FABO ACADEMY X - CHINA

COMPUTER CONTROLLED CUTTING

COMPUTER CONTROLLED CUTTING

Is where the computer is controlling an end effector, can be a knife, laser, water jet, hot wire, based on a digital design file.

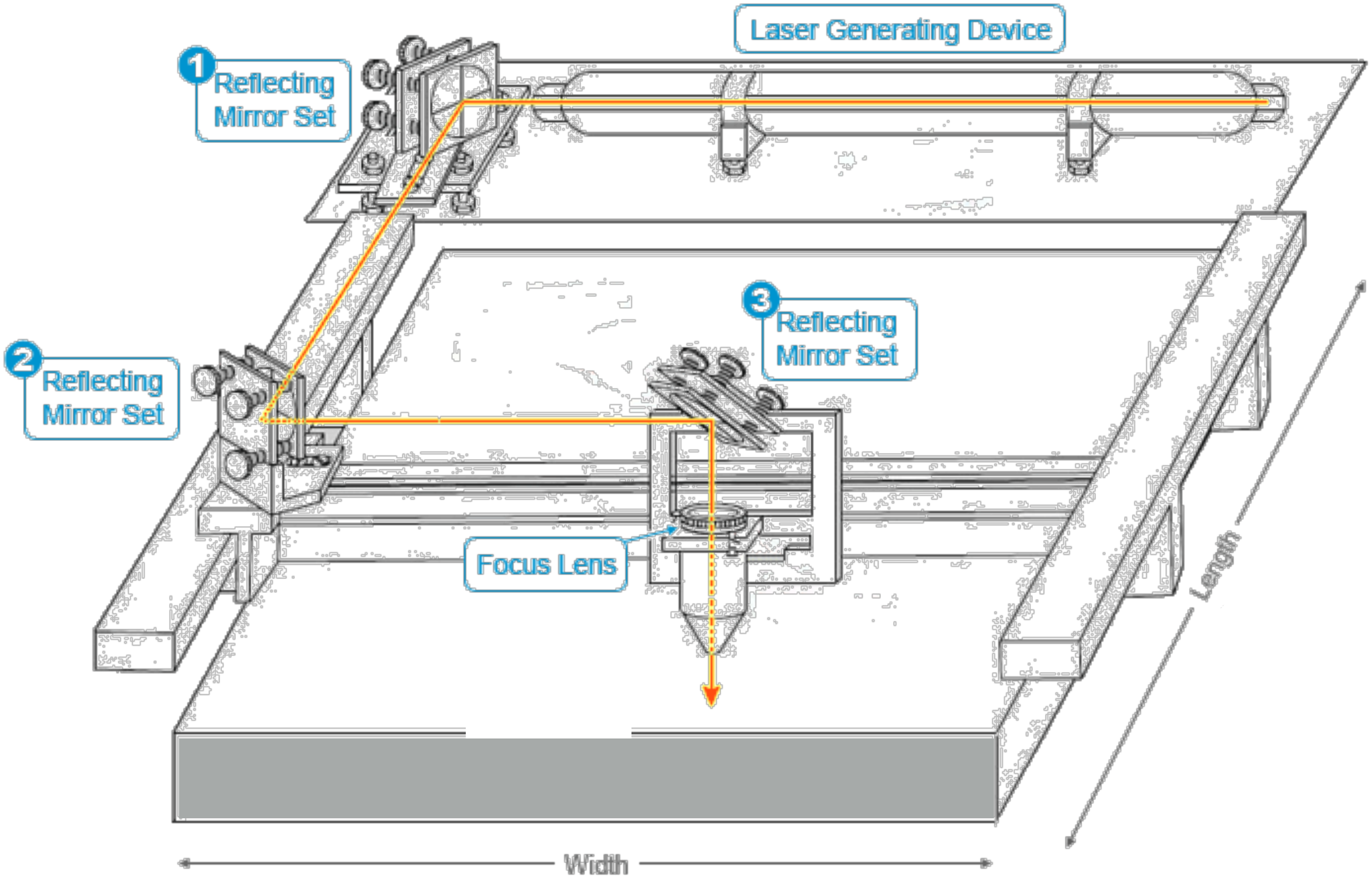
LASERS CUTTERS

- CO2 Laser (10 micron)
  Common applications: Wood, acrylic, glass, paper, textiles, plastics, foils & films, leather, stone

- Fibre Laser Solid State Laser (1 micron)
  Common applications: marking metal, coated metals and high contrast marking on plastics.

- **CO2 lasers** are best suited for non-metals while **Fiber lasers** for metals.

LASER CUTTER: HOW DOES IT WORK?



LASER CUTTING

FILE PREPARATION

Open file in Illustrator

- assign thickness to cutting lines 0,05pt
- assign colors to lines: each color has its own laser settings
- cutting sequence: colors specify which line is cut first

Laser settings assigned to colors

- Power: How much power the laser outputs.
- Speed: How fast the laser head is traveling.
- PPI: Some times called frequency, it is the pulse of the laser, in other words, how rapid the laser fires.

LASER CUTTING – FILE PREPARATION

Laser settings assigned to the colors of the lines in your drawing

- Power: How much power the laser outputs.
- Speed: How fast the laser head is traveling.
- PPI: Some times called frequency, it is the pulse of the laser, in other words, how rapid the laser fires.

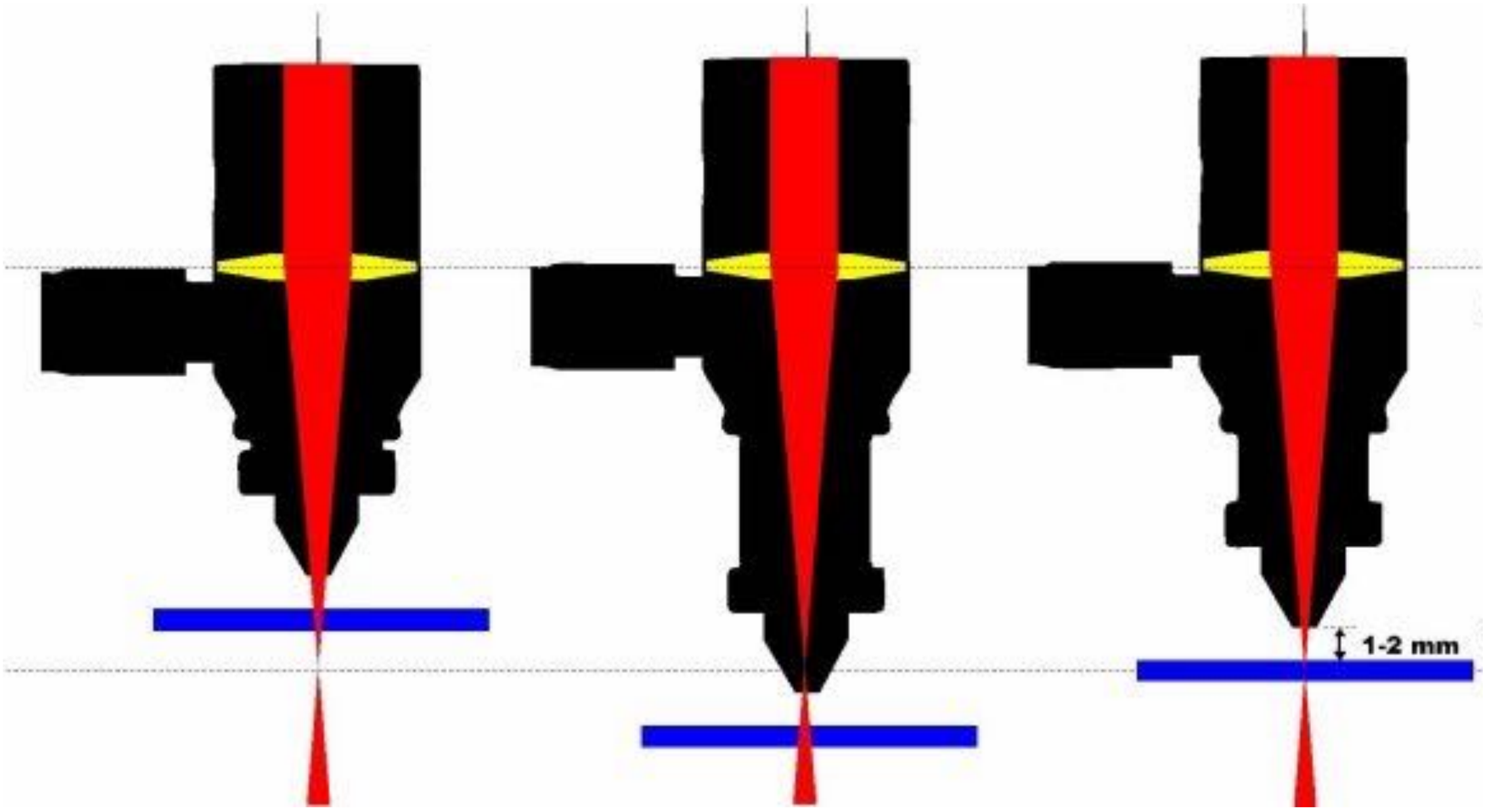
	Color	% Power	% Speed	PPI
1	Black	100.0	4.0	1000
2	Red	100.0	1.0	1000
3	Green	100.0	3.0	1000
4	Yellow	50.0	100	500
5	Blue	50.0	100	500
6	Magenta	50.0	100	500
7	Cyan	50.0	100	500
8	Orange	50.0	100	500

LASER CUTTING

OPERATING THE MACHINE

1. Turn on the laser cutter, the airflow and the exhaust filter.
2. Insert a sheet of material.
3. Focus the laser head.
4. Send the file from PC to the laser cutter.
5. Use laser cutter control panel to start cutting.

LASER CUTTER: LASER BEAM FOCUS



OUT OF FOCUS

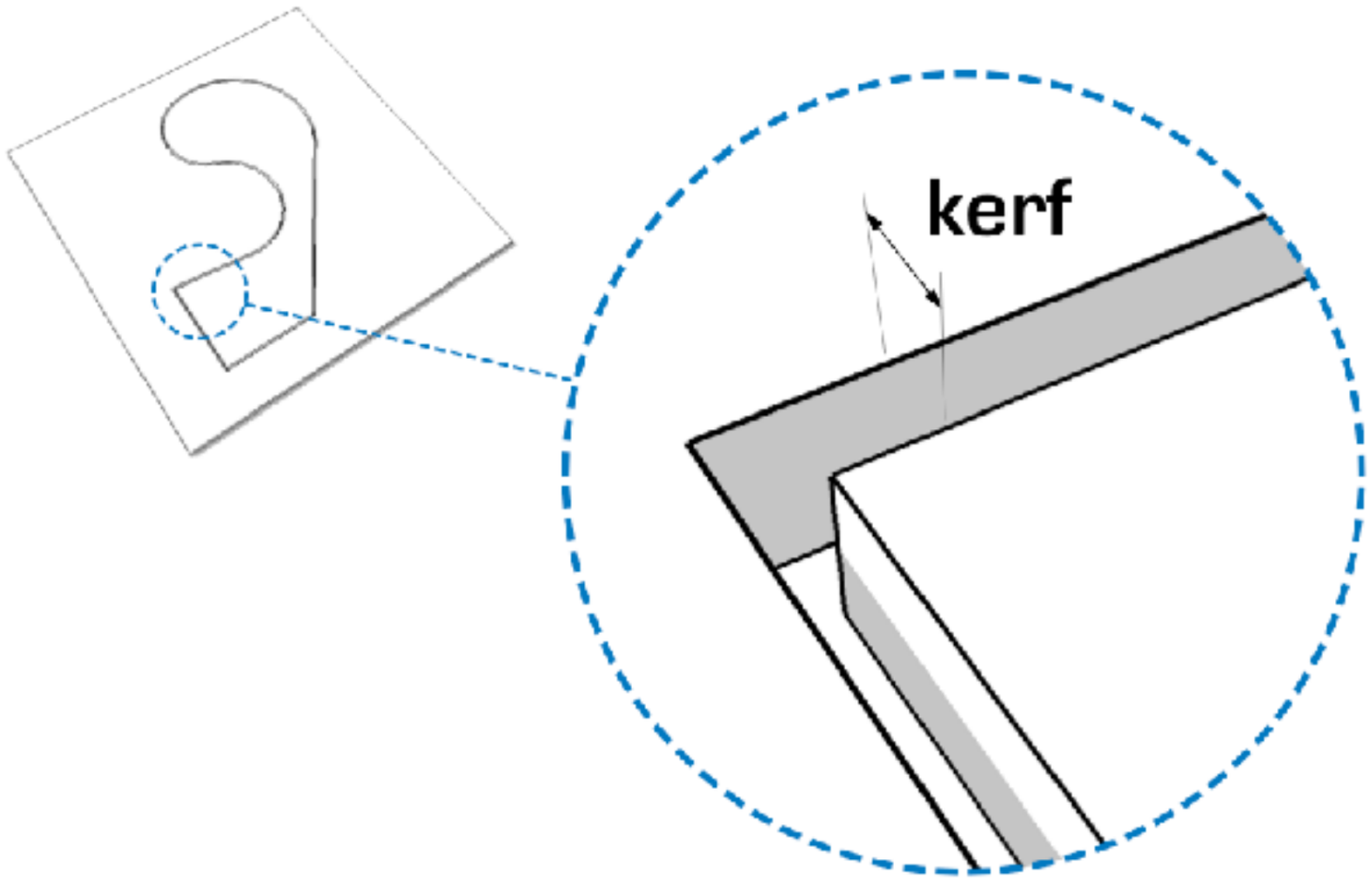
ON FOCUS

WORKPIECE MUST BE
INTO THE FOCUS OF THE LASER BEAM

LASERS CUTTER SAFETY

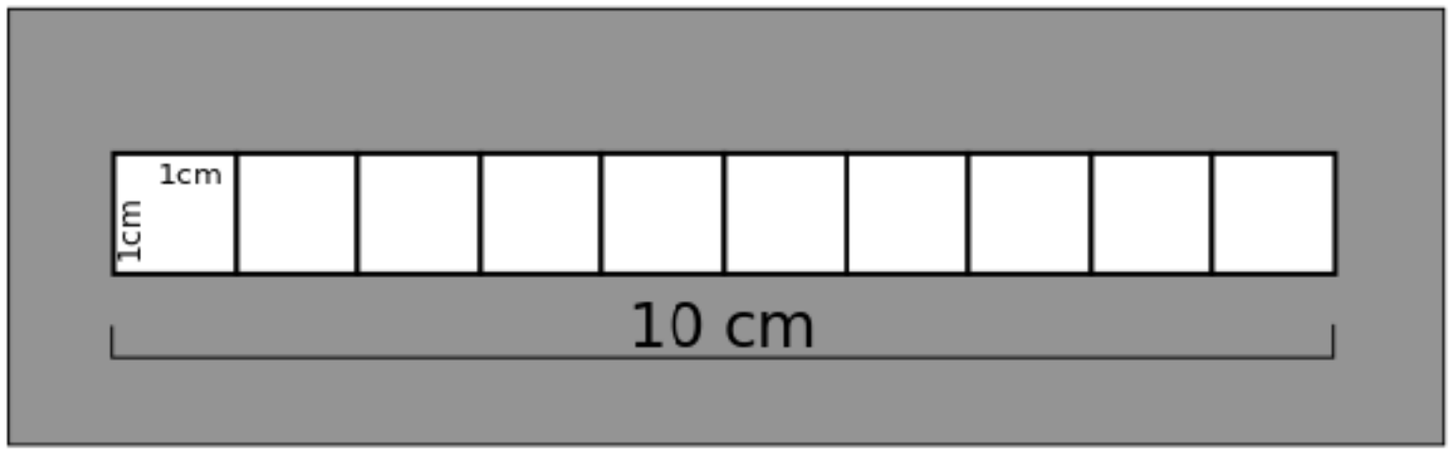
- Ensure good ventilation.
- Airflow and filter must be ON.
- Only cut safe material. (flame test)
- **NEVER EVER** leave the laser unattended while cutting.

KERF CALCULATION

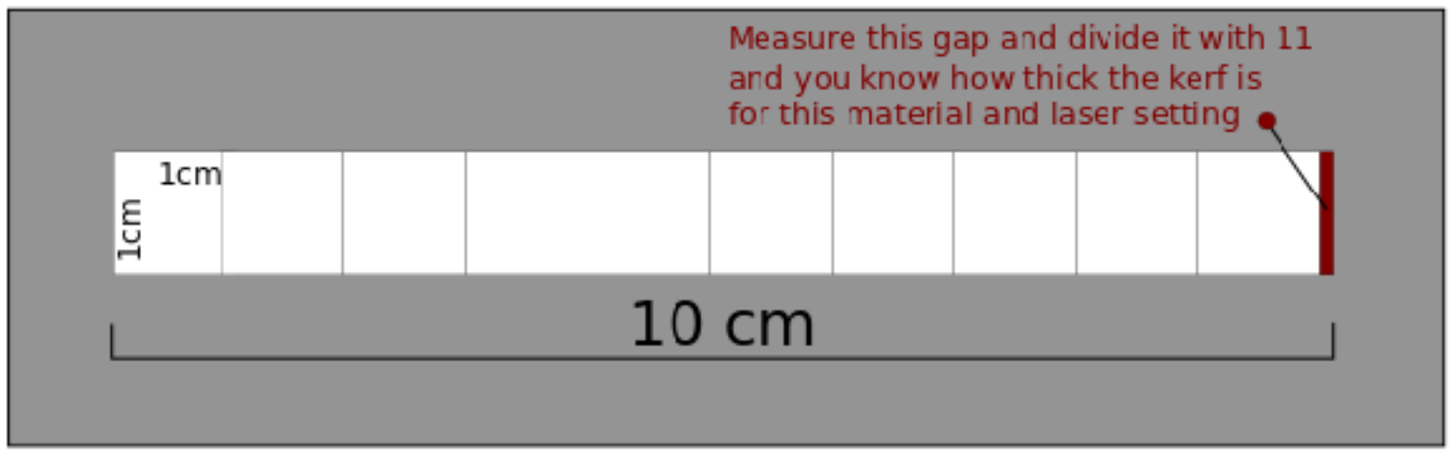


- The laser burns away a portion of material when it cuts through.
- This is known as the laser kerf and ranges from 0.08mm – 1mm depending on the material type, its thickness and laser settings (power, speed, PPI).

KERF CALCULATION



Laser cut the design and put the rectangles back in the slot.



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COOL THINGS YOU CAN DO WITH A LASER CUTTER

living hinges or “kerf bending”

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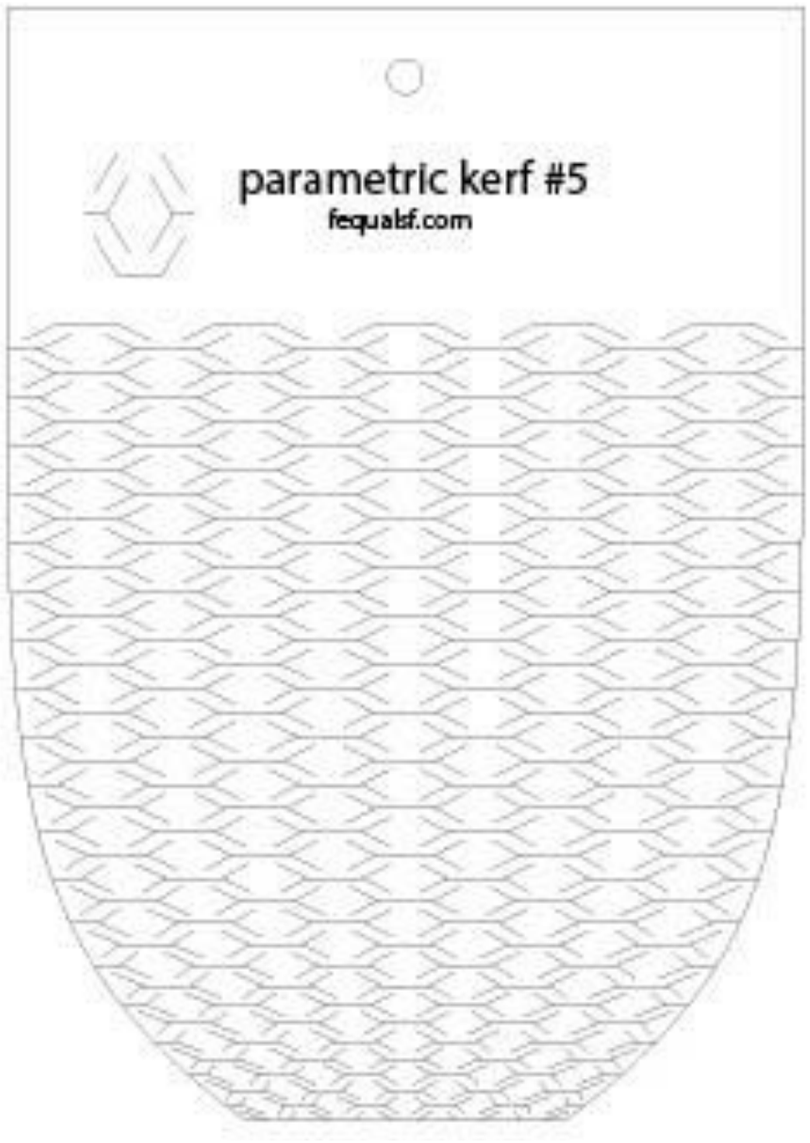
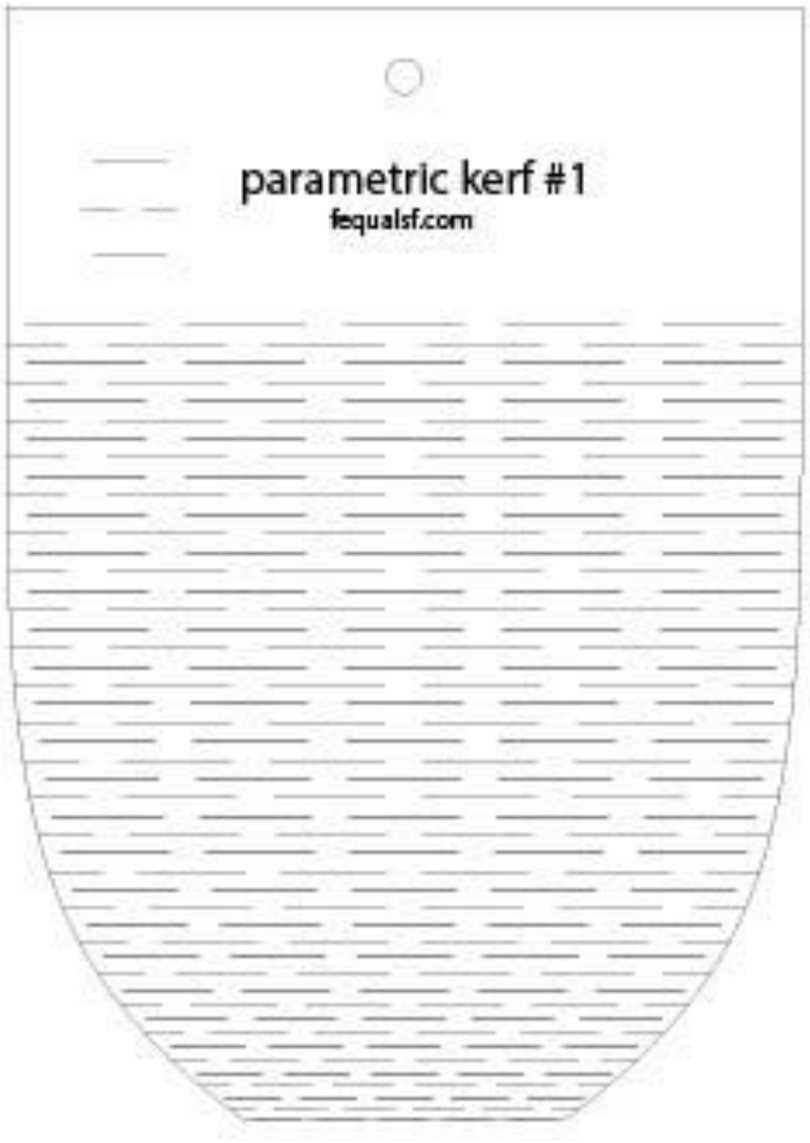
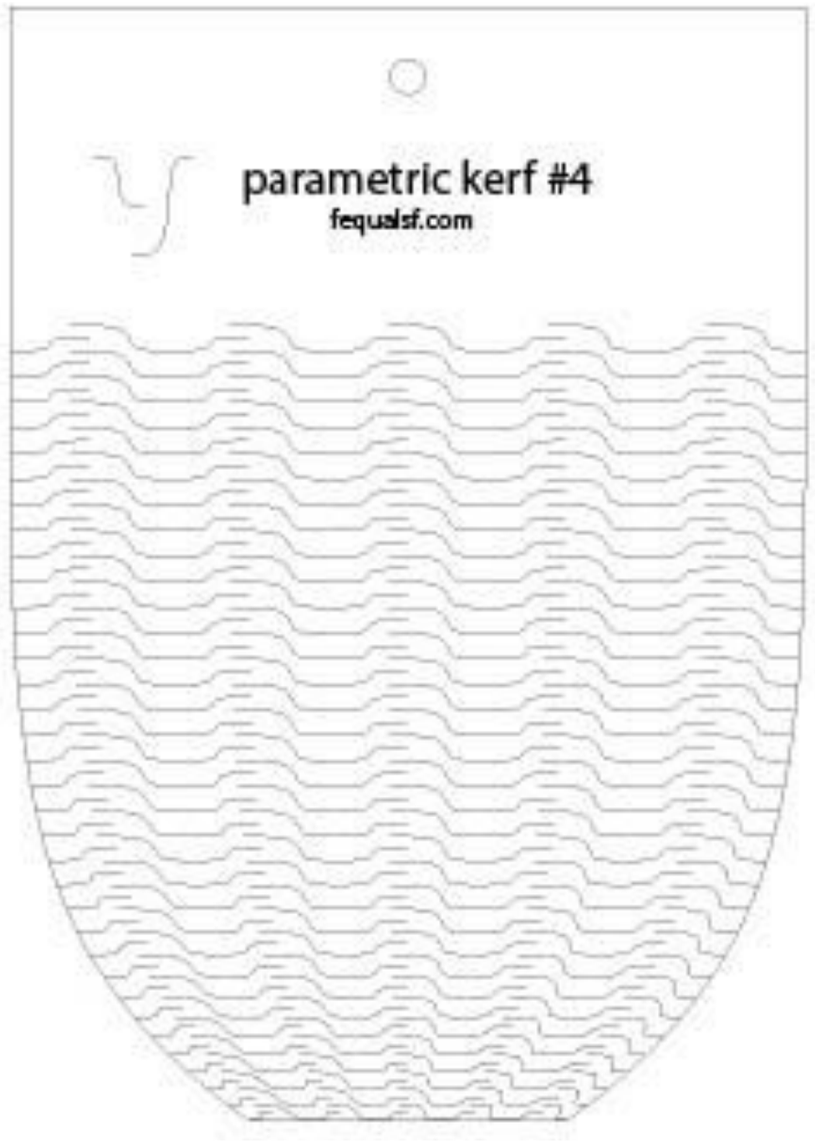
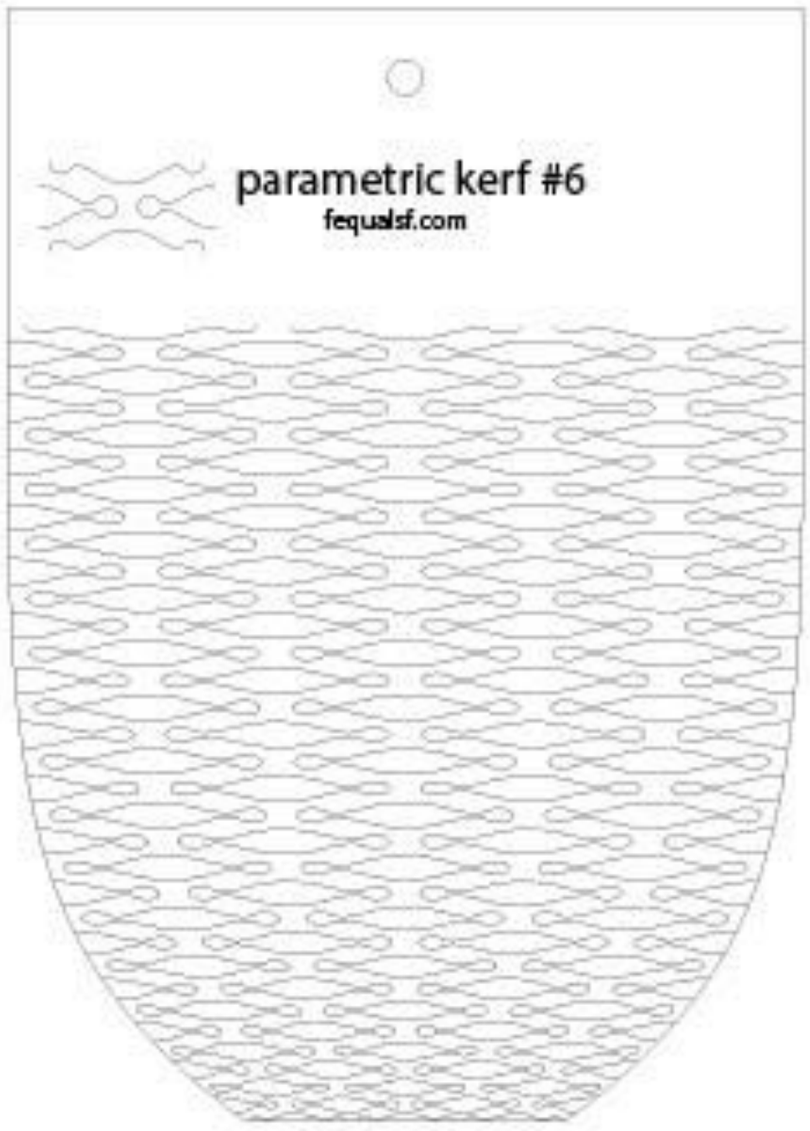


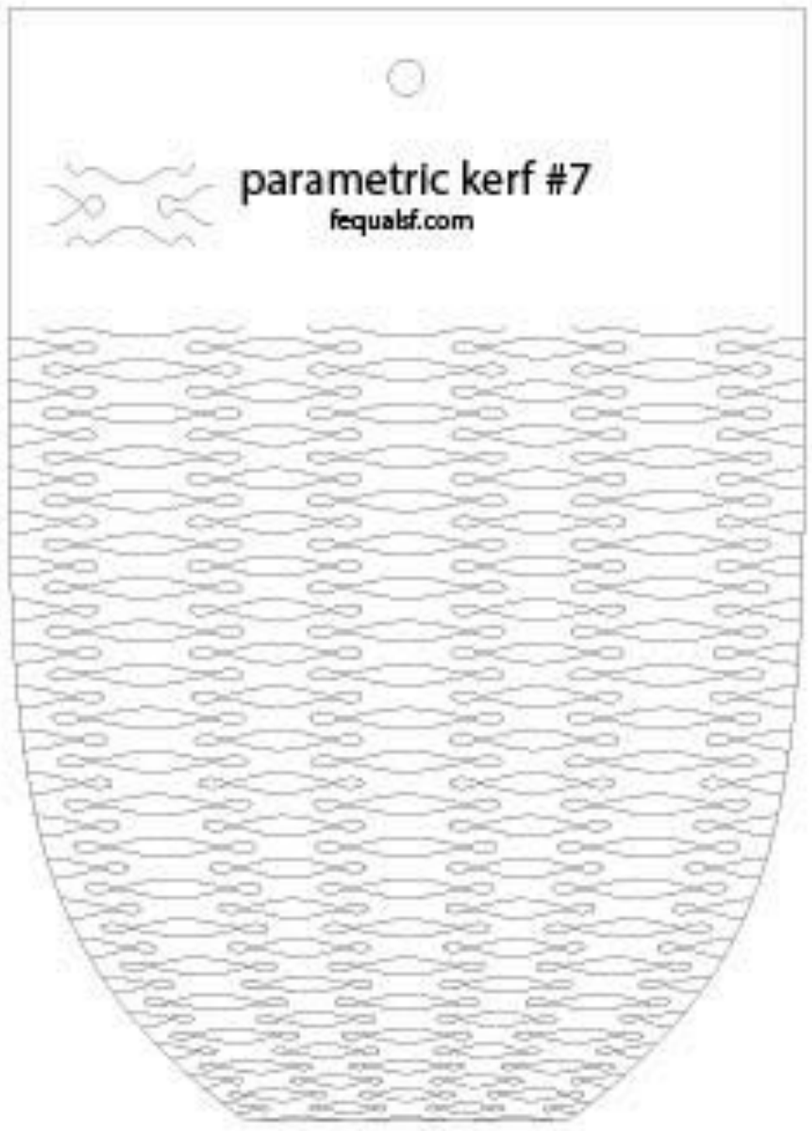


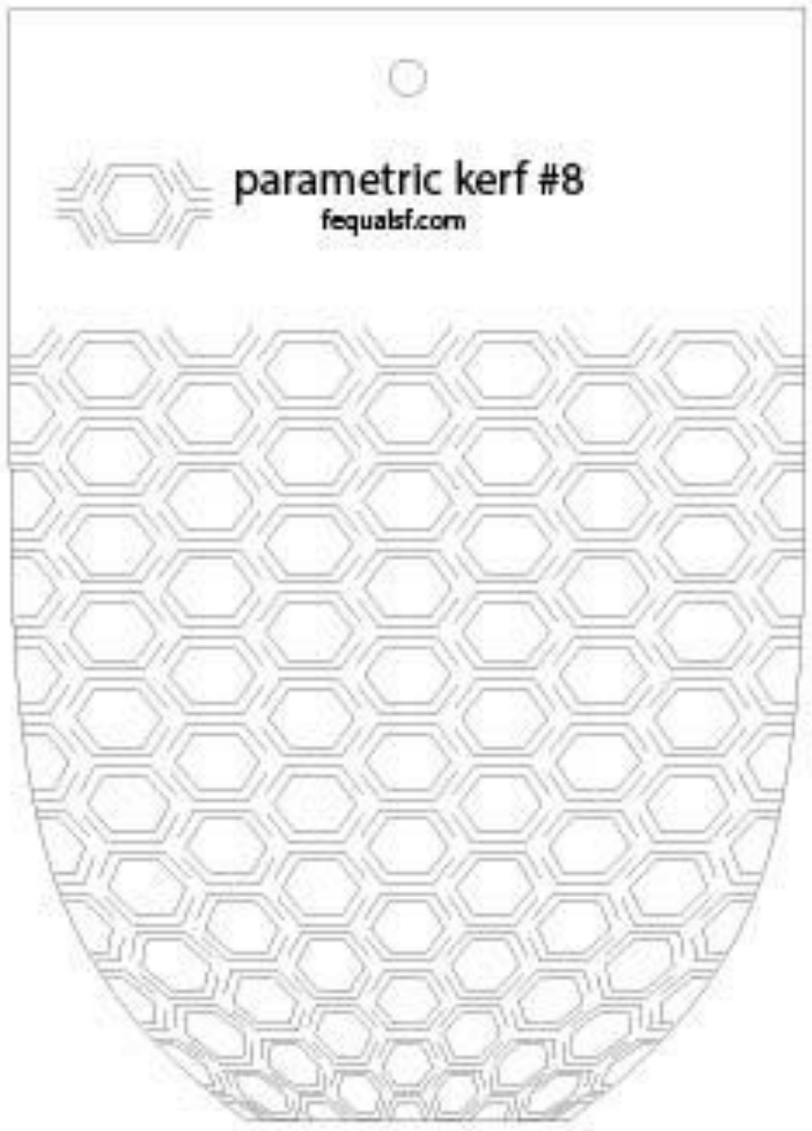


COOL THINGS YOU CAN DO WITH A LASER CUTTER

living hinges or “kerf bending”

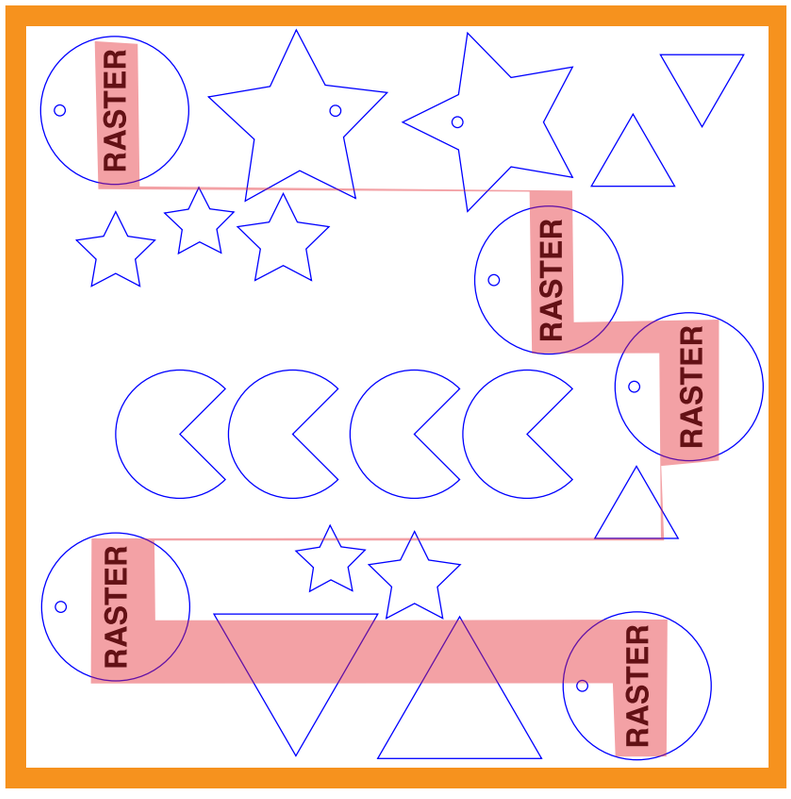




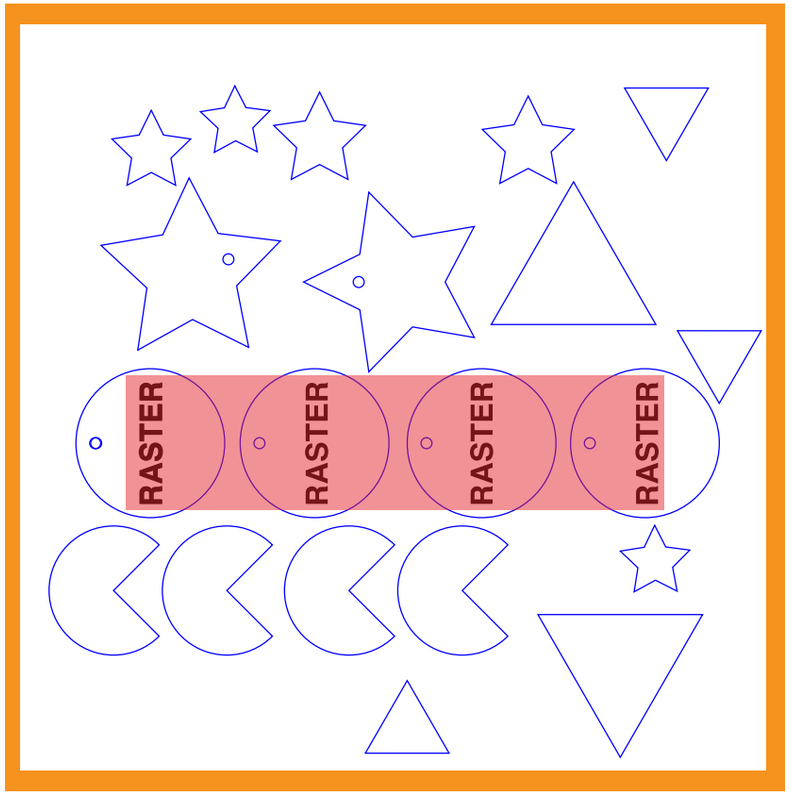


RASTER SHAPE ENGRAVING

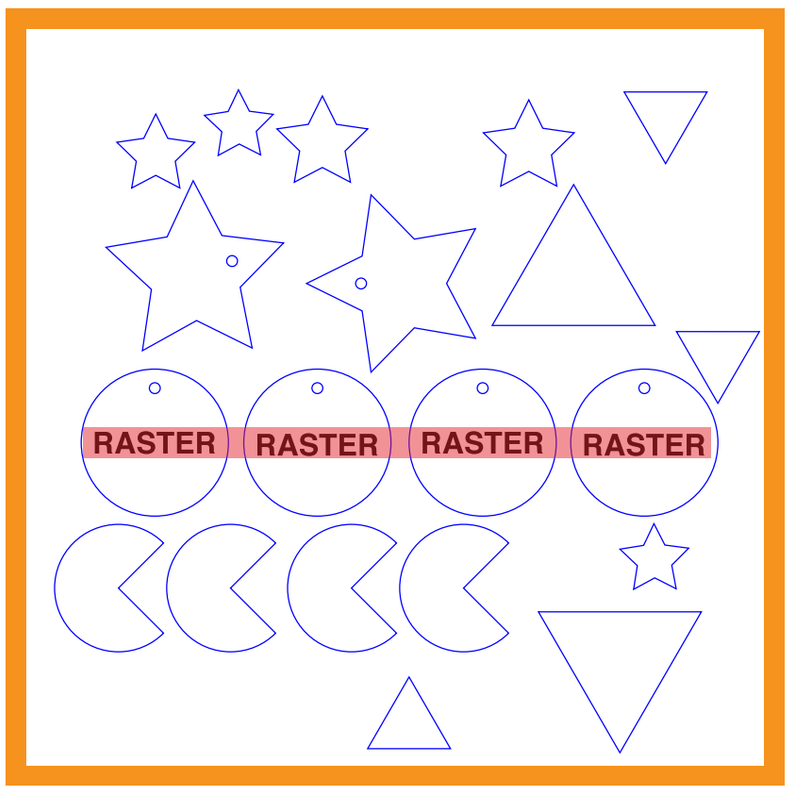
- Any shape filled in black will be engraved (text, shapes, bitmaps)
- The disposition of the parts that will be engraved is important in order to reduce cutting time (when engraving, laser swings left to right and moves bottom to top)
- The red area shows the movement of the laser head.



not efficient,
waste of time



better but
not ok



efficient, no time
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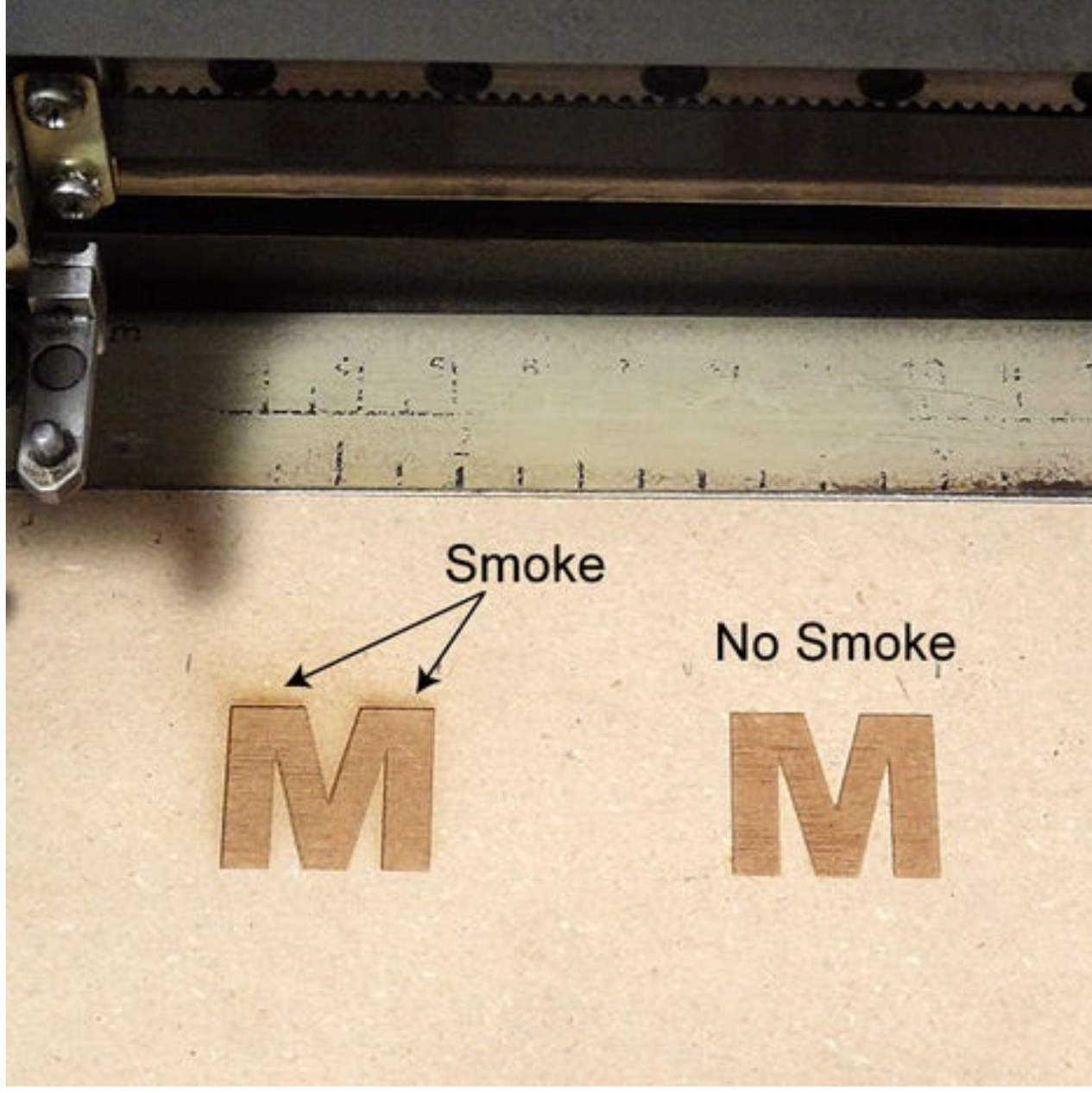
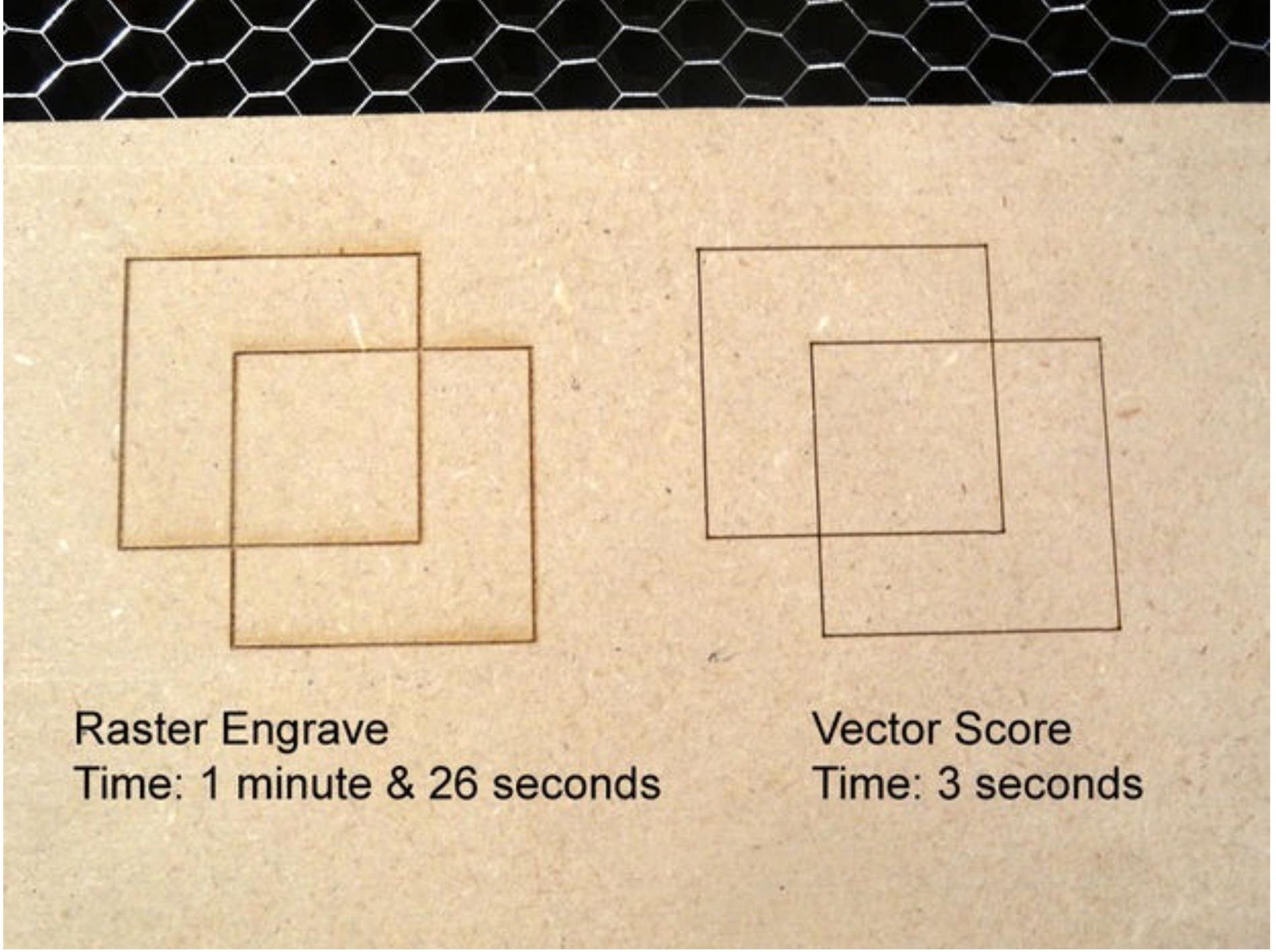


RASTER ENGRAVING

To avoid smoke stain use masking tape (laser settings must be modified)



RASTER ENGRAVING vs VECTOR SCORING

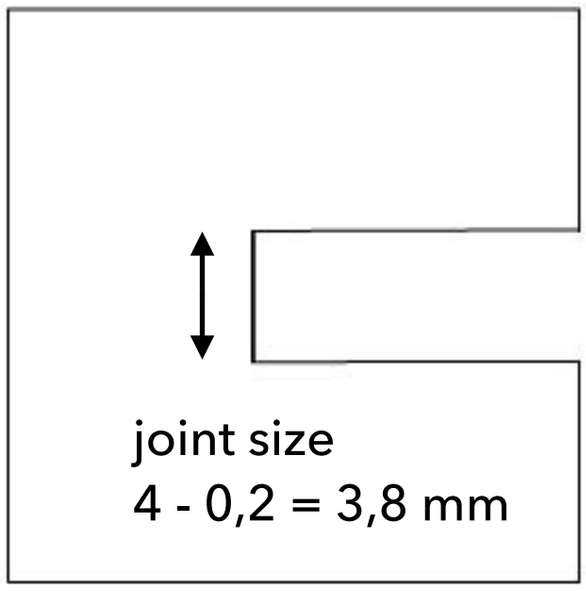
Scoring can be used to engrave vectors instead of fillings or raster images. It is like cutting, but the laser is set to a lower power and faster speed.

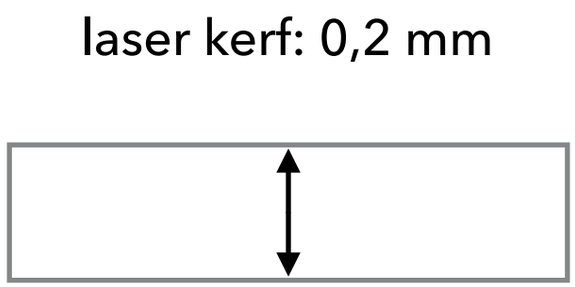
REFINING RASTER ENGRAVING WITH VECTOR SCORING

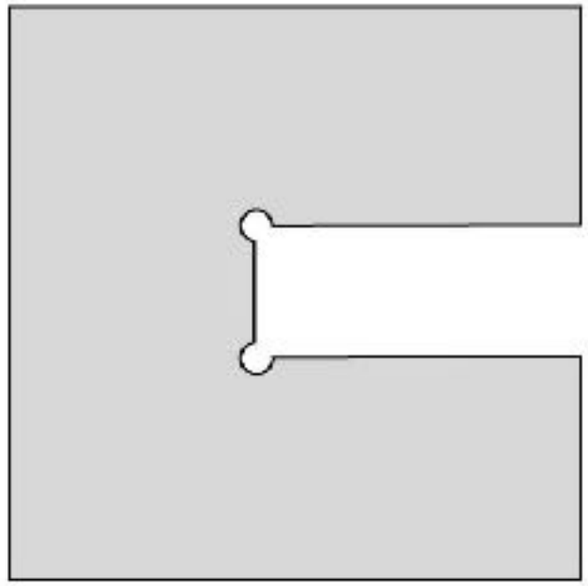
Scoring can be used to refine a raster engrave.

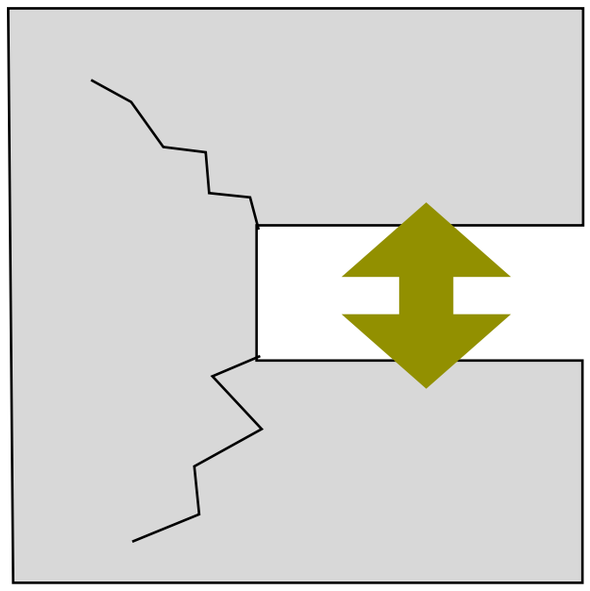
The black filling defines the engraving area, the red outline vector define the scoring, on Illustrator they are two different shapes.

PRESS FIT JOINTS





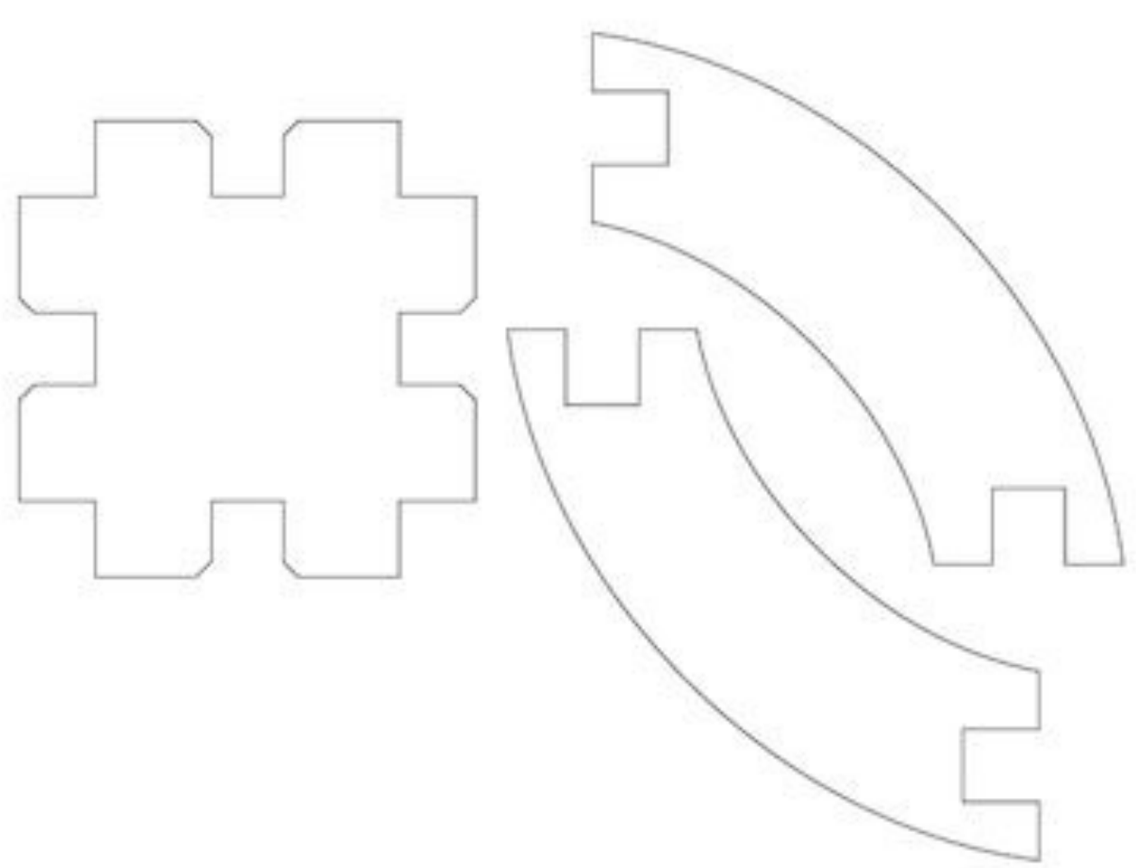


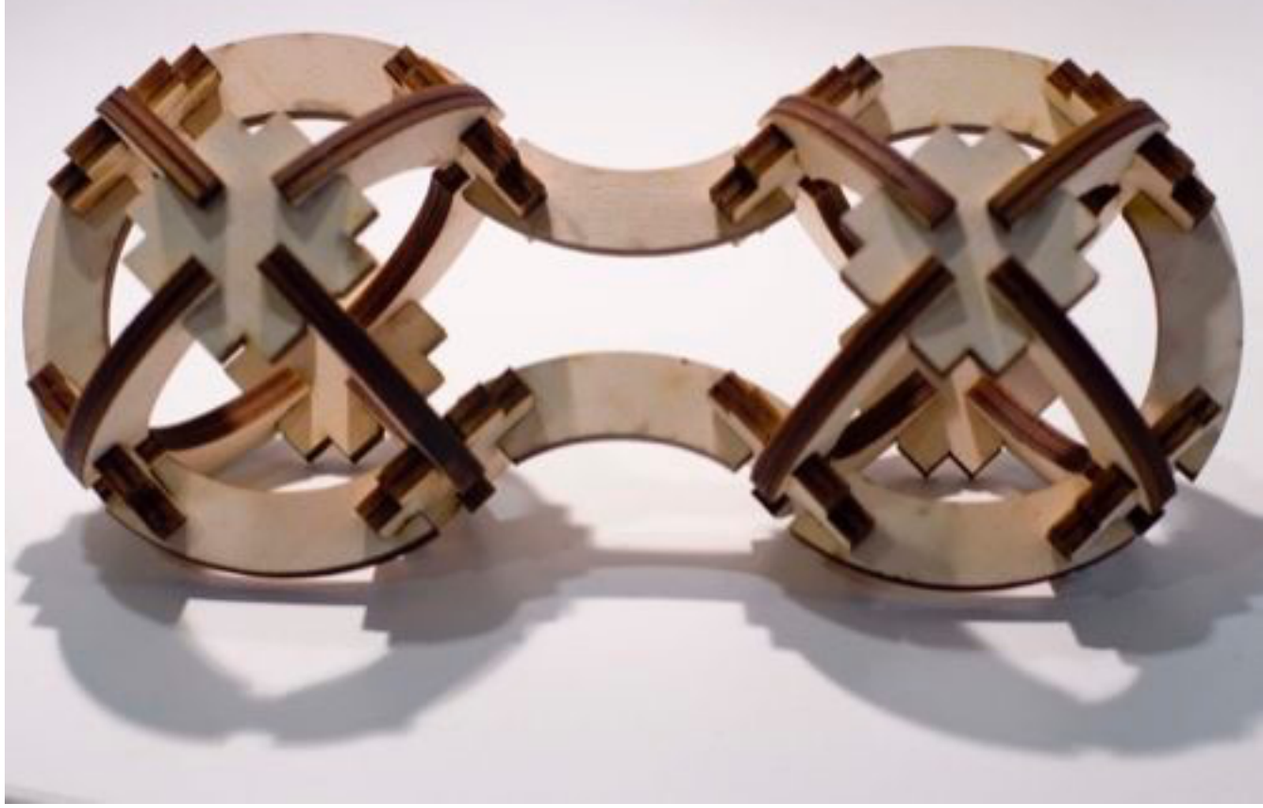


Press fit:
Knowing the thickness of the material determines the size of the joint. Kerf must be precisely measured otherwise the fit will be too loose or too tight.

joint size = material thickness - kerf

Using a**crylic:**
when using press fit joints with acrylic material, always cut away the angles with small circles to distribute stress forces over a longer perimeter. If you don’t do it all the stress will concentrate in the angle and crack the plastic.





PRESS FIT JOINTS CONSTRUCTION KIT

FABO ACADEMY X 同济大学设计创意学院

DESIGN AND CUT A NAME TAG WITH A STAND AND PRESS FIT JOINTS.

Exercise 1

DESIGN AND CUT A NAME TAG WITH A STAND AND PRESS FIT JOINTS.

- Pieces must fit together without using glue, nails, screws or other fasteners.
- Measure your material thickness with a caliper.
- Draw the joints using a parametric design.
- Cut a test part and check if the fit is ok, too tight or too loose.
- Duplicate and position all the parts you need to cut, trying to avoid waste of material (nesting).