



orion

LZR Laser Welder

Benchtop Users Guide

Version 20200708 • Part #1154



sunstone[™]

The Micro Welder Experts



**ATTENTION: Read the Safety Guide before operating this welder!
Operator assumes all liability.**

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ISSUE	DATE	APPROVAL	VALID FROM MODEL n°	NOTES
0	7/1/2006	G.M. 7/1/06	MG01100	
1	6/4/2009	G.M. 6/4/2009	MG01160	
2	4/19/2010	G.M. 4/19/2010	MGO1147	
3	2/4/2011	G.M. 2/4/2011	MGO1177	
4	4/28/2014	G.M. 4/28/2014	MGO1345	
5	5/16/2016	G.M. 5/16/2016	LZR1000	
6	6/24/2020		LZR1000	GENERAL FORMATTING CHANGES

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Chapter 1: General Warnings and Safety

Carefully read and follow all instructions to ensure proper use and maintenance of the equipment. Read all general warnings and cautions before operating the welder.



LASER WARNING

Be aware of the danger of being exposed to visible and invisible laser radiation. If you see this symbol:

- Don't ever introduce mirrors or reflecting objects in the welding chamber while the welder is in use.
- Check the weld chamber exclusively through the green-tinted viewing glass found on the front of the welder.
- Don't ever remove the leather strip curtains that cover the opening to the weld chamber.
- When using the welder, ensure that no one is seated with their face being eye-level with the weld chamber. This includes children whose standing height would be level with the weld chamber.
- It is also recommended that the weld operator use adequate and approved working gloves when using the welder.



FIRE WARNING

Be aware of the danger of fire when working with flammable materials. When there is a danger of fire, it is very important to follow the instructions provided from the manufacturer during the installation of the welder.

- Don't weld near flammable materials.
- Remove all flammable materials from nearby the welder. If this is not possible, carefully cover all flammable material with fireproof material.
- Place a fire extinguisher in the vicinity of the welder.

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EXPLOSION WARNING

The Argon gas cylinder is under pressure and can consequently explode if the cylinder is not handled with the necessary cautions.

- Protect any cylinder from excessive heat and mechanical stresses.
- Install the cylinders in a vertical position and position it with a fixed support chain or with a proper cylinder case to avoid falls or knocks.
- Place the cylinders away from the welding place and from electric circuits. Use only regulation cylinders, pressure reducers, and pipes and joints approved for compressed gas. Regularly inspect and maintain the cylinder and parts.



GAS AND FUMES WARNING

- The welding processes produce fumes and gas, which can be harmful and dangerous if inhaled.
- Do not breathe any welding fumes.
- Don't cover the grids and vents placed on the welder.
- Carefully read the supplied instructions regarding the different types of metals, cleaning substances, and shielding gases.
- When possible, dedicate a room for the use of this welder. If the room is small, use only if well ventilated. The shielding gas used to weld can gradually change the air causing sickness or death. Assure that the air in the room is safe to breathe.
- Don't weld near any degreasing, cleaning, or vaporization areas. The heat could react with the vapors to form very toxic and irritating gases.
- Check that the metals do not have impurities that may produce fumes or gases during the weld process.



ELECTRIC WARNING

Be aware that dangerous voltages used by the laser may have sufficient power to cause electric shock and subsequent injury or death.

- Touching electric parts under voltage can cause fatal injuries or serious burns. The electric circuits are always under voltage when the welder is switched on. Incorrect installation and/or inappropriate wiring and grounding of the welder is dangerous.
- Don't touch electric parts under voltage.
- Remove the power plug from the welder before installing or performing any maintenance to the welder.
- Ensure that the power cord is correctly connected to both the wall plug and to

the back of the welder in accordance with this manual and any local standards and rules.

- Switch off the welder when not in use.
- Do not use any power cables that are damaged or that are not rated for this welder. Ensure that the cables are not near any heat sources.
- Use the equipment only when in perfect conditions. Immediately repair or change any damaged parts.



LASER RADIATION

Laser radiation is an electromagnetic emission with micrometric wavelengths that are placed in the far infrared (CO₂ laser), in the near infrared (laser at Nd-YAG, Nd-YVO₄), in the visible (laser He: Ne or Argon), or in the ultraviolet (excimer laser) ranges. Laser radiation produced from the LZR welders is invisible and therefore can be dangerous to eyes and skin.

NOTE: Direct exposure of a laser beam can cause irreversible damage to eyesight and vision.

To avoid permanent damage to the operator and others nearby, it is necessary to follow safety guidelines and precautions.

Any person in the near vicinity of the welder, and who may be exposed to harmful levels of laser radiation, must be informed when the laser is active.

Due to the high power of the laser generated in this welder, it is possible that the laser may reflect off of welded pieces. If this happens, the reflected light can be potentially dangerous to the eyes and the skin. As stated previously, the laser generated in the LZR welder is invisible, and therefore it is not easy to identify if the laser is reflecting off the piece, nor is it easy to know where the laser may be travelling once reflected.

NOTE: It is crucial to be protected from the reflected light beams, because they can be sufficiently intense to create permanent damages to the eyes or to the skin

NOTE: The laser generated here is a class IV. The risks associated with class IV lasers include not only the risk of direct or reflected radiation, but also of diffused radiation. These lasers can present a remarkable risk for the skin and eyes, as well as a fire risk when working near flammable materials

Laser Recitation Absorption

Human tissue absorbs electromagnetic radiation in different ways, depending on the wavelength of the radiation. Eyes and skin accept some wavelengths, while refracting others. Specifically relating to the eye, the cornea and the lens both allow lasers within the 400-1400nm wavelengths to pass through and reach the retina. The wavelength of the LZR welders is 1064nm, and therefore it will pass through unobstructed to the retina.

The absorption of radiation through skin will vary from person to person. Therefore, seeing as the absorption may vary, the exact and specific details are hard to state regarding the maximum tolerable exposure levels.

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The extent of damages due to radiation absorption depends on the wavelength. The short wavelengths (ultra-violet UV-C 180-280nm, UV-B 180-280nm, UV-A 315-400nm) generally provoke and cause photochemistry effects: cataract or opacification of the lens in the eye, blackening or reddening for the skin. Major wavelengths (infrared: IR-a 780-1400nm IR-c 3000-10 E6nm) generally provoke thermal effects: retinal detachment and photocoagulation for the eye, burning for the skin. The extent of the damage depends on the quantity of absorbed radiation and on the power and intensity of the radiation source.

CLASSIFICATION AND DANGER LEVELS

Laser classifications are based on the laser's ability to cause damage to people. All lasers are classified according to their output, from Class 1, which describes lasers which are of such low power that they represent no hazard at all, to Class 4 lasers which are always hazardous.

The Orion LZR laser welder belongs is a class IV device and can harm you, not only from direct or reflected radiation, but also from diffused radiation. For these reasons, you must take all precautions to assure that safety guidelines are established and followed. In addition, you and every operator must be informed of the risks deriving from the exposure to laser radiation, and must be provided with the proper personal protective equipment, potentially consisting of certified protection glasses for the laser radiation.

RADIATION VISION CONDITIONS

The laser beam is highly collimated and intense as it is generated and leaves the internal resonator. If this collimated beam were to pass through to a person's retina, the focused beam of high-dense power can be very dangerous. Conversely, if the beam becomes divergent and spreads out, then the beam is much less dense and therefore less dangerous. Below are some different scenarios related to viewing the laser beam.

- **Direct View of a Laser Beam.** This type of exposure is the most dangerous and can occur through the opening to the weld chamber, or if the optics have been removed.
- **Direct View of a Reflected Laser Beam.** This can happen anytime the laser beam reflects off a reflective surface. A reflected beam can be equally dangerous as a direct view of a laser beam.
- **Direct View of a Laser Beam Exiting a Fiber Optic.** This can happen anytime the optical fiber is connected to the resonator. The beam can be dangerous even if viewed from considerably far away.
- **Direct View of a Laser Beam After Focusing Optics.** This can happen if the beam is not absorbed at the end of its path. This beam can be dangerous even if viewed over considerable distances. Filters and protective glasses can guarantee the safety for short exposures, on the condition that they are well dimensioned and certified to be safe for the wavelength being used.
- **Viewing a Diffused Laser Beam After Focusing the Optics.** This happens when using this welder. Viewing the diffused beam is not dangerous over a short period of time, and viewing through a filtering lens can guarantee safety, even during long exposures..

THE NOMINAL OCULAR HAZARD DISTANCES (NOHD) FOR THE LZR LASERS IS LESS THAN 15M FOR DIRECT OR SPECULAR REFLECTED RADIATION, AND LESS THAN 0.5M FOR THE DIFFUSED REFLECTION. ONLY A SUITABLE WELD LENS WITH OPTICAL DENSITY GREATER THAN 4 CAN SUFFICIENTLY PROTECT THE SIGHT FROM THE ACCIDENTAL VIEWING OF HARMFUL LASER RADIATION.

NOTE: Always use certified eye protection.

RISKS FOR THE EYES AND THE SKIN

The cornea and the retina can be burned and damaged, possibly irreversibly, if exposed to intense laser radiation, regardless of duration. Also, exposure to a less intense laser radiation over a long duration can result in similar dangerous and possibly irreversible outcomes. Injury to eyes and skin is highly probable in any case of direct vision of any laser beam.

Skin can also burn if submitted to focused direct radiation. In addition to focused direct exposure, exposure to ultraviolet radiation over time can also cause negative consequences to skin.

SAFETY GENERAL PRESCRIPTIONS

Sunstone Engineering strongly recommends that you develop a Standard Operating Procedure (SOP) to follow when operating and servicing the welder. A written copy of this procedure should be easily accessible to any operator using the welder. Regular training and review of the process is recommended as well to ensure:

- Operators are familiar with the system functioning procedures;
- Operators are aware of the dangers related to the exposure to radiation, and the biological effects that could result from exposure to the skin and eyes;
- Operators understand the need to use Individual Protection Devices (IPDs).

Manufacturer Seals

There are various seals in and on the LZR welder. These seals must not be, for any reason, broken or removed without authorization from Sunstone Engineering.

NOTE: Removing or breaking certain seals on this welder can have immediate and negative effects on the weld system.

WARNING: Do not use the welder before it has been declared to be in conformance with actual directives.

NOTE: Do not open and access internal parts of the welder. Only to authorized personnel who are qualified, trained, and aware of the potential electric risks. Sunstone Engineering denies all responsibility for any interventions on behalf of untrained personnel.

Safety Labels

The safety labels applied to the welder are in conformance with both the FDA and European safety rules. They must not be removed or damaged. For possible changes contact Sunstone Engineering.



Laser N. 1. Laser Warning. Side 22, Side 50

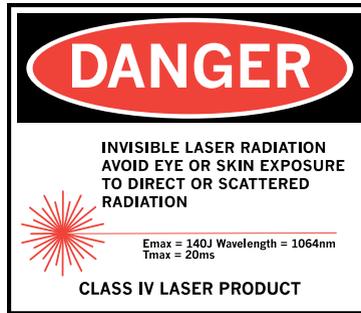


Laser N. 2. Laser Class Information. 104 x 52, 52 x 26

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Laser N. 3. Radiation Information. 104 x 52, 52 x 26



Laser N. 4. Laser Exposure Information. 56 x 40



Laser N.5. Laser Technical Data. 104 x 25



Laser N.6. Laser Opening Information. 104 x 26



Electric N.1. Electrical Shock Warning. Side 22, Side 50

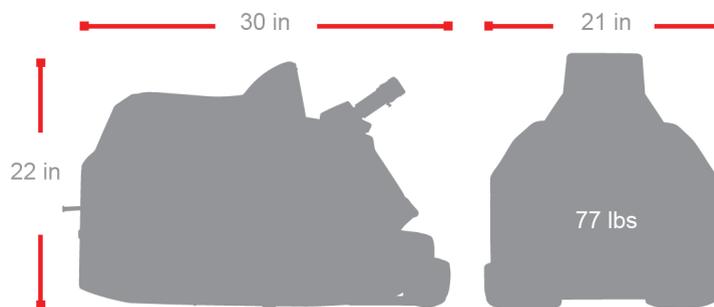
PRODUCT IDENTIFICATION LABEL

This label shows the data about the manufacturer, the electric specifications, the generator power, and the risk class of the laser welder.

Manufacturer: Elettrolaser s.r.l. via dell' Industria, 35 37060 Sona Verona ITALY	Dealer: Sunstone Engineering R&D Corp., 1693 American Way #5 Payson, UT 84651			
Model: <input type="text" value="Orion"/>	S.N. : <input type="text" value="LZR01001"/>	To prevent electrical shocks, do not remove covers. For any service refer only to qualified staff.		
Voltage: <input type="text" value="230 V -10/5%"/>	Frequency: <input type="text" value="50/60 Hz"/>			
Ph. number: <input type="text" value="1"/>	Weight: <input type="text" value="55 Kg"/>	Year of Manufacture: <input type="text" value="2015"/> Month of manufacture: <input type="text" value="04"/>		
Drain power: <input type="text" value="1.7 kW"/>	Max. energy: <input type="checkbox"/> 60J <input type="checkbox"/> 100J			
Wavelength: <input type="text" value="1064 nm"/>	CLASS IV LASER	MADE IN ITALY		

Technical Specifications

SPECIFICATION	DESCRIPTION
Electric Input VAC	110V or 230V
Electric Power Phase	Single Phase
Electric Frequency Hz	50-60 Hz
Average Energy Consumption	100 W
Laser Crystal Type	Nd:YAG
Wavelength	1064 nm
Weld Energy	0.1-60 or 0.1-100 J
Weld Length	0.5-10 ms
Repetition Frequency	0.5-30 Hz
Peak Power	3.5-7 KW
Duty Cycle	80%
Weld Spot Size	0.2-2.0mm
Maximum Argon Gas Pressure	1.5 bar
Cooling Type	Liquid
Fuse	12 A
Weight	77 lbs/35 kg
Dimensions LXWXH	30X21X22 inches/76X53X56cm
Work Environment Temperature	17 ° F/35 ° C
Maximum Humidity During Operation	65%
Noise Level	<70 dB(A)
Recommended Argon Purity	99.8-99.996%
Shield Gas Consumption (Argon)	2-4 con 1.5 bar
Coolant	Deionized Water



Chapter 2: Installation

Carefully follow these instructions to prepare the Orion LZR laser welder for safe operation:

- Position the welder on a strong, sturdy table or workbench that is able to support the weight of the welder (approximately 73 lbs/33 Kg). Verify all four support legs of the laser are resting firmly on the table or workbench.



Figure 8.1 Gas Inlet Connections. Argon shield gas is connected to the "Gas" inlet on the left; compressed air may be connected to the "Air" inlet on the right.



Figure 8.2 Insert the Interlock into the Interlock port found on the rear of the welder.

- If using shielding gas, connect it to the Gas Inlet connection as shown in Figure 8.1. Do not exceed 1.5 bar of pressure to the shielding gas connection. The Air Inlet connection can be used to blow compressed air on welded pieces that may heat up during the welding process.

NOTE: Do not exceed 1.5bar of pressure to the shielding gas connection.

- Connect the power cable to the wall outlet and then to the back of the welder.
- Connect the Interlock into the Interlock Port on the back of the welder, as shown in Figure 8.2.
- Connect the foot pedal to the Remote Control Port found on the rear of the welder (see Figure 9.1).

ATTENTION: Use only the cables and equipment shipped with the welder or provided by Sunstone. Do not substitute or change any cables or plugs.

- Remove the eyepieces from the containers and fasten them on the tips of the microscope tubes. Tighten the screw on the tube using a 2.5mm Allen wrench and plug the connector. See Figure 9.2 on next page.

Note: To align the microscope crosshairs, see chapter 23.

NOTE: As a general practice, the eyepiece with the crosshairs should be placed in the right ocular tube.

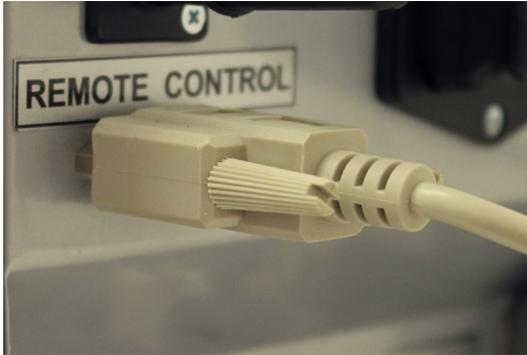


Figure 9.1 Foot Pedal Connection.



Figure 9.2 Attach eyepieces to the microscope tubes and tighten the screws with an Allen wrench. Generally speaking, the eyepiece with the crosshairs is attached to the right tube.

Adding Cooling Water

NOTE: During the first setup and installation, extra steps are needed to get the welder functioning. The next steps are only important during the initial setup, or after changing the water in the welder.

Refer to Figure 9.3 and carefully follow these steps to add cooling water:

- Insert the plastic tube and connector shipped with the welder to the Female Connector “Remove Water” Port located at the bottom of the rear panel, as shown in Figure 9.3. This port is used for filling and removing the water from the welder.
- Remove the Red Plug from the Upper Connector tube.
- Connect the funnel that was shipped with the welder to the other end of the plastic tube to fill the tank.
- Using the deionized water that was shipped with the welder, fill the welder until you see water coming out of the Upper Connector of the tank.
- Remove the plastic connection from the Female Connector, but do not replace the Red Plug yet. To minimize the amount of spilled water, place your thumb over the open end of the tube while removing it from the connector.
- Turn on the welder by flipping the switch on the back of the welder. **Do not turn the key switch.**
- Push the internal joystick down for 5 to 6 seconds, until you hear the fans and the pump turn on. This will force the air out of the system.



Figure 9.3. To fill the welder with coolant water, attach the funnel, tube, and connector to the bottom Female Connector “Remove Water” Port. Remove the Red Plug from the Upper Connector tube. Fill the welder with deionized water that comes with the Orion LZR laser welder.



Figure 9.4. The final step to filling the tank is replacing the Red Plug on the end of the Upper Connector.

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- Wait about 60 seconds, then turn the key and press start. If an error message appears saying: "ERROR 02 TEST FLUX H2O" then follow these instructions:
 - Turn the key to the off position.
 - Turn the welder off using the power switch on the rear panel.
 - Turn the welder on using the power switch on the rear panel.
 - Push the internal joystick down and hold down for 5 to 6 seconds or until you hear the welder's fans and the pump turn on. The air will be forced out of the system. You should not see the error message. If the error message persists, call Sunstone's customer service team at +1-801-658-0015 for assistance.
 - Turn the key and press the Start Button which will appear on the display screen.
- If you do not see the "ERROR 02 TEST FLUX H2O" error, your welder is ready to use. The final step is to plug the Upper Connector with the Red Plug, as seen in Figure 9.4.



Figure 10.1. Make sure the Emergency Stop Button is disengaged.



Figure 10.2. Turn the key clockwise to access the touchscreen controls.



Figure 10.3. Touch the Start Button to adjust weld parameters and start welding.

Powering the Welder for the First Time

- Ensure that the Emergency Stop Button is disengaged and not pushed in. See Figure 10.1.
- Turn on the welder by flipping the switch on the back of the welder.
- Insert the key and turn clockwise so the key is vertical. See Figure 10.2.
- A Start Button will appear in the touchscreen interface. Press the Start Button to adjust weld parameters and to weld. See Figure 10.3.
- When you have pressed "START" on the display the default set values will appear and the inscription "VERIFICATION VALUES LASER ACTIVE".

NOTE: Do not proceed with the installation if the display does not show as described above. If you encounter any problems or errors, consult chapter 5 of this document, or contact Sunstone Engineering.

At this point you will be able to set welding parameters, load saved settings, if desired, and begin welding.

To turn the welder off, turn the key to the Locked position, wait for the touchscreen to display the message "LASER LOCKED," then flip the rear power switch to the off position.

ATTENTION: When the welder is not being used, ensure that the key is removed from the welder.

Chapter 3: Controls

Chamber Controls

Welder controls are conveniently placed inside the Orion LZR laser welder's chamber. Refer to Figure 11.1 to see where these controls are placed. From within the chamber, you are able to:

- Operate the touchscreen display with the Joystick (A).
- Change the brightness of the LED chamber lighting (B).
- Change the direction of the shield gas delivery (C).
- Change the direction of the compressed air delivery (D).

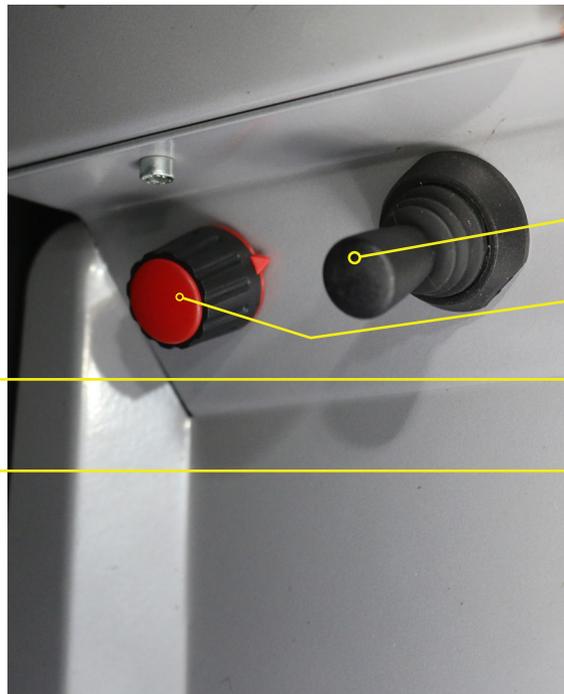
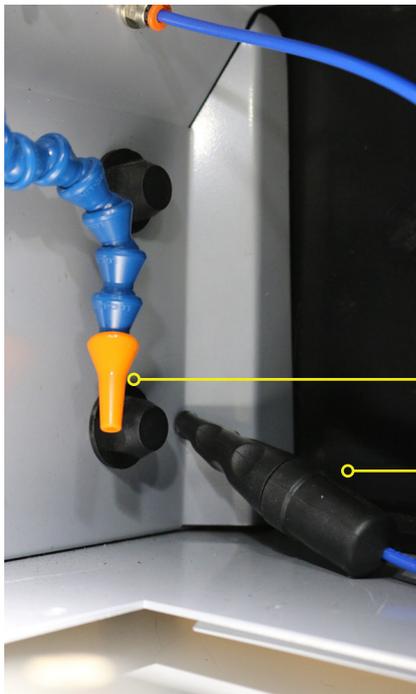


Figure 11.1. Controls located inside the welding chamber:

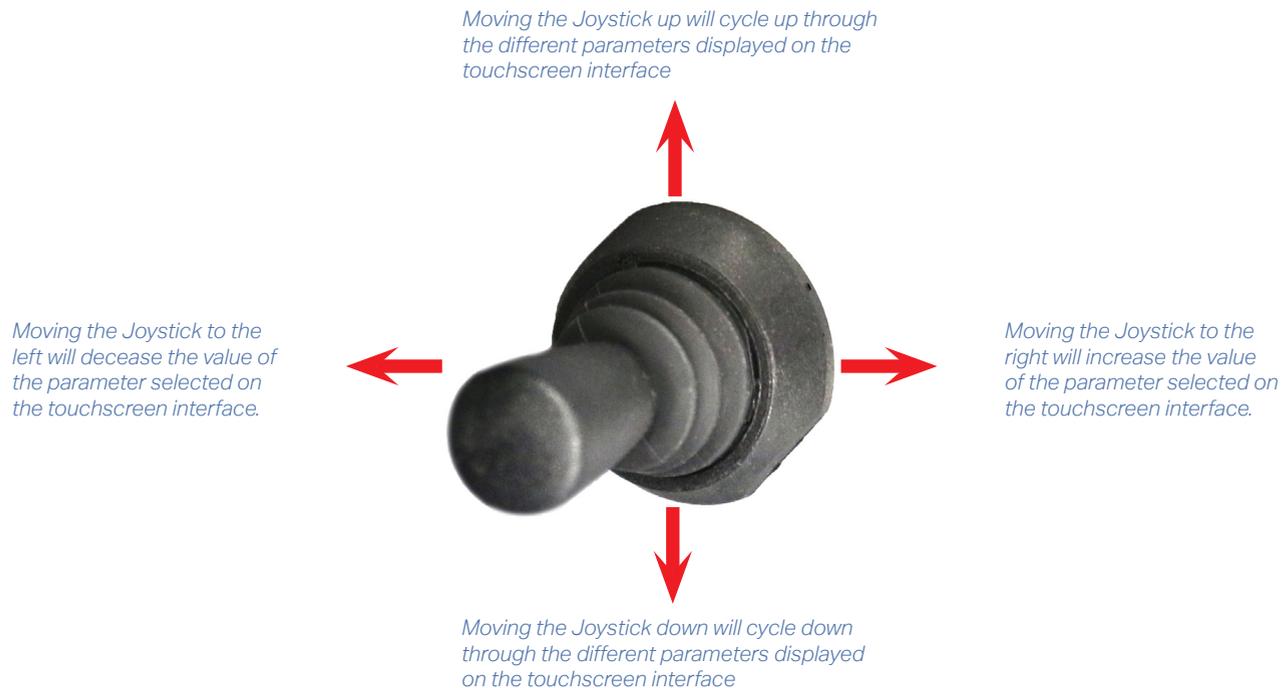
A. Touchscreen Display Joystick

B. LED Chamber Lighting Control

C. Shield Gas Delivery Stream

D. Compressed Air Delivery Stream

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JOYSTICK CONTROL

The Orion LZR laser welder has a Touchscreen Display. Changes to the welder's parameters and settings can be achieved by tapping a '+' or '-' button or moving a slider bar using your finger. In addition to the touchscreen controls, the welder also has a Joystick inside the weld chamber. When using the Joystick, the selected parameter will be outlined with an orange box. By moving the Joystick, you can cycle through the parameters and also make changes to the selected parameter. See the illustration above for reference.

LED CHAMBER LIGHT CONTROL

Using the LED Chamber Light Control you are able to increase or decrease the brightness of the LED light within the welding chamber. Turn the knob clockwise to increase brightness. Turn the knob counter-clockwise to decrease the brightness.

SHIELD GAS DELIVERY

For better welding results, it is often best to shield the weld from oxygen by flooding the weld area with an inert gas such as Argon. Adjust the gas slider on the Interface to choose the amount of gas to be discharged during a weld. Place the Shield Gas Delivery Nozzle close to the weld area. Gas is then automatically discharged when a weld is initiated.

COMPRESSED AIR DELIVERY

You can use compressed air to cool the weld area during or after the weld, if necessary. After you've connected compressed air to the rear of the welder using 8mm tubing, position the Compressed Air Nozzle as needed and bend the nozzle slightly to release air.

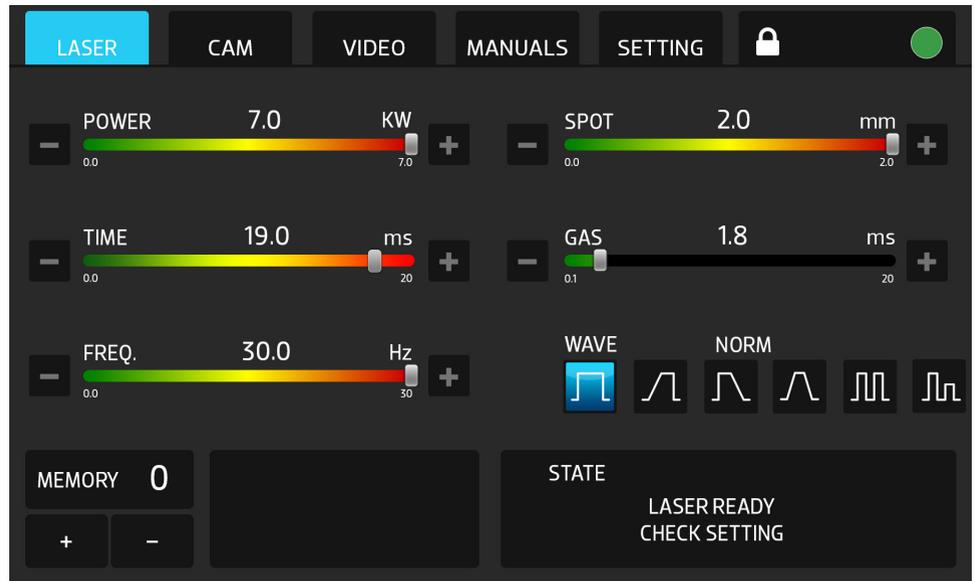


Figure 13.1. The Orion LZR laser welder's features are controlled with the Touchscreen Display. Touch the screen with your finger to make changes to features or control settings.

Touchscreen Display Controls

You are able to control all weld parameters from the Touchscreen Display Control (see Figure 13.1). Simply use your finger to touch the screen or the Joystick to select features or control settings. At the top of the screen are five tabs: Laser, Cam, Video, Manuals, and Settings. A description of each tab follows.

LASER TAB

Under the Laser Tab you are able to control all aspects of the weld, such as power, length of time of the weld, spot size, weld frequency, and gas timing. The weld waveform can also be selected.

Power

The Power Slider is used to select the power of the weld. The power range for the LZR is different for every model.

Time

The Time Slider is used to select the duration of the weld. Time is as equally important as power to achieve the desired weld. Adding more time adds more energy to the weld, resulting in a more powerful weld.

Frequency

The Frequency Slider is used to select the rate at which the welds are made. Selecting "0" will cause the welder to weld only when the foot pedal is initially pressed. Each subsequent foot pedal press will cause a weld. With a setting other than zero, the welder will continue to weld at that rate per second for as long as the foot pedal is pressed. To stop the welds, simply lift your foot off the pedal. In some cases, the slider bar may automatically

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adjust to a lower value than what is selected. This may occur when either the power and/or time value is too large to handle a high repetition rate. The frequency will automatically adjust to the highest possible value given the selected power and time. If changes are made to either the power or the time, slide the Frequency Bar up to ensure that the welder is set to the maximum weld rate.

Spot Size

The Spot Size Slider is used to set and adjust the weld spot diameter. Be aware that reducing the spot size channel the energy into a smaller area, which will affect the weld results. Sunstone recommends reducing the power slightly when reducing the spot size.

Gas Flow

The Gas Flow Slider is used to select the amount of time that protective shield gas (argon) is allowed to flow after the last weld is made. A value of "0" will deactivate the gas flow.

Waveform

You can choose from six different waveforms. Each waveform has different characteristics. The available waveforms are:

- Normal (Square)
- Slope+ (Upslope)
- Slope- (Downslope)
- BRD (both up and down slope)
- Pulse (2 square welds)
- FDC (2 square welds, one at 50% power).

The most common waveforms are Normal, Slope+, and Slope-.

Memory

This box shows the currently selected saved settings. Pressing the "+" and "-" buttons below the memory number will cycle through the saved settings. It is possible to name each saved setting, and the saved name will be displayed in the box to the right of the memory boxes.

Memory Box

This box will display instructions, status conditions, system settings, warnings, and error messages.

CAMERA TAB

The Camera Tab provides a live video feed of the work area. This tab also displays most of the same parameters found on the Home Screen. See Figure 15.1 for reference. You can touch any parameter and use the "+" or "-" button in the lower right corner to raise or lower the selected parameter (highlighted in blue text). You can also



Figure 15.1. When you press the Cam Tab you are able to view the weld area while still accessing weld parameter controls.

cycle through the parameters and make adjustments using the Joystick found inside the weld chamber. The Joystick-selected parameter is highlighted with an orange box and text.

Power

The Power Slider is used to select the power of the weld. See page 13 for more information.

Time

The Time Slider is used to select the duration of the weld. See page 13 for more information.

Spot

The Spot Size Slider is used to select the weld spot diameter. See page 14 for more information.

Frequency

The Frequency Slider is used to select the rate at which the welds are made. See page 14 for more information.

Gas

The Gas Flow Slider is used to select the amount of time that protective shield gas (Argon) is allowed to flow after the last weld is made. See page 14 for more information

Wave

Touch Wave to select a particular waveform. See page 14 for more information.

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Memory

This box will display instructions, status conditions, system settings, warnings, and error messages.

Zoom

Tapping this button will change the camera zoom from 1x to 2x to 4x and then back to 1x.

Menu

The Menu Button will replace the on-screen weld parameters with certain parameters relating to the camera. There are four blue buttons that will position the crosshairs on the screen. There is the option to turn on or off the full screen video. This will hide the weld parameters while welding, and will allow the video feed to fill the screen. Auto Exposure can be turned on/off. Finally, the white balance of the camera can be manually adjusted to enhance the picture lighting and quality. Pressing "Save" will save any changes and exit back to the regular camera view. Pressing "Del." will delete any changes and exit back to the regular camera view.

VIDEO TAB

The Video Tab provides you with the option to view pre-loaded videos. See Figure 16.1. A list of available videos is found in the far-left column. Selected videos will play on screen, and user can pause, fast forward, rewind, or skip to the next or previous video in the list. Volume controls are also available on screen.

MANUALS

The Manuals Tab provides on-screen documentation and instructions for the operator to read and reference when using the welder. See Figure 17.1 on the next page.

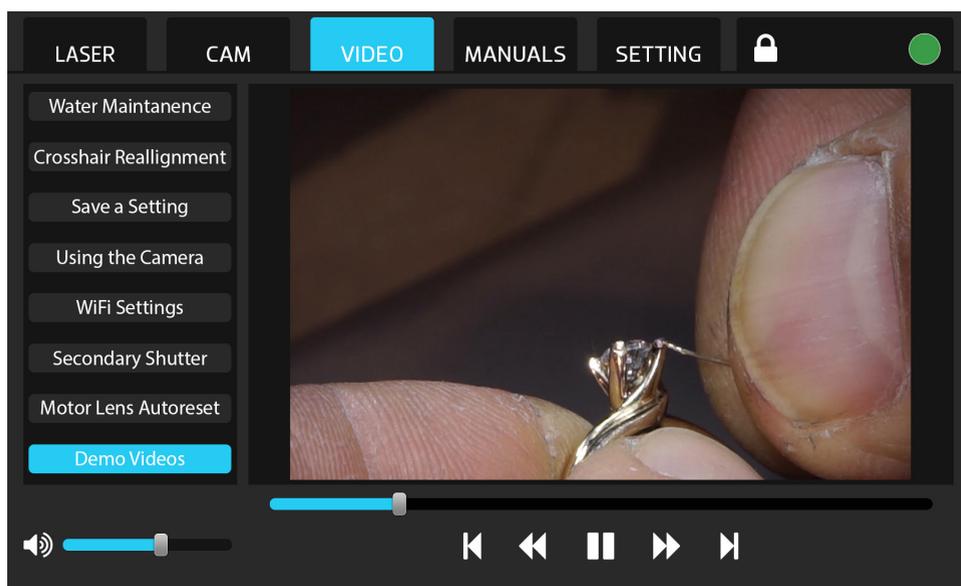


Figure 16.1. Press the Video Tab to access how-to and other instructional videos.

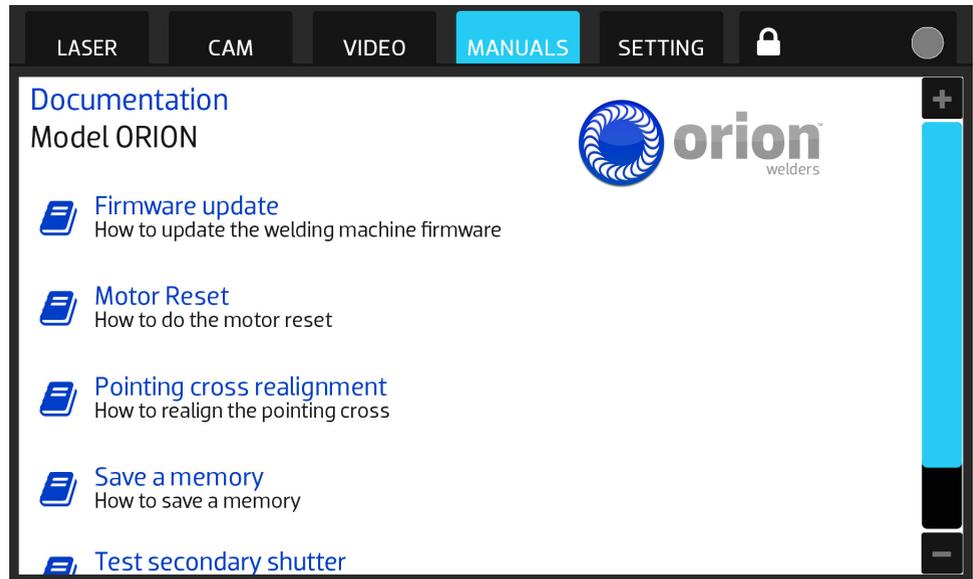


Figure 17.1. Press the Manuals Tab to access this documentation.

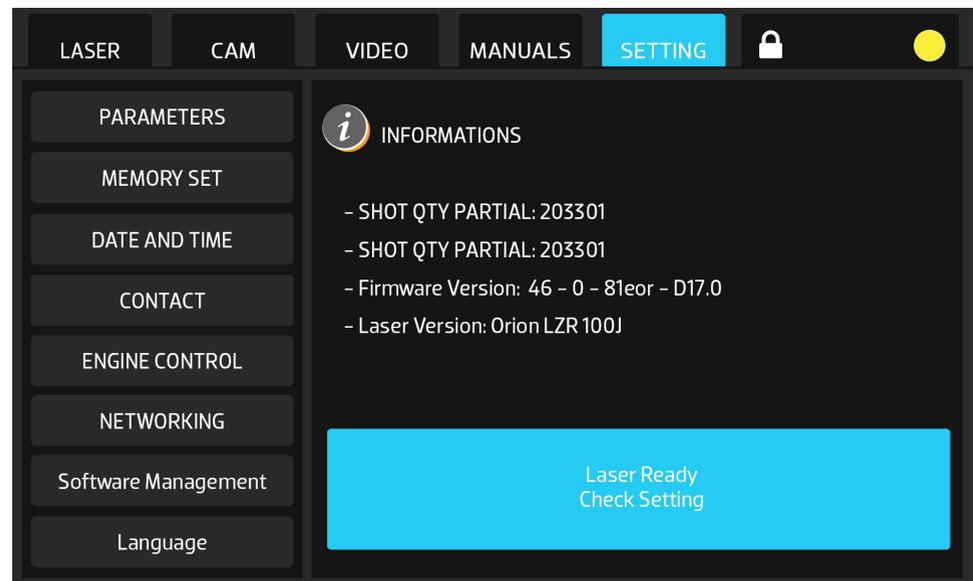


Figure 17.2. Press the Settings Tab to display general welder settings.

SETTINGS TAB

The Settings Screen has multiple sub-tabs with different contents. See Figure 17.2. The main settings screen displays the weld counter, firmware version, and welder model number. The system status box is also visible on this page.

Parameters

The Parameters Tab displays various parameters including: the standby time, up/down movement of the optional motorized pedestal stand, and other temperature and setting readouts. See Figure 18.1 on the next page.

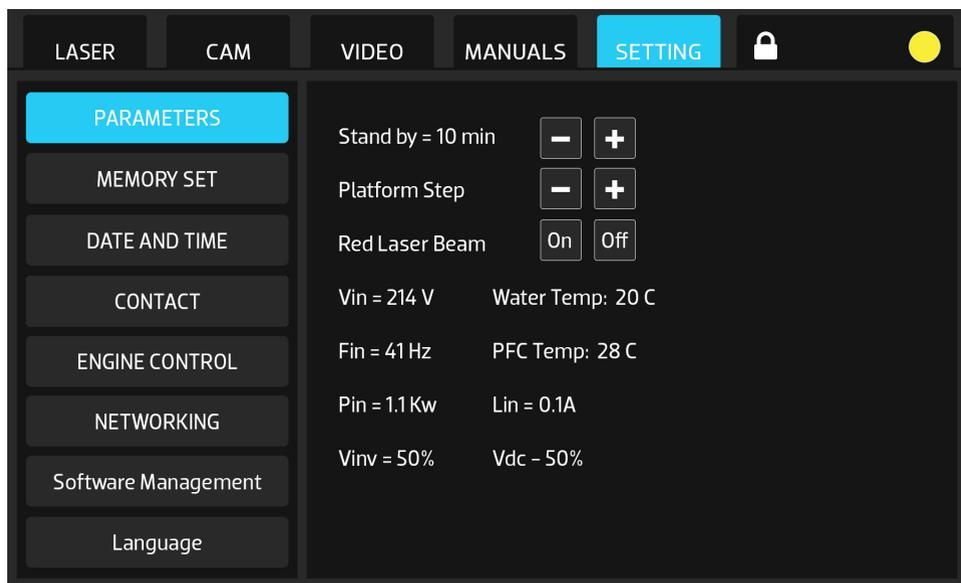


Figure 18.1. Press the Parameters Tab to set Stand-by Time, Platform Step, and view welder temperatures and other controls.

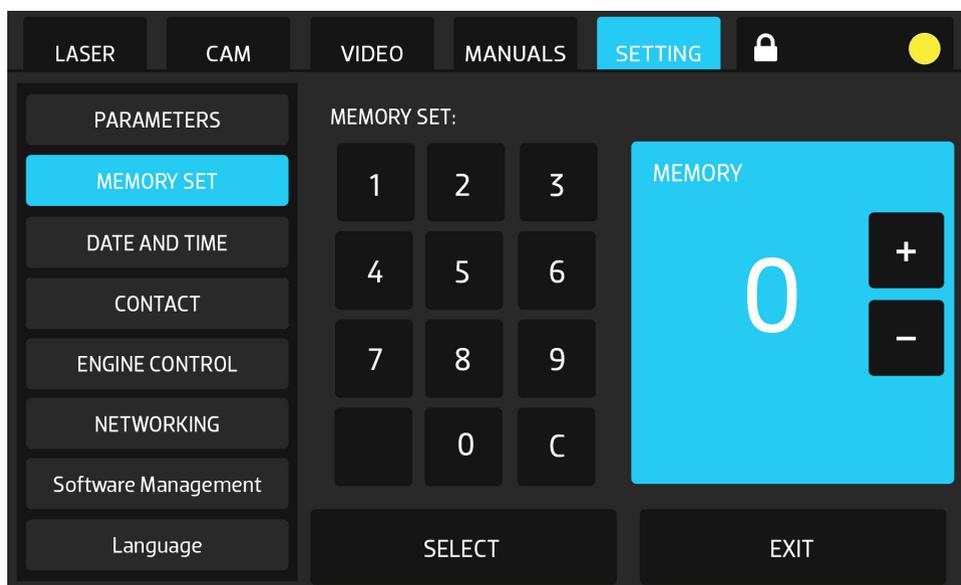


Figure 18.2. Press the Memory Set Tab to load or save any weld setting.

Memory Set

The Memory Set Tab allows you to quickly load any saved setting by number rather than scrolling through one by one. See Figure 18.2.

Date and Time

The Date and Time Tab allows you to set the current date and time. See Figure 19.1.

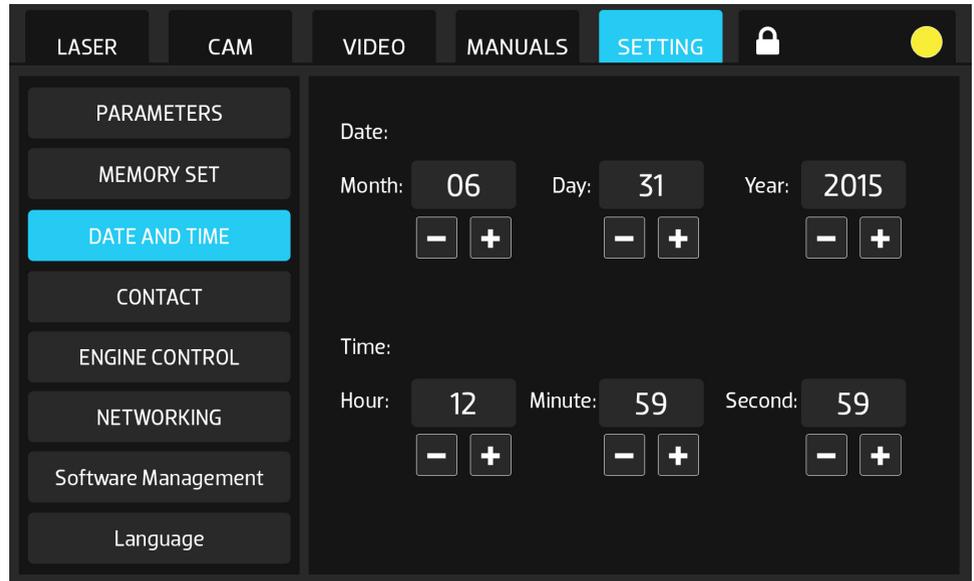


Figure 19.1. Press the Date And Time Tab to set the welder's internal clock and calendar. Simply touch the plus or minus buttons to change month, day, and year.

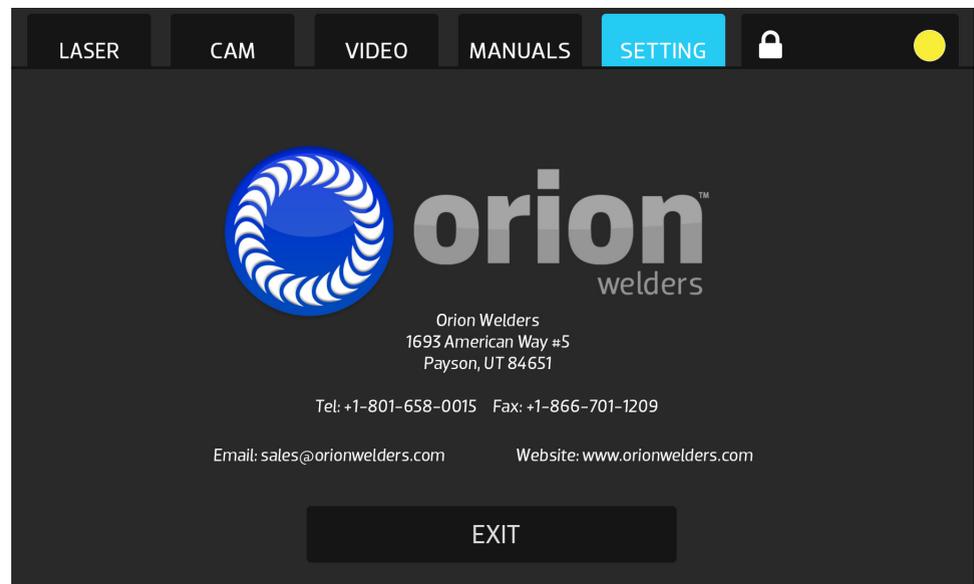


Figure 19.2. If you need customer service, please call or text +1-801-658-0015.

Contact

The Contact Tab displays all the contact details for Sunstone Engineering LLC should you need customer service assistance. See Figure 19.2.

Engine Control

The Engine Control Tab can be used when the welder is equipped with optional accessories designed for automated welding. For example, a rotary ring clamp can be purchased and used to make uniform weld beads around an object such as a ring or tube. Contact Sunstone customer service for assistance.

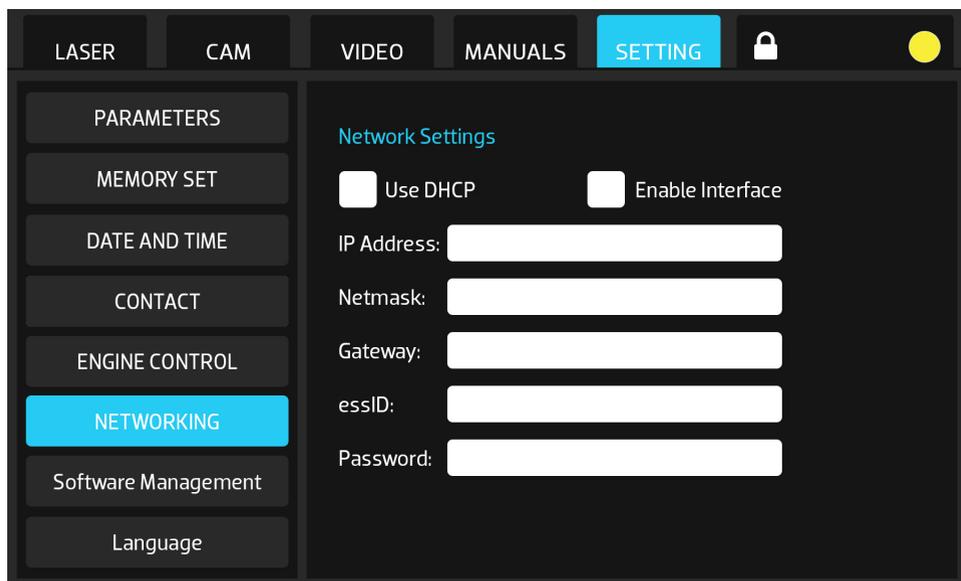


Figure 20.1. Press the Networking Tab to connect the welder to a LAN so it can be controlled remotely.

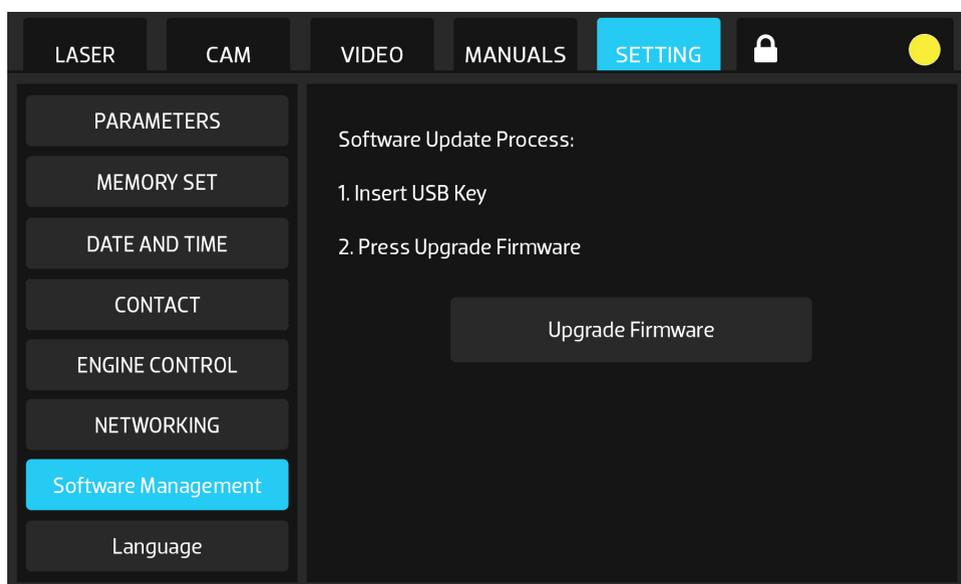


Figure 20.2. Press the Software Management Tab to update the welder's software.

Networking

The Networking Tab can be used to connect the welder to a LAN, which in turn can allow you to control the welder remotely. See Figure 20.1. To view and control the screen remotely, users will need to download and install the VNC software available at www.realvnc.com.

Software Management

The Software Management Tab can be used to update the welder's software. See Figure 20.2.

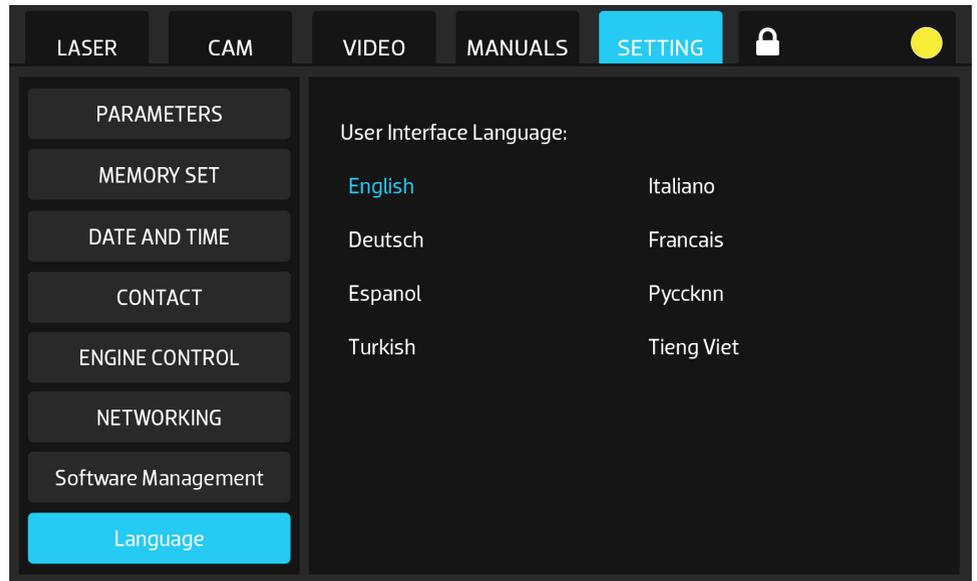


Figure 21.1. The Orion LZR laser welder can be controlled using eight different languages. Press the Language Tab to select the language of choice.

Language

The Language Tab can be used to change the language of the interface. Available languages include: English, Spanish, Italian, German, French, Russian, Turkish, and Vietnamese.

Chapter 4: Maintenance



ATTENTION: Do not open the laser case and panels. Even if powered off, some internal parts may still be subject to live voltage and the possibility of electric shock.

*Any required maintenance on the laser's optic rail and trajectory path, must be performed **EXCLUSIVELY** by Sunstone Engineering or an agent authorized by Sunstone Engineering.*

In order to keep your welder in a safe and optimal working condition, ensure that the following safety measures are followed:

- Change the leather protection strips that cover the entrance to the weld chamber if there are ever any signs of wear or damage.
- If the green-tinted viewing glass for viewing inside the weld chamber should ever break, this must be replaced immediately and only with approved spare parts. Regular glass or plastic cannot be used as these do not provide safety from the laser emission. Do not use the welder if the glass is broken.
- Do not remove the filter inserted in the microscope lens.
- Do not insert large mirror-like surfaces (mirrors, aluminum sheets, chrome plated items) into the weld chamber. These mirror-like surfaces could cause dangerous reflections of the laser beam inside the weld chamber.

The following maintenance items can be performed by you since they do not create any risk of personal injury:

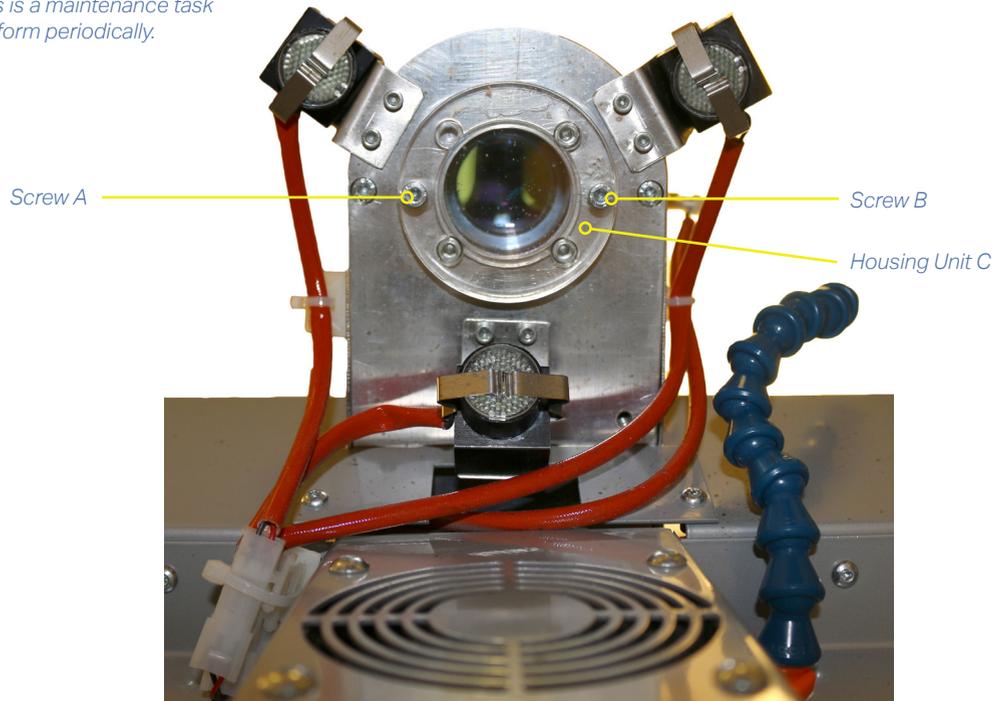
Cleaning or Replacing the Protection Lens

Over time, the protective glass lens may become dirty and cause a reduction in the amount of weld energy that is delivered. If the lens becomes dirty or contaminated with metal slag, it will need to be cleaned and/or possibly replaced.

Periodically check the lens of the microscope that is found inside the weld chamber. This special glass is treated with an anti-glare of 1064 nm. The lens is held in place with two screws at the bottom of the optic assembly.

To change or clean the protective lens carefully follow these instructions:

Figure 23.1. Cleaning or replacing the Protection Lens is a maintenance task you should perform periodically.



- Unscrew the two screws A and B seen in Figure 23.1.
- Disconnect the housing unit C from the optic assembly and remove the lens.
- Clean the lens surface with a soft and non-abrasive cloth.
- Do not try to scrape off the metal slag that may be deposited on the lens. This could potentially remove some of the protective filter material on the lens.
- Reinsert the lens into place and carefully reposition everything back into place.

ATTENTION: It is recommended to keep this lens clean. If it becomes dirty with metal deposits, it is recommended to replace the lens. It is possible that the metal slag deposits could heat up while the laser is in use, and the lens could crack or break due to the heat.

Realigning the Microscope Crosshairs

The welding crosshairs must be aligned correctly in order to be able to make accurate and precise welds. The crosshairs can become out of alignment anytime the welder is moved or lifted. Any impact to the microscope could also affect the crosshairs alignment.

Aligning or realigning the crosshairs is a simple process that any operator can perform.

ATTENTION: Make sure that your hands and other objects are free and clear of the path of the laser beam when testing the crosshairs alignment. If the crosshairs are misaligned, the beam may travel to unexpected locations inside the weld chamber.

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Figure 24.1. Before realigning the crosshairs, make sure the microscope is firmly attached to the welder.

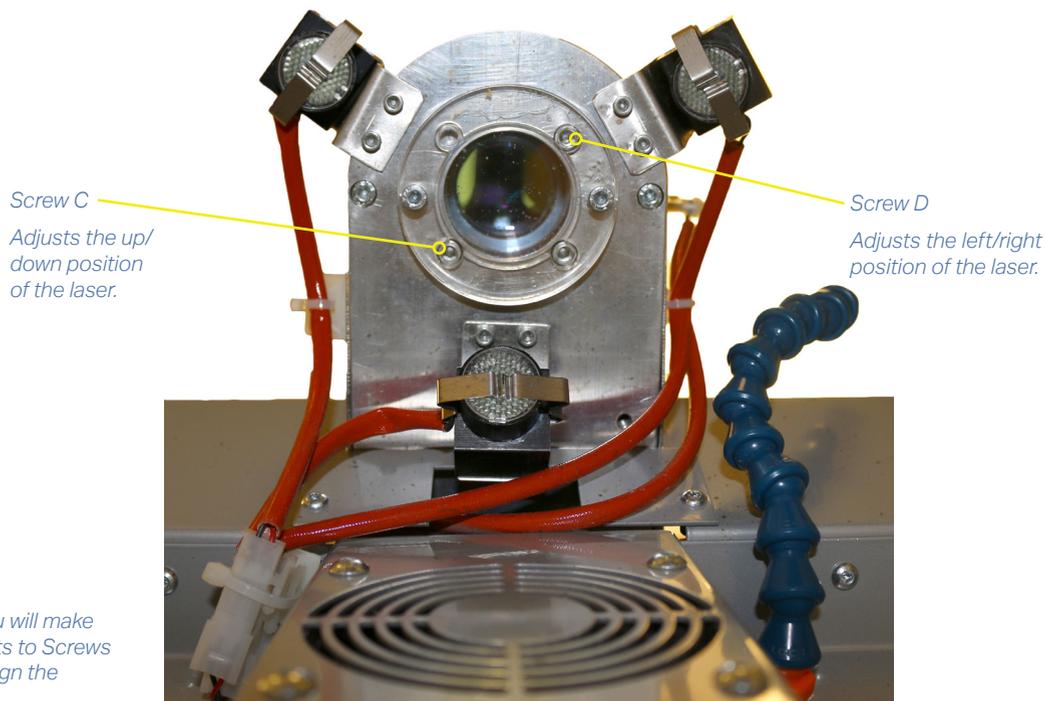


Figure 24.2. You will make fine adjustments to Screws C and D to realign the crosshairs.

Before making any adjustments, make sure the stereomicroscope is firmly attached in place. Also, make sure that the eyepieces are set to the '0' position before making any alignment changes. See Figure 24.1.

To set the cross alignment it is necessary to make slight adjustments to two Allen screws inside the chamber (See Figure 24.2). These screws require a 3 mm Allen key.

The easiest way to align the cross hairs is to place a flat metal piece inside the chamber so that it is in focus through the microscope. Then perform low-powered welds one at a time to see where the laser is being directed onto the metal piece.

Screw C adjusts the vertical (up/down) positioning of the laser. Turning the screw in a clockwise direction will raise the weld spot location.

Screw D adjusts the horizontal (left/right) positioning. Turning the screw in a clockwise direction will move the weld spot location to the right.

Only adjust one screw at a time. Typically, only small adjustments are needed. A quarter turn of the screw will result in a large change in the weld spot location.

Continue turning these screws until you are able to make the weld spot location fall in line with the crosshairs.

ATTENTION: Always use small adjustments when aligning the crosshairs. Ensure that the test piece you are welding on stays stationary inside the weld chamber.

CAUTION: Do not completely unscrew either of these adjustment screws.

Periodically Changing the Cooling Water

It is necessary to periodically change the internal refrigerating liquid (deionized water only). The purpose in changing the water is to avoid the formation of micro alga inside the cooling system that could reduce or block thermal exchange efficiency.

ATTENTION: It is advisable to change the cooling water at least every two years, and in particular before or after any periods of heavy usage.

HOW TO REMOVE THE WATER

- Insert the plastic connection equipped with the welder to the lower Female Connector at the bottom of the rear panel. See Figure 25.1.
- Remove the Red Plug in Upper Connector and let the water drain out.

Figure 25.1. To remove the cooling water, connect the plastic tube and connector that came with your welder to the Female Connector at the bottom of the rear panel. When you remove the Red Plug from the Upper Connector, the water will drain out.

Red Plug and Upper Connector

Female Connector

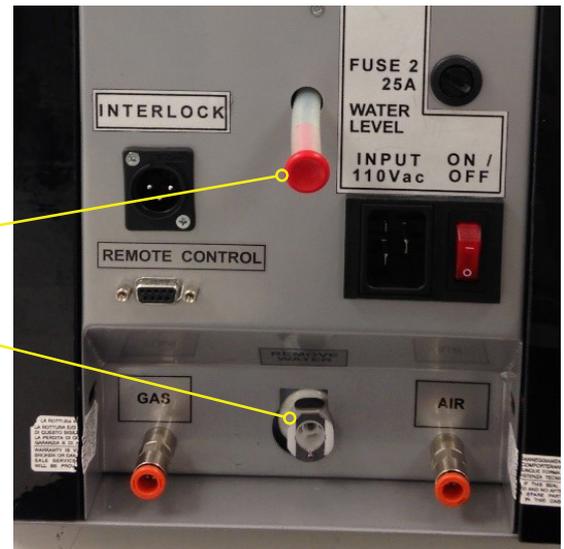




Figure 26.1. To refill the cooling tank, connect the plastic hose to the Female Connector. Connect the funnel to the hose. Remove the Red Plug from the Upper Connector. Fill the tank until water comes out of the upper tank. Use only deionized water.

Upper Connector

Female Connector

Red Plug (removed)

HOW TO REFILL THE COOLING SYSTEM

- Insert the plastic connection equipped with the welder to the lower Female Connector at the bottom of the rear panel. See Figure 26.1.
- Remove the Red Plug in Upper Connector.
- Use the funnel equipped with the welder to refill the tank.
- Continue to fill the welder until you see water coming out of the Upper Connector of the tank.
- Replace the Red Plug in the Upper Connector and remove the plastic connection from the lower Female Connector.

Chapter 5: Error Messages and Troubleshooting

The table shows information regarding the various error and messages that may appear on the welder.

ERROR NUMBER	MESSAGE	CAUSE	REMEDY
01	Error Simmer	The laser lamp is not switching on.	A. Check the fuse. B. Contact Sunstone Engineering.
02	Not Working Refrigerating Liquid (Error 02 Test Flux H20)	The refrigerating liquid is not flowing inside the cooling pipes. A. The pump is not working. B. The water is dirty and needs to be changed.	A. Make sure there is water in the welder, and that the water level is full. This might be a good opportunity to change the water. B. Before turning the key switch, remove the red plug on the back of the unit and push the Joystick down for 5-6 seconds to force start the water pump and clear any air in the system. This process may need to be repeated 2-3 times. C. Contact Sunstone Engineering.
03	Refrigerating Liquid High Temperature	The refrigerating liquid has reached the temperature mark of 55°C. Possible causes: A. High work cycle of the welders. B. Insufficient liquid inside the tank. C. Faulty or not working cooling fans. D. Too much dust or dirt on the heat pump.	A. With the welder turned on, wait 15 min until the error disappears. B. Make sure there is water in the welder. Add water if needed. C. Make sure the fans are working. If not, contact Sunstone Engineering. D. Blow compressed air into the welder to remove dust or dirt that may have settled inside. Do not open the case without assistance.

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ERROR NUMBER	MESSAGE	CAUSE	REMEDY
04	High Electronic Temperature	The internal thermostat inside the power electronic has noticed an high temperature: A. High work cycle. B. Dust or dirt left on the cooling fans. C. Non-working cooling fans.	A. Let the welder rest for 15-20 minutes and wait for the error to disappear. B. Blow some compressed air into the welder to remove any dust or dirt that may have settled inside. C. Contact Sunstone Engineering.
05	Relay Input	The welder will not weld.	A. Check the connection to the power supply. B. Change the power supply.
06	Low Capacitor Voltage	The capacitors are not charging. A. The generator is broken.	Contact Sunstone Engineering
07	Blocked Optical Motor	The motor that sets weld diameter doesn't move.	A. Switch off the welder and switch on again. By powering off and then on the welder will perform a motor check. If the error persists contact Sunstone Engineering.

OTHER ANOMALIES AND TROUBLESHOOTING

PROBLEM	RESOLUTION
The welder switches on but is not in the START position	Verify the key position inside the weld chamber.
The display shows the parameters but the laser doesn't shoot.	Check that the foot pedal is connect to the welder.
The microscope shutter closes, but no weld is made.	A. The power and time settings are too low. B. MS5 zoom drum is not in the correct position. C. Clean the protective lens.
The lights inside the welding chamber do not turn on.	A. Check the light adjustment knob inside the weld chamber and make sure it is not in the off position (see Figure 11.1). B. Check the fuses.
Smoke created from the weld rises towards the microscope and impairs vision of the workpiece.	A. The filter on the internal fan of the welding chamber is too dirty. B. The fan is not working; check the fuse.

PROBLEM	RESOLUTION
The shielding gas doesn't flow when the pedal is pushed.	<ul style="list-style-type: none"> A. Check the home screen to verify the gas flow is turned on. B. Check that the input pressure is not higher than 2 Bars. C. Check the flux regulator inside the weld chamber. D. Verify that in gas tubing is not kinked or blocked.
I try to blow compressed air from the nozzle, but no air comes out.	<ul style="list-style-type: none"> A. Verify that in gas tubing in not kinked or blocked. B. The compressed air pressure is too low.
The laser doesn't turn on.	<ul style="list-style-type: none"> A. Verify that the switch placed on the back is in ON position. B. Verify that the emergency stop switch is released. C. Check the fuses. D. Verify the welder is plugged in to an active power source.

Note: When replacing fuses, ensure that the replacement fuse is of the same rating and same type. It is always recommended to have a fuse installed when using this welder.

Chapter 6: Safety Systems

The Orion LZR laser welder is equipped with a high number of safety system checks designed to prevent laser radiation leaks. These safety systems include the following:

Resonator Shutter

The Resonator Shutter is formed from a small flag controlled by an electromagnet and it is placed inside the Laser Resonator. The shutter disconnects the laser inside the resonator when the welder is in STAND-BY mode. The purpose of this device is to prevent the generation of undesired laser radiation. When the power switch is turned on, and the key is NOT turned on, the Resonator Shutter is engaged. When the key is turned on the shutter is disengaged. When the key is turned off, the shutter is engaged again.

Microscope Shutter

The Microscope Shutter is a liquid crystal filter (LCD) that dims completely when a regulated voltage is supplied. It is placed between the 45° mirror and the focus lens of the microscope. The shutter obstructs the operator's vision through the microscope at the precise moment the laser weld is initiated. The purpose of this device is to prevent the operator from exposure to the visible radiation light flash that may result from the weld being formed.

The Microscope Shutter is the second of three safety systems deployed when a weld is made. This shutter is normally in an opened state and is independent from the previously mentioned Resonator Shutter. This allows the microscope to be used at any moment.

After the key has been turned to 'start', the shutter will engage under the following steps:

- The foot pedal is pressed.
- The microprocessor responds by engaging the shutter.
- The microprocessor turns on the laser lamp.
- The shutter remains engaged as the lamp is on, and then also remains engaged for a short time after the lamp is turned off while the weld puddle cools and solidifies.
- The shutter will disengage allowing the operator to see through the microscope again.

Microscope Infrared Filter

The Microscope Infrared Filter is an optical glass designed to filter laser radiation of 1064nm. It has a slight gray color but is perfectly transparent. It is placed inside the microscope. See Figure 31.1. The purpose of this filter is to preserve the operator's eyes from leaks and to completely ensure that all laser light is blocked from passing through the microscope. The filter is opaque to the wavelength of 1064nm prevents any possibility of laser light passing through the microscope.

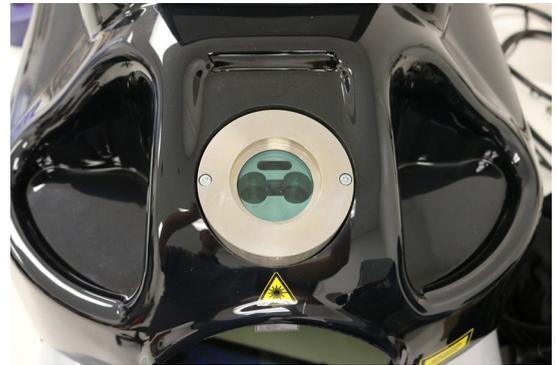


Figure 31.1. Microscope Infrared Filter.

Weld Chamber Infrared Filter

This filter is an optical glass designed to filter laser radiation of 1064nm (see Figure 31.2). It has a slight green tint but is perfectly transparent. Operators should look through this window any time they need to view inside the weld chamber, rather than looking through the leather strips.

ATTENTION: If this filter should ever break, it is very important to get it replaced with a new filter. To ensure safety, use only original and approved spare parts from Sunstone Engineering.



Figure 31.2. Weld Chamber Infrared Filter.

Leather Strips Protecting the Chamber Opening

The opening to the weld chamber is covered with skirted leather strips, which allow you to insert your hands and workpieces into the weld chamber, while still blocking the laser from escaping the weld chamber (see Figure 31.3). It is necessary to have this protection installed on the welder for two main reasons:

- To prevent the laser light from escaping the weld chamber and to shield the bright flash that occurs during welding.
- To help retain shielding gas (argon) while welding, and also allow the shield gas to dissipate after the welding is finished.

The leather strips prevent laser light from leaving the chamber, and at the same time helps improve the usage of shielding gas.

ATTENTION: If the leather strips should ever break, wear out, or not provide full coverage, they should be immediately replaced with a new set. To ensure safety, use only replacement parts supplied by Sunstone Engineering.

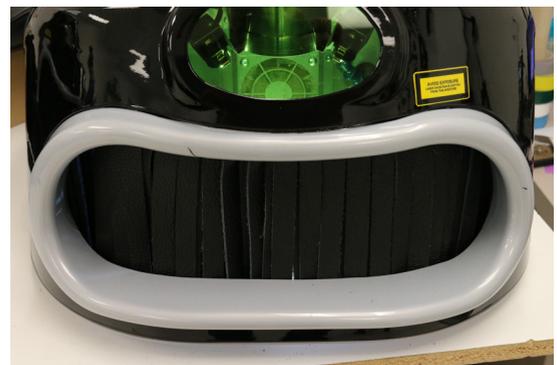


Figure 31.3. The leather strips at the front of the weld chamber prevent laser radiation from escaping the chamber while still allowing you to insert your hands and workpieces.

Chapter 7: Suggested Settings

METAL TYPE	POWER	SPOT SIZE	TIME ms	FREQUENCY	WAVE
Yellow Gold Thin	2.0	0.2	2.0	5.	SLO+
Yellow Gold Wire	2.4	0.4	2.4	6.5	SLO+
Yellow Gold Smoothing	3.6	0.7	3.6	6.5	SLO+
White Gold Thin	1.5	0.2	1.6	6.5	SLO-
White Gold Wire	1.7	0.4	1.7	6.5	SLO-
White Gold Smoothing	2.3	0.8	2.1	6.5	SLO-
Rose Gold Thin	1.6	0.2	1.9	5	SLO+
Rose Gold Wire	1.8	0.3	2.2	5	SLO+
Rose Gold Smoothing	3.2	0.6	3.1	6.5	SLO+
Silver Thin	3.7	0.3	3.7	5	NORM
Silver Wire	4.2	0.3	4.2	5	NORM
Silver Smoothing	4.5	0.4	4.5	4	NORM
Platinum Thin	1.8	0.4	0.8	5	NORM
Platinum Wire	1.8	0.5	1	1.6	NORM
Platinum Smoothing	2.2	0.8	1.8	1.9	NORM
Stainless Steel Thin	1	0.3	1	6	NORM
Stainless Steel Wire	1.2	0.5	1.2	7	NORM
Stainless Steel Smoothing	1.8	0.7	1.8	7	NORM
Titanium Thin	1.6	0.7	1.8	7	NORM
Titanium Wire	1	0.2	0.2	2.5	NORM
Titanium Smoothing	1	0.2	0.2	2.5	NORM
Palladium Thin	1.6	0.2	1.3	5	NORM
Palladium Wire	1.8	0.5	1.6	6.5	NORM
Palladium Smoothing	2.4	0.7	1.8	8	NORM
Nickel Silver Thin	1.6	0.7	1.4	5	NORM
Nickel Silver Wire	1.4	0.8	1.4	7	NORM
Nickel Silver Smoothing	1	0.9	1.9	8	NORM

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