

SAFETY PRECAUTIONS

1-1 Fume and Gas Hazards



FUMES AND GASES can be hazardous

Welding and cutting produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding and cutting fumes and gases. The recommended way to determine adequate ventilation is to sample for the composition and quantity of fumes and gases to which personnel are exposed.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes and metals.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding and cutting fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld or cut in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld or cut on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

1-2 Arc Rays and Welding Hazards



ARC RAYS can burn eyes and skin

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

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding, cutting, or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear body protection made from durable, flame resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap.



WELDING AND CUTTING can cause fire or explosion

Welding or cutting on closed containers such as tanks, drums or pipes, can cause them to blow up. Sparks can fly off from the welding or cutting arc. The flying sparks, hot work piece and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating or fire. Check and be sure the area is safe before doing any welding or cutting.

- Remove all flammables within 35 ft. (10.7 m) of the welding or cutting arc. If this is not possible, tightly cover them with approved covers.
- Do not weld or cut where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding and cutting can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding or cutting on a ceiling, floor, bulkhead or partition can cause fire on the hidden side.
- Do not weld or cut on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld or cut where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding or cutting area as practical to prevent welding or cutting current from traveling long, possibly unknown paths and causing electric shock, sparks and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear body protection made from durable, flame resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding or cutting.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or by-pass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes and metals.



ELECTRIC SHOCK can kill

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In gas metal arc welding (GMAW), the wire, wire reel, drive roll housing and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulated gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is danger of falling.
- Use AC output ONLY if required for the welding or cutting process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a GMAW DC constant voltage (wire) welder, 2) a DC manual (stick) welder or 3) an AC welder with reduced open circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state/provincial and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first and double-check connections.
- Keep cords dry, free of oil and greases and protected from hot metal and sparks.
- Frequently inspect power cord for damage or bare wiring. Replace cord immediately if damaged. Bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground or another electrode from a different machine.

- Do not touch electrode holders connected to two welding machines at the same time since double open circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process when not in use.

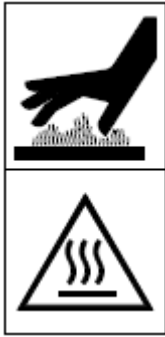


CYLINDERS CAN EXPLODE if damaged

Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

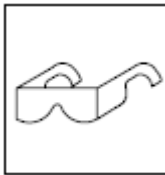
- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding, cutting or other electrical circuits.
- Never drape a welding electrode or cutting torch over a gas cylinder.
- Never allow a welding electrode or cutting torch to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only the correct compressed gas cylinders, regulators, hoses and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve. Do not stand in front of or behind the regulator when opening the valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

1-3 Additional Safety Warnings for Installation, Operation and Maintenance



HOT PARTS can burn

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns



FLYING METAL OR DIRT can injure or kill

- Welding, cutting, chipping, wire brushing and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



BUILDUP OF GAS can injure or kill

- Shut off compressed gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



ELECTRIC AND MAGNETIC FIELDS (EMF) can affect implanted Medical Devices

- Wearers of Pacemakers and other
- Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting or induction.



NOISE can damage hearing

- Noise from some processes or equipment can damage hearing.
- Wear approved ear protection if noise level is high.



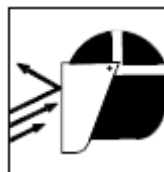
FIRE OR EXPLOSION hazard

- Do not install or place unit on, over or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated and protected to handle this unit.



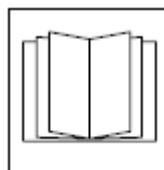
MOVING PARTS can injure

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers or guards when maintenance is finished and before reconnecting input power.
- Keep away from pinch points such as drive rolls.



FLYING SPARKS can injure

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand and body protection.
- Sparks can cause fires – keep flammables away.



READ INSTRUCTIONS

- Read and follow all labels and the
- Owner's Manual carefully before installing, operating, or servicing the unit. Read the safety information at the beginning of the manual and each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manual, industry standards and national, state/provincial and local codes.



WELDING WIRE can injure

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people or any metal when threading welding wire.



COMPRESSED AIR can injure or kill

- Before working on compressed air system, turn off and lockout/tagout unit, release pressure and be sure air pressure cannot be accidentally applied.
- Relieve air pressure before disconnecting or connecting air lines.
- Check compressed air system components and all connections and hoses for damage, leaks and wear before operating unit.
- Do not direct air stream toward self or others.
- Wear protective equipment such as safety glasses, hearing protection, leather gloves, heavy shirt and trousers, high shoes, and a cap when working on compressed air system.
- Use soapy water or an ultrasonic detector to search for leaks – never use bare hands. Do not use equipment if leaks are found.



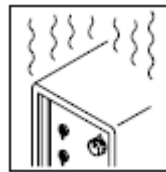
ARC WELDING AND PLASMA CUTTING can cause interference

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electro-magnetically compatible.
- To reduce possible interference, keep cables as short as possible, close together, and down low, such as on the floor.
- Locate welding or cutting operation 100 meters from any sensitive electronic equipment.
- Be sure welding machine or plasma cutter is installed and grounded according to its Owner's Manual.
- If interference still occurs, the user must take extra measures such as moving the welding or cutting machine using shielded cables, using line filters or shielding the work area.



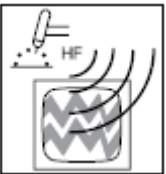
TRAPPED AIR PRESSURE AND WHIPPING HOSES can injure

- Release air pressure from tools and system before servicing, adding or changing attachments or opening compressor oil drain or oil fill cap.



OVERUSE CAN CAUSE OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter air flow to unit.



H.F. RADIATION can cause interference

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- Have the installation regularly checked and maintained.
- If notified by the FCC about interference, stop using the equipment at once.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

IMPORTANT: Be sure to follow your facility's lock out / tag out procedures.

1-4 California Proposition 65 Warnings

Welding or cutting equipment 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 Section 25249.5 et seq.)

This product contains chemicals, including lead, known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after use.*

1-5 EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). The current from arc welding (and allied processes including spot welding, gouging, plasma arc cutting, and induction heating operations) creates an EMF field around the welding circuit. EMF fields may interfere with some medical implants, e.g. Pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passersby or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.

3. Do not coil or drape cables around your body.
4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld while carrying the welding power source wire feeder.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

1-6 Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a free download from the American Welding Society at www.aws.org or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com)

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com)

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www.sparky.org)

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com)

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5N5 (phone: 1-800-463-6727, website: www.csa-international.org)

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org)

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org)

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburg, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices – phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov)

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Road, Atlanta, GA 30333 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH)

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