

SERVICE INSTRUCTIONS

for fuel-burning heater type



STROCO 15.00 M

Applicable from heater no.

12V: 238

24V: 405

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

Technical approval no. SP 555 AD 06

EU directive 42/245:

EU technical approval no. E5 10R-03152

Heating directive E 2001/56:

EU technical approval no. R122 E5 00002

ISO certified

Developed with aid from the Danish Environmental Protection Agency



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.

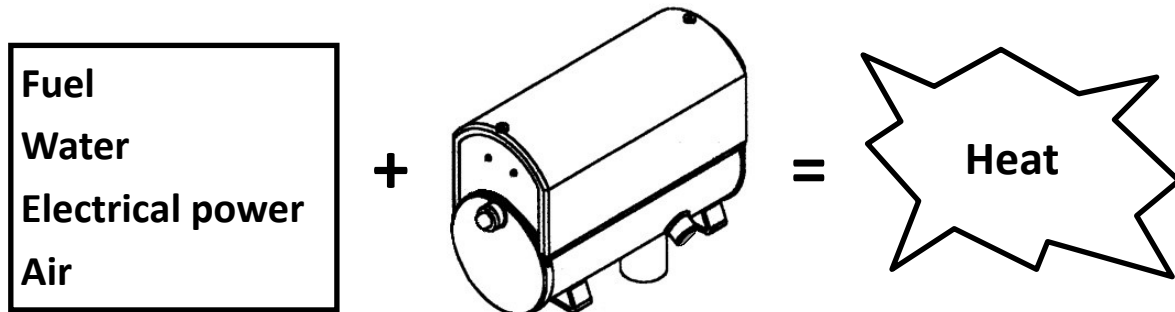
The heater must not be used where there is risk of ignition of flammable vapours and/or materials. Nor where there is risk of accumulation of toxic gasses, e.g. in closed spaces.

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

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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.

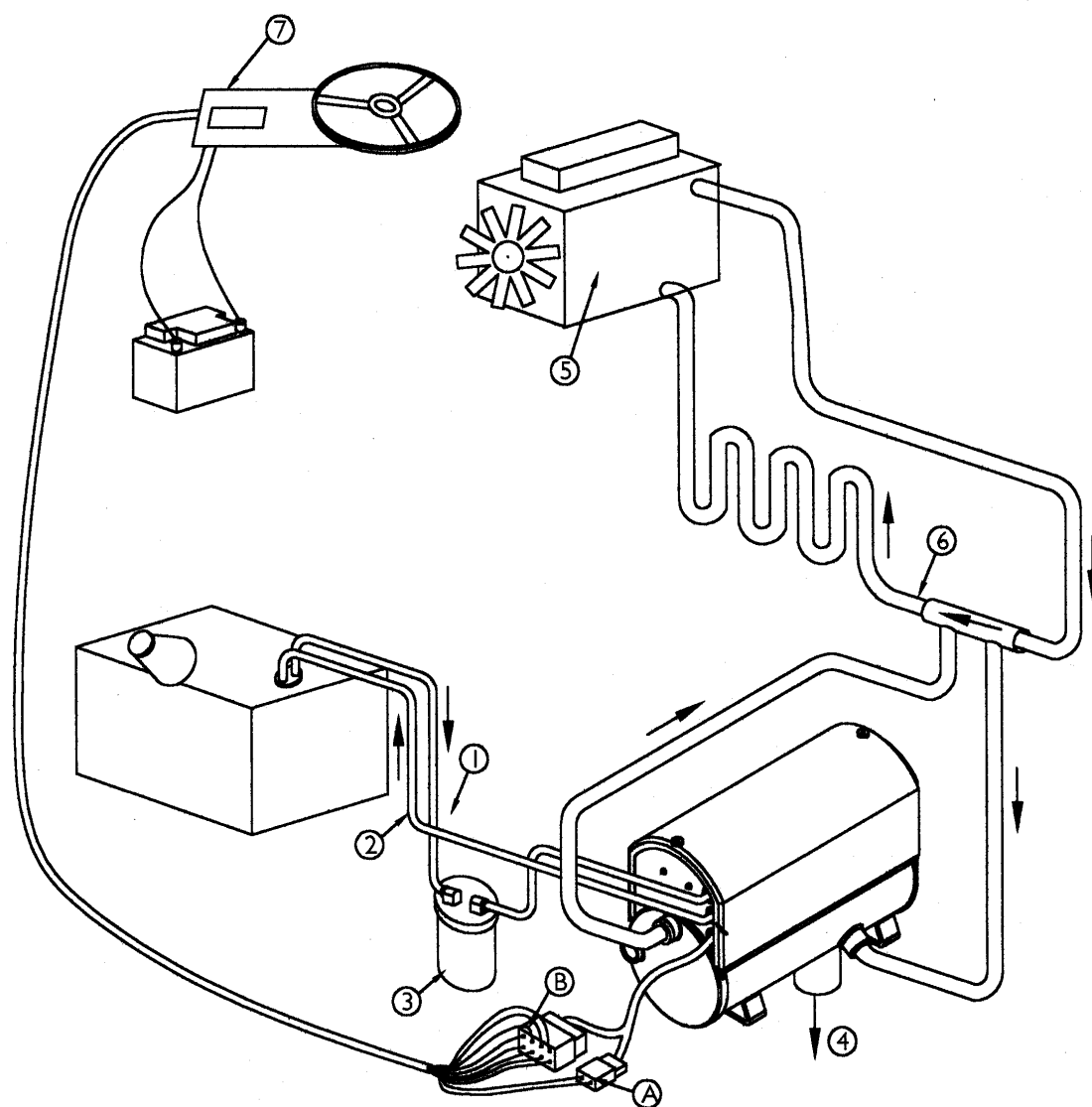
The heart of the heater is the combustion section. Fuel is pumped to here and vaporized by a nozzle. This fuel vapour ignites, establishing a flame (combustion). One of the factors that ensure correct combustion of the fuel vapour is regulation of air intake. The combustion process and other functionality 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.

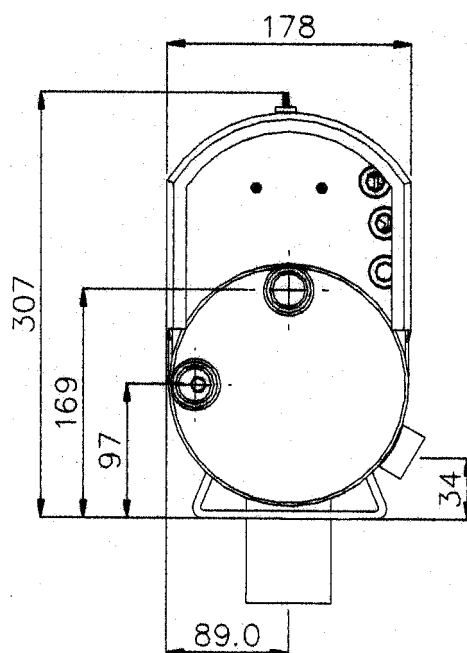
Precautionary measures are always better than repairs, and there are a number of *Maintenance Procedures* that should be undertaken regularly to ensure the continued working order of the heater. Please consult the maintenance section. Section 1 in the manual deals with the installation of the heater,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

Schematic diagram of fuel-burning heater

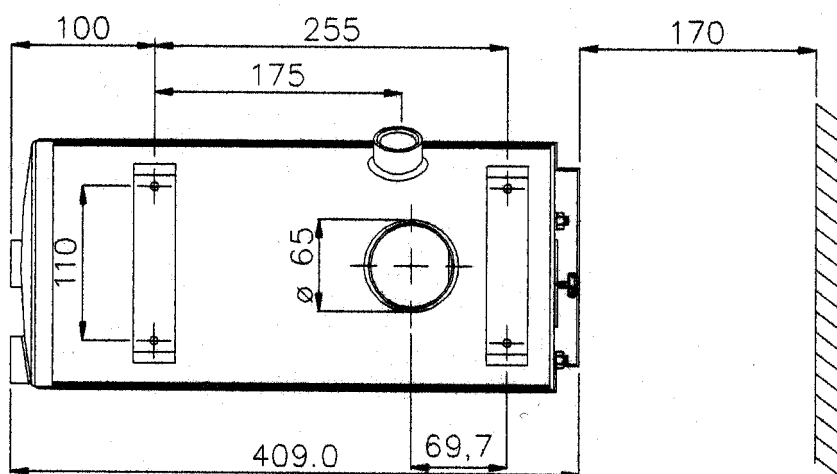


1: Supply, diesel fuel, 2: Return, diesel fuel, 3: Filter, 4: Exhaust, 5: Engine, 6: Heating system, 7: Control panel

BUILT-IN DIMENSIONS



All measurements +/- 2 mm.



INSTALLATION GUIDE/INSTALLATION PLAN

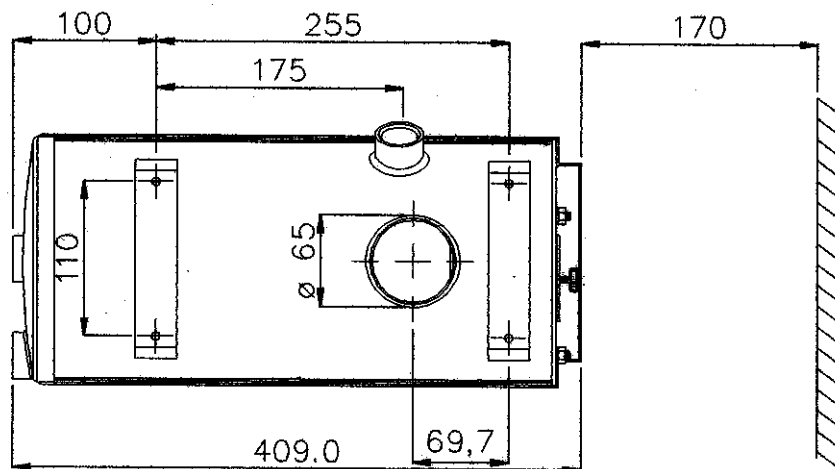
In general: Installation must be performed in accordance with the ECE regulation R122 standard.

These instructions apply to STROCO fuel-burning heater, type 15.00 M.

- **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.
- **Non-insulated exhaust pipes/hoses must have at least 7.5 cm to flammable material.**
- **Fuel hoses placed on the outside of the vehicle must be screened to prevent any damage. Electric cables may not be placed next to fuel hoses.**
- **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 impede 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.**
- **Electrical installations for the heater must comply with SEN 3607111 "Electric installations for motor vehicles" or similar.**
- **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 75 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.**
- **Place the orifice of the exhaust pipe so that the combustion is not materially affected by airflows around the vehicle to prevent heating damage on adjacent vehicle components, and to prevent ignition of grass, etc.**
- **The exhaust pipe must be designed to work with local exhaust ventilation, although not directly connected, as this can affect combustion.**

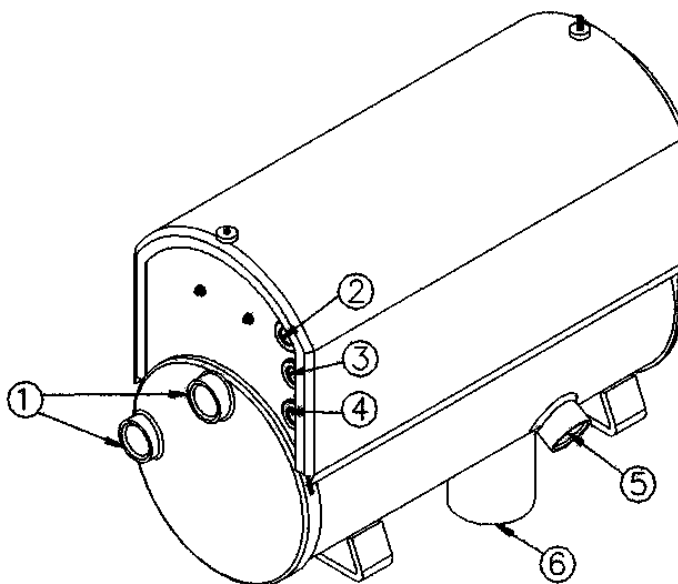
INSTALLATION GUIDE/INSTALLATION PLAN

- The vehicle must have safety measures to ensure that no exhaust ends up in rooms where there are people.
- The exhaust pipe should be max. 4000 mm in length and should be 65 mm in diameter.
- If the heater is mounted in driver, passenger or storage room, this part of the fuel line must be made from solid-drawn pipe steel. Connection to the fuel supply of the vehicle must be established outside these rooms.
- If the heater is mounted in driver or passenger rooms, the air inlet must be led to fresh air.
- The exhaust pipe should be made from a material that resists heat and corrosion (AISI 304 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 hoses.

Water/fuel connection



Pos 1: Exit for supply water:
3/4" thread

Pos 2: Inlet for fuel supply (to the fuel pump of the heater from the fuel tank):
Connection of fuel hose with 1/4 x 1/4 mm nipple.

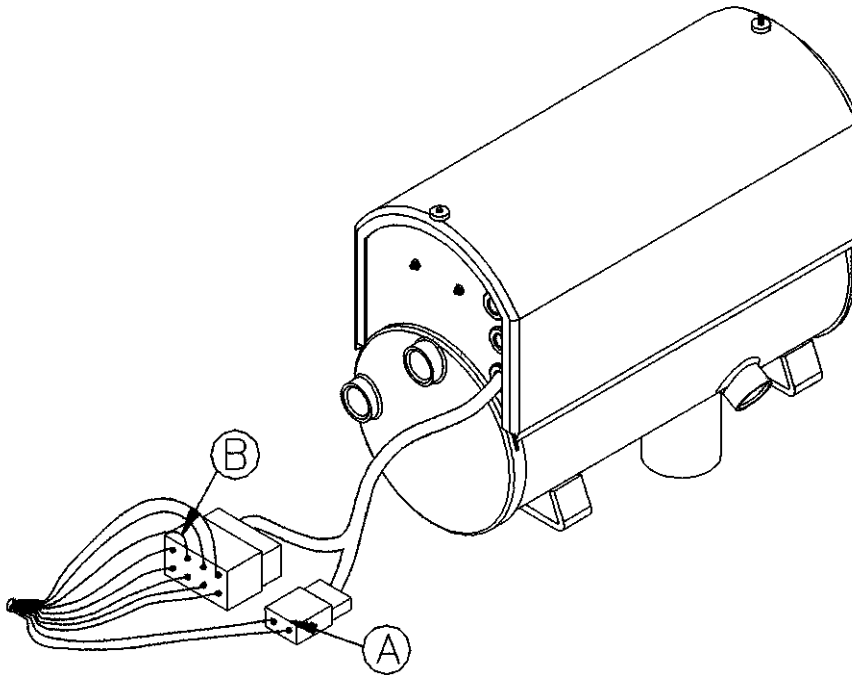
Pos 3: Exit for return fuel (to fuel tank):
Fuel hose with 1/4 x 1/4 nipple.

Pos 4: Electric connecteion, 8- and 2-pin connectors.

Pos 5: Inlet for return water:
3/4" thread.

Pos 6: Exhaust:
External dimensions Ø65 mm.

ELECTRICAL CONNECTIONS



The heater is available in two versions that can be used only for either 24V DC or 12V DC. The external connections are gathered in 8-pin connectors A and B. The internal connectors of the heater appears on a separate diagram, see page 32. Connect connectors as follows:

Connector A: Connected to the circulation pump.

Pin B1: Connected to the diagnostic lamp. The other end of the diagnostic lamp is connected to + (positive) contact. The diagnostic lamp must be a LED.

Pin B2: Connect to - for a low temperature.

Pin B3: Connect through a 10A (at 24V) and 8A (at 12V) fuse to + (positive).

Pin B5: Connect to the room fan relay.

Pin B7: Connect to the main switch or timer. Connect the other end of the switch through an 8A fuse to + (positive).

Pin B8: Connect to frame (negative).

NOTE: The Heater can be set to adjust the temperature within two ranges (see page 8-9: high/low temperature). Select the low range by connecting wire B2 to frame point M. Select the *NORMAL* range by *NOT* connecting B2.

TECHNICAL SPECIFICATIONS

Technical data:

STROCO Fuel-burning heater type 15.00 M:	Fuel-burning heater unit with integrated automatic controls and alarm functions.
Dimensions L x W x H:	409 x 178 x 307 mm
Weight:	17.5 kg
Connections:	The fuel-burning heater is connected to the electrical installation, fuel tank and water/heating system of the vehicle.
Supply voltage:	24 or 12V DC
Fuel:	Diesel EN 590
Fuel consumption:	approx. 1.25 kg/h
Fuel filter:	Filter area: 1937 cm² Filter degree: 0.02 mm Connection: 1/4"RG
Heating effect:	Output approx. 13 kW
Power consumption:	approx. 5A at 24V DC (incl. circulation pump) 9A at 12V DC (incl. circulation pump)
Combustion data:	CO₂: approx. 10%, Soot figure: 0-1 Bacharach
Circulation pump:	approx. 22.5 l/min.
Fuel pump:	Operating pressure: 8 bar (kg/cm²)
Nozzle:	1.46 kg/h (0.40 Usgal/h 80°S)
Photo unit:	Type LDR
Over boiling protection:	Type Therm-o-disce Breaking temperature 110°C
Control thermostat:	NTC 10 K sensor. Boiler temperature: High: making/breaking approx. 73/80°C Low: making/breaking approx. 55/60°C Cab ventilation: 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).

TECHNICAL SPECIFICATIONS

Pre-ventilation period:	At first start approx. 60 sec. At restart approx. 10 sec.
Post-ventilation period:	approx. 120 sec.
Under voltage:	At 24V system: Connection or disconnection approx. 20.5/22 VDC At 12V system: Connection or disconnection approx. 10.5/11.5 VDC
Over voltage:	At 24V system: Connection or disconnection approx. 30/29.5 VDC At 12V system: Connection or disconnection approx. 15/14.5 VDC
Safety time:	Max. 15 sec.
Contact load:	Max. 10 Amp (cabin fan pin B5)
Electrical connection:	15 pin AMP connector (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. This is referred to as the low range in this text.

Please note: Connect cable B2 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 B2 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.

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.
Electrodes, nozzle, and turbolator should be clean and undamaged.
Replacement of the nozzle and subsequent check that the nozzle is centred in the turbolator.
Checking of electrode setting as per page 24.
Improper combustion can lead to boiler or combustion pipe being blackened by soot.
The nozzle service life is limited. Do not attempt to clean or repair the nozzle, but replace it with a new one.
Inspection of the photoelectric sensor for cracks; cleaning if necessary.
Inspection of the coupling between fan motor 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!

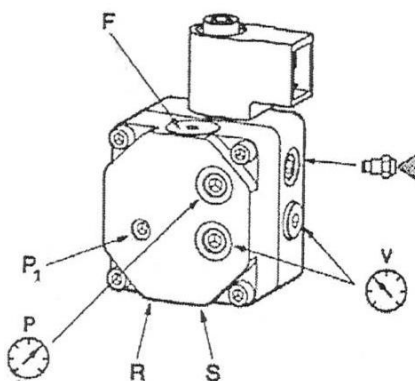
- When using biofuel, the fuel pump must be replaced every 2 years.
- Fuel hoses must be replaced every 2 years regardless of fuel type. Fuel hoses must be replaced with original STROCO fuel hoses, or approved hoses that meet the same minimum specifications.
- It is important that hoses, seals etc. be 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 in the heating system.
The pump is running continuously while the main switch/start clock is connected and the oil burner system is running.
The pump is connected to connector A.

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.

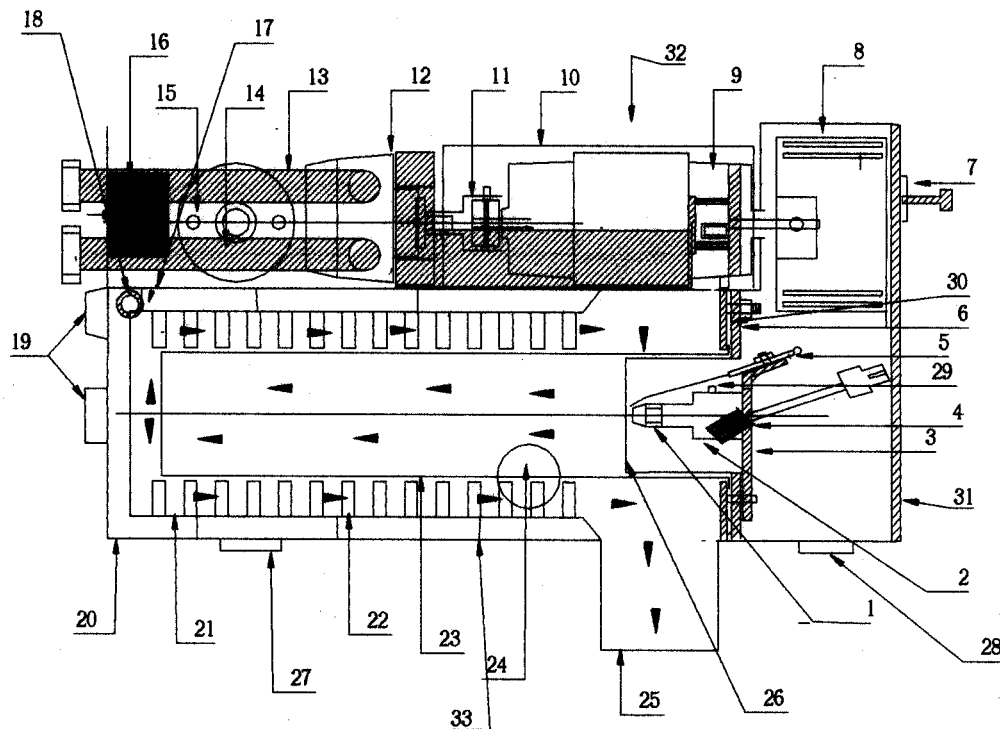
If the flame goes out during operation, the safety relay switches on the ignition to attempt a restart. If the fuel does not ignite, the safety relay disconnects, the fuel supply stops, and the alarm is activated. If the fuel does ignite successfully, the combustion process continues until the control 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 approx. 21V/11.8V 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 | Nozzle | 18 | Operation thermostat |
| 2 | Nozzle retainer | 19 | Exit water 3/4"RG |
| 3 | Nozzle retainer plate | 20 | Outer boiler |
| 4 | Photo | 21 | Inner boiler |
| 5 | Igniters | 22 | Copper pins |
| 6 | Flange | 23 | Burner pipes |
| 7 | Air shutter | 24 | Entry water 3/4"RG |
| 8 | Fan Wheel | 25 | Chimney |
| 9 | Fan motor | 26 | Burner |
| 10 | Automatic controls | 27 | Foot |
| 11 | Coupling | 28 | Foot |
| 12 | Fuel pump | 29 | Oli pipes |
| 13 | Fuel hose | 30 | Gasket |
| 14 | Fuel hose | 31 | End cover |
| 15 | Ignition coil | 32 | Plastic cover ABS |
| 16 | Ignition oscillator | 33 | Spiral |
| 17 | Over boiling protection | | |

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 B pin 3, 4, and 7 (see page 32).
- 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 A13? (see page 32)

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).

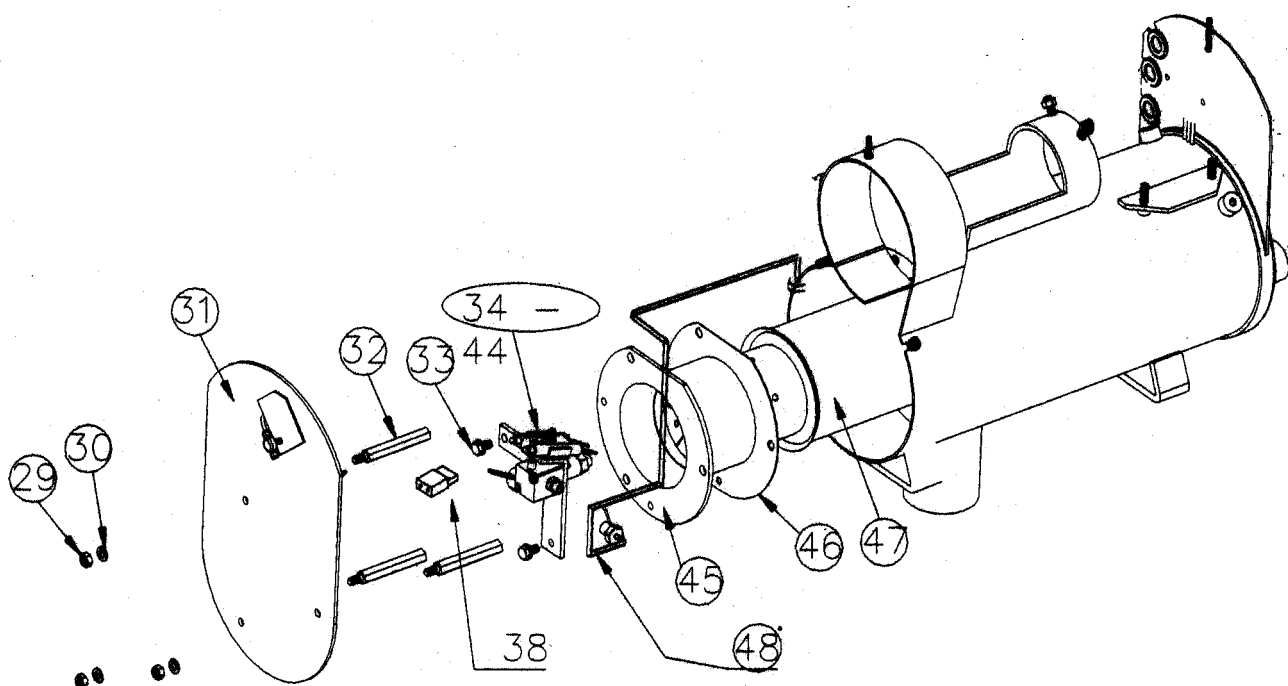
Servicing and repairs may only be performed by qualified personnel. Unauthorised tampering presents a serious safety hazard. The warranty may be void if repairs are attempted by unauthorised persons.

DISMOUNTING BURNER AND COMBUSTION CHAMBER

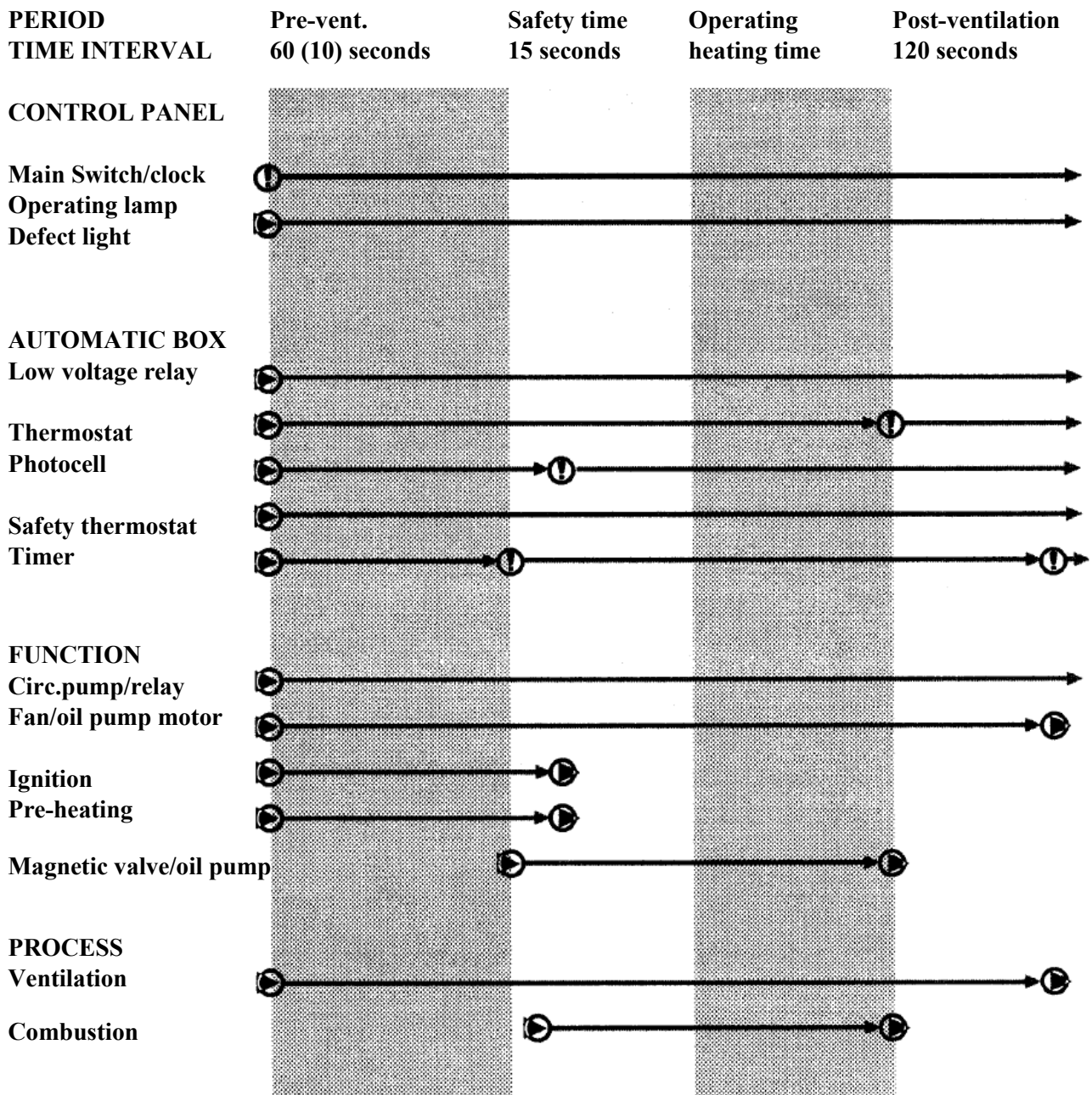
Access to the burner and combustion chamber is obtained by dismounting the end cover (pos. 31) at the three 6 mm nuts (pos. 29) and the three 6 mm stay bolts (pos. 32).

Dismount the oil pipe (pos. 48) and the connectors (pos. 38).

Remove the burner (pos. 34), and the combustion chamber (pos. 47) is free.



PROCESS CONTROL DIAGRAM



*Note: When starting first time the pre-ventilation time is 60 seconds.
When starting during the operating period the pre-ventilation time is 10 seconds*

①: Signal for either connection or disconnection

②: Connection

③: Disconnection

Please note: THE HEATER MUST NOT BE USED IN GARAGES, SERVICE STATIONS, OR OTHER LOCATIONS WHEREVER 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 24.
- 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 CONTROL OF ELECTRODES

Carried out when checking the ignition coil and ignition oscillator.

During ignition control, the solenoid coil connector must be disconnected.

Access to the burner unit is obtained by removing the end flange of the burner, unscrewing the three 6 mm nuts, and removing the burner.

Remove and cover the photocell to prevent it from being exposed to light.

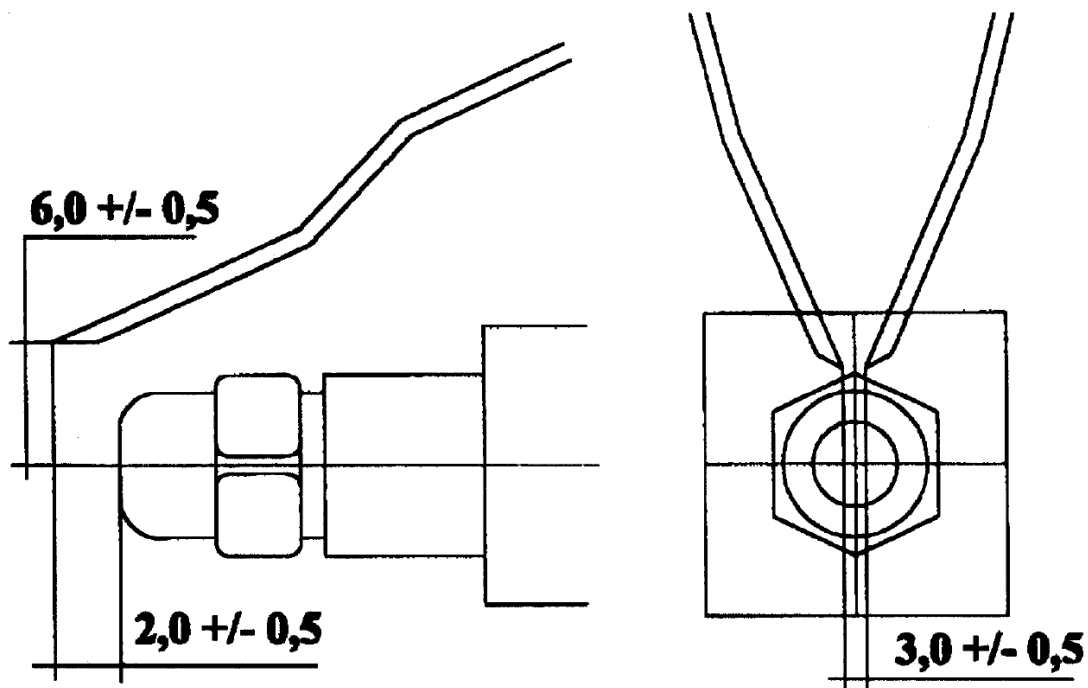
Start the burner. Voltage discharges at the electrodes can now be observed. The automatic controls provide power to the ignition oscillator and ignition coil of the ignition system via connector A, pin 2 (see page 32).

The ignition coil and oscillator are mutually connected and do not work separately.

The ignition oscillator picks the minus of the operating current apart, and these pulses are then transformed by the ignition coil to high voltage, discharged as a spark between the igniters.

If no charge occurs, the causes may be:

1. Defective ignition cable.
2. Electrode settings.
3. Dirt on the electrodes.
4. Defective ceramic coating on the electrode unit.
5. Ignition coil, oscillator, automatic controls.



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 32).

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 32).

UNDER/OVERVOLTAGE

Undervoltage

If the voltage is below 22/11.5V (in step 0) and below 20.5/10.5V during pre-ventilation, operating and post-ventilation, the undervoltage alarm will be activated. The alarm can be reset only with the off switch and a voltage exceeding 22/11.5V.

Overvoltage

If the voltage exceeds 29.5/15V, the alarm will be activated, and the alarm will be reset below 29/14.5V.

Setting the air volume

The air volume for the combustion is regulated by turning pos. 21 (see page 27) + and - . The air setting influences the complete combustion of the fuel, i.e. too little air (soots up, black smoke) or excessive air (blue smoke).

The correct setting is measured from the smoke:

The CO₂ (carbon dioxide) content of the smoke must be 10-11%, and the soot figure close to 0-1 Bacharach.

Fuel pre-heater

The preheater is mounted on the nozzle retainer, which it heats.

The preheater operates when the heater is started, but is disconnected during operating.

The preheater is to ensure that a flame is established during cold starts.

The automatic system controls the pre-heater, which is powered through connector F, approx. 3 Amp (see page 32).

Fuel pump

The fuel pump is mounted on the motor engine bracket with two 6 mm tailstock screws.

The pump is mounted in a two-wire system where ventilation occurs automatically through the return line.

The solenoid valve of the pump is activated by the automatic controls through connector L (see page 32).

The operating pressure of the pump must be 8 bars (kg/cm²). The pressure can be set on screw P (see page 16).

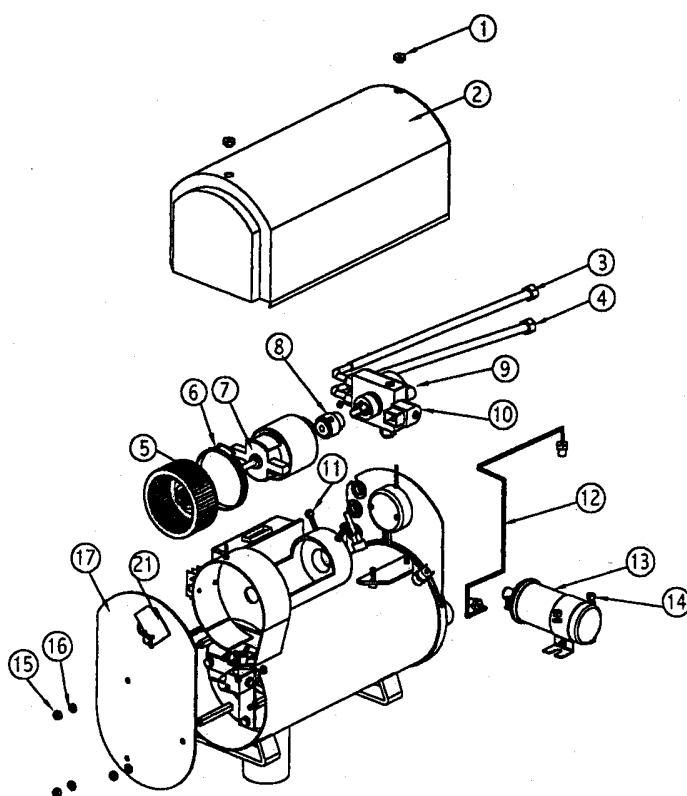
The pump is running when the fan motor is running, but fuel is not released for atomisation in the nozzle until the solenoid valve is activated.

It is important that the suction line of the pump is completely tight, and that a fuel filter (Stroco type 2000) has been mounted in the suction line.

REPLACING THE FAN MOTOR

The fan motor is replaced according to the chart below referring to the position numbers on the illustration.

Sequence	Action
1	Turn off the power and check that the heater is dead before any replacement work is commenced
2	Loosen knurled screws pos. 1 and remove casing pos. 2
3	Loosen nut pos. 15
4	Remove nuts and washers pos. 15 and 16
5	Remove end casing pos. 17
6	Remove ignition coil pos. 13 by removing nuts pos. 14
7	Removes pressure pipe pos. 12
8	Removes hoses pos. 3 and 4 and wire for solenoid valve pos. 10 on fuel pump pos. 9
9	Loosen screws pos. 11 and remove the fuel pump
10	Remove fan wheel pos. 5
11	Loosen tensioning band pos. 6 and remove fan motor pos. 7
12	Mounted in the opposite sequence



Setting the air volume

Adjust the air volume for combustion by loosening and turning air valve no. 21 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 technical specifications.

CHECKING THE 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 (12V system):

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 21).

If the voltage is correct in plug L, pin 2 (see page 32), 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 32).

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. 50/70°C

Please note: This temperature range can be selected by connecting cable B2 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 B2 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 32) 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.

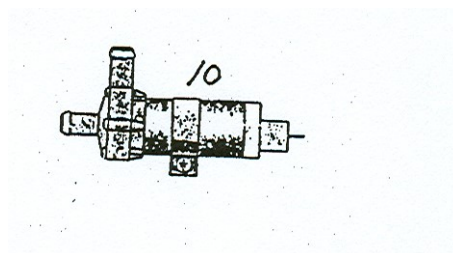
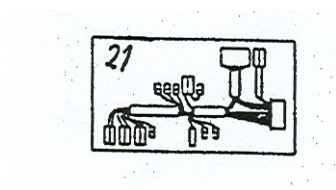
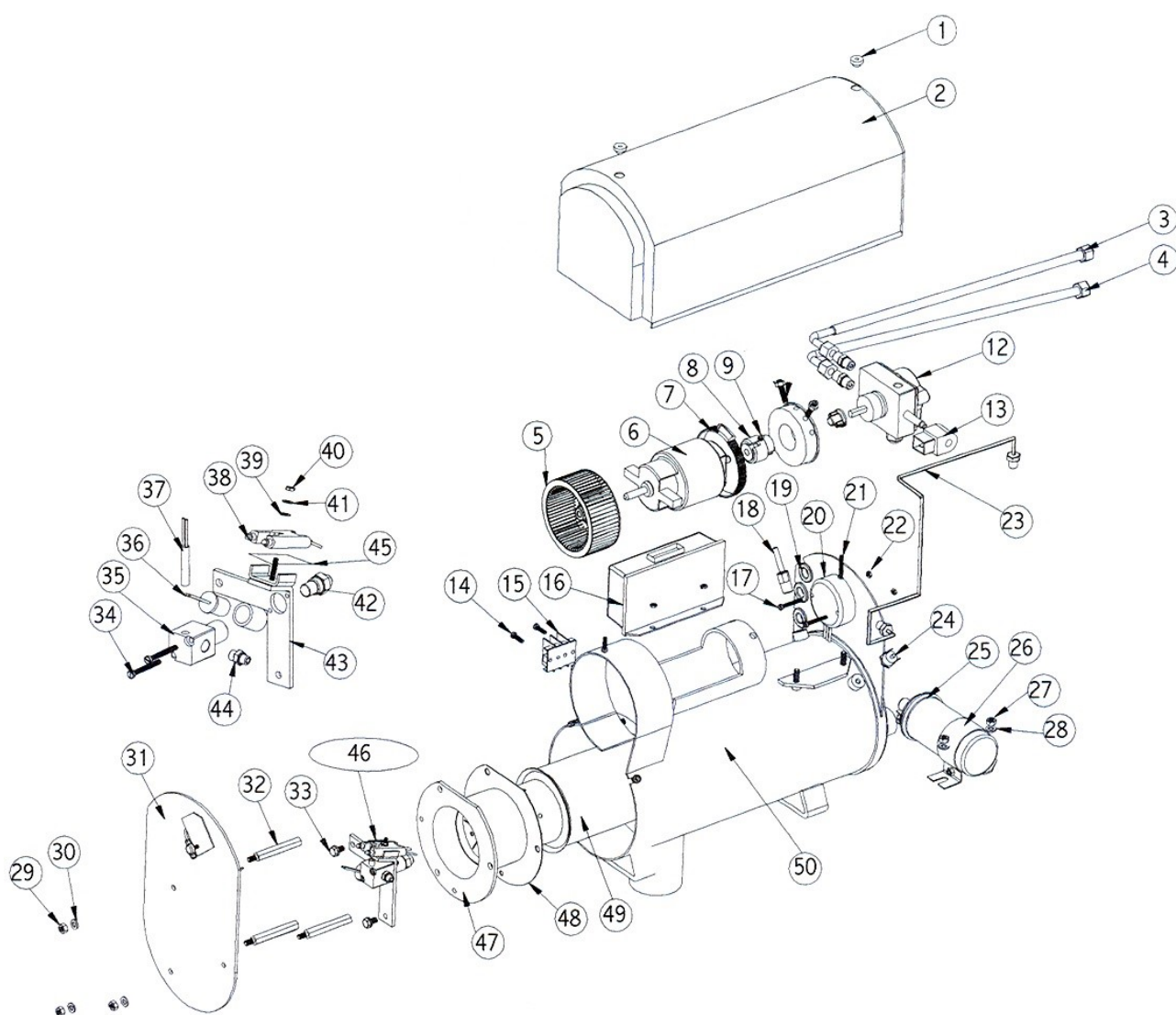
It is a good idea to investigate the reason for the cut-out before and after re-activation.

- 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?

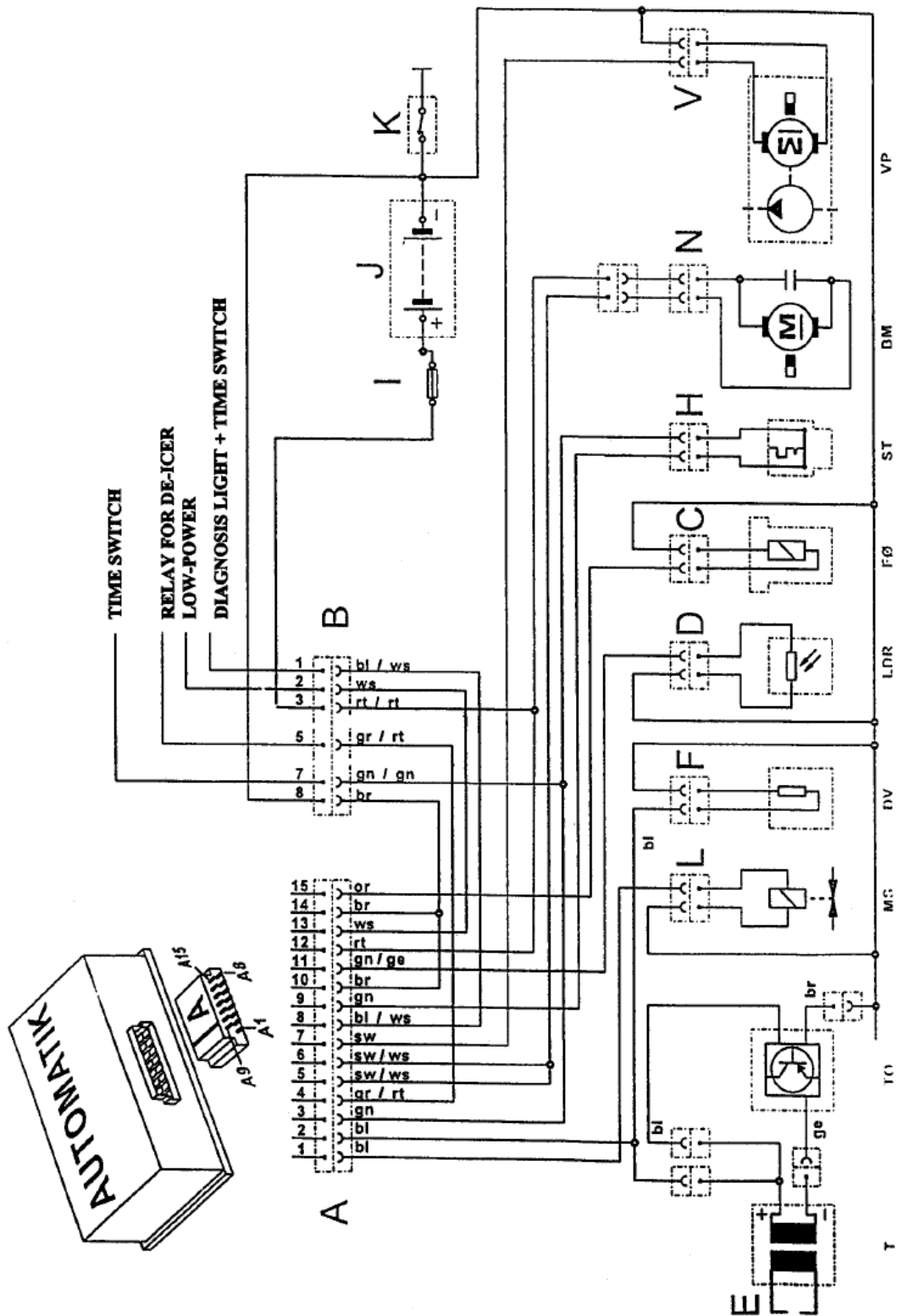
ASSEMBLY DRAWING - PARTS LIST

Pos.	Description	Part number
1	Nut for plastic cover	35.035
2	Plastic cover	15.034
3	Fuel hose 500 mm with 90° angle, biodiesel	35.178
4	Fuel hose 500 mm with 90° angle, biodiesel	35.178
5	Fan wheel	15.270
6	Fan motor 24/12V	15.340/15.342
7	Clip	15.017
8	Coupling, complete	35.360
9	Pointed screw	15.002
10	Circulation pump 24/12V	11.700/11.702
12+13	Fuel pump, complete 24/12V	31.370-2/31.371
13	Solenoid valve 24/12V	31.376/31.373
14	Screw 4x16	15.003
15	Earth connector	31.380
16	Automatic system 24/12V	35.520-1/35.522-1
16	Automatic system with 20 deg. hysteresis 24/12V	35.525-1/35.524-1
17	Screw 4x25	15.005
18	Temperature sensor	15.010
19	Rubber lead-in	15.006
20	Ignition oscillator	15.510
21	Cable harness	15.570
22	Nut 4 mm	15.007
23	Oil pressure pipe, complete	15.250
24	Overboiling device	35.030
25	Ignition coil 12V (24V-fyr)	30.490
26	Holder ignition coil	15.008
27	Nut 6 mm	15.009
28	Washer 6 mm	15.011
29	Top nut	15.012
30	Washer 6 mm	15.013
31	End cover	15.014
32	Stay bolt	15.015
33	Bolt 6 x 10 mm	15.018
34	Screw 35 x 4 mm	15.120
35	Nozzle retainer	35.130
36	Photocell LDR	31.160
37	Preheater element 24/12V	15.142/15.143
38	Electrodes	15.100
39	Flexible washer	30.110
40	Nut 4 mm	15.007
41	Washer 4 mm	30.111
42	Nozzle	15.071
43	Electrode fitting	15.090
44	Nipple	30.210
45	Electrode rubber	30.112
46	Nozzle retainer, complete	15.121
47	Combustion unit	15.041
48	Gasket	15.028
49	Combustion pipe	15.040
50	Boiler	15.540

ASSEMBLY DRAWING - PARTS LIST



ELECTRICAL DIAGRAM



Key to abbreviations		Colour codes	
A	Connectors for automatic system	bl	blue
B	Automatic system: Elektron. Control unit	br	brown
BM	Main connector	ge	yellow
C	Fan motor	gn	green
D	Connector for operating thermostat	gr	grey
E	Connector for photocell	or	orange
F	Igniters	rt	red
H	Connector for nozzle preheater	sw	black
L	Connector for overboiling device	ws	white
LDR	Connector for solenoid valve	vl	violet
ST	photocell		
N	Overboiling device		
FØ	Connector for fan motor		
RVP	Sensor for operating thermostat		
T	Relay for circulation pump		
TO	Ignition coil		
V	Ignition oscillator		
VP	Connector for circulation pump		
DV	Circulation pump		
MS	Nozzle preheater		
I	Solenoid valve		
J	Fuse 8A		
K	Accumulator		
	Main switch		

INSTALLATION IN BOATS

Fuel lines, fuel filter, melt-fuse valves, etc.

Fuel lines must be made of either steel or copper, be permanently laid up and protected from mechanical loads. Soft soldering is not allowed for any pipe joints.

A fuse-melt valve must be inserted in the fuel line as close to the combustion chamber of the device as possible to disconnect the fuel flow if the outside temperature exceeds 80°C. If the return line is connected to the tank in a manner that allows the tank to be drained through it, it must also be equipped with a fuse-melt valve. A short, approved (type approved by the directorate) hose may be used in the pipe between the fuse-melt valve and heater. If the filter is located in the same room as the heater, it must be located between the fuse-melt valve and heater. The suction line must be connected to the top of the tank if the volume exceeds 10 l.

Expansion vessels in general

Every central heating system must be equipped with one or more expansion vessels, the total value of which is sufficient to take up the thermal expansion of the water during normal operating conditions.

Open expansion vessels

Open expansion vessels must be made from sheet steel. Vessels must be fixed and equipped with terminating pipes with an aperture of least 25 mm.

Expansion vessels with diaphragms

These are systems intended for a maximum heat output of no more than 50 Mcal/h and a resulting boiler pressure below 5.5 bar and with expansion vessels with a static pressure height below 15m VS.

Electrical system

It must be possible to disconnect the heater outside the room in which it is located. This does not, however, apply to hot water circulation pumps.

All cables must be permanently fixed.

The electrical system must be implemented as a two-conductor system, i.e. where + on the heater must be returned to the battery -.

For other specifications, see the section on electrical connections and the section Technical specifications.

Air inlet

If the heater is to be used at the same time as the boat engine, the heater must be equipped with a separate air inlet. The requirement applies only, however, if the engine performance exceeds 450 HK. A ventilation hose may be used with a diameter of at least Ø70 mm and a length of maximum 4m.

The sections below concern conditions to be given special consideration in connection with installation in boats.

General information

In boats, the heater must be located as low as possible, and the exhaust must be outside. In all types of installation, the supplied circulation pump must be installed in the return line (cold). In the example below, the radiators have been located in a two-wire system, but one-wire systems can, of course, also be used just as both free expansion and pressure expansion may be used.

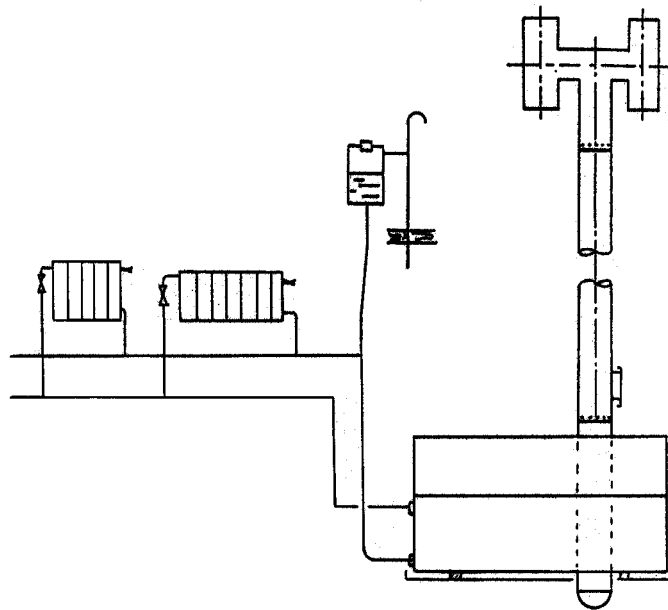


Fig. 1 shows a basic plan for a two-wire system.

INSTALLATION IN BOATS

Rooms in which fuel-burner heater are installed must be equipped with ventilation in addition to the air required for combustion. All ventilation pipes from the heater must be led separately to a free deck, and the outlet must be kept free of superstructures, ect. The upper part of pipe must be able to take up heat expansion. The inner cross section of the pipe must always exceed the connection branch of the unit, Ø65 mm, and the pipe must be equipped with cleanout doors to enable complete cleaning. The maximum length of the exhaust pipe is 4 meter. Ventilation pipes must be made from stainless steel pipes or stainless steel hoses approved for a minimum temperature of 600°C. All joints must be ensured by pipe clamps, clips or the like..

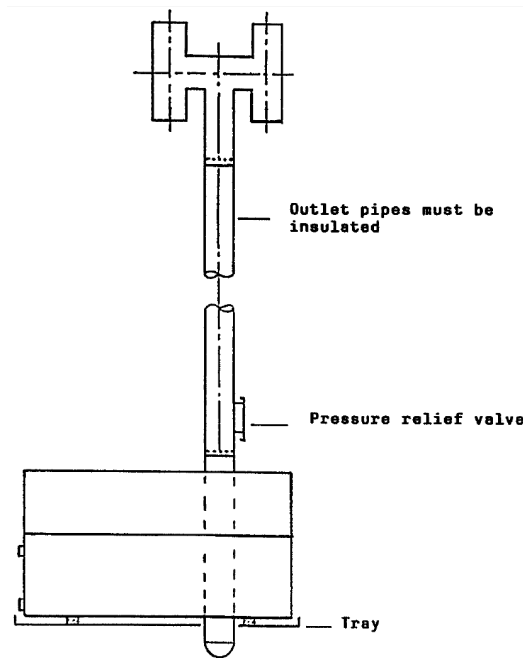


Fig. 2 shows a basic plan for the installation of ventilation pipes.

If there is combustible material within a distance of 7.5 cm from the unit or ventilation pipe, it must be shielded with incombustible material.

In boiler rooms, the unit must be placed in an fuel-proof tray with an edge of at least 50mm. The tray must have a discharge pipe with at least the same inner diameter as the delivery pipe, never below 15mm. The pipe must be led to a drain tank (vessel).

Systems with water circulation must have frost protection in periods where temperatures below 0°C can be expected.

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.

Nozzles and wear parts are not covered by the warranty.

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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