

Water Heater

Workshop Manual

Thermo Pro 50 Eco

Thermo Pro 50 Eco - D 24 V



- While a Webasto heater is in use, the product surface, connected hoses, ducting and air outlet(s) may become hot to the touch. Contact with skin may cause burns.
- Improper installation or repair of Webasto heating systems can cause fire or the leakage of deadly carbon monoxide leading to serious injury or death.
- NEVER attempt to install or repair a Webasto heating system unless you have successfully completed Webasto factory training and have the technical skills, technical information, tools and equipment required to properly complete the necessary procedures. Only genuine Webasto parts may be used.
- Webasto rejects any liability for problems and damage caused by the system being installed by untrained personnel.
- Webasto products produce temperatures high enough to ignite surrounding combustible materials such as inflammable liquids, gases, vapor, and other combustible matter. The heater must be switched off when loading or unloading inflammable materials to prevent the risk of explosion.
- ALWAYS and carefully follow Webasto installation and repair instructions and heed all WARNINGS.



WARNING: Cancer and Reproductive Harm
www.P65Warnings.ca.gov

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1 Introduction

1.1 Contents and purpose

This workshop manual serves to support instructed personnel, which repairs the Thermo Pro 50 Eco water heaters.

1.2 Meaning of signal words

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

WARNING

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

IMPORTANT

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

NOTE

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

1.3 Additional documentation to be used

Information of the general installation and operating instructions is not contained in this workshop manual. If repairs are necessary, these documents must also be used.

1.4 Safety precautions and regulations

In principle, the general accident prevention regulations and current works safety instructions are applicable.

"General safety precautions" which go beyond the scope of these regulations are listed in the following.

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

1.4.1 Statutory regulations governing installation

Type approvals according to ECE-R 10 (EMC) and ECE-R 122 (Heater) exist for the Thermo Pro 50 Eco heater.

For the installation, primarily the regulations of the directive ECE-R 122 and the regulations contained in the installation instructions must be observed.

NOTE

The regulations of these guidelines are binding in the scope of the EU Directive 70/156/EEC and/or EC/2007/46 (for new vehicle models from 29/04/2009) and should also be observed in countries in which there are no special regulations!

The Thermo Pro 50 Eco water heater was designed for use in commercial vehicles.

The applicable regulations must be taken into account when installing in special vehicles. Other uses are possible in consultation with Webasto.

1.4.2 General safety precautions

Never attempt to install or repair a Webasto heating system unless you have successfully completed Webasto factory training and have the technical skills, technical information, tools and equipment required to properly complete the necessary procedures. Only genuine Webasto parts may be used. Webasto rejects any liability for problems and damage caused by the system being installed by untrained personnel.

The repair and commissioning of the unit may only be carried out by professionals trained by Webasto. The repair and installation of the unit may only be carried out in accordance with the workshop manual and the installation instructions.

The year of initial start-up must be permanently marked on the type label by removing the inapplicable years.

The heaters are approved for heating the motor vehicle engine and the vehicle cab, however not for heating the hazardous-material cargo area.

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

The heater may not be installed in the cab or the passenger compartment of vehicles.

When checking the coolant level, the procedure described by the vehicle manufacturer must be followed.

DANGER

Webasto heaters must be switched “off” when re-fueling at filling stations and/or while loading or unloading flammable materials for transport, to prevent the risk of explosion. Please review owner’s manual for safety and use instructions.

WARNING

The heater **must not be operated:**

- In filling stations and tank farms.
- At locations at which highly flammable gases or dusts can form, and at locations at which highly flammable liquids or solid materials are stored (e.g. near fuel, coal and wood dust, grain warehouses, dry grass and leaves, cardboard, paper, etc.)
- In enclosed rooms (e.g. garages), not even via the timer or Telearstart.
- Without at least 20 % brand name anti-freeze in the water of the heating circuit.
- outside the operating temperature range of -40 °C to +80 °C. Otherwise the electronics may suffer permanent damage.

There is a danger of burns, as the heater and the attached parts may be extremely hot.

The heater:

- may only be operated with the fuel specified on the type label and at the nominal voltage specified on the type label.
- must be shut down by immediately switching off the heater and removing the fuse in case of heavy smoke, unusual combustion noises or fuel odours. The heater must not be restarted until the unit has been checked exclusively by professionals duly trained by Webasto.
- must be switched off during work in the engine compartment and may not be cleaned with high-pressure cleaning units or compressed air.
- Must be put into operation at least once a month for 10 minutes with the engine cold.
- should be checked by a professional every 2 years, at the commencement of the heating period.

Liability:

- Non-compliance with the installation/operating instructions and the warnings contained therein will lead to the exclusion of all liability 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.

Be sure to read the operating instructions of the heater before commissioning.

1.5 Spare parts

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

2 General description

Parking heating mode

The water heater is used in conjunction with the original vehicle heating system in the parking heating mode for

- Cab pre-heating
- Engine pre-heating
- Pre-heating of other equipment (e.g. units).

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

Auxiliary heating mode

The water heater operates during engine operation and is used to thermally support the cooling system. The water heater is integrated in the cooling system, the fuel system and the electrical system of the vehicle.

When the engine is shut off, the water heater is not automatically switched off.

NOTE

This workshop manual describes the retrofit variant of the heater. For heaters installed directly at the vehicle manufacturer's plant, other control units with other connectors, software or application parts may be used which are not described in this manual. Information is only available for these heaters via the documentation of the vehicle manufacturer.

The heater operates with regulation according to the coolant temperature.

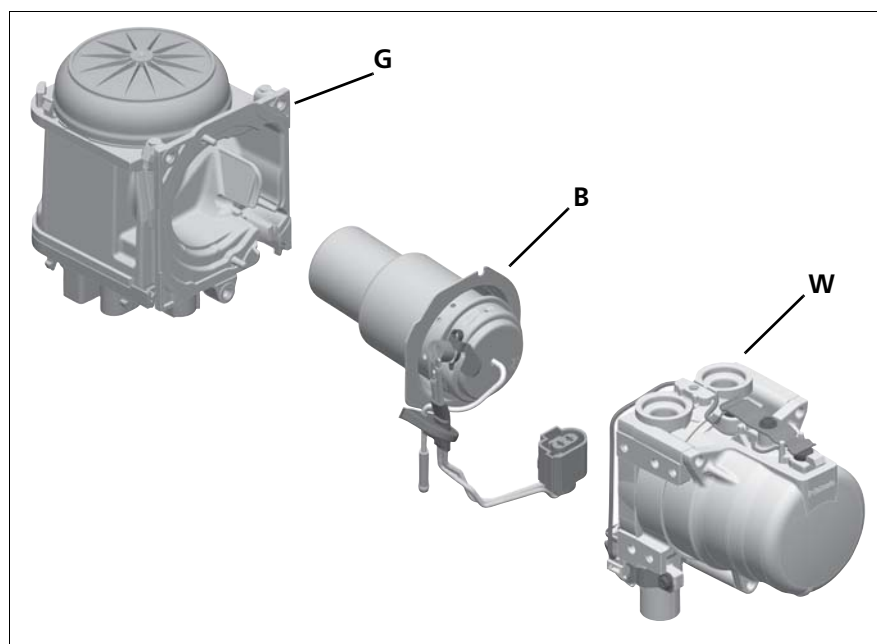
Depending on the deviation of the current coolant temperature from the set-point temperature at the coolant temperature sensor, the burner output is controlled within a range of 2.5 to 5 kW.

The Thermo Pro 50 Eco heater consists of the combustion-air fan unit (G) with the control unit, the heat exchanger (W) and the burner unit (B).

The following components are arranged in the heater for control and monitoring:

- Control unit
- Exhaust temperature sensor
- Coolant temperature sensor
- Overheating sensor

The fuel supply is provided from an external source via a metering pump, which is connected to the fuel system of the vehicle.



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

Fig. 201 Thermo Pro 50 Eco

2.1 Combustion-air fan unit with control unit

The combustion-air fan unit contains:

- the heater type label
- the connection piece for the combustion air pipe
- the control unit with the plug-in contacts
- the engine and the impeller

The combustion-air fan unit supplies the air required for the combustion process from the combustion air inlet to the combustion chamber.

NOTE

It is not permissible to dismantle the combustion-air fan unit.

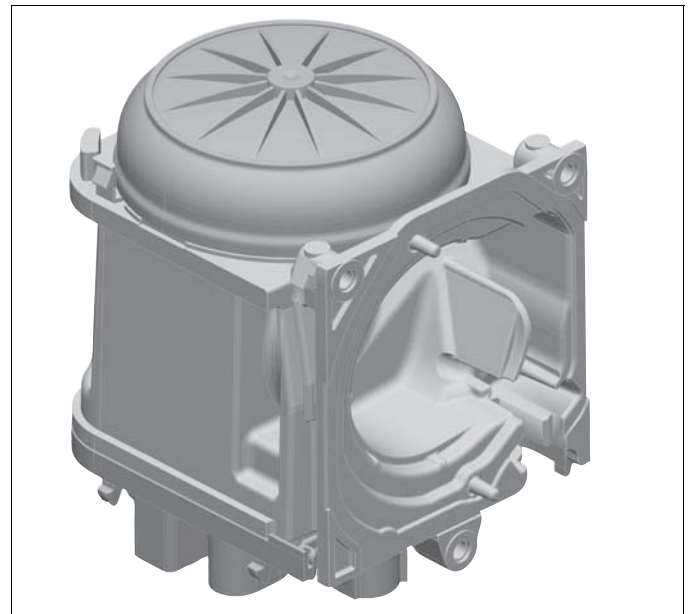
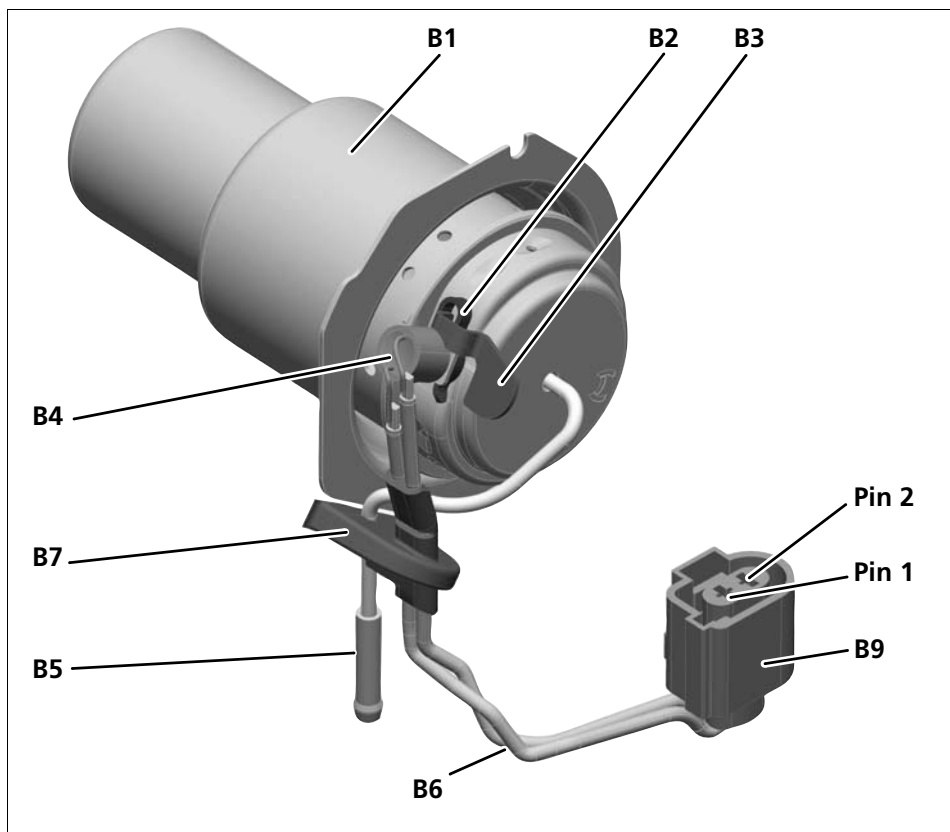


Fig. 202 Combustion-air fan unit

2.2 Burner unit

The fuel-air mixture is processed and the actual combustion takes place in the burner unit. The fuel flows via the fuel pipe to the evaporator, where it is distributed and is evapo-

rated using the glow plug. The air required for combustion is provided by the combustion-air fan unit and flows into the combustion chamber via holes in the burner.



- B1 = Combustion pipe with evaporator mount and evaporator
- B2 = Retaining spring for glow plug
- B3 = Cooling flag for glow plug
- B4 = Glow plug
- B5 = Fuel pipe
- B6 = Glow plug cable
- B7 = Grommet
- B9 = Glow plug connector

Fig. 203 Burner unit

2.2.1 Glow plug

The glow plug (B4) is connected to the control unit via an electrical line with a connector (B9). The glow plug is fastened to the evaporator mount with a retaining spring (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 with the glow plug when the heater is started.

2.3 Heat exchanger

The heat generated in the heat exchanger by combustion is transferred to the coolant circuit.

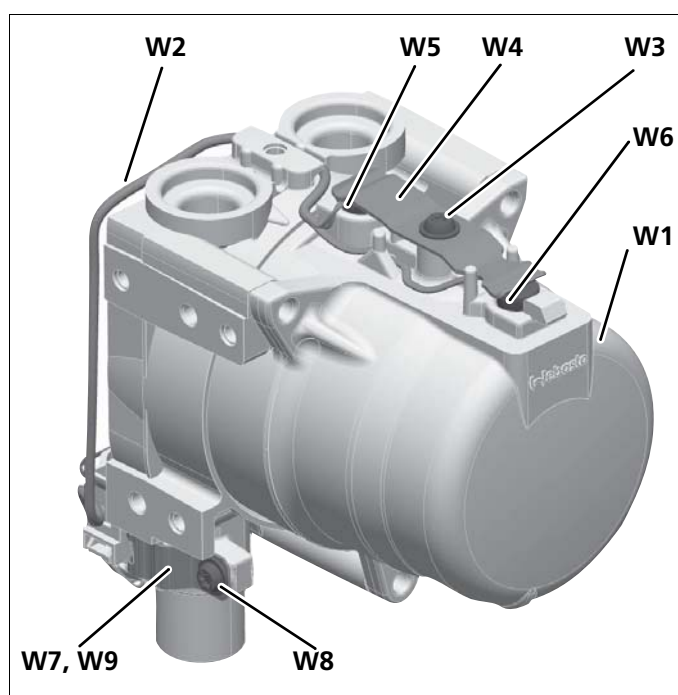


Fig. 204 Heat exchanger

- W1 = Heat exchanger
- W2 = Cable of temperature sensors
- W3 = Self-tapping screw, 40x10
- W4 = Retaining spring for sensors
- W5 = Temperature sensor
- W6 = Overheating sensor
- W7 = Exhaust temperature sensor, covered by retaining spring (W9)
- W8 = Self-tapping screw, 40x10
- W9 = Retaining spring

2.3.1 Temperature sensor and overheating sensor

The temperature sensor detects the coolant temperature in the heat exchanger of the heater as an electrical resistance. This signal is fed to the control unit, where it is processed. The temperature sensor (W5) and the overheating sensor (W6) form a unit together with the cable and the connector.

The overheating sensor protects the heater against impermissibly high operating temperatures. This sensor triggers the safety switch-off of the heater at a temperature higher than $125 \pm 8 \text{ }^\circ\text{C}$.

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 have a linear behaviour. A sudden increase in the resistance occurs at approx. $125 \text{ }^\circ\text{C}$.

2.3.2 Exhaust temperature sensor

The exhaust temperature sensor (W7) is used to detect the flame and impermissible exhaust temperatures.

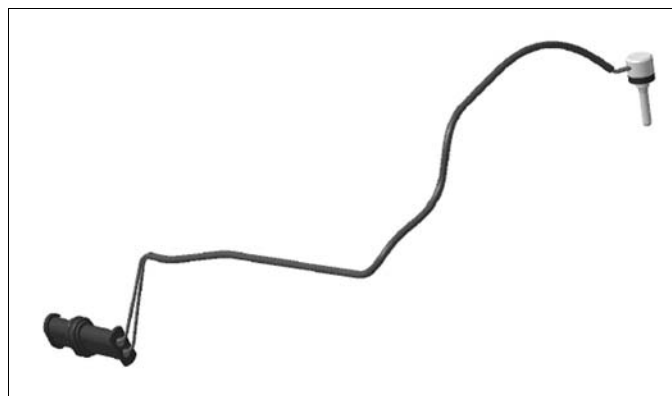


Fig. 205 Exhaust temperature sensor

2.4 Circulation pump

The U4847 24 Econ 24 V circulation pump ensures a feed rate of the coolant in the vehicle heater and heater circuit. The pump is switched on with the control unit and runs during the entire operation of the heater. The circulation pump is a centrifugal pump with a brushless EC motor. The circulation pump is equipped with a 2-pin connector socket which is connected to the control unit by means of a separate wiring harness.

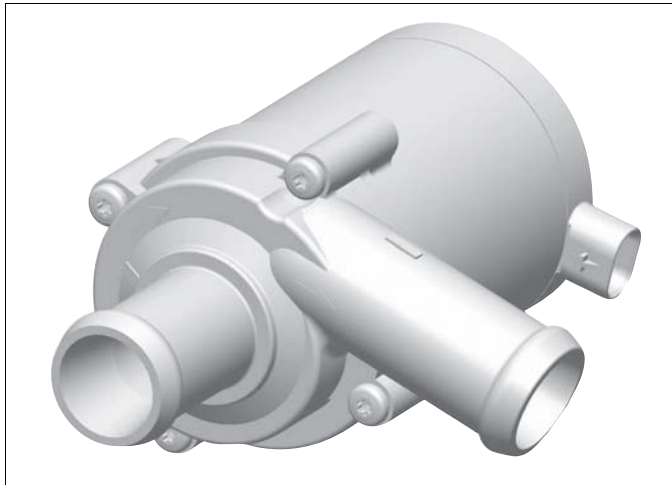


Fig. 206 Example of U4847 Econ 24 V circulation pump

NOTE

Only the U4847 Econ 24 V circulation pump may be connected to the Thermo Pro 50 Eco heater.

2.5 Metering pump

The fuel metering pump is a combined pumping, metering and shut-off system. This dry-primeable reciprocating piston pump supplies the fuel from the vehicle fuel tank to the fuel connection piece of the heater via fuel lines. Installation is usually carried out near the fuel tank. The metering pump is not equipped with a pulsation damper. The metering pump is connected to the heater with the heater wiring harness.

IMPORTANT

Only the model DP42 fuel metering pump may be used for the Thermo Pro 50 Eco heater. Observe the model designation on the component for this purpose. When replacing the metering pump, the CO₂ settings must be checked. see Section 8.3.

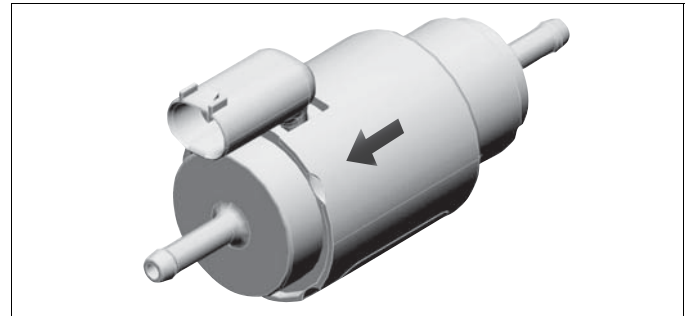


Fig. 207 DP42 metering pump

2.6 Heater controls

The heater can be operated in two ways:

- Webasto BUS (W bus)
- Analogue

Examples of analogue control:

- Switch with operating indicator
- Standard timer

NOTE

Additional information on the respective heater control is contained in the specific installation and operating instructions.

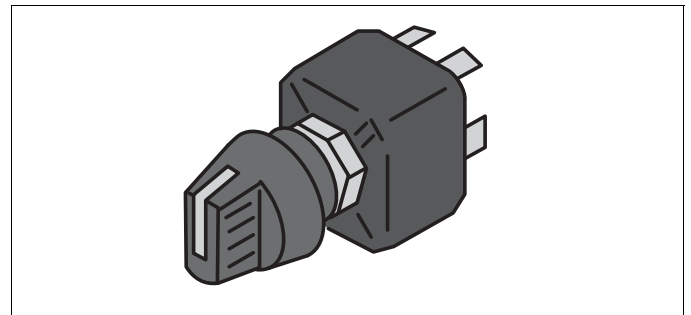


Fig. 208 Switch with operating indicator

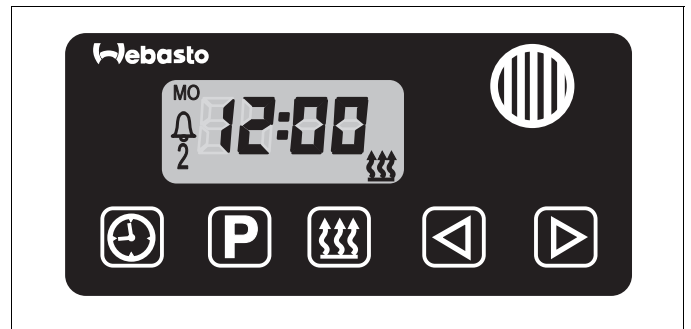


Fig. 209 Standard timer

3 Description of Operation

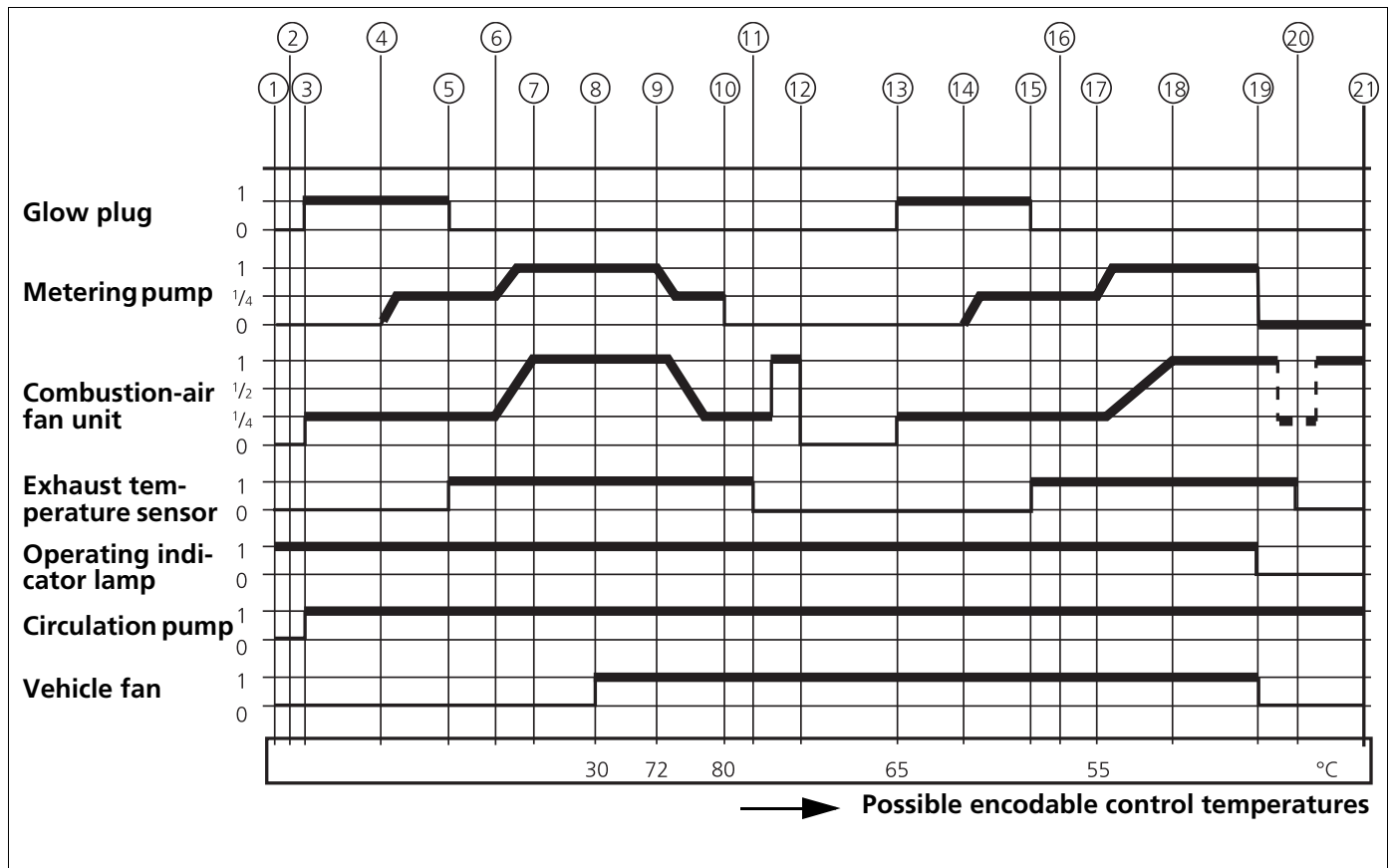


Fig. 301 Operating sequence Thermo Pro 50 Eco

- | | |
|-------------------------------------|--------------------------------------|
| 1) Switching on | 12) Run-on ended |
| 2) Component check | 13) Preheating 15 to 20 sec. |
| 3) Preheating 40 s. | 14) Metering pump/partial load (1/4) |
| 4) Metering pump/partial load (1/4) | 15) "Flame ON" detection |
| 5) "Flame ON" detection | 16) Stabilisation time |
| 6) Stabilisation time | 17) Coolant temperature dropped |
| 7) Full load | 18) Full load |
| 8) Vehicle fan "On" | 19) Switching off (run-on) |
| 9) Control range | 20) "Flame OFF" detection |
| 10) Control break | 21) Run-on ended |
| 11) "Flame OFF" detection | |

3.1 Switch on

The heater is switched on depending on the equipment variant with various heater controls (see Section 2.6).

3.2 Starting and control mode

After combustion begins (start), controlled heating automatically begins.

At a higher coolant temperature, the heating capacity is modulated between 2.5 kW and 5 kW. The objective is to achieve and maintain the control temperature.

The original vehicle heater fan does not switch until the coolant is sufficiently heated (from approx. 30 °C).

If the coolant temperature increases above the set-point value of the control temperature, the heater switches into "OFF state ready". The circulation pump, the original vehicle heater fan and the operation indicator continue to operate during the "OFF state ready".

The heater starts again automatically after the coolant has cooled to the pre-encoded restart temperature.

3.3 Switch off

When the heater is switched off, the operation indicator on the heater control goes out. Combustion is ended and the run-on begins. However, the circulation pump, the glow plug and the combustion-air fan unit continue to run during the run-on time to cool the heater. It is permissible to switch on the heater again during the run-on. However, restarting does not take place until after the run-on is complete.

IMPORTANT

A maximum run-on of 175 sec is activated when the heater is switched off.

The heater supply voltage must be ensured for this time .

4 Technical data

The technical data is contained in the current version (part no. 9026479_) of the installation instructions.

5 Faults, Troubleshooting

General

This section describes troubleshooting on the Thermo Pro 50 Eco heater.

IMPORTANT

Troubleshooting work demands precise knowledge of the structure and theory of operation of the various components and must be carried out by trained personnel only.

The functional relationships are described in Section 2 and 3.

IMPORTANT

Error detection is generally limited to the localisation of the defective components. The following fault causes are not taken into account and should always be checked or a fault should be excluded for the following reasons:

- Corrosion on connector
- Loose contact on connector
- Crimping error on connector
- Completeness of connector
- Corrosion on lines and fuses
- Corrosion on battery terminals
- Impermissible high ambient temperature

Each time an error is eliminated, a functional check must be carried out in the vehicle; switch the heater off and on again beforehand.

Procedure in case of errors or faults and lock-outs

IMPORTANT

Always determine the error cause for the lock-out first, then eliminate the lock-out.

If errors occur in the heater, they will be detected by the control unit as a fault. Depending on the type and weighting of the fault, a fault run-on can be initiated. When a fault run-on is initiated, the heater remains in **fault lock-out**. In addition, an error code is output after a fault is detected during the fault switch-off.

This is carried out by the operation indicator or by the switch with an operating indicator. The error code is used by the workshop or the authorized Webasto dealer for troubleshooting.

Fault causes

A fault occurs when one or more error have occurred. Possible errors are, e.g.

- Overvoltage/undervoltage
- Malfunctions of all components, e.g. due to a short circuit or open circuit
- Overheating of the heater
- Impermissible exhaust temperature
- False starts
- Flame failures

Elimination of fault lock-outs

1. Switch on heater



2. An error has occurred and is detected by the control unit as a **fault**



3. The **error code** is output via the heater control



4. Any active **heater lock-out** is cancelled (as described below)



4.1. The heater detects an error as a **fault**



4.2. **Fault switch-off** with subsequent **fault lock-out**



4.3. The **error code** is output via the heater control



5. Switch off heater



6. Determine error cause (e.g. with or without **error code**, visual inspection of fuses and connectors, etc.)



7. Eliminate error



8. Switch on heater



9. **Fault lock-out** unlocked



10. The heater switches into the control mode

Certain errors result in the errors being added up in the error memory. If the number of errors in the error memory has exceeded a limit, the heater changes over to the heater lock-out. The maximum number of errors in the error memory or the error memory limit is defined by Webasto.

Heater Lockout Reset Procedure:

1. Using switch or standard timer control, turn heater on
2. Remove the main power connection to heater from battery or pull fuse for a minimum of 20 seconds.
3. Using switch or standard timer control, turn the heater off.
4. Reinstall main heater power connection where previously disconnected.

Rectify the cause of the fault.

IMPORTANT: Heater fault codes can be read using PC Diagnostics, however, the heater lockout reset must be manually performed using the procedure stated above.

5.1 Troubleshooting without error code output

Possible faults

The overview only shows some of the possible faults. The Webasto Service Hotline must be contacted in individual cases.

IMPORTANT

The error points specified from Tables Fig. 501 and Fig. 502 DO NOT match the error code numbers for error code output!

Heater Mode	Fault Description	Possible error point (see Table Fig. 502)
Start	Heater does not react, no component starts up, no display by operation indicator	6, 8
	Heater smokes in start-up phase	1, 2, 4, 9, 11, 14, 15
Combustion operation	Heater runs through start, however switches off prematurely	1, 3, 4, 5, 7, 9, 10, 11, 14, 15
	Heater has rough combustion	1, 4, 9, 11, 14
	Heater smokes in heating phase	1, 4, 9, 11, 14, 15, 16
	Heater runs, vehicle interior cold	10, 12
Run-on	Heater smokes in run-on phase	14
Other	Fuel odour	1, 4, 9, 14
	Exhaust odour in vehicle interior	11
	Coolant loss	5, 10
	Heater lock-out	13

Fig. 501 Overview of possible errors

Functional test of heater and its components

Error point	Component	Recommended workshop action	Parameter
1	DP42 metering pump	Check continuity from connector X11 (brown wire) to earth. Check continuity from connector X1 , Pin 5 to connector X11 (blue wire)	
		Measure coil resistance of DP42 metering pump, also see Section 8.5	5.20 ohms $\pm 5\%$ at $22 \pm 5\text{ }^{\circ}\text{C}$, test current: $< 1\text{ mA}$
		Measure fuel feed rate (use Webasto Thermo Test PC Diagnostics for controlling the metering pump), also see Section 8.5	Diesel feed rate at metering pump frequency of 7 Hz and feed time of 60 s: 12.0 to 14.6 ml
		Check connection of fuel line on all connection pieces in accordance with general installation instructions	
2	Glow plug	Measure glow plug resistance on glow plug connector X5 (green wire), also see Section 9.3.1	Cold resistance at $22 \pm 5\text{ }^{\circ}\text{C}$: $0.780 \pm 0.110\text{ ohms}$
3	Sensors	Check the cold resistance of the coolant temperature sensor W5 on the connector X3 (Pin 2 and 4), also see Section 9.7	Cold resistance at $22 \pm 5\text{ }^{\circ}\text{C}$: 2,296 to 5,047 ohms, Test current: $< 1\text{ mA}$
		Check the cold resistance of the overheating sensor W6 on the connector X3 (Pin 1 and 3), also see Section 9.7	Cold resistance at $22 \pm 5\text{ }^{\circ}\text{C}$: 30 to 250 ohms, Test current: $< 1\text{ mA}$
		Check the cold resistance of the exhaust temperature sensor W7 on the connector X6 (Pin 1 and 2), also see Section 9.8	Cold resistance at $22 \pm 5\text{ }^{\circ}\text{C}$: 2,050 to 2,220 ohms, Test current: $< 1\text{ mA}$
4	Combustion-air fan unit	Conduct component test on function of combustion-air fan unit with Webasto Thermo Test PC Diagnostics. No rubbing noises may be heard. Check CO ₂ settings in accordance with Section 8.3	<ul style="list-style-type: none"> – Specify a set-point speed of 6,000 rpm – Listen for rubbing and friction noises. In addition, start-up must be audible up to the specified speed. – No “Combustion air fan blocking guard” fault message may occur.
5	U4847 Econ 24 V circulation pump	Check wiring	
		Conduct component test to check function of circulation pump with Webasto Thermo Test PC Diagnostics	Touch pump with hand; pump functions if slight vibration or running can be felt
		Measure resistance on circulation pump connector X4 , also see Section 8.4	Resistance at $22 \pm 5\text{ }^{\circ}\text{C}$: $20 \pm 1\text{ kohms}$
		Check pump for leaks	
		Check self-venting installation position, also see Section 8.4 or general installation instructions	

Fig. 502 Overview of functional test of heater and its components

Error point	Component	Recommended workshop action	Parameter
6	Power supply	Without Webasto Thermo Test PC Diagnostics Measure power supply on heater connector X2 , Pin 1. Also see Fig. 701, Fig. 702 and Fig. 703.	Check fuse F2 Check power supply
		With Webasto Thermo Test PC Diagnostics Measure operating voltage from Webasto Thermo Test PC Diagnostics	
7	Undervoltage detection	With Webasto Thermo Test PC Diagnostics Measure operating voltage from Webasto Thermo Test PC Diagnostics	<ul style="list-style-type: none"> – The voltage may not drop below 20.0 V for more than 10 consecutive seconds – Check fuse F2
		Without Webasto Thermo Test PC Diagnostics Measure power supply on heater connector X2 , Pin 1. Also see Fig. 701, Fig. 702 and Fig. 703.	
8	Operation indicator (standard timer or switch with operating indicator)	When the immediate heat button/switch with an operating indicator is operated, the light in the display/on the operating indicator is activated	Operation indicator of standard timer: <ul style="list-style-type: none"> – Measure power supply on connector X9, Pin 11 – Check continuity on connector X9, Pin 12 to earth – Check fuse F2
			Operation indicator of switch with operating indicator <ul style="list-style-type: none"> – Measure power supply on switch with operating indicator S4, Pin A – Check continuity on switch with operating indicator S4, Pin F to earth – Check fuse F2
9	Fuel connection	Observe fuel fill level and fuel removal from tank	
		Check integration in vehicle fuel system	
		Check fuel lines for leaks, kinking and clogging, especially in the area of the intake-side line connectors	
		Disconnect the fuel line from the heater, hold the hose in a catch container and operate the metering pump with the Webasto Thermo Test PC Diagnostics for 60 s at 7 Hz. When doing so, watch whether the fuel is pumped bubble-free	
		If fuel sprays out of the line when the line is separated from the heater, the fuel pipe of the burner unit is probably clogged. If this is the case, the burner unit must be replaced.	

Fig. 502 Overview of functional test of heater and its components

Error point	Component	Recommended workshop action	Parameter
10	Coolant circuit	Check the integration in the vehicle coolant circuit in accordance with the general installation instructions	<p>IMPORTANT</p> <p>Observe the direction of flow of the coolant circuit. Check the connection of the coolant hoses to the water connection piece according to the marking (arrow markings) on the heater. Check components for leaks.</p>
		Eliminate kinks and rubbing spots	
		Check whether coolant circuit is correctly bled	
		Check for leaks on heater, water connection piece, sensors, circulation pump and hoses and eliminate	
		Check circulation in coolant circuit	
11	Exhaust system and air intake system	Check whether intake pipe and exhaust pipe are routed in accordance with general installation instructions	<p>No exhaust gas may be sucked in through the combustion air pipe</p>
		Check whether sufficient distance is present to passenger compartment fresh-air intake of vehicle	
		Check to make sure lines are not clogged	
		Eliminate existing leaks on intake pipe and exhaust pipe (no CO ₂ in intake air)	
		The exhaust pipe outlet may not be routed under the intake pipe inlet	
12	Vehicle fan	Check fuse F1	
		Observe coolant temperature (K5 switches at approx. 25 °C)	
		Check switching signal on the relay K5 , ground on Pin 85 and positive on Pin 86 (audible, also see wiring diagram in general installation instructions)	
		Check coolant temperature signal wire (green/white, gn/wh), Pin 86 on K5	
13	Control unit/ heater locked	Determine error cause for lock-out, then eliminate lock-out.	
14	Burner unit	Dismantling and visual inspection	

Fig. 502 Overview of functional test of heater and its components

Error point	Component	Recommended workshop action	Parameter
15	Sooting: Exhaust gas temperature has increased to maximum permissible value	Dismantling and visual inspection of burner unit, exhaust temperature sensor, combustion pipe and heat exchanger, see Section 9.8	Clean or completely replace depending on condition
16	Optional room thermostat	Room thermostat B4 does not switch	Clean or replace components
		Check connection	

Fig. 502 Overview of functional test of heater and its components

5.2 Troubleshooting with error code output

Equipment with switch with an operating indicator

The type of fault is displayed with a flashing code via the operating indicator lamp during the heater run-on time for operation with a switch with an operating indicator. After five short signals, the long flashing pulses must be counted. The number of long flashing pulses matches the error code number in the table below.

Example:

.....- - - - -- - - - - = F 03

Equipment with standard timer

If the system is fitted with a standard timer, the fault is indicated on the timer's display after an error has occurred.

Error code number/ Number of flashing pulses	Fault message	Possible causes	Recommended workshop action
F 00	Heater lock-out or control unit defect, fuse defective, wiring defective, go to specialised workshop	Fuses	Check fuses F1, F2 and F3
		Electrical wiring	Check battery connections: + on Pin 1, – on Pin 2 (connector X2) and + on Pin 1 (connector X1 , switch-on signal)
		Heater lock-out	Delete heater lock-out
		Control unit defect	Replace combustion-air fan unit with control unit
F 01	No start (after 2 starting attempts)	Fuel system	Check fuel level
			Check fuel filter
			Check fuel standpipe and fuel line for leaks
			Bleed fuel system
Combustion air/exhaust pipe	Check combustion air/exhaust pipe for foreign bodies and clean if necessary		
	Burner unit	Clean burner unit and replace if necessary	
F 02	Flame abort	Fuel system	Check fuel level
			Check fuel filter
			Check fuel standpipe and fuel line for leaks
			Bleed fuel system
		Burner unit	Clean burner unit and replace if necessary
Metering pump delivers too little fuel	Check fuel delivery		
F 03	Undervoltage or overvoltage	Power supply	Check battery
			Check electrical connections
F 04	Flame was detected prior to combustion	Exhaust temperature sensor defective	Functional check of exhaust temperature sensor; replace exhaust temperature sensor if necessary
F 05	Not available	Not available	Not available
F 06	Coolant temperature sensor defective	Wiring	Check wiring for damage, open circuit and short circuit
		Coolant temperature sensor defective	Check resistance of coolant temperature sensor; replace if necessary
F 07	Metering pump defective	Wiring	Check wiring for damage, open circuit and short circuit
		Metering pump defective	Functional check of metering pump; replace metering pump if necessary

Fig. 503 Error code output by standard timer/switch with operating indicator

Error code number/ Number of flashing pulses	Fault message	Possible causes	Recommended workshop action
F 08	Combustion-air fan unit defective	Wiring	Check wiring for damage, open circuit and short circuit
		Combustion-air fan unit blocking guard	Functional check of combustion-air fan unit; replace combustion-air fan unit if necessary
		Combustion-air fan unit defective	Replace combustion-air fan unit
F 09	Glow plug defective	Wiring	Check wiring for damage, open circuit and short circuit
		Glow plug defective	Functional check of glow plug with Webasto Thermo Test PC Diagnostics; replace glow plug if necessary
F 10	Overheating	Heater overheated	Check coolant level, bleed coolant circuit. NOTE "Metering pump defective" subsequent fault can occur in conjunction with overheating! Check circulation pump for operation
		Coolant temperature sensor defective	Check wiring for damage, open circuit and short circuit
			Functional check of coolant temperature sensor; replace if necessary
		Overheating sensor defective	Check wiring for damage, open circuit and short circuit
			Functional check of overheating sensor; replace if necessary
		F 11	Circulation pump defective
Circulation pump defective	Replace circulation pump		
F 12	Battery main switch defective	Wiring	Check wiring for damage, open circuit and short circuit
		Battery main switch defective	Functional check of battery cut-off switch; replace if necessary
F 13	Operation of vehicle fan defective	Wiring	Check wiring for damage, open circuit and short circuit
		Vehicle fan relay defective	Functional check of battery fan relay; replace vehicle fan relay if necessary
F 14	Overheating sensor defective	Wiring	Check wiring for damage, open circuit and short circuit
		Overheating sensor defective	Check resistance of overheating sensor; replace if necessary
F 15	Pre-heating/ignition circuit defective	Wiring	Check wiring for damage, open circuit and short circuit
		Glow plug defective	Functional check of glow plug with Webasto Thermo Test PC Diagnostics; replace glow plug if necessary
F 16	Exhaust gas temperature too high	Wiring	Check wiring for damage, open circuit and short circuit
		Exhaust temperature sensor defective	Resistance measurement of exhaust temperature sensor; replace exhaust temperature sensor if necessary
		Heater sooted	Visual inspection of the intake and exhaust-gas tract (exclusion of plugging and partial plugging), clean burner unit and heat exchanger; replace components if necessary
F 17	Exhaust temperature sensor defective	Wiring	Check wiring for damage, open circuit and short circuit
		Exhaust temperature sensor defective	Resistance measurement of exhaust temperature sensor; replace exhaust temperature sensor if necessary

Fig. 503 Error code output by standard timer/switch with operating indicator

NOTE

The Webasto Thermo Test PC Diagnostics provides additional information on the errors named above (measured values, point in time of occurrence, etc.).

6 Operating tests

6.1 General

This section describes the tests of the heater and its components in the installed and the removed state.

WARNING

The heater may not be operated in closed rooms, such as garages or workshops, without exhaust extraction, not even with time preselection.

6.2 Operating checks in vehicle

1. Switch on vehicle fan and set temperature control to "hot".
2. Make sure that the coolant circuit and the fuel system are carefully bled in accordance with the vehicle manufacturer's specifications.
3. Switch on the heater with the heater control.
When the heater is switched on, the circulation pump and the combustion-air fan unit run. This is audible. The vehicle fan is switched on by the heater when the coolant temperature has reached approx. 30 °C (vehicle-specific).
4. Allow the heater to run in the combustion mode. Check the heating effect at the outlet nozzles of the vehicle fan.
5. Switch off the heater with the heater control after the functional check.

A maximum run-on of 175 sec is activated when the heater is switched off. Acoustically perceptible due to a reduction in the burner noise, continued running of the combustion-air fan unit with an increase in the speed after approx. 60 sec., for active cooling of the heater and operation of the circulation pump.

Then the entire system is switched off.

NOTE

The heating effect is dependent on several factors: To evaluate it, the outside temperature, the vehicle model, the engine temperature, the type of integration in the vehicle coolant system, the quantity of coolant to be heated up and the time since the start must be used for the evaluation. The coolant temperature determined by the heater and the coolant or engine temperature indicated by the vehicle may differ considerably, as the respective sensors are installed at different locations and may measure different temperatures.

7 Circuit diagrams

Fig. 701, Fig. 702 and Fig. 703 show the possible circuits of the Thermo Pro 50 Eco heater.

Legend for wiring diagram.

Table 1 Cable cross-sections


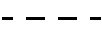
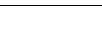
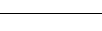
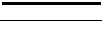
	Length < 7.5 m	Length 7.5 - 15 m
	0.75 mm ²	1.0 mm ²
	1.0 mm ²	1.5 mm ²
	1.5 mm ²	2.5 mm ²
	2.5 mm ²	4.0 mm ²
	4.0 mm ²	6.0 mm ²

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 for the line lengths and cross sections only apply to cables which comply with the standard DIN EN 13602.

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

Item	Description	Comment
①	Temperature coding	D+ signal relationship of control temperatures Thermo Pro 50 Eco to engine status (see installation instructions)
②	Standard clock P2	with positive on connection 10: Continuous operation for immediate heating Connection 10 open: Heating duration is programmable (10 to 120 min.), basic setting 120 min.
③	Vehicle fuse	for vehicle fan
④	Vehicle fan switch	
⑤	Connector of metering pump	Crimp and shrink tight when installing
A1	Heater	Thermo Pro 50 Eco
A2	Control unit	Thermo Pro 50 Eco
ATS	Exhaust temperature sensor	PT2000
B4	Room thermostat	optional
BA	Operating indicator (switch S4)	Bulb max. 2 W
BM	Burner motor	Combustion-air fan unit
DP	Metering pump	Fuel pump for heater
F1	20 A fuse	Flat fuse SAE J 1284
F2	5 A fuse	Flat fuse SAE J 1284
F3	20 A fuse	Flat fuse SAE J 1284
FZG	Vehicle fan	
GS	Glow plug	
H1	"Heating" symbol in the display	Operating indicator (in Pos. P2)
H3	Symbol light	Bulb (in item P2)
H5	Switch-on indicator pumping device	Bulb max. 1.2 W
H6	Lighting of immediate heat button, operating indicator BA, switch-on check	Red LED (in Pos. P2)
K3	Relay	Circulation pump remote control
K5	Vehicle fan relay	
P2	Standard timer	For programmed operation
S4	Switch with operating indicator	with operating indicator BA, in place of standard timer

Thermo Pro 50 Eco

Table 3 Legend for wiring diagrams (Section 2 of 2)

Item	Description	Comment
S8	Immediate heating signal	Momentary-contact switch (optional via remote control)
S10	Electronic battery cut-off switch	optional
ÜHS	Overheating sensor	Sensor on heat exchanger
UP	Circulation pump	
WTS	Coolant temperature sensor	Coolant temperature in coolant circuit
X1	Plug connector, 10-pin	Vehicle connector on Pos. A2
X2	Plug connector, 2-pin	Power supply on Pos. A2
X3	Plug connector, 4-pin	Pos. ÜHS and WTS to Pos. A2
X4	Plug connector, 2-pin	Pos. UP to Pos. A2
X5	Plug connector, 2-pin	Pos. GS to Pos. A2
X6	Plug connector, 2-pin	Pos. ATS to Pos. A2
X10	Plug connector, 4-pin	W bus PC Diagnostics
X11	Plug connector, 2-pin	to Pos. DP
X20	Plug connector, 3-pin	on Pos. A2, engine contact
Y2	Solenoid valve for pumping device	

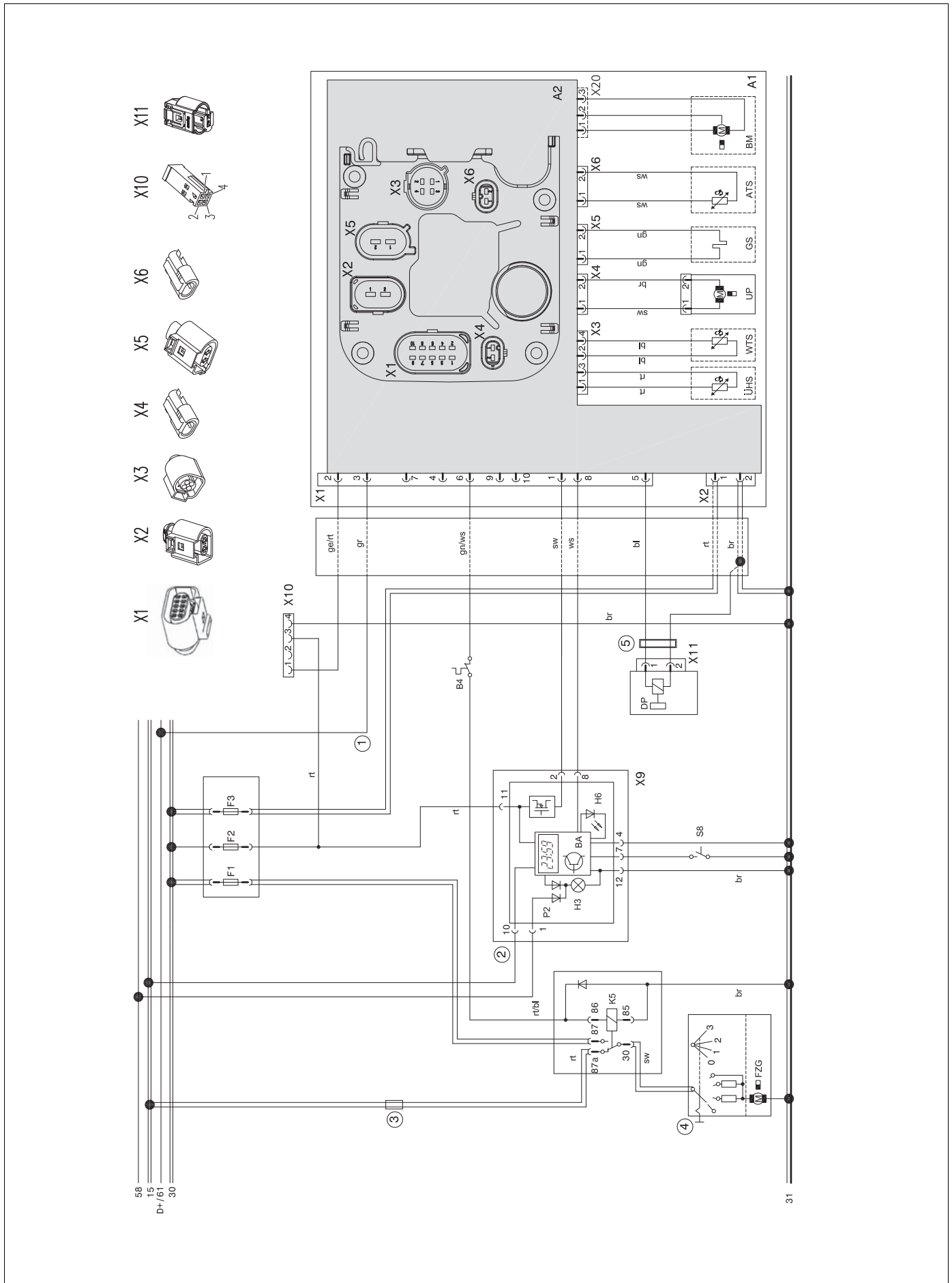


Fig. 701 System wiring diagram for Thermo Pro 50 Eco with standard timer

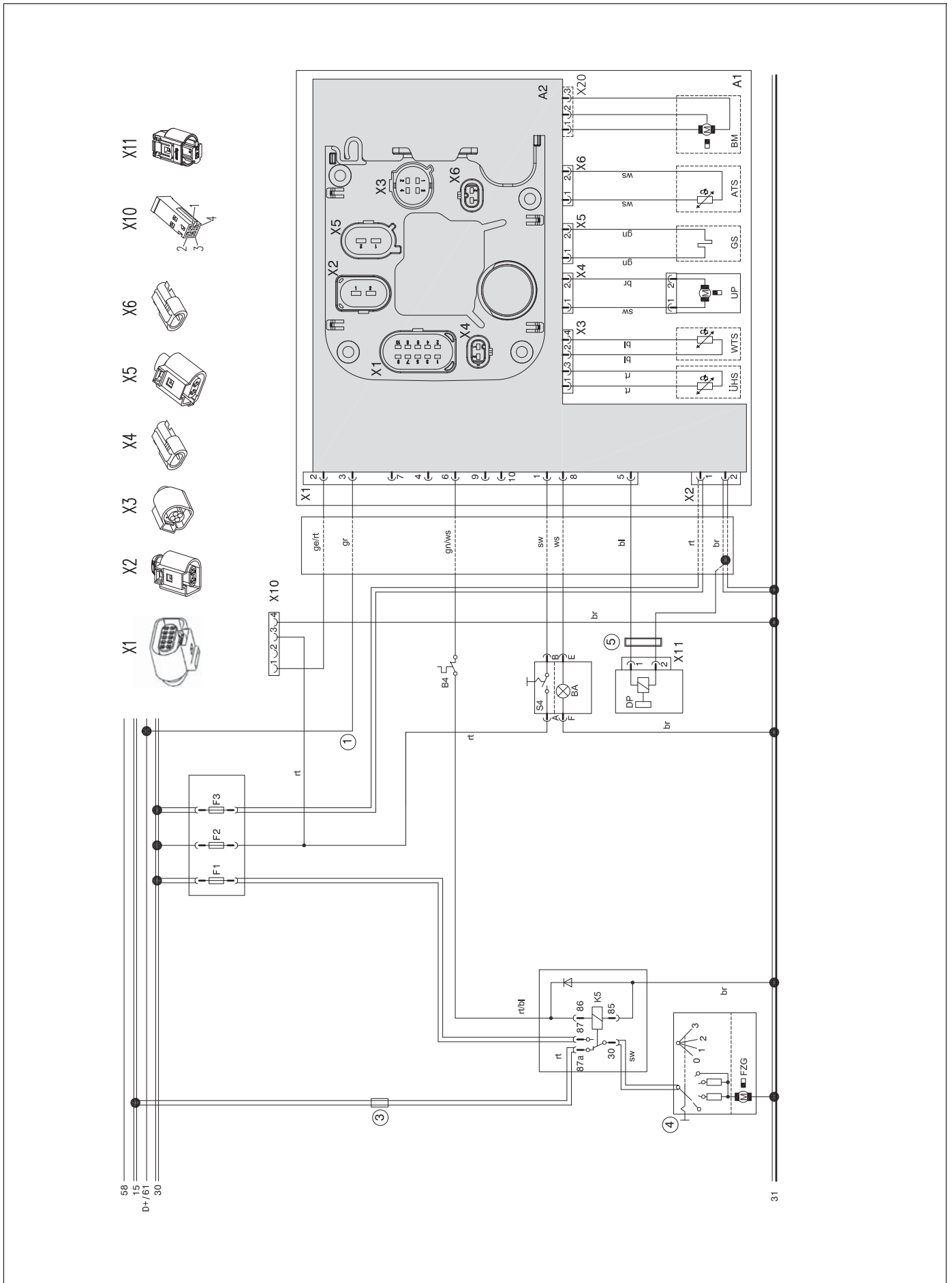


Fig. 702 System wiring diagram for Thermo Pro 50 Eco with switch with operating indicator

8 Servicing work

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

8.1 Work on heater

The power supply must always be disconnected before all work on the heater (pull fuses F1, F2 and F3, see wiring diagrams in Chapter 7).

To prevent component damage, the heater power supply must not be interrupted during operation or run-on.

When conducting repair work on the heater, it must be completely removed.

After the heater and all coolant-carrying components have been installed, the entire coolant system must be filled, bled and checked for leaks with the specified system pressure in accordance with the vehicle manufacturer's instructions.

The general installation instructions and the vehicle-specific installation instructions for the heater must be observed when carrying out repairs which make it necessary to change the installation location.

8.2 Work on vehicle

IMPORTANT

A temperature of 120 °C with the operating voltage connected and the heater switched off must never be exceeded in the area of the heater (e.g. during painting work on the vehicle).

8.3 CO₂ setting

NOTE

After repairing the heater and/or replacing the metering pump, the adjustment of the CO₂ value should be checked.

IMPORTANT

After replacing the combustion-air fan unit with the control unit, the CO₂ value must be checked and reset if necessary.

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

The heater is optimally set to a CO₂ value for operation at altitudes up to 2,800 m above sea level at the factory. Continuous operation above 2,800 m above sea level can result in heavy smoke and soot.

NOTE

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

The following table shows the nominal CO₂ setting value in full-load combustion operation in dependence on the geodetic altitude at which the setting is made.

Table 4 CO₂ adjustment values

Altitude [m above sea level]	Nominal CO ₂ setting value at 20 °C ambient temperature [% by vol.]
	5 kW
0	9,4
500	10,2
1000	10,7
1500	11,5

8.4 Circulation pump

The power consumption is approx. 18 W with a nominal volume flow rate with counter-pressure > 140 mbar of 450 l/h.

Electrical checking of circulation pump

Internal resistance of the circulation pump: 20 ± 1 kohms

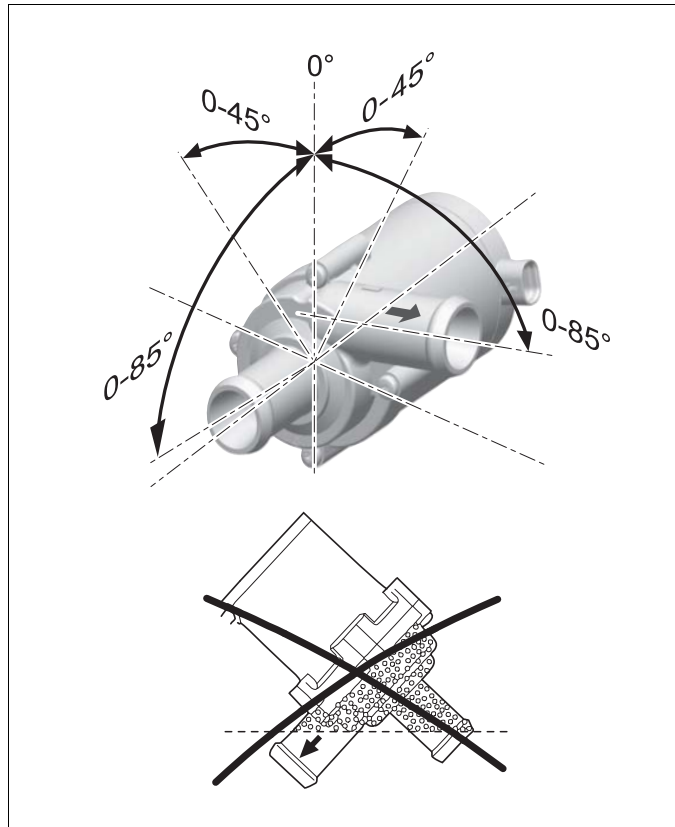


Fig. 801 Installation positions of U4847 Econ 24 V circulation pump

NOTE

Ensure the correct direction of flow of the circulation pump (arrow marking) to the vehicle coolant circuit. The installation position of the circulation pump must be chosen so that the circulation pump is self-bleeding. It must be possible for the air volume trapped in the circulation pump to escape upward by itself via the connection piece. Improper installation can result in faults in the circulation pump operation.

NOTE

Dropped pumps must not be used further. Dropping the pump can result in external impact points and internal damage. External damage can result in leaks in the hose connection pieces. In extreme cases, possible cracks in the plastic part can result in a leak between the pump interior or the surrounding area and the electronics area. As a consequence, pump malfunctions can occur due to the penetration of cooling liquid into the electronics area.

8.5 DP42 metering pump

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

Electrical checking of metering pump

Coil resistance of the DP42 metering pump:
5.20 ohms \pm 5 % at 22 ± 5 °C , test current: < 1 mA

Carry out the function **component test of metering pump** with Webasto Thermo Test PC-Diagnose.

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

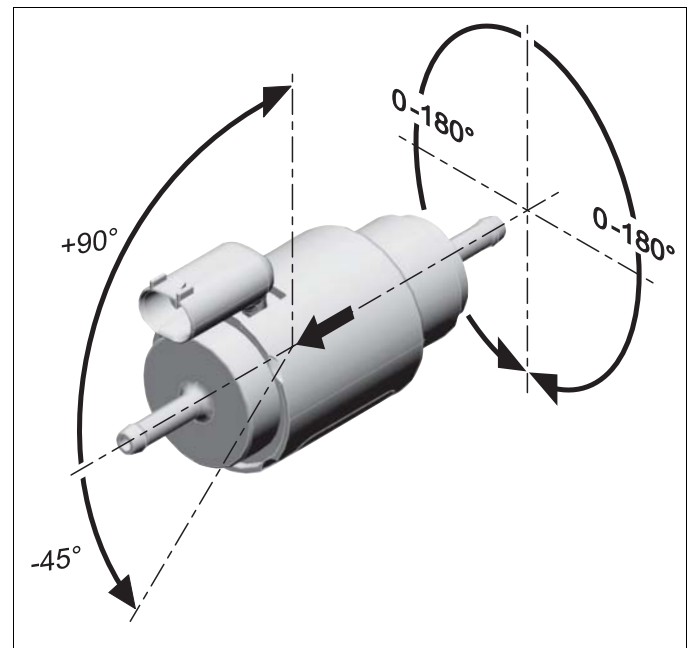


Fig. 802 Installation position of DP42 metering pump

8.6 Checking work

The following servicing work is to be carried out at least every two years to maintain the functional reliability of the heater:

- Read out fault memory.
- Check electrical connections for contact corrosion and firm seating.
- Check exhaust and combustion air lines for damage and to ensure that they are clear.
- Check fuel line for leaks.
- Check coolant circuit and circulation pump for leaks.
- Check hoses for cracks.
- Replace fuel filter if installed.
- Conduct operating test of heater as described in Chapter 6.

8.7 Heater, removal and installation

WARNING

The heater may not be operated in closed rooms, such as garages or workshops, without exhaust extraction, not even with time preselection.

8.7.1 Removal

- 1 Interrupt the heater power supply by removing the fuses F1, F2 and F3.
- 2 Disconnect electrical connectors from heater.

NOTE

All open plugs and connectors must be protected against moisture and soiling.

- 3 Depressurise the coolant system.
- 4 Loosen hose clamps and pull coolant hoses off coolant connection pieces of heater. The coolant hoses must be secured against draining.
- 5 Loose combustion air pipe and exhaust pipe on heater and pull off.
- 6 Loosen hose clamps and pull off fuel line. Seal off fuel connection piece on heater and fuel line with suitable sealing plugs etc.
- 7 Detach heater from bracket; remove bracket from body if necessary.

8.7.2 Installation

- 1 Move heater into specified installation position and tighten heater screws to 8 Nm.

NOTE

The screw must be carefully inserted in the existing threads and screwed in by hand.

- 2 Mount fuel line and secure with hose clamp.
- 3 Mount coolant hoses and secure with clamps.

IMPORTANT

Observe the direction of flow of the coolant circuit. Mount the coolant hoses on the heater on the water connection pieces according to the marking (arrow markings).

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

8.8 Restarting

Before starting the heater for the first time, complete the following checklist.

DANGER

Webasto heaters must be switched "off" when re-fueling at filling stations and/or while loading or unloading flammable materials for transport, to prevent the risk of explosion. Please review owner's manual for safety and use instructions.

After the heater has been installed, the coolant circuit and the fuel supply system must be carefully bled. The specifications of the vehicle manufacturer must be observed when doing so.

All coolant and fuel connections must be checked for leaks and secure attachment during the test run. Should a fault occur in the heater during operation, then troubleshooting must be carried out (see Chapter 5).

NOTE

To support bleeding of the coolant circuit, the circulation pump can be put into operation via the Component test function of the Webasto Thermo Test PC Diagnostics.

NOTE

The heater can be put into operation with the Webasto Thermo Test Diagnostics.

With the fuel line completely drained, the line must be filled with the Webasto Thermo Test PC Diagnostics.

HEATER MOUNTING		Complete (Yes/No/Comments)
1	Is the heater installation safely secure / rigid? (Ensure that all bracket bolts are tight)	
2	Is there a safe clearance from heat generating Components? (I.e. exhaust, etc...)	
3	Is there sufficient clearance between heater and any vehicle moving components under all operating conditions? (steering cranked to extreme positions, torqued engine, suspension, etc...)	
4	Is the heater mounted in an acceptable position according to the limitations noted in the installation manual?	
5	Is the heater installed in a protected location from road debris and splash-water or items stored in the same area?	
6	Is there a sufficient amount clearance between the heater and the ground? (Coolant heaters only)	

COOLANT SYSTEM		Complete (Yes/No/Comments)
1	Is there a safe clearance (min 4 in.) from heat generating components? (exhaust, etc...)	
2	Is there a safe clearance from sharp edges / objects? Ensure a heat protective has been installed (if applicable)	
3	Are there any kinks, sharp bends or the possibility for pinched hoses or harnesses, cuts and rub through?	
4	Have all the hose clamps been properly positioned and tightened?	
5	Has the coolant system been topped off and bled per the vehicle manufacture's specifications for proper mixture and type?	
6	Has a pressure test been performed on the coolant system under all operating conditions?	
7	Have the coolant hoses been installed so that they are below the coolant filler cap?	
8	Has the coolant flow direction been verified?	

ELECTRICAL		Complete (Yes/No/Comments)
1	Has all wiring been safely secured away from moving components and / or heat sources?	
2	Check for proper power and ground connections.	
3	Has blower motor functionality been tested (if applicable)?	
4	Check for proper fuse tap connection.	
5	Verify the correct fuses are in the specified locations per the installation manual.	
6	Ensure heater and vehicle fuse boxes are closed and secure. Was the Webasto fuse block installed in a location protected from water and / or moisture?	
7	Ensure blower motor resistor (1.0Ω) is securely mounted and has sufficient clearance from any plastic component and battery.	
8	Ensure battery is mounted securely and connections are properly tightened.	
9	Ensure battery is at $\geq 12.2\text{Vdc}$.	

FUEL SYSTEM		Complete (Yes/No/Comments)
1	Is the standpipe properly mounted in the fuel tank? (sealed, structural integrity maintained).	
2	Validate the standpipe does not interfere with function of sending unit by checking fuel gauge for proper operation before completing installation of tank.	
3	Verify that all fuel lines are properly secured and are a safe distance (min. 4 in.) from exhaust systems and / or moving components.	
4	Check all fuel lines for leaks or kinks.	
5	Check fuel line clamps for proper positioning and tightness. Ensure fuel system is free of leaks.	
6	Ensure fuel pump is securely mounted in a cool location NOTE: Vehicle fuel tank area is generally a location with minimal sound transfer path to vehicle interior.	

EXHAUST SYSTEMS		Complete (Yes/No/Comments)
1	Is the muffler and clamps securely tightened?	
2	Has muffler and exhaust tube been routed a safe distance (min. 2 in.) from flammable material?	
3	Ensure drain-holes are drilled in low bend areas of exhaust tube.	
4	Ensure exhaust is venting a safe distance from any vehicle interior openings.	
5	Ensure exhaust is venting in the direction that will not cause back pressure while driving.	

COMBUSTION AIR INTAKE		Complete (Yes/No/Comments)
1	Is the combustion air intake drawing fresh air from a non-turbulent location? (i.e. not in direction of travel)	
2	Ensure air intake system is securely fastened.	

HEATER FUNCTION		Complete (Yes/No/Comments)
1	Ensure heater starts and runs for a minimum of 20 minutes.	
2	Ensure vehicle blower turns "ON".	
3	Ensure warm air is blown out of interior vents after blower is activated.	
4	Ensure timer (control device) is functioning.	
5	Check and Modify CO2 setting as needed based on altitude (will the heater "live" or spend a lot of time above XXXXXX Feet) (See service manual for instructions to make adjustment)	

COSMETICS		Complete (Yes/No/Comments)
1	Has the vehicle interior, engine compartment, trunk & glove compartment been inspected for cleanliness after installation.	
2	Has user manual placed in glove box?	
3	Is the vehicle clock time correct after disconnecting the battery?	

If you have any questions, contact our technical support team at (800) 860-7866 or via email at: info-us@webasto.com.

9 Repair

NOTE

The seals must always be replaced before assembling the heater.

9.1 Dismantling and assembling heater

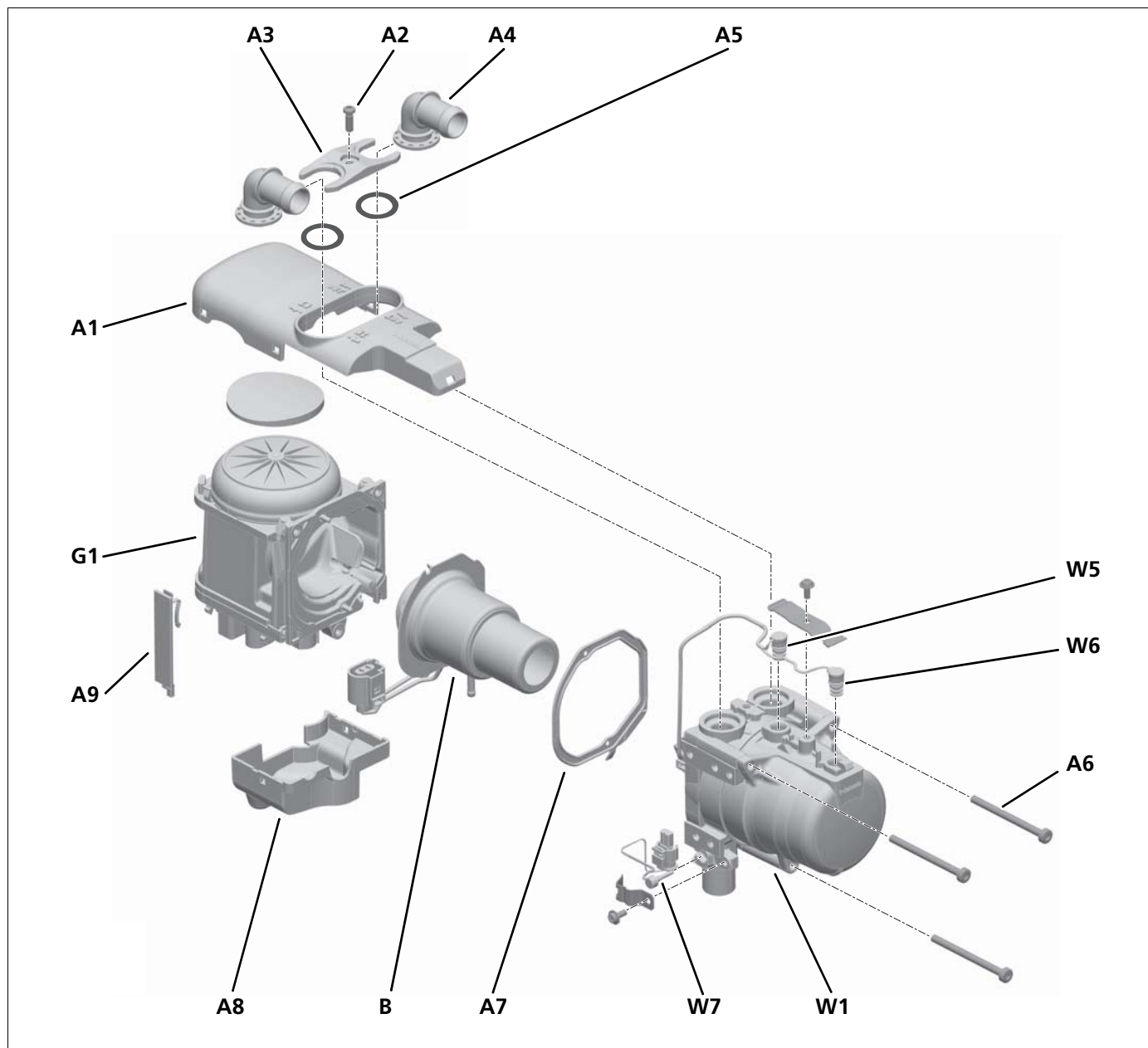


Fig. 901 Component description for Thermo Pro 50 Eco heater

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

9.1.1 Dismantling heater

1. Loosen screw (A2, Fig. 901) and remove water connection piece (A4) with retaining plate (A3) and O-rings (A5).
 2. Loosen heater cover (A1) at side detents on combustion-air fan unit (G1) with a screwdriver. Then remove heater cover (A1) from heater toward front.
 3. Remove cable cover (A9) from combustion-air fan unit (G1).
 4. Release connector cover (A8) on side facing away from fuel connection piece at side detents with a screwdriver and take off heater.
 5. Release latch of connector and pull connector off control unit.
 6. For information on replacing defective temperature sensors (W5 and W6): see Section 9.6.
 7. Replacement of defective exhaust temperature sensor (W7), see Section 9.7.
 8. Loosen screws (A6) and pull heat exchanger (W1) of combustion-air fan housing (G1) in axial direction of screw fitting.
 9. For information on removing the burner unit (B), see Section 9.2.1.
8. Moisten new O-rings (A5) and lay in heat exchanger (W1), then fasten water connection piece (A4) and retaining plate (A3) with screw (A2).
Tightening torque 7.5 ± 0.7 Nm.

NOTE

The sensors can be damaged during removal. Once removed, sensors may not be reinstalled. Only new sensors may be used.

9.1.2 Assembling heater

1. Installation of temperature sensors (W5/W6): see Section 9.6.3.
2. Installation of exhaust temperature sensor (W7), see Section 9.7.2.
3. For information on installing burner unit (B) see Section 9.2.2.
4. Clean heat exchanger (W1) inside and outside and place on fan. Tighten 3 screws (A6) to 7 ± 0.7 Nm.
5. Lay cable in cable duct, see Fig. 919.
6. Place cable cover (A9) on combustion-air fan unit (G1).
7. Hook heater cover (A1) on heat exchanger (W1) into heater and engage in locking lugs of combustion-air fan unit (G1).

9.2 Burner unit

9.2.1 Removing burner unit

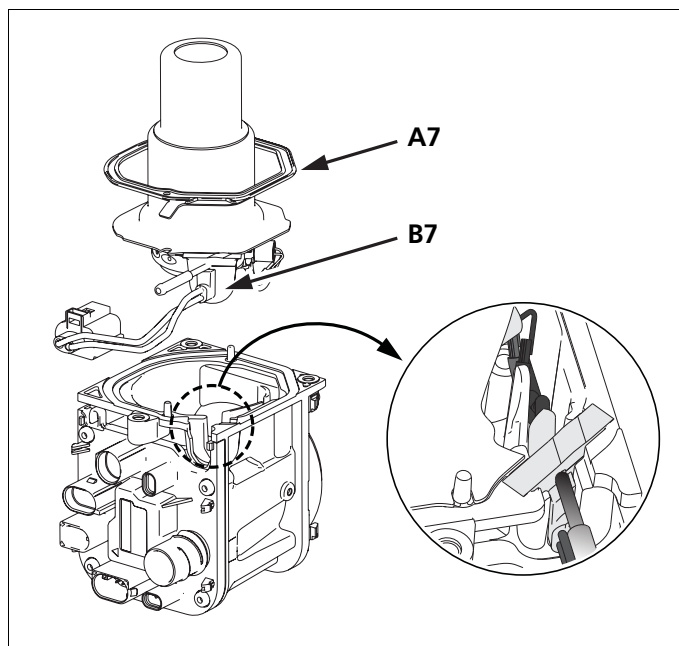


Fig. 902 Burner unit and combustion-air fan unit

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

1. Remove gasket (A7).
2. Slide grommet (B7) with slight pressure onto fuel pipe (B5) out of combustion-air fan unit (G1) while lifting off burner unit (B) vertically upward.

9.2.2 Installing burner unit

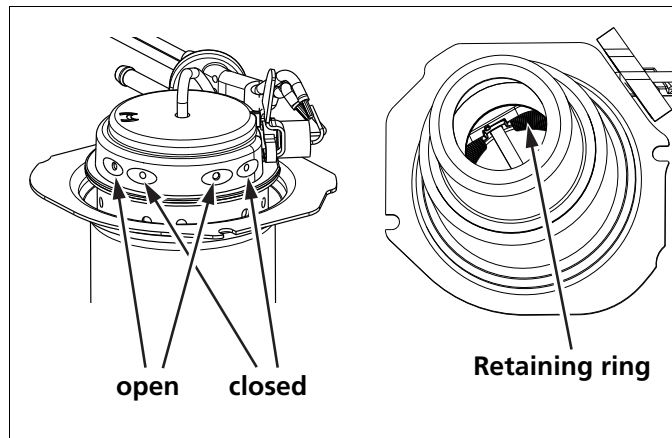


Fig. 903 Burner unit

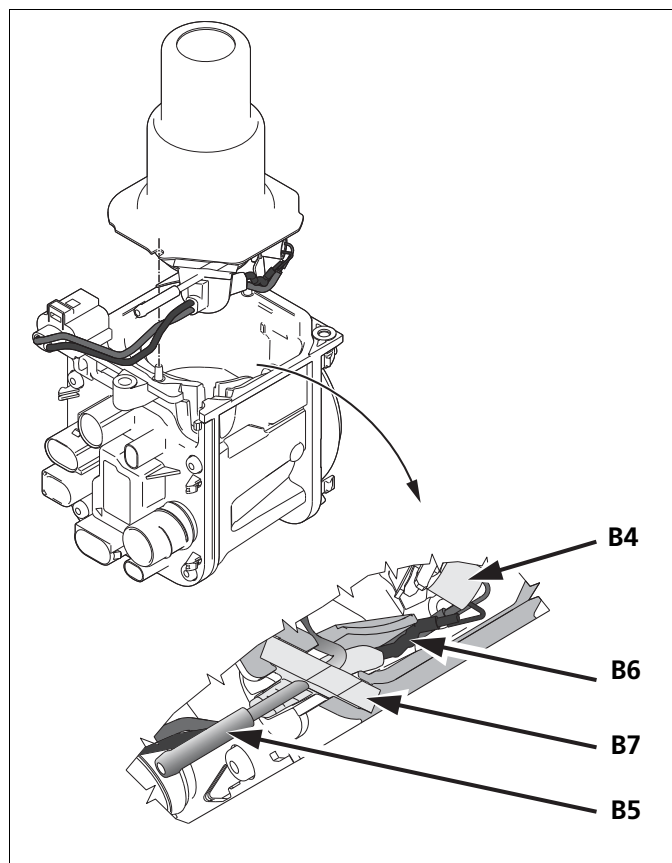


Fig. 904 Detailed illustration of cable routing for glow plug

1. Pre-position burner unit with grommet (B7) in combustion-air fan unit (G1). During installation, make sure that the glow plug cable (B6) and grommet (B7) are mounted in the guide and groove provided on the combustion-air fan unit (G1) (see Fig. 904). Press grommet (B7) into groove provided until it completely fill out the installation space.
2. Mount gasket (A7) on positioning pins of combustion-air fan unit (G1) with flat side facing combustion-air fan unit (G1).
3. Then proceed with the installation of the heat exchanger (W1) as described in Section 9.1.2.

9.3 Glow plug

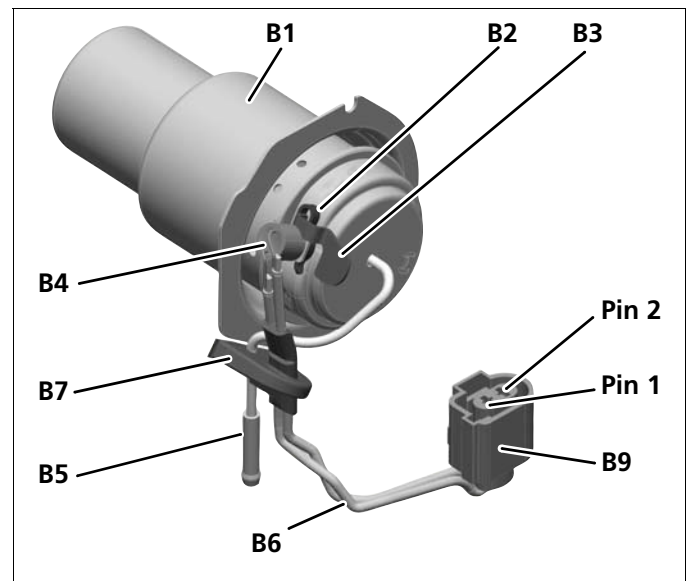


Fig. 905 Burner unit with glow plug

9.3.1 Electrical test of glow plug

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

Cold resistance at 22 ± 5 °C: 0.780 ± 0.110 ohms

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

Short-circuit resistance: < 0.500 ohms.

NOTE

The measurement must be carried out with a multimeter according to the four-conductor measuring principle. To measure the cold resistance, the glow plug must be adjusted to room temperature.

9.3.2 Removing glow plug

NOTE

The removal of the glow plug may entail an increased application of force, therefore destroying the glow plug.

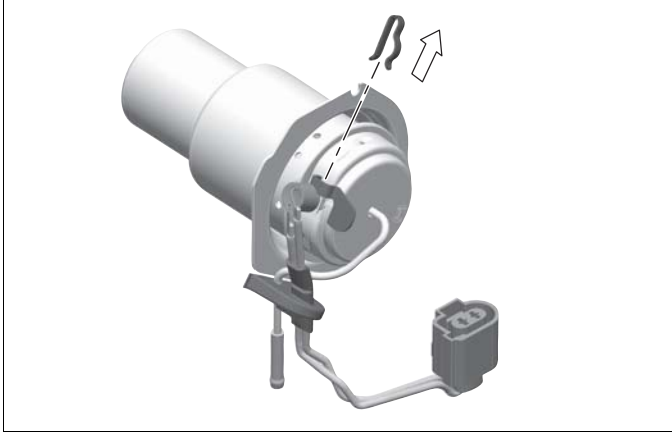


Fig. 906 Remove retaining spring



Fig. 907 Remove cooling flag

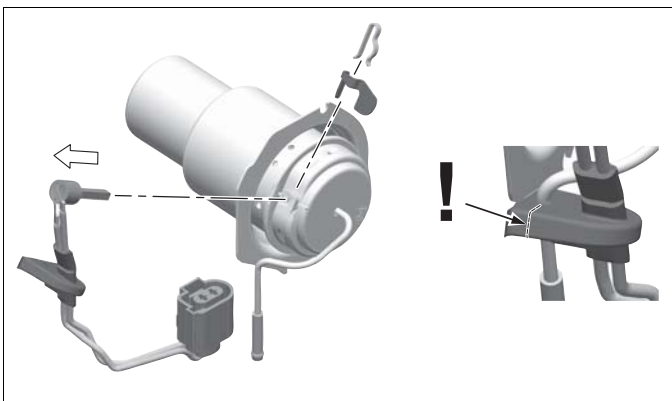


Fig. 908 Remove glow plug

9.3.3 Installing glow plug

IMPORTANT

Only use a new glow plug during installation. Uninsulated areas of the glow plug cable must not touch and must not come into contact with metal parts of the burner unit or the combustion air housing (danger of short circuits).

The glow plug must not be twisted or jammed and must be seated in the guide as far as possible during installation (danger of breakage).

When installing the burner unit, the cable must be routed so that it lies in the groove provided. Also see Section 9.2.2 and Fig. 904.

1. Position combustion pipe with evaporator mount horizontally toward rear (see Fig. 909).
2. Slide glow plug (B4) with unbent cable (B6) as far as possible into mounting hole of glow plug dome (B8).

IMPORTANT

Install glow plug (B4) with groove (B11, below ceramic) toward combustion pipe (see detail Fig. 913).



Fig. 909 Installing glow plug

3. Hold cooling flag (B3) in groove (B11) with hand on glow plug dome (B8) (see Fig. 910 and Fig. 913).

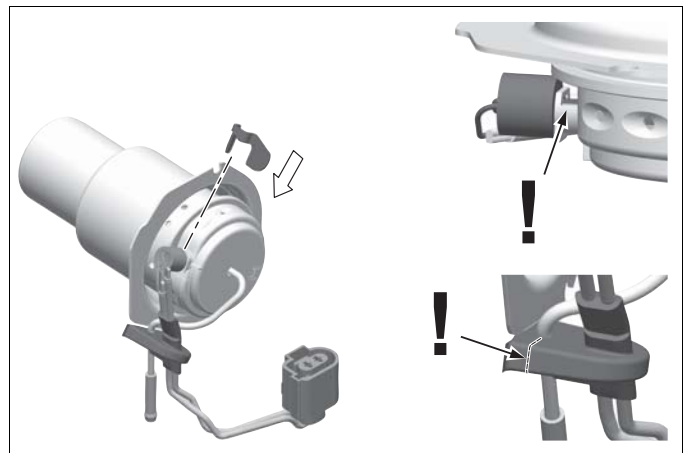


Fig. 910 Installing cooling flag

- Slide retaining spring of glow plug (B2) over cooling flag (B3) and glow plug dome (B8) (for orientation of retaining spring B2, see Fig. 913).

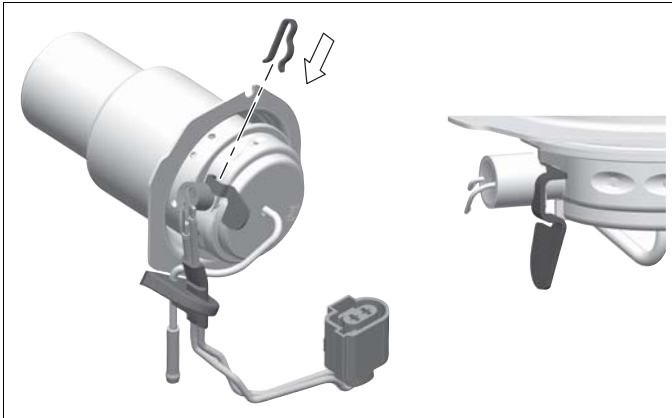


Fig. 911 Installing retaining spring

IMPORTANT

The glow plug (B4) must be installed in the glow plug dome as far as possible.

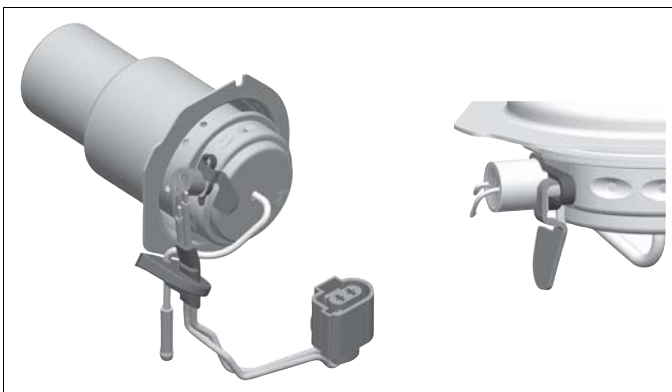


Fig. 912 Installing glow plug properly

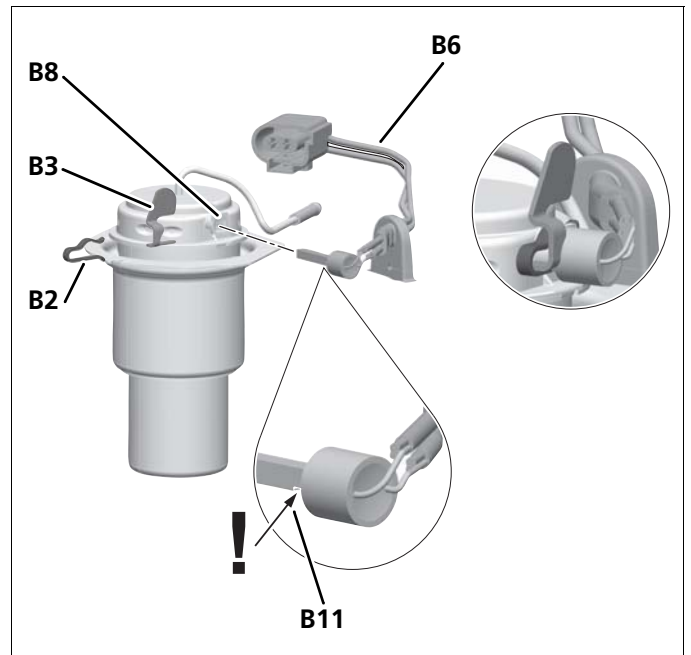


Fig. 913 Installing glow plug

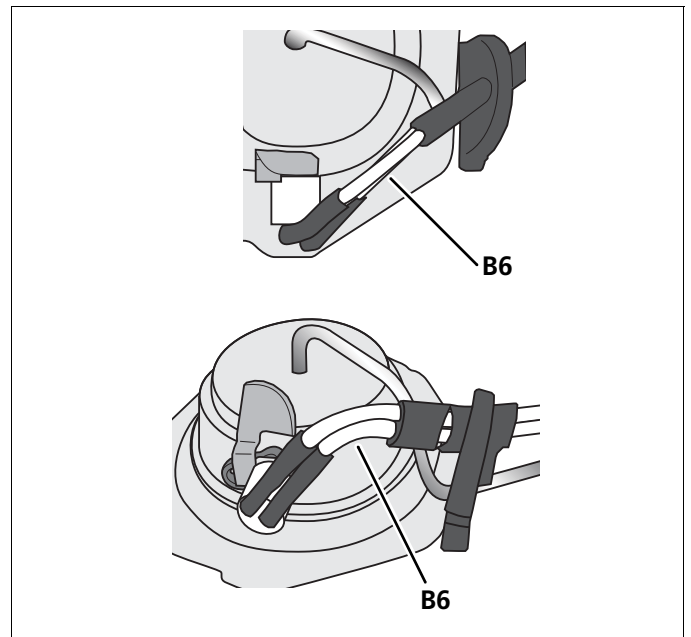


Fig. 914 Routing glow plug cable with slight bend

- Route glow plug cable (B6) as shown in Fig. 915 with a slight bend and slide grommet (B7) onto fuel pipe (B5).

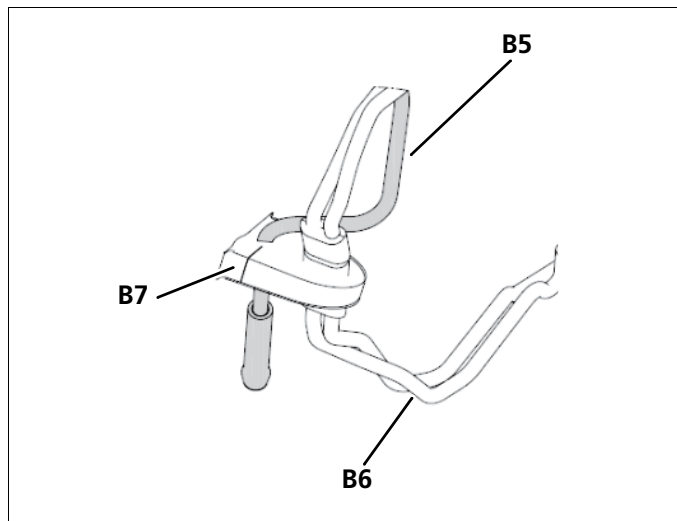


Fig. 915 Glow plug cable, grommet and fuel pipe

9.4 Combustion-air fan unit and control unit

The combustion-air fan unit and the control unit may not be disassembled further.

Combustion-air fan unit assembly spare part.

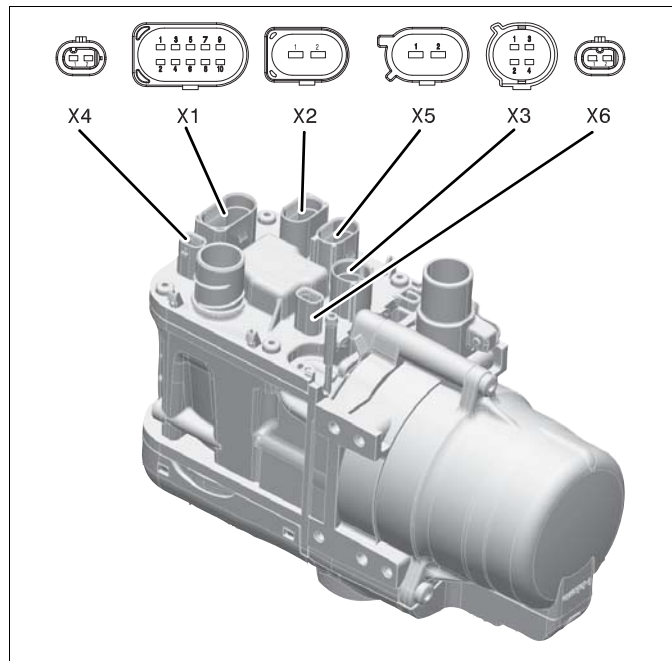


Fig. 916 Combustion-air fan unit with illustration of connectors (variant shown is equipped with the maximum connector assignment)

- X1 = Heater controller connector (10-pin)
- X2 = Power supply connector to vehicle (2-pin)
Contact 1: Power supply terminal 30 (Fuse)
Contact 2: Earth connection
- X3 = Temperature sensor connector (4-pin)
- X4 = Connector for 2x circulation pump (2-pin)
- X5 = Glow plug connector (2-pin)
- X6 = Exhaust temperature sensor connector

NOTE

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

IMPORTANT

Any blind connectors present must be remounted on the new control unit.

9.5 Heat exchanger

The heat exchanger must be replaced as a complete assembly.

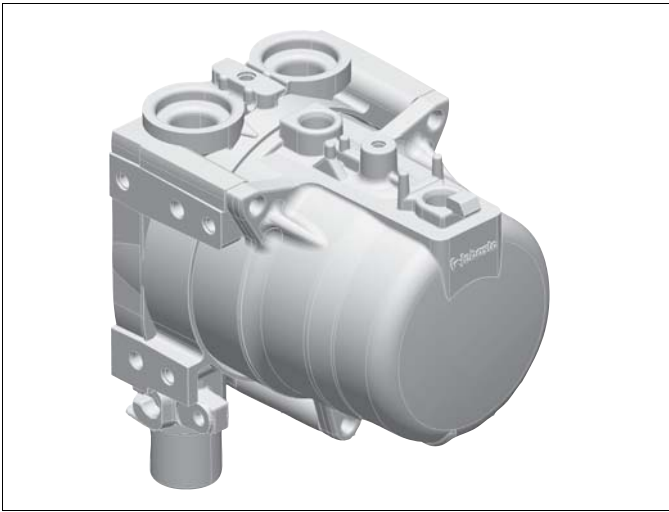


Fig. 917 Heat exchanger

IMPORTANT

The heat exchanger may not be dismantled into its individual parts.

NOTE

Water connection pieces with retaining plate must be checked for damage and replaced if necessary. The unit's temperature sensors, exhaust temperature sensor, gaskets and screws for water connection pieces and temperature sensors must be replaced in accordance with Section 9.6.3, 9.7.2 and 9.8.1.

IMPORTANT

Observe the direction of flow of the coolant circuit. Mount the connection of the coolant hoses to the water connection piece according to the marking (arrow markings) on the heater.

9.6 Temperature sensor/Overheating sensor

9.6.1 Checking sensors

NOTE

The sensors must not be removed for checking.

When checking the cold resistance, a distinction must be made between the variants of the sensors W5 and W6 (see Fig. 919). To do this, the contacts of connector X3 of the sensors are connected to a multimeter and the resistance is measured (test current: < 1 mA).

Table 5 Sensor resistance values

Sensors	Contacts on connector 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, wire crimpings and deformations of the plastic cap of the sensors must also be checked.

9.6.2 Removing temperature sensor/overheating sensor

For information on removing heater cover, see Section 9.1.1. Pull connector X3 of sensors out of control unit. When doing so, make sure connector lock is released. Loosen screw (W3, see Fig. 204), remove retaining spring (W4) and pull sensors (W5 and W6) out of heat exchanger (W1).

NOTE

The sealing O-ring of the sensor can stick to the housing after some operating time, preventing its removal. Once sensors have been removed, they cannot be reused, but instead must be replaced with new ones.

9.6.3 Installing temperature sensor/overheating sensor

NOTE

The gaskets of the sensors must be moistened with a suitable lubricant prior to installation in the heat exchanger.

1.

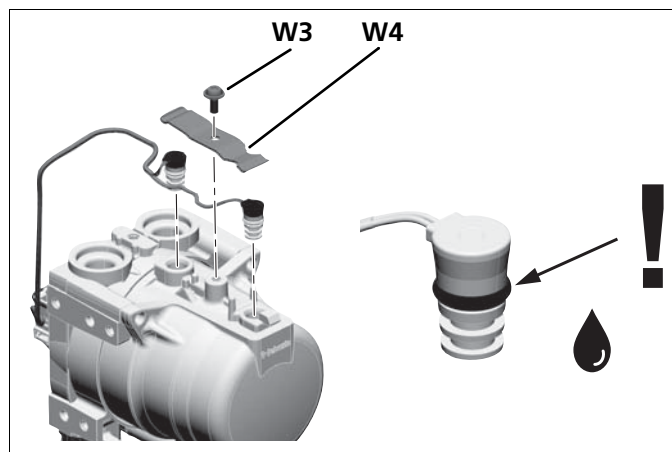


Fig. 918 Moistening gaskets

2.

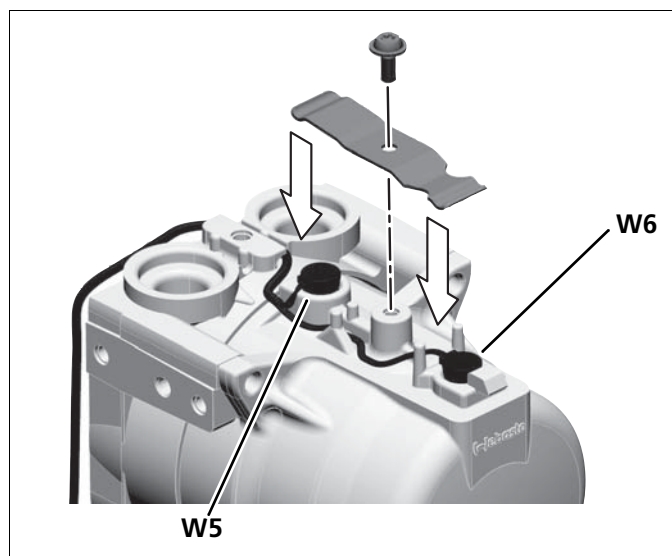


Fig. 919 Position retaining spring while watching cable routing and position of sensors W5 and W6

3.

IMPORTANT

When screwing on the sensors, do not re-cut the thread several times. The screw must be carefully inserted in the existing threads and screwed in by hand.

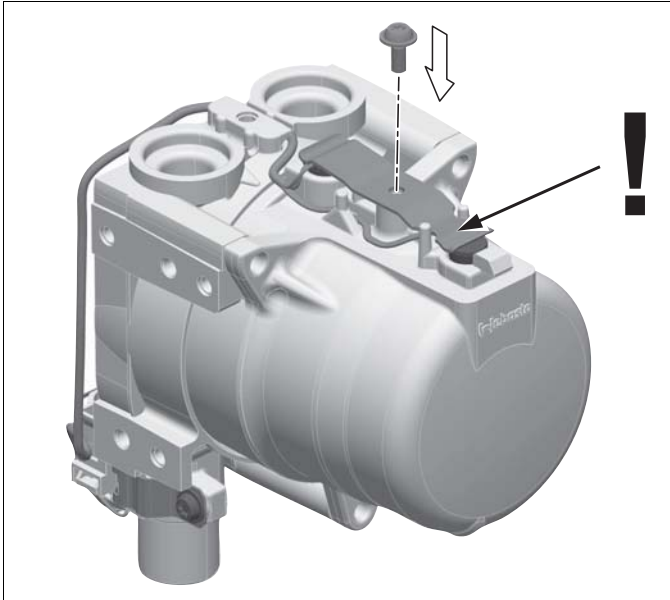


Fig. 920 Mounting screw

4.

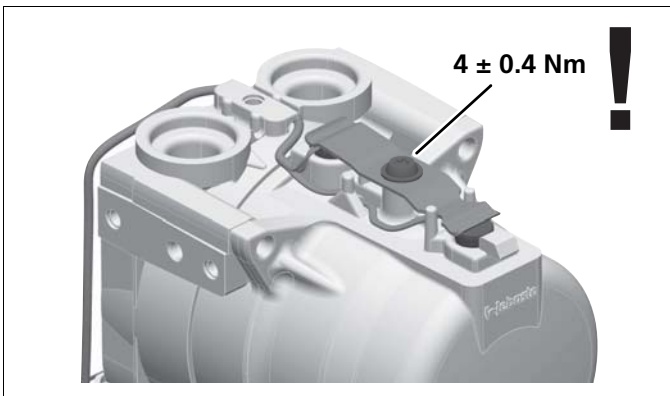


Fig. 921 Tightening screw

9.7 Exhaust temperature sensor

9.7.1 Checking exhaust temperature sensor

NOTE

The exhaust temperature sensor may not be removed for checking.

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

Table 6 Resistance value of exhaust 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, wire crimpings and deformations of the plastic cap of the exhaust temperature sensor must also be checked.

9.7.2 Removing exhaust temperature sensor

For information on removing the connector cover, see Section 9.1.1. Pull connector X6 out of the control unit. When doing so, make sure connector lock is released.

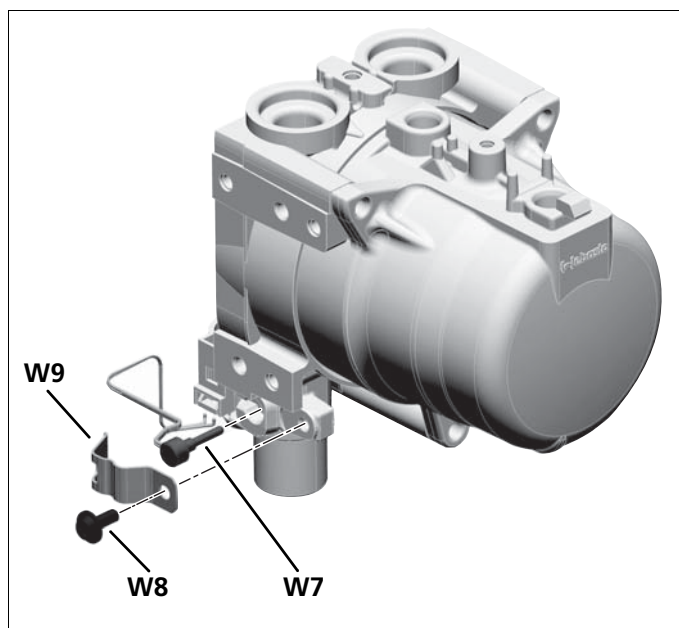


Fig. 922 Removing exhaust temperature sensor

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

9.7.3 Installing exhaust temperature sensor

NOTE

Once sensors have been removed, they cannot be reused, but instead must be replaced with new ones.

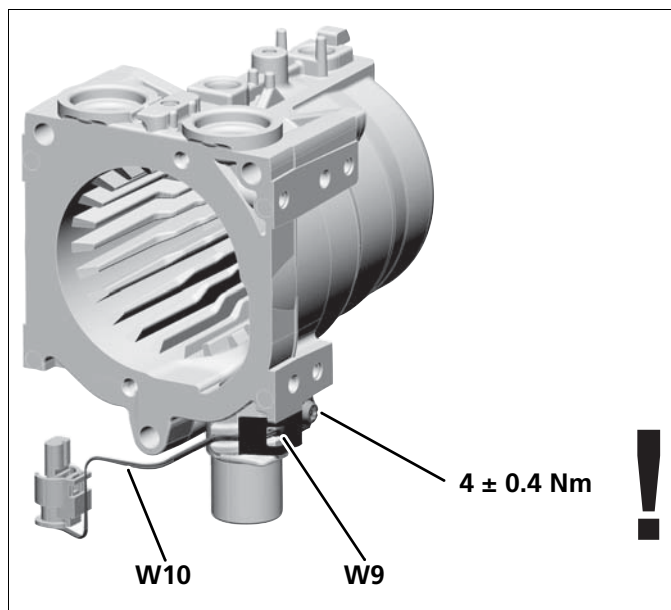


Fig. 923 Installing exhaust temperature sensor

1. Mount exhaust temperature sensor (W7, Fig. 922) in hole on exhaust pipe of heat exchanger.

IMPORTANT

- Do not kink cable (W10) on exhaust temperature sensor.
 - When screwing on, do not re-cut the thread several times. The screw must be carefully inserted in the existing threads and screwed in by hand.
2. Lay cable (W10) in groove on exhaust pipe and fasten retaining spring (W9) with screw (W8, Fig. 922). Tightening torque 4.0 ± 0.4 Nm.
 3. Insert connector X6 on connector place on control unit.

IMPORTANT

When mounting the connector cover, make sure that the cable of the exhaust temperature sensor is not crushed.

9.8 Water connection piece

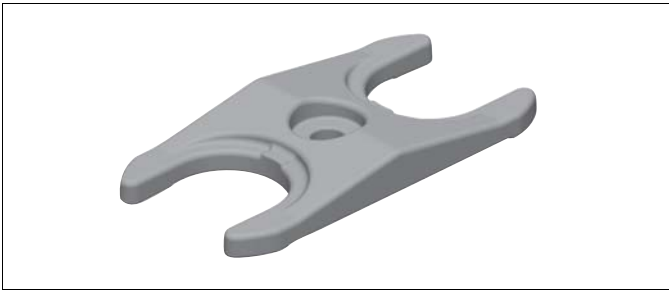


Fig. 924 Retaining plate

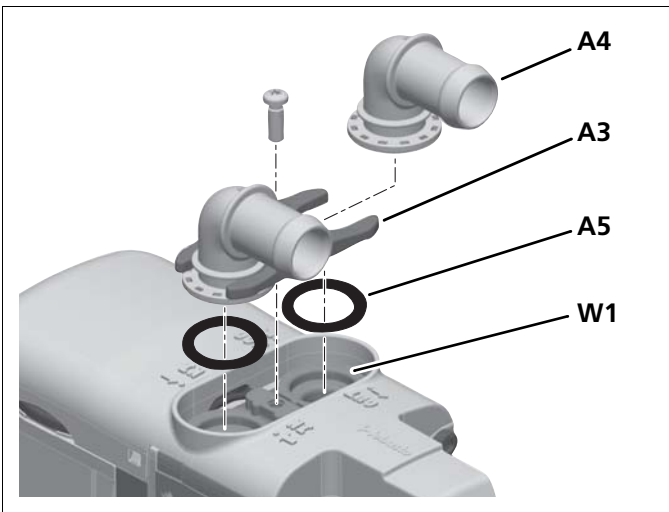


Fig. 925 Retaining plate for installing water connection piece

9.8.1 Installing water connection piece

1. The contact surfaces of the O-rings in the heat exchanger must be clean and must not have any damage.
2. Moisten new O-rings (A5) and lay in heat exchanger openings.
3. Fix water connection piece (A4) in place in retaining plate (A3) and position as assembled unit in heat exchanger (W1). Align water connection piece for installation case.

IMPORTANT

When screwing on the retaining plate with the water connection piece, do not re-cut the thread several times. The screw must be carefully inserted in the existing threads and screwed in by hand.

4. Guide screw into hole and screw on with 7.5 Nm.

10 Packing, Storage and Shipping

10.1 General

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

The temperatures during transport and storage may not drop below -40 and may not exceed 60 °C.

10.2 Storage

Position of heater:

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

Heaters must always be stored in the delivery packaging or in similarly suitable packaging in closed rooms!

After being removed from the delivery packaging, the heaters should only rest on the aluminium parts. The type label and the surface of the heater must be protected against damage with a suitable surface (e.g. cardboard).

During storage the heater should be covered, it must be protected from dust, dirt and moisture.

The heater may not come into contact with chemicals or their vapours, e.g. fuel, battery fluids or brake fluids.

No dirt, water or chemicals may enter into the openings of the heater during storage.

The heater must be protected from impact loads and penetration of foreign bodies.

10.3 Transport

The heater can be transported in any position and must always be packed in suitable packaging.

The heater must be protected against mechanical damage.

NOTE

If an entire heater is returned, then it must be completely drained of operating fluids. It must be ensured that no fuel or coolant residues can escape during packing and/or shipping.

The coolant connection piece and the fuel connection must be sealed off with blind plugs.

Shipping address

The address of the responsible Webasto service center can be found on <http://dealers.webasto.com>.

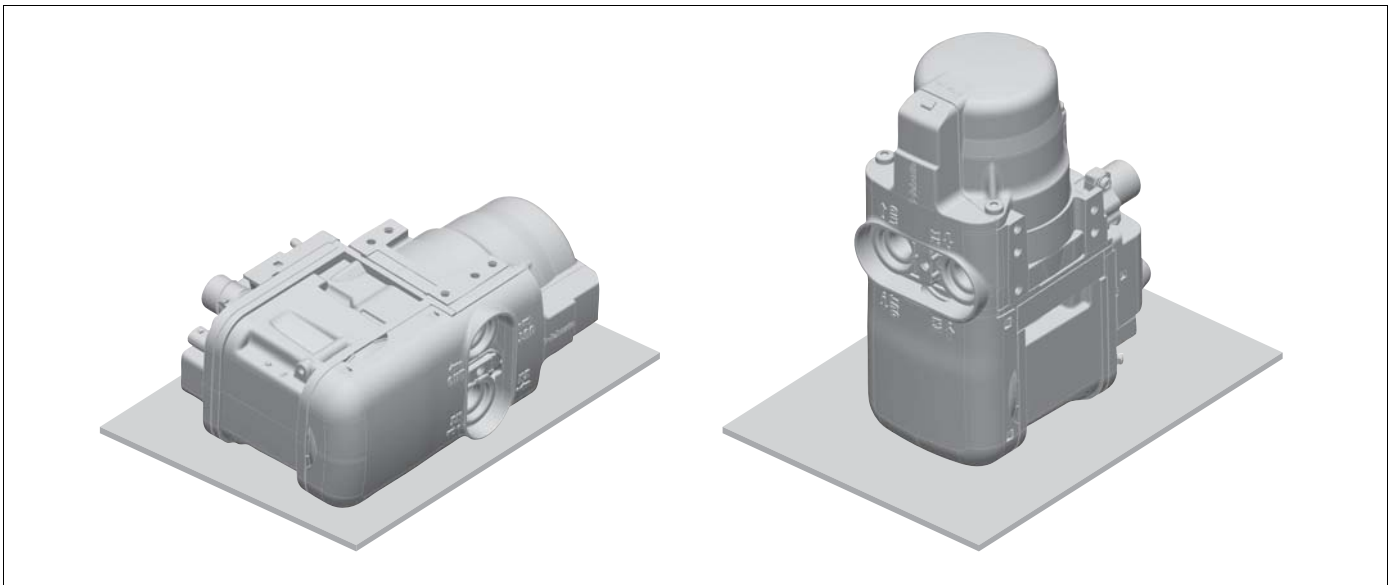


Fig. 1001 Preferred position of Thermo Pro 50 Eco heater for storage and transport



Feel the Drive

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