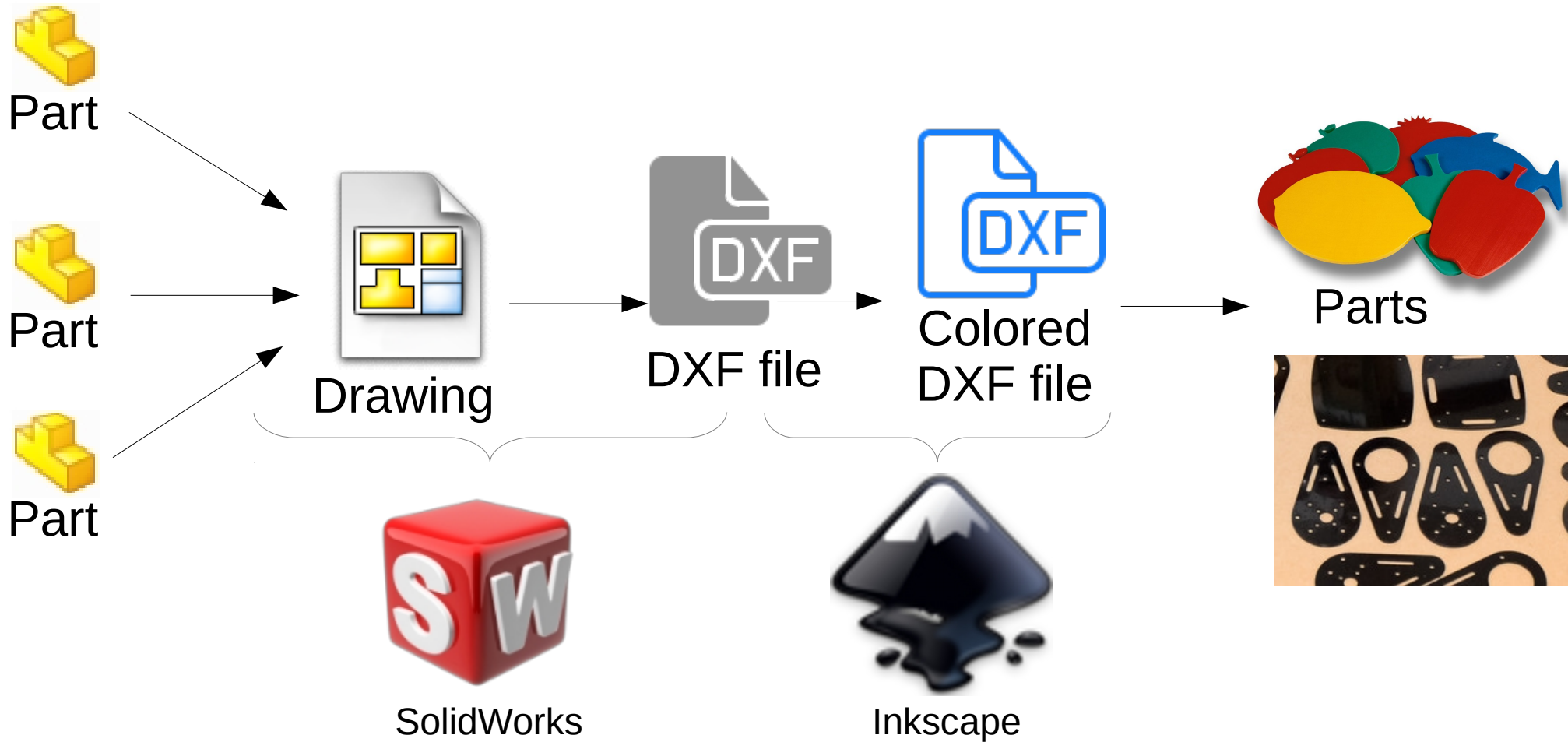


15-294 Rapid Prototyping Technologies:

Laser Cutter Intro

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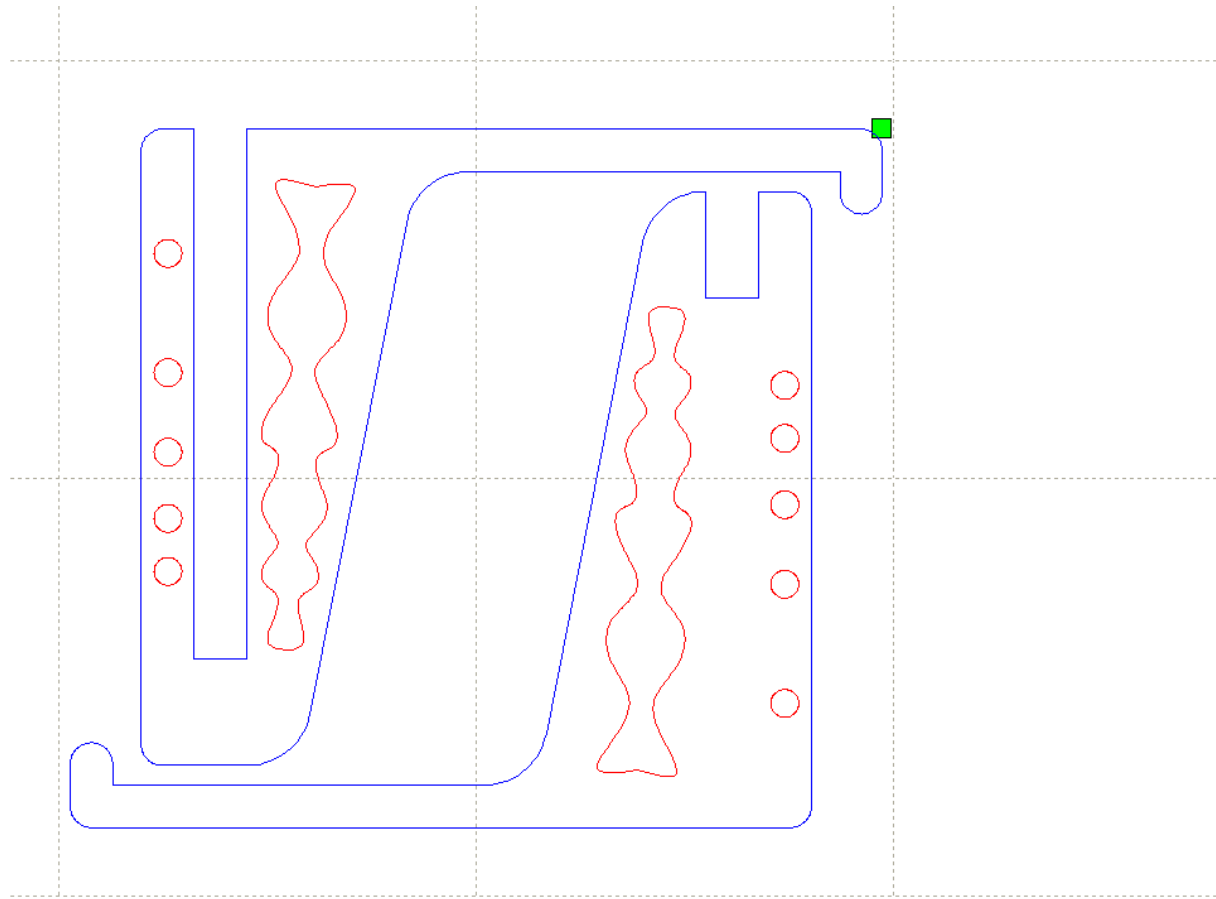
From Design to Plastic



What the Colors Mean

- On older laser cutters, color meaning is fixed:
 - Red means “cut”
 - Black or blue means “engrave”
- On modern laser cutters, color meanings are user-definable.
 - Use color to define the cut ordering.
 - Always cut the holes first, then cut the outline.
 - Example: holes = red, outline = blue.
 - So tell the cutter to do red first, then blue.

Cut the Holes First, Then the Outline



Rabbit Laser RL-80-1290

- 80 watt CO₂ laser
- 1200x900 mm bed
- Exhaust filter
- Chiller



The Laser Tube



How It Works

- Pointing laser (red, low power)
- Cutting laser (invisible, high power, dangerous!)
- Coolant chiller (stay below 32° F)
- Compressed air to clear debris
- Exhaust system with filtration
- Settings based on type of material:
 - Power level (never go above 85%)
 - Cutting speed (slower speed cuts deeper)



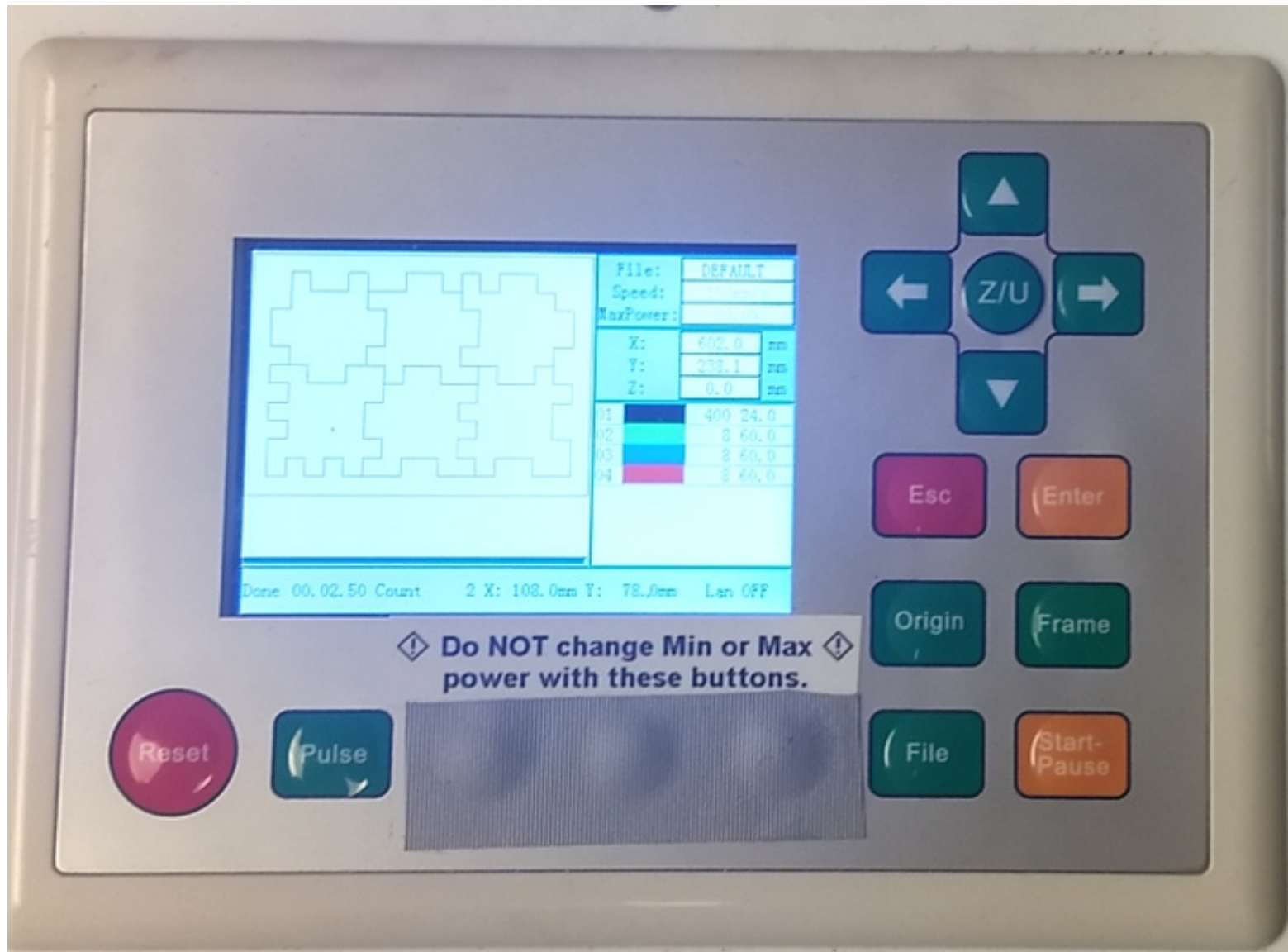
RL-80-1290 Control Panel

Emergency Stop
(E-Stop) Button

- Leave the E-Stop on.
- Leave the key turned on.
- Use the three small buttons to turn the lighting, laser tube, and blower on or off.



RL-80-1290 Control Panel



RDWorks Client Program

The screenshot displays the RDWorks Client Program interface. The main workspace shows a blue laser cutting path for a large letter 'W'. A dimension line above the path indicates a width of 50 mm (~ 2 inches). The path includes several circular holes and wavy internal cutouts. The interface includes a menu bar (File, Edit, Draw, Config, Handle, Tool, Model, View, Help), a toolbar with various icons, and a coordinate system at the top showing X and Y values in mm. On the right side, there are several panels: a 'Work' table, a 'Color' panel, a 'Line/column setup' table, and a 'Laser work' control panel.

Layer	Mode	Output	Hide
	Cut	Yes	No
	Cut	Yes	No

Num	space1	space2	Dislocation	Mirror
X: 1	0.000	0.000	0.000	<input type="checkbox"/> H <input type="checkbox"/> V
Y: 1	0.000	0.000	0.000	<input type="checkbox"/> H <input type="checkbox"/> V

Virtual array Bestrew... Nesting

Laser work

Start Pause/Continue Stop

SaveToFile UFileOutput Download

Position: Current position

Path optimize Cut scale

Output select graphics Go scale

Selected graphics position

Device

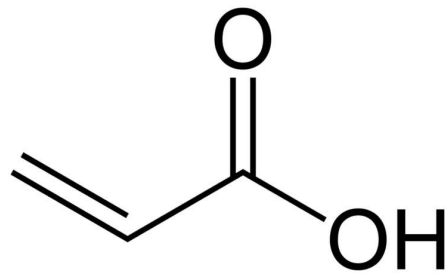
Setting Device---(USB:Auto)

--- Welcome to use the Laser system of cutting,Propose the display area 1024*768 or higher ---

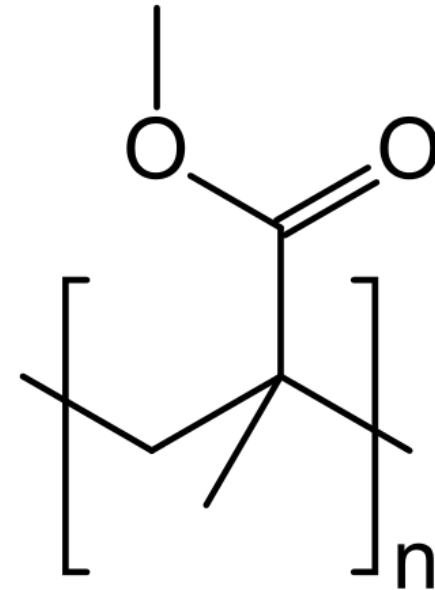
X:637.661mm,Y:331.686mm

What Is Acrylic?

- Polymer of acrylic acid:
poly (methyl methacrylate)



Acrylic acid



poly (methyl methacrylate)

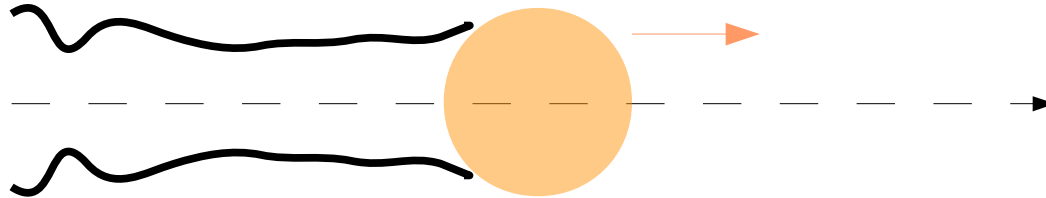
- Also known as Plexiglass, Lucite, Perspex...
- Can be either *cast* or *extruded*. Cast is better for laser cutting; extruded is easier to thermoform.

Thickness Variance

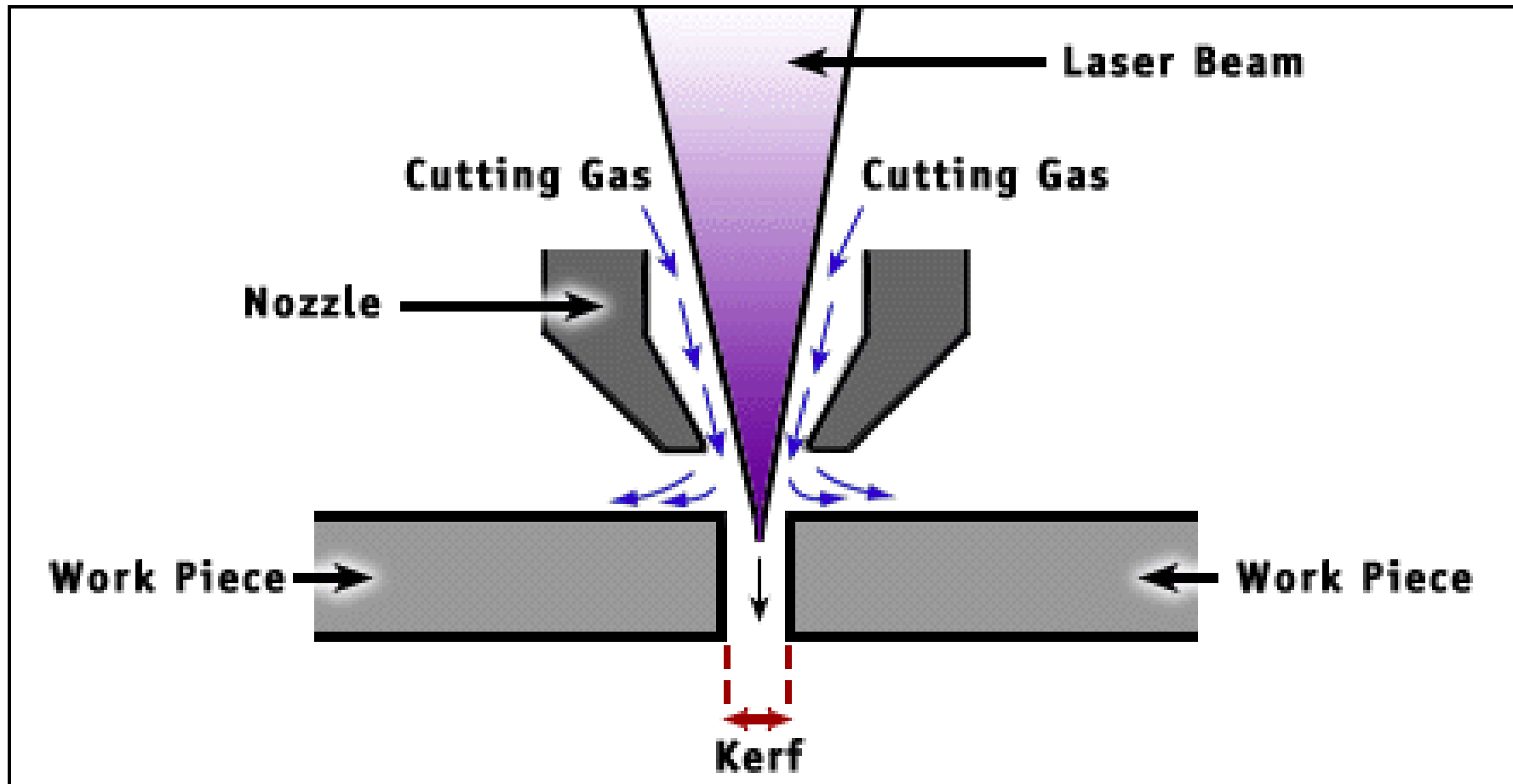
- We order 1/8 inch cast acrylic sheets.
- What we get:
 - Sometimes 0.125 inch sheets.
 - Sometimes 0.118 inch (3 mm) sheets.
- Thickness tolerance +0.015 to -0.025 inches.
- Thickness can vary:
 - From one batch to another
 - From one edge of a sheet to the other edge!
- Thickness matters for press fit.

Beam Width

- The beam cuts by burning and melting.
- The width of the beam is non-negligible.



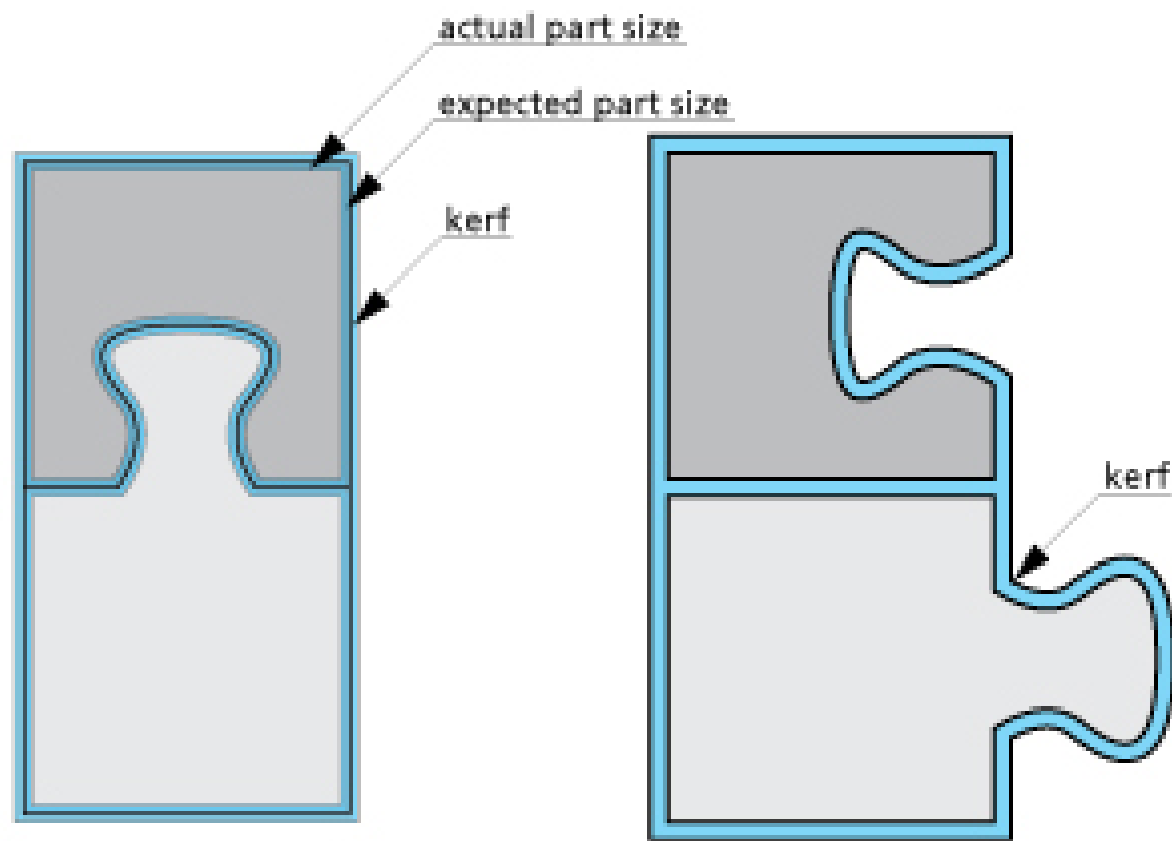
Kerf



Kerf

- Typically 0.08 to 0.45 mm (3 to 18 thousandths of an inch), depending on:
 - Laser optics and focusing
 - Type of material
 - Thickness of material
- Consequences:
 - Parts will be undersize
 - Holes will be oversize
- Example: 0.1 inch diameter spirograph holes:
 - Measured diameter 0.106 inches (kerf 0.006")

Kerf



Nested Pattern

Offset Kerf

Offset compensates for
lost material

Cut Residue

- Sometimes parts are discolored due to:
 - Smoke/ash plume from the melting plastic.
 - Residue from the honeycomb re-melting and contaminating the part.
- Wiping with isopropanol (rubbing alcohol) can clean up the part.
- Acetone (nail polish remover) sometimes works better.
- IDeATe supplies plastic cleaner.



How to Get a Press Fit

- Measure the actual thickness of your sheet.
- Make the slot tighter than the actual thickness, to take the kerf into account.
- If a slot is too tight, use a file to open it up.

Safety

- Fire extinguisher and smoke/heat alarm.
- Remember the E-Stop button.
- Chiller temp must be below 32° F.
- Never open the door while the laser is active.
- Never cut materials not on the approved list:
 - Acrylic, Delrin, cardboard, thin wood, MDF (fiberboard), and Yupo paper are all okay.
 - Ask about other materials.
- Lots of stuff that's bad to cut:
 - ABS plastic will catch fire
 - PETG produces oily smoke that dirties the lens and mirrors
 - Anything with chlorine, e.g. styrofoam, vinyl: poison gas!