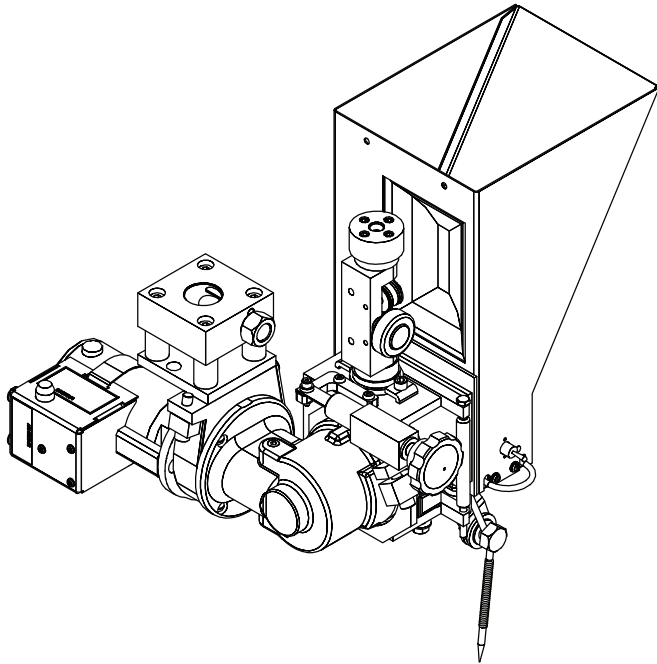


Operator's Manual

MAXsa™ 22 WIRE DRIVE



For use with machines having Code Numbers:
12433



Register your machine:

www.lincolnelectric.com/register

Authorized Service and Distributor Locator:

www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

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.

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.

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.



KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

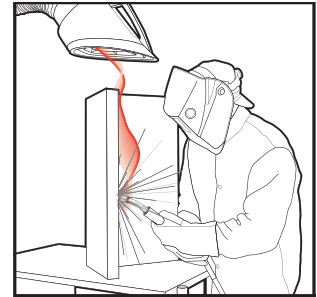
READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.



WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**



SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.



SECTION A: WARNINGS



CALIFORNIA PROPOSITION 65 WARNINGS



WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.*)



WARNING: Cancer and Reproductive Harm
www.P65warnings.ca.gov

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.



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.



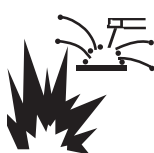
FUMES AND GASES CAN BE DANGEROUS.



- 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 hardfacing (see instructions on container or SDS) 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 unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also 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 Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS 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.



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, 14501 George Carter Way Chantilly, VA 20151.



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.

Refer to
<http://www.lincolnelectric.com/safety>
for additional safety information.

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Parts List	parts.lincolnelectric.com

Content/details may be changed or updated without notice. For most current Operator's Manual, go to parts.lincolnelectric.com.

PRODUCT SUMMARY

The MAXsa™ series of Automatic Wire Drives are designed for hard automation, submerged arc welding. The heavy-duty gearbox and feed plate have many years of proven reliability while a new permanent magnet motor has been added.

The MAXsa™ 22 WIRE DRIVE consists of a high torque motor and gearbox assembly with a heavy-duty feed plate housing knurled drive rolls for positive, accurate wire feeding of heavy welding wire. Depending on which options are used, the MAXsa™ has many axes of rotation for ease of fixturing and locating.

RECOMMENDED PROCESSES

- The MAXsa™ series of wire drive packages are best suited for submerged arc welding.

PROCESS LIMITATIONS

- MIG welding
- Robotic applications

EQUIPMENT LIMITATIONS

The MAXsa™ series of wire drives cannot be used with the NA3, NA-4, or NA-5 series of Lincoln Automatics.

COMMON EQUIPMENT PACKAGES

Basic Package

- K2803-X Power Wave® AC/DC 1000 SD
- K2814-X MAXsa™ 10 Controller/Feed Head
- K2370-X MAXsa™ 22 Wire Drive

Basic Package with optional kits:

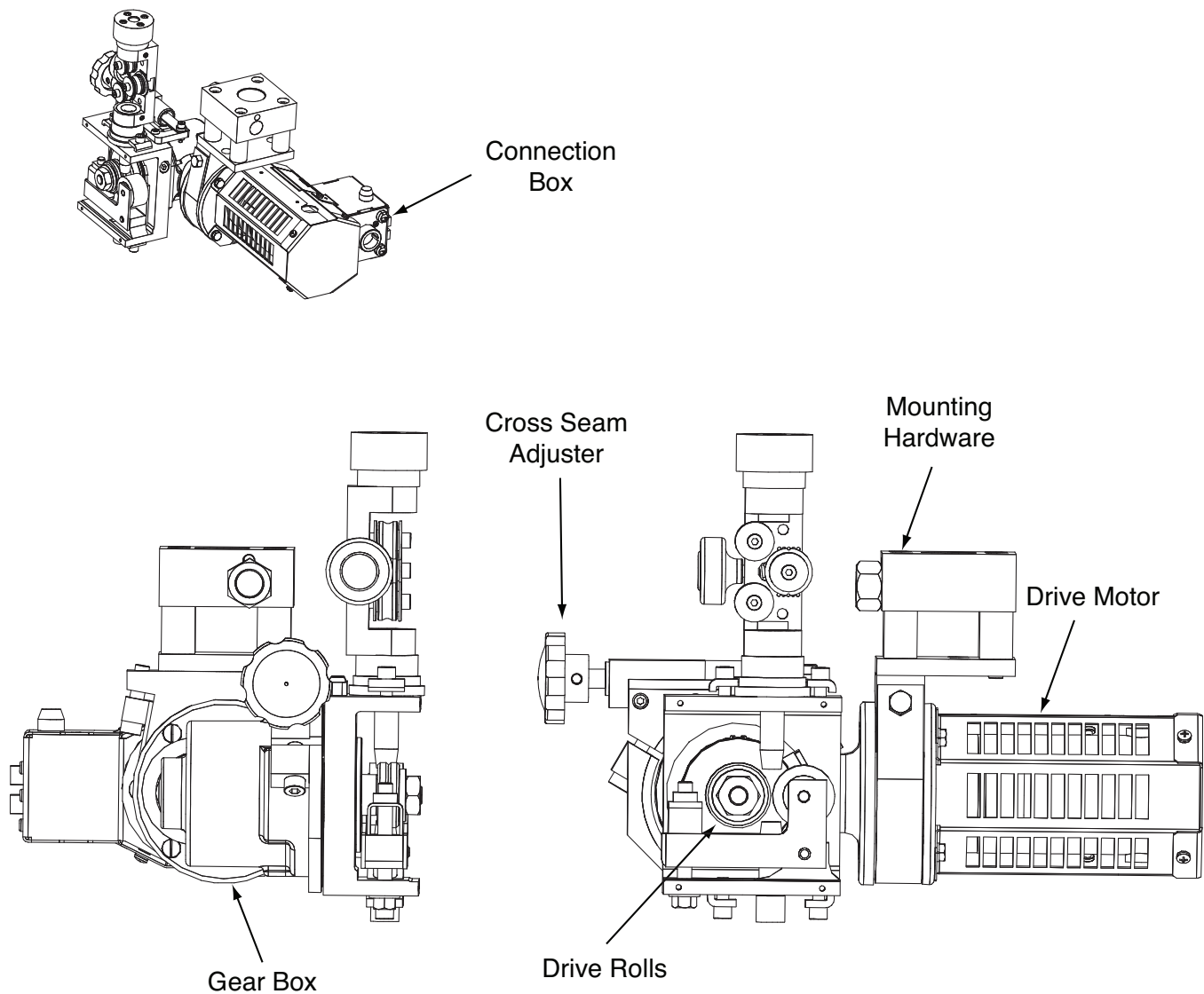
- K2803-X Power Wave® AC/DC 1000 SD
- K2311-1 MAXsa™ Motor Retrofit Kit
- K2312-X MAXsa™ 29 Wire Drive
- K2626-X Wire Drive Controller (for fixture builders that do not require the MAXsa™ 10 Controller).

MAXsa™ 22 WIRE DRIVE



DESIGN FEATURES - MAXsa™ 22

- Closed-loop speed control.
- Knurled drive rolls.
- Heavy cast aluminum gearbox housing and feed plate assembly.
- Wire straightener.
- Cross Seam Adjuster
- Flux Hopper (not shown)
- Mounting Hardware for accessories
- 32Vdc permanent magnet, high torque motor.
- Gears included to change speed range.

FIGURE A.1a - LOCATION OF MAXsa™ 22 COMPONENTS

MAXsa™ 22 WIRE DRIVE



TECHNICAL SPECIFICATIONS - MAXsa™ 22 WIRE DRIVE

Spec.	Type	142:1 Speed Ratio			95:1 Speed Ratio			57:1 Speed Ratio		
		Speed	Wire Size Solid	Wire Size Cored	Speed	Wire Size Solid	Wire Size Cored	Speed	Wire Size Solid	Wire Size Cored
K2370-3	MAXsa™ 22	10-200	7/32	5/32	10-300	1/8	5/32	40-500	1/16	3/32
Wire Feeders - Input Voltage and Current										
Voltage					Input Amperes					
32V DC (40V Pulse Width Modulated)					6.7 Amps (max.)					
PHYSICAL DIMENSIONS										
MODEL	HEIGHT			WIDTH		DEPTH		WEIGHT		
K2370-3	12.0 in. (305 mm)			14.0in (355mm)		10.0in (254mm)		80.0lbs (36.3kg)		
TEMPERATURE RANGES										
OPERATING TEMPERATURE RANGE					STORAGE TEMPERATURE RANGE					
-4°F to 104°F (-20°C to 40°C)					-40°F to 185°F (-40°C to 85°C)					
WELDING PROCESSES										
Process	Electrode Diameter Range			Output Range (Amperes)			Wire Feed Speed Range			
SAW	.045" – 7/32" (1.2 – 5.6 mm)			200 - 2000+ (with paralleled machines)			10 - 500 ipm (.25 – 11.43 m/minute)			

MAXsa™ 22 WIRE DRIVE



SAFETY PRECAUTIONS

Read this entire installation section before you start installation.



WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.

- Do not touch electrically hot parts.

HIGH FREQUENCY PROTECTION

Locate the MAXsa™ Wire Driveaway from radio controlled machinery.

NON-STANDARD SAFETY INFORMATION



CAUTION

The MAXsa™ series of wire drives may be at welding voltage potential when the output of the power source is active.

INPUT AND GROUND CONNECTIONS

Only a qualified electrician should connect the MAXsa™ 22 WIRE DRIVE. Wire Drive Installation should be made in accordance with the appropriate National Electrical Code, all local codes and the information in this manual.

LOCATION AND MOUNTING

The MAXsa™ Wire Drive will operate in harsh indoor environments. It has an IP2X rating.

This equipment is for industrial use only and it is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in residential locations due to conducted as well as radiated radio-frequency disturbances. The EMC or RF classification of this equipment is Class A.

MAXsa™ 22 WIRE DRIVE



Power Wave® AC/DC 1000 SD SUBARC SYSTEM Connections (See Figure A.3)

Diagram shown is for a single arc system. Refer to the power source manual for additional connection options (Multi-arc and/or parallel machines).

Mounting Dimensions

The MAXsa™ Wire Drive can be mounted by using the four 3/8-16 tapped holes or the two 0.562 through holes. See mounting hole locations (See Figure A.4).

FIGURE A.3 - CONNECTION DIAGRAM

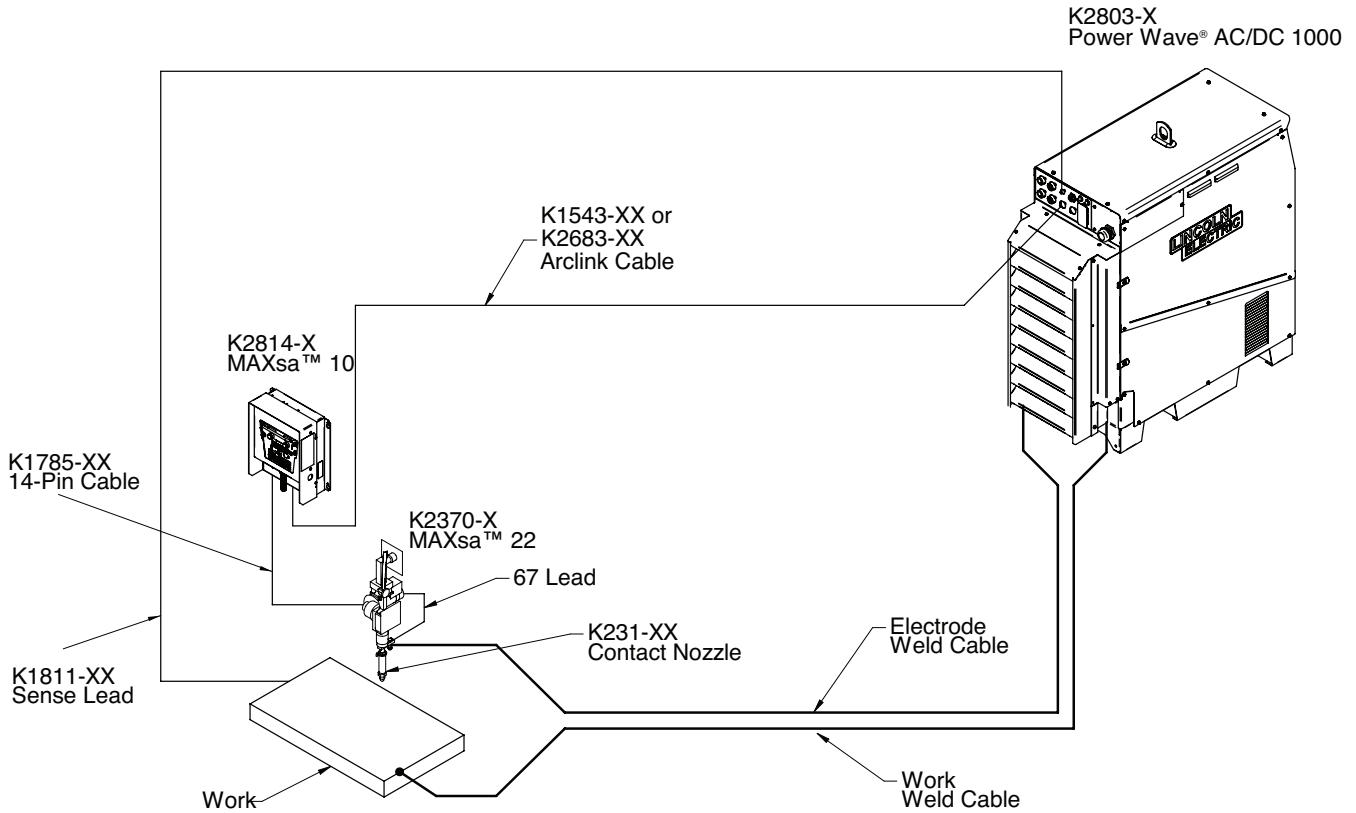
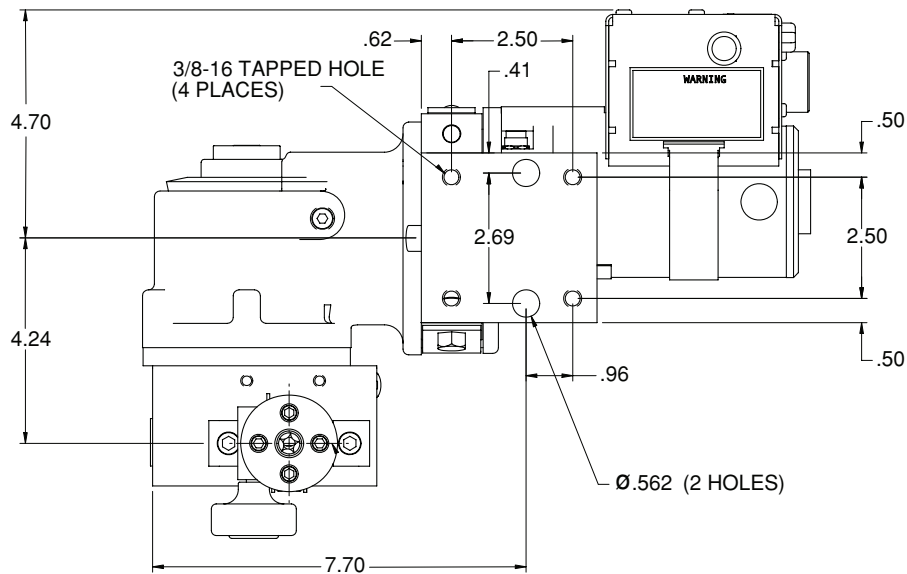


FIGURE A.4 - MOUNTING DIMENSIONS



MAXsa™ 22 WIRE DRIVE

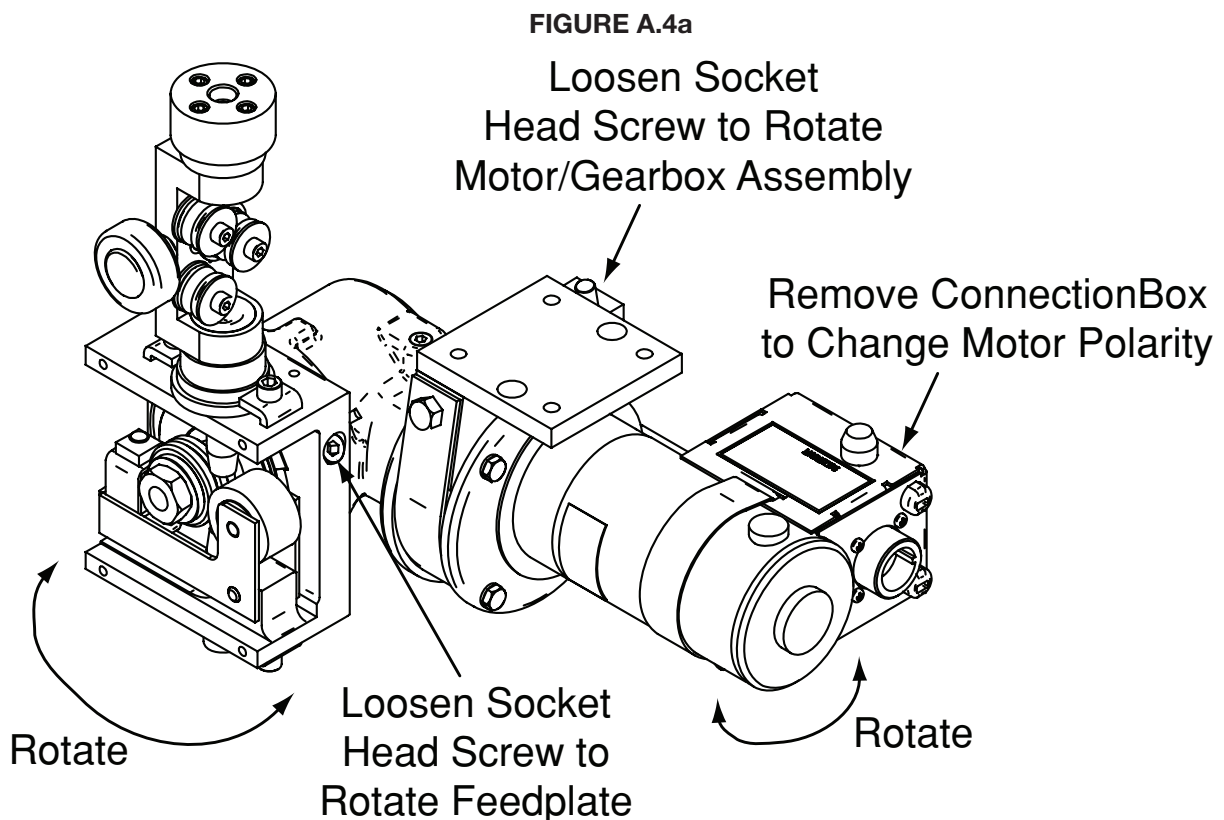


CHANGING THE WIRE DRIVE CONFIGURATION

The MAXsa™ 22 WIRE DRIVE can be reconfigured to fit in any hard automation application.

As shipped, the MAXsa™ 22 WIRE DRIVE Drive Rolls rotate clockwise to feed the wire down. Reconfiguring the Wire Drive per Figure A.4a may require reversing the direction of the motor. This is accomplished by reversing the motor polarity so that the wire will feed correctly. Follow these instructions to reverse the motor polarity. See the Wiring Diagram in Section F of this manual

1. Remove all power from the MAXsa™ Wire Drives.
2. Disconnect the Control Cable from the MAXsa™ Wire Drive Connection Box.
3. Loosen the fastener from the Band Strap to the Connection Box, which secures the assembly to the Motor housing, and expose the leads inside of the Connection Box.
4. Locate the Motor leads that go from the Motor to the Control Cable connector on the inside of the Connection Box.
5. Carefully disconnect the Motor leads from the harness by pulling the quick-connect terminals apart.
6. Reverse the motor leads and reconnect the quick-connect terminals (see the Wiring Diagram).
7. Carefully replace the wire harness back into the Connection Box and place back onto the Motor housing locating over the Motor lead grommet. Ensure that the tachometer leads are completely covered by the Channel that snaps into the Connection Box. The Connection Box assembly should be pushed all the way up to the Motor-to-Gearbox Adapter Plate.
8. Before securing the Connection Box to the Motor housing with the Band Strap, ensure that none of the harness leads are being pinched underneath the edges of the Connection Box and Channel.
9. Place the Band Strap into the "T" slot on the side of the Connection Box and wrap it around the Motor housing.
10. Replace the fastener between the Band Strap and the Connection Box. Tighten so that the Connection Box cannot move on the Motor housing.



MAXsa™ 22 WIRE DRIVE



WIRE FEED MECHANISM

All MAXsa™ Wire Drive units are shipped with 142:1 ratio gears. Gears are included to change to either 95:1 or 57:1 ratio depending on wire size to be used.

As shipped, the drive mechanism parts are designed to feed 3/32 through 7/32(2.4mm - 6.0mm) wire. Other wire sizes will require different drive rolls and guide tubes. See table A.1.

The Idle Roll pressure will need to be adjusted for the wire being used. The indicator shows two settings -

.035 - 3/32" (0.9 - 2.4mm)

.120.- 7/32" (3.0 - 6.0mm)

The tension adjustment is to be made after loading the wire into the drive rolls.

NOTE: Lower tension may need to be needed to prevent crushing of some cored wires or softer alloy solid wires.

GEAR RATIO CONVERSION

(See Figure A.4b)

1. Remove the 2 hex head screws and the 2 slot head screws holding the Motor to the Wire Drive Gearbox assembly.
2. Remove existing Adapter Plate and Motor Assembly.
3. Take the two long screws removed in step 1 and screw one into each of the tapped holes located on the face of fiber input helical gear. Insert the screws through the full thickness of the gear, and using a screwdriver wedged between the screws to prevent rotation, remove the hex nut that holds the gear to the shaft. Remove plain washer.

4. Pull the gear from the shaft using the screws as a pulling device.

5. Be certain woodruff key is properly located on the shaft. Screw the adapter plate and motor assembly mounting screws into the new fiber input helical gear from the stenciled side and place the gear on the shaft. Replace plain washer, tighten the hex nut, and remove the adapter plate and motor assembly mounting screws from the gear.

6. Support the pinion properly and, with the proper size punch, drive the roll pin that holds the pinion out of the shaft. Pull the pinion off. Remove the Ring Magnet from the pinion gear and snap it onto the new pinion gear. Before installing the new pinion gear with the Ring Magnet onto the motor shaft, ensure that the flat washer is located at the bottom of the shaft. Install the new pinion and replace the roll pin.

7. Cover the teeth of the motor pinion and the input gear with a non-fluid molydisulfide type grease such as Non-Fluid Oil Corporation's A-29 Special/MS Lubricant. This grease can be scooped from the cavity of the gear case.

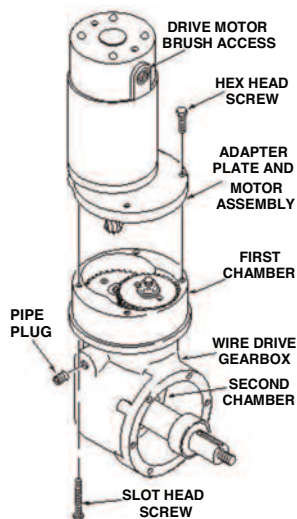
8. Reassemble the motor to the gearbox. Make sure the gears mesh properly and the adapter plate locating bead is in its cavity. Replace and tighten the four screws removed in step 1.

IMPORTANT

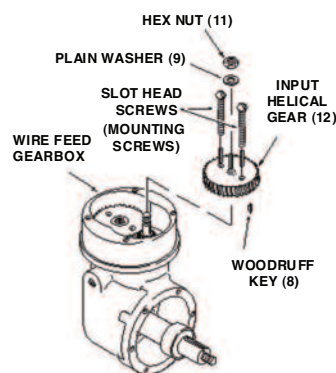
See the MAXsa™ 10, or power source manual for instructions on configuring the system for the new gear ratio.

FIGURE A.4b

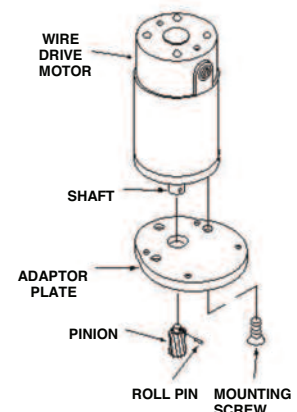
- WIRE DRIVE MOTOR GEAR BOX



- CHANGING THE WIRE FEED GEAR RATIO



- DRIVE MOTOR PINION GEAR REMOVAL



MAXsa™ 22 WIRE DRIVE



TABLE A.1 - DRIVE ROLL KITS

KP1899 DRIVE ROLL KIT			INCLUDED WITH KIT			
Drive Roll Kit Number	Wire Sizes & Types		Drive Roll Part Number	Drive Roll No. required	Incoming Guide	Outgoing Guide
KP1899-1	3/32-7/32"	Wires	KP1885-1	2	KP2116-2	KP1963-1
KP1899-2	1/16-3/32"	Wires	KP1886-1	2	KP2116-1	KP2097-2
KP1899-3	.035-.052"	Solid Wire	KP1887-1	1	KP1967-1	KP2097-1
KP1899-4	.045-.052"	Cored Wire	KP1892-1	2	KP1967-1	KP2097-1

NOTE: Twinarc drive rolls are included with the Twinarc kits.

ELECTRODE CONNECTIONS

Because the Power Wave® AC/DC 1000 SD can produce either a DC positive, DC negative or AC output the electrode and work connections do not need to be reversed for the different polarities. Additionally no DIP switch changes are required to switch between the different polarities. All of this is controlled internally by the Power Wave® AC/DC. The following directions apply to all polarities:

Connect the electrode cable(s) to the "electrode" stud(s) on the power source. Connect the other to the contact assembly at the Wire Drive. Be sure the connection makes tight metal-to-metal electrical contact. The electrode cable should be sized according to the specifications given in Table A.2.

NOTE: On the Power Wave® 1000 SD, the Electrode studs are on the lower left rear corner of the machine. On older units they are on the lower left front corner. On those machines, the cables can be routed through the oval hole in the cable tray before being connected to the output terminals.

TABLE A.2 - Output Cable Guidelines

Total Cable Length ft (m) Electrode and Work Combined	Duty Cycle	Number of Parallel Cables	Cable Size Copper
0 (0) to 250 (76.2)	80%	2	4/0 (120 mm ²)
0 (0) to 250 (76.2)	100%	3	3/0 (95 mm ²)

When using inverter type power sources like the Power Wave®, use the largest welding (electrode and work) cables that are practical. When using AC applications the current can reach very high levels. Voltage drops due to cable resistance can become excessive, leading to poor welding characteristics if undersized welding cables are used.

REMOTE SENSE LEAD SPECIFICATIONS

The MAXsa™ 22 Wire Drive has an ELECTRODE sense lead extending from the connection box that is mounted to the motor. This sense lead is critical to the accuracy of the Power Wave® welding process. A ring terminal is provided at the end of the lead. This lead must be extended and connected to the electrode connection at the nozzle. This connection should be made as close to the welding arc as possible. Use at least a 12 AWG wire with a proper sized ring terminal. Use a screw with a lock washer and nut to make the connection, then insulate the connection with electrical tape. Proper care should be taken to protect the sense lead from becoming disconnected or damaged. The loss of a sense lead connection can adversely affect welding performance. The system may have multiple sense lead configurations available. Consult the power source manual on how to configure the power source for the sense leads.

NOTE: The WORK sense lead (21) for the MAXsa™ 22 Wire Drive system is typically connected at the back of the Power Wave® AC/DC 1000 SD. If the MAXsa™ wire drive is to be used in an older system, (PF10A and/or K2344-X) the WORK sense lead must be brought out of the motor connection box and connected to the workpiece.

K325 - TC-3 TRAVEL CARRIAGE

The TC-3 travel carriage is available in two models. Both are “High Capacity” and suitable for multiple arc welding.

K325HC-S (Standard - 952:1 ratio)

5” to 70”/min (127mm to 1.88M/mim)

K325-HC-F (High Speed - 254:1 ratio)

15” to 270”/min (381mm to 6.86M/min)

NOTE: Although the carriages can be set for speeds down to zero, speed variations increase dramatically with uneven loading when operated below the recommended minimum speeds.

The maximum amount of equipment that a K325 carriage can safely carry is shown in Table A.3

It is important when mounting wire reels, and other equipment to the TC-3 Travel Carriage that there is a minimum of overhung weight. The Wire Drive mountings are to be such that the heads are within 19” (483mm) from the front of the carriage as shown in Figure A.5.

FIGURE A.5

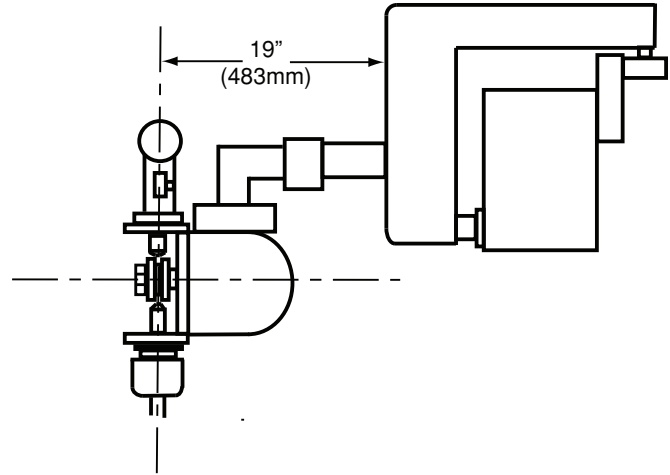


TABLE A.3 - MAXIMUM EQUIPMENT LOAD FOR TC-3

MULTIPLE ARC OPERATION		TANDEM TWINARC®
Two MAXsa™ Wire Drives and Controls	Three MAXsa™ Wire Drives and Controls	Two MAXsa™ Wire Drives and Controls
Two Wire Reels (60 # Coils)	Three Wire Reels (60# Coils)	Four Wire Reels(60# Coils) Centrally Located
Two K29 Vertical Adjusters	Three K29 Vertical Adjusters	Two K29 Vertical Adjusters
Two K96 Horizontal Adjusters	Three K96 Horizontal Adjusters	Two K96 Horizontal Adjusters
Flux Hopper	Flux Hopper	Flux Hopper
150# of Auxiliary Equipment Centrally Located over TC-3	No Auxiliary Equipment	No Auxiliary Equipment

INSTALLATION

The TC-3 comes factory assembled to fit an 8" (203mm) beam. See print G1458 for instructions to use it on 10" (254mm) or 12" (305mm) beams.

The Carriage Release Handle, the Wire Reel Support Bracket and the Wire Drive Support Bracket are not factory mounted. They should be mounted to the carriage before it is placed on the beam per the following instructions.

1. Insert the clutch handle into the hole on the right side of the carriage so that the end of the handle is goes into the lift yoke.
2. Line up the hole in the handle and the hole in the lift yoke and insert the roll pin that came taped to the handle. Drive in the roll pin until it is flush with the yoke.
3.
 - a. If the MAXsa™ 10 Control Box is not going to be mounted on the carriage, mount the Wire Reel Support Bracket to the left front corner of the carriage using the hardware provided.
 - b. Do not mount the Wire Reel Support if the K2462-1 Control Box Mounting Bracket for the MAXsa™ 10 is to be mounted on the carriage. Another means of mounting the wire must be used such as a K390 or a user supplied support for a K299 or K162-1 Spindle Kit (ordered separately).

NOTE: Do not mount the K2462-1 Bracket for the MAXsa™ 10 Control Box until after the carriage is placed on the beam.

4. Install the Wire Drive Mounting Bracket that is supplied with the MAXsa™ 22, using the hardware and insulators provided. See Figure A.6.

5. Use an ohmmeter to be sure that the Wire Reel shaft and the Wire Drive Mounting Bracket are electrically isolated from the TC-3 frame.

With the release handle all the way down, set the carriage on the beam. It should run freely along the beam. With the release handle in the up position the drive gear should engage the track and hold the carriage securely in position.

If the MAXsa™ 10 Control Box is to be mounted to the TC-3:

1. Attach the K2462-1 bracket to the left side of the carriage per the instructions included with the bracket.

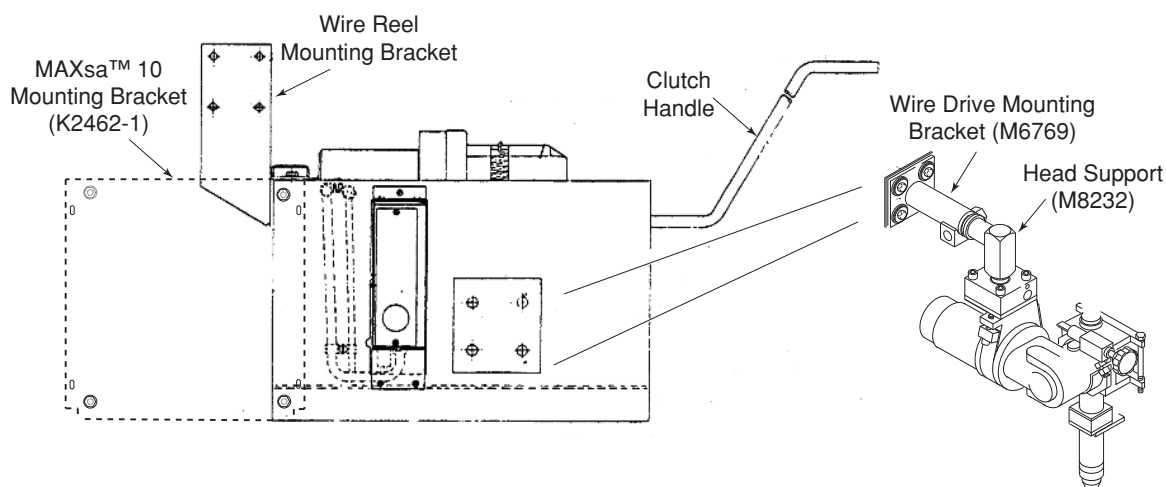
NOTE: Make certain that there is enough clearance to the left of the beam to accommodate the K2462-1 bracket

2. Mount the MAXsa™ 10 Control Box to the bracket and connect the 4 pin connector from the Travel Control to the mating receptacle on the bottom of the MAXsa™ 10 Control Box.

Keep the load on the TC-3 as uniform as practical. Install cables so that they move smoothly with the carriage. Clamp the weld cables to the carriage using the cable clamp on the left rear corner.

After all of the equipment has been mounted to the carriage, the tracking of the drive gear and the bearings should be checked.

FIGURE A.6 - WIRE DRIVE MOUNTING



MAXsa™ 22 WIRE DRIVE



INCLINED OPERATION OF TC-3

1. The beam should have a Knurled Drive Flange and the TC-3 should have the straight toothed Drive Gear (T13586 - ordered separately).

⚠ CAUTION

When the carriage is used in an inclined application the unit is free to move whenever the Carriage Release Handle is pulled down. This may happen even if a counter balance weight is used. With a proper counterbalance and if the flux hopper and wire reel(s) are mounted off of the carriage, this "freewheeling" is less likely to occur since the changing weight will not affect the counterbalance.

2. With a tilt of 5° or less, a counterbalance is typically not required (see CAUTION).
3. A tilt in excess of 5° will require a counter weight as shown in Figure A.10. The amount of counterweight will depend on the tilt angle and the amount of load on the carriage. Beam angles should be limited to 10° or less.

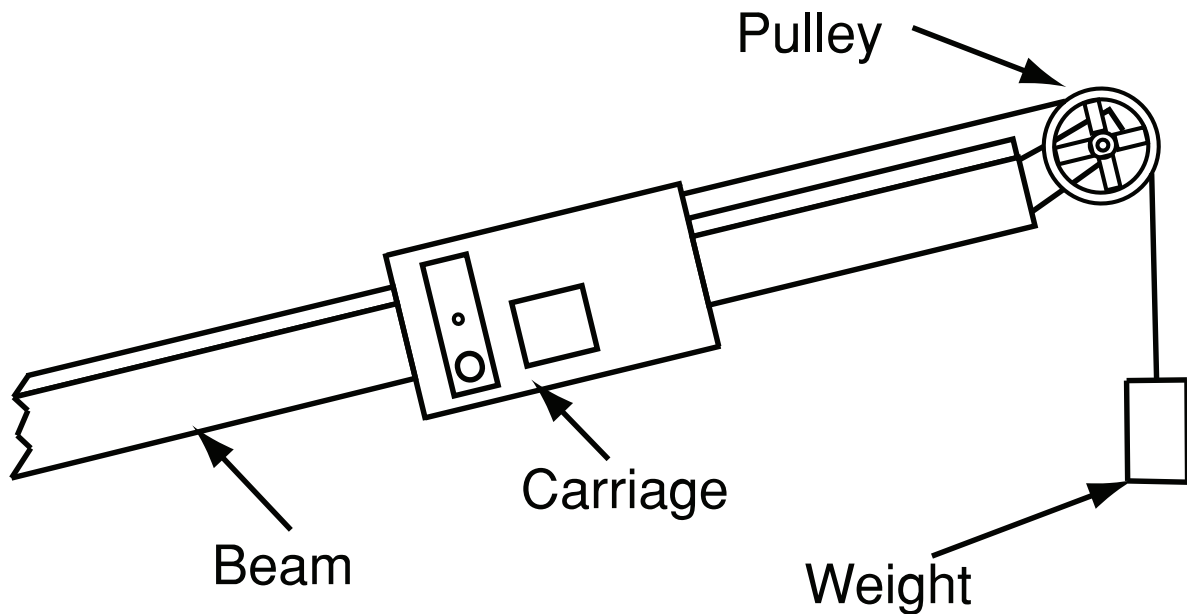
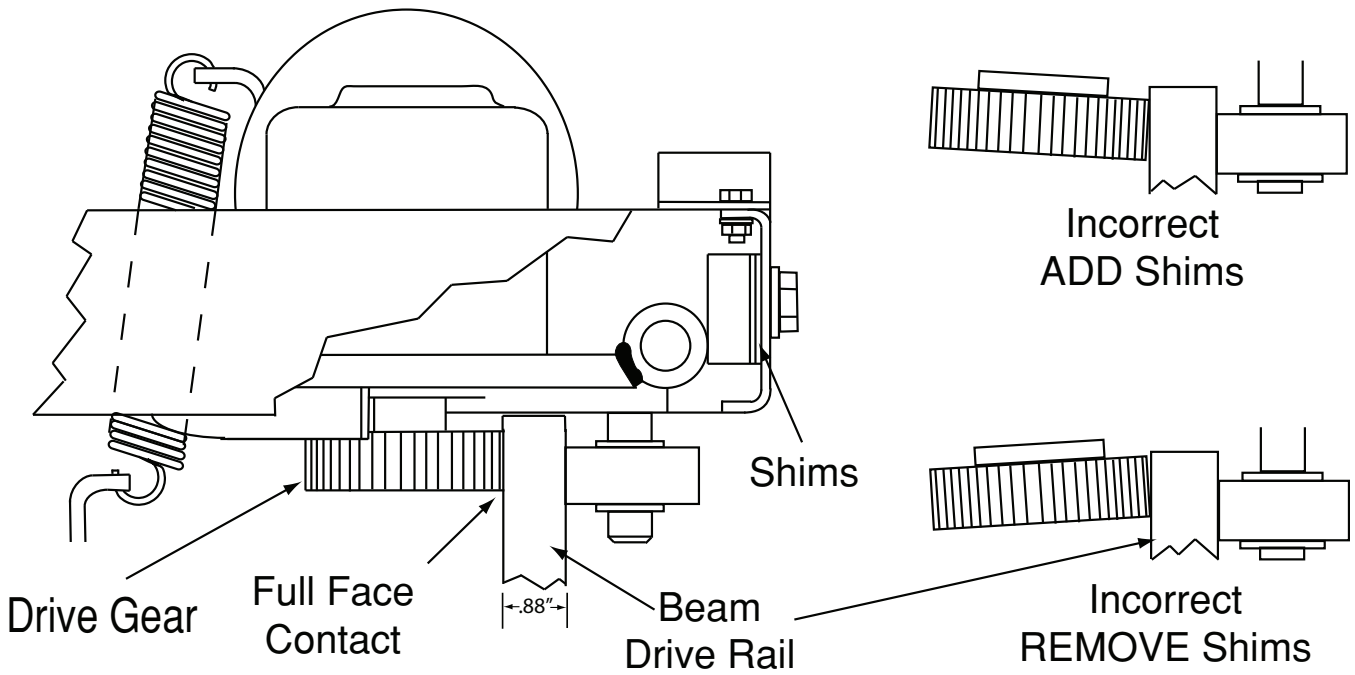
FIGURE A.10 - INCLINED OPERATION

FIGURE A.7 - DRIVE GEAR TRACKING



DRIVE GEAR TRACKING

The TC-3 is shimmed at the factory so that the drive gear sits flat against a .88" (22mm) flange when the release handle is in the up position. If the flange dimension is other than .88" (22mm) the shims under the TC-3 gear box mounting will have to be changed accordingly. See Figure A.7.

NOTE: TC-3 units are shipped with a helical tooth drive wheel that is suitable for use on a smooth drive rail. A straight tooth gear (T13586) is available for use on a drive rail with a straight cut knurl.

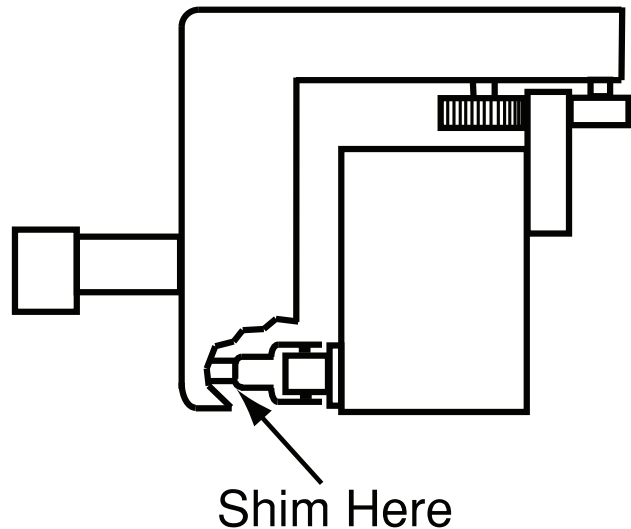
CARRIAGE BEARING TRACKING

Bearing tracking can be checked by placing a strip of white paper over the area where the bearings ride. With the drive gear disengaged (handle down), move the carriage over the strips. If the tracking is correct the bearings will leave a uniform trace on the paper. See Figure A.8. If traces are not correct add shims as necessary. See Figure A.9.

FIGURE A.8 - BEARING TRACKING



FIGURE A.9 BEARING SHIMS



ROUTINE OPERATION

Once the procedures and parameters are properly set at the controller the operator should be able to make production welds without changing those settings. A typical weld sequence is as follows:

1. Before starting, make sure that:
 - a. There is enough wire on the reel(s) to finish the weld.
 - b. The flux hopper is filled with new or properly screened flux.
2. Energize the power source and wait for it to stabilize (all Status LED's Green).
3. Position the Wire Feed Head at the start of the weld. Be sure the TC-3 Carriage or travel mechanism is set to move in the proper direction
4. Set the travel switch for "Automatic Travel" if the "Hand Travel" position was used to position the feed head in Step 3.

STARTING TECHNIQUES

1. **Hot Starting** - refers to starting the weld with the Wire Drive head stationary and the wire not touching the workpiece.
 - a. Always cut the end of the wire to a sharp point.
 - b. Press Feed Forward until the wire touches the work piece and the flux hopper activates to put flux around the starting point.
 - c. Press Feed Reverse to retract the wire 1/8" to 1/4" (3.2-6.4mm).
 - d. Use the Set-Up menu of the MAXsa™ 10 or remote controller to determine whether the travel will begin with Start Button pressed or with weld current (preferred).
 - e. Press the START button to initiate the weld.
 - f. Press the STOP button to begin the stopping sequence.
 - h. If necessary, press the Feed Reverse to move the electrode out of the way.

2. **On-the-fly Starting** - refers to starting the weld after the travel begins to get a "scratch" start. Normally this type of starting requires the use of a 'run-on' tab to insure proper weld deposition at the beginning of the weld.

- a. Use the Set-Up Menu of the MAXsa™ 10 to set the travel to start with the start button.
- b. Follow the Hot Starting procedure.

Cold Starting - refers to starting the weld with the Wire Drive Head stationary and the electrode touching the work.

- a. This procedure is not recommended for the Power Wave® AC/DC 1000 / MAXsa™ 22 WIRE DRIVE combinations but may work OK with smaller diameter wires and proper setting of the Start parameters.
- b. Follow Hot Starting procedure but omit "step c".

HEAD POSITION ADJUSTMENTS

The MAXsa™ 22 WIRE DRIVE can be easily adjusted to any weld position. The most often used adjustments are available on both the MAXsa™ 22 Wire Drive. See Figure B.1

The entire Wire Drive can be moved into or out of the Mounting Bracket (M6789). If using a K29 Vertical Lift Adjuster it can be locked in either the horizontal or vertical position once the vertical position is set. See Figure B.3.

If the Wire Drive is rotated to a position where the faceplate is upside down, the contact nozzle and the wire straighter and guide tubes will need to be reversed. The polarity of the motor will also need to be changed so the wire feeds in the proper direction. See the Installation Section, Changing the Wire Drive Configuration for instructions on changing the motor polarity.

FIGURE B.1 - FEED HEAD ADJUSTMENT

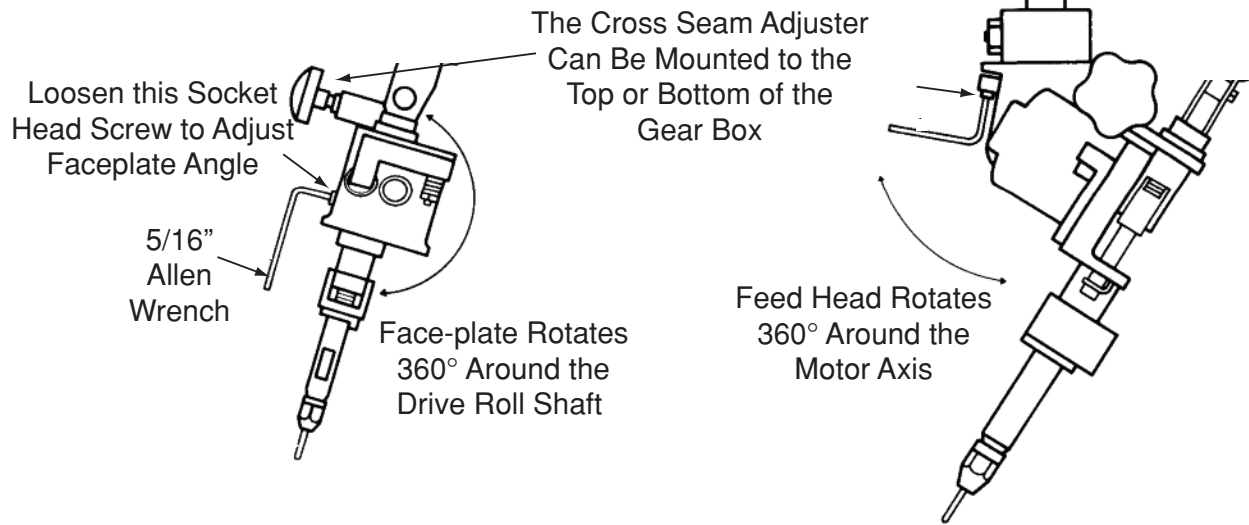
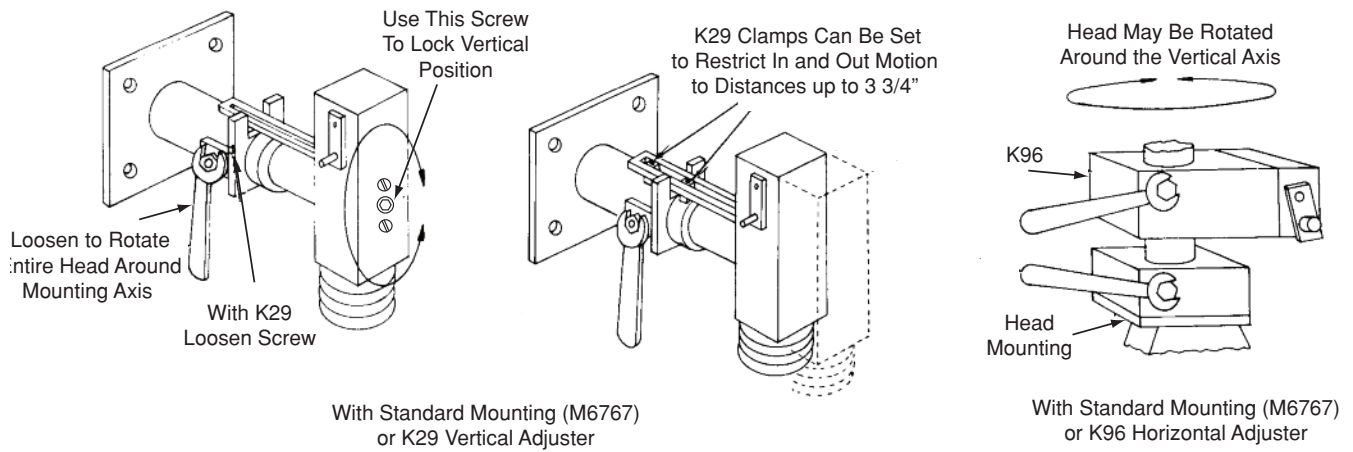


FIGURE B.3 - VERTICAL ADJUSTMENT



OPTIONS AND ACCESSORIES are
available at
<http://www.lincolnusmarketing.com/>

Follow these steps:

1. Go to <http://www.lincolnusmarketing.com/>
2. In the Search field type E9.181 and click on the Search icon (or hit 'Enter' on the keyboard).
3. On the Results page, scroll down to the Equipment list and click on E9.181.

All of the information for the Power Wave System accessories can be found in this document.

K2311-1 Motor Conversion Kit (for 142:1 NA Style Wire Drives)--
This conversion kit converts old NA style wire drives to MAXsa™ 22 WIRE DRIVE.

1. Remove the 2 hex head screws and the 2 slot head screws holding the Motor to the Wire Drive Gearbox assembly.
2. Remove existing Adapter Plate and Motor Assembly.
3. The Conversion Kit Motor is shipped configured for a 142:1 gear ratio. The existing gearbox must be configured for a 142:1 gear ratio for the Conversion Kit to assemble correctly. If both assemblies are not configured for the same gear ratio, this must be done before continuing. (See Gear Ratio Conversion Kit instructions.)
4. Cover the teeth of the new Motor pinion gear with a non-fluid molydisulfide type grease such as Non-Fluid Oil Corporation's A-29 Special/MS Lubricant. This grease can be scooped from the cavity of the gear case First Chamber.
5. Reassemble the new Adapter Plate and Motor Assembly on the Wire Drive Gearbox; making sure the gears mesh properly and the Adapter Plate locating bead is in its cavity. Replace and tighten the 4 screws removed in step 1.

SUBMERGED ARC CONTACT ASSEMBLIES

K231-[X/XX] CONTACT NOZZLE

The K231- [x/xx] is used for submerged arc welding with currents generally under 600 amps. Higher currents can be used but result in somewhat faster tip wear. The outer flux cone deposits flux around the arc for full coverage with minimum flux consumption.

Contact tips for the electrode diameter specified on the order are shipped with each nozzle. A different contact tip is required for each electrode diameter used.

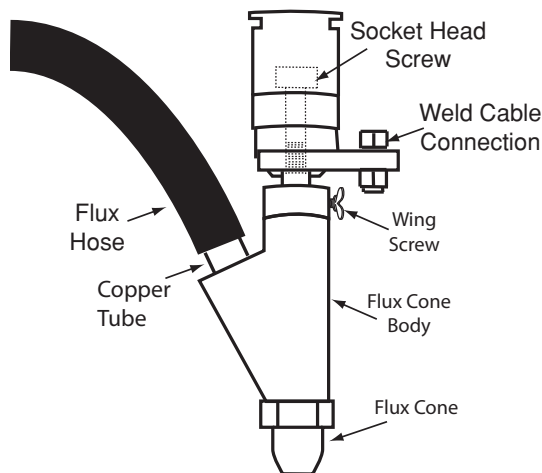
Installation - Nozzles ordered for 3/32" (2.4 mm) electrode include a liner and a contact tip adapter. Screw the adapter into the end of the nozzle and the contact tip into the adapter.

Insert the outgoing wire guide from the wire feed head into the top of the K231 and install the assembly in position on the bottom of the wire feed head. Lock it in position using the two clamps provided with the head.

Connect one end of the rubber flux hose to the tube at the bottom of the flux hopper. Fit the short copper tube in the other end of the rubber hose then insert the copper tube into the hole in the flux cone body. See Figure C.1

CAUTION - Pushing the copper tube too far into the flux cone body will cause a short between the cone and nozzle if the cone touches the work.

FIGURE C.1 - K231



Connect the lug on the electrode cables from the power source to the tab on the contact nozzle and tighten the bolt and nut. See Figure C.1.

Operation - DO NOT completely straighten the electrode. A slight curvature is required in the electrode to insure good electrical contact inside the contact tip.

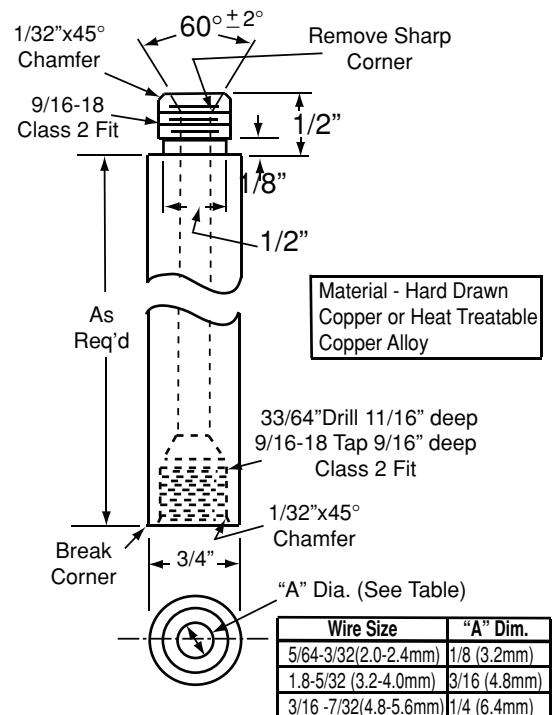
Maintenance - Replace the contact tip when it no longer provides accurate wire location or good electrical contact. Rusty and dirty wire or excessively high currents increase tip wear. Always keep replacement tips in stock.

To replace the contact tip, first loosen the retaining wing nut and remove the flux cone body. Then unscrew the tip and replace it.

A special socket head screw holds the nozzle body to the insulator. If the nozzle body becomes loose, remove the nozzle from the head, tighten the screw and reassemble nozzle.

Extensions - The K231 nozzle can be extended if necessary. Order part number S12003 for a 5" (127mm) extension or make any length per drawing in Figure C.2.

FIGURE C.2 - EXTENSION



K226 CONTACT ASSEMBLY

The K226 assemblies are used for welding at currents from 600 to 1000 amps.

Model K226-T - (2 tapered jaws)
3/32" and 1/8" (2.4 and 3.2mm) electrode

Model K226-R - (1 tapered and 1 rectangular jaw)
1/8" thru 7/32" (3.2 - 5.6mm) electrode

Installation - Remove the two nozzle mounting clamps from the wire drive. Insert the outgoing wire guide from the wire feed head into the top of the K226 and install the assembly in position on the bottom of the wire feed head. Use the two screws provided with the K226 to attach it to the wire drive. See Figure C.3.

NOTE: Removing the 4 screws that hold the nozzle body to the mounting block allows the nozzle to be rotated to any of four positions 90° apart. See Figure C.3.

Connect two (2) electrode cables to the contact jaws (one under each 1/2-13 nut. Make sure that the cable lugs are flat against the copper and tighten the nuts securely. See Figure C.3.

Slip the rubber flux hose that comes with the K226 on to the flux hopper valve. Fit the copper tube into the other end and place it in the clip on the lower jaw assembly. See Figure C.3.

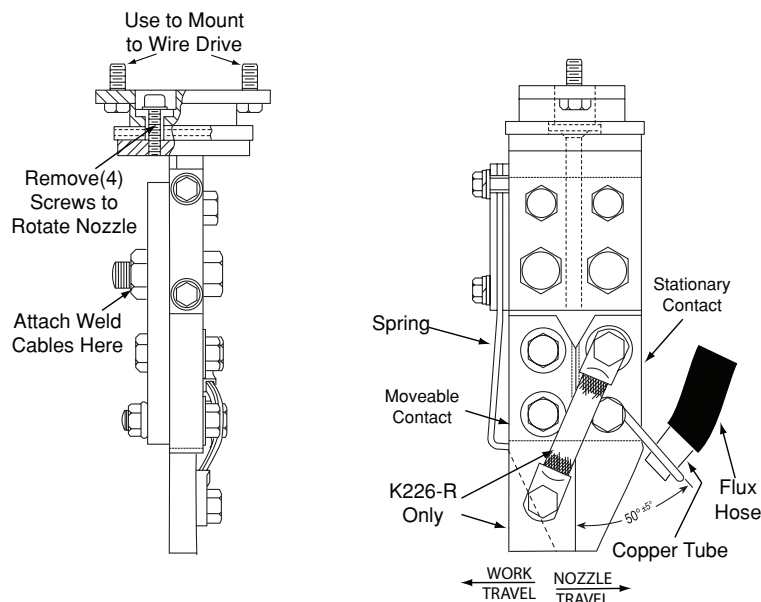
Maintenance - Rusty or dirty wire and/or excessively high welding currents increase wear on the contact jaws. When arcing occurs or the electrode becomes loose in the jaws, remove the jaws and 'dress' them with a file. When necessary, the jaw inserts should be replaced.

NOTE: Units made prior to 1979 did not have inserts. The replacement jaws will have them.

The contact jaws must be kept in line with the wire guide. Align the jaws as follows: (See Figure C.3)

1. Loosen the stationary contact jaw screws.
2. Release the tension on the moveable jaw by loosening the screws holding the spring.
- 3 Place a straight 14" (or longer) piece of bare 5/32" (4.0mm) wire through the wire guide and into the drive rolls of the feed head.
4. Adjust the stationary contact so the wire touches the jaw at the center of the groove for the entire length of the jaw.
5. Tighten the screws, remove the wire and re-tighten the screws holding the spring to apply tension to the moveable jaw. The moveable jaw should move freely when finished.

FIGURE C.3 - K226 CONTACT NOZZLE ASSEMBLY



MAXSA™ 22 WIRE DRIVE



K148 CONTACT NOZZLE AND K149 Linc-Fill™ LONG STICKOUT EXTENSION

This nozzle is available in three models and can be used for Innershield® or submerged arc processes.

K148-A - For 3/32" and 1/8" (2.4 - 3.2mm) wire.

K148-B - For 5/32" and 3/16" (4.0 - 4.8mm) wire.

K148-C - For 1/16" to 5/64" (1.6 to 2.0mm) wire.

Current Ratings

A. Without Linc-Fill Attachment

Innershield Welding:

600 amps, 100% duty, no water cooling

1100 amps, 100% duty, with water cooling

Submerged arc welding:

1100 amps, 100% duty, no water cooling

B. With K149 Line-Fill Attachment

Innershield or Submerged Arc Welding:

1100 amps, 100% duty, no water cooling

Water Cooling Attachment

When using currents over 600 amperes at high duty cycles water cooling always increases contact tip life. The cooling attachment, Part No. T12928 must be ordered separately. Installation instructions are included in the kit. Connect the attachment to the water supply and the drain with rubber tubing obtained locally. Water flow should be between 1/2 to 1 gallon (1.9 to 3.8L) of tap water per minute.

K149 Installation (See Figure C.5)

1. Install the K149 attachment before mounting the K148 nozzle on the welder.
2. Place a small C-clamp on the spring supporting members (A) and (B) in such a manner that the spring can be compressed. Look up into the hole in the end of contact tip and tighten the C-clamp until the tang lifts off the surface of the tip.
3. Remove the 3/8" (9.5 mm) set screw (C) in the body (A).
4. Remove the contact tip clamping nut (D) and the contact tip.
5. Remove the brass thread protecting collar (E).
6. Remove the dirt shield (F) from the barrel of the nozzle.

7. Slide the center guide (G) up out of the pivot body until the tang is above the window.
8. Place the Linc-Fill guide assembly into the nozzle window, and then lower the center guide tube (G) back down to its original position.
9. Line up the spot at the top of the center guide tube (G) with the 3/8" (9.5 mm) tapped hole in the upper pivot block (A) and put the 3/8" (9.5 mm) set screw (C) back into the hole and tighten securely.

FIG. C.4 - TYPICAL CONFIGURATIONS

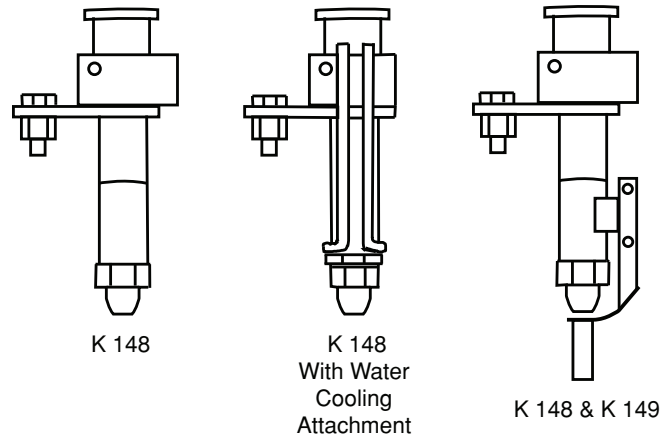
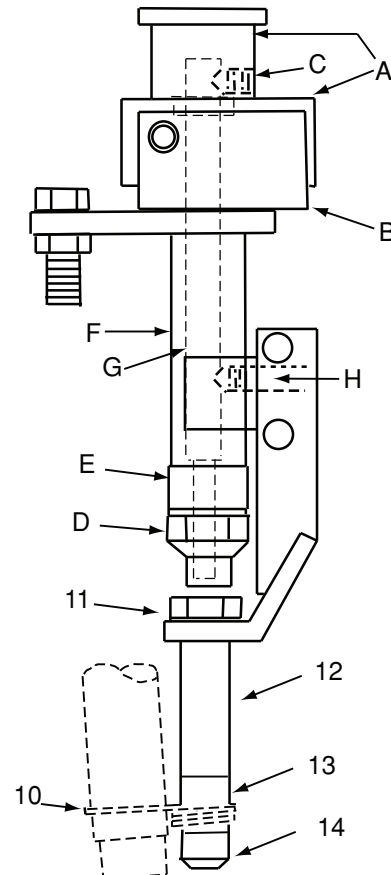


FIG. C.5 - K149 INSTALLATION



MAXSA™ 22 WIRE DRIVE



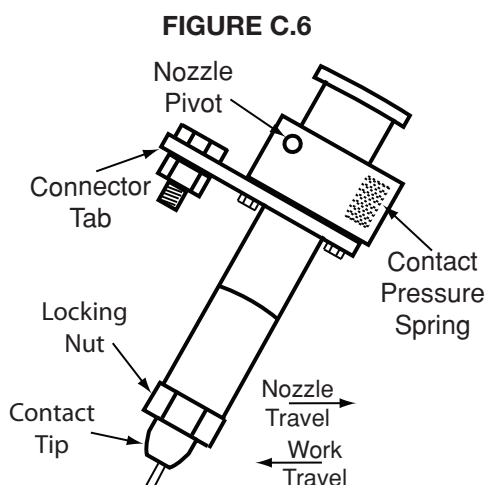
10. Line up the lower spot in the center guide tube (G) with the 3/8" (9.5 mm) set screw (H) and tighten the screw securely.
11. Replace the brass thread protecting collar (E). It is important that this protecting collar be pulled up against its locating shoulder, otherwise the tip locking nut will not clamp the tip securely.
12. Replace the contact tip and its clamping nut (D) and tighten securely.
13. Assemble the proper combination of extension guides (Items 12, 13 and 14) with locking nut (Item 11) for the welding procedure to be used.
14. For Submerged Arc welding, screw the flux hose clamp (Item 10) onto the extension housing.

K148 Nozzle Installation

To install the nozzle on the head, insert the outgoing wire guide from the head into the nozzle assembly. Place the combined assembly in position on the bottom of the wire feed roll box. Clamp it in place using the two clamps supplied with the head.

Before pulling the clamps up tight the nozzle must be positioned relative to the travel direction as shown in Figure C.6. This position is set so accidental contact between the work and the nozzle will not compress the contact pressure spring. If positioned otherwise, such accidental contact may cause arcing inside the contact tip.

After the nozzle is positioned in the proper relationship with the travel direction, the connector tab for the electrode cables can be moved to any of four positions 90 degrees apart. To change the tab, remove the two 1/4-20 hex head screws at the connector tab to loosen it from the tapered collar on the nozzle body. Turn the tab to the desired position. Replace and tighten the 1/4-20 screws.



Operation

The same contact tip, S13763, is used for 3/32" (2.4 mm) through 3/16" (4.8 mm) diameter electrodes. S16388 is used for .062 (1.6 mm) and 5/64 (2.0 mm) electrode.

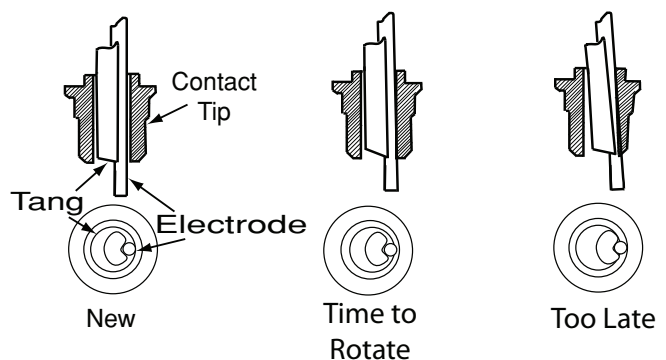
Loading of Wire

Straighten the start end of the coil for at least eight inches, pass the end down through the appropriate wire straightener. Inch the wire through the wire feeder and the nozzle. When using .062 (1.6 mm) or 5/64 (2.0 mm) Innershield electrode with a K148-C nozzle, make sure that the wire is in the "vee" groove of the pressure tang. For the .062 (1.6 mm) and 5/64 (2.0 mm) wire sizes, it may be necessary to back off on the idle roll pressure so that there is little or no flattening of the wire.

Because the electrode is held against one point of the contact tip, it wears a groove at that point. When the groove is about one half the diameter of the electrode, rotate the contact tip to a new position per the instructions below. Careful positioning of the contact tip will provide four to six wear spots depending upon the electrode size.

When welding with the small diameter electrodes, it will be necessary to change contact position more frequently since the amount of tip wear that can be tolerated is much less. The tang should never be allowed to touch the I.D. of the contact tip. If the groove is allowed to wear until the tang touches the I.D. of the contact tip, welding current passes through the tang. This causes electrical wear and overheating of the tang and the contact tip. See Figure C.7.

FIGURE C.7



To rotate the tip, clip the end of the electrode and inch it up until it is free of the contact tip. Loosen the locking nut about one-half turn and pull the nozzle body to relieve the pressure of the tang against the inside of the contact tip hole. At this moment rotate the tip the proper amount and then retighten the locking nut.

To install a new contact tip proceed as follows:

1. Clip the end of the electrode and inch it up until it is free of the tip.
2. Remove the contact tip locking nut.
3. Relieve the spring pressure of the contact tip against the steel tang in the hole of the contact tip. To do this, push the nozzle body so the steel tang is approximately centered in the 3/8" (9.5 mm) hole in the contact tip. Under these conditions the contact tip can be easily removed from the nozzle body.
4.
 - a. Before installing the new tip, make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.
 - b. Push the nozzle body to one side to relieve the pressure and insert the new contact tip.
5.
 - a. Check the locking ring threads making sure they are free or any foreign material. A small application of locally available high temperature anti-seize compound or graphite grease on these threads insure a longer thread life of the two mating parts.
 - b. Replace the locking ring and tighten securely.
6. Check the contact tip to be certain it is tight in the nozzle body. If the tip is not tight, arcing will take place between the tip contact surface and the nozzle contact surface which will damage the nozzle body.

K285 Concentric Flux Cone

The K285 Concentric Flux Cone is designed to fit on a K148 (with or without the K149 attachment) or on a K129 Tiny Twin-Arc® nozzle. This attachment deposits the flux so that it surrounds the electrode(s).

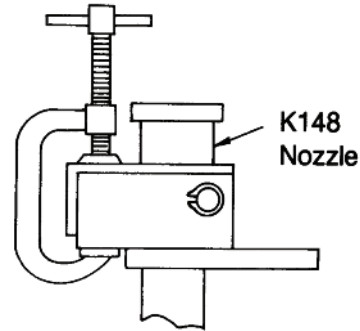
NOTE: If using a K149 extension, the electrical stick-out will be limited to 4" (102mm).

The K285 consists of two pieces that are electrically isolated from each other. The stationary segment is clamped to the nozzle and the moveable portion which supports the flux hose and the concentric cone allows for vertical adjustment of the flux cone.

K285 Installation to the K148

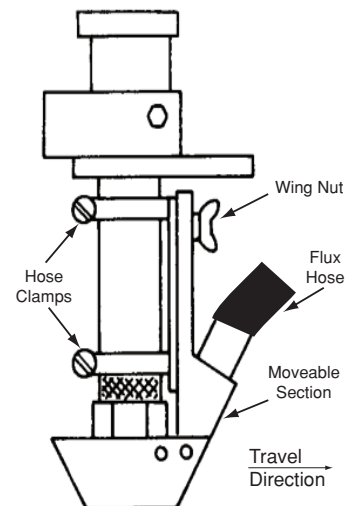
1. Remove the tension on the center guide tube using a "C" clamp as shown in Figure C.8. Apply only enough clamping force to relieve the tang pressure from the contact tip.
2. Remove the contact tip clamping nut and the contact tip.

FIGURE C.8



3. Remove the brass thread protecting collar and slide the dirt shield off of the nozzle.
4. Make sure that all the threads are clean and replace the collar, the contact tip and the clamping nut and remove the "C" clamp.
5. Loosen the hose clamps of the K285 entirely, place them around the nozzle and tighten them so that the stationary part of the K285 covers the opening in the nozzle body as shown in Figure C.9.
6. Position the moveable section to the desired flux height and tighten the wing nut.
7. Cut the flux hose to required length and connect as shown.

FIGURE C.9 - K148

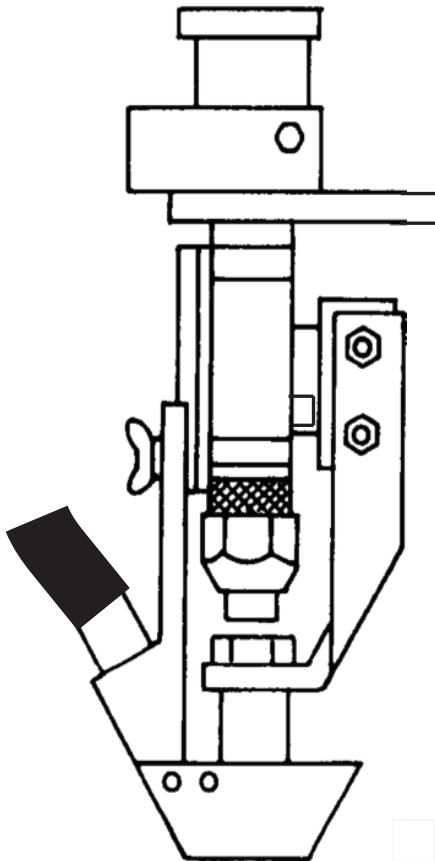


K285 Installation with K149

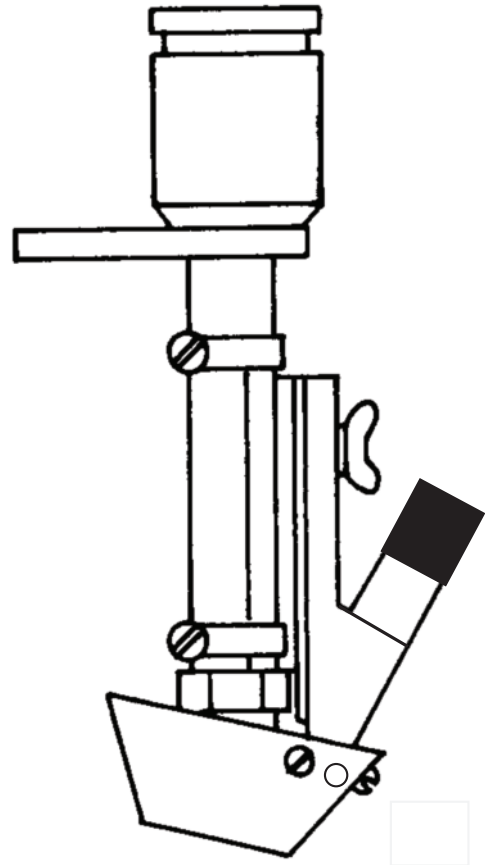
1. Install the K149 to the K148 per the instructions.
2. Loosen the hose clamps of the K285 entirely, place them around the nozzle and tighten them so that the stationary part of the K285 is directly opposite the K149 arm. See Figure C.10.

NOTE: The lower hose clamp must be positioned so it does not touch the arm of the K149.

4. Position the moveable section to the desired flux height and tighten the wing nut. Use the center or lower tapped hole depending on the electrical stickout
5. Cut the flux hose to required length and connect as shown.

FIGURE C.10 - K285/K149**K285 installation with the K129**

1. Unscrew the hose clamps enough so they can slip over the tip holder clamping nut.
2. Position the stationary portion of the K285 as shown in Figure C.11 and tighten the clamps.
3. Position the moveable section to the desired flux height and tighten the wing nut.
4. Due to the 7° angle of the tips it may be necessary to pivot the cone as shown. Remove the outermost screws from each side of the cone. Tilt the cone and put the two screws into the rear of the cone. Tighten all 4 screws.
5. Cut the flux hose to required length and connect as shown.

FIGURE C.11 - K285/K129**IMPORTANT****K285 on ALL Nozzles**

After the K285 is installed to any of the compatible nozzles, use an ohmmeter or a test light to insure proper insulation (no continuity) between the copper flux cone and the nozzle body.

K285 Used in Horizontal Fillet Applications

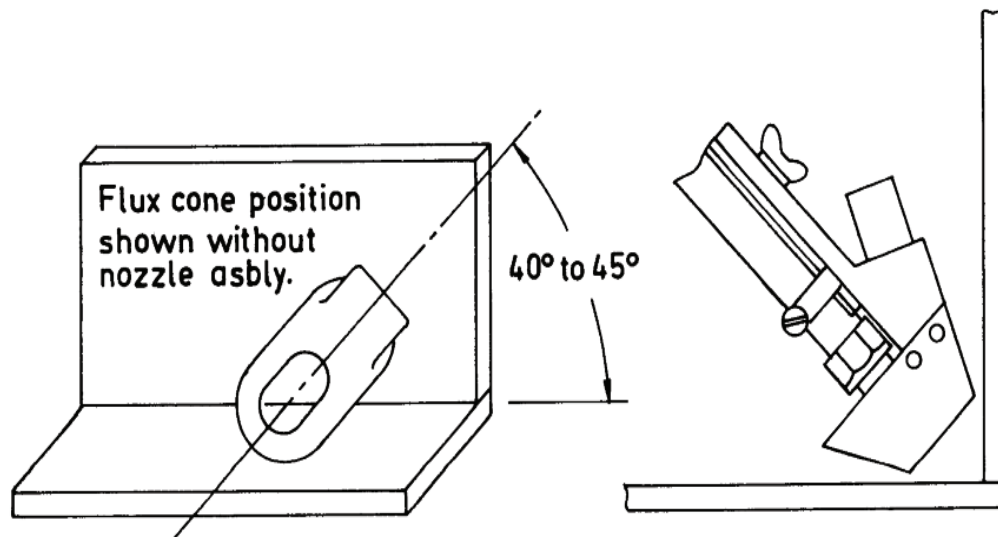
1. **With K148 or K148/K149 combination** - After the K285 has been attached to the nozzle body:
 - a. Set the head and nozzle to the desired electrode angle.
 - b. Loosen the two hold down screws that hold the nozzle to the faceplate and rotate the entire assembly 40 to 45° and retighten the screws.
 - c. Feed the electrode to the proper stickout and position it in the joint.
 - d. Slide the K285 flux cone down to about 1/8" (3.0mm) away from both the vertical and horizontal plates and tighten the wing screw. See Figure C.12.
2. **With the K129 Tiny Twin-Arc® Nozzle** - After the K285 has been attached to the nozzle body:
 - a. Set the head and nozzle to the desired electrode angle.
 - b. Feed the electrode through the tips to the proper stickout and place the nozzle into the welding position.
 - c. Loosen the K285 hose clamps and rotate the flux cone unit about 40 to 45° and retighten the clamps.
 - d. Slide the K285 flux cone down to about 1/8" (3.0mm) away from both the vertical and horizontal plates and tighten the wing screw. See Figure C.12.

K285 in Deep Narrow Gap Applications

For narrow, deep groove welds it may be necessary to remove the copper cone from the moveable arm of the K285.

NOTE: In Horizontal fillet applications, the flux hopper will not function properly if fastened to the faceplate of the wire drive. Mount the Flux hopper directly above the K285 flux entry point. Flux hose angles should be no greater than 35° to ensure good flux flow from the hopper to the cone.

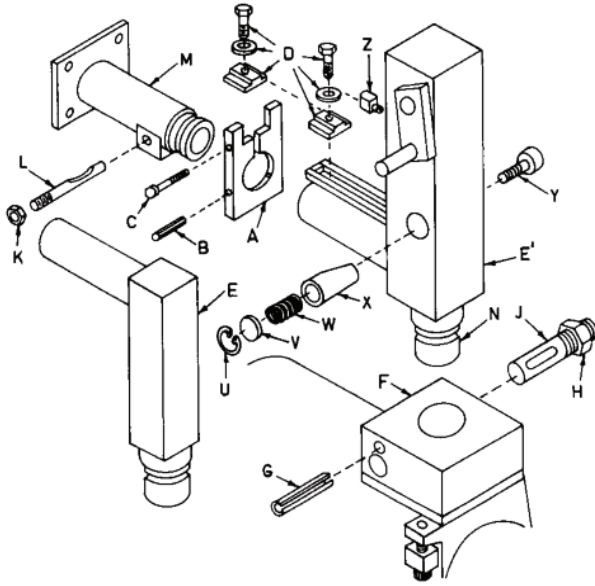
FIGURE C.12 - K285 IN HORIZONTAL FILLET APPLICATION



K29 VERTICAL HEAD ADJUSTER

Automatic welding applications frequently require raising and/or lowering of the feed head assembly. The K29 provides an easy method of accomplishing this task by simply turning a crank handle. A height variation of 4" (102mm) is possible with this attachment.

FIGURE C.13 - K29



Installation

Check the package for the following items (See Figure C.13):

1. Head Adjustment Lock (A).
2. 1/4" (6.3mm) diameter Roll Pin (B).
3. 12"-13x2.75" Hex Head Locking Screw (C).
4. Two adjustable clamps with hardware (D).
5. Vertical Head Lift Adjuster (E).

To install the K29, proceed as follows:

1. If the Feed Head (F) is already mounted to the Head Support (E), be sure that the lock nut (H) on the Feed Head Draw Bolt (J) is tight, and drive out the Roll Pin (G) with a 5/16" punch.
2. While supporting the Feed Head, loosen the locking nut (H) and remove the head from the Head Support (E).
3. Loosen the Lock Nut (K) on the Draw Bolt (L) and remove the Head Support (E) from the Mounting Bracket (M).

4. Slide the Head Adjustment Lock (A) over the end of the Mounting Bracket (M).
5. Align the hole of the Head Adjustment Lock with the groove in the Mounting Bracket and drive in the 1/4" Roll Pin (B).
6. Using the 1/2" x 2.75 Locking Screw, tighten the Head Adjustment Lock with the open slot in the up position.
7. Slide the Vertical Head Lift Adjuster (E) into the Mounting Bracket (M) and tighten the Draw Bolt Nut (K).
8. Install the two Clamps (D), one on each side of the Head Adjustment Lock with the hardware provided.

NOTE: If a K96 Horizontal Adjuster is to be used, install it now per the instructions provided. If not, proceed to Step 9.

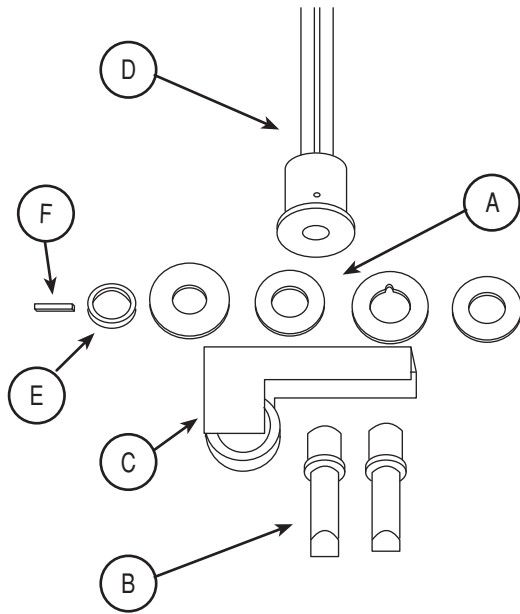
9. With the Draw Bolt (J) and the Lock Nut (H) in place, raise the Feed Head in to position on the up and down lift shaft (N) and tighten the Lock Nut.
10. Drive the 5/16" Roll Pin (G) back in to it's original position.

Adjustment and Locking

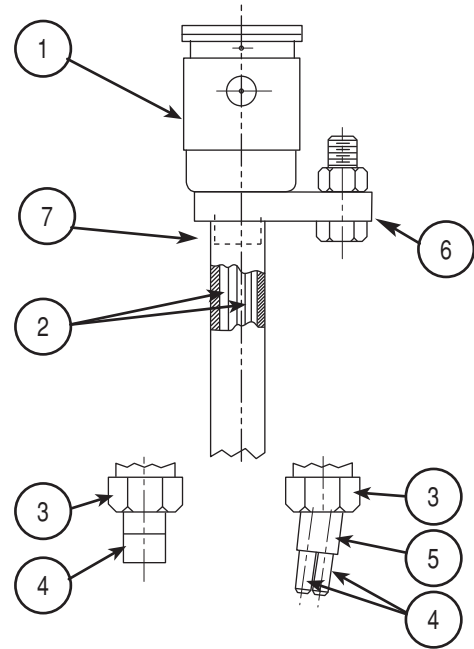
Rotational movement of the lifting mechanism is kept to a minimum by the spring loaded, wedge shaped pin (X) that is always in contact with the vertical slide. The Socket Head Screw (Y) on the right side of the K29 housing is used as a locking mechanism to keep the head at a desired height.

NOTE: Extreme tightening of the locking screw may cause the wedge to jam so that the lift cannot move in either direction. If this occurs, back the screw out two turns and tap on it to release the wedge.

FIGURE C.16 - K129 TINY TWINARC® COMPONENTS



- A - Drive Rolls
- B - Guide Tubes
- C - Idle Roll Arm
- D - Incoming Wire Guide
- E - Drive Roll Spacer
- F - Key



- 1 - Nozzle Assembly
- 2 - Guide Tubes
- 3 - Locking Collar
- 4 - Contact Tip(s)
- 5 - Tip Holder
- 6 - Connection Tab
- 7 - Mounting Block

K129 TINY TWINARC® KIT

Twin arc welding is a process where two wires of the same size are fed through a nozzle by a single wire drive. The K129-x/xx can be used for wire sizes .045" through 3/32" (1.0 - 2.4mm).

The gear ratio of the MAXsa™ 22 WIRE DRIVE as shipped is 142:1. This may not provide enough wire speed for the procedure. Gears for 95:1 or 57:1 ratio are also shipped with the MAXsa™ 22 WIRE DRIVE units. See the instructions in this manual to change the gear ratio.

Each assembly listed below comes with a wire reel, a reel brake, shaft and mounting bracket and all of the wire drive components for the particular wire size.

K129-1/16 .045" thru 1/16" (1.0 -1.6mm) Wires

K129-5/64 5/64" (2.0mm) Wire

K129-3/32 3/32" (2.4mm) Wire

NOTE: For .045" or .052" wire order KP1901-1 Wire Drive Kit for use with the K129-1/16 kit.

INSTALLATION

A. For .045" through 5/64"(1.0-2.0mm) Wires

1. Remove the following items from the standard Feed Head.
 - The wire straightener.
 - The nozzle assembly.
 - Both upper and lower guide tubes.
 - The drive rolls.
 - The idle roll assembly.
 - The tension spring assembly.

NOTE: The idle roll arm pivot pin is held in place by a set screw that is accessed from the outgoing surface of the faceplate.

2. Place the new double grooved drive roll (A) on the shaft with the key. Replace the clamping washer and the locking nut and tighten securely.

MAXSA™ 22 WIRE DRIVE



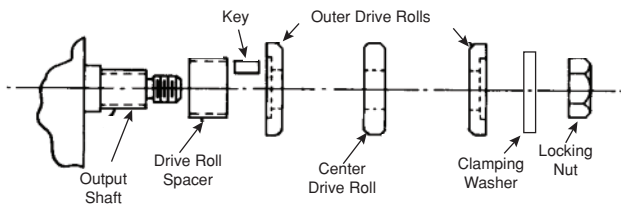
B. For 3/32 (2.4mm) Wire

- Remove the items listed in Step "A" plus:
 - The drive roll key.
 - The drive roll spacer.

NOTE: The set screw that holds the drive roll spacer in place is accessible once the idle roll assembly is removed.

- Oil or grease the O.D. of the new shorter drive roll spacer (E) and place it on the output shaft. Push it back as far as it will go and tighten the set screw.
- Place the new longer key (F) in the keyway.
- Place the outer, center and second outer drive rolls (A) on the shaft. Replace the clamping washer and the locking nut and tighten securely. See Figure C.17.

FIGURE C.17



C. Nozzle Installation

- Install the new idle roll arm (C) using the pin and set screw from the original assembly.
- Replace the tension spring and screw and adjust the tension screw to the .045-3/32 line on the indicator plate.
- Insert one of the guide tubes (B) in the top of the faceplate. Line up the holes in the guide tube with the grooves in the drive rolls to insure proper wire feed.

NOTE: If using the K281 Twinarc Wire straightener, follow the supplied instructions and skip to Step 5.

- Put the dual ingoing wire guide (D) over the ingoing guide tube and lock it down with the two "L" shaped clamps from the wire straightener.

- Insert the two long insulated wire guides (2) into the Twinarc nozzle (1) making sure that they are seated in the holes in the mounting block (7). Place the contact tip (4) or tip holder (5) into the end of the nozzle making sure the tubes fit into the holes. Lock it securely in place with the locking collar (3). See Figure C.16.

NOTE: For applications that require staggered or cross seam wire placement rather than in-line, the contact tip or tip holder may be rotated. Re-adjust the head position to maintain the proper wire-to-work angle.

For overlay applications a special "side by side" tip holder (part# S17728) that accepts standard contact tips is available.

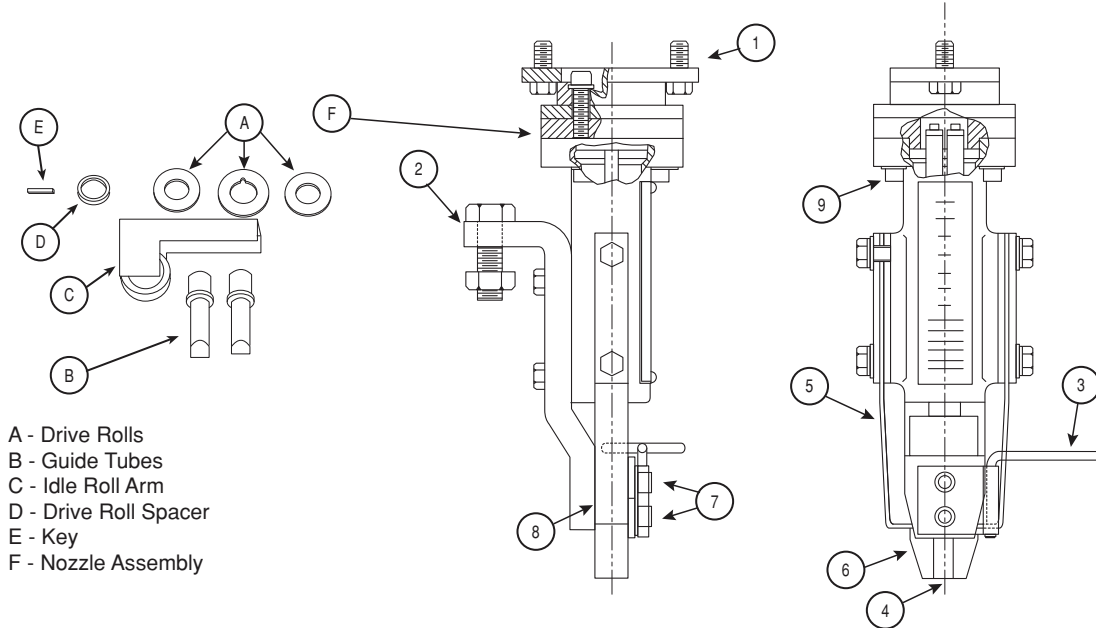
- Place the other guide tube (B) into the outgoing side of the faceplate. Place the nozzle over the guide tube and lock it in place with the two socket head screws.
- Bolt the electrode cable(s) of the proper size and number, to the connection tab (6) using the hardware provided. If using multiple cables, use both sides of the tab.

E. Maintenance

Replace the Contact Tip(s) when they no longer provide accurate wire placement or good electrical contact. Before installing the new contact tip or tip holder:

- Make sure that the threads and bottom surface of the nozzle are clean and bright. These are current carrying surfaces and must be clean.
- Check that the locking collar is free of foreign material. A coating of locally available "anti-seize" compound or graphite grease will help insure longer thread life.
- Before replacing the contact tip or tip holder:
 - Inch the wire past the end of the nozzle.
 - Slide the long wire guides on to the wire making sure they are properly seated in the mounting block (see Figure C.16).
 - Slide the new contact tip or tip holder over the wires again making sure that the wire guides are properly seated.
 - Replace the locking collar and tighten securely.

FIGURE C.18 - K225 TWINARC® COMPONENTS



- A - Drive Rolls
 B - Guide Tubes
 C - Idle Roll Arm
 D - Drive Roll Spacer
 E - Key
 F - Nozzle Assembly

K225 SUBMERGED ARC TWINARC® KIT

Twin arc welding is a process where two wires of the same size are fed through a nozzle by a single wire drive. The K225 Twinarc Kit can be used to weld with 5/64", 3/32" or 1/8" (2.0, 2.4 or 3.2mm) electrodes. Both wires must be the same size.

The gear ratio of the MAXsa™ 22 WIRE DRIVE as shipped is 142:1. This may not provide enough wire speed for the procedure. Gears for 95:1 or 57:1 ratio are also shipped with the MAXsa™ 22 WIRE DRIVE units. See the instructions in this manual to change the gear ratio.

Each assembly comes with a wire reel, a reel brake, shaft and mounting bracket, a dual wire straightener and all of the wire drive components for the particular wire size. See Figure C.18.

The Nozzle Assembly (F) has two spring loaded large copper jaws (6) that press the electrodes against the copper center block (4). This system provides good electrical contact and insures constant electrical stick-out (E.S.O.) It also helps to maintain acceptable nozzle temperatures during welding.

INSTALLATION

1. Remove the following items from the standard Feed Head.
 - The wire straightener.
 - The nozzle assembly.
 - Both upper and lower guide tubes.
 - The drive rolls.
 - The idle roll assembly.

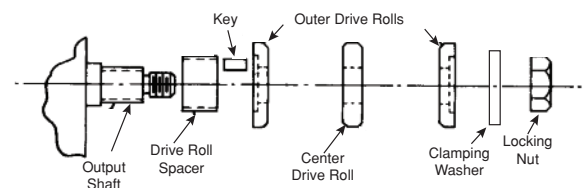
NOTE: The idle roll arm pivot pin is held in place by a set screw that is accessed from the outgoing surface of the faceplate.

- The tension spring assembly.
- The Drive Roll Spacer.

NOTE: The set screw that holds the drive roll spacer in place is accessible once the idle roll assembly is removed.

2. Oil or grease the O.D. of the new shorter drive roll spacer (E) and place it on the output shaft. Push it back as far as it will go and tighten the set screw.
3. Place the new longer key (F) in the keyway.
4. Place the outer, center and second outer drive rolls (A) on the shaft. Replace the clamping washer and the locking nut and tighten securely. See Figure C.19.

FIGURE C.19



MAXsa™ 22 WIRE DRIVE



Nozzle Installation (See Figure C.18)

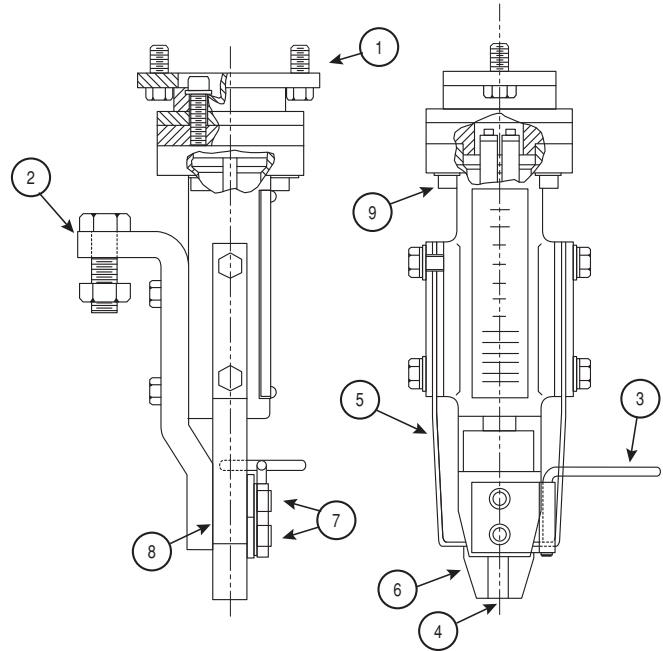
1. install the new idle roll arm (C) using the pin and set screw from the original assembly.
2. Replace the tension spring and screw and adjust the tension screw to the proper line on the indicator plate.
3. Insert one of the guide tubes (B) in the top of the faceplate. Line up the holes in the guide tube with the grooves in the drive rolls to insure proper wire feed.
4. Put the Dual Wire Straightener over the ingoing guide tube and lock it down with the two "L" shaped clamps.
5. Place the other guide tube into the top of the K225 Nozzle Assembly (F) and slide the guide tube into the Wire Drive faceplate until the mounting screws (1) can be started into the tapped holes in the faceplate. Tighten both screws.

NOTE: For applications that require staggered or cross seam wire placement rather than in-line, the nozzle can be rotated by loosening the two 1/4-20 socket head screws (9) that hold the nozzle to the mounting base. If the desired angle cannot be obtained, remove the screws and put them into alternate holes. Retighten when properly adjusted.

6. Connect the weld cables of the proper size and number to the copper bar (2). If using multiple cables, use both sides of the bar.
7. Route the flux hose from the flux hopper to the clip (3) on the K225 nozzle.
8. Spacing between the electrodes is maintained by the center block which comes in three sizes. The .50" and .625" center blocks come with the kit. A .375" block is also available. See the parts list for the part number. To change the center block, See Figure A-30:
 - Loosen both of the Pressure Springs (5).
 - Remove the two Socket Head Screws (7).
 - Put a small amount of graphite grease on the screw threads and install the new copper block.
 - Replace the two screws and tighten securely.
 - Tighten the four screws holding the Pressure springs.

IMPORTANT

Make sure that the mating surface (8) between the Center Block (4) and the Copper Bar (2). is bright, clean and smooth. This junction carries the full weld current.

FIGURE C.20**Maintenance**

The most extensive contact wear takes place on the center contact block. The side pressure jaws are made of a harder longer lasting material. Replace the center block when there is no pressure on the wire from the side contact jaws.

Make sure that the mating surface (8) between the Center Block (4) and the Copper Bar (2). is bright, clean and smooth. This junction carries the full weld current.

K281 SOLID WIRE STRAIGHTENER FOR TINY TWINARC®

The K281 wire straightener can be used to straighten .045" through 3/32" (1.0-2.4mm) wires. It is recommended for applications requiring long stickout and/or where accurate wire placement is essential. The following table shows the recommended maximum electrical stick-out (ESO).

Wire Size (mm)	ESO - Standard Wire Guide (mm)	ESO - K281 Straightener (mm)
.045" (1.0)	3/8" (9.5)	5/8" (16.0)
.052" (1.3)	1/2" (12.5)	3/4" (19.0)
1/16" (1.6)	3/4" (19.0)	1-1/4" (32.0)
5/64" (2.0)	1.00" (25.4)	1-3/4" (44.5)
3/32" (2.4)	1-1/4" (32)	2.0" (51)

GENERAL INFORMATION

1. For best wire straightening the plane of the K281 rolls (A) should be as close as possible to the plane of the wire reels.
2. The K281 moving arm (B) should be pointing toward the wire reels and the adjusting knob (C) should be away from the reels.
3. The K281 can be mounted to the wire drive in two different positions. The head can then be positioned to meet the above requirements.

INSTALLATION

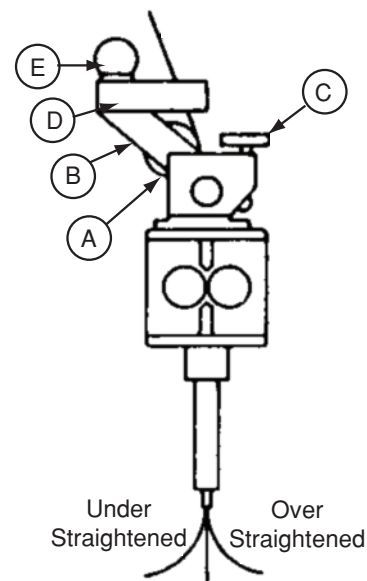
1. Remove the Spring Wire Guide if installed.
2. Remove the K129 Ingoing Guide Tube.
3. Insert the new Ingoing Wire Guide (with ceramic inserts) that comes with the K281.
4. Position the K281 over the wire guide as outlined above and tighten the two hex head screws.

WIRE LOADING AND ADJUSTMENT

1. Turn the adjusting knob (C) to the maximum open position.
2. Remove the top ingoing guide block (D) by loosening the thumb screw (E).
3. Straighten the first 10" (254mm) of each wire (the straighter the wire the easier to load).

4. Insert one wire through each of the guide block holes.
5. Push both wires through and between the rollers and down through the guide tube until they touch the drive roll(s). Press the Cold Inch to start the wires through the wire drive.
6. Replace the upper guide block making sure that each wire is in its respective groove of both rollers. Tighten the thumb screw.
7. Turn the adjusting knob until the moving arm is approximately at the mid position of its total travel.

FIGURE C.21



The tips should be in line with the O.D. of the drive rolls for initial straightening adjustment. If the wires bow to the right when inched down through the tips they are being over straightened. If the wires bow to the left, they are being under straightened. Adjust the knob until the wires come out parallel and uniform.

Depending on how the wire enters the K281, there may be some side bow. Slight rotation of the K281 may eliminate this condition.

Once the wire is sufficiently straight, the tip orientation can be changed to whatever angle between "in-line" and "cross seam" is required.

NOTE: For overlay applications with Tiny Twinarc, a special side by-side tip holder (Part # S17728) is available that accepts standard tips.

SAFETY PRECAUTIONS



WARNING

ELECTRIC SHOCK can kill.



- Only Qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

ROUTINE MAINTENANCE

- Check weld cables, control cables and gas hoses for cuts.
- Clean and tighten all weld terminals.
- Inspect and clean drive rolls and inner wire guide and replace if worn.

PERIODIC MAINTENANCE

- Every six months check the motor brushes. Replace them if they are less than 1/4" long.
- Every year inspect the gearbox and coat the gear teeth with a moly-disulfide filled grease. DO NOT use graphite grease.

CALIBRATION SPECIFICATION

All calibration is factory set on the MAXsa™ Wire Drive.

To verify the wire feed speed:

- Adjust the wire feed speed to 100 in/min (2.54m/min) and provide a COLD FEED Signal.
- Measure the actual wire feed speed with a calibrated wire feed speed tachometer (K283).
- The measured wire feed speed should be within $\pm 2\%$ of the set value.

NOTE: If a K283 is not available, feed wire for 15 seconds and measure the wire. Repeat several times to get an average measurement. It should be 25" (635mm) $\pm 2\%$.

SENSE LEAD FUSE

There should never be any current flowing through the sense leads! The sensing lead circuit is current protected in the Power Wave® AC/DC 1000 SD.

If the MAXsa™ 22 WIRE DRIVE is used in an older system, a fuse in series with the #21 sense lead in the wire drive Connection Box protects the sense lead circuit from weld current due to incorrect configuration. If this fuse ever opens, check the sense lead configuration to ensure proper connections. The fuse must be replaced with a comparable fuse with a rating of less than 1 amp before welding. The fuse being open or missing would have the same effect on the welding as having a disconnected sense lead.

HOW TO USE TROUBLESHOOTING GUIDE

WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

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 (SYMPTOMS)”. 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 Lincoln Authorized Field Service Facility.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

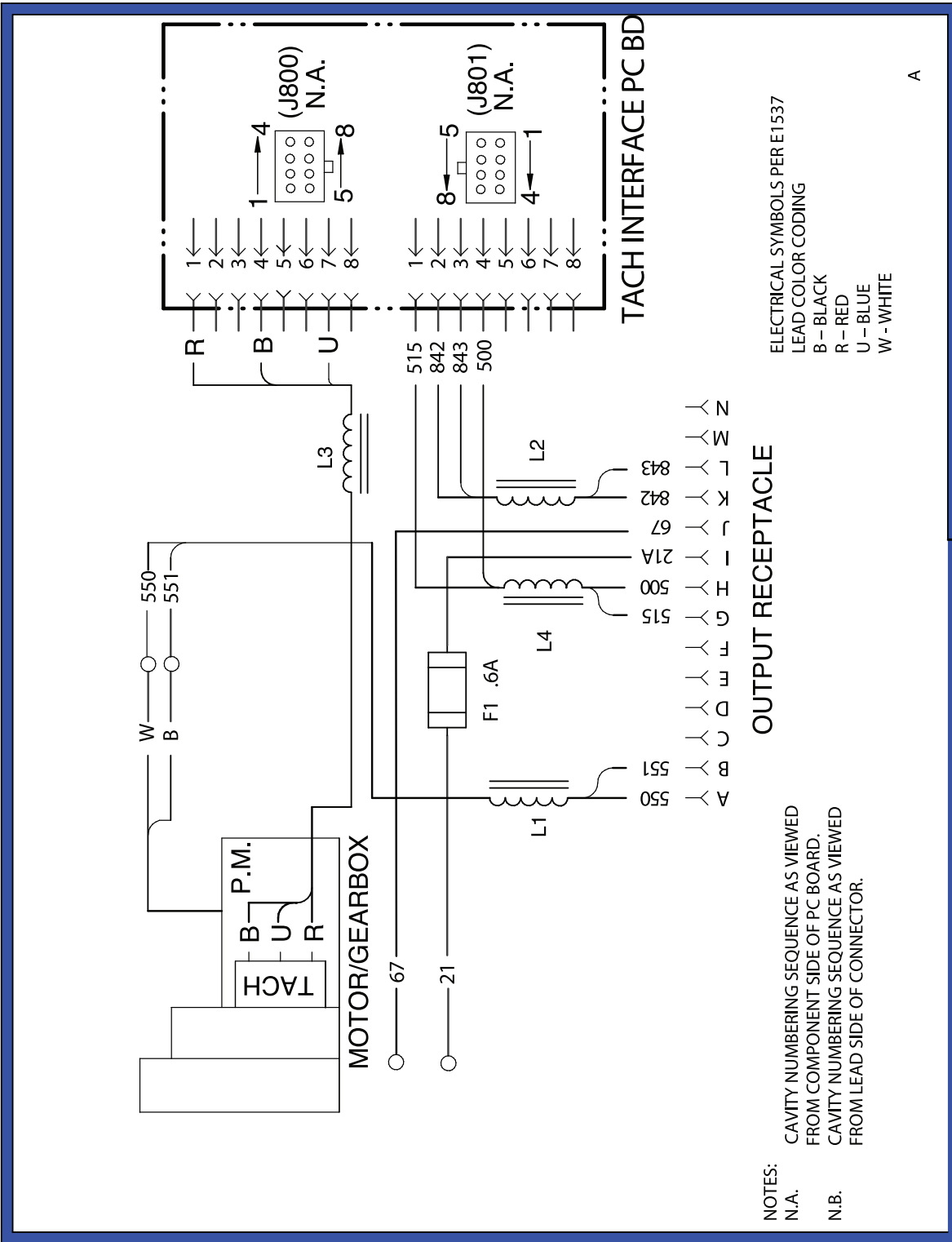
Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
Drive rolls turn, but wire will not feed or wire feeding is rough or uneven.	<ol style="list-style-type: none"> 1. Wire jammed or kinked on route through wire drive. Remove wire from wire drive, then feed in new wire. Note any obstruction. 2. Incorrect drive rolls and/or guide tubes, or incorrect pressure setting. Ensure drive rolls and/or guide tubes are stamped with wire diameter being used. Replace if necessary. Check for proper pressure setting. 3. Worn drive rolls. Replace, or reverse if split type. 4. Partially flashed or melted contact tip. Replace contact tip. 	<p>If all recommended possible areas of misadjustments have been checked and the problem persists, contact your local Lincoln Authorized Field Service Facility.</p>
Variable or "hunting" arc.	<ol style="list-style-type: none"> 1. Contact tip worn or incorrect size. Replace contact tip. 2. Worn or undersized work cables or poor connections to work. Inspect and repair, or replace as necessary. 3. Loose electrode connections. The following connections must be tight: electrode cable to wire drive and power source, work cable to power source and work, contact tip to nozzle. 4. Rusty electrode. Replace electrode. 	
Wire consistently runs at the wrong speed	Gear ratio is not set properly. See the MAXsa™ 10 or the Power Wave® AC/DC 1000 Operator's Manual to set the proper gear ratio.	

 **CAUTION**

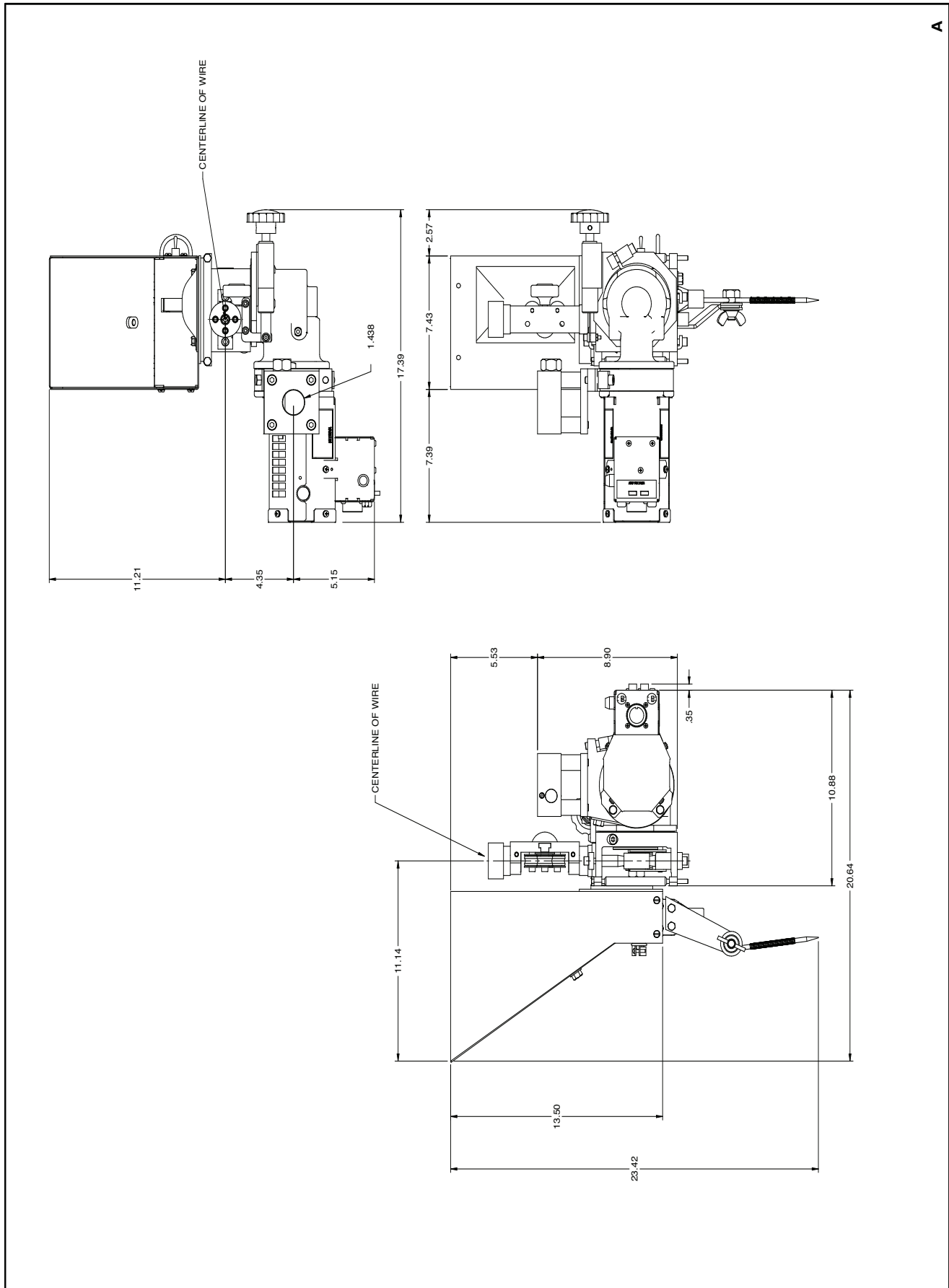
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

WIRING DIAGRAM MAXsa 22



M22271

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.



L13370-2

MAXsa™ 22 WIRE DRIVE



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

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

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.

CUSTOMER ASSISTANCE POLICY

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