KeyGree

USER'S MANUAL

TIG-315P ACDC
TIG-400P ACDC
TIG-500P ACDC

Do it easy, comfortable, trustable.

TIG 315P ACDC/400P ACDC/500P ACDC

PLASMA CUTTER

Contents

1. Advantage

Keygree's inverter AC/DC pluse TIG welding machine, combines many functions in one –MMA & DC Constant Current TIG & DC Pulse TIG & AC Constant Current TIG & AC Pulse TIG. The machine is suitable for many different material's welding, such as carbon steel, copper, titanium, aluminum, magnalium and so on. It has both good static load and dynamic characteristic, MCU control, other advantages going as below:

- IGBT high frequency soft switch transform, high efficiency and reliability
- MCU controlled technology, multi-function in one machine, convenient to use
- foot switch to control current is optional
- passive power factor correction makes power factor higher
- easy to arc starting, stable arc, high performance
- accurate adjustment can achieve great penetration, aesthetic appearance of weld seam and low electrode consumption

2. Safety warning !

2.1 Please follow the instructions to avoid serious physical injury !

(1) The design of machine considered fully requirement of safety, but please read the instructions carefully before using, or it may lead to serious accidents such as physical injury even death.
(2) Such behaviors as construction around the input power supply, selection of the location, usage & storage & disposition of pressure gas, storage of finished workpiece and disposal of waste should follow the relevant regulations and enterprise's internal standards.
(3) Unauthorized access is prevented from the location of welding works.
(4) The user of heart pacemaker should keep away from the welding spot without the permission of doctor. Magnetic field of working welding machine influence the heart pacemaker.
(5) The installation, overhaul and maintenance of welding machine should be practised by the qualified people.
(6) To ensure the safety, please understand the content of this manual well and operate the machine right.
(7) The machine could not use for other purpose except welding.

2.2 Please follow the instructions to avoid personal safety accidents caused by electric shock !

(1) Do not touch the live parts.
(2) Install earth device according to the application criteria by electrical operator.
(3) The installation and overhaul should be operated five minutes later after the power supply is turned off.
(4) Do not use capacity lack cable or cable with dilapidated insulation cover.
(5) Make sure the connections of cables are insulated.
(6) Do not use the machine after the outer casing is removed.

(7) Please use dry insulated gloves.
(8) Please use safety net and fasten safety belt while working aloft.
(9) Check periodically, if there is any dilapidation, rewrap it or replace it.
(10) Turn off all the input power supply when the machine is not in usage.
(11) Make sure to use anti-electric shock appliances while operating the welding machine in confined spaces or higher position.

2.3 Wear safety protective appliances.

Make sure to wear protective appliances and clothing to prevent hurting eyes and burning skin.

2.4 Matters needing attention while changing the gas.

Make sure to obey regulations to install part exhaust or to use effective protective respirators to prevent harmful gas toxic or asphyxia (welding smoke and CO gas harm health).

2.5 Standardize operations to prevent injury by machines.

Keep fingers, hair and clothes from moving parts such as fan to avoid injury.

2.6 Welding smoke and gas.

Generally, welding smoke will not harm operators if the place is in good ventilation. If it happens in confined spaces or the welding consumable is pungent, additional ventilation measures are needed.

2.7 Prevent the harm from arc radiation, splash and welding slag.

(1) Electric arc radiates a great light which may hurt eyes or burn skin so do not look at the arc light directly without a mask.
(2) Wear those goggles with enough protection, arc light, splash and welding slag may hurt eyes.
(3) Wear protective appliances such as leathery welding gloves, garments with long sleeves, welding helmet, welding spats, apron and so on, to protect your body from hurt.

2.8 Prevent accidents from fire, explosion or break.

Welding sparks may result in a fire, so make sure no inflammable materials nearby. Heat radiated from welding places may lead to fire hazard as well, for example an inflammable filled oil drum may burst into flame because of the heat.

(1) Inflammable materials are not allowed in welding places, splash and hot welding seam may result in a fire.
(2) Welding cable should be well connected with workpiece, or over heat may result in a fire.
(3) It's forbidden to weld in flammable gases or weld on the container filled with inflammable materials, otherwise it may cause explosion.
(4) It's forbidden to weld in airtight container, otherwise it may cause breakage.
(5) Have a fire extinguisher nearby, and have a trained person to use it.

2.9 Avoid machine burning and fire accident.

(1) Avoid machine burning and fire accident caused by over-heating.Please keep the input power supply more than 20cm away from the wall, more than 50cm away from inflammable materials.

(2) Avoid machine burning and fire accident caused by welding sparks.Never make welding sparks splash on inflammable materials or enter the inside through gas inlet or opening.

2.10 Avoid machine impact and damage caused by drop.

(1) Use anchor bolt to fasten welding machine when it's installed on a scaffold, do remember to fasten the gas bottle as well if any.

(2) People are forbidden to stand under or movement ahead of the machine when it's lifted by truck or crane, to avoid hurting.

(3) Adequate pull of rope is required when hoisting. The angle of rope at the hook should not be more than 30°C.

3. Power appliance

MODEL		TIG-315AC/DC	TIG-400AC/DC	TIG-500AC/DC
Input power supply		Three Phase AC380V		
Rated input minimum power		14KVA	24KVA	27KVA
Input protection	Fuse	20A	30A	40A
	Breaker	40A	40A	60A
Cable	Input	4mm²	5.5mm²	6mm²
	Output	35mm²	38mm²	50mm²
	Grounding	4mm²	5.5mm²	6mm²

Note: the capacity of fuse and breaker in the table are for reference only.

4. Main technique data

Model	TIG-315AC/DC	TIG-400AC/DC	TIG-500AC/DC
Rated input voltage	Three Phase 380V±10%/50Hz		
Rated input capacity	13KVA	24KVA	25.7KVA
Rated input current	20A	36A	39A
Constant current	5-315A	10-400A	20-500A
Peak current	5-315A	10-400A	20-500A
Welding current for MMA	20-315A	10-400A	20-500A
Drive current for MMA	10-200A		
Base current	5-315A	10-400A	20-500A
Start arc current	20-160A		
Crater arc current	5-315A	10-400A	20-500A
Duty ratio	1-100%		
AC bias ratio	-50%~+30%		
Pulse frequency	0.2-20Hz		
AC frequency	20-200Hz	15-150Hz	20-100Hz
Pre-flow time	0.1-15s		
Gas delay time	0.1-15s		
Current slow up time	0.1-10s		
Current decay time	0.1-15s		
Cleaning ratio	-40%~+40%		
Rated duty cycle	60%		
No-load voltage	57V		
Efficiency	79%	78%	77%
Power factor	0.95		
Net weight	40Kg	40Kg	70Kg
Insulation of main transformer	H		
Insulation of output reactor	B		

Note: the rated AC is defined in the condition of 50Hz.

5. Operation and instruction

5.1 Introduction of main functions.

(1) Front Panel

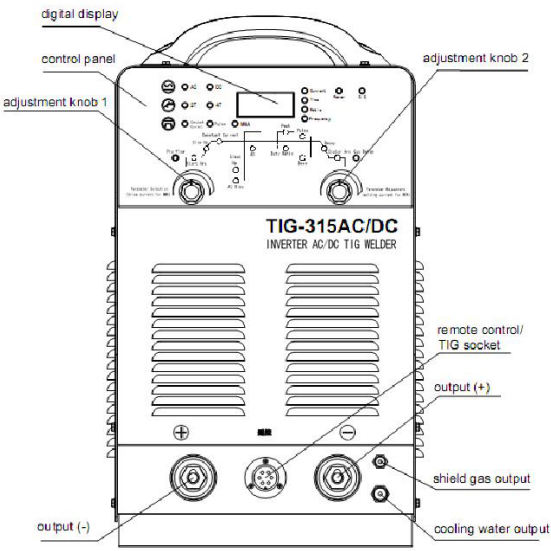


Table1: Front Panel

(2) Power adjustable foot pedal (customize)

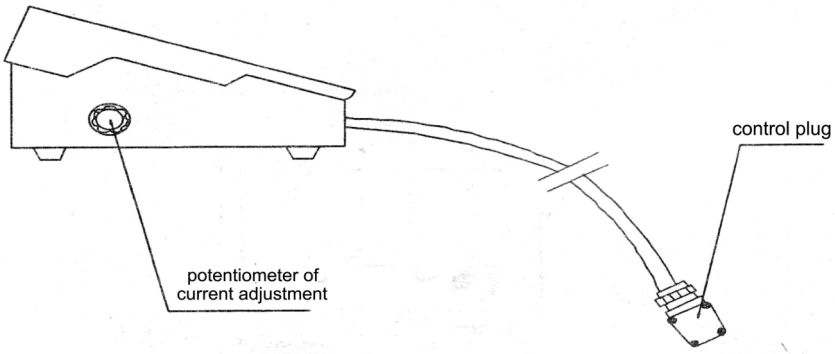


Table 2:Power Adjustable Pedal Switch

The foot pedal is used for striking arc control and current adjustment. After the control plug of foot pedal is put into socket on panel, the welding current begins to be controlled by foot pedal automatically. Step down the foot pedal, the welding machine starts working, the current varies directly with the degree of stepping down the foot pedal. The upper limit of current is controlled by the potentiometer of curent adjustment.

(3) Back Panel

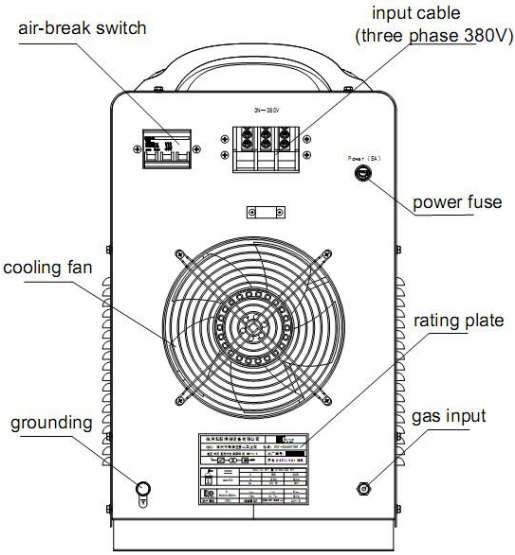


Table3: Back Panel

(4) Control Panel

As shown in table 4, control panel is used for selecting functions and setting data of welding machine. Control panel including digital display、adjusting knobs、selection keys and LED indicator lights.

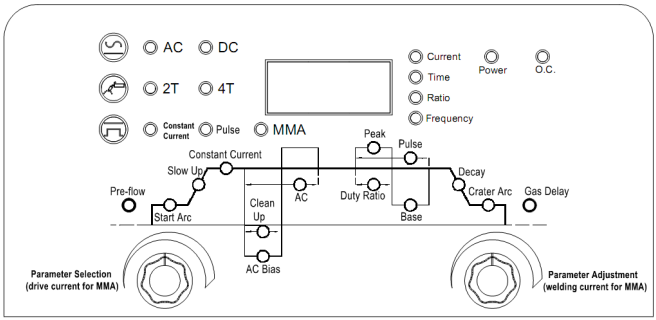
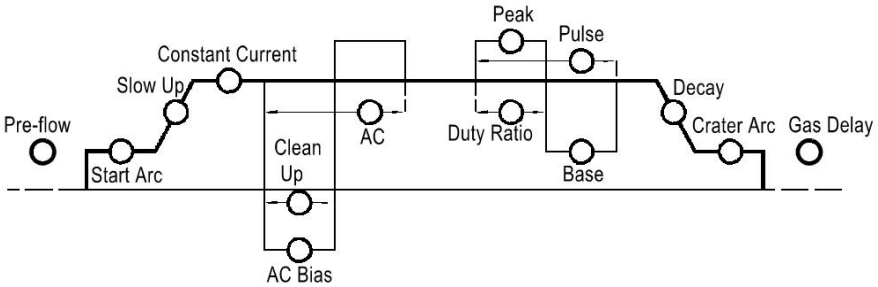


Table3: Control Panel

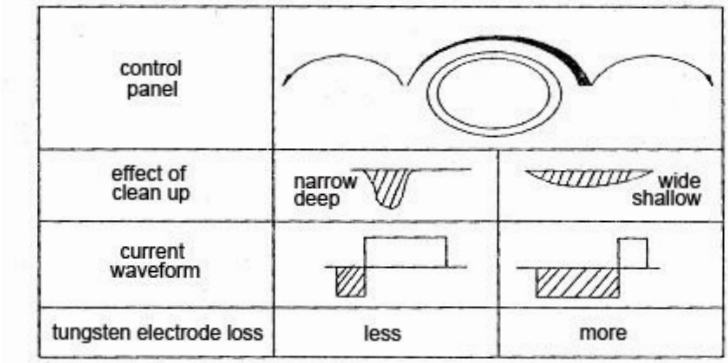
1) Functions selection and data setting.

First line: ○ AC ○ DC
Working mode conversion between AC TIG welding and DC TIG welding.
Second line: ○ 2T ○ 4T
Operation mode conversion between 2T and 4T.
Under 2T operation, the machine starts working after pressing the switch of torch, the machine stops welding when releasing the switch.
Under 4T operation, press the switch for the first time, it gives machine start-arc current, release the switch, current begins climbing to the normal welding current. Press the switch again after the welding is finished, the welding current begins dropping to crater arc current and stay, release the switch, machine stops working.
Third line: ▯ Constant Current ▯ Pulse ▯ MMA
Function conversion among constant current TIG welding、pulse TIG welding and MMA welding.

Fourth Line:



Interpretation:
① Pre-flow: pre-flow time.
② Start Arc: start-arc current.
③ Slow Up: climbing time of welding current.
④ Constant Current: welding current under the mode of constant current output.
⑤ Clean Up: time ratio of output clean current
Under AC TIG welding, user can achieve the most satisfactory effect by choosing clean up width and penetration.



⑥ AC Bias: ratio of clean current and welding current.
Adjust this parameter, reasonable cleaning effect can be achieved for the change of clean current.
⑦ AC: the working frequency of AC output.
⑧ Peak: peak current of pulse output.
⑨ Duty Ratio: time ratio of peak current in pulse output. All position welding and thin plate welding can be achieved by controlling the welding penetration.
⑩ Pulse: the working frequency of pulse output.
⑪ Base: pilot arc current of pulse output.
⑫ Decay: dropping time of welding current.
⑬ Crater Arc: the current value before arc blowout.
⑭ Gas Delay: the time of keeping offering gas after welding is finished.

Parameter selection (drive current for MMA): select the parameters mentioned above. Clockwise rotation is selecting to right, counterclock rotation is selecting to left; under MMA welding, to adjust the drive current.
Parameter adjustment (welding current for MMA): adjust the parameters. Clockwise rotation to increase, counterclock rotation to decease. Press this knob and rotate right or left to realize quick adjustment; under MMA welding, to adjust the welding current.
When the machine is shut off, it can store data automatically, so user could use it directly without setting next time.

2) Protection LED – O.C.

This yellow LED does not light when the machine work normally. When it in over-heat protection、over-current protection、over-voltage protection, the LED will light up and machine will stop working. The explanations are as below:

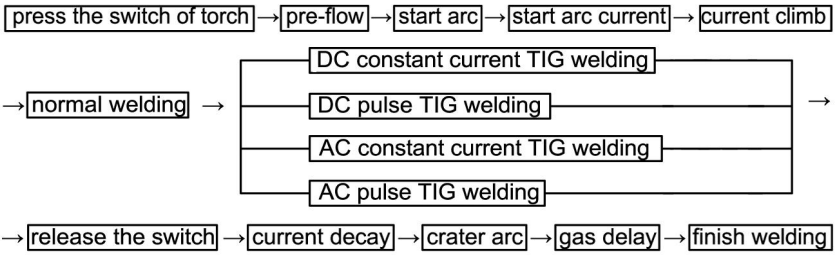
① display 801: over-voltage protection, contact the supplier or OUR's service center to seek professional help.
② display 802 or 803: over-current protection, contact the supplier or OUR's service center to seek professional help.
③ display 804: over-heat protection, stop working, wait for the temperature inside the machine goes down.
④ display 805: user may press the switch of torch for a long time when there is no output current, or the switch is broken. Examine the torch or foot pedal.
⑤ display 806: low water level protection. If user choose to use air-cooled torch, keep pressing the knobs of "parameter selection" and "parameter adjustment" simultaneously for about 3 seconds, low water level protection will be cancelled; on the contrary, if user choose water-cooled, keep pressing the two knobs simultaneously to setup low water level protection.

3) Power LED

This red LED will light up when the power is on.

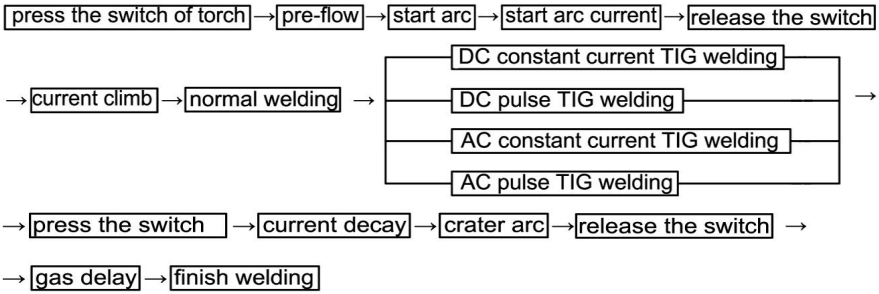
5.2 Working procedures.

(1) 2T welding operation:



Thickness (mm)	Diameter of tungsten electrode (mm)	Welding current (A)	Diameter of welding wire (mm)	Flow rate of argon gas (L/min)	Argon layer (front & back)	Preheat temperature (℃)	Remark
1	2	40-60	1.6	7-9	Front 1		flangede edge welding
1.5		50-80	1.6-2.0				flangede edge welding or single welded butt welding
2	2-3	90-120	2-2.5	8-12			Butt welding
3	3	150-180	2-3				V groove butt welding
4	4	180-200	3	10-15	1-2/1		
5		180-240	3-4				
6	5-6	240-280	4	14-16	1-2/1		
8		260-320	4-5		2/1	100	
10		280-340			3-4/1-2	100-150	
12	5-6	300-360		16-20		150-200	
14		340-380	5-6			180-200	
16	6				4-5/1-2	200-220	
18		360-400				200-240	
20				20-22		200-260	
16-20		340-380		16-22	2-3/2-3		
22-25	6-7	360-400		20-22	3-4/3-4		

(2) 4T welding operation:



aluminium & aluminium-magnesium alloy - -

MMA/TIG welding parameter (for reference only)

MMA welding specification (for reference)

Thickness (mm)	<1	2	3	4-5	6-12	⩾13
Diameter of welding electrode (mm)	1.5	2	3.2	3.2-4	4-5	5-6
Welding current (A)	20-40	40-50	90-110	90-130	160-250	250-400

6. Installation and operation

6.1 Installation environment

(1) Put the machine indoors with low humidity and less dust, shelter it from the direct sunlight and rain, environment temperature is in the range of -10℃~40℃.
(2) The inclination of the ground is no more than 15 ℃.
(3) Welding location should be sheltered from the wind.
(4) Welding machine should be placed more than 20cm away from walls, more than 10cm away from other welding machines.
(5) If water cooled torch is used, protect it from the cold.

6.2 Voltage of power supply

(1) Waveform should be standard sine wave, effective value is 380V±10%, frequency is 50Hz/60Hz.
(2) Unbalance level of three phase voltage is ≤5%.

6.3 Installation of machine

The power supply of machine should be AC three phase 380V/50Hz, users should have distribution cabinet with air-break switch in it, and make it well grounded.

(1) Connect the grounding cable.
(2) output + : (DC TIG) connect with work clamp
(DC MMA) connect with the electrode holder

(3) output ~ : (AC TIG) connect with work clamp
(this socket is for TIG-500AC/DC & TIG-630AC/DC; as for TIG-315AC/DC, connect work clamp with “output +” in AC TIG welding function)
(4) output - : (TIG) connect with TIG torch
(MMA) connect with work clamp
(5) Use a rubber hose to connect the outlet of gas regulator with gas inlet of welding machine.
(6) Connect the gas inlet of TIG torch with gas outlet of welding machine.
(7) Insert the control plug of TIG torch or foot pedal into the socket on the front panel of welding machine.
(8) If water cooled system is used, connect the water tank with water inlet of welding machine, connect water inlet of TIG torch with water outlet of welding machine.
(9) Turn on the air-break switch of the welding machine.
(10) Connect the input three phase cable with the power source, turn on the power.

7. Principle introduction

Principle block diagram as shown in table 5:

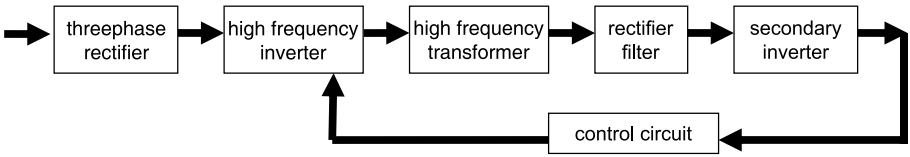


Table5:principleblockdiagram

The machine adopts IGBT high frequency inverter technology.
power frequency three phase 380V input → rectifying → transported to the inverter which is composed by IGBT and other components → being inverted into high frequency AC current → voltage of high frequency AC current been reduced by high frequency transformer → high frequency rectifier filter → (TIG-500AC/DC & TIG-630AC/DC) DC current output that is suitable for welding → (TIG-315AC/DC) adjustable low frequency AC square wave current inverted by secondary inverter
By experiencing this process, the dynamic response of the welding machine is improved, the size and weight of transformer & reactor are reduced, the overall efficiency is highly improved.
The design of control circuit enable the good welding technological properties of the welding machine regardless of circumstances (such as voltage fluctuates、length of output cable varies). Arc start is very easy, welding arc is stable, weld shape is good, welding current could be adjusted continuously.

The output characteristics of welding machine as shown in table 6:

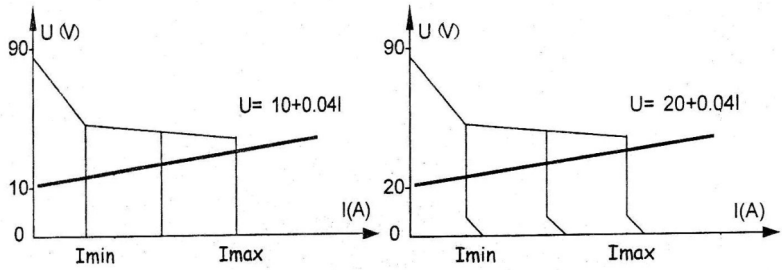


Table 6: output characteristics

8. Maintenance

Repair must be performed by a qualified repair person. If you encounter any difficulties that can't solve by yourself, please contact your suppliers or OUR's service center to seek help.
Attention: the highest voltage inside the machine is about 600V, so it's forbidden to open the casing for safety. Protective measures must be done to prevent electric shock in repairing.

8.1 Normalities that are easy to be misunderstood

The following phenomena are normal when the welding machine is working:

(1) The machine will stop working when the input voltage is too low.
(2) In high temperature environment, the machine is working for a long time or working with high current for a relatively long time, the thermal relay inside will make the machine stop working automatically, protection LED will light up and it's shown "804" on digital display. In this condition, leave the machine in "no-load" situation for a few minutes, it will recover soon.
(3) In high temperature environment, the machine is working with load for a long time, the air-break switch on the back panel may turn off automatically, input power is cut off. In this condition, the switch on distribution cabinet should be turned off, turn on the machine about 5 minutes later. When recover the power, turn on the air-break switch on the machine firstly, and then the power switch on distribution cabinet to control on/off of machine. After turning on the machine, make it "no-load" working for a while and then use it normally.

8.2 Points for attention

(1) The voltage of three phase power should be in the range of 340V~420V, lack of phase is not allowed.
(2) The grounding of machine should be correct and reliable.
(3) Check periodically whether inner circuit connection is in good condition. Tighten the loose connections or it will be easily damaged and lead to unstable welding.

(1) (4) When the capacity of welding cable is big, do not wind them together.
(5) The power must be cut off when the welding is finished
(2) (6) Use the machine outdoors, should shelter it from rain and snow, but should not

8.3 Problems and solutions of the welding machine

8.3.1 Before a overhaul check as follows:

(1) Is the voltage of three phase power in the range of 340V~420V? Does the power lack of phase?
(2) Is the grounding of input cable correct and reliable?
(3) Is the protective grounding of machine correct and reliable?
(4) Is the connection of welding cable correct? Do they connect well?

8.3.2 Common problems and solutions as Appendix A shown.

8.4 Periodical check and maintenance

(1) Clear the dust of welding machine with dry and clean compressed air by qualified repair person every year. Check whether inner circuit connections are in good condition (esp. plugs), tighten the loose connections. Check the connection condition of cable joints and other joints at least once a month.
(2) Check whether the adjustment knobs are loose.

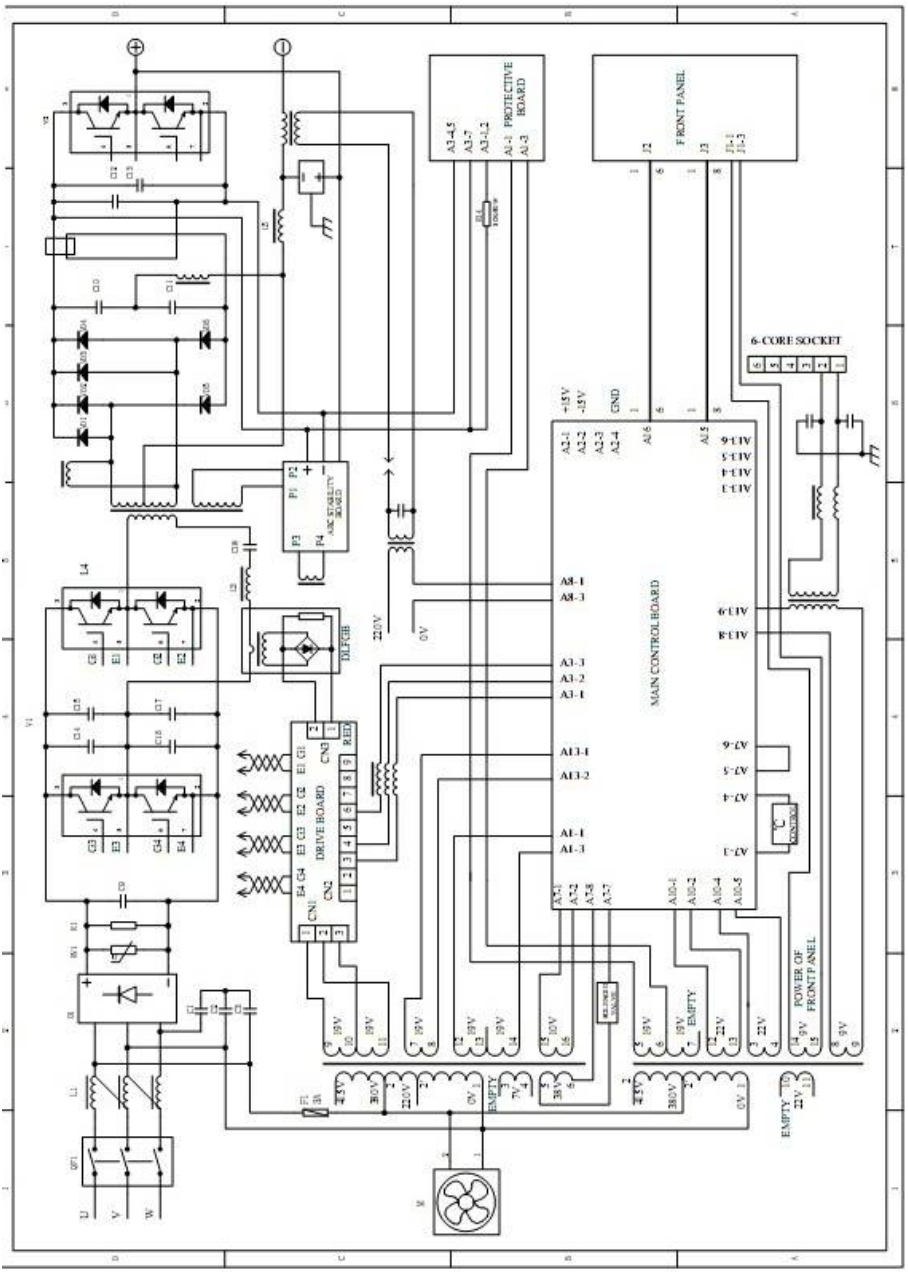
8.5 Common problems and solutions

Appendix A:

NO	Problems	Reasons	Solutions
1	Turn on the machine, the power LED is off, the machine doesn't work.	① The power lacks of phase. ② Inside protective tube 2A is broken. ③ There is wire broken.	① Check components and circuit. ② Check whether fan,power transformer,main control board are alright. ③ Check wires.
2	The air-break switch on the back panel is turned off automatically when the machine isn't working with load for a long time.	The following components may be damaged: IGBT module, three phase rectifier module, output diode module, and so on	① Check and change for new one. ② When IGBT is damaged, check the 12Ω,5.1Ω resistors on drive board, SR160
3	Welding current is not stable.	① Lack of phase. ② Main control board is damaged.	① Check the power supply. ② Check and change for new main control board.
4	Welding current could not be adjusted.	① There is wire broken. ② Main control board is damaged. ③ Foot pedal is damaged.	Check and change for new one

5	Protection LED lights up, it shown "801""(over-voltage protection).	① Secondary IGBT is damaged. ② Main control board is damaged.	Change for new secondary IGBT and main control board.
6	Protection LED lights up, it shown "802"or "803" (over-current protection).	① Secondary IGBT is damaged. ② Main control board is damaged.	Change for new secondary IGBT and main control board.
7	Protection LED lights up, it shown "804" (over-heat protection).	① Working current is too high. ② Environment temperature is too high. ③ Temperature relay is damaged.	① Working with no-load, waiting for the temperature goes down. ② Change for new temperature relay.
8	Protection LED lights up, it shown "805" (switch of TIG torch is abnormal).	① Press the switch of torch for a long time in the condition of no output current. ② The switch of torch (foot pedal) is damaged.	① Release the switch. ② Check the torch (foot pedal) or change for new one.
9	Protection LED lights up, it shown "806" (water flow is abnormal).	Check water flow is free or not, for example water tank, switch, TIG torch and so on.	Repair water tank, switch and TIG torch.

9. Schematic diagram of main loop



10. Schematic diagram of main loop

NO.	Mark	Name	Model	Qty.
1	Qf1	air-break switch	DZ47-63D(40A/3P)	1
2	D1	three phase rectifier module	MDS75A/1600	1
3	D1,D2,D3,D4	fast recovery diode module	DBC2F200N6S	2
4	D5,D6	fast recovery diode module	DBC2F200P6S	1
5	L1	input common mode inductor	WSE-315	1
6	L3	resonance inductor	WSE-315	1
7	L5	output reactor	WSE-315	1
8	C1-C3	terylene capacitor	CL-630V-0.1UF	3
9	C4	fan-start capacitor	1UF/630V	1
10	C6	polypropylene capacitor	20UF/1400VDC	1
11	C14-C17	leaded ceramic disc capacitor	203/200V	4
12	C9-C9	CBB16 capacitor	10UF/1400VDC	2
13	C12	polypropylene capacitor	2UF/500V	1
14	C14,C15	leaded ceramic disc capacitor	2KV/222	4
15	C20-C23	leaded ceramic disc capacitor	0.01UF/3KV	4
16	RV1	Piezoresistor	MYG/20K/821	1
17	R1	metal film resistor	200K/3W	2
18	R14	wire-wound resistor	50W/30□	8
19	V1	IGBT module	F4-50R12MS4	1
20	V2	IGBT module	BSM100GB120DN2B	1
21	T1	main transformer	WSE-315	1
22	T2	step-up transformer	WSE-315	1
23	T3	power transformer	WSE-315	1
24	T4	square wave power transformer	WSE-315	1
25	T6	isolation transformer	5V in, 5V out	1
26	F1	protective tube	3A(6×30)	1
27	M1	axial flow fan	200FXY7-D/380V	1
28	SM	temperature relay	KSD-302/80 degree	1
29	LM	current sensor	CHF-300E	1
30	J4	socket	panasonic 6-core	1
31		display board	WSE-315	1
32		main control board	20090102	1
33		drive board	20090101	1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