

A heater kit contains:

- Heater, mounting bracket
- Fuel hose (3 meters), pump, a fuel tank connection to a standard tank (30 litres)
- Power supply cable (4 meters), control panel cable (10 meters)
- Mounting screws, clamps
- Accessories indicated on the package: Control panel or GENIUS control panel, temperature sensor for the thermostat, exhaust outlet through the hull.

PLACING THE HEATER

Place the heater so that at least a part of the air to be warmed can be taken outside. This will allow good ventilation and drying effect.

When choosing a place for the heater remember that warm air hoses placed outside the heated space will lose plenty of heat. Minimize their length and isolate them carefully. It is more economic to place the heater close to the space to be heated and use a separate fresh air inlet. You don't have to isolate the warm air hoses inside (f. ex. under the bed); the hoses function as "radiators" for they dry the space and balance the temperature differences.

Remember also that as the heater blows warm air inside, an equivalent amount of air must be let out f. ex. through a ventilator or return to the heater as circulating air.

Maintenance is usually easiest to perform when the heater is removed from its bracket. If the heater is examined on its place, place the heater so that the led indicators near the fresh air inlet and the control display are in sight.

Place the heater so that the heater is above the tank's fuel level. The heater will however not be damaged if the filler hole of the tank and thereby the fuel level temporarily rises above the heater.

The fuel hose can be lengthened between the pump and the tank.

INSTALLATION

Mounting bracket

Screw the heater's mounting bracket to its place so that the heater is set in a horizontal position.

Pump and fuel hose

Attach the fuel pump in an upright position close to the fuel tank but above the fuel level, the suction downwards. Max high between tank and heater 2m. If you need to pass the fuel hose and the pump's power supply cable through narrow gaps, disconnect the hose connector above the pump and unplug the power supply cable from the pump's connection terminal (the polarity is insignificant). Attach the fuel hose carefully so that it won't vibrate or rub against anything. Don't attach the pump too tight; this may cause disturbing noise.

Fuel tank connection

The fuel is conducted with a suction hose either from a separate tank (15, 22 or 30 litres) using a suitable tank connection, or from a diesel tank by using a tank connection kit. Install a shut-off to the tank connection if the fuel level in the tank or in the fuel hose can rise above the pump. Attach the fuel hoses carefully and protect them from heat or mechanical strain.

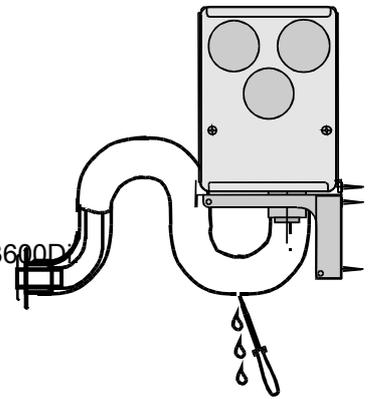
Exhaust outlet

Exhaust is led out and combustion air taken in through hull with a coaxial exhaust outlet.

For installing the outlet you need to make one \varnothing 50 mm hole and four 5,5 mm holes (use the outlet end as a model). Cut the inner pipe a bit too long, so that it can't slip from its place. Bend the exhaust outlet hose as shown in the picture and make a little hole on the **outer** hose, on the lowest part.

This way the condensation water can trip away.

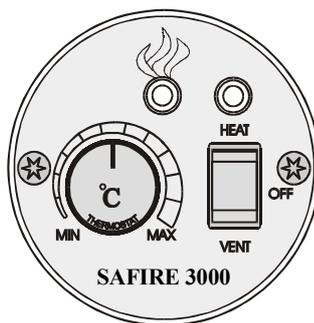
Max. length of exhaust tube is 2m for 2400Di, 2600Di and 3200Di and 1,5m for 3600Di.



Thermostat

Place the thermostat's sensor to a place where it can measure the temperature in the room in the best way. If you are using a GENIUS control panel, you can connect two thermostats to the heater; one to be used during the night in the sleeping cabin and one for the daytime to be used in the front cabin.

Control panels



Place the control panel so that the display is easy to see and use, and that there's no danger of starting the heater by accident. The basic control panel can be either surface or flush mounted. The GENIUS control panel is designed to surface mounting only. Attach the control panel to the heater with an included cable.

Electric wiring

See the wiring diagram below.

The heater's **power supply cables** should be connected straight to the battery (red +, blue -). If you need longer cables, you should change also the original cables to thicker ones so that the area of the wires (mm²) corresponds their length (m); f. ex. 6 meter long wires should be entirely at least 6 mm² thick.

NB! The housing of the heater is galvanic connected to the minus-pole of the battery.

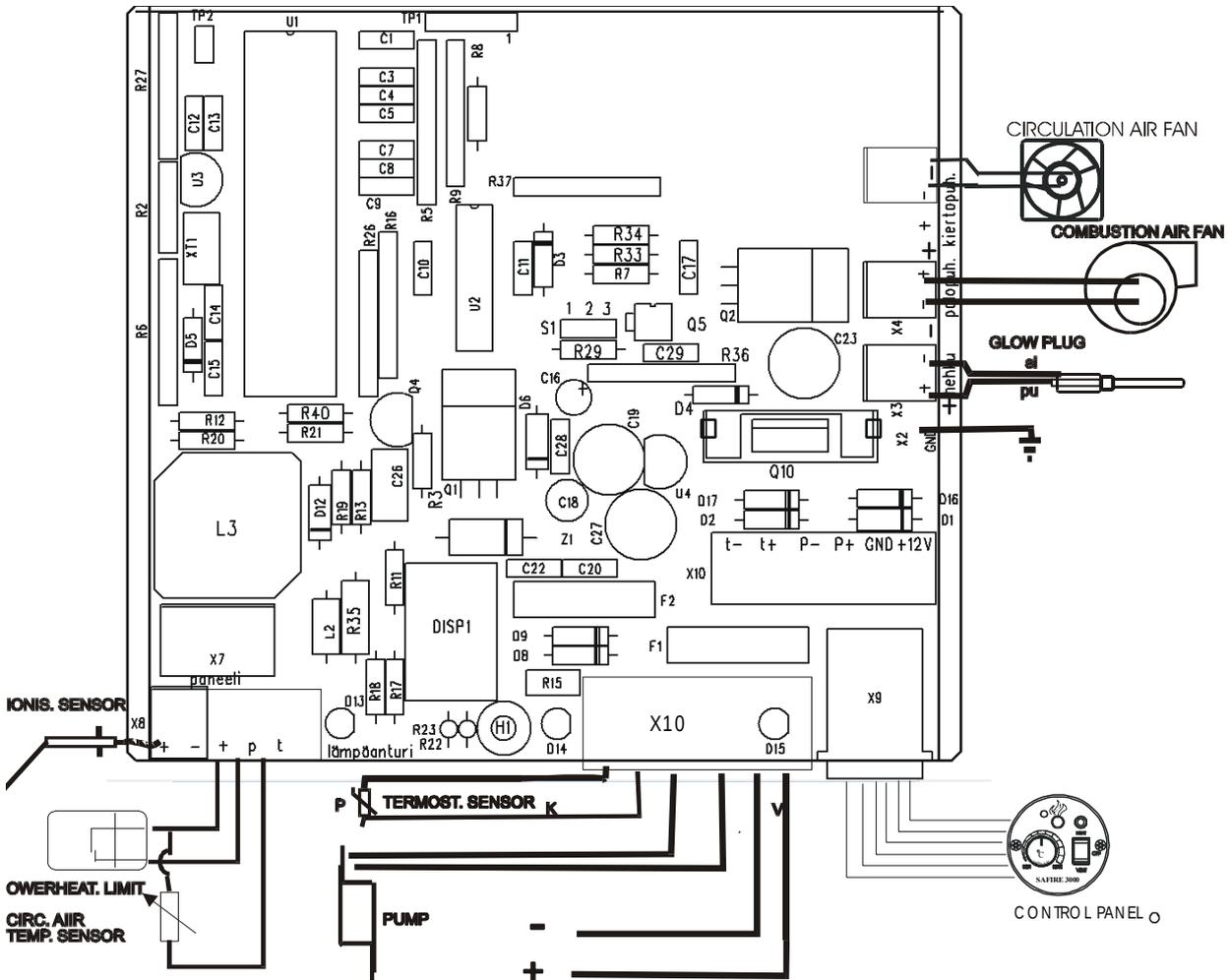
You can connect a separate main switch to the heater and a 20A time delay fuse near the battery (there is a 20A main time delay fuse F1 on the circuit board).

Be careful not to connect the wires wrong. This would melt the 7,5A fuse F2, which protects the electronics. Connect the thermostat's sensor to the connector X10.

The system detects automatically the installed thermostat and changes the Power control on the control panel to Temperature control.

Connect the pump's power supply cables to the connector X10.

Fix the cables so that water does not get into the heater among them.



USAGE

BEFORE USING THE HEATER

Before using the heater make sure that

- the tank and the fuel hose are properly installed
- the heater is properly attached to the mounting bracket
- the combustion air, circulation air and exhaust can flow freely
- there aren't any foreign objects inside or near the heater or in its exhaust outlet, or substances which are flammable or can produce smells.

Fuel

The best fuel is winter grade light fuel oil, or off-road gas oil. If you can't find winter grade fuel during the summer, you can use summer grade light fuel oil or paraffin oil. To remove condensation water, add about 2% isopropanol-based antifreeze for gasoline engines (not antifreeze for diesel engines!) to the fuel.

If you don't use the heater in the winter and store it in a cold place, use paraffin oil the last time you use the heater, and leave the fuel hoses full (paraffin oil has a low cloud point). Paraffin oil will protect the hose from freeze.

CONTROLLING THE HEATER AND INDICATOR LEDS

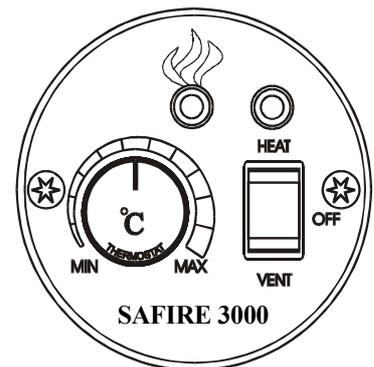
Basic control panel

Start: turn the switch to position "HEAT/ON".

Ventilation: turn the switch to position "VENT".

Turn off: turn the switch to position "OFF".

Adjust heating power, temperature (heaters with thermostat) or ventilation power (if the ventilating mode is active) with the adjustment knob. To obtain the normal room temperature, turn the adjustment knob to point upwards.



GENIUS control panel

Turn the heater on or off according to the instructions on the display.

Return to the main menu with "BACK"-button. Scroll the main menu with arrow keys, choose an item with "OK"-button.

NB!: After a power failure the time must be set again.



INDICATOR LEDS

Indicator LEDs on the control panel:

Green LED above the switch of the basic control panel: the heater is on. If the LED is not on when starting the heater, the heater's power supply is probably disconnected.

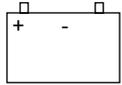


Green LED (flame) on the control panel: the flame sensor has detected a flame and combustion is in process.

Indicator LEDs on the end of the heater:



Green LED D10: the flame sensor has detected a flame and combustion is in process.



Yellow LED D2: the voltage is low, under 10,8V (or under 9V during the ignition).

The battery voltage may be too low, the power supply cables too thin or some connection in the wiring loose.

During the start the voltage can be lower, because the voltage drop caused by the filament current in the power supply cables can be up to 0,5V. If the voltage drops below the limits mentioned above, the aftercooling mode activates and the heater turns off.



Red LED D9: malfunction detected, the combustion stops.

On the end of the heater is a display which indicates the type of malfunction (see Malfunctions; NB: the display is upside down). If you have turned the heater off, you can see the latest malfunction type on the display again by turning the switch to "VENT": the latest error code shows on the display.

GENIUS CONTROL PANEL

Control the heater according to the instructions indicated on the GENIUS control panel. The normal start: Push BACK, the text HEATER CONTROL appears on the display; push OK, the text START appears on the display, push OK and the heater starts. The menu ADJUST POWER allows you to adjust either the power or the temperature. Choose menu items with arrow keys, except with OK. If you desire extra strong ventilation, choose DRYING VENTILATE. On this mode the heater takes more fresh air; this improves the drying effect while the heating power is low (practical f. ex. in the summer when the air is damp but not very cold).

Return to the main menu with BACK. NB! All selections are not allowed in every mode.

STARTING THE HEATER

Start the heater with **ON/HEAT-OFF-VENT**-switch. **Green LED above the switch** turns on. The pump operates (you can hear tapping, the dot on the circuit board display blinks), the fans are operating.



Green LED (flame) on the end of the heater and on the basic control panel lights about 1 1/2–3 minutes after the start when the flame sensor has detected a sufficient flame.

The ignition process ends in about 6 1/2 minutes. The heater operates on the power set with the thermostat or with the adjustment knob; the main fan measures the temperature of the room and operates on sufficient power.

HEATING POWER

Make sure that the temperature chosen on the thermostat or the chosen power settings correspond to your needs.

ADJUSTING THE HEATING POWER

If your heater has a thermostat, it will adjust the power automatically. If you want to change the heating power temporarily, adjust the temperature settings; the power level will change to correspond to the set limit.

If your heater doesn't have a thermostat, adjust the power manually with the adjustment knob. NB! The main fan doesn't operate on the new power level until the temperature of the air requires it.

TURNING OFF THE HEATER

Turn the heater off by turning the switch into OFF position; the pump stops, the heater goes into aftercooling mode and after that turns off.

Do not cut the power supply off f. ex. from the main switch when the aftercooling is on process (about 6 1/2 minutes)!

If the power supply is cut off, the heater starts next time only after it is set on ventilating mode (error code A).

MALFUNCTION

(To identify the LEDs: see wiring diagram)

NORMAL FUNCTION



Green LED above the switch of the basic control panel: the heater is on and gets current.

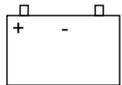
Green LED (flame) on the control panel and on the end of the heater: the flame sensor has detected a flame in the burner.

A blinking dot on the circuit board display: the pump is operating.

MALFUNCTIONS

The **green LED** above the switch is not on when starting the heater: the heater's power supply is off. If the LED is not on after the start process (about 6 1/2 min.) the heater goes into aftercooling mode and turns off. This will happen f. ex. if the fuel system is empty during the start. If you don't notice anything unusual, you may try to restart the heater.

The **green LED (flame)** turns off when the heater is operating, the red LED on the end of the heater is on, and the heater turns off: the fuel tank may be empty or the fuel inlet is defective. Check the situation.



The **yellow LED** on the end of the heater: The voltage is too low (less than 10,8 V or 9 V during the start). During the start process the voltage can be lower.

Usually undervoltage during the start is caused by too thin and/or too long power supply cables, oxidation in some connection or otherwise bad contact. Check the battery first, then the wires and connections. If the yellow LED is on during operation and the heater turns off, the battery is probably about to drain.



The **red LED** on the end of the heater: the heater is turned off because of a malfunction displayed on the circuit board.

Usually this is caused by lack of fuel, which stops the combustion; the error code on the circuit board display is 3.

NB! If you have turned off the heater after some malfunction, you can see the latest error code on the display again by turning the switch to the position "VENT": the number of the latest malfunction which caused the heater to turn off shows on the display.

ERROR CODE NUMBERS ON THE CIRCUIT BOARD DISPLAY

Number 1: Overheating.

Overheating is usually caused by a blockage on the normal warm air circulation (f. ex. too much restriction on the warm air grilles or too much fuel. See p. 7, Examination).

Number 2: The flame sensor electrode is sooty or defective. Clean the electrode (see p. 8). A short circuit may have occurred on the housing.

Number 3: The heater has turned off because the combustion has stopped. Usually this is caused by lack of fuel or a block in the fuel system.

Number 4: The glow plug is defective, the connection might be loose, or either the connector or the wire might be defective.

Number 5: The flame fan or its wires are defective.

Number 6: The main fan or its wires are defective.

Number 7: Undervoltage (see p. 5, Indicator LEDs).

Number 8: The pump's electric circuit is broken.

Number 9: The temperature sensor of the circulating air or its wires are defective.

Letter A means that the heater wasn't turned off normally. This is caused by either a rapid voltage drop or because the power supply is cut off with the main switch before the aftercooling process is finished. Turn the switch to VENT position for a little while, the heater will start normally.

The dot on the circuit board display is supposed to blink same frequency as pump. If this does not happen and the pump does not make a tapping noise, and there isn't any malfunction, the pump doesn't get current. The problem is either on the pumps wires, in the spool or on the circuit board.

If the dot on the display blinks but the pump does not make a tapping noise and the wires are ok, the problem is in the pump usually because of clouded fuel.

EXAMINATION, MAINTENANCE AND SERVICE

EXAMINATION

Check regularly especially, if the combustion in the burner is different, that

1. the heater gets current.
2. the combustion air access is clear; f. ex. spiders, mosquitoes, snow, water or ice can block the air flow.
3. the exhaust outlet is clear.
4. the fuel hose does not leak.
5. there aren't any impurities or water on the bottom of the fuel tank.
6. the fuel filter is clean.
7. the air hose of the tank is clear.
8. there isn't any dust inside the heater; it may cause smells and risk of fire.

If the heater doesn't seem to get enough fuel (the power is lower, the combustion is different), measure the fuel inlet: Remove the fuel filter (it may cause measurement errors). When the heater operates normally on maximum power, put the fuel hose into a measuring glass with a certain amount of fuel in it. Let the heater operate for 6 minutes. Multiply the amount of fuel consumed by 10, and you will get the fuel inlet/hour.

On maximum power the **3600Di** heater consumes 340-380ml/h, **3200Di** heater 300-340 ml/h, **2600Di** , heater 240-280ml/h and the **2400Di** heater 220-260 ml/h.

If the measured fuel consumption is above these limits, check the cause: the tank (or the measuring glass) may be placed above the heater, or the default settings of the pump have been changed and the pumps pulsation is too frequent. The normal pulsation on maximum power with the **3600Di** heater is 180 pulses/min and 50 pulses/min on minimum power **3200Di** heater is 160 pulses/min and 50 pulses/min on minimum power **2600Di** heater is 130 pulses/min and 50 pulses/min on minimum power, with the **2400Di** heater 120 pulses/min on maximum power and 50 pulses/min on minimum power.

If the heater gets too much fuel, the combustion may be impure and cause risk of overheating. If the overheating is caused by defective electronics or pump, always contact your nearest maintenance service.

If the fuel consumption is too low, there might be a blockage in the fuel system. If the filter is clean, check the fuel hose: the fuel in it may be clouded, if the hose has been in a cold place for a long time. If the blockage is not thorough, you can dissolve it rather quickly with isopropanol (= common anti-freeze for gasoline engines). You may also force isopropanol into the hose when the pump operates (during start) f. ex. with a hypodermic syringe or bicycle pump.

Also a little leak in the suction hose (before the pump) may cause the low fuel consumption. Check if there is a significant amount of bubbles in the hose. With extensive usage also the fuel inlet pipe near the burner may be blocked. If this happens, change the pipe or clean it f. ex. by heating it with a gas flame and blowing by compressed air it empty.

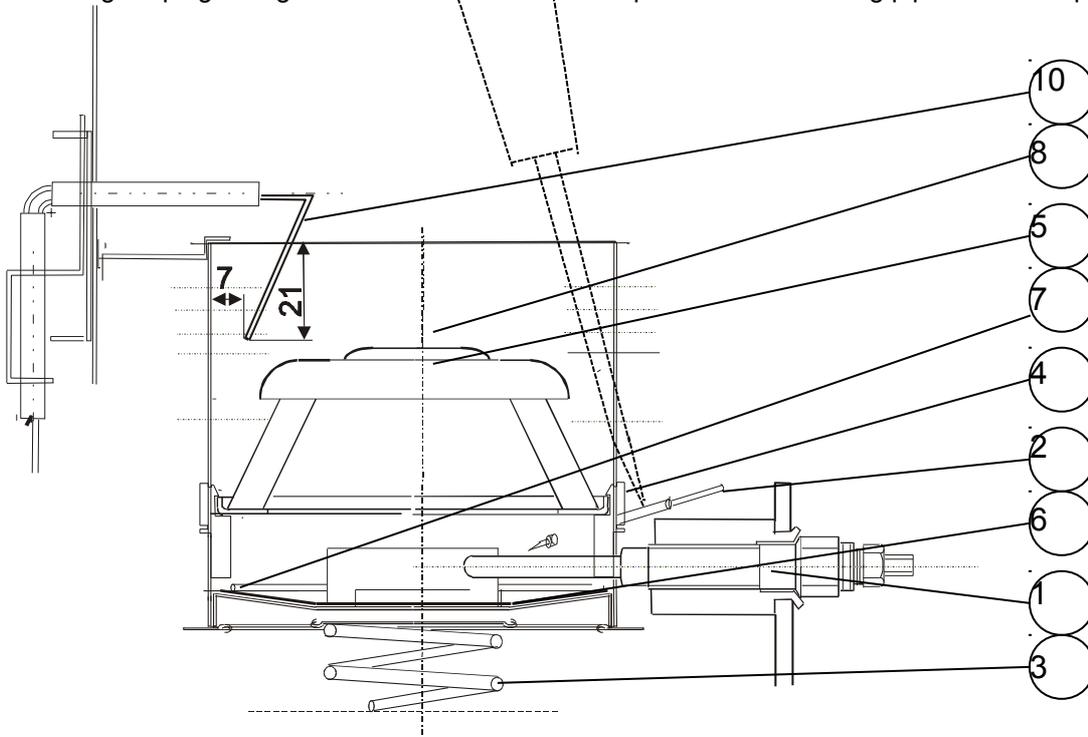
WINTER

Remove the battery wire for winter.

If the heater is unused in a cold place for a long time, the fuel in the hoses and in the tank may become clouded (this may happen also with winter grade fuel oil). The last time you use the heater before the winter, use paraffin oil to avoid starting problems in the spring. Make sure that paraffin oil fills the fuel hose, the pump and the fuel filter. In the spring it's best to acquire new fuel.

OPENING AND CLEANING THE COMBUSTION CHAMBER

1. Remove the heater from the mounting bracket; **watch out** for fuel dripping from the fuel pipe. Remove the bottom first: Unscrew the two screws on the bottom and tap lightly from the ends with a suitable block of wood.
2. Remove the thermal barrier from around the combustion chamber. Remove the fuel feed pipe (2).
3. Open the lid of the combustion chamber and remove the spring supporting the burner (3) and its base plate (11).
4. Remove the glow plug (1).
5. Remove the burner (8): use a hammer and a suitable block of wood.
6. Open the lock mechanism (4) of the burner cap (5) f. ex. with a screwdriver: push the screwdriver next to the lock mechanism between the hole cylinder and the lower ring so that the hole cylinder gives in and the lower ring has room to slide pass the lock mechanism. Rotate the screwdriver and lift the burner cap simultaneously.
7. Clean the burner f. ex. with an old toothbrush. Remove the carbon deposit from the bottom f. ex. by first heating it with a gas flame or warm air fan and then scraping it off f. ex. with a screwdriver.
8. If necessary, change the backing (6). The backing stays on its place with a locking spring (7).
9. Assemble in an opposite order. Make sure that the burner is on its place in a right position. Use the glow plug to align the burner. Check also the position of the casing pipe of the fuel pipe.



CLEANING THE FLAME SENSOR ELECTRODE

Error code number 2 in the circuit board display indicates that the flame sensor electrode is sooty, defective or that a short circuit has occurred on the housing. A sooty sensor is caused by impure combustion; **always** clean the burner too. After you have removed the burner, you can clean the electrode without having to remove it. If necessary, you can remove the electrode on the end of the heat exchanger: open the locking spring under the “claws” that keep it steady. Use f. ex. alcohol-based cleaning agent (windshield washer fluid) for cleaning.

NB! Make sure that the insulation of the electrode is clean to prevent any leakage current which can cause malfunction. Don't let the filament of the electrode touch the burner!

Place the flame sensor tip according to the measurements on the picture above. Check the measurements f. ex. with a cardboard model. If necessary, you can bend the filament of the electrode. Be careful not to break the insulation. Small fractures however don't have an impact on the function of the electrode.

CHECKING AND CLEANING THE PUMP

Check the pump by letting an air bubble into the hose. On one pulse the fuel pushes forward about 18–20 mm. If the fuel advances slowly, there might be a blockage. Air bubbles indicate an air leak on the suction or in the pump.

If the pump doesn't operate properly although the dot on the error code display blinks, or if you verify by measuring that the pump's performance is not sufficient although the pulse frequency is right and there aren't any blockages, the problem might be in the pump. The most common malfunctions in the pump are:

1. Blockage in the pump, or restriction or jamming of the piston caused by external impurities or clouded fuel.
2. Corrosion caused by water during a long period of time.
3. Leakage of the check valve during the suction caused by impurities or corrosion.

CLEANING MINOR IMPURITIES AND CLOUDED FUEL IN THE PUMP

1. Release the hose connectors from the pump.
2. Now you can press isopropanol (a common anti-freeze for gasoline engines and truck air brakes) through the pump.

OPENING AND CLEANING THE PUMP

1. Release the hose connectors from the pump.
2. Release the wires from the pump.
3. Remove the connector strip (8) so that it rests on the filaments of the spool.
4. Unscrew the iron housing (1) of the pump and remove it.
5. Pull the upper end (3) of the pump out of the spool (4), the piston (9) and the spring (10) are removed at the same time.
6. Pull also the lower end (5) of the pump out.
7. Wash the inner parts of the pump f. ex. with isopropanol. Check the function of the piston and the cylinder: there shouldn't be any "roughness" or stiffness.
8. Test the check valve: connect a hose in the outlet connector (11) and blow air under the fluid level. The valve should not leak. If necessary, try to clean the valve by squeezing a powerful stream of fluid forward through the valve.
9. **DO NOT OPEN** the sealed connection between the pump's housing (6) and the valve's housing (7): the connection specifies the right piston stroke.
10. Assemble in reverse order. Remember to check that the o-rings (12 and 13) and their grooves are clean.

When you assemble the pump, check the clamps to make sure that the hose connections are tight. Bubbles after the pump reveal leaks on the suction. NB! If there is air inside the pump, it may take a while before the pump is completely empty of air.

