

// Laser Reference Guide

// Overview

// **Rowmark** is proud to be an industry leader in the development and manufacture of engraveable plastic sheet and continues to innovate, engineer and introduce new laser-friendly materials to the market every year. Rowmark laserable materials are manufactured with impact modified acrylic resins to fabricate exceptionally well with CO2 laser systems. While laserable plastics have become more fabrication-friendly over the years, it is still **important to experiment** with various materials and laser settings. Different color plastics, even those in the same product family, can require unique speed and power settings. As you work through this process and you recognize you have achieved your optimal results, be sure to **document** them for future projects. Collecting this information will help you **customize your own** personal reference from your projects and experience!

There are numerous variables that can affect the lasering process for both rastering and cutting acrylics. These differences include but are not limited to color, gauge, density, texture and composition of the sheets. Another key factor would be the processes used to manufacture the material, even when they are made by the same manufacturer. As such, while you likely received speed and power settings from your laser manufacturer, they are intended as a starting point for your laser materials. However, experimentation with materials and settings is truly the best way to achieve your optimal results.

// General Print Driver Setting Observations

Power Setting

- Higher burns deeper. Too much power sacrifices detail. Has no effect on running time.
- Lower burns shallower. Too little power sacrifices detail. Has no effect on running time.

Speed Setting

- Higher saves time. Burns shallower and reduces detail.
- Lower increases time. Burns deeper but too deep may reduce detail.

PPI Setting

- Higher increases the burning or melting effect. Produces finer detail if speed is not too fast.
- Lower decreases the burning or melting effect. Reduces image detail if set too low.
- Has no effect on running time and very little effect on depth.

General Observations

- Doubling the power doubles the depth and halving the power halves the depth.
- Halving the speed doubles the depth and doubling the speed halves the depth.

// Standard Lens Options

Lens | Beam Diameter | Usage

| | | |
|------|-------|---|
| 1.5" | .003" | Fine detailed lasering |
| 2.0" | .005" | Standard for engraving and cutting with emphasis on engraving better than cutting |
| 2.5" | .007" | Standard for engraving and cutting with emphasis on cutting better than engraving |
| 4.0" | .012" | Deep material distance engraving and cutting |

- **Focus is Key.** Focus is critical in laser engraving whether auto or manual. Running a job out of focus can result in wide kerfs, flaming and melting. Be sure to focus **every** project, even when using similar substrates.
- **Cleaning Optics** - Wipe the lens lightly with a soft cloth or lens tissue moistened with optic cleanser. Wiping in a circular motion, working outward from the center is the most effective method. Never wipe the lens with a dry cloth, this may scratch it or remove the protective coating.

// **Heat Stress** – Lasers are incredibly powerful pieces of equipment and generate a significant amount of heat. This is why it is imperative both to safety and achieving optimal results, to control these parameters effectively in your fabrication process. Lasering acrylics with excessive power, high PPI, too slow of speed or even an out of focus beam can result in 'concentrated heat' in the material which can cause degradation, cracking or warp. This is also true when lasering large areas as ablation of larger amounts of the cap surface can also result in heat build-up in the core layer. Rowmark recommends using lower power and DPI with multiple passes in these applications to allow the material time to relax and cool.

// Laser Setting Recommendations

The recommendations in this document are intended for reference purposes only and are provided by Rowmark to our customers as a courtesy. This guide offers safe starting point settings however adjustments may be necessary to achieve your optimal results as variations in equipment, environment and materials will inevitably yield different results.

| ADA Alternative® Lucent | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|----------------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 30 | 80 | 600 | 1 | 30 | 15 | 1000 | 1 |
| Trotec – 60 watt | 30 | 80 | 500 | 1 | 30 | 5 | 400 | 1 |
| Universal – 40 watt | 30 | 70 | 500 | 1 | 40 | 5 | 400 | 1 |
| GCC – 30 watt | 30 | 70 | 500 | 1 | 40 | 5 | 400 | 1 |
| Dremel DigiLab | 30 | 100 | Low | 1 | 50 | 20 | 55 | 1 |

| ColorCast Acrylics™ ColorHues™ Reflexions | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 600 | 1 | 70 | 20 | 5000 | 2 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 | 70 | 2 | 400 | 2 |
| Universal – 40 watt | 40 | 80 | 400 | 1 | 80 | 5 | 400 | 2 |
| GCC – 30 watt | 40 | 80 | 400 | 1 | 80 | 5 | 400 | 2 |
| Dremel DigiLab | 30 | 100 | Low | 1 | 80 | 20 | 75 | 1 |

➤ When lasering cast acrylics, a second pass with a 'soft focus' can create a smoother 'glass like' finish. To achieve a soft focus, drop your laser bed out of focus approximately .020". (comparable to the gauge of Rowmark FlexiBrass material)

| Durmark | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 60 | 75 | 400 | 1 | 85 | 20 | 40 | 1 |
| Trotec – 60 watt | 60 | 75 | 400 | 1 | 85 | 20 | 400 | 1 |
| Universal – 40 watt | 60 | 70 | 400 | 1 | 80 | 5 | 400 | 1 |
| GCC – 30 watt | 70 | 70 | 400 | 1 | 80 | 5 | 400 | 1 |

| FlexiBrass® FlexiColor® | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|-------------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 20 | 80 | 400 | 1 | 30 | 15 | 1000 | 1 |
| Trotec – 60 watt | 20 | 70 | 400 | 1 | 30 | 5 | 400 | 1 |
| Universal – 40 watt | 20 | 80 | 400 | 1 | 30 | 8 | 400 | 1 |
| GCC – 30 watt | 35 | 80 | 400 | 1 | 30 | 5 | 400 | 1 |
| Dremel DigiLab | 30 | 100 | Low | 1 | 55 | 20 | 50 | 1 |

// Laser Setting Recommendations - *continued*

| LaserGlow® Reverse Engrave | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---------------------------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 400 | 1 -2 | 60 | 30 | 1000 | 1 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 -2 | 60 | 3 | 400 | 1 |
| Universal – 40 watt | 40 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |
| GCC – 30 watt | 40 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |

| LaserLights LaserMAGS | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|----------------------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 20 | 80 | 400 | 1 | 25 | 15 | 1000 | 1 |
| Trotec – 60 watt | 20 | 70 | 400 | 1 | 25 | 5 | 400 | 1 |
| Universal – 40 watt | 20 | 80 | 400 | 1 | 25 | 8 | 400 | 1 |
| GCC – 30 watt | 35 | 80 | 400 | 1 | 25 | 5 | 400 | 1 |

| LaserMax® LaserMark® LaserMax Reverse Light Blockers | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 400 | 1 | 60 | 30 | 1000 | 1 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 | 60 | 3 | 400 | 1 |
| Universal – 40 watt | 30 | 80 | 400 | 1 | 70 | 5 | 400 | 1 |
| GCC – 30 watt | 40 | 80 | 400 | 1 | 70 | 5 | 400 | 1 |
| Dremel DigiLab | 30 | 100 | Low | 1 | 65 | 20 | 65 | 1 |

| MetalGraph Plus® FusionGrafix™ | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 400 | 1 | 60 | 30 | 1000 | 1 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 | 60 | 3 | 400 | 1 |
| Universal – 40 watt | 40 | 80 | 400 | 1 | 70 | 5 | 400 | 1 |
| GCC – 30 watt | 40 | 80 | 400 | 1 | 70 | 5 | 400 | 1 |

| Textures | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 40 | 70 | 400 | 1 -2 | 60 | 30 | 1000 | 1 |
| Trotec – 60 watt | 40 | 70 | 400 | 1 -2 | 60 | 3 | 400 | 1 |
| Universal – 40 watt | 50 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |
| GCC – 30 watt | 50 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |

| UltraGrave™ Matte Satin | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|------------------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 400 | 1 -2 | 50 | 30 | 1000 | 1 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 -2 | 60 | 5 | 400 | 1 |
| Universal – 40 watt | 40 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |
| GCC – 30 watt | 40 | 80 | 400 | 1 -2 | 70 | 5 | 400 | 1 |

| The Naturals | Raster Power | Raster Speed | DPI | Passes | Vector Power | Vector Speed | Frequency or PPI | Passes |
|---------------------|--------------|--------------|-----|--------|--------------|--------------|------------------|--------|
| Epilog – 60 watt | 35 | 70 | 400 | 1 | 60 | 30 | 1000 | 1 |
| Trotec – 60 watt | 35 | 70 | 400 | 1 | 60 | 3 | 400 | 1 |
| Universal – 40 watt | 30 | 80 | 400 | 1 | 60 | 5 | 400 | 1 |
| GCC – 30 watt | 40 | 80 | 400 | 1 | 70 | 5 | 400 | 1 |
| Dremel DigiLab | 30 | 100 | Low | 1 | 65 | 20 | 65 | 1 |

// Best Practices - for lasering plastics

- **ALWAYS** remove the Rowmark printed protective masking before **raster** engraving.
- **Bottom Up Engraving** – Change the orientation of your laser to begin engraving from the bottom of the material upwards. This simple step will minimize the amount of residue being exhausted over previously engraved material which can re-deposit on the warm core and make post-fabrication clean up a challenge. You can change the orientation of your laser to bottom up engraving from the advanced tab in your print driver.
- **Reds & Blues** – Due to the color density of some of the more vibrant color selections, Rowmark recommends running two passes to achieve optimal results. The first pass should ablate the majority of the micro-surface while the second pass removes any residual colorant to offer you a clean, sharp result. Once again, using the ‘bottom up’ engraving method helps to facilitate optimal results in these applications.
- **Soft Focus** – When lasering reverse engraveable materials, a second pass with a soft focus can create a smoother ‘glass like’ finish which in turn will offer more vibrant results in your color filling efforts. A soft focus is achieved by focusing your laser to your material then dropping your laser bed out of focus approximately .020” then run your second pass.
- **DPI vs. PPI** - DPI applies to **raster** engraving, *whereas* PPI applies to **vector** cutting. When ‘**raster engraving**’ your image will determine how many times the laser tube must fire to produce the image you desire, PPI will be ignored. As such, when ‘**vector cutting**’ you determine your PPI setting while the DPI will be relatively ignored. Lowering the number of laser firings per inch, particularly when engraving larger text or objects, will help keep the material cooler, minimizing warp tendencies. Setting your DPI at 400 for photo engraving will also help minimize the ‘banding effect’ often experienced with these projects.
- **Vector Cutting** – When your application will permit, Rowmark recommends leaving the protective masking in place when laser vector cutting. This will minimize residue and ease post-fabrication clean up. An additional tip for clean vector cuts would be to apply a small amount of dish soap and ‘coat’ the surface of your material. Let the soap dry then cut. Rinse your material under warm water to easily wash away soap and residue. Ensure your laser has an accurate focus to achieve the cleanest cuts. **Note:** PPI’s over 400 are likely to result in tacky edges.

- **Air Assist** – The purpose of using air assist when vector cutting is to force air directly onto the surface of the material to reduce heat and disperse combustible gases from the cutting surface by directing a constant stream of air across the cutting surface, minimizing possible flaming and scorching. Rowmark strongly encourages the use of air assist in the **vector cutting** process however not in the raster engraving portion of your job as it can result in the re-deposit residue in the engraved portion of your project.
- **Cleaning** – While experienced engravers may have some success using alternative cleaners for post-fabrication clean up, Rowmark strongly recommends cleaning with only warm water and mild dish soap. Damage and degradation of materials through the use of alternative cleaning solvents is solely the responsibility of the user.
- **Ventilation** – A **necessity** ... NOT an accessory! Your laser manufacturer will recommend a minimum of cubic feet per minute of air to be exhausted contingent on the size of your laser cabinet. This not only removes the smoke and dust from your cabinet keeping your optics cleaner but also exhausts & dilutes any dangerous fumes to acceptable level. **NEVER** operate your laser without an **efficiently operating exhaust** ventilating outdoors at the CFM recommended.
- **Safety** – While offering these guidelines as safe starting points for laser engravers, we need to recognize all machines and fabrication circumstances will vary from shop to shop. Common practice will reinforce the engraving basics: Most laserable plastics can be engraved at high speed with the power adjusted according to the wattage of your laser. Some will require multiple passes. Cutting plastic is best achieved using relatively slower speed and higher power. **Respect** your equipment and the materials you fabricate ... keep in mind plastics are flammable so **NEVER** leave your laser running unattended!
- **WARNING** – Never laser engrave or cut materials containing PVC (Polyvinylchloride). These fumes are extremely toxic and so caustic that they can chemically corrode the metal parts of your laser system and will nullify most laser warranties.

// Leading Equipment Manufacturers

- Epilog Laser Systems | Golden, CO | epiloglaser.com
- Full Spectrum Laser | Las Vegas, NV | fslaser.com
- GCC America | Walnut, CA | gccworld.com
- Kern Laser Systems | Wadena, MN | kernlasers.com
- Rabbit Laser USA | Middletown, OH | .rabbitlaserusa.com
- Trotec Laser Systems | Wels, Austria | troteclaser.com
- Universal Laser Systems | Scottsdale, AZ | ulsinc.com
- Vision Engraving Systems | Phoenix, AZ | visionengravers.com
- Xenetech Global | Baton Rouge, LA | xenetech.com

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