

Water Heater

Workshop Manual

Thermo Pro 50 Eco

Thermo Pro 50 Eco - D 24 V ADR
(Diesel, dangerous-goods transport)



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.

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1 Introduction

1.1 Contents and purpose

This workshop manual is designed to assist instructed personnel in the repair of Thermo Pro 50 Eco water heaters.

1.2 Meaning of signal words

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

CAUTION

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

ATTENTION

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

NOTE

This signal word is used to draw your attention to a special feature.

1.3 Additional documentation to be used

This workshop manual does not contain information relating to the general Installation and Operating Instructions. These documents are also to be used in the event of a repair.

1.4 Requirements and safety information

The general accident prevention regulations and valid operational safety instructions must be observed.

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

The special safety requirements that pertain to this workshop manual are highlighted in the individual sections and procedural descriptions.

1.4.1 Statutory regulations governing installation

The Thermo Pro 50 Eco heater has been type-tested and approved in accordance with ECE-R 10 (EMC) and ECE-R 122 (heater).

The provisions of ECE-R 122 and those in the Installation Instructions should be consulted in the first instance for installation.

NOTE

The regulations in these directives are binding in the area of validity covered by EU Directive 70/156/EEC and/or 2007/46/EC (for new vehicle models from 29/04/2009) and should also be observed in countries where there are no specific regulations.

The water heater Thermo Pro 50 Eco has been designed for installation in commercial vehicles. If it is installed in special-purpose vehicles, the applicable regulations must be observed. Alternative applications are possible in agreement with Webasto.

1.4.2 General safety information

Repair and commissioning of the unit may only be carried out by specialist personnel trained by Webasto. Repair and installation of the unit must be carried out in accordance with the workshop manual and installation instructions.

The year of initial commissioning must be permanently marked on the type label by removing the numbers of the inapplicable years.

The heaters are approved for heating the vehicle engine and the cab but they are not approved for heating cargo areas used to carry dangerous goods/hazardous substances.

The heater may only be installed in motor vehicles or in independent heating systems with a minimum coolant capacity of 4 litres.

The heater must not be installed in the driver's or passenger's compartment of vehicles.

Follow the instructions of the vehicle manufacturer when checking the coolant level.

CAUTION

The heater may **not be operated**:

- at filling stations and tank facilities.
- at locations where highly flammable gases or dust can form, or at locations where highly flammable liquids or solid materials are stored (e.g. near fuel, coal and wood dust, grain storage areas, dry grass and leaves, cardboard boxes, paper, etc.).
- in closed rooms (e.g. garages), nor with time pre-selection or the Telestart function.
- unless the water in the heating circuit contains at least 20% of a brand name anti-freeze.
- outside of the permissible operating range of -40 °C to +80 °C. If this temperature is exceeded, the electronics can be permanently damaged.

Risk of burn injuries as the heater and its add-on parts can become very hot.

- The heater may only be operated using the fuel and the rated voltage stated on the type label.
- In the event of significant amounts of smoke, unusual combustion noises or a smell of fuel, the heater must be put out of operation immediately by switching it off and removing the fuse. Restarting may only be carried out after the unit has been checked by specialist trained personnel trained by Webasto.
- The heater must be switched off before carrying out work in the engine compartment; it must not be cleaned with high-pressure cleaning equipment or compressed air.
- At least once a month, the heater must be operated for 10 minutes when the engine is cold.
- The heater should be tested by a professional every 2 years, no later than the start of the heating period.

Liability claims:

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

1.5 Spare parts

The identity numbers of the available spare parts can be found in the Webasto spare parts catalogue or online at <http://dealers.webasto.com>.

2 General description

Parking heating

In parking heating mode, the water heater works together with the vehicle's heating system for

- Cab pre-heating,
- Engine pre-heating
- Pre-heating of further equipment (e.g. power units).

The water heater operates independently of the vehicle engine and is integrated into the cooling system, the fuel system and the electrical system of the vehicle.

Depending on the equipment, the ADR function is provided (for vehicles for transporting hazardous materials).

Auxiliary heating

The water heater works during engine operation and provides thermal assistance to the cooling system. The water heater is integrated into the cooling system, the fuel system and the electrical system of the vehicle.

When the engine is switched off, the water heater is not automatically switched off. Automatic shut-off of the water heater when the engine is switched off is only possible in vehicle applications for the transportation of hazardous goods (ADR).

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 operates fully automatically, controlled by the coolant temperature.

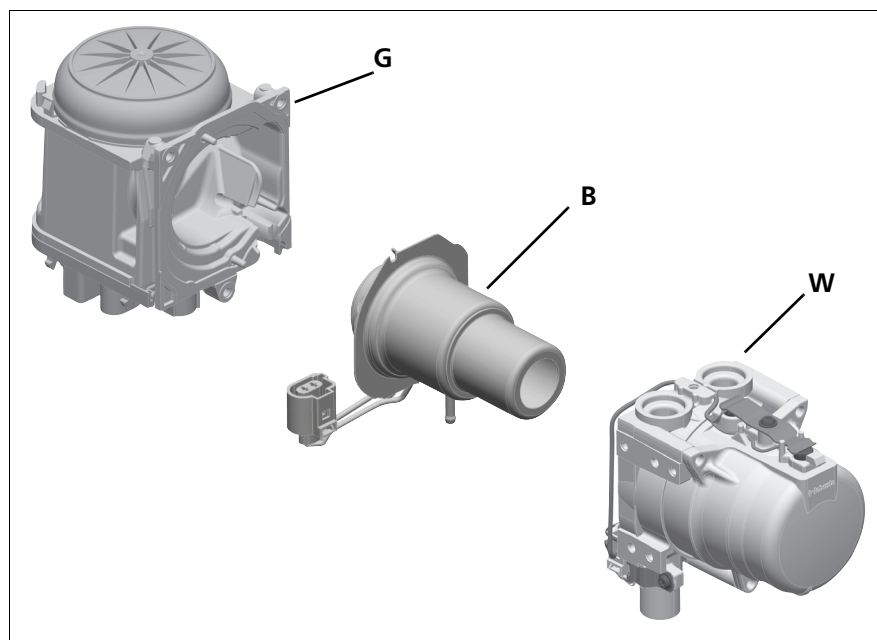
The burner output is controlled within the limits between 2.5 and 5 kW depending on the deviation of the current coolant temperature from the setpoint at the coolant temperature sensor.

The Thermo Pro 50 Eco heater comprises the combustion air fan unit with control unit, the heat exchanger and the burner unit.

The following control and monitoring components are integrated in the heater:

- Control unit
- Exhaust gas temperature sensor
- Coolant temperature sensor
- Overheat sensor

The fuel is supplied externally by means of a fuel pump that is connected to the fuel system of the vehicle.



- B = Burner unit assembly
G = Combustion air fan unit assembly
W = Heat exchanger assembly

Fig. 1 Thermo Pro 50 Eco

2.1 Combustion air fan unit with control unit

The combustion air fan unit comprises:

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

The combustion air fan unit supplies the air necessary for combustion from the combustion air inlet to the combustion chamber.

NOTE

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

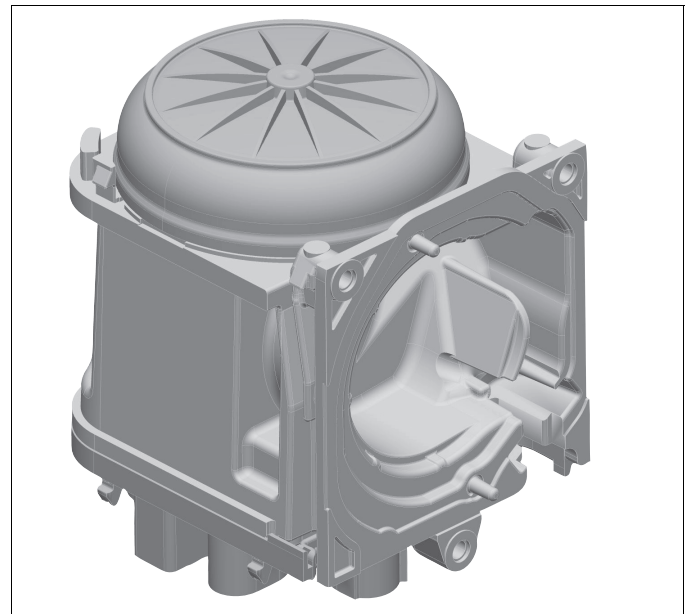


Fig. 2 Combustion air fan unit

2.2 Burner unit

The burner unit is where the fuel/air mixture is prepared and where the actual combustion takes place. 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.

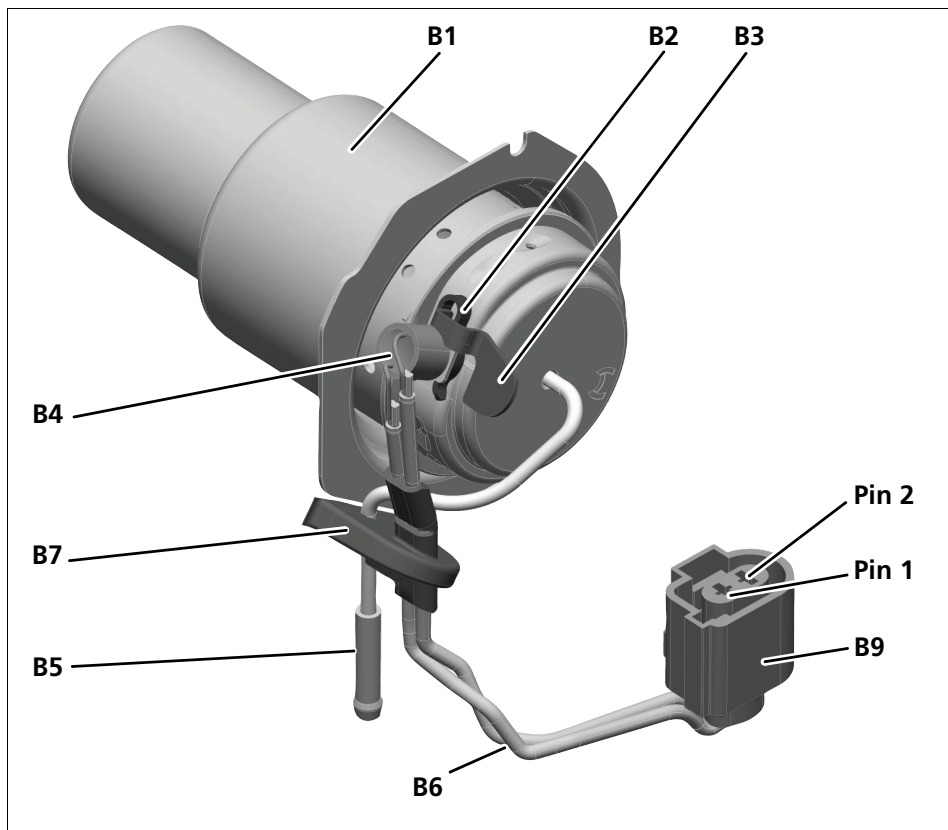


Fig. 3 Burner unit

- B1 = Fuel pipe with evaporator holder and evaporator
- B2 = Spring clip for glow plug
- B3 = Cooling flag for glow plug
- B4 = Glow plug
- B5 = Fuel pipe
- B6 = Glow plug cable
- B7 = Grommet
- B9 = Connector glow plug

2.2.1 Glow plug

The glow plug (B4) is connected to the control unit via an electrical cable with a connector (B9). The glow plug is attached to the vaporiser holder via a spring clip (B2). A cooling flag (B3) provides for heat dissipation from the glow plug, and therefore reduces the temperature at the glow plug connection lines.

The fuel/air mixture is ignited by the glow plug when the heater is started.

2.3 Heat exchanger

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

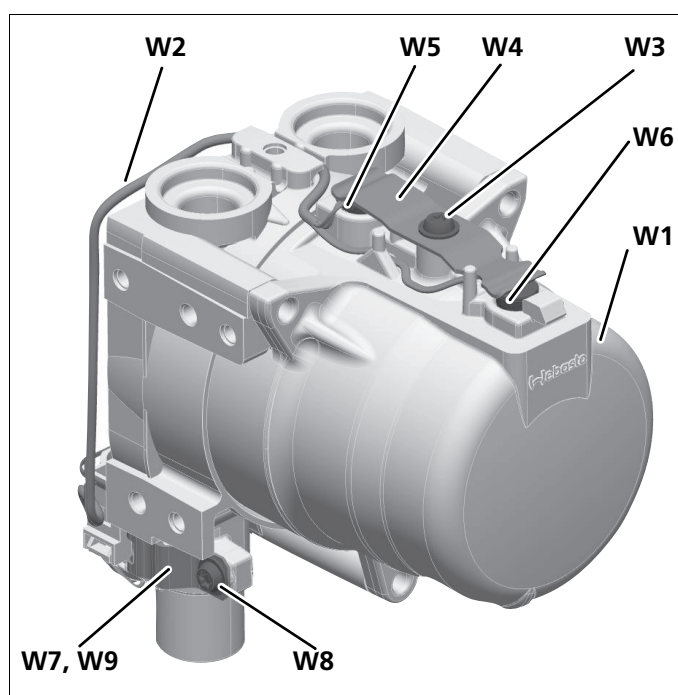


Fig. 4 Heat exchanger

- W1 = Heat exchanger
- W2 = Cable temperature sensors
- W3 = Self-tapping bolt 40x10
- W4 = Spring clip sensors
- W5 = Temperature sensor
- W6 = Overheat sensor
- W7 = Exhaust gas temperature sensor, covered by spring clip (W9)
- W8 = Self-tapping bolt 40x10
- W9 = Spring clip

2.3.1 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 (W5) and the overheating sensor (W6) together with the cable and the connector form one unit.

The overheating sensor protects the heater from impermissibly high operating temperatures. This triggers the heater's safety shutdown at a temperature of above $125 \pm 8^\circ\text{C}$.

The temperature sensor is a semi-conductor component with a negative temperature coefficient (NTC), i.e. the resistance of the component decreases as the temperature increases. The overheating sensor is a semi-conductor component with a positive temperature coefficient (PTC), i.e. the resistance of the component increases as the temperature increases. In contrast to the temperature sensor, the characteristic curve of the overheating sensor does not demonstrate linear behaviour. A sudden increase in resistance is observed at approx. 125°C .

2.3.2 Exhaust gas temperature sensor

The exhaust gas temperature sensor (W7) detects the flame as well as impermissible exhaust gas temperatures.

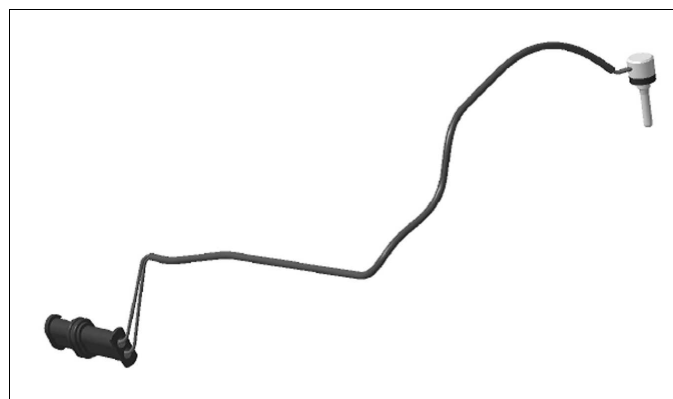


Fig. 5 Exhaust gas temperature sensor

2.4 Coolant pump

The coolant pump U4847 Econ 24 V 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.

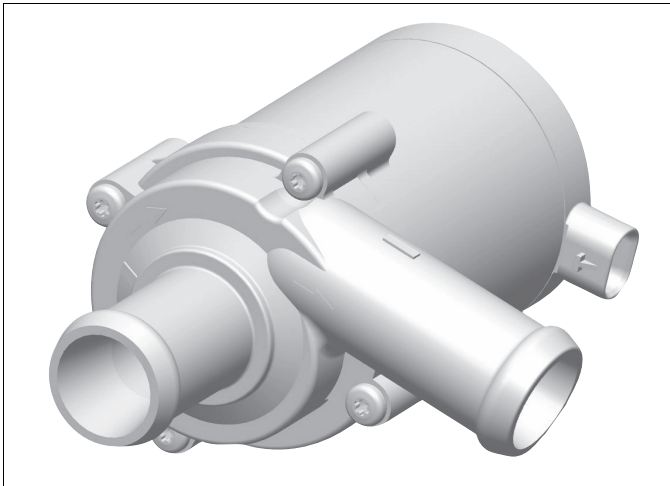


Fig. 6 Example U4847 Econ coolant pump 24V

The UP500 pump is an additional coolant pump. The pump is designed to deliver a flow of coolant mixture to parking heaters or preheaters in motor vehicles. After the engine has been switched off, the pump can maintain a flow to the parking heater or cooling system.

In the case of a blocked rotor, dry running, overvoltage or low voltage, an internal fault which falls below the minimum speed or overtemperature, the pump automatically performs a temporary shutdown.



Fig. 7 Example UP500 coolant pump

ATTENTION

Only the fuel pump of type DP42 may be used with the Thermo Pro 50 Eco heater. Observe the type designation on the component. The CO₂ setting should be checked when replacing the fuel pump. See section 8.3.

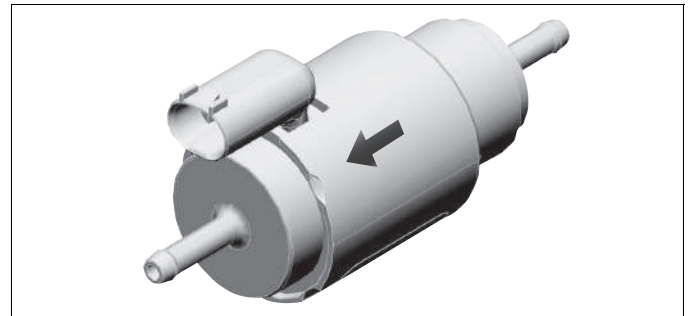


Fig. 8 DP42 fuel pump

2.5 Fuel pump

The fuel pump 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 heater via the heater wiring harness.

3 Functional description

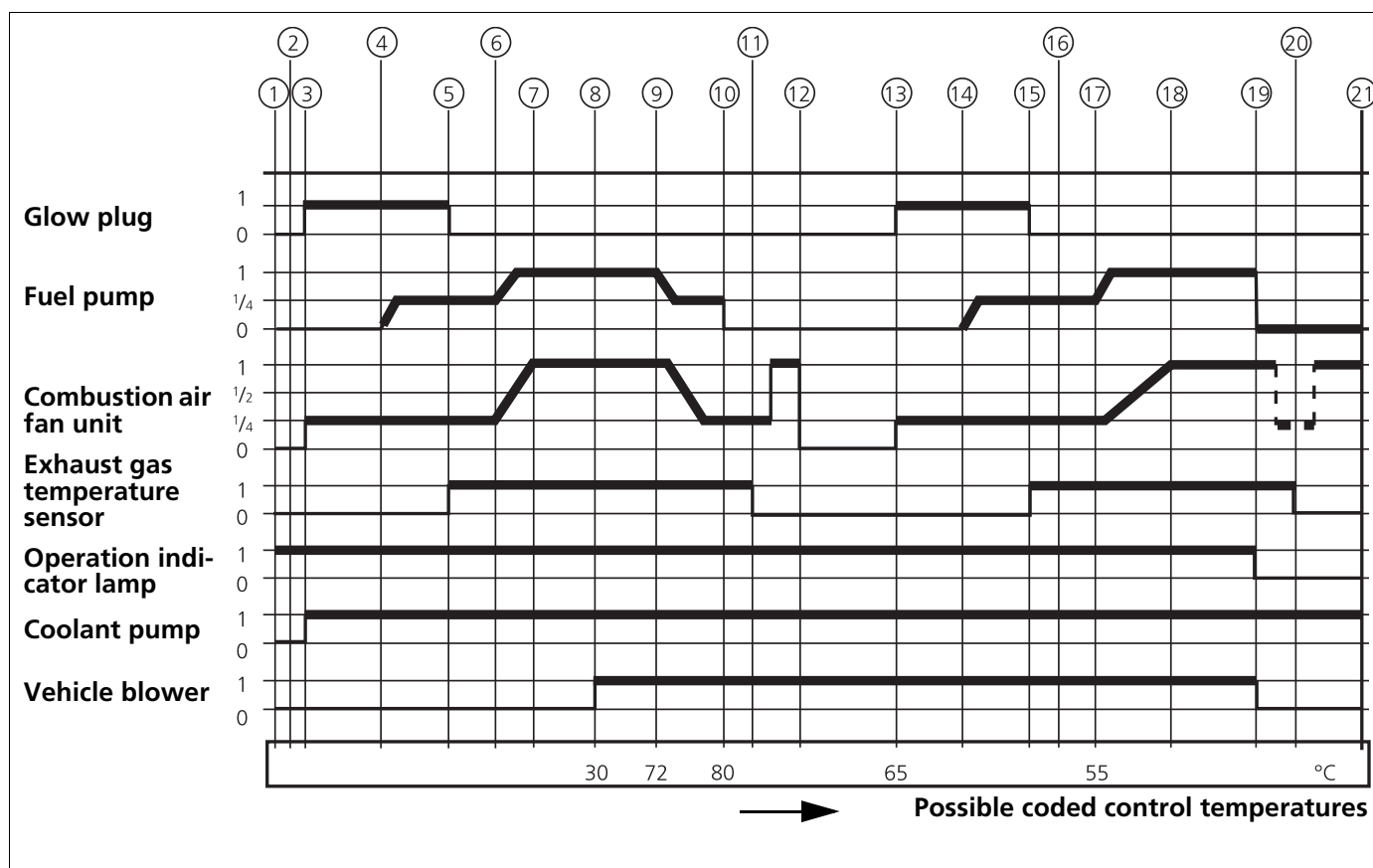


Fig. 10 Functional sequence Thermo Pro 50 Eco

- | | |
|-----------------------------------|--|
| 1) Switching on | 12) After-running period finished |
| 2) Component sensing | 13) Preheating 15 to 20 s |
| 3) Preheating 40 s | 14) Fuel pump / partial load (1/4) |
| 4) Fuel pump / partial load (1/4) | 15) "Flame ON" detection |
| 5) "Flame ON" detection | 16) Stabilization time |
| 6) Stabilization time | 17) Coolant temperature dropped |
| 7) Full load | 18) Full load |
| 8) Vehicle blower "On" | 19) Switching off (after-running period) |
| 9) Control range | 20) "Flame OFF" detection |
| 10) Control pause | 21) After-running period finished |
| 11) "Flame OFF" detection | |

3.1 Switching on

Switching on the heater uses different control elements depending on the equipment version.

3.2 Start and control mode

Automatically controlled heater operation begins when combustion is initiated (start). The heating capacity is modulated between 2.5 kW and 5 kW at higher coolant temperatures. The aim is to reach and maintain the control temperature.

The vehicle's heater fan only switches on when the coolant has warmed up sufficiently (above approx. 30°C).

If the coolant temperature rises above the setpoint for the control temperature, the heater switches to "off-status ready". The coolant pump, the vehicle's heater fan and the operating display remain operational during "off-mode ready".

The heater starts up again automatically after the coolant has cooled down to the precoded cut-in temperature.

3.3 Switching off

When the heater is switched off, the indicator lamp on the control element goes out. Combustion is ended and after-running begins. The coolant pump, glow plug and combustion air fan unit continue to run during the after-running period in order to cool down the heater. It is possible to switch the heater back on during the after-running period. The heater restarts after the after-running period has elapsed.

ATTENTION

The after-running period lasts a maximum of 175 s after switching off.

The supply voltage to the heater must be ensured for this period (exception for ADR vehicles).

3.4 Heater functions in ADR vehicles

The heater is put into operation with the control element.

An ADR shutdown is triggered if

- the vehicle's engine is turned off (generator signal (D+) is switched off),
- a pumping device is placed into operation (auxiliary drive signal (NA) is active).

In this case, combustion is terminated and a shortened after-running period, the ADR after-running period, is initiated. 40 seconds after occurrence of the ADR event, the ADR after-running period is ended.

The heater is then in "ADR lock" mode. Before re-starting, the On/Off switch must be set to "Off" and the auxiliary drive signal must no longer be active.

The disconnecter (emergency off switch) may only be actuated in the event of danger since the heater will be switched off without any after-running period (possible overheating).

4 Technical data

The technical specifications are given in the current version of the installation instructions (ID no. 9026479_).

5 Malfunctions and troubleshooting

General information

This section describes how to identify and remedy faults in the Thermo Pro 50 Eco heater.

ATTENTION

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

Please refer to sections 2 and 3 for information on how the functions interact.

ATTENTION

Troubleshooting is generally restricted to locating faulty 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

Carry out a function check in the vehicle after rectifying each fault. Prior to this, switch the heater off and on again.

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

ATTENTION

Always determine the cause of the lock-out first before rectifying the lock-out!

The control unit recognises faults in the heater as malfunctions. Afterrunning may be initiated depending on the type and severity of the fault. If afterrunning is initiated in the case of fault, the heater remains in the **lock-out** state. A fault code is also output after detecting a malfunction during the fault switch-off.

This is carried out via the indicator lamp or by the switch with function display. The fault code assists the workshop or Webasto Technical Service in determining the fault.

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,
- overheating of heater,
- impermissible exhaust temperature,
- unsuccessful starts,
- flame failure.

Elimination of fault lock-outs

1. Switch on the heater



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



3. The **fault code** is shown on the control element



4. If set, cancel **heater lock-out** (as described in the following)



4.1. The heater detects a fault as a **malfunction**



4.2. **Fault switch-off** followed by **fault lock-out**



4.3. The **fault code** is shown on the control element



5. Switching off the heater



6. Determine cause of fault (e.g. with or without **fault code**, visual inspection of fuses and plug connections, ...)



7. Rectify fault



8. Switch on the heater



9. Reset **fault lock-out**



10. The heater assumes control mode

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 Webasto.

Reset heater lock-out

Heater lock-out can be cancelled

- via Webasto Thermo Test (WTT)
- or by switching on the heater.

Pull fuse **F3** for at least 10 s. Switch off heater.

Reinsert fuse **F3**. Switch on the heater.

5.1 Fault code table (fault codes, flash codes)

*: Indicator lamp of control element flashing: Number of long flash pulses after 5 short flash pulses				
Fault code (analogue)	Fault code (hexadecimal)	Error message	possible causes	Recommended action in workshop
F00 or 0*	F01 F81 F91 F92 F07	No component fault	Fuses	Check fuses F1, F2 and F3
			Electrical wiring	- Check battery connections: + at 12 / - at 9 / + at 3 (switch-on signal), connector X8 - Check control element: check contacts of W-bus cable (yellow cable)
			Heater lock-out	Delete heater lock-out
			Control unit defective	Replace control unit
F01 or 1*	F02 F82 F4E	No start	Fuel system	Check fuel level
				Check fuel filter
				Check tank extracting device and fuel line for leaks
				Bleed fuel system
			Combustion air / exhaust line	Check combustion air/exhaust line for foreign objects and clean if necessary
F02 or 2*	F03	Flame failure	Fuel system	Check fuel level
				Check fuel filter
				Check tank extracting device and fuel line for leaks
				Bleed fuel system
			Burner unit	Clean burner unit or replace if necessary
F03 or 3*	F04	Supply Voltage too high	Power supply	Check battery
	F84	Operating voltage too low		Check electrical connections
F04 or 4*	F05	Flame was detected prior to combustion	Exhaust gas temperature sensor defective	- Check operation of exhaust gas temperature sensor, replacing if necessary - Check fuel system upstream pressure to fuel pump - Check delivery quantity of fuel pump
F06 or 6*	F14 F94	Temperature sensor	Wiring	- Check wiring for damage, break and short-circuit - Resistance check
			Temperature sensor defective	Check operation of temperature sensor, replacing if necessary
F07 or 7*	F08 F88	Fuel pump	Wiring	Check wiring for damage, break and short-circuit
			Fuel pump DP42 faulty	Replace fuel pump DP42
F08 or 8*	F09 F89 F95	Combustion air fan	Combustion air fan blocked	Check operation of combustion air fan, replacing if necessary
			Combustion air fan defective	Replace combustion air fan

*: Indicator lamp of control element flashing: Number of long flash pulses after 5 short flash pulses

Fault code (analogue)	Fault code (hexadecimal)	Error message	possible causes	Recommended action in workshop
F09 or 9*	F8A	Glow plug / electronic ignition unit interruption	Wiring	Check wiring for damage, break and short-circuit
	F0A	short-circuit in electrical circuit	Glow plug defective	Check operation of glow plug, replacing if necessary
F10 or 10*	F06	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*	F0B F8B	Coolant pump short circuit	Wiring	Check wiring for damage, break and short-circuit
		Interruption	U4847 Econ coolant pump defective	Replace coolant pump
F12 or 12*	F16	Battery disconnect or electronic battery switch short-circuit	Electronic battery switch wiring faulty	Check wiring for damage, break and short-circuit
				Check power intake of battery disconnect
F13 or 13*	F13	Vehicle fan power circuit short circuit	Wiring	Check wiring for damage, break and short-circuit
			Vehicle fan relay	Check wiring for damage, break and short-circuit
				Check operation of vehicle fan relay, replacing if necessary
F14 or 14*	F1B FAB	Overheat sensor short circuit	Wiring	Check wiring for damage, break and short-circuit
		Interruption	Overheating sensor defective	Check operation of overheating sensor, replacing if necessary
F15 or 15*	F2E F22	The glow/ignition-element power circuit is defective	Wiring	Check glow plug wiring for damage, break and short-circuit
			Glow plug defective	Check operation of glow plug, replacing if necessary
F16 or 16*	F4F	Exhaust gas temperature too high	Exhaust gas temperature sensor defective	Check wiring for damage, break and short-circuit
			Heater fouled	Check operation of exhaust gas temperature sensor, replacing if necessary
				Check burner - Visual inspection with cleaning, replace burner if necessary, - Visual inspection with cleaning, replace burner head if necessary - Visual inspection with cleaning of inner heat exchanger surface (replace the heat exchanger if necessary)
F17 or 17*	F31 F4D	Exhaust-gas temperature sensor: open or short circuit	Wiring	Check wiring for damage, break and short-circuit
			Exhaust gas temperature sensor defective	Check operation of exhaust gas temperature sensor, replacing if necessary

5.2 Troubleshooting (fault symptoms)

Symptom		Possible cause	Possible troubleshooting
A	Heater does not respond, no component running, operation indicator remains off	Operating voltage	– Check fuses (F2, F3). Unlock heater, see section 5. – Measure supply voltage to heater connector X2, pin 1.
		Operation indicator (control element or ON/OFF switch)	Operating indicator control element – Check fuse F2 – Measure supply voltage on the switch with function display S4, pin A – Check continuity against earth on connector with function display S4, pin F
B	Heater will not start, briefly starts up then switches immediately to afterrunning, operating indicator flashing	DP42 fuel pump	CAUTION The fuel pump must not be operated with the operating voltage. Power must not be supplied to the pump when a control unit is connected. – Check fuel line connection to fuel pump DP42. Connect Webasto Thermo Test and evaluate. – Check clear passage and seating of the flat spring contacts of the fuel pump connector and line – Measure resistance of fuel pump DP42 (resistance at $22 \pm 5^{\circ}\text{C}$: $0.8 \pm 0.1 \text{ ohm}$) – Setpoints: resistance at 25°C: 4.95 to 5.45 ohm
		Combustion air fan	– Check exhaust system and air intake system (see symptom C 'Excess smoke from heater during start-up phase'). Connect Webasto Thermo Test and evaluate. • Set target speed of 6000 rpm Listen for grinding and start-up noises. Start up to the specified speed must be heard. The error message "Fan motor stiff" must not be activated. – In the event of short-circuit or break: check fan wiring
		Coolant pump U4847 Econ 24V Coolant pump UP500	– Check coolant level. Connect Webasto Thermo Test and evaluate. Switch on component test via Webasto Thermo Test, touch pump with your hand, the pump is operating if slight vibration can be felt. – Check wiring – Check self-bleeding position, see section 8.4
		Temperature sensor	– Check coolant level. Connect Webasto Thermo Test and evaluate. Check cold resistance of the temperature sensor. – Setpoints: internal resistance of the coolant pump $20 \pm 1 \text{ kOhm}$
		Glow plug	– Connect Webasto Thermo Test and evaluate. Measure glow plug resistance at glow plug connector X5. See "Electrical test of glow plug" on page 34 – Setpoints: cold resistance at $22 \pm 5^{\circ}\text{C}$: $0.8 \pm 0.1 \text{ ohm}$

Symptom		Possible cause	Possible troubleshooting
C	Excessive smoke from heater during start-up phase	Glow plug	See symptom B, glow plug
		Fuel pump DP42	See symptom B, fuel pump DP42
		Combustion air fan	See symptom B, combustion air fan
		Fuel connection	– Check fuel level and fuel supply from the tank – Check integration in the vehicle's fuel system – Check fuel lines for leaks, kinks and clogging, especially in the area of line connectors on the intake side – Disconnect fuel line from heater, hold hose in a collection container and operate the fuel pump with Webasto Thermo Test. (measured value fuel delivery rate 115 ml/h*Hz). Fuel should be delivered free of bubbles
		Exhaust system and air intake system	– Check lines for blockages – Rectify any leaks in the intake line and exhaust pipe (no CO₂ in intake air) – Make sure that the exhaust line outlet is not located beneath the intake line inlet. – Make sure that the intake line and exhaust line are installed in accordance with the installation instructions, see Thermo Pro 50 Eco Installation Instructions – Make sure that there is sufficient distance from the interior fresh air intake to the vehicle
		Burner unit	– Removal and visual inspection – If the fuel pipe to the burner unit is blocked, replace the burner unit
D	Heater goes out prematurely	Undervoltage detection	– Check fuses (F2, F3) – Webasto Thermo Test, observe supply voltage to switched-on heater. Setpoints:: The voltage must not fall below 20.0 V for more than 10 consecutive seconds
		DP42 fuel pump	See symptom B, fuel pump DP42
		Combustion air fan moves stiffly	See symptom B, combustion air fan
		Fuel connection	See symptom C, fuel connection
		Coolant circuit	– Check integration into the coolant circuit of the vehicle in accordance with the Thermo Pro 50 Eco installation instructions. Remove kinks and chafing points. – Check heater, water connection, coolant pump and hoses for leaks, rectifying if necessary – Make sure that the coolant circuit is bled correctly – Check circulation in coolant circuit
		Exhaust system and air intake system	See symptom C, exhaust system and air intake system
		Burner unit	See symptom C, burner unit
E	Irregular combustion noise	DP42 fuel pump	See symptom B, fuel pump DP42
		Burner unit	See symptom C, burner unit
F	Excessive smoke from heater during heating phase	DP42 fuel pump	See symptom B, fuel pump DP42
		Fuel connection	See symptom C, fuel connection
		Exhaust system and air intake system	See symptom C, exhaust system and air intake system
		Burner unit	See symptom C, burner unit

Symptom		Possible cause	Possible troubleshooting
G	Heater running, vehicle interior cold	Vehicle blower	– Check fuse F1 – Check coolant temperature (K5 switches at approx. 30 °C) – Check switching signal at relay K5, ground at Pin 85 and positive at Pin 86, (audible, see wiring diagram in Thermo Pro 50 Eco installation instructions) – Check coolant temperature of-signal line (green/white, gr/w), Pin 86 on K5
H	Excessive smoke from heater during after-running period	Exhaust system and air intake system	See symptom C, exhaust system and air intake system
I	Smell of fuel	Fuel connection	See symptom C, fuel connection
		DP42 fuel pump	See symptom B, fuel pump DP42
		Glow plug	See symptom A, glow plug
J	Smell of exhaust in vehicle interior	Exhaust system and air intake system	See symptom C, exhaust system and air intake system
K	Coolant loss	Coolant pump U4847 Econ Coolant pump UP500	See symptom B, coolant pump
		Coolant circuit	See symptom D, coolant circuit

6 Function checks

6.1 General information

This section describes the checks conducted on the heater and its components in the installed and uninstalled state.

CAUTION

Even if you use the timer, the heater must not be operated in enclosed spaces such as garages and workshops without an emissions extraction system.

6.2 Function checks in the vehicle

1. Switch vehicle blower on, set temperature control to "warm".
2. Make sure that the coolant circuit and fuel system have been carefully bled according to the vehicle manufacturer's regulations.
3. Switch heater on with control element.
When the heater is switched on, the coolant pump and the combustion air fan unit operate. This can be checked by listening. The vehicle blower is switched on via the heater when the coolant temperature has reached approx. 30 °C.
4. Run heater in heating mode. Check heating effect on the outflow nozzles of the vehicle blower.
5. After the functional test, switch the heater off with the control element.

The after-running period lasts a maximum of 175 s 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 s, for active cooling of the heater and operation of the coolant pump. It is then shut down completely.

NOTE

The heating effect depends on several factors: For assessment, the external temperature, the vehicle type, the engine temperature, the type of integration into the coolant system of the vehicle, the quantity of the coolant to be heated and the time since the start. The coolant temperature measured by the heater and the coolant or engine temperature displayed by the vehicle may differ significantly, as the individual sensors are installed in different places and may evaluate different temperatures.

7 Wiring diagrams

The wiring diagrams show the possible connections for the heaters.

System wiring diagram for Thermo Pro 50 Eco and control element:

Figure	Wiring diagram
Fig. 11	MultiControl or SmartControl (with battery disconnecter, W-bus operation)
Fig. 12	MultiControl or SmartControl (analogue operation)
Fig. 13	UniControl
Fig. 14	ThermoCall TC4
Fig. 15	SmartControl (ADR)
Fig. 16	On/off switch (ADR)

Legend to wiring diagrams.

Table 1 Cable cross-sections

	Length < 7.5 m	Length 7.5 - 15 m
————	0.75 mm ²	1.0 mm ²
- - - - -	1.0 mm ²	1.5 mm ²
—————	1.5 mm ²	2.5 mm ²
=====	2.5 mm ²	4.0 mm ²
=====	4.0 mm ²	6.0 mm ²

Table 2 Cable colours

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

The information on cable lengths and cross-sections only apply to cables which comply with DIN EN 13602.

Table 3 Legend to wiring diagrams (Section 1 of 2)

No.	Description	Remarks
A1	Heater	Thermo Pro 50 Eco
A2	Control unit	-
A4	ThermoCall	TC4 Entry or TC4 Advanced
A5	W-bus temperature sensor	Optional, for TC4 Advanced only
ATS	Exhaust gas temperature sensor	PT2000
B4	Room thermostat	Optional
BA	Function display (switch S4)	Light 0.15 W to max 2 W
BM	Burner motor	Combustion air fan unit
DP	Fuel pump	Fuel pump for heater
F1	Fuse 20A	Blade type fuse SAE J 1284
F2	Fuse 1A	Blade type fuse SAE J 1284
F3	Fuse 20A	Blade type fuse SAE J 1284
FZG	Vehicle blower	-
GS	Glow plug	-
H1	Symbol on display	-
H2	LED (green, blue, white, red)	Operation indicator, Ready indicator, ON indicator, fault list
H5	Bulb/LED	ON indicator, pumping device (max. 500 mA)

Table 3 Legend to wiring diagrams (Section 1 of 2)

No.	Description	Remarks
H8	LED (green) (in Item S9)	ON indicator, operating indicator
K5	Relay with free-wheeling diode	Vehicle blower
P	Smart- / MultiControl	(W-bus)
P1	SmartControl	(W-bus)
P2	UniControl	(W-bus)
S4	Switch	ON/OFF
S5	Switch	Auxiliary drive / pumping device
S6	Switch, 1 or 2-pin	Disconnecter
S7	Battery disconnecter (BTS)	Electronically controlled disconnecter (max. 500 mA)
S9	Pushbutton	ThermoCall TC4
S12	Pushbutton	External Quick Heating button (optional)
UEHS	Overheat sensor	Sensor on heat exchanger
UP	Coolant pump	-
V1 / V2	Diode	Min. 500 mA (optional, not included in wiring harness)
V3	Diode	For analogue Smart- / MultiControl connection (optional)
WTS	Coolant temperature sensor	Coolant temperature in coolant circuit
X1-X6	Plug connection	To Item A2
X7	Plug connection	To item UP
X10	Plug connection	W-Bus, Smart- / MultiControl connection, Telestart (12 V only), ThermoCall or diagnosis
X11	Plug connection	To item DP
X12	Plug connection	To item P or P1 or to A4
X15	Plug connection	W-bus temperature sensor connection
X16	Plug connection	To item A5 (optional)
X17	Plug connection	To Item A4
X20	4-pin plug connection	To item S4 or SmartControl/MultiControl connection, analogue
X21	4-pin plug connection	To Item A4
X31	10-pin plug connection	To Item P2
Y2	Solenoid valve / pump	Auxiliary drive / pumping device

Table 4 Legend for comments

No.	Description	Remarks
①	Temperature codes	D+ signal (see Installation Instructions, "Setting the control temperatures for the heater")
③	Fuse for vehicle fan	Fuse in vehicle
④	Vehicle blower switch	-
⑤	Butt connector for fuel pump	Crimp and shrink-fit on installation
⑥	Wiring harness	-
⑨	Optional extension available	(connection to plug connection X10)
⑩	Connection	MultiControl / SmartControl / UniControl, Telestart (12 V only), ThermoCall or diagnostics via W-Bus
⑪	Connection	MultiControl / SmartControl / UniControl or switch (analogue)
⑰	Positive from terminal 15/75 to connection 10:	Continuous heating mode is possible in connection with quick heating function provided the ignition is switched on.
⑱	When connecting to terminal 30:	Continuous heating mode is possible with ignition switched off.

Table 5 Legend for X1 connector, 10-pin

No.	Description	Remarks
1	Input, switch-on signal (ON/OFF)	-
2	W-bus	-
3	Terminal D+	-
4	Auxiliary drive	-
5	Output, fuel pump	-
6	Output, vehicle fan relay	-
7	Output, battery disconnecter afterrunning signal	-
8	Operating indicator/error code output	-
9	Not used	-
10	Not used	-

Table 6 Legend for X31 connector, 10-pin

No.	Description	Remarks
1	Connector 31 (Vehicle)	Battery -
2	W-bus	Data link for heater
3	Switch output	Analogue switch-on signal for the heater
4	Switch output	Button, analogue switch-on by a temporary earth
5	Connector 30 (Vehicle)	Battery +
6	Setpoint sensor -	Temperature set point (only for analogue air heaters)
7	Setpoint sensor +	-
8	-	-
9	Connector 58 (Vehicle)	Backlight (dashboard light)
10	Connector 15 (Vehicle)	Ignition positive

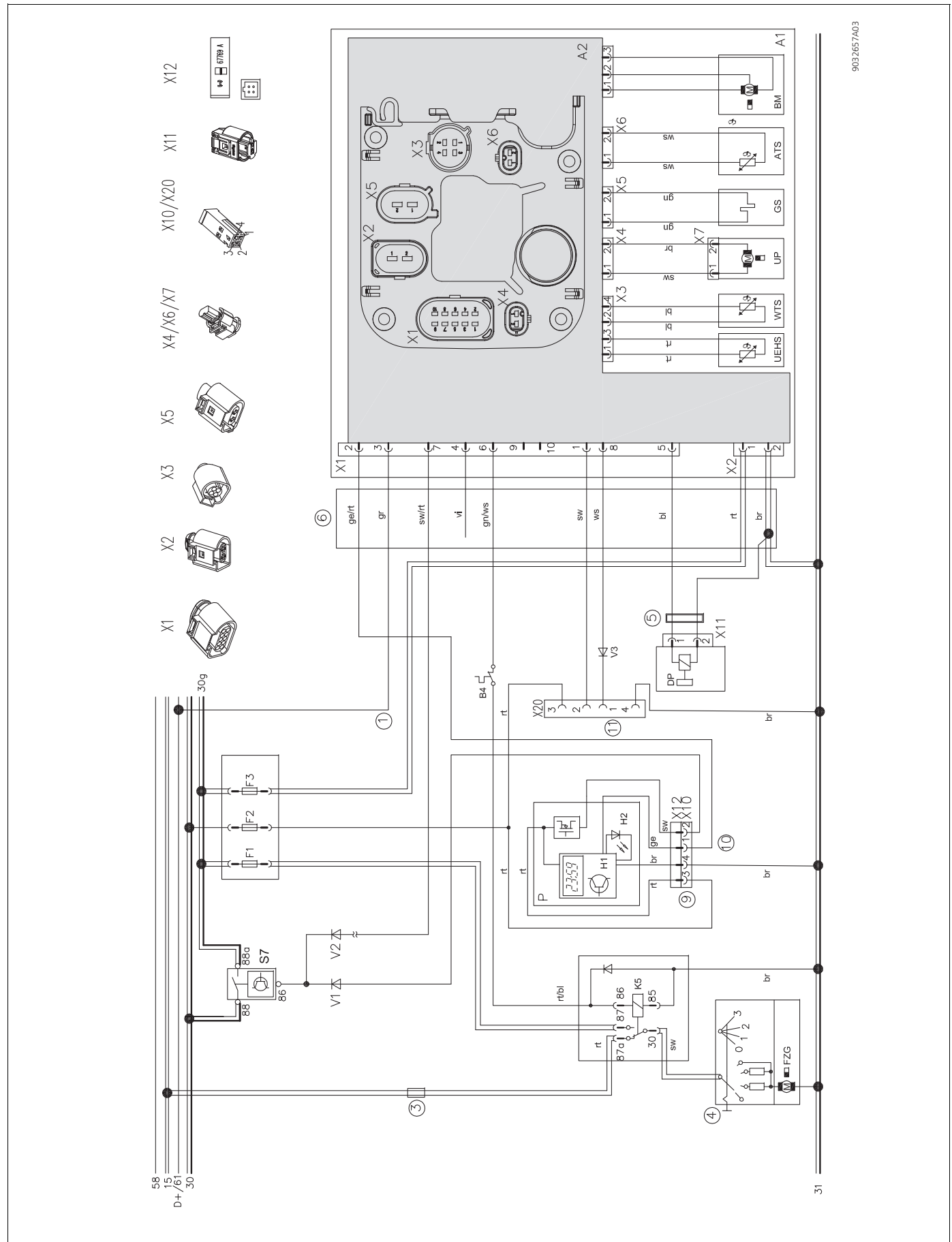


Fig. 11 MultiControl or SmartControl (with battery disconnect, W-bus operation)

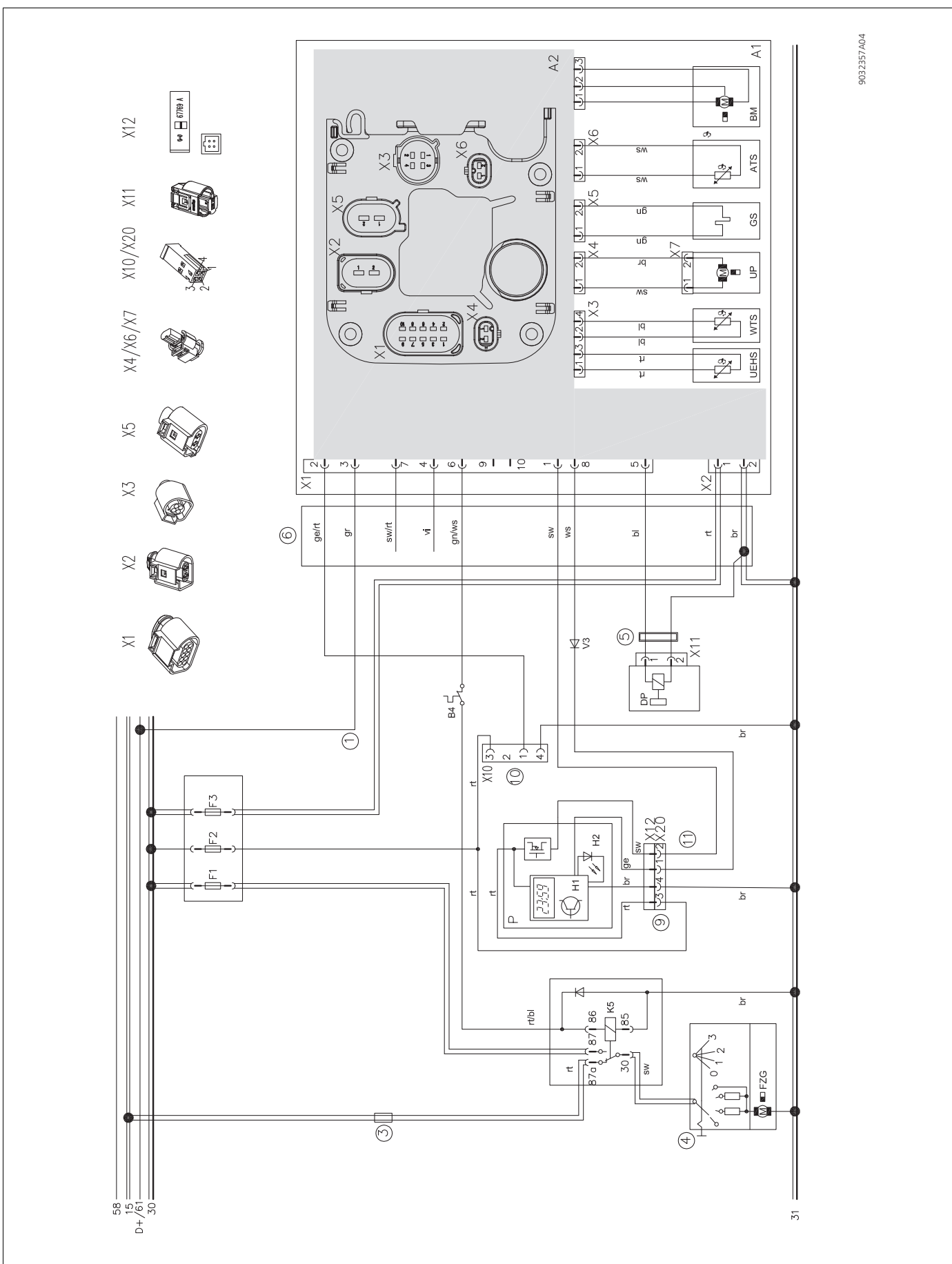
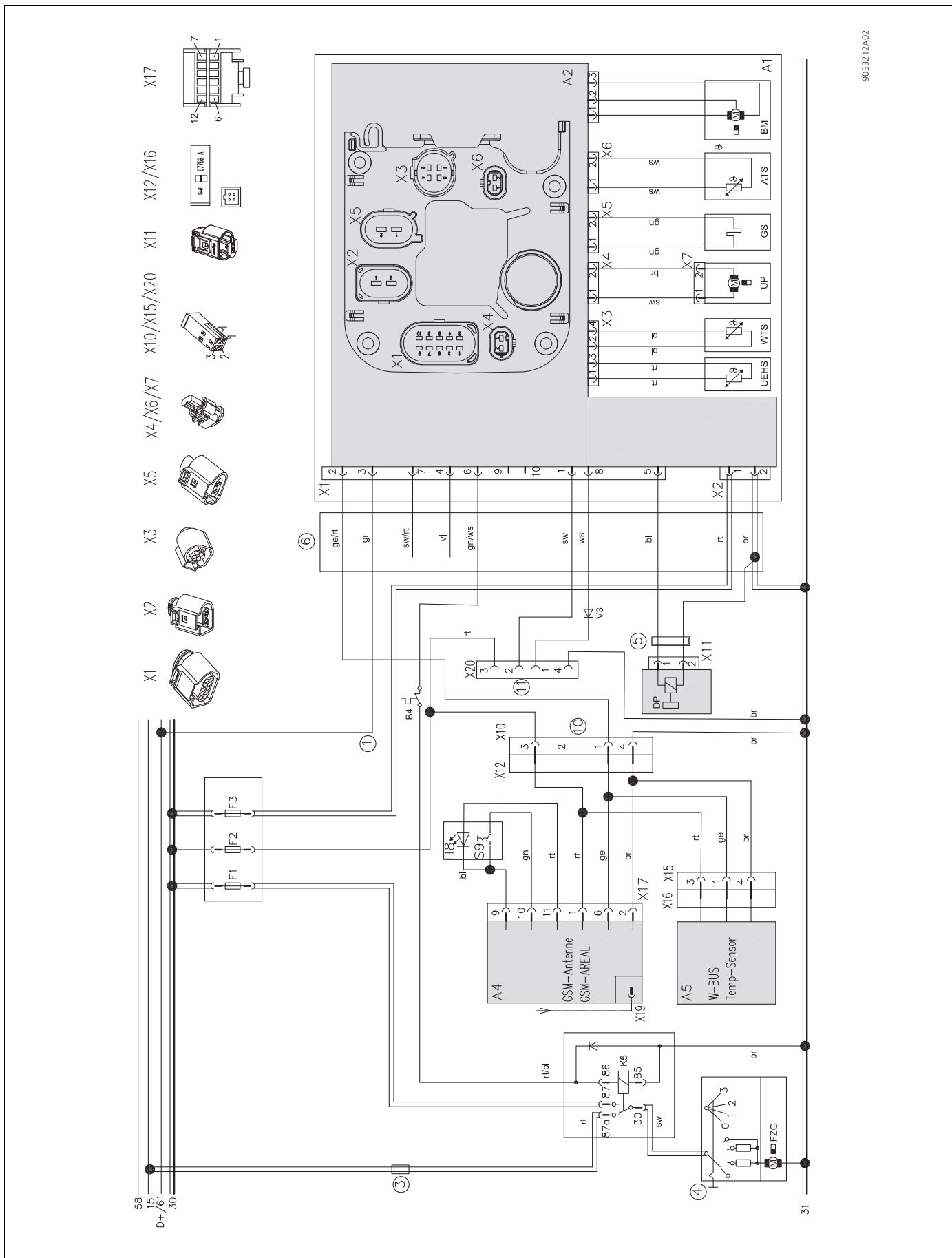


Fig. 12 MultiControl or SmartControl (analogue operation)



Fig



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Fig. 14 ThermoCall TC4

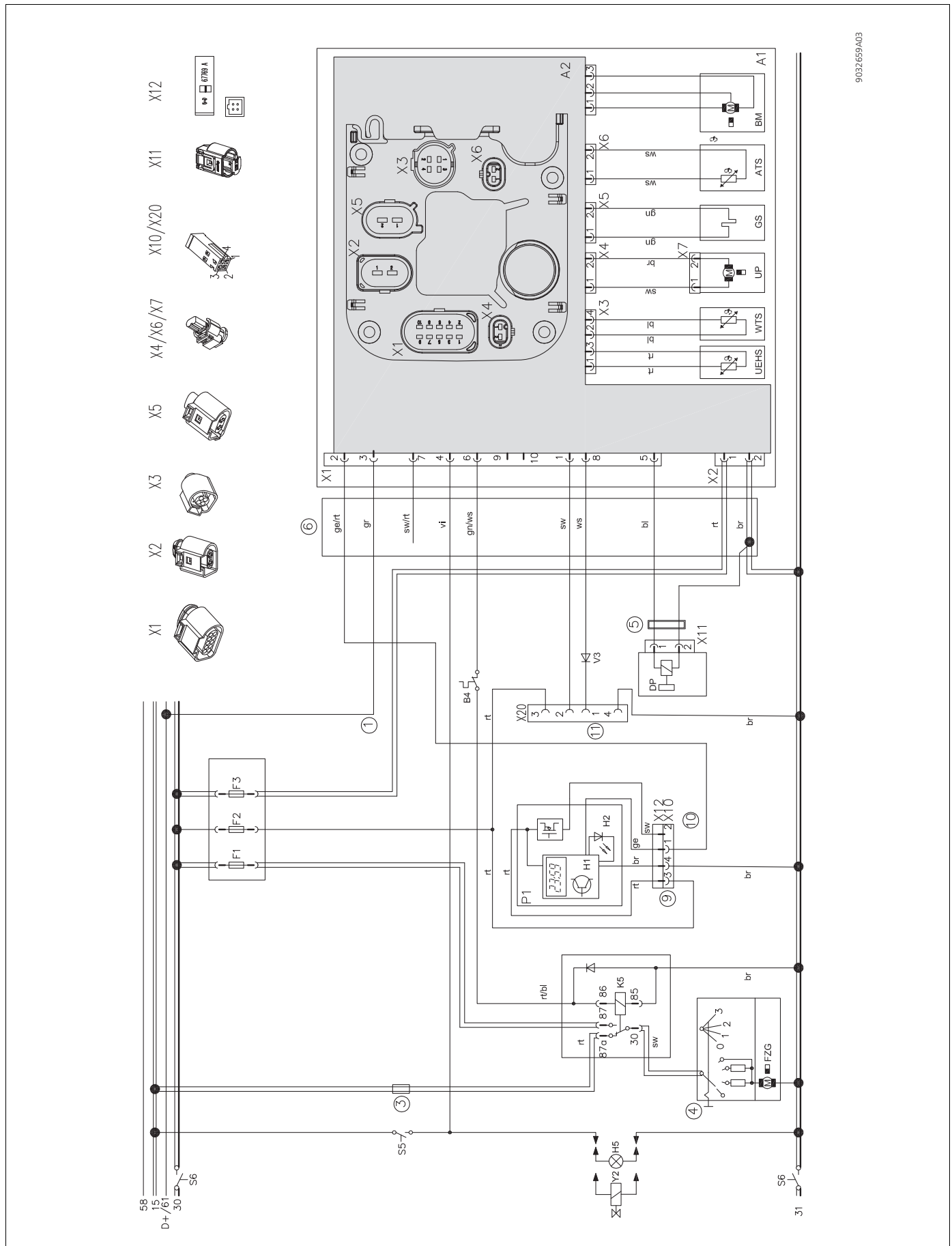
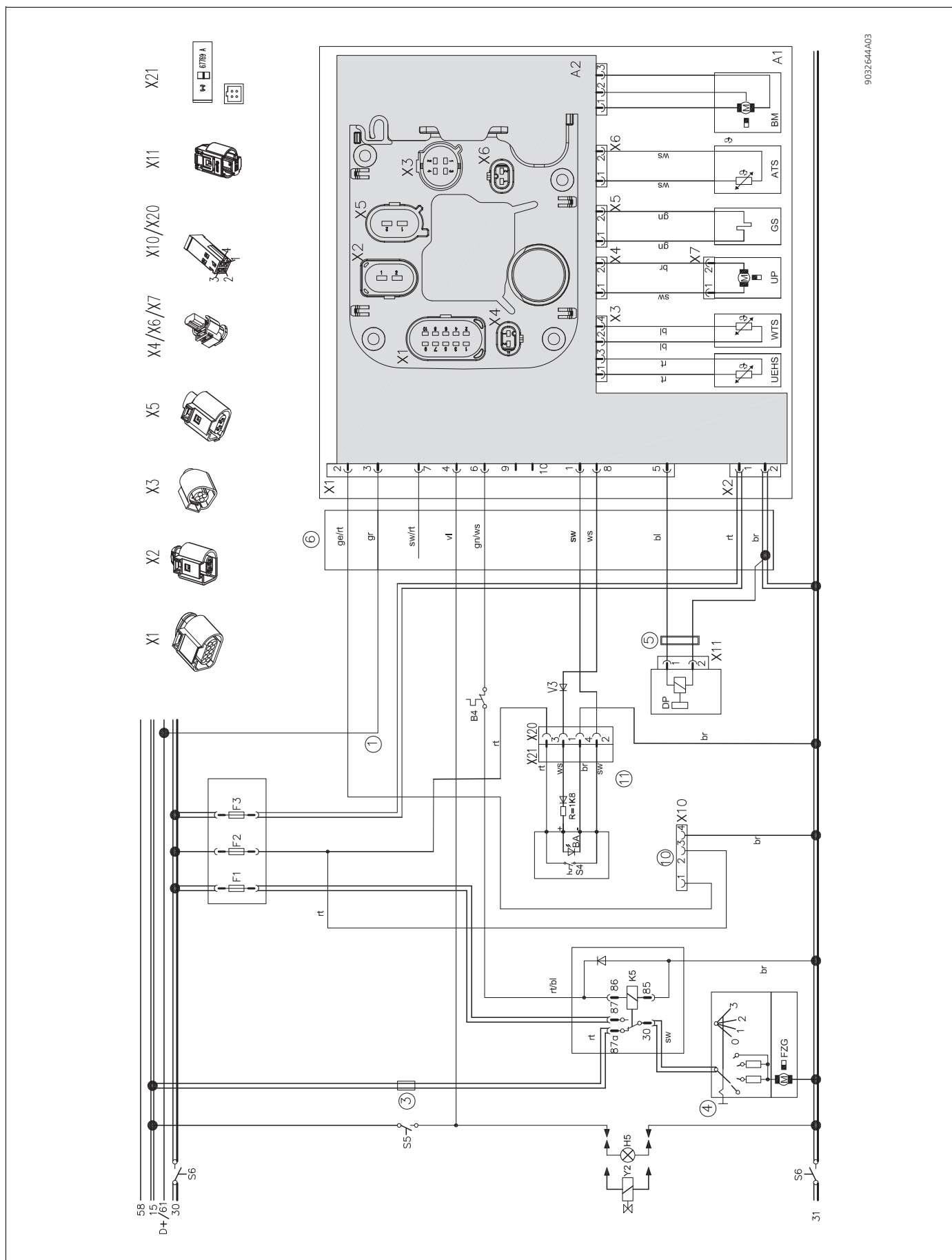


Fig. 15 SmartControl (ADR)



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Fig. 16 On/off switch (ADR)

8 Servicing

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

8.1 Working on the heater

Always disconnect the power supply before carrying out any work on the heater (remove fuses F1, F2 and F3, see wiring diagrams section 7).

To prevent damage to components, the power supply of the heater must not be interrupted during operation or after-running.

The heater must be completely removed when carrying out repair work.

Once the heater and all coolant-carrying components have been installed, the entire coolant system should be filled, bled and checked for leaks at the specified system pressure.

Refer to the general installation instructions and the vehicle-specific installation instructions for repairs that require the heater to be installed in a different position.

8.2 Working on the vehicle

ATTENTION

With the operating voltage applied and the heater is switched off, on no account must a temperature of 125 °C be exceeded in the vicinity of the heater (e.g. vehicle paint-work).

8.3 CO₂ setting

NOTE

After repairing the heater and replacing the fuel pump it is necessary to check the CO₂ setting.

ATTENTION

After replacing the combustion air fan unit with control unit, the CO₂ value should be checked and re-adjusted if necessary.

The CO₂ setting is carried out with Webasto Thermo Test PC diagnostics.

The heater is set in the factory with a CO₂ value for ideal operation at heights of up to 2,800m above sea level. Continuous operation at more than 2,800 m above NHN may lead to a high level of production of smoke and soot.

NOTE

The CO₂ value is corrected using the Webasto Thermo Test PC diagnostics. The CO₂ measurement and adjustment must be carried out at maximum heating capacity. The CO₂ content is measured approx. 20 mm in front of the exhaust gas outlet inside the exhaust pipe with a CO₂ tester (e.g. from MSI).

The following table shows the rated CO₂ setting in combustion mode full load in accordance with the geodetic height at which the setting is carried out.

Table 7 CO₂ setting values

Height [m above sea level]	Rated CO ₂ setting at 20°C ambient temperature [vol.-%]
	5 kW
0	9.4
500	10.2
1000	10.7
1500	11.5

8.4 Coolant pump

The power consumption of the U4847 Econ 24 V is approx. 18 W and a rated volume flow of 500 l/h at a counter-pressure of 140 mbar.

Electrical test of the coolant pump

Internal resistance of the coolant pump: $20 \pm 1 \text{ k}\Omega$

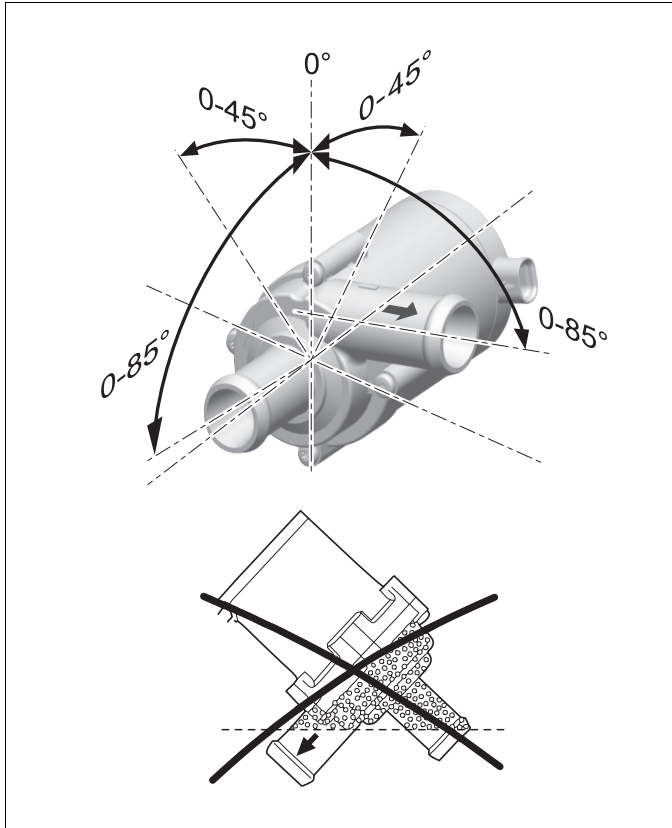


Fig. 17 Installation positions coolant pump U4847 Econ 24 V

The power consumption of the UP500 is approx. 12 W and a rated volume flow of 500 l/h at a counter-pressure of 160 mbar.

Electrical test of the coolant pump

Internal resistance of the coolant pump: $20 \pm 1 \text{ k}\Omega$

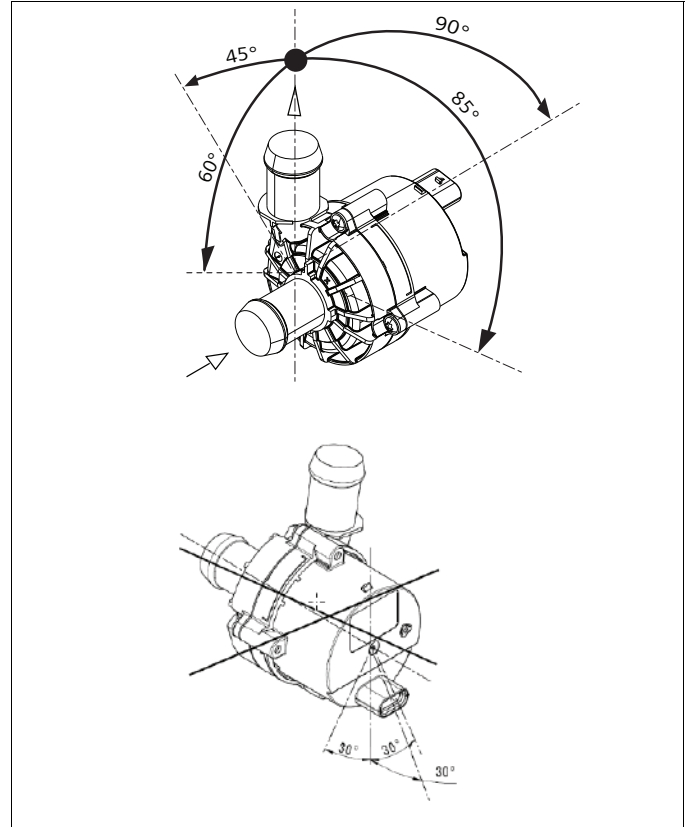


Fig. 17 Installation positions of coolant pump UP500

NOTE

Ensure the direction of flow of the coolant pump (arrow marking) is correct with respect to the vehicle coolant circuit. The installation position of the coolant pump must be selected such that the coolant pump can perform automatic bleeding. The air volume contained in the coolant pump must be able to escape upwards independently via the connection pieces. Incorrect installation may lead to malfunctions of the coolant pump operation.

NOTE

Pumps that have been dropped are not to be re-used. A fall of the pump may lead to external damage. External damage may lead to leakages of the hose connection pieces. Possible cracks in the plastic part may in extreme cases lead to a leakage between the pump compartment or the environment of the electronic area. This may result in operational failures of the pump due to the ingress of coolant into the electronic area.

8.5 Fuel pump DP42

Check of the installation positions and installation conditions of the fuel pump in accordance with the general installation instructions for the Thermo Pro 50 Eco. The Thermo Pro 50 Eco heater must only be operated using the fuel pump DP42.

Electrical test of the fuel pump

Coil resistance of the fuel pump DP42:

5.20 ohm $\pm$ 5% at 22 $\pm$ 5°C, test current: < 1 mA.

Perform the function **Component test of fuel pump** using Webasto Thermo Test PC diagnostics.

Setting	7 Hz / 60 secs	7 Hz / 240 secs
Diesel	13.4 ml	53.6 ml

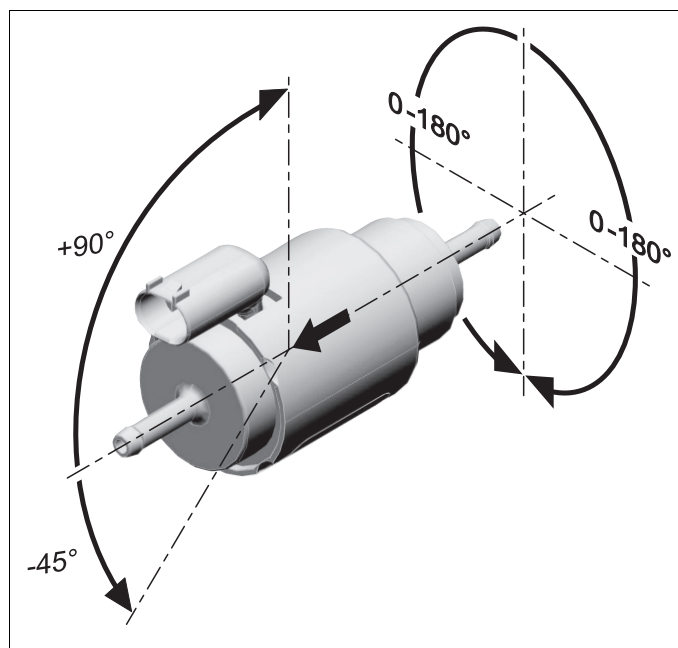


Fig. 18 Installation positions of fuel pump DP42

8.6 Checks

The following service work should be carried out at least every two years to maintain the operational reliability of the heater:

- Read out fault code memory.
- Check the electrical connections for contact corrosion and firm seating.
- Checking exhaust gas and combustion air line for damage and ensuring they are clear.
- Check fuel line for leaks.
- Check coolant circuit and coolant pump for leaks.
- Check hoses for cracks.
- Change the fuel filter if fitted.
- Check heater operation as described under section 6.

8.7 Removing and installing heater

CAUTION

Even if you use the timer, the heater must not be operated in enclosed spaces such as garages and workshops without an emissions extraction system.

8.7.1 Removal

- 1 Interrupt power supply of the heater by removing fuses F1, F2 and F3.
- 2 Detach electric plug connections on heater.

NOTE

Protect all open plugs and connectors from moisture and dirt.

- 3 Depressurise coolant system.
- 4 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.
- 5 Release and detach combustion air line and exhaust pipe at heater.
- 6 Release hose clips, detach fuel line. Close off fuel connection piece at heater and fuel line with suitable plugs or similar.
- 7 Detach heater from the bracket, if necessary remove holder from the chassis.

8.7.2 Installation

- 1 Place heater on the bracket in the specified installation position and tighten heater screws with 8 Nm.

NOTE

The screw is to be inserted carefully by hand into the available thread and screwed in.

- 2 Connect fuel line and secure with hose clip.
- 3 Connect coolant hoses and secure with hose clips.

ATTENTION

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

- 4 Reestablish all electrical connections.
- 5 Connect combustion air line and exhaust pipe.
- 6 Re-insert fuses F1, F2 and F3.
- 7 Bleed coolant circuit.
- 8 Bleed fuel system of vehicle if necessary.

8.8 Restarting

Carefully bleed the coolant circuit and the fuel supply system after installing the heater. Observe the vehicle manufacturer's specifications.
During the test run, check all coolant and fuel connections for leaks and tight fit. If the heater encounters a fault during operation, perform the troubleshooting procedure to locate the malfunction (see section 5).

NOTE

To assist bleeding of the coolant circuit, the coolant pump can be operated using the "Component test" function in the Webasto Thermo Test PC diagnostics.

NOTE

The heater can be put into operation with Webasto Thermo Test PC diagnostics. When the fuel line is completely empty, it should be filled by means of the Webasto Thermo Test PC diagnostics.

9 Repair

NOTE

Seals should generally be renewed before reassembling the heater.

9.1 Dismantling and assembling the heater

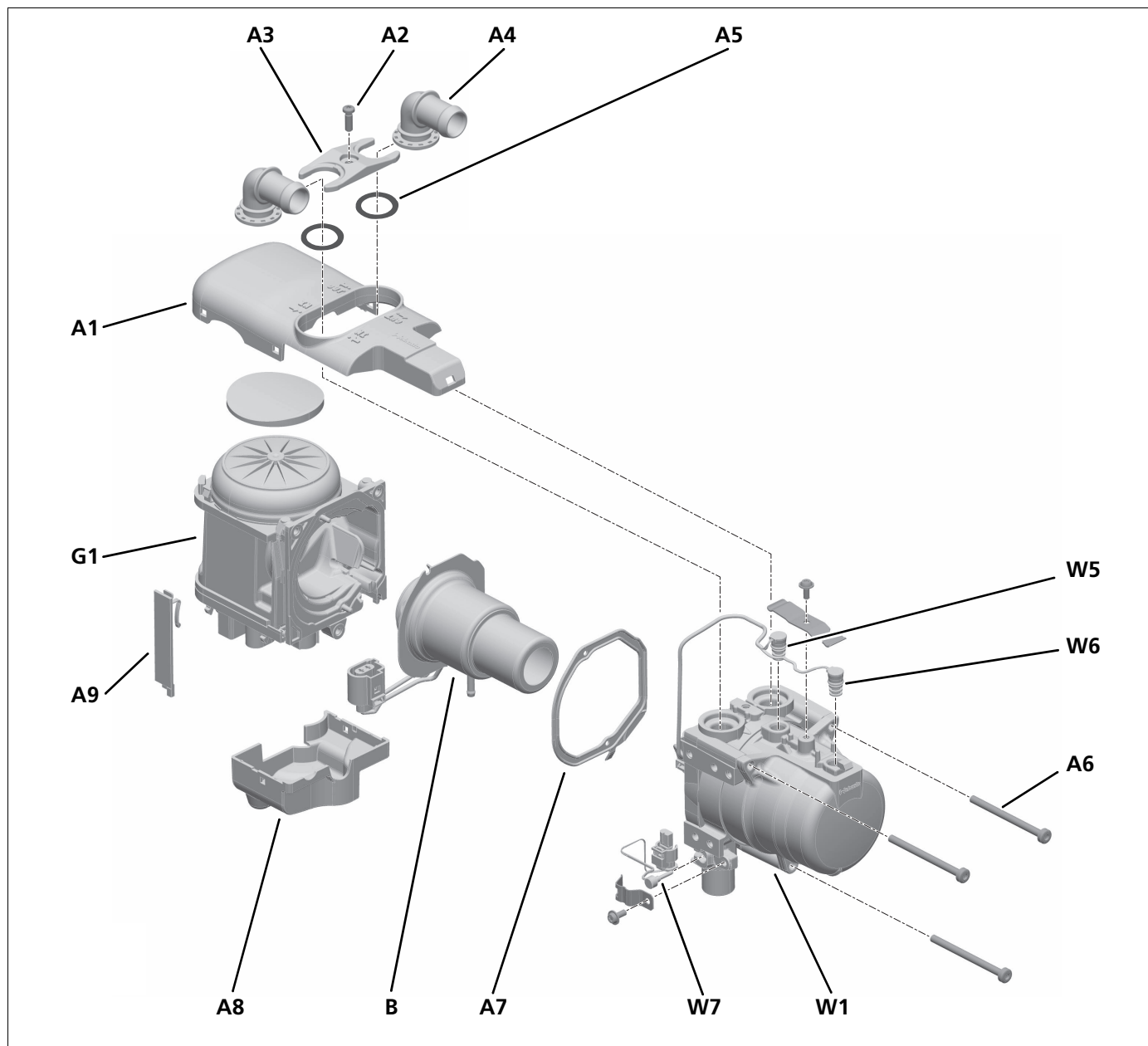


Fig. 19 Component diagram heater Thermo Pro 50 Eco

A1	Heater cover	A7	Seal	W1	Heat exchanger
A2	Bolt	A8	Connector cover	W5/W6	Sensors
A3	Retaining plate	A9	Cable cover	W7	Exhaust gas temperature sensor
A4	Water connection piece	B	Burner unit		
A5	O-ring	G1	Combustion air fan unit with control unit		
A6	Bolt				

9.1.1 Disassemble heater

1. Undo screw (A2, Fig. 19) and remove water connection piece (A4) with retainer plate (A3) and O-ring (A5).
 2. Detach heater cover (A1) on the side latches of the combustion air fan unit (G1) with a screwdriver. Then remove the heater cover (A1) from the front of the heater.
 3. Remove the cable cover (A9) from the combustion air fan unit (G1) .
 4. Detach connector cover (A8) on the side facing away from the fuel connection piece by using a screwdriver on the side latches, and remove from the heater.
 5. Detach the latch of the connectors and disconnect the connectors from the control unit.
 6. To replace faulty temperature sensors (W5 and W6): see section 9.6.
 7. Replace defective exhaust gas temperature sensor (W7), see section 9.7.
 8. Undo screws (A6) and remove heat exchanger (W1) from the combustion air fan unit (G1) in axial direction of the screw connection.
 9. Remove burner unit (B), see section 9.2.1.
8. Wet new O-rings (A5) and insert into the heat exchanger (W1) and attach the water connection pieces (A4) and the retaining plate (A3) with the screw (A2). Tightening torque 7.5 ± 0.7 Nm.

NOTE

The sensors may be damaged when removed. Sensors which have been removed must not be re-installed. Only new sensors may be used.

9.1.2 Assemble heater

1. For assembly of temperature sensors (W5/W6): see section 9.6.3.
2. For assembly of the exhaust gas temperature sensor (W7), see section 9.7.2.
3. Assembly of burner unit (B), see section 9.2.2.
4. Clean interior and exterior of heat exchanger (W1) and mount on the fan. 3 Tighten screws (A6) to 7 ± 0.7 Nm.
5. Insert cable into the cable conduit, see Fig. 37.
6. Place cable cover (A9) onto the combustion air fan unit (G1).
7. Insert heater cover (A1) on the heat exchanger (W1) into the heater and lock into place in the locking lugs of the combustion air fan unit (G1).

9.2 Burner unit

9.2.1 Disassembly burner unit

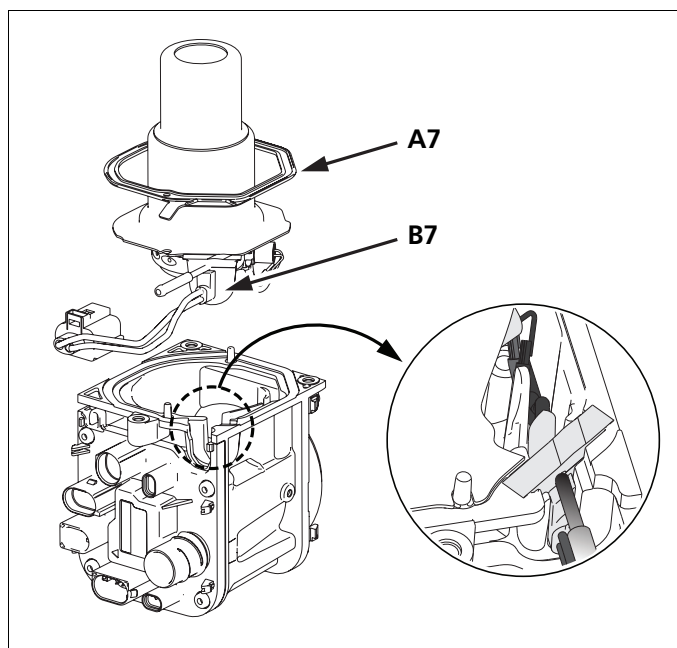


Fig. 20 Burner unit and combustion air fan unit

Dismantle the heater as described in section 9.1.1 up to point 8.. The connectors are disconnected. Set the fan down with the burner unit positioned vertically.

1. Remove seal (A7).
2. Push the bush (B7) out of the combustion air fan unit (G1) with slight pressure on the fuel pipe (B5) and lift up the burner unit (B) vertically.

9.2.2 Assembling the burner unit

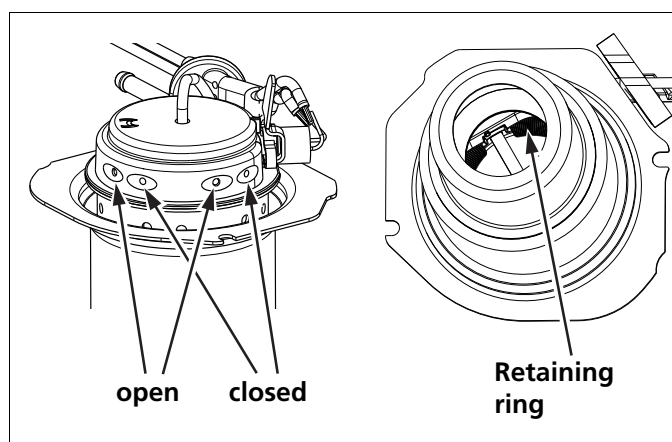


Fig. 21 Burner unit

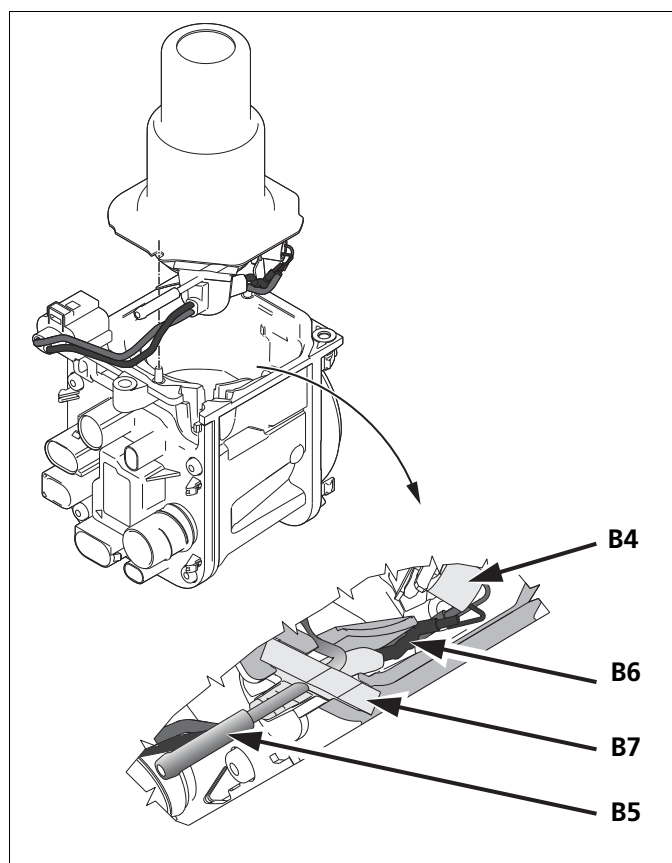


Fig. 22 Detailed diagram of cable routing glow plug

1. Pre-position burner unit with bush (B7) in the combustion air fan unit (G1). On assembly, ensure that the glow plug cable (B6) and the bush (B7) are inserted in the guide provided and the groove of the combustion air blower unit (G1) (see Fig. 22). Push the bush (B7) into the groove provided until it completely fills the installation space.

2. Place the seal (A7) with the flat side facing the combustion air fan unit (G1) on the positioning pins of the combustion air fan unit (G1).
3. Then continue with assembly of the heat exchanger (W1) as described in section 9.1.2.

9.3 Glow plug

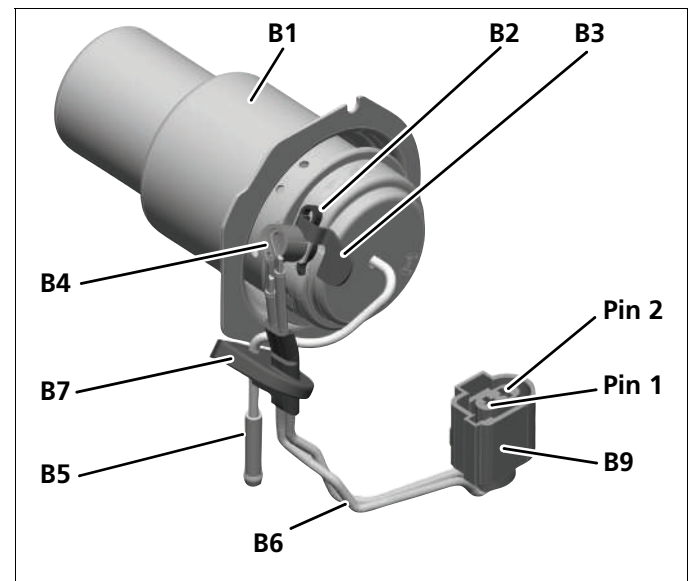


Fig. 23 Burner unit with glow plug

9.3.1 Electrical test of glow plug

The cold resistance is to be tested by connecting contacts 1 and 2 of the glow plug connector to a multimeter.

Cold resistance at 22 ± 5 °C: 0.780 ± 0.110 Ohms.

Short-circuit test when installed: connect contact 1 of the connector to the combustion air fan unit.

Short-circuit resistance: < 0.500 Ohms.

NOTE

Measurement is to be carried out with a multimeter in accordance with the four conductor measuring principle. In order to measure the cold resistance, the glow plug is to be brought to room temperature.

9.3.2 Disassembly glow plug

NOTE

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

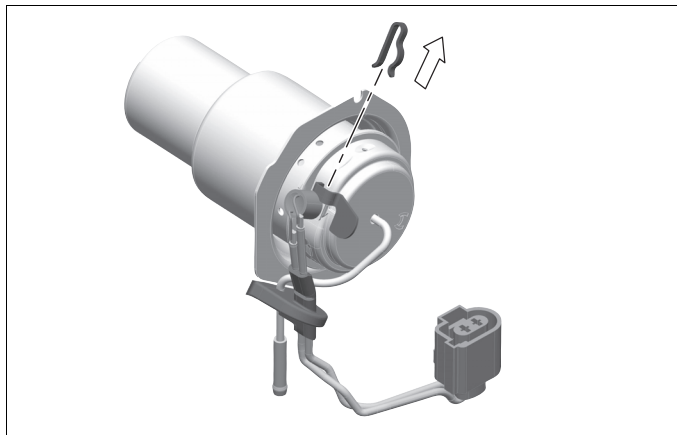


Fig. 24 Disassemble spring clip

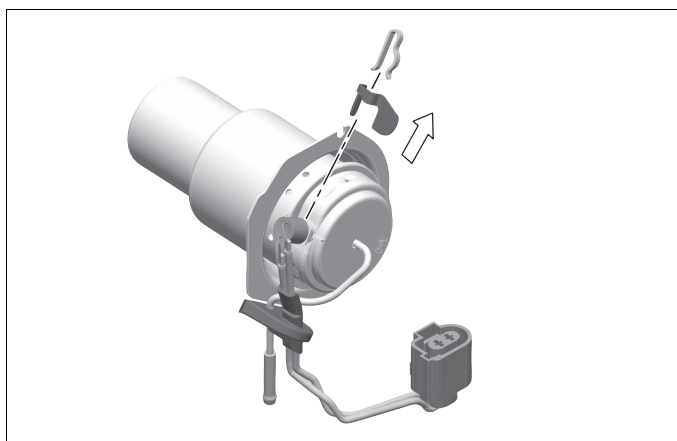


Fig. 25 Disassemble cooling flag

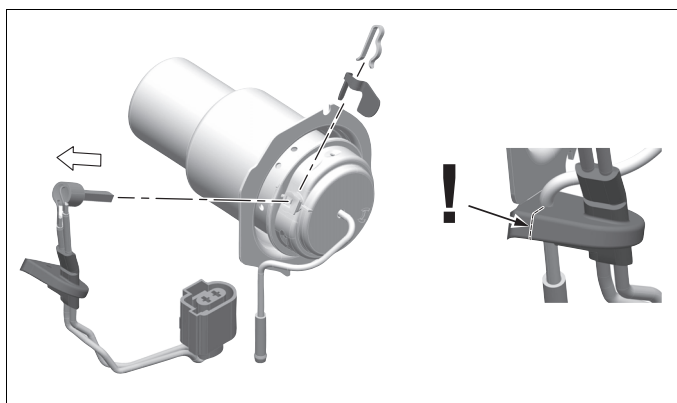


Fig. 26 Disassemble glow plug

9.3.3 Assembly glow plug

ATTENTION

On assembly, only a new glow plug must be used. 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). On assembly, the glow plug must not be twisted or tilted and must be pushed as far as it will go into the guide (risk of breakage). On assembly of the burner unit, the cable must be routed in such a way that it lies in the groove provided. See also section 9.2.2 and Fig. 22.

1. Position combustion pipe horizontally with evaporator holder towards the rear (see Fig. 27).
2. Push the glow plug (B4) with straight cable (B6) into the locating hole of the glow plug mandrel (B8) as far as it will go.

ATTENTION

Fit glow plug (B4) with the groove (B11, below the ceramic) in the direction of the combustion pipe (see detail Fig. 31).

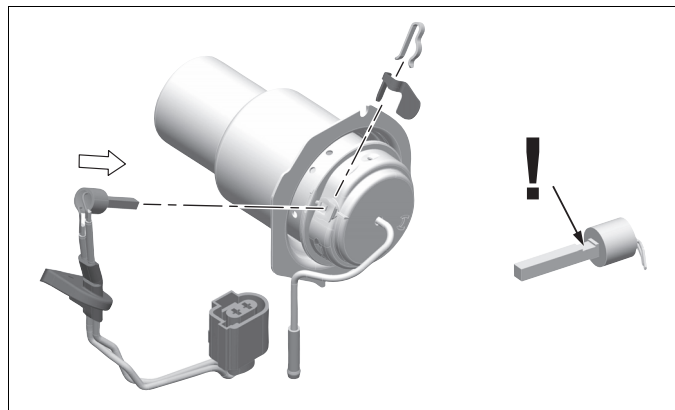


Fig. 27 Fit glow plug

3. Hold the cooling flag (B3) in the groove (B11) with your hand on the glow plug mandrel (B8) (see Fig. 28 and Fig. 31).

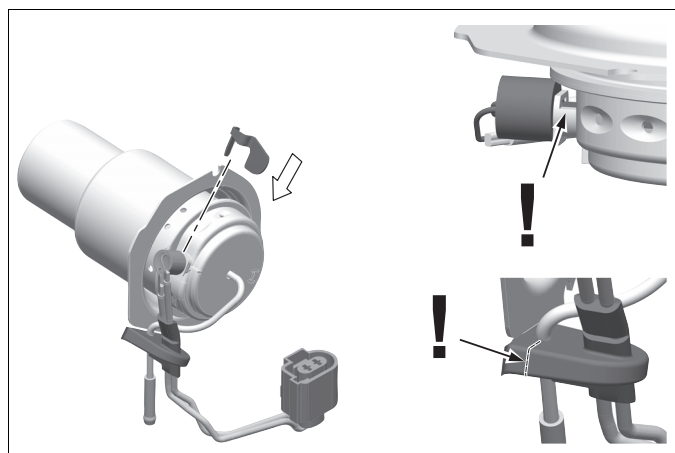


Fig. 28 Fit cooling flag

4. Push spring clip (B2) over cooling flag (B3) and glow plug mandrel (B8) (for orientation of spring clip B2, see Fig. 31).

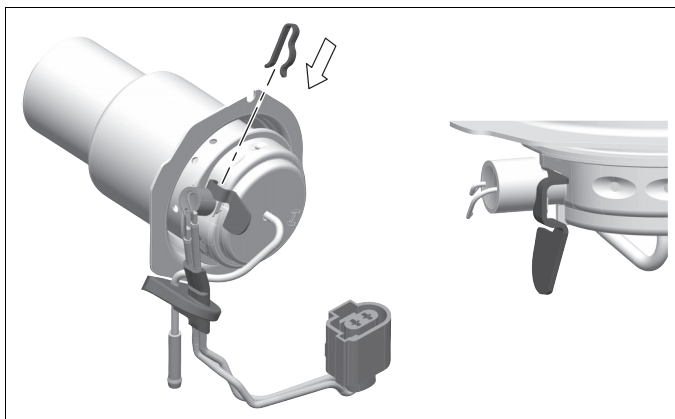


Fig. 29 Fit spring clip

ATTENTION

The glow plug (B4) must be fitted onto the glow plug mandrel as far as it will go.

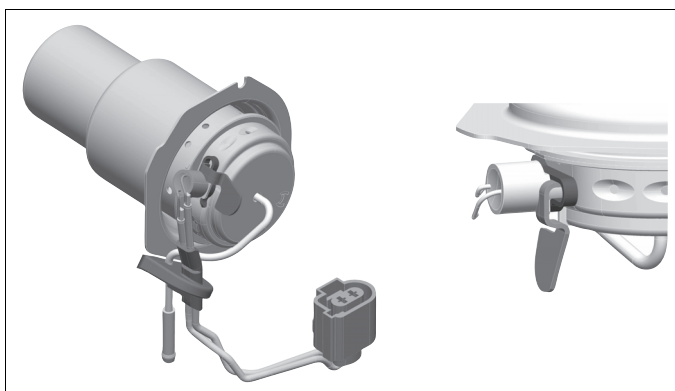


Fig. 30 Glow plug correctly mounted

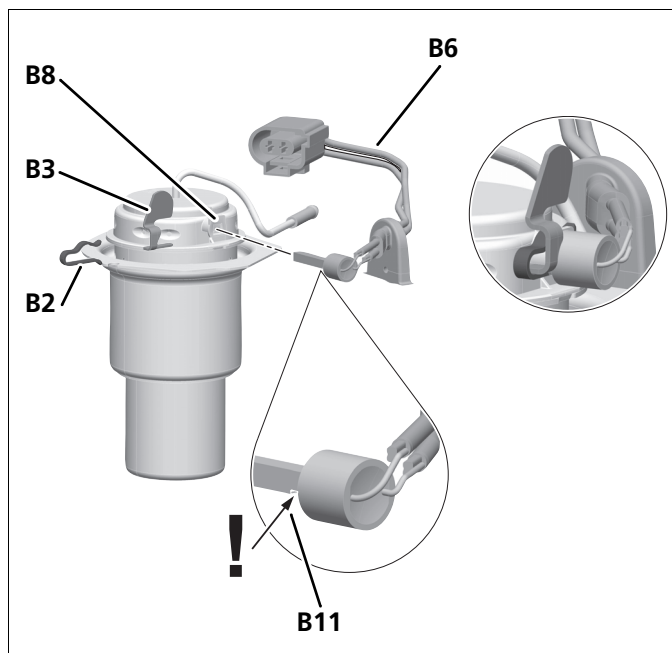


Fig. 31 Assembly glow plug

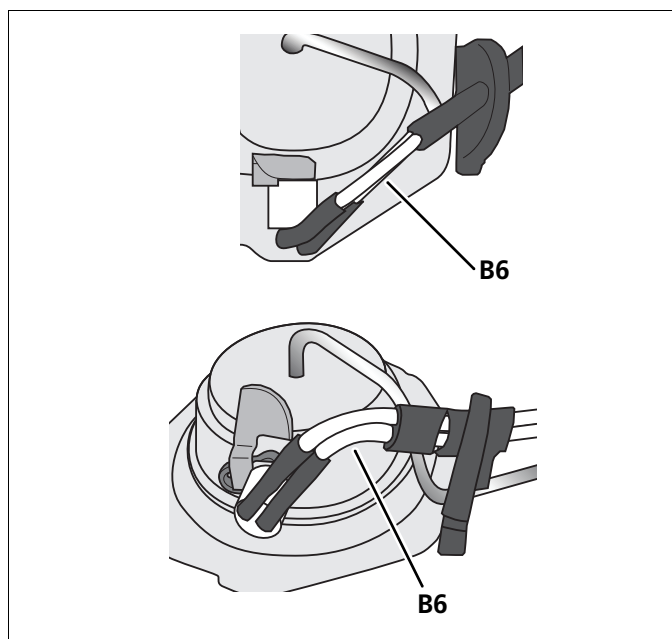


Fig. 32 Laying of glow plug cable with slight bend

5. Lay the glow plug cable (B6) with a slight bend, as shown in Fig. 33, and push the bush (B7) onto the fuel pipe (B5).

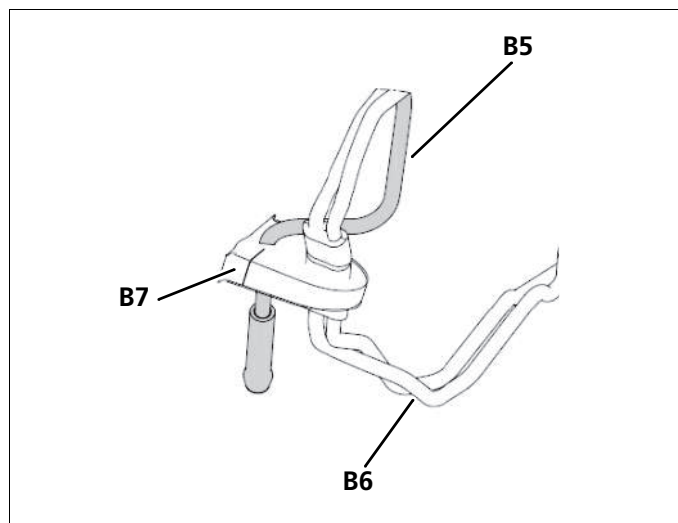


Fig. 33 Glow plug cable, bush and fuel pipe

9.4 Combustion air fan unit and control unit

The combustion air fan unit and the control unit must not be further disassembled. Spare part assembly combustion air fan unit.

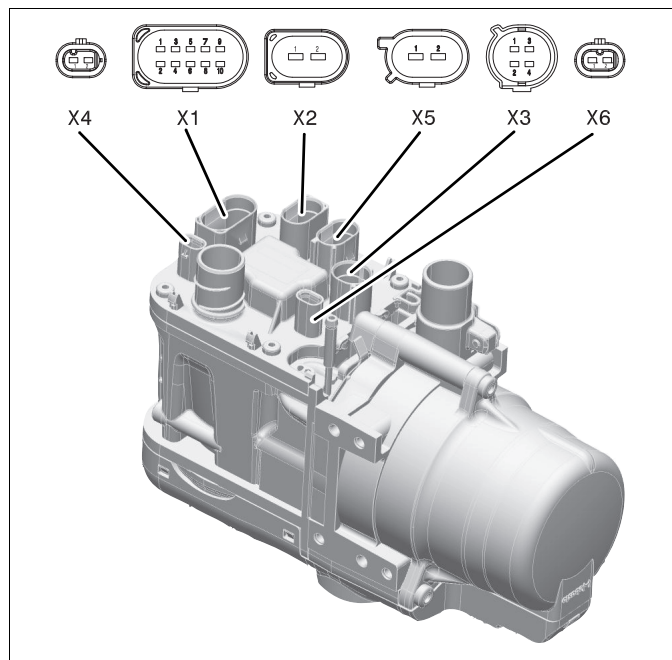


Fig. 34 Combustion air fan unit with connector diagram (the version shown is the one with the maximum pin assignment)

- X1 = Connector heater control (10-pin)
- X2 = Connector power supply to vehicle (2-pole)
Contact 1: Power supply terminal 30 (fuse)
Contact 2: Earth connection
- X3 = Connector temperature sensors (4-pin)
- X4 = Double connector coolant pump (2-pin)
- X5 = Connector glow plug (2-pin)
- X6 = Connector for exhaust gas temperature sensor (2-pin)

NOTE

When replacing the combustion air fan unit, the CO₂ setting must be checked in accordance with section 8.3.

ATTENTION

Any existing dummy connectors are to be re-fitted on the new control unit.

9.5 Heat exchanger

The heat exchanger is to be replaced as a complete assembly.

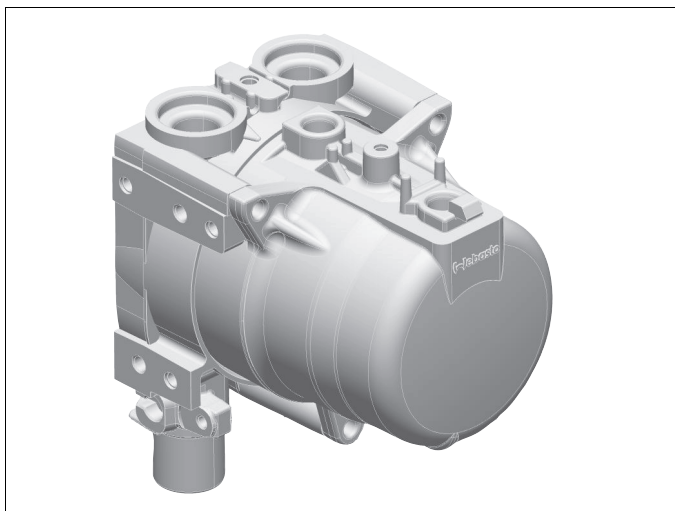


Fig. 35 Heat exchanger

ATTENTION

The heat exchanger must not be disassembled into its individual parts.

NOTE

Water connection pieces with retaining plates are to be checked for damage and replaced if necessary.
The units temperature sensors, exhaust gas temperature sensor, seals and screws for water connection pieces are to be replaced as per sections 9.6.3, 9.7.2 and 9.8.1.

ATTENTION

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

9.6 Temperature sensor / overheating sensor

9.6.1 Inspection of the sensors

NOTE

The sensors must not be disassembled for inspection.

When checking the cold resistance, a distinction is to be made between the two versions of sensors W5 and W6 (see Fig. 37). For this purpose, the contacts of connector X3 of the sensors is contacted with a multimeter and the resistance measured (test current: < 1 mA).

TableResistance values of sensors

Sensors	Contacts on connectors X3	Cold resistance at 22 ± 5 °C [Ohms]	
		min.	max.
W5	2 and 4	2,296	5,047
W6	1 and 3	30	250

In addition, the short-circuit to earth to the metal housing, pinching of lines and deformations of the plastic cap of the sensors are to be checked.

9.6.2 Disassembly of temperature sensor / overheating sensor

For disassembly of heater covers see section 9.1.1. Pull connector X3 of the sensors out of the control unit. Ensure that the connector lock is released. Undo screw (W3, see Fig. 4), remove retaining spring (W4) and pull sensors (W5 and W6) out of the heat exchanger (W1).

NOTE

The sealing O-ring of the sensor can get stuck on the housing after some time in operation, and as a result prevent disassembly. Sensors which have been disassembled must not be re-used but must be replaced by new ones.

9.6.3 Assembly of the temperature sensor / overheating sensor

NOTE

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

1.

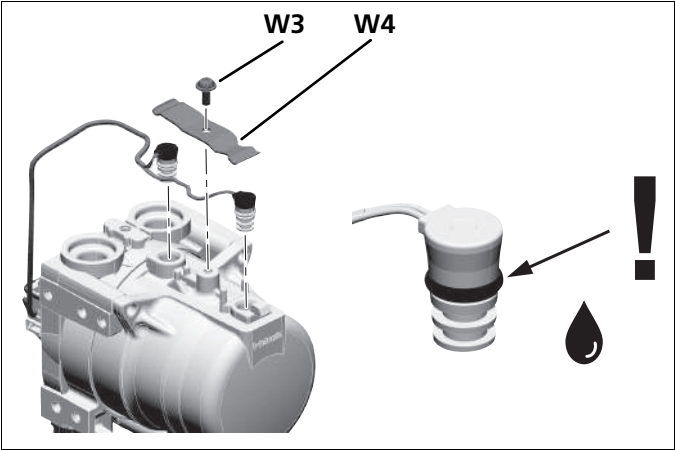


Fig. 36 Wet the seals

2.

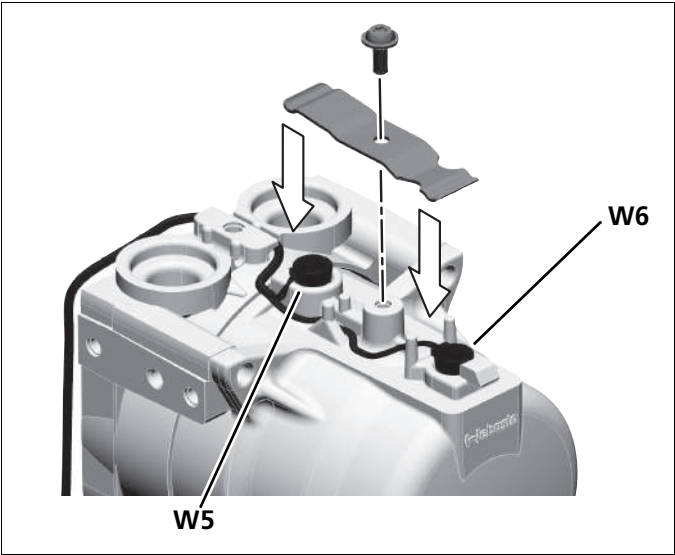


Fig. 37 Position the retaining spring, note cable routing and position of sensors W5 and W6

3.

ATTENTION

When screwing in the sensors, do not re-furrow the thread again. The screw is to be inserted carefully by hand into the available thread and screwed in.

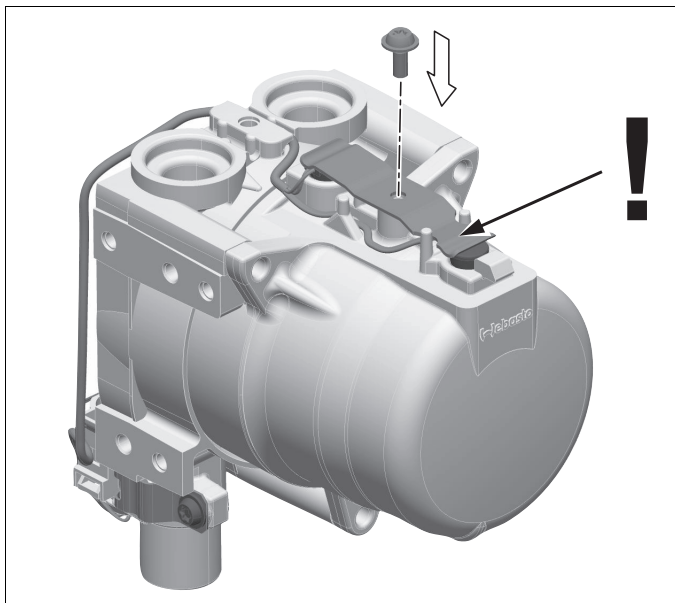


Fig. 38 Mounting bolt

4.

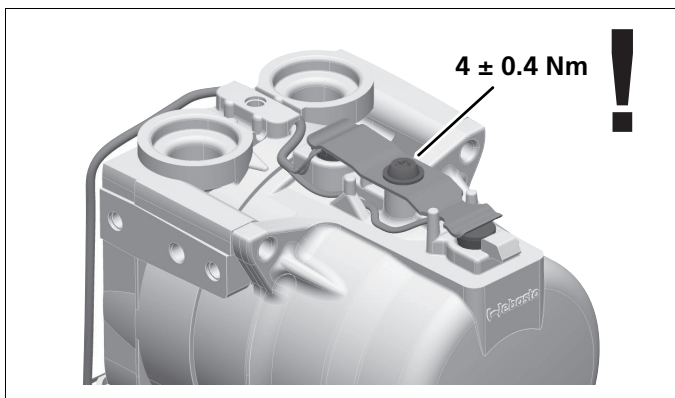


Fig. 39 Tighten screw

9.7 Exhaust gas temperature sensor

9.7.1 Test of exhaust gas temperature sensor

NOTE

The exhaust gas temperature sensor must not be disassembled for inspection.

Contact the contacts of the connector X6 of the exhaust gas temperature sensor with a multimeter and measure the resistance.

TableResistance value exhaust gas temperature sensor

Sensor	Contacts on connector X6	Cold resistance at 22 ± 5 °C [Ohms]	
		min.	max.
W7	1 and 2	2,050	2,220

In addition, the short-circuit to earth to the metal housing, pinching of lines and deformations of the plastic cap of the exhaust gas sensor are to be checked.

9.7.2 Disassembly of exhaust gas temperature sensor

For disassembly of the connector cover, see section 9.1.1. Pull connector X6 out of the control unit. Ensure that the connector lock is released.

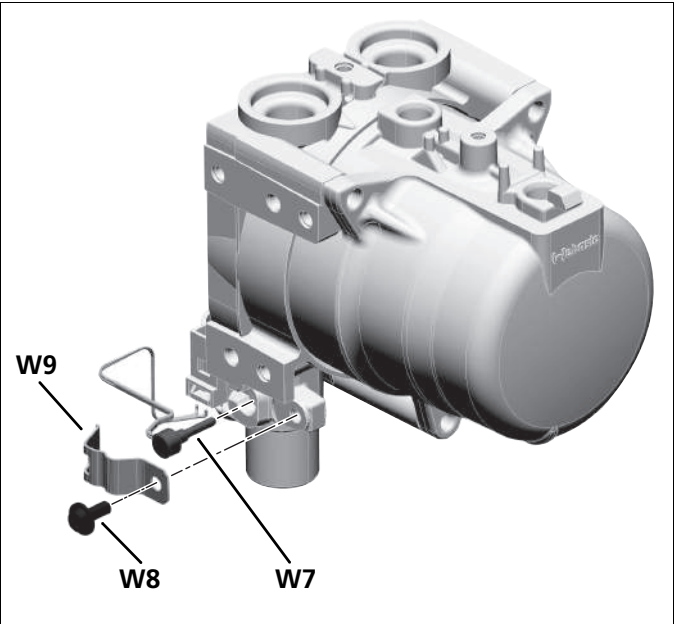


Fig. 40 Disassembly of exhaust gas temperature sensor

1. Undo screw (W8).
2. Remove retaining spring (W9) and pull exhaust gas temperature sensor (W7) out of the exhaust gas pipe on the heat exchanger.

9.7.3 Assembly of exhaust gas temperature sensor

NOTE

Sensors which have been disassembled must not be re-used but must be replaced by new ones.

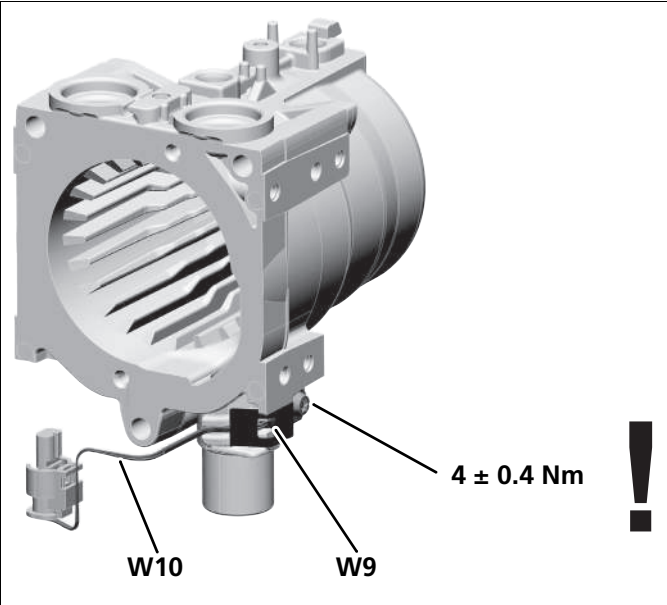


Fig. 41 Assembly of exhaust gas temperature sensor

1. Insert exhaust gas temperature sensor (W7, Fig. 40) into the bore hole on the exhaust pipe of the heat exchanger.

ATTENTION

- Do not bend the cable (W10) on the exhaust gas temperature sensor.
 - When screwing in, do not re-furrow the thread again. The screw is to be inserted carefully by hand into the available thread and screwed in.
2. Insert cable (W10) into the groove on the exhaust pipe and fix retaining spring (W9) with the screw (W8, Fig. 40). Tightening torque 4.0 ± 0.4 Nm.
 3. Insert connector X6 into the connector board on the control unit.

ATTENTION

When fitting the connector cover, ensure that the cable of the exhaust gas temperature sensor is not pinched.

9.8 Water connection piece

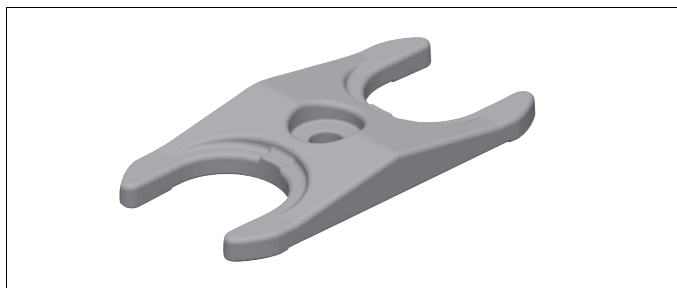


Fig. 42 Retaining plate

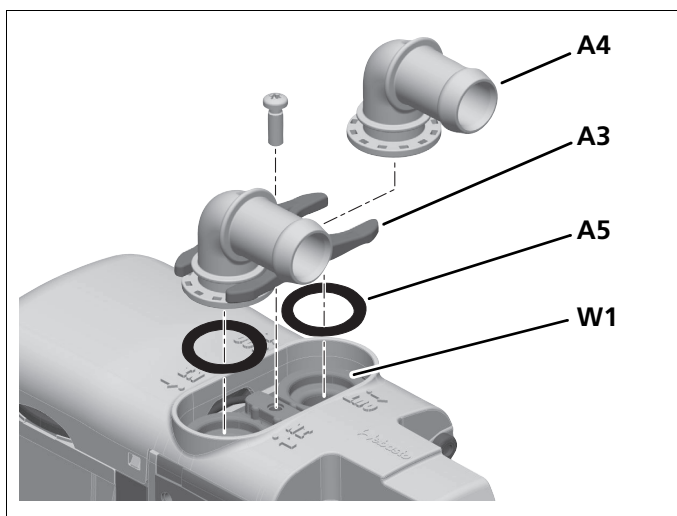


Fig. 43 Assembly of retaining plate water connection piece

9.8.1 Assembly of the water connection piece

1. The contact surfaces of the O-rings in the heat exchanger must be clean and must not show any signs of damage.
2. Wet new O-rings (A5) and insert into the openings in the heat exchanger.
3. Fix the water connection piece (A4) in the retaining plate (A3) and position as an assembled unit in the heat exchanger (W1). Align the water connection piece for assembly.

ATTENTION

When screwing on the retaining plate with the water connection piece and sensors, do not re-furrow the thread again. The screw is to be inserted carefully by hand into the available thread and screwed in.

4. Insert screw into the bore hole and screw tight with 7.5 Nm $\pm$ 0.7 Nm.

10 Packaging/storage and shipping

10.1 General information

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

The temperatures during transportation and storage must not drop below or exceed the ambient temperatures defined in the technical data in the installation instructions.

10.2 Storage

Position of heater:

The heater can be stored in any position. There are no restrictions.

Heaters should always be stored in the original or similar packaging in closed rooms!

After removing the delivery packaging, the heaters should only rest on the aluminium parts. The type label and the surface of the heaters should be protected from damage by placing suitable material under them (e.g. cardboard).

The heater should be covered during storage and protected from dust, dirt and moisture.

The heater must not come in contact with chemicals or their vapours, e.g. fuels, battery fluids or brake fluids.

During storage, dirt, water or chemicals must not get into the heater through the openings. The heater is to be protected against impact loads and ingress of foreign bodies.

10.3 Transport

The heater can be transported in any position and always in suitable packaging!

The heater must be protected from mechanical damage.

NOTE

When sending in a complete heater, the unit must be completely drained of fuel. Steps must be taken to ensure that residual fuel or coolant cannot leak out while packing the unit and during shipping.

Close off the coolant connection pieces and fuel connection with dummy plugs.

Shipping address:

You will find the address for your Webasto dealer at <http://dealers.webasto.com>.

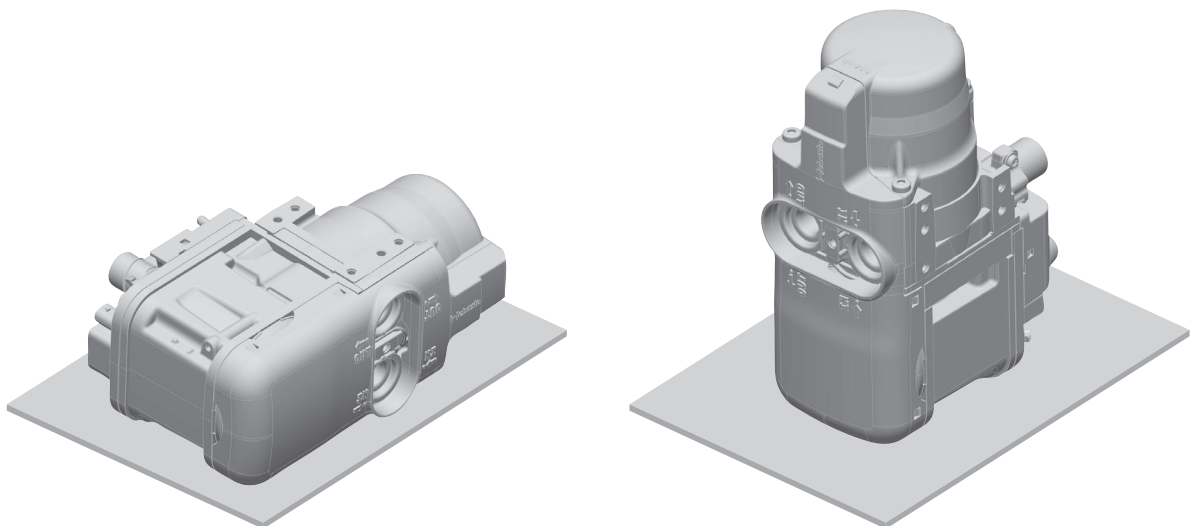


Fig. 44 Preferred position of Thermo Pro 50 Eco heater for storage and transportation

These are the original instructions. The German language is binding. To request this documentation in another language, please locate and contact your local Webasto dealer. You can find your nearest dealer at: <https://dealerlocator.webasto.com/en-int>. To provide feedback (in English or German), please email: feedback2tdt@webasto.com

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