OPERATOR'S MANUAL

ARC 180 BATTERY+CHARGER

Part No. **9027H**

IMPORTANT

Read this Operator's Manual completely before attempting to use this equipment.

Save this manual and keep it handy for quick reference.

Pay particular attention to the safety instructions we have provided for your protection.

Contact your distributor if you do not fully understand this manual.

CONTENT

§1 Safety

Notice: **The instructions are for reference only. The manufacturer reserves the right to explain the differences between the description and the product due to product changes and upgrades!**

Welding and cutting equipment can be dangerous to both the operator and people in or near the surrounding working area, if the equipment is not correctly operated. Equipment must only be used under the strict and comprehensive observance of all relevant safety regulations. Read and understand this instruction manual carefully before the installation and operation of this equipment.

§1.1 Common Safety Precautions

§1.1.1 Symbols Explanation

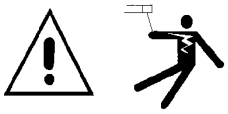
- The above symbols mean warning!

Notice! Running parts, getting an electric shock or making contacts with thermal parts will cause damage to your body and others. The underline message is as follows:

Welding is quite a safe operation after taking several necessary protection measures!

§1.1.2 Machine Operating warnings!

- The following symbols and words explanations are for some damages to your body or others, which could happen during the welding operation. While seeing these symbols, please remind yourself and others to be careful.
- Only people who are trained professionally can install, debug, operate, maintain and repair the welding equipment covered with this Operator's Manual!
- During the welding operation, non-concerned people should NOT be around, especially children!
- After shutting off the machine power, please maintain and examine the equipment according to §4 because of the DC voltage existing in the electrolytic capacitors at the output of the power supply!



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 internal machine 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 dangerous.

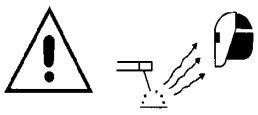
- Never touch live electrical parts.
- Wear dry, hole-free gloves and clothes to insulate your body.
- Be sure to install the equipment correctly and ground the work or metal to be welded to a good electrical (earth) ground according to the operation manual.
- The electrode and work (or ground) circuits are electrically “hot” when the machine is ON. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
- Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- Be Careful when using the equipment in small places, falling-off and wet circumstance.
- Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- Never dip the electrode in water for cooling.
- Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- When working above the floor level, use a safety belt to protect yourself from a fall should you get an electric shock!

FUMES AND GASES CAN BE DANGEROUS.

Smoke and gas generated whilst welding or cutting can be harmful to people’s health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Do not breathe the smoke and gas generated whilst welding or cutting, keep your head out of the fumes. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below the Threshold Limit Values using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.
- Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- Shielded gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet and follow your employer's safety practices.



ARC RAYS: Harmful to people's eyes and skin.

Arc rays from the welding process produce intense visible and invisible ultraviolet and infrared rays that can burn eyes and skin.

- Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding.
- Use suitable clothing made from durable flame-resistant material to protect your skin and that of your coworkers from the arc rays.
- 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 metal.

SELF-PROTECTION

- Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

• Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

 **DO NOT** add any fuel near an open-flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

 **WELDING SPARKS can cause fire or explosion.**

Welding on closed containers, such as tanks, drums, or pipes, can cause them to explode. Flying sparks from the welding arc, hot work piece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding

• Remove fire hazards material from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

• Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situation.

• When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

• Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”.

• Vent hollow castings or containers before heating, cutting or welding. They may explode.

• Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuff less trousers, boots· and a cap over your hair. Wear earplugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

• Connect the work cable to the work as close to the welding area as practical. Work

area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

Rotating parts may be dangerous.

- Use only compressed gas cylinders containing the correct shielding gas for the process used and 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.
- Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - At a safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a gas cylinder.
- Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

Gas Cylinders.

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

- Protect gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames sparks, and arcs.
- Insure cylinders are held secure and upright to prevent tipping or falling over.
- Never allow the welding electrode or earth clamp to touch the gas cylinder, do not drape welding cables over the cylinder.
- Never weld on a pressurised gas cylinder, it will explode and kill you.
- Open the cylinder valve slowly and turn your face away from the cylinder outlet valve and gas regulator.

Gas build up.

The build up of gas can causes a toxic environment, deplete the oxygen content in the air resulting in death or injury. Many gases use in welding are invisible and odourless.

- Shut off shielding gas supply when not in use.
- Always ventilate confine spaces or use approved air-supplied respirator.

Electric and Magnetic Fields.

Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). The discussion on the effect of EMF is ongoing in the entire world. Up to now, no material evidences show that EMF may have effects on health. However, the research on the effect of EMF is still ongoing. Before any conclusion, we should minimize exposure to EMF as few as possible.

In order to minimize EMF, we should use the following procedures:

- Route the electrode and work cables together – Secure them with tape when possible.
- All cables should be put away and far from the operator.
- Never coil the power cable around your body.
- Make sure welding machine and power cable to be far away from the operator as far as possible according to the actual circumstance.
- Connect the work cable to the workpiece as close as possible to the area being welded.
- The people with heart-pacemaker should be away from the welding area.

Noise can damage hearing.

Noise from some processes or equipment can damage hearing. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.


Hot parts.

Items being welded generate and hold high heat and can cause severe burns. Do not touch hot parts with bare hands. Allow a cooling period before working on the welding gun. Use insulated welding gloves and clothing to handle hot parts and prevent burns.

§1.1.3 EMC device classification


Radiation Class A Device.

- Only can be used in the industrial area
- If it is used in other area, it may cause connection and radiation problems of circuit.

Radiation Class B device.

- It can meet the radiation requirements of residential area and industrial area. It also can be used in residential area which power is supplied by public low voltage circuit.

EMC device can be classified by power nameplate or technical data.

Hi-zone welding machines belong to Class A.

§1.1.4 EMC measure

In the special situation, the specified area may be affected, the standard of radiation limit value has been complied with (eg: The device, which is easy effected by electromagnetism, is used at the installation location, or there is radio or TV near the installation location). In this condition, the operator should adopt some appropriate measures to remove interference.

According to the domestic and international standards, the ambient devices' electromagnetism situation and anti-interference ability must be checked:

- Safety device
- Power line, Signal transmission line and Date transmission line
- Date processing equipment and telecommunication equipment
- Inspection and calibration device

The effective measures avoid the problem of EMC:

a) Power source

Even though the power source connection meet rules, we still need to take additional

measure to remove the electromagnetic interference. (eg: Use the right power filter.)

b) The welding line

- Try to shorten the length of cable
- Put the cable together
- Be Far away from other cable

c) Equipment connection

d) Ground connection of work-piece

e) When necessary, use appropriate capacitance to connect the ground

e) Shielding, when necessary

- Shield the ambient devices
- Shield the whole welding machine

§1.2 Battery Safety Precautions

Please note before use!

- During operation keep everyone, especially children, away.
- Use battery only with equipment with which it was supplied.
- Never use or store the battery in extremely hot or humid conditions. See the Owner`s Manual for specific operating and storage information.
- Never open, puncture, repair, disassemble, or modify the battery.

Inflammable and explosive!

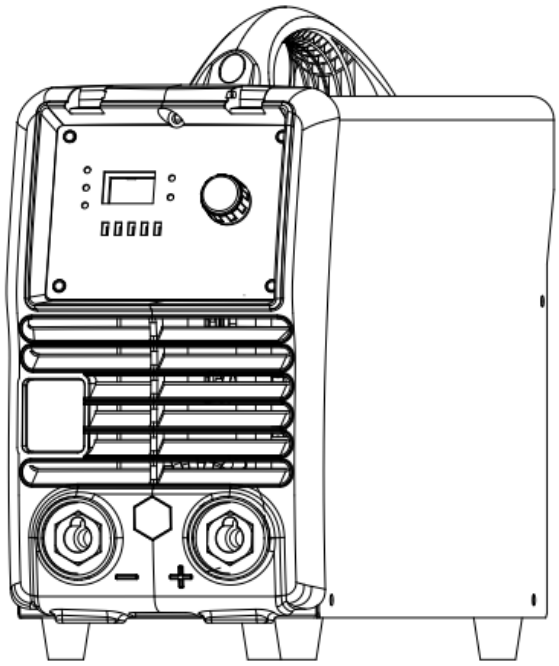
- Never install or place charger on, over, or near combustible surfaces.
- Keep battery away from fire, out of direct sunlight, and away from other sources of heat.
- Never use or charge the battery if it has been dropped or damaged.
- Never overcharge a battery or charge battery longer than specified (if charger is not equipped with automatic shutoff). See the Owner`s Manual for specific information on battery charging.
- Do not allow tools, conductive materials, or other objects to touch both battery terminals at the same time.
- Keep battery away from sources of high voltage.

§2 Overview

§2.1 Features

- **Performance**

1. Built in high-performance lithium-ion battery, convenient for use in various environments.
2. Extremely low weight and versatility.
3. MMA, VRD and TIG welding modes are available to meet different welding requirements.



- **Interface design**

1. More user friendly.
2. With an image of electricity display, you can always know the remaining battery power.
3. Variable amperage control with digital meter, for a simultaneous welding current display.

- **Protection mechanism**

1. Equipped with temperature, voltage and current sensors for high protection.
2. Fully protected against over-voltage, under-voltage and over-heat.
3. Battery protection is set inside to prevent the battery from overheating.

§2.2 Brief Introduction

The traditional inverter welding machine the Pulse Width Modulation (PWM) technology and the Insulated Gate Bipolar Transistor (IGBT) power modules. This kind of welding machine is not only bulky and bulky, but also relies heavily on 220~400V AC input, which is not easy to move, making it impossible for workers to use the welding machine in high mountains, steep cliffs, narrow or places without power supply network.

Therefore, in this case, the lithium battery welding machine came into being. The ARC 180 BATTERY series uses large capacity and high conversion efficiency lithium battery to store electric energy and provide energy input for the welding machine, so that the welding machine can work continuously.

The ARC 180 BATTERY series is small in size and light in weight, which is convenient for the operator to carry around. The appearance and operation interface design is humanized, with battery power display function, convenient to observe the remaining power at any time. In addition, it has a variety of welding modes, which can be selected by the operator according to the actual situation.

The ARC 180 BATTERY series has excellent performance: constant current output make welding arc more stable; fast dynamic response speed reduces the impact from the arc length fluctuation to the current; accurate stepless current adjustment and pre-setting function. There are also some automatic protection functions for under voltage, over current, over heat, etc. inside the welder, when the problems listed before occurred, It can self-protect, prolong the usefull life, greatly improved the reliability and practicality of the welding machine.

§2.3 Technical Data

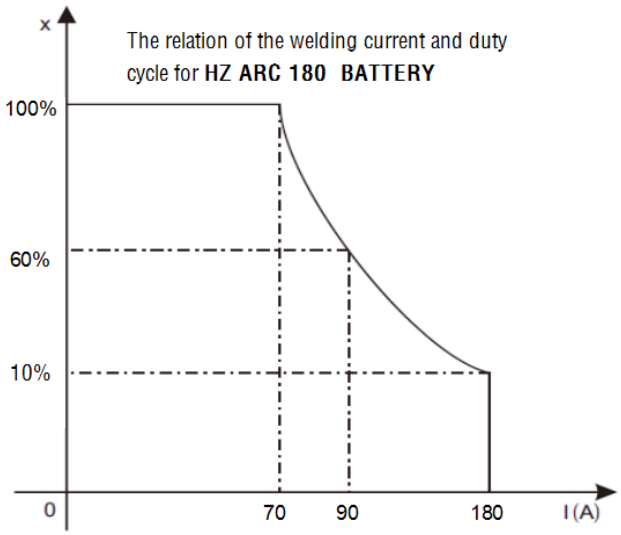
Models / Parameters	HZ ARC 180 BATTERY	
Battery Type	Lithium ion	
Battery Capacity (WH)	740	
AC Charging voltage (V)	230V±10%	
Charging Time (H)	1.5	
Rated Voltage of battery (V)	74	
Charging current (A)	8	
	MMA	TIG
No Load Voltage (V)	83.5	83.0
Duty cycle (40℃ 10 min)	10% 180A 60% 90A 100% 70A	
Welding Current Range (A)	Electricity>40%	Electricity≤40%
	10~180	10~150
Protection class	IP21S	
Cooling	AF	
Weight (Kg)	11.57	
Dimensions (mm)	440*150*280	

Electrode (mm)	Φ2.5*350	Φ3.2*350	Φ4.0*350
Welding capability (PCS)	15, 75A	8, 120A	4, 150~180A

Note: The above parameters are subject to change with future machine improvement!

§2.4 Duty cycle and Over-heat

"X" stands for Duty Cycle, which is defined as the portion of the time a welding machine can weld continuously with its rated output current within a certain time cycle (10 minutes).

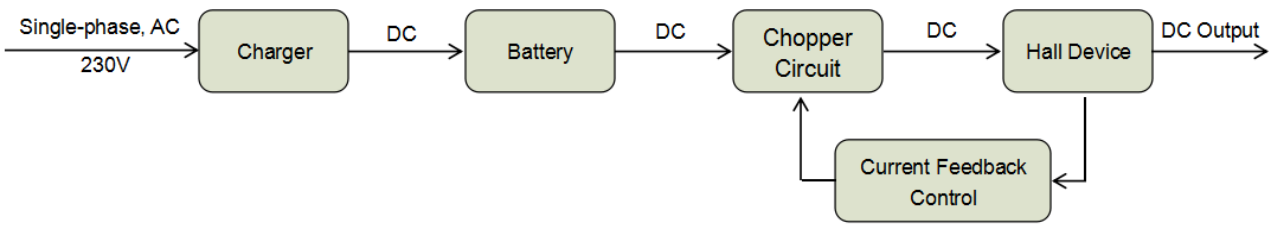


The relation between the duty cycle "X" and the output welding current "I" is shown as the right figure.

If the welding machine is overheating, the IGBT over-heat protection sensing will send a signal to the welding machine control unit to cut the output welding current off and light the over-heat pilot lamp on the front panel. In that case, the machine should not be welding for 10~15 minutes to cool down with the fanrunning. When operating the machine again, the welding output current or the duty cycle should be reduced.

§2.5 Working Principle

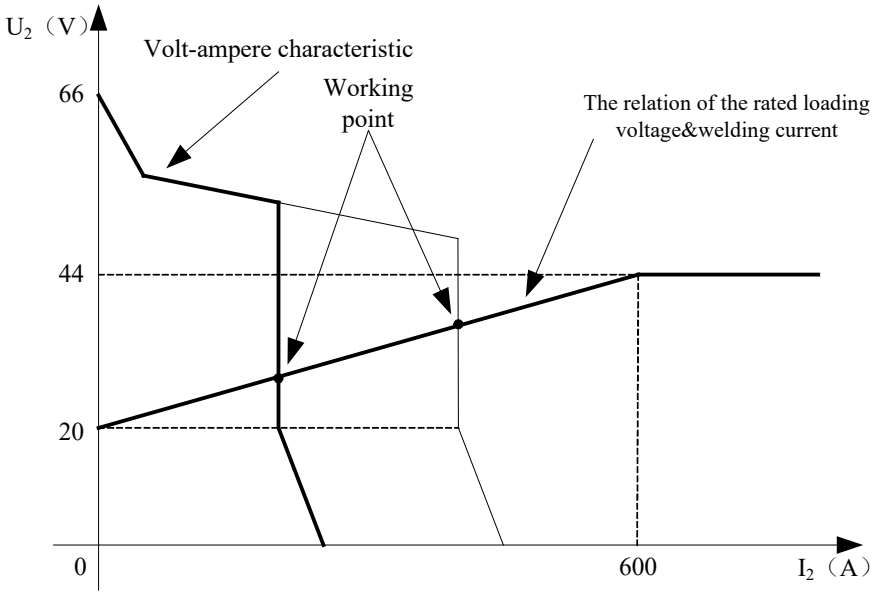
The working mode of HZ ARC BATTERY series products is shown in the figure below. Single-phase 230V AC is converted to DC (about 74V) by a charger and then stored in a lithium battery pack inside the welder. The circuit mainly uses current feedback technology and chopper circuit to ensure the output current is stable and is outputted by resistance. At the same time, the current parameters can be adjusted to ensure the ideal welding effect.



§2.6 Volt-Ampere Characteristic

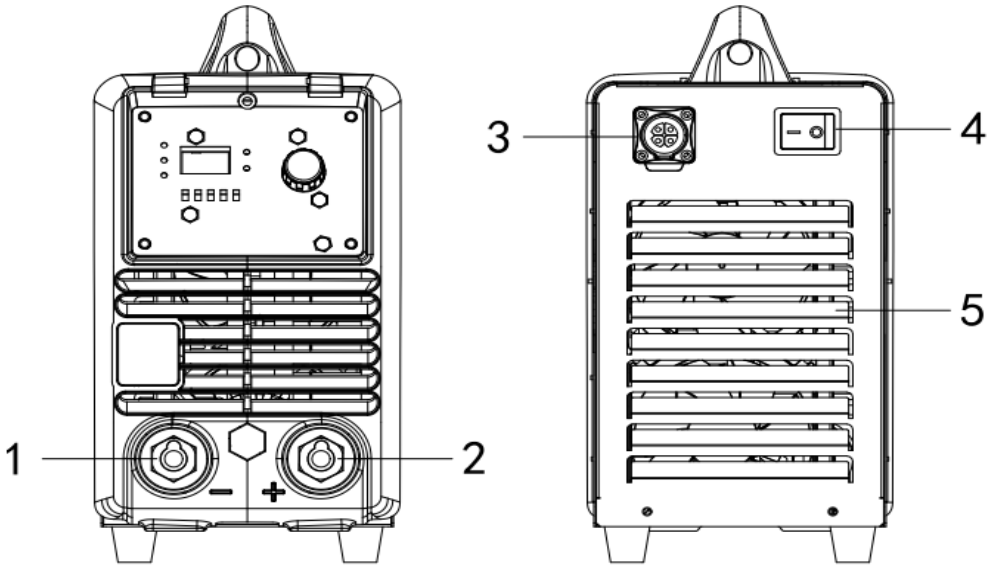
The ARC 180 BATTERY series has excellent volt-ampere characteristic. Referring to the following graph. In MMA welding, the relation between the rated loading voltage U2 and welding current I2 is as follows:

When $I_2 \leq 600A$, $U_2 = 20 + 0.04\ I_2$ (V); When $I_2 > 600A$, $U_2 = 44$ (V).



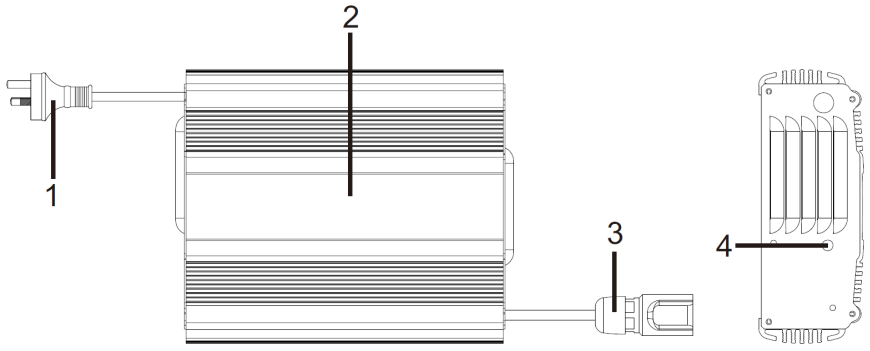
§3 Installation & Operation

§3.1 Layout for the Front and Rear Panel



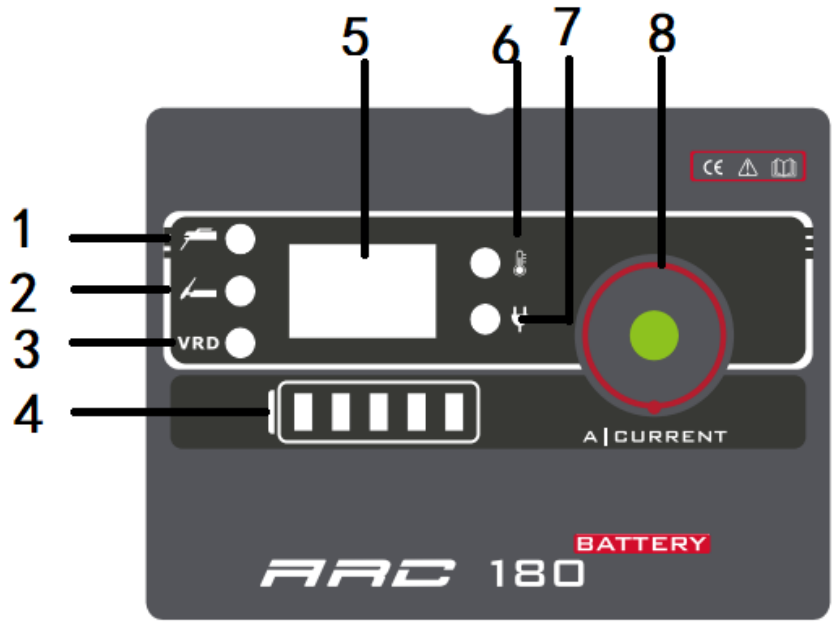
1. **“-” Output terminal.**
2. **“+” Output terminal.**
3. **Charging port**: Connect charger and charge internal battery with charger.
4. **Power switch**: control power through and break.
5. **Fan**: Take away heat to cool the machine.

§3.2 Layout for Charger



1. **Power socket**: Connect the AC power grid to supply the charger.
2. **Charger.**
3. **Charging socket**: Connect the charging port of the machine and charge the battery.
4. **Status indicator**: The red breathing light indicates ready for charging, the red light indicates charging, the green light indicates full battery, and the green breathing light indicates standby.

§3.3 Layout for the Control Panel



1. **MMA welding mode indicator**.
2. **TIG LIFT indicator**.
3. **VRD welding mode indicator**.
4. **Battery display.***
5. **Current display.***
6. **Alarm indicator**: When over voltage, over current, or overheating occurs, the indicator lights on.
7. **Power indicator**: When the machine is powered on, the indicator lights on.
8. **Current knob**: Rotate it to adjust welding current, and press it to select welding mode.

*** Denotes more detailed explanation of function to follow.**

Further Controls Explained

Current display (3)

Under normal conditions, the regulated current value will be displayed. During welding, the welding current will be displayed. When abnormal conditions occur, the error code will be displayed.

VRD welding mode indicator (5)

In VRD welding mode, the no-load voltage is relatively low, so as to reduce the risk of electric shock, avoid accidents and property losses.

Battery display (8)

It can clearly display the remaining power of the internal battery under the current state. Battery display has 5 grids in total, each grid represents 20% of the power, and the full state is 100% of the power. When the power is cleared or insufficient, the machine will shut down by itself.

NOTE: When the power is sufficient, the maximum output current is 180A. When the remaining power is less than 40% (i.e. the number of grids is less than 2), the maximum output current is 150A.

§3.4 Installation for MMA Welding

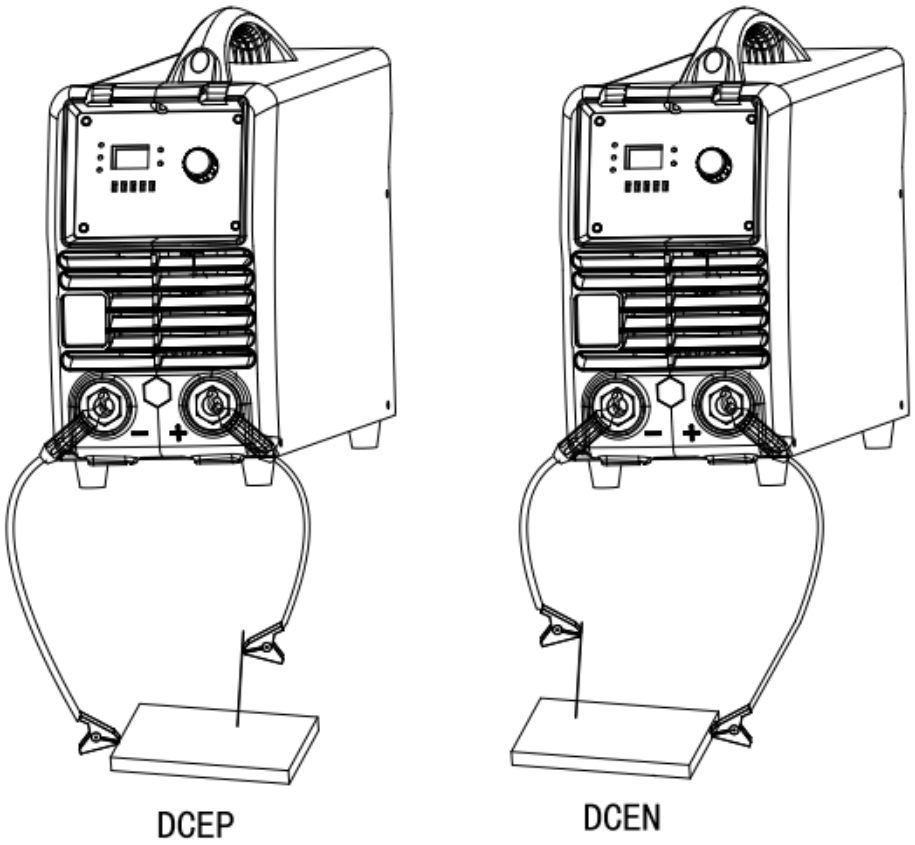
§3.4.1 Set up installation for MMA Welding

Connection of Output Cables

Two sockets are available on this welding machine. For MMA welding the electrode holder is shown be connected to the positive socket, while the earth lead (work piece) is connected to the negative socket, this is known as DCEP. However various electrodes require a different polarity for optimum results and careful attention should be paid to the polarity, refer to the electrode manufacturer's information for the correct polarity.

DCEP: Electrode connected to "+" output socket.

DCEN: Electrode connected to "-" output socket.



(1) Switch the ON/OFF Switch to OFF;
(2) Connect the earth lead to “-”, tighten clockwise;
(3) Connect the electrode lead to “+”, tighten clockwise;

§3.4.2 Operation for MMA Welding

(1) Make sure that the battery power is sufficient. You can know the power by observing Battery display. If the power is low, please charge as soon as possible.
(2) Turn the power switch, so that the power switch is “ON” position, then the power indicator light, the fan comes on, the device work properly.
(3) Select the MMA or VRD function by press the current knob.
(4) Set the welding current relevant to the electrode type and size being used as recommended by the electrode manufacturer.
(5) Place the electrode into the electrode holder and clamp tight.
(6) Strike the electrode against the work piece to create and arc and hold the electrode steady to maintain the arc.
(7) Commence welding. If necessary, readjust the welding current to obtain the welding condition required.
(8) After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.
(9) Switch the ON/OFF Switch to the OFF position.

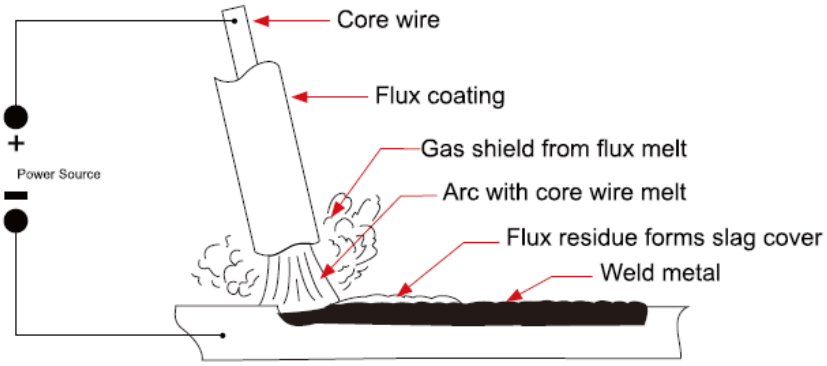
NOTE:

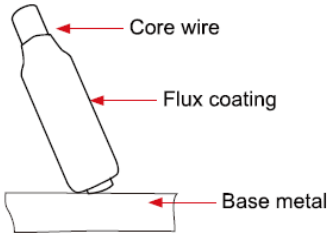
- Note the polarity of wiring, the general DC welding wire in two ways. Selected according to the technical requirements of welding the appropriate connection, if you choose incorrectly will result in arc instability and spatter large adhesion and other phenomena, such cases can be quickly reversed to joints.
- If the work piece distance from the welding machine, the second line (electrode holder and ground) is longer, so choose the appropriate conductor cross-sectional area should be larger to reduce cable voltage drop.

§3.4.3 MMA Welding

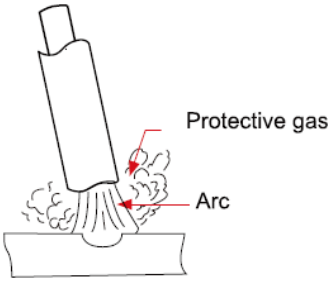
One of the most common types of arc welding is manual metal arc welding (MMA) or stick welding. An electric current is used to strike an arc between the base material and a consumable electrode rod or ‘stick’. The electrode rod is made of a material that is compatible with the base material being welded 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 slag covering over the weld metal must be chipped away after welding.





- 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.

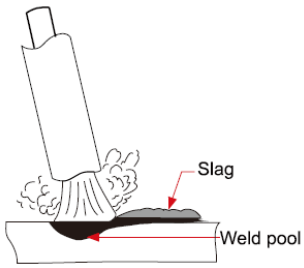


- The deposit is covered and protected by a slag which comes from the electrode coating.
- The arc and the immediate area are enveloped by an atmosphere of protective gas.

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 deoxidizer
- 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 filler metal to the molten pool. These additional functions are provided mainly by the covering on the electrode.

§3.4.4 MMA 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

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

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 may be used for various thicknesses of section base on using a general purpose type 6013 electrode.

■ Welding Current (Amperage)

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

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 astable 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.

■ 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

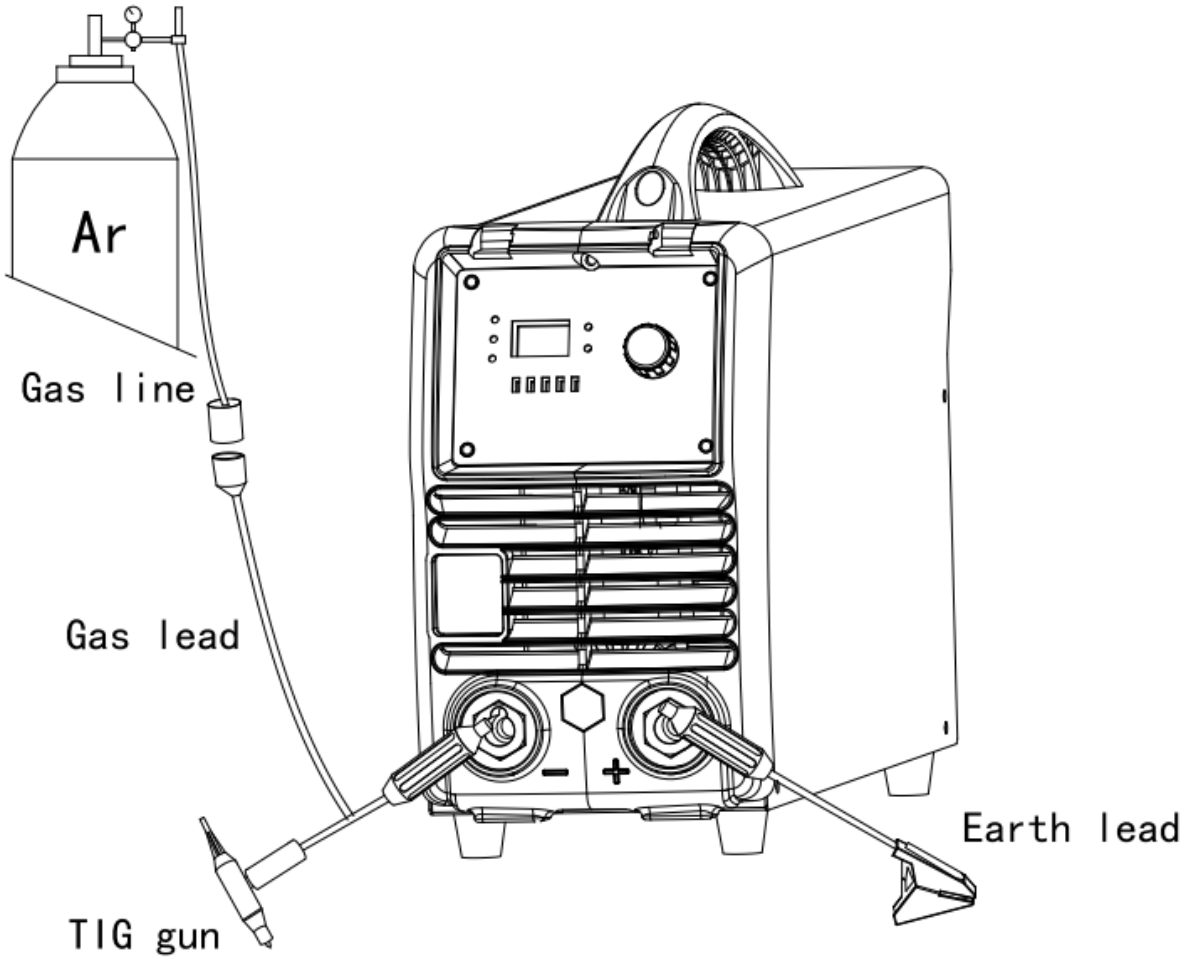
The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time, the electrode is fed downwards to keep the correct arc length at all times. Excessive travel speeds lead to poor fusion, lack of penetration etc, while 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 case, sedges should be clean and free of any contaminates. The type of joint will be determined by the chosen application.

§3.5 Installation & Operation for TIG Welding

§3.5.1 Set up installation for TIG Welding



(1) Switch the ON/OFF Switch to OFF;
(2) Connect the earth lead to “+”, tighten clockwise;
(3) Connect the TIG torch cable to “-”, tighten clockwise;
(4) Using a secured Argon cylinder, slowly crack open then close the cylinder valve while standing off to the side of the valve. This will remove any debris that may be around the valve & regulator seat area;
(5) Install the regulator and tighten with a wrench;
(6) Connect the gas hose to the outlet of the Argon regulator, and tighten with a wrench;
(7) Be sure the gas valve on the torch is closed, and slowly open the Argon Cylinder Valve to the fully open position;
(8) Connect the ground clamp to your work piece;
(9) Plug the power cable into the appropriate outlet.

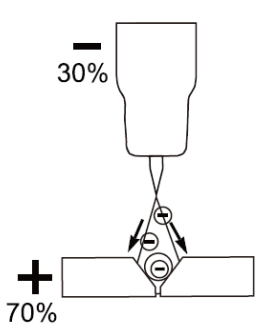
NOTE:

- When TIG operation, the shielded gas is inputted to welding gun directly.
- Secure the gas cylinder in an upright position by chaining them to a stationary support to prevent falling or tipping.

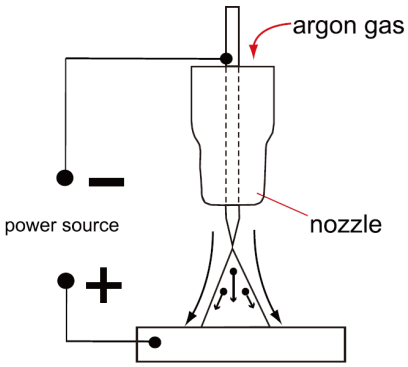
§3.5.2 Operation for TIG Welding

(1) Make sure that the battery power is sufficient. You can know the power by observing Battery display. If the power is low, please charge as soon as possible.
(2) Turn the power switch to the “ON” position, the power indicator should illuminate, the fan comes on, the device work properly.
(3) Select the LIFT TIG function by press the current knob.
(4) Rotate the current knob to the desired amperage.
(5) The tungsten must be ground to a blunt point in order to achieve optimum welding results. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning.
(6) Install the tungsten with approximately 3mm to 7mm sticking out from the gas cup, ensuring you have correct sized collet.
(7) Tighten the back cap.
(8) Commence welding. If necessary, readjust the welding current to obtain the welding condition required.
(9) After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.
(10) Switch the ON/OFF Switch to the OFF.

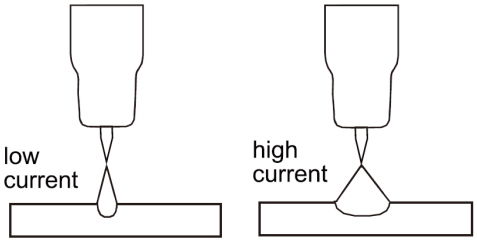
§3.5.3 DC TIG Welding



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 torch will be connected to (this rule applies to all the other forms of DC welding as well).

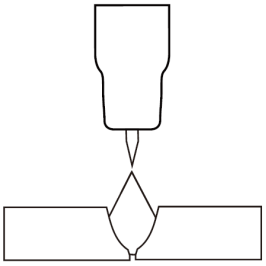


DC TIG welding is a process in which an arc is struck between a TUNGSTEN electrode and the metal work piece. The weld area is shielded by an inert gas flow to prevent contamination of the tungsten, molten pool and weld area. When the TIG arc is struck the inert gas is ionized and superheated changing its 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 19,000°C. 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.

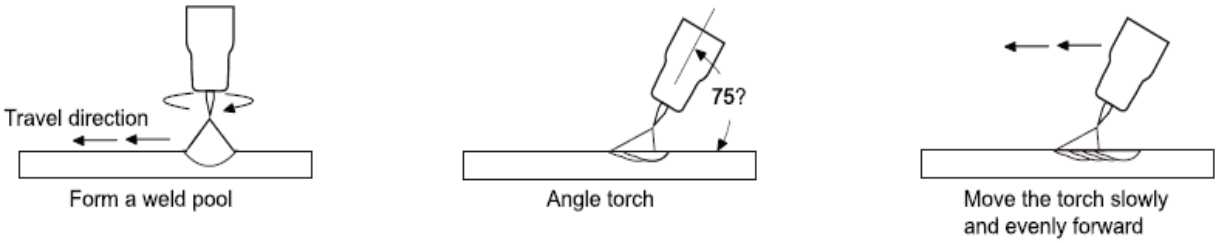


The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material so less current (amps) is required, thicker material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

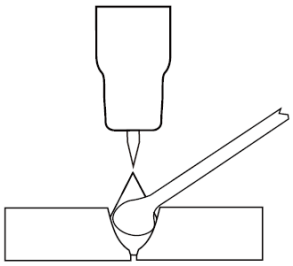
§3.5.4 TIG Welding Fusion Technique



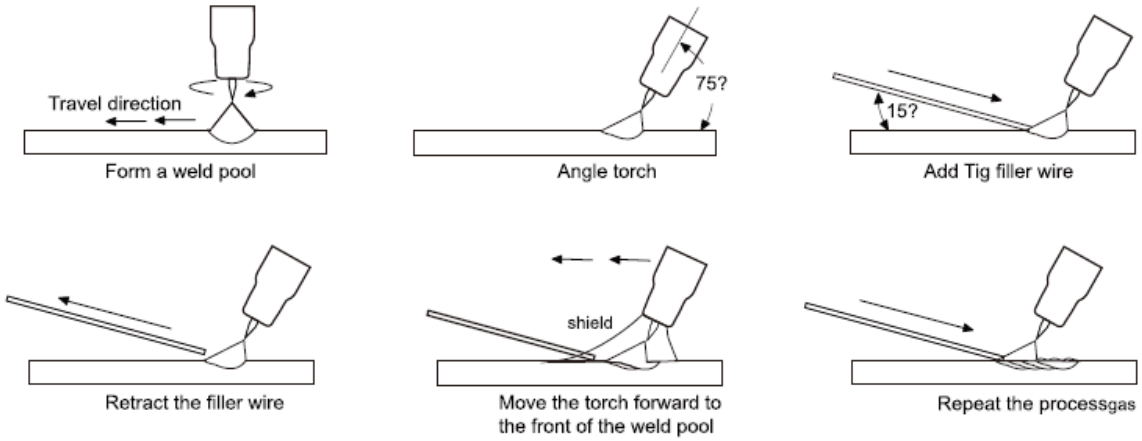
Manual TIG welding is often considered the most difficult of all the welding processes. Because the welder must maintain a short arc length, great care and skill are required to prevent contact between the electrode and the work piece. Similar to Oxygen Acetylene torch welding, TIG welding normally requires 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.



TIG Welding with Filler Wire Technique



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 oxidized and contaminating the weld pool.



§3.5.5 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 non-consumable 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, amps required and whether you are using AC or DC welding current. Tungsten electrodes are color-coded at the end for easy identification. Below are the most commonly used tungsten electrodes found in the New Zealand and Australian market.

Thoriated 

Thoriated tungsten electrodes (AWS classification EWTh-2) contain a minimum of 97.30 percent tungsten and 1.70 to 2.20percent thorium and are called 2 percent thoriated. They are the most commonly used electrodes today and are preferred for their longevity and ease of use. Thorium however is a low-level radioactive hazard and many users have switched to other alternatives. Regarding the radioactivity, thorium is an alpha emitter but when it is enclosed in a tungsten matrix the risks are negligible. Thoriated tungsten should not get in contact with open cuts or wounds. The more significant danger to welders can occur when thorium oxide gets into the lungs. This can happen from the exposure to vapours during welding or from ingestion of material/dust in the grinding of the tungsten. Follow the manufacturer's warnings, instructions, and the Material Safety Data Sheet (MSDS) for its use.

E3 (Color Code: Purple) 

E3 tungsten electrodes (AWS classification EWG) contain a minimum of 98% percent tungsten and up to 1.5 percent Lanthanum and small percentages of Zirconium and Yttrium they are called E3 Tungsten. E3 Tungsten Electrodes provide conductivity similar to that of thoriated electrodes. Typically, this means that E3 Tungsten Electrodes are exchangeable with thoriated electrodes without requiring significant welding process changes. E3 deliver superior arc starting, electrode lifetime, and overall cost-effectivenes. When E3 Tungsten Electrodes are compared with 2% thoriated tungsten, E3 requires fewer re-grinds and provides a longer overall lifetime. Tests have shown that ignition delay with E3 Tungsten Electrodes actually improves over time, while 2% thoriated tungsten starts to deteriorate after only 25 starts. At equivalent energy output, E3 Tungsten Electrodes run cooler than 2% thoriated tungsten, thereby extending overall tip lifetime. E3 Tungsten Electrodes work well on AC or DC. They can be used DC electrode positive or negative with a pointed end, or balled for use with AC power sources.

Ceriated (Color Code: Orange) 

Ceriated tungsten electrodes (AWS classification EWCe-2) contain a minimum of 97.30 percent tungsten and 1.80 to 2.20percent cerium and are referred to as 2 percent ceriated. Ceriated tungsten performs best in DC welding at low current settings. They have excellent arc starts at low amperages and become popular in such applications as orbital tube welding, thin sheet metal work. They are best used to weld carbon steel, stainless steel, nickel alloys, and titanium, and in some cases it can replace 2 percent thoriated electrodes. Ceriated tungsten is best suited for lower amperages it should last longer than Thoriated tungsten higher amperage applications are best left to Thoriated or Lanthanated tungsten.

Lanthanated (Color Code: Gold) 

Lanthanated tungsten electrodes (AWS classification EWLa-1.5) contain a minimum of 97.80 percent tungsten and 1.30percent to 1.70 percent lanthanum, and are known as 1.5 percent lanthanated. These electrodes have excellent arc starting, a low burn off rate, good arc stability, and excellent re-ignition characteristics. Lanthanated tungsten also share the conductivity characteristics of 2 percent thoriated tungsten. Lanthanated tungsten electrodes are ideal if you want to opti-mise your welding capabilities. They work well on AC or DC electrode negative with a pointed end, or they can be balled for use with AC sine wave power sources. Lanthanated tungsten maintains a sharpened point well, which is an advantage for welding steel and stainless steel on DC or AC from square wave power sources.

Zirconiated (Color Code: White) 

Zirconiated tungsten electrodes (AWS classification EWZr-1) contain a minimum of 99.10 percent tungsten and 0.15 to 0.40percent zirconium. Most commonly used for AC welding Zirconiated tungsten produces a very stable arc and is resistant to tungsten spitting. It is ideal for AC welding because it retains a balled tip and has a high resistance to contamination. Its current-carrying capacity is equal to or greater than that of thoriated tungsten. Zirconiated tungsten is not recommended for DC welding.

Tungsten Electrodes Rating for Welding Currents

Tungsten Diameter mm	DC Current Amps Torch Negative 2% Thoriated	AC Current Amps Un-Balanced Wave 0.8% Zirconiated	AC Current Amps Balanced Wave 0.8% Zirconiated
1.0mm	15~80	15~80	20~60
1.6mm	70~150	70~150	60~120
2.4mm	150~250	140~235	100~180
3.2mm	250~400	225~325	160~250
4.0mm	400~500	300~400	200~320

§3.5.6 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.

Electrode Tip/Flat

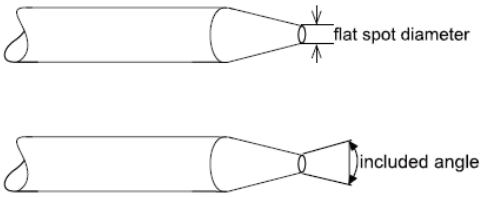
The shape of the tungsten electrode tip is an important process variable in precision arc welding. A good selection of tip/flat size will balance the need for several advantages. The bigger the flat, the more likely arc wander will occur and the more difficult it will be to arc start. However, increasing the flat to the maximum level that still allows arc start and eliminates arc wonder will improve the weld penetration and increase the electrode life. Some welders still grind electrodes to a sharp point, which makes arc starting easier. However, they risk decreased welding performance from melting at the tip and the

possibility of the point falling off into the weld pool.

Electrode Included Angle/Taper - DC Welding

Tungsten electrodes for DC welding should be ground longitudinally and concentrically with diamond wheels to a specific included angle in conjunction with the tip/flat preparation. Different angles produce different arc shapes and offer different weld penetration capabilities. In general, blunter electrodes that have a larger included angle provide the following benefits:

• Last Longer
• Have better weld penetration
• Have a narrower arc shape
• Can handle more amperage without eroding.



Sharper electrodes with smaller included angle provide:

• Offer less arc weld
• Have a wider arc
• Have a more consistent arc

The included angle determines weld bead shape and size. Generally, as the included angle increases, penetration increases and bead width decreases.

Tungsten Diameter	Diameter at the Tip - mm	Constant Included Angle - Degrees	Current Range Amps	Current Range Pulsed Amps
1.0mm	.250	20	5~30	5~60
1.6mm	.500	25	8~50	5~100
1.6mm	.800	30	10~70	10~140
2.4mm	.800	35	12~90	12~180
2.4mm	1.100	45	15~150	15~250
3.2mm	1.100	60	20~200	20~300
3.2mm	1.500	90	25~250	25~350

§3.6 Operation environment

▲ Height above sea level ≤1000 M.

▲ Operation temperature range: -10 ~ +40°C.

▲ Air relative humidity is below 90% (20°C).

▲ Preferable site the machine some angles above the floor level, the maximum angle does not exceed 15℃.

▲ Protect the machine against heavy rain and against direct sunshine.

▲ The content of dust, acid, corrosive gas in the surrounding air or substance cannot exceed normal standard.

▲ Take care that there is sufficient ventilation during welding. There must be at least 30cm free distance between the machine and wall.

§3.7 Operation Notices

▲ Read Section §1 carefully before starting to use this equipment.

▲ Connect the ground wire with the machine directly.

▲ Before operation, none concerned people should not be around the working area and especially children. Do not watch the arc in unprotected eyes.

▲ Ensure good ventilation of the machine to improve Duty Cycle.

▲ Turn off the engine when the operation finished for energy consumption efficiency.

▲ When power switch shuts off protectively because of failure. Don’t restart it until problem is resolved. Otherwise, the range of problem will be extended.

▲ In case of problems, contact your local dealer if no authorized maintenance staff is available!

§4 Maintenance & Troubleshooting

§4.1 Maintenance

In order to guarantee safe and proper operation of welding machines, they must be maintained regularly. Let customers understand the maintenance procedure of welding machines. Enable customers to carry on simple examination and inspections. Do your best to reduce the fault rate and repair times of welding machines to lengthen service life of arc welding machine. Maintenance items in detail are in the following table.

● **Warning: For safety while maintaining the machine, please shut off the main input power and wait for 5 minutes, until capacitors voltage already drop to safe voltage 36V!**

Date	Maintenance items
Daily examination	Observe that the knobs and switches in the front and at the back of arc welding machine are flexible and put correctly in place. If any knob has not been put correctly in place, please correct. If you can't correct or fix the knob, please replace immediately. If any switch is not flexible or it can't be put correctly in place, please replace immediately! Please get in touch with maintenance service department if there are no accessories. After turn-on power, watch/listen if the arc-welding machine has shaking, whistle calling or peculiar smell. If there is one of the above problems, find out the reason and clear it. If you can't find out the reason, please contact your local service repair station or distributor/Agent. Observe that the display value of LED is intact. If the display number is not intact, please replace the damaged LED. If it still doesn't work, please maintain or replace the display PCB. Observe that the min./max.Values on LED agree with the set value. If there is any difference and it has affected the normal welding results, please adjust it. Check whether the fan is damaged and whether it is normal to rotate or control. If the fan is damaged, please change immediately. If the fan does not rotate after the machine is overheated, observe if there is something blocking the blade. If it is blocked, please clear the problem. If the fan does not rotate after getting rid of the above problems, you can poke the blade by the rotation direction of fan. If the fan rotates normally, the start capacity should be replaced. If not, change the fan. Observe whether the fast connector is loose or overheated. If the arc-welding machine has the above problems, it should be fastened or changed. Observe whether the current output cable is damaged. If it is damaged, it should be insulated or changed.
Monthly examination	Using the dry compressed air to clear the inside of arc welding machine. Especially for clearing up the dusts on radiator, main voltage transformer, inductors, IGBT modules, fast recover diodes, PCB's, etc. Check screws and bolts in machine. If loose, please screw it tight. If it is shaved, please replace. If it is rusty, please erase rust on all bolts to ensure it works well.
Quarter-yearly examination	Check whether the actual current accords with the displaying value. If they did not accord, they should be regulated. The actual welding current value can be measured by and adjusted by plier-type ampere meter.
Yearly examination	Measure the insulating impedance among the main circuit, PCB and case, if it below 1MΩ, insulation is thought to be damaged and need to change, and need to change or strengthen insulation.

§4.2 Troubleshooting

- **Before the welding machines are dispatched from the factory, they have already been tested and calibrated accurately. It is forbidden for anyone who is not authorized by our company to do any change to the equipment!**
- Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- Only professional maintenance staff that is authorized by our company could overhaul the machine!
- **Be sure to shut off the Main Input Power before doing any repair work on the welding machine!**
- If there is any problem and there is no authorized professional maintenance personal on site, please contact local agent or the distributor!

If there are some simple troubles with the welding machine, you can consult the following Chart:

S/N	Troubles	Reasons	Solutions
1	Turn on the power source, and fan works, but the power light is not on.	The power light damaged or connection is not good	Test and repair the inside circuit of power light
		Power PCB failures	Repair or change power PCB Pr2
2	Turn on the power source, and the power light is on, but fan doesn't work	There is something in the fan	Clear out
		The fan motor damaged	Change fan motor
3	Turn on the power source, and the power light is not on, and fan doesn't work	No input voltage	Check whether the battery is fully charged
4	No no-load voltage output	There is trouble inside the machine	Check the main circuit, Pr1 and Pr2
5	No current output in the welding	Welding cable is not connected with the two output of the welder.	Connect the welding cable to the welder's output
		Welding cable is broken	Wrap, repair or change the welding cable
		Earth cable is not connected or loosen	Check the earth clamp
6	Not easy to start arc in the welding, or easy to cause sticking	The plug loosen or connect not well	Check and tighten the plug
		Oil or dust covered the workpiece	Check and clear out
		Wrong mode selected	Check the MMA selector switch is selected
7	The arc is not stable in the welding process	The arc force is too small	Increase the arc force

8	The welding current cannot be adjusted	Welding current potentiometer in the front panel connection not so good or damaged		Repair or change the potentiometer
9	The penetration of molten pool is not enough(MMA)	The welding current adjusted too low		Increase the welding current
		The arc force adjusted too small		Increase the arc force
10	Arc blow	Airflow disturbance		Use the shelter from airflow
		The electrode eccentricity		Adjust the electrode angle
				Change the electrode
		Magnetic effect		Incline the electrode to the opposite way of the magnetic blow
				Change the position of earth clamp or add earth cable in the two side of workpiece
				Use the short arc operation
11	The alarm light is on	Over heat protection	Over welding current	Induce the welding current output
			Working time too long	Induce the duty cycle (interval work)
		Over current protection	Unusual current in the main circuit	Test and repair the main circuit and drive PCB (Pr1)

§4.2.1 Battery trouble shooting

The following chart addresses some of the common problems of battery. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

NO.	Trouble	Possible Reason
1	Battery Overheating	Slight short circuit in lithium battery
		Use time is too long
2	End of sudden discharge	The power in the lithium battery is discharged, and the self-protection function is turned on, resulting in power failure
		The protection function of the protection circuit is not recovered or fails, and the lithium battery is short circuited to the outside of the consumer
3	Unable to charge	Damaged protection circuit or controller
		Line disconnection
4	Battery short circuit	Battery package and diaphragm paper are broken
5	Discharge too fast	The battery began to age, and the internal resistance was too large, resulting in the reduction of the effective capacity
6	Charge too slowly	Charger damaged
		The battery began to age, and the internal resistance was too large, resulting in the reduction of the effective capacity
7	Volume expansion	Longer service life and shorter battery life
		Battery temperature too high
8	Battery explosion	There is a fault (overcharge) in the capacity dividing cabinet
		Poor diaphragm closure effect
		Internal short circuit

§4.2.2 MMA Welding trouble shooting

The following chart addresses some of the common problems of MMA welding. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

NO.	Trouble	Possible Reason	Suggested Remedy
1	**No arc**	Incomplete welding circuit	Check earth lead is connected. Check all cable connections
		No power supply	Check that the battery is fully charged
2	**Porosity − small cavities or holes resulting from gas pockets in weld metal**	Arc length too long	Shorten the arc length
		Work piece dirty, contaminated or moisture	Remove moisture and materials like paint, grease, oil, and dirt, including mill scale from base metal
		Damp electrodes	Use only dry electrodes
3	**Excessive Spatter**	Amperage too high	Decrease the amperage or choose a larger electrode
		Arc length too long	Shorten the arc length
4	**Weld sits on top, lack of fusion**	Insufficient heat input	Increase the amperage or choose a larger electrode
		Work piece dirty, contaminated or moisture	Remove moisture and materials like paint, grease, oil, and dirt, including mill scale from base metal
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
5	**Lack of penetration**	Insufficient heat input	Increase the amperage or choose a larger electrode
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
		Poor joint preparation	Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up
6	**Excessive penetration - burn through**	Excessive heat input	Reduce the amperage or use a smaller electrode
		Incorrect travel speed	Try increasing the weld travel speed
7	**Uneven weld appearance**	Unsteady hand, wavering hand	Use two hands where possible to steady up, practice your technique
8	**Distortion − movement of base metal during welding**	Excessive heat input	Reduce the amperage or use a smaller electrode
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
		Poor joint preparation and or joint design	Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up
9	**Electrode welds with different or unusual arc characteristic**	Incorrect polarity	Change the polarity, check the electrode manufacturer for correct polarity

§4.2.3 DC TIG Welding trouble shooting

The following chart addresses some of the common problems of DC TIG welding. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

NO.	Trouble	Possible Reason	Suggested Remedy
1	T**ungsten burning away quickly**	Incorrect Gas or No Gas	Use pure Argon. Check cylinder has gas, connected, turned on and torch valve is open
		Inadequate gas flow	Check the gas is connected, check hoses, gas valve and torch are not restricted.
		Back cap not fitted correctly	Make sure the torch back cap is fitted so that the o-ring is inside the torch body
		Torch connected to DC+	Connect the torch to the DC- output terminal
		Incorrect tungsten being used	Check and change the tungsten type if necessary
		Tungsten being oxidized after weld is finished	Keep shielding gas flowing 10~15 seconds after arc stoppage. 1 second for each 10amps of welding current.
2	**Contaminated tungsten**	Touching tungsten into the weld pool	Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 2~5mm
		Touching the filler wire to the tungsten	Keep the filler wire from touching the tungsten during welding, feed the filler wire into the leading edge of the weld pool in front of the tungsten
3	**Porosity - poor weld appearance and color**	Wrong gas/ poor gas flow/ gas leak	Use pure argon. Gas is connected, check hoses, gas valve and torch are not restricted. Set the gas flow between 6~12 l/min. Check hoses and fittings for holes, leaks et
		Contaminated base metal	Remove moisture and materials like paint, grease, oil, and dirt from base metal
		Contaminated filler wire	Remove all grease, oil, or moisture from filler metal
		Incorrect filler wire	Check the filler wire and change if necessary
4	**Yellowish residue/ smoke on the alumina nozzle & discolored tungsten**	Incorrect Gas	Use pure Argon gas
		Inadequate gas flow	Set the gas flow between 10~15 l/min flow rate
		Alumina gas nozzle too small	Increase the size of the alumina gas nozzle
5	**Unstable Arc during DC welding**	Torch connected to DC+	Connect the torch to the DC- output terminal
		Contaminated base metal	Remove materials like paint, grease, oil, and dirt, including mill scale from base metal

		Tungsten is contaminated	Remove 10mm of contaminated tungsten and re grind the tungsten
		Arc length too long	Lower torch so that the tungsten is off of the work piece 2~5mm
6	**Arc wanders during DC welding**	Poor gas flow	Check and set the gas flow between 10~15 l/min flow rate
		Incorrect arc length	Lower torch so that the tungsten is off of the work piece 2~5mm
		Tungsten incorrect or in poor condition	Check that correct type of tungsten is being used. Remove 10mm from the weld end of the tungsten and re sharpen the tungsten
		Poorly prepared tungsten	Grind marks should run lengthwise with tungsten, not circular. Use proper grinding method and wheel.
		Contaminated base metal or filler wire	Remove contaminating materials like paint, grease, oil, and dirt, including mill scale from base metal. Remove all grease, oil, or moisture from filler metal
7	**Arc difficult to start or will not start DC welding**	Incorrect machine set up	Check machine set up is correct
		No gas, incorrect gas flow	Check the gas is connected and cylinder valve open, check hoses, gas valve and torch are not restricted. Set the gas flow between 10~15 l/min flow rate
		Incorrect tungsten size or type	Check and change the size and or the tungsten if required
		Loose connection	Check all connectors and tighten
		Earth clamp not connected to work	Connect the earth clamp directly to the work piece wherever possible

§4.3 List of error code

Error Type	Error code	Description	Lamp status
Thermal relay	E01	Over-heating (1st thermal relay)	Yellow lamp (thermal protection) always on
	E02	Over-heating (2nd thermal relay)	Yellow lamp (thermal protection) always on
	E03	Over-heating (3rd thermal relay)	Yellow lamp (thermal protection) always on
	E04	Over-heating (4th thermal relay)	Yellow lamp (thermal protection) always on
	E09	Over-heating (Program in default)	Yellow lamp (thermal protection) always on
Welding machine	E10	Phase loss	Yellow lamp (thermal protection) always on
	E11	No water	Yellow lamp (lack water) always on
	E12	No gas	Red lamp always on
	E13	Under voltage	Yellow lamp (thermal protection) always on
	E14	Over voltage	Yellow lamp (thermal protection) always on
	E15	Over current	Yellow lamp (thermal protection) always on
	E16	Wire feeder over load	
Switch	E20	Button fault on operating panel when switch on the machine	Yellow lamp (thermal protection) always on
	E21	Other faults on operating panel when switch on the machine	Yellow lamp (thermal protection) always on
	E22	Torch fault when switch on the machine	Yellow lamp (thermal protection) always on
	E23	Torch fault during normal working process	Yellow lamp (thermal protection) always on
Accessory	E30	Cutting torch disconnection	Red lamp blink
	E31	Water cooler disconnection	Yellow lamp (lack water) always on
Communication	E40	Connection problem between wire feeder and power source	
	E41	Communication error	
Battery	E0b	Serious battery heating	Yellow lamp (thermal protection) always on
	E0P	Low quantity of electricity	

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