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# MV Airo 5

## Diesel Powered Air Heater

### Instruction Manual

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## **Preface**

Thank you for purchasing the MV Airo 5 Air heater. This instruction book describes the structures, working principles, installation and operation of the MV Airo 5. For correct use of the heater please, please read this instruction book carefully before installation and use. The instruction book should be saved in a convenient place for later reference.

## **Attention**

- 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 the user may have through this instruction manual. If you have any doubts or find anything incorrect in this manual, please contact the company directly.
- Check the heater for any damage when unpacking and contact the dealer immediately if any damage 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.



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

## Introduction

The main equipment of the MV Airo 5 Air Heater (hereinafter referred to as 'the heater') is 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 an independent air passage. Cold air is drawn into the air passage by the fan and blown out when it becomes hot.

The heat can be supplied by the heater to the driver's cab and passenger's compartment independent of the engine. The schematic diagram is shown in Fig I.

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

1. Control switch
2. Heater
3. Fuel Pump
4. Reducing T
5. Fuse box

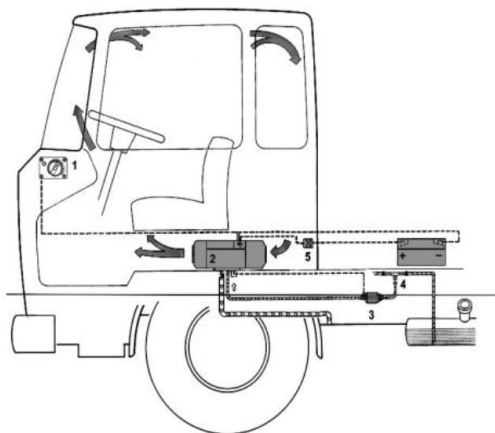


Figure I

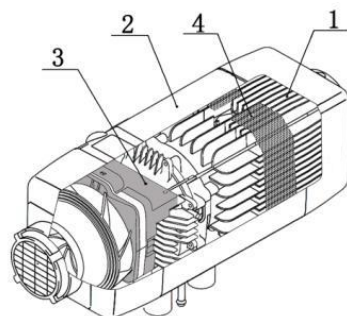
## Technical Data

Heat Power (W)	5000	
Fuel	Gasoline	Diesel
Rated Voltage	12V/24V	
Fuel Consumption	0.19~0.66	0.19~0.60
Rated Power Consumption (W)	15~90	
Working (Environment) Temperature	-40℃~+20℃	
Weight of Main Heater (kg)	5.9	
Dimensions (mm)	425×148×162	
Mobile phone control (Optional)	No limitation	
Remote control (Optional)	Without obstacles ≤800m	

### Structure and Working Principle

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

1. Heat Exchanger
2. Case Assembly
3. ECU
4. Insulating mat



F

Figure II

Figure III shows the structure of the combustion furnace and assembly of controller.

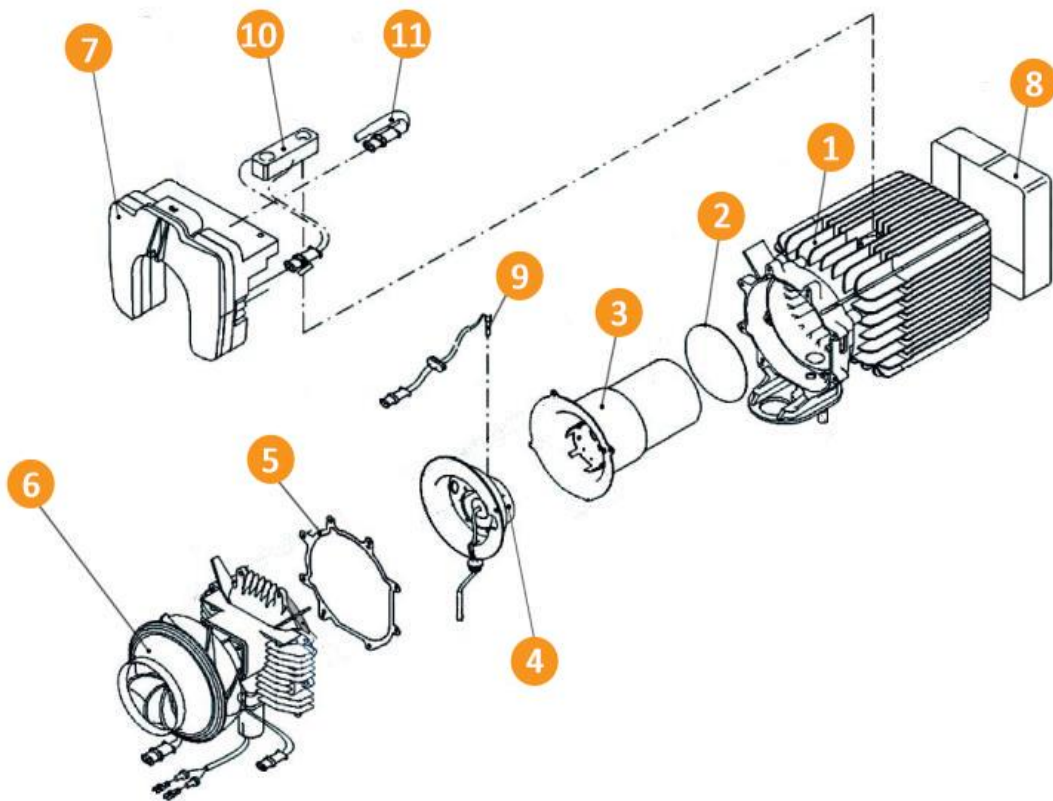


Figure III

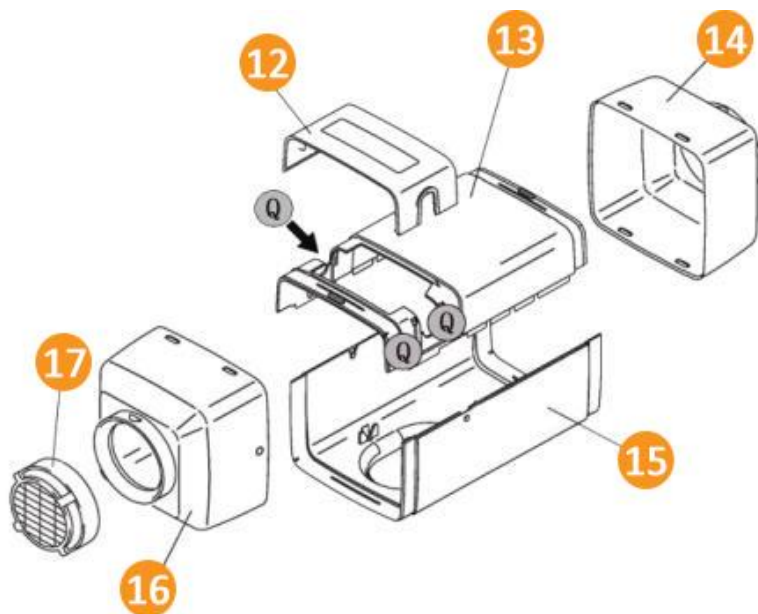


- 1. Heat Exchanger**
- 2. O-ring**
- 3. Combustion Chamber**
- 4. Burner Assembly**
- 5. Gasket**
- 6. Air Motor Assembly**
- 7. ECU**
- 8. Insulating Mat**
- 9. Glow Pin**
- 10. Overheat Sensor**
- 11. Temperature Sensor**

The heat exchanger is made of die-cast aluminium with radiating fins around and at the rear end. The combustion pipe is installed in the inner cavity. The combustion core with protective hood is fixed on the front end base of the combustion pipe. Fuel comes to the combustor core through the fuel pipe and is ignited by the glow plug (which also serves as a flame sensor) after atomization. The flame enters the gap between the inner walls of the furnace body through the exhaust pipe vent.

The fresh air supporting combustion of the furnace comes from the supporting air inlet port and is sent to the combustion pipe by the combustion supporting air blades of the fan motor.

## Heater Cases



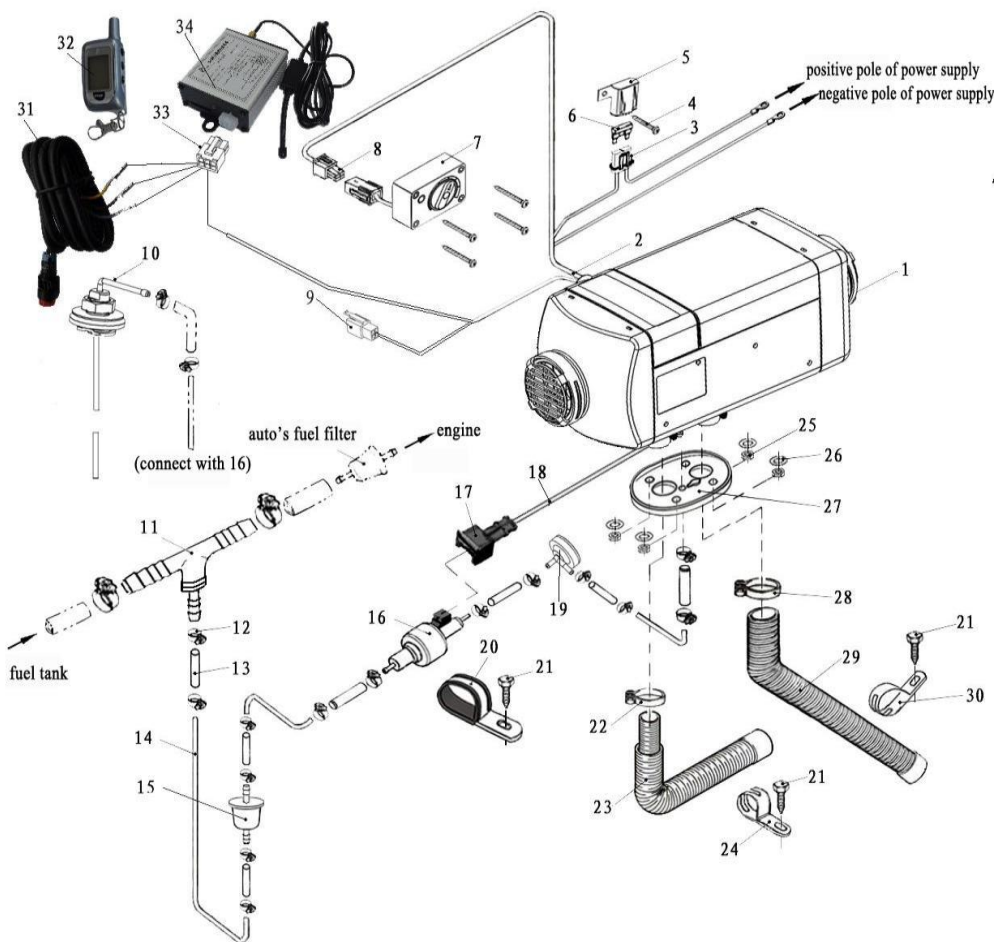
**Figure IV**

- 12.** Junction box cover
- 13.** Top Case
- 14.** Outlet Cover
- 15.** Bottom Case
- 16.** Inlet Case
- 17.** Grill



## Installation

The kit includes everything necessary for installation, it is recommended that you do not tamper or alter any parts as it is all ready straight out of the box.<sup>2</sup>





### Figure V

- |   |                                    |
|---|------------------------------------|
| 1. Heater   | 2. Main wiring harness             |
| 3. Fuse holder                                      | 4. Self tapping screw              |
| 5. Fuse box cover                                   | 6. Fuse                            |
| 7. Control switch                                   | 8. Connector X9 for control switch |
| 9. Trouble diagnosis connector                      | 10. Fuel suction pipe              |
| 11. Reducing T                                      | 12. Fuel pipe clamp                |
| 13. Fuel pipe joint                                 | 14. Fuel pipe                      |
| 15. Fuel filter                                     | 16. Fuel pump                      |
| 17. Fuel pump connector                             | 18. Fuel pump leading wire         |
| 19. Damper  | 20. Fuel pump clamp                |
| 21. Self tapping screw                              | 22. Air inlet pipe clamp           |
| 23. Air inlet pipe                                  | 24. Air inlet pipe fixing clamp    |
| 25. M6 Nut  | 26. Washer                         |
| 27. Gasket  | 28. Exhaust pipe clamp             |
| 29. Exhaust pipe                                    | 30. Exhaust pipe fixing clamp      |
| 31. Manual button                                   | 32. Remote controller              |
| 33. Plug of remote control receiver or GSM receiver |                                    |
| 34. Remote control receiver or GSM receiver         |                                    |

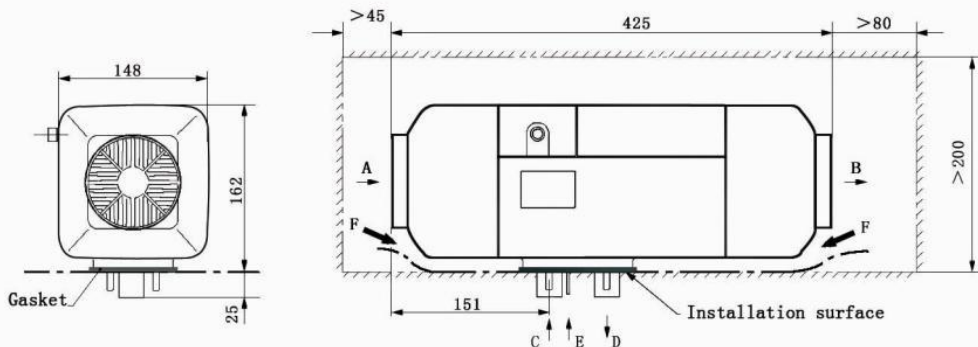
**Note:** The positions and ways of fixing various parts may vary from one vehicle to another, but the general principles remain the same.

### 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

## 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 VI shows the minimum distances required.



**Figure VI**

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

Choose a flat installation surface, any bumps 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. Make sure to insert the gasket between the heater and vehicle body as shown in figure VI. File down any drill holes to again ensure an even mounting surface. Tighten the M6 bolts provided to a torque setting of 6Nm+1Nm.



The direction of the heater for installation is shown in figure IX. 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.

### Supply of combustion air

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.

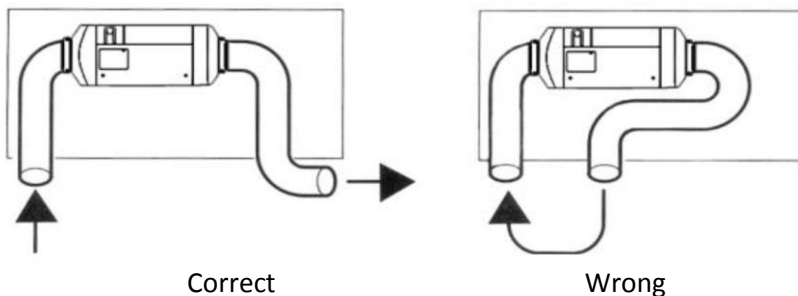


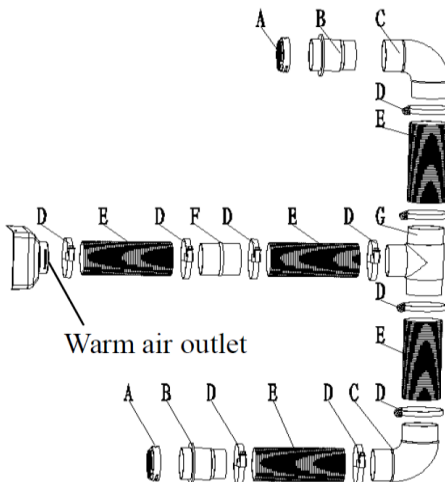
Figure X

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

**Additional Ducting (Optional)**

Quantity of ducting can be purchased according to needs.

No.	Name	Specification
A	Grill	Φ 90
B	Diameter changes joint	Φ 90/60
		Φ 89/85
C	Elbow	Φ 90
D	Clamp	Φ 80~100
E	Ducting	Φ 90/ Φ 95
F	Connecting	Φ 90
G	Reducing T	Φ 90

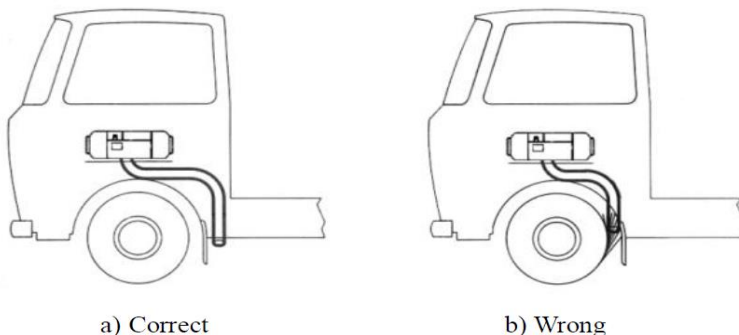


**Figure XI**

## 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.

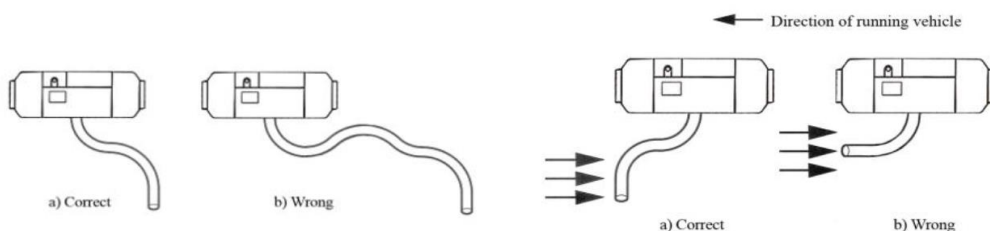
The pipes should exit at the bottom of the vehicle, ensuring that the openings are far enough away from any splashing water or dirt that can clog them.



**Figure XII**

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 hood on the vents of the air inlet pipe and exhaust pipe must 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 XIII**

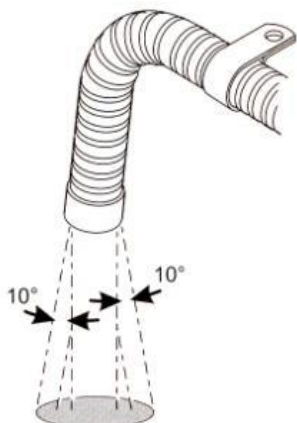
**Figure XIV**

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.

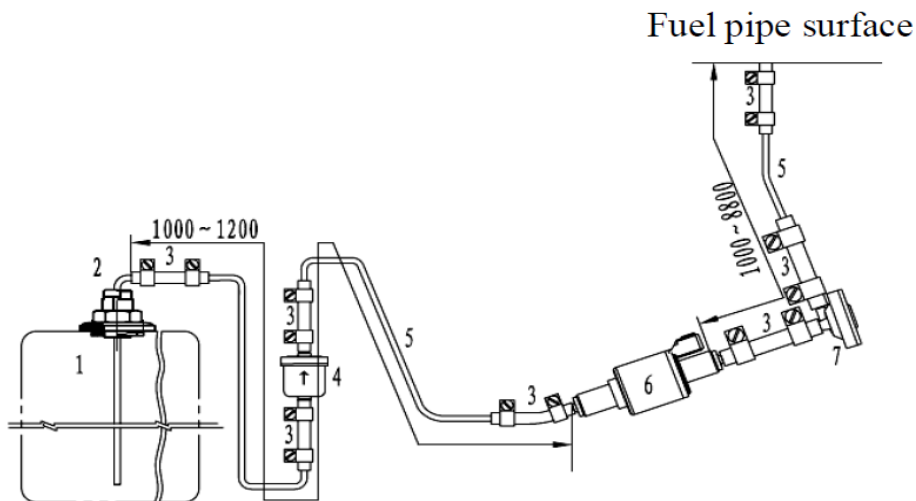
Any exposed exhaust should be covered with a heat shield to prevent scalding.



**Figure XV**



### 3B. Installation of Fuel Lines



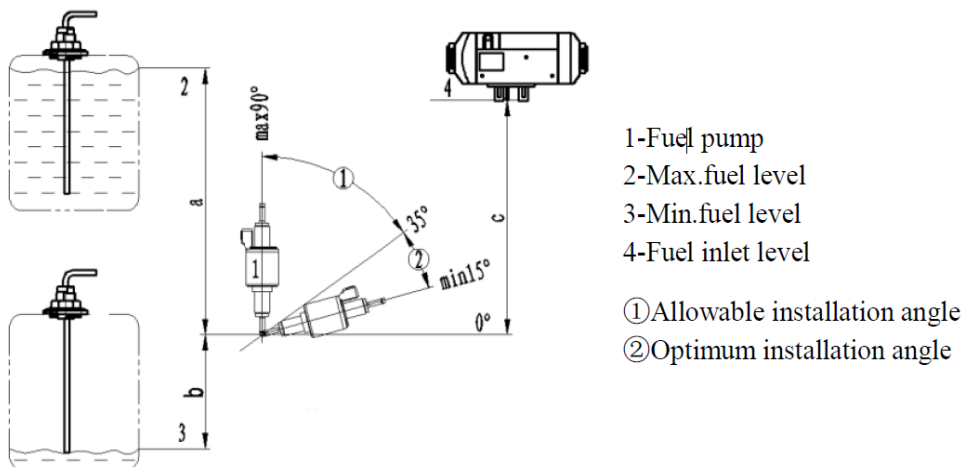
**Figure XVI**

- |              |                   |                        |
|--------------|-------------------|------------------------|
| 1. Fuel Tank | 2. Fuel Extractor | 3. Fuel pipe connector |
| 4. Filter    | 5. Fuel pipe      | 6. Fuel pump           |
| 7. Damper    |                   |                        |

The vehicles own fuel tank can be used to supply the heater or a separate tank can also be applied. 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 ignition.

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 XVII.

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



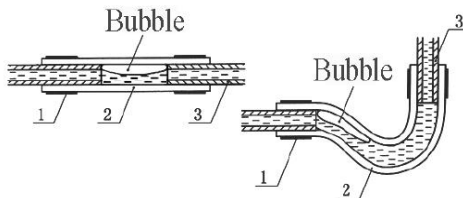
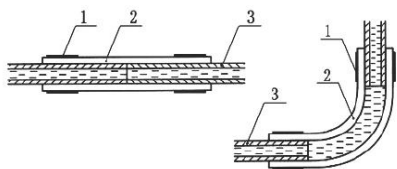
**Figure XVII**

Figure XIII shows the ideal way 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 use.**



**Correct**

**Wrong**

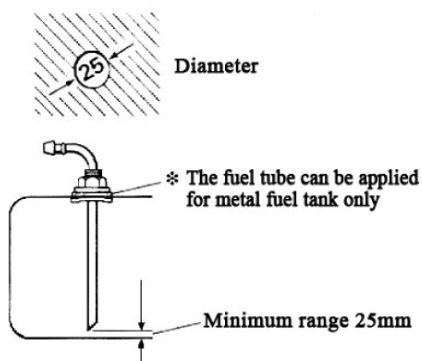
1. Fuel pipe clamp 2. Fuel pipe fitting 3. Fuel pipe

**Figure XVIII**

Figure XVIII shows the correct way to connect fuel lines to prevent the build up of air bubbles.

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.



**Figure XIX**





## Figure XX

Figure XX 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 otherwise.

Connect the main wiring harness to the heater by gently removing the junction box cover. Connect the 18-wire connector X6 of the wire bundle to the controller socket. 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.

Insert sheet fuse into fuse holder 'F' and replace the upper cover tightly. Use screws 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 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. Then insert the terminals to the spring terminals of the fuel pump connector.

Use four self tapping screws to fix the control switch in a position that can be seen easily seen to identify working conditions and also for easy access. The terminal for the control switch (Fig. XXI) inserts into the pin seat and connects with a self-locking mechanism to X9 on the main wiring harness.



**Figure XXI**

Any surplus wires should be kept in good condition and wrapped in electric tape to avoid short circuiting.

## Circuit Interfaces

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/flame sensor
- X3: Overheat sensor
- X4: Leads to fuel pump
- X5: Temperature sensor
- X6: Holzer element
- X7: Main wiring harness

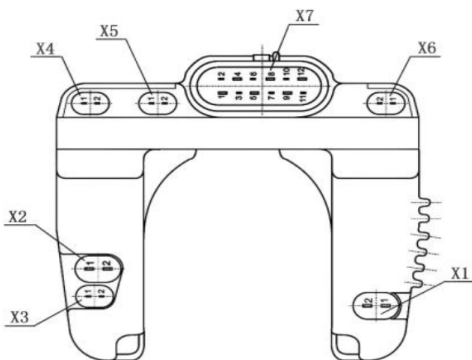


Figure XXII

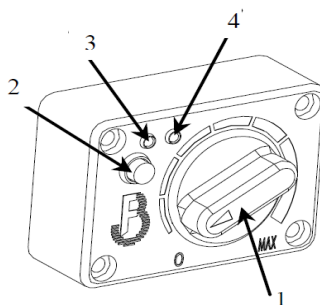


Figure XXIII

1. Control knob    2. Mode transformation button  
3. Mode indication light    4. Working indicator light



## 4. Operation Instructions

Turn the control switch knob clockwise and the power indicator (green LED) will come on. The heater will then begin to run according to the temperature set by the control knob. The time delay in the start stage from fuel supply to fuel pump is 45 seconds.

After the combustion is ignited, you can regulate the temperature by turning the control knob accordingly.

When the mode indicating light turns red, the heater has reached a constant temperature mode. If you then want to adjust the temperature you need to press the curve sign on the control switch, turn the knob to the desired temperature and press the mode-transfer button. The indicating light should then turn green and the heater will convert to a constant power mode.

When in a constant power mode, simply repeat the process to convert it to a constant temperature mode.

To turn the heater off manually, turn the knob anti-clockwise to position '0'. Three seconds after, the indicator light will go out. If the fuel pump is still working it will shut down immediately but the fan will continue to run for 180 seconds.





## 5A. 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.



## 5B. Fault Finding

During use the heater may become unable to start normally or die out after start up. You should then turn the heater off for at least 5 seconds by turning the control knob anticlockwise to position '0' and then restart the heater.

Circuit troubles may be caused by different reasons, such as corrosion of contacts, wires and fuses and terminals or poor/wrong contact of wires and connectors. You should regularly check these troubles to ensure good maintenance of the heater.

The main reasons for troubles will be indicated by the green LED flashes on the control switch. Count the number of **long flashes** to identify the problem.



<b>Number of Long Flashes</b>	<b>Cause of Problem</b>
<b>1</b>	Failure of second start
<b>2</b>	Termination of the fifth time of combustion
<b>3</b>	Voltage out of specified range
<b>4</b>	Flame sensor temperature too high in the start period
<b>5</b>	Flame sensor: Broken or short circuit
<b>6</b>	Temperature sensor: Broken circuit or short-circuit
<b>7</b>	Fuel pump: Broken circuit or short-circuit
<b>8</b>	Fan motor: Broken circuit, short-circuit or clogged
<b>9</b>	Glow pin: Broken circuit or short-circuit
<b>10</b>	Overheated
<b>11</b>	Overheat sensor: Broken circuit or short-circuit
<b>12</b>	Control switch: Broken circuit or short-circuit

Thank you for purchasing the MV Airo 5.