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SHENZHEN UNITWELD WELDING AND MOTOR CO.,LTD

OPERATION INSTRUCTION

INVERTER WELDER **ARC160D**



SAFETY



PROFESSION



QUALITY

FOREWORD

Thanks for your purchase of Our inverter welder.

Please read this manual carefully to properly operate the machine before operation, and preserve it for reference in case.

The product has been designed according to national and international standards, and meets relevant standards such as GB/T15579-1、IEC60974、EN60974、AS60974、UL60974 and so on.

The product conforms to equipment requirement of A in the EMC requirement.

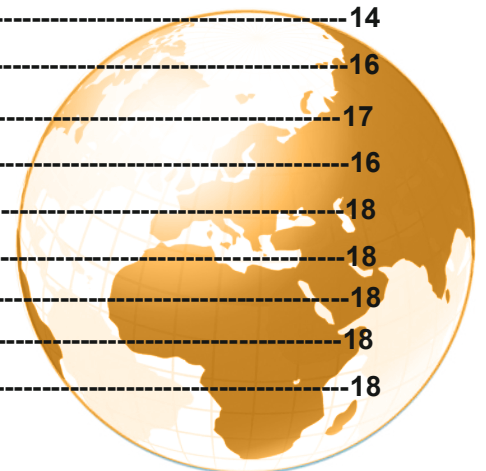
The design and manufacturing technology of the product are patented.






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DIRECTORY

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1. SAFETY

	<p>Beware of electric shock!</p> <ul style="list-style-type: none"> ● Install grounding device according to application standard. ● Do not touch live parts with naked skin, wet gloves or wet clothes. ● Be sure you are insulated from ground and workpiece. ● Cover the cover plate of the machine before power on to avoid an electric shock. ● Confirm the safety of your working position.
	<p>Beware of fire hazard!</p> <ul style="list-style-type: none"> ● Please install the machine on non-combustible materials to avoid a fire. ● Make ensure there are no inflammables near the welding position to avoid a fire.
	<p>Beware of explosion!</p> <ul style="list-style-type: none"> ● Do not install the machine in an environment with explosive gas to avoid an explosion.



Replacing the components can be dangerous.







- Only professionals can replace the components of the machine.
- Make sure there are no foreign bodies such as wire leads, screws, gaskets and metal bars falling into the machine inside when replacing the components.
- Make sure the connecting wires inside the machine are correctly connected after replacing the PCBs, and then the machine can be run. Otherwise, there is a risk of damage to property.

Carrying or moving the machine can be dangerous.

- Cut the input power off via the switching box before moving the welding machine.
- The handle can only be used for moving the welding machine by hand in short distance, and it cannot be used for lifting. Otherwise, personal injury or property damage may be caused by a drop.
- Make sure that the flying rings are tightened, and that the machine enclosure and cover are fixed when moving the welding machine with a crane,
- Two lifting belts should be used when lifting the welding machine, and the angle formed by the lifting belt and the vertical should be smaller than 15°.
- Do not apply any stress on the operation panel and cover when moving the welding machine. Otherwise, personal injury or property damage may be caused by a drop.
- Do not install and run the welding machine when the machine is damaged or lacks any components. Otherwise, fire hazard or personal injury may be caused.

Precautions for operation

	<p>Smoke-may be harmful to your health!</p> <ul style="list-style-type: none"> ● Keep your head away from the smoke to avoid inhalation of waste gas in welding. ● Keep the working environment well ventilated with exhaust or ventilation equipment when welding.
	<p>Arc radiation-may hurt your eyes and burn your skin!</p> <ul style="list-style-type: none"> ● Use proper mask and wear protective clothing to protect your eyes and body. ● Use proper mask or curtain to protect onlooker from being injured.

	<p>Magnetic field can make cardiac pacemaker a bit wonky.</p> <ul style="list-style-type: none"> ● People with cardiac pacemaker should consult the doctor before carrying out welding. ● Stay away from the power source to reduce the affect of magnetic filed.
	<p>Improper use and operation may result in a fire or an explosion.</p> <ul style="list-style-type: none"> ● Welding spark may result in a fire, so please make ensure there are no inflammables near the welding position, and pay attention to fire safety. ● Ensure there is fire extinguisher nearby, and make sure someone has been trained to operate the fire extinguisher. ● Do not cut closed container. ● Do not use this machine for pipe thawing.
	<p>Hot workpiece can cause severe scald.</p> <ul style="list-style-type: none"> ● Do not touch hot workpiece with bare hands. ● Cool the welding torch for a while after continuously working.
	<p>Excessive noise does great harm to people's hearing.</p> <ul style="list-style-type: none"> ● Wear ear covers or other hearing protectors when welding. ● Give warning to onlooker that noise may be potentially hazardous to hearing.
	<p>Moving parts may injure your body.</p> <ul style="list-style-type: none"> ● Please keep away from moving parts (like fan). ● Each door, panel, cover, baffle plate, and protective device the like should be closed and located correctly.
	<p>Seek professional support when trouble strikes.</p> <ul style="list-style-type: none"> ● When trouble strikes in installation and operation, please inspect according to related contents in this manual. ● If you still cannot understand fully, or you still cannot solve the problem, please contact the dealer or the service center of JASIC to obtain professional support.

Precautions for discard

Pay attention to the following when discarding the welding machine:

- Burning the electrolytic capacitors in the main circuit or on the PCBs may cause an explosion.
- Burning the plastic parts such as the front panel may produce poisonous gas.
- Dispose it as industrial waste.

2. SYMBOL EXPLANATION

WARNING



Matters to be noticed in operation



Objects to be specially described and pointed out



It is prohibited to dispose the electrical waste together with other common wastes. Please protect the environment.

3. PRODUCT OVERVIEW

Unique electric structure and air channel design in this series of machines can speed up the heat rejection of the power device as well as improving the duty cycles of the machines. The unique heat rejection efficiency of the air channel can effectively prevent the power devices and control circuits from being damaged by the dust absorbed by the fan, and the reliability of the machine is greatly improved thereby.

The machine adopts streamline shape. Front and rear panels and handle are sprayed with rubber oil which gives good touch feeling.

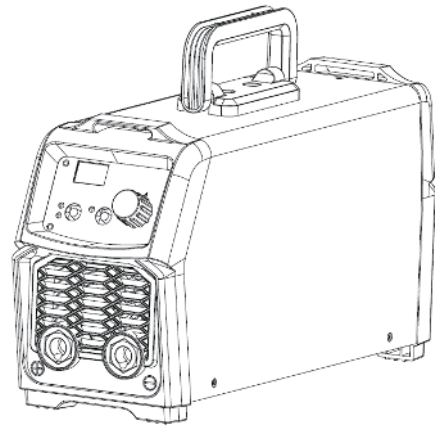


Fig 1

4. FUNCTION OVERVIEW

➤ **Various function designs**

- ◆ Hot start arc ignition function: make the arc ignition in MMA welding easier and more reliable.
- ◆ Self-adaptive arc force technology: obviously improve the performance of the machine in long-cable welding and contribute to long-distance welding.

5. PERFORMANCE CHARACTERISTICS

➤ **Advanced IGBT inverter technology**

- ◆ Inverting frequency of 42-52 kHz greatly reduces the volume and weight of the welder.
- ◆ Great reduction in magnetic and resistance loss obviously enhances the welding efficiency and energy saving effect.
- ◆ Working frequency is beyond audiorange, which almost eliminates noise pollution.

➤ **Leading control mode**

- ◆ Advanced control technology meets various welding applications and greatly improves the welding performance.
- ◆ It can be widely used in acid and basic electrode welding.
- ◆ Easy arc starting, less spatter, stable current and good shaping.

➤ **Nice shape and structure design**

- ◆ Front and rear panels in shape of streamline make the whole shape nicer.
- ◆ Excellent insulating property.
- ◆ Waterproof, antistatic and anticorrosion.

6. ORDER INFORMATION

Model	Function Configuration	Product Code
ARC160D	Hot start arc ignition self-adaptive arc force Anti-stick MMA/Lift-TIG VRD	Z2A4
ARC200D		Z2A5

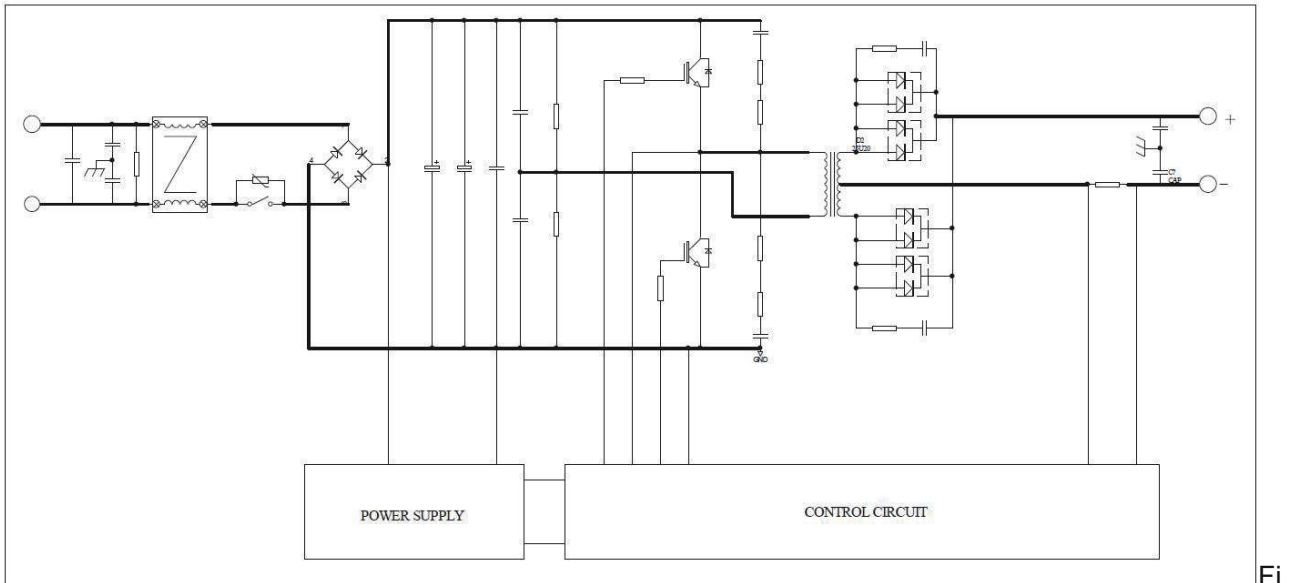
7. TECHNICAL PARAMETERS

Technical Parameter	Unit	Model			
		ARC160D		ARC200D	
Rated input voltage	V	AC120V±15% 50/60HZ	AC240V±15% 50/60HZ	AC120V±15% 50/60HZ	AC240V±15% 50/60HZ
Rated input power	KVA	5	7.1	6	9.4
Welding current range	A	20-120	20-160	20-140	20-200
	V	20.8-24.8	20.8-26.4	20.8-25.6	20.8-28
Rated duty cycle ^①	%	20		20	
No-load voltage	V	85		85	
Overall efficiency	%	85		85	
Housing protection grade	IP	21S		21S	
Power factor	cosφ	0.7		0.7	
Insulation grade		H		H	
Standard		IEC60974-1			
Noise	db	<70			
Size	with handle ^②	305* 112* 190 mm		335* 112* 190 mm	
Weight	kg	3.560		4.220	
Applicable electrode	mm	1.0-3.2		1.0-5.0	

“①”- under the environment temperature of 40°C

“②”- Not every piece of machine has the same design. Differences may exist upon customers' requirements.

8. ELECTRICAL SCHEMATIC DIAGRAM



g. 1

9. OPERATION CONTROL AND DESCRIPTION

1. Display meter: To show welding current normally. Showing "E-1" indicates Over current protection, "E-3" indicates over heating protection

2. TIG/MMA: To switch Lift-TIG/MMA welding mode

3. Welding current knob: To adjust the output current.

4. VRD switch: To turn ON/OFF VRD function

5. "+" output terminal: To connect the electrode holder.

6. "-" output terminal: To connect the work clamp.

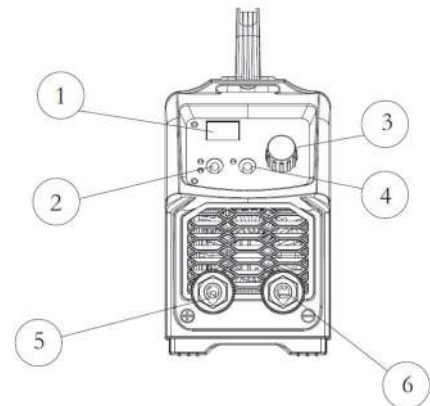


Fig. 2

7. Handle

8. Power input: power input cable.

9. Power switch: Power ON/OFF switch.

10. Cooling fan.

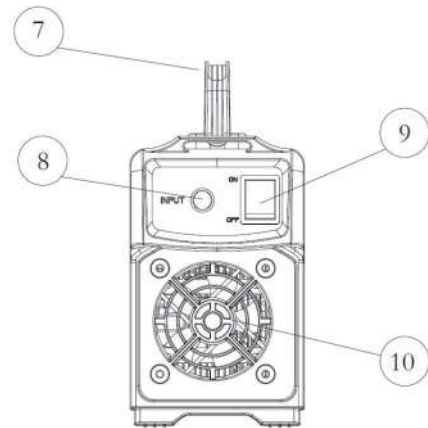
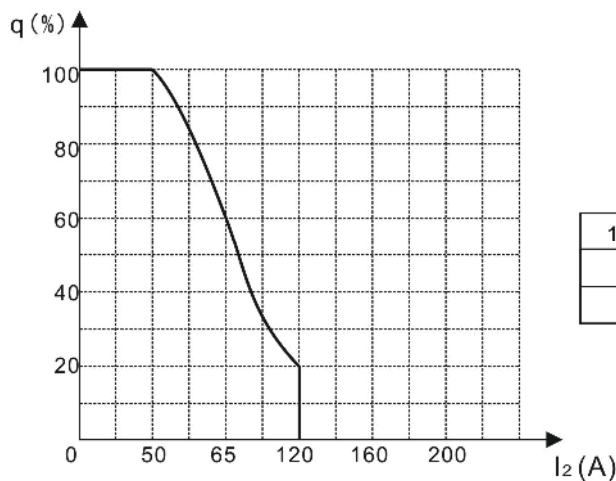


Fig. 3

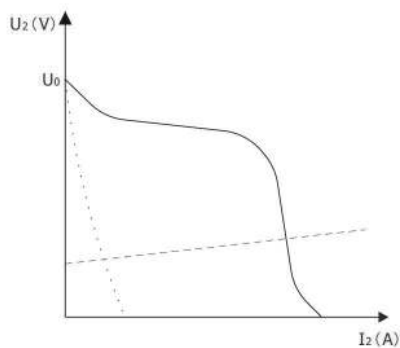
10. SYSTEM CHARACTERISTICS

1) Duty cycle

Rated duty cycle refers to the percentage of the normal work time of the machine under rated maximum current holding in the period when taking 10 minutes as a period. The rated duty cycle of this series is 30% depending on different models. Using the welding machine continuously overrunning the rated load may lead to overheating of the machine, and frequently using the machine overrunning the rated load may accelerate the aging of the machine or even burn the machine.



2) Output characteristic



	External characteristic of maximum output
	External characteristic of minimum output
	Relationship with rated load

11. INSTALLATION, DEBUGGING AND OPERATION

Note: Please install the machine strictly according to the following steps.

Turn off the power supply switch before any electric connection operation.

The housing protection grade of this machine is IP21S, so do not use it in rain.

Please DO NOT use this machine for thawing frozen pipes.

11.1 Connection of switching box

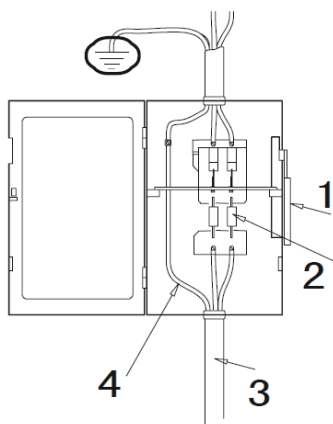


Figure 2-1

1. Power switch of the switching box
2. Fuse ($\geq 60\text{A}$)
3. Input power cord of the welding machine
4. Yellow-green earth wire (earth, not connect to the null line)

Connect according to the figure on the left or in other correct ways. Cut off the main power before connection.

Note: No operation with power on.

- Ask professional electrician to do the connection.
- Do not connect two welding machines to the same switching box.
- Please install leakage protector when using the machine in damp working place, on steel tower or on steel plate.

11.2 Installation

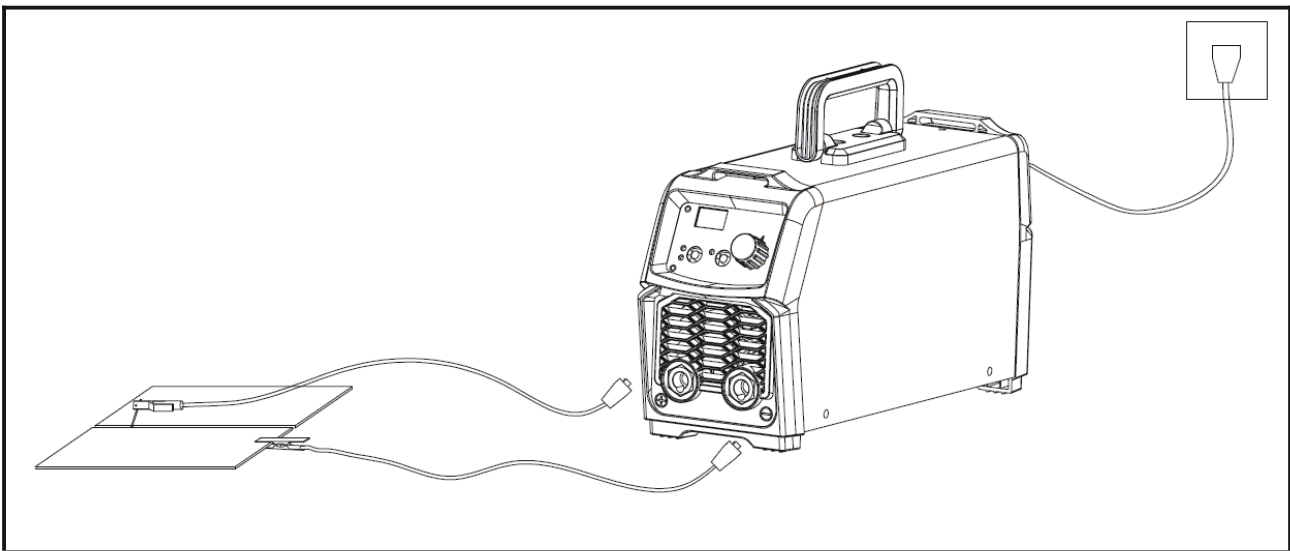


Fig.4 Schematic Diagram of MMA Welding

- 1) A primary power supply cable is available for this welding machine. Connect the power supply cable to the rated input power.
- 2) The primary cable should be tightly connected to the correct socket to avoid oxidization.
- 3) Check whether the voltage value varies in acceptable range with a multi-meter.
- 4) Insert the cable plug with electrode holder into the “+” socket on the front panel of the welding machine, and tighten it clockwise.
- 5) Insert the cable plug with work clamp into the “-” socket on the front panel of the welding machine, and tighten it clockwise.
- 6) Ground connection is needed for safety purpose.

The connection as mentioned above in 4) and 5) is DCEP connection. Operator can choose DCEN connection according to workpiece and electrode application requirement. Generally, DCEP connection is recommended for basic electrode, while there is no special requirement for acid electrode.

11.3 Operation

- 1) After being installed according to the above method, and the power switch being switched on, the machine is started with the power LED on and the fan working.
- 2) Pay attention to the polarity when connecting. Phenomena such as unstable arc, spatter, and electrode sticking could happen if improper mode is selected. Exchange the polarity if necessary.
- 3) Select cable with larger cross-section to reduce the voltage drop if the secondary cables (welding cable and earth cable) are long.

Preset the welding current according to the type and size of the electrode, clip the electrode and then welding can be carried out by short circuit arc ignition. For welding parameters, please refer to the below table.

11.4 Welding parameters table (for reference only)

Electrode Diameter (mm)	Recommended Welding Current (A)	Recommended Welding Voltage (V)
1.0	20~60	20.8~22.4
1.6	44~84	21.76~23.36
2.0	60~100	22.4~24.0
2.5	80~120	23.2~24.8
3.2	108~148	23.32~24.92
4.0	140~180	24.6~27.2
5.0	180~220	27.2~28.8
6.0	220~260	28.8~30.4

Note: This table is suitable for mild steel welding.

12. CAUTION

12.1 Working Environment

- 1) Welding should be carried out in dry environment with humidity of 90% or less.
- 2) The temperature of the working environment should be between -10°C and 40°C.
- 3) Avoid welding in the open air unless sheltered from sunlight and rain. Keep it dry at all times and do not place it on wet ground or in puddles.
- 4) Avoid welding in dusty area or environment with corrosive chemical gas.
- 5) Gas shielded arc welding should be operated in environment without strong airflow.

12.2 Safety Tips

Over-current/over-heating protection circuit is installed in this machine. When the output current or inner temperature exceeds the set standard, the machine will stop automatically. However, excessive use of machine will lead to welder damage. Therefore, please note:

1) Ventilation

This welder can create powerful welding current that has strict cooling requirements that cannot be met with natural ventilation. Therefore the internal fan is very important in enabling the machine to work steadily with effective cooling. The operator should make sure that the louvers be uncovered and unblocked. The minimum distance between the machine and nearby objects should be 30cm. Good ventilation is of critical importance to the normal performance and lifespan of the machine.

-
- 2) Welding operation is forbidden while the machine is overload. Remember to observe the max load current at any moment (refer to the corresponding duty cycle). Make sure that the welding current should not exceed the max load current. Overload could obviously shorten the machine's lifespan, or even damage the machine.
 - 3) Over-voltage is forbidden.
Regarding the power supply voltage range of the machine, please refer to "Technical Parameters" table. This machine is of automatic voltage compensation, which enables the maintaining of the voltage range within the given range. In case that the input voltage exceeds the stipulated value, it would possibly damage the components of the machine.
 - 4) An earth terminal is available for the machine. Connect it with an earth cable (section $\geq 6\text{mm}^2$) to avoid the static and electric shock.
 - 5) A sudden halt may occur with the yellow LED on the front panel on while the machine is of over-load status. Under this circumstance, it is unnecessary to restart the machine. Keep the built-in fan working to lower the temperature inside the machine. Welding can be continued after the inner temperature falls into the standard range and the yellow LED is off. There may be something failed if the yellow LED keeps illuminating.

13. BASIC KNOWLEDGE OF WELDING

Manual metal arc welding, MMA for short, is an arc welding mode by manually operating electrode. Equipment for MMA is simple, convenient and flexible to operate, and with high adaptability. MMA is applied to various metal materials with thickness more than 2mm and various structures, in particular to workpiece with complex structure and shape, short weld joint or bending shape, as well as weld joints in various spatial locations.

13.1 Welding Process of MMA

Connect the two output terminals of the welder to the workpiece and electrode holder respectively, and then clamp the electrode by the electrode holder. When welding, arc is ignited between the electrode and the workpiece, and the end of the electrode and part of the workpiece is fused to form a weld crater under the high-temperature arc. The weld crater is quickly cooled and condensed to form weld joint which can firmly integrally connect two separate pieces of workpiece. The coating of the electrode is fused to produce slag to cover the weld crater. The cooled slag can form slag crust to protect the weld joint. The slag crust is removed at last, and the joint welding is finished.

13.2 Tools for MMA

Common tools for MMA include electrode holder, welding mask, slag hammer, wire brush (see Fig. 5),

welding cable and labor protection supplies.

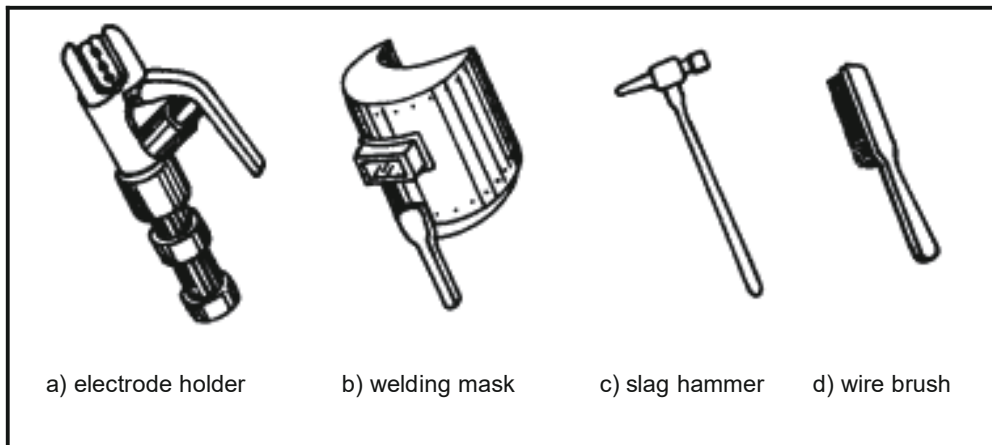


Fig. 5 Tools for MMA

a) Electrode holder: a tool for clamping electrode and conducting current, mainly including 300A type and 500A type.

b) Welding mask: a shielding tool for protecting eyes and face from injuring due to arc and spatter, including handholding type and helmet type. Colored chemical glass is installed on the viewing window of the mask to filter ultraviolet ray and infrared ray. Arc burning condition and weld crater condition can be observed from the viewing window during welding. Thus, welding can be carried out by operators conveniently.

c) Slag hammer (peen hammer): for the use of removing slag crust on the surface of weld joint.

d) Wire brush: for the use of removing dirt and rust at the joints of the workpiece before welding, as well as cleaning the surface of weld joint and the spatter after welding.

e) Welding cable: generally cables formed from many fine copper wires. Electrode holder and welding machine are connected via a cable, and this cable is named as welding cable (live wire). Welding machine and workpiece are connected via another cable (earth wire). The electrode holder is covered with insulating material performing insulation and heat insulating.

13.3 Basic Operation of MMA

1) Welding joint cleaning

Rust and greasy dirt at the joint should be removed completely before welding in order to implement arc igniting and arc stabilizing conveniently as well as ensure the quality of weld joint. Wire brush can be used for condition with low requirement on dust removal; grinding wheel can be used for condition with high requirement on dust removal.

2) Posture in operating

Take flat welding of butt joint and T-shaped joint from left to right as an example. (See Fig. 6) The operator should stand at the right side of the working direction of weld joint with mask in the left hand and electrode holder in the right hand. The left elbow of the operator should be put on his left knee to prevent

his upper body from following downwards, and his arm should be separated from the costal part so as to stretch out freely.

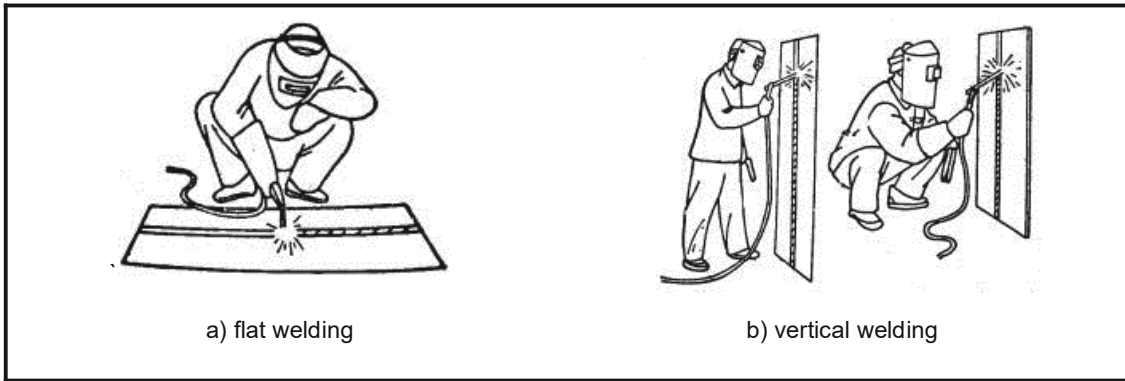


Fig. 6 Posture in welding

3) Arc igniting

Arc igniting is the process for producing stable arc between electrode and workpiece in order to heat them to implement welding. Common arc ignition mode includes scraping mode and striking mode. (See Fig.7) During welding, touch the surface of the workpiece with the end of the electrode by scraping or light striking to form short circuit, and then quickly lift the electrode 2~4mm away to ignite arc. If arc ignition fails, it is probably because there is coating at the end of the electrode, which affects the electric conduction. In this case, the operator can strongly knock the electrode to remove the insulation material until the metal surface of the core wire can be seen.

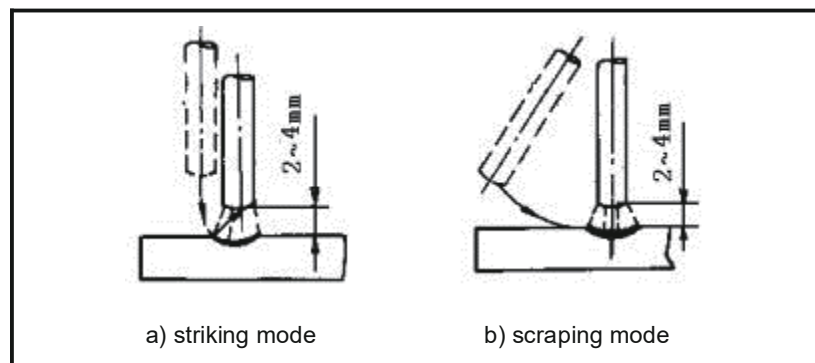


Fig. 7 Arc ignition modes

4) Tack weld

For fixing the relative positions of the two pieces of weldment and welding conveniently, 30~40mm short weld joints are welded every certain distance in order to fix the relative positions of the workpiece during welding assembly. This process is named as tack weld.

5) Electrode manipulation

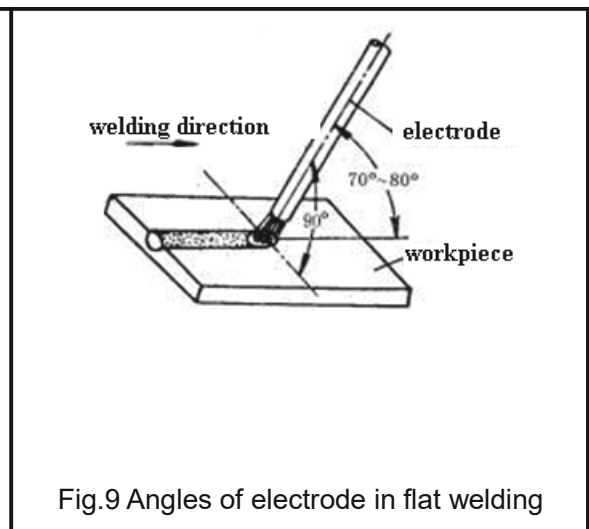
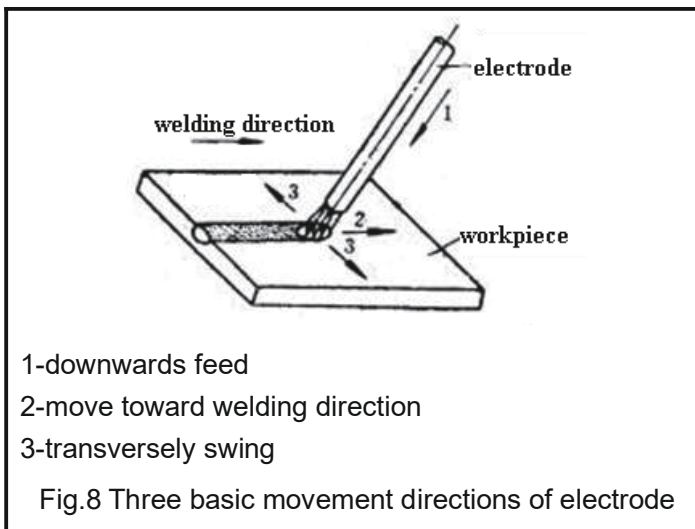
The electrode manipulation actually is a resultant movement in which the electrode simultaneously moves in three basic directions: the electrode gradually moves along the welding direction; the electrode

gradually moves toward the weld crater; and the electrode transversely swings. (See Fig.8) Electrode should be correctly manipulated in three movement directions after arc is ignited. In butt welding and flat welding, the most important is to control the following three aspects: welding angle, arc length and welding speed.

Welding angle: the electrode should be inclined in $70^{\circ}\sim 80^{\circ}$ forwards. (See Fig.9)

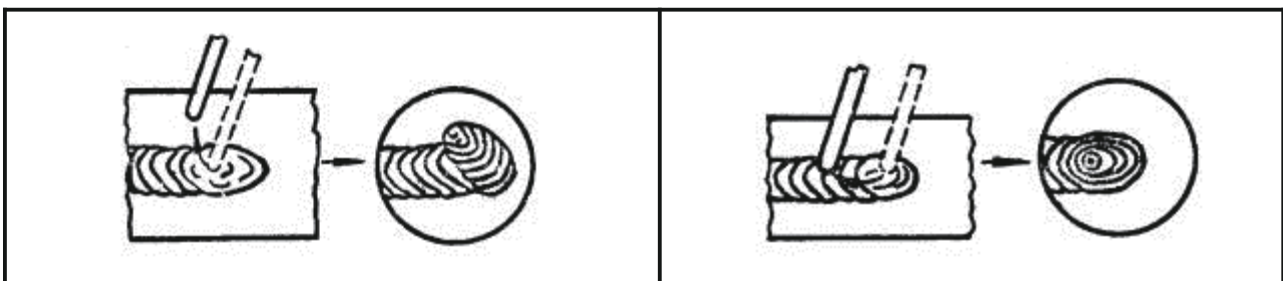
Arc length: the proper arc length is equal to the diameter of electrode in general.

Welding speed: proper welding speed should make the crater width of the weld bead about twice the diameter of the electrode, and the surface of the weld bead should be flat with fine ripples. If the welding speed is too high, and the weld bead is narrow and high, the ripples are rough, and the fusion is not well implemented. If the welding speed is too low, the crater width is excessive, and the workpiece is easy to be burned through. Besides, current should be proper, electrode should be aligned, arc should be low, and welding speed should not be too high and should be kept uniform during the whole welding process.



6) Arc extinguishing

Arc extinguishing is unavoidable during welding. Poor arc extinguishing may bring shallow weld crater and poor density and strength of weld metal by which cracks, air holes, slag inclusion and shortage the like are easy to be produced. Gradually pull the end of the electrode to the groove and raise the arc when extinguishing arc, in order to narrow the weld crater and reduce the metal and heat. Thus, defects such as cracks and air holes can be avoided. Pile up the weld metal of the crater to make the weld crater sufficiently transferred. Then, remove the excessive part after welding. The operation modes of arc extinguishing are shown in the figure below.



a) arc extinguishing at the outside of weld bead	b) arc extinguishing on the weld bead
--	---------------------------------------

Fig.10 Arc extinguishing modes

7) Weldment cleaning

Clean welding slag and spatter with wire brush and tools the like after welding.

14. MAINTENANCE

WARNING



The following operation requires sufficient professional knowledge on electric aspect and comprehensive safety knowledge. Operators should be holders of valid qualification certificates which can prove their skills and knowledge. Make sure the input cable of the machine is disconnected from the electricity utility before uncovering the welding machine.

- 1) Check periodically whether inner circuit connection is in good condition (esp. plugs). Tighten the loose connection. If there is oxidization, remove it with sandpaper and then reconnect.
- 2) Keep hands, hair and tools away from the moving parts such as the fan to avoid personal injury or machine damage.
- 3) Clean the dust periodically with dry and clean compressed air. If welding environment with heavy smoke and pollution, the machine should be cleaned daily. The pressure of compressed air should be at a proper level in order to avoid the small parts inside the machine being damaged.
- 4) Avoid rain, water and vapor infiltrating the machine. If there is, dry it and check the insulation of the equipment (including that between the connections and that between the connection and the enclosure). Only when there are no abnormal phenomena anymore, can the machine be used.
- 5) Check periodically whether the insulation cover of all cables is in good condition. If there is any dilapidation, rewrap it or replace it.
- 6) Put the machine into the original packing in dry location if it is not to be used for a long time.

15. TROUBLESHOOTING

WARNING



The following operation requires sufficient professional knowledge on electric aspect and comprehensive safety knowledge. Operators should be holders of valid qualification certificates which can prove their skills and knowledge. Make sure the input cable of the machine is disconnected from the electricity utility before uncovering the welding machine.

15.1 Common Malfunction Analysis and Solution:

Malfunction Phenomena	Causes and Solutions
Turn on the machine, the power LED is off, the fan doesn't work, and no welding output.	(1) Check if the power switch is closed. (2) No input power.

Turn on the machine, the fan works, but the output current is unstable and can't be controlled by potentiometer when welding.	(1) The current potentiometer fails. Replace it. (2) Check if any loose contact exists inside the machine. If any, reconnect.
Turn on the machine, the power LED is on, the fan works, but no welding output.	(1) Check if any loose contact exists inside the machine. (2) Open circuit or loose contact occurs at the joint of output terminal. (3) The Abnormity indicator LED is on. a) The machine is under over-heating protection status. It can recover automatically after the welding machine is cooled. b) Check if the thermal switch is ok. Replace it if damaged. c) Check if the thermal switch is loosely connected, and reconnect it if necessary.
The electrode holder becomes very hot.	The rated current of the electrode holder is smaller than its actual working current. Replace it with a bigger rated current.
Excessive spatter in MMA welding.	The output polarity connection is incorrect. Exchange the polarity.
Breaker trips when turn on the machine	Check primary rectifier bridge and IGBT

This product is being improved unceasingly, so differences may appear in parts except for functions and operation. Thanks for understanding.

APPENDIX A: PACKING, TRANSPORTATION AND STORAGE

A1. Packing

No.	Name	Unit	Quantity
1	User's manual for ARC series (English)	Volume	1
2	Quick plug fittings	Pack	2
3			
4			
5			

“*” - Not all products have this part.

A2. Transportation

Equipment should be handled with care in transportation to avoid severe impact. Equipment should be prevented from being affected with damp and caught in the rain in transportation.

A3. Storage

Temperature for storage: -10°C~+40°C

Humidity for storage: relative humidity≤90%

Storage life: 12 months

Place for storage: ventilated indoor place without corrosive gas

APPENDIX B: REVISION HISTORY

No.	Description	Version	Time
1			
2			
3			
4			
5			
6			



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