

AIR-HEATER FOR VEHICLES

Bring warm and happiness for everyone



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AIR-HEATER FOR VEHICLES



- **Technical Description**
- **Installation Instructions**
- **Operating Instructions**

Maintenance Instructions

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Operating Principle and Use of SF4200 Air Heaters

The SF4200 air heaters are designed to be used as auxiliary heaters for trucks, RVs, boats, construction and farm equipment. The heaters will provide heat and keep a comfortable air temperature for the operator (driver) cab, small RV, passenger vans, mini buses, boats, etc for a fraction of the cost in comparison to engine idling.

Automatic controls will keep the air temperature in your comfort zone.

Compact design, low volume, easy maintenance, safety protection, auto self diagnosis, optional timers, wireless remote control, low emissions and low operating cost makes the heaters ideal to use in trucks, boats, farm and construction equipment.

◆ Operation

The fuel pump delivers fuel to the heater atomizer. The glow pin ignites the fuel-air mixture. Burning fuel heats up the heat exchanger. The heat is transferred into circulating air through the heat exchanger, then the warm air circulates through the truck cabin or sleeper berth keeping it warm.

◆ Use and Application

Widely used in: cars, commercial and industrial equipment, trucks, passenger vans, buses, motor and sail boats, and houseboats. In addition, the heaters are used for heating RV's, travel trailers, recreational cabins.

Installation Instructions and Regulations

◆ Heater Installation

Select the location to place the heater, most of the time the heater is installed on the floor or side wall under the bed in the truck storage compartment or under the seat in passenger vans in order for the heater exhaust fumes to be exhausted directly to the outside of the cabin or passengers space, and the warm air can be easily distributed throughout the cabin.

Heater shall be protected from excessive heat, exposure, and possible contamination from fuel or oil. Keep heater exhaust away from electrical wires, fuel lines, water lines, and any other heat sensitive and flammable materials. Provide sufficient ventilation.

All precautions must be taken when arranging the heater placement to minimize the risk of injury or damage to property.

◆ Fuel Supply

The fuel intake connections shall NOT be in the passenger compartment or operator (driver) cabin. In vehicles where a separate fuel tank is used for the heater, the fuel tank lines and intake connection must be clearly identified. A warning sign shall be permanently attached to the intake connection or fuel tank indicating that the heater must be switched OFF before refueling.

◆ Exhaust System

The exhaust outlet must be arranged in a way that the exhaust fumes go directly to the outside of the vehicle. Prevent penetration of exhaust fumes into the vehicle interior through the ventilation system, warm air intakes, or open windows.

◆ Combustion Air Intake

The heater combustion air shall NOT be taken from passenger compartment, cargo space or operator (driver) cabin. The air intake shall be protected from possible water, debris, snow and ice intake into combustion chamber, and cannot be blocked by any object at any time. Point the air intake away from vehicle travel direction.



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◆ Please Note:

- Failure to comply with the regulations, safety instructions, repairs done by unauthorized person, or use of aftermarket parts voids warranty and relieves manufacture, distributors, dealers, and installation technicians from any and all liabilities.
- The installer is responsible for all damages to the property or person that arises from faulty installation of the heater.

Safety Instructions and Operation

Disconnect vehicle battery power before commencing repair or performing heater maintenance.

Before beginning any work on the heater, switch the heater OFF and let all hot parts cool down.

The heater shall NOT be used in: poor ventilated rooms, garages, shops, multi-storage car park, etc. Use heater only in open, well ventilated areas.

Use of aftermarket parts is strictly prohibited unless authorized by the manufacturer.

Installation and operation of the heater shall comply with statutory regulations, safety instructions and specifications as stated in the installation and operating instructions.

Extreme precaution shall be taken when installing and maintaining electrical wiring, fuel supply, combustion air and exhaust system.

Unauthorized persons are not allowed to do any repairs or maintenance.

Debris and any other remains shall be removed and cleaned before reinstalling the heater into another vehicle.

The heater shall NOT be used in hazardous places such as but not limited to: fuel depots, carbon storage, timber warehouse, granaries and other places where combustible or flammable vapor or dust may be present.

Heater must be switched OFF during refueling.

The heater shall be installed in a spacious compartment. Fuel canisters, oil cans, spray cans, gas cartridges, fire extinguisher, cleaning rags, clothing, papers, or any combustible or flammable materials shall NOT be stored or transported on or next to the heater.

Defective or burned fuses shall be replaced only with same type and same rating fuses.

In the event of a fuel leak; turn OFF the heater immediately, disconnect and cap off fuel line. The leak is to be repaired by a professional, authorized technician.

◆ Please note:

- DO NOT shut down the heater by disconnecting the power unless required to do so by an emergency.



WARNING

- Carbon monoxide monitoring sensor with alarm shall be installed in all passenger compartments, operator or driver cabin, and sleeper berth.

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Technical data and specifications

Model	SF4200			
Heating value (±10%) Btu/hr (kW)	Super	High	Medium	Low
	14334 (4.2)	10921 (3.2)	7508 (2.2)	3754 (1.1)
Fuel consumption US. Gal/hr (l/h)	0.13 (0.51)	0.16 (0.37)	0.06 (0.24)	0.03 (0.12)
Fuel type	Diesel			
Air flow (±10%) cfm	86	70	52	32
Electric power consumption (watt) (12 and 24 V)	42	27	15	10
Start-up (12 and 24 V) Watt	≤100 W			
Rated voltage	12 and 24 Volt			
Voltage lower limit	About 10.5 Volt and 21 Volt time-voltage protection: 20sed			
Voltage upper limit	about16 Volt and 32 Volt time-voltage protection s: 20sed			
Overheat protection (±10%)	(115°C) 239 F			
Allowed ambient temperature	(-40 C ~ 76 C) -40 F ~ 168 F			
Weight lb (kg)	About. 9.9 lb (4.5kg)			

◆ Please note:

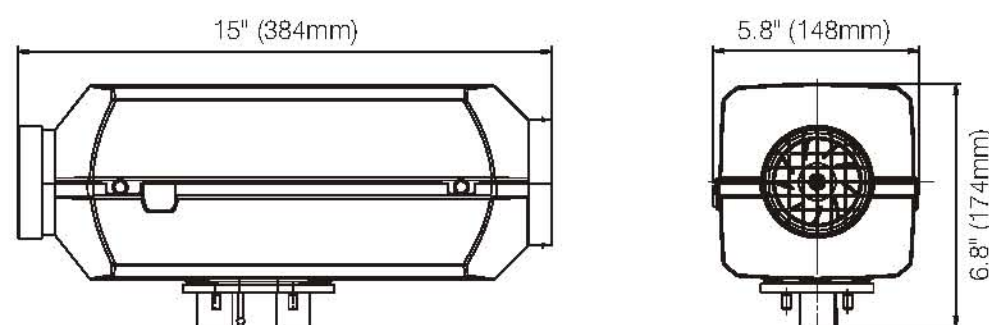
Listed technical data is subject to the tolerances of ±10 %.



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◆ Heater Dimensions



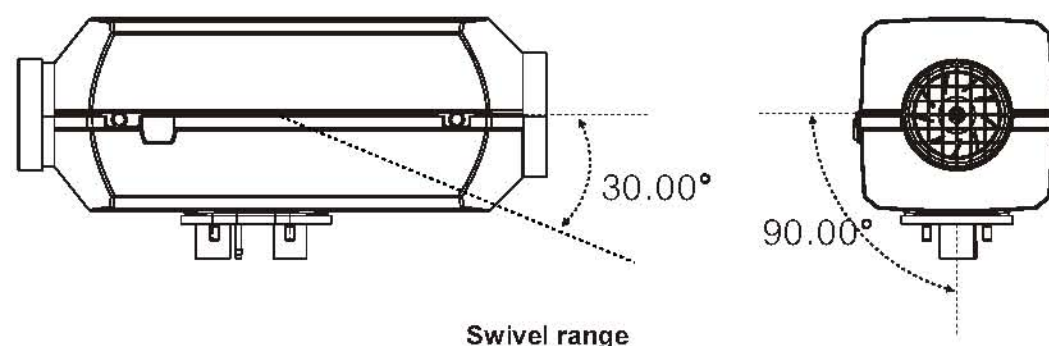
Overall dimensions

Choosing Heater Location and Position

Most of the time the heater is installed on the floor under the bed in the truck storage compartment or under the seat in passenger vans or mini busses.

◆ Tolerable swivel range

Depending on the installation conditions, swivel angles should be as shown below:



Swivel range

Note: The glow pin→shall face upward.

◆ Please note:

• In the heating mode, the heater can deviate from the shown normal or maximum installations positions by up to +15° in all directions in order to accommodate the vehicle or boat movement.

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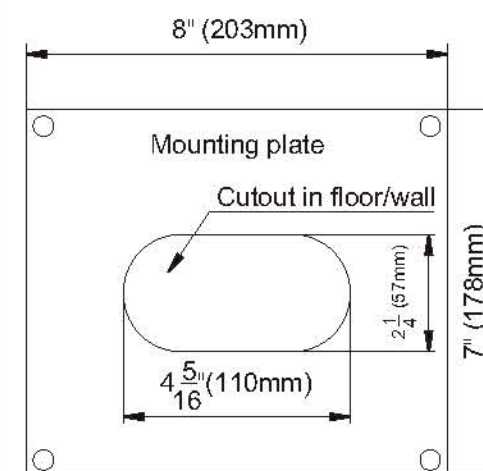


◆ Mounting heater on the floor or wall using mounting plate

Fastening the heater on the vehicle floor or wall.

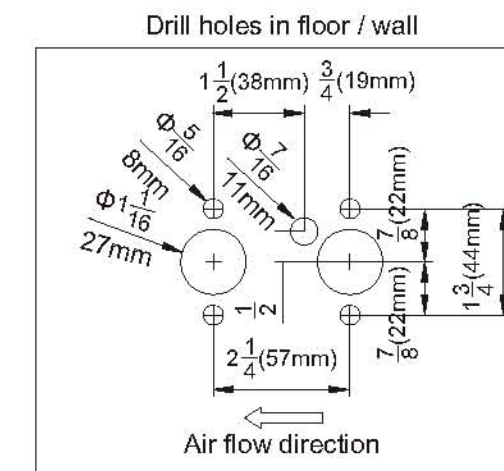
If the mounting surface is not smooth and even use the mounting plate.

Cut hole in floor or wall if using mounting plate as shown on the drawing.



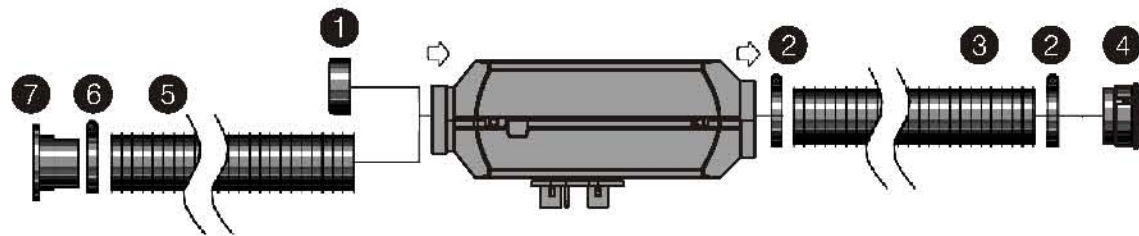
◆ Mounting heater on the floor or wall without mounting plate

When installing the heater without the mounting plate, cut holes in floor or wall. The floor or wall shall be smooth and even.





Installation heater air system (Example)



Item	Description	Item	Description
1	Safety grid	5	Air inlet pipe
2	Hose clamp	6	Hose clamp
3	Air outlet pipe	7	Air intake screen
4	Air outlet screen		

◆ Please note:

Safety instruction:

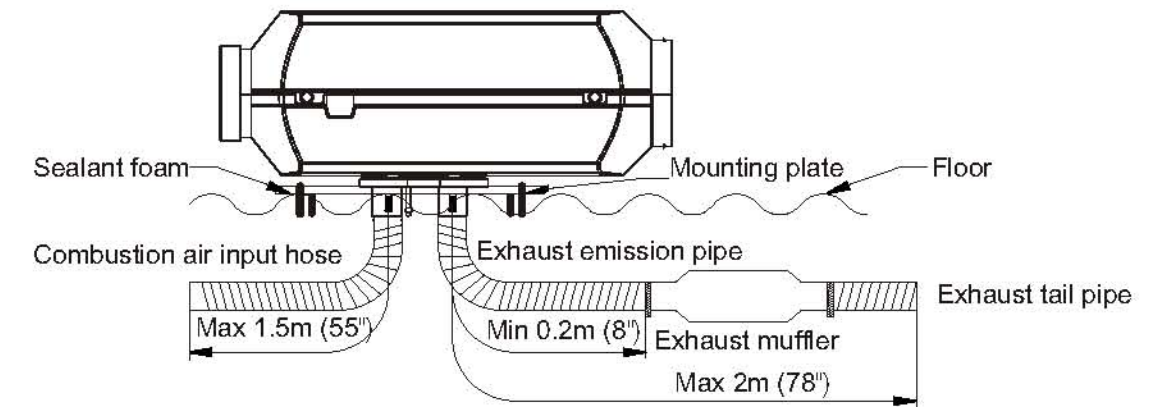
- Prevent possibility of sucking the engine or heater exhaust fumes into the heater.
- Prevent the warm air to be directly sucked back into the cold air return.
- Use only temperature-resistant hose (flex) for the hot air.
- Install protective cover over the heater if there are possibility that the heater may be touched by passenger (s) or operator when heater is using to prevent personal injury and also protect the heater from possible damage from cargo or contact with flammable materials.
- Install hot air duct in the way so it is protected from possible touching by humans and or heat sensitive materials.
- Install cold air return in the way so it will not suck the air from dirty or contaminated environment.

Combustion air system

Install the tube of the combustion air intake in such a way that the air intake is protected from sucking water, snow, ice, dust, hot air, exhaust fumes or any other debris into the combustion chamber.

Exhaust System

Fasten the exhaust silencer (muffler) at suitable position to the vehicle frame, route the flexible exhaust pipe from the heater to the exhaust silencer and fasten with hose clamps. Use hose clamps to attach the exhaust flex pipe to the vehicle body.



◆ Safety Instruction



Warning

- The entire exhaust system gets very hot during operation and immediately after the heater has been working. Keep the exhaust system parts away from any flammable materials; wires, hoses, fuel lines, carpets, plastics, brake lines, etc.
- Maintain at least 1/2" air gap between the exhaust pipe and sheet metal walls in order to prevent the heat transferring through the metal and damaging materials on the other side of the wall. Use heat shields if necessary. Point the heater exhaust tail pipe slightly downward, in open air, away from travel direction and at least 12" away from any combustible or flammable materials. Tail pipe cannot protrude beyond the lateral limits of the vehicle. Route the exhaust pipe in such a way so the exhaust fumes cannot be sucked into the vehicle.
- Do not perform any work on the exhaust system while the heater is working. Before working on the exhaust system, first turn the OFF heater and wait until all parts have cooled down completely, always wear safety gloves and eye protection.

Fuel Supply

The following safety instructions must be observed when mounting the fuel pump, routing fuel lines and installing fuel tank pick-up tube.

Turn OFF vehicle engine and heater before working on the fuel supply or before refueling. Do not use "naked" lights, open flames, do not smoke, do not inhale fuel vapors and avoid fuel contact with skin. Work only in well ventilated area.

When installing fuel lines, use only a sharp knife to cut fuel hoses and pipes. Interfaces shall not be crushed and must be free of burrs.

The fuel line from the pump to the heater should be installed at a continuous rise.

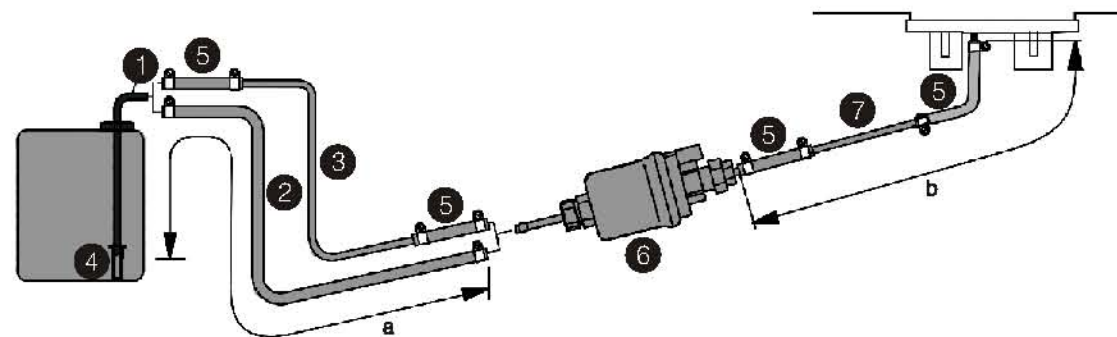
Fuel lines must be fastened to avoid damage and / or noise from vibrations.

Route the fuel lines in a way that they are protected from vehicle distortion, movement, etc. Never route or fasten fuel lines to the heater or vehicle exhaust system. When the fuel line crosses a hot element, always ensure there is sufficient clearance. If necessary, install heat deflection plates.



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Item	Description	Item	Description
1	Fuel intake pipe	2 / 3 / 7	Fuel hose
6	Fuel pump	5	Fuel line connecting hose
4	Fuel filter		

◆ Safety Instructions for fuel lines and fuel tanks in passenger compartment

In a passenger buses, vans or any other passengers vehicle the fuel lines and fuel tanks shall NOT be routed through the passenger compartment, operator or driver's cab.

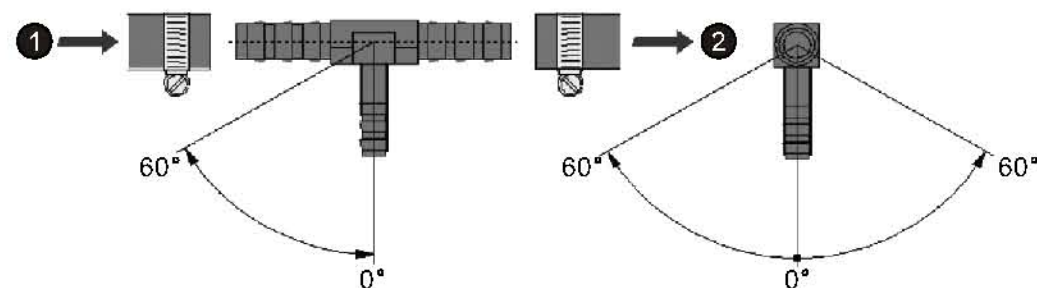
Fuel tanks in passenger vehicles must be positioned in such a way that the exits are NOT in direct danger from a possible fire.

◆ Fuel supply for diesel heater using T connector

You may use T connector to tap into existing fuel line as long as the T is installed before engine fuel pump.

◆ T fitting Setting Angle

Use the installation positions shown in the diagram when inserting a T fitting.



1 Direction of flow from the fuel tank

2 Direction of flow to vehicle engine

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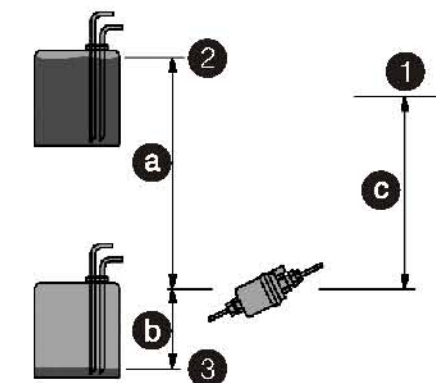
◆ Max. suction and pressure height

Max. height from fuel tank to heater — a= 12' (3.6m)

Max. suction height from bottom of tank — b= 3.9' (1.2m)

Max. heater height — c = 10' (3.0m)

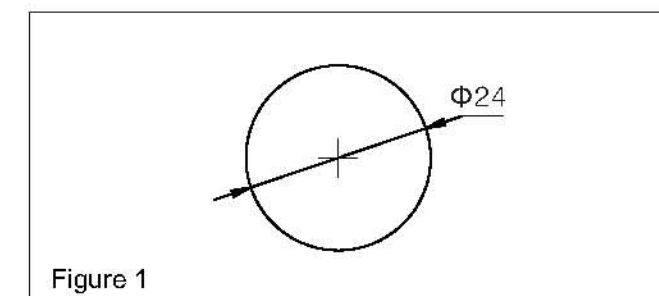
1— connection to heater, 2—max fuel level, 3—min. fuel level



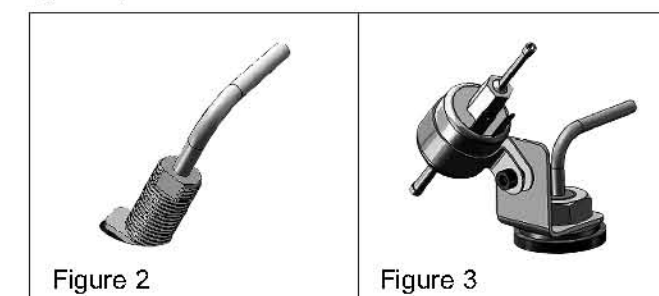
◆ Mounting of fuel intake system

• Install method

Drill 31/32" (24mm) hole in appropriate location in top of fuel tank, as shown figure 1:



Mount the fuel intake system and fuel pump, as shown figure 2, 3



◆ Please note:

• When drilling into the fuel tank, take precautions to prevent possible sparks from electric tools (ground all tools). Prevent shavings and any other debris to fall into the fuel tank.

Operating Instructions

Before starting the heater, perform a safety check: all components must be firmly fastened, check for fuel leaks. Bleed fuel line and prime fuel pump.



To start the heater; turn the control knob to “high” (turn the knob clockwise), push heat button, the blower motor will start running. After about 60 sec. the fuel pump will start pumping the fuel. If the fuel is not ignited in about 90 sec. (possible air in fuel line) the igniter will shut down for about 1 min. and then it will start the process again. The process will repeat until there is no more air in fuel line.

Heater at high altitudes:

1. Heating at altitudes below 5,000 ft (1,500 m), -unlimited heating possible.
2. Using heater at altitudes higher than 5,000 ft (1,500 m) requires installing an altitude pressure sensor.

Description of functions

◆ Operation

When the heater is turned ON, the control lamp (Red) comes ON. The combustion air blower starts running, the glow pin will starts heating up, and fuel pump starts pumping fuel. Once the flame is stable, glow pin will turn OFF.

◆ Heating mode

Once the air reaches the desirable temperature fuel pump will turn OFF, the combustion fan and air fan will keep operating on the low speed, The heat light will stay ON. The heater will restart after the air temperature drop below setting point. After the heater is turned OFF the air fan and combustion air fan will operate for approximately 2 mins on the low speed in order to evacuate exhaust fumes and cool down the combustion chamber.

Controls and Safety Device

If the heater does not ignite within 90 seconds after starting the fuel pump, the start process repeats several times. After several unsuccessful starting attempts the controller will lock the system in order to prevent fuel flooding the chamber. You can restart the process by switching the heater OFF and then ON again.

If the flame goes off during operation, the heater will restart by itself. If the heater does not ignite after several attempts, the heater will lock and it will need to be turned OFF and ON manually.

In the case of overheating (for example, debris clogging the cold air intake, poorly vented warm air), the overheating sensor is triggered, the fuel supply is interrupted and the heater turns OFF. Once the overheating has been eliminated, the heater can be restarted manually by turning OFF and ON again. If the heater has been switched OFF and ON too many times in short period of time, the controller will lock, wait for about 15 mins and turn the heater ON again.

If the lower or upper voltage limit is reached, the heater will turn OFF.

The heater does not start when the glow pin is defective or when the fuel pump power is interrupted.

The fan speed is continuously monitored. If the fan motor does not start or if the speed deviates by more than 40%, the heater will turn OFF after 60 sec.

The controller can be enabled again and it will flash fault code:

- Use chart below to read the fault code list.
- Do not switch the heater OFF and ON again more than twice.

◆ Please note:

- Emergency shut down.

In event of an emergency, shut down the heater as follows:

- Try to turn the heater OFF with the control panel.
- Pull the fuse out.
- Disconnect battery power.



Electrical systems

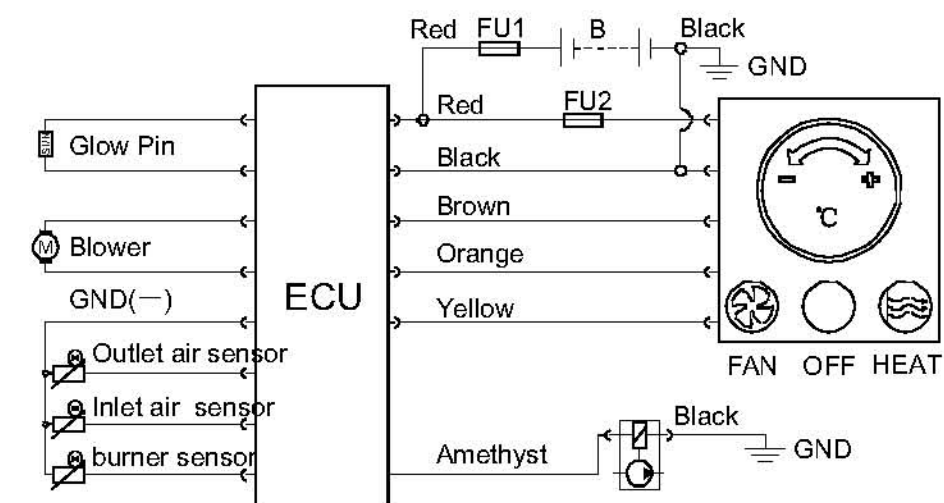


Safety Instruction for wiring the heater

The Heater shall be connected to the power according to the EMC requirements. See instruction below;

- Ensure that the electric cable's insulation is not damaged. Avoid: chafing, kinking, jamming or exposure to heat.
- Seal all unused connector chambers with filler plugs to ensure there are not dirt enter into and water-proof.
- All electrical connection shall be free of corrosion and firmly connected.
- Lubricate all outside connections with contact grease.

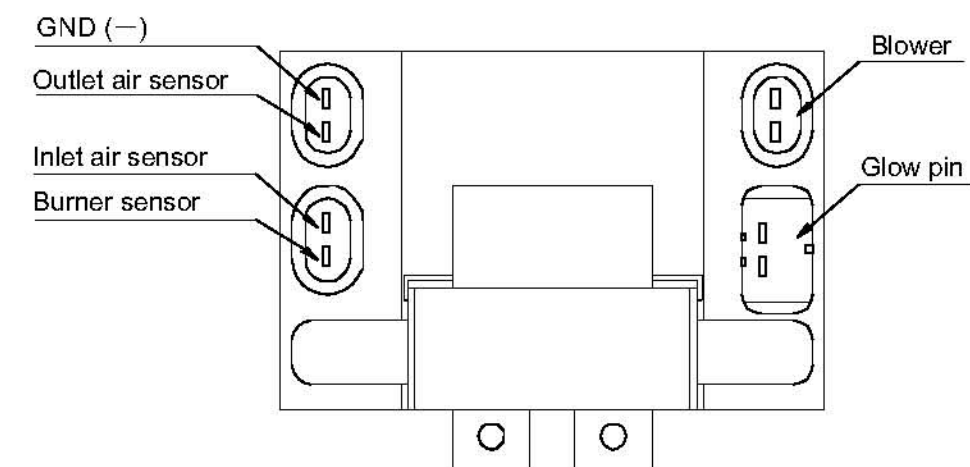
◆ Wiring of the Heater



◆ Annex list

Wire color	Function	Wire color	Function
Red	DC 12V/24V (+)	Brown	line of communication A
Black	GND (-)	Orange	line of communication B
Yellow	Starting line	Amethyst	Fuel pump line (+)

◆ Control module





Troubleshooting, Malfunctions and Maintenance

◆ Malfunction checklist

Heater does not start after being turned on; switch the heater OFF and ON again. If the heater still does not start, check the following:

- is there fuel in the tank?
- are fuses ok?
- are electrical cables, all connections, etc OK?
- is anything clogging the combustion air supply or exhaust system?
- check the air fan if it is spinning freely
- does the control panel flash the fault code?

◆ Troubleshooting diagnosis chart

Please record the number of closed when the lamp is flashing, while the heater function failure. Then check the list 4.1 and shoot trouble.

• List 4.1

Code flashing times	Description	Solution
1 Time	The power supply voltage too high	Check the voltage, possible alternator drive belt too loose, check charging system
2 Times	The power supply voltage too low	Check the voltage, charge battery, check charging system
3 Times	The burner temperature sensor malfunction	Check the temperature sensor connection and position whether it is correct Check the temperature sensor wires for possible damage or short
4 Times	Inlet air temperature sensor is fault	
5 Times	Outlet air temperature sensor malfunction	
6 Times	Glow pin malfunction	Check the voltage between glow pin terminals it should read 12 or 24 V Check for broken wires and loose connection, shorting out wires Remove and check the glow pin for any visible damage; replace glow pin if damaged
7 Times	Fuel pump malfunction	Check the voltage at fuel pump Check wires for damage and connections and short circuit at fuel pump Check fuel pump for any damage
8 Times	Blower malfunction	Check blower wires for damage and proper connections Check blower for any visible damage
10 Times	Ignite fail or flame extinguish protection	Check whether there fuel in tank Check all fuel connections Check if fuel pump is working Check if the glow pin is working normally Check if the air inlet / exhaust is blocked
11 Times	Burner overheating protection	Check the fuel pump pressure Defective fuel injector
12 Times	Outlet warm air temperature overheating protection	Check the return inlet air and warm outlet air for blockage
13 Times	Flame extinguished or burner overheating forbids the system operation	Disconnection power and re-connection again
14 Times	Communication fault	Check all wire connection



• **To reset the system:** press "OFF" button→waiting for 15 minutes, it should clear the fault codes, turn ON the system. If the system does not clear the code, disconnect battery power, wait few minutes, hook up the battery power and turn the system ON.

◆ Maintenance Instructions

Switch the heater ON at least once a month for about 10 minutes, even if there is no need for heat.

Check the opening of the combustion air supply and the exhaust system after longer standstill periods; clean if necessary.

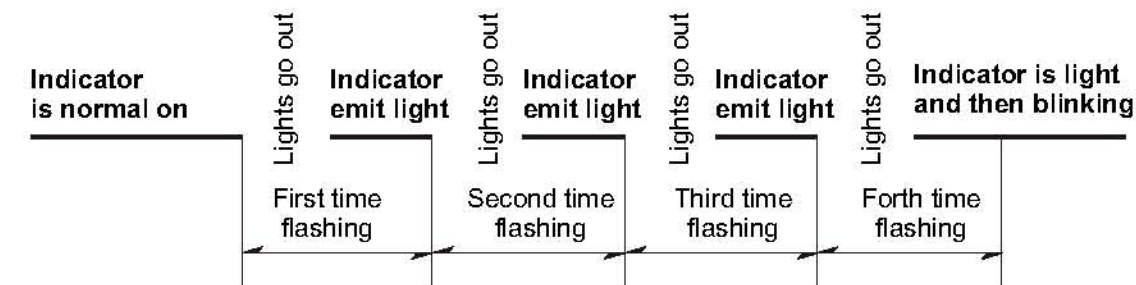
Before the heating period starts the heater should undergo a trial run. If persistent extreme smoke, unusual burning noises or unburned fuels smell develop or if electric / electronic parts heats up, the heater shall be switched off immediately. Remove fuse or disconnect battery power.

At least once a year have the heater checked by authorized, trained service technician. Remove glow pin and atomizer screen; clean the screen and the atomizer chamber with wire brush, if notice that there is excessive carbon build up the entire combustion chamber shall be cleaned out.

◆ Please note

- The warranty claims will become void if the heater is repaired or serviced by an unauthorized person.

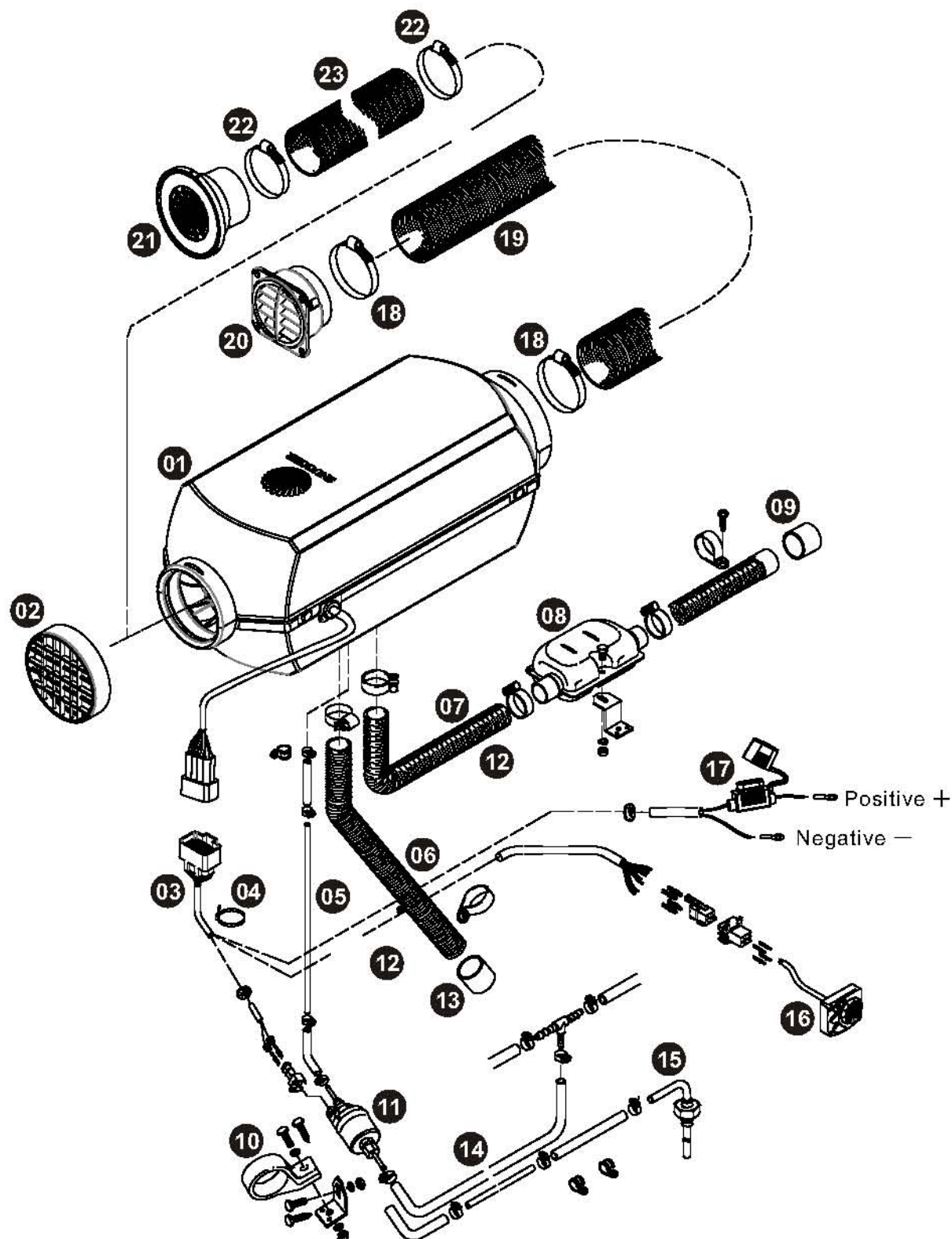
◆ Explain



Nstruction: one time flashing is point to the light on to light out the illustrations show forth time flashing, it mean there are sensor abnormal from the above form show like that.



Installation Components Diagram SF4200

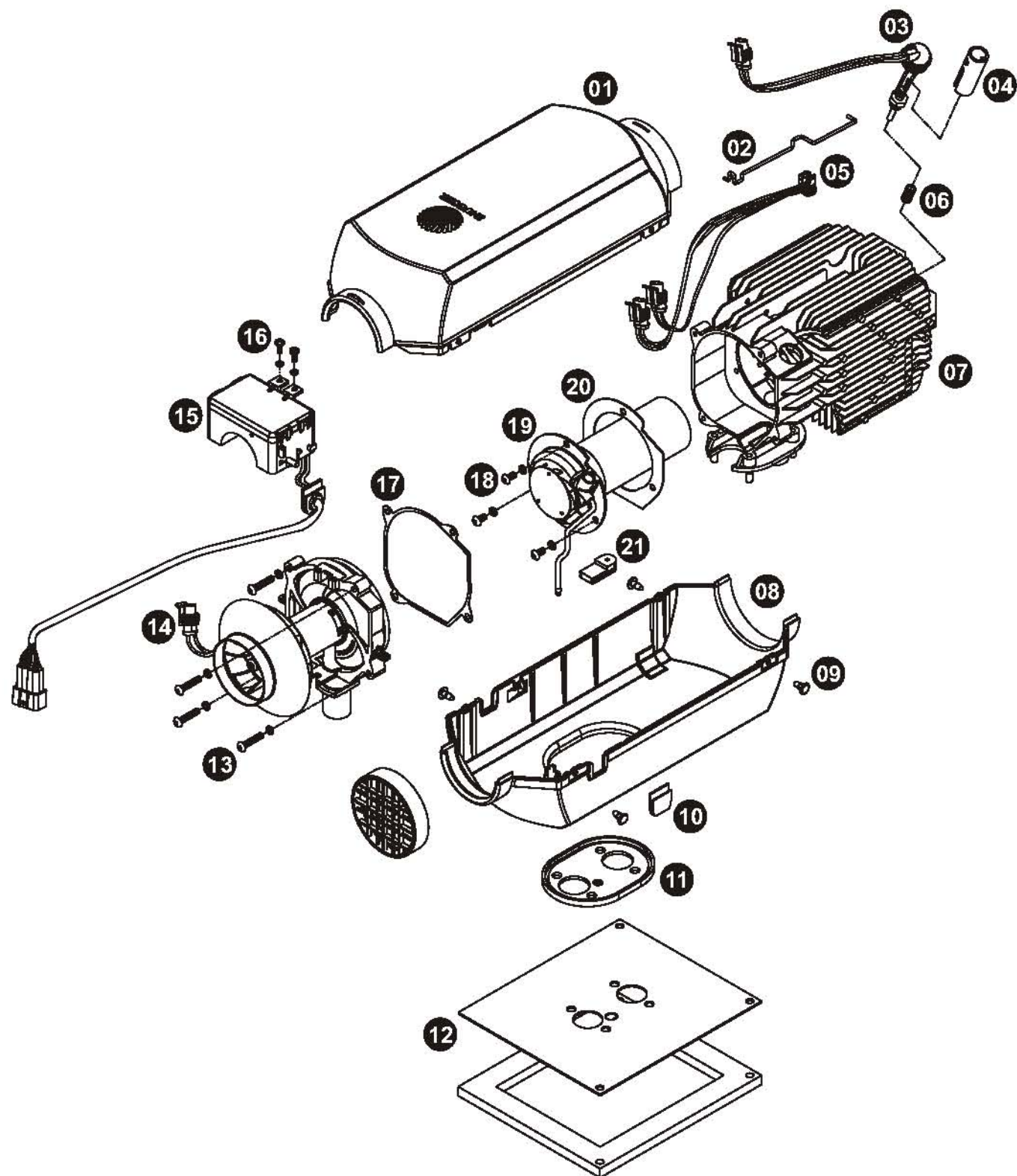


Components list of the air-heater

Item	Description	Qty
1	Heater assembly	1
2	Safety screen	1
3	Heater Harness	1
4	Cable ties	30
5	Fuel pipe, $\Phi 4 \times 1$ mm	8m
6	Air inlet pipe $\Phi 25$ mm	1
7	Exhaust pipe $\Phi 24$ mm	1
8	Exhaust silencer	1
9	End sleeve, Exhaust pipe	1
10	Pipe-clamp #2	1
11	Fuel pump	1
12	Fuse 5A	1
13	End sleeve, Air inlet hose	1
14	Fuel pipe $\Phi 3.5 \times 3$ mm	1m
15	Fuel pickup assembly	1
16	Mini control panel	1
17	Fuse 24V/15A (12V/20A)	1
18	Hose clamp #3	2
19	Warm air hose $\Phi 90$ mm	1
20	Air outlet screen	1
21	Air intake screen	1
22	Hose clamp #4	2
23	Warm air hose $\Phi 75$ mm	1



Heater Assembly Drawing SF4200



Parts list of SF4200

Item	Description	Qty
1	Top cover	1
2	Clamp spring	1
3	Glow pin	1
4	Hexagon socket	1
5	Temperature sensor	1
6	Burner filter screen 1	1
7	Heat exchanger housing	1
8	Bottom cover	1
9	Nylon rivet	4
10	Plug	1
11	Rubber buffer	1
12	Sealant foam & mounting plate	1
13	Panhead screw M5 x 25, spring washer	3
14	Combustion fan and motor	1
15	Control unit	1
16	Cross panhead screws M4 x10	1
17	Gasket,heat exchanger	1
18	Panhead screw M5 x 14, spring washer	1
19	Burner assembly	1
20	Seal gasket	1
21	Grommet	1