

SERVICE INSTRUCTIONS

for fuel-burning heater type



STROCO 35.02 M LE HYBRID

Applicable from heater no.

Diesel/HVO: 44969

RME: 31032

STROCO ApS, Energivej 3, DK-6800 Varde, tel. +45 86961066

Technical approval no. SP 555 AD 05

EU directive 42/245:

EU technical approval no. E5 10R-03153

Heating directive E 2001/56:

EU technical approval no. R122 E5 00002

ISO certified

Developed with aid from the Danish Environmental Protection Agency

This manual covers many different version of STROCO 35.02 M
- Please check label on top of the heater to identify correct version.

Example of label:

| | | | | | | | |
|-------------------------------|--------------|-------------------------------------|--|-----|-------|----|-------|
| strocco | | E5 | <table><tr><td>122</td><td>00002</td></tr><tr><td>10</td><td>03153</td></tr></table> | 122 | 00002 | 10 | 03153 |
| 122 | 00002 | | | | | | |
| 10 | 03153 | | | | | | |
| MOBILE HEATING SOLUTIONS | | DK 8450 HAMMEL TEL. + 45 - 86961066 | | | | | |
| Type | 3502 M LE | Kw | 30 | | | | |
| No. | 45691 | Year | 2020 | | | | |
| V | 24 | W | 100 | | | | |
| Fuel | Dieselolie | | | | | | |
| Approval no. | SP 555 AD 05 | | | | | | |
| Date of install. | | | | | | | |
| JP Maskinfabrik A/S DK | | | | | | | |



The minimum conditions below must be met in order to maintain the right to claims under the warranty.

- 1. Installation must be carried out as described in this manual.**
- 2. Service and maintenance must be performed in a proper professional manner. Maintenance/service must be performed within the established schedule.**
- 3. Only original spare parts may be used.**
- 4. The heater may only be used for the type of fuel stated on the model plate.**
- 5. The heater may only be used with the voltage stated on the model plate.**



The heater must not be used in service stations.

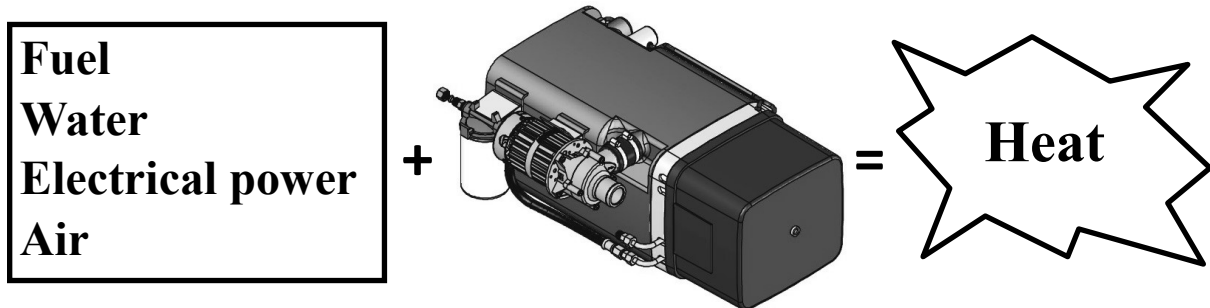
The heater must not be used where there is risk of ignition of flammable vapours and/or materials. Nor where there is risk of accumulation of toxic gasses, e.g. in closed spaces.

The heater must not be used if the heater or its exhaust opening is near flammable materials, e.g. dry grass.

| | PAGE: |
|---|-------|
| Description | 6-7 |
| Schematic diagram of fuel-burning heater | 7 |
| Built-in dimensions | 8 |
| Installation guide/Installation plan | 9-10 |
| List of connections | 11 |
| Electrical connections | 12-13 |
| Technical specifications | 14-15 |
| Explanation of terminology | 15 |
| Maintenance | 16-18 |
| Description of functionality - operation | 19 |
| Description of functionality | 20 |
| Troubleshooting - how? | 21 |
| Disconnection of combustion chamber | 22 |
| Process control diagram | 23 |
| Alarm functionality | 24 |
| Combustion unit | 25 |
| Voltage check on electrodes | 26 |
| Photoelectric sensor | 27 |
| Under-/overvoltage | 28 |
| Replacement of fan motor | 29 |
| Fuel preheater | 30 |
| Fuel pump | 30 |
| Inspection of fuel pump solenoid valve | 30 |
| Control thermostat sensor | 31 |
| Assembly drawing - part list | 32-35 |
| Electrical diagram | 36-37 |
| Technical specification for electrical heating..... | 38-43 |
| Warranty conditions | 44 |
| Dealers | 45 |

DESCRIPTION

It is important to read and understand this manual before using the STROCO heater to ensure optimum utility and safety. Please remember to complete warranty card at www.stroco.dk.



The presence of the above-mentioned basic elements, in the right quantities and correct mixtures, is essential to the heat production of the STROCO heater.

In case of failure or unsatisfactory operation, make sure to check these basic elements first.

The STROCO heater is independent of the operation of the vehicle's engine, and vice versa. This means that interruptions in one system do not affect the operation of the other. However, lack of electrical power or fuel will affect both systems, if both engine and heater are connected to the same battery and fuel tank.

The fuel-burning heater's job is to heat the water in the heating system. It does this by burning fuel at a high temperature in the combustion chamber. This heat is transferred to the water in the boiler section of the heater, and the water is pumped into the heat exchanger units in a continual process, where the hot water acts as a transfer agent between heat production (the heater) and heat exchangers.

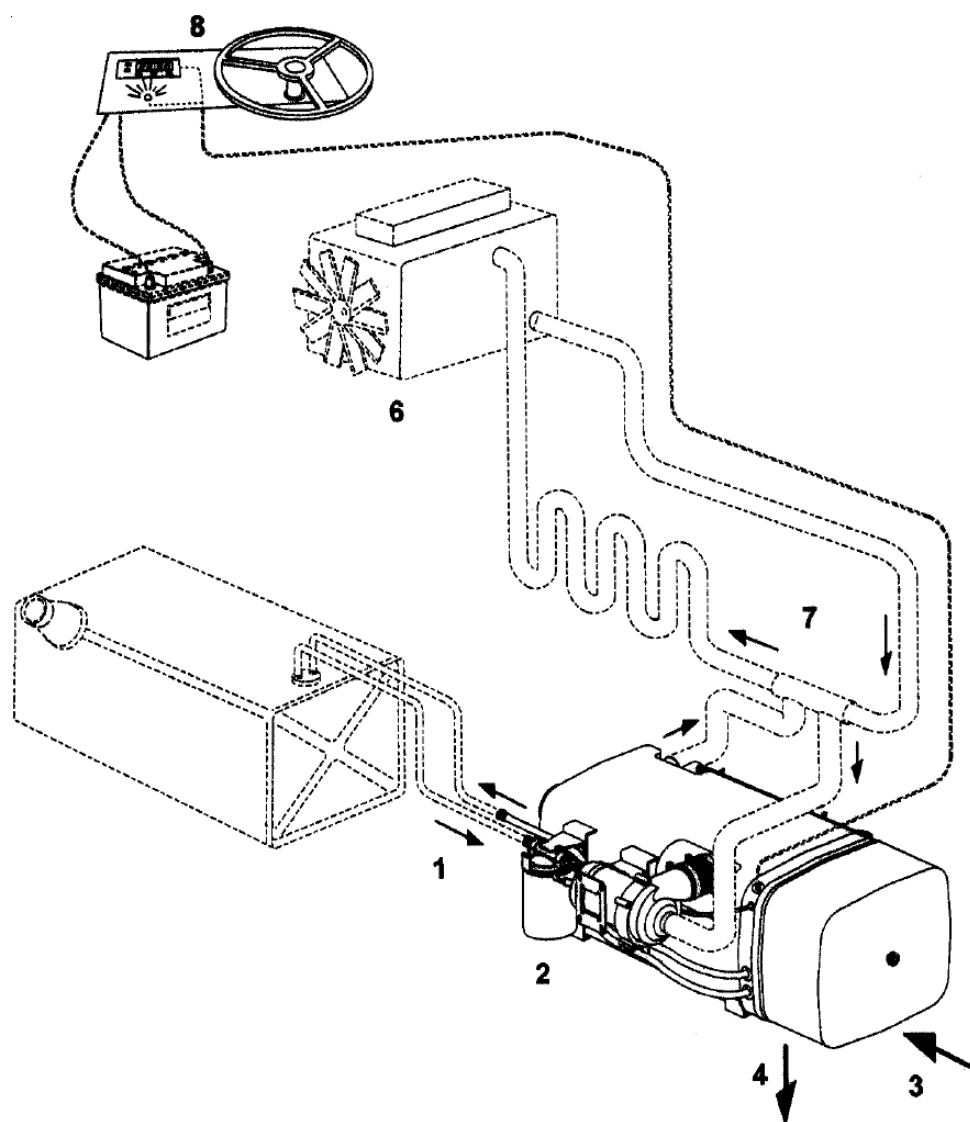
The heart of the heater is the combustion section. Fuel is pumped to here and vaporized by a nozzle. This fuel vapour ignites, establishing a flame (combustion). One of the factors that ensure correct combustion of the fuel vapour is regulation of air intake. The combustion process and other functionality of the heater is controlled by the brain of the system: the electronic control and monitoring unit. This automatic system ensures that the process follows predetermined routines. If the process should deviate from these routines, or if the combustion process fails or becomes deficient due to poor supply of the basic elements - fuel, water, and air - the system shuts down the process. In theory, the presence of the basic elements alone should ensure the combustion process, but since we require the process to be highly efficient and reliable, it must run in a controlled manner. This manual will help you to keep the heater running satisfactorily at all times. What to do if the heater is not working, or performs inadequately?

The section *Alarm Functionality* can help you to locate the source of an error and analyse the symptoms.

The section *Error Remedy Instructions* in the Description of Functionality explains and illustrates remedial actions.

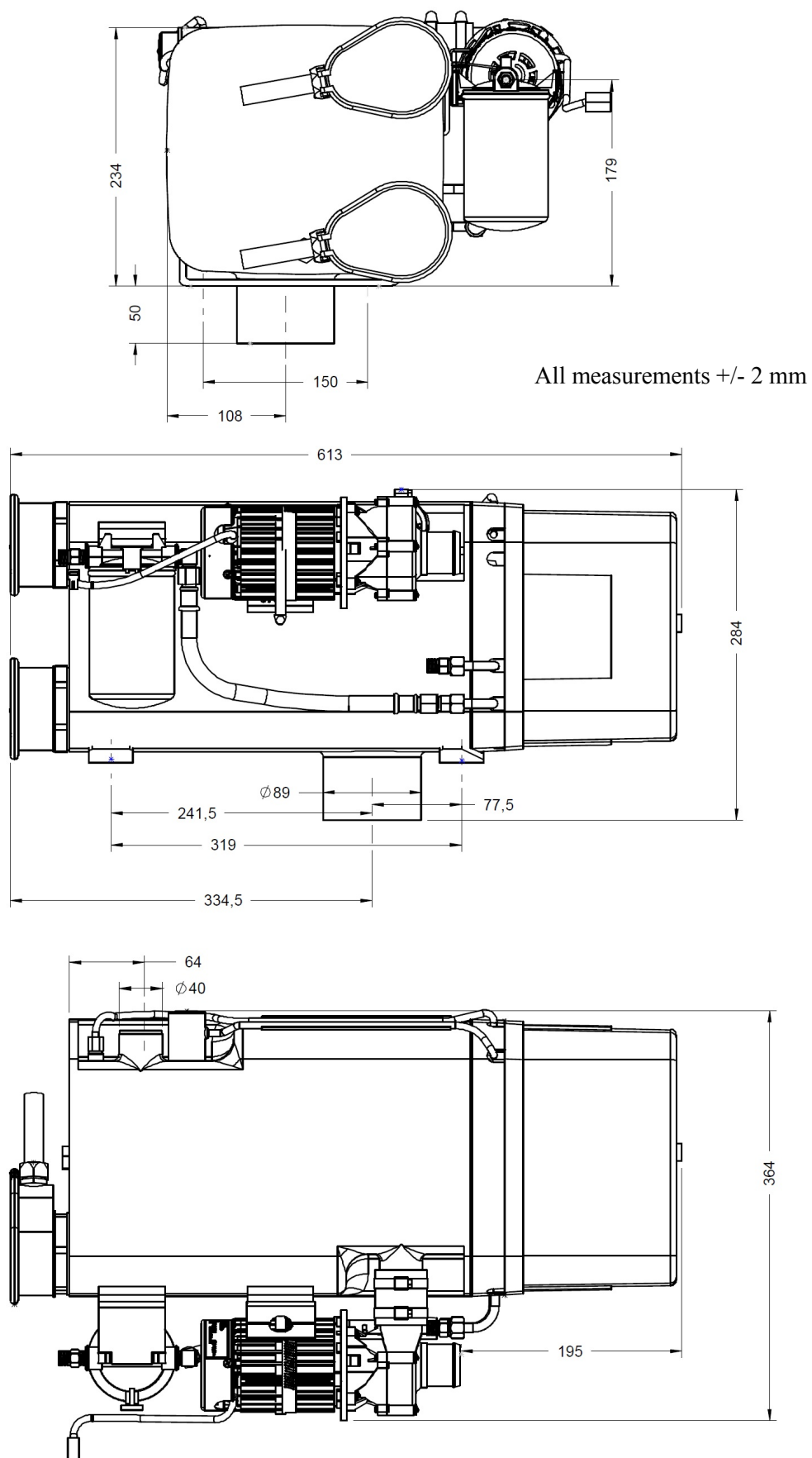
Precautionary measures are always better than repairs, and there are a number of *Maintenance Procedures* that should be undertaken regularly to ensure the continued working order of the heater. Please consult the maintenance section. Section 1 in the manual deals with the installation of the heater, i.e. the actual fitting. The other sections deal with servicing and maintenance exclusively.

Schematic diagram of fuel-burning heater



1:Fuel, 2:Filter, 3:Air, 4:Exhaust, 6:Engine, 7:Heating system, 8:Control panel

BUILT-IN DIMENSIONS



INSTALLATION GUIDE/INSTALLATION PLAN

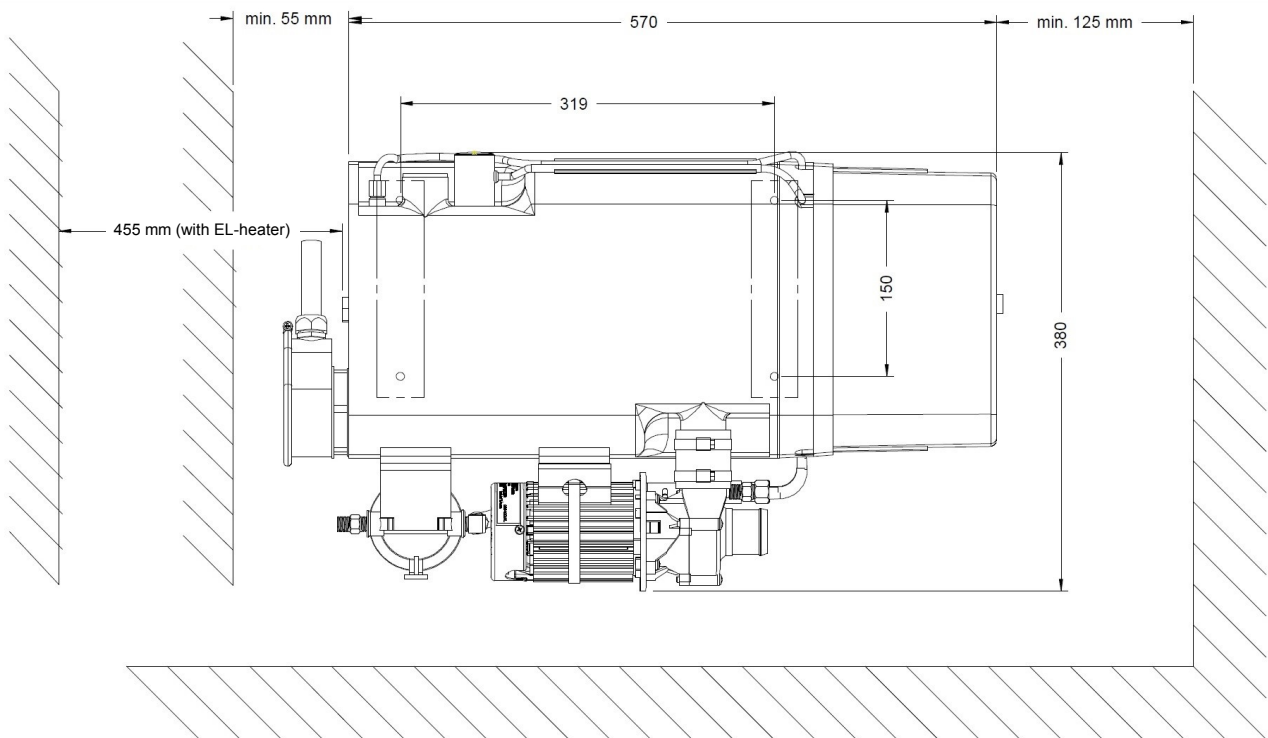
In general: Installation must be performed in accordance with the ECE regulation R122 standard.

This guide applies to STROCO fuel-burning heater type 35.02 M LE HYBRID.

- **Material and design of fuel hoses/pipes: TA max. -40°C/+120°C.**
In case of replacement of hoses, use ONLY hoses from STROCO ApS, or hoses approved by STROCO ApS. The heater's warranty will be void if any other hoses are used. Leaky hoses and joints lead to increased risk of fire.
- **Fuel hoses located on the outside of the vehicle must be shielded against damage. Electrical cables must not be run next to fuel hoses.**
- **Uninsulated exhaust pipes/hoses must be located at least 7.5 cm from flammable materials.**
- **The fuel-burning heater should be mounted where it is protected from water and spatter from the vehicle's wheels, and from impact or other damaging effects. It is very important to clean the surrounding area thoroughly when servicing the unit, and to check all electrical connections and plugs, greasing with acid-free grease. The area should be kept free of damp. Covers, casings etc., must not be removed.**
- **The heater must be positioned in an way that does not impact maintenance work on the heater and the vehicle's other components. If necessary, the heater must be placed in a separate box.**
- **Installation must be performed in such a way that heat impact from the vehicle's engine and exhaust system does not damage the heater. Conversely, the vehicle's components must be protected against damage from the heater's exhaust.**
- **The water system which the heater will be connected to must be fitted with a pressure control valve for safety.**
- **The heater should be installed in as low a position as possible relative to the vehicle's cooling/heating system.**
- **If the heater is installed inside a casing, this must have an air intake opening of at least 100 cm². (The air intake must not be blocked off). The casing must be made from a non-flammable material.**
- **Intake air for the heater must not come from rooms where there are people. The placement of the intake must be such that exhaust gas from the vehicle does not mix with the intake air.**
- **The air intake must be placed and designed to avoid clogging by snow or dirt. The air intake must be placed to keep the airflow around the vehicle from interfering with the pressure in the system.**
- **The opening of the exhaust pipe must be placed so that:**
 - 1) **Combustion is not notably affected by airflow around the vehicle.**
 - 2) **There is no heat damage to adjacent vehicle components.**
 - 3) **There is no risk of igniting dry grass etc.**
- **The exhaust pipe must be designed to work with local exhaust ventilation, although not directly connected, as this can affect combustion.**
- **The vehicle must have safety measures to ensure that no exhaust ends up in rooms where there are people.**

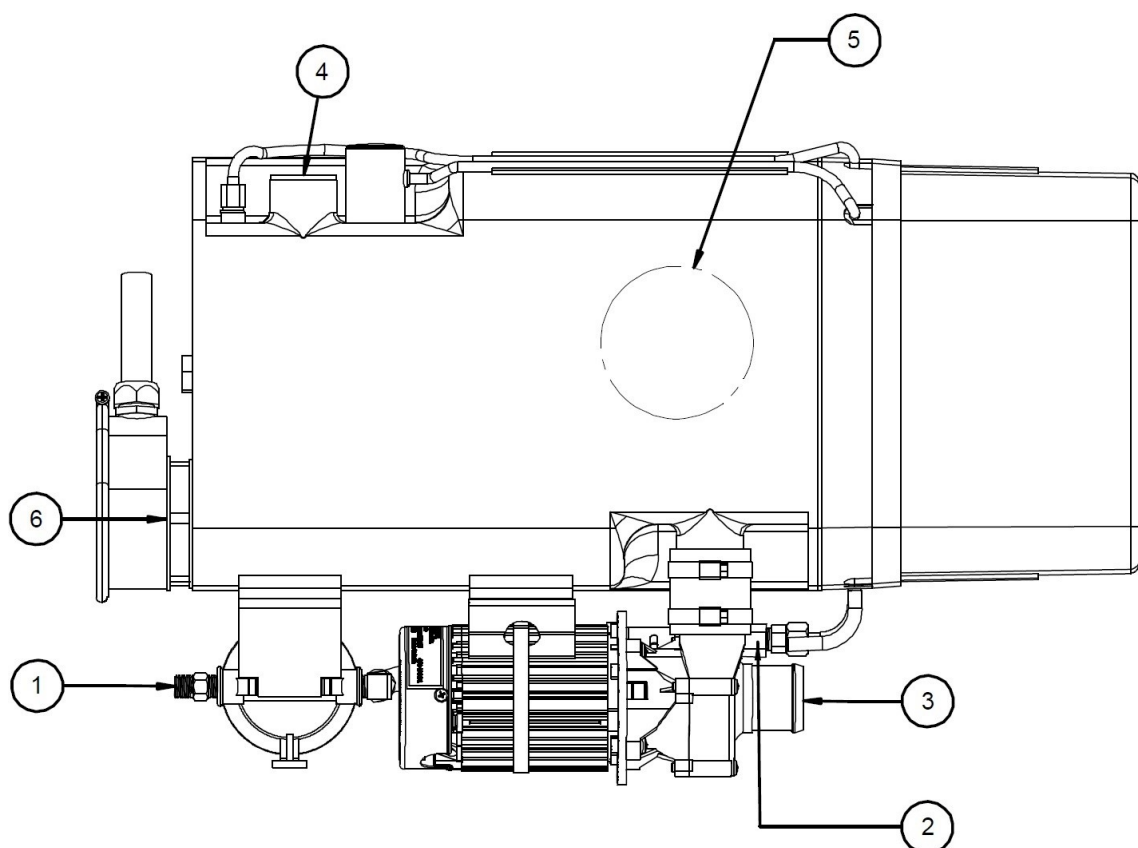
INSTALLATION GUIDE/INSTALLATION PLAN

- The exhaust pipe should be max. 4000 mm in length and should be 90 mm in diameter.
- If the heater is installed in a cargo area, that section of the fuel line must be made of steel. Connections to the vehicle's fuel supply must be made outside this area.
- The heater may not be installed in a driver's or passengers' compartment.
- The exhaust pipe should be made from a material that resists heat and corrosion (AISI304 SS 2333 alloy steel resistant to max. 800°C with at least 0.75 mm wall thickness).
- Connections to the exhaust system must be tight and secured with brackets.
- If the heater is installed in a cargo area, the exhaust must be made from an unbroken steel pipe.
- After installation, the model plate must be accessible and readable.
- **THE EXHAUST MUST BE ROUTED OUTSIDE OF THE VEHICLE IN HOSE OR PIPE.**



There should be adequate room at the combustion end of the heater to remove the combustion unit and combustion pipe. Minimum distances are shown in the illustration. We recommend mounting the heater unit on vibration dampers. In this case, the heater connections should be made with flexible hose.

Water/fuel connection



Pos 1: Intake fuel flow (to heater fuel pump from vehicle fuel tank):
Connection of fuel hose with 1/4 x 1/4 fitting (standard design).

Pos 2: Outlet fuel return (to fuel tank):
Fuel hose with 1/4 x 1/4 fitting (standard design).

Pos 3: Intake return water: Branch for connection of 38 mm frost resisting hose.

Pos 4: Outlet supply water: Branch for connection of 38 mm frost resisting hose.

Pos 5: Exhaust: Outer diameter Ø90 mm.

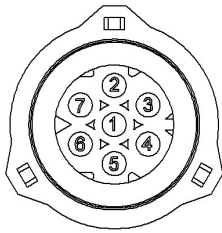
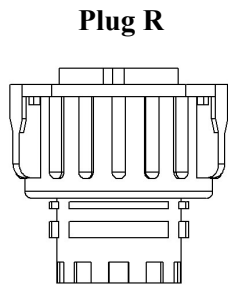
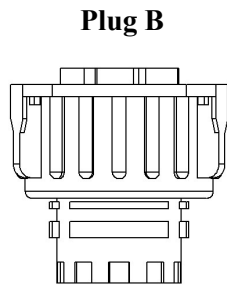
Pos 6: Connection of electrical immersion heater.

ELECTRICAL CONNECTIONS

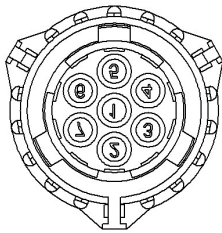
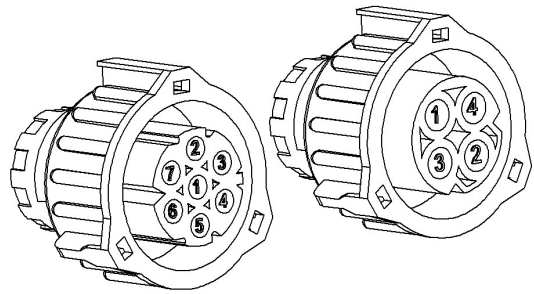
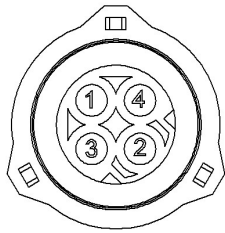
The fuel-burning heater is available in two versions: 12V or 24V. External connections are collected in a 7 pin plug labelled B and 4 pin plug labelled R. The heater's internal connections are illustrated in the diagram on page 36. Always use correct cable dimensions according to applicable standard... The dimensions mentioned are minimum requirements.

- Pin B1:** Free.
- Pin B2:** Connect to main switch or timer. The other side of the switch should be connected via 10A fuse to + (positive).
- Pin B3:** Connect via 10A fuse if separate operation of the circulation pump is desired.
- Pin B4:** Signal from magnetic coil open fuel pump (+) max. load 1A, for hour reading.
- Pin B5:** Connect to diagnostics lamp. The other side of the diagnostics lamp should be connected to + switch. Diagnostics lamp should be an LED. For safety reasons, make sure that the diagnostics lamp is placed within the driver's field of vision so that potential errors can be detected quickly and the heater can be checked.
- Pin B6:** Connect to - (negative) if low temperature is desired.
- Pin B7:** Connect to relay for cabin fan.
- Pin R1:** Connected via 15A fuse to + (positive). If the fuel used is RME, the fuse must be 20A.
- Pin R2:** Connected via 10A fuse to + (positive). Please note: Join together the + cables from the two fuses and route to the vehicle's battery in a 4 mm² cable.
- Pin R3:** Free.
- Pin R4:** Connect to chassis earth (negative). Use at least the same cable thickness as B3 and B4.

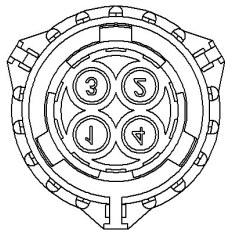
PLEASE NOTE: The heater can be set to adjust the temperature within two ranges (see p. 14-15: High/low temperature). Select the low range by connecting cable B6 to chassis point M. Select the *NORMAL* range by *NOT* connecting B6.



Front



Back



TECHNICAL SPECIFICATIONS

Technical data:

**STROCO fuel-burning heater
type 35.02 M LE HYBRID:**

**Fuel-burning heater with integrated control system and safety
and alarm functionality.**

Dimensions L x W x H:

613 x 245 x 234 mm

Weight:

30 kg total. (plus any optional parts).

Connections:

**The fuel-burning heater connects to the vehicle's electrical
installation, fuel tank and water/heating system.**

Supply voltage:

24 or 12V DC see label on heater

Fuel:

Diesel EN 590 - RME EN 14214

Fuel filter:

**Filter area: 1937 cm²
Degree of filtration: 0.02 mm
Connection: 1/4"RG**

Heating output:

Diesel/HVO 23/30 kW - RME 30 kW, see label on heater.

Power consumption:

**11A at 24V DC diesel/HVO. 14A at RME
22A at 12V DC diesel/HVO
3A Pre-heater element diesel. 6A at RME
2.5A at 24V DC filter pre-heater - optional**

Combustion data:

**CO₂: Diesel/HVO 30 kW 10% - RME 30 kW 10%
Sooting level: 0-1 Bacharach
Stated values +/-1%**

Circulation pump:

6000 l/h at 0,4 bar Power consumption: 6.6A at 24V DC

Fuel pump:

**Working pressure: RME 11.6 bar - Diesel/HVO 30 kW 9.6 bar
- Diesel/HVO 23 kW 11.6 bar. See label on heater.**

Nozzle:

Please see spare part list.

Photo unit:

Type LDR

Overtemperature control:

**Type Therm-o-dise
Disconnect temperature 110°C**

Control thermostat:

**NTC 10 K sensor. Boiler temperature:
High: stop/disconnect approx. 73/80°C
Low: stop/disconnect approx. 55/60°C (LE-J approx. 50/70°C)
Cabin fan: Start approx. 50°C/Stop approx. 45°C.**

**MAX. AMBIENT
TEMPERATURE:**

80°C

**IMPORTANT! THE HEATER SYSTEM MUST BE FILLED WITH AN ANTI-CORROSIVE
ADDITIVE (E.G. 40-60% ANTI-FREEZE) (SEE ENGINE SPECIFICATIONS).**

| | |
|-------------------------------|--|
| Pre-ventilation: | For cold start approx. 60 sec. For restarting approx. 10 sec. |
| Post-ventilation: | Approx. 120 sec. |
| Undervoltage: | In 24V units: Disconnect/connect approx. 20.5/22V DC In 12V units: Disconnect/connect approx. 10.5/11.5V DC |
| Overvoltage: | In 24V units: Disconnect/connect approx. 30/29.5V DC In 12V units: Disconnect/connect approx. 15/14.5V DC |
| safety period: | Max. 15 sec. |
| Switch load: | Max. 10A (cabin fan pin B7) |
| Electrical connection: | 15 pin AMP plug (A in electrical diagram) |

Explanation of terminology

Low temperature boiler supply water

At low supply water temperatures, the control thermostat cuts out at approx. 60°C and cuts in at approx. 55°C (LE-J at approx. 70°C and cuts in at approx. 50°C). This is referred to as the low range in this text.

Please note: Connect cable B6 if the low temperature range is desired.

High temperature boiler supply water

At high supply water temperatures, the control thermostat cuts out at approx. 80°C and cuts in at approx. 73°C. This is referred to as the high range in this text. This is the temperature range most commonly used.

Please note: Do not connect cable B6 if the high temperature range is desired.

Overheating protection (max. temperature)

Excessive heating of the boiler water is prevented by means of a circuit breaker in the overtemperature thermostat, which is activated at approx. 110°C. If the circuit is tripped, disconnecting the electrical system, it must be reactivated manually by pressing the black button on the thermostat. The system does not restart automatically, even if the water has cooled down again.

Safety period in case of flame failure

If no flame is established, the safety relay switches on the ignition to attempt a restart. If there is still no flame within the relay's safety period of 15 seconds, the relay cuts out and the systems starts to post-ventilate. If the safety relay cuts out, the error lamp comes on.

Pre-ventilation

The heater starts up with a pre-ventilation period of 60 seconds. This period is reduced to 10 seconds once the heater is in regular operation where start and stop is controlled by the thermostat.

MAINTENANCE

To ensure reliable operation of the fuel-burning heater, perform the following maintenance inspections at least once per year, at the end of the heating season, or well ahead of the start of the season.

General servicing:

- Replacement of the fuel filter.
- Replacement of the nozzle.
- Inspection of motor carbon brushes.
- Inspection of pipes and hoses for any leaks. It is particularly important that the heater's fuel suction hose has absolutely no leaks. All fuel hoses should be replaced every 2 years. Use only hoses sourced from STROCO, or hoses approved by STROCO. The heater's warranty will be void if it is fitted with hoses not approved by STROCO, or if there is no documentation of replacement of fuel hoses with 2 year intervals.
- Inspection of the boiler and combustion pipe. Removal of any soot or incrustation from the boiler.
- Replacement of the combustion pipe if damaged.
- Inspection of the combustion unit. Replacement of the nozzle and subsequent check that the nozzle is centred in the turbolator. Electrodes, nozzle, and turbolator should be clean and undamaged. Checking of electrode setting as per page 26. Improper combustion can lead to boiler or combustion pipe being blackened by soot. Inspection of the photoelectric sensor for cracks; cleaning if necessary. Inspection of the coupling between fan wheel and fuel pump; replacement of the coupling if the contact surfaces are worn. When the combustion unit is fitted back on the boiler, adjust the fuel pressure to the correct value and then adjust the air setting to comply with relevant combustion data.
- Inspection of all cables and electrical connections for possible damage or corrosion.
- Outside the heating season, run the heater for at least 15 min. per week.

IMPORTANT!

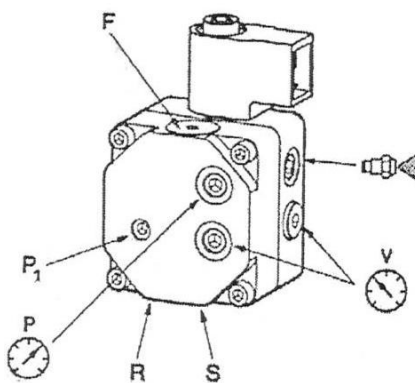
- When using RME, the fuel pump must be replaced every 2 years.
- Fuel hoses must be replaced every 2 years regardless of fuel type. Fuel hoses must be replaced with original STROCO fuel hoses, or approved hoses that meet the same minimum specifications.
- It is important that hoses, seals etc. be inspected for leaks continually. Leaky fuel lines present a serious safety hazard. The warranty on the STROCO fuel-burning heater will be void in case of deficient or improper servicing.




Inspection of pump suction

- Is there fuel in the tank?
- Check vacuum, max. -0.4 bar, connect to port "V" and check with vacuum gauge STROCO part no. 13.909.
- Are the fuel filter, intake line, or any taps clogged or closed?
- Is the fuel very cold and viscous?

Inspection of pump pressure

- Check fuel pressure; connect gauge to port "P".
- Adjust the pressure at port "P1"; check with pressure gauge STROCO part no. 13.902.
- Unsteady gauge readings are a sign of air in the intake line.
- For fuel pressure, please consult the technical specifications.



| | |
|---|--|
| P ₁ | Pressure regulation |
| S | Intake line G 1/4 |
| R | Return line G 1/4 |
|  | Nozzel attachment left G 1/8 (alternatively right) |
|  | Pressure gauge attachment front G 1/8 (alternatively left) |
|  | Vacuum gauge attachment G 1/8 |
| F | Cartridge filter |

Fuel filter

The filter is located on the fuel intake line between the fuel pump and the fuel tank.

Install the filter so that the arrows correspond to the flow direction.

On replacement, inspect the filter and joints for any leaks.

Circulation pump

The circulation pump transports water around the heating system.

The pump runs constantly when the main switch/starting clock is activated and the heating unit is operational.

The pump is activated via the circulation pump relay. The relay receives a control current from the control system through plug A, pin 7.

When the relay is active, the pump receives its working power via the relay from main plug R, pin 2 (see page 36).

During operation, plug V, pin 1 should read out 24V (12V).

DESCRIPTION OF FUNCTIONALITY - OPERATION

The heater can be started using the main switch on the dashboard. Alternatively, a starting clock can function as main switch.

The start-up process connects control current from the installation (12V or 24V battery).

The main power supply is connected directly to the heater's control system, which controls the power supply to the heater.

The pump relay is activated immediately on start-up to start the circulation pump. The pump runs constantly when the main switch is activated.

The control thermostat sends a signal to start up the combustion unit when the boiler temperature drops below the set value.

During the *pre-ventilation period*, the ignition electrodes (sparks) receive current, the fan motor runs, and the nozzle pre-heater is engaged.

The fuel pump solenoid valve is switched on approx. 60 seconds after system start-up to release fuel to be vaporised in the nozzle. *The safety timer* is engaged at the same time.

Once the flame is established, the nozzle pre-heater and ignition are disengaged. The starting sequence is now complete, and the combustion unit remains operational until the control thermostat cuts it off and the *ventilation period* begins.

When the control thermostat completes the circuit again, the starting sequence repeats with a *pre-ventilation period* of 10 seconds.

The control system's *monitoring* is focused primarily on the combustion process.

If the fuel does *not* ignite on start-up, the safety relay remains active. After approx. 10 seconds, the safety relay disconnects, and post-ventilation begins.

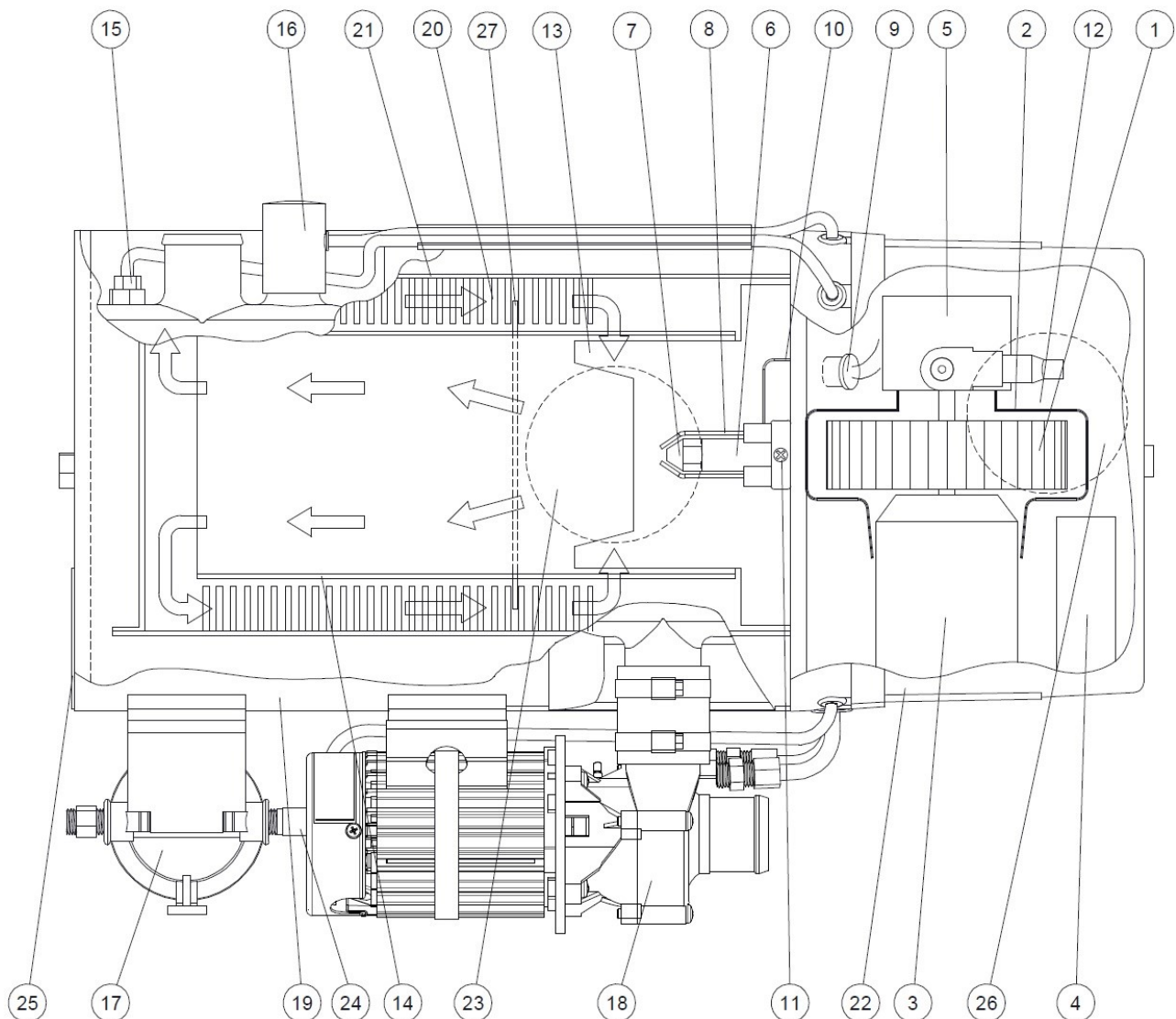
If the flame goes out during operation, the safety relay switches on the ignition to attempt a restart. If the fuel does not ignite, the safety relay disconnects, the fuel supply stops, and the alarm is activated. If the fuel does ignite successfully, the combustion process continues until the control thermostat cuts it off.

The electronic circuit is controlled automatically, so fuel supply stops in case of component failure in photoelectric or engine circuits. In case of abnormal operating conditions, such as flame failure during operation or false light during pre-ventilation, the automatic safety system stops the heater and activates *Alarm functions*. It is therefore important to install the LED lamp that displays this alarm from the system within the driver's field of vision so that potential errors can be detected quickly.

The control system has an integrated motor voltage regulator, which maintains a constant 21.5V on the fan motor.

The heater's *pre- and post-ventilation* and *low voltage logic* is also controlled by the automatic system.

DESCRIPTION OF FUNCTIONALITY



- | | |
|---|------------------------------------|
| 1 Fan wheel | 15 Temperature sensor |
| 2 Fan housing | 16 Overtemperature control |
| 3 Motor | 17 Fuel filter |
| 4 Control system | 18 Circulation pump |
| 5 Fuel pump | 19 Outer boiler |
| 6 Nozzle socket | 20 22 mm copper pins |
| 7 Nozzle | 21 Inner boiler |
| 8 Ignition electrode block | 22 Plastic cover |
| 9 Photoelectric sensor | 23 Exhaust |
| 10 Fuel pipe | 24 Fuel hose |
| 11 Lock bolt for ignition electrode block | 25 Connection for immersion heater |
| 12 Air plate | 26 Air intake |
| 13 Combustion unit | 27 Flue gas conduit |
| 14 Combustion pipe | |

If you initiate troubleshooting because the heater is not working correctly, be sure to note the state and condition of the unit before and after the fault, if possible, in order identify the problem prior to repairs.

- Is the main switch or starting clock inactive?
- Is the operation/diagnostics lamp on?
- Does the operation/diagnostics lamp show an error in case of alarm functions?
- Have any irregularities with the heater been observed prior to the fault? Any unusual smells, sounds, of visible changes?
- Is there fuel in the tank?
- Is there water in the system?
- Is the power supply to the heater okay? 24V plug (R pin 1, 2, and 4) (see page 36).
- Is the air intake unobstructed?
- Are the fuses in the electrical circuit intact?
- Has the overtemperature control been tripped?
- Has the desired temperature range been selected correctly using cable B6? (see page 36)

Before further troubleshooting, note the automatic control of the heater in various sequences. Certain functionality, e.g. pre-ventilation and ignition, only runs in limited periods.

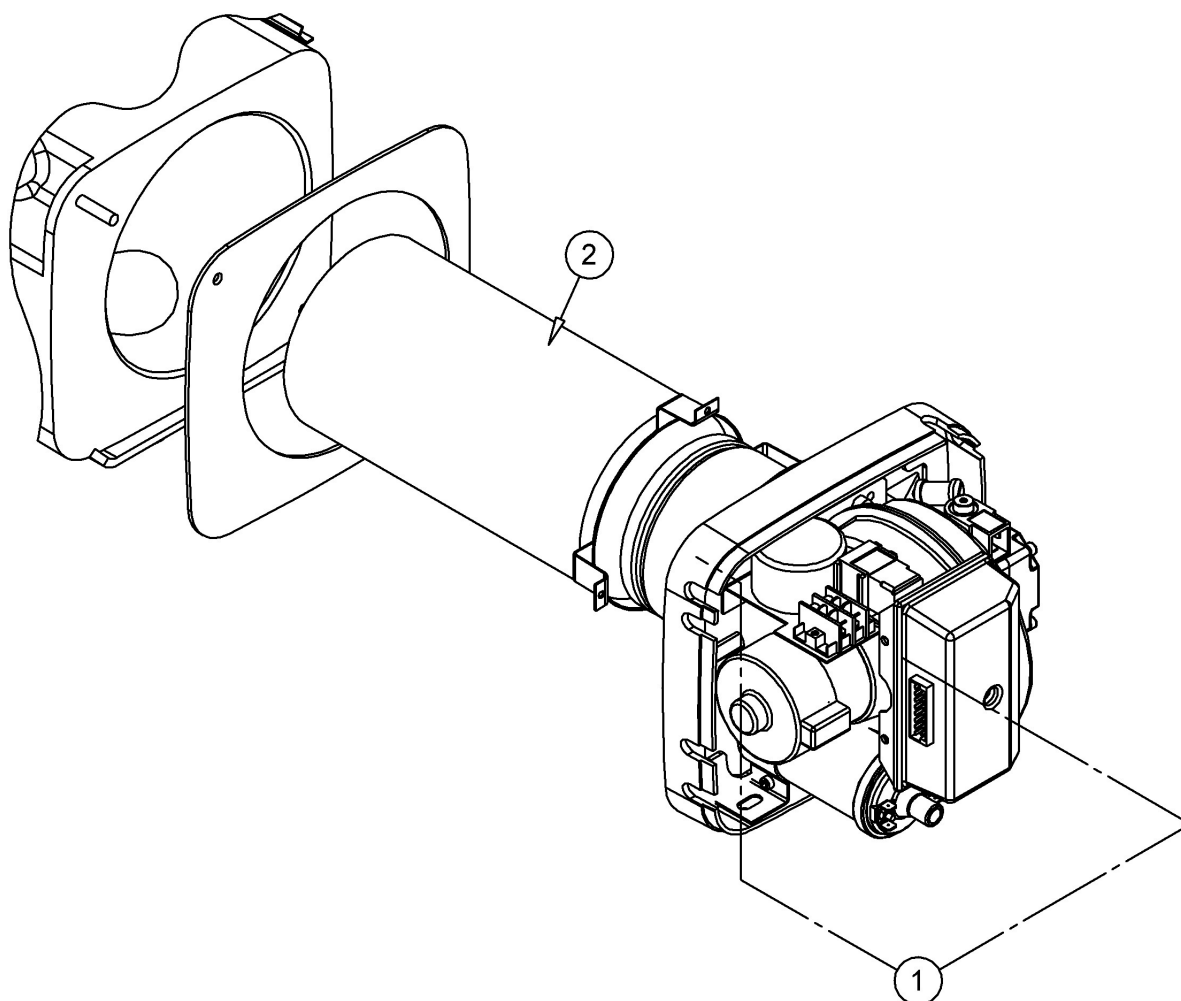
If the heater stops automatically due to errors, the post-ventilation will run for approx. 120 seconds, and the diagnostics lamp will come on (see page 23).

Servicing and repairs may only be performed by qualified personnel. Unauthorised tampering presents a serious safety hazard. The warranty may be void if repairs are attempted by unauthorised persons.

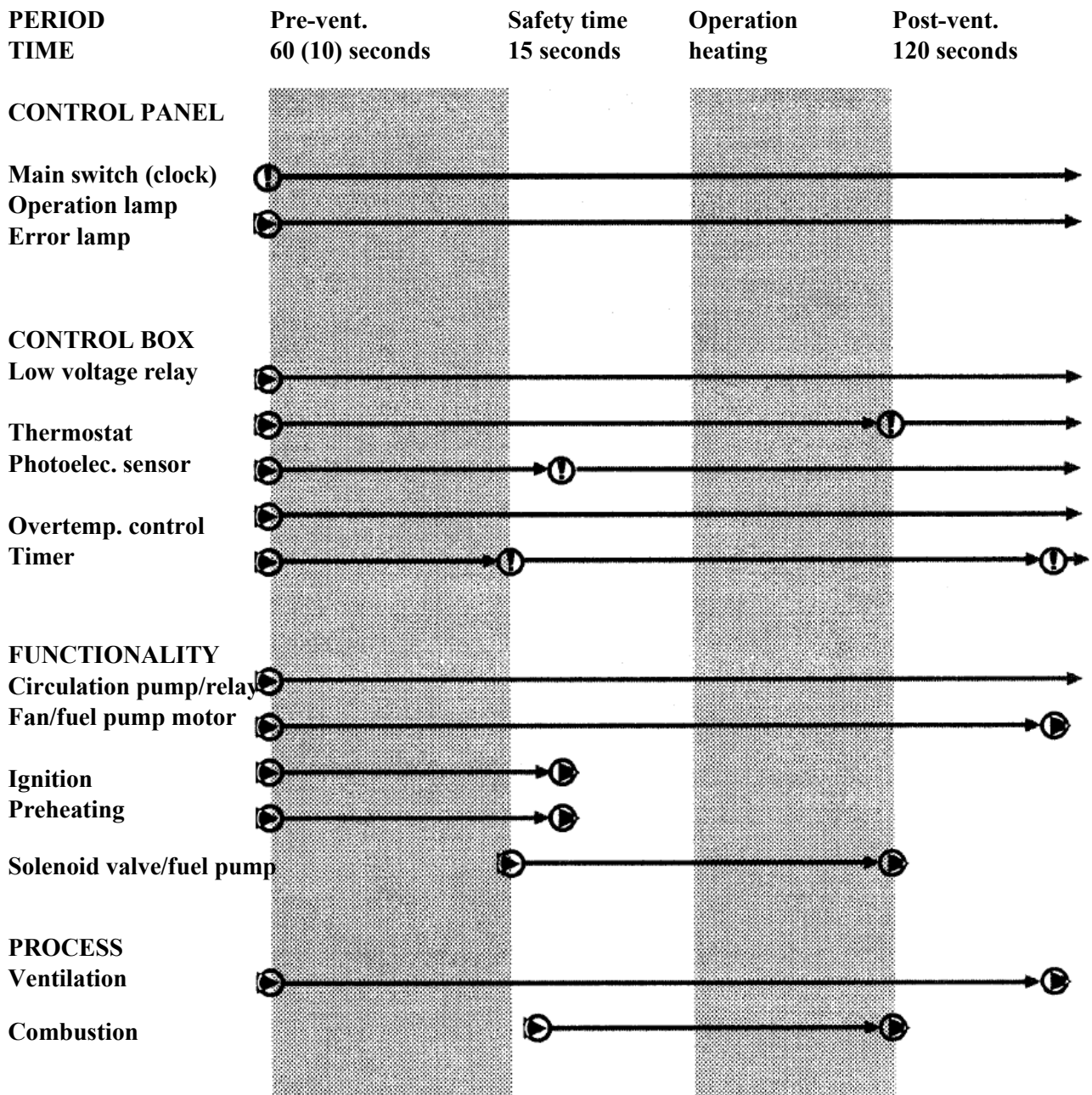
DISCONNECTION OF COMBUSTION CHAMBER

Detach overtemperature control plug, control thermostat, circulation pump, and main plug(s).
Detach fuel lines.

Gain access to the combustion chamber by removing tow M8 nuts (pos. 1) The combustion head can now be detached to reveal the combustion pipe (pos. 2).



PROCESS CONTROL DIAGRAM



Please note: When cold starting the heater, the pre-ventilation time is 60 seconds. When starting during normal operation, the pre-ventilation time is 10 seconds.

①: Signal for activation or deactivation

▶: Activation

◀: Deactivation

Please note: THE HEATER MUST NOT BE USED IN GARAGES, SERVICE STATIONS, OR OTHER LOCATIONS WHERE THE USE OF OPEN FIRE IS PROHIBITED!

| Type of defect | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | With LED indicator (seconds) | Display indicator | Remedy |
|--------------------------------|---|---|---|---|---|---|---|---|---|---|----|---------------------------------|----------------------|--------------------------------|
| 0 Normal operation | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 0 | |
| 1 Safety time exceeded | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 1 | Page 25 |
| 2 Ignition failure, or no fuel | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 2 | Page 26 |
| 3 Photodetector defective | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 3 | Page 27 |
| 4 Undervoltage | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 4 | Page 28 |
| 5 Overvoltage | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 5 | Page 28 |
| 6 Fan defective | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 6 | Page 29 |
| 7 Solenoid valve defective | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 7 | Page 30 |
| 8 Sensor defective | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 8 | Page 31 |
| 9 Too many start attempts | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 9 | (reset at operation and light) |
| 10(A) Overtemperature alarm | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | A | Page 31 |

IMPORTANT !

Heater with LED indicator:

Black areas mean red light.

White areas mean no light.

Dotted areas mean blinking light.

The combustion unit is the heart of the combustion process. It mixes air with fuel vapour, which is ignited by a spark from the coil.

The flame is registered by the photoelectric sensor.

Correct setting of the combustion unit is important to ensure efficient combustion:

Please observe the following:

- Electrode settings, as per page 26.
- Proper centring of the nozzle in the turbolator.

In case of flame failure

Possible reasons:

- The fuel tank is empty.
- The intake line is leaky.
- Air collecting in the intake line.
- The fuel pump is not drawing fuel.
- The fuel pump is not rotating, due to defective coupling.
- The fuel pump pressure is low.
- The pump solenoid valve is not supplying fuel to the nozzle.
- Dirt from the fuel tank is blocking the nozzle.
- The fuel is very cold and viscous.
- The intake and return fuel lines have been switched around.
- No spark due to defective coil/oscillator or ignition cable.
- No spark due to short-circuited electrodes or carbon deposits on the ceramic insulator.

Manual re-activation

If the control system has been deactivated by the safety relay, it can be re-activated by switching off the mains switch on the dashboard for approx. 5 seconds and then switching it on again. The heater should then start up normally.

VOLTAGE CHECK ON ELECTRODES

Perform when inspection ignition and oscillator. Detach overtemperature control plug, control thermostat sensor, and solenoid valve. When inspecting the ignition, short-circuit the overtemperature control plug to keep the ignition functioning.

For access to the combustion unit, please see the section "Disconnection of combustion chamber", page 22.

The discharge by the electrodes can now be inspected as described.

The ignition system receives power for the ignition oscillator and coil from the control system via plug A pin 2 (see page 36).

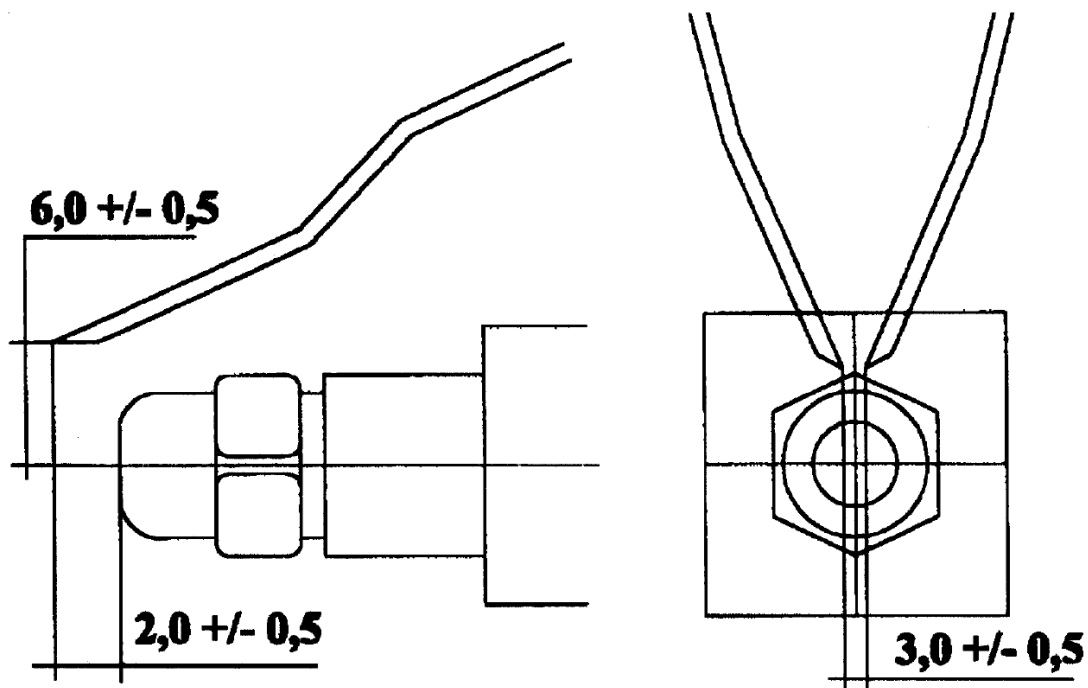
The ignition oscillator and coil are interconnected and will not function separately.

The ignition oscillator changes the negative operating current into impulses, which are transformed by the ignition coil into high voltage and discharged in the form of a spark between the ignition electrodes.

Discharge failure may be caused by:

1. A defective ignition cable.
2. Electrode settings.
3. Dirt on the electrodes.
4. Defective ceramic coating on the electrode unit.
5. Ignition coil, oscillator, control system.

Adjust the electrodes using the illustration below.



PHOTOELECTRIC SENSOR

The photoelectric sensor must not be exposed to light during the pre-ventilation; this will cause an error indication.

When the pre-ventilation period ends and the fuel supply begins, the sensor should pick up light. Otherwise the safety relay will shut down the process.

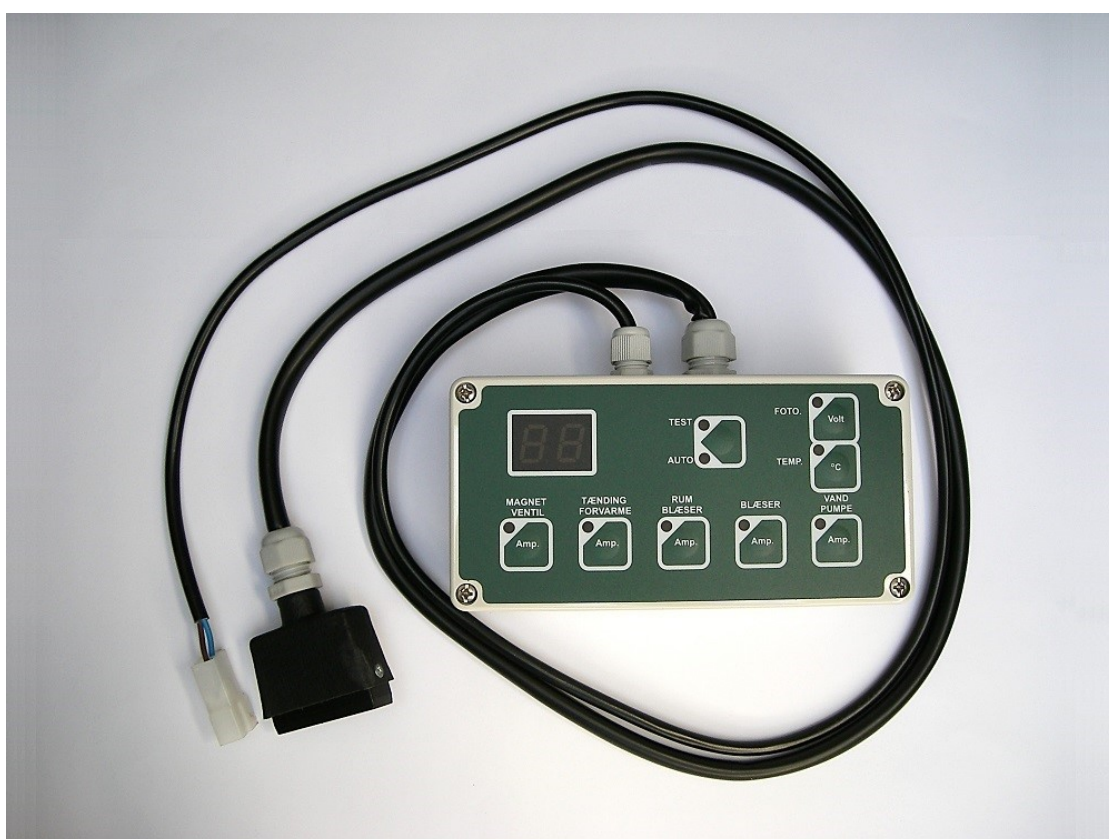
The photoelectric sensor connects to the control system via plug D (see page 36).

Adjustment and remedial action

If the light-sensitive LDR in the photoelectric sensor is shortcircuited or defective, the control system will not allow the heater to start.

If the sensor does not detect enough light while the flame burns, the system will also shut down. This may be caused by dirt on the sensor or incorrect placement in the combustion unit. Troubleshoot the photoelectric sensor using STROCO testing device part no. 35.960. The sensor voltage should be 4.9V when the combustion unit is off. When the heater is operational, the voltage should be 0V. For 12V system, check the voltage at the photoelectric sensor, plug D. See electrical diagram.

The photoelectric sensor can be disconnected in plug D (see page 36).



| Description | Part number |
|-----------------------|-------------|
| STROCO Testing device | 35.960 |

UNDER/OVERVOLTAGE

Undervoltage

The undervoltage alert is activated if the system voltage drops below 22/11.5V (in step 0) and below 20.5/10.5V during pre-ventilation, operation, and post-ventilation. The alarm can only be reset with the switch off and the voltage above 22/11.5V.

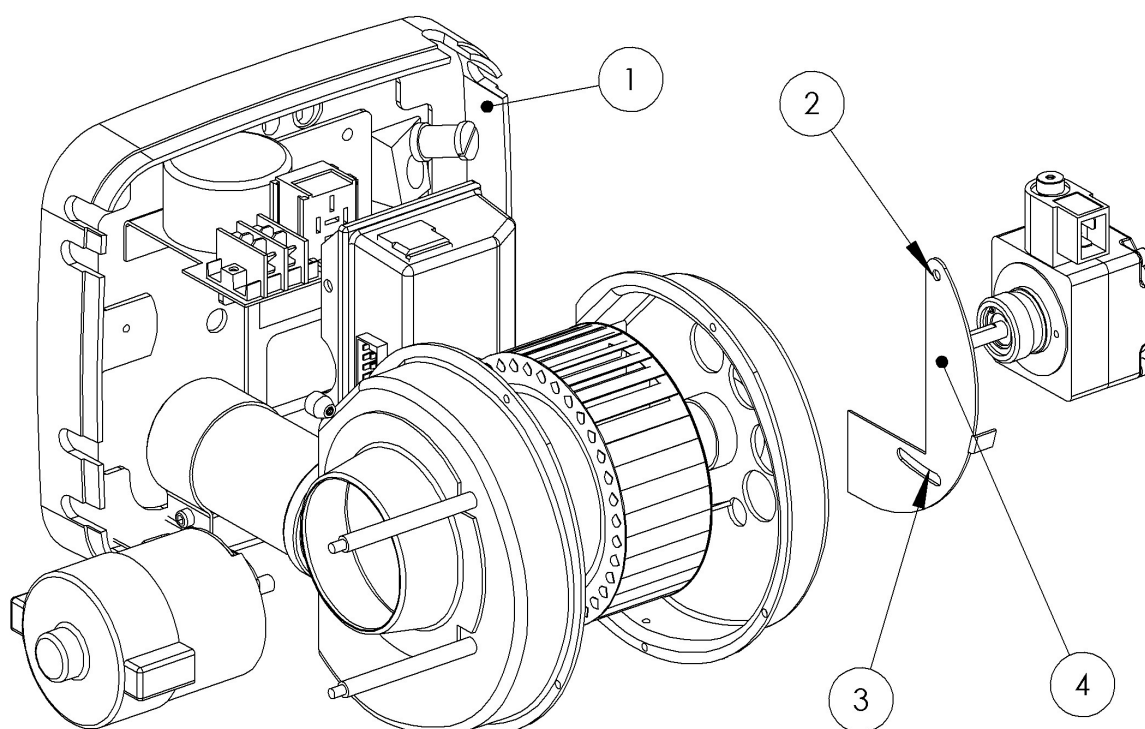
Overvoltage

The alarm is activated if the voltage is above 30/15V and reset below 29.5/14.5V.

REPLACEMENT OF FAN MOTOR

Replace the motor by detaching the fan housing from flange no. 1 and then disassembling the housing. Detach the fan wheel and remove the two M4 screws holding the motor in place. When replacing the fan motor, make sure that the bearing can rotate freely, even when the new fan motor is mounted completely.

To maximise airflow, install the fan wheel with the shortest distance possible to the fan housing air intake - approx. 2 mm. This will ensure optimum contact area for the fuel pump coupling.



Setting the air volume

Adjust the air volume for combustion by loosening screw no. 2 and 3 and turning air valve no. 4 to + or -.

The air setting affects the fuel combustion. Black smoke = not enough air, blue/grey smoke = too much air.

Check the correct air setting using STROCO soot gauge part no. 13.982 or STROCO flue gas tester part no. 13.983

For combustion data, please see page 14.

SERVICING

Fuel pre-heater

The pre-heater is located in the nozzle holder, which it heats. It is activated upon start-up of the heater unit, but remains inactive during regular operation.

The pre-heater ensures flame establishment when cold starting.

The automatic system controls the pre-heater, which is powered via plug F, approx. 3A for diesel/HVO and 6A for RME. (see page 36)

Fuel pump

- The fuel pump is attached to the fan housing with two 6 mm set screws.
- The pump is installed in a two-pipe system with automatic ventilation through the return pipe.
- The pump solenoid valve is activated by the control system via plug L (see page 36).
- The pump's working pressure value can be found on page 14. Adjust the pressure using screw P1 (see page 17).
- The pump is operational while the fan motor is running, but fuel is not supplied to the nozzle for vaporisation until the solenoid valve is activated.
- The pump's intake must be absolutely free of leaks and fitted with a fuel filter (see spare parts list for filter types).

Inspection of fuel pump solenoid valve

The simplest way to check the field coil is using a STROCO test device part no. 35.960. The field coil should draw 0.2A-0.4A power. An audible click from the solenoid valve indicates that the field coil is activated. Field coil and solenoid valve can be checked manually:

Take a reading of the coil voltage before checking the solenoid valve. The voltage should be approx. 24V (12V) in plug L pin 2 (see page 36).

Please note: The plug has no electrical power until *after the pre-ventilation period*, and the power is *cut off again after approx. 10 seconds*, if the photoresistor does not register combustion. (see the diagram for normal operation, page 23).

If the voltage is correct in plug L, pin 2 (see page 36), proceed to check the field coil's magnetic force. The core of the coil becomes magnetised when an electrical current is applied. (E.g. use a screwdriver).

If the photoelectric sensor registers light during pre-ventilation, this is interpreted as a malfunction in the solenoid valve. The error message can only be reset with the switch in the "off" position.

Control thermostat sensor

The control thermostat sensor connects to the control system via plug C (see page 36).

The sensor reads the temperature in the boiler from its position screwed into a socket on the side of the boiler.

The thermostat may be set to two different operational ranges:

1: Cut in/cut-off: approx. 55/60°C (LE-J cut in/cut-off: approx. 50/70°C)

Please note: This temperature range can be selected by connecting cable B6 to chassis earth.

2: Cut in/cut-off: approx. 73/80°C (The normal range).

Please note: This temperature range can be selected by not connecting cable B6 to chassis earth.

The simplest way to check the temperature sensor is using STROCO testing device part no. 35.960. Activate the heater and raise the operating temperature to 22-85°C. The sensor is functional if the test device displays a temperature reading. If the test device display is blinking, the temperature sensor is defective. If in doubt, you can check the sensor manually:

A defective temperature sensor is evident by the heating process continuing beyond the pre-set range, and finally being shut down by the overtemperature control.

Voltage readings on a working temperature sensor should show the following:

A decrease in voltage as the temperature rises. Once the sensor voltage falls to 1.2V, the thermostat should disconnect (for the normal temperature range). An increase in voltage as the temperature falls. At 3.6V, the thermostat should connect (for the normal temperature range).

If the voltage reading is constant and does not follow changes in temperature, the sensor is defective and the thermostat will not function.

Replace the sensor by detaching plug C (see page 36) and unscrewing the sensor from its socket.

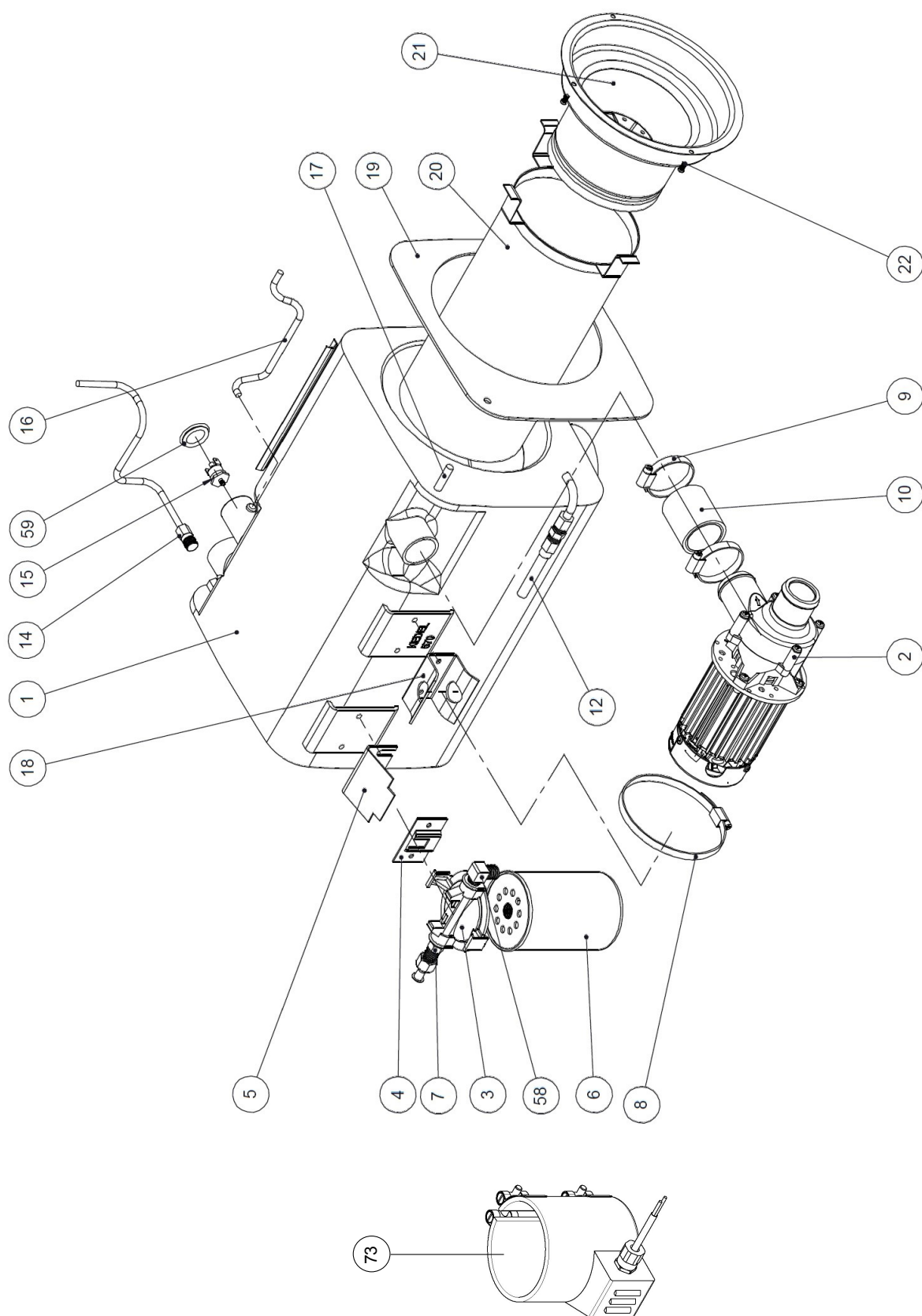
Overheating control (max. temp.)

This device ensures that the water in the boiler is not heated beyond 110°C. The overtemperature control is screwed into a socket on the side of the boiler next to the temperature sensor. If the control cuts out in case of overtemperature, the error lamp will come on.

The device cannot be re-activated by attempting to re-start via the main switch; this must be done manually by depressing the overtemperature device's black button. Re-activation will not take place until the boiler temperature has dropped.

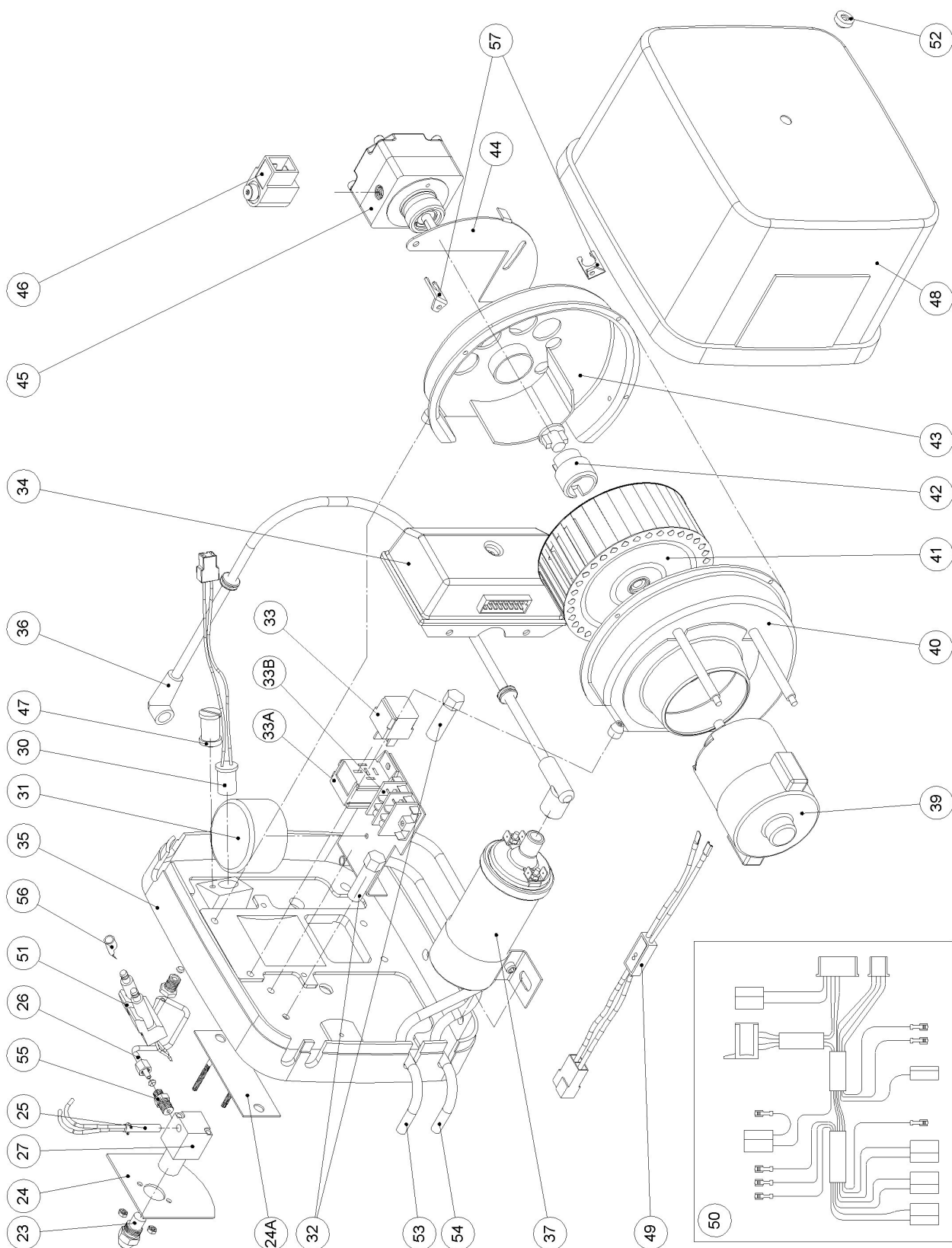
It is a good idea to investigate the reason for the cut-out before and after re-activation.

- 1 Is there water in the system?**
- 2 Is there sufficient circulation?**
- 3 Has the system been bled properly for air?**
- 4 Is the thermostat functioning properly?**



PARTS LIST

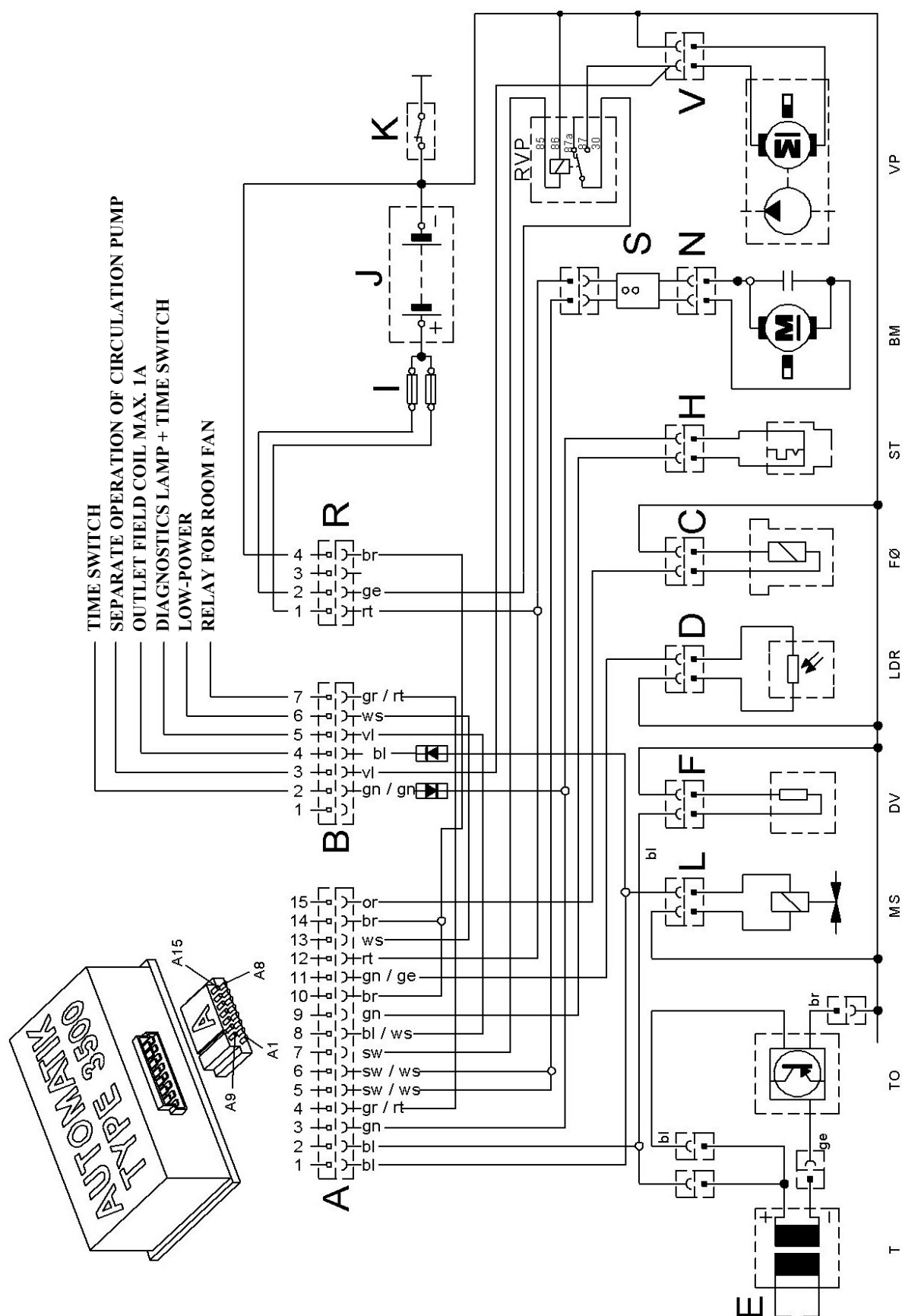
| Pos. | Description | Part number | |
|-------|---|---------------|---------------|
| | | Diesel | RME |
| 1 | Boiler 35.02 M hybrid | 35.543 | 35.543 |
| 2 | Circulation pump Highflow 24V | 35.470 | 35.470 |
| 3+4 | Installation kit | 11.039 | 11.039 |
| 3+4+6 | Fuel filter cpl. | 11.038 | 11.038-1 |
| 5 | Bracket for fuel filter | 35.015 | 35.015 |
| 6 | Fuel filter cartridge | 11.037 | 11.037-1 |
| 7 | Nipple 1/4 x 1/4 thread | 30.395 | 30.395 |
| 8 | Clip 71-95 | 35.581 | 35.581 |
| 9 | Clip 32-44 | 35.021 | 35.021 |
| 10 | Rubber hose | 35.022 | 35.022 |
| 12 | Fuel hose 300 mm | 35.179 | 35.179 |
| 14 | Temperature sensor | 35.010 | 35.010 |
| 15 | Overtemperature control | 35.030 | 35.030 |
| 16 | Cable for overtemperature control | 35.031 | 35.031 |
| 17 | Support bolt 8 mm | 35.023 | 35.023 |
| 18 | Bracket for circulation pump 35470 | 35.459 | 35.459 |
| 19 | Gasket ring | 35.028 | 35.028 |
| 20 | Combustion pipe | 35.042 | 35.042 |
| 21 | Combustion unit | 35.041 | 35.041-1 |
| 22 | Screw 4 mm | 35.024 | 35.024 |
| 58 | Angle 1/4 x 1/4"RG / Nipple 1/4"RG + 14 x 1.50 mm | 30.390/35.019 | 30.390/35.019 |
| 59 | Plug for overtemp. | 35.013 | 35.013 |
| 73 | Filter pre-heater (optional) | 11.046 | 11.046 |



PARTS LIST

| Pos. | Description | Part number | |
|-------|---|-------------------|-------------------|
| | | Diesel | RME |
| 23 | Nozzle for 23 kW (LE) | 35.073 | N/A |
| 23 | Nozzle for 30 kW (LE) | 35.072 | 35.072 |
| 24 | Air plate | 35.080 | 35.082 |
| 24A | Plate for nozzle socket | 35.123 | 35.123 |
| 25 | Pre-heater element | 31.142 | 31.143 |
| 26 | Oil pressure pipe cpl. | 35.250 | 35.250 |
| 27 | Nozzle socket | 30.130 | 30.130 |
| 30 | Photoelectric sensor | 31.160 | 31.160 |
| 31 | Ignition oscillator | 35.510-1 | 35.510-1 |
| 32 | 8 mm nut | 35.026 | 35.026 |
| 33 | Relay for circulation pump | 31.190 | 31.190 |
| 33A | Bracket for relay holder and chassis connection clamp | 35.033 | 35.033 |
| 33B | Chassis connection clamp | 31.380 | 31.380 |
| 34 | Control system 24/12V (LE) | 35.520-1/35.522-1 | 35.520-1/35.522-1 |
| 34 | Control system 24V J (LE-J) | 35.526 | 35.526 |
| 35 | Flange | 35.036 | 35.036 |
| 36+57 | Ignition cable | 35.170-1 | 35.170-1 |
| 37 | Ignition coil 12V (24V heater) | 30.490 | 30.490 |
| 39 | Fan motor 24/12V | 35.340-1/35.342-1 | 35.340-1/35.342-1 |
| 40 | Fan housing, motor section | 35.037 | 35.037 |
| 41 | Fan wheel | 35.270 | 35.270 |
| 42 | Coupling cpl. | 35.360 | 35.360 |
| 43 | Fan housing, intake | 35.032 | 35.032 |
| 44 | Air valve | 35.300 | 35.300 |
| 45+46 | Fuel pump LE cpl. 24V | 31.372 | 31.372 |
| 46 | Solenoid valve 24/12V | 31.376/31.373 | 31.376/31.373 |
| 47 | Plastic nut for photoelectric sensor | 35.140 | 35.140 |
| 48 | Plastic cover | 35.034-1 | 35.034-1 |
| 48 | Plastic cover with air intake | 35045 | 35045 |
| 49 | Fuse for fan motor | 35.575 | 35.575 |
| 50 | Wiring harness cpl. | 35.570-1 | 35.570-1 |
| 51 | Electrode block | 35.101 | 35.101 |
| 52 | Nut | 35.035 | 35.035 |
| 53 | Fuel line return | 35.018 | 35.018 |
| 54 | Fuel line supply | 35.016 | 35.016 |
| 55 | Nipple 4 x 1/8 straight | 35.127 | 35.127 |
| 56 | Rahjan coupling | 35.188 | 35.188 |

PAGE 36



Keys to abbreviations

| | |
|-----|------------------------------|
| A | Control system plug |
| B | Main plug signal cables |
| BM | Fan motor |
| C | Control thermostat plug |
| D | Photoelectric sensor plug |
| E | Ignition electrodes |
| F | Nozzle pre-heater plug |
| H | Overtemperature control plug |
| L | Field coil plug |
| LDR | Photoelectric sensor |
| ST | Overtemperature control |
| N | Fan motor plug |
| R | Main plug power supply |
| FØ | Control thermostat sensor |
| RVP | Circulation pump relay |
| T | Ignition coil |
| TO | Ignition oscillator |
| V | Circulation pump plug |
| VP | Circulation pump |
| DV | Nozzle pre-heater |
| MS | Field coil |
| I | Fuse |
| J | Accumulator |
| K | Main switch |

Color codes

| | |
|----|--------|
| bl | blue |
| br | brown |
| ge | yellow |
| gn | green |
| gr | grey |
| or | orange |
| rt | red |
| sw | black |
| ws | white |
| vl | violet |

TECHNICAL SPECIFICATION FOR ELECTRICAL HEATING

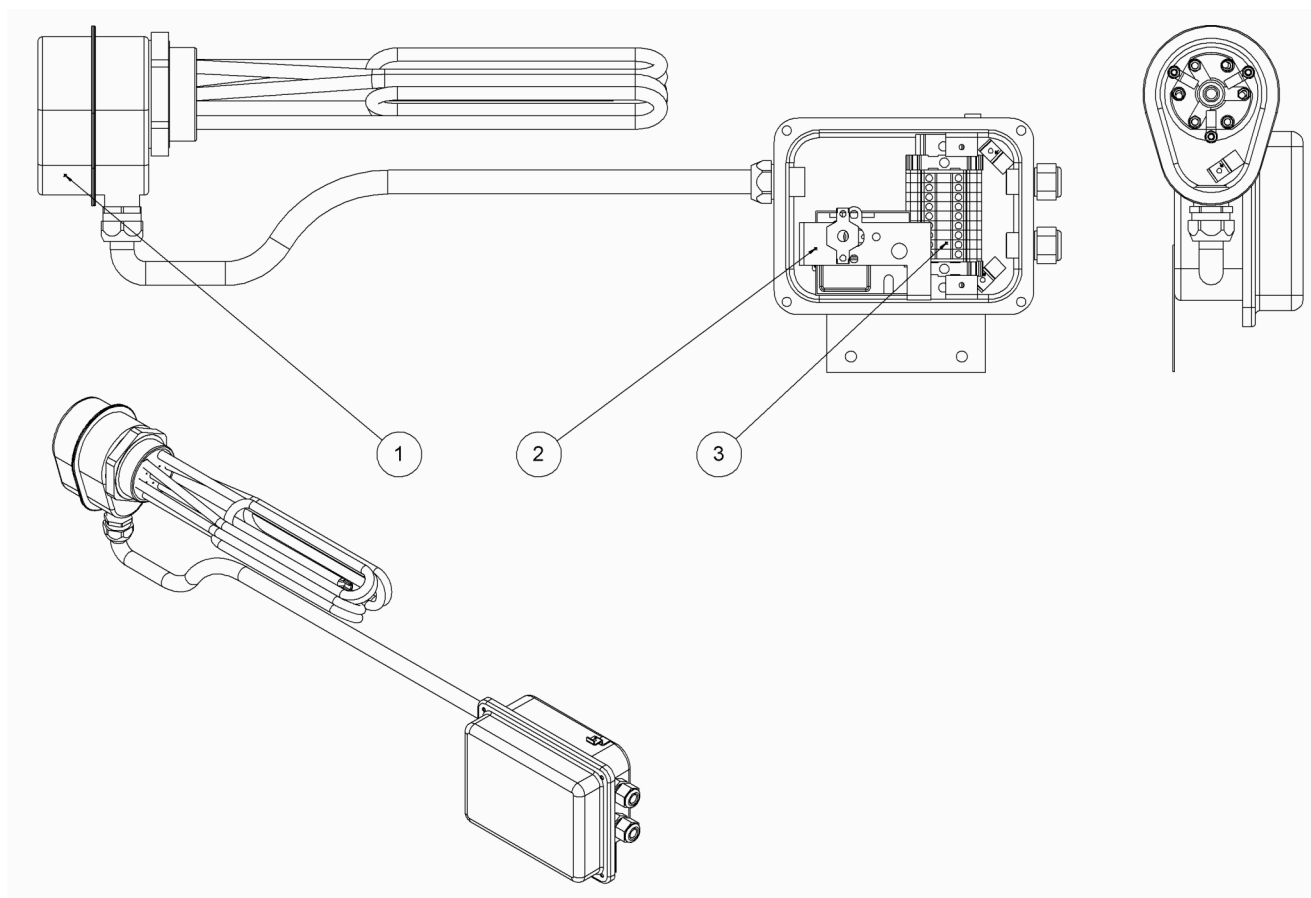
Description

STROCO LE HYBRID is used to heat the vehicle during parking and day to day travel on hybrid or all-electric vehicles. STROCO Electrical heater is mounted in the vehicle's existing heating system and can heat the driver's area, passenger space and engine. STROCO Electrical heater has built-in heating elements operating thermostat and safety thermostat. The type designation 7,5 kW + 15 kW indicates the power size of the heating elements in kW. The electrical connection to the electrical elements is made via a HVDC contactor (not supplied by Stroco) to the heating elements. The HVDC contactor is controlled via the electrical mechanical contactor inside the connection box which receives an active 24VDC signal from the vehicle's heat control system to pull the HVDC contactor. When the temperature is reached, the mechanical contactor breaks the 24 voltage to the HVDC contactor. For circulation of the water use connection B3 with 10 Amp secured cable connected to the heating control system.

STROCO 35.02 M LE HYBRID should be fitted so that the cover on the electrical unit may be removed.

Technical specifications

| | |
|------------------------|--|
| Type: | STROCO 35.02 M LE HYBRID EL type 7,5 kW - 15 kW |
| Heating output: | 7,5 kW + 15 kW total 22,5 kW |
| Electrical connection: | Terminal block via cable gland |
| Control thermostat: | Adjustable 37-85°C |
| Safety thermostat: | 110°C, push-button reset |
| Operating voltage EL: | Standard 672V DC, Optional 620 - 727V DC. See label on the box of el-heater. (Max 10% overvoltage) |

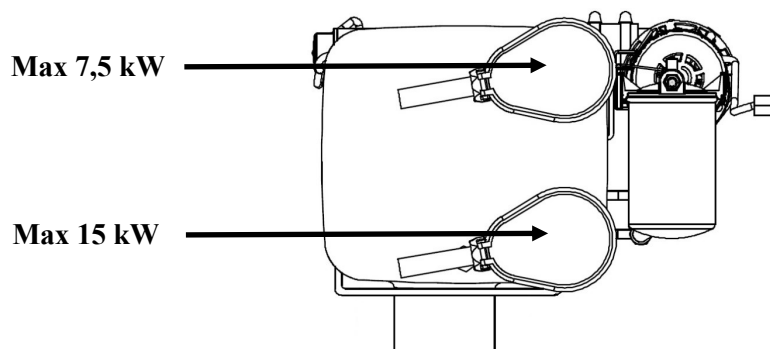


| Pos. | Description | Part no. |
|------|--|----------|
| 1 | El-heater 7,5 kW 672V DC w/ext. coupl. housing 750 mm cpl. | 11.927 |
| 1 | El-heater 15 kW 672V DC w/ ext. coupl. housing 750 mm cpl. | 11.936 |
| 2 | Thermostat EGO 30-85°C/110 | 11.926 |
| 3 | Connection Block | 11.915 |

Optional

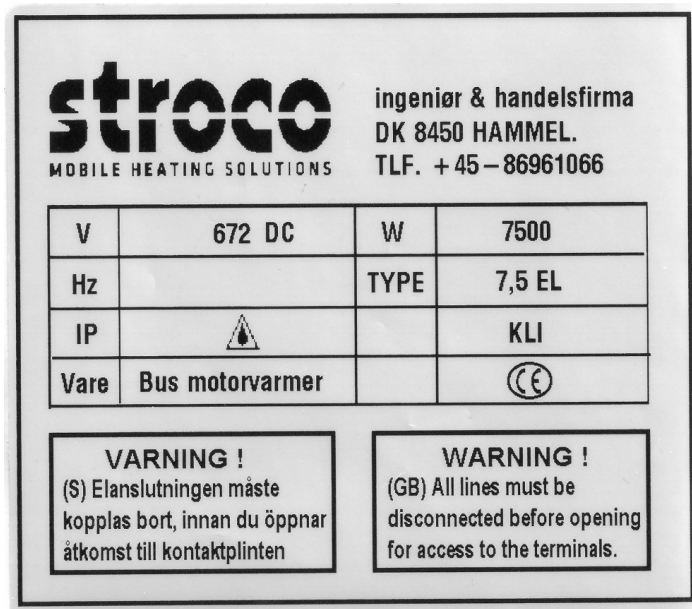
| | | |
|---|--|--------|
| 1 | El-heater 7,5 kW 620V DC w/ext. coupl. housing 1000 mm cpl. | 11.932 |
| 1 | El-heater 12,5 kW 620V DC w/ext. coupl. housing 1000 mm cpl. | 11.933 |
| 1 | El-heater 15 kW 727V DC w/ext. coupl. housing 750 mm cpl. | 11.950 |

WARNING - It is not allowed to install higher capacity on these postions!



LABELS STROCO 35.02 M EL-HEATING

The EI-heater is labelled with a model plate and warning label, as shown below.



The following is a description of the electrical installation. Please refer to the diagram on the nextpage.

The electrical installation is described below and refers to diagrams on the next page.

1 Ground connections

Ground Connections may only be performed, as shown in the diagram on the next page. Ground connections between individual parts must not be conducted outside the armoured hoses. The connecting box connects to the vehicle chassis. The vehicle chassis cleans from paint and rust prevented thoroughly. A minimum Ø3.5 mm even cutting or threading screw fitted with a tooth disc may be used.

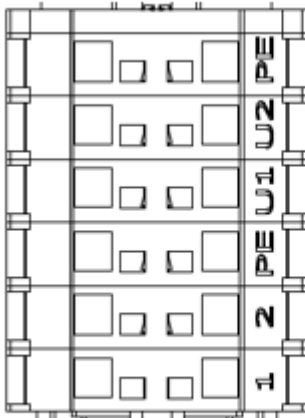
2 Thermostat

Operating thermostat can be set steplessly from 37°C to 85°C. The thermostat has a built-in hysteresis of 12 K, i.e. there is 12°C between the connecting and disconnecting. The operating temperature is set with a screwdriver at . The safety thermostat disconnects if the temperature exceeds 110°C. The thermostat can be reconnected by pressing the red button.

Note ! The setting and reconnection of thermostats must only be carried out with disconnected main Switch of the vehicle.

3 Level sensor for low water level of heating circuit.

Level sensor shall be used to block activation of heating elements when water level is low to prevent damage on the heating elements. (Not supplied by Stroco).



PE= Ground

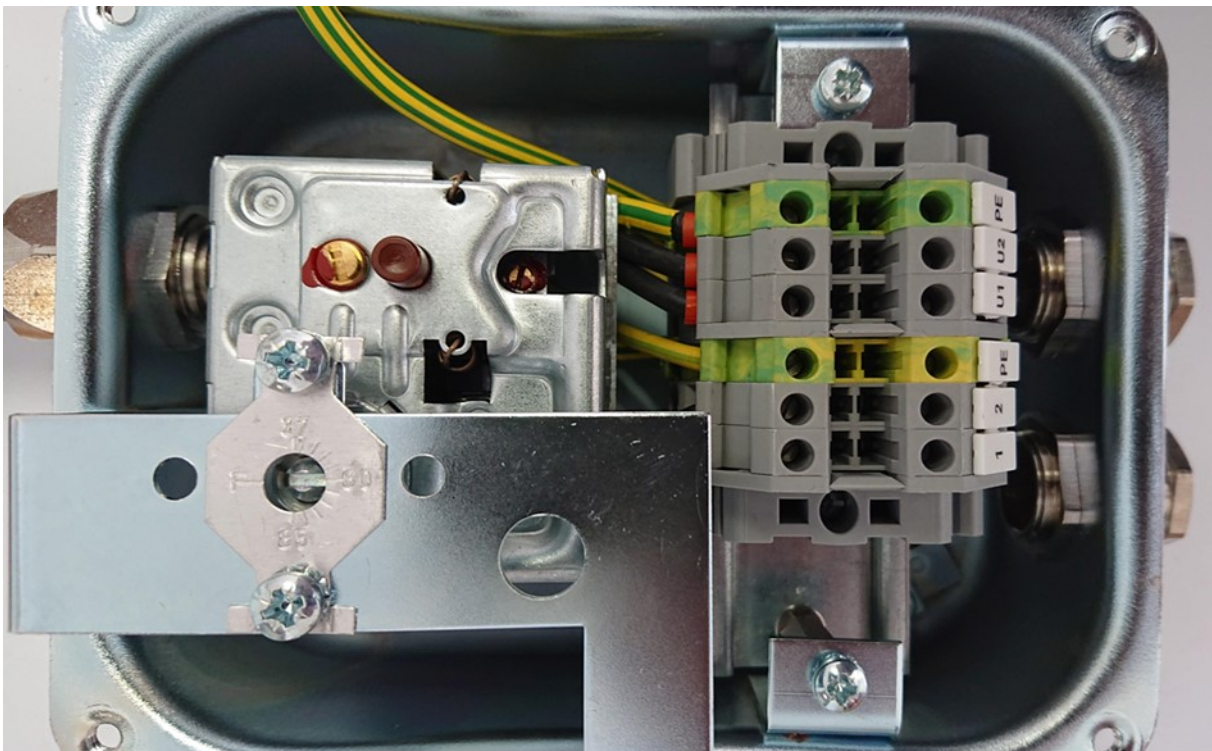
U2= HV + 672VDC from HVDC contactor (not supplied by Stroco).

U1= HV - 672VDC from HVDC contactor (not supplied by Stroco).

PE= Ground

2= Outgoing 24VDC to HVDC contactor (not supplied by Stroco).

1= incoming 24VDC from vehicle heating system or I/O module
when heat is demanded (not supplied by Stroco).



WARRANTY CONDITIONS

STROCO heaters and parts are covered by 24 months warranty. The warranty is valid from the date of installation, however, no more than 36 months from the date of delivery.

However, the warranty only applies if the guidelines are followed:

- The STROCO heater is properly mounted according to manual
- Warranty card correctly completed with serial number at www.stroco.dk

The warranty covers manufacturing defects and material defects.

THE WARRANTY LAPSE IF:

- Changes that have been made to the system or the system is NOT built in accordance with our instructions

During the warranty period, STROCO is obligated to repair units or parts that we determine to be defective. Repairs for complaints must be made in an authorized service workshop or at one of our partners' workshops.

Labour costs for any complaints on heaters or parts are not covered by STROCO:

If you observe defects in the system during the warranty period, the defective parts should be sent postage paid to STROCO with information about the defect and delivery date/heater no.

STROCO's assessment of the defect, and whether it is covered by the warranty, will always be final and binding for the customer.

STROCO will only accept warranty claims that have been approved beforehand. STROCO can only accept warranty claims if the owner/user can present written documentation to show that all service and safety instructions have been followed. All warranties will be void if the installation guide and other instructions in this manual have not been followed. The same applies if installation and maintenance has not been performed in a proper professional manner, or if unoriginal parts have been used for servicing or repairs.

Consequential losses:

STROCO assumes no liability for personal injury, damage to property, or operating losses resulting from failure of the unit, no matter the cause (including manufacturing defects).

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