

# Technical Description and Installation Instructions Operating Instructions

**Eberspächer**

## VEHICLES HEATERS

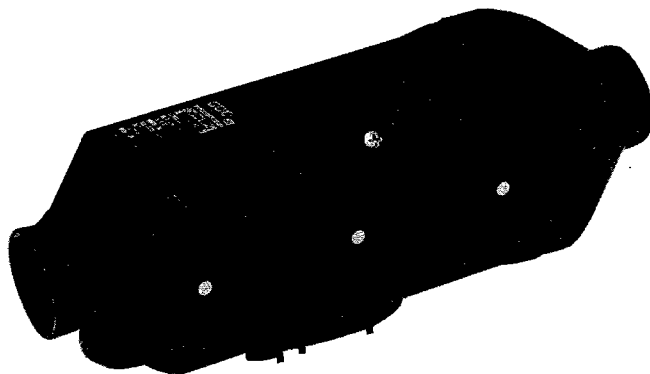
EBERSPÄCHER  
EBERSPÄCHERSTRASSE 24  
D-7300 ESSENINGEN  
TEL. (0714) 3105-0  
TELEX 72050 EBER  
TELEFAX (0714) 3109-0 26

### Cat. No.

Basic heater	12 V 25 1688 05 00 00
with standard equipment	24 V 25 1689 05 00 00
Universal installation kit	25 1688 80 00 00

Timers must be ordered separately as additional equipment, see page 2.

See Additional Equipment Catalog for further accessories.



## Specifications

Heating medium	Air	Ventilation operation	possible with suitable circuits
Hot air throughput without counter-pressure <sup>1)</sup>	<b>High / Medium / Low</b> 110 70 70 kg/h $\pm 10\%$	Radio interference suppression	remote, additional suppression measures possible
Heating capacity <sup>1)</sup>	<b>High / Medium / Low</b> 1800 1200 850 W $\pm 10\%$	Weight	approx. 3.5 kg
Fuel	Diesel fuel (commercially available)		
Fuel consumption <sup>1)</sup>	<b>High / Medium / Low</b> 0.21 0.14 0.10 l/h $\pm 10\%$		
Rated voltage	12 V or 24 V respectively		
Operating range			
Minimum voltage <sup>2)</sup>	10 V or 20 V respectively		
Maximum voltage <sup>3)</sup>	14 V or 28 V respectively		
Electric power consumption <sup>1)</sup>	at start 12 V = 250 W $\pm 10\%$ after about 50 seconds: 24 V = 490 W $\pm 10\%$ In High / Medium / Low operation 30 20 20 W $\pm 10\%$		

<sup>1)</sup> at rated voltage

<sup>2)</sup> an undervoltage safety device built into the control unit switches off the heater at around 10.5 V or 21 V respectively.

<sup>3)</sup> an overvoltage safety device built into the control unit switches off the heater at around 15 V or 30 V respectively.

**TECHNICAL  
DEPARTMENT**

## Contents

Scope of delivery/Cat. Nos.	2,3
Official regulations/General	4
Installation instructions	5-15
Typical installation/installation position	5
Installing the heater	6
Principal dimensions	6
Permissible installation positions/ Fastening methods	6,7
Running the heating air	7
Running the combustion air	8
Running the exhaust	8
Fuel supply	9,10
Fuel at low temperatures	10
Electrics/wiring diagrams	11-13
Function description	14,15
Operation	16

## Scope of delivery

Item	Qty.	Designation/Cat. No.
1-6	1	Basic heater with standard equipment 12 V 25 1688 05 00 00 24 V 25 1689 05 00 00

The standard equipment comprises:

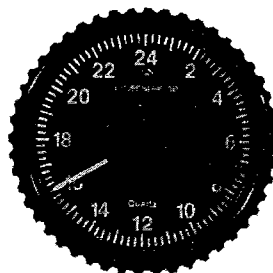
1	1	Basic heater 25 1688 01 (12 V), 25 1689 01 (24 V) (not available alone)
2	1	Control unit
3	1	Holder for control unit
4	1	Metering pump with built-in fuel filter
5	1	Relay
6	1	Operating unit

To be ordered in addition:

-	1	Universal installation kit 25 1688 80 00 00
---	---	---

## Optional timers

7.



### Heater timer with fasteners

Cat. Nos.

12 V 25 1482 89 09 00  
24 V 25 1482 89 10 00

8.

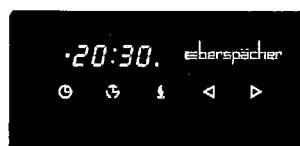


### Heater timer with fasteners

Cat. Nos.

12 V 25 1482 89 19 00  
24 V 25 1483 89 02 00

9.



### Heater timer

Cat. Nos.

12 V 25 1482 89 35 00  
24 V 25 1483 89 07 00

(fasteners only required  
for installation with  
screen)

Cat. No.

25 1482 70 01 00



## 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 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. The proposed installations in the installation instructions are only examples. Other installation locations are also permissible, provided they comply with the general installation requirements: the manufacturer should be consulted if necessary. In all other respects, differences from the installation instructions, particularly with regard to 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. Failing that, the manufacturer's warranty is null and void for the entire heater system, as is the general operating permit.
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.
10. Further information on installation (e. g. in boats and ships) is available on request from the manufacturer.

## Factory plate

The factory plate is fastened to the basic heater.

J. EBERSPÄCHER ESSLINGEN MADE IN W. GERMANY	
Heizgerät Typ	
Ausführung	
Fabrik Nr.	
Prüfzeichen	W S
Brennstoff	
Elektr. Werte	
Wärmestrom	
Betriebsüberdruck	
Erste Inbetriebnahme	
88	89 90

Year commissioned

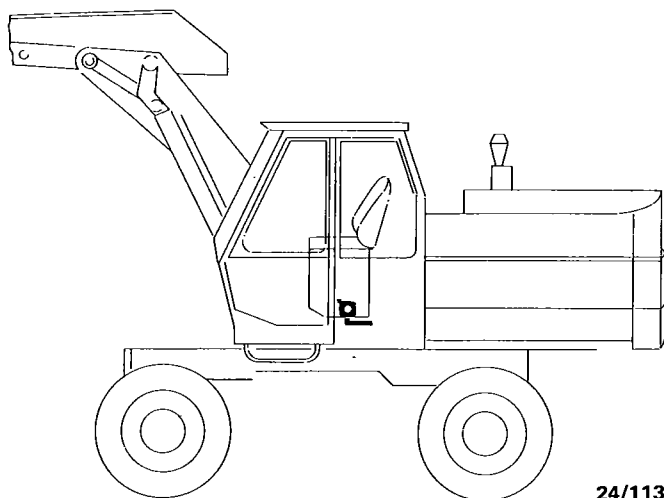
Type approval has been applied for at the Federal Motor Vehicle Office for vehicles registered in West Germany.

## Installation Instructions

The suggestions put forward in these installation instructions are only examples. Possibilities other than those illustrated (e. g. in the selection of the installation position or means of running air) are also permissible provided they meet the requirements of the West German road traffic regulations (StVZO), and if necessary after consultation with the manufacturer.

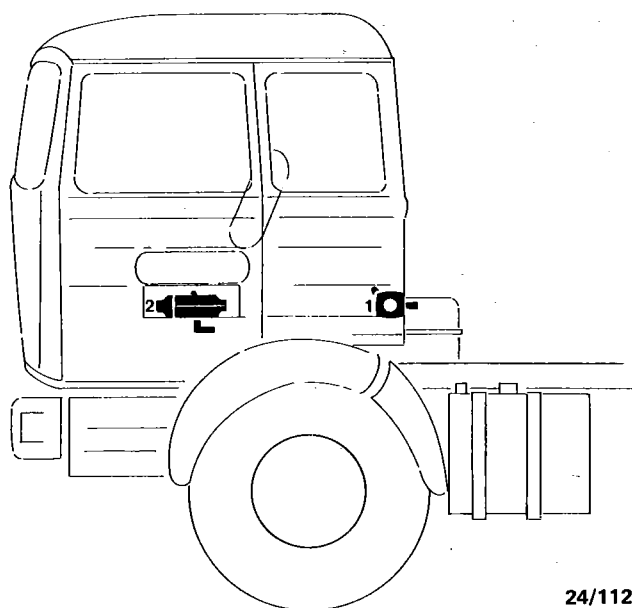
### Typical installations/installation position

#### in the cab of the excavator

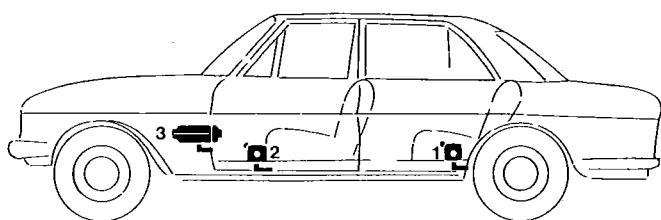


#### in the truck cab

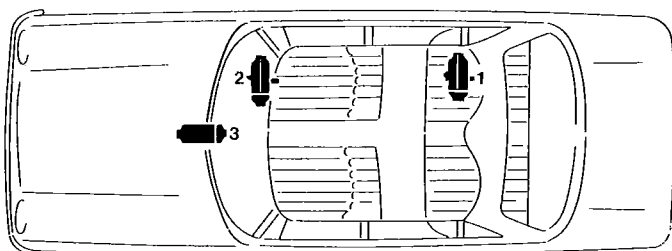
1. on the rear panel of the cab
2. under the driver's seat



#### inside a passenger car



1. under the back seat, inside or underfloor
2. in front of the passenger seat
3. on the center console



## Installing the heater

The D1LC heaters are suitable and approved for installation in vehicle areas used by persons. Installation in the driver or passenger areas of motor buses\* is not permitted.

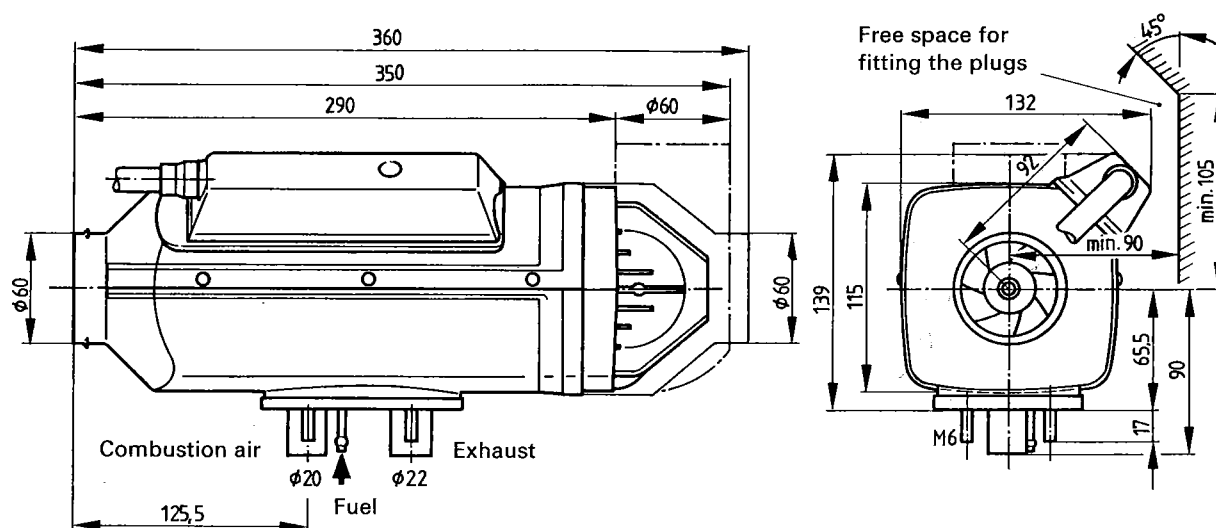
In the case of installation in areas used by persons, the exhaust, combustion air and fuel lines must not have detachable connections inside these areas, and must be laid splash water proof at the penetrations to the outside.

For this reason the heater must be fitted by its base on an outside panel of the vehicle or on the vehicle floor, using the seal seated on the base.

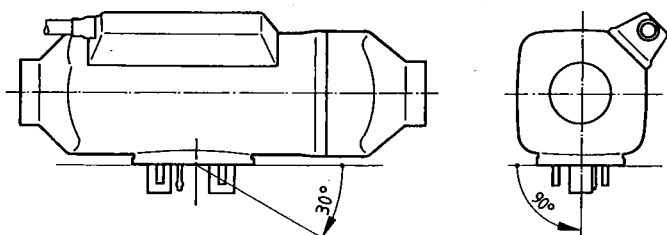
The factory plate must be clearly visible when the heater is installed. If necessary a second plate (duplicate) with the same information as the original can be affixed to a point on the heater clearly visible after installation or to a cover located in front of the heater. A second plate is not necessary if the original is visible after removal of a cover without the aid of tools.

\* Vehicles with more than 9 seats.

## Principal Dimensions



## Permissible installation positions



The heater should be installed in the standard position as shown. See sketch for maximum permissible deviations.

Please consult the manufacturer if further differences are required.

During starting and thermostatic operation a heater installed in the standard position may deviate, due to the inclination of the vehicle during motion, up to  $\pm 15^\circ$  in both axes from the standard position.

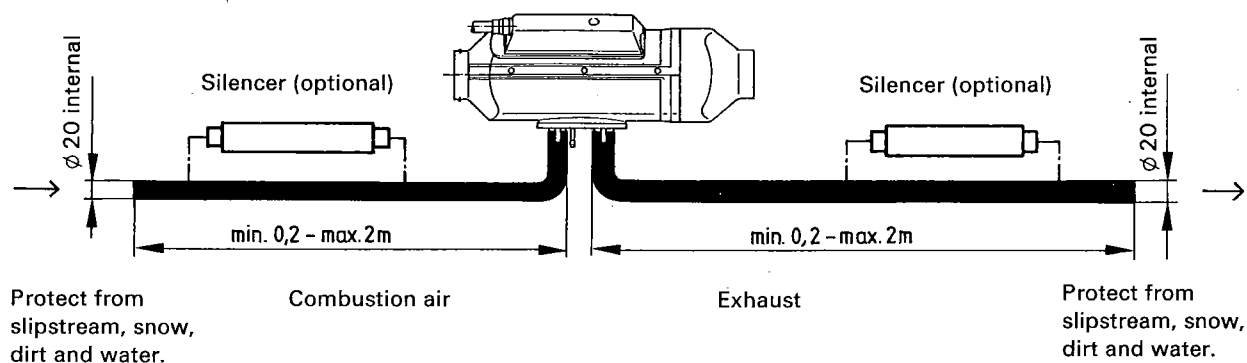
Continuous heating operation after starting is possible at a deviation of up to  $\pm 30^\circ$  from the standard position. With deviations exceeding  $\pm 30^\circ$  reliable heating operation is no longer possible. However, this does not lead to damage of the heater if the changes in the operating position are only for brief periods.

**Important: the plug connection must always point upwards.**



## Running the combustion air/Running the exhaust

Permissible diameters, lengths, bends of combustion air and exhaust lines.



Permissible diversions – exhaust line: max. 180°; combustion air line: max. 180°.

The scope of delivery includes a flexible exhaust pipe, 22 mm internal dia., 1 m long. This can be shortened as required. For longer pipes see the Additional Equipment Catalog.

The scope of delivery includes a flexible combustion air pipe, 20 mm internal dia., 1 m long. This can be shortened as required. For longer pipes see the Additional Equipment Catalog.

Additional noise suppression is possible by installing an exhaust silencer or combustion air silencer (see Additional Equipment Catalog). The permissible overall length, including silencer, remains unchanged.

The combustion air must be sucked in from the outside, not from the passenger compartment or trunk.

Do not install the intake opening facing the slipstream, but run it in such a manner that dirt and snow cannot enter and that any water which does enter can flow out.

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 the lowest points for draining off condensate.

Arrange the exhaust outlet and the combustion air opening such that the exhaust cannot be sucked back in 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 or heater blowers need be expected<sup>1)</sup>, 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.

<sup>1)</sup> This requirement can be considered met if the outlet opening of the exhaust line is located at the usual places in motor vehicles (see also examples on page 5), e. g. in engine compartment, in wheel case, on the vehicle underside, or on the rear of the cab.

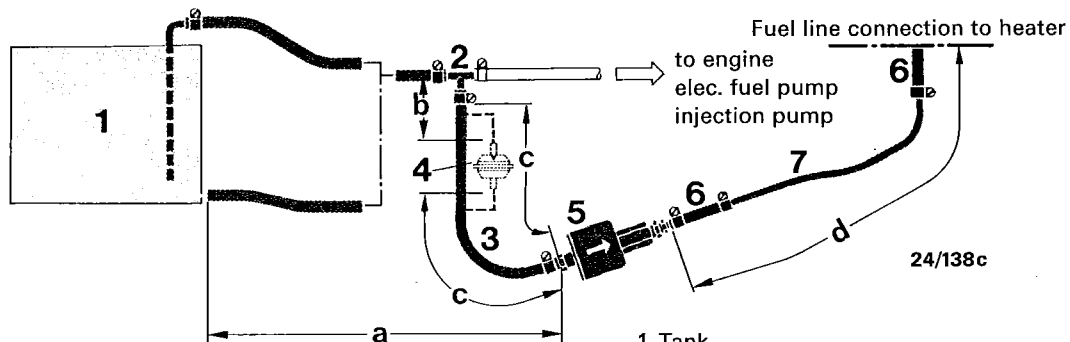


## Fuel supply

The instructions given here should not be disregarded as deviations may cause malfunctions.

### 1. Fuel intake from fuel line to engine (usually in passenger cars):

Precondition: the fuel line from the fuel tank to the engine must be tight, so that the flow of fuel is not interrupted when the engine is not running.



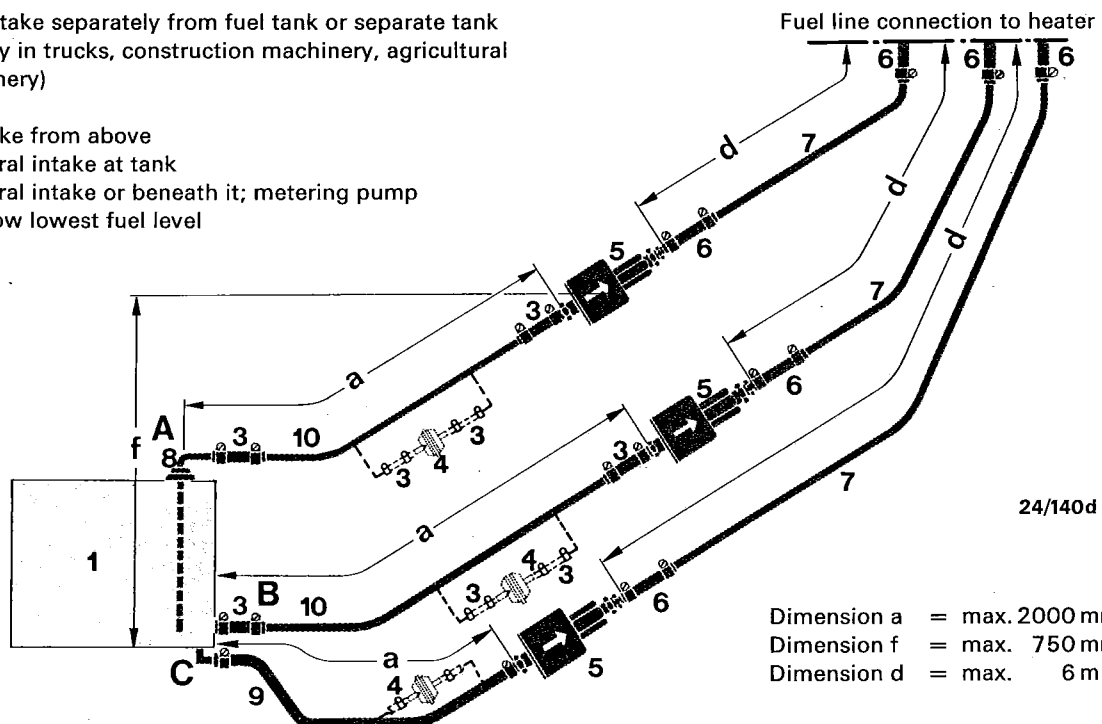
- 1 Tank
- 2 Fuel branch
- 3 Fuel tube, internal dia. 5 mm
- 4 Fuel pre-filter (vertical, up to 30° downward if fuel line is tapped)  
Cat. No. 25 1226 89 00 37, only necessary if fuel is contaminated
- 5 Fuel metering pump (15° to vertical, inclined upward)
- 6 Fuel tube, internal dia. 3.5 mm
- 7 Fuel pipe, plastic, internal dia. 1.5 mm
- 8 Tank connection, internal dia. 2 mm
- 9 Tube or plastic pipe (max. internal dia. 5 mm)
- 10 Fuel pipe, plastic, internal dia. 2 mm

Dimension a = max. 2000 mm for diesel oil  
 Dimension b = 50 mm  
 Dimension c = max. 300 mm  
 Dimension d = max. 6 m for diesel oil

At all joints, fuel pipe (7) and connection pieces must touch.

### 2. Fuel intake separately from fuel tank or separate tank (usually in trucks, construction machinery, agricultural machinery)

- A = intake from above
- B = lateral intake at tank
- C = lateral intake or beneath it; metering pump below lowest fuel level

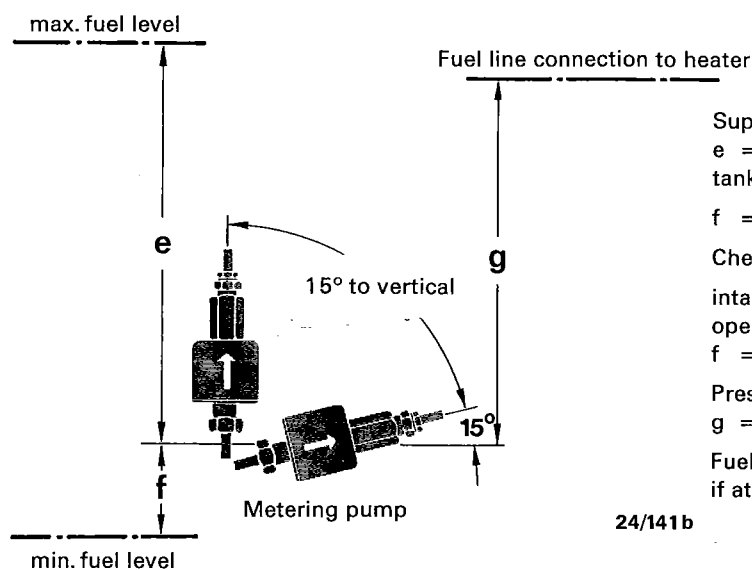


Dimension a = max. 2000 mm with diesel oil  
 Dimension f = max. 750 mm with diesel oil  
 Dimension d = max. 6 m with diesel oil

With connection types A and B, the intake line – A includes tank connection (8) – including all connection points must have an internal dia. of 2 mm; for this reason, fuel pipe (10) and connections must touch each other at every joint.

All fuel lines and connecting points must be completely tight.

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



Supply pressure from tank to metering pump:

e = max. 3000 mm suction head:

tank at zero pressure

f = max. 750 mm with diesel oil

Check whether tank ventilation works properly

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

f = 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.

## 2. Important

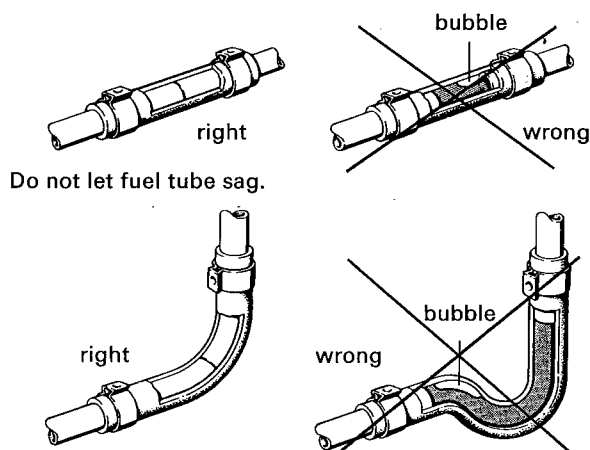
Protect fuel lines, filter and metering pump from overheating; do not install near silencers and exhaust pipes. Temperatures above 30°C lead to gas bubbles and problems with gasoline.

When installing the fuel line, fuel filter and fuel metering pump near the rear axle, be sure to take the spring deflection of the rear axle into consideration.

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

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

Fuel pipes connected by means of a fuel tube. Fuel pipe sections must abut.



### Fuel grades/Fuel 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).

Therefore difficulties can only arise at extremely low temperature (as in the engine – see the vehicle's instruction manual).

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

If no special cold-weather diesel fuel is available at low temperatures, mix kerosine or gasoline according to the adjacent table.

Temperature	Winter diesel oil	Additive
From 0°C to -15°C**	100%	–
From -15°C to -25°C	50%	50% kerosine or gasoline
From -25°C to -40°C	–	100% kerosine*

\* or special winter diesel oils

\*\* 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

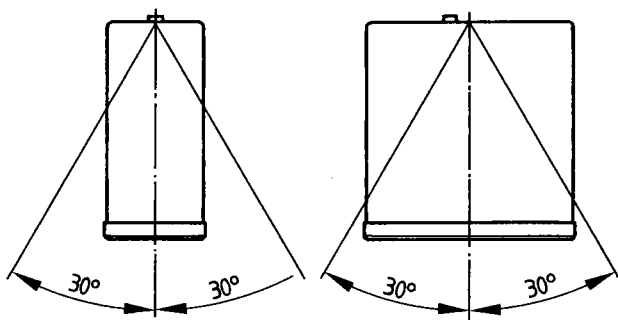
In special cases, the heaters can also be operated on extra light fuel oil (above 0°C) or kerosine. If in doubt consult the manufacturer.

## 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.

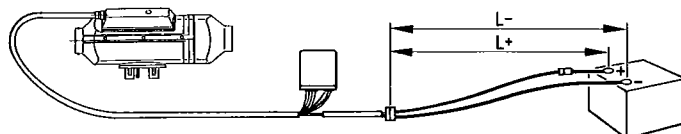
Fit the control unit so that it is protected from splash water (from both its own vehicle and preceding ones). Outside installation is thus not permissible. The unit is best arranged in the vehicle interior, with the plugs pointing downward.

Control unit



The pilot light (built into the operating unit) should be within the field of vision of the driver, or at least be visible to him without great effort.

The following cable cross-sections must be observed between battery and heater, in order that the maximum permissible voltage losses in the cables (0.5 at 12 V rated voltage and 1 V at 24 V) are not exceeded.



$L^+ + L^- < 5 \text{ m} \rightarrow \text{cross-section } 4 \text{ mm}^2$   
 $L^+ + L^- 5 \text{ to } 8 \text{ m} \rightarrow \text{cross-section } 6 \text{ mm}^2$

If the positive cable is to be connected to the fuse box (e. g. terminal 30), the vehicle's cable too from the battery to the fuse box must be included in the calculation of the total line length, and if necessary redimensioned in accordance with the above.

Smear plug and earth connections with contact protection grease outside the vehicle interior.

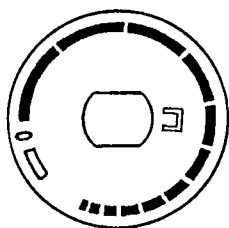
## Operating unit and heater timer

The scope of delivery includes the operating unit, which comprises the On-Off switch with control feature for the heating capacity, a red light for illumination, and a green operating pilot light.

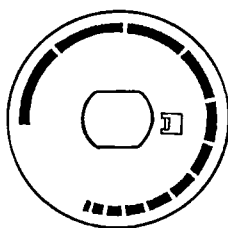
Two scale discs are supplied with the operating unit.

Scale disc 1 is fitted if operation is exclusively with the operating unit. The operating unit then serves as an On switch and temperature controller.

Scale disc 2 is fitted if a timer is used for actuation. Switch-on is then exclusively with the heater timer, and the temperature is selected with the rotary knob. See wiring diagram for connection.



1



2

## Temperature control

A temperature sensor is arranged on the intake side inside the heater, and – in conjunction with the controller of the operating unit – switches the heater to "High", "Medium" or "Low" depending on the intake temperature and the controller setting.

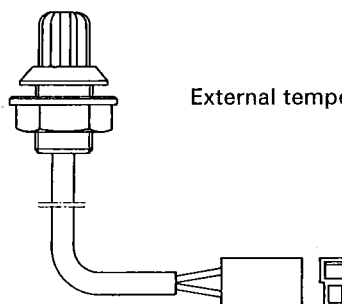
This arrangement of the temperature sensor is only suitable in recirculated-air operation (heating air intake from the area being heated).

If the heater is operated with fresh air (heating air intake from the outside), the built-in temperature sensor must be disconnected, and an external temperature sensor (Cat. No. 25 1482 89 45 00) must be fitted in the interior.

The sensor must not be attached to uninsulated outer panels, and must be protected from draughts and direct sunlight. See wiring diagram for connection.

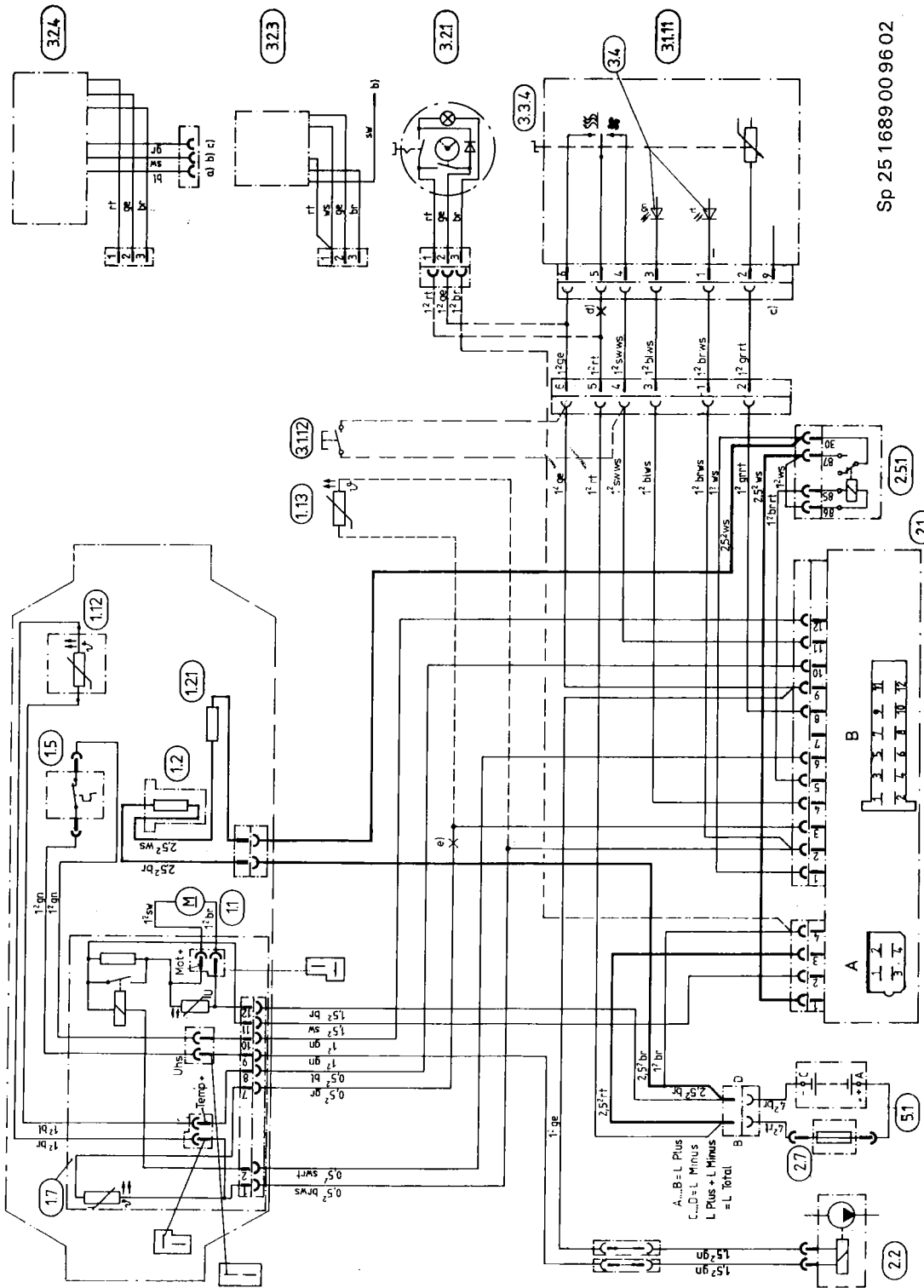
Important:

On/Off-regulation of the heating capacity using an additional thermostat is not permitted, as it puts an unduly heavy strain on the battery.



External temperature sensor

### Wiring diagram D1L C – 24 V 25 1689 05 00 00



## PARTS LIST

- |        |   |        |                                   |       |                             |  |
|--------|---|--------|-----------------------------------|-------|-----------------------------|--|
| 1.1    | Blower motor  | 1.1.3  | Temperature sensor, external      | 3.2.4 | Timer, digital, rectangular | b) to terminal 15  |
| 1.2    | Glow plug   | 2.1    | Control unit                      | 3.3.4 | Potentiometer with switch   | c) lighting terminal 58                                  |
| 1.2.1. | Resistor for glow plug (24 V only)  | 2.2    | Fuel metering pump                | 3.4   | Switch-on pilot light       | d) break line here to connect timer                      |
| 1.5    | Safety thermal cutout switch  | 2.5.1  | Glow plug relay                   |       | Lightning                   | e) break here to connect an external temperature sensor- |
| 1.7    | PCB with controller temperature sensor, speed change and plug distributor | 2.7    | Main fuse, 25 A                   | 5.1   | Diagnostic light            |  |
|        |   | 3.1.11 | Operating unit                    |       | Battery                     | rt = red = green   |
|        |   | 3.1.12 | Pushbutton for diagnostic display |       |                             | br = brown = yellow                                      |
| 1.12   | Flame monitor   | 3.2.1  | Timer, analog, circular           |       |                             | ws = white = grey  |
|        |   | 3.2.3  | Timer, digital, square            |       |                             | sw = black = blue  |

Sp 251689009602

a) Test (workshop) digital timer

b) to terminal 15

c) lighting terminal 58

d) break line here to connect timer

e) break here to connect an

external temperature sensor

rt = red      gn = green

br = brown      ge = yellow

ws = white gr = grey

sw = black bl = blue

## Function description

### Control elements

1. Operating unit included in scope of delivery (see also pages 2 and 3)
2. Heater timer (additional part, optional, see page 2). The heater can be switched on at once using the timers, or they can be used to preset the switch-on time (24 hours to 10 days depending on version).

### Mode of operation

Procedure after starting, normal start.

<b>Switch-on</b>	Green pilot light in the operating unit "on".
After 3 secs.:	Blower "On" at full speed. Heater coil of glow plug "On".
After 25 to 65 secs.:	Fuel conveying "On".
When stable flame has been obtained:	Glow plug off.
The heater now operates at full heating capacity (1800 W), and the hot air heated at the heat exchanger passes through the air outlet into the room being heated.	

### Control

Once the intake (or room) temperature set at the control unit (between 10°C and 30°C has been reached), the heater switches to "Low" heating capacity (reduced blower noise). If the 850 W heating capacity is insufficient, the heater switches to "Medium" (1200 W) with "Low" blower speed. In most cases the Low-Medium-Low control sequence with low blower speed will supply the heat requirement. If however the "Medium" stage is not sufficient, the heater switches back to "High". This again entails full blower speed.

After switch-off the green pilot light goes out. The blower continues to run to cool the heater down. This delayed shut-off terminates automatically after about 3 minutes.

### Controls and safety equipment

The flame is monitored by the flame sensor(7), and the max. permissible temperature by the safety thermal cutout switch (5). Both affect the control unit (20), which shuts down the heater in the event of faults.

1. If the heater fails to ignite within 90 seconds of fuel starting to be pumped, starting is repeated as described. If the heater still fails to ignite after 90 seconds of fuel pumping, fault shutdown takes place.
2. If the flame goes out spontaneously during operation, a restart is first attempted. If the heater fails to ignite within 90 seconds of fuel pumping, or if it does ignite but goes out again within 10 minutes, fault shutdown takes place. The heater can be reset by switching it off and then back on again.
3. In the event of overheating the safety thermal cutout switch (5) is operated, the fuel supply is interrupted, and fault shutdown takes place. If the fault shutdown is due to overheating, the switch-on pilot light (green) and the light (red) in the operating

unit flash alternately at a steady rate. Further fault indication signals can be called using an additional unit – also see Troubleshooting and Repair Manual.

Once the cause of the overheat has been removed, the unit can be restarted by switching it off and then back on again.

4. If the voltage drops below 10.5 or 21 V or rises above 15 or 30 V as the case may be, fault shutdown takes place.
5. If the glow plug is defective and the electric cable to the metering pump is interrupted, the heater will not start.
6. When the heater starts the operation of the blower motor is checked once. If it does not start, the heater reacts as for fault. During operation, the blower motor is monitored in cyclic manner (every 4 minutes). If the motor speed is below the allowed limit, fault shutdown follows.
7. When the heater is switched off the glow plug is switched on during the delayed shutdown for about 30 seconds (after-glow) to clear the heater of combustion residues.

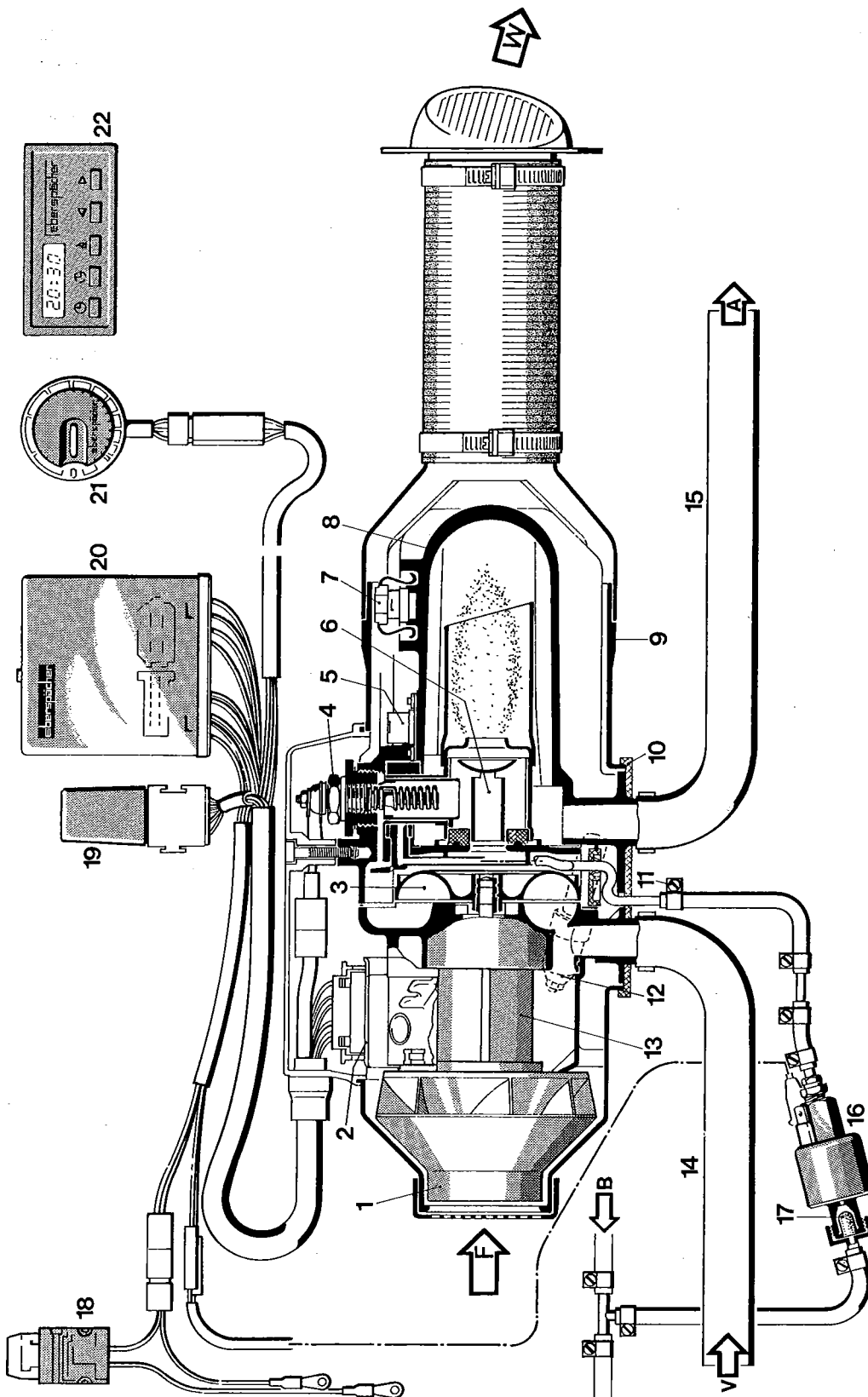
Please note:

When carrying out electric welding work on the vehicle, disconnect the positive terminal from the battery and earth it in order to protect the control unit.

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

The heater must not be operated in garages.

## Sectional drawing



F = fresh air  
V = combustion air  
B = fuel  
W = hot air  
A = exhaust

15 Exhaust line  
16 Fuel metering pump  
17 Fuel strainer  
18 Main fuse, 25 A  
19 Relay, glow plug  
20 Control unit  
21 Operating unit  
22 Heater timer

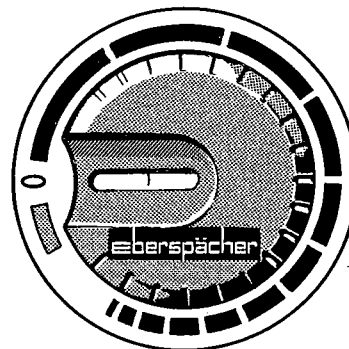
8 Heat exchanger  
9 Outer casing  
10 Flange seal  
11 Fuel line  
12 Series resistor for glow plug (for 24 V only)  
13 Blower motor  
14 Combustion air intake line

### PARTS LIST

1 Hot air blower wheel  
2 PCB with controller temperature sensor  
3 Combustion air blower wheel  
4 Glow plug  
5 Safety thermal cutout switch  
6 Combustion chamber  
7 Flame monitor

## Operation with the actuating unit

Blue field	= Ventilation
0	= Off – after switch-off automatic delayed shutoff for cooling down
Red field	= Heating – turning to the right results in lower heat output
Illuminated field in knob:	When vehicle lights are on – red display In heating operation – green display (pilot light) In the event of faults various flashing lights (consult workshop) In the event of overheating: steady green/red flashing Flashing signal: — — — — —



### Self-help in the event of trouble:

Non-starting	Switch off and back on again. Not more than twice. Check fuse. Consult workshop.
Overheating	Remove cause (e. g. blockage of hot air ducts). Switch off and back on again.

See "Heater Timer" operating instructions for operation using timer.

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

The heater must not be operated in garages.

By fitting an additional unit (see wiring diagram for connection) further diagnostic signals can be called by pushing a

button (1/2 to 2 secs.).

	0	8	16 Sek.
Operation			
Warning over-/undervoltage <sup>1)</sup>	— — — — —		
Overvoltage cutout*	— — — — —	— — — — —	
Undervoltage cutout <sup>1)</sup>	— — — — —	— — — — —	
Glow ignition plug break*	— — — — —	— — — — —	
Burner motor not turning*	— — — — —	— — — — —	
Short-circuit in changeover relay	— — — — —	— — — — —	
Mistaken flame recognition*	— — — — —	— — — — —	
Safety time exceeded <sup>2)</sup>	— — — — —	— — — — —	
Non-start	— — — — —	— — — — —	
Overheat <sup>3)</sup>	— — — — —	— — — — —	— — — — —
Short-circuit in fuel metering pump*	— — — — —	— — — — —	
Temperature sensor defective*	— — — — —	— — — — —	
Flame sensor defective*	— — — — —	— — — — —	
Flame cutout at "Low" setting <sup>2)</sup> , Heater goes out by itself	— — — — —	— — — — —	
Flame cutout at "High" setting <sup>2)</sup> , Heater goes out by itself	— — — — —	— — — — —	
Control unit defective*	— — — — —	— — — — —	

With faults marked \* consult the after-sales service.

<sup>1)</sup> Charge the battery at undervoltage.

<sup>2)</sup> Switch off and back on again, but not more than twice.

Then consult the after-sales service.

<sup>3)</sup> Remove cause of overheat (e. g. blocked heating air ducts). Switch off and back on again.