

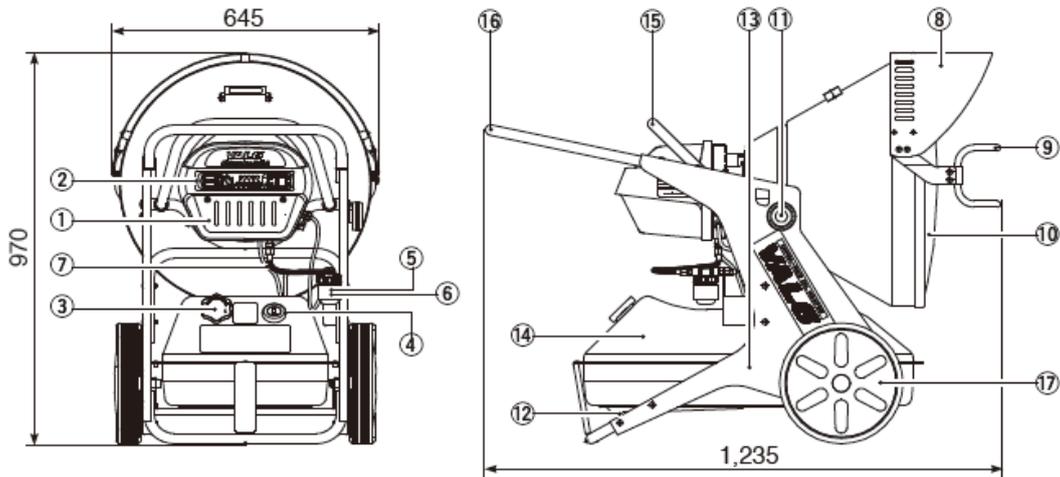
VAL6 EPX

Maintenance Manual



Shizuoka Seiki Co., Ltd.

1 Names of components

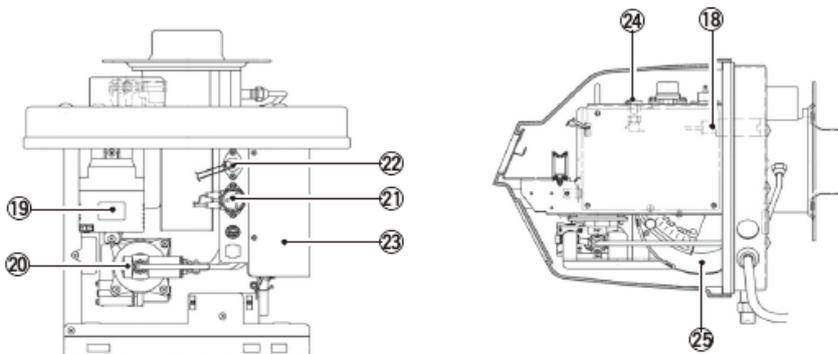


- ① Burner Cover
- ② Switch Section
- ③ Fuel Cap
- ④ Fuel Gauge
- ⑤ Fuel Filter
- ⑥ Strainer Heater

- ⑦ Fuel Suction and Return Hoses
- ⑧ Visor
- ⑨ Safety Guard
- ⑩ Radiation Disk
- ⑪ Knob Bolt
- ⑫ Drain Bolt

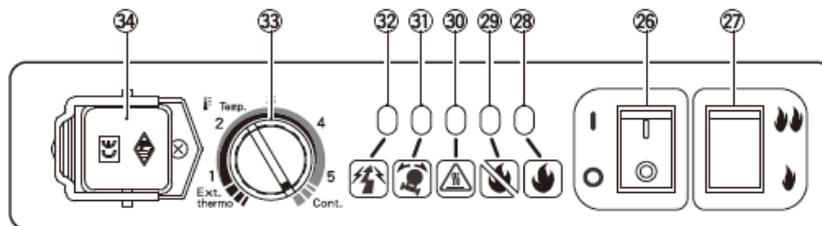
- ⑬ Tank Legs
- ⑭ Fuel Tank
- ⑮ Burner Handle
- ⑯ Transport Handle
- ⑰ Wheel

◆ Burner Section



- ⑱ Flame Monitor (Flame Eye)
- ⑲ Ignition Transformer
- ⑳ Fuel Pump
- ㉑ Tip-over Sensor
- ㉒ Overheat Sensor
- ㉓ Circuit Board
- ㉔ Fuse
- ㉕ Air Intake Motor

◆ Switch Section



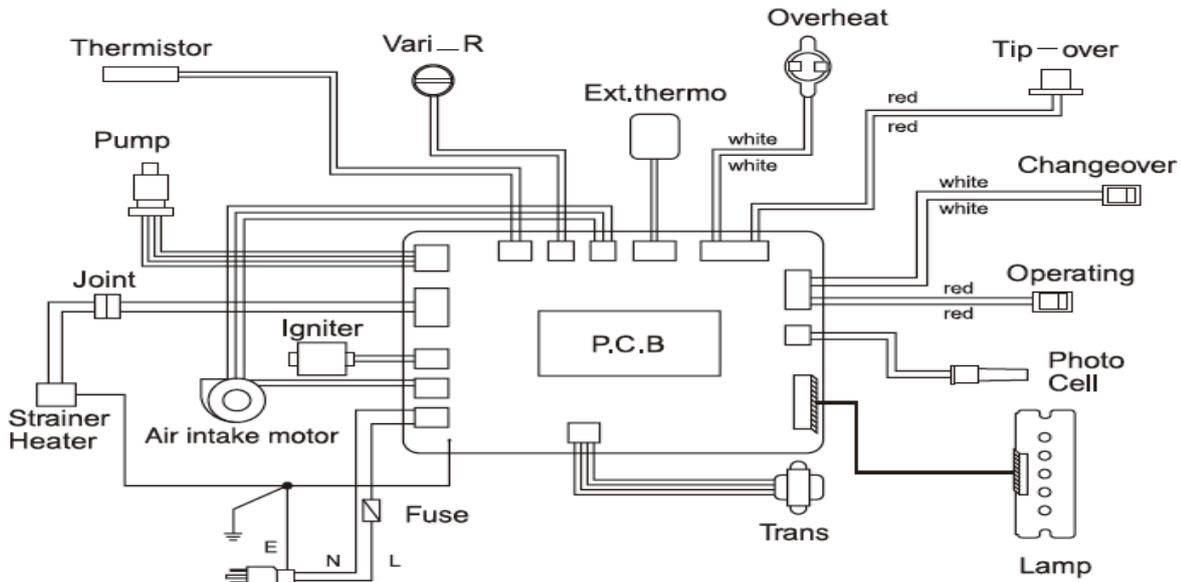
- ㉖ Operating Switch
This ignites or extinguishes the flame.
- ㉗ Change-over Switch
This changes over combustion in two step combustion.
- ㉘ Operation Lamp
- ㉙ Misfire Lamp

- ⑳ Overheat Lamp
- ㉑ Tip-over Lamp
- ㉒ Overvoltage Lamp
- ㉓ Internal Thermostat Knob
- ㉔ External Thermostat Connector

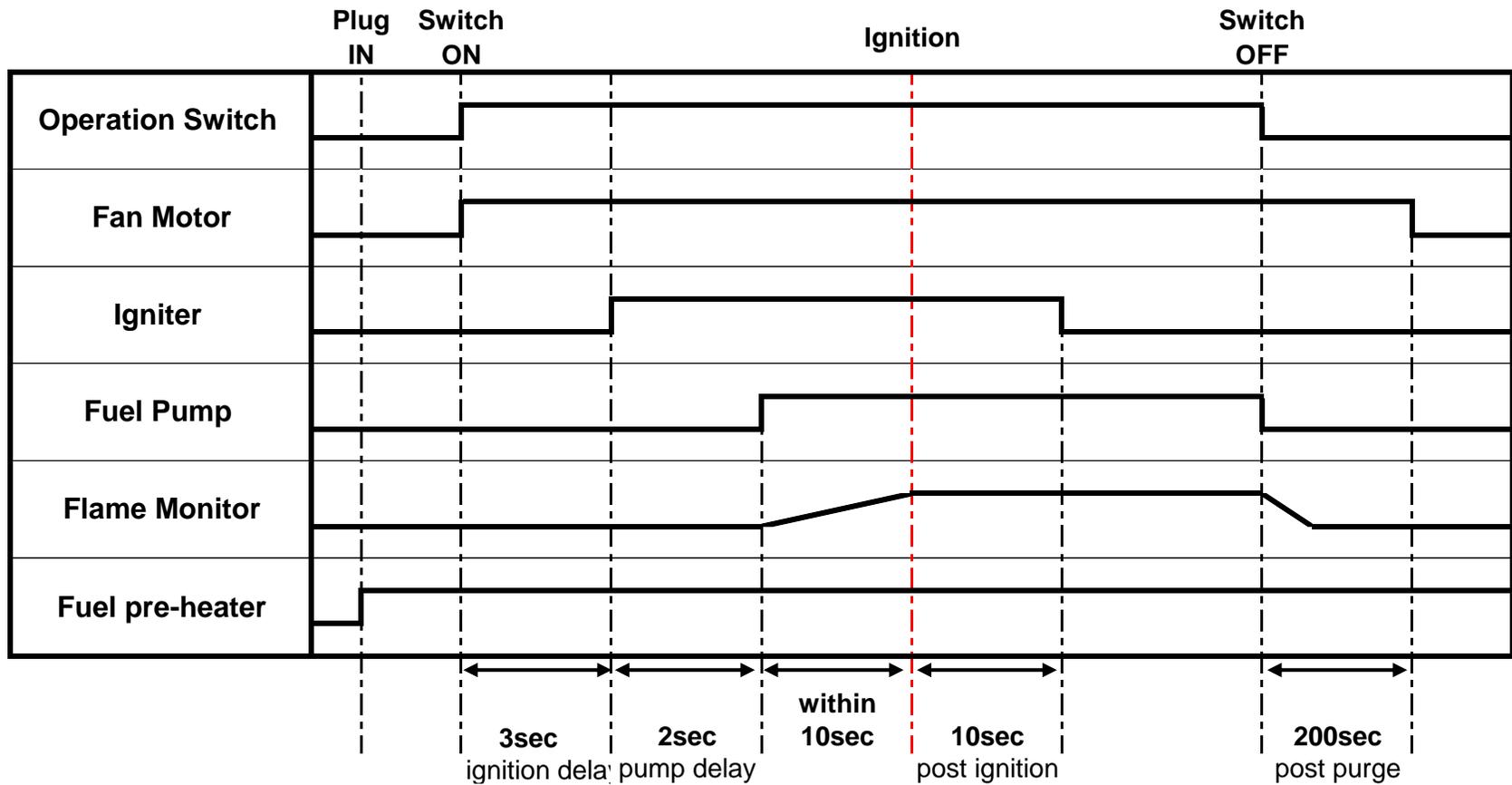
2 Specifications

Model		EPX1	EPX5	
Power Source		230V, 50Hz	120V, 60Hz	
Type		Radiated direct fired		
Heat Output	High	35,000kcal/hr	140,000BTU/hr	
	Low	25,000kcal/hr	100,000BTU/hr	
Fuel		Kerosene or Fuel-Oil no heavier than No.2 (Diesel)		
Tank Capacity		58Liters	15.4gallons	
Fuel Consumption	High	3.19kg/hr	1.02gallons/hr	
	Low	2.32kg/hr	0.75gallons/hr	
Nozzle Size		0.75gal/60° H for H lot 0.85gal/60° H		
Continuous Operating Time	High	15 hours		
	Low	20 hours		
Power Consumption	in igniting		115W	120W
	in operation	High	92W	90W
		Low	86W	89W
Noise Level (In operation)	High	67 dB (A)		
	Low	63 dB (A)		
Fuse		1.6A	3.0A	
External Dimension (H x W x D)		970 x 645 x 1,235 mm	38.2 x 25.4 x 48.6 in	
Dry Weight		50kg	110lbs	
Accessories		<ul style="list-style-type: none"> • Filter element x 2 • Nozzle x 1 • Nozzle Wrench x 1 • Oil Seal x 2 		

3 Wiring Diagram



4 Sequence Time Chart



5

Description of indication lamps

					
① Normal operation					●
② Misfire				★	
③ Overheated			★		
④ Tilted		★			
⑤ Overvoltage detected	★				
⑥ Power shutdown	●	●	●	●	●
⑦ Misfire 5 times in a row	★	★	★	★	
⑧ Low voltage detected	●				●
⑨ Abnormal fan speed	★	★	★		

●/● = lighting ★ = blinking

	Status/(Timing)	Possible causes	Remedy
① Normal operation	Operation lamp is lit, but heater <u>doesn't start</u>	Standby condition for thermostat (The preset temperature of internal/external thermostat is below the ambient temperature)	Increase the preset temperature of thermostat. *To keep heater running continuously, an internal thermostat knob is set on "Cont." position.
② Misfire <u>Description:</u> When the heater does not ignite or the flame is extinguished during operation, the misfire lamp will blink.	(At the start of the operation)	Direct sunlight hits flame monitor	Turn away from the direct sunlight
	(Within 15 seconds after switching on)	Lens of flame monitor is dirty or dusty	Clean the lens of flame monitor with soft cloth
	(During the operation)	Nozzle or filter element is clogged	Replace a Nozzle or filter element
	Fuel pump is idling with clicking sound	Loose fitting in fuel line	Tighten all fittings and repeat start-operation
④ Tilted <u>Description:</u> When the heater topples to the ground or gets a high impact, the tilted lamp will blink	Other	Nozzle or filter element may be clogged	Replace a nozzle or filter
	(During the operation)	Burner unit is overheated	Remove the causes of overheat
⑤ Overvoltage detected <u>Description:</u> When the heater detects extremely high-voltage, the overvoltage lamp will blink.	(At the start of the operation)	The heater stays on slope	Move the heater to flat level
	(During the operation)	The heater gets a high impact	Restart the heater
⑥ Power shutdown <u>Description:</u> When the power supply is restored after it shuts down during operation because of blackout or other reason, all lamp will light.		Extremely high voltage is detected	Check the voltage of power source
		Standard voltage:230V (EPX1)/ 120V (EPX5)	
		Power supply shuts down such as a blackout	

	Status/(Timing)	Possible causes	Remedy
⑦ Misfire 5 times in a row <u>Description:</u> When the heater does not ignite with five (5) consecutive tries, four (4) lamps will blink.	Start procedure is fail with five(5) consecutive tries thus the heater shall be beyond switch control to avoid unexpected accident	Nozzle or filter element is clogged	Replace a Nozzle or filter element
		Loose fitting in fuel line	Tighten all fittings and repeat start-operation
* Unburned oil may be present in combustion chamber after consecutive tries, please drain it to avoid a fire.			
⑧ Low voltage detected <u>Description:</u> When the heater detects lower voltage at the beginning of or during the operation, the overvoltage lamp will light with operation lamp is lighting.	Operation is normal but the low voltage lamp is lit	Less than 90% of standard voltage is detected	Check the voltage of power source
⑨ Abnormal fan speed <u>Description:</u> When the air intake motor does not rotate or rotate slowly, three (3) lamps will blink.	Fan motor does not rotate, or does rotate slowly	Voltage depression	Check the voltage of power source
		Fan motor is clogged	Replace a fan motor

6 Standard resistance & Standard Voltage

Chart1 Standard resistance of functional parts

Parts name	Connector No.	Lead	Condition	Resistance		Remarks	
				EPX1 (230V)	EPX5 (120V)		
Operation switch	CN 1	1-2 PIN	Red-Red	on	0 Ω		
				off	∞ Ω		
Changeover switch	CN 1	4-5 PIN	White-White	on	0 Ω		
				off	∞ Ω		
Tip-over switch	CN 2	1-2 PIN	Red-Red	inactive	0 Ω	Activation: at an angle of 50-80 degree Restitution: at an angle of less than 25 degree	
				active	∞ Ω		
Overheat protection	CN 2	3-4 PIN	White-White	inactive	0 Ω	OFF: 90±4°C	
				active	∞ Ω	ON: 70±7°C	
Thermistor (Temperature sensor)	CN 17	Black-Black		0°C	24k Ω		
				10°C	19.5k Ω		
				20°C	13k Ω		
				30°C	8.9k Ω		
Adjustable resistor (Internal thermostat cable)	CN 16	White-White		Ext. thermo	0 Ω		
				Scale 3	1k Ω		
				Cont.	2k Ω		
Photo cell (Flame monitor)	CN 9	Black-Black	dark light	approx. DC5V* under DC1.2V*			
Transformer	CN 10	Red-White	input	approx. 1.6k Ω	approx. 200 Ω		
		Purple-Purple	output	under 10 Ω	under 6 Ω		
Igniter	CN12	Black-Black (fine)	input (board)	approx. a few MΩ			
		Black-Black (thick)	output (electrode)	approx. 3k Ω	approx. 4k Ω		
Solenoid pump	CN 14	1-3 PIN	Yellow-Yellow	-	approx. 3.3k Ω	approx. 700 Ω	High: 12.5kgf/cm2 Low: 7.0kgf/cm2 for H lot High: 10kgf/cm2 Low: 5.5kgf/cm2
		2-4PIN	Blue-Blue	-	approx. 400 Ω	approx. 80 Ω	
Fan motor	CN 15	EPX1 Red-Red EPX5 Brown-Brown	-	approx. 380 Ω	approx. 80 Ω	Air inlet opening: Normal scale 5	

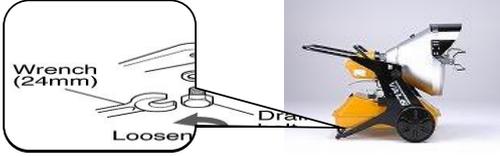
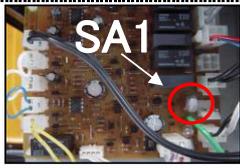
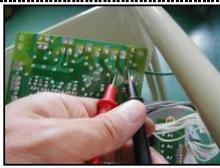
*in standby condition

Chart2 Input & Output of Burner Control

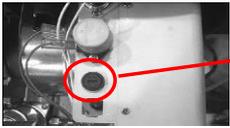
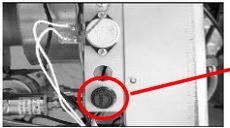
Parts name	Connector No.	Lead	Condition	Voltage	
				EPX1	EPX5
Power plug	CN 11	Black-White	-	AC 230V	AC 120V
Transformer	CN 10	Red-White	input	AC 230V	AC 120V
		Purple-Purple	output	AC 15V	
Ignition transformer	CN 12	Black-Black (fine)	input (board)	AC 230V	AC 120V
Solenoid pump	CN 14	1-3 PIN	Yellow-Yellow	AC 230V	AC 120V
		2-4PIN	Blue-Blue	AC 120-180V	AC 60-96V
Fan motor	CN 15	EPX1 Red-Red EPX5 Brown-Brown	-	AC 230V	AC 120V

Phenomenon		No.
Fuel is leaking		1-2
Fuse blows out	At the time of plugging into the power supply	3-4
	At the time of turning on operation switch	5
	About 3 seconds after turning on operation switch	6
	About 5 seconds after turning on operation switch	7
	At the time of changing to low combustion	8
Heater cannot start up (heater does not operate at all with switching on)	No lamp is lit	9-18
	Only operation lamp is lit, but heater does not start	19-21
	Overheat lamp is lit (Overheat protection is working)	22-24
	Tip-over lamp is lit (Tip-over switch is working)	25-27
	Overvoltage lamp is lit (Overvoltage detection is working)	28-29
	Overheat, tip-over and overvoltage lamp is lit (Abnormal fan speed detection is working)	30-35
	Overheat, tip-over and overvoltage lamp is lit (Abnormal fan speed detection is working)	36-37
Electrode is not sparking		38-41
The heater does not ignite	Fuel pump doesn't turn on (no vibration of fuel pump)	42-46
	Fuel pump is idling with clicking sound	47-48
	Fuel is not sprayed normally from the nozzle	49-55
Combustion stops during the operation	Misfire lamp is lit within about 15 seconds after switching on	56-62
	Overheat lamp blinks during operation (in any time)	63
	Tip-over lamp blinks during operation (in any time)	64-65
	Overvoltage lamp lights during operation (Low voltage detection is working)	66-67
Combustion is not stable		68
Smoke comes out	Smoke is continuous for about 3 minutes (or heater produces WHITE smoke)	69-70
	Heater produces BLACK smoke	71
	Heater is using in high altitude	72
Smell of fuel comes out		73-75
Flame bounces out from the disk		76
	Heater is using in high altitude	77
Changeover switch doesn't work		78-81
Internal thermostat doesn't work (Heater doesn't stop operation at preset temperature)		82-87

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Fuel is leaking				
1	Drain gasket and/or packing is defective	Remove a drain bolt from tank after draining fuel, and check whether its packing are damaged	Fuel leaks because of broken bolt packing	Replace a packing
	《How to drain the fuel》			
2	Too much fuel in the tank	Check the fuel level		Drain excess fuel
Fuse blows out				
At the time of plugging into the power supply				
3	Transformer coil is short-circuited	Disconnect transformer connector (CN 10) from burner control board, then measure coil resistance values of two leads	If either lead shows $0\ \Omega$, the transformer is short-circuited	Replace a transformer
		Cord color: red-white(input) purple-purple(output) Standard value: EPX1 red-white: about $1.6\text{k}\Omega$ purple-purple: about $10\ \Omega$ EPX5 red-white: about $200\ \Omega$ purple-purple: about $6\ \Omega$		
		-Without multimeter Disconnect transformer connector (CN 10) from burner control board, then put plug into AC outlet	If the fuse is intact, the transformer is short-circuited	Replace a transformer
4	Surge absorber(SA1) on burner control is short-circuited	Measure resistance at surge absorber (SA1)	If it shows $0\ \Omega$, surge absorber is short-circuited	Replace a burner control
	《How to check SA1》	 		
At the time of turning on operation switch				
5	Fan motor is short-circuited	Disconnect fan motor connector (CN 15) from burner control, then measure resistance between terminals	If it shows $0\ \Omega$, the fan coil is short-circuited	Replace a fan motor
		(Cord color & Standard value) EPX1 brown-brown: about $380\ \Omega$ EPX5 red-red: about $80\ \Omega$		
		-Without multimeter Unplug fan motor connector (CN 15), and then start operation	If the fuse is intact, the fan coil is short-circuited	Replace a fan motor

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
About 3 seconds after turning on operation switch				
6	Ignition transformer is short-circuited	Disconnect ignition transformer connector (CN 12) from burner control, then measure resistance between terminals	If it shows $0\ \Omega$, the coil of ignition transformer is short-circuited (Cord color & Standard value) black-black (fine): few M Ω	Replace an ignition transformer
		Disconnect ignition transformer cord from electrode, then measure its resistance	If it shows $0\ \Omega$, the coil of ignition transformer is short-circuited (Cord color & Standard value) EPX1 black-black (thick): approx. 3k Ω	Replace an ignition transformer EPX5 black-black (thick): approx. 4k Ω
		-Without multimeter Disconnect ignition transformer connector (CN 12), and then start operation	If the fuse is intact, the ignition coils is short-circuited	Replace an ignition transformer
About 5 seconds after turning on operation switch				
7	Fuel pump is short-circuited	Disconnect fuel pump connector (CN 14) from circuit board, then measure resistance between terminals	If it shows $0\ \Omega$, the fuel pump coil is short-circuited (Cord color & Standard value) EPX1 blue-blue: approx. 400 Ω	Replace a fuel pump EPX5 blue-blue: approx. 80 Ω
		-Without multimeter Disconnect fuel pump connector (CN 14), then turn on	If fuse is intact, the fuel pump coil is short-circuited	Replace a fuel pump
At the time of changing to low combustion				
8	Solenoid valve of fuel pump is short-circuited	Disconnect fuel pump connector (CN 14) from circuit board, then measure resistance between terminals	If it shows $0\ \Omega$, the fuel pump coil is short-circuited (Cord color & Standard value) EPX1 yellow-yellow: approx. 3.3k Ω	Replace a fuel pump EPX5 yellow-yellow: approx. 700 Ω
Heater cannot start up (heater does not work at all with switching on)				
No lamp is lit				
9	Power source is not supplied	Measure voltage of AC outlet. Standard: AC230/120V (or plug in another power tool and see if it works)	If it shows 0V, power cable is not receiving electricity. (or if under 90% of standard, could be power shortage)	Plug into a working outlet
10	Fuse is blowing out	Take fuse out from fuse box, and then check each lead with circuit tester	If circuit tester reads $\infty\ \Omega$, fuse blows out	Find a cause(s) of blown fuse and solve it,(refer to #1-8), then replace with a new fuse
<p>«How to replace a fuse»</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>(EPX1)</p>  </div> <div style="text-align: center;"> <p>(EPX5)</p>  </div> </div>				

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
11	Power cord is disconnected	Take power source connector (CN 11) out from burner control, then check each lead with circuit tester	If either of the lead is broken, power cord is broken	Replace a power cord
12	Power source connector is loose connection	Plug in power source connector (CN 11) again, then turn on	If it works normally, power source connector fails on contact	Plug in connector (CN 11) firmly
13	Transformer connector is loose connection	Plug in transformer connector (CN 10) again, and then turn on	If it works normally, transformer connector fails on contact	Plug in connector (CN 10) firmly
14	Circuit board (Burner control) is defective	Measure voltage at input side of transformer connector (CN 10) (Cord color & Standard value) EPX1 red-white: AC230V (input voltage)	If power source is normal and tester reads 0V at input side, burner control is defective EPX5 red-white: AC120V (input voltage)	Replace a burner control
15	Transformer is defective	Measure voltage at output side of transformer connector (CN 10) (Cord color & Standard value) purple-purple: AC12.5V	If tester reads normal voltage at input side, and reads 0V at output side, transformer is defective	Replace a transformer
16	Transformer cord is disconnection	Disconnect transformer connector (CN 10) from burner control, then measure resistance. (Cord color & Standard value) EPX1 red-white: approx. 1.6kΩ purple-purple: approx. 10Ω	If it shows $\infty\Omega$, the transformer cord is disconnection EPX5 red-white: approx. 200Ω purple-purple: approx. 6Ω	Replace a transformer
17	Operation switch connector is loose connection	Plug in operation switch connector (CN 1) again, and then turn on	If it works normally, operation switch connector fails on contact	Plug in connector (CN 1) firmly
18	Operation switch is defective	Take operation switch connector (CN 1) out, then check the conduction	If it doesn't conduct when turned on switch, operation switch is defective	Replace an operation switch
Only operation lamp is lit, but heater does not start				
19	Thermostat connector (CN6) is loose connection	Plug in thermostat connector (CN 6) again, and then turn on	If it works normally, thermostat connector fails on contact	Plug in connector (CN 6) firmly
20	External thermostat is working / External thermostat cord is disconnection / External thermostat is defective	Check the conduction of external thermostat	If it doesn't conduct ($\infty\Omega$), External thermostat is working / External thermostat cord is disconnection / External thermostat is defective	Change the setting of a thermostat / Replace a thermostat

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
21	Internal thermostat is working (the preset temperature of internal thermostat is below the ambient temperature)	Increase the preset temperature of thermostat	If it works normally, the heater is under control of thermostat. 	Increase the preset temperature of thermostat. *To keep heater running, an internal thermostat knob shall be set on "Cont." position.
Overheat lamp is lit (Overheat protection is working)				
22	Overheat protection connector (CN 2) is loose connection	Plug in overheat protection connector (CN 2) again, and then turn on	If it works normally, overheat protection connector fails on contact	Plug in connector (CN 2) firmly
23	Overheat protection is working / Overheat protection cord is disconnection / Overheat protection is defective	Check the conduction of overheat protection (Cord color&Standard value) white-white: Conduction 0 Ω	If it doesn't conduct ($\infty \Omega$). Overheat protection is working / Overheat protection cord is disconnection / Overheat protection is defective	Wait till the heater cool down for several minutes / Replace a overheat protection
24	Not applicable in above			Replace a burner control
Tip-over lamp is lit (Tip-over switch is working)				
25	Tip-over switch connector (CN 2) is loose connection	Plug in tip-over switch connector (CN 2) again, and then turn on	If it works normally, tip-over switch connector fails on contact	Plug in connector (CN 2) firmly
26	Tip-over switch cord is disconnection / Tip-over switch is defective	Check the conduction of tip-over switch (Cord color&Standard value) red-red: Conduction 0 Ω	If it doesn't conduct ($\infty \Omega$) when the heater is on the level, Tip-over switch cord is disconnection / Tip-over switch is defective	Replace a tip-over switch
27	Not applicable in above			Replace a burner control
Overvoltage lamp is lit (Overvoltage detection is working)				
28	Excessive voltage is detected	Measure voltage of AC outlet. Standard: EPX1 AC230V EPX5 AC120V	If excessive voltage is detected (over 300V for EPX1 / over 150V for EPX5) in AC outlet, overvoltage detection is working	Plug into a working outlet
29	Not applicable in above			Replace a burner control
Overheat, tip-over and overvoltage lamp is lit (Abnormal fan speed detection is working)				
30	Terminal connector for condenser of fan motor is loose connection	Plug in terminal connector for condenser of fan motor again, and then turn on	If it works normally, terminal connector for condenser of fan motor	Plug in terminal connector firmly
31	Condenser of fan motor is defective	Measure resistance at condenser of fan motor Standard: detect resistance for a moment and return to $\infty \Omega$	If it shows $\infty \Omega$ immutably, condenser is defective	Replace a fan motor
32	Fan speed sensor connector (CN 8) is loose connection	Plug in fan speed sensor connector (CN 8) again, and then turn on	If it works normally, fan speed sensor connector (CN 8) fails on contact	Plug in connector (CN 8) firmly
33	Fan motor connector (CN15) is loose connection	Plug in fan motor connector (CN15) again, and then turn on	If it works normally, fan motor connector (CN15) fails on contact	Plug in connector (CN 15) firmly

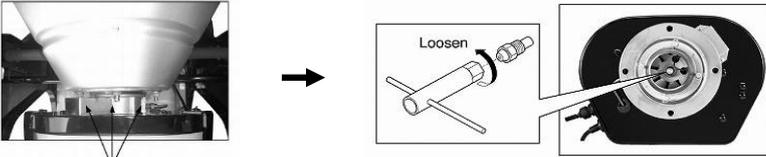
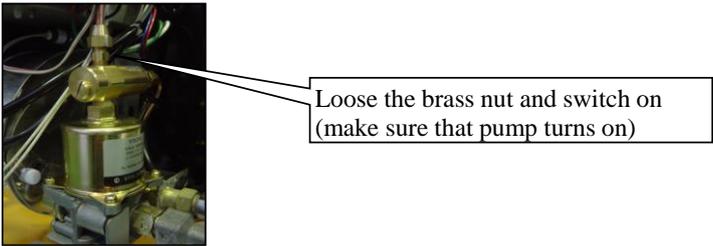
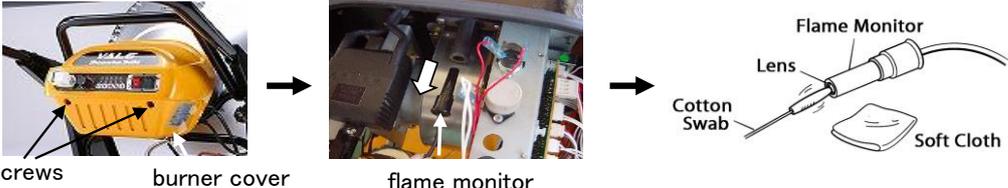
8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
34	Fan motor is stuck	Turn the fan by hand	If the fan doesn't rotate or does rotate hardly, the fan motor is stuck	Remove an obstacle in fan motor or replace a fan motor
35	Fan motor is defective	Measure voltage at terminal for fan motor (CN15) on burner control Standard: EPX1 AC230V EPX5 AC120V	If it shows AC 230V/120V, fan motor is defective	Replace a fan motor
			If it shows AC 0V, burner control is defective	Replace a burner control
Overheat, tip-over and overvoltage lamp is lit (Abnormal fan speed detection is working)				
36	Power supply is recovered after power shutdown such as a blackout while the operation switch is Disconnect a power plug while the operation switch is "ON"	Once the operation switch is "OFF", then turn on the operation switch again	If the heater works, power supply is shut down while the operation switch is "ON"	Switching "OFF" and "ON"
37	Not applicable in above			Replace a burner control
Electrode is not sparking				
38	Ignition transformer connector (CN12) is loose connection	Plug in ignition transformer connector (CN12) again, and then turn on the operation switch	If it works normally, ignition transformer connector (CN12) fails on contact	Plug in connector (CN12) firmly
39	Ignition transformer is defective / Ignition transformer cord is disconnection Burner control is defective	Measure voltage at terminal for ignition transformer (CN12) on burner control Standard: EPX1 AC230V EPX5 AC120V	If it shows AC 230V/120V, fan motor is defective	Replace an ignition transformer
			If it shows AC 0V, burner control is defective	Replace a burner control
40	Ignition transformer is defective	Take an ignition transformer cord out from electrode, then measure resistance of ignition transformer	If it shows $\infty \Omega$, the ignition transformer is (Cord color & Standard value) EPX1 black-black (thick): approx. 3k Ω	Replace an ignition transformer EPX5 black-black (thick): approx. 4k Ω
41	Electrode is defective (abnormal electrode)	Confirm that an electrode or a high-voltage cord are not wet or dirty by grime		Replace an electrode Clean an electrode or a high-voltage cord
	(clearance is out of alignment)	Refer to drawing①(See diagram blow)		
The heater does not ignite				
Fuel pump doesn't turn on (no vibration of the fuel pump)				
42	Fuel pump connector (CN14) is loose connection	Plug fuel pump connector (CN14) again, and then turn on the operation switch	If it works normally, fuel pump connector fails on contact	Plug connector (CN14) firmly
43	Fuel pump is defective Burner control is defective	Measure voltage at terminal for fuel pump connector (CN14) on burner control Cord color: blue-blue Standard value: EPX1: AC 120~180V EPX5: AC 60~96V	If it shows AC 120~180V/60~96V, the pump is defective	Replace a fuel pump
			If it shows AC 0V, burner control is defective	Replace a circuit board

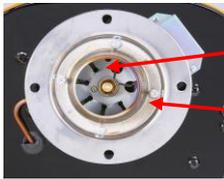
8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
44	Fuel pump is defective	Disconnect fuel pump connector (CN 14) from burner control, then measure coil resistance	If it shows $\infty \Omega$, fuel pump is defective (Cord color & Standard value) EPX1 blue – blue: approx. 400k Ω	Replace a fuel pump EPX5 blue – blue: approx. 80 Ω
45	Photo cell(flame monitor) detects outside light such as a sunlight before ignition	Turn the heater around against the outside light	If it works normally, the heater detects outside light	Turn the heater around / Remove a reflective object near the heater
46	Photo cell(flame monitor) or burner control is defective	Measure voltage at photo cell connector (CN9) with the connector on burner control (Condition: Standard value) in dark: approx. DC 5V in light: less than DC 1.2V	If it shows less than DC 1.2V when the photo cell is covered, the photo cell or burner control is defective	Replace a photo cell or a burner control
Fuel pump is idling with clicking sound				
47	Fuel pump is inhaling air	If the heater is brand-new or after refueling, the air is remaining in fuel line		Repeat start-operation 2 or 3 times in order to pump air out of fuel line * NEVER repeat more than 5 times in a row as fire may result
		If not, confirm no loose fitting in fuel line	If there are some loose fitting in fuel line, fuel pump suck the air	Tighten all fittings and repeat start-operation
48	Any clog in fuel filter, fuel line or fuel pump	Clean the fuel filter, fuel line or fuel pump		Replace a fuel filter, fuel line or fuel pump
Fuel is not sprayed normally from the nozzle				
49	Fuel line is clogged			Clear the clog in fuel line
50	Fuel filter (element) is clogged	Check with eyes whether or not the fuel filter is dirty or fouled		Replace a fuel filter
<p>《How to replace a fuel filter》</p> <p>The diagram illustrates the process of replacing a fuel filter. It shows a fuel strainer assembly with an element. The steps are: 1. Loosen the tightening ring. 2. Remove the element. 3. Reassemble with a new element and tightening ring. A legend identifies the components: O Ring Gasket, Cup, and Tightening Ring.</p>				

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
51	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
<p>《How to replace a nozzle》</p>  <p>unscrew three nuts and take the burner unit off</p>				
52	Fuel pump is clogged or defective	Loose the brass nut, then switch on and check whether fuel comes out (place a pan under the pump)	If no fuel is pump up or fuel is not flowing at least 2" high, the fuel pump is clogged or defective (see exhibit "How to restore the fuel flow")	Replace a fuel pump Clean and flush the tank with kerosene, alcohol or acetone
<p>《How to check the fuel pump》</p> 				
53	Fuel filter and/or nozzle is clogged by thick fuel		Because of low temperature, fuel viscosity increase thus fuel filter and/or nozzle is clogged	Replace a fuel filter and/or nozzle, and warm the fuel or mix kerosene with diesel
<p>(Fuel is sprayed normally form the nozzle)</p>				
54	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
55	Fuel is contaminated with water		Because of condensation, there is the dew condensation water in the	Replace a fuel thoroughly
<p>Combustion stops during the operation</p> <p>Misfire lamp blinks within about 15 seconds after switching on</p>				
56	Lens of photo cell is dirty or dusty	Take a flame monitor out, and check whether its lens is clear or not	If it is dirty or dustiness, flame monitor cannot detect flame properly	Clean the lens of flame monitor with soft cloth
<p>《How to clean the lens of photo cell》</p>  <p>screws burner cover flame monitor</p>				

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
57	Poor lighting is detected by flame monitor	Remove a burner and check whether the whirl vane and inside of draft tube are clear or not	If they are dirty or dustiness, flame monitor cannot detect flame light properly	Clean the whirl vane and inside of draft tube or replace a vane *clean the lens of flame monitor
«How to clean the whirl vane and inside of draft tube <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>whirl vane</p> <p>draft tube</p> </div> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; margin-left: 20px; width: fit-content;"> <p>Clean the whirl vane and inside of draft tube (especially behind whirl vane) till they are shining</p> </div> </div>				
58	Flame monitor connector (CN 9) is loose connection	Plug flame monitor connector (CN 9) again, and then turn on	If it works normally, flame monitor connector fails on contact	Plug connector (CN9) firmly
59	Flame monitor is defective	Measure voltage at flame monitor connector on burner controller standard dark – about DC5V light – DC 1.2V and under	If voltage doesn't change, flame monitor fails	Replace a flame monitor
60	Nozzle is clogged	Operate the burner unit alone and see flame condition	Flame is disproportionate	Replace a nozzle
	Fuel flow is decreased		Oil-drop spatters	Replace a fuel pump
	Fuel pump is clogged		Flame is smaller than usual	Replace a nozzle
61	Nozzle is clogged	Replace a nozzle		
61	Combustion air is too much	Check whether air inlet opening for combustion is appropriate	If opening is larger, imperfect combustion occurs by too much oxygen	Adjust a air inlet opening Normal scale: 5
62	Not applicable in above			Replace a burner control
Overheat lamp blinks during operation (in any time)				
63	Overheat protection is working because of high ambient temperature	Ambient temperature must be under 40°C		Move the heater to the place with low ambient temperature
Tip-over lamp blinks during operation (in any time)				
64	The heater receive a strong impact or is on a slope			Prevent the heater from receiving a strong impact or place the heater on a flat
65	Tip-over switch cord is disconnection / Tip-over switch is defective	Check the conduction of tip-over switch Cord color: red-red Standard: 0Ω (with level off)	If it doesn't conduct ($\infty \Omega$) when the heater is on the level, Tip-over switch cord is disconnection / Tip-over switch is defective	Replace a tip-over switch

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Overvoltage lamp lights during operation (Low voltage detection is working)				
66	The heater detects low voltage	Check the voltage of power source Standard: EPX1 AC230V EPX5 AC120V	If it shows less than 90% of standard voltage, the heater detects low voltage	Plug into a working outlet
67		Not applicable in above		Replace a burner control
Combustion is not stable				
68	Loose fitting in fuel line	Confirm no loose fitting between fuel tank and fuel pump	If any loose fitting exist, fuel pump suck the air	Tighten all fittings and repeat start-operation
Smoke comes out				
Smoke is continuous for about 3 minutes (or heater produces WHITE smoke)				
69	Fuel viscosity is increased by low ambient temperature	Check whether ambient temperature is not under minus 20 degree Celsius (-20°C) and make sure winter fuel is used	If temperature is under -20°C or summer fuel is used, fuel is not sprayed normally from the nozzle because fuel viscosity is increased by low ambient temperature	Warming up fuel, refueling winter fuel or mixing kerosene with fuel in order to decrease fuel viscosity
70	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
Heater produces BLACK smoke				
71	Combustion air is insufficient	Check whether a combustion fan is working	If the combustion fan does not run, imperfect combustion occurs by low	Replace a combustion fan and/or a burner control
		Check whether vanes of combustion fan are dusty	If vanes are dusty, imperfect combustion is occurs by low oxygen	Clean a vanes of combustion fan
		Check whether air inlet opening for combustion is appropriate	If opening is small, imperfect combustion occurs by low oxygen	Adjust a air inlet opening Normal scale: 5
		Check whether applied voltage is normal Standard: EPX1 AC230V EPX5 AC120V	If applied voltage is lower than 108V, imperfect combustion by decreasing of combustion fan rotation speed occurs	Find a cause(s) of low voltage and solve it * or plug into another outlet
Heater is using in high altitude				
72	Concentration of oxygen for combustion is low because of high altitude	Check whether the heater is operating in an altitude higher than 1000m	If its altitude is higher than 1000m, imperfect combustion occurs by low oxygen environment	Expand an air inlet opening gradually until smoke is clear away Normal scale: 5
<p>《How to adjust a air inlet opening》</p> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; display: inline-block;"> <p>expand an air inlet gradually until smoke is clear away or flame doesn't protrude from the radiation disk. (scale :from 5 to 5.5 or 6 etc)</p> </div>				

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Smell of fuel comes out				
73	Combustion air is too much	Check whether air inlet opening for combustion is appropriate	If air inlet opening is too much, imperfect combustion occurs	Narrow an air inlet opening Normal scale: 5
74	Fuel filter element is clogged	Check with eyes whether or not the fuel filter is dirty or fouled		Replace a fuel filter
75	Nozzle is incorrect	Check whether correct nozzle is used 0.85USgal/h 60° H for only H-lot 0.75USgal/h 60° H for others		Replace a correct nozzle
Flame bounces out from the disk				
76	Combustion air is insufficient	Check whether vanes of combustion fan are dusty	If vanes are dusty, imperfect combustion is occurs by low oxygen	Clean a vanes of combustion fan
		Check whether air inlet opening for combustion is appropriate	If opening is small, imperfect combustion occurs by low oxygen	Adjust a air inlet opening Normal scale: 5
Heater is using in high altitude				
77	Oxygen for combustion is low because of high altitude	Check whether the heater is operating in an altitude higher than 1000m	If its altitude is higher than 1000m, imperfect combustion occurs by low oxygen environment	Expand an air inlet opening gradually until smoke is clear away Normal scale: 5
Changeover switch doesn't work				
78	Changeover switch cord is disconnection / Changeover switch is defective	Check the conduction of tip-over switch Cord color: white-white Standard: 0Ω (with changeover switch "ON")	If it doesn't conduct ($\infty \Omega$) when the changeover switch is "ON", changeover switch cord is disconnection / changeover switch is defective	Replace a changeover switch
79	Solenoid valve cord is disconnection / Solenoid valve is defective	Measure voltage at 1-3 PIN terminal of fuel pump connector (CN 14) on burner control	If it shows standard voltage AC 230V (EPX1)/AC 120V (EPX5), the fuel pump is defective.	Replace a fuel pump
			If it shows 0V, the burner control is defective.	Replace a burner control
80	Solenoid valve of fuel pump is short-circuited	Disconnect fuel pump connector (CN 14) from circuit board, then measure resistance between terminals	If it shows 0Ω, the fuel pump coil is short-circuited. (Cord color & Standard value) EPX1 yellow-yellow: approx. 3.3kΩ	Replace a fuel pump EPX5 yellow-yellow: approx. 700Ω
81		Not applicable in above		Replace a burner control
Internal thermostat doesn't work (Heater doesn't stop operation at preset temperature)				
82	External thermostat is working	Remove or turn off an external thermostat	If it works normally, the heater complies with the preset of external	Remove or turn off an external thermostat
				《Relationship between Internal thermostat and External thermostat》 Heater shall comply with higher preset temperature between internal and external thermostat. In order to activate the external thermostat, an internal thermostat knob must be set on "Ext. thermo" position. Or the external thermostat must be removed, turned off or set at lowest preset temperature when the internal thermostat is used.

8 VAL6 EPX Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
83	Adjustable resistor (Internal thermostat cable) connector (CN 16) is loose connection	Plug adjustable resistor connector (CN 16) again	If it works normally, adjustable resistor connector fails on contact	Plug connector (CN 16) firmly
84	Adjustable resistor (Internal thermostat cable) is defective	Disconnect adjustable resistor connector (CN 16) from burner control, then measure coil resistance values (Standard value on each scale)	If it shows $\infty \Omega$ or considerably abnormal value, the adjustable resistor is defective Ext. thermo - 0Ω Scale 3 - $1k \Omega$ Cont. - $2k \Omega$	Replace an adjustable resistor (internal thermostat cable)
85	Thermistor (Temperature sensor) connector (CN 17) is	Plug thermistor connector (CN 17) again	If it works normally, thermistor connector fails on contact	Plug connector (CN 17) firmly
86	Thermistor (Temperature sensor) is defective	Disconnect thermistor connector (CN 17) from burner control, then measure coil resistance values (Standard value on each preset temperature)	If it shows $\infty \Omega$ or considerably abnormal value, the thermistor is defective 0°C - $24k \Omega$ 10°C - $19.5k \Omega$ 20°C - $13k \Omega$ 30°C - $8.9k \Omega$	Replace a Thermistor (Temperature sensor)
87		Not applicable in above		Replace a burner control

