

Water Heaters

Installation Instructions

BBW 46

DBW 46

Be sure to read these Operating Instructions prior to putting the heater into operation.

9/1998

Webasto

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Installation Instructions

Legal Provisions for Installation

For testing the heater in accordance with Section 19, 20 or 21 StVZO (German Regulations Authorising the Use of Vehicles for Road Traffic) the following regulations are primarily to be observed (Section 22 a StVZO):

NOTE:

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

Within the scope of the StVZO "General Design Certifications" have been granted by the Federal Office for Motor Traffic for the BBW 46 and DBW 46 water heaters with the following design approval numbers:

- ~ S 185 for heaters BBW 46 - petrol
- ~ S 186 for heaters DBW 46 - diesel

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

- a) upon the homologation of the vehicles in accordance with Section 20 StVZO
- b) upon any individual test in accordance with Section 21 StVZO, or
- c) upon any examination in accordance with Section 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 7.4 a of Appendix VIII 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 is dependent on this certificate. The approval certification is to be kept in the vehicle.

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

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

The discharge opening of the exhaust pipe should point upward, sideways, or in the case that the exhaust pipes are routed 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.

Exhaust pipes must be routed so that the possibility of exhaust fumes entering the interior of the vehicle is remote. The functioning of any parts of the vehicle essential for its operation must not be impaired.

The openings of the combustion air inlet and exhaust gas outlet pipes must be so designed that a spherical object of 16 mm dia. 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.

For the routing of fuel lines and the installation of additional fuel tanks, Sections 45 and 46 StVZO are to be adhered to. The most important excerpts therefrom are as follows:

Fuel lines must be designed in such a way that they remain 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 evap-

orating fuel can neither collect nor be ignited by hot components or electrical equipment.

The heater must not be installed in spaces occupied by persons.

The operating state of the heater at any given time – at least an indication as to whether it is "on" or "off" - must be easily recognisable.

The installation of components which are not of an approved type will lead to the revocation of the General Design Certification of the heater and thus the General Operating Permit of the entire vehicle. The same applies to improperly performed repairs or those where other than genuine replacement parts have been used.

Use of the Water Heater

The BBW 46 / DBW 46 water heaters, in conjunction with

- the vehicle's heating system, are used for
- heating the passenger compartment,
- defrosting the vehicle's windows,
- preheating water-cooled engines.

The water heaters operate independently of the vehicle's engine and are connected to the cooling system, the fuel system and the electrical system of the vehicle.

BBW 46 / DBW 46

Installation Location

Preferably, the heater should be installed in the engine compartment in the splash-water protected area of the front fenders or at the splash wall.

The heater should be installed at a level as low as possible so as to ensure automatic venting of the heater and the circulating pump. This is of special importance since the circulating pump is not of the self-priming type.

CAUTION:

The openings of the water connecting pipe sockets must never, not any installation position, point downward.

CAUTION:

The heater must not be installed :

- in the immediate vicinity of or above hot vehicle parts
- in the direct splashwater area of the wheels

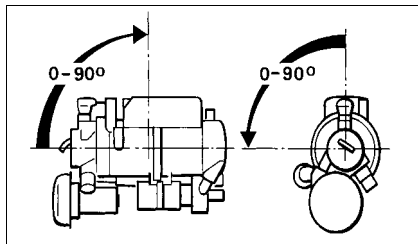


Fig 1: Installation Positions

Type Plate

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

The years not applicable must be removed from the type plate.

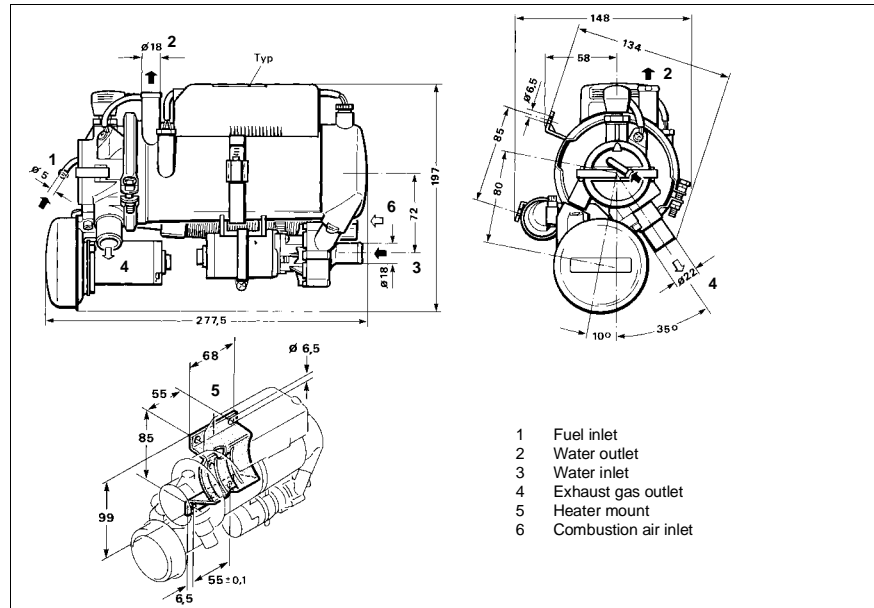


Fig 2: Installation Drawing BBW 46 / DBW 46

Mount

The heater mount must be fitted to the vehicle body or the intermediate support by means of at least four M6 screws.

It is required that washers and lock washers be used.

In the case of level body surfaces, the washers must have a minimum diameter of 22 mm.

Do not use sheet metal screws for attaching the mount.

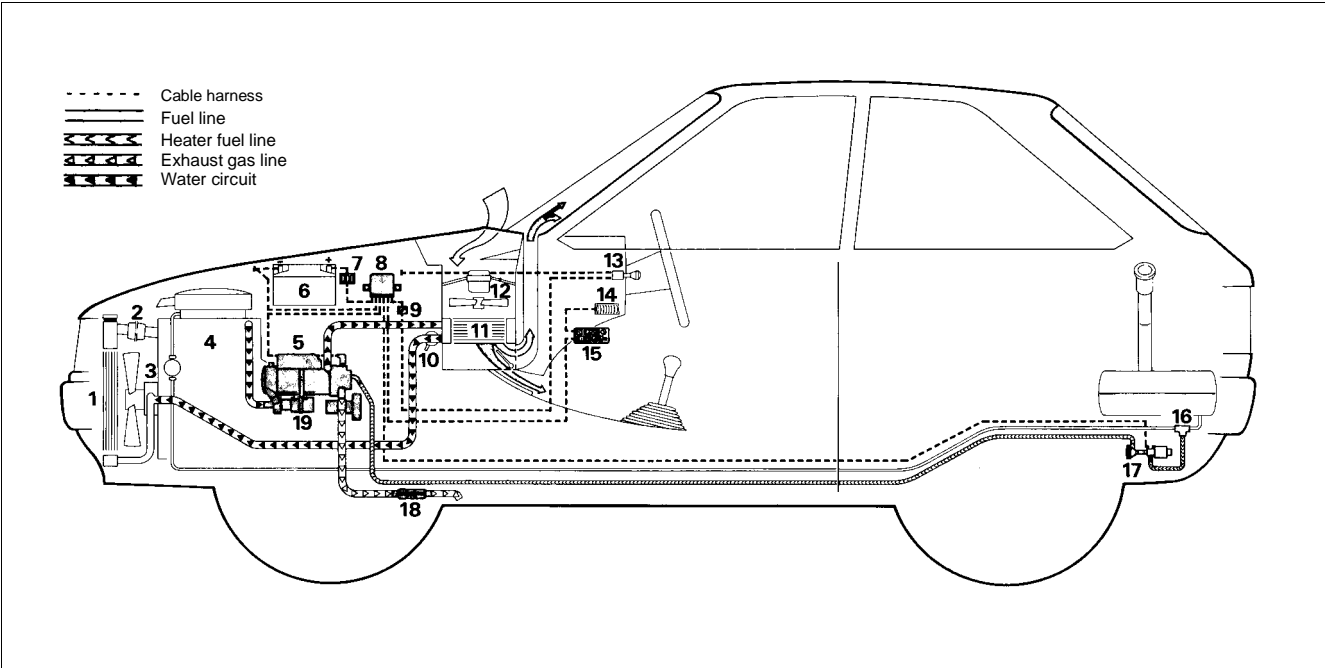


Fig 3: Installation example of BBW 46 / DBW 46 heating device in a passenger car (inline integration)

- 1 Radiator
- 2 Cooling water thermostat
- 3 Water pump (of vehicle engine)
- 4 Vehicle engine with standard equipment
- 5 Water heater
- 6 Battery
- 7 Fuse holder
- 8 Control unit
- 9 Relay (for vehicle fan)
- 10 Regulating valve of vehicle heating
- 11 Heat exchanger of vehicle heating
- 12 Vehicle heating fan
- 13 Switch for vehicle heating fan
- 14 Fuse bank in vehicle
- 15 Digital timer
- 16 Fuel extractor
- 17 Fuel metering pump
- 18 Exhaust silencer
- 19 Circulating pump

BBW 46 / DBW 46

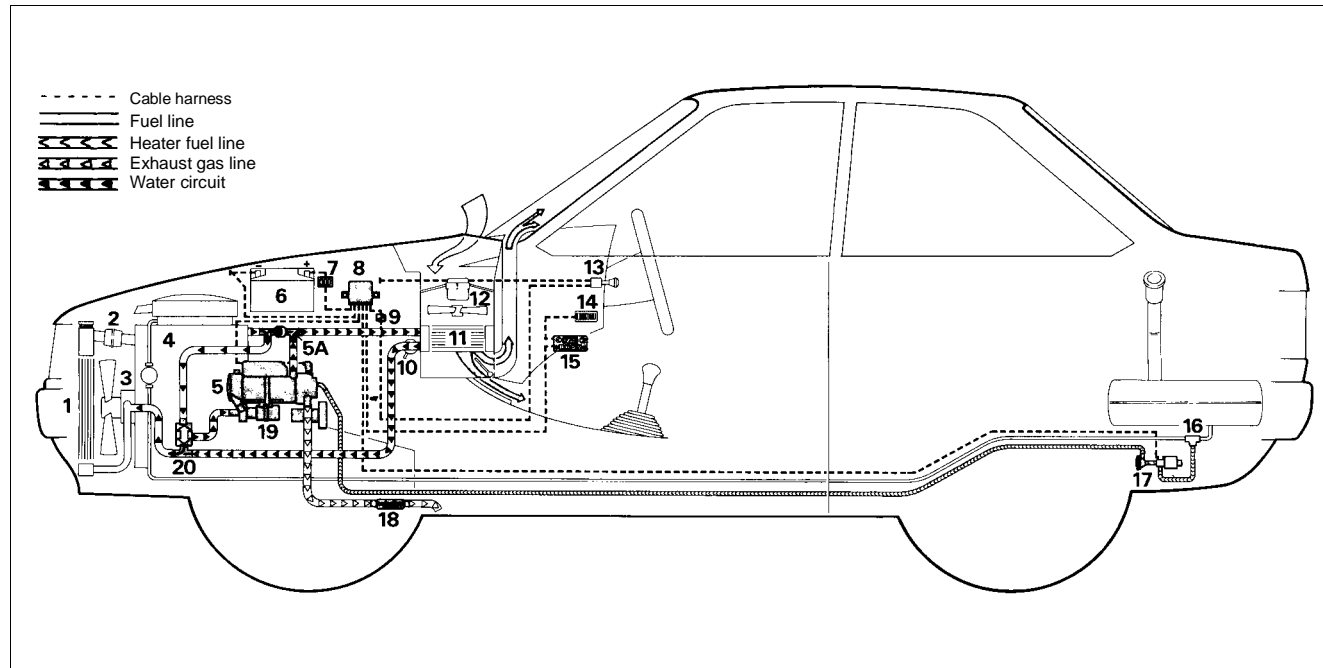


Fig 4: Installation example of BBW 46 / DBW 46 heating device in a passenger car (thermostat integration)

- | | | |
|--|---|-------------------------|
| 1 Radiator | 7 Fuse holder | 14 Fuse bank in vehicle |
| 2 Cooling water thermostat | 8 Control unit | 15 Digital timer |
| 3 Water pump(of vehicle engine) | 9 Relay (for vehicle fan) | 16 Fuel pick-up |
| 4 Vehicle engine with standard equipment | 10 Regulating valve for vehicle heating | 17 Fuel metering pump |
| 5 Water heater | 11 Heat exchanger, vehicle heating | 18 Exhaust silencer |
| 5A Non-return valve | 12 Vehicle heating fan | 19 Circulating pump |
| 6 Battery | 13 Switch for vehicle heating fan | 20 Thermostat |

Connection to the Vehicle's Cooling System

The heater is to be connected to the vehicle's cooling system in accordance with Figs 3, 4, 5 and 6. A minimum of 4 litres of coolant must be maintained in the cooling circuit.

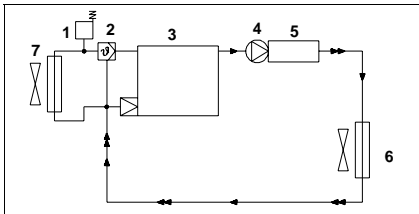


Fig 5: Integration into Engine/Water Circuit "Inline Integration"

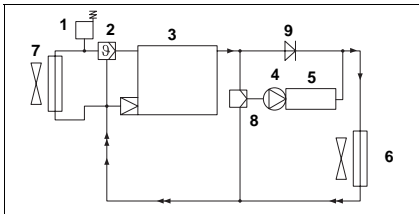


Fig 6: Integration into Engine/Water Circuit "Thermostat Integration"

Legend of Figs. 5 and 6:

- 1 Expansion tank
- 2 Thermostat
- 3 Vehicle engine
- 4 Circulating pump
- 5 Heating device
- 6 Heat exchanger of heater
- 7 Radiator
- 8 Thermostat
- 9 Non-return valve

The integration of the heater into the cooling circuit is to be performed in the flow line of the vehicle's heat exchanger.

As a rule, the water hoses supplied by Webasto with the heater should be used. If this is not the case, the hoses must comply with DIN 73411 requirements as a minimum. The hoses are to be routed without any kinks and – to ensure proper venting – in an upward pitch, if possible. Hose connections must be secured against slipping off by means of hose clamps.

NOTE:

When securing the hose clamps to the heater, be sure to fit them between the bead (thicker part) of the hose and the heater. The hose clamps must be tightened to a torque of 2.0 + 0.5 Nm.

Before the heater is started up for the first time, or after the coolant has been replaced, it must be ensured that the cooling system is properly bled. Heater and piping should be installed in such a way that static bleeding of the system is ensured.

During heating operation, inadequate bleeding may lead to a malfunction due to overheating.

Re-Positioning of Circulating Pump

The circulating pump may be integrated into the water circuit either by installation at the location provided on the heater or at a heater-remote location. It is important that the correct direction of flow through the heater be observed (water outlet at top / water inlet at bottom) as otherwise malfunctions will occur!

Connection to the Fuel System

Fuel system integration without non-return valve in the tank

The heater's fuel supply circuit must be integrated in the return line as shown in Fig. 3.

Fuel system integration with non-return valve in the tank or fuel system integration in the case of single-line fuel supply

Tank extractor with 90°-elbow is to be installed in the tank fitting (Fig. 7)

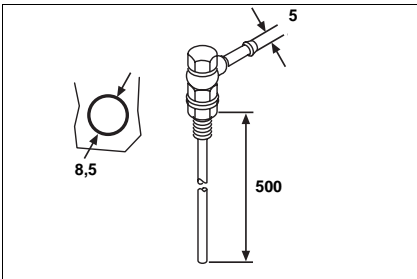


Bild 7: Tankarmatur 90°

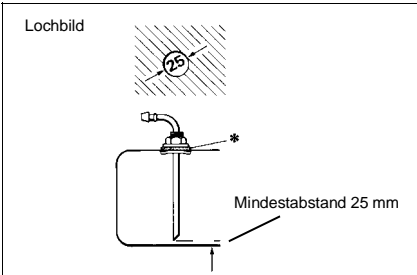


Bild 8: Webasto-Tankentnehmer

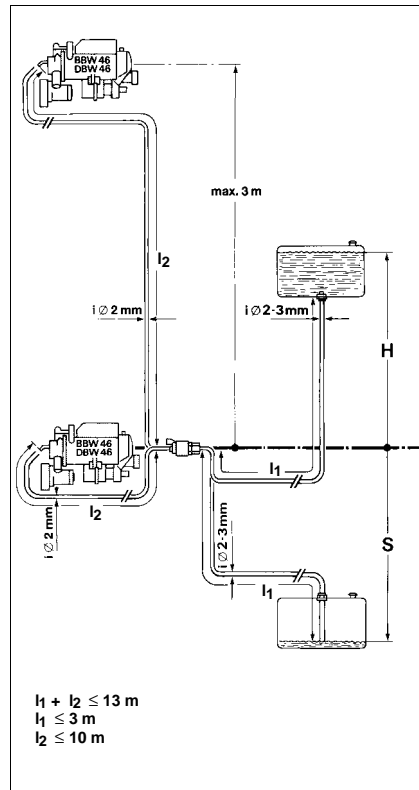


Fig 9: Fuel Supply

Fuel Supply

Details on the permissible pressure at the fuel extraction point are contained in the table below.

Permissible fuel feed height H (m)	at max. permissible overpressure (bar) in fuel line	
0.00	1.5	
1.25	1.4	
2.50	1.3	
3.75	1.2	
5.00	1.1	
6.25	1.0	
7.50	0.9	
8.75	0.8	
10.00	0.7	
Permissible fuel suction height S (m)	at max. permissible underpressure (bar) in fuel tank	
	petrol	diesel
0.00	-0.15	-0.15
0.50	-0.11	-0.11
1.00	-	-0.07

NOTE

A fuel flow line can usually be identified by the in-line fuel filter.

NOTE:

If the vehicle's fuel system is equipped with a vapour separator, fuel extraction is to take place upstream of same.

For fuel extraction from flow or return lines it is imperative that the special Webasto fuel pick-up (see Fig. 10) be used.

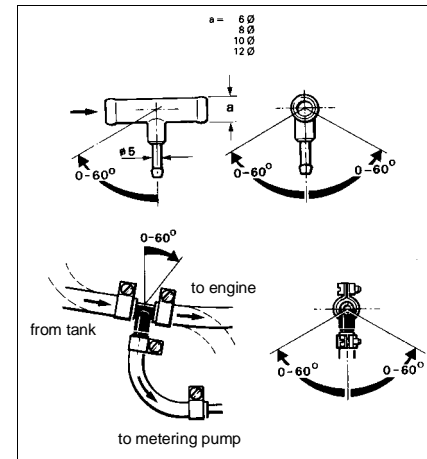


Fig 10: Webasto Fuel Pick-Up

The fuel pick-up is to be mounted so that any air or gas bubbles that may form are automatically discharged toward the tank (see Fig. 10).

Air or gas bubbles in the fuel line of the vehicle can form if there is a leak in the vehicle's carburettor or fuel pump, or if the ambient temperature exceeds the evaporating temperature of the fuel.

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 radiating from the engine, which may result in malfunctions of the combustion operation.

If the heater is installed in vehicles with petrol injection systems it must therefore be determined whether 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 in which case it must be ensured that the return pipe extends almost to the bottom of the tank. If this is not the case, it is possible to extend the return pipe.

Where the fuel pump is mounted outside the tank, the connection to the fuel system can be accomplished between the fuel tank and the fuel pump.

Fuel Lines

NOTE:

The hose clamps are to be tightened to a torque of 1.0 + 0.4 Nm.
Any fuel that may have leaked is to be removed from the engine or heater prior to starting up the heater or engine.

Only steel, copper and plastic pipes made of plasticised, light-resistant and temperature-stabilised 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 larger than 4 mm, air or gas bubbles accumulate which result in malfunctions if the lines sag or are routed in a downward pitch. If the diameters shown in Fig. 9 are used you can be sure that no unwanted bubbles will form.

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).

Connecting Two Pipes Using a Hose

The proper connection of fuel lines using a hose is shown in Fig. 11.

Check for leaks!

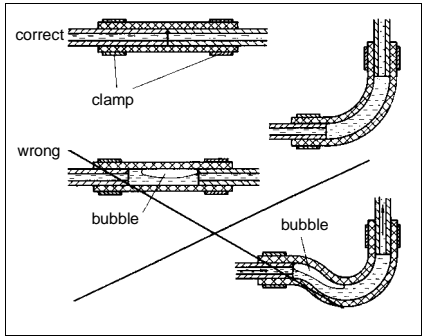


Fig 11: Pipe/Hose Connection

Metering Pump

The metering pump is a combined fuel delivery, metering and shutoff system and is subject to certain installation criteria (see Figs. 8 and 11).

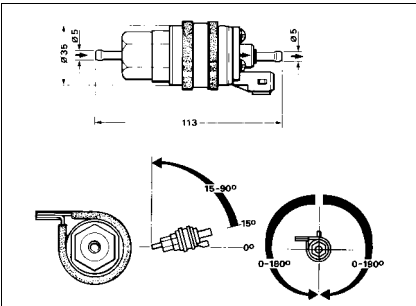


Fig 12: Metering Pump without Diaphragm Damper Installation position and mounting

Installation Location

Prior to installing the metering pump make sure that the maximum pressure prevailing at the fuel extraction point is lower than the max. permissible value indicated in the table on page 6.

It is recommended that the metering pump be installed in a location which sufficiently cool. On no account must the permissible ambient temperature at any given operating state be in excess of + 20°C.

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.

The preferred installation location is near the tank.

Installation and Mounting

The metering pump is to be attached by vibration-damping suspension. The installation position is restricted as shown in Fig. 12 in order to ensure proper self-ventilation of the system.

Combustion Air Supply

The combustion air required must be drawn in from the outside of the vehicle.

The combustion air should be drawn in at a splash-water protected location.

The combustion air intake opening must be so located that the possibility of clogging due to contamination is remote. It **must not** point in the direction of travel.

The combustion air line can be so routed that it features several bends (total of 270° , smallest bending radius 50 mm). The combustion air line can have a length of max. 1000 mm.

On no account should the combustion air be extracted from areas occupied by persons. If the heater is located in an enclosed installation casing, a ventilation opening of at least 3 cm² is required.

Where the heater is installed in the vicinity of the vehicle tank in a common installation space, 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 splash-proof.

Exhaust Pipe

The exhaust pipe (inside diameter 22 mm) may have a length of up to 5m and may feature several bends (in total 720° , smallest bending radius 50 mm).

The exhaust silencer is preferably to be mounted in the vicinity of the heater. It must not be installed near the combustion air intake opening.

Operation of the BBW 46 / DBW 46 heater is also permissible without silencer.

The discharge opening of the exhaust pipe **must not** point in the direction of travel (see Fig. 14).

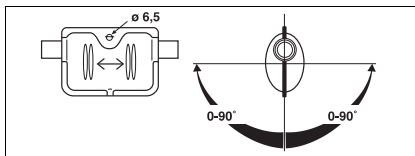


Fig 13: Exhaust silencer
Direction of flow (optional)

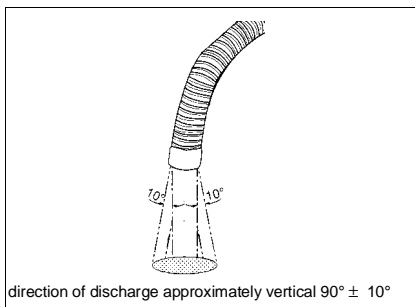


Fig 14: Exhaust Pipe Discharge Opening
Installation Position

Rigid pipes made of unalloyed steel with a minimum wall thickness of 1.0 mm or flexible tubes of alloyed steel should be used as exhaust pipes.

NOTE:

Any condensation water that may have collected in the exhaust pipe must be drained immediately. If necessary, it is permitted to drill a condensation water drain hole.

Electrical Connections

Control Unit/Heater Connection

The electrical connection of the heaters is to be performed in accordance with Fig. 16.

The connection of the digital timer should be carried out in accordance with the circuit diagram shown in Fig. 15.

Vehicle Fan

The activation of the vehicle fan is controlled by the vehicle fan relay, see circuit diagram shown in Fig. 16.

Connection of Telestart Receiver T60

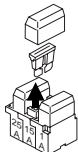
The connection of Telestart receiver T60 is to be carried out as shown in Fig. 16.

Tuning of Telestart T60 Handheld Transmitter and Receiver

NOTE:

Each receiver can be allocated 2 handheld transmitters.

- Place batteries in battery compartment.
- Pull antenna out of transmitter approx. 5 cm.

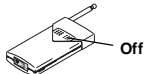
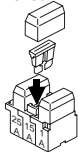


Wait 10 seconds

Interrupt voltage supply for at least 10 seconds by removing the 15A flat fuse (blue).

NOTE:

If the Telestart receiver is retrofitted, fuse F2, 1A (black) has to be removed.



- Immediately after reinstalling the flat fuse press the "Off" button.



Wait 5 seconds

- Briefly press the "Start" button.

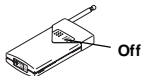


Operation indicator on transmitter is flashing.



Wait 15 seconds

- Briefly press the "Off" button.



Operation indicator on transmitter no longer flashes.

- Tuning is finished.

If any specified time period is exceeded or fallen short of, tuning will not be successful and the procedure is to be repeated from the beginning. Proceed in the same way for tuning and thus allocating a second transmitter.

Retrofitting the T60 Telestart Receiver

NOTE:

The BBW 46 / DBW 46 water heaters can be retrofitted with the T60 Telestart remote control.

The retrofit kit T60 consists of the following parts:

- Transmitter T60 with 2 alkaline LR1 1.5V batteries
- Standard antenna T6
- Receiver T6
- Mounting hardware (bag) comprising
 - 2 sheet metal screws
 - 1 receptacle housing
 - 1 tab connector housing
 - 3 push-on receptacles

The installation may only be performed by authorised Webasto service centres.

CAUTION:

The receiver must be installed in the interior of the vehicle. It is not permitted to extend the cable harness (approx. 70 cm long) provided on the receiver.

- Determine suitable installation location for receiver T6 in the interior of the vehicle, in the vicinity of the digital timer.
- Mount receiver using the sheet-metal screws (contained in the kit).

Installation of Antenna

NOTE:

Preferably, the antenna should be installed in the interior of the vehicle, at the top in the centre of the windshield or rear window. If installed at different locations, the range is likely to be diminished.

For an optimal reception, a distance of 2 ± 0.5 cm from the windshield edge is to be maintained (Fig. 15). The cable should be routed upward, beneath the panelling in the vehicle roof and then directed to the right or left to the chassis member.

NOTE:

In the case of lack of space, the antenna may be installed up to 15 cm off-centre.

- Clean windshield or rear window using grease-dissolving cleaner (e.g. methylated spirits).
- Peel off protective film from antenna and glue antenna in place.

- Route antenna cable to receiver.
- Establish plug connection at receiver and tighten connector hand-tight.
- Secure antenna cable using cable ties.

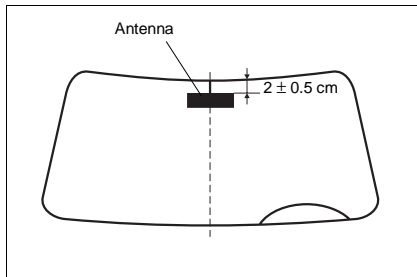


Fig 15: Installation of Antenna

NOTE:

Do neither shorten nor sharply bend antenna cable.

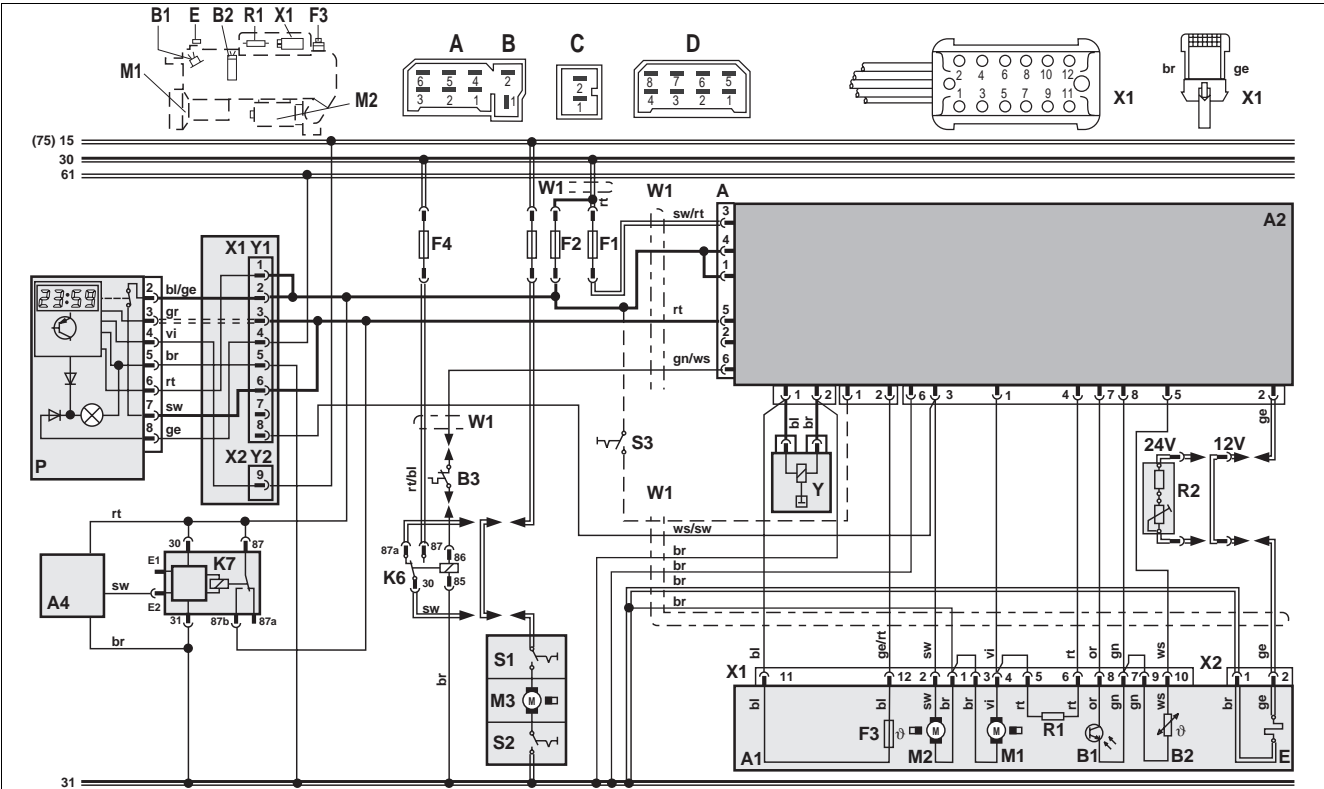


Fig 16: Automatic control circuit BBW 46 / DBW 46, 12V digital timer and Teletstart T6 (legend see page 12)

Wire Cross-Sections		
	< 7.5 m ²	7.5 - 15 m ²
≡ ≡ ≡	0.5 mm ²	0.75 mm ²
—	0.75 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

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

Pos.	Designation	Remarks
A1	Heater	BBW 46 / DBW 46
A2	Electronic control unit	SG 1560
A4	Telestart receiver	T 6
B1	Flame detector	
B2	Temperature sensor	
B3	Room thermostat	for vehicle fan on/off
E	Glow plug	
F1	Fuse 16A	motor vehicle fuse DIN 72581
F2	Fuse 8A	motor vehicle fuse DIN 72581
F3	Temperature fuse	
F4	Fuse 16A	motor vehicle fuse DIN 72581
K6	Relay	for vehicle fan
K7	Relay	for Telestart receiver
M1	Motor	combustion air fan
M2	Motor	circulating pump
M3	Motor	vehicle fan
P	Timer, digital	for presetting operating time
R1	Resistor	for part-load operation
R2	Resistor	only required for 12-volt glow plugs in a 24-volt heater
S1	Switch for vehicle fan	S1 or S2 depending on vehicle
S2	Switch for vehicle fan	S1 or S2 depending on vehicle
S3	Switch for circulating pump	for separate activation
V3	Diode (in pos. A2)	
V108	Transistor (in pos. A2)	
W1	Cable harness	
X1	Connector 12-pole	
X2	Connector 2-pole	
X4	Connector 1-pole	
Y	Metering pump	

Initial Operation**NOTE:**

The safety information contained in the Operating Instructions have to be adhered to!

After the heater has been installed, the water circuit and the fuel supply system are to be thoroughly bled. Follow the directions of the vehicle manufacturer.

Perform a test run of the heater thereby checking all water and fuel connections for leakage and security. Should the heater fail during operation, troubleshooting activities are to be carried out.

Malfunctions**Fault Lock-Out Due to Malfunctions of the Heater**

If no flame forms fuel is delivered for max. 180 seconds.

If the flame is extinguished during operation, fuel is delivered for max. 90 seconds.

In the event of overheating fuel supply is immediately stopped.

CAUTION:

No visual indication occurs in the case of overheating.

Fault Lock-Out Due to Undervoltage

In the case of an undervoltage of 9.5 ± 0.1 V (in the case of 12-volt heaters) or 19 ± 1 V (in the case of 24-volt heaters), measured at the input of the control unit, occurring over a period of 20 seconds, the heater will shut down in its fault lock-out mode and an after-run period will follow.

Interlock Deactivation

- Eliminate cause of malfunction
- Resetting is performed by switching the heater off and back on again (the 'off' period has to last for at least 1 sec).
- In the case of overheating, the temperature fuse has to be replaced or the temperature limiter to be reset.

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.

Fuel for BBW 46 (Petrol):

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

Fuel for DBW 46 (Diesel):

The diesel fuel specified by the vehicle manufacturer is suitable as fuel for the heater. When changing to cold-resistant fuels, the heater must be operated for about 15 minutes to ensure that the fuel line and fuel pump are also filled with the new fuel.

Any negative effect caused by additives is not known.

Heater	Operating Mode	BBW 46	DBW 46
Mark of approval		~S 185	~S 186
Type		water heater with vaporising burner	
Heat output	full load part load	4.6 kW 2.3 kW	
Fuel		petrol	diesel
Fuel consumption	full load part load	0.63 l/h 0.23 l/h	0.58 l/h 0.29 l/h
Rated voltage		12 or 24 volts	
Operating voltage range		10 ... 14 volts or 20 ... 28 volts	
Rated power consumption without circulating pump (without vehicle fan)	full load part load	44 W 33 W	
Max. permissible ambient temperature:			
Heater:	- operation - storage	-40° ... + 80°C -40° ... +100°C	
Control unit:	- operation - storage	-40° ... + 75°C -40° ... + 85°C	
Metering pump:	- operation - storage	-40° ... + 20°C -40° ... + 85°C	
Max. allowable working pressure (heat carrier)		0.4 ... 2.0 bar	
Filling capacity of heat exchanger		0.25 l	
Min. amount to be maintained in the circuit		4.00 l	
Volume flow of circulating pump against 0.1 bar		950 l/h	
CO ₂ content in exhaust gas (perm. funct. range)		10 ... 10.5 % by vol.	
Dimensions of heater		length 277 mm width 148 mm height 197 mm	
Weight incl. control unit and circulating pump		3.9 kg	

Version

Type

DBW 46 Supplementary Heater
Water heater for "diesel" fuel

Type

BBW 46 Supplementary Heater
Water heater for "petrol" fuel

The BBW 46 / DBW 46 water heaters are designed for 12-volt or 24-volt operation.

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

