Safety Depends on You
Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT. And, most importantly, think before you act and be careful.
SAFETY

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

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

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

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

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

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Diezel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The above for Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The above for Gasoline Engines

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of “Safety in Welding & Cutting - ANSI Standard Z49.1” from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of “Arc Welding Safety” booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.
**ARC RAYS can burn.**

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

---

**ELECTRIC SHOCK can kill.**

3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (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, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semi-automatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semi-automatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semi-automatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

---

**FUMES AND GASES can be dangerous.**

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.

5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.
WELDING and CUTTING SPARKS can cause fire or explosion.
6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

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

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

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

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.i. Read and follow NFPA 51B “Standard for Fire Prevention During Welding, Cutting and Other Hot Work”, available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

Refer to http://www.lincolnelectric.com/safety for additional safety information.
PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté spécifiques qui paraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L’Arc
1. Protégez-vous contre la secousse électrique:
   a. Les circuits à l’électrode et à la pièce sont sous tension quand la machine à souder est en marche. Éviter toujours tout contact entre les parties sous tension et la peau nue ou les vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire très attention de bien s’isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
   d. Ne jamais plonger le porte-électrode dans l’eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s’appliquent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas où on reçoit un choc. Ne jamais enrouler le câble-électrode autour de n’importe quelle partie du corps.

3. Un coup d’arc peut être plus sévère qu’un coup de soliel, donc:
   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu’un verre blanc afin de se protéger les yeux du rayonnement de l’arc et des projections quand on soude ou quand on regarde l’arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l’arc.
   c. Protéger l’autre personnel travaillant à proximité au soudage à l’aide d’écrans appropriés et non-inflammables.


5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans latéraux dans les zones où l’on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d’incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d’incendie.

8. S’assurer que la masse est connectée le plus près possible de la zone de travail qu’il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d’autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d’incendie ou d’échauffement des chaines et des câbles jusqu’à ce qu’ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d’opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l’arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (gas fortement toxique) ou autres produits irritants.


PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformément au code de l’électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l’installation et l’entretien du poste seront effectués par un électricien qualifié.

3. Avant de faire des travaux à l’extérieur de poste, la débrancher à l’interrupteur à la boîte de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.
Thank You— for selecting one of our QUALITY products. We want you to take pride in operating this product as much pride as we have in bringing this product to you!

CUSTOMER ASSISTANCE POLICY
The business of our company is manufacturing and selling high quality welding equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask us for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. We are not in a position to warrant or guarantee such advice, and assume no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer’s particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

We are a responsive manufacturer, but the selection and use of specific products sold by us is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond our control affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing.

Please Examine Carton and Equipment For Damage Immediately
When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, Claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Product__________________________________________
Model Number______________________________________
Code Number or Date Code (if available)____________________
Serial Number (if available)______________________________
Date Purchased_____________________________________
Where Purchased____________________________________

Whenever you request replacement parts or information on this equipment, always supply the information you have recorded above.

Read this Operators Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

⚠️ WARNING
This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

⚠️ CAUTION
This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.
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SAFETY
Read the entire manual before installing and operating the AC 120.

**WARNING**

ELECTRIC SHOCK can kill.
- Only qualified personnel should install or operate this equipment.

- Machine must be plugged into a receptacle which is grounded per any national, local or other applicable electrical codes.

- The AC 120 power switch is to be in the OFF ("O") position when connecting power cord to input power.

- Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground.

- Always wear dry insulating gloves.

FUMES AND GASES can be dangerous.
- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.

WELDING SPARKS can cause fire or explosion.
- Keep flammable material away.
- Do not weld on closed containers.

ARC RAYS can burn eyes and skin.
- Wear eye, ear and body protection.

GENERAL DESCRIPTION
The AC 120 is composed of a single phase transformer and is suitable for welding in alternate current using stick electrodes (type 6013) with diameters from 1/16 to 5/64 in. The AC 120 is rated for a 20% duty cycle at a rated output of 55 amps. A 55A output can be drawn for 2 minutes out of each 10 minute period without overheating.

SELECT SUITABLE LOCATION
This machine can operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation:

- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.

- Dirt and dust that can be drawn into the machine should be kept to a minimum.

- Keep machine dry and do not place it on wet ground or in puddles. Do not use in wet or damp locations. Store indoors.

**WARNING**

- Do not mount over combustible surfaces.
TECHNICAL SPECIFICATIONS

INPUT – SINGLE PHASE ONLY

<table>
<thead>
<tr>
<th>Voltage/Frequency</th>
<th>Input Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>120V/60Hz</td>
<td>15 Amps @ Rated Output</td>
</tr>
</tbody>
</table>

RATED OUTPUT

<table>
<thead>
<tr>
<th>Duty Cycle</th>
<th>Amps</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>55</td>
<td>27</td>
</tr>
</tbody>
</table>

OUTPUT RANGE

Welding Current Range

AC Output: 50-90 amps

Maximum Open Circuit Voltage

37

PHYSICAL DIMENSIONS

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.00 in.</td>
<td>7.00 in.</td>
<td>11.00 in.</td>
<td>24.5 lbs.</td>
</tr>
<tr>
<td>280 mm</td>
<td>178 mm</td>
<td>280 mm</td>
<td>11 kg.</td>
</tr>
</tbody>
</table>

RECOMMENDED INPUT FUSE SIZES AND EXTENSION CORDS

<table>
<thead>
<tr>
<th>Breaker/Fuse Size</th>
<th>Input Amps</th>
<th>Power Cord</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Amp</td>
<td>15 - 20</td>
<td>15 Amp, 125V Three Prong Plug (NEMA Type 5-15P)</td>
</tr>
</tbody>
</table>

Extension Cord

Up to 25 Ft. (7.6 m):

Three Conductor #12 AWG (3.3 mm²) or Larger

RECOMMENDED ELECTRODE & MATERIAL THICKNESS

1/16” or 5/64” Fleetweld 37 (E6013)
IDENTIFY AND LOCATE COMPONENTS
(See Figure A.1)

If you have not already done so, unpack the AC 120 from its carton and remove all packing material around the unit.

1) INPUT CORD CONNECTION
This machine is intended to operate off a standard household type receptacle (20A, 120V, 60Hz, single phase, grounded). Refer to the Technical Specifications at the beginning of this manual. If connected to a circuit protected by fuses, use time delay fuses marked “D”.

2) WORK CLAMP
The work clamp and cable is attached to the welder at the factory. The work clamp must be directly connected to the workpiece or the work bench. Make sure the contact to the workpiece is adequate by avoiding painted or nonmetallic surfaces.

3) ELECTRODE HOLDER
The Electrode holder and cable is attached to the welder at the factory. It has special contact jaws to grasp the bare part of the welding electrode.

4) INSTRUCTION MANUAL

5) POWER SWITCH

---

INPUT CONNECTIONS

CODE REQUIREMENTS FOR INPUT CONNECTIONS

⚠️ WARNING ⚠️

- This welding machine must be connected to a power supply in accordance with applicable electrical codes.
- If there is any question about the installation meeting applicable electrical code requirements, consult a qualified electrician.

Do not connect the AC 120 to an input power supply with a rated voltage that is greater than 125 volts.

Do not remove the power cord ground prong.
THERMAL PROTECTION

If the duty cycle is exceeded, a thermal protector will shut off the output until the machine cools to a reasonable operating temperature. The Power Switch will illuminate if this condition occurs, which is an automatic function of the AC 120 and does not require user intervention. Output will resume once the machine cools.

MAKING A WELD
(See Figure B.1)

Insert the bare part of the electrode into the electrode holder jaws and connect the work clamp to the welding piece. Make sure to have good electrical contact. Turn the AC 120 on. Lower Helmet or while holding shield in front of face strike the electrode work point on the workpiece as if striking a match. Do not hit the electrode on the workpiece, which will damage the stick electrode and make striking an arc difficult. Immediately after striking the arc try to maintain a distance from the workpiece that is equivalent to the diameter of the electrode used. Maintain this distance continually during the weld.

Refer to the "Learning to Weld" section in this manual for more information on:
- How to correctly strike an arc.
- The correct welding position.
- Proper travel speed.

Once the electrode is burned down turn the machine off and remove the stub by opening the jaws of the electrode holder and insert a new electrode. The welded work piece and electrode stub are hot after welding, allow time to cool down before touching or use pliers to move. Always make sure the AC 120 is turned off before setting down the Electrode Holder.

ELECTRODE SELECTION

For best results use genuine Lincoln Electric Fleetweld 37 electrodes in the 1/16" or 5/64" size. This is suitable for welding up to 14ga steel.

LEARNING TO WELD

The serviceability of a product or structure utilizing this type of information is and must be the sole responsibility of the builder/user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying this type of information. These variables include, but are not limited to, welding procedure, plate chemistry and temperature, weldment design, fabrication methods and service requirements.

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.

The Arc-Welding Circuit

The operator’s knowledge of arc welding must go beyond the arc itself. He must know how to control the arc, and this requires a knowledge of the welding circuit and the equipment that provides the electric current used in the arc. Figure B.1 is a diagram of the welding circuit. The 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 holder to 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 complete 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 allowing the welding circuit to pass through hinges, bearings, electronic components or similar devices that can be damaged.
**WARNING**

**ELECTRIC SHOCK can kill.**
Carefully review the ARC WELDING SAFETY PRECAUTIONS at the beginning of this manual.

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. A gap is made in the welding circuit (see Figure B.1) by holding the tip of the electrode.

Arc welding is a 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.

**What Happens in the Arc?**

Figure B.2 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 electric arc created by the electric current flowing through the space between the end of the electrode and the work. The temperature of this arc is about 6000°F (3315°C), which is more than enough to melt metal. The arc is very bright, as well as hot, and cannot be looked at with the naked eye without risking painful injury. A very dark lens, specifically designed for arc welding, must be used with a hand or face shield whenever viewing the arc.

The arc melts the base metal and actually digs into it, much as the water through a nozzle on a garden hose digs into the earth. The molten metal forms a 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 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 flux for the molten pool. The flux picks up impurities and forms the protective slag.

Four simple manipulations are of prime importance. Without complete mastery of these four, further welding is more or less futile. With complete mastery of the four, welding will be easy.

1. **The Correct Welding Position**
   Beginners will find it easier to learn how to control the welding arc using the two-handed technique shown below. This requires the use of a head shield.
   
   a. Hold the electrode holder in your right hand.
   b. Touch your left hand to the underside of your right.
   c. Put the left elbow against your left side. (For welding left-handed it is the opposite.)
   
   If you are using a hand shield, hold the electrode holder in your right hand and the hand shield in your left. (For welding left-handed it is the opposite.)

   Whenever possible, weld from left to right (if right-handed). This enables you to see clearly what you are doing. Hold the electrode at a slight angle as shown in Figure B.3.

2. **The Correct Way to Strike an Arc**
   Be sure the work clamp makes good electrical contact to the work.

---

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 with an extruded chemical covering.
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 1/16 to 1/8" (1.6 to 3.2mm) 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 3/8" (9.5mm) behind the electrode as shown in Figure B.4.

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.

COMMON METALS
Most metals found around the home 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 and angle irons. This type of steel can usually be easily welded without special precautions.

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

Joint Types and Positions
Five types of welding joints are: Butt joint, Fillet joint, Lap joint, Edge joint and Corner joint see Figure B.5.

Of these, the Butt joint and Fillet joint are the two most common welds.

FIGURE B.5

Butt joint
Lap joint
Edge joint
Fillet joint
Corner joint

Butt Joints
Butt joints are the most widely used welds. Place two plates side by side.

Tack the plates at both ends, otherwise the heat will cause the plates to move apart. (See FIGURE B.6):

FIGURE B.6

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.
Types of Butt Joint
Now weld the two plates together. Weld from left to right (if right-handed). Point the electrode down in the crack between the two plates, keeping the electrode slightly tilted in the direction of travel. *(See Figure B.7)*

**FIGURE B.7**

![Diagrams of Butt Joint](Image)

Watch the molten metal to be sure it distributes itself evenly on both edges and in between the plates.

Fillet Joint
When welding fillet joints, it is very important to hold the electrode at a 45° angle between the two sides, or the metal will not distribute itself evenly. *(See Figure B.8)*

**FIGURE B.8**

![Diagrams of Fillet Joint](Image)

To make it easy to get the 45° angle, it is best to put the electrode in the holder at a 45° angle, as shown:

Types of Fillet Joint

Multiple Pass Welds
Make multiple pass horizontal fillets as shown in figure B.9. Put the first bead in the corner. Hold the electrode angle needed to deposit the filler beads as shown putting the final bead against the vertical plate. Make sure to remove the slag from the weld prior to making the next pass.

**FIGURE B.9**

![Diagrams of Multiple Pass Welds](Image)
This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

**Step 1. LOCATE PROBLEM (SYMPTOM).**
Look under the column labeled “PROBLEM (SYMPTOM)”. This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

**Step 2. POSSIBLE CAUSE.**
The second column labeled “POSSIBLE CAUSE” lists the obvious external possibilities that may contribute to the machine symptom.

**Step 3. RECOMMENDED COURSE OF ACTION**
This column provides a course of action for the Possible Cause, generally it states to contact your local Authorized Field Service Facility.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Authorized Field Service Facility.
<table>
<thead>
<tr>
<th>PROBLEMS (SYMPTOMS)</th>
<th>POSSIBLE CAUSE</th>
<th>RECOMMENDED COURSE OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power source stops.</td>
<td>Thermal Overload Protection activated due to overload.</td>
<td>The Thermal Protection automatically resets when the transformer has cooled (approximately 15 minutes)</td>
</tr>
<tr>
<td>Power switch on but no weld current.</td>
<td>Bad connection between ground-clamp and workpiece.</td>
<td>Clean or wire brush the work surface.</td>
</tr>
<tr>
<td>Unstable arc.</td>
<td>Impurities on base metal.</td>
<td>Clean with wire brush.</td>
</tr>
</tbody>
</table>
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.
<table>
<thead>
<tr>
<th>WARNING</th>
<th>• Do not touch electrically live parts or electrode with skin or wet clothing.</th>
<th>• Keep flammable materials away.</th>
<th>• Wear eye, ear and body protection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish</td>
<td>• No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</td>
<td>• Mantenga el material combustible fuera del área de trabajo.</td>
<td>• Protéjase los ojos, los oídos y el cuerpo.</td>
</tr>
<tr>
<td>Attention</td>
<td>• Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</td>
<td>• Gardez à l’écart de tout matériel inflammable.</td>
<td>• Protégez vos yeux, vos oreilles et votre corps.</td>
</tr>
<tr>
<td>German</td>
<td>• Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</td>
<td>• Entfernen Sie brennbare Material!</td>
<td>• Tragen Sie Augen-, Ohren- und Körperschutz!</td>
</tr>
<tr>
<td>Ponguese</td>
<td>• Não toque partes elétricas e electrodos com a pele ou roupa molhada.</td>
<td>• Mantenha inflamáveis bem guardados.</td>
<td>• Use proteção para a vista, ouvido e corpo.</td>
</tr>
<tr>
<td>Japanese</td>
<td>● 避電中の電気部品、又は溶材にヒ プやぬれた者で触れること。</td>
<td>● 燃えやすいものの側での溶接作業は絶対にしてはなりません。</td>
<td>● 目、耳及び身体に保護具をして下さい。</td>
</tr>
<tr>
<td>Chinese</td>
<td>● 皮肤或湿衣服切勿接触带电部件及 锯缘。</td>
<td>● 把一切易燃物品移離工作場所。</td>
<td>● 佩戴眼，耳及身体勞動保護用具。</td>
</tr>
<tr>
<td>Korean</td>
<td>● 전도체나 용접봉을 젊은 헝걸 또는 피부로 접촉하지 마십시오.</td>
<td>● 인화성 물질을 접근 시키지 마십시오.</td>
<td>● 폐, 귀와 틈에 보호장구를 작용하시십시오.</td>
</tr>
<tr>
<td>Arabic</td>
<td>● لابس الأجزاء التي بسرى فيها التيار الكهربائي أو الإسترداد بجلي الجسم أو بالملابس المبللة بالمواد</td>
<td>● ضع المواد القابلة للاختلال في مكان بعيد.</td>
<td>● ضع أدوات وملابس وافية على عينك وأذنك وحسب.</td>
</tr>
<tr>
<td></td>
<td>● دعماً جسمك على جسمك خلال العمل.</td>
<td></td>
<td>● ضع عازلاً على جسمك خلال العمل.</td>
</tr>
<tr>
<td>• Keep your head out of fumes.</td>
<td>• Turn power off before servicing.</td>
<td>• Do not operate with panel open or guards off.</td>
<td></td>
</tr>
<tr>
<td>• Use ventilation or exhaust to remove fumes from breathing zone.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Los humos fuera de la zona de respiración.</td>
<td>• Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</td>
<td>• No operar con panel abierto o guardas quitadas.</td>
<td></td>
</tr>
<tr>
<td>• Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Gardez la tête à l’écart des fumées.</td>
<td>• Débranchez le courant avant l’entretien.</td>
<td>• N’opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</td>
<td></td>
</tr>
<tr>
<td>• Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vermeiden Sie das Einatmen von Schweißrauch!</td>
<td>• Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</td>
<td>• Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</td>
<td></td>
</tr>
<tr>
<td>• Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Mantenha seu rosto da fumaça.</td>
<td>• NÃO opere com as tampas removidas.</td>
<td>• Mantenha-se afastado das partes moventes.</td>
<td></td>
</tr>
<tr>
<td>• Use ventilação e exaustão para remover fumo da zona respiratória.</td>
<td>• Não toque as partes elétricas nuas.</td>
<td>• Não opere com os painéis abertos ou guardas removidas.</td>
<td></td>
</tr>
<tr>
<td>• 頭部遠離煙霧。</td>
<td>• 維修前切斷電源。</td>
<td>• 儀表板打開或沒有安全罩時不準作業。</td>
<td></td>
</tr>
<tr>
<td>• 在呼吸區使用通風或排風器除煙。</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 업고로부터 홋킬기를 멀리하시십시오.</td>
<td>• 보수전에 전원을 차단하십시오.</td>
<td>• 판넬이 열린 상태로 작동하지 마십시오.</td>
<td></td>
</tr>
<tr>
<td>• 홍조지역으로부터 홋킬기를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 압수전에 전원을 차단하십시오.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Warning**

**Attention**

**Precaution**

**Aviso de Precaución**

**Atenção**

**注意事項**

**警告**

**위험**

**تحذير**

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**LEIA E COMPREenda AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.**

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的編輯材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다。

أقرأِ بتمعن واحفظ تدابير التخلص من هذه المواد والمواد قبل استعمالها واتبع تدابير الوقاية لصاحب العمل.