

Safety Information



Safety First

Torchmate and Lincoln Electric Cutting Systems 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.

WARNING

DO NOT INSTALL, OPERATE, OR REPAIR THIS EQUIPMENT WITHOUT READING THE SAFETY WARNINGS CONTAINED THROUGHOUT THIS MANUAL.

Think before you act— and be careful.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH.

KEEP CHILDREN AWAY.

IF YOU WEAR A PACEMAKER, YOU SHOULD CONSULT WITH YOUR 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.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

Electric Shock



ELECTRIC SHOCK can kill.

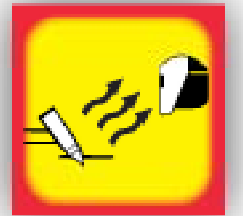
- 1.1 The electrode and work (or ground) circuits are electrically "hot" when the power source is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 1.2 Disconnect the power source before performing any service or repairs. When the power source is operating, voltages in excess of 250 volts are produced. This creates the potential for serious electrical shock - possibly even fatal.
- 1.3 Insulate yourself from work and ground using dry insulation. Wear dry gloves and clothing. Take extra care when the work place is moist or damp.
- 1.4 Always be sure the work cable makes a good electrical connection with the metal being cut or gouged. The connection should be as close as possible to the area being cut or gouged.
- 1.5 Ground the work or metal to be cut or gouged to a good electrical (earth) ground.
- 1.6 Maintain the plasma torch, cable and work clamp in good, safe operating condition. Repair or replace all worn or damaged parts. Replace damaged insulation.

- 1.7 Never dip the torch in water for cooling or plasma cut or gouge in or under water.
- 1.8 When working above floor level, protect yourself from a fall should you get a shock.
- 1.9 Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.
- 1.10 Also see Items 4.3 and 6.

2. ARC RAYS can burn.

- 2.1 Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultraviolet and infrared rays. These will damage your eyes and burn your skin if you are not properly protected.
- 2.2 Use safety glasses and a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when performing or observing plasma arc cutting or gouging. Glasses, head-shield, and filter lens should conform to ANSI Z87.1 standards.

Arc Rays



| Arc Current | Minimum Shade No. | Suggested Shade No. |
|---------------|-------------------|---------------------|
| Less than 20A | 4 | 4 |
| 20A-40A | 5 | 5 |
| 40A-60A | 6 | 6 |
| 60A-300A | 8 | 9 |
| 300A-400A | 9 | 12 |
| 400A-800A | 10 | 14 |

- 2.3 Use suitable clothing including gloves made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 2.4 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, Gases and Dust



3. FUMES AND GASES can be dangerous.
 - 3.1 Plasma cutting or gouging may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When cutting or gouging, keep your head out of the fumes. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone.
 - 3.2 Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
 - 3.3 When plasma cutting or gouging on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required.
 - 3.4 Additional precautions are also required when cutting (zinc) galvanized steel or materials containing or coated with any of the following:

| | | | | |
|----------|-----------|--------|-----------|----------|
| Antimony | Beryllium | Cobalt | Manganese | Selenium |
| Arsenic | Cadmium | Copper | Mercury | Silver |
| Barium | Chromium | Lead | Nickel | Vanadium |
 - 3.5 The operation of plasma cutting or gouging fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment, and the specific procedure and application involved. Worker exposure levels should be checked upon installation and periodically thereafter to be certain levels are within applicable OSHA PEL and ACGIH TLV limits. For information on how to test for fumes and gases in your work place, refer to publications section of this manual.
 - 3.6 Do not use plasma cutting or gouging equipment 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. Remove all sources of these vapors.

- 3.7 Gases used for plasma cutting and gouging can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 3.8 Read and understand the manufacturer's instructions for this equipment and follow your employer's safety practices.
- 3.9 This product, when used for cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects
- 3.10 Some dust created by routing, sawing, grinding, drilling, and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Avoid prolonged contact with this dust. Wear protective clothing and wash exposed areas with soap and water. Allowing dust to get into your mouth, eyes, or lay on the skin may promote absorption of harmful chemicals.

Some examples of these chemicals are:

 - Lead from lead-based paint.
 - Crystalline silica from bricks and cement and other masonry products.
 - Arsenic and chromium from chemically-treated lumber (CCA).
- 3.11 Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

4. Cutting flame and sparks can cause FIRE OR EXPLOSION.

- 4.1 Fire and explosion can be caused by hot slag, sparks, oxygen fueled cutting flame, or the plasma arc.
- 4.2 Have a fire extinguisher readily available. Provide a fire watch when working in an area where fire hazards may exist.
- 4.3 When not cutting or gouging, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 4.4 Be sure there are no combustible or flammable materials in the workplace. Any material that cannot be removed must be protected.

Fire or Explosion



Safety First (continued)

- 4.4.1 Sparks and hot materials from cutting or gouging can easily go through small cracks and openings to adjacent areas.
- 4.4.2 Avoid cutting or gouging near hydraulic lines.
- 4.4.3 Do not cut or gouge 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).
- 4.4.4 Vent hollow castings or containers before heating, cutting or gouging. They may explode.
- 4.5 Do not add fuel to engine driven equipment near an area where plasma cutting or gouging is being done.
- 4.6 Connect the work cable to the work as close to the cutting or gouging area as practical. Work cables connected to the building framework or other locations away from the cutting or gouging area increase the possibility of the 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.
- 4.7 Hydrogen gas may be formed and trapped under aluminum work pieces when they are cut underwater or while using a water table. DO NOT cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.
- 4.8 Read and follow NFPA 51B "Standard for Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, Ma 022690-9101.

- 5. CYLINDER may EXPLODE if damaged.
 - 5.1 Use only compressed gas cylinders containing the correct 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.
 - 5.2 Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
 - 5.3 Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from plasma cutting or gouging, arc welding operations and any other source of heat, sparks, or flame.
 - 5.4 Never allow any part of the electrode, torch or any other electrically "hot" parts to touch a cylinder.
 - 5.5 Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
 - 5.6 Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
 - 5.7 Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.
- 6. FOR ELECTRICALLY powered equipment.
 - 6.1 Turn off input power using the disconnect switch at the fuse box before working on the equipment.
 - 6.2 Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
 - 6.3 Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Cylinder Explosion



Electrical Power



Plasma Arc



7. PLASMA ARC can injure.
 - 7.1 Keep your body away from nozzle and plasma arc.
 - 7.2 Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.

Electric and Magnetic Fields



8. ELECTRIC AND MAGNETIC FIELDS may be dangerous
 - 8.1 Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Cutting or gouging current creates EMF fields around torch cables and cutting machines.
 - 8.2 EMF fields may interfere with some pacemakers, so operators having a pacemaker should consult their physician before cutting or gouging.
 - 8.3 Exposure to EMF fields during cutting or gouging may have other health effects which are now not known.
 - 8.4 All operators should use the following procedures in order to minimize exposure to EMF fields from the cutting or gouging circuit:
 - 8.4.1 Route the torch and work cables together - Secure them with tape when possible.
 - 8.4.2 Never coil the torch cable around your body.
 - 8.4.3 Do not place your body between the torch and work cables. If the torch cable is on your right side, the work cable should also be on your right side.
 - 8.4.4 Connect the work cable to the workpiece as close as possible to the area being cut or gouged.
 - 8.4.5 Do not work next to cutting power source.

9. AUTOMATIC OPERATION

- 9.1 Any CNC machine may begin to operate automatically without warning. Only a trained individual familiar with the software, machine, and computer system should operate this equipment.
- 9.2 Keep the immediate area around the CNC machine clear of materials that may cause interference. Keep area clear of bystanders.
- 9.3 All untrained persons should not work on or near a CNC machine. Do not leave the CNC machine unattended while power is on to any electronics.

10. NOISE

- 10.1 Noise can cause permanent hearing loss. CNC operation, plasma arc cutting, plate marking, routing, and drilling can cause noise levels that exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.
 - 10.1.1 To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
 - 10.1.2 Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- 10.2 For information on how to test for noise refer to the publications section of this manual.

11. HEAVY PARTS

- 11.1 Parts of CNC machines are heavy. Also, material you are cutting may be heavy. Use caution when lifting or moving them. To avoid injury, get someone to help you, or use a mechanical lifter. When using a mechanical lifter, follow all the manufacturer's safety guidelines.
- 11.2 Review the Occupational Safety & Health Administration (OSHA) technical manual Sect. 7, Ch 1.5. See the publications section for additional information.

Automatic Operation



Noise



Heavy Parts



FLYING DEBRIS



12. FLYING DEBRIS

- 12.1 Metal cutting and marking operations create waste that can fragment and fly. Make sure you have proper eye protection and that everyone close to the CNC operations has proper eye protection, too.
- 12.2 Review the ANSI Z87.1 requirements. See the publications section for additional information.

PINCH & CRUSH POINTS



13. PINCH AND CRUSH POINTS

- 13.1 Pinch and crush points are those normally moving parts of machinery, like CNC machines, that can pinch, capture, crush, or sever parts of your body. Be aware of hazardous pinch and crush points.
- 13.2 Don't repair or adjust the machine with the controls on.
- 13.3 When the end of a CNC machine's travel creates a "hard stop," it creates a crush point. Keep fingers and hands away from this.
- 13.4 Do not stack or store any additional items in contact with the machine. These could create additional pinch or crush points, or could create a falling hazard.

ROTARY TOOLS



14. SHARP ROTARY TOOLS

- 14.1 Routing and drilling use high-speed rotating bits and cutters with sharp edges. Keep clear of bits when in use.
- 14.2 Turn the router, spindle, or drill off when changing bits. Be careful of the sharp edges.

15. HOT MATERIALS

- 15.1 Plasma cutting uses an electric arc that can reach temperatures of 45,000°F (25,000°C). Oxygen-fuel cutting flames can be up to 6,330°F (3,500°C). Any parts and scrap will be very hot after cutting. Use extreme care.
- 15.2 Use tongs and wear protective gloves when handling recently cut material. Also, consider other devices for safe hot material handling.
- 15.3 It is safest to let material cool completely before handling.

HOT MATERIAL



16. MECHANICAL DRIVES

- 16.1 High-speed mechanical drives made of gears, belts, and or drive screws are used by CNC machines. Keep clear of them during operation.
- 16.2 Do not attempt to service, adjust, or otherwise touch these components while the machine is on.
- 16.3 Secure loose clothing and cables to prevent entanglement.

MECHANICAL DRIVES



17. AIR LINES UNDER PRESSURE

- 17.1 Some tools use compressed air or gases. Often flexible tubing (lines) bring the high-pressure air or gas to the machine. Inspect these lines periodically. Repair or replace damaged lines.
- 17.2 Hot sparks, flying debris, other objects, or vehicles can melt, burn, or puncture these lines. Check them for punctures, burns, or other damage or defects that could cause failure.
- 17.3 Check the routing of the lines to keep them away from traffic and from underfoot.

PRESSURIZED AIR LINES



PUBLICATIONS

Refer to the following standards or their latest revisions for more information:

- OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
- ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
- NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
- ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
- ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
- AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
- NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
- CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
- NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
- ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

Technical Support

Call, Fax, or Email

When building the table if a question or concern arises or a part is missing, please contact Torchmate technical support.

Technical support will also help you with operating the CNC system, and troubleshooting problems.

Technical support is available Monday through Friday from 6:00 AM to 4:00 PM Pacific Standard Time.



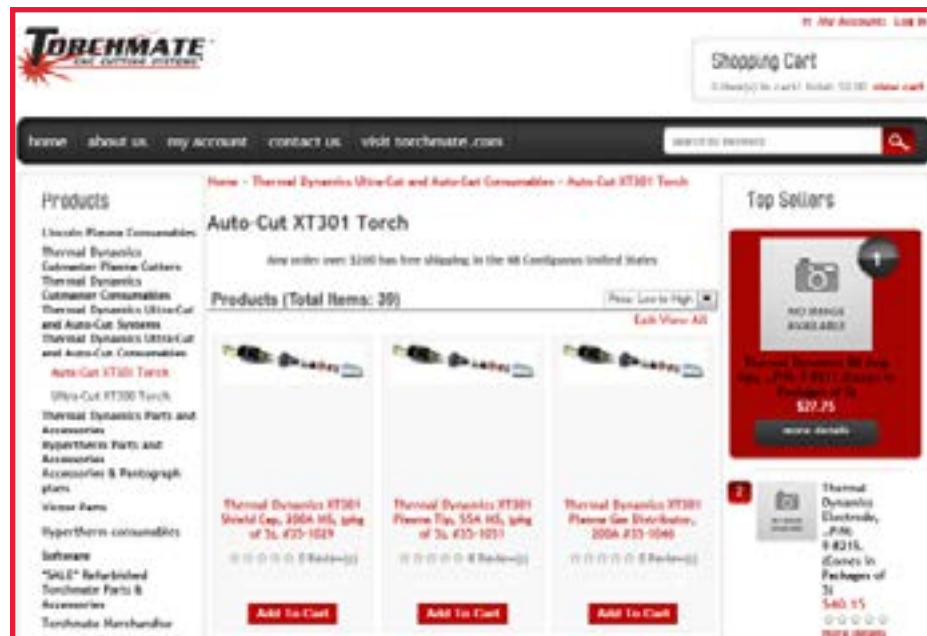
Toll Free: 1-866-571-1066

International: 775-673-2200

Fax: 775-673-2206

Email: support@torchmate.com

Call us for
Consumables,
or visit our
web store



www.TorchmateStore.com

