

# K397 AUTOMATIC INNERSHIELD® GUN AND CABLE ASSEMBLY

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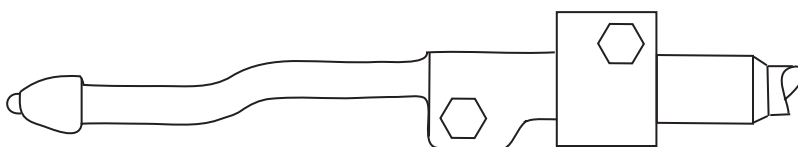
October, 2007

Models K397- [ ]

## 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.

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.



## OPERATOR'S MANUAL



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**ELECTRIC**

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## WARNING



### CALIFORNIA PROPOSITION 65 WARNINGS



Diesel 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.**



### 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 idler 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.

Mar '95



### 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:**

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

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic 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.



### 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.



### 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 below Threshold Limit Values (TLV) 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.

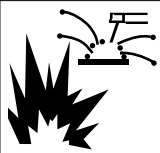
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

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## 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.

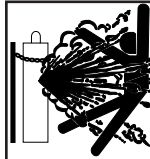
6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when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



## CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.

- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Jan, 07

## 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. Eviter 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 recoit 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 soleil, 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.
4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

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 un 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes 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 pistelage. 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.
11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

## 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'intérieur 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 a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product ... as much pride as we have in bringing this product to you!

## CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric 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. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes 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.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric 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 refer to [www.lincolnelectric.com](http://www.lincolnelectric.com) for any updated information.

## **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 \_\_\_\_\_

Serial Number \_\_\_\_\_

Date Purchased \_\_\_\_\_

Where Purchased \_\_\_\_\_

Whenever you request replacement parts or information on this equipment, always supply the information you have recorded above. The code number is especially important when identifying the correct replacement parts.

## **On-Line Product Registration**

- Register your machine with Lincoln Electric either via fax or over the Internet.
  - For faxing: Complete the form on the back of the warranty statement included in the literature packet accompanying this machine and fax the form per the instructions printed on it.
  - For On-Line Registration: Go to our **WEB SITE at [www.lincolnelectric.com](http://www.lincolnelectric.com)**. Choose "Quick Links" and then "Product Registration". Please complete the form and submit your registration.

**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**.

## DESCRIPTION

The K397 Automatic Innershield Gun and Cable Assemblies provide the flexible arc welding maneuverability and other features desired for robotic or automated fixture applications using semiautomatic or automatic Innershield welding procedures:

### 1. 'Quick-Change' Nozzle Contact Tips

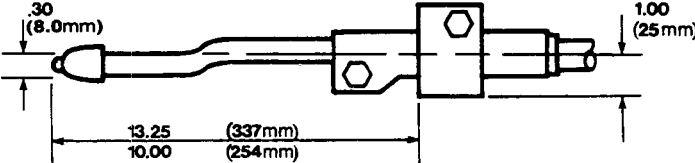
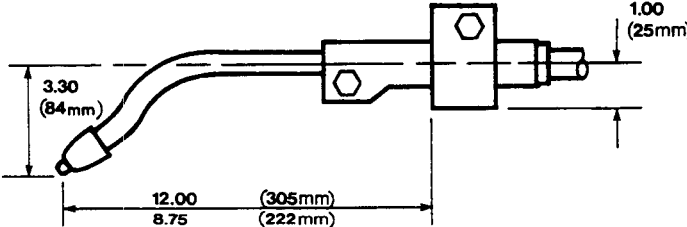
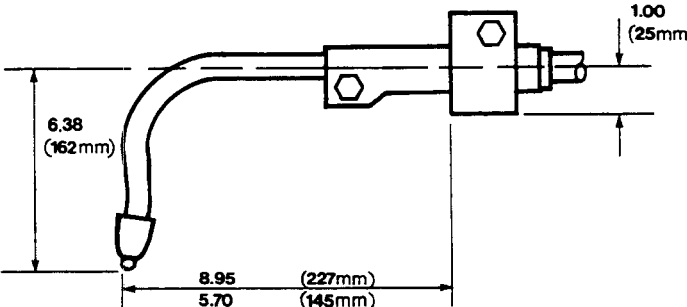
The threadless contact tips insert into the nozzle and are secured by tightening the nozzle's collet-type clamp nut. Contact tips are available for .062, .068,  $\frac{5}{64}$  and  $\frac{3}{32}$  in. (1.6, 1.7, 2.0, 2.4 mm) dia. Innershield electrode sizes. The K397 assemblies are shipped with one each of the .068 and  $\frac{5}{64}$  in. (1.7 and 2.0 mm) contact tip sizes, and a snap-on insulator for the nozzle's tip clamp nut.

### 2. Insulated Nozzle Handle and Mounting Clamp

The flexible gun cable is assembled to a rugged polyester glass handle and provided with a steel collar to prevent cable wear, and an aluminum mounting clamp to securely mount the handle to the robot wrist bracket, or automated fixture. The handle's nozzle clamp rigidly holds the desired nozzle position to maintain tight control of the electrode position.

### 3. Versatile Nozzle Shapes and Ratings

Standard K397 assemblies are available with the choice of two cable lengths and three nozzle shapes. Each is rated for welding with .062 through  $\frac{3}{32}$ " (1.6 through 2.4 mm) dia. Innershield electrode sizes at up to 500 amps, 80% duty cycle:

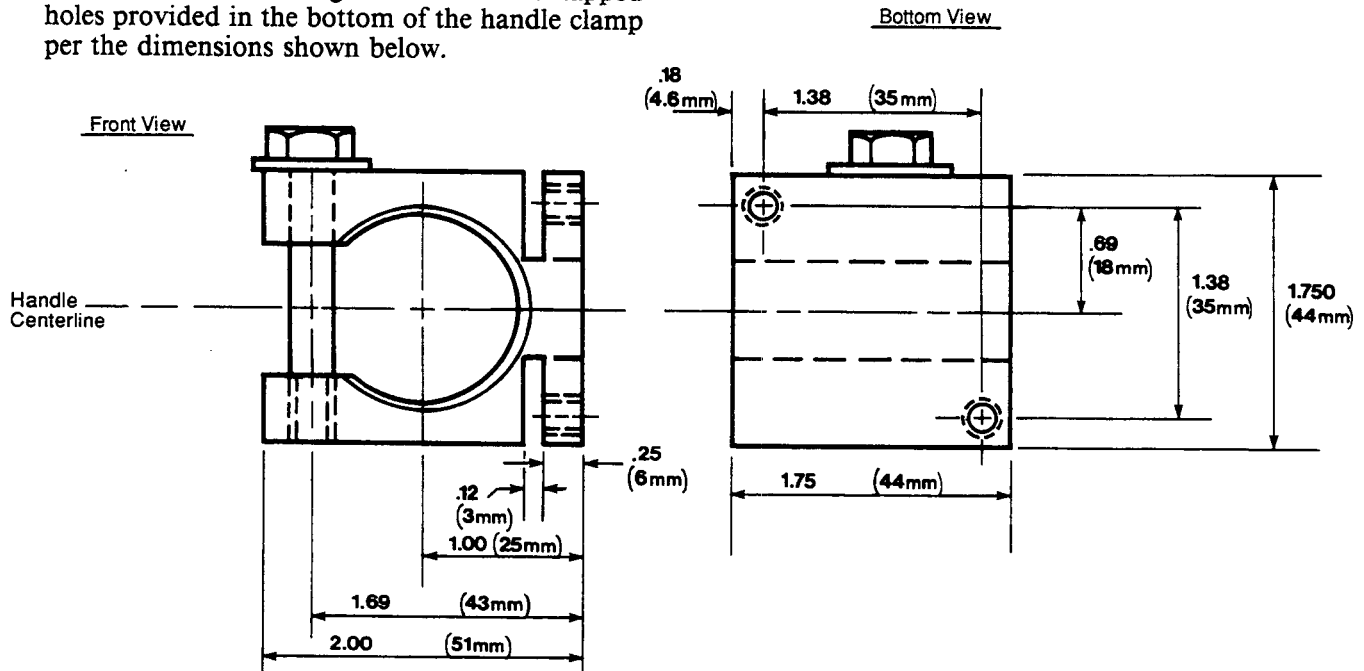
| TYPE                    | CABLE LENGTH                  | NOZZLE SHAPE AND TYPICAL DIMENSIONS                                                                            |
|-------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------|
| K397-5<br>K397-15       | 5 ft (1.5 m)<br>15 ft (4.5 m) | Straight<br>(with off-set)  |
| K397-45-5<br>K397-45-15 | 5 ft (1.5 m)<br>15 ft (4.5 m) | 45°                        |
| K397-82-5<br>K397-82-15 | 5 ft (1.5 m)<br>15 ft (4.5 m) | 82°                        |

These gun and cable assemblies are intended for use with the NA-5R Wire Drives, or NA-3 and NA-5 Automatic Heads (using the available S17619 Gun Cable Adapter), and are therefore not provided with a gun trigger or a hand shield.

# INSTALLATION

## MOUNTING AND POSITIONING

1. Mount the handle clamp to the robot wrist bracket or fixture bracket using the two 1/4-20 tapped holes provided in the bottom of the handle clamp per the dimensions shown below.



2. With the handle adjusted to the desired angular and linear position in the handle clamp, the clamping bolt should be tightened to approximately 20 in.-lb (2.3 N·m). Do not excessively tighten.

**CAUTION:** The nozzle clamping bolt, located at the nozzle end of the handle, will be electrically hot while welding. Be sure that the handle positioning will not permit this bolt head to be grounded to a conductive surface.

3. The nozzle should be fully inserted into the end of the handle and the desired angular position secured by tightening the nozzle clamping bolt at the end of the handle. The recommended tightening torque is about 55 in.-lb (6.2 N·m).
4. To change contact tips:
  - a. Remove the nozzle nut insulator by pulling it off the nozzle nut with a slight twisting action.
  - b. Loosen the nozzle nut with a 11/16" wrench and pull the tip out of the end of the nozzle with pliers. A back-and-forth twisting action will ease removal.
  - c. Install the new tip, stenciled with the wire size being used, by inserting the funneled end fully into the end of the nozzle and securing it by tightening the nozzle nut. The recommended tightening torque is about 85 in.-lb (9.6 N·m).
  - d. Reinstall the nut insulator by snapping it on over the nozzle nut.

**NOTE:** The nut insulator need not necessarily be used. However, since the nozzle nut is electrically hot while welding, the nut insulator should be used for those applications where the nozzle nut is apt to contact the weldment during the weld cycle. The nut insulator also serves as a spatter shield for the nozzle nut.

## CABLE CONNECTION

Allowing appropriate slack in the cable for required nozzle manipulations, route the cable as smoothly as possible to the wire drive unit.

### For NA-5R Wire Drives, or Other Lincoln LN-Type Feeders:

1. Fully insert the male end of the nozzle cable into the cable connector block on the front end of the wire drive.
2. Securely tighten the locking screw in the connector block with a 3/16" Allen wrench.

### For NA-3 or NA-5 Automatic Wire Feed Heads:

1. The optional S17619 Gun Cable Adapter must be inserted over the outgoing guide tube of the head and secured with the nozzle mounting clips provided with the head.
2. Connect the electrode cable(s) from the automatic

control to the Gun Cable Adapter using the 1/2-13 bolt provided with the Adapter.

3. Fully insert the male end of the gun cable into the Gun Cable Adapter and securely tighten the locking screw with a 3/16" Allen wrench.

**NOTE:** Heads must contain proper drive roll and guide tubes for 1/16-3/32 in. (1.6-2.4 mm) electrode. K397-3/32 cannot be used with 3/32-7/32 in. (2.4-5.6 mm) drive roll and guide tubes.

## OPERATION

Wire feeding problems can be avoided by observing the following practices:

1. Do not kink or pull cable around sharp corners.
2. Keep the cable as straight or smoothly routed as possible, especially when loading electrode. It is advisable to provide flexible suspension support in applications where the cable slack is free-hanging.
3. Keep cable liner clean. (Refer to Maintenance Section.)
4. Use only clean rust-free electrode. Innershield electrode has the proper surface lubrication.
5. Remove spatter from contact tip and nozzle nut or nut insulator as necessary to prevent excessive

spatter build-up.

6. Replace the contact tip if it is fused or deformed, or if tip wear causes signs of arc instability.

**NOTE:** A worn tip may be rotated to an unworn section to extend the useful life of the contact tip.

To Start The Weld:

1. Position the nozzle with the proper electrode stick-out distance from the end of the contact tip to the work.
2. With the end of the electrode nearly or lightly touching work, start the arc. Avoid pushing the electrode into the joint before starting the arc.

## MAINTENANCE

Before any gun is disassembled, remove gun and cable from wire feeder or shut off welder.

### Disassembly

1. **Nozzle** — To remove nozzle from gun, loosen the hex head screw at end of handle and pull nozzle straight out. To reinstall, insert the nozzle, push in as far as possible, and tighten screw. The recommended tightening torque is about 55 in.-lb (6.2 N-m).
2. **Cable** — To remove cable from handle, remove nozzle and slip the spatter shield out of the front of the handle. Remove the snap ring from cable connector and slip handle off the cable.

### Gun Cables

Clean cables after using approximately 300 pounds (136 kg) of electrode. Remove the cable from the wire feeder and lay it out straight. Remove the contact tip from the gun nozzle. Using an air hose and only partial pressure, gently blow out the cable from the gun end. Too much pressure at the start will cause the dirt to form a plug. Flex the cable over its entire length and again blow out the cable. Repeat this procedure until no further dirt comes out.

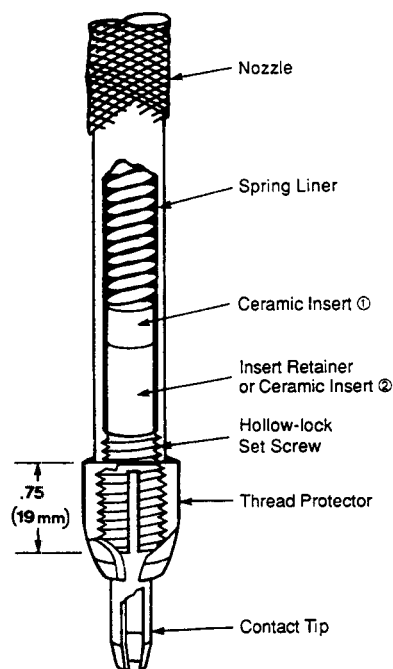
### Gun Nozzles

1. Replace worn contact tips as required (refer to the "Installation section — Mounting and Positioning"), or rotate worn tip to an unworn section.
2. Remove spatter from tip as required to prevent excessive build-up.
3. Replace worn spring liners in nozzles. The life of the liner can be doubled by rotating liner 180°. The liner can be pulled out the back end of the nozzle by wedging the blade of a small screwdriver in the I.D. and pulling.
4. Internal parts of nozzles can be removed and replaced by removing the internal hollow-lock set screw from the contact tip end of the nozzle with a 5/32 in. Allen wrench.

The ceramic inserts and retainer will normally fall out the end of the nozzle but if they do not, gently drive the spring liner towards the outgoing end of the nozzle.

See appropriate parts list page for construction details and replaceable parts. When re-assembling nozzle, make certain the ceramic nozzle insert is placed next to the spring liner. The hollow-lock set

screw is to be tightened to give the dimension specified below as measured from the hollow-lock set screw to the end of the nozzle (with nozzle nut removed).



① Larger I.D. Insert for 45° and 82° nozzles only.

② Retainer used in straight nozzle only.

## TROUBLESHOOTING GUIDE

| Trouble                                                                                                                                     | Possible Cause                                                                                                                                                                                                                                                                                                                                                                                                                    | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drive rolls turn but wire drive will not feed or wire feeding is rough or uneven.                                                           | <ul style="list-style-type: none"> <li>a. Gun cable kinked and/or twisted.</li> <li>b. Wire jammed in gun and cable.</li> <li>c. Incorrect drive rolls, guide tubes or contact tip.</li> <li>d. Gun cable dirty.</li> <li>e. Worn drive rolls.</li> <li>f. Electrode rusty and/or dirty.</li> <li>g. Worn nozzle liner.</li> <li>h. Partially flashed or melted contact tip.</li> <li>i. Broken ceramic nozzle insert.</li> </ul> | <ul style="list-style-type: none"> <li>a. Keep as straight as possible. Inspect cable and replace if necessary.</li> <li>b. Remove wire from gun and cable — feed in new wire. Note any obstruction. Replace gun and cable if necessary.</li> <li>c. Be sure the wire diameter being used is stamped on drive rolls, guide tubes and contact tip. Replace if necessary.</li> <li>d. Clean cable. (Refer to Maintenance Section.)</li> <li>e. Replace or reverse split drive roll type.</li> <li>f. Replace contaminated electrode.</li> <li>g. Replace nozzle liner.</li> <li>h. Replace the contact tip.</li> <li>i. Replace ceramic insert.</li> </ul> |
| Variable or "hunting" welding arc.                                                                                                          | <ul style="list-style-type: none"> <li>a. Contact tip worn or incorrect size.</li> <li>b. Worn or undersize ground cables or poor ground connections.</li> <li>c. Loose electrode connections.</li> </ul>                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>a. Replace or rotate contact tip.</li> <li>b. Inspect — repair or replace as necessary.</li> <li>c. Be sure the following connections are tight: electrode cable to wire feeder and power source, work cable to power source and work, gun cable to wire feeder contact block, gun nozzle to handle connection and contact tip to nozzle.</li> </ul>                                                                                                                                                                                                                                                              |
| Poor arc striking with sticking or "blastoffs", weld porosity, narrow and ropy looking bead or electrode stubbing into plate while welding. | <ul style="list-style-type: none"> <li>a. Improper procedures or techniques.</li> </ul>                                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>a. See "Innershield Electrodes Production Welding Guide" (N675).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Contact tip pushes out of nozzle.                                                                                                           | <ul style="list-style-type: none"> <li>a. Nozzle nut insufficiently tight.</li> <li>b. Wire Drive Unit drive roll pressure too high.</li> </ul>                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>a. Nozzle nut to be tightened to approximately 85 in.-lb (9.6 N-m).</li> <li>b. Set proper drive roll pressure per Wire Drive Unit Instruction Manual.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## NEW COMPONENTS PARTS LIST

|                                            | Straight | 45°         | 82°       |
|--------------------------------------------|----------|-------------|-----------|
| Nozzle Assembly                            | M14808-1 | M14808-2    | M14808-3  |
| Nozzle                                     | M14806-1 | M14806-2    | M14806-3  |
| Nozzle Liner                               | T12931-5 | T12931-32   | T12931-32 |
|                                            |          |             |           |
| Nozzle Nut                                 |          | S17615      |           |
|                                            |          |             |           |
| Nozzle Nut Insulator                       |          | S17624      |           |
|                                            |          |             |           |
| Nozzle Contact Tip:                        |          | S17614-.062 |           |
| .062 in. (1.6 mm)                          |          |             |           |
| .068 in. (1.7 mm)                          |          | S17614-.068 |           |
| 5/64 in. (2.0 mm)                          |          | S17614-5/64 |           |
| 3/32 in. (2.4 mm)                          |          | S17614-3/32 |           |
|                                            |          |             |           |
| Handle Clamp                               |          | S17616      |           |
|                                            |          |             |           |
| Cable Assembly:                            |          |             |           |
| 15 ft (4.5 m)                              |          | L7049-1     |           |
| 5 ft. (1.5 m)                              |          | L7049-2     |           |
|                                            |          |             |           |
| Gun Cable Adapter<br>(for Automatic Heads) |          | S17619      |           |

**WARRANTY SUPERSEDED  
SEE IMWS 1**



|                                       |                                                                                                                                                                                                                     |                                                                                                               |                                                                                                   |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|                                       |                                                                                                                                                                                                                     |                                                                                                               |                                                                                                   |
| <b>WARNING</b>                        | <ul style="list-style-type: none"> <li>Do not touch electrically live parts or electrode with skin or wet clothing.</li> <li>Insulate yourself from work and ground.</li> </ul>                                     | <ul style="list-style-type: none"> <li>Keep flammable materials away.</li> </ul>                              | <ul style="list-style-type: none"> <li>Wear eye, ear and body protection.</li> </ul>              |
| Spanish<br><b>AVISO DE PRECAUCION</b> | <ul style="list-style-type: none"> <li>No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</li> <li>Aislese del trabajo y de la tierra.</li> </ul>                                           | <ul style="list-style-type: none"> <li>Mantenga el material combustible fuera del área de trabajo.</li> </ul> | <ul style="list-style-type: none"> <li>Protéjase los ojos, los oídos y el cuerpo.</li> </ul>      |
| French<br><b>ATTENTION</b>            | <ul style="list-style-type: none"> <li>Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</li> <li>Isolez-vous du travail et de la terre.</li> </ul>                   | <ul style="list-style-type: none"> <li>Gardez à l'écart de tout matériel inflammable.</li> </ul>              | <ul style="list-style-type: none"> <li>Protégez vos yeux, vos oreilles et votre corps.</li> </ul> |
| German<br><b>WARNUNG</b>              | <ul style="list-style-type: none"> <li>Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</li> <li>Isolieren Sie sich von den Elektroden und dem Erdboden!</li> </ul> | <ul style="list-style-type: none"> <li>Entfernen Sie brennbares Material!</li> </ul>                          | <ul style="list-style-type: none"> <li>Tragen Sie Augen-, Ohren- und Körperschutz!</li> </ul>     |
| Portuguese<br><b>ATENÇÃO</b>          | <ul style="list-style-type: none"> <li>Não toque partes elétricas e electrodos com a pele ou roupa molhada.</li> <li>Isole-se da peça e terra.</li> </ul>                                                           | <ul style="list-style-type: none"> <li>Mantenha inflamáveis bem guardados.</li> </ul>                         | <ul style="list-style-type: none"> <li>Use proteção para a vista, ouvido e corpo.</li> </ul>      |
| Japanese<br><b>注意事項</b>               | <ul style="list-style-type: none"> <li>通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。</li> <li>施工物やアースから身体が絶縁されている様にして下さい。</li> </ul>                                                                                                | <ul style="list-style-type: none"> <li>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。</li> </ul>                                | <ul style="list-style-type: none"> <li>目、耳及び身体に保護具をして下さい。</li> </ul>                              |
| Chinese<br><b>警告</b>                  | <ul style="list-style-type: none"> <li>皮肤或湿衣物切勿接触带电部件及焊条。</li> <li>使你自己与地面和工件绝缘。</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>把一切易燃物品移离工作场所。</li> </ul>                                              | <ul style="list-style-type: none"> <li>佩戴眼、耳及身体劳动保护用具。</li> </ul>                                 |
| Korean<br><b>위험</b>                   | <ul style="list-style-type: none"> <li>전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오.</li> <li>모재와 접지를 접촉치 마십시오.</li> </ul>                                                                                                    | <ul style="list-style-type: none"> <li>인화성 물질을 접근 시키지 마십시오.</li> </ul>                                        | <ul style="list-style-type: none"> <li>눈, 귀와 몸에 보호장구를 착용하십시오.</li> </ul>                          |
| Arabic<br><b>تحذير</b>                | <ul style="list-style-type: none"> <li>لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجلد الجسم أو بالملايس المبللة بالماء.</li> <li>ضع عازلا على جسمك خلال العمل.</li> </ul>                        | <ul style="list-style-type: none"> <li>ضع المواد القابلة للاشتعال في مكان بعيد.</li> </ul>                    | <ul style="list-style-type: none"> <li>ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.</li> </ul>   |

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

|                                                                                                                                                                                               |                                                                                                                                                                                              |                                                                                                                                                                 |                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                                              |                                                                                                             |                                                                               |  |
| <ul style="list-style-type: none"> <li>● Keep your head out of fumes.</li> <li>● Use ventilation or exhaust to remove fumes from breathing zone.</li> </ul>                                   | <ul style="list-style-type: none"> <li>● Turn power off before servicing.</li> </ul>                                                                                                         | <ul style="list-style-type: none"> <li>● Do not operate with panel open or guards off.</li> </ul>                                                               | <b>WARNING</b>                                                                      |
| <ul style="list-style-type: none"> <li>● Los humos fuera de la zona de respiración.</li> <li>● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</li> </ul> | <ul style="list-style-type: none"> <li>● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</li> </ul>                                         | <ul style="list-style-type: none"> <li>● No operar con panel abierto o guardas quitadas.</li> </ul>                                                             | Spanish<br><b>AVISO DE PRECAUCION</b>                                               |
| <ul style="list-style-type: none"> <li>● Gardez la tête à l'écart des fumées.</li> <li>● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</li> </ul>       | <ul style="list-style-type: none"> <li>● Débranchez le courant avant l'entretien.</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</li> </ul>                       | French<br><b>ATTENTION</b>                                                          |
| <ul style="list-style-type: none"> <li>● Vermeiden Sie das Einatmen von Schweißrauch!</li> <li>● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</li> </ul>                        | <ul style="list-style-type: none"> <li>● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</li> </ul>                                                     | <ul style="list-style-type: none"> <li>● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</li> </ul>                                | German<br><b>WARNUNG</b>                                                            |
| <ul style="list-style-type: none"> <li>● Mantenha seu rosto da fumaça.</li> <li>● Use ventilação e exaustão para remover fumo da zona respiratória.</li> </ul>                                | <ul style="list-style-type: none"> <li>● Não opere com as tampas removidas.</li> <li>● Desligue a corrente antes de fazer serviço.</li> <li>● Não toque as partes elétricas nuas.</li> </ul> | <ul style="list-style-type: none"> <li>● Mantenha-se afastado das partes moventes.</li> <li>● Não opere com os painéis abertos ou guardas removidas.</li> </ul> | Portuguese<br><b>ATENÇÃO</b>                                                        |
| <ul style="list-style-type: none"> <li>● ヒュームから頭を離すようにして下さい。</li> <li>● 換気や排煙に十分留意して下さい。</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。</li> </ul>                                                                                                  | <ul style="list-style-type: none"> <li>● パネルやカバーを取り外したまま機械操作をしないで下さい。</li> </ul>                                                                                | Japanese<br><b>注意事項</b>                                                             |
| <ul style="list-style-type: none"> <li>● 頭部遠離煙霧。</li> <li>● 在呼吸區使用通風或排風器除煙。</li> </ul>                                                                                                        | <ul style="list-style-type: none"> <li>● 維修前切斷電源。</li> </ul>                                                                                                                                 | <ul style="list-style-type: none"> <li>● 儀表板打開或沒有安全罩時不準作業。</li> </ul>                                                                                           | Chinese<br><b>警告</b>                                                                |
| <ul style="list-style-type: none"> <li>● 얼굴로부터 용접가스를 멀리하십시오.</li> <li>● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</li> </ul>                                                                 | <ul style="list-style-type: none"> <li>● 보수전에 전원을 차단하십시오.</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>● 판넬이 열린 상태로 작동치 마십시오.</li> </ul>                                                                                        | Korean<br><b>위험</b>                                                                 |
| <ul style="list-style-type: none"> <li>● ابعاد رأسك بعيداً عن الدخان.</li> <li>● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.</li> </ul>              | <ul style="list-style-type: none"> <li>● أقطع التيار الكهربائي قبل القيام بأية صيانة.</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.</li> </ul>                                            | Arabic<br><b>تحذير</b>                                                              |

**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銀焊材料，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.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.



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