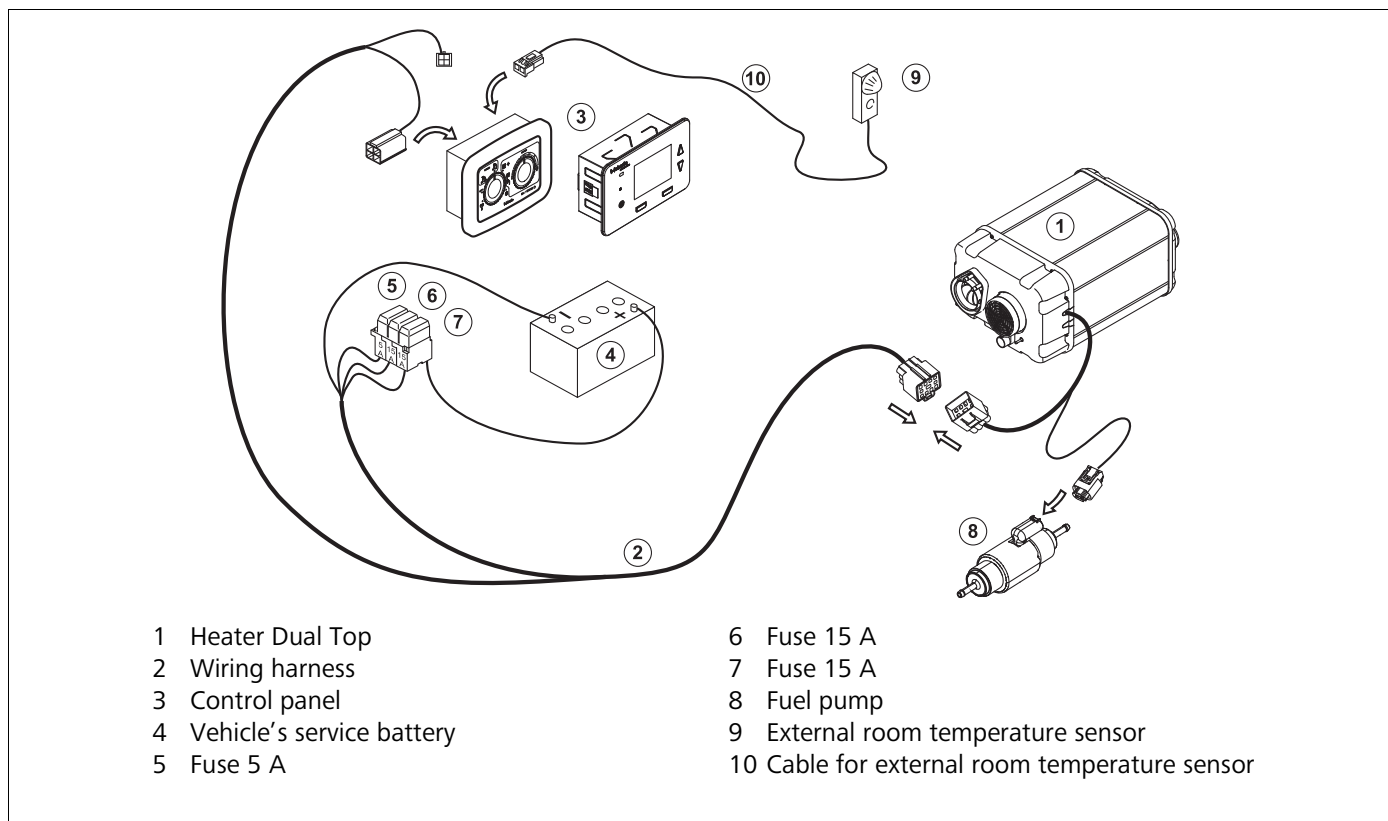


Fig. 602 Schematic diagram of electrical connections for Dual Top Evo 6

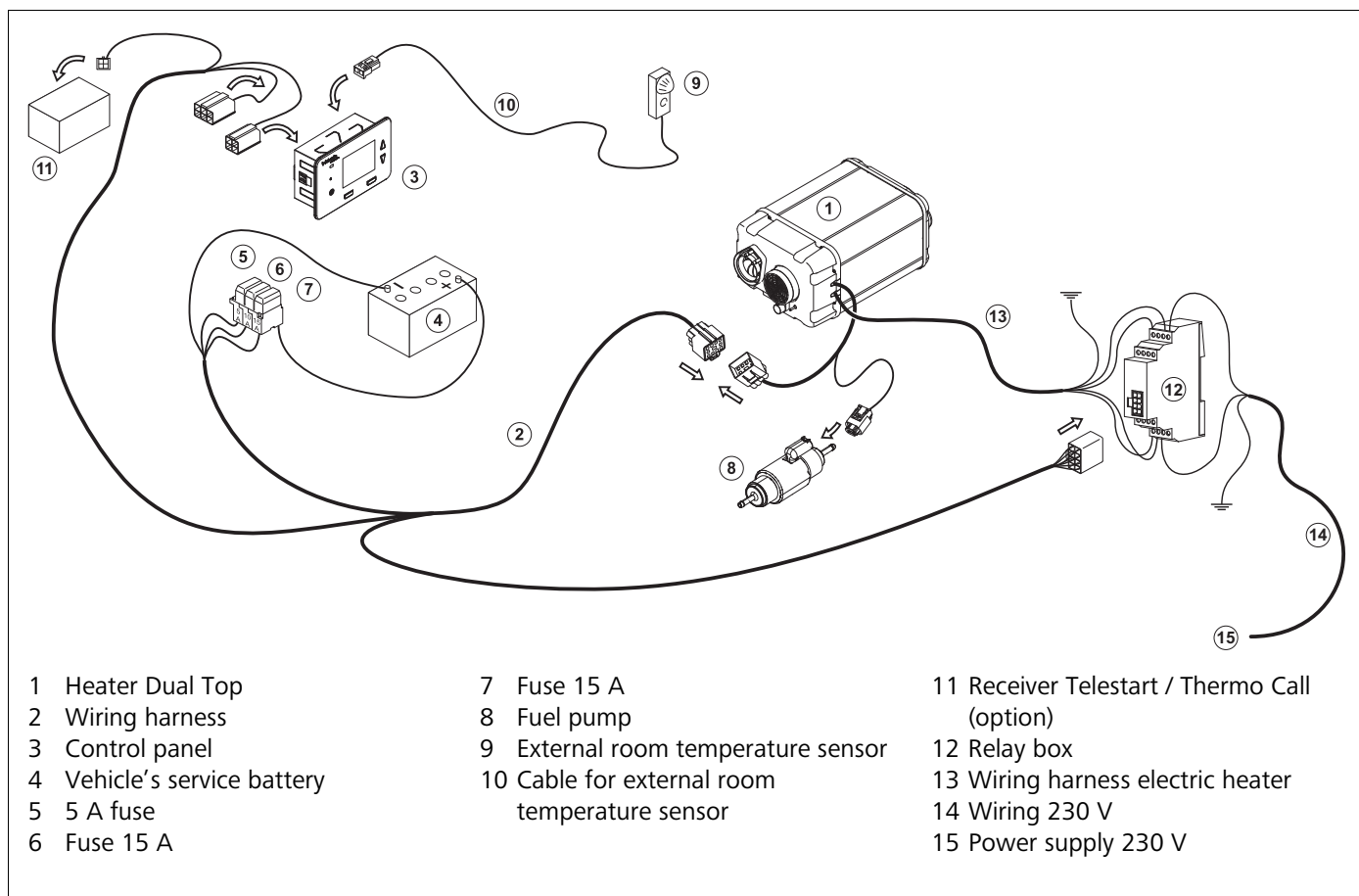
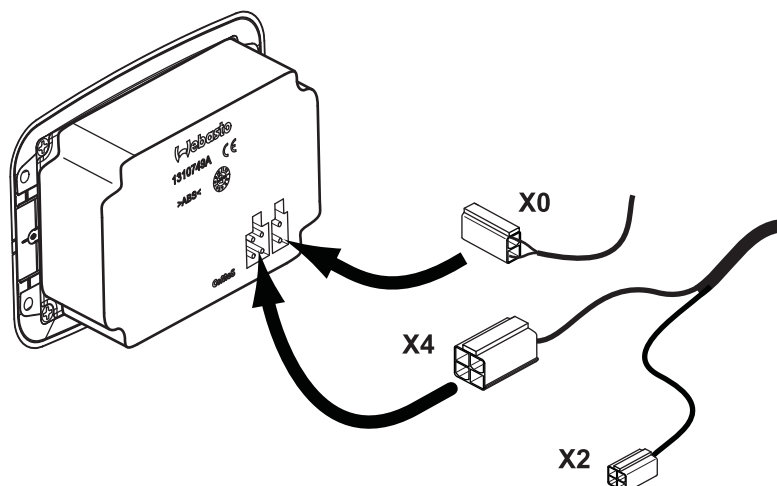


Fig. 603 Schematic diagram of electrical connections for Dual Top Evo 7/8



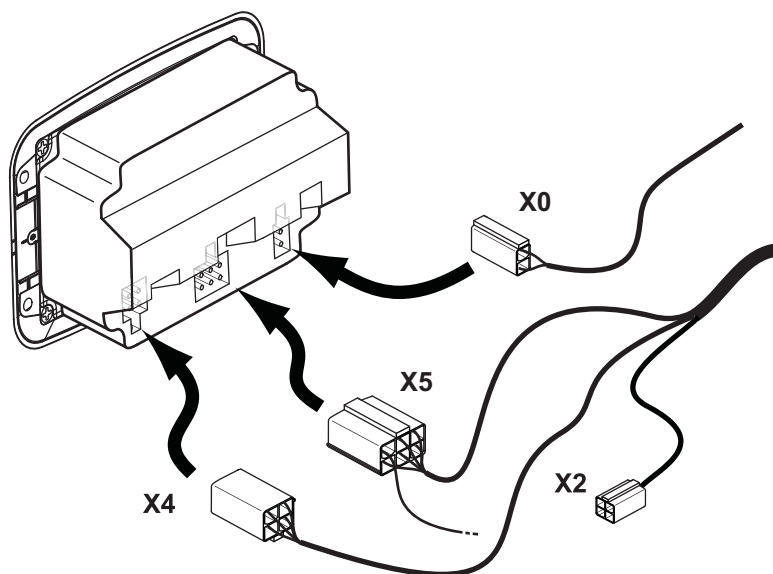
X0 (2-pin) of room temperature sensor to control panel

X2 is for:

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

X4 (4-pin) of wiring harness to control panel

Fig. 604 Electrical connections Manual control panel



X0 (2-pin) of room temperature sensor to control panel

X2 is for:

- Webasto Thermo Test PC-diagnosis and
- Webasto Telestart / Thermo Call

X4 (4-pin) of wiring harness to control panel

X5 (6-pin) of wiring harness to control panel

Fig. 605 Electrical connections for programmable control panel

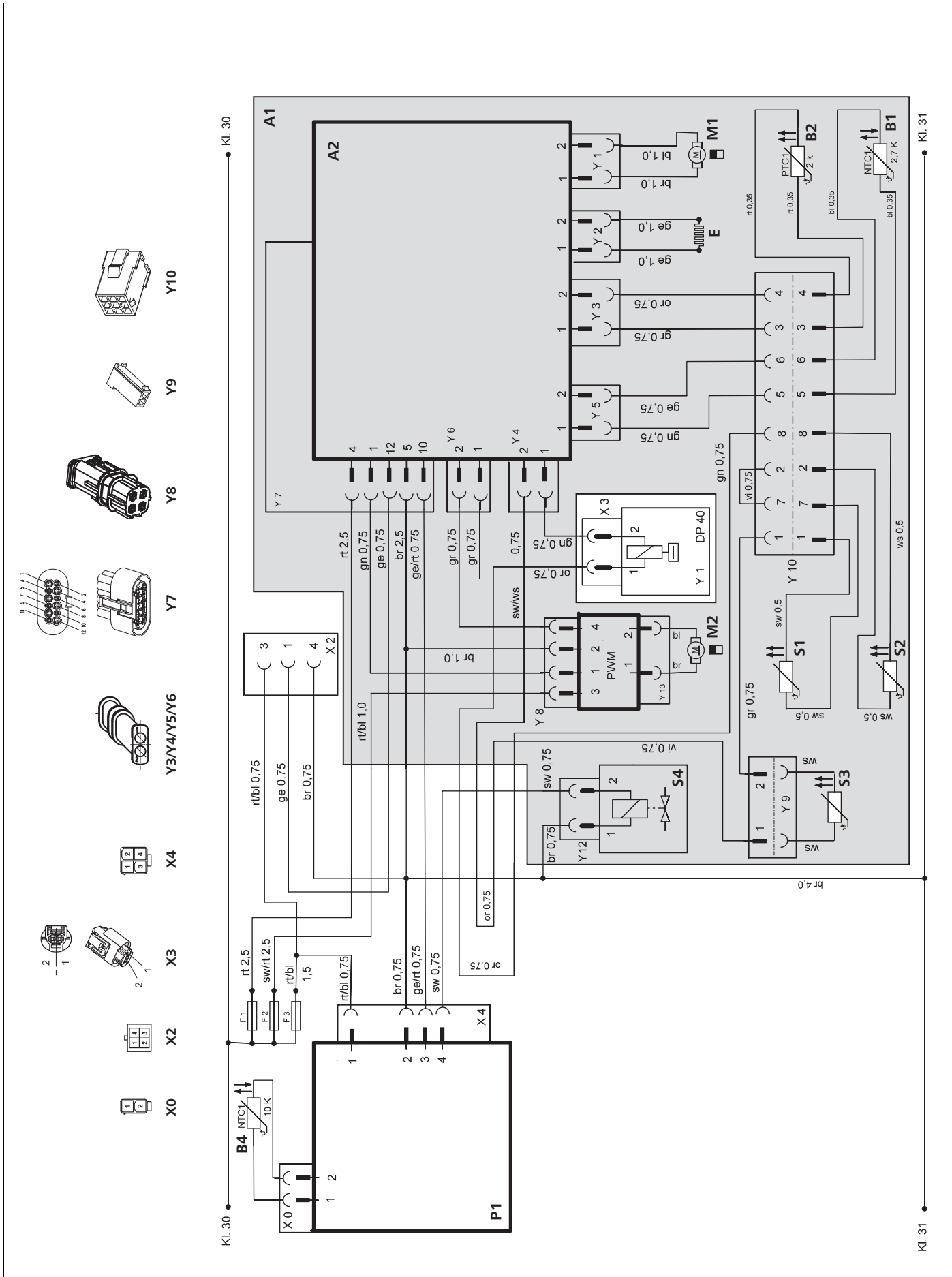


Fig. 606 Wiring harness for Dual Top RHA 100 (older version, heater Ident. No. 9015314A and 9015314B)

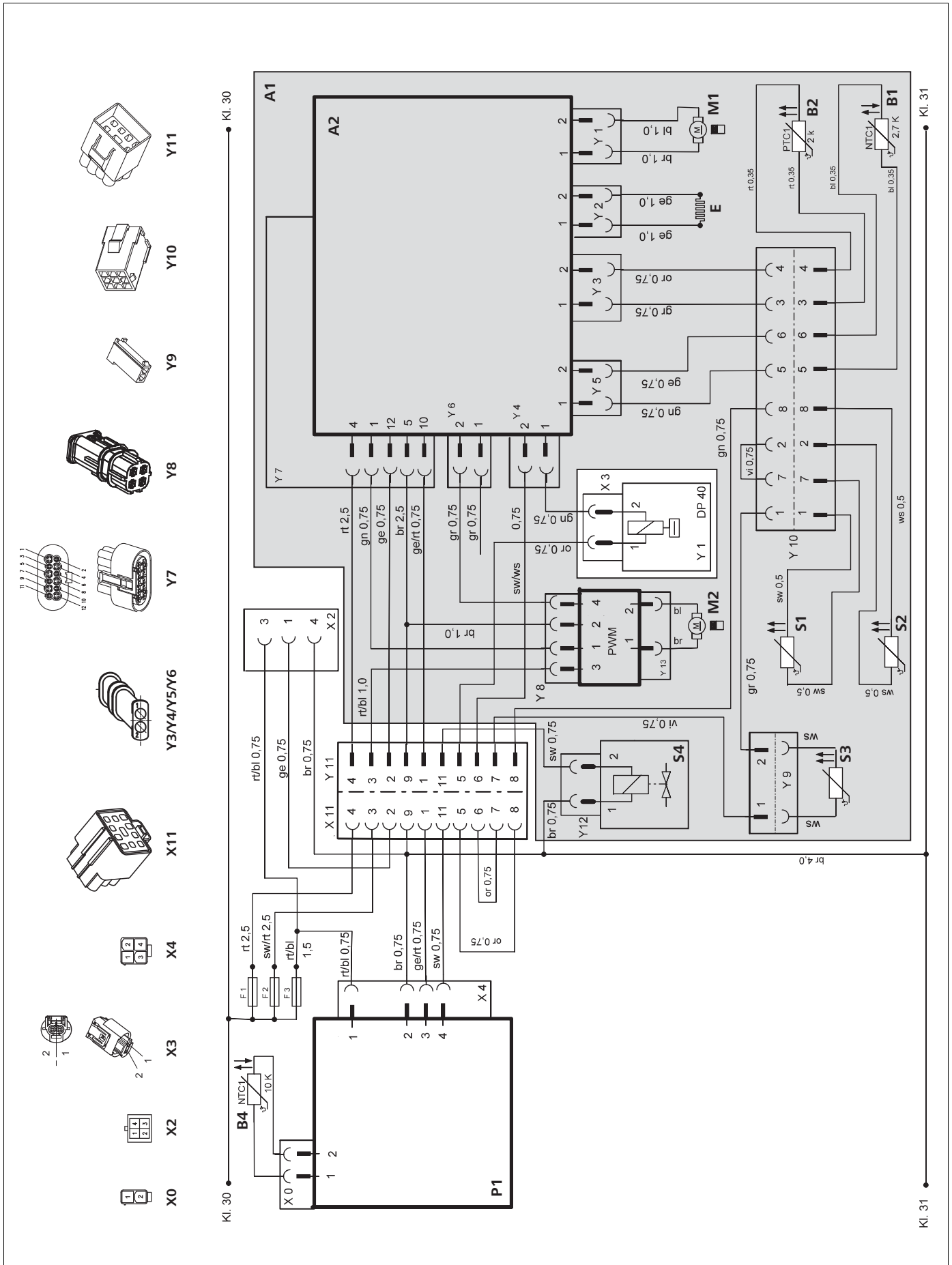


Fig. 607 Wiring diagram for Dual Top RHA 100 (newer version, heater Ident. No. 9015314C) and Dual Top Evo 6

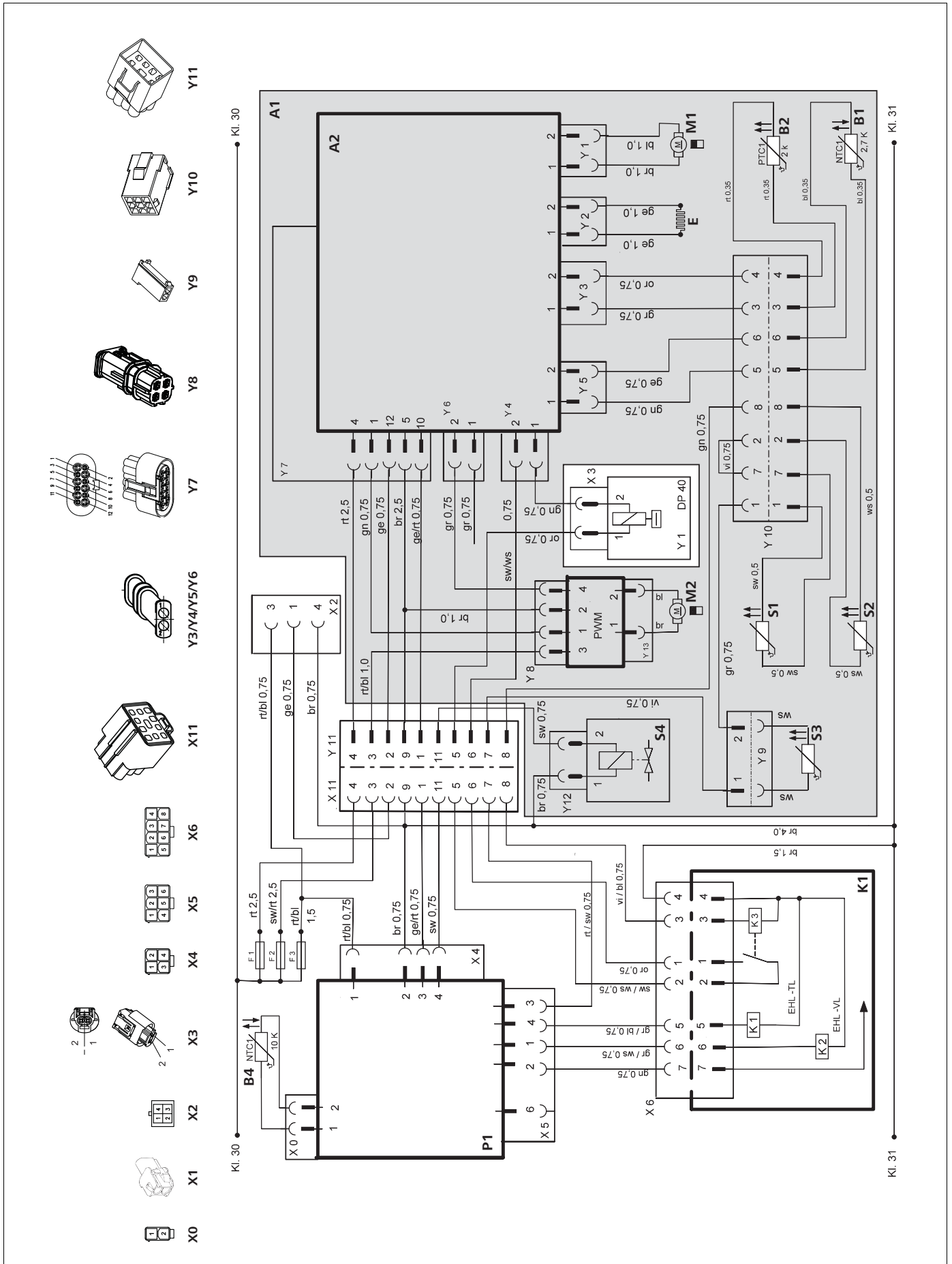


Fig. 608 Wiring diagram for Dual Top Evo 7/8

## 6.2 Legend for circuit diagrams

Table 601 Legend for wiring diagrams

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 15 A	for thermo unit
F2	Fuse 15 A	for PWM module
F3	5 A fuse	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 boiler
X0	Plug connector, 2-pin	To control panel (external room temperature sensor)
X1	Plug connector, 2-pin	2 pcs, to electric heater inside Dual Top (not for Dual Top Evo 6)
X2	Plug connector, 4-pin	To PC-diagnosis / Telestart / Thermo Call
X3	Plug connector, 2-pin	To fuel pump Y1
X4	Plug connector, 4-pin	To control panel
X5	Plug connector, 6-pin	To control panel (not for Dual Top Evo 6)
X6	Plug connector, 8-pin	To relay box (not for Dual Top Evo 6)
X11	Plug connector, 12-pin	On external wiring harness, to Dual Top heater
X12	Wire end	4 pcs to relay box, 1 to ground (not for RHA 100)
Y1	Fuel pump	DP 40
Y1	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

**Table 602 Cable colours**

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

## 7 Servicing work

### 7.1 General

This section describes the servicing work that can be carried out on the heater when it is installed.



**CAUTION:**

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

### 7.2 Working on heater

Disconnect the main power cable from the service battery before carrying out any work on the heater. The battery power must not be disconnected whilst the heater is operating or slowing down as a result of the risk of the heater overheating and the overheating guard thus being tripped. If you wish to carry out extensive repair work on the heater, it may be a good idea to remove it completely. Refer to the relevant installation instructions for repairs that necessitate the installation position being changed.

The CO<sub>2</sub> setting is carried out with Webasto Thermo Test PC Diagnostics.

The heater is optimally set to a CO<sub>2</sub> 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<sub>2</sub> value is corrected with the Webasto Thermo Test PC Diagnostics. The CO<sub>2</sub> measurement and setting must be carried out at the maximum heating capacity. The measurement of the CO<sub>2</sub> value is carried out approx. 20 mm in front of the end of the exhaust outlet inside the exhaust pipe with a CO<sub>2</sub> tester (e.g. from MSI).

The measured CO<sub>2</sub> 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<sub>2</sub> value.

### 7.3 Work on vehicle



**IMPORTANT:**

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

### 7.4 Heater test run



**CAUTION:**

The heater must not be operated in enclosed areas such as garages and workshops without an emissions extraction system.

### 7.5 CO<sub>2</sub> setting



**NOTE:**

After repairing the heater and/or replacing the fuel pump, the adjustment of the CO<sub>2</sub> value should be checked.



**IMPORTANT:**

After replacing the control unit, the CO<sub>2</sub> value must be checked and reset if necessary.



## 7.6 Service work

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

- the heater must be switched "OFF" before cleaning.
- clean heater exterior (do not use high-pressure water or air hoses, prevent the ingress of water).
- disinfect water supply system.  
See operating instructions.
- descale water supply system.  
See operating instructions.
- examine electrical connections for corrosion of contacts and to ensure that they are secure.
- check the following lines for signs of damage, to ensure that they are secure and clear:
  - Exhaust lines
  - Combustion air lines
  - Cooling air lines
  - Cold air intake lines
  - Hot air distribution lines

**IMPORTANT:**

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 ensure that they are secure.
- inspect hoses for cracks.
- check the manual drainage function with the control panel.

## 7.7 Visual inspections and installation instructions

Check whether the entire system is installed in accordance with the installation instructions.

## 7.8 Removal and installation



**IMPORTANT:**

When the heater is installed it must not be dismantled.

### 7.8.1 Heater, removal and installation

#### 7.8.1.1 Removal

1. Drain 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 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 bolts.
7. Remove the heater.

#### 7.8.1.2 Installation

See Installation Instructions.

### 7.8.2 Control panel, removal and installation

#### 7.8.2.1 Manual control panel (for Dual Top Evo 6)

1. Disconnect the battery.
2. Remove control panel as shown (see Fig. 701).
3. Disconnect the wiring harness plug X11.
4. Disconnect plug X0 of the room temperature sensor.

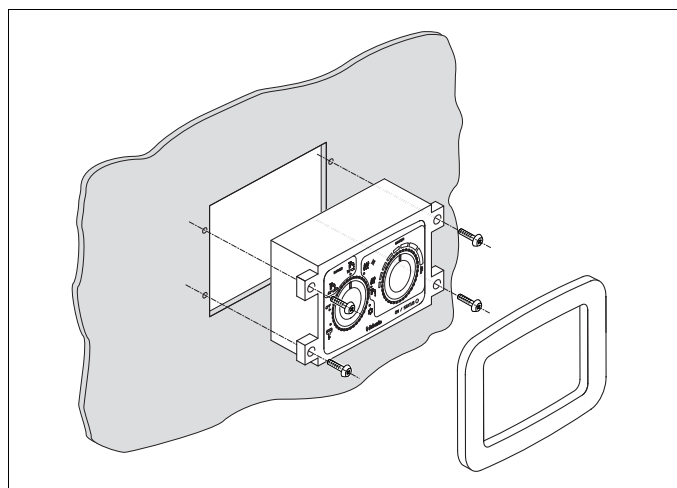


Fig. 701 Manual control panel (dis)assembly

#### 7.8.2.2 Programmable control panel (for Dual Top Evo 6/7/8)

1. Disconnect the battery.
2. Remove control panel:  
Place 1 or 2 suction cups on the control panel.  
Alternatively, slide flat, smooth material (e.g. plastic card) under the control panel at the left and right hand side.  
Pull to remove the control panel out of the adapter.  
Careful: do not damage control panel or furniture.  
See 7.8.2.3.
3. Disconnect the wiring harness plugs X4 and X5.
4. Disconnect plug X0 of the room temperature sensor.

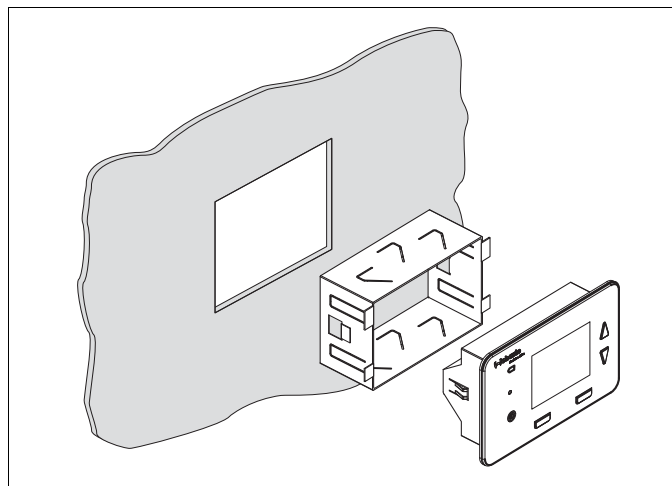


Fig. 702 Programmable control panel (dis)assembly

#### 7.8.2.3 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 it has been removed from the vehicle.

Any further disassembly will void the warranty.

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

After repairs a functional test shall be performed.

#### 8.1.1 Work on dismantled components



##### **IMPORTANT:**

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

##### 8.1.1.1 Cleaning

- All components disassembled shall be cleaned.
- Sealing compound on components must be carefully and completely removed using suitable means.

##### 8.1.1.2 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.

### 8.2 Dismantling heater

So that you can check or replace a component of the Dual Top heater, you should dismantle the heater until you have reached the part concerned.

Follow the instruction in this chapter for dismantling and assembly.

#### 8.2.1 Removing housing cover

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

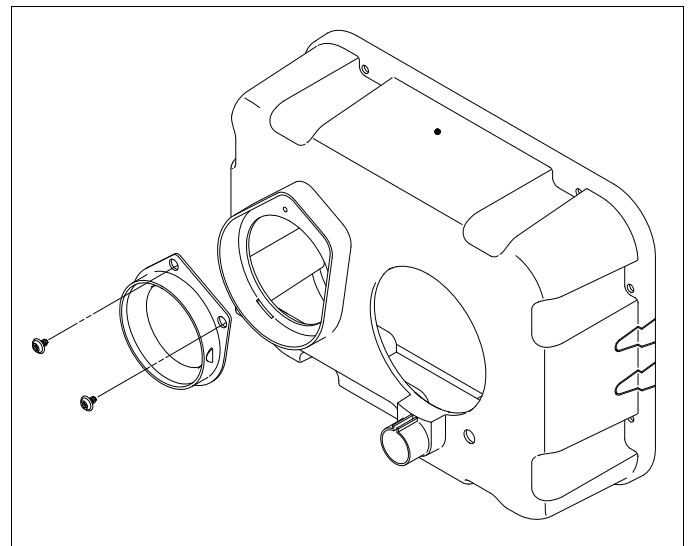


Fig. 801 Slightly loosen 2 T20 screws of cover of heating air blower.

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

**Only Dual Top Evo immersion pump version:**

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

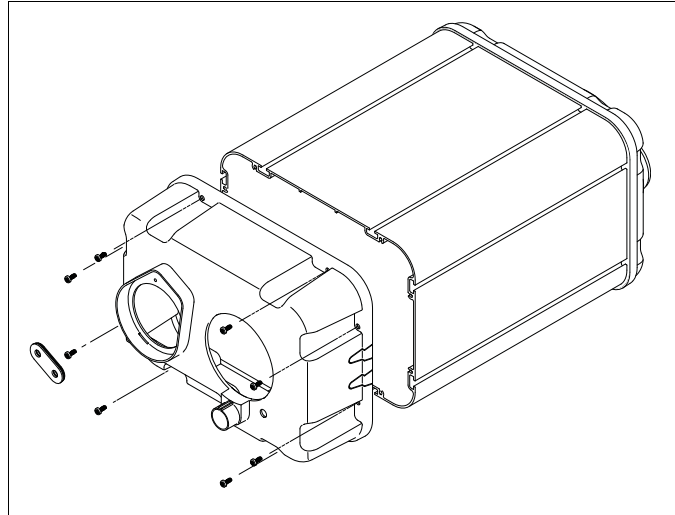


Fig. 802 Remove housing cover with inlet interfaces.



**NOTE:**

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

Remove cooling shell foam gasket and air intake grill.

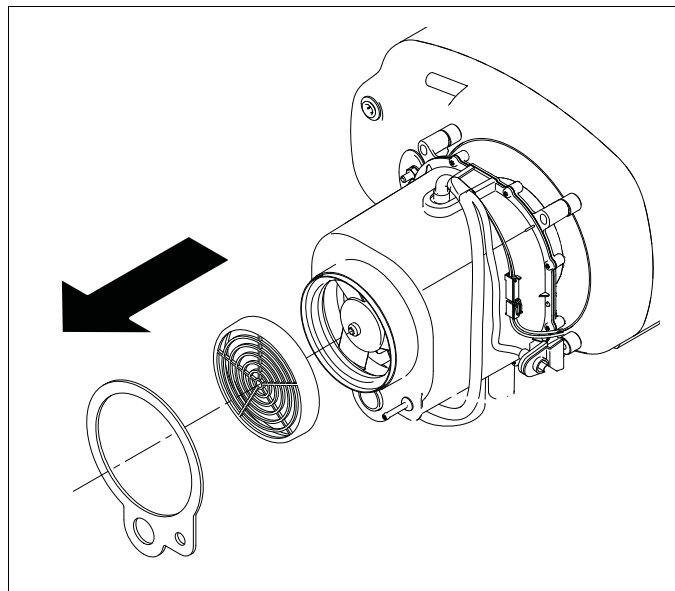


Fig. 803 Remove gasket and grill.

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



**NOTE:**

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

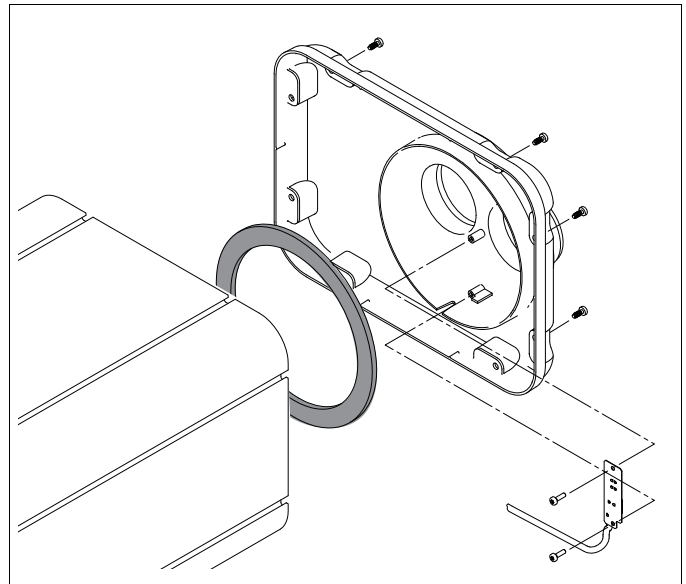


Fig. 804 Remove housing cover, gasket and metal retaining plate.

### 8.2.2 Removing heating air blower assembly

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

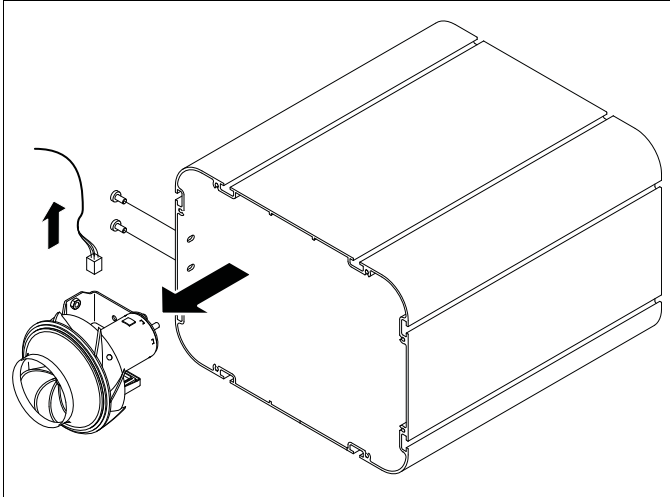


Fig. 805 Remove heating air blower assembly.



**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 Evo 7/8:**

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

### 8.2.3 Removing housing and insulating elements

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

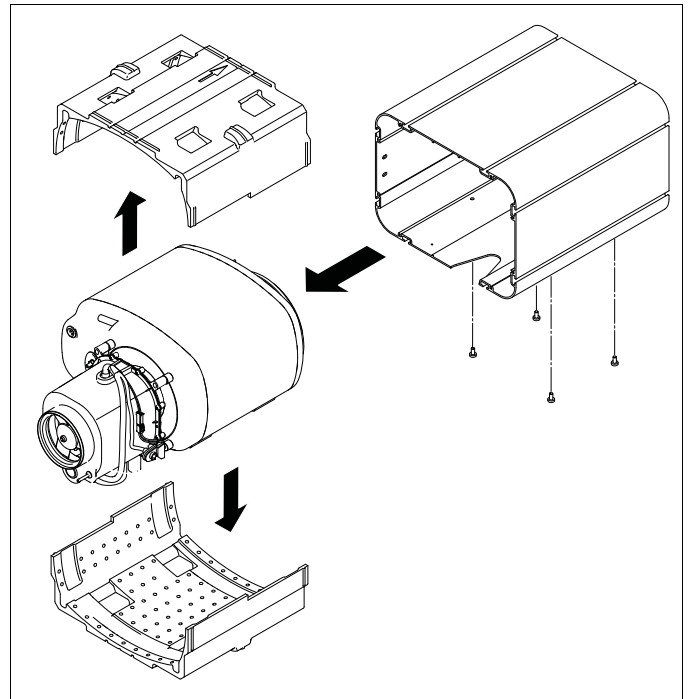


Fig. 806 Remove boiler.

### 8.2.4 Removing ventilation/overpressure valve and solenoid valve

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

**Only Dual Top Evo immersion pump version:**

Pull ventilation hose of Dual Top off ventilation/overpressure valve.

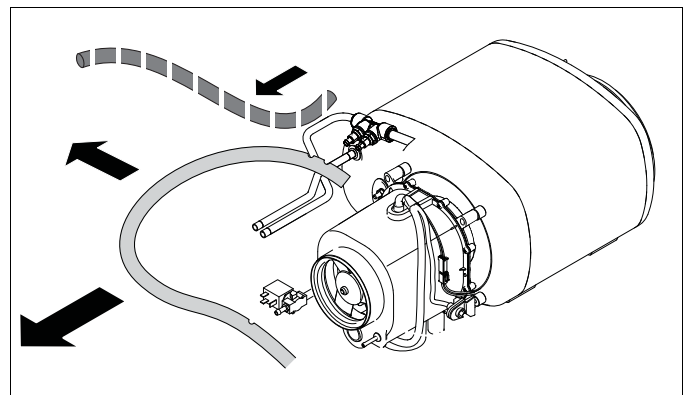


Fig. 807 Remove drain hose.

Pull 2 1-pin plugs out of solenoid valve.

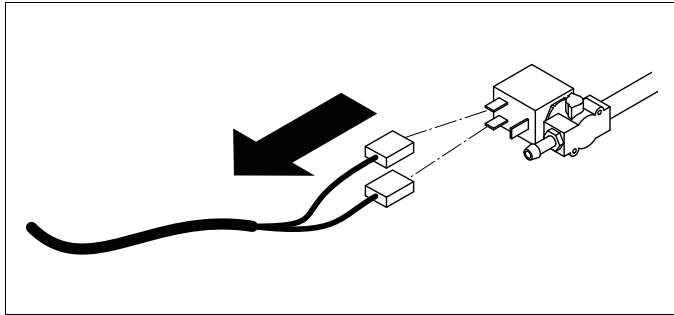


Fig. 808 Remove connector.

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

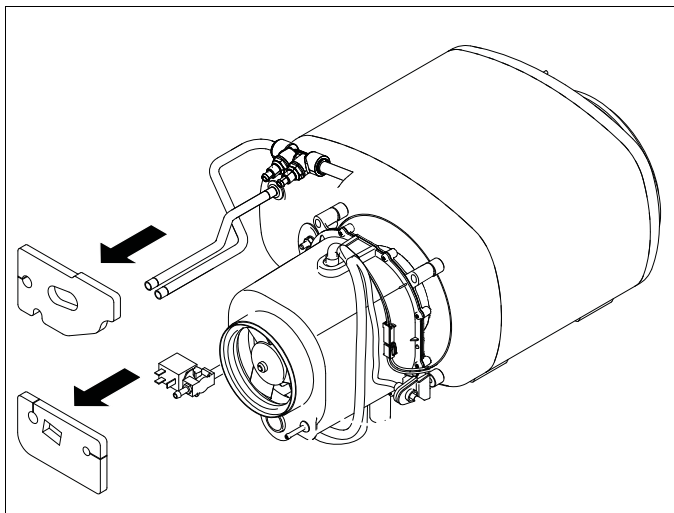


Fig. 809 Remove insulation.

Use flat (-) screwdriver to push down ring below solenoid valve and pull valve up to remove it from boiler.



**IMPORTANT:**  
Avoid that screwdriver makes scratches on the tube.  
Scratches will cause leakage. Alternative: use plastic tool.

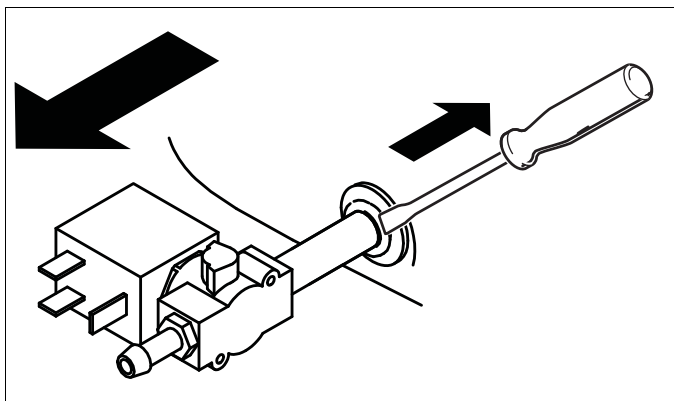


Fig. 810 Remove solenoid valve.

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

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



**IMPORTANT:**  
Avoid that screwdriver makes scratches on the tube.  
Scratches will cause leakage. Alternative: use plastic tool.

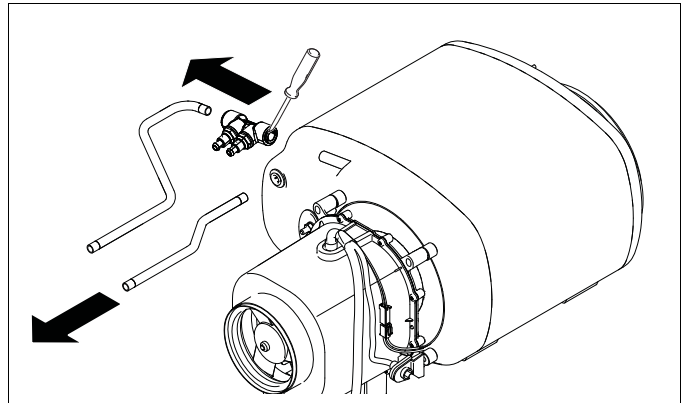


Fig. 811 Remove hot and cold-water line connections and ventilation/overpressure valve.

### 8.2.5 Removing thermo unit, sensors and sensor wiring harness

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

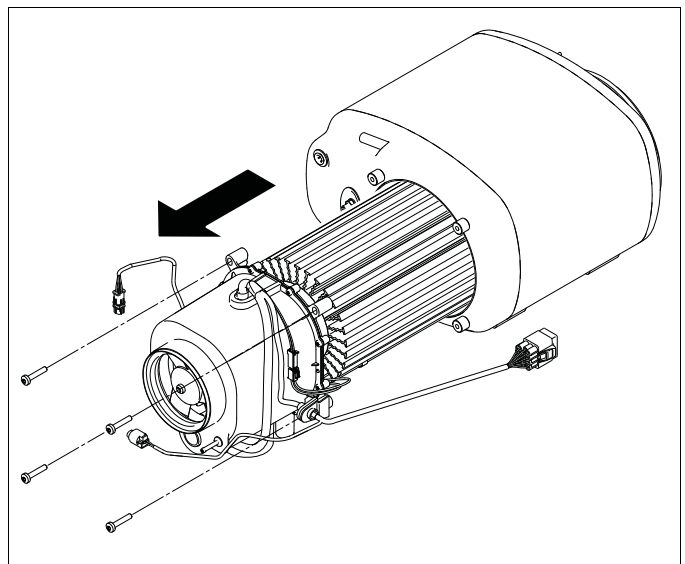


Fig. 812 Remove thermo unit including heat exchanger.

Backside boiler: Loosen 7 mm hex nut that attaches water temperature switch and water temperature sensor of sensor wiring harness to back of boiler.  
Remove sensor wiring harness and pink-coloured silicone guard.  
Disconnect 8-pin plug of sensor wiring harness from internal wiring harness.

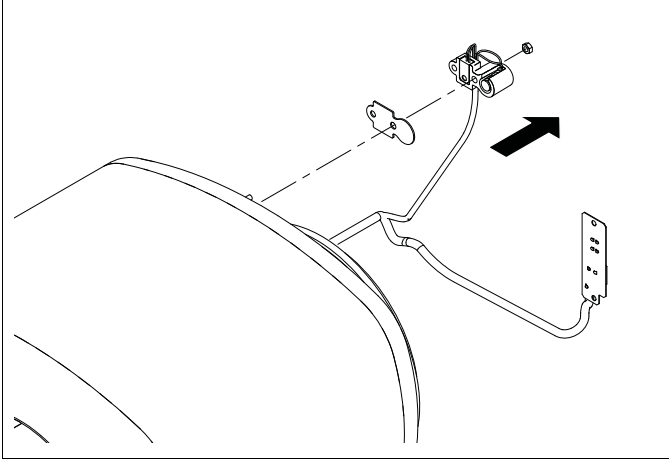


Fig. 813 Remove water temperature switch and sensor.

Remove 4 springs from back of heat exchanger.



**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.

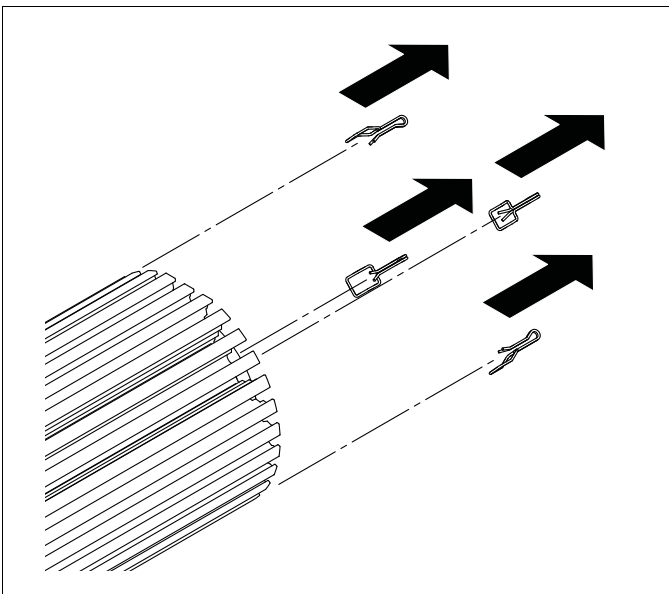


Fig. 814 Remove 4 springs.

Loosen 2 T10 screws that hold overheating switch to backside heat exchanger.  
Remove wires and cable fasteners from the ribs on the heat exchanger.  
Disconnect plug 2-pin of wiring overheating protector from internal wiring harness.

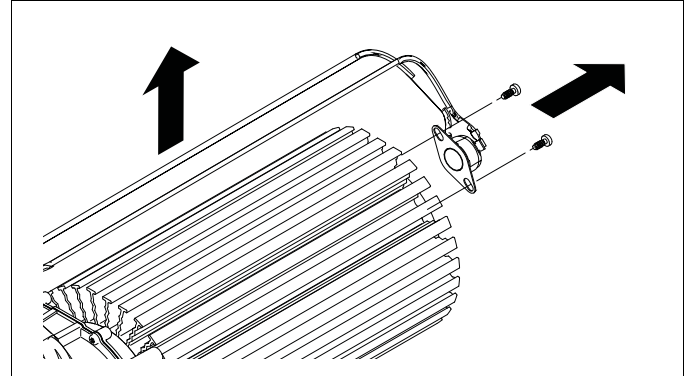


Fig. 815 Remove overheating protection.

### 8.2.6 Removing electrical heating elements

**Only for Dual Top Evo 7/8:**

Disconnect 2 X1 plugs (2-pin, 1x grey and black, 1x brown and blue) of cable from relay box to electrical heating elements.

Loosen T10 screw on back of heat exchanger to remove holding plate of electrical heating elements.

Pull electrical heating element backwards to take them out of heat exchanger.

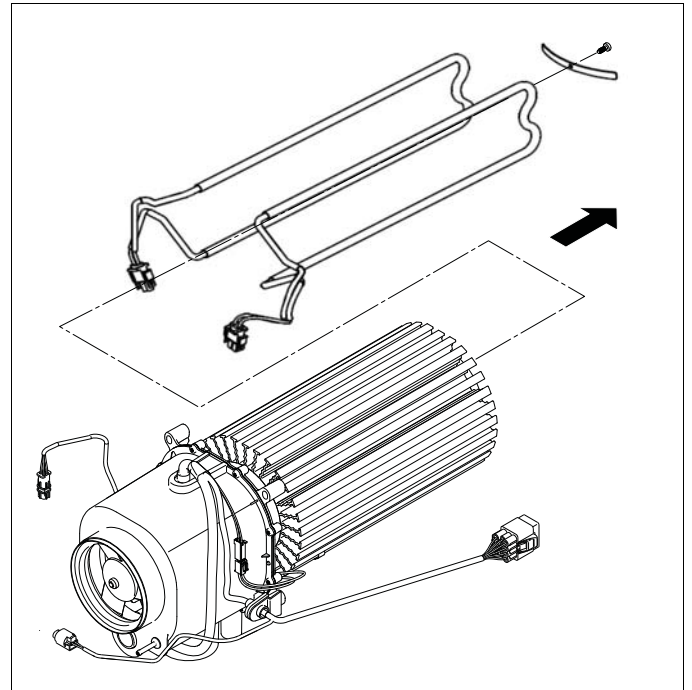


Fig. 816 Remove electrical heating elements.

**8.2.7 Removing control unit and internal wiring harness**

Remove exhaust gasket from exhaust and cooling air outlet.

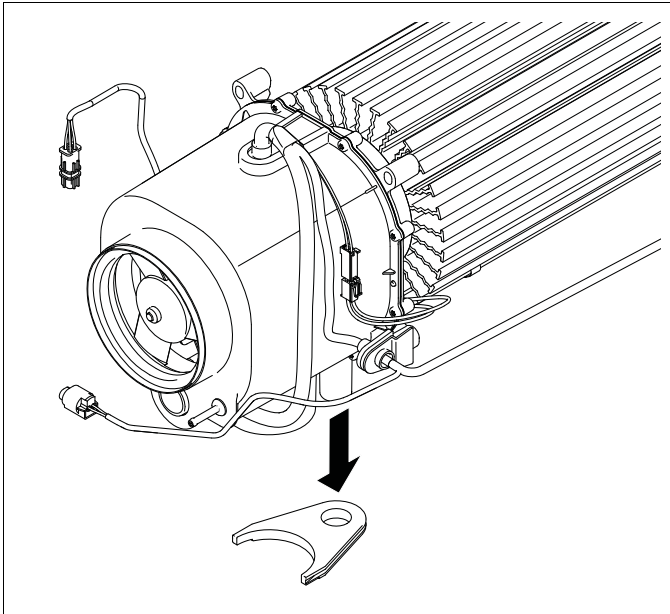


Fig. 817 Remove exhaust gasket.

Loosen 8 screws T20 to remove cooling shell.

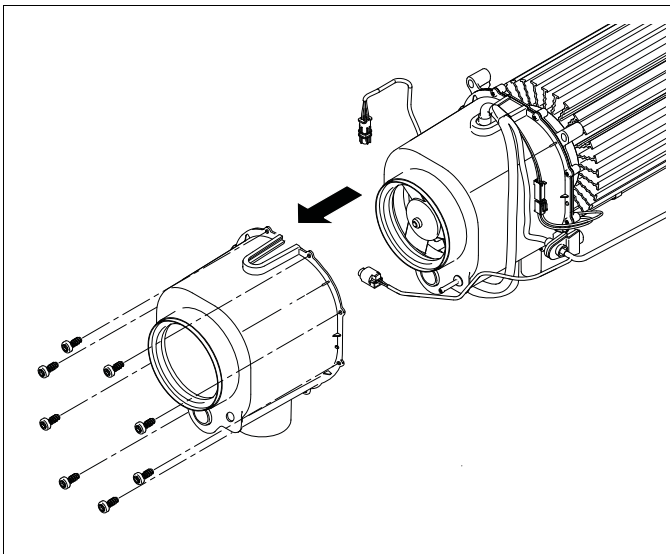


Fig. 818 Remove cooling shell.

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

Control unit:

- 1 = Temperature sensor control unit
- 2 = Hall sensor for speed of combustion and cooling air blower

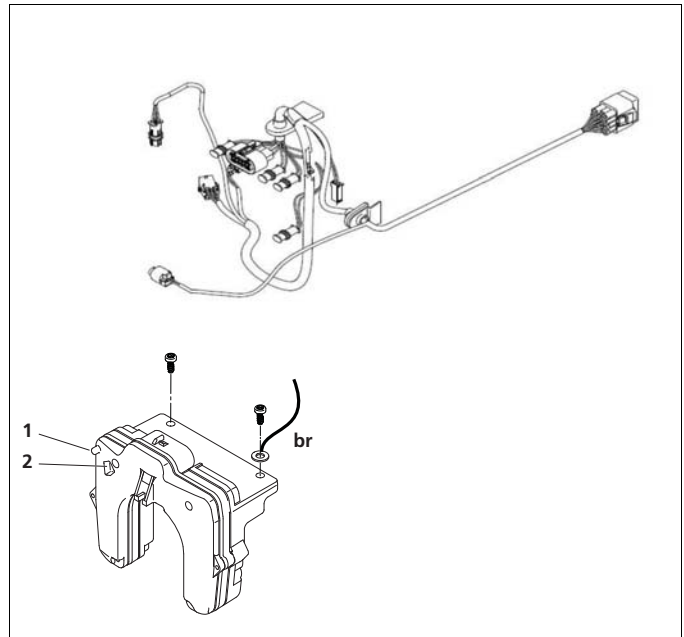


Fig. 819 Remove control unit.

Remove cooling shell gasket.

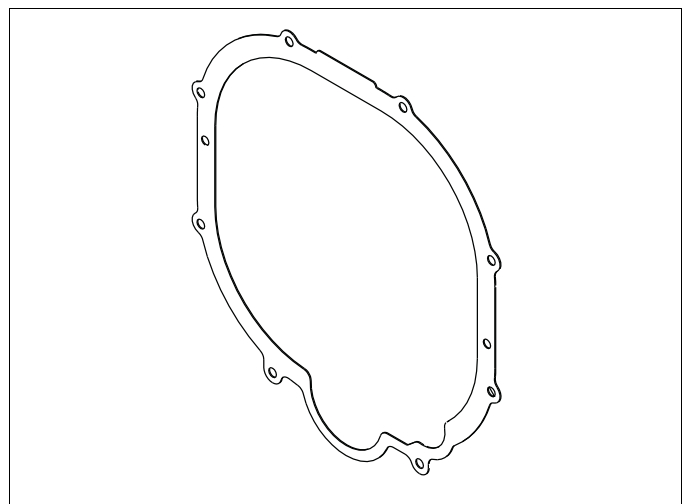


Fig. 820 Removal of cooling shell gasket.



**NOTE:**

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



### 8.2.8 Removing drive

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

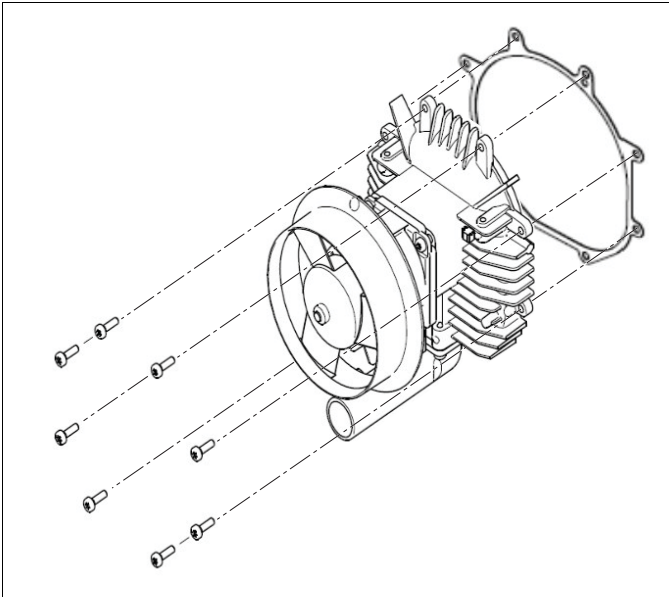


Fig. 821 Remove heat exchanger and gasket.

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

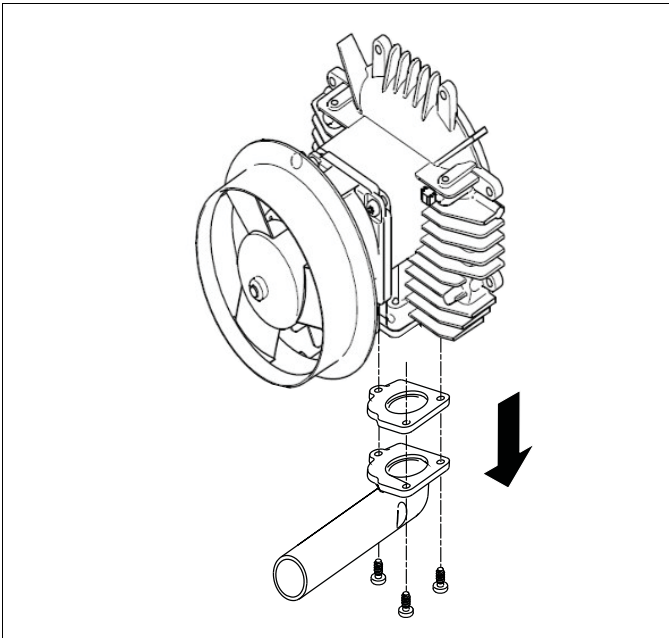


Fig. 822 Remove combustion air intake and gasket.

### 8.2.9 Removing evaporator housing assembly, glow plug and combustion pipe assembly

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

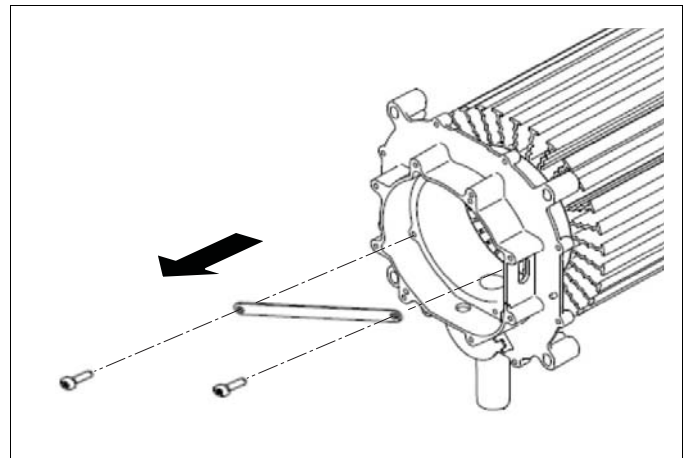


Fig. 823 Remove clamping yoke.

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

Press grommet of fuel line inwards.

Remove evaporator housing assembly with fuel line and glowplug from heat exchanger.

Pull holding spring glowplug to remove glowplug from evaporator housing assembly.

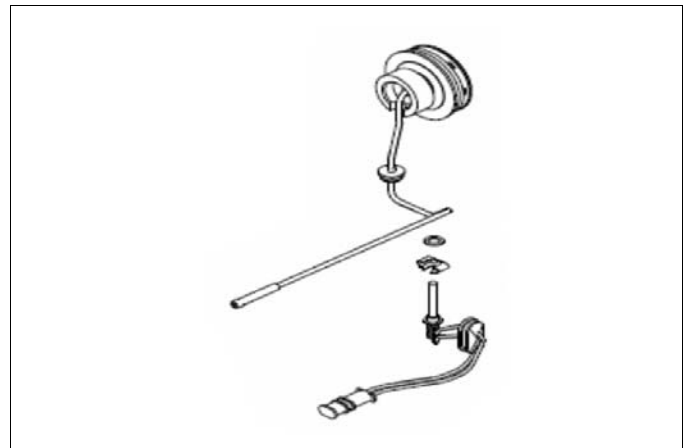
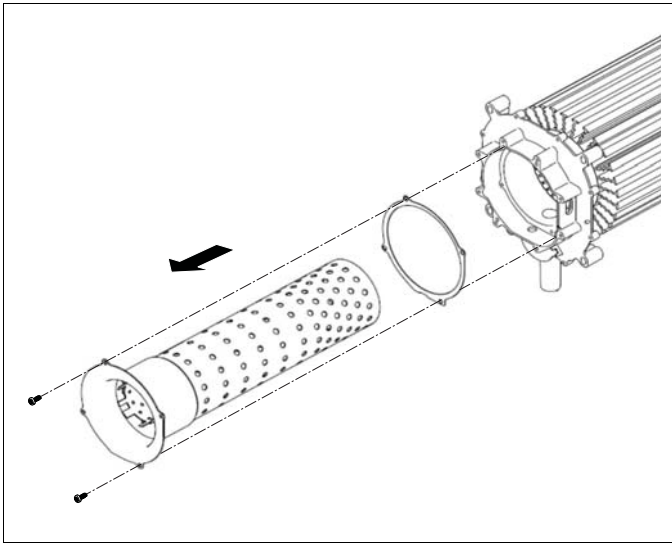


Fig. 824 Remove evaporator housing assembly and glow plug.

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



*Fig. 825 Remove combustion pipe assembly and gasket.*

### 8.3 Assembling

#### 8.3.1 Installing evaporator housing assembly, glow plug and combustion pipe assembly

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

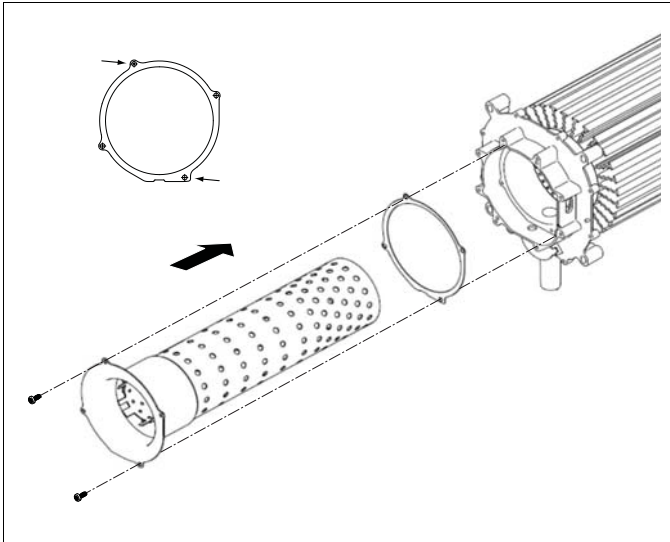


Fig. 826 Install combustion pipe assembly and gasket.



**NOTE:**

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

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

Guide fuel line from inside to outside through large hole in bottom of heat exchanger.

Position evaporator housing assembly in combustion pipe assembly.

Press grommet fuel line in hole heat exchanger.

Guide wiring glowplug from inside to outside through small hole in side of heat exchanger.

Press grommet on glowplug wire through the hole in the heat exchanger.

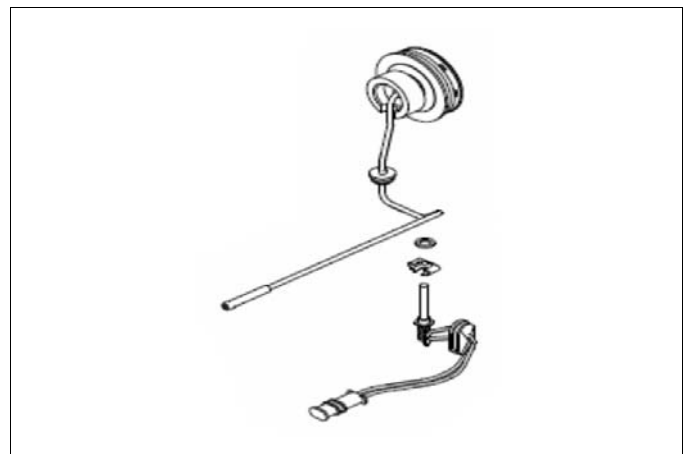


Fig. 827 Install evaporator housing assembly and glow plug.

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

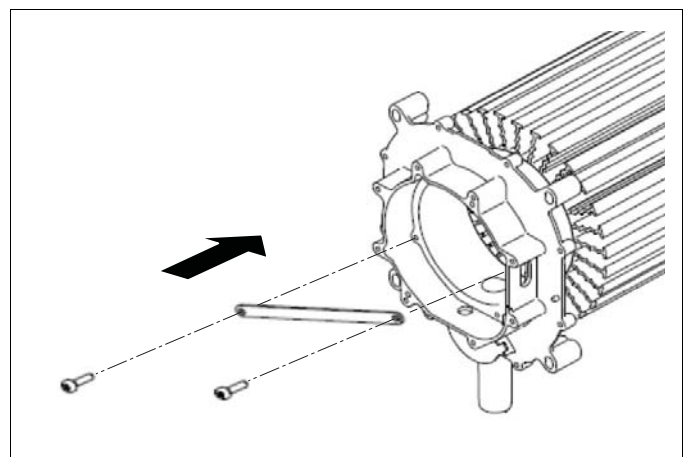


Fig. 828 Install clamping yoke.

### 8.3.2 Installing drive

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

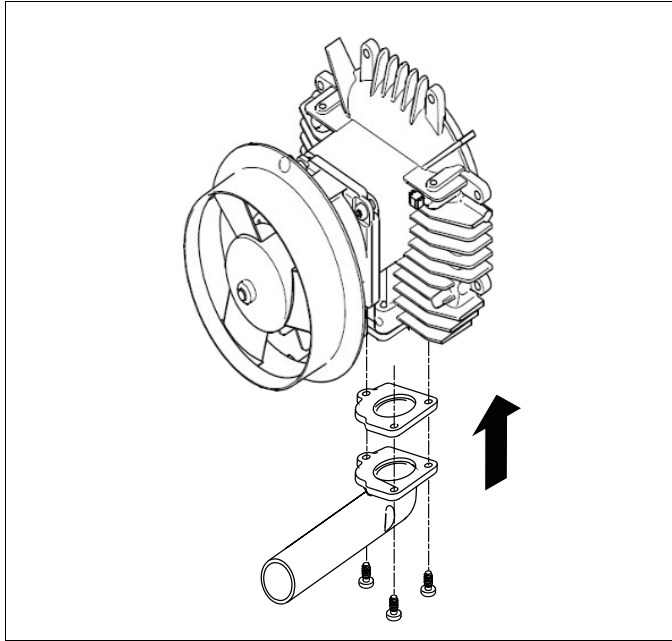


Fig. 829 Install combustion air intake and gasket.

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



**NOTE:**

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

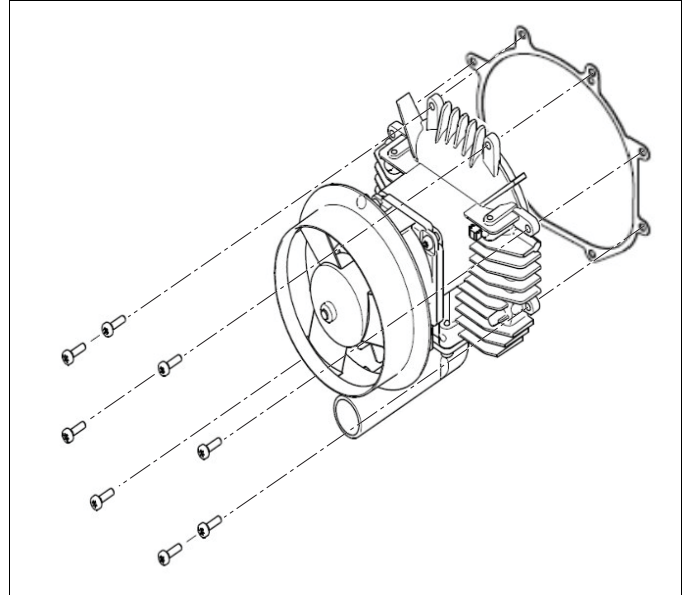


Fig. 830 Install heat exchanger and gasket.



**NOTE:**

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

### 8.3.3 Installing control unit and internal wiring harness

Connect 2 plugs from thermo unit (Y1 and Y2, see Fig. 601) and 5 plugs of internal wiring harness (Y3, Y4, Y5, Y6 and Y7, see Fig. 601) to control unit.

Put control unit on drive assembly and fix with 2 screw T20. Use 1 of these screws to fix brown wire.

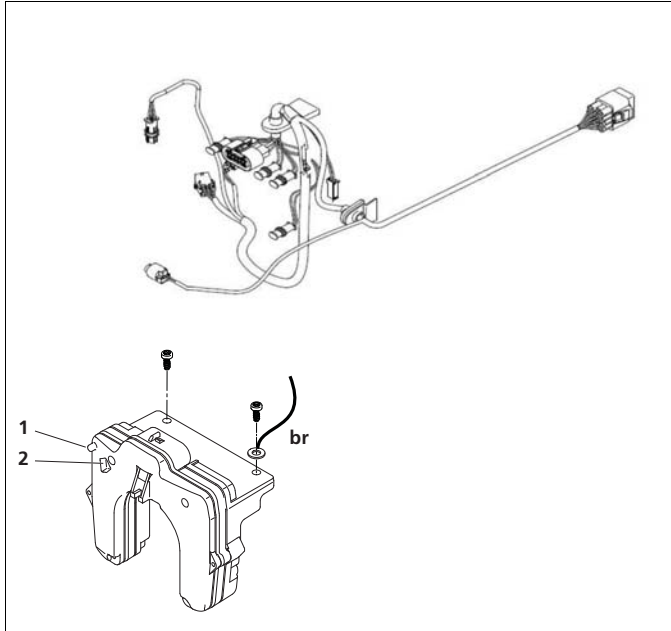


Fig. 831 Install control unit

Put gasket exhaust on exhaust and cooling air outlet.

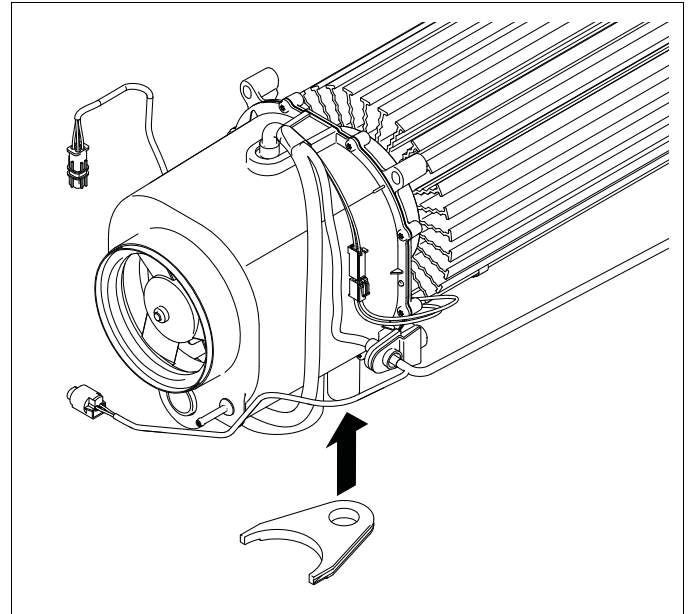


Fig. 833 Install exhaust gasket.

Attach cooling shell to heat exchanger with 8 screws T20.

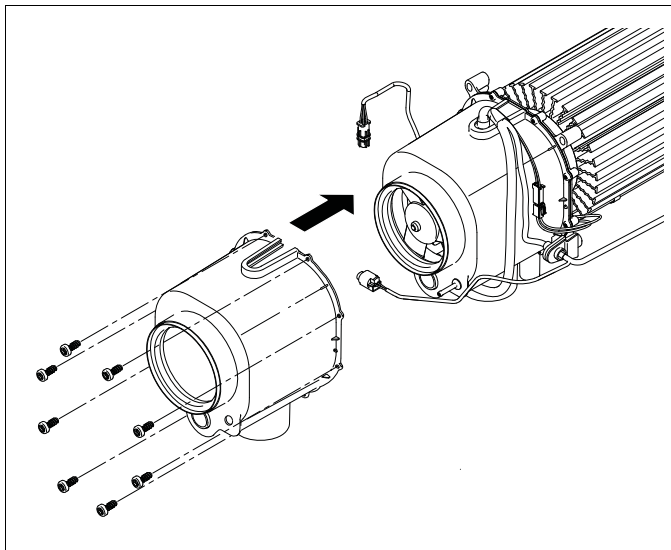


Fig. 832 Install cooling shell.



**NOTE:**

- small rubber grommet between cooling shell and fuel line
- large rubber grommet between cooling shell and wiring harness

8.3.4 Installing electrical heating elements

**Only for Dual Top Evo 7/8:**

Slide electrical heating element from backside into the heat exchanger.



**NOTE:**  
Observe the correct position of the electrical heating elements.

Fix electrical heating elements to heat exchanger with securing plate and T10 screw.  
Connect 2 plugs X1 (2-pin, 1x grey and black, 1x brown and blue) of wiring elements to wiring from relay box.

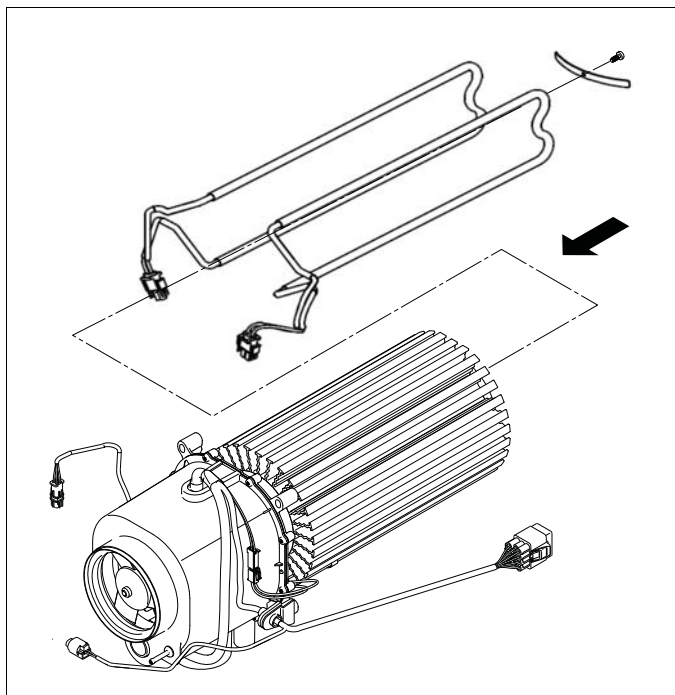


Fig. 834 Install electrical heating elements.

8.3.5 Installing thermo unit, sensors and sensor wiring harness

Fix overheating protector to backside heat exchanger with 2 screws T10.

Connect 2-pin plug of wiring overheating protector to internal wiring harness.

Fix wires to ribs of heat exchanger using cable ties.

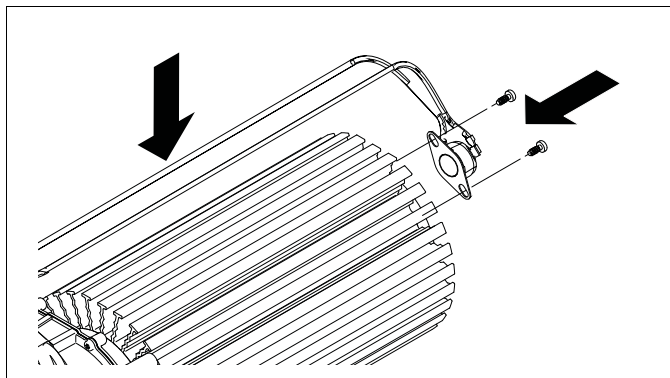


Fig. 835 Install overheating protection.

Fit 4 springs on heat exchanger.

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:**  
With older heaters (Ident. No. 9015314A, see type label on heater) the silicone guide pads must be replaced with springs after the heat exchanger is removed.  
Due to a different heat conductivity, the control unit must also be replaced.

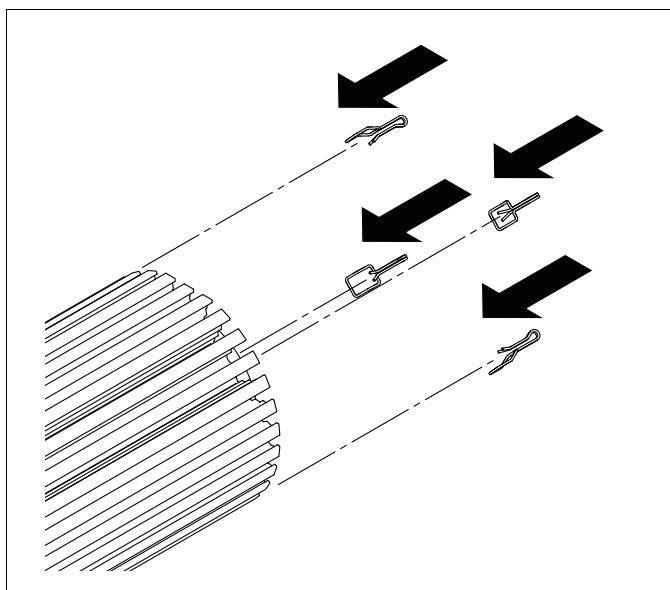


Fig. 836 Install 4 springs.

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

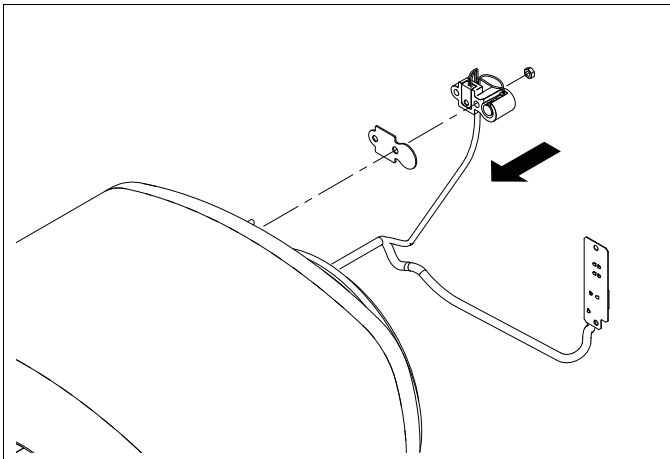


Fig. 837 Install water temperature switch and sensor.

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.

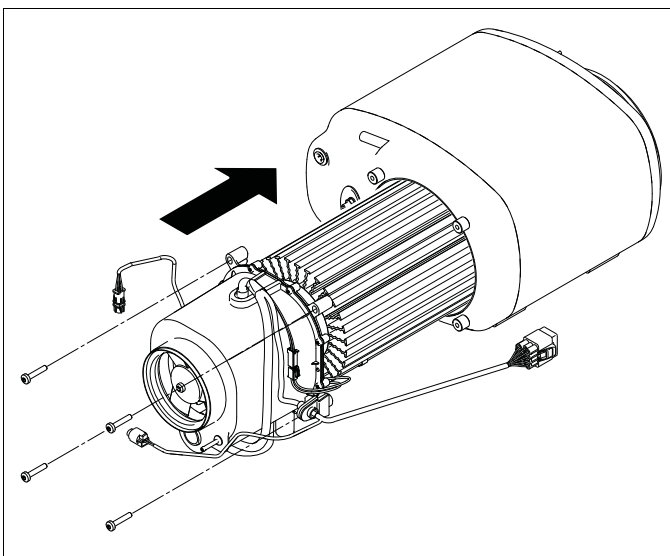


Fig. 838 Install thermo unit including heat exchanger.

### 8.3.6 Installing ventilation/overpressure valve and solenoid valve

Push air ventilation/overpressure valve as far as possible on connection of boiler.  
 Push hot water pipe as far as possible into air ventilation/overpressure valve and cold water pipe into connection of boiler.

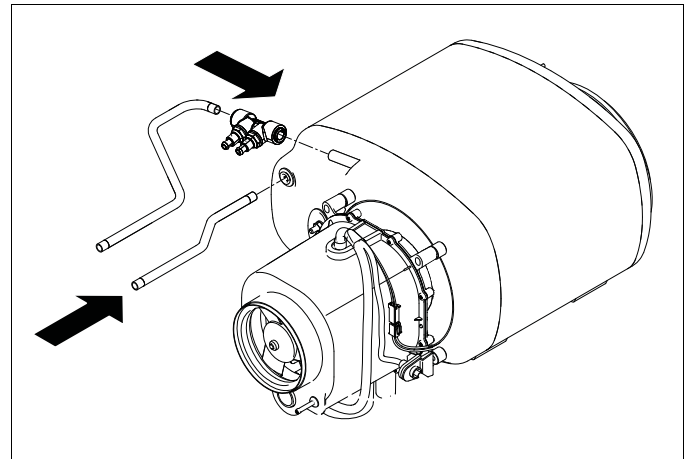


Fig. 839 Install ventilation/overpressure valve and hot and cold-water line connection.

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

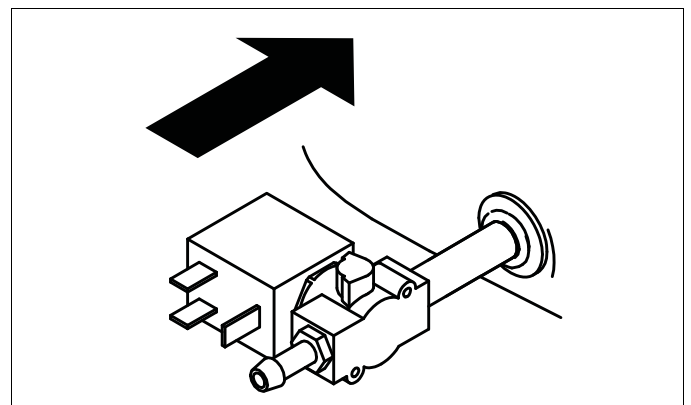


Fig. 840 Install solenoid valve.



Attach 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.

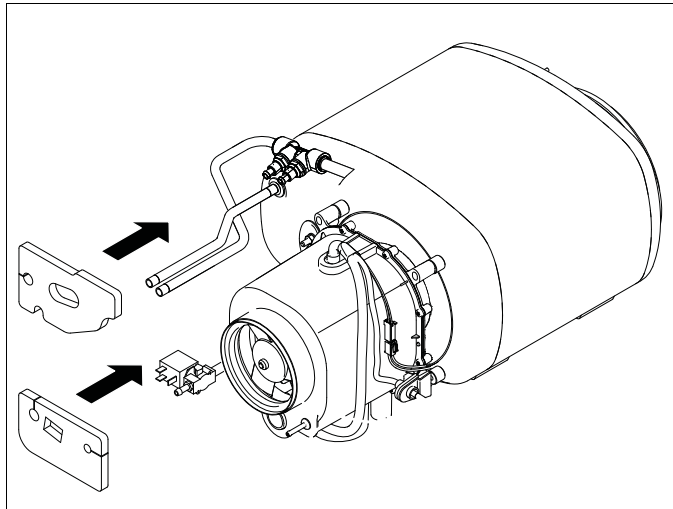


Fig. 841 Install insulation.

Connect 2 1-pin plugs with solenoid valve.  
Use 2 parallel pins of valve.  
Doesn't matter which wire colour is connected to which pin (upper or lower).

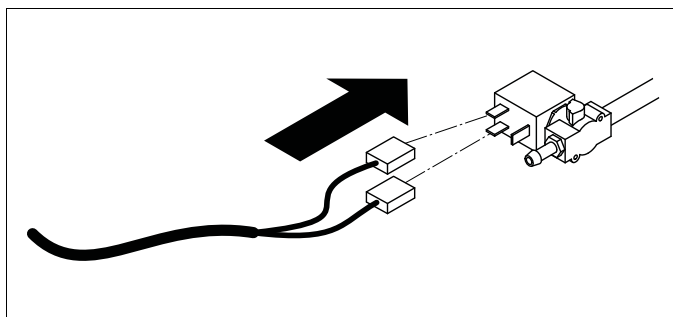


Fig. 842 Connect plugs.

**Dual Top Evo standard version:**

Connect drain hose to 2 openings on ventilation/overpressure valve (A, D) and to 1 opening on solenoid valve (B).

Position open end in cooling air outlet (C).

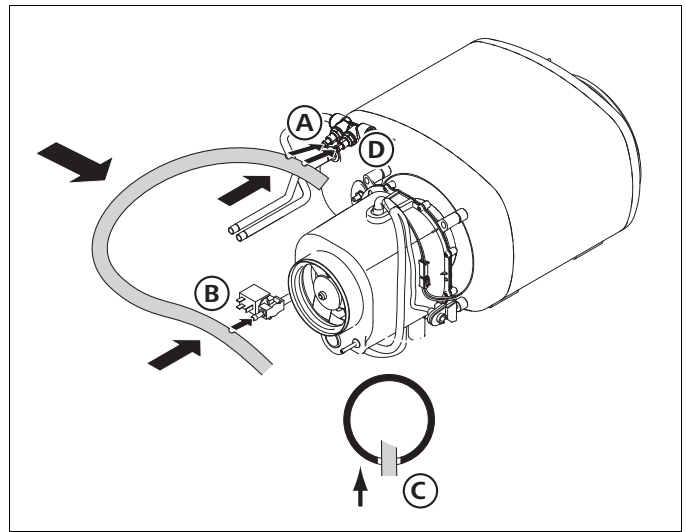


Fig. 843 Install drain hose (standard version).

**Dual Top Evo immersion pump version:**

Connect drain hose to 1 opening on ventilation/overpressure valve (A) and to 1 opening on solenoid valve (B).

Position open end in cooling air outlet (C).

Connect ventilation hose of Dual Top to ventilation/overpressure valve (D).

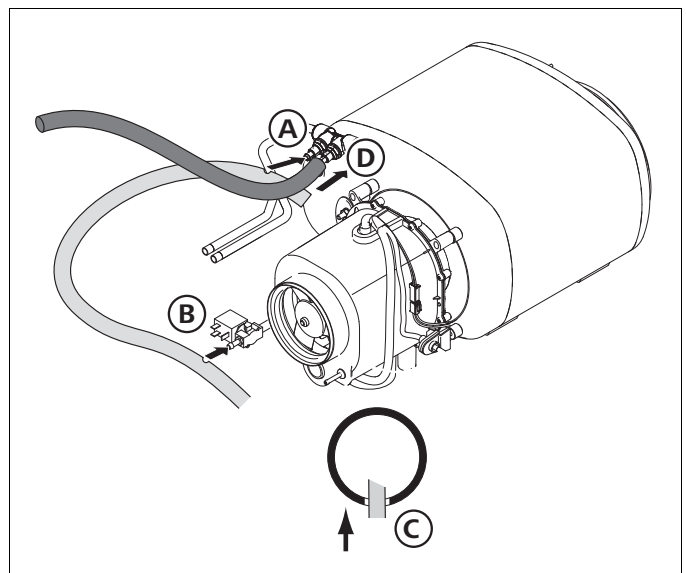


Fig. 844 Install drain hose and ventilation hose of Dual Top (immersion pump version).



### 8.3.7 Removing housing and insulating elements

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 harness between bottom of boiler and lower part insulation (groove in insulation element).

Carefully slide Dual Top including insulation elements into housing.



**NOTE:**

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

Fix boiler to housing with 4 screws T30 on bottom of Dual Top.

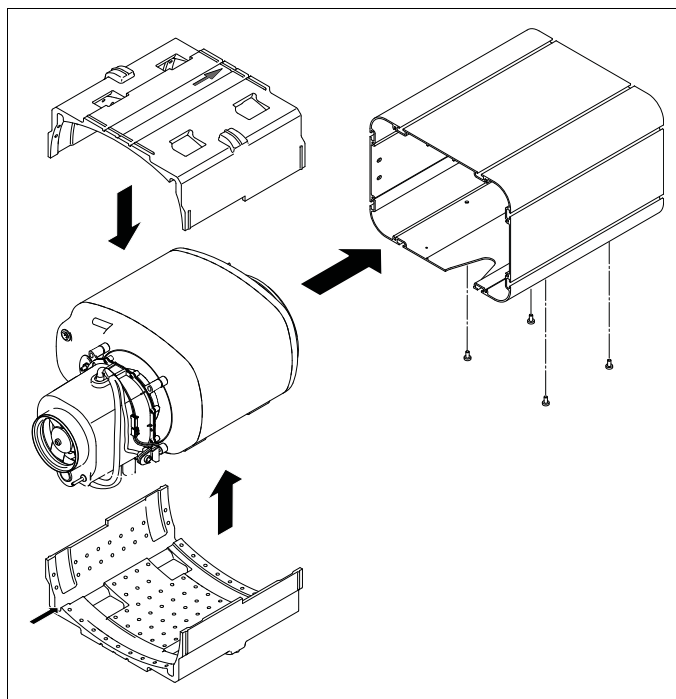


Fig. 845 Install insulating elements and boiler.

**Only for Dual Top Evo 7/8:**

Fix green/yellow ground wire to housing with screw T30 and hex nut SW 10 mm.

Tightening torque:  $9 \pm 0.9$  Nm.

### 8.3.8 Installing heating air blower assembly

Connect 4-pin plug of internal wiring harness to PWM module.

Attach heating air blower assembly to Dual Top housing with 2 T30 screws.



**NOTE:**

- Ensure the correct cable connection, 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 housing.
- Do not tighten screws completely yet!
- Make sure that wires don't touch rotating parts.

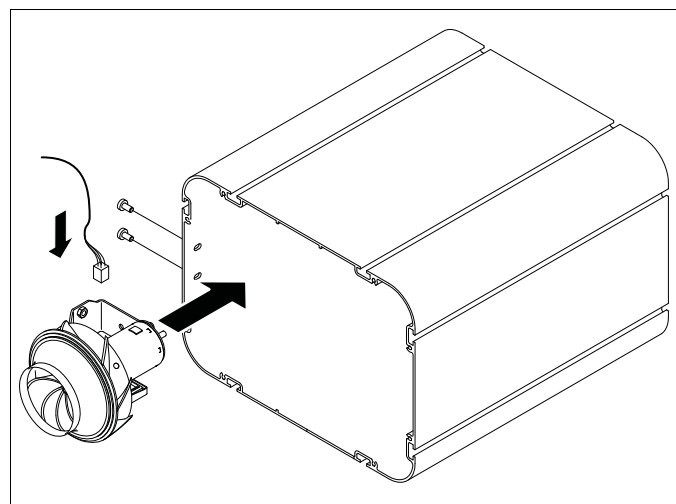


Fig. 846 Install heating air blower assembly

### 8.3.9 Installing housing cover

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



**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  $\geq 2$  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!

Fasten housing cover with hot air outlet to Dual Top housing with 8 T25 screws.  
Tightening torque: 6 Nm.

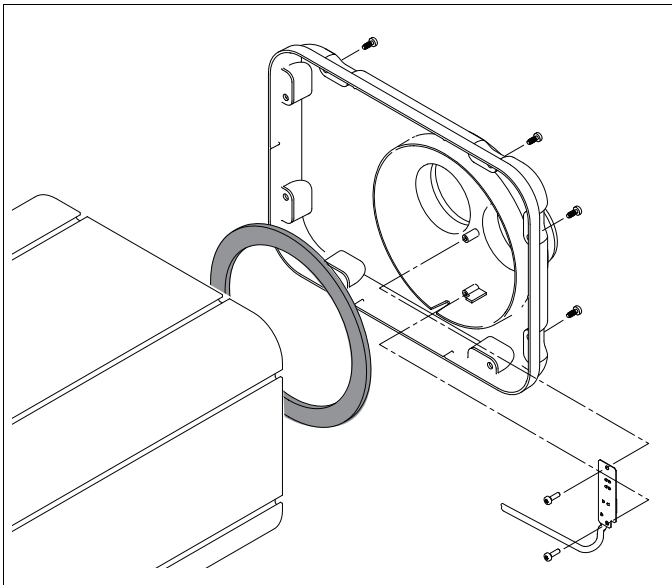


Fig. 847 Install metal retaining plate, gasket and housing cover with hot air outlet.

Install air intake grill and cooling shell foam gasket.

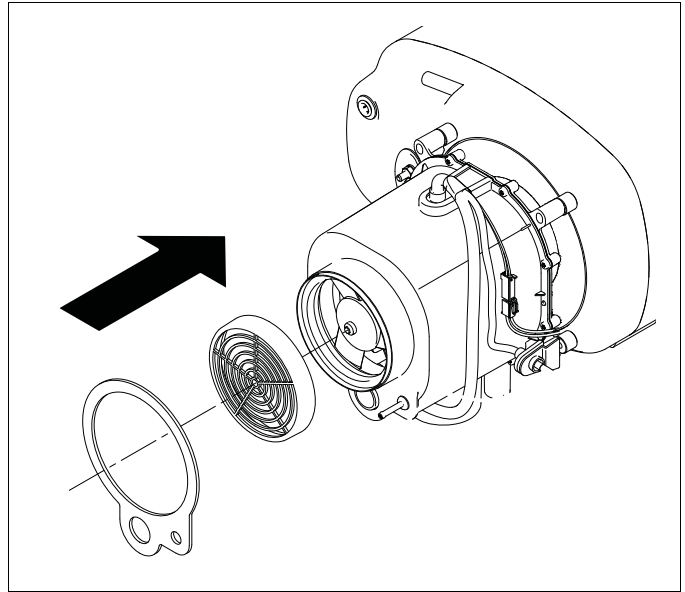


Fig. 848 Install grill and gasket.

Slide grommet water in- and outlet into housing cover with inlet interfaces.

Housing cover must be inserted into groove of grommet.

Guide connectors water pipes through rubber gasket.

**Only Dual Top Evo immersion pump version:**

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

Fasten housing cover with inlet interfaces on Dual Top with 8 T25 screws.  
Tightening torque: 6 Nm.

**NOTE:**

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

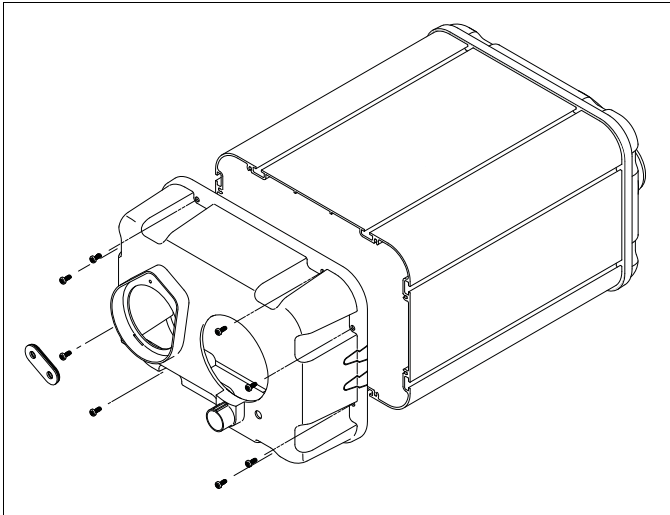


Fig. 849 Install housing cover with inlet interfaces.

Position cover heating air blower and heating air blower assembly in such a way that heating air blower can rotate freely.

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 housing.

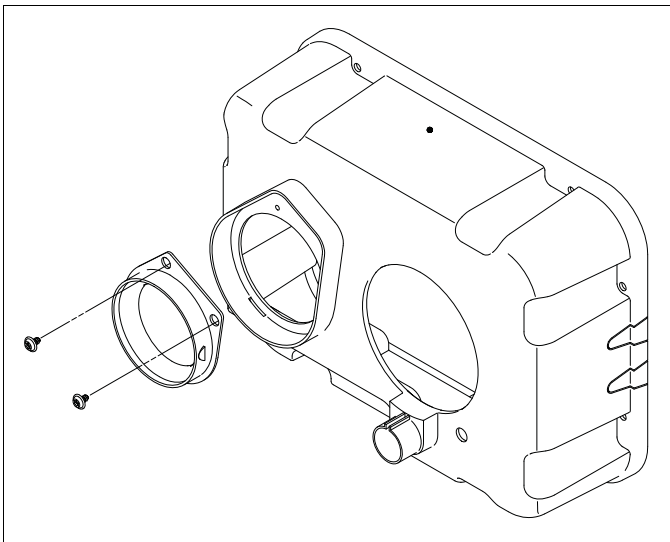


Fig. 850 Tighten 2 T20 screws.

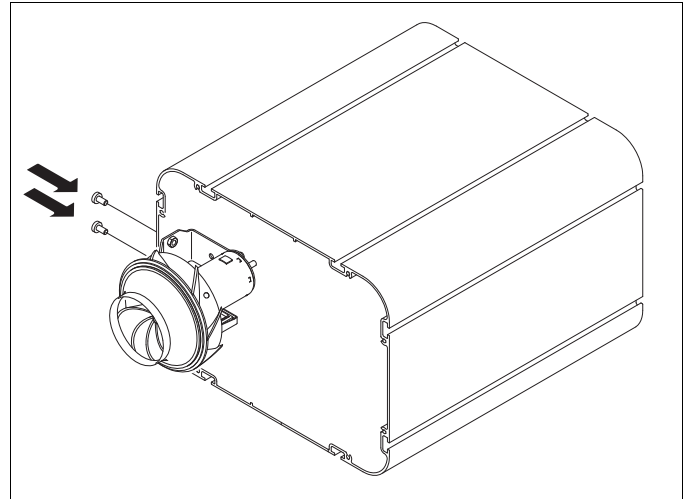


Fig. 851 Tighten 2 T30 screws.

**NOTE:**

Ensure 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.

### 8.4 Replacement of older Dual Top RHA 100/ Dual Top Evo 6 version with newer one

Webasto recommends the following procedure when older types heaters Dual Top RHA 100 are completely replaced by newer types.

Older versions of the Dual Top RHA 100 heaters have the following Ident. No. (see type label on heater): 9015314A and 9015314B.

Newer versions of the Dual Top RHA 100 heaters (produced after June 2008) have Ident. No. 9015314C.

#### Conversion kit:

The external wiring harnesses are not compatible. Webasto recommends the use of the conversion kit 1315728A.

#### Required tools:

TYCO die 5-1579001-1 (for 0.75 mm<sup>2</sup> lines)  
 TYCO die 539737-2 (for 1.5 and 2.5 mm<sup>2</sup> lines)  
 Side cutters  
 Wire strippers

#### Procedure:

- 1 Disconnect heater's 12 V power supply from battery.
- 2 Disconnect wiring harness from fuel pump.
- 3 Cut off old wiring harness as close as possible to Dual Top heater (approx. 5 cm).

- 4 Secure lines for fuel pump of old wiring harness (orange and green/white cables).
- 5 Strip 6 wires of old wiring harness (vehicle side) approx. 5 mm.
- 6 Slide individual wire seals onto lines.  
 NOTE: Observe wire cross-sections and colours of seals. Crimp pins and seals onto wires.  
 See Fig. 852.
- 7 Insert pins of wiring harness, pins of short orange wires and blind plugs (conversion kit) into connector housing (see Table 801 and Fig. 852).
- 8 Connect new heater with connector Y11 to new connector X11 of old external wiring harness and with connector X3 to fuel pump.

**Table 801** Pin assignment

Slot	Wire
1	yellow/grey (ge/gr) or yellow/blue (ge/bl)
2	yellow (ge)
3	red (rt) 1.5 mm <sup>2</sup>
4	red (rt) 2.5 mm <sup>2</sup>
5	orange (or), to Slot 8
6	orange (or), to Slot 7
7	orange (or), to Slot 6
8	orange (or), to Slot 5
9	brown (br)
10	Blind plug, large
11	black
12	Blind plug, small

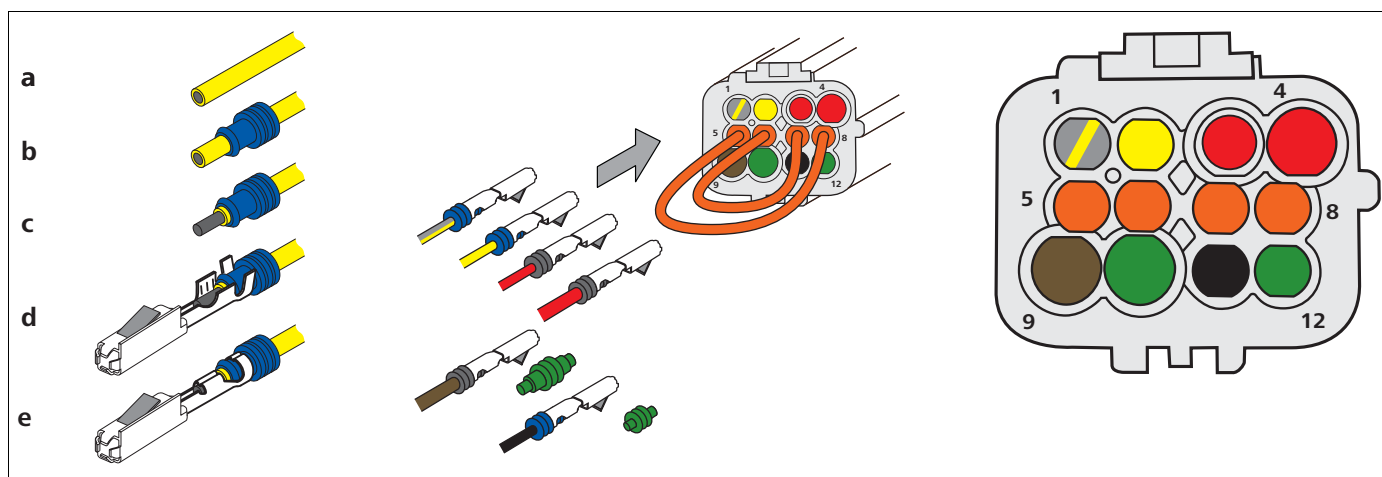


Fig. 852 Convert old wiring harness with connector X11 for new heater

## 9 Packaging, storage and shipping

### 9.1 General

The heater or its components which are sent to Webasto for testing must be cleaned and packaged so that they are protected against damage when handled, transported and stored.

An ambient temperature of + 85 °C or - 40 °C must not be exceeded for storage.

**IMPORTANT:**

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.



The telephone number of each country can be found in the Webasto service center leaflet or the website of the respective Webasto representative of your country.

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