

Air Top Pro 25

Air Heater



English

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1 Introduction

1.1 About this document

For determining and carrying out maintenance, repairs or the replacement of the heater. Air Top Pro 25.

1.2 Statutory regulations governing installation

This document is a supplement to the Operating and Installation Instructions, which are available on request from Webasto. The stipulations of these regulations are binding in the area covered by Regulation (EU) 2018/858 and should also be observed in countries where there are no specific regulations. Failure to follow the installation instructions will result in the invalidation of the type approval for the heater and therefore invalidation of the general homologation of the vehicle. For vehicles with an EU type approval, an entry is not required in accordance with § 19 section 4 of appendix VIII b of German StVZO. Country-specific registration regulations must be complied with.

The noise emissions from the Webasto Air Top Pro 25 heater are below the threshold specified in section 1.7.4.2. u) of the Machinery Directive 2006/42/EC.

1.3 Using this document

- Read and observe this workshop manual when determining and carrying out repairs to the application or the replacement of the Air Top Pro 25.
- Always follow the important information regarding installation and the operating instructions, along with the legal provisions contained therein.

1.4 Use of symbols and highlighting



DANGER

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



WARNING

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



CAUTION

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



NOTE

This signal word denotes a Special Technical Feature or (if not observed) potential damage to the product.



Refers to separate documents which are enclosed or can be requested from Webasto.

- ✓ Requirements for the following necessary action.

1.5 Qualification of workshop personnel

The personnel must have the following qualifications:

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

1.6 Warranty and liability

Webasto shall not assume liability for defects or damage that are the result of the installation and operating instructions, and the instructions in this document, being disregarded. This liability exclusion particularly applies for:

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

1.7 Disposal



WEEE directive

This product must not be disposed of with normal household waste.

Dispose of this product according to the applicable rules and regulations. Information about proper disposal is provided by the municipal authorities, the responsible household waste recycling centre and/or your local distribution partner.

1.8 Spare parts

You can find details of genuine replacement devices and accessories:

- on request from Webasto.

2 Safety

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

2.1 Intended use

The air heater Air Top Pro 25 is used

- to heat cabins, boats, commercial vehicles, minibusses, vans/transporters, ambulances and motor homes.
- to defrost vehicle windows.
- for heating cargo.

They are not approved for heating a cargo area used to transport dangerous goods.

The heaters operate independently of the engine and are connected directly to the fuel tank and the electrical system of the vehicle.

They may be used for vehicles with either water- or air-cooled engines.

2.2 General safety information



DANGER

Danger of poisoning and suffocation

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

- Do not switch on or operate the heater.

**CAUTION****Overheating possible**

An emergency off switch may only be actuated in the event of danger since the heater will be switched off without pump overrun.

- ▶ Always switch the heater on and off via the control element.

**NOTE****Incorrect handling**

- ▶ Protect the heater against mechanical stress (e.g. dropping, impacts or knocks).
- ▶ Do not stand on the heater.
- ▶ Do not place any objects on top of the heater.
- ▶ Avoid shutting down the heater incorrectly during the after-running period. After switching off via the control element, the fan of the heater continues to run.
- ▶ Always switch off the heater via the control element.
- ▶ Do not disconnect from the power supply until the after-running period has elapsed.

2.3 Regulations and legal requirements

Within the scope of the European Regulation (EU) 2018/858, the Air Top Pro 25 has type-approvals in accordance with ECE-R 122 (Heating) and ECE-R 10 (EMC).

2.4 Working on the heater

**NOTE**

Before dismantling the heater, disconnect the power supply at the vehicle battery, or remove fuses **F1** and **F2**.

**NOTE**

Always carry out a visual inspection before starting repair work:

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

The main battery power must not be disconnected as long as the heater is operating or after running due the risk of the heater overheating and consequently the overheating safeguard tripping.

**NOTE****Replace component:**

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

**NOTE**

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

2.5 Working on the vehicle

**NOTE**

The temperature of the heater must not be over 85 °C when switched off. See chapter 6, "Technical data" on page 9.

2.6 Heater test run

**NOTE**

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.

2.7 Checks

Webasto recommends the following service before and after each heating period:

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

3 General description

Air heater Air Top Pro 25 is designed in accordance with the evaporator principle primarily consists of the following components:

- Drive unit (combustion air fan, heating air fan and drive motor)
- Heat exchanger
- the burner with combustion chamber and flow guide
- Control unit
- Housing parts
- Base seal
- Sensors
- Wiring harness and blanking plug

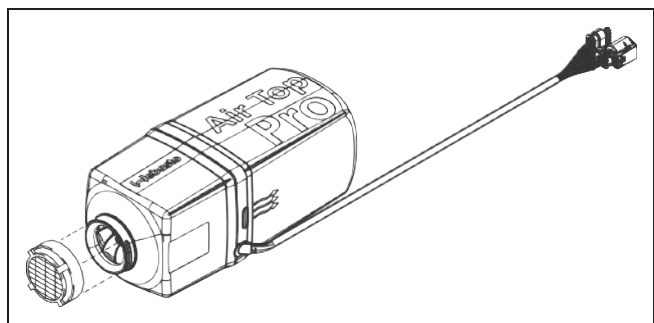


Fig. 1 Air Top Pro 25 air heater

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

- a control unit with an air pressure sensor
- Glow plug
- Overheating sensor
- an air temperature sensor
- an external room temperature sensor (optional)

The fuel supply is provided externally via a fuel pump.

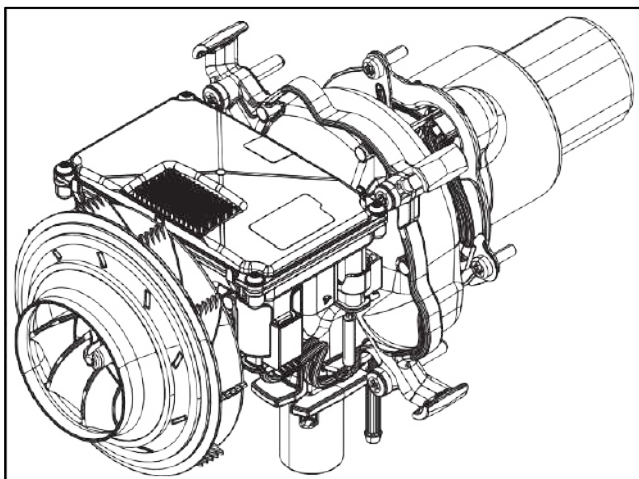


Fig. 2 Air Top Pro 25 air heater without housing and heat exchanger

4 Description of the components

4.1 Drive unit

The drive unit consists of the drive motor, the combustion air fan, the hot air fan and the fan housing.

The combustion air fan conveys the air necessary for combustion through the combustion air inlet into the combustion chamber.

The heating air fan feeds air from the air inlet via the heat exchanger to the hot air outlet.

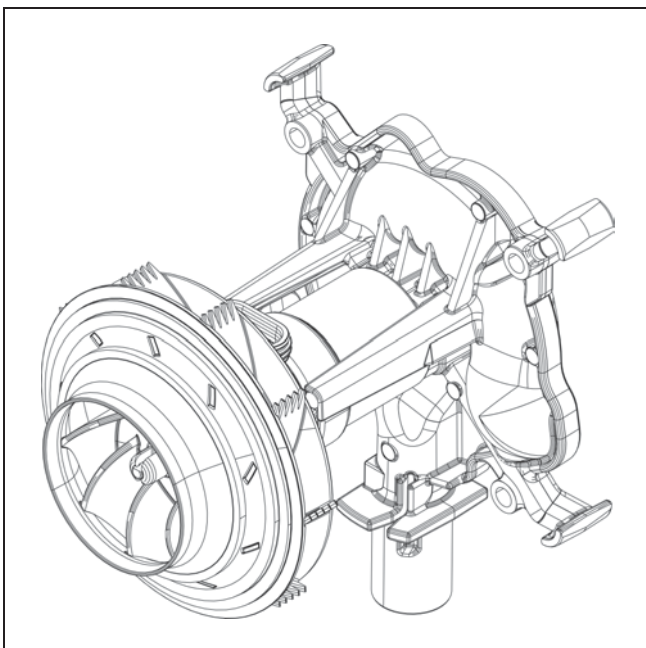


Fig. 3 Drive unit with heating air impeller

4.2 Heat exchanger

In the heat exchanger, the heat generated by the combustion process is transferred to the air, delivered by the heating air fan.

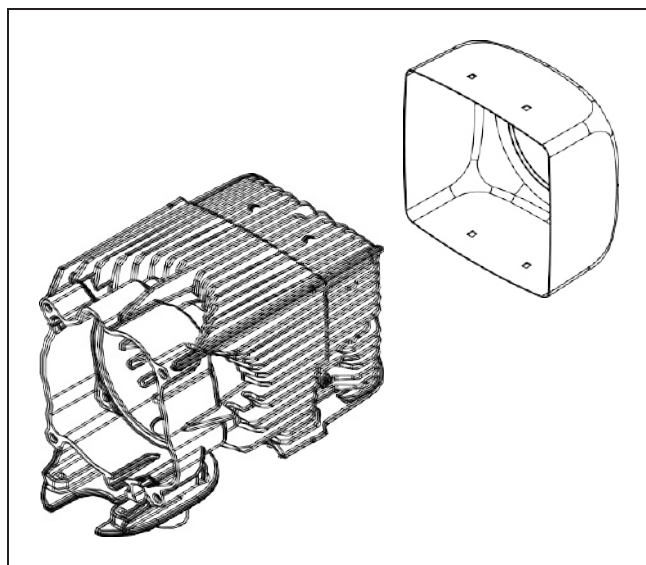


Fig. 4 Heat exchanger with cooling cap

4.3 Burner with combustion chamber

In the burner insert, the fuel is distributed via the evaporator. The air/fuel mixture burns in the combustion chamber, thus heating the heat exchanger.

The distinction between the petrol and diesel variants is made by different burners, as well as an additional flow guide on the rear of the burner for the petrol variant (see Fig. 6).

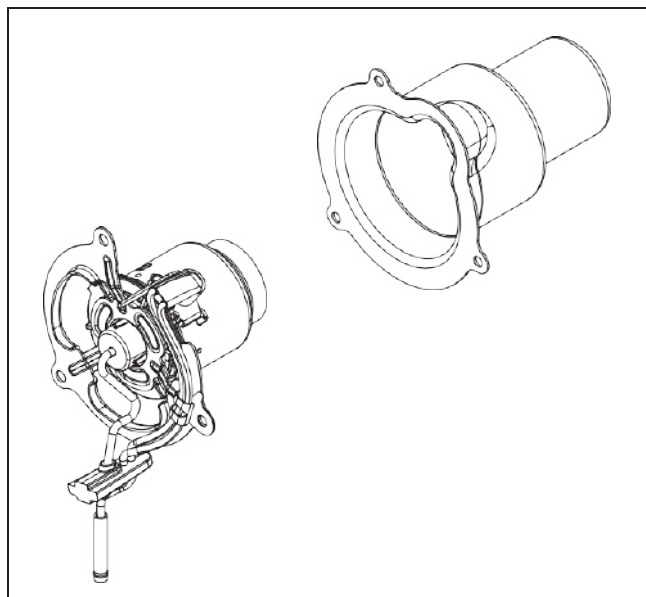


Fig. 5 Burner with combustion chamber

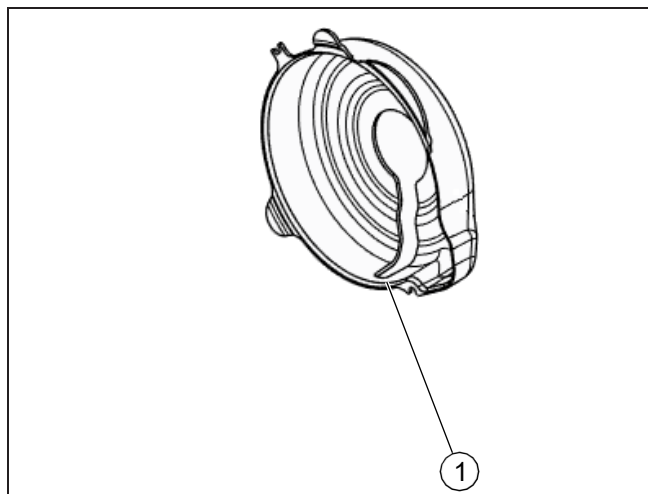


Fig. 6 Flow guide

1 Petrol flow guide

4.4 Control unit


NOTE

The control unit must not be disassembled.

The control unit is the central component for ensuring the functional sequence. It monitors the components, evaluates the signals from the sensors, and regulates the Heating mode.

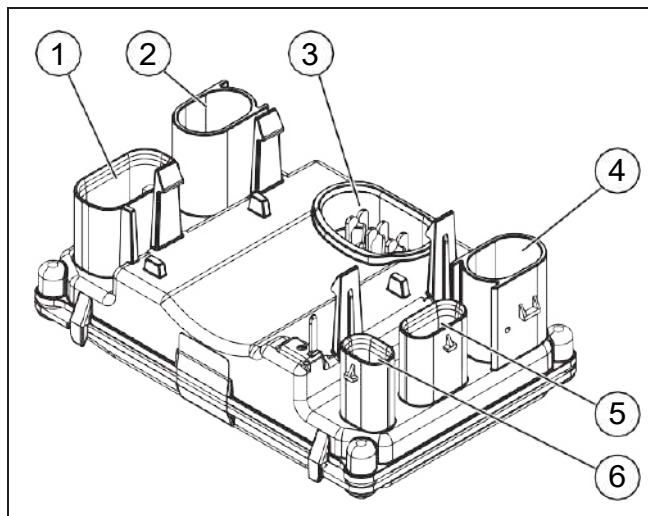


Fig. 7 Control unit

1 Vehicle wiring harness signal line connection (X5)	2 Vehicle wiring harness power supply connection (X3)
3 Drive motor connection (X1)	4 Glow plug connection (X2)
5 Overheat sensor connection (X4)	6 Air temperature sensor connection (X6)

4.5 Glow plug and sensors

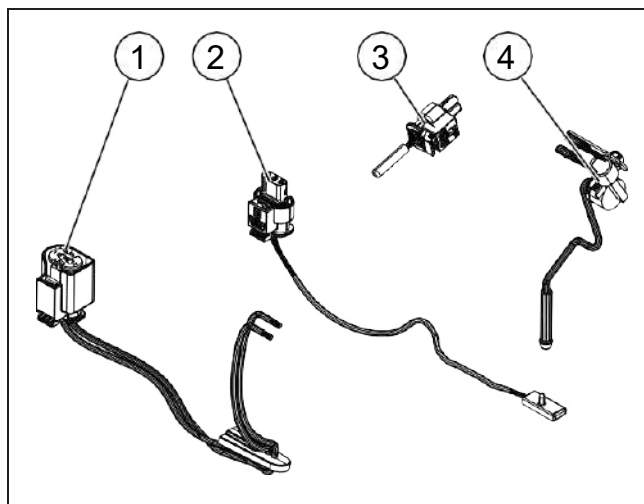


Fig. 8 Glow plug and sensors

1 Glow plug wiring harness (X2)	2 Overheat sensor (X4)
3 Air temperature sensor (X6)	4 Glow plug

4.5.1 Glow plug

The fuel/air mixture is heated by the glow plug when the heater has been started.

In the heater Air Top Pro 25, the glow plug also functions as flame detector. The flame detector is a low-impedance PTC resistor which changes its resistance as a function of the heat, emitted by the flame. This change in resistance is evaluated by the control unit, and in this way the flame status is monitored throughout the entire heater operation.

4.5.2 Overheat sensor

The overheating sensor measures the temperature in the fin area of the heat exchanger while the heater is operating. The control unit evaluates the signal, regulates the heating air outlet temperature and controls the overheating shut-down function.

4.6 Fuel pump

The fuel for combustion is supplied by the fuel pump.

The fuel pump is a combined delivery, metering and shut-off system for the heater's fuel supply. The heater Air Top Pro 25 must be operated with the DP 42.4 fuel pump. For the diesel variant of the heater, the fuel pump with damper is used.

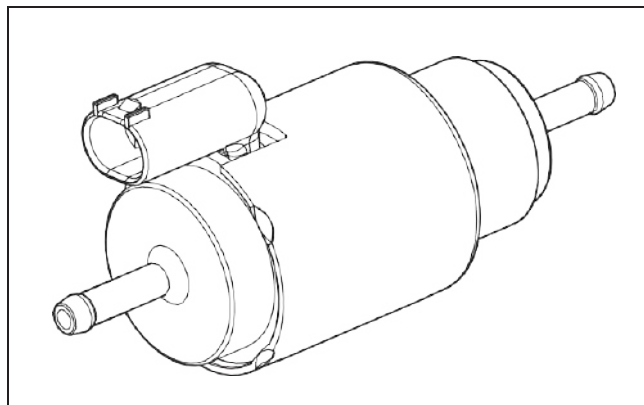


Fig. 9 DP 42.4 fuel pump

5 Functional description

5.1 Control panel

The control element is used to:

- Switch the heater on and off.
- Set the desired room temperature (between approx. 41 °F and 95 °F (5 °C and 35 °C)).
- Reset the heater after a malfunction.
- Display fault codes:
 - For control elements with a display: The error code is shown on the display.
 - For control elements without a display: The error code is indicated by the flashing sequence of the indicator light.
- To activate further functions or modes depending on the control element.

5.2 Switching on

The heater is switched on and off by different switch signals. Depending on the system equipment, the switching signals are generated via W-Bus, LIN or CAN by a control element, an external gateway or an external control unit. Set the control element to the desired temperature. If the room temperature is below the setpoint temperature, the start-up process begins.



See the operating and installation instructions for the control element.

If the documents are not available, they can be requested from Webasto for Webasto control elements.



NOTE

Always switch off the heater via the control element

After switching off via the control element, the heater switches to a short controlled run-on phase. Switching off incorrectly, without after-run, can cause damage to the heater.



NOTE

If the room temperature is above the set temperature, the heater is in control pause and only the hot air fan is running. When an external room temperature sensor is connected, the hot air fan does not run.

The internal components and flame formation are checked during the switch-on routine.

Start

The heater is started via a switch-on signal from the control element.

When the heater is started, the drive motor, the fuel pump and the glow plug are put into operation. The heater starts in a low load level and is slowly ramped up to the required heating power. During this start-up phase, the glow plug is used to check whether a flame has formed.

Automatic restart

If no flame is created or the flame fails, an automatic start-up procedure will be repeated. If no flame is created again, the start attempt is terminated. A fault switch-off occurs with an after-run of the combustion air fan. The heater can

only be put back into operation after it has been switched off. Depending on the temperature of the heating air, the control unit decides which start process is selected. Start processes are identical in sequence, but differ in the length of the individual phases (preheating, fuel delivery, etc.). The heater only starts if the temperature in the heat exchanger is below a defined threshold.



NOTE

The heater will assume fault lock-out mode after a failed restart. Briefly switch the heater off and on (for at least 2 seconds) to reset fault lock-out.

5.3 HEAT mode

The room temperature is measured by an air temperature sensor located on the intake side of the heater or by an externally located room temperature sensor. If the measured temperature is lower than the value set on the control element, the heating capacity of the heater increases to the required or, if applicable, maximum available heating capacity until the required temperature is reached.

To increase the service life of the burner, the heating mode is briefly interrupted every 8 hours, followed by an automatic restart.

5.3.1 Control mode

In control mode, the heater and combustion air fan speed and the fuel pump delivery rate depend on the heating power. The glow plug is switched off.

5.3.2 Control pause

After reaching the temperature set on the control element, the heating capacity is reduced. The speed of the heating and combustion air fan and the delivery rate of the fuel pump are reduced according to the remaining heat requirement, if necessary down to the lowest heating capacity level.

If, at minimum heating capacity, the temperature set on the control element is exceeded, the fuel pump will be shut down and combustion stops. After completing the shut-down routine, the heater enters a control pause. When a room temperature sensor is connected, the control pause speed is 0.



NOTE

Changes to the settings on the control element are implemented by the control unit/heater with a time delay.

5.4 Switching off

When the heater is switched off, the indicator lamp on the control element goes out. If no fuel has yet been delivered or if the heater is in control pause, the heater will be switched off immediately with no afterrunning period. If fuel delivery has already begun it will stop immediately when the heater is switched off. The heater is switched off in the same way as the transition from control mode to control pause. The heater is then switched off automatically.

5.5 Heater mode

Depending on the installed control element, different heater modes can be selected.

For this, please also refer to the operating instructions for the respective control element.

5.5.1 Boost

In Boost mode, the heater can increase its heating capacity to a maximum of 2.5 kW. The Boost function is available for a maximum of 6 hours per heating process and is dependent on a maximum outside temperature of 59°F (15°C). After an externally initiated switch-off command, the boost time is available again.

5.5.2 Standard

In standard mode, the heater can regulate up to a maximum output of 2.0 kW.

5.5.3 Eco

In eco mode, the heater can regulate up to a maximum output of 1.4 kW.

5.5.4 Forced Boost

This mode is intended for use in ambulance applications. It cannot be selected via the Webasto control elements. It is activated if, during ongoing heating operation, either a ground signal is applied to pin 4/X1 or a corresponding command is received via LIN/CAN communication.

In Forced Boost mode, the heater enters the boost stage; the specified and measured room temperature value is not taken into account. The overheating thresholds and other safety-relevant functions of the heater remain valid.

The Forced Boost mode is maintained for the duration of the applied ground potential, but for a maximum of 30 minutes. A cool-down phase at full load then takes place before Forced Boost can be activated again.

5.5.5 Ventilation

The hot air blower is operated in 4 stages that can be selected via the control element in order to circulate air in the vehicle interior or, in fresh air mode, to convey it from the outside into the vehicle interior. Temperatures of 15°F (70°C) must not be permanently exceeded.

As the combustion air fan and the heating air fan are driven by a common motor, the combustion air fan also runs in this mode. The fuel pump and the glow plug are not in operation. There is no regulation based on sensor values.

5.6 Fault switch-off

The control unit detects faults in individual heater components and malfunctions during start-up and operation. The heater shuts down and assumes fault lock-out when:

- No repeated or faulty start-up
- Internal air temperature sensor faulty
- Overheating sensor interrupted or short-circuited.
- Overheating sensor installed incorrectly.
- Glow plug interrupted or short-circuited.
- Drive motor overloaded or blocked or short-circuited or interrupted
- Fault in electrical circuit of fuel pump
- Undervoltage below 10.5 V / 21.5 V for longer than 20 seconds
- Overvoltage above 16 V/32 V for longer than 6 seconds
- Control unit defective.
- Overheat issue

- ▶ Control elements with display: the fault code is shown on the display.
- ▶ Control elements without display: the fault code is indicated by the flashing sequence of the indicator lamp.

5.6.1 Releasing the fault lock-out

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 fault lock-out (as described in the following).
5. Switch off the heater (min. 5 sec.).
6. Determine the cause of the malfunction (e.g. with or without a fault code, visual inspection of the fuses and plug connections, etc.).
7. Rectify fault.
8. Switch on the heater.
9. Fault lock-out unlocked.
10. The heater assumes control mode.

5.6.2 Reset heater lock-out

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.

The heater lock-out can be reset:

- with the Webasto System Diagnosis
- or by switching on the heater. Remove fuse **F1** for at least 10 secs. Switch off the heater. Re-insert fuse **F1**. Switch on the heater.

6 Technical data

Unless limit values are specified, the technical data listed in the table is subject to the usual tolerances for heaters of $\pm 10\%$ at an ambient temperature of $+20\text{ }^{\circ}\text{C}$ and at nominal voltage and under nominal conditions.

Electrical components

The control unit and glow plug are designed for either 12 V or 24 V operation.

The temperature sensors and the drive motor for the heating and combustion air fan are not dependent on voltage.

Fuel for Air Top Pro 25 (gasoline)

The fuel prescribed by the vehicle manufacturer according to DIN EN 228 is suitable as fuel.

Fuel for Air Top Pro 25 (Diesel)

The diesel fuel specified by the vehicle manufacturer in accordance with DIN EN 590 is suitable for use. Heating oil class EL - not heating oil L - can also be used, provided it corresponds to the quality customary on the German market according to DIN 51603.

No lasting effects from additives are known.

When taking fuel from the vehicle tank, the vehicle manufacturer's admixture regulations must be observed.

When changing to cold-resistant fuels, the heater must be operated for approx. 15 minutes to fill the fuel system with the new fuel.



NOTE

The technical data apply under the following conditions: ambient temperature: 68°F (20°C), geodetic height: 0 m above sea level, rated voltage. The standard tolerances of $\pm 10\%$ for heaters shall apply if no limits are specified.

Heater	Air Top Pro 25	
Type approval: EMC	E1 R10 - 06 9946	
Type approval: Heating	E1 R122 - 00 0662	
Design	Air heater with evaporator burner	
Duration of boost [h]	6	
Fuel	Petrol DIN EN 228 Ethanol fuel E85 DIN EN 15293 - E100 DIN EN 15376	Diesel DIN EN 590 HVO DIN EN 15940
Fuel consumption - control range g/h (L/h) [boost]	0.03 - 0.07 [0.09] (0,11 - 0,28) [0,35]	0.02 - 0.06 [0.08] (0,09 - 0,24) [0.30]
Rated voltage [V]	12	12 / 24
Operating voltage range [V]	10.5 - 16	10.5 - 16 / 20.5 - 31
Rated power consumption over control range [W] (boost)	3.3 - 12.0 (20.1)	3.3-12.0 (20.1) / 8.0-12.2 (21.2)
Heat flow over control range BTU [kW] (Boost)	2,700 - 6,800 [0,8 - 2,0] (2,5)	0,7 - 2,0 (2,5)
Altitude capability, maximum operating altitude above sea level ft [m]	18,000 [5,500]	
Permissible ambient temperature:		
Heater operation - °F [°C]	-40 - 104 [-40 - +40]	
Fuel pump operation (gasoline / diesel) °F [°C]	-40 - 68 [-40 - +20 / 30]	
Control unit operation °F [°C]	-40 - 167 [-40 - + 75]	
Permissible combustion air intake temperature °F [°C]	-40 - 68 [-40 - +20]	
Adjustment range for interior temperature F° [°C]	41 - 95 [+5 - +35]	
Maximum pressure loss in hot air system [hPa]	1.5	
Volumetric flow of hot air at fan speed against 0.5 hPa [m3/h] / [rpm]: Full load 2.0 kW	max. 86 / 4750	
Volumetric flow of hot air at fan speed against 0.7 hPa [m3/h] / [rpm]: Boost 2.5 kW	max. 100 / 5450	
CO2 in exhaust gas (permitted functional range) 1 kW / 2 kW [%]	5.0 - 8.0 9.0 - 12.5	

Heater	Air Top Pro 25
Length / height / width - in [mm]	12. 6 ± 0.1 / 4.9 ± 0.1 / 5 ± 0.1 [321 ± 2 / 125 ± 1 / 128 ± 1]
Heater weight - lbs [kg]	6.4 [2,9]
IP protection class: Heater	IP5K4K
IP protection class: Fuel pump	IPX6 / IPX7 / IP6K9K

6.1 Setpoints

Heater	Operation	12 V	24 V
Undervoltage shutdown in control mode (tripping time >20 s)		10.5 V [12 V]	21.5 V [24 V]
Undervoltage shutdown with active glow plug (tripping time >20 s)		9.5 V [12 V]	19.5 V [24 V]
Overvoltage shutdown in control mode (tripping time > 6 s)		> 16 V	> 32 V

Table 1: Setpoints Air Top Pro 25

7 Malfunctions and troubleshooting

7.1 General information



NOTE

Troubleshooting is generally restricted to locating faulty heater components.

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

- ▶ Corrosion on the connector
- ▶ Loose contact on the connector
- ▶ Crimping fault on the connector
- ▶ Completeness of the connector
- ▶ Corroded cables and fuses
- ▶ Corroded battery terminals

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



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.

Fault symptoms	Possible cause	Remedy
Heater produces black smoke	Combustion air and/or exhaust system blocked	Check combustion-air and exhaust-gas routing for free passage

Table 2: General fault symptoms

7.3 Fault symptoms while operating

The following table lists the possible fault symptoms during operation which should be checked first. In the event of a malfunction, the fault is to be located and rectified with the aid of this table. It is important to ensure that the fault symptom is clearly identified.

If the fault symptom is not included in this table, or if the malfunction is not identified under the specific fault symptom, the malfunction can be determined by the displayed fault codes according to the following tables. In an emergency you can contact our technicians on our Service Hotline.



NOTE

Every fault is indicated by the flashing LED on the heater control after the overrun has ended. All faults could possibly be caused by a faulty control unit if the other components are in order.

Fault symptoms	Occurrence	Possible cause
Heater will not start and LED on control element not lit	Immediate	Incorrect wiring, defective fuse
Heater will not start, but LED lit	Immediate	When switching on, the device immediately enters a control pause, whereby the control pause speed is 0 rpm when using an external temperature sensor.

Table 3: Fault symptoms while operating

7.2 General fault symptoms

The following table lists the possible fault symptoms.

Fault symptoms	Possible cause	Remedy
Heater switches off automatically	No combustion after start and re-start Switch-on check flashes	Briefly switch heater off and on again
	Flame goes out during operation Switch-on check flashes	Briefly switch heater off and on again
	Heater overheats Switch-on check flashes	Check if hot-air ducting is unobstructed, allow heater to cool down, briefly switch heater off and on again
	Battery voltage too low Switch-on check flashes	Charge battery Briefly switch heater off and on again

7.4 Error code output

Error code output: HEX	Faults	Fault details	Recommended measures
H00	No error	No error	No action necessary
H01	Control unit fault	Control unit defective, faulty EOL programming	Replace the control unit.
H02	No start	No flame was formed, even after a restart.	1. Check for fault in air intake and exhaust systems 2. Troubleshooting in the fuel system 3. Check the fuel pump 4. Electrical check of glow plug
H03	Flame failure	The flame goes out during operation and no longer reformed after a restart attempt.	See error 02
H04	Supply voltage too high	The operating voltage was higher than the maximum permissible value for too long.	Check system voltage
H05	Flame was detected prior to combustion.	The flame monitor detected a flame before combustion started.	1. Check for fault in air intake, exhaust systems 2. Troubleshooting in the fuel system 3. Check the fuel pump 4. Electrical test of glow plug
H06	Overheating / Overheating temperature sensor (OTS)	Overheating lock-out has tripped (heater overheated).	1. Check for fault in air intake/blow-out side, exhaust systems 2. Troubleshooting in the fuel system
H07	Heater lock-out.	Heater lock-out was activated.	1. Reset heater lock-out and attempt restart 2. Read out further fault messages and work through the instructions Reset heater lock-out: switch on heater. Pull fuse F1 for at least 10 s. Switch off the heater. Reinsert fuse F1. Switch on the heater.
H08	Fuel pump short circuit	The fuel pump circuit has a short circuit to earth.	Electrical check of fuel system
H09	Combustion air fan short circuit	The combustion air fan has a short circuit to earth or the fan motor is overloaded.	Electrical check of combustion air fan motor
H12	Communication faulty	Communication faulty (bus fault, protocol error).	1. Troubleshoot the communication / control element area; check the electrical connection from the control element to the heater. 2. Replace control unit
H14	Temperature sensor short circuit (internal, external)	There is a short to ground in the electrical circuit of the temperature sensor.	Electrical check of external/internal temperature sensor
H15	Combustion air fan blocking guard	Combustion air fan blocking guard has tripped.	1. Check for fault in the fan motor. 2. Heating air intake fan wheel snagging or jammed. 3. Combustion air intake fan wheel snagging or jammed.

Error code output: HEX	Faults	Fault details	Recommended measures
H17	Gradient exceedance of the overheating temperature sensor (OTS).	Incorrect application or impermissible insulation (OTS gradient too great).	Check for fault in air intake/blow-out side, exhaust systems
H19	Glow plug short circuit	There is a short to ground in the electrical circuit of the glow plug / ignition spark generator.	Electrical check of glow plug
H22	Glow plug resistance out of tolerance	The glow plug resistance is out of tolerance during start-up.	Replace glow plug
H81	EOL checksum error	The EOL data set in the EEPROM has a checksum error.	Replace control unit
H82	No start during test-run	No start during test-run	See error 02
H84	Operating voltage too low.	The operating voltage was below the minimum permissible value for too long.	Check system voltage
H88	Fuel pump interruption	The fuel pump circuit is interrupted or has a short circuit to UB.	Electrical check of fuel system
H89	Combustion air fan interruption	The combustion air fan circuit is interrupted or has a short circuit to UB.	Electrical check of fan motor
H92	Maintain W-bus command	Maintaining command failed. If the fault occurs, no operation or Fault switch-off.	Troubleshooting in the area of W-bus communication / W-bus control element / W-bus Telestart
H93	Gradient undershooting during start	Incorrect position of the overheating temperature sensor (OTS gradient too small)	1. Check the position of the overheating temperature sensor (OTS) 2. Check fuel supply
H94	Temperature sensor interruption (internal, external)	The temperature sensor is interrupted or has a short circuit to UB.	Electrical check of external/internal temperature sensor
H95	Combustion air fan motor communication error	Communication to the combustion air fan motor is interrupted or faulty.	1. Check wiring, check voltage 2. Replace motor
H99	Glow plug / electronic ignition unit interruption	The glow plug / ignition spark generator is interrupted or has a short circuit to UB.	Electrical check of glow plug
H1B	Overheating temperature sensor (OTS) short circuit	There is a short circuit to earth on the switched line of the element.	Electrical check of the overheating temperature sensor (OTS)
H2A	Pressure sensor interruption	The pressure sensor circuit is interrupted.	Replace control unit
H2C	Pressure sensor short circuit	The pressure sensor has a short circuit to UB.	Replace control unit
H2E	Glow plug resistance out of tolerance	The glow plug resistance is outside the tolerance during calibration.	Replace glow plug

Error code output: HEX	Faults	Fault details	Recommended measures
H4E	Fuel pump timer exceeded	The maximum permissible delivery time of the fuel pump without a successful start has been exceeded.	See error 02
AB	Overheating temperature sensor (OTS) interruption	The overheating temperature sensor circuit is interrupted or has a short circuit to UB.	Electrical check of the overheating temperature sensor (OTS)
AD	D+ signal interruption	The D+ signal is interrupted or has a short circuit to UB.	Check wiring
AE	Auxiliary drive interruption	The auxiliary drive signal is interrupted or has a short circuit to UB.	Check wiring
H5A	Overheating temperature sensor (OTS) values implausible	The values from the overheating temperature sensor (OTS) are implausible when compared to the air intake temperature sensor (ATS) (gradient evaluation).	Check the air ducting, check for possible false air ingress.

Table 4: Error code output

Error code output: Flash code / FXX	Error message	Fault details	Recommended measures
00	Control unit fault	Control unit defective, faulty EOL programming.	1. Troubleshooting in the area of W-bus communication / W-bus control element / W-bus Tele-start 2. Replace control unit
01	No start	No flame was formed, even after a restart.	1. Check for fault in air in-take and exhaust systems 2. Troubleshooting in the fuel system 3. Check the fuel pump 4. Electrical check of glow plug
02	Flame failure	The flame goes out during operation and no longer reformed after a restart attempt.	See error 01
03	Supply voltage too high	The operating voltage was higher than the maximum permissible value for too long.	Check system voltage
04	Flame was detected prior to combustion.	The flame monitor detected a flame before combustion started.	1. Check for fault in air in-take, exhaust systems 2. Troubleshoot the fuel system 3. Check the fuel pump 4. Electrical test of glow plug

Error code output: Flash code / FXX	Error message	Fault details	Recommended measures
05	Flame sensor interruption	There is a break or short to UB in the electrical circuit of the flame detector.	Electrical check of flame monitor
06	Temperature sensor interruption (internal, external)	The temperature sensor is interrupted or has a short circuit to UB.	Electrical check of external/ internal temperature sensor
07	Fuel pump interruption	The fuel pump circuit is interrupted or has a short circuit to UB.	Electrical check of fuel system
08	Combustion air fan short circuit	The combustion air fan has a short circuit to earth or the fan motor is overloaded.	Electrical check of combustion air fan motor
	Combustion air fan blocking guard	Combustion air fan blocking guard has tripped.	1. Check for fault in the fan motor. 2. Heating air intake fan wheel snagging or jammed. 3. Combustion air intake fan wheel snagging or jammed.
09	Glow plug / electronic ignition unit interruption	The glow plug / ignition spark generator is interrupted or has a short circuit to UB.	Electrical check of glow plug
10	Overheating at overheating temperature sensor (OTS)	Overheating lock-out has tripped (heater overheated)	1. Check for fault in air intake/blow-out side, exhaust systems 2. Troubleshooting in the fuel system
11	Overheating temperature sensor (OTS) interruption	There is a break or short to UB in the electrical circuit of the overheating sensor.	Electrical check of over-heating sensor
12	Heater lock-out	Heater lock-out was activated.	1. Reset heater lock-out and attempt restart 2. Read out further fault messages and work through the instructions Delete heater lock-out: 1. Switch on the heater. 2. Pull fuse F1 for at least 10 s. 3. Switch off the heater. 4. Reinsert fuse F1. 5. Switch on the heater.
14	Gradient undershooting during start	Incorrect position of the overheating temperature sensor (OTS gradient too small)	1. Check the position of the overheating temperature sensor (OTS) 2. Check fuel supply

Table 5: Error code output (flash code or FXX-display)

8 Function checks

8.1 General information

This section describes the checks conducted on the heater in installed and uninstalled state to verify that it is in working order.


NOTE

Continue to follow the warnings and information provided in the operating- and Installation instructions.


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.

8.1.1 Required test and measuring equipment

The test and measuring equipment must be calibrated and measuring equipment suitability must be certified.

- Digital multimeter: for measuring electrical resistance [Ohm], electrical continuity 0.1 Ohm, test current < 5 mA
- Suitable voltage source.
Supplies electrical voltage [Volt]
10 - 30 Volt,
≥ 30 Ampere
- Charged vehicle battery
- PC / Laptop.
System requirements:
 - See the Webasto System Diagnosis Operating Instructions
 - Information can be found at dealers.webasto.com
- Webasto diagnostic adapter incl. Webasto System Diagnosis software.
Diagnostic adapter is available from Webasto.
- CO₂ measuring device:
Minimum specifications CO₂ measuring device:

	Resolution	Precise	Area
CO	10 ppm	±5%	0-2000 ppm
CO ₂	0,1%	±5%	0-16%


NOTE

Technical data refer to an ambient temperature of 68°F (20 °C), an air pressure of 1013 hPa.

A schematic diagram of the components necessary to operate a heater is shown below. Application-specific interfaces must be taken into account.

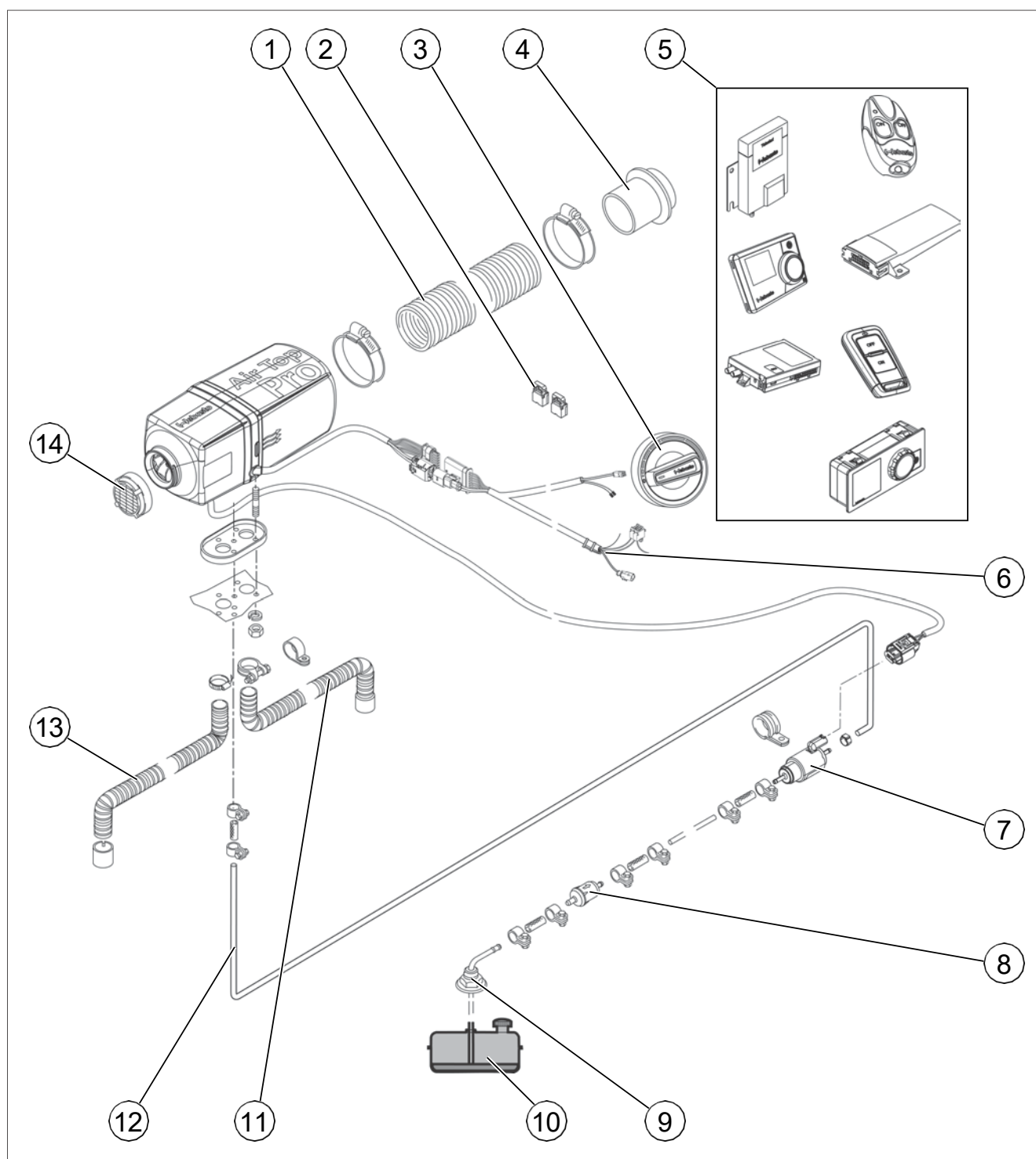


Fig. 10 Component overview

1	Hot air outlet hose	2	Heater fuse
3	Heater control digital rotary selector	4	Hot air outlet nozzle
5	Control elements	6	Electr. vehicle Interface
7	Fuel pump	8	Fuel filter
9	Tank extracting device	10	Fuel tank
11	Exhaust pipe	12	Fuel line
13	Combustion air intake pipe	14	Hot-air intake grille

8.1.2 Function check in the vehicle

Check the following points:

1. **Vehicle settings**
 - Test and bleed fuel system.
 - Check battery voltage
2. **Heater settings**
 - Switch on the heater at the control element.
 - Check heating action. Run the heater in combustion mode. Check the heating effect at the outlet nozzles.
 - Switch off the heater again at the control element.

8.2 Check and set CO₂ in exhaust gas

The CO₂ content in the exhaust gas is set via the corresponding menu in the Webasto System Diagnosis.



ATTENTION

The CO₂ measuring instruments must be calibrated. The heater must be switched off.

Petrol heaters: The measured CO₂ content at partial load (1.5 kW) 4700 rpm must be at:

- 0 m: 7 vol%,
- 1,600 ft (500 m): 7.5 vol%
- 3,200 ft (1000 m): 8 vol%
- 4,900 ft (1500 m): 8.6 vol%

After adjustment, the CO₂ content at full load should be 12 ± 0.5 vol%.



NOTE

The heater will now run in normal mode again and can be switched off at the control element. The heater is set at the factory to match the fan motor.

8.3 Testing individual components

If a fault is detected in a specific component or module in the Webasto system diagnosis, the fault pattern can be checked in accordance with the following instructions.



NOTE

If this procedure is not able to detect the fault, contact Webasto at 800-860-7866 Mon-Fri 8-5 EST) and follow the prompts to contact the technical assistance department.



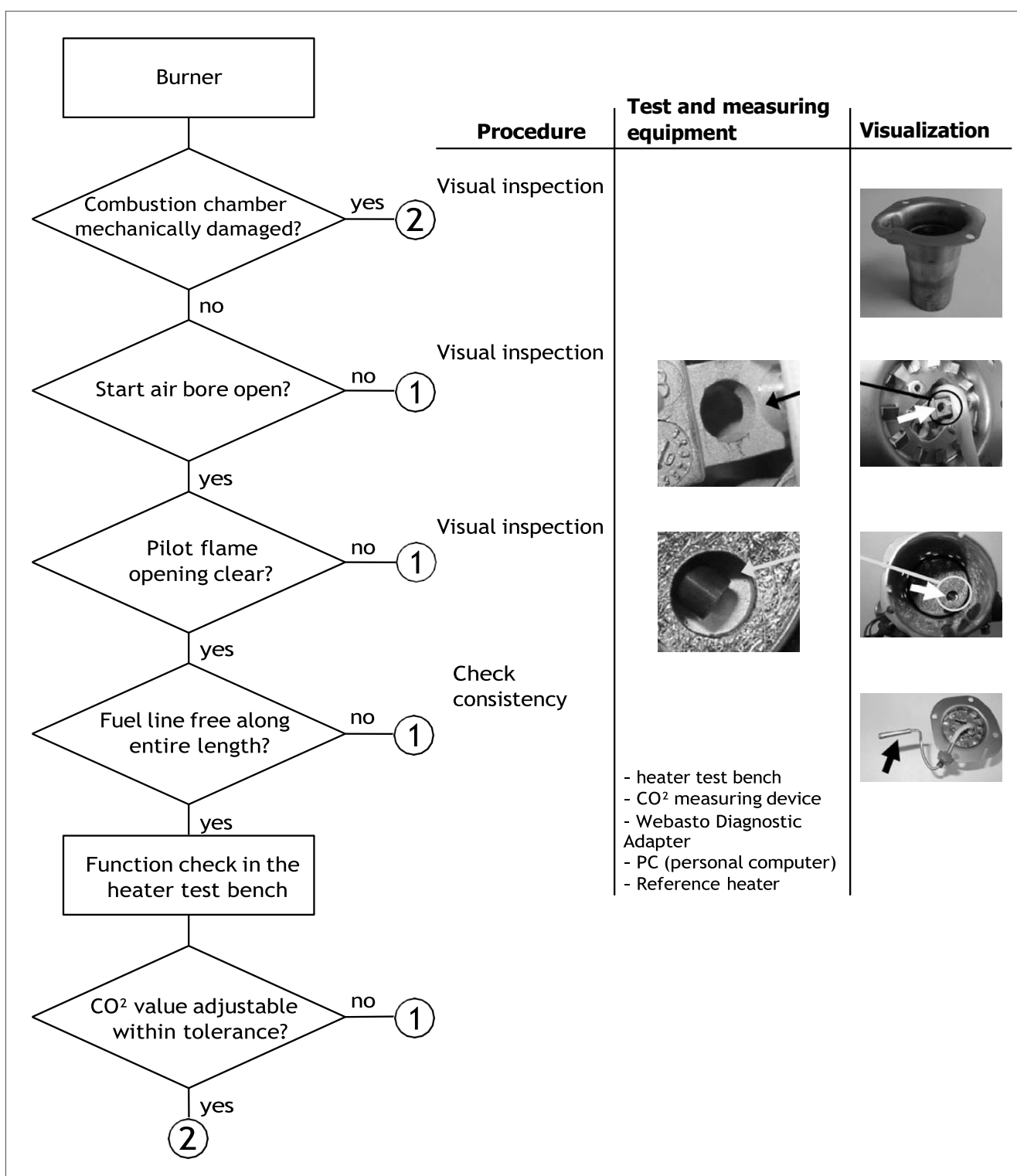
NOTE

Damage caused by soiling will not be recognised by Webasto!

①	Replace component. Within the warranty period, send in the defective component (not the entire heater) to Webasto.
②	Replace component and continue.
③	Replace the heater. Within the warranty period, send in the defective heater to Webasto.
④	Continue.
A	(Or B, C), See flow chart.

Table 6: Legend of diagram

8.3.1 Component: burner



8.3.2 Glow plug component

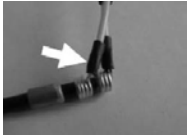


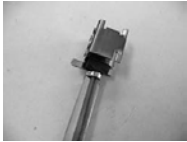
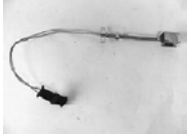
NOTE

The resistance must be measured with a ohmmeter suitable for low resistance. Measuring the resistance with a simple digital multimeter is too inaccurate to determine the exact values. A new glow plug can be measured as a reference.

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

Glow plug	12 V	24 V
Resistance at 25 °C	0.263 - 0.323 Ohm	1.125 - 1.375 Ohm
Test current	< 5 mA	< 5 mA

Glow plug	Procedure	Test and measuring equipment	Visualization
Contacts detached? yes 2 no	Visual inspection		
Cables damaged? yes 2 no	Visual inspection		
Ceramic element broken? yes A no	Visual inspection		
External resistance: 24 V 1.1 - 1.6 Ohm? 12 V 0.2 - 0.4 Ohm? yes 1 no 2	Resistance measurement	Digital multimeter	
A Ceramic element broken due to force? no 1 yes 2	Visual inspection		

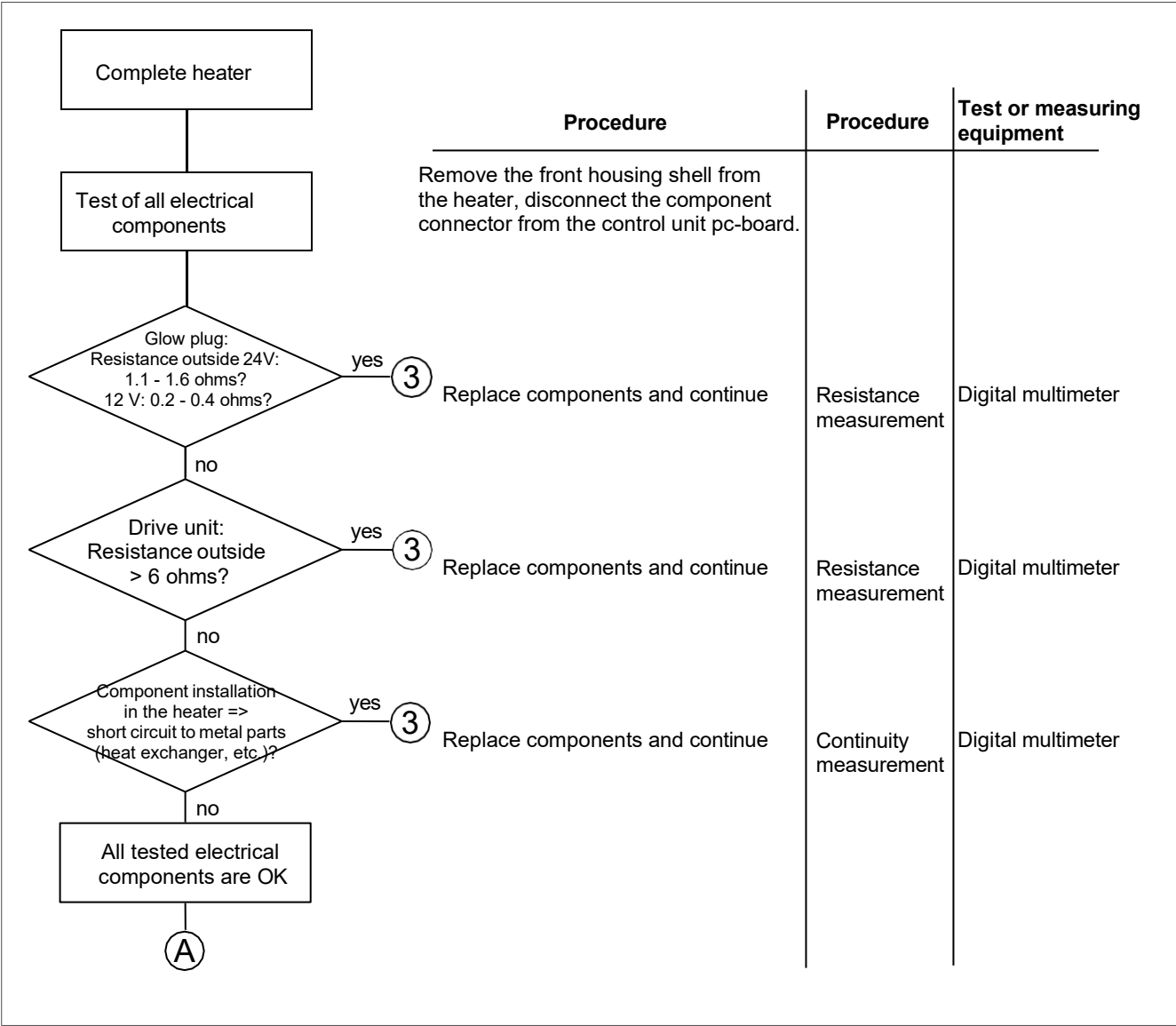
Overheating temperature sensor	Procedure	Test and measuring equipment	Visualization
Contacts detached? yes ② no	Visual inspection		
Cables damaged? yes ② no	Visual inspection		
Connector damaged? yes ② no	Visual inspection		
Resistance outside 2-2.5 Ohm? yes ② no ①	Resistance measurement	Digital multimeter	

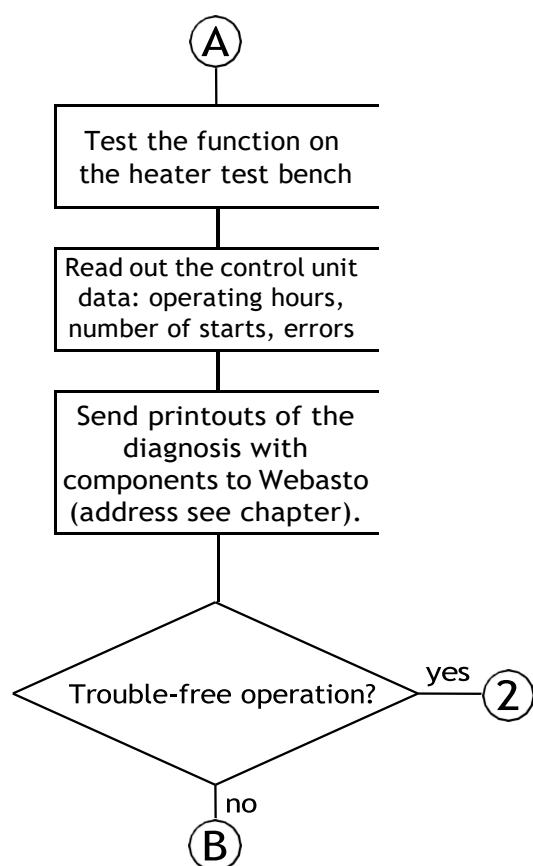
```

graph TD
    CU[Control unit] --> D1{Externally damaged?}
    D1 -- yes --> 2a((2))
    D1 -- no --> D2{Trouble-free operation in reference heater?}
    D2 -- no --> 1((1))
    D2 -- yes --> 2b((2))
  
```

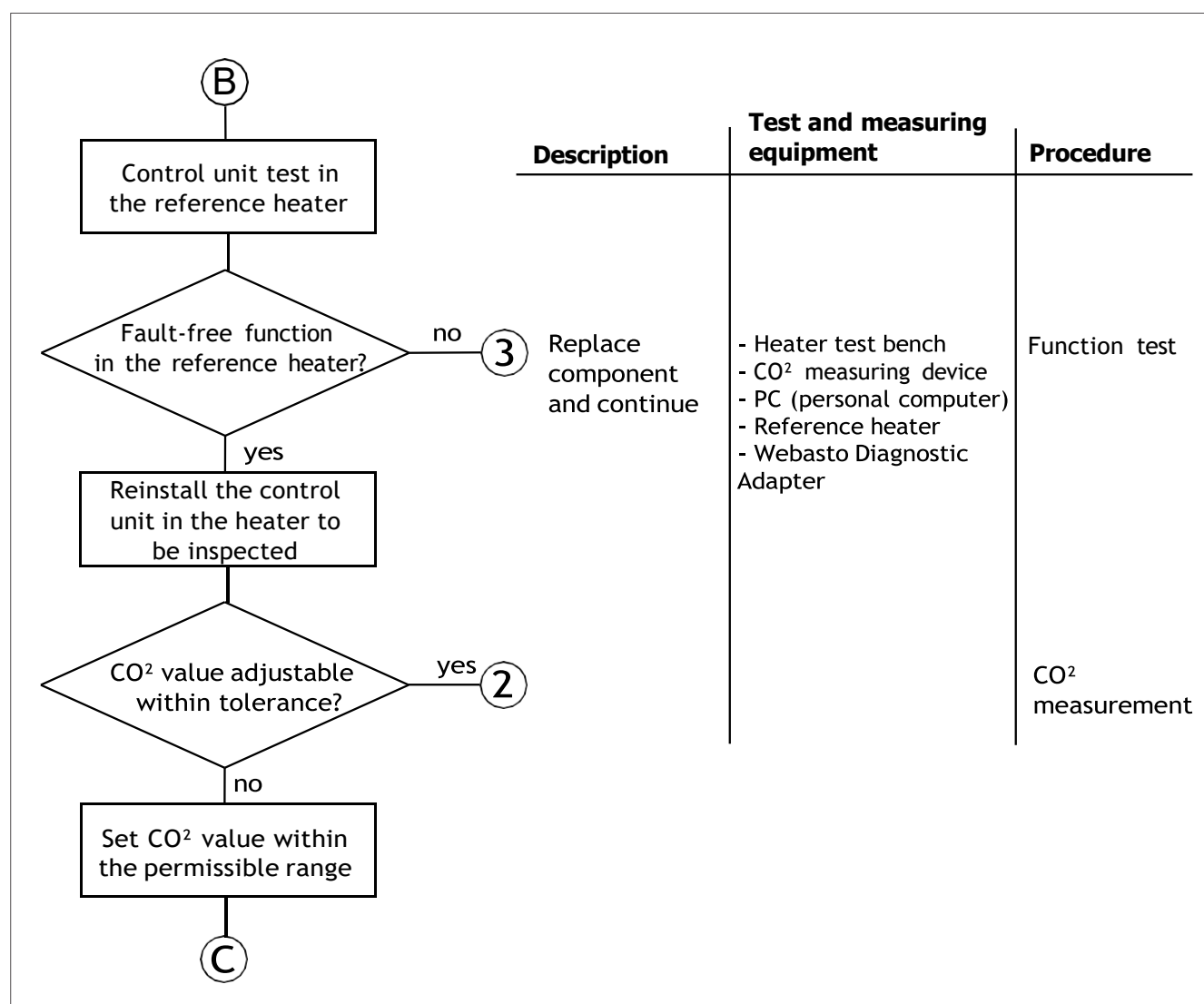
Procedure	Test or measuring equipment	Visualization
Visual inspection		
Carry out a functional check with the reference device, mount the control unit to be diagnosed in the reference heater, carry out a functional check	- Heater test stand - PC (personal computer) - Webasto diagnostic adapter - Reference heater	

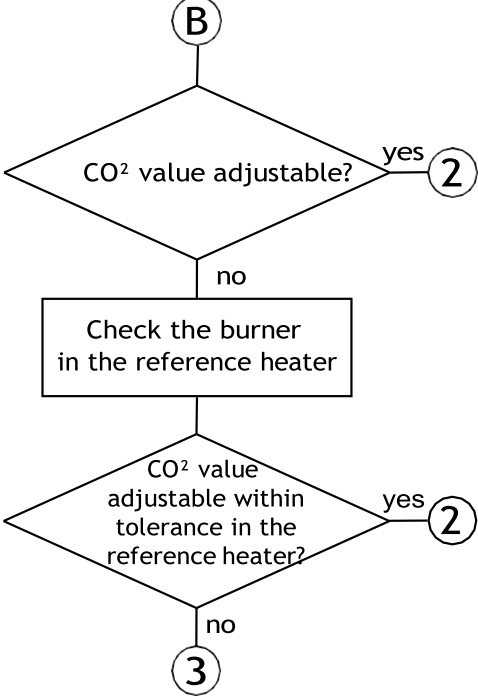
8.3.6 Component: heater





Description	Test and measuring equipment	Procedure
	- Heater test bench - PC (personal computer) - Webasto Diagnostic Adapter	Function test



Description	Test and measuring equipment	Procedure
 <pre> graph TD B((B)) --> D1{CO² value adjustable?} D1 -- yes --> 2((2)) D1 -- no --> R1[Check the burner in the reference heater] R1 --> D2{CO² value adjustable within tolerance in the reference heater?} D2 -- yes --> 2 D2 -- no --> 3((3)) </pre>	Perform function test with reference heater. Set reference device to nominal CO² value on site according to image after 5 minutes of operation, install burner to be inspected in reference device, measure CO² value after 5 minutes of operation	- Heater test bench - CO² measuring device - PC (personal computer) - Reference heater - Webasto Diagnostic Adapter Function test CO² measurement

9 Wiring diagrams

9.1 General information

The heater Air Top Pro 25 can be operated with various control elements, including a rotary switch (W-bus), MultiControl, SmartControl or Thermoconnect.

The wiring diagrams show the possible 12- or 24-volt circuits with:

- MultiControl element
- MultiControl element and battery disconnecter
- ADR operation with SmartControl

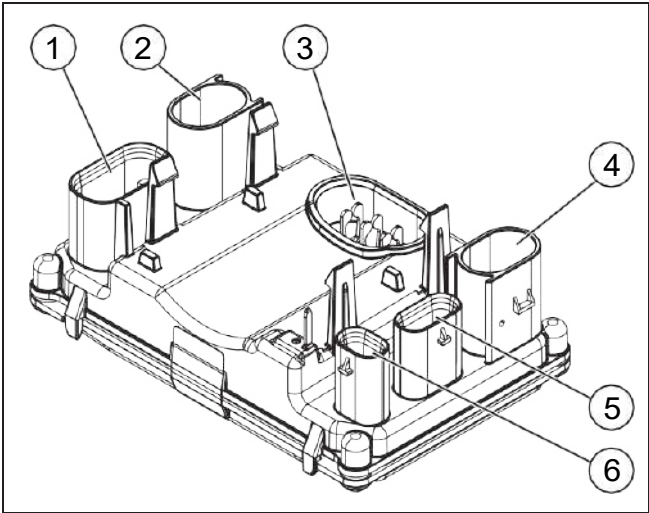


Fig. 7 Control unit

1	Vehicle wiring harness signal line connection (X5)	2	Vehicle wiring harness power supply connection (X3)
3	Drive motor connection (X1)	4	Glow plug connection (X2)
5	Overheat sensor connection (X4)	6	Air temperature sensor connection (X6)

9.2 Wiring diagrams

No.	Configuration
1	12 V / 24 V with MultiControl (see Fig. 12)
2	12 V / 24 V with rotary switch and vehicle blower (see Fig. 13)
3	12 V / 24 V ADR operation with rotary switch (see Fig. 14)
4	12 V / 24 V ADR operation with SmartControl (see Fig. 15)

Table 7: Wiring diagram overview

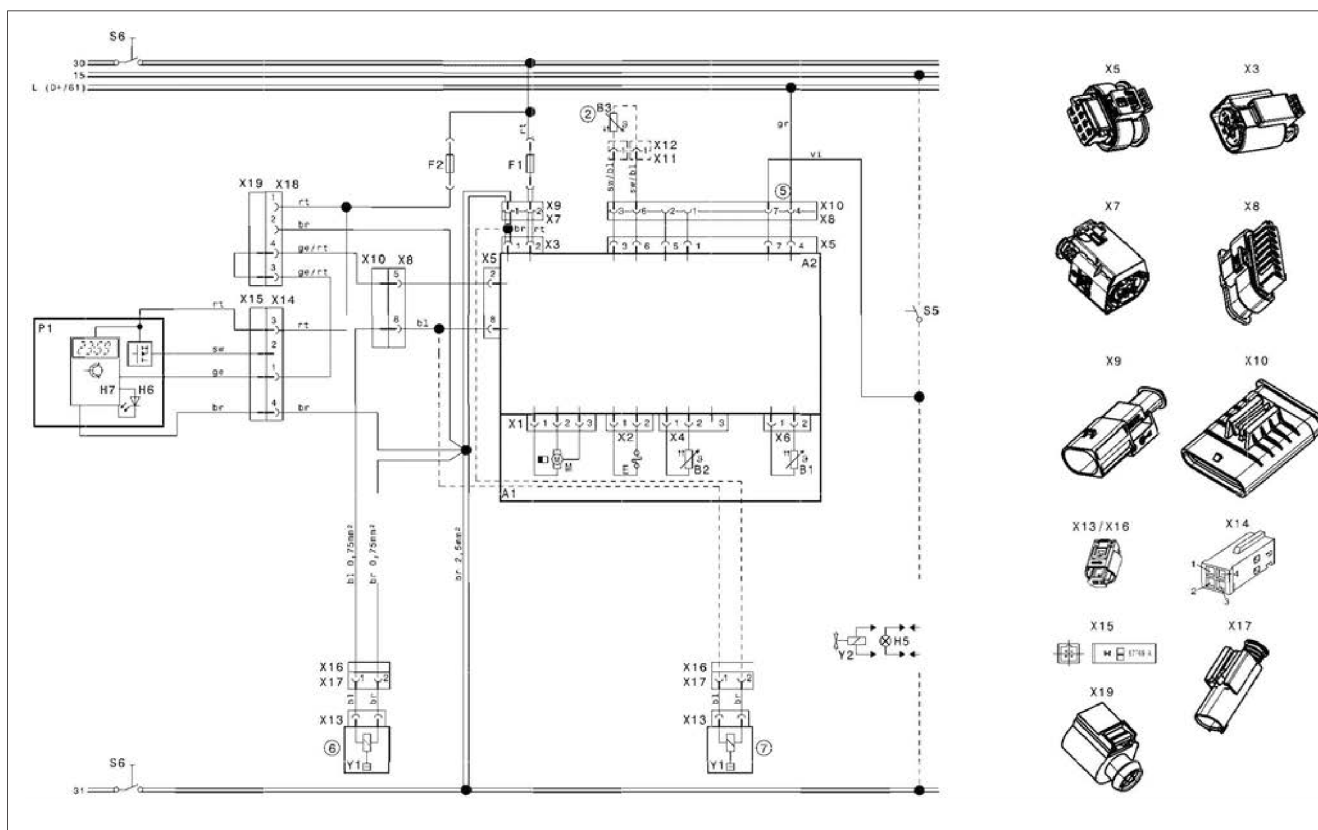


Fig. 12 SmartControl wiring diagram

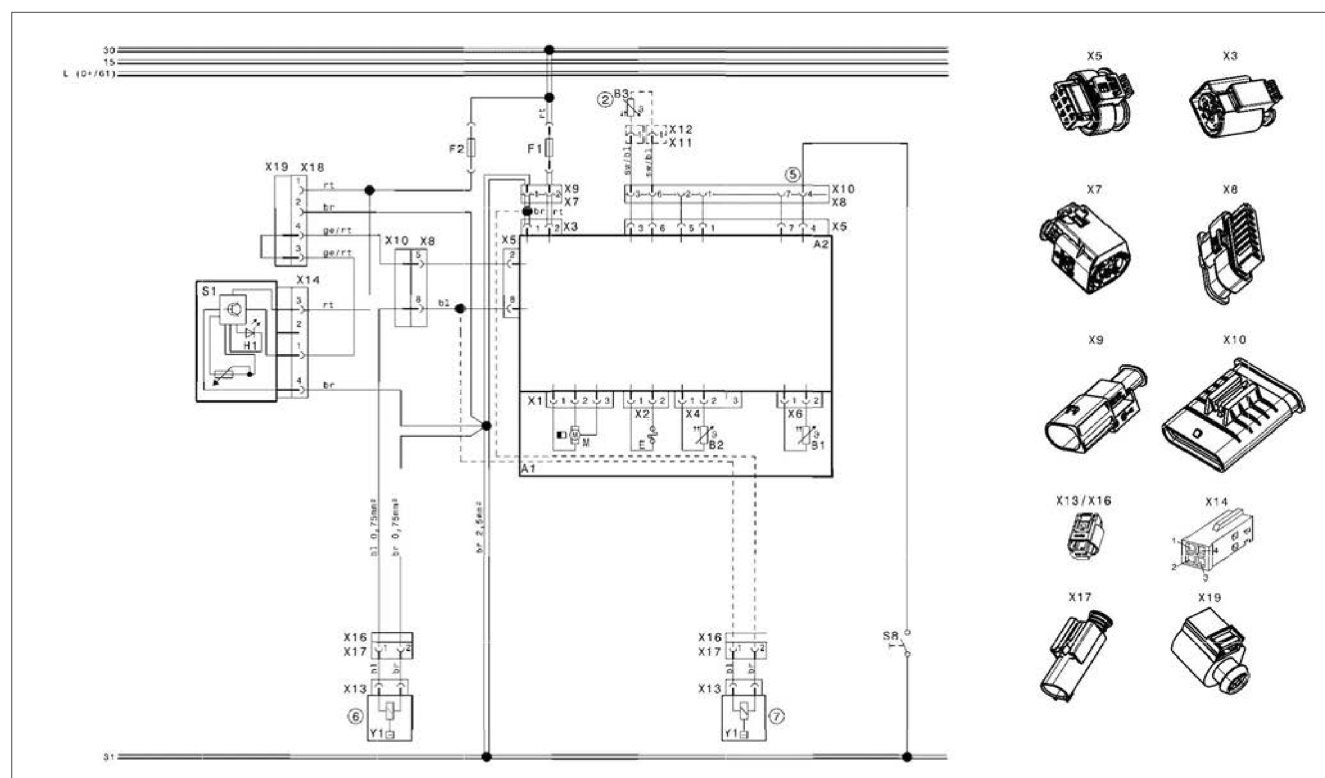


Fig. 13 Wiring diagram for rotary switch

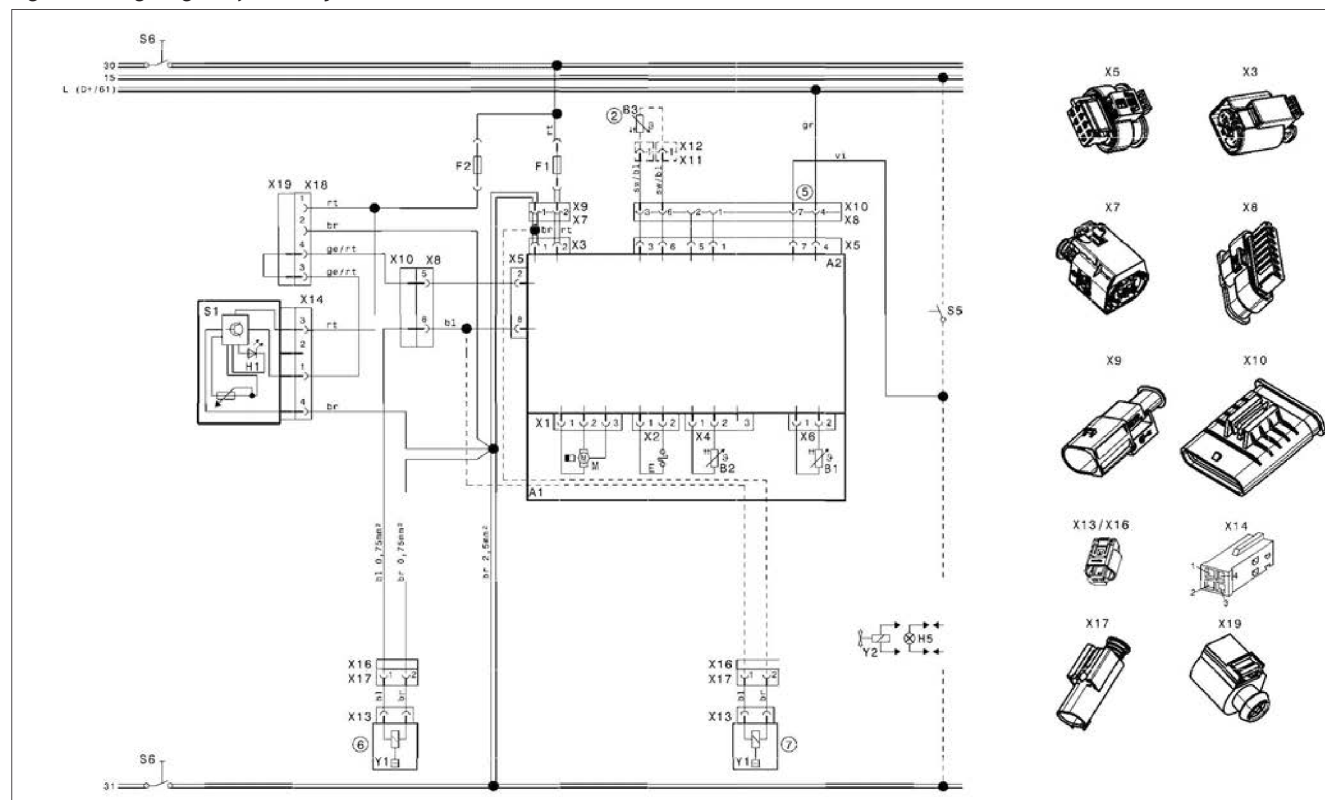


Fig. 14 Wiring diagram for ADR operation with rotary switch

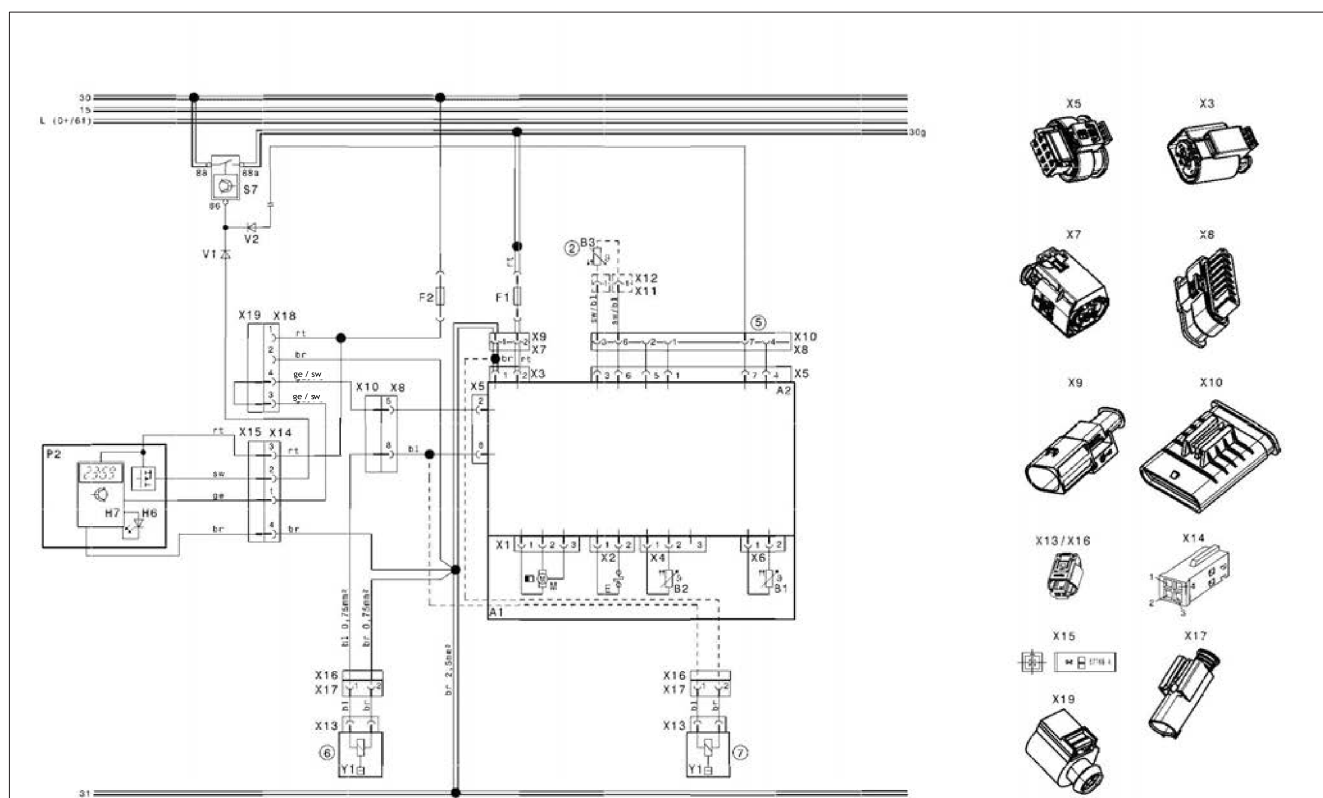


Fig. 15 MultiControl

9.3 Legend to wiring diagram

Pos.	Designation	Comment
②	External room temperature sensor	optional
⑤	Grey / violet cable	- required for ADR, BTS or FB - If not used, tie back the wires.
⑥	Fuel pump connection	Alternative 1
⑦	Fuel pump connection	Alternative 2
A1	Heater	Air Top Pro 25
A2	Control unit	
B1	Temperature sensor	Internal
B2	Overheat sensor	Overheating protector
B3	Temperature sensor	External (optional)
E	Glow plug	-
F1	Fuse: 24 V = 20 A; 12 V = 20 A	Blade fuse DIN 72581-3
F2	Fuse 1A	Blade fuse DIN 72581-3
F3	Fuse 1A	Not included in the wiring harness
F4	Fuse 1A	Not included in the wiring harness
H1	Green/red LED (in pos. S1)	Power-on indicator, error code display
H6	LED (green, blue, white, red)	Operating indicator, standby indicator, power-on indicator, error indicator
H7	Symbol in display	-
M	Motor	Combustion and heating air blower
P2	Multicontrol	
S1	Rotary switch control element (Rotary Control)	ON/OFF and target temperature
S5	Switch	Power take-off / conveyor
S6	Single or double-pole switch	Isolator switch
S7	Battery isolator switch	Electronically controlled isolator switch (max. 500 mA)
S8	Switch	Activation of Forced Boost function (Ambulance)
V1 / V2	Diode	Min. 500 mA (not included in the wiring harness)
X1-X6	Plug connection	At pos. A2
X7	2-pin plug connection	Heater power supply connector
X8	8-pin plug connection	Heater signal connection plug

Pos.	Designation	Comment
X9	2-pin plug connection	Vehicle wiring harness power supply connection
X10	8-pin plug connection	Vehicle wiring harness signal connection
X11	1-pin connector (x2)	To item B3 (optional)
X12	1-pin connector (x2)	At item B3 (optional)
X13/ X16	2-pin plug connection	At item Y1
X14	4-pin connector	W-Bus, SmartControl / MultiControl or Rotary Control connection
X15	4-pin connector	At item P1, P2 or S1
X17	2-pin plug connection	Metering pump wiring harness connection
X18	4-pin connector	Diagnosis connection
X19	4-pin connector	Diagnosis loop, if the diagnosis system is not connected.
Y1	Fuel pump	
Y2	Solenoid valve / pump	Power take-off / conveyor

9.4 Cable cross-sections and colors



Wires or components shown with dashed lines are optional and not included in the scope of delivery or in the wiring harness.

Line length	< 7.5 m	7.5 – 15 m
Cable cross-sections (Wiring diagram based on < 7.5 m)	0.5 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

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

9.5 Pin assignments plug connection X9

No.	Description
1	Power supply - (terminal 31)
2	Power supply + (terminal 30)

9.6 Pin assignments plug connection X10

No.	Description
1	CAN Low
2	CAN High
3	External temperature sensor -
4	D+ / Forced Boost
5	WBUS / LIN
6	External temperature sensor + / LIN 12V
7	Auxiliary drive / battery isolator switch
8	Metering pump / free (depending on version)

10 Servicing

10.1 General information

This section describes the permissible servicing work on the heater when installed.

10.2 Working on the heater

The fuse must always be removed before any work is carried out on the heater. The main battery power must not be disconnected whilst the heater is operating or after running due to the risk of the heater overheating and consequently the overheating safeguard tripping. For extensive repair work on the heater, complete disassembly is necessary.

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

10.3 Working on the vehicle



ATTENTION

On no account must a temperature of 185°F (85°C) be exceeded in the vicinity of the heater (e.g. vehicle paintwork).

10.4 Heater test run



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.



ATTENTION

Operation of the heater without the cover is not permitted.

10.5 Servicing



NOTE

To prevent mechanical parts from seizing, the heater should be run for approx. 10 minutes every 4 weeks.

The heater requires no maintenance. It should however be checked at regular intervals, at the start of the heating period at the latest (when the heater will be used more frequently due to colder weather conditions) by Webasto-trained technical personnel.

The following servicing jobs should be carried out to maintain the functional reliability of the heater:

- Check the hot air inlet and outlet for dirt and foreign objects. (Contaminated or insulated hot air ducts can lead to overheating.)
- Cleaning heater exterior (make sure no water gets in).

Checking exhaust and combustion air intake lines for damage and ensuring they are clear.

- Replace the fuel filter, if installed.
- Check fuel line and filters for leaks.

10.6 Visual inspections or installation instructions

10.6.1 Hot air system



ATTENTION

Due to the high pressure in the vehicle system, it is not permitted to integrate the heater into the vehicle's air circulation system.

A temperature sensor is mounted on the control unit which, in conjunction with the control element, operates the heater in the corresponding heating output range according to the intake temperature and the setting of the control element. The heating capacity is set such that, after the selected interior temperature has been reached quickly, the output is maintained at the preselected value. Alternatively, the heaters can be operated with an external room temperature sensor (see chapter 11.1.2, "Carrying out modifications" on page 35 modifications).



NOTE

Only materials that can permanently withstand temperatures of at least 266°F (130°C) are to be used for the heating air duct.

The maximum pressure loss of the hot air system must not exceed 1.5 hPa (see). The heating capacity will be reduced if the limit is exceeded.

The inside diameter of the main section of the heating air line should be 1.2 in (60 mm). If thinner lines are used, the permissible pressure drop is exceeded more quickly. The heating air hose is to be secured at the connection points. The heater can be used in recirculated air mode if there is a grille on the heating air inlet and outlet side. A short circuit of the heating air flow must be avoided.



ATTENTION

In vehicles used to transport persons, the air outlet opening is to be arranged such that it is at least 20 cm away from any parts of the body.

When switched on, the heater automatically checks the internal rise in temperature. If this is above the specified limits, the start is aborted and an error message (see chapter 7, "Malfunctions and troubleshooting" on page 11) is displayed. The resistance to flow in the connected heating air system must be reduced to ensure stable heater operation.

10.6.2 Fuel line



WARNING

Make sure there are no leaks!

- Checking electrical connections for contact corrosion and ensuring they are secure.

10.6.3 Combustion air intake line



DANGER

Use only combustion air intake lines approved by the manufacturer. Damage caused by confusing the exhaust line with the combustion air intake line.



NOTE

During installation, make sure that the nearby fuel pump cables are not damaged.

Requirements of the combustion air intake line	Value
Max. length of combustion air intake without silencer - ft (m)	16.4 (5) **
Min. length with exhaust or / and combustion air intake silencer - ft (m)	8.2 (2.5) **
Recommended min. length with integrated combustion air intake silencer - ft (m)	1.6 (0.5)
Min. length with external combustion air intake silencer	*
Inside diameter - in (mm)	0.9 (22)
Smallest bend radius - in (mm)	2 (50)
Max. sum of all bends	270°

Table 8: Limit values of combustion air intake line

*: The external combustion air intake silencer can be connected directly to the heater. The combustion air intake line serves as a connection piece.

**: Maximum total length of combustion air intake line and exhaust line combined.

10.6.4 Exhaust pipe

- ✓ Avoid syphons (risk of condensation accumulation).
- Do not secure the exhaust line to heat-sensitive parts.

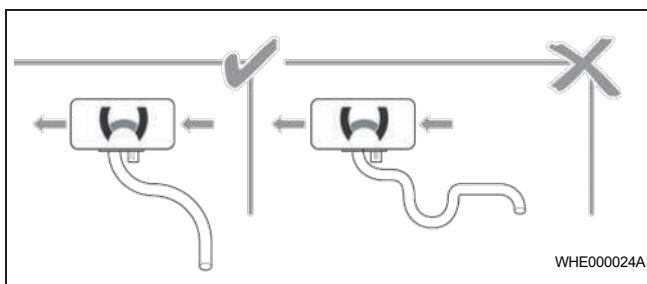


Fig. 16 Routing the exhaust line

- Install exhaust lines continually falling from heater (condensation can drain off).
- Insulate exhaust line (use appropriate insulation) to prevent condensation.
- Maintain maximum length of exhaust line.

10.6.5 Supply voltage connection

Preferably from the vehicle's central electrical system.

An additional blade terminal fuse holder is to be installed to protect the heater (supplied with the heater). The fuse holder must only be installed in the vehicle interior.

- F = 20 A

10.6.6 Removing and installing



ATTENTION

The heater must not be dismantled when installed.

10.6.6.1 Heater disassembly

1. Remove the fuse.
2. Disconnect the wiring harness connector.
3. Disconnect the cable to the fuel pump at the disconnection point.
4. If necessary, Disconnect the hot air hose or hoses.
5. Disconnect the fuel inlet connection at the heater.
6. Disconnect the combustion air inlet and exhaust outlet connections at the heater.
7. Remove the four nuts and lock washers on the heater.

8. Remove the heater and discard the base seal at the exhaust outlet.

10.6.6.2 Heater installation

1. Place the heater with a new base seal at the exhaust outlet in the installation position and secure with 4 nuts and lock washers (use only genuine Webasto nuts).
2. Tighten the nuts to 53 in.-lbs. (6 Nm).
3. Secure the fuel inlet connection at the heater.
4. Secure the combustion air inlet and exhaust outlet connections at the heater.
5. Connect the fuel pump cable to the wiring harness for the fuel pump.
6. Connect the wiring harness connector.
7. If necessary, Heating air hose or hoses, connect and secure.
8. Insert the fuse.
9. Bleed the fuel supply system (see chapter 10.6.7, "Commissioning" on page 34)

10.6.7 Commissioning



NOTE

Due to the low fuel consumption, the heater must be switched on multiple times to fill the fuel line to the heater.

During a test run of the heater, all connections must be checked for leaks and a secure fit. If the heater encounters a fault during operation, perform the troubleshooting procedure to locate the fault.

11 Repair

11.1 General information

This section describes the permissible repair work on the Air Top Pro 25 heater when removed. Any further dismantling will invalidate the warranty. For assembling the heater only use the spare parts from the corresponding spare parts kits.

11.1.1 Work on stripped down components



ATTENTION

All sealing elements between the disassembled components and the base seal must always be discarded and replaced.

Cleaning

- All sealing surfaces are to be cleaned with white spirit and then dried with compressed air.
- Any remaining seal residues on the components must be carefully removed completely using a suitable tool.

Visual inspection

- Check all components for damage (cracks, deformation, wear, etc.) and replace as required.
- Check connectors and leads for corrosion, loose connections, crimp faults, etc., and repair them if necessary.
- Check plug strips for corrosion and contacts to ensure they are secure. Repair them if necessary.

11.1.2 Carrying out modifications

- Installation of an external room temperature sensor for optimal temperature control.

Installation of an external room temperature sensor

The heater optimally regulates the desired temperature if its air temperature sensor is exposed to the air temperature of the main occupied area. This may not always be possible due to installation conditions (fresh air admixture) with the air temperature sensor plugged into the control unit. In this case, optimum temperature control can be ensured by using an external room temperature sensor fitted in the appropriate area.

Pass through

1. Select an appropriate installation location for the external room temperature sensor.



NOTE

The external room temperature sensor should not be mounted directly exposed to hot air and not too close to heat sources (e.g. vehicle heating system). The external room temperature sensor should be installed at medium height in the vehicle cabin on vertical surfaces.

The installation location should not be in direct sunlight.

Do not install the external room temperature sensor behind curtains or suchlike.

2. Temporarily install the external room temperature sensor and connect to the wiring harness (see chapter 9.2, "Wiring diagrams" on page 29).
3. Install the external room temperature sensor.
4. Carry out a test run and check the control behavior.

11.2 Dismantling and assembling

11.2.1 Removing and fitting the housing parts

Remove housing parts

1. The grilles for the heating air inlet and outlet can be released from the lock by twisting and pulled off forwards.
2. The air intake and air outlet hoods can be levered off and removed with a blunt blade in the  areas.
3. Pull the wiring harness grommet out of the air outlet hood, remove the blanking plug from the recess on the opposite side and set it aside. Then pull the hood off the heat exchanger.
4. The cover for the heating air outlet can be released from the lock and removed by pressing in the retaining lugs at the top and bottom with a suitable tool.

Fitting housing parts

1. Slide on the hot air outlet cover until the 4 fixing holes correctly engage in the locking lugs of the heat exchanger.
2. Slide the air outlet hood onto the heat exchanger.



NOTE

This is easiest if the hood is placed vertically on a table with the outlet opening facing downwards.

3. The side of the wiring harness outlet can be freely selected. Insert the wiring harness grommet into the recess here.
4. Fit the air intake cowl. Push the air intake cowl onto the air outlet cowl until the two side locking lugs engage correctly.



NOTE

When fitting the air intake cowl, ensure that the wiring harness grommet and blanking plug are seated tightly.

5. Place the grilles for the heating air inlet and outlet on the front and rear cowls and lock them by twisting.
6. Check the smooth running of the hot air fan by hand; when switching on later, pay attention to any noises. Sensor magnets on the combustion air fan must be free of ferrous chips etc.

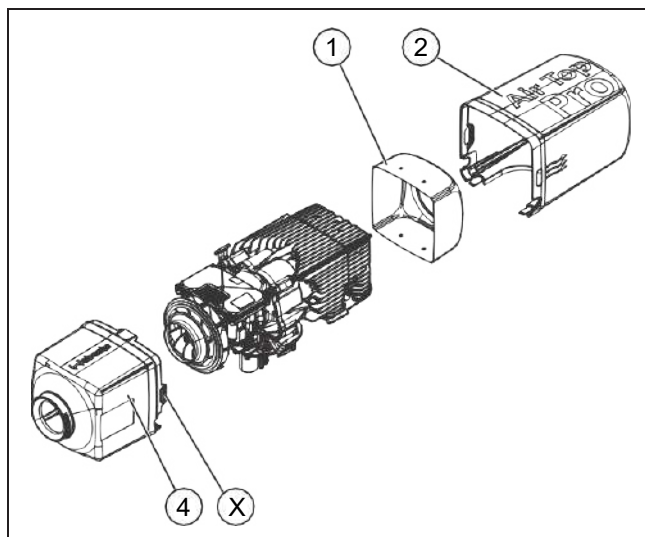


Fig. 17 Removing and fitting the housing parts

1	Cover for heating air outlet (cooling cap)	2	Air outlet cowl
3	Air intake cowl		

11.2.2 Replacing control unit

Disassembly

1. Remove the heater (see chapter 10.6.6.1, "Heater disassembly" on page 34).
2. Remove housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
3. Disconnect the connectors on the control unit.
4. Spread open the retaining hooks, remove the control unit.
5. Carry out the work on the disassembled components (see chapter 11.1.1, "Work on stripped down components" on page 34).



NOTE

Do not carry out any repairs to the control unit. The control unit must not be opened.

Installation

1. Move the control unit into the installation position and press it onto the motor contact until the control unit engages.
2. Reconnect the connectors in accordance with Fig. 7.
3. Fit the housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
4. Install the heater (see chapter 10.6.6.2, "Heater installation" on page 34).

5. Check and, if necessary, adjust the CO₂ setting (see chapter 8.2, "Check and set CO₂ in exhaust gas" on page 18).
6. Check the smooth running of the hot air fan by hand; when switching on later, pay attention to any noises. Sensor magnets on the combustion air fan must be free of ferrous chips etc.

11.2.3 Replacing the overheating temperature sensor

Disassembly

1. Remove the heater (see chapter 10.6.6.1, "Heater disassembly" on page 34).
2. Remove housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
3. Disconnect connector X5 on the control unit.



ATTENTION

Do not pull the wires.

4. Unscrew the screw fitting.
5. Remove the overheating temperature sensor.

Installation

1. Place the overheating temperature sensor on the heat exchanger in the installation position, secure it with the spring and then secure it with the screw.
2. Ensure that the overheating temperature sensor is correctly positioned in the heat exchanger.
3. Connect connector X5 to the control unit. Ensure that the cable routing is parallel between the ribs of the heat exchanger.



ATTENTION

Observe the minimum distance .2 in (5 mm) between the sensor element and the protective sleeving. The protective sleeving must not touch the sensor element.

4. Return the cooling cap to its installation position, ensuring that it engages correctly.
5. Fit the housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
6. Install the heater (see chapter 10.6.6.2, "Heater installation" on page 34).

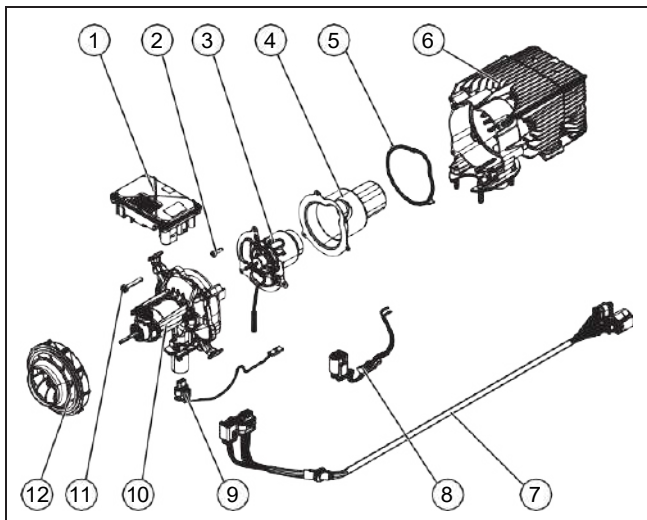


Fig. 18 Replacing the control unit, combustion air fan and overheating temperature sensor

1	Control unit	2	Screw
3	Burner	4	Combustion tube
5	Gasket	6	Heat exchanger
7	Wiring harness	8	Glow plug wiring harness
9	Overheating temperature sensor	10	Drive unit
11	Screw	12	Heating air blower

11.2.4 Replacing drive unit (drive motor, combustion air fan and intake housing)

Disassembly

1. Remove the heater (see chapter 10.6.6.1, "Heater disassembly" on page 34).
2. Remove housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
3. Remove the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
4. Spread the locking of the hot air fan and pull the hot air fan off the motor shaft by hand.
5. Remove the screws.
6. Pull the drive unit off the heat exchanger, remove the seal and discard it.
7. Carry out the work on the disassembled components (see chapter 11.1.1, "Work on stripped down components" on page 34).



ATTENTION

The motor is not sealed!

Installation

1. Ensure that the sealing surfaces on the intake housing and on the heat exchanger are not damaged.
2. Ensure the presence and position of the flow guide, position the new seal on the flange of the heat exchanger.
3. Pay attention to the correct routing of the glow plug lead.
4. Move the drive unit into the installation position and secure it with screws.
5. Tighten the screws to 62 ± 12 in-lbs (7 ± 0.7 Nm).
6. Install the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
7. Push the hot air fan onto the motor shaft until the lugs on both side audibly latch into the shaft groove at the stop.
8. Fit the housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
9. Install the heater (see chapter 10.6.6.2, "Heater installation" on page 34).
10. Check and, if necessary, adjust the CO₂ setting (see chapter 8.2, "Check and set CO₂ in exhaust gas" on page 18).



ATTENTION

The Drive unit must not be mounted on the shaft.

11.2.5 Replacing burner, combustion chamber and heat exchanger

Disassembly

1. Remove the heater (see chapter 10.6.6.1, "Heater disassembly" on page 34).
2. Remove housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
3. Remove the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
4. Remove the combustion air fan (see chapter 11.2.4, "Replacing drive unit (drive motor, combustion air fan and intake housing)" on page 36).
5. Removing the flow guide.
6. Unscrew the screw and remove the burner Fig. 5.
7. Pull the combustion chamber and seal out of the heat exchanger and discard the seal.
8. Carry out the work on the disassembled components (see chapter 11.1.1, "Work on stripped down components" on page 34).

Installation

1. Insert the new seal Fig. 18 into the heat exchanger and move combustion chamber into the assembly position.



ATTENTION

When carrying out the following step, ensure that the fuel connection is not bent.

2. Insert the burner into the heat exchanger. Ensure that the glow plug cable is arranged as shown.
3. Fasten the burner with screws.
4. Tighten the screws to 35 ± 7 in-lbs (4 ± 0.4 Nm).
5. Insert the flow guide.
6. Install the combustion air fan (see chapter 11.2.4, "Replacing drive unit (drive motor, combustion air fan and intake housing)" on page 36).
7. Install the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
8. Fit the housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
9. Install the heater (see chapter 10.6.6.2, "Heater installation" on page 34).

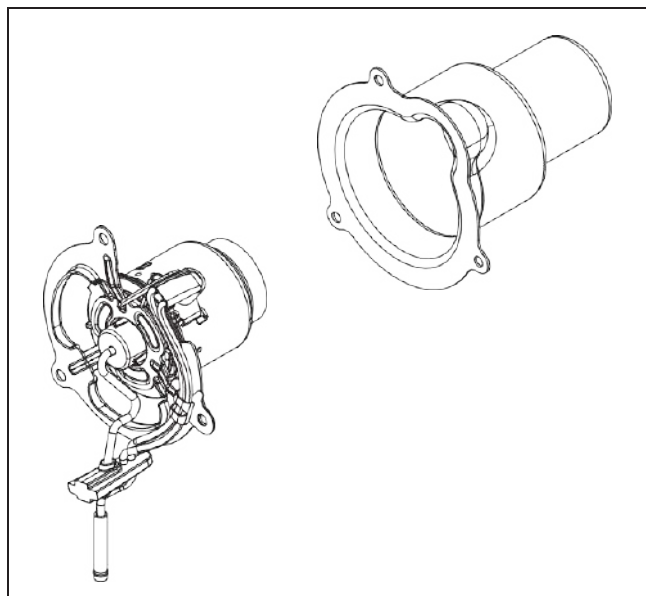


Fig. 5 Burner with combustion chamber

11.2.6 Changing glow plug

Disassembly

1. Remove the heater (see chapter 10.6.6.1, "Heater disassembly" on page 34).
2. Remove housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
3. Remove the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
4. Remove the combustion air fan (see chapter 11.2.4, "Replacing drive unit (drive motor, combustion air fan and intake housing)" on page 36).
5. Remove the flow guide.
6. Remove the three screws.



NOTE

Ensure that the burner has detached from the combustion chamber.

7. Carefully pull out the burner.



ATTENTION

The glow plug must be removed with the utmost care and must not be twisted (risk of breakage). After prolonged operation, the glow plug may become stuck in place due to fuel deposits. In this case apply penetrating oil and allow to work in until the glow plug can be removed.

8. Pull out the spring, remove the cooling fin and pull out and remove the glow plug from the burner.
9. Remove the combustion chamber and seal from the heat exchanger and discard the seal.
10. Carry out the work on the disassembled components (see chapter 11.1.1, "Work on stripped down components" on page 34).

Installation

1. Insert the new seal Fig. 18 into the heat exchanger and move combustion chamber into the assembly position.



ATTENTION

When installing the glow plug, ensure that the contacts face the heat exchanger. Otherwise there is a risk of short-circuiting.

2. Position combustion pipe horizontally with evaporator holder towards the rear.
3. Push the glow plug into the mounting hole in the combustion tube as far as it will go.

**ATTENTION**

In the following procedure make sure that the glow plug is fitted up to the stop in the burner.

4. Secure the glow plug with the screw. Tighten the screw to 4.4 in-lbs (0.5 Nm).
5. Insert the burner into the heat exchanger. Make sure that the flame detector cable (only available for petrol units) is arranged under the fuel line.

**ATTENTION**

In the following step, ensure that the grommet seals tightly with the heat exchanger.

6. Secure the burner and air baffle with screws. Tighten the screws to 53 in-lbs (6 Nm).
7. Install the combustion air fan (see chapter 11.2.4, "Replacing drive unit (drive motor, combustion air fan and intake housing)" on page 36).
8. Install the control unit (see chapter 11.2.2, "Replacing control unit" on page 35).
9. Fit the housing parts (see chapter 11.2.1, "Removing and fitting the housing parts" on page 35).
10. Install the heater (see chapter 10.6.6.2, "Heater installation" on page 34).

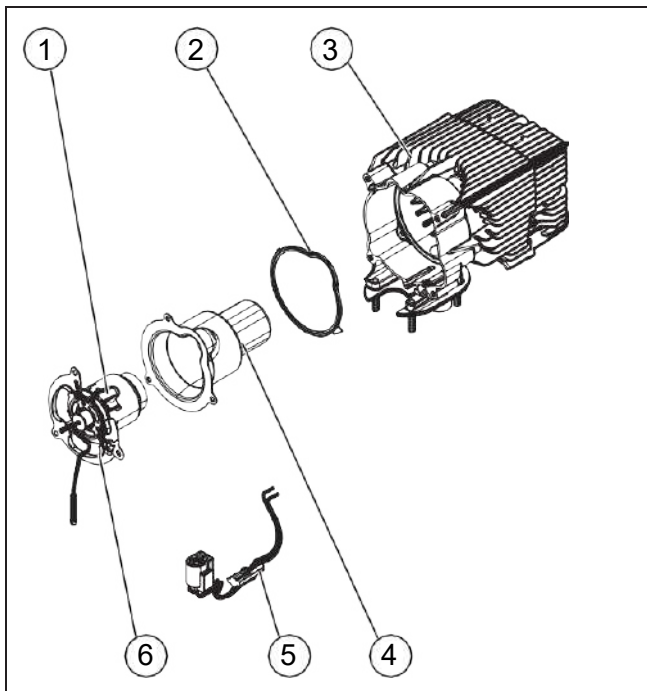


Fig. 20 Changing the glow plug, burner

1	Connection for glow plug wiring harness	2	Gasket
3	Heat exchanger	4	Combustion tube
5	Glow plug wiring harness	6	Burner

12 Packaging / storage / shipping

12.1 General information

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

**NOTE**

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

12.2 Storage and transportation

Sending in the complete heater

- The heater must be completely drained of fuel.

For packaging and shipping

- Make sure that the remaining fuel or coolant cannot leak out.
- Seal the coolant connection pieces and the fuel connection with dummy plugs.

Storage

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

Packaging

- Always store heaters in the original or similar packaging in a closed room.

Transport

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

After removing the delivery packaging

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



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