CNSI Microfluidics Laser Cutting Data

Material

Always check materials list BEFORE attempting to cut/engrave a material. If unsure contact IW Staff.

Allowed Materials

Plastics:

- ABS (acrylonitrile butadiene styrene)
- Acrylic (also known as Plexiglas, Lucite, PMMA)
- Delrin (POM, acetal) — **Must use nitrogen assist when cutting delrin**
- Kapton tape (Polyimide)
- Mylar (polyester)
- Nylon (melts badly)
- PDMS
- PETG (polyethylene terephthalate glycol)
- Polypropylene (PP) — melts somewhat
- Styrene
- Two-tone acrylic — top color different than core material

Foam:

- Depron foam (often used for RC planes)
- EPM
- Gator foam (foam core gets burned and eaten away compared to the top and bottom hard shell)

Other:

- Cloths (leather, suede, felt, hemp, cotton)
- Magnetic Sheets
- Papers
- Rubbers(neoprene, etc supplier try: mcmaster.com)
- Woods(MDF, balsa, birch, poplar, red oak, cherry, holly, etc. supplier try: midwestproducts.com)

Prohibited Material

- **Metals** (our laser cutters are not powerful enough nor setup to cut through metals and attempting to do so could damage the machine)
    - Metals (cannot be engraved however a certain type of paint/tape which chemically bonds with the metal may be used to mark materials)
- **Polycarbonate** (PC, Lexan) — Lexan creates large amounts of fumes
- **Teflon** (PTFE, Polytetrafluoroethylene) – cutting creates Fluorine gas
- **Any material containing chlorine**
    - **PVC** (Cintra) — contains chlorine
    - **Vinyl** — contains chlorine
- **HDPE**: “milk bottle” plastic. It gets gooey, melts and catches on fire.
- **Epoxy**
- **Glass** — you can engrave glass, but trying to cut it will cause cracking or breakage
- **Fiberglass**

- **Printed circuit board** (FR4 and other material types)
- **Carbon Fiber**

Material Vendors

Acrylic sheet, optically clear, from McMaster Carr: part number 8560K239
http://www.mcmaster.com/#catalog/119/3558/=molz4w

Cutting Parameters

Acrylic Sheet

Cutting 1/8”, 100% power, 0.4 ipm, 2000 Hz, (Dave Bothman, 5/5/13 - clean cut)

Cutting 1/4”, 100% power, 0.15 ipm, 1000 Hz, z offset -.125, (Dave Bothman, 5/5/13 - clean cut)

PDMS

250um PDMS with mylar backing on back side and removed from front

Cutting 42% power, 2.0 1ps, 5000Hz (Peter Mage, 5/9/13 - some flash and soot - recipe needs to be refined)

Double Sticky Tape

25% power, 3 ips

Gore Teflon Foam 1/16“ 15% power, 0.5% speed, 1000 Hz (DB 7/9/15)

Silicone Rubber sheet, 1/8” 100% power, 0.1% speed, 2000 Hz - use Nitrogen gas (DB 7/9/15)

Guideline Cutting Recipes

Acrylic

1. 1/8 acrylic

	Color	Power	Speed	PPI/Hz	Passes	Air Assist	Correction	Z-Offset
Engrave	Black	25	20	PPI	-	on	0	0

	Color	Power	Speed	PPI/Hz	Passes	Air Assist	Correction	Z-Offset
Cut	Red	25	0.4	Hz	1	on	10	0
Cut	Blue	100	0.4	PPI	1	on	10	0

-1/10 acrylic

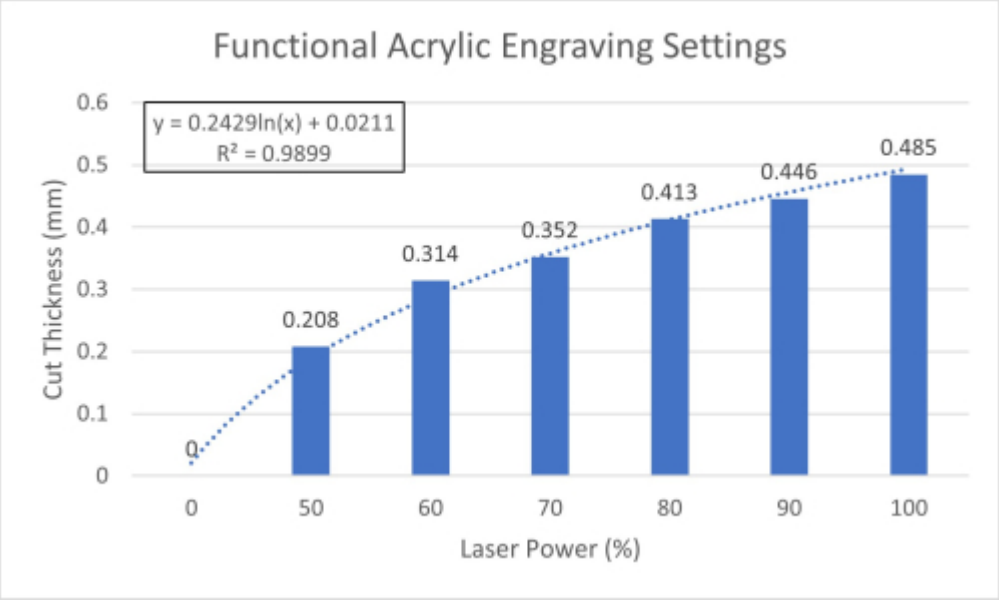
	Color	Power	Speed	PPI/Hz	Passes	Air Assist	Correction	Z-Offset
Skip	Black	-	-	-	-	on	-	-
Cut	Red	2	0.1	Hz	1	Hz	1	0
Cut	Blue	15	0.5	Hz	5	Gas 1	0	0

Functional Engraving Recipes

For users looking to cut acrylic at different depths, these different cut depths were tested at different power settings. Data courtesy of Ph.D. student Sanghun Jee on a Trotec 60W CO2 laser cutter. Thank you Sanghun!

Engraving Cut Thickness	Engraving Settings
0 mm	0% power, 0% speed
0.208 mm	50% power, 30% speed
0.314 mm	60% power, 30% speed
0.352 mm	70% power, 30% speed
0.413 mm	80% power, 30% speed
0.446 mm	90% power, 30% speed
0.485 mm	100% power, 30% speed

For users who wish to engrave at different depths than those listed above, here is a graph and equation that may help out with making estimations of what laser power to use.



Scribing microscope slides for breaking -Dave Bothman - 16 Dec. 2015

- Recipe: 100% power, 3% speed, 1000 Hz, 1 pass
- Focus on top of slide
- Place a paper towel wetted with water on glass in area to be cut
- Cut through the paper
- Break on scribed line