Using the lasercutter

Jasper Sterk
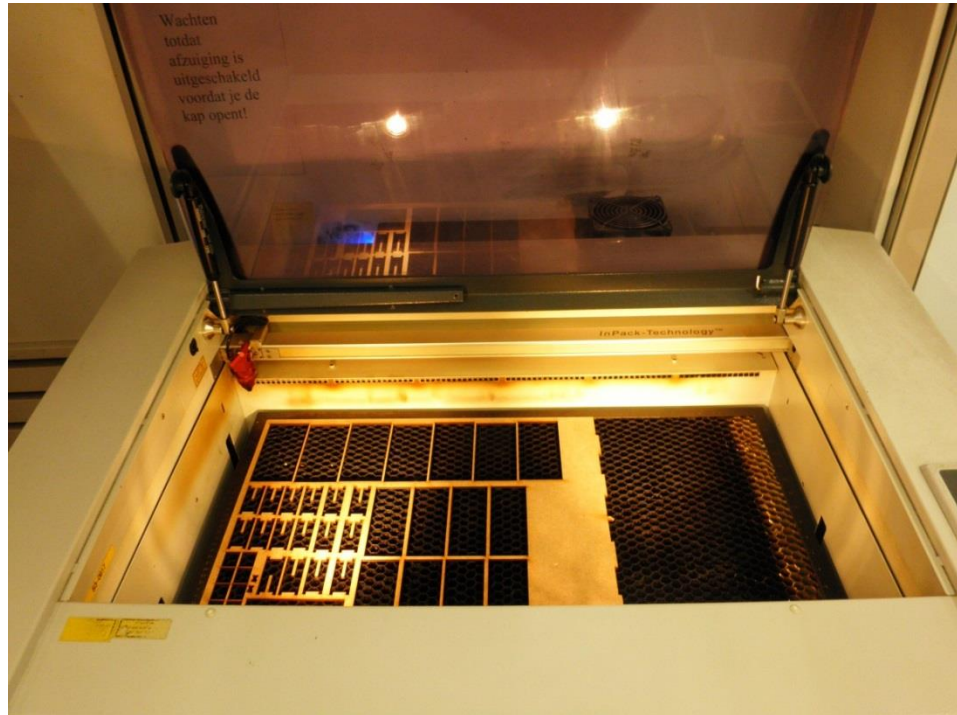
TU/e Technische Universiteit
Eindhoven
University of Technology

What is a lasercutter

Machine that melts, burns, vaporizes away material by using a focused beam of light (in our case 80 Watt infrared CO_2 laser)

It can:
- Cut materials (partly or completely through)
- Engrave materials

TU/e Technische Universiteit Eindhoven University of Technology

What can you do with the laser cutter

Combinations of the following:

- Cutting vector lines to create shapes with planar and curved edges.
- Vector marking lines/patterns into the surface of materials at different depths (only width of the beam).
- Raster engraving fill areas at different depths to create patterns in the surface of materials.
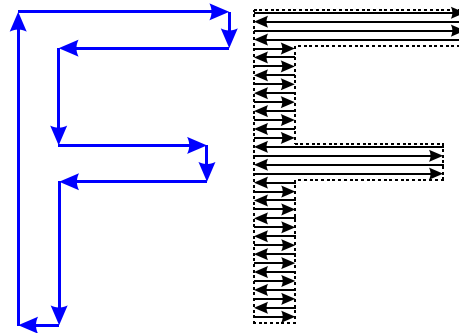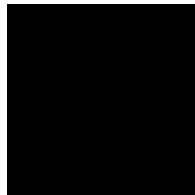
Vector (lines) versus engraving (bitmap -> points) operation

What can you do with the laser cutter 2

Engraving and cutting outline

Engraving only

Cutting outline only

Engraving depth profile depending on percentage black.

How to indicate the Laser Cutter what to do?

Principle working sequence:

1. Engraving (black or grey areas)
2. Vector marking (indicate by red lines)
3. Cutting (sequence indicated by other color lines, see next slides)

Cutting sequence

Cutting sequence. The cutting sequence is controlled through usage of color. Use them in sequence of the table in next slide.

Because cut parts can change position, the sequence should be (inside parts first):

1. Raster engraving (Black)
2. Vector marking curves (Red)
3. Cutting of holes in objects containing holes (Blue)
4. Cutting outline of objects containing holes (Desert Blue)
5. …
6. If needed cutting of outside frame (in this case Cyan is used)
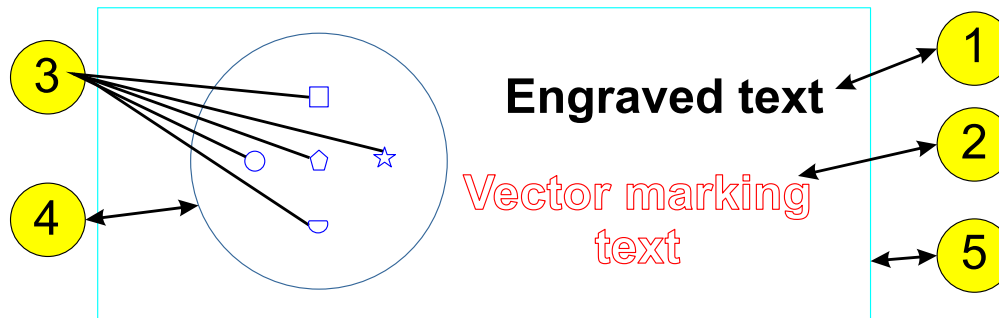
Colors for cutting sequence

No.	Colour	RBG colours			CMYK colours			
		R	G	B	C	M	Y	K
1	Black	0	0	0	0	0	0	100
2	Red	255	0	0	0	100	100	0
3	Blue	0	0	255	100	100	0	0
4	Desert Blue	51	102	153	40	20	0	40
5	Cyan	0	255	255	100	0	0	0
6	Green	0	255	0	100	0	100	0
7	Grass Green	0	153	51	60	0	40	40
8	Forest Green	0	102	51	40	0	20	60
9	Olive	153	153	51	0	0	40	40
10	Brown	153	102	51	0	20	40	40
11	Walnut	102	51	0	0	20	40	60
12	Plum	102	0	102	0	40	0	60
13	Purple	153	0	104	20	80	0	20
14	Magenta	255	0	255	0	100	0	0
15	Orange	255	102	0	0	60	100	0
16	Yellow	255	255	0	0	0	100	0

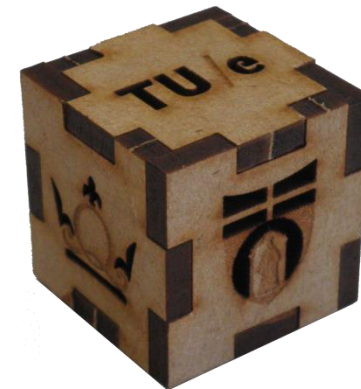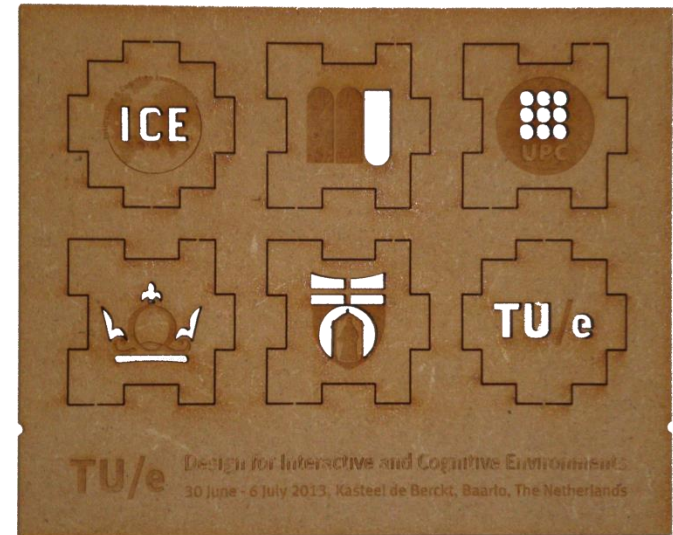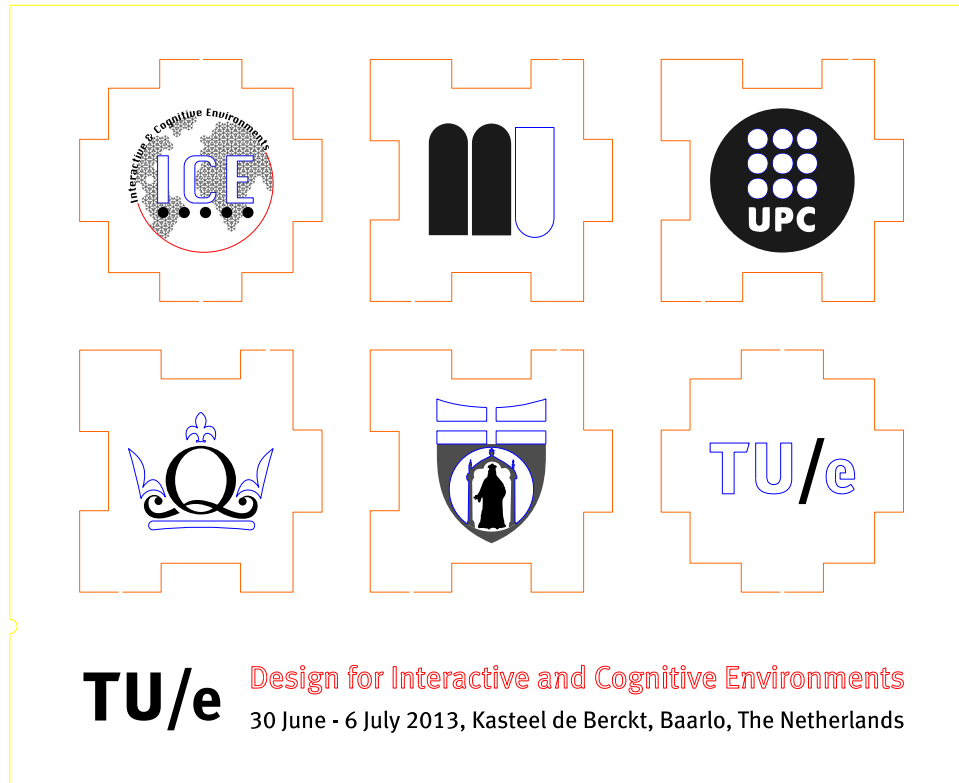Technische Universiteit Eindhoven University of Technology

How to prepare files

We use CorelDraw which can open or import older versions of AutoCAD dxf and dwg, Adobe Illustrator ai, eps, and pdf files and more.

- **Scale**. Use 1:1 scale on a maximum 700 * 400 mm canvas or page. Keep some clearance on the edges (a few mm).
- **Color**. Use colored lines (see before table) for cutting or vector marking, use black /grey for raster engraving.
- **Lay out**. Lay out (nest) the various parts on the canvas or page in order to reduce material usage.
- **Shared/double lines**. Be careful when parts share cutting lines: usually this leads to double lines meaning cutting twice. *Delete redundant copies of lines! Files with double lines will be rejected.*
- **Details**. For thick materials the laser needs more power and the material might burn or melt away leading to less clear details.
- **Text and fonts.** Convert fonts to outlines. We don't have all fancy fonts you use.
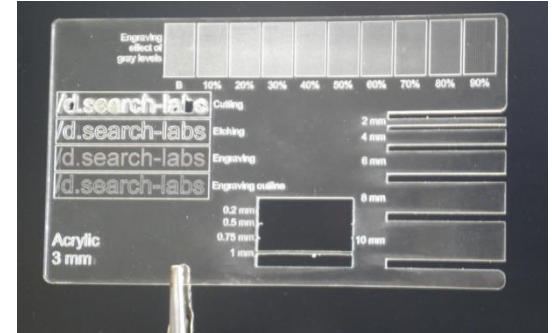
Example
(designed by Thomas van der Werff)

TU/e Design for Interactive and Cognitive Environments
30 June - 6 July 2013, Kasteel de Berckt, Baarlo, The Netherlands

Other examples

Designs by Leonie Tenthof van Noorden

- Example of operations on clear acrylic

- Mdf painted white
- Green adhesive sheet attached
- lasercut
- parts peeled away
By Rens Branckaert

Several designs by Marina Toeters by-wire.net and Loe Feijs

- Clear acrylic
- Transparent adhesive sheet on the backside
- Laser engraved and cut from the front side

Materials

- Materials that can be used include:
  - Textile materials (leather, suede, felt, hemp, cotton)
  - Wood (balsa, burch, plywood, mdf up to 9 mm thickness. Should be flat)
  - Vivak
  - Paper
  - Cardboard
  - Acrylics (also named PMMA, Plexiglas, perspex)
  - Certain types of self-adhesive sheets.
- Materials that cannot be used:
  - Metals (reflect the beam)
  - Foam board (foam will start burning)
  - Any material containing chlorines e.g. PVC (corrosive gases, dioxines)
  - Polycarbonate (Lexan)
  - ABS (tends to melt rather than vaporize)
  - HDPE (high density poly ethylen, "milk bottle plastic") (gets gooey, catches fire.)
- Available materials (you have to supply other materials yourself, check with staff)
  - MDF thickness 2, 3, 4, 6, 9 mm
  - Clear transparent acrylic (perspex) thickness 2, 3, 4, 5, 6, 8 mm (about 10 times as expensive as MDF)
  - Clear transparent Vivak thickness 0.5, 1.0 , 1.5 mm

TU/e Technische Universiteit Eindhoven University of Technology

Lasercutting

Submitting files

- The laser cutter is available only for ID staff and ID master, ID PDEng, and ID PhD and master students and only **for ID Education or ID Research related activities.**
- **Maximum size 700 * 400 mm landscape**. Smaller is not a problem.
- Check the cutting sequence (colors).
- **Remove all multiple lines** (see before).
- **In the file name please include your name, the material (mdf – acrylic, own material) and thickness.** We try to save material by combining more jobs on a single sheet. If you don't want this, please indicate clearly (e.g. centered on a sheet).
- Submit your files through e-mail to **lasercut.dsearch@tue.nl**
- We experienced conversion problems with *.ai files in the file format of Adobe Creative Cloud, and sometimes in CS6 format. Please use one of the older CS formats e.g. CS4 instead.
- Generally files will be processed on first-come first-go basis, although staff may decide on deviations from this principle.
- You will receive an e-mail as soon as your job has been processed or in case of questions about your request so monitor your e-mail.
- You can find your finished job in the cabinet next to the entrance of LG 0.59

Resources

- Our laser cutter webpage (includes illustrator templates and color swatches): https://studiegids.tue.nl/opleidingen/graduate-school/masters-programs/industrial-design/facilities/labs/generic-make-labs/rapid-prototyping-lab/laser-cutter/
- Staff: Jan Rouvroye, Chet Bangaru, Jasper Sterk
- Buying materials
  - Do-it-yourself shops Karwei, Praxis, Gamma, ...
  - Houthandel van Hoorn Nuenen http://houthandelvanhoorn.nl/

  Shops for acrylics
  - Eriks kunststoffen Eindhoven (used to be Kubra Nuenen, located Achtse Barrier): http://eriks.nl/nl/nieuws/kunststoffen/
  - http://www.planoplastics.nl/ (located Hurkse straat)
  - Internetshop http://www.kunststofshop.nl or https://www.pyrasied.nl/