IGBT Inverter Plasma Cutter With TIG/MMA Function

Model:CTM-160

INSTRUCTION & MAINTENANCE MANUAL

Read this entire manual carefully and completelybefore installation or operation of the Pneumatic Oil Extractor

Description: This machine is used to weld ferrous or nonferrous metals.

Disclaimer: The information, illustrations and instructions described in this manual are based on the latest product information available at the time of publication. The manufacturer and distributors reserve the right to make modifications at any time as a result of product changes, and such modifications are not obligated to notify any organization or individual. In addition, welder is a special type of work, and welding equipment is special equipment. Welding work must be executed by qualified workers after professional training. Therefore, the manufacturer and distributors are only responsible for the quality of the product. They shall not be liable for direct or indirect joint and several liability including loss of profit caused by omissions or misdescriptions that may exist in this operation manual. This manual will contain as much as possible the safety operation and preventive measures related to this equipment, but cannot completely exclude the occurrence of accidents. The manufacturer and distributors shall not be liable for any direct or indirect joint and several liability, for any incidental or consequential damages caused by any accident, that may occur outside of this manual. For more detailed health and safety information, please contact the relevant professional agencies, welding materials or welding flux manufacturers if necessary..

No warranty service is available in the following circumstances:

- ✓ The consumables of the machine are not covered by the warranty, such as welding wires, flux, fuse, protective tube, quick connector, wire feeder and tension roller, etc..
- ✓ Machine failures caused by incorrect input power voltage or fluctuating power supply are not covered by the warranty.
- ✓ Malfunction of the machine and parts damage caused by wrong connection or incorrect operation.
- ✓ The warranty will be invalid if the machine is disassembled or refitted without the permission of the manufacturer, resulting in accidental work or unexpected damage of the machine.
- ✓ Accidental damage during transportation, storage, and transshipment.
- ✓ Problems caused by man-made damage, natural disaster of force majeure and accidental damage.

CONTENTS

⚠ Safety precautions

The equipment is designed for the qualified personnel who have passed professional training. The operator shall have sufficient professional knowledge of welding, cutting and circuit, and have obtained the qualification certificate of welder. Only operate the machine after reading and fully understanding all the safety precautions and warnings in the manual and of welding operations. Basic safety precautions should always be followed when using tools, to reduce the risk of personal injury and damage to equipment. The device is simple and reliable in selecting and performing all of its functions. The operator must strictly follow the safety precautions below and execute them as required. Improper use and maintenance will reduce the safety performance of the machine.

1. The operator must have passed the systematic training and assessment of local welder's relevant learning institution and obtained the qualified certificate before operating the equipment.

2. The wire and cable connection of the equipment, as well as the installation, must be operated by qualified professional and technical personnel.

3. The welding and cutting protective equipment used by the operator must be provided by the manufacturer or distributor approved by the national safety supervision department of the local country.

4. Welding and cutting is dangerous work, which may cause harm to you or others, so sufficient protection should be done during welding and cutting. Please strictly abide by the relevant safety precautions of the job operation. For more details, please refer to the relevant safety guidelines for the operators to comply with the manufacturer's regulations on accident prevention.

5. Please make sure that the welding/cutting machine is reliably grounded when working. Please contact the professional electrician to solve the problems in time if there is any doubt that the socket is not grounded or the grounding is not reliable.

6. Before welding/cutting , check whether the insulation layer of all wires and cables of the machine is damaged or they are wrongly connected timely and fix them in a timely manner if they are.

7. The faulty machine must be repaired by professional technicians. The machine must be disconnected from the electricity supply before repair and maintenance.

8. Do not operate the welding/cutting machine in humid environment, otherwise it may cause electric shock or short circuit accident.

9. It is strictly forbidden to re-modify the equipment or the attached equipment related to the operation of the equipment without permission, to avoid accidents.

10. The disposal of the scrap equipment must comply with the relevant policies and regulations of the local government.

⚠ Warnings

Welding and cutting is a special type of work, with a certain degree of danger. Professional training, correct operation and necessary protective measures can effectively avoid and reduce the damage and loss caused by machine accidents.

Personal and others' safety protection	
	**When welding and cutting equipment is working, it will generate noise, strong light and high temperature sparks, which will cause harm to human hearing, eyes and skin. Correct protective measures and proper operation training are necessary to prevent injury accidents.**
1	Aprotective helmet with a shading filter must be worn to protect the face and eyes during welding and cutting operations or when watching welding/cutting operations.
2	Wear a helmet with the correct filter and cover plate to protect the eyes, face, neck and ears from arcing sparks and bright light during welding operation or observation. Warn bystanders not to look at the arc and not to expose their skin in the area of strong light arc or high temperature spark
3	Wear flame retardant gloves, flame retardant welding/cutting overalls, flame retardant shoes, and welding/cutting helmets or protective caps to protect against arcing bright lights, high temperature sparks or hot metal particles. A flame retardant apron is also available to protect against thermal radiation and high temperature sparks.
4	Hot sparks or metal can get into rolled-up sleeves, trouser legs or pockets. Before welding/cutting, sleeves and collars should be buttoned, and clothes with front pockets should not be worn.

5	Use appropriate flame retardant shields or curtains to protect other persons from arc radiation and high temperature sparks.
6	Welding slag has high temperature, and can be splashed over a long distance. During the removal of welding slag, the operator and viewers should wear additional safety goggles over safety glasses.
7	It is forbidden to touch the welding work piece with bare hands to avoid accidental scald and burn.

Fire and explosion precaution	
	**During welding and cutting, high temperature flame and arc will be generated, which will cause fire; high temperature welding slag and sparks will also cause fire and explosion.**
1	Protect yourself and others from flying sparks and hot metal
2	Flammable and explosive items are not allowed to be placed in the welding/cutting area. Flammable materials that needed to be used in welding/cutting process must be covered with flame retardant materials.
3	Hot sparks and metal can fly into cracked floors and walls, which need to be protected against fire hazards.
4	Do not weld and cut on sealed high-pressure gas tanks, which may cause explosions.
5	Fire extinguishing equipment, such as fire hose, water bucket, sand bucket or portable fire extinguisher, must be provided in the welding and cutting area. Furthermore, regularly check the effectiveness of these fire extinguishing equipment, and carry out the training on the safe use of these fire extinguishing equipment.
6	After finishing the welding/cutting operation, check whether there is high temperature spark or metal, which might cause fire and timely dispose. If necessary, go to the firefighter for help.

Prevention of Electric Shock Injuries	
	**A person contacting with live electrical components or machine can produce an electric shock, which will cause serious injury to the human body or death. Do not use welding/cutting machines in humid environment where movement is limited or there is a risk of falling.**
1	Ensure reliable grounding of the machine to prevent electric shock accident caused by electric leakage.
2	Make sure that the work piece connected to the ground clamp of the machine is reliably grounded.
3	Connect the ground clamp with the work piece reliably, or it might cause electric shock accident.
4	Check the wires and cables frequently, and replace it in time if the insulation layer is damaged.
5	Keep everything dry when welding/cutting, including clothing, working area, cables, flashlights, electrode stand and power supply.
6	Make sure that every part of your body will not contact with the live electrical parts.
7	Never stand directly on metal or the ground when have to work in a narrow or humid environment. Please stand on dry wood or insulating platform, wearing shoes with insulated rubber sole.
8	Please wear dry gloves without holes when turn on the machine power.
9	Please turn off the machine before taking off the gloves.
10	It is forbidden to replace the ground cable of the machine with other wires and cables.
11	There is high voltage inside the machine. Non-professionals are strictly forbidden to open the casing or start the machine for maintenance.
Protective Measures for Electromagnetic Fields	
	**When an electric current flows through a conductor, it generates an electromagnetic field, which can be harmful to the human body.**
1	Welders with cardiac pacemakers shall consult a doctor if they are suitable for welding and cutting operations.

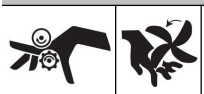
2	Human exposed to the electromagnetic field may cause unknown health effects.
3	Welders should minimize electromagnetic field damage through the following methods.
3.1	Wrap the electrodes and the working cable with insulating cloth and secure them with tape if possible.
3.2	Do not wrap wires and cables around arms.
3.3	Do not put cables around your body. Put the cables on one side if possible.
3.4	The clamping position on the work piece, by the working cable, should be as close as possible to the area to be welded or cut.
3.5	The welding/cutting machine and cable shall not be close to the body during operation.

Protection Against Fumes and Gas

Welding and cutting produces a lot of fumes and gas, which is harmful to human health.

1	Keep your head out of the fumes. Do not breathe the fumes.
2	Keep well ventilation in welding/cutting working environment. Do not weld or cut in a confined space and there must be an air exhaust and dust remove system.
3	Do not weld in locations near degreasing or spraying operations. The heat and arc produced in the operation can react with chlorinated hydrocarbon to form highly toxic and irritating gases, which is harmful to the human body and might cause birth defects, and in some cases, can lead to cancer.
4	If you experience temporary eye, nose, or throat discomfort during welding/cutting operation, it may be caused by inadequate ventilation. Please stop the operation immediately and take measures to improve ventilation in the working area.
5	For specific ventilation requirements of welding and cutting working area, please refer to relevant documents of welder profession.

Gas Cylinder Safety	
	**Cylinders connected to welding/cutting equipment may rupture and leak gas, if not being properly operated. A sudden rupture of a cylinder valve or relief valve can cause injury or even death to human body.**
1	The cylinder should be away from high temperature and fire source. Do not use hard objects to scratch on the cylinder body.
2	A suitable gas should be selected and stored in the cylinder during welding and cutting. The pressure reducing valve should be installed on the cylinder according to the cylinder manufacturer's operating instructions. Do not use quick connectors for cylinder gas hose connection and please make sure that the gas hose and fittings is reliably connected, without any leakage.
3	Keep cylinders fixed upright at all times and the cylinder can be chained or belted to a suitable trolley, base, wall, post or shelf. Never fix the cylinder to the work table or machine, to avoid they become part of the circuit.
4	Ensure that the cylinder valve is closed when it is not in use. If there is no hose connected to the cylinder, put a dust cap on the valve port in time.

Moving Parts Safe Protection	
	**Moving parts, such as fans, rotors and belts, can be hazardous.**
1	Before welding/cutting, keep all doors, panels, covers closed.
2	Only qualified professionals and technicians can remove the machine casing for maintenance.
3	Make sure that hands, hair, clothing and tools are out of movement range of the moving parts

Package and transportation

1. During packaging, storage and transportation, please pay attention to the placement identification, waterproof identification, bearing identification, layer number identification and other protective identifications on the package.
2. During the transportation and transshipment, it is prohibited to throw the

products at will, and strong impact and vibration are prohibited.

3. Equipment should be stored in a rainproof, moisture-proof and well ventilated place, and the ambient temperature of storage should be -25℃~55℃.

PARAMETER

Model	CTM-160
Parameters	**Value**
Rated input voltage	AC220V±10% 50/60Hz 1PH
Rated input power (kVA):	6.6
Rated input current (A):	30
Rated duty cycle:	40
Output current range (A):	10-40（CUT）/10-180（TIG）/10-160（MMA）
Open circuit voltage (V):	250（CUT）/70（MMA/TIG）
Power factor:	≥0.93
Efficiency:	≥75
Insulation grade:	H
IP grade:	IP21S
Cooling method:	Air cooling
Max. cutting thickness (mm):	15
Package dimensions (mm):	402*275*320
N.W. (kg):	6.0

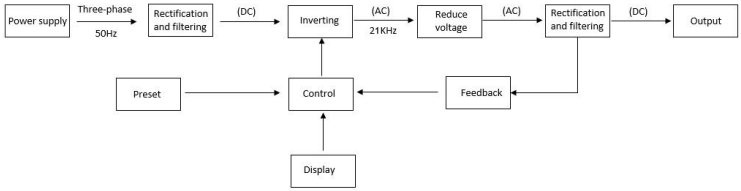
PRODUCT DESCRIPTION

This series inverter plasma cutter invert 50Hz/60Hz power supply into high frequency high voltage power supply, through a high power device IGBT, and then after step-down rectifying and pulse width modulation (PWM) technology, output high power DC supply for cutting. Thanks to the advanced inverter technology, the weight and volume of the main transformer are greatly reduced, and the efficiency is increased by 35%, which features stable and reliable quality, lightweight and energy saving performance, etc..

8	Coupling device, positive pole (+): in TIG / Plasma cutting process, connected with earth clamp, which then is connected to the work piece; in MMA welding process, connected with MMA electrode holder.
9	Power switch: turn on / off the input power.
10	Gas pressure reducer: regulate gas flow
11	Air inlet: compressed air / argon gas input

WORKING PRINCIPLE

1. Working principle diagram



1.1. Covert the alternating-current input into direct-current output by a bridge rectifier;

1.2. Under the control of PWM, IGBT inverts the above-mentioned direct current into 20 KHz alternating-current and transmits power through high-frequency transformer;

1.3. Output the welding current that meets the requirements set after secondary rectification and reactor filtering;

1.4. Protection circuit works in time and provides signal to PWM circuit (overheat, overcurrent);

1.5. The closed-loop control method is adopted to make the cutting power source have
good anti-grid fluctuation ability and excellent cutting performance.

INSTALLATION AND WIRING

1. Requirements for installation location

1.1. The cutting machine should not be installed in a location exposed to direct sunlight and rain. Install and keep it in a low humidity and little dust environment, and within the ambient air temperature range of - 10 ℃ ~ 40 ℃.

In addition to the features of the inverter power supply above, it also has good dynamic characteristics, stable arc, good welding quality and is easy to control, etc.. Apply to cut and weld carbon steel, stainless steel, nonferrous metal and other metal materials. They are widely used in electric power construction, shipbuilding, machinery manufacturing, building construction, indoor and outdoor decoration, hardware products, furniture manufacturing, kitchen equipment and other industries.

This series of cutting machines are manufactured in accordance with IEC60974-1 <Arc Welding Equipment -- Part 1: Welding Power Sources>, Safety Requirements for Arc Welding Equipment.

1. This series of cutters have following features:

1.1. Three in one combo design, multi-function cutting and welding machine for plasma cutting, MMA and TIG welding;

1.2. Simple appearance design, small volume, light weight, multilayer control circuit board and separation of control system and cooling system, ensuring higher reliability and longer service life;

1.3. Good arc characteristics, easy arc striking and stable arc;

1.4. Adopts high frequency high voltage arc starting system with additional voltage increasing function, achieves fast arc starting and arc success rate is up to 99.8%, especially suitable for all kinds of spot welding operations;

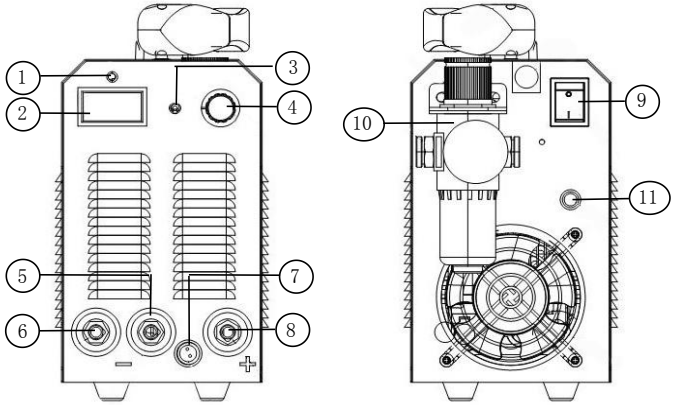
1.5. Manual arc welding function is suitable for welding acid, alkaline, stainless steel, cast iron and other welding electrodes, with excellent welding performance. It also can be applied to welding electrodes of different specifications, such as ø2.0mm/ ø2.5mm/ ø3.2mm/ ø4.0mm;

1.6. Narrow cutting seam, clean cutting edge, and anti-deformation;

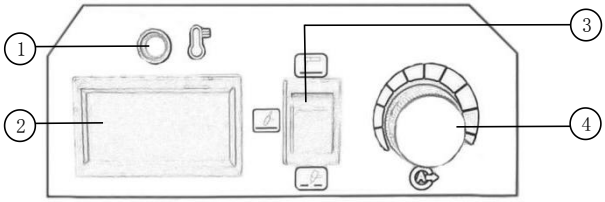
1.7. Thanks to the IP21S protection grade, this cutting machine works reliably even under harsh environmental conditions;

2. Appearance:

CTM-160



Panel：



1	Error indicator light: It will lit when the machine is under overcurrent or overheat protection.
2	Current display: Real-time display of output current value, and display the value being set when in data setting.
3	Function select switch: Switch among MMA/TIG/Plasma cutting functions.
4	Welding current adjustment knob: Rotate to adjust the output welding current.
5	MMA welding cable coupling device, negative pole (-): connected with earth clamp, which then is connected to the work piece
6	Gas electric hybrid socket: connect with TIG welding torch / cutting torch gas electric plug.
7	TIG welding torch / cutting torch control socket: connect with TIG welding torch / cutting torch trigger control line.

1.2. The machine shall not be placed on an inclined surface, the ground surface shall be flat, and the inclination of the welding machine shall not exceed 10 °.

1.3. Ensure no wind at the working station, and suitable precautions should be taken to prevent wind.

1.4. Keep at least 20cm space in front and back of the cutting machine body, and at least 10cm space on the left and right sides to ensure good ventilation conditions around the machine.

2. Requirements of power input

The power supply waveform should be standard sin wave, the rated voltage is 220V±10% with 50Hz or 60Hz frequency. Phase unbalance of three-phase voltage≤5%

Model	**CTM-160**
Parameters	**Value**
Power supply:	AC220V±10% 50/60Hz 1PH
Rated output current:	40A（CUT）/180A（TIG）/160A（MMA）
Input cable:	≥2.5mm^2
Output cable:	16mm^2（CUT）/25mm^2（TIG、MMA）
Ground cable:	≥2.5mm^2

3. Connection of machine power supply

Pay attention to prevent electric shock

Wear goggles

Warning: The followings should be aware of when connecting the cutting machine to a power supply

a) The connection of power cord must be carried out by qualified electricians and technicians.

b) The connection of power cord must comply with national and local policies and regulations.

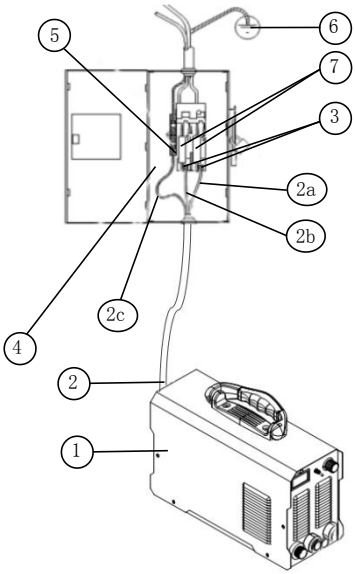
c) Before connecting the power supply, the power supply of the electric control box must be disconnected.

d) A ground cable must be connected from the power supply to the work, and the ground cable has a reliable grounding terminal. The yellow green earth wire of the machine must be reliably connected with the grounding cable.

e) Before connecting the power cords, it is necessary to confirm the parameters of the power supply on the name plate of the machine which allowed to be connected, and verify the input power supply is consistent with the allowable power supply of the machine.

f) The thread pressing screws must be pressed tightly, and cannot be loose and fake connection.

Wiring of single phase AC220V 50/60Hz cutting machine



No.	Item	No.	Item
1	Cutting machine	3	Live wire terminal block
2	Power cord	4	Electric control box
2a	Live wire L	5	Earth wire terminal block
2b	Neutral wire N	6	GND
2c	Earth wire	7	Overcurrent protection device

BRIEF INSTRUCTION FOR CUTTING OPERATION

1. Plasma cutting process

1.1. Connect the gas hose to the gas inlet on the rear panel of the cutting machine and compressed air source, and tighten the joint firmly with hose clamp or with other methods to avoid air leakage, and ensure that the air source can provide appropriate pressure, sufficient flow rate and be dry. Regulate the air pressure between 0.35-0.4MPa.

1.2. Connect the coupling nut of the cutting torch with gas electric hybrid connector under the front panel and tighten it. Connect the aviation plug of the cutting torch to the corresponding interface on the cutting machine panel, and screw the interface screw.

1.3. Connect the quick plug of the ground cable, one end of which is connected with a earth clamp, to the quick socket of the output current "+" pole under the front panel and turn clockwise to tighten; then clamp the work piece with earth clamp.

1.4. Connect the power cord to the distribution box with the corresponding input voltage level according to the cutting machine's, do not connect the wrong voltage, and ensure that the error of the supply voltage is within the allowable range.

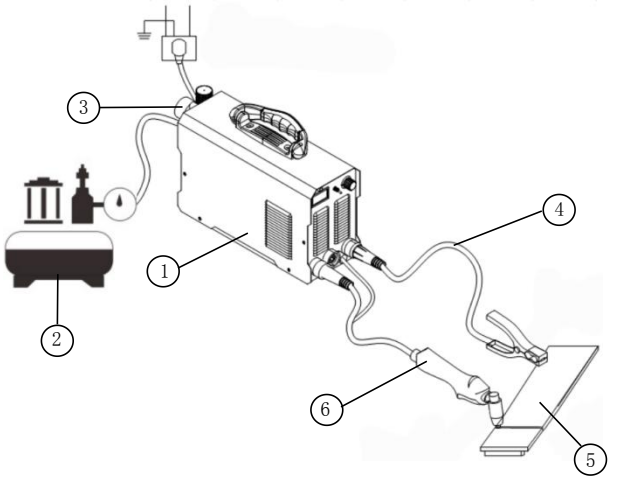
1.5. Turn on the machine with pressing the power switch, work LED is lit, and cooling fan works.

1.6. Select plasma cutting process by the function select switch and set current parameters on the panel according to the requirements and start cutting.

1.7. Carry out the cutting operation according to the normal procedure. During the cutting process, the cutting parameters can be modified according to the actual situation.

1.8. After cutting operation, turn off the power switch and turn off the switch of the distribution box.

1.9. Schematic diagram of cutting process:



No.	Item	No.	Item
1	Cutting power supply	4	Earth clamp
2	Air compressor	5	Work piece
3	Air pressure reducing valve	6	Torch

2. TIG welding process

2.1 Connect the quick plug of the ground cable, one end of which is connected with a earth clamp, to the quick socket of the output current “+” pole under the front panel and turn clockwise to tighten; then clamp the work piece with earth clamp;

2.2 Connect the coupling nut of the TIG welding torch with gas electric hybrid connector under the front panel and tighten it. Connect the aviation plug of TIG welding torch to the corresponding interface on the cutting machine panel, and screw the interface screw;

2.3 Connect the power cord to the distribution box with the corresponding input voltage level according to the cutting machine’s, do not connect the wrong voltage, and ensure that the error of the supply voltage is within the allowable range.

2.4 Turn on the machine with pressing the power switch, work LED is lit, and cooling fan works;

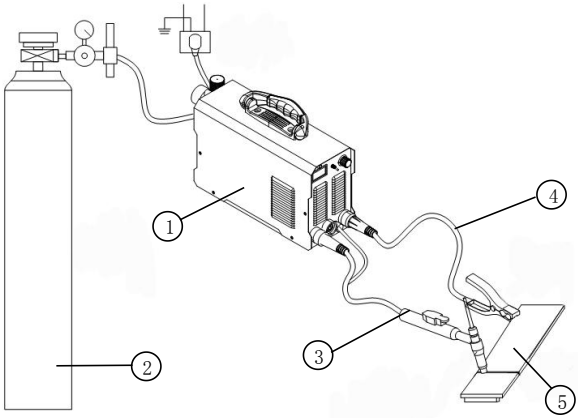
2.5 Select TIG welding process by function select switch and set current parameters on the panel according to the requirements, point the welding torch at the

work piece and press the trigger to start welding;

2.6 Carry out the welding operation according to the normal procedure. During welding process, the welding parameters can be modified according to the actual situation;

2.7 After welding operation, turn off the power switch and turn off the switch of the distribution box.

2.8 Schematic diagram of TIG welding process:



No.	Item	No.	Item
1	Welding power supply	4	Earth clamp
2	Argon gas cylinder	5	Work piece
3	TIG welding torch		

3. MMA welding process

3.1. Connect the quick plug of the ground cable, one end of which is connected with an earth clamp, to the quick socket of the output current “-” pole under the front panel and turn clockwise to tighten it; then clamp the work piece with earth clamp.

3.2. Connect the quick plug of the welding cable, one end of which is connected with an electrode holder, to the quick socket of the output current “+” pole under the front panel and turn clockwise to tighten it; clamp the welding electrode with the electrode holder;

3.3. Connect the power cord to the distribution box with the corresponding input

voltage level according to the cutting machine's, do not connect the wrong voltage, and ensure that the error of the supply voltage is within the allowable range.

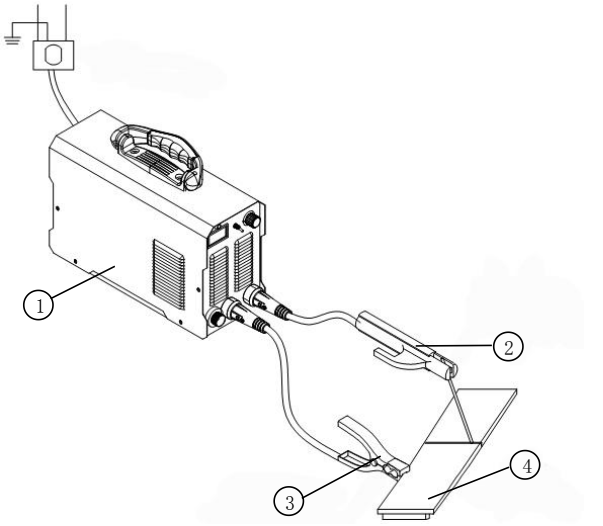
3.4. Turn on the machine with pressing the power switch, work LED is lit, and cooling fan works.

3.5. Select MMA welding process by function select switch and set current parameters on the panel according to the requirements; start welding operations when the electrode contacts the work piece;

3.6. Carry out the welding operation according to the normal procedure. During welding process, the welding parameters can be modified according to the actual situation;

3.7. After welding operation, turn off the power switch and turn off the switch of the distribution box.

3.8. Schematic diagram of MMA welding process:



No.	Item	No.	Item
1	Welding power supply	3	Earth clamp
2	Electrode holder	4	Work piece

MAINTENANCE

1. Dust removal

Inspection by professional maintenance personnel every 3 to 6 months. Clean all parts inside the cutting machine with dry compressed air. After cleaning the inside of the machine, the removed side plate should be reset before using the cutting machine again. Note that if the removed side plate is not reset, the cooling effect of the fan will be invalid, which may lead to the burning of transformer and semiconductor power devices. Meanwhile, pay attention to check whether the fastening screws of input and output connecting cable are loose, whether the contact is tight, and whether the machine shell is grounded.

2. Inspection of wire and cable

Inspect the wire and cable every time before cutting operation to ensure that the insulation layer is not damaged, the wiring is correct, and the joint piece is not loose.

COMMON MACHINE MALFUNCTIONS AND SOLUTIONS

Warning：

Machine maintenance must be carried out by qualified professional and technical personnel!

The highest voltage inside the machine can reach to 600V!!! For your safety, do not open the cover at will. During maintenance, safety protection such as preventing electric shock should be prepared well.

The power supply of the machine must be turned off when installing the wiring and replacing the cutting/welding torch accessories.

1. Before overhaul

1.1 Check whether the line voltage of single-phase power supply is in the range of 200v ~ 240v, and whether there is phase loss phenomenon.

1.2 Check if power cable of the machine is correctly and reliably connected.

1.3 Check if earth wire of the machine is correctly and reliably connected.

1.4 Check whether the wiring connection is correct and whether the contact is firm and reliable.

2. Common machine problems and troubleshooting

No.	Problem	Root cause	What to do
1	No digital display. Fan doesn't work. No no-load output.	Power switch was turned off or damaged	Check or replace the power switch
		Power supply phase missing	Check power input if phase loss and troubleshooting
		Whether there is electricity in the grid connected to the output cable	Check the grid voltage
		Filter capacitor and bridge rectifier have been damaged, resulting in failure to start the machine	Replace filter capacitor and bridge rectifier
		Power frequency transformer damaged	Replace power frequency transformer
		Control board damaged	Replace control board
2	No digital display. Fan works. Error indicator light is off. There's no load output.	Digital display meter or indicator light is damaged	Replace digital display meter or indicator light
		Loose connection wire	Check and tighten the connecting wire
		Control board damaged	Check the problem of control board or replace it

3	Digital display and fan work. Error indicator light is on. No no-load output.	Poor ventilation of power supply leads to overheating protection	Improve ventilation
		Ambient temperature is too high	Wait for 5-10 minutes and it will automatically resume to work
		Exceeds the rated duty cycle	Wait for 5-10 minutes and it will automatically recover
4	Digital display and fan work. Error indicator light is off. There's high frequency discharge sound and no-load output. No gas discharge.	No gas discharge from the input air hose	Check and make sure the input air hose works
		Press the torch trigger, if the solenoid valve does not jump and its terminal block is in good contact, it might be solenoid valve damage	Replace the solenoid valve
		If problems still exist after replacing the solenoid valve, the control circuit is damaged	Replace the control circuit board
		Gas electric hybrid socket blocked	Check and fix the gas electric hybrid socket