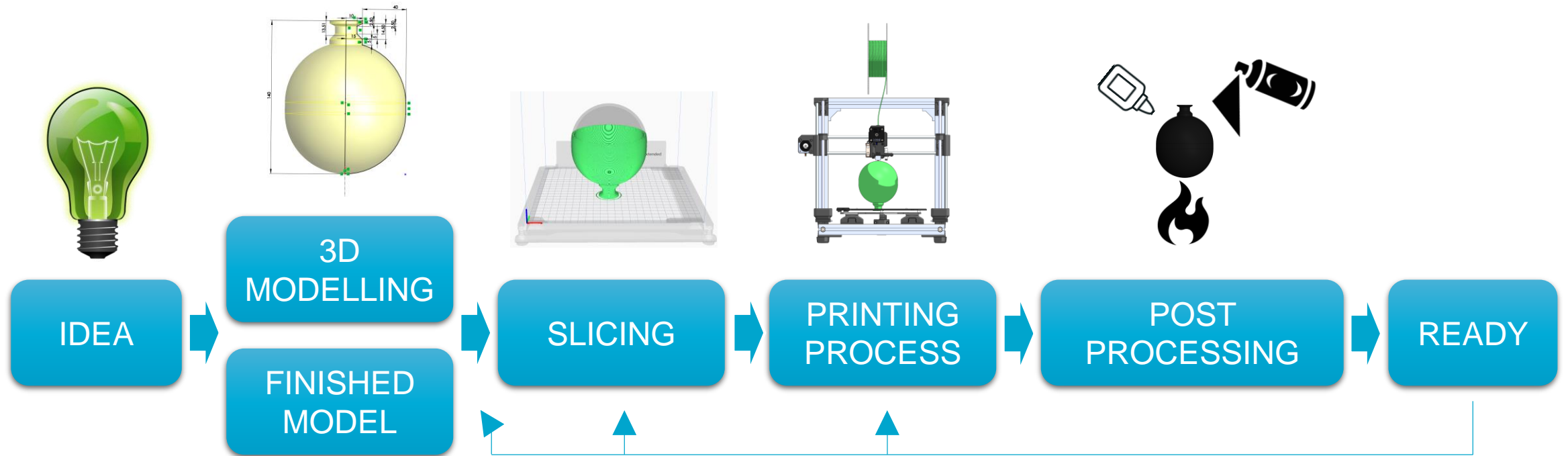




# 3D-Printing process

# Topics



- Need

- 3D printing services
- Model libraries
- Manufacturers
- 3D-Modelling

- How the object is formed?

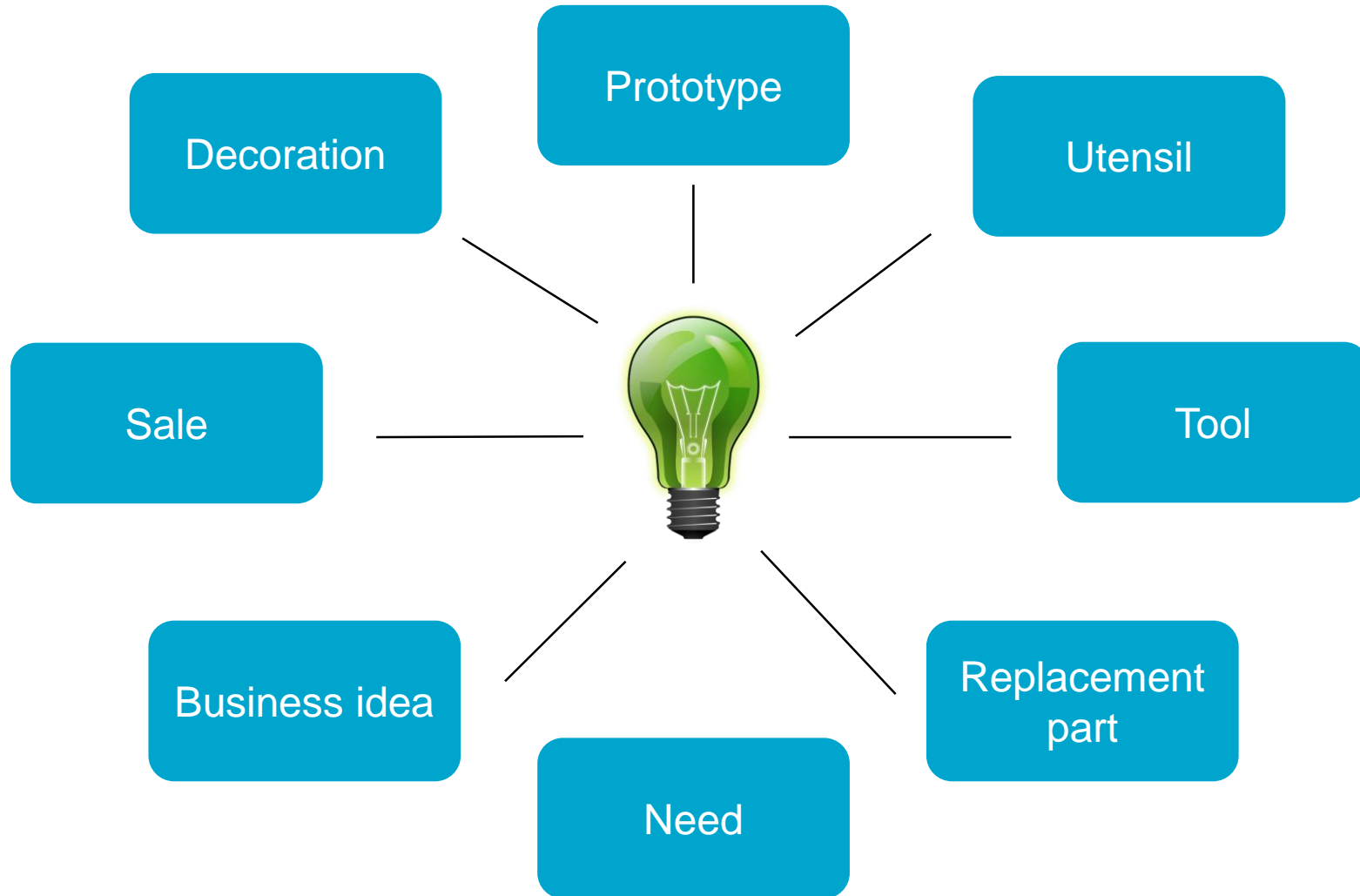
- Preparations
- Settings
- Monitoring
- Cleaning

- If needed

# Idea

# Idea

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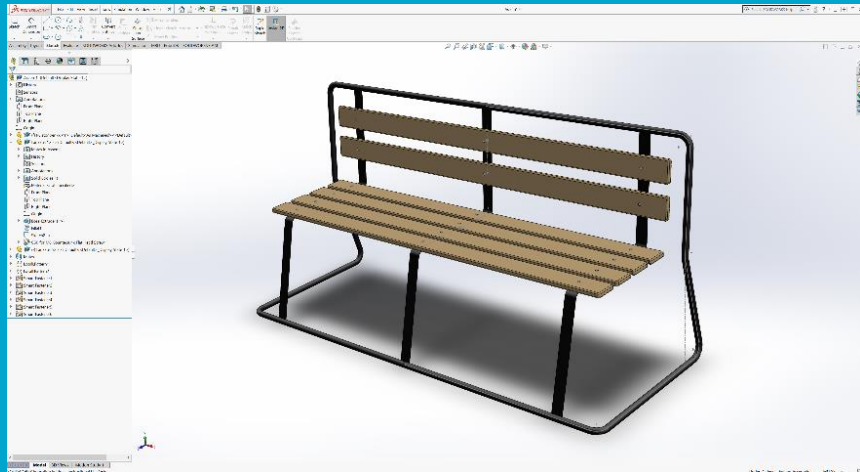
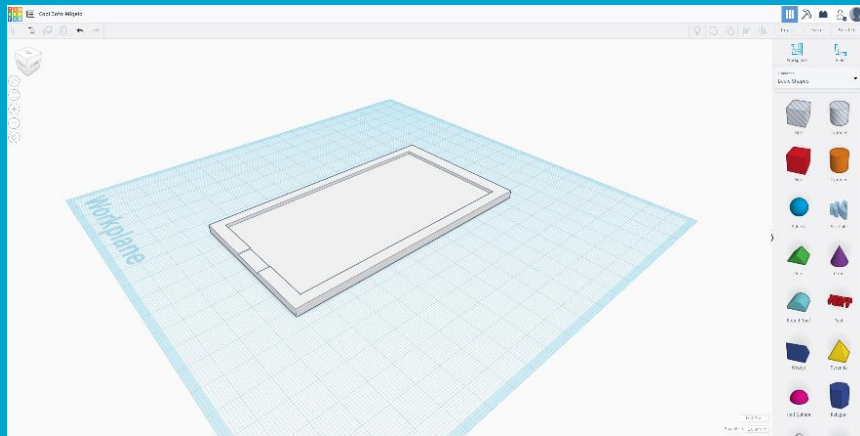
# From idea into a plan

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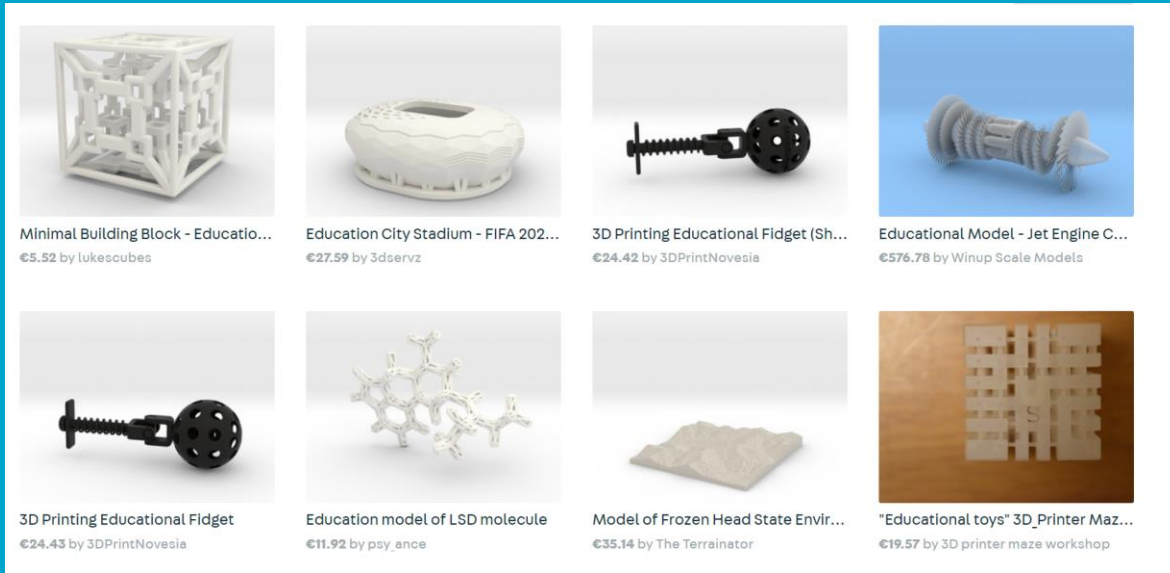
- Requirements for the part
  - Durability
  - Possibility to clean
  - Ecological
- Resources available
  - Equipment
  - Models
  - Softwares
  - Time

# Modelling



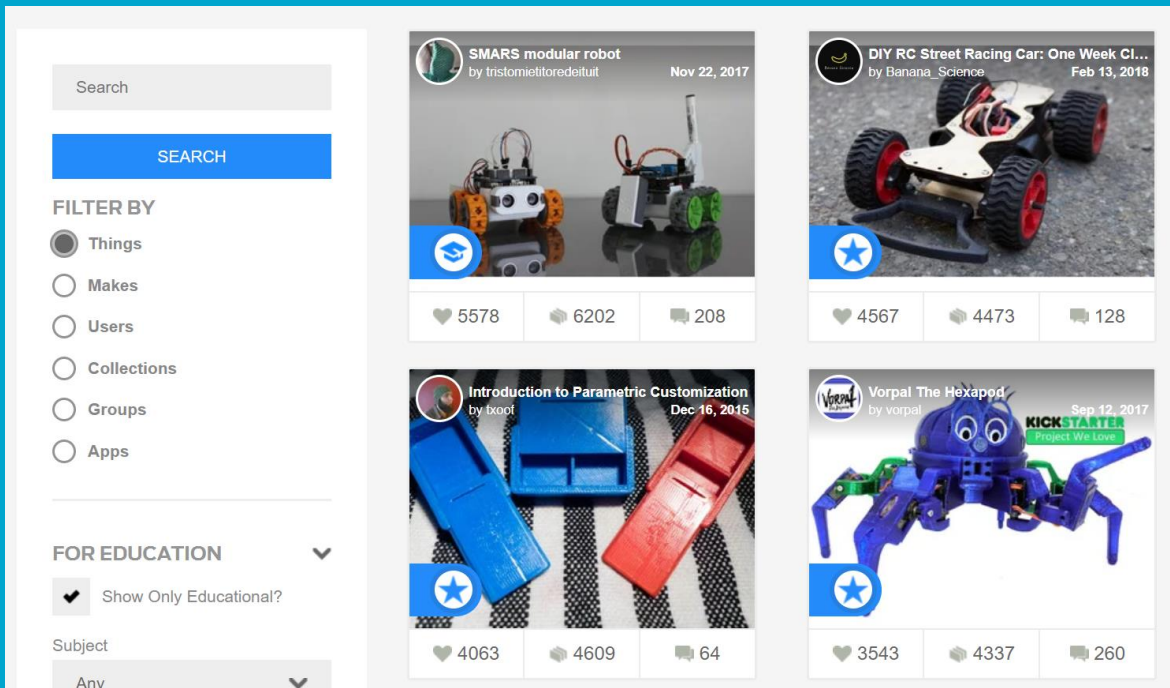
# Modelling with different programs

- TinkerCad
- SketchUp
- Fusion 360
- Siemens NX
- Solidworks
- Blender
- OpenSCAD
- Rhinoceros
- ...



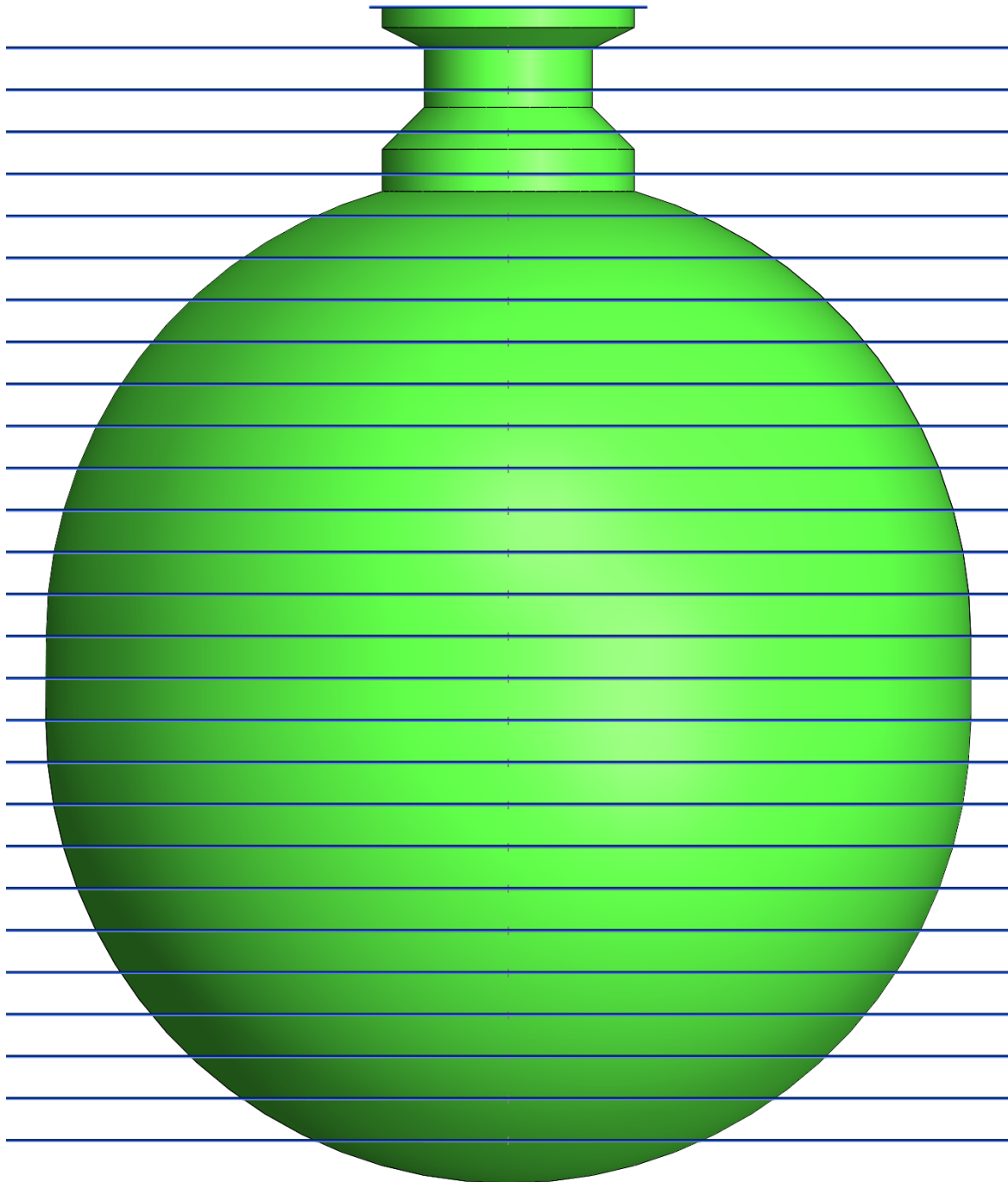
# Ready to print models

- Grabcad
- thingiverse
- shapeways
- Craftcloud
- Myminifactory
- Cults3d
- ...





# Slicing



# Slicing (FDM)

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- “Driving instructions” to the 3D printer on how to create the physical object
- PrusaSlicer, Preform, Cura, Simplify3D, 3DSlicer, Slic3r...

**Quality** ⌵

Layer Height 🔗 0.2 mm

**Shell** ⌵

Wall Thickness 1.3 mm

Wall Line Count 3

Top/Bottom Thickness 1.2 mm

Top Thickness 1.2 mm

Top Layers 6

Bottom Thickness 1.2 mm

Bottom Layers 6

Horizontal Expansion 0 mm

**Infill** ⌵

Infill Density 20 %

Infill Pattern Triangles ⌵

**Material** 📄 ⌵

Printing Temperature 255 °C

Build Plate Temperature 🔗 60 °C

Enable Retraction

**Speed** ⌵

Print Speed 70 mm/s

**Travel** ⌵

Z Hop When Retracted

**Cooling** ⌵

Enable Print Cooling

Fan Speed 40 %

**Support** ⌵

Generate Support 🔗

**Build Plate Adhesion** ⌵

Enable Prime Blob

Build Plate Adhesion Type 🔗 ↺ Skirt ⌵

Settings

Information

**DETAILS** ⌵

🕒 Print Time 5 h 18 min

📄 Layers 370

💧 Volume 64.09 mL

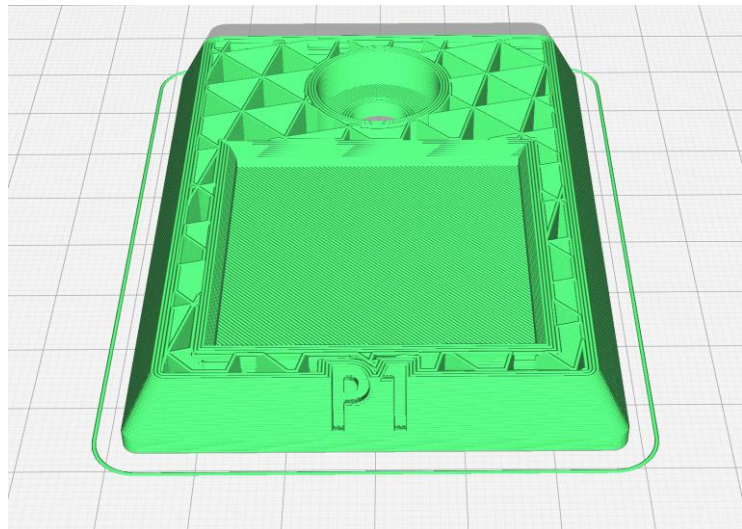
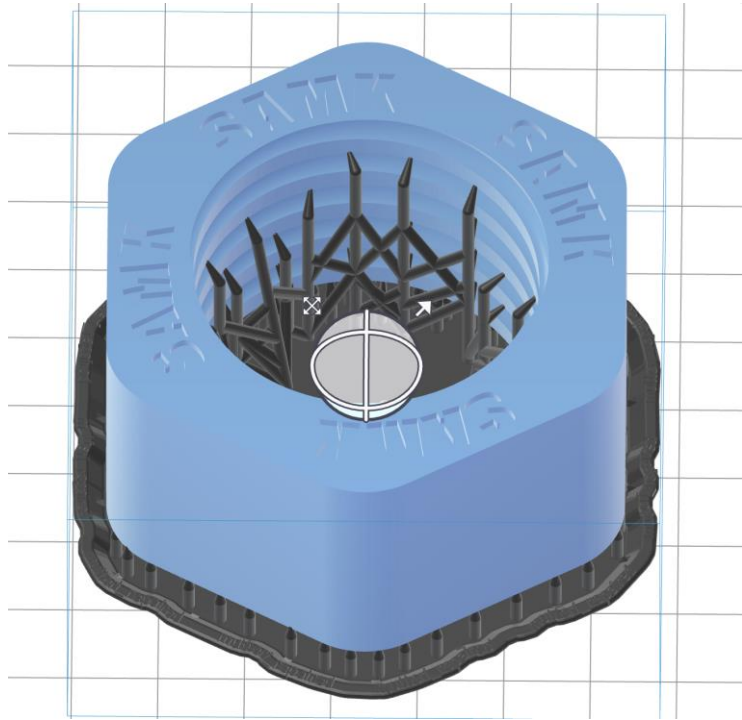
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**PRINTABILITY** ⌵

👍 Printability Pass

# Slicing

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# Slicing

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- Quantity
- Speed
- Material
- Support
- Orientation
- Infill
- Wall thickness

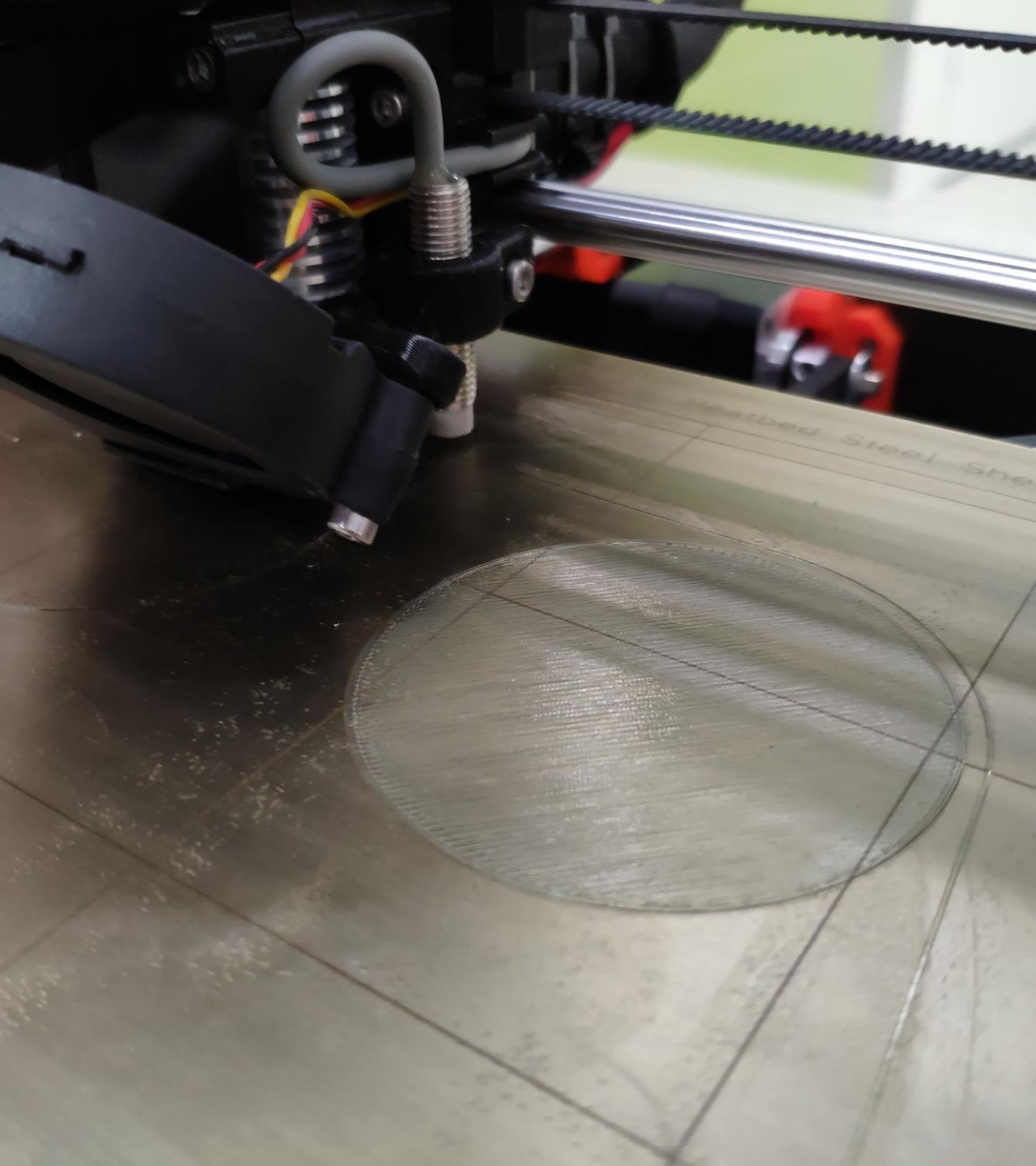
# Printing



# Preparations

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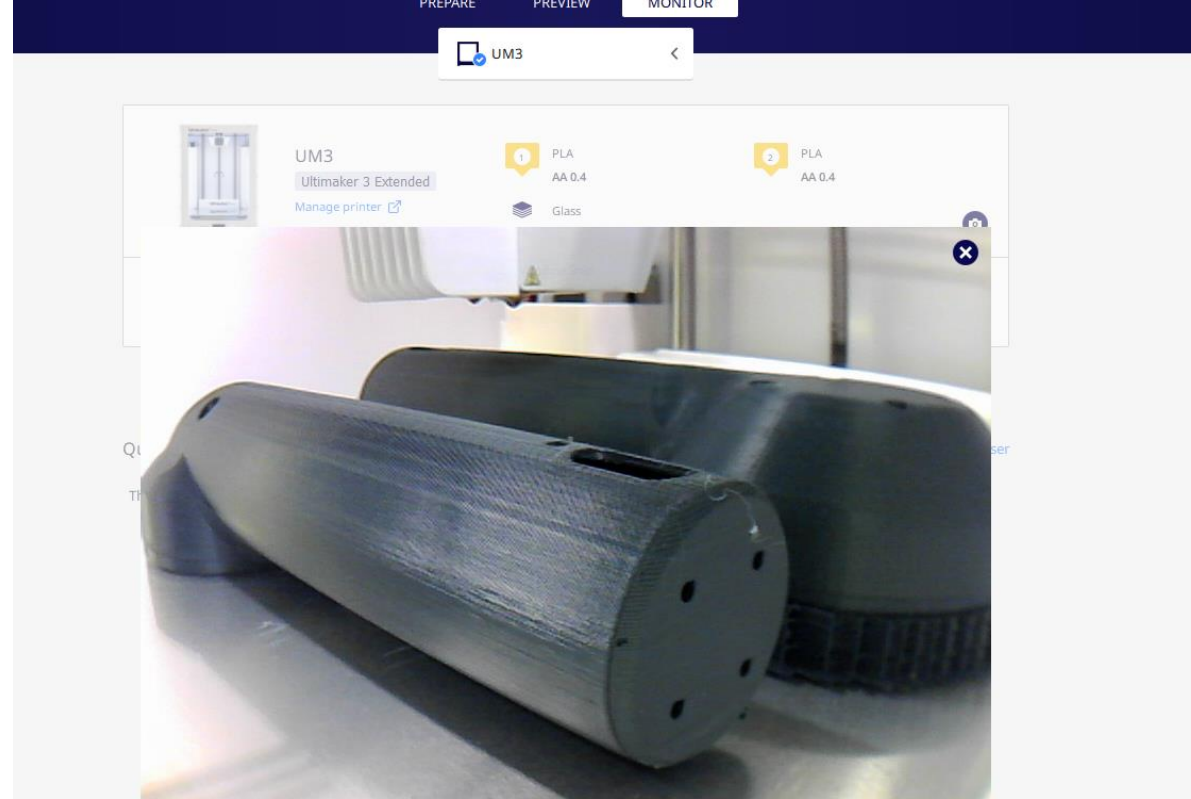
- Cleaning
- Inserting material
- Heating chamber
- Bed leveling
- Cleaning the powder
- Moving the file to the printer



# First layer / Start

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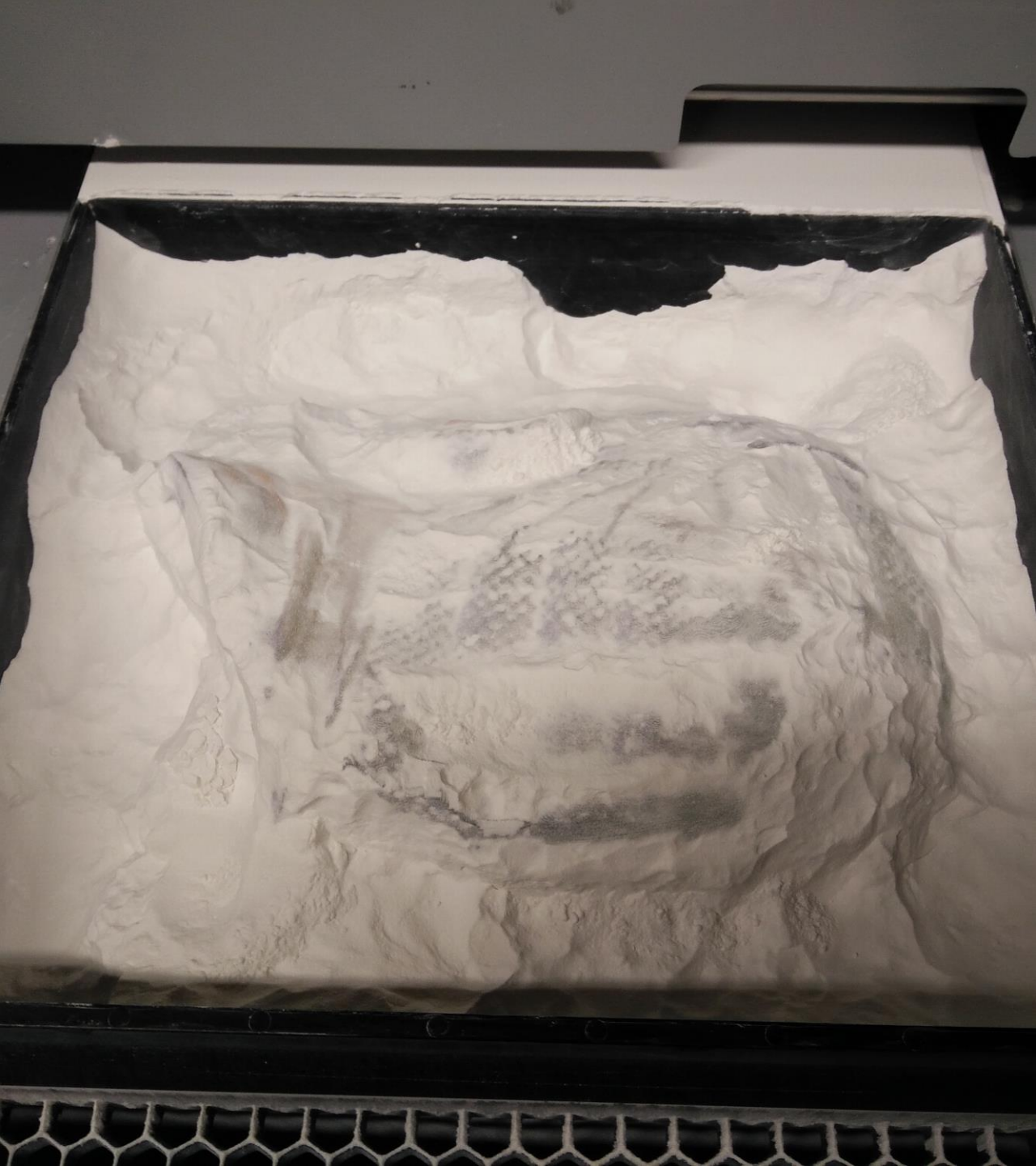
- How the printer behaves
- Successful first layer
- Adhesion
- Material clogging
- Settings



# Monitoring

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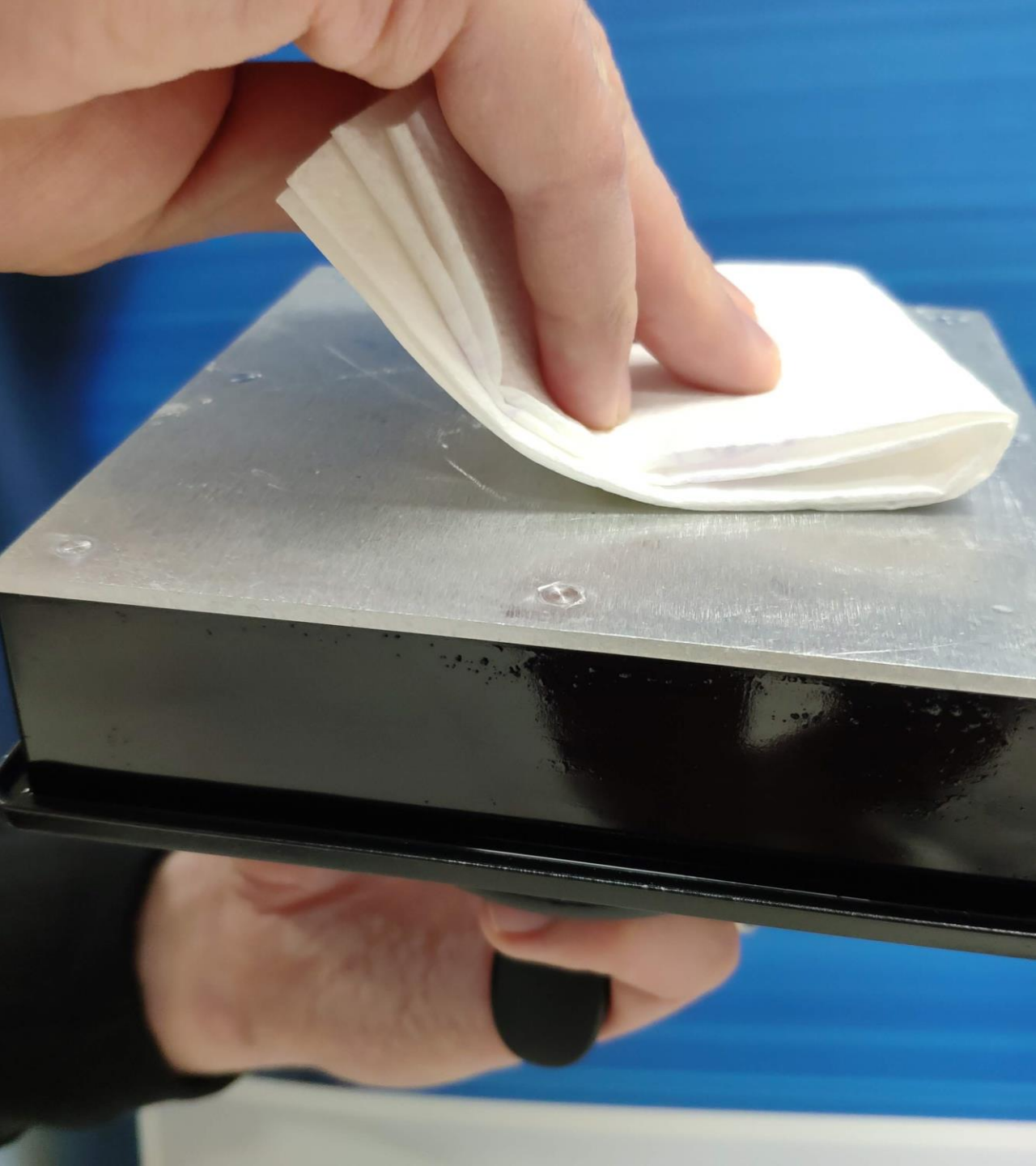




# Print finish

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- Cooling down bed and nozzle
- Cooling printing chamber
- Removing excess powder
- Removing material and storing it
- Cleaning



## Cleaning

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# Checking the finished object

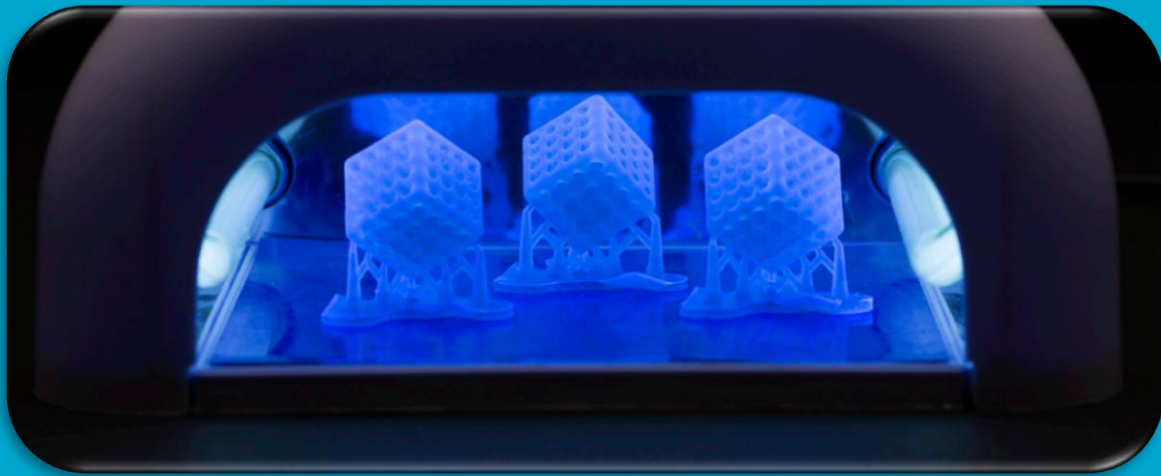
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- Successful?
- Measurements?
- Transformations?

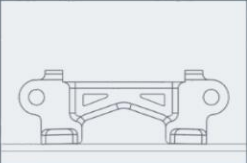



# Post processing



[https://www.flickrriver.com/photos/creative\\_tools/sets/72157625807924478/](https://www.flickrriver.com/photos/creative_tools/sets/72157625807924478/)



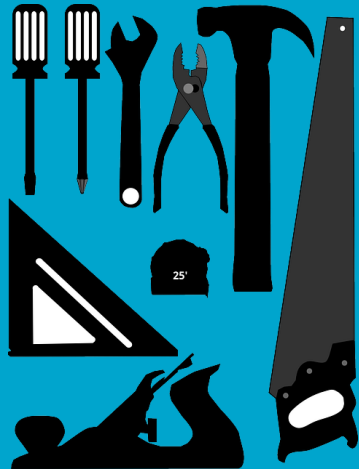
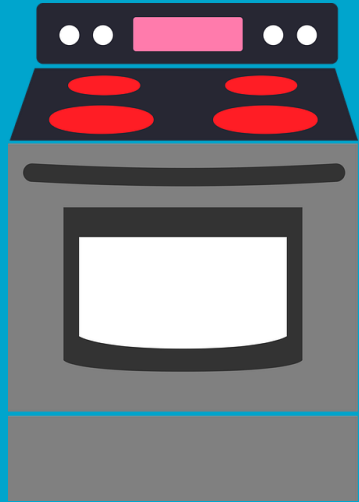
<https://formlabs.com/eu/blog/how-to-post-cure-3d-prints>

Prep	Print	Debind	Sinter
			
Secure, web-based software constructs build plans from STL or CAD files, automatically generating supports and control parameters based on part geometry and material.	Layer by layer, a green part is shaped by extruding bound metal rods—metal powder held together by wax and polymer binders—in a process called Bound Metal Deposition™.	The green part is immersed in proprietary debind fluid, dissolving primary binder and creating an open-pore channel structure throughout the part in preparation for sintering.	As the part is heated to temperatures near melting, remaining binder is removed and metal particles fuse together causing the part to densify up to 96-99.8%.

<https://www.desktopmetal.com/products/studio>

# Post-processing

- Post-processing which has to be done
  - Removing excess material
  - Heating / sintering
  - Drying
  - UV

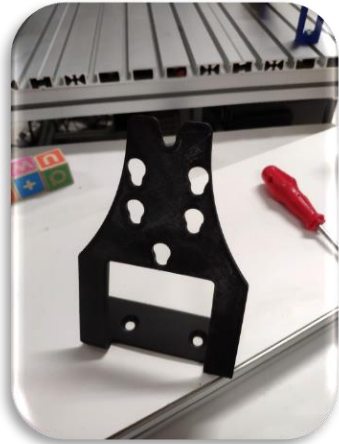
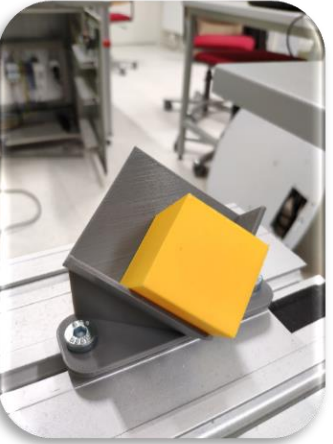


# Post-processing

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- Coating or any other means of post-processing
  - Coating
  - Treating features (Heat)
  - Mechanical treatment
  - Chemicals

# Usage and iterations

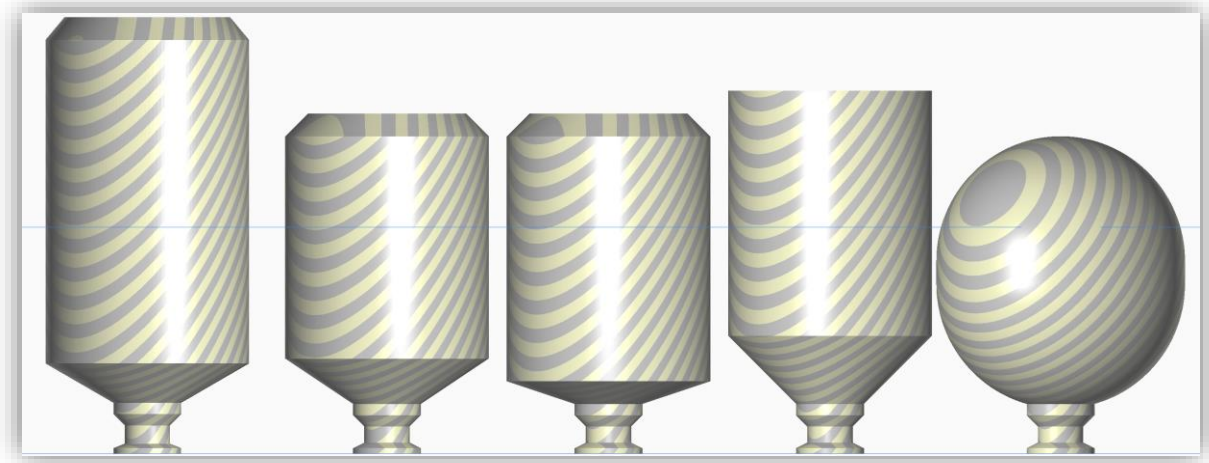


# Suitability

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- Measurements
- Functionality
- Durability
- Feedback
- Suggestions





## Iterations

- Changing sizes
- Improving functionality
- Adjusting tolerances
- Uniqueness