

# Workshop Manual

## Thermo Top Evo HD / RV

Water Heater



### English

**This document is valid for:**

Thermo Top Evo HD (Diesel)

Thermo Top Evo RV (Diesel)

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# 1 Introduction

## 1.1 About this document






This workshop manual is designed to assist trained personnel in the repair of the product Thermo Top Evo HD / RV.

This workshop manual is part of the product and contains all the information, settings and instructions necessary to repair Thermo Top Evo HD / RV.

## 1.2 Using this document

- Read and understand this workshop manual before repairing the Thermo Top Evo HD / RV.
- The Installation Instructions and the Operating Instructions and the important information and legal provisions contained therein should be read and observed when working on the heater.

## 1.3 Use of symbols and highlighting

	<b>DANGER</b> This signal word denotes a hazard with a high degree of risk which, if not avoided, will lead to death or serious injury.
	<b>WARNING</b> This signal word denotes a hazard with a moderate degree of risk which, if not avoided, may lead to minor or moderate injury.
	<b>CAUTION</b> This signal word denotes a hazard with a low degree of risk which, if not avoided, will lead to minor or moderate injury.
	<b>NOTE</b> This signal word denotes a Special Technical Feature or (if not observed) potential damage to the product.
	Refers to separate documents which are enclosed or can be requested from Webasto.

Symbol	Explanation
✓	Requirements for the following necessary action
▶	Necessary action

## 1.4 Intended use

The water heater Thermo Top Evo HD / RV is currently approved for the following applications:

- Motor vehicles of category M1.
- Commercial vehicles

If it is installed in special-purpose vehicles, observe the applicable regulations for this. Alternative applications are possible in agreement with Webasto.

## 1.5 Safety

Observe the general accident prevention regulations and the valid operational safety instructions.

"General safety requirements" that extend beyond the framework of these regulations are specified in the following.

Special safety requirements concerning this manual are highlighted in the individual chapters and procedural descriptions.

## 1.6 General safety information



### DANGER

#### Danger of explosion

In environments with combustible vapours, flammable dust and hazardous goods (e.g., petrol stations, tank facilities, fuel store, coal bunkers, timber yard or grain warehouses).

- ▶ Do not switch on or operate the heater.



### DANGER

#### Danger of poisoning and suffocation

Do not operate the heater in closed rooms that do not have an exhaust extraction unit.

- ▶ Do not switch on or operate the heater, not even with timer or Telearstart.



#### Overheating caused by insufficient coolant or defective coolant flow

- ▶ Check coolant system (heater and vehicle).
- ▶ Check the coolant. There must be at least 20% of a brand-name antifreeze in the water of the heating circuit.
- ▶ Contact a Webasto service workshop.

## 1.7 Qualification of the repair personnel

To work on the heater, personnel must have the following qualifications:

- Successful completion of Webasto training.
- Corresponding qualification for working on technical systems.
- Installation and operating instructions as well as the notes it contains must be observed.

## 1.8 Warranty and liability

Webasto shall not assume liability for defects or damage that are the result of the installation and operating instructions being disregarded. In particular, this liability exclusion applies in the following cases:

- Installation by untrained personnel.
- Conversion of the unit without permission from Webasto.
- Improper use.
- Repairs or device replacement not carried out by a Webasto service workshop.

## 1.9 Spare parts

You can find available original spare parts:

- In the Webasto spare parts catalogue.
- In the dealer portal <https://dealers.webasto.com>.



### NOTE

Before ordering the spare part, make sure that the parking heater has been upgraded to a stand-alone auxiliary heater (e.g. by reading the EOL data record via WTT).

## 1.10 Abbreviations

Abbreviation	Meaning
DEC	Decimal
EOL	End Of Line
HD	Heavy Duty
HEX	Hexadecimal

Abbreviation	Meaning
RV	Recreational Vehicle
WTT	Webasto Thermo Test PC Diagnosis

## 2 Description

### 2.1 General description

The water heater Thermo Top Evo HD / RV (Fig. 1) is used to compensate for the heat deficit in consumption-optimised vehicle engines.

The water heater serves as the parking heater to:

- Heat the vehicle interior.
- Defrost vehicle windows.
- Preheat water-cooled vehicle engines.

The heater can be upgraded with an additional kit for stand-alone auxiliary heating.

**NOTE**

This workshop manual describes the retrofit version of the heater. In the case of heaters installed directly by the vehicle manufacturer, different control units with different connectors and different software as well as different application parts may be used which are not described in this manual. For these heaters, information is only available in the documentation of the vehicle manufacturer.

The heater is designed according to the evaporator principle. The heater can be operated at maximum heat capacity level (full load), minimum heat capacity level (partial load) or continuously variable between maximum and minimum heat capacity level (Continuous Coolant Temperature Control). The control is carried out via an internal temperature sensor.

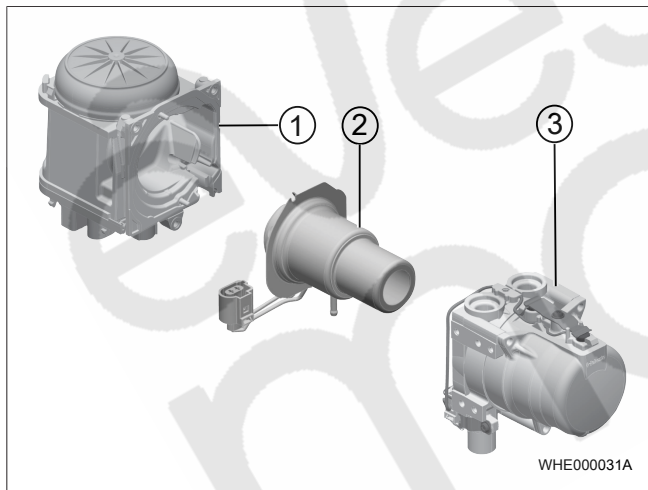


Fig. 1

- ① Combustion air fan unit
- ② Burner unit
- ③ Heat exchanger unit

### 2.2 Combustion air fan unit / control unit

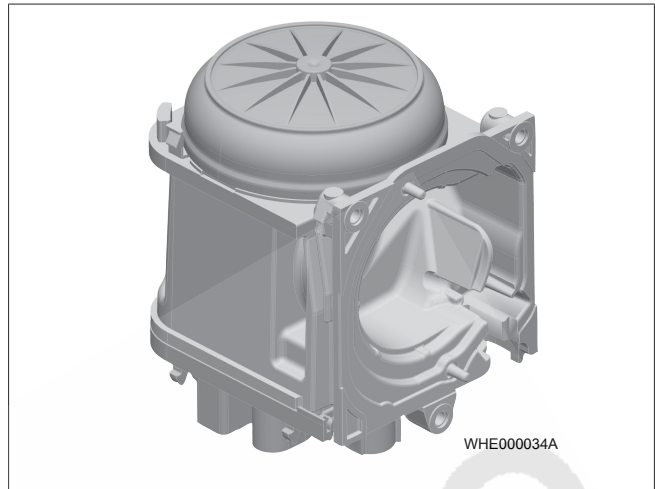


Fig. 2

**NOTE**

It is not permitted to dismantle the combustion air fan unit.

The combustion air fan unit comprises:

- The heater type label.
- The connection piece for the combustion air line.
- The control unit with plug-in contacts.
- The motor and the impeller.

The combustion air fan supplies the air required for the combustion process from the combustion air inlet into the combustion chamber.

### 2.3 Burner unit

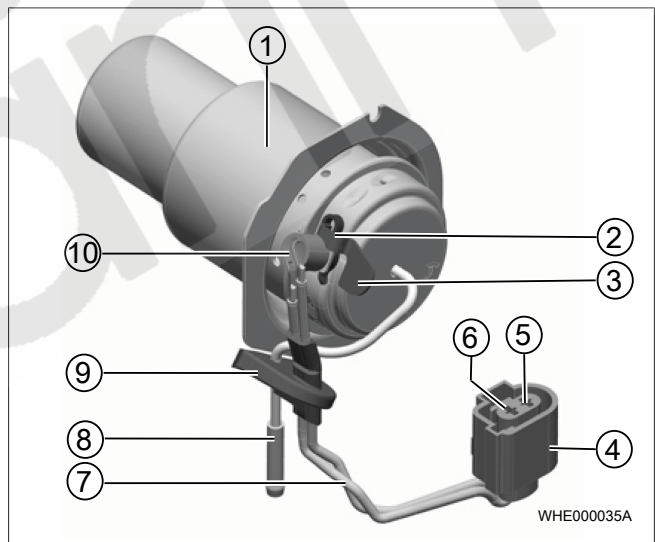


Fig. 3

- ① Fuel pipe with evaporator
- ② Spring clip for glow plug
- ③ Cooling flag for glow plug
- ④ Glow plug / flame monitor
- ⑤ Pin 2
- ⑥ Pin 1 holder and evaporator
- ⑦ Glow plug cable
- ⑧ Fuel pipe
- ⑨ Grommet
- ⑩ Glow plug / flame monitor

The fuel/air mixture is prepared and the actual combustion takes place in the burner unit. The fuel passes through the fuel pipe to the evaporator where it dissipates and is evaporated with the aid of the glow plug. The air required for combustion is provided by the combustion air fan unit and flows into the combustion chamber via bore holes in the burner.

### 2.3.1 Glow plug / flame monitor

The glow plug / flame monitor is connected to the control unit via an electrical cable with a connector. The glow plug is attached to the vaporiser holder via a spring clip. A cooling flag provides for heat dissipation from the glow plug. It therefore reduces the temperature at the glow plug connection lines.

The glow plug ignites the fuel-air mixture during the start-up phase. The glow plug is switched off when the maximum heating power is reached. It is only used to monitor the flame from this point on. The electrical resistance of the glow plug decreases after the flame is extinguished and no more heat is applied. It is detected by the control unit.

## 2.4 Heat exchanger unit

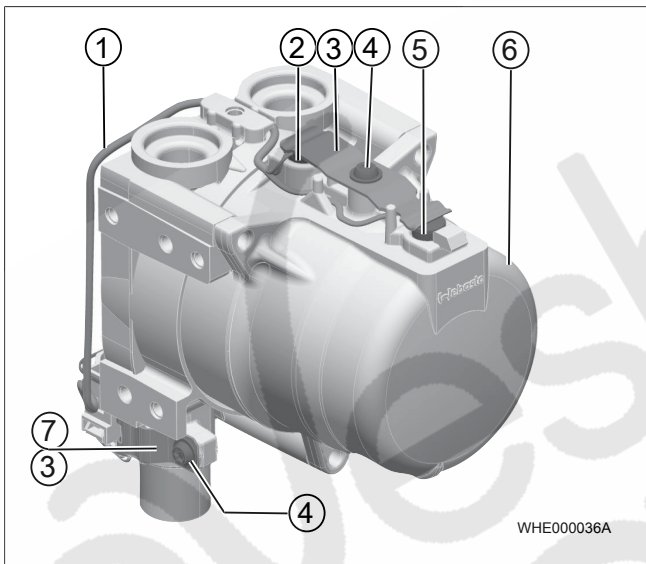


Fig. 4

- |                             |  |
|-----------------------------|--|
| ① Cable temperature sensors | ⑤ Overheat sensor  |
| ② Temperature sensor        | ⑥ Heat exchanger   |
| ③ Spring clip               | ⑦ Exhaust gas temperature sensor, covered by spring clip |
| ④ 40x10 self-tapping bolt   |  |

The heat exchanger transfers the heat generated in the combustion process to the coolant circuit.

### 2.4.1 Temperature sensor and overheating sensor

The temperature sensor registers the coolant temperature in the heat exchanger of the heater as an electrical resistance. This signal is sent to the control unit, where it is processed. The temperature sensor and the overheating sensor together with the cable and the connector form one unit.

The overheating sensor protects the heater from impermissibly high operating temperatures. The overheating sensor responds at a temperature higher than 125°C and the control unit switches the heater off.

### 2.4.2 Exhaust gas temperature sensor

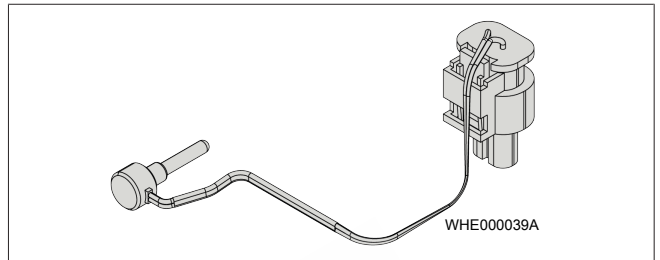


Fig. 5

The exhaust gas temperature sensor detects impermissible exhaust gas temperatures.

The cable of the exhaust gas temperature sensor is a high temperature resistant electrical cable with Teflon insulation. The exhaust gas temperature cable:

- can withstand permanent temperatures of up to 185°C
- is sensitive to external mechanical impact.

## 2.5 Coolant pump U4847 Econ

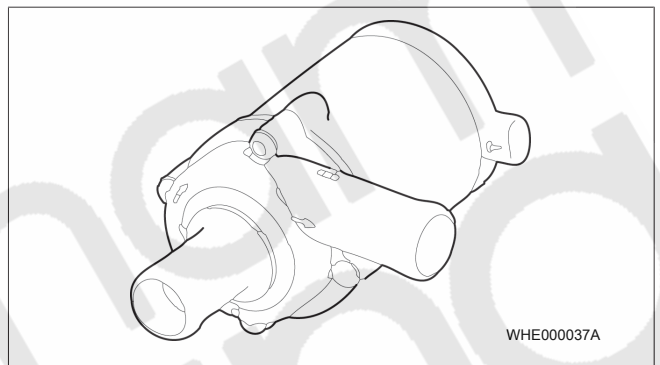


Fig. 6

The coolant pump U4847 Econ ensures a flow rate of the coolant in the heater and heater circuit of the vehicle. The pump is switched on by the control unit and runs continuously during heater operation. The coolant pump is a centrifugal pump with a brushless EC motor.

The coolant pump has a 2-pin connector socket and is connected to the control unit via a separate wiring harness.

## 2.6 DP42 fuel pump

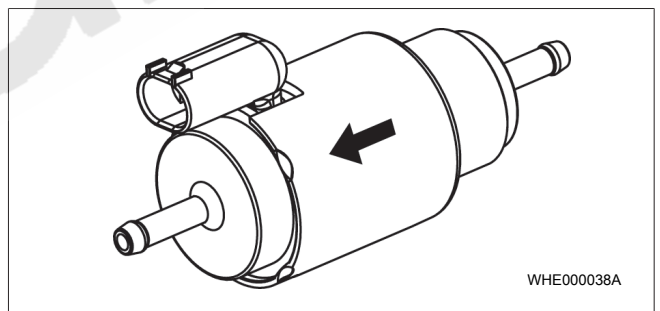


Fig. 7

The fuel pump DP42 is a combined delivery, metering and shut-off system. This dry-suction piston pump delivers the fuel via fuel lines from the vehicle tank to the fuel connection piece of the heater. It is normally installed near the tank. The fuel pump does not have a pulsation damper. The fuel pump is connected to the control unit and with an earthing point on the vehicle chassis via the heater wiring harness.

**NOTE**

Only the fuel pump of type DP42 may be used with the heater Thermo Top Evo. Observe the type designation on the component. The CO<sub>2</sub> setting should be checked when replacing the fuel pump. See chapter 6.2, "CO<sub>2</sub> setting" on page 20.

### 3 Functional description

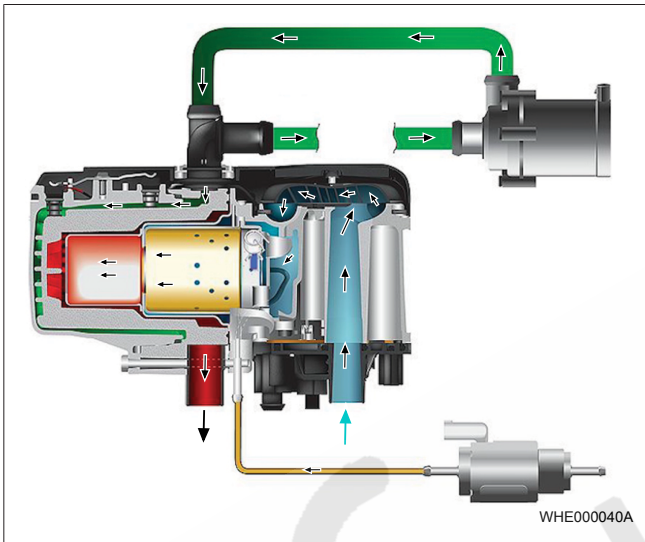


Fig. 8

**NOTE**

The heaters described in this manual can be put into operation using either an analogue or a W-Bus-compatible control element and the WTT. If the WTT is connected, the connection to other control elements is disconnected. Refer to the system wiring diagram for different configuration options.

#### 3.1 Switching on / start process

With the parking heater, the heater is started via a switch-on signal from the control element. With the auxiliary heater, the heater is started when the auxiliary heater signal is received at the heater inlet. The auxiliary heating signal depends on previously defined switch-on conditions, such as the outside temperature (below 5°C) and the motor running.

When the heater is started, the combustion air fan, the coolant pump and the glow plug are put into operation. The fuel pump is then switched on. The diesel heater starts in a low load level and is slowly ramped up to maximum heating power. During this start-up phase, the glow plug is used to check whether a flame has formed. If no flame is created or the flame fails, an automatic start-up procedure can be repeated. If no flame is created again, the start attempt is terminated. A fault switch-off occurs with an after-run of the combustion air fan. The heater can only be put back into operation after it has been switched off.

Depending on the coolant temperature, the control unit decides which start process is selected. Start processes are identical in sequence, but differ in the length of the individual phases (pre-heating, fuel delivery, etc.).

#### 3.2 Heating mode

After the maximum heating power (full load or Continuous Coolant Temperature Control) has been reached, the glow plug starts monitoring and checking the flame.

When a certain temperature is reached (around 80 °C), the heater switches to the energy-saving partial load mode or it regulates the heating capacity so that a constant setpoint temperature of 80°C is reached.

If the temperature continues to increase, the heater switches to the control pause at a certain temperature (around 84°C). After the coolant has cooled down, the heater restarts at the lowest heat capacity level. If the temperature increases again to a defined switching temperature, the heater switches to the control pause again.

If the coolant temperature drops further due to increased heat demand at the lowest heat capacity level, the heater again provides the full heat capacity.

The temperature of the switching points is programmed in the control unit.

If the flame fails during normal operation, a restart procedure is automatically initiated.

#### 3.3 Restart after fault switch-off

After removing the cause of the fault, switch the heater on again using the normal switch-on signals. This does not apply after overheating or if a fault occurs several times without intermediate combustion operation.

#### 3.4 Start after a long period of inactivity

If the heater is not put into operation for a longer period of time, this will not affect its starting function. However, restrictions must be made when filling the fuel lines. Pre-deliver fuel for the heater with the WTT:

- ▶ Select the "Fuel priming" button and fill the line until fuel is present at the heater.

#### 3.5 Switching off / switch-off function

**NOTE**

The after run time and the combustion air fan speed depend on the heater type and operating state from which the heater is switched off.

When a switch-off signal is received, when the burnout temperature is reached, when the set heating time is reached or in the event of malfunctions, the combustion operation is stopped and burnout is initiated. The control of the fuel pump is immediately interrupted and the fan speed is lowered. The fan speed is increased again after the burnout for cooling.

Switch-off or new switch-on signals are processed according to the following rules:

1. A switch-off signal always follows at a control element.
2. If the original switch-on signal is no longer present or the heating period supplied has expired, this is interpreted as a switch-off signal.
3. New switch-on signals are ignored until the original switch-on signal is no longer present.
4. The heating time cannot therefore be changed during operation. The heater must be switched off and on again with a different heating period.

5. If the heater was started as an auxiliary heater, a switch-off operation of the vehicle engine must be interpreted as a switch-off signal (legal requirement).
6. The heater can only be restarted after the burnout has been completed and the first cooling phase (forced after-running period) has been completed. New switch-on signals are stored temporarily until then and are not followed.

## 4 Malfunctions and troubleshooting

### 4.1 General information

This chapter describes troubleshooting on the Thermo Top Evo HD / RV.



#### DANGER

Troubleshooting assumes detailed knowledge of the design and functional principle of the heater and must only be carried out by specifically trained personnel.



#### NOTE

Troubleshooting is generally restricted to locating faulty heater components.

The following potential sources of malfunction are not taken into account as they should always be checked to rule them out as the cause of fault:

- ▶ Corroded connector.
- ▶ Loose plug connector.
- ▶ Crimping defect at connector.
- ▶ Completeness of the connector.
- ▶ Corroded cables and fuses.
- ▶ Corroded battery terminals.
- ▶ Impermissibly high ambient temperature.



#### NOTE

The heater can lock if several faults are registered. To unlock the heater, see chapter 4.7, "Reset heater lock-out" on page 9. All heater components are queried by the control unit. The component must be checked first when there is a defect. If it is OK, it must be assumed that the control unit is defective.

Carry out a function check of the Thermo Top Evo HD / RV in the vehicle after rectifying each fault.

### 4.2 Diagnostic interface

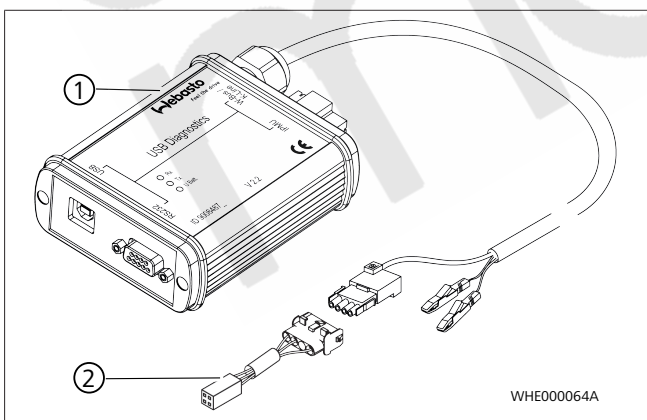


Fig. 9

① USB interface

② Diagnostic adapter



Connect and use the WTT USB interface, diagnostic adapter and adapter cable as described in the Operating Instructions.

The heater is diagnosable. With the WTT diagnostic adapter and the WTT diagnostic software installed on a PC, the heater can be tested when installed.

The diagnostic adapter is connected to diagnostic connector provided in the heater wiring harness (see chapter 10, "Wiring diagrams" on page 31). The diagnostic adapter is connected to the WTT USB interface.

The WTT USB interface is connected to the PC (at least, USB 2.0 port).

Then, the WTT diagnostic software is started on the PC and the connection established to the heater.



For more information about the WTT and adapters, see <https://dealers.webasto.com>.



#### NOTE

When the control element is connected via W-bus, disconnect the connector and connect the adapter plug. After the diagnostics, reconnect the control element.

### 4.3 Cause of malfunctions

A malfunction is caused when one or more faults occur. Possible faults are:

- overvoltage / undervoltage.
- malfunctions of all components, e.g. due to short-circuit or break.
- the heater overheating.
- unsuccessful starts.
- flame failure.
- impermissible exhaust temperature.

### 4.4 Explanation of terms

#### Permanent heater lock-out

The heater can no longer be switched on. The lock can only be released in a workshop. An error message is stored.

- A fault switch-off occurs six times in succession without the maximum heating capacity being reached.
- The heater overheats.



#### NOTE

If the fault is an undervoltage switch-off due to a weak battery, no locking occurs.

#### Fault switch-off

A malfunction will cause the heater to switch off with burnout or prevent the heater from starting. An error message is stored. A restart requires a switch-off signal and a new switch-on signal.

- A malfunction in the power supply or in the control unit results in immediate shutdown of the heater without burnout. No error is entered.



#### NOTE

A fault switch-off with an after-running period occurs at an undervoltage of 11.5 volts for more than 20 seconds (burnout).

A fault switch-off with an after-running period occurs at an undervoltage of 16 volts (measured on the heater) for more than 5 seconds (burnout).

The specified overvoltage or undervoltage depends on the software and is measured at the control unit input.

**NOTE**

If the heater is switched off and locked, there is no display on the control element. The heater can be started once there is no longer a fault. During a heater lock-out, the heater is locked and can no longer be switched on.

**damage**

A malfunction does not affect the current combustion mode. If a malfunction occurs, the heater automatically tries to start again. An error message is stored.

**Cancelling the fault lock-out**

The cause of the malfunction has been eliminated. The fault lock-out is cancelled by switching the heater off and on again.

**NOTE**

A permanent heater lock-out / overheating lock-out can only be rectified with WTT. Read out and print out the heater faults stored in the fault code memory with WTT. The heater lock-out can be removed without deleting the fault code memory using the "Delete heater interlock" menu command.

**4.5 Procedure in the case of fault, malfunction and lock-out**

**NOTE**

- ▶ Always determine the cause of the lock-out first before rectifying the lock-out. The control unit recognises faults in the heater as malfunctions. Troubleshooting may be initiated depending on the type and severity of the malfunction.

Faults with the heater are detected by the control unit as a malfunction and a fault after-run. Afterwards, the heater remains in the fault lock-out. A fault code is output after detecting a malfunction during the fault switch-off.

The fault code is shown on the control element either by flashing or by a letter combination on the display (depending on the type of control element).

The fault code assists the workshop or Webasto Technical Service in determining the fault.

The heater lock-out can be reset:

- via the WTT.
- by switching the heater on at the control element, removing fuse F1 (20 A) within 10 seconds and plugging it in again after 10 seconds.

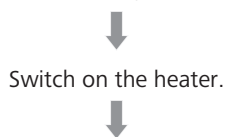
**NOTE**

In exceptional cases, the heater lock-out can be cancelled by disconnecting the power supply to the control unit. The malfunction must be rectified in advance.

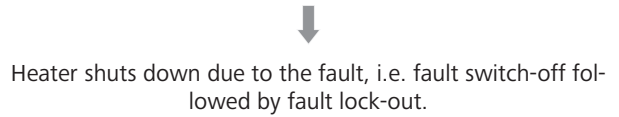
**4.6 Deleting fault code**

**4.6.1 Deleting a fault code with WTT**

Connect diagnostic cable to the heater diagnostic plug (next to fuses).



There is a fault and it is detected by the control unit as a relevant malfunction.



**NOTE**

Print out or note the fault code memory.

Rectify the fault.

Clear fault code memory with the command Clear fault code memory or Heater lock-out in the Fault code memory menu.

Switch on the heater.

Fault lock-out unlocked.

**NOTE**

Certain faults add to the fault count in the fault code memory. The heater assumes heater lock-out mode when the number of faults in the fault code memory exceeds a limit value. The maximum number of fault in the fault code memory and the limit value of the fault code memory is defined by the software.



## 4.6.2 Deleting a fault code without WTT

Switching on the heater (via control element).



There is a fault and it is detected by the control unit as a relevant malfunction.



Heater shuts down due to the fault, i.e. fault switch-off followed by fault lock-out. The fault code is shown on the control element.



Determine the cause of the fault  
(e.g. with or without fault code output,  
visual inspection of fuses and connectors, ...)



Switch off heater.



Rectify the fault.



Switch on the heater.



Fault lock-out unlocked.

## 4.7 Reset heater lock-out

### 4.7.1 Heater unlocking without WTT

- ▶ Remove the fuse for at least 10 seconds within 10 seconds after switching on.
- ▶ Switching on the heater (via control element).



#### NOTE

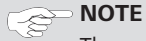
When on-board power supply is applied, never disconnect the connector from the heater.

- ▶ Reinsert the fuse.
- ▶ Switching off the heater (via control element).

### 4.7.2 Heater unlocking with WTT

See chapter 4.6.1, "Deleting a fault code with WTT" on page 8.

## 4.8 Fault codes (fault codes, flash codes)



### NOTE

The control element can be connected via W-bus or analogue (see wiring diagrams):

- W-Bus connection: the HEX fault codes (Hxx) are shown in the display
- Analogue connection: the analogue (Fxx) fault codes are shown in the display

A \* after the value in the "fault code (analogue)" column means:

- ✓ The control element switch has an analogue connection.
- ▶ When the indicator lamp flashes, count the long flash pulses after the 5 short flash pulses.

Fault code (analogue)	Fault code (HEX)	Error message	Possible causes	Recommended action in workshop
F00 or 0*	H01 H11 H3F H81 H87 H23 H26 HA6	No component fault	Fuses Electrical wiring Heater lock-out Control unit defective / incompatible	▶ Check fuses F1, F2 ▶ Check battery connections: + at 12 / - at 9 / + at 3 (switch-on signal), connector X8 ▶ Check control element: check contacts of W-bus cable (yellow) ▶ Delete heater lock-out ▶ Replace control unit
F01 or 1*	H4E H39 H02 H82	No start	Fuel system Combustion air / exhaust line Burner unit	▶ Check fuel level ▶ Check fuel filter ▶ Check tank extracting device and fuel line for leaks ▶ Bleed fuel system ▶ Check combustion air/exhaust line for foreign objects and clean if necessary ▶ Clean burner unit or replace if necessary ▶ Check glow plug
F02 or 2*	H2F H83	Flame failure	Fuel system Burner unit	▶ Check fuel level ▶ Check fuel filter ▶ Check tank extracting device and fuel line for leaks ▶ Bleed fuel system ▶ Clean burner unit or replace if necessary
F03 or 3*	H04 H4C H84	Supply voltage too high	Power supply	▶ Check battery ▶ Check electrical connections
F04 or 4*	H05	Flame was detected prior to combustion	The combustion chamber sensor detected a flame before combustion started	▶ Check for fault in air intake and exhaust systems ▶ Check for fault in the fuel system ▶ Check the electrical components of the glow plug
F06 or 6*	H14 H94	Temperature sensor	Wiring Temperature sensor defective	▶ Check wiring for damage, break and short-circuit ▶ Resistance check ▶ Check the operation of temperature sensor and replace if necessary
F07 or 7*	H08 H88	Fuel pump	Wiring	▶ Check wiring for damage, break and short-circuit

Fault code (analogue)	Fault code (HEX)	Error message	Possible causes	Recommended action in workshop
			Fuel pump DP42 faulty	► Replace fuel pump DP42
F08 or 8*	H89 H2D H15	Combustion air fan	Combustion air fan blocking guard	► Check the operation of the combustion air fan and change the combustion air blower if necessary
			Combustion air fan defective	► Replace combustion air fan
F09 or 9*	H19 H99 H40 H22 FOA	The glow/ignition-element power circuit is defective	Wiring	► Check wiring for damage, break and short-circuit
			Glow plug defective	► Check the operation of glow plug and replace if necessary
F10 or 10*	H37 H86 H06 H58	Heater overheats	Heater overheats	► Check coolant level, bleed coolant circuit
				► Check operation of coolant pump
			Overheating protection defective	► Check wiring for damage, break and short-circuit
				► Check operation of overheating protection, replacing if necessary
F11 or 11*	H0B H8B HA9 HC0 HC1 HC2 HC3 HC4	Coolant pump short circuit	Wiring	► Check wiring for damage, break and short-circuit
		Interruption	U4847 Econ coolant pump defective	► Replace coolant pump
F13 or 13*	H13 H30	Vehicle fan power circuit short circuit	Wiring	► Check wiring for damage, break and short-circuit
			Vehicle blower relay	► Check wiring for damage, break and short-circuit
				► Check the operation of vehicle fan relay and replace if necessary
F14 or 14*	H1B HAB	Overheat sensor short circuit	Wiring	► Check wiring for damage, break and short-circuit
		Interruption	Overheating sensor defective	► Check the operation of overheating sensor and replace if necessary
F15 or 15*	H2E	The glow/ignition element circuit is defective	Wiring	► Check glow plug wiring for damage, break and short-circuit
			Glow plug defective	► Check the operation of glow plug and replace if necessary
F16 or 16*	H4F	Exhaust gas temperature too high	Exhaust gas temperature sensor defective	► Check wiring for damage, break and short-circuit
				► Check operation of exhaust gas temperature sensor, replacing if necessary
			Heater fouled	Check burner ► Visual inspection with cleaning, replace burner if necessary ► Visual inspection with cleaning and replace the burner if necessary

Fault code (analogue)	Fault code (HEX)	Error message	Possible causes	Recommended action in workshop
				▶ Visual inspection with cleaning of inner heat exchanger surface (replace the heat exchanger if necessary)
F17 or 17*	H4D H31	Exhaust gas temperature sensor break or short circuit	Wiring	▶ Check wiring for damage, break and short-circuit
			Exhaust gas temperature sensor defective	▶ Check operation of exhaust gas temperature sensor and replace it if necessary

#### 4.9 Fault codes entered in the error memory (Webasto Thermo Test)

Fault code (HEX)	Fault code (DEC)	WTT error message	Double-click to view error details in WTT	Recommended action in workshop
00	-	No error	No error	No action required
01	1	Control unit fault	Control unit is defective, faulty EOL programming or water temperature sensor is defective	▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater, restart heater
02	2	No start	No flame formed even after repeated start attempt	<ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
04	4	Supply Voltage too high	The operating voltage was higher than the maximum permissible value for too long	▶ Check the on-board power supply voltage
05	5	Flame was detected prior to combustion	The combustion chamber sensor detected a flame before combustion started	<ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
06	6	Heater overheats	Overheating lock-out has tripped (heater overheated)	<ul style="list-style-type: none"> <li>▶ Check the vehicle coolant circuit</li> <li>▶ Check coolant pump</li> <li>▶ Check the electrical components of the temperature sensors</li> <li>▶ Check the heater for visible damage and leaks, then check coolant circuit for leaks. Then start the heater again.</li> </ul>
08	8	Fuel pump short circuit	There is a short circuit to earth in the electrical circuit of the fuel pump	▶ Check the electrical components of the fuel system
0P	11	Coolant pump short circuit	The coolant pump has a short circuit to earth or the motor is overloaded	▶ Check the electrical components of the coolant system
10	16	Coolant switching valve short circuit	The coolant switching valve has a short circuit to earth	▶ Check the electrical components of the coolant switching valve
11	17	Incorrectly coded control unit	Incorrectly coded control unit or wrong heater (for fuel type) installed	<p>This fault can only occur in vehicles with a CAN bus or LIN bus connection to the heater:</p> <ul style="list-style-type: none"> <li>▶ Check the heater type plate against the vehicle fuel type</li> <li>▶ Proceed according to vehicle manufacturer's specifications</li> </ul>

Fault code (HEX)	Fault code (DEC)	WTT error message	Double-click to view error details in WTT	Recommended action in workshop
12	18	W-bus communication failure	Bus fault, protocol error	Operation remains unchanged when fault occurs. Error occurs several times (> 10) and there are malfunctions during heater operation: <ul style="list-style-type: none"> <li>▶ Fault in area of W-bus communication / check Telestart receiver</li> <li>▶ Replace the control unit (combustion air fan unit) or heater</li> </ul>
13	19	Check the electrical components of the coolant switching valve	There is a short circuit to earth in the vehicle fan circuit	▶ Check for fault in the vehicle fan area
14	20	Temperature sensor short circuit	There is a short circuit to earth in the temperature sensor	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check the resistance, check the operation of temperature sensor and replace if necessary</li> </ul>
15	21	Burner motor blocking guard	Burner motor blocking guard has tripped	<ul style="list-style-type: none"> <li>▶ Check for fault in the combustion air fan</li> <li>▶ Check for fault in the intake air system (foreign objects)</li> </ul>
19	25	The glow/ignition-element power circuit short circuit	The glow/ignition-element power circuit short circuit	▶ Check the electrical components of the glow plug
1P	27	Overheat sensor short circuit	There is a short circuit to earth on the switched line of the element	▶ Check the electrical components of the temperature sensors
22	34	Glow plug reference resistance not reached at start	The glow plug has not reached the required reference resistance or the temperature at start	<ul style="list-style-type: none"> <li>▶ Check glow plug wiring for damage, break and short-circuit</li> <li>▶ Check the operation of glow plug and replace if necessary</li> </ul>
23	35	Crash lock enabled	The crash lock was enabled	▶ Replace heater in case of crash and completely check the installation
26	38	PCB temperature sensor short circuit	There is a short circuit to earth in the PCB temperature sensor	▶ Replace control unit
2D	45	The electrical circuit of the combustion air fan is defective	The fan motor speed is below the expected value	▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater
2E	46	The glow/ignition-element power circuit is defective	The glow plug resistance is outside the valid value range	<p>If it occurs several times (&gt;3):</p> <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
2F	47	Flame abort	The flame goes out during operation. Another start attempt is made.	<p>Error occurs several times (&gt; 10):</p> <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
30	48	Vehicle fan break or short circuit	Vehicle fan break or short circuit to +Ub	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check the operation of vehicle fan relay and replace if necessary</li> </ul>
31	49	Exhaust gas temperature sensor break or short circuit	Exhaust gas temperature sensor break or short circuit to +Ub	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check operation of exhaust gas temperature sensor and replace it if necessary</li> </ul>
37	55	Water temperature too high during initial start-up	No additional information available	This fault can only occur during the initial start-up of the heater (at the vehicle manufacturer):

Fault code (HEX)	Fault code (DEC)	WTT error message	Double-click to view error details in WTT	Recommended action in workshop
				<ul style="list-style-type: none"> <li>▶ Allow the coolant system to cool. -Try initial start-up again</li> <li>▶ Check the electrical components of the temperature sensors</li> </ul>
38	56	The first start attempt failed	No additional information available	Error occurs several times (> 10): <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
39	57	The first start attempt failed – no restart	No additional information available	Error occurs several times (> 3): <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
3A	58	W-bus / LIN-bus short circuit to earth	No additional information available	<ul style="list-style-type: none"> <li>▶ Check for fault in area of W-bus communication</li> </ul>
3C	60	Internal control unit fault 60	No additional information available	<ul style="list-style-type: none"> <li>▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater</li> </ul>
3D	61	Internal control unit fault 61	No additional information available	<ul style="list-style-type: none"> <li>▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater</li> </ul>
3E	62	Internal control unit fault 62	No additional information available	<ul style="list-style-type: none"> <li>▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater</li> </ul>
3f	63	Incorrect data set version loaded	No additional information available	<ul style="list-style-type: none"> <li>▶ Delete the fault, lock-out release/engage heater lock-out on heater, restart heater</li> </ul>
40	64	Glow plug / ignition spark generator – coiled filament broken	One of the heating circuits of the glow plug / ignition spark generator is interrupted	<ul style="list-style-type: none"> <li>▶ Check glow plug</li> <li>▶ Replace the control unit (combustion air fan unit or heater)</li> </ul>
4C	76	Component protection overvoltage	Switch-off function in case of extremely high overvoltage for component protection	<ul style="list-style-type: none"> <li>▶ Check the on-board power supply voltage</li> </ul>
4D	77	Exhaust gas temperature sensor short circuit	Exhaust gas temperature sensor short circuit to earth	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check operation of exhaust gas temperature sensor and replace it if necessary</li> </ul>
4E	78	Timer DP_max exceeded	No additional information available	Error occurs several times (> 3): <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
4F	79	Exhaust gas temperature too high	The exhaust gas temperature has exceeded the upper limit value	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check operation of exhaust gas temperature sensor and replace it if necessary</li> <li>▶ Burner inspection:               <ul style="list-style-type: none"> <li>• Visual inspection with cleaning and replace the burner unit if necessary,</li> <li>• Visual inspection with cleaning and replace the burner head if necessary</li> <li>• Visual inspection with cleaning of inner heat exchanger surface (replace the heat exchanger if necessary)</li> </ul> </li> </ul>

Fault code (HEX)	Fault code (DEC)	WTT error message	Double-click to view error details in WTT	Recommended action in workshop
5P	91	PCB temperature sensor overheating	The temperature in the control unit has exceeded the upper limit value	<ul style="list-style-type: none"> <li>▶ Allow the heater to cool down</li> <li>▶ Check temperature and ventilation of installation space</li> </ul>
81	129	EOL checksum error	The EOL data set in the EEPROM has a checksum error	<ul style="list-style-type: none"> <li>▶ Delete the fault, cancel fault lock-out/engage heater lock-out on heater</li> </ul>
82	130	No start during test-run	No start during test-run	<p>This fault can only occur during the initial start-up of the heater (at the vehicle manufacturer):</p> <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
83	131	Flame interruption (FAZ)	The flame has cut out more than FFC (EEPROM) in one heating cycle	<p>Error occurs several times (&gt; 3):</p> <ul style="list-style-type: none"> <li>▶ Check for fault in air intake and exhaust systems</li> <li>▶ Check for fault in the fuel system</li> <li>▶ Check fuel pump</li> <li>▶ Check the electrical components of the glow plug</li> </ul>
84	132	Operating voltage too low	The operating voltage was lower than the minimum permissible value for too long	<ul style="list-style-type: none"> <li>▶ Check the rule of thumb: does the customer use the heating for longer than the duration of his trip?</li> <li>▶ Check the on-board power supply voltage</li> </ul>
86	134	Excessive water temperature without combustion	Error is set if the water temperature has exceeded 145°C during the control pause	<p>Error occurs several times (&gt; 3):</p> <ul style="list-style-type: none"> <li>▶ Check for faults in coolant system and bleed system</li> <li>▶ Check temperature sensors</li> <li>▶ Switch heater</li> </ul>
87	135	Permanent heater lock-out	The permanent heater lock-out was activated	<ul style="list-style-type: none"> <li>▶ Reset heater lock-out - attempt restart</li> <li>▶ Read out further fault messages and work through recommended course of action</li> </ul>
88	136	Fuel pump interruption	There is a break or short circuit to +Ub in the electrical circuit of the fuel pump	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the fuel system</li> </ul>
89	137	Combustion air fan interruption	There is a break or short circuit to +Ub in the electrical circuit of the combustion air fan	<ul style="list-style-type: none"> <li>▶ Check for fault in the combustion air fan</li> </ul>
8P	139	Coolant pump interruption	There is a break or short circuit to +Ub in the coolant pump	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the coolant system</li> </ul>
90	144	Coolant switching valve break	There is a break or short circuit to +Ub in the coolant switching valve circuit	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the coolant switching valve</li> </ul>
92	146	Maintaining command failed	Maintaining command failed. No operation when fault occurs or fault switch-off	<ul style="list-style-type: none"> <li>▶ Check for fault in area of W-bus communication</li> </ul>
94	148	Temperature sensor interruption	There is a break or short circuit to +Ub in the temperature sensor	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the temperature sensors</li> </ul>
99	153	Glow plug / ignition spark generator interruption	There is a break or short circuit to +Ub in the glow plug/ignition spark generator	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the glow plug</li> </ul>

Fault code (HEX)	Fault code (DEC)	WTT error message	Double-click to view error details in WTT	Recommended action in workshop
9C	156	Intelligent undervoltage switch-off	The available heating time of the intelligent undervoltage switch-off is expired	<ul style="list-style-type: none"> <li>▶ Check the rule of thumb: does the customer use the heating for longer than the duration of his trip?</li> <li>▶ Check the on-board power supply voltage</li> </ul>
A6	166	PCB temperature sensor interruption or short circuit to +Ub	There is an interruption or a short circuit to +Ub in the PCB temperature sensor	<ul style="list-style-type: none"> <li>▶ Replace control unit</li> </ul>
A9	169	Insufficient coolant flow rate	The fault occurs if the coolant temperature during the start / GPR (glow plug ramp) / FMM (flame monitor measuring phase) phases exceeds the switching threshold for burnout in the control pause	<ul style="list-style-type: none"> <li>▶ Check the vehicle coolant circuit</li> <li>▶ Check coolant pump</li> <li>▶ Check the electrical components of the temperature sensors</li> <li>▶ Check the heater for visible damage and leaks, then check coolant circuit for leaks. Then start the heater again.</li> </ul>
AA	170	Transmission on W-bus failed	Transmission on W-bus failed (no or disturbed response even after the telegram has been repeated four times)	<ul style="list-style-type: none"> <li>▶ Check for fault in area of W-bus communication</li> </ul>
AB	171	Overheat sensor interruption	There is a break or short circuit to +Ub in the electrical circuit of the overheating sensor	<ul style="list-style-type: none"> <li>▶ Check the electrical components of the temperature sensors</li> </ul>
AC	172	Pressure sensor interruption	There is a break or short circuit to +Ub in the pressure sensor	<ul style="list-style-type: none"> <li>▶ Replace control unit</li> </ul>
C0	192	Coolant pump: Lifebeat signal is missing or implausible	No additional information available	<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check operation of coolant pump and replace if necessary</li> <li>▶ Check the coolant pump type</li> </ul>
C1	193	Coolant pump: dry run	No additional information available	<ul style="list-style-type: none"> <li>▶ Check coolant level</li> </ul>
C2	194	Coolant pump: Blocking or overcurrent shutdown		<ul style="list-style-type: none"> <li>▶ Check coolant flow</li> <li>▶ Bleed coolant pump. Rectify possible cause</li> </ul>
C3	195	Coolant pump: excess temperature shutdown		<ul style="list-style-type: none"> <li>▶ Check anti-freeze in the coolant, change coolant if necessary</li> </ul>
C4	196	Coolant pump: RPM too low		<ul style="list-style-type: none"> <li>▶ Check wiring for damage, break and short-circuit</li> <li>▶ Check operation of coolant pump and replace if necessary</li> </ul>



## 4.10 Fault or fault entry in the control unit



### NOTE

Read out the fault code memory with WTT before every repair on the heater. Print existing errors before deleting them and make them available to the Webasto hotline or warranty department.

At low temperatures and when there is no wind, smoke and/or odours may be observed for a short time during start and/or burnout.

Mist is a normal occurrence when the exhaust system has not been thoroughly heated or in unfavourable weather conditions and cannot be avoided.

Fumes: are discharged directly from the exhaust end section.

Mist: is only visible a few centimetres after the exhaust end tube.



### NOTE

The overview only covers some of the possible faults. In individual cases, please contact the Webasto service hotline.

Fault description	Possible fault point (see chapter 4.11, "Functional test of the heater and its components" on page 18)
Heater does not respond:	1, 2, 3, 4, 14
Heater does not heat	5, 6, 7, 8, 10, 12
Heater goes out prematurely	1, 5, 7, 10, 12
The heater combustion is not stable	5, 8, 10, 12
Excessive smoke from heater during start-up phase	5, 8, 10, 12
Telestart cannot be taught	1, 3, 4, 14
Heater is running, vehicle passenger compartment is cold	7, 9, 11, 13, 16
Excessive smoke from heater during heating phase / white smoke	5, 7, 8, 10, 12
Excessive smoke from heater during after-running period	5, 10, 12
Smell of fuel	5, 6, 7, 8, 10, 12
Smell of exhaust gas in the passenger compartment	5, 6, 7, 8, 10, 12
Coolant loss	9, 11

## 4.11 Functional test of the heater and its components

Fault point	Component	Recommended action in workshop	Parameters
1	Power supply	<ul style="list-style-type: none"> <li>▶ Measure supply voltage under load at heater connector X2</li> </ul>	Undervoltage switch-off < 11.5 V
2	Clock	<ul style="list-style-type: none"> <li>▶ Press the flame button, the display illumination must light up.</li> <li>▶ Check the W-bus signal at pin 2 at heater connector X1 or diagnostic connector with an LED lamp against "+".</li> </ul>	LED flickers when the button is pressed.
3	Receiver (Telestart 91 and T100 HTM)	<ul style="list-style-type: none"> <li>▶ Check the W-Bus signal at the 6-pin plug on the receiver pin 2 with an LED lamp against pin 1 "+".</li> </ul>	LED flickers when the ON button is pressed.
4	Transmitter (Telestart)	<ul style="list-style-type: none"> <li>▶ Assign / teach transmitter to receiver according to instructions.</li> <li>▶ Check operating mode on the Telestart handheld transmitter (heating / ventilation).</li> <li>▶ Check the battery of the handheld transmitter for sufficient capacity and replace it if necessary.</li> </ul>	
5	Fuel pump	<ul style="list-style-type: none"> <li>▶ Check passage of connector X1 pin 6 to connector X7 (blue wire).</li> <li>▶ Check passage of connector X7 (brown wire) against earth.</li> <li>▶ Measure the coil resistance of the fuel pump DP42.</li> <li>▶ Measure the delivery rate with WTT.</li> <li>▶ Check connection of the fuel line to the connection piece in accordance with the general installation instructions.</li> </ul>	<p>For resistance values, see chapter 6.4, "DP42 fuel pump" on page 21</p> <p>Diesel delivery rate: 7 Hz, 60 s: 12.0 to 14.6 ml.</p>
6	Glow plug	<ul style="list-style-type: none"> <li>▶ Measure glow plug resistance at glow plug connector X5 (white line).</li> </ul>	chapter 7.6.1, "Glow plug / check the electrical components of the flame monitor" on page 25
7	Sensors	<ul style="list-style-type: none"> <li>▶ Coolant temperature sensor: check cold resistance at connector X3 (pin 2 and 4).</li> <li>▶ Overheating sensor: check cold resistance at connector X3 (pin 1 and 3).</li> <li>▶ Exhaust gas temperature sensor: check cold resistance at connector X6 (pin 1 and 2).</li> </ul>	For resistance values, see chapter 7.9.1, "Inspection of the sensors" on page 28
8	Combustion air fan	<ul style="list-style-type: none"> <li>▶ Check the operation of the fan motor with WTT "Component test": There should not be any scraping noises.</li> <li>▶ Check the CO<sub>2</sub> setting.</li> </ul>	
9	Coolant pump	<ul style="list-style-type: none"> <li>▶ Check the operation of the coolant pump with WTT "component test".</li> <li>▶ Measure the resistance at coolant pump connector X4.</li> <li>▶ Check the pump for leaks.</li> <li>▶ Check self-bleeding installation position, see chapter 6.3, "Coolant pump U4847 Econ" on page 21 or general installation instructions.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Touch with your hand: the pump is operating if slight vibration can be felt.</li> </ul> <p>10 ± 1 kOhms</p>
10	Fuel connection	<p>Are bubbles visible in the fuel line / are bubbles pumped during the flow rate test (see point 5)? If yes, then:</p> <ul style="list-style-type: none"> <li>▶ Change the integration or routing of the line.</li> <li>▶ Check integration in the vehicle's fuel system.</li> <li>▶ Check fuel level (no reserve), check the fuel withdrawal.</li> <li>▶ Check fuel lines for leaks, kinks or blockages.</li> </ul>	
11	Coolant circuit	<ul style="list-style-type: none"> <li>▶ Check integration into the coolant circuit of the vehicle in accordance with the general/vehicle-specific installation instructions.</li> <li>▶ Check whether the coolant circuit needs to be bled.</li> <li>▶ Check circulation in coolant circuit.</li> <li>▶ Remove kinks and chafing points.</li> </ul>	

Fault point	Component	Recommended action in workshop	Parameters
		<ul style="list-style-type: none"> <li>▶ Check heater for leaks: water connection, coolant pump and hoses.</li> <li>▶ Check coolant mixture ratio.</li> </ul>	e.g. down to -40°C
12	Exhaust system and intake air system	<ul style="list-style-type: none"> <li>▶ Check the installation of the intake pipe and exhaust pipe according to the general/vehicle-specific installation instructions.</li> <li>▶ Check lines for insulation/blockages.</li> <li>▶ Check intake pipe and exhaust pipe for leaks (no CO<sub>2</sub> in intake air).</li> <li>▶ Check the distance from the interior fresh air intake to the vehicle</li> </ul>	
13	Vehicle blower	<ul style="list-style-type: none"> <li>▶ Check switching signal at relay K1, Pin 86 (see wiring diagram in general/vehicle-specific installation instructions).</li> <li>▶ Check coolant temperature (K1 switches at approx. 40°C -55°C, depending on the software).</li> <li>▶ Check the flap position of the vehicle heating system (settings on the A/C control panel according to installation instructions).</li> </ul>	
14	Control unit / heater locked	<ul style="list-style-type: none"> <li>▶ Release lock</li> </ul>	See chapter 4.7, "Reset heater lock-out" on page 9
15	Control unit (fault code memory)	<ul style="list-style-type: none"> <li>▶ Read out fault code memory with WTT, print and then delete fault code memory.</li> <li>▶ When sending the heater to Webasto, make sure to include the printed error log.</li> <li>▶ Replace the fan unit if the control unit is defective.</li> </ul>	
16	Coolant switching valve	<ul style="list-style-type: none"> <li>▶ Check passage of connector X1 pin 4 to connector X15.</li> <li>▶ Check passage of connector X15 (brown wire) against earth.</li> <li>▶ Connect 12 V voltage to connector X1 pin 4.</li> </ul>	The valve can be heard switching
17	Burner unit / heat exchanger	<ul style="list-style-type: none"> <li>▶ Disassembly and visual inspection of burner unit, combustion tube, heat exchanger and exhaust gas temperature sensor.</li> </ul>	chapter 5.2, "Exhaust gas temperature sensor" on page 20

## 5 Function checks

### 5.1 Function check in the vehicle

**NOTE**  
 The heating effect is dependent on multiple factors: The outside temperature, type of vehicle, engine temperature, type of integration in the vehicle's cooling system, quantity of coolant to be heated and the time since start-up must be taken into account for the assessment. The coolant temperature determined by the heater and the coolant or engine temperature displayed by the vehicle may differ significantly as the corresponding sensors are fitted in different positions and may evaluate different temperatures.

- ✓ The coolant circuit and the fuel system are bled in accordance with the vehicle manufacturer's instructions.
- ▶ Set vehicle fan to level 1 - 2 or to the level recommended in the vehicle-specific operating instructions.
- ▶ Switch the heater on via the control element. The coolant pump and combustion air fan start up when the heater is switched on. Check that they can be heard. The heater switches on the vehicle fan when the coolant reaches a temperature of 40°C to 55°C (heater-specific) After max. 240 seconds, the exhaust can be heard flowing out of the exhaust silencer or connection socket.
- ▶ Run the heater in combustion mode. Check heating effect on the outflow nozzles of the vehicle blower.
- ▶ Switch the heater off again with the control element.

The after-running period lasts a maximum of 175 seconds after switching off. This is audible due to the reduction in the combustion noise, continued operation of the combustion air fan unit with an increase in speed after approx. 60 seconds, for active cooling of the heater and operation of the coolant pump. It is then shut down completely.

### 5.2 Exhaust gas temperature sensor

**NOTE**  
 If cable damage is present: Precautions should be taken to protect the cable of the exhaust gas temperature sensor, e.g. fitting suitable cover.

If the exhaust gas temperature sensor suffers external mechanical damage, this component can be replaced without the need for additional work.

Additional work (visual inspections) is required if:

- An obvious thermal defect is visible.
- There is an error message (no identifiable mechanical defect).
- ▶ Carry out the visual inspection of the:
  - Burner.
  - Exhaust pipes.
  - Combustion tube.
  - Heat exchanging ribs (inner surface).
  - Pay attention to soot deposition, fuel residue as well as carbonisation. Clean all affected parts.

If the burner has soot deposits, fuel residue and/or carbonisation, check the burner. The burner must not be deformed. There must be no visible cracks (e.g. welded seam damaged). Replace the burner if necessary.

## 6 Servicing

This section describes the servicing jobs that can be carried out on the heater and its components when installed.

### 6.1 Checks

- ▶ To maintain the operational reliability of the heater, perform the following service tasks operations every 2 years:
  1. Read out fault code memory.
  2. Check the electrical connections for contact corrosion and firm seating.
  3. Check electrical wiring for damage.
  4. Check exhaust gas and combustion air line for damage and ensure that they are clear.
  5. Check fuel line for leaks.
  6. Check hoses for cracks.
  7. Check heater operation.

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

**NOTE**  
 After repairing the heater and replacing the fuel pump, check the CO<sub>2</sub> setting.

**NOTE**  
 After changing the fan unit or the control unit, check the CO<sub>2</sub> value and reset it if necessary.

**NOTE**  
 Measure and set the CO<sub>2</sub> at the highest heat capacity level (full load / 100% heat capacity = display in WTT: "full load" or "Continuous Coolant Temperature Control").  
 The CO<sub>2</sub> value can be corrected in selection point 2.7.1. CO<sub>2</sub> calibration of the WTT.  
 Measure the CO<sub>2</sub> content approx. 20 mm in front of the exhaust outlet inside the exhaust pipe with a CO<sub>2</sub> tester (e.g. from MSI).

Adjust the CO<sub>2</sub> setting with WTT and the CO<sub>2</sub> tester prescribed by Webasto.

Commercially available AU multi-gas exhaust gas testers must not be used for adjusting the CO<sub>2</sub> level of the heater.

The heater is set in the factory with a CO<sub>2</sub> value for ideal operation at heights between 0 and 1000 m above sea level. Continuous operation at more than 1000 m above sea level may lead to a high level of production of smoke and soot. To prevent the device from failing and being put at risk, the CO<sub>2</sub> value should be adjusted in consultation with Webasto.

The following table shows the rated CO<sub>2</sub> setting at the highest capacity level in accordance with the geodetic height at which the setting is carried out.

Height [m above sea level]	Rated CO <sub>2</sub> setting at 20°C Ambient temperature [vol.-%] 5 kW
0	9.5
500	10.1
1000	10.7

### 6.3 Coolant pump U4847 Econ

**NOTE**  
The coolant pump must not be used again if it has been dropped or knocked over.

Power consumption is approx. 12 W with a rated volume flow of 450 l/hr.

#### Installation positions of coolant pump U4847 Econ

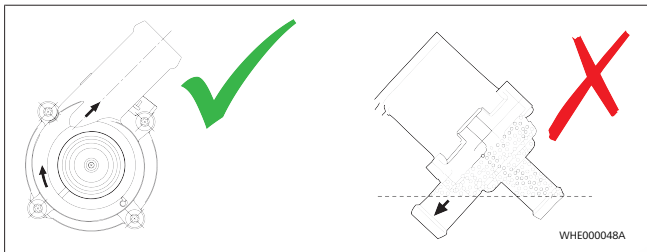


Fig. 10

- ✓ Ensure the correct direction of flow of the coolant pump to the vehicle coolant circuit.
- ▶ The installation position of the coolant pump must be selected such that the coolant pump can perform automatic bleeding.

#### Electrical test of the coolant pump

Internal resistance of the coolant pump: 10 ±1 kOhm.

### 6.4 DP42 fuel pump

#### Installation positions of fuel pump DP42

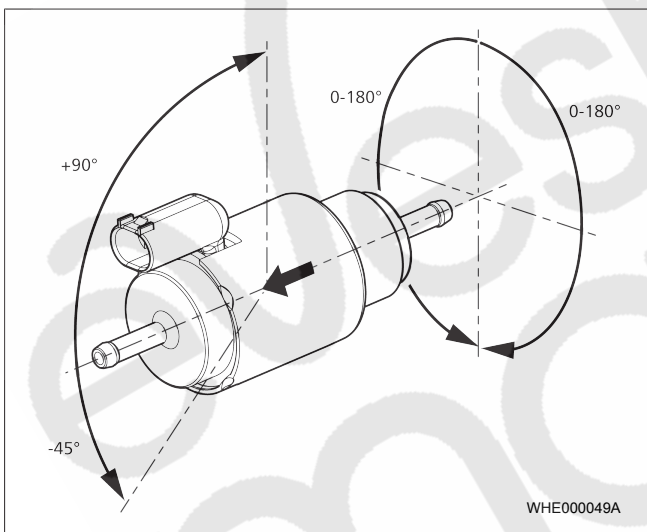


Fig. 11

Check of the installation positions and installation conditions of the fuel pump are in accordance with the general Installation Instructions for the Thermo Top Evo.

#### Electrical test of the fuel pump

Coil resistance of the fuel pump DP42:  
5.20 Ohm ±0.5% at 20 ±2°C.

#### Fuel pump component test

Perform the function "**Component test of fuel pump**" using the WTT.

Setting	7 Hz / 60 secs	7 Hz / 180 secs
Diesel	12.0 to 14.6 ml	36.2 to 44.3 ml

### 6.5 Removing and installing heater

#### Removal

**CAUTION**  
**Risk of injury from flying sparks**  
▶ Do not work on the device while it is live.

- ▶ Disconnect the heater power supply from the vehicle battery.
- ▶ Detach electric plug connections on heater.

**NOTE**  
Protect all open plugs and connectors from moisture and dirt.

- ▶ Depressurise coolant system.
- ▶ Release hose clips and detach the coolant hoses from the water connection pieces on the heater. Prevent coolant from dripping out of the coolant hoses.
- ▶ Release and detach combustion air line and exhaust pipe at heater.
- ▶ Loosen the hose clips on the fuel line and pull them off. Close off fuel connection piece at heater and fuel line with suitable plugs or similar.
- ▶ Detach heater from the bracket, if necessary remove bracket from the chassis.

#### Installation

- ▶ Place heater on the bracket in the specified installation position.
- ▶ Carefully manually insert the heater screws into the existing thread and screw them in.
- ▶ Tighten the heater screws with 8 Nm.
- ▶ Attach the fuel line and secure it with hose clips.
- ▶ Connect coolant hoses and secure with hose clips.

**CAUTION**  
**Damage to the control unit due to reversed polarity**  
▶ Ensure correct polarity of the connection wires. Direct connection to the power supply without an intermediate fuse is not permitted.

- ▶ Reestablish all electrical connections.
- ▶ Connect combustion air line and exhaust pipe.
- ▶ Connect vehicle battery.
- ▶ Bleed coolant circuit.
- ▶ Bleed fuel system of vehicle if necessary.

### 6.6 Restarting

**CAUTION**  
**Risk of coolant circuit overheating**  
▶ When bleeding, observe the vehicle manufacturer's instructions.

After installing the heater:

- ✓ The coolant temperature should be < 30°C before the heater is put into operation. Otherwise, the heater may not operate in combustion mode.
- ▶ Carefully bleed the coolant circuit and the fuel supply system.
- ▶ Start the test run.
- ▶ During a heater test run, check all coolant and fuel connections for leaks and tightness.

If the heater malfunctions during operation, troubleshoot the unit.

**NOTE**

To assist bleeding of the coolant circuit, the coolant pump can be operated using the "Component test" function in the WTT.

The heater can be put into operation with WTT. When the fuel line is completely empty, fill the line with the WTT.

## 7 Repair

**NOTE**

Do not reuse removed seals.

### 7.1 Required tools

Tool description	Amount
Torx screwdriver Tx25	1
Torque wrench (range covers 5-6 Nm, for Tx25)	1
Installation tester	1
EV simulator with rotary field display	1
Combination pliers	1

## 7.2 Dismantling and assembling the heater

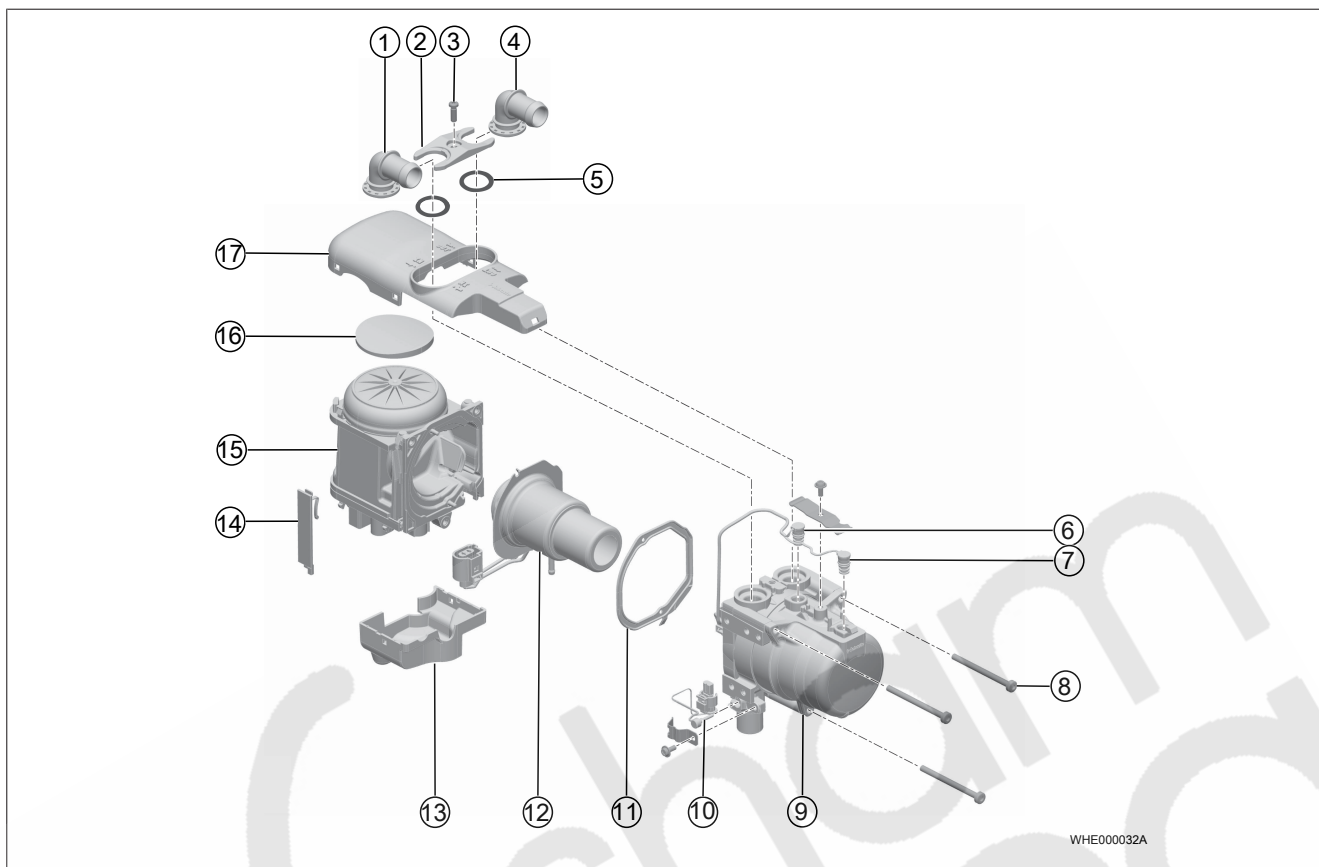
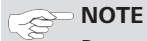


Fig. 12

- |   |                               |   |   |
|---|-------------------------------|---|---|
| ① | Water connection piece inlet  | ⑩ | Exhaust gas temperature sensor            |
| ② | Bracket plate                 | ⑪ | Seal                                      |
| ③ | Bolt                          | ⑫ | Burner unit                               |
| ④ | Water connection piece outlet | ⑬ | Connector cover                           |
| ⑤ | O-ring                        | ⑭ | Cable cover                               |
| ⑥ | Temperature sensor            | ⑮ | Combustion air fan unit with control unit |
| ⑦ | Overheat sensor               | ⑯ | Damping pad                               |
| ⑧ | Bolt                          | ⑰ | Heater cover                              |
| ⑨ | Heat exchanger                |   |   |

### 7.3 Disassemble heater

**NOTE**

Remove / install the temperature sensor / overheating sensor as a combined unit.

**NOTE**

Never remove the temperature sensors for testing. The sealing O-ring of the sensor can get stuck after some period on the housing and as a result obstruct removal.

Do not reuse removed sensors.

For references, see Fig. 12.

- ▶ Loosen Torx T25 screw (item 3).
- ▶ Remove water connection piece (item 1 and 4) with retaining plate (item 2) and O-rings (item 5).
- ▶ Loosen the heater cover (item 17) on the side latches on the combustion air fan unit (item 15) with a screwdriver.
- ▶ Remove the heater cover (item 17) from the front of the heater.
- ▶ Remove the cable cover (item 14) from the combustion air fan unit (item 15).
- ▶ Loosen the lower connector cover (item 13) on the side facing away from the fuel connection piece with a screwdriver on the side latches and remove it from the heater.
- ▶ Loosen the connector assembly of the combustion air fan unit (underside).
- ▶ Pull the connector out of control unit.
- ▶ Undo screws (item 8) and remove heat exchanger (item 9) from the combustion air fan unit (item 15) in axial direction of the screw connection.

Remove the burner unit (item 12): see chapter 7.5, "Burner unit " on page 24.

Replace temperature sensors (item 6, 7): see chapter 7.9.2, "Remove / install the temperature / overheating sensor" on page 28.

Replace the exhaust gas temperature sensor (W7): see chapter 7.9.3, "Install / remove exhaust gas temperature sensor" on page 29.

### 7.4 Assemble heater

For references, see Fig. 12.

- ▶ Install the temperature sensors (item 6, 7): see chapter 7.9.2, "Remove / install the temperature / overheating sensor" on page 28.
- ▶ Install the exhaust gas temperature sensor (item 10), see chapter 7.9.3, "Install / remove exhaust gas temperature sensor" on page 29.
- ▶ Install the burner unit (item 12), see chapter 7.5, "Burner unit " on page 24.
- ▶ Clean the interior and exterior of the heat exchanger (item 9).
- ▶ Mount the heat exchanger (item 9) on the combustion air fan unit (item 15).
- ▶ Tighten screws (3x, item 8) with  $7 \pm 0.7$  Nm.
- ▶ Insert the temperature / overheating sensor cable into the cable duct, see Fig. 23.
- ▶ Position the cable cover (item 17) on the combustion air fan unit (item 15) so that the clips engage correctly.
- ▶ Hook the heater cover (item 17) on the heat exchanger (item 9) into the heater and lock into place in the locking lugs of the combustion air fan unit (item 15).

- ▶ Insert new O-rings (item 5) into the heat exchanger (item 9) (see chapter 7.10, "Water connection piece" on page 29).
- ▶ Fasten the water connection piece (item 4) and the retaining plate (item 2) with the Torx T25 screw (item 3). Tightening torque  $7.5 \pm 0.7$  Nm.

### 7.5 Burner unit

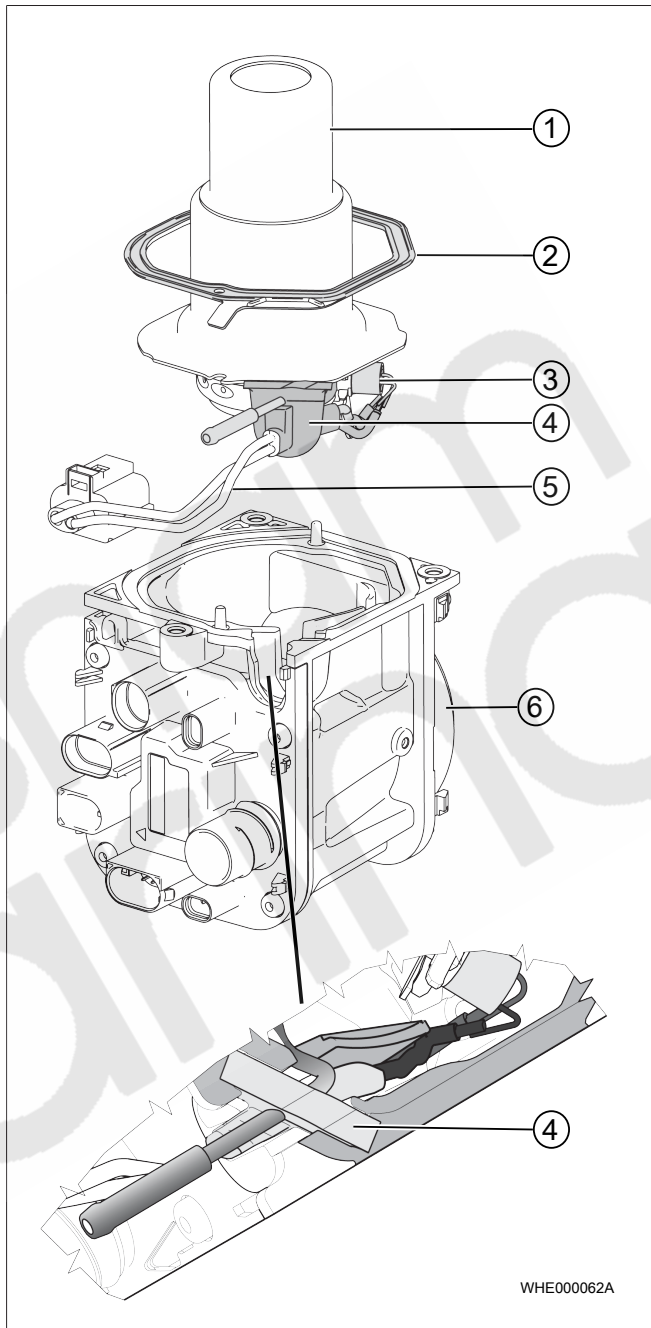


Fig. 13

- |                             |                           |
|-----------------------------|---------------------------|
| ① Burner unit               | ④ Glow plug bush          |
| ② Seal                      | ⑤ Glow plug cable         |
| ③ Glow plug / flame monitor | ⑥ Combustion air fan unit |

#### Remove burner unit

- ✓ Remove the heater as described in chapter 6.5, "Removing and installing heater" on page 21.
- ✓ Set the fan down with the burner unit positioned vertically.
- ▶ Remove the seal (item 2, Fig. 13).



- ▶ Push the glow plug bush (item 4) out of the combustion air fan unit with slight pressure on the fuel pipe and lift up the burner unit vertically.

#### Install burner unit

- ✓ Glow plug cable bush covers the fuel line.
- ✓ The course of the glow plug cable follows the shape of the cutout in the combustion air fan unit.
- ▶ Pre-position burner unit with glow plug cable bush in the combustion air fan unit.
- ▶ Push the glow plug cable bush into the groove provided until it completely fills the installation space (see item 4).
- ▶ Place the seal (item 2) with the flat side facing the combustion air fan unit on the positioning pins of the combustion air fan unit.

Then continue assembling the heat exchanger as described in chapter "6.3 Assemble heater" on page 15.

## 7.6 Glow plug / flame monitor

### 7.6.1 Glow plug / check the electrical components of the flame monitor



#### NOTE

Allow the glow plug to cool before testing the cold resistance.



#### NOTE

In order to measure the cold resistance, bring the glow plug to room temperature.



#### NOTE

Perform the measurement with a multimeter.

Check the cold resistance:

- ✓ Glow plug removed:
- ▶ Connect contacts 1 and 2 of the glow plug connector to a multimeter.
- Cold resistance at  $23 \pm 5^\circ\text{C}$ : 0.235 to 0.355 Ohms.

Check the short-circuit resistance:

- ✓ Glow plug installed.
- ▶ Connect contact 1 of the connector to the fan housing.
- Short-circuit resistance:  $< 0.15$  Ohms.

### 7.6.2 Remove glow plug / flame monitor



#### NOTE

Removal of the glow plug may involve increased use of force and therefore lead to destruction of the glow plug.

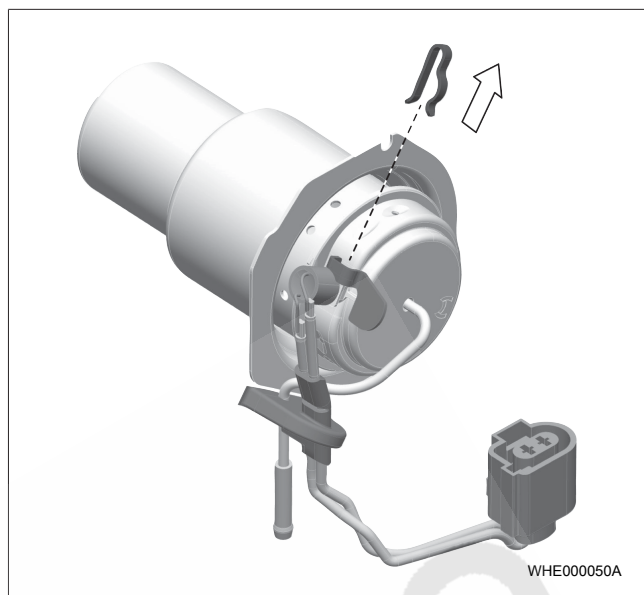


Fig. 14

- ▶ Remove the spring clip.

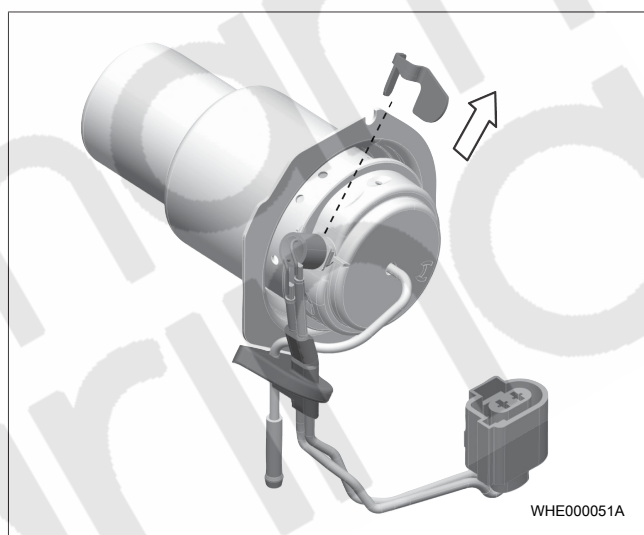


Fig. 15

- ▶ Remove the cooling flag.

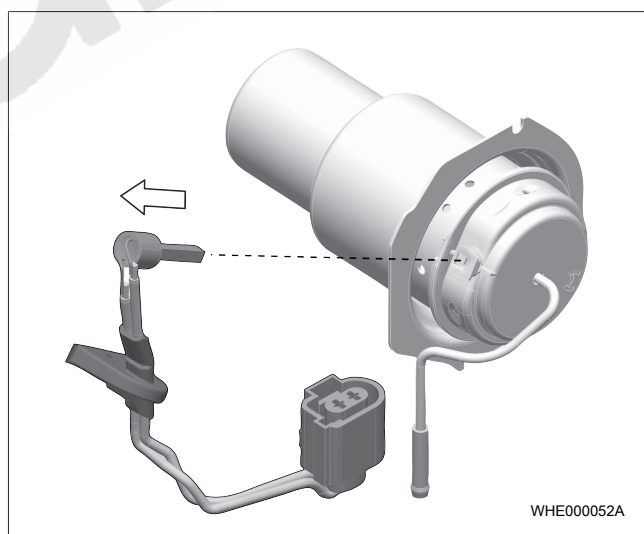


Fig. 16

- ▶ Remove the glow plug.

### 7.6.3 Install glow plug / flame monitor



**NOTE**

Only use a new glow plug.  
 Uninsulated parts of the glow plug cable must not touch each other and must not come into contact with metal parts of the burner unit or of the combustion air housing (risk of short-circuiting).  
 Do not twist or tilt the glow plug during assembly and insert it into the guide as far as possible.  
 When assembling the burner unit, route the cable so that it lies in the cutout of the combustion air fan unit (item 6, Fig. 13).

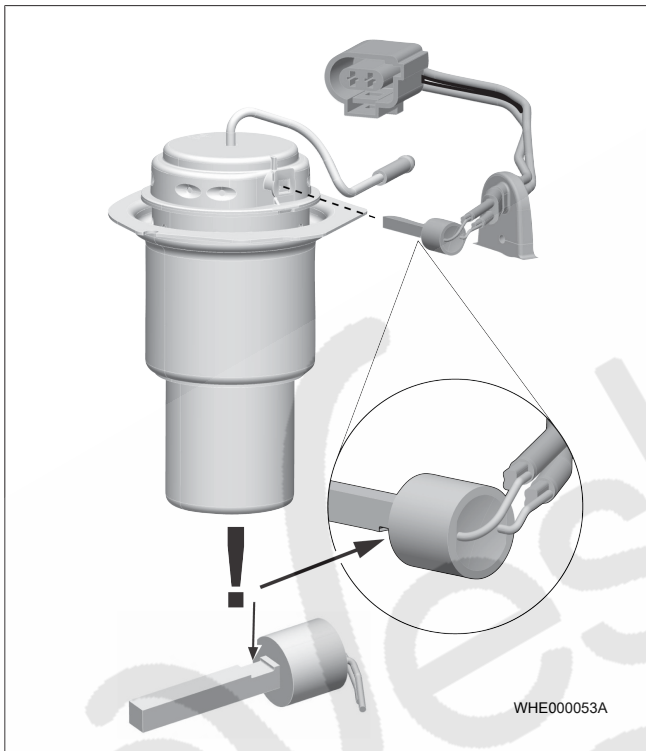


Fig. 17

- ▶ Position combustion pipe horizontally with evaporator holder towards the rear.
- ▶ Push the glow plug into the mounting hole in the combustion tube as far as it will go.
- ▶ Fit glow plug correctly with the groove (see detail Fig. 17).



**NOTE**

If the spring clip and the cooling flag do not fit properly, the glow plug must be turned by 90°.



Fig. 18

- ▶ Hold the cooling flag in the groove with your hand on the glow plug mandrel.
- ▶ Push spring clip over cooling flag and glow plug mandrel (for orientation of spring clip, see Fig. 18).

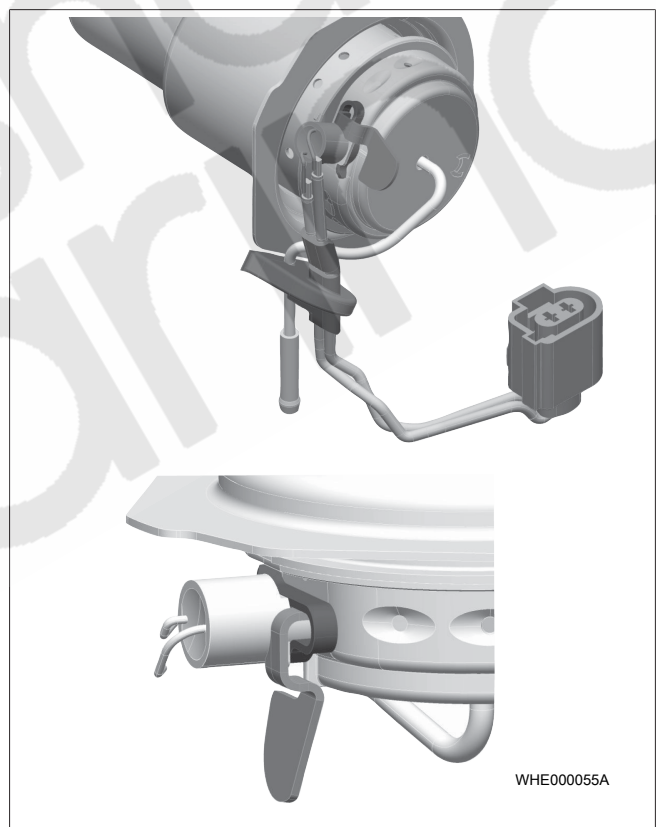


Fig. 19

- ✓ The glow plug must be installed in the glow plug mandrel as far as it will go.
- ▶ Glow plug correctly installed.

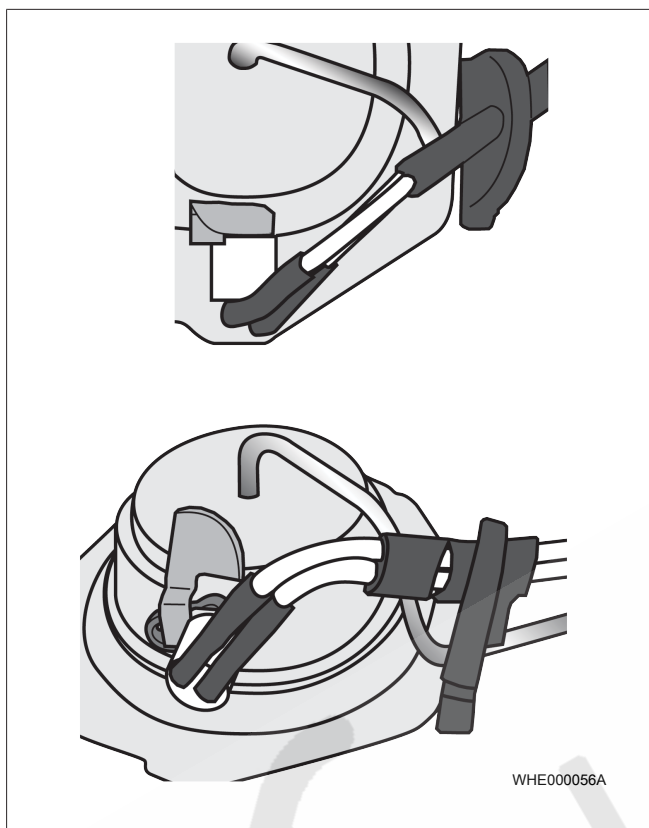


Fig. 20

- ▶ Route the glow plug cable with a slight bend and push the glow plug cable bush onto the fuel line (see Fig. 20).

### 7.7 Combustion air fan unit and control unit

**CAUTION**  
 If there is a fault in the combustion air fan unit or in the control unit, change the combustion air fan unit and the control unit as a complete assembly. Do not disassemble the combustion air fan unit or the control unit into its individual parts.

**NOTE**  
 When replacing the combustion air fan unit, the CO<sub>2</sub> setting must be checked.

**NOTE**  
 Any dummy connectors are to be fitted on the new control unit.

**NOTE**  
 Fig. 21 shows the plug assignment.

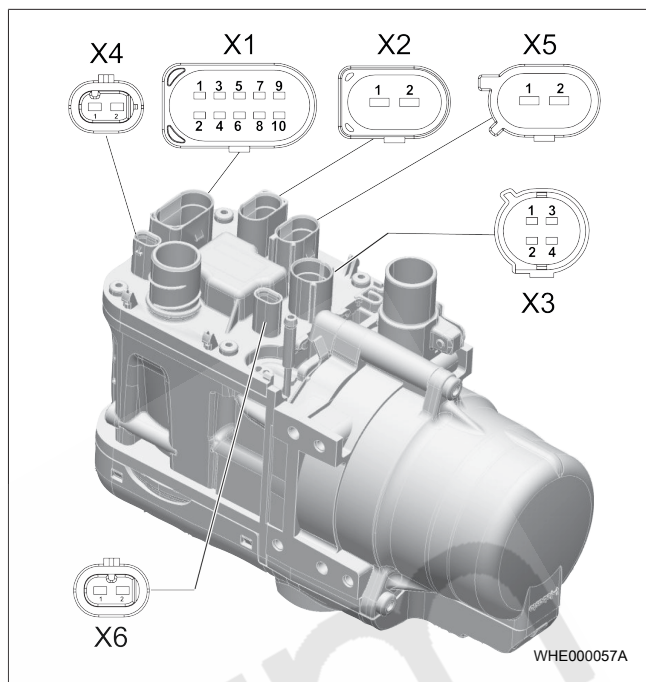


Fig. 21

- X1 Connector heater control
- X2 Connector of power supply to vehicle  
 Contact 1: Power supply terminal 30, fused  
 Contact 2: Earth connection
- X3 Connector of temperature sensors
- X4 Double connector coolant pump
- X5 Glow plug connector
- X6 Exhaust gas temperature sensor connector

### 7.8 Heat exchanger

**CAUTION**  
 If there is a fault in the heat exchanger, replace the heat exchanger as a complete assembly. Do not disassemble the heat exchanger into its individual parts.

**NOTE**  
 Check sensors and water connection pieces with retaining plate for damage and replace them if necessary.

**NOTE**  
 Observe direction of flow of the coolant circuit. Connect the coolant hoses to the water connection pieces according to the marking (arrows) on the heater.

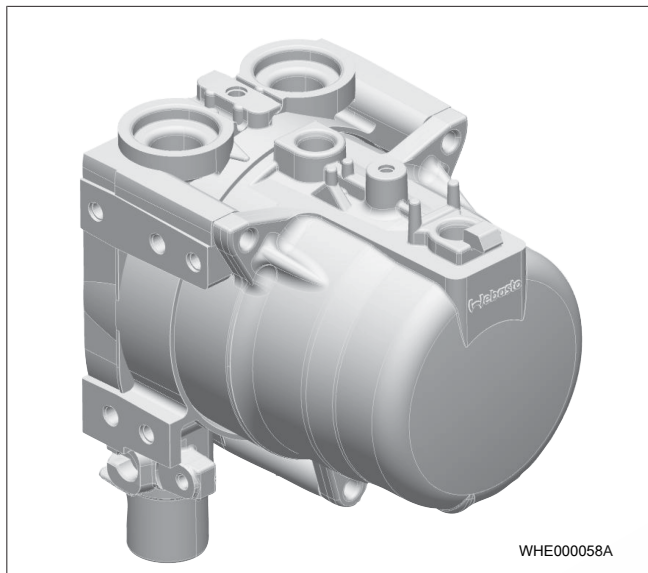


Fig. 22

## 7.9 Sensors



**NOTE**

Never reuse removed sensors.

### 7.9.1 Inspection of the sensors



**NOTE**

Do not remove sensors for testing.

- ▶ Contact the contacts of the sensor connector with a multimeter and measure the resistance (test current: < 1 mA).

Sensor	Connectors	Contacts	Cold resistance at 22 +/- 5°C, test current < 1 mA [Ohm] min. – max.
Temperature	X3	2 and 4	2000 – 4000
Overheating	X3	1 and 3	30 – 250
Exhaust gas temperature	X6	1 and 2	2130 - 2230

- ▶ Check:
  - Short-circuit to earth to the metal housing.
  - Pinching of lines.
  - Deformations of the plastic cap of the sensors.

### 7.9.2 Remove / install the temperature / overheating sensor

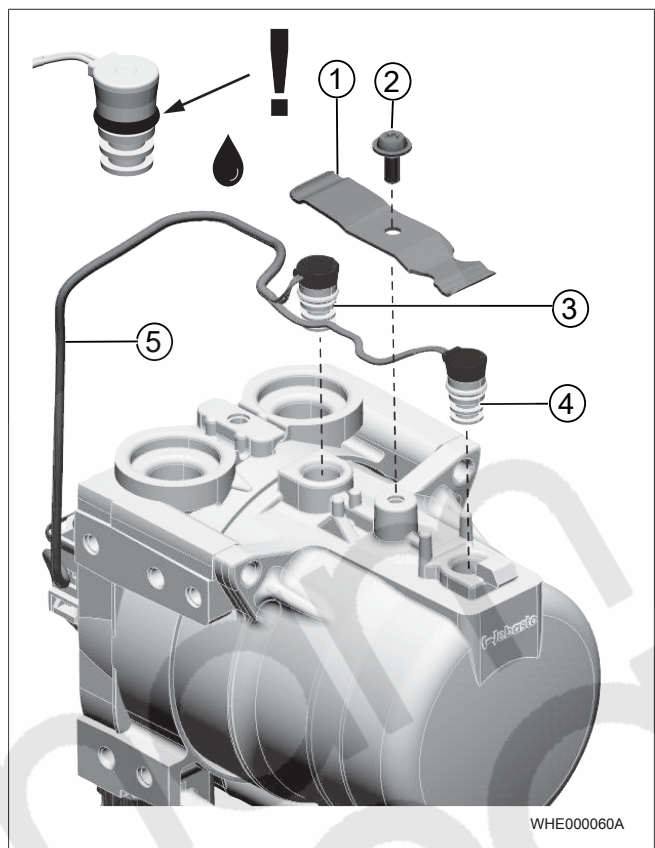


Fig. 23

- ① Retaining plate
- ② Bolt
- ③ Temperature sensor
- ④ Overheat sensor
- ⑤ Sensor line

#### Removal



**NOTE**

Remove / install the temperature sensor / overheating sensor as a combined unit.



**NOTE**

The sealing O-ring of the sensor can get stuck after some period on the housing and as a result obstruct removal.

- ▶ Remove the heater covers.
- ▶ Disconnect the connector for the temperature / overheating sensors.
- ▶ Pull the connector for the temperature / overheating sensors out of the control unit.
- ▶ Loosen Torx T25 screw.
- ▶ Remove the spring clip.
- ▶ Pull the sensors out of the heat exchanger.

#### Installation



**CAUTION**

Excessive tightening or repeated tapping can damage the thread.

- ▶ Carefully manually insert the screw into the existing thread and screw it in.



**NOTE**

The seals of the sensors must be wetted with suitable lubricant before being inserted.



**NOTE**

Note cable routing and position of sensors.

- ▶ Wet the seals.
- ▶ Press the sensors vertically into the heat exchanger.
- ▶ Position the sensor line.
- ▶ Position the spring clips.
- ▶ Mount the Torx T25 screw by hand.
- ▶ Tighten screw (4 ±0.4 Nm).

**7.9.3 Install / remove exhaust gas temperature sensor**

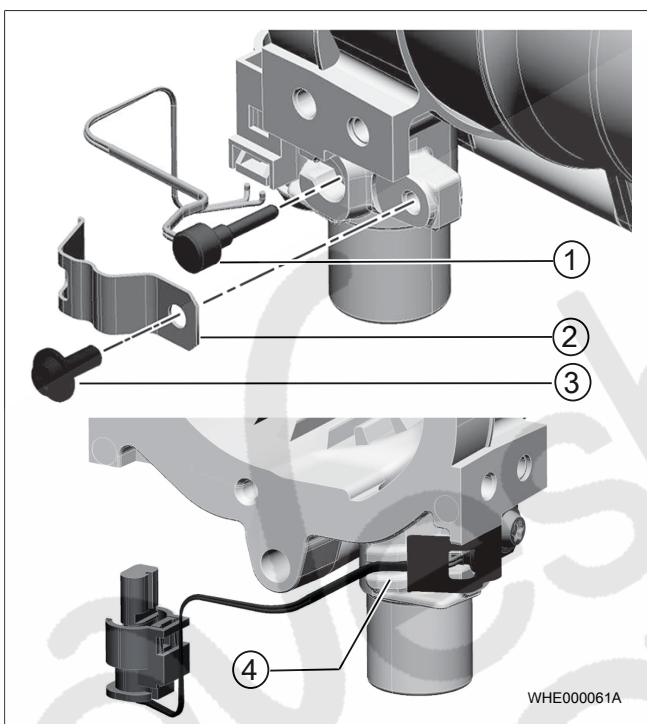


Fig. 24

- |                                  |          |
|----------------------------------|----------|
| ① Exhaust gas temperature sensor | ③ Bolt   |
| ② Spring clip                    | ④ Groove |

**Removal**

- ▶ Remove the connector cover.
- ▶ Loosen the exhaust gas temperature sensor plug lock.
- ▶ Pull the exhaust gas temperature sensor plug out of the control unit.
- ▶ Loosen the screw.
- ▶ Remove the spring clip.
- ▶ Pull the exhaust gas temperature sensor out of the exhaust gas pipe on the heat exchanger.

**Installation**



**CAUTION**

**Possible cable break**

- ▶ Do not bend the cable on the exhaust gas temperature sensor.
- ▶ Do not pinch the exhaust temperature sensor cable between the cover and heater.



**CAUTION**

**Excessive tightening or repeated tapping can damage the thread.**

- ▶ Carefully manually insert the screw into the existing thread and screw it in.

- ▶ Insert exhaust gas temperature sensor into the hole on the exhaust pipe of the heat exchanger.
- ▶ The screw is to be inserted carefully by hand into the available thread and screwed in.
- ▶ Insert cable into the groove on the exhaust pipe.
- ▶ Fasten spring clip with screw. Tightening torque 4.0 ± 0.4 Nm.
- ▶ Connect the connector onto the connector board on the control unit.
- ▶ Fit the cover.

**7.10 Water connection piece**

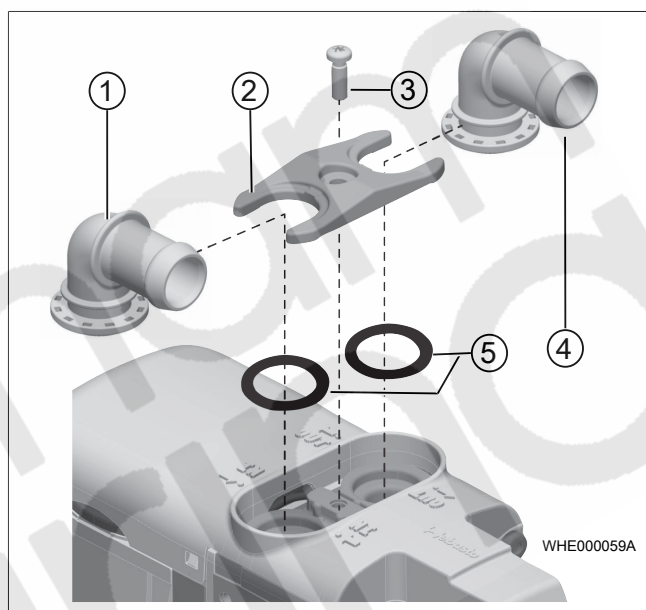


Fig. 25

- |                                |                                 |
|--------------------------------|---------------------------------|
| ① Water connection piece inlet | ④ Water connection piece outlet |
| ② Retaining plate              | ⑤ O-rings                       |
| ③ Bolt                         |                                 |

**Removal**

- ▶ Loosen the screw.
- ▶ Remove the water connection piece and retaining plate as an assembled unit.
- ▶ Remove the O-rings.
- ▶ Clean the contact surfaces of the O-rings in the heat exchanger and check for damage.

**Installation**



**CAUTION**

**Excessive tightening or repeated tapping can damage the thread.**

- ▶ Carefully manually insert the screw into the existing thread and screw it in.

- ✓ The contact surfaces of the O-rings in the heat exchanger must be clean and must not show any signs of damage.
- ▶ Wet new O-rings.
- ▶ Insert O-rings into the heat exchanger openings.

- ▶ Fix the water connection piece in the retaining plate.
- ▶ Fix the water connection piece and retaining plate and position as an assembled unit in the heat exchanger.
- ▶ Align the water connection piece for the connection of the coolant lines.
- ▶ Insert the screw into the hole and carefully insert it by hand into the existing thread and screw it in.
- ▶ Screw the screw with  $7.5 \pm 0.7$  Nm.

## 8 Packaging / storage / shipping

### 8.1 Preferred position for storage and transportation

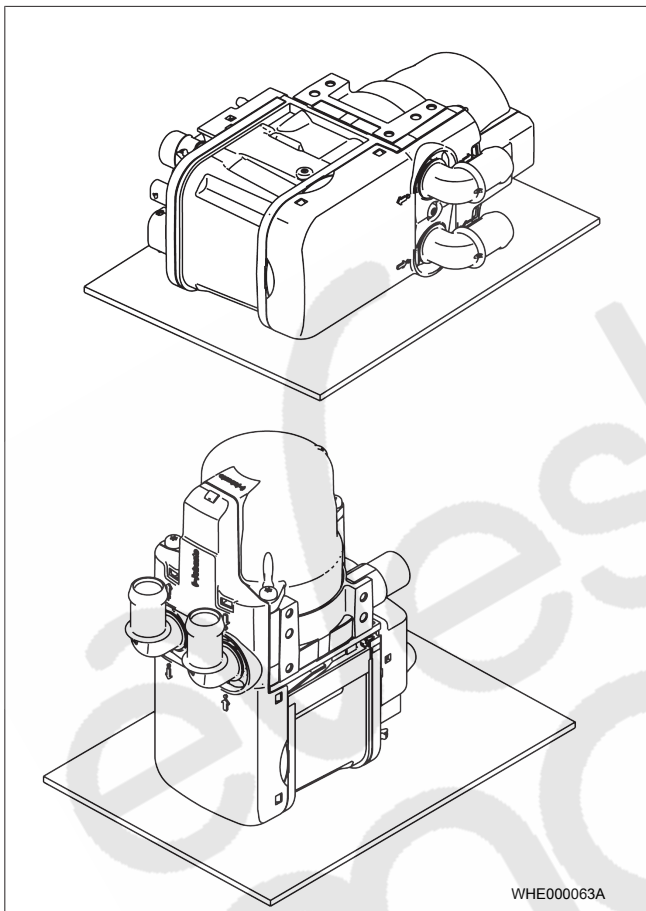


Fig. 26

### 8.2 General storage

The heater and/or its external components that are being sent to Webasto for testing or repair must be cleaned and packaged in such a way that they are protected from mechanical damage, soiling and environmental influences during handling, transportation and storage.

### 8.3 Storage and transportation



#### CAUTION

#### Possible health / environmental damage

If a complete heater is returned:

- ▶ The heater must be completely drained of fuel.
- ▶ When packing or shipping, ensure that fuel or coolant residues cannot escape.
- ▶ Seal the coolant connection pieces and the fuel connection with dummy plugs.

Recommendations for:

#### Sending in the heater:

- ▶ The heater must be completely empty.

#### Packaging and shipping:

- ▶ Make sure that the remaining coolant cannot leak out. Close off the coolant connection pieces with protective caps.

#### Storage and packaging:

- The heater can be stored in any position.
- Cover the heater and protect the heater against dust, dirt and moisture.
- Do not store the heater with chemicals or vapours, e.g. fuels, battery fluids or brake fluids.
- Dirt, water or chemicals must not get into the heater through the openings, see above.
- The electrical contacts must be protected from mechanical damage.
- Always store the heater in the original or similar packaging in a closed room.

#### Transporting the heater:

The heater can be transported in any position in suitable packaging.

#### Removing the delivery packaging:

- ▶ Grasp the heater suitably at the heat exchanger (aluminium and steel parts) and remove it.
- ▶ The type label and the surface of the heater should be protected from damage by placing suitable material under them (e.g. cardboard).

## 9 Technical data

The technical specifications are provided in the Installation Instructions.

# 10 Wiring diagrams

## 10.1 Wiring diagram of Thermo Top Evo and control elements

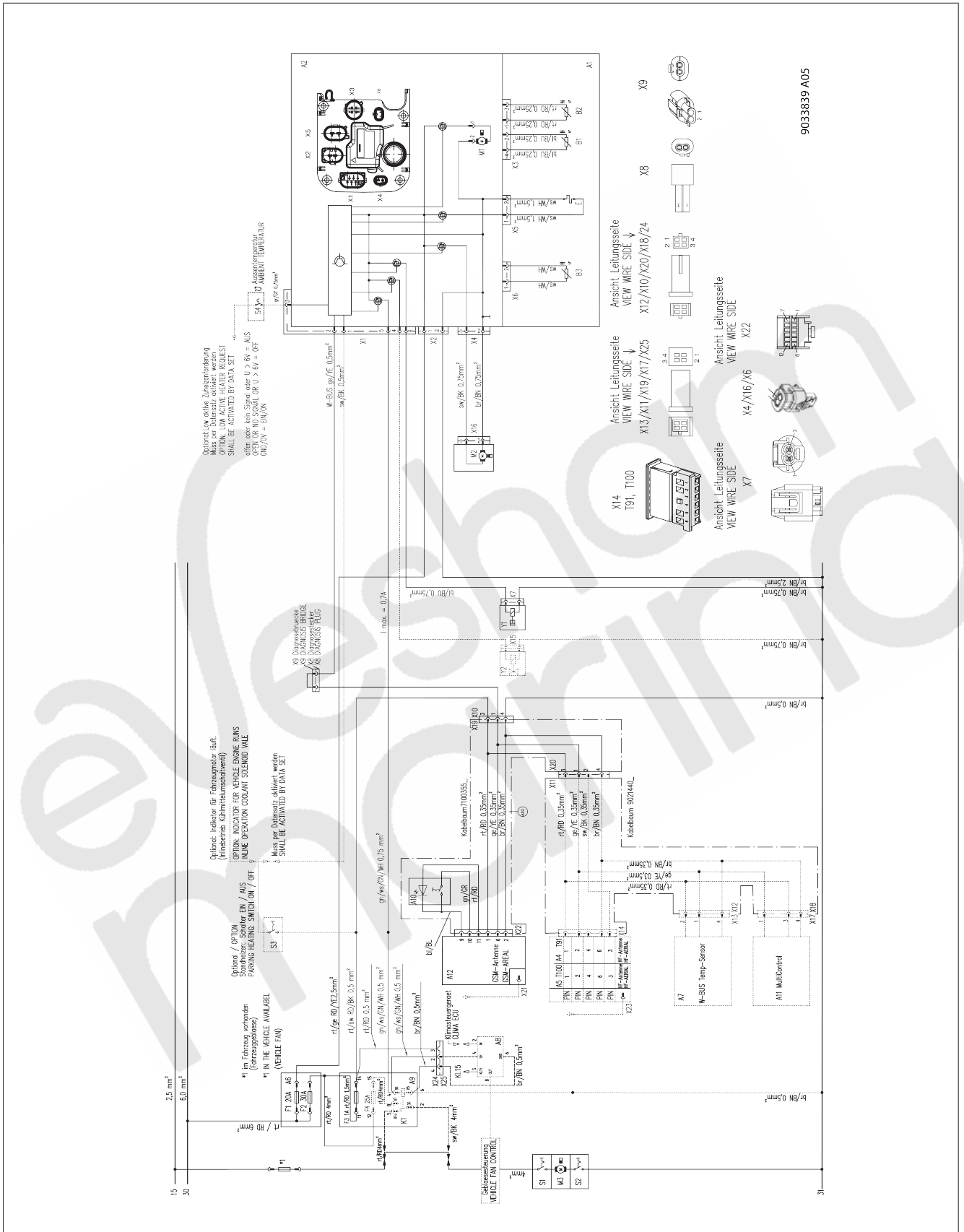


Fig. 27

## 10.2 Legend to wiring diagram

No.	Description	Remarks
A1	Heater	Thermo Top Evo
A2	Control unit	
A4	Telestart T91	
A5	Telestart T100	
A6	Fuse holder	W-bus temperature sensor
A7	W-bus temperature sensor	Fan controller
A8	Gateway LIN PWM	Relay socket with fuses
A9	Relay socket with fuses	Push button e.g. 7100356
A10	Button TC4	
A11	MultiControl	
A12	TC4	
B1	Temperature sensor	Water temperature
B2	Temperature sensor	Overheating
B3	Only TT-EVO HD / RV	Exhaust gas temperature sensor
E	Glow plug	
F1	Fuse 20A	
F2	Fuse 30A	
F3	Fuse 1A	
F4	Fuse 25A	
K1	Relay	Vehicle blower
M1	Motor	Combustion air fan
M2	Motor	Coolant pump
M3	Vehicle blower	
S1	Switch for vehicle blower	
S2	Switch for vehicle blower	
S3	On/Off switch	
S4	Auxiliary heating switch	
S5	Immediate heating button (optional)	
X1	6-pin plug connection	Vehicle signal
X2	2-pin plug connection	Power supply
X3	4-pin plug connection	Temperature sensors
X4	2-pin plug connection	Coolant pump
X5	2-pin plug connection	Glow plug
X6	2-pin plug connection	Exhaust gas temperature sensor
X7	2-pin plug connection	Fuel pump
X8	2-pin plug connection	Diagnostics
X9	2-pin plug connection	Diagnosis bridge
X10	4-pin plug connection	Control elements
X11	4-pin plug connection	Control elements
X12	4-pin plug connection	Temperature sensor W bus
X13	4-pin plug connection	Temperature sensor W bus



No.	Description	Remarks
X14	6-pin plug connection	T91 / T100
X15	2-pin plug connection	Solenoid coolant valve X15 switchover to inline operation only in conjunction with 12 V signal on pin 1.
X16	2-pin plug connection	Coolant pump
X17	4-pin plug connection	MultiControl
X18	4-pin plug connection	MultiControl
X19	4-pin plug connection	
X20	4-pin plug connection	
X21	FAKRA code D	HF-SMB RF-SMB
X22	12-pin plug connection	TE Connectivity 174042-2
X23	FAKRA Code I	HF-SMB RF-SMB
X24	4-pin plug connection	
X25	4-pin plug connection	
Y1	Fuel pump	DP42
Y2	Solenoid coolant valve	

These are the original instructions. The German 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.

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