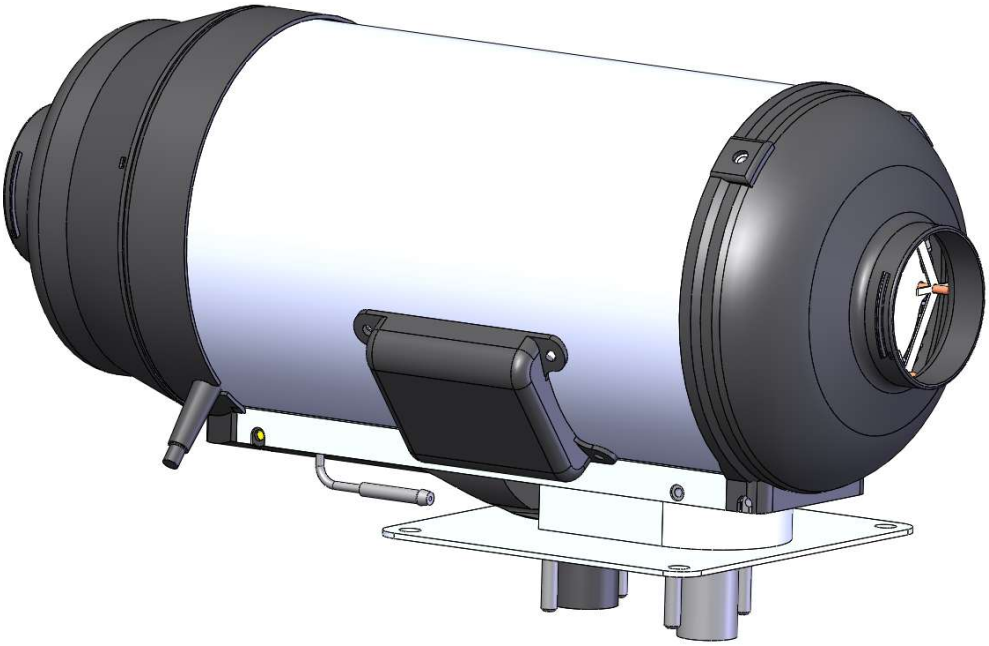
Entiffic Air



Improper installation of the Entiffic Heating System can cause fire, leakage of harmful carbon monoxide leading to serious injury or death.

To install and maintain a Entiffic Heating System, professional expertise and technical documentation is necessary. Special tools and equipment may also be necessary.

NEVER try to install or maintain a Entiffic Heating System, without prior training and experience with the Entiffic heater series.

Carefully follow all instructions provided by Entiffic and this installation guide.

Entiffic rejects any liability for damage or problems caused by the product, if installed by untrained personnel or against the instructions provided in the installation guide.

1 Table of Contents

2 Use of the heater

The Entiffic Air is a self-powered heater, designed to work independently, only connected to supply of diesel fuel and a 12V battery. Once operating temperature is reached, the Entiffic Air will deliver a surplus of power to charge the connected battery.

2.1 Control Interface

Control unit

Button 1) Power setting and Error reset button:

- *If the heater is in error mode then use button 1 to reset error.*
- *If the heater is not in error mode button 1 can be used to adjust the power output of the heater. There are 5 power settings corresponding to 5 fuel rates: 0.12, 0.14, 0.16, 0.18, 0.20 l/hr. To adjust the power setting follow below sequence:*
    1. *Push button 1. This disables the thermostat. Yellow LED is on.*
    2. *Turn the knob to the desired power setting. Yellow LED is on.*
    3. *Push button 1. This selects the power setting. Yellow LED is flashing.*
    4. *Turn the knob back to temperature setpoint. Yellow LED is flashing.*
    5. *Push button 1. Enables the thermostat. Yellow LED is off.*

Button 2) Automatic Heating:

- *A Long 2 sec push on button 2 will activate automatic heating mode. If the temperature measured internal in the control unit is above the temperature setpoint of the knob the Yellow LED will be on. When the measured temperature falls below the setpoint temperature the heater will enter heating mode.*
- *When heating mode is activated the Green LED will flash during starting up. Once normal operation mode is reached, the green LED will be constantly on. When the temperature setpoint is reached the heater will shot down. While the heater is shutting down the green LED will flash. After shot down the yellow LED will be on indication the heater is still in automatic heating mode.*
- *A long 2 sec push on button 2 will deactivate automatic heating mode and activate idle mode.*

Knob:

- *The knob adjusts the temperature setpoint between 0 °C and 30 °C by turning it.*

LED indications
Green LED:

- *Constantly lit when heater is heating and startup sequence is finished.*
- *Flashing more on than off indicating the heater is in starting up mode.*
- *Flashing more off than on indicating the heater is in shutting down mode.*

LED:
- *The LED is constantly lit.*
    - *Heater is in automatic heating mode waiting for the room temperature to fall below setpoint temperature.*
    - *Or heater is in power setting mode.*
- *Flashing:*
    - *The heater is in power setting mode.*
    - *Or heater is signalling an Error together with the red LED*

Red LED signaling:
- *Error code with 0.4 Hz f frequency and with 8-second gap*

No LED signaling:
- *Heater is in idle mode*

3 Installation

Before installation, please observe these important points:

- *Adhere to the statutory regulations before proceeding with the installation. Note: The heater is not approved for use in hazardous areas.*
- *The heater is approved to be installed in vehicles of vehicle category M, N and O and as a space heater in containers, cabins, boats etc.*
- *For installation in wheeled vehicles, the latest statuary regulation of ECE/UN R122 must be read, understood and followed.*
- *Important: Connect by means of the supplied wires and 10A fuse directly with the battery. Connecting via relays and similar components might cause the heater to malfunction.*

3.1 Installation and dimensions of the heater

The installation dimensions and space requirement are shown in the Figure 1.
- *The heater is connecter to a structure with 4xM6 bolts through the interface plate pos 6.*
- *A gasket must be fitted under the interface plate pos 6 to avoid exhaust gas to enter the room that the heater is installed in. Make sure that the sealing can withstand 230 C.*
- *The heater should be installed horizontally, with a maximum deviation of 5 degrees from horizontal.*
- *It must be checked that the casing is not in contact with any exterior parts.*
- *ensure that the heater is fitted in a position where it is protected from splashing water and spray. The heater must be installed in such a way that no water can reach the main heater unit.*
- *The openings for the combustion air inlet, the exhaust outlet and the fuel pipe must be sealed if the heater is installed in the interior. The exhaust should be sealed with fire retardant materials.*

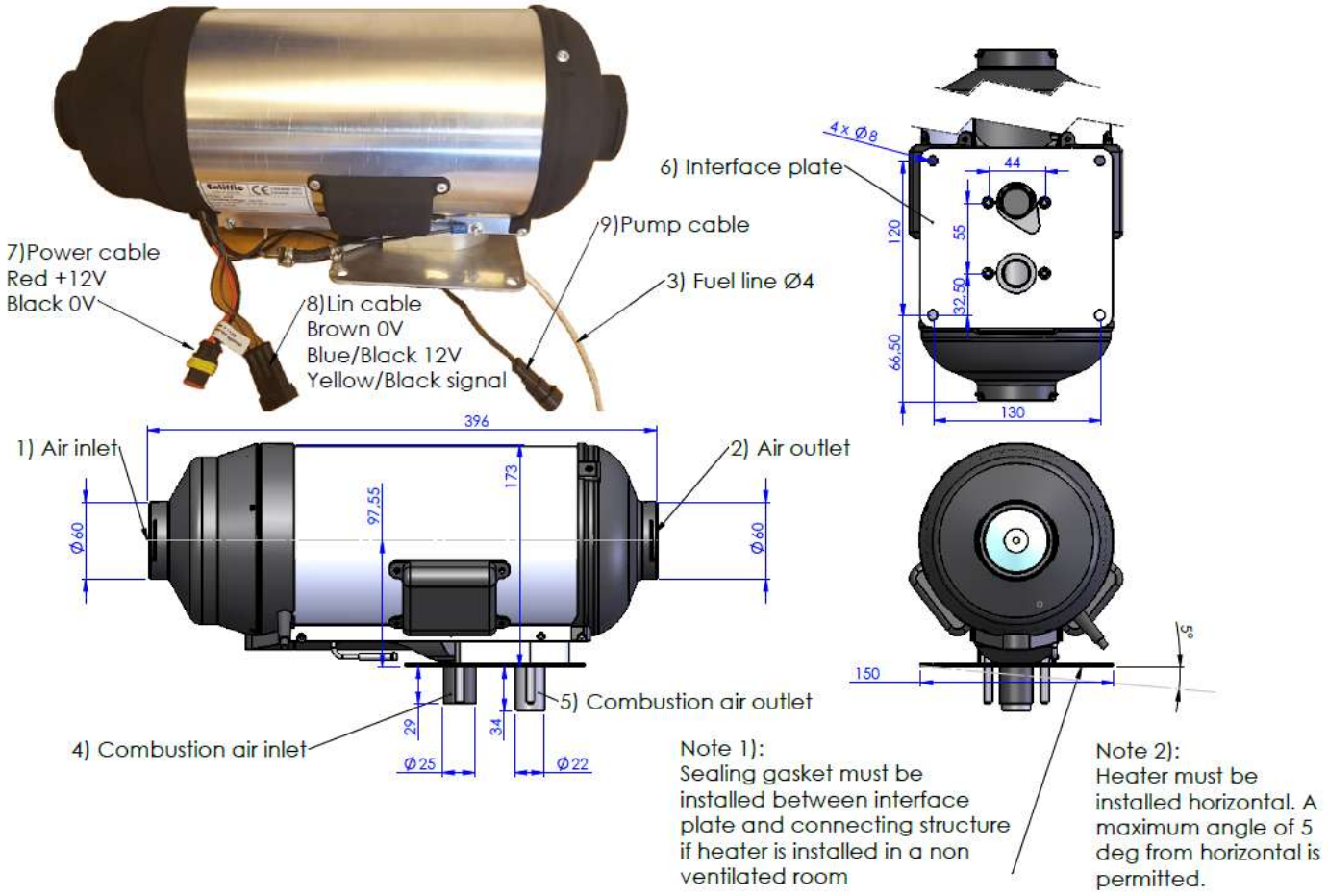


Figure 1: Shows the heater and interface dimensions.

3.2 Maximum air duct length

Combined max. length of air hose:	*10m*
Max length of inlet air hose:	*5m*
Bends on both inlet and outlet hose:	*540 deg.*
Connection pieces	*3*
Air hose diameter	*60mm*

Table 1

Note: Be aware that each connection piece will decrease the airflow drastically. (some pieces can increase resistance comparable to 5m of air hose.)

Insulation of air hose is a very cheap and effective way to increase the heating efficiency.

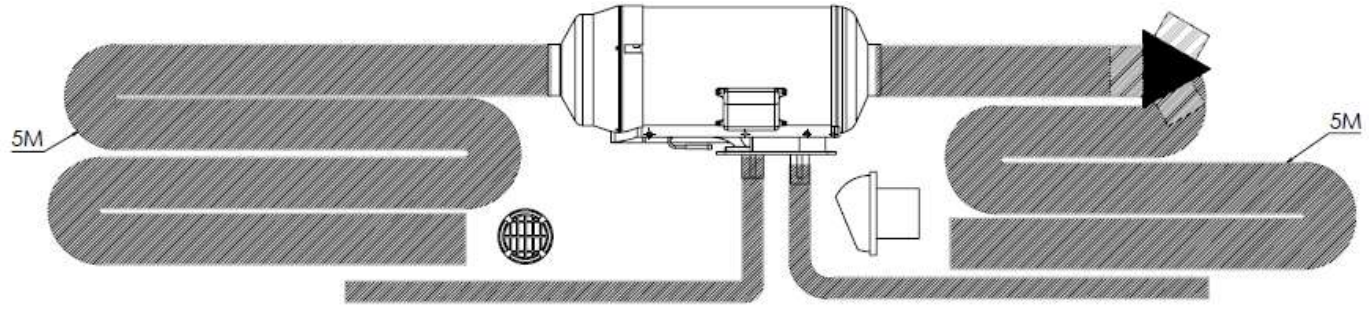


Figure 2: Example of the heater installed with a maximum tubing as listed in Table 1. Except that the heater is shown with 1080 deg bend in the picture and only 540 deg is allowed.

If necessary, a grill is fitted to prevent leaves and other unwanted objects to enter the heating unit.

Figure 3 - Grill for Air-Inlet hose

Important:

- *Only materials that can permanently withstand temperatures of at least 150 °C may be used for the hot air-Outlet hose. The hot air opening is to be positioned in such a way that the air is not blown on to any surrounding parts that cannot withstand the heat and in a position, that insures a free air flow, at all times. The air outlet and intake vents, should always be installed in a position that makes them unlikely to get blocked by any objects and at least 20 cm from any surface.*
- *The hot air tubes must be secured at all connection points.*
- *If the heater is used without an air inlet hose, an inlet grill should be installed on the heater*
- *If the heater is used together with another heating system special attention must be made to ensure that the system will function.*
- *Make sure to keep a proper distance between inlet and outlet air duct when recycling heated air.*

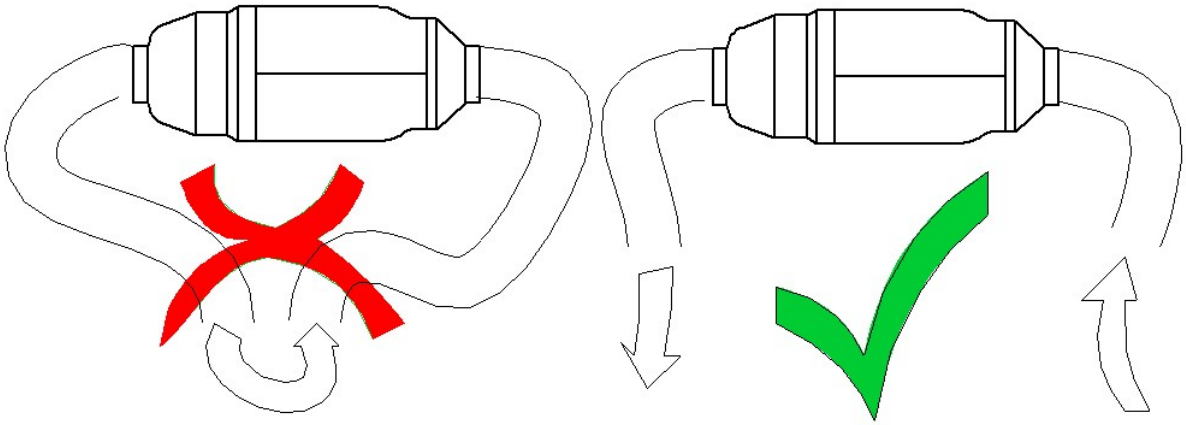


Figure 4

3.3 Room Temperature Sensor

The control unit of the heater comes with a pre-integrated temperature sensor. If the Control Unit is mounted in a place not suited for measuring the temperature, an additional temperature sensor can be acquired and installed instead.

The control unit/temperature sensor should not be mounted:

- *In the direct current of hot air (from the vehicle's own heating system or the hot air from the heater).*

- *Be placed in direct sunlight (for example on the dashboard).*
- *Be installed behind curtains or the like.*

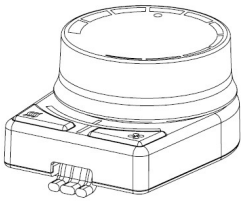


Figure 5 shows the control unit that is equipped with an internal temperature sensor

3.4 Fuel supply

The heater must be connected to a fuel tank that is equipped with a fuel filter. In Table 2 the maximum dimension is given for the fuel line. The dimension is illustrated in Figure 6

Fuel supply line length from Fuel Tank to Metering Pump	*≤ 2 Meter*
Fuel supply line length from metering Pump to Heater Unit	*≤ 6 Meter*
Max height difference between Fuel Tank and Metering Pump	*Max ± 1 Meter*

Table 2

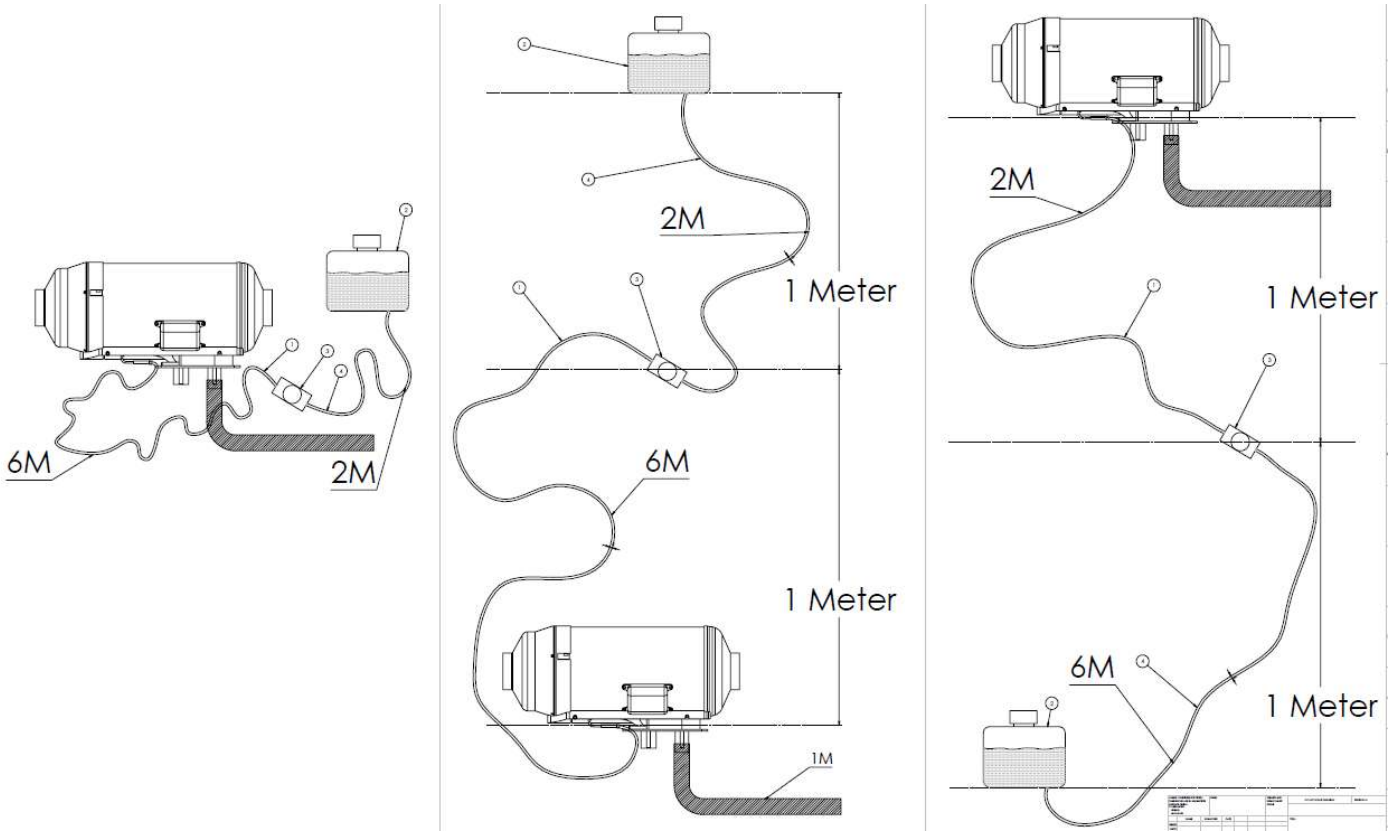


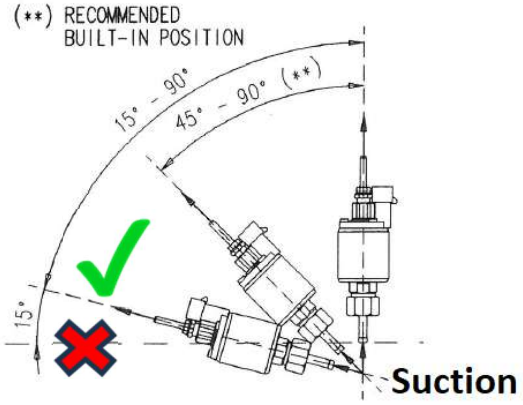
Figure 6 shows the maximum dimension for the fuel line installation

<u>When installing in vehicles registered for ADR transport:</u> The statutory regulation of ADR governing fuel tanks, must be adhered to. A sign must be affixed to the fuel filler neck warning that the heater must be switched off before refueling.

Entiffic Air standard fuel line is a plastic line PA 11, of inner Ø3mm and outer Ø4mm.

Important installation notes:

- *The connection points along the fuel line must be 100% air tight, make sure that the fuel line/pipe and the connection joint / hose are fitted tightly together, and clips are used to secure the connection.*
- *The fuel pump must be installed in an angle as shown in Figure 7. This will prevent air from getting stuck inside the pump.*
- *The fuel pump and fuel lines must not be installed within range of the radiated heat from hot parts. A heat shield must be used to protect the parts if necessary.*
- *The tank fitting must be made from metal.*



Installation angle of fuelpump
Recommended angle of installation is 15°- 90° from horisontal
***Preferred angle** of installation is 45°-90 °from horisontal*

Figure 7 recommended installation position of fuel pump

3.5 Exhaust system

- *The exhaust outlet must be positioned to prevent emissions from entering the heated space through ventilators, fresh air inlets or open windows.*
- *The exhaust should be located such that no dirt, mud and water will cover the exhaust outlet. Installation of a Gooseneck/water lock/muffler is necessary for installation on boats.*
- *The last 10 cm of the exhaust hose must be installed a maximum of 5° from vertical.*
- *Max. sum of all bends must be below 360deg.*
- *Make sure that the exhaust only affects materials that endure heating of 350°C*

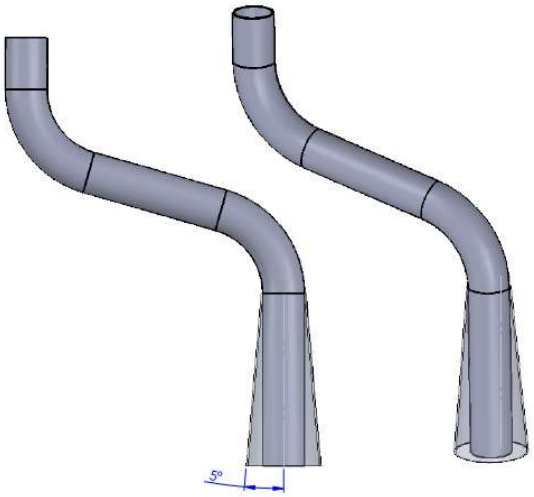


Figure 8 Illustrates the exhaust pipe and the maximum installation tolerance from vertical

3.6 Combustion air inlet

- *The air for the combustion chamber of the heater must not be drawn from the passenger department or a room that is not ventilated.*
- *The air inlet must be so positioned or guarded to prevent blocking by snow, water, tools or other unintended foreign objects/materials.*
- *The air inlet must be placed in a manner that prevents wind from affecting the air flow into the air inlet pipe.*

3.7 Electrical Installation

- *Installation kit power cable is 4.9 m long. Red wire is for +12V. Black wire is 0V.*
- *Installation kit Lin-bus cable is 4.6 m long.*
- *Installation kit pump cable is 6 m long.*
- *A 15-amp fuse must be installed together with the battery*
- *Cables must be fitted in way that prevents mechanical stress on plugs and cables.*
- *Be aware that loose cables may be subject to mechanical stress due to vibrations.*
- *Do not expose the wiring connections to extreme bends.*

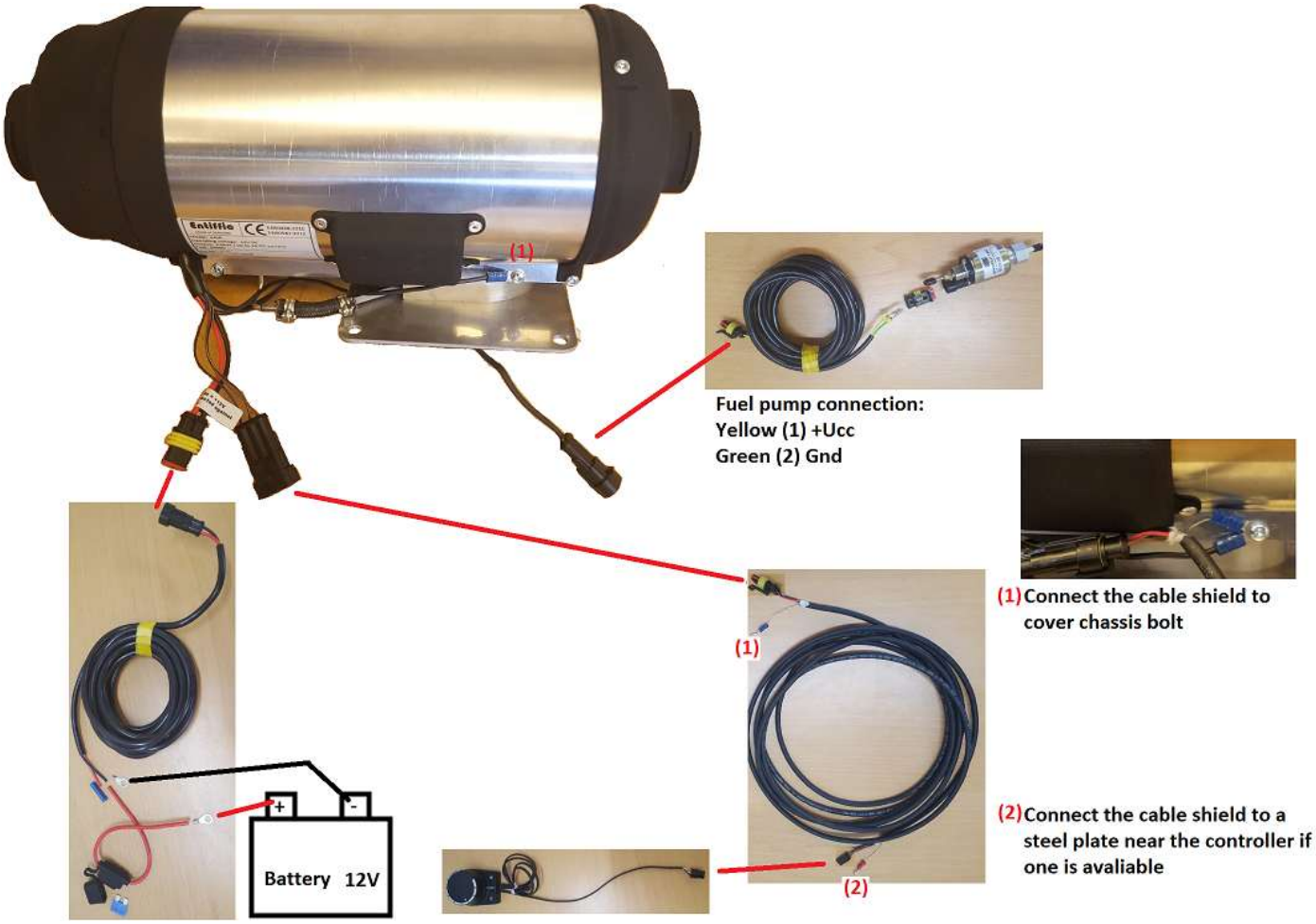


Figure 9 Illustrates the electrical connections

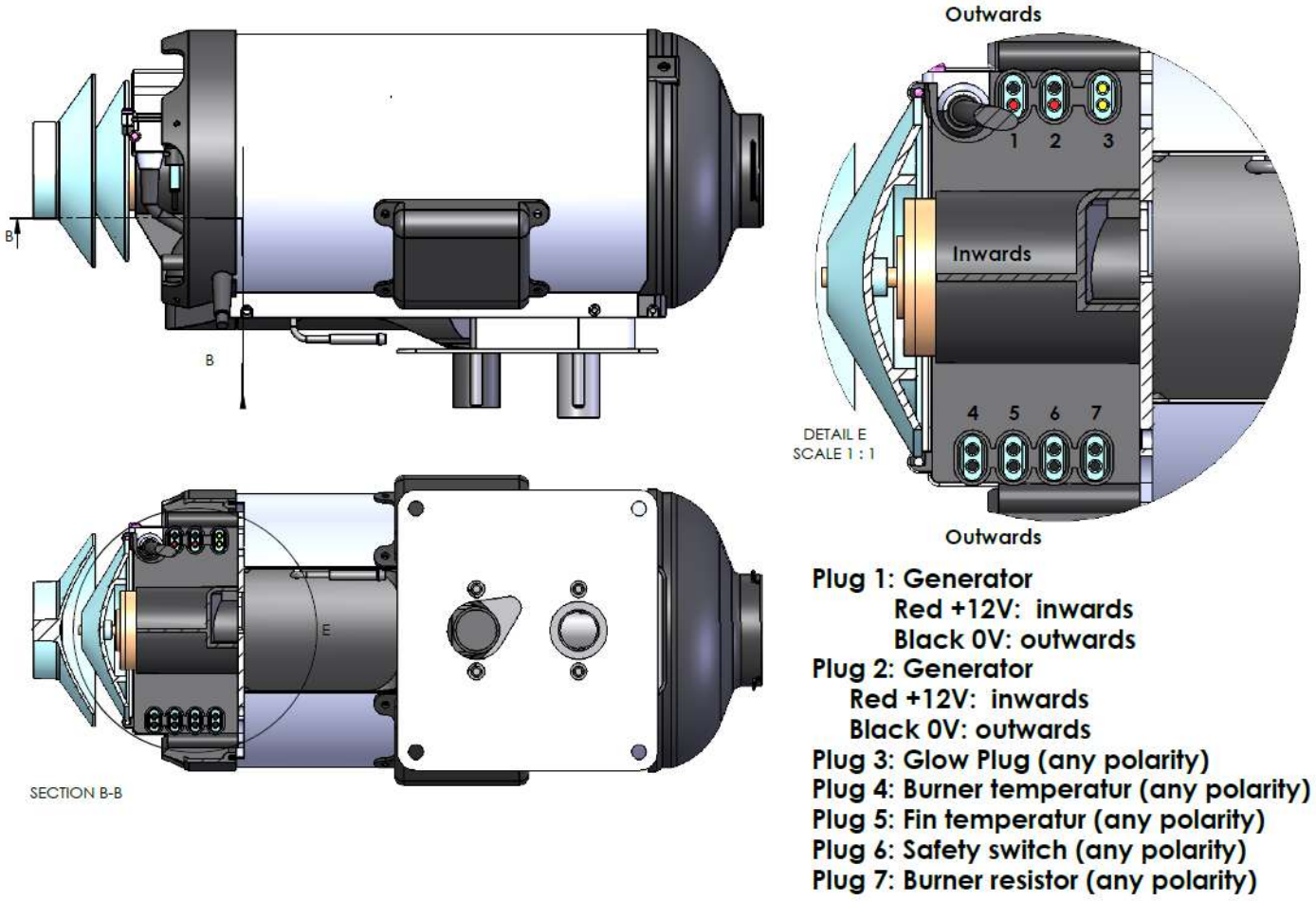


Figure 10 Shows the interior plug and their position in the heater.

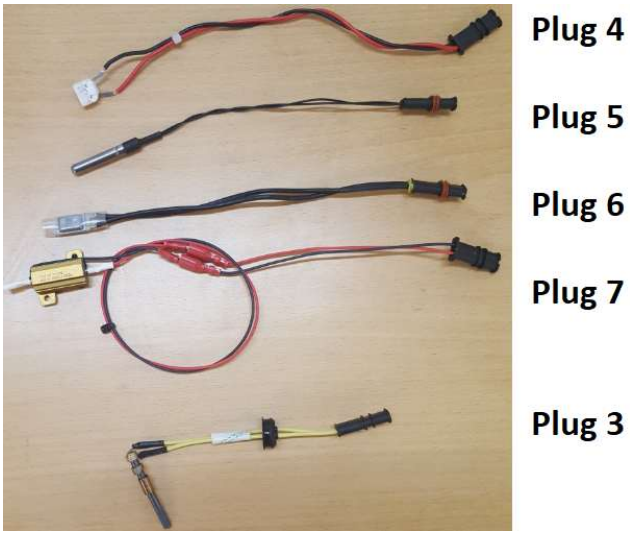


Figure 11 Shows the interior plugs except the generator plugs

3.8 External breaker for on/off (optional)

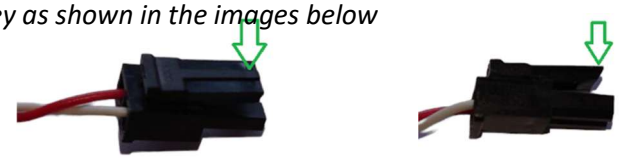
It is possible to supply the heater with an additional / manual on/off switch.

It is necessary that the switch is of a type that can maintain a setting, as it is necessary to connect a wire with 12V+.

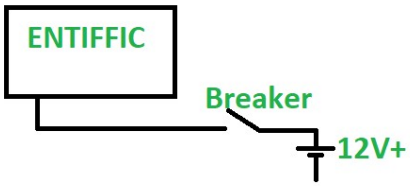
Note that the manual switch activates the same function in the heater as button "1" on the control panel. This means that the thermostat will send a signal to the heater when it is to be in operation/stand by.

Installation:

On the control unit there are 2 wires with a red/white conductor and a small black 2 pole plug. Identify the 2-pin connector with the lock key as shown in the images below



Cut the white wire immediately behind the plug and connect the white wire to the output of the switch. Connect the other leg of the switch to 12V+



4 Drilling Template and example dimensions of gasket plate

- *The gasket must rest again the heater outlet pipes to seal exhaust gas from the space heated. For this reason, the gasket must have a minimum temperature resistance of 230°C.*

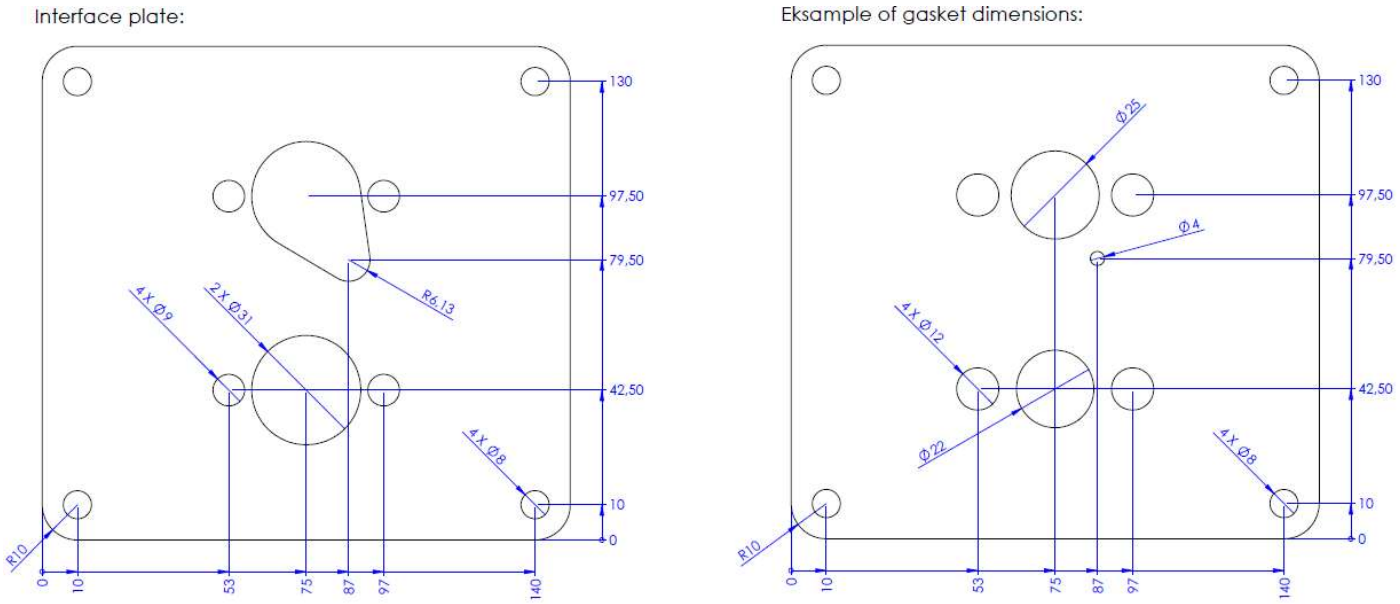


Figure 12: Shows the dimension of interface plate and recommended gasket dimensions.

5 First Start

- *Connect heater to fully charged 12V battery – observe correct polarity*
- *Bleed the fuel lines prior to first start. As a minimum, the fuel line between tanks and pump must be filled with fuel before attempting to start the heater.*
- *It is expected that the heater enters an error mode during first start, due to lack of fuel. Reset the error code and restart the heater. This process might need to be repeated several times until all air is removed from the full line.*

6 Error Codes

If an error occurs, the red LED will flash. The red LED signals the Error Code, by the number of flashes followed by a break. The number of flashes in the pulsation determines the error code.

Example: E09 corresponds to the red LED flashing 9 times and E09+Y corresponds to Yellow LED on and red LED flashing 9 times.

Error Codes Table: according to prog 170		
ID	Fault description	Possible cause of error
E02	Internal temperature drops during startup	Could be air in fuel lines, exhaust blocked or incorrect exhaust installation.
E03	Internal temperature drops during startup. Is checked during startup.	Could be air in fuel lines, exhaust blocked or incorrect exhaust installation
E04	Internal temperature is not increasing. Is checked during startup.	Check for missing fuel supply and faulty fuelpump. Check temperaturesensor on top of combustionchamber. (resistance in sensor must have measure resistance of 1050 Ω ± 50Ω). Check for sod in combustionchamber and position of burnercup.
E05	Sudden temperature drops during operation. Is checked when heater is fully operational.	Check fuel pump, check for air in fuel lines, exhaust blocked or incorrect exhaust installation
E06	Internal temperature is too low during operation and falling. Is checked after 110 sec	Check fuelpump and check for air in fuel lines, exhaust blocked or incorrect exhaust installation
E07	Internal temperature is decreasing too fast. Is checked during startup	Could be air in fuel lines, faulty fuel pump, exhaust blocked or incorrect exhaust installation. If occurs mid operation (long after startup completed, check if fuel pump provides fuel
E08	Internal temperature is decreasing too fast. Is checked when heater is fully operational.	Temp in combustion chamber drops 7 degrees or more within 10 seconds: 1: Air in fuel supply/defective fuel pump. 2: Check temperature gauge on top of combustion chamber. 3: Check if air intake for combustion has been exposed to overpressure (may be due to the intake pointing towards the direction of travel and has been exposed to strong wind or snow)
E09	No connection between User panel and Heater	Too much EMC noise, broken plugs, broke wires, incorrect installation of control cable.
E02+Y	Circulation blower failure - rpm too slow	Circulation blower mechanically blocked or blower motor defect. Frozen condense may block the fan.
E03+Y	Combustion blower failure rpm too slow	Combustion blower mechanically blocked or blower motor defect.
E04+Y	Battery voltage below 10 V	Check battery
E05+Y	Heater is too hot during operation	Outlet air is blocked
E06+Y	Heater is too hot while idle	Check auxiliary equipment and make sure the outlet air is not blocked. Check Plugs inside heater.
E07+Y	Too high voltage on thermoelectrical generator	Check Plugs inside heater.

E08+Y	*Glow plug failure*	*Check Plugs inside heater. Check for defect Glow plug*
E09+Y	*Connection between User panel and Heater has been off too long*	*Too much EMC noise, broken plugs, broke wires, incorrect installation of control cable.*

Should an error occur, the heater will automatically start to cool down and stop operation. After complete shut-down, reset the heater by pushing once on button 2. Do not unplug power while the heater is cooling down this may damage the heater if it is hot.

If an Error Code occurs the following may cause the fault or identify the cause of the fault:

- *Visually inspect the heater for any abnormalities and smell of diesel or exhausts.*
- *Loose connection along fuel line, air is entering the system.*
- *Loose plug connection internally in the heater*
- *Loose plug connection externally. Battery, battery fuse, controller connection, pump connection.*
- *Blocking of the combustion air intake or the exhaust pipe opening.*
- *Temperature sensor defects.*
- *Overheating sensor interrupt, short circuit or installed incorrectly.*
- *Glow plug defect.*
- *Fan motor overload, blocked or defect.*
- *Error in the metering pump.*
- *Low voltage < 10.0 or High voltage > 16V, longer than 1 seconds*
- *Control unit defect*
- *Overheating due to improper installation*
- *Incorrect installation combustion air inlet and outlet*

Contact an authorized installer in case the heater continues to enter error mode.

7 Technical data

- *The technical data provided are based on an ambient temperature of 20°C.*
- *All components are designed for 12V.*
- *The diesel fuel specified by the manufacturer in accordance with EN590, must be used. Class EL heating oil (not L heating oil) may also be used if it complies to the normal quality available in the Western European markets pursuant to DIN 51603 or EN ISO 3735 standards.*
- *If the fuel class is changed make sure that the heaters has been operated until all fuel lines are filled with the new fuel class used.*

Entiffic D-Air Heater	
Fuel	*Diesel/Class EL heating oil (EN 590 / DIN 51603 or EN ISO 3735)*
Input Voltage	*12V*
Heat output	*2 kW*
Air flow volume	*65 m3/hr*
Generated electrical power	*10-15W surplus for battery charging*
Fuel consumption	*0,1 l/hr by min output* *0,2 l/hr by max output*
Heater operating temp.	*-30°C - +30°C*

Heater storage temp.	-30°C - +85°C
Metering pump operating temp.	-30°C - +28°C
Metering pump storage temp.	-30°C - +85°C
Control panel operating temp.	-30°C - +75°C
Control panel storage temp.	-30°C - +85°C
Combustion air inlet temp.	-30°C - +30°C
Adjustable interior temp.	+5°C - +28°C
Dimentions (L x W x H)	400mm x 135mm x 175mm
Weight	4,6 kg