

# **ARC 160**

# **ARC 200**



## **INSTRUCTION MANUAL**

**IMPORTANT:** Read This Instruction Manual Completely before operating this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the hazards and safety precautions provided for your protection and for the protection of those in the immediate vicinity where this device is to be used. Contact your distributor if you do not fully understand this manual or require additional information.

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## Features

- MMA stick welding
- IGBT Inverter technology makes for a smooth and stable welding output
- Lightweight and compact design weighing only 4.6 and 6.8kg respectively
- Lift TIG welding operation
- Built-in Arc Force/Automatic hot start/anti sticking control
- Built-in automatic protection functions for over heating, over current/voltage etc



PLEASE NOTE that under no circumstances should your ARC 160/200 be altered or changed in any way from standard factory configuration. Doing so, will void the machine warranty.

## 1.0 Recommended Safety Precautions

### 1.1 Personal Safety Warning Signs



The above safety warning signs indicate the risk of personal injury or even death. **IMPORTANT!** Hot or moving parts can cause serious injury and electric shock can kill. Use the following ARC160/200 operation guidelines to insure your own personal safety and for those in the immediate vicinity of your work area.

### 1.2 Arc Welding Risks

Ensure your personal safety and of those nearby by observing the following risks surrounding the use of this machine.

- Only qualified technicians should service, maintain or repair your ARC160/200
- Only those specifically trained in Arc welding procedures should operate this machine
- During operation, clear the work area of individuals not required in the operation, especially children
- Adhere to precautions contained in section 5. DC voltage remains in the capacitors after the machine has been shut off and may cause electric shock



- NEVER TOUCH electrical parts
- Use dry, Arc rated gloves and other protective safety gear
- Protect yourself from work and ground using dry insulation. Make sure insulation is sufficiently covering the working area.
- Use caution when working in confined spaces, in wet environments or where falling is a risk

### CLOTHING:

Suitable clothing must be worn to prevent excessive skin exposure to UV radiation, sparks and molten metal. Flame-proof, loose fitting cotton clothing buttoned to the neck, protective leather gloves, spats, apron and steel toe safety boots are also highly recommended. In addition, use a helmet with the recommended shade lens for amperage listed in the shade chart below.

<b>Less than 150 amps</b>	<b>Shade 9</b>
<b>150 to 250 amps</b>	<b>Shade 10</b>
<b>250 to 300</b>	<b>Shade 11/12</b>
<b>300 to 350</b>	<b>Shade 13</b>
<b>Over 350 amps</b>	<b>Shade 14</b>

Use one shade darker for aluminium welding

### FUMES AND GASES CAN BE DANGEROUS:

- Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. 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 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.

- Shielding 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 CAN BURN:

- 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 helpers 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.

## **WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION.**

- Remove fire hazards 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 situations.
- 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.
- Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding 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.
  - 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 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.

## **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 all around the world. Until now, no material evidences show that EMF may have effects on health. However, the research on damage of EMF is still ongoing. Before any conclusions are made, we should minimize exposure to EMF as much 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 the welding machine and power cable are as far away from the operator as possible.
- Connect the work cable to the workpiece as close as possible to the area being welded.
- People with heart pacemakers should stay away from the welding area.

The equipment complies with electromagnetic compatibility on the class A which is intended for users in any locations other than residential locations where the electrical power is provided by public low-voltage supply system.

## **1.3 Electrical Shock**

- Never touch 'live' electrical parts
- Earth clamp all work materials
- Never work in wet or damp environments

Avoid electric shock by:

- Wearing dry, insulated boots
- Using dry, leather gloves
- Never changing electrodes with bare hands or wet gloves
- Never cool electrode holders in water
- Work on a dry, insulated floor where possible
- Never hold the electrode or holder under your arm

## **1.4 User Responsibilities**

- Read the Instructional Manual prior to using your ARC160/200
- Unauthorised repairs to this equipment may endanger the technician and operator and will void your Warranty. Only qualified personnel should perform repairs
- Always disconnect mains power before investigating equipment malfunctions
- Replace broken, damaged, missing or worn parts & hoses immediately.
- Equipment should be cleaned & serviced periodically

## **2.0 Introduction**

WELDARC Arc Series welders are general MMA arc welders which adopt the latest pulse width modulation (PWM) technology and the insulated gate bipolar transistor (IGBT) power module. It can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. These machines are readily portable thanks to their small size and also have a low consumption.

WELDARC Arc Series have excellent performances: constant current output makes arc welding 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 welders, when the problems listed above occur, the alarm on the front panel will light up and the output current will be cut off. These safety features can prolong the machines life and greatly improve the reliability and practicability of the welders.

WELDARC Arc Series welders can also perform TIG welding. When performing MMA welding, if the electrode touches the workpiece over two seconds, the welding current will drop to the minimum current automatically to protect the electrode. While TIG welding, the minimum current will be output first until the arc is ignited by the lifting method. The output current will rise to the preset value, which can protect the electrode.

MMA—Manual Metal Arc welding;

PWM—Pulse-Width Modulation;

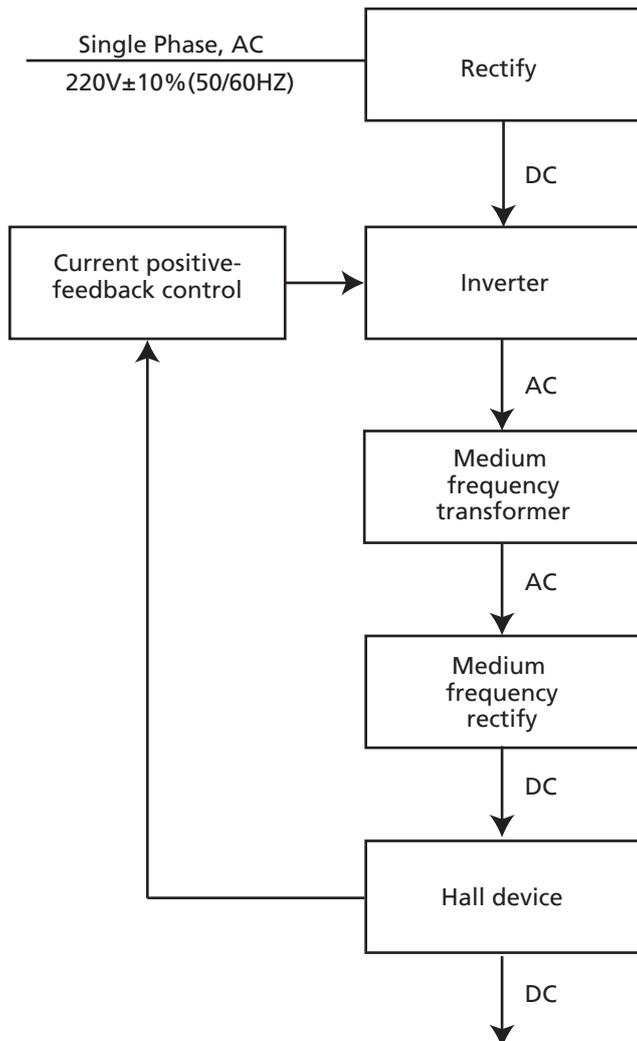
IGBT—Insulation Gate Bipolar Transistor;

TIG—Tungsten Inert Gas welding.

## 2.1 Working Principle

The working principle of WELDARC Arc welders is shown as the following figure.

Single phase 220V±10% work frequency (50/60 Hz) AC is rectified into DC, then is converted to medium frequency AC (about 20KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectified by medium frequency rectifier (fast recovery diodes), and is outputted by inductance filtering. The circuit adopts current feedback control technology to ensure current output stability. The welding current parameter can also be adjusted continuously to meet welding requirements.

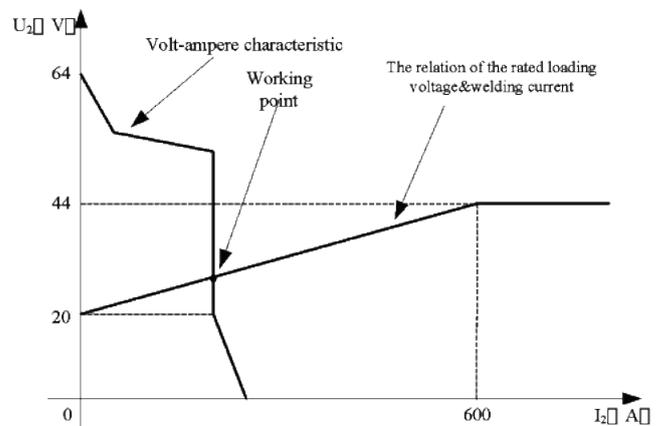


## 2.2 Volt-Ampere Characteristic

WELDARC Arc Series welders have excellent volt-ampere characteristic, displayed in the following graph. In MMA welding, the relation between the rated loading voltage  $U_2$  and welding current  $I_2$  is as follows:

$$\text{When } I_2 \leq 600\text{A, } U_2 = 20 + 0.04 I_2 \text{ (V) ;}$$

$$\text{When } I_2 > 600\text{A, } U_2 = 44 \text{ (V) .}$$



### 3. Installation & Adjustment

#### 3.1 Parameters

Machine	ARC 160	ARC 200
Power Supply Voltage (V)	1~220/230/240±10% 50/60Hz	
Rated Input Power (KW)	5.2	7.5
Effective Current (A)	15.9	20
Welding Current Range (A)	5~160	10~200
Duty Cycle @ (40°C 10min)	25% 160A 60% 110A 100% 95A	25% 200A 60% 125A 100% 100A
Power Factor	0.73	0.75
Protection Class	IP23	
Insulation Class	F	
Dimensions (LxWxHmm)	280x120x220	300x120x220
Net Weight (Kg)	4.6	6.8
Max No-Load Voltage (V)	45 (70)	50 (75)

Note: The above parameters are subject to change with the improvement of machines.

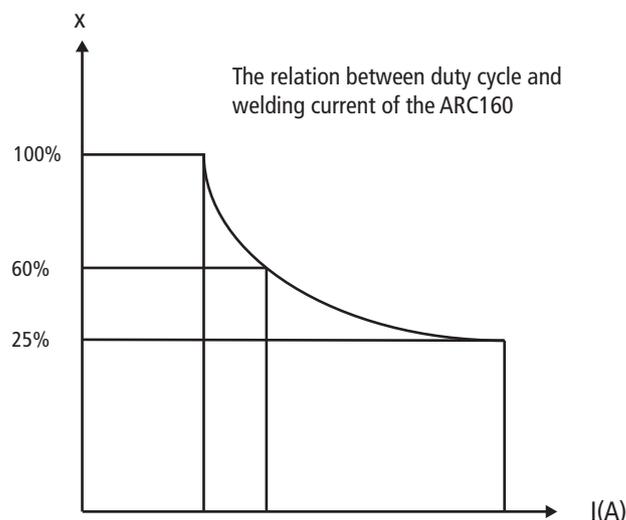
#### 3.2 Duty cycle & Over heating

The letter "X" stands for duty cycle, which is defined as the proportion of the time that a machine can work continuously within a certain time (10 minutes).

The rated duty cycle means the proportion of the time that a machine can work continuously within 10 minutes when it outputs the rated welding current.

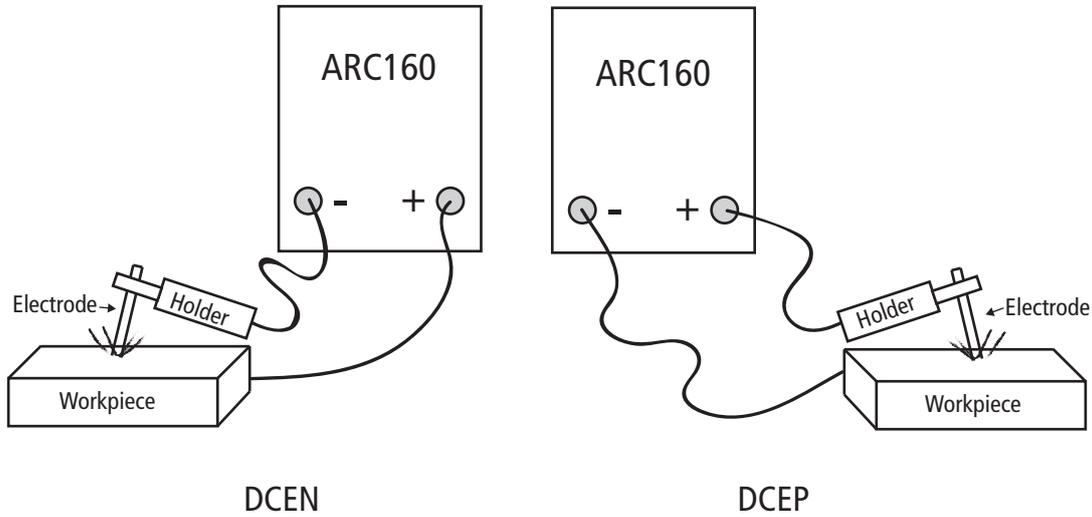
The relation between the duty cycle "X" and the output welding current "I" is shown as the right figure.

If the welder overheats, the IGBT over-heat protection unit inside it will output an instruction to cut the output welding current, and will light up the over-heat pilot lamp on the front panel. In the even this occurs, the machine should be relaxed for 15 minutes to cool the fan. When operating the machine again, the welding output current or the duty cycle should be reduced.



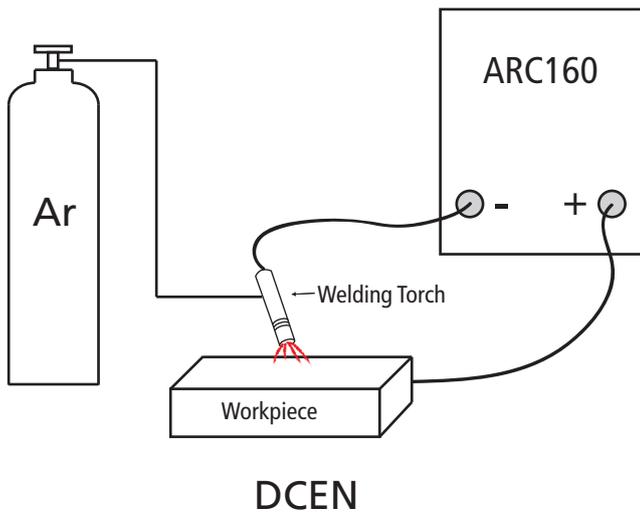
### 3.3 Welding polarity connection way

#### 3.3.1 MMA ( ie: ARC160)



Choosing the connection of DCEN or DCEP is based on the arc stable burning condition. Different electrodes need different connection ways. Please refer to the electrode manual.

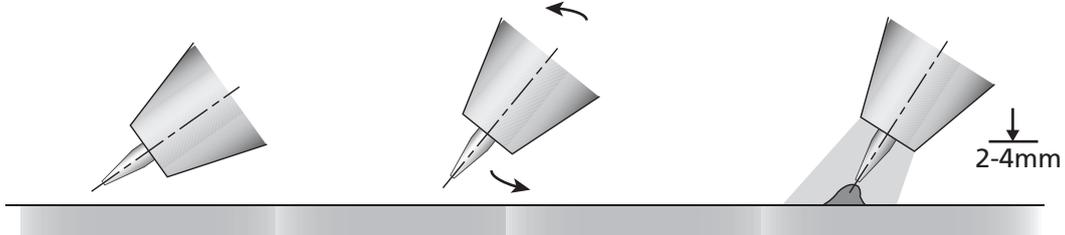
#### 3.3.2 TIG ( ie: ARC160)



1. Place the welding gun aslant

2. Scrape the electrode with the workpiece.

3. Lift arc.

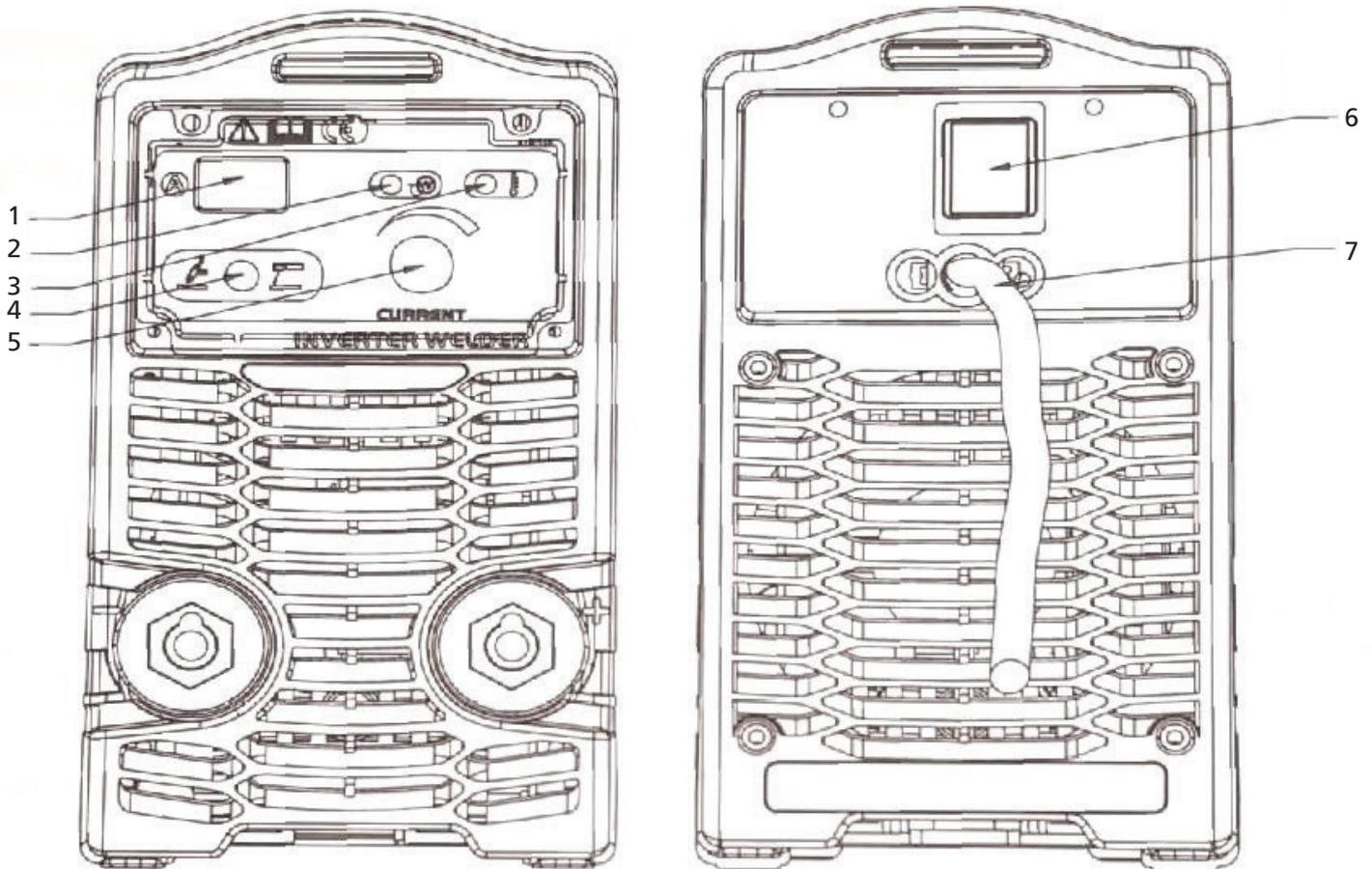


Steps of scraping arc

Striking arc in TIG welding: when a tungsten electrode touches the workpiece, the short-circuit current is only 10A. After generating an arc, current can rise to the set welding current. If the tungsten electrode touches the workpiece when welding, the current will drop to 10A within 2 seconds - which can reduce tungsten spoilage, prolong the life of the tungsten electrode, and prevent tungsten clipping.

## 4.0 Operation control and connectors

### 4.1 Layout for front & rear panel (example for ARC 160)



- |                               |                                                                                                                                                            |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Current display            | Pre-setting current display                                                                                                                                |
| 2. Power pilot lamp           | This pilot lamp, when lit, indicates that the machine is on                                                                                                |
| 3. Alarm pilot lamp           | When the machine has less voltage, over current or over heating, this pilot lamp indicates when lit that the protection of the machine has been activated. |
| 4. Conversion switch          | Choose (right), MMA<br>Choose (left), TIG                                                                                                                  |
| 5. Welding current regulation | Set welding current(10-160A)                                                                                                                               |
| 6. Power Switch               | Choose "ON", power through;<br>Choose "OFF", power cut off.                                                                                                |
| 7. Cable Clamp                | Fastened the mains cable                                                                                                                                   |

## 4.2 Welding Current Adjustment

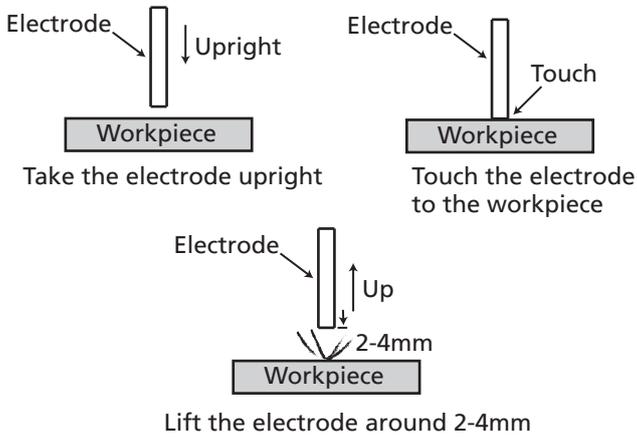
Welding current range is 10~160A(ARC 200 is 10-200A).

WELDarc Arc Series welders have the function of pre-setting welding current. Before welding, adjust the welding current, the welding current display will show the ampere. It is convenient to set parameters and adjust accurately.

## 4.3 Welding Operation

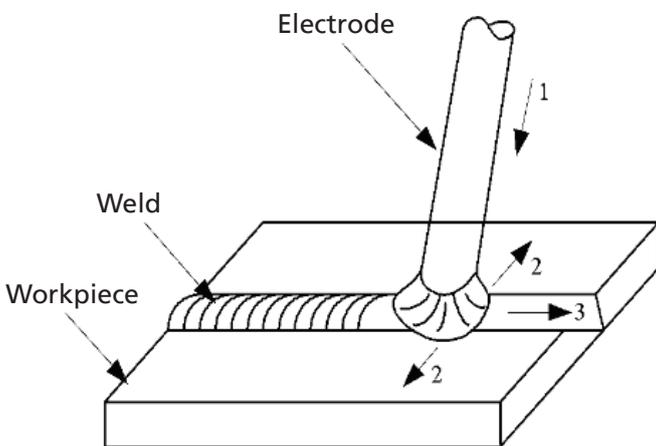
### 4.3.1 Striking Arc

Knocking arc: take the electrode upright to touch the workpiece, after forming short circuit, quickly lift up about 2~4 mm, and an arc will be ignited. This method is difficult to master. But when welding brittle or hard steel, it is better to use the knocking method.



Lifting arc: take the electrode to scrape the workpiece for striking arc. But it may cause the arc to scratch, so must lift arc in the groove.

### 4.3.2 Manipulation of electrode



1. Electrode Moving
2. Electrode swing right & left
3. Electrode movement along the weld

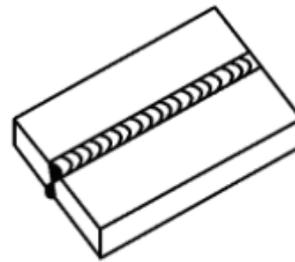
In MMA welding, there are three motions being matched in the end of the electrode: the electrode moving to the molten pool along axes, the electrode swing right and left and the electrode moving along welding way.

The operator can choose the manipulation of electrode based on welding joint sharpness, welding position, electrode spec, welding current and operation skill, etc.

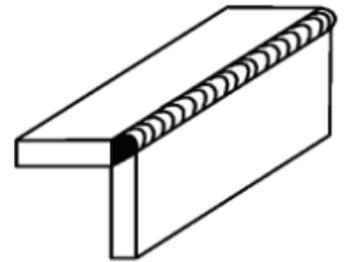
## 4.4 Welding Parameters

### 4.4.1 Joint form in MMA

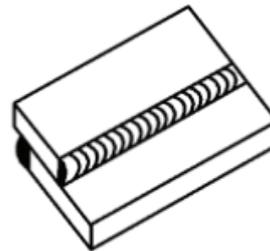
In MMA welding, the common basic joint form: butt joint, lap joint, corner joint & T joint.



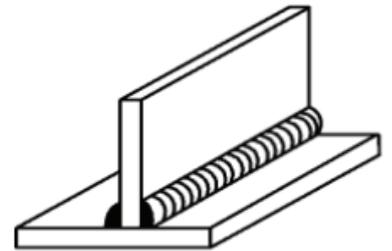
Butt joint



Corner joint



Lap joint



T joint

The electrode diameter selection is based on the workpiece thickness, welding position, joint form, welding layer, etc. Please refer to the following table.

The welding current reference for different electrode diameters					
Electrode diameter/mm	1.6	2.0	2.5	3.2	4.0
Welding current/A	25~40	40~60	50~80	100~130	150~210
The relation between the welding current(I)' factor(K) & electrode(d) (I=K*d: Carbon electrode)					
Electrode diameter/mm	1.6	2~2.5	3.2		
Factor/K	20~25	25~30	30~40		

- The electrode should be dried according to the appropriate user manual before using. This is necessary for reducing the hydrogen of the molten pool and welding seam, and avoiding blowhole and cold crack.
- In the welding process the arc must not be too long, otherwise it will cause unstable arc burning, large spatter, light penetration, undercut, blowhole, etc. If the arc is too short, it will cause electrode stick.
- In MMA welding the arc length is usually equal to 0.5~1.0 of the electrode diameter. The basic electrode's arc length is not beyond the electrode diameter, it's better to choose the short arc welding; the acid electrode's arc length is equal to the electrode diameter.

## 4.5 Troubleshooting

Issue	Cause	Preventative measures
Welding seam doesn't meet the requirement	The groove angle is incorrect The root face and assembly gap is not equal. Welding techniques parameters are unreasonable The welder's operation skill is low	Choosing the proper groove angle & assembly gap, improve the assembly quality Choosing the proper welding parameters Improve operation skills
Undercut	Over current Arc length is too long The electrode angle is wrong Manipulation of electrode is incorrect	Choosing the proper welding current & speed The arc should not be drawn too long The electrode angle should be correct Manipulation of electrode should be correct
Incomplete penetration	The groove angle or gap is too small, the root face is too big Welding parameters are not suitable, or the assembly is not good  The welder's operation skill is low	Correctly choose and process the groove size Correctly assemble and ensure clearance Choose suitable welding current & speed  Improve operation skills
Incomplete fusion	The welding thermal input is too low There is rust & dust on the side of groove The slag between the layers is not cleared well	Choose the correct welding parameters Enhance the clearness of layers
Overlap	The temperature of molten pool is too high The liquid metal concretes slowly	Choose parameters based on the welding position Strictly control the molten hole size
Crater	The crater time is short lasting Over current in the welding of thin plate	In the crater, the electrode should remain for a short time to manipulate electrode After the molten pool is filled in by metal, take to the side to avoid a crater
Blowhole	There is residue like oil, rust or water on the work piece surface and groove The coating of electrode is damped & not drying Under current or over speed when welding The arc is too long or lean burning, the molten pool protection is not good Over current, the coating of electrode falls off and loses protection Manipulation of electrode is incorrect	Clear out the dust around groove for about 20-30mm Strictly dry the electrode according to manual Correctly choose parameters to operate Use the short arc operation Welding location in the field should have anti-wind protection Don't use an invalid electrode
Inclusion & slag inclusion	The slag clears bad in the middle layer in the welding process Under current or over speed when welding Welding operation is incorrect The welding material can not match the work piece The groove design & processing are not proper	Choose an electrode with good slag detachability Strictly clear the slag in the layers Correctly choose the welding parameters Adjust the electrode angle and manipulation method
Hot crack	In the process of solidification, the inter crystal segregation is caused. At the same time, with the effect of welding stress, the hot crack is formed.	Strictly control the percentage of S and P in welding material. Adjust the structure of welding material. Adopt the basic electrode.
Cold crack	Three reasons will cause cold crack: The structure turned from the martensite The residual stress caused by big restraint intensity The residual hydrogen in welding gap	Adopt low hydrogen type basic electrode Bake under instructions before use Remove the feculence before use, reduce the percentage of hydrogen Adopt appropriate parameters and heat input After welding, do dehydrogenation.

## 4.7 Operation Environment

- Height above sea level is below 1000m.
- Operation temperature range:-10°C~+40°C.
- Relative humidity is below 90 %(+20°C). relative humidity is below 50% (40°C).
- The inclination of the power source does not exceed 10°.
- Protect the machine against heavy rain or in hot circumstance against direct sunshine.
- The content of dust, acid, corrosive gas in the surrounding air or substance can not exceed normal standards.
- Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

## 4.8 Operation Notices

- Read section 1 carefully before attempting to use this equipment.
- Connect the ground wire with the machine directly, and refer to section 3.
- Input power must be AC as one phase, 50Hz, 220V±10%.
- In the case of closing the power switch, no-load voltage may be exported. Do not touch the output electrode with any part of your body.
- Do not watch the arc with no eye protection.
- Ensure good ventilation of the machine to improve duty ratio.
- Turn off the engine when the operation is finished to economize energy sources.
- When power switch shuts off protectively because of failure. Don't restart it until the problem is resolved. Otherwise, the range of potential problems will be exacerbated.

## 5.0 Troubleshooting

S/N	Troubles	Reasons		Solutions
1	When the machine is powered on, the fan works but the power light is not on	Light damaged or has a bad connection		Test/repair the inside circuit of power light Pr3
		Power PCB Failures		Repair or change power PCB Pr2
2	When the machine is powered on, the power light is on but the fan doesn't work	There is something in the fan		Clear out
		The fan motor is damaged		Change fan motor
3	When the machine is powered on, neither the fan or power light work	No input voltage		Check whether there is input voltage
		Over Voltage (input voltage is too much or too little)		Check input voltage
4	No no-load voltage output	There is trouble inside the machine		Check the main circuit, Pr1 & Pr2
5	No current output	Welding cable is not connected with the two outputs of the welder		Connect the welding cable to the welders output
		Welding cable is broken		Wrap, repair or change the welding cable
		Earth cable is not connected or loosened		Check the earth clamp
6	Not easy to start arc when welding, or easy to cause sticking	Earth cable is not connected or loosened		Earth cable is not connected or loosened
		Earth cable is not connected or loosened		Earth cable is not connected or loosened
		Earth cable is not connected or loosened		Earth cable is not connected or loosened
7	The arc is not stable during welding	The arc force is too small		Increase the arc force
8	The welding current can not be adjusted	The welding current potentiometer in the front panel has a bad connection or is damaged		Repair or change the potentiometer
9	The penetration of the molten pool is not enough (MMA)	The welding current is adjusted too low		Increase the welding current
		The arc force is adjusted too small		Increase the arc force
10	Arc blow	Airflow Disturbance		Use the shelter from airflow
		The electrode eccentricity		Change the electrode
		Magnetic effect		Incline the electrode to the opposite direction of the magnetic blow
				Change the position of earth clamp
		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)