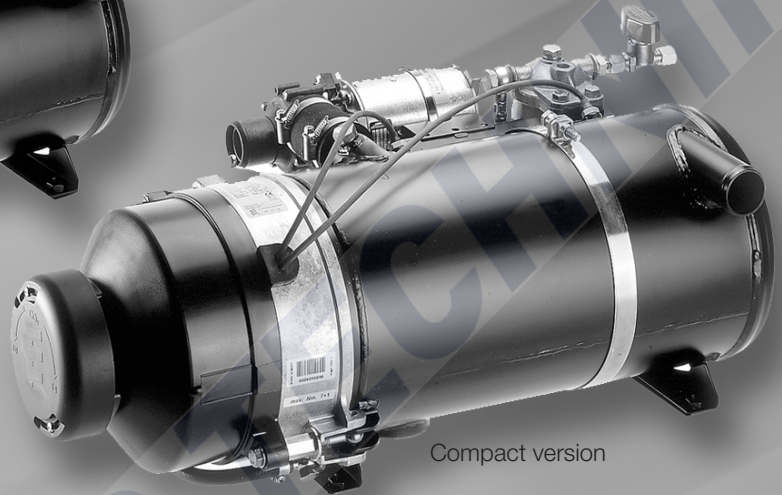


HYDRONIC L-II

Troubleshooting and Repair Instructions



Normal version



Compact version

Heater

Order No. – normal version

Order No. – compact version

Hydronic L 16	25 2486 02 00 00	---	
Hydronic L 24	25 2487 02 00 00	25 2487 05 00 00	
Hydronic L 30	25 2488 02 00 00	25 2488 05 00 00	25 2599 05 00 00
Hydronic L 35	25 2489 02 00 00	25 2600 02 00 00	25 2489 05 00 00

**Engine-independent water heater
for diesel fuel**



Eberspächer
A world of comfort

1 Introduction

Contents

This list of contents provides precise information about the contents of these Troubleshooting and Repair Instructions.

If you are looking for a specific term, use the index at the end of this document.

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1 Introduction

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1 Introduction

Foreword

These Troubleshooting and Repair Instructions are applicable to the heaters listed on the title page, to the exclusion of all liability claims.

Depending on the version or revised status of the heater, there may be differences between it and these troubleshooting and repair instructions.

The user must check this before carrying out the repair work and, if necessary, take the differences into account.



Important!

Safety instructions for installation and repair!

Improper installation or repair of Eberspächer heaters can cause a fire or result poisonous exhaust entering the inside of the vehicle. This can cause serious and even fatal risks.

The heater may only be installed according to the specifications in the technical documents or repaired using original spare parts by authorised and trained persons.

Installation and repairs by unauthorised and untrained persons, repairs using non-original spare parts and without the technical documents required for installation and repair are dangerous and therefore are not permitted.

A repair may only be carried out in connection with the respective unit-related technical description, installation instructions, operating instructions and maintenance instructions. This document must be carefully read through before / during installation and repair and followed throughout. Particular attention is to be paid to the official regulations, the safety instructions and the general information.

Please note!

The relevant rules of sound engineering practice and any information provided by the vehicle manufacturer are to be observed during the installation and repair.

Eberspächer does not accept any liability for defects and damage, which are due to installation or repair by unauthorised and untrained persons.

Compliance with the official regulations and the safety instructions is prerequisite for liability claims. Failure to comply with the official regulations and safety instructions leads to exclusion of any liability of the heater manufacturer.

Accident prevention

General accident prevention regulations and the corresponding workshop and operating safety instructions are to be observed.

Special text structure, presentation and picture symbols

Special text formats and picture symbols are used in these instructions to emphasise different situations and subjects. Please refer to the following examples for their meanings and appropriate action.

Special text formats and presentations

- A dot (•) indicates a list, which is started by a heading.
 - If an indented dash (–) follows a “dot”, this list is a sub-section of the black dot.

Picture symbols



Danger!

This information points out a potential serious or fatal danger. Ignoring this information can result in severe injuries.



Danger! High voltage!

This information points out a potential serious or fatal danger due to high-voltage. Ignoring this information can result in severe injuries and damage to property.



Caution!

This information points out a dangerous situation for a person and / or the product. Failure to comply with these instructions can result in injuries to people and / or damage to machinery.

Important information before starting work

Initial commissioning of the heater or functional test after a repair

- After installing the heater, the whole fuel supply system must be carefully vented: please refer to and follow the vehicle manufacturer's instructions.
- During the heater trial run, all fuel connections must be checked for leaks and secure, tight fit.
- If faults occur while the heater is running, use a diagnostic unit to determine and correct the cause of the fault.

Component replacement

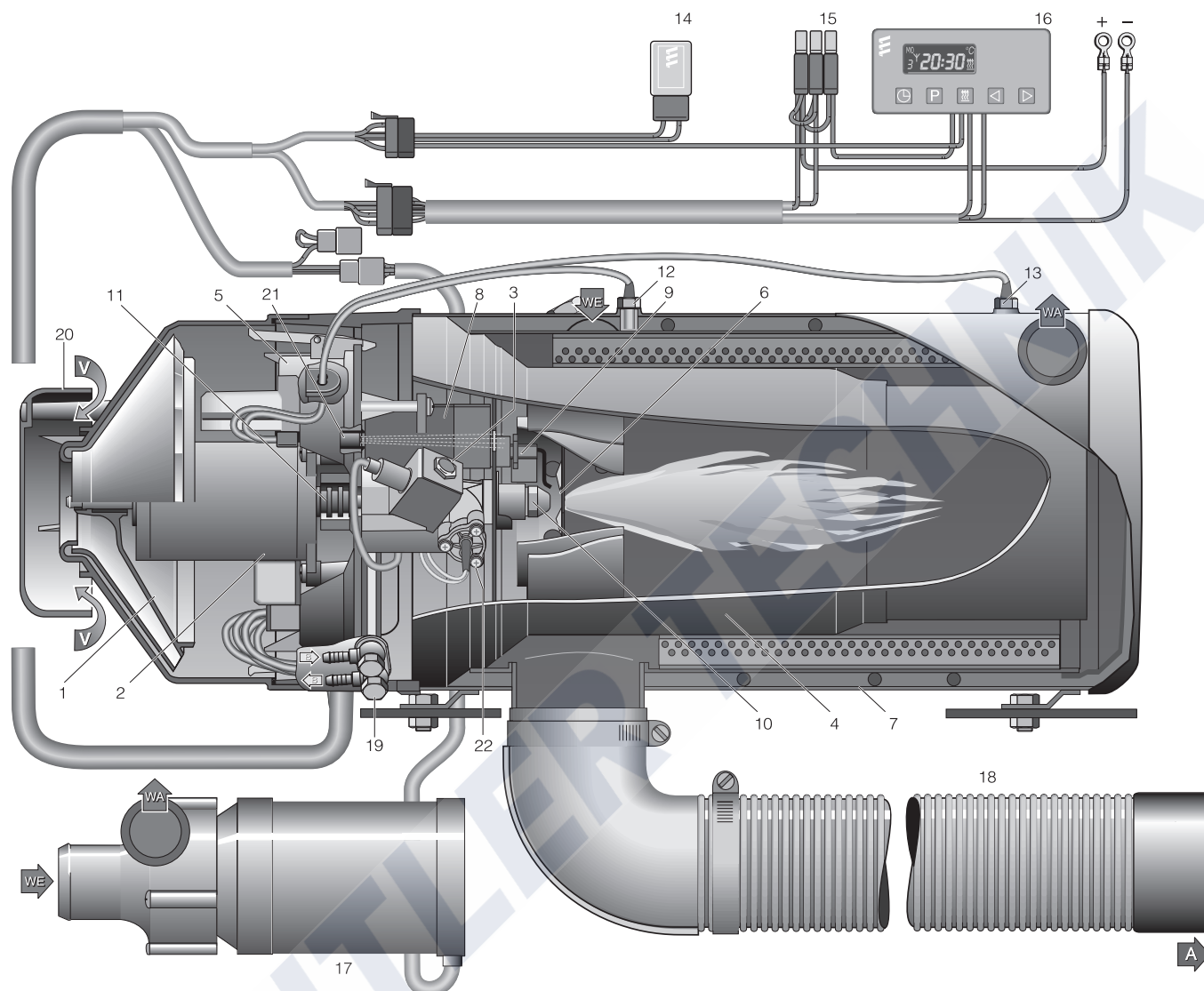
The components listed below must be replaced at the end of the given operating period:

- Heat exchanger after 5000 operating hours,
- Burner after 3000 operating hours,
- Nozzle after 600 operating hours or at least once per year.



2 Function

Cutaway view



Sketch 1

- | | | |
|----------------------------|--------------------------------------|------------------|
| 1 Impeller | 11 Coupling | A Exhaust |
| 2 Electrical motor | 12 Temperature sensor | B Fuel |
| 3 Solenoid valve | 13 Overheating sensor | V Combustion air |
| 4 Flame tube | 14 Relay (vehicle blower control) | WA Water outlet |
| 5 Control box | 15 Fuses | WE Water inlet |
| 6 Combustion chamber | 16 Module timer | |
| 7 Heat exchanger | 17 Water pump | |
| 8 Ignition spark generator | 18 Exhaust pipe | |
| 9 Ignition electrodes | 19 Fuel connection | |
| 10 Fuel nozzle | 20 Hood (CO ₂ adjustment) | |
| | 21 Flame monitor | |
| | 22 Nozzle pre-heater | |

2 Function

Structure of the heater

The heater consists of a heat exchanger and a removable burner. A combustion chamber consisting of a flame tube with integrated mixer is used in the heat exchanger. The flame tube can be pulled out of the heat exchanger if necessary.

The control box and electric motor are fixed to the burner flange under the hood of the burner. The fuel pump is fixed to the burner housing.

The following additional parts are required to run the heater:

- Water pump
- Additional parts for connection to the water circuit
- Additional parts for the fuel supply
- Additional parts for the exhaust system
- Control unit

Order No. see technical description, for further additional parts see additional parts catalogue.

Special features of the heater

- If the water throughput is too low the water discharge temperature is limited by premature compensation.
- The time taken for the temperature rise in the heating medium is monitored. If it rises too fast (water flow too low) the heater automatically switches "OFF" and begins with the after-running, the cycle then begins again.
- Constant comparison of the temperature sensor and over-heating sensor measurements provides additional heater safety. If the difference between the measured values is too large (water flow too low) the heater prematurely switches "OFF".

Operating instructions

The heater is operated by a control unit. Detailed operating instructions are supplied with the control unit.

Please note!

You will be issued the operating instructions by the installation workshop.

Description of functions

Switch on the heater

On switching on the heater, a component test is performed (3 seconds), the water pump is then started up.

Note:

The nozzle pre-heater is switched on the first time the heater is switched on.

- In the Hydronic L16 / L24, the nozzle pre-heater remains switched on until the heater switches "OFF" or is switched off beforehand.
- In the Hydronic L30 / L35, the operating time of the nozzle pre-heater is limited to 15 min.

Burner start

The electric motor starts and drives the combustion air impeller and the fuel pump.

After approx 10 seconds the ignition is switched on and then the fuel solenoid valve opens. Within these 10 seconds a rotary check is performed on the electric motor. The fuel and combustion air in the combustion chamber form an ignitable mixture.

The mixture is ignited by a high-voltage ignition spark. The flame monitor recognises the flame's flicker frequency and switches off the ignition spark generator. The hot combustion gases flow through the heat exchanger and transfer the heat to the heating medium.

Please note!

- The heater operates depending on the heat requirements, this means the burner's switching on and switching off times vary.
- The water pump remains in service the whole time the heater is running, even during pause mode and during after-running.

Options

- If temperature lowering is activated the "ON / OFF" control temperatures are lowered by approx 8K. For connection of the ON / OFF switch for temperature drop, see circuit diagram on pages 45 and 46.
- The water pump can be run independently of the heater if appropriate controls are installed. For connection of the additional "ON / OFF" switch for separate water pump control, see circuit diagram on pages 45 and 46.
- With control of the vehicle's blower, the vehicle blower is switched on or off at the following water temperatures.
 - Water temperature > 55 °C → Vehicle blower "ON"
 - Water temperature < 50 °C → Vehicle blower "OFF"

Switching off the heater

If the heater is switched off the fuel solenoid valve closes and after-running simultaneously starts for approx 3 minutes.

After the after-running has finished the heater is automatically switched off.

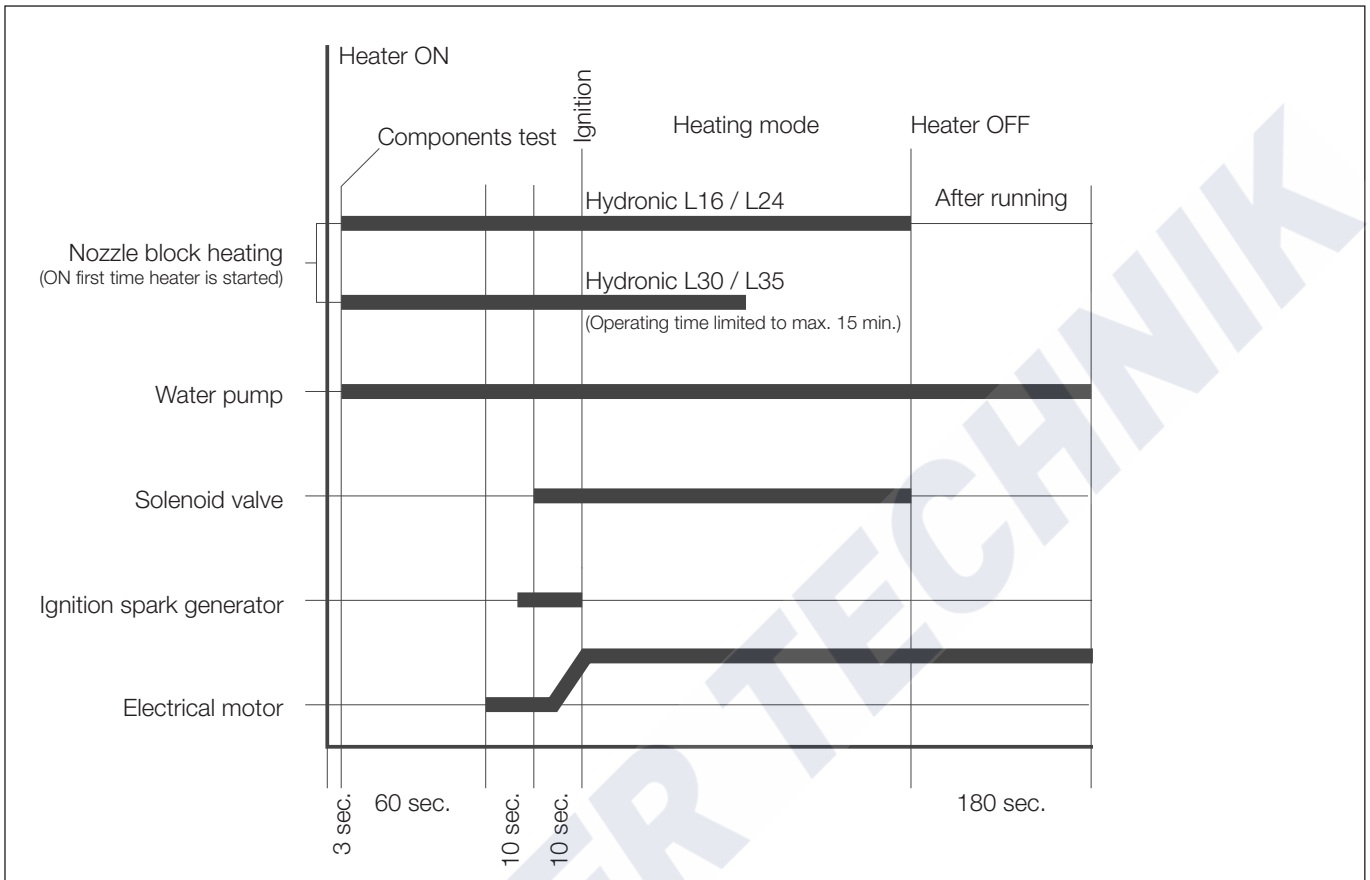
Please note!

Until it is switched off, including during the after-running, the fuel is circulated.



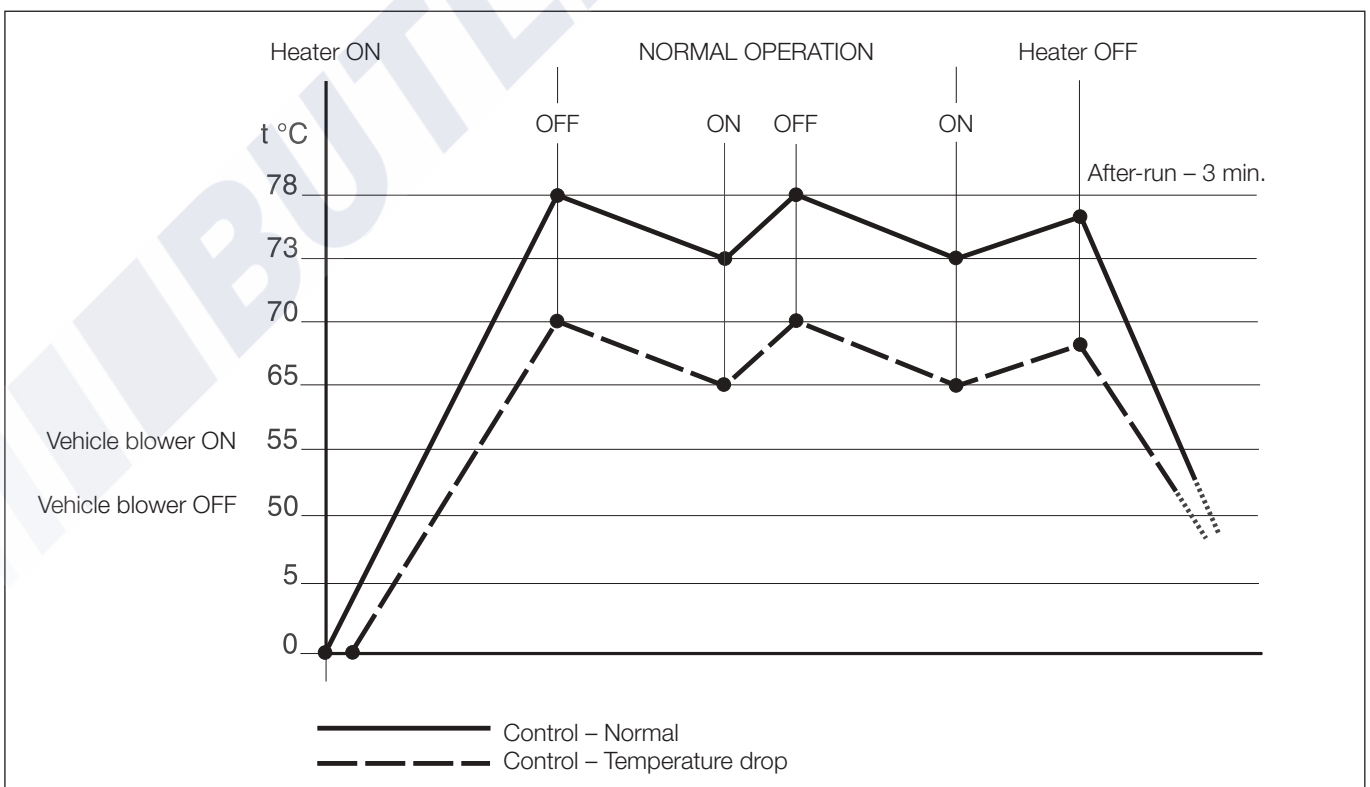
2 Function

Functional diagram



Sketch 2

Control diagram



Sketch 3

2 Function

Control and safety devices

The heater is equipped with the following control and safety devices.

- If the heater does not ignite the control box* is locked after an unpermissible number of unsuccessful start attempts.
 - If the water throughput is too low the water discharge temperature is limited by premature compensation.
 - The time taken for the temperature rise in the heating medium is monitored. If it rises too fast (water flow too low) the heater automatically switches "OFF" and begins with the after-running, the cycle then begins again.
 - Constant comparison of the temperature sensor and over-heating sensor measured values provides additional heater safety, because if the difference between the measured values is too large (water flow too low) the heater is prematurely switched off (shut-down on fault). After an impermissible number of shut-downs on fault, the control box is locked.*
 - If the lower or upper voltage limit is reached, the heater is automatically shut down.
 - If the flame sensor detects a flame during the heater's after-running the heater is automatically switched off. After an impermissible number of shut-downs on fault, the control box is locked.*
- * The lock can be cancelled and the faults read out:
- using the module timer / EasyStart T timer
 - using the EasyStart R+ radio remote control.
- For other control units by connecting:
- by connecting the diagnostic unit
 - the EDiTH diagnostics tool.
- For details of operation and fault list, see these Troubleshooting and Repair Instructions from page 13.

Emergency stop – EMERGENCY OFF

If an emergency stop – EMERGENCY OFF – is necessary during operation, proceed as follows:

- Switch the heater off at the control unit or
- remove the fuse or
- disconnect the heater from the battery.



3 Product information

Technical data, heater	Hydronic L-II			
Heater	Hydronic L16	Hydronic L24	Hydronic L30	Hydronic L35
Version	HL2-16	HL2-24	HL2-30	HL2-35
Heating distribution medium	Mixture of water and antifreeze (Proportion of antifreeze at least 10 % up to 50 % maximum)			
Heat flow in watt (at ambient temperature -10 °C)	16 000	24 000	30 000	35 000
Temperature values – at water inlet	ON 73 °C / OFF 78 °C			
Temperature values – at water outlet	ON 85 °C / OFF 118 °C			
Fuel	Diesel – commercially available (DIN EN 590) Heating oil EL (DIN 51603)			
Fuel consumption (at ambient temperature -10 °C)	2.0 l/h	2.9 l/h	3.65 l/h	4.2 l/h
Rated voltage	24 volt			
Operating range	20 volt			
<ul style="list-style-type: none"> Lower voltage limit: An undervoltage protection installed in the control box switches off the heater if the voltage limit is reached. 				
<ul style="list-style-type: none"> Upper voltage limit: An overvoltage protection installed in the control box switches off the heater if the voltage limit is reached. 	30 volt			
Electrical power consumption (during operation)	60 watt	80 watt	105 watt	120 watt
Water volume (in the heater)	approx. 2.4 l			
Minimum throughput (minimum at heater)	1400 l/h	2000 l/h	2600 l/h	3000 l/h
Allowable ambient temperature	in operation		without operation	
Heater	-40 °C to +85 °C		-40 °C to +100 °C	
Allowable operating temperature	-40 °C to +90 °C / briefly up to +120 °C			
Heating medium				
Combustion air	< 60 °C			
Operating pressure (in the heater)	2.5 bar			
CO ₂ values (% vol.)	9 – 11	9 – 11	9 – 11	9.5 – 11.5
CO in the exhaust	< 0.04			
Smoke spot no. (Bacherach)	< 4			
Weight	approx. 18 kg			
Interference suppression class	4 for VHF / SW / LW, 5 for MW			
Degree of protection	IP 54			



Caution!

Safety instructions for technical data!

Failure to comply with the technical data can result in malfunctions.

Please note!

If no limit values are given, the technical data listed is with the usual heater tolerances of ± 10 % at nominal voltage, 20 °C ambient temperature and Esslingen reference altitude.

3 Product information

Technical data, water pump	Flowtronic 5000
Heating medium	Mixture of water and antifreeze (Proportion of antifreeze at least 10 % up to 50 % maximum)
Delivery rate	5200 l/h \pm 10 % at 0.2 bar delivery pressure
Operating pressure, water circuit	max. 2 bar
Weight (without bracket, clip and coolant)	2.04 kg
Rated voltage	24 volt
Operating range	20 – 28 volt
Power consumption at 5200 l/h and 0.2 bar discharge pressure	104 watt \pm 10 %
Interference suppression class	3 according to DIN 57879 / Part 1 VDE 0879
Degree of protection	IP 54A according to DIN 40 050 Sheet 1
Electrical fusing for third party controls	15 A
Temperature conditions	
Heating medium	-40 °C to + 90 °C short-term (15 min.) +115 °C
Ambient, operating	-40 °C to + 90 °C short-term (15 min.) +115 °C
Dry running	No
Blocking	The motor remains undamaged within a period of max 6 seconds.
Shaft - impeller connection	Mechanical seal



Caution!

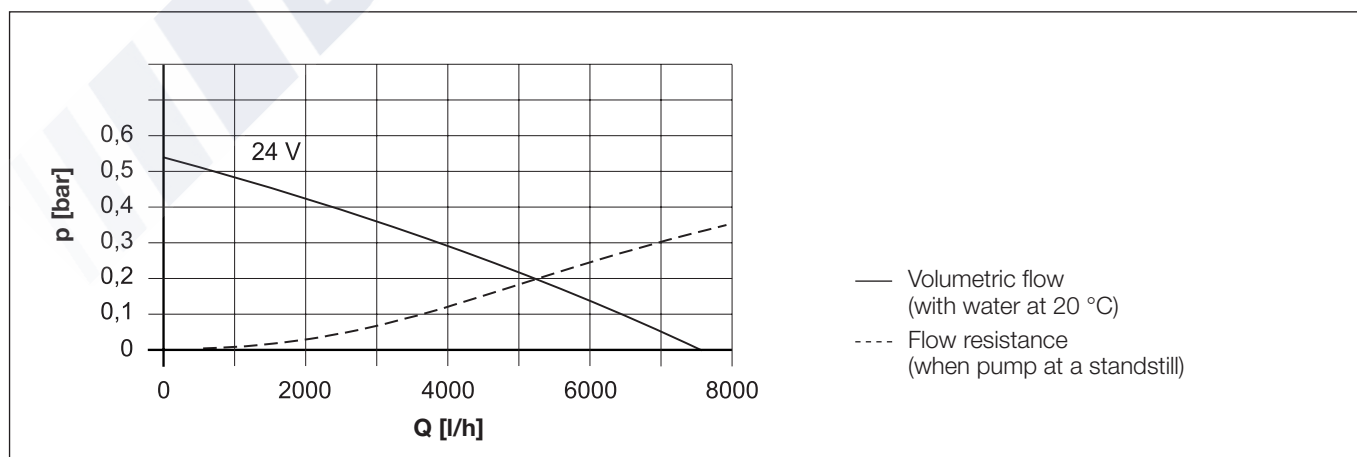
Safety instructions for technical data!

Failure to comply with the technical data can result in malfunctions.

Please note!

- Provided no limit values are given, the technical data provided is with the usual water pump tolerances of \pm 10 % at rated voltage, 20 °C ambient temperature and reference altitude Esslingen.
- The Flowtronic 5000 water pump is installed in compact heaters.
- The water pumps must be assigned to the heaters depending on the minimum throughput rate and cooling water volume.

Pumping and pressure loss characteristic curves



Sketch 4



3 Product information

Technical data, water pump	Flowtronic 5000 S
Heating medium	Mixture of water and antifreeze (Proportion of antifreeze at least 10 % up to 50 % maximum)
Delivery rate	5200 l/h \pm 10 % at 0.2 bar delivery pressure
Operating pressure, water circuit	max. 2 bar
Weight (without bracket, clip and coolant)	2.2 kg
Rated voltage	24 volt
Operating range	20 – 28 volt
Power consumption at 5200 l/h and 0.2 bar discharge pressure	104 watt \pm 10 %
Interference suppression class	1 for VHF, 5 for SW, 2 for MW and LW to DIN 57879 / Part 1 VDE 0879
Degree of protection	IP 54A according to DIN 40 050 Sheet 1
Electrical fusing for third party controls	15 A
Temperature conditions	
Heating medium	-40 °C to + 90 °C short-term (15 min.) +115 °C
Ambient, operating	-40 °C to + 90 °C short-term (30 min.) +115 °C
Dry running	No
Blocking	The motor remains undamaged within a period of max 6 seconds.
Shaft - impeller connection	Magnetic coupling



Caution!

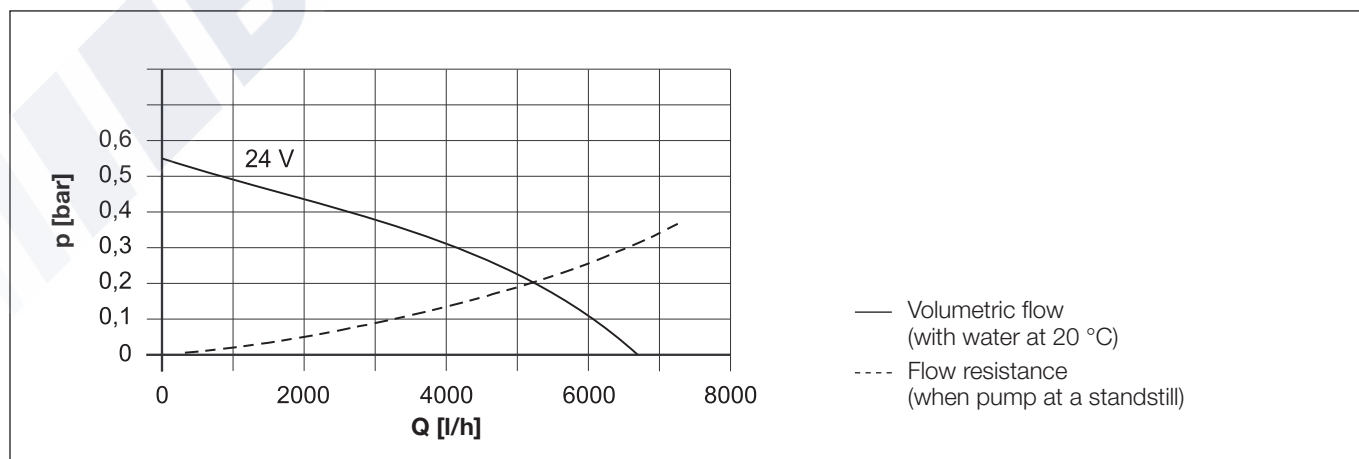
Safety instructions for technical data!

Failure to comply with the technical data can result in malfunctions.

Please note!

- Provided no limit values are given, the technical data provided is with the usual water pump tolerances of \pm 10 % at rated voltage, 20 °C ambient temperature and reference altitude Esslingen.
- The water pumps must be assigned to the heaters depending on the minimum throughput rate and cooling water volume.

Pumping and pressure loss characteristic curves



Sketch 5

3 Product information

Technical data, water pump	Flowtronic 6000 SC
Heating medium	Mixture of water and antifreeze (Proportion of antifreeze at least 10 % up to 50 % maximum)
Delivery rate	6000 l/h $\pm 10\%$ at 0.4 bar delivery pressure
Operating pressure, water circuit	max. 2 bar
Weight (without bracket, clip and coolant)	2.5 kg
Rated voltage	24 volt
Operating range	18 – 32 volt
Power consumption at 5200 l/h and 0.2 bar discharge pressure	210 watt $\pm 10\%$
Interference suppression class	5 for LW, MW, SW 1, SW2, VHF according to DIN EN 55 025
Degree of protection	IP 25 (electronically encapsulated) according to DIN 40 050, Part 9
Electrical fusing for third party controls	15 A
Temperature conditions	
Heating medium	-40 °C to + 90 °C short-term (15 min.) +115 °C
Ambient, operating	-40 °C to + 90 °C short-term (15 min.) +100 °C
Storage	-40 °C to 120 °C
Dry running	approx. 45 min. – the motor switches itself off after approx. 45 min.
Blocking	Yes – the start-up attempts are continued without limit.



Important!

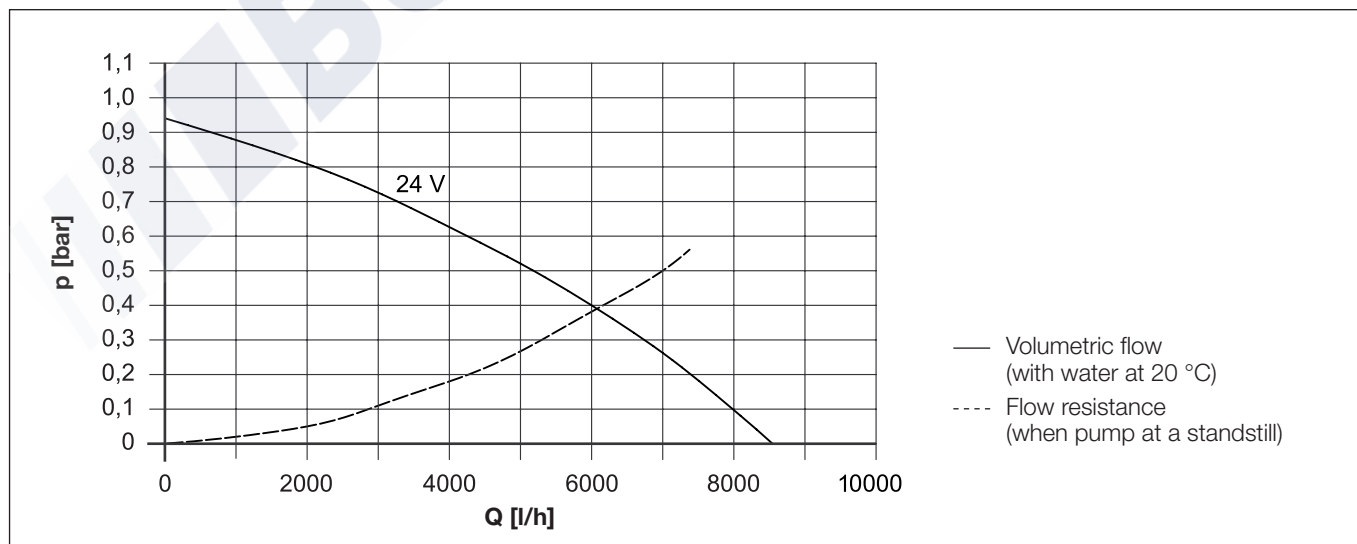
Safety instructions for technical data!

Failure to comply with the technical data can result in malfunctions.

Please note!

- Provided no limit values are given, the technical data provided is with the usual water pump tolerances of $\pm 10\%$ at rated voltage, 20 °C ambient temperature and reference altitude Esslingen.
- The water pumps must be assigned to the heaters depending on the minimum throughput rate and cooling water volume.

Pumping and pressure loss characteristic curves



Sketch 6



4 Troubleshooting

What to check first in case of faults

- Faulty wiring (short circuits, interruption).
- Visual inspection for
 - corroded contacts
 - defective fuses
 - damaged electrical leads, connections and terminals
 - damaged exhaust and combustion air circuit.
- Battery voltage when heater started <20 volt (measure voltage at control box).
- Check fuel supply.
- On changeover to winter service: Is summer diesel still in the line?
- Delayed start → nozzle block heating switched on for 60 seconds.

Locking the control box

The control box is locked if the following faults occur:

- Overheating
If the heater overheats 3x in succession – fault code 012, is displayed as AF 015 → the control box is locked.
- Flame in after-run
If the fault “flame in after-run” is signalled 3x in succession – fault code 058, is displayed as AF 016 → the control box is locked.
- Too many attempted starts
If the heater carries out ten failed start attempts in succession – fault code 052, is displayed as AF 050 → the control box is locked.

Cancel the control box lock

Cancellation of the control box lock is described on pages 17 to 21.

Cancelling control box lock without diagnostic equipment

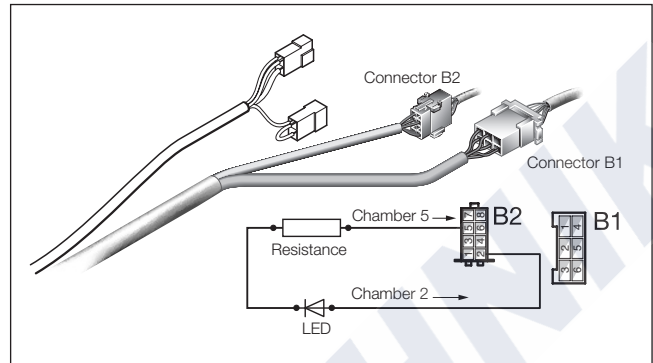
If the heater is switched on, apply plus at 18-pin cable harness connector, pin 13, cable 1² ge/rt (water pump third party control) for approx. 3 sec. → the control box is unlocked.

4 Troubleshooting

Fault diagnosis – flashing code (LED with series resistor)

The electronic control box can store up to 5 faults. The defective component and type of fault are output by the control box as a flashing code and are displayed by an LED with series resistor (approx. 1 kΩ / 1W). The LED with series resistor is connected to the 8-pin connector of the heater cable harness (chamber 2, cable 1² bl/ws and chamber 5, cable 1² ge). The flashing codes of the defective components and the corresponding fault codes are described on page 14. Possible causes and remedial action are explained in the fault code tables (pages 22 – 25).

LED and series resistor



Sketch 7

Flashing code

	400 ms pause at the start of the flashing code	8 sec.	16 sec.
Operation without faults	[Solid bar]		
Flame monitor Fault code 16, 51, 58	[Short pulse]	[Short pulse]	
Safety time exceeded Fault code 50, 52	[Short pulse]	[Short pulse]	[Short pulse]
Flame cutout Fault code 54	[Short pulse]	[Short pulse]	
Overheating Fault code 12, 15	[Short pulse]	[Short pulse]	[Short pulse]
Burner motor Fault code 32, 33	[Short pulse]	[Short pulse]	
Undervoltage cut-off Fault code 11	[Short pulse]	[Short pulse]	[Short pulse]
Overvoltage cut-off Fault code 10	[Short pulse]	[Short pulse]	[Short pulse]
Temperature sensor Fault code 14, 60, 61, 71, 72	[Short pulse]	[Short pulse]	[Short pulse]
Connection error Fault code 20, 21, 25, 37 – 39, 44 – 49, 80 – 83	[Short pulse]	[Short pulse]	[Short pulse]
Control box Fault code 90 – 97	[Short pulse]	[Short pulse]	[Short pulse]

Short pulse – flash duration: 0.4 sec.
 Long pulse – flash duration: 2.0 sec.
 Pause between the pulses: 0.4 sec.
 Period of a flashing sequence: 8.0 sec.

Sketch 8



4 Troubleshooting

Overview of the individual test equipment and control units

The electronic control box can store up to 5 faults, which can be read out and displayed. The following test equipment can be used to query the fault memory in the control box and if necessary to delete the locking of the control box:

Testing equipment	Order No.:
• Diagnostic unit	22 1529 89 00 00
also required:	
Adapter cable	22 1000 31 66 00
• EDiTH diagnostics tool	
– Basic adapter with software	22 1542 89 00 00
also required:	
Hydronic L-II extension	22 1539 89 00 00
– ISO adapter	22 1541 89 00 00
also required:	
Adapter cable	22 1000 31 66 00
• Burner tester	22 1527 89 00 00

If the diagnostics cable is connected, the following control units can also be used to query the fault memory in the control box and if necessary to delete the locking of the control box:

Control units	Order No.:
• Module timer	22 1000 30 34 00
• EasyStart T	22 1000 32 88 00
• EasyStart R+	22 1000 32 80 00

Please note!

If the fault memory cannot be read out, check the diagnostics cable is properly laid and is not damaged.

External diagnostics system

If an external, vehicle-specific diagnostics system → Consult the vehicle manufacturer.

4 Troubleshooting

Diagnostic unit

(Order No.: 22 1529 89 00 00)

An adapter cable is also required to connect the diagnostic unit (Order No.: 22 1000 31 66 00).

The current fault is displayed as "AF" and a 2-digit number and is always written in the memory position F1. Preceding faults are moved to the memory locations F2 – F5, if necessary the content of memory position F5 is overwritten.

Please note!

- Not only the defective component, but also a defective current circuit results in a fault being displayed.
- Fault code, fault description, cause / remedial action are described on pages 22 – 25.



Sketch 9

- L – Delete fault memory
- L – Delete fault memory
- D – Switch heater On / Off, request diagnosis
- ◀ – Reverse, F5 – F1
- ▶ – Forward, F1 – F5, current fault (AF)

Connecting the diagnostic unit

- Disconnect the 8-pin connector of the heater's cable harness and connect the adapter cable.
- Connect the diagnostic unit to the adapter cable. The display is as follows:



Query the fault memory

- Use the D key to switch on the heater. The display is as follows:



- After 8 sec. the following is displayed: The display is as follows:



Heater has no malfunction

or



e.g. current fault / fault code 64

or



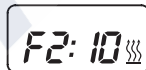
Fault diagnosis is not possible

Possible causes:

- Adapter cable is not properly connected.
- Control box is defective or is not capable of diagnosing (not a universal control box).

Display of the fault memory F1 – F5 or F5 – F1

- Press the ◀ or ▶ button again, or press several times, to display the fault memory. The display is as follows:



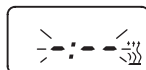
e.g. fault memory 2 / fault code 10

Please note!

Only the fault memory locations with a fault assigned to them are displayed.

Delete fault memory

- Press both L buttons simultaneously until the following appears in the display: The display is as follows:



- If all the fault memory locations have been deleted the most recent fault is displayed. The current fault is not reset to 00 until the heater is restarted – provided no new fault exists. The display is as follows:



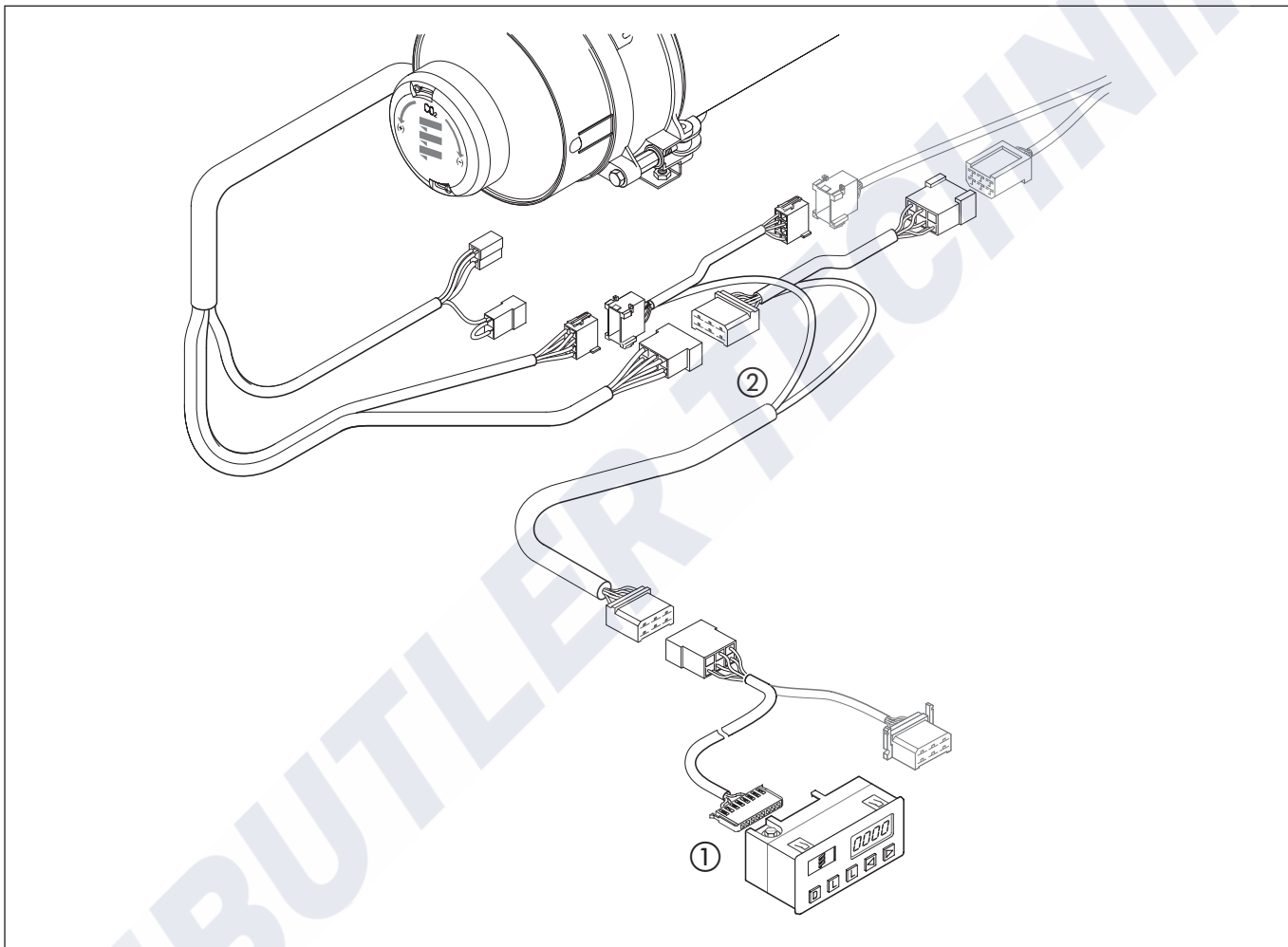
Heater has no malfunction

4 Troubleshooting

Cancel the control box lock

- Delete the fault memory as described and switch off the heater using the **[D]** button.
- The control box lock is cancelled and the diagnosis is ended.

The display is as follows:



Sketch 10

- ① Diagnostic unit with connection cable
- ② Adapter cable

4 Troubleshooting

EDiTH customer service program with ISO adapter

(Order No.: 22 1541 89 00 00)

An adapter cable is also required to connect the ISO adapter
(Order No.: 22 1000 31 66 00).

Please note!

- It is very important to always install in the given order.
- Not only the defective component, but also a defective current circuit results in a fault being displayed.
- Fault code, fault description, cause / remedial action are described on pages 22 – 25.
- The EDiTH customer service program software is not included in the scope of supply, it must be downloaded from the service portal.
- Faults 1 – 5 only are displayed in heaters up to serial No. 12 000.
In addition to faults 1 –5, measured values are also displayed in heaters from serial No. 12 001.

Connect ISO adapter

- Disconnect the heater's cable harness.
- Connect the adapter cable to the cable harness – as shown in the sketch.
- Connect the adapter cable to the ISO adapter.
- Connect the SUB-D connection cable with the PC and the ISO adapter.

Install software on the PC

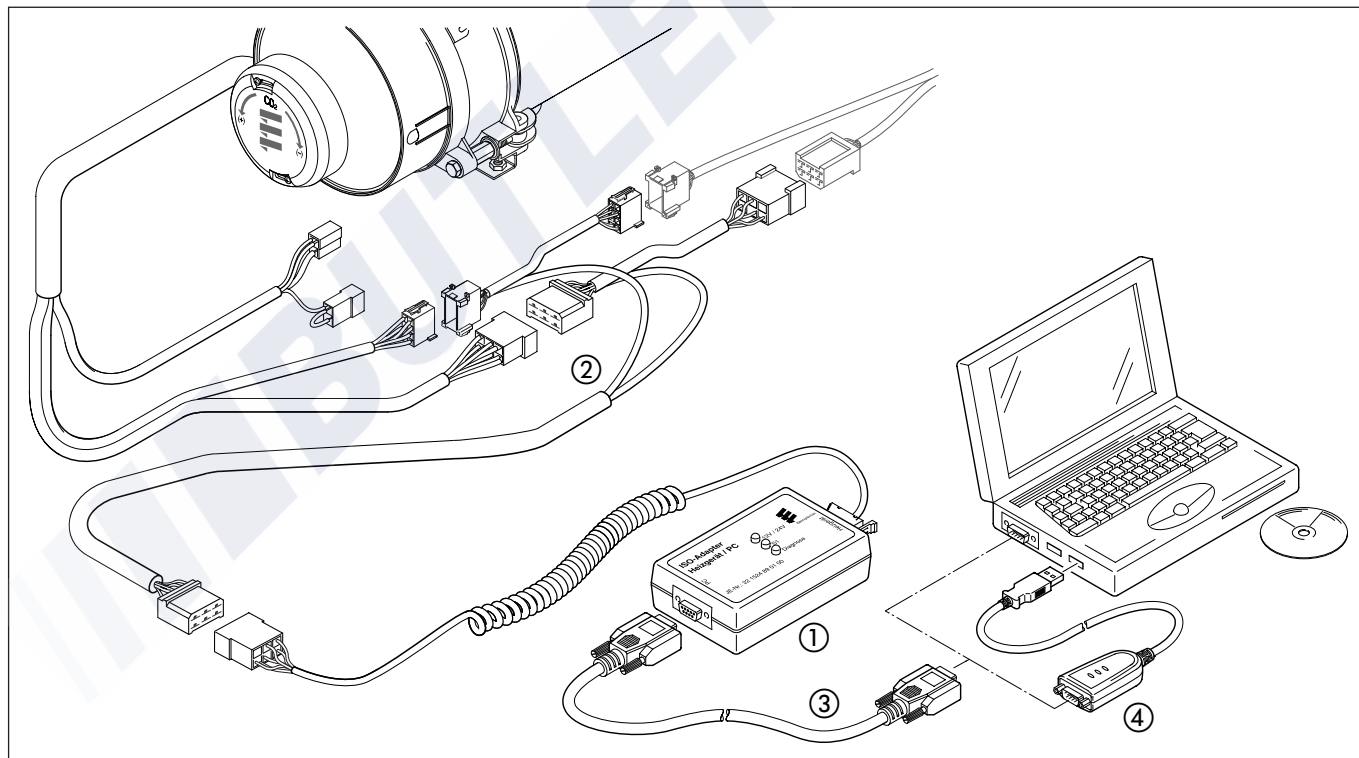
- To start, double click the “setup.exe” file and follow the SETUP program instructions.

Enquire / delete fault memory F1 – F5 or cancel the control box lock

- Start the software at the PC:
 - on the Desktop → double-click the “EDiTH” icon
 - Select heater type
 - Press the “GO” button.
- Delete fault memory or cancel the control box lock:
 - press the “Delete fault memory” button
 - the stored faults F1 – F5 are deleted and the control box is unlocked.

Quit diagnosis

- Press the “STOP” button → fault memory query is ended.



Sketch 11

- ① ISO adapter
- ② Adapter cable
- ③ SUB-D connection cable
- ④ Adapter USB to serial RS-232



4 Troubleshooting

EDiTH customer service program with basic adapter

EDiTH basic adapter
(Order No.: 22 1542 89 00 00)

An additional extension is required to check the control box
(Order No.: 22 1539 89 00 00).

Please note!

- It is important to always follow the precise connection order!
- The flame monitor integrated in the control box can only be tested properly if the corresponding mating connector (a) is plugged in.
- Only push or pull on the connectors, not on the cables!
- Use only the mains cable and RS232 cables with snap ferrites included in the scope of supply. Original accessories with snap ferrites only are to be used for connecting the test equipment.
- Not only the defective component, but also a defective current circuit results in a fault being displayed.
- Fault code, fault description, cause / remedial action are described on pages 22 – 25.

⚠ Important! Magnetic field!

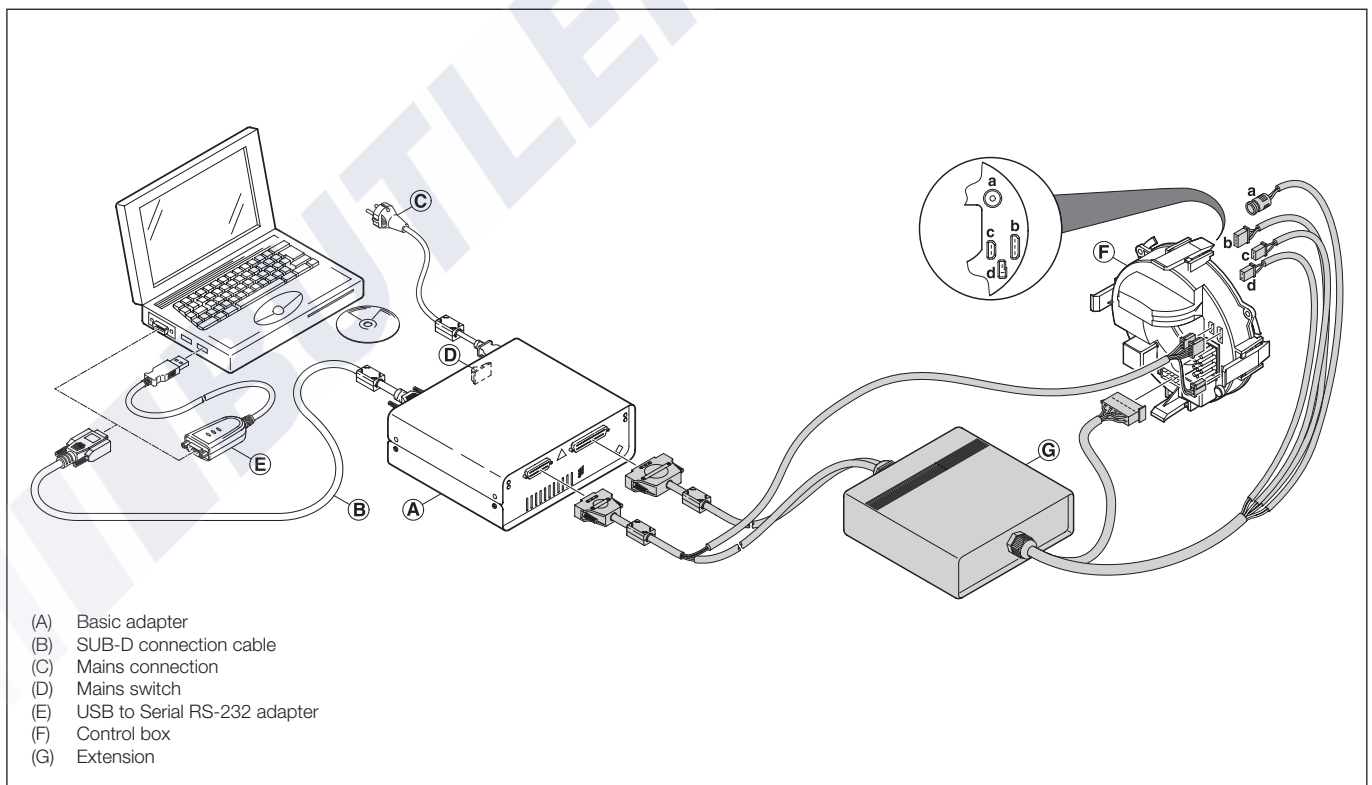
During the test operation a magnetic field develops at the adapter. Therefore, do not place any objects such as data media, credit cards, etc. on the adapter or in its immediate vicinity.

Connect basic adapter

- Start computer and wait until the system has successfully booted.
- Start PC software.
- Insert the unit connector of the mains cable in the basic adapter and connect the mains connection to the mains.
- Connect the SUB-D connection cable with the PC and basic adapter.

Connect extension and test control box

- Connect the extension to the basic adapter.
 - Connect extension and basic adapter to control box.
 - Switch on basic adapter at mains switch.
 - Select the control box version and operating voltage (12 V / 24 V) in the PC software.
 - Start the control box test with the PC software.
- A more detailed description of how to operate the basic adapter is given in the EDiTH online help.



Sketch 12

4 Troubleshooting

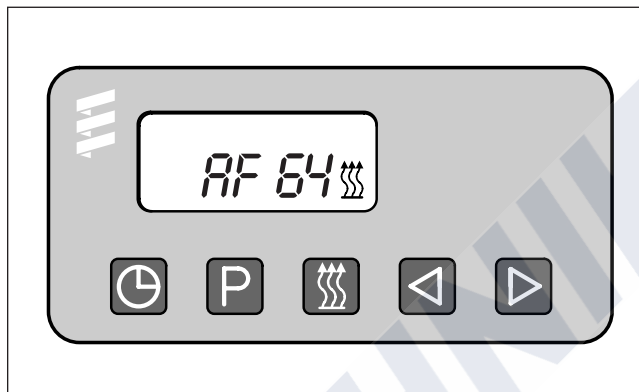
Module timer

(Order No.: 22 1000 30 34 00)

The current fault is displayed as "AF" and is always written in memory position F1. Preceding faults are moved to the memory locations F2 – F5, if necessary the content of memory position F5 is overwritten.

Please note!

- Not only the defective component, but also a defective current circuit results in a fault being displayed.
- The fault code, fault description, cause / remedial action are described on pages 22 – 25.



Sketch 13

- ⌚ – Time
- P – Preset
- 🔥 – Heat
- ⏪ – Reverse
- ⏩ – Forward

Query fault memory F1 – F5

Condition:

The heater is switched off.

- Press 🔥 button → the heater is switched on.
- Press ⌚ button and keep it depressed, then press P button within 2 seconds.
The display is as follows:
AF = current fault
3 digit number = fault code
🔥 flashes.
- Press ⏪ button once or several times, fault memory positions F1 – F5 are displayed.

Cancel the control box lock and simultaneously delete the fault memory

Condition:

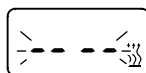
An electrical connection exists from terminal 15 (ignition) to the module timer, 12-pin connector, chamber 10.

- Press 🔥 key
The display is as follows:
the current fault, e.g. F15.
- Press button ⌚ and keep it depressed, then press button P within 2 seconds.

The module timer is now in the "Enquire fault memory" program.

- Switch off ignition (terminal 15).
- Simultaneously press button ⌚ and button P, in addition, switch on the ignition (terminal 15) and wait until the following appears in the display.

After ignition "ON" the following appears in the display:



Display flashes,
heater symbol does not flash

- Switch the heater off and on → the control box is unlocked, the heater restarts.

After switching the heater off and on and renewed query of the fault memory, the following appears in the display:



Display flashes,
heater symbol does not flash



4 Troubleshooting

EasyStart R+ radio remote control

(Order No.: 22 1000 32 80 00)

EasyStart T timer

(Order No.: 22 1000 32 88 00)

If faults occur while the heater is running, they are displayed with "Err" after the mobile unit or timer is activated.

The current fault is displayed. The stored faults "F1" to "F5" can be enquired.

Please note!

- The bl/ws diagnostics cable must be connected in order to perform the diagnosis. To this end, please refer to and follow the circuit diagram for the radio remote control or the timer and for the heater.
- If the diagnostics cable is not connected, the "Diagnosis" menu is blocked.
- Not only the defective component, but also a defective current circuit results in a fault being displayed.
- Fault code, fault description, cause / remedial action are described on pages 22 – 25.



Sketch 14

- Back control button
- Next control button
- ON / OFF activation button for mobile unit / timer
- OK button (symbol selection / input confirmation)

Enquire / delete fault memory

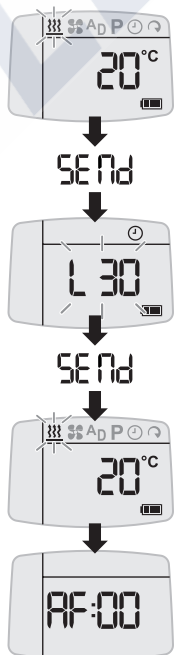
Activate mobile unit / timer
(see EasyStart R+ / EasyStart T operating instructions)

Confirm symbol with .

Heater is switched on.

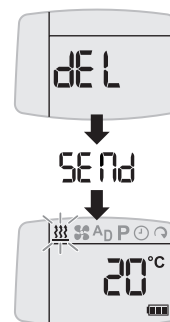
Confirm operating time with .

Briefly press and **simultaneously.**



The following actions are possible:

- Retrieve fault memory.
Open the fault memory locations F1 – F5 with or .
 - Retrieve fault memory again.
Briefly press and **simultaneously.**
 - Delete fault memory (display dEL)
Press .
- Press again.





The diagnosis is completed.

Switch off the heater.

4 Troubleshooting


Fault code table

Fault code display	Fault description	Cause • Remedial action
000	No fault	--
010	Overvoltage cut-off	Overvoltage (> 30 volt) applied to control box for at least 20 seconds without interruption – heater not working. • Disconnect 18-pin connector at control box, start the vehicle's engine. Measure the voltage between PIN 15 (cable 2.5 ² rt) and PIN 16 (cable 2.5 ² br), if voltage > 30 volt → check generator controller.
011	Undervoltage cut-off	Under voltage (< 19 volt) applied to control box for at least 20 seconds without interruption – heater not working. • Disconnect 18-pin connector at control box, start the vehicle's engine. Measure the voltage between PIN 15 (cable 2.5 ² rt) and PIN 16 (cable 2.5 ² br). The measured value and the voltage at the battery should be the same. In case of a voltage drop, check the fuses, the supply cables, the negative connections and the positive support point on the battery for correct contact.
012	Overheating	Temperature at overheating sensor >130 °C. • Check water circuit: – Check all hose connections for leaks – Vent water circuit – Check valves in water circuit, replace if necessary – Temperature difference between water inlet and water outlet must be <10 K, if not → check minimum flow rate of the heating medium, see Technical Data for values. • Check water pump, replace if necessary. • Check overheating sensor, replace if necessary, see diagram on page 38.
014	Difference between the overheating and temperature sensor is too large	Difference between measured values of the temperature sensor and overheating sensor impermissibly high for a lengthy time. • Check installation of both sensors, tighten sensor if necessary, tightening torque for both sensors 2.5 Nm + 0.5 Nm. • Check temperature sensor and overheating sensor, see diagram on pages 37 and 38. • Check minimum throughput of the heating medium, see Technical Data for values.
015	Operating lock-out – control box is locked	Fault code 012 “Overheating” three times in succession → fault code 015 is displayed. Unlock the control box by deleting the fault memory, see pages 17 to 21. • For remedial action see fault code 012.
016	Operating lock-out – control box is locked	Fault code 058 “flame in after-run” three times in succession → fault code 016 is displayed. Unlock the control box by deleting the fault memory, see pages 17 to 21. • For remedial action see fault code 058.
020	Ignition spark generator interruption  Danger! High voltage!	Control lead from ignition spark generator to control box is interrupted or short-circuited. • Check cable loom from ignition spark generator to control box, if necessary remove interruption or short circuit. • Check function of the ignition spark generator only using the burner tester, replace ignition spark generator if necessary. • If faults are not corrected by the remedial action listed above → replace control box.
021	Ignition spark generator earth short  Danger! High voltage!	Earth short in control lead from ignition spark generator to control box. • Check cable loom from ignition spark generator to the control box, if necessary remove earth short. • Check function of the ignition spark generator only using the burner tester, replace ignition spark generator if necessary. • If faults are not corrected by the remedial action listed above → replace control box.




4 Troubleshooting

Fault code table

Fault code display	Fault description	Cause • Remedial action
025	Diagnosis output short circuit	Cable 1 ² bl/ws from 18-pin control box connector, chamber 12 to 8-pin cable harness connector, chamber 2 has short circuit with + U _B . • Check cable and connections, if necessary remove short circuit.
032	Burner motor does not rotate at start	Impeller chafes or is blocked. Burner motor is defective.
033	Burner motor does not rotate during operation  Apply max. 12 volt to burner motor	Generator voltage is too low. • Check impeller for free running. • Check cables and connections to burner motor. • Check function of the burner motor only using the burner tester, replace burner motor if necessary. • If faults are not corrected by the remedial action listed above → replace control box. Fuel pump is blocked. • Check fuel pump for free running, replace burner if necessary.
037	Water pump fault	Check first: • Water pump Bus 2000 / Flowtronic 6000 S is installed? • “Diagnosis” cable loom from the water pump Bus 2000 is connected? • Voltage applied to the Bus 2000 water pump? If yes – Disconnect plug-in connector from “diagnosis” cable loom. Start heater – If fault code 037 is no longer displayed, then check Bus 2000 water pump for dry running or blocking. – If fault code 037 is still displayed, then use remedial action as described for the water pump (standard design). • Water pump (standard design / Flowtronic 5000 / 5000 S) is installed? If yes – Disconnect plug-in connector from “water pump” cable loom, apply voltage to 2-pin connector of the “water pump” cable loom and check function. If the water pump is functioning ok, then check fuse (15 A), cable loom and connections of the water pump → if fault code 037 still displayed, then replace the control box.
039	Vehicle blower control short circuit	Cable 1 ² sw from 18-pin control box connector, chamber 6 to 8-pin cable harness connector, chamber 7, on to blower relay has short circuit. • Check cable and connections, if necessary remove short circuit. • Check installation of the relay. • Replace relay. • If faults are not corrected by the remedial action listed above, then replace control box.
044	Water pump Relay coil interruption	• Check installation of the relay at the control box. • Replace relay.
045	Water pump Relay coil short circuit	• If faults are not corrected by the remedial action listed above, then replace control box.
046	Solenoid valve interruption	“Solenoid valve” cable loom from control box (connector position “D”) to solenoid valve is interrupted or has earth short. • Check cables and connections from solenoid valve, remove earth short if necessary. • Replace solenoid valve coil. • If faults are not corrected by the remedial action listed above, then replace control box.
047	Solenoid valve short circuit	“Solenoid valve” cable loom from control box (connector position “D”) to solenoid valve has earth short. • Check cables and connections from solenoid valve, remove earth short if necessary. • Replace solenoid valve coil. • If faults are not corrected by the remedial action listed above, then replace control box.

4 Troubleshooting

Fault code table

Fault code display	Fault description	Cause • Remedial action
048	Nozzle block heating Relay coil interruption	<ul style="list-style-type: none"> • Check installation of the relay at the control box. • Replace relay.
049	Nozzle block heating Relay coil short circuit	
050	Operating lock-out Control box is locked	Control box locked by 10 start attempts without flame detection. Unlock the control box by deleting the fault memory, see pages 17 to 21. <ul style="list-style-type: none"> • For remedial action see fault code 052.
051	Flame monitor signals "Flame before fuel"	<ul style="list-style-type: none"> • Replace burner.
052	Safety time exceeded, no start  Danger! High voltage! Note when checking the ignition spark generator	No flame detected within the ignition phase. <ul style="list-style-type: none"> • Check combustion air inlet and exhaust system. • Check fuel supply (flow and return). • Check flame tube for correct installation in heat exchanger. • Check function of the ignition spark generator only using the burner tester, replace ignition spark generator if necessary. • Check distance between ignition electrodes, if necessary renew ignition electrodes. • Check electric cables and connections. • Check flame monitor for dirt, clean if necessary. • Replace fuel nozzle. • If faults are not corrected by the remedial action listed above, then replace control box.
054	Flame cutout during operation	Heater has ignited, the flame is detected and signals flame cutout twice within an operating time of 60 minutes. <ul style="list-style-type: none"> • Check fuel supply (flow and return). • Carry out CO₂ measurement. • Replace fuel nozzle. • If faults are not corrected by the remedial action listed above, then replace control box.
058	Flame does not extinguish during after-run	Flame monitor signals that flame has not extinguished 30 seconds after after-run "ON". <ul style="list-style-type: none"> • Check heat exchanger, clean if necessary, then take a CO₂ measurement. • Test the solenoid valve using the burner tester, replace if necessary. • If fuel continues to be pumped during after-run → replace fuel pump. • If faults are not corrected by the remedial action listed above, then replace control box.
060	Temperature sensor interruption	Temperature value outside operating range. <ul style="list-style-type: none"> • Check plug-in connection to the temperature sensor and cable to the control box. • Check temperature sensor, see diagram on page 37.
061	Temperature sensor short circuit	<ul style="list-style-type: none"> • If faults are not corrected by the remedial action listed above, then replace control box.
071	Overheating sensor interruption	Temperature value outside operating range. <ul style="list-style-type: none"> • Check plug-in connection to the overheating sensor and cable to the control box. • Check overheating sensor, see diagram on page 38.
072	Overheating sensor short circuit	<ul style="list-style-type: none"> • If faults are not corrected by the remedial action listed above, then replace control box.
081	Combustion indicator light short-circuit	Cable 1 ² ge/ws from 18-pin control box connector, chamber 8 to 8-pin cable harness connector, chamber 3, on up to combustion indicator light is short-circuited. <ul style="list-style-type: none"> • Check cable and connections, if necessary remove short circuit. • Check combustion indicator light, replace if necessary.



4 Troubleshooting

Fault code table

Fault code display	Fault description	Cause • Remedial action
083	Fault indicator light short circuit	Cable 1 ² gr from 18-pin control box connector, chamber 5 to 8-pin cable harness connector, chamber 6, on to fault indicator light is short-circuited. <ul style="list-style-type: none"> • Check cable and connections, if necessary remove short circuit. • Check fault indicator light, replace if necessary.
090	Control box defective	<ul style="list-style-type: none"> • Replace control box.
091	External interference voltages	Possible causes: <ul style="list-style-type: none"> • Distance between ignition electrodes not ok → check distance between ignition electrodes, if necessary renew ignition electrodes. • Interference voltages from charger or other sources of interference → Remove interference voltages. • If faults are not corrected by the remedial action listed above, then replace control box.
092 093 094 097	Control box defective	<ul style="list-style-type: none"> • Replace control box.

5 Repair instructions

Repair instructions

The permitted repair work to the heater is described in the "Repair Instructions" chapter. If extensive repairs are necessary, it makes sense to dismantle the heater.

The heater is assembled in the reverse order, note and follow any additional instructions.

Please note!

After completing all the work on the heater, you must carry out a functional check.

Always observe the following safety instructions before working on the heater

Danger!

- Always switch off the heater beforehand and leave it to cool.
- Disconnect the battery.
- Relieve the overpressure in the cooling water circuit by opening the radiator screw cap.
- Do not switch on the heater if burner is dismantled.
- Before removing the ignition spark generator, disconnect plug-in connections in cable harness.
- The heater must not be operated in closed rooms such as garages or workshops.
Exception:
Exhaust suction available directly at the entry to the exhaust pipe.

Important!

- The seals of dismantled components must be renewed.
- During repair work, check all components for damage and if necessary replace.
- Check connector contacts, plug-in connections and cables for corrosion and damage and if necessary repair.
- Only ever use Eberspächer spare parts if replacements are necessary.
- After working on the cooling water circuit the level of the cooling water must be checked and if necessary the refrigerant must be topped up according to the vehicle manufacturer's instructions.
The cooling water circuit must then be vented.
- Operation or the after running of the heater may only be stopped in an emergency (see "EMERGENCY OFF" page 8) by interrupting the battery current (risk of heater overheating).

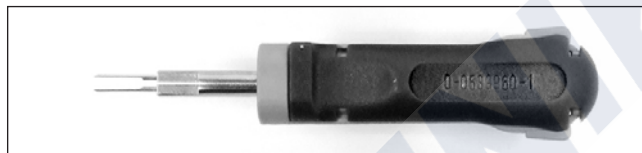
Special tool

AMP release tool

The AMP release tool is used to release plug-in contacts in a connector housing.

This release tool can be ordered directly from AMP.

- For Micro Timer AMP Order No. 0-0539960-1



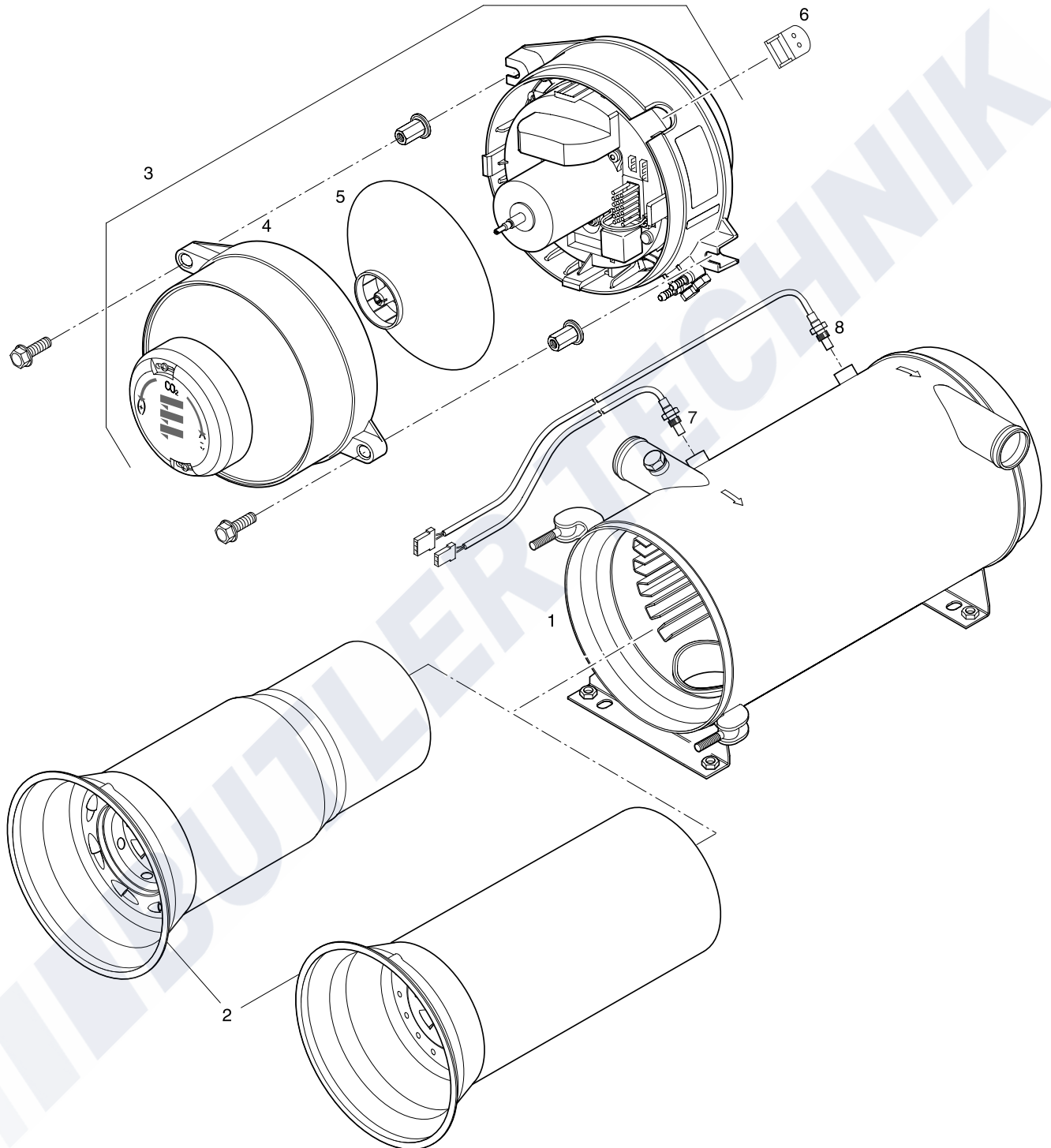
- For Junior Power Timer AMP Order No. 1-1579007-6





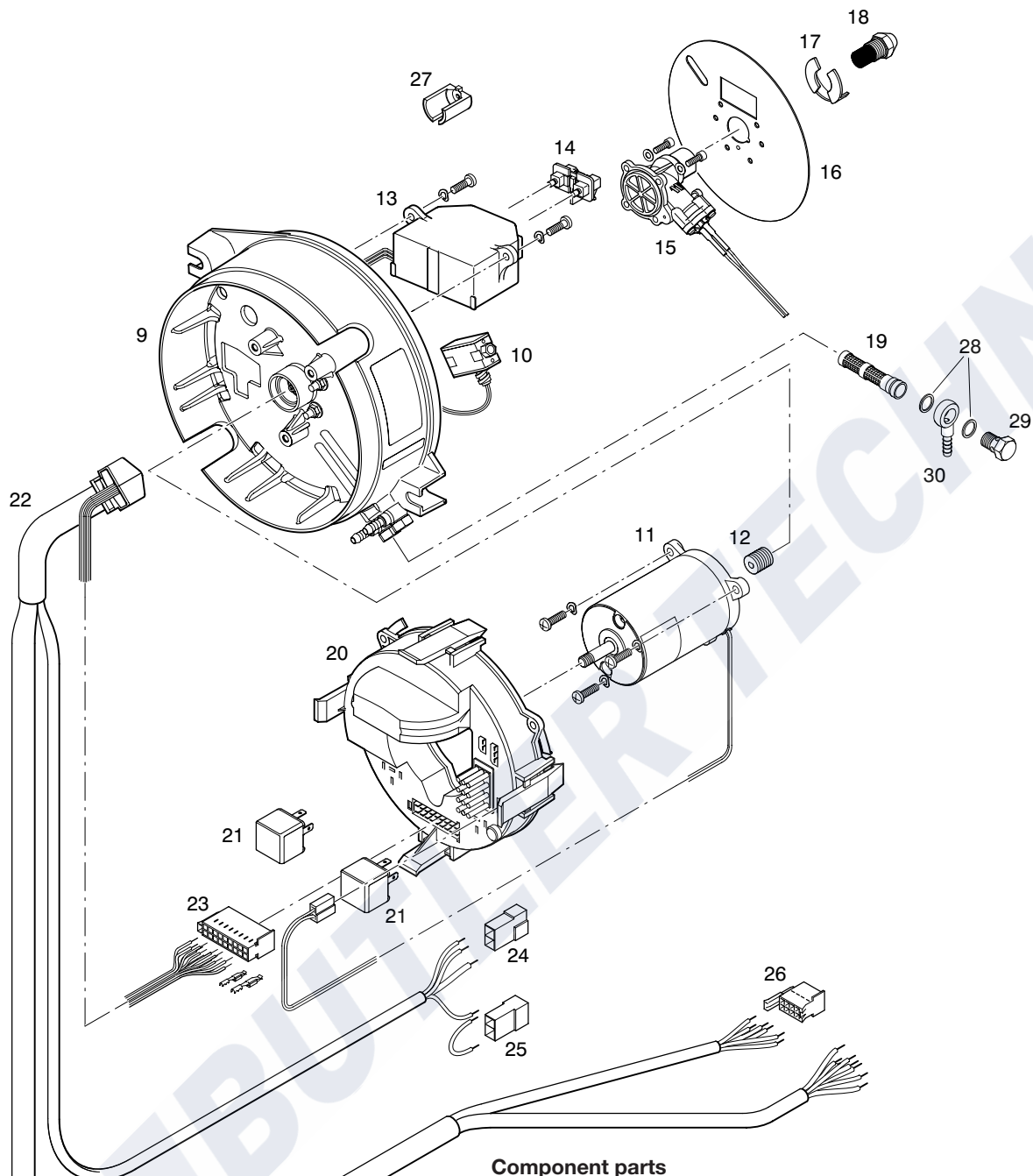
5 Repair instructions

Assembly drawing



5 Repair instructions

Assembly drawing



Component parts

- | | |
|--|--|
| 1 Heat exchanger | 16 Baffle plate |
| 2 Flame tube, HL2-16 / HL2-24
HL2-30 / HL2-35 | 17 KL fuse |
| 3 Burner | 18 Fuel nozzle |
| 4 Hood | 19 Fuel filter |
| 5 Impeller | 20 Control box, 24 volt |
| 6 Grommet | 21 Relay |
| 7 Temperature sensor | 22 Cable harness |
| 8 Overheating sensor | 23 Receptacle housing, 18 pin |
| 9 Fuel pump
(integrated in burner housing) | 24 Tab connector housing, 2-pin |
| 10 Solenoid valve | 25 Tab connector housing, 2-pin |
| 11 Electric motor, 24 volt | 26 Receptacle housing, 8 pin |
| 12 Coupling | 27 Check gauge for ignition
electrode |
| 13 Ignition spark generator, 24 volt | 28 Seal, A10 x 13.5 DIN 7603 AL |
| 14 Ignition electrode | 29 Banjo bolt |
| 15 Nozzle pre-heater | 30 Ring connector |

Sketch 17



5 Repair instructions

Remove hood (see Figure 1 and 2)

- Loosen both of the hood's retaining screws.
- Remove hood.



Risk of injuries!

- The impeller has sharp edges.
 - Avoid touching the impeller or if necessary wear safety gloves.

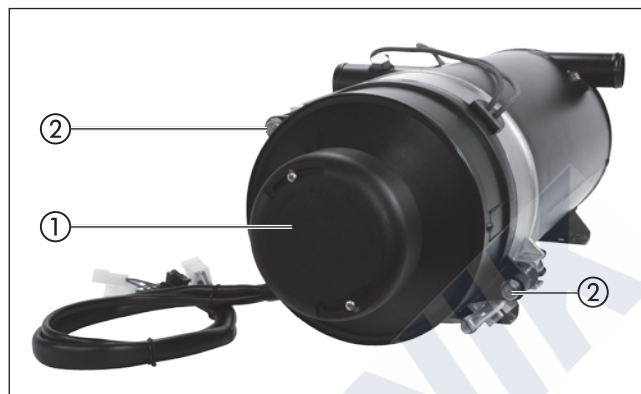


Figure 1

- ① Hood
- ② Retaining hood / burner

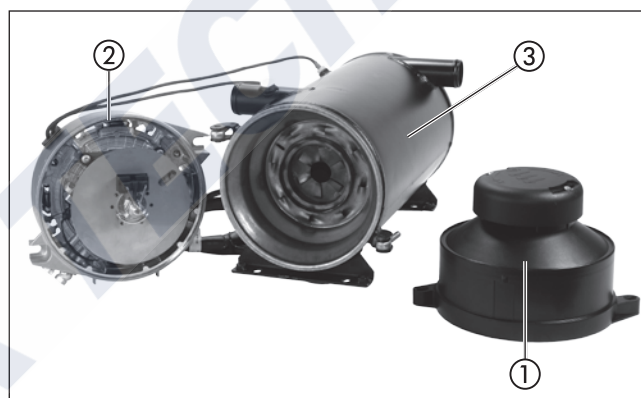


Figure 2

- ① Hood
- ② Burner
- ③ Heat exchanger

Remove impeller (see Figure 3)

- Unscrew impeller **in** clockwise direction, use a screwdriver to hold the motor shaft.

Please note!

When assembling, tighten the impeller with 1 Nm +0.5 Nm.

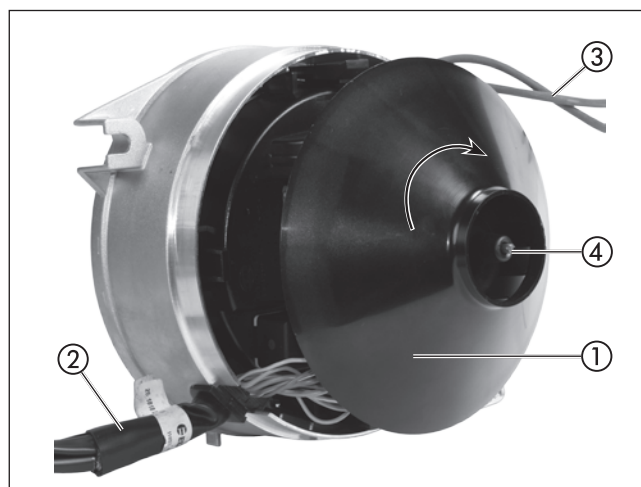


Figure 3

- ① Impeller
- ② Cable harness, heater
- ③ "Temperature sensor" cable loom and "overheating sensor" cable loom
- ④ Motor shaft (thread)

5 Repair instructions

Dismantling the burner (see Figure 4 and 5)

- Remove hood.
- Disconnect “temperature sensor” cable loom and “overheating sensor” cable loom at control box.
- Remove grommet from burner housing.

Please note!

The fuel lines should remain connected, if necessary, lengthen the fuel lines.

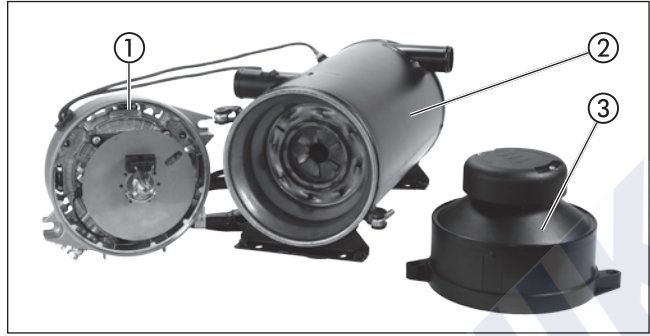


Figure 4

- ① Burner
- ② Heat exchanger
- ③ Hood

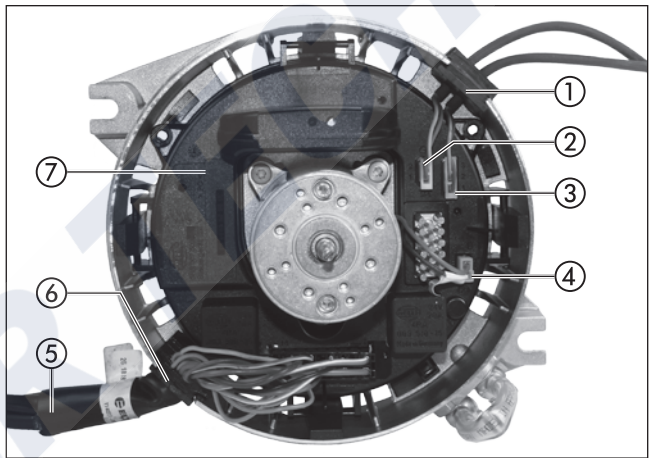


Figure 5

- ① Grommet, “temperature sensor” cable loom and “overheating sensor” cable loom
- ② “Temperature sensor” cable loom
- ③ “Overheating sensor” cable loom
- ④ “Burner motor” cable loom
- ⑤ Cable harness, heater
- ⑥ Grommet, cable harness, heater
- ⑦ Control box

Dismantling the control box (see Figure 5 and 6)

- Remove hood.
- Dismantle the burner.
- Unscrew impeller **in** clockwise direction, use a screwdriver to hold the motor shaft.
- Disconnect all connectors at the front- and rear of the control box.
- Unlock and remove control box with 4 clamps.

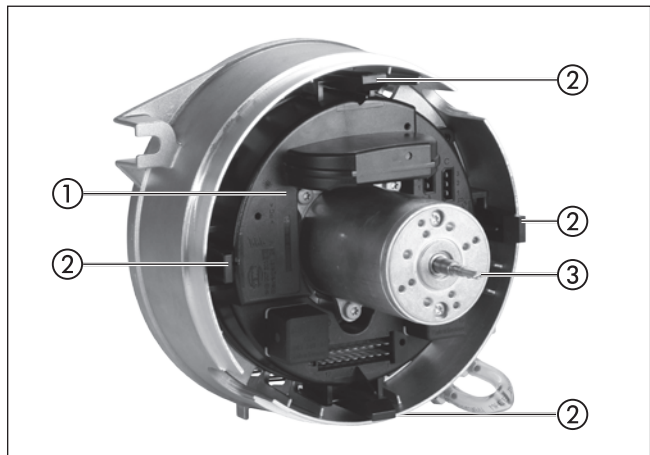


Figure 6

- ① Control box
- ② Clamps
- ③ Motor shaft (thread)



5 Repair instructions

Dismantling the burner motor (see Figure 5, 7 and 8)

- Remove hood.
- Dismantle the burner.
- Unscrew impeller **in** clockwise direction, use a screwdriver to hold the motor shaft.
- If necessary, use the burner tester to test the burner motor (see below).
- Disconnect "burner motor" cable loom at control box, slot "B".
- Undo three retaining screws of burner motor.
- Remove burner motor.

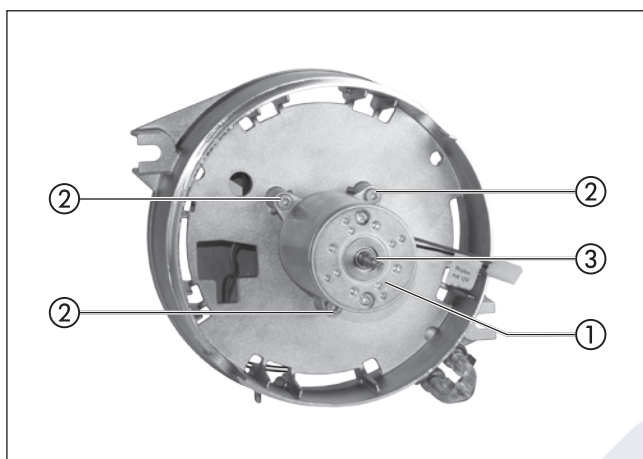


Figure 7

- ① Burner motor
- ② Retaining screws
- ③ Motor shaft (thread)

Please note!

Use the coupling, screws and plain washers included with the spare part for the assembly.
Tighten the impeller with 1 Nm +0.5 Nm.

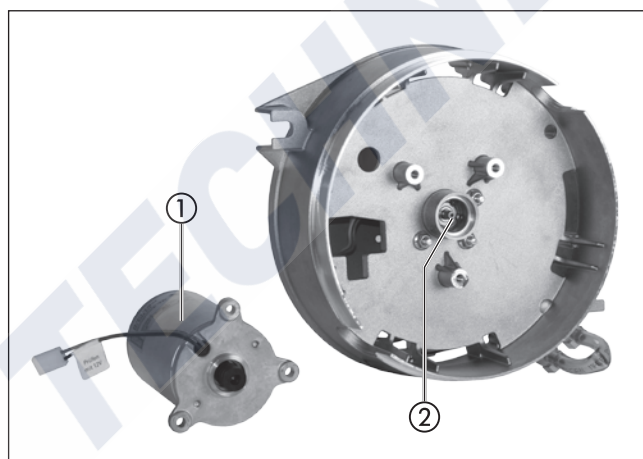


Figure 8

- ① Burner motor
- ② Coupling

Check the function and speed of the burner motor using the burner tester (see Sketch 18)

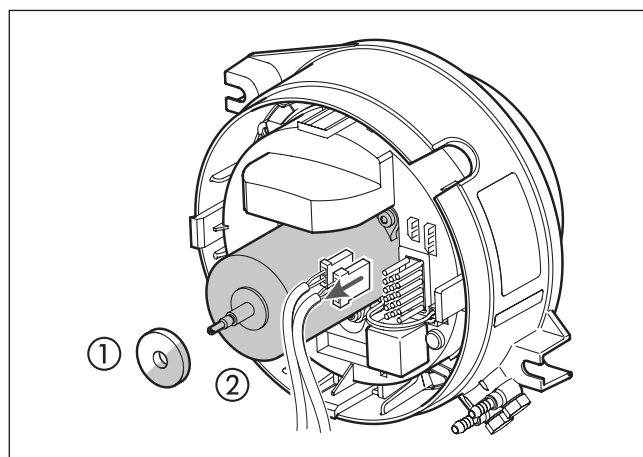
- Disconnect all connectors from the control box.
- Connect burner tester.
- Make a mark on the impeller.
- Keep "Heating ON" pressed for 4 seconds → the heater starts, the electric motor must run for 180 seconds (after-run) →
 - if yes, measure speed using non-contact tachometer.
 - if no, replace the electric motor.

Speed of the electric motor

Hydronic L16	3800 ±350 rpm
Hydronic L24	4200 ±350 rpm
Hydronic L30	4800 ±350 rpm
Hydronic L35	5200 ±350 rpm

⚠ Risk of injuries!

- The impeller has sharp edges.
 - Avoid touching the impeller or if necessary wear safety gloves.



Sketch 18

- ① Impeller with mark
- ② Burner motor

Please note!

Read and follow the burner tester operating instructions.
Let the electric motor to run for 180 seconds.

5 Repair instructions

Dismantling the ignition electrodes (see Figure 9 and 10)

- Remove hood.
- Dismantle the burner.
- Disconnect ignition electrodes from ignition spark generator.

Please note!

- If the Ignition spark generator, ignition electrodes or pump housing is replaced it is necessary to check the distance between the ignition electrodes with a check gauge. The check gauge is included with the spare parts.
- Push the check gauge in the fuel nozzle and press up to the limit stop. The electrode tips must lie against the square surfaces of the check gauge, if not → renew ignition electrodes.
- If the insulation body of the ignition electrodes is damaged → renew ignition electrodes.
- Do not touch the fuel nozzle opening when measuring the electrode spacing.
- The check gauge is solely for checking and not for setting the distance between the electrode tips.
- If the distance between the ignition electrodes differs from what it should be → renew ignition electrodes.
- Bending the ignition electrodes is not allowed.

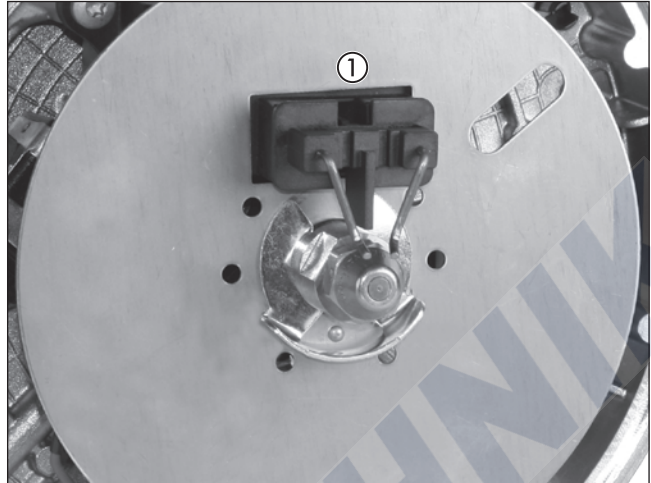


Figure 9

- ① Ignition electrodes

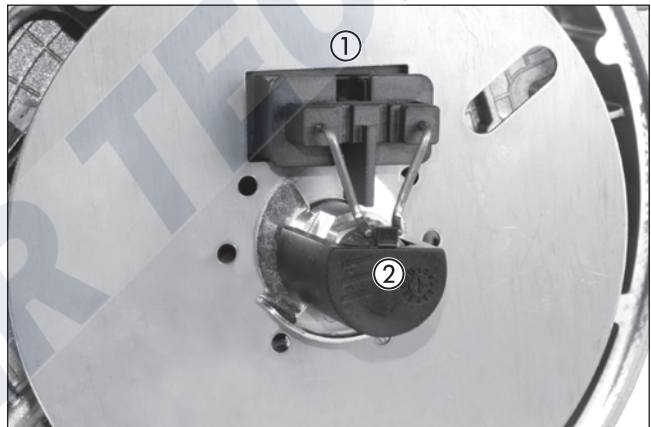


Figure 10

- ① Ignition electrodes
- ② Check gauge

Dismantling the fuel nozzle (see Figure 11)

- Remove hood.
- Dismantle the burner.
- Dismantle the ignition electrodes.
- Unscrew fuel nozzle from the nozzle block, press against the nozzle block with wrench.

Please note!

- When installing the fuel nozzle do not touch the nozzle opening.
- After installing the fuel nozzle, check the position of the ignition electrodes, renew if necessary.
- Tightening torque for fuel nozzle: 16 ± 1 Nm.

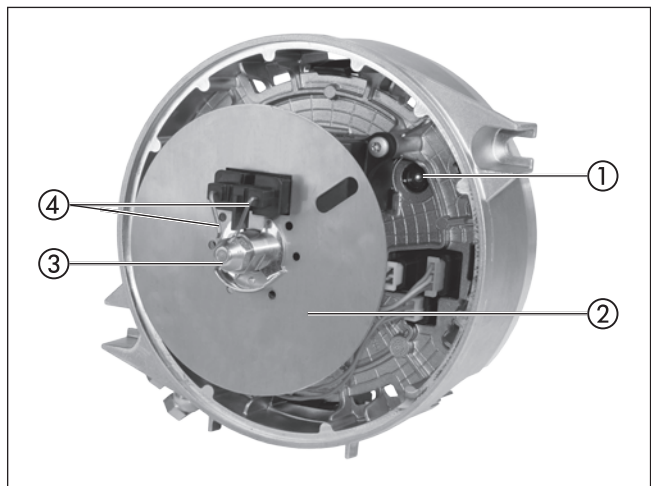


Figure 11

- ① Flame monitor
- ② Baffle plate
- ③ Fuel nozzle
- ④ Ignition electrodes



5 Repair instructions

Dismantle ignition spark generator (see Figure 12 – 14)

- Remove hood.
- Dismantle the burner.
- Dismantle the ignition electrodes.
- Pull fuse clip (KL fuse) off nozzle block and remove baffle plate.
- If necessary, use the burner tester to test the ignition spark generator (see below).
- Disconnect ignition spark generator cable loom at control box, slot "E".
- Undo both retaining screws of ignition spark generator.
- Remove ignition spark generator.

Please note!

- When installing insert the ignition spark generator in the burner housing locator fixings.
- Use the screws and plain washers included with the spare part for the assembly.
- After installing, check distance between ignition electrodes, if necessary renew ignition electrodes.
- Lay the cable harnesses as shown in Figure 8 and 9.

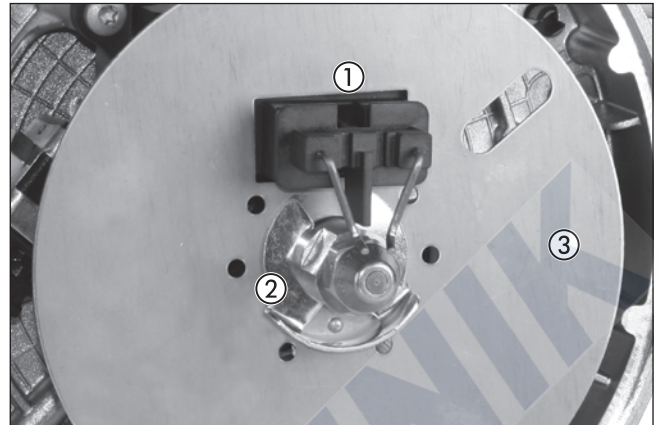


Figure 12

- ① Ignition electrodes
- ② Fuse clip (KL fuse)
- ③ Baffle plate

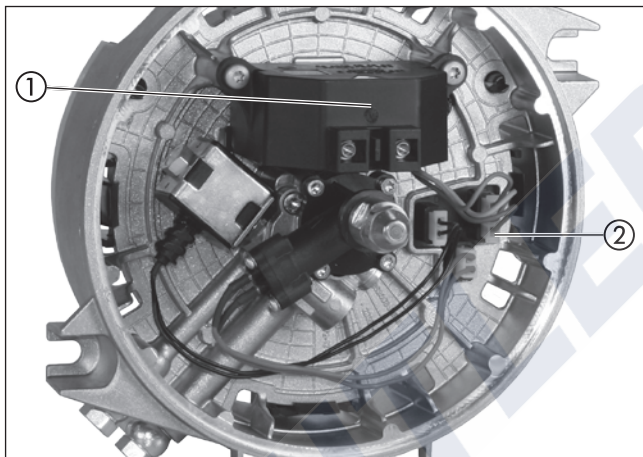


Figure 13

- ① Ignition spark generator
- ② Connection of the "ignition spark generator" cable loom to the control box, slot "E"

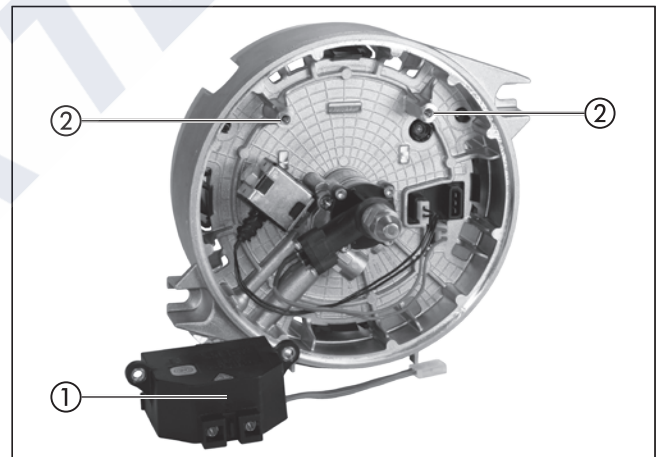


Figure 14

- ① Ignition spark generator
- ② Locator fixings for the ignition spark generator

Testing the ignition spark generator using the burner tester



Danger!

- A spark gap with a voltage of approx. 20 000 volt forms between the electrodes.
 - Test the ignition spark generator only using the burner tester.
 - Do not test ignition spark generator without ignition electrodes.



High voltage!

Always note when testing the ignition spark generator!

Functional check

- Disconnect all connectors from the control box.
- Connect burner tester.
- Press "ZFG" button → a spark gap must form between the electrodes
 - if not, replace the ignition spark generator.

5 Repair instructions

Dismantling the solenoid valve (see Figure 15 and 16)

- Remove hood.
- Dismantle the burner.
- If necessary, use the burner tester to test the solenoid valve (see below).
- Disconnect "solenoid valve" cable loom at control box, slot "D".
- Loosen hexagon nuts from solenoid valve.
- Remove solenoid valve coil.
- Unscrew magnet.

Please note!

When installing lay the cable looms as shown in Figure 15.

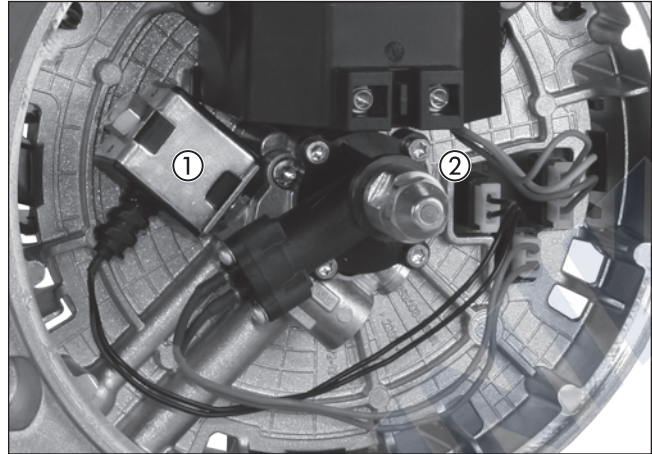


Figure 15

- ① Solenoid valve
- ② Connecting the "solenoid valve" cable loom to the control box, slot "D"

Testing the solenoid valve using the burner tester

- Disconnect all connectors from the control box.
- Connect burner tester.
- Press "MV" button → solenoid valve must click – if not, replace solenoid valve.

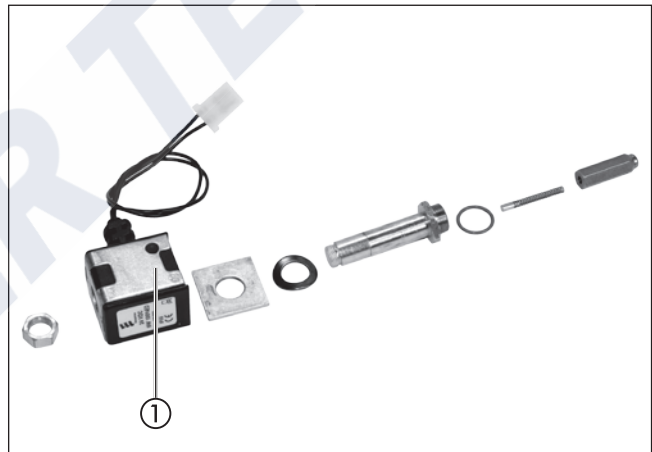


Figure 16

- ① Solenoid valve



5 Repair instructions

Dismantling the nozzle pre-heater (see Sketch 19)

- Remove hood.
- Dismantle the burner.
- Disconnect ignition electrodes from ignition spark generator.
- Unscrew fuel nozzle (3) from the nozzle pre-heater (2), at the same time press against the nozzle pre-heater with a spanner. Reuse the fuel nozzle.
- Pull fuse clip (KL fuse) from the nozzle pre-heater and remove diffuser.
- Disconnect cable loom from control box, slot "F".
- Dismantle the nozzle pre-heater. Keep the screws and spring lock washers for reuse.

Please note!

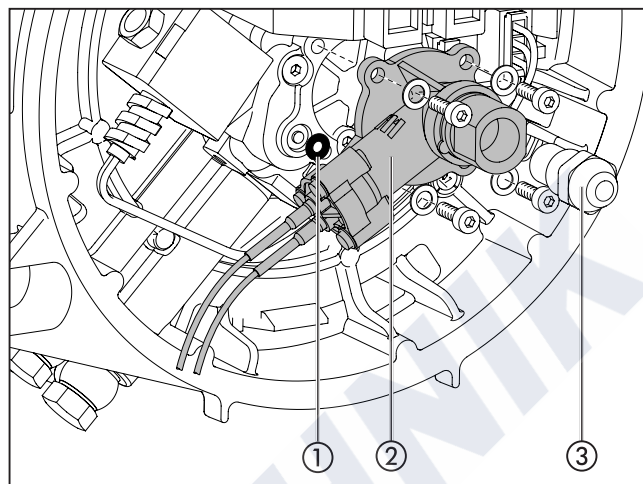
- When installing the fuel nozzle do not touch the nozzle opening.
- After installing the fuel nozzle, check the position of the ignition electrodes, renew if necessary.

Functional check of the nozzle pre-heater

- Connect ohmmeter to the 2-pin receptacle housing → if the measured value is approx. 5 – 10 Ω the nozzle pre-heater is ok, if not, replace the nozzle pre-heater.

Installing the nozzle pre-heater

- Check the O-ring (1) is properly positioned and fits in the pump housing.
- Install the nozzle pre-heater (plastic) using the screws and spring lock washers saved for reuse, tightening torque 2 +0.5 Nm.
- Plug cable loom into control box, slot "F".
- Install the deflector and push on fuse clip (KL fuse).
- Fit fuel nozzle (3), press down on the nozzle pre-heater with a spanner. Tightening torque for fuel nozzle 16 ±1 Nm.
- Install ignition electrodes on ignition spark generator. Check the position of the ignition electrodes, renew if necessary.
- Install the burner.
- Fit the hood.



Sketch 19

- ① O-ring, pump housing
- ② Nozzle pre-heater
- ③ Fuel nozzle

5 Repair instructions

Dismantling the flame tube (see Figure 17 and Sketch 20)

- Remove hood.
- Dismantle the burner.
- Remove flame tube from the heat exchanger.

Please note!

When installing insert the detent of the flame tube in the groove of the heat exchanger.

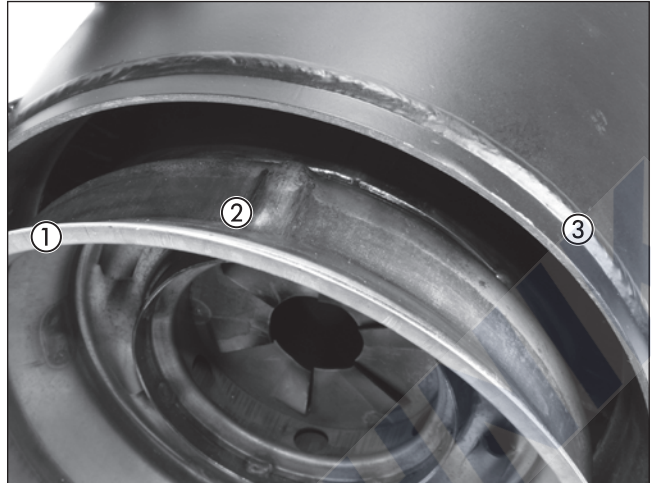
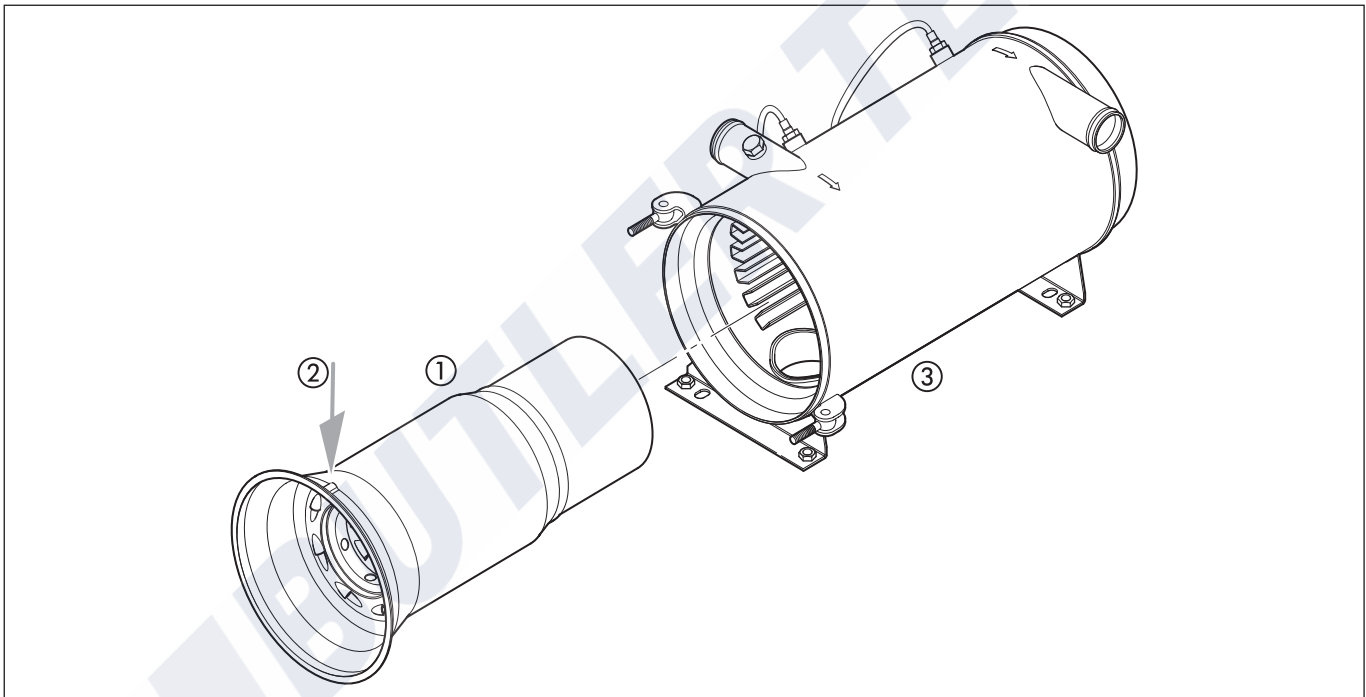


Figure 17

- ① Flame tube
- ② Detent on flame tube
- ③ Heat exchanger



Sketch 20

- ① Flame tube
- ② Detent on flame tube
- ③ Heat exchanger



5 Repair instructions

Dismantling the temperature sensor and overheating sensor (see Figure 18 and Figure 19)

- Remove hood.
- Dismantle the burner.
- Unscrew impeller **in** clockwise direction, use a screwdriver to hold the motor shaft.
- Disconnect temperature and/or overheating sensor connectors at control box.
- Unscrew temperature sensor and overheating sensor from the heat exchanger.

Please note!

For temperature sensor and overheating sensor resistance values, see page 38.

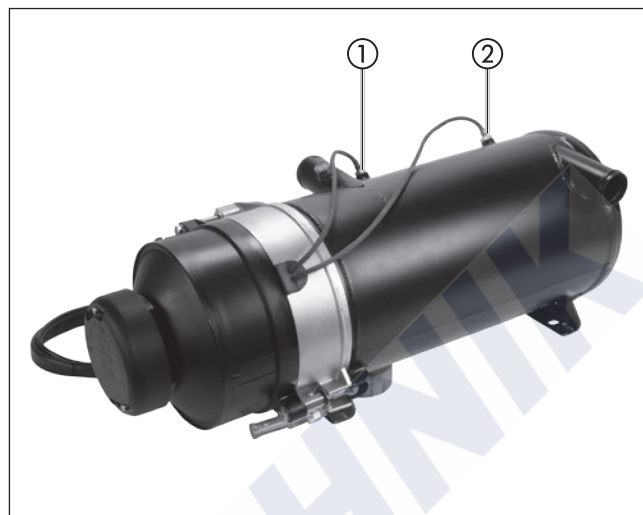


Figure 18

- ① Temperature sensor
- ② Overheating sensor

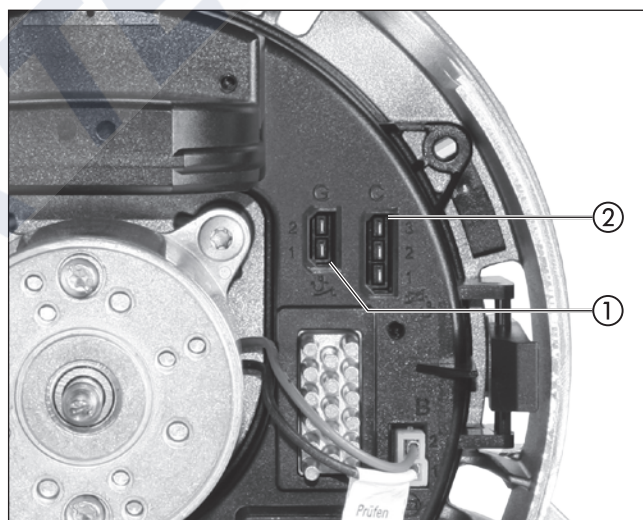


Figure 19

- ① Control box – slot “G” for temperature sensor
- ② Control box – slot “C” for overheating sensor

5 Repair instructions

Resistance values for temperature sensor and over-heating sensor (see Sketches 21 and 22)

Test the temperature sensor and the overheating sensor using a digital multimeter and compare the values with the diagram or the characteristic values table.

If the measured values do not match the diagram or the characteristic values table, then replace the temperature sensor or the overheating sensor.

Check for earth short:

There must be no electrical connection between the sensor connections and the housing.

Resistance value must be ∞ .

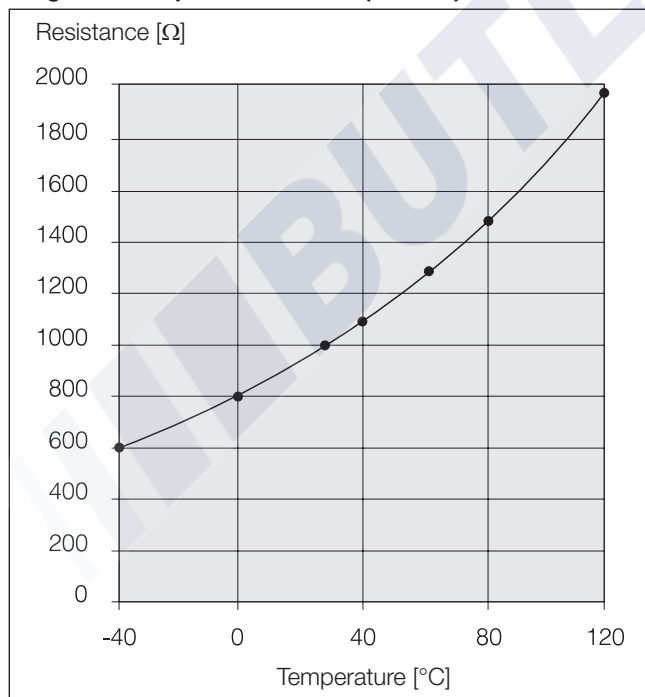
Characteristic values table – temperature sensor (PTC)

Temp. [°C]	Resistance value [Ω]	all. deviation [$\pm\Omega$]
- 40	567	18
0	815	15
25	1000	12
40	1122	16
60	1299	23
80	1490	30
100	1696	44
120	1915	52
130	2023	62

Characteristic values table – overheating sensor (NTC)

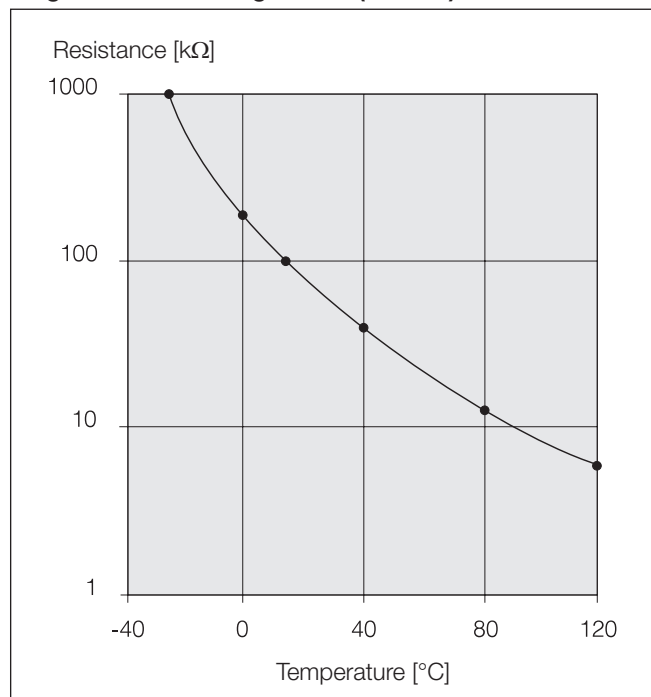
Temp. [°C]	Resistance value [Ω]	all. deviation [$\pm\Omega$]
- 40	3 492 000	324 600
0	337 933	21 560
25	103 517	5 000
40	55 143	3 130
60	25 950	1 727
80	13 118	995
100	7 099	597
120	4 069	374
130	3 135	300
150	1 917	199
180	981	115
200	668	85

Diagram – temperature sensor (section)



Sketch 21

Diagram – overheating sensor (section)



Sketch 22



5 Repair instructions

Dismantling the gauze fuel filter (see Figure 20)

- Remove hood.
- Dismantle the burner.
- Unscrew the banjo bolt and the ring connector from the fuel flow line at the burner.
- Unscrew the gauze fuel filter from the burner housing, clean or replace.



Danger!

Risk of fire, explosion and poisoning!

- Caution when handling fuel.
- Avoid naked flames when handling fuel.
- Do not smoke, this also applies where fuel is only noticed by its characteristic odour.
- Do not inhale fuel fumes.
- When dismantling the fuel flow line, collect any escaping fuel.

Notes on the fuel flow rate and the pressure in the fuel system

Precise checking of the fuel flow rate is not possible.

If necessary the combustion can be checked by checking the CO₂ level in the exhaust.

If it is necessary to change the combustion air set in the factor (CO₂ level), this can be achieved by turning the adjusting cap (see page 40).

To ensure perfect function of the fuel pump you must ensure that the partial vacuum in the fuel system does not become too large (see diagram).

Reliability performance of the heater depending on the underpressure (partial vacuum) in the fuel system

In order to ensure the fuel pump works, it is necessary to ensure that the underpressure in the fuel system is not too large (see table).

	Fuel pressure (P) Heater inlet	Fuel pressure (P) Filter inlet
Preferred range *	min. -0.3 bar	min. -0.2 bar
Allowable range **	-0.45 bar to -0.3 bar	-0.35 bar to -0.2 bar
Critical range ***	-0.55 bar to -0.45 bar	-0.45 bar to -0.35
Heating mode not possible	< -0.55 bar	< -0.45 bar

* Range for design of the fuel supply.

** The counterpressure in the fuel supply can increase over the operating power due to deposits (filter becomes blocked).

*** Heater becomes susceptible to faults (gas bubbles are formed / fault code 52, 54).

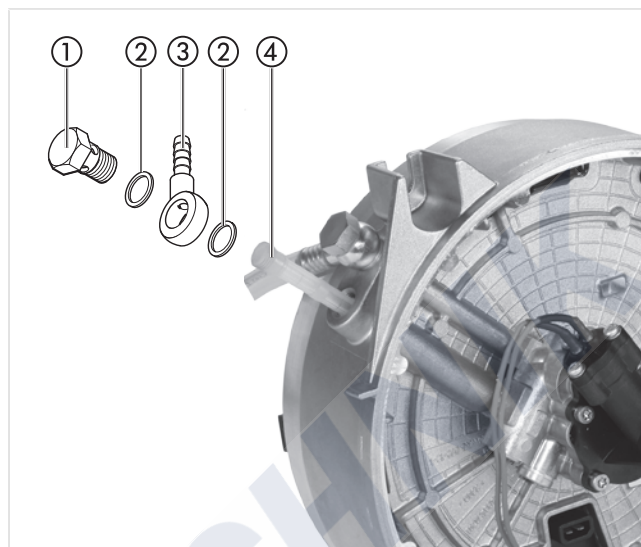


Figure 20

- ① Banjo bolt
- ② Seal, A10 x 13.5 DIN 7603 AL
- ③ Ring connector
- ④ Gauze fuel filter

Please note!

Install banjo bolt and ring connector with new seals (A10 x 13.5 DIN 7603 AL). Tightening torque of the banjo bolt 12 ± 1.2 Nm.

5 Repair instructions

Measure CO₂-level in the exhaust



Danger!

Risk of injury, fire and poisoning!

- The heater must not be operated in closed rooms such as garages or workshops without an exhaust extraction system.
- Do not operate the heater if the burner is dismantled.

Please note!

- It is necessary to measure the CO₂ level, if necessary adjust the combustion air:
 - after repairs to heater (functional check).
 - if combustion is not working properly.
 - after replacing the fuel nozzle.



Figure 21

- ① Adjusting cap

Measurement

Measure the CO₂ level of the heater in the vehicle ready for service.

In order to take a correct measurement of the CO₂- level the heater must have reached its operating temperature.

Measure the CO₂ level using a CO₂ indicator, to this end, read and follow the manufacturer's instructions.

Adjusting the combustion air (see Figure 21)

- Undo the adjusting cap screws.
 - If the CO₂ level is less than 9 % by vol, turn the adjusting cap to the left (CO₂ +).
 - If the CO₂ level is higher than 11 % by vol, turn the adjusting cap to the right (CO₂ -).
- Retighten the adjusting cap.
- If proper adjustment of the CO₂ level is no longer possible:
 - Check the burner for damage.
 - Check the speed of the electric motor.
 - Replace fuel nozzle.



5 Repair instructions

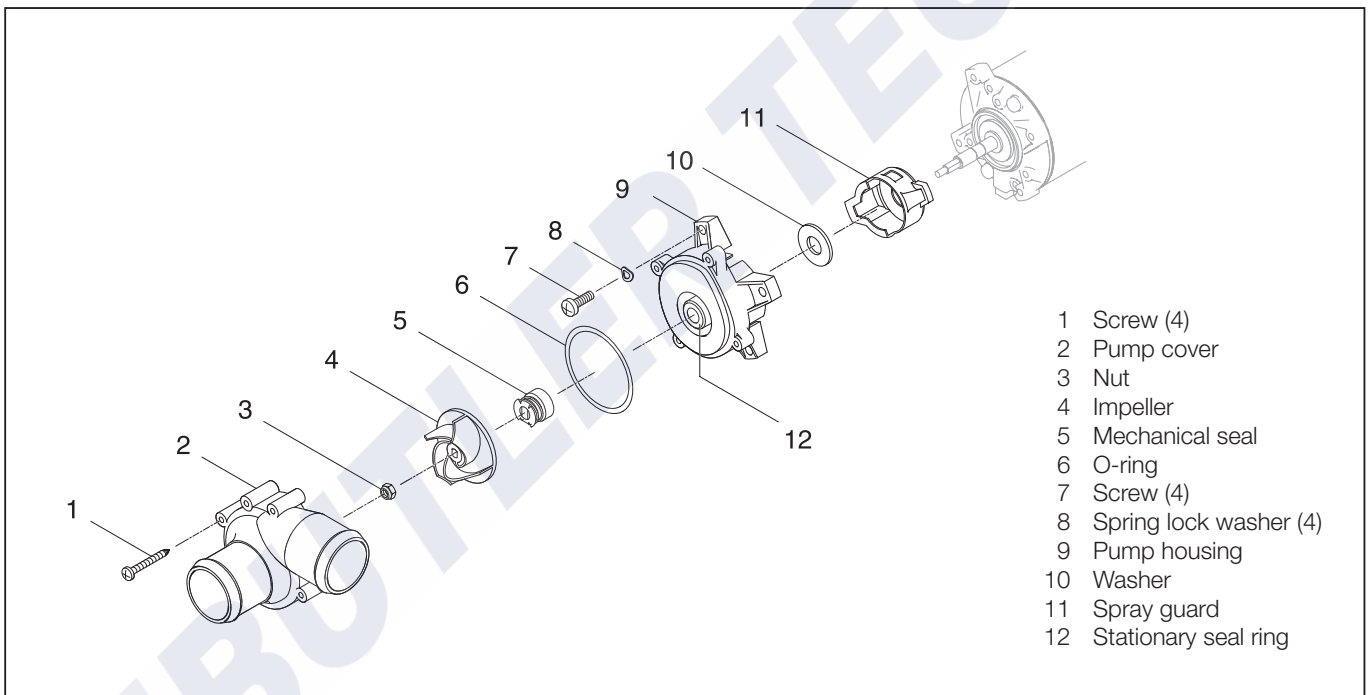
Dismantling the Flowtronic 5000

(see Sketch 23)

1. Remove the screws (1) on the pump cover (2).
2. Remove the pump cover (2) and check for damage.
3. Undo the nut (3) while holding on to the impeller (4), unscrew from the motor shaft and dispose of the nut.
4. Pull the impeller (4) off the motor shaft and throw away.
5. Undo and dispose of the screws (7) with spring lock washers (8) on the pump housing (9).
6. Pull the pump housing (9) with mechanical seal (5) and stationary seal ring (12) and O-ring (6) from the motor shaft and throw away.
7. Remove the washer (10) and if necessary the spray guard (11) off the motor shaft and throw away.
8. Check motor for smooth and easy movement and examine for damage, unbalance and noise generation.

Please note!

- The Flowtronic 5000 spare parts kit (Order No.: 25 1818 99 29 10) contains a new mechanical steel seal which requires particular care to install. The mechanical seal may only be replaced together with the replacement of the complete seal kit.
- Before using the Flowtronic 5000 spare parts kit (Order No.: 25 1818 99 29 10), check to ensure the maximum shelf life of the mechanical seal (printout on the protective covering + 4 years) has not been exceeded.



Sketch 23

5 Repair instructions

Assembling the Flowtronic 5000

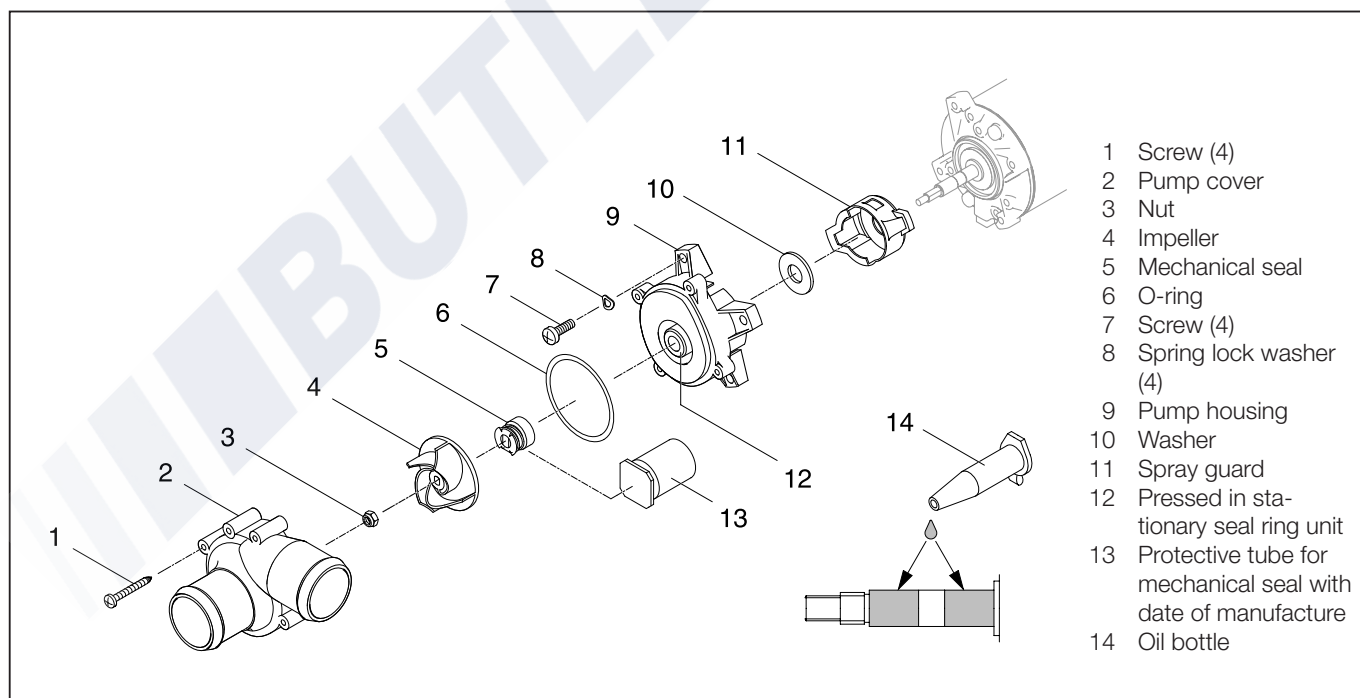
(see Sketch 24)

1. Remove dirt and deposits from the motor shaft.
2. Check the screws on the end plate for secure fit and if tighten necessary (2 Nm torque).
3. Push the spray guard (11, Sketch 24) and washer (10) onto the motor shaft up to the limit stop.
4. Apply a lubricating film of assembly oil to the whole of the motor shaft, in a horizontal position as shown in Sketch 24. To do this, pierce the tip of the oil bottle or cut it open and carefully apply the assembly oil on the intended parts of the motor shaft.
5. Remove the pump housing (9) with pressed in stationary seal ring unit (12) from the separate packaging.
6. Push the pump housing (9) onto the motor shaft up to the splash guard (11). Align the mounting holes with the threaded holes in the motor flange.
7. Attach the pump housing with the screws (7) and spring lock washers (8) (4 Nm torque).
8. Remove the mechanical seal (5) from the protective tube (13).
9. Align the mechanical seal (5) with the motor shaft (flat surfaces) and push on up to the limit stop.
10. Push the impeller (4) onto the motor shaft. The mechanical seal expands.
11. Screw on the nut (3), at the same time fasten the impeller (4) and tighten the nut (1.5 Nm torque).
12. Place the O-ring (6), unskewed, on the pump housing (9) over the edge.
13. Place the pump cover (2) on the pump housing (9) and fasten with screws (1) (2 Nm torque).
14. Install the circulating pump in the vehicle
15. Perform functional and leak test



Important!

- Do not damage the surface of the motor shaft.
- If using a liquid cleaning agent, ensure it does not penetrate the motor bearings.
- The motor shaft must be completely greased with assembly oil, otherwise proper assembly (self-adjustment) of the mechanical seal is not ensured and results in leaks.
- Do not damage or remove the anti-friction film on the sliding surface of the stationary seal ring unit. Take care to avoid contamination with foreign bodies.



Sketch 24



5 Repair instructions

Dismantling the Flowtronic 6000 S / 6000 SC

(see Sketch 25)

- 1 Remove 4 screws (10) in pump cover.
- 2 Remove pump cover, clean, examine for leaks and damage and throw away O-ring (1).
- 3 Undo the nut (2) while holding onto the impeller (5), remove from the shell shaft and dispose of.
- 4 Pull off the support ring (3) and impeller with inner rotor and thrust ring (4) from the shell shaft and throw away.
- 5 Remove screws (5) and spring lock washers (6) from the shell (7).

Please note!

The tight fit of the centring ring on the inside of the shell (7) makes pulling off difficult. In addition, the magnetic forces of the coupling must be overcome when pulling off. The centring ring remains hanging onto the outer rotor.

- 6 Remove the shell (7) with diaphragm (8) by pulling it axially off the motor flange and throw away together with O-ring (3).
- 7 Remove flat seal (9) from motor and throw away.
- 8 Carefully remove dirt and deposits from the outer rotor.
- 9 Check motor for smooth and easy movement and, together with the outer rotor, check for damage, unbalance and noise and if necessary throw away.



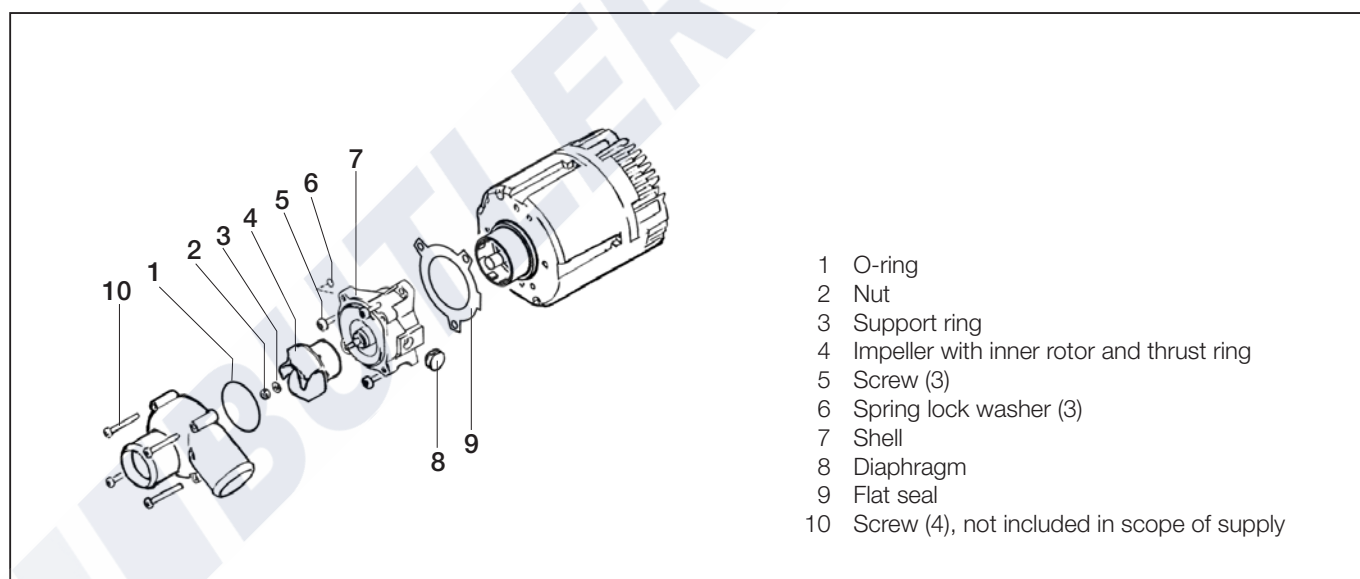
Important!

The specified order must be adhered to when dismantling or assembling. It is important for the pump to be completely dismantled as described to enable any interior damage to be identified and repaired.

Ensure that no small particles or parts enter the body of the pump through the water inlet and outlet connections.

Please note!

- The magnets on the inside of the outer rotor are fragile and can be torn off the adhesive point if excessive forces are applied. If using a cleaning agent, prevent liquid from getting inside the motor. Signs of flash rust on the outer rotor of the dismantled pump are normal. Flash rust is not an indication that the outer rotor no longer fulfils its function – transfer or torque from motor shaft to pump impeller.



Sketch 25

5 Repair instructions

Assembling the Flowtronic 6000 S / 6000 SC

(see Sketch 25)

1. Firmly push the centring ring onto the collar of the motor flange and at the same time centre it.
2. Place the new shell (8) on the outer motor, centre on the centring ring and fix onto the motor flange using the new screws and new spring lock washers.
3. Carefully push the new impeller with inner rotor (5) onto the shell shaft.
4. Mount the new thrust ring (4), new support ring (3) and new nut (2) onto the shell shaft while holding onto the impeller (5).
5. Place the new O-ring (1) over the edge of the shell (8) free of twist.
6. Place the pump cover on the shell (8) and fix with 4 screws (9).
7. Install the circulating pump in accordance with the appropriate installation instructions.
8. Perform leak and functional test.

The tightening values (torques) of the fixing elements are given in the table below and must be precisely adhered to during assembly.

Tightening values		
Item	Name	Nm.
2	Nut	1.4 ±10 %
6	Screw	3.5 ±10 %
9	Screw	2.0 ±10 %



Important!

A slight magnetic stray field exists in the impeller components with inner rotor (5) and the outer rotor when they are dismantled. When dismantling and assembling, ensure that no small ferromagnetic parts are lying about loose in the immediate vicinity of the installation area. These could be attracted by the magnetic systems of the impeller with inner rotor (5) and the outer rotor and block assembly or running of the motor.

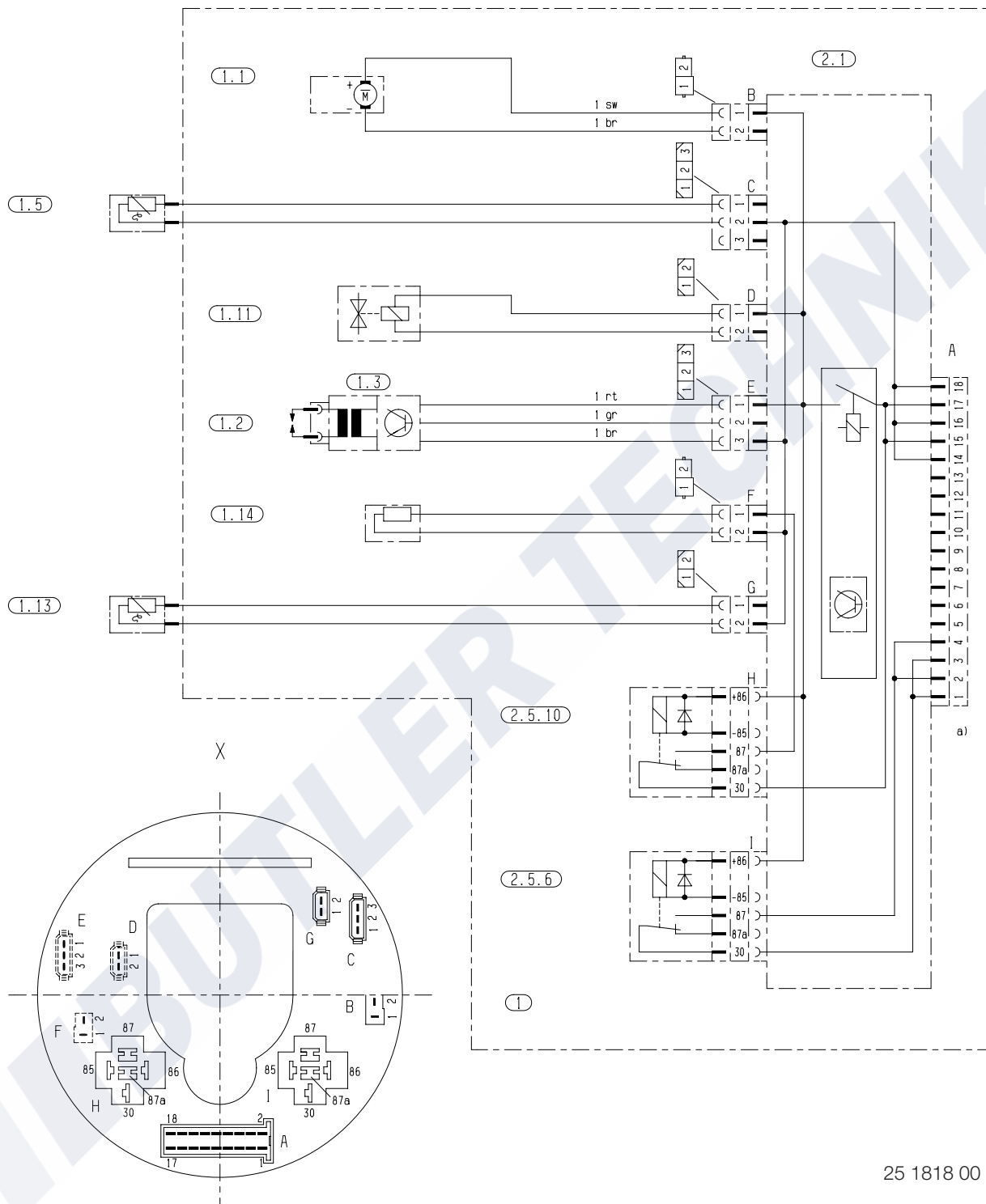
Please note!

Due to the magnetic forces in the shell (8), do not install with mounted impeller (5) but one after the other. The magnetic coupling between the impeller with inner rotor (5) and outer rotor causes accelerated merging of the components. When pushing them on, ensure that the plain bearing between the impeller with inner rotor (5) and shell (8) is not damaged.



6 Circuit diagram

Heater circuit diagram – Part 1

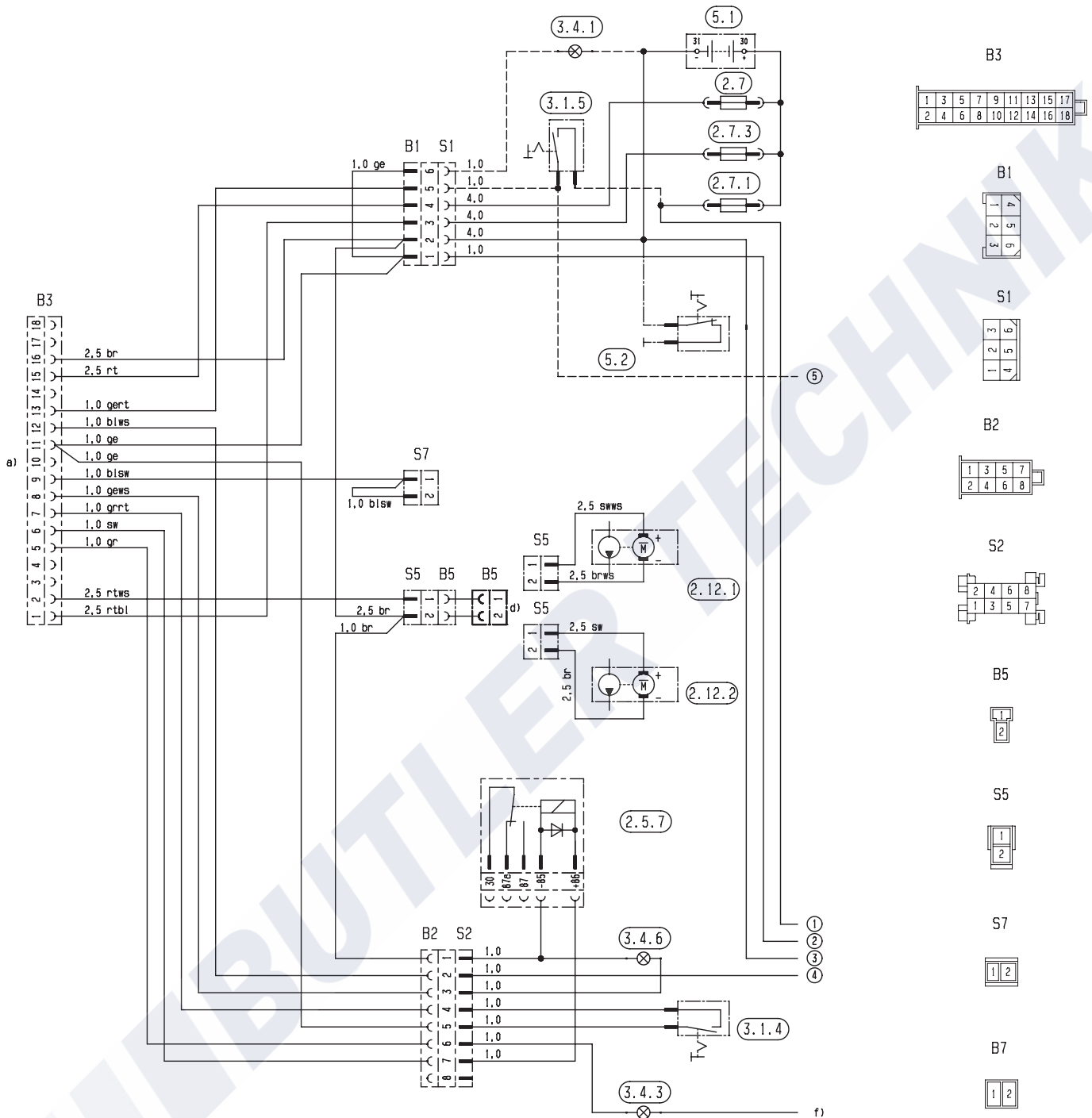


Parts list

- | | | | |
|------|---------------------------------------|--------|---|
| 1 | Heater | 2.1 | Control box |
| 1.1 | Burner motor | 2.5.6 | Relay, water pump |
| 1.2 | Ignition electrodes | 2.5.10 | Relay, heating cartridge |
| 1.3 | Ignition spark generator | a) | Connection, control unit |
| 1.5 | Overheating sensor | X | Graphic illustration of the control box from the impeller side |
| 1.11 | Fuel solenoid valve | | Connectors and bush housings are shown from the cable inlet side. |
| 1.13 | Sensor, control temperature, interior | | |
| 1.14 | Heating element for fuel nozzle | | |

6 Circuit diagram

Heater circuit diagram – Part 2



25 2488 00 97 01

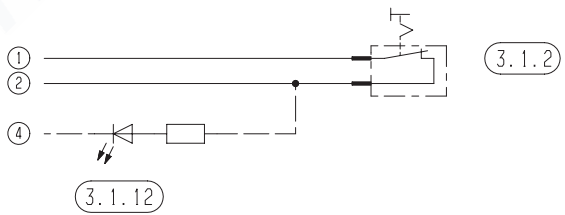
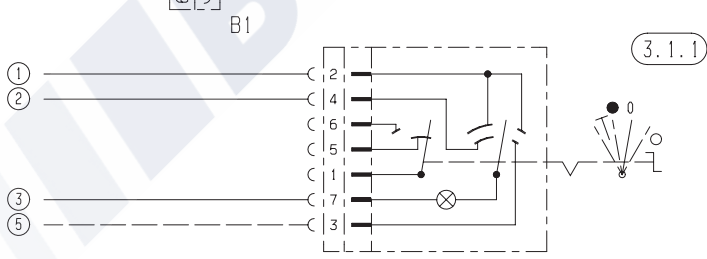
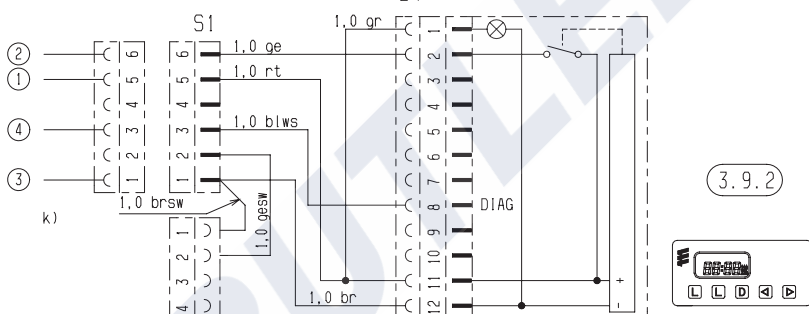
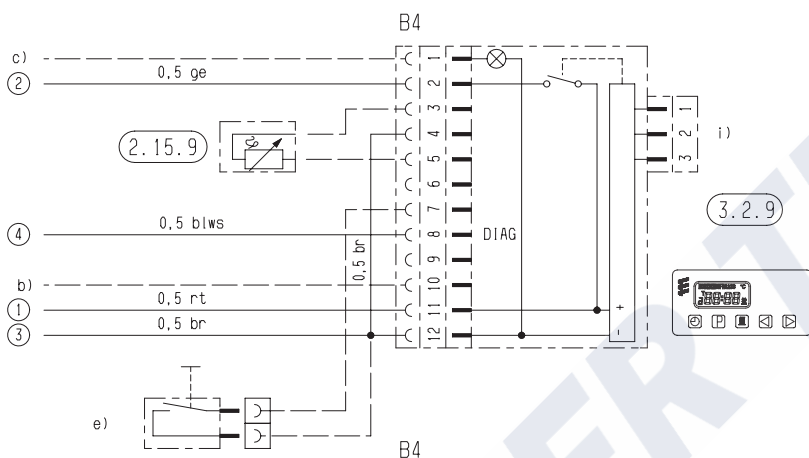
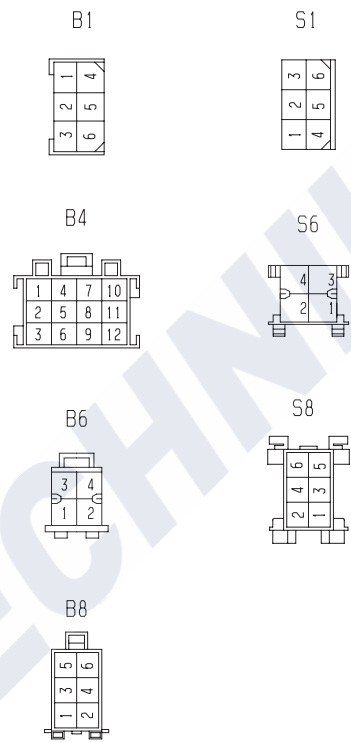
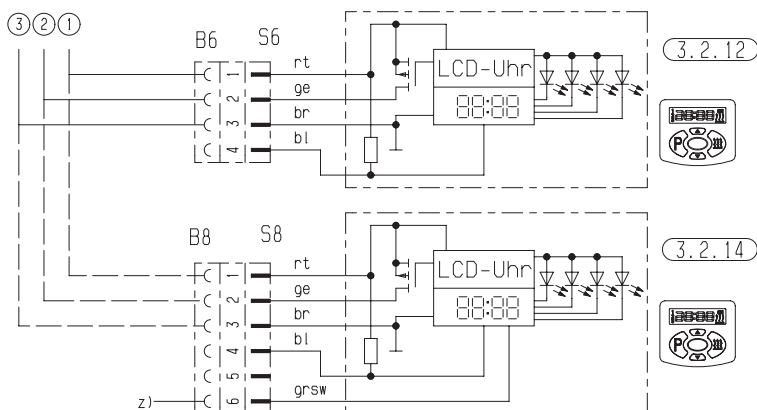
Parts list

- | | | | | | |
|--------|--------------------------------------|-------|----------------------|----|---|
| 2.5.7 | Relay for control, vehicle blower | 3.4.1 | Switch on control | a) | Heater connection |
| 2.7 | Main fuse 15 A | 3.4.3 | Fault indicator lamp | d) | Optionally 2.12.1 or 2.12.2 |
| 2.7.1 | Fuse, actuation 5 A | 3.4.6 | Fuel indicator lamp | f) | If using 3.2.6 optionally terminal 15 or terminal 30 – otherwise switch on positive (cable 1 ² yellow) |
| 2.7.3 | Fuse, water pump 15 A | | | | |
| 2.12.1 | Water pump, Flowtronic 6000 SC | 5.1 | Battery | | |
| 2.12.2 | Water pump, Flowtronic 5000 / 5000 S | 5.2 | Battery disconnect | | |
| 3.1.4 | Switch, temperature lowering | | | | |
| 3.1.5 | Switch, water pump | | | | |



6 Circuit diagram

Circuit diagram for control units



Parts list

- 2.15.9 Temperature sensor (outside temperature)
- 3.1.1 Universal switch
- 3.1.2 Switch, heat, continuous operation
- 3.1.12 Fault code query
- 3.2.9 Module timer
- 3.2.12 Timer, mini (12 / 24 volt)
- 3.2.14 Timer, mini lighting (12 / 24 volt)
- 3.9.2 Diagnostic unit
 - b) Connect to +15
 - c) Lighting, terminal 58
 - e) External "ON / OFF" button (option)
 - i) Connection, radio module
 - k) Not included in scope of supply of 3.9.2
 - z) Terminal 58 (lighting)

Insulate unused cable ends.

Connectors and bush housings are shown from the cable inlet side.

6 Circuit diagram

Parts list for circuit diagram, EasyStart control units

- 2.15.1 Temperature sensor (room temperature)
(included in scope of supply of EasyStart R+,
optional for EasyStart T and EasyStart R)
- 2.15.9 Temperature sensor (outside temperature) (optional)

- 3.1.7 "OFF" button
- 3.1.9 "Heat / ventilate" switch
(included in EasyStart T scope of supply,
optional for EasyStart R)
- 3.1.16 Radio remote control button

3.2.15 EasyStart T timer

- 3.3.9 Radio remote control, EasyStart R (stationary unit)
- 3.3.10 Radio remote control, EasyStart R+ (stationary unit)

3.6.1 Lead harness

3.8.3 Antenna

- c) Terminal 58 (lighting)
- d) Parking / cab ventilation with vehicle blower (optional)
- e) Connection, EasyStart T timer
- g) External "ON / OFF" button (optional)

Cable colours circuit diagrams

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

Connectors and bush housings are shown from the cable inlet side.

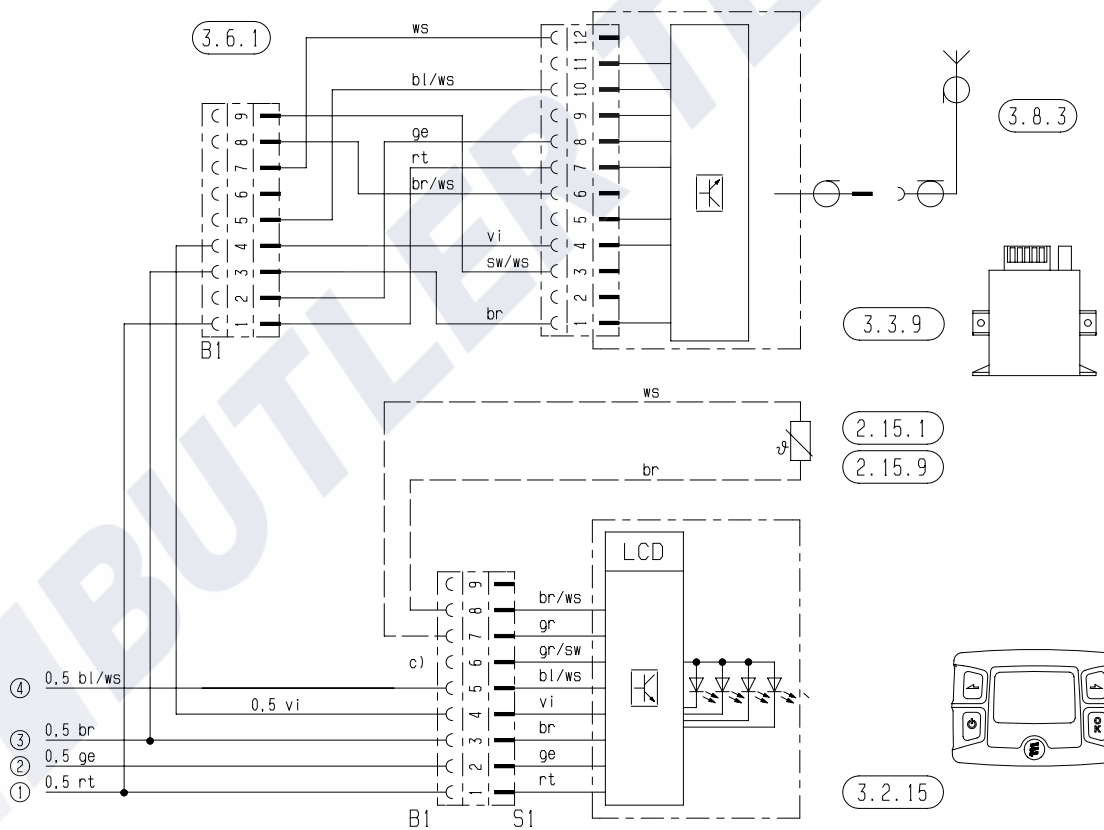
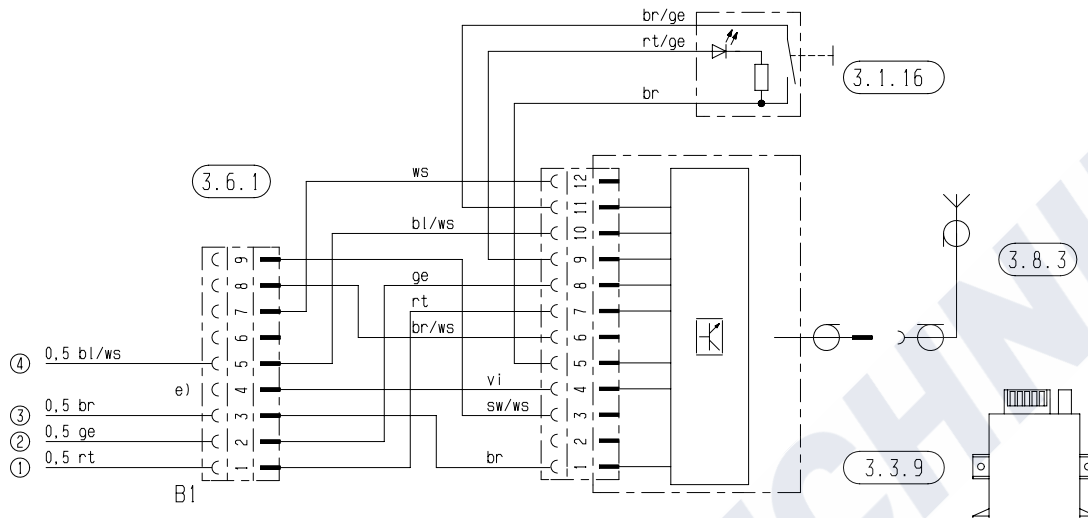
Please note!

For circuit diagrams, see page 49 – 51.

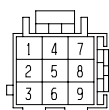


6 Circuit diagram

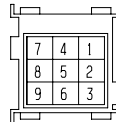
Circuit diagram, EasyStart R control units



B1

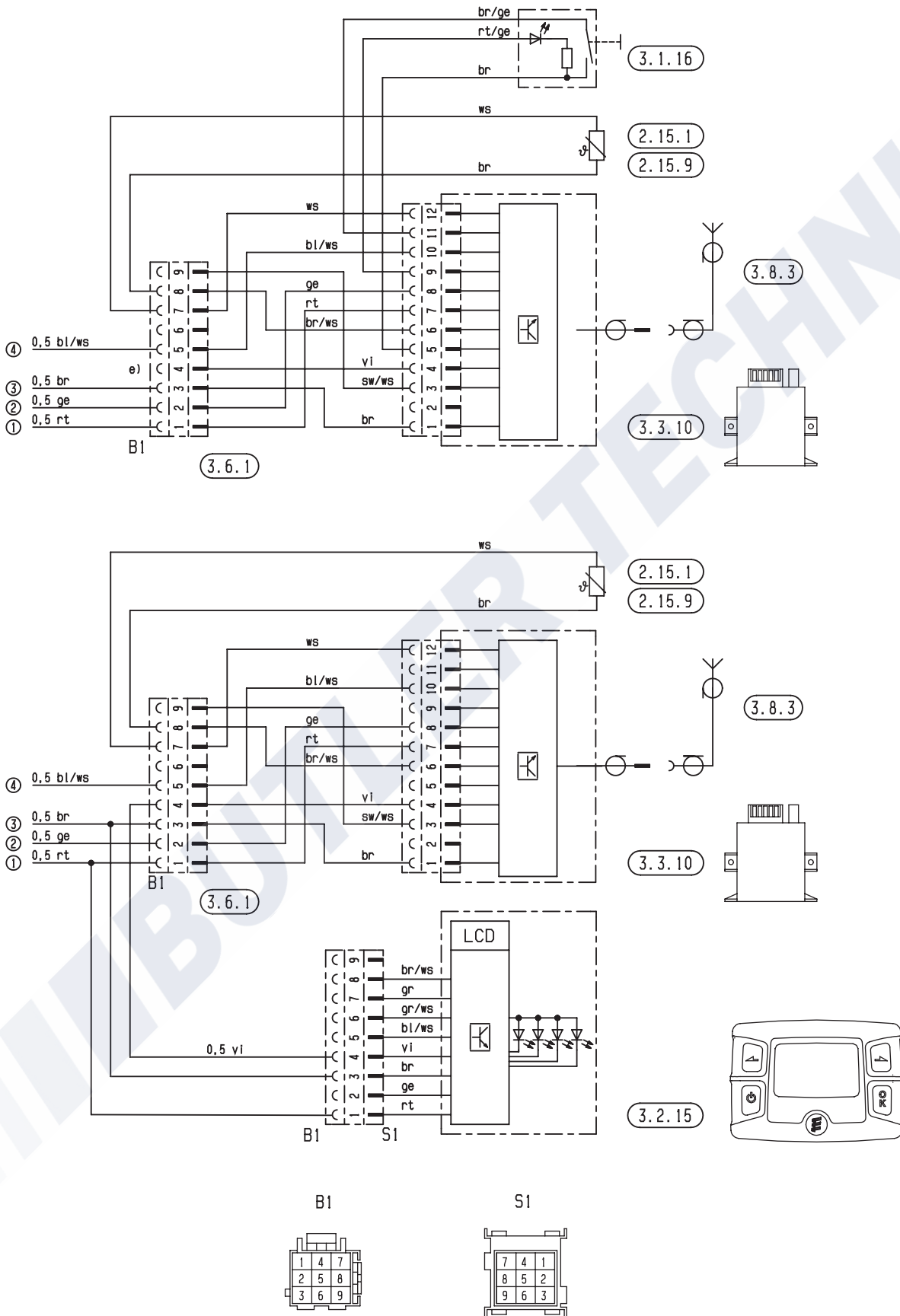


S1



6 Circuit diagram

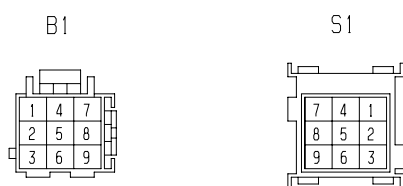
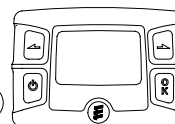
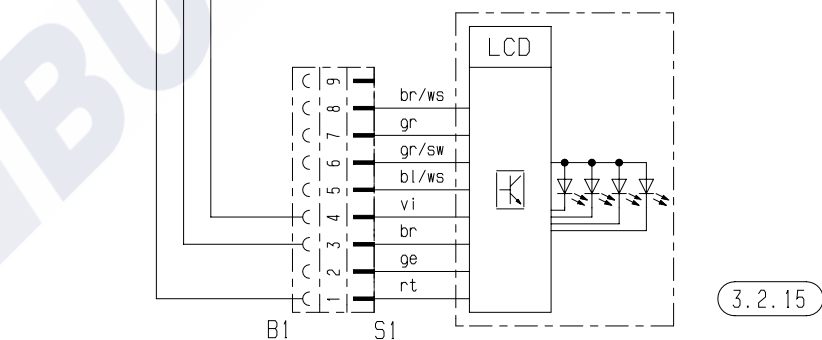
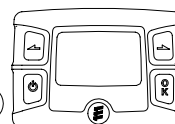
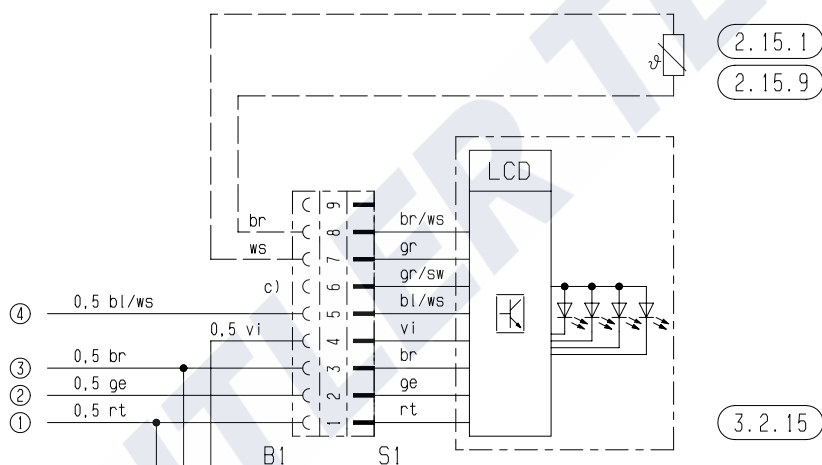
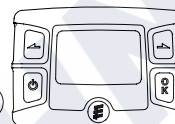
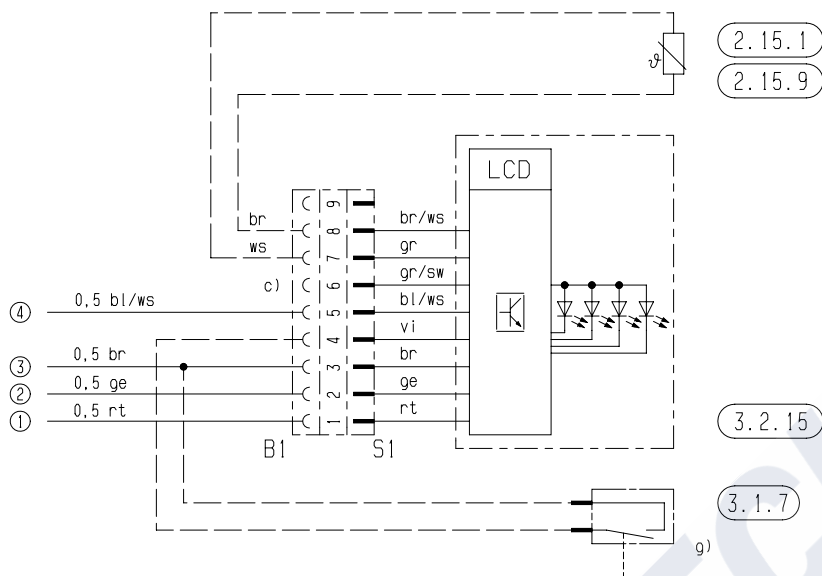
Circuit diagram, EasyStart R+ control units





6 Circuit diagram

Circuit diagram, EasyStart T control units



7 Service

Certifications

The high quality of Eberspächer's products is the key to our success.

To guarantee this quality, we have organised all work processes in the company along the lines of quality management (QM). Even so, we still pursue a large number of activities for continuous improvement of product quality in order to keep pace with the similarly constantly growing requirements made by our customers.

All the steps necessary for quality assurance are stipulated in international standards. This quality is to be considered in a total sense.

It affects products, procedures and customer / supplier relationships.

Officially approved public experts assess the system and the corresponding certification company awards a certificate.

Eberspächer has already qualified for the following standards:

**Quality management in accordance with
DIN EN ISO 9001:2000 and ISO/TS 16949:1999**

**Environmental management system in accordance with
DIN EN ISO 14001:1996**

Disposal

Disposal of materials

Old devices, defect components and packaging material can all be separated and sorted into pure-grade fractions so that all parts can be disposed of as required in an environment-friendly manner recycled where applicable. Electric motors, control boxes and sensors (e.g. temperature sensors) are deemed to be "electronic scrap".

Dismantling the heater

The heater is dismantled according to the repair stages in the current troubleshooting / repair instructions.

Packaging

The packaging of the heater can be kept in case it has to be sent back.

EC Declaration of Conformity

We herewith confirm that the product named in the following

Heater type Hydronic L-II

conforms to the prime safety requirements defined in the Directive of the EU Council for harmonisation of the legal regulations of the member states with regard to electromagnetic compatibility (89 / 336 / EEC).

This declaration applies to all heaters produced according to the Hydronic L-II production drawings – which are an integral part of this declaration.

The following standards / directives have been used to assess the product with regard to electromagnetic compatibility:

- EN 50081 – 1 Basic form interference emission.
- EN 50082 – 1 Basic form of interference immunity.
- 72 / 245 / EEC – Modification status 2006 / 28 / EC interference suppression in motor vehicles.



7 Service

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BUTLER TECHNIK

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