



# Safety Guide

*Read this guide before using any Sunstone and Orion welder.*

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**sunstone**<sup>™</sup>

The Micro Welder Experts

## READ THIS GUIDE BEFORE WELDING

- The following safety notifications are generalized for all types of welding and are not inclusive. All users should exercise reasonable caution while using this device.
- Read the owner's manual before using this welder.
- Only personnel trained and certified by the manufacturer should service the unit.
- Use only genuine replacement parts from the manufacturer.



## IMPORTANT NOTICES

- The weld output is rated at an ambient temperature of 20°C and the welding time may be reduced at higher temperatures.
- Sunstone and Orion welding systems should not be used in the operation of thawing pipes. The welding power source should not be used in this manner.



## SAFETY PRECAUTIONS FOR FIRE OR EXPLOSION

- A welding arc will create sparks. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Ensure your work area is clean and safe for welding. Do not weld where flying sparks can strike flammable material.
- Do not install or operate unit near combustible surfaces or near flammables.
- Do not overload your building's electrical wiring. Be sure the power distribution system is properly sized, rated, and protected to handle this unit.
- Remove all flammable materials from the welding area. If this is not possible, tightly cover them with approved covers.
- Protect yourself and others from flying sparks and hot metal.
- Watch for fire and keep a fire extinguisher nearby.
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors.
- Remove combustibles, such as butane lighters or matches, from your person before doing any welding.
- Do not exceed the equipment's rated capacity.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.



## SAFETY PRECAUTIONS FOR ELECTRICAL SHOCK

Sunstone capacitive dual pulse welders are equipped with universal power supplies and can be used with both 110- and 220-volt AC wall power. No voltage selection is required prior to powering the welder. The welder will detect the voltage and make the appropriate adjustments automatically. Touching live electrical parts can cause fatal shocks or severe burns.

The input power circuit and the internal circuits of the welder are live when the power switch is turned on. Additionally, the internal capacitors remain charged for a period of time after the welder is turned off and/or power is disconnected. Incorrectly installed or improperly grounded equipment is a hazard. Do not operate welder in a wet or damp environment.

- Care should be taken not to create a short across the positive and negative terminals. At full power the weld current carries thousands of amps and is dangerous if the terminals are accidentally bridged.
- All welds are performed at low voltage for increased safety.
- Remove personal jewelry before welding (i.e. rings, watches, bracelets, etc.).
- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Properly install and ground this equipment according to this manual and national, state, and local codes.
- Do not weld with wet hands or wet clothing.
- Always verify the supply ground. Be sure the input power cord ground wire is properly connected to a ground terminal in the disconnect box or that the input power cord plug is connected to a properly grounded receptacle outlet. Do not remove or bypass the ground prong.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect the power cord and ground conductor for damage or bare wiring. Replace immediately if damaged. Check ground conductor for continuity.
- Turn off all equipment when not in use.
- Use only well-maintained equipment and repair or replace damaged parts at once.



### PERSONAL PROTECTIVE EQUIPMENT RECOMMENDATIONS

Every person in the immediate work area must wear/utilize proper Personal Protection Equipment. Often sparks fly from the weld joint area. Take precautions to avoid trapping a spark within your own clothing. Arc welding produces infrared and UV rays that can burn the retinal tissues within the eyes and cause burns to exposed skin, similar to a sun burn.

- The stereo microscope provides proper eye protection when pulse arc welding. No additional protection is necessary.
- Wear protective garments such as oil-free, flame-resistant leather gloves, heavy shirt, cuff-less trousers, high shoes, and a cap. Avoid synthetic fibers as they melt easily.
- Use an approved face shield or safety goggles with side shields when tack welding or when observing others performing pulse arc and tack welds.
- Use a sunscreen of SPF 30 or high if welding for extended periods of time.

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- Use ear protection and button shirt collar. Wear complete body protection.
- Use the included weld shutter system.

## SAFETY PRECAUTIONS FOR HOT METAL AND CABLES

- Welding material with high thermal conductivity will cause metal to heat rapidly.
- Be aware that repetitive welds in the same location can cause metal to become hot.
- Avoid touching weld spots immediately after the weld as they will be hot. Do not touch hot weld areas bare-handed.
- Allow sufficient cooling time before handling welded pieces.
- Be aware weld cables as they can become extremely hot after extended use.



## SAFETY PRECAUTIONS FOR FUMES AND GASES

Welding produces fumes and gases that can be hazardous to your health. Sunstone welders produce minimal fumes and gases when compared to large-scale arc welders. Though not required, some form of ventilation is recommended.

- Do not breathe fumes.
- Ventilate the area; use forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDS) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Welding in confined spaces requires good ventilation or an air-supplied respirator. Always have a trained watch person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



## SAFETY PRECAUTIONS FOR FALLING EQUIPMENT

- Use a working surface of adequate physical strength to support the welding unit during operation or storage.
- Secure welding unit during transport so that it cannot tip or fall.



## SAFETY PRECAUTIONS FOR HIGH FREQUENCY PITCH AND VOLUME

- Welding with high frequency pulse agitation can produce loud, high-pitched sounds. It is recommended to use hearing protection when welding with agitation turned on.



## MAGNETIC FIELDS CAN AFFECT IMPLANTED MEDICAL DEVICES

- Persons with pacemakers and other implanted medical devices should keep away.
- Persons with Implanted medical device should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.
- Never coil weld cables around your body.
- Route all welding cables together.



## OVERUSE CAN CAUSE OVERHEATING

- Provide for a cooling period between strenuous welding schedules and follow rated duty cycle.
- If overheating occurs often, reduce duty cycle before starting to weld again.



## OBSERVE ALL NECESSARY PRECAUTIONS ASSOCIATED WITH COMPRESSED GASES

- Use only compressed gas cylinders containing the correct shielding gas for the process used.
- Always keep cylinders in an upright position and secured to a fixed support.
- Cylinders should be located away from areas where they may be struck or subjected to physical damage and a safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.



## CE TESTED AND CERTIFIED

Sunstone welders are tested for electrostatic discharge immunity up to 2kV for CE compliance.

# Types of Sunstone Welding Technologies

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## Pulse Arc Welding

A pulse-arc welder is a specialized type of a Tungsten Inert Gas (TIG) welder. In TIG welding, a tungsten electrode is used in combination with electrical energy to start and sustain a high temperature plasma stream, or an arc. This plasma arc is used as a heat source to melt the work-piece metal. Filler metal can also be added to build up joints and create strong and reliable weld “beads” or weld seams.

TIG welders can use AC (alternating current) or DC (direct current) energy to initiate the pulse-arc-weld. Sunstone pulse arc welders use industrial capacitive discharge technology to produce the pulse-arc weld. Because AC wall voltage can vary up to 20% during the day, capacitive welders have the advantage over AC technologies by precisely storing energy before the welding process. This means that Sunstone welders will produce repeatable welds.

## Pulse Arc Welding Fundamentals

Pulse Arc welding uses electrical energy to create a plasma discharge. The high temperature plasma in turn melts metal in a small spot. This process takes place in milliseconds. The process is clean, controllable, and perfect for intricate and minute welding applications.

### Pulse arc welding process:

1. The user touches the electrode to the surface with very light pressure.
2. The Pulse Arc Welder turns on the shielding gas (argon).
3. The electrode retracts and sends a burst of electrical energy – forming a plasma arc.

**NOTE:** *The weld is only made after the electrode lifts from the surface.*

The penetration of your weld spot depends on many different factors. However, as a rule of thumb you can expect the penetration of the weld spot to be approximately  $\frac{1}{4}$  of the diameter of the weld spot. Factors like electrode shape and condition also effect the weld penetration

## Laser Welding

In its simplest form, a laser crystal is pumped full of potential energy using a high energy flash lamp. The crystal then releases this absorbed energy at a single wavelength (or vary narrow band of wavelengths). The light is reflected between two mirrors, one mirror having a lower level of reflection that allows light to escape. The light is then focused and directed by the laser optics to the weld location. Some versions of this technology add potential energy to the YAG crystal with diode lasers or flash lamps, and use technology called a Q-switch to release all the energy at one time.

## Laser Welding Fundamentals

One fantastic property of lasers is the ability to direct energy to a location without the need for physical contact, as is a must for both resistance and pulse arc welding. However, this no-contact advantage is tempered slightly by the requirement that the beam be focused and have line of sight to the weld location. Small beam size is critical to produce the required energy per square mm necessary to melt metals.

In a typical benchtop laser welder, the operator looks through a microscope, equipped with an optical shutter for eye protection, at a cross hair target over the work piece. Usually the laser focal point and the user microscope focal point have been aligned to the same plane. Positioning the work piece under the microscope and bringing it into focus produces the correct beam diameter. The minimum beam diameter correlates to an exact match between the focal plane and the laser focus. By moving the focal point of the beam higher or lower, the welding machine changes the beam spot size. A typical minimum to maximum spot size will correspond to .2-2mm.

## Resistance Welding (Tack Welding)

Resistance welding, often called tack or fusion welding, places a large electrical current through two workpieces to join them together. At the contact point between the two materials there is a resistance to the flow of the electrical current. As electrical current is passed through this contact point, resistive heating takes place. When enough current passes through the workpieces the temperature (especially at the interface between the two pieces) can become hot enough to melt the metal in a spot. The terms resistance welder and spot welder are descriptive of this process.

If you limit the amount of energy and electrical current going into the weld you can create a temporary or weak weld called a "tack" weld. It provides the ability to temporarily position a part before permanent welding. This ability opens a multitude of creative possibilities. It also helps eliminate the need for complicated binding or clamping of parts before permanent welding or soldering.

## Sunstone Contact Information

- Call or Text **+1-801-658-0015**
- Visit **[www.sunstonewelders.com](http://www.sunstonewelders.com)**
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