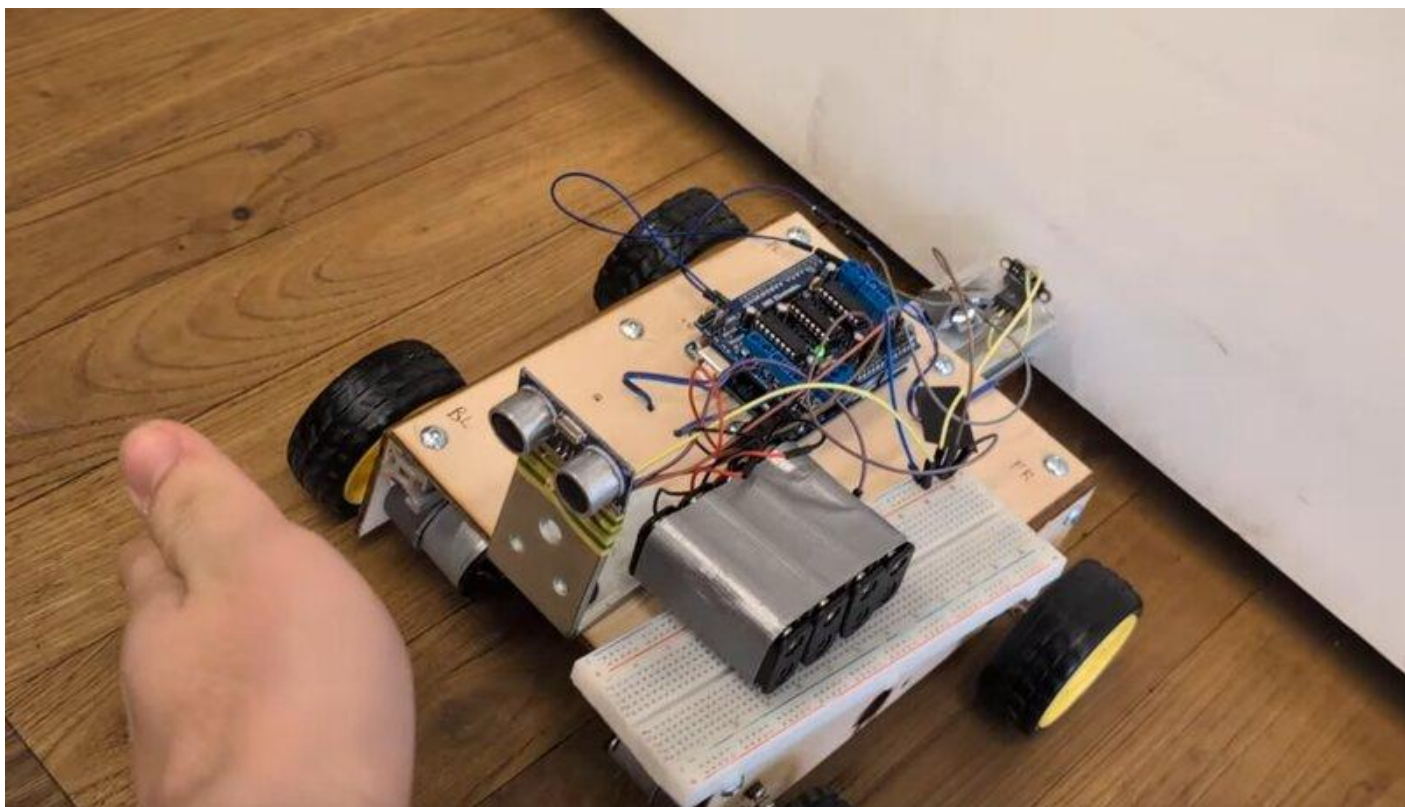


# Week 13: Molding & Casting

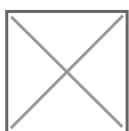
- regional review
- machine presentations
- local class
- Materials
- Chocolate

# regional review

## SAM



## Forrest



## Kirsjanis

<https://gitlab.com/kriwkrow/pico-nc>



# Patrick

# machine presentations

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<https://www.youtube.com/embed/sVUsoqN4CzQ?si=hTxIXIbVTvjTlvSG>

[https://www.youtube.com/embed/sVUsoqN4CzQ?si=ci7gNEyZHg\\_7RYRV](https://www.youtube.com/embed/sVUsoqN4CzQ?si=ci7gNEyZHg_7RYRV)

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# local class

[guerilla guide to CNC machining](#)



<https://lcamtuf.coredump.cx/gcnc/>

[https://player.vimeo.com/video/707650918?badge=0&autoplay=0&player\\_id=0&app\\_id=58479](https://player.vimeo.com/video/707650918?badge=0&autoplay=0&player_id=0&app_id=58479)

<https://thenounproject.com> (not free anymore ☹)

How to a make Crystal Clear Ice Sphere

<https://www.smooth-on.com/product-line/mold-max/?quicksearch>

<https://fabacademy.org/2021/labs/kamplintfort/students/mattissen-gerhard/assignments/week15/>

<https://fabacademy.org/2021/labs/kamplintfort/students/mattissen-gerhard/assignments/week18/>





[https://fabacademy.org/archives/2015/eu/students/postma.ronald/02\\_progress/week\\_09.html](https://fabacademy.org/archives/2015/eu/students/postma.ronald/02_progress/week_09.html)



<https://fabacademy.org/2020/labs/leon/students/adrian-torres/week15.html>

[ferris File-A-Wax 148x88x37mm](#)

<https://youtu.be/wMRSPXt48CI?si=QapaiAiej4CBpQQa>

[3D Printed Injection Molds - The Craftsman Steady Craftin](#)

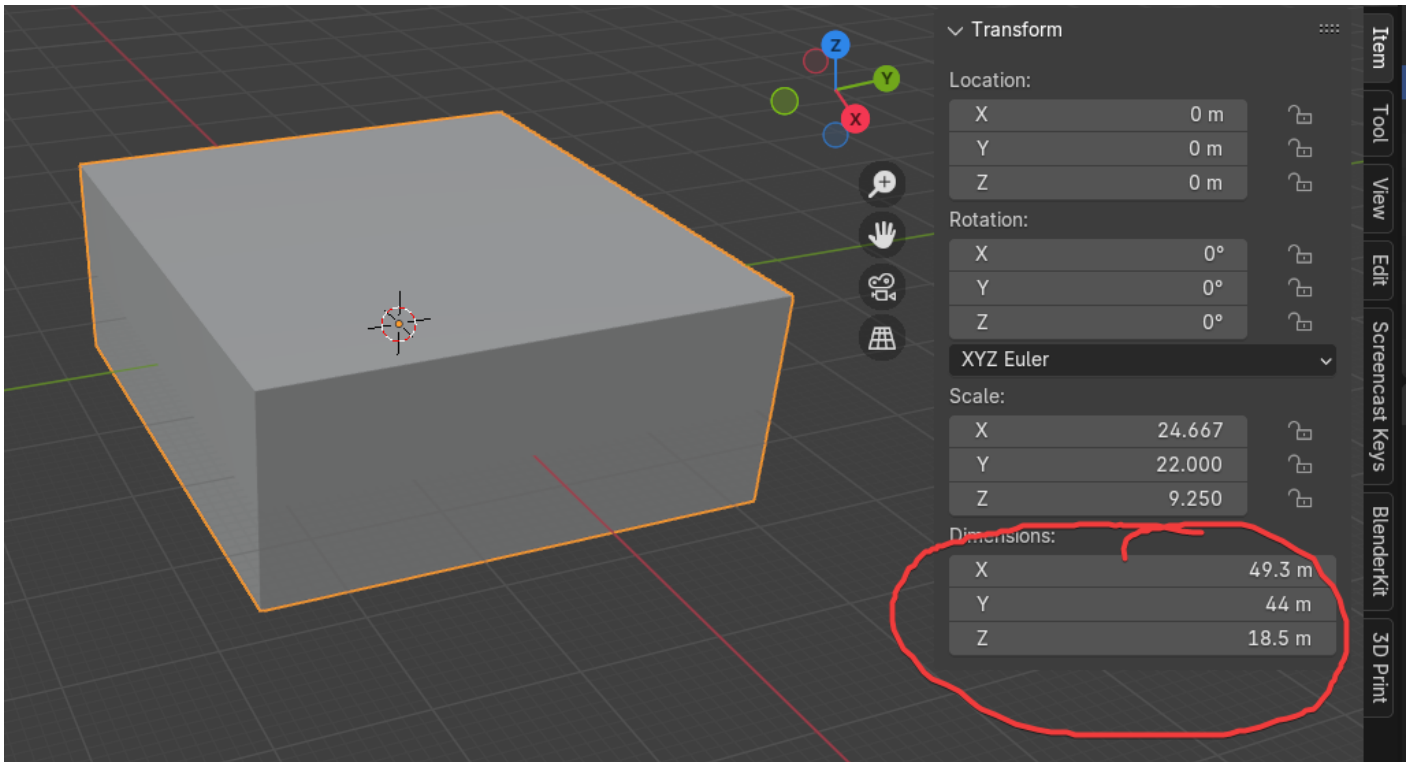
# Lifecasting:



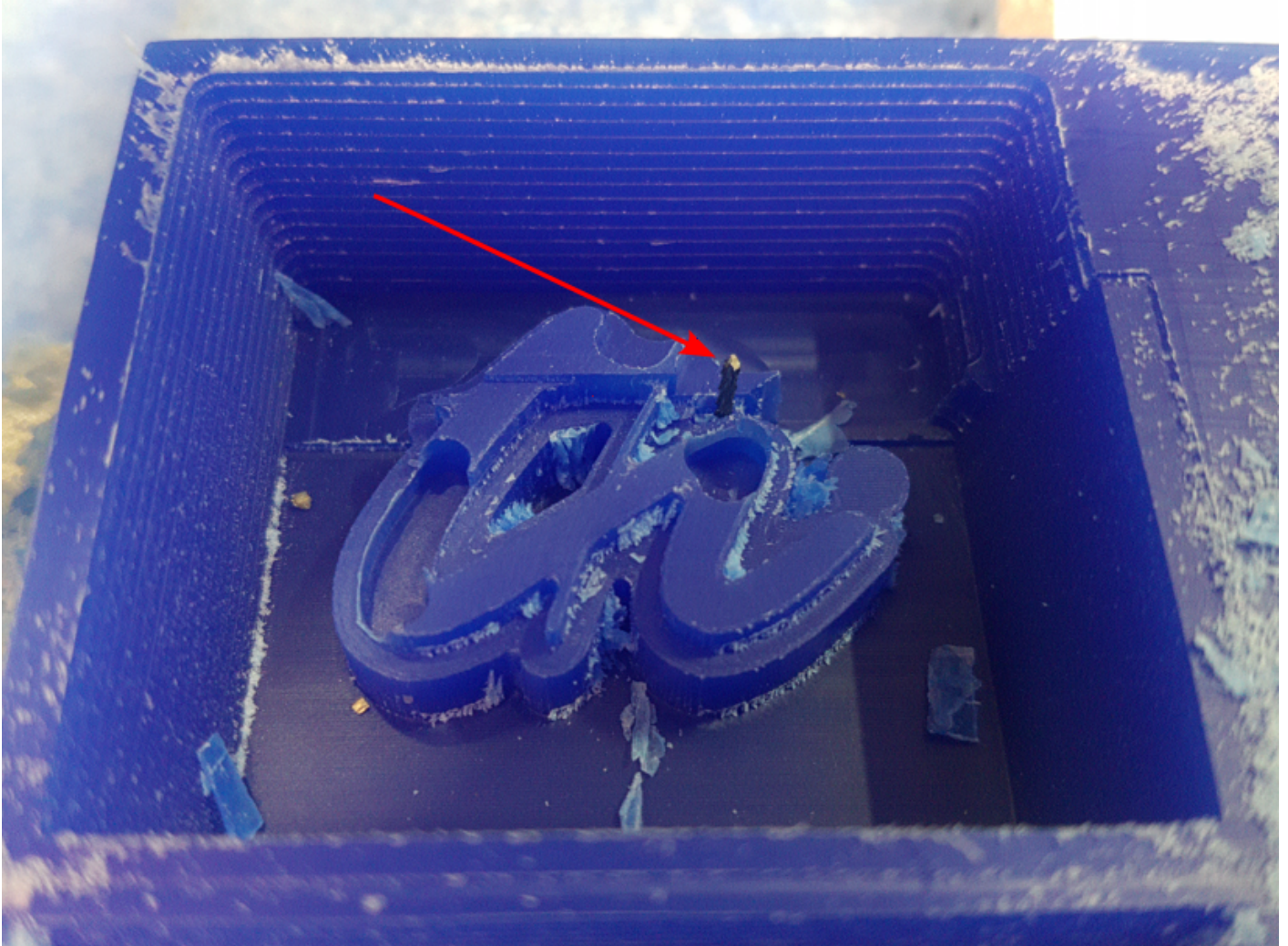
## Blender - mods

If you model your part in blender, you should start with a cube 49.3333 m x 44 m x 18.5 m in size.

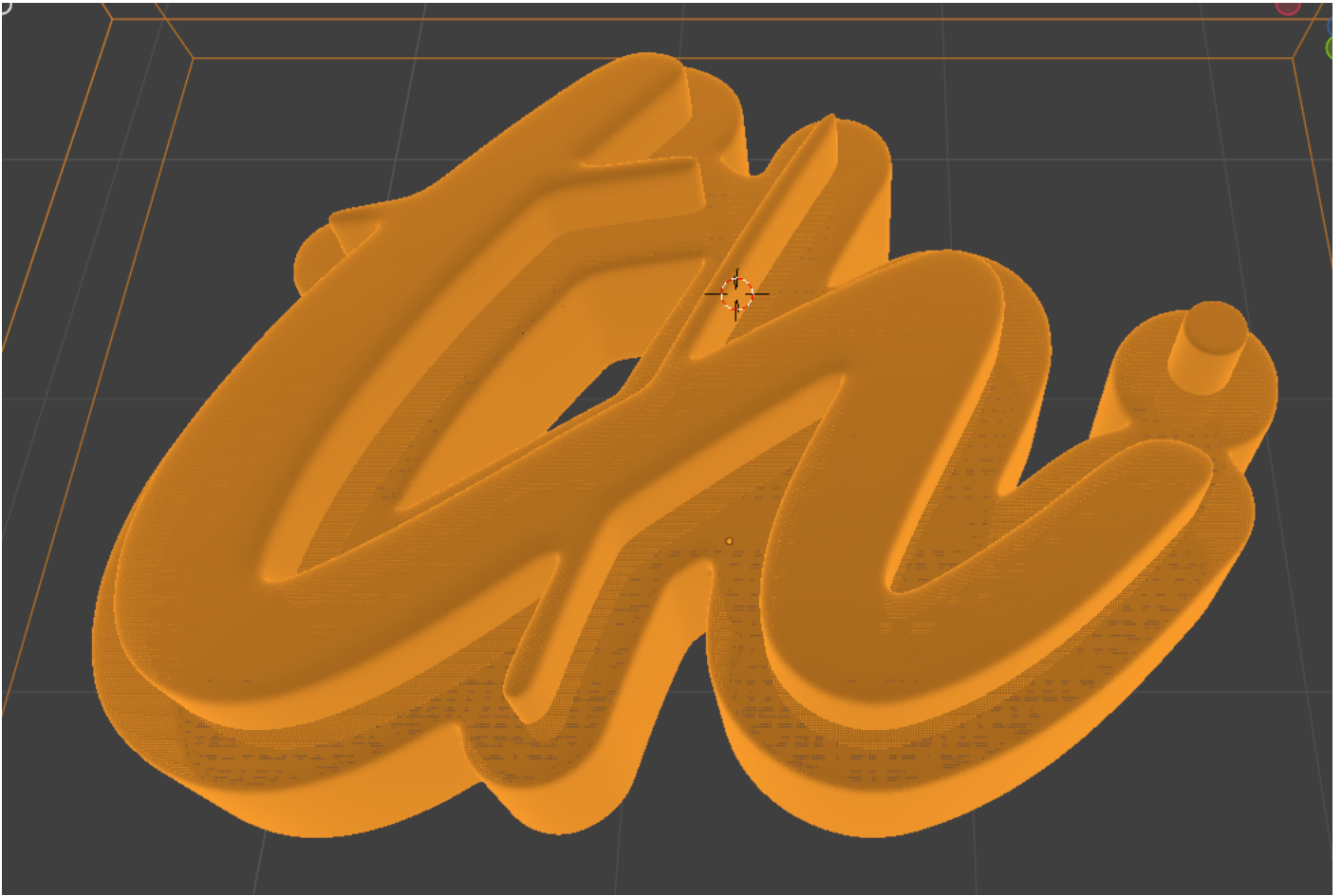




Hmm....I was just about to document the blender - mods - workflow when this happened:



If the roughing doesn't enter in a hole and the finishing is 5 mm deeper, the tool breaks.

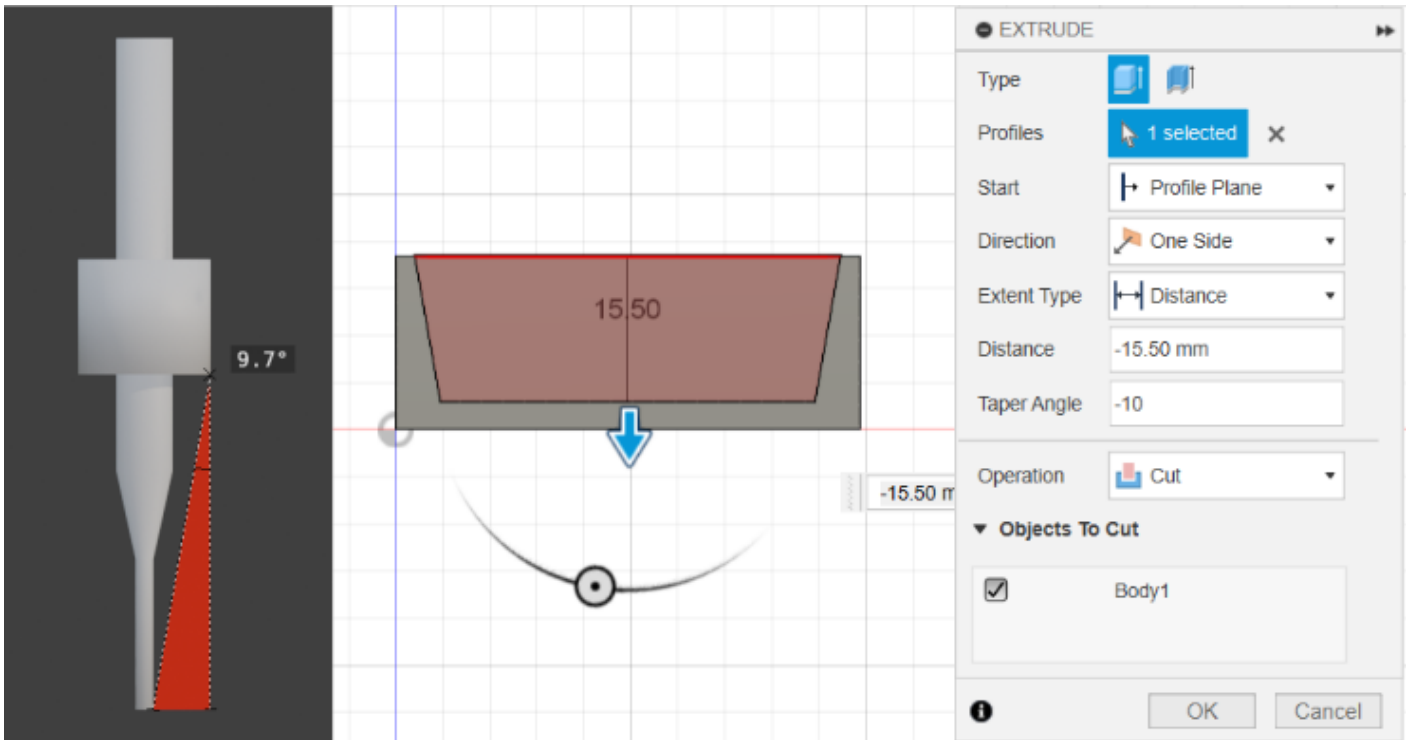


Let's use Fusion 

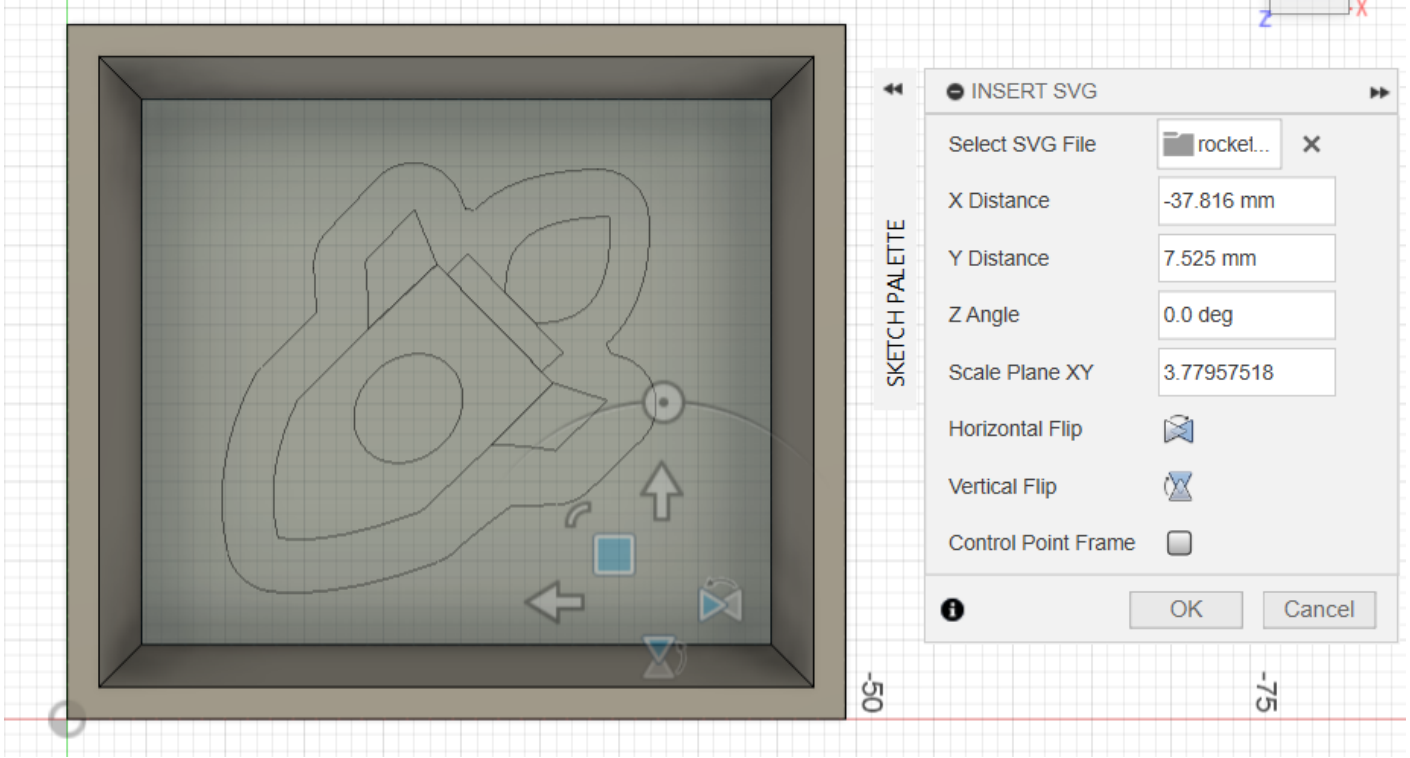
# Fusion

Extrude a box 49,3333 m x 44 m x 18,5

Create a cavity 2mm from the edge, 15,5 mm deep. If you give the sidewalls a 10° draft angle, you won't be able to hit it with the 1mm mill.



Place your svg (imported with the right scale factor of 3,77957518)

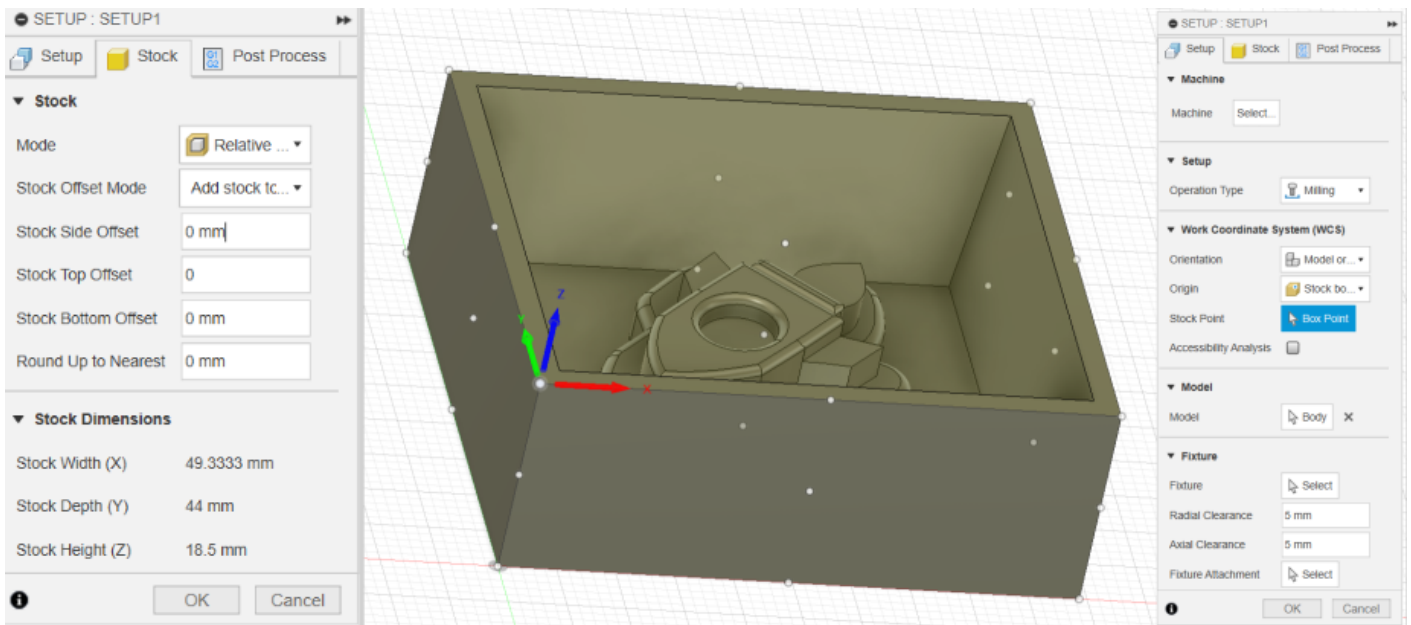


and extrude it.



In the Manufacturing workbench we create a setup, with a stock of 0-offset and the origin bottom-left at the upper corner:





For the roughing I use "Adaptive Clearing" with the following settings:



ADAPTIVE : ADAPTIVE1

▼ Tool

Tool

Select...

#5 - Ø3.175mmr...

Coolant

Flood

▼ Feed & Speed

Preset

Default pres...

Spindle Speed

5000 rpm

Surface Speed

49.8728 m/min

Ramp Spindle Speed

5000 rpm

Cutting Feedrate

1000 mm/min

Feed per Tooth

0.2 mm

Lead-In Feedrate

1000 mm/min

Lead-Out Feedrate

1000 mm/min

Transition Feedrate

1000 mm/min

Ramp Feedrate

333.333 mm/min

Plunge Feedrate

333.333 mm/min

Plunge Feed per Re...

0.0666667 mm

Shaft & Holder

OK

Cancel

ADAPTIVE : ADAPTIVE1

▼ Geometry

Machining Boundary

None

▼ Stock Definition

Define Stock By

Stock bo...

Model

▼ Avoid/Machine Surfaces

View Absolute Values

Surface Groups

Group

Name	Radial	Axial
<div>Model</div>	0 mm	0 mm

+

▼

↑

↓

×

⚙

Total Radial Stock To...

0.5 mm

Total Axial Stock To L...

0.5 mm

OK

Cancel

ADAPTIVE : ADAPTIVE1

▼ Passes

Tolerance

0.1 mm

Machine Shallow Areas

Optimal Load

1.27 mm

Both Ways

Minimum Cutting Radi...

0.3175 mm

Machine Cavities

Use Slot Clearing

Direction

Climb

Maximum Roughing S...

7.9375 mm

Fine Stepdown

0.79375 mm

Flat Area Detection

Minimum Stepdown

0.0001 mm

Minimum Axial Engag...

0 mm

Order by Depth

Order By Area

Stock to Leave

Fillets

OK

Cancel

A 3D visualization of a CNC machining process. The background is a green rectangular block representing the initial workpiece. Overlaid on this are numerous yellow lines representing the tool's path as it moves across the surface. The path is complex, with many sharp turns and loops, indicating a multi-pass machining strategy. Several red, semi-transparent cylindrical shapes are positioned along the path, likely representing the tool's position at specific points in time. The overall effect is a dense, intricate web of yellow lines covering the top and sides of the green block, illustrating the volume of material being removed.

For the finishing I use Parallel:

PARALLEL : PARALLEL1

Tool

Select...

#3 - Ø1mm flat...

Coolant

Disabled

Feed & Speed

Preset

PCB/Carbor...

Spindle Speed

12000 rpm

Surface Speed

37.6991 m/min

Ramp Spindle Speed

12000 rpm

Cutting Feedrate

500 mm/min

Feed per Tooth

0.0208333 mm

Lead-In Feedrate

500 mm/min

Lead-Out Feedrate

500 mm/min

Transition Feedrate

500 mm/min

Ramp Feedrate

333.333 mm/min

Plunge Feedrate

333.333 mm/min

Plunge Feed per Re...

0.0277778 mm

Shaft & Holder

OK

Cancel

PARALLEL : PARALLEL1

Geometry

Machining Boundary

Selection

Machining Boundary...

Select

Closed Chain 1

Tool Containment

Tool cent...

Additional Offset

0 mm

Contact Point Bounc...

Contact Only


Slope

Rest Machining

Model

OK

Cancel



PARALLEL : PARALLEL1

Passes

Tolerance

0.01 mm

Machine Steep Areas

Add Perpendicular Pa...

Simple Ordering

Pass Direction Refere...

Select

Pass Direction

0 deg

Stepover

0.1 mm

Cusp Height

0.07071 mm

Direction

Both w...

Up/Down Milling

Both

Multiple Depths

Stock to Leave

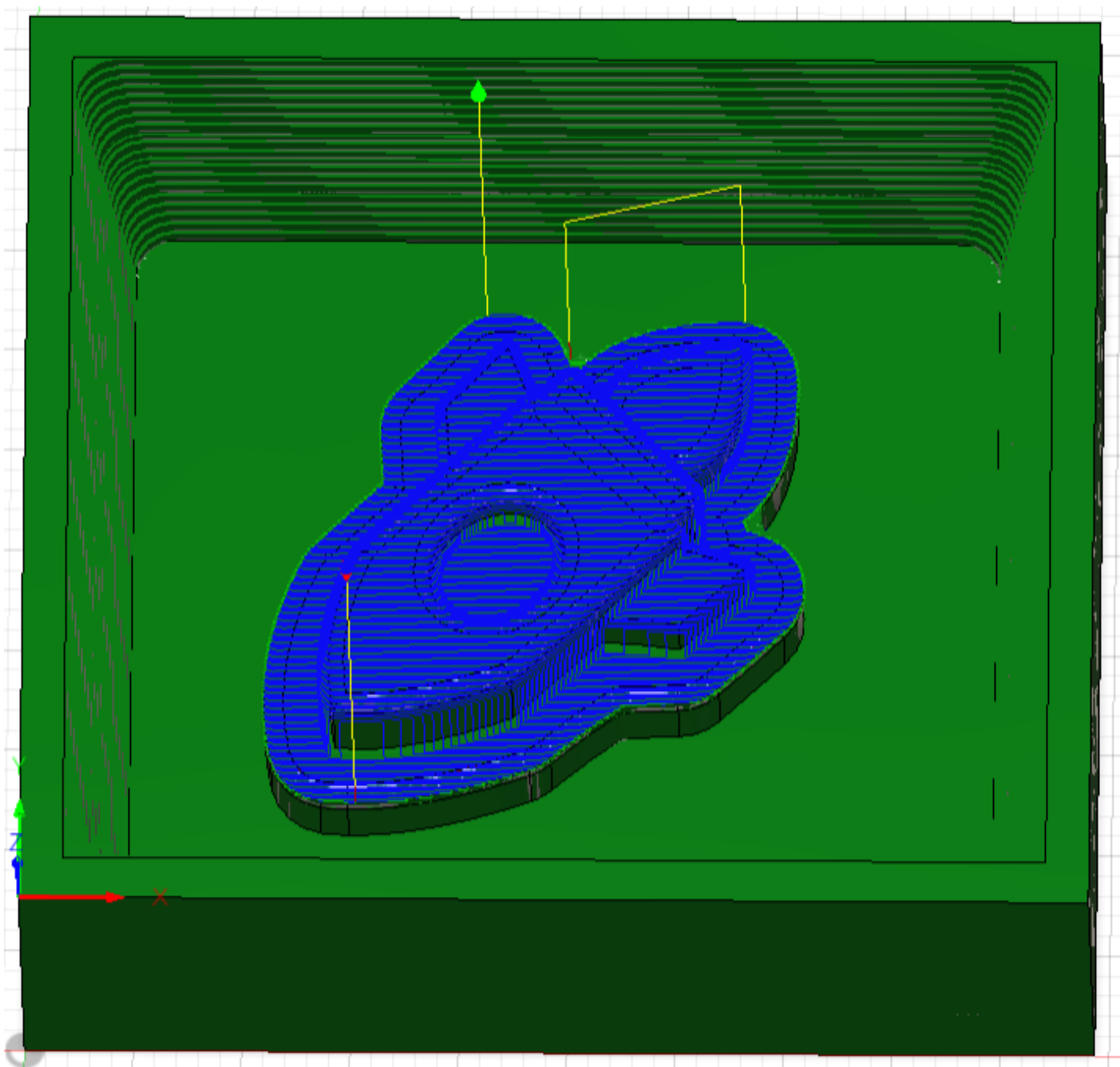
Fillets

Smoothing

Feed Optimization

OK

Cancel



Total time is 23:27

# Materials

## General

- important information
  - pot life: how long do we have between mixing two components together and pouring
  - cure time: how long it takes to harden
  - post cure (but not so important)
  - mix ratio
  - what if someone gets it on their skin/in their eye/mouth
  - what protective equipment is needed?
    - protective mask?
    - fume hood?
    - goggles?
    - long sleeves?

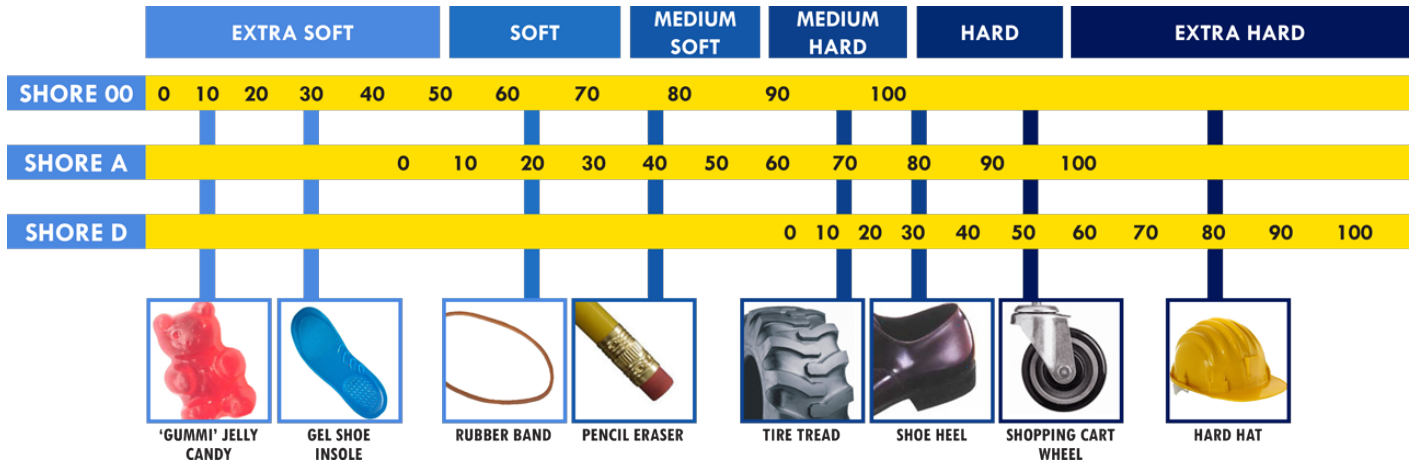
## Specification

Material	Pot Life	Cure time	Mix Ratio	Useful Temp (max)	Useful Temp (min)	Heat Deflection Temp	Shore Hardness
Mold Star 15 SLOW	50 min	4 h	1:1	232 °C	-53 °C	-	15A
Mold Star 30	45 min	6 h	1:1	232 °C	-53 °C	-	30A
Sorta-Clear 37	25 min	4 h	1:1	-	-	-	37 A
Smooth Cast 305	7 min	30 min	1:1	-	-	50 °C	70 D
Smooth Cast 326	7-9 min	60 min	1:1	-	-	50 °C	72 D

## General Info about (Shore Hardness Scale)

- The **Shore 00** Hardness Scale measures rubbers and gels that are *very soft*

- The **Shore A** Hardness Scale measures the hardness of flexible mold rubbers that range in hardness from very soft and flexible, to medium and somewhat flexible, to hard with almost no flexibility at all. *Semi-rigid* plastics can also be measured on the high end of the Shore A Scale
- The **Shore D** Hardness Scale measures the hardness of *hard* rubbers, semi-rigid plastics and hard plastics.



# Safety Information

## Mold Materials

### • **Mold star 15 slow cure**

- safety
- use in properly ventilated area
- Safety glasses, long sleeves and rubber (vinyl only! Latex will inhibit the cure of the rubber) gloves
- store in room temperature (23°C) (warmer reduces shelf life)
- mixing container should have straight edges and flat bottom
- mixing sticks should be flat and stiff
- product has a limited shelf time!

#### IMPORTANT:

- avoid contact with eyes, slight transient irritation possible
- flush with water 15 min and seek medical attention
- remove from skin with waterless hand cleaner, then soap and water

### • **Mold Star 30**

- safety
- same as mold star 15

- **SORTA-Clear 37**

- safety
- same as mold star 15

IMPORTANT:

- use only with adequate ventilation

# Cast Materials

- **Smooth-Cast 326**

- safety
- store in warm environment (23 °C )
- liquids are moisture sensitive and will absorb atmospheric moisture
- mixing container should be clean and made out of metal, glass or plastic
- mixing in a well ventilated area
- safety glass, long sleeves and rubber gloves to minimize containment risk
- test application is recommended!

IMPORTANT:

“ ⚠️ WARNING: Known to the state of CA to cause cancer, birth defects or reproductive harm

- PART A (YELLOW):
- contains diphenyldiisocyanate
- SUSPECTED OF CAUSING CANCER
- vapors can be significant if heated or sprayed may cause lung damage and sensitization
- only use with adequate ventilation!
- contact with eye and skin may cause severe irritation!
- flush eyes with water for 15min and get immediate medical attention
- remove from skin with soap and water
- PART B (BLUE):
- is irritating to the eye and skin
- avoid prolonged or repeated skin contact
- flush eyes with water for 15min and get immediate medical attention
- remove from skin with soap and water

- **Smooth-Cast 305**

- safety
- wear safety glasses, long sleeves and rubber gloves to minimize contamination risk
- only in well-ventilated area

IMPORTANT:

⚠ WARNING: Known to the state of CA to cause cancer, birth defects or reproductive harm

- PART A:
- IRRITATING TO EYES, SKIN & MUCOUS MEMBRANES
- contains Methylene Diphenyl Isocyanate
- SUSPECTED OF CAUSING CANCER
- do not get in eyes and mucous membranes
- do not take internally
- do not breathe fumes
- use only with adequate ventilation
- WEAR CHEMICAL RESISTANT GLOVES AND EYE PROTECTION !!
- PART B:
- not that contaiges
- CAUTION: HOT!!
- GETS HOT WHEN MIXED (100 °C), cool before handling

off the shelf materials:

- **chocolate**
- **candle wax**
- **soap**
- **nougat**

# Chocolate

We have the <https://springlane.de/products/sous-vide-garer-henry-inkl-vakuumierer-und-vakuumiertuten>

