

**Air Heaters**

**Installation Instructions**

# **Air Top 2000 S**

**Type AT 2000 S-B** (Petrol)

**Type AT 2000 S-D** (Diesel)

**Modèle AT 2000 S-B** (Essence)

**Modèle AT 2000 S-D** (Diesel)

**5/2000**

The logo for Webasto, featuring a stylized 'W' icon followed by the word 'Webasto' in a bold, sans-serif font.

## Table of Contents

	Page
<b>Installation Instructions</b>	
Legal Provisions for Installation	1
Installation	3
Heating Air System	5
Installation diagram	6
Installation Example	7
Fuel Supply	8
Combustion Air Supply	11
Exhaust Pipe	11
Electrical Connections	12
Connection diagram	14
Circuit Diagrams	15
Legende for Circuit diagrams	22
Initial Operation	23
Shut-Down on Faults	23
Technical Data	24
Version	25
Drilling Template	26

## Installation Instructions

### Legal Provisions for Installation

For testing the heater in accordance with §§ 19, 20 or 21 StVZO (German Road Licensing Regulations) the following regulations are primarily to be observed (§ 22 a StVZO):

#### NOTE:

**These provisions are binding within the scope of the StVZO and should also be observed in countries where no special regulations are in effect!**

Within the scope of the StVZO (German Road Licensing Regulations) "General Design Certifications" have been granted by the Federal Office for Motor Traffic for the Air Top 2000 S air heaters with the following design approval numbers:

- S 324 (Diesel)
- S 325 (Petrol)

The installation of the heaters must be performed in accordance with these Installation Instructions. The installation must be checked

- upon the homologation of the vehicles in accordance with § 20 StVZO
- upon any individual test in accordance with § 21 StVZO, or
- upon any examination in accordance with § 19 StVZO by a registered expert or examiner for motor traffic, an expert for automotive vehicles, or any other authorised official, in accordance with paragraph 4 of Appendix IIb to the StVZO

and in the case of item c) the proper installation must be certified on the approval certificate contained on the design certification stating the following:

- vehicle manufacturer
- vehicle type and
- vehicle identification number

The effectiveness of the design certification (homologation) is dependent on this certificate. The approval certification is to be kept in the vehicle.

The year of the initial operation must be durably marked on the type plate of the heater by the installer by removing the years that do not apply.

The heat exchanger of the air heater is not to be used for longer than ten years and must thereafter be replaced by the manufacturer or one of its authorised dealers with a genuine replacement part.

If exhaust pipes lead through passenger areas, these pipes must also be replaced with genuine replacement parts after ten years.

**Whenever the heater is removed it is imperative that the gasket located underneath be replaced.**

The heaters are approved for heating the passenger compartment and the driver's cabin, not however, the cargo space for the transport of hazardous materials.

When using the heater in special vehicles (e.g. "ADR" vehicles for the transport of hazardous materials) or in vehicles not subject to StVZO regulations (e.g. ships) all regulations that may be locally applicable are to be complied with.

When installing the AT 2000 S-D heater in vehicles for the transport of hazardous materials the requirements laid down in ADR 002 and ADR 003 (Technical Guidelines relating to the ordinance of transporting hazardous materials on the road) must be fulfilled in addition to those of the StVZO.

**"Heating air system"**: Heating air intake openings must be so arranged that the possibility of exhaust fumes from the vehicle engine and the heater being drawn in is remote under normal operating conditions.

Extracting the combustion air from the interior of the vehicle is not permissible.

**"Combustion air pipe"**: The combustion air required must be drawn in from the outside of the vehicle. Inside passenger areas the combustion air lines are permitted to have a maximum of four joints and must be provided with a splash-proof opening leading through the outside wall. These joints must be so sealed that a total leakage rate of 200 l/h at an overpressure of 0.5 mbar is not exceeded.

The pipe including lead-through, joints, material and type of construction must be specified in the installation instructions.

Mounting and removal of the pipe must be possible with tools only, the pipe must be protected against damage and be permanently vibration-proof.

**"Exhaust gas pipe"**: The heaters must be so designed that the exhaust fumes are discharged to the atmosphere. Exhaust pipes must be so routed that the possibility of exhaust gases penetrating the interior of the vehicle is remote. The functioning of any parts of the vehicle essential for its operation must not be impaired. Any condensate or water that may have entered must not be able to collect in the exhaust gas line. Drain holes are permissible; these must discharge the liquid to the atmosphere via lines that are leakproof in relation to the interior of the vehicle. The discharge opening of the exhaust pipe is to point upward, sideways or, in the case of routing the exhaust pipes on the underside of the bottom of the vehicle, it must be positioned near the lateral or rear edge of the driver's cab or vehicle.

Inside areas where people are present, exhaust pipes may have a maximum of one joint, and their lead-through through the outer wall/bottom of the vehicle must be splash-proof. It is permissible to connect a drain pipe provided with a leak-proof metal joint to discharge the water penetrated into the exhaust pipe. The drain pipe is to be passed through the outside wall or the bottom of the ve-

hicle through a sealed bush.

The heat exchanger, the connected exhaust pipe as well as any drain pipe that may be connected must be so sealed that in the event of an overpressure equivalent to the twofold overpressure of the exhaust gas at maximum permissible exhaust pipe length – however, at a minimum overpressure of 0.5 mbar – a leakage rate of a total of 30 l/h is not exceeded.

The pipe including lead-through, joints, material and type of construction must be specified in the installation instructions.

Mounting and removal of the pipe must be possible with tools only, it must be protected against damage and be permanently vibration-proof.

Only metal pipes may be used. These must not exceed a temperature of 110 °C if the possibility of accidental contact in the vehicle's interior exists. It is permissible to install a protection against accidental contact.

#### **“Combustion Air Inlet” and “Exhaust Gas Outlet”:**

During installation it must be ensured that the openings of the combustion air inlet and exhaust gas outlet pipes are so designed that a spherical object of 16 mm diameter cannot be introduced.

Electric lines, switchgear and controlgear of the heater must be so arranged in the vehicle that their functioning cannot be impaired under normal operating conditions.

All tubes leading from the heater toward the outside must be routed through splashwater-proof openings.

In the case of buses, the heater must be installed neither in the driver's compartment nor in the passenger area.

For the routing of fuel lines and the installation of additional fuel tanks, articles 45 and 46 StVZO are to be adhered to.

The most important excerpts therefrom are as follows:

Fuel lines are to be designed in such a way that their stability remains unaffected by torsional stresses in the vehicle, engine movement and the like. They must be protected against mechanical damage. All parts of the fuel system must be protected against heat which would impair

their operation, and must be located such that dripping or evaporating fuel can neither collect nor be ignited by hot components or electrical equipment.

In the case of buses, fuel lines and fuel tanks may be located neither in the passenger area nor in the driver's compartment. In these vehicles the fuel tanks must be located such that they do not pose a direct hazard to the exits in the event of a fire. The fuel must not be supplied by means of gravity or gauge pressure in the fuel tank.

Mounting instructions for Webasto fuel tanks for fuel supply of heating units in vehicles:

In the case of buses, installation must not be performed in the passenger area or in the driver's compartment.

The fuel filler neck must not be located inside the passenger area or the driver's compartment in any vehicle.

Petrol fuel tanks must not be located directly behind the front panelling of the vehicle.

They must be separated from the engine in such a manner that the possibility of fuel inflammation is remote even in the event of an accident. This does not apply to tractor vehicles with open cabs.

The operating state of the heater at any given time – i.e. at least whether it is on or off – must be easily recognizable.

The installation of components that are not of an approved type will lead to the invalidation of the General Design Certification of the heater and thus the General Operating Permission of the vehicle. The same applies to improperly performed repairs or those where other than genuine replacement parts were used.

## Scope of Application of the Air Heaters

The Webasto Air Top 2000 S air heaters are designed to provide the following features:

- heating the vehicle's saloon,
- defrosting the vehicle's windows.

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

They can be used in vehicles with water-cooled or air-cooled engines.

## Installation

### CAUTION:

The legal provisions 29 and 30 relating to the installation are to be adhered to.

It is not permitted to operate the heater without control unit cover (results in overheating of the heater).

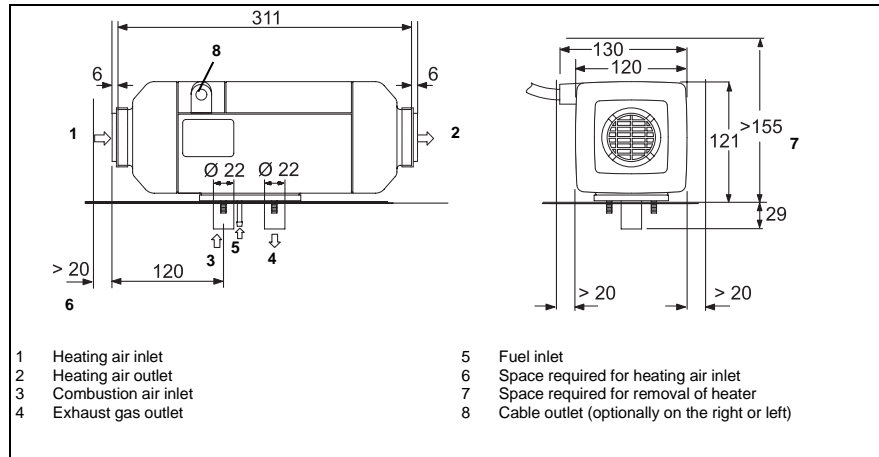


Fig. 1: Dimensions of the Heater

## Installation Details for Air Top 2000 S

### NOTE:

The different vehicle-specific installation conditions should be taken into account.

## Installation Location

The heater should be installed in the vehicle's interior (with the exception of buses, see Legal Provisions).

If the heater is installed in an installation housing, such housing must be purchased from Webasto and must be of a Webasto-approved design.

If installed in the vehicle's interior, the lead-through openings for combustion air inlet, exhaust gas outlet and fuel pipe must be splash-water protected.

For this purpose, the special gasket supplied with the heater must be used (see Fig. 4). **The gasket must be renewed prior to each re-installation.**

## Mounting the Heater

When mounting the Air Top 2000 S heater, the M 6 nuts must be tightened to a torque of 6 Nm +1 Nm.

The mounting dimensions as well as the space required for the performance of servicing work are shown in the installation drawing (Fig. 1). The specified horizontal and axial angles of inclination must not be exceeded (Fig. 2).

We recommend installing petrol-operated heaters so that

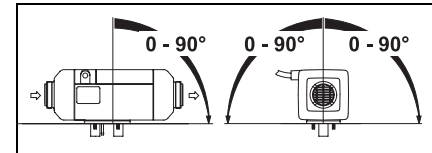


Fig. 2: Recommended installation position for diesel-operated heaters

the exhaust gas pipe points vertically down.

### NOTE:

Other installation positions may cause increased wear to the burner.

# Air Top 2000 S

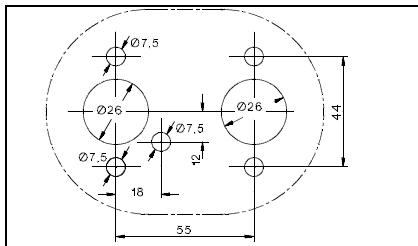


Fig. 3: Hole Pattern

A gasket (Fig. 4) must be fitted between heater and car body. **The gasket must be renewed prior to each re-installation.** The support surface for the heater mounting foot **must be level**. A special tool is available from the manufacturer for drilling the holes and levelling the support surface, if necessary. Surface irregularities of up to max. 1 mm can be compensated for by means of the gasket.

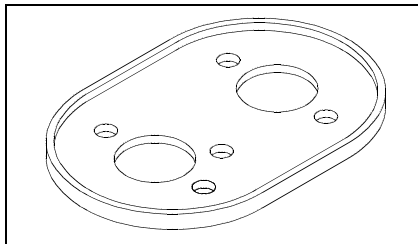


Fig. 4: Gasket

## CAUTION:

After the installation has been performed, a check must be carried out to verify that no part of the housing is in contact with any surrounding parts. Non-compliance could result in a blockage of the heater fan.

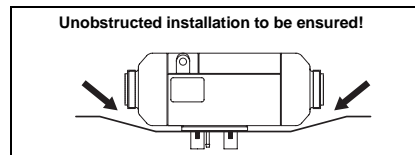


Fig. 5: Installation

## Name Plate

The type plate must be located at a place where it is protected against damage and be easily accessible once the heater has been installed (or else, a type plate duplicate is to be used).

The years not applicable are to be removed from the type plate.

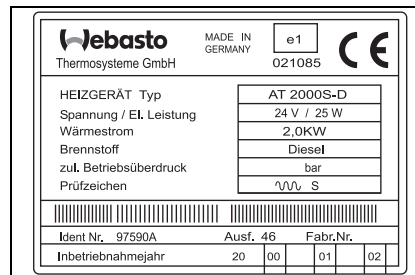


Fig. 6: Name Plate

## Heating Air System

### NOTE:

It is not permissible to integrate the heater into the vehicle's air ducting system.

The air heater can be operated in the recirculating air mode only.

A temperature sensor is installed in the heater on the heating air intake side which, in conjunction with the heater control element and dependent upon the intake temperature and position of the setpoint transmitter, operates the heater within the appropriate heat output range. Heat output is so adjusted that after a quick reaching of the preset interior temperature the same will be maintained at the preset value.

Minimum inside diameter of heating air pipe is 55 mm (nominal diameter is 60 mm)

### NOTE:

For heating air ducts only materials capable of withstanding a temperature of at least 130° may be used.

The hot air discharge opening is to be located so that the hot air is not directed onto parts that are not resistant to heat.

### CAUTION:

In vehicles designed for the transportation of passengers, the air outlet openings must be arranged in such a way that they cannot be obstructed by passengers.

Maximum air pressure drop between intake and delivery side of the heating air line: 1.0 mbar (head of water: 10 mm).

If this value is exceeded, the temperature limiter is expected to trip. The heating air hose is to be secured at the joints.

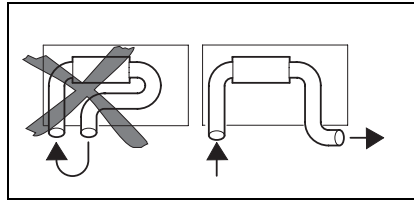


Fig. 7: Heating air inlet and heating air outlet

**When operated in the recirculating mode, the heater can also be used without any accessories for the heating air circuit (the hot air must be prevented from re-entering the heating circuit).**

### NOTE:

The installation must be checked for the following:

- "closed circuit" of air between the vehicle heater and the heater air inlet
- "closed circuit" of air between heater air inlet and heater air outlet
- adequate space for taking in heating air (heating air to be extracted from the cool space of the cabin, e.g. in the case of installation underneath a bunk)

If an installation housing is used, the area around the air discharge nozzle must be tightly sealed so that no hot air can enter the installation box.

## External Temperature Sensor

The installation of an external temperature sensor is recommended if the heater is installed in an installation housing or in location with poor ventilation (e.g. under-neath bunks). Extremely short cycle times of the heater can thus be avoided.

## Mounting of External Temperature Sensor

The external temperature sensor must be mounted in the vehicle cab at mid-height on surfaces as vertical as possible.

- The temperature sensor must not
- be located directly in the hot air stream (vehicle's or heater's heating air).
- be mounted in the vicinity of heat sources (e.g. vehicle's heating system).
- be exposed to direct sun radiation (e.g. on the dashboard).
- be mounted behind curtains or the like.

# Air Top 2000 S

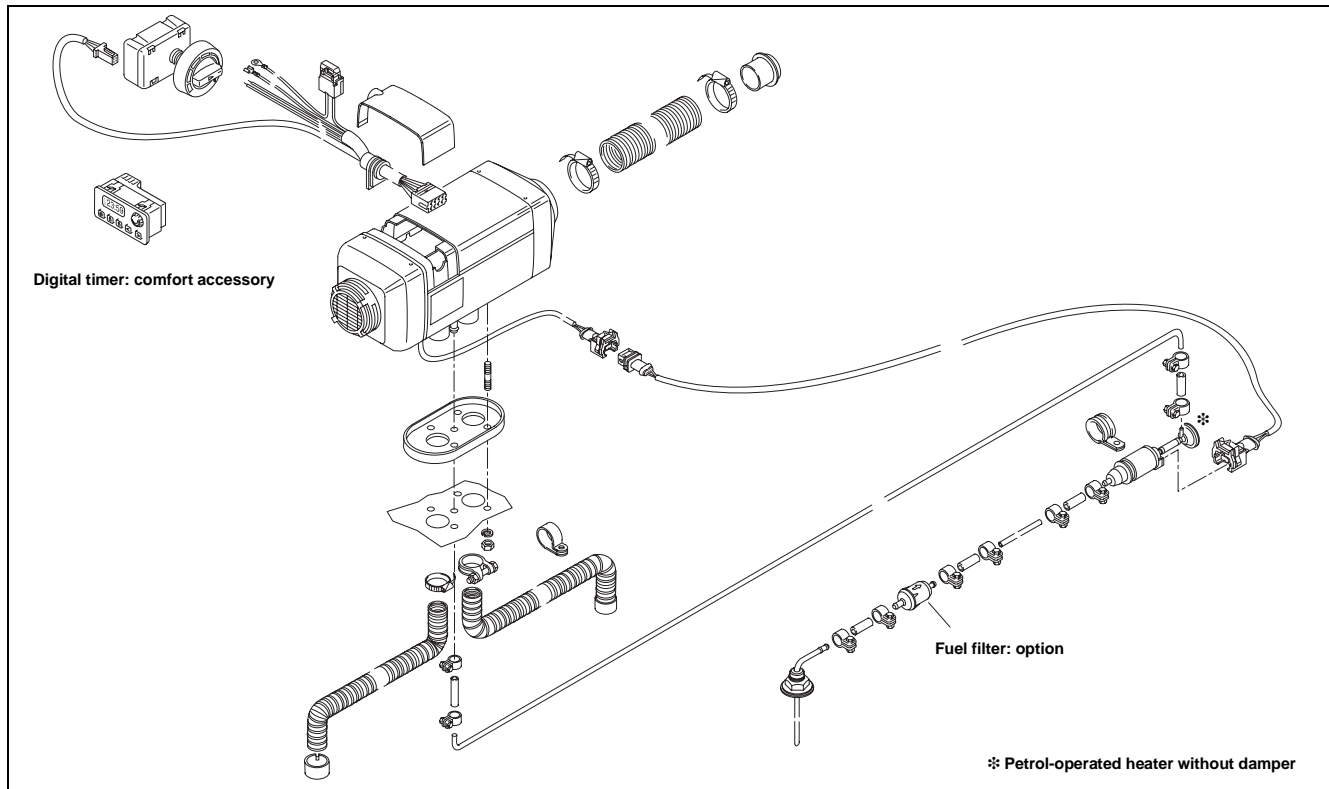


Fig. 8: Installation diagram for air heater



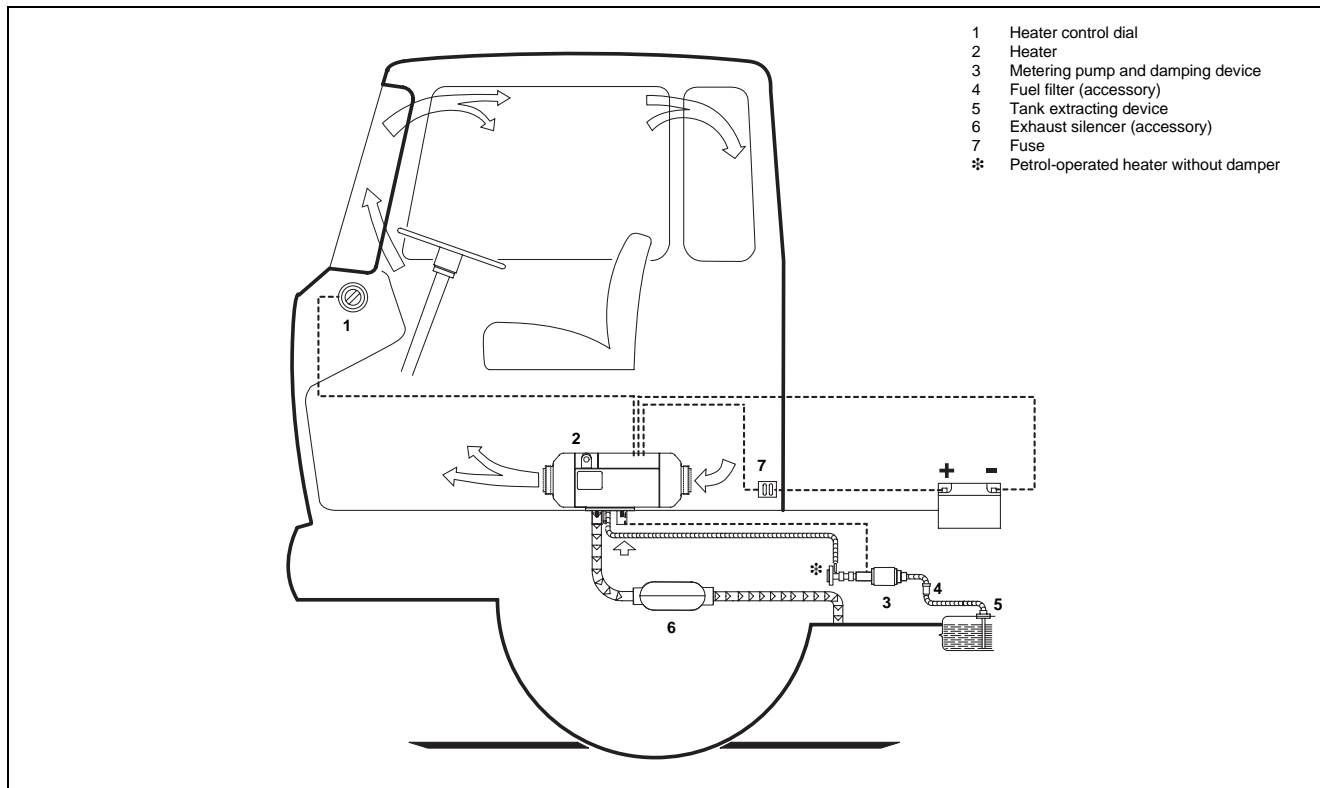


Fig. 9: Installation Example for the Air Heater

# Air Top 2000 S

## Fuel Supply

Fuel is extracted from the vehicle's fuel tank or a separate fuel tank. The values relating to the permissible pressure at the fuel extraction point are shown in Fig. 10.

permissible fuel feed height H (m)	at max. permissible overpressure (bar) in fuel line
0.00	0.2
1.00	0.11
2.00	0.03
permissible fuel suction height S (m)	at max. permissible underpressure (bar) in fuel tank
0.00	-0.10
0.50	-0.06
1.00	-0.02

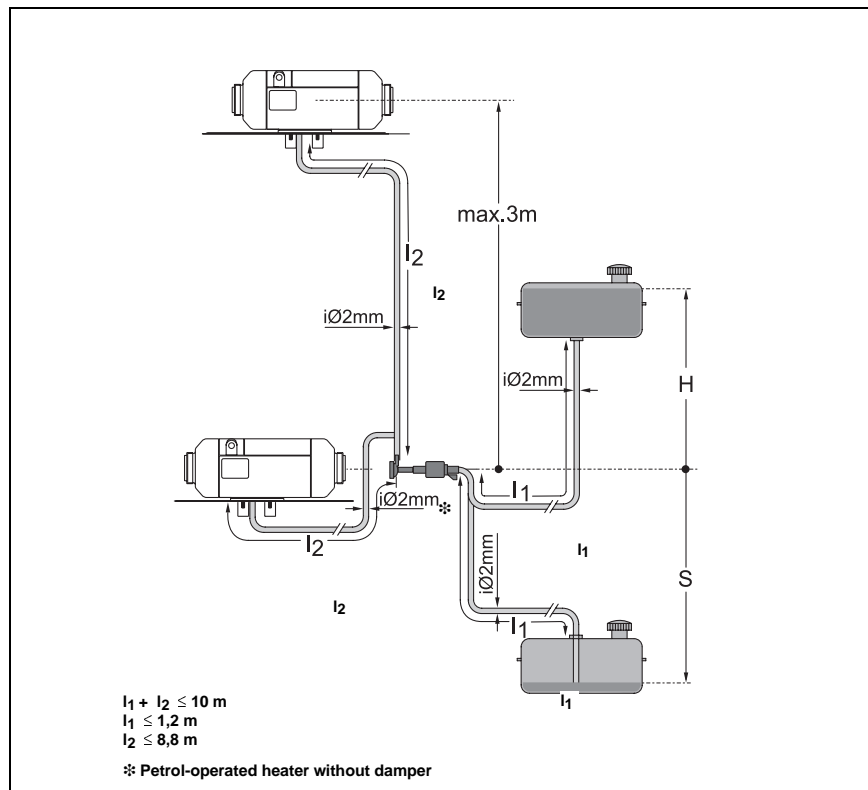
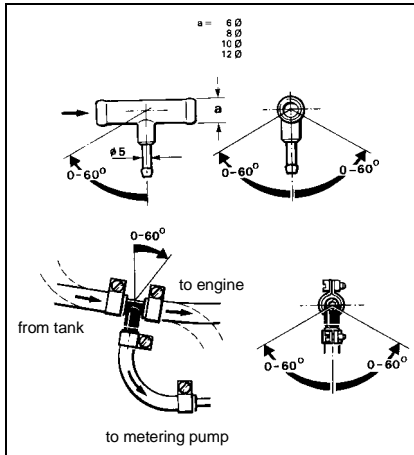


Fig. 10: Fuel Supply

## Vehicles with Carburetor Engines

In passenger cars, fuel may only be extracted with the special Webasto fuel pickup (see Fig. 11) and as close to the tank as possible. The connection can be made either in the flow or the return pipe whereby it must be ensured that the return pipe reaches almost to the bottom of the tank. Failing this, the return pipe can be extended.

The fuel pickup is to be so mounted that any air or gas bubbles are automatically discharged into the tank (see Fig. 11).



**Fig. 11: Webasto Fuel Pickup**

Fuel should not be extracted in the vicinity of the engine since here gas bubbles are likely to form in the lines owing to the heat radiation of the engine, which may result in malfunctions of the combustion operation.

## Vehicles with Fuel Injection Engines

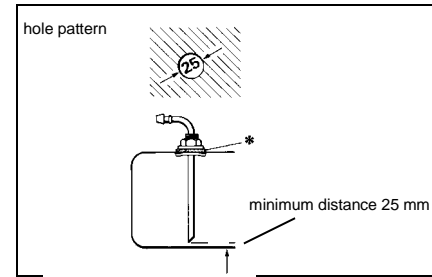
When installing the heater in vehicles with petrol injection systems it must be determined whether the fuel pump is mounted inside or outside the tank.

Where the fuel pump is located inside the tank, the fuel can only be drawn from the return pipe and only by using the Webasto fuel pickup (see Fig. 11) whereby it must be ensured that the return pipe reaches almost to the bottom of the tank. Failing this, the Webasto tank extracting device (see Figs. 12, 13 and 14) can be used.

Where the fuel pump is mounted outside the tank, the fuel may only be extracted between the tank and the fuel pump and also only by using the Webasto fuel pickup (see Fig. 11).

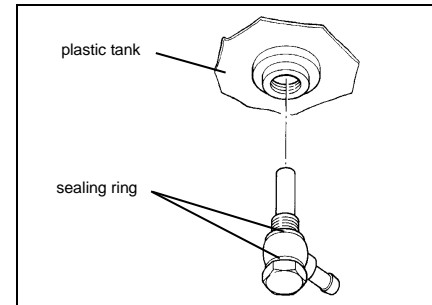
## Vehicles with Diesel Engines

Fuel must be drawn from the fuel tank or a separate tank (see Figs. 12, 13 and 14). With this method of fuel being supplied from a separate tank, no pressure-related influence is possible.

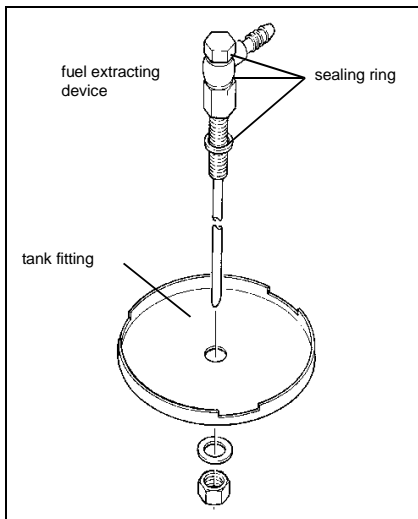


**Fig. 12: Webasto Tank Extracting Device**

\* tank extracting device only to be used with metal fuel tanks



**Fig. 13: Fuel Extraction From the Plastic Tank (Extraction Via Tank Drain Plug)**



**Fig. 14: Fuel Extraction from the Plastic Tank**  
(Extraction Via Tank Fitting)

**NOTE:**  
The fitting must be made of sheet steel!

## Fuel Lines

Only steel, copper and plastic pipes made of plasticized, light-resistant and temperature-stabilized PA 11 or PA 12 (e.g. Mecanyl RWTL) in accordance with DIN 73378 may be used as fuel lines. As in the majority of cases it is not possible to route the lines in a continuous upward pitch,

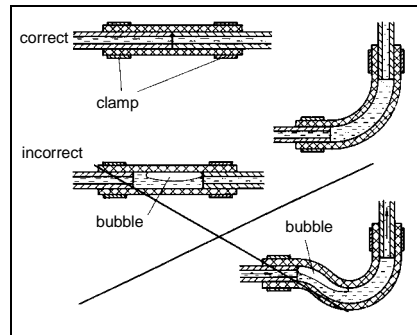
the inside diameter must not exceed a given dimension. If the inside diameter is equal to or larger than 4 mm, air or gas bubbles accumulate which result in malfunctions if the lines sag or are routed in a downward pitch. When the diameters shown in Fig. 10 are used, you can be sure that no unwanted bubbles will be formed.

The lines leading from the metering pump to the heater should not be routed in a downward pitch.

To prevent the fuel lines from sagging, freely suspended lines must be secured. Mounting should be performed in such a manner that the lines are protected against flying stones and thermal influence (exhaust pipe). To prevent the fuel lines from slipping off they are to be secured at the joints by means of hose clamps.

## Connecting Two Pipes Using a Hose

The proper connection of fuel lines using a hose is shown in Fig. 15. Check for leakage!

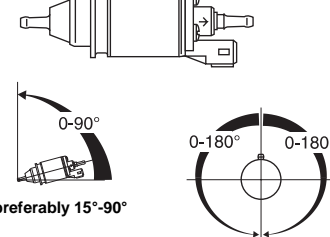


**Fig. 15: Pipe/Hose Connection**

## Metering Pump

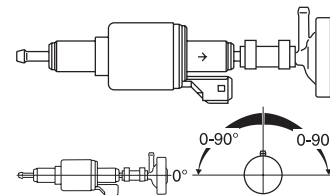
The metering pump is a combined delivery/metering and shutoff system and is subject to certain installation criteria (see Figs. 10, 16 and 17).

### AT 2000 S-B. 12-volt - Petrol



**Fig. 16: Metering Pump DP 2**  
Installation Position and Mounting

### AT 2000 S-D. 12-volt and 24-volt versions - Diesel



**Fig. 17: Metering Pump DP 30**  
Installation Position and Mounting

## Installation Location

It is recommended that the metering pump be installed in a cool location. The permissible ambient temperature must not exceed a temperature of + 20°C at any given operating state.

Metering pump and fuel lines must not be mounted within the radiation range of hot vehicle parts. If necessary, a radiation protection is to be provided.

## Installation and Mounting

The metering pump is to be attached by a vibration-dampening suspension device. The installation position is restricted as shown in Figs. 16 and 17 in order to ensure proper self-bleeding of the system.

Owing to the hazard of corrosion, only genuine Webasto parts may be used for the plug connection between metering pump and metering pump cable harness.

## Fuel Filter

If dirt in the fuel must be reckoned with, only Webasto filter, order no. 487 171, should be used. The filter is preferably be installed in vertical position, where this is not possible, it may also be installed horizontally (direction of flow to be observed).

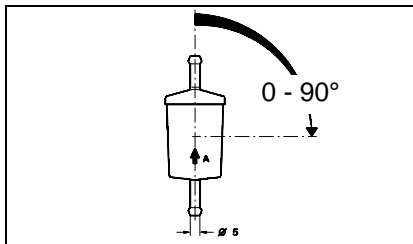


Fig. 18: Fuel Filter

## Combustion Air Supply

On no account may the combustion air be extracted from areas where persons are present. The combustion air intake opening must not point in the direction of travel. It must be so located that the possibility of clogging due to contamination is remote.

### NOTE: Unique to Petrol-Operated Heaters!

The combustion air must be drawn in at a sufficiently cool, splash-water protected location by means of the combustion air line.

If the heater is located in an enclosed installation housing, combustion air must be drawn in from the outside of the vehicle and the exhaust gas be discharged to the atmosphere. The lead-through openings must be so designed that the possibility of exhaust fumes entering the interior of the vehicle is remote.

For further regulations refer to the Legal Provisions.

## Exhaust Pipe

Rigid pipes made of unalloyed or alloyed steel with a minimum wall thickness of 1.0 mm, or flexible tubes of alloyed steel only are to be used as exhaust pipes. The exhaust pipe is to be secured to the heater, e.g. by means of a clamp. For further regulations refer to the Legal Provisions.

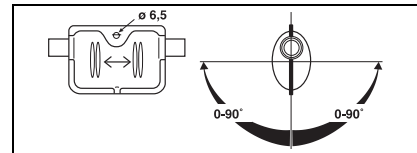


Fig. 19: Exhaust Silencer

Direction of flow optional

The exhaust silencer is preferably to be mounted in the vicinity of the heater.

Operation of the heater is also permissible without exhaust silencer.

## Combustion Air Intake and Exhaust Pipes

Both pipes leading away from the heater are to be routed in a downward pitch. If this is not possible, a  $\varnothing$  5mm condensate drain hole is to be provided at the lowermost point.

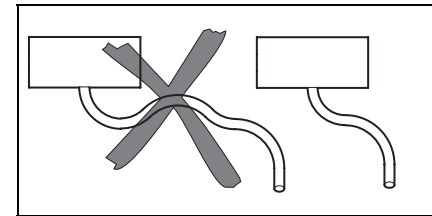


Fig. 20: Prevent condensation from forming

The lines must not point into the direction of travel.

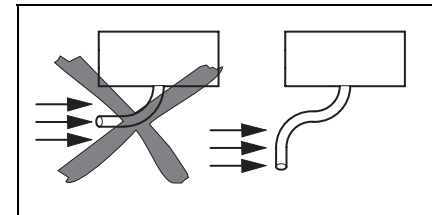


Fig. 21: Lines not in direction of travel

# Air Top 2000 S

The lines must be so arranged that any clogging due to contamination is not to be expected.

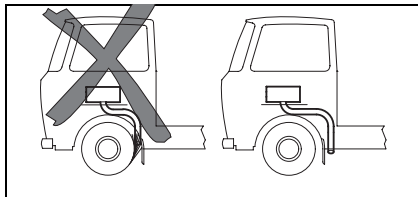


Fig. 22: Avoid areas exposed to water, mud or snow

## CAUTION:

A fire hazard exists if the installation position of the exhaust pipe discharge opening differs from that shown in Fig. 23.

To prevent any damage to the metering pump cable it is not permissible to extend the combustion air supply pipe by means of an exhaust pipe section.

Length of combustion air intake and exhaust pipes:  
with silencer: max. 2.0 m  
without silencer: max. 5.0 m

## NOTE:

For exhaust pipes lengths of 2 m and more, insulated exhaust pipes are to be used (dew point not reached)

Inside diameter of pipes:

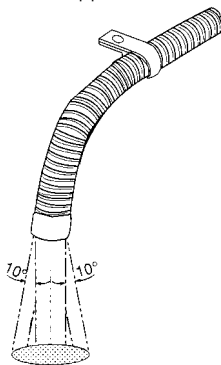
Combustion air pipe: 22 mm  
Exhaust pipe (metal): 22 mm

Smallest bending radius: 50 mm

Total angle of all bends:

Combustion air pipe: max. 270°  
Exhaust pipe: max. 270°

To ensure an angle of discharge of  $90^\circ \pm 10^\circ$ , it is required that the pipe clamp be attached no more than 150 mm, from the exhaust pipe end



direction of discharge approximately vertical  $90^\circ \pm 10^\circ$

Fig. 23: Exhaust Pipe Discharge Opening  
Installation Position

## Electrical Connections

### NOTE:

When using the combination or standard digital timer a remote-control pushbutton may be provided near the bunk for added convenience. The connection is to be performed in accordance with wiring diagram 32, 33, 35 or 36.

The electrical connection is to be performed in accordance with the automatic control wiring diagram (Fig. 31, 32, 33, 34, 35, 36 or 37).

## Connection in Vehicles for the Transportation of Dangerous Goods (ADR)

When installing the Air Top 2000 S heaters in vehicles for the transport of hazardous materials, the requirements laid down in ADR 002 and ADR 003 (Technical Guidelines relating to the ordinance of transporting hazardous materials on the road) must be fulfilled in addition to those of the StVZO. The electrical connection is to be performed in accordance with wiring diagrams Fig. 34, 35 or 36.

On vehicles without auxiliary drives, electrical connection is to be performed in accordance with automatic control circuit diagram Fig. 37.

### NOTE:

Switch S4 must be so installed that in the event of a pumping device being put into operation, a plus potential is applied across the corresponding input of the electronic control unit.

### CAUTION:

If no voltage to ground is present at the control unit input X11/2 upon start-up all ADR functions will be inoperative. After the plus potential has been applied across the control unit input X11/2 (auxiliary drive ON) a short after-run period of 20 seconds takes place and subsequently the control unit is in its "fault lock-out" state.

### CAUTION:

In accordance with the Technical Guidelines relating to the ordinance of transporting hazardous materials on the road,

heaters may only be switched on by means of a special switch installed in the driver's cabin and are to be actuated manually. If the heater is equipped with a combination or standard digital timer, it must be ensured that pin 4 on the combination or standard digital timer remains unassigned. The heater can therefore only be started up by means of the instant heating button. No other digital timers are allowed to be used in ADR vehicles.

### Connection of the Heater

To connect the cable harness, remove the control unit cover on the heater and connect the cable harness connectors with the control unit.

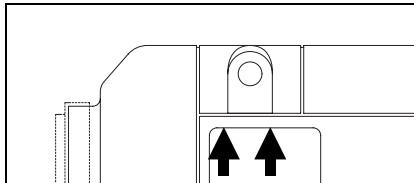


Fig. 24: Removal of Control Unit Cover

#### NOTE:

Lift off control unit cover applying a blunt edge at its side (see arrows in Fig. 24)

### Be sure not to touch the printed conductors of the control unit.

Prior to starting up the heater for the first time, reinstall the control unit cover to prevent any undue escaping of heating air (overheating of heater).

Cable lead-through can optionally be located on the left or right. To ensure that the cable lead-through in the control unit cover provides a tight seal, the cable grommet on the cable harness must be displaced accordingly.

### Connection to Supply Voltage

Preferably to be supplied from the vehicle central electrical system.

**To provide the heater with adequate protection, an additional flat fuse holder is to be installed (supplied with the heater). The fuse holder may only be installed in the vehicle interior.**

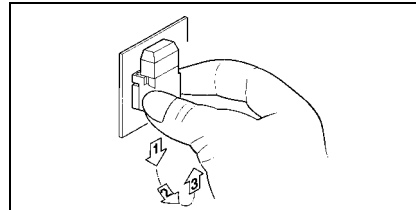


Fig. 25: Removal of Mounting Plate of Fuse Holder

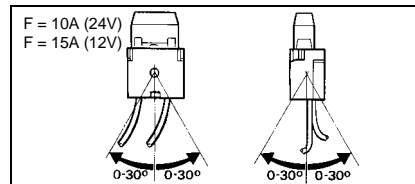


Fig. 26: Fuse Holder, Installation Position

### Connection of Heater Control Element

The cable harness is prepared for connection to the set-point transmitter (mechanical). To withdraw the connector pull at the connector housing only. If the cable harness is pulled, the connector housing is locked (self-locking).

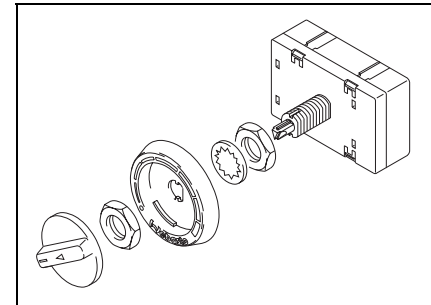


Fig. 27: Heater Control Knob

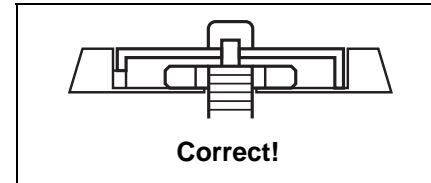


Fig. 28: Mounting of Heater Control Knob

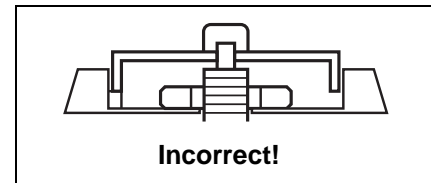


Fig. 29: Mounting of Heater Control Knob (incorrect)

**NOTE:** The optical fiber must be in contact with the rotary knob. As an option, an external temperature sensor can be installed in the passenger area.

# Air Top 2000 S

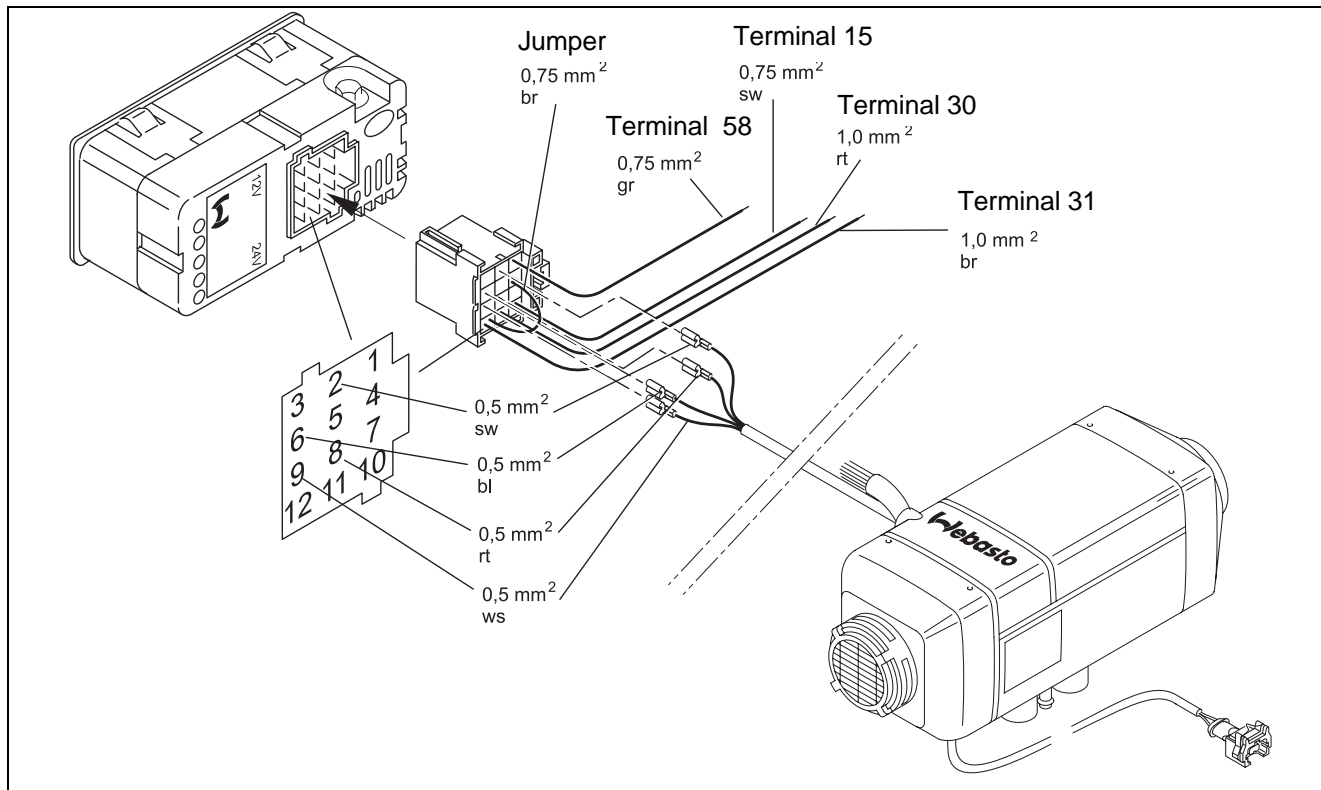


Fig. 30: Connection diagram AT 2000 S, "Comfort" version's scope of delivery



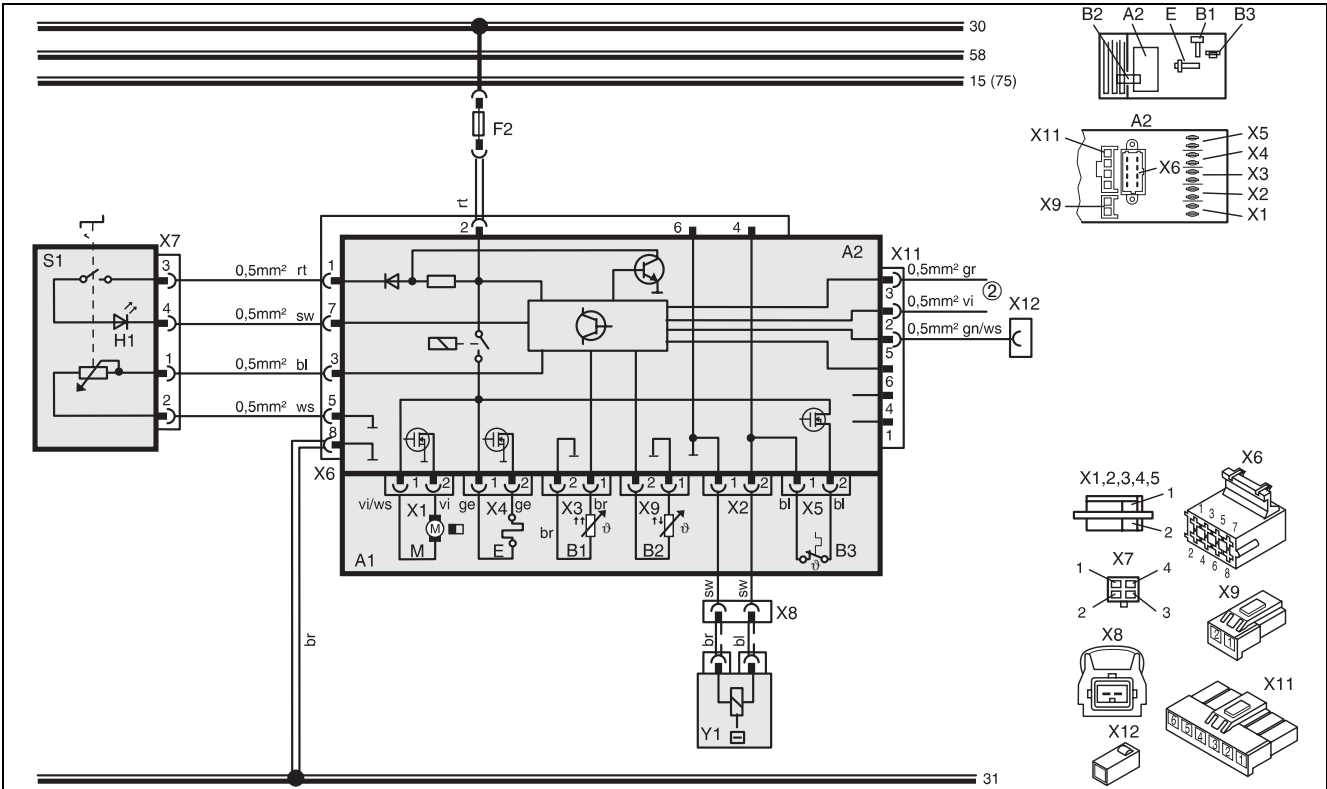


Fig. 31: Wiring Diagram (Automatic Control) for AT 2000 S Heater, 12 /24 V, with Control Knob, legend see page 50

# Air Top 2000 S

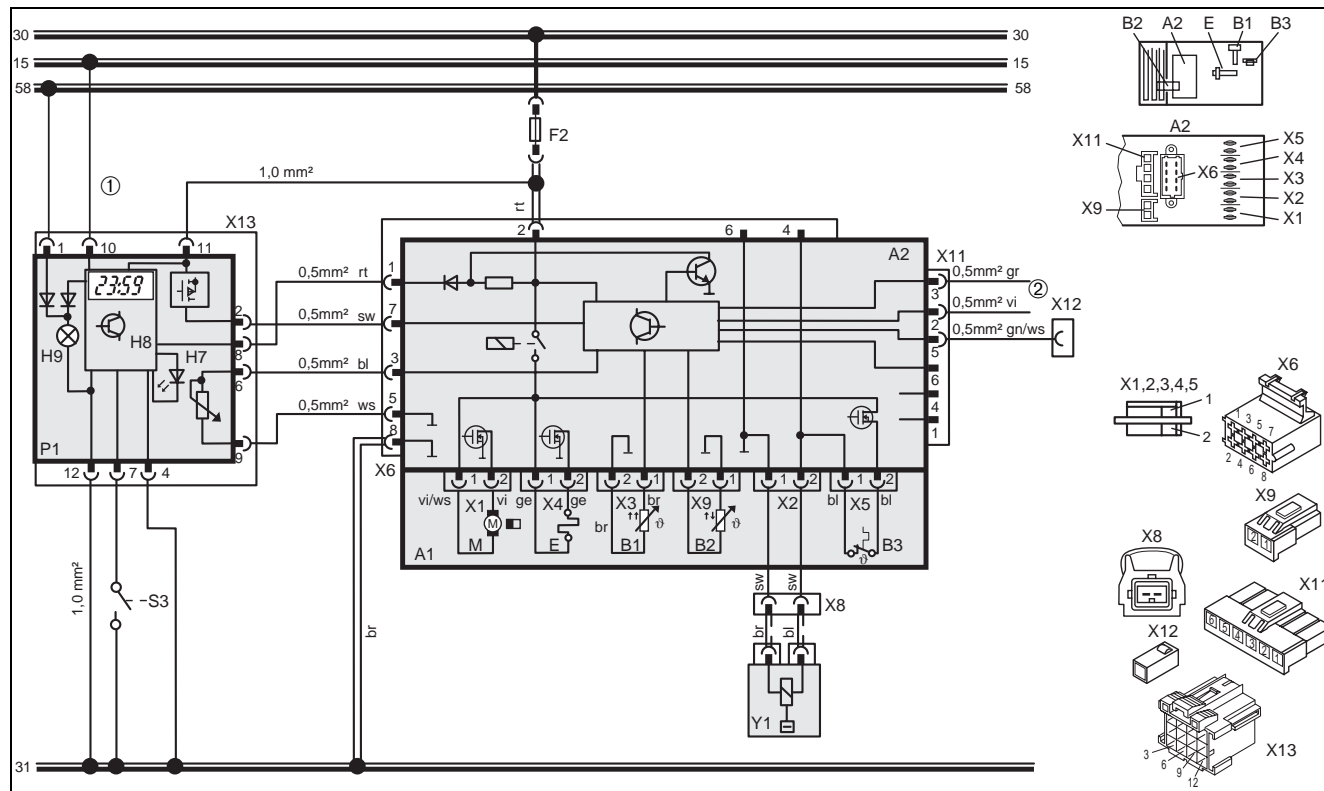


Fig. 32: Automatic Control Circuit Diagram AT 2000 S, 12V/24V with Combination Timer, for legend see page 50

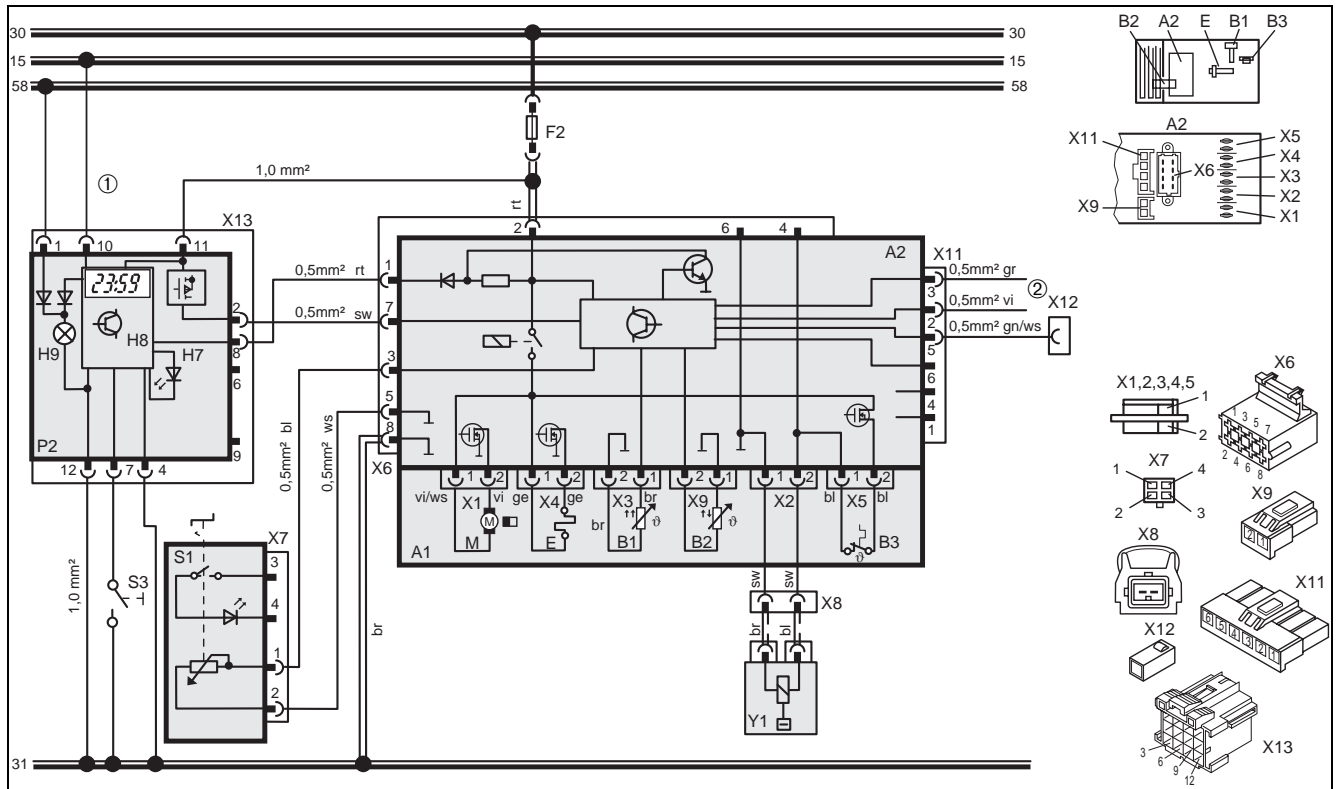


Fig. 33: Automatic Control Circuit Diagram AT 2000 S, 12V/24V with Heater Control Knob and Standard Digital Timer, for legend see page 50

# Air Top 2000 S

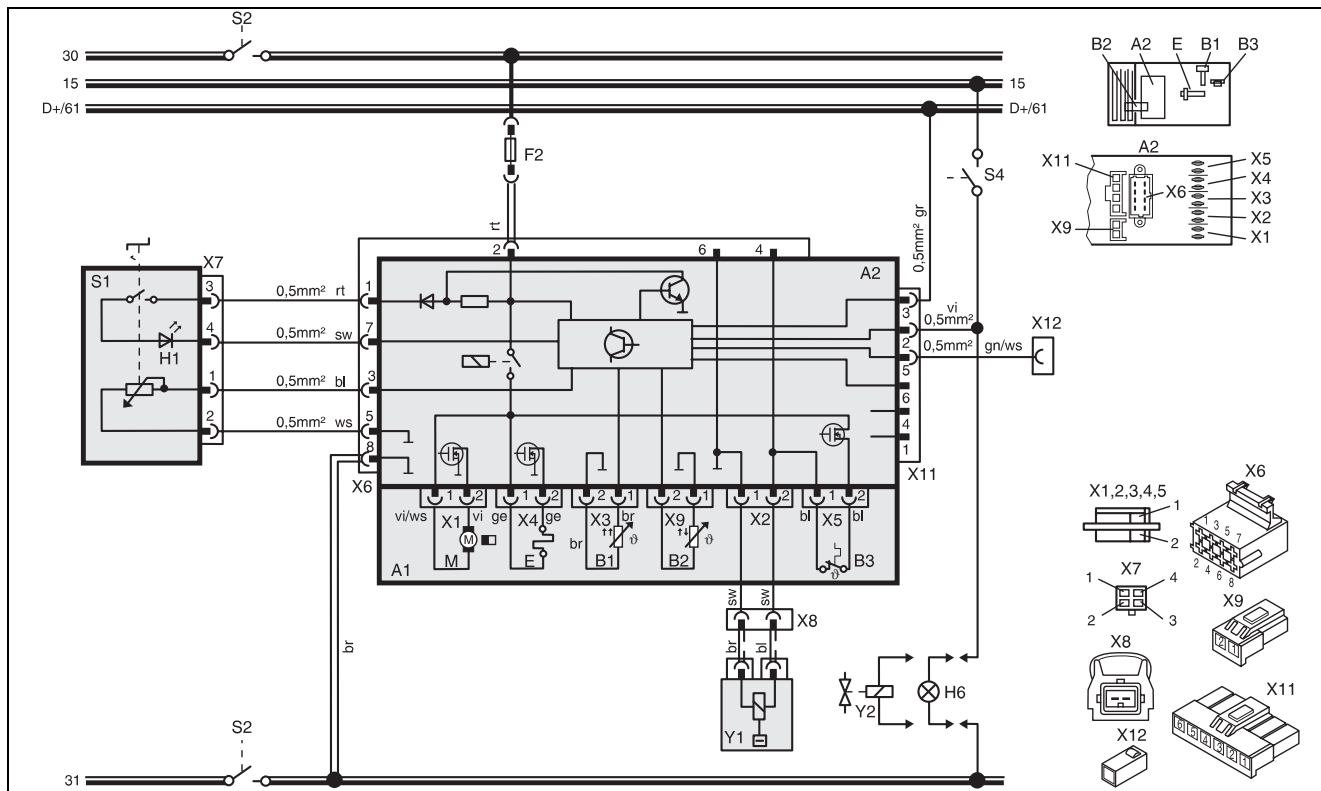


Fig. 34: Automatic Control Circuit Diagram AT 2000 S, 24V ADR-Operation with Heater Control Knob, for legend see page 50

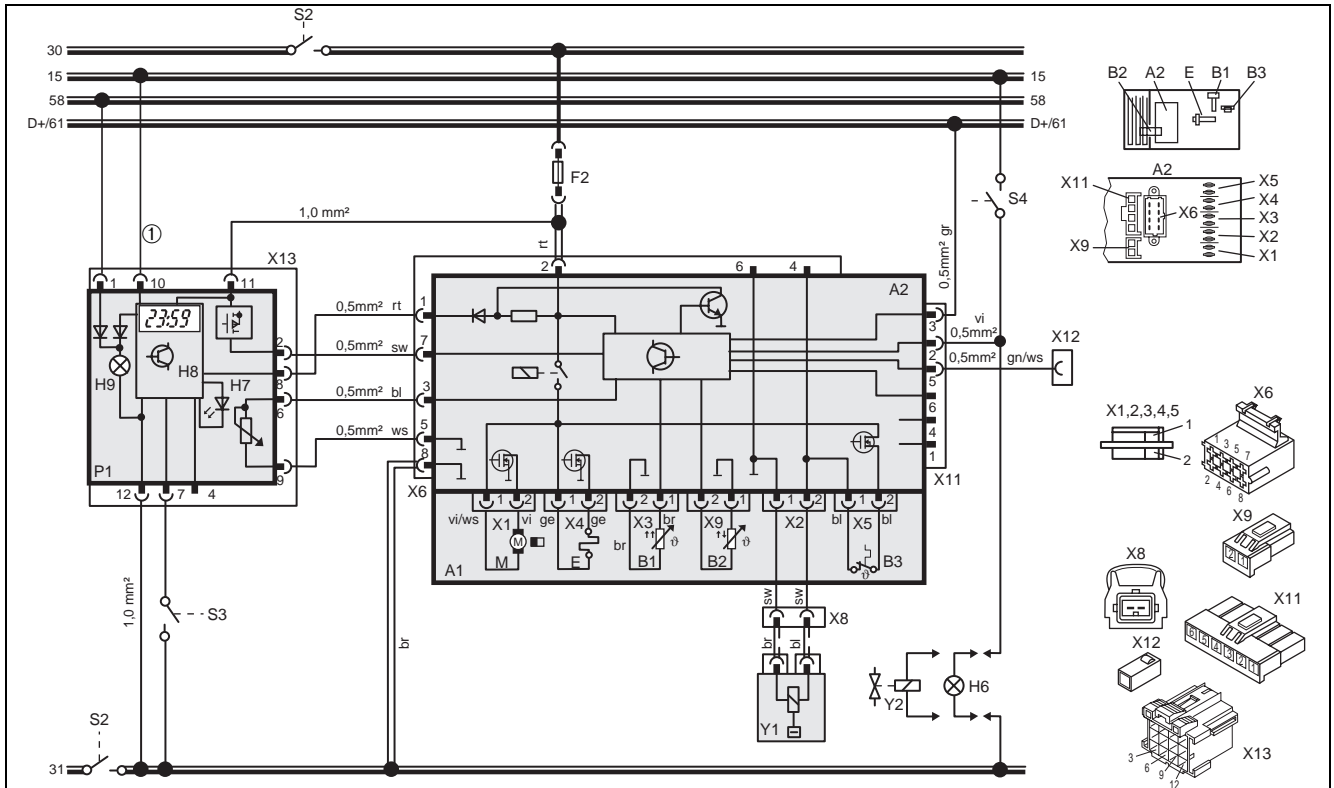


Fig. 35: Automatic Control Circuit Diagram AT 2000 S, 24V ADR-Operation with Combination Timer, for legend see page 50

# Air Top 2000 S

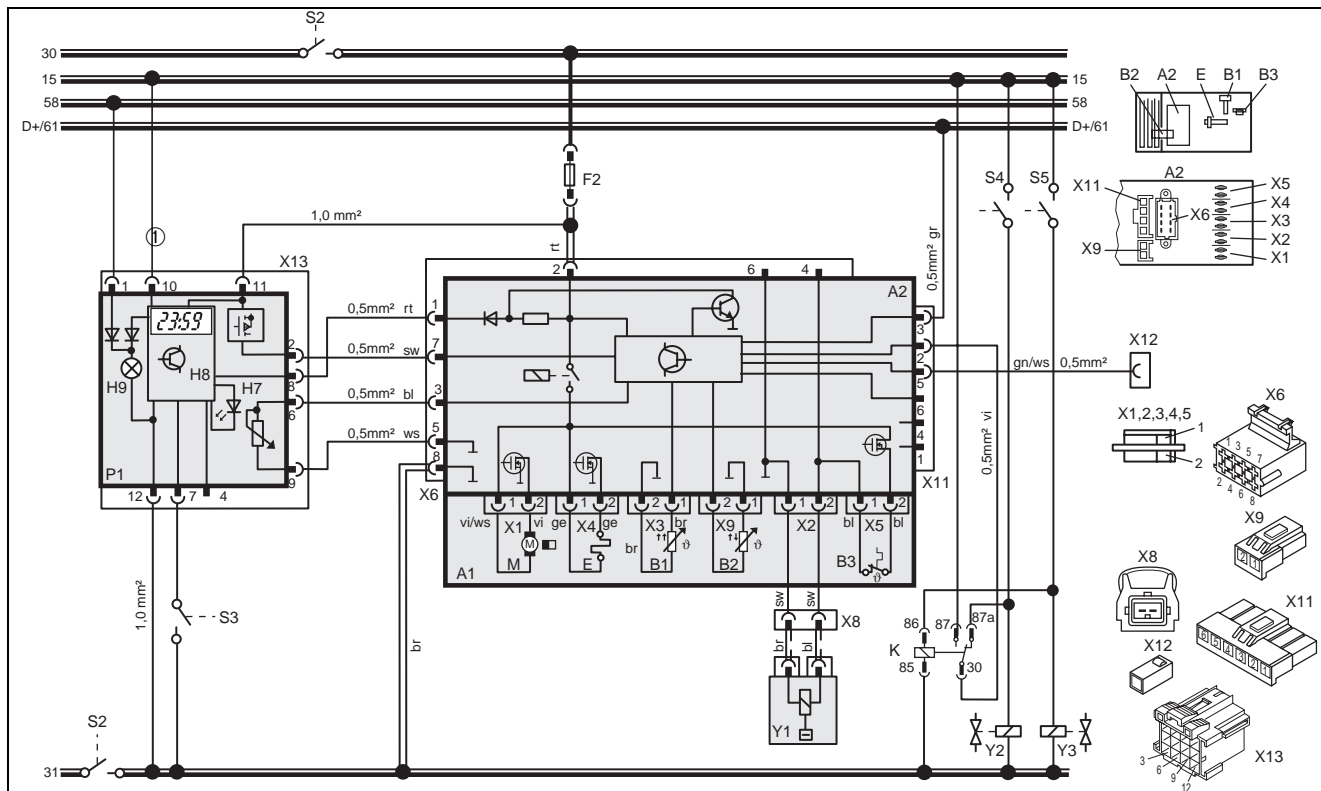


Fig. 36: Automatic Control Circuit Diagram AT 2000 S, 24V ADR-Operation with Combination Timer and 2 Auxiliary Drives, for legend see page 50

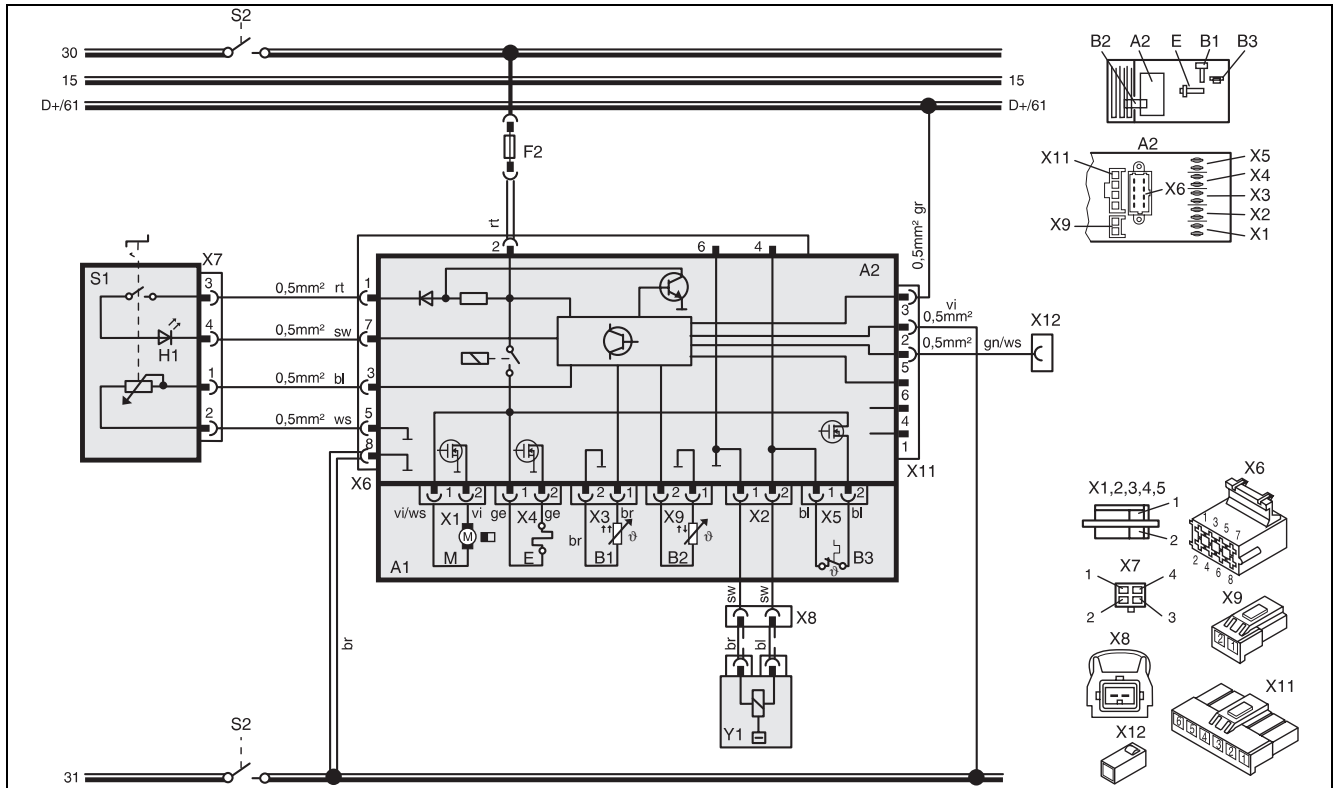







Fig. 37: Automatic Control Circuit Diagram AT 2000 S Diagnosis, 24V ADR-Operation with Heater Control Knob on vehicles without auxiliary drives, for legend see page 50

# Air Top 2000 S

## Legende for circuit diagrams:

Pos.	Designation	Remarks
A1	Heater	Air Top 2000 S
A2	Electronic control unit	
B1	Flame detector	
B2	Temperature sensor	
B3	Overheating protection	
E	Pencil-type glow plug	
F2	Fuse 24V 10A/12V 15A	flat fuse SAE J 1284
H1	LED	green (in pos. S1)
H6	Lamp (min. 1.2W)	operation indicator of pumping device
H7	LED	red (in pos. P)
H8	Heating symbol in display (in pos. P)	operation indicator, overheating indicator
H9	Lamps (in pos. P)	display illumination
M	Motor	
P1	Combination timer (1531)	
P2	Standard digital timer (1531)	
S1	Control element	setpoint generator switch
S2	Disconnecting switch 1 or 2 poles.	Emergency Stop switch; electr. or pneum.
S3	Push-button switch	instant heating button
S4	Switch	on pumping device I
S5	Switch	on pumping device II
X1-X5	Connector 2pole	at pos. A2
X6	Connector 8pole	at pos. A2
X7	Connector 4pole	at pos. S1
X8	Connector 2pole	
X9	Connector 2pole	at pos. A2
X11	Connector 6pole	at pos. A2
X12	Connector 1pole	diagnostic link (K-lead)
X13	Connector 12pole	at pos. P
Y1	Metering pump,	
Y2	Solenoid valve	for pumping device I
Y3	Solenoid valve	for pumping device II

Wire cross sections		
	< 7.5 m	7.5 - 15 m
	0.75 mm <sup>2</sup>	1.5 mm <sup>2</sup>
	1.0 mm <sup>2</sup>	1.5 mm <sup>2</sup>
	1.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>
	2.5 mm <sup>2</sup>	4.0 mm <sup>2</sup>
	4.0 mm <sup>2</sup>	6.0 mm <sup>2</sup>

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

- ① Positive voltage from terminal (15/75) to pin 10:  
continuous operation in the instant heating mode as long as ignition is switched on

No positive voltage at pin 10:  
variable heating times can be programmed (10 min up to 120 min),  
basic setting: 120 min

- ② Connections X11/2 and X11/3 only for ADR function



## Initial Operation

After the heater has been installed, the fuel supply system is to be bled thoroughly.

### NOTE:

Owing to the low fuel consumption it is required that the heater be turned on repeatedly to fill the fuel line leading to the heater.

During a test run of the heater all connections are to be checked for leakage and security. Should a malfunction of the heater occur during operation, fault isolating measures are to be performed.

## Shut-Down on Faults

Faults related to individual heater components and malfunctions during the start-up sequence are detected in the control unit.

The heater is shut down (fault lock-out) in the following cases:

- unacceptable flame detector resistance
- insufficient temperature sensor resistance
- pencil-type glow plug/glow plug control defective
- insufficient fan speed, short circuit or interruption
- fault in the metering pump circuit or overheat protection circuit (during start-up phase only)
- undervoltage of less than 10 volts or overvoltage of more than 15 volts and for longer than 20 seconds (applies to 12-volt heaters)
- undervoltage of less than 20 volts or overvoltage of more than 30 volts and for longer than 20 seconds (on 24-volt heaters)
- control unit defective

No fuel is delivered in case of overheating.

An after-run cycle is performed as is the case when the heater is shut down manually.

After the after-run cycle has been terminated, the control unit is in the fault lock-out state.

An overheating condition is indicated by a flashing operation indicator.

Eliminate cause of malfunction.

To deactivate the fault lock-out, the heater is to be briefly (min. 2 seconds) turned off and then switched back on again one time.

## Fault Code Display

If the heater is equipped with a combination or standard digital timer, a fault code is indicated on the display of the digital timer whenever a malfunction has occurred:

F 01	No start-up (after 2 start-up attempts)
F 02	Flame extinguished (repeated >5)
F 03	Undervoltage or overvoltage
F 04	Premature flame detection
F 05	Flame detector interruption or flame detector short-circuit
F 06	Temperature sensor interruption or temperature sensor short-circuit
F 07	Metering pump interruption or metering pump short-circuit
F 08	Fan motor interruption or fan motor short-circuit or fan motor incorrect speed
F 09	Pencil-type glow plug interruption or pencil-type glow plug short-circuit
F 10	Overheating

## Technical Data

Unless tolerances are shown within the technical data table, a tolerance of  $\pm 10\%$  applies at an ambient temperature of  $+20^{\circ}\text{C}$  and at the rated voltage and conditions.

### Electrical Components:

Control unit, motor, fuel metering pump, light bulb in the digital timer\* and pencil-type glow plug are designed either for 12-volt or 24-volt operation.

The digital timer\*, temperature limiter and flame detector are voltage-independent components.

\* Presetting of heater operating times is not possible for ADR-operation

### Fuel for AT 2000 S-B (Petrol):

The fuel specified by the vehicle manufacturer is suitable as fuel for the heater.

### Fuel for AT 2000 S-D (Diesel/Fuel Oil EL):

The Diesel fuel specified by the vehicle manufacturer is suitable as fuel for the heater. Also EL class fuel oil – not, however, L type fuel oil – can be used provided it conforms to the usual quality on the German market in accordance with DIN 51603.

Any negative effect caused by additives is not known.

When the fuel for the heater

is drawn from the vehicle's fuel tank, the vehicle manufacturer's specifications concerning additives are to be observed.

When changing to cold-resistant fuels, the heater must be operated for approx. 15 minutes to ensure that the fuel pump is filled with the new fuel.

Any addition of waste oil is not permitted.

Heater	Operation	AT 2000 S-B	AT 2000 S-D
Mark of approval		-S 325	-S 324
Type		air heater with vaporizing type burner	
Heat output	control range	1.1 – 2.0 kW	0.9 – 2.0 kW
Fuel		petrol	Diesel/heating oil EL
Fuel consumption	control range	0.1 .. 0.2 kg/h (0.16 .. 0.27 l/h)	0.1 .. 0.21 kg/h (0.12 .. 0.24 l/h)
Rated voltage		12 volts	12 volts    24 volts
Operating voltage range		10 ... 15 volts	10 ... 15 volts    20 ... 30 volts
Rated power consumption	control range	9 .. 22 W	
Permissible ambient temperature: Heater: - operation - storage		-40° ... +40°C -40° ... +85°C	
Metering pump: - operation - storage		-40° ... +20°C -40° ... +85°C	
Heater control: - operation - storage		-40° ... +75°C -40° ... +85°C	
Perm. combustion air intake temperature		-40° ... +20°C	
Setting range for interior temperature	control range	+10 ... + 40 °C	
Flow rate of heating air against 0.5 mbar	max.	70 m <sup>3</sup> /h	
CO <sub>2</sub> content in exhaust gas (permissible operating range)	max.	9.5 ... 10.5	9.5 ... 12.0
Dimensions of heater		length 311 ± 2 mm width 120 ± 1 mm height 121 ± 1 mm	
Weight of heater		2.6 kg	

**Version**

**AT 2000 S-B (Petrol)**

Air heaters for petrol fuel  
(12 volts)

**AT 2000 S-D (Diesel)**

Air heaters for  
"Diesel/EL Fuel Oil EL"  
(12 or 24 volts)

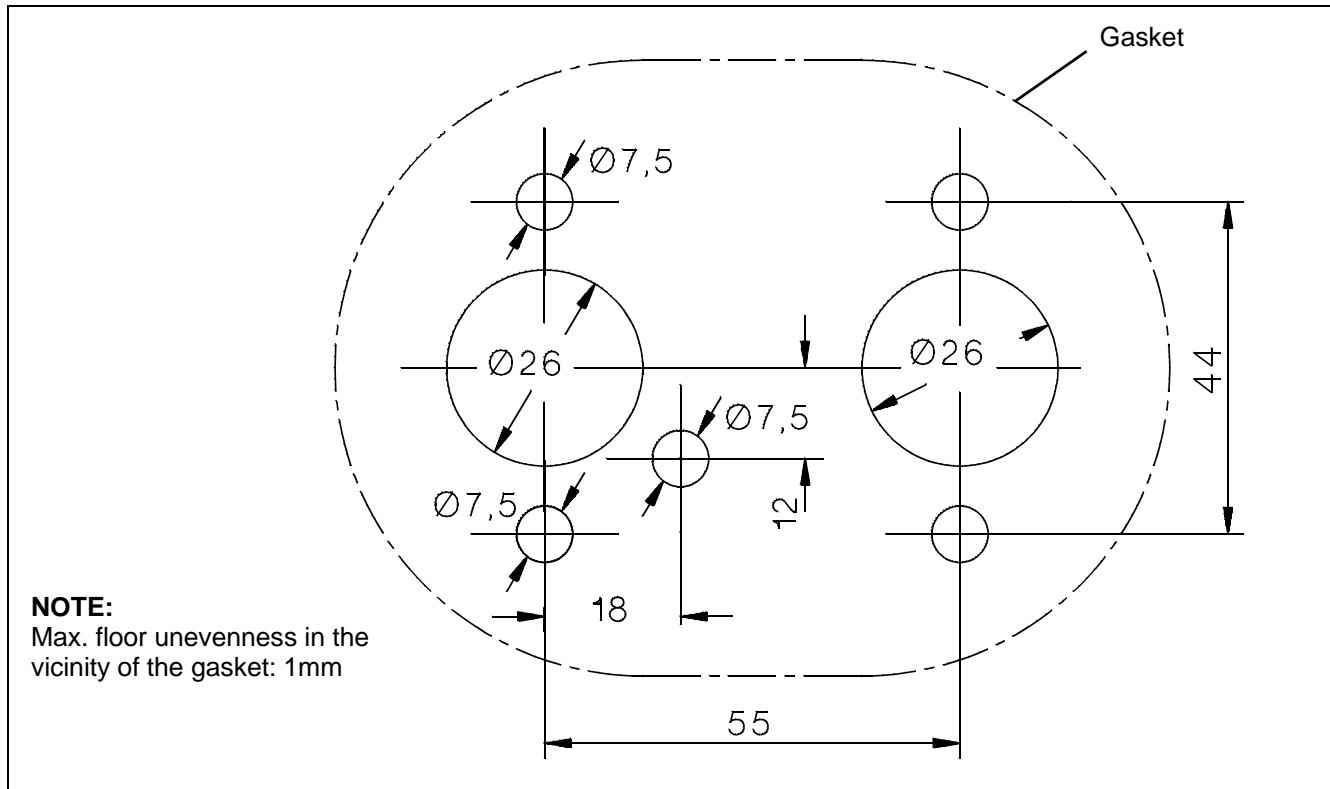


Fig. 38: Drilling template

# Webasto Service Phone Line

In case you encounter technical problems with your auxiliary heater - **Webasto's world-wide Service Network will be glad to assist you!**

Simply dial the **Service Phone Number** for your country as indicated below.

Webasto's Top Service for our customers

