Dear Customer

This instruction manual will help you get to know your new machine. Read the manual carefully and you will soon be familiar with all the great features of your new product. Meanwhile, please remember safety rules and operate as instructed.

If you treat your product carefully, this definitely helps to prolong its enduring quality and reliability-things which are both essential prerequisites for getting outstanding results.

Production specification may change without advance notice.

The model you purchase is for:

- ☐ EXPERT TIG 210 AC/DC PFC

Please find corresponding models from the “Contents”.

Important:

Please take special note of safety rules and operate as instruction in case of damage and serious injury.

Safety Rules

“Danger” indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

“Warning!” indicates a possible hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are explained in the text.

“Caution” indicates a possible hazardous situation which, if not avoided, may result in slight or moderate injury.

“Note!” indicates a situation which implies a risk of impaired welding result and damage to the equipment.

“Important!”indicates practical tips and other useful special-message. It is no signal word for a harmful or dangerous situation.

Utilisation for intended purpose only. The machine may only be used for jobs as defined by the “Intended purpose”.

Utilisation for any other purpose, or in any other manner, shall be deemed to be “not in accordance with the intended purpose”. The manufacturer shall not be liable for any damage resulting from such improper use.

Safety signs. All the safety instructions and danger warnings on the machine must be kept in legible condition, not removed, not be covered, pasted or painted cover.

Safety inspection. The owner/operator is obliged to perform safety inspection at regular intervals.

The manufacturer also recommends every 3-6 months for regular maintenance of power sources.

Electric shock can kill. Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In MIG/MAG welding, the wire, drive rollers, wire feed housing and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

Do not touch live electrical parts of the welding circuit, electrodes and wires with your bare skin or wet clothing.
The operator must wear dry hole-free insulating welding gloves and body protection while performs the welding.

Insulate yourself from work and ground using dry insulating protection which is large enough to prevent you full area of physical contact with the work or ground.

Connect the primary input cable according to rules. Disconnect input power or stop machine before installing or maintenance.

If welding must be performed under electrically hazardous conditions as follow: in damp locations or wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or in

occasion when there is a high risk of unavoidable or accidental contact with the work piece or ground. Must use additional safety precautions: semiautomatic DC constant voltage (wire) welder, DC manual (Stick) welder and AC welder with reduced open-load voltage.

Maintain the electrode holder, ground clamp, welding cable and welding machine in good, safe operating condition. Replace damaged part immediately.

Electric and magnetic fields (EMF) may be dangerous. If electromagnetic interference is found to be occurring, the operator is obliged to examine any possible electromagnetic problems that may occur on equipment as follow:

- Minas, signal and data-transmission leads
- IT and telecoms equipment
- Measurement and calibration devices
- Wearers of pacemakers

Measures for minimizing or preventing EMC problems:

- Mains supply

If electromagnetic interference still occurs, despite the fact that the mains connection in accordance with the regulations, take additional measures

- Welding cables

Keep these as short as possible.
Connect the work cable to the work piece as close as possible to the area being welded.
Lay them well away from other cables.
Do not place your body between your electrode and work cables.

- Equipotential bonding
- Workpiece grounding (earthing)
- Shielding

Shield the entire welding equipment and other equipment nearby.

ARC rays can burn. Visible and invisible rays can burn eyes and skin.

Wear an approved welding helmet or suitable clothing made from durable flame-resistant material (leather, heavy cotton, or wool) to protect your eyes and skin from arc rays and sparks when welding or watching.

Use protective screens or barriers to protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or material.

Fumes and gases can be dangerous. Welding may produce fumes and gases, breathing these fumes and gases can be hazardous to your health.

When welding, keep your head out of the fume. If inside, ventilate the area at the arc to keep fumes and gases away from the breathing zone. If ventilation is not good, wear an approved air-supplied respirator.

Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator.

Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

Welding and cutting sparks can cause fire or explosion. When not welding, make sure the electrode circuit is not touching the work or ground. Accidental contact can cause sparks, explosion, overheating, or fire. Make sure the area is safe before doing any welding.

Welding and cutting on closed containers, such as tanks, drums, or containers, can cause them to blow up. Make sure proper steps have been taken.

When pressure gas is used at the work site, special precautions are required to prevent hazardous situations.

Connect work cable to the work as close to the welding zone as practical to prevent welding current from passing too long and creating fire hazards or overheat.

Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

Be attention that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas and start a fire. Remove fire hazardous from the welding area, if not possible, cover them thoroughly. Do not weld where flying sparks can strike flammable material and where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).

Protect yourself and others from flying sparks and hot metal. Remove any combustibles from operator before perform any welding.

Keep a fire extinguisher readily available.

Empty containers, tanks, drums, or pipes which have combustibles before perform welding.
Remove stick electrode from electrode holder or cut off welding wire at contact tip when not in use.

Apply correct fuses or circuit breakers. Do not oversize or bypass them.

Cylinder can explode if damaged. Pressure gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

Cylinders should be located away from areas where they may be struck or subjected to physical damage. Use proper equipment, procedures, and sufficient number of persons to lift and move cylinders.

Always install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling over or tipping.

Keep a safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

No touching cylinder by welding electrode, electrode holder or any other electrically “hot” parts. Do not drape welding cables or welding torches over a gas cylinder.

Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the process used; maintain them and associated parts in good condition.

Use only compressed gas cylinders containing the correct shielding gas for the properly operating regulators designed for the gas and pressure used. All hoses,

fittings, etc. should be suitable for the application and maintained in good condition.

Open the cylinder valve slowly and keep your head and face away from the cylinder valve outlet.

Valve protection caps should be kept in place over valve expect when the cylinder is in use or connected for use.

Hot parts can burn. Do not touch hot parts with bare hand or skin.

Ensure equipment is cooled down before perform any work.

If touching hot parts is needed, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

Flying metal or dirt can injure eyes. When welding, chipping, wire brushing, and grinding can cause sparks and flying metal. It can hurt your eyes.

Remember wear appropriate safety glasses with side shields when in welding zone, even under your welding helmet.

Noise can damage hearing. Noise from some processes or equipment can damage hearing.

Remember wear approved ear protection to protect ears if noise level is high.

Moving parts can injure. Stay away from moving parts such as fans.

Stay away from pinch points such as drive rolls.

Keep all doors, panels, covers, and guards closed and securely in place.

Have only qualified persons remove doors, panels, covers, or guards for servicing and maintenance.

Reinstall doors, panels, covers, or guards when servicing and maintenance is finished and before reconnecting input power.

Overuse can cause overheating. Use machine follow duty cycle. Reduce current or reduce duty cycle before starting to weld again.

Allow cooling period.

Do not block or filter airflow to unit.

Safety markings. Equipment with CE-markings fulfils the basic requirements of the Low-Voltage and Electromagnetic Compatibility Guideline (e.g. relevant product standards according to EN 60 974).

Equipment with CCC markings meets the requirements of implementations rules for China compulsory certification.

Contents

1-GENERAL REMARKS

1-1 Brief introduction

The power source is controlled by microcomputer, has DC MMA, AC MMA, DC TIG, DC pulse TIG, AC TIG, AC pulse TIG, mixed waveform TIG welding process, which are used for carbon steel, stainless steel, copper, titanium, aluminum and Al-Mg alloy welding. With ideal static characteristic and dynamic characteristics, comprehensive control functions, EXTIG-PAC enjoys following features:

-Single phase AC 230V power supply, small size, light weight and easy to move.
-Good control and adjust ability, multi-function, save cost.
-APFC power factor correction technology, low harmonic content, less pollution to the grid.
-Easy arc-starting, stable arc, less spatter and excellent welding.
-HF ignition, easy to operate.
-Foot pedal switch optional for welding current control.
-By adjusting parameters like peak current, base current, pulse frequency, duty cycle as well as AC current, AC frequency, clean ratio, it can control the welding penetration, welding width, welding seam surface, and extend the tungsten electrode life.
-Multiple patented technology, high reliability and durability.

1-2 Functional principle

This welding machine applies HF inverter technology. 1- phase 230V input volt is rectified, filtered, and voltage stabilized by PFC circuit, inverted into HF AC by IGBT single tube, reduced by HF transformer, rectified by HF rectifier, then output DC power suitable for welding. After this process, the welding machine's dynamically responsive speed has been greatly increased, so the welding machine size and weight are reduced noticeably.

Special design of control circuit makes welding machines keep good welding performance despite of external condition changes like grid voltage fluctuation or different output cable length. Good features include easy arc start, stable arc, good welding seam and continuous adjustment of welding current. Schematic diagram is shown in Fig. 1-2-1:

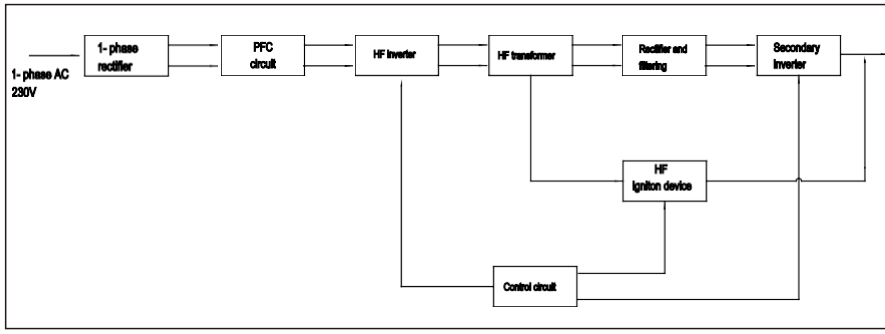


Fig. 1-2-1: Schematic Diagram

1-3 Output characteristics

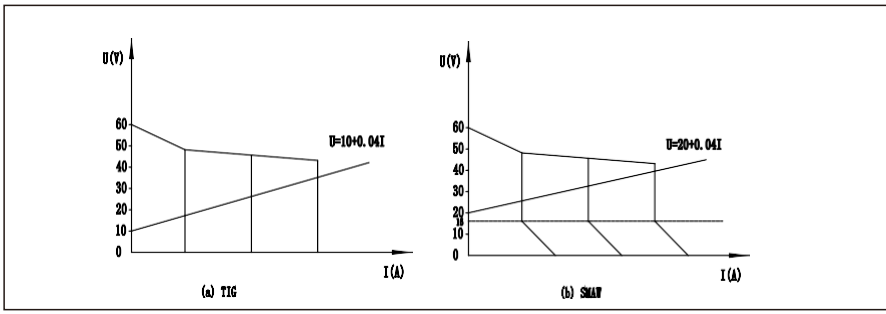


Fig.1-3-1: Output characteristics

1-4 Duty cycle

Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating. If unit overheats, thermostat(s) opens, output stops, and cooling fan run. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

NOTE! Exceeding duty cycle can damage unit and void warranty.

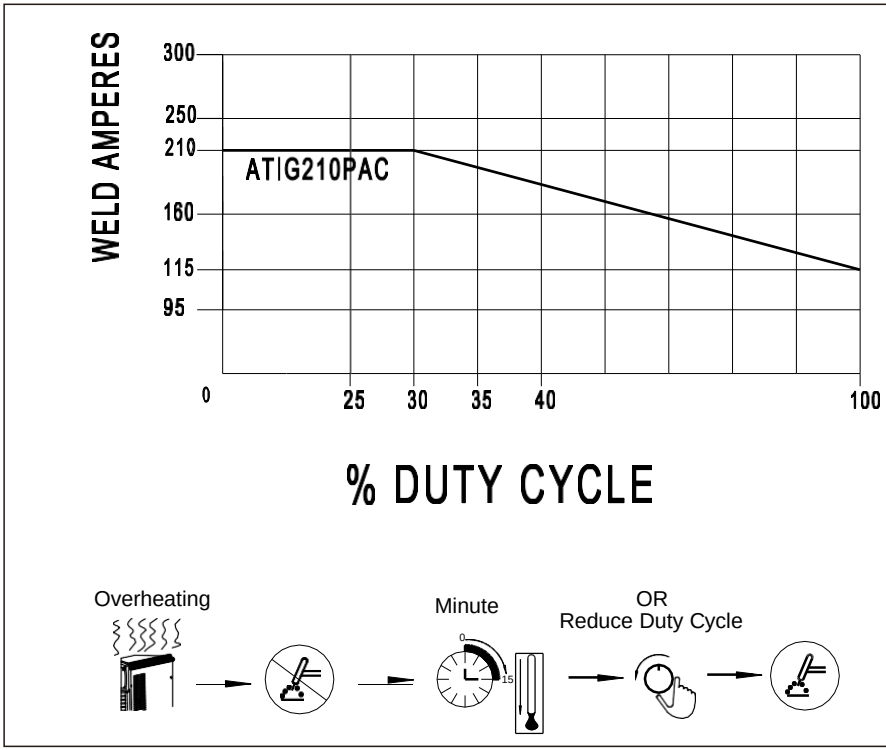


Fig. 1-4-1: Duty cycle

2 - BEFORE COMMISSIONING

Warning! Operating the equipment incorrectly can cause series injury and damage. Do not use the functions described here until you have read and completely understood “Safety rules” in the beginning.

2-1 Utilization for intended purpose only

The power source may only be used for SMAW and TIG welding. Utilization for any other purpose, or in any other manner, shall be deemed to be “not in accordance with the intended purpose”. The manufacturer shall not be liable for any damage resulting from such improper use.

Please perform the inspection and maintenance work in accordance with all the instructions given in this manual.

2-2 Machines set-up regulations

The power source is tested to "Degree of protection IP21S", However, direct wetting to inner electric part should be avoided.

Warning! A machine that topples over or falls from its stand can easily kill someone. Place machine on an even, firm floor in such a way that it stands firmly.

The venting duct is a very important safety feature. When choosing the machine location, make sure it is possible for the cooling air to enter and exit unhindered through the louvers on the front and back of machine. Any electroconductive metallic dust from e.g. grinding-work must not be allowed to get sucked into the machine.

2-3 Mains connection

-The power source is designed to run on the mains voltage given on the respective rating plates.
-The mains cables and plugs must be mounted in accordance with the relevant technical standard.
-The power supply socket come with power source is designed to use strictly according to the marked voltage class.

Note! Inadequately dimensioned electrical installations can lead to protection failed or partially failed. The mains plug and socket, and its fuse protection, must be dimensioned in accordance with local power supply.

3- EXTIG210PAC

3-1 System components

This series power source can be equipped with many different accessories and can be used in various sites with different configurations. (Refer to Fig. 3-1-1)

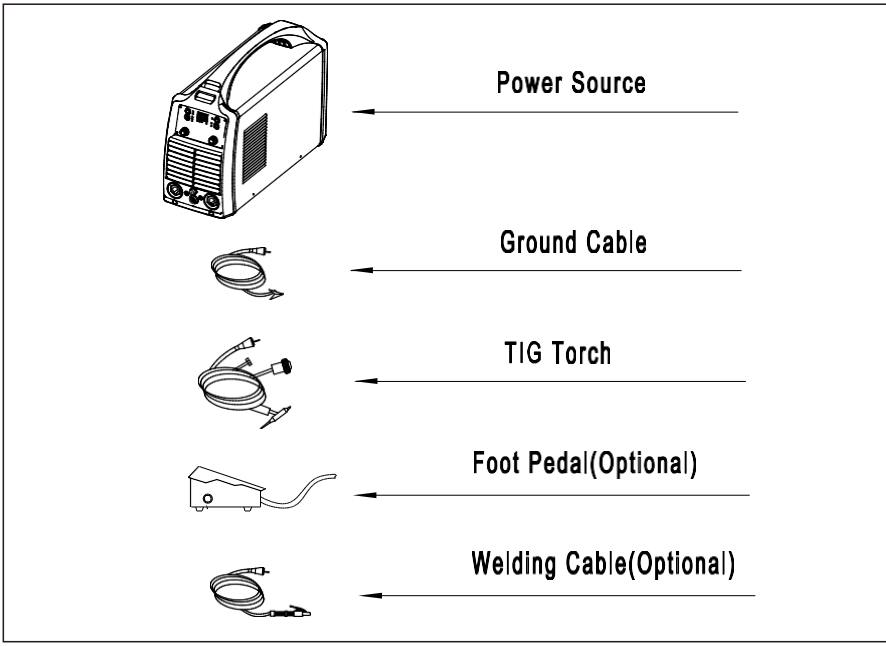


Fig. 3-1-1: System components

3-2 Standard equipments

Only be equipped with the necessary accessories, can the power source operates well. The following is the needed accessories list.

TIG welding
-Power source
-Ground cable
-TIG torch
-Gas input parts (provide protective gas)
-Pressure-reduce regulator
-Filler wire (according to different applications)

SMAW welding
-Power source
-Ground cable
-Electrode holder
-Electrode

3-3 Control panel

The functions on the control panel are all arranged in a very logical way. The various parameters needed for welding are easy to select, by pressing the appropriate button. (Refer to Fig. 3-3-1)

Note! Your machine has certain functions that are not in accordance with this operating manual, or vice versa. Also, certain illustrations may be slightly different from the actual controls on your machine. However, these controls function in exactly the same way.

Warning! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described here until you have read and completely understood this operating manual.

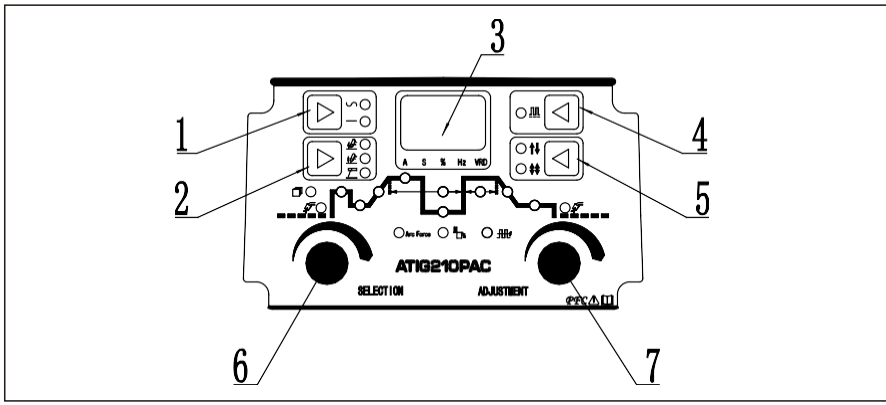


Fig. 3-3-1: Control panel

1. AC/DC selection button: select between AC, DC, mixed waveform on TIG mode, select between AC, DC on MMA mode.

Important! When the two indicator lights light up, it means the machine is on mixed waveform TIG mode.

2. Function selection button: select between HF TIG, Lift TIG, MMA.
3. Digital displayer
4. Pulse selection button: On TIG mode, to switch between constant current and pulse, when the indicator light lights up, it's pulse mode, when the indicator light lights off, it's constant current mode.
5. Operating mode selection button: on TIG mode, select between 2 step, 4 step.

Torch operation mode:

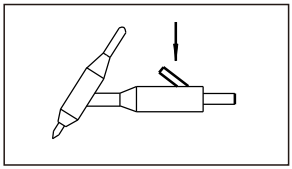


Fig. 3-3-2: Press torch trigger

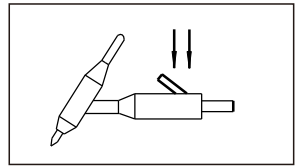


Fig. 3-3-3: Hold torch trigger

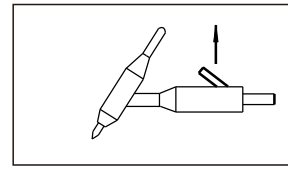


Fig. 3-3-4: Release torch trigger

2-step operation mode（HF TIG） (Fig. 4-3-5):
a. Press and hold torch trigger to start welding
- Open solenoid valve, shielding gas will flow out to expel air from torch hose (pre-gas time depends on the hose length). Then HF ignition device works and arc starts.
- Output current continuously increases from initial current to welding current.
b. Release torch trigger to stop welding
- Release torch trigger, welding current will continuously decrease at a certain rate and time until it reaches to zero.
- The solenoid valve will continue to operate for a period of time (post-gas time), allowing the shielding gas to protect tungsten electrode and molten pool. Then the solenoid valve stops working, gas stops and welding finishes.

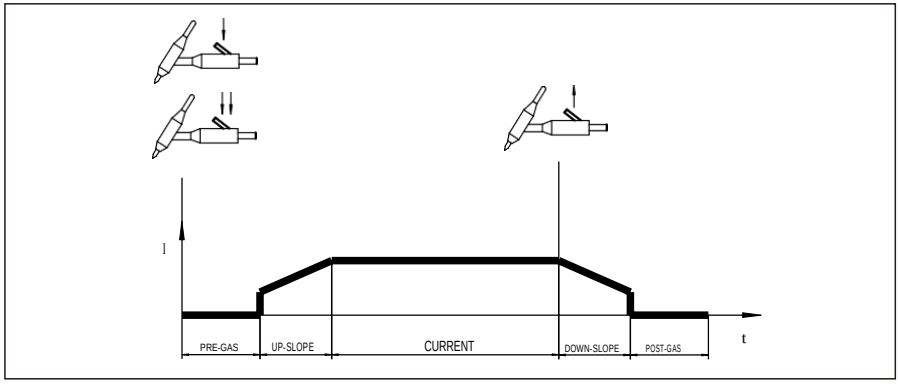


Fig. 3-3-5: 2 step operation mode 4-

step operation mode (Fig. 3-3-6):
a. Press and hold torch trigger to start welding
- Open solenoid valve, shielding gas will flow out to expel air from torch hose (pre-gas time depends on the hose length). Then HF ignition device works and arc starts.
- Output current starts at initial current and time of initial current output depends on the time that torch trigger is pressed and held.
b. Release torch trigger
- Output current increases from initial current to welding current, and the time is called up slope time.
- If the initial current is not required, the torch trigger needs not to be held. Quickly press torch trigger to start arc, then quickly release it and output current will increase to welding current.
c. Press and hold torch trigger again when the welding completes
- Welding current will continuously decrease at a certain rate until it reaches to crater-filler current and the time is called down slope time.
- Time of crater-filler current depends on the time that the torch trigger is pressed and held again.
d. Release torch trigger
- The output current is continuously lowered to zero and arc blowout. The solenoid valve will continue to work for the selected period of time (post-gas time), allowing the shielding gas to protect tungsten electrode and molten pool. Then the solenoid valve stops running, gas stops and welding completes.

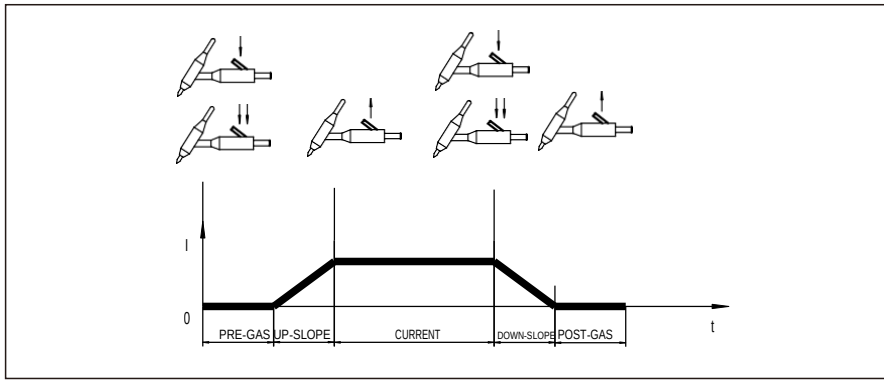


Fig.3-3-6: 4 step operation mode

6. Parameter selection knob: clockwise rotation to select from left to right, anti-clockwise rotation to select from right to left.

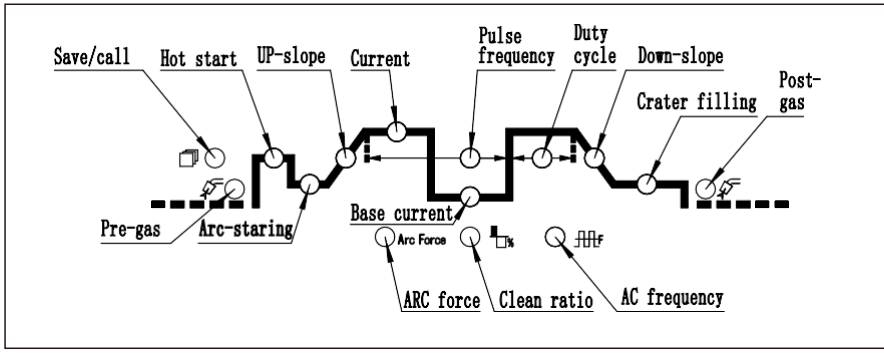


Fig. 3-3-7: Schematic diagram Save/call——

indicate when save/call program.
Pre-gas——time elapse of gas flow before welding. Factory setting: 0.05s.
Hot start——hot start current on TIG mode. Factory setting: 50 A
Arc-starting——Arc starting current. Factory setting: 50 A
Up-slope——Time elapse of welding current up slopes from arc starting current. Factory setting: 0.2s
Current——Welding current at CC welding or peak current at pulse welding. Factory setting: 100 A
Pulse frequency——Frequency of AC pulse TIG or DC pulse TIG. Factory setting: 40Hz
Base current——Pilot arc current at AC/DC pulse TIG. Factory setting: 10 A
Duty cycle——Time ratio of peak current at AC pulse TIG/DC pulse TIG. Factory setting: 50% Down–slope——Time of welding current slopes down to crater filling current. Factory setting: 0.5 s
Crater filling——Current value before arc blowout. Factory setting: 50A
Post-gas——Time of gas flow after welding ends. Factory setting: 5.0 s
Arc force——arc force current on MMA welding mode. Factory setting: 50A
Clean ratio——time ratio of current for cleaning in AC TIG welding. Factory setting: 0%
Important! For AC TIG, cleaning width of welding seam and penetration can be changed by regulating clean ratio so as to obtain optimum welding quality.
AC frequency——Frequency of AC TIG/AC pulse TIG. Factory setting: 60Hz

7. Parameter adjustment knob: adjust selected parameter. Clockwise rotate to increase value, anti-clockwise rotate to decrease value. Press this button to rotate for quick adjustment.

8. Other functions:
1) Restore factory setting: press function selection button and parameter selection knob at the same time for 3s, restore factory setting.
2) Gas test: press parameter selection knob and pulse selection button at the same time for 3s, enter into gas test mode.
3) Other sub-menu parameters:
a. Press parameter selection knob ad AC/DC selection button for 3s, enter into sub-menu interface, select sub-menu parameters by rotating parameter selection knob; adjust current sub-menu parameters by rotating parameter adjustment knob.
b. After finishing the setting, re-press parameter selection knob ad AC/DC selection button for 3 seconds, it will save the setting and exit from the sub-menu interface, and recover to regular interface.

No.	Sub-menu parameter	Display	Description	Remark
1	Panel/remote control	FP0~FP1	Fp0: Panel control FP1: Remote control	Factory setting: Fp1
2	Welding mode	FP5~FP7	Fp5: normal mode Fp6: repeat welding mode (2/4 step indicators light on) Fp7: spot welding mode (2/4 step indicators do not light up)	Factory setting: Fp5
3	Arc start polarity selection on TIG mode	FP8,FP9	Fp8: reversed polarity FP9: straight polarity	Factory setting: Fp8
4	VRD ON/OFF	Fu0, Fu1	Fu0: VRD on FU1: VRD off	Factory setting: Fu0
5	MMA hot start time adjustment	F0.2-F2.0	F0.2-F2.0 means 0.2S-2S	Factory setting: 0.5S
6	TIG spot welding time adjustment	P0.1-P9.9	P0.1-P9.9 means 0.1S-9.9S	Factory setting: 1S

No.	Sub-menu parameter	Display	Description	Remark
7	Welding program call function	L01-L10	L01-L10: means stored programs	Enter into program call mode:select needed channel no. LXX, press parameter selection knob and AC/DC selection button for 3s, call program, save/call indicator lights up, exit from sub-menu interface, start welding. At this stage, only can check parameter, can not advise parameter. Exit from program call mode: enter into sub-menu interface,select needed channel no. LXX, press parameter selection knob and AC/DC selection button for 3s, save/call indicator lights off, exit from call mode.
8	Welding program save function	C01-C10	C01-C10: 10 channels for storing welding programs	Save (select channel CXX, press parameter selection knob and AC/DC selection button for 3s, save current program in this channel. On this time, save/call indicator lights up for 2s,save is successfully.)
9	Program version number	U00	Program version number	This parameter is not adjustable

Table 3-3-1: Sub-menu parameters

3-4 Interface
Front Panel

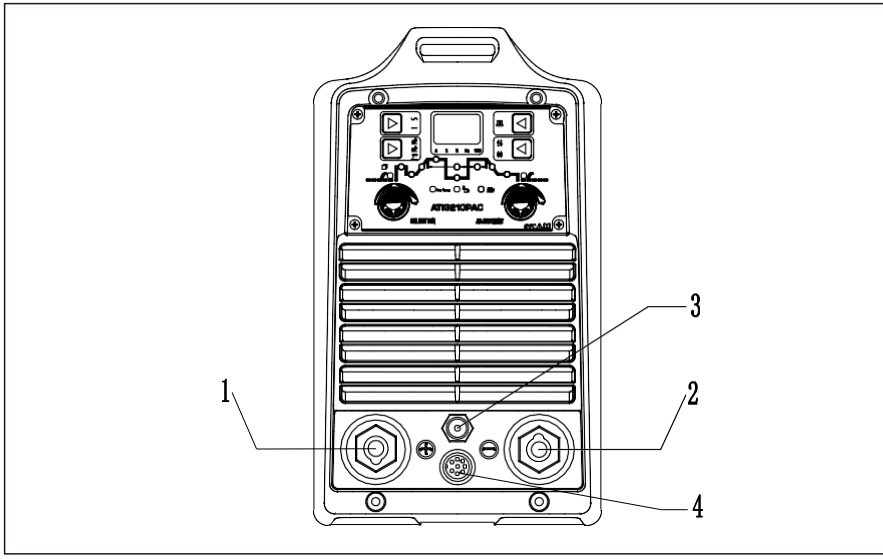


Fig. 3-4-1: Front panel

1. Welding cable quick socket (+)
In TIG mode, connect with work piece;
In SMAW mode, connect with electrode holder.
2. Welding cable quick socket (-)
In TIG mode, connect with TIG torch;
In SMAW mode, connect with work piece.
3. Gas outlet
Connect with TIG torch gas connector.
4. Control socket
Connect with TIG torch, foot pedal, or control cable of automation system.

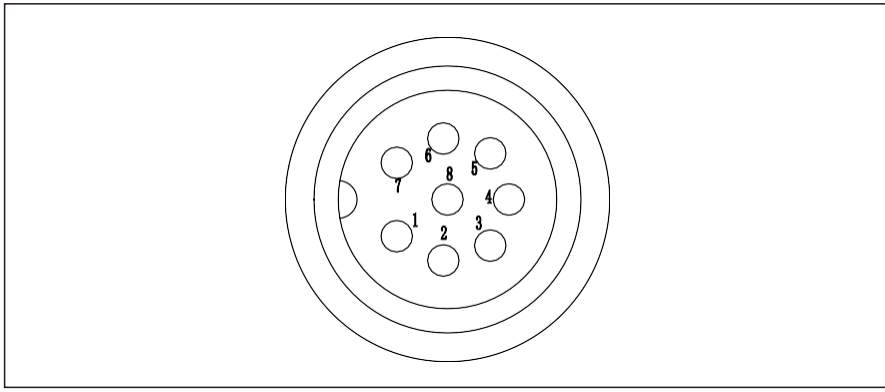


Fig. 3-4-2: Control socket

Socket pin	Description
1	Torch switch signal
2	Torch switch signal
3	Current signal, with pin 7 connect to ON/OFF signal lines of special equipment
4	5V power signal
5	Remote control current signal 1
6	Remote control current signal 2
7	Signal ground
8	Potentiometer signal ground

Table 3-4-1: Socket pin description

Rear Panel

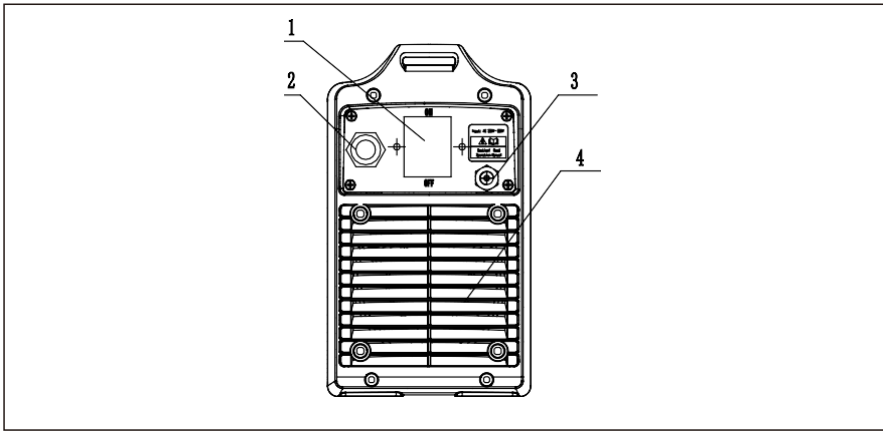


Fig. 3-4-3: Rear panel

1. Power switch
Supply power single phase 230Vac for welding machine by this switch. When switch “ON”, power light and LED light up, and the fan runs.
2. Power supply cable
Three pin wires, the mixed-colored wire must be firmly grounded; the rest 2 wires connect to 1-phase AC230V 50/60Hz power supply.
3. Gas inlet
Connect gas regulator via gas hose
4. Fan
Cool down heating device inside welding machine.

Foot pedal switch
Foot pedal switch can be used for arc start control and welding current regulation. Welding current 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. The max. current value is preset by the potentiometer on the foot pedal. (Refer to Fig. 3-4-3)

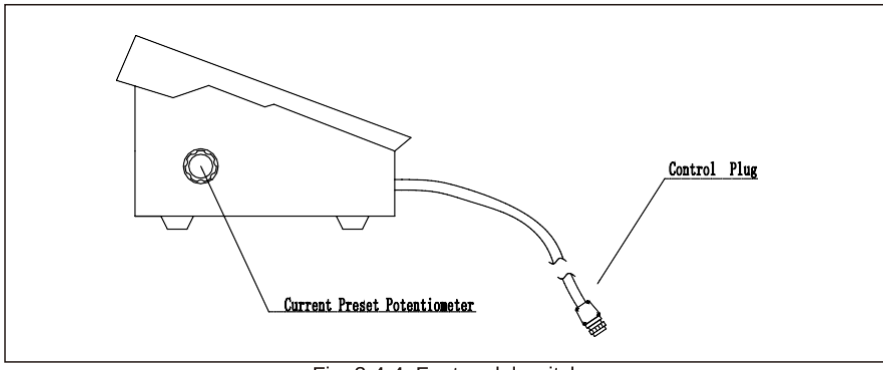


Fig. 3-4-4: Foot pedal switch

3-5 Installation and operation

Warning! Electric shock is very dangerous. If the machine is plugged into the mains electricity supply during installation, there is a high risk of very serious injury and damage. Only carry out work on the machine when
- the mains switch is in the “OFF” position,
- the machine is unplugged from the mains.

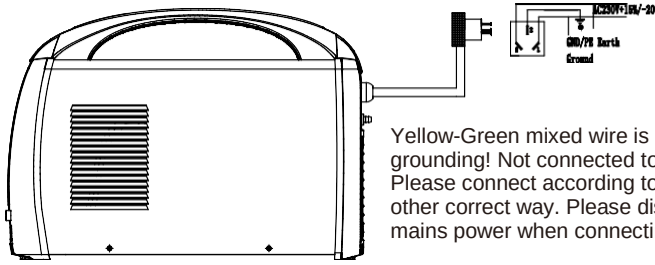
Input power supply cable installation
Please note the size of fuse and circuit breaker in the table below are for reference only.

Model		EXTIG210PAC
Power supply		1- phase AC230V +15%/-20%, 50/60Hz
Electricity grid min. capacity		6.5KVA
Input protection	Fuse	16A
Cable size (mm^2)	Input cable	2.5mm2
	Output cable	16mm2
	Protective GND wire	2.5mm2

Table 3-5-1: Specifications of mains input

Note: Capacity of fuse and circuit breaker in above table is for reference only.
Connection between input cable and distribution box, (refer to Fig. 3-5-1).

Warning!
-Never perform hot-line work!
-Electric connection should be done by professional electrician!
-Two machines should not be connected to the same one circuit breaker!
-Check the input voltage, circuit breaker, input cable in accordance with Table 3-5-1.



Yellow-Green mixed wire is used for grounding! Not connected to zero wire! Please connect according to picture or other correct way. Please disconnect mains power when connecting!

Fig. 3-5-1: Connection between input cable & distribution box

Power socket and using region

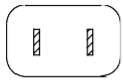
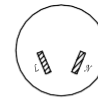
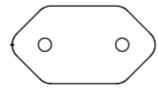
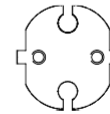
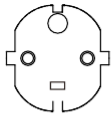
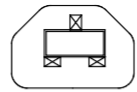
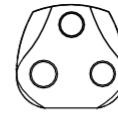
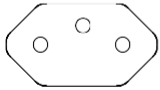
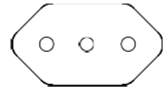
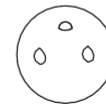
		
A: 2-plug flat type	B: 2-plug flat + GND round hole type	C: 2-plug flat 8 type
		
D: 3-plug flat 8 type	E: 2-plug round (4.0mm) type	F: 2-plug round (4.0mm) type
		
G: 2-plug round + GND round hole type	I: 3-pin flat type	K: 3-pin round type
		
M: Switzerland type	N: Italy type	O: Denmark type

Table 4-5-2: Power socket selection

Country	Type	Country	Type
Asian-Pacific region			
Hong-Kong	I	Macau	E, G
Vietnam	A, B, E, G	Thailand	A, B
Malaysia	I	Singapore	I
Indonesia	E, G	India	I, K
Australia	C, D	New-Zealand	C, D
Japan	A, B	Korea	E, G
Middle East region			
Saudi Arabia	A, B, I	Iran	E
Dubai	G		
Europe region			
Italy	E, N	Austria	E, F, G
Poland	E, F, G	Hungary	F, G
Greece	E, F, G	Belgium	E, F, G
Netherlands	E, F, G	United Kingdom	I
France	E, F, G	Switzerland	E, M
Spain	E, F, G	German	E, F, G
Finland	E, F, G	Denmark	E, F, G, O
Russia	E, F, G	Turkey	E, F
America region			
United States	A, B	Canada	A, B
Mexico	A, B	Columbia	A, B
Venezuela	A, B	Brazil	A, B, E
Peru	A, B, E	Argentina	C, D
Chile	E, N	Uruguay	E
Africa region			
Rep. South Africa	K		

Table 4-5-3: Using region selection

Gas regulator installation

Warning! The inert gas can be hazardous to your health. Work in a place only if it is well ventilated. Please do not use the shielding-gas cylinder until you have completely read and followed all the instructions about shielding-gas cylinder and accessories.

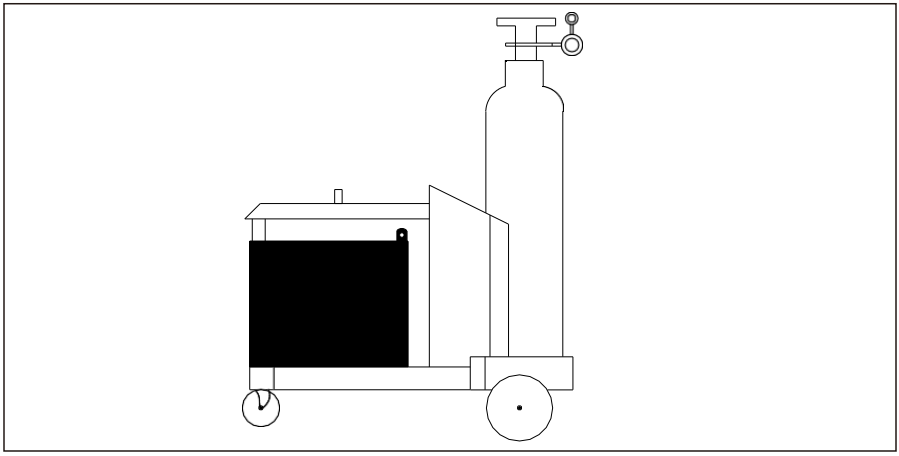


Fig. 3-5-2: Gas cylinder installation

1.If purchase the integrated machine (Fig. 3-5-2), stand the gas cylinder on the floor of the rolley and secure by fixing the cylinder strap around a point in the top third of the cylinder-but never around the neck of the cylinder. If not integrated type, please keep the gas cylinder stand straight and fixed well, or use cylinder bracket to prevent it from falling down or inclining;
2.Take the protective cap off the gas cylinder;
3.Open the gas valve by turning anticlockwise and blow dust and dirt away;
4.Check whether the gas regulator is leakproof;
5.Screw the gas regulator onto the gas cylinder and tighten it; 6.Connect the gas tube's connector to the outlet of gas regulator;

Warning! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described here until you have read and completely understood the following documents:
-"Safety rules"
-"Before commissioning"

Warning! Preparing when plug is on and power switch is in turn-on position may cause danger. Switch it off and unplug it from the mains when preparing.

TIG welding installation and operation
Gas regulator installation

Warning! Inert gas is harmful to people, and may even cause people suffocated. So please weld in a good ventilation environment. Before using gas cylinder, read and follow instructions of compressed protective gas cylinder and relative devices.

1. Take the protective cap off the shielding-gas cylinder;
2. Briefly open the shielding-gas cylinder valve anticlockwise to blow off any dust and dirt;
3.Check the tightness of gas regulator;
4.Screw the gas regulator onto the gas cylinder and tighten it;
5.Connect the gas hose's connector to the outlet of gas regulator.

Installation and operation of gas-cooled TIG welding

1. Plug the ground cable into the output socket (+) and fasten it;
2. With the other end of ground cable, establish a connection to the work piece;
3. Plug the control plug of torch into the welding machine control socket;
4. Plug gas connector on the end of torch to gas inlet on welding machine front panel, and latch it in firmly;
5. Connect torch welding cable with the output socket (-) and fasten it;
6. Connect gas regulator to gas cylinder;
7. Connect one end of gas hose to gas outlet of gas cylinder, fasten by hose clamps;
8. Connect the other end of gas hose to gas inlet on back panel of power supply, fasten by hose clamps;
9. Connect with single phase 230V power supply, and put the power switch in ON position;
10. Select AC/DC/Pulse TIG process;
11. Rotate parameter selection knob to select parameter;
12. Rotate parameter adjustment knob to adjust parameter;
13. Open pressure-reducing valve of gas regulator;
14. Press torch trigger, adjust flow meter knob of gas regulator to suitable value, then release torch trigger;
15. Press torch trigger and start welding.

SMAW welding installation and operation

Stick welding with basic electrode: E7018

1. Plug the ground cable into the output socket (-) and fasten it;
2. With the other end of ground cable, establish a connection to the work piece;
3. Plug the welding cable into the output socket (+) and fasten it;
4. Connect with single phase 230V power supply, and put the power switch in ON position;
5. Select AC/DC MMA process;
6. Rotate parameter selection knob to select parameter;
7. Rotate parameter adjustment knob to adjust parameter;
8. Start welding.

Stick welding with acid electrode: E6013

1. Plug the ground cable into the output socket (+) and fasten it;
2. With the other end of ground cable, establish a connection to the work piece;
3. Plug the welding cable into the output socket (-) and fasten it;
4. Connect with single phase 230V power supply, and put the power switch in ON position;
5. Select AC/DC MMA process;
6. Rotate parameter selection knob to select parameter;
7. Rotate parameter adjustment knob to adjust parameter;
8. Start welding.

3-6 Technical data

Model		EXTIG210PAC
Rated input voltage/frequency (V/Hz)		Single phase,AC230V +15%/-20%, 50/60Hz
Rated input power (KW)		5.7
Rated max. input current (A)		25
Rated efficient input current (A)		14
Open load voltage (V)	MMA	13.2 (VRD)
	TIG	60
Welding current range (A)	MMA	10~170
	TIG	3~210
MMA ARC-force current (A)		0~100
MMA hot start current (A)		0~100
Pre-gas time (s)		0.01~9.99
Arc strike current (A)		40~100
Arc starting current (A)		3~210
Up-slope time (s)		0~10
Pulse frequency (HZ)		0.2~500
Base current (A)		3~210
AC frequency (Hz)		10~250
Clean ratio (%)		-40~40
Duty cycle (%)		5~95
Down-slope time (s)		0~15
Crate filling current (A)		10~210
Post-gas time (s)		0.1~60
Rated duty cycle(%) (@40 C)	MMA	60
	TIG	60
TIG mode ARC-starting type		HF/LIFT
Insulation class		F
Maximum argon flow（L/min）		20
Weight (Kg)		11.5
Dimension L×W×H (mm3)		430×160×300

Table 3-6-1: Technical data

3-7 Disassembly and reassembly

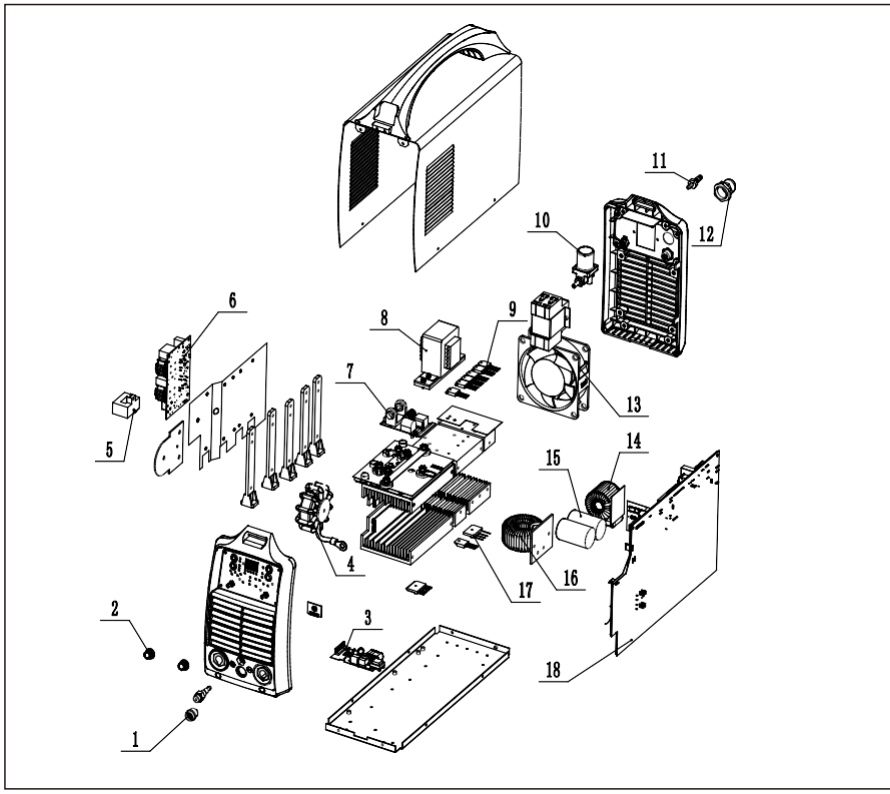


Fig. 3-7-1: Disassembly and reassembly of unit

No.	Item
1	Aviation socket
2	Potentiometer
3	Anti-common-mode inductor board
4	Output reactor
5	Current sensor
6	Over voltage protection board
7	HF arc board
8	Power transformer
9	IGBT

No.	Item
10	Solenoid valve
11	Gas inlet
12	Waterproof cable clamp connector
13	Fan
14	PFC inductor
15	Alumion electrolytic capacitor
16	Main transformer
17	Rectifier bridge
18	Main control and drive board assembly

Table 3-7-1: Main components list

4- TROUBLE SHOOTING

Note! The following troubles and causes are uncertain. However, during the process of MMA and normal using conditions, that might happen.

NO.	TROUBLE	CAUSES	REMEDY
1	Indicator lights of display board do not light up, fan does not run, no output when machine switches on	1. Power switch is damaged 2. No electricity on the electricity grid 3. Open circuit in power supply cable	1. Check power switch 2. Check power supply on the electricity grid 3. Check the connection of power supply cable
2	Indicator lights of display board light up, there is no E04 on displayer but welding machine does not have output	1) Over-current protection 2) Output cable is not well connected 3) Main control board is damaged	1) Turn off the machine, and turn on after 1 minute 2) Check connection of output cable 3) Check and repair
3	Circuit breaker on the switchboard trips while in welding	1) Following devices may be damaged: MOSFET, output diode, etc. 2) Input rectifier bridge is damaged	Check and replace
4	Welding current is not stable	1) Display board is damaged 2) Main control board is damaged 3) Bad connection within the welding machine, especially at connectors	Check and replace
5	Welding current is not adjustable	1) Display board is damaged 2) Main control board is damaged 3) Foot pedal is damaged	Check and replace

NO.	TROUBLE	CAUSES	REMEDY
6	Display E04 (overheat protection)	1) Welding current is too high 2) Environmental temperature is too high 3) Temperature relay is damaged	1) Change on open load mode and cool down 2) Change on open load mode and cool down 3) Replace
7	Display E02 (Switch is abnormal)	1) Torch trigger or foot pedal switch is often on 2) Control wiring harness plug of the display board is damaged or not well connected 3) Main control board is damaged	1) Check 2) Check connection 3) Check and replace main control board

Table 4-1: Trouble shooting

Error code display

NO.	TROUBLE	CAUSES	REMEDY
E10	Torch trigger is normally closed	1. Torch trigger (foot pedal switch) keeps pressing when on open lode mode 2. Torch trigger cable is short circuit	1. Release trigger or check trigger 2. Check cable connection 3. Replace
E13	Arc stabilizing circuit is over current protection	Arc stabilizing circuit has problem	Check and repair
E16	Fan is abnormal	1. Fan motor is locked-rotate 2. Fan is damaged	1.Check and repair 2.Check and replace
E19	Over heat protection	1. Inner machine is too hot 2. Temperature relay is damaged	1. Wait machine to cool down 2. Replace

Table 4-2: Error code display

5 - CARE AND MAINTENANCE

Before open the machine

Warning! An electric shock can be fatal. Before doing any work on the machine:
- Switch it off and unplug it from the mains
- Put up a clearly legible and easy-to-understand warning sign to stop anybody inadvertently switching it back on again
- Discharge the capacity if necessary
- Bolt in outer case also works for ground connection. Never use other bolt which cannot work for ground connection

Maintenance of welding power source
Please follow the instructions as below to ensure normal use of power source
- Conduct safety check at regular intervals (see “Safety rules”)
- Dismantle machine side panels and clean machine inside with clean and low-pressure compressed air by professional technician, not less than twice per year. Clean the components at a certain distance only
- If a lot of dust has accumulated, clean the cooling-air ducts

Daily maintenance

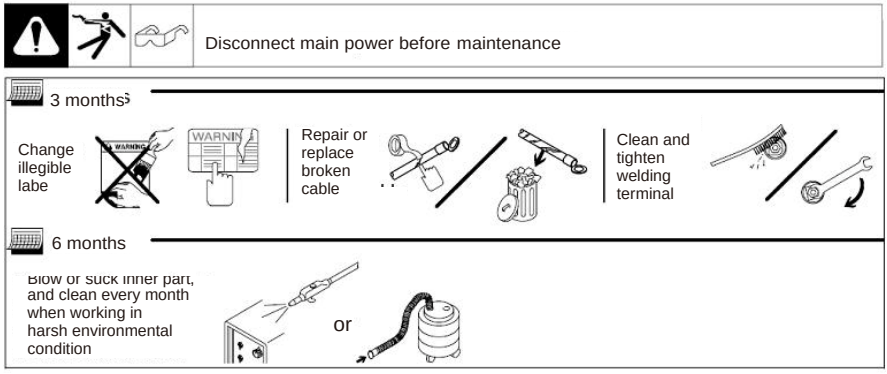


Fig. 5-1: Daily maintenance

6 - WELDING TECHNIQUE GUIDE

Note! This section being general welding technique guide is for reference only. Specific functions of your machine please refer to previous chapters.

6-1 TIG Welding Guide

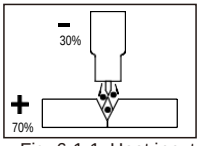


Fig. 6-1-1: Heat input

The DC power source uses what is known as DC (direct current) in which the main electrical component known as electrons flow in only one direction from the negative pole (terminal) to the positive pole (terminal). In the DC electrical circuit there is an electrical principle at work which should always be taken into account when using any DC circuit. With a DC circuit 70% of the energy (heat) is always on the positive side.This needs to be understood because it determines what terminal the TIG x DC circuit 70% of the energy (heat) is always on the positive side.This needs to be understood because it determines what terminal the TIG torch will be connected to (this rule applies to all the other forms of DC welding as well).

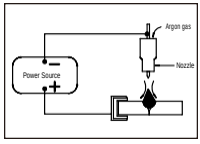


Fig. 6-1-2: TIG arc

DC TIG welding is a process in which an arc is struck between a TUNGSTEN electrode and the metal work piece. The weld area is shielded by an inert gas flow to prevent contamination of the tungsten, molten pool and weldarea.
When the TIG arc is struck the inert gas is ionized and superheated changing it's molecular structure which converts it into a plasma stream.

This plasma stream flowing between the tungsten and the work piece is the TIG arc and can be as hot as 9000K+. It is a very pure and concentrated arc which provides the controlled melting of most metals into a weld pool. TIG welding offers the user the greatest amount of flexibility to weld the widest range of material and thickness and types. DC TIG welding is also the cleanest weld with no sparks or spatter.

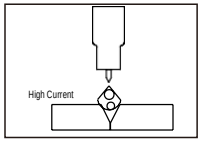


Fig. 6-1-3: High current

The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material so less current (amps) is required, thicker

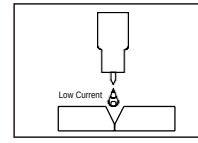


Fig. 6-1-4: Low current

material requires a more powerful arc with more heat so more current (amps) are necessary to melt the material.

HF ARC IGNITION for TIG Welding
For HF arc ignition, keep a distance about 3~5mm between tungsten electrode and work piece. When press torch switch, HF signal will break down tungsten electrode and work piece, and present a spark, welding machine immediately increases power, converting the spark to a full arc. HF arc ignition method has the least tungsten inclusion defect in TIG welding.

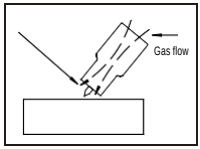


Fig. 6-1-5: Tungsten off the work

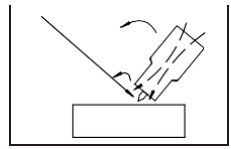


Fig. 6-1-6: Tungsten touches the work

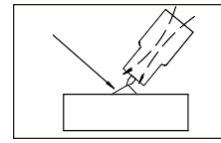


Fig. 10-1-8: Established TIG Arc

TIG Welding Fusion Technique

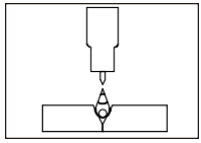


Fig. 6-1-9: TIG arc

Manual TIG welding is often considered the most difficult of all the welding processes. Because the welder must maintain a short arc length, great care and skill are required to prevent contact between the electrode and the workpiece. Similar to Oxygen Acetylene torch welding, TIG welding normally requires two hands and in most instances requires the welder to manually feed a filler wire into the weld pool with one hand while manipulating the welding torch in the other.

However, some welds combining thin materials can be accomplished without filler metal like edge, corner, and butt joints. This is known as Fusion welding where the edges of the metal pieces are melted together using only the heat and arc force generated by the TIG arc. Once the arc is started the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist is creating a weld pool of the desired size. Once the weld pool is established tilt the torch at about a 75° angle and move smoothly and evenly along the joint while fusing the materials together.

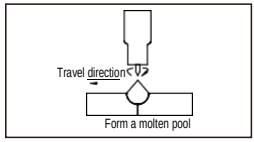


Fig. 6-1-10: Form a weld pool

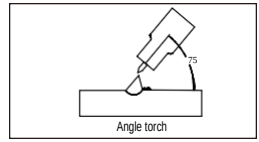


Fig. 6-1-11: Angle torch

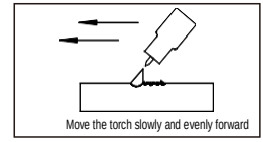


Fig. 6-1-12: Torch move

TIG Welding with Filler Wire Technique

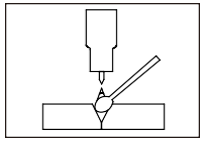


Fig. 6-1-13: Add TIG filler wire

It is necessary in many situations with TIG welding to add a filler wire into the weld pool to build up weld reinforcement and create a strong weld. Once the arc is started the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist is creating a weld pool of the desired size.Once the weld pool is established tilt the torch at about a 75° angle and move smoothly and evenly along the joint.The filler metal is introduced to the leading edge of the weld pool. The filler wire is usually held at about a 15° angle

and fed into the leading edge of the molten pool, the arc will melt the filler wire into the weld pool as the torch is moved forward. Also a dabbing technique can be used to control the amount of filler wire added, the wire is fed into the molten pool and retracted in a repeating sequence as the torch is moved slowly and evenly forward. It is important during the welding to keep the molten end of the filler wire inside the gas shield as this protects the end of the wire from being oxidised and contaminating the weld pool.

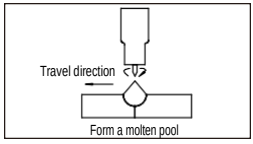


Fig. 6-1-14: Form a weld pool

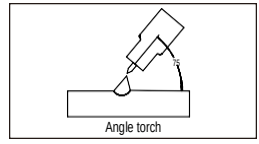


Fig. 6-1-15: Angle torch

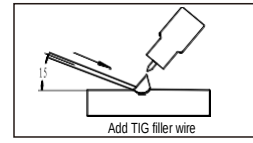


Fig. 6-1-16: Add TIG filler wire

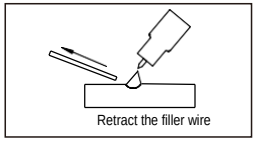


Fig. 6-1-17: Retract the filler wire

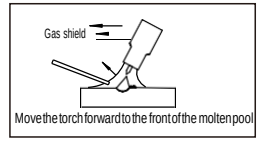


Fig. 6-1-18: Torch move

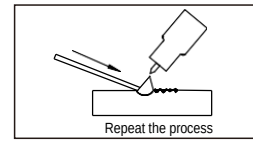


Fig. 6-1-19: Repeat the process

Tungsten Electrodes

Tungsten is a rare metallic element used for manufacturing TIG welding electrodes. The TIG process relies on tungsten's hardness and high-temperature resistance to carry the welding current to the arc. Tungsten has the highest melting point of any metal, 3,410 degrees Celsius.

Tungsten electrodes are nonconsumable and come in a variety of sizes, they are made from pure tungsten or an alloy of tungsten and other rare earth elements. Choosing the correct tungsten depends on the material being welded, the amount of amps required and whether you are using AC or DC welding current.
Follow are common used tungsten types: Thoriated, Ceriated, Lanthanated, Zirconiated

Tungsten Electrodes Rating for Welding Currents

Table 6-1-1:Tungsten electrodes rating for welding currents

Tungsten Diameter(mm)	DC Current Amps Torch Negative2% Thoriated
1.0mm	15 - 80
1.6mm	70 -150
2.4mm	150 - 250
3.2mm	250 - 400
4.0mm	400 - 500

Tungsten electrodes rating for welding currents

Tungsten Preparation

Always use DIAMOND wheels when grinding and cutting. While tungsten is a very hard material, the surface of a diamond wheel is harder, and this makes for smooth grinding. Grinding without diamond wheels, such as aluminum oxide wheels, can lead to jagged edges, imperfections, or poor surface finishes not visible to the eye that will contribute to weld inconsistency and weld defects.
Always ensure to grind the tungsten in a longitudinal direction on the grinding wheel. Tungsten electrodes are manufactured with the molecular structure of the grain running lengthwise and thus grinding crosswise is "grinding against the grain." If electrodes are ground crosswise, the electrons have to jump across the grinding marks and the arc can start before the tip and wander. Grinding
longitudinally with the grain, the electrons flow steadily and easily to the end of the tungsten tip. The arc starts straight and remains narrow, concentrated, and stable.

Table 6-1-2: Tungsten diameter rating for angle and current

Tungsten Diameter	Constant Included Angle - Degrees	Current Range Amps
1.0mm	20	05 - 30
1.6mm	25	08 - 50
1.6mm	30	10 - 70
2.4mm	35	12 - 90
2.4mm	45	15 - 150
3.2mm	60	20 - 200
3.2mm	90	25 - 250

Tungsten diameter rating for angle and current

6-2 SMAW (STICK) welding technique

One of the most common types of arc welding is manual metal arc welding (SMAW) or stick welding. An electric current is used to strike an arc between the base material and a consumable electrode rod or 'stick'. The electrode rod is made of a material that is compatible with the base material being welded and is covered with a flux that gives off gaseous vapours that serve as a shielding gas and providing a layer of slag, both of which protect the weld area from atmospheric contamination. The electrode core itself acts as filler material the residue from the flux that forms a slag covering over the weld metal must be chipped away after welding.

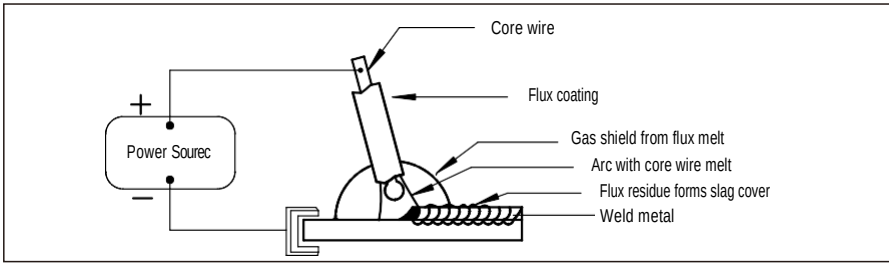


Fig. 6-2-1: Stick arc

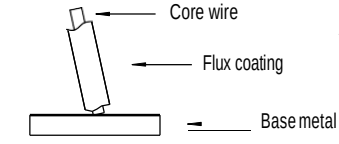


Fig. 6-2-2: ARC ignition

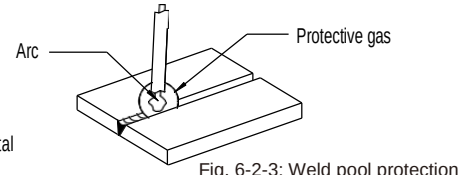


Fig. 6-2-3: Weld pool protection

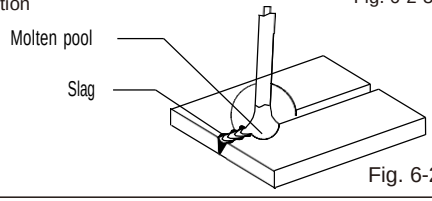


Fig. 6-2-4: Slag

The arc is initiated by momentarily touching the electrode to the base metal.
- The heat of the arc melts the surface of the base metal to form a molten pool at the end of the electrode.
- The melted electrode metal is transferred across the arc into the molten pool and becomes the deposited weld metal.
- The deposit is covered and protected by a slag which comes from the electrode coating.
- The arc and the immediate area are enveloped by an atmosphere of protective gas.

Manual metal arc (stick) electrodes have a solid metal wire core and a flux coating. These electrodes are identified by the wire diameter and by a series of letters and numbers. The letters and numbers identify the metal alloy and the intended use of the electrode.

The Metal Wire Core works as conductor of the current that maintains the arc.
The core wire melts and is deposited into the welding pool.

The covering on a shielded metal arc welding electrode is called Flux.
The flux on the electrode performs many different functions.
These include:
- producing a protective gas around the weld area
- providing fluxing elements and deoxidizers
- creating a protective slag coating over the weld as it cools
- establishing arc characteristics
- adding alloying elements

Covered electrodes serve many purposes in addition to adding filler metal to the molten pool. These additional functions are provided mainly by the covering on the electrode.

SMAW (Stick) Welding Fundamentals

Electrode Selection
As a general rule, the selection of an electrode is straight forward, in that it is only a matter of selecting an electrode of similar composition to the parent metal.However, for some metals there is a choice of several electrodes, each of which has particular properties to suit specific classes of work. It is recommend to consult your welding supplier for the correct selection of electrode.

Electrode Size

The size of the electrode generally depends on the thickness of the section being welded, and the thicker the section the larger the electrode required. The table gives the maximum size of electrodes that maybe used for various thicknesses of section base on using a general purpose type 6013 electrode.

Table 6-2-1:Electrode size

Average Thickness of Material(mm)	Maximum Recommended Electrode Diameter(mm)
1.0 - 2.0	2.5
2.0 - 5.0	3.2
5.0 - 8.0	4.0
8.0 - >	5.0

Electrode size

Welding Current (Amperage)

Correct current selection for a particular job is an important factor in arc welding. With the current set too low, difficulty is experienced in striking and maintaining a stable arc. The electrode tends to stick to the work, penetration is poor and beads with a distinct rounded profile will be deposited. Too high current is accompanied by overheating of the electrode resulting undercut and burning through of the base metal and producing excessive spatter. Normal current for a particular job may be considered as the maximum, which can be used without burning through the work, over-heating the electrode or producing a rough spattered surface.
The table shows current ranges generally recommended for a general purpose type 6013 electrode.

Table 6-2-2: Welding current (Amperage)

Electrode Size ø (mm)	Current Range (Amps)
2.5	60 - 95
3.2	100 - 130
4.0	130 - 165
5.0	165 - 260

Notes: Welding current (Amperage)

Arc Length

To strike the arc, the electrode should be gently scraped on the work until the arc is established. There is a simple rule for the proper arc length; it should be the shortest arc that gives a good surface to the weld. An arc too long reduces penetration, produces spatter and gives a rough surface finish to the weld. An excessively short arc will cause sticking of the electrode and result in poor quality welds. General rule of thumb for down hand welding is to have an arc length no greater than the diameter of the core wire.

Electrode Angle

The angle that the electrode makes with the work is important to ensure a smooth, even transfer of metal. When welding in down hand, fillet, horizontal or overhead the angle of the electrode is generally between 5 and 15 degrees towards the direction of travel. When vertical up welding the angle of the electrode should be between 80 and 90 degrees to the work piece.

Travel Speed

The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time, the electrode is fed downwards to keep the correct arc length at all times. Excessive travel speeds lead to poor fusion, lack of penetration etc, while too slow a rate of travel will frequently lead to arc instability, slag inclusions and poor mechanical properties.

Material and Joint Preparation

The material to be welded should be clean and free of any moisture, paint, oil, grease, mill scale, rust or any other material that will hinder the arc and contaminate the weld material.

Joint preparation will depend on the method used include sawing, punching, shearing, machining, flame cutting and others. In all cases edges should be clean and free of any contaminates. The type of joint will be determined by the chosen application.

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