Overview

First of all, thank you for choosing the heater produced by Jingwei Company. As a professional heater manufacturer, we have been dealing in designing and producing automotive heaters for over 40 years and our company will try to provide you with comprehensive and good-quality services.

YJH-Q (A) series of volatile atomized fuel liquid heater takes use of the combustion heat transfer to heat the engine coolant or cab heating equipment so as to preheat the water-cooled engine and supply heat to the cockpit. This heater is featured in small fuel consumption, higher thermal efficiency, and quicker heating and lower exhaust emissions. In winter, it can greatly reduce the difficulty of the engine cold start, reduce engine wear and fuel consumption and thus extend the engine life.

YJH-Q (A) series of heaters take use of external electromagnetic pumps for oil supply, and the external control systems and ignition systems are equipped for easy maintenance for users.

In order to better use this product, please read the manual in detail.

Please read carefully about the information of this book about ⚠ (warning) and ★ (note), which users must be sure to implement thoroughly when using and checking our products.

Our company will not be liable for any compensation for any issues caused when you do not follow the manual.

Notices for Use:

⚠ **For any matters indicated by ★ (Warning),** if they are neglected or improperly handled, it may lead to fires and other risks and thus result in serious personal injury accidents.

⚠ **For any matters indicated by ★ (Note),** if they are neglected or improperly handled, it may affect the full performance of the product and may cause serious personal injury accidents in serious cases.

⚠ (Warning):

1. It is absolutely prohibited to use the gasoline as fuels so as to prevent any deflagration.
2. It needs to use the antifreeze solution compliant with the ambient temperature, and if not, the antifreeze solution may be frozen and can't circulate.
3. Do not place any combustibles or flammable or explosive dangerous goods near to the heater, otherwise it may cause fires.
4. There should be no obstructions within 300mm below the exhaust port of the heater. If there are any materials not resistant to high temperature under the exhaust port, such as wire harness, rubber pipelines and hydraulic pipelines, etc., it may easily lead to fires due to high temperature of the exhaust port.
5. During the routine maintenance, please check to see if there is no fuel exudation in the lower part of the heater. Once the oil spill is found, check it immediately, otherwise it may cause a fire.
6. When the heater is in normal operation, it is strictly forbidden to turn off the heater with the vehicle's main power switch. Before turning off the main power switch of the vehicle, please turn off the heater at least three minutes in advance. Otherwise, the heat in the heater will not be released, which will damage the heater and even cause fires.

★ **(Notes):**

1. It is strictly prohibited to modify the heater, use parts and components not produced by our company for repairs (replacement) and make installations and setups with the methods incompliant with the requirements of our company. The Company shall not be liable for any accident or damage caused by the above reasons.
2. Make sure whether the outer skins of the wire harness of the heater, the mainframe of the heater, the floor of the vehicle and the contact points of the vehicle body is damaged or not. If the outer skin of the wire harness is damaged, it may cause a fire due to short circuit.
3. Always check the level of the coolant in the compensation tank. The liquid level should be kept at 1/3 to 2/3 of the height of the tank. If the liquid level is too low, it will cause the heater to be dry and then possibly cause a fire hazard.
4. When replacing the coolant, remove the discharge plug of the heater and completely discharge the air from the circulatory system.
5. The heater system should be filled with the fuel compliant with the ambient temperature. If the fuel does not match the fuel label, it will cause the oil in the pipeline to be waxed and accordingly the heater can't burn normally.

The physical products specially ordered will be different from the Specification in sizes and parameters. If there is anything not mentioned here, please contact our company.

The company has the final interpretation of this manual! Our company reserves the final rights of interpretation on this Specification.

Contents

1. Service conditions and technical parameters

- Ambient temperature for storage: -55℃ to +70℃;
- Ambient temperature for operation: -41℃ to + 50℃;
- Constant temperature of outlet water: 65℃ to 80℃;
- Operating voltage: DC12 (10-15) V/24 (20-30) V.
  Generally, automotive batteries are used as power supply. When it is powered with AC mains, it's best to use a stabilized voltage power supply. Please note that the power of the power supply must be greater than the power consumption for ignition of the heater. It is recommended to use more than 400W stabilized-voltage power supply, otherwise, the heater may not work normally if the power supply is unstable;
- This product cannot be immersed in water and cannot be washed directly with water. Please install the heater at a place where it can't be showered; **(if waterproofness is necessary, please give an order with special requirements)**
- It is recommended that this product is recommended for use with low temperature diesel oil suitable for ambient temperature.

Ambient temperature	Over 5℃	Over -5℃	Over -15℃	Over -30℃	Over -40℃
Fuel to be used	0#Diesel	-10#Diesel	-20#Diesel	-35#Diesel	-50#Diesel

- Altitude of Use: ≤3,000 meters for civilian goods, ≤5,500 meters for military products
- Normal working speed: 0-100km /h;
- Suitable for preheating all kinds of water-cooled engine under low temperature and heat supply for the operation room of the engineering machinery;

Make sure that your operating environment is in accordance with the service conditions of the product.

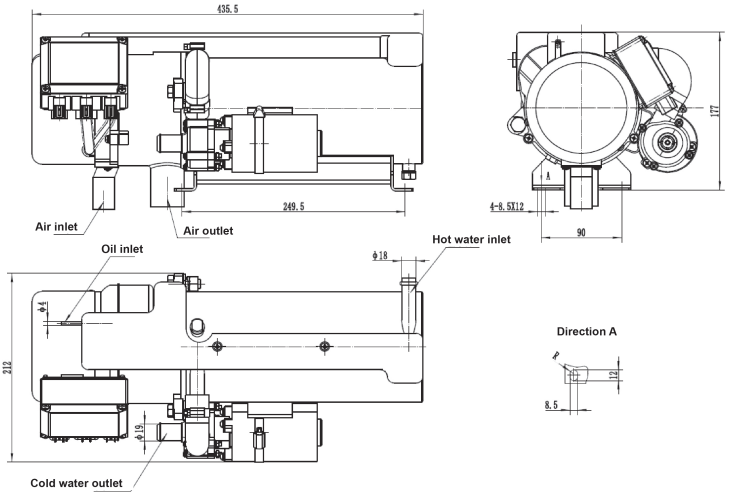


Figure 1: Outline Drawing of YJH-Q(A)

2. Structure and operating principle

As shown in Figure 2, YJH-Q (A) series of fuel heater system mainly consists of the control box, the rotor assembly of motor, combustion chamber, heat exchanger, water pump and external electromagnetic oil pump.

After having been turned on, the heater enters into the self-check program; if the voltage is less than 20V (10V for 12V heater) or higher than 30V (15V for 12V heater), the heater will give an alarm and indicate the fault; if the voltage is normal, the water pump works and the ignition plug is powered on for preheating. After about 60 seconds of pre-heating, the electromagnetic oil pump and the rotor assembly of the motor are powered on and work. The fuel oil is delivered from the tank by the electromagnetic oil pump to the volatile network and volatizes when it contacts heats and mixes with combustion-supporting air delivered by the rotor assembly of the motor, the oil and gas mixture ignites in the combustion room under the high temperature caused by the ignition plug, where the heat is brought away with the circulating liquids in the heat exchanger and the combustion exhaust gases are discharged from the exhaust port. With the internal temperature of the heater rising, the flame detector feedbacks signals to

the control box to control the circuit to power off the ignition plug and turn on the indicators, which indicates that the heater enters into the normal working condition.

If the heater does not work properly within the specified period, it will be ignited once again; if the heater still can't work normally for a second time or the heater is operating normally while the control box fails to detect the feedback signal, the heater will stop igniting. Meanwhile, detect the cause of the abnormal operation and wait until the status indicator indicates the fault code after 90s when the heater cools down.

When the heater enters the normal working condition and the temperature of the hot water outlet reaches 60□, the control box gradually reduces the heat to reduce the oil consumption through the frequency conversion pulse width modulation mode. After the water temperature reaches 80□, the electromagnetic oil pump stops the oil supply and the heater stops burning while the water pump continuously operates. The main motor works for further approximate 3 minutes to cool down the heater. The status indicator goes out while the power indicator lights on after the main motor stops working. When the heater water temperature sensor senses that the outlet water temperature is below 65 ° C, the heater is re-ignited, which shall be repeated as such.

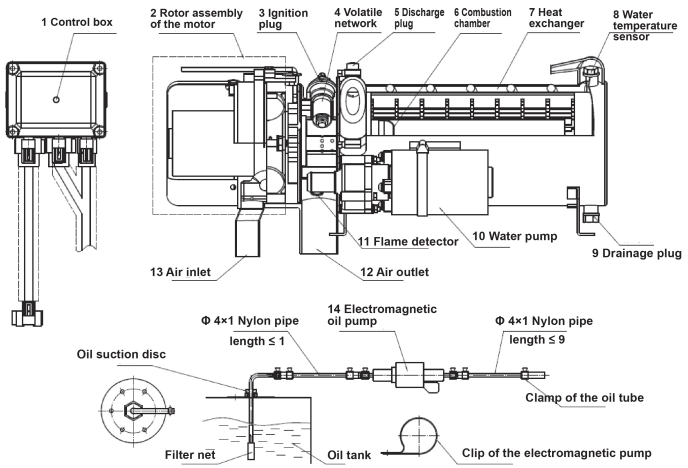
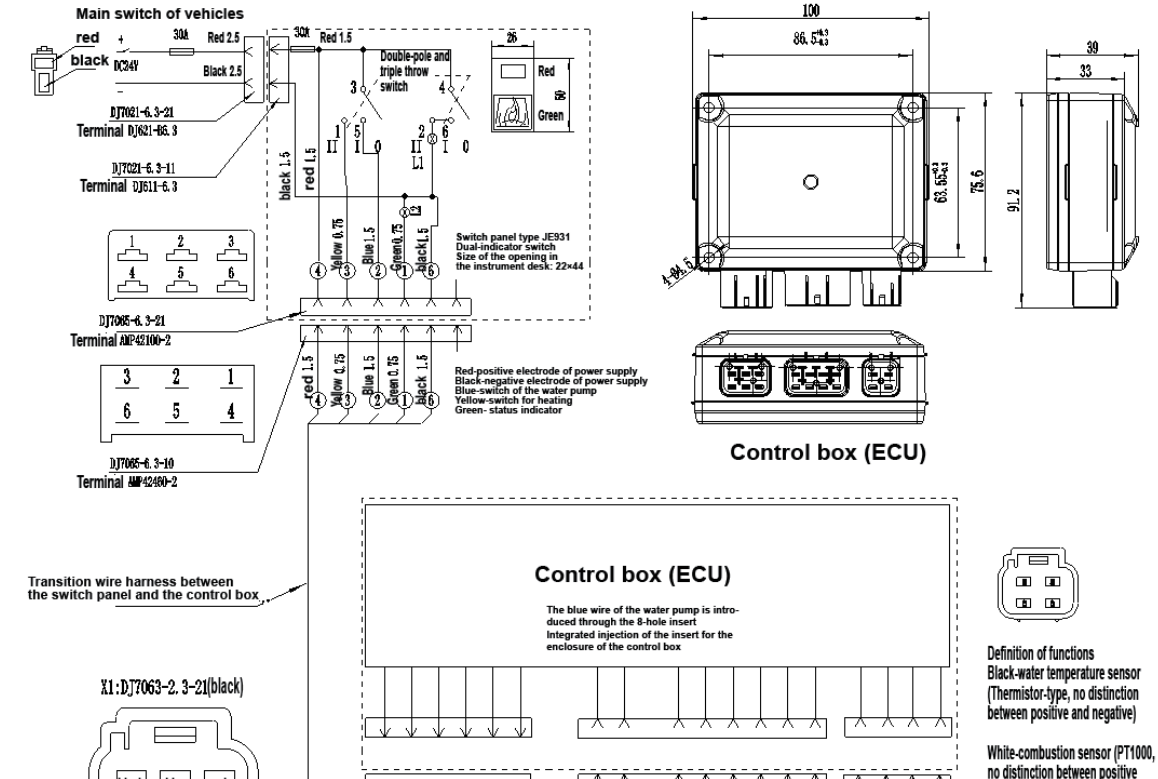
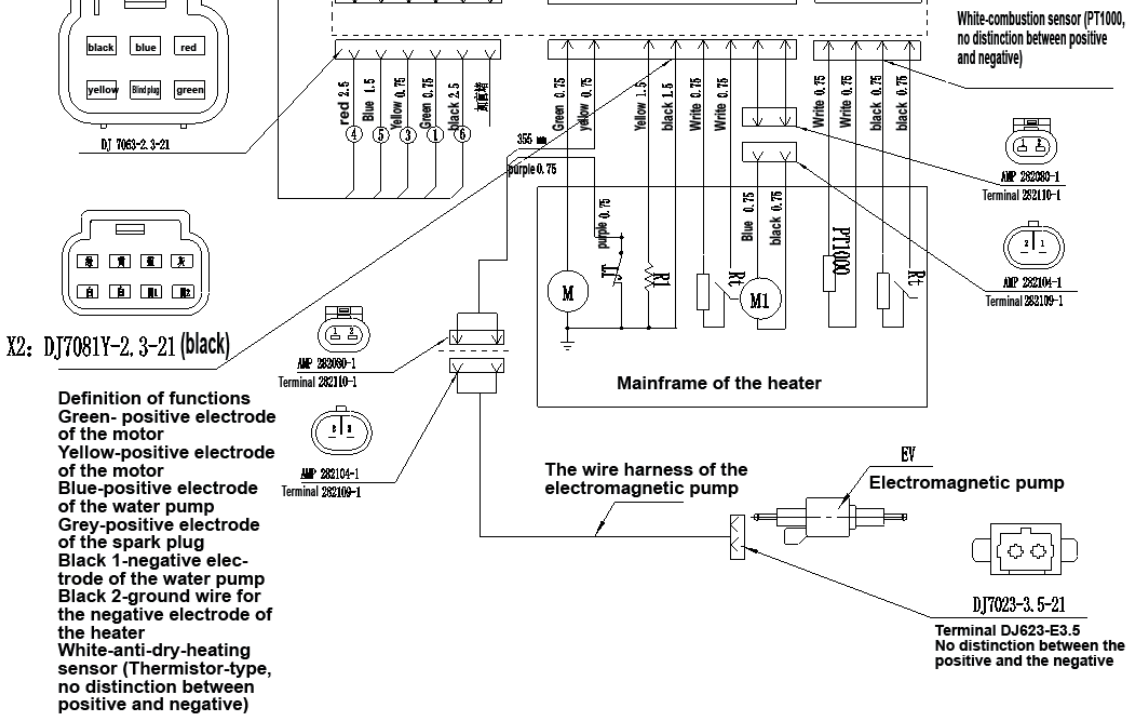


Figure 2: Structure Diagram of YJH-Q(A)

List of Electric Components

R1	Ignition plug	M	Main motor
Rt	Water temperature sensor	JT	Thermocutout
KT	Flame sensor	M1	The motor of the water pump





Note: the wire sequence is the one that observed when you look at the exposed terminal

Figure 3: Electric circuit diagram of the YJH-Q(A) series

3. Installation instructions

The following should be noted when the heater is installed:

- Installation and fixation of the heater:

a. It should be placed horizontally (± 5°).

b. It should be arranged where it is subject to small vibrations.

c. It is recommended to install the shroud above the heater to extend the heater's service life if it is exposed to the cabin.

d. It is prohibited to put any combustible or flammable or explosive dangerous goods near to the heater.

- Installation of the heater's fuel pipelines:

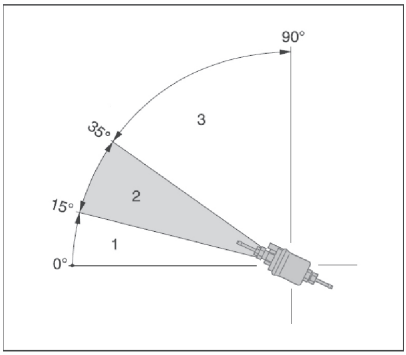
a. Oil can be directly taken from the vehicle fuel tank through a separate oil pipeline not shared with other equipments on the vehicle.

b. The difference of the height between the fuel level of the tank and heater height cannot exceed ± 500mm.

c. The length of the oil pipeline from the fuel outlet of the oil tank to the electromagnetic pump is not more than 1m while the oil pipeline from the electromagnetic pump to the heater is not more than 9m and the electromagnetic pump should be mounted horizontally (it is best to mount it upwards 15 ° to 35 ° but not downwards.).

d. Separately set up an oil tank when the distance between the oil tank and the heater is more than 10m or the vehicle is a petrol one.

e. The oil pipe should be made of Φ 4x1 nylon pipe (or rubber hose) with special joints, the oil pipe joints must be tightened and the protective sleeve should be applied to the oil pipe and fixed onto the vehicle body.



- Installation of the intake and exhaust pipes:

a. There shall not be any obstacle within 300mm of the air inlet and air outlet, otherwise it will cause poor exhaust of the heater and affect the normal combustion. Special attention: because the temperature of the exhaust gas outlet is higher, there must be no any wire hardness, rubber hose or other non-high temperature resistant materials so as to avoid fires.

b. Please note the followings when installing the intake pipe: Do not use the exhaust gas as the combustion-supporting air. The inlet direction should not be directly opposite the direction of travelling and the installed inlet pipe should be inclined downwards.

c. Please note when installing the exhaust pipe: The exhaust port must be placed outside the vehicle; the exhaust pipe shall not exceed the boundary of the vehicle side and the exhaust pipe should be inclined downwards.

d. In order to prevent the exhaust pipe from being damaged by vibration, it must be fixed.

e. When the heater is arranged in the cabin, the air inlet and the air outlet must be connected to the open space outside the cabin. The exhaust gases are harmful to the human body and the combustion-supporting air consumes oxygen, hence both of them can never be connected to the inside of the cabin. The air outlet may be connected with a metal corrugated hose less than 2m long, and the angle of the bend should be greater than 90 °.

- Connection of water pipeline:

a. The water inlet of the water pump is connected to hot water outlet of the engine (Note: It is not allowed to be connected to the pipeline between the thermostat and the cooling water tank of the engine) and the hot water outlet of the heater is connected to the return pipe of the engine; if it will be used for heating, it should be connected to the heating equipments firstly and then to the return pipe of the engine.

b. The water pump can be removed from the engine and separately arranged. Please note that the water inlet of the water pump should be arranged under the water outlet of the engine. It is not allowed that there is any bend of the water pipeline of the heater affecting water circulation. The water pipeline should be protected with rubber sleeves when it passes through the vehicle body and bends must be arranged at the right-angled turn. An example of installation is shown in Figure (4) and Figure (5).

- Coolant filling:

a. After the coolant is filled into the heater, it must be ensured that the water pipeline is unblocked, if necessary, the discharge plug of the heater can be opened to discharge the gas.

b. When the heater is activated frequently, check whether the coolant in the circulatory system is adequate and the water circulation is smooth.

- Circuit connection:

a. Control box and heater are connected via a transition wire harness as indicated in the drawing. The wire harness should be protected with rubber sleeves when it passes through the vehicle body and the outer protection sleeve of the wire harness should be fixed firmly. For the vehicles transporting dangerous goods, a good contact must be especially paid attention to prevent the occurrence of sparks. Note: You can also choose to install the insulation pad. A wire of 4mm2 should be used as power cord for the machine of 12v due to the large voltage drop.

b. The heater must be fitted with fuse (25A) at the positive input terminal of the power cord of the switch.

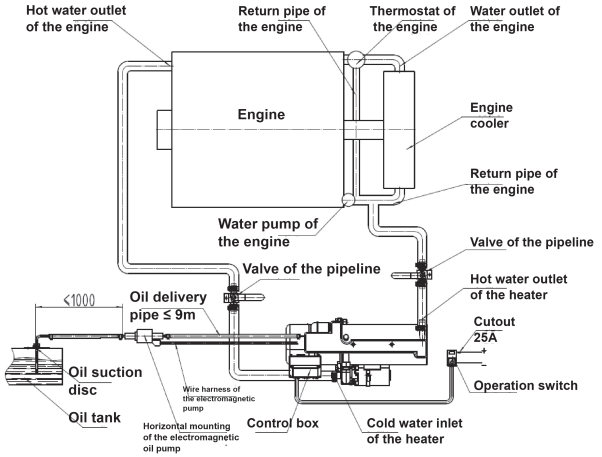


Figure 4: Installation Diagram of the Engine of YJH-Q(A) Heater for Preheating under Low Temperature

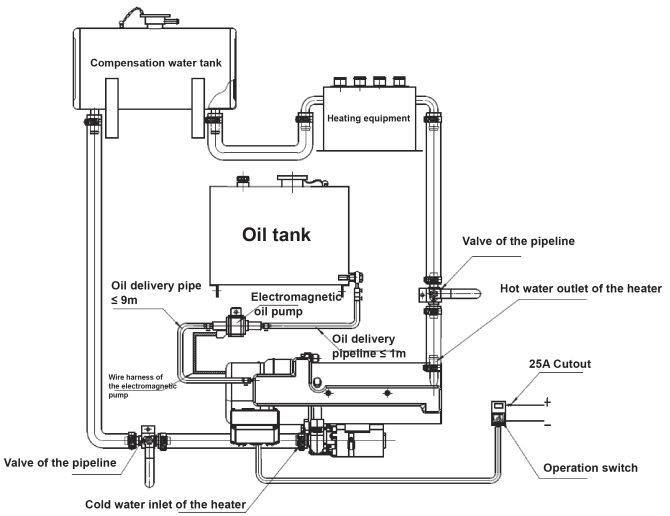


Figure 5: Installation Diagram of the Engineering Mechanical Operation Room of YJH-Q(A) Heater for Heating

4. Operation methods

● Operation Instructions of the Switch Panel

The indicators are separately the power indicator (green) and the status indicator (red) and the status indicator indicates the heater operating status and fault code.

● Turn on: It only needs to press down the switch (level I for the water circulation for single time; level II for the switch of the heater running)

a. The heater starts to work, the power indicator lights (green) and the heater begins the self-check program.

b. If the self-check is normal, the status indicator lights (red) when the heater starts to run normally.

c. If the status indicator (red) light flashes, that is, the heater is working abnormally. For details, please refer to the fault code table.

● Turn off: Turn off the heater switch.

The power indicator (green) turns off, the electromagnetic pump is powered off, fuels supply is stopped, the heater stops working and the combustion-supporting rotor driven by the main motor of the heater continuously works so that the heater is cooled down and then the status indicator (red) does not immediately goes out and will light for about 3 minutes. It will go out when the heater cools down and the main motor stops operating.

★Note: When the status indicator (red) is on, it is forbidden to turn off the power switch of the vehicle (key switch, power gate), otherwise the heat inside the heater cannot be dissipated, causing failures of the heater or causing a fire.

5. Description of the fault code

The control circuit has a number of fault recognition functions, which shall continue to monitor the working state (including battery voltage and combustion states, etc.) during the operation of the heater. When the heater works abnormally, the status indicator (red) will flash in binary code to indicate the type of fault.

For the status indicator (red), each flashing 5 times is grouped into one group. There are long-time flash and short-time flash, a long-time flash is 1s, representing 1 while a short-time flash is 0.2s, representing 0, with an interval of 0.5s. The interval of each group of flashes is 3s, indicating a variety of fault status. For the fault codes, please refer to the table.

Fault code table (indicator light flashes by binary code to indicate fault type. Indicator lights 5 times each time, the flash is divided into long-time flash and short-time flash, a long-time flash is 1s, representing 1, while a short time flash is 0.2s, representing 0, with an interval of 0.5s. The interval of each group flashes is 3s.)				
Fault Type	**Fault code**	**Description Fault**	**Cause of fault**	**Elimination of fault**
FAULT 00	00000	The combustion sensor is short-circuited.	The resistance value of the combustion sensor is too large.	Replace the combustion sensor or control box.
FAULT 01	00001	The load is short-circuited.	The current of the load is too large	Check whether the current of the motor, the water pump, the ignition plug and the electromagnetic pump is normal.
FAULT 02	00010	The power voltage is too high.	The turn-on detection voltage for is too high.	Detect the voltage, if the voltage is too high, check the regulator of the generator; if not, replace the control box.
FAULT 03	00011	The power voltage is too low.	The voltage of the heater is continuously kept too low for 10s.	Detect the voltage, if the voltage is low, check the output voltage of the generator and the voltage drop of the line; if not, replace the control box
FAULT 04	00100	The combustion sensor is short-circuited.	The resistance value of the combustion sensor is too small.	Check whether the line is short-circuited and replace the combustion sensor or the control board.
FAULT 05	00101	The overheat sensor is short-circuited.	The resistance value of the overheat sensor is too large.	Replace the overheat sensor and check the wiring or replace the control box.
FAULT 06	00110	The overheat sensor is short-circuited.	The resistance value of the overheat sensor is too small.	Replace the overheat sensor or the control box.
FAULT 08	01000	The current of the electromagnetic pump is too large.	The current of the electromagnetic pump is too large.	Replace the electromagnetic pump or the control box.

FAULT 11	01011	The water temperature sensor is short-circuited.	The resistance value of the water temperature sensor is too small.	Replace the water temperature sensor or the control box.
FAULT 12	01100	The water temperature sensor is short-circuited.	The resistance value of the water temperature sensor is too large.	Replace the water temperature sensor or the control box.
FAULT 13	01101	The heater can't be ignited.	The heater can't be ignited.	If the heater works, check the wiring of the combustion sensor and others, replace the combustion sensor or the control box; if not, check the oil pipeline of the heater.
FAULT 14	01110	Disruption in combustion occurs.	Disruption in combustion occurs after the ignition	If there is not enough oil in the oil tank, fill oil into the tank; if the oil pipeline leaks, tighten the oil pipeline; if the combustion sensor is short-circuited, replace the combustion sensor or the control box.
FAULT 18	10010	The ignition plug is short-circuited.	The resistance value of the ignition plug is too large.	Replace the ignition plug and tighten the wires.
FAULT 19	10011	The current of the ignition plug is too large.	The current of the ignition plug is too large.	Check the line of the ignition plug and replace the ignition plug or the control box
FAULT 21	10101	The current of the motor is too large.	The main motor stalls or the interior of the motor is short-circuited.	Check the wiring of the main motor, plug out the inserts to directly cause the main motor to work. If the rotation speed is low, replace the main motor, otherwise, replace the control box.
FAULT 22	10110	The current of the water pump is too large.	The water pump stalls or the interior of the motor is short-circuited.	Check the motor of the water pump and replace the water pump or the control box
FAULT 25	11001	The air pressure value is too low.	The air pressure sensor is damaged.	Replace the control box.
FAULT 26	11010	The air pressure value is too high.	The air pressure sensor is damaged.	Replace the control box.
FAULT 27	11011	The heater is too hot.	The air inlet and the air outlet of the heat are blocked.	Check whether the air inlet and the air outlet are blocked and whether they are properly installed.
FAULT 29	11101	Do not detect the motor is working.	The main motor does not work after being powered on, or the controller is not arranged properly or the fan is too far away from the controller.	Check the wiring of the main motor, plug out the inserts to directly test whether the main motor works, if not, replace the main motor, otherwise, replace the control box.
FAULT 30	11110	The heater operates without water.	The water circulation of the heater is not in good conditions or lacks of antifreeze solution	Check the water pipeline system of the heater, open the valve and fill coolant, and then open the discharge plug of the heater to discharge gas.
FAULT 32		No feedback signal is detected.	The control wire harness may be defective.	