



J. Eberspächer  
Eberspächerstr. 24  
D-73730 Esslingen

Telefon (zentral)  
(07 11) 9 39 - 0  
Telefax  
(07 11) 9 39- 05 00

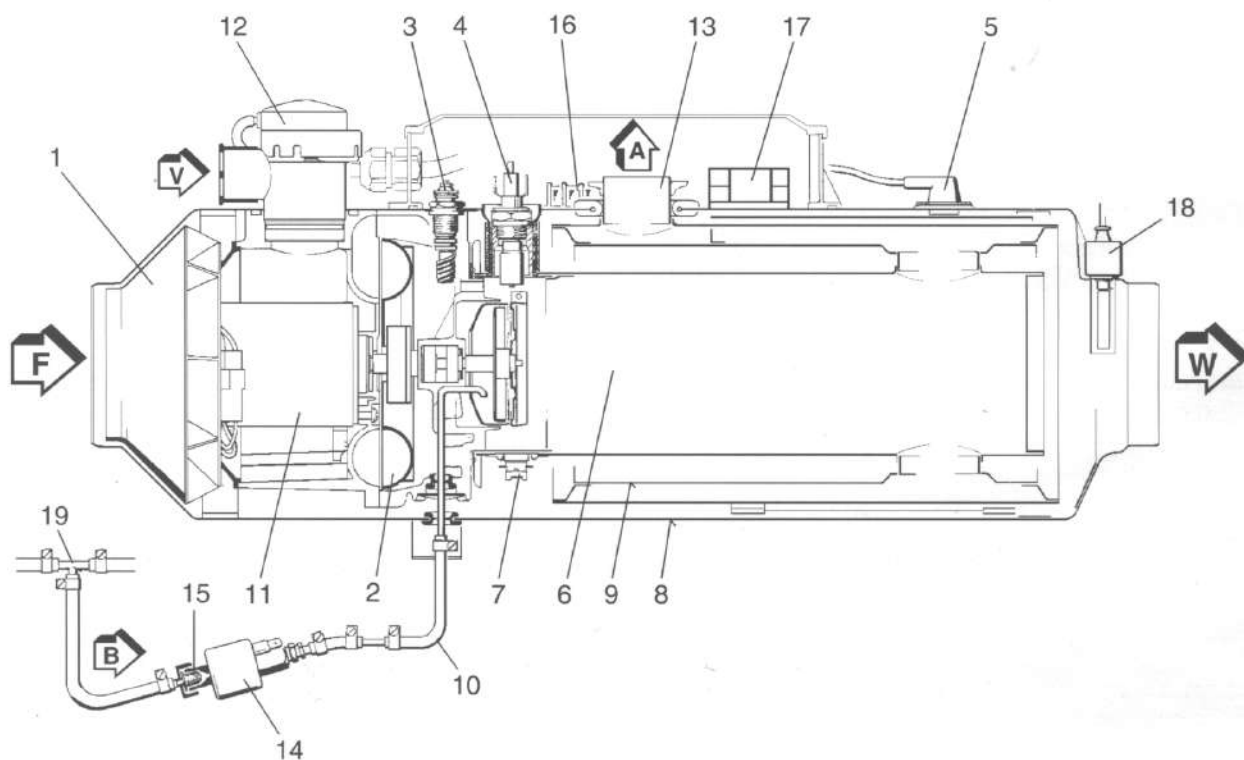
This Troubleshooting and Repair Manual is valid  
for the following Model

### V7S

25 1728 00 00 00 - 24 V

Contents	Page
Sectional view .....	2
Description of function .....	3
In cases of malfunction, first of all check. ....	4
Function and malfunction test .....	4 - 8
Circuit diagram .....	9
Repair Instructions .....	10 - 14
Measurement of fuel delivery .....	15

## Sectional view V7S



### List of parts

- |                                   |                                   |                              |                    |
|-----------------------------------|-----------------------------------|------------------------------|--------------------|
| 1. Heating air blower             | 8. Outer casing                   | 15. Fuel strainer            | F = Fresh air      |
| 2. Combustion air blower impeller | 9. Heat exchanger                 | 16. Plug connector           | V = Combustion air |
| 3. Glow plug series (resistor)    | 10. Fuel line                     | 17. Ignition spark generator | B = Fuel           |
| 4. Glow spark plug                | 11. Blower motor                  | 18. Temperature sensor       | W = Hot air        |
| 5. Overheating switch             | 12. Combustion air solenoid valve | 19. Fuel branch piece        | A = Exhaust gas    |
| 6. Combustion chamber             | 13. Exhaust pipe                  |                              |                    |
| 7. Flame sensor                   | 14. Fuel metering pump            |                              |                    |



## Description of function

### Ventilation

When switched on to the 'Ventilation' position according to the operating plate, only the heating air blower is started up. This conveys fresh air into the area to be ventilated.

### Heating

Sequence after switch-on

Switch-on:	Pilot light ON Glow filament of the glow plug and ignition spark generator ON Blower ON at full speed
After 25 sec.:	Fuel metering pump ON (with fuel delivery for 'High' heat flow)

When a steady flame has formed, the glow plug will switch off with approx. 10 seconds delay. The heater will now continue to operate for at least 30 seconds under positive control with the heat flow on 'High'. Regulation of the heat flow can then take place.

### Regulation of the heat flow

In Heating mode, the required heat flow can be steplessly adjusted with the control knob on the temperature control.

The heater itself is operated in 2 settings. In the 'Low' setting, the fuel metering pump runs at low frequency and delivers a small amount of fuel. Accordingly, the solenoid valve for combustion air is switched to 'Low'.

In the 'High' setting, the fuel metering pump runs at high frequency and the solenoid valve for combustion air is switched to 'High'. This ensures that the correct fuel-air mixture ratio is obtained in both settings with the same blower speed.

According to heat requirement (outside temperature) and the setting of the control knob (desired discharge temperature), the heater switches over at various intervals from 'High' to 'Low' and vice versa. The length of the intervals at which the heater operates on 'High' or 'Low' is a function of the actual discharge temperature which is measured by a temperature sensor in the discharge hood and the desired discharge temperature, corresponding to the setting of the control knob.

### Switch-off

When the heater is finally switched off, the pilot light will extinguish. The blower motor will then run on for cooling purposes. This running-on will cease automatically after 3 minutes.

## Control and safety devices

The flame is monitored by the flame sensor (7), the maximum permissible temperature by the overheating switch (5). Both these devices influence the control unit which switches the heater off in the event of any malfunction.

1. If the heater does not fire up within 90 seconds after commencement of fuel delivery, starting as described is repeated.  
If the heater does not fire up after a further 90 seconds from fuel delivery, Malfunction shutoff will take place.
2. If the flame extinguishes of its own accord during operation, restart is carried initially. If the heater does not fire up within 90 seconds from switch-on of fuel delivery or extinguishes again within 10 minutes, Malfunction shutoff will take place.  
Malfunction shutoff can be cancelled by switching briefly ON and OFF.
3. In the event of overheating, the overheating switch (5) will respond, the fuel supply will be interrupted, and subsequently Malfunction shutoff will take place.  
If overheating is the cause of Malfunction shutoff, the ON pilot light will flash at regular intervals.  
Additional malfunction signals can be invoked with optional extra equipment.  
After the cause of overheating has been remedied, the unit can be restarted by switching OFF and ON again.
4. If the voltage drops below approximately 21 volts or rises to over approximately 30 volts, Malfunction shutoff will take place after 20 seconds. Brief periods of over- and undervoltage will have no effect.
5. When the heater is switched on, one-time checking of the blower motor is carried out. If it does not start up, the heater will switch to Fault mode.  
During operation, the blower motor is monitored cyclically (every 4 minutes). If the motor speed is below the permissible limit, Malfunction shutoff will take place.

### Please note:

If electric welding is carried out on the vehicle, to protect the control unit, the positive pole should be disconnected from the battery and earthed.

When carrying out function testing of the heater, the operating control should be turned fully towards 'High'.

### In cases of malfunction, first of all check:

- Is there fuel in the tank?
- Are the fuses intact?
- Are electrical leads and connections OK?
- Are the combustion air and exhaust ducts unobstructed?

If soot is produced by combustion, check the following:

Combustion air duct or exhaust duct blocked? ..... Remove obstruction.

Fuel metering pump delivery excessive? ..... Measure fuel delivery; if necessary, replace fuel delivery pump.

Precipitation in the heat exchanger? ..... Clean heat exchanger, replace if necessary.

### Function and malfunction test

#### Invoking diagnostic signals

Switch the heater on.

On the back of the 'Heat-OFF-Ventilate' tumbler switch (3.1.3), short-circuit terminals 1 (ye) and 2 (bk/wh) for 0.5 to 5 seconds (Fault code scan 3.1.12); or at control unit plug connector B, short-circuit connection B9 (ye) and B11 (bk/wh) for 0.5 to 5 seconds (see Circuit Diagram).

The pilot light (3.4.1) will flash and emit a diagnostic signal (page 6).

Remedy the malfunction as described under Trouble-shooting (pages 7 and 8).

#### Diagnostic test with the JE Diagnostic Unit

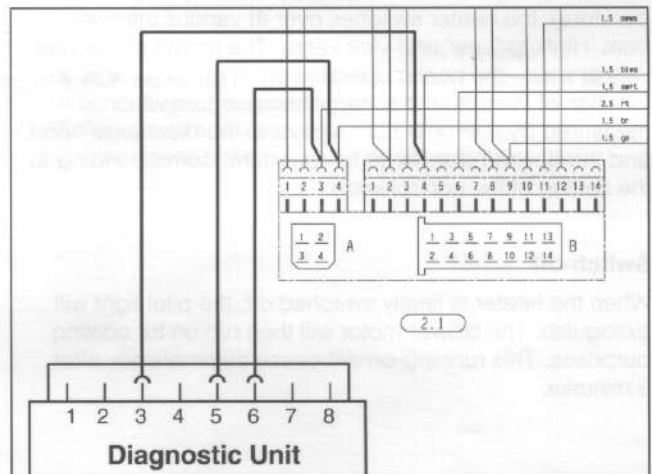
Diagnostic Unit Order No. 22 15 12 89 00 00

The malfunction will be displayed by the Diagnostic Unit as a 3-digit number.

Malfunction Codes, description of malfunctions and their remedy are described on pages 7 and 8.

#### Connecting the JE Diagnostic Unit to the control unit (see Figure opposite)

- From the Diagnostic Unit (8-pin flat-pin plug enclosure, compartment 3) run and connect a lead to the control unit, plug connector B4 (1.5<sup>2</sup> bl/wh).
- From the Diagnostic Unit (8-pin flat-pin plug enclosure, compartment 5) run and connect a lead to the control unit, plug connector A3 (+).
- From the Diagnostic Unit (8-pin flat-pin plug enclosure, compartment 6) run and connect a lead to the control unit, plug connector A4 (-).

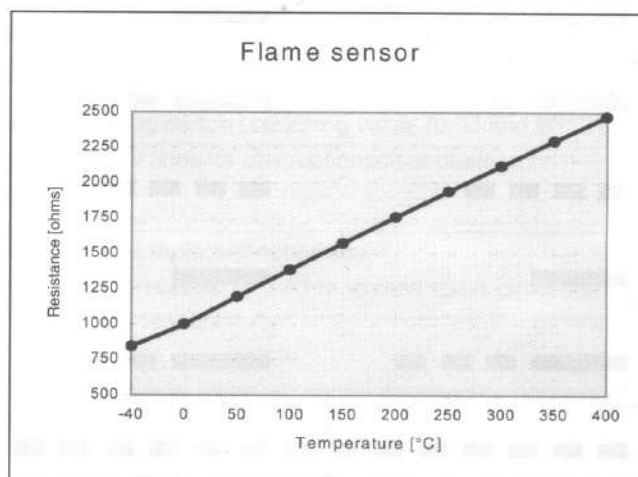
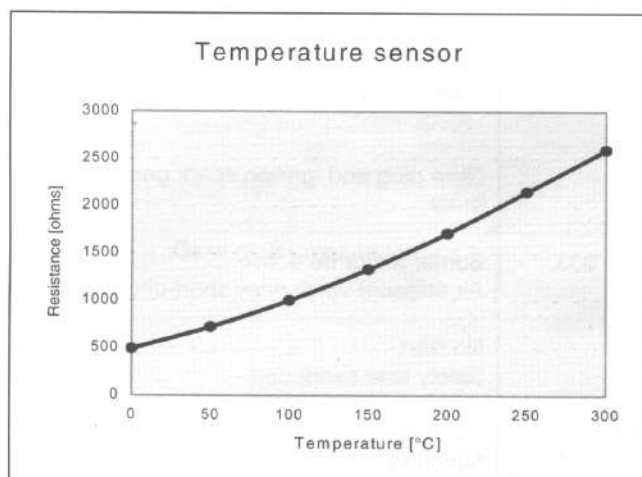




### Check values

Speed of blower motor (at nominal voltage)

- High )
- Low ) 3400 ± 300 RPM
- Afterrun )



Solenoid valve: approx. 100  $\Omega$  at 25 °C

Fuel metering pump: approx. 20  $\Omega$

Glow spark plug: approx. 1  $\Omega$

Potentiometer with series resistor: 680  $\Omega$  to 1150  $\Omega$

Overheating switch: switching values 70 °C and 90 °C

Diagnostic signal		Fault Code	Malfunction
0	8 sec.		
		000	no malfunction
		001, 002	Advance warning: over/undervoltage
		010	Overvoltage - shutoff
		011	Undervoltage - shutoff
		020	Glow plug and ignition spark generator break
		029 - 033, 036	Burner motor defective Air solenoid valve relay short-circuit
		052	No start Safety time exceeded
		012	Overheating Metering pump break
		047	Metering pump short-circuit
		060 - 063	Temperature sensor: break Short-circuit Setpoint pot.: break, short-circuit
		064, 065	Flame sensor: break, short-circuit
		056	Flame cutout, LOW setting
		054	Flame cutout, HIGH setting
		090, 092 - 094	Control unit defective
		091	Malfunction due to external interference voltage (Reset)



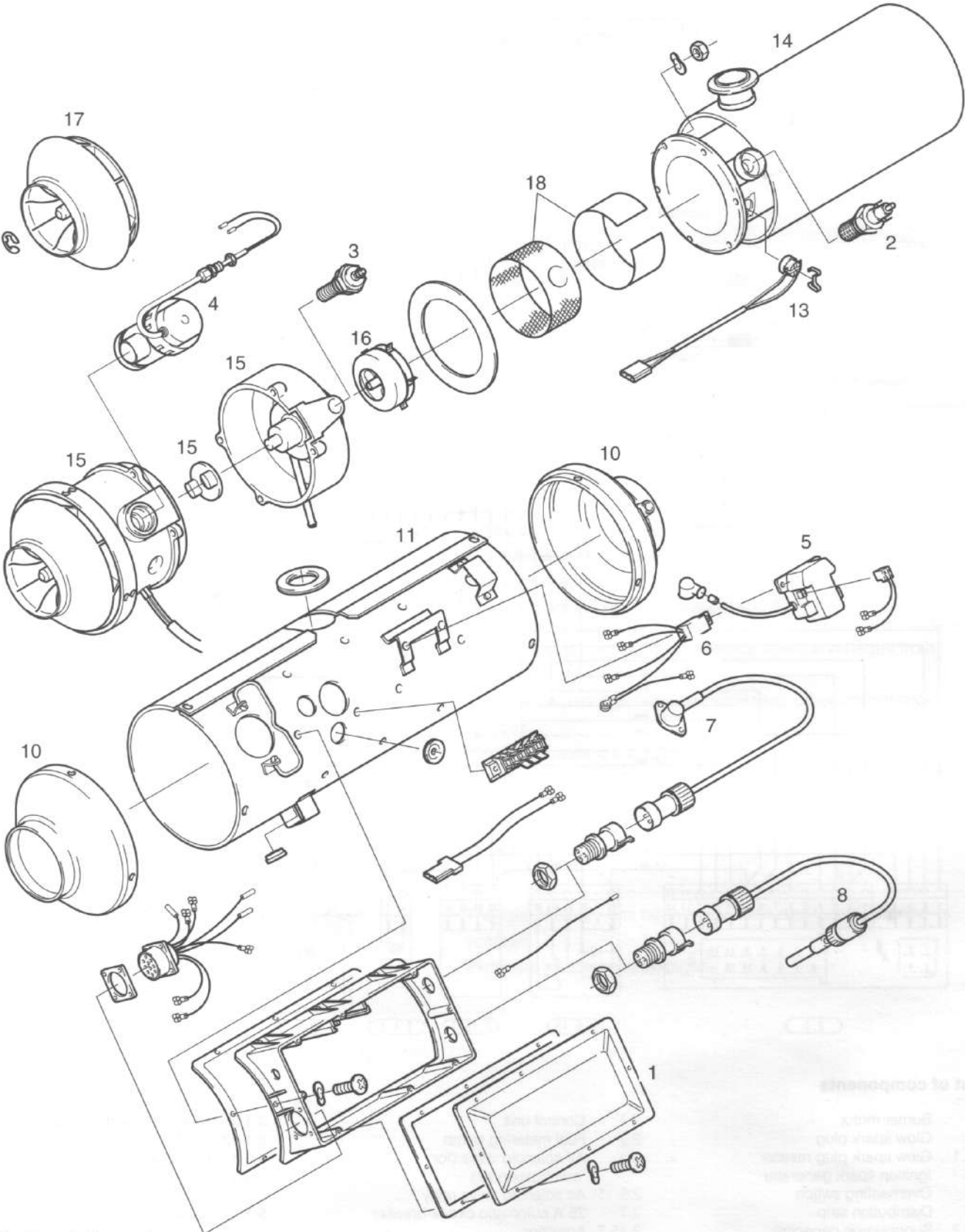
Fault Code	Description of fault	Comment / Remedy
000	no malfunction	---
001	Advance warning overvoltage	Voltage btw. A3 and A4 at control unit 28 volts.
002	Advance warning undervoltage	Voltage btw. A3 and A4 at control unit 22 volts.
010	Overvoltage shutoff	Voltage btw. A3 and A4 at control unit 29.4 volts.
011	Undervoltage shutoff	Voltage btw. A3 and A4 at control unit 21 volts. (voltage values must be present 20 seconds) Check battery regulator and electrical leads
012	Overheating or Metering pump break (B12)	Check connection control unit to metering pump for continuity. Check overheating switch (switching value 70 °C and 90 °C). Check heating air lines for obstruction; clear obstruction if necessary.
020	Glow plug break (A1)	Check glow plug, replace if necessary Check connection control unit A1 to ignition spark generator and to glow plug for continuity. Please note! Break in glow filament alone will not be detected on account of parallel connected ignition spark generator.
025	Short-circuit diagnostic output (B4)	Check connection control unit B4 to amplifier for short-circuit to positive.
029	Burner motor defective	Speed deviation longer than 240 seconds:
032		Speed < 40% relative to setpoint (motor not turning)
033		Measure voltage with blower running with analog voltmeter. If voltage is present, but motor not running, replace motor.
036	Air solenoid valve relay short-circuit (B6)	Check connection control unit B6 to relay connection 2.5.15 for short-circuit to positive. If OK → replace relay.
047	Metering pump short-circuit (B12)	Check connection control unit B12 to metering pump for short- circuit. Check metering pump, replace if necessary.
052	No start - safety period exceeded	No flame detected within starting phase. Flame sensor value < 100 °C (1380 Ω). Check fuel supply and glow plug Check exhaust and combustion air ducts Check flame sensor Flame sensor values: see Graph page 5.

<b>Fault Code</b>	<b>Description of fault</b>	<b>Comment / Remedy</b>
054 056	Flame cutout, HIGH setting Flame cutout, LOW setting	Heater has ignited (flame detected) and signals flame cutout in one of the settings Check fuel flow rate, blower speed and fuel supply Check exhaust and combustion air ducts If combustion OK → check flame sensor, replace if necessary»Flame sensor values: see Graph page 5
060 061	Temperature sensor break (B3) Temperature sensor short-circuit (B3)	Temperature sensor signals temperature value outside control range. Check connecting leads. Resistance value between B2 and B3 > 3000 $\Omega$ (if break) Resistance value between B2 and B3 < 260 $\Omega$ (if short-circuit) Temperature sensor values: see Graph page 5
062 063	Setpoint potentiometer break (B8) Setpoint potentiometer short-circuit (B8)	Potentiometer of operating control signals value outside control range. Check connecting leads. Resistance value between B2 and B3 > 3000 $\Omega$ (if break) Resistance value between B2 und B3 < 260 $\Omega$ (if short-circuit) Standard values: 680 $\Omega$ - 1150 $\Omega$
064 065	Flame sensor break (B10) Flame sensor short-circuit (B10)	Flame sensor signals temperature value outside measuring range. Resistance value between B2 und B10 > 3200 $\Omega$ (if break). Resistance value between B2 und B10 < 200 $\Omega$ (if short-circuit) Check connecting leads. Flame sensor values: see Graph page 5
091	Fault due to external interference voltage (Reset)	Malfunction of control unit due to interference voltages from vehicle supply. Possible causes: low batteries, chargers, other interference sources Eliminate interference voltages.
090 092 093 094	Control unit defective (internal fault / Reset) Control unit defective (ROM error) Control unit defective (RAM error) Control unit defective (EEPROM error)	Internal error in microprocessor / memory detected, replace control unit.
255	Control unit fault memory erased	The fault memory has been overwritten due to interference voltages. Eliminate interference voltages.





Repair Instructions



For Description and  
Order Nos. Of spare parts,  
see Spare Parts List

List of components

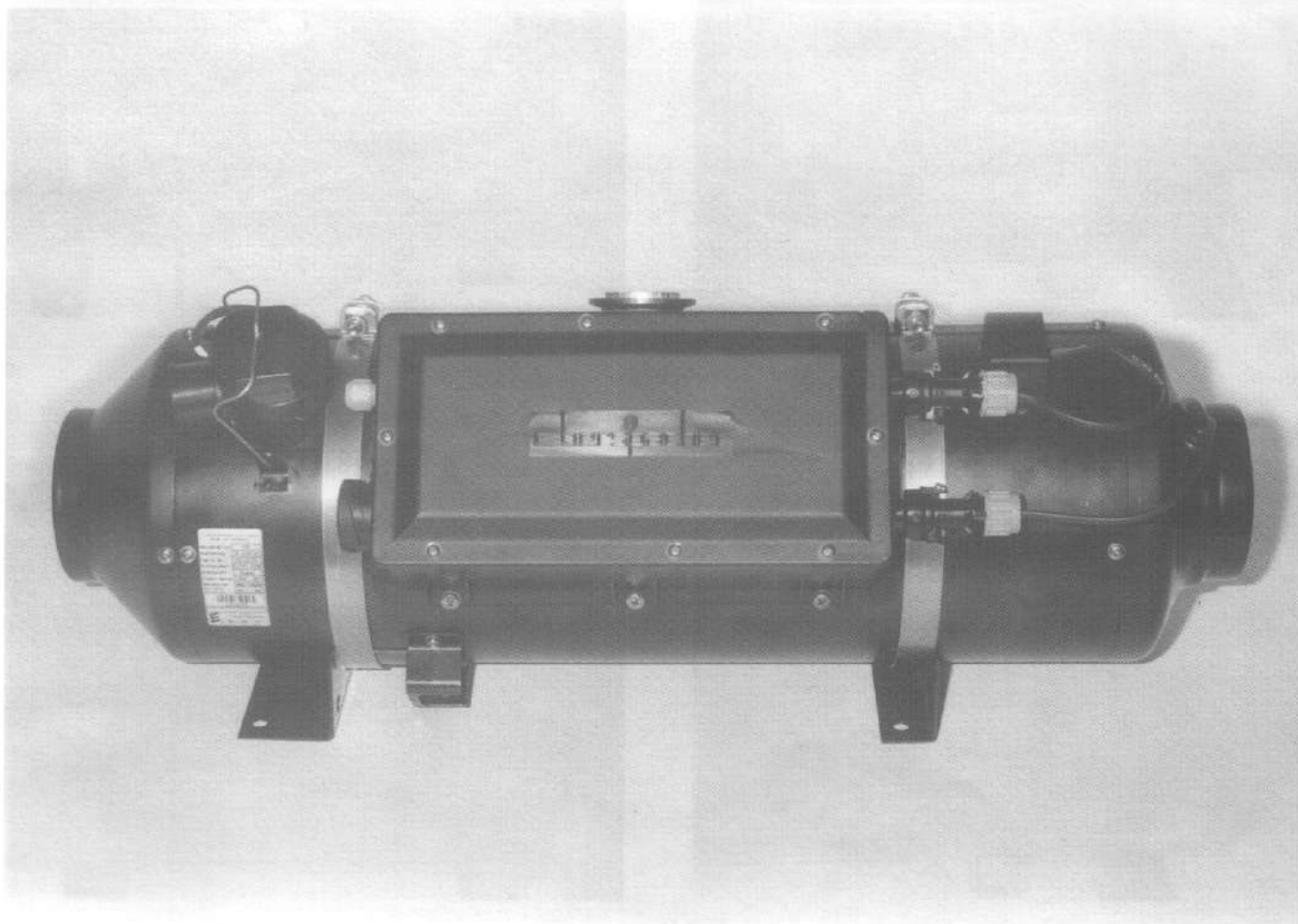
1	Light housing
2	Light bulb
3	Light bulb
4	Light bulb
5	Control unit
6	Switch
7	Switch
8	Cable
9	Light bulb
10	Light housing
11	Light housing
12	Light bulb
13	Cable
14	Light bulb
15	Light bulb
16	Light bulb
17	Light housing
18	Light bulb

## Repair steps

### Disassembly/assembly

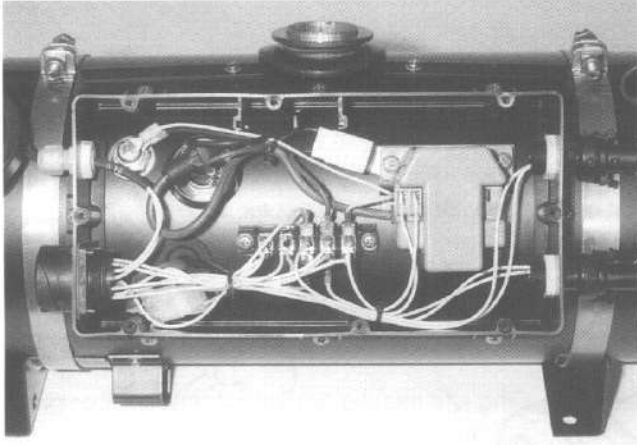
1. Cover
2. Glow spark plug
3. Glow plug
4. Solenoid valve
5. Ignition spark generator
6. Suppression capacitor
7. Overheating switch
8. Temperature sensor
9. Preparation for disassembly of outer jacket
10. Hoods, brackets, clamp clips
11. Outer jacket
12. Heat exchanger with blower from outer jacket
13. Flame sensor
14. Blower with rotating diffuser mechanism and heat exchanger
15. Blower, coupling and rotating diffuser mechanism, complete
16. Rotating diffuser mechanism
17. Blower impeller
18. Combustion chamber lining

### View of complete unit

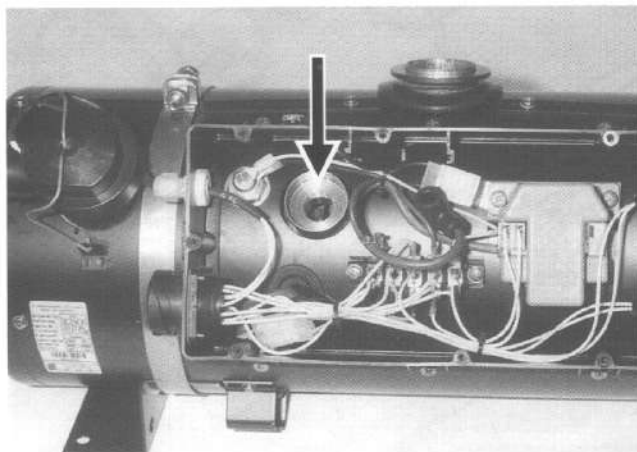


## Assembly/disassembly

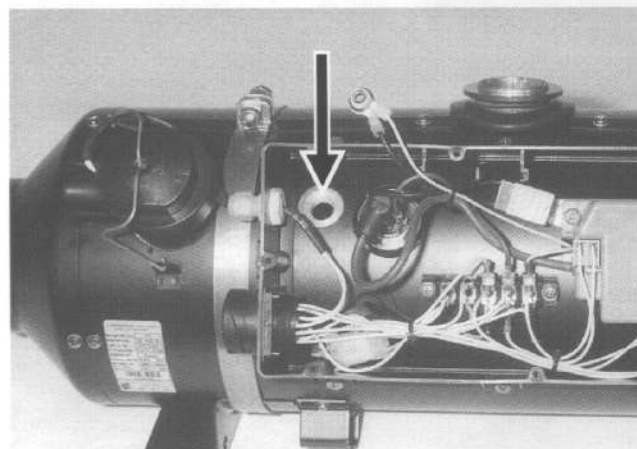
1. Cover



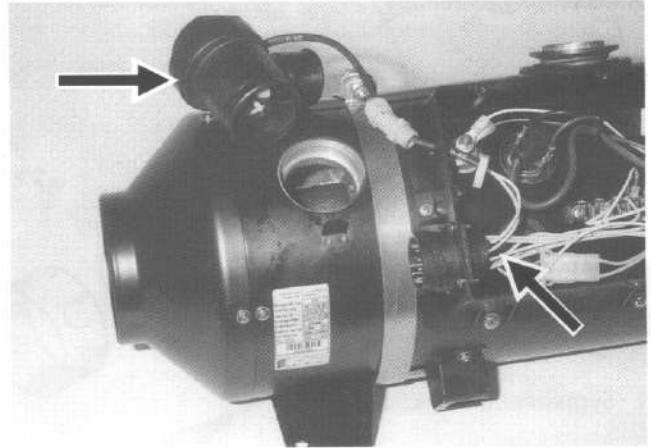
2. Glow spark plug



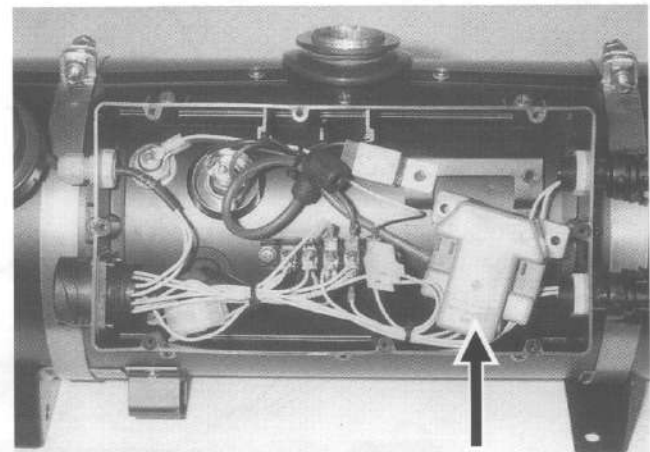
3. Glow plug



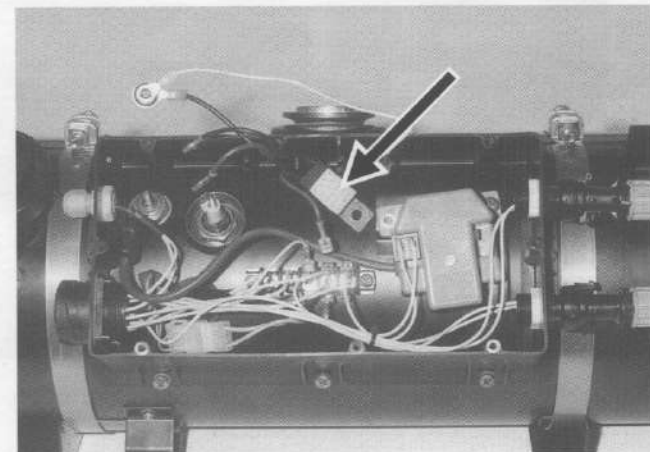
4. Solenoid valve  
Use Schlemmer 1.6 mm dia. drift No. 7704 49 6 to  
remove pin contacts



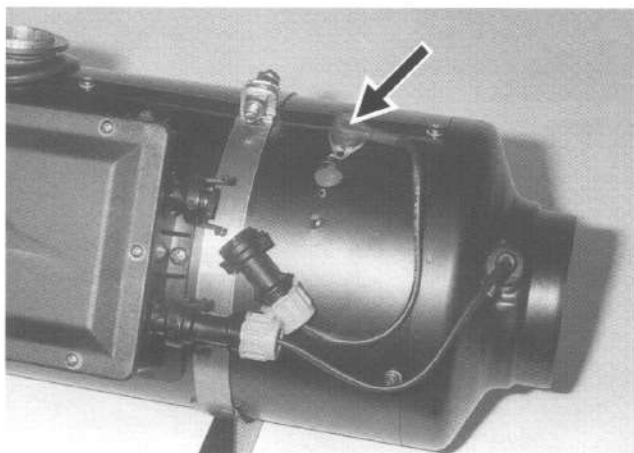
5. Ignition spark generator



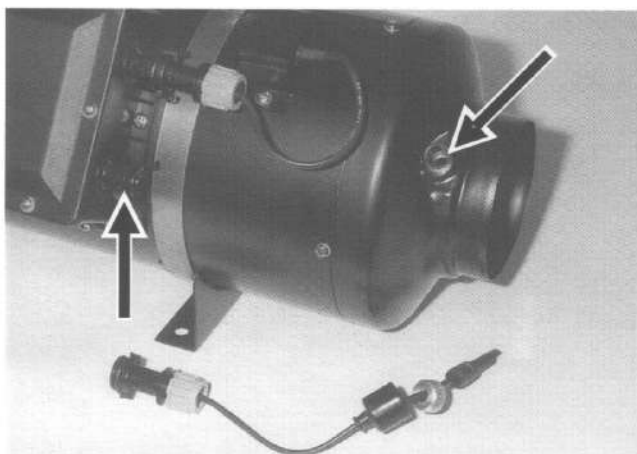
6. Suppression capacitor



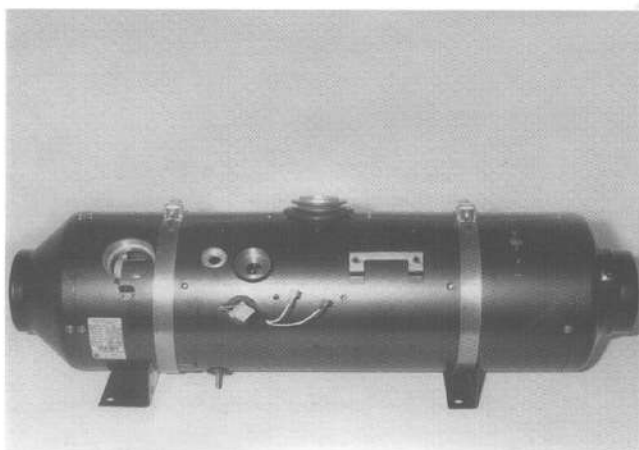
7. Overheating switch



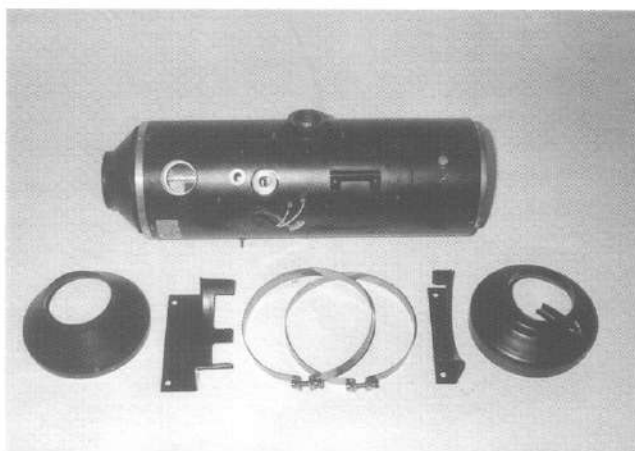
8. Temperature sensor



9. Preparation for disassembly of outer jacket

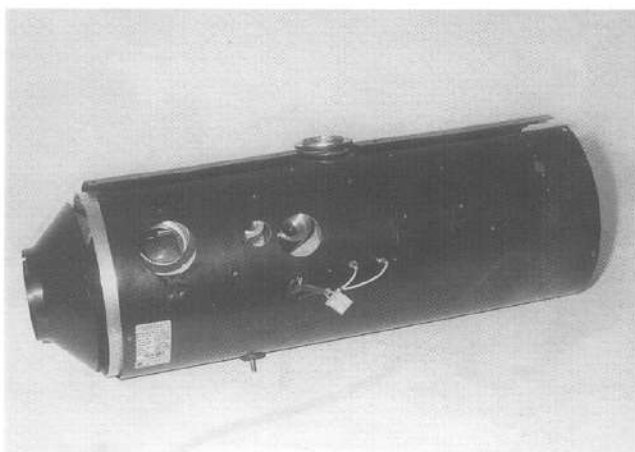


10. Hoods, brackets, clamp clips

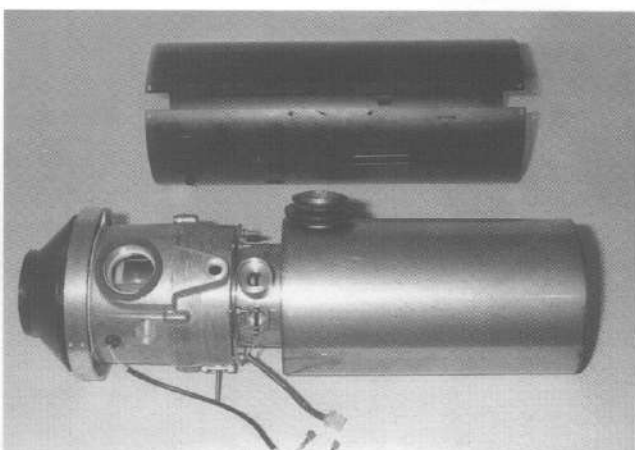


11. Outer jacket

When assembling the screws on the longitudinal joint, draw the jacket together with the clamp clips

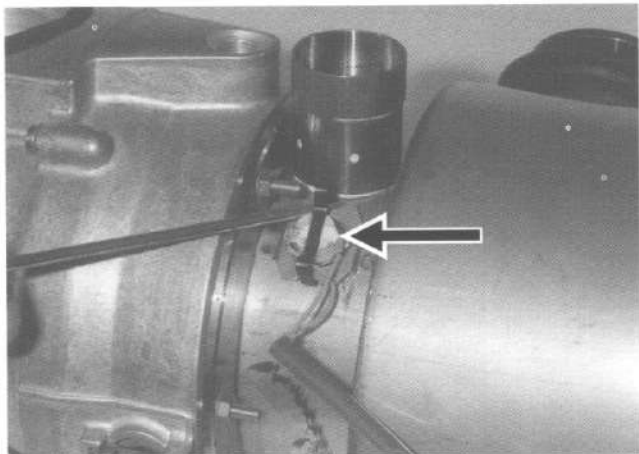


12. Heat exchanger with blower from outer jacket

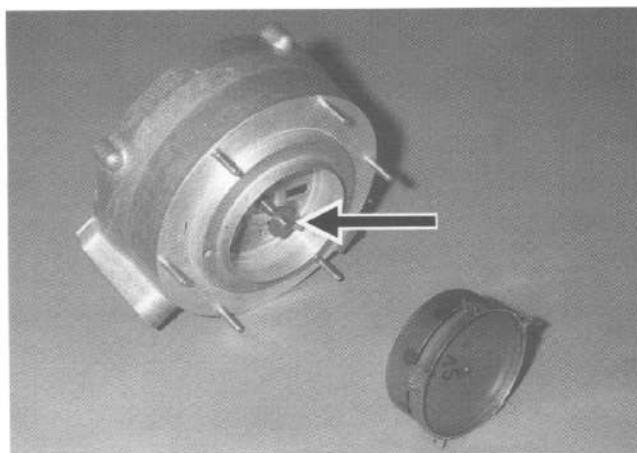




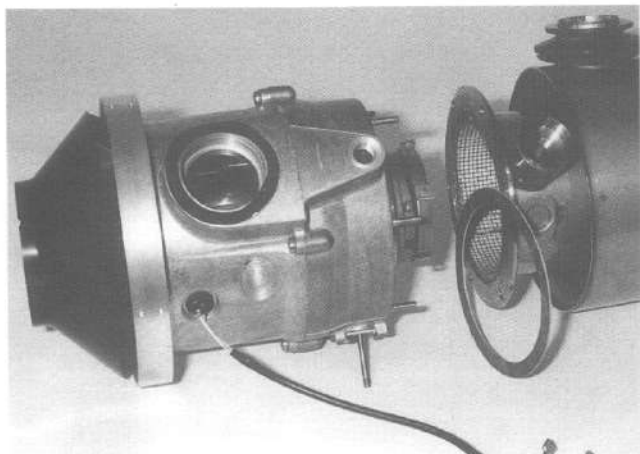
13. Flame sensor



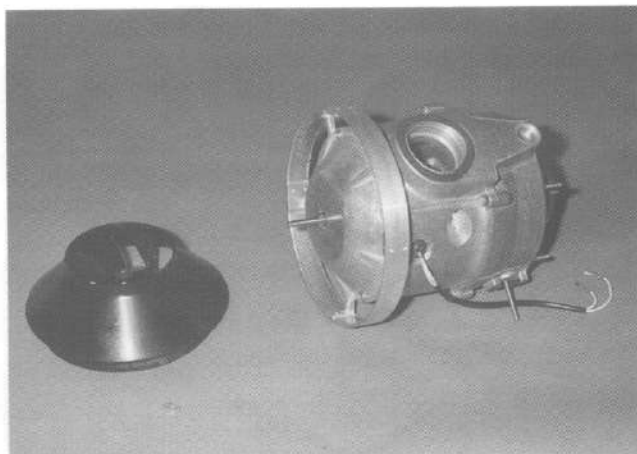
16. Rotating diffuser mechanism  
Note bearing cover desk (arrow)



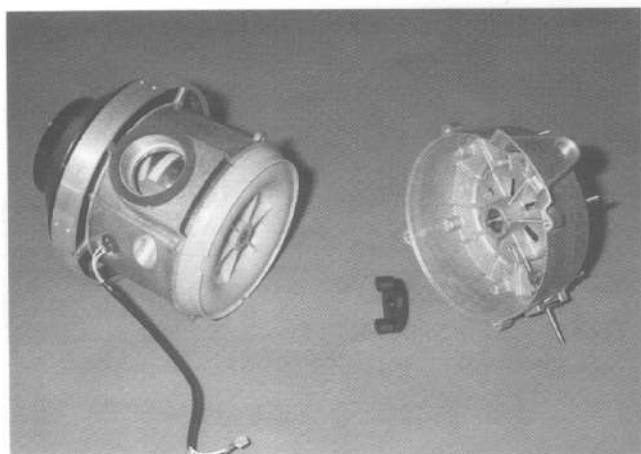
14. Blower with rotating diffuser mechanism and heat exchanger



17. Blower impeller



15. Blower, coupling and rotating diffuser mechanism complete



18. Combustion chamber lining





## Measurement of fuel delivery

**IMPORTANT!** Fuel measurement should only be carried out with the battery properly charged. During measurement, at least 22 volts or max. 26 volts should be present at the control unit.

### 1. Preparation

Pull the fuel line off the heater and insert it in a graduated measuring glass.

Apply voltmeter to lead at plug connector A of the control unit

Connect terminal 3 (+) and terminal 4 (-).

Switch on heater; when fuel is being delivered uniformly (approx. 25 - 55 seconds after switching on), the fuel line is filled and vented.

Switch heater off and empty measuring glass.

### 2. Measurement

Switch heater on.

Fuel delivery will commence approx. 25 - 55 seconds after switching on.

During measurement, hold the measuring glass at the level of the glow spark plug.

Measure voltage on voltmeter.

After 90 seconds of fuel delivery, it will shut off automatically.

Switch heater off.

Read off quantity of fuel in the measuring glass.

### 3. Evaluation

Transfer the values read off to the graph.

The fuel consumption is OK if the point of intersection of the two values lies within the limit curve.

If the point of intersection is located outside, the fuel metering pump must be replaced.

V7S 25 1728 - 24 V

