



# MV Airo 2 & 5

## Alpine Auto

AIR HEATER

INSTRUCTION MANUAL

Ed 3.01

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## Preface

Thank you for purchasing the MV Airo 2 and/or Airo 5 diesel powered hot air heater (petrol versions of the MV Airo 2 are available at special request). This instruction book describes the structures, working principles, installation, and operation of the MV Airo 2/5. For correct use of the heater, please read this instruction book carefully before installation and use. The instruction book should be saved in a convenient place for reference later.

### Note

- This instruction book is subject to revision without notice, but the instruction book is in conformity to the purchased product.
- Our effort is to explain all questions you may have. If you have any doubts or find anything incorrect in this manual, please contact us directly.
- Check the heater for any damage when unpacking and contact the dealer immediately if anything is found.
- If any troubles arise during application, please contact MV Heating or other customer service stations authorized by this company. We shall do our best to provide service to you.

Comply with the operation manual for installation and operation, to ensure prolonged and reliable use.



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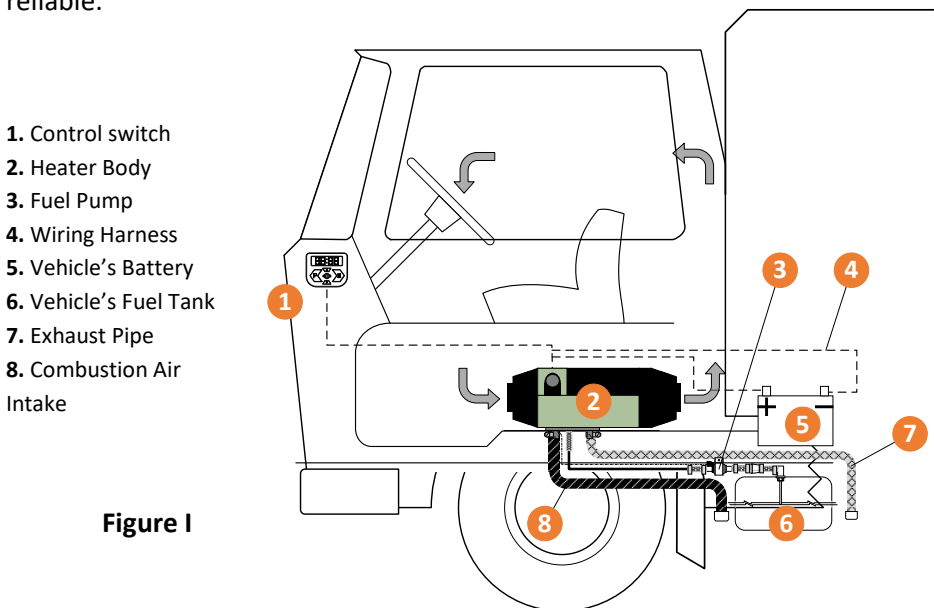
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## Introduction

The main parts of both the MV Airo 2 and Airo 5 air heaters (hereinafter referred to as 'the heater') are a small fuel furnace controlled by a single-chip micro-processor. Its furnace body (the heat exchanger) is located in the hood shaped case, which serves as an independent air passage. Cold air is drawn into the air passage by the fan, heated by the heat exchanger and blown out as hot air.

An example of how the heater operates is shown in Figure I. Hot air is supplied by the heater to the driver's cab and/or passenger's compartment independently from the engine. The same theory applies to campervans, cranes, marine vessels etc.

The heater is fully automatically controlled. It features a compact structure, easy installation, low running costs, easy maintenance and is safe and reliable.



**Figure I**



## MV Airo 2 Technical Data

<b>Output (w)</b>	2000	
<b>Fuel</b>	Petrol	Diesel
<b>Voltage</b>	12/24V	12/24V
<b>Fuel Consumption (l/h)</b>	0.14 - 0.27	0.12 - 0.24
<b>Power Consumption</b>	14 - 29	
<b>Working Temperature</b>	-40°C - 20°C	
<b>Weight (KG)</b>	2.6	
<b>Dimensions (mm)</b>	323x120x121	

<b>Variable Output</b>	Current Draw
<b>Position</b>	12V (Amps)
<b>PO1</b>	0.9
<b>PO2</b>	1.1
<b>PO3</b>	1.2
<b>PO4</b>	1.3
<b>PO5</b>	1.5
<b>PO6</b>	1.7
<b>PO7</b>	1.9

## MV Airo 5 Technical Data

<b>MV Airo 5</b>	
<b>Heat Power</b>	5kW
<b>Fuel</b>	Diesel
<b>Rated Voltage</b>	12V24V
<b>Fuel Consumption</b>	0.19 - 0.60l/h
<b>Rated Power Consumption</b>	15 - 90W
<b>Working Temperature</b>	-40°C — 20°C
<b>Weight of Main Heater</b>	5.9Kg
<b>Dimensions</b>	425X148X162mm
<b>Mobile Phone Control (Optional)</b>	No limitation
<b>Remote Control (Optional)</b>	Without obstacles ≤800m

## Structure

The structure of the main body is shown in Figure II.

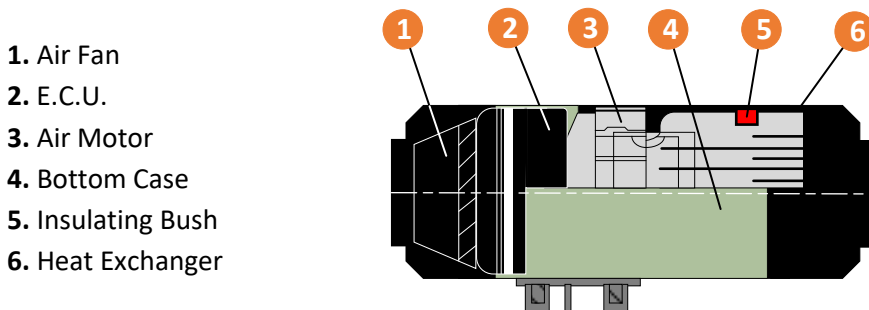
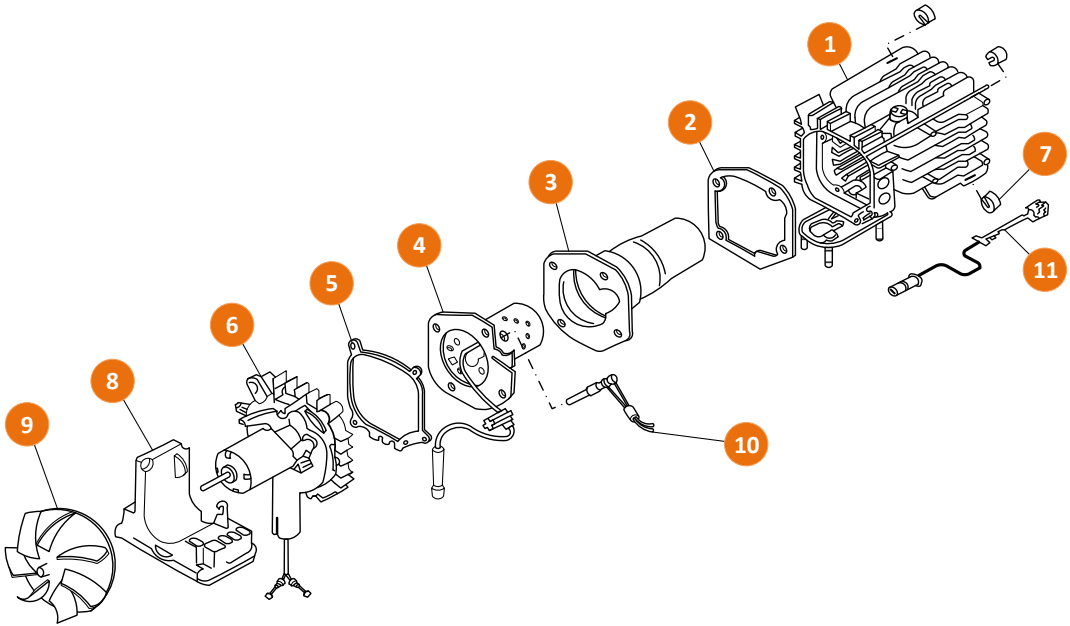


Figure II

## MV Airo 2 Internal Structure

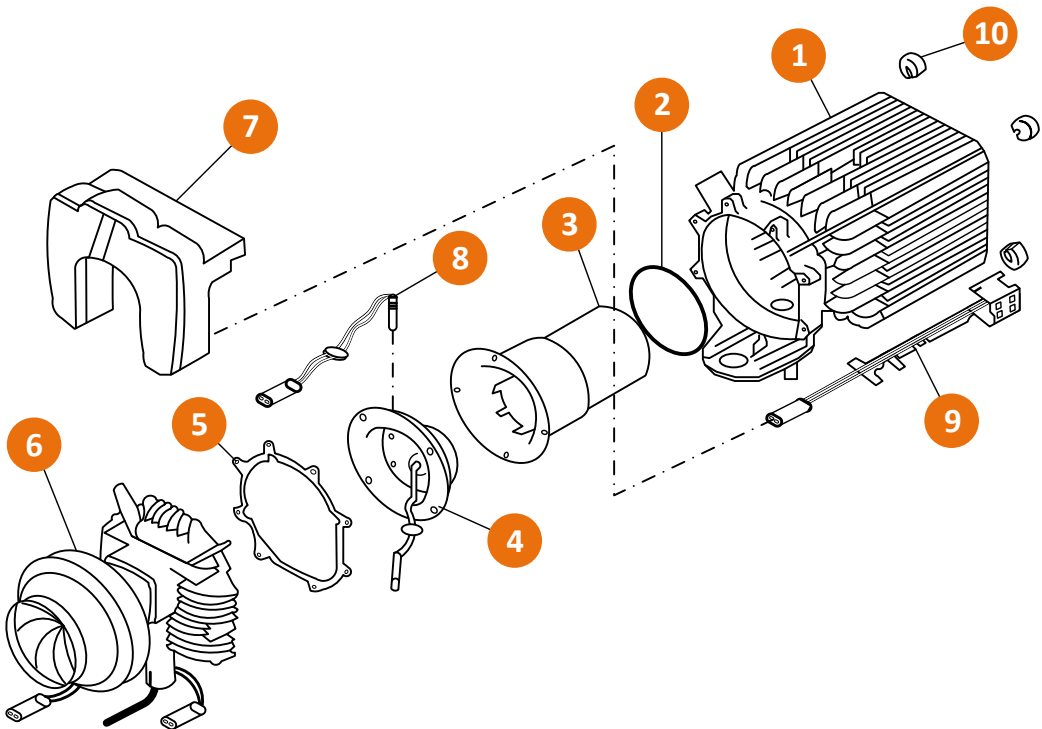


**Figure III**

- |                       |                       |
|-----------------------|-----------------------|
| 1. Heat exchanger     | 2. Gasket 1 (4 hole)  |
| 3. Combustion chamber | 4. Burner Assembly    |
| 5. Gasket 2 (5 hole)  | 6. Air Motor Assembly |
| 7. Insulating bush    | 8. ECU                |
| 9. Air Fan Wheel      | 10. Glow Pin          |
| 11. Overheat Sensor   |                       |



## MV Airo 5 Internal Structure



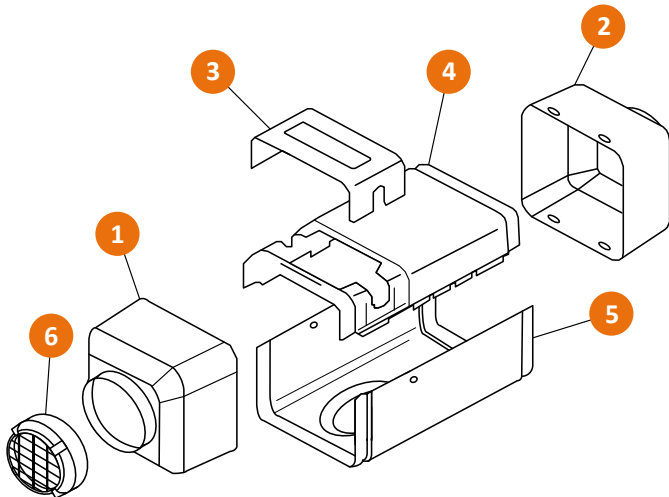
**Figure IV**

- |                       |                       |
|-----------------------|-----------------------|
| 1. Heat Exchanger     | 2. O-ring             |
| 3. Combustion Chamber | 4. Burner Assembly    |
| 5. Gasket             | 6. Air Motor Assembly |
| 7. ECU                | 8. Glow Pin           |
| 9. Overheat Sensor    | 10. Insulating Bushes |

The heat exchanger is made of die cast aluminium with radiating fins around and at the rear end. The combustion tube is located inside the heat exchanger, and the burner assembly is fixed on the front end of the combustion tube. Fuel is fed to the burner assembly through the fuel inlet pipe by the aid of the fuel pump. It is ignited by the glow pin, which also serves as a flame sensor after ignition. The flame is supported in the burner assembly and sealed in the combustion tube. All combustion gases exit the heater through the exhaust port.

Combustion air is fed into the heater via the combustion air pipe and is supported efficiently by the combustion air fan, located on the rear of the air motor. Cool air enters the air inlet, is heated by the heat exchanger, and is pushed out the air outlet by the fresh air fan of the air motor assembly.

## Heater Cases



**Figure V**

**1.** Inlet cap

**4.** Top Case

**2.** Outlet Cap

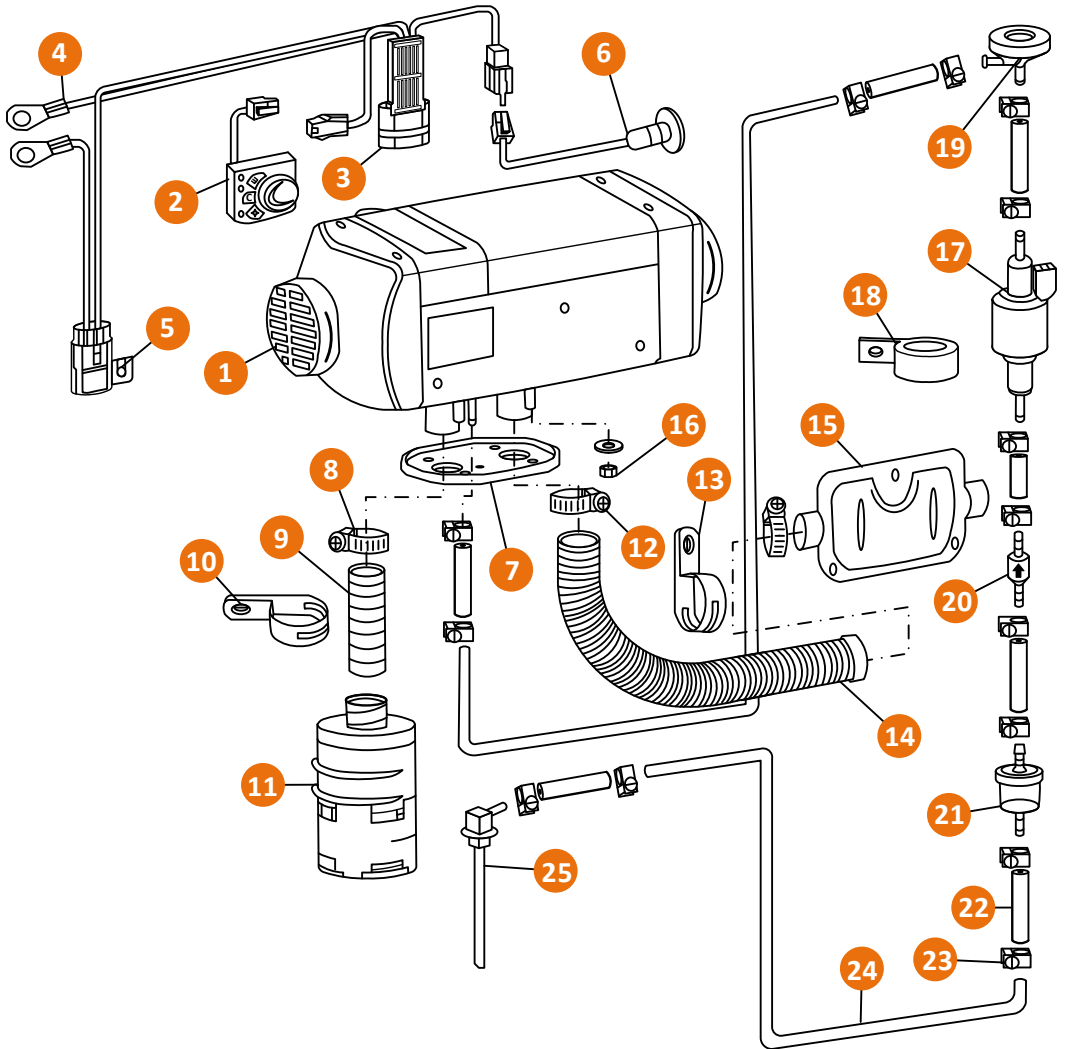
**5.** Bottom Case

**3.** ECU Cover

**6.** Grill

## Installation

The kit includes everything necessary for a standard installation.



### Figure VI

- |                               |                                       |
|-------------------------------|---------------------------------------|
| 1. Main Heater Body           | 2. Control Unit (with accessory plug) |
| 3. Main Wiring Harness        | 4. To Power Supply                    |
| 5. Fuse Holder                | 6. External Temperature Probe         |
| 7. Mounting Gasket            | 8. Combustion Air Pipe Clamp          |
| 9. Combustion Air Pipe        | 10. Combustion Air Pipe Strap         |
| 11. Combustion Pipe Silencer  | 12. Exhaust Pipe Clamp                |
| 13. Exhaust Pipe P-Clip       | 14. Exhaust Pipe                      |
| 15. Exhaust Silencer*         | 16. M6 Nut & Washer (x4)              |
| 17. Fuel Pump                 | 18. Fuel Pump Mount                   |
| 19. Fuel Pump Damper          | 20. Non-Return Valve                  |
| 21. Fuel Filter               | 22. Fuel Pipe Connector               |
| 23. Fuel Pipe Connector Clamp | 24. Fuel Pipe                         |
| 25. Fuel Standpipe            |                                       |

\*Unsealed, must be installed outside of the vehicle. When purchased with a marine kit, the silencer will be sealed, and attached to the exhaust pipe as part of a single system

Figure VI shows the diagram for an Airo 2 installation. The position and ways of fixing of various parts may vary from one vehicle/boat to another, but the general principles remain the same.

**Attention:**

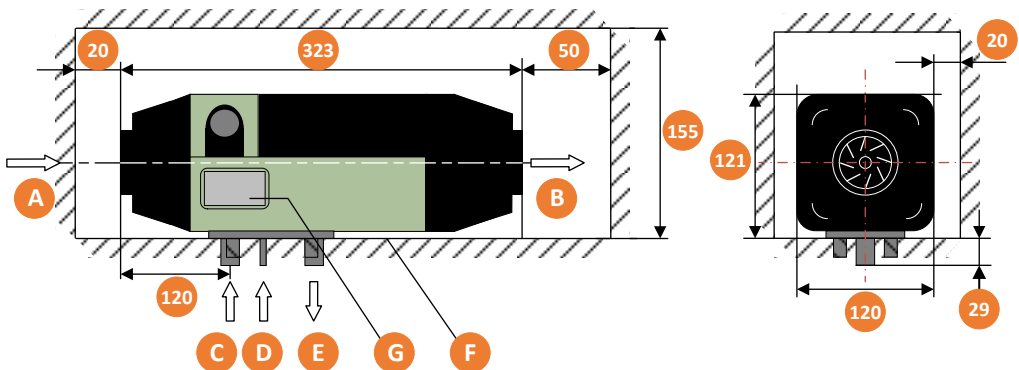
- Do not mount the heater near any flammable sources
- Do not install the heater in closed spaces without ventilation
- Do not place the heater near anything that can cause a blockage

- Do not mount the heater near any water sources and protect it from any splashing or road debris

## Installation of the Main Heater Body

For the ease of servicing, fault finding and air flow it's recommended that the main body is placed in an area with easy access. Figure VII shows the minimum distances required on the MV Airo 2 and Figure VIII shows the distances for the Airo 5.

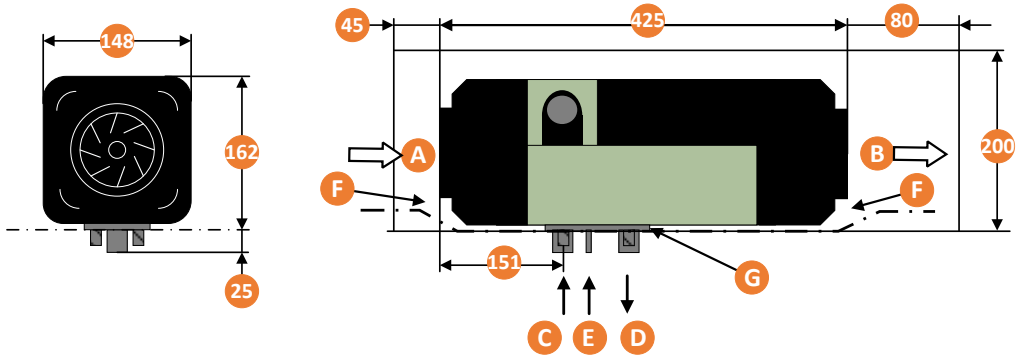
### MV Airo 2 Dimensions



**Figure VII**

- |                                |                                 |
|--------------------------------|---------------------------------|
| <b>A.</b> Air heating inlet    | <b>B.</b> Air heating outlet    |
| <b>C.</b> Combustion air inlet | <b>D.</b> Fuel inlet            |
| <b>E.</b> Exhaust outlet       | <b>F.</b> Non-interference area |
| <b>G.</b> Information label    | <b>H.</b> Installation surface  |
| <b>I.</b> Gasket               |                                 |

## MV Airo 5 Dimensions



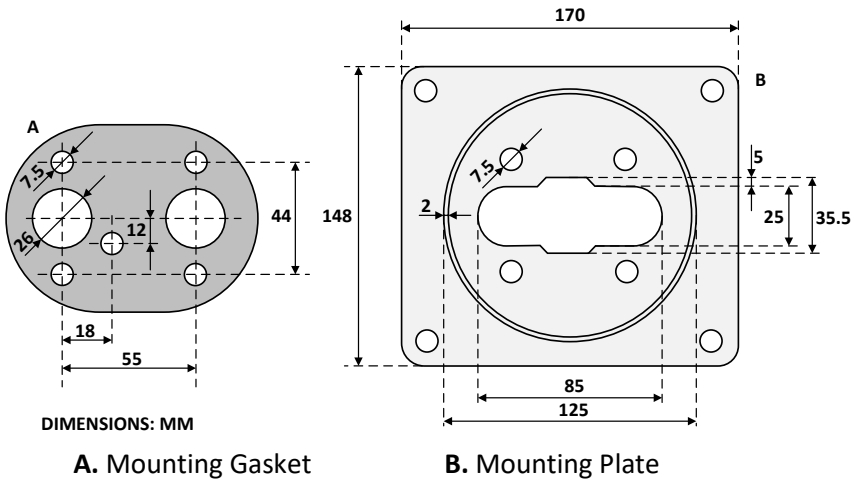
**Figure VIII (Dimensions: mm)**

- |                                |                                 |
|--------------------------------|---------------------------------|
| <b>A.</b> Air inlet            | <b>B.</b> Air outlet            |
| <b>C.</b> Combustion air inlet | <b>D.</b> Exhaust outlet        |
| <b>E.</b> Fuel inlet           | <b>F.</b> Non-interference area |
| <b>G.</b> Installation Surface |                                 |

Choose a flat installation surface, any undulations could cause the case to twist and will not ensure an even mount. Make sure there are no foreign bodies between the bottom of the heater and the installation surface itself. This will ensure a good seal between the two. File down any drill holes to again ensure an even mounting surface. Tighten the M6 bolts provided to a torque setting of 6Nm+1Nm.

Figure IX shows the position of the installation holes. If the installation area is less than 1.5mm thick a mounting plate will be required (Figure IX).

## Mounting Gasket and Plate Dimensions

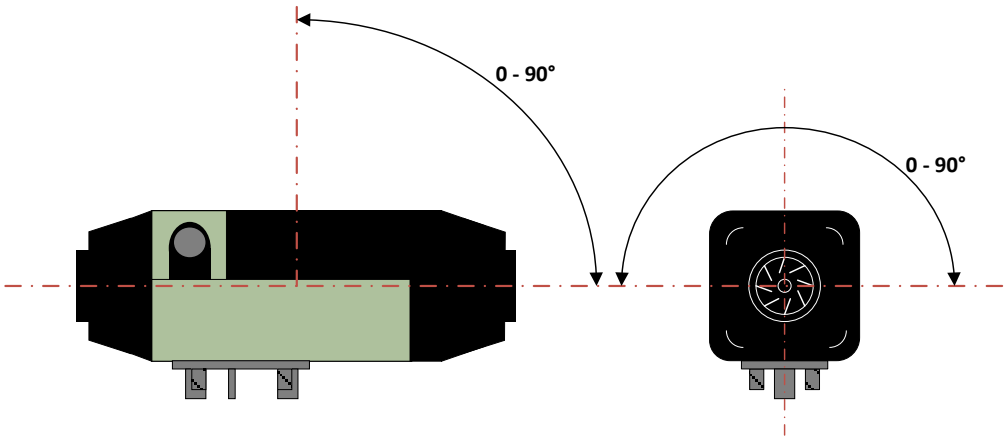


**Figure IX**

The mounting gasket and mounting plate required in most vehicle installations is shown above. Marine and other applications may require a bulkhead mounting bracket. These are available at MV Heating and the heater's main footprint remains the same.

If the heater is being reinstalled, a new gasket should be used.

## Angle of Installation



**Figure X**

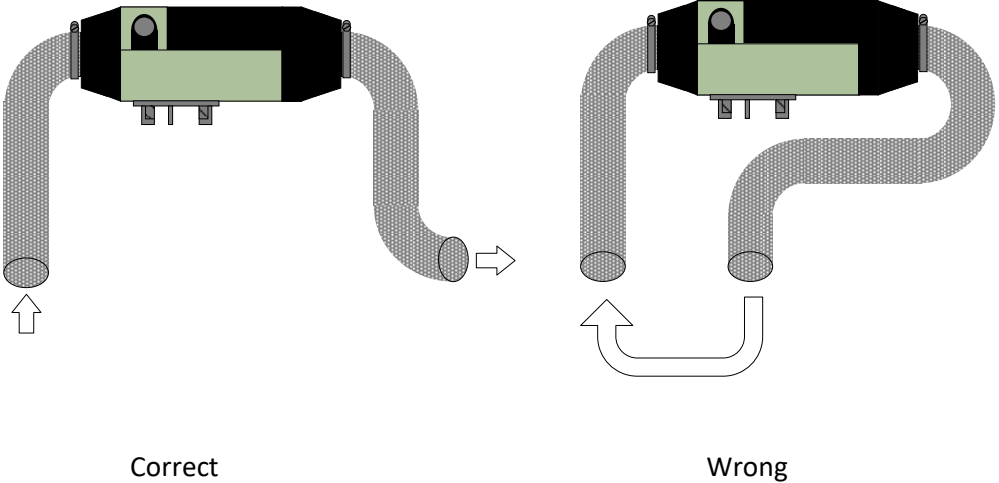
The angle of installation is shown in figure X. Ensure you do not exceed the inclination angle or normal operation will be affected.

After installation, make sure there is no friction between the fan and other nearby parts to ensure smooth operation and make sure the heater label is clearly visible for ease of maintenance in the future.



## Air Inlet & Outlet

Make sure that the hot air outlet does not exit onto any parts affected by heat and that it isn't directed toward the flow of anything that can cause a blockage, near splashing water or near the vehicles exhaust.



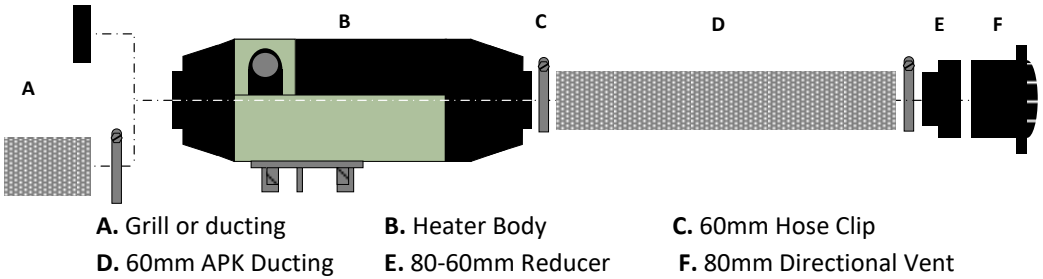
**Figure XI**

Avoid re-entering of the supplied hot air into the inlet port (as shown in Figure XI). If no inlet pipe is required, make sure the grill is installed at the inlet port instead (Figure V no. 6).

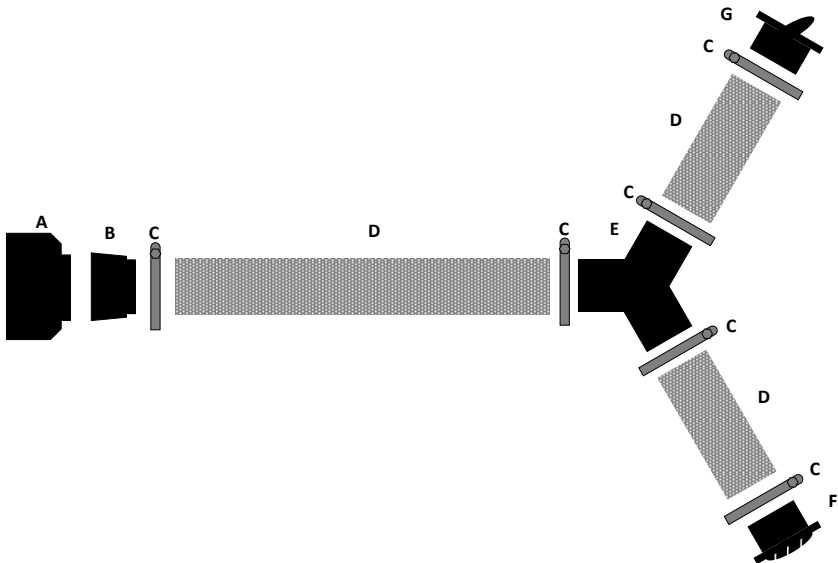
Ducting can be configured in various ways as shown overleaf. The **MV Airo 2 uses 60mm ducting**, and the **MV Airo 5 uses 90mm**, but can be reduced down to 80mm if desired as shown in Figure XIII on the next page.

## Additional Ducting

Quantity of ducting can be purchased according to needs.



**Figure XII**



**A.** Heater Outlet **B.** 90-80mm Reducer (Optional) **C.** 80mm Hose Clip **D.** 80mm APK Ducting **E.** 80mm 'Y' Branch **F.** 80mm Directional Vent **G.** 80mm Open/Close Vent

**Figure XIII**

## Installation of Combustion Air Pipe and Exhaust

The combustion air inlet pipe sucks in fresh air from outside of the vehicle and the exhaust discharges fumes outside of the vehicle. Measures must be taken to avoid the fumes from re-entering the vehicle.

The pipes should exit at the bottom of the vehicle, ensuring that the openings are far enough away from any splashing water or dirt that can clog them.

Figure XIV shows the right and wrong way to install the pipework.

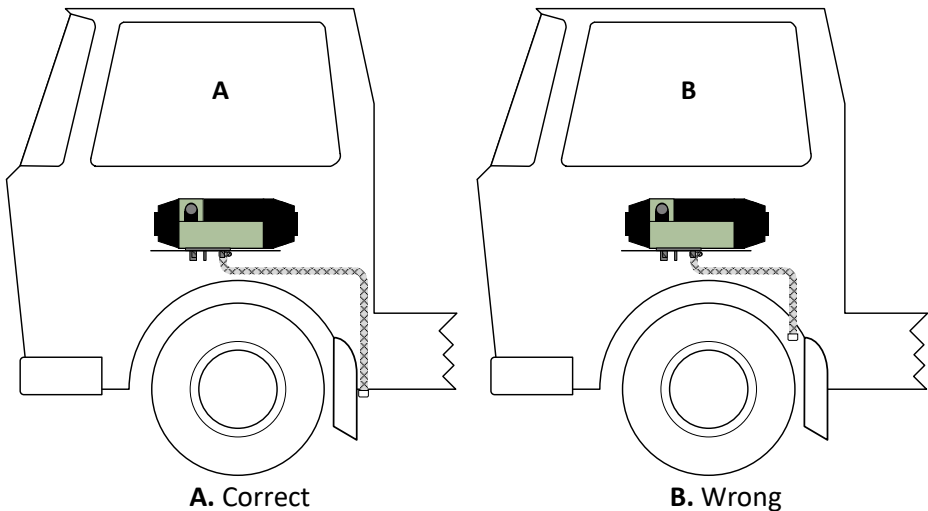
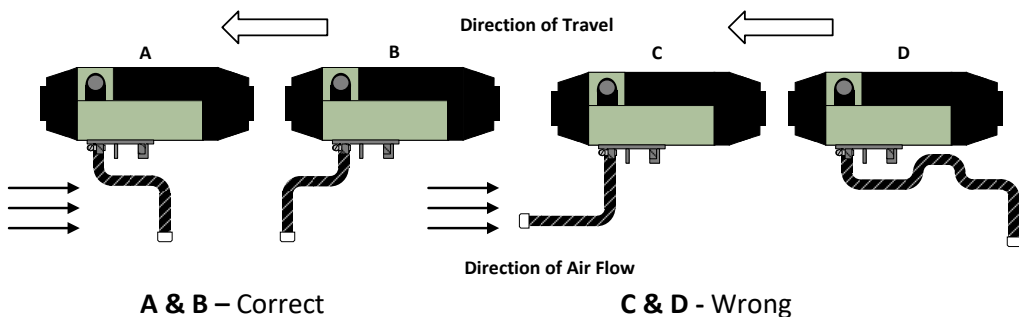


Figure XIV

Only use the inlet pipe and exhaust provided with the kit for installation. The exhaust pipe is made of corrugated stainless steel while the combustion pipe is aluminium covered in paper and plastic. **Do not** confuse the two. Use the supplied clamps to fix them securely to the combustion air inlet and the exhaust outlet on the heater. The protective end cap on the outlet of the

combustion air pipe and exhaust pipe should be kept in good condition. Do not damage or remove them.

Both the combustion air pipe and exhaust pipe should come downward from the heater and face opposite to the vehicle's direction of travel. If the pipe cannot avoid a curve, make sure the radius is no smaller than 50mm and the sum of all curves does not exceed 270°. Figure XV shows the right and wrong way to install the combustion air intake. Note that it is the same for the exhaust too.

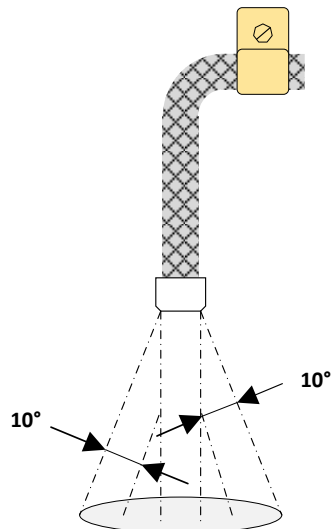


**Figure XV**

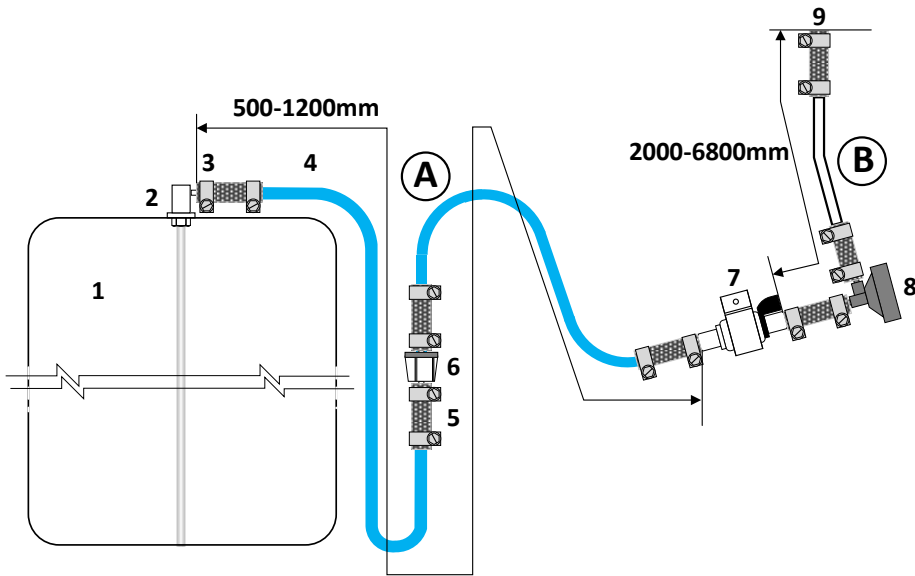
When the heater is operating, the exhaust will get hot, so make sure it is installed away from any parts that could get damaged by high temperatures. The exhaust vent should also point downward to the road surface with an angle of  $90^\circ \pm 10^\circ$ . This is best achieved by fixing a clamp 150mm from the pipe end.

Any exposed exhaust should be covered with a heat shield to prevent scalding.

**Figure XVI**



## Installation of Fuel Lines



**Figure XVII**

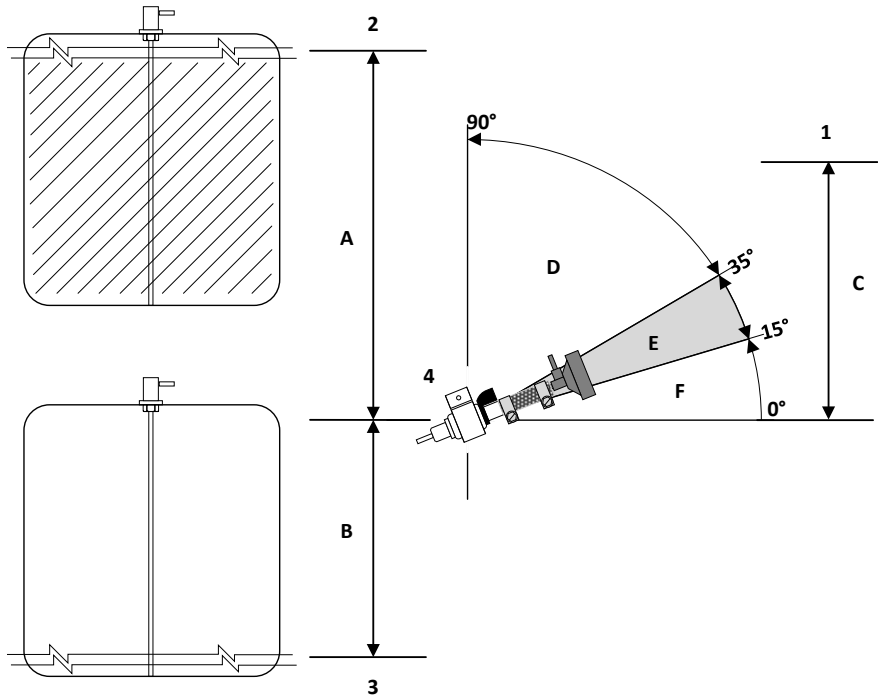
- |                           |                            |                                  |
|---------------------------|----------------------------|----------------------------------|
| 1. Fuel Tank              | 2. Fuel Standpipe          | 3. Fuel line connector hose clip |
| 4. Fuel Line              | 5. Fuel line connector     | 6. Fuel Filter                   |
| 7. Fuel Pump              | 8. Damper                  | 9. Heater Body                   |
| A. Blue Plastic Fuel Line | B. Clear Plastic Fuel Line |                                  |

**NOTE:** Copper fuel should be used for inland waterways vessels.

The vehicle's own fuel tank can be used to supply fuel to the heater, a separate tank can be used if necessary. If a separate tank has been used, please ensure that it is not installed in the driver or passenger cab and is away from anything that could cause a fire risk or inhaling of toxic fumes.

Always fit the fuel pump on the anti-vibration mount securely onto the vehicle. Ensure the outlet of the fuel pump tilts upward. The correct angle is shown in figure XVIII.

Where possible the fuel line should ideally be placed uphill to the fuel pump to ensure ideal bleeding of the fuel line.



1. Heater Body

3. Min. Fuel Level

2. Max. Fuel Level

4. Fuel Pump and Damper

### Fuel Pump Angle & Suction Height

A. 3000mm

B. 500mm

C. 2000mm

D. Not acceptable

E. Acceptable (between 15-35°)

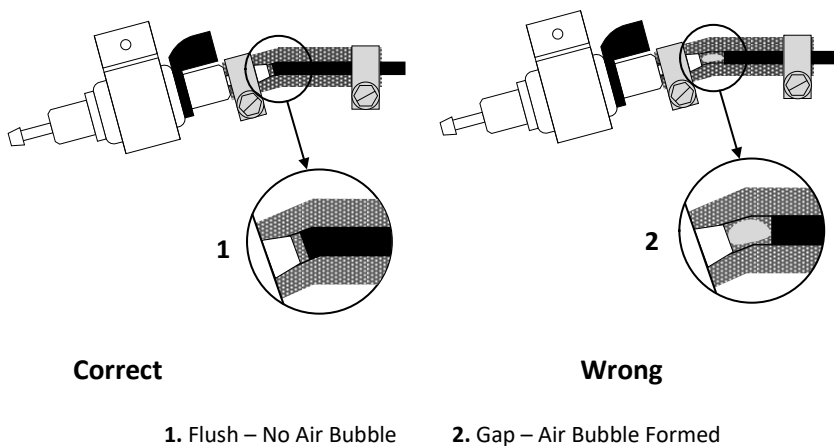
F. Not acceptable

**Figure XVIII**

Figure XVIII shows the ideal angle to mount the fuel pump

The fuel pump's outlet should tilt upward at an angle between 15°-35° (as shown above). Only use the fuel line provided, ensure the pipe is placed away from any possible debris and avoid any sagging in the line. Make sure the fuel line does not flow downward toward the fuel pump. This will prevent correct fuel flow and produce air bubbles in the line.

**The fuel filter, fuel pipe and clamps should all be replaced after 2 years of us**



**Figure XIX**

Figure XIX shows the correct way to connect fuel lines to prevent the build-up of air bubbles. Ensuring they are flush and minimising bends.

When the fuel is being sucked from the vehicle tank, or an independent tank, a suction pipe is required. Make sure all the openings are appropriate for the installation and a tight seal is maintained for the base of the suction pipe.

The bottom of the suction pipe should be about 30-40mm from the bottom of the fuel tank so as to avoid sucking impurities or sediment from the bottom of the fuel tank.

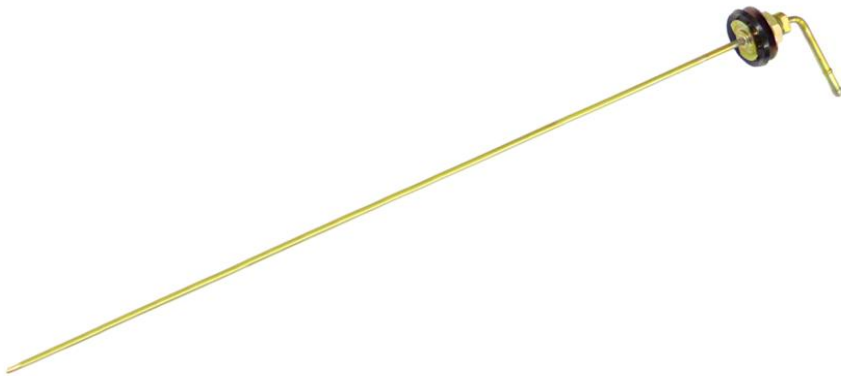
## Fuel Standpipe

A fuel standpipe (or suction pipe) will need to be installed in the vehicle's fuel tank or an independent fuel tank depending on what the installation calls for. Sealant is not required to fit the standpipes.

Depending on the standpipe provide in the kit you will need to install the standpipe in one of two ways.

Standpipe 1: (**Part No:** AHZ-034)

**Figure XX**



Usually supplied in Marine kits and supplied bent, this standpipe is installed like so:

- Drill a hole in the top of the vehicle's fuel tank  $\Phi 22 \pm 0.2\text{mm}$  in size. Ensure it is smooth and clean of burrs
- Remove the top nut and washers and bend the standpipe straight
- Cut the standpipe down to size if necessary
- Fit the standpipe by tilting it into position into the newly drilled hole
- Place the rubber and metal washers back on top followed by the nut and tighten it securely on top



Standpipe 2 (Sender Unit Pipe): (**Part No:** AHZ-035)



**Figure XXI**

Supplied mainly in vehicle kits, this standpipe (or sender unit pipe) is installed like so:

- If possible; remove the sender unit from the vehicle's fuel tank, this will make it easier to attach the nut securely back onto the standpipe
- Drill a  $\Phi 6 \pm 0.2\text{mm}$  hole into the sender unit
- Remove the nut from the standpipe and feed it through the hole ensuring the rubber 'o' ring remains on the standpipe 'head' side
- Replace the nut on the standpipe to secure it safely to the sender unit.
- Replace the sender unit into the fuel tank.
- Alternatively, to use in a marine application, simply tap an M6 hole into the fuel tank, and screw the fuel standpipe with O-ring inside.

The bottom of the fuel standpipe should be 30-40mm from the bottom of the fuel tank to allow enough suction of fuel and at the same time not allow impurities and sediment to be drawn up the standpipe.



# MV Airo 2 Wiring Diagram

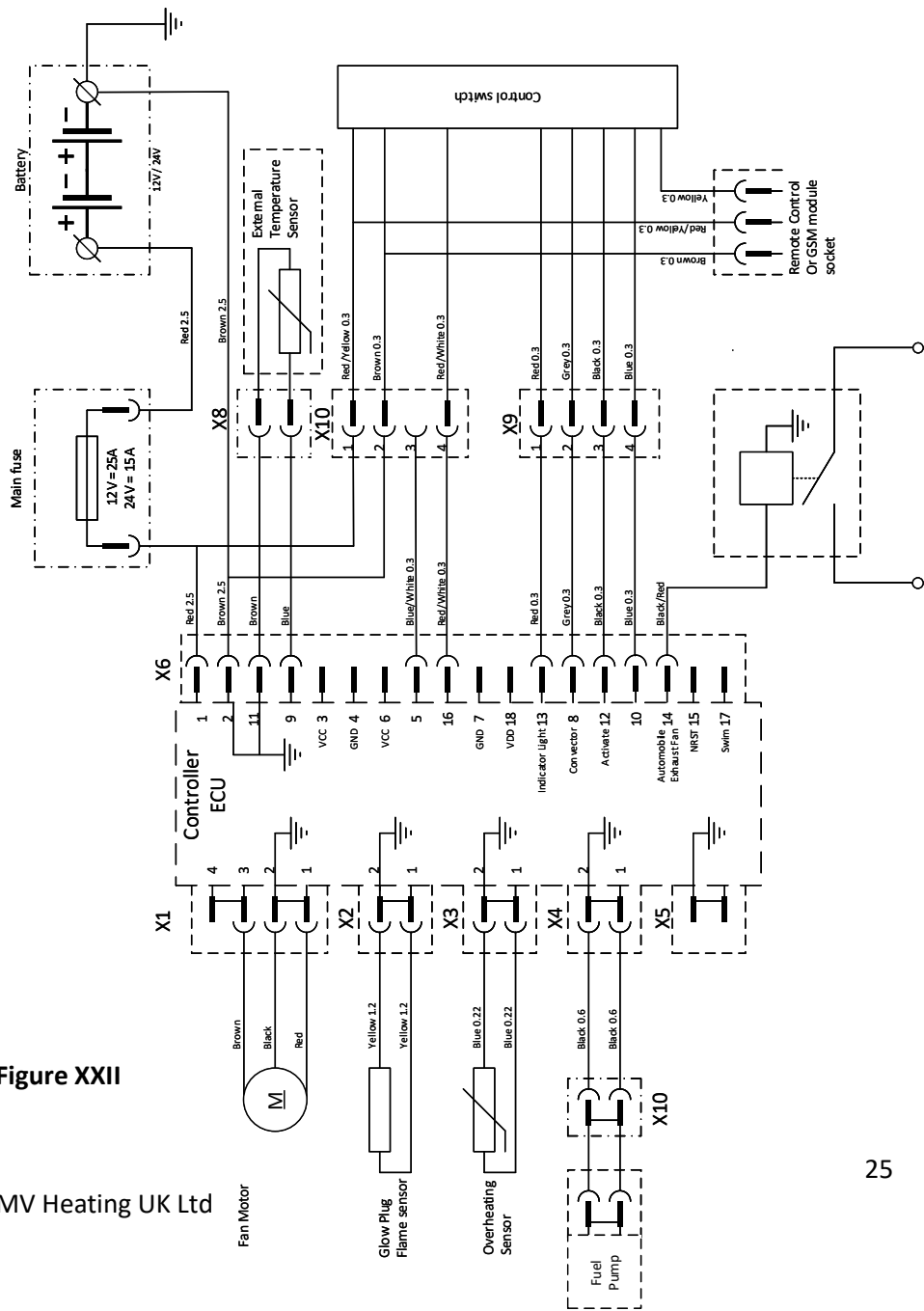


Figure XXII

The previous page shows the wiring diagram for the heater.

The wires of the main heater have been made into bundles. They can be laid according to the positions of various components and should be fixed to the proper locations. The distance between two fixing points should not exceed 300mm.

**Note:** Any exposed wire outside the vehicle should be protected so as not to be ripped by any road debris or similar.

Connect the main wiring harness to the heater by gently removing the junction box cover. Connect the 12-wire connector of the main wiring harness to the controller socket (X7). The main harness can exit the heater to the left or to the right. Then replace the cover ensuring a good seal is kept all the way round. A fuse will already be inserted into the fuse holder (20A for 12V heaters and 15A for 24V versions).

Connect the 2.5mm<sup>2</sup> red wire and the 2.5mm<sup>2</sup> brown wire in the wire harness to the spring terminals and then to the positive and negative of the vehicles battery.

Straighten the fuel pump leads (two 0.6mm<sup>2</sup> black wires) and put them through the opening on the wall of the air inlet pipe. They can then be connected via the spring plug straight to the fuel pump or using the fuel pump extension loom if more length is required.



# MV Airo 5 Wiring Diagram – Brushless Version

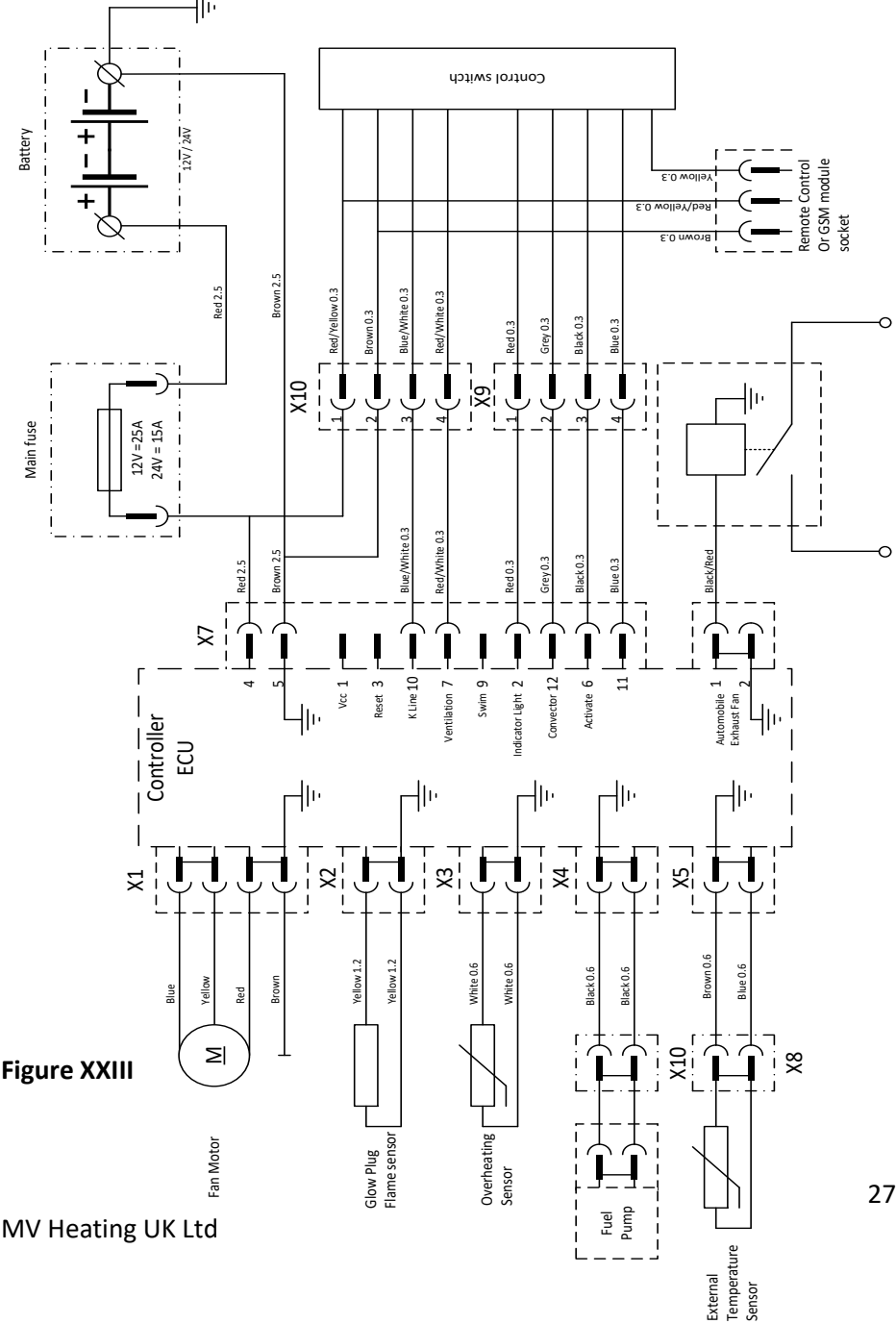


Figure XXIII



Figure XXIII shows the wiring diagram for the MV Airo 5. The wires of the main heater have been made into bundles. They can be laid according to the positions of various components and should be fixed to the proper locations. The distance between two fixing points should not exceed 300mm.

**Note:** Any exposed wire outside the vehicle should be protected so as not to be ripped by any road debris etc.

Gently remove the Airo 5's junction box cover and insert the main connector of the wiring harness into the E.C.U. at X7 (figure XXV). **WARNING:** The tab on the main connector should be facing upright when connected, as the E.C.U. will become damaged if plugged the incorrect way in. Next connect the temperature probe plug into X5. The loom can either exit to the right, or left of the heater body, depending on preference. The junction box cover can now be replaced into position, ensuring the rubber grommet sits neatly in the cut out of the ECU cover.

A bladed fuse will already be inserted into the holder 'F' (20A for 12V versions and 15A for 24V). Use a screw to fix it in a suitable position on the vehicle.

Connect the 2.5mm<sup>2</sup> red wire and the 2.5mm<sup>2</sup> brown wire in the wire harness to the spring terminals and then to the positive and negative of the vehicle's battery.

Straighten the fuel pump leads (two 0.6mm<sup>2</sup> black wires) and put them through the opening on the wall of the combustion air inlet pipe of the heater. Then insert the plug to the spring terminals of the fuel pump connector.

## **Timer and Rheostat Control Plugs**

Use a single screw to fix the timer control or rheostat control in place. They are best installed so that they can be seen and operated easily to identify working conditions and for easy access. The black and clear plugs connect to the corresponding plugs on the loom (below). The remaining three-pin socket on the timer or rheostat control plugs into the remote-control receiver if one is installed. An adaptor cable may be necessary.

## **External Remote Temperature Sensor Probe**

The remote temperature sensor probe is best installed at shoulder height whilst sat down, ensuring ample air flow and a clear ambient temperature reading

It is inserted into the corresponding blue and brown wire plug just off from the main E.C.U. connection X6 (Figure XXVII) on the Airo 2, or into X5 (Figure XXVIII) on the MV Airo 5.

## ECU Connections – Airo 2

The connection parts on the controller case are designed in such a way that wrong connections are impossible to make.

The following circuit interfaces can be found on the controller case; these are:

- X1: Fan motor
- X2: Glow plug
- X3: Overheat sensor
- X4: Leads to fuel pump
- X5: Unused
- X6: Main Wiring Harness

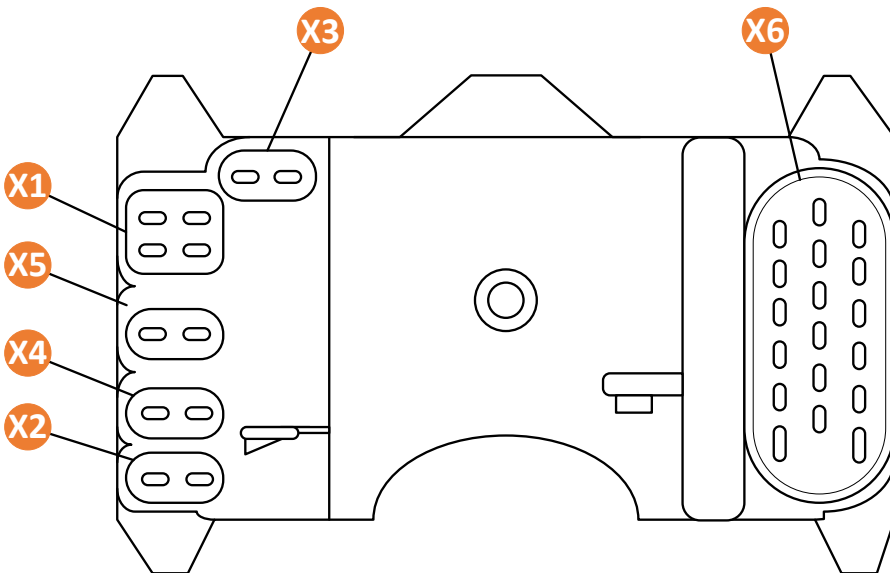


Figure XXVII

## ECU Connections – Airo 5

The connections on the ECU are made so that plugging the wrong connector in is difficult due to the orientation points inside the connectors. If you pay attention to these, then each plug will be a nice push fit, and no force should be required.

Figure XXV shows the correct connections and their wire colours:

- X1: Air motor (red, yellow, brown and blue)
- X2: Glow plug/flame sensor (brown and yellow)
- X3: Overheat sensor (2 x blue)
- X4: Fuel pump (2 x black)
- X5: Temperature sensor (brown and blue/purple)
- X6: Convactor Motor (empty)
- X7: Main wiring harness (bulk)

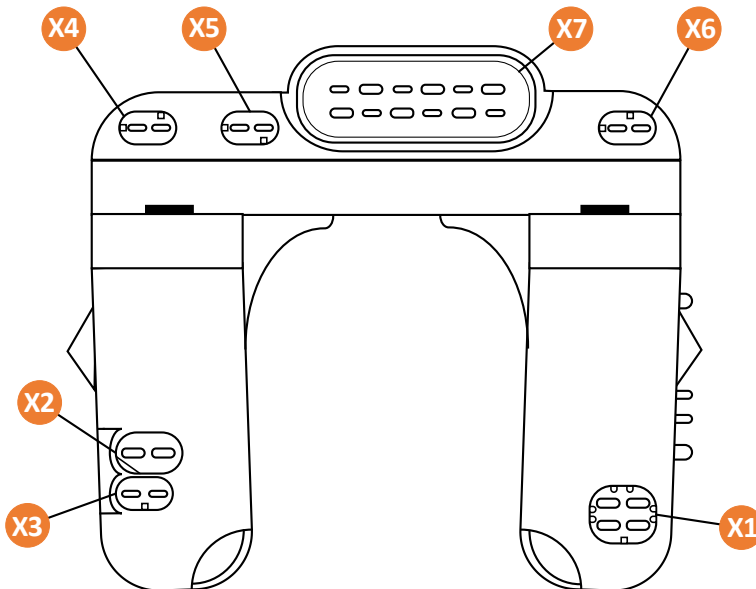
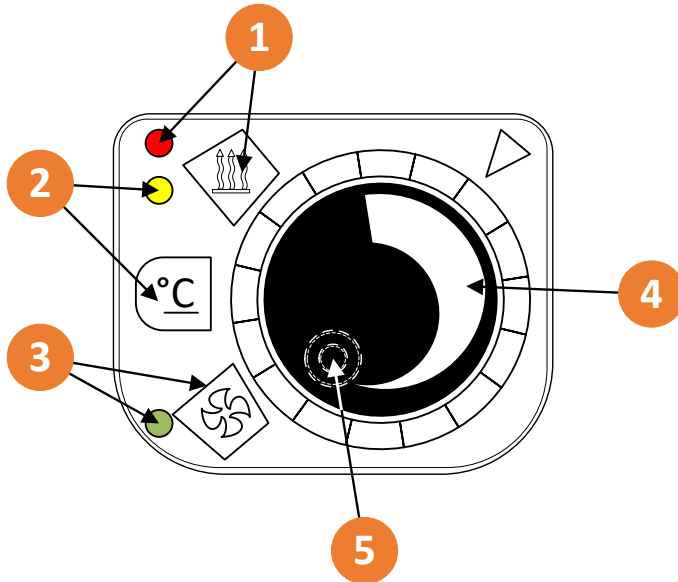


Figure XXVIII



## Operation

### Rheostat Control



**Figure XXIX**

1. Variable Output Button and Indicator Light
2. Temperature Button and Indicator Light
3. Fan Only (Cold Air) Button and Indicator Light
4. Control Knob
5. Fixing Screw Hole (Located underneath control knob)

The rheostat (or rotary) control works by twisting the control knob to the desired heat setting, and using the buttons listed to determine the heaters function. The Alpine Auto model of heaters have a fully automatic altitude function that operates up to 5000m, allowing the user to take their vehicle almost anywhere!



## **On/Off**

- 1)** Press the top button to turn the heater on, and the red light will appear.
- 2)** Use the rotary knob to control the heaters fan speed from high to low (the higher the fan speed, the quicker the vehicle will get warmer!)
- 3)** Press the top button again, to switch the unit off (the unit will go into a two-minute cool-down cycle).

## **Thermostatic Mode**

- 1)** Press the middle button to turn the heater on, and the yellow light will appear.
- 2)** Use the rotary knob to control the temperature from high to low.
- 4)** Once the heater reaches the temperature set on the rotary knob, it will shut itself down.
- 5)** Once the temperature has dropped again, the heater will turn back on, and start to heat again.
- 3)** This process will continue until you press the middle button again, to switch the unit off (the unit will go into a two-minute cool-down cycle).

## **Fan Mode**

- 1)** Press the bottom button to use the fan only mode.
- 2)** Press the bottom button again to turn the fan off.

## LCD Digital 7-Day Timer

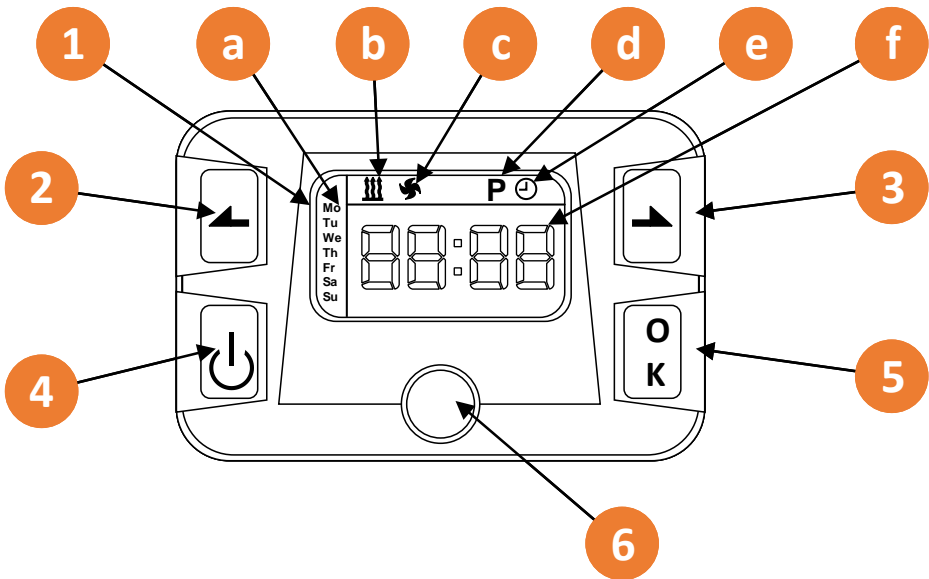


Figure XXX

- |                       |                                   |
|-----------------------|-----------------------------------|
| 1. LCD Screen         | a. Days of the week               |
| 2. Left Arrow Button  | b. Heating Symbol                 |
| 3. Right Arrow Button | c. Fan Symbol (later models only) |
| 4. Power/Back Button  | d. 'P' (Timer) Symbol             |
| 5. OK Button          | e. Clock Symbol                   |
| 6. Fixing Screw Hole  | f. Clock Face                     |

### Functions:

- 7 day timer, able to be programmed 3 times daily
- 7 step variable output mode
- Thermostatic mode from 05°C to 35°C
- Adjustable cold air fan mode (on later versions)

## Changing Language

The language should be set to English. However, if it isn't or the control has been reset to default settings it will revert to Chinese. Please follow these steps to convert the language to English.

**1.** Turn on the control with the power button. Wait for the symbols to stop flashing, then press the power button again.

**2.** Navigate to the clock face symbol at the top of the control by using the arrow keys. When it is flashing press both arrow keys simultaneously.

**3.** P1 now appears.

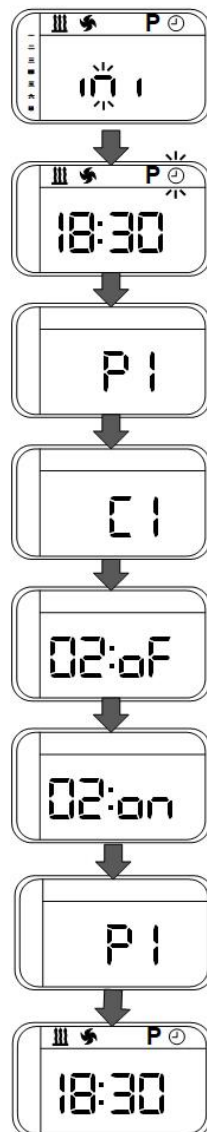
**4.** Press ok and C1 will appear.

**5.** Keep pressing ok slowly until '02:oF' appears.

**6.** Press any of the arrow keys until the screen reads '02:on'

**7.** Keep pressing ok until back to the P1 menu screen

**8.** Press power button to return. The language will now be set to English.



## Changing the Date and Time

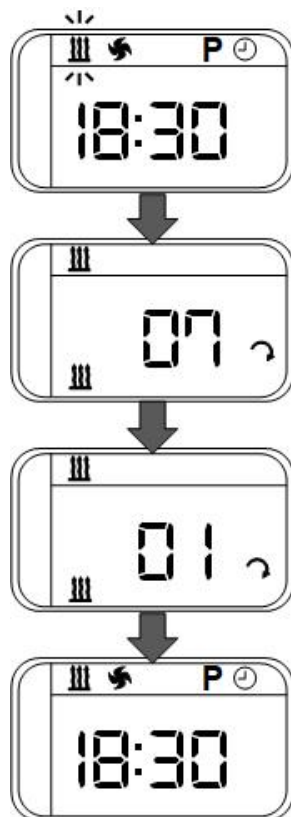
1. To change the date and time, navigate to the clock face symbol and press ok.
2. Select the day of the week it is first using the arrow keys, and pressing ok to confirm.
3. Select the hour using the arrow keys, and pressing ok to confirm.
4. Finally, select the minutes in the same way.
5. Once completed, the control will return to the home screen (displaying the correct time)

**NOTE:** If the LCD digital timer is disconnected from the loom, the date and time will need to be re-entered.



## Manual On/Off

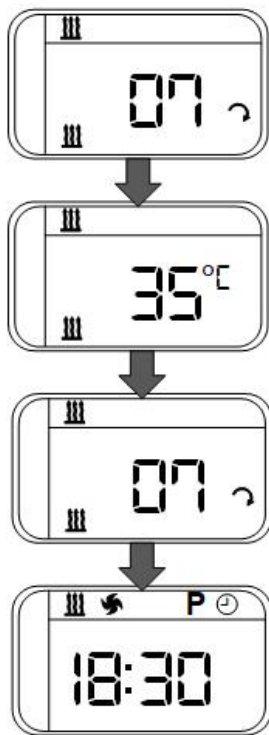
1. To switch the power on manually, navigate to the heating icon, and press ok
2. The heater will start automatically.
3. Use the arrow keys to adjust the output of the heater from high to low (07 to 01 respectively)
4. To switch the heater off, simply press the heater button to return to the home screen.



## Switching to Thermostatic Mode

To switch to thermostatic mode, turn the heater on manually, as stated in the previous step.

1. Once the heater is on, press and hold the ok button for three seconds and then release it.
2. The display should change to a temperature setting which can be adjusted from 05°C to 35°C using the arrow keys.
3. To adjust back to the variable output mode, simply press and hold the ok button again for 3 seconds and then release it.
4. To switch the heater off, press the power button to return to the home screen.



## Fan Mode

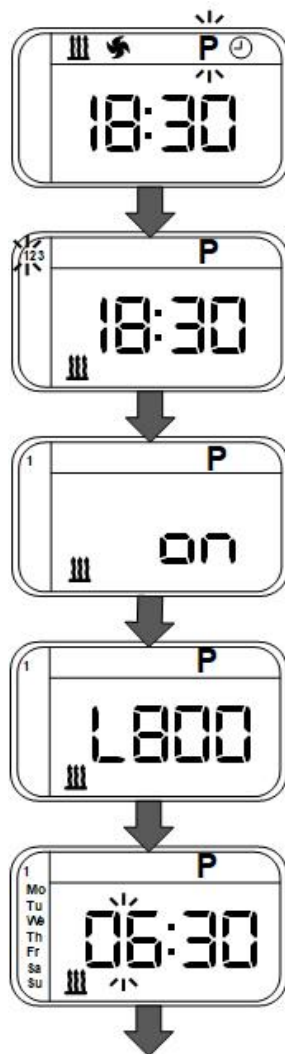
The fan mode works in the same way as the manual on/off mode. Simply navigate across to the fan symbol and confirm with OK. The fan will then automatically switch on and its speed can be adjusted from high to low (07 to 01 respectively) using the arrow keys. To switch it off, press the power button.

**NOTE:** Some earlier models will not have this function.

## Pre-setting Heating Times

The digital control can be used as a 7-Day timer, and is able to be preset to switch on up to three times a day.

1. Navigate to the 'P' symbol, and press OK.
2. Using the arrow keys select the number 1 (flashing) at the top of the screen and press OK – Number 1 is the first heating time.
3. Using the arrow keys, select 'ON', as this will allow the heater to switch on after the presetting is finished. Press OK to confirm.
4. Select the length of time you want the heater to run for by using the arrow keys. – L800 represents 800 minutes. Run time can be selected from 50-990. Press OK to confirm.
5. Select the hour you wish the heater to start at by using the arrow keys and then pressing OK to confirm.





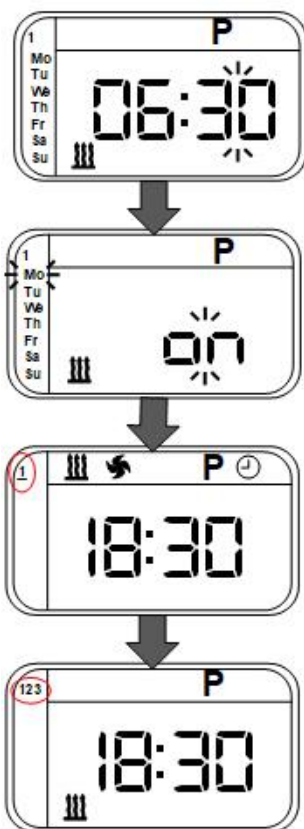
6. Select the minutes in the same way and press OK to confirm.

7. The next step is choosing which day of the week you want the heater to run. Starting with Monday, use the arrow keys to change from 'OFF' to 'ON' and press OK to confirm. Continue this all the way through to Sunday.

8. The preset time should now be set. This will be indicated by the small, underlined number 1 at the top of the screen.

9. To set the second and third heating times, simply repeat all the steps but select 2 or 3 instead of 1 (see step 2.) to set those heating times.

**NOTE:** To turn any of the preset times off without altering the set times, simply go through to step 3 and select 'OFF' using the arrow keys. Then repeatedly press OK until you have returned to the home screen.



## Installation Fuel Priming Feature

### ATTENTION:

- Not to be used in normal heater operation
- Disconnect the fuel line from the heater first, to prevent flooding of the heater and place in a suitable receptacle.

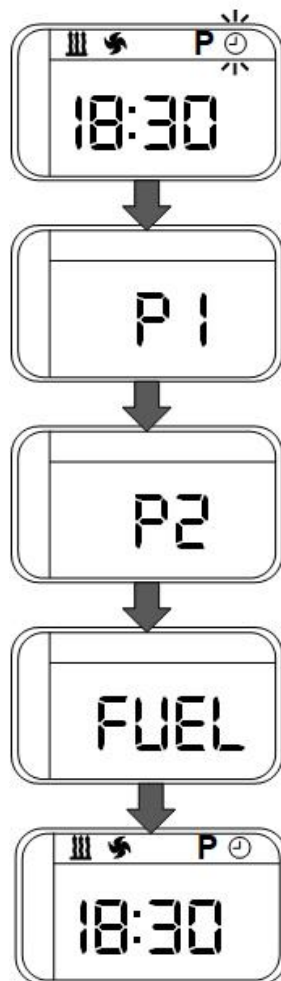
1. To enter the fuel priming mode, navigate to the clock face using the arrow keys and press both arrow keys simultaneously.

2. P1 should appear on the screen.

3. Select P2 by pressing any arrow key, and confirm with OK.

4. The fuel pump will begin to rapidly pump the fuel.

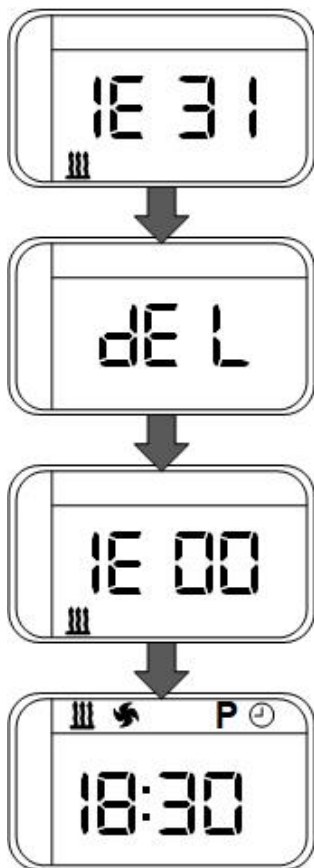
5. It will automatically shut down after three minutes, or press any key to stop the pumping at any time, and return to the home screen.



## Checking Error Codes

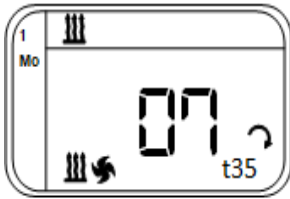
Once an error code has been displayed, and the problem has been amended, follow these steps to reset it.

1. Check the error using the arrow keys. Exit by pressing either OK or the power button.
2. Press both arrow keys to display message 'dEL'.
3. Press OK to delete all errors or power to go back. Once the display reads 'IE00' then no errors have been found.
4. Press OK or power to return.

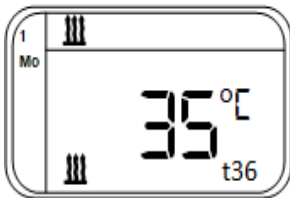


## Entering Altitude Mode

When the heater is running, press the left arrow key and the 'Ok' keys simultaneously. The heating icon, and fan icon should appear at the same time at the bottom of the display. Altitude mode has now been set.

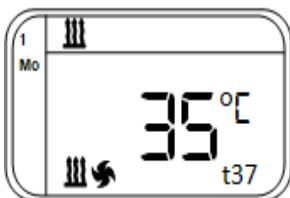


To turn off the altitude mode, press the power button, or press the 'OK' button and left arrow key simultaneously to switch back to the regular heating mode. You can use the arrow keys to change the variable output setting from 01-07.



To change the display to thermostatic mode, press and hold the 'OK' button.

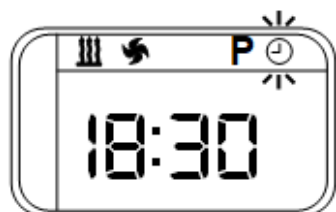
Use the arrow keys to change the temperature control.



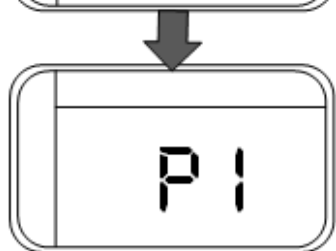
The same can be done whilst in altitude mode. Simply press and hold the 'OK' button to change from variable output to thermostatic mode and use the arrow keys to change the temperature.

Fault codes can be checked by holding both arrow keys at the same time.

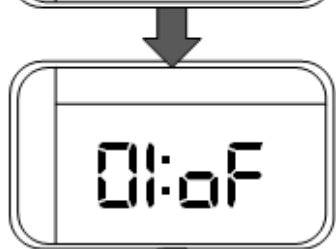
## Changing Temperature Scale (Celsius and Fahrenheit)



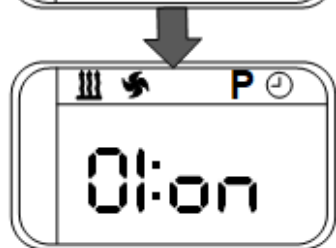
1. Scroll across to the clock face and press the two arrow keys together, 'P1' should appear.



2. Press 'OK' three times until 01:oF appears on the screen, this means it is in Fahrenheit mode.



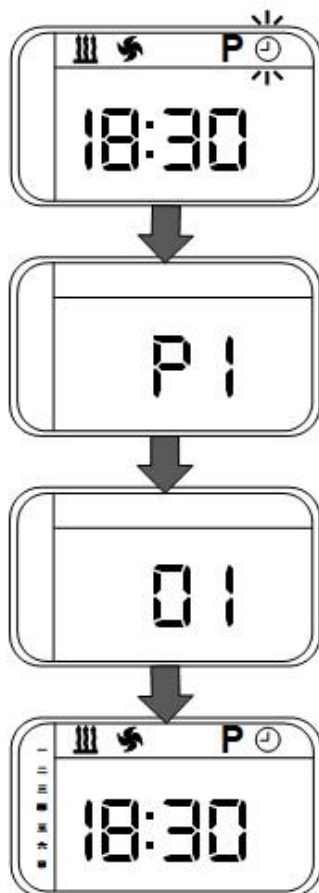
3. To switch it to centigrade, press the right arrow key so the screen reads '01:on'. The temperature scale will now display as centigrade.



4. Press the power button to return to the home screen.

## Resetting Digital Controller to Factory Settings

1. Navigate to the clock face on the menu and simultaneously press both arrow buttons.
2. P1 should appear on the screen.
3. Using the left arrow key select '—01', confirm by clicking the 'OK' button.
4. The control should now be reset to its original factory settings.





## Maintenance

Once the heater is installed, it should ideally be turned on a few times to remove any air trapped in the fuel lines. Also ensure there is no leaking from the lines and that all electric terminals fit securely together.

You should also regularly:

- Check the air inlet and outlet for any pollution or foreign matters
- Clean the externals of the heater
- Check for corrosion or loose connections of the circuits
- Check the combustion air inlet and exhaust pipe for damage and clogs
- Check the fuel line for leaks

To ensure a long life of the heater it is advised that you run it for at least 10 minutes every month, to prevent malfunction of mechanical parts.

After 10 years the heat exchanger, overheat sensor and exhaust should be replaced by a professional.

If any welding is being attempted on the vehicle, please remove the positive power supply wire and earth it to protect the controller from any damage.

## Fault Codes

### Rheostat Control

When the ECU had discovered a fault, the rheostat control will flash a fault code. The control should therefore be ideally placed where it can be clearly seen and accessed.

The faults will be displayed as flashes. Count the flashes to determine the code.

Number of Flashes	Cause of Problem
1	Failure of second start
2	Termination of the third time of combustion
3	Voltage power out of specified range
4	Glow plug temperature increases slowly
5	<b>Air heaters will not flash 5 times</b>
6	Temperature sensor: Broken circuit or short-circuit
7	Fuel pump: Broken circuit or short-circuit
8	Fan motor: Broken circuit, short-circuit or clogged
9	Glow pin: Broken circuit or short-circuit
10	Overheated
11	Overheat sensor: Broken circuit or short-circuit
12	Control switch: Broken circuit or short-circuit





## Timers

1E-02 : Overheat – Check for obstruction or damaged ducting

1E-10 : Ignition failure – Check fuel supply, blocked supply or fuel pump

1E-30 : Voltage too high

1E-31 : Voltage too low – check battery or voltage drop in supply cable

1E-52 : Overheat sensor failure

1E-70 : Fuel pump open circuit or ECU failure

1E-80 : Air motor failure

1E-90 : Glow pin failure

1E-d3: Maintenance Reminder

Thank you for purchasing the MV Airo 2

