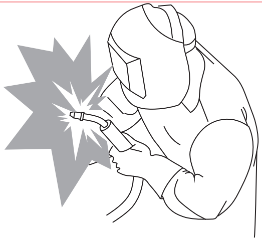


MIG/MAG-130SA,150SA,170SA

User’s Manual
For Metal Inert/Active Gas Arc Welding（MIG/MAG）

⚠ WARNING

ARC WELDING can be hazardous.

This document contains general information about the topics discussed herein.This document is not an application manual and does not contain a complete statement of all factors pertaining to those topics.

This installation,operation,and maintenance of arc welding equipment and the employment of procedures described in this document should be conducted only by qualified persons in accordance with applicable codes,safe practices,and manufacturer’s instructions.

Always be certain that work areas are clean and safe and that proper ventilation is used.Misuse of equipment,and failure to observe applicable codes and safe practices,can result in serious personal injury and property damage.

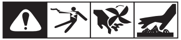
SECTION 1 - SAFETY PRECAUTIONS - READ BEFORE USING

1-1. Symbol Usage

⚠ Means Warning! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ Marks a special safety message.

☞ ***Means "Note"; not safety related.***



This group of symbols means Warning! Possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

▲The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.

▲Only qualified persons should install, operate, maintain, and repair this unit.

▲During operation, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground-check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet. When making input connections, attach proper grounding conductor first- double-check connections.

- Frequently inspect input power cord for damage or bare wiring-replace cord immediately if damaged - bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

FUMES AND GASES can be hazardous.

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

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals,such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather and wool) and foot protection.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, 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.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor,bulkhead,or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums,or pipes,unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards. Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.

FLYING METAL can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

BUILDUP OF GAS can injure or kill.

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

HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.

MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

NOISE can damage hearing.

- Noise from some processes or equipment can damage hearing.
- Wear approved ear protection if noise level is high.

CYLINDERS can explode if damaged.

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

- Protect compressed gas cylinders from excessive heat, mechancal shocks, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder-explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses,and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring - be sure power supply system is properly sized, rated, and protected to handle this unit.

FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.

OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.

STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.

H.F. RADIATION can cause interference.

- High-frequency(**H.F.**) can interfere with radio navigation,safety services,computers,and communicationsequipment.
- Have only qualified persons familiar with electronic equipment perform this installation.

- The user is responsible for having a qualified electrician promply correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut,keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagneticallycompatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

Metal Inert/Active Gas-shielded arc welding (MIG/MAG) or Gas Metal Arc Welding (GMAW) methods are some processes which melt and join metals by heating them with an arc between a small diameter metal wire electrode and the workpiece.

With the MIG welding the small diamete metal wire electrodes may be low alloy steel welding wires,stainless steel welding wires,flux cored welding wires,etc. Gases or inert gases are commonly argon,helium and a mixture of argon and helium.

With the MAG welding the small diamete metal wire electrodes may be low alloy steel welding wires,flux cored welding wires,etc. The most common active gases are a mixture of argon and $C0_2$, rather than just $C0_2$.

It is necessary to use shielded gas for some flux cored welding wires. But,it is not necessary to use outer shielded gas for some flux cored welding wires, these flux cored wires are commonly referred to as '**self-protecting**' flux cored welding wires. The welding method using flux cored welding wires,but the outer shielded gas is not used,is too referred to as '**No Gas**' flux cored wire arc welding by some people.

With the help of the MIG/MAG, GMAW or '**No Gas**' flux cored wire arc welding, you can weld thin or thick steel plates,pipes and other materials in any position.

For MIG/MAG, GMAW or '**No Gas**' flux cored wire arc welding, 'semi-automatic' welding operation method, meaning the arc is 'self-adjusting', is commonly used.Any variation in the arc length produces a change in the 'burn-off' rate allowing rapid re-establishment of the original arc length. Even in the hands of an inexperienced welder it would be possible to produce acceptable looking welds in a very short period of time.

In this semi-automatic welding process, the arc is burning between a thin metal wire electrode and the workpiece. The arc and weld zone are enveloped in a protective gas shield. The wire is fed automatically from a spool, through a welding torch, which is usually connected to the positive terminal and is moved by hand. But the 'semi-automatic' principle of operation doesn't mean these processes is semi-skilled; it refers to the control of welding parameters that would have to be controlled by the operator.that is,the welding voltage will be changed by adjusting the position of voltage selection switch;The welding current will be changed by adjusting the wire feed speed. The faster the speed the higher the amperage draw;The welding speed is controlled by the operator.

Because these welding methods are easy to use and good quality weld bead can be obtained, they have all but replaced Manual Metal Arc (MMA) welding. Why can these welding methods replace MMA welding? Because the output characteristics of the MIG/MAG welding power source is completely different from that of the MMA welding power source.

For MMA/TIG welding，the welding power source characteristic curve is a typical 'drooping' characteristic, or constant-current output characteristic. With the drooping

characteristic , a small change in arc voltage will produce a much smaller change in arc current, depending upon the open circuit voltage (OCV) of the welding machine. This means the wire 'burn-off' rate is much slower for MMA welding, or put another way, for any given change in arc length the welding current change is small. This allows manual welding to take place, as even in the hands of a skilled welder, arc length will vary as welding is progressed, but under these circumstances the current changes will only be small.

For MIG/MAG, GMAW and '**No Gas**' flux cored wire arc welding, the welding power source characteristic curve is a typical 'flat' characteristic, or constant-voltage output characteristic. With the 'flat' characteristic , a large change in current will produce a small change in voltage. This means the wire 'burn-off' rate is much quicker, or put another way, for any given change in arc length the welding voltage change is small. Therefore, in all semi-automatic welding the arc-length and the wire 'burn-off' rate are controlled by the welding machine. The welding current increases as the arc-length decreases so as to rapidly compensate for the increase in wire 'burn-off' rate. This response rate needs to be extremely rapid. Of course the welder needs to try and maintain a consistent wire 'stick-out' length. The wire 'stick-out' length may best be described as the distance from the contact tip of welding gun to the workpiece.

If the same person were asked to make a weld using MMA, in the same training period, it would be most unlikely they would succeed. This is because the only variable parameter is output current of the MMA welding power source. Get that wrong and the results will be poor. Whereas MIG/MAG welding or '**No Gas**' flux cored wire arc welding, being semi-automatic, controls voltage and wire feed speed automatically, thereby, it is easy to mastery in a shorter period of time. This means training courses don't need to be lengthy affairs.

In the MIG/MAG, GMAW and '**No Gas**' flux cored wire arc welding processes, methods of molten globules transfer are mainly "dip" or "globular" transfer.The "dip" transfer, also known as short-circuiting transfer, is carried out using currents below 200 amps and voltages below 24 volts. Under these conditions the arc is so short that the molten globules at the electrode tip 'short-circuit' to the workpiece at rapid, regular intervals. The welding current during short-circuiting melts off the electrode tip and allows re-establishment of the arc. This is ideal for welding on thin materials and out of position working and/or root runs for butt welds.The "globular" transfer, that is a kind of transfer without short-circuiting, is carried out using currents over 200 amps and voltages over 24 volts. Under these conditions the arc is so long that the molten globules at the electrode tip 'not short-circuit' to the workpiece. This is ideal for welding on thick materials.So,in setting up the machine, you must a suited welding voltage, which needs to be in keeping with the wire feed speed or the welding current . If the wire feed speed and welding voltage to be set are not suited, incorrect arc condition may be produced.

In the MIG/MAG arc welding processes,Gas flow rates will depend on the worksite conditions and the workpiece to be welded. If you use a mixture of argon and $C0_2$,

you should set a flow rate of between 12-18 ltrs/min. If Gas flow rates are too high or low,the porosity of weld bead will occur.

The contact tip is another important consideration. This does get damaged easily and is essential to good electrical contact, as it transfers current to the wire. Therefore, a worn tip will present all sorts of electrical contact problems.
The feed roll pressure is another important factor.often overlooked as not being particularly, as is the drum break. If pressure is too high it will deform the wire and cause poor current pick-up, too little pressure and the wire will misfeed.

How is the wire feed speed and voltage selected ?
What are the settings on the front panel of the welding machine controlling?
Do you always get high levels of spatter when welding?
What gas flow rate should be selected?
What is the importance of the contact tip and weld quality?
How do you need to set the feed roller pressure?

These are just a few basic questions. If you cannot answer these or are not familiar with the terms, some weld defects or poor weld bead will be inevitable.

If you would like to improve your welding skills, productivity and quality of weld bead.,Please get practice and learn to knowledge on the welding, or visit some website to learn to knowledge on the welding.

SECTION 3- INSTALLATION AND CONNECTION INSTRUCTIONS

3－1. GENERAL DESCRIPTION

MIG/MAG-130/150/170SA welding machines are designed for those who have an occasional need for a welder，and suitable for light fabrication and repair welding . These welding machines are developed specifically for the nonprofessional welder.The welding machine is compact to allow portability and easy storage on a shelf or under a workbench.

These welding machines are designed in accordance with the IEC60974-1 or EN60974-1 safety standards, with single-phase input voltage and DC output current. The machine is mainly used in the welding of metallic materials such as low-carbon steel, low-alloy steel, stainless steel, etc. The welding machine features low cost, high production efficiency, high anti-rust performance, welding slag free and so on. The machine can be widely applied and welding operations can be done at any position.

MAG-190R welding machines are three types of metal arc welding machines. The technical specifications or parameters of the product are showed on its nameplate.

CAUTION: For different type welding machine,the technical specifications or parameters is different.

3－2. EXPLANATION OF THE TECHNICAL SPECIFICATIONS LISTED ON THE NAMEPLATE

Single-phase transformer,Rectifier,DC output.

Application standards: EN60974-1:2005 or IEC 60974-1:2005.

U_1: Rated AC input voltage of the welding power source (tolerance: ±10%)

I_{1max}: Max. input current

I_{1eff}: Max. effective input current

X: duty cycle

It is the ratio between the load duration time and the full cycle time.

Note1: This ratio is between 0~100%.

Note2: For this standard, one full cycle time is 10min.For example, if the rate is 10%, the loaded time shall be 1 minutes and rest time shall be 9 minutes.

Duty cycle is based on a ten minute period.This means that the arc may be drawn for two minutes out of each ten minute period without any danger of overheating .If it is used more than two minutes during several successive ten minutes peiods, it may overheat.

U_0: Non-load voltage

It is the open-circuit output voltage of the welding power source.

I_2: output current

U_2: Output load voltage

The rated loaded output voltage $U_2=14+0.05I_2$

V_{max}: max. wire feeding speed

D: wire diameter

A / V—A / V: The adjustable range of current and its corresponding load voltage.

IP: Protection grade . For example, IP21,approving the welding machine as suitable for use indoors; IP23,. approving the welding machine as suitable for use outdoors in the rain.

S Suitable for hazardous environments.

⚠ Please read the User’s Manual carefully before use.

1~ Symbol of single-phase AC power supply and rated frequency （e.g. 60 Hz）.

： Beyond rain.

H： Class of Insulation.

Environmental conditions:

Welding power sources shall be capable of delivering their rated output when the following environmental conditions prevail:

a) range of the temperature of the ambient air:

during operation:	–10 °C to +40 °C;
after transport and storage at:	–20 °C to +55 °C;

b) relative humidity of the air:
up to 50 % at 40 °C;
up to 90 % at 20 °C;

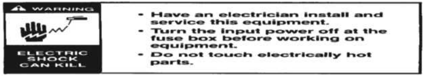
c) ambient air, free from abnormal amounts of dust, acids, corrosive gases or substances, etc. other than those generated by the welding process;

d) altitude above sea level up to 1 000 m;

e) base of the welding power source inclined up to 10°.

3－3. INSTALLATION

WARNING: Only qualified personnel should install,use,or service the welding machines.



WARNING

ELECTRIC SHOCK CAN KILL

- Have an electrician install and service this equipment.
- Turn the input power off at the fuse box before working on equipment.
- Do not touch electrically hot parts.

Machine Installation Location - Place the welding machine to there where is free circulation of air.

- The machine should be installed, operated and maintained by the professionals or people with the relevant experience.
- The welding operation should be done by the people who are familiar with the related safety operation technology.
- The machine should not be used for the purpose other than welding.
- The input voltage should be in conformity with the rated voltage described on the nameplate.
- The welding machine should be placed on the plane surface. If placed on tilted surface, measures should be taken to prevent it from falling.

Welding Machine Assembly

For MIG/MAG-130/150/170SA welding machines, the input power cable should be connected to power supply.For the No gas flux cored welding wire, The shielded gas is needless. The shielded gas is necessary when the solid or some flux welding wire is used. The shielded gas may be CO_2 or 80%Ar+20% CO_2 or Ar etc.

MIG/MAG-130/150/170SA Series Welding Machines are of the welding voltage adjustment switch, Wire Feed Speed or Current Adjustment Knob.The welding gun is fixed.

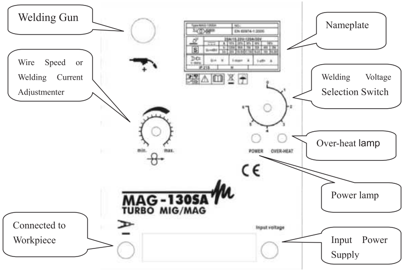


Figure 1 **The front panel of the** MIG/MAG-**130SA welding power source**

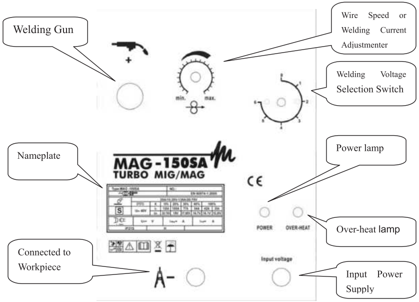


Figure 2 **The front panel of the** MIG/MAG-**150SA welding power source**

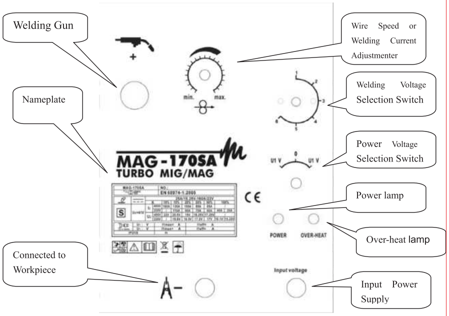


Figure 3 **The front panel of the** MIG/MAG-**170SA welding power source**

Input Power and Grounding Connections

Only qualified persons should install,use or service these equipments. Protect yourself and others from possible serious injury or death.

WARNING: Do not operate with covers removed. Disconnect input power before servicing.
Do not touch electically live parts.

- Before starting the installation,check with the power company to be sure your power supply is adequate for the voltage,amperes,phase,and frequency specified on the welding machine nameplate,Also be sure the planned installation will meet all local and national code requirements.Some welding machines may be operated from a single phase line or from one phase of a two or three phase line.
- Before connecting the input cable to the power supply,check that the power(on-off) switch operates in the position corresponding to the input voltage that the machine will be connected to.

CAUTION :If the power switch setting does not match the input power voltage,you may burn up the welding machine!

- If it is necessary, connect the “**PE**” or **green/yellow grounding wire** in the input cord to a system ground per the applicable national and local codes.

Connect The Machine To Power Supply

- The connection to the main lines is made by the end user. It has to be performed by qualified electricians or by the people trained in this area.
- Power supply cable to the machine must be connected to the main power supply switch.The main power supply has been labeled in the nameplate of the machine,for example,1～，50Hz，220VAC or 230/400VAC,etc.

- If the user want to increase the length of power supply cable the 3x1.5~2.5 mm² lines should be used.
- Before turning on the main power supply switch user must check carefully these connections of the power supply cable and earth cable (Yellow/Green) to the machine.

⚠ **Be sure that connections are fastened tightly. Loose or incorrect fastening may cause the connection to overheat or burn. Unexpected results may occur if a mistake is made in the network connection. Pay attention that the connection of** the “**PE**” or **green/yellow grounding wire of the input cord to a system ground.**

Connect The Gas Cylinder

- After placing the gas cylinder , fasten it with the chain. To operate safely and get best results use approved gas regulator.
- Connect the pressure regulator to the shielding gas cylinder .
- By using a gas tube, Connect Gas Input of the welding power source to the gas supply system outlet.
- Screw the gas hose pressure regulator and open the shielding gas cylinder.
- Open the Gun gas valve,and Setting of the gas flow with the adjustment valve. Usually,the gas flow is about 6~12L/min.

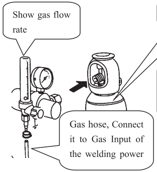


Figure 4 Connection of gas hose and the gas cylinder

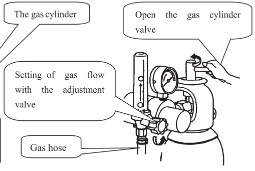

Open the gas cylinder valve
Setting of gas flow with the adjustment valve
Gas hose

Figure 5 Open the gas valve and Setting of gas flow

3－4. OPERATING INSTRUCTIONS

- The welding machine should be put in the place with good ventilation. The ambient environment should not have dust, humidity and vapor.
- The machine should be kept away from the sunlight and rain. It should not be used in the rain.

CAUTION : Duty cycle is based on a ten minute period.This means that the arc may be drawn for two minutes out of each ten minute period without any danger of overheating .If it is used more than two minutes during several successive ten minutes peiods, it may overheat.

Control Functions

The desired welding curent is set by turning the wire speed knob (Wire speed or Welding current adjustment).Clockwise rotation raises the wire feed speed or the welding current, counterclockwise rotation reduces the wire feed speed or the welding current.

The desired welding voltage is set by turning the voltage selection switch (Welding voltage selection switch).Clockwise rotation raises the welding voltage, counterclockwise rotation reduces the welding voltage.

SECTION 3- INSTALLATION AND CONNECTION INSTRUCTIONS

Use and protection of the gas cylinder

- Before using the machine the operator should check the gas cylinder and other devices to see if the gas pressure gauge works normally, if the gas valve control device has gas leaking and if all the gas pressure devices are within the effective period and in conformity with the safety requirements.
- The gas cylinder used for the machine should be tied firmly with the belt or the chain and should be placed on the floor.
- The gas valve should be turned off after the welding work is finished. The gas cylinder should be isolated from the heat source and no hazardous articles like the inflammable substances should be placed near the gas cylinder.
- Using a hose connect the outlet of the gas cylinder to the gas inlet of the machine. Then turn on the gas valve and adjust the gas flow to 6-12L/min.

Use and protection of the wire feeder

- Place the welding wire in the notch corresponding to the wire feeding wheel through the wire feeding tube and insert it into the welding gun directly.Then press the pressing shaft of the wire feeding wheel down on the welding wire. Finally turn on the switch of the welding gun and wait until the welding wire extends out for 10-15mm. After the above operations are finished, the welding operation can begin.
- The weight of the welding wire equipped with the feeding drive system is 0.5-5kg. Welding wire more than 5Kg shall not be used. Otherwise, the wire feeder may be damaged or the feeding speed may be excessively low.
- The diameter of the welding wire should be 0.6-0.8mm.

Caution: Please don’t use the gun mouth to face any part of the human body during wire feeding!

Other precautions

- When the thermal protection device is working, it will shut off the output of the welding machine and the yellow indicator lamp will be on.When the thermal protection device is automatically reset, the yellow indicator lamp will be off.
- If the output welding cable is excessively long, it will result in the unstable welding process.
- The input voltage of the power should be kept stable.The larger fluctuation of the voltage will affect the performance of the welding machine.

3—5. MAINTENANCE

WARNING: ELECTRIC SHOCK can kill.
Do not touch electrically live parts such as output terminals or internal wiring.
MOVING PARTS can injure.

Routine preventative maintenance is not required.

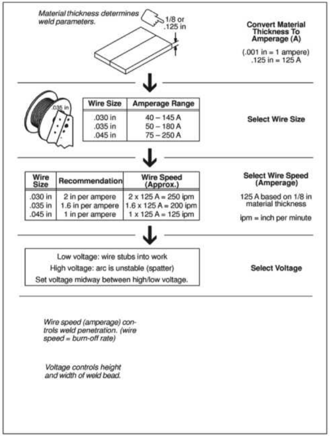
If either output welding cable requires replacement for other reasons, it should be replaced with the appropriate part -and only by qualified personnel .

- Any incorrect or improper operation may cause failure and damage of the machine.
- Before maintenance and repair of the machine, the main power must be shut off.
- In case of the failure occurs or some consumptive parts need to be replaced, the related work of repair or maintenance should be done by professionals.

SECTION 4—METAL INERT/ACTIVE GAS SHIELDED ARC WELDING (MIG/MAG) PROCEDURE

4—1. Typical Welding Process Control Settings

NOTE ☞ *These settings are guidelines only. Material and wire type, joint design, fitup, position, shielding gas, etc. affect settings. Test welds to be sure they comply to specifications.*



Material thickness determines weld parameters.
1/8 or .125 in
Convert Material Thickness To Amperage (A)
(.001 in = 1 ampere)
.125 in = 125 A
.035 in
Select Wire Size
Select Wire Speed (Amperage)
125 A based on 1/8 in material thickness
ipm = inch per minute
Select Voltage
Wire speed (amperage) controls weld penetration. (wire speed = burn-off rate)
Voltage controls height and width of weld bead.

Wire Size	Amperage Range
.030 in	40 – 145 A
.035 in	50 – 180 A
.045 in	75 – 250 A

Wire Size	Recommendation	Wire Speed (Approx.)
.030 in	2 in per ampere	2 x 125 A = 250 ipm
.035 in	1.6 in per ampere	1.6 x 125 A = 200 ipm
.045 in	1 in per ampere	1 x 125 A = 125 ipm

Low voltage: wire stubs into work
High voltage: arc is unstable (spatter)
Set voltage midway between high/low voltage.

Figure 4 Typical GMAW Process Control Settings

Three simple manipulations are of prime importance. Without complete mastery of these four, further welding is futile .With compete mastery of the four, welding will be easy.

1） **The Correct Welding Position**
2） **The Correct Arc Length**
3） **The Correct Welding Speed**

4—2. Holding And Positioning Welding Gun

NOTE *Welding wire is energized when gun trigger is pressed. Before lowering helmet and pressing trigger, be sure wire is no more than 1/2 in (13 mm) past end of nozzle, and tip of wire is positioned correctly on seam.*

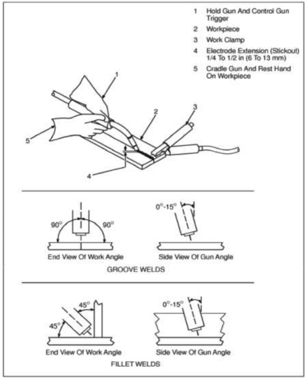


Figure 5 Holding And Positioning Welding Gun

Figure 5 illustrates the correct welding position for left -handed people (For right - handed it is opposite):

a. Hold the gun in your left hand

b. Touch right hand to under side of left hand.

c. The welding gun trigger is controlled by the left hand .

Weld with two the hand whenever possible .

Whenever possible, weld from left to right (if right-hand).This enables you to see clearly what you are doing.

Hold the gun at a slight angle as Figure 5 shown .

4—3. Conditions That Affect Weld Bead Shape

NOTE *Weld bead shape depends on gun angle, direction of travel, electrode extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.*

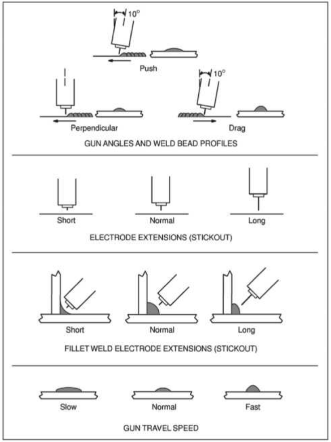

10°
Push
10°
Perpendicular
Drag
GUN ANGLES AND WELD BEAD PROFILES
Short
Normal
Long
ELECTRODE EXTENSIONS (STICKOUT)
Short
Normal
Long
FILLET WELD ELECTRODE EXTENSIONS (STICKOUT)
Slow
Normal
Fast
GUN TRAVEL SPEED

Figure 6 Conditions That Affect Weld Bead Shape

Once the arc has been established, maintaining the correct arc length becomes extremely important .The arc should be short,approximately 1.5-3.0 mm long .As the wire burns off the wire must be fed to the work to maintain correct arc length.

The easiest way to tell whether the arc has the correct length is by listening to its sound. A nice,short arc has a distinctive,“crackling”sound ,very much like eggs frying in a pan.The incorrect, long arc has a hollow, blowing or hissing sound.

4－4. Gun Movement During Welding

NOTE ☞ *Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.*

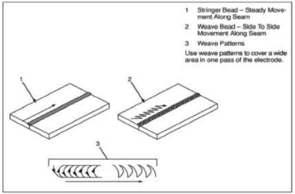

1 Stringer Bead – Steady Movement Along Seam
2 Weave Bead – Side To Side Movement Along Seam
3 Weave Patterns
Use weave patterns to cover a wide area in one pass of the electrode.
1
2
3

Figure 7 Gun Movement During Welding

The Correct Welding Speed

The important thing to watch while welding is the puddle of molten metal right behind the arc.**DO NOT watch the arc itself.**It is the appearance of the puddle and the ridge where the molten puddle solidifies that indicate correct welding speed.

Most beginners tend to weld too fast, resulting in a thin, uneven,“wormy” looking bead.They are not watching the molten metal.

IMPORTANT: For general welding it is not necessary to weave the arc; neither forwards and backwards nor sideways. Weld along at a steady pace. You will find it easier.

NOTE: When welding on thin plate, you will find that you will have to increase the welding speed, whereas when welding on heavy plate ,it is necessary to go more slowly in order to get good penetration.

4－5. Poor Weld Bead Characteristics

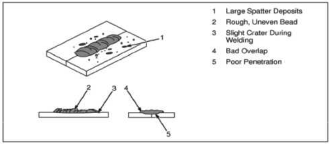


Figure 8 Poor Weld Bead Characteristics

4－6. Good Weld Bead Characteristics

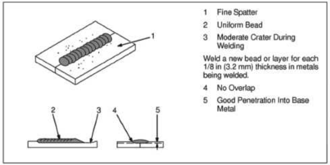

1 Fine Spatter
2 Uniform Bead
3 Moderate Crater During Welding
Weld a new bead or layer for each 1/8 in (3.2 mm) thickness in metals being welded.
4 No Overlap
5 Good Penetration Into Base Metal
1
2
3
4
5

Figure 9 Good Weld Bead Characteristics

4－7. Practice Of Welding

The best way of getting practice in the three skills that enable you to maintain :

1. Correct Welding Position
2. Correct Way to Strike An Arc
3. Correct Arc Length and Welding Speed

is to spend a little more time on the following exercise.

Use the following:

Mild Steel Plate: 2 mm or heavier Welding wire: 0.6~0.8mm Current Setting: 70~120 Amps

Do the following:

1) Learn to strike the arc.Be sure the angle of the gun is right.
2) When you can strike an arc, practice the correct arc length.Learn to distinguish it by its sound.
3) When you are sure that you can hold a short, crackling arc, start moving.Look at the molten puddle constantly, and look for the ridge where the metal solidifies.
4) Run beads on a flat plate.Run them parallel to the top edge (the edge farthest away from you) .This gives you practice in running straight welds,and also,it gives you an easy way to check your progress .the 10th weld will look considerderably better than the first weld,By constantly checking on your mistakes and your progress, welding will soon be a matter of routine.

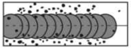
4－8. Common Metals

Most metals found around the farm or small shop are low carbon steel, sometimes referred to as mild steel. Typical items made with this type of steel include most sheet metal, plate, pipe and rolled shapes such as channels, angel irons and “I” beams .This Type of steel can usually be easily welded without special precautions.Some steel, however,contains higher carbon. Typical applications include plates, axles, connecting rods, shafts, plowshares and scraper blades. These higher carbon steels can be welded successfully in most cases; however ,care must be taken to follow proper procedures, including preheating the metal to be welded and, in some cases, carefully controlling the temperatures during and after the welding process ,For further information on identifying various types of steel and other metals ,and for proper procedures for welding them ,we again suggest you purchase a book on Arc Welding.

Regardless of the type of metal being welded, it is important in order to get a quality weld that it be free of oil, paint, rust or other contaminants.

5－1. Excessive Spatter

Table 1. Excessive Spatter

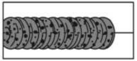


Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

Possible Causes	Corrective Actions
Wire feed speed too high.	Select lower wire feed speed.
Voltage too high.	Select lower voltage range.
Electrode extension (stick-out) too long.	Use shorter electrode extension (stickout).
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
Dirty welding wire.	Use clean, dry welding wire. Eliminate pickup of oil or lubricant on welding wire from feeder or liner.

5－2. Porosity

Table 2. Porosity

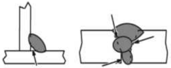


Porosity – small cavities or holes resulting from gas pockets in weld metal.

Possible Causes	Corrective Actions
Inadequate shielding gas coverage.	Check for proper gas flow rate. Remove spatter from gun nozzle. Check gas hoses for leaks. Eliminate drafts near welding arc. Place nozzle 1/4 to 1/2 in (6-13 mm) from workpiece. Hold gun near bead at end of weld until molten metal solidifies.
Wrong gas.	Use welding grade shielding gas; change to different gas.
Dirty welding wire.	Use clean, dry welding wire. Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding. Use a more highly deoxidizing welding wire (contact supplier).
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.

5－3. Incomplete Fusion

Table 3. Incomplete Fusion

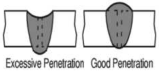


Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceeding weld bead.

Possible Causes	Corrective Actions
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient heat input.	Select higher voltage range and/or adjust wire feed speed.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding. Adjust work angle or widen groove to access bottom during welding. Momentarily hold arc on groove side walls when using weaving technique. Keep arc on leading edge of weld puddle. Use correct gun angle of 0 to 15 degrees.

5－4. Excessive Penetration

Table 4. Excessive Penetration

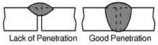


Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed. Increase travel speed.

5－5. Lack Of Penetration

Table 5. Lack Of Penetration



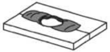
Lack Of Penetration – shallow fusion between weld metal and base metal.

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.

Possible Causes	Corrective Actions
Improper weld technique.	Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration. Keep arc on leading edge of weld puddle. Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Insufficient heat input.	Select higher wire feed speed and/or select higher voltage range. Reduce travel speed.

5－6. Burn-Through

Table 6. Burn-Through

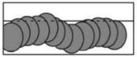


Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed. Increase and/or maintain steady travel speed.

5－7. Waviness Of Bead

Table 7. Waviness Of Bead

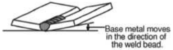


Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

Possible Causes	Corrective Actions
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Unsteady hand.	Support hand on solid surface or use two hands.

5－8. Distortion

Table 8. Distortion



Distortion – contraction of weld metal during welding that forces base metal to move.

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position. Make tack welds along joint before starting welding operation. Select lower voltage range and/or reduce wire feed speed. Increase travel speed. Weld in small segments and allow cooling between welds.

5－9. Common Shielding Gas

Table 9. Shielding Gas

Gas	Argon	Argon + 1% O_2	Argon + 2% O_2	Argon + 5% O_2	Argon + 8% CO_2	Argon + 25% CO_2	Argon + 50% CO_2	CO_2	Helium	Argon + Helium
Spray Arc Steel		Flat & Horizontal[5] Fillet	Flat & Horizontal[5] Fillet	Flat & Horizontal[5] Fillet	Flat & Horizontal[5] Fillet	Flat & Horizontal[1] Fillet		Flat & Horizontal[1] Fillet		
Short Circuiting Steel					All Positions	All Positions	All Positions	All Positions		
Spray Arc Stainless Steel		Flat & Horizontal[5] Fillet	Flat & Horizontal[5] Fillet							
Short Circuiting Stainless Steel						All Positions				
Spray Arc Aluminum	All Positions[5]								All Positions	All Positions
Short Circuiting Aluminum	All Positions									

1 Globular Transfer
2 Heavy Thicknesses
3 Single Pass Welding Only
4 90% HE + 7-1/2% AR + 2-1/2% CO_2
5 Also for GMAW-P, All Positions

TABLE OF CONTENTS

SECTION 1— SAFETY PRECAUTIONS－READ BEFORE USING

1－1. Symbol Usage
1－2. Arc Welding Hazards
1－3. Additional Symbols For Installation,Operation,And Maintenance
1－4. EMF Information

SECTION 2— PRINCIPLES OF METAL INERT/ACTIVE GAS SHIELDED ARC WELDING (MIG/MAG)

SECTION 3— INSTALLATION AND CONNECTION INSTRUCTIONS

3－1. GENERAL DESCRIPTION
3－2. EXPLANATION OF THE TECHNICAL SPECIFICATIONS LISTED ON THE NAMEPLATE
3－3. INSTALLATION
3－4. OPERATING INSTRUCTIONS
3－5. MAINTENANCE

SECTION 4—METAL INERT/ACTIVE GAS SHIELDED ARC WELDING (MIG/MAG) PROCEDURE

4－1. Typical FLUX MIG and MIG/MAG Welding Machines
4－2. Typical MIG/MAG Welding Process Control Settings
4－3. Holding And Positioning Welding Gun
4－4. Conditions That Affect Weld Bead Shape
4－5. Gun Movement During Welding
4－6. Poor Weld Bead Characteristics
4－7. Good Weld Bead Characteristics
4－8. Practice of welding
4－9. Common Metals

SECTION 5— WELDING TROUBLESHOOTING

5－1. Excessive Spatter
5－2. Porosity
5－3. Incomplete Fusion
5－4. Excessive Penetration
5－5. Lack Of Penetration
5－6. Burn-Through
5－7. Waviness Of Bead
5－8. Distortion
5－8. Common Shielding Gas