Welding & Cutting Equipment

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STUD WELDING UNIT

CAD 81 Series

Owner's Manual

DC | 1 PHASE | 50/60 HZ | STUD WELDER

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Thank You

From

Canaweld

Thank you for choosing a Canaweld machine, with 40+ years of welding equipment manufacturing experience overseas, you can feel confident that you have made the right choice.

Since the 1980s, the founders of Canaweld have been actively involved in research & development, production and sales within the welding and cutting industries. They have filed countless patents and set new standards in the welding industry.

For over a decade the founders of Canaweld, have been members of the Technical Committee (TC 26) of the **International Electro-technical Commission (IEC). IEC** is the world's leading organization on international standards for all electrical, electronic, and related technologies.

The company has also been an **expert member of the Canadian Standards Association (CSA), within the Technical Committee, responsible for Canadian standards of welding and cutting machines.**

Canaweld was created with the aim of providing our customers with advanced technologies. Our products, from design to assembly, are created with years of experience in research & development, materials engineering, quality control and testing.

Canaweld machines are among the best in the world in terms of quality.
The materials used in our designs are some of the best available on the market.
We believe in the high performance of our equipment and, therefore, offer a 3-year warranty.

We use strict test procedures, and our expectations exceed the required standards. For example, according to International Standards, machines must be tested at 40°C (104°F), but Canaweld tests the machines at both 40°C and 50°C (122°F). In doing so, we ensure that our machines will continue to operate even in hot climates.

Finally, all machines are only packaged and shipped when they pass strict mandatory tests.

This user manual should be read carefully to fully understand the machine you have purchased and how to maintain it in the best operating condition.

For more information on our full line of products please visit our website or contact a dealer in your local area, our dealer list can be found on our website: www.canaweld.com

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1.1 General Safety Precautions

Users of Canaweld welding and plasma cutting equipment are ultimately responsible for ensuring that everyone working on or around the equipment follow all safety measures. Safety precautions must fulfill the criteria for welding or plasma cutting equipment of this sort. In addition to the usual workplace laws, the following guidelines should be followed. To keep yourself and others safe, read, obey, and save these critical safety warnings and operating instructions. You are entirely responsible for the Product's safe operation. Canaweld does not and cannot give any assurances or warranties about the product's safety in your environment. This device is not designed for use in residential areas where the electrical power comes from a public low-voltage supply source. Due to both conducted and radiated disturbances, it may be challenging to ensure electromagnetic compatibility of the equipment in certain regions. This product is only for removing metal. Any other usage might result in bodily harm and/or damage to the equipment. In the event of a malfunction, contact a professional for assistance.

All work must be done by skilled employees who are familiar with how the welding or plasma cutting equipment works. Incorrect equipment operation can lead to dangerous circumstances, resulting in harm to the operator and equipment damage. Anyone who works with welding or plasma cutting equipment should understand how it works, where the emergency stops are situated, what safety measures should be followed, and how to utilize plasma cutting and/or welding.

Use approved personal safety equipment, such as safety glasses, flame-resistant clothes, and safety gloves. Avoid wearing scarves, bracelets, rings, and other loose-fitting items that may become stuck or cause burns. The operator must guarantee that no unauthorized personnel are present in the equipment's working area when it is turned on and no one is exposed to the arc when it is struck. The work environment must be free from drafts and appropriate for the job. The return cable must be securely connected and working on high voltage equipment must be done by a qualified electrician only. A proper and clearly marked fire extinguishing equipment must be close at hand. While the equipment is in operation, do not lubricate or maintain it.

1.2 Safety Precautions & Symbol

Before working on the machine, read the owner's manual.

Read the safety information at the beginning of the manual. To fully understand the machine's capabilities and safety measures, read this manual thoroughly. Follow the Owner's Manuals, industry standards, and national, province, state, and local requirements.

DANGER!

The symbol indicates a dangerous action that will result in death or serious injury if not prevented. The potential dangers or hazards are depicted in the symbols next to them or discussed in the text.

ELECTRIC SHOCK

Touching electrical components can cause fatal electric shock and severe burns. By using a dry insulating mat or cover, insulate yourself from the workpiece and ground. While the machine is powered on, do not remove the machine cover, or touch any electrical components or circuits without a pair of proper and dry insulating gloves. Equipment that has been incorrectly placed or grounded is a hazard. ELECTRIC SHOCK can cause death or severe injuries. Do not touch any active electrical components. Wear dry insulating gloves and body protection with no holes in them. Use dry insulating mats or blankets large enough to avoid any direct touch with the work or ground to isolate oneself from the work and ground. If the torch pieces touch the work or the ground, do not touch them. Inspect the input power cable and ground conductor on a regular basis for aging or bare wiring; repair promptly if damaged; bare wiring can kill. When not in use, turn off all equipment. Do not utilize cables that are worn, broken, undersized, or repaired. Avoid wrapping the torch cable around your body. If codes demand it, connect the workpiece to a good electrical (earth) ground. Only use well-maintained equipment. Repair or replace broken pieces at the same time. When operating above floor level, use a safety harness. Maintain the integrity of all panels and coverings. Do not try to bypass or overcome the safety mechanisms. Only use the torch types which indicated in the owner's manual. When the trigger is pressed, keep your hands away from the electrode/tungsten tip and the arc. Clamp the work cable to the workpiece (not a component that will fall away) or the worktable as close to the welding area as possible. When not attached to the workpiece, insulate the work clamp to avoid contact with any metal objects. Before inspecting, cleaning, or replacing torch parts, and before installing or repairing this machine, turn off the power. Install, ground, and operate this equipment in accordance with its owner's manual and any national, province, state, and local laws. Always ensure that the input power cord ground wire is correctly connected to the ground terminal and the cord connector is attached to a properly grounded receptacle outlet. Attach the correct grounding conductor first while establishing input connections. Maintain cables by keeping them dry, clear of oil and grease, and away from hot metal and sparks.

High DC VOLTAGE exists inside the machine even after turning off.

Even after disconnecting the input power, there is dangerous DC voltage in inverter welding power sources. Before touching any parts, turn off the inverter, disconnect the input power, and wait for the input capacitors to discharge.

BURNS AND ELECTRIC SHOCK RISK WEAR DRY INSULATED GLOVES.

When replacing the consumables, always use dry insulated gloves. During welding, the consumables get extremely hot, and serious burns are possible. If the power supply is turned on, touching the consumables might cause an electric shock. Never

touch the exposed parts of the welding torch/electrode holder of the machine, change or clean consumables while the machine is on, because the shocking voltage between the parts will be extremely dangerous and even fatal.

WELDING can result in a fire or explosion.

From the welding arc, hot metal and sparks are ejected that can cause fire or explosion. Before performing any welding, double-check that the location is safe. Welding has the potential to start a fire or explosion. Remove all combustible materials around the work area. If this isn't feasible, use certified covers to firmly cover them. Avoid welding in areas where flying sparks might ignite combustible materials. Make sure you and others are safe from flying sparks and hot metal. Be aware that welding sparks and hot materials can easily pass-through minor gaps and holes and onto surrounding places. Keep an eye out for flames and a fire extinguisher nearby. Welding on a ceiling, floor, bulkhead, or wall might result in a fire on the concealed side. Do not weld on combustible-filled containers or closed containers like tanks, drums, or pipelines unless they have been adequately prepared according to relevant safety standards. Check the area for sparks, glowing embers, and flames when the task is completed. Only use the proper fuses or circuit breakers. Do not oversize or bypass them. All work should be done in accordance with applicable safety regulations, and a fire watcher and extinguisher should be available. To avoid welding currents from traveling too long, perhaps unknown courses and generating electric shock, sparks, and fire dangers, connect the work cable to the work as near to the welding area as possible. Never weld on containers containing potentially combustible products; they must first be emptied and thoroughly cleaned. Never perform welding where combustible dust, gas, or liquid vapors (such as gasoline) are present in the atmosphere. Welding pressurized cylinders, pipelines, or containers is prohibited. Wear flame-resistant, long-lasting body protection (leather, heavy cotton, wool). Oil-free clothes, such as leather gloves, a thick shirt, cuffless pants, work boots with electrical insulated sole, and a hat, are all recommended for body protection. Avoid placing the device near or on flammable materials. Before performing any welding, make sure you don't have any combustibles on you, such as butane lighter or matches.

EXCESSIVE NOISE HAZARD

Be cautious if there is excessive noise in the workplace. Wear hearing protection if the noise level is too high. Workers nearby are also impacted by noise and may require hearing protection.

Hot PARTS HAZARD

All welded pieces become extremely hot immediately after welding or cutting, causing burns to anybody in touch with exposed skin. After welding or cutting, do not contact the workpiece, ground clamp, or electrode holder/torch instantly, and wait for a cooling interval before picking them up. To avoid burns, use proper equipment while working with hot parts, and use thick insulating welding/cutting gloves and clothes as well.

WELDING/CUTTING FUMES HAZARD

Welding and cutting generate gases and fumes. The inhalation of these gases and vapors might be hazardous. These gases and fumes can replace oxygen in the body, causing harm or death. Keep your head away from the welding or cutting area and avoid inhaling the fumes and gases. If the weld/cut is indoors, ventilate the environment or utilize local forced ventilation at the weld site to eliminate smoke and gas. Wear an authorized air supply respirator if ventilation is insufficient. Only work inside if you are properly ventilated or using an air-supplied respirator. For any materials being used, read the Material Safety Data Sheet (MSDS) and the manufacturer's instructions.

DANGEROUS GASES AND FUMES HAZARD

Welding and cutting coated metal, such as stainless steel, are not permitted, unless the coating has been removed from the weld or cut area, and the area is thoroughly ventilated, and an air-supplied respirator is used as well. During welding or cutting, the coating and all metals containing these elements can produce harmful fumes. Do not cut containers that contain poisonous or reactive products or containers that have previously held toxic or reactive materials; they must first be emptied and thoroughly cleaned. Cut away from degreasing, cleaning, or spraying processes. The arc's heat and light can combine with vapors to produce very poisonous and unpleasant fumes.

DANGEROUS GAS HAZARD FROM THE SHIELDING / CUTTING GAS CYLINDERS

Turn off the shielding/cutting gas, when not in use. These gases can displace air, lowering oxygen levels and resulting in harm or death.

CYLINDERS can explode if they are damaged.

Excessive heat, mechanical shocks, physical damage, slag, open flame, sparks, and arcs should all be avoided while using compressed gas cylinders. Keep cylinders away from any electrical or cutting/welding circuits. Never allow a welding torch/electrode holder or plasma arc torch to make electrical contact with a cylinder. An explosion will occur if you cut a pressurized cylinder. When the cylinder is not in use or attached for use, keep the protective cap on the valve. To avoid falling or tipping, install and secure cylinders in an upright position by chaining them to a fixed support or equipment cylinder rack. Lift and move cylinders with the proper equipment, procedures, and a sufficient number of people. Read and obey the directions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA). Use just the right compressed gas cylinders, regulators, hoses, and fittings for the job, and keep them and their parts in excellent working order. When opening the cylinder valve, face away from the valve outlet. When opening the valve, make sure you're not standing in front of or behind the regulator.

ARC RAYS HAZARD

The visible and invisible light (ultraviolet and infrared rays) produced by the welding or cutting process can burn the eyes and skin. Wear an

appropriate welding helmet with suitably shaded filter lenses to protect your face and eyes from welding rays. Cover any exposed skin, arms, or neck. Wear protective clothing made of flame-resistant material (leather, thick cotton, or wool). Protect people from flashes, glare, and sparks by using a safety screen or barriers.

ESD- ELECTROSTATIC DISCHARGE

During welding/cutting, an electric static charge can be produced and released into any items contacted by the welder/cutter after welding/cutting. Before touching any boards or electronic components, put on a grounded wrist strap. When storing, moving, or shipping PC boards, use proper static-proof bags and boxes.

MOVING PARTS HAZARD

Typical welding/cutting machines may include several moving elements, such as rollers and fans. Hands should be kept away from moving elements like fans. Keep a safe distance from moving parts. Keep your distance from pinch spots like drive rolls. Keep loose garments and hair out of the path of moving parts. All doors, panels, covers, and guards should be closed and secured. Only allow qualified individuals to remove doors, panels, coverings, or guards as needed for maintenance and troubleshooting. When the maintenance is performed, reinstall the doors, panels, covers, or guards before reconnecting the input power.

BATTERY EXPLOSION can cause injury.

Do not use welding machine to charge batteries or jump start vehicles that can cause explosion.

FALLING EQUIPMENT can cause injury.

Lift just the unit, not the gas cylinders, or other attachments together. Make sure you have equipment with adequate capacity to raise the unit. If you're going to relocate the unit using lift forks, be sure they're long enough to reach the other side. When working from an aerial location, keep equipment (cables and cords) out of the way of moving vehicles.

Sparks and hot metal blow out from the arc can cause injury.

Flying hot metal generated by welding can cause injury. Wear a face shield or safety goggles with side shields that are approved. Protect your skin by wearing suitable body protection. To prevent sparks from entering your ears, use flame-resistant ear plugs or earmuffs. Wear safety glasses with side shields or wear face shields.

EXPLODING INVERTER PARTS can cause injury.

When electricity is connected to inverter power sources, faulty parts can explode or cause other parts to explode. Turn off the power source and then start to service the inverters, and always wear a face shield and long sleeves to protect your body and skin.

EMF- ELECTRIC MAGNETIC FIELDS can cause fault in electrical devices such as pacemakers.

Electric magnetic fields are formed during welding or cutting, which might cause faults in electrical components or Implanted Medical Devices in the surrounding area. Those who wear pacemakers or other implanted medical devices should stay away from EMF emitted by welders/cutters. Before arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations, wearers of implanted medical devices should consult their doctor and the device manufacturer.

Welding can cause interference in electronic equipment.

Electronic equipment, such as computers and computer-driven equipment, such as robots, can be harmed by electromagnetic energy. Keep cables short, close together, and low as possible, to prevent any interference. Welding should be done far away from any sensitive electrical equipment. Ensure that this welding power source is installed and grounded in accordance with the instructions in this manual. If interference still occurs, the user should consider relocating the equipment, employing shielded cables, utilizing line filters, or shielding the workspace.

1.3 Important Safety Precautions

- Put on dry insulating gloves. Avoid touching the electrode with your bare hand. Wearing damp or damaged gloves is not permitted.
- Injuries can be caused by flying components. When servicing a unit, always wear a face shield. Put on a cap and safety glasses. Wear a welding helmet with the appropriate filter shade. Wear full bodily protection.
- The most unstable position of the equipment must not be inclined up more than 10°. Auxiliary components such as gas cylinders, wire feed units, or cooling devices may impact stability depending on the kind of equipment, and they must be considered.
- Before changing torch consumables, working on the machine, turn off the power and unplug the input plug.
- After the power is switched off, dangerous voltage remains on the input capacitors. Do not touch fully charged capacitors. Always wait 60 seconds after turning off the power before working on the machine and check the input capacitor voltage to ensure it is near zero before touching any parts.

1.4 Minimizing EMF (Electrical and Magnetic Fields) Exposure from the Welding / Cutting Circuit.

Arc welding and related processes such as gouge, plasma arc cutting, and spot welding generate an EMF field surrounding the welding circuits. Some medical devices, such as pacemakers, can be affected by EMF. Protective precautions for those who have medical implants must be implemented. For example, limit passing by or do individual risk assessments for welders. By following the relevant procedures, EMF exposure can be reduced. Twist or tape cables together, or use a cable cover, to keep them close together.

Precautions about Implanted Medical Devices

Before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating procedures, implanted medical device wearers should consult their doctor and the device manufacturer. Follow the above procedures only if your doctor has approved you.

Avoid putting your body between welding or cutting cables. Arrange the wires so that they are to one side and away from the operator. Work away from the welding power source and do not sit or lean on it. Keep your head and body as far away from the welding circuit's equipment as possible.

Work clamp should be connected to the workpiece as near to the weld or cut area as possible. Welding should not be done while carrying the welding or cutting power source or wire feeder. If you have an Implanted Medical Device in your body, you should consult your doctor before doing or going near arc welding, spot welding, gouging, or plasma arc cutting activities. Do not wrap cables around your body or coil them. It is the user's responsibility to install and operate the equipment in accordance with the manufacturer's instructions. If electromagnetic disturbances are detected, it is the user's obligation to fix the problem with the manufacturer's technical help. In other circumstances, resolving the problem may be easy by connecting the machine to the earth and the workpiece. In other circumstances, it might include building an electromagnetic screen that encloses the power source and the work area, along with applying some input filters. Cutting/welding equipment must be connected to the power source in accordance with the manufacturer's instructions. If interference occurs, further precautions, such as mains supply filtering, may be required. Shielding the supply cable of permanently installed equipment in metallic conduit or equivalent should be considered. The shielding should be electrically continuous over its whole length. The shielding should be attached to the power supply to preserve excellent electrical contact between the conduit and the power source enclosure. The user must analyze any electromagnetic concerns in the surrounding region before installing the device. The user must confirm that all other devices in the area are compatible. This may necessitate extra precautions. Where the workpiece is not tied to earth for electrical safety or because of its size and location, such as a ship's hull or constructing steel work, a connection linking the workpiece to earth may minimize emissions in some cases. The workpiece without earth increases the danger of harm to users or damage to other electrical equipment. The workpiece should be connected to earth by a direct connection to the workpiece. If direct connection is not permitted, bonding should be accomplished via adequate capacitances determined in accordance with national rules. Changing the earth circuit arrangements should be authorized only by someone who is qualified to assess whether the alterations would raise the danger of injury, such as by enabling parallel cutting/welding current return pathways, which may damage the earth circuits of other equipment. IEC 60974-9 provides additional advice, Arc Welding Equipment, Part 9: Installation and Use.

Interference concerns may be alleviated by selective screening and shielding of other cables and equipment in the direct vicinity. For some particular applications, screening of the complete cutting/welding system may be considered.

1.5 Grounding of Welding/Cutting Machines:

In an electric circuit, there is an active wire that supplies power, a neutral wire that returns the current and a 'grounding wire' that provides an additional path for electrical current to safely return to the ground in the event of a short circuit. A copper conductor is connected from the wiring system's metal rod to a set of ground connection terminals in the service panel.

Because electricity always seeks the shortest path to the earth, if the neutral wire is broken or interrupted, it is the grounding wire that provides a direct path to the ground. Because of this direct physical connection, the earth can act as the path of least resistance, preventing an appliance or person from becoming the shortest path.

Importance of Electrical Grounding

Protects Against Electrical Overloads

You may occasionally experience power surges or be struck by lightning during severe weather conditions. These occurrences may generate dangerously high levels of electricity, which can destroy your electrical appliances. By grounding the electrical system, all excess electricity is directed to the earth rather than frying the system's connected appliances. The appliances will be secure and safe from large electrical surges.

Stabilizes the Voltage Levels

Grounding the electrical system makes it easier to distribute the right amount of power to the right places. This ensures that the circuits are never overloaded and, as a result, do not blow. The earth can be regarded as a common reference point for any electrical system's voltage sources. This aids in maintaining stable voltage levels throughout the electrical system.

Earth Conducts with Least Resistance

One of the primary reasons for grounding your electrical appliances is that the earth is a great conductor, capable of carrying all excess electricity with minimal resistance. When you ground the electrical system and connect it to the earth, you are allowing excess electricity to flow somewhere without resistance rather than through you or your appliances.

Prevents Serious Damage and Death

When you fail to ground the electrical system, you endanger your appliances and even your life. When high voltage is passed through a device, it is fried and irreparably damaged. An excess of electricity can even start a fire, endangering your property and the lives of your loved ones.

Welding and Cutting Equipment Grounding

Welding/cutting machines are typically grounded via a third grounding wire connected to their electrical connections. Mobile engine-driven generator welding units should be grounded by connecting a cable from the machine's ground stud to a metal stake driven into the ground. Always follow the manufacturer's instructions for properly grounding the model being used.

Auxiliary receptacles on welding machines may or may not be protected by a ground-fault circuit interrupter (GFCI). In wet or damp areas, GFCI adapters or "pigtails" should be used. Tools,

extension cords, and other items plugged into these receptacles must be grounded or double insulated.

When connecting the work piece to the welding table, make sure the table is grounded as well (typically a cable from the table leg to the building structure). Avoid grounding to a structure that is a long distance away from the weld. Never use flammable liquid pipelines as a ground, and never use electrical conduit as a ground.

Precautions to prevent an electrical shock

To reduce the extent of live parts, ensure that all cables are in good condition, with no bare insulation or frayed wires.

Keep cables safe from vehicle traffic and other hazards so they don't get damaged, cut, or pinched.

Check that the rod electrode holder is properly insulated.

During a welding/cutting operation, always keep your hands and body dry.

Avoid standing in water, on wet surfaces, using wet hands, or wearing sweaty clothing. Never immerse energized (hot) electrode holders or torches in water.

Avoid coming into direct contact with live welding equipment and the workpiece. Connect the work or metal to a good electrical ground. Always shield yourself from the work and the ground. If performing arc welding in wet or high humidity conditions, wear appropriate protective equipment such as rubber boots and rubber pads. Wear rubber gloves beneath your welding gloves. Use an insulating mat under the operator if the welding/cutting operation must be performed on steel or another conductive material. Put the welding or cutting machine in close proximity. In the event of an emergency or an accident, the machine can be quickly turned off to cut off the power source. When not in use or on breaks, turn off the welding or cutting machine. Before leaving the cutting/welding area, disconnect the machine from the power grid. When moving from one working position to another, do not hold or move the torch/electrode holder and the Ground (Earth) return cable at the same time If the power source to the equipment has not been cut.

What should I do in case of an electric shock?

Call for medical assistance right away.

DO NOT USE YOUR "BARE HANDS" on the victim until he or she is away from the live electrical source. If an appliance or electrical equipment is the electrical source, turn off the power at the fuse box or circuit breaker panel, or, if possible, turn off the appliance or electrical equipment and unplug it. Simply turning off the equipment is insufficient.

If the electricity cannot be turned off and the victim is still in contact with the electrical source, determine whether the victim should be moved, or the wire should be pushed away from the victim (call for emergency help if the wire is a high voltage power line).

Wear dry gloves or cover your hands with cloth if you must move a victim away from a live contact, and stand on dry insulating material such as cardboard, wood, or clothes. When attempting to move the victim, ensure that you have good footing and will not slip or fall.

Move the wire or power source away from the victim or push the victim off the live electrical source with a dry piece of wood, broom, or other dry, insulating object or material.

If there is a risk of neck or spinal injuries (for example, from a fall), do not move the victim unless absolutely necessary.

If the victim is not breathing, provide artificial respiration.

If the victim's heart has stopped, perform CPR (only if you are trained in CPR).

Apply a sterile dressing to burns. There could be burns where the power source touched the victim and where the electricity exited the body (to ground). Electrical burns may appear minor on the surface, but they can be severe deep within the tissue. Maintain the victim's comfort, warmth, and rest, and keep an eye on his or her breathing.

Information Sources for Grounding

American Welding Society, ANSI Z49.1:2005 "Safety in Welding, Cutting & Allied Processes."

National Fire Protection Association, NFPA 70, "National Electrical Code", 2005.

American Welding Society, Safety and Health Fact Sheet No. 29, "Grounding of Portable and Vehicle Mounted Welding Generators", July 2004.

American Welding Society, AWS A3.0-2001, "Standard Welding Terms and Definitions"

Guide for Helmet Shade Number

When cutting or watching, use face protection (helmet or shield) with appropriate filter glasses to protect your face and eyes from arc rays and sparks (see Safety Standards). The suggested colors in the table below are offered for the convenience of the operator.

Process	Welding Current (A)	Minimum Protective Shade Size	Recommended* Shade Size
GMAW / MIG & Flux Cored Arc Welding (FCAW)	Less than 55	7	-
	55 to 155	10	11
	155 to 240	10	12
Gas Tungsten Arc Welding (GTAW)	Less than 50	8	10
	50 to 150	8	12
	150 to 500	10	14
Shielded Metal Arc Welding (SMAW)	Less than 60	7	10
	60 to 160	8	10
	160 to 250	10	12
	250 to 550	11	14
Recommendation: take a shade that is too dark to see the weld zone. Then try a lighter shade which ensures sufficient view of the weld zone without going below the minimum.			

Additional Safety Information

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

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

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

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

Safe Practices for Welding and Cutting Containers that have Held Combustibles, American Welding Society Standard AWS A6.0 from Global Engineering Documents. 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. Website: www.global.ihs.com.

Safe Practice for Occupational and Educational Eye and Face Protection, ANSI Standard Z87.1 from American National Standards Institute. Website: www.ansi.org.

❑Précautions de sécurité et les symboles (French)

Mesures de sécurité generals

Les utilisateurs d'équipement de soudage et de coupage au plasma Canaweld sont en fin de compte responsables de s'assurer que toute personne travaillant sur ou autour de l'équipement respecte toutes les mesures de sécurité. Les mesures de sécurité doivent répondre aux critères d'un équipement de soudage ou de découpe au plasma de ce type. En plus des lois habituelles sur le lieu de travail, les directives suivantes doivent être suivies. Pour assurer votre sécurité et celle des autres, lisez, respectez et conservez ces avertissements de sécurité et instructions d'utilisation essentiels. Vous êtes entièrement responsable de l'utilisation sûre du produit. Canaweld ne donne et ne peut donner aucune assurance ou garantie quant à la sécurité du produit dans votre environnement. Cet appareil n'est pas conçu pour être utilisé dans des zones résidentielles où l'alimentation électrique provient d'une source publique de basse tension. En raison des perturbations conduites et rayonnées, il peut être difficile d'assurer la compatibilité électromagnétique de l'appareil dans certaines régions. Ce produit est uniquement destiné à enlever du métal. Toute autre utilisation peut entraîner des blessures corporelles et/ou endommager l'équipement. En cas de dysfonctionnement, contactez un professionnel pour obtenir de l'aide. Tous les travaux doivent être effectués par des employés qualifiés qui connaissent le fonctionnement de l'équipement de soudage ou de découpe au plasma. Une utilisation incorrecte de l'équipement peut conduire à des circonstances dangereuses, entraînant des blessures pour l'opérateur et des dommages pour l'équipement. Toute personne qui travaille avec un équipement de soudage ou de découpe au plasma doit comprendre comment il fonctionne, où se trouvent les arrêts d'urgence, quelles sont les mesures de sécurité à respecter et comment utiliser la découpe au plasma et/ou le soudage. Utilisez des équipements de sécurité personnelle approuvés, tels que des lunettes de sécurité, des vêtements résistant aux flammes et des gants de sécurité. Évitez de porter des écharpes, des bracelets, des bagues et d'autres articles amples qui pourraient se coincer ou causer des brûlures. L'opérateur doit garantir qu'aucune personne non autorisée ne se trouve dans la zone de travail de l'équipement lorsqu'il est allumé et que personne n'est exposé à l'arc lorsqu'il est amorcé. L'environnement de travail doit être exempt de courants d'air et adapté à la tâche. Le câble de retour doit être solidement connecté et les travaux sur les équipements à haute tension ne doivent être effectués que par un électricien qualifié. Un équipement d'extinction d'incendie approprié et clairement identifié doit être à portée de main. Pendant que l'équipement est en fonctionnement, ne le lubrifiez pas et ne l'entretenez pas.

Précautions et symboles de sécurité

Avant de travailler sur la machine, lisez le manuel d'utilisation.

Lisez les informations de sécurité au début du manuel. Trouvez chaque partie à étudier dans le manuel pour bien comprendre les capacités de la machine. Respectez les manuels du propriétaire, les normes industrielles et les exigences nationales, provinciales, étatiques et locales.

DANGER!

Le symbole indique une action dangereuse qui entraînera la mort ou des blessures graves si elle n'est pas évitée. Les dangers ou risques potentiels sont représentés par les symboles qui leur sont accolés ou discutés dans le texte.

CHOC ELECTRIQUE

Le contact avec des composants électriques peut provoquer un choc électrique mortel et des brûlures graves. En utilisant un tapis isolant sec ou une couverture, isolez-vous de la pièce à travailler et de la terre. Lorsque la machine est sous tension, ne retirez pas le capot de la machine et ne touchez pas les composants ou circuits électriques sans un gant isolant sec et approprié. Un équipement mal placé ou mal mis à la terre présente un risque. Les CHOCS ELECTRIQUES peuvent causer la mort ou des blessures graves. Ne pas entrer en contact avec des composants électriques actifs. Porter des gants isolants secs et des protections corporelles non trouées. Utiliser des tapis ou des couvertures isolants secs suffisamment grands pour éviter tout contact direct avec l'ouvrage ou le sol afin de s'isoler de l'ouvrage et du sol. Si les pièces de la torche entrent en contact avec l'ouvrage ou le sol, ne pas les toucher.

Inspectez régulièrement le câble d'alimentation d'entrée et le conducteur de terre pour vérifier qu'ils ne sont pas vieillissants ou dénudés ; réparez-les rapidement s'ils sont endommagés ; les fils dénudés peuvent tuer. Lorsque vous n'utilisez pas l'appareil, éteindre tous les équipements. N'utilisez pas de câbles usés, cassés, sous-dimensionnés ou réparés. Évitez d'enrouler le câble du chalumeau autour de votre corps. Si les

codes l'exigent, connectez la pièce de travail à une bonne mise à la terre électrique (earth). N'utilisez que du matériel bien entretenu. Réparez ou remplacez les pièces cassées en même temps. Lorsque vous travaillez au-dessus du niveau du sol, utilisez un harnais de sécurité. Maintenez l'intégrité de tous les panneaux et revêtements.N'essayez pas de contourner ou de surmonter les mécanismes de sécurité. N'utilisez que les types de torche indiqués dans le manuel d'utilisation. Lorsque vous appuyez sur la gâchette, gardez vos mains de l'électrode/du bout du tungstène et de l'arc. Fixez le câble de travail à la pièce (et non à un élément qui va tomber) ou à la table de travail, aussi près que possible de la zone de soudage. Lorsqu'elle n'est pas fixée à la pièce, isolez la pince de travail pour éviter tout contact avec des objets métalliques. Avant d'inspecter, de nettoyer ou de remplacer des pièces de la torche, et avant d'installer ou de réparer cette machine, mettez-la hors tension. Installez, mettez à la terre et utilisez cet équipement conformément au manuel d'utilisation et aux lois nationales, provinciales, nationales et locales. Assurez-vous toujours que le fil de terre du cordon d'alimentation d'entrée est correctement connecté à la borne de terre et que le connecteur du cordon est fixé à une prise de courant correctement mise à la terre. Fixez d'abord le bon conducteur de mise à la terre lorsque vous établissez les connexions d'entrée. Entretenez les câbles en les gardant au sec, exempts d'huile et de graisse, et à l'écart du métal chaud et des étincelles.

Une tension continue élevée existe à l'intérieur de la machine même après l'avoir éteinte.

Même après avoir déconnecté l'alimentation d'entrée, il existe une tension continue dangereuse dans les sources d'alimentation de soudage de l'onduleur. Avant de toucher une quelconque pièce, éteignez l'onduleur, déconnectez l'alimentation d'entrée et attendez que les condensateurs d'entrée se déchargent.

RISQUE DE BRÛLURES ET DE CHOCS ÉLECTRIQUES - PORTER DES GANTS SECS ISOLÉS

Lors du remplacement des consommables, utilisez toujours des gants secs et isolés. Pendant le soudage, les consommables deviennent extrêmement chauds et des brûlures graves sont possibles. Si l'alimentation électrique est sous tension, le fait de toucher les consommables peut provoquer un choc électrique. Ne touchez jamais les parties exposées de la torche de soudage/du porte-électrode de la machine, ne changez pas ou ne nettoyez pas les consommables lorsque la machine est allumée, car la tension de choc entre les pièces sera extrêmement dangereuse, voire mortelle.

La soudure peut provoquer un incendie ou une explosion.

L'arc de soudage projette du métal chaud et des étincelles qui peuvent provoquer un incendie ou une explosion. Avant d'effectuer toute soudure, vérifiez que l'endroit est sûr. Le soudage est susceptible de déclencher un incendie ou une explosion. Retirez tous les matériaux combustibles autour de la zone de travail. Si cela n'est pas possible, utilisez des couvertures certifiées pour les recouvrir fermement. Évitez de souder dans des zones où des étincelles pourraient enflammer des matériaux combustibles. Assurez-vous que vous et les autres personnes êtes à l'abri des étincelles et du métal chaud. Sachez que les étincelles de soudage et les matériaux chauds peuvent facilement passer à travers de petits trous et interstices et atteindre les endroits environnants. Gardez un œil sur les flammes et un extincteur à proximité.Le soudage sur un plafond, un plancher, une cloison ou un mur peut provoquer un incendie sur le côté caché. Ne soudez pas sur des récipients remplis de combustible ou des récipients fermés tels que des réservoirs, des fûts ou des canalisations, à moins qu'ils n'aient été préparés de manière adéquate conformément aux normes de sécurité en vigueur.

Une fois la tâche terminée, vérifiez l'absence d'étincelles, de braises incandescentes et de flammes dans la zone. N'utilisez que les fusibles ou les disjoncteurs appropriés. Ne les surdimensionnez pas et ne les contournez pas. Tous les travaux doivent être effectués conformément aux règles de sécurité en vigueur, et un surveillant d'incendie et un extincteur doivent être disponibles. Pour éviter que les courants de soudage ne se déplacent trop longtemps, peut-être sur des parcours inconnus, et ne génèrent des chocs électriques, des étincelles et des risques d'incendie, connectez le câble de travail à l'ouvrage aussi près que possible de la zone de soudage. Ne soudez jamais sur des récipients contenant des produits potentiellement combustibles; ils doivent d'abord être vidés et soigneusement nettoyés. Ne jamais effectuer de soudage lorsque des poussières, des gaz ou des vapeurs liquides combustibles (comme l'essence) sont présents dans l'atmosphère. Il est interdit de souder des bouteilles, des canalisations ou des conteneurs sous pression. Portez des protections corporelles résistantes aux flammes et de longue durée (cuir, coton lourd, laine). Pour la protection corporelle, il est recommandé de porter des vêtements exempts d'huile, tels que des gants en cuir, une chemise épaisse, un pantalon sans revers, des bottes de travail avec une semelle isolée électriquement et un chapeau. Évitez de placer l'appareil à proximité ou sur des matériaux inflammables. Avant d'effectuer des travaux de soudage, assurez-vous que vous n'avez pas de combustibles sur vous, comme un briquet au butane ou des allumettes.

RISQUE DE BRUIT EXCESSIF

Soyez prudent s'il y a un bruit excessif sur le lieu de travail. Portez des protections auditives si le niveau sonore est trop élevé. Les travailleurs à proximité sont également touchés par le bruit et peuvent avoir besoin de protections auditives.

DANGER LIÉ AUX PIÈCES CHAUDES

Toutes les pièces soudées deviennent extrêmement chaudes immédiatement après le soudage ou le coupage, provoquant des brûlures à toute personne en contact avec la peau exposée. Après le soudage ou le coupage, ne pas toucher instantanément la pièce, la pince de masse ou le porte-électrode/la torche, et attendre un intervalle de refroidissement avant de les ramasser. Pour éviter les brûlures, utilisez un équipement approprié

lorsque vous travaillez avec des pièces chaudes, ainsi que des gants et des chiffons de soudage/coupage épais et isolants.

RISQUE DE FUMÉES DE SOUDAGE/COUPAGE

Le soudage et le coupage génèrent des gaz et des fumées. L'inhalation de ces gaz et vapeurs peut être dangereuse. Ces gaz et vapeurs peuvent remplacer l'oxygène dans le corps, ce qui peut causer des dommages ou la mort. Tenez votre tête éloignée de la zone de soudage ou de découpage et évitez d'inhaler les fumées et les gaz. Si la soudure/le découpage a lieu à l'intérieur, ventilez l'environnement ou utilisez une ventilation forcée locale sur le site de soudure pour éliminer la fumée et les gaz. Porter un appareil respiratoire à adduction d'air autorisé si la ventilation est insuffisante. Ne travaillez à l'intérieur que si vous êtes correctement ventilé ou si vous utilisez un respirateur à adduction d'air. Pour tous les matériaux utilisés, lisez la fiche de données de sécurité (FDS) et les instructions du fabricant.

RISQUE DE GAZ ET DE FUMÉES DANGEREUX

Le soudage et le coupage de métaux revêtus, comme l'acier inoxydable, ne sont pas autorisés, à moins que le revêtement n'ait été retiré de la zone de soudage ou de coupage, et que la zone soit bien ventilée et qu'un masque respiratoire à adduction d'air soit également utilisé. Pendant le soudage ou le découpage, le revêtement et tous les métaux contenant ces éléments peuvent produire des fumées nocives. Ne coupez pas les récipients qui contiennent des produits toxiques ou réactifs ou les récipients qui ont précédemment contenu des matériaux toxiques ou réactifs ; ils doivent d'abord être vidés et soigneusement nettoyés. Coupez à l'écart des processus de dégraissage, de nettoyage ou de pulvérisation. La chaleur et la lumière de l'arc peuvent se combiner aux vapeurs et produire des fumées très toxiques et désagréables.

DANGER DE GAZ DANGEREUX PROVENANT DES CYLINDRES DE GAZ DE BLINDAGE / DE COUPE

Éteignez le gaz de protection/de coupe lorsqu'il n'est pas utilisé, car ces gaz peuvent déplacer l'air, abaisser les niveaux d'oxygène et entraîner des blessures ou la mort.

RISQUE DE RAYONS DE ARC

La lumière visible et invisible (rayons ultraviolets et infrarouges) produite par le processus de soudage ou de coupage peut brûler les yeux et la peau. Portez un casque de soudage approprié avec des lentilles filtrantes convenablement ombragées pour protéger votre visage et vos yeux des rayons de soudage. Couvrez toute peau, bras ou cou exposés. Portez des vêtements de protection fabriqués dans un matériau résistant aux flammes (cuir, coton épais ou laine). Protégez les personnes contre les éclairs, l'éblouissement et les étincelles en utilisant un écran ou des barrières de sécurité.

Les CYLINDRES peuvent exploser s'ils sont endommagés.

La chaleur excessive, les chocs mécaniques, les dommages physiques, les scories, les flammes nues, les étincelles et les arcs électriques doivent être évités lors de l'utilisation des bouteilles de gaz comprimé.

Tenir les bouteilles à l'écart de tout circuit électrique ou de tout circuit de coupure ou de soudage. Ne laissez jamais une torche de soudage/un porte-électrode ou une torche à arc plasma entrer en contact électrique avec une bouteille. Une explosion se produira si vous coupez une bouteille sous pression. Lorsque la bouteille n'est pas utilisée ou fixée pour être utilisée, gardez le bouchon de protection sur le robinet. Pour éviter de tomber ou de basculer, installez et fixez les bouteilles en position verticale en les enchaînant à un support fixe ou à un support de bouteilles d'équipement. Soulevez et déplacez les bouteilles avec l'équipement et les procédures appropriés et un nombre suffisant de personnes. Lisez et respectez les instructions figurant sur les bouteilles de gaz comprimé, l'équipement associé et la Compressed Gas Association (CGA). Utilisez les bouteilles de gaz comprimé, les détendeurs, les tuyaux et les raccords qui conviennent le mieux à votre travail et maintenez-les, ainsi que leurs pièces, en excellent état de fonctionnement. Lorsque vous ouvrez le robinet de la bouteille, ne vous approchez pas de la sortie du robinet. Lorsque vous ouvrez le robinet, assurez-vous de ne pas vous tenir devant ou derrière le détendeur.

ESD-DÉCHARGE STATIQUE ELECTRIQUE

Pendant le soudage/la découpe, une charge électrique statique peut être produite et libérée dans tous les objets avec lesquels le soudeur/la découpe entre en contact après le soudage/la découpe. Avant de toucher des cartes ou des composants électroniques, mettez un bracelet relié à la terre. Lorsque vous stockez, déplacez ou expédiez des cartes PC, utilisez des sacs et des boîtes antistatiques appropriés.

RISQUE D'EXPOSITION À DES PIÈCES EN MOUVEMENT

Les machines de soudage/coupage typiques peuvent comprendre plusieurs éléments mobiles, tels que des rouleaux et des ventilateurs. Les mains doivent être tenues à l'écart des éléments mobiles comme les ventilateurs. Gardez une distance de sécurité avec les pièces en mouvement. Restez à distance des points de pincement comme les rouleaux d'entraînement. Gardez les vêtements amples et les cheveux hors de la trajectoire des pièces mobiles. Toutes les portes, panneaux, couvercles et protections doivent être fermés et sécurisés. Ne permettez qu'à des personnes qualifiées de retirer les portes, panneaux, couvercles et protections doivent être fermés et sécurisés. Ne permettez qu'à des personnes qualifiées de retirer les portes, panneaux, couvertures ou protections si nécessaire pour la maintenance et le dépannage. Une fois l'entretien effectué, réinstallez les portes, panneaux, couvertures ou protections avant de reconnecter l'alimentation d'entrée.

L'EXPLOSION DE LA BATTERIE peut causer des blessures.

N'utilisez pas la machine à souder pour charger des batteries ou démarrer des véhicules, car cela pourrait provoquer une explosion.

LA CHUTE D'UN ÉQUIPEMENT peut causer des blessures

Ne soulevez que l'unité, et non le train de roulement, les bouteilles de gaz ou autres accessoires, à l'aide de l'anneau de levage. Assurez-vous de disposer d'un équipement d'une capacité suffisante pour soulever l'unité. Si vous devez déplacer l'appareil à l'aide de fourches de levage, assurez-vous qu'elles sont suffisamment longues pour atteindre l'autre côté. Lorsque vous travaillez depuis un emplacement aérien, gardez l'équipement (câbles et cordons) hors de la trajectoire des véhicules en mouvement.

Les étincelles et les projections de métal chaud provenant de l'arc peuvent causer des blessures.

Les projections de métal chaud générées par le hachage et le meulage peuvent causer des blessures. Portez un écran facial ou des lunettes de sécurité avec écrans latéraux homologués. Protégez votre peau en portant une protection corporelle appropriée. Pour éviter que les étincelles ne pénètrent dans vos oreilles, utilisez des bouchons d'oreille ou des protège-oreilles résistant aux flammes. Portez des lunettes de sécurité avec des écrans latéraux ou des écrans faciaux.

L'EXPLOSION DES PIÈCES DE L'INVERSEUR peut provoquer des blessures.

Lorsque l'électricité est connectée aux sources d'alimentation des onduleurs, les pièces défectueuses peuvent exploser ou provoquer l'explosion d'autres pièces. Coupez la source d'alimentation et commencez à entretenir les onduleurs, et portez toujours un écran facial et des manches longues pour protéger votre corps et votre peau.

Les champs électromagnétiques peuvent provoquer des défaillances dans les appareils électriques tels que les stimulateurs cardiaques.

Des champs électromagnétiques se forment pendant le soudage ou le découpage, ce qui peut provoquer des défaillances dans les composants électriques ou les dispositifs médicaux implantés dans la zone environnante. Les personnes qui portent des stimulateurs cardiaques ou d'autres dispositifs médicaux implantés doivent rester à l'écart des CEM émis par les soudeurs/coupeurs. Avant toute opération de soudage à l'arc, de soudage par points, de gougeage, de découpe à l'arc plasma ou de chauffage par induction, les porteurs de dispositifs médicaux implantés doivent consulter leur médecin et le fabricant du dispositif.

La soudure peut provoquer des interférences dans les équipements électroniques

Les équipements électroniques, tels que les ordinateurs et les équipements pilotés par ordinateur, comme les robots, peuvent être endommagés par l'énergie électromagnétique. Gardez les câbles courts, proches les uns des autres et aussi bas que possible, pour éviter toute interférence. Le soudage doit être effectué loin de tout équipement électrique sensible. Assurez-vous que cette source de courant de soudage est installée et mise à la terre conformément aux instructions de ce manuel. Si les interférences persistent, l'utilisateur doit envisager de déplacer l'équipement, d'utiliser des câbles blindés, des filtres de ligne ou de protéger l'espace de travail.

Mesures de sécurité importantes

- Mettez des gants isolants secs. Évitez de toucher l'électrode à main nue. Le port de gants humides ou endommagés est interdit.
- Des blessures peuvent être causées par la projection de composants. Lors de l'entretien d'un appareil, portez toujours un écran facial. Mettez une casquette et des lunettes de sécurité. Portez un casque de soudage avec la teinte de filtre appropriée. Portez une protection corporelle complète.
- La position la plus instable de l'appareil ne doit pas être inclinée vers le haut de plus de 10°. Les composants auxiliaires tels que les bouteilles de gaz, les unités d'alimentation en fil ou les dispositifs de refroidissement peuvent avoir un impact sur la stabilité selon le type d'équipement, et il faut en tenir compte.
- Avant de changer les consommables de la torche, de travailler sur la machine, mettez-la hors tension et débranchez la fiche d'entrée.
- Après la mise hors tension, une tension dangereuse subsiste sur les condensateurs d'entrée. Ne pas entrer en contact avec des condensateurs complètement chargés. Attendez toujours 60 secondes après avoir coupé le courant avant de travailler sur la machine, et vérifiez que la tension du condensateur d'entrée est proche de zéro avant de toucher une quelconque pièce.

Minimiser l'exposition CEM (champs électriques et magnétiques) du circuit de soudage / coupage.

Le soudage à l'arc et les procédés connexes tels que le découpage à la gouge, le découpage au plasma et le soudage par points génèrent un champ électromagnétique autour des circuits de soudage. Certains dispositifs médicaux, comme les stimulateurs cardiaques, peuvent être affectés par les CEM. Des précautions de protection doivent être prises pour les personnes qui ont des implants médicaux. Par exemple, il faut limiter le passage ou procéder à une évaluation individuelle des risques pour les soudeurs. En suivant les procédures appropriées, l'exposition aux CEM peut être réduite. Torsadez ou scotchez les câbles ensemble, ou utilisez un cache-câble, pour les maintenir proches les uns des autres.

Précautions concernant les dispositifs médicaux implantés: Avant d'effectuer ou de s'approcher de procédures de soudage à l'arc, de soudage par points, de gougeage, de découpe au plasma ou de chauffage par induction, les porteurs de dispositifs médicaux implantés doivent consulter leur médecin et le fabricant du dispositif. Ne suivez les procédures ci-dessus que si votre médecin vous a donné son accord.

Évitez de mettre votre corps entre les câbles de soudage ou de coupe. Disposez les câbles de manière à ce qu'ils soient sur le côté et loin de l'opérateur. Travaillez loin de la source de courant de soudage et ne vous asseyez pas ou ne vous appuyez pas dessus. Gardez votre tête et votre corps aussi loin que possible de l'équipement du circuit de soudage. La pince de travail doit être reliée à la pièce à souder aussi près que possible de la zone de soudure ou de coupe. Le soudage ne doit pas être effectué en portant la source de courant de soudage ou de coupe ou le dévidoir de fil. Si vous avez un dispositif médical implanté dans votre corps, vous devez consulter votre médecin avant d'effectuer ou de vous approcher d'activités de soudage à l'arc, de soudage par points, de gougeage ou de découpe à l'arc plasma. N'enroulez pas les câbles autour de votre corps et ne les enroulez pas.

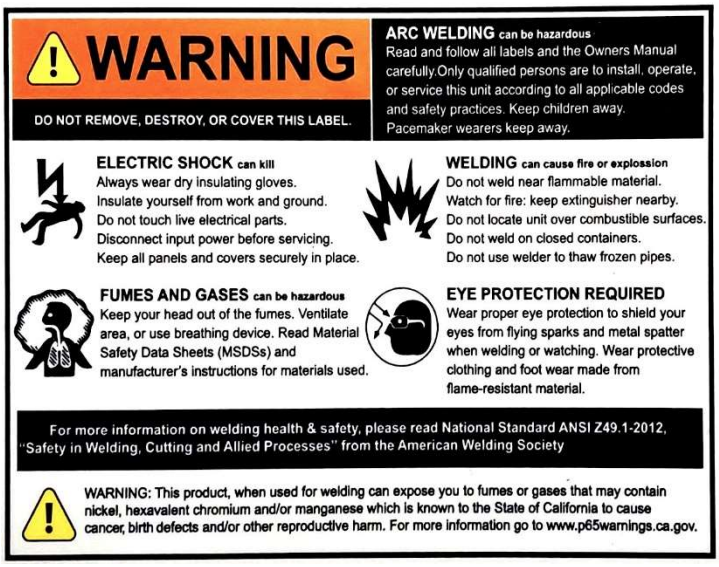
Il est de la responsabilité de l'utilisateur d'installer et d'utiliser l'équipement plasma conformément aux instructions du fabricant. Si des perturbations électromagnétiques sont détectées, il est de l'obligation de l'utilisateur de résoudre le problème avec l'aide technique du fabricant. Dans d'autres circonstances, il peut être facile de résoudre le problème en reliant la machine de découpe à la terre et à la pièce de travail. Dans d'autres circonstances, il peut s'agir de construire un écran électromagnétique qui entoure la source d'énergie et la zone de travail, ainsi que d'appliquer certains filtres d'entrée.

Les équipements de coupe doivent être connectés à la source d'alimentation conformément aux instructions du fabricant. Si des interférences se produisent, des précautions supplémentaires, telles que le filtrage de l'alimentation secteur, peuvent être nécessaires. Le blindage du câble d'alimentation de l'équipement de coupe installé en permanence dans un conduit métallique ou équivalent doit être envisagé. Le blindage doit être électriquement continu sur toute sa longueur. Le blindage doit être fixé à l'alimentation électrique du matériel de coupe afin de préserver un excellent contact électrique entre le conduit et le boîtier de la source d'alimentation. L'utilisateur doit analyser tout préoccuper électromagnétique dans la région environnante avant d'installer l'appareil. L'utilisateur doit confirmer que tous les autres appareils de la région sont compatibles. Cela peut nécessiter des précautions supplémentaires. Lorsque la pièce de travail n'est pas reliée à la terre pour des raisons de sécurité électrique ou en raison de sa taille et de son emplacement, comme la coque d'un navire ou la construction d'un ouvrage en acier, une connexion reliant la pièce de travail à la terre peut minimiser les émissions dans certains cas. La pièce de travail sans mise à la terre augmente le risque de blessures pour les utilisateurs ou de dommages pour d'autres équipements électriques. La pièce de travail doit être reliée à la terre par une connexion directe à la pièce de travail. Si la connexion directe n'est pas autorisée, la mise à la terre doit être réalisée par des capacités adéquates déterminées conformément aux règles nationales.

La modification des dispositions du circuit de terre ne doit être autorisée que par une personne qualifiée pour évaluer si les modifications augmentent le risque de blessure, par exemple en activation des voies de retour de courant de coupe parallèles, qui peuvent endommager les circuits de terre d'autres équipements. La norme CEI 60974-9 fournit des conseils supplémentaires, Matériel de soudage à l'arc, partie 9 : Installation et utilisation. Les problèmes d'interférence peuvent être atténués par le blindage sélectif d'autres câbles et équipements situés à proximité directe. Pour certaines applications, le blindage de l'ensemble du système de découpe au plasma peut être envisagé.

1.6 Warning Label

This power supply has this warning notice attached to it. It is critical that the operator and maintenance professional comprehend the meaning of these warning symbols.



❑Introduction

Thank you for buying our product. In order to get the best performance out of the equipment and ensure the maximum lifespan of its parts, the use and maintenance instructions contained in this manual must be read and strictly complied with, as well as the safety instructions. They will help you to avoid potential hazards that may exist when working with this product or on the worksite. If repairs to the equipment are required, we recommend that our clients contact our service center workshops, as they have the necessary equipment and personnel that are specifically trained and constantly updated.
Please note that our machines and equipment are constantly developed and so changes may be made in terms of their construction and features.

❑Description

Our new stud welding equipment is carefully constructed of the finest components and materials available. Used properly, this equipment will give you years of efficient service.
The system incorporates the latest in engineering advances, for completely reliable welding of mild steel, stainless steel, aluminum, copper and lead-free brass fasteners.
You have purchased a product which:

- Conforms to machinery directives 2006/42/EC
- Conforms to low voltage directives 2006/95/EC
- Complies IEC 60974 for ARC welding equipment
- Conforms to IPC-A-610-Class II
- RoHS Compliant 2002/95/EC

The CAD 81 is a capacitor discharge stud welder which utilizes a bank of charged capacitors to provide the energy needed for the welding process. The stored energy is discharged at the base of the specially designed CD stud and it fuses the stud to the base material.
The CAD 81 capacitor discharge stud welding device, allows for the welding of pins and threaded studs ranging from M3 to M8. These studs can be made of steel, stainless steel, aluminum and brass. The welding process is carried out in accordance with DIN EN ISO 13918.

The principal characteristics of a welding unit are:

- ✓ Equipped with microprocessor control
- ✓ Weld Range: US Stud Size #4 – 5/16", Metric Stud Size (M3-M8), Stud diameter 0.112" – 0.312"
- ✓ Input power 115/230V, 50,60 Hz (internally switchable)
- ✓ Self-monitoring of all important functions
- ✓ Diagnostic LEDs
- ✓ Table on the front panel indicating standard values for various stud diameter
- ✓ 81000UF capacitance
- ✓ Portable, only weigh 25 lbs
- ✓ Ergonomic design
- ✓ Dual ground cable
- ✓ Enhanced Duty Cycle
- ✓ To accommodate fasteners that are up to 3 inches long

❑Technical data

The general technical data of the system is summarized in Table 1.

Description	CAD 81 Stud Welding System
Welding procedure	Capacitor discharge stud welding
Standard gun	INC-C1 (contact gun) INC-G1 (gap gun)
Welding range	M3 to M8
Welding material	Mild steel, stainless steel, aluminum and brass
Welding rate	Up to 20 studs/min (with M3)
Capacitance	81000 µF
Welding time	1 to 3ms
Charging voltage	50 to 195VDC (Adjustable)
Primary power	230V/115V, 50/60HZ (Internally switchable)
Fuse	2 x 20A slow blow, 250 V
Cooling type	Fan
IP code	IP 21S
Dimensions (DxWxH)	12x12x5 inch (305x305x127 mm)
Weight	25 lbs (11.3 Kg)

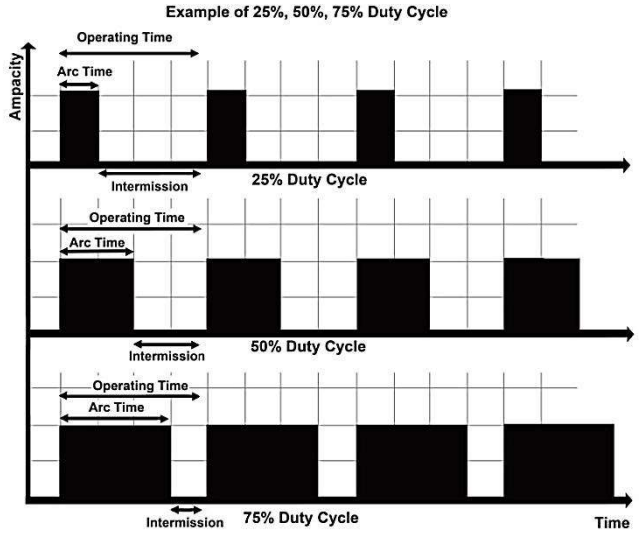
Table 1

NOTE: CANAWELD is always striving to produce the best possible products and improving the quality. Therefore, reserves the right to change, improve or revise the specifications or design of this or any product without prior notice. Such updates or changes do not entitle the buyer of equipment previously sold or shipped to the corresponding modifications, updates, improvements, or replacement of such items. The values specified in the table above are optimal values, your values may differ. Individual equipment may vary from the above specifications due in part, but not exclusively, to any one or more of the following: variations or changes in manufactured components, installation and conditions and power grid supply conditions.

❑Usage limits

The use of a welder is typically discontinuous, in that it is made up of effective work periods (welding) and rest periods (for the positioning of parts, the replacement of stud and etc. This welder is dimensioned to supply a I2 max nominal current in complete safety for a period of work of X% of the total usage time. The regulations in force establish the total usage time to be 10 minutes. The work cycle is considered to be X% of this period of time. When the work cycle permitted is exceeded a trip switch trips, which protects the welding machine's internal components against dangerous overheating and prevents incorrect functioning of the machine (After several minutes the overheat cut-off rearms automatically and the welder is ready for use again (Automatic reset error). This equipment is built to have a protection level of IP 21 S.
The criteria for rating special stud welding power sources differ from those of conventional arc welding machines. This is because stud welding necessitates a high current for a relatively short duration, as a result the current output requirements for a stud welding power source are higher, but the duty cycle is significantly lower compared to other types of

arc welding machines. The duration of a stud weld cycle is generally less than one second. For example, when a machine can be operated 20 times per minute, at rated load without causing its components to exceed their maximum allowable temperatures, then the machine has a 34 percent duty cycle rating.



❑Transporting

This device can be easily transported due to its light weight. When transporting the device, ensure that it cannot be damaged, proper packaging can protect the device from weathering effects, particularly moisture.

Warning: do not touch live electrical parts. Disconnect input power cord before moving unit.

❑Open the packaging

Based on the available models of the machine the parts can be as follows:

- CAD 81 stud weld unit
- C1 contact gun
- carrying case
- 1/8" Allen wrench
- tubular box spanner 13*17
- two ground cables
- M3, M4, M5, M6 stud chuck
- Operating manual

Upon receiving the system:

- Remove the welding generator and all relevant accessories components from their packaging.
- Check that the weld machine is in good condition, if not report any problems immediately to the seller-distributor.
- Make sure all ventilation grilles are open and that no foreign bodies are blocking the air circulation.

❑Installation and connections

The installation site for the system must be carefully chosen in order to ensure its satisfactory and safe use. The user is responsible for the installation and use of the system in accordance with the producer's instructions contained in this manual. Before installing the device, the user must take into consideration the potential electromagnetic problems in the work area. In particular, we suggest that you should avoid installing the system close to:

- Signaling, control and telephone cables.
- Radio and television transmitters and receivers.
- Computers and control and measurement instruments.
- Security and protection instruments.

Select a site for the equipment that is capable of supporting its weight, ensure that the site is clear from traffic routes where people may trip over cables or where the equipment may be damaged by other equipment or vehicles. Avoid hanging connecting cables over sharp edges or placing them near heat sources.

Persons fitted with pace-makers, hearing aids and similar equipment must consult their doctor before going near a machine in operation. The equipment's installation environment must comply to the protection level of the frame i.e. IP 21 S (IEC 60529 publication). The system is capable of working in environments where working conditions are particularly hard.

This system is cooled by means of the forced circulation of air, and must therefore be placed in such a way that the air may be easily sucked in and expelled through the apertures made in the frame.

The equipment must be assembled as follows:

- Connect the welding machine to the utility line.
- Connect up the welding cables.

General requirements for work area:

- Ensure a clear, well lit work area with unrestricted movement for the operator.
- Only install the stud welder on an even surface. The four anti-vibration pads located on the bottom of the stud welder guarantee its anti-skid position and serve as vibration dampers.
- The work area should be well ventilated, as welding emits fumes which can be dangerous.
- Always maintain easy access to the ON/OFF switch of the welder, and the electrical mains supply.
- Do not expose the welder to rain and do not operate in damp or wet locations.
- The stud welder should not be place in close proximity to any high frequency welding equipment, share a common ground and/or common power supply. Doing so could damage sensitive electronics and will void the stud welder's warranty.
- Install the stud welder close to the welding location.
- The electrical connecting cable used for mains operation is of adequate length. Additional extension cables cause a voltage drop, possibly leading to unit disturbances.
- Do not use extension cords unless approved by the manufacturer.
- Ensure sufficient ventilation of the working room when operating the system.
- The housing of the stud welder CAD 81, corresponds to safety class IP21S, as per IEC60974-1, please note that

this protection system is not appropriate for operating the device in rainy conditions.

Where welding must be undertaken in environments with increased risk of electric shock, confined spaces or in the presence of flammable or explosive materials, it is important that the environment be evaluated in advance by an “expert supervisor”. It is also recommended that welding in these circumstances be carried out in the presence of persons trained to intervene in emergencies.

❑Connecting the welding machine to the utility line

Connection of the machine to the user line (electrical current) must be performed by qualified personnel.

Before connecting the welding machine to the mains power supply, **make sure that rated voltage and frequency correspond to those provided by the mains power supply** (see the rating label on welding machine and check input voltage available at site) and that the welding machine’s power switch is turned to “O”. The three pole cable supplied with the system must be used for the connection to the mains power supply. This cable is made up:

- Two conductors that are used to connect the machine to the power supply.
- The third, which is YELLOW GREEN, is used for making the “GROUND” connection.

Connect a suitable load of normalised plug (2p + e) to the power cable and provide for an electrical socket complete with fuses or an automatic switch. The ground terminal must be connected to the ground conducting wire (YELLOW- GREEN) of the supply.

CAD 81 stud welding machine can also work at 115VAC and 230VAC, **but please note that this will require changes to be made inside the device.**

Model	CAD 81
Primary power	230V/115V, 50/60HZ
Main's fuse*	2 x 20A,250V, slow blow
Charging fuse	10A, 250V, slow blow
Control fuse	2A, 250V, slow blow
Fuse for fan	2A, 250V, slow blow

Table 2

*Always replace fuses with the correct replacement value, do not use oversized fuses that may damage the unit. Always disconnect the stud welder from the mains power supply when replacing fuses or servicing the stud welder.

Improving the Input Supply Network:

In case the input supply voltage network is not stable, improve it, if possible, Such as:

- Reduce the number of powerful electrical devices operating simultaneously, using the same power supply.
- Increase the cross section of power supply cable in the event of a significant voltage drop. Consult an electrician for the cable cross section calculation.
- If possible, ask your workshop electricity supplier, change the tap of your power transformer network and decrease or increase your network input voltage, and receive a stable voltage for all appliances in your workshop.

❑ Capacitor discharge stud welding

Principles of Operation: Capacitor discharge stud welding derives its heat from an arc produced by the rapid discharge of electrical energy stored in a bank of capacitors. According to ISO 14555, there are two different techniques for capacitor discharge stud welding with tip ignition: the contact method and the gap method. These methods primarily differ in the way the arc is initiated.

In contact welding method, the stud is inserted into the stud holder of the machine (**Fig. 1**,(1)) and positioned so that its ignition tip is directly on the surface of the component (**Fig. 1**,(2)). A spring in the welding gun presses the stud against the metal. Once the capacitor power has been switched on, the ignition tip abruptly explodes and vaporizes partially and the arc is generated (**Fig. 1**,(3)). The stud is advanced still further towards the parent material and finally remains in the solidified melt (**Fig. 1**,(4)). The time period between the ignition of the arc and the solidification of the weld pool is approximately 3ms. The use of contact welding is not recommended for rapidly oxidizing materials such as aluminum and aluminum alloys. This is because the arcing period is longer with contact welding compared to gap stud welding. The contact method is used only for welding mild steel studs.

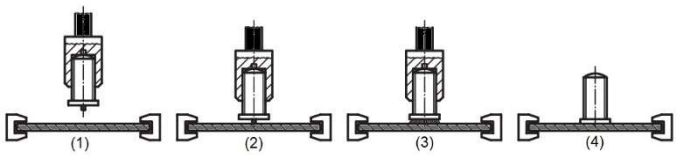


Fig. 1

The main difference between welding with gap and the technique described above is that, prior to starting the welding process, the stud is positioned at a specific and adjustable distance from the workpiece (**Fig. 1**,(1)). The solenoid, which is integrated into the welding gun INC-G1, lifts the welding element from the workpiece to an adjusted value above the workpiece and tensions a pressure spring. When the capacitor bank is switched on, the stud accelerates towards the metal surface, and the welding process continues as described above (**Fig. 1**,(2,3,4)).

A welding time of about 1ms makes it possible to weld aluminum and its alloys without gas shielding. It is also suitable for welding mild steel and stainless steel.

One of the capabilities of the capacitor discharge method is its ability to weld studs onto thin sections. Materials as thin as 0.75mm can be welded without burning through. With the CANAWELD CAD 81 stud welding device, pins and threaded studs ranging from M3 to M8 as well as various weld fasteners made of steel or stainless steel can be welded in accordance with DIN EN ISO 13918.

Stud Materials: The materials commonly used for capacitor discharge stud welding are low carbon steel, stainless steel, aluminum, and brass. Low carbon steel and stainless steel studs generally have the same compositions as those used for

arc stud welding. For aluminum, the commonly used alloys are the 1100 and 5000 series. Copper alloy studs are primarily made of compositions No.260 and No.268.

Stud Designs: The designs for capacitor discharge stud welding studs vary standard shapes to complex forms for special applications. The size range of theses studs is 1/16 to 1/2 inch (1.6 to 12.7mm) in diameter. The contact and gap capacitor discharge studs are designed with a tip or projection at the weld end. The size and shape of the tip is important; the standard tip is cylindrical in shape (see ISO 13918).

Material Welded: In general, the same metal combinations that can be joined by the capacitor discharge method can also be welded. These combinations include carbon steel, stainless steel, and aluminum alloys. The typical combination of base metal and stud metal are shown in the **Table 3** (according to ISO 14555)

Stud material	Parent material				
	ISO/TR 15608 material groups 1 to 6, 11.1	ISO/TR 15608 material groups 1 to 6, 11.1 and galvanized and metal coated steel sheet, maximum thickness 25 µm of coating	ISO/TR 15608 material group 8	Copper and lead free copper alloys, e.g. CuZn37 (CW508L)	ISO/TR 15608 material groups 21 and 22
S235 4.8 (weldable)	highly weldable for any application[a]	weldable within limits[b]	highly weldable for any application[a]	weldable within limits[b]	not weldable
1.4301 1.4303	highly weldable for any application[a]	weldable within limits[b]	highly weldable for any application[a]	weldable within limits[b]	not weldable
CuZn37 (no ISO standard available)	weldable within limits[b]	weldable within limits[b]	weldable within limits[b]	highly weldable for any application[a]	not weldable
EN AW-Al99,5	not weldable	not weldable	not weldable	not weldable	weldable within limits[b]
EN AW-AlMg3	not weldable	not weldable	not weldable	not weldable	highly weldable for any application[a]

[a] For example, for force transfer.
[b] For force transfer.

Table 3

❑ Overview of the controls

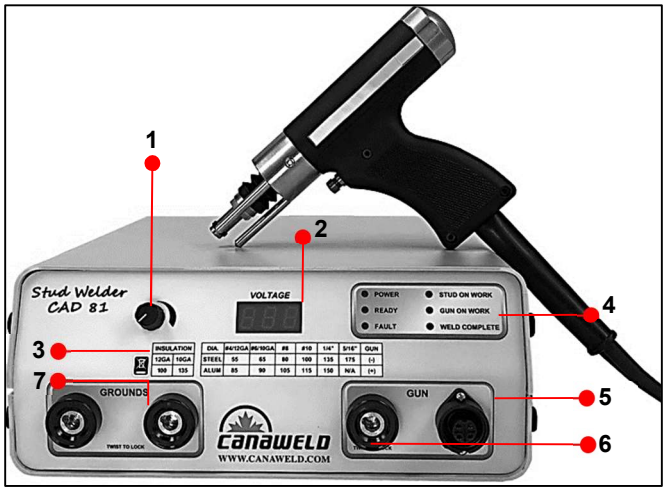


Fig. 2: overview of the front panel

item	Description
1	Welding voltage control knob
2	Welding voltage display
3	The following table provides support for determining the appropriate charging voltage
4	Display of operating states
5	Control cable socket
6	Welding cable socket
7	Ground cable socket

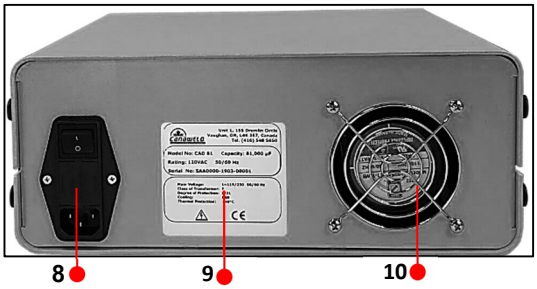


Fig. 3: overview of the rear panel

item	Description
8	Mains switch and mains plug
9	Rating plate
10	Fan

- **Welding voltage control knob:** The voltage control knob is located on the front of the stud welder. This knob is used to increase or decrease the capacitor charge voltage. Refer to the chart on the front of the stud welder to determine the approximate voltage for different fastener diameters.
  Turning the knob clockwise will increase the voltage, while turning it counter-clockwise will cause the stud welder to discharge excess voltage to internal resistors and recharge to a lower setting.

WARNING: Repeatedly charging and discharging the capacitors quickly using the voltage control knob may damage the unit. It is important to allow the unit's internal fan sufficient time to cool the resistors after discharge.

- The CAD 81 Stud Welding System is equipped with seven indicator displays:
  - **Charge voltage:** This three-panel red digital LED displays the actual charge voltage on the capacitor bank.
  - **The "Power" on light** is an AMBER single LED that indicates when the power switch is turned on and connected to the mains.
  - The **"Capacitors at charge"** ready light is a single green LED, this LED indicates that the capacitor has successfully charged to the correct voltage, as determined by the voltage selection knob.
  - **Fault light:** This red LED indicates a fault with the stud welder. A steady light indicates that the safety circuit has been activated. A flashing light indicates that the transformer has overheated.
  - The green **"Stud on work surface"** light is used to indicate a complete electrical path from the stud to the welding system. When this light is activated, the unit is ready to weld a fastener. This indicator is specially used in contact welding mode.
  - The green **"Foot on work surface"** indicator light is used to show that there is a complete electrical path from the gun foot piece to the welding system. When this light is on, it means that the unit is ready to weld a fastener in gap mode.

Note: The operator will notice that when welding with a CANAWELD INC-G1 gap gun, the "stud on work surface" LED will be initially activated. Then, when the trigger is pulled, the "foot on work surface" LED will be activated. When using a CANAWELD INC-C1 contact gun, only the "stud on work surface" LED will be activated.

- **Weld Complete Light:** The GREEN "Weld Complete" indicator is a momentary LED that activates at the end of the weld cycle, once the gun is removed from the welded fastener. This LED indicates that the weld has been successfully completed, with the selected energy being fully discharged within the specified time frame.

- **Voltage Table:** The voltage table located on the front panel of the stud welder provides approximate voltage settings for steel and aluminum fasteners. These numbers serve as starting values, and the actual voltage should be adjusted accordingly for your specific application. It's important to note that the provided voltages are for "flanged" fasteners. For mini-flange, DIN, or non-flanged fasteners, the voltages will be lower.
- The **control cable connector** of the welding pistol attaches to a four-pin connector located on the front of the stud welder. This connector provides the gun trigger signal and “foot on work” indicator for gap mode welding.
- **Welding cable connector**: The welding pistol's weld cable connector attaches to the front of the unit in the gun connector socket. Insert the connector into the socket and twist it clockwise to tighten. Make sure the connector is tightly.
- **Ground cable connector:** There are two ground cable connectors on the front of the CAD 81 Stud Welding System. Insert each cable connector into the ground socket and twist it clockwise to tighten. Ensure that these connectors are securely fastened. These cables serve as the return path for the welding current. To achieve proper grounding, connect each ground cable to the workpiece. Whenever possible, weld between the ground cables to minimize the impact of "arc blow" on the weld quality.
- **Mains switch:** The mains switch is located at the rear of the stud welding unit and is used to turn the stud welder on and off.
- The **rating plate** is located on the rear side of the stud welder. It contains information regarding the manufacturers name, address, country of origin, product designation, method of welding, date of manufacture, production number and main connection values.

❑Connection of the stud welding unit

After installation, connect the stud welding device to the power supply using the mains plug. The main power switch and plug are located at the back of the unit.

Note: Do not use an extension cord with this unit.

All connection sockets and operating elements are easily accessible on the front panel of the stud welding unit. Connect the stud welding pistol and the ground cables to the stud welder as shown in **Fig. 2: overview of the front panel**.

- Connect the ground cables to the specified ground sockets. Rotate the connectors in a clockwise direction until they stop. Proceed to attach the quick clamps to the work piece. Attach the welding ground clamps to the workpiece at approximately 180 degrees from each other. This will help prevent arc blow during welding.

Note: Remove paint, oil and other impurities, as well as rust and non-conductive coating from both the welding surface and the contact points of the ground clamps.

Note: The stud welding unit must be switched off before making any connections.

- Connect the welding cable of the stud welding pistol into the indicated socket. Turn the connector clockwise until it stops. Then, connect the control cable connector into the four-pin socket. Finally, turn the screw connector on the outside of the plug to secure it to the socket.

Note: Only loosely made connections will result in damage to the plug connectors.

The length of the welding cable, which includes both the gun and ground cables, as well as the size of the cable, are very important in stud welding. There is a significant power loss in the welding circuit caused by using either excessively small or too long welding cables. The length of the weld cable used also affects the heat. It is important to always use the supplied cables; otherwise, the welding arc becomes too erratic.

- The stud welder must be switched off when installing the stud chuck. To place the stud in the chuck, loosen the backstop screw until the fastener extends about 1/16 to 1/8 inch (1.5 - 3mm) from the front of the chuck. Then, tighten the backstop locking nut to maintain this position. If the fasteners are longer than 1-½ inch, fully loosen the backstop to ensure maximum engagement in the chuck.

Fig. 4

- If you are welding aluminum, the gun setup should be as shown in **Fig. 5** First follow the instructions for **Fig. 4** Then fully insert the chuck into the gun and tighten the chuck-locking nut. Loosen the two legs by releasing the four set screws on the faceplate. Adjust the legs so that only the flange (approximately 1/32 inch or 0.79mm) of the fastener is visible beyond the brass ring. Tighten the four set screws on the legs. lastly, adjust the spring pressure using the slot screw at the rear of the gun. The pressure should be set to a positive number.

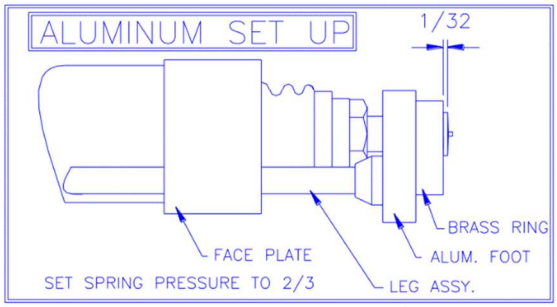


Fig. 5

- If you are welding mild (carbon) or stainless steel, the gun setup will be as shown in **Fig. 6**. First, follow the directions in **Fig. 4**. Then, fully insert the chuck into the gun and tighten the chuck-locking nut. Loosen the two legs by releasing the four set screws in the faceplate. Adjust the legs so that approximately 3/32 inch or 2.4mm of the fastener is visible beyond the brass ring. Tighten the four set screws in the legs. Finally, adjust the spring pressure at the slot screw in the rear of the gun. The pressure should be set to a negative number. With these steps completed, the gun setup is now finished.

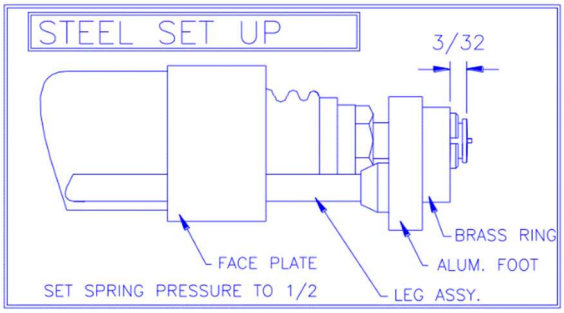


Fig. 6

❑Welding parameters

After verifying that the welding power source is installed and your weld gun is setup properly for your application, the final step is to adjust the stud welding machine to the proper setting.
First, turn the welding voltage control knob to the minimum setting, and then switch on the mains switch. This will power all LEDs and perform a quick diagnostic check. Next, the amber LED will illuminate, indicating the line voltage (115VAC or 230VAC). On the front panel, the digital LED will display the charge voltage. Once the charge voltage is reached, the "ready" LED will light up. Adjust the charging voltage using the front panel knob. Refer to the table on the front panel to determine the approximate voltage setting for the chosen fastener. The charging voltage to be set on the stud welding device depends on the following factors:

- Material of the workpiece
- Thickness of the workpiece
- Material of the welding stud
- Diameter of the welding stud

the charging voltage can be adjusted using the control knob on the display. The table on the front panel of the CAD 81 Stud Welding system provides standard values for welding fasteners of different sizes. The charge voltage is selected based on the fastener's diameter. However, please note that the estimated voltages listed below are only applicable to "flanged" fasteners and may not be suitable for mini-flange, DIN, or non-flange fasteners. Therefore, it is important to adjust the voltage according to your specific application.

Table 4

Diameter	#4/12GA	#6/10GA	#8	#10	1/4"	5/16"	GUN
Steel	55	65	80	100	135	175	**-**
Aluminum	85	90	105	115	155	NA*	**+**

In the chart above, "GUN" indicates the spring pressure setting on the CANAWELD INC-G1 gap gun. "-" indicates a decrease in spring pressure on the gun spindle, while "+" indicates an increase in spring pressure on the gun spindle. This increase in spring pressure results in greater velocity at the moment the weld is made. The chart setting shown above are reference settings that should be used as starting points.
Position the weld pistol with a fastener in the gun on the work piece. The "stud on work" LED will be illuminated. Depress the trigger on the welding gun. In gap mode only, the "foot on work" light will activate. Pull the trigger rapidly to discharge the unit. After the stud is welded, remove the gun from the stud by pulling it away perpendicularly from the work surface. The "weld complete" light will momentarily activate, and the unit will begin recharging. Once the unit is successfully recharged, the "ready" light will turn on. In order to achieve optimal stud welding results, it is necessary to carry out test welds with different settings.

❑Reverse polarity

Sometimes, it may be beneficial to use reverse polarity during stud welding. Reverse polarity is often recommended when welding to brass material or through galvanized materials.
Normally, straight polarity is used in stud welding. In straight polarity the work surface is the positive electrode and the stud is negative. Current flows from the negative electrode to the positive electrode. Typically, the positive electrode runs approximately 20% hotter than the negative electrode. This increase in temperature is caused by the electron bombardment on the positive electrode. Using straight polarity concentrates the heat on the work and provides maximum penetration into the base material. Reverse polarity is used to enhance the welding of galvanized steel because the current flows from the work surface to the stud. This current direction has a tendency to lift off and expel impurities from the work surface thereby providing a stronger weld. To initiate reverse polarity welding with the CAD 81 Stud Welding System, start by unplugging all weld cables from the unit. Next, plug the gun weld cable into one of the ground sockets. leaving the other ground socket empty. Connect one ground cable to the gun weld cable connector. Alternatively, you can contact CANAWELD INC for a "Y" connector to use two ground cables in this setup. This will ensure that the current flows from the ground to the gun.

❑CNC interface

If your CAD 81 Stud Welding System has already been configured for automatic capability, you will find a 15-pin sub-miniature "D" connector on the rear of the unit. This connector provides inputs and outputs for automation purposes. The following signals are provided:

- Start external (pins 1 and 6)
- Signal indicating that the capacitors are charged (pins 4 and 9)
- Stud onto workpiece signal (pins 3 and 8)
- Fastener reload signal (pins 2 and 7)
- Weld complete signal (same as reload)
- Foot on workpiece (pins 10 and 11)

❑Quality control and inspection

Quality control of a capacitor discharge stud weld is more challenging compared to an arc stud weld, due to the absence of a steady arc during welding and a visible weld flash. Testing of the weld is limited to a mechanical test and visual inspection of the welded stud. typically, standard work tests have to be carried out and supervised by the user before welding on a structure and after a specified number of welds have been completed. The specific number of welds after which a standard work test is required is agreed upon with the customer.

For further information, please refer to the following standards: DIN EN ISO 14555 "Arc stud welding of metallic materials" or DVS Guideline 0905, Part 2. The tests described in this section are written in simplified terms, following regulations. They refer to work tests that are carried out and supervised by the user before and during welding.

Demands on the company: The company must employ a technical supervisor responsible for welding matters, as well as qualified operating personnel for stud welding. (see DVS Guideline 0905, part 2, section 4)

Proof of qualification: In the case of components which documentation must be provided for, or stud welding works which as per DIN 4100, DIN 4113 are subject to acceptance, the processing company must submit a certificate of competence or a proof of qualification for working with stud welding equipment (see DVS Guideline 0905, part 2, sections 4.1 and 4.2). The proof of qualification applies in particular to the fastening of structures that are relevant in terms of safety regulations. When being used in the building industry, only approved base and stud materials may be used (for example, see DIN 4100. section 2.1, certificate of approval for stainless steel; DIN 4113, part 2).

Carrying out visual inspection: A good weld will result in all around weld, with a small visible amount of weld surrounding the flange of the stud.

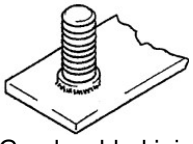
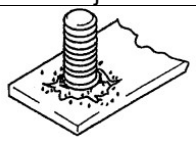
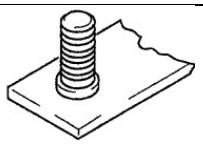
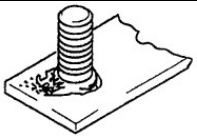
Condition	Possible cause	Corrective actions
 Good welded joint Low spatter around the weld joint	Correct parameters	-
 Many spatter around the weld	Weld energy too high, insufficient plunging speed (spring force or lift too low)	Reduce weld energy, increase plunging speed or lift
 Welding too cold, Gap between flange and workpiece	Weld energy too low, plunging speed too low, insufficient support of parent material	Increase weld energy, correct plunging speed, provide support
 One sided weld pool, one sided spatter collar	Effect of arc blow, unsymmetric ground connection, welding gun put at an angle	Take care of symmetrical ground connection, put welding gun vertically to the workpiece

Table 5

Mechanical testing includes bend testing and proof tensile loading. The maximum nut torque values for proof testing studs using this method are provided in the table below.

Stud Material	Stud Size	Maximum Fastening Torque (a)		Maximum Tensile Load (b)		Maximum Shear Load	
		lbf · in.	N · m	lb	kN	lb	kN
Low-carbon, Copper-Flashed Steel	6-32	6	0.7	500	2.2	375	1.7
	8-32	12	1.4	765	3.4	575	2.6
	10-24	14	1.6	960	4.3	720	3.2
	1/4-20	43	4.9	1750	7.8	1300	5.8
	5/16-18	72	8.1	2900	13	2200	9.8
	3/8-16	106	12	4300	19	3250	14
Stainless Steel 304 or 305	6-32	10	1.1	790	3.5	590	2.6
	8-32	20	2.3	1260	5.6	940	4.2
	10-24	23	2.6	1530	6.8	1150	5.1
	1/4-20	75	8.5	2680	13	2160	9.6
	5/16-18	126	14	3750	17	3100	14
	3/8-16	186	21	4850	22	4550	20
Aluminum Alloy 1100	6-32	2.5	0.3	200	0.9	125	0.6
	8-32	5	0.6	295	1.3	185	0.8
	10-24	6.5	0.7	380	1.7	235	1.0
	1/4-20	21.5	2.4	670	3.0	415	1.9
	5/16-18	36	4.1	1125	5.0	695	3.1
	3/8-16	53	6.0	1660	7.4	1000	4.4
Aluminum Alloy 5086	6-32	3.5	0.4	375	1.7	235	1.0
	8-32	7.5	0.8	585	2.6	365	1.6
	10-24	10	1.1	735	3.3	460	2.0
	1/4-20	32.5	3.7	1360	6.1	850	3.8
	5/16-18	54.5	6.2	2300	10	1400	6.2
	3/8-16	81	9.2	3400	15	2100	9.4
Copper Alloy (Brass) 260 and 268	6-32	8	0.9	600	2.7	390	1.7
	8-32	16	1.8	860	3.8	560	2.5
	10-24	18.5	2.1	1040	4.6	680	3.0
	1/4-20	61	6.4	1950	8.7	1275	5.7
	5/16-18	102	12	3280	15	2140	9.5
	3/8-16	150	16	4800	21	3160	14

Table 6: Torque, Tensile, and Shear Loads for Capacitor Discharge Welded Studs

Bend test: The bend test is a simple work test which serves to roughly check the setting values selected. The welding zone is subjected to undefined tension, pressure and bending. A minimum of 5 studs are welded and bent by slipping a tube over the stud. The test is considered successful when no superficial fissures or fractures are detected in the welding zone. bend the

stud element with the bending device once by 30° in any direction.

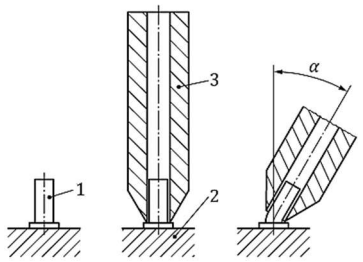


Fig. 7

1: Welding element, 2: Welded joint, 3: Bending device

Fracture examination

Bending test

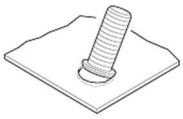
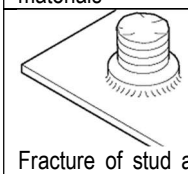
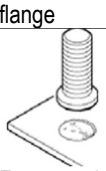
Appearance of fracture	Possible cause	Recommended corrective actions
 Tearing of parent materials	Correct parameters	none
 Fracture of stud above flange	Correct parameters	none
 Fracture in the weld metal	Weld power too low Plunging speed too low Combination stud/parent material unsuitable	Increase weld power Increase plunging speed Select suitable material

Table 7

❑Arc blow effect

An arc blow effect can occur when ground connections are not proportionally distributed in relation to the base material mass, when there is varying material distribution or when welding at the edge of a workpiece. This phenomenon results in an undesired deflection of the arc, leading to single-sided melting of the stud material, increased pore formation and undercuts in the welding area.

The arc blow effect is proportional to the current and can be influenced by symmetric installation of the ground clamps, fitting of compensation masses, or rotating the welding gun around its vertical axis.

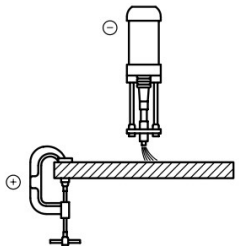
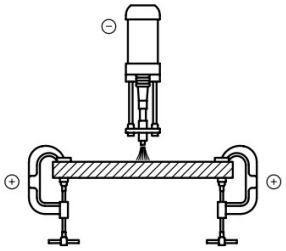
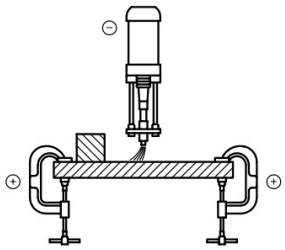
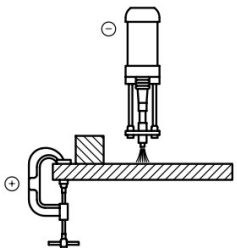
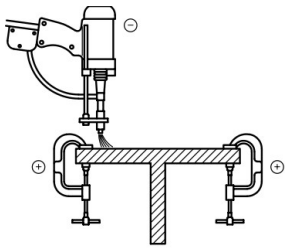
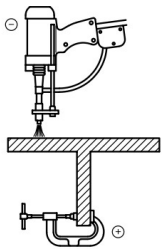
Cause	Remedy
	
	
	

Table 8

❑Maintenance

The stud welder is constructed in such a way that only a minimum of maintenance is required. The interior of the stud welder should, however, be cleaned at regular intervals depending on the environmental at the location of use. Clean the unit with compressed air only.

Work with care: do not work in a hurry but with concentration. Injuries and accidents cannot be undone.

Danger during cleaning: Improper cleaning of the stud welding device can endanger personnel. Before any cleaning work is done, the stud welding device must be disconnected from the mains power supply and secured against accidental switch on. Make sure that no liquids get into the device.

Avoid using harsh detergents when cleaning the device.

The frequency of cleaning depends on the operating conditions of the stud welding device.

Electric shock hazard: Before starting any maintenance work, disconnect the mains plug. Ensure that nobody connects the equipment to the mains while the equipment is open. Do not insert any conductive objects, such as wires, into the ventilation slots.

Checking plugs and cables: All cables must be inspected regularly to ensure that there is no danger exists from worn or damaged insulation or unsafe electrical connections. Pay special attention to the cables near the stud gun, as this is where maximum wear occurs.

Worn cables not only produce inconsistent welds, but they can also overheat or spark.

Replacement of Components: Defective components should only be replaced by trained CANAWELD INC technicians. The optimal performance of your stud welder can only be ensured when using original CANAWELD INC spare parts.

- Check the connection and control cables daily.
- Check the welding and earth cables weekly.
- The inside of the stud welding unit must be cleaned at least every three months.

Danger from insufficiently qualified operating personnel:
Only professional service personnel authorized by us may service the machine!

Cleaning the stud welding gun: remove slag and welding spatters from the gun using a suitable tool. The frequency of cleaning the gun will depend on the operating conditions of the stud welding gun.

❑Troubleshooting

There are a few basic rules to follow when trouble shooting any capacitor discharge stud welding system. They are as follows:

- When approaching a weld and the studs are not sticking, it is important take a step back and assess the entire situation. More often than not the issue will be something simple, such as incorrect polarity, poor grounding, or coiled cables.
- After ensuring that the weld has all necessary external components, inspect the cables. This is the part of the welder that receives the most wear and is naturally most susceptible to failure. If possible, switch the cables and use a set that you are certain is in good condition.
- Only unplug the ground and gun cables after confirming that the issue lies with the stud welder. A defective cable could potentially prevent the unit from charging up its capacitor bank.

Before troubleshooting the system, it is important to note that a common misconception is that inconsistent welds are always caused by a faulty control unit. However, this is rarely the case. If the welder is defective, it will rarely fire at all.

When inconsistency occurs, it usually indicates that the setup is marginal, or there may be an issue with the parent metal. This could explain the variations in the welds.

If the problem cannot be corrected by adjustments on the control unit, inspect the gun. Check if the stud is properly engaged within the collet or chuck and if it is securely tightened.

If no issues are visible externally, examine the internal components of the gun. Is it able to move freely back and forth within the bearing?

Issues with the control unit are rare. The only likely cause of inconsistency in the control unit would be a loose connection, which would be easily noticeable, such as arcing on the capacitor bus bars or at the connections.

Remember, before suspecting the equipment, take a step back and evaluate the entire situation. Many times, the issue can be easily resolved by ensuring proper setup.

If, after observing all of the preliminary pointers, it is obvious that there is a defect within the system, contact an authorized CANAWELD INC service center for information on servicing your system.

❑Fault light indications

The CAD 81 Stud Welding System is powered by an intelligent microcontroller that can notify the operator if a problem occurs during welding, displaying a fault code. Some fault codes will reset themselves within a few seconds, while others will require the operator to power down the machine. If a particular fault code persists, please contact an authorized CANAWELD INC service center for information on servicing your system.

Description	LEDs (Fault code)				
	Fault	Ready	Stud	Foot	Weld complete
Safety Actuated Fault	On continuous	Off	Off	Off	Off
High temperature fault	Fast flash	Off	Off	Off	Off
Low 28V fault	Slow flash	Slow flash	Off	Off	Off
Charge fault	Slow flash	Slow flash	Slow flash	Off	Off
Discharge fault	Slow flash	Off	Off	Slow flash	Off
Gun not removed fault	Slow flash	Off	Off	Off	Slow flash

Note: A high temperature fault (fast blinking fault light) indicates that the transformer is operating at a temperature above it's normal range. In this case, do not turn off the machine. Instead, allow the internal cooling fan to cool the transformer until it automatically resets.

❑ Causes of poor or erratic welds

1. **Loose collet.** The collet does not grip the stud tightly. **Solution:** Change collet
2. **Insufficient engagement of the stud in the collet. Solution:** Remove the collet from the gun, loosen the back-stop so that approximately 1/8" of the stud is protruding from the collet, and then reinstall the collet in the gun.
3. **Faulty or loose ground connection**
   Solution: Repair or tighten the ground connectors.
4. **Poor surface condition**
   Solution: Grind the surface that will be welded, removing any mill scale or anodizing.
5. **Broken or loose cables**
   Solution: Repair cables
6. **Dirt in gun causing gun to jam**
   Solution: Clean gun with compressed air, soft cloth and WD-40™.
7. **incorrect Polarity**
   Solution: Change the cable hookup as described in Section **"Connection of the stud welding unit"**.
8. **Use of center punch**

Solution: Do not use punches that leave a deep indentation. Do not use permanent markers or grease pencils. Use a graphite pencil or scribe line only.

9. **Cables coiled**
   Solution: Uncoil cables.
10. **Arc Blow**
    Solution: In severe cases there will be no melting under one edge of the flange while the opposite side appears excessively hot. The principal cause of arc blow is a magnetic field induced by current flow during the weld. It occurs most often in long, narrow strips of metal or near edges of sheets or plates. In some cases, a change in grounding position will correct the problem. Always try to weld between the two ground cables provided.
11. **Incorrect fastener stick-out**
    Solution: Adjust the backstop and/or foot piece so that approximately 3/32" of the fastener protrudes beyond the foot piece for welding aluminum, or 1/8" of the fastener protrudes beyond the foot piece for welding steel.
12. **Incorrect spring pressure**
    Solution: Set the spring pressure to "-" for steels and to "+" for aluminum.
13. **Poor stud quality**
    Solution: Use only CANAWELD INC's pre-cleaned fasteners to ensure quality.

❑Meaning of graphic symbols on machine

The symbols used in this operating manual have the following meanings:

1. The non-observance of safety instructions can cause damage to the operator and observers. The safety instructions of this manual are marked with the general symbol for danger safety symbol in compliance with DIN 4844-W9.

   This sign warns you of hazards that could result in injury to individuals or significant damage to materials.
2. Warning of electrical voltage is specifically marked with the safety symbol in compliance with DIN 488-W8.

   In addition to these symbols, the words "danger to health" or "mortal danger" refer to the degree of a possible danger.
   Safety instructions the non-observance of which may endanger the machine and its functions are marked with the terms "caution" or "warning".
3. General instructions are marked with the hand symbol.

❑ Electronic Waste (WEEE), Directive 2002/96/EC:

Please help minimize the effects we have on the environment by not disposing of electronic waste (e-waster) with household trash. Please follow your local instructions for disposal and/or recycling of electronic equipment and batteries.

❑ Conduct in the case of malfunctions

If malfunctions occur, first try to detect and eliminate the causes according to the Section “Troubleshooting”. In all other cases, contact our service department.
If you require service, please ensure that you provide the following information:

- Customer number
- Product designation
- Serial number
- Year of construction
- Options
- Material of stud and work piece
- Stud dimensions

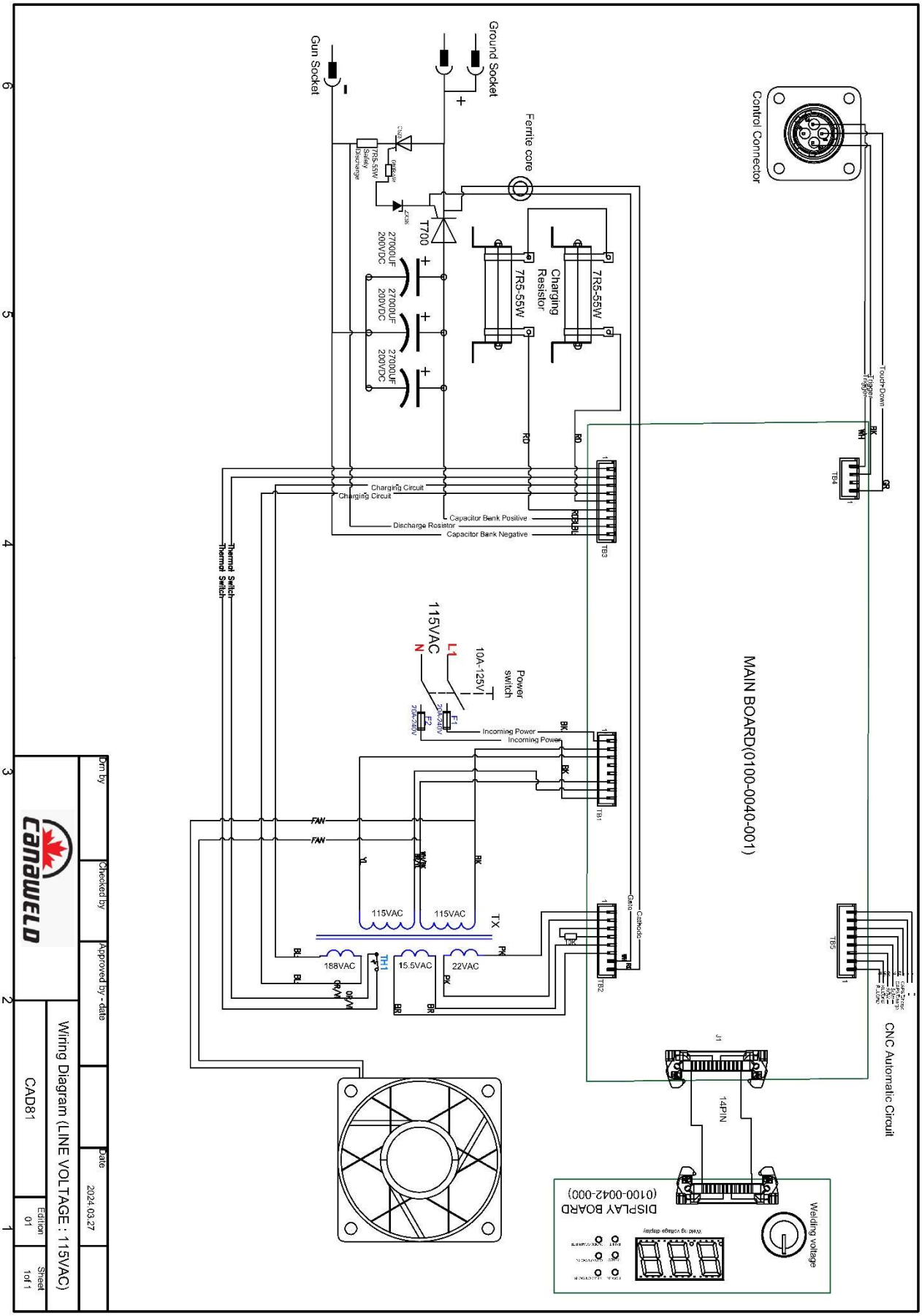
Providing this information will help us save time and avoid unnecessary costs, such as delivering the wrong spare parts.

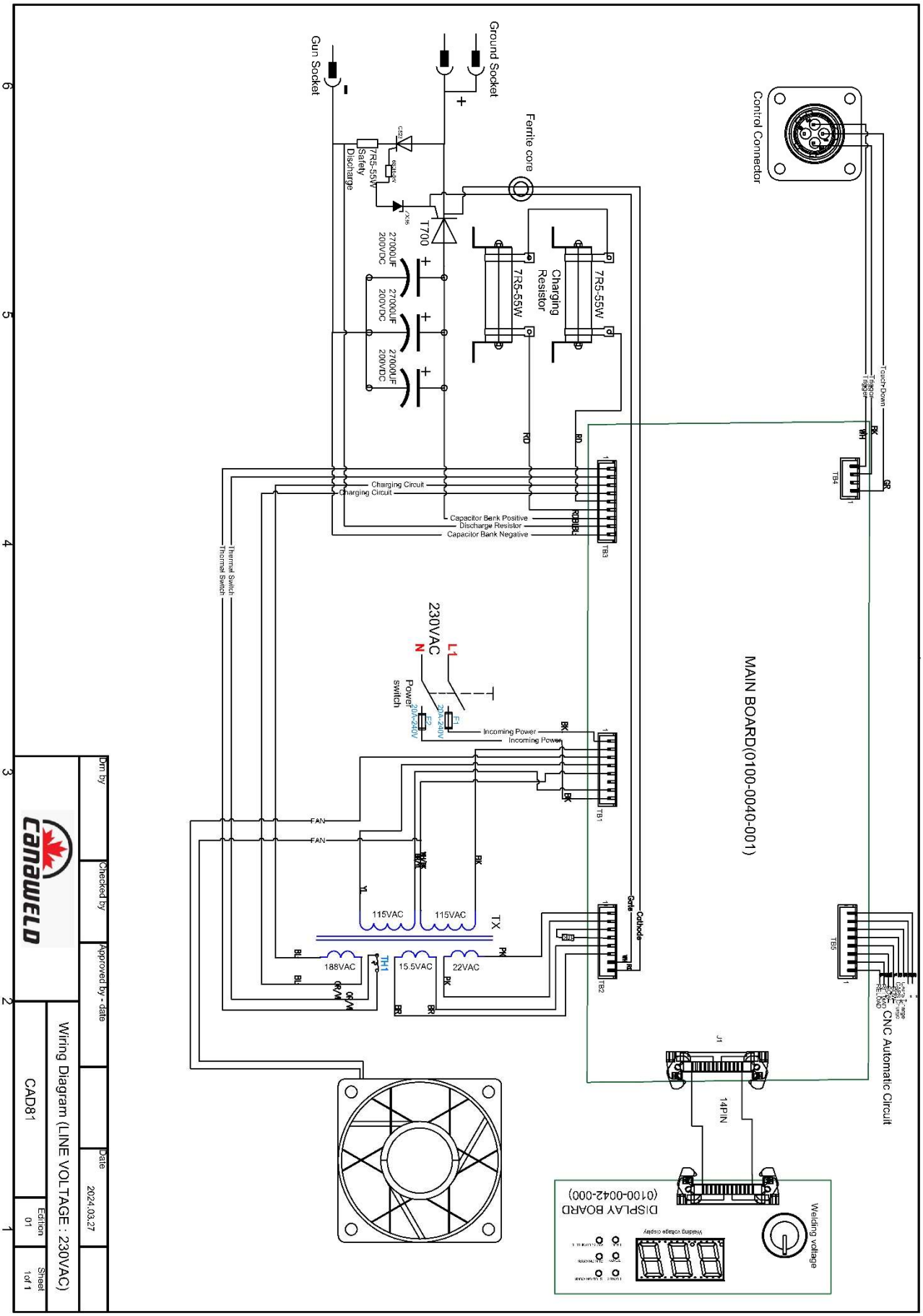
❑ Contacts and service address

If you have any questions regarding the operation of the stud welding system, retrofits or if you require service, please contact your responsible service office or the following address:

CANAWELD, INC.
155 DRUMLIN CIRCLE, UNIT 1P
VAUGHAN, ON L4K 3E7
Tel: 416-548-5650
Fax: 416-548-5651
www.canaweld.com

❑Wiring diagram





Dm by			
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Approved by - date			
Wiring Diagram (LINE VOLTAGE : 230VAC)			
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	Sheet 1of 1		