LaserStar Laser Welder SOP



1. Scope
   1. This document provides the procedure for operating the LaserStar Laser Welder.

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1. Reference Documents

Referenced within this Document

* + 1. None

External Documents

* + 1. None

1. Equipment and/or Materials
   1. Laser welder
   2. Argon
   3. Sample
2. Safety
   1. Follow all Nanofab safety procedures.
   2. Radiation produced by laser light is capable of melting, burning or vaporizing almost any material. Refer to **Section II Safety** of the Operation and Service Manual for the proper safety guidelines prior to using this equipment.
3. Setup Procedures

Turning on the Machine

* + 1. Reserve and enable the equipment in CORAL. (Packaging – Laser Welding)
       1. Obtain the interlock connector from staff in the office.
    2. Check that the Main Switch and Key Switch are in the OFF positions. See *Figure 1*.
    3. Turn Main Switch ON.
       1. For optimal performance, wait approximately 5 minutes before turning on Key Switch.
    4. Turn Key Switch ON.
       1. The green system ON indicator should light up on the keypad and the tool will carry out a series of tests. If a failure occurs, an error message will display on the control panel.
    5. Once the self-test has completed, the green OK indicator should turn on.

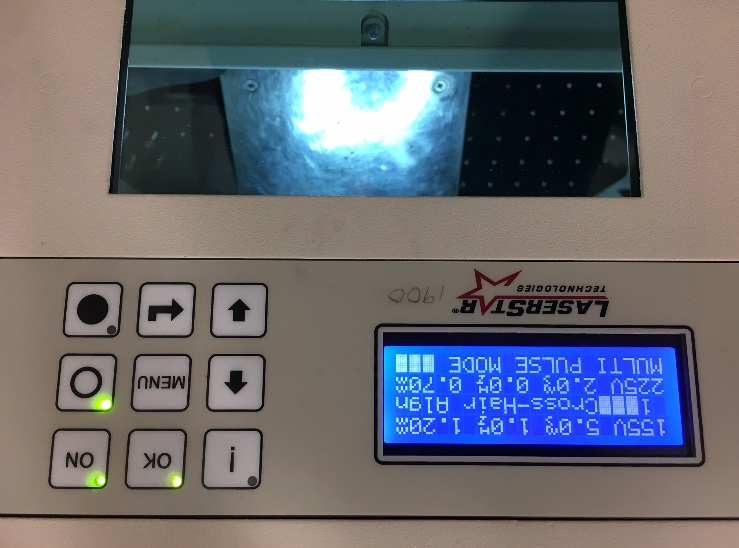


Main Switch

Key Switch

**Figure 1, Main and Key Switches**

* + 1. Press the Shutter Open button. See *Figure 2.*



Shutter Open

**Figure 2, Control Panel and Keypad**

Adjust the Binocular Stereo Microscope

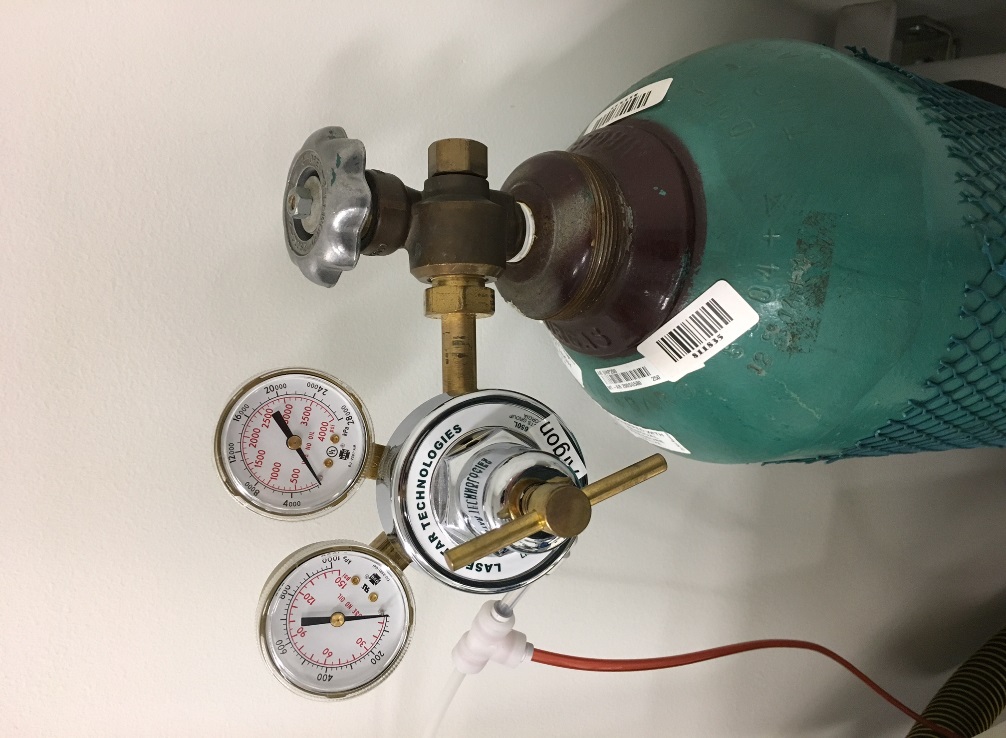
* + 1. After the equipment is turned on and the tests are completed without fault, place a sample on the stage in the welding area.
    2. Ensure eyepieces are pushed onto the eyepiece as far as they can go.
    3. Adjust the stage height so that the sample is in focus when seen only through the left eyepiece.
    4. Look through the right eyepiece and turn the adjustment ring so that the cross hair appears focused on the sample.

Setting Operating Parameters

* + 1. On the keypad, use the enter key to select the operating parameters and the arrow keys to change the parameter values.
       1. Press the enter key and the selected parameter value flashes.
       2. Press the enter key several times to step through the different parameters.
          1. The parameters consist of Voltage, Pulse Time, Pulse Frequency and Pulse Width.
    2. You will have to experiment with different settings as different materials will require different settings to properly weld together.
       1. The settings may be saved, but note that when the equipment is shut off completely, the stored settings are deleted and the tool defaults back to the original settings.

Turning on the Gas and Foot Pedal Controller

* + 1. Open the Argon gas bottle by turning the valve about 1 full turn. The pressure gauges should both increase shortly after opening the valve. See *Figure 3.*



Open/Close Valve

**Figure 3, Argon Gas Bottle**

* + 1. Flip the switch on the foot pedal controller to on. See *Figure 4.*

A picture containing indoor, wall, bathroom, white

Description generated with very high confidence

**Figure 4, Foot Pedal Controller**

1. Welding

Preparing to Weld

* + 1. Place the work piece that you intend to weld on the stage in the welding chamber.
    2. Put both hands through the openings in the welding chamber so that you can hold and align the materials you intend to weld.
    3. CAUTION: Do not position your hands under the cross hair. The laser welds in the position of the cross hair and your hands will be burned if the laser is activated.
    4. Adjust the stage up or down again to make sure the cross hair is focused on the materials you intend to weld.

Welding

* + 1. Looking through the eyepieces, join the materials you intend to weld together so the exact spot you want to weld is positioned directly under the cross hair.
    2. Press the pedal down lightly until you hear one click. This will enable the gas flow.
    3. Let gas fill the chamber for one or two seconds and then press the pedal down all the way. This will enable the laser and start the welding.
    4. When welding occurs, the view shutter in the eyepiece will shortly black out to protect your eyes from the laser.
    5. In Multi-Pulse Mode, the laser will continually fire with the frequency set in the parameters for the duration of time that the foot pedal is being pressed.
       1. For example, if the frequency is set to 1Hz, the laser will fire once every second.

Switching the Equipment Off

* + 1. Turn the Key Switch to the OFF position.
    2. Turn the Main Switch to the OFF position.
    3. Close the Argon gas valve. Note that the pressure gauges won’t decrease immediately after closing the valve.
    4. Turn off the foot pedal controller unit.
    5. Remove the interlock connector and return to staff.
    6. Disable the tool in CORAL.

1. Process Notes

Material Selection

* + 1. The figure below summarizes the weldability of some common materials used.
       1. The figure was taken from a technical article, Laser Welding Fundamentals, published by Amada. A link to the article can be found here: http://www.amadamiyachi.com/educationalresources/articles

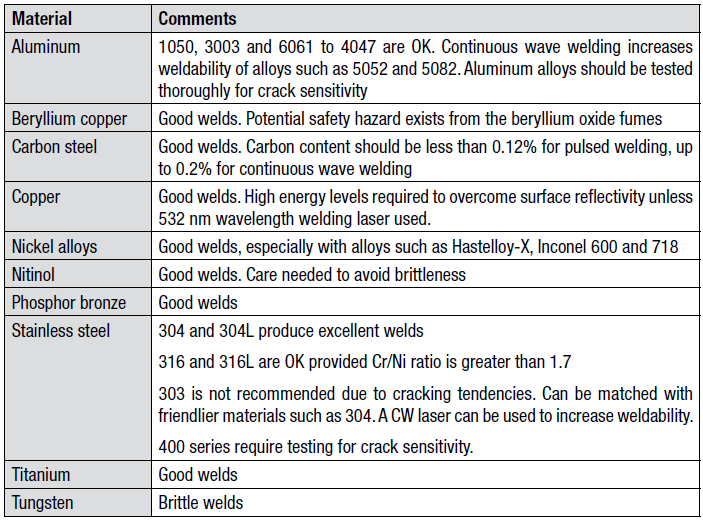


Figure 5, Weldability of Common Materials

Welding Dissimilar Metals

* + 1. The figure below provides general guidelines for welding dissimilar metals.
       1. The figure was taken from the same technical article as the figure above, Laser Welding Fundamentals, published by Amada. A link to the article can be found here: http://www.amadamiyachi.com/educationalresources/articles

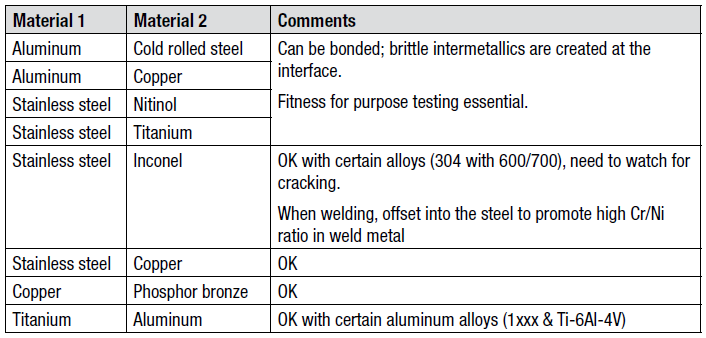


Figure 6, Welding Dissimilar Metals

1. Revision History

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| --- | --- | --- | --- |
| Rev | Date | Originator | Description of Changes |
| 1 | 05 Dec 2017 | Chris Adams | Initial writing. |
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