KeyGree

USER'S MANUAL

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

Do it easy, comfortable, trustable.

TIG 315P/400P/500P

PLASMA CUTTER

Contents

1. Uses And Features

TIG-P inverter pulse TIG/MMA welding machine, combines many functions in one –DC Constant Current TIG Welding, DC Pulse TIG welding & DC Stick Welding. The machine is suitable for many different material's welding, such as carbon steel, copper, titanium, stainless steel 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
- pulse current, pulse frequency, pulse width can be adjusted at will.
- 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 work piece 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. Installation And Operation

3.1 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°C~40°C.
(2) The inclination of the ground is no more than 15 °C.
(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 freeze.

3.1 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%.

3.1 Voltage of power supply

Model		TIG-315P	TIG-400P	TIG-500P
Input Power Supply		three phase AC380V±10%		
Rated Input Minimum Power		14.5KVA	17.8KVA	25KVA
Input	Fuse	40A	40A	40A
Protection	Air Circuit Breaker	63A	63A	60A
Cable	Input	4mm2	4mm2	6mm2
	Output	35mm2	50mm2	50mm2
	Earth Lead	4mm2	4mm2	6mm2

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

4. Main technique data

Machine input power is 3phase 380V 50Hz AC power., User should have a switchboard or distribution panel, circuit breaker or switch, well connecting on earth cable

a) DC Sticking Using:

i. well connecting welding cable
ii. switch on circuit breaker of power source
iii. connect 3phase cable into distribution panel or switch board, switch on

b) TIG Using:

i. connect welding cable into positive point , TIG torch into negative point
ii. well connect gas pipe and gas supply device; well connect water pipe and water supply device, if using water cooled torch
iii. switch on circuit breaker
iv. connect 3phase cable into distribution panel or switch board, switch on

5. Principle introduction

Principle block diagram as shown in table 2:

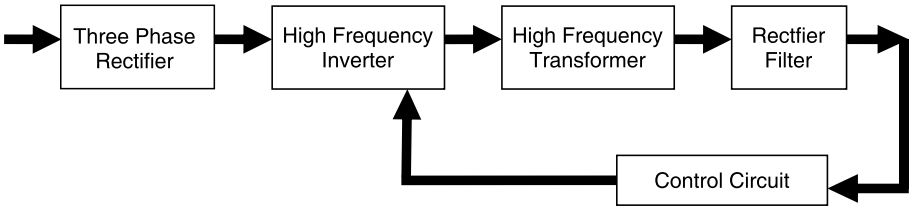
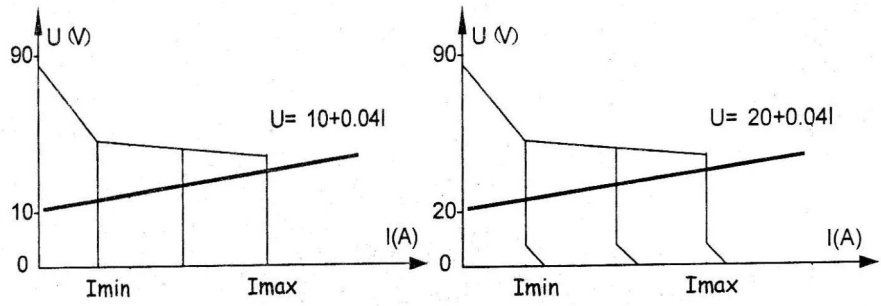


Table 2: Principle Block Diagram

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

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 3:



（Table 3a): TIG welding output characteristics (Table 3b): MMA welding output characteristics

6. Operation and instruction

3.1 Introduction of main functions

5.1.1 Front panel

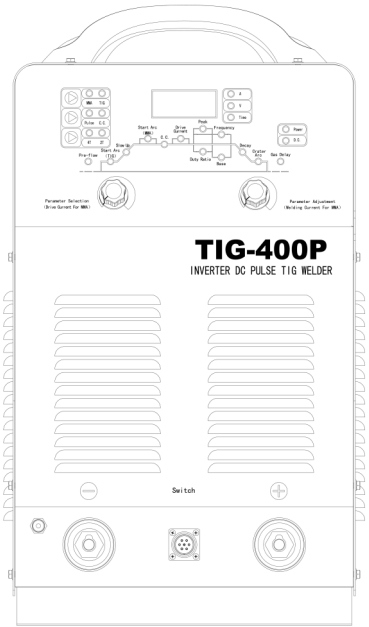


Table 4: front panel

5.1.2 Power adjustable foot pedal (customize)

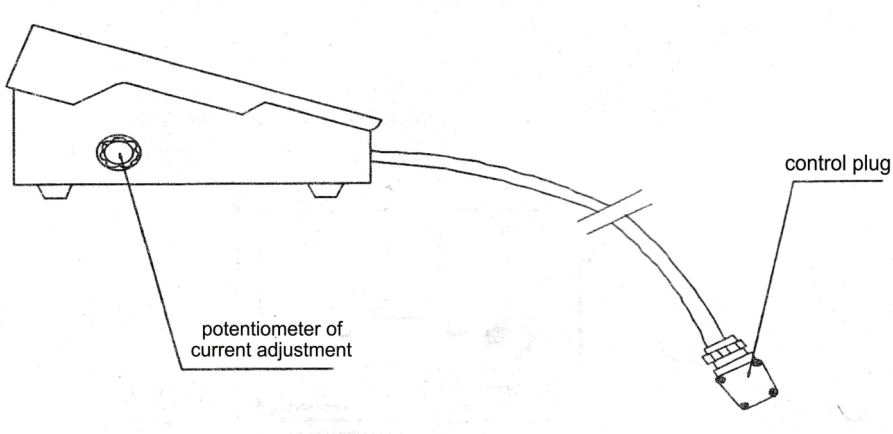


Table 5: power adjustable pedal switch

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.

5.1.3 Back panel

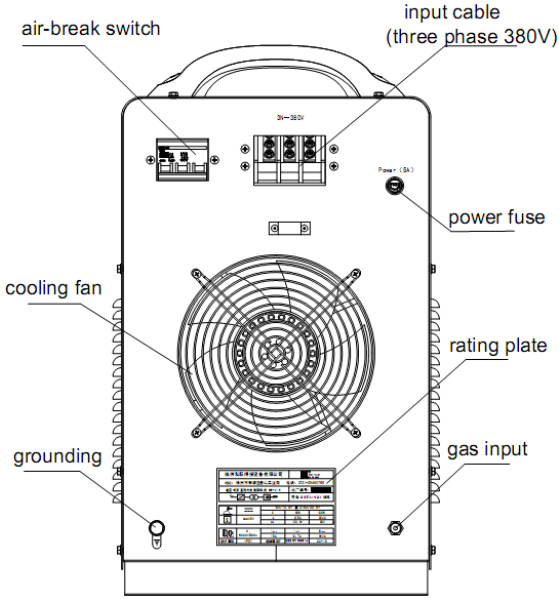


Table 6: Back panel

5.1.4 Control pane

As shown in table 7, 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.

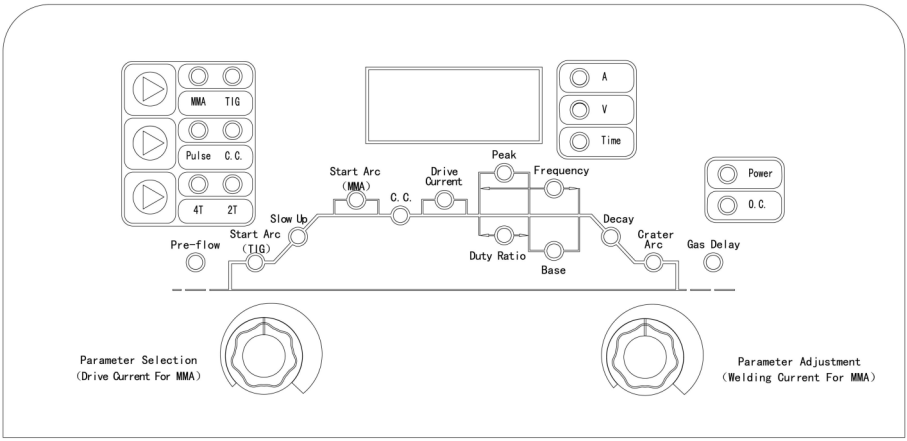


Table 7: Control pane

1）Functions selection and data setting

First line: ○ MMA ○ TIG

Working mode conversion between MMA welding and TIG welding.

Second line: ○ Pulse ○ Constant Current

Under TIG operation: operation mode conversion between DC constant current TIG and DC pulse TIG.

Under MMA operation: operation mode conversion between current display and voltage display.

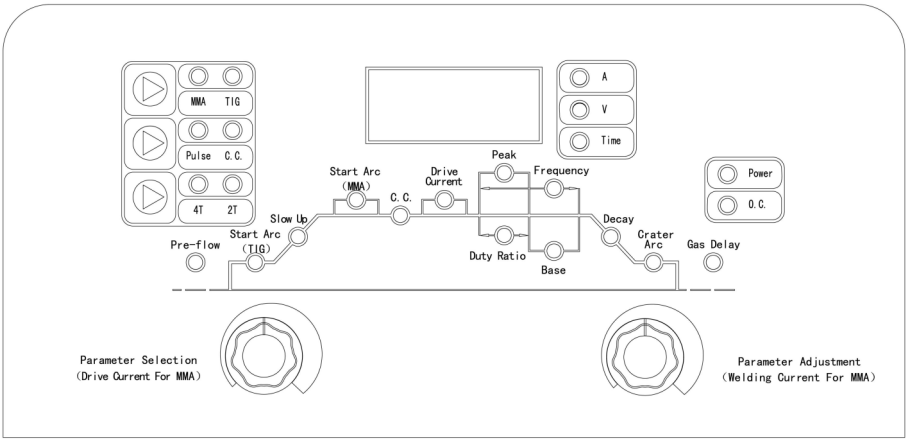
Third line: ○ 2T ○ 4T

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.

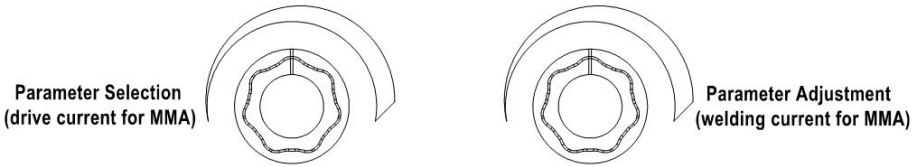
Under 4T operation, press the switch for the first time, it gives machine start-arc current, release the switch, current begins climbing to the normal welding current. Press the switch again after the welding is finished, the welding current begins dropping to crater arc current and stay, release the switch, machine stops working.

Fourth line:



Interpretation:

(1) Pre-flow: pre-flow time.
(2) Start Arc: start-arc current.
(3) Slow Up: climbing time of welding current.
(4) Arc strike: start-arc current of MMA operation mode
(5) Constant Current: welding current under the mode of constant current output.
(6) Force: force current of MMA operation mode.
(7) Peak: peak current of pulse output.
(8) 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.
(9) Pulse Frequency: the working frequency of pulse output.
(10) Base: pilot arc current of pulse output.
(11) Decay: dropping time of welding current.
(12) Crater Arc: the current value before arc blowout.
(13) 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.

Air cooled and Gas cooled section: the default way is the Water cooled section. If user want to change into Air cooled, please push Preference. 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,ow water level protection, the LED will light up and machine will stop working. The explanations are as below:

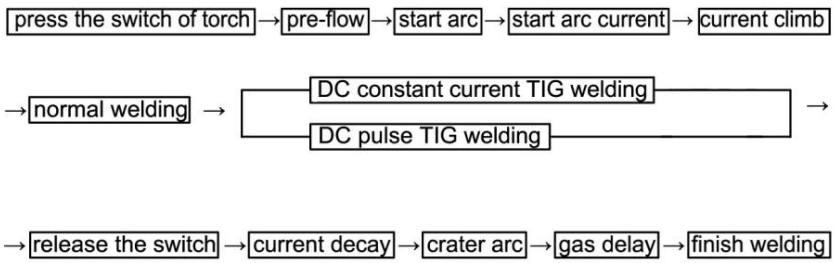
(1) display 804: over-heat protection, stop working, wait for the temperature inside the machine goes down.
(2) display 805: user may press the switch of torch for a long time when there is no output current, or the switch is broken. Examine the torch or foot pedal.
(3) display 806: low water level protection. 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

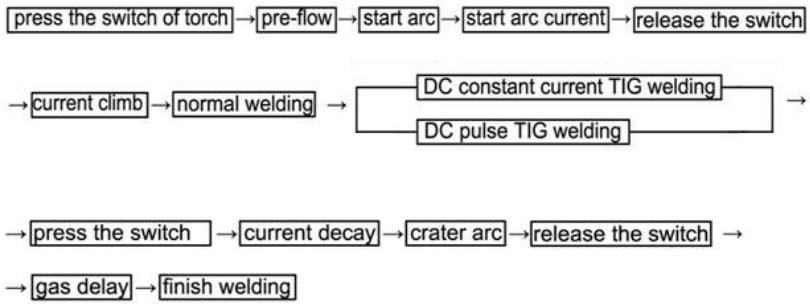
This red LED will light up when the power is on.

5.2 Working procedures.

5.2.1 2T welding operation



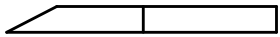
5.2.1 4T welding operation



TIG welding parameter (for reference only)

Thickness (mm)	Diameter of tungsten electrode (mm)	Diameter of welding wire (mm)	Welding current (A)	Flow rate of argon gas (L/min)	Distant of Argon layer (mm)	Argon layer (front & back)
0.4	1.0-1.6	0-1.0	5-30	4-5	1	①,②
1.0	1.0-1.6	0-1.6	10-30	5-7	1	①,②
1.5	1.0-1.6	0-1.6	50-70	6-9	1	②
2.5	1.6-2.4	1.6-2.4	70-90	6-9	1	②
3.0	1.6-2.4	1.6-2.4	90-120	7-10	1-2	②,③
4.0	2.4	1.6-2.4	120-150	10-15	2-3	④,③
5.0	2.4-3.2	2.4-3.2	120-180	10-15	2-3	④,③
6.0	2.4-3.2	2.4-3.2	150-200	10-15	3-4	④,③
8.0	3.2-4.0	3.2-4.0	160-220	12-18	4-5	④
12.0	3.2-4.0	3.2-4.0	180-300	12-18	6-8	④

①



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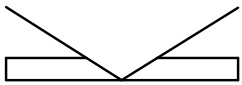
③



④

MMA welding specification (for reference)

Thickness (mm)	≤1	1-2	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	90-120	90-130	160-250	250-400

6. 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 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.

6.1 Installation environment

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.

6.2 Installation environment

(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.

(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.

(6) Use the machine outdoors, should shelter it from rain and snow, but should not hinder the ventilation.

6.3 Problems and solutions of the welding machine

6.3.1 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?

6.3.2 Common problems and solutions as Appendix A shown

6.4 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.

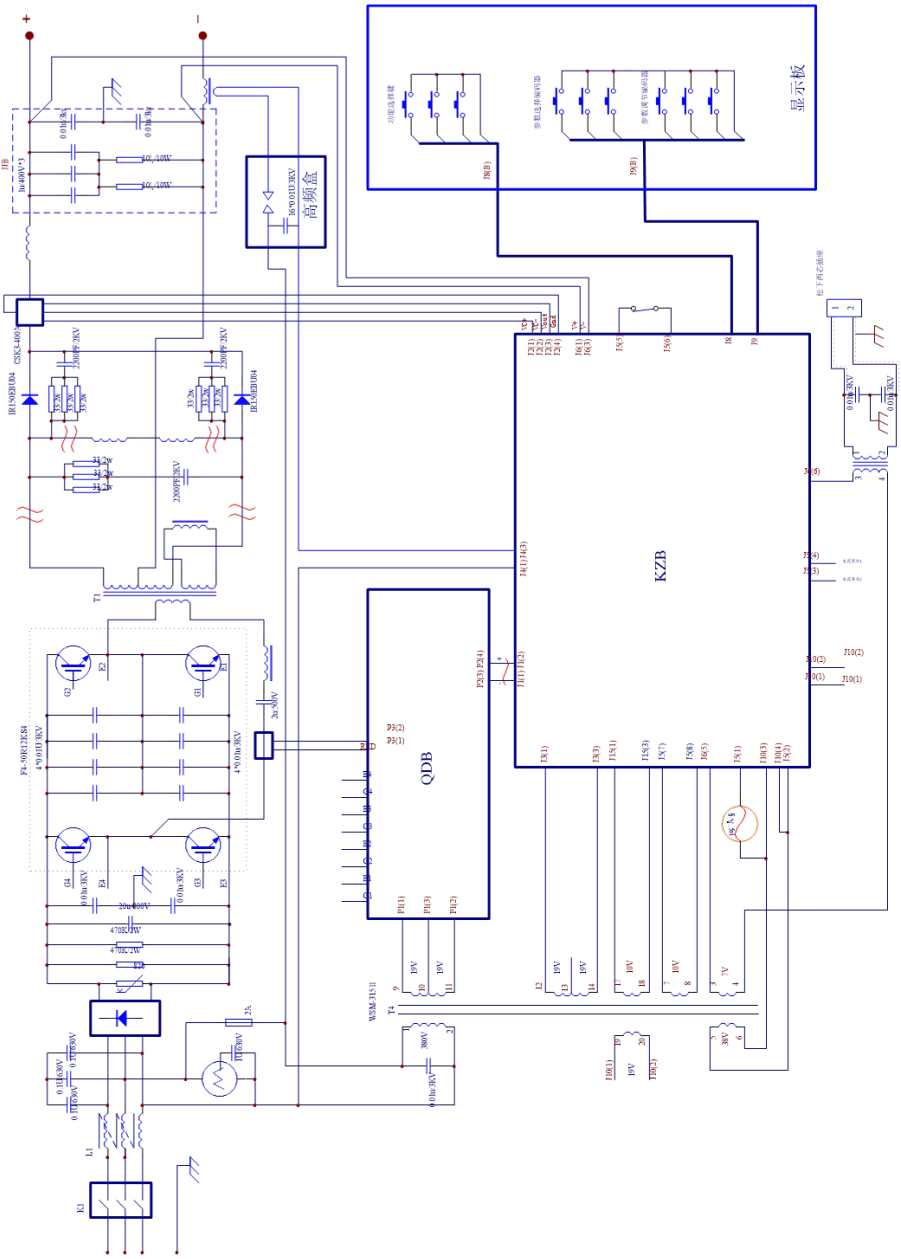
Power source list and accessories list

NO	Name/model	Qt.y	Remarks
01	TIG-P welding machine	1set	
02	TIG torch	1pc	
03	Welding cable	1pc	
04	Electrode hoder cable	1pc	
05	User's manual	1pc	

Specification:

MODEL	TIG-315P	TIG-400P	TIG-500P
Rated input voltage	three phase 380V±10%/50Hz		
Rated input capacity	13.7KVA	13.9KVA	20KVA
Rated input current	15A	21A	30A
Rated duty cycle	60%	60%	60%
Pre-flow time	0.1-15s		
Crater arc current	10-160A		
Current slow up time	0.1-10s		
Current decay time	20-160A		
Constant current	5-315A	5-400A	5-500A
Drive current for MMA	10-200A		
Peak current	5-315A	5-400A	5-500A
Duty ratio	1%-100%		
Pulse frequency	0.2-50Hz		
Base current	5-315A	5-400A	5-500A
Current decay time	0.1-15s		
Crater arc current	5-315A	5-400A	5-500A
Gas delay time	0.1-15s		
Efficiency	89%		
Power factor	0.95		
Net weight	26.5Kg	28.5Kg	43Kg
Insulation of main transformer	H		
Insulation of output reactor	B		

7. Schematic diagram of main loop



8. Main components list

TIG-315P:

NO	Mark	Name	Model	Qty.
1	K1	air-break switch	DZ47-63D (40A/3P)	1
2	D1	three phase rectifier module	MDS60A/1200v	1
3	C1-C3	terylene capacitor	CL-630V-0.1UF	3
4	R1	varistor	MY31-820V-3KA±10%	1
5	R2-R3	metal-film resistor	RJ-2W-470kΩ±5%	2
6	N1-N4	IGBT module	F4-50R12KS4	1
7	C4	fan-start capacitor	1uF/630V AC capacitor	1
8	D2-D3	fast recovery diode module	IR150EBU04	1
9	C5	polypropylene capacitor	MFD-DA01 800VDC 20uF±5%	1
10	C6-C15	Ceramic capacitor	CT81-4F-0.01μF/3KV	10
11	T1	main transformer	WSM-315.3.1.0	1
12	T2	step-up transformer	ZX7-400Ⅲ.1.2.0	1
13	T4	power transformer	WSM-315.3.2-1	1
14	T5	isolation transformer	ZX7-400Ⅲ.4-3	1
15	F1	protective tube	2A (6×30)	1
16	M	axial flow fan	200FZY7-D (380V 1phase)	1
17	SW	temperature relay	JUC-6F 70℃	1
18		High-frequency case	WSM-315.4.2.0	1
19		display board	WSM-315.1.1.1.0	1
20		main control board	WSM-315.6.0	1
21		drive board	WSME-315.7.0	1

TIG-400P:

NO	Mark	Name	Model	Qty.
1	K1	air-break switch	DZ47-63D (40A/3P)	1
2	D1	three phase rectifier module	MDS100A/1200v	1
3	C1-C3	terylene capacitor	CL-630V-0.1UF	3
4	R1	varistor	MY31-820V-3KA±10%	1
5	R2-R3	metal-film resistor	RJ-2W-470kΩ±5%	2
6	N1-N4	IGBT module	F4-50R12KS4	1
7	C4	fan-start capacitor	1uF/630V AC capacitor	1
8	D2-D3	fast recovery diode module	MURP20040CT	1
9	C5	polypropylene capacitor	MFD-DA01 800VDC 20uF±5%	1
10	C6-C15	Ceramic capacitor	CT81-4F-0.01μF/3KV	10
11	T1	main transformer	WSM-315.3.1.0	1
12	T2	step-up transformer	ZX7-400Ⅲ.1.2.0	1
13	T4	power transformer	WSM-315.3.2-1	1
14	T5	isolation transformer	ZX7-400Ⅲ.4-3	1
15	F1	protective tube	2A (6×30)	1
16	M	axial flow fan	200FZY7-D (380V 1phase)	1
17	SW	temperature relay	JUC-6F 70℃	1
18		High-frequency case	WSM-400.4.1.0	1
19		display board	WSM-315.1.1.1.0	1
20		main control board	WSM-400.6.0	1
21		drive board	WSME-315.7.0	1

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.


KeyGree