Hydronic

Eberspächer ®

D3W Z Troubleshooting and Repair Manual

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This Troubleshooting and Repair Manual is valid for the following Models

Hydronic D3W Z	- 12 Volt	25 1926 00 00 00
Hydronic D4W SC	- 12 Volt	25 1917 01 00 00
	- 12 Volt	25 1917 05 00 00
Hydronic D5W SC	- 12 Volt	25 1975 05 00 00
	- 12 Volt	25 1920 05 00 00
Hydronic B4W SC	- 12 Volt	20 1752 05 00 00
	- 12 Volt	20 1770 05 00 00
Hydronic B5W SC	- 12 Volt	20 1765 05 00 00
	- 12 Volt	20 1753 05 00 00

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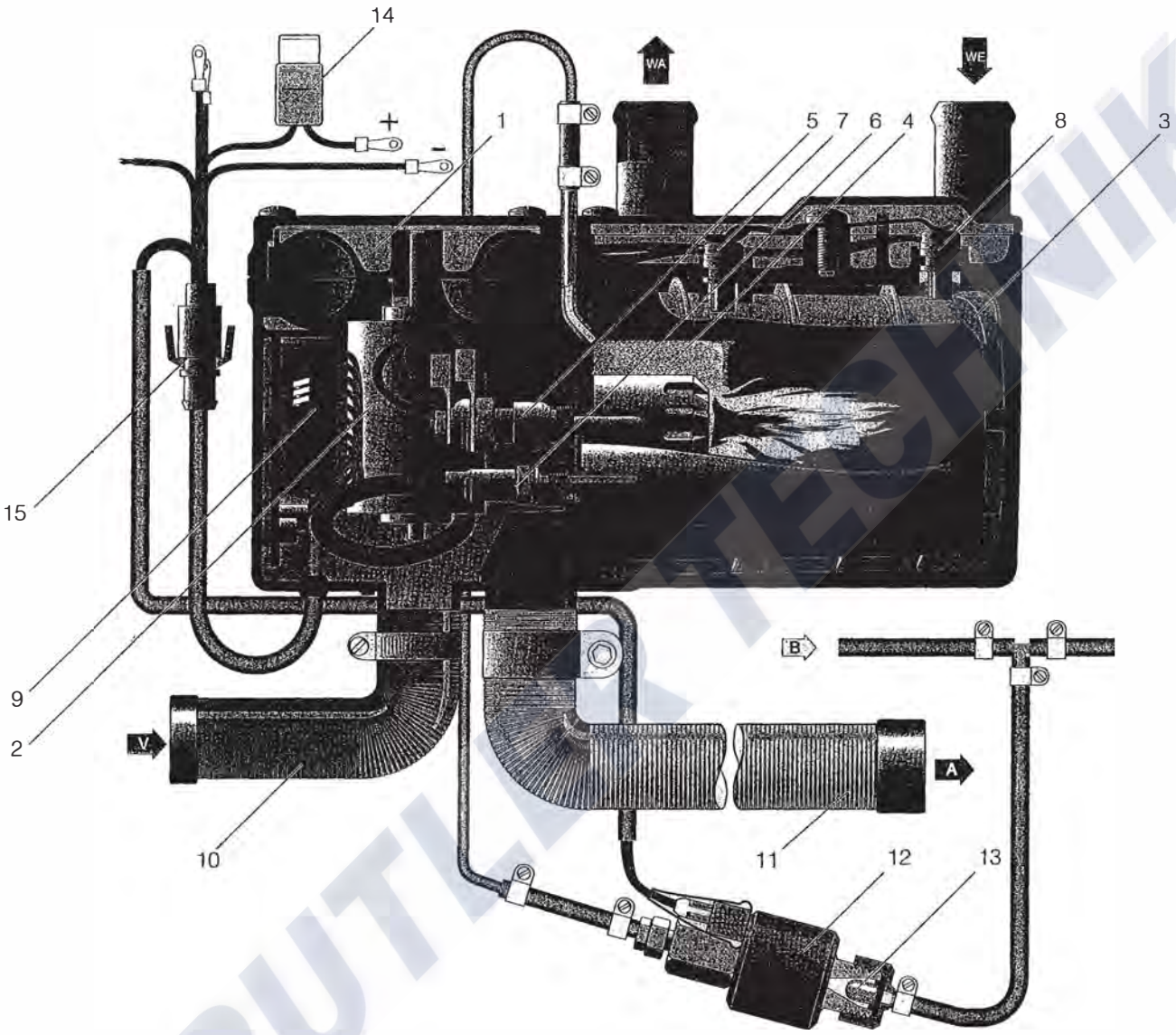
25 1926 95 10 33 01.1998 Modifications reserved Printed in Germany

Sectional view, Hydronic D3W Z

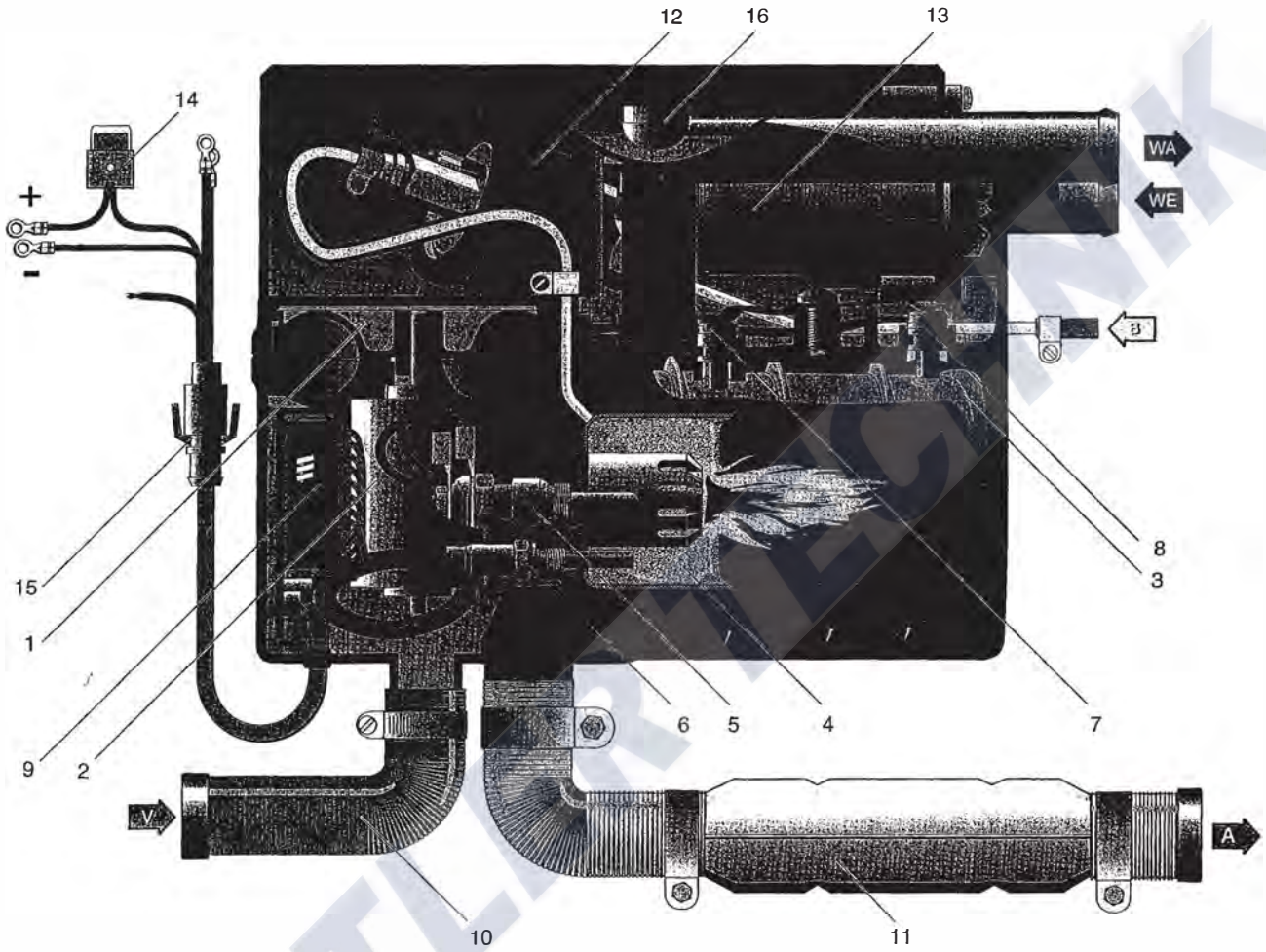


List of components

1 Combustion air blower
2 Electric motor
3 Heat exchanger
4 Combustion chamber
5 Pencil-type glow plug
6 Flame sensor
7 Temperature sensor
8 Overheating sensor
9 Control unit
10 Combustion air hose
11 Exhaust silencer
12 Metering pump
13 Pot-type strainer
14 Main fuse
15 Interface / 8-pin plug connector

A = Exhaust gas
B = Fuel
V = Combustion air
WA = Water outlet
WE = Water inlet

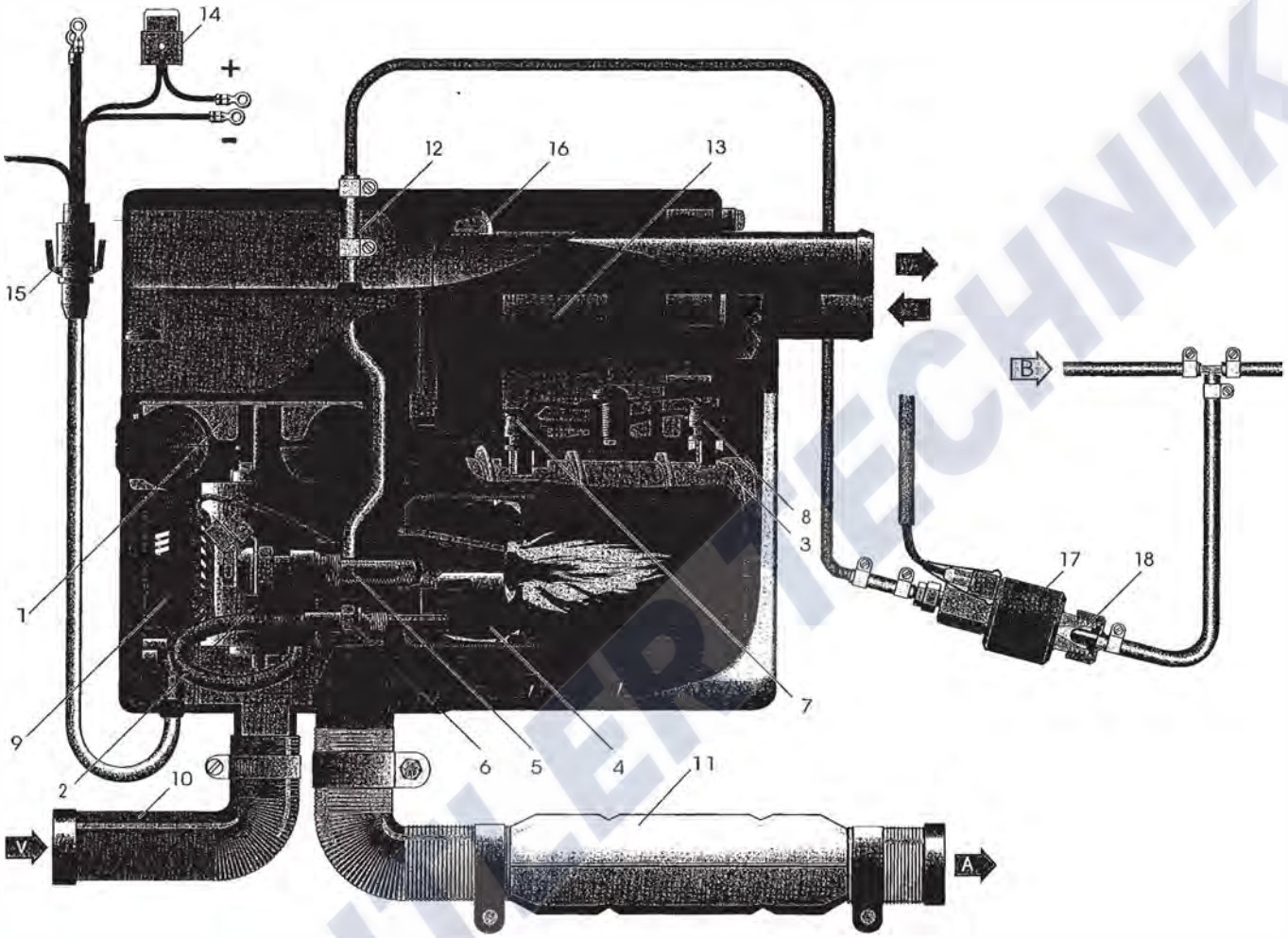
Sectional view, Hydronic D4W SC / D5W SC (D5W SC - Heat exchanger extended)



List of components

1	Combustion air blower	
2	Electric motor	
3	Heat exchanger	
4	Combustion chamber	
5	Pencil-type glow plug	
6	Flame sensor	
7	Temperature sensor	
8	Overheating sensor	
9	Control unit	
10	Combustion air hose	
11	Exhaust silencer	
12	Metering pump	
13	Water pump	
14	Main fuse	
15	Interface / 8-pin plug connector	
16	Vent	
A	=	Exhaust gas
B	=	Fuel
V	=	Combustion air
WA	=	Water outlet
WE	=	Water inlet

Sectional view, Hydronic B4W SC / B5W SC (B5W SC - Heat exchanger extended)



List of components

1	Combustion air blower	
2	Electric motor	
3	Heat exchanger	
4	Combustion chamber	
5	Pencil-type glow plug	
6	Flame sensor	
7	Temperature sensor	
8	Overheating sensor	
9	Control unit	
10	Combustion air hose	
11	Exhaust silencer	
12	Fuel connection	
13	Water pump	
14	Main fuse	
15	Interface / 9-pin plug connector	
16	Vent	
17	Metering pump	
18	Pot-type strainer	

A	=	Exhaust gas
B	=	Fuel
V	=	Combustion air
WA	=	Water outlet
WE	=	Water inlet

Description of function

Hydronic D3W Z

If the vehicle engine supplies insufficient heat (in the warming-up stage, in town traffic, traffic jam...), the supplementary heater will cut in automatically and supplement the vehicle heater in 2 stages:

HIGH - 3300 W)
or) heat flow.
LOW - 1600 W)

All starting and regulating functions, as well as the after-running function for cooling after switch-off, take place fully automatically. The electric power supply has fuse protection in the form of a 25 A main fuse.

As regards control and safety devices, please see the Description of Function for Hydronic D4W SC below.

Hydronic D4W SC / D5W SC / B4W SC / B5W SC

According to circuitry, the heater can be operated as pure auxiliary heater, or as combined auxiliary and supplementary heater to compensate for insufficient heat supply from the vehicle engine.

Auxiliary heater operation

Switch-on

When switched on, the pilot light in the operating control will illuminate (switched, timer ...).
The water pump will cut in and, in accordance with a predetermined program with pre-scavenging and pre-heating, combustion air blower, glow plug and metering pump commence combustion process.
When a steady flame has formed, the glow plug is switched off by timer.

Heating mode

According to heat requirement, the Hydronic regulates its output in the following stages:

	D4W SC	D5W SC	B4W SC	B5W SC
POWER	4000 W	---	4000 W	---
HIGH	3300 W	5000 W	3300 W	5000 W
LOW	1600 W	2400 W	1500 W	1500 W
OFF	controlled interval	controlled interval	controlled interval	controlled interval

The temperatures are permanently programmed into the electronic control unit.

If the heat requirement on "LOW" setting is so small that the cooling water temperature reaches 85 °C, the unit will enter a controlled interval. This is followed by the blower running on at high RPM for approximately 100 seconds. The pilot light illuminates in the controlled interval as well and the water pump continues running until controlled start takes place.

If the heater is switched off or malfunction shutoff occurs, the blower will run on at low RPM.

IMPORTANT:

Before switching on or pre-programming heater operation, set the vehicle heating lever to "HOT" (maximum setting) and the blower to "slow setting" (low current consumption).

Control and safety features

The flame is monitored by the flame sensor (6), and the maximum permissible temperature by the overheating sensor (8). These two sensors influence the control unit, which shuts the heater off in the event of malfunction.

1. If the heater does not ignite within 90 seconds after commencement of fuel delivery, the start cycle will be repeated.
   If the heater still does not ignite within 90 seconds from fuel delivery, malfunction shutoff will take place.

2. If the flame extinguishes of its own accord during operation, a fresh start cycle will initially be carried out.
   If the heater does not ignite within 90 seconds after commencement of fuel delivery, or ignites but extinguishes again, malfunction shutoff will take place. The fault which caused the shutdown can be cleared by turning the system off and then on again.

3. In the event of overheating (water starvation, inefficiently ventilated cooling water circuit), the overheating sensor (8) will respond, the fuel supply will be interrupted, this being followed by malfunction shutoff.
   After the cause of overheating has been eliminated, the unit can be restarted by switching off and then switching on again (provided that the unit has cooled down sufficiently).

4. If the voltage drops below approximately 10 volts or rises to over approximately 16 volts, malfunction shutoff will take place.

5. If the glow plug is defective or there is a break in the electric lead to the metering pump, the heater will not start.

6. The speed-governed burner motor is monitored at all times. If, in the event of a fault, it does not start up or is jammed, malfunction shutoff will take place.

Please note!

When carrying out electric welding on the vehicle, for protection of the control unit the positive pole of the battery should be disconnected and the lead connected to chassis.

If malfunctions occur, please check the following first of all:

- Fuel in the tank?
- Fuses OK?
- Electric leads, joints and connections OK?
- Combustion air and exhaust gas ducts unobstructed?

If combustion is sooty, please check the following:

Combustion air or exhaust gas ducts obstructed? ... clear obstruction.
Metering pump delivering too much? ... Measure fuel delivery; if necessary, replace metering pump.
Precipitation in the heat exchanger? ... Clean heat exchanger; replace if necessary.

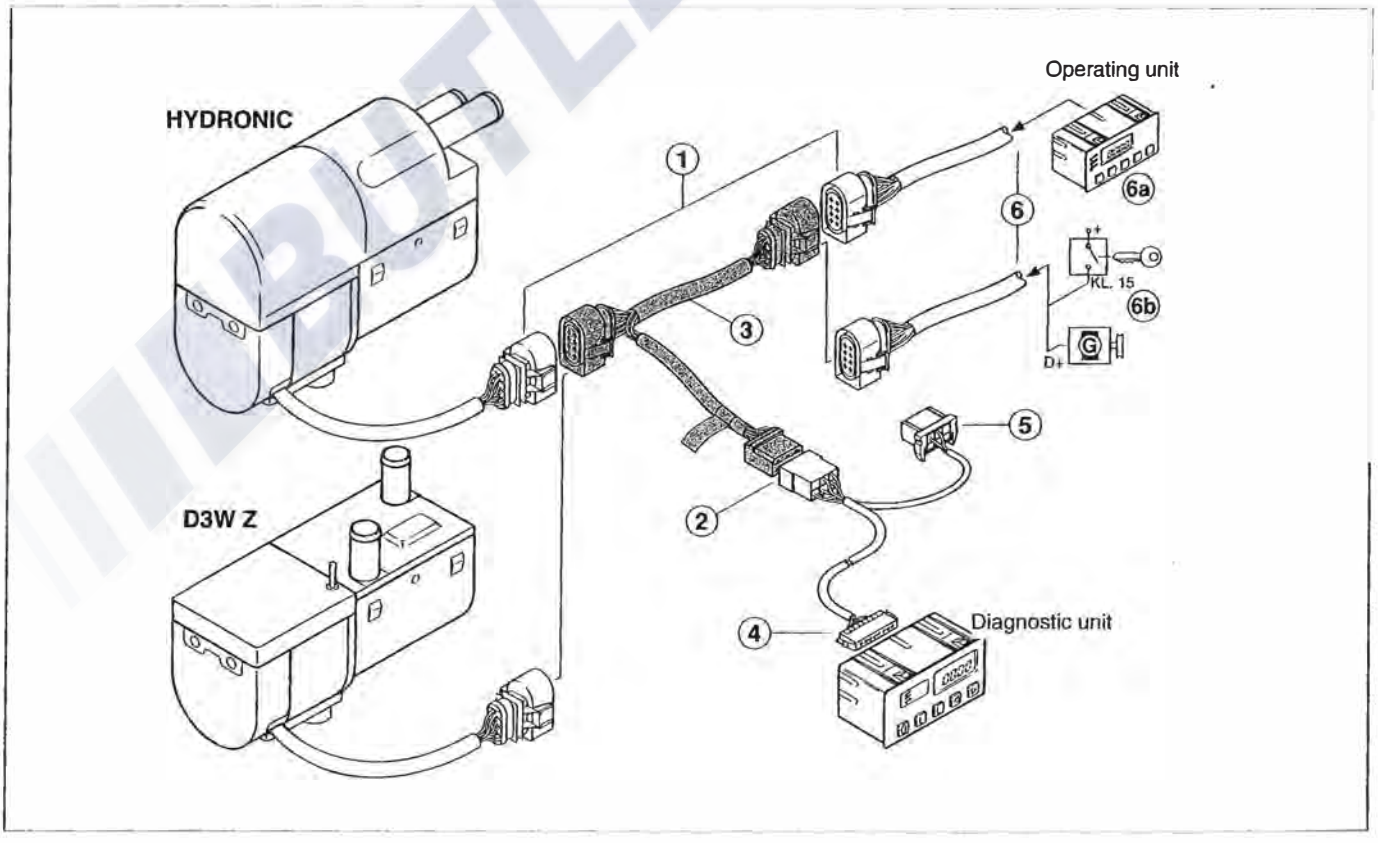
Function and malfunction test

Connection of the JE Diagnostic Unit to the Hyronic D3W Z or Hydronic D4W SC / D5W SC (B4W SC / B5W SC) using the adapter cable (see Figures below)

Order No. Adapter cable 22 1000 30 71 00

1. Disconnect the plug cabling operating unit/cable harness (1).
2. Connect the adapter cable (3) to the cabling (2) diagnostic unit.
3. Connect the adapter cable (3) to the cabling operating unit and to the cable harness.
4. Connect 8 terminal flat plug (4) to diagnostic unit.
5. Connector (5) remains free.
6. Start diagnostics
   6a HYDRONIC:
   - Turn on heating using operating unit
   6b Model D3W Z:
   - Turn on ignition and start motor.
   - If a 5° temperature switch has been fitted, this needs to be shorted out for commissioning.

Important:
Observe the order of the steps when connecting the equipment.



Carrying out the diagnostic test with the JE Diagnostic Unit or module clock

Order No. Diagnostic Unit 22 1512 89 00 00

The malfunction is displayed by the diagnostic unit in the form of a 3-digit number.
Malfunction codes, description of the malfunction and remedies are described on pages 8 and 9.

Fault Code	Description of fault	Comment / Remedy
000	no malfunction	- - -
010	Overvoltage shutoff	Voltage btw.1 (rt) and 2(br) at connector B1/S1 >16 V
011	Undervoltage shutoff	Voltage btw.1 (rt) and 2 (br) at connector < 10.2 V (voltage values must be present > 20 seconds) Check battery, regulator and electrical leads
012	Overheating	Check temperature at temperature or overheating sensor > 125 °C. Check water circuit
014	Possible overheating detected (difference evaluation)	Difference of measured values at temperature sensor >15 °C (min. 70 °C water temperature and metering pump in operation); Check temperature sensor and overheating sensor; replace if necessary. Check values: See Graph page 11 Check water throughput
015 *	Operation disable because perm. number of possible overheatings exceeded (over-heating counter)	Perm. overheating counter reading exceeded.Heating enable only possible by means of diagnostic system (press both "L L" keys simultaneously)
017	Overheating detected (hardware threshold value)	Temperature at temperature or overheating sensor > 130 °C, emergency OFF if Fault Code 012 or 014 not applicable; check water circuit, check temperature sensor and overheating sensor; replace if necessary; See Graph page 11
020	Glow plug break	Check glow plug and electrical cabling for continuity and change if necessary
021	Glow plug output overload	Check glow plug and electrical cabling for continuity and change if necessary
030	Combustion air blower motor EMF outside perm. range	Blower impeller or electric motor jammed (frozen solid, dirty, etc.) Remedy jam, replace electric motor if necessary
031	Combustion air blower motor break	Check lead to combustion air motor (el. motor) for continuity, replace electric motor if necessary
032	Combustion air blower motor short-circuit	Check combustion air blower motor (electric motor); replace if necessary. Check supply lead (chafed, etc.)
038 *	Vehicle fan relay control break	Check electric lead to relay, remedy break, replace relay if) necessary
039 *	Vehicle fan relay control short-circuit	Check electric lead to relay, remedy short-circuit replace relay if necessary
041 *	Water pump break	Check supply lead to water pump for continuity, remedy break, replace water pump if necessary
042 *	Water pump short-circuit (see page 11 for values)	Check supply lead to water pump for short-circuit, check water pump, replace if necessary
047	Metering pump short-circuit	Check supply lead to metering pump for short-circuit, check metering pump, replace if necessary
048	Metering pump break	Check supply lead to metering pump for continuity, remedy break, replace metering pump if necessary
050 *	Operation disable due to excessive start attempts	Safety time counter reading exceeded, Heating only possible via diagnostic system (press "LL" keys simultaneously)

* does not apply to Hydronic D3W Z

Fault Code	Description of fault	Comment / Remedy
051	Cold blow time exceeded	At start, if flame sensor above 70 °C > 240 sec.; Check exhaust gas and combustion air supply, check flame sensor, replace if necessary. Flame sensor values: see Graph page 11
052	Safety time exceeded	When all perm. start attempts used up; check fuel delivery and fuel supply: see Graph page 10, Check exhaust gas and combustion air ducts
053 *	Flame cutout from POWER control stage	Prelim. warning: heater remains ready to operate if start repeats still permissible. Warning signal is cancelled if a perm. repeat successful. Malfunction: if no further start repeat permissible. Check fuel delivery and fuel supply: see Graph page 10. Check exhaust gas and combustion air ducts. If combustion OK -→ check flame sensor, replace if necessary. Flame sensor values: see Graph on page 11
054	Flame cutout, HIGH setting	see Remark for Code 053
056	Flame cutout, LOW setting	see Remark for Code 053
060	Temperature sensor break (see page 11 for values)	Check connecting leads. Ohmic value with break at the plug B2 > 2 MΩ, see circuit diagram (observe the control unit design).
061	Temperature sensor short-circuit (see page 11 for values)	Check connecting leads. Ohmic value with short-circuit at the plug B2 < 50 Ω, see circuit diagram (observe the control unit design).
064	Flame sensor break (see page 11 for values)	Check connecting leads. Ohmic value with break at the plug B2 > 3040 Ω, see circuit diagram (observe the control unit design).
065	Flame sensor short-circuit (see page 11 for values)	Check connecting leads. Ohmic value with short-circuit at the plug B2 < 780 Ω, see circuit diagram (observe the control unit design).
071	Overheating sensor break (see page 11 for values)	Check connecting leads. Ohmic value with break at the plug B2 > 2 MΩ, see circuit diagram (observe the control unit design).
072	Overheating sensor short-circuit (see page 11 for values)	Check connecting leads. Ohmic value with short-circuit at the plug B2 < 50 Ω, see circuit diagram (observe the control unit design).
090	Control unit defective (internal fault/Reset)	Internal fault in the microprocessor / memory exists. Exchange the control unit.
091	External interference voltage	Control unit disturbance due to interference voltage from the electrical system. Possible causes: Poor batteries, battery charger, other sources of interference. Eliminate the interference voltage.
092 093 094 097	Control unit defective (ROM error) Control unit defective (RAM error) Control unit defective (EEPROM error) Control unit defective	Internal fault in the microprocessor / memory exists. Exchange the control unit.
098 – 103	Control unit defective (EEPROM error)	Exchange the control unit

* does not apply to Hydronic D3W Z

Measurement of fuel delivery

Metering pump: approx. 10 Ω

MPORTANT ! Fuel measurement should only be carried out with properly charged battery. During measurement, at least 11 volts or maximum 13 volts should be applied to the control unit.

1. Preparation

Remove metering pump cover (Hydronic D4W SC / D5W SC only).
Pull the fuel line off the heater or from the combustion chamber (Hydronic D4W SC / D5W SC) and insert in a graduated measuring glass.
Switch the heater on; when fuel delivery is uniform (approximately 40 seconds after switching on), the fuel line is full and vented.

2. Measurement

Switch heater on.
Fuel delivery commences approximately 40 seconds after switching on.
Hold the graduated measuring glass at glow plug height during measurement.
After 90 seconds of fuel delivery, it will shut off automatically.
Switch heater off.
Read off quantity of fuel delivered in the graduated measuring glass.

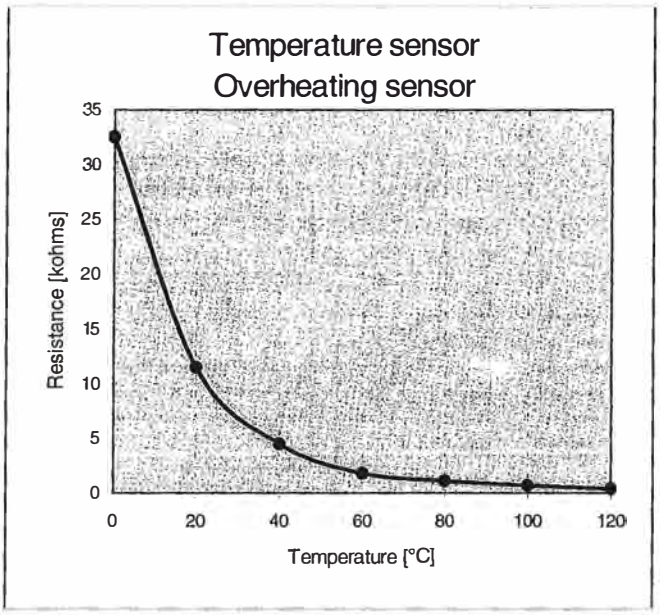
3. Evaluation

Nominal value	Hydronic D3W Z	Hydronic D4W SC	Hydronic D5W SC	Hydronic B4W SC	Hydronic B5W SC
max.:	7,8 cm^3 / 90 s	7,7 cm^3 / 90 s	8,6 cm^3 / 90 s	10,7 cm^3 / 90 s	12,0 cm^3 / 90 s
min.:	6,8 cm^3 / 90 s	6,7 cm^3 / 90 s	7,5 cm^3 / 90 s	9,3 cm^3 / 90 s	10,5 cm^3 / 90 s

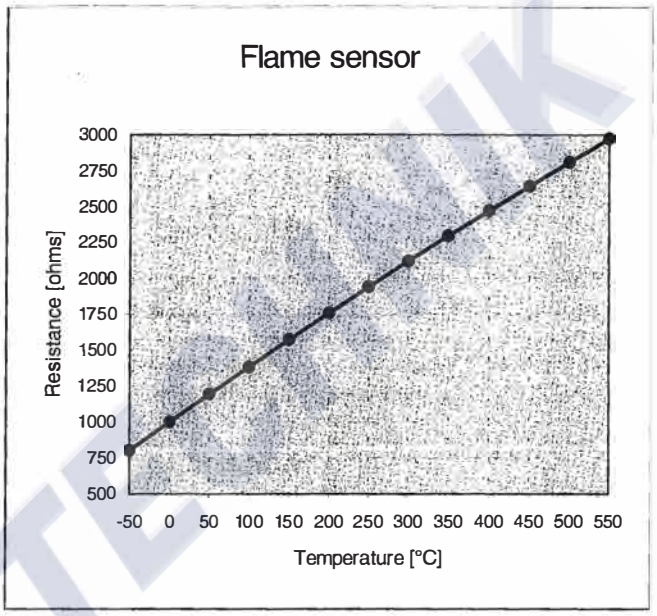
If the measured quantity of fuel is over or under the nominal value, the metering pump must be replaced.

Checking the sensors

To check the sensors, measure the resistance at current temperature, see following diagrams.

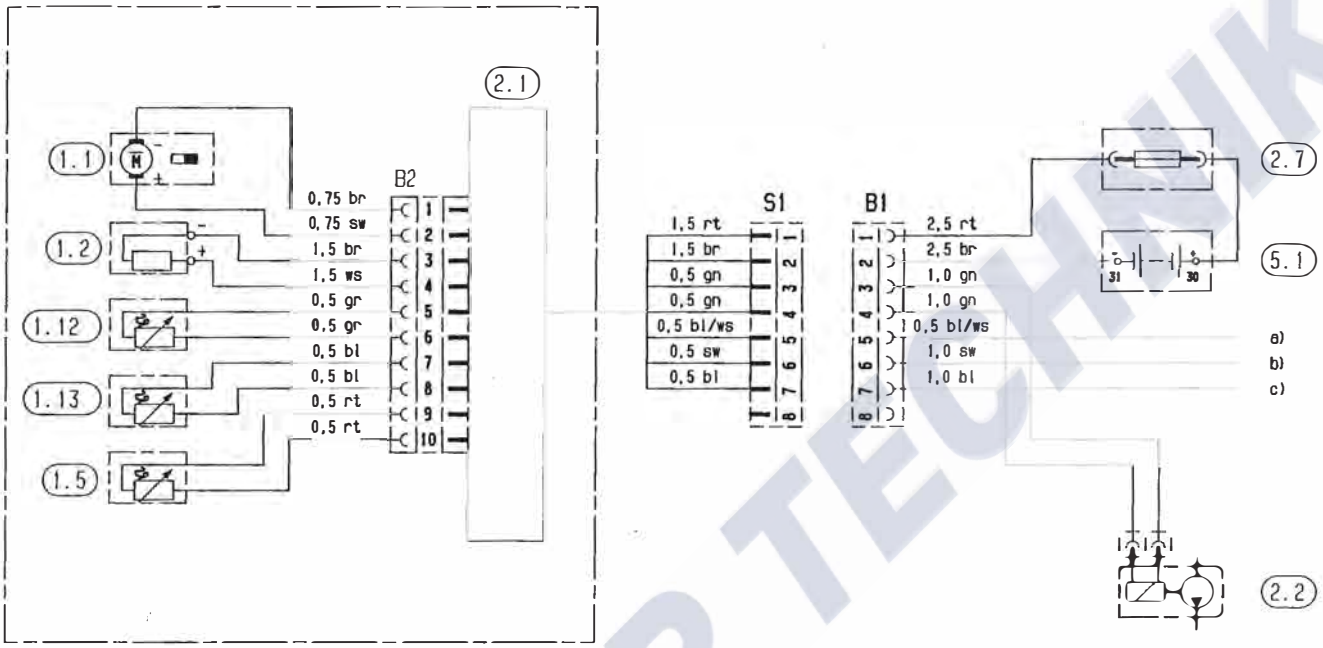


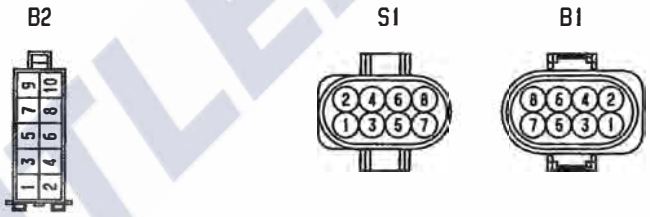
R > 2 MΩ = open circuit
R < 50 Ω = short circuit



R > 3040 Ω = open circuit
R < 780 Ω = short circuit

Circuit diagram Hydronic D3W Z





List of components

1.1	Burner motor	5.1	Battery	bl	= blue
1.2	Glow plug			br	= brown
1.5	Overheating sensor			gn	= green
1.12	Flame sensor	a)	Diagnostics	gr	= grey
1.13	Temperature sensor	b)	+15 or temperature switch	rt	= red
		c)	D+ alternator	sw	= black
2.1	Control unit			ws	= white
2.2	Metering pump				
2.7	25 A main fuse				

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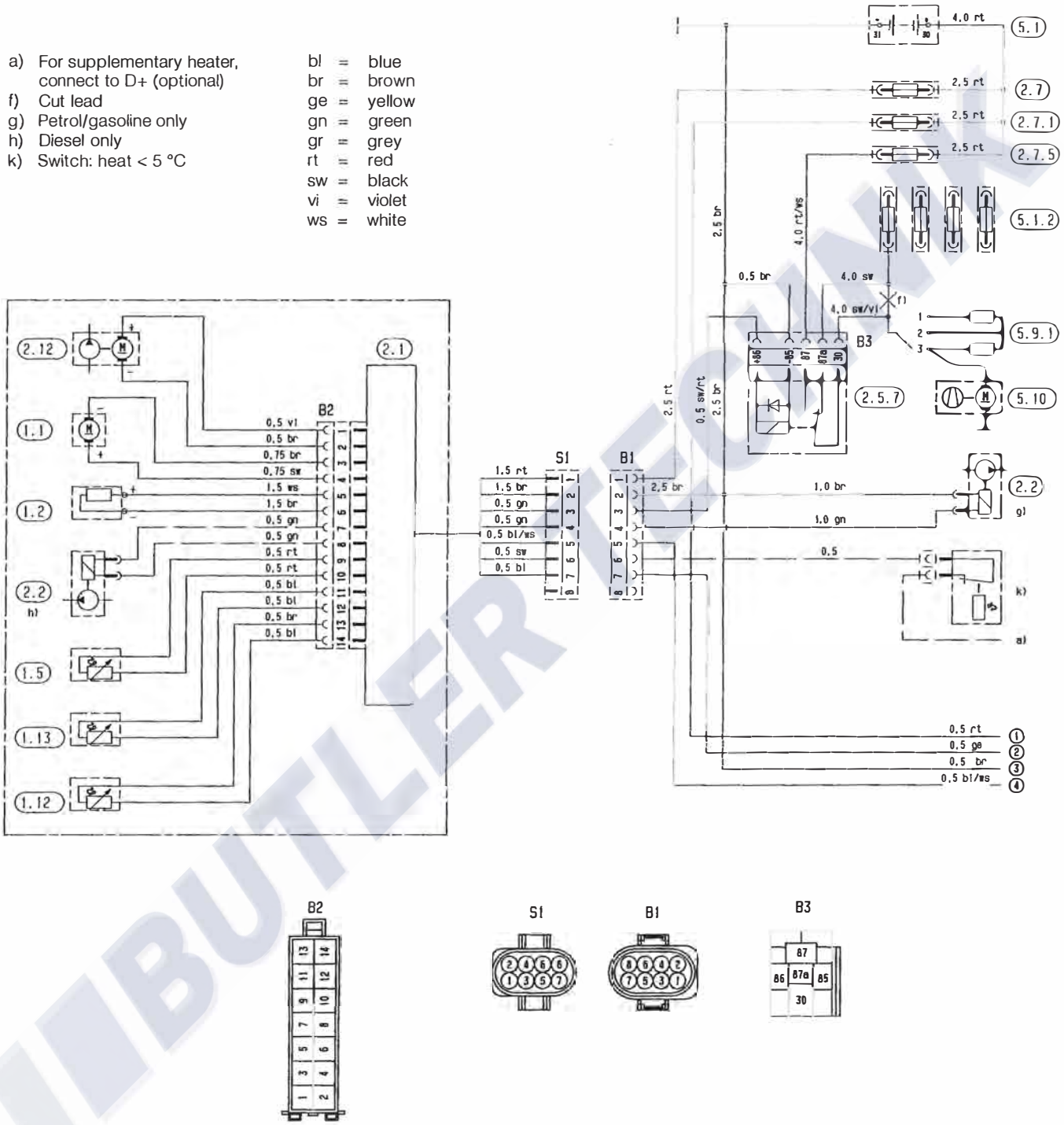
Circuit diagram Hydronic D4W SC / B4W SC (continued page 15)

a) For supplementary heater, connect to D+ (optional)
f) Cut lead
g) Petrol/gasoline only
h) Diesel only
k) Switch: heat < 5 °C

bl = blue
br = brown
ge = yellow
gn = green
gr = grey
rt = red
sw = black
vi = violet
ws = white



List of components (continued page 15)

1.1	Burner motor	2.1	Control unit	5.1	Battery
1.2	Glow plug	2.2	Metering pump	5.1.2	Vehicle fuse block
1.5	Overheating sensor	2.5.7	Vehicle fan relay	5.9.1	Vehicle fan switch
		2.7	25 A main fuse	5.10	Vehicle fan
1.12	Flame sensor	2.7.1	5 A operation fuse		
1.13	Temperature sensor	2.7.5	Vehicle fan fuse 25 A		
		2.12	Water pump		

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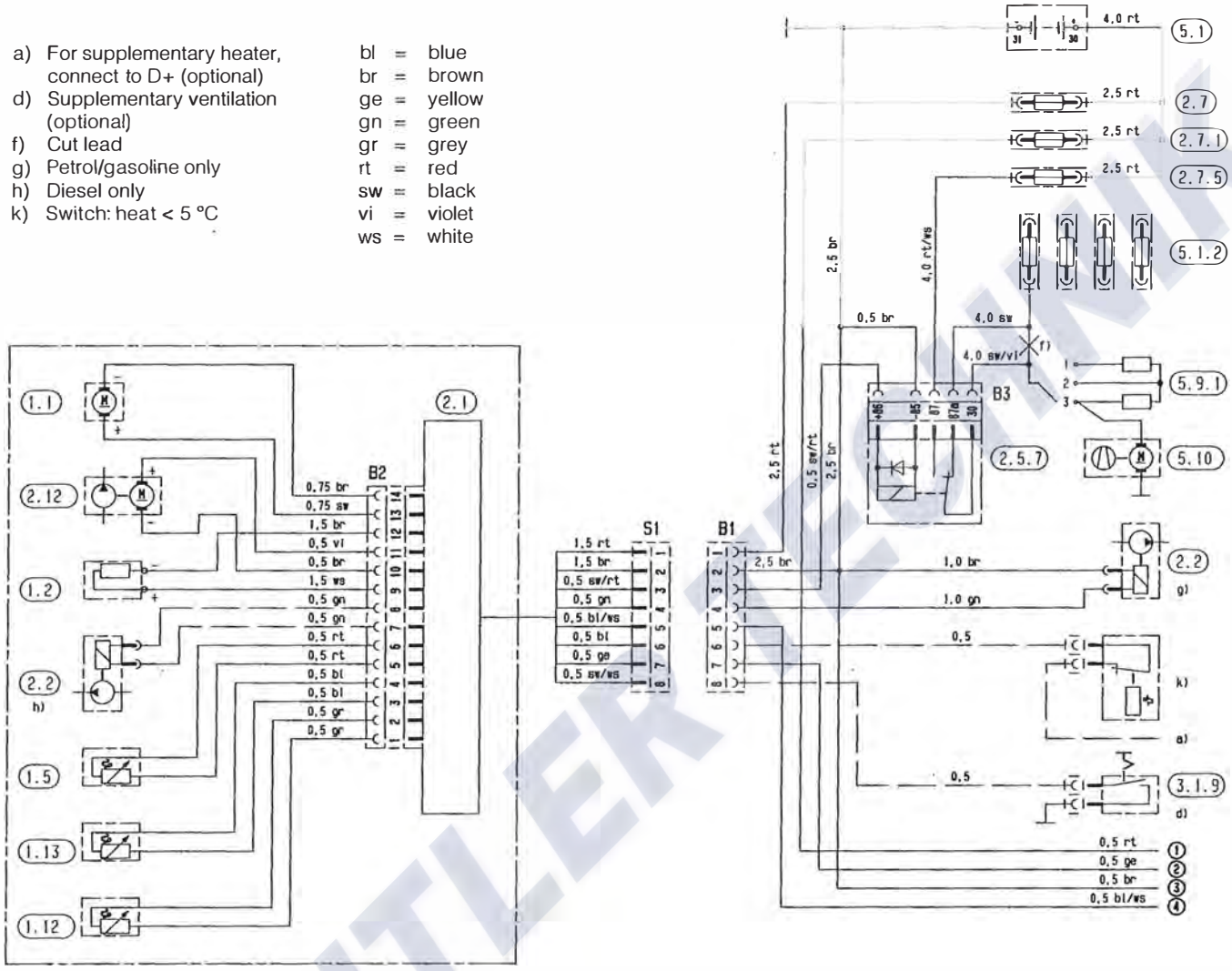
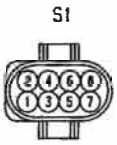
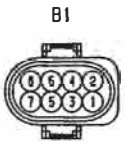
Circuit diagram Hydronic D5W SC / B5W SC (continued page 15)

a) For supplementary heater, connect to D+ (optional)
d) Supplementary ventilation (optional)
f) Cut lead
g) Petrol/gasoline only
h) Diesel only
k) Switch: heat < 5 °C

bl = blue
br = brown
ge = yellow
gn = green
gr = grey
rt = red
sw = black
vi = violet
ws = white







List of components (continued page 15)

1.1	Burner motor	2.1	Control unit	3.1.9	Heat / Ventilate selector switch
1.2	Glow plug	2.2	Metering pump		
1.5	Overheating sensor	2.5.7	Vehicle fan relay	5.1	Battery
		2.7	25 A main fuse	5.1.2	Vehicle fuse block
1.12	Flame sensor	2.7.1	5 A operation fuse	5.9.1	Vehicle fan switch
1.13	Temperature sensor	2.7.5	Vehicle fan fuse 25 A	5.10	Vehicle fan
		2.12	Water pump		

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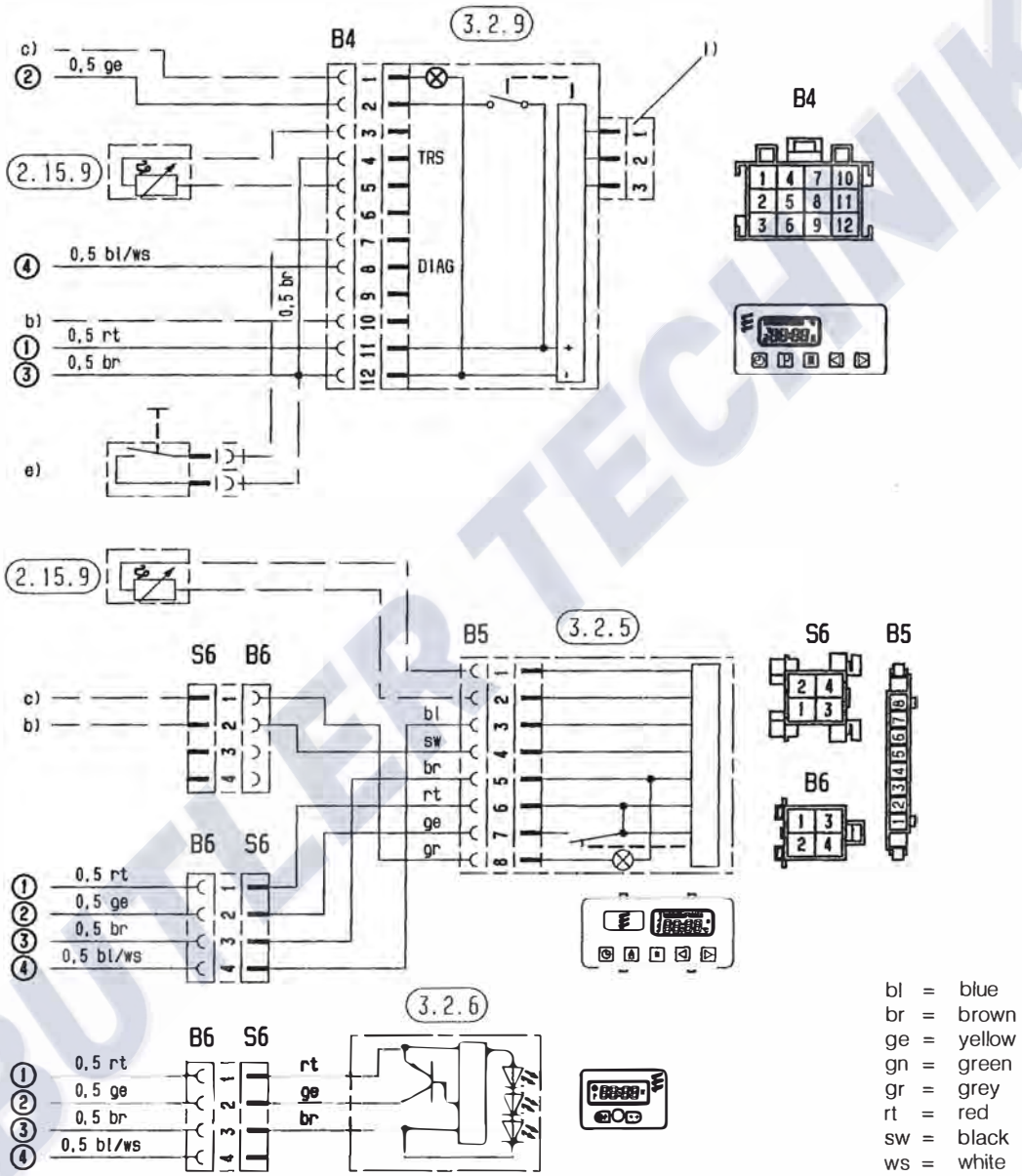
Circuit diagram, operating controls for Hydronic D4W SC / D5W SC / B4W SC / B5W SC



bl = blue
br = brown
ge = yellow
gn = green
gr = grey
rt = red
sw = black
ws = white

List of components (continued)

2.15.9 Ambient temperature sensor

3.2.5 Square 7-day timer
3.2.6 Mini timer
3.2.9 Square timer, module

b) Connect to +15
c) Lighting terminal '58'
e) External ON/OFF button (optional)
i) Spark module connection

Length positive + length negative:
≤= 5 m: cross-section 4 mm²
≥ 5 m ≤= 8 m: cross-section 6 mm²

Insulate unused lead ends.
Connector and socket housings are hown from lead entry side.

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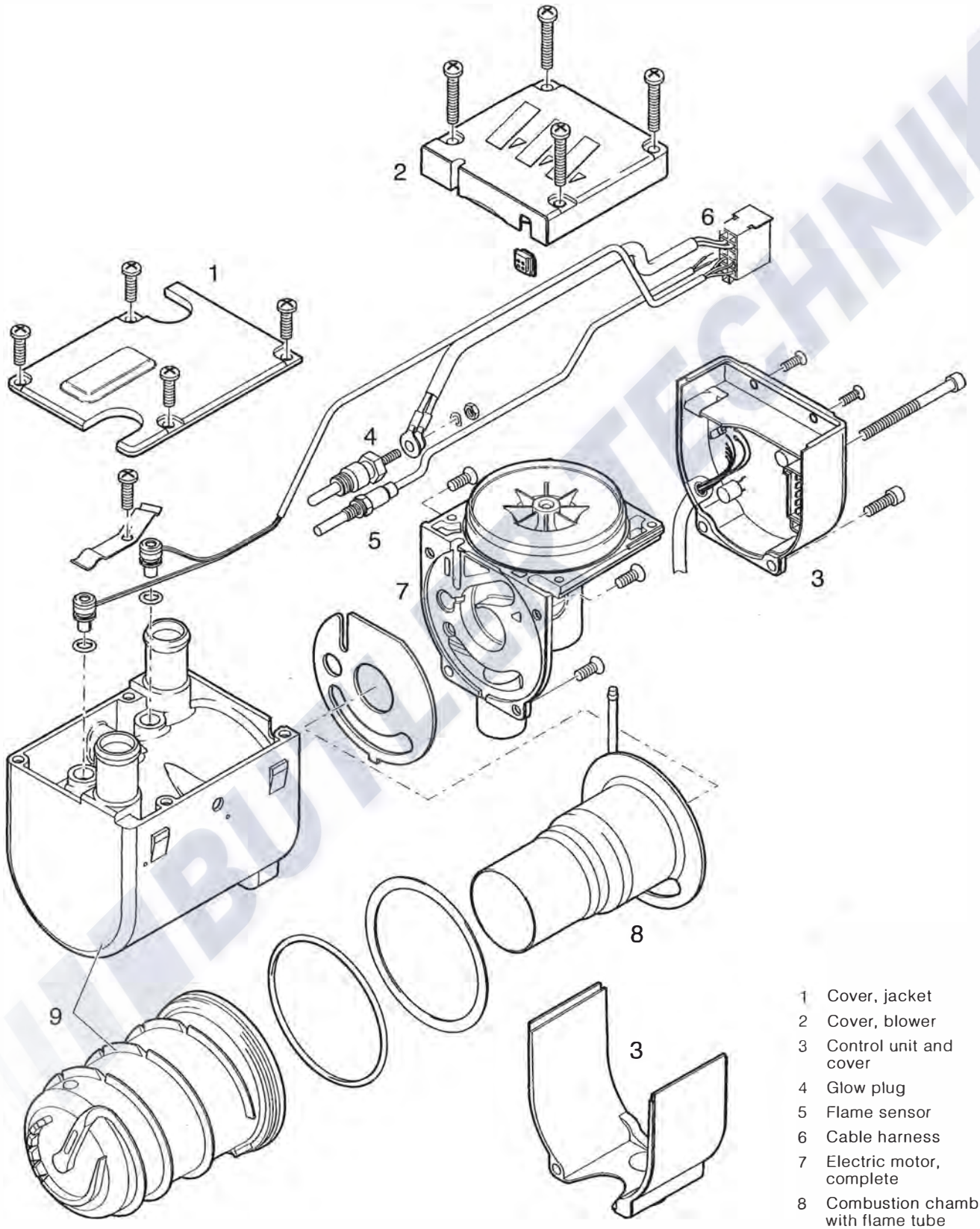
Repair Instructions, Hydronic D3W Z



1 Cover, jacket
2 Cover, blower
3 Control unit and cover
4 Glow plug
5 Flame sensor
6 Cable harness
7 Electric motor, complete
8 Combustion chamber with flame tube
9 Heat exchanger and jacket

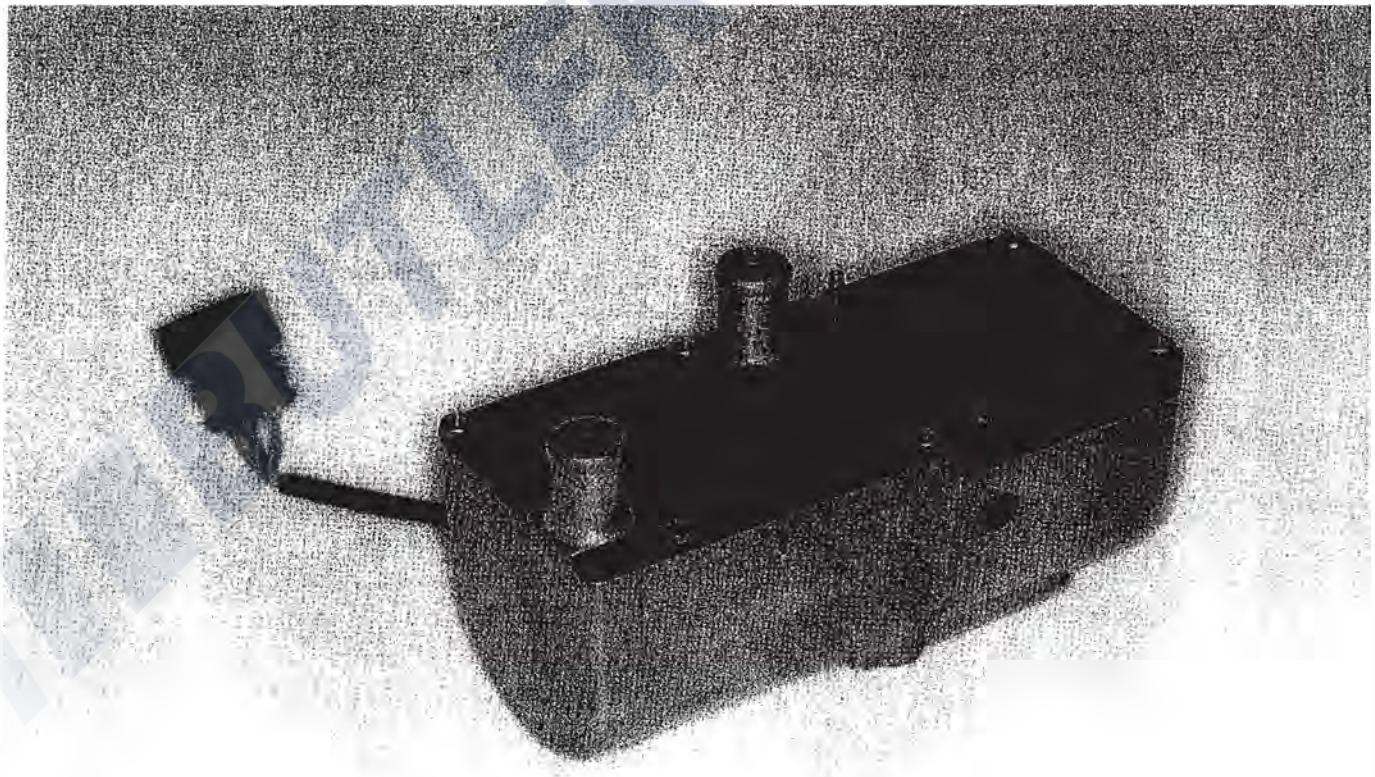
Order No., see Spare Parts List

Repair steps

Disassembly / Assembly

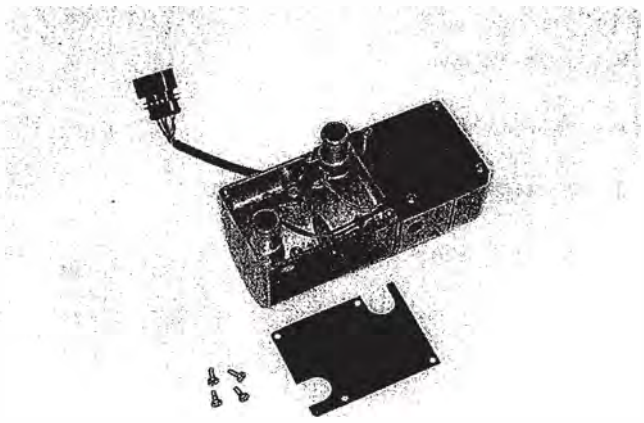
1. Cover, jacket
2. Cover, blower
3. Control unit and cover
4. Glow plug
5. Flame sensor
6. Cable harness
7. Electric motor, complete
8. Combustion chamber with flame tube
9. Heat exchanger and jacket

View of complete unit, Hydronic D3W Z

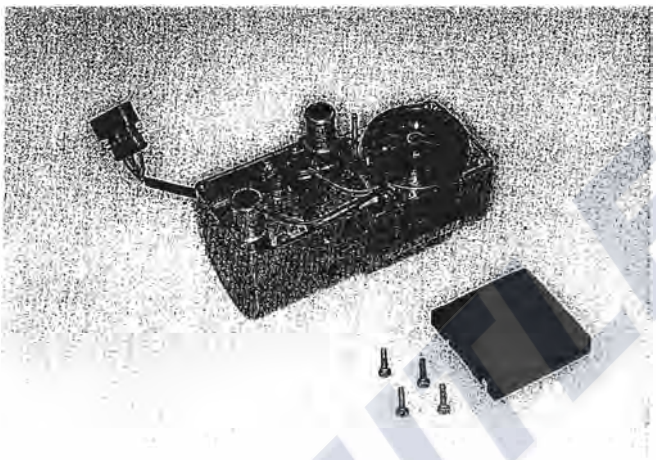


Disassembly / Assembly

1. Cover, jacket



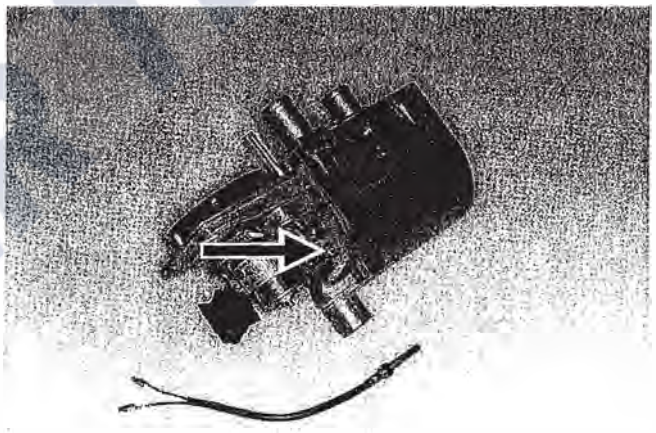
2. Cover, blower



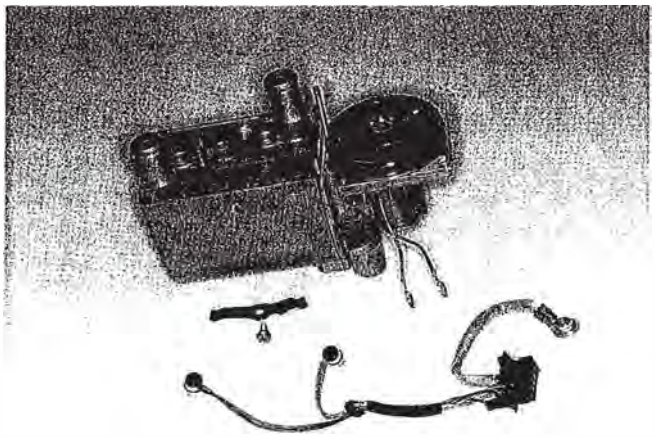
3. Control unit and cover

4. Glow plug

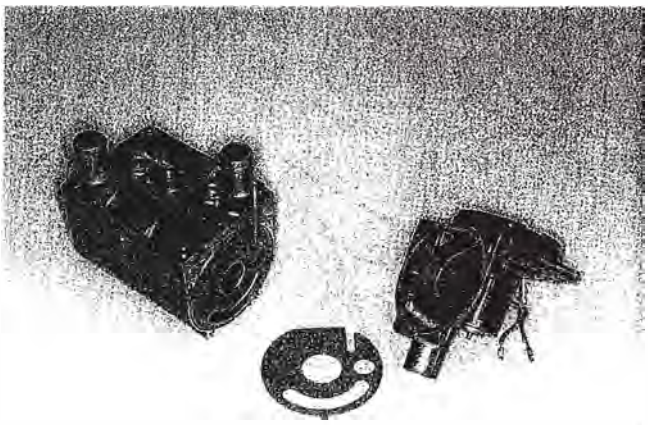
5. Flame sensor
For removal of tab receptacles, use AMP extractor tool No. 725 864-1



6. Cable harness



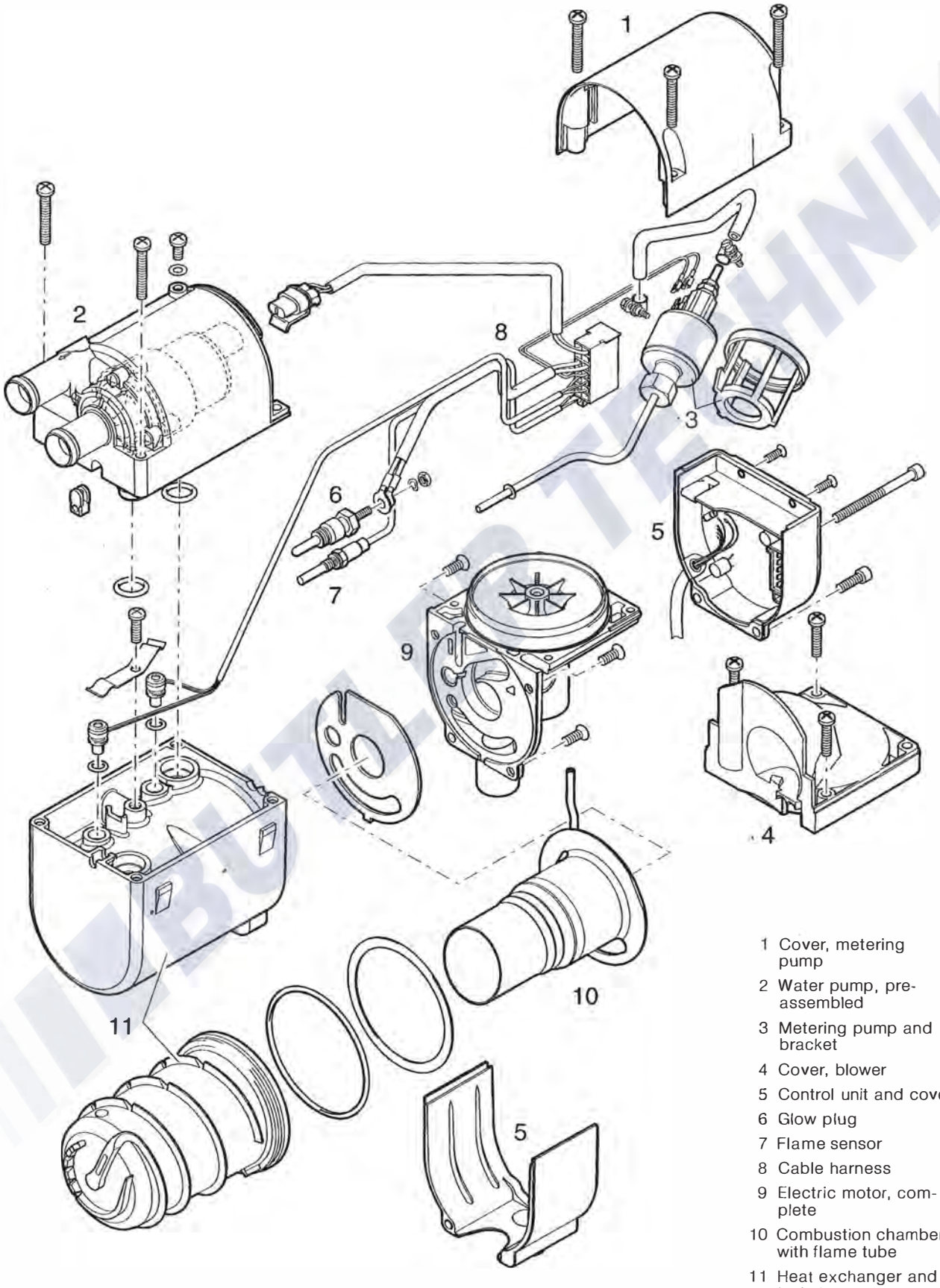
7. Electric motor, complete



8. Combustion chamber with flame tube

9. Heat exchanger and jacket
Align slot on heat exchanger (arrow) with lug in jacket

Repair Instructions, Hydronic D4W SC / D5W SC



1 Cover, metering pump
2 Water pump, pre-assembled
3 Metering pump and bracket
4 Cover, blower
5 Control unit and cover
6 Glow plug
7 Flame sensor
8 Cable harness
9 Electric motor, complete
10 Combustion chamber with flame tube
11 Heat exchanger and jacket

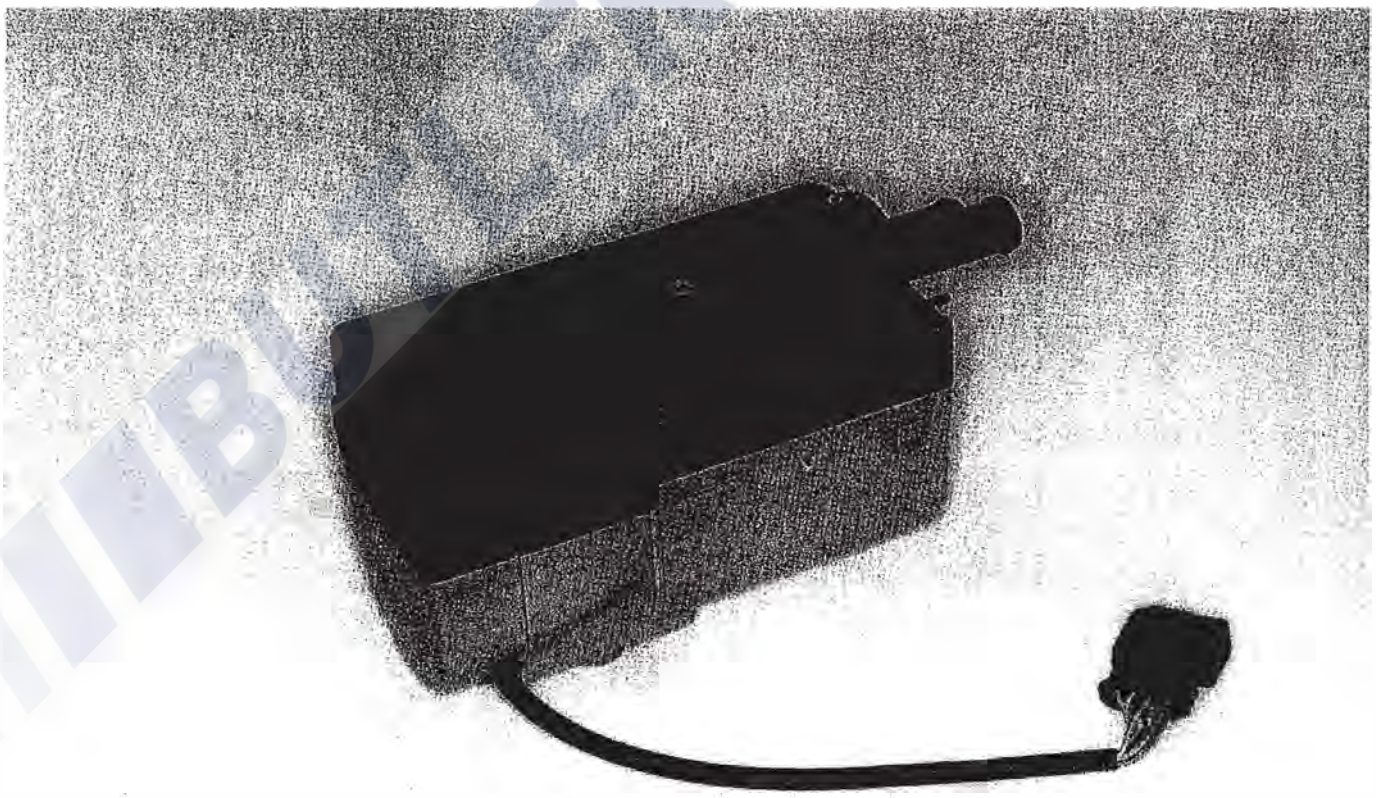
Order No., see Spare Parts List

Repair steps

Disassembly / Assembly

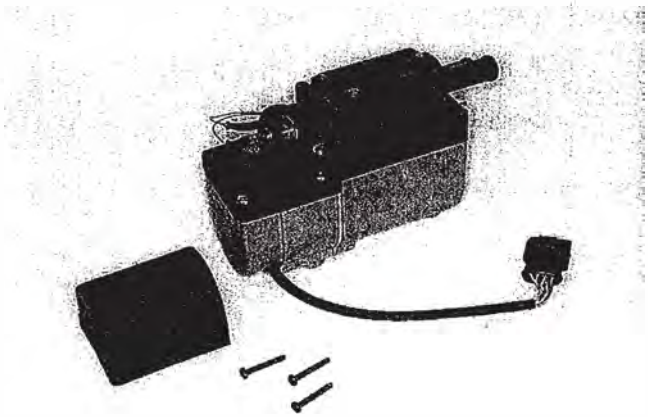
1. Cover, metering pump
2. Water pump, pre-assembled
3. Metering pump and bracket
4. Cover, blower
5. Control unit and cover
6. Glow plug
7. Flame sensor
8. Cable harness
9. Electric motor, complete
10. Combustion chamber with flame tube
11. Heat exchanger and jacket

View of complete unit, Hydronic D4W SC / D5W SC

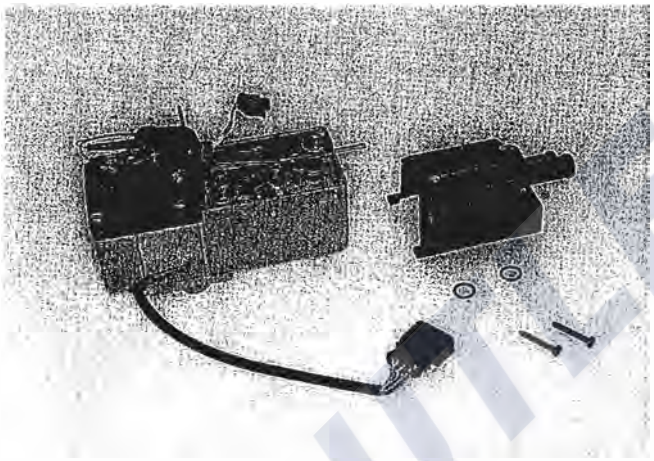


Disassembly / Assembly

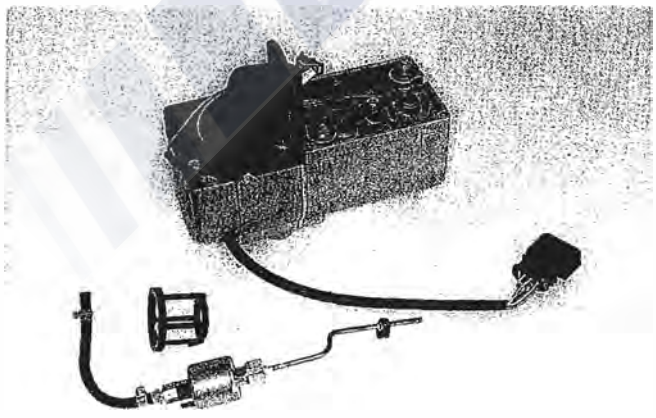
1. Cover, metering pump



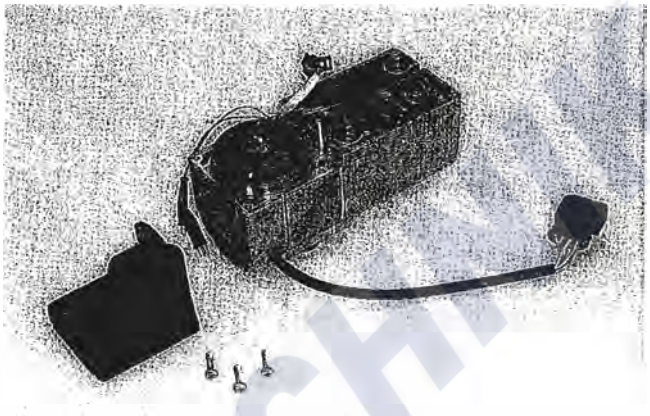
2. Water pump, pre-assembled
When mounting, place O-rings on connection on water pump housing



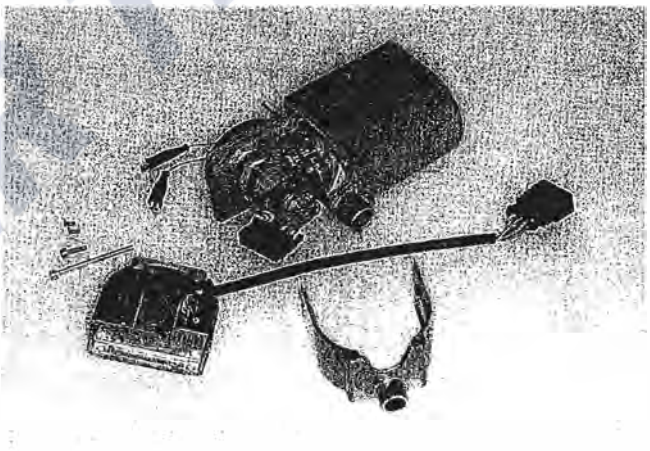
3. Metering pump and bracket



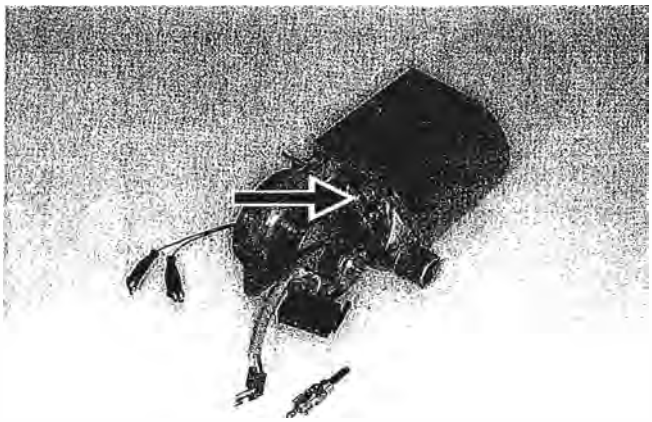
4. Cover, blower



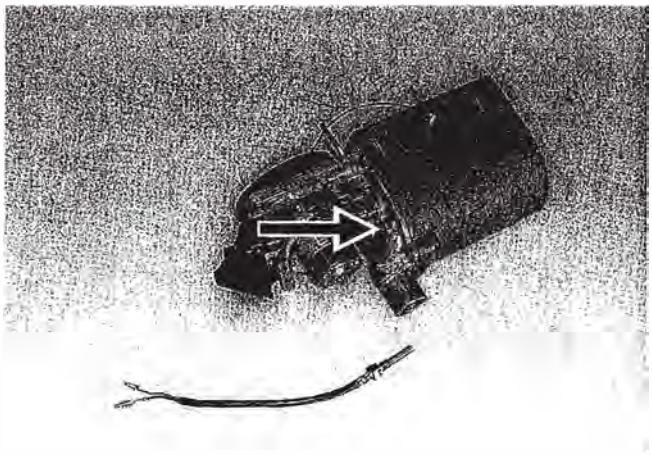
5. Control unit and cover



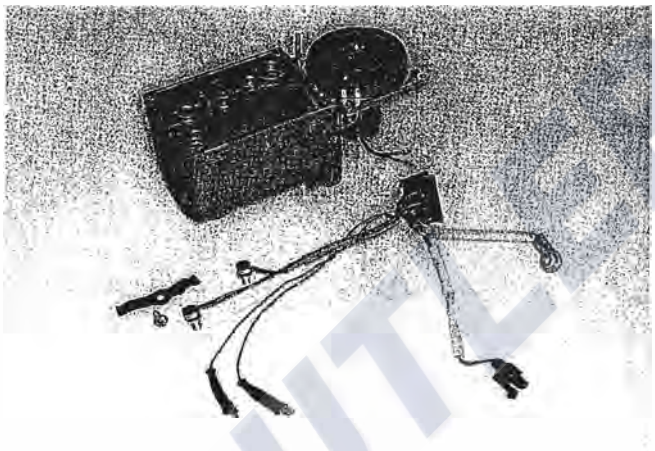
6. Glow plug



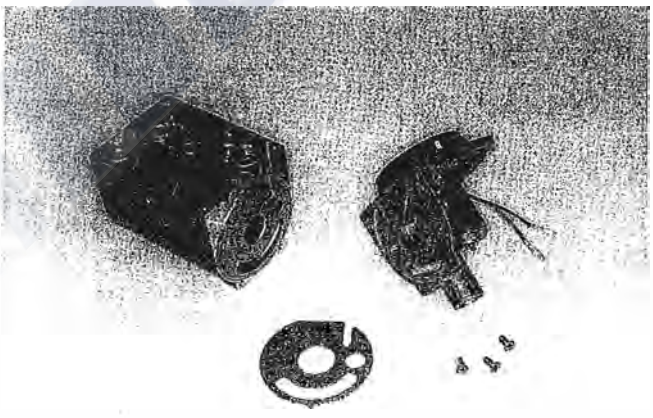
7. Flame sensor
For removal of tab receptacles, use AMP extractor tool No. 725 864-1



8. Cable harness

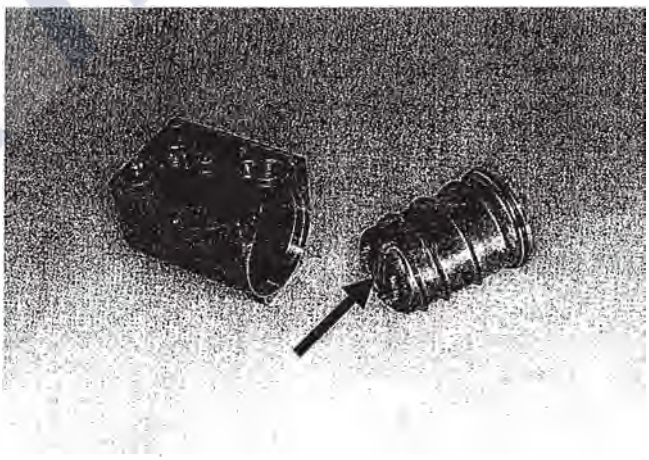


9. Electric motor, complete

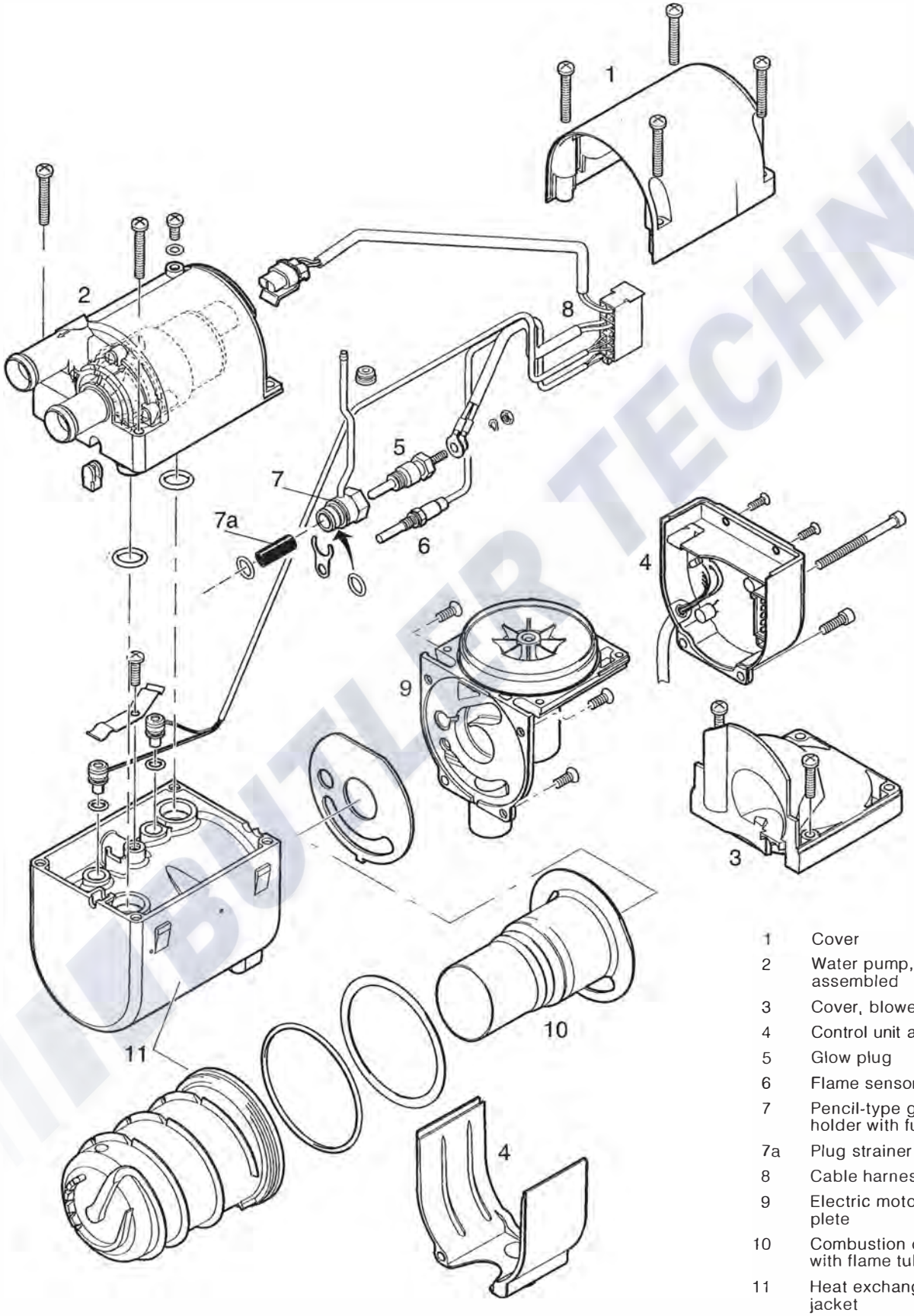


10. Combustion chamber with flame tube

11. Heat exchanger and jacket
Align slot on heat exchanger (arrow) with lug in jacket



Repair Instructions, Hydronic B4W SC / B5W SC



1	Cover
2	Water pump, pre-assembled
3	Cover, blower
4	Control unit and cover
5	Glow plug
6	Flame sensor
7	Pencil-type glow plug holder with fuel feed
7a	Plug strainer
8	Cable harness
9	Electric motor, complete
10	Combustion chamber with flame tube
11	Heat exchanger and jacket

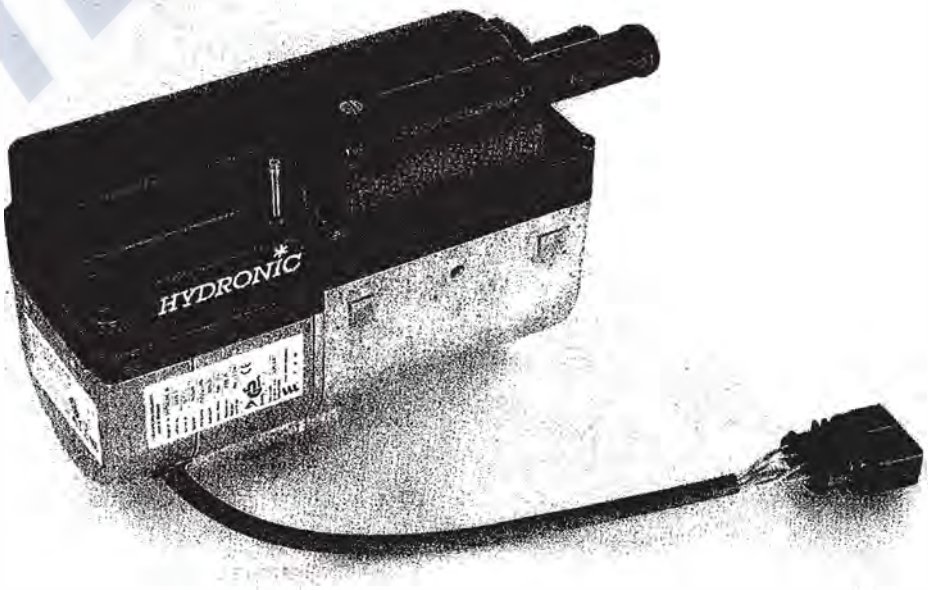
Order No., see Spare Parts List

Repair steps

Disassembly / Assembly

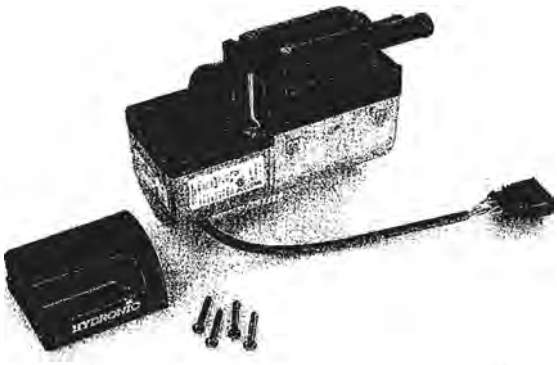
1. Cover
2. Water pump, pre-assembled
3. Cover, blower
4. Control unit and cover
5. Glow plug
6. Flame sensor
7. Pencil-type glow plug holder with fuel feed
8. Cable harness
9. Electric motor, complete
10. Combustion chamber with flame tube
11. Heat exchanger and jacket

View of complete unit, Hydronic B4W SC / B5W SC

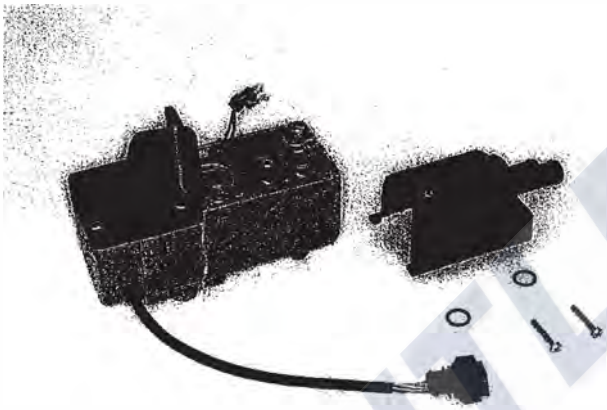


Repair steps, Disassembly / Assembly

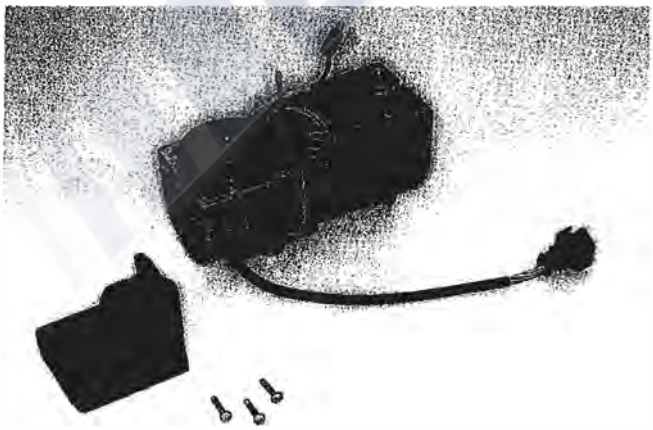
1. Cover



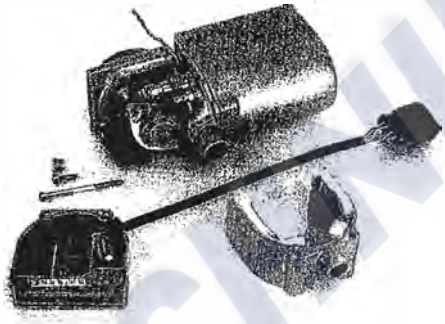
2. Water pump, pre-assembled
When mounting, place O-rings on connection on water pump housing.



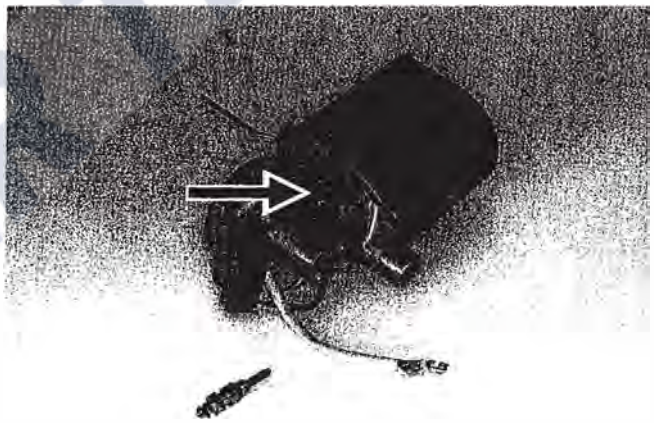
3. Cover, blower



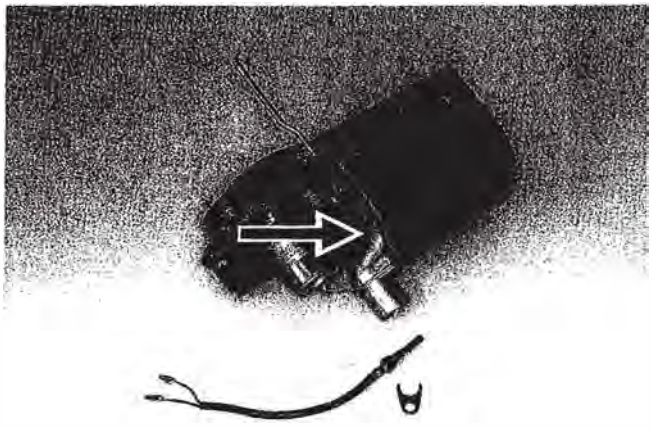
4. Control unit and cover



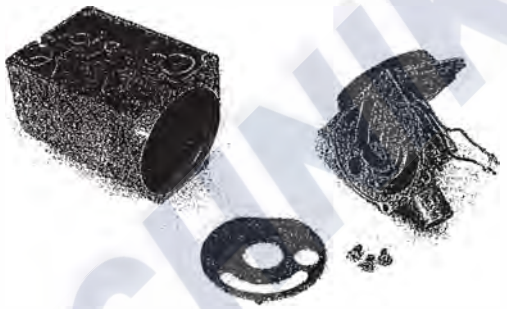
5. Glow plug
When slackering and lightening the pencil-type glow plug, hold the glow plug holder in position by its hexagon.



6. Flame sensor
For removal of tab receptacles, use AMP extractor tool No. 725 864-1.



9. Electric motor, complete

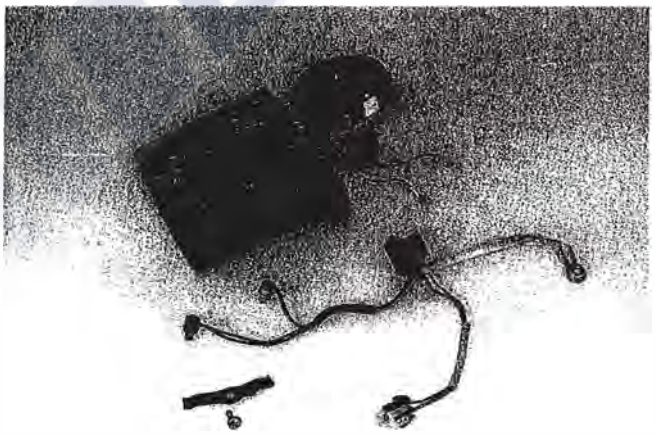


7. Pencil-type glow plug holder with fuel feed

Important - O-rings: when changing the plug strainer, the two O-rings should be renewed at the same time.
The passage for plug venting must be unobstructed.
Fit plug strainer flush on the glow plug shank; the weld spots of the plug strainer must locate opposite the plug vent.

10. Combustion chamber with flame tube

8. Cable harness



11. Heat exchanger and jacket
Align slot on heat exchanger (arrow) with lug in jacket.