

## HYDRONIC L-II BOXED ENCLOSURE SERIES



### 12 VOLT ASSEMBLIES

- 25.2800.10.1612 HYD 16 L-II Boxed Off-Highway Assembly
- 25.2800.10.2412 HYD 24 L-II Boxed Off-Highway Assembly
- 25.2800.10.3012 HYD 30 L-II Boxed Off-Highway Assembly
- 25.2800.10.3612 HYD 30 L-II Boxed Off-Highway Assembly (6000L Pump)
- 25.2800.10.3512 HYD 35 L-II Boxed Off-Highway Assembly

### 24 VOLT ASSEMBLIES

- 25.2800.10.1600 HYD 16 L-II Boxed Off-Highway Assembly
- 25.2800.10.2400 HYD 24 L-II Boxed Off-Highway Assembly
- 25.2800.10.3000 HYD 30 L-II Boxed Off-Highway Assembly
- 25.2800.10.3600 HYD 30 L-II Boxed Off-Highway Assembly (6000L Pump)
- 25.2800.10.3500 HYD 35 L-II Boxed Off-Highway Assembly

\* standard kits use the 5000L coolant pump

**A WORLD OF COMFORT**



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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 trouble-shooting and repair instructions.

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

## 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

- This 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.

Underlined blue text denotes a cross-reference, which can be clicked in the PDF format. The part of the document named in the text is then displayed.

### PICTURES SYMBOLS



**DANGER!**

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

- ➔ This arrow indicates the appropriate precaution to take to avert the danger.



**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.

- ➔ This arrow indicates the appropriate precaution to take to avert the danger.



**PLEASE NOTE!**

These remarks contain recommendations for use and useful tips for the operation, installation and repair of the heater.

## SAFETY INSTRUCTIONS FOR INSTALLATION AND REPAIR



**CAUTION!**

Improper installation or repair of Espar heaters can cause a fire or toxic 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.
- When carrying out electric welding on the vehicle, the positive cable at the battery should be disconnected and placed at ground to protect the ECU.

## LIABILITY CLAIM / GUARANTEE

Espar 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.

# 1 INTRODUCTION

## ACCIDENT PREVENTION

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

### INITIAL START-UP OF THE HEATER OR FUNCTIONAL TEST AFTER A REPAIR

- After installation or carrying out a repair on the heater, the coolant circuit and the whole fuel supply system must be vented carefully.
- Comply with the instructions issued by the vehicle manufacturer.
- During the heater trial run, all water and fuel connections must be checked for leaks and secure, tight fit.
- If faults occur while the heater is running, use a diagnostic unit to correct the cause of the fault.

#### EMERGENCY SHUTDOWN — EMERGENCY OFF

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

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

#### PLEASE NOTE!

### DIAGNOSTIC COMPATIBILITY

Only EDiTH and EasyStart diagnostic products are compatible with Hydronic II heaters. Older diagnostic products like the 7day timer, Digi-Diagnostic and “Fault code retrieval device” are not compatible.

#### WARNING TO INSTALLER!

Correct installation of this heater is necessary to ensure safe and proper operation.

Read and understand this manual before attempting to install the heater. Failure to follow all these instructions could cause serious or fatal injury.

- Disconnect the vehicle battery before starting any kind of work.
- Before working on the heater, switch the heater off and let all hot parts cool down.
- The heater must not be operated in closed areas, e.g. a garage or in a multi-storey parkade.

The heater must not be mounted in the passenger compartment of vehicles. However, a heater in a hermetically sealed enclosure which also complies with the aforementioned conditions may be used.

All appropriate precautions must be taken when arranging the heater to minimize the risk of injuries to people or damage property.

Parts related to the fuel system must not be located in the passenger compartment.

#### WARNING - EXPLOSION HAZARD!

- Heater must be turned off while re-fueling.
- Do not install heater in enclosed areas where combustible fumes may be present.

A warning sign is to be fixed to the intake connection indicating that the heater must be switched off before refuelling.

#### WARNING - FIRE HAZARD!

- Install the exhaust system so it will maintain a minimum distance of 50mm (2”) from any flammable or heat sensitive material.
- Ensure that the fuel system is intact and there are no leaks.

The heater must not pose a fire hazard. This requirement is deemed to be fulfilled if adequate clearance is ensured for all parts during installation, sufficient ventilation is provided and fireproof materials or heat shields are used.

# 1 INTRODUCTION

## WARNING - ASPHYXIATION HAZARD!

- Route the heater exhaust so that exhaust fumes cannot enter any passenger compartments.
- If running exhaust components through an enclosed compartment, ensure that it is vented to the outside.

The air for the heater's combustion chamber must not be sucked in from the vehicle's passenger compartment.

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## WARNING - SAFETY HAZARD ON COOLANT HEATERS USED WITH IMPROPER ANTIFREEZE MIXTURES!

- The use of Espar coolant heaters requires that the coolant in the system to be heated contains a proper mixture of water and antifreeze to prevent coolant from freezing or slushing.
  - If the coolant becomes slushy or frozen, the heater's coolant pump cannot move the coolant causing a blockage of the circulating system.
  - This situation could cause engine damage and/or personal injury. Extreme care should be taken to ensure a proper mixture of water and antifreeze is used in the coolant system.
  - Refer to the engine manufacturer for coolant recommendations requirements.
- 

## SAFETY INSTRUCTIONS FOR APPLICATION AND PROPER PURPOSE!

The heater must only be used and operated for the range of application stated by the manufacturer in compliance with the "Operating instructions" included with every heater.

The factory nameplate or duplicate must be affixed so that it can still be easily read when the heater is installed in the vehicle.

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## SAFETY INSTRUCTIONS FOR APPLICATION AND PROPER PURPOSE!

The cooling water and components of the cooling water circuit can get very hot.

- Parts conveying water must be routed and fastened in such a way that they pose no temperature risk to man, animals or material sensitive to temperature from radiation/direct contact.
  - Before working on the cooling water circuit, switch the heater off and wait until all the components have cooled down completely, if necessary wear safety gloves.
- 

## WARNING - ASPHYXIATION HAZARD!

- All RV installations must comply with the requirements of the Recreational Vehicle Industry Association.  
References: NFPA 1192, CSA B139.
  - Field wiring should be done in accordance with the Canadian Electrical Code, Part 1.
- 

## CAUTION!

During electrical welding work on the vehicle disconnect the power to the heater in order to protect the control unit.

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## DISPOSAL

Disposal of materials

Old devices, defective components and packaging material can all be separated and sorted, so that all parts can be disposed of as required in an environmentally friendly manner and recycled when possible. Electric motors, control boxes and sensors (e.g. temperature sensors) are deemed to be "electronic scrap".

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## PLEASE NOTE!

All measurements contained in this manual contain metric and approximate SAE equivalents in brackets eg. 25mm (1").

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## PLEASE NOTE!

Refer to the heater manual for more information.

Read and save these instructions for reference.

Reference our website for further information: [www.espar.com](http://www.espar.com)

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Direct questions to Espar Heater Systems:

Canada & U.S.A. 1-800-387-4800

This publication was correct at the time of print. However, Espar has a policy of continuous improvement and reserves the right to amend any specifications without prior notice.

# 1 INTRODUCTION

## INSTRUCTIONS

Please read carefully the following instructions, these have been compiled to assist you with every aspect of installing your heater.

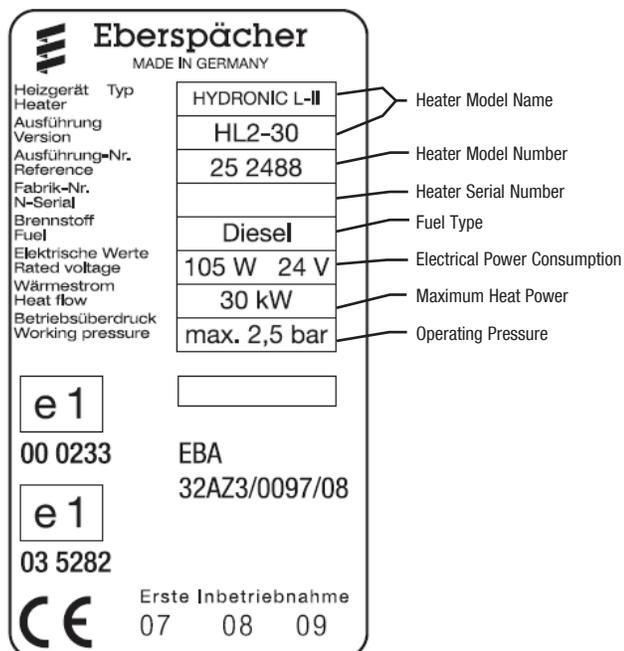
Special attention is required to the Safety or Caution areas, which are found at the end of each section.

To ensure maximum performance from your heater and for your own safety, please adhere to the following instructions closely. Be aware that in the unlikely event of a heater failure during the warranty period, that the warranty may be rejected if the heater is not installed in accordance with these instructions.

When installing the heater, for your own safety, please use all necessary personal protection/safety equipment required.

## HEATER IDENTIFICATION PLATE

The heater identification plate provides all of the heater information, which is required when filing a warranty claim such as Heater Model, Type, Part Number and Serial Number. This information must be included on every warranty claim, so be sure to record it before any warranty repair work is completed.



## INSTALLATION PROCEDURE

- Remove all the components from the box
- Gather required tools
- Gather required parts not included i.e. ¼" rubber fuel line, box mounting hardware, fuel pick up pipe, controller.
- Locate suitable mounting location with clearance to remove the enclosure lid and mounting of the exhaust fitting.
- Plan coolant system layout, fuel system layout and wiring layout with the recommendations below.

## FUEL SUPPLY

- A direct connection to the fuel source with a dedicated fuel pick up is most ideal. An auxiliary tank can also be used.
- Most manufactures will have additional ports available on the fuel tank. If there is not one available it may be necessary to drill the tank and install a fuel pick up pipe.
- The fuel line must be properly sized for the furnace in use (1/4" rubber hose)
- Fuel line clamps need to be properly placed and tightened to prevent the possibility of trapping air.
- Fuel lines should be cleanly cut and butted together to prevent the possibility of trapping air.

### PLEASE NOTE!

The L-II series heaters require a feed and return line for fuel, however, the boxed assembly has the return line feeding back into the sending line via a Tee fitting. Therefore only one single line is required from the outside of the box.

There is a quick disconnect bleeder fitting located on the return line inside the boxed enclosure. This fitting can be used to properly bleed the line during the initial set up. During the initial fuel priming of the system you should disconnect this fitting and place the male side into the cup or cylinder. Once all of the air bubbles appear to be removed from the lines you can reconnect the fitting. This process can be repeated if air does get back into the fuel system during the heater operation.

# 1 INTRODUCTION

## COOLANT CONNECTIONS

The heater is integrated in the vehicle's cooling water circuit. An alternative option is to install the heater with its own cooling water circuit with a header tank.

### CAUTION!

The cooling water and components of the water circuit can get very hot. Before working on the cooling circuit, switch the heater off and wait until all the components have cooled down completely, if necessary wear safety gloves.

### PLEASE NOTE!

- When installing the heater, please note the direction of the flow of the cooling water circuit.
- Route the water hose without any kinks, and in a rising position if possible.
- When routing the water hose, observe a sufficient clearance to hot vehicle parts.
- Protect all water hoses from chafing and from extreme temperatures.
- After the heater and/or vehicle has been running for 2 hours retighten all hose clamps.
- Before commissioning the vehicle for the first time or after changing the cooling water, the whole circuit including the heater must be vented without air bubbles as per the vehicle manufacturer's instructions.

## EXHAUSTION AND COMBUSTION AIR SYSTEM

### DANGER!

- The exhaust is hot and should be routed away from the heat sensitive parts and materials.
- The exhaust should not terminate underneath the vehicle or be positioned below vents, openings, slide-outs and awnings.
- The exhaust should not be pointed downward.

### CAUTION!

Exhaust systems that do not follow the recommended specifications must be approved by Espar.

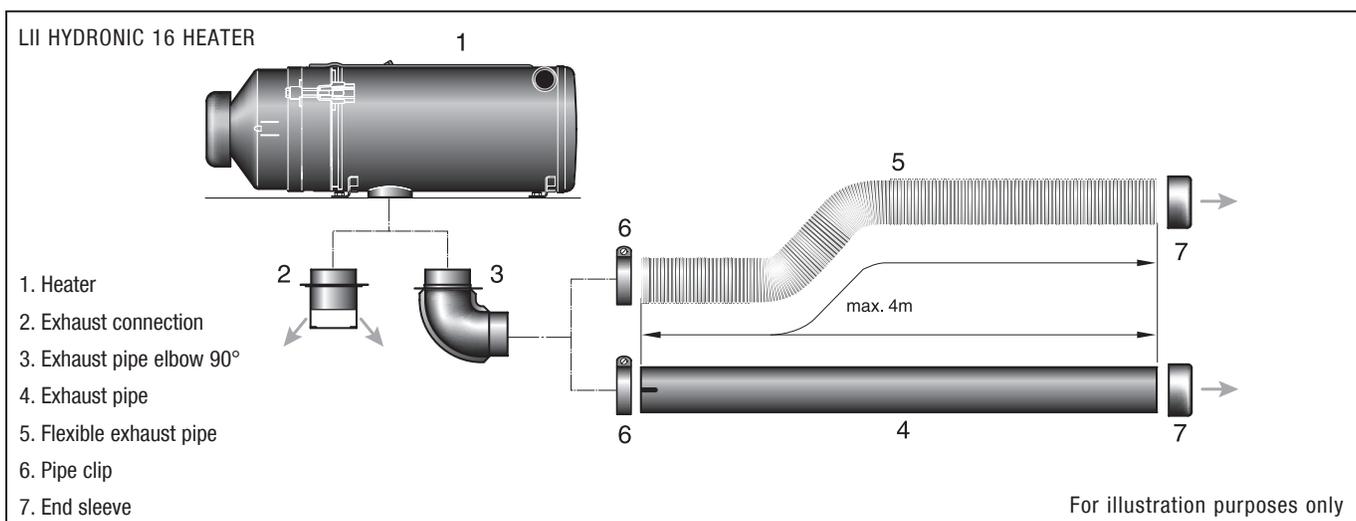
### PLEASE NOTE!

These remarks contain recommendations for use and useful tips for the operation, installation and repair of the heater.

### AVAILABLE PARTS FROM ESPAR

2. Exhaust Outlet 70mm 22.1000.40.0400
3. Exhaust Elbow 22.1000.40.0300
5. Flexible Stainless Steel Exhaust 70mm 5530015
6. Muffler Clamp 3 inch 5530004

Items 4 and 7 must be custom made for your application and are not supplied by Espar.



## 2 ELECTRICAL SYSTEM

### ELECTRICAL

 CAUTION!

Electrical leads, switches and control units for the heater must be arranged in the vehicle so that their operation under normal operating conditions is not impaired in any way. All lines leading from heater to the outside must be laid so that they are splash proof at the opening.

Run “positive-negative” cable section from the Hydronic directly to the battery and connect up.

---

 CAUTION!

Do not under any circumstances remove power from the heater while the unit is operating. The heater must be allowed to cycle through its 3 minute cool down cycle. You risk damaging the internals of the control unit and electrode assembly if this happens and will not be covered under warranty.

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 PLEASE NOTE!

- The Hydronic L-II enclosure kit has an internal harness connecting the heater to the coolant pump, controller, diagnostics pigtail and the external harness. The 12 Volt version has leads for wiring to the 12/24 Volt convertor. Both harnesses have a lead to mount the controller inside the boxed enclosure.
  - The external harness has two positive (red) leads both 20 ft. in length, one for the heater and one for the coolant pump. There is also 15 ft. of controller line if the installer chooses to mount an external switch or timer.
- 

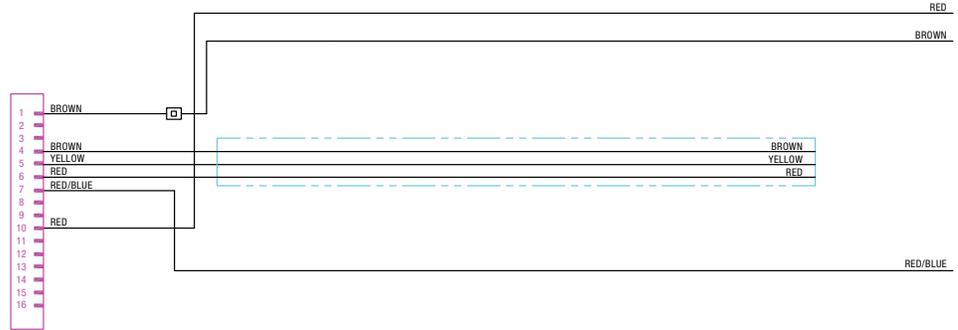
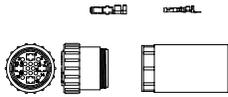
For further details on the wiring schematics please refer to the technical CD that is provided with the kit.

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## 2 ELECTRICAL

Hydronic L-II outside Harness  
25.2800.70.1014

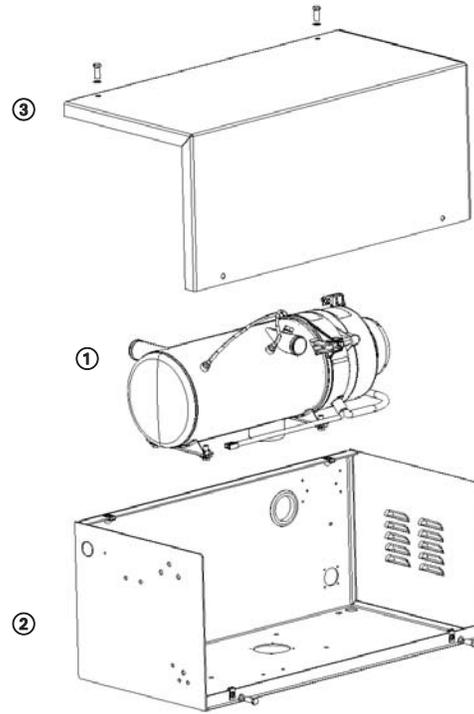


- Red = Positive heater
- Brown = Ground
- Red/Blue = Positive coolant pump
- Yellow = Heater switch

### 3 PARTS LIST

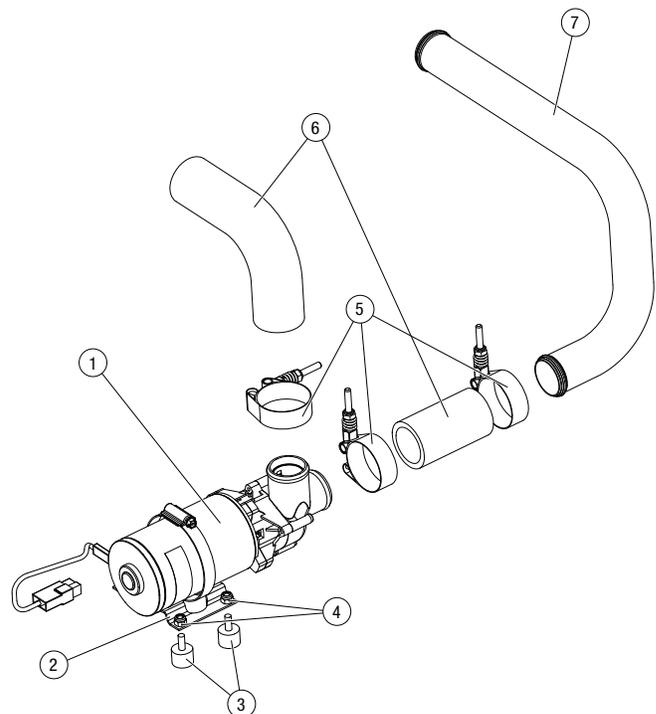
#### HEATER / BASE / LID

1	Hydronic Heater L-II 16Kw	25.2486.02.0000
	Hydronic Heater L-II 24Kw	25.2487.02.0000
	Hydronic Heater L-II 30Kw	25.2488.02.0000
	Hydronic Heater L-II 35Kw	25.2489.02.0000
2	Base	25.2800.40.1021
3	Lid	25.2800.40.1022



#### COOLANT PUMP ASSEMBLY

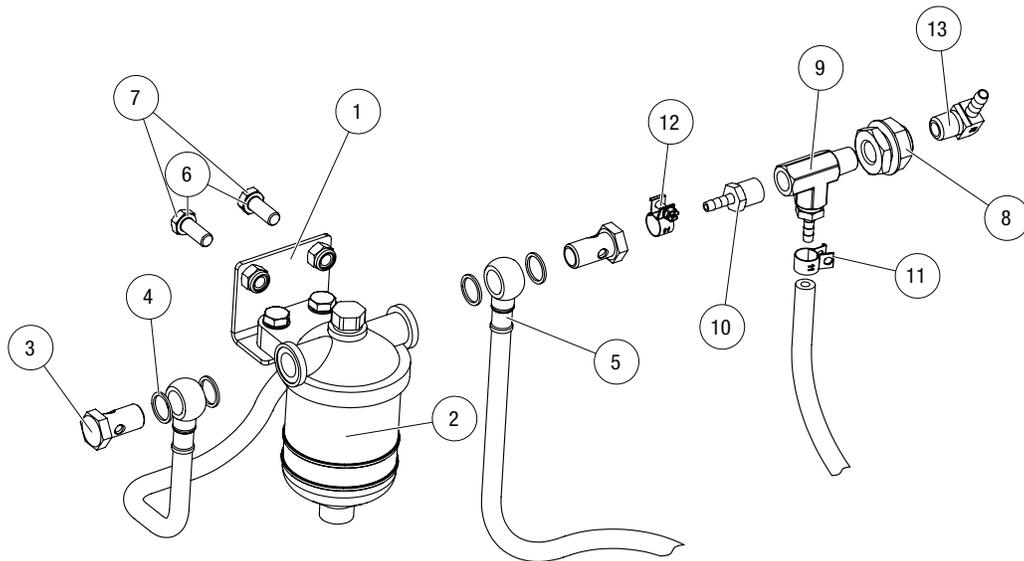
1	5000L Flowtronic Coolant Pump	25.1818.29.0000
	6000L Mechanical Coolant Pump (Red Pump)	25.2751.60.3500
2	Mounting Bracket	25.1371.26.0001
3	Shock Mount with 15mm Stud	5540031
4	Hex Nut M6X1.0 Lock Nylon	20.2900.40.0134
5	1-1/2" Constant Torque Clamp	5560015
6	Silicone Formed Hose 90*	5520098
7	Tube Liner, Coolant Line	5530025



## 3 PARTS LIST

### FUEL FILTER ASSEMBLY

1	Fuel Filter Bracket	25.2800.40.1024
2	Fuel Filter	330.00.052
3	Hollow Bolt	104.09.002
4	Gasket A14X18	323.16.006
5	Fuel Supply Line External	25.1698.05.0300
6	8mm Washer	5590085
7	Bolt Hex M8 X 25	5590021
8	1/4 Anchor Coupling w/washer	5590198
9	1/4 MNPT Street Tee	5520062
10	1/4 MNPT Straight 3/16 Barb	5520064
11	Clamp 11 MM	10.2068.01.1098
12	Clamp 12MM	10.2068.01.2098
13	1/4" 90Deg Hose Barb x Male Pipe	5590197



## 4 CONTROLLERS

The most common choice for this application would be the Low Voltage Disconnect switch. There are 3 variations of the switch currently available, the part numbers and operations are shown below. The unit can also be operated with the use of a Push/Pull Switch, Programmable or 7 Day Timer. For more information and part numbers for these options please visit our website @ espar.com

### PROGRAMMABLE TIMER WITH LVD

25.2800.70.1010

operates as simple On/Off switch with internal count down timer and LVD



Wire Colors:  
Output - Yellow  
Ground - Brown  
Input Voltage - Red

### PROGRAMMABLE TIMER WITH LVD DUAL INPUT

25.2800.70.2020

operates as 25 2800 70 1010 with added inputs for timer and temp. sensor

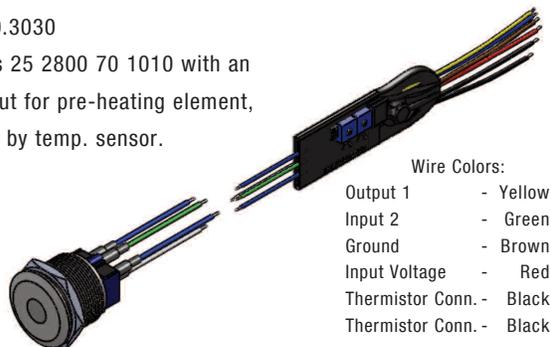


Wire Colors:  
Output 1 - Yellow  
Input 2 - Green  
Ground - Brown  
Input Voltage - Red  
Thermistor Conn. - Black  
Thermistor Conn. - Black

### PROGRAMMABLE TIMER WITH LVD DUAL OUTPUT

25.2800.70.3030

operates as 25 2800 70 1010 with an added output for pre-heating element, if indicated by temp. sensor.



Wire Colors:  
Output 1 - Yellow  
Input 2 - Green  
Ground - Brown  
Input Voltage - Red  
Thermistor Conn. - Black  
Thermistor Conn. - Black

### GENERAL SPECIFICATIONS

- 1) Input – 12-24V DC
- 2) Switch – Lighted, Momentary, panel-mounted with robust wash-down gasket seal.
- 3) Output #1 – 4A Max
- 4) Screwdriver adjustable timer.
- 5) Screwdriver adjustable voltage cut-off

### INITIALIZATION

- 1) Reads battery voltage – if voltage greater than 16V – sets battery voltage cut-off settings for 24V – if voltage is less than 16V – sets battery voltage cut-off settings for 12V.
- 2) Reads battery threshold potentiometer and sets voltage cut-off settings based on previous determination of 12 or 24 V system. Cut-offs are 10.5 - 12.5V in .25V increment and 21 - 25V in .5V increments.
- 3) Reads timeout potentiometer and sets timeout threshold value – range is set by dip-switch position 1 (Left Switch) – Highest setting is infinite timeout.
- 4) Dip Position 1 (left switch) sets Time Mode (See below for setting procedure)
- 5) Voltage and Timeout settings are displayed as a series of flashes of the LED. The setting of the Timer, Temperature and LVD (low voltage disconnect) must be completed prior to applying power to the switch. To change the settings, power must be removed from switch, and then the adjustments can be made.

### SETTING THE TIMER (WITH POWER DISCONNECTED)

Setting the timer to minute or hours is determined by the position of the dip switch 1. Up position is hours and the down position is for minutes. The timer can be set for 10 minutes to 120 minutes or 2 hours to 24 hours and can also be set for continuous running. Adjustments are made by turning the “TIME” dial with a small screwdriver. Depending on the dip switch position, turning the dial clockwise will increase the time by 10 minute increments to a 120 minute maximum or by 2 hours increments to a 24 hour maximum. When the dial is turned completely clockwise this sets the switch to act as an on/off switch with no timer function.

### SETTING THE LVD (WITH POWER DISCONNECTED)

The LVD can be set in .25 volt increments.

Turning the “BAT” dial completely counter clockwise will set the LVD to its lowest value. (10.5v for 12 volt system and 21v for 24 volt system) Turning the Dial clockwise will increase the LVD values by .25 volt increments for 12 volt systems and .5 volts for 24 volt systems to maximum value. (12.5 v for 12 volt system and 25 for 24 volt system)

### HOUR METER

The hour meter will count the hours after the first hour of operation. To read the run time, push and hold the button for at least 6 seconds. When the button is released the LED will give a series of slow and fast flashes. The first set of slow flashes will be the first number of the hours. Then a burst of fast flashes will break the next number. The next set of slow flashes will be the second number of total run time. The same will follow for the 3rd and 4th numbers. To clear the hour meter press and hold the button for 2 minutes and it will reset the hour meter back to 0.



## 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.

### UNLOCKING CONTROL BOX LOCK WITHOUT DIAGNOSTIC EQUIPMENT

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

### FAULT DIAGNOSIS - FLASHING CODE (LED WITH SERIES RESISTOR)

The electronic control box can store up to 5 faults.

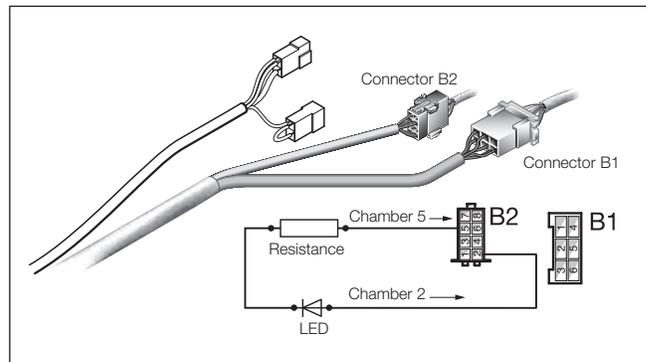
The defective component and type of fault are output by the control box as a flashing code and are displayed by an LED with series resistor (approx. 1 k $\Omega$  / 1W).

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 16.

Possible causes and remedial action are explained in the fault code tables (page 24).

### LED AND SERIES RESISTOR

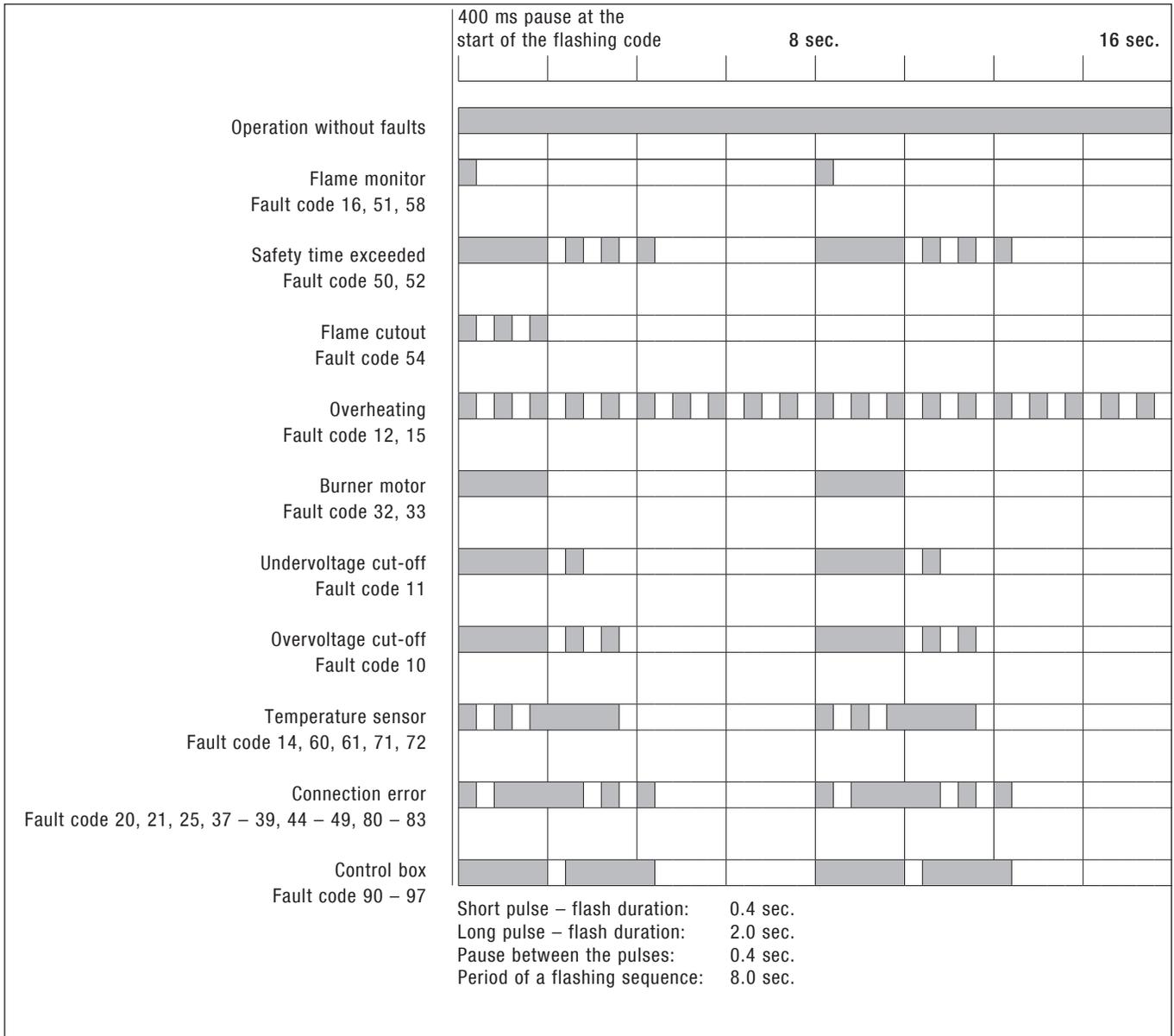


### FLASHING CODE

Please see next page!

# 4 TROUBLESHOOTING

## FLASHING CODE



## 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	20 2900 70 50 60
• EDiTH diagnostics tool	
– ISO adapter	22 1541 89 00 00

#### PLEASE NOTE!

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

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## 4 TROUBLESHOOTING

### DIAGNOSTIC UNIT

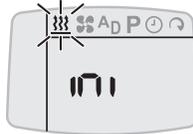
#### Automatic detection

Five seconds after the diagnostic unit has been connected to the heater using the adapter cable, the automatic detection starts to determine the type of heater to which the diagnostic unit is connected.

#### PLEASE NOTE!

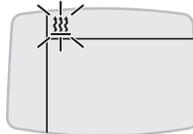
- If the automatic detection was successful, if necessary, the heater is briefly started and then switches off again.

Display until the automatic detection is completed.



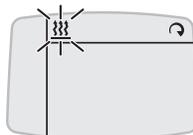
Display

- if a water heater has been detected
- if air heaters 1L, 3L, 5L or Airtronic, Airtronic M, Airtronic L air heaters (control box cable loom fixed, moulded) were detected.



Display,

- if the Airtronic, Airtronic M, Airtronic L air heaters (control box cable loom wound with cable tape) were detected.



Confirm flashing symbol with  possible displays:

- if no errors/faults exist

further action → display fault memory, delete fault memory.



- if errors/faults exist

further actions → display current fault and fault memory, delete fault memory.



#### Display current fault in fault memory

Simultaneously press  and   
Display: e.g. AF : 12



#### Display fault memory F1 – F5

press  or   
Display: e.g. F1 : 20



#### Display current fault in the fault memory again

Simultaneously press  and   
Display: e.g. AF : 12



#### Delete the fault memory and as a result, at the same time cancel the control box lock

Current fault or fault F1 – F5  
confirm with .  
Confirm display dEL again with .



The fault memory is deleted and the control box is unlocked.



#### QUIT DIAGNOSIS

##### Switch off heater

Press , the heater is switched off.

Perform the diagnosis again

Press , the display is activated.

For further procedure, see left-hand column.

## 4 TROUBLESHOOTING

### EDITH COSTUMER 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.: 20 2900 70 50 58)

#### 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 24 to 26.

### CONNECT ISO ADAPTER

- Disconnect the heater's cable harness.
  - Connect the adapter cable to the cable harness.
  - Connect the adapter cable to the ISO adapter.
  - Connect the SUB-D connection cable with the PC and the ISO adapter.
- 

### 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.

### 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

## 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 <sup>2</sup> rt) and PIN 16 (cable 2.5 <sup>2</sup> 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 <sup>2</sup> rt) and PIN 16 (cable 2.5 <sup>2</sup> 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 shortcircuited. • 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 <sup>2</sup> bl/ws from 18-pin control box connector, chamber 12 to 8-pin cable harness connector, chamber 2 has short circuit with + U <sub>B</sub> . • 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   <b>Apply max. 12 volt to burner motor</b>	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 <sup>2</sup> 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.

## 4 TROUBLESHOOTING

FAULT CODE TABLE

FAULT CODE DISPLAY	FAULT DESCRIPTION	CAUSE • REMEDIAL ACTION
046	Solenoid valve interruption	<p>“Solenoid valve” cable loom from control box (connector position “D”) to solenoid valve is interrupted or has earth short.</p> <ul style="list-style-type: none"> <li>• Check cables and connections from solenoid valve, remove earth short if necessary.</li> <li>• Replace solenoid valve coil.</li> <li>• If faults are not corrected by the remedial action listed above, then replace control box.</li> </ul>
047	Solenoid valve short circuit	<p>“Solenoid valve” cable loom from control box (connector position “D”) to solenoid valve has earth short.</p> <ul style="list-style-type: none"> <li>• Check cables and connections from solenoid valve, remove earth short if necessary.</li> <li>• Replace solenoid valve coil.</li> <li>• If faults are not corrected by the remedial action listed above, then replace control box.</li> </ul>
048	Nozzle block heating Relay coil interruption	<ul style="list-style-type: none"> <li>• Check installation of the relay at the control box.</li> <li>• Replace relay.</li> </ul>
049	Nozzle block heating Relay coil short circuit	
050	Operating lock-out Control box is locked	<p>Control box locked by 10 start attempts without flame detection.</p> <p>Unlock the control box by deleting the fault memory, <a href="#">see pages ?? to ??</a>.</p> <ul style="list-style-type: none"> <li>• For remedial action see fault code 052.</li> </ul>
051	Flame monitor signals “Flame before fuel”	<ul style="list-style-type: none"> <li>• Replace burner.</li> </ul>
052	Safety time exceeded, no start  <b>Danger!</b> <b>High voltage!</b> <b>Note when checking the ignition spark generator</b>	<p>No flame detected within the ignition phase.</p> <ul style="list-style-type: none"> <li>• Check combustion air inlet and exhaust system.</li> <li>• Check fuel supply (flow and return).</li> <li>• Check flame tube for correct installation in heat exchanger.</li> <li>• Check function of the ignition spark generator only using the burner tester, replace ignition spark generator if necessary.</li> <li>• Check distance between ignition electrodes, if necessary renew ignition electrodes.</li> <li>• Check electric cables and connections.</li> <li>• Check flame monitor for dirt, clean if necessary.</li> <li>• Replace fuel nozzle.</li> <li>• If faults are not corrected by the remedial action listed above, then replace control box.</li> </ul>
054	Flame cutout during operation	<p>Heater has ignited, the flame is detected and signals flame cutout twice within an operating time of 60 minutes.</p> <ul style="list-style-type: none"> <li>• Check fuel supply (flow and return).</li> <li>• Carry out CO<sub>2</sub> measurement.</li> <li>• Replace fuel nozzle.</li> <li>• If faults are not corrected by the remedial action listed above, then replace control box.</li> </ul>
058	Flame does not extinguish during after-run	<p>Flame monitor signals that flame has not extinguished 30 seconds after after-run “ON”.</p> <ul style="list-style-type: none"> <li>• Check heat exchanger, clean if necessary, then take a CO<sub>2</sub> measurement.</li> <li>• Test the solenoid valve using the burner tester, replace if necessary.</li> <li>• If fuel continues to be pumped during after-run → replace fuel pump.</li> <li>• If faults are not corrected by the remedial action listed above, then replace control box.</li> </ul>

## 4 TROUBLESHOOTING

FAULT CODE TABLE

FAULT CODE DISPLAY	FAULT DESCRIPTION	CAUSE • REMEDIAL ACTION
060	Temperature sensor interruption	Temperature value outside operating range. • Check plug-in connection to the temperature sensor and cable to the control box.
061	Temperature sensor short circuit	• Check temperature sensor, see diagram on page 37. • If faults are not corrected by the remedial action listed above, then replace control box.
071	Overheating sensor interruption	Temperature value outside operating range. • Check plug-in connection to the overheating sensor and cable to the control box.
072	Overheating sensor short circuit	• Check overheating sensor, see diagram on page 38. • If faults are not corrected by the remedial action listed above, then replace control box.
081	Combustion indicator light short-circuit	Cable 1 <sup>2</sup> 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. • Check cable and connections, if necessary remove short circuit. • Check combustion indicator light, replace if necessary.
083	Fault indicator light short circuit	Cable 12 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. • Check cable and connections, if necessary remove short circuit. • Check fault indicator light, replace if necessary.
090	Control box defective	• Replace control box.
091	External interference voltages	Possible causes: • 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	Control box defective	• Replace control box.
093		
094		
097		

## 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

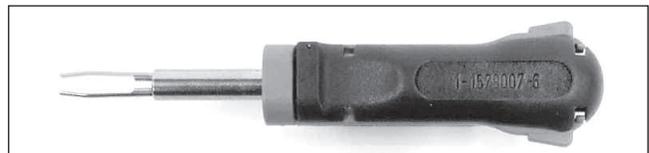
#### AMP RELEASE TOOL

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

206 00 205

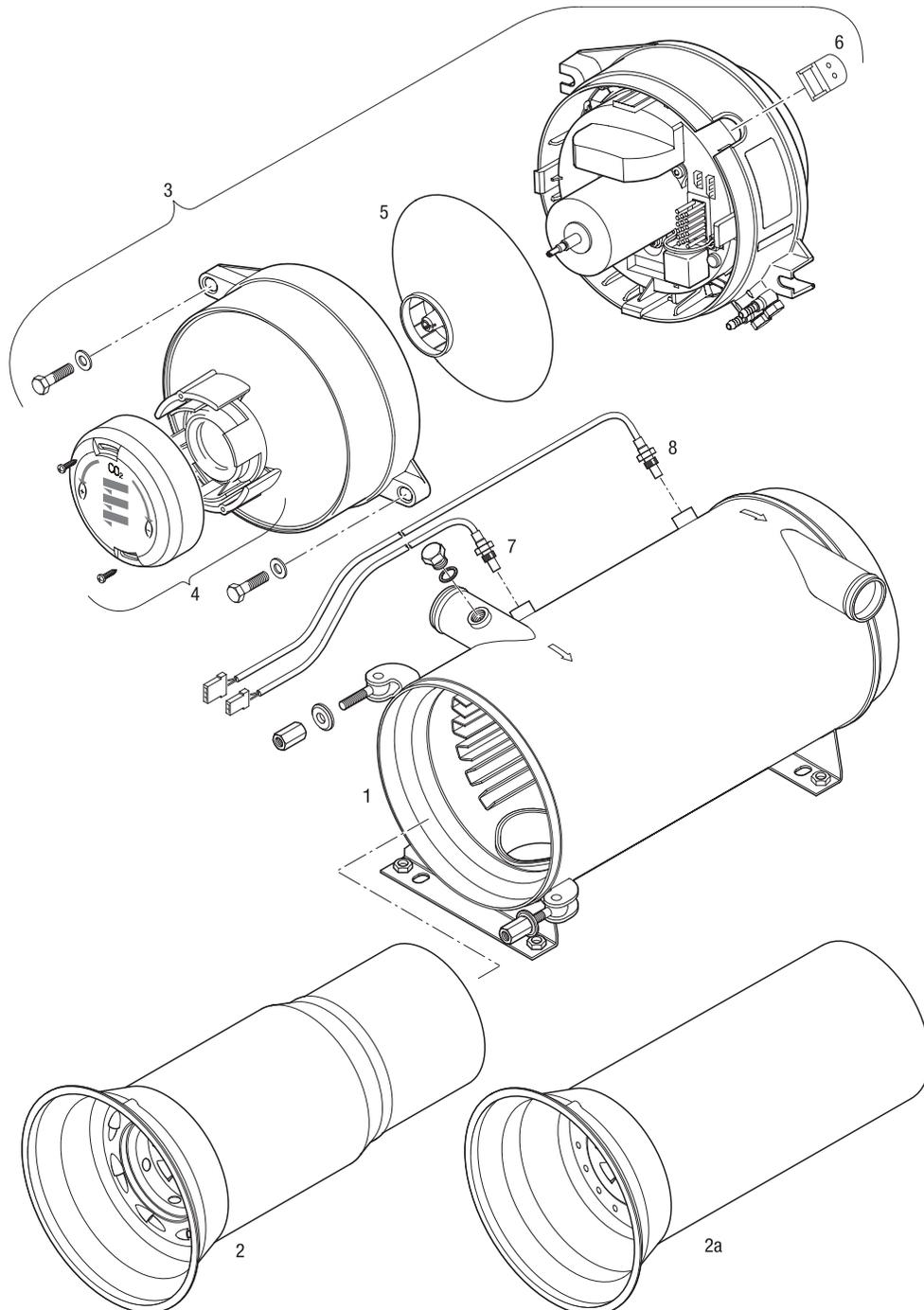


206 00 215



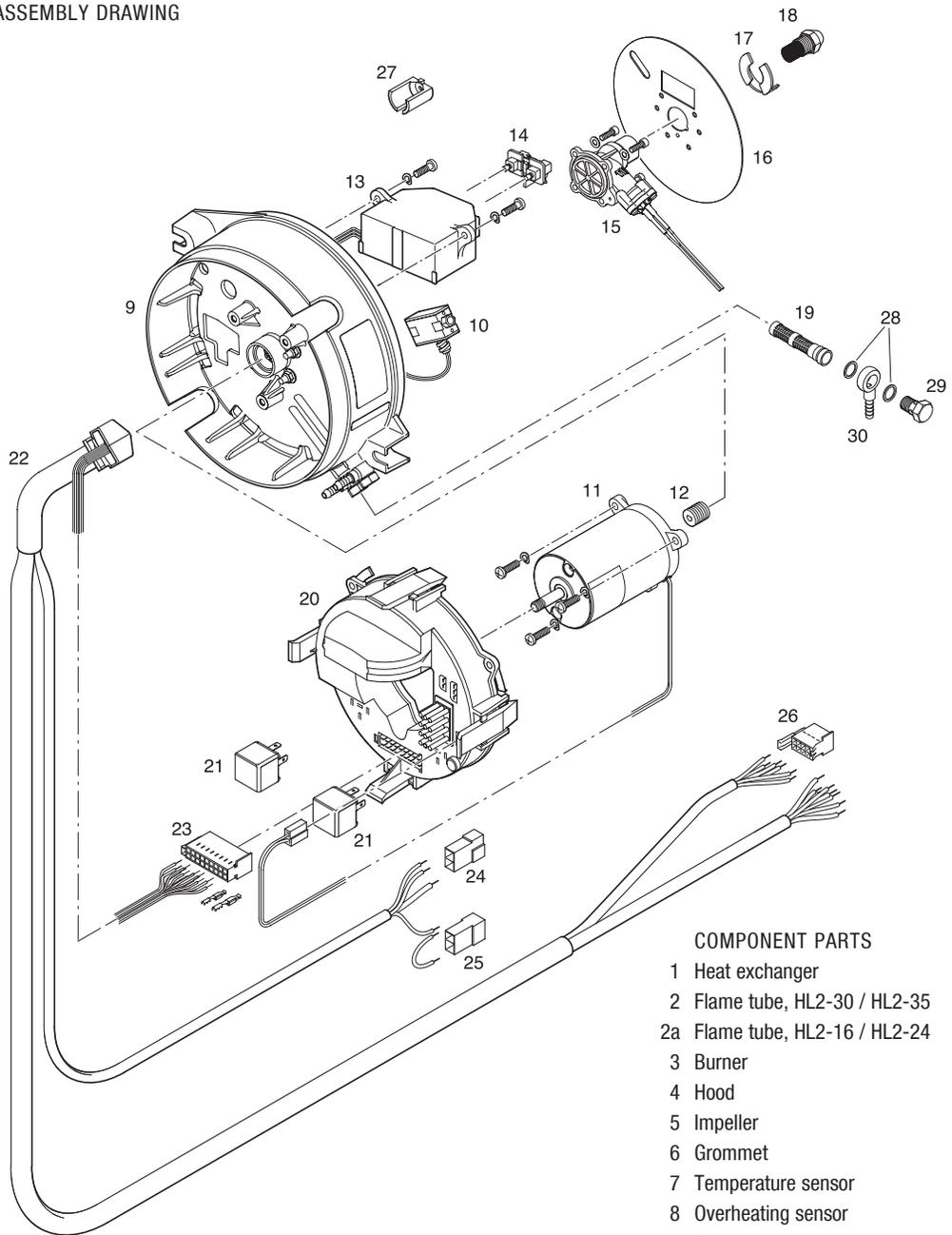
# 5 REPAIR INSTRUCTIONS

ASSEMBLY DRAWING



## 5 REPAIR INSTRUCTIONS

### ASSEMBLY DRAWING



#### COMPONENT PARTS

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

## 5 REPAIR INSTRUCTIONS

### REMOVE HOOD (see Figure 1 and 2)

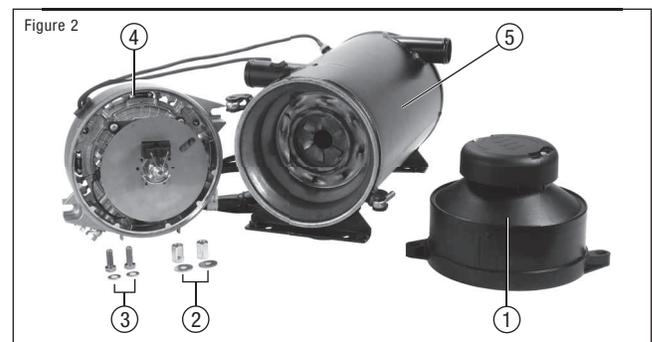
- Loosen both of the hood's retaining screws.
- Remove hood.

#### RISK OF INJURIES!

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



- Figure 1
- ① Hood
  - ② Retaining screw



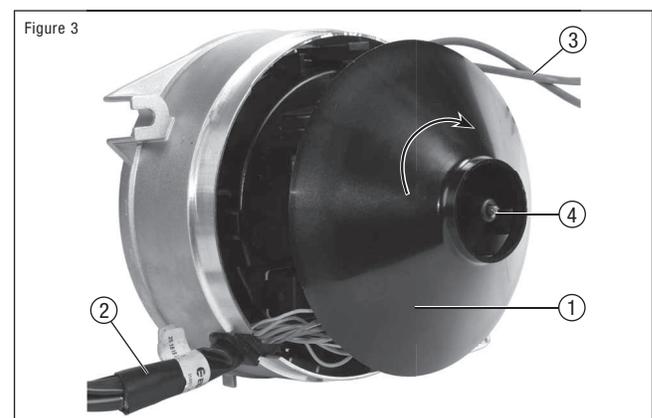
- Figure 2
- ① Hood
  - ② Retaining screws, burner
  - ③ Retaining screws, hood
  - ④ Burner
  - ⑤ Heat exchanger

### 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)

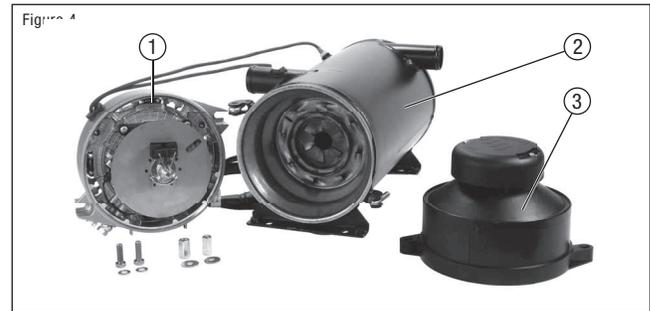
## 5 REPAIR INSTRUCTIONS

### DISMANTLING THE BURNER (see Figure 4 and 5)

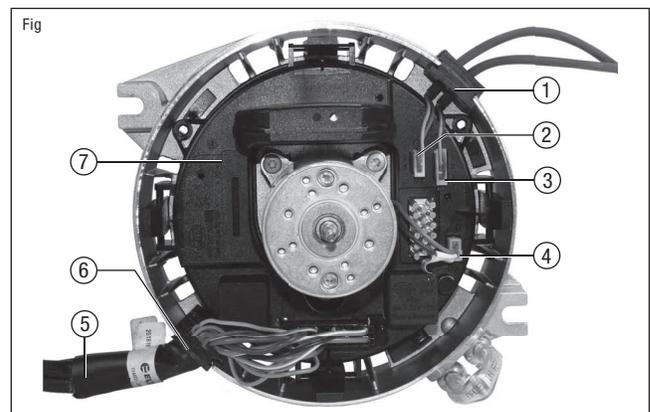
- Remove hood.
- Disconnect “temperature sensor” cable loom and “overheating sensor” cable loom at control box.
- Remove grommet from burner housing.

#### PLEASE NOTE!

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



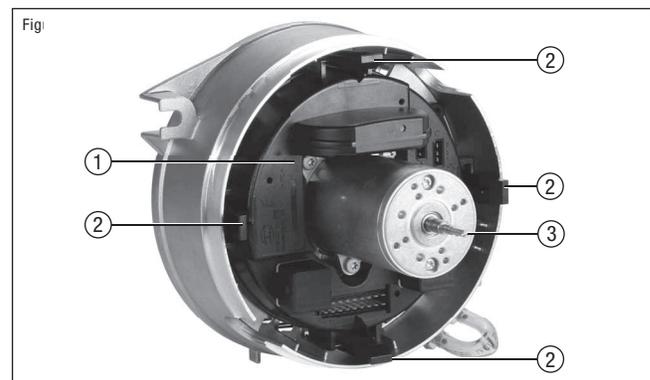
- Figure 4
- ① Burner
  - ② Heat exchanger
  - ③ Hood



- Fig
- 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.

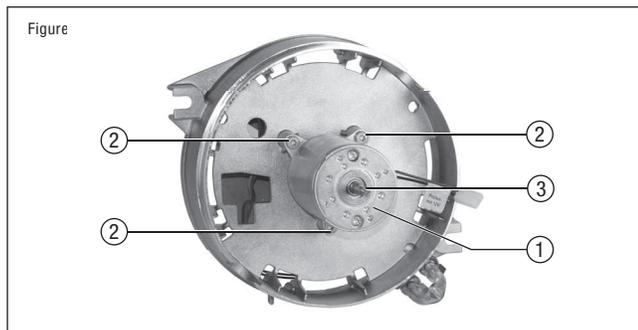


- Fig
- ① Control box
  - ② Clamps
  - ③ Motor shaft (thread)

## 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.



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

CHECK THE FUNCTION AND SPEED OF THE BURNER MOTOR USING THE BURNER TESTER (see Sketch on the right side)

- 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 (afterrun) →
  - 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



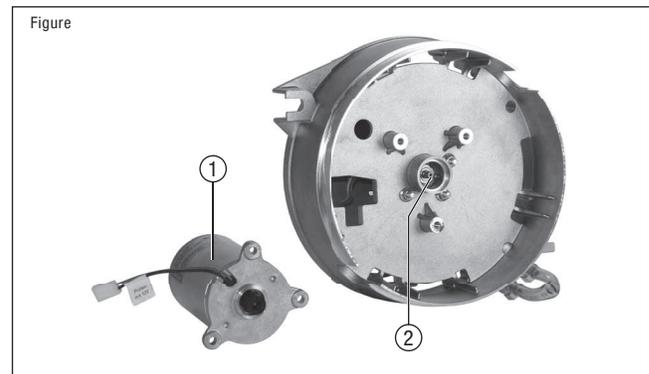
**RISK OF INJURIES!**

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

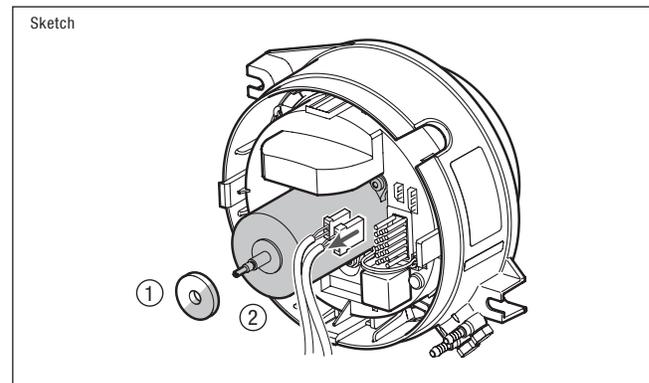
### PLEASE NOTE!

Use the coupling, screws and plain washers included with the spare part for the assembly.

Tighten the impeller with 1 Nm +0.5 Nm.



- ① Burner motor
- ② Coupling



- 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!

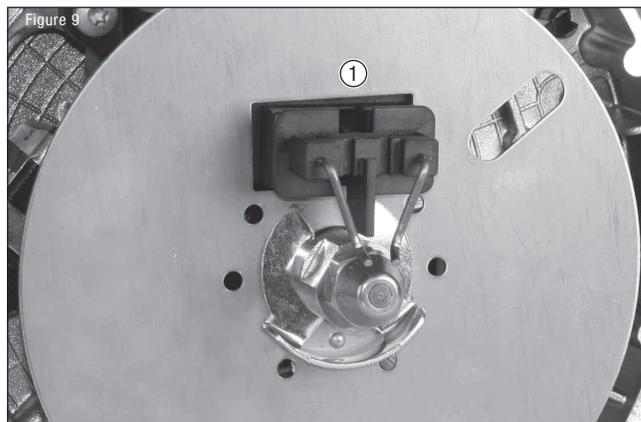
- If the Ignition spark generator, ignition electrodes or pump housing is replaced it is necessary to check the distance between the ignition electrodes with a check gauge.  
The check gauge is included with the spare parts.
- Push the check gauge in the fuel nozzle and press up to the limit stop. The 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.

### DISMANTLING THE FUEL NOZZLE (see Figure 11)

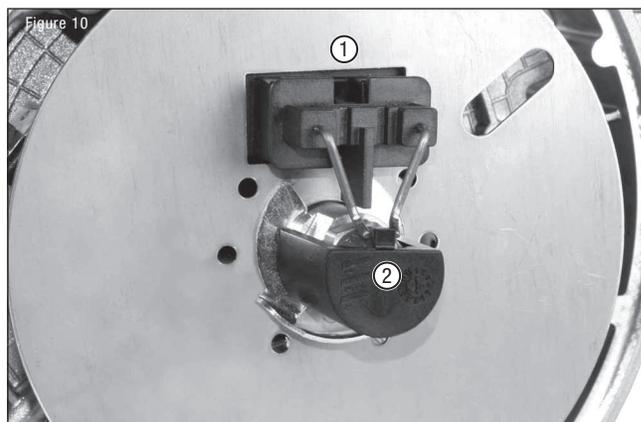
- Remove hood.
- Dismantle the burner.
- Dismantle the ignition electrodes.
- Unscrew fuel nozzle from the nozzle block, press against the nozzle block with wrench.

#### PLEASE NOTE!

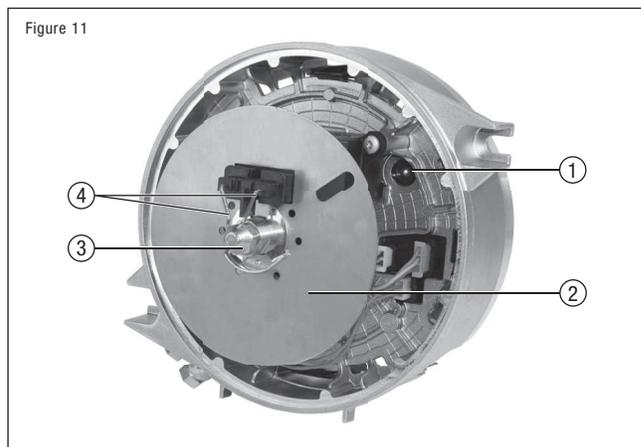
- When installing the fuel nozzle do not touch the nozzle opening.
- After installing the fuel nozzle, check the position of the ignition electrodes, renew if necessary.
- Tightening torque for fuel nozzle:  $16 \pm 1$  Nm.



① Ignition electrodes



① Ignition electrodes  
② Check gauge



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

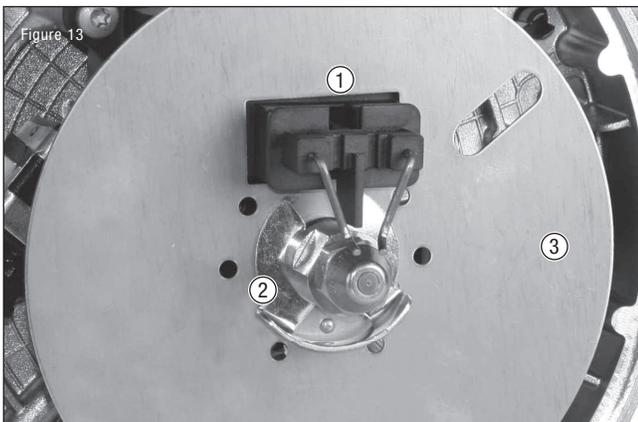
## 5 REPAIR INSTRUCTIONS

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.

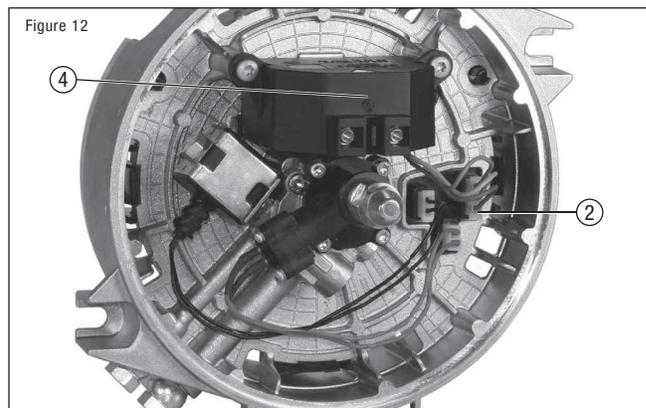


- Figure 13
- ① Ignition spark generator
  - ② Connection of the "ignition spark generator" cable loom to the control box, slot "E"

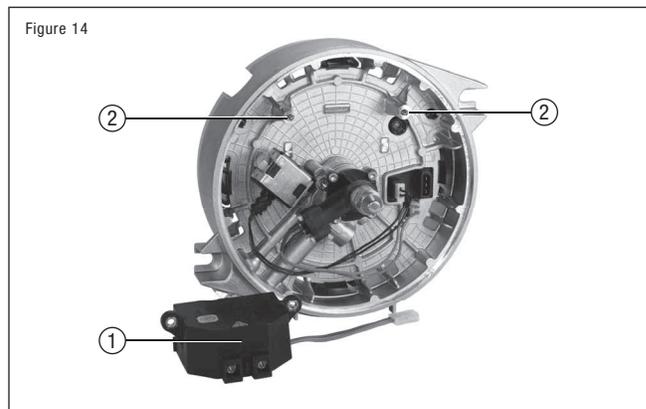
### ⚠ RISK OF INJURIES!

- 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!



- Figure 12
- ① Ignition electrodes
  - ② Fuse clip (KL fuse)
  - ③ Baffle plate



- Figure 14
- ① Ignition spark generator
  - ② Locator fixings for 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.

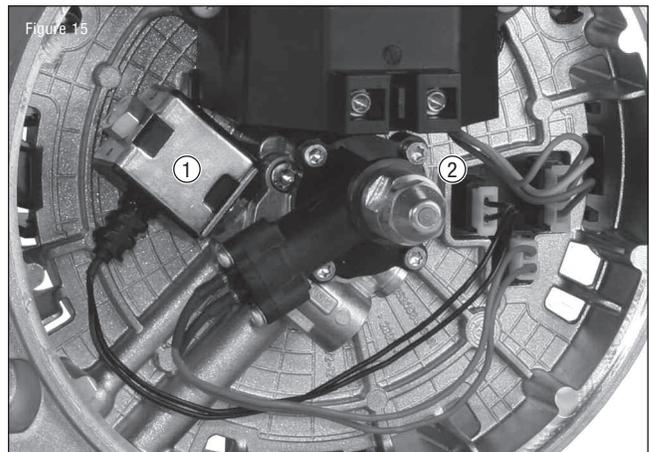
## 5 REPAIR INSTRUCTIONS

### DISMANTLING THE SOLENOID VALVE (see Figure 15 and 16)

- Remove hood.
- Dismantle the burner.
- 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!

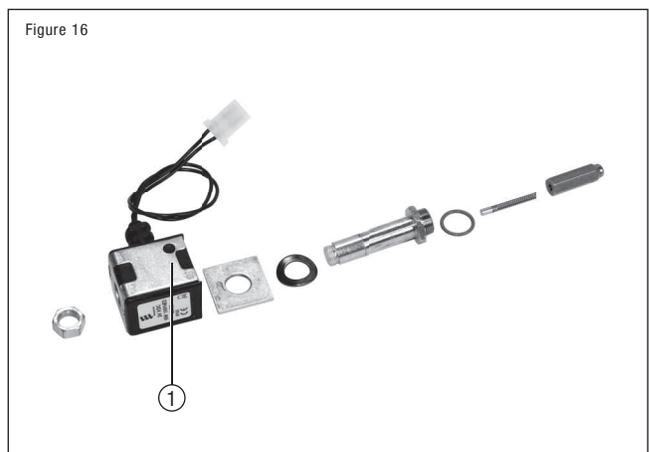
When installing lay the cable looms as shown in Figure 15.



- 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.

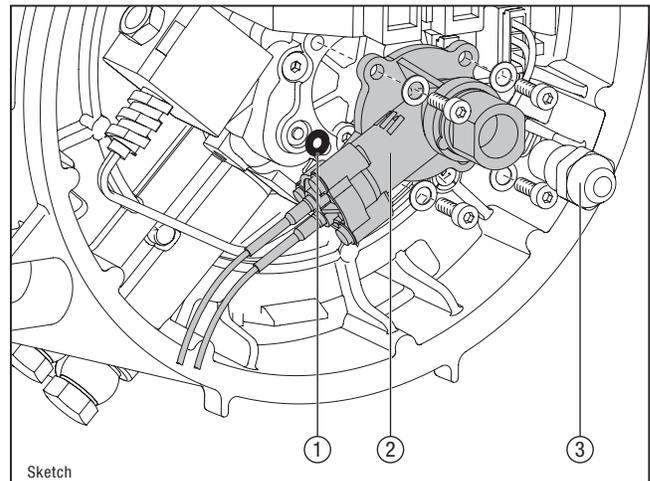


- ① Solenoid valve

## 5 REPAIR INSTRUCTIONS

### DISMANTLING THE NOZZLE PRE-HEATER (see Sketch)

- 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.



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

### 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.

## 5 REPAIR INSTRUCTIONS

DISMANTLING THE FLAME TUBE (see Figure 17 and Sketch)

- 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.

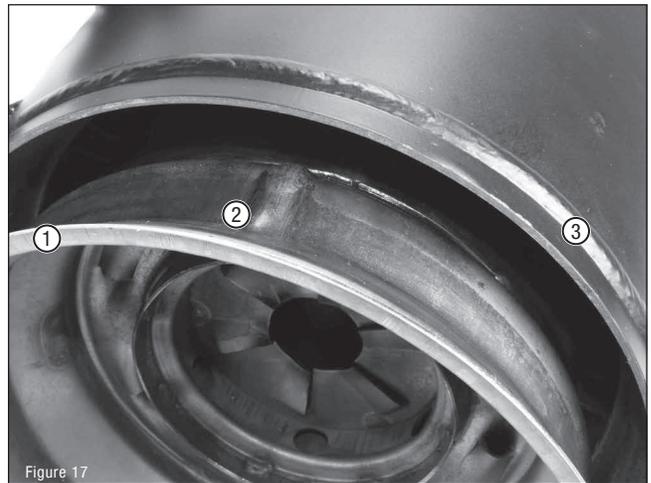
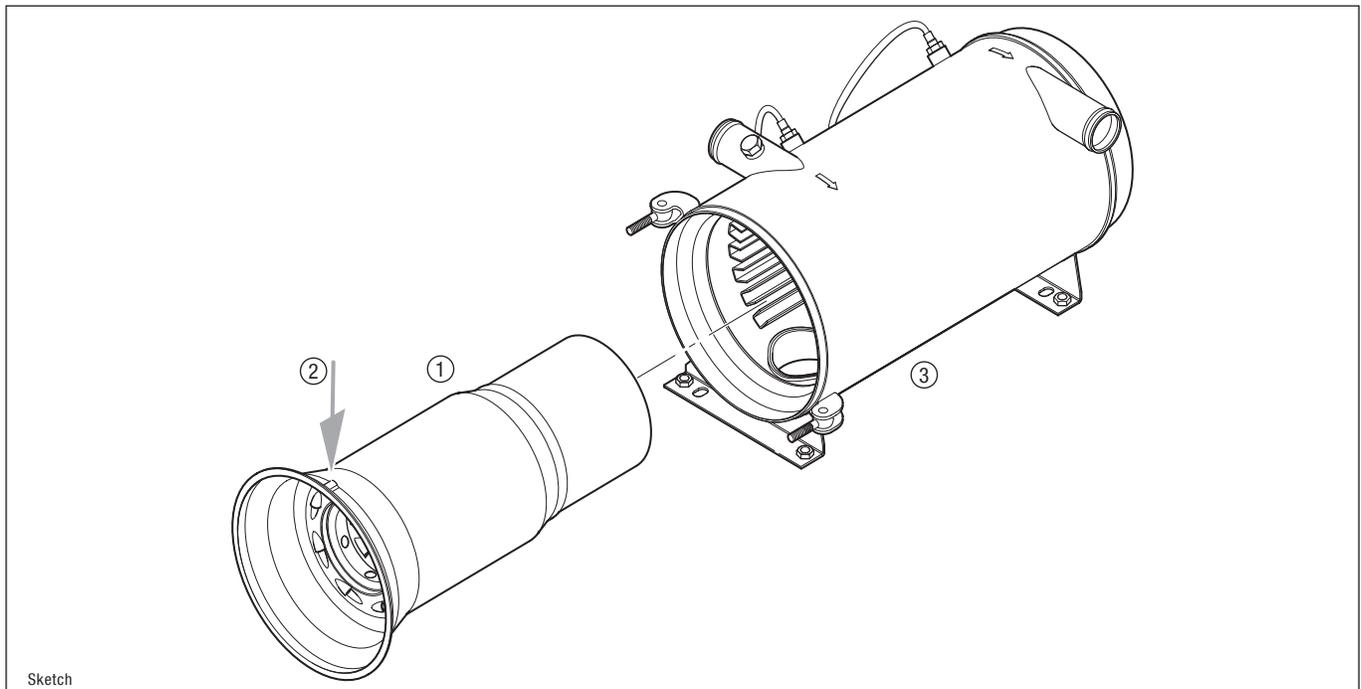


Figure 17

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



Sketch

- 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!

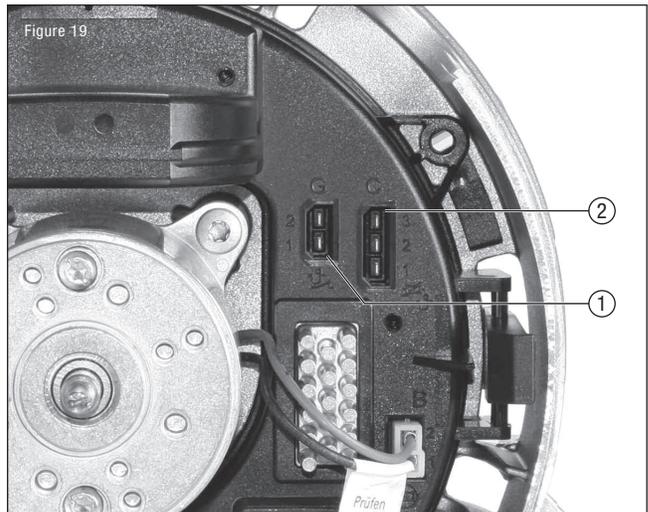
For temperature sensor and overheating sensor resistance values, see [page ??](#).

Figure 18



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

Figure 19



- ① Solenoid valve

## 5 REPAIR INSTRUCTIONS

RESISTANCE VALUES FOR TEMPERATURE SENSOR AND OVER HEATING SENSOR (see Sketches)

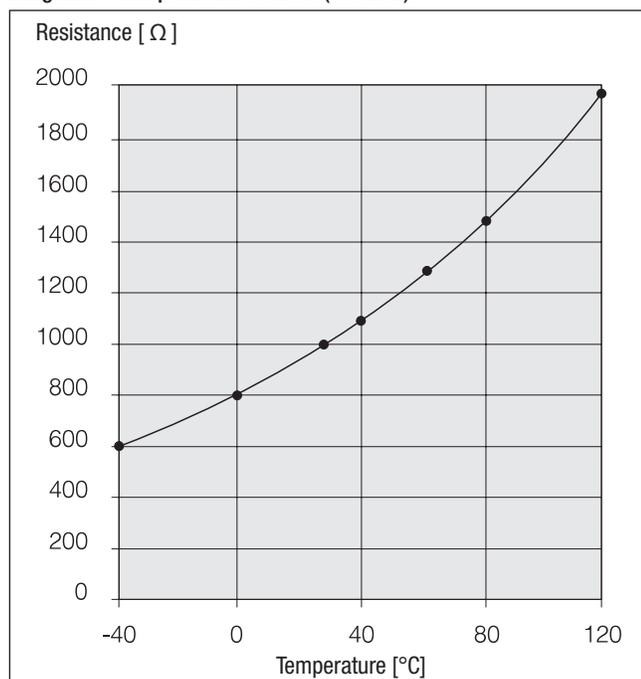
Test the temperature sensor and the overheating sensor using a digital multimeter and compare the values with the diagram or the characteristic values table.

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

Characteristic values table – temperature sensor (PTC)

Temp. [°C]	Resistance value [ $\Omega$ ]	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

Diagram – temperature sensor (section)



Check for earth short:

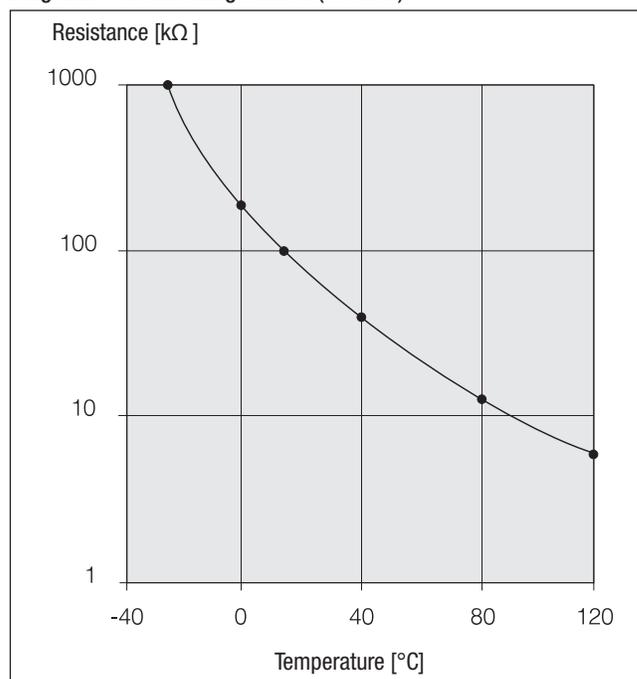
There must be no electrical connection between the sensor connections and the housing.

Resistance value must be  $\infty$ .

Characteristic values table – overheating sensor (NTC)

Temp. [°C]	Resistance value [ $\Omega$ ]	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 – overheating sensor (section)



## 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.

### **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.
- When carrying out electric welding on the vehicle, the positive cable at the battery should be disconnected and placed at ground to protect the control box.

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 CO<sub>2</sub> level in the exhaust.

If it is necessary to change the combustion air set in the factor (CO<sub>2</sub> level), this can be achieved by turning the adjusting cap (see page ??).

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).

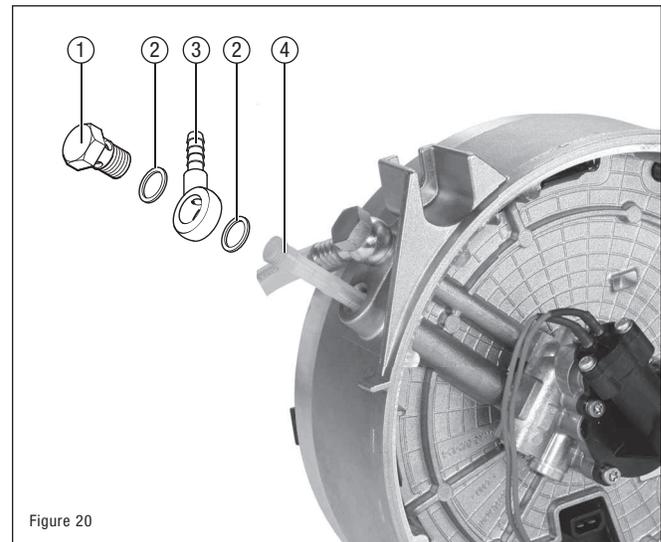


Figure 20

- ① Banjo bolt
- ② Seal, A10 x 13.5 DIN 7603 AL
- ③ Ring connector and Gauze fuel filter
- 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  $12 \pm 1.2$  Nm.

RELIABILITY PERFORMANCE OF THE HEATER DEPENDING ON THE UNDER-PRESSURE (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).

## 5 REPAIR INSTRUCTIONS

### MEASURE CO<sub>2</sub>-LEVEL IN THE EXHAUST



**DANGER!**

**RISK OF FIRE, EXPLOSION 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 CO<sub>2</sub> level, if necessary adjust the combustion air:
  - after repairs to heater (functional check).
  - if combustion is not working properly.
  - after replacing the fuel nozzle.

### MEASUREMENT

Measure the CO<sub>2</sub> level of the heater in the vehicle ready for service.

In order to take a correct measurement of the CO<sub>2</sub>- level the heater must have reached its operating temperature.

Measure the CO<sub>2</sub> level using a CO<sub>2</sub> 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 CO<sub>2</sub> level is less than 9 % by vol, turn the adjusting cap to the left (CO<sub>2</sub> +).
  - If the CO<sub>2</sub> level is higher than 11 % by vol, turn the adjusting cap to the right (CO<sub>2</sub> –).
- Retighten the adjusting cap.
- If proper adjustment of the CO<sub>2</sub> level is no longer possible:
  - Check the burner for damage.
  - Check the speed of the electric motor.
  - Replace fuel nozzle.



① Adjusting cap

## 5 REPAIR INSTRUCTIONS

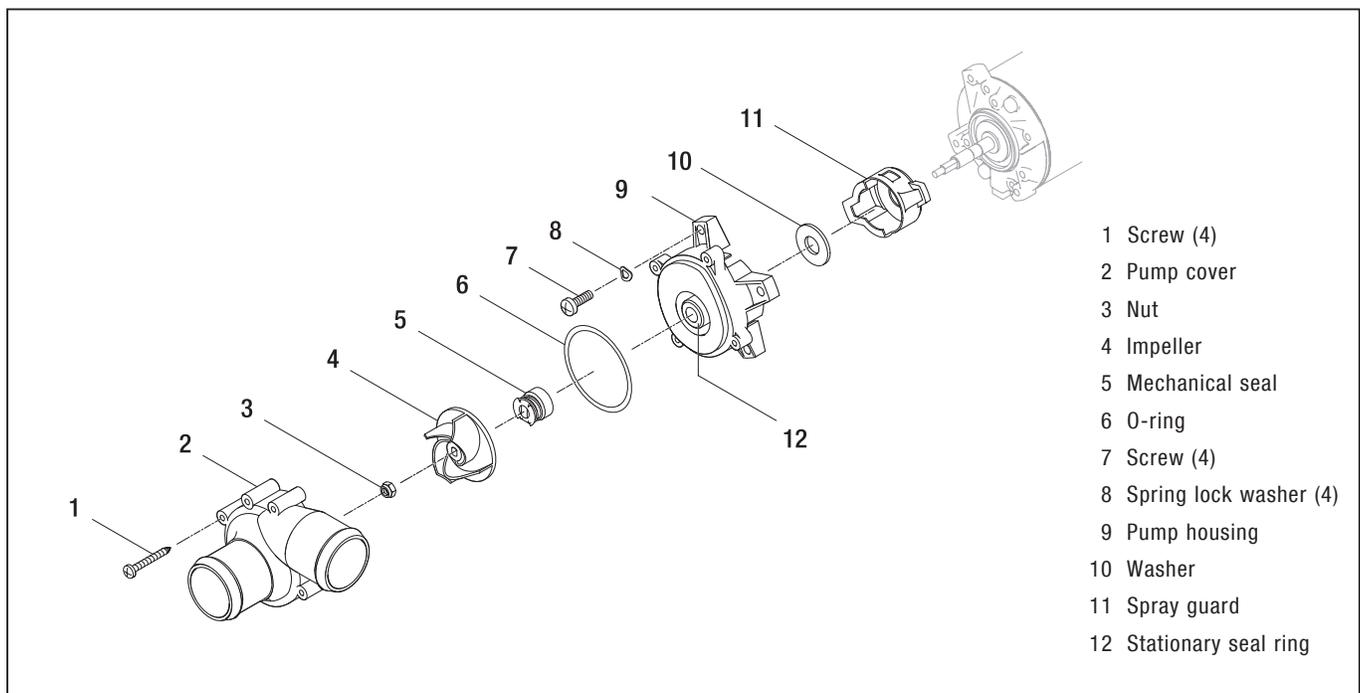
### DISMANTLING THE FLOWTRONIC 5000

(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 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

## 5 REPAIR INSTRUCTIONS

### ASSEMBLING THE FLOWTRONIC 5000

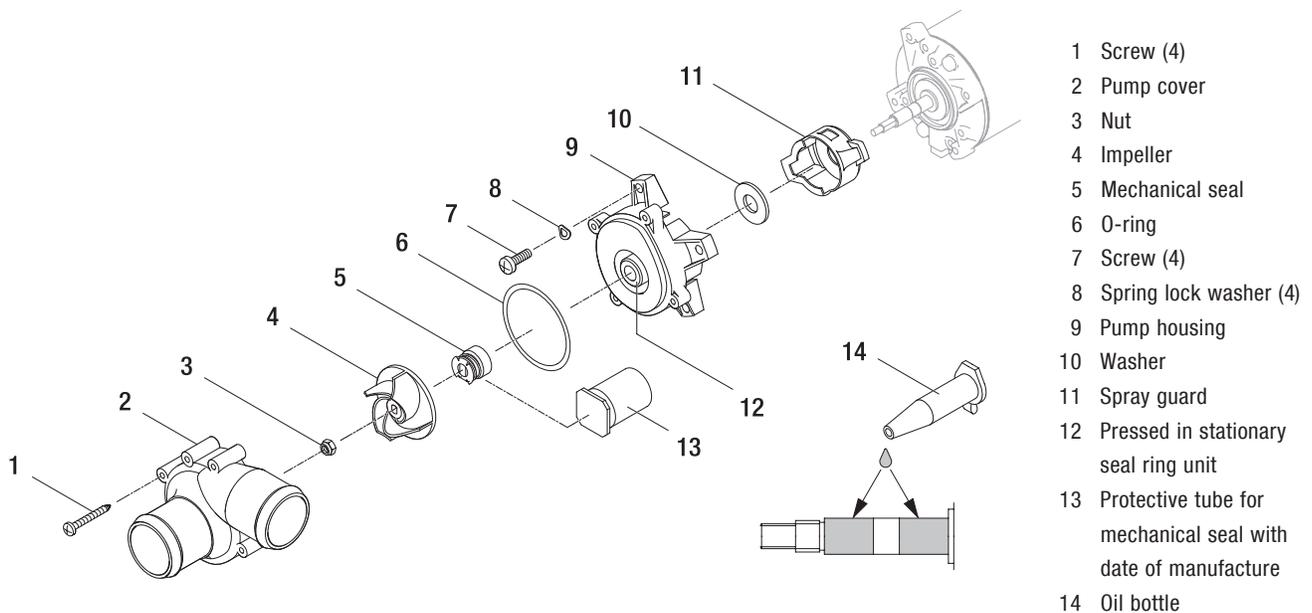
(see Sketch 24)

- 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



## 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!

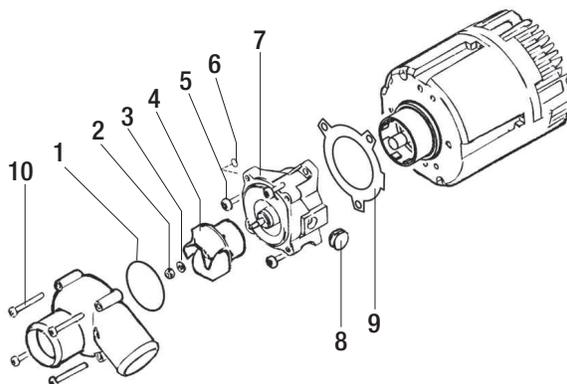
The specified order must be adhered to when dismantling or assembling. It is important for the pump to be completely dismantled as described to enable any interior damage to be identified and repaired.

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



- 1 O-ring
- 2 Nut
- 3 Support ring
- 4 Impeller with inner rotor and thrust ring
- 5 Screw (3)
- 6 Spring lock washer (3)
- 7 Shell
- 8 Diaphragm
- 9 Flat seal
- 10 Screw (4), not included in scope of supply

## 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.

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

NOTES:

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