

Preface

Thank you for choosing 5kW Air parking heater

This instruction book describes the structures, working principles, installation and operation of the air-heating parking heater. For correct use of the heater, please read this instruction book carefully before installation and use. The instruction book shall 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 users may have through this instruction book. If you have any doubts or find anything incorrect in this instruction book, please contact our company directly.
- At first unpacking, please check the heater and its accessories against the packing list. Please contact the dealer immediately if any problem is found.
- If any trouble arises during application, please contact the Department of Marketing of our company or other customer service stations authorized by this company. We shall do our best to provide service to you.

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1 Introduction

The main equipment of Model FJH-5/ □ air parking 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-shape case, which serves as independent air passage. Cold air is sucked into the air passage by the heat supplying fan and blown out when it becomes hot, so as to form

Another heating system that is independent to the original heating system of the vehicles. In such a way,

heat can be supplied by the heater to driver's cab and passengers' compartment no matter the engine is working or not working. The schematic diagram is shown in Fig. 1.

The heater is fully automatically controlled. It features in compact structure, easy installation, energy-saving, environmental protection, safety and reliability, easy maintenance, etc.

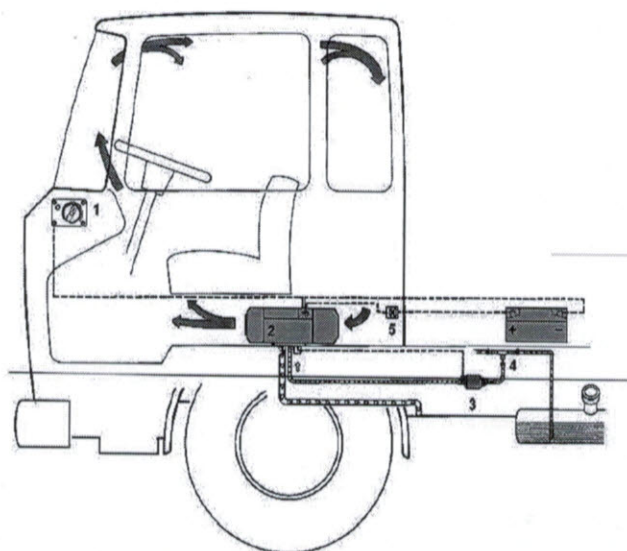


Fig. 1

- 1- Control switch 2- Heater
3- Fuel pump 4- Reducing T
5- Fuse box

2 Main Technical Specifications

Please refer to Table 1 for main technical specifications.

Table 1

Heat Power (W)	5000	
Fuel	Gasoline	Diesel
Rated Voltage	12V/24V	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	

3 Structures and Working Principles

The structures of the main heater are shown in Fig. 2

3.1 Combustion furnace

Fig. 3 is the diagram for structure of the combustion furnace and assembly of controller.

The furnace body (heat exchanger 15) is made of die-casting aluminum, with radiating fins around and at the rear end. Combustion pipe 22 is installed in the inner cavity. The combustor core 20 with a protective hood is fixed on the front-end base 12 of the combustion pipe. Fuel comes to the combustor core through the fuel tube 19 and is ignited by the glow plug 11 (also serves as flame sensor) after atomization. The flame enters the gap between the inner walls of the furnace body through the rear-end guide pipe 13 of the combustion pipe. The exhaust is discharged through exhaust tube vent 23.

The fresh air for supporting combustion of the furnace comes from the supporting air inlet port 17 and is sent to the combustion pipe by the combustion supporting air blades 18 of the fan motor.

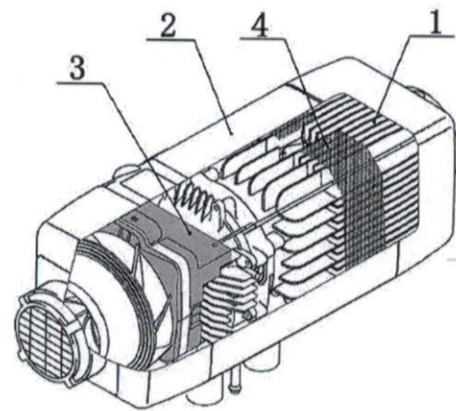


Fig. 2

1-Combustion furnace; 2-Hood-shape case;
3-Controller; 4-Insulating mat

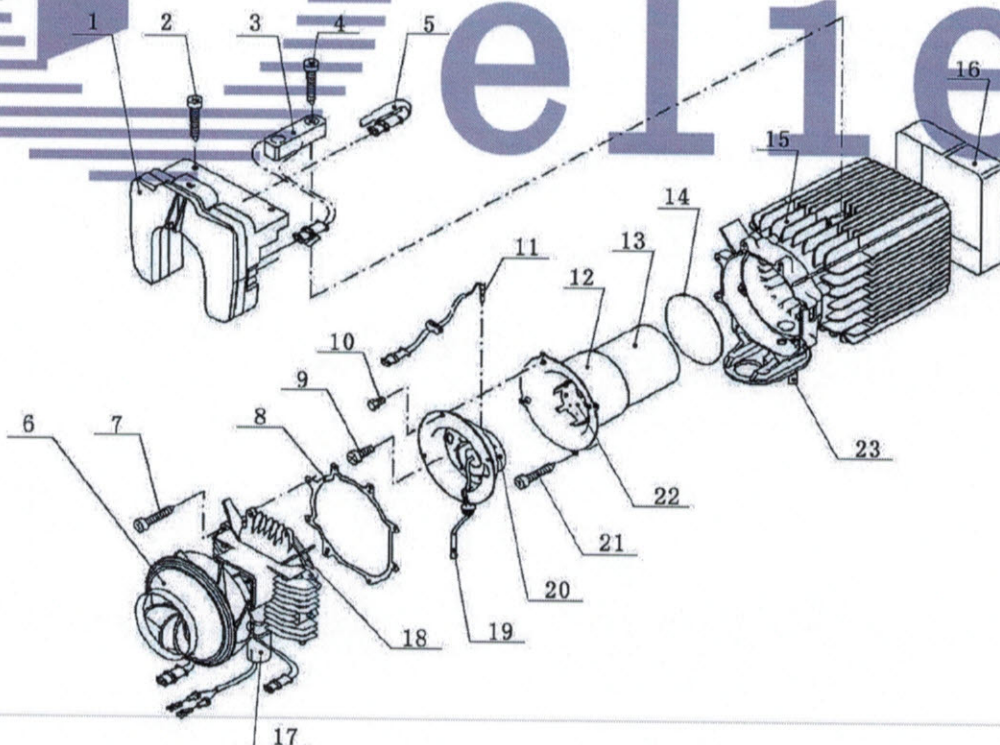


Fig. 3

1-Controller; 2-Screw; 3-Overheat sensor; 4-Screw; 5-Temperature sensor (internal); 6-Blade wheel of heating fan; 7-Screw; 8-Seal of heat exchanger; 9-Screw; 10-Screw; 11-Glow plug/Flame sensor; 12: Pipe base; 13: Guide pipe; 14-O-ring; 15-Heat exchanger; 16-Insulating mat; 17-Inlet of combustion supporting air; 18-Combustion supporting fan blades; 19-Fuel tube; 20-Combustor core; 21-Screw; 22-Combustion pipe; 23-Exhaust tube vent

3.2 Hood-Shape Case

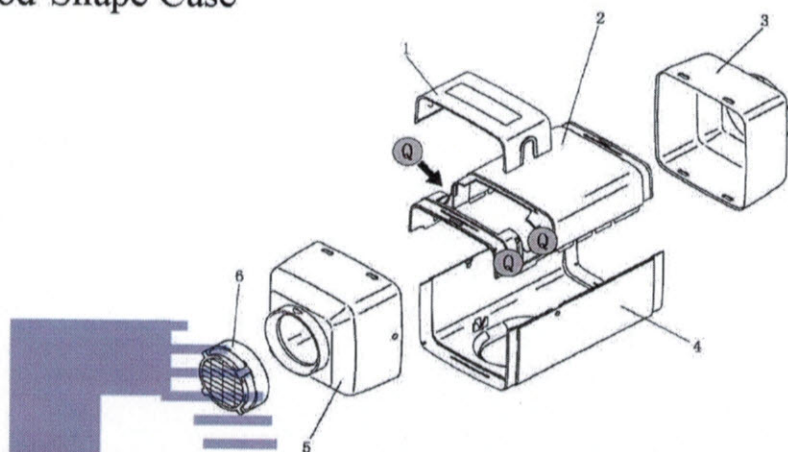


Fig. 4

1-Junction box cover; 2-Top hood-shape cover; 3-Hot air outlet;
4. Bottom hood-shape cover; 5-Air inlet of heater; 6-Air inlet hood

The structure of the hood-shape case is shown in Fig. 4. It consists of the top cover 2 (The junction box cover 1 can be fixed on its window), bottom cover 4, air inlet hood 6, air inlet of heater 5 and hot air outlet 3. They form an air heating passage. Blade wheel of heating fan (Fig.6-3) on the fan motor (the same fan for supporting combustion) sucks in cold air from the air inlet. The air is heated by the heat exchanger and sent out from the hot air outlet.

3.3 Controller

The controller (Fig. 3-1) is installed behind the heating fan blades. The single-chip processor is the core of the controller. After turning on the heater, the controller will automatically complete control and monitoring on all working procedures and implementation of trouble protective functions of the heater in accordance with the preset programs.

3.3.1 Control of Working Procedures

Adjustment and control on operational status are performed during the whole working cycle (start-operation-stop) of heater in terms of the rotation speed of fan motor, supply quantity of fuel pump, on-off of glow plug,

functional switch-over between the glow plug and flame sensor according to given time sequence and in consideration of the preset value and measured value of the temperature of the temperature control point, furnace cavity temperature, surface temperature of the heat exchanger and other random parameters.

3.3.2 Locking Due to Troubles

When the heater can not be ignited normally, or can not sustain normal combustion after ignition, or broken circuit or short-circuit occurs to the glow plug, fan motor, fuel pump, or various sensors and components, or in case of overheating of heat exchanger, five times of termination of combustion, twice of unsuccessful ignition or abnormal power voltage, the heater will turn off and enter into locked status for protection.

The method to relieve the trouble-caused locking status is to turn off the control switch and re-start after at least 2 seconds.

3.3.3 Display of Troubles

For convenience of maintenance and repair, troubles of the heater can be identified by the controller and displayed by the indicators (green LED) of the control switch.

In trouble status, indicator flashes at different frequencies. During the period between two fast flashes, there will be a few times of 1.3Hz slow flashes. The times of slow flashes represent the types of troubles, as shown in Table 2.

Table 2

Times of flashes of LED	Cause of trouble
1	Failure of second start
2	Termination of the fifth time of combustion
3	Power voltage out of specified range
4	Temperature of flame sensor too high in the start period
5	Broken circuit or short-circuit of flame sensor
6	Broken circuit or short-circuit of temperature sensor
7	Broken circuit or short-circuit of fuel pump
8	Broken circuit, short-circuit, or rotation clogging of fan motor
9	Broken circuit or short-circuit of glow plug
10	Overheated
11	Broken circuit or short-circuit of overheating sensor
12	Broken circuit or short-circuit of control switch

3.3.4 Circuit Interfaces

The following circuit interfaces can be found on the controller case: socket X1 for fan motor, socket X2 for glow plug/flame sensor, socket X3 for overheating sensor, socket X4 for the leads to fuel pump, socket X5 for temperature sensor, X6 for Holzer element and socket X7 for the main wire bundle. Please refer to Fig. 5 for their locations.

The connection parts are designed with such structures that wrong connection is made impossible.

3.4 Sensors and Safety Protection

3.4.1 Flame Sensor (also as Glow Plug)

This component has dual functions. When it is used as flame sensor, its characteristic of variable resistance with temperature is utilized to monitor the temperature of the furnace cavity. It is used to determine if the furnace is ignited in the ignition stage. In normal working condition, it is used to determine if the flame or combustion is continuing.

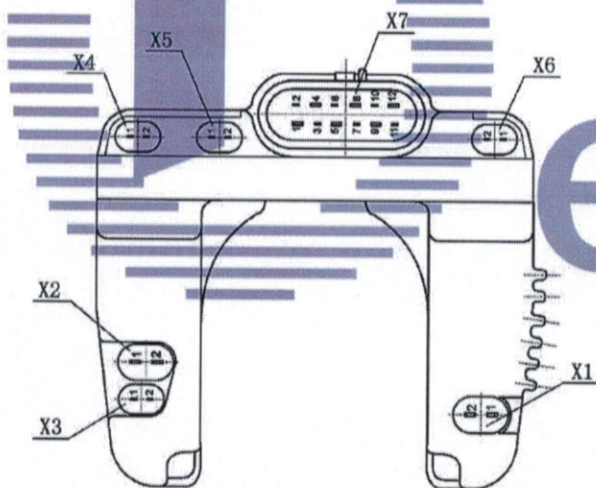


Fig. 5

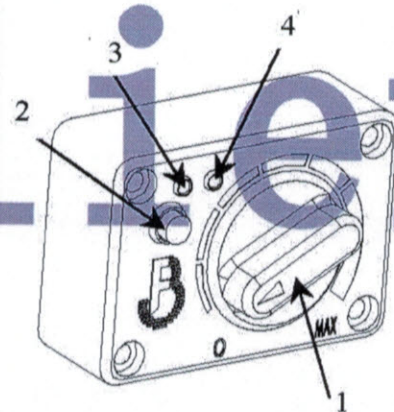


Fig. 6

1-Control Knob

2-Mode-transformation button

3-Mode indicating light

4-Working indicating light

3.4.2 Overheating Sensor

The overheating sensor is installed on the middle of the outer wall of the heat exchanger. If the temperature here becomes higher than 250°C , the fuel pump circuit will be cut off by the controller and supply of fuel is stopped and then the heater is turned off for purpose of overheating

protection.

3.4.3 Temperature Sensor

The temperature sensor is plugged into the corresponding socket on the controller. It measures the air temperature at the air inlet.

The working status and output power of the combustion furnace is regulated by the controller based on the measured temperature.

3.5 Control Switches

The control switch is shown in Fig. 6. Its control knob is used for the following operations: turning on or off of the heater and eliminating locking of the heater due to trouble interrupt and converting from constant temperature working mode to constant power working mode through the mode conversion button.

Constant temperature mode: when the mode transformation button is not pressed down, the indicating light turns red. Use the control knob to set the control temperature of the heated area (adjustable continuously from 5°C to 35°C).

Constant power mode: when the mode transformation button is pressed down, the indicating light turns green, then use the control knob adjust the power. (adjustable continuously between 1.5KW and 5KW).

Constant lighting of the indicator (green) on the control switch indicates normal operation of the heater. Flashing of the indicator indicates trouble status of the heater (see Section 3.3.3 for details).

3.6 Power Supply

The power supply to the heater is a common power source for the engine of the vehicle, but with an independent safety device. When the power voltage is lower than the specified lower limit or higher than the specified higher limit for 20 seconds continuously, trouble display will occur to the heater and the heater will be turned off automatically with trouble display.

3.7 Fuel Supply

The fuel for the heater can be from the fuel tank or from another independent fuel tank. A special-purpose fuel pump is used for transmission of fuel and regulation of supply quantity of fuel.

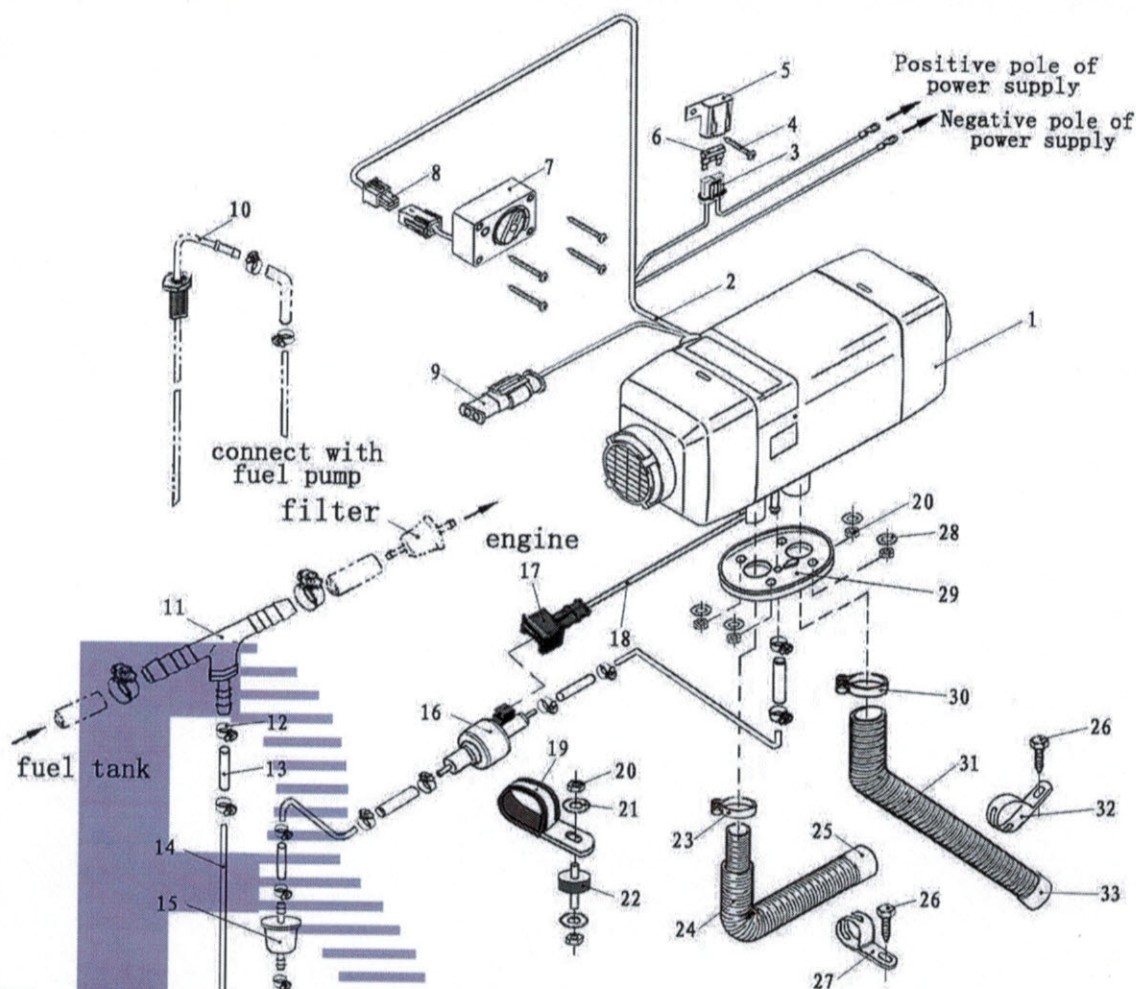


Fig. 7

1-Main heater; 2-Main wire bundle; 3-Fuse holder; 4-Self-tapping screw; 5-Fuse box cover; 6-Plug sheet fuse; 7-Control switch; 8-Connector X9 for control switch; 9-Trouble diagnosis connector X8; 10-Fuel sucking pipe; 11-Reducing T; 12-Fuel tube clamp; 13-Fitting of fuel tube; 14-Fuel tube; 15-Fuel filter; 16-Fuel pump; 17-Fuel pump connector; 18-Fuel pump leads; 19-Fuel pump holder; 20-M6Screw; 21-Curved spring washer; 22-Shock-reducing tightening piece; 23-Air inlet tube clamp; 24-Air inlet tube; 25-Protective hood for air inlet tube; 26-Self-drilling and self-tapping screw; 27-Fixing clip for air inlet tube; 28-Washer; 29-Gasket; 30-Exhaust tube clamp; 31-Exhaust tube; 32-Fixing clip for exhaust tube; 33-Protective hood for exhaust tube

4 Installation

Only special-purpose parts can be used for installation of the heater. Fig. 7 is the diagram for installation. The positions and ways of fixing of various parts may vary from one automobile model to another, but the general principles must be followed in conformity with the requirements of this chapter. Otherwise the heater may not work normally or safety problems may occur.

4.1 Requirements for Installation and Places of Application of the Heater

4.1.1 It is not allowed to use the heater in locations with inflammable or explosive substances such as flammable gas or flammable dust.

4.1.2 It is not allowed to use the heater in closed space (such as garage or maintenance workshop without air ventilation) to avoid danger of poisoning due to exhaust from burning.

Attention: Under either of the above circumstances, it is not allowed to use the heater even at the timer stand-by state or wireless remote control state.

4.1.3 It is not allowed to install and use the heater in bedrooms.

4.1.4 If the heater is installed in special-purpose vehicles (such as vehicles for dangerous goods), special rules must be followed in installing the heater.

4.1.5 Never place fuel tank, compression tank, fire extinguisher, clothes, paper, etc. near the heater or opposite to the hot air vent.

4.2 Installation of the Main Heater

4.2.1 The main heater can be installed inside the vehicle or outside the vehicle. But when it is installed in the cab or passenger compartment, a protective cover that seals the heater from the cab or compartment must be used and the protective cover must have enough ventilation towards the outside. The temperature within the protective cover shall not exceed 40°C, otherwise troubles may occur.

If the heater is installed outside the vehicle, measures must be taken to avoid splash of water onto the heater.

4.2.2 For convenience of heating air flow and installation, maintenance of the main heater, enough space must be provided for installation. Please refer to the scope of double dot line for the space for installation, as shown in Fig. 8.

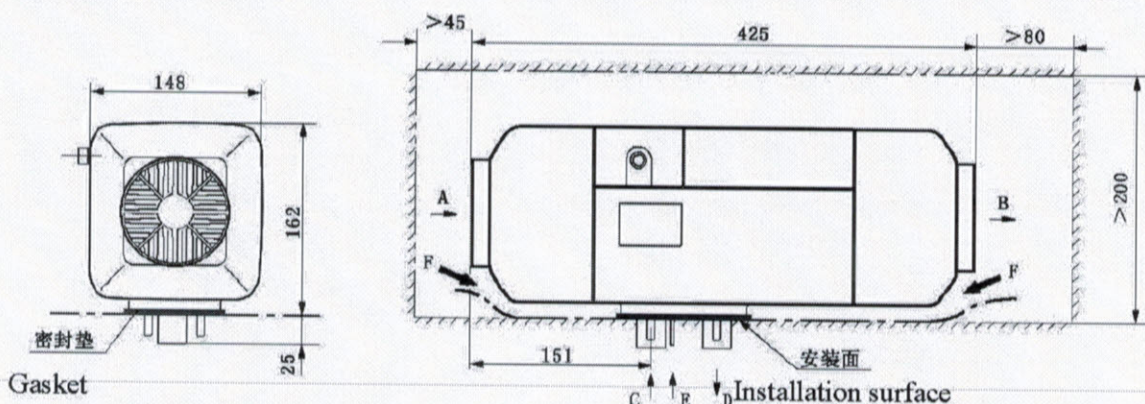


Fig. 8

A-Entry of air for heating; B-Supply of heated air;

C-Entry of combustion supporting air; D-Discharge of exhaust

E-Entry of fuel; F-Non-interference area

4.2.3 Good sealing is necessary between the main heater and the installation surface on the vehicle. A special gasket (as shown in Fig. 8) supplied by the manufacturer must be inserted in between during installation. The installation surface must be even enough. Its parts at the installation bases of the main heater shall have unevenness of less than 1mm. After drilling installation holes, evenness must be improved according to this requirement. At installation, please rotate the four M6 nuts, provided by the manufacturer, tight. The torque for tightening shall be 6Nm+1Nm.

In addition, please make sure that there is not any foreign matter in the gap between the bottom surface of the main heater and the installation surface of the vehicle (Fig. 8-F).

Please refer to Fig. 9 for positions of installation holes.

Attention: For re-installation of the main heater, a new gasket must be used to replace the old one.

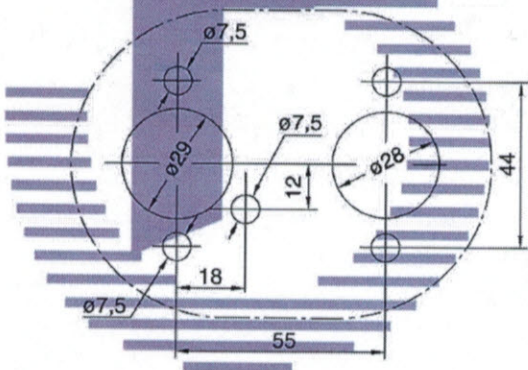


Fig. 9

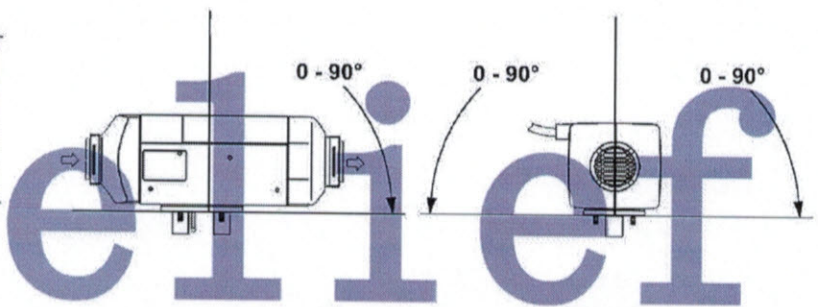


Fig. 10

4.2.4 Direction for installation of the main heater is shown in Fig. 10. Attention must be paid to that the inclination angle shall not exceed the limit, or normal operation will be affected.

4.2.5 After installation of the main heater, please check and make sure that there is not any contact or friction between the blade wheel of fan and other nearby parts to avoid unsmooth operation

4.2.6 After installation, mark the year of first operation on the nameplate of the heater. Such mark must be permanent.

4.3 Installation of Air Heating System

4.3.1 The air heating system of the heater shall not be connected with the air channel of the vehicle. Either independent outer circulation or inner

circulation mode can be adopted.

4.3.2 When an external heating air tube is attached to the heater, the tube diameter shall not be smaller than 90mm. Its material shall be capable to resist temperature of 150°C.

4.3.3 The maximum pressure drop between the air inlet side and air outlet side of the air heating system shall not be greater than 0.3kPa.

4.3.4 The hot air from the heating system shall not erupt onto such parts that are unable to resist heat. In case of passenger vehicles, measures shall be taken to avoid blocking of the hot air vent by passengers. A self-provided protective net can be installed if necessary.

4.3.5 For heater working in external circulation mode, the position of air inlet port shall be proper to guaranteed that under normal operation no splash of water can enter. No water can be sucked into the heater and no exhaust from the engine can be sucked in.

4.3.6 For heater working in internal circulation, measures shall be taken to avoid re-entering of the supplied hot air into the air inlet port (as shown in Fig. 11). If no air inlet tube is attached in this mode, an air inlet hood with grids (Fig. 4-6) must be installed at the air inlet port of the main heater. The inlet air shall be drawn from the cold area of the compartment, such as under the seats or berths.

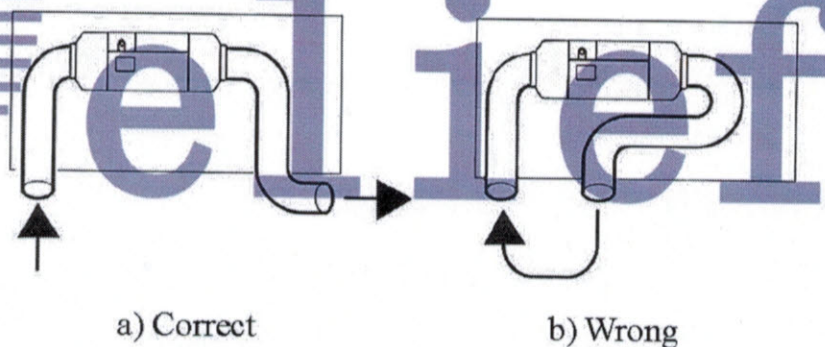


Fig. 11

4.3.7 In case of heater working in external circulation mode and working in internal circulation with protective hood, external temperature sensors must be installed within the temperature control region. The probe shall be installed in a place that is not affected by hot air flow, not close to heat source, away from direct sunshine, and not sheltered by other objects. The internal temperature shall be removed before installation. A hole is drilled beside the junction box. The leads of the external sensor shall be put through and connect to socket X5 of the controller. The gap between the leads and the hole shall be made as small

as possible to prevent leakage of air flow.

4.4 Installation of Fuel Supply System

4.4.1 Fuel for the heater can be supplied from the fuel tank of the vehicle or supplied by an additional independent fuel tank. When an independent fuel tank is used, it is not allowed to install the fuel tank in the cab or passenger compartment or any region that is possibly to cause fire. It is not allowed to place the fuel inlet port in such locations as mentioned above.

4.4.2 The elevation difference between the heater and the heater fuel pump and between the fuel tank and the heater fuel pump produces pressure (or suction force) from fuel to the fuel pump. The inner diameter and length of the fuel tube is related to the resistance of the fuel route. Such factors shall be included in your consideration at installation. Please refer to Fig. 12 for related data.

Elevation of fuel supply H (m)	Allowable maximum Excessive pressure of fuel tube kPa
0.00	20
1.00	11
2.00	3
Elevation of fuel suction S (m)	Allowable maximum negative pressure of fuel pipe kPa
0.00	-10
0.50	-6
1.00	-2

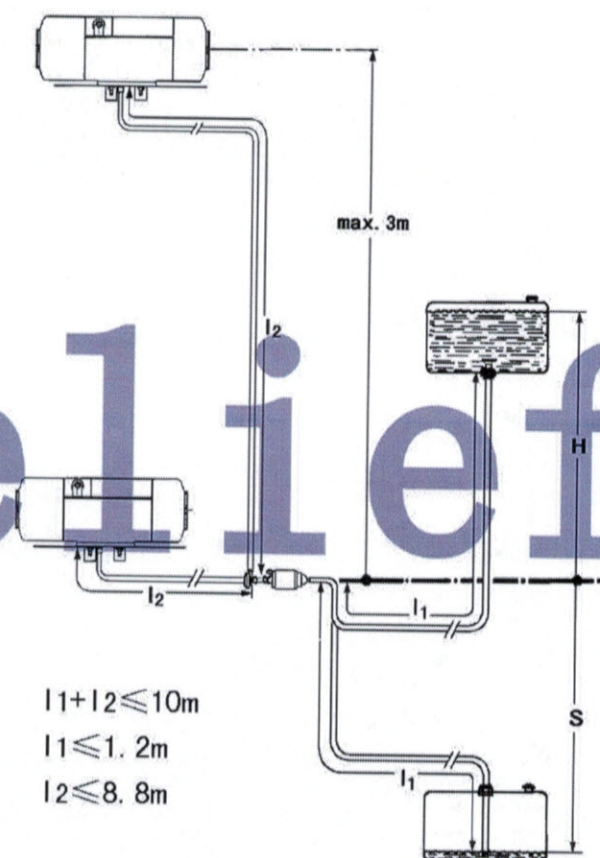


Fig. 12

4.4.3 Installation of Fuel Pump

4.4.3.1 The fuel pump shall be installed in places that can avoid heat radiation from the vehicle parts that can emit heat and in places with cool air. Its ambient temperature shall not exceed 20°C .

4.4.3.2 Directions of installation of the fuel pump are shown in Fig. 13. When installing the fuel pump, please use the fuel pump holder supplied with the heater to hold the pump tight. The pump is fixed with the

shock-reducing tightening piece.

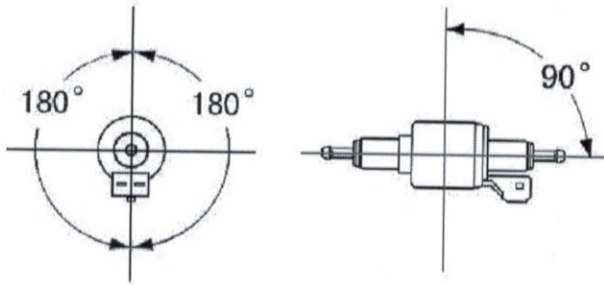


Fig. 13

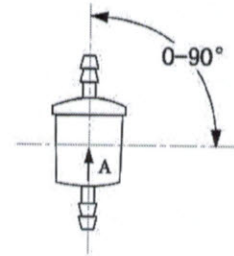


Fig. 14

4.4.4 Installation of Fuel Filter

A fuel filter shall be installed before the fuel inlet port. Please make sure that the fuel flow mark “A” is correctly followed. Its position shall be in conformity with Fig. 14.

4.4.5 Installation of Fuel Tube

4.4.5.1 Only the flexible nylon tube, which has good light-resistance and thermal stability, supplied with the heater can be used as the fuel tube. The inner diameter of the tube is $\Phi 2\text{mm}$.

4.4.5.2 The place for installation of fuel tube shall be resistant against flying stones and shall be away from any heat emitting parts of the vehicle. Protective device can be installed if necessary.

4.4.5.3 The fuel tube from the fuel pump to the main heater shall be in any directions other than downward direction. The fuel tube shall be tied in some proper location to make it fixed. The distance between two ties shall be less than 50cm.

4.4.5.4 The fuel tube fittings supplied with the heater shall be used for connections between fuel tube and fuel pump, fuel tube and heater, fuel tube and sucking tube of fuel tank and fuel tube and reducing T. The fuel tube shall ties with fuel tube clamps. Bubbles shall be eliminated from the connecting places (Fig. 15).

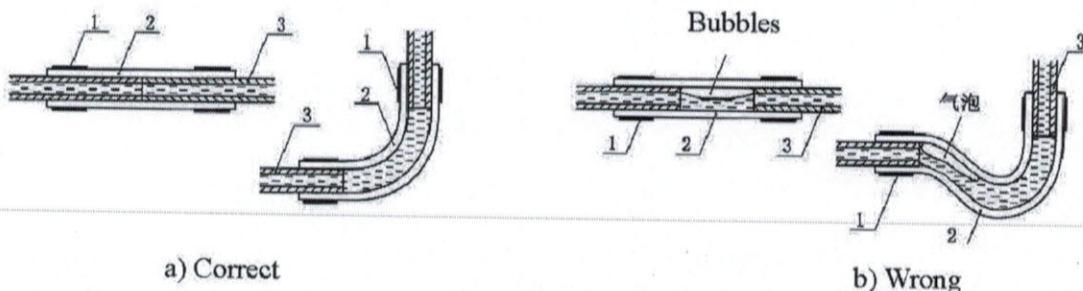


Fig. 15

4.4.6 Installation of Fuel Sucking Device

4.4.6.1 When fuel is sucked from the vehicle fuel tank or from an independent fuel tank, a sucking pipe shall be used. Attention shall be paid to that the openings on the fuel tank (or tank cover) for installation shall be appropriate in size, with trimmed brim and with good evenness around the opening. Good sealing is necessary for the base of the fuel sucking tube. The bottom end of the fuel sucking tube shall be 30mm-40mm from the bottom of fuel tank to suck enough fuel and at the same time to avoid sucking in impurities sediment on the bottom of fuel tank.

4.4.6.2 If fuel is sucked from the fuel pipe to the engine, the fuel pipe from the fuel tank to the fuel filter shall be disconnected and re-connected with the thicker pipes of the reducing T and the thinner pipe of the reducing T shall connect the fuel pump of the heater via oil tube fitting and fuel tube. The angle for installation must in conformity with Fig. 16, or normal work of the heater will be affected.

After installation, the vehicle engine shall be started and then turned off after one minute's work to eliminate air trapped in the fuel sucking pipe.

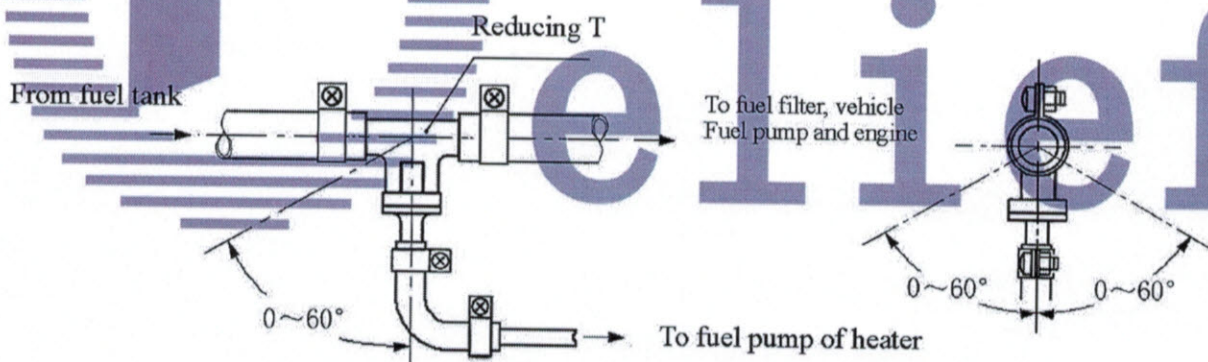


Fig. 16

4.5 Installation of Electrical System

4.5.1 The wiring diagram for the heater is shown in Fig. 17. The wires of the main heater for connection to outside circuits have been made into wire bundles. They can be laid according to the positions of various components and shall be fixed in some proper locations. The distance between two fixing points shall not exceed 30cm. Attention: Any exposed wire bundle out of the vehicle body or out of the wiring groove must be protected by

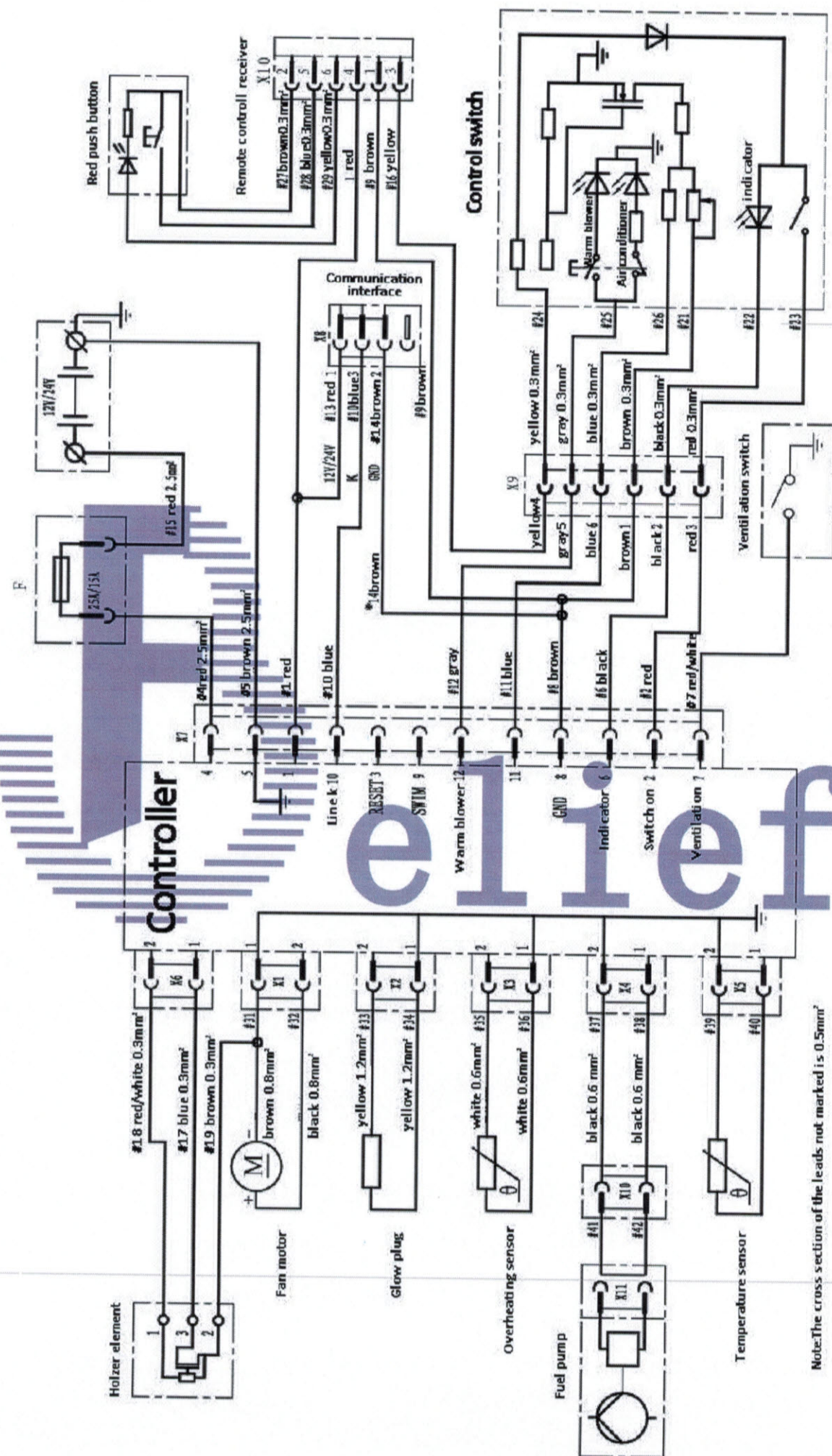


Fig. 17

Note: The cross section of the leads not marked is 0.5mm²

4.5.2 Connection of the main wire bundle with the heater: Use a blunt tool to pry the places marked “⊙” gently to remove the junction box cover (Fig. 4-1). Connect the 12-wire connector X7 of the wire bundle to the controller socket. The wire bundle can come out from either the right side or the left side of the heater. Then replace the junction box cover. Make sure to have good sealing between the junction box cover and upper cover and between the junction cover box and the wire bundle sealing mat to avoid any thermal malfunction due to leak of air from the hood-shape case.

4.5.3 Insert sheet fuse into fuse holder F and replace the upper cover tightly. Use screws to fix it in a proper location in the vehicle.

4.5.4 Connect the 2.5mm^2 red wire and the 2.5 brown wire in the wire bundle to the hole terminals with springs and therefore connect to the “+” and “-” terminals of the vehicle battery.

4.5.5 Straighten the fuel pump leads (two 0.6mm^2 black wires) with their protective tubes, which is made a coil inside the combustion supporting air inlet port, and put them through the opening on the wall of the air inlet tube. Insert the terminals at the end of the wires with pressed springs into the socket of the fuel pump connector and therefore connect to the fuel pump.

4.5.6 Use four self-tapping screws to fix the control switch in a position for convenient operation and the arrangement shall make easy observation on the indicator on the case, so as to identify the working conditions (operation/stop) of the heater easily. The terminals on the leads from the control switch shall be inserted into the pin seat according to the sequence shown in Fig. 18 and connect with self-locking mechanism to connector X9 on the main wire bundle.

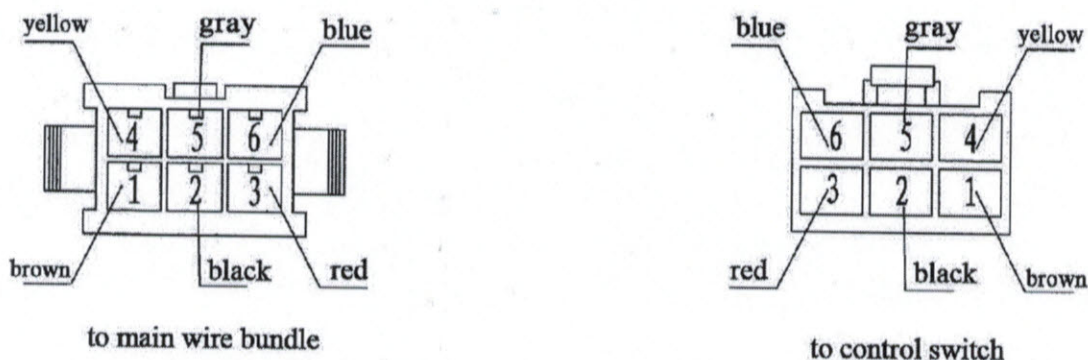


Fig. 18

4.5.7 The surplus wires in the wire bundle at the moment are wires for function expansion. They shall be kept in good condition. Their ends shall be wrapped with electrician's insulating tape to avoid short-circuit or earthing.

4.6 Installation of Combustion Supporting Air Sucking Tube and Exhaust Discharge Tube

4.6.1 The combustion supporting air must be sucked in from external fresh air outside the vehicle. The exhaust from combustion must be discharged into the air through exhaust tube. Measures must be taken to avoid the exhaust from re-entering the vehicle.

The tubes go through the outer wall or holes on the bottom of vehicle. Measures must be taken to prevent entering of splash water. The tubes must be protected and can resist shock permanently.

4.6.2 Only the air inlet tube and exhaust tube provided with the heater can be used. The air inlet tube is made with two corrugated aluminum tubes, one inside the other. The exhaust tube is corrugated stainless steel tube. Please identify them and do not make mistake at installation. To connect them with the heater, please use the supplied clamps to fix them tightly on the combustion supporting air inlet and exhaust tube vent respectively. The protective hood on the vents of the air inlet tube and exhaust tube must be kept in good condition. Do not damage them or remove them.

As to the thinner tube of the air inlet tube, its end with a notch shall slip on the combustion supporting air port and let the fuel pump leads come through the notch. Attention shall be paid to that do not damage the protective cover of the fuel pump leads. The thicker tube slips on the thinner tube and the total length of the tube can be adjusted according to your needs.

4.6.3 Both the air inlet tube and exhaust tube shall come outwards and downwards from the heater (Fig. 19), otherwise a $\Phi 5\text{mm}$ hole shall be prepared at the bottom of the tube for discharge of condensation water. Also, the sum of all curve angles for each tube shall not exceed 270° .

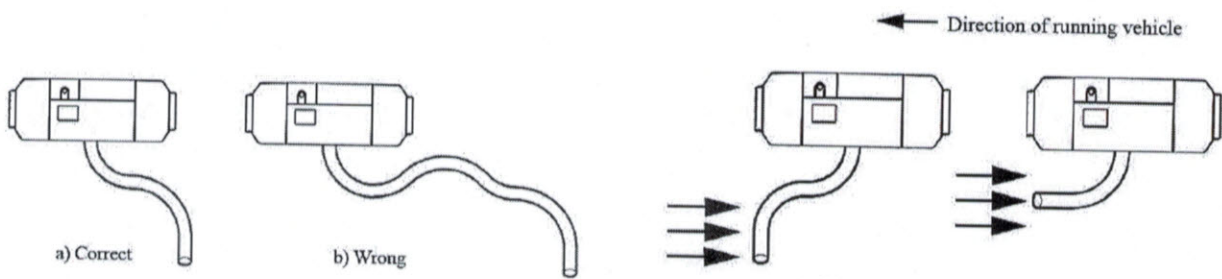


Fig. 19

Fig. 20

4.6.4 The openings of the tubes shall not be opposite to the direction of the running vehicle. (Fig. 20)

4.6.5 Arrangement of the tubes shall protect the tube openings from blocking by slurry, rain and snow or other dirt. (Fig. 21)

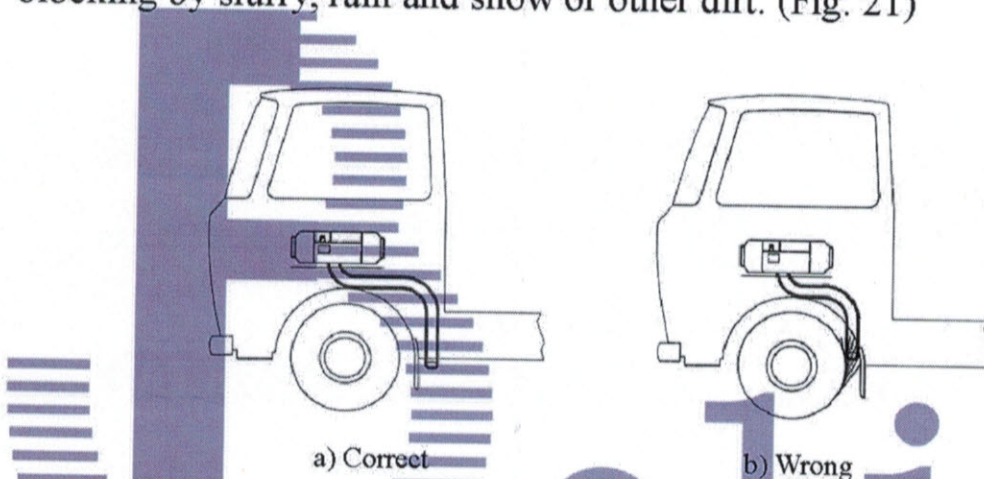


Fig. 21

4.6.6 When the heat is working, the exhaust tube is at high temperature. In installation, make sure to install it in far distance from plastic parts or other objects with poor thermal resistance of the vehicle body. The exhaust tube shall be properly fixed. The exhaust vent shall be downwards, perpendicular to road surface with an angle of $90^\circ \pm 10^\circ$. To ensure such an angle, the fixing clip for the exhaust tube shall be within 150mm from the tube end. (Fig. 22)

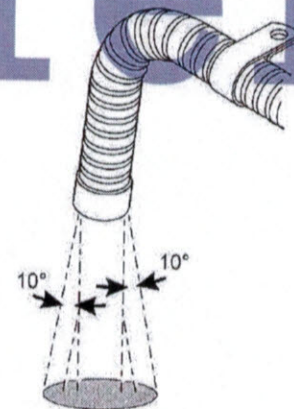


Fig. 22

Warning: Violation against the above requirements may cause fire.

4.6.7 If the section of the exhaust tube inside the vehicle may be touched by passenger, a protective cover has to be installed to prevent human contact and scald.

5 Methods of Operation

5.1 The heater control with two ways

(1) Use the control switch.

(2) Control with extended function, use the remote controller or GSM mobile phone controller.

The distance of the remote control is $\leq 150\text{m}$, there are no distance limit of the GSM mobile phone controller.

5.2 Use the control switch

5.2.1 Turn the control knob clockwise and the power is on the controller and the work indicator (green LED) comes to light. At this moment, the heater comes to the start stage. The controller will run heating program according to the temperature control target set by the control knob. In the start stage, the time delay from switch-on to fuel supply to the fuel pump is 45 seconds.

5.2.2 After the combustor is ignited, if you want to regulate the heating temperature or the heater power, you can turn the control knob according to the arc mark around the control switch.

5.2.2.1 If the mode-transformation button is not pressed down (constant temperature mode), mode indicating light turns red. If you want to adjust the heating temperature, press the curve sign on the control switch, turn the control knob, press the mode-transformation button, mode indicating light turns green, then the heater will convert to the constant power mode.

5.2.2.2 If the mode-transformation button is pressed down (constant power mode), mode indicating light turns green. If you want to adjust the power, press the curve sign on the control switch, turn the control knob, press the mode-transformation button, mode indicating light turns red, the heater will convert to the constant temperature mode.

5.2.3 If you want to turn off the heater manually, turn the knob anticlockwise to position "0", 3 seconds after, the work indicator goes out. If the fuel pump is at work before the heater is turned off, the pump will shut down immediately. But the fan will continue to run for 180 seconds.

5.3 The user can install a ventilation switch oneself, if you want the heater work for air circulation only under normal temperature without any heating, you can close the ventilation switch. The wind capacity can be continuously regulated with the control knob.

6 Treatment of Usual Troubles

6.1 During use, the heater may become unable to start normally or die out after start. Such troubles may lead to locking state. In such case, you can turn the control knob anticlockwise to position “0” and turn off the heater and keep it in such state for at least 2 seconds. Then, restart the heater.

6.2 Circuit troubles may be caused by different reasons, such as corrosion of connectors, poor contact of connectors, wrong connection of wires, corrosion of wires or fuse, corrosion of battery poles, etc. Users need to check and prevent such troubles and offer good maintenance.

6.3 The reasons for the troubles to the heater can be indicated by the green LED on the control switch (see Section 3.3.3 for details). When the following troubles occur, users can take measures to solve:

a) Failure to turn on the heater and the LED, the reason is open circuit of fuse or wrong connection of wires.

b) The heater runs idly and no start process occurs after the heater is powered on, this indicates that the temperature of air inlet (or the ambient temperature around the external temperature sensor) is higher than the set heating temperature, or called hot start. In such case, you need to turn the control switch knob clockwise to have a higher set temperature.

c) When the LED flashes once, it indicates failure of second start. You should check if the fuel tube is clogged or there is not enough fuel in the fuel tank.

d) When the LED flashes for three times, it indicates that the power voltage is out of the allowable range. If the voltage is low, please charge the battery.

e) When the LED flashes for ten times, it indicates an overheating trouble. Check shall be performed to find any clogging at the hot air outlet and any obvious leak of air flow through the hood-shape case.

6.4 If the LED flashes for the number of times that are not mentioned above, the reasons for the troubles are complicated. Users are not capable for their solution. The problems shall be checked and solved by the service stations authorized by the manufacturer.

7 Precautions

7.1 After the heater is installed, it shall be turned on repeatedly for a few

times so as to remove air trapped in the fuel supply system thoroughly and fill the fuel route with fuel only.

7.2 Trial operation is necessary for the heater before it is put into normal use. At trial operation, you have to check leakage from all connections and all safety issues. If discharge of dense smoke is observed or irregular combustion noise or fuel smell is sensed, the heater must be turned off. Please take out the fuse, making the heater unable to operate. The heater can only be put into use after it is tested by qualified professionals.

7.3 Before each heating season, check shall be performed by qualified professionals for maintenance works, details as follows:

- a) check air inlet and air outlet to find any pollution or foreign matters;
- b) clean the external of the heater;
- c) check if there is any corrosion or loose connection for electric contacts;
- d) check to find any clogging and damage to the air inlet tube and exhaust tube;
- e) check to find any leakage on the fuel tube;

7.4 If the heater will not work for a long time, you'd better run it once every four weeks and let it run for 10 minutes at least to prevent malfunction of mechanical parts.

7.5 The air inlet port and air outlet vent of the heater must be kept clean and unblocked to provide smooth route for air flow, so as to prevent overheating.

7.6 If fuel is replaced with low-temperature fuel, run the heater for at least 15 minutes to fill new fuel into the fuel tube and fuel pump.

7.7 When fill fuel for the heater, you have to turn off the power first. To do this, just turn the control switch anticlockwise to position "0".

7.8 The heat exchanger of the heater can not work for longer than 10 years. When it has worked for ten years, it must be replaced with a qualified one. The replace work must be performed by the heater manufacturer or its authorized agent. At this time, the overheating sensor shall be replaced too.

7.9 The exhaust tube of the heater for discharge of waste gas after combustion, if arranged in an area with passengers, shall be replaced with

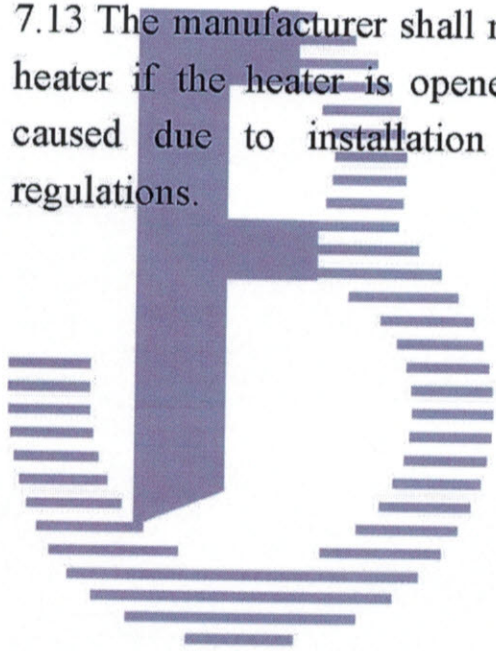
qualified one when it has worked for 10 years.

7.10 If electric welding is performed to the vehicle, please detach the positive wire of power supply of the heater from the battery and connect it to earth to protect the controller from any damage.

7.11 The ambient temperature shall be in the range of $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ for transport and storage of the heater to avoid any damage to its electronic elements and components.

7.12 Only authorized customer service stations are allowed to provide repair and installation for the heater. It is prohibited to make repair by yourself or use non-manufacturer's parts or components so as to avoid danger.

7.13 The manufacturer shall not be held responsible for any damage to the heater if the heater is opened without authorization or such damage is caused due to installation or operation with violation against the regulations.



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