

User's Manual



CUT50C IGBT
CUT70C IGBT

PREFACE



Dear Users:

Thank you for your use of the inverter welding machine series products produced by Huayilong. CUT50C/70C IGBT is the single-tube IGBT air plasma cutter manufactured by us based on the advanced inversion technology. The working principle is to adopt the pulse width modulation (PWM) and high power switch component IGBT to rectify 50Hz/60Hz power frequency to direct current, invert the current into high frequency up to 20KHz and then reduce the voltage for rectification. The PWM output can support high power DC power supply for welding; due to the switch power inverting technology adopted, the weight and volume of the welding machine decrease greatly and the whole-set conversion rate increases by over 30%.

We recommend you read carefully and understand completely this manual before installation and operation in order to protect the safety of you and others.

VI TROUBLES AND TROUBLESHOOTING

6-1 TROUBLES AND TROUBLESHOOTING

 WARNING		Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:
<ul style="list-style-type: none"> • Troubleshooting must be completed by personnel with professional competency or competent personnel. • Before operation, be sure to turn off the power supplies of this product, distribution box (user's equipment), related devices (external devices connected with the input terminal); and due to the discharge of the capacitor, be sure not to operate until the welding power supply is turned off for at least 5min. 		

■ Common Troubles, Causes and Troubleshooting

S N	TROUBLES	CAUSES	SOLUTIONS
1	After power-on, the operation indicator is not on and the cutter does not work	<ul style="list-style-type: none"> • The cutter lacks phase • Wire broken 	<ul style="list-style-type: none"> • Check the power supply • Check if the fan, power transformer and main control panel are intact • Check the wires
2	Overheat indicator is on	<ul style="list-style-type: none"> • Too high temperature inside • Temperature relay damaged 	<ul style="list-style-type: none"> • Use it after the machine is cooled • Replace it
3	No air out during air check	<ul style="list-style-type: none"> • Solenoid valve damaged • Airway jammed • Control panel damaged • Too high filter output pressure 	<ul style="list-style-type: none"> • Have a check and replace it • Check the airway • Replace it
4	Cutting gun control switch invalid	<ul style="list-style-type: none"> • Switch damaged • Wire broken • Control panel damaged 	<ul style="list-style-type: none"> • Replace it • Splice the wire • Replace it
5	Too wide kerf	<ul style="list-style-type: none"> • Too slow cutting speed • Nozzle burned 	<ul style="list-style-type: none"> • Improve the speed • Replace it
6	Slanting kerf	<ul style="list-style-type: none"> • Nozzle burned • Nozzle and electrode not aligned • Cutting gun not vertical 	<ul style="list-style-type: none"> • Replace it • Adjust them • Adjust it vertical

6-2 SOLUTIONS AFTER REASONS FOUND

- When this device fails or other peripheral components have defects, please contact the local dealer for maintenance.

- Before check, be sure to turn off the power supplies of this product, distribution box (user's equipment), related devices (external devices connected with the input terminal); and due to the discharge of the capacitor, be sure not to operate until the welding power supply is turned off for at least 5min.



WARNING In order to prevent the semiconductor and P plate from being damaged by static, please follow the instructions below:

Before touching the conductor of the cables and P plate inside the device, you may remove the static in advance via touching the housing metal position with your hand, etc.

The device is designed with excellent 3-resistance structure; however, in order to improve the service life and reliability under severe circumstances, remove the device cover and clean various parts inside with dry compressed air at least once every 6 months. (If the heat radiator is covered with dust, the heat radiation will be affected and the bad effect IGBT and drive circuit will be affected on. In addition, the dust accumulated between the transformer coils will lead to the insulation performance decrease.) Please specially note if PCB wiring terminals on IGBT inverter plate and fast recovery diode plate rectifier loosen and oxidate.

(3-6 months) conduct an internal check for the welding power supply. For details, please refer to the user manual.

	1	2	3
Regular check Period	/ /	/ /	/ /
	4	5	6
Year/Month/Day	/ /	/ /	/ /

You may make the label and fill in the date for the regular check.

■ Check contents

In addition to the check items below, the user may add more check items according to his/her actual situation.

Remove dust inside

- Remove the cover, remove the dirt or foreign matters hard to be blown away. Use the compressed air without water contained (dry air) to blow the accumulated dust inside away.

Routine Check

- Remove the cover and be sure to pay attention to the check on the following items and non-routine items.
- Check if there is rare odor, fading or overheat damage traces and the connection points are loose.

Cable Check

- Please mainly check such non-routine check items (supplementary fastening, etc) as the earth wire, cables, etc.

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2. In order to prevent dust harm and poison such as welding smoke, etc, be sure to use the specified local exhaust equipment and breath protective devices.
3. In case of welding on the bottom of cases, boilers, vessels, etc, as such gases heavier than air as CO₂, Air, etc will settle on the bottom, therefore, make sure sufficient gas exchange and breath protective tools are available.
4. When working in the narrow place, please accept the check of the supervisor, make sure sufficient air exchange is available and prepare the breath protective devices.
5. Do not conduct welding in degreasing, cleaning and spraying areas.
6. When welding the steel plate with plating or coating, harmful fume and gases may occur, so always use breath protective tools.



DANGER

In order to prevent fire, explosion, burst, etc, be sure to follow the following regulations:



- * Splashes and hot parent materials having just been welded may cause fire.
- * When the point with bad cabling, the side current loop of such parent materials as steel bar, etc have incomplete touch, electric heating may occur and thus cause fire.
- * Do not weld on the container with flammables, otherwise, explosion may occur.
- * Do not weld the sealed container, such as trough (case), tube, etc, otherwise, burst may occur.

1. Do not place flammables in the welding place.
2. Do not weld near flammable gases.
3. Do not keep the hot parent material having just been welded near flammables
4. When welding parvis, ground or wall, remove the flammables on the back.
5. Make sure the cable connection point is well insulated.
6. The cable on the parent material shall close to the welding point as possible.
7. Do not weld such units as gas pipe, sealed trough, etc with gases.
8. Always place some extinguishers near the welding area to prevent fire.



CAUTION

In order to prevent welding arc, splash, welding slag, noise, etc from harming you and others, please use the specified protective tools.



- * Arc may cause eye inflammation or skin burning, etc
- * Splash and welding slag can burn your eyes and your skin.
- * Noise may affect listening.

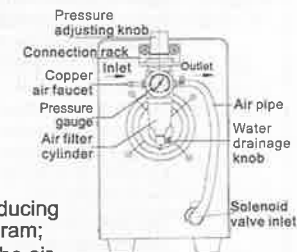
1. When welding or monitoring the welding, please use protectors with enough opacity.
2. Please wear protective glasses.
3. Please use welding protectors welding such as leather protective gloves, long-sleeve clothes, foot protectors and aprons.
4. Install protective barriers around the welding place in order to prevent arc from harming others.
5. In case of large noise, be sure to use sound-insulated devices.

4-2 OPERATION

4-2-1 OPERATION AND INSTALLATION PROCESS

■ Installation and operation of the air reducing valve

- Put seal tapes around the copper air faucet and tighten it on IN and OUT terminals;
- Put seal tapes around the meter and tighten it on the meter position;
- Fasten the connection rack on the installation position of the pressure reducing valve on the rear of the welding machine as shown in the diagram;
- Screw out the plastic nut and fasten the pressure reducing valve onto the connection rack as shown in the diagram;
- Let air pass, pull the voltage adjusting knob, adjust the air pressure (the scale in the meter: KG) to the specified voltage (rotate towards "+" to increase the pressure and rotate towards "-" to decrease the pressure) and then press the voltage adjusting knob;
- The meter scale position is shown in the diagram; the position in the diagram indicates 4 KG air pressure;
- When too much water is in the air filter cylinder, the water drainage valve should be opened to let 1 water out;



■ Installation of cutting gun

- The installation method of TCD60 gun head is shown in the diagram:
- Insert one side of the electrode into the gun handle and head.
- Insert the diverter into the other side of the electrode.
- Connect the nozzle with the electrode and the diverter respectively.
- Connect the protection casing onto the nozzle, screw it into the gun head and tighten it with force.

■ The installation method of P80 gun head is shown in the diagram:

- Screw one side of the electrode with screw threads into the gun handle head and tighten it.
- Insert the diverter into the other side of the electrode as shown in the diagram.
- Connect the nozzle with the electrode and the diverter respectively.
- Connect the protection casing onto the nozzle, screw it into the gun head and tighten it with force.



CAUTION

During the installation of Tianzong-100 gun head, screw the electrode into the gun head with an inner hexagon spanner and tighten it with force; otherwise, the inside threads of the electrode may be burned easily.

4-2-2 NOTICES TO CUTTING

- When preparing for cutting, hold the cutting gun (the cutting gun does not contact the workpiece for a model of non-contact arc striking) and press the gun switch; at this time, plasma arc will eject from the nozzle hole, indicating the electrode, nozzle, etc are installed correctly. If there is no plasma arc or only weak plasma arc ejected from the nozzle hole, it indicates the electrode and nozzle are installed improperly, so reinstallation is necessary after power-on.

Connection of input power supply

! DANGER Please configure one power distribution box for every welding machine.


- Connect the cable on the input side to the output terminal of the switch of the power distribution box.





IV. USE INSTRUCTIONS

4-1 OPERATION BEFORE AND AFTER WELDING

4-1-1 PREPARATION BEFORE OPERATION

! DANGER		During operation, be sure to use protective devices or air exhaust system to protect you and others from being damaged due to the welding fume and ensure sufficient oxygen supply.
<ul style="list-style-type: none"> • If the welding operation is conducted in small and badly ventilating area, it may lead to the oxygen deficiency and even make people suffocated. • The fume intake during welding is very harmful to the human body; be sure to provide fume exhaust and air exchange methods or use the respiratory protective device. 		

! WARNING		During operation, be sure to use protective devices to protect you and others from being damaged by the arc, splash, noise, etc caused by welding.	
<ul style="list-style-type: none"> • Wear the special protective clothes, such as gloves, safety boots, etc to protect eyes and the exposed skin. • Please prepare shades or use protective masks with shadow shield. 			

4-1-2 WORK AFTER OPERATION

- Power off
Firstly power off this device and then the power distribution box.


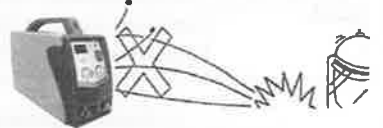


! CAUTION In order to make this product fully cool down, be sure to disconnect the power supply after over 5min when the welding operation is finished.

1-3 HANDLING, INSTALLATION PLACE

1-3-1 HANDLING

! CAUTION Keep flat during transport; properly protect the welding machine to prevent scratches, bruises, etc.

1-3-2 INSTALLATION PLACE

Place the welding machine in the rainproof room with no direct sunshine, low humidity and little dust (room temperature 10°C~40°C).	Any conductive foreign object can not enter the welding power supply.
	
Keep the welding power supply over 20cm away from the wall. Two welding machines should be over 30cm apart when placed in parallel.	Conduct the welding at the place without wind (use the wind shield, etc).
	

! CAUTION This product should be used indoor; it's recommended not to use it in the place which may suffer from rain.

In case this product is soaked with rain, rain drops may fall into the power supply inside; at this time, a serious accident may occur. Therefore, ask professional personnel to conduct related check and maintenance.

1-4 DEVICE PARTS

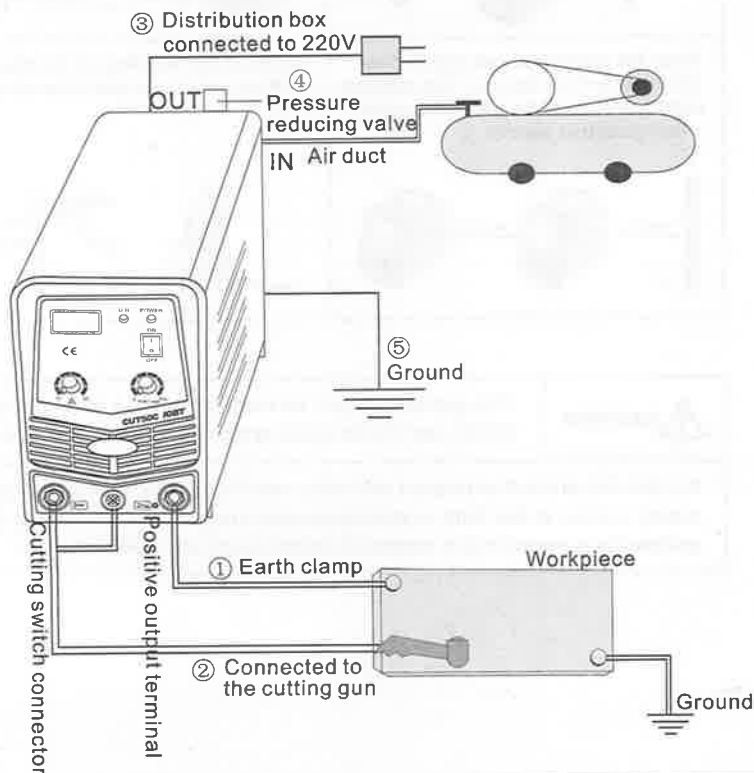
1-4-1 APPARATUSES NECESSARY FOR WELDING CONSTRUCTION

No.	Standard products needed	RMKS
①	Earth clamp	300A
②	Cutting gun	TCD60/P80
③	Distribution box	Single-phase 220V/ 3-phase 380V
④	Net pipe	3M

No.	Standard products needed	RMKS
⑤	Pressure reducing valve	SAW2000-02
⑥	Earth cable	Over 16mm ²
⑦	Hose clamp	Φ9X16



NOTICE The connection diagram of the cutter is shown below. Be sure to use this welding machine with the specified cutting gun, earth clamp together; otherwise, it will affect the welding performance and may damage the machine. Replace the gas source before the use of the argon welding and cutting functions.



III. CONNECTION

3-1 CONNECTION

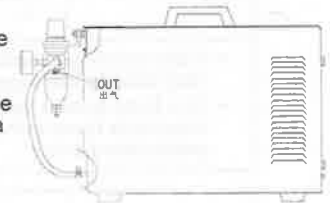


Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:

- Please connect the cable after turning off the distribution box, this power switch and power supplies of related equipment.
- Do not operate when there is water on your hand.
- Make sure the exposed conductor part is reliably insulated, such as connection position.
- Never place any heavy object on the cable or make the cable touch the welding position.
- In order to ensure safety, ask professional electrical construction operator with qualifications to conduct the reliable construction.

3-1-1 CONNECTION OF OUTPUT SIDE

- Connect the output terminal of the compressor to the input terminal (IN) of the pressure reducing valve via the air duct, and tightly connect the output terminal (OUT) of the pressure reducing valve to the copper tube on the rear of this machine via high-pressure leather hose.
- Connect the copper nut on the cutting gun with the pneumo-electric output terminal on the front of this machine, and tighten this nut clockwise (to prevent gas leakage); connect the rapid socket on the earth clamp with the positive output terminal on the front panel of the cutter and tighten the socket.
- Connect the switch plug on the cutting gun with the switch connector of the cutting gun on the panel. (for the cutter with arc maintenance, connect the arc maintenance wire on the cutting gun with the arc maintenance terminal).
- Screw the electrode into the cutting torch to the end, slightly tighten them with force and then properly install the nozzle and protection cover in a proper order.



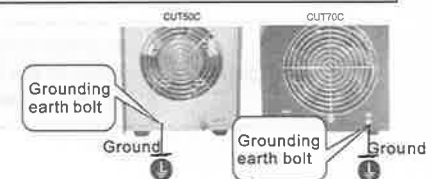
3-1-2 CONNECTION OF INPUT SIDE

Connection of earth wire



CAUTION As the tap water pipe and reinforced bars for houses have no full grounding, never connect the earth wire to such places.

- Connect one end of the earth wire to the rear grounding terminal
- Reliably ground the other end of the earth wire



2-8 WORKING PARAMETERS OF CUTTER

The plasma arc cutting is a method to make local metal to rapidly melt through extremely thin and hot plasma arc and then blow away the melted metal with airflow.

ITEM \ MODEL	CUT50C	CUT70C
Power supply	AC220V	AC380V
Nozzle aperture (mm)	1.2	1.5
Air pressure (kg)	4	5.5
Cutting thickness (mm)	1~12	1~25

Air plasma cutting specs for low-carbon steel

Plate thickness (mm)	Conduction nozzle aperture (mm)	Cutting current (A)	Airflow (L/min)	Cutting speed (M/min)
6	φ1	30	8	0.24
10	φ1.2	40	70	0.30
20	φ2	100	70	0.35
30	φ2.5	125	70	0.30

Air plasma cutting specs for stainless steel

Plate thickness (mm)	Conduction nozzle aperture (mm)	Cutting current (A)	Airflow (L/min)	Cutting speed (M/min)
6	φ1	30	8	0~2.5
10	φ1.2	40	70	0~2.5
20	φ2.5	100	70	0~2.0
30	φ3	125	70	0~2.0

Air plasma cutting specs for aluminum and aluminum alloy

Plate thickness (mm)	Conduction nozzle aperture (mm)	Cutting current (A)	Airflow (L/min)	Cutting speed (M/min)
6	φ1.2	40	10	0~30
10	φ1.5	100	70	0~30
20	φ2.5	125	70	0~25
30	φ3.5	125	70	0~25

1-4-2 CABLE CONNECTION

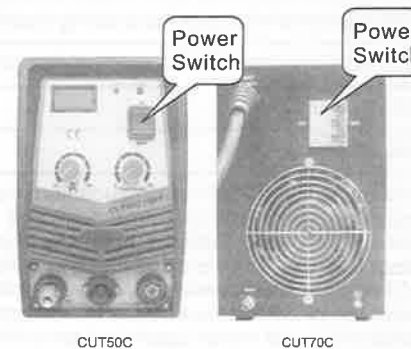
NOTICE	Waterproof measures
When this welding machine is used under the circumstance with water, be sure to adopt waterproof measures in the cable connection position. (If water enters the connection position, the insulation resistance may decrease or even the short circuit may occur between connecting lines, thus causing failures.	

- The product adopts (-) output; after the electrode holder cable is connected with the output terminal, a scope for the welding operation can be provided. (Of course, the parent metal side cable should adopt proper length based on the actual condition).
- Be sure to pay attention to the following when connecting cables:
The length and wire diameter (sectional area) should be selected properly; otherwise, the welding performance will decrease due to the voltage drop on the cable.
- Therefore, when connecting the extended cable, please note the following:
 - The relation between the cable extension and sectional area. Refer to the number table of the cable connection. (the same for the parent metal connection).
 - Shorten the connection cable length as possible.
 - Connect to the parent metal when needing to connect the (+) voltage test terminal of the parent metal.
 - Try to use single cable and not to lengthen it in the middle.

1-5 NAMES AND FUNCTION OF VARIOUS PARTS

1-5-1 POWER SWITCH (BREAKER)

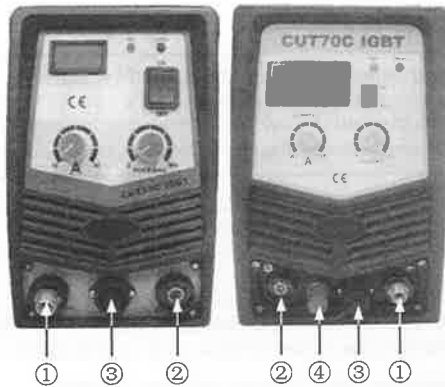
CAUTION	About Power Supply
Under the circumstance that the electric generator is used, be sure to disconnect the power supply when starting the generator.	



Connection and disconnection operation of the power switch

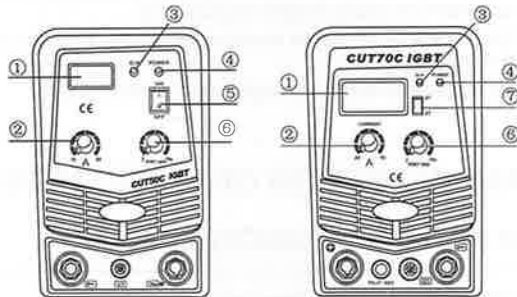
- Power-on state when the power switch is on the up.
- Power-off state when the power switch is on the down.

1-5-2 FRONT WIRING PART



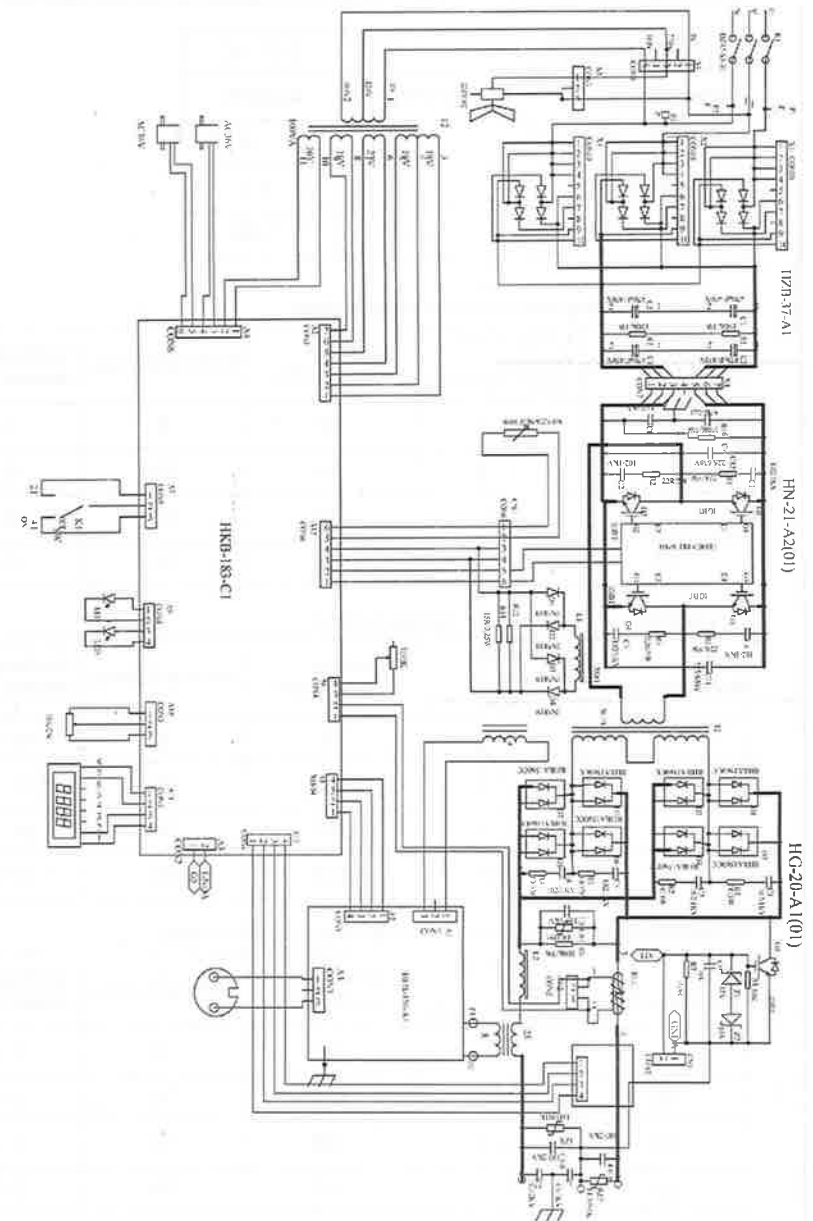
①	Cutting gun connector • Reliably connected to the cutting gun
②	Parent material connector • Reliably connected to the parent material cable
③	Control socket • Connected to the control socket of the cutting gun
④	Transferred arc connection post (+) • Transferred arc connection post connected to the cutting gun

1-5-3 OPERATION PANEL



NO.	NAME	FUNCTION
①	Digital panel meter	Used to display the welding current
②	Current adjusting knob	Adjusts the welding current
③	Abnormality indicator	Displays the abnormal status of the welding machine
④	Power indicator	Displays the working status of the welding machine
⑤	Power switch	Controls the power
⑥	Post-blow adjusting knob	Adjusts the post-blow time
⑦	Rocker switch	When the cutter is in non-self-locking position, press the cutting gun switch to start normal cutting and release the switch to stop cutting, suitable for short seam cutting; when the cutter is in self-locking position, after the cutting gun switch is pressed and the arc striking is successful, the switch can be released to start normal cutting; when press the switch again to stop cutting, suitable for long seam cutting.

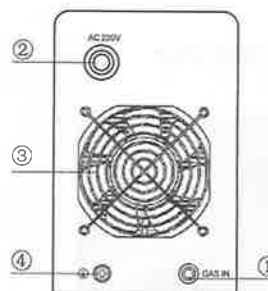
2-7 CIRCUIT DIAGRAM(CUT70C)



2-6 PRODUCT BREAKDOWN (CUT70C)

S N	Name	RMKS
1	Rapid socket	The output "+"pole connected to the workpiece to be cut via the output cable
2	Self-locking wire buckle	Fix the input cable
3	Control panel	Core control circuit, PWM adjustment and IGBT drive control available
4	Power frequency transformer	Supplies 5V and 27V power to the main control panel
5	Silicon bridge	Rectifies 3-phase 380V current into DC540V current
6	Bottom plate	For DC smoothing after input rectification
7	Power switch	Used to turn on/off the welding machine
8	Plate rectifier	For secondary rectification
9	Reactor	Output DC smoothing
10	Absorbing plate	Absorbs output high frequency
11	Main transformer	Reduces AC voltage after inversion
12	Fan	Used to cool heating components inside
13	Inversion board	Inverts DC into mid-frequency square wave AC
14	Solenoid valve	Controls air opening/close
15	Arc-striking coil	Induces high-frequency voltage and penetrates air arc striking
16	Run-on plate	Controls high frequency

1-5-4 REAR PANEL



①	Air inlet <ul style="list-style-type: none"> When the welding machine operates, never put any wind-shielding object nearby.
②	Power incoming wire <ul style="list-style-type: none"> When the power incoming wire is connected, in order to prevent it from being loosened, be sure to have reliable connection.
③	Fan <ul style="list-style-type: none"> Inlet where the fan inhales cool air Never put any wind-shielding object nearby Action of the cooling fan
④	Grounding terminal <ul style="list-style-type: none"> Please use a reliable grounding method.

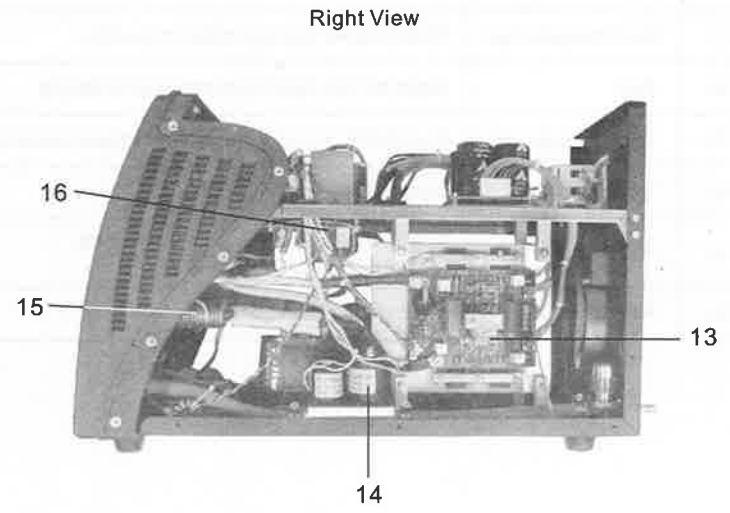
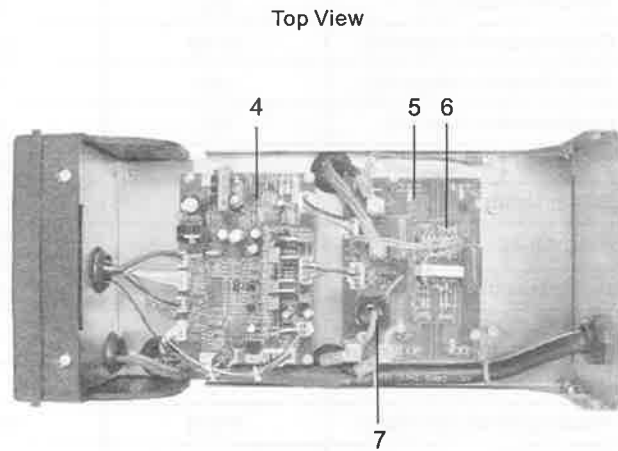
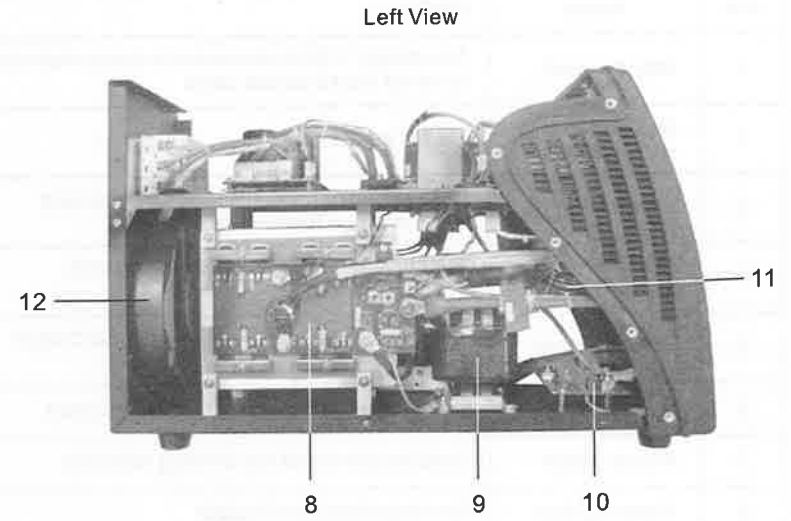
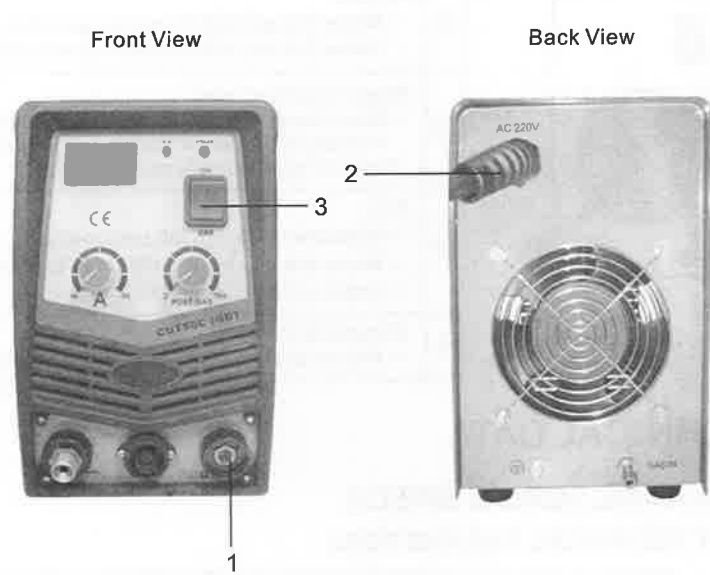
II. TECHNICAL DATA

2-1 PARAMETERS & SPECS

2-1-1 TECHNICAL PARAMETERS

PARAMETERS \ MODEL	CUT50C	CUT70C
Input power voltage (V)	AC220V±15%	AC380V±10%
Rated input current(A)	28.5	14.5
No-load voltage (V)	230	280
Output current scope (A)	10-50	20-70
Rated output voltage (V)	100	108
Load duration rate (%)	60	60
Efficiency (%)	85	85
Power factor(cosφ)	0.93	0.93
Arc striking method	Contact arc striking	Non-contact arc striking
Recommended air pressure (KG)	4.5	5.5
Air exhaust via air compressor recommended (m ³ /min)	0.17	0.25
Insulation class	F	F
Housing protection class	IP21S	IP21S
Weight (KG)	9	21
External dimensions (mm)	410*170*320	555*218*355

2-2 Product Configuration Diagram (CUT50C)



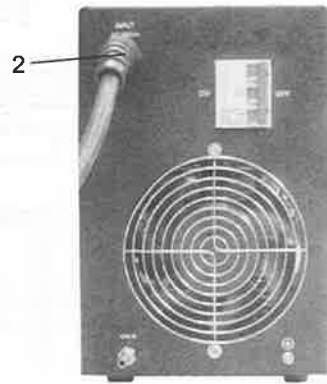
2-5 PRODUCT CONFIGURATION DIAGRAM (CUT70C)

Front View



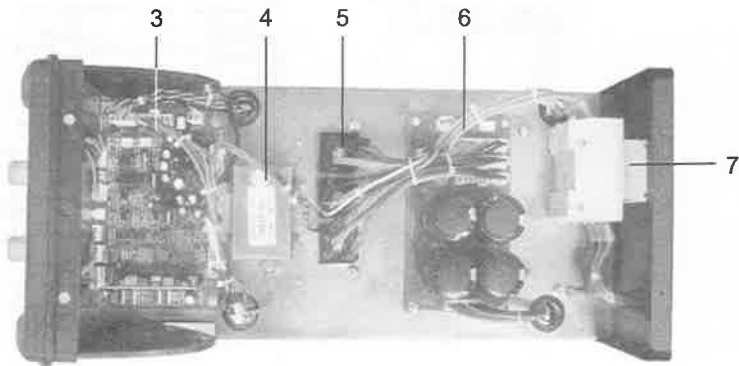
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Back View



2

Top View



3

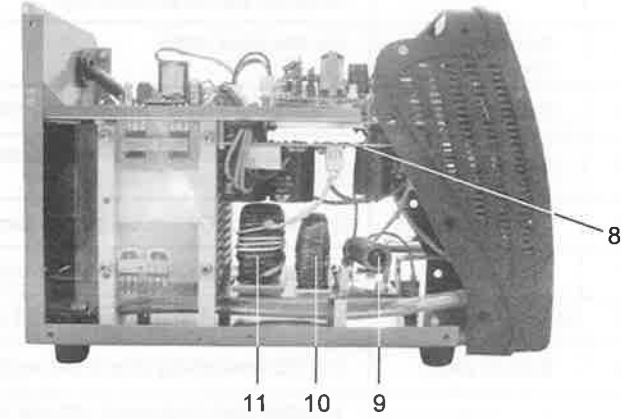
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5

6

7

Left View



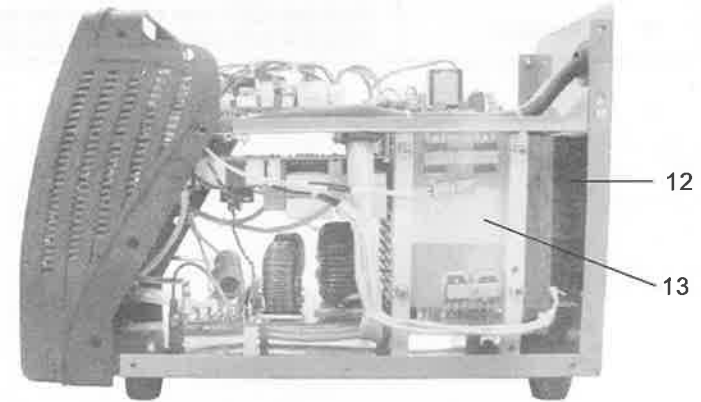
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11

10

9

Right View



12

13

2-3 PRODUCT BREAKDOWN (CUT50C)

SN	NAME	RMKS																											
1	Rapid socket	The output "+" pole connected to the workpiece to be cut via the output cable																											
2	Self-locking wire buckle	Fix the input cable																											
3	Power switch	Used to turn on/off the welding machine																											
4	Control panel	Core control circuit, PWM adjustment and IGBT drive control available	5	Inversion board	Inverts DC 310V into the branch current of 50KHZ.	6	Drive module	Drives the connection/disconnection of IGBT	7	Current transformer	Protects IGBT and prevent IGBT overcurrent	8	Bottom plate	For DC smoothing after input rectification	9	Arc-striking coil	Induces high-frequency voltage and penetrates air arc striking.	10	Reactor	Output DC smoothing	11	Main transformer	Reduces AC voltage after inversion	12	Fan	Used to cool heating components inside	13	Radiator	Reduces IGBT heat to prevent the welding machine from being damaged due to heat
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2-4 CIRCUIT DIAGRAM(CUT50C)

