

FABO ACADEMY X - CHINA

COMPUTER CONTROLLED CUTTING

镭射切割



COMPUTER CONTROLLED CUTTING / 电脑控制的切割

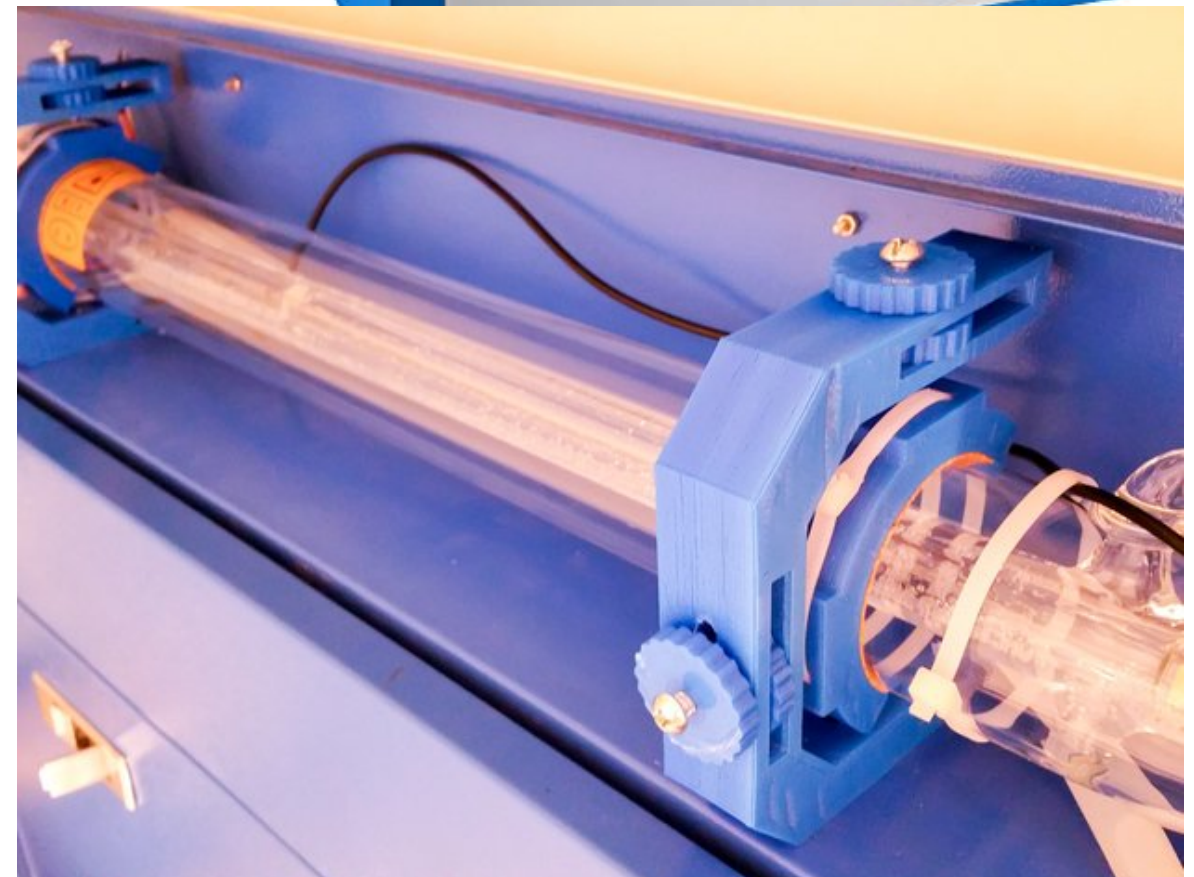
Is where the computer is controlling an end effector, can be a knife, laser, water jet, hot wire, based on a digital design file.

基于数字设计文件，由电脑来执行操作控制终端工具。切割方式可以是刀切、镭射切、水喷射、热线切割等。



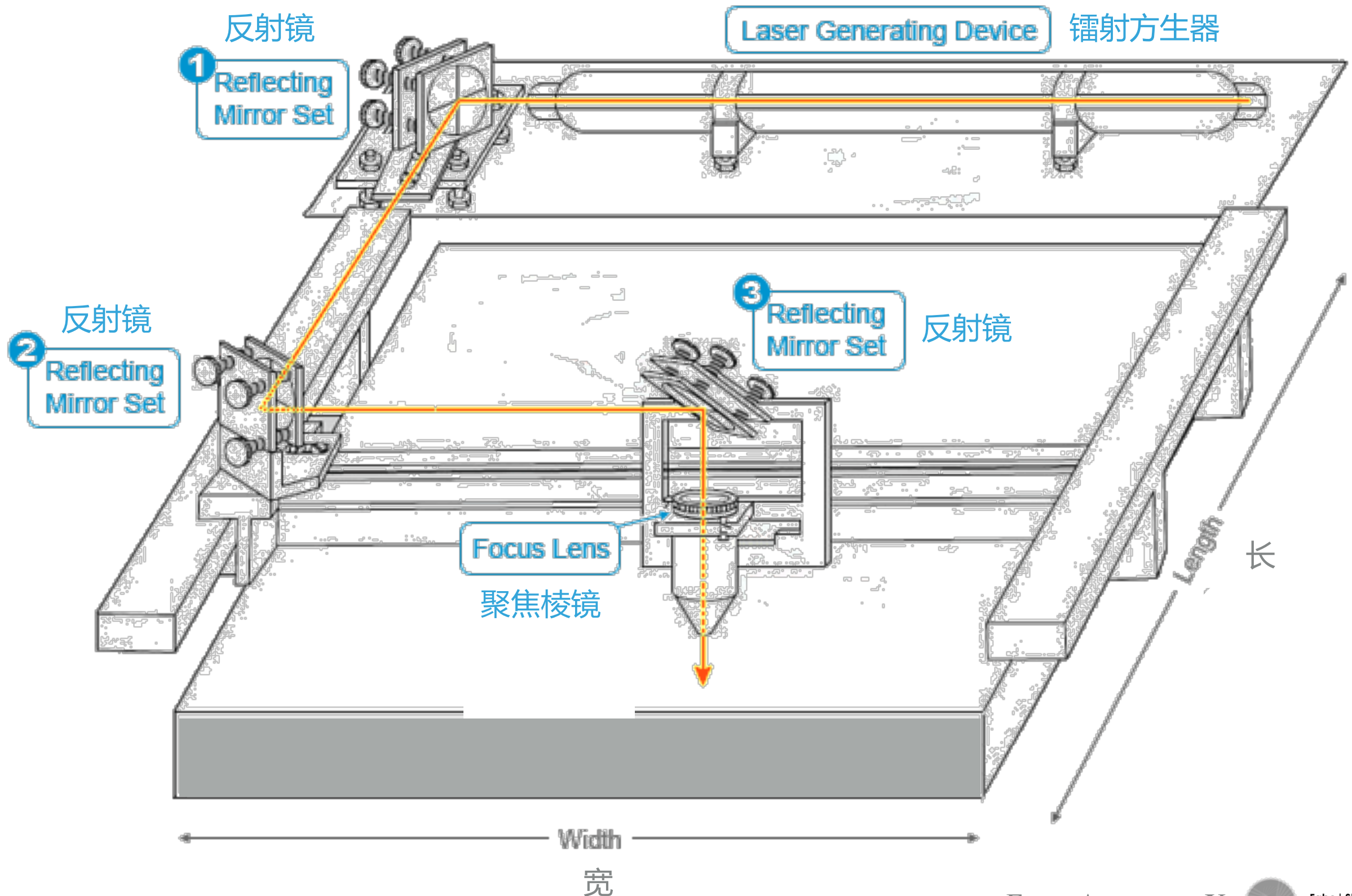
LASERS CUTTER / 镭射切割

- CO2 Laser (10 micron)
Common applications: Wood, acrylic, glass, paper, textiles, plastics, foils & films, leather, stone
- **CO2镭射 (10微米)**
主要应用材料: 木头、亚克力、玻璃、纸、布料、塑料、箔和薄膜、皮革、石头



LASER CUTTER: HOW DOES IT WORK?

镭射切割:它是如何工作的?



LASER CUTTING OPERATING THE MACHINE

镭射切割 机器的操作

1. Turn on the laser cutter, the airflow and the exhaust filter.
打开镭射切割机, 抽风机和过滤器。
2. Insert a sheet of material.
将材料放入切割区。
3. Focus the laser head.
调准激光头。
4. Send the file from PC to the laser cutter.
将文件从电脑发送到镭射切割机上。
5. Use laser cutter control panel to start cutting.
使用激光切割机控制面板开始切割。



LASERS CUTTER SAFETY

镭射切割 | 安全性

- Ensure good ventilation.
确保空气流通。
- Airflow and filter must be ON.
抽风机和过滤器务必打开。
- Only cut safe material. (flame test)
只能使用安全材料。(可以进行燃烧测试)
- **NEVER EVER** leave the laser unattended while cutting.
当机器工作时，请**不要离开**。



LASERS CUTTER SAFETY

镭射切割 | 安全性

What can happen when you leave a laser cutter unsupervised



A student at MIT went to get a sandwich while the laser was running. This is what he found when he came back.

LASER CUTTING - FILE PREPARATION

镭射切割文件准备工作

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

镭射切割颜色设定

	Color 颜色	% Power 功率	% Speed 速度	PPI 频率
	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 FILE PREPARATION

镭射切割 文件准备工作

Open file in Design Software

- assign thickness to cutting lines 0,05pt
- assign colors to lines: each color has its own laser settings

Laser settings assigned to colors of the lines in your drawing

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

在Illustrator里面打开文件

- 切割线厚度设定为0.05pt
- 设定切割线颜色：每一种指定颜色都可以对其进行参数配置

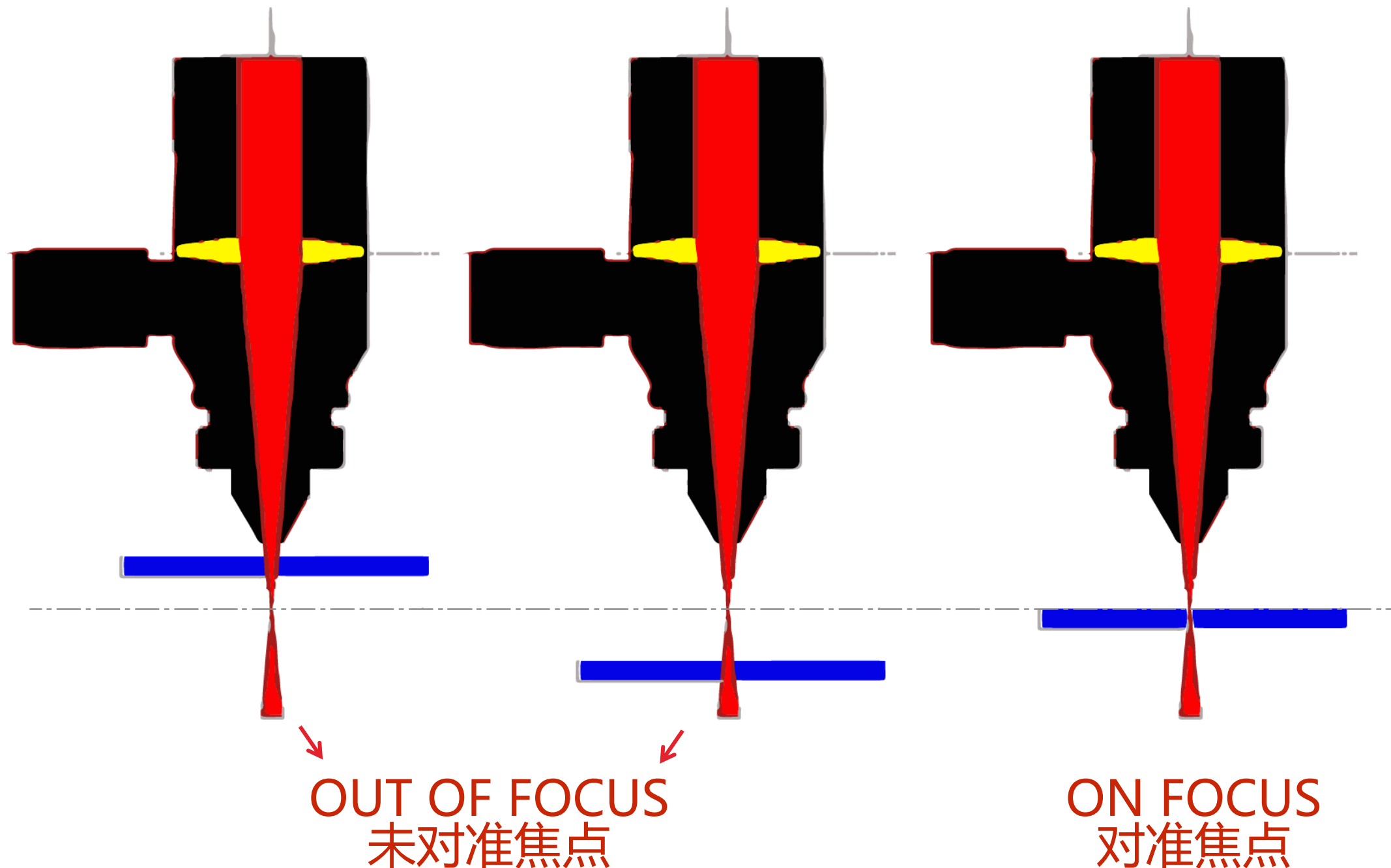
设置镭射切割的指定颜色

- 功率：设定镭射切割的输出功率
- 速度：设定镭射切割的移动速度
- PPI：有些时候我们称为频率, 这是激光的脉冲, 换句话说，激光燃烧的速度有多快。



LASER CUTTER: LASER BEAM FOCUS

镭射切割 | 激光对焦



WORKPIECE MUST BE INTO THE FOCUS OF THE LASER BEAM
【注意】请务必先将要切割的工作材料放在镭射的对焦点上，再工作。

VECTOR CUTTING



0:07 / 2:01

YouTube

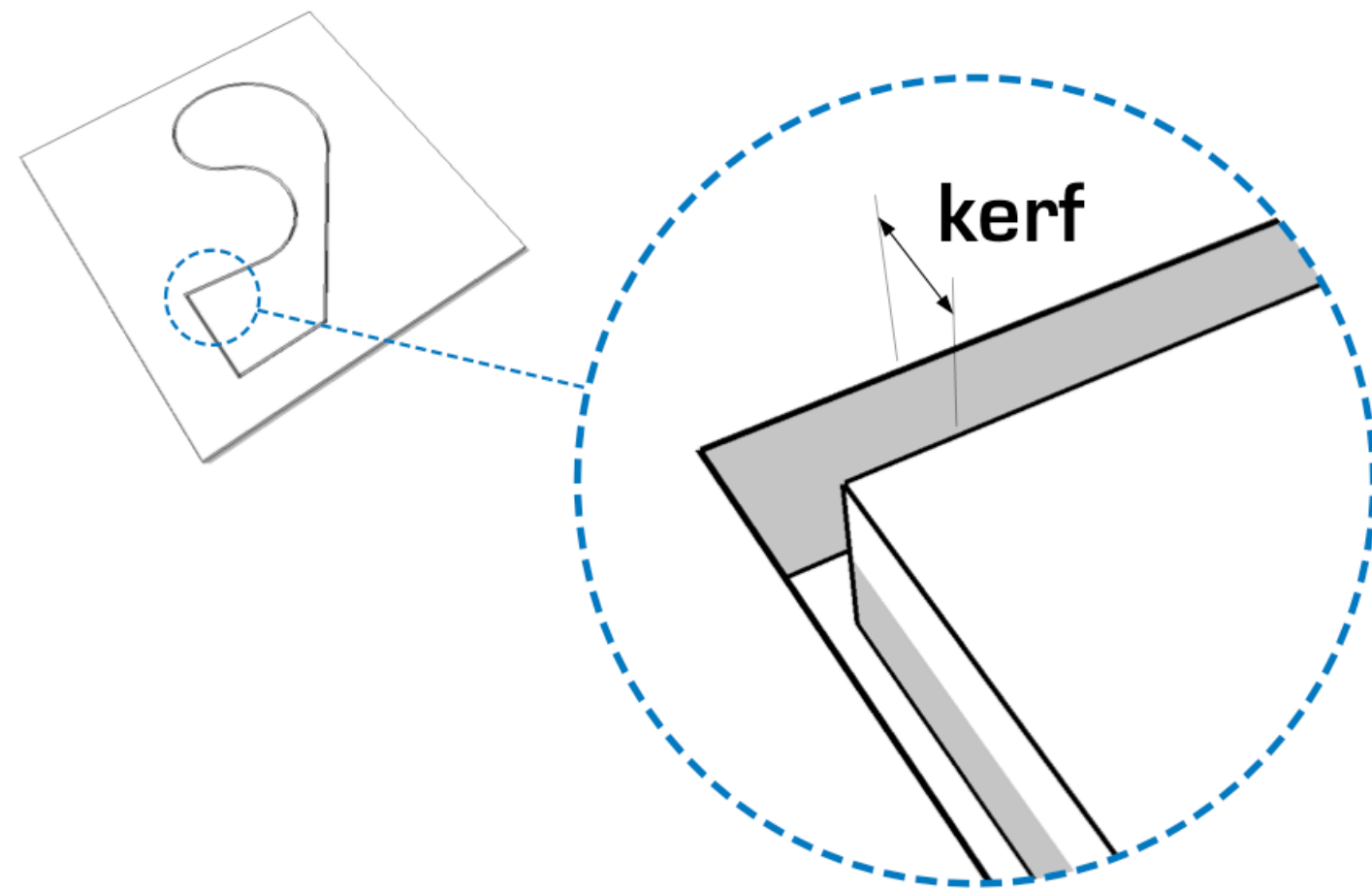


RASTER ENGRAVING OR VECTOR CUTTING?

Laser engrave & cut city maps



KERF CALCULATION / 切缝耗损计算



- The laser burns away a portion of material when it cuts through.
- 激光切割时会烧掉一部分材料。
- 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).
- 这就是切缝耗损，大概是 0.08mm – 1mm 的尺寸，具体取决于材料类型，它的厚度和切割参数设定（功率、速度和频率）。

RASTER SHAPE ENGRAVING

镭射塑形 | 雕刻

- Any shape filled in black will be engraved (text, shapes, bitmaps)

任何填充黑色的图都可以雕刻 (文字, 形状, 位图)

Logo

Logo



ASSIGNMENT 1

Design a modular “Totem” with engraved elements and joints.
Cut two modules and analyze them.
Modify the design, cut an improved version.
Laser cut all the modules and assemble them without using glue.



WHAT IS A TOTEM?



"THUNDER BIRD"
AS A MAN

"SKANA"
THE KILLER-WHALE

"CHET-WOOT"
THE BEAR
Spitting up the Wolf Man

FROG

"SE-SOOK"

TWO-HEADED SERPENT

"OL-HIYO"
THE SEAL

"WALALEE"
THE SALMON

"LE-LOO"
THE WOLF

THE RAVEN

FROG

THE ANCIENT
POWERFUL SUPERNATURAL

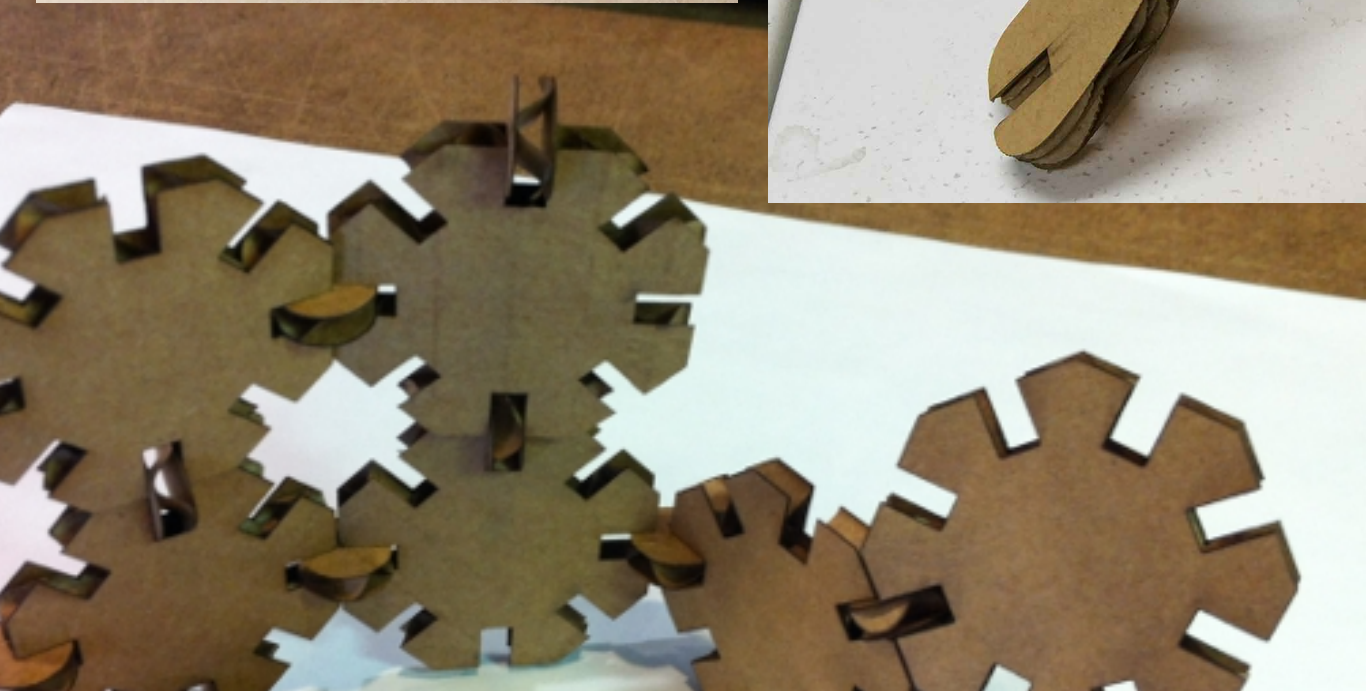
"KUUMA"
THE BULLHEAD

"EL-KOLIE"
THE WHALE



A totem is a symbol that serves as an emblem of a group of people, such as a family, clan, lineage, or tribe, originated in the Native American cultures.

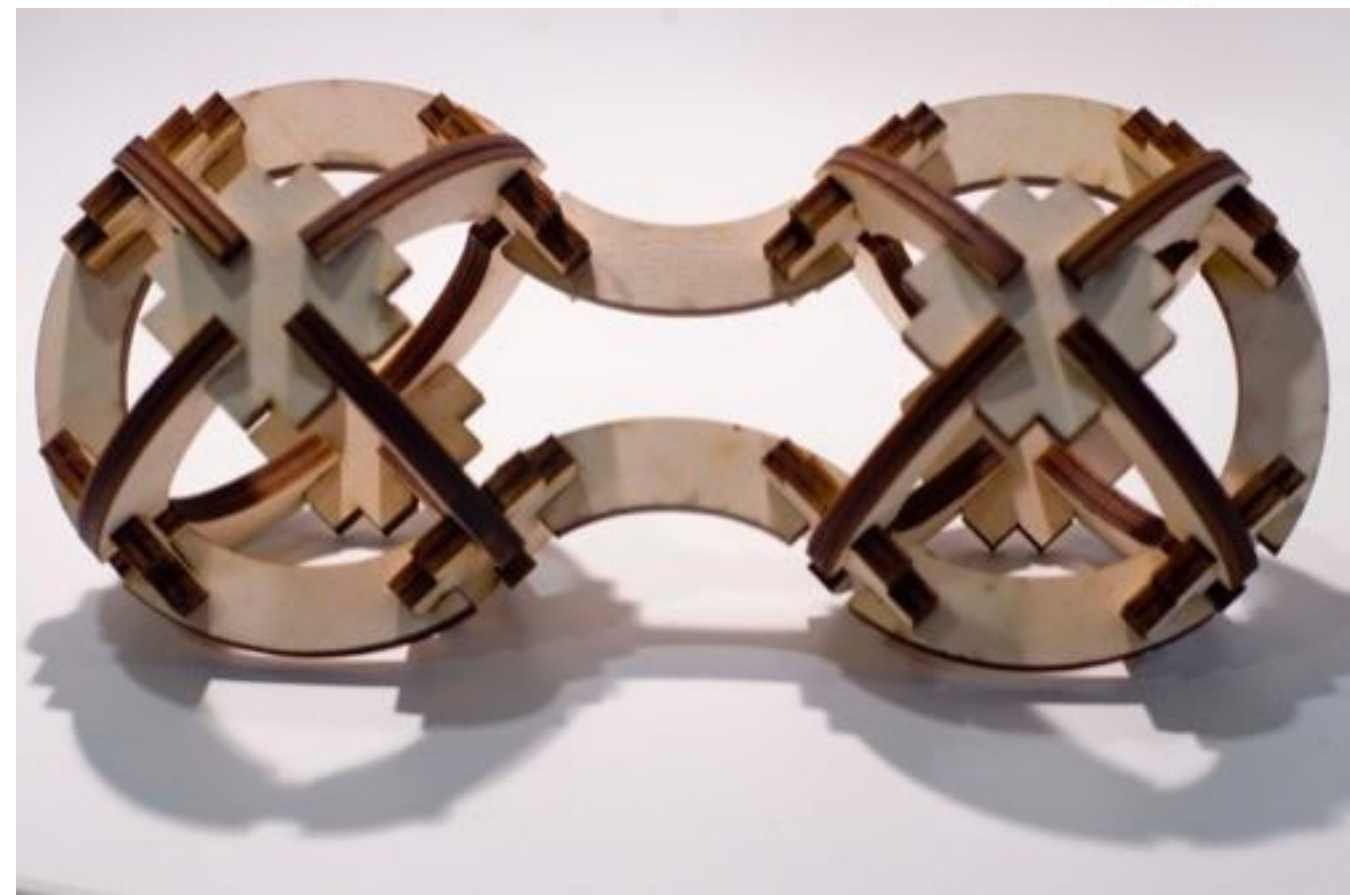
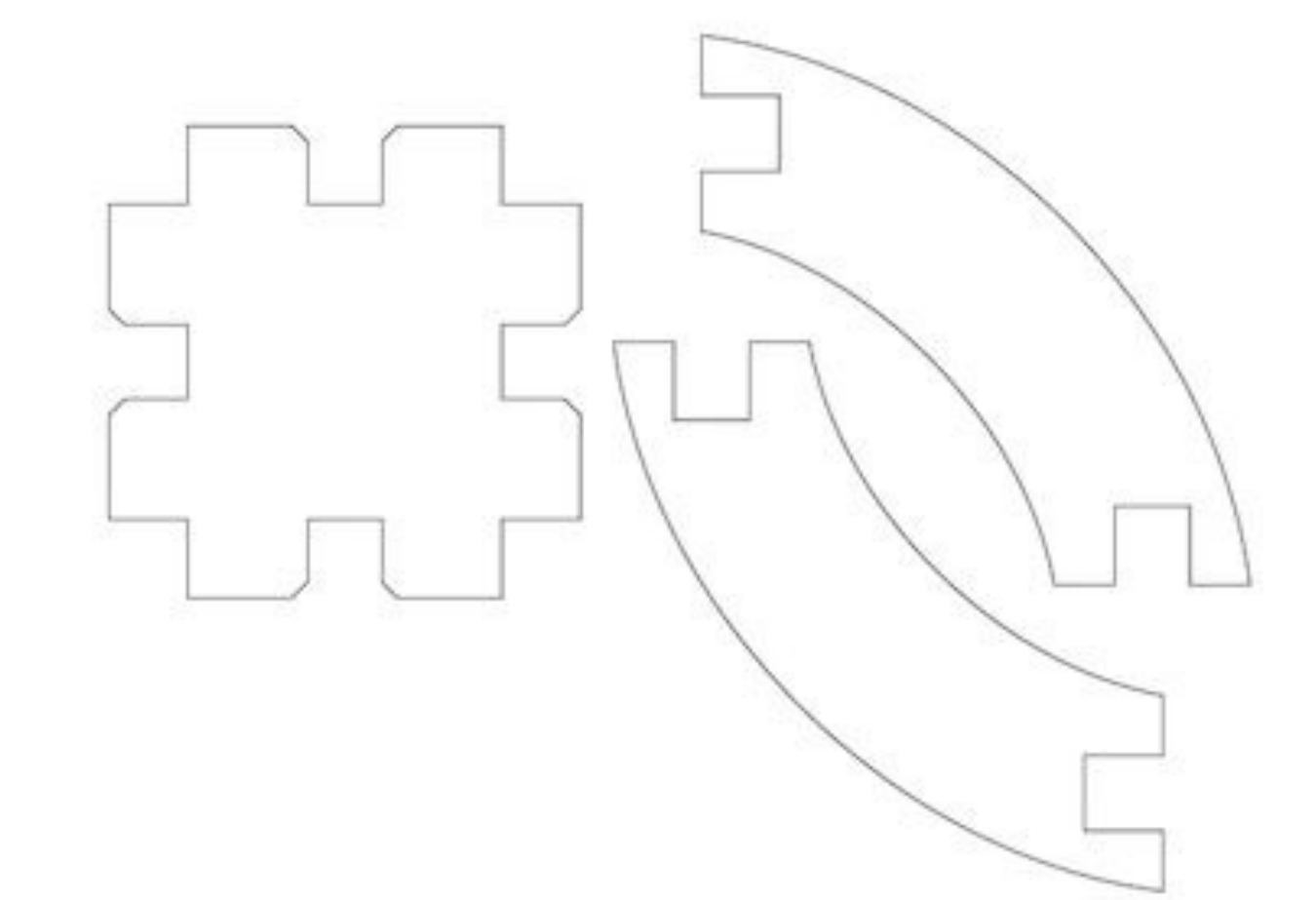
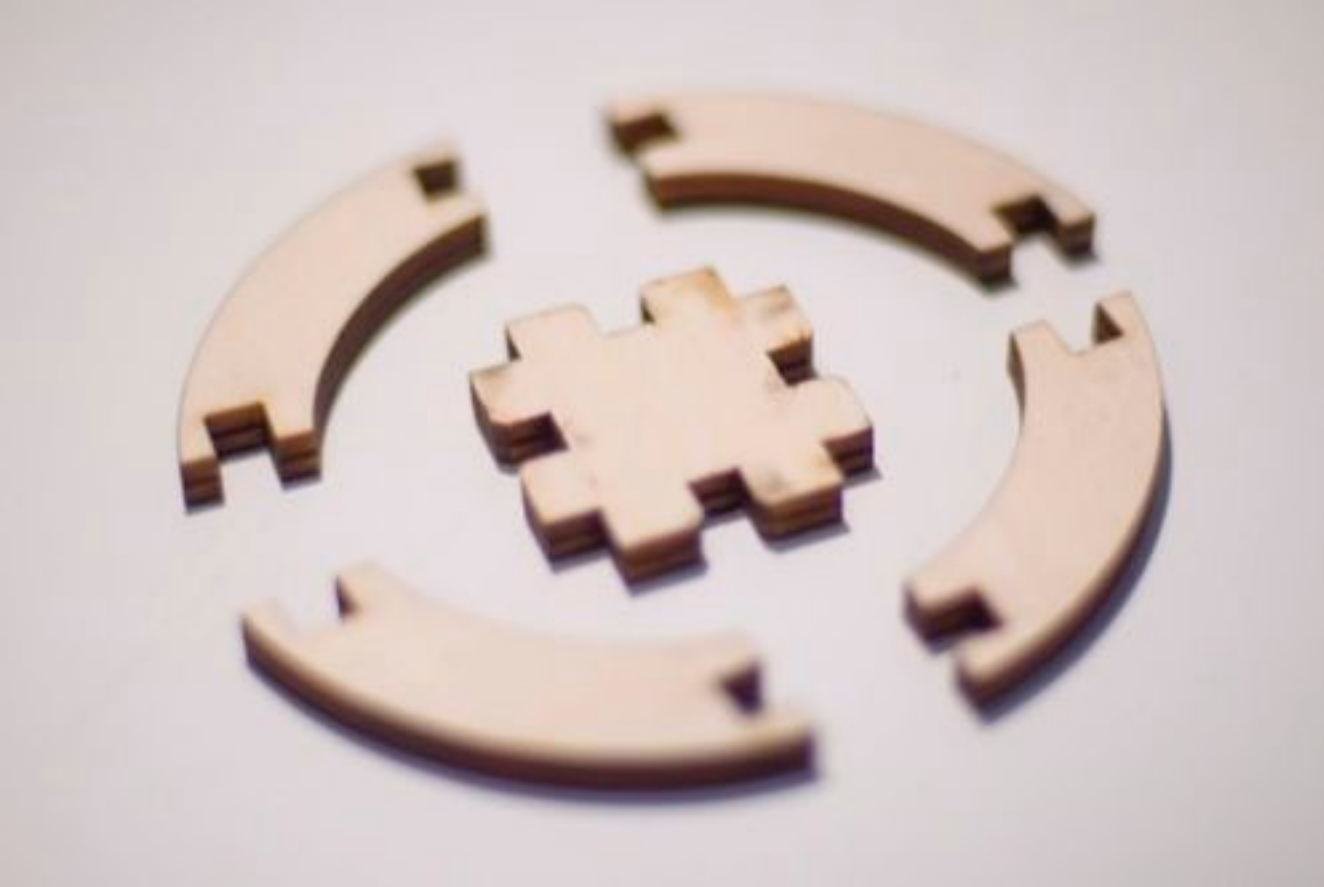




Create a "Symbolic" object that you can use during your interview, to "break the ice" or stimulate the conversation.

It can have any shape you want.

It must have "press fit joints" and engraved parts like text or images.



PRESS FIT JOINTS CONSTRUCTION KIT / 压合接头的结构作品



PRESS FIT JOINTS / 设计连接处



joint size: $4,0 - 0,2 = 3,8$ mm
连接处尺寸: $4,0 - 0,2 = 3.8$ mm

Press fit:

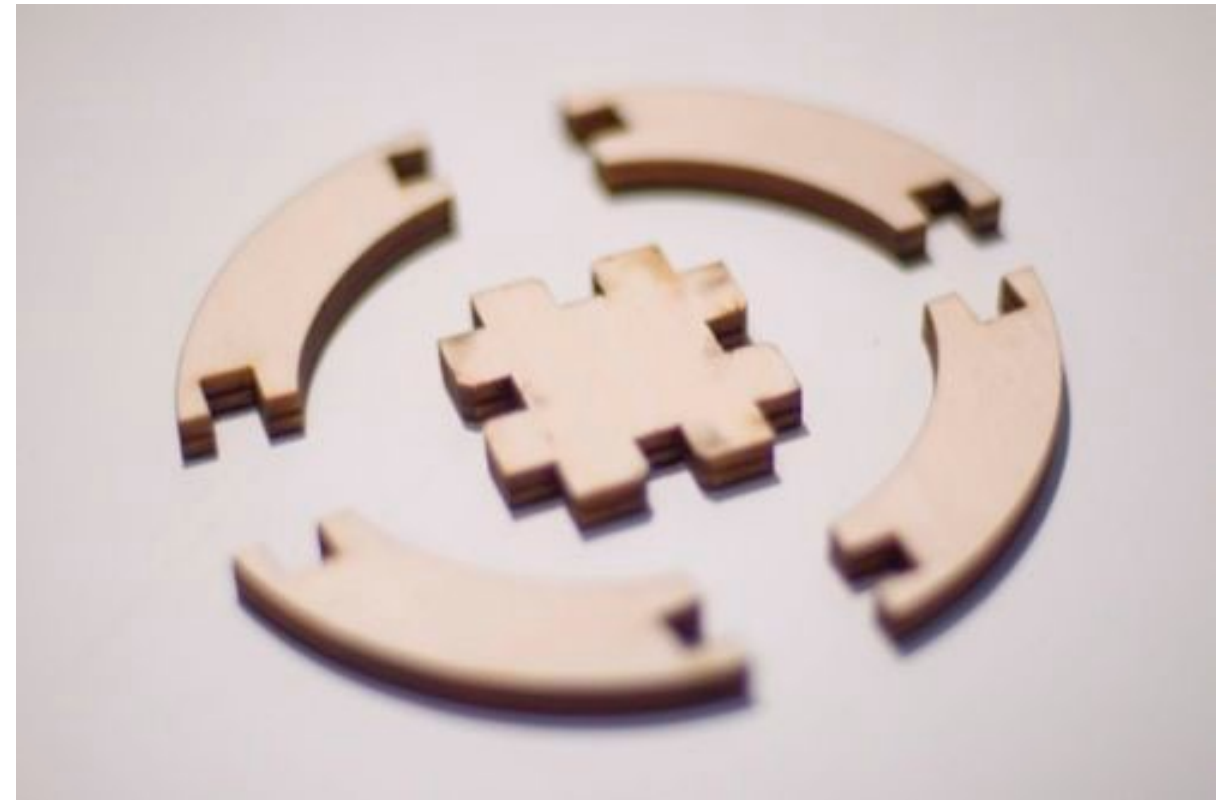
Knowing the thickness of the material determines the size of the joint. Kerf must be precisely measured otherwise the fit will be too loose or too tight.

连接处尺寸:

材料的厚度决定了连接处的尺寸。连接处的尺寸必须精确测量否则匹配时会太紧或太松。

joint size = material thickness - kerf

连接处尺寸 = 材料厚度 - 耗损



Units

☒ Inch ☐ Millimeters

Width

mm

Height

mm

Depth

mm

Are these inside or outside dimensions?

☒ Inside ☐ Outside

Material Thickness

[Custom Thickness](#)

Open or closed box?

☒ Open ☐ Closed

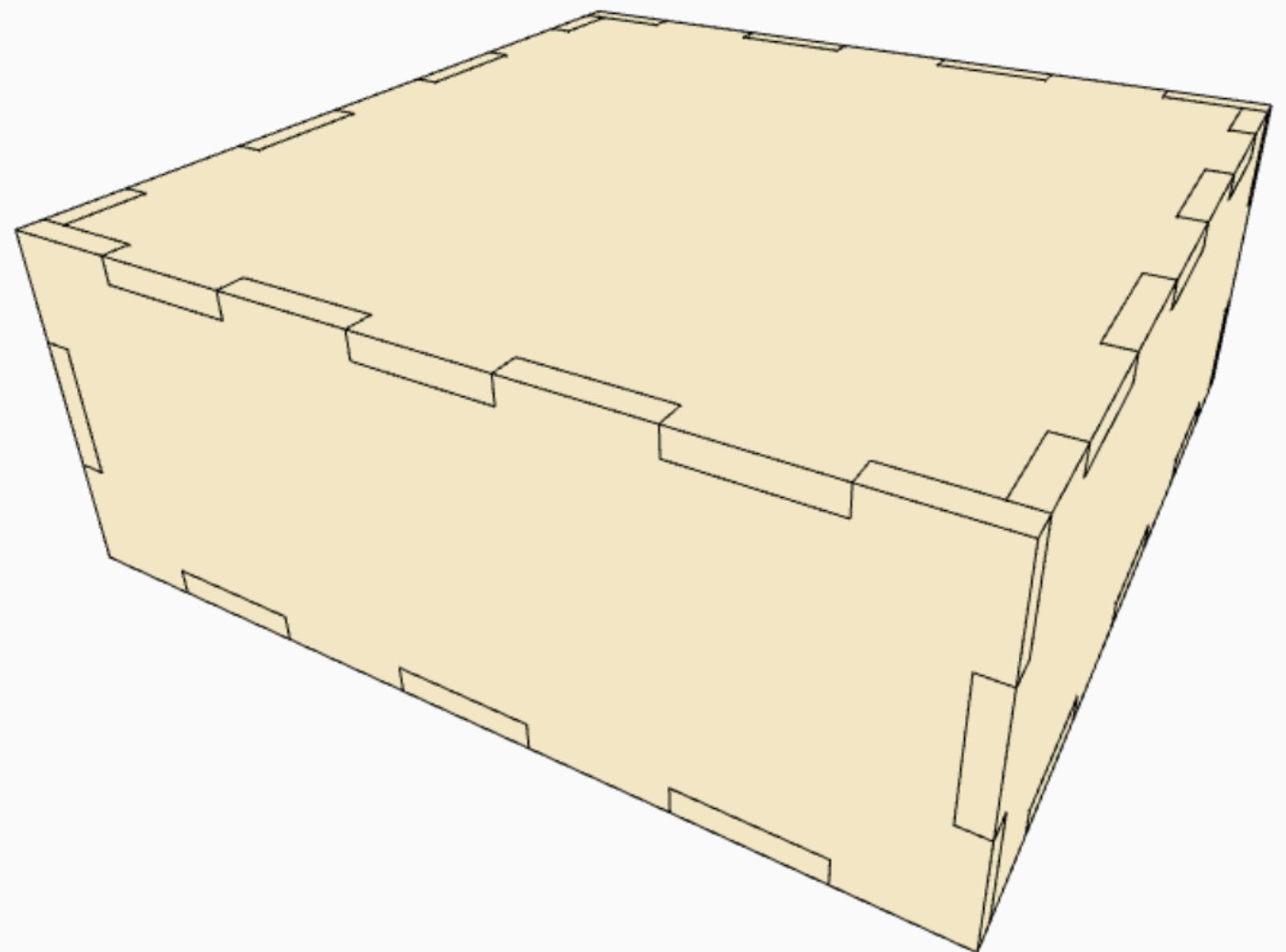
Edge Joints

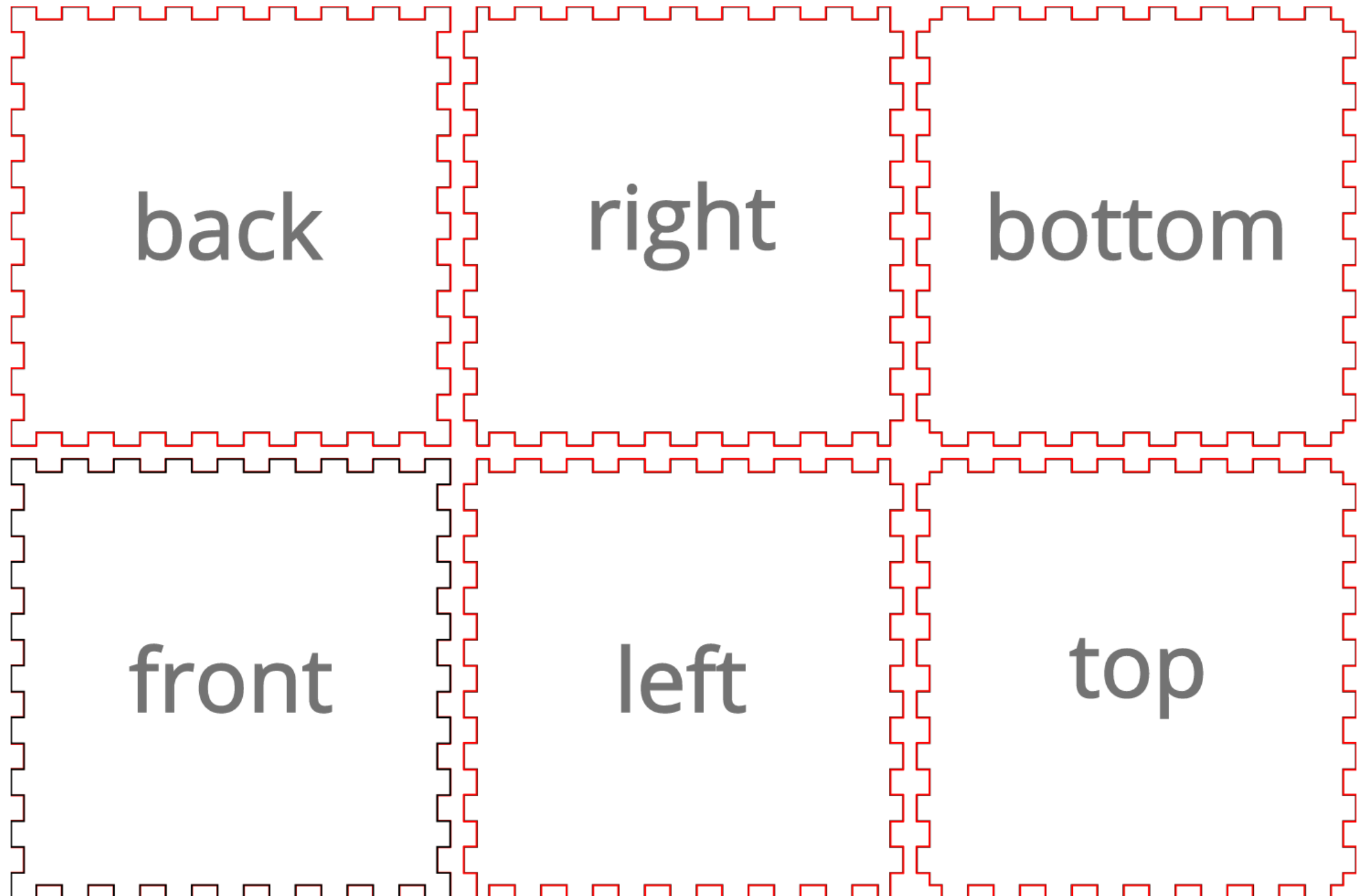
☐ Flat ☒ Finger ☐ T-Slot

Finger Size

15

[Download Box Plans](#)





Labels and Spacing

Line Formatting

Kerf and Corner Compensation

Cut Compensation Type

None

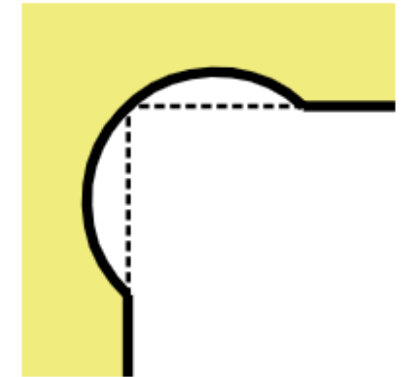
Kerf

Corner Compensation

Router Bit Diameter

0.1

mm



Labels and Spacing

Line Formatting

Kerf and Corner Compensation

Cut Compensation Type

None

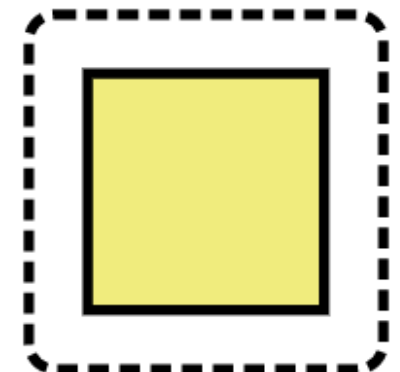
Kerf

Corner Compensation

Kerf (Beam Dia / 2)

0.1

mm



REFERENCE

http://academy.cba.mit.edu/classes/computer_cutting/index.html

http://academy.cba.mit.edu/classes/computer_design/index.html

