

Foreword

Thank you for choosing the LGK-ID IGBT Digital Air Plasma Cutter of Delixi (Hangzhou) Inverter Co., Ltd. Before use LGK-ID IGBT Digital Air Plasma Cutter, please carefully read this Manual to ensure correct use. Incorrect use may lead to abnormal operation, failure and reduction of service life of LGK-ID IGBT Digital Air Plasma Cutter and even personal injury accidents. Therefore, you must carefully read this Manual and strictly follow it. This Manual is a standard Annex, which is must be properly kept after reading for overhauling and maintaining the Inverter Air Plasma Cutter in future.

Except Operating Instructions stated herein, this Manual also provides the circuit diagram for your information. If you have any questions or special requirements on this products, please contact our local offices or distributors, you also can phone the Customer Service Center of our headquarters directly, we are at your service.

The contents of this Manual are subject to change without prior notice

Before unpacking, please carefully read the following contents:

1. Whether the products are damaged, the spare parts are broken and fall off or main body is scratched during the transportation.
2. Whether the rated value stated on the nameplate of this machine is consistent with your ordering requirements, as well as the machine ordered, Product Certificate, User's Manual and Warranty are within the carton.

Our company has strict Quality Assurance System on the manufacturing and packaging of the products, in case of any inspection omitted, please immediately contact our Company or your supplier to deal with it.



Warning

Without written permission, no reproduction, dissemination or use of this Manual and its related contents are allowed, or you'll be investigated for legal responsibility for any damages.

Table of Contents

Foreword	
I. Product Introduction	1 -
II. Notice For Safety	2 -
III. Main Technical Parameters	3 -
IV. Installation And Operation	4 -
V. Welding Operation Instruction	7 -
5.1 Functon Introduction	7 -
5.2 Operating Instruction For Plasma Cutter	8 -
VI. Routine Maintenance And Precautions	10 -
6.1 Plasma Cutter Preparation Instruction	10 -
6.2 Plasma Cutter Operation Instruction.....	10 -
VII. Routine Maintenance And Precautions	11 -
7.1 Maintenance.....	11 -
7.2 Precautions.....	11 -
VIII. Troubleshooting	13 -
Schedule	13 -

I. Product introduction

The DSP digital control inverter technology is adopted in the production of the LGK-40ID Series Inverter Air Plasma Cutter of our company.

The large power device of single-tube IGBT is adopted in the inverter power supply. The 50/60Hz working frequency is converted into 32kHz high frequency before voltage reduction and rectification, and then a large power DC power supply is output by adopting the pulse width modulating (PWM) technology, while the weight and volume of the main transformer are dramatically reduced and is generally over 30% more efficient than other cutters of the same type.

Main Advantages of the LGK-40ID series cutter

- The single-tube IGBT inverter technology is adopted for large power and integral reliability.
- Touch control panel with a single knob, 2T/4T function, and accurately adjustable welding parameters are adopted for flexible & easy operation and lower labor strength.
- Gas source economy: take high pressure air as plasma gas source.
- High speed for cutting: the cutting speed has been improved approximate 2 times compared with traditional gas cutting.
- Sheet cutting is easier and faster. Arc striking is easier.
- The shell designed with a combination of plastic and metal is attractive in appearance, light in weight, and durable in use.

II. Notice for Safety

IMPORTANT:



- Do not cut off power in order to prevent damage of machine during cutting.
- The control switch of the cutting torch must be turned off before cutting while ensuring that the cutting torch is cut off from the base material to prevent arc burns.
- It is necessary to install safety protection switch for electric leakage.
- The labor protection appliances must be approved by department of state administration of work safety supervision.
- Operator must be with effective qualification “Welding (gas cutting) operation for metal” for special operation.
- Do not perform operation with electricity for maintenance and repair of cutter!

Electric shock – may cause serious injury!

- Install grounding device according to relevant requirements.
- Do not contact live component while skin is exposed, wearing with wet gloves or in wet clothes.
- Ensure the insulation among you, ground and work piece.
- Ensure your operating position is safe.

Flue gas – it is harmful to health!

- Keep head away from flue gas.
- Operator must use ventilation device or air extraction device to prevent breathing of flue gas while operate cutter.

Arc radiation – may damage your eyes and burn your skin!

- Wear appropriate mask, optical filter and protective cloth to protect your eyes and body.
- Protect observer by appropriate mask or curtain.

Fire – welding sparks may cause fire. Ensure there is no inflammable material approach to cutting area and keep safe.

Noise – excessive noise may damage your hearing.

- Protect your ears by ear muff or other hearing protective device.
- Warn observers that noise may damage their hearing.

Fault – seek professional service for fault.

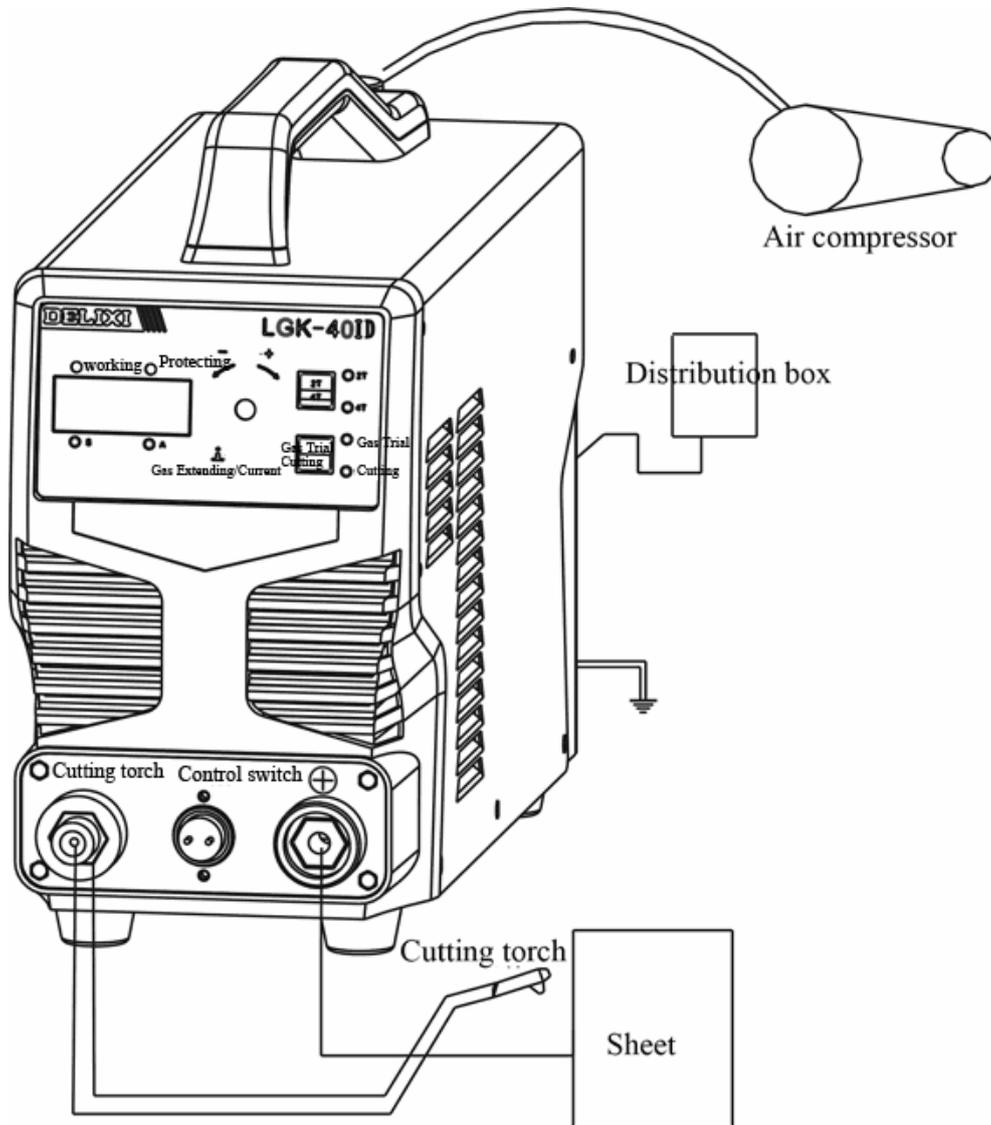
- Troubleshoot according to relevant items of this manual while there are difficulties for installing and operating.
- If you still not understood after reading or not troubleshoot according to this manual, please contact your distributor or our service center for professional service immediately.

III. Main Technical Parameters

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Model	LGK-40ID	LGK-60ID
Input Voltage	Single-phase AC 220 V \pm 10% 50/60Hz	Three-phase AC 380V \pm 10% 50/60Hz
Rated Input Power (kVA)	4.8	7.7
Rated Input Current (A)	22	12
No-load Voltage (V)	245	280
Output current range (A)	20-40	20-60
Rated output voltage (V)	96	104
Duty cycle range (%)	60	60
Loss for no load (W)	40	50
Efficiency (%)	85	85
Power factor	0.93	0.93
Arc-starting method	Contact arc-starting	Contact arc-starting or non-contact arc-starting can be selected.
Recommended pressure for air compressor (MPa)	0.45	0.45
Insulation Level	F	F
Shell Enclosure protection class	IP21S	IP21S
Dimension (W×D×H), mm	155×420×305	205×360×480
Weight (kg)	8	13

IV. Installation and Operation



Connection diagram for cutter (Figure 1)

First use heavy cable to prevent voltage dropping while using main input cable. The resistance of main cable may obstruct voltage dropping of input cable and affect arc striking and other systems.

4.1 Connection for input cable

- 1) Each machine is equipped with a power cable. Please select appropriate voltage according to input voltage otherwise it may damage internal elements inside.
- 2) Ensure good connection between power switch or positive electrode and power cable to prevent oxidation and measure power value for cutting by voltmeter.

4.2 Connection for output cable (Figure 1)

2a Connection for cutting torch

Connect copper nut of cutting torch with conductive cable. And connect plug on cable clamp to terminals on front panel by screwing in clockwise (prevent air leakage).

2b Connection for switch on cutting torch

Connect plug of switch on cutting torch to switch and screwing the electrode in sequence, and then assemble nozzle.

2c Grounding cable

Connect one end of grounding cable to the plug under front panel with mark of plug and rotate in clockwise; the other end of grounding cable connects to work piece.

4.3 Installation and operation of air compressor (Figure 2 and Figure 3)

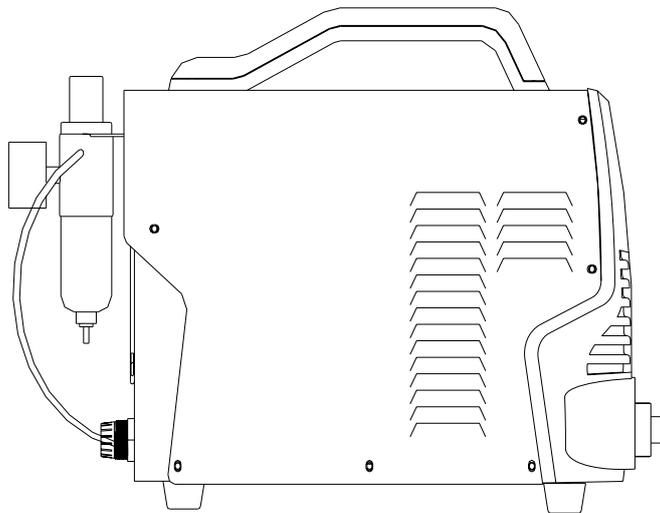


Figure 2

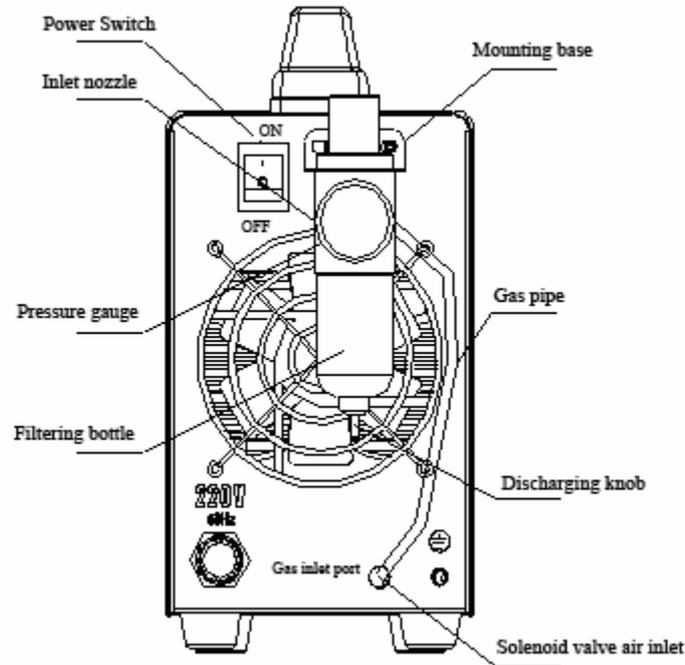


Figure 3

- 1) Apply sealant on the copper gas nozzle and set to position of IN and OUT.
 - 2) Apply sealant on heading and then set it to the top.
 - 3) Fix the joint frame in position by nut.
 - 4) Unscrew nut and fix gas valve on joint frame. Adjust air pressure by pressure valve (“+” up, “-” down).
 - 5) Press relief valve and air pressure of 4 kg will be displayed on heading.
 - 6) Turn on discharging knob and turn it off after water is discharged completely if water in container is excessive.
- 4.4 Assembly instruction for cutting torch
- 1) Insert one end of electrode to cutting torch.
 - 2) The other end of electrode connects with aviation socket.
 - 3) One end of nozzle connects with electrode and the other end connects with protective casing.
 - 4) Assemble into cutting torch and then screw it.

V. Welding Operation Instruction

5.1 Function Introduction

5.1.1 Front Panel and Back Panel of the Cutter

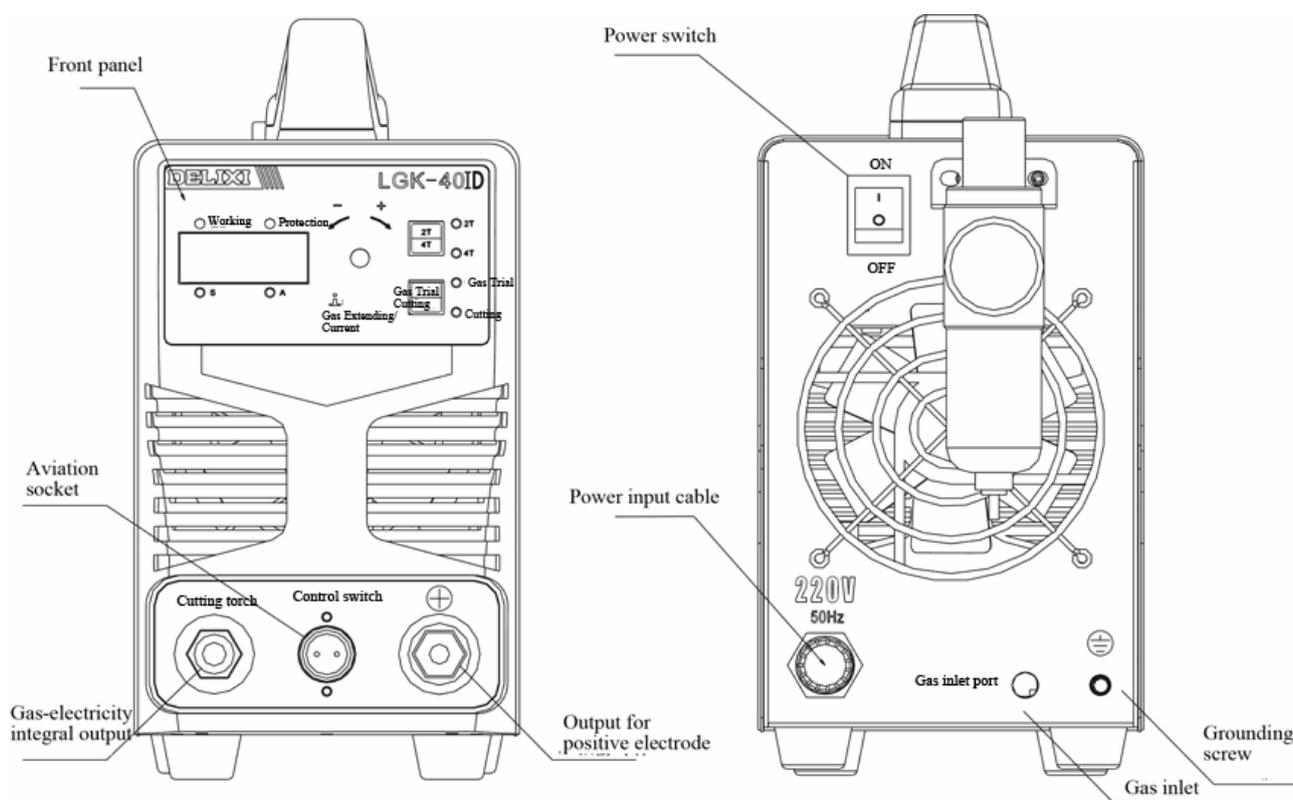


Figure 4 LGK-40ID Front Panel & Back Panel

5.1.2 Control Panel of the Cutter

The control panel of the cutter illustrated in figure 3 is used for function option and parameter setting of the cutter. It includes the digital display window, the adjustment button, and the LED indicator lamp.

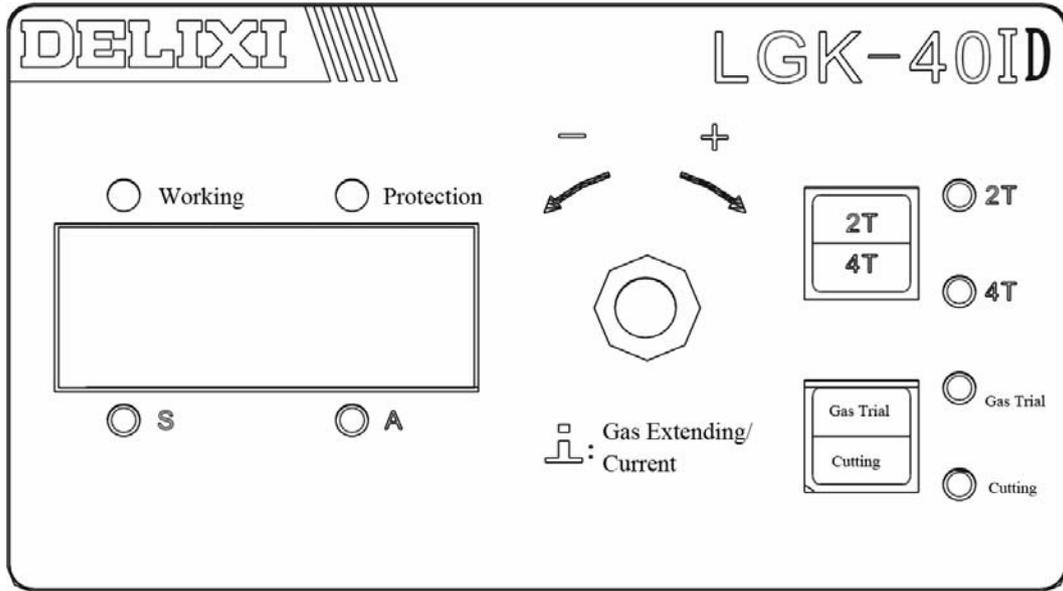


Figure 3 Control Panel

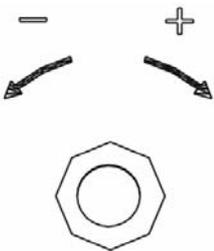
5.2 Function Options and Parameter Setting & Display

1.



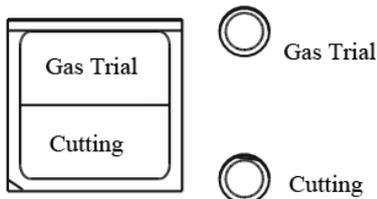
Current /delayed gas extending switching display

2.



current adjustment/delayed gas extending time switching & setting

3.



State switching between the two-step action (non-auto locked) and the four-step action (Auto locked) of the cutter, and the gas trial.

(1) The Two-step Mode means the cutting gun begins to cut when its switch is pressed and stops cutting when its switch is released. The gas supply stops later after the cutting stops.

- (2) The Four-step Mode means the cutter outputs cutting current when the cutting gun switch is pressed for the first time, and it keeps the cutting current when the switch is released. After the cutting is over, the cutter stops current output when the cutting gun switch is pressed and released once more. The gas supply stops later after the cutting stops.
 - (3) The function of gas trial is used for checking whether the gas duct is normal before cutting.
- 4.

Working Protection

Working Indicator Lamp: When the green indicator lamp is on, it indicates the cutter is in the working state.

Protection Indicator Lamp: When the yellow indicator lamp is on, it indicates fault in the cutter, while the digital code tube displays protection signal indicating code in the display area.

“E-01” means overheating protection, which indicates that the internal temperature of the cutter is too high, and it is necessary to stop welding and wait for the temperature to go down.

“E-02” means over-current protection, which indicates fault in the cutter and the cutter enters over-current protection state.

“E-03” means high frequency protection. If the cutting gun is kept pressed to conduct invalid percussion against high frequency for 10 seconds, the cutter stops all outputs and enters protection state for shutdown and restart.

“E-04” means under-voltage protection. When the voltage is under 250VAC, the cutter enters under-voltage protection state.

“E-05” means over-voltage protection. When the voltage is over 450VAC, the cutter enters over-voltage protection state.

“E-09” means incorrect communication between the cutter panel and the main control circuit board. You may check whether there is something wrong with the connecting cable between the cutter panel and control panel.

VI. Preparation and Operation of Cutting

6.1 Preparation for plasma cutter.

- 1) Ensure cutter to be with reliable grounding.
- 2) Ensure connector to be with good connection.
- 3) Ensure voltage to be appropriate.
- 4) Ensure input cable and gas bottle to be without corrosion and damage.

6.2 Operating instruction for plasma cutter

- 1) On the front panel, turn the power switch to position of “ON”. Indicator lamp for power will be on and cooling fan is operating.
- 2) Turn on air valve or switch for controlling air and set the pressure and flow to rated value (refer to flow table).
- 3) Press switch on cutting torch to activate solenoid valve. You will hear sound of spark discharging caused by high frequency and see gas flow out of cutting torch. Do not aim to self or other personnel to prevent injury. (Nozzle of cutting torch will inject plasma arc for cutter with pilot arc).
- 4) Select appropriate cutting current according to thickness and technology requirement of work piece.
- 5) Maintain distance between nozzle and work piece at 1 to 2 mm. Press control switch on cutting torch, and then there is high frequency discharging between nozzle and work piece. The sparks caused by high frequency arc will disappear after arc-starting. Operator may cut work piece at this time.



Caution

Plasma cutting requires coordination between cutting current and air pressure to achieve optimum cutting performance and quality therefore adjust air pressure and flow repeat to achieve optimum cutting performance. Larger flow may enhance cooling effect and cause not arc or unstable arcing, however, smaller flow may cause overheating of nozzle and electrode to make them burn out.



Warning

Do not insert or draw cables or connectors while cutter is in operation, otherwise it may be harmful for personnel safety and damage machine. Cut off power first if it is necessary to do this.

VII. Routine maintenance and precautions



Warning

All maintenance must be performed while power is off. Open cover after remove power plug.

7.1 Maintenance

1. Purge inside by dry and clean compressed air regularly. Remove dust every month if cutter is operated in the environment of heavy smoke and serious air pollution. Above operations must be performed while power is off.
2. Pressure of compressed air should be not larger in order to prevent damage of elements inside. Above operations must be performed while power is off.
3. Check circuit connections inside regularly in order to ensure correct connection and firm connectors (especially for inserted connector or element). Remove rust and oxidation film by abrasive paper if they are rusty and looseness, and then reconnect and fix.
4. Prevent the ingress of water or water vapor for cutter. Dry it if there is water or water vapor. And then measure the insulation condition of cutter by megameter (including space between connecting points and space between connecting point and body shell). Perform cutting operation after ensure they are normal.
5. Store cutter in the original package and place it in dry condition if it is not used for long time.

①Cautions: Free maintenance assurance may be failure if customer repair any fault of cutter power by themselves without our authorization during warranty period

7.2 Precautions

1. Environment

- 1) Cutting operation must be performed in a dry condition with air humidity of not greater than 90%.

- 2) Ambient temperature range between -10°C to 40°C
- 3) Do not operate cutter in sunshine or in the rain to prevent the ingress of water or rainwater.
- 4) Do not operate cutter in the environment with dust or corrosive gas.
- 5) Do not perform gas protective welding in the environment with strong air flow.

2. Keys to Safety

This cutter is equipped with protection circuits for over voltage, over current and over heating. System will shut down if network voltage, output current and inside temperature exceed setting value. Cutter will be normal after relevant phenomenon is normal. Indicator lamp for fault will be off and cutter is normal while cut off power and then turn it on for over current condition. Excessive operation may damage cutter as well (e.g. voltage is higher), therefore you must be in accordance with following:

- 1) Good ventilation!

This cutter is small one. During the operation, nature ventilation may not meet the cooling requirements of cutter due to the larger current. In order to ensure good ventilation, operator must ensure air vent is not covered or blocked and the distance between cutter and surrounding objects should be not less than 0.3 meter. Above items are important for the operation and service life of cutter.

- 2) Do not overload!

Operator should observe the max. allowable load current (relative to duty cycle range) and maintain cutting current not greater than max. allowable load current. Over current may shorten service life of cutter obviously or even burn it out.

- 3) Do not over voltage!

Power voltage listed in “main performance parameters list”. Generally, automatic compensation circuit in cutter may maintain rated output power required for normal operation. It may not meet the output power required if voltage is too low, however, it may damage cutter if power voltage exceeds power voltage. Operator must observe above condition and take proper preventive measures.

- 4) Each cutter is equipped with a grounding bolt behind machine and grounding mark. Select a cable with the section of not less than 4 mm² to discharge static electricity or prevent electric leakage for grounding of cutter before operating.
- 5) Cutter will enter into protection status and stop operating if it exceeds the standard duty cycle range. It indicates that excessive heat activates the temperature control switch to stop operating of cutter, and red indicator lamp is on at front panel. During this condition, do not remove power plug and maintain cooling fan inside to operate to cool the power device. If yellow indicator lamp is off, it indicates that temperature is drop to normal range, system is back to normal.

VIII. Troubleshooting**Schedule**

Fault	Troubleshooting
Indicator lamp for power is off, fan is not operating and without cutting output	<ol style="list-style-type: none"> 1. Power switch is damaged 2. Ensure network connected with input cable is live or not. 3. Ensure input cable is open or not.
Indicator lamp for power is on, fan is not operating or operating for a while and without cutting output.	<ol style="list-style-type: none"> 1. Connect with 380 V power by mistake to cause it activate over voltage protection circuit. Reconnect with 220 V power and restart. 2. 220V power is unstable (input cable is too long) or connect with network to cause it activate over voltage protection circuit. Increase the diameter of input cable or joint for fixing input cable. Shut down and restart after 2 to 3 minutes. 3. Connect power switch for on and off in short time to cause it activate over voltage protection circuit. Shut down and restart after 2 to 3 minutes. 4. Wire between switch and power panel is looseness and fix them again. 5. 24 V relay in main circuit is not engaged or damaged. Check 24 V power and relay. Replace it by same model one if relay is damaged.
Fan is operating and indicator lamp for fault is off, without rustle caused by high frequency discharging. No arc-starting when struck.	<ol style="list-style-type: none"> 1. Use multimeter (LGK-40ID) to measure the voltage between positive and negative poles of VH-07 plugging on MOS plate and upper power plate should be DC 308V. 2. Auxiliary power does not work if the green indicator lamp for auxiliary power on the upper power plate is off. Check for fault point and contact the distributor. 3. Check any poor contact for each wire. 4. Control circuit is fault. Check reason and contact distributor. 5. Control cable of cutter is broken.
Indicator lamp for fault is off and with rustle caused by high frequency discharging. No welding output.	<ol style="list-style-type: none"> 1. Cable of cutter is damaged. 2. Grounding cable is damaged or not connects with work piece to be welded. 3. Connections for positive output terminals or gas and electric output terminals of welding torch are looseness.
Indicator lamp for fault is off and with rustle caused by high frequency discharging. Arcing when struck.	<ol style="list-style-type: none"> 1. Poor contact between primary wire of striking arc transformer and power plate. Refix it. 2. Discharge nozzle is oxidized or too long. Remove the surface oxidation film of discharge nozzle or adjust the distance of discharge nozzle to 1 mm. 3. Some elements of high frequency arc striking circuit are damaged. Check and replace.
Indicator lamp for fault is on but without output.	<ol style="list-style-type: none"> 1. Over current protection. Shut down and restart after indicator lamp for fault is off. 2. Overheating protection. Do not shut down and wait for 2 to 3 minutes. 3. Inverter circuit is fault. Remove power plug for main transformer on MOS plate (close to fan VH-07 inserter) and restart. <p>1) Indicator lamp for fault is still on. Shut down and remove high frequency arc</p>

VIII. Troubleshooting

	<p>striking power plug (close to fan VH-03 inserter) and restart.</p> <ul style="list-style-type: none">a. Indicator lamp for fault is on due to some field effect transistors on MOS plate are damaged. Check and replace the same type field effect transistor.b. Indicator lamp for fault is off due to step up transformer of high frequency arc striking circuit is damaged and need to be replaced. <p>2) Indicator lamp for fault is off.</p> <ul style="list-style-type: none">a. Medium transformer is damaged. Measure the primary inductance and Q value of transformer by electric bridge.b. Some transformer secondary rectifying tubes are penetrated. Check and replace by same type. <p>4. Feedback circuit is opened.</p>
Output current is unstable or not controlled by potentiometer during cutting.	<ul style="list-style-type: none">1. Check poor contact for each connection especially for connector etc.