

THANKS FOR PURCASHING OUR PRODUCT

WT – 315 DI

AC / DC PULSE TIG WELDING MACHINE



WEIRO

OPERATION MANUAL

(Read the manual carefully before installation, operation and maintenace)

Safety Depends on You

WEIRO are welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation... and thoughtful operation in your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

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WT-DI Series Block Diagram Of Principle:

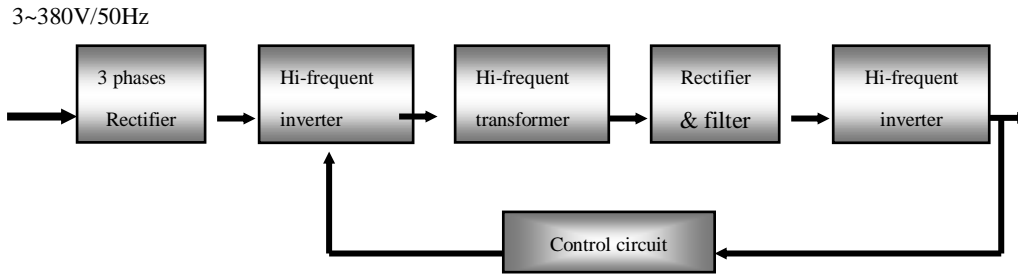


Figure 1: Block diagram of principle

This series welding machines apply IGBT HF inverter technology. Inputted line frequency 3-phase 380V are rectified by rectifier, inverted into HF AC, reduced by HF transformer, rectified and filtered by HF rectifier, then output DC volt or 50Hz AC square wave volt suitable for welding by second invert. After this process, the welder's dynamical responsive speed has been great increasing, the size and weight of welder's transformer and reactor are reduced noticeable. Power source enjoy sound anti-fluctuating ability due to excellent circuit loop control.

Power source can reach their potential as well as easy arc-start, stable arc, pretty weld formation and continuous regulation of welding current during external context changes (As to fluctuation in input power supply and extended welding cables) due to reasonable control circuit design.

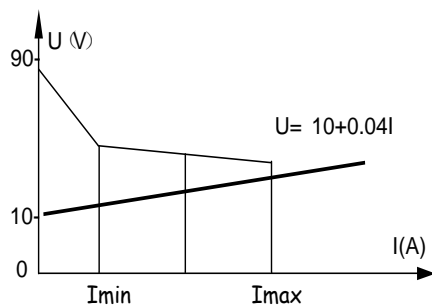


Figure 2: TIG mode Volt-Ampere curve

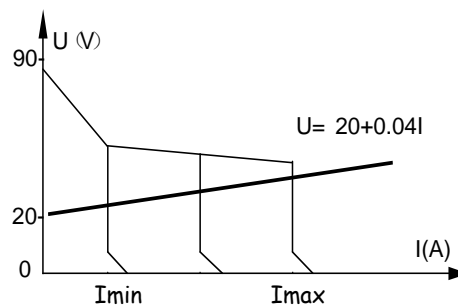


Figure 3: SMAW mode Volt-Ampere curve

1. Main technical parameters

Item	WT315DI	WT500DI	WT630DI
Rated input volt	3 phase 380V/50Hz		
Rated input capacity	9.3KVA	18.2KVA	30KVA
Rated input current	14.4A	29.7A	55A
Constant current	5-315A	20-500A	20-630A
Peak current	5-315A	20-500A	20-630A
Welding current for SMAW	20-315A	20-500A	20-630A
Arc force current for SMAW	10-200A		
Base current	5-315A	20-500A	20-630A
Arc-start current	20-160A		
Crater fill current	5-315A	20-500A	20-630A
Pulse ratio	1-100%		
AC bias	-50%~+30%		
Pulse frequency	0.2-50Hz		
Pre-gas flow	0.1-15s		
Post-gas flow	0.1-15s		
Up-slope	0.2-10s		
Down -slope	0.1-15s		
Oxide clean ratio	-40%~+40%		
Rated duty cycle	60%	60%	35%
Voltage in open load	64V	76V	76V
Efficiency	79%	77%	
Power factor	0.95		
Insulation degree of main transformer	H		
Insulation degree of output reactor	B		
Weight	40Kg	70Kg	80 Kg

Table 1: Parameter Specification

2. Main circuit diagram

1) WT315DI

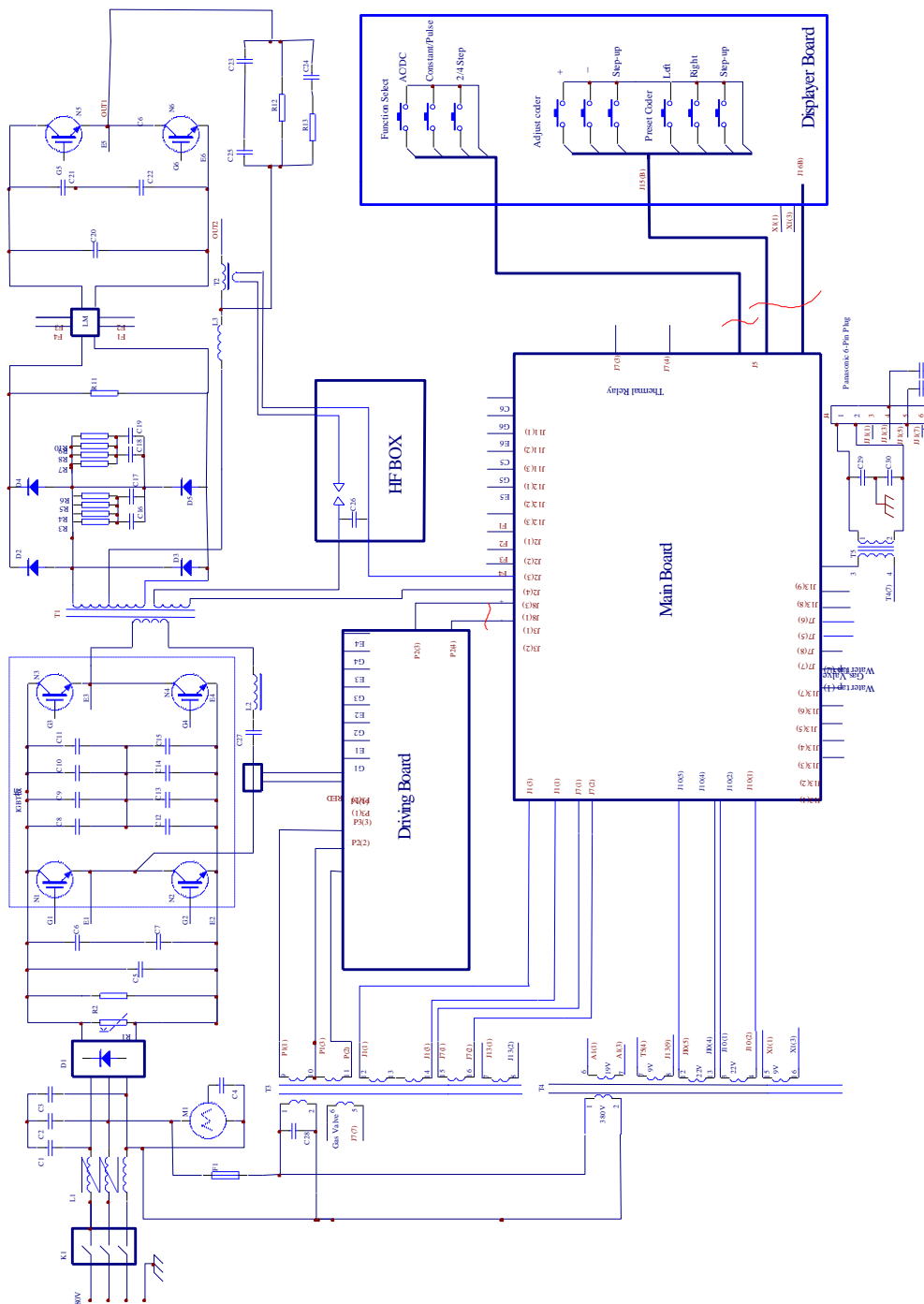


Figure 4: Main Circuit Diagram for WT315DI

WT-DI series inverter multifunctional welding machines can be divided into three types (315DI, 500DI and 630DI). They can perform DC constant current TIG welding, DC pulse TIG welding, square wave AC constant current TIG welding, square wave AC pulse TIG welding, which are used for carbon steel, copper, titanium, aluminum as well as aluminum-magnesium alloy welding. Because of reasonable static and sound dynamic characteristic the welders enjoy, they have comprehensive operational functions.

Features and benefits:

- ◆ Feature for AC/DC TIG welding, good looking weld, deep melting and low electrode consumption.
- ◆ Self-diagnostic function with error code display.
- ◆ HF soft switch transform, high efficiency, small size, light weight.
- ◆ Multi-function, convenience, good adjustability.
- ◆ Knob-control preset of all parameters and welding state, simple and convenient.
- ◆ Excellent weld seam quality can be achieved due to its effect on all important areas of the weld.
- ◆ Non-source power factor compensation technology, high PF (power factor).
- ◆ Easy to arc-starting, stable arc, high performance.
- ◆ A type enjoys the synchronous mutual arc function.
- ◆ Adjustable argon stopping time of lag, current descending time and the current of stopping arc improve the TIG welding performance.

Applications:

- ◆ Suitable for mild steel, Copper, Titanium, Aluminum and Al-Mg alloy welding.
- ◆ Electric power, petrochemical Construction.
- ◆ Boiler pressure container manufacture.
- ◆ Shipyards.
- ◆ Bicycle, fitness equipment, and stainless furniture manufacture.

1. Pre-installation

1.1 Installation Environment

The WT-DI is designed for use in adverse environments. Examples of environments with increased adverse conditions are:

- In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts;
- In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator;
- In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.
- Environments with adverse conditions do not include places where electrically conductive parts, in the near vicinity of the operator, which can cause increased hazard, have been insulated.
- The gradient of ground must be no more than 10°
- Ensure no wind at the welding position, or use screen to block the wind.
- The distance between welder and wall must be more than 20cm, between welders more than 10cm to ensure enough heat radiation.
- When using water-cooled torch, must be care of not being frozen.
- Welding power sources with degree of protection IP23S may be stored, but are not intended to be used outside during precipitation unless sheltered.

1.2 Installation Location

Be sure to locate the welder according to the following guidelines:

- In areas, free from moisture and dust.
- Ambient temperature between 0 degrees C to 40 degrees C.
- In areas, free from oil, steam and corrosive gases.
- In areas, not subjected to abnormal vibration or shock.
- In areas, not exposed to direct sunlight or rain.

1.3 Power Source Connections

Warning

Thermal Arc advises that this equipment be electrically connected by a qualified electrician. **ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.**

DO NOT TOUCH live electrical parts.

- SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures.
- Lockout/tagging procedures consist of padlocking line disconnect switch in open position.
- Removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1.4 Power Supply Requirements

- Input volt must be standard sine wave, effective value $380V \pm 10\%$, and frequency 50Hz.
- Unbalance degree of 3- phase volt must be no more than 5%
- Power supply

Product type		315	500	630
Power supply		3 phase AC380V		
Min. capacity	Power network	14KVA	27KVA	45KVA
Input volt protection	Fuse	20A	40A	60A
	Circuit breaker	40A	60A	100A
Cable size (cross-section)	Input volt	4mm ²	6mm ²	10mm ²
	Output volt	35mm ²	50mm ²	70mm ²
	Ground lead	4mm ²	6mm ²	10mm ²

Table 5: Power supply connection

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

2. Installation:

- The input power of this series welding machines is three phase AC 380V/50Hz. Operator must use the properly disconnected switchboard or switch box(not provided by our company) which is equipped circuit breaker, and should ground the welder safely and firmly.
- Connect ground lead.
- Connect terminal socket (+) to workpiece on AC/DC TIG, to stick holder cable on SMAW.
- Connect TIG torch to terminal socket (-) on AC or DC TIG, connect socket (-) to workpiece on SMAW.
- Connect welder's gas inlet to gas regulator by gas hose.
- Connect TIG torch's gas inlet to welder's gas outlet.
- Wire foot pedal switch or torch control cable to control cable socket.
- When use water-cooled torch, connect water circulator to welder's water inlet and torch's water inlet to welder's water outlet.
- Power on air switch on the welder's rear panel.
- Connect input power cable to switch box and power on.

1. Function introduction

1.1 Front panel illustration and parts number reference

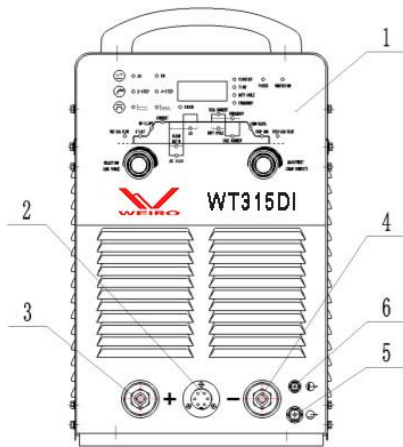


Figure 5: Model WT315DI

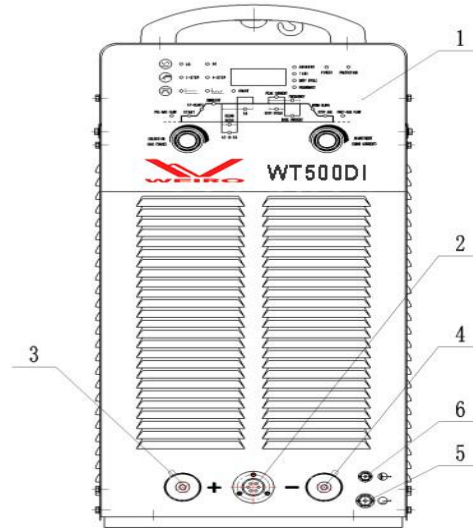


Figure 7: Model WT500DI/630DI

(1) Control panel

Set the welding parameters.

(2) TIG socket

Connect the TIG torch or foot pedal switch when processing TIG welding.

(3) Terminal socket (+)

Connect to electrode holder when in SMAW mode; Connect to the workpiece when in TIG mode.

(4) Terminal socket (-)

Connect the workpiece in SMAW mode; connect to the TIG torch in TIG mode.

(5) Water outlet

(6) Gas outlet

Connect to TIG torch gas hose.

1.2 Foot pedal switch with adjustable welding current

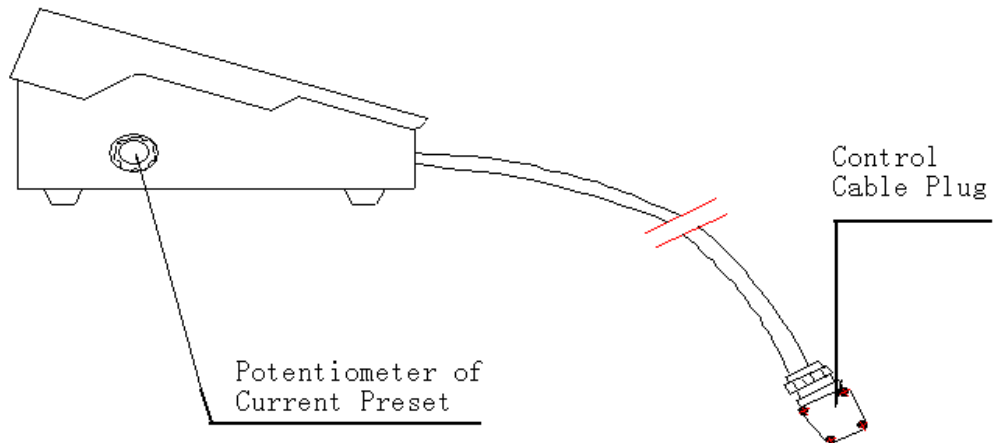


Figure 8: Foot pedal switch

Foot pedal switch can be used for arc start control and welding current regulation of model 315. Welder will switch automatically to foot pedal control after the control plug is connected to welder's control cable socket. When the pedal is stepped on, the welder begins to work at welding current in line with the degree of the pedal being pressed.

1.3 Rear panel illustration and parts number reference

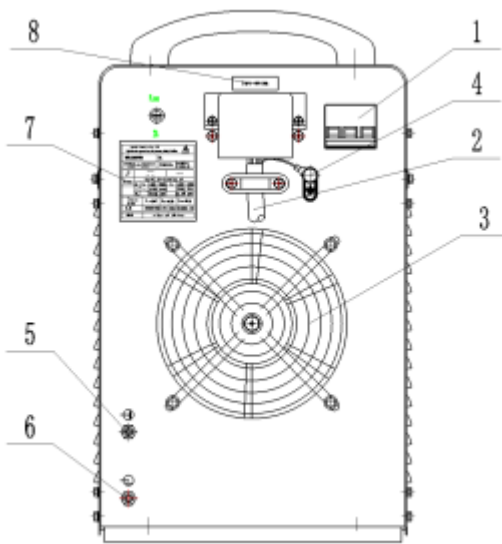


Figure 9: Model WT315DI

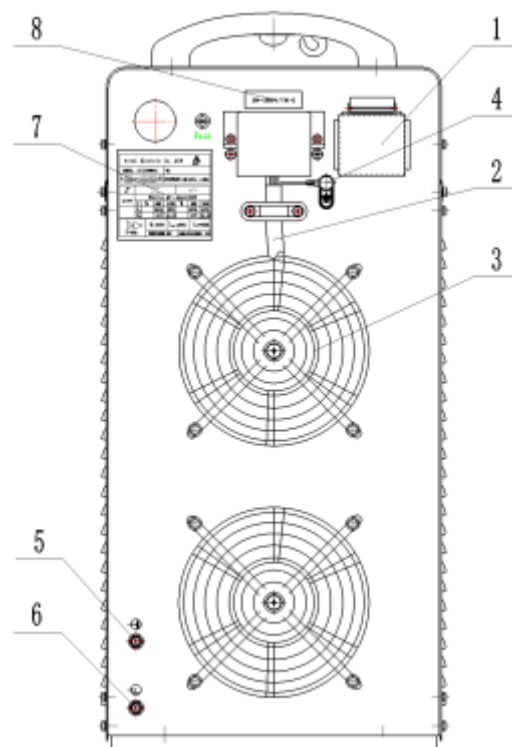


Figure 10: Model WT500DI/630DI

(1) Circuit Breaker

The function of circuit breaker is to protect welding machine by automatic trip to cut the power supply while in machine is during overload or failure. Use switch on the switch box to start or stop welding machine. Don't use this circuit breaker as power switch.

(2) Input power cable

It is 4-pin cable. The mixed-colored wire must be firmly grounded, the rest wires connect to corresponding 3-phase power supply (380V 50Hz).

(3) Cooling fan

Used to cool down the components in the welding machine.

(4) Ground bolt

To ensure operators not to be harmed and welding machine to work normally, make sure the ground bolt grounded firmly by ground cable, or make sure the ground wire (mixed-colored) of the input power cable grounded firmly.

(5) Gas inlet (Part of electromagnetic valve)

Connect to Argon gas regulator with gas hose.

(6) Water inlet

(7) Specification Plate

(8) Warning mark

1.4 Control panel

The control panel is shown as Figure 7, which is used to select welder functions and to set up parameters. The control panel is consisting of digital displayer, regulation knobs, and LED indication lights.

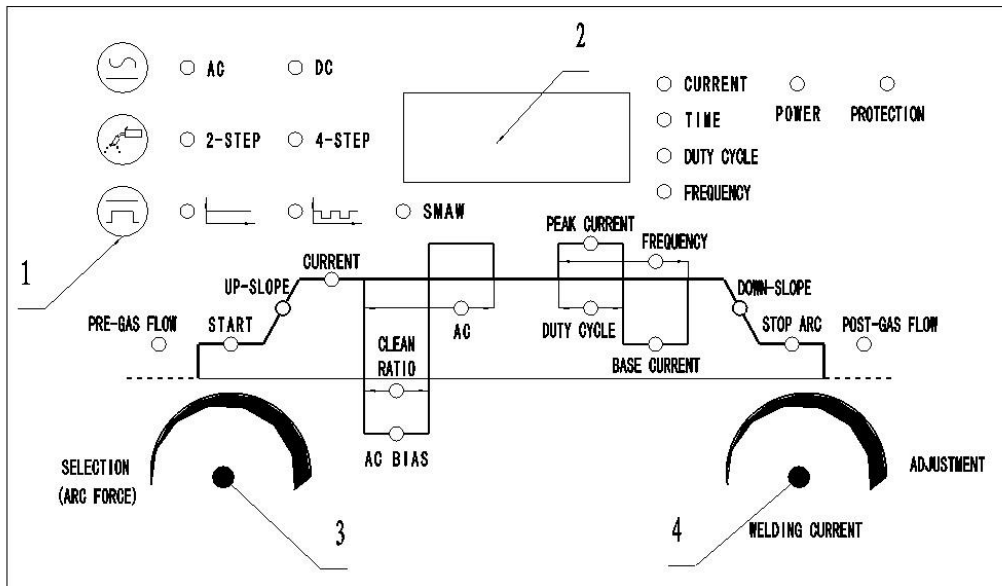


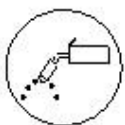
Figure 11: Control panel



AC

DC

- DC TIG/AC square wave TIG

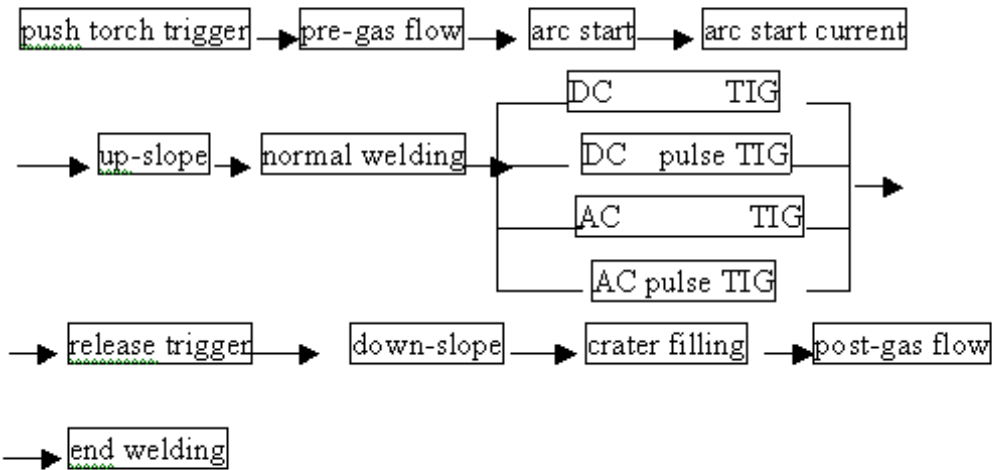


2-STEP

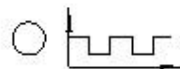
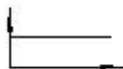
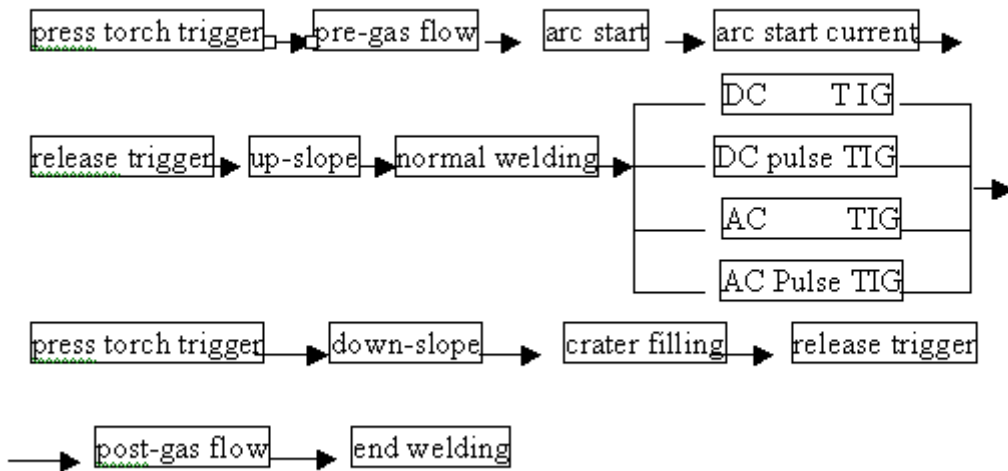
4-STEP

- 2-step (Non-Auto lock) / 4-step (Auto lock)

1). 2-step:

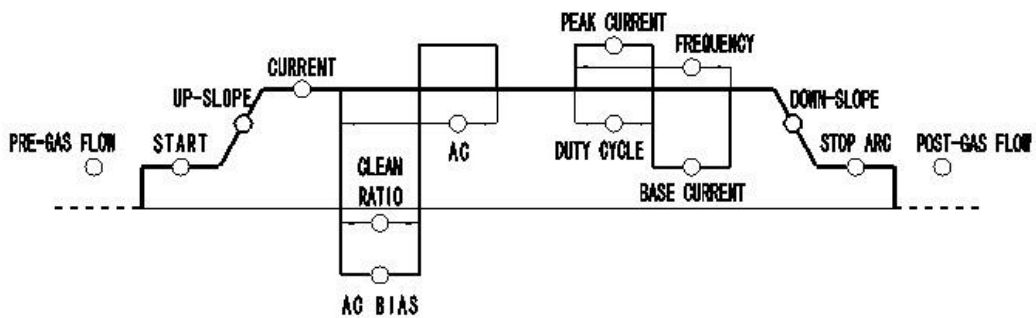


2). 4-step:



SMAW

- Constant current TIG/Pulse TIG /SMAW



1.4.1 Glossary:

1. Pre-gas flow: Time elapse of gas flow before welding
2. Arc-start: Min current of start arc
3. Up-slope: Time elapse of welding current slopes up
4. Constant current: welding current on output constant current
5. Oxide clean ratio: time ratio of output clean current

While in AC TIG, regulate clean width and penetration to obtain optimum welding quality.

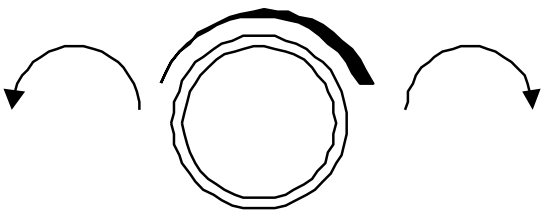


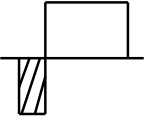
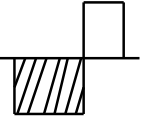
Control panel		
Clean effect	 Narrow & deep	 Wide & shallow
Wave form of current		
Consumption of tungsten electrode	More	Less

Figure 12: Illustration for Oxide clean ratio

6. AC Bias: Ratio of clean current dividing by welding current.

By adjusting the parameter, as to adjusting clean current result in reasonable oxide clean effect.

Suggestion: At the same clean effect, reduce clean ratio and increase AC bias to obtain deeper penetration, higher productivity and prolong tungsten electrode lifespan.

7. AC frequency: Frequency of output AC
8. Peak: Peak value of output pulse
9. Pulse ratio: Time ratio between length of peak value current and length of whole single pulse applied in pulse TIG, can be easily used for controlling penetration in all-position or thin sheet welding.
10. Pulse frequency: Output pulse frequency
11. Base current: Arc maintenance current of output pulse

-
12. Down –slope: Time of welding current slopes down
 13. Crater filling: Welding current of crater filling.
 14. Post-gas flow: Time of gas flow after ending welding



Figure 13: Parameters Setting Knob

Function selection knob: Used for shifting modes illustrated previously. Tuning clockwise can select modes orderly from left to right, while select reversely by tuning counter-clockwise.

Parameters preset knob: Used for adjusting the values of parameters. Increase by tuning clockwise, reducing by tuning counter-clockwise. Press the knob and tune right or left for quick adjustment.

Welder can automatically save the set-up for next use while turning off the machine

1.4.2 “Protection” indicator light: lights on yellow and the machine stops welding automatically during overheat, over-current, over-voltage or water insufficient, but will not light on while in normal welding. Protection codes are illustrated below:

1. Display 801: Over-voltage protection. Please turn off welder immediately and inform authorized reseller to repair.
2. Display 802 or 803: Over-current protection. Please turn off welder immediately and inform authorized reseller to repair.
3. Display 804: Overheat protection. Please turn off welder immediately to cool it down.
4. Display 805: Pulling torch trigger for a long time with no current or torch damaged. Repair welding torch or foot pedal
5. Display 806 (500,630 types): Water insufficient protection. The default setting is “water cooled”. It does work while using a water-cooled torch at normal water circulation. When applied air-cooled torch, the welder’s protection light will light on and display “806” protection code. Press the Function selection and parameter preset knobs simultaneously for up to 3 seconds to eliminate water insufficient protection. Redo the same way to back to previous mode.

1.4.3 Power on/off light: It displays red when power on.

2. Suggested welding parameters setting:

Sheet/ plate thickness (mm)	Diameter of Tungsten electrode (mm)	Welding current(A)	Wire diameter /mm	Argon flow rate/L.min ⁻¹	Welding layer face/back	Preheat temperature	Remark
1	2	40-60	1.6	7-9	Face 1		Flange welding
1.5		50-80	1.6-2.0				Flange welding or single side butt welding
2	2-3	90-120	2-2.5	8-12		-	Butt welding
3	3	150-180	2-3				
4	4	180-200	3	10-15	1-2/1		V-shape bevel butt welding
5		180-240	3-4				
6	5	240-280	4	14-16	1-2/1		
8		260-320	4-5		2/1	100	
10		280-340			100-150		
12	5-6	300-360		16-20	3-4/1-2	150-200	
14		340-380				180-200	
16	6	360-400	5-6	20-22	4-5/1-2	200-220	
18						200-240	
20		340-380		16-22	2-3/2-3	200-260	
16-20				20-22			3-4/3-4
22-25	6-7	360-400	20-22	3-4/3-4			

Table 6: TIG welding parameters

Workpiece thickness (mm)	< 1	2	3	4 ~ 5	6 ~ 12	≥13
Welding electrode diameter (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

Table 7: SMAW welding parameters

WARNING: *Have a qualified electrician do the maintenance and trouble shooting work. Turn the input power off, using the disconnect switch at the fuse box before working inside the machine.*

1. Cautions:

- Rivet equipment name tag on the specified area of the case, otherwise the inside parts will possibly be damaged.
- Connect welding cable to terminals firmly, otherwise the terminals will be burn out which will cause the instability of welding process.
- Avoid welding cable and control cable being broken, and prevent welding machine from being short circuit.
- Never let welding machine be bumped into or stacked up by heavy objects.
- Ensure good ventilation
- Under high temperature, if work with large current for long period, welder may shut down automatically due to thermal protection acts .At this point, let the machine runs under open-load for a few minutes, and it will be automatically recover.
- Under high temperature, if work with large current for long period, welder may shut down automatically due to air switcher trips. Cut off the power supply to the electricity switchboard on frame, and wait for 5 minutes to turn on the air switcher on the power source fist then connect the power supply to the electricity switchboard on frame. And leave the machine runs under open-load condition for a while.
- After welding, cut off the Argon gas supply and the power supply.

2. General maintenance

- Remove dust from power resource with pressure air by qualified individuals every 3-6 months. Check if the jointers are loose.
- Check regularly if cables are worn out, knobs are loose, and components of panel are damaged.
- Check regularly if cables are tightly connected to cable connecting terminals in case of terminals being burnt out.
- Clean and replace Contact Tip and Tungsten Electrode in time.

3. Procedure for regular checking prior to maintenance

- Check if all front panel switches are on the proper positions.

-
- Check if the input volt has the phase missing. (Input power 3 phase 380V/50HZ)
 - Check if the input cable is connected correctly and firmly with the power source.
 - Check if the ground lead is connected correctly and firmly.
 - Check if the welding cables are connected correctly and firmly.
 - Check if gas regulator is in good situation and gas flows out normally.

WARNING: Have a qualified electrician do the maintenance and trouble shooting work. Turn the input power off, using the disconnect switch at the fuse box before working inside the machine. Don't open up case uninstructed, the max volt inside machine is 600V, Never discharge high voltage to welder case with welding torch! Shut down power source before changing or repairing welding cable or torch.

No	TROUBLE	CAUSES	WHAT TO DO
1	Indicator light does not light on and doesn't work when machine switches on.	(1)Phase missing (2)Fuse size (2A) breaks (3)Input cable break down	(1)Inspect power source (2)Inspect fan, transformer for ZKB/QDB and control board are in good condition or not (3) Inspect cable
2	Circuit Breaker trips automatically while welder working on without big welding current for long time	The following components may probably damaged : IGBT module, 3 phase rectified module, output diode module, and other components Short circuit	(1) Inspect and replace (2)When IGBT module breakdown, check if resistors 12Ω, 5.1Ω and SR160 on driving board are damaged or not.
3	Welding current is not stable.	(1)Phase missing (2)Main control board is damaged.	(1) Inspect power source (2) Inspect and replace
4	Welding current is not adjustable.	(1) Conductive wire broken. (2)Main control board is damaged. (3) Encoder is damaged	Inspect and replace
5	Display 801 protection code (over voltage)	(1)Secondary IGBT module is damaged (2)Main control board is Damaged	Replace secondary IGBT module and main control board
6	Display 802 or 803 protection code (over current)	(1)Secondary IGBT module is damaged (2)Main control board is damaged	Replace secondary IGBT module and main control board
7	Display 804 Protection code (overheat)	(1)Welding current is too large (2)Environmental temperature is too high. (3)Thermal switch is damaged	(1)Working in open load, idle and cooling down (2) Replace thermal switch
8	Display 805 protection code	(1)Torch trigger has been pushed for a long time in open load (2)Welding torch trigger or foot pedal switch is damaged	(1) Inspect the torch or foot pedal switch and replace it (2) Release the trigger
9	Display 805 protection code (water insufficient)	(1) No water supply (2) Bad water circulation (3)Water valve, water circulator or torch are damaged	(1)Connect to water supply (2)Inspect water circulation (3)Replace the valve, circulator or torch

Table 8: Trouble Shooting

1. General

The user is responsible for installing and using the arc welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected, then it shall be the responsibility of the user of the arc welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see note. In other cases it could involve constructing an electromagnetic screen enclosing the welding power source and the word complete with associated input filters. In all cases electromagnetic disturbances shall be reduced to the point, where they are no longer troublesome.

NOTE: The welding circuit may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury.

2. Assessment of area

Before installing arc welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- 1) Other supply cables, control cables, signaling and telephone cables, above, below and adjacent to the arc welding equipment;
- 2) Radio and television transmitters and receivers;
- 3) Computer and other control equipment;
- 4) Safety critical equipment, for example guarding of industrial equipment;
- 5) The health of the people around, for example the use of pacemakers and hearing aids;
- 6) Equipment used for calibration or measurement;
- 7) The immunity of other equipment in the environment is compatible. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- 8) The time of day that welding or other activities are to be carried out.

3. Methods of reducing emissions

1) Public supply system

Arc welding equipment should be connected to the public supply system according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional

precautions such as filtering of the public supply system. Consideration should be given to shielding the supply cable of permanently installed arc welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

2) Maintenance of the arc welding equipment

The arc welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the arc welding equipment is in operation. The arc welding equipment should not be modified in any way, except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

3) Welding cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

4) Equipotent bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive an electric shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

5) Earthling of the work piece

Where the work piece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example ships hull or building steelwork, a connection bonding the work piece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthling of the work piece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the work piece to earth should be made by a direct connection to the work piece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

6) Screening and shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

Feedback Form

Name of Company			
Address			
Contact person		Title	
Telephone No		Fax No.	
Email Address			
Company's filed of business			
Comments :			

Thank you for taking the time to share your feedback. Your comments and suggestions will help us to serve you better.