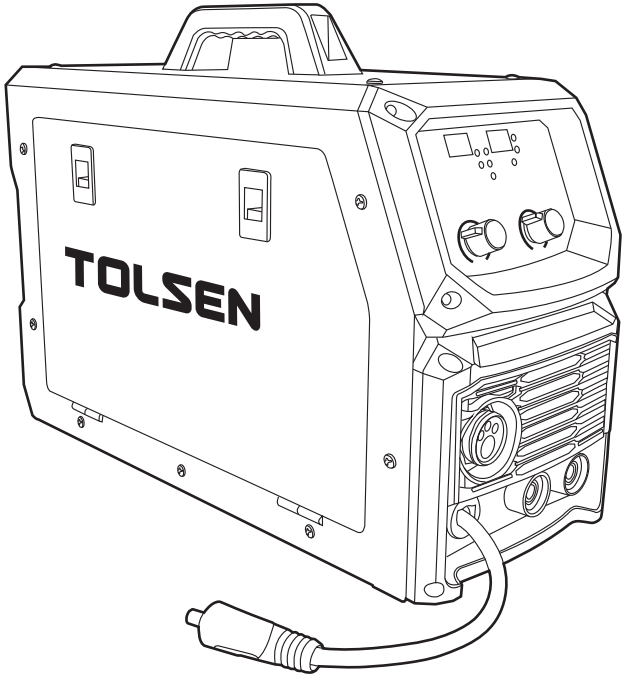
TOLSEN

44023

INVERTER MIG DC WELDING MACHINE

INSTRUCTION MANUAL



SAVE THIS MANUAL !
You will need this manual for safety instructions, operating procedures and warranty.
Put it and the original sales receipt in a safe dry place for future reference.

IMPORTANT SAFETY INFORMATION

⚠ Warning: Protect yourself and others from injury— read and follow these precautions.

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 Safety Standards. a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all
▲ 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.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voitage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- 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 ind disconnect box or that cord plug is connected to a properly grounded receptadle outlet.
- When making input connections, attach proper grounding conductor first-double-check connections.
- Frequently inspect input power cord for damage or bare wiringreplace 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.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety hamess if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workplece 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 in inverter-type welding power sources after removal of input power.

- 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 local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables,u coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or whiled wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air andd 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 ophighly toxic and irritating gases.erations. The heat and rays of the arc can react with vapors to form
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weldd area, the area is well ventilated, and while wearing an air-suppliedd respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

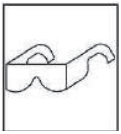
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of fil-d ter lenses 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, glare and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or 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.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- 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, sparks, 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.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



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 inure 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.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

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, mechanical shocks, physical damage, 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.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

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.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.

READ INSTRUCTIONS.

- Read Owner's Manual before using or servicing unit.
- Use only genuine Miller/Hobart replacement parts.

H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly 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 tominimize 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 electromagnetically compatible.
- 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 groundedd 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.

EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic FieldsWelding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concen 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 committees judgment, has not demonstrated that exposure to powerfrequency 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 possibie

About Pacemakers: To reduce magnetic fields in the workplace, use the following procedures:Pacemaker wearers consult your doctor before welding or going near welding operations. If cleared by your doctor, then following the above procedures is recommended.

Electromagnetic Compatibility(EMC)

ELECTROMAGNETIC EMISSION

- All electrical equipment generates small amounts of electromagnetic emission due to current transferring in the equipment. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result . Electrical emissions may affect not only welding machines but also many kinds of electrical equipment like radio and TV reception, numerical controlled machines, telephone systems, computers etc.
- The user is responsible for installing and using the equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earth the welding the welding circuit, in other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.
- The circuit may or may not be earthed for safety reasons. Changing the earth arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths which may damage the earth circuits of other equipment.
- Extra precaution may be required when the welding power source is used in a domestic establishment.
- Special measures shall be taken to achieve compliance with welding power source including HF frequency for arc ignition and stabilizing; it may be required use of shielded cables and in any case to resolve the particular implementation (e.g. with robot, computer and any other electrical and electronic equipment connected to welding power source) to call the technical assistance of the manufacturer.
- EMC classification according to IEC 60974-10: Class A.

Warning: This Class A welding equipment is not applicable to living areas powered by a low-voltage public power system.It may be difficult to ensure electromagnetic compatibility in these areas due to conduction and radiation interference.

ASSESMENT OF THE SURROUNDING AREA

Before installing the welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account- if needed arrange the working hoursthatnot coincidewiththose.

- Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment,
- Radioandtelevisiontransmitters andreceivers,
- Computer andother control equipment,
- Safety critical equipment,
- Presenceofheart beatregulators,heart cells,hearingdevices oretc. nearby,
- Equipmentusedfor calibration ormeasurement,
- Theimmunity ofother equipmentintheenvironment.

The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.

METHODS OF REDUCING EMISSIONS

- Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. Our welding machines are filtered against emission according to standards. If interference still occurs, it may be necessary to take additional precautions such as filtering of the mains supply.
- The equipment should be routinely maintained according to the manufacturer's recommendations. The welding equipmentshouldnotbemodifiedwithouttheapprovalofmanufacturer.
- The welding cables should be kept as short as possible and should be positioned close together, running at or close tothe floorlevel.Power cables andsignal cablesshouldbekeptseparately.
- Keeping cablesintheshape of-8- andtaping togetherreduceemission.
- Connect earth clamp to work-piece as close to the weld as possible. Butthe usershould be control whether this situationdamagetopeople andequipment ornot.

MAINTENANCE MADE BY UNQUALIFIED PERSONS MAY CAUSE INJURIES

- Electrical devices should not be repaired by unqualified persons. Improper repairs can cause serious injuries or even death during applications.
- The components of the gas circuit works under pressure. The service given by unqualified persons may cause explosions and operators can be injured seriously.

OVERUSE CAN CAUSE OVERHEATING

- Allowcoolingperiod,followrated welding time and rest or interval time.
- Reducecurrentorreducewelding time before starting toweldagain.
- Donotblock airflowto unit.
- Donotfilter airflowtounitwithouttheapprovalofmanufacturer.

PROTECTION

- Donot expose theweldingmachinetorain,protectfromwaterdrops and vapour.


Beyond rain

Do not weld on and cut closed tubes or pipes.

- Before welding on closed containers, open and clear them entirely. Welding operations on these partsmust be performed with the utmost caution.
- Never weld containers or pipes containing or which have contained substances that could give rise to explosions.

Weldingequipmentwarms up so never position them on flammable surfaces.

OBEY ALL THE SAFETY RULES STATED IN THE MANUAL!

PRINCIPLES OF MIG/MAG OR NO GAS FLUX CORED WIRES ARC WELDING

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 work-piece. With the MIG welding the small diameter 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 diameter 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 C02, rather than just C02.

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 work-piece. 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 work-piece.

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 work-piece 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 work-piece. 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 work-site conditions and the work-piece to be welded. If you use a mixture of argon and C02 , you should set a flow rate of between 6-10 L/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 track-slip.

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.

PRINCIPLES OF MANUAL METAL ARCWELDING (MMA)

Shielded Metal Arc Welding, MMA or Stick welding is a process which melts and joins metals by heating them withl an arc between a coated metal electrode and the workpiece, The electrode outer coating, called flux, assists in creating the arc and provides the shielding gas and slag covering to protect the weld from contamination. The electrodel core provides most of the weld filler metal.

When the electrode is moved along the workpiece at the correct speed the metal deposits in a uniform layer called a bead. The Stick welding power source provides constant current (CC) and may be either alternating current (AC) or directl current (DC), depending on the electrode being used. The best welding characteristics are usually obtained using Dcl power sources. The power in a welding circuit is measured in voltage and current. The voltage (Volts) is governed by the arc lengthl between the electrode and the workpiece and is influenced by electrode diameter. Current is a more practical measure of the power in a weld circuit and is measured in amperes (Amps).

The amperage needed to weld depends on electrode diameter, the size and thickness of the pieces to be welded,land the position of the welding. Generally, a smaller electrode and lower amperage is needed to weld a small piece than a large piece of the same thickness. Thin metals require less current than thick metals, and a smail electrodel requires less amperage than a large one.

It is preferable to weld on work in the flat or horizontal position. However, when forced to weld in vertical or overheadl positions it is helpful to reduce the amperage from that used when welding horizontally.

Best welding results arel achieved by maintaining a short arc, moving the electrode at a uniform speed, and feeding the electrode downwardl at a constant speed as it melts.

More specific information on the Stick welding procedure is provided in the following sections.

No one can learn to weld simply by reading about it .Skill comes only with practice. The following pages will help the inexperienced welder to understand welding and develop his skill .For more detailed information order a book on Arc Welding.

The operator's knowledge of arc welding must go beyond the arc itself .He must known how to control the arc, and this requires a knowledge of welding circuit and the equipment that provides the electric current used in the arc. The welding circuit begins where the electrode cable is attached to the welding machine and ends where the work cable is attached to the welding machine .Current flows through the electrode cable to the electrode holder, through the electrode and across the arc. On the work side of the arc, the current flows through base metal to the work cable and back to the welding machine .the circuit must be compete for the current to flow. To weld, the work clamp must be tightly connected to clean base metal .Remove paint, rust ,etc. as necessary to get a good connection .Connect the work clamp as close as possible to the area you wish to weld. Avoid the welding circuit to pass through hinges, bearings, electronic components or similar devices that can be damaged.

The electric arc is made between the work and the tip end of a small metal wire, the electrode, which is clamped in a holder and the holder is held by the welder. A gap is made in the welding circuit by holding the tip of the electrode 1.5-2.0mm away from the work or base metal being welded. The electric arc is established in this gap and is held and moved along the joint to be welded, melting the metal as it is moved.

Arc welding is manual skill requiring a steady hand, good physical condition, and good eyesight .the operator controls the welding arc and, therefore, the quality of the weld made.

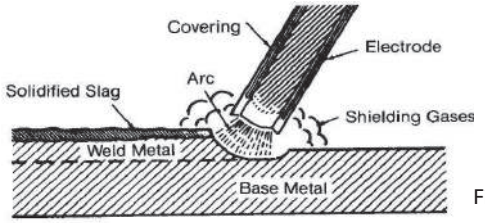


Figure 1 The welding arc

What Happens in the Arc

Figure 1 illustrates the action that takes place in the electric arc. it closely resembles what is actually seen during welding . The "arc stream "is seen in the middle of the picture .this is the arc created by the current flowing through the space between the end of the electrode and the work .The temperature of this arc is about 60000 F. ,Which is more than enough to melt the base metal .The arc is very bright ,as well as hot ,and cannot be looked at with the naked eye without risking painful injury.The very dark lens, specially designed for arc welding, must be used with the hand or face shield whenever viewing the arc.

The arc melts the base metal and actually digs into it, much as water through a nozzle on a garden hose digs into the earth . The molten metal forms a molten pool or crater and tends to flow away from the arc .As it moves away from the arc, it cools and solidifies. A slag forms on top of the weld to protect it during cooling

The function of the covered electrode is much more than simply to carry current to the arc .The electrode is composed of a core of metal wire around which has been extruded and baked chemical covering. The core wire melts in the arc and tiny droplets of molten metal shoot across the arc into the molten pool .The electrode provides additional filler metal for the joint to fill the groove or gap between the two pieces of the base metal. The covering also melts or burns in the arc.It has several functions.It makes the arc steadier, provides a shield of smoke-like gas around the arc to keep oxygen and nitrogen in the air away from the molten metal, and provides a fluxe for the molten pool. The flux picks up impurities and forms the protective slag .The principal differences between the various types of electrodes are in their coatings. By varying the coating, it is possible to greatly alter the operating characteristics of electrodes. By understanding the differences in the various coating, you will gain a better understanding of selecting the best electrode for the job you have at hand .In selecting an electrode you should consider:

1. The type of deposit you want, e.g. mild steel, stainless, low alloy.
2. The thickness of the plate or base metal you want to weld.
3. The position it must be welded in (down hand, out-of-position).
4. The surface condition of the base metal to be weld.
5. Your ability to handle and obtain the desired electrode.

Four 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

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

a. Hold the electrode holder in your right hand
b. Touch left hand to underside of right hand.
c. Put the left elbow into your left side.

Weld with two the hand whenever possible .This gives complete control over the movements of electrode. Whenever possible, weld from left to right (if right-hand).This enables you to see clearly what you are doing. Hold the electrode at a slight angle as shown.

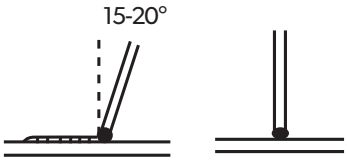


Figure 2 Correct Welding Position

2. The Correct Way to Strike An Arc

Be sure the work clamp makes good electrical contract to the work .
Lower your headshield and scratch the electrode slowly over the metal, and you will see sparks flying.
While scratching, lift the electrode 3 mm and the arc is established.
NOTE: If you stop moving the electrode while scratching, the electrode will stick.
NOTE: Most beginners try to strike the arc by a fast jabbing motion down on the plate .
Result: They either stick or their motion is so fast that they break the arc immediately

3. The Correct Arc Length

The arc length is the distance from the tip of the electrode core wire to the base metal.
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 electrode burns off the electrode 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. 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.The ridge should be approximately 10mm behind the electrode.

Figure 3 Molten puddle

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.

WELDING PRACTICE

The best way of getting practice in the four skills that enable you to maintain :
1. Correct Welding Position
2. Correct Way to Strike An Arc
3. Correct Arc Length
4. Correct Welding Speed

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

Use the following:
Mild Steel Plate: 5 mm or heavier
Electrode: 1/8'' (3.2mm)
Current Setting: 100~120 Amps AC

Do the following:
1. Learn to strike the arc by scratching the electrode over the plate .Be sure the angle of the electrode is right and Be sure to use both hands.
2. When you can strike an arc without sticking, 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.

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 wear plates, axles, connecting rods, shafts, plowshares and scraper blades. These higher carbon steels cabin 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.

PRINCIPLES OF TIG WELDING

TIG(Tungsten Inert Gas) welding is a process which melts and joins metals by heating them with an arc between TIG torch and the work-piece.The shielded gas is required for TIG welding.Argon or Ar gas is usually used for the shielded gas.According to the needs of welded joints, the filled wire may be used.Sometimes, the filled wire is not used.The welding material of the filled wire is generally similar to that of the base metal or the welded metal.The arc can melt the filled wire and the base metal or the welded metal.No slag for TIG welding.The shielded gas can protect the weld from contamination.When TIG torch is moved along the work-piece at the correct speed the metal deposits in a uniform layer called a bead.TIG welding, generally, the left hand holds the filled wire, the right hand holds the TIG torch, the head wears the protective mask.In TIG welding operation, it is more difficult, compared to MMA welding. It takes a long time to train to obtain better weld bead.

TIG welding arc starting mode is divided into the High Frequency(HF)starting arc and LIFT-ARC or contact starting arc.For the High Frequency(HF)starting arc,the tungsten electrode of the TIG torch is not in contact with the work-piece, and the arc is ignited by the High Frequency and High voltage.For the LIFT-ARC starting arc,the tungsten electrode of the TIG torch is in contact with the work-piece, and the arc is ignited by the Lifting of the TIG torch. For series welding machines,the LIFT-ARC is used.For more information about TIG welding, check out the relevant information.

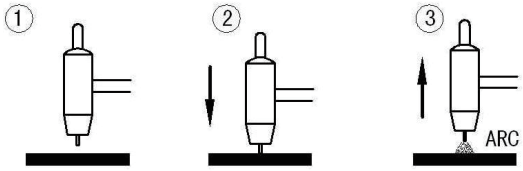


Figure 4 LIFT-ARC of the TIG welding

Figure 5 Shape of the tungsten electrode

Tungsten Electrode

Colour and model	Electrode material	DC	Apply
Golden WL15	1.5%La2O3	√	carbon steel,stainless steel,Cu and copper alloy, Ti and titanium alloy
Blue WL20	2%La2O3	√	alloy steel,Cu and copper alloy
Gray WC20	2%CeO2	√	
Blue WY	2%YO2	√	

Tungsten electrode diameter		Nozzle type	DC Current Range
0.020"	0.6mm	3, 4, 5	2~20
0.040"	1.2mm	4, 5	15~80
1/16"	1.6mm	4, 5, 6	15~120
3/32"	2.4mm	6, 7, 8	6~200

INSTALLATION AND CONNECTION INSTRUCTIONS

General Description

Series welding machines are DC MIG,MAG,No gas shielded Flux wire welding,TIG and MMA welding machines. These welding machines are equipped with a handle for safe lifting.
welding power source intended for use for a laymen(operator who does not weld in the performance of his profession and has little or no formal instruction in arc welding).
These machines require single phase, 230 VAC, 50Hz input power.
These machines are ideal for a wide variety of welding applications such as repair, construction, light fabrication and farm repair.

Figure 6
Front panel of the welding machine

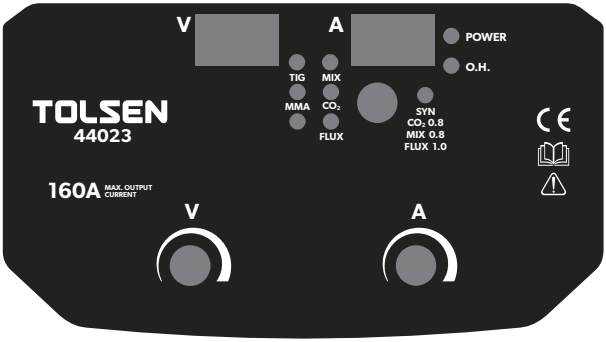


Figure 7 Control and Display Panel

- **V Meter**: Voltage Meter.
- **A Meter**: Current Meter.
- **POWER LED1**: Power indicator light LED1.
- **O.H(Over Heat)LED2**: Over Heat Protection indicator light LED2.

This light will come on and welding will stop when the internal temperature of the machine is too high. Allow the machine to run while cooling. The light will go out when welding can resume.

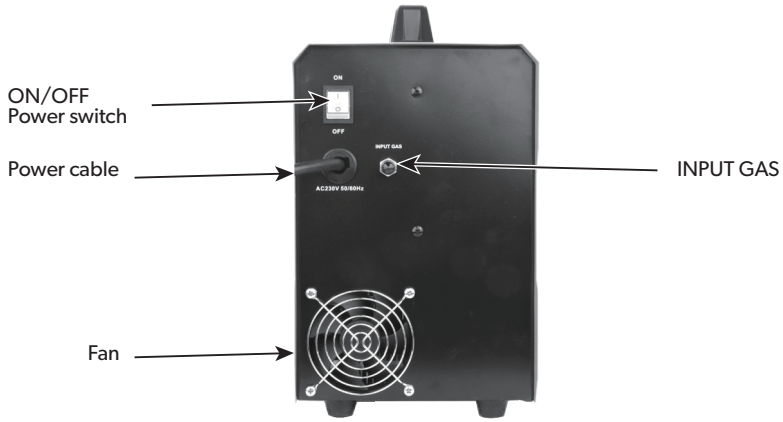


Figure 8 Back panel of the welding machine

•ON/OFF Power switch
In the "0" or OFF position no power is being supplied to the unit. In the "1" or ON position power is supplied to the unit.
•Power cable: 230 VAC , 50 Hz
The power supply cable connects the welding machine to the 1~, 230 volt power supply.
•INPUT GAS
1. TIG Argon arc welding does not use Input Gas (On the back panel).
2. Input Gas of the TIG torch must be connected to the external Ar gas supply system.

Output connection and output polarity:

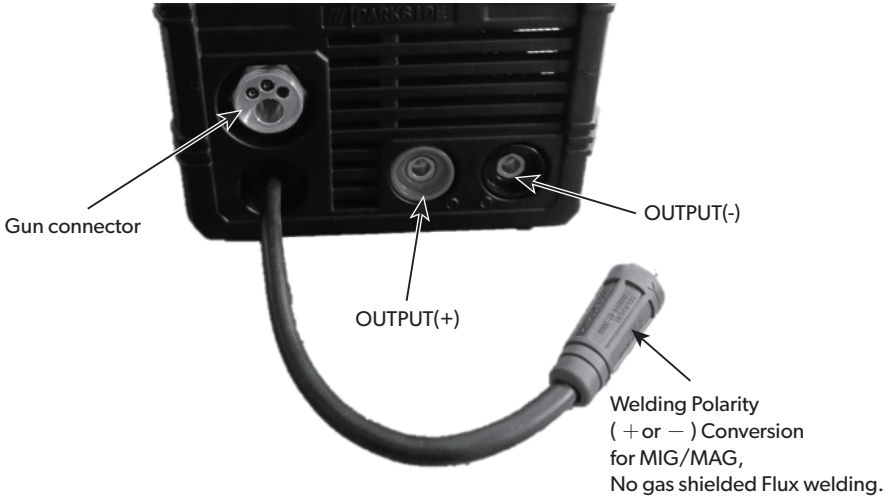
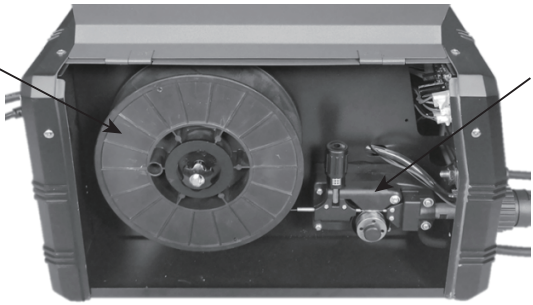


Figure 9 Output connection and output polarity of the welding machine

OUTPUT(+)and OUTPUT(-): Quick connector connection-type output connection

Wire reel shaft for MIG/MAG, 1.0/Al(5356)welding or No gas flux wire welding



Wire Feeder for MIG/MAG, 1.0/Al(5356)welding or No gas flux wire welding

Figure 10 Internal wire feeder structure of the welding power source
Wire weight: 0.5-5Kg

Unpacking

- Remove cartons, bags or Styrofoam containing the welder and accessories.
- Check the contents with the packing list below.

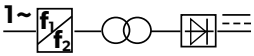
ITEM	QTY.
Welding Machine	1 Unit
Gun	1 Unit
Electrode Holder and cable	1Unit
Ground cable and work Clamp	1Unit
User's Manual	1Set

Explanation Of The Technical Specifications Listed On The Nameplate

MAIN TECHNICAL SPECIFICATIONS:
The technical specifications or parameters of the product are showed on its nameplate.

TOLSEN INVERTER MIG DC WELDING MACHINE					
44023		No.:			
1~		EN IEC 60974-1: 2018/A1:2019			
		40A/16.0V—160A/22.0V			
		X (%)	20	60	100
S	U_0 60.5V	I_2 (A)	160	92	72
		U_2 (V)	22.0	18.6	17.6
1~50/60Hz		U_1=230V	I_1Max=25.5A	I_{1eff}=11.4A	
		20A/20.8V—160A/26.4V			
		X (%)	20	60	100
S	U_0 60.5V	I_2 (A)	160	92	72
		U_2 (V)	26.4	23.7	22.9
1~50/60Hz		U_1=230V	I_1Max=30.0A	I_{1eff}=13.5A	
		15A/10.6V—160A/16.4V			
		X (%)	20	60	100
S	U_0 59V	I_2 (A)	160	92	72
		U_2 (V)	16.4	13.7	12.9
1~50/60Hz		U_1=230V	I_1Max=20.5A	I_{1eff}=9.2A	
IP21S		H			

Explain:



Single phase input AC power supply, inverter, Transformer, Rectifier, DC current or voltage output

MIG/MAG welding or GMAW process

MMA welding process

TIG welding process

Norm: Application standards, for example,EN 60974-6:2016,etc.
U1: Rated AC input voltage of the welding power source, for example, 1~ (single phase), 230V.
50HZ: Rated frequency of single phase AC power supply.
I1max: Max. input current.
I1eff: Max. effective input current.
▬▬:Rated maximum welding time in continuous mode ton (max) at the rated maximum welding current at an ambient temperature of 20 °C, expressed in minutes and seconds.
▬ ▬ ▬:Rated maximum welding time in intermittent mode Σ ton at the rated maximum welding current at an ambient temperature of 20 °C during an uninterrupted time of 60 min, expressed in minutes and seconds.
Special note: the welding time is shortened accordingly at the ambient temperature above 20°C.
U0: Non-load voltage. It is the open-circuit output voltage of the welding power source.
I2: output current or welding current
U2: Output load voltage or welding voltage.The rated loaded output voltage U2=14+0.05I2 for MIG/MAG. U2=20+0.04I2 for MMA. U2=10+0.04I2 for TIG.
A / V—A / V: The adjustable range of current and its corresponding load voltage.
IP: Protection grade. For example, IP21S, approving the welding machine as suitable for use indoors; IP23S, approving the welding machine as suitable for use outdoors in the rain.
: Beyond rain.
H: Insulation grade.

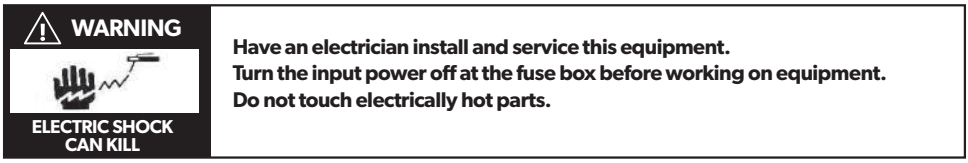
Household appliances shall not be disposed of in household waste.Recycling treatment needs to be required according to relevant laws or regulations.

Welding Environment

▲Always have a qualified person install and operate this equipment.
▲Always be aware of your work environment. Be sure to keep other people, especially children, away from you while welding.
▲Keep the environment you will be welding in free from flammable materials.
•Always keep a fire extinguisher accessible to your welding environment.
•Make sure the area is clean, dry and ventilated. Do not operate the welder in humid, wet or poorly ventilated areas.
•In order to cool down the machine and have an efficient work, keep the machine at least 30cm away from the surrounding objects. Do not place any heat source, as oven, to front side of the machine where the cooling air is taken from. Welding machine must not be effected of heat directly.
•Do not place the machine in small and narrow places. Beware of excessive dust and dirt.
•Do not operate the machine under direct sunlight, rain and wind. Machines should be operated on lower capacities when ambient air temperature exceeds 40°C.
•Please use a suitable exhaust system for gases. Use breathing apparatus if there is a risk of inhaling any welding.
•Avoid welding where air-flow is high. Protect the welding area with curtains or mobile screens.
•Transport and place the device on firm and level ground so that it may not fall over. The maximum permissible angle of inclination for transport and assembly is 10°.
•Mount the welder on a secure bench or cart that will keep the welder secure and prevent it from tipping over or falling.
•If the cylinder is placed on the machine lock the chain to secure the tube, if not be sure that gas cylinder is chained vertically to a wall.
•This machine is protected electronically against overloading. Do not use stronger fuses than those stated on the type plate of the device.
•Ensure that the earth clamp has good and direct contact near the welding location. Do not direct welding current over chains, ball bearings, steel cables, protection conductors etc., Otherwise they may melt.
•Use lifting eyes for lifting the machine. Do not lift the machine by using a fork-lift or a similar vehicle.
•Keep harmful arc rays shielded from the view of others.

Installation

⚠ **WARNING:** Only qualified personnel should install,use,or service the welding machine.



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 people with the relevant experience.
▲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.

Power requirement

AC single phase 230V, 50Hz with a circuit breaker is required. **DO NOT OPERATE THIS UNIT IF THE ACTUAL** power source voltage is less than 180 volts ac or greater than 260volts ac.

Input Power and Grounding Connections

▲Only qualified persons should install,use or service these equipment. Protect yourself and others from possible serious injury or death.
•High voltage danger from power source! Consult a qualified electrician for proper installation of receptacle. This welder must be grounded while in use to protect the operator from electrical shock.
•Do not remove grounding prong or alter the plug in any way. Do not use any adapters between the welder's power cord and the power source receptacle. Make sure the POWER switch is OFF when connecting your welder's power cord to a properly grounded power source.
•Before connecting, please check if the voltage of the power supply is in conformity with the rated voltage indicated on the machine nameplate.

⚠ **WARNING:** Do not operate with covers removed.
Disconnect input power before servicing.
Do not touch electrically live parts.
CAUTION: If the power supply does not match the input power voltage, you may burn up the welding machine!

- 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～, 230VAC, 50Hz.
- Before turning on the main power supply switch user must check carefully these connections of the power supply cable and earth cable (Yellow/Green) or the "PE" or green/yellow grounding cable or wire 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 earth cable (Yellow/Green) to PE end of the machine.

If the power plug is used, then the plug should also have good grounding.

Connection FOR MIG/MAG and NO GAS FLUX WIRE WELDING

- For MIG/MAG welding, connect the work-piece to Output (-) of the welding machine, Connect the Welding Polarity Conversion to Output (+) of the welding machine, not Loose. Connect the gas hose of the gas supply system to gas input (on back panel）.
- For No gas flux wire welding,connect the work-piece to Output (+) of the welding machine, Connect the Welding Polarity Conversion to Output (-) of the welding machine, not Loose.

Connection FOR MMA

- Connect the Electrode holder to Output(+) of the welding machine, not Loose.
- Connect the work-piece to Output(-) of the welding machine, not Loose.
- Do not use the Welding Polarity Conversion.

Connection FOR TIG

- Connect the TIG torch to Output(-) of the welding machine, not Loose.
- Connect the work-piece to Output(+) of the welding machine, not Loose.
- Connect the gas hose of the gas supply system（external Ar gas supply system） to TIG torch.
- Do not use the Welding Polarity Conversion.

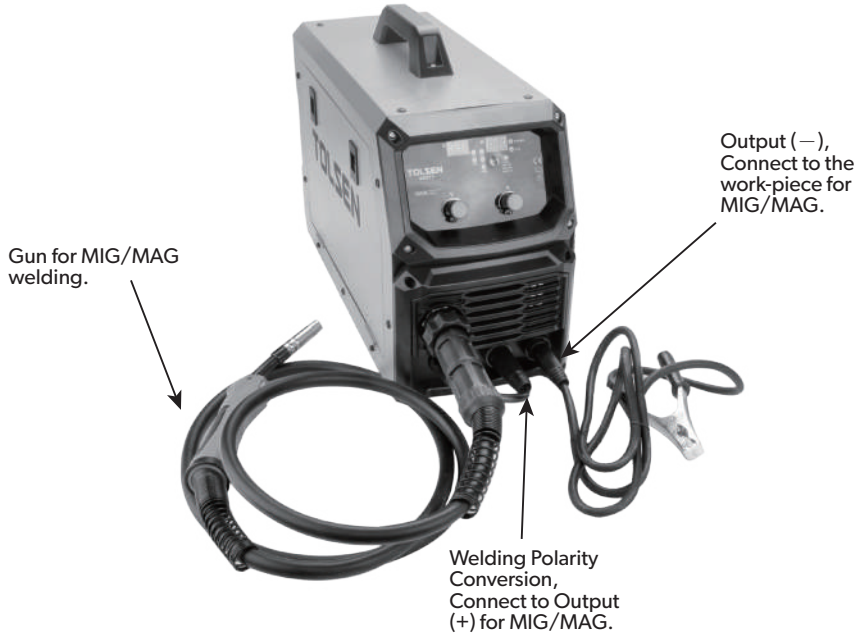


Figure 11 Connection of Welding Polarity Conversion and Work-piece Welding cable for MIG/MAG welding

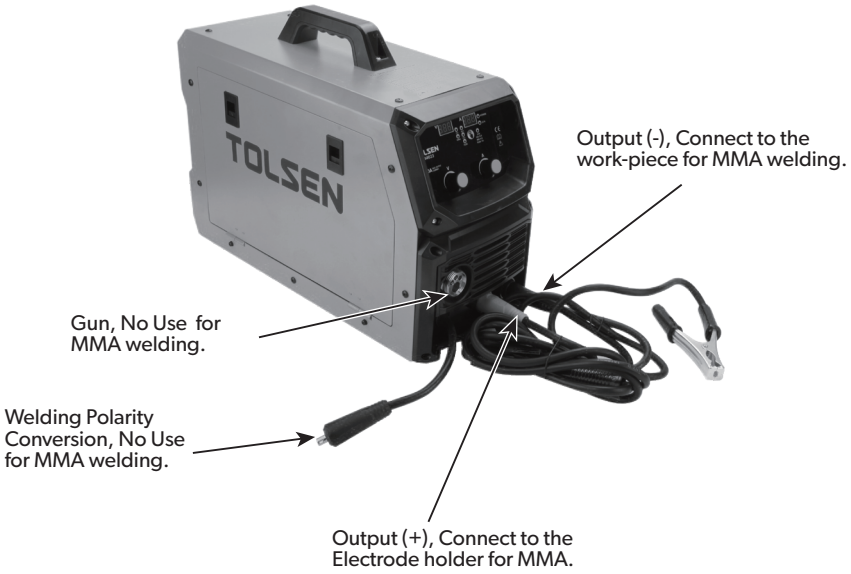


Figure 12 Connection of Electrode holder and Work-piece Welding cable for MMA welding

Connect The Gas Cylinder

- After placing the gas cylinder , fasten it with the chain. To operate safely and get best results use approved gas regulators and heaters.
- Briefly open the gas cylinder valve several times in order to blow out any dirt and particles present .
- Connect the pressure regulator to the shielding gas cylinder .
- Connect one end of gas hose to the gas supply inlet or gas input of the welding machine On the back panel. The other end is for connecting the hose to pressure regulator.
- Screw the gas hose pressure regulator and open the shielding gas cylinder.
- Setting of the gas flow with the adjustment valve. For more information about gas adjustment check the following page.
- For CO_2 MAG welding,Connect power supply cable of gas Heater(1～,36V or 110VAC,etc) to heater power supply.

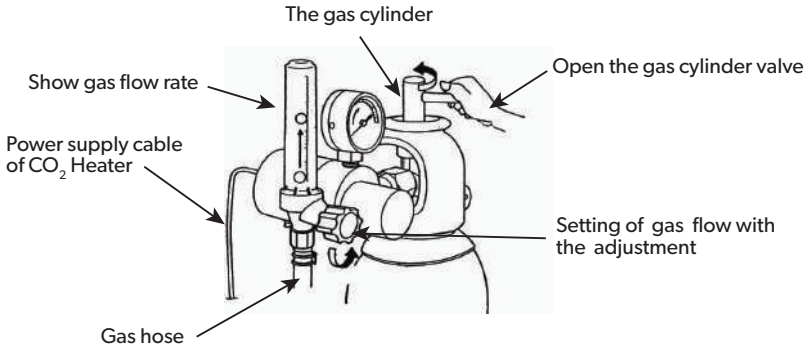


Figure 14 Open the gas valve and Setting of gas flow （for CO_2 MAG welding）

Thread The Welding Wire

⚠ To avoid any problems during operation, this part has to be understood correctly. Inappropriate and incomplete operation may result in poor welding quality and harm the gun, this kind of failures are out of warranty.

- Ensure that the diameters of the drive rolls are correct.
- Raise the pressure assembly of the drive rolls.
- Thread the wire to the gun through the guides into the liner.
- Close and tighten pressure assembly.

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.

Overheat:

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.

MMA WELDING PROCESS

- Connect the Electrode holder to Output(+)（red） of the welding machine, not Loose.
- Connect the work-piece to Output(-)（black） of the welding machine, not Loose.
- Select MMA by using Welding process or method selection key.
- Select or set welding current parameter according to the thickness of the work-piece, electrode diameter and welding position, etc.

TIG WELDING PROCESS

- Connect the work-piece and cable to Output (+) of the welding power source.
- Connect TIG torch and cable to Output (−) of the welding power source.
- Select TIG by using Welding process or method selection key.
- Gas input of the TIG torch must be connected to the external Ar gas supply system.
- Select or set welding current parameter according to the thickness of the work-piece, electrode diameter and welding position,etc.

For example,

Operating method for MIG/MAG(CO_2)welding

1.Connect the work-piece,gas and power supply to the welding machine.
2.Turn on the switch of the power supply.
3.By using the selection key of the Welding process or method,select 'MIG or MAG' welding method.
4.By using the welding parameters adjustment knob,set the wire feeding speed or welding current and voltage according to the thickness of the work-piece, arc characteristics,weld formation and welding spatter,etc.
5.By using the gun switch and wire,install the wire, and extend the wire out from the head of the gun.
6.Now,you can start to weld.

ADJUSTING THE GAS FLOW FOR MIG/MAG

- The indicators on the regulator at the tube side shows the pressure and the other shows the flow rate "L/min".
- Appropriate gas flow rate must be between 8 and 10 times of the diameter of the wire in use.

EXAMPLE: Diameter of the wire: 0,8 mm.
Gas flow rate: (8-10) x 0,8 ≈ 6-8 L/min

ALIGNING DRIVE ROLLS FOR APPROPRIATEWIRE DIAMETER

⚠ Always control the rolls on the flange for compatibility with diameter of the wire, because alignment problems are out of warranty.

- Both sides of the rolls are labeled according to appropriate wire diameter.
- Rolls must be inserted into the flange in such a way that appropriate diameter of the wire to be feed is seen from outside. After installing the rolls, the screws should be positioned and fastened.

ADJUSTING THE FREE WIRE LENGTH,WELDING CURRENT AND VOLTAGE

- In order to obtain good welding characteristics, free wire length (L1) has to be adjusted by the following instructions. The diameter of the wire (d) and the distance (L) between the nozzle and the contact tip is important.
- Free wire length (L1) is the distance between the end of wire and the contact tip.
- Free wire length (L1) may be varied by the adjusting welding current (I2) and voltage(U2).
- For Short Circuit Transfer Arc,L is about 0~3mm, L1 is about 10d.For example,d=1.0mm,L1=10mm. For Short Circuit Transfer Arc,U2 is about 16~20V,I2 is about 90~120A.

THE 2T FUNCTIONS OF THE GUN SWITCH

- It is also called 2T switch, indicating the number of Gun switch strokes.sometime it is also called short welding selection switch mode.
- **2T Mode**: When operating at 2T mode, once the gun switch is triggered, wire feeding and current starts and when it is released the operation ends.

Figure 15 Relations between Welding Arc and the gun switch on/off at 2T Mode

Other instructions: Power cable H07RN-F 3G 1.5 mm2.The length of the power cable is 2m.

Fuse

Voltage (V)	Maximum rated input current (A)	Maximum effective input current(I1eff)(A)	Circuit breaker Fuse (A)
230	27.2	11.6	30

Functions and parameters

Welding method	Parameter	Parameter range
MMA TIG	Current （－－A） Current （－－A）	30～140A 30～200A

Electrode diameter and recommended welding current for MMA welding.

Electrode diameter	Current range
1.6mm	40-55 A
2.0mm	55-80 A
2.5mm	80-100 A
3.2mm	100-120 A

Other symbols(Include the error code displayed)

1 ~	Single phase	O.H	overheat protection
⎓	Direct Current (DC)		Increase / Decrease
U2 I2	Descent feature curve (MMA，TIG)	U2 I2	Flat feature curve (MIG/MAG/FLUX)
	Read the operation instructions!		Household appliances shall not be disposed of in household waste.
E04	Internal over-current	E05	Output over-current
E07/E12	Over heat	E11	Software version problem

- O.H.: Overheat protection.O.H LED is lit, E07/E12 is displayed, indicating the occurrence of overheating protection. Welding power supply has thermal or overheat protection, when the temperature is too high, the welding machine will cut off the welding current.Thermal or overheat protection is automatically reset when the temperature drops again.
- E04 / E05: Overcurrent protection. E04 / E05 is displayed, indicating that overcurrent protection occurs.The power supply of the welding machine shall be cut off, and the overcurrent protection shall be eliminated after the power supply switch is turned on.Otherwise, the welding machine may fai

TROUBLESHOOTING

TROUBLE	REASON	REMEDY
1. Machine does not work.	Power source switch is out of order.	Change the switch.
	Fuse is blown out.	Change the fuse.
	Electronic Card is out of order.	Contact your authorized technical
2. The welding machine is operated, the fan is not running.	Bed connection of Fan.	Check and Replace it if necessary.
	Fan is out of order.	Change the Fan.
	Power source circuit of Fan is out of order.	Check and Replace it if necessary.
3. While this welding machine is operated, no current output.	It is possible of over-heating protection status.	Wait till the welding operation will be available.
	It is possible of over-current protection status.	Switch off the power supply, restart ON/OFF Switch of the welding
	The output rectifier is possibly damaged.	Check and Replace it if necessary.
	The feed back circuit is possibly damaged.	Check and Replace it if necessary.
	Possible unavailability of the connection of	Check and Reconnect it.
4. Welding parameters cannot be adjusted.	The main control PCB is out of order.	Change the control PCB
5. Welding current isn't stabilized.	Circuits are possibly damaged.	Check and replace them if necessary.
	Possible capacitors are possibly damaged.	Replace them if necessary.
	Possible unavailability of connection inside this welding machine.	Check and reconnect if necessary.
	Possible disconnection of earth cable, or unavailability of connection of the earth cable and work-piece.	Check and reconnect if necessary.

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.

The welder needs the regular maintenance as following:

Periodically clean dust, dirt, grease, etc. from your welder. Every six months, or as necessary, remove the cover panel from the welder and air-blow any dust and dirt that may have accumulated inside the welder.Replace power cord, ground cable, ground clamp, or electrode assembly when damaged or worn.

MINOR AND ROUTINE MAINTENANCE

Stored in a clean dry location free from corrosive gas, dust and high humidity. Temperatures should range from 10°F–120°F and a relative humidity less than 90%.

WARNING: Before removing any screw on the machine for maintenance, power supply must be disconnected from the electric lines and enough time should be allowed for capacitor discharging. During maintenance, pay attention to the moving parts in the machine.

PERIODIC MAINTENANCE Once every three months

- Clean the labels on the machine . Repairor replace the worn out labels.
- Repair or replace the worn out welding cables.
- Clean and tighten weld terminals.
- Check Electrode Holder, earth clamp and their cables.
- Check the main connections inside the machine. Once every six months
- Open the covers of the machine and clean with dry air.

NOTE: The above recommended maintenance periods are indicative according to our general experience, these may vary from work shop to work shop and the conditions of the welding site.

Order spare parts:

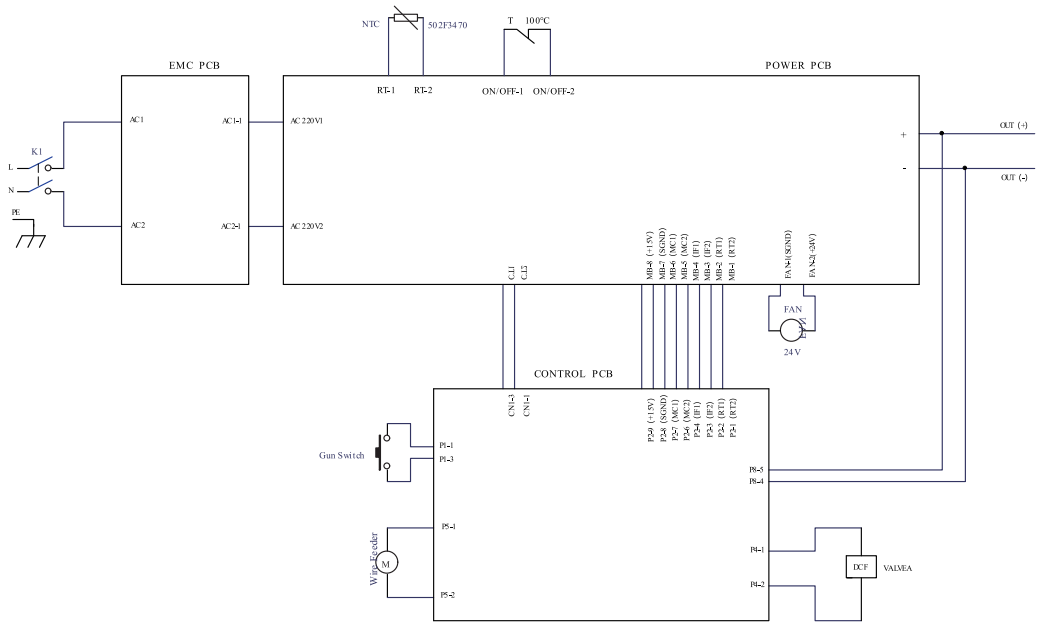
The following data must be provided when ordering the spare parts:

- Welding machine model
- material model

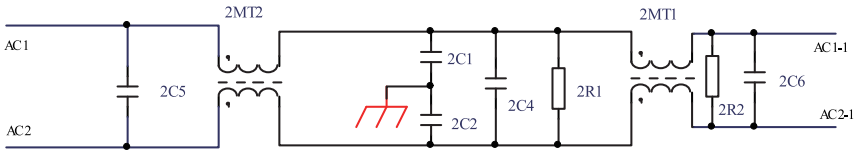
Spare parts list

No.	Name（Specification model）	quantity
1	Welding cable（16mm2，2m）	1
2	Grounding or work-piece cable（16mm2，2m）	1
3	Electrode holder（KDH-2000）	1
4	200A Earth clamp （KDC-1200）	1
5	200A MIG/MAG Gun	1

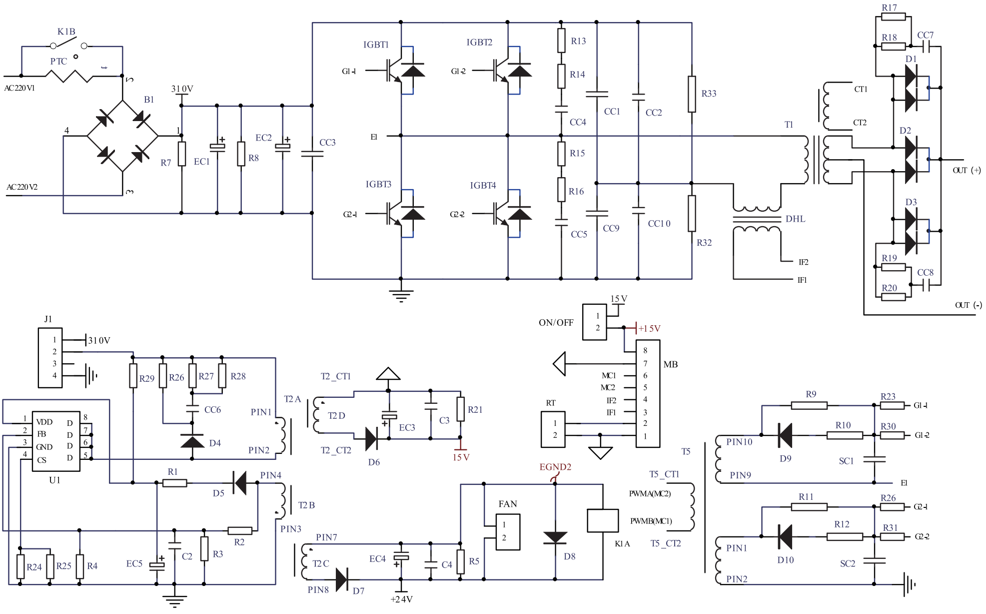
CIRCUIT SCHEMATIC DIAGRAM



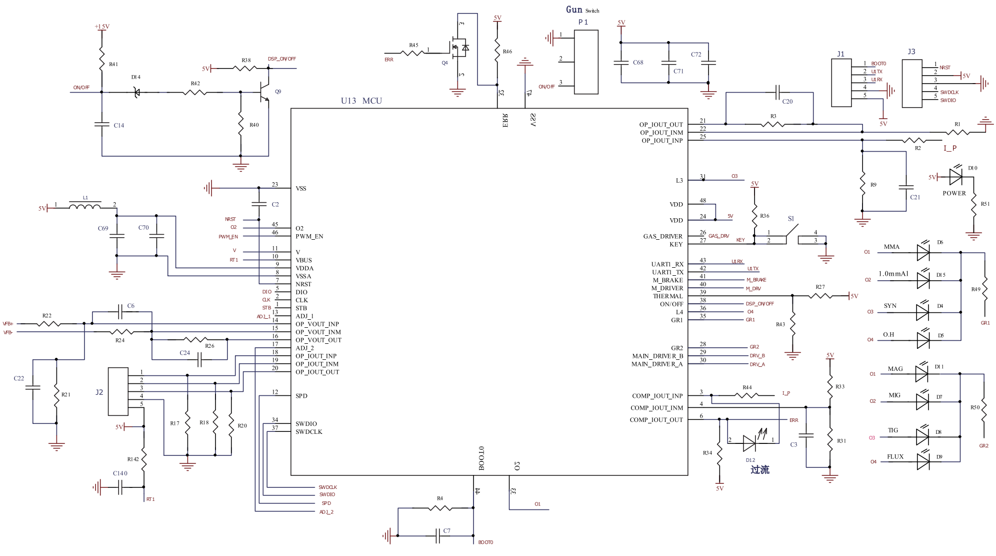
(1)



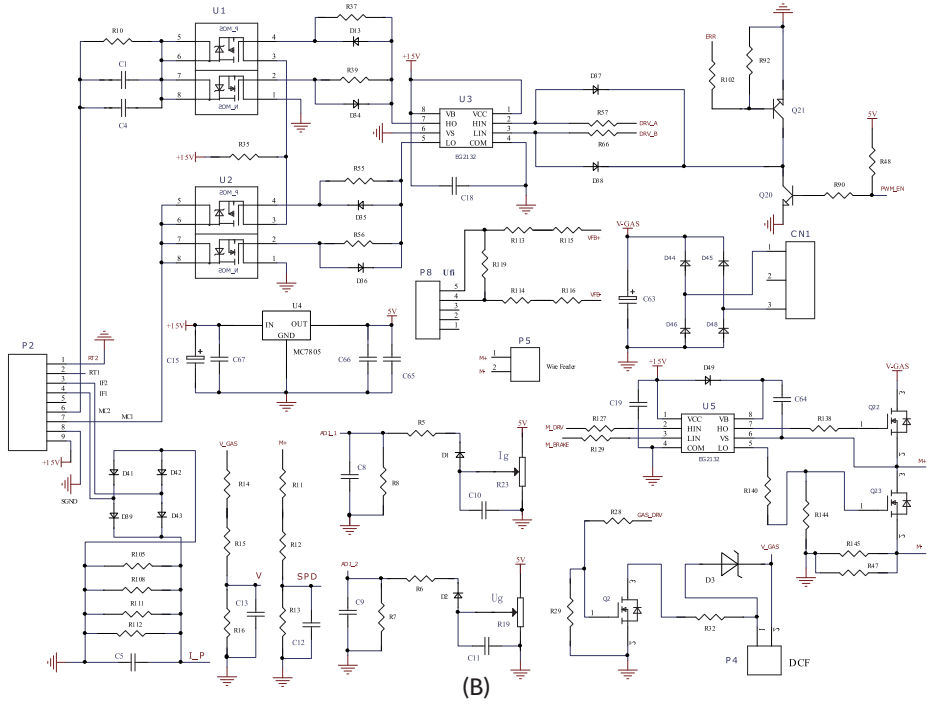
(2)EMC PCB


K1B
PTC
AC220V1
AC220V2
B1
310V
R7
EC1
R8
EC2
CC3
IGBT1
IGBT2
IGBT3
IGBT4
G1-1
G1-2
G2-1
G2-2
E1
R13
R14
CC4
R15
R16
CC5
CC1
CC2
CC9
CC10
R33
R32
T1
DHL
IF2
IF1
CT1
CT2
R17
R18
CC7
D1
D2
D3
R19
R20
CC8
OUT (+)
OUT (-)
J1
U1
VDD
FB
GND
CS
R29
R26
R27
R28
CC6
D4
PIN1
PIN2
T2A
R1
D5
PIN4
T2B
PIN3
R2
R3
R24
R25
R4
EC5
C2
T2_CT1
T2D
T2_CT2
EC3
C3
R21
D6
15V
PIN7
T2C
PIN8
D7
EC4
C4
R5
+24V
ON/OFF
+15V
MB
MC1
MC2
IF2
IF1
RT
EGND2
FAN
D8
K1A
T5
T5_CT1
PWMA(MC2)
PWMB(MC1)
T5_CT2
PIN10
PIN9
D9
R9
R10
R23
R30
SC1
PIN1
PIN2
D10
R11
R12
R26
R31
SC2

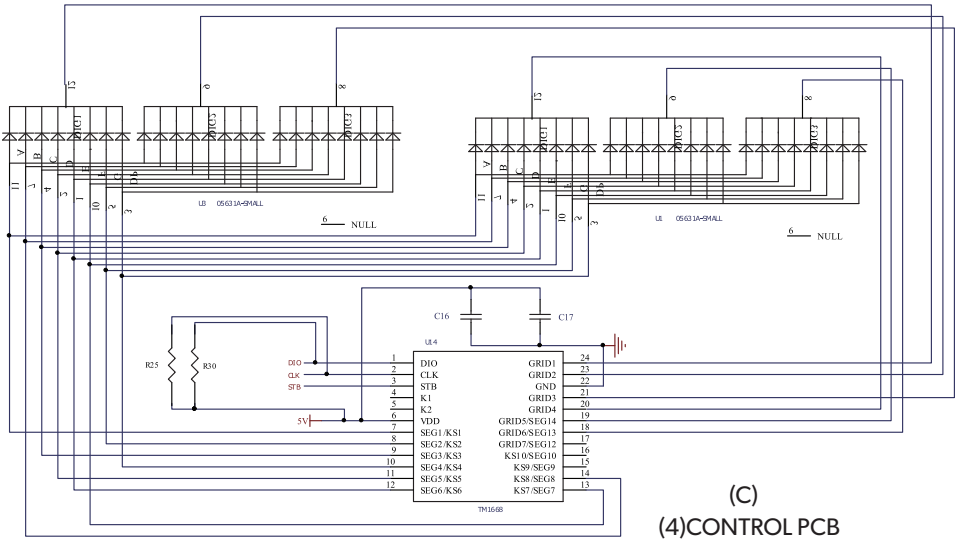
(3)POWER PCB


U13 MCU
Gun Switch
P1
+15V
R41
D14
R42
R38
DSP_ON/OFF
Q9
R40
C14
ON/OFF
ERR
R45
Q4
R46
5V
C68
C71
C72
J1
J3
BOOT0
ULTX
ULRX
NRST
SWDCLK
SWDIO
VSS
O2
PWM_EN
V
VBUS
VDDA
VSSA
NRST
DIO
CLK
STB
ADJ_1
OP_VOUT_INP
OP_VOUT_INM
OP_VOUT_OUT
ADJ_2
OP_IOUT_INP
OP_IOUT_INM
OP_IOUT_OUT
SPD
SWDIO
SWDCLK
L1
C69
C70
C2
R22
C6
R24
R26
C24
VFB+
VFB-
C22
R21
J2
R17
R18
R20
R142
C140
RT1
R4
C7
BOOT0
O1
O3
L3
VDD
GAS_DRIVER
KEY
S1
R36
UART1_RX
UART1_TX
M_BRAKE
M_DRIVER
THERMAL
L4
GR1
R27
R43
GR2
MAIN_DRIVER_B
MAIN_DRIVER_A
DRV_B
DRV_A
COMP_IOUT_INP
COMP_IOUT_INM
COMP_IOUT_OUT
R44
I_P
R33
R31
R34
D12
C3
过流
C20
R3
R1
R2
R9
C21
D10
POWER
R51
MMA
D6
1.0mmAl
D15
SYN
D4
O.H
D5
R49
MAG
D11
MIG
D7
TIG
D8
FLUX
D9
R50

(A)

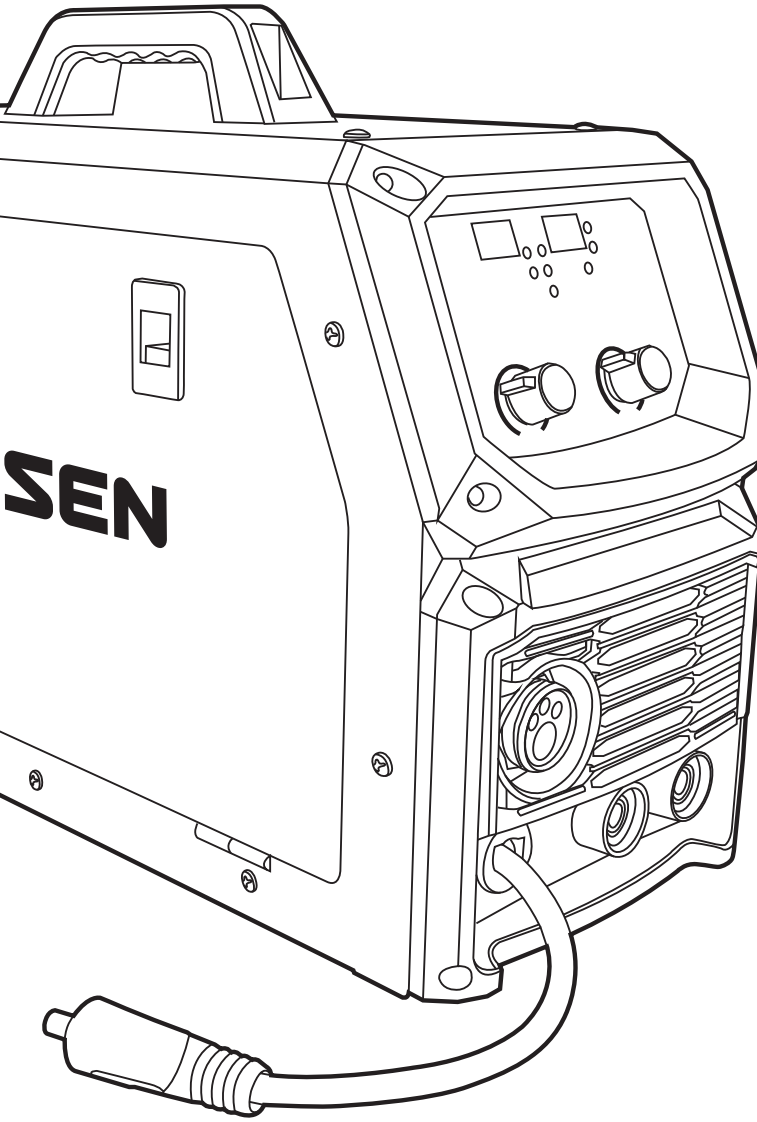


(B)



(C)
(4)CONTROL PCB

Guarantee:
The equipment has the usual statutory manufacturer's warranty (1 year).Damage due to overload and normal wear is not under the warranty due to misuse.For your warranty, please contact your dealer.



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