SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

⚠ **Protect yourself and others from injury—read, follow, and save these important safety precautions and operating instructions.**

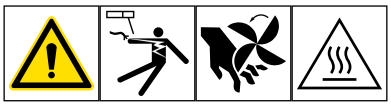
1-1. Symbol Usage

⚠ **DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.**

⚠ **Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.**

NOTICE – *Indicates statements not related to personal injury.*

☞ *Indicates special instructions.*



This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid these hazards.

1-2. Handheld Laser Welding Safety Definitions

Table 1–1. Handheld Laser Welding Safety Terms and Definitions

Term	Definition*
Maximum Permissible Exposure (MPE)	The level of laser radiation to which an unprotected person may be exposed without adverse biological changes in the eye or skin.
Nominal Hazard Zone (NHZ)	The space within which the level of the direct, reflected, or scattered radiation may exceed the applicable MPE. Exposure levels beyond the boundary of the NHZ are below the applicable MPE.
Nominal Ocular Hazard Distance (NOHD)	The distance along the axis of the unobstructed beam from a laser, fiber end, or connector to the human eye beyond which the irradiance or radiant exposure is not expected to exceed the applicable MPE.
Optical Density (OD)	A formula used to calculate the required level of laser eye protection.
Laser Controlled Area (LCA)	A laser use area where the occupancy and activity of those within is controlled and supervised. This area may be defined by walls, barriers, or other means. Within this area, potentially hazardous exposure is possible.
Laser Safety Officer (LSO)	One who has the authority and responsibility to monitor and enforce the control of laser hazards and effect the knowledgeable evaluation and control of laser hazards.

*Ref. ANSI Z136.9–2013

See Specifications section for product-specific Laser Technical Data and Handheld Laser Hazard Calculations.

1-3. Handheld Laser Welding Hazards

⚠ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Principal Safety Standards. Read and follow all Safety Standards.**

⚠ **Only qualified persons should install, operate, maintain, and repair this equipment. A qualified person is defined as one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project and has received safety training to recognize and avoid the hazards involved.**

⚠ **During operation, keep everybody, especially children, away.**

CLASS IV INVISIBLE LASER RADIATION can permanently damage eyes and skin.

Exposure to laser light can inflict severe retina and/or cornea injuries leading to permanent eye damage and can cause skin damage. Some laser light, including the welding beam (1070 nm) is invisible. Follow all safety precautions to prevent accidental exposure to invisible, direct, and reflected beams.

- Operate the system only in a Laser Controlled Area.
- A certified Laser Safety Officer must be present to ensure a safe working environment.
- When the power supply is activated, the laser device is in a danger state and all precautions must be taken as if the laser is ready to emit.
- Protective laser eyewear must be worn inside the Laser Controlled Area if the system can be active (keyswitch turned On).
- Laser beam can penetrate through metal parts to objects or people on the other side. Never hold parts for processing in a position where laser penetration of the metal may result in a hazard.
- All persons in the Laser Controlled Area must wear all recommended personal protective equipment (PPE), including laser safety eyewear and laser welding helmet, to protect against eye damage from any reflected or scattered laser beams as well as welding bright light, ultraviolet (UV) light, heat, and sparks.
- Exposure to infrared (IR) and UV light radiation can seriously injure skin. All persons in the Laser Controlled Area must wear all recommended PPE, including heat-resistant gloves, caps, leather apron, and other heat-resistant clothing. Sleeves and collars must be buttoned at all times.
- Never look at the weld pool except from behind the torch.
- This product also contains a Class 2M guide laser. The guide laser emits visible laser radiation at a wavelength range of 600 to 700 nm and is capable of producing a peak power of 1 mW. Do not stare into the beam or view directly with optical instruments.

REFLECTED AND SCATTERED INVISIBLE CLASS IV LASER BEAMS can cause permanent eye damage and vision loss.

Numerous secondary laser beams called specular reflections can be produced at various angles near the laser output aperture. Metals such as aluminum and copper can reflect laser energy away from the weld. The reflected laser energy can be hazardous to all personnel in the Laser Controlled Area.

- All persons in the Laser Controlled Area must wear all recommended PPE, including laser safety eyewear and laser welding helmet, to protect against eye damage from any reflected or scattered laser beams as well as welding bright light, UV light, heat, and sparks.
- Spectators should never attempt to view the welding process or processed part from the opposite side of the laser source. Spectators should only attempt to view the welding process or processed parts from behind the operator of the laser device, and only when wearing all recommended PPE.
- Highly reflective metals such as aluminum and copper can cause some portion of the beam energy to be reflected from the target and require additional precautions.
- Specular reflections can present a hazard to the operator if any portion of the beam is reflected from multiple surfaces.
- Take precautions to understand the expected cone of specular reflection for each processed part. Do not attempt to view the part or place any part of the body within the expected specular reflection cone.
- Set parameters correctly to achieve melting of the target part. Incorrect parameters can result in more reflections.

LASER LIGHT and INFRARED (IR) and ULTRAVIOLET (UV) RADIATION can injure skin.

IR and UV light radiation, as well as heat and sparks, can burn. Exposure to UV light can cause sunburn, increase risk of skin cancer, and accelerate signs of skin aging.

- All persons in the Laser Controlled Area must wear all recommended PPE, including heat-resistant gloves, caps, leather apron, and other heat-resistant clothing. Sleeves and collars must be buttoned at all times.
- If any PPE becomes damaged while using the welding power source, immediately stop and replace damaged PPE.

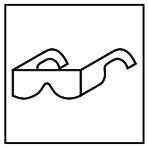
Looking directly into a LASER APERTURE, even with full eye protection, can cause permanent vision loss.

Laser safety eyewear does not protect from direct beam exposure.

- Never look directly into a laser aperture such as the output fiber or torch when the unit is powered, even if wearing full eye protection.
- Never point the torch at another person.
- Operators and all others inside the Laser Controlled Area must use the specified laser safety eyewear in combination with a laser welding helmet with appropriate filters and face shield when the power supply is in use.
- Avoid positioning the laser and all optical components at eye level.
- Avoid using the laser in a darkened environment.
- Always turn the key to the Off position and remove the key when working with the output, such as when mounting the laser head into a feature.
- Do not install or terminate the laser head when laser is active. Always ensure the key is in the Off position and the unit is disconnected from AC power.

Wearing INCORRECT OR DAMAGED LASER SAFETY EYEWEAR can cause permanent vision loss.

Laser safety eyewear alone does not provide sufficient protection when power supply is in use.



- Operators and all others inside the Laser Controlled Area must use the specified laser safety eyewear in combination with a laser welding helmet with appropriate filters and face shield when the power supply is in use.
- Laser safety eyewear must have an optical density of 7 or greater at nominal laser wavelength of 1070 nm.
- The laser welding helmet must be capable of withstanding a specular laser reflection of full power and nominal working distance for a time duration long enough to avoid injury.
- Before using a pair of laser safety eyewear, check labeling on the eyewear and confirm it meets the specified requirements.
- Prior to use, inspect laser safety eyewear for any cracking, discoloration, coating damage, pitting, or crazing. Also check the mechanical integrity of the frame or strap.
- If laser safety eyewear becomes damaged while using the welding power source, immediately stop and replace damaged eyewear.

Device operation requires LASER CONTROLLED AREA (LCA) with safety interlocks.

Welding within a laser controlled area protects personnel outside the area who are not wearing PPE from hazardous exposure. The interlocks automatically shut down laser emission if someone unexpectedly enters.

- Designate a Laser Safety Officer responsible for the safety of users and trained on potential hazards such as reflections.
- Provide suitable barriers to secure a laser safe work area and to prevent the beam from escaping the area. Any barriers used in the LCA should be made of a laser-safe material that can withstand direct and diffusely scattered beams.
- An LCA is a light-tight enclosure with laser-blocking panels, and access door with interlock switch, and Laser On warning sign. Any windows must be laser safe. Ceiling requirement depends on structure above the welding cell.
- Post warning signs outside the LCA when the laser is in use. Appropriate warning signs should be posted throughout the controlled area, especially at any entrances to and from the area. For example, a sign warning of potential eye hazard should be placed outside the entrance to the enclosed controlled area.
- Restrict access to the LCA only to those individuals who are trained in laser safety while operating a laser. Post a sign with the names of all persons authorized to work in the LCA.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The input power circuit and machine internal circuits are also live when power is on. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Disconnect input power before installing or servicing this 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, and local codes.
- Do not store or use equipment in standing water.

- 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—double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring — replace immediately if damaged — bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or repaired cables.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Keep all panels and covers securely in place.
- Do not open the power source. There are no operator serviceable parts inside.

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.

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.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the weld. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding beam. If this is not possible, tightly cover them with approved covers.
- Do not weld 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 can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not cut or weld on tire rims or wheels. Tires can explode if heated. Repaired rims and wheels can fail. See OSHA 29 CFR 1910.177 listed in Safety Standards.
- Do not weld 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 (see Safety Standards).
- Do not weld where the atmosphere can contain flammable dust, gas, or liquid vapors (such as gasoline).
- Wear body protection made from leather or flame-resistant clothing (FRC). 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.
- 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 bypass 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.

NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear appropriate ear protection if noise level is high.

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 or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder—explosion will result.
- Use only 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 proper equipment, correct procedures, and sufficient number of persons to lift, move, and transport cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

FUMES AND GASES can be hazardous.

Welding 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.
- Ventilate the work area and/or use local forced ventilation at the weld to remove welding 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 watchperson nearby. Welding 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 in locations near degreasing, cleaning, or spraying operations. The heat and rays of the beam can react with vapors to form highly toxic and irritating gases.
- Do not weld 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 the operator is wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

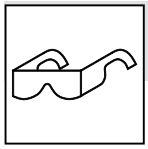
1-4. Additional Hazards For Installation, Operation, And Maintenance

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.

FALLING EQUIPMENT can injure.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use correct procedures and equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94-110) when manually lifting heavy parts or equipment.



FLYING METAL OR DIRT can injure eyes.

Welding, 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.

MOVING PARTS can injure.

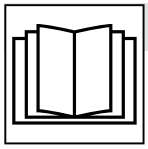
- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

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.

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.



READ INSTRUCTIONS.

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

1-5. California Proposition 65 Warnings

⚠ **WARNING – This product can expose you to chemicals including lead, which are known to the state of California to cause cancer and birth defects or other reproductive harm.**

For more information, go to www.P65Warnings.ca.gov.

1-6. Principal Safety Standards

Safe Use of Lasers. American National Standard ANSI Z136.1. Website: lia.org.

Safety of Laser Products. IEC 60825. Website: lia.org.

OSHA Technical Manual (OTM) Section III, Chapter 6: Laser Hazards. Website: www.osha.gov.

Performance Standards for Light-Emitting Products. Title 21, Code of Federal Regulations (CFR), Chapter I, Subchapter J, Part 1040.10. Website: ecfr.gov.

Safety in Welding, Cutting, and Allied Processes, American Welding Society standard ANSI Standard Z49.1. Website: www.aws.org.

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute. Website: safetyequipment.org.

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1. Website: www.aws.org.

National Electrical Code, NFPA Standard 70 from National Fire Protection Association. Website: www.nfpa.org.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1 from Compressed Gas Association. Website: www.cganet.com.

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2 from Canadian Standards Association. Website: www.csagroup.org.

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B from National Fire Protection Association. Website: www.nfpa.org.

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910.177 Subpart N, Part 1910 Subpart Q, and Part 1926, Subpart J. Website: www.osha.gov.

OSHA *Important Note Regarding the ACGIH TLV, Policy Statement on the Uses of TLVs and BEIs.* Website: www.osha.gov.

Applications Manual for the Revised NIOSH Lifting Equation from the National Institute for Occupational Safety and Health (NIOSH). Website: www.cdc.gov/NIOSH.

Laser 2026–02