Introduction to 3D Printing

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Technology at Hand

Fused filament fabrication (FFF)

or

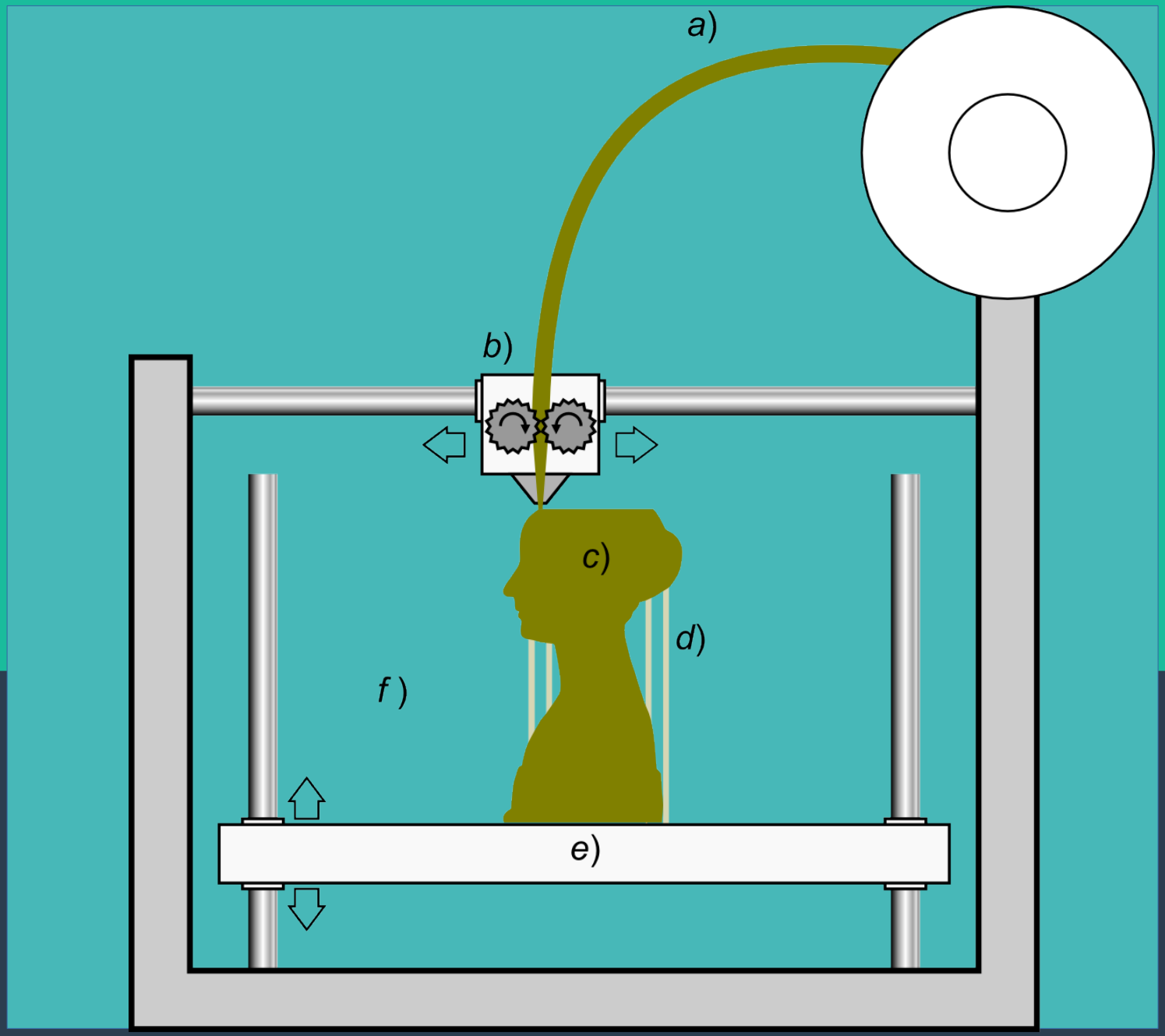
Fused deposition modeling (FDM)

=

Volume integration in horizontal slices with melted plastic

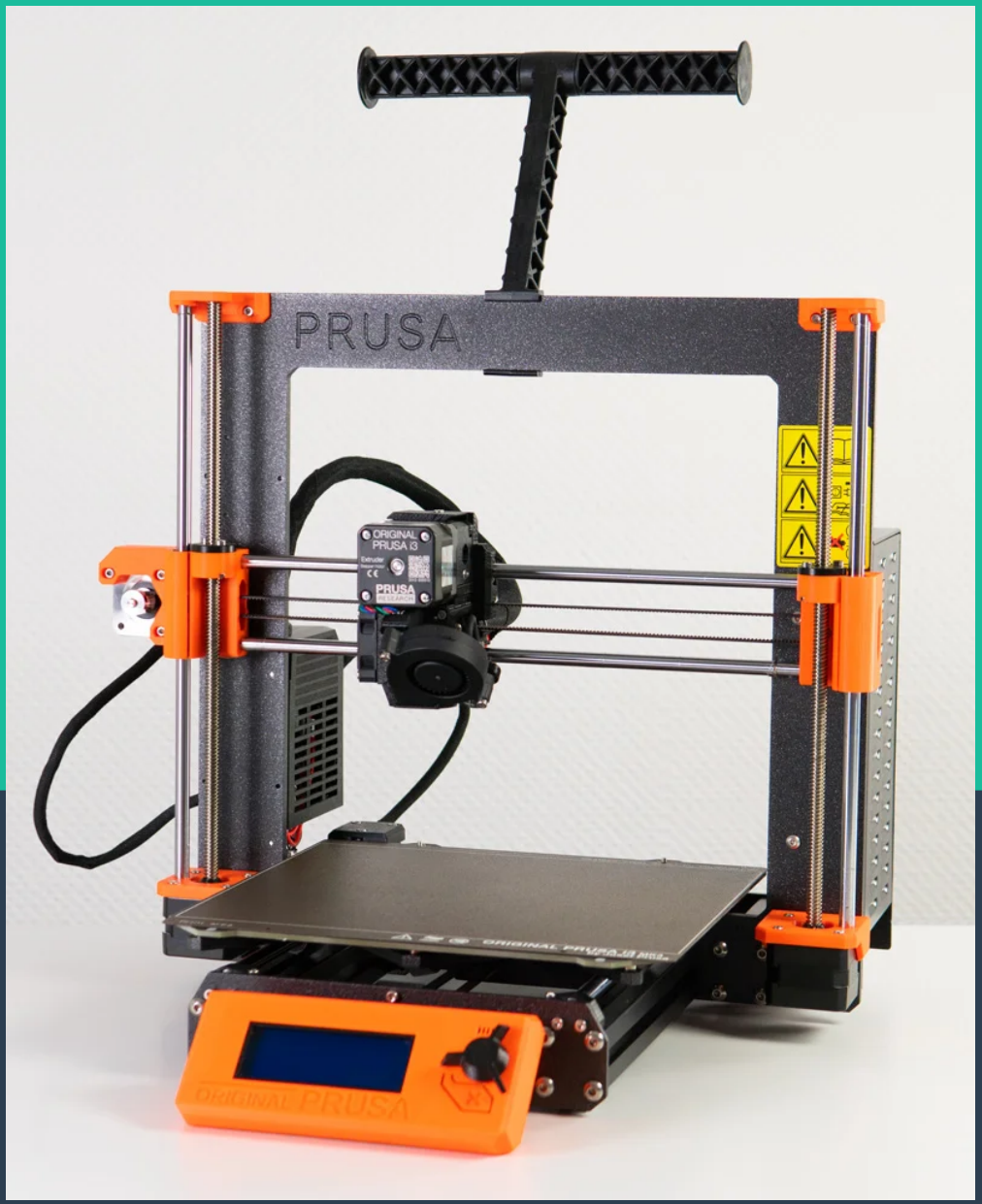
More small print. Is it important?

Technology at Hand



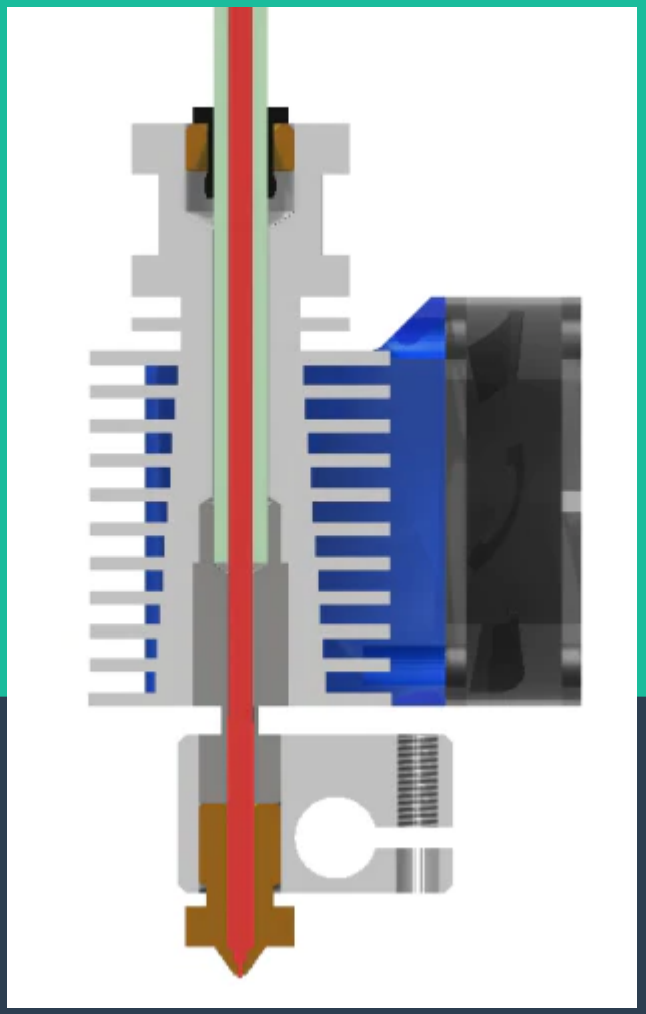
https://en.wikipedia.org/wiki/3D_printing_processes#Material_extrusion

The Prusa i3 MK3 / MK3S+



https://i.all3dp.com/wp-content/uploads/2020/11/18100847/original-prusa-i3-mk3s-1.jpg

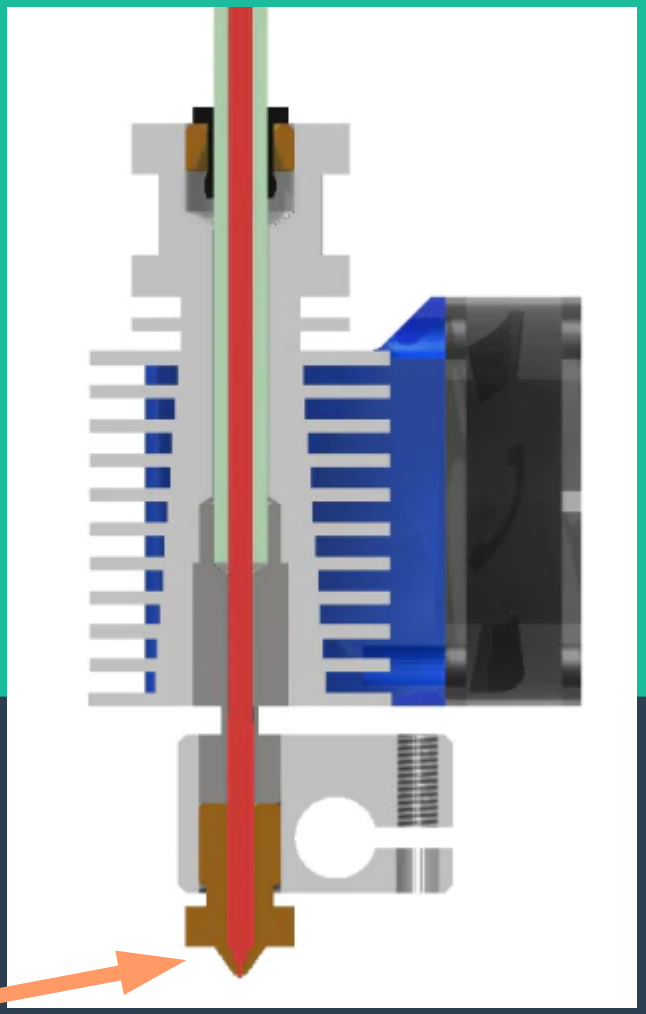
The Hotend



https://www.filastruder.com/products/all-metal-e3d-v6-hotend?variant=39254019309639

The Hotend

Nozzle



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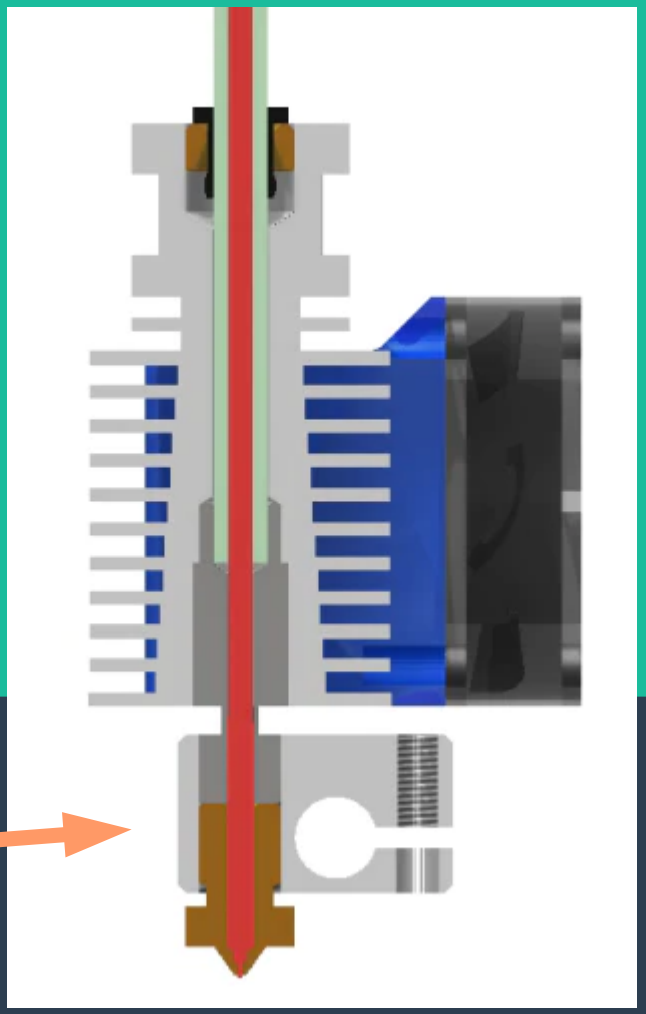
The Hotend

Heater Block



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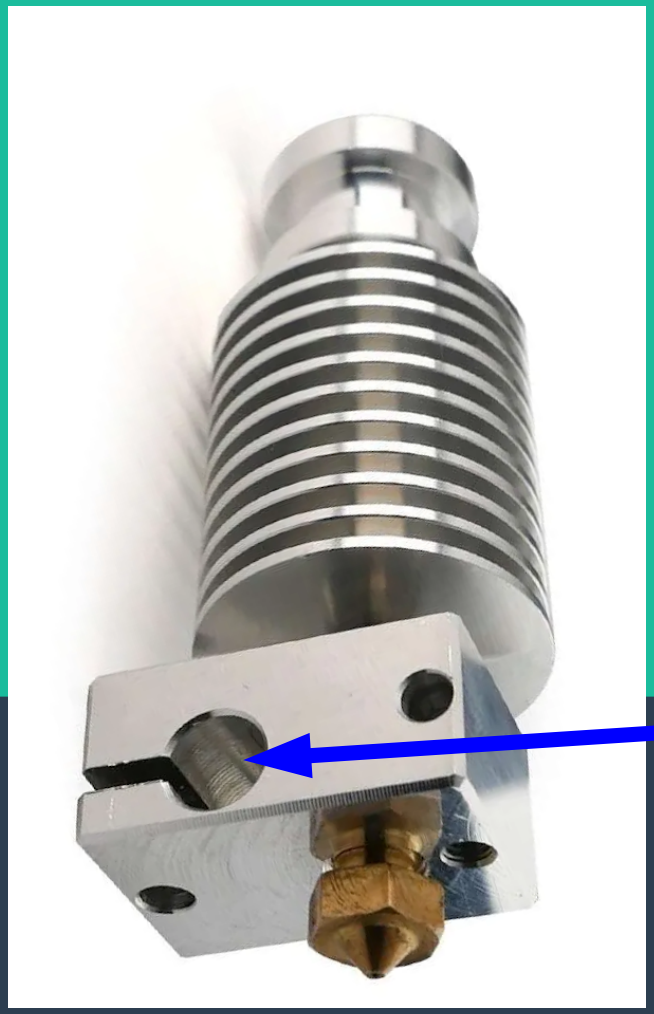
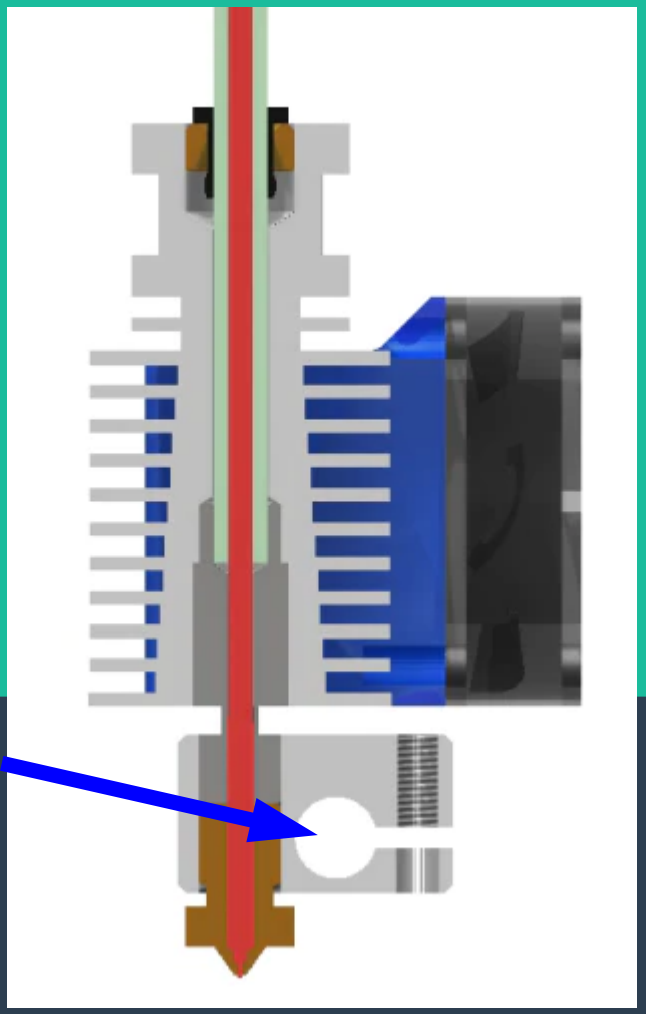
The Hotend



Heater Cartridge



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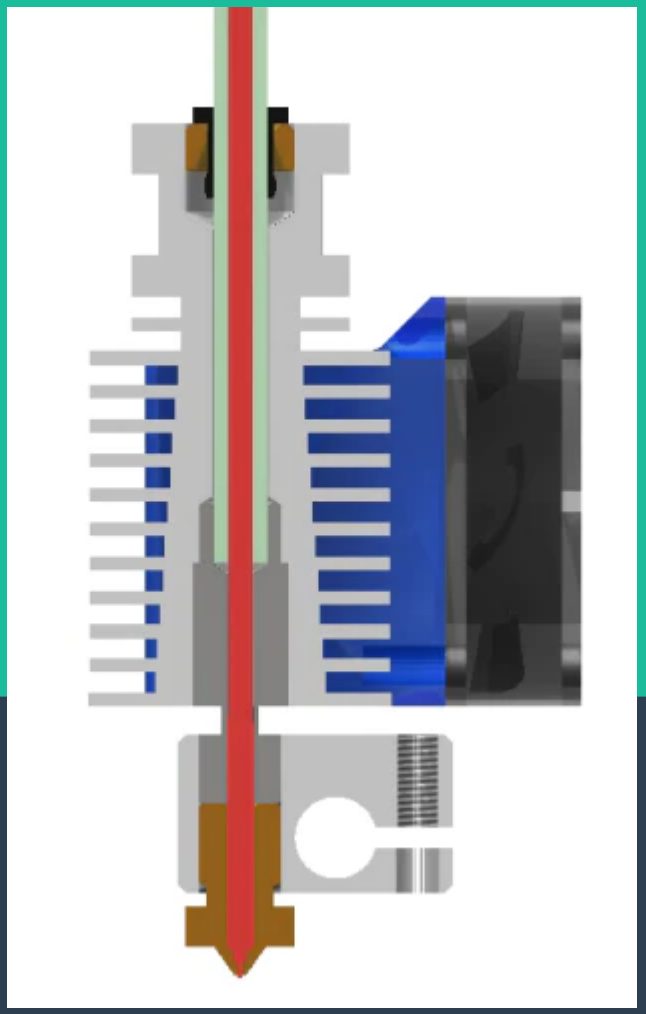

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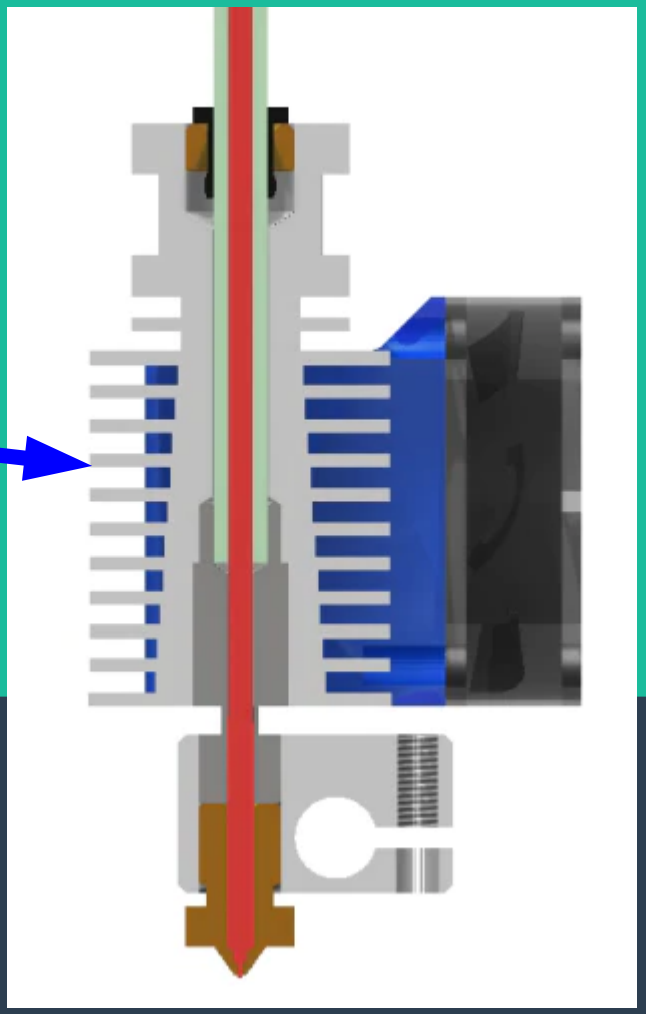
The Hotend

Heatsink



https://www.filastruder.com/products/all-metal-e3d-v6-hotend?variant=39254019309639

The Workflow

- Create / acquire 3D model
- Export in sliceable file format:

  .STL, .OBJ, .3MF, .STEP, etc.
- Slice
- Print

We're focusing on slicing next.

Slicing

Prusa Slicer 2.5.2

Prusa Slicer 2.5.2: Let's try it out with tetrahedron.stl

Slicing

Prusa Slicer 2.5.2

test_support_structure.stl courtesy of fabiorinaldus at https://www.thingiverse.com/thing:278924

Print Failures

- Part Detachment
  - > Spaghetti monster

It's a drag, but it's not as bad as ...

Print Failures

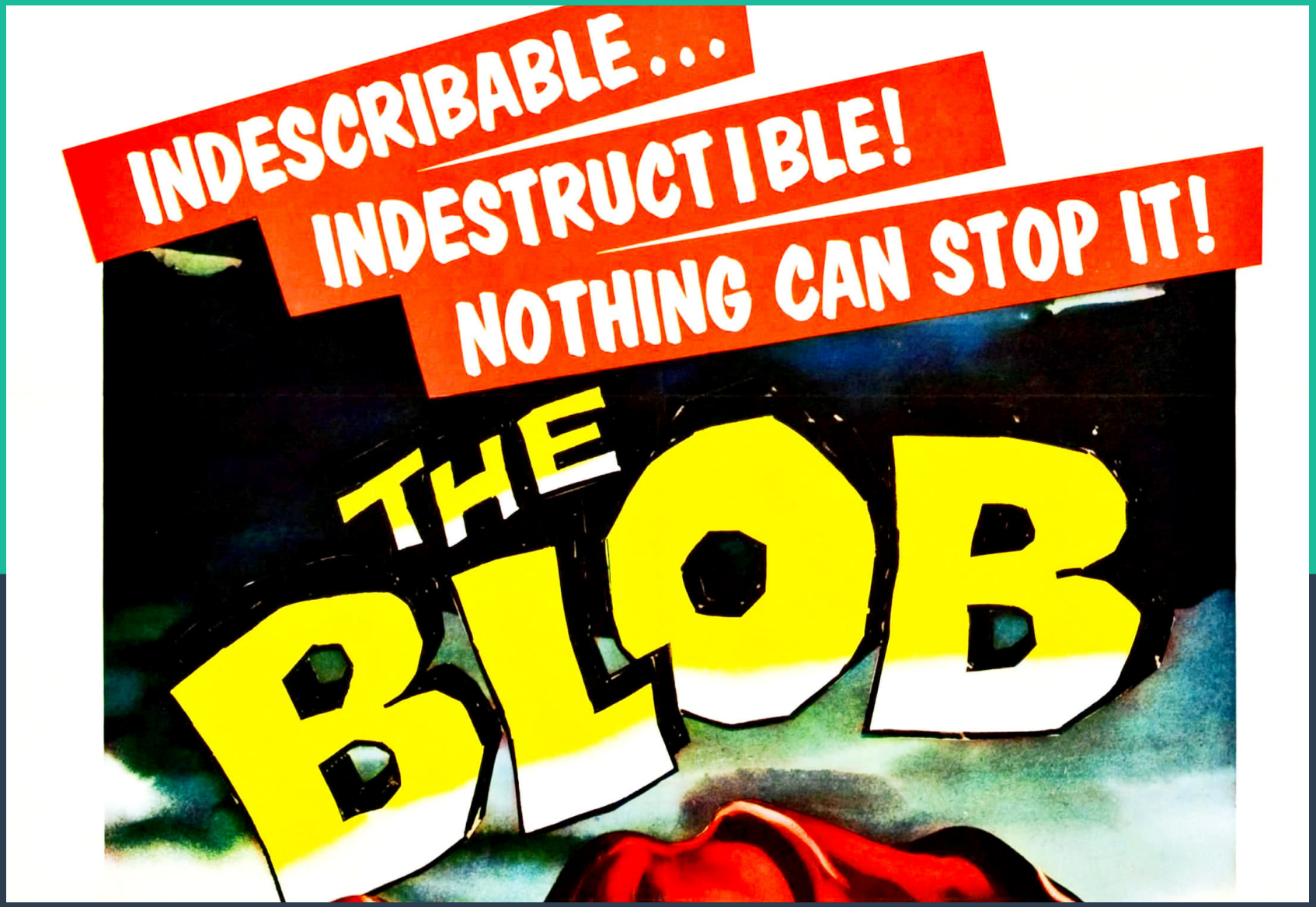
- Part Detachment
  - > Spaghetti monster
- The BLOB

THE BLOB!!!

Print Failures

THE BLOB!!!

Print Failures

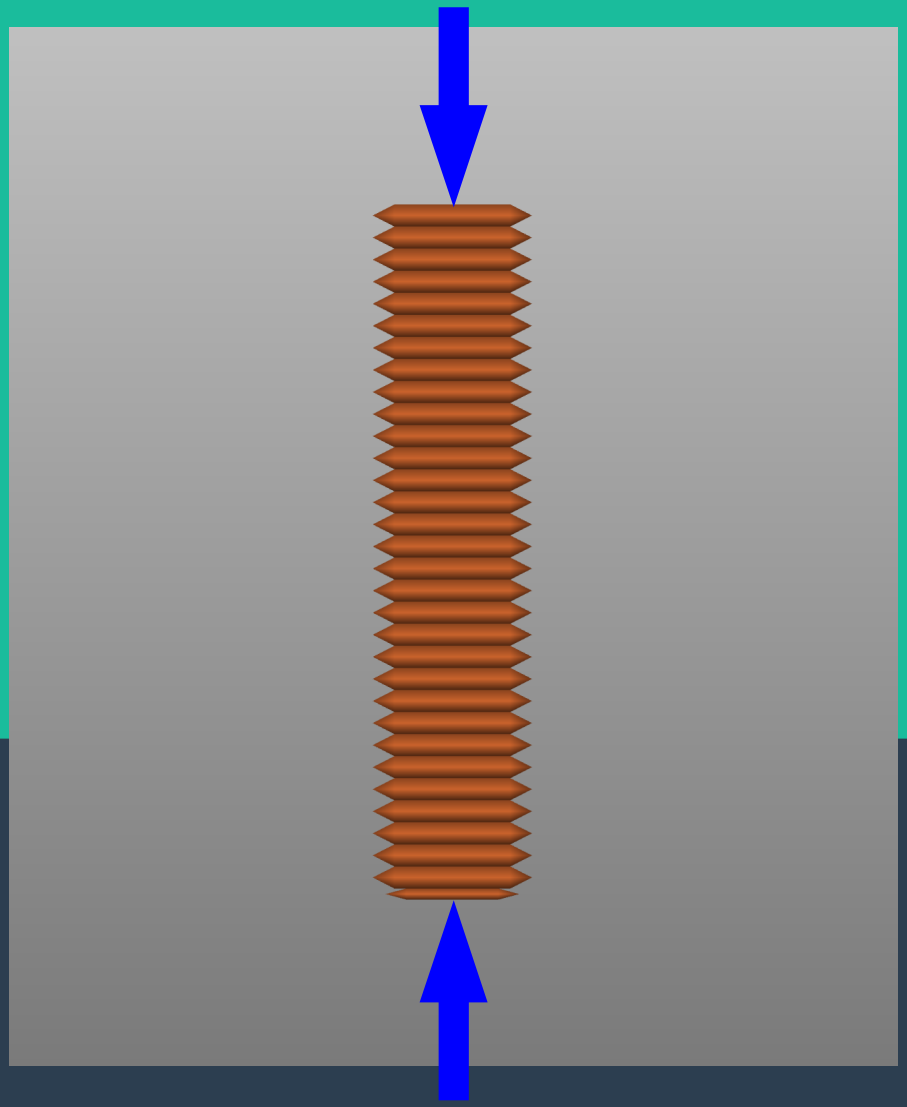


THE BLOB!!!

Print Failures

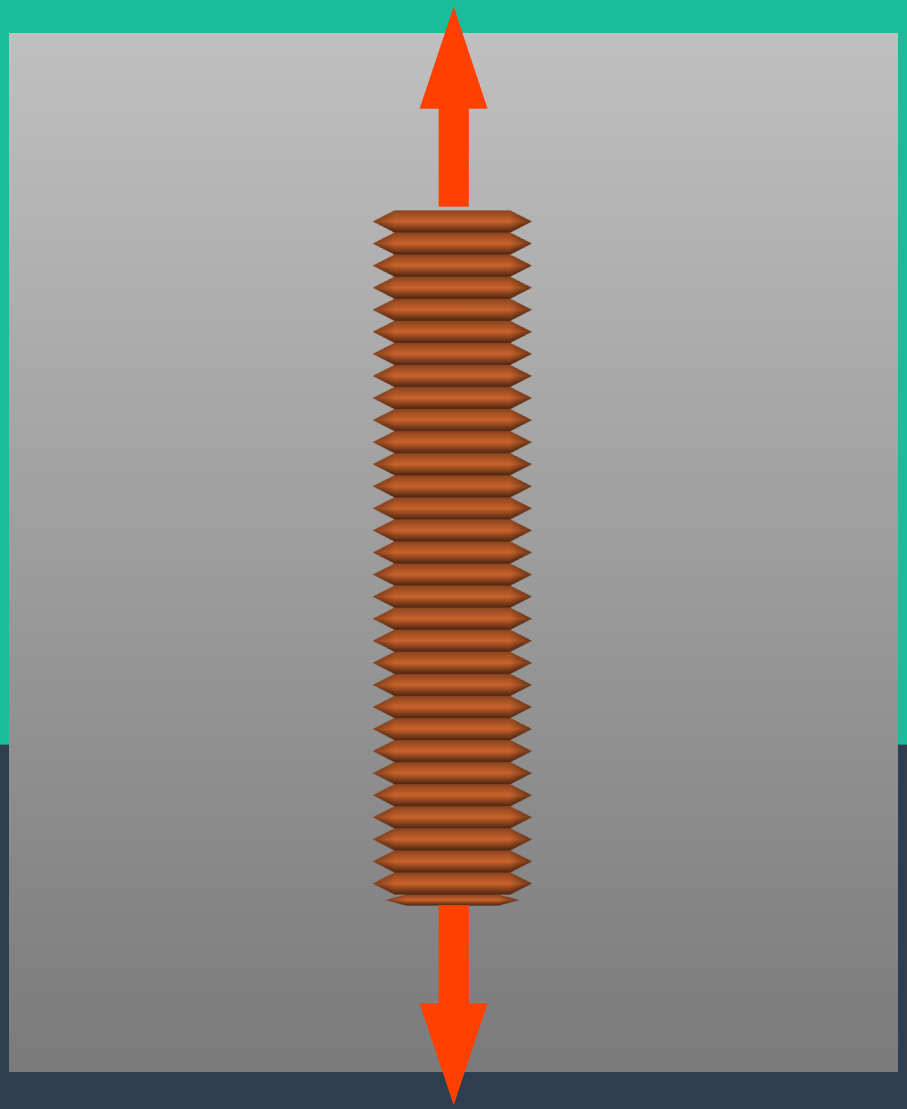
THE BLOB!!!

Part Strength



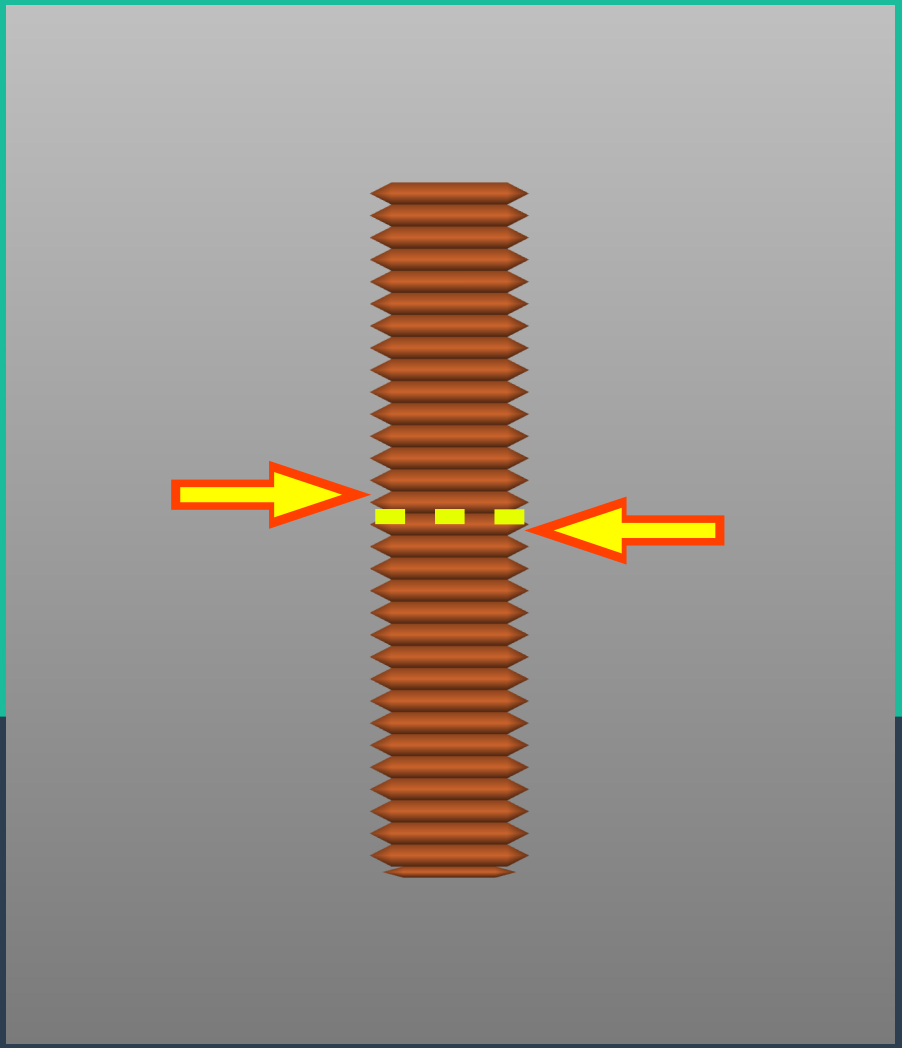
Compression is the best

Part Strength



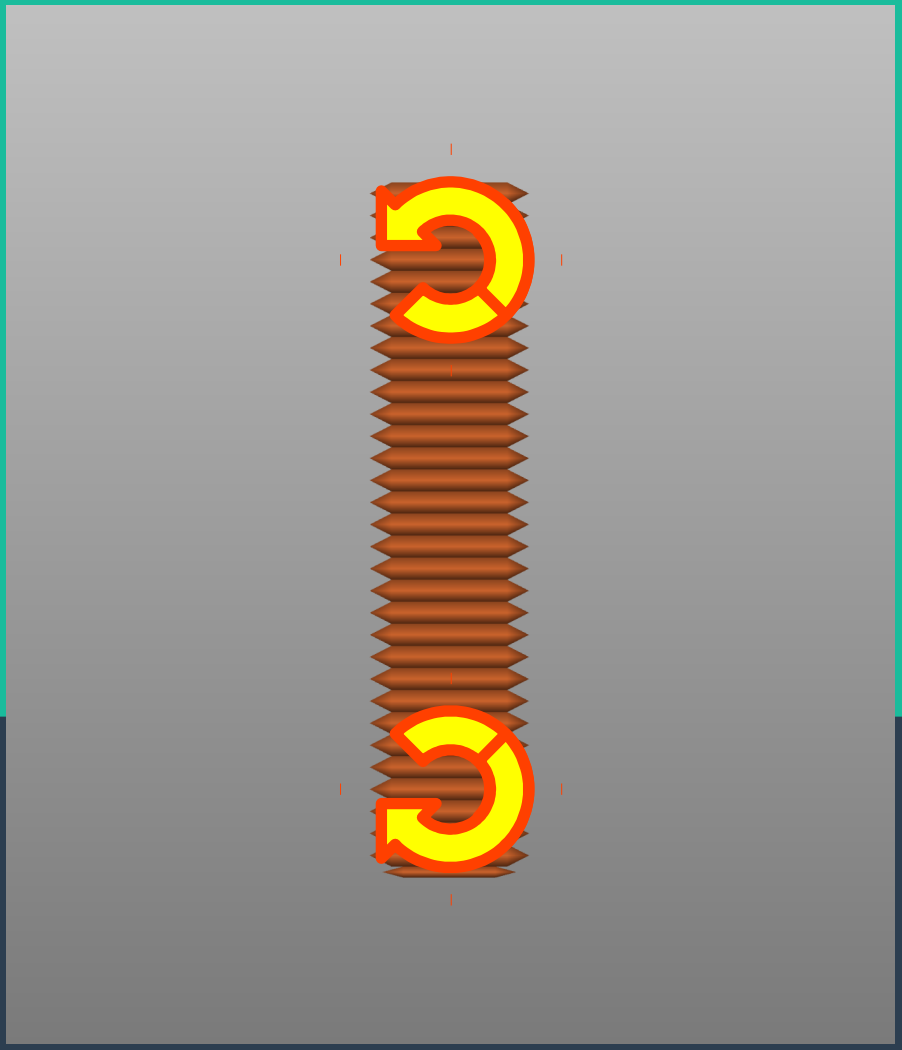
Tension is not good

Part Strength



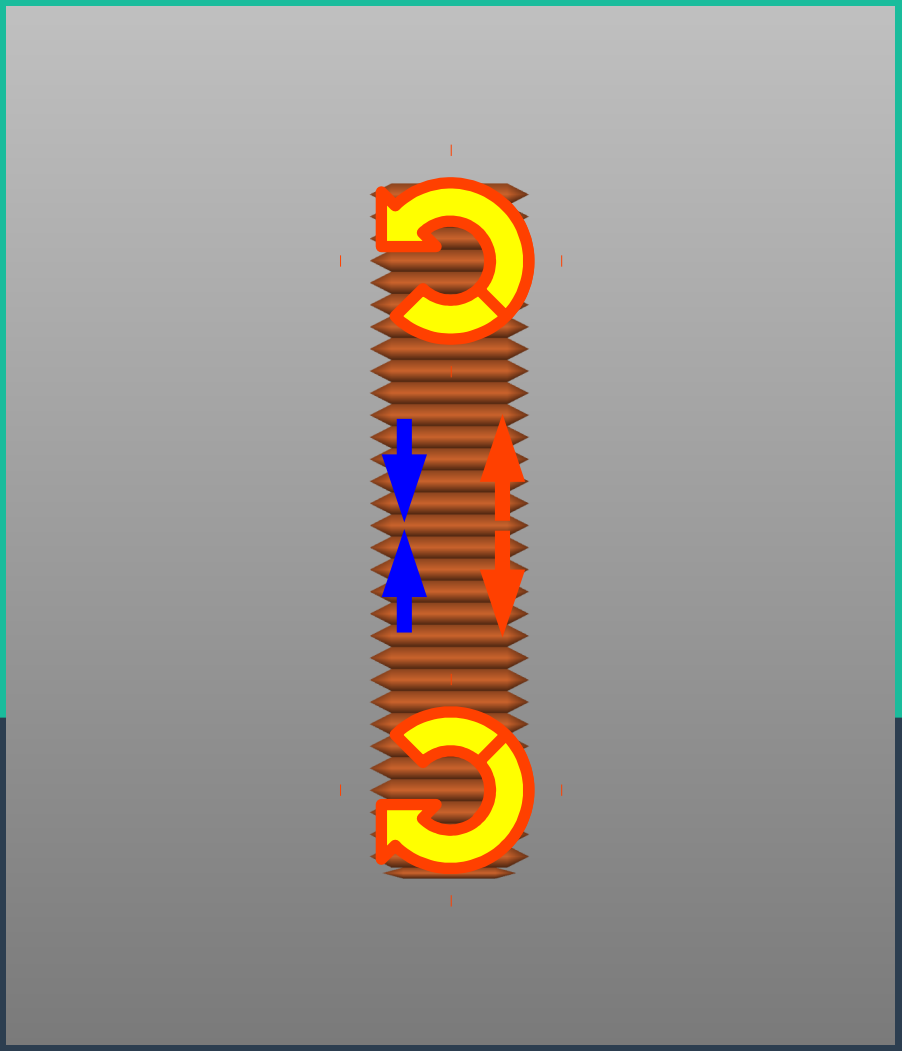
Shear. Real bad.

Part Strength



Bending. I think it's the worst.

Part Strength



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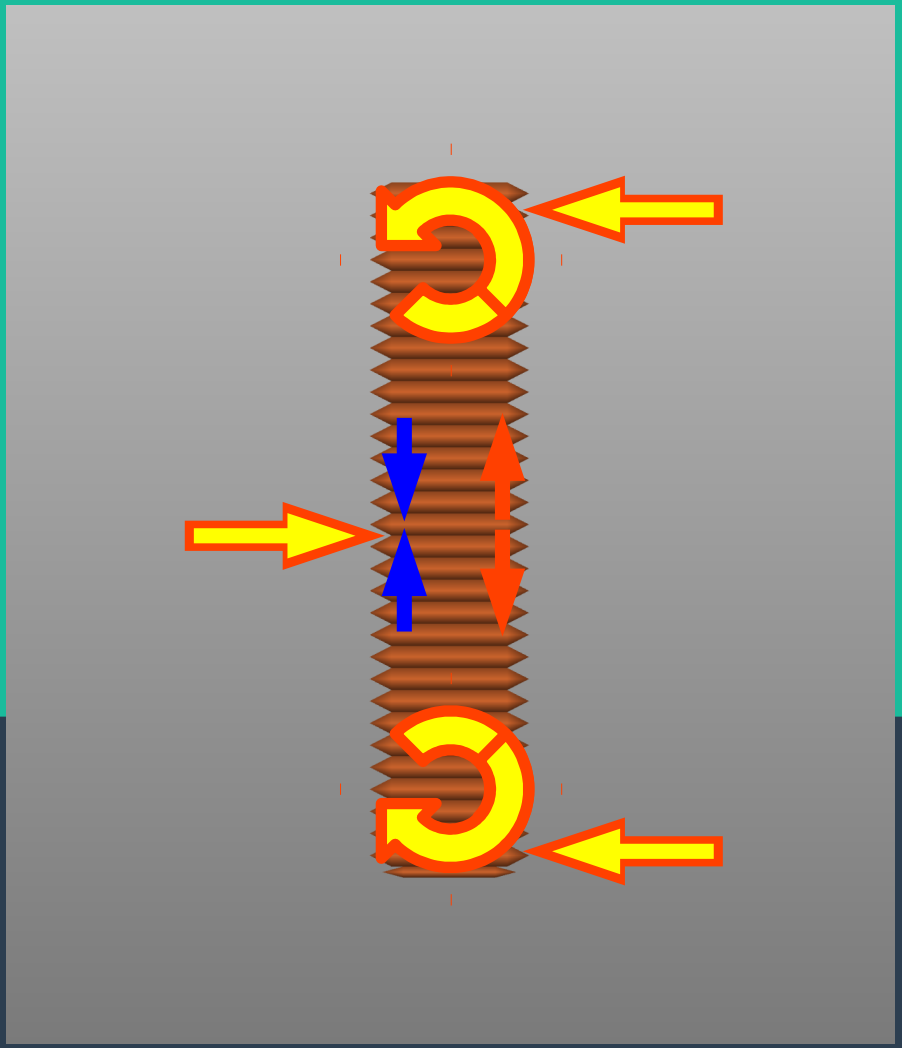


In practise, bending is often induced by lateral stresses.

Design for 3D Printing

Very orientation-dependent!

Strength, unique opportunities

It's really very orientation-dependent

Design for 3D Printing

Very orientation-dependent!

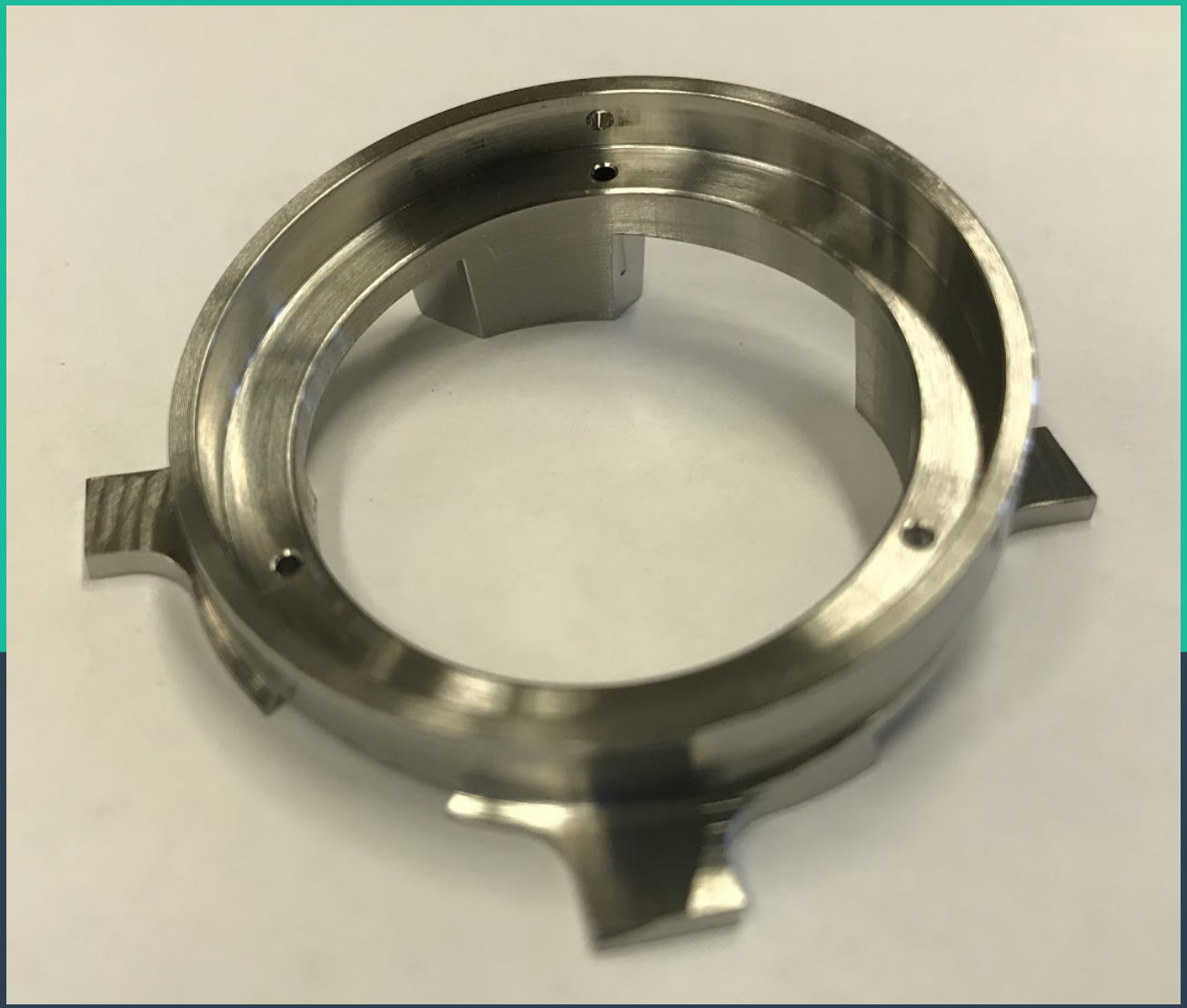
Strength, unique opportunities

PLA isn't very strong!

Stationary and / or low loading applications

It's really very orientation-dependent

3D Printing for Design



José Bustamante

3D Printing for Design

José Bustamante

The Gearbox Makerspace

Wong 0080

Come visit!

Thanks to Thomas Brunner!