Welcome to the LuciteLux® Continuous Cast Acrylic Laser Processing Guide

Introduction

CO_2 laser systems provide an ideal, non-contact method for cutting and engraving LuciteLux® acrylic. Both processes can be combined into a single manufacturing step, and run without the need for tool cleaning or sharpening and without cutting fluids or polishing compounds.

The 10.6micron wavelength emitted from the CO_2 laser is absorbed very efficiently by polymeric materials such as LuciteLux® acrylic. The absorbed laser light is converted to heat, and the heat causes material that is directly in the laser's path to vaporize (ablation). Higher laser power densities can be used to cut through LuciteLux® sheets leaving a clean, square and polished edge. Lower laser power densities can be used to engrave a high definition, permanent mark into the surface of the material for branding or serializing parts. Figure 1 shows a sheet of LuciteLux® that was cut and engraved using a CO_2 laser in a single, continuous operation.

Figure 1. Raster engraving, vector engraving and cutting LuciteLux® in a single laser processing operation.

Laser Cutting

A 2.0 lens (two inch focal length) is suitable for most cutting applications. Air assist with back sweep is recommended for cuts greater than 0.250". The back sweep will allow direction of the high-pressure air across the surface of the work piece instead of down the cut where it could cause frosting of the cut edge. Gas assist with nitrogen is recommended for thicknesses greater than 0.500". For gas assist, a cone will provide better direction of the low-pressure nitrogen to the cut. Since the nitrogen pressure is

low, frosting of the edge due to rapid cooling is not an issue. Also, for thicknesses greater than 0.500", switching to a 3.0 lens will provide a more uniform cut through the thickness of the work piece due to reduced beam divergence.

When cutting, it is best to remove the masking from the top side of the work piece so that it will not interfere with the laser cut. Leave the masking on the bottom side of the work piece to protect it from reflections off the cutting table. For applications where edge quality is critical, the work piece should be elevated about an inch above the cutting table to avoid all reflections.

For cutting, the laser is usually run at 100% of its rated power. Lower cut speeds are used for thicker materials. Figure 2 provides guidance on laser power selection and laser cutting speed respectively.

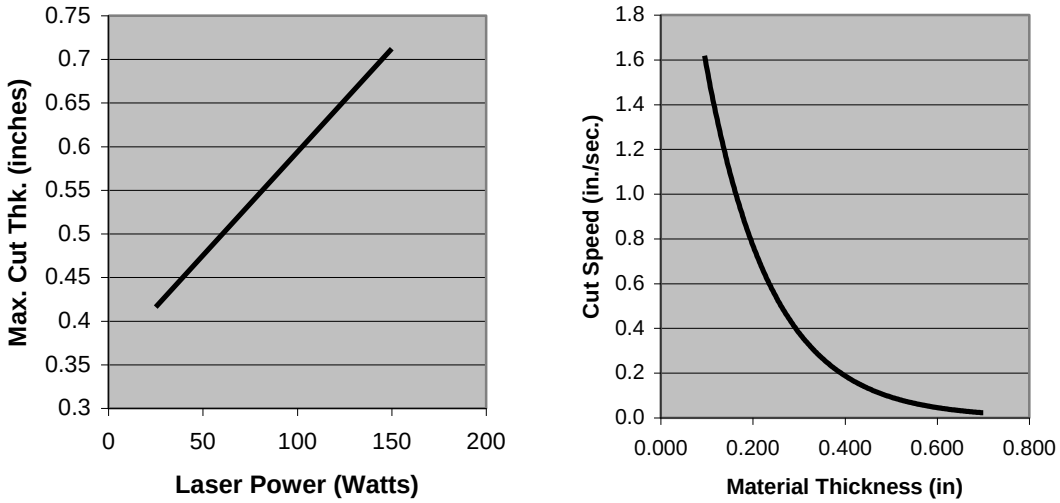

Figure 2. Maximum thickness that can be cut as a function of laser power (left), and maximum cut speed as a function of material thickness (right).

Laser Engraving

Laser engraving can be done in raster mode as well as vector mode as demonstrated in Figure 1. In each case, the engraving depth is a function of the laser power density. Figure 3 provides information on raster engraving depth and vector engraving depth as a function of laser power at constant engraving speed.

A 2.0 lens (two inch focal length) is suitable for most laser engraving applications. For applications that require very fine detail, High Power Density Focusing Optics (HPDFO) are recommended. This will provide a much smaller laser spot size than the 2.0 lens.

For most applications, the masking should be removed from the top side of the work piece. The top side masking should be left in place for deep raster engraving (depths of greater than 0.010") in order to avoid hazing of adjacent surfaces due to re-deposition of ablated material. Leave the masking on the bottom side of the work piece to protect it from mechanical damage (scratches).

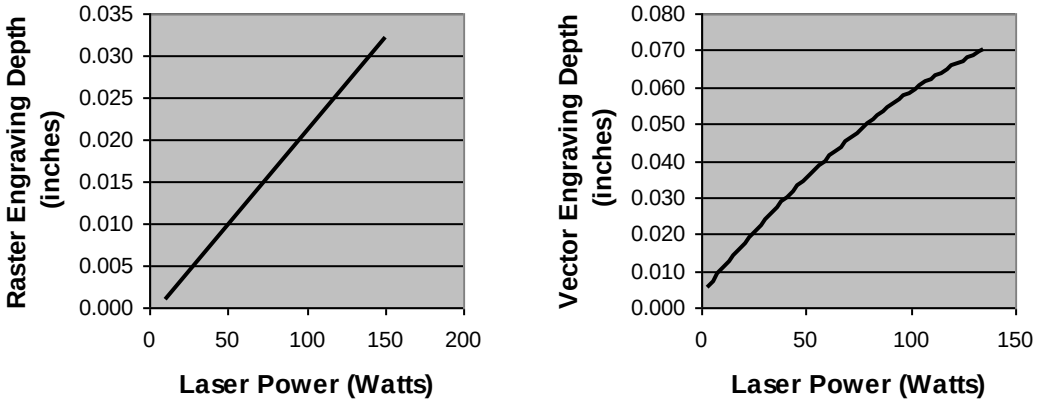

Figure 3. Raster engraving depth as a function of laser power (left), and vector engraving depth as a function of laser power (right).

High Volume Manufacturing
For cutting operations, increasing the laser power will improve the throughput of the laser system. A dual laser system allows the beams from two lasers to be combined into a single beam, thus providing the maximum cutting power. Universal Laser Systems offers a unique configuration that combines the two beams in a complementary manner for superior cutting uniformity. For engraving, the two beams can be operated in parallel so that two identical parts can be processed simultaneously. Work surfaces as small as 16" x 12" are available for smaller work pieces, and sizes range up to 48" x 24" for larger work pieces. Options are also available for longer work pieces (ie. 24" x unlimited length).

Caution
Acrylic materials such as LuciteLux® are flammable. Laser systems should not be left unattended when processing any acrylic material.

This information is given expressly in regards to participants laser processing LuciteLux® continuous cast acrylic sheet. For further information please contact Lucite International, Inc. via our website at www.lucitelux.com or call 1-800-4LUCITE, and ask for sheet technical services, or contact Universal Laser Systems at www.ulsinc.com

UNIVERSAL®
LASER SYSTEMS