



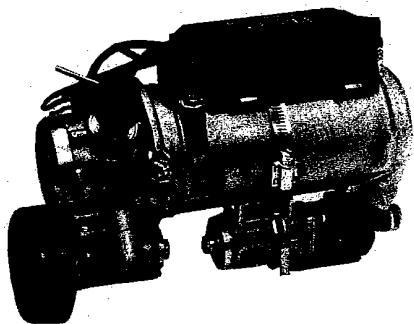
Water heaters B 5 W / D 5 W

Technical Description
Installation and Operating Instructions

Eberspächer

J. Eberspächer
Eberspächerstr. 24
D - 7300 Esslingen
Telefon (zentral)
(07 11) 3109-0
Telefax
(07 11) 3109-5 00

Water heaters independent of engine
B 7 W for petrol, D 7 W for diesel



B 5 W

		Cat. No.
Basic unit with standard equipment	12 V	20 1690 05 00 00
	24 V	20 1691 05 00 00
Universal installation kit (without control elements)		20 1690 81 00 00

D 5 W

		Cat. No.
Basic unit with standard equipment	12 V	25 1732 05 00 00
	24 V	25 1733 05 00 00
Universal installation kit (without control elements)	12 V	20 1690 81 00 00
	24 V	25 1733 81 00 00

Control elements (to be ordered separately, see page 2).
See Additional Equipment Catalog for other accessories.

Specifications

Heating medium	Water, coolant
Heating capacity ¹⁾	High: 5000 W ± 10% Low: 1250 W ± 10%
Regulation of heating capacity	High: full capacity Low: 1/4 capacity Off: by temperature sensor, depending on heat requirement
Fuel (see also page 11)	B 5 W: petrol (commercial grade) D 5 W: diesel (commercial grade). See also "Fuel at Low Temperatures".
Fuel consumption ¹⁾	B 5 W: High: 0.68 l/h Low: 0.17 l/h D 5 W: High: 0.60 l/h Low: 0.15 l/h } ± 10%
Rated voltage ⁴⁾	12 V or 24 V
Operating range	
Minimum voltage ²⁾	10 V or 20 V
Maximum voltage ³⁾	14 V or 28 V

Electric power consumption with circulation pump, without hot-air blower

B/D 5 W	at start	265 W ± 10% (12 V)
		480 W ± 10% (24 V)
B/D 5 W	in continuous operation	High: 44 W ± 10%
		Low: 28 W ± 10%

Permissible operating pressure 0.4 to 2.0 bars gauge pressure

Water throughput of water pump against 0.1 bar 950 l/h

Minimum water throughput Heater, approx. 450l/h

Radio interference suppression Remote, additional interference suppression measures possible

Weight approx. 4 kg (without silencer, metering pump, control unit)

Ambient temperature -40°C to +80°C

¹⁾ at rated voltage

²⁾ an undervoltage safety device built into the control unit switches off the heaters at approx. 10.5 V or 21 V, as the case may be.

³⁾ an overvoltage safety device built into the control unit switches off the heaters at approx. 15 V or 30 V, as the case may be.

⁴⁾ B 5 W (for 12 V only)

Contents:

	Page
Scope of delivery/Cat. No.	2, 3
Installation instructions	4
Official regulations	4
Principal dimensions	5
Installing the heater	6
Permissible installation positions	6
Running the combustion air	6
Running the exhaust	6
Connection to water circulation system	7, 8
Fuel supply/Fuel at low temperatures	9 – 11
Electrics/Wiring diagrams	11 – 13
Description of operation/Elimination of malfunctions	14 – 16

Scope of delivery(see page 3 for illustration):

Item	Qty.	Designation/Cat. No.
B 5 W		
1-3	1	Basic heater with standard equipment 12 V 20 1690 05 00 00 24 V 20 1691 05 00 00
D 5 W		
1-3	1	Basic heater with standard equipment 12 V 25 1732 05 00 00 24 V 25 1733 05 00 00
Standard equipment for B/D 5 W includes:		
1	1	Basic heater (not available alone) B 5 W – 12 V 20 1690 01 D 5 W – 12 V 25 1732 01 D 5 W – 24 V 25 1733 01
2	1	Control unit
3	1	Metering pump with built-in fuel filter
To be ordered in addition for B/D 5 W:		
-	1	Universal installation kit for B/D 5 W 12 V 20 1690 81 00 00
-	1	Universal installation kit for D 5 W 24 V 25 1733 81 00 00
4	as req'd	Check valve 254 00 070
5	as req'd	Vent pipe 20 1645 89 01 00

Control elements, optional



Timer

Cat. No.

12 V 25 1482 89 25 00

24 V 25 1483 89 10 00

Fasteners
(only required for installation with screen)

Cat. No.

25 1482 70 01 00

Timer with fasteners

Cat. No.

12 V 25 1482 89 19 00

24 V 25 1483 89 02 00



Universal switch

Cat. No.

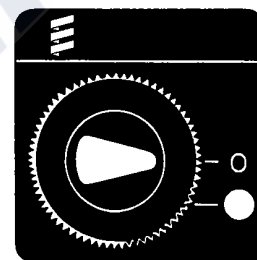
25 1380 89 04 00

Bulb for universal switch

Cat. No.

12 V 207 00 005

24 V 207 00 006



If other switches generally used in motor vehicles are used, they must be able to take at least 10 A.

Important:

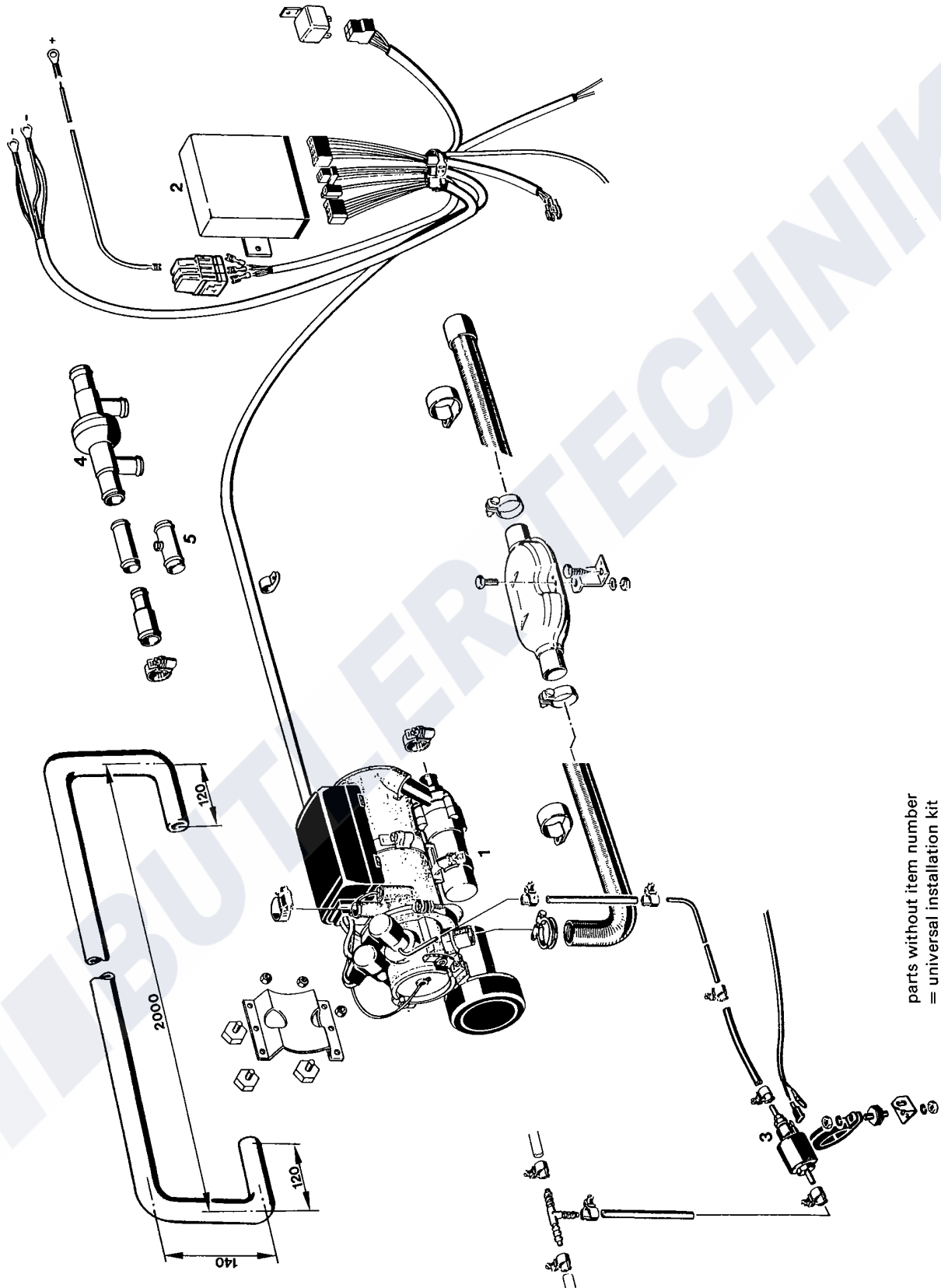
Before switching on or pre-programming heating operation, set the heater lever of the vehicle to "warm" (maximum position) and the blower switch or lever to the slowest speed (low power consumption).

Operating instructions for timers and switches are supplied with these control elements.

In the case of vehicles with automatic heater, set the heater lever to "Max." and open the heating vent before switching off the ignition.



Scope of delivery



parts without item number
= universal installation kit

Installation instructions:

Heaters B 5 W and D 5 W are intended, in conjunction with the vehicle heating system, to preheat car engines and small truck engines, to heat up cabs and to defrost windscreens. They are connected up to the cooling water circuit, the electrical system and the fuel system of the vehicle.

Approval, official regulations, general

1. For vehicles registered in West Germany (subject to the road traffic regulations StVZO), the heaters are approved by the Federal Motor Vehicle Office and receive an official test symbol (B 5 W \mathcal{W} S 201, D 5 W \mathcal{W} S 202) indicated on the name plate.

The year of first operation is a requirement of German approval not representing a model number.

2. If the heater is installed in special-purpose vehicles (e. g. vehicles transporting dangerous cargoes), the regulations applicable to such vehicles must be observed.

3. The heater must not be operated in closed rooms, e. g. garages.

The heater must always be switched off when the petrol tank is to be filled.

4. The heaters must be installed by a workshop approved by the manufacturer and in compliance with the installation instructions.

5. The heaters may only be used for the purpose specified by the manufacturer and in compliance with the operating instructions supplied with every heater.

Operating the heater is not permitted where inflammable vapours or dust can build up (e. g. near fuel, coal or sawdust stores, grain silos etc.).

6. Differences from the installation instructions, particularly with regard to the water supply connection, wiring (wiring diagrams), fuel supply, combustion air and exhaust ducts, and use of operating and control elements not supplied by the manufacturer, are only permissible with the written approval of the manufacturer.

Since water heaters are incorporated into the cooling system of the vehicle engine, they form an integral part of the cooling system.

The following points must therefore be borne in mind:

- 6.1 The heater must always be mounted below the cooling water level of the radiator or vehicle heat exchanger in such a way that it operates in the flow direction of the engine circuit.
- 6.2 The entire cooling system including the heater must be bled to free it of bubbles following installation and in accordance with the engine manufacturer's specifications. All water connections (clips) must be tightened sufficiently to prevent all leaks and then retightened after 2 hours of operation or 100 km driving.

- 6.3 All water ducts must be protected against chafing and excessive temperatures (radiated heat from exhaust pipes).

- 6.4 Following any work on the cooling water system (repairs, cooling water change), the system must be bled as set forth in 6.2.

- 6.5 The coolant should contain at least 10 % antifreeze all year round as corrosion protection.

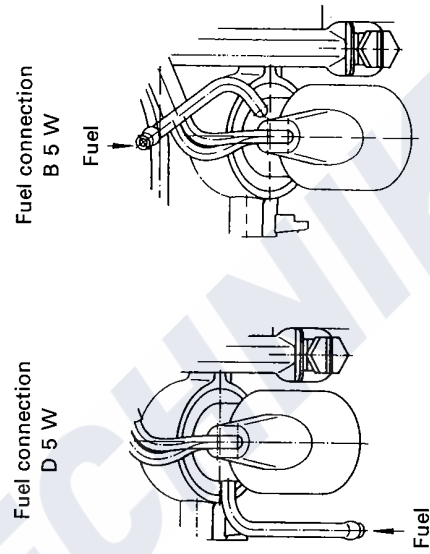
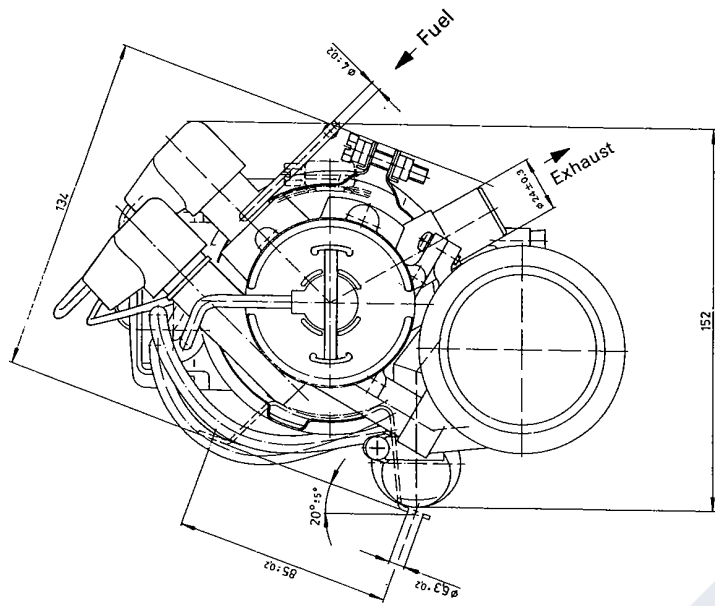
In cold weather the coolant must contain antifreeze in sufficient quantity. Operating the heater with frozen coolant is not permitted.

If the above instructions are not complied with, the manufacturer's warranty for the entire heater system is null and void, and possibly the general operating permit for the vehicle.

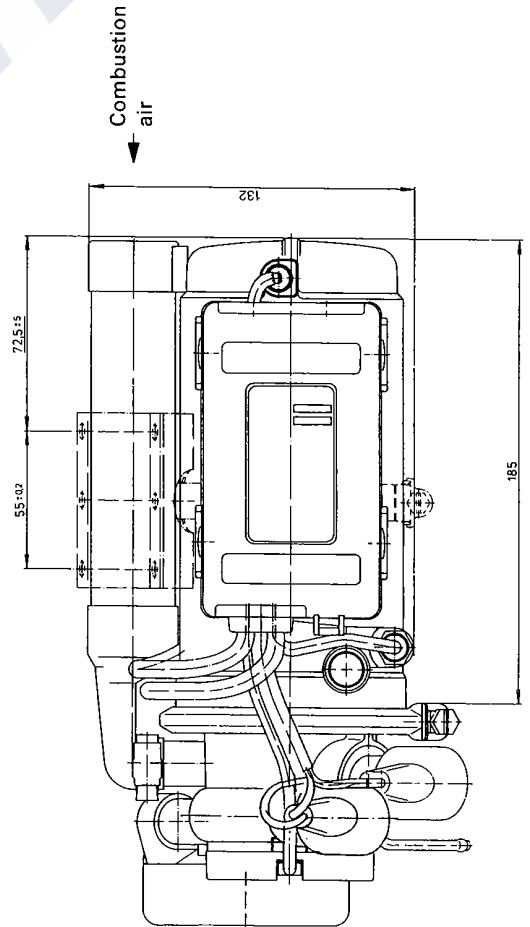
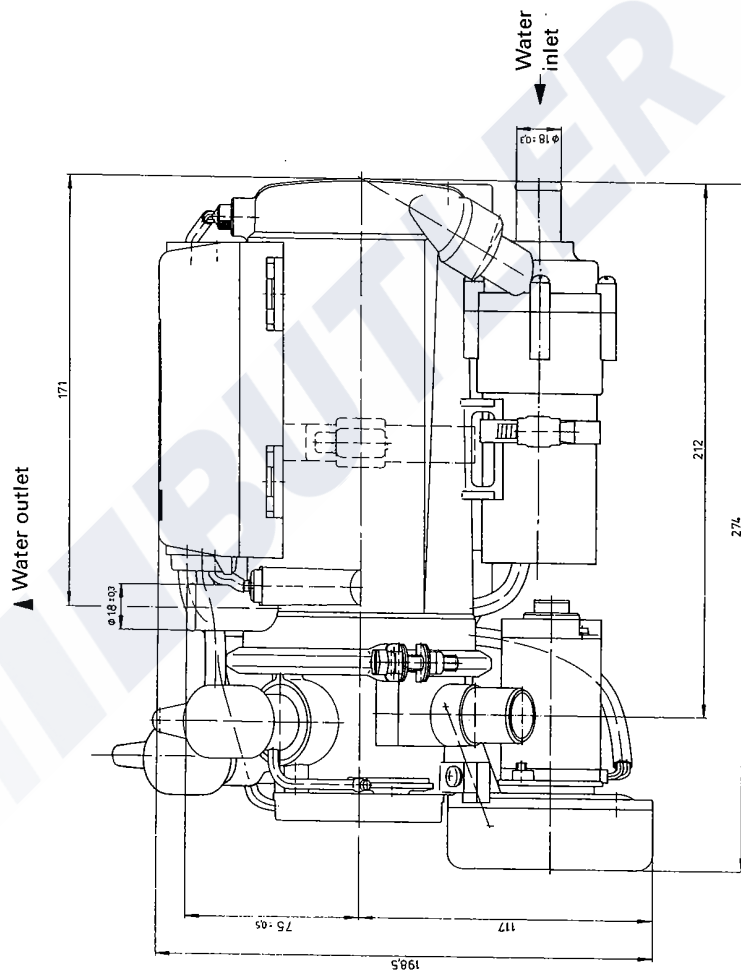
7. Every combustion process generates exhaust gas, which has toxic constituents. Because of this and the high temperatures generated, the exhaust duct must comply without fail with the installation instructions. Failure to comply with the instructions or operation of the heater in closed rooms (garages) harbours the risk of poisoning.
8. When the heater or the heating system is damaged, an authorized workshop must be called in to repair the damage in an expert manner and using genuine spare parts. Makeshift repairs (on one's own initiative) or the use of non-genuine spare parts are dangerous, and therefore not permitted. When carried out in cars, they invalidate the general design approval of the heater and consequently the general permit of the vehicle.
9. The warranty conditions are set forth in the heater booklet given to you by the after-sales service workshop when the heater is installed. Only our warranty conditions shall apply.



Principal dimensions and permissible installation positions



38/116



Installing the heater:

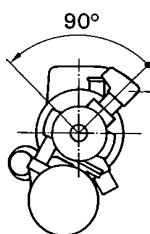
The heater is installed in the engine compartment, as low down as possible so that the heat exchanger and water pump can bleed themselves. Note which installation positions are permissible.

The factory plate must be clearly visible with the heater installed. If necessary, a second plate (duplicate) may be affixed, with the same information as the original, to a place on the heater clearly visible after installation, or to a cover placed in front of the heater. A second plate is unnecessary if the original is visible after removal of a cover without the aid of tools.

Permissible installation positions

Permissible installation position of burner (glow plug)

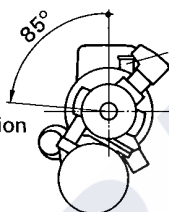
Extreme position left of glow plug



Standard position right of glow plug
Glow plug

Permissible installation position of heat exchanger (water connection)

Standard position of water connection vertical

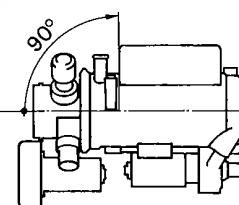


Extreme position left of water connection

Water connection

Standard position horizontal.
Install heater at a slight angle to ensure complete venting.

Extreme position vertical



The position of the glow plug in relation to the water connection can be changed within the given installation positions after releasing the clip and turning the burner and heat exchanger.

Running the combustion air/exhaust

Running the combustion air

The combustion air must be sucked in from the outside (not from the passenger compartment or trunk). A silencer is fitted on the heater. If the heater is installed in the engine compartment – as shown in these installation instructions – the combustion air intake is already provided.

Running the exhaust

The scope of delivery includes a flexible exhaust hose, internal dia. 24 mm, 1250 mm long.

This must be cut open at a suitable point and the exhaust silencer inserted (see illustration, p. 3 and 8).

The exhaust line can be shortened if required.

Exhaust lines must not project beyond the sides of the vehicle. They must be laid either with a slight slope or with 5 mm dia. holes at their lowest points for draining off condensate.

The exhaust outlet and the combustion air inlet must be so arranged that exhaust cannot be sucked in again directly.

The exhaust outlet must be on the outside. Exhaust lines must be laid in such a way that neither the penetration of exhaust into the vehicle interior nor the intake of exhaust through the vehicle blower need be expected¹⁾, and that the operation of essential vehicle parts is not affected (ensure adequate clearance). Place the outlet opening of the exhaust line in such a way that it cannot be clogged by dirt and snow and that any water which does enter can run off. Do not install facing the slipstream.

¹⁾ This requirement is deemed met when the outlet of the exhaust pipe points upwards or to the side, or – when the exhaust is run under the vehicle floor – is positioned close to the side or rear edge of the cab or vehicle.



Connection to cooling water circuit:

The pressure in the water circuit must be limited to an overpressure of max. 2 bar by means of a pressure relief valve (e. g. a radiator filler cap).

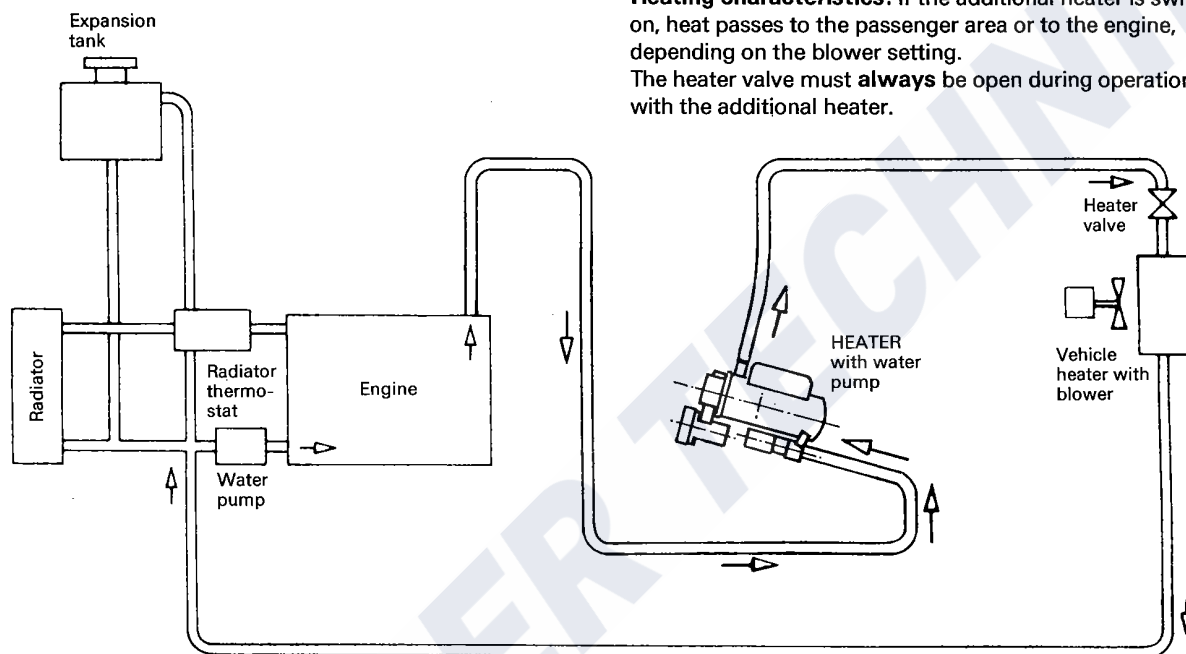
There is a choice of possibilities:

1. Cut open cooling water hose between engine and heat exchanger of vehicle, and insert heater.

Advantage: Very easy fitting

Disadvantage: Water flows through heater during motor heating operation, which can reduce the throughput.

Heating characteristics: If the additional heater is switched on, heat passes to the passenger area or to the engine, depending on the blower setting. The heater valve must **always** be open during operation with the additional heater.



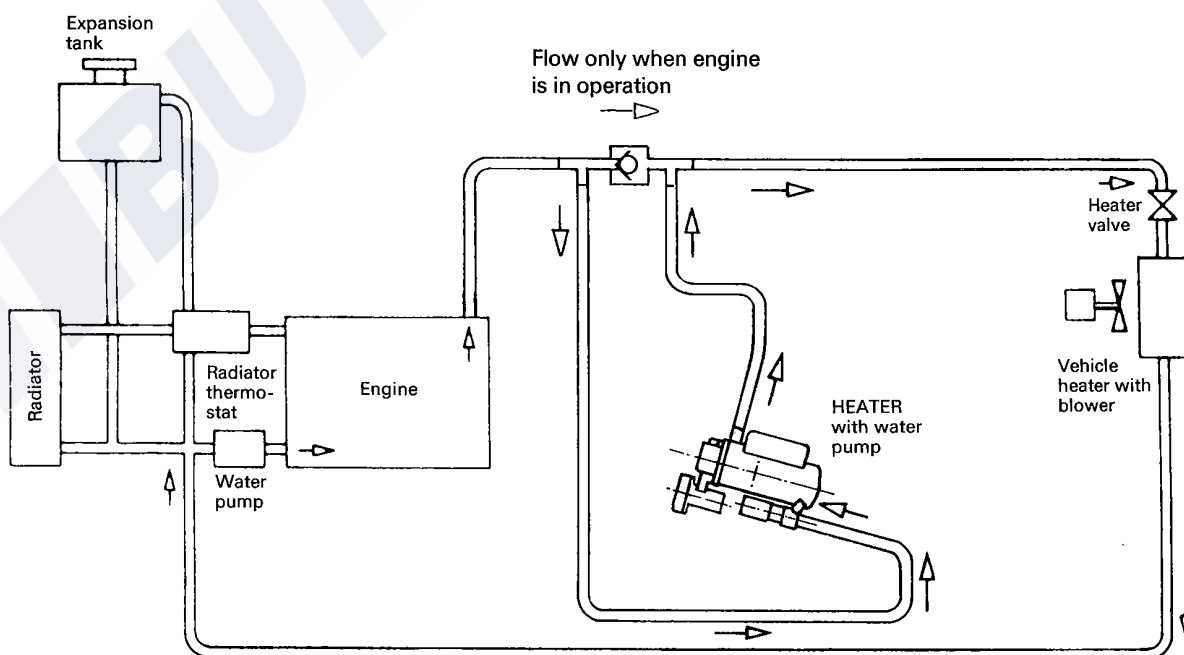
38/102

2. As 1., but with check valve parallel to the heater in the line between the motor and the heat exchanger of the vehicle.

This variant is recommended for vehicles with engines of up to 2 litres cubic capacity.

Heating characteristics as for 1.

Advantage: No drop in effectiveness of engine heating when additional heater is off.



38/102-1

3. As for 2, but with additional thermostat in supply line to heater

This variant of the water circuit must be used for vehicles with engines of more than 2 litres cubic capacity.

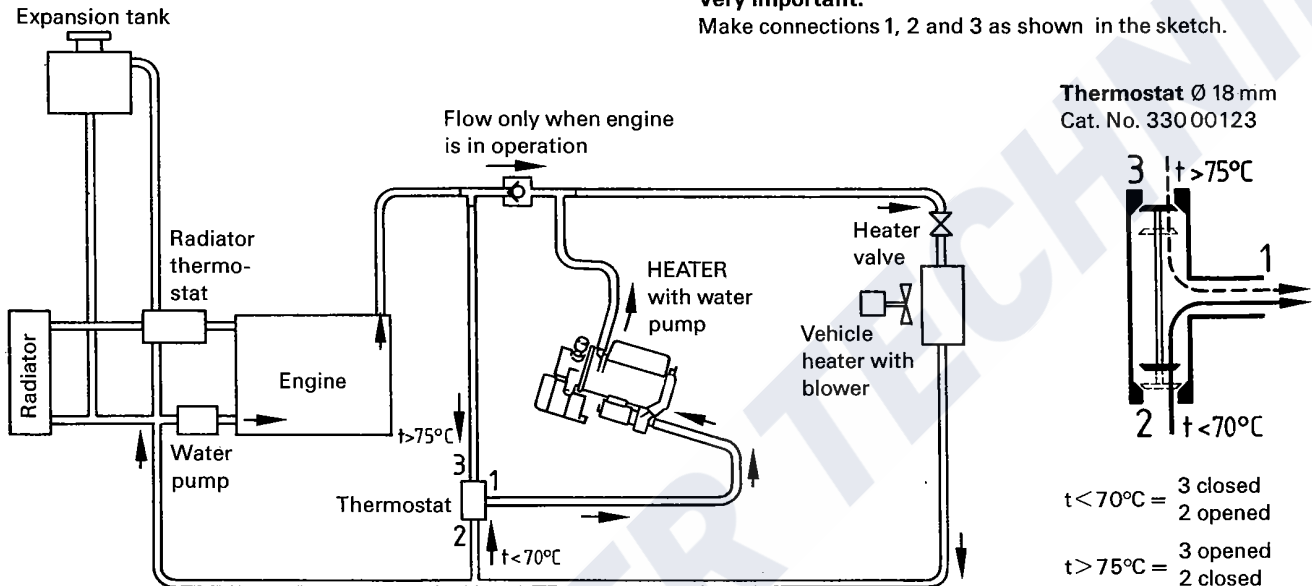
Heating characteristics:

First, the heat from the additional heater is supplied only to the cab up to a cooling water temperature of approx. 70°C E small circuit = rapid warm-up.

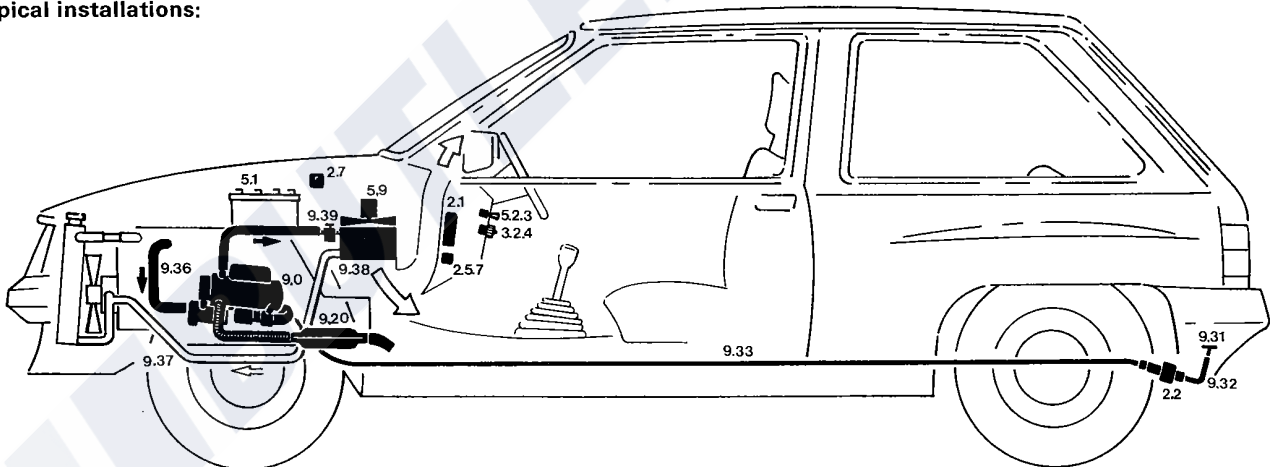
If the temperature of the cooling water rises further, the thermostat gradually switches over (completed at 75°C) to the larger circuit = additional engine heating.

Very important:

Make connections 1, 2 and 3 as shown in the sketch.



Typical installations:



38/111

- | | | |
|---|---------------------------------|---|
| 2.1 Control unit | 5.1 Battery | 9.36 Cooling water line from engine to heat exchanger in passenger area |
| 2.2 Fuel metering pump | 5.2.3 Switch for vehicle blower | 9.37 Cooling water line from heat exchanger in passenger area to engine |
| 2.5.7 Relay for switching on vehicle blower | 5.9 Vehicle blower | 9.38 Heat exchanger in passenger area |
| 2.7 Fuse box | 9.0 Heater | 9.39 Control valve of engine heater |
| 3.2.4 Timer or universal switch | 9.20 Silencer for exhaust | |
| | 9.31 Fuel branch | |
| | 9.32 Fuel intake line | |
| | 9.33 Fuel supply line | |



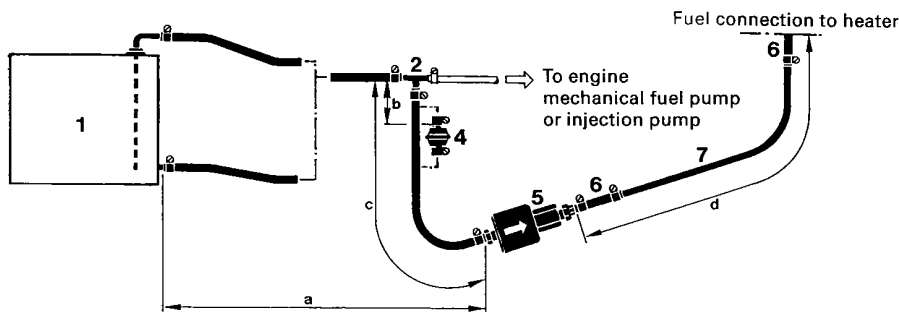
Fuel supply

Divergences from the instructions set forth here are not permitted, as they can lead to malfunctions.

1. For cars with diesel engines, and for cars with petrol engines having mechanical pump.

Fuel tapped from the fuel supply line to the engine.

Precondition: The fuel line from the fuel tank to the engine must be leak-free, so that there is no break in the fuel column when the engine is not running.



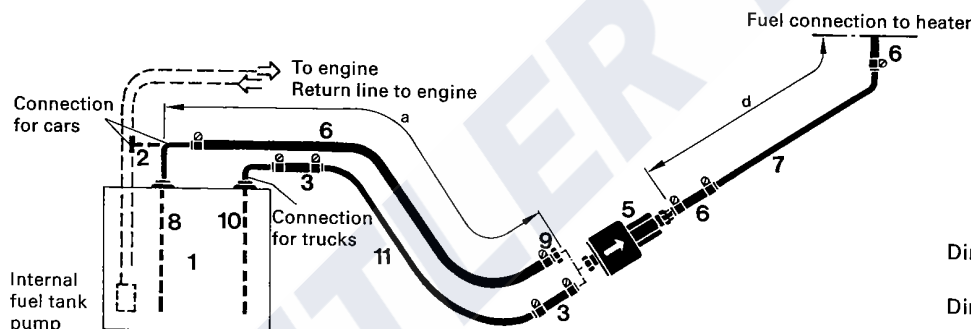
Dimension a = max. 2 m with petrol
max. 2 m with diesel
Dimension b = 50 mm
Dimension c = max. 300 mm
Dimension d = max. 4 m with petrol
max. 6 m with diesel

2. For cars with petrol injection engines and for trucks with diesel engines.

Tapping fuel from the supply line downstream of the delivery pump is prohibited in cars, since pressures of up to 10 bars can occur.

The following possibilities are available:

2.1 Tapping fuel – where possible – using a separate riser pipe, fitted to the fuel tank fitting in the case of cars, an directly into the fuel tank in the case of trucks.



Dimension a = max. 2 m with petrol
max. 2 m with diesel
Dimension d = max. 4 m with petrol
max. 6 m with diesel

2.2 If it is not possible to fit a separate riser pipe in the case of cars with petrol injection engines, the return line can be tapped using a T-piece.

Conditions:

1. There must be no valve installed in the return line of the fuel tank.
2. The pressure in the return line must not exceed 2 bars. For pressures greater than 0.3 bars and up to 2 bars, a pressure reducing valve (additional equipment Cat. No. 20 1645 89 30 00) must be provided upstream of the metering pump.

2.3 If it is not possible to fit a separate riser pipe in the case of trucks with diesel engines, the fuel supply line can be tapped (as shown under 1.).

1 Fuel tank (vehicle tank or separate tank)

2 Fuel branch

3 Fuel hose, internal dia. 5 mm

Cat. No. 360 75 350

4 Fuel pre-filter

(only necessary when contaminated fuel is used)

Cat. No. 25 1226 89 00 37

5 Fuel metering pump (15° to vertically upwards)

6 Fuel hose, internal dia. 3.5 mm

Cat. No. 360 75 300

7 Fuel pipe, plastic, internal dia. 1.5 mm

Cat. No. 090 31 118

8 Riser pipe, internal dia. 2 mm
external dia. 4 mm

9 Connection socket
external dia. 4 mm

10 Riser pipe, internal dia. 2 mm
external dia. 6 mm

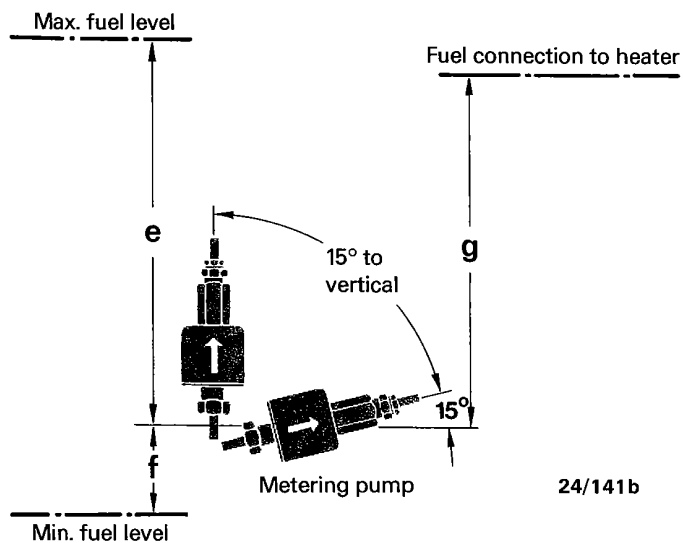
11 Fuel pipe, internal dia. 2 mm

Cat. No. 090 31 125

Cat. No.
20 1645 89 35 00

Cat. No. 25 1226 89 50 00

3. Permissible suction and pressure heads for installations as per 1. and 2.; permissible positioning of metering pump.



Supply pressure from tank to metering pump:

e = max. 3000 mm

Suction head:

with tank at zero pressure:

f = max. 500 mm with petrol

max.1000 mm with diesel oil

Check whether tank ventilation is working properly

intake from tank when underpressure occurs during operation (valve 0.03 bars in tank cap)

f = max. 150 mm with petrol

max. 400 mm with diesel oil

Pressure head, metering pump to heater:

g = max. 2000 mm

Fuel line, metering pump to heater, should not have a slope if at all possible.

4. Important

Sections 45 and 46 of the West German road traffic regulations also apply, with due alteration of details, for the fuel lines and additional tanks of heaters.

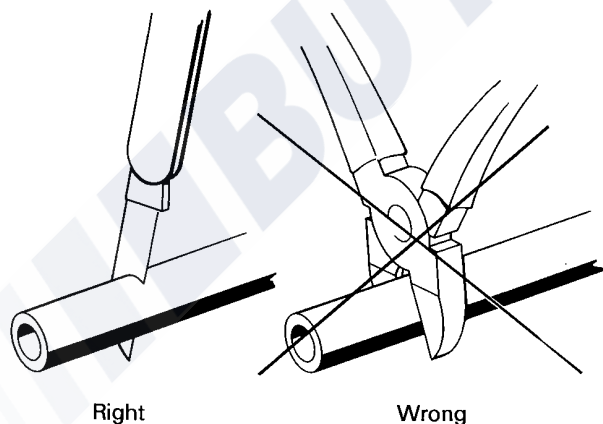
Protect fuel line, filter and metering pump from overheating; do not install near silencers and exhaust pipes. Temperatures above 30°C lead to gas bubbles and problems with petrol.

When laying fuel line, fuel filter and fuel metering pump near the rear axle, allow for the spring deflection of the latter.

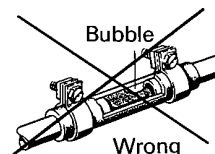
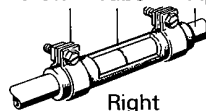
For connection of the fuel branches, always use rubber tubing, never plastic pipe.

Cut fuel tubes and pipes to length only with a sharp knife. Cuts may not be indented, and must be burr-free.

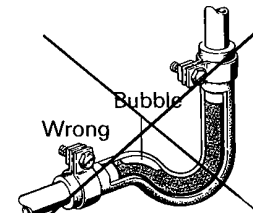
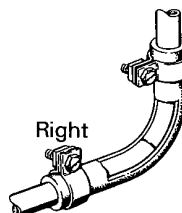
Connect up fuel pipes with a fuel tube. Fit the fuel pipe flush.



Clip with screw Tube Pipe



Heat and bend plastic pipe



38/108



Fuel grades/Fuel for D 5 W at low temperatures

The heater can take without problem the same fuel you use in your tank. In the USA diesel fuel no. 1 and no. 2. Admixture of used oil is not permitted.

The refineries automatically adapt their fuels to normal winter temperatures (winter diesel).

Difficulties can therefore only arise at extremely low temperature (as in the engine – see the vehicle’s instruction manual).

If the heater is fuelled from a separate tank, the following rules must be observed: at temperatures above 0°C, any type of diesel fuel can be used.

If there is no special diesel fuel available at low temperatures, mix in petroleum or petrol according to the table.

Temperature	Winter diesel fuel	Additive
0°C to -15°C**	100%	-
-15°C to -25°C	50%	50% Petroleum or petrol
-25°C to -40°C	-	100% Petroleum*

* or special cold-weather diesel fuels
 ** or in accordance with fuel manufacturer’s specifications

The fuel line and the fuel pump must be filled with new fuel by operation for 15 minutes.

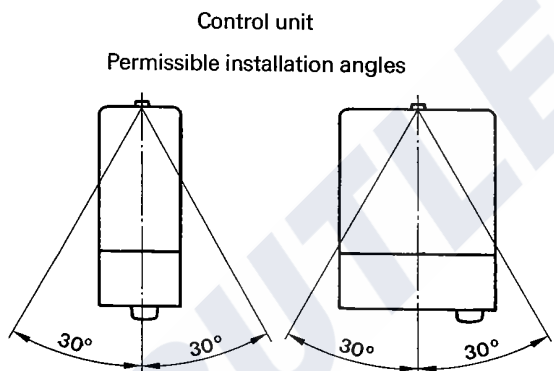
Fuel for special cases

In special cases, the heaters can also be operated with extra-light fuel oil (above 0°C) or petroleum. If in doubt, please consult the manufacturer.

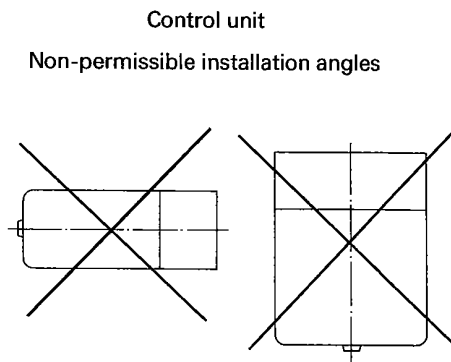
Electrics:

Arrange electric cables, switches and control units in the vehicle in such a way that their correct functioning cannot be impaired under normal operating conditions.

Fit the control unit so that it is protected from splash water (from both its own vehicle and preceding ones). Outside installation is thus not permissible. The unit is best arranged in the vehicle interior, with the plugs pointing downward.



38/109



38/110

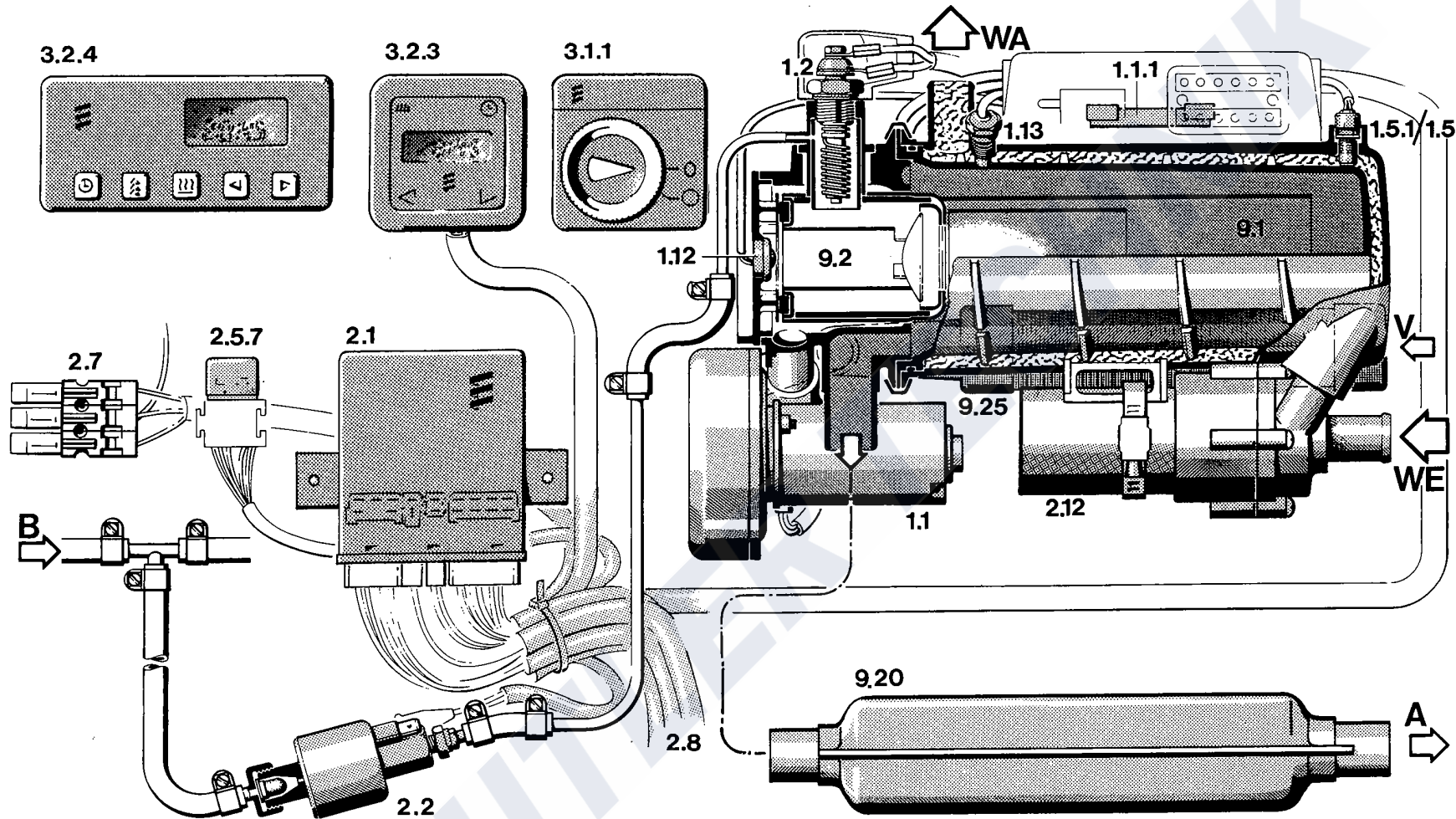
Parts list

- 1.1 Burner motor
 - 1.1.1 Series resistor for partial load
- 1.2 Glow plug
 - 1.2.1 Series resistor for glow plug for 24 V
- 1.5 Safety thermal cutout switch } depending on heater version
 - 1.5.1 Safety thermal cutout fuse
- 1.12 Flame sensor
- 1.13 Temperature sensor
- 2.1 Control unit
- 2.2 Fuel metering pump
- 2.5.7 Relay for switching on vehicle blower
 - 2.7.1 ON-switch fuse, 8 A
 - 2.7.4 Glow plug fuse, 16 A
 - 2.7.5 Vehicle blower fuse, 25 A
- 2.12 Water pump
- 3.1.1 Universal switch
- 3.1.2 Switch for continuous (heating) operation
 - 3.2.1 Timer, analog, circular
 - 3.2.3 Timer, digital, square
 - 3.2.4 Timer, digital, rectangular
- 5.1 Battery
 - 5.1.2 Vehicle fuse box
- 5.9.1 Blower switch
- 5.10 Blower

- a) break
- b) if required, connection of relay for triggering water solenoid valve
- c) external control of water pump (if required)
- d) parts already provided in vehicle
- f) test (workshop)
- g) on terminal 15
- h) only for heater with separate water pump
- i) Timer illumination, terminal 58

- rt red
- br brown
- ws white
- sw black
- gn green
- ge yellow
- vi violet





- 1.1 Burner motor
- 1.1.1 Series resistor for partial load
- 1.5 Safety thermal cutout switch (optionally safety thermal cutout fuse 1.5.1) depending on heater version

- 1.5.1 Safety thermal cutout fuse
- 1.12 Flame sensor
- 1.13 Temperature sensor
- 1.2 Glow plug
- 1.2.1 Series resistor for glow plug for 24 V
- 2.1 Control unit

- 2.2 Fuel metering pump
- 2.5.7 Relay for switching on vehicle blower
- 2.7 Fuse box
- 2.8 Cable harness
- 2.12 Water pump
- 3.1.1 Universal switch

- 3.2.3 Timer (digital)
- 3.2.4 Timer (digital)
- 9.1 Heat exchanger
- 9.2 Combustion chamber
- 9.20 Silencer for exhaust
- 9.25 Silencer for combustion air

- WE = water inlet
- WA = water outlet
- V = combustion air
- B = fuel
- A = exhaust



Description of function

Heaters B 5 W and D 5 W are of identical design wherever practicable. The only differences are in the design of the combustion chamber and the setting of the metering pump. Furthermore, a series resistor for the glow plug is necessary with the D 5 W – 24 V.

The supplied metering pumps are permanently set to the differing fuel quantities with petrol or diesel fuel.

Control elements (see also p. 2)

A choice is possible in B 5 W and D 5 W between:

1. Universal switch (3.1.1). If other switches generally used in motor vehicles are employed, they must be able to take at least 10 A.
2. Timer (3.2.3, 3.2.4)
Using the timer, the heater can be switched on at once or preset in advance.

IMPORTANT:

Before switching on or pre-programming heating operation, set the heater lever of the vehicle to "warm" (maximum position) and the blower switch or lever to the slowest speed (low power consumption). Operating instructions for timers and switches are supplied with these control elements.

Switching on

The pilot light on the switch or timer comes on at switch-on. The combustion air blower and water pump start up, the glow plug glows (preliminary glowing). After a pre-glowing time of approx. 20 to 50 seconds, depending on the operating voltage, the metering pump starts to pump fuel into the combustion chamber with the rapid pulse frequency for full load, and ignition follows.

Once the flame sensor (1.12) has signalled to the control unit that combustion has taken place correctly, the glow plug is switched off. The heater continues to run at full heating capacity.

Heating operation

When the cooling water reaches a temperature of approx. 55°C, the temperature sensor (1.13) switches on the vehicle blower. Depending on the heat intake from the heating circuit, various operating conditions can be set:

1. The heat intake is 5000 W and above: the heater then works continuously in the "High" stage: the cooling water temperature is max. 80°C.
2. The heat intake is between 1250 W and 5000 W: (normal circumstances).
The cooling water temperature now continues to rise. At approx. 80°C, the temperature sensor switches the heater to the "Low" position.
Fuel quantity and combustion air quantity (speed of combustion air blower) are reduced to a heating capacity of approx. 1250 W. Since the heat requirement exceeds 1250 W, the cooling water temperature drops. At approx. 70°C, the temperature sensor switches the heater back to "High".
3. The heat intake is less than 1250 W (very seldom): At approx. 80°C, the temperature sensor switches the heater first to the "Low" setting.
The low heat requirement means that the temperature continues to rise. At approx. 85°C, the fuel supply is cut off, and the combustion air blower runs another 180 secs (delayed shutoff): water pump and vehicle blower remain in operation during this delayed shutoff period and the regulation interval now commencing. The pilot light stays on. Once the coolant has cooled down to approx. 70°C, the heater starts in the "High" setting and does not switch back to the "Low" stage until the coolant temperature is 80°C.

Switching off

The fuel supply is stopped when the heater is switched off. The pilot light goes out, and the combustion air blower and water pump continue to run for approx. 180 seconds until they cut out automatically.

Safety equipment

The flame is monitored by the flame sensor (1.12), and the max. permissible temperature by the safety thermal cutout fuse (1.5.1) or optionally by the safety thermal cutout switch (1.5). Both of these affect the control unit (2.1) which shuts down the heater in the event of faults.

1. If the heater fails to ignite within 90 seconds of fuel being pumped, repeat the starting procedure as above.
If the heater again fails to ignite after 90 seconds of fuel pumping, malfunction shutdown follows.
2. If the flame goes out spontaneously during operation, the heater is first restarted. If the heater fails to ignite within 90 seconds of the fuel supply being switched on, or if it ignites but goes out again within 3 minutes, automatic malfunction shutdown follows.
This shutdown can be lifted by briefly switching the heater off and back on again.
3. In the event of an overheat (lack of water, not properly bled cooling water circuit), the safety thermal cutout fuse (1.5.1) blows or the safety thermal cutout switch (1.5) operates, stopping the fuel supply, followed by a malfunction shutdown.
Once the cause of the overheat has been eliminated, a new safety thermal cutout fuse can be inserted or the button on the safety thermal cutout switch pressed in, and the heater restarted by switching it off and back on again.
4. If the voltage drops below 10,5 or 21 V (as the case may be), or rises above 15 V or 30 V, automatic malfunction shutdown follows.
5. The heater does not start if the glow plug is defective and the electrical cable to the metering pump is broken.
6. The function of the burner motor is checked once when the heater is started: if it fails to start, the heater indicates malfunction.

You can remedy the following malfunctions yourself

If the heater does not start when switched on,

1. check the 3 fuses 8 A for heater
16 A for glow plug
25 A for vehicle blower (if this fuse is defective the heater starts but no hot air is conveyed)
located in the fuse box between battery and heater.
2. check the glow plug and replace it if necessary,
3. switch the heater off and on again, not more than twice.
If the heater still does not start, have the trouble seen to in a workshop.

Please note:

1. The coolant should contain at least 10 % antifreeze the whole year round as a protection against corrosion.
2. During electrical welding work on the vehicle, disconnect the positive pole from the battery and earth it, in order to protect the control unit.
3. The heater must never be switched on while the tank is being filled.
4. The heater must not be operated in garages.
5. Switch on the heater briefly (about 10 secs.) about once a month during the warm season too. This prevents the water pump and burner motor seizing up.
6. Before unscrewing the safety thermal cutout fuse, open the radiator filler cap to depressurize the system.
7. Before inserting the safety thermal cutout fuse, smear thread and O-ring with lubricant (e.g. silicone grease, glycerine, Vaseline).
Screw in the fuse until resistance can be clearly felt, and the fuse is up against the contact surface of the heat exchanger.