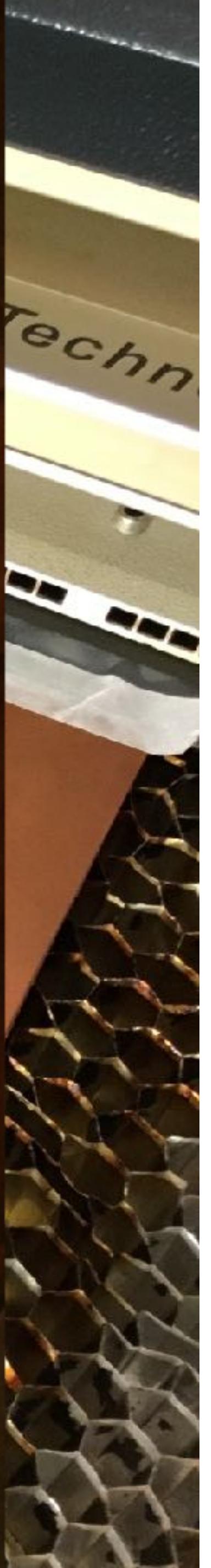
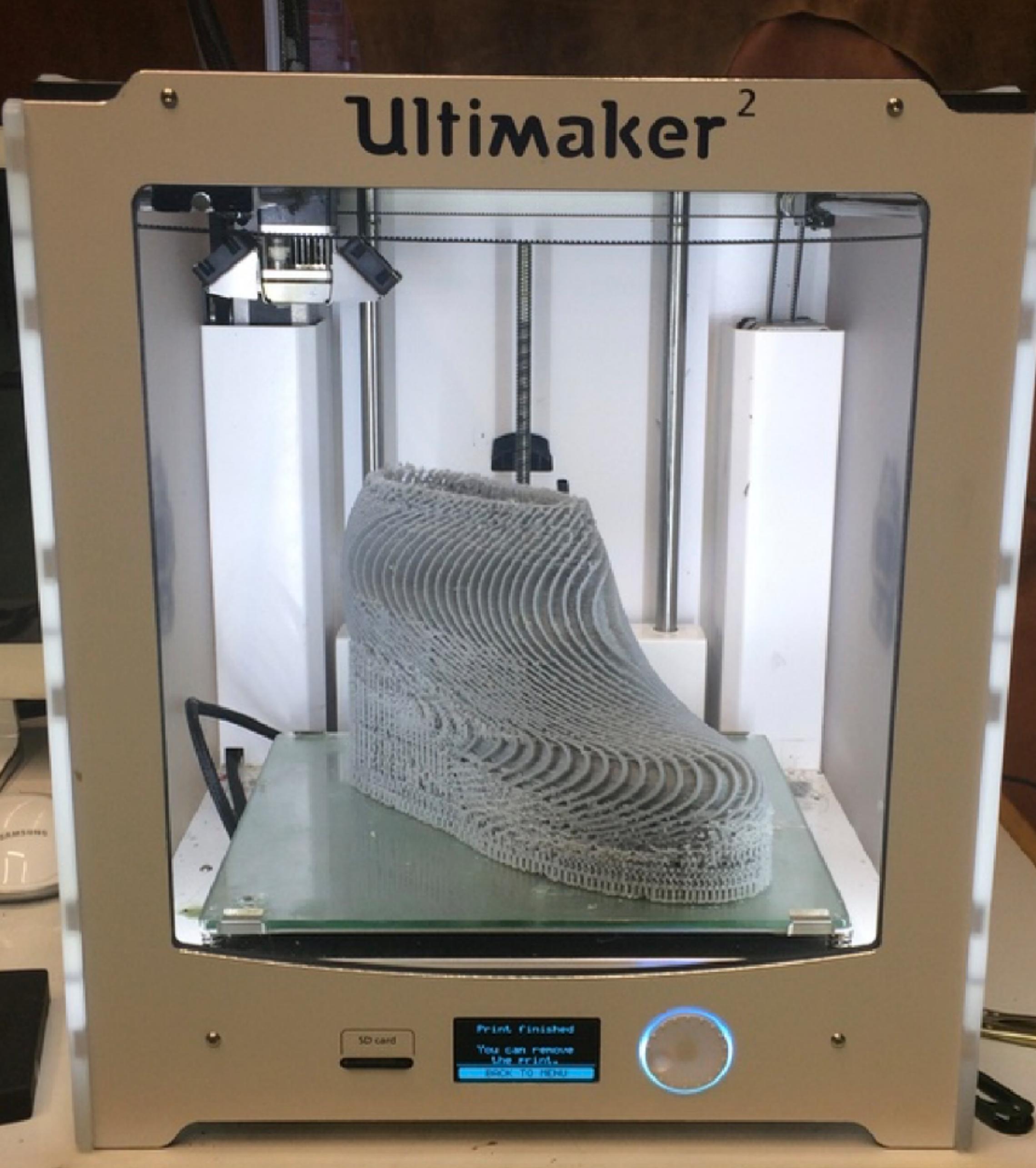
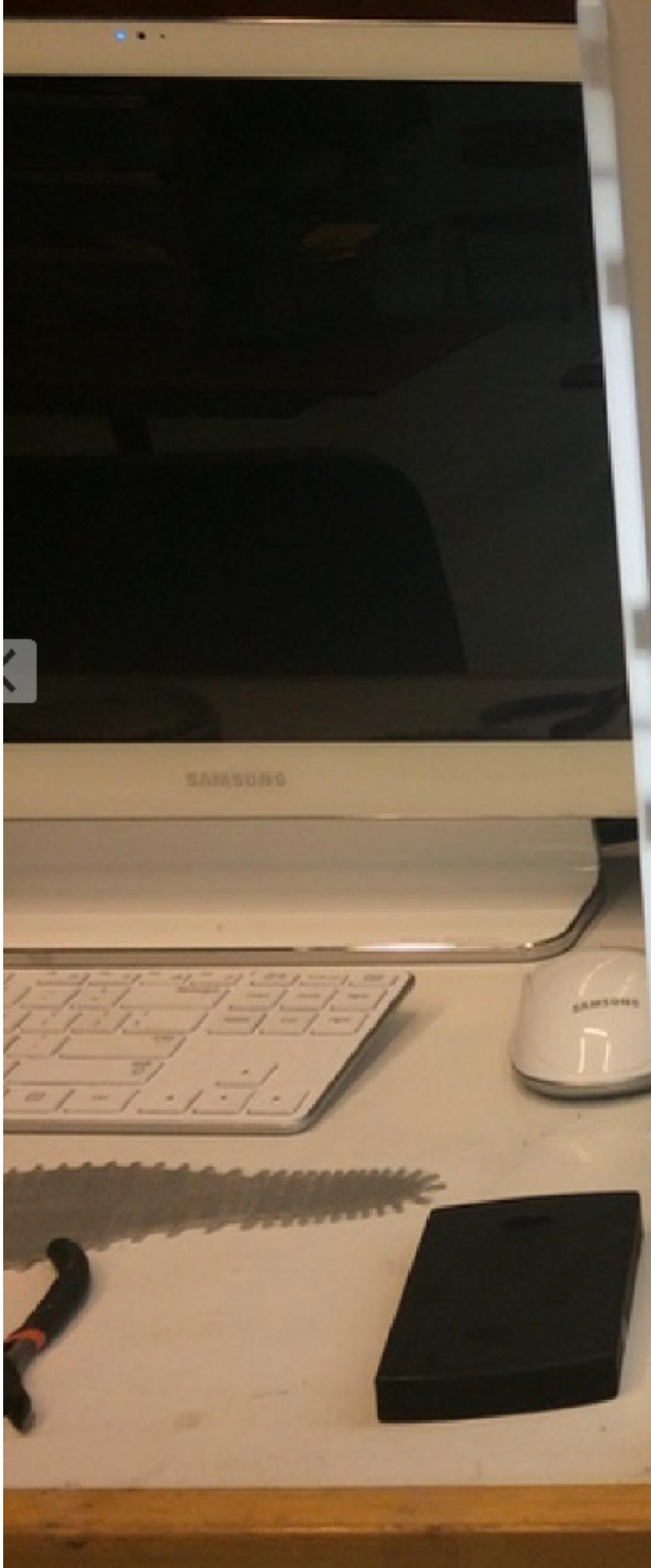


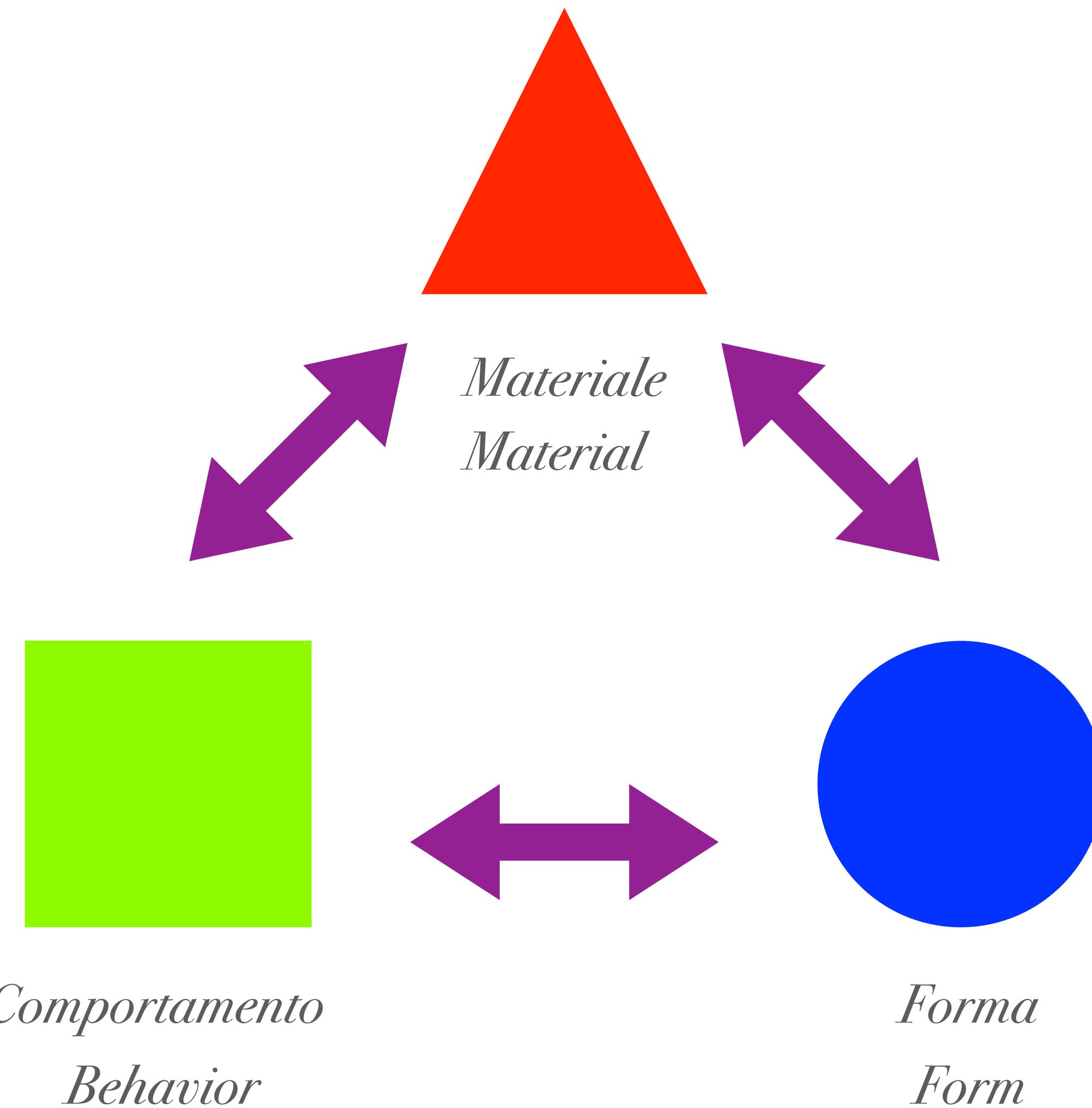


# Soft Sensing for MM<sub>3</sub>D Light Stampa Flessibile



# STAMPA IN MATERIALE FLESSIBILE :: FLEXIBLE PRINTING

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# FilaFlex

THE ORIGINAL ELASTIC FILAMENT FOR 3D PRINTING

PROPERTIES	STANDARD	VALUE	UNIT	TEST CONDITION
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Shore hardness, method A	ISO 868	82	SHORE A	
Ultimate tensile strength	DIN 53504	54	Mpa	
Elongation to break	DIN 53504	700	%	200 mm/min
Compression set	ISO 815	25	%	72 h; 23 °C
Impact resilience	ISO 4662	42	%	
Abrasion resistance	ISO 4649 method A	30	mm <sup>3</sup>	
Tear propagation resistance	ISO 34-1	70	kN/m	500mm/min
Density	ISO 1183-1	1200	kg/m <sup>3</sup>	
Tensile storage modulus	ISO 6721-1,-4	48	MPa	20 °C
Tensile storage modulus	ISO 6721-1,-5	33	MPa	60 °C



3D Printing  
diventa  
Additive Manufacturing



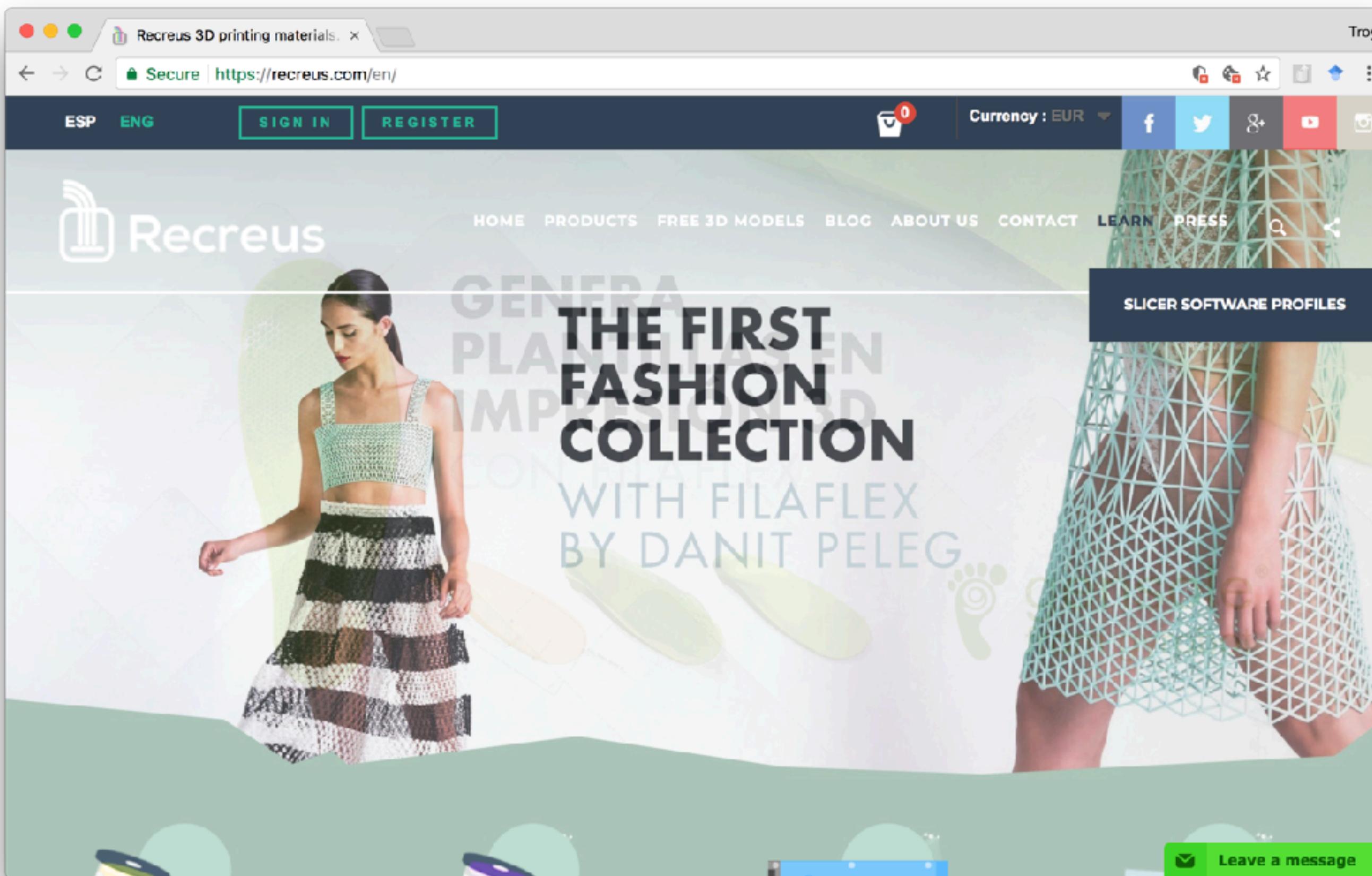
## FDM - FUSED DEPOSITION MODELLING

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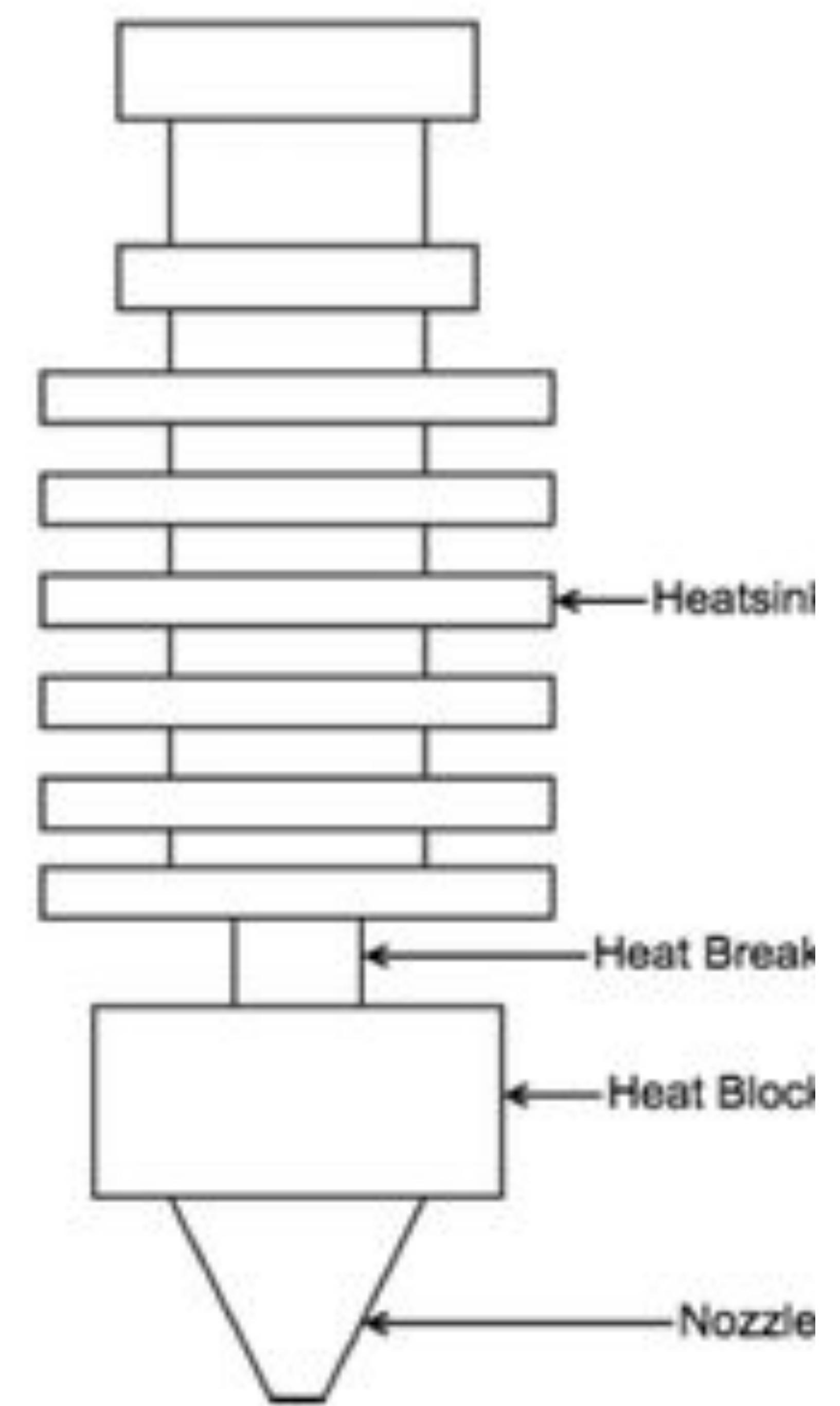
- Extrusion
- Think Hot Glue Gun on XYZ
- Sand Castle Rule
- More expensive printers offer water soluble support material.
- Resolution 0.1 mm minimum
- Consider different axis

# FILAMENTI

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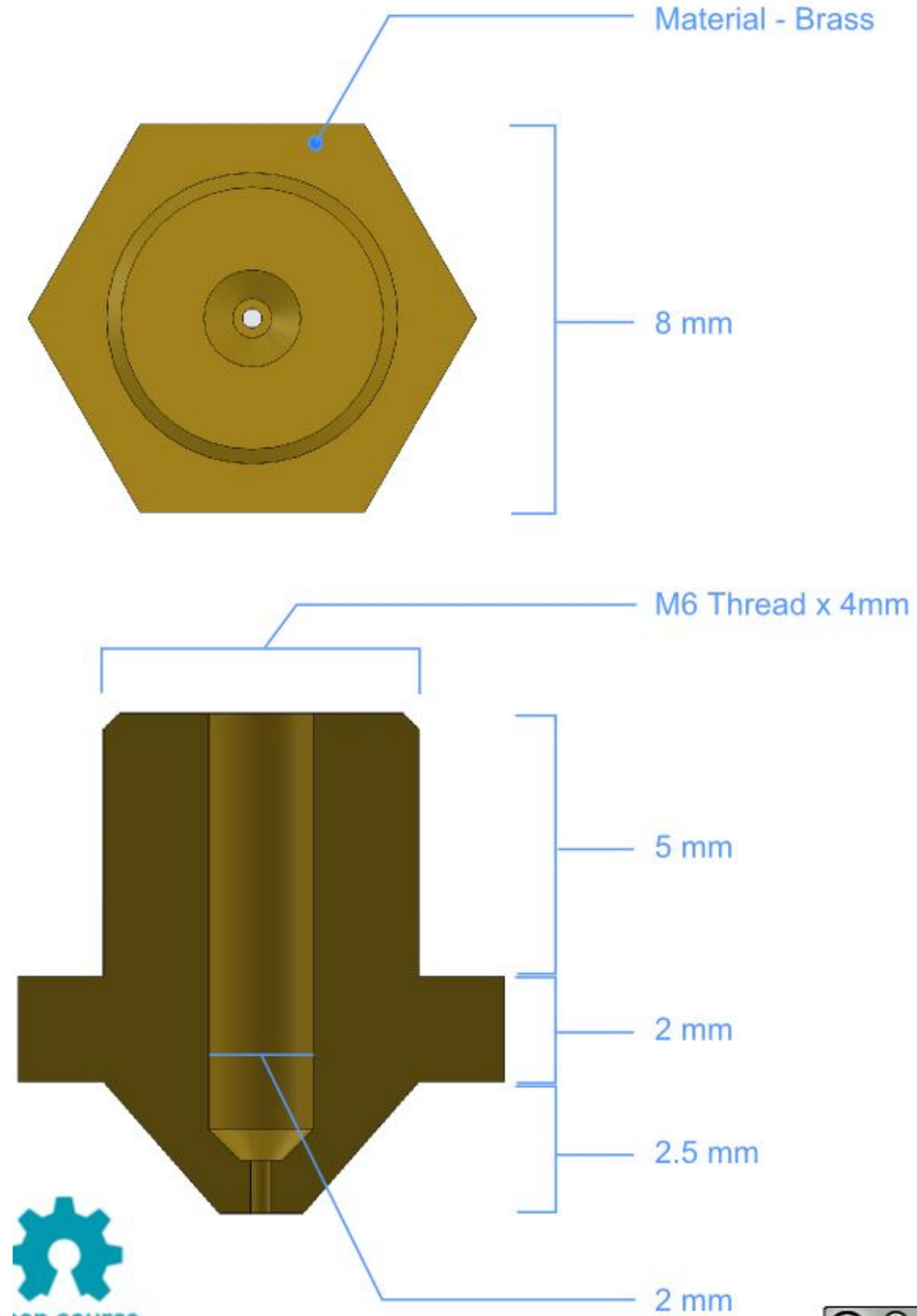
- TPU 95A
- TPE-S
- FilaFlex
- NinjaFlex
- WillowFlex
- Arnitel



## HOT END

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➤ Dov'è Caldo



# NOZZLE

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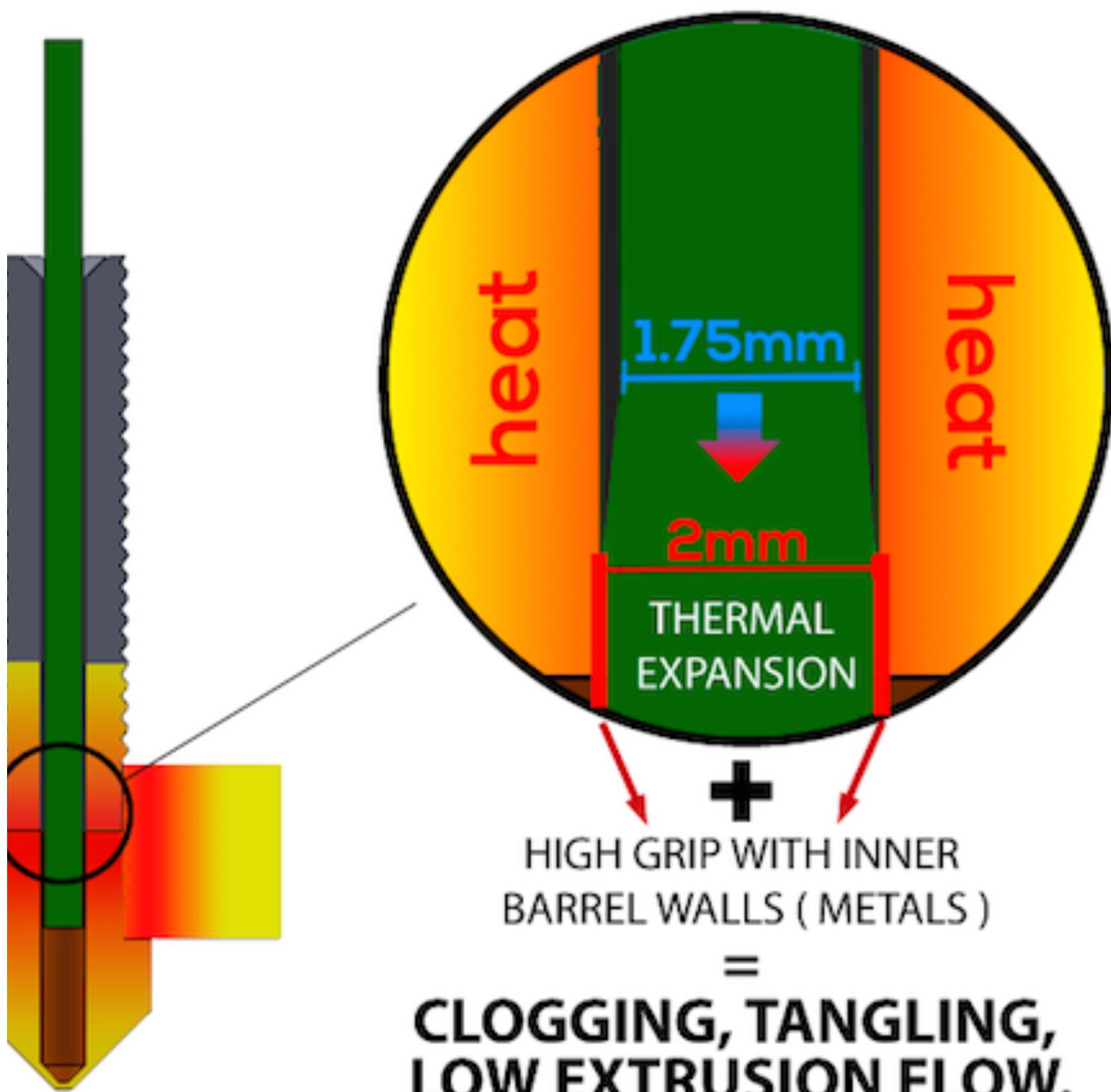
- L' uscita del filamento
- Più grosso è più veloce.
- Più piccolo è più raffinato.



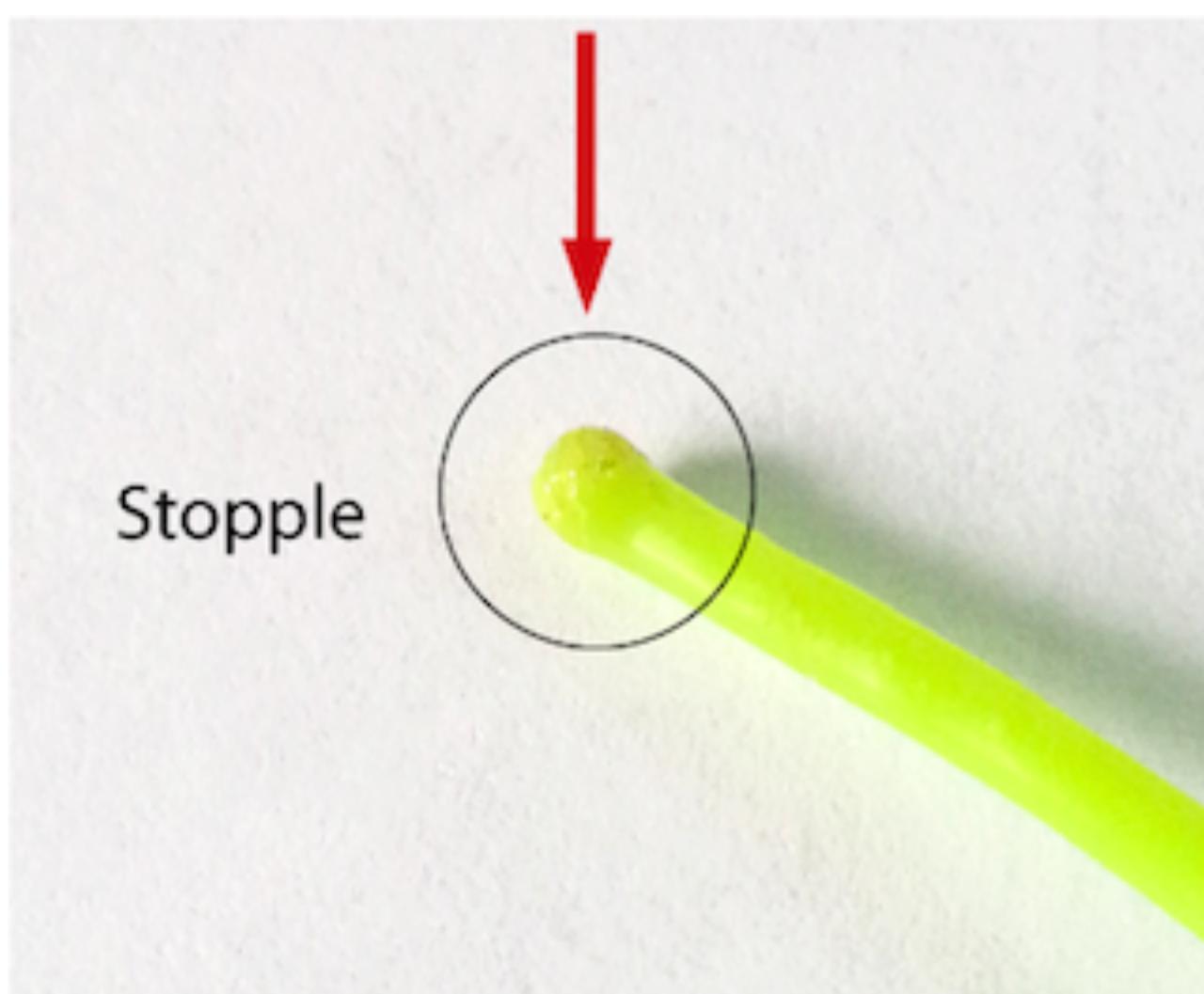
open source  
hardware

Designed by aSensar [ <http://asensar.com> / <http://DIY-India.com> ]





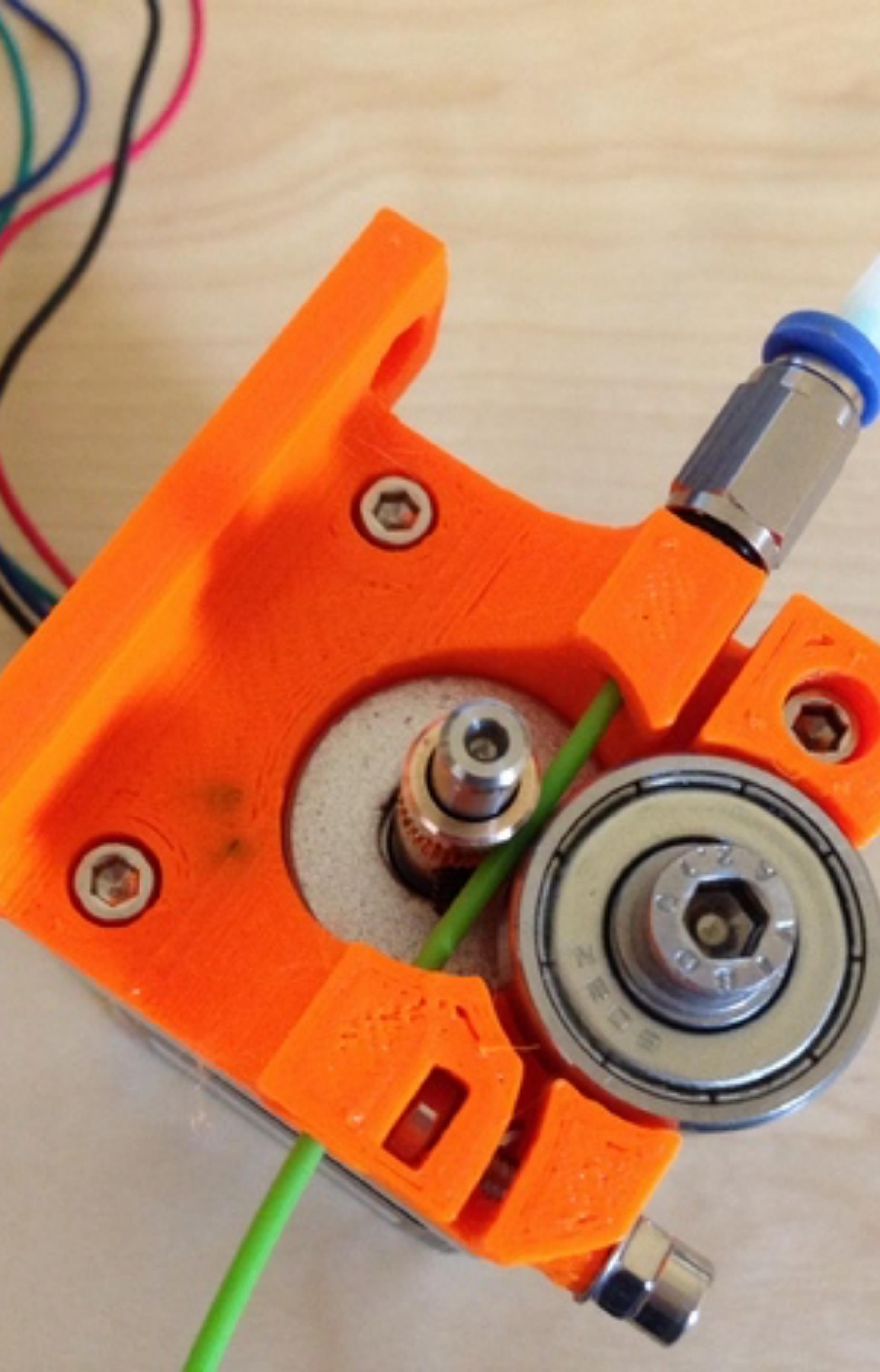
• find when  
ends, there  
d, Budhas  
problems  
(s), with  
110mm/s



# STOPPLE

---

- Troppo freddo / Troppo Veloce
- <http://manual.slic3r.org/intro/overview>
- <http://recreus.com/en/content/11-learn>



## DRIVE

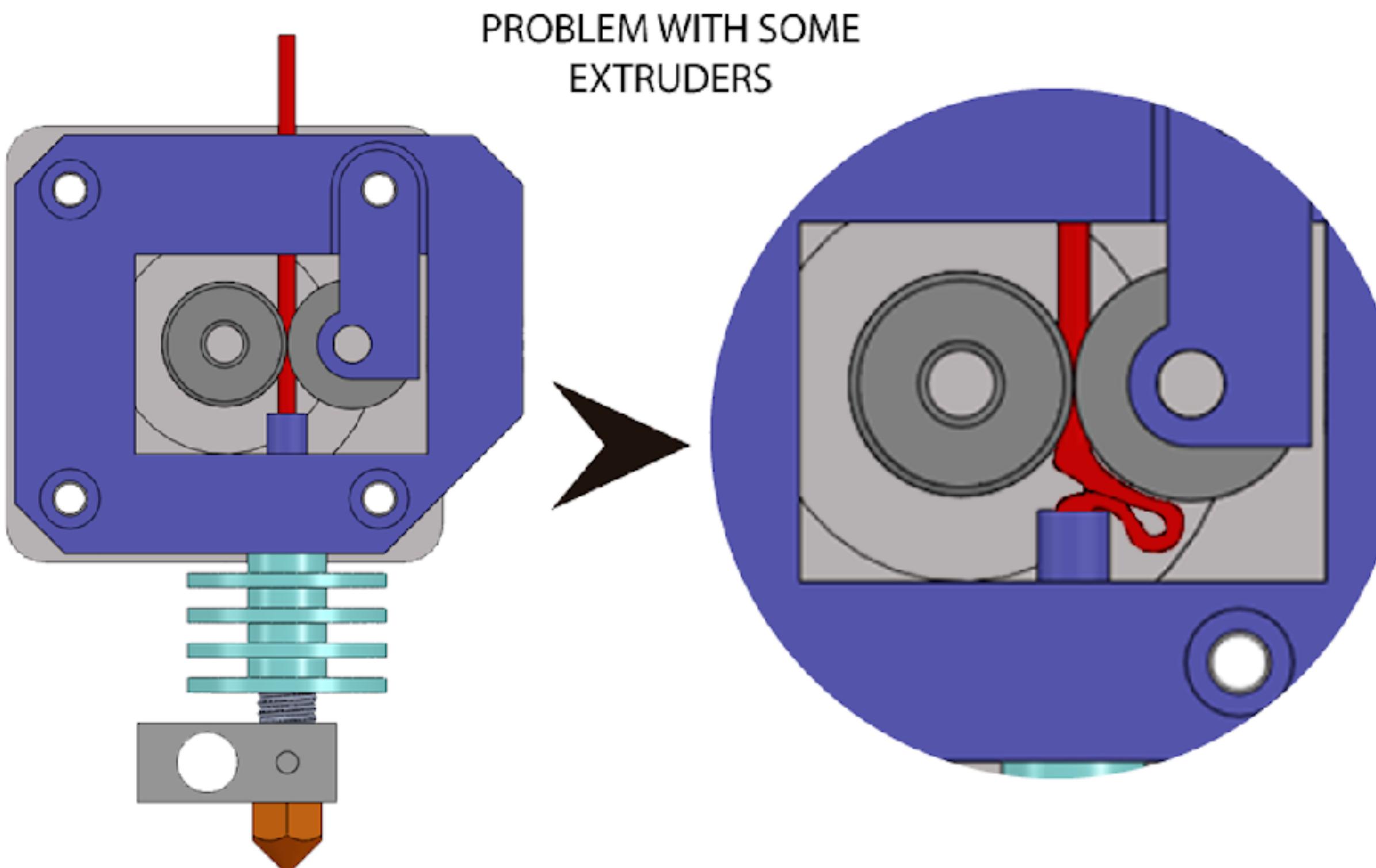
---

- Un stepper con un meccanismo di tensione.
- Forza il materiale dentro il nozzle



## DRIVE TENSION TANGLE

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- A volte il filamento esce dal buco.
- “You can’t push a rope.”



## LAYERING

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- Come carta
- Tra 0.05 e la dimensione del nozzle
- (.4mm a 1.2)



# FLOW

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- Come il materiale attraversa il nozzle.



## SPOOL

---

- Se non è fatto benne crea un sacco di problemi. Controlla la dimensione



## STEPPING

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- Quanto i livelli sono visibili
- How visible are the layers in the final model.



## SHELL

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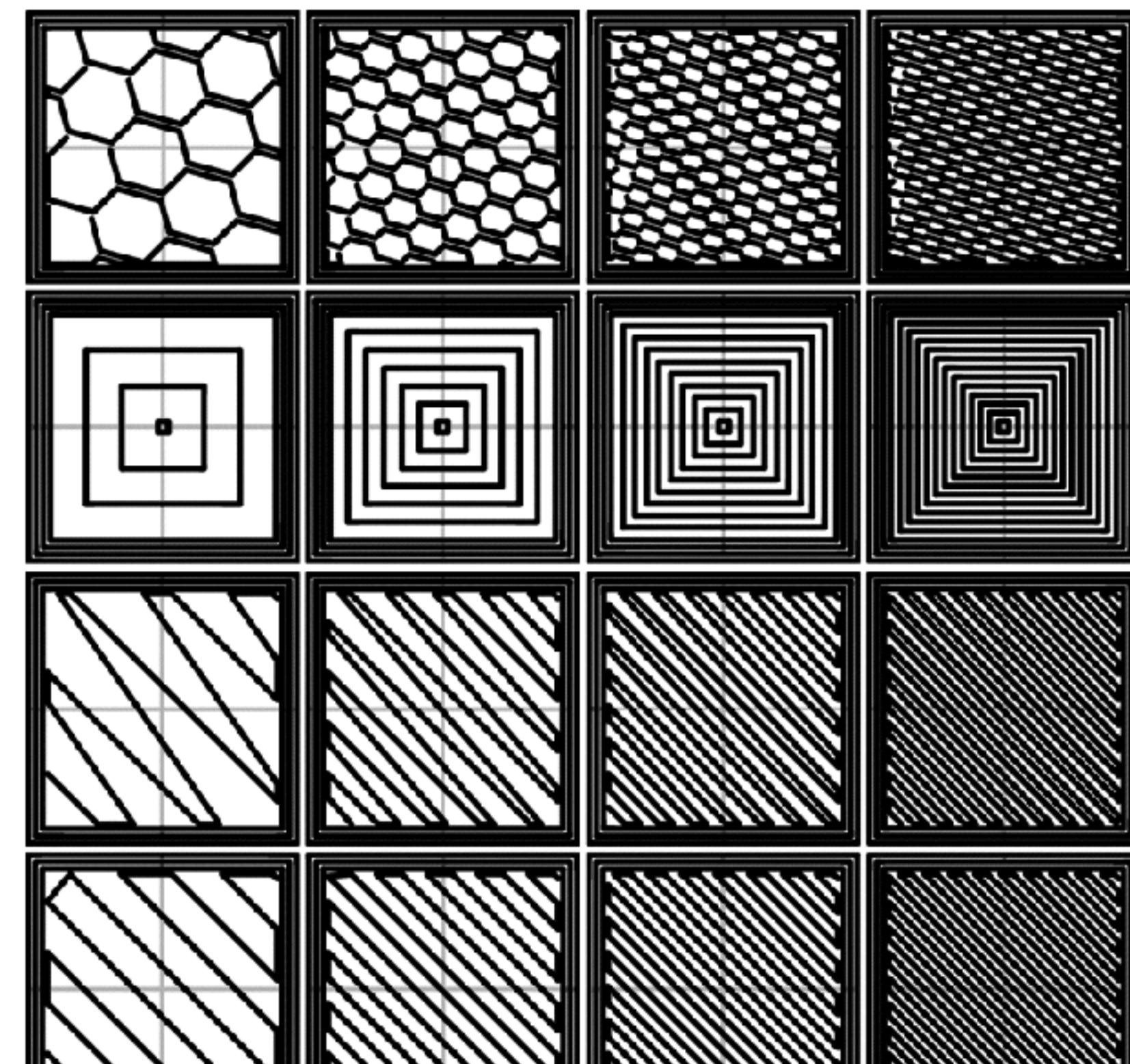
- La parte esterna del modello.
- A contiguous mesh
- Usually Inner and Outer,  
Horizontal or Vertical



# INFILL

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- Struttura Interna
- Molto importante per noi  
perche è visibile





## RETRACTION

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- Quando saltiamo da un punto ad un altro, quanto la stampante riprende.
- How far the filament is pulled back into the machine before it moves away.



## SLICING

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- il programma che crea il gCode per la stampante
- A program that separate a Mesh into layers

Code	Parameters	Description
Motion	(X Y Z A B C U V W apply to all motions)	
<a href="#">G0</a>		Rapid Move
<a href="#">G1</a>		Linear Move
<a href="#">G2, G3</a>	I J K or R, P	Arc Move
<a href="#">G4</a>	P	Dwell
<a href="#">G5</a>	I J P Q	Cubic Spline
<a href="#">G5.1</a>	I J	Quadratic Spline
<a href="#">G5.2</a>	P L	NURBS
<a href="#">G38.2 - G38.5</a>		Straight Probe
<a href="#">G33</a>	K	Spindle Synchronized Motion
<a href="#">G33.1</a>	K	Rigid Tapping
<a href="#">G80</a>		Cancel Canned Cycle
<b>Canned cycles</b>	(X Y Z or U V W apply to canned cycles, depending on active plane)	
<a href="#">G81</a>	R L (P)	Drilling Cycle
<a href="#">G82</a>	R L (P)	Drilling Cycle, Dwell
<a href="#">G83</a>	R L Q	Drilling Cycle, Peck
<a href="#">G73</a>	R L Q	Drilling Cycle, Chip Breaking
<a href="#">G85</a>	R L (P)	Boring Cycle, Feed Out
<a href="#">G89</a>	R L (P)	Boring Cycle, Dwell, Feed Out
<a href="#">G76</a>	P Z I J R K Q H L E	Threading Cycle
<b>Distance Mode</b>		
<a href="#">G90, G91</a>		Distance Mode
<a href="#">G90.1, G91.1</a>		Arc Distance Mode
<a href="#">G7</a>		Lathe Diameter Mode
<a href="#">G8</a>		Lathe Radius Mode
<b>Feed Rate Mode</b>		
<a href="#">G93, G94, G95</a>		Feed Rate Mode
<b>Spindle Control</b>		
<a href="#">M3, M4, M5</a>	S	Spindle Control
<a href="#">M19</a>		Orient Spindle
<a href="#">G96, G97</a>	S D	Spindle Control Mode
<b>Coolant</b>		
<a href="#">M7, M8, M9</a>		Coolant Control
<b>Tool Length Offset</b>		
<a href="#">G43</a>	H	Tool Length Offset
<a href="#">G43.1</a>		Dynamic Tool Length Offset
<a href="#">G43.2</a>	H	Apply additional Tool Length Offset
<a href="#">G49</a>		Cancel Tool Length Compensation
<b>Stopping</b>		
<a href="#">M0, M1</a>		Program Pause
<a href="#">M2, M3</a>		End

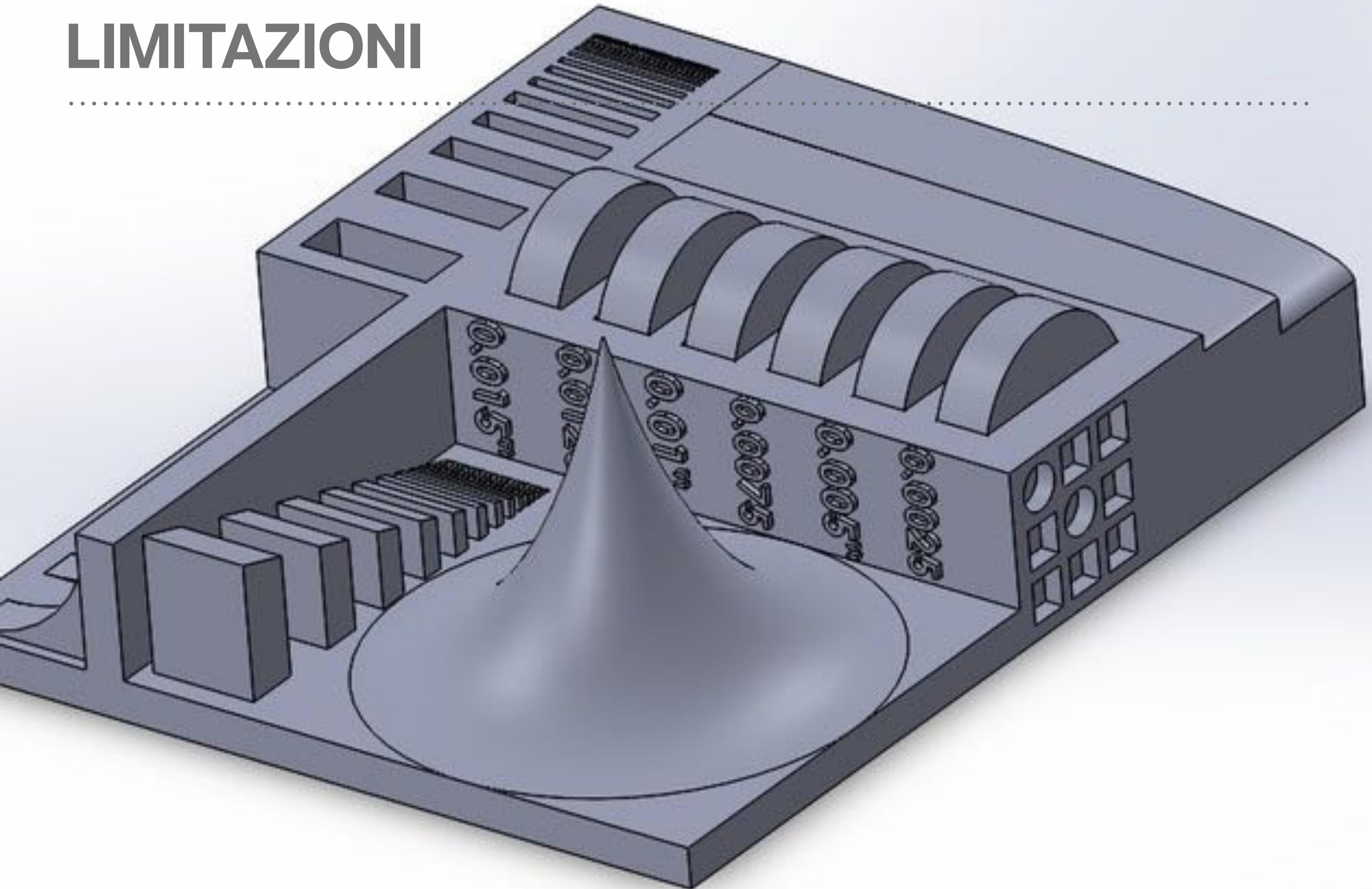
# G-CODE

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- Linguaggio lla macchina
- Molto semplice
- Machine Language that describes the movement, speed and amount of material to extrude on each level
- <https://github.com/troykyo/SoleMakerSavingGcode>

# LIMITAZIONI

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# Flexible Rules



## REGOLA DEL CASTELLO DI SABBIA

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- Se il modello e' fatto in sabbia...
- If this structure was made of wet sand, would it break?
- 45% limit
- Arch is good,  
Flat is bad.



# CALIBRAZIONE

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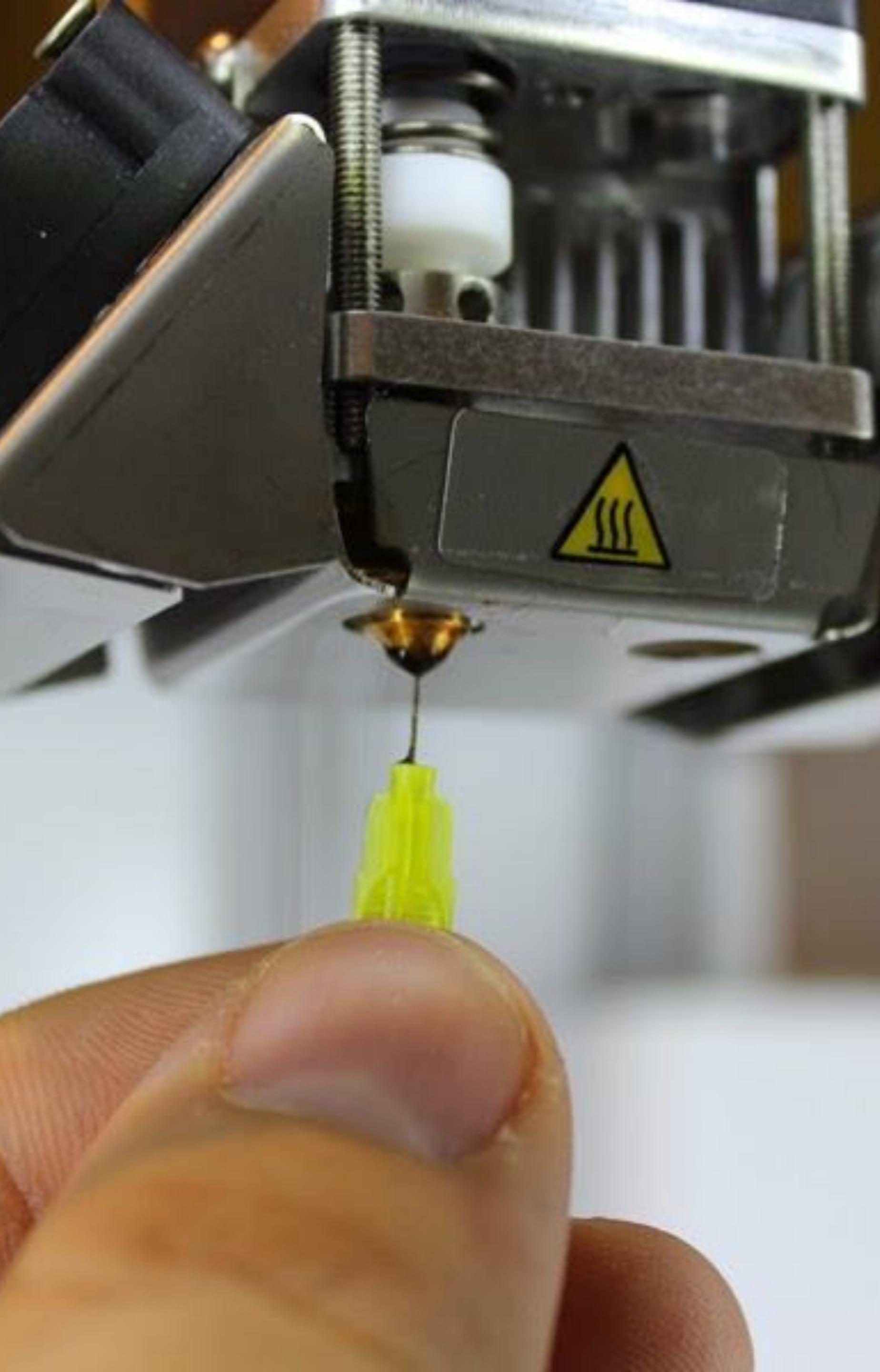
- Livello del board
  - Nozzle è pulito
  - Tensione è giusta
  - Primo livello
- 
- Level the Board
  - Check the Nozzle
  - Drive Tension
  - First Layer Distance



## LEVELING

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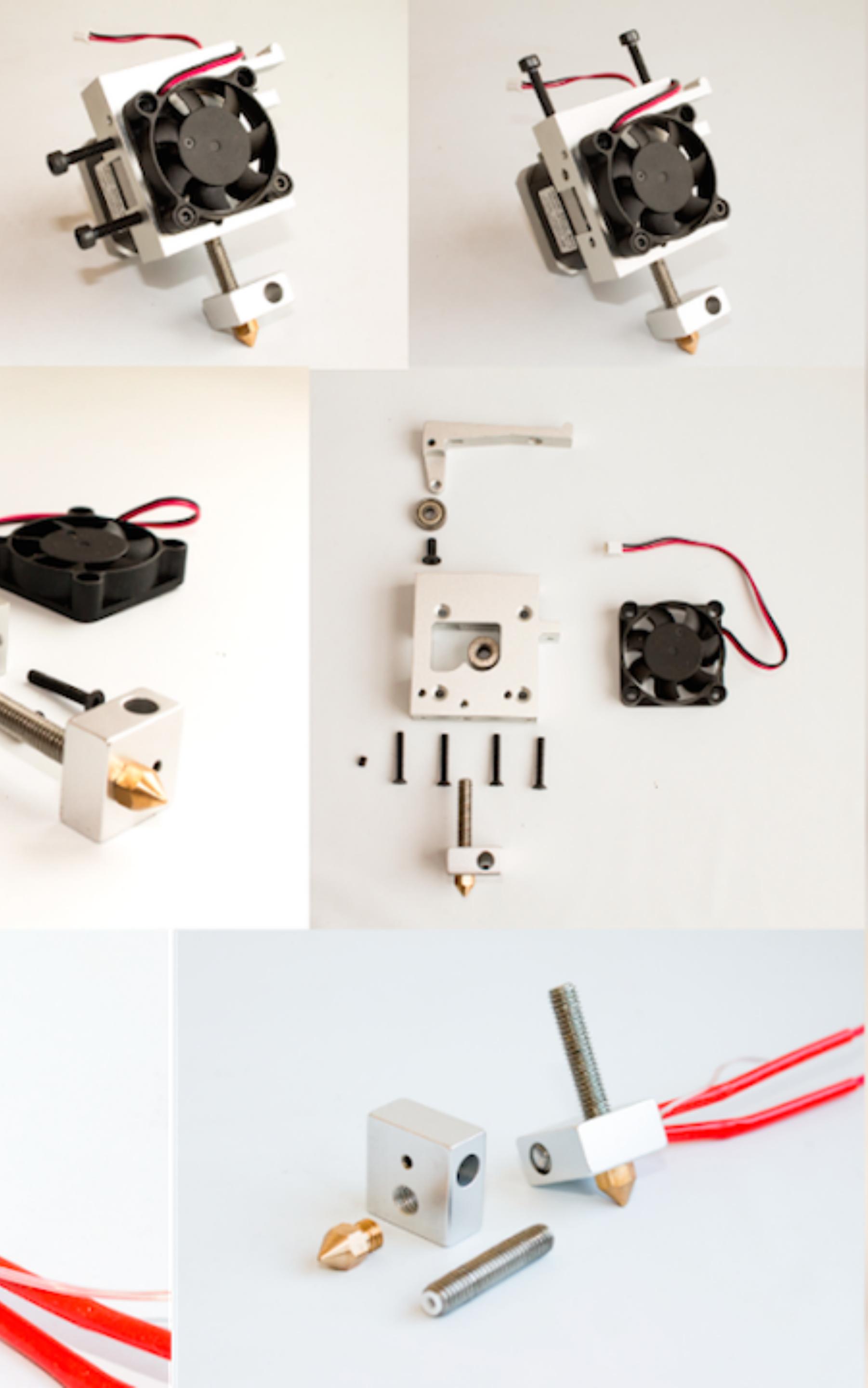
- .05 a .1 mm dalla Board



## NOZZLE

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- Controlla la temperatura
- Strumenti per pulire
- Non danneggiare il teflon
- Make sure you can heat the machine and that material extrudes evenly
- Syringe or acupuncture needle
- Do not scrape



## DRIVE TENSION

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- Se fa un clicking e' troppo
- Make sure it feeds evenly.
- Get the Sticky feeling



## LE REGOLE

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- Vai Piano 40mm/Min
- Pulisce bene il nozzle
- Anche dentro.
- Quando la tensione è giusta, stop.