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Universal laser systems material settings

Laser processing of materials can be a nuanced and highly technical endeavor. Proper selection of processing parameters for laser cutting, engraving, and marking a material can vary based on several factors including:Without software assistance, users resort to iterative testing and experience to achieve adequate results on each process. This is a highly unreliable and time-consuming process that can be temperamental and does not always transfer from system to system or between laser sources of different power ranges. This complexity stands as a frustrating barrier to the unlimited potential benefits offered by laser systems.The Intelligent Materials Database is one of many features offered by ULS to improve the simplicity of laser material processing. It reduces complexity to a simple three step process: 1) select a compatible material from a list, 2) choose the type of processes to be performed (cutting, marking, or engraving), and 3) enter the material thickness. From this information, the Intelligent Materials Database is able to automatically generate the material's optimal processing parameters, allowing the user to focus on being productive and to not be burdened with the need for experimentation.The Intelligent Materials Database accomplishes this remarkable reduction in complexity by compensating for several factors:the type and thickness of the material to be processed, the current laser system configuration, and the desired process type to compensate for a variety of phenomena. The following section describes in more detail the types of considerations that the Intelligent Materials Database handles.Material ConsiderationsThe Intelligent Materials Database contains laser material processing parameters for hundreds of materials ranging from the commonly used (cherry wood, acrylic, glass) to the application-specific (3M™ Double Coated Tape 4411-4412, Marnot™ XL hard coated Lexan™ PC, Hastelloy™). In each case, the database determines which materials can be marked, cut, or engraved with the current laser system configuration. For example, a laser system configured with a fiber laser is capable of marking PC plastic but is unable to cut or engrave. A laser system with a CO2 laser can mark and engrave, but may not be able to cut through thicker PC sheets if the laser has a lower power rating. The Intelligent Materials Database knows these peculiarities and is able to guide the user as to what can and cannot be processed.Moreover, the database will take into account the current laser system configuration and ensure that processing results are consistent across the broad range of compatible materials.Depth ConsiderationsIn laser cutting and laser engraving applications, the Intelligent Materials Database automatically adjusts the speed of cut to achieve the desired results. In laser cutting, this means that the material will be completely separated. In laser engraving, this means that the depth will be held consistent. In both cases, results are achieved at the highest possible throughput.Power ConsiderationsMaterials respond differently to laser sources of different power levels. Cutting ½" (12.7mm) acrylic with 150 watts of laser power is about twice as fast as cutting with 75 watts. Some materials such as thin films exhibit better processing behavior at lower power levels. Wood darkens when marked with lower-power lasers, but stays the same color at higher-power levels. In all cases, the laser material processing parameters must be adjusted to compensate for the power level of the laser source.ULS offers a variety of laser sources with power ranging from 10 watts to 500 watts. Some laser cutting, engraving, and marking machines can be equipped with multiple lasers. In many laser systems, the laser power can be mixed and matched. A PLS6.150D for instance, can use both a 75 watt laser and a 10 watt laser at the same time. To increase flexibility, the lasers on any laser system can be reconfigured in less than 30 seconds using Rapid Reconfiguration™, a unique and powerful feature offered only by ULS.Selecting the correct laser material processing parameters in regard to laser power can be complex. This is another area in which the Intelligent Materials Database adds tremendous value. It automatically adjusts the processing parameters to account for any laser configuration. The database provides the best suggested settings for a wide range of requirements. For example, the database provides solutions for requirements as diverse as using a single 25 watt laser to cut ¼" (6.35 mm) ABS as well as using dual lasers with 40 and 50 watts to mark granite. This amazing feature extends across the entire ULS product line and dovetails with other ULS technologies such as Dual Laser Configuration™, Multi-Wavelength™ and MultiWave Hybrid™ technologies, etc. to give users simple access to an incredible range of processing capabilities without any of the associated complexity.Wavelength ConsiderationsULS offers lasers of three different wavelengths: 10.6µm CO2, 9.3µm CO2, and 1.06µm Fiber. Each wavelength interacts differently with each material. A 10.6µm CO2 laser may have no effect on Aluminum whereas the 1.06µm Fiber laser can produce high contrast marks. Polycarbonate produces frosted marks with the 10.6µm CO2 and 9.3µm CO2 sources, but a dark black mark with the 1.06µm Fiber. The Intelligent Materials Database uses the type of laser or lasers which are attached to the laser system and can adjust the laser material processing parameters accordingly.Capacity ConsiderationsSome materials are capable of being processed in more than one way with a single laser source. One prominent example is rubber used for making stamps. It can either be directly marked or cut to create a true representation of the design file or processed in "Rubber Stamp Mode" to make a high-quality functional rubber stamp. This process involves adding "shoulders" to the markings to enhance the strength of the marking ridges. The Intelligent Materials Database contains the correct settings for each type of process, affording the user the flexibility to produce either of the above-mentioned effects on the same material.Other ConsiderationsFor several materials, there are considerations which do not fall cleanly into any particular category and are simply displayed to the user as "processing notes". These notes vary based upon material. For instance, cutting through thick wood can cause soot and flames to contaminate the lens. Therefore, the notes suggest using the coaxial air attachment on the air assist assembly to protect the optics and increase the longevity of the laser system. Users can also add their own processing notes to each material, providing a convenient place to store information relevant to specific materials. The Materials Library is the world's premier source for information on laser material processing. It provides information on the types of materials that can be laser processed and the processes (laser cutting, engraving and marking) that are possible with a given material. Additionally, the Materials Library highlights considerations for your laser system configuration necessary to process a given material as well as how ULS technology innovations can be leveraged to obtain the best possible results. This library is an evolving resource with updates made on a regular basis. Search By MaterialSearch By Industry and Manufacturer© 2022 Universal Laser Systems, Inc. All rights reserved. Universal Laser Systems logo and name are registered trademarks of Universal Laser Systems, Inc. All other company and product names are trademarks or registered trademarks of their respective companies. We have two of them. They are CO2 based lasers with 60 watts of power. Requirements for Use Never leave the laser unattended when running. Be vigilant about fire safety: a CO2 extinguisher is fixed to one of the lasers and is the preferred extinguisher to use. Before use check the lens for dirt (its housing unscrews and you can take it out), a dirty lens can shatter from laser heat, if dirty clean it with the camera lens cleaning kit. Remember to turn on the fan. Printing from Inkscape In order to print from Inkscape in the vector format, you need to: Convert any objects (shapes, text, bitmaps) to paths. Convert bitmaps/png/rasters using the Path -> Trace Bitmap. Convert shapes using Path -> Object to Path. You also need your stroke width to 0.02 pixels or less (be sure units on line width are "px" not "in") Make sure that the stroke color is solid (ex R:255, G:0, B:0, A:255 for a red line) Print from the Extensions-> Export->Win32 Vector Print. In this screen cut properties can be assigned to colors. You must also select raster for each color (box to the left of each color). In order to print greyscale, print from the File->Print Dialog box. See more details below. Tips: Go to File > Document Properties and change Display Units to Inches to make alignment easier If the laser is starting anywhere but the top left corner, click X-Y, and reset the origin to the top left corner If you send a print job and the top is open the laser will not turn on the cutting laser but will show a red dot where it will cut. You can repeat any job by just pushing the green button again (great for multiple passes on a cut). When you are cutting through a material it is best to use a platform that allows air to escape from under the material. You will get cleaner cuts. Be sure any material you are cutting is cut all the way through before moving it, as you will not be able to get it in exactly the same spot again. When cutting make a small notch in your design along the edge of your material. You can use this to test if the cut is all the way through. Use the "skip" fuction for specific colors to avoid recutting areas you do not want to pass over again. Do a fast light vector on paper or cardboard to test placement. If you are engraving glass you can put your peice right over it. Plastics release fumes for several hours. Keep finished pieces in the laser enclosure with exhaust on until it no longer produces smells. Engrave with 70% gray instead of black - gives cleaner image, reduces chipping. When doing a raster of a photo first take it into Gimp and adjust the contrast to maximize the parts of the image you want to emphasize. Be sure to check the advanced tab to be sure there are not settings that mess with your print. If you find your image is extended or stretched try adjusting the image density slider in the print driver. 5 is a good setting. When printing a raster from the regular print menu in Inkscape remember to go to Document Properties and change the page color from transparent to white. Otherwise you will get a big block of black. Focusing Information This cutter is equipped with the 4.0 Lens and a 2.0 lens, which means its point of Focus is roughly 4" or 2". The 4 has more room to fudge distances, the 2 is a crisper line. We have a 3D Printed focus tool, which should allow you to focus correctly. Just load your piece into the cutter, below the laser head. Place the focus tool on top. While the printer is on, hit the Z button; then use the up and down arrows to move the laser head up and down. Use the Focus Tool the same way you would on the Epilog, the laser head should bump the notch on the tool and push it out of the way. It is now focused. Recommended Settings MATERIAL CUT/ENGRAVE POWER PPI SPEED RESULTING DEPTH NOTES ACRYLIC - CAST AND EXTRUDED LIGHT RASTER ENGRAVING 22% 500 100% .002" ACRYLIC - CAST AND EXTRUDED DEEP RASTER ENGRAVING 100% 500 90% .010" ACRYLIC - CAST AND EXTRUDED VECTOR ENGRAVING 20% 1000 4% .005" ACRYLIC - CAST AND EXTRUDED VECTOR CUTTING 100% 1000 2% .25" DENIM RASTER ENGRAVING 45% 400 100% A bit PAPER VECTOR CUTTING 15% 200 3.2% .02" PLYWOOD VECTOR CUTTING 75% 250 4.8% .125" PLYWOOD RASTER ENGRAVING 50% 250 30% .02" PLYWOOD RASTER ENGRAVING 50% 250 30% .02" CARDBOARD VECTOR CUTTING 25% 250 4% .125" CARDBOARD VECTOR ENGRAVING 10% 250 4.0% .05" CARDBOARD RASTER ENGRAVING 30% 250 80% .01" Medium dark engraving ANODIZED ALUMINUM RASTER ENGRAVING 30% 500 100% .001" ANODIZED ALUMINUM VECTOR ENGRAVING 4% 1000 4% .001" GLASS / CRYSTAL RASTER ENGRAVING 100% 300 30% .001" GLASS / CRYSTAL VECTOR ENGRAVING 10% 300 7.9% .001" LEATHER RASTER ENGRAVING 19% 500 100% .001" LEATHER VECTOR ENGRAVING 3% 500 4% .001" LEATHER VECTOR CUTTING 50% 200 2.1% .1" RUBBER STAMPS RASTER ENGRAVING 23% 500 23% .03" Smells really bad. Be sure to let air clear before opening. Only used laser safe rubber RUBBER STAMPS PERFORATED VECTOR CUTTING 60% 90 3.1% .04" WOOD RASTER ENGRAVING 100% 500 25% .02" WOOD VECTOR ENGRAVING 80% 500 10.1% .03" WOOD VECTOR CUTTING 50% 250 3.1% .125" Cotton Cloth VECTOR CUTTING 60% 400 8% Prone to lighting on fire. Must monitor entire time closely. Fire will start on edges or where folded. Fire will also start where path crosses self. More material settings and info on page 47 of the manual What Material Can Be Laser Cut Cutting Material Max thickness Notes WARNINGS! Many woods 1/4" Avoid oily/resinous woods Be very careful about cutting oily woods, or very resinous woods as they also may catch fire. Plywood/Composite woods 1/4" These contain glue, and may not laser cut as well as solid wood. MDF/Engineered woods 1/4" These are okay to use but may experience a higher amount of charring when cut. Paper, card stock thin Cuts very well on the laser cutter, and also very quickly. Cardboard, carton thicker Cuts well but may catch fire. Watch for fire. Cork 1/4" Cuts nicely, but the quality of the cut depends on the thickness and quality of the cork. Engineered cork has a lot of glue in it, and may not cut as well. Avoid thicker cork. Acrylic/Lucite/Plexiglas/PMMA 1/2" Cuts extremely well leaving a beautifully polished edge. Thin Polycarbonate Sheeting (Print Raster Prints exactly what you see as Raster (as interpreted by settings in advanced tab) Remember it prints the full page so reduce page size in document properties for faster prints. Vector Prints Nothing Raster /Vector Prints exactly what you see as Raster (as interpreted by settings in advanced tab) Extensions > Export > Win 32 Vector Print Raster Prints as raster only lines that have thickness above .200px Vector Cuts all lines at .200px or less Raster / Vector First does raster of any fill of your vector art, then does cuts of lines under .200px Burning a Photo to Wood To burn a photo or anything with grey scale you need to go to the Advanced tab on the printer driver window. Here you can choose to do HalfTone or Error Diffusion for the grey scale. The rule of thumb is that you should use Error Diffusion on rough surfaces and HalfTone on smooth surfaces. It is also best to play with the contrast in another program before printing, the more contrast and sharpness the better. There is a great description of the technical aspects of this process at: Remember: When printing a raster from the regular print menu in Inkscape and remember to go to Document Properties and change the page color from transparent to white. Otherwise you will get a big block of black. Additional materials at: Additional Resources Repair Notes If it randomly stops working two things to check: USB Spot - It uses a virtual usb port so if it is unplugged from a port and put in another the computer can get confused about what usb to use. Try other ports, or reinstalling driver. Random Setting Reset - From time to time it will forget the settings in firmware. It then defaults to serial as the communication. You need to go into settings and change the preference to "parallel". Max bed cutting size: 30" x 18" Replacing Lens. Lens are .75 or 19.05mm in Diameter. Lens should be mounted using Loctite 409. Tips for installing lens. Custom text Acrylic Sheet (12 in x 24 in) Cast sheets in various colors good for use in laser cutters \$18.00 per Sheet Add to cart Cast Acrylic Sheet, Clear, 12" x 12" x 0.118" \$8.00 per Square Sheet Add to cart High Impact Polystyrene (white) .030 or .020 - Food Safe \$6.00 per 21.25"x30.25" Sheet Add to cart Large Acrylic Sheet (Clear w blue protection) 0.060 \$12.00 per 21.25"x30.25" Sheet Add to cart Laser Safe Adhesive Vinyl (PVC-Free) -- FULL SHEET (24" x 36") This is the only adhesive vinyl that is safe for use on the lasers. It can be lasered or cut in the vinyl cutter. \$0.65 per Linear inch Add to cart Laserable plywood, 12" x 12", 1/8" thickness Laserable plywood, 12" x 12", 1/8" thickness -- HALF SHEET OF LASERABLE WOOD, You will need to laser in half in there aren't half... \$4.00 per 1/2 sheet Add to cart Laserable plywood, 12" x 24, 1/8" thickness Sheets of plywood, 12" x 24, 1/8" thickness \$6.00 per sheet Add to cart Laserable Rubber Sheet Laser-safe rubber for stamps \$25.00 per Sheet Add to cart Laserable Rubber Square Inch Please try to leave as much usable area. Use sheets that have already had cutouts first. \$0.50 per per square inch Add to cart

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