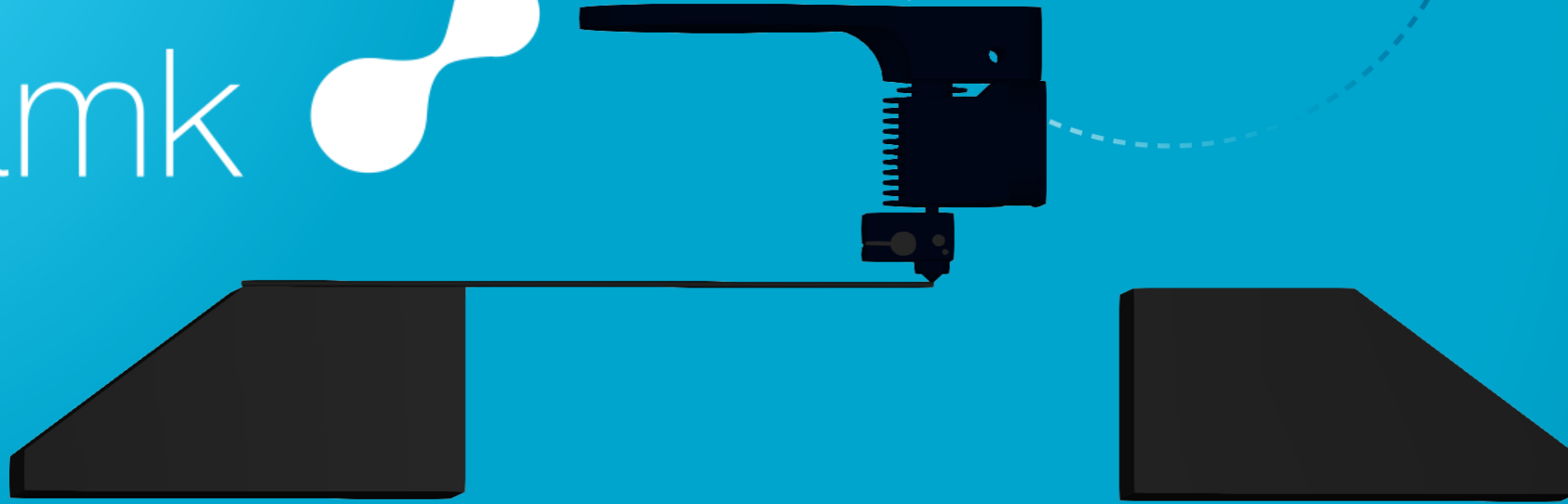


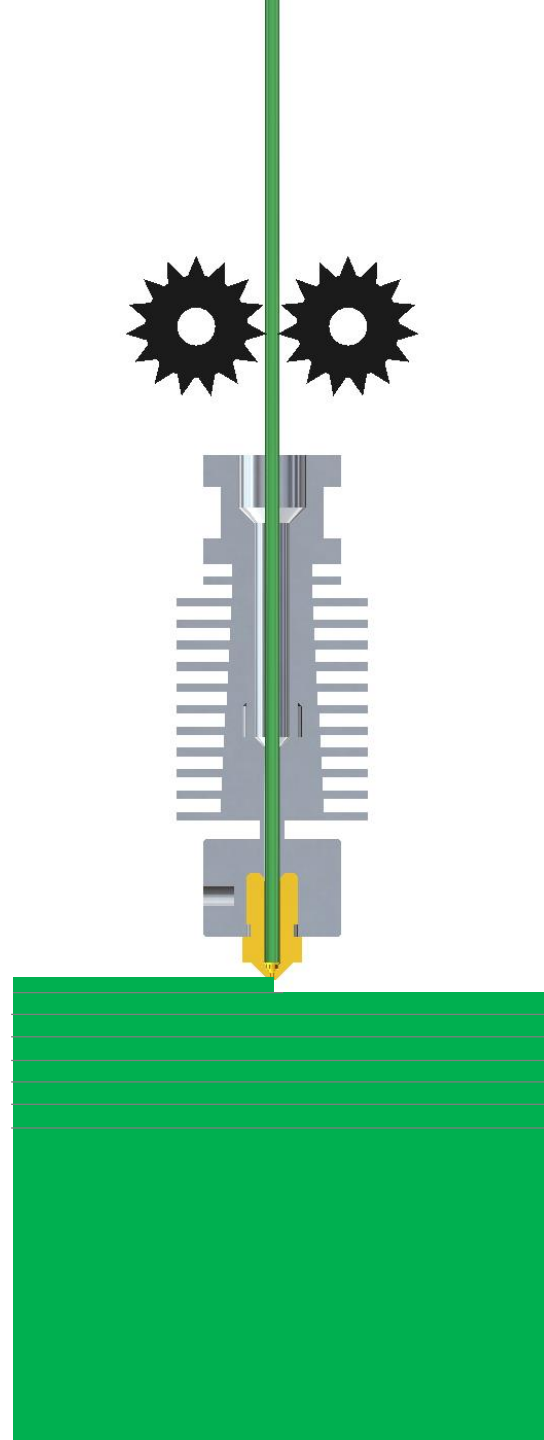
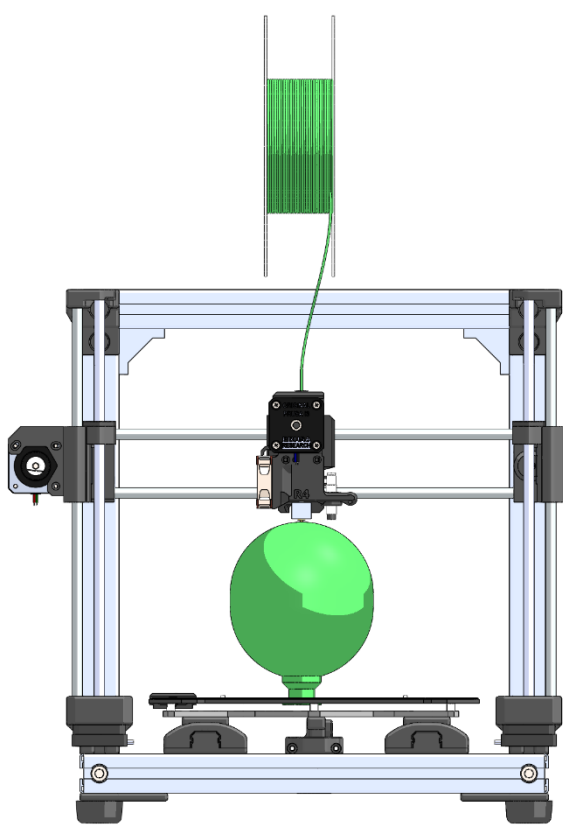
samk



3D-Printing – FDM - fused deposition modeling

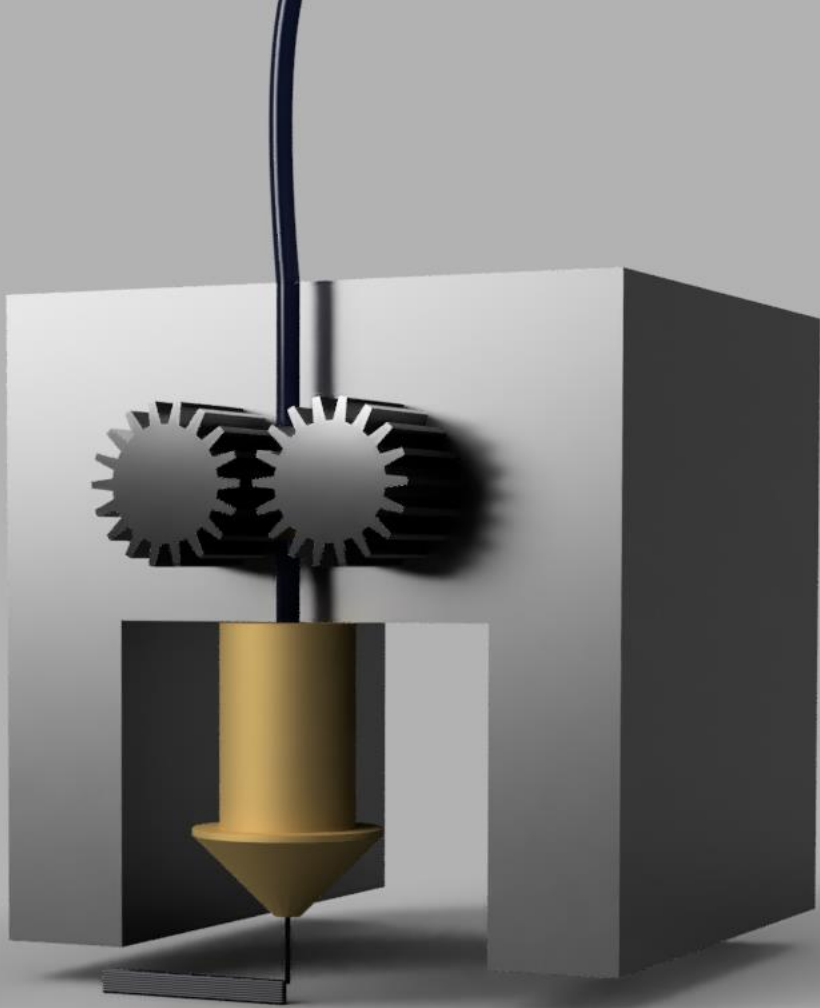
Material extrusion

FDM / FFF



Material extrusion

- FDM aka. Fused Deposition Modeling
- Technology is based on extruding material through a hot nozzle which moves above the build plate
- The nozzle moves in X- and Z-direction, and the build plate where part is created on, moves in Y-direction

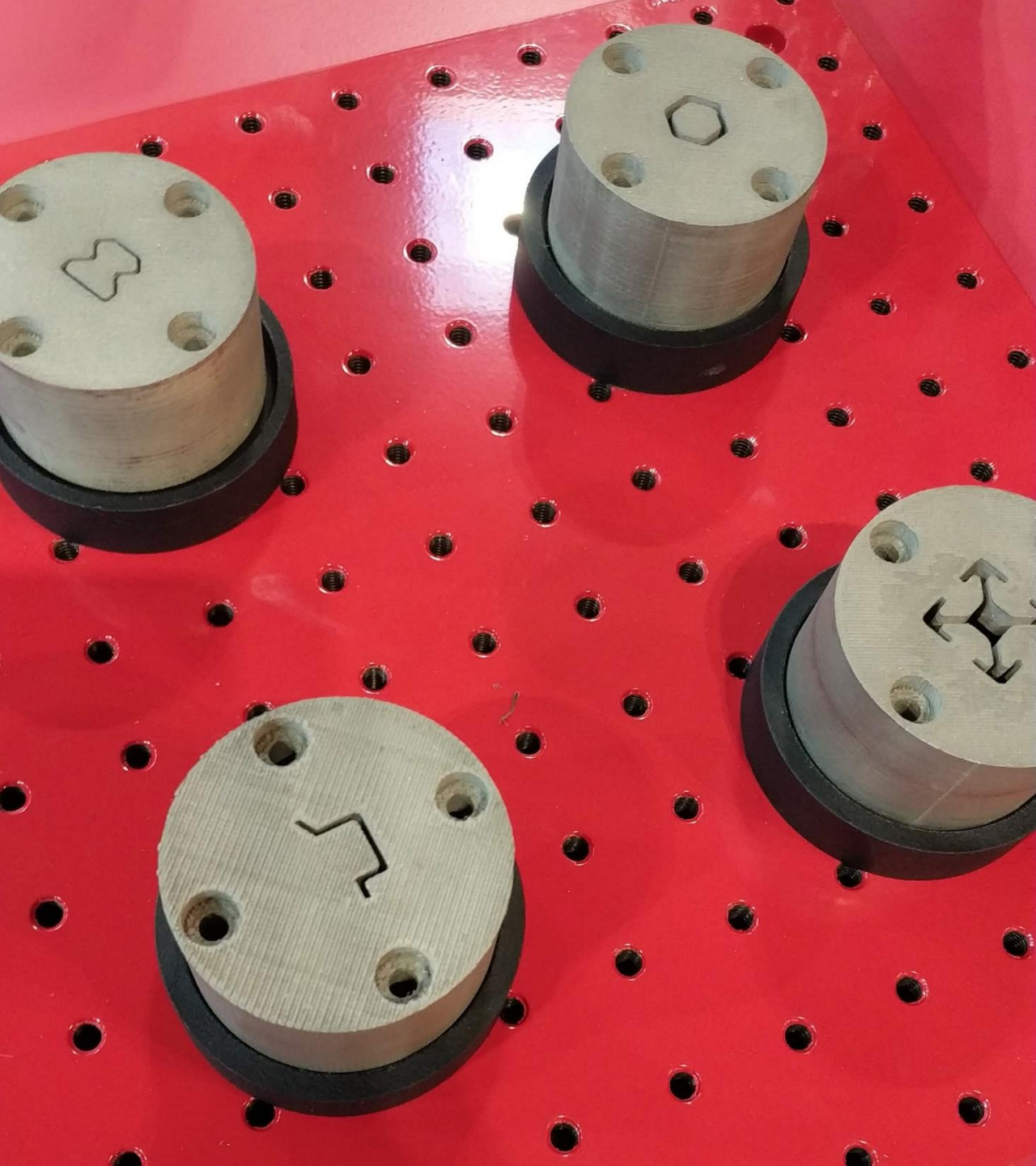


Material extrusion

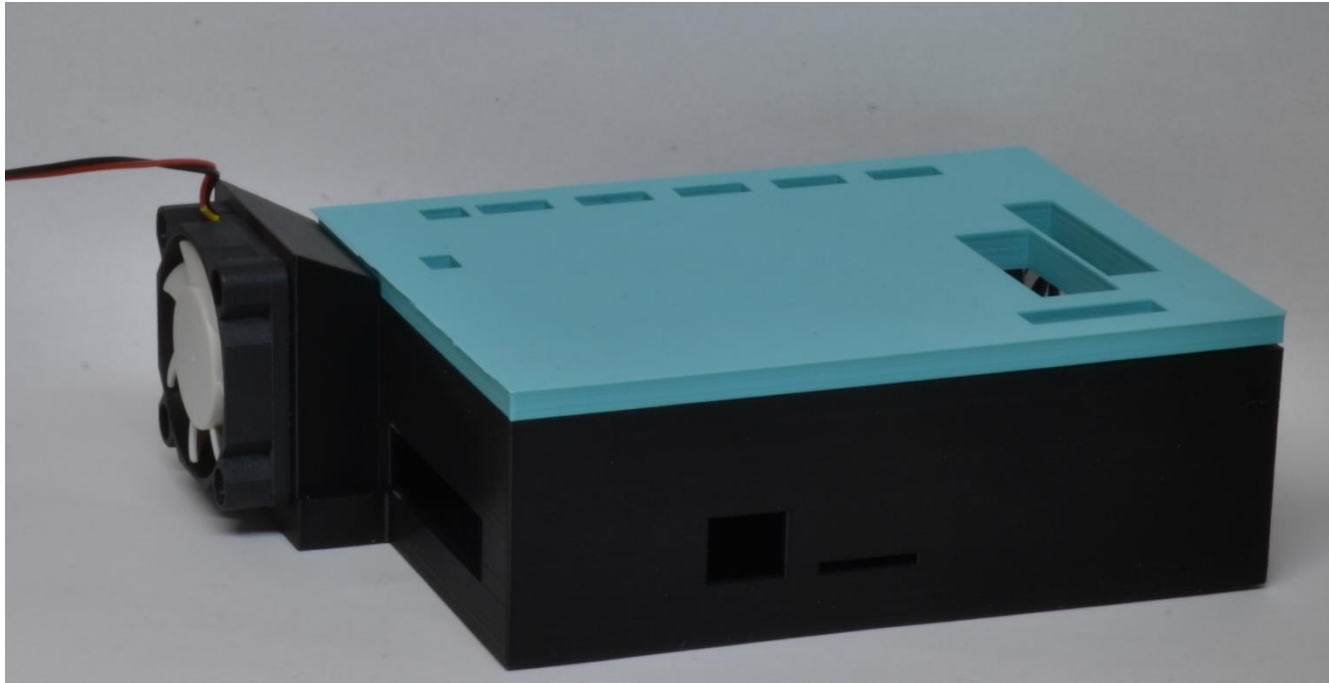
- Most common is plastic filament.
- Materials are usually different polymers and their blends
- For example PLA, ABS and PET(G)

Applications - FDM

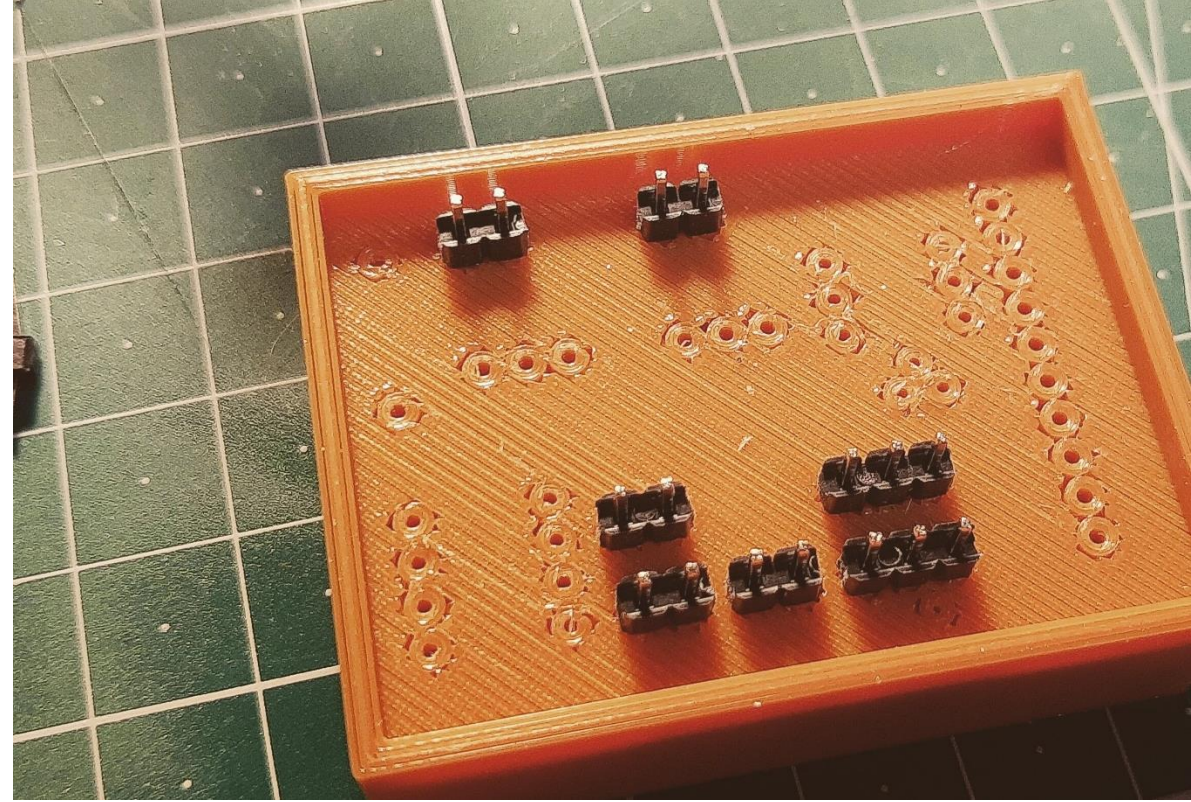
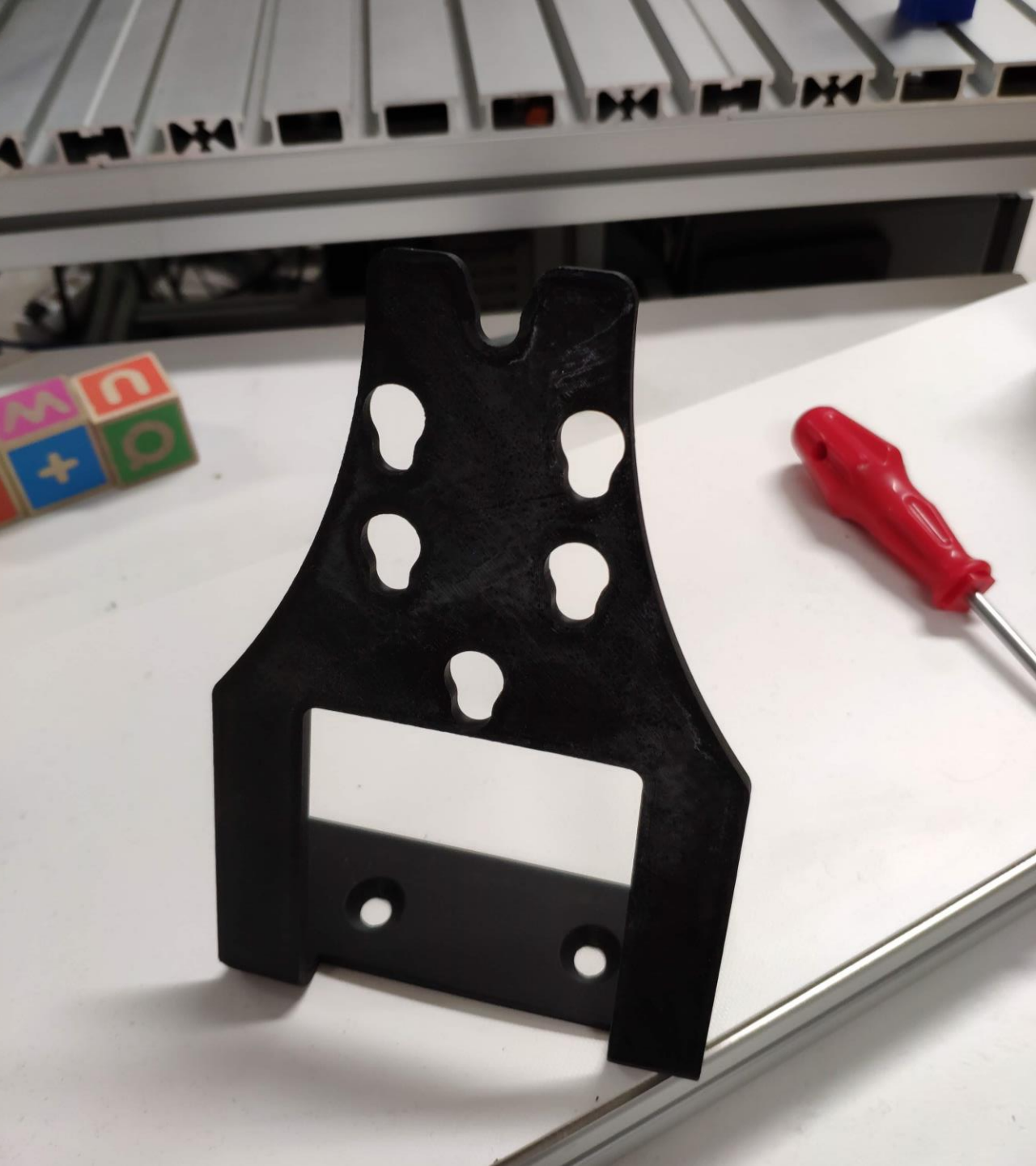
FDM



Molds / Dies



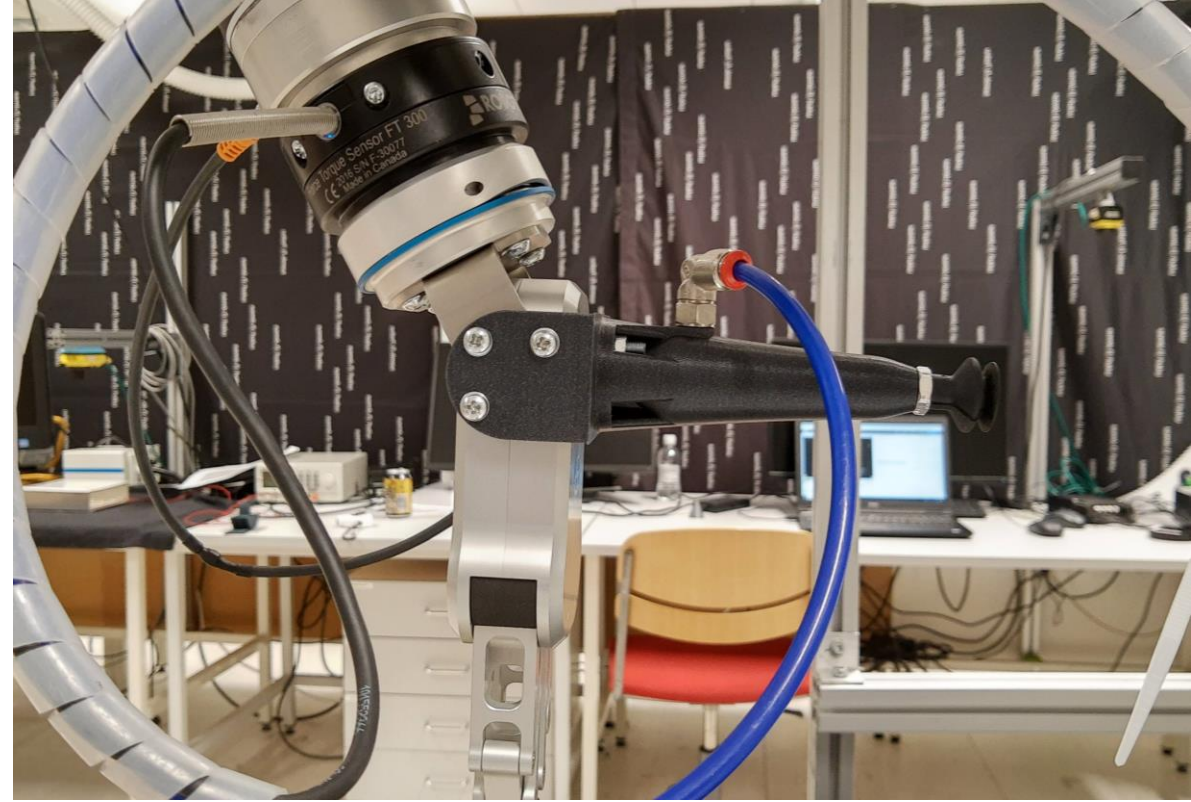
Cases



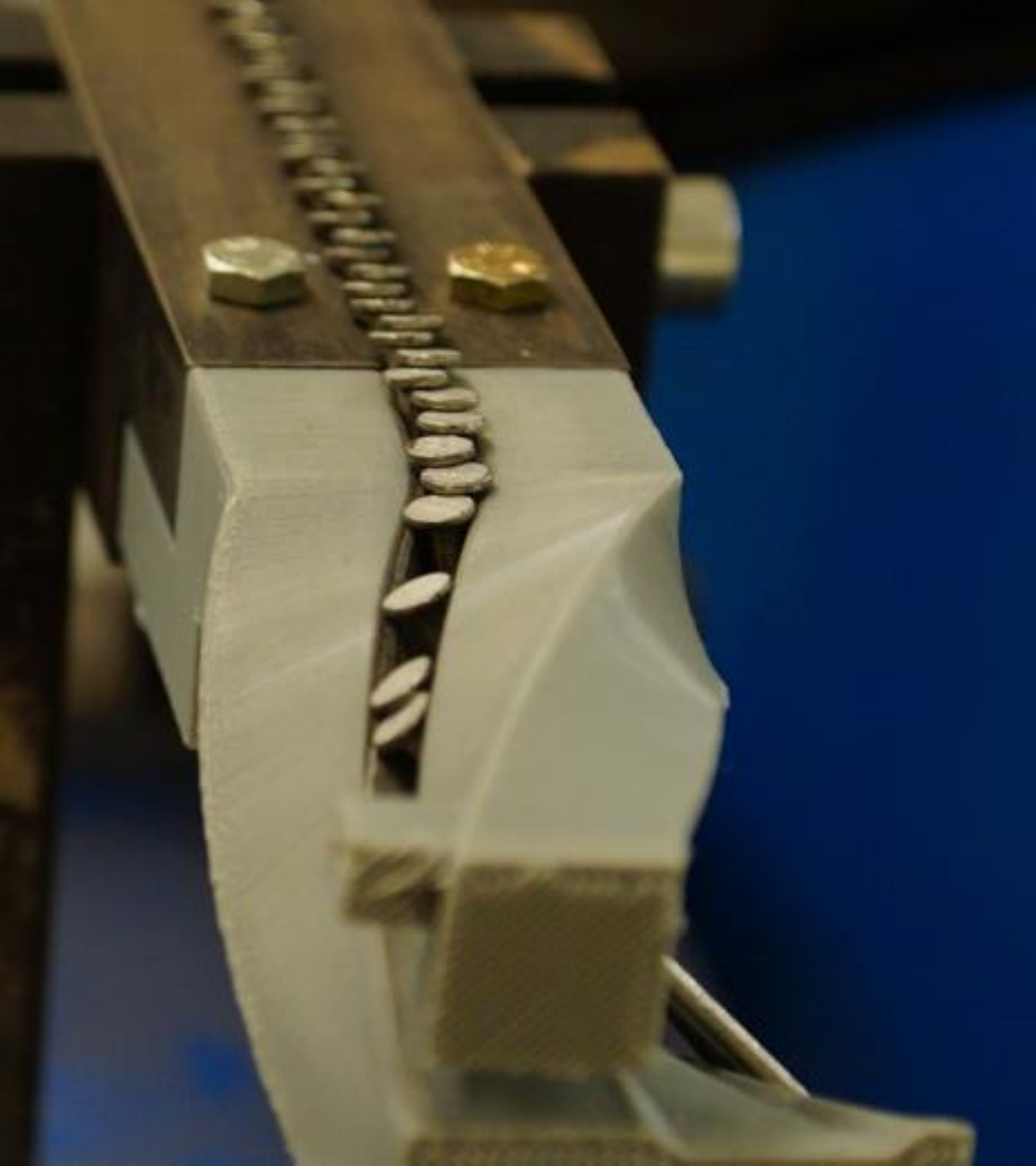
Jigs



Adapters

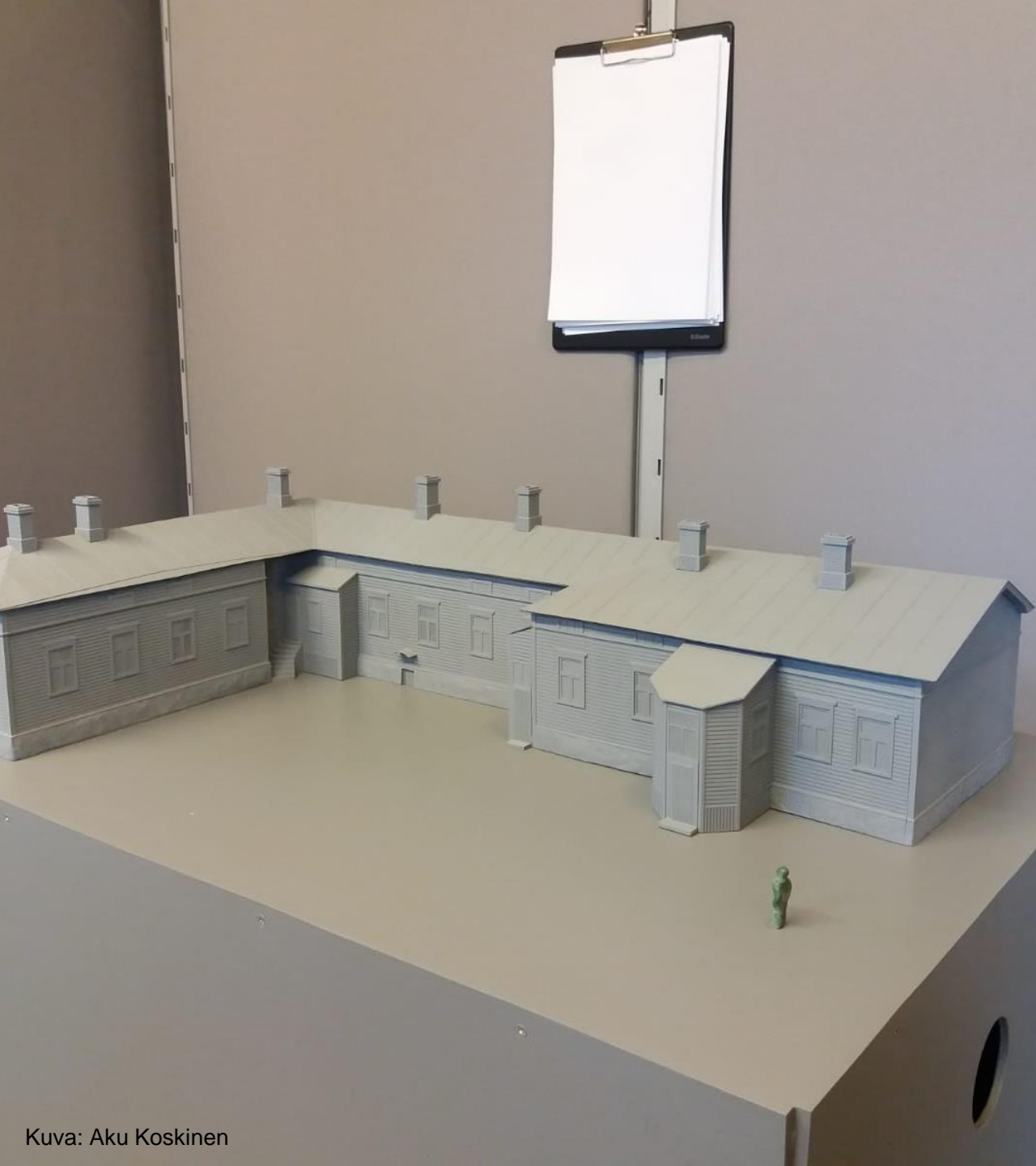


Grippers



Kuva: Leaklook.io

Prototypes



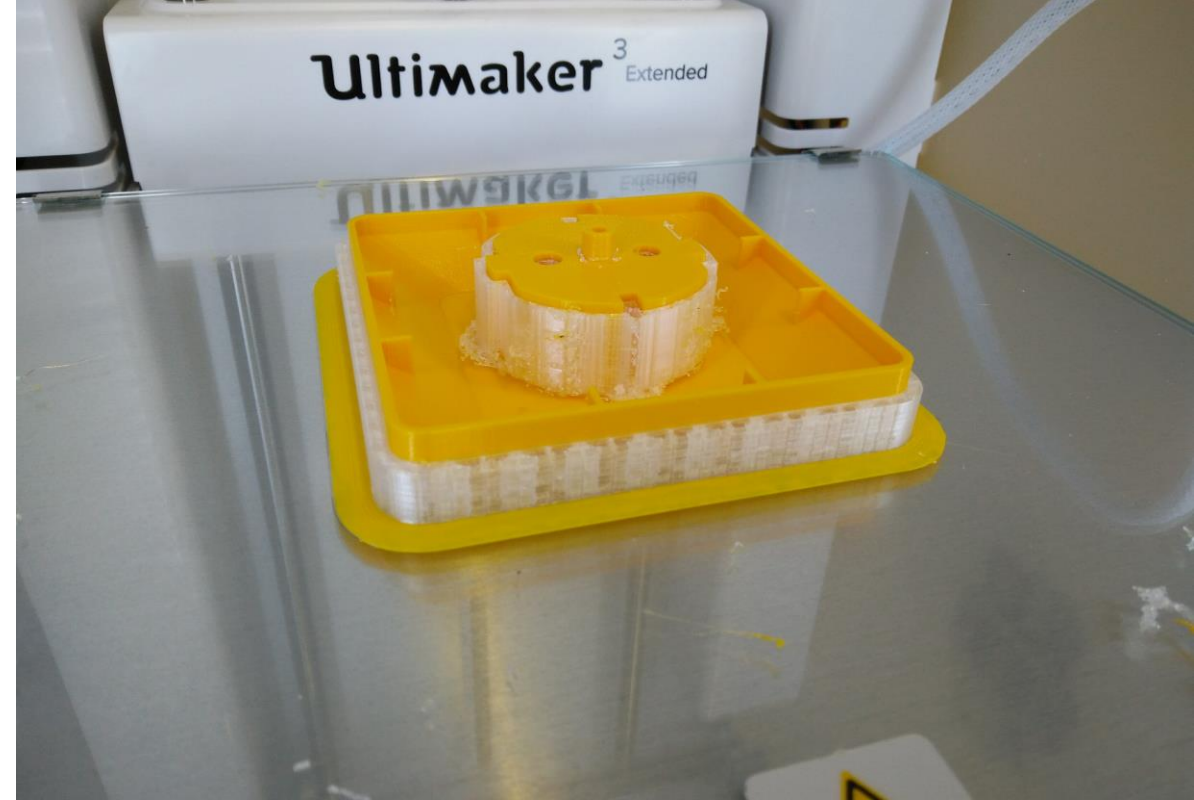
Kuva: Aku Koskinen



Kuva: Aku Koskinen

History / Art

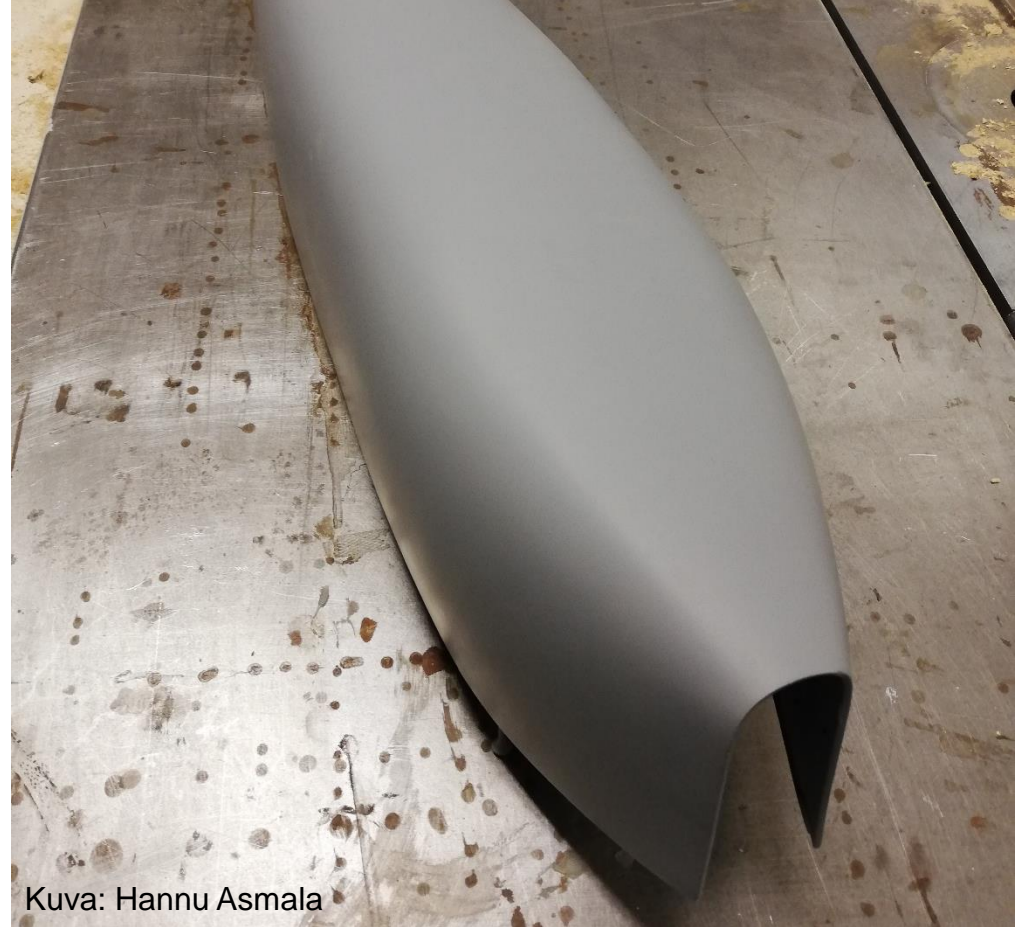
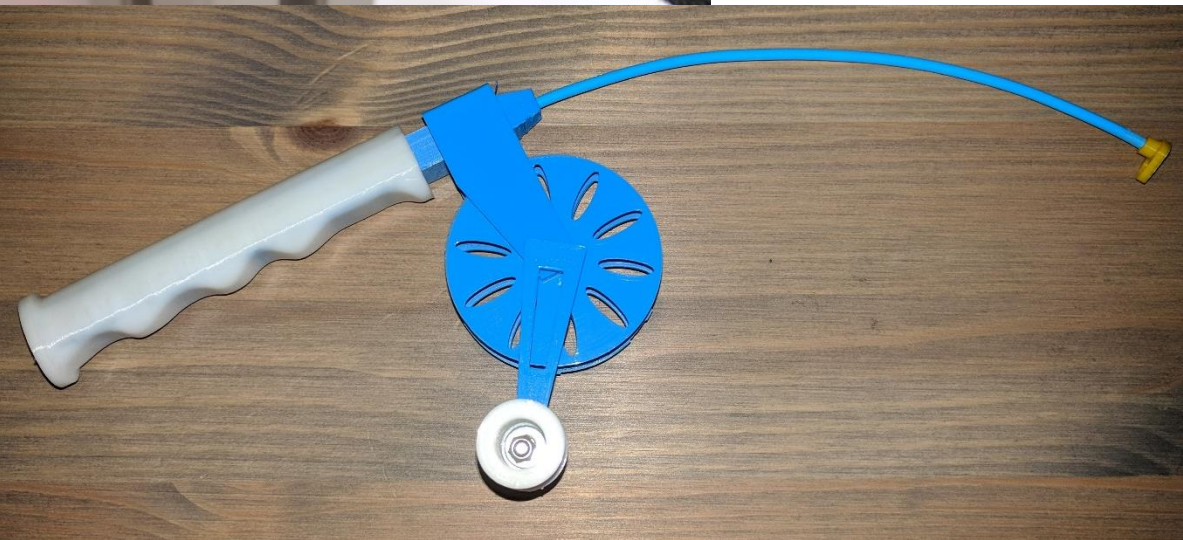
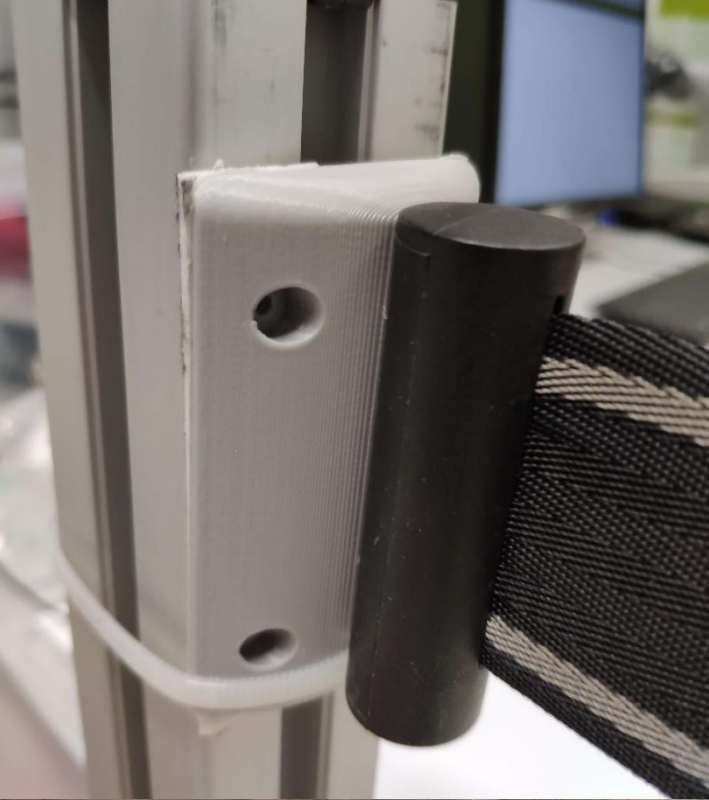




Spare parts

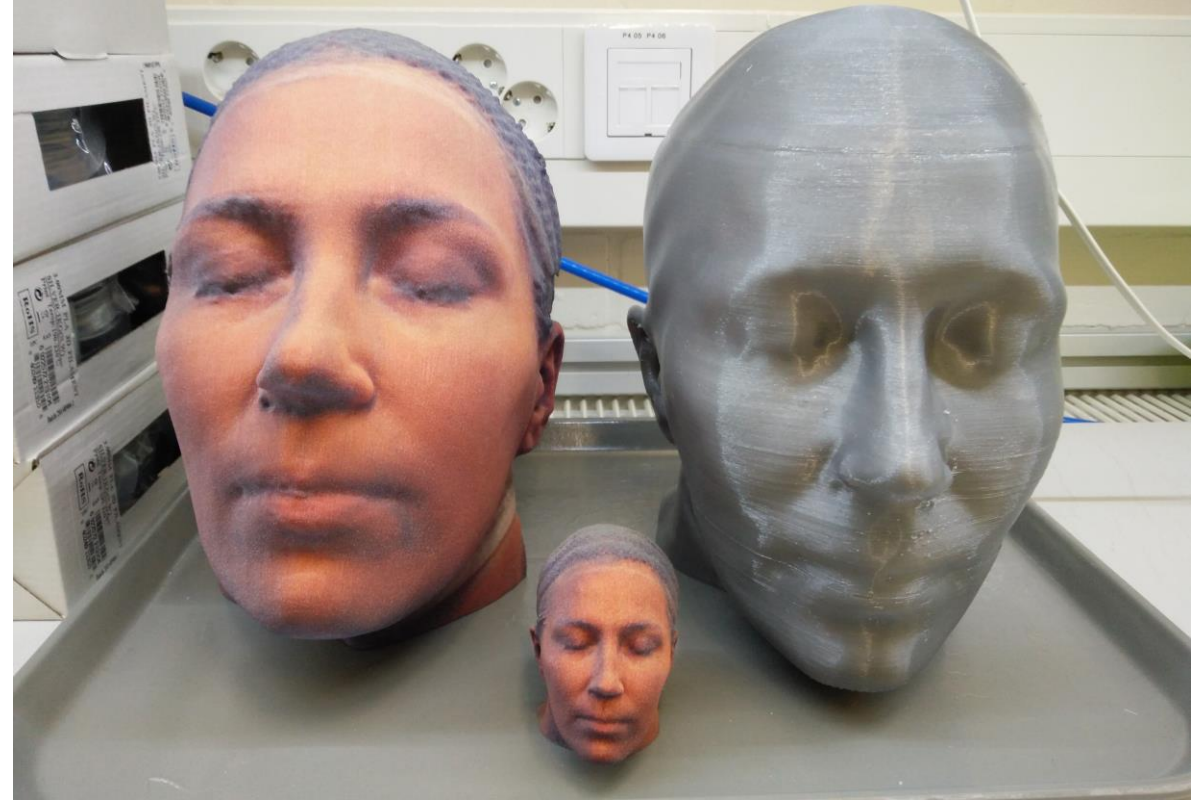


Toys



Kuva: Hannu Asmala

Practical objects



Education / Training

Printers

FDM

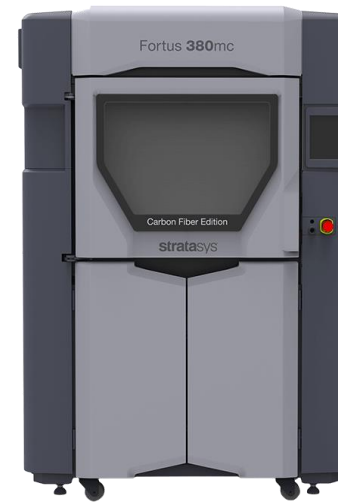
Industrial printers

Minifactory Ultra



- XY-resolution depends on nozzle
- Z-resolution 50-200 μm
- Build volume 330 x 180 x 180 mm
- Price 45k €

Stratasys Fortus 380mc



- XY-resolution 127 μm
- Z-resolution min. 100 μm
- Build volume 355 x 305 x 305 mm
- Price 70k €

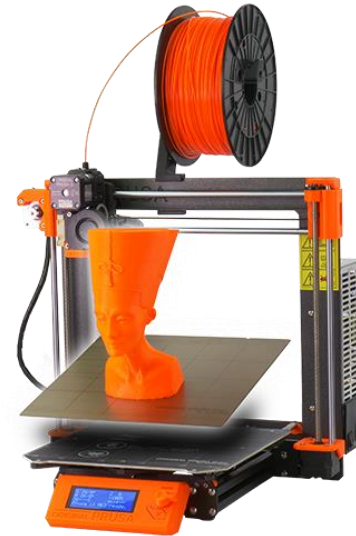
Consumer printers

Creality Ender 3



- XY-resolution 100 μm
- Z-resolution 50 – 200 μm
- Build volume 220 x 220 x 250 mm
- Price 150-250 €

Prusa i3 MK3S+



- XY-resolution 70 μm
- Z-resolution 50 – 300 μm
- Build volume 250 x 210 x 210 mm
- Price 769-1000 €

Pros and Cons

FDM

Pros vs cons

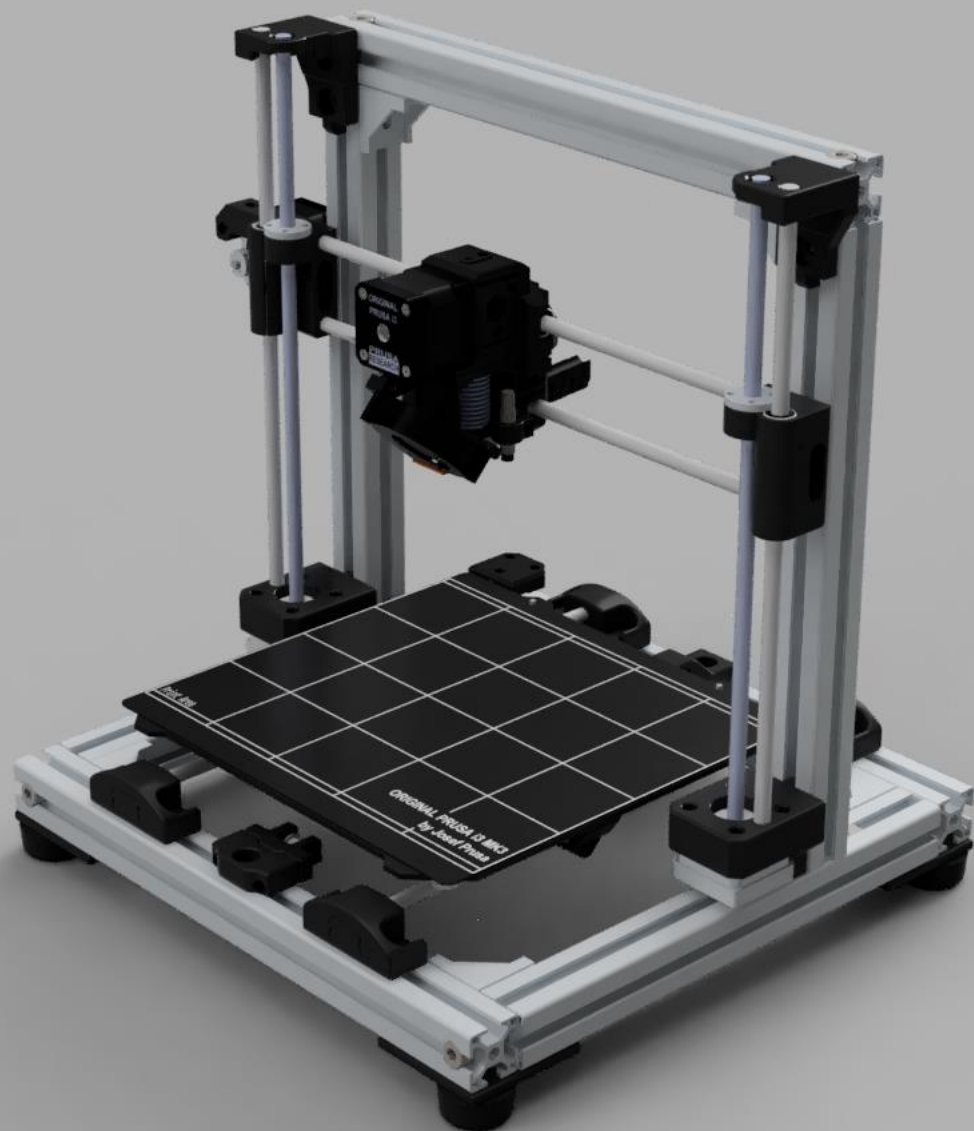
Pros

- Ease of use
-> Very easy to start using, example in schools
- Softwares are simple
- Cheap
- Easily scalable
- Easy change spare parts
- Cheap spare parts

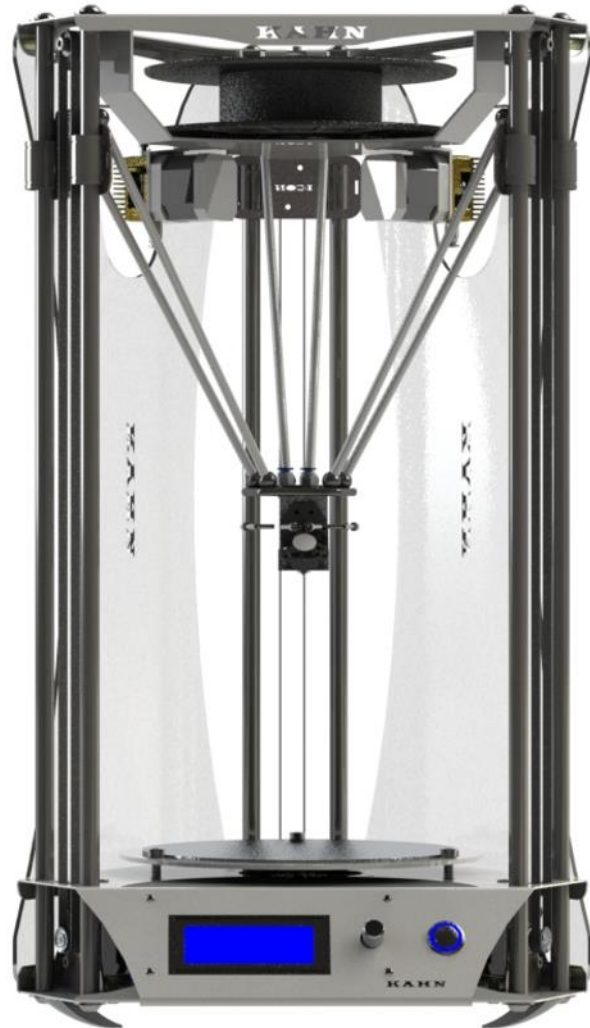
Cons

- Materials might not exceed industry specifications
- Quality and details
- Speed
- Weak(ish) part with default settings

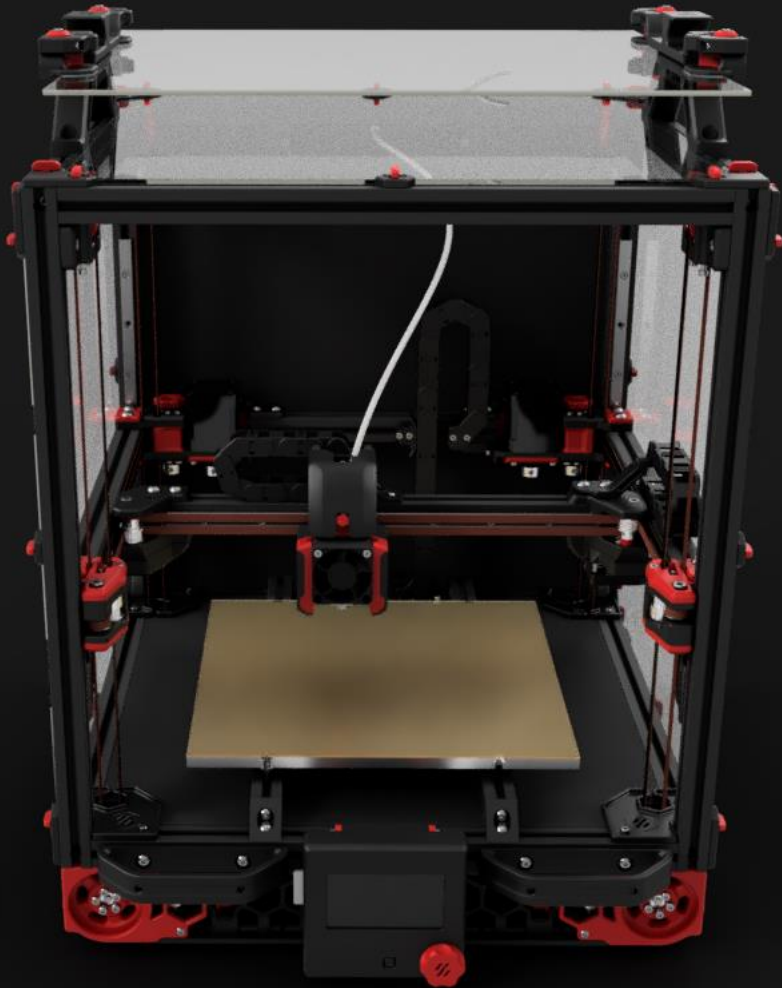
Mechanics / Kinematic types



Cartesian



Delta



CoreXY

3D-Printing - FDM – Mechanics, frame