



AIR HEATER

W-5.5 E-5.0 E-2.0



LF Bros
AIR HEATER

TECHNICAL SPECIFICATIONS,
installation, operation and
maintenance instructions

INNOVATION



KAN-BUS communication



Constant Temperature & Intelligent Frequency Conversion



Flameout protection



Anti-electrophoresis function



Auto-ranging power supply



Ignition test under low temperature -40°C



GLAD TO OFFER SERVICE FOR YOU!



Please read and safekeep carefully.

THIS MANUAL DESCRIBES ITS STRUCTURE AND INSTALLATION INSTRUCTIONS.
PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING AND USING,
AND ENSURE THE CORRECT USE OF IT.
PLEASE SAFEKEEP AFTER READING.

Attention!

- THE MANUAL CONTENTS MAYBE HAVE SOME CHANGE, WITH NO SPECIAL NOTIFICATION,
BUT THE MANUAL IS IN ACCORDANCE WITH THE PRODUCT.
- WE TRY TO EXPRESS CLEARLY EVERYTHING THAT USERS HAVE TO LEARN.
PLEASE CONTACT US DIRECTLY IF YOU HAVE ANY PROBLEM OR GOOD ADVICE.
- AFTER OPENING THE PACK BOX FOR THE FIRST TIME, PLEASE CHECK THE MAIN EQUIPMENT AND
SPARE PARTS ACCORDING TO THE PACKING LIST.
IF THERE IS ANY PROBLEM, PLEASE CONTACT THE DISTRIBUTOR QUICKLY.
- IF MALFUNCTION HAPPENS DURING THE USE,
PLEASE CONTACT THE MARKETING DEPARTMENT OR THE SERVICE STATION THAT WE AUTHORIZE.
WE WILL SERVE YOU WHOLEHEARTEDLY.
- PLEASE KEEP THE WARRANTY CARD CAREFULLY,
AND GIVE THE FEEDBACKS ACCORDING TO THE TERMS. THIS WARRANTY
CARD IS THE ONLY VALID CREDENTIAL OF AFTER-SALE SERVICE.



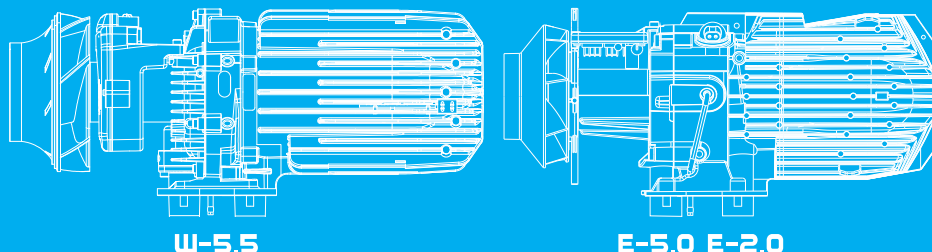


ELABORATE DESIGN TO ACHIEVE
THE FIRST BRAND OF AIR HEATER INDUSTRY



SMART CARE

IT MAKES YOU FEEL THAT WINTER SEEMS LIKE SPRING!



AIR HEATER
W-5.5 E-5.0 E-2.0

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Packing List (W-series)									
No.	Name	Specification	Unit	Quantity	No.	Name	Specification	Unit	Quantity
1	Main equipment	24V diesel	Set	1	14	Intake (exhaust) pipe clip	German hose clamp Φ28mm	Piece	2
2	Main wire harness	Fuse (24V/20A)	Set	1	15	Fixing clip for intake (exhaust) pipe	Φ27mm	Piece	4
3	Fuel pump	24V(68mL/1000 times)	Piece	1	16	Tee	Φ90mm	Piece	1
4	Fuel pump connection line		Piece	1	17	Gasket	Φ18mm x Φ6.5mm x 1.5mm	Piece	9
5	Control switch and wire harness		Piece	1	18	Nut	M6	Piece	4
6	Fuel filter		Piece	1	19	Self-drilling tapping screw	ST5.5 x 25mm	Piece	8
7	Oil-conveying pipe	Nylon tube Φ7mm	Piece	1	20	Fule pipe clip	Φ32mm	Piece	1
8	Air inlet pipe	Φ25mm x 600mm	Piece	1	21	Fuel filter		Piece	1
9	Exhaust pipe	Φ25mm x 600mm	Piece	1	22	Self-tapping screw	M3 x 30mm	Piece	4
10	Air duct	Φ90mm x 600mm	Piece	1	23	Nylon cable ties	200mm	Piece	5
11	Gasket		Piece	1	24	Air inlet hood		Piece	1
12	Fuel tank		Piece	1	25	Air outlet hood		Group	1
13	Fuel tank	15L	Piece	1	26	Φ90 air duct clip	Φ80mm - Φ100mm	Piece	2

Table 1

Packing List (E-series)

No.	Name	Specification	Unit	Quantity	No.	Name	Specification	Unit	Quantity
1	Main equipment	12V/24V diesel	Set	1	13	Intake (exhaust) pipe clip	German hose clamp Φ 28mm	Piece	2
2	Main wire harness	Fuse (20A)	Set	1	14	Fixing clip for intake (exhaust) pipe	Φ 27mm	Piece	4
3	Fuel pump	12V/24V (28mL/1000 times)	Piece	1	15	Fuel tank	10L/5L	Piece	1
4	Diverter	Φ 90/75mm	Piece	1	16	Gasket	Φ 18mm x Φ 6.5mm x 1.5mm	Piece	9
5	Control switch and wire harness		Piece	1	17	Nut	M6	Piece	4
6	Fuel filter		Piece	1	18	Self-drilling tapping screw	ST5.5 x 25mm	Piece	8
7	Oil-conveying pipe	Nylon pipe Φ 7mm	Piece	1	19	3M Double-sided back foam	45mm x 35mm x 2mm	Piece	1
8	Air inlet pipe	Φ 25mm x 600mm	Piece	1	20	Nylon cable ties	200mm	Piece	5
9	Exhaust pipe	Φ 25mm x 600mm	Piece	1	21	Air inlet hood		Piece	1
10	Air duct	Φ 90/75/60mm x 600mm	Piece	1	22	Φ 90 air duct clip	Φ 80mm - Φ 100mm	Piece	2
11	Gasket		Piece	1	23	Tee	Φ 90/75mm	Piece	1
12	Dead plate		Piece	1	24	Fuel pipe clip	Φ 32mm	Piece	1

Table 2

I Overview

The main equipment of air parking heater (hereinafter referred to as the heater) is a small fuel furnace controlled by a single-chip microprocessor. Its furnace body (that's the heat exchanger) is located in the hood-shape case, which serves as an 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 to the original heating system of the vehicles. In this way, heat can be supplied by the heater to driver's cab and passengers' compartment no matter the engine is working or not. The schematic diagram is shown in Fig. 1 (W) and Fig. 2 (E). The heater is fully automatically controlled, and it has many advantages, such as compact structure, easy installation, energy saving, environmental protection, safety and reliability, and simple maintenance.

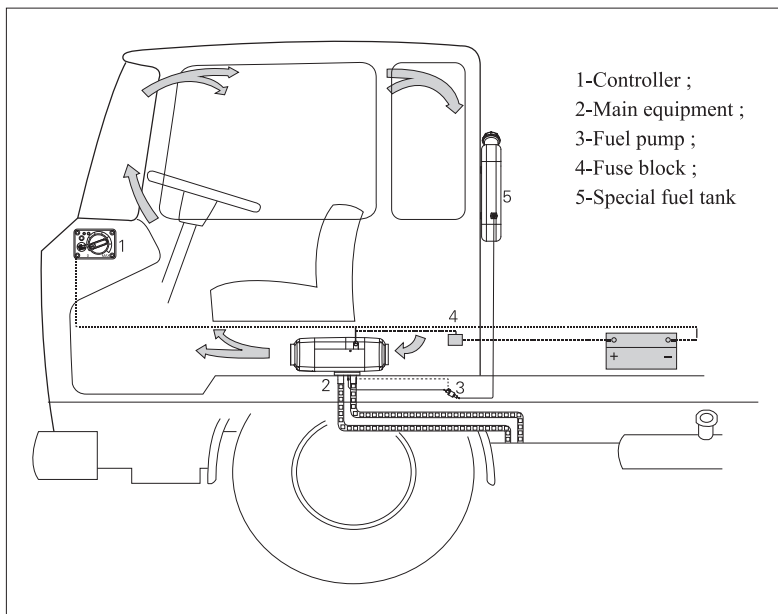


Fig. 1 (W)

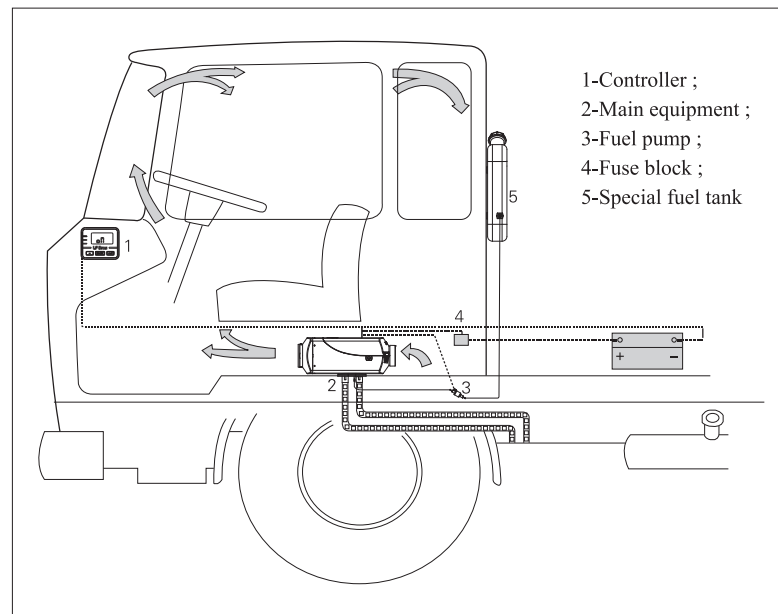


Fig. 2 (E)

II Main Technical Parameters

Please refer to table 3 (W) and table 4 (E) for the main technical specifications.

Thermal power	5500W
Fuel	Diesel
Rated voltage	24V
Fuel consumption	0.19 ~ 0.60 (L/h)
Rated power	15 ~ 90 W
Operating (ambient) temperature	-40℃ ~ +40℃
Weight of the main equipment	5.75 kg
Dimension	425 x 148 x 162 mm

Table 3 (W)

Thermal power	3000W/5000W
Fuel	Diesel
Rated voltage	12V/24V
Fuel consumption	0.15 ~ 0.55 (L/h)
Rated power	40W
Operating (ambient) temperature	-40℃ ~ +40℃
Weight of the main equipment	4.45 kg
Dimension	372 x 141 x 150 mm

Table 4 (E)

Thermal power	2000W
Weight of the main equipment	2.6kg
Dimension	335x116x123 mm

Table 5 (E)

III Structure and Work Principle

3.1 - The structure of the main heater is as shown in Fig. 3 (W) and Fig. 4 (E).

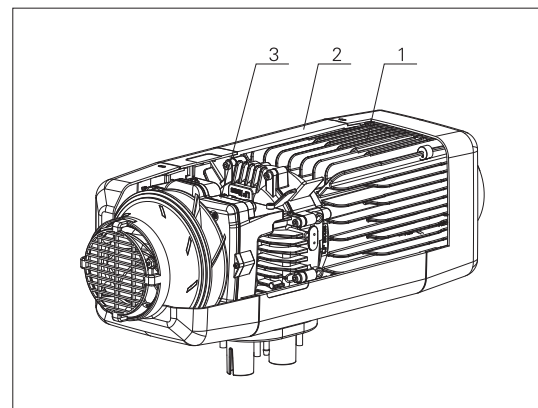


Fig. 3 (W)

1-heat exchanger; 2-Hood-shape case; 3-Controller

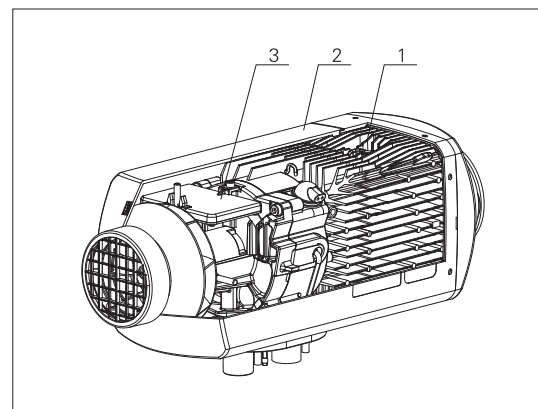


Fig. 4 (E)

1-heat exchanger; 2-Hood-shape case; 3-Controller

3.2 - Case

The case structures of W and E are as shown in Fig. 5 and Fig. 6. Blade wheel of the heating fan on the fan motor (the same motor for the combustion-supporting fan) sucks in cold air from the air inlet and delivers the air after being heated by the heat exchanger out through the hot air outlet.

3.3 - Controller (circuit board)

The controller is mounted on the rear side of the heating fan. After startup, it will automatically complete the control and monitor of the entire working procedures of the heater and the implementation of the fault protection function according to the pre-programmed procedures.

3.3.1 - Control of Working Procedures

Adjustment and control on the operating state are performed during the whole working cycle (start-up->operation->shutdown) of heater in terms of the rotation speed of fan motor, the frequency of fuel pump, the on-off of glow plug, and the function conversion with the flame sensor in according to given time sequence combined with the preset value and measured value of the temperature of the temperature control point, the temperature of furnace chamber, surface temperature of the heater exchanger and other random parameters.

3.3.2 - Fault Lock

The heater will automatically shut down and get into the locking state for protection, when the following conditions happen: 1) The heater can't be ignited or can't work naturally after being ignited 2) The open circuit or short circuit happens to the glow plug, fan motor, fuel pump and sensors etc. 3) Overheat of heat exchanger, flame out, unsuccessful ignition, abnormal voltage. To cancel the fault lock, turn the control switch off for more than 3 seconds and then restart it.

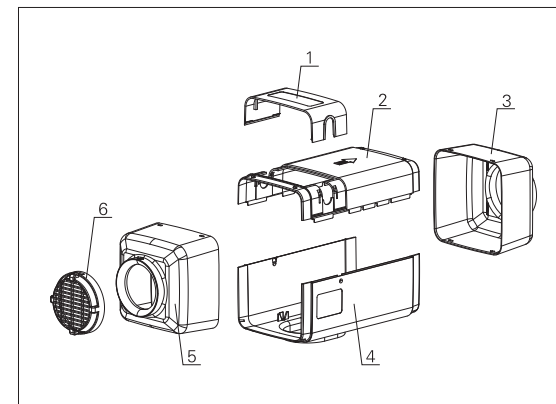


Fig. 5 (W)

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

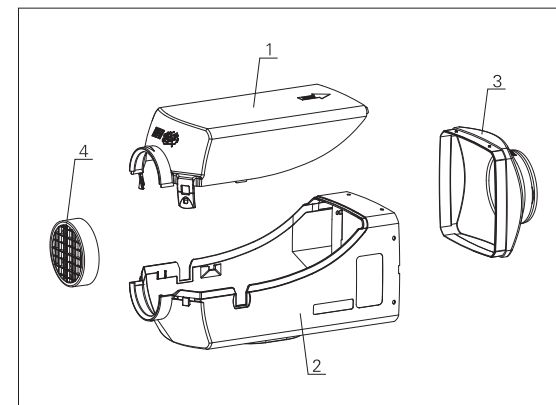


Fig. 6 (E)

1-Top hood cover; 2-Bottom hood cover 3-Hot air outlet;
4-Air inlet hood

3.3.3 - Circuit Interfaces

3.3.3.1 - Circuit Interfaces (W)

The following circuit interfaces can be found on the controller outer case: X1 for fan motor socket, X2 for glow plug/flame sensor socket, X3 for overheating sensor socket, X4 for the socket of the leads of the fuel pump, X6 for the main harness of the circuit board. Please refer to Fig. 7 for their locations.

The connection parts are designed with structures to avoid wrong connection.

3.3.3.2 - Circuit Interfaces (E)

The following circuit interfaces can be found on the controller outer case: X1 for glow plug/flame sensor socket, X2 for overheating sensor socket, X3 for fan motor socket. Please refer to Fig. 8 for their locations.

3.4 - Sensors and Safety Protection

3.4.1 - Flame Sensor (that's the Glow Plug)

This component has dual functions. When it works as the flame sensor, it can monitor the temperature of the furnace cavity with its special characteristic of variable resistance with temperature. It is used to judge whether the furnace is ignited or not in the ignition stage. In normal working condition, it helps to judge whether the flame is burning continuously or not.

3.4.2 - Overheating Sensor

The overheating sensor is installed on the outer wall of the middle of the heat exchanger. When the exchanger's temperature is over 210 °C for a long time, the controller cuts off the oil pump circuit, stops the fuel supply, and then shuts down the heater to protect the system from overheating.

3.4.3 - Temperature Sensor

The temperature sensor is plugged into the corresponding socket on the controller, and it measures the air temperature at the air inlet, and according to this temperature, the controller changes the working status of combustion furnace to adjust the output power.

3.5 - Power Supply

The heater shares the power supply with the car's engine, but with a separate fuse. When the power supply voltage is lower than the specified lower limit value or higher than the specified upper limit value, the heater will automatically report the fault.

3.6 - Fuel Supply

The fuel used by the heater can be supplied by a special fuel tank. Fuel delivery and fuel supply adjustment is via a special fuel pump.

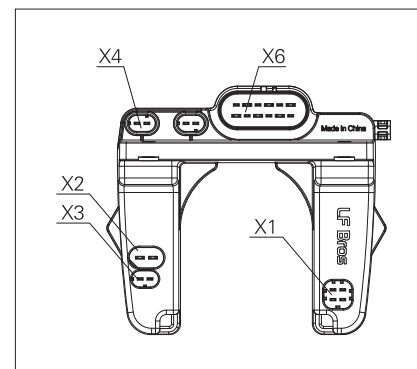


Fig. 7 (W)

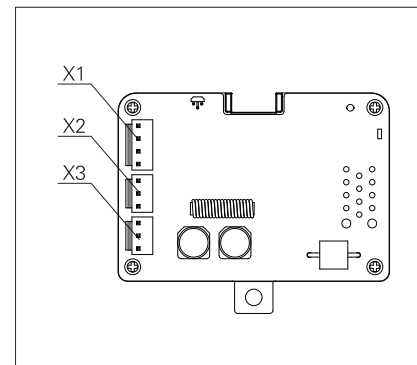


Fig. 8 (E)

IV Installation

Only special parts can be used for installation of the heater. Fig. 9 (W) and Fig. 10 (E) is the diagram for installation. The positions and fixing ways of various parts may vary for different types of vehicles, but the general principles must be followed in conformity with the requirements of this chapter. Otherwise, the heater may not work normally, even 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 the danger of poisoning due to exhaust from burning.

4.1.3 - It is not allowed to install and use the heater in the living room.

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

4.1.5 - Make sure to keep fuel tank, compression tank, fire extinguisher, clothes, paper, etc. away from the heater, and also avoid them to opposite to the hot air vent.

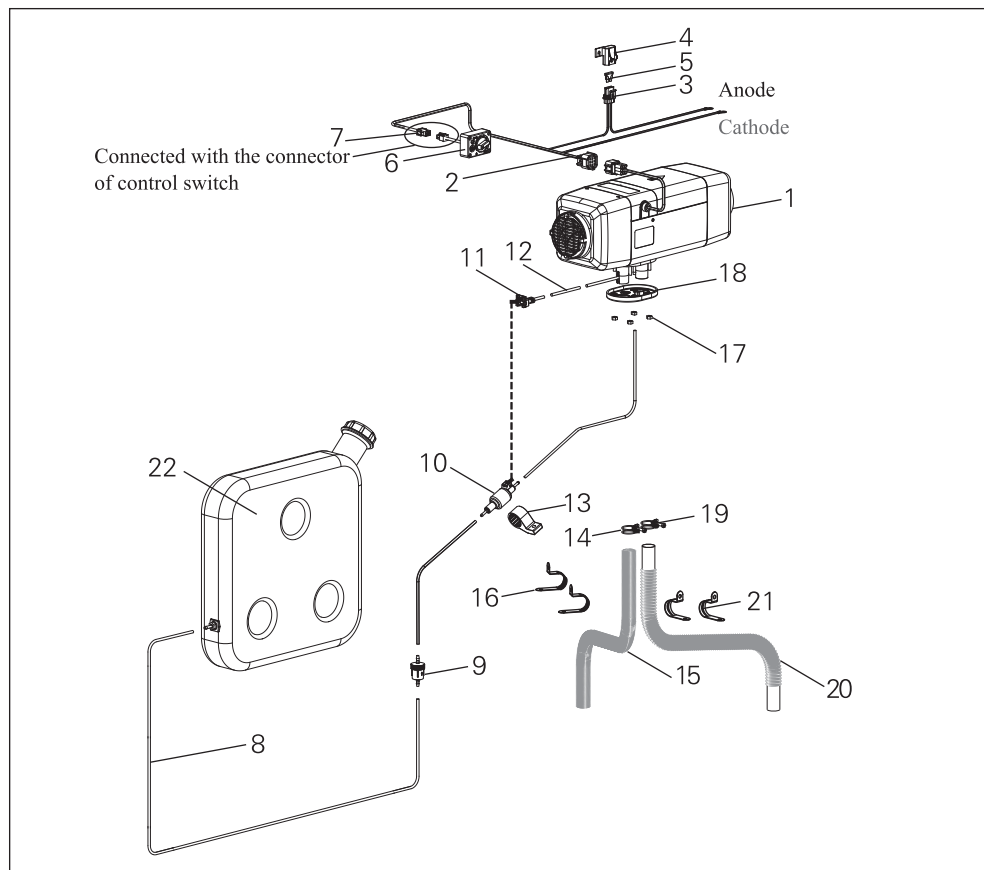


Fig. 9 (W)

1-Heater; 2-Main harness; 3-Fuse holder; 4-Fuse box cover; 5-Inserting disk fusing; 6-Control switch; 7-Connector for control switch X9; 8-Fuel pipe; 9-Fuel filter; 10-Fuel pump; 11-Fuel pump connector; 12-Pump leading wire; 13-Fuel pump clamp; 14-Air inlet pipe clamp; 15-Air inlet pipe; 16-Air inlet pipe fixing clamp; 17-M6 nut; 18-Gasket; 19-Exhaust pipe fixing clamp; 20-Exhaust pipe; 21-Exhaust pipe fixing clamp; 22-Fuel tank.

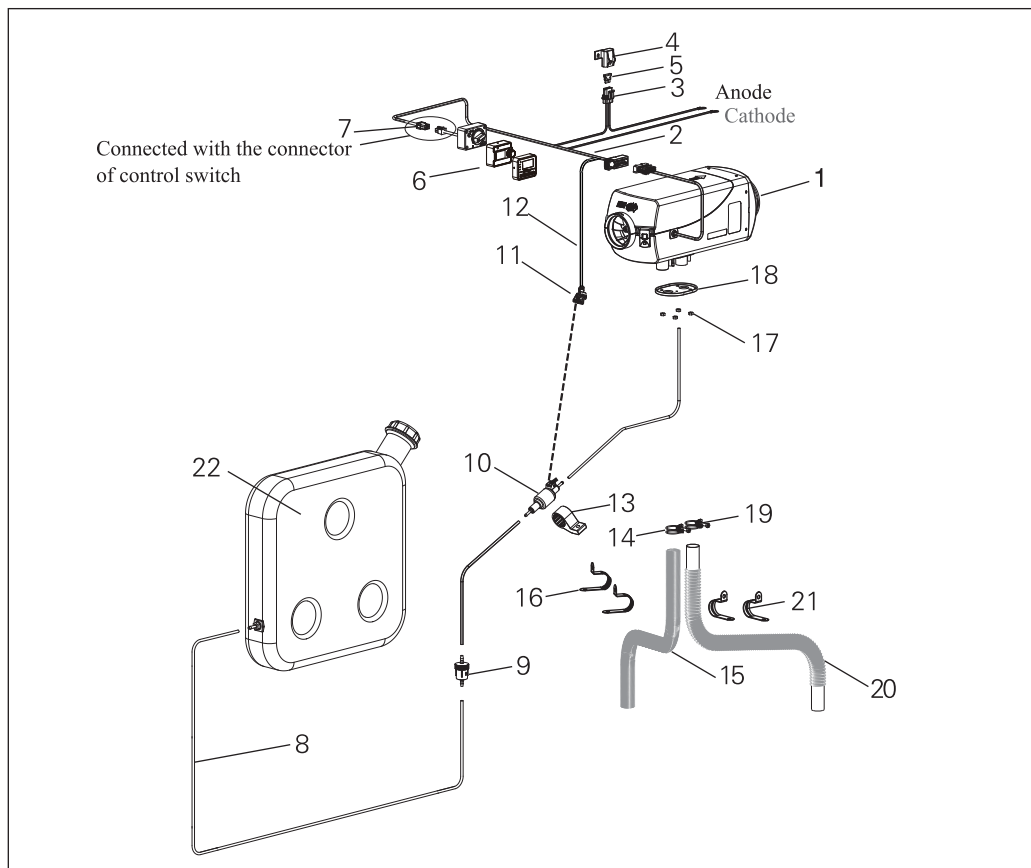


Fig. 10 (E)

- 1-Heater;
- 2-Main harness;
- 3-Fuse holder;
- 4-Fuse box cover;
- 5-Inserting disk fusing;
- 6-Control switch;
- 7-Connector for control switch X9;
- 8-Fuel pipe;
- 9-Fuel filter;
- 10-Fuel pump;
- 11-Fuel pump connector;
- 12-Pump leading wire;
- 13-Fuel pump clamp;
- 14-Air inlet pipe clamp;
- 15-Air inlet pipe;
- 16-Air inlet pipe fixing clamp;
- 17-M6 nut;
- 18-Gasket;
- 19-Exhaust pipe fixing clamp;
- 20-Exhaust pipe;
- 21-Exhaust pipe fixing clamp;
- 22-Fuel tank.

4.2 - Installation of the main equipment

4.2.1 - The main equipment can be installed inside or outside of the vehicle. But when it is installed outside the vehicle, a shield (supplied by retailers) which can prevent the damage (splash of stones) from external force should be provided. The heater can't be soaked in the water or in the rain. If the heater is corroded by rain and water, please stop using the heater immediately and let a qualified technician to inspect all components.

4.2.2 - To ensure heating air flow and easy installation and maintenance of the main equipment, 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.11 and Fig.12 and Fig. 13.

Make sure that there are no Interference objects in the gap between the bottom surface of the main equipment and the mounting surface of the vehicle.(Fig. 11-F and Fig.12-F and Fig. 13-F).

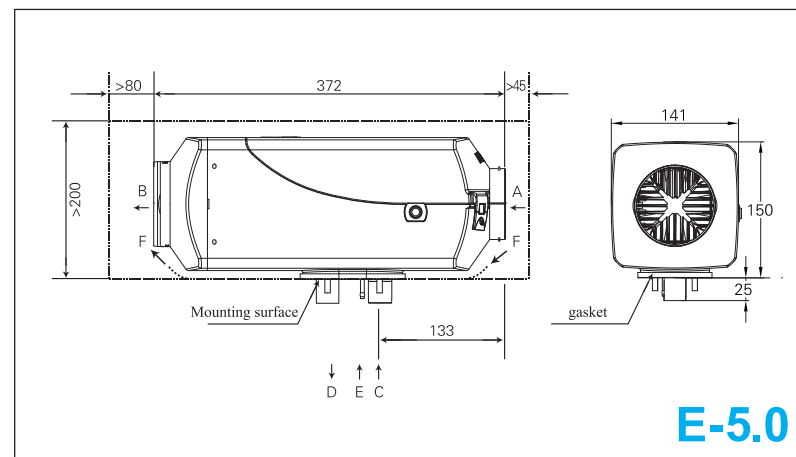


Fig. 12 (E)

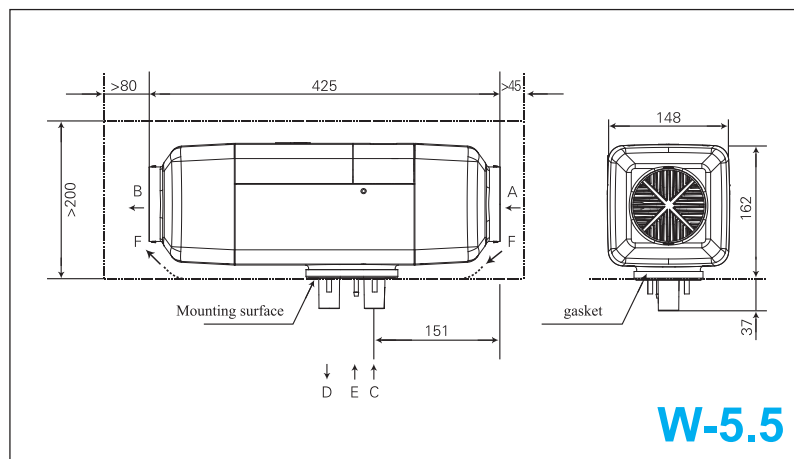


Fig. 11 (W)

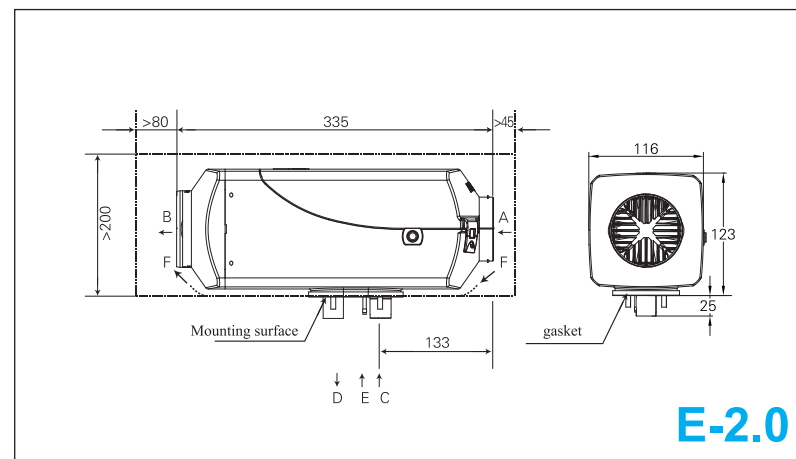


Fig. 13 (E)

A-Inlet of air to be heated; B-Outlet of heated air; C-Inlet of combustion supporting air; D-Discharge of exhaust; E-Fuel inlet; F-None-interference area;

4.2.3 - Good sealing is necessary between the main equipment and the installation face on the vehicle. A special gasket (as shown in Fig. 11 and Fig. 12) supplied by the manufacturer must be padded for installation. The installation surface must be even enough. Its parts at the installation bases of the main equipment shall have unevenness less than 1 mm. After drilling installation holes, evenness must be improved according to this requirement, when installation, please rotate the four M6 nuts provided by the manufacturer tightly, The torque for tightening shall be 6Nm+1Nm. The position of installation holes is shown in the Fig. 13.

4.2.4 - If the thickness of the installation panel is $< 1.5\text{mm}$, a mounting plate is needed. The gab between the mounting plate and the car body must also be sealed (Fig.14). Please confirm the actual size with the real product.

Note: A new gasket must be replaced when the main unit is reinstalled.

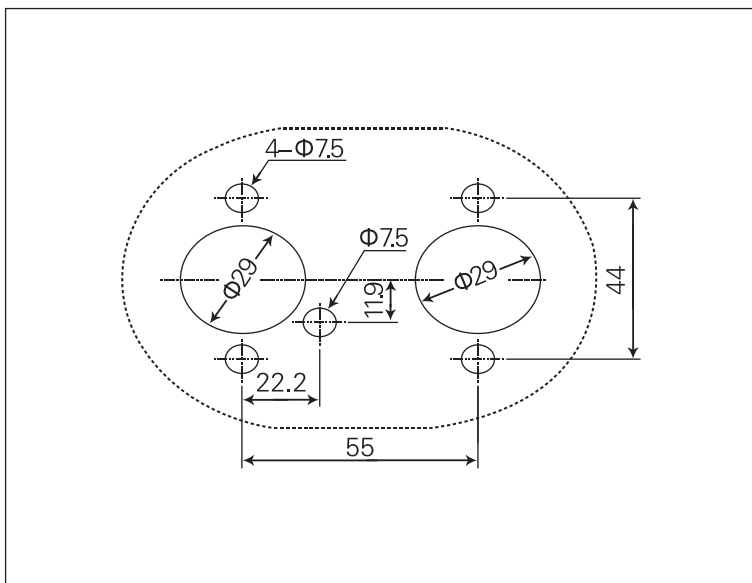


Fig. 13

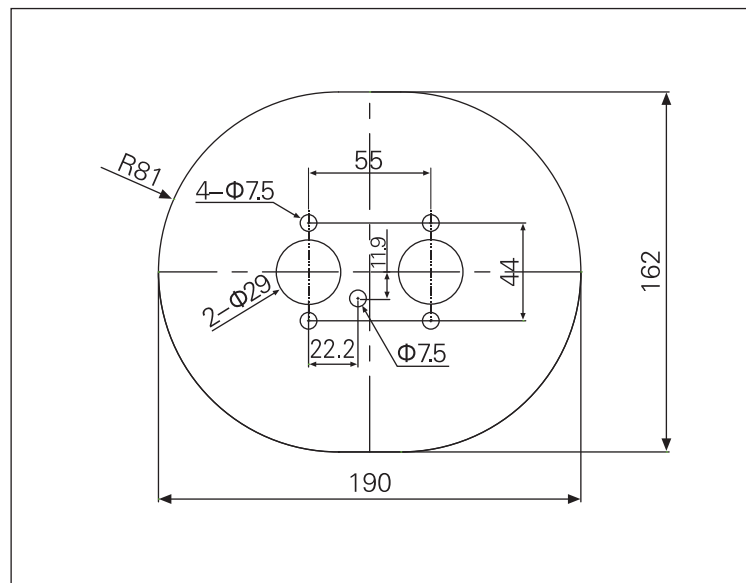


Fig. 14

4.2.5 - The installation direction of the main heater is as shown in Fig. 15 and Fig.16. It must be noted that the tilt angle has to be exactly 90 degrees on both sides, otherwise, it will affect the normal operation.

4.2.6 - After the installation, it must be checked to ensure that there is no contact or friction between the fan wheel and the surrounding components to prevent malfunction during work.

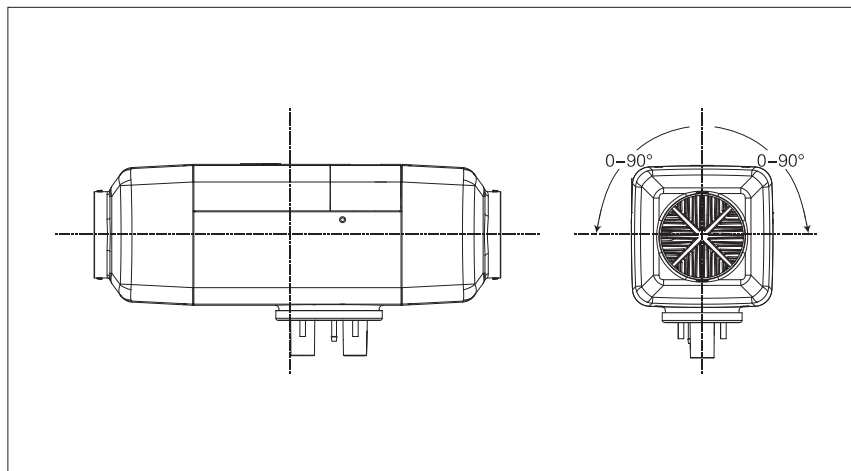


Fig. 15 (W)

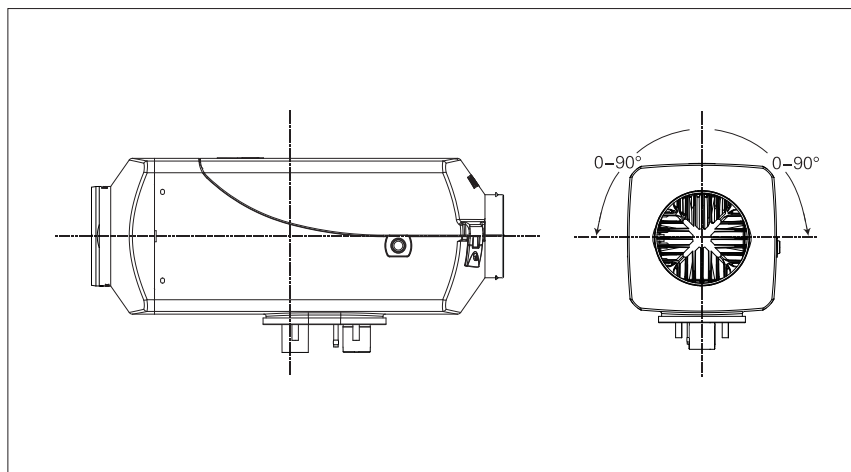


Fig. 16 (E)

4.3 - Installation of Air Heating System

4.3.1 - It's recommended to select the independent outer circulation or inner circulation mode of heater for installation. If the air heating system of the heater has to be connected with the air duct of the vehicle, in order to ensure the air duct unobstructed, the connection way should be decided by the professionals.

4.3.2 - When an external heating air pipe is attached to the heater, its material shall be capable to resist the 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 higher 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 the case of passenger vehicles, measures shall be taken to avoid the block of the hot air vent by passengers. A self-provided protective net shall be installed if necessary.

4.3.5 - 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. 17). The inlet air shall be drawn from the cold area of the compartment, such as under the seats or berths. If no air inlet pipe is attached in this mode, an air inlet hood with grids (W: Fig. 5-6; E: Fig. 6-4) must be installed at the air inlet port of the main equipment.

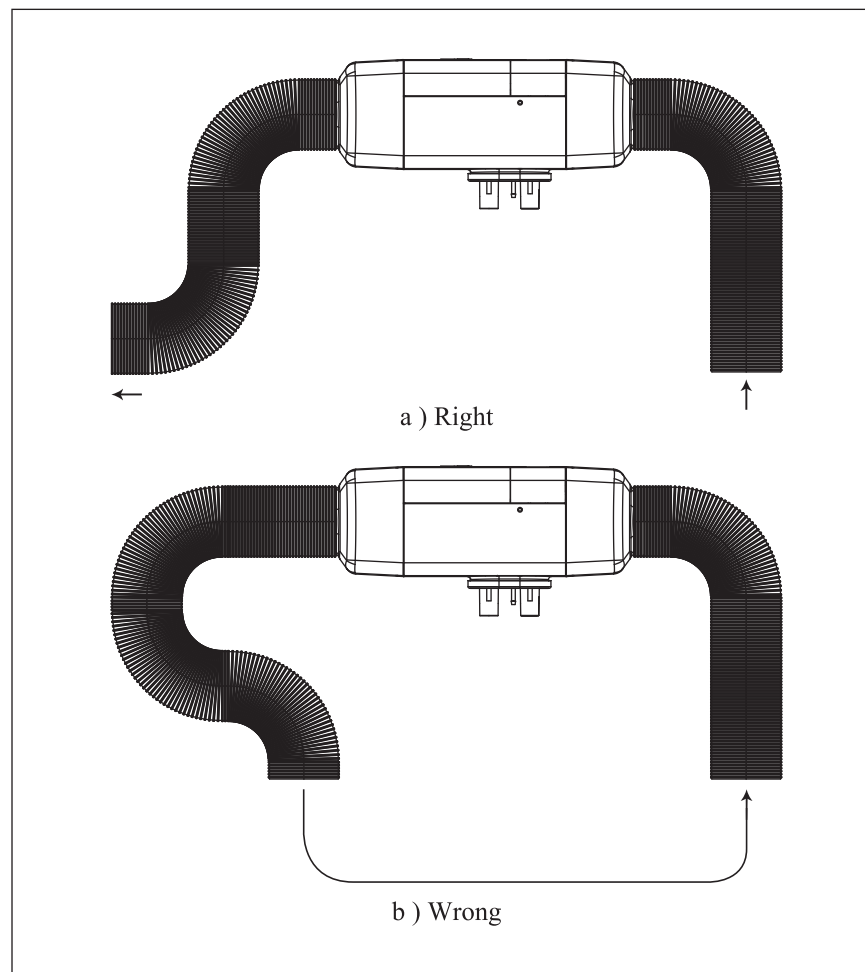


Fig. 17

4.4 - Installation of Fuel Supply System

The fuel supply system for the heater is as shown in Fig. 18.

4.4.1 - The fuel pump shall be fixed in protective rubber clamp to eliminate the transfer of vibrations. The outlet of the fuel pump shall tilt upwards. The tilt angle can be selected from the range of $45^\circ \sim 95^\circ$ (as shown in Fig. 19). When conditions permit, the fuel pipe between the fuel pump and the heater shall go up gradually.

4.4.2 - The elevation difference between the level of fuel and the fuel pump as well as the elevation difference between the fuel pump and the fuel inlet of the heater can produce pressure (or suction) in the fuel pipeline (See Fig. 19). Therefore, these dimensions shall conform to the requirements as follows: $a \leq 3\text{m}$; $b \leq 0.5\text{m}$; $c \leq 2\text{m}$

Note: Please check the vent hole on the fuel tank cap during installation.

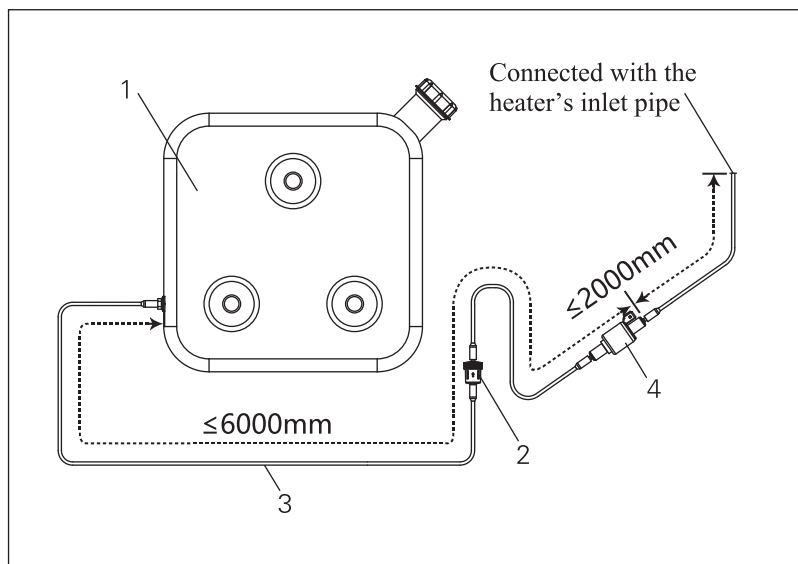


Fig. 18

1. Fuel tank; 2. Filter; 3. Fuel connecting pipe; 4. Fuel pump;

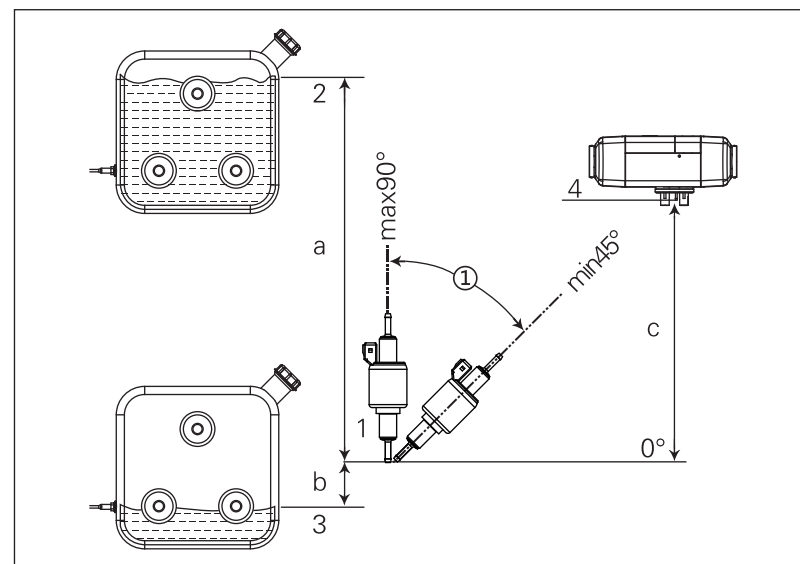


Fig. 19

1-Fuel pump; 2-The highest level of fuel; 3-The lowest level of fuel;
4-Fuel inlet level for the main equipment; ①The prior installation angle

4.4.3 - Installation of Fuel Filter

A fuel filter should be installed before the fuel inlet port of the fuel pump. Make sure that the fuel flow is correctly followed. Its position shall be exactly 90 degrees - in conformity with Fig. 20.

The fuel filter should be replaced every 6 months, so do the fuel pipe fittings and clamps.

4.5 - Installation of Electrical Components

4.5.1 - Connection diagram of the main wire harness and the heater is as shown in Fig. 21 and Fig. 22. The wires of the main equipment 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 300mm. To be noted that any exposed wire bundle out of the vehicle body or out of the wiring groove must be protected by the corrugated pipe.

4.5.2 - Connect the red wire on the fuse box to the “+” terminals of the vehicle's battery; while connect the black wire on the main harness to the “-” terminals of the vehicle's battery.

4.5.3 - Connect the fuel pump leads with the fuel pump.

4.5.4 - Install the control switch in a position for convenient operation. The arrangement shall make an easy observation on the indicator on the case to identify the working conditions (operation/stop) of the heater easily. The terminals of the leads of the control switch should be plugged in the socket according to the order as shown in Fig. 23, and then connected with the self-locking mechanism to the connector X9 on the main wire harness.

4.5.5 - Each wire end shall be wrapped with electrician's insulating tape to avoid short-circuit.

4.6 - Installation of Combustion Supporting Air Sucking Pipe and Exhaust Discharge Pipe.

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

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

4.6.2 - Only the air inlet pipe and exhaust pipe provided with the heater can be used. The air inlet pipe is an aluminum bellow; the exhaust pipe is a stainless steel bellow. They cannot be installed incorrectly or swapped during installation. To connect them with the heater, please use the supplied clamps to fix them tightly on the combustion supporting air inlet and exhaust pipe vent respectively. The protective hood on the vents of the air inlet pipe and exhaust pipe must be kept intact and shall not be damaged or removed.

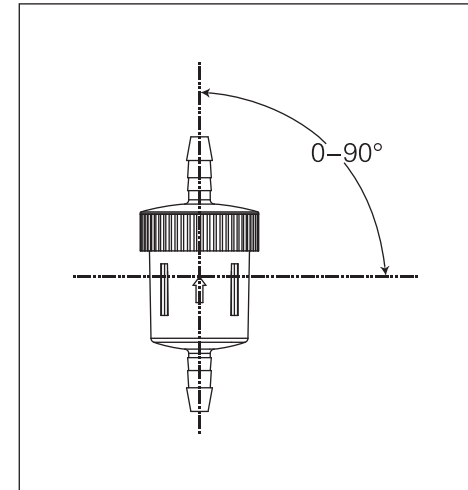


Fig. 20

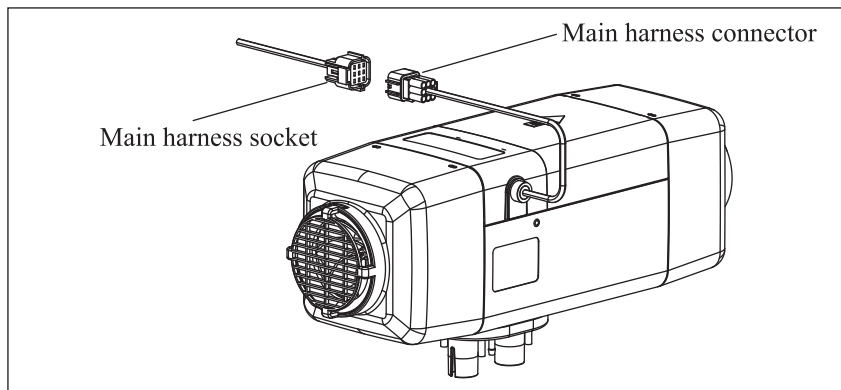


Fig. 21 (W)

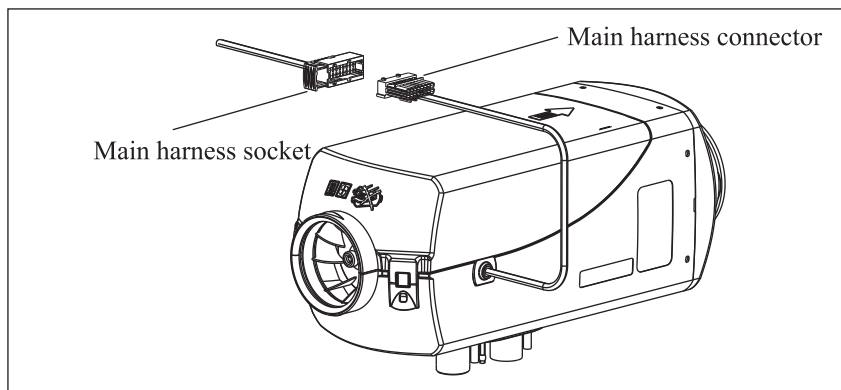


Fig. 22 (E)

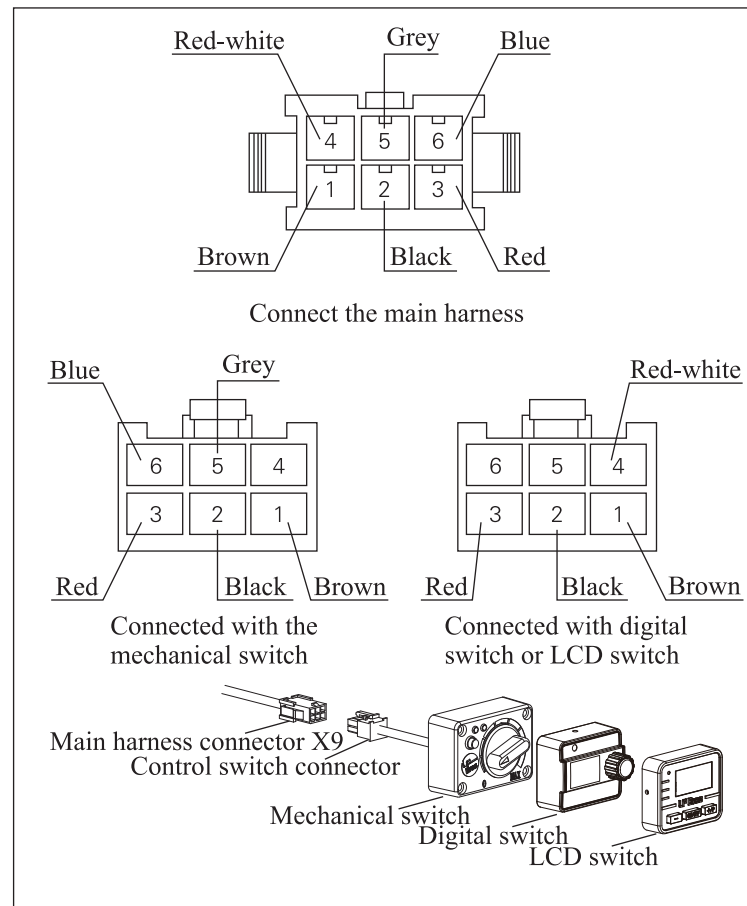


Fig. 23

Installation Direction Diagram of the Air Inlet Pipe

← The direction of the running vehicle

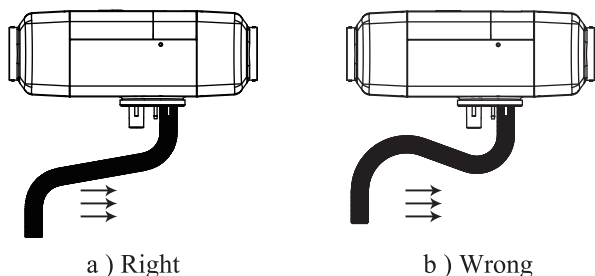


Fig. 24

← The direction of the running vehicle

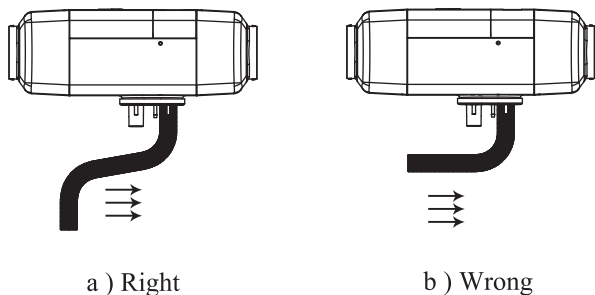


Fig. 25

Installation Direction Diagram of the exhaust pipe

← The direction of the running vehicle

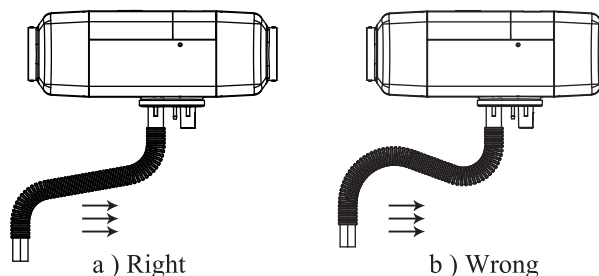


Fig. 26

← The direction of the running vehicle

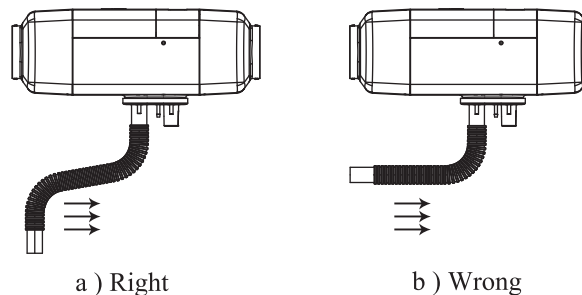


Fig. 27

4.6.3 - Both the air inlet pipe and exhaust pipe shall come outwards and downwards from the heater (Fig. 24 and Fig. 26), or a $\Phi 5\text{mm}$ hole shall be prepared at the bottom of the pipe for discharge of condensate water. If the pipe has to be bent, the bending radius of the pipe cannot be less than 50mm. Also, the sum of all curve angles for each pipe shall not exceed 270° .

4.6.4 - The openings of the pipes shall not be opposite to the direction of the running vehicle. (Fig. 25 and Fig. 27).

4.6.5 - Arrangement of the pipes shall protect the pipe openings from blocking by slurry, snow or other dirt. (Fig. 28)

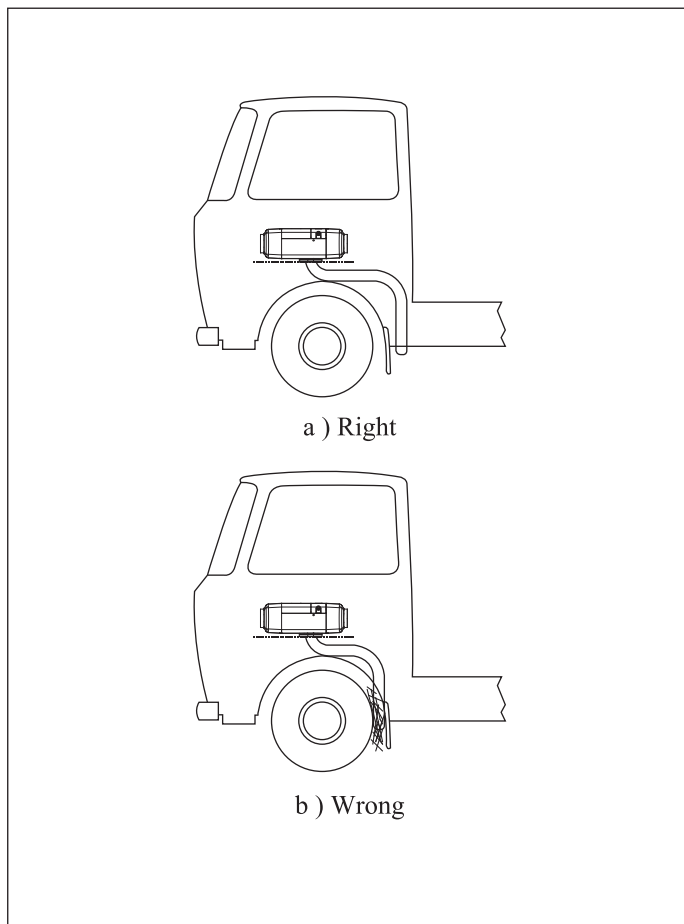


Fig. 28

4.6.6 - When the heater is running, the exhaust pipe is at high temperature. During installation, make sure to install the pipe in the far distance from the plastic parts or other objects with the poor thermal resistance of the vehicle body. The exhaust pipe 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 clamp for the exhaust pipe shall be within 150mm from the pipe end. (Fig. 29)

Warning: Violation against the above requirements may cause the fire. We won't afford any responsibility for any consequences caused by not installing according to our requirement..

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

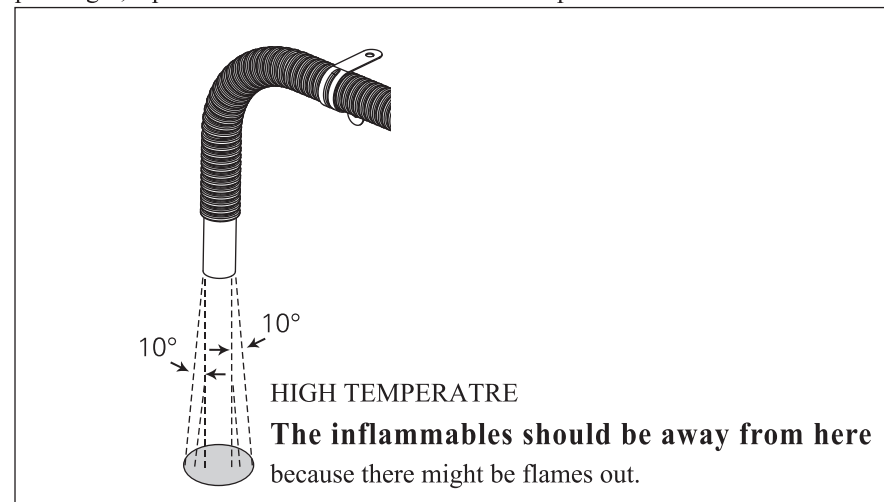


Fig. 29

V Solutions to Common Malfunction

5.1 - During use, the heater might be unable to start naturally or die out after startup, which would lead to malfunction locking state. In such case, you could turn off the heater and keep it in shutdown status for above 3 seconds. Then restart the heater.

5.2 - Circuit malfunction might 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 pay attention to inspection and maintenance to prevent such troubles from happening.

VI Precautions

6.1 - After installation of the heater, the air trapped in the fuel supply system shall be removed thoroughly to make the fuel line filled up with fuel. Please use the fuel pumping mode until the fuel lines are fully filled with the fuel.

6.2 - The heater shall be commissioned before use. Carefully check the leaks and safety conditions of all connections during the test run. If the 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, to make the heater unable to operate. The heater can only be put into use after being repaired by qualified professionals.

6.3 - Before each heating season starts, a careful inspection shall be performed by qualified professionals for maintenance, details as follows:

- a) Check the contamination and foreign matter in the air inlet and outlet.
- 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 blockage and damage to the air inlet pipe and exhaust pipe.
- e) Check to find any leakage on the fuel line.

6.4 - If the heater is not used 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.

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

6.6 - When replacing low-temperature fuel, the heater should be operated for at least 15 minutes to fill the new fuel into the fuel line and fuel pump.

6.7 - The heater must be turned off before refueling.

6.8 - The heat exchanger should not be used for more than 5 years. After expiration, it must be replaced with genuine parts and replaced by the heater manufacturer or its authorized agent. At this time, the overheating sensor shall also be replaced at the same time.

6.9 - If it's arranged in the area of passengers, the exhaust pipe of the heater for a discharge of fumes shall be replaced with genuine parts when the usage time is reaching 5 years.

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

6.11 - During the transportation and storage of the heater, the ambient temperature should not exceed the range of -40 °C□85 °C range to prevent any damage to electronic components.

6.12 - Only authorized customer service stations are allowed to install and repair the heaters, and non-original parts are prohibited from being used to avoid danger.

6.13 - The manufacturer shall not be 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.

VII Function and description of control switch

7.1 - Mechanical Switch

7.1.1 - Heating (temperature) working mode: start button is in the press state, and start indicator is light green. Use the control knob to set the control temperature (continuously adjustable between 10 °C ~ 30 °C). See Fig. 30.

7.1.2 - Power working mode: start button is in the released state, and the start indicator is light red. You can use the control knob to adjust the heater's power (continuously adjustable between 1.0KW ~ 5.5KW). See Fig. 31.

7.1.3 - Emergency start (fuel filling function)

The operation is as follows (See Fig. 32):

- (1) Turn on and wait for the "working indicator" to start flashing.
- (2) Press the start button (mode switch button) no less than 6 times in the frequency of 1 time/second.

The work indicator will stop flashing, indicating that the system has been switched to the emergency start state. In the emergency start state, the fuel pump will continue to supply oil at a high frequency until the ignition is successful or stop running when the pump has pumped oil for about 500 times, but still fail to ignite. Then one can repeat the above procedures to start "fuel filling function".

7.1.4 - When shutting down, turn the control knob to the "0" position. After 3 seconds, the work indicator is off. If the pump is in operation before shutting down, it will stop immediately, while the fan will run until the temperature of the case of the heat exchanger drops to +50 °C.

Control switch is as shown. Its control knob and start button is used for the following operations:

Start button is in the pressed state Start indicator is light green

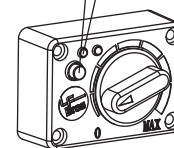


Fig. 30

Start button is in the released state Start indicator is light red

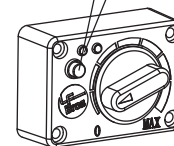
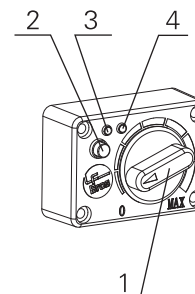


Fig. 31



1 - control knob; 2 - start button;
3 - start indicator; 4 - work indicator

Fig. 32

7.2 - LCD switch

(after the initial installation please start the heater with the “7.2.4.1 - Fuel pumping mode” to remove the air lock from the fuel pipes)

7.2.1 - Startup

7.2.1.1 - Long press the "ON/OFF" button for 3 seconds, the buzzer will sound, and the main LCD screen displays "ON" (See Fig. 33).

7.2.1.2 - The glow plug will start to work in about 2 seconds. The main LCD screen displays voltage U8V - U16V (for 12V) or U18V - U32V (for 24V) (See Fig. 34).

7.2.1.3 - The fuel pump will start pumping fuel in about 1 minute and 30 seconds (See Fig 35).

7.2.1.4 - After the successful ignition the heater starts running naturally in about 5 minutes. The settings couldn't be adjusted until completing the startup process. The main LCD screen displays the ambient temperature (See Fig. 36).

7.2.2 - Working mode selection

7.2.2.1 - Power working mode:

Click the "+/P" button, and then click the "ON/OFF" button to enter into power mode.

Press the "-" or "+/P" button to adjust the power. After adjusting, wait 3 seconds for the buzzer to sound, and the setting is completed. The main LCD screen displays the set power (P: 1.4kW - 5.0kW) (See Fig. 37).

Note: The maximal power is dependent on the version of heater.

7.2.2.2 - Temperature (thermostat) working mode:

Click the "+/P" button, and then click the "ON/OFF" button to enter into temperature mode.

Press the "-" or "+/P" button to adjust the temperature. After adjusting, wait 3 seconds for the buzzer to sound, and the setting is completed. The main LCD screen displays the set temperature (t: 10°C - 35°C) (See Fig. 38).

Note: The achievable maximal temperature is directly dependent on the version of heater, volume of the heated cabin, exterior temperature and thermal resistance of the walls.

7.2.3 - Shutdown

Long press the "ON/OFF" button for 3 seconds to execute the shutdown command.

At this time, the heater will stop working in a heat dissipation state for 2-3 minutes, and the main screen will display "OFF" (See Fig. 39).

7.2.4 - Initialization mode selection:

7.2.4.1 - Fuel pumping mode:

Long press "+/P" button for 5 seconds. The buzzer will sound once and the heater will enter into the fuel pumping mode. The main LCD screen displays "Poli" (See Fig. 40).

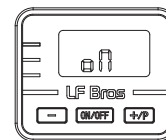


Fig. 33



Fig. 34



Fig. 35



Fig. 36



Fig. 37

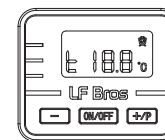


Fig. 38

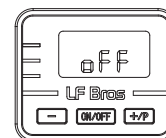


Fig. 39

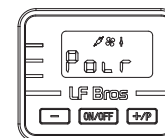


Fig. 40

Note: It's used for filling the fuel pipe with diesel for the first-time use, or after the heater stopped because of insufficient diesel left in the fuel tank. Normally it would take two cycles to fill up the whole fuel line.

7.2.4.2 - Ventilation mode:

Long press "-" button above 3 seconds. The buzzer will sound once, and the heater will enter into ventilation mode. The main LCD screen displays the fan speed (900 - 3500 RPM) (See Fig. 41).

Note: It's used to blow the residue fuel left in the heater, when the heater has been shut down abnormally. And one should remember to turn off the ventilation mode to access the normal use.

7.2.5 - Troubleshooting

7.2.5.1 - Wire harness disconnection of the switch is:

When turn on the heater, the main screen is black or displays "Conn" (See Fig. 42), indicating that the wiring harness of the switch is not securely connected, please check.

7.2.5.1.1 - When the red-white wire harness is disconnected, the LCD screen will not show anything. After 5 seconds, the "Circuit Board" will perform the shutdown process to turn off the heater. The "Circuit Board" will take the heater's shutdown as a normal shutdown.

7.2.5.1.2 - When any one of the other three wire harness are disconnected, the buzzer will sound continuously, and the LCD displays "Conn"(See Fig. 42). After 5 seconds, the "Circuit Board" will execute the shutdown process to turn off the heater. The "Circuit Board" takes the heater's shutdown as a normal shutdown.

In both variants make sure that all electrical connections are connected and follow the "7.2.1 - Startup" mode.

7.2.5.2 - Sudden power failure is:

7.2.5.2.1 - When the heater has just been turned on, and the fuel pump has not started pumping the diesel yet, the 12V/24V power supply is suddenly disconnected. The heater will be powered off directly. The "Circuit Board" will take the heater's shutdown as a normal shutdown. Follow the "7.2.1 Startup" mode and it will enter into the normal startup process.

7.2.5.2.1 - When the heater is in one of the working modes, the 12V/24V power cord is disconnected. The heater will be powered off directly. The "Circuit Board" will take the shutdown as an illegal shutdown. Follow the "7.2.1 - Startup" mode, the "Circuit Board" will perform the sweeping process (to clear the residual oil), and the buzzer will sound long once, and the LCD displays "LOST" (See Fig 43). Please wait for a couple of minutes to enter into the normal startup process.

7.2.5.3 - Abnormal shutdown is:

When you turn the heater on and the main screen displays "LOST"(See Fig. 43), indicating that it was an illegal shutdown last time. Please wait at least 5 minutes for the automatic processing to complete, and it will automatically switch to the normal power-on state.

7.2.5.4 - Fault code:

If the buzzer sounds continuously, the screen displays "E0 - E15". This is the fault code (F00 - F15). Please refer to the fault report table for troubleshooting (for example E7 is F07 fault code - the fuel pump fault) (See Fig. 44).

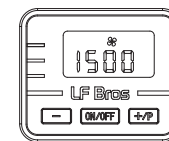


Fig. 41

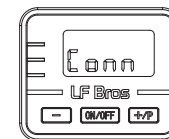


Fig. 42



Fig. 43

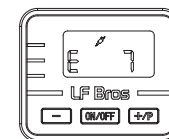


Fig. 44

7.3 - Digital Switch

(after the initial installation please start the heater with the “7.3.4 - Fuel pumping mode” to remove the air lock from the fuel pipes)

7.3.1 - Startup

7.3.1.1 - Long press the knob for 3 seconds, the buzzer will sound, and the screen displays "ON" (See Fig. 45).

7.3.1.2 - The glow plug will start to work in about 2 seconds. The fuel pump will start pumping fuel in about 1 minute and 30 seconds. The screen displays voltage U8V - U16V (for 12V) or U18V - U32V (for 24V) (See Fig 46).

7.3.1.3 - After the successful ignition the heater starts running naturally in about 5 minutes. The settings couldn't be adjusted until completing the startup process. The screen displays the ambient temperature (See Fig. 47).

7.3.2 - Working mode selection

7.3.2.1 - Power working mode:

Rotate the knob (left or right at random) to switch to the settings.

The clockwise rotation increases the power, while the counterclockwise rotation reduces the power. After the adjustment, wait for 3 seconds. When the buzzer sounds, the setting is completed. (Digital display value P: 1.4KW-5.0KW) Click the knob in this state to enter into the temperature mode adjustment (See Fig. 48).

Note: The maximal power is dependent on the version of heater.

7.3.2.2 - Temperature (thermostat) working mode:

Rotate the knob at random to switch to the settings.

The clockwise rotation increases the temperature, while the counterclockwise rotation decreases the temperature. After the adjustment, wait for 3 seconds. When the buzzer sounds, the setting is completed (digital display value t: 10°C-35°C). Click the knob in this state to enter into the power mode adjustment (See Fig. 49).

Note: The achievable maximal temperature is directly dependent on the version of heater, volume of the heated cabin, exterior temperature and thermal resistance of the walls.

7.3.3 - Shutdown

Long press the knob for 3 seconds to execute the shutdown command.

At this time, the heater will stop working in a heat dissipation state for 2-3 minutes, and the screen will display "OFF" (See Fig. 50).

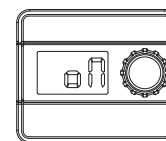


Fig. 45

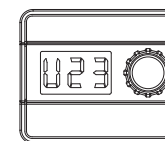


Fig. 46

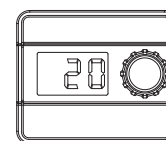


Fig. 47

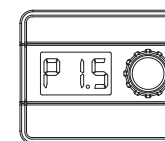


Fig. 48

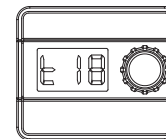


Fig. 49

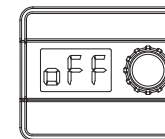


Fig. 50

7.3.4 - Initialization mode selection

Fuel pumping mode:

Long pressthe knob for 5 seconds. The buzzer will sound once and the heater will enter into the fuel pumping mode.

The screen displays "PoL" (See Fig. 51).

Note: It's used for filling the fuel pipe with diesel for the first-time use, or after the heater stopped because of insufficient diesel left in the fuel tank. Normally it would take two cycles to fill up the whole fuel line.

7.3.5 - Troubleshooting

7.3.5.1 - Wire harness disconnection of the switch is:

When turn on the heater, the main screen is black or displays "Con", indicating that the wiring harness of the switch is not securely connected, please check (See Fig. 52).

7.3.5.1.1 - When the red-white wire harness is disconnected, the digital screen will not show anything. After 5 seconds, the "Circuit Board" will perform the shutdown process to turn off the heater. The "Circuit Board" will take the heater's shutdown as a normal shutdown.

7.3.5.1.2 - When any one of the other three wire harness are disconnected, the buzzer will sound continuously, and the screen displays "Con" (See Fig. 52). After 5 seconds, the "Circuit Board" will execute the shutdown process to turn off the heater. The "Circuit Board" takes the heater's shutdown as a normal shutdown.

In both variants make sure that all electrical connections are connected and follow the "7.3.1 - Startup" mode.

7.3.5.2 - Sudden power failure is:

7.3.5.2.1 - When the heater has just been turned on, and the fuel pump has not started pumping the diesel yet, the 12V/24V power supply is suddenly disconnected. The heater will be powered off directly. The "Circuit Board" will take the heater's shutdown as a normal shutdown. Follow the "7.3.1 - Startup" mode and it will enter into the normal startup process.

7.3.5.2.2 - When the heater is in one of the working modes, the 12V/24V power cord is disconnected. The heater will be powered off directly. The "Circuit Board" will take the shutdown as an illegal shutdown. Follow the "7.3.1 - Startup" mode, the "Circuit Board" will perform the sweeping process (to clear the residual oil), and the buzzer will sound long once, and the screen displays "Los" (See Fig. 53). Please wait for a couple of minutes to enter into the normal startup process.

7.3.5.3 - Abnormal shutdown is:

When you turn the heater on and the screen displays "Los" (See Fig. 53), indicating that it was an illegal shutdown last time. Please wait at least 5 minutes for the automatic processing to complete, and it will automatically switch to the normal power-on state.

7.3.5.4 - Fault code:

If the buzzer sounds continuously, the screen displays "E0 - E15". This is the fault code (F00 - F15). Please refer to the fault report table for troubleshooting (for example E7 is F07 fault code - the fuel pump fault See Fig. 54).

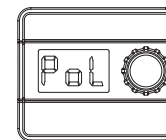


Fig. 51

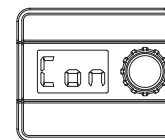


Fig. 52

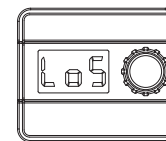


Fig. 53

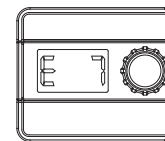


Fig. 54

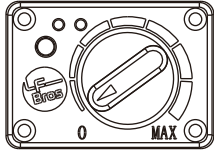

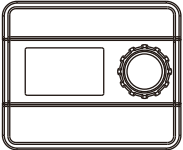
Fault Code	Fault Description	Solutions	Fault Code	Fault Description	Solutions
F00	Control unit error / incorrect parameter setting / hot start recognition	① replace the control panel	F07	Metering pump is open or shorted	① the wire of fuel pump is open or shorted
F01	Failed to start (has been tried twice) / failed to form a flame	① fuel exhaustion ② bubbles in the oil line and the oil supply is discontinuous ③ fuel pump is abnormal ④ bad quality of fuel	F08	Motor of the fan is open or shorted; or motor of fan is overloaded or blocked	① motor blade is stucked ② motor fault
F02	Flame off (already repeated 3 times)	① bubbles in the fuel line and the fuel supply is discontinuous ② fuel pump is abnormal ③ bad quality of fuel	F09	The glow plug is shorted	① short-circuit of ignition needle ② the wire of ingnition needle is connected reversely
F03	Undervoltage or overvoltage	① confirm if the voltage of the power supply matches the voltage of the heater ② poor power cord installation ③ access to additional non-compliant power cord ④ power converter can not provide enough current ⑤ power converter output voltage is instable	F10	Overheat	① a large flow of fuel pump is connected by mistake ② air duct of air inlet or air outlet is blocked
F04	Premature ignition identification	① residual fuel in the heater	F11	Overheat sensor is shorted or overtemperature sensor is shorted	① Pt1000 shell temperature sensor failure
F05	Thermal efficiency failure (burning problems or pump failure)	① fuel pump is abnormal ② filter is blocked ③ fuel inlet is blocked ④ too much carbon deposition ⑤ Pt1000 senser fault	F12	Glow plug connection	① poor contact of the wire of glow plug ② glow plug failure
F06	Temperature sensor is open or shorted	① temperature sensor of circuit board is damaged	F14	The overheat sensor is not positioned correctly	① Pt1000 sensor is installed incorrectly
			F15	Open circuit of setpoint generator	
					   <p>Mechanical switch LCD switch Digital switch</p>

Table 5

RECORD FOR REPAIRS AND MAINTENANCE

DESIGNED BY  LF BROS



DATE	MAINTAINED ITEMS AND THE MAINTENANCE CAUSE
<div> <div>/</div> <div>/</div> <div>/</div> </div> <div>DAY / MONTH / YEAR</div>	
<div> <div>/</div> <div>/</div> <div>/</div> </div> <div>DAY / MONTH / YEAR</div>	
<div> <div>/</div> <div>/</div> <div>/</div> </div> <div>DAY / MONTH / YEAR</div>	

- 1、 THE WARRANTY TIME IS ONE YEAR FOR NON-ARTIFICIAL MALFUNCTION.
- 2、 THIS PRODUCT IS QUALIFIED AFTER INSPECTION AND MEETS THE MARKET STANDARDS.
- 3、 BEFORE THE USAGE, PLEASE INQUIRE QUALIFIED TECHNICIANS TO AVOID THE WRONG OPERATION.
- 4、 PLEASE CONTACT LF BROS MAINTANCE STATION. DO NOT DISASSEMBLY ARTIFICIALLY.

**It is necessary to inspect and maintain the heater by
qualified installer before using every winter.**





ALL RIGHTS RESERVED



This product has been approved successfully by the National patent.
It is protected by “The patent law of the People's Republic of China”
Without the written permission of Heilongjiang LF Bros Technology Company, Ltd.,
any form of the pirate copy or reproduction is illegal.

CE IP44 ROHS ENEC