Digital Skills for Joiners

Mastering Software Tools

Handbook 2

Co-funded by
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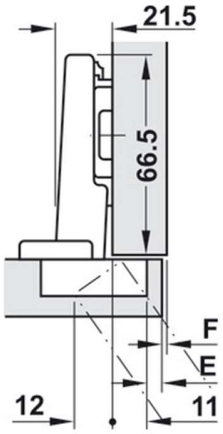
Erasmus+ Project: **Digital Joiner 4.0**

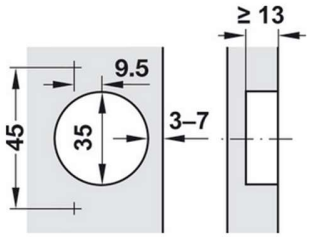
2023-1-DE02-KA220-VET-000154860 Key competences for VET Joiners

Website: digitaljoiner.com

Chapter 1

Häfele Database: Working online





Products\Furniture Fittings\Hinges\Cup Hinge\Blum Clip Top

www.haefele.com

Working steps when searching for a special fitting for furniture.

1.Ergebnisse einschränken/ Restrict results	
2. Blum Topfscharniere/ Blum Cup hinge	Für Holztüren/ For wooden furniture doors
2. Öffnungswinkel/ Angle for cabinet door opening	110° – 110°
3. Montage/ Assembly	Eckanschlag/Corner stop
4. Topfbefestigung/ Pot mounting	Werkzeuglos/Tool-free
5. Bohrbild/ Drilling pattern	45/9,5 mm
6. Komfortfunktion/ Comfort function	Schließautomatik mit Dämpfung Automatic closing with damping

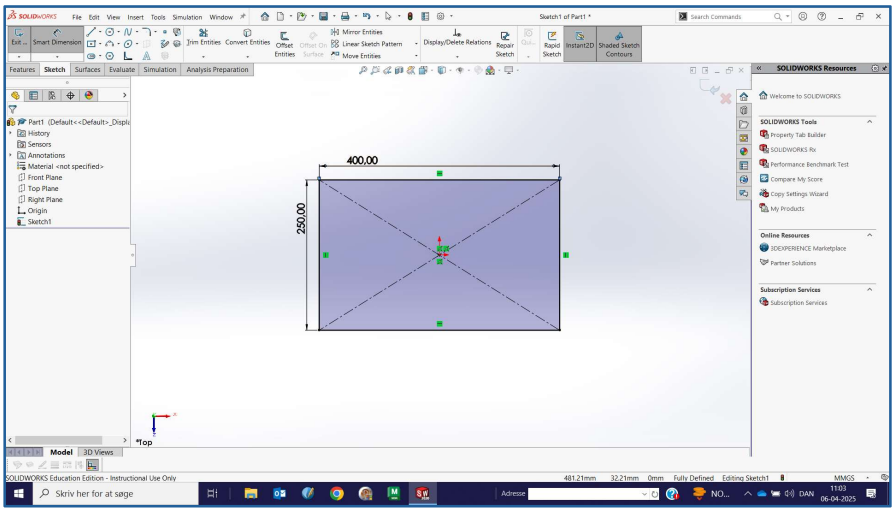
Online video: https://digitaljoiner.com/movies/ --> Online database for fittings

Chapter 2

SolidWorks: Process for creating a board with holes

Sketch

First step is to create a new SKETCH and define the size of our object, 250 x 400 mm, with the SMART DIMENSION tool.



Extrusion

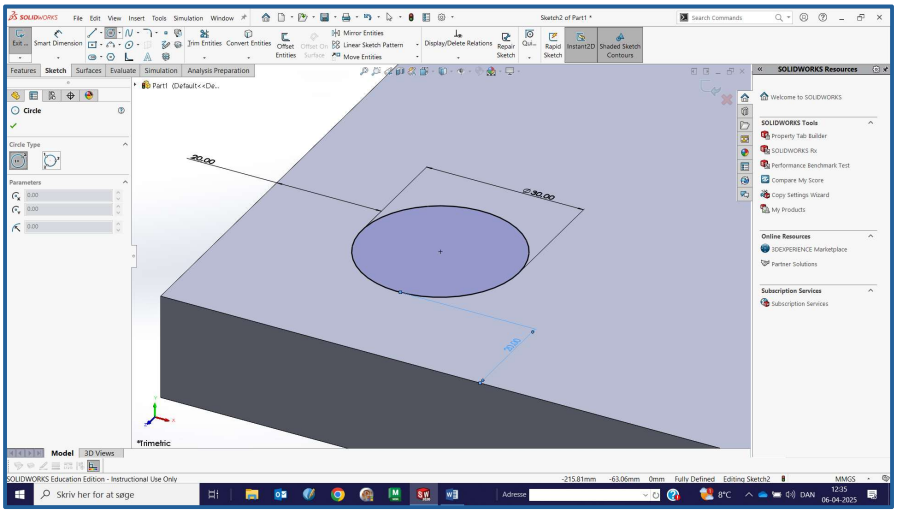
The sketch SKETCH will be extruded into a 3D object with Extruded Bosse/Base function. Thickness reads 20 mm.

Hole

Create a new sketch on top of the 3D object.

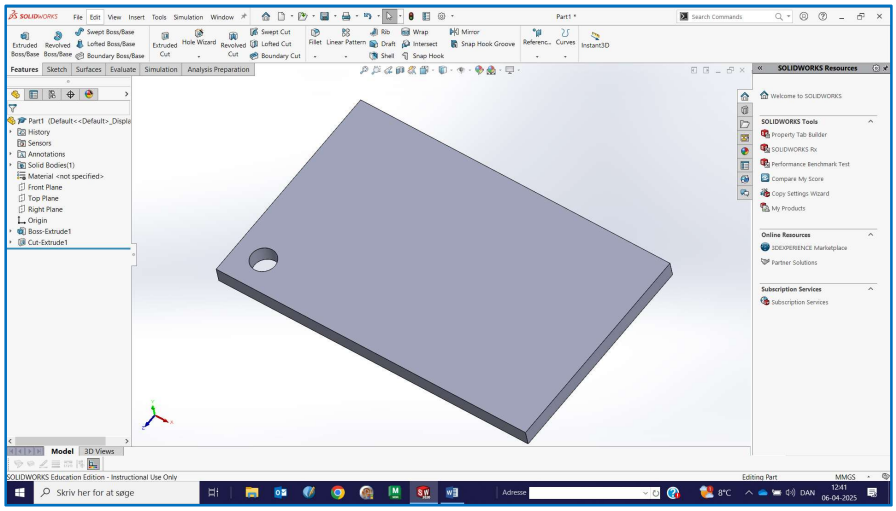
Select CIRCLE tool and draw a circle on the top surface near the corner.

Select SMART DIMENSION, set the measurements in 20 mm in relation to the edges, then set the diameter of the circle to 30 mm.



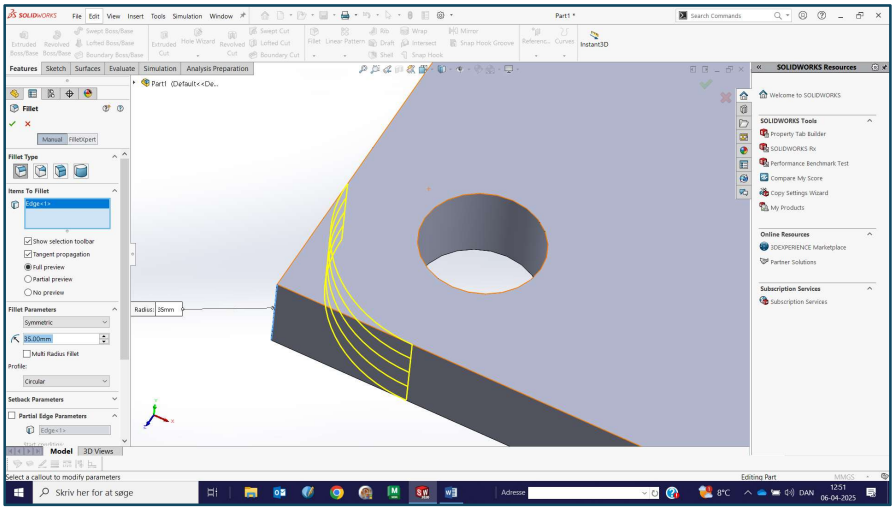
Cutting a Hole

Choose EXTRUDED CUT and cut through the material.



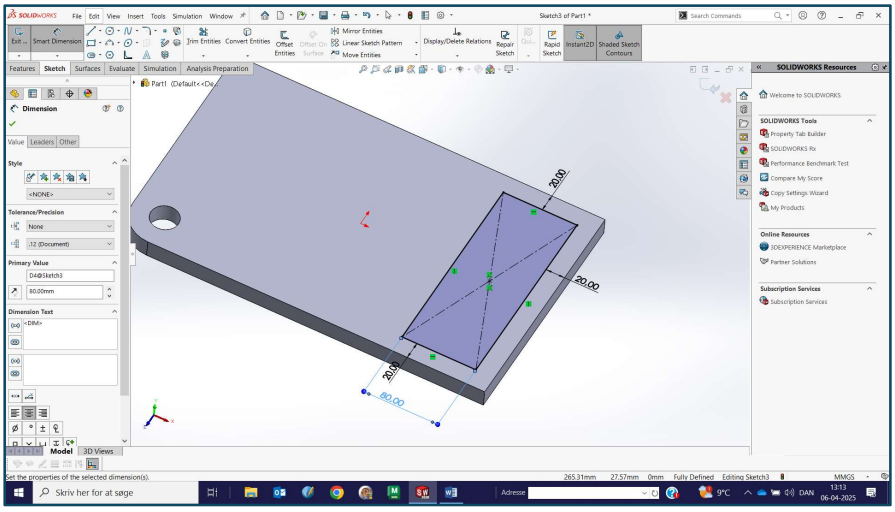
Creating a Round Corner

Select FILLET tool with a 35mm radius and confirm.



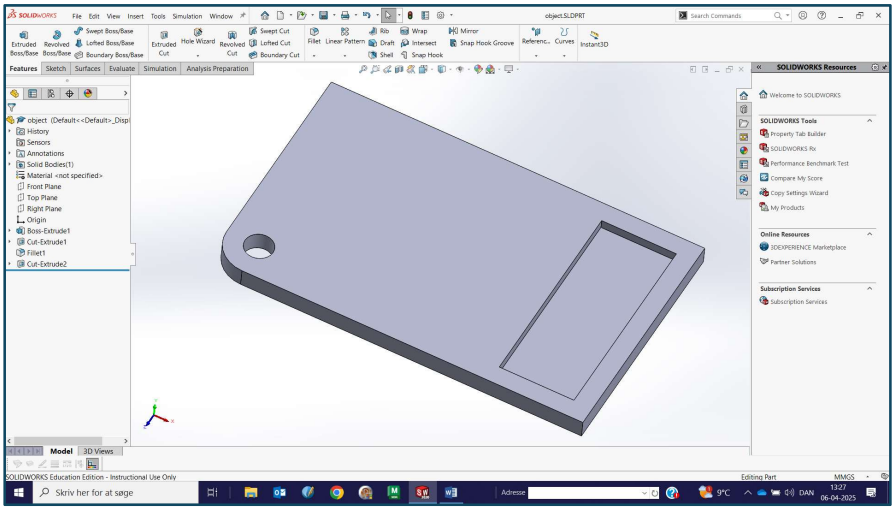
Pocket

Make a sketch with the RECTANGLE tool. Define size 20 mm from each of the three edges on the left side.



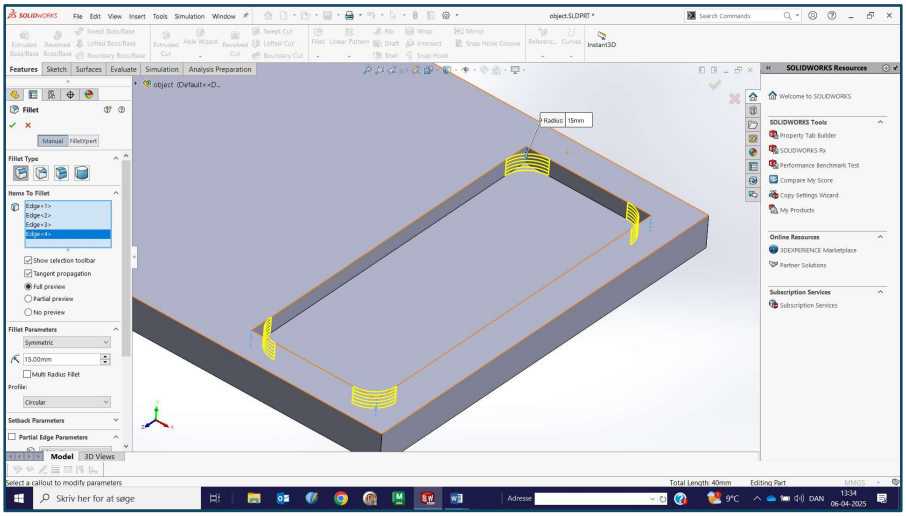
Cutting a Pocket

Use the EXTRUDED CUT tool to make a pocket. Choose a cutting depth 10 mm.



Creating a Rounded Corner

Select tool FILLET Make a curve with a radius of 15 mm

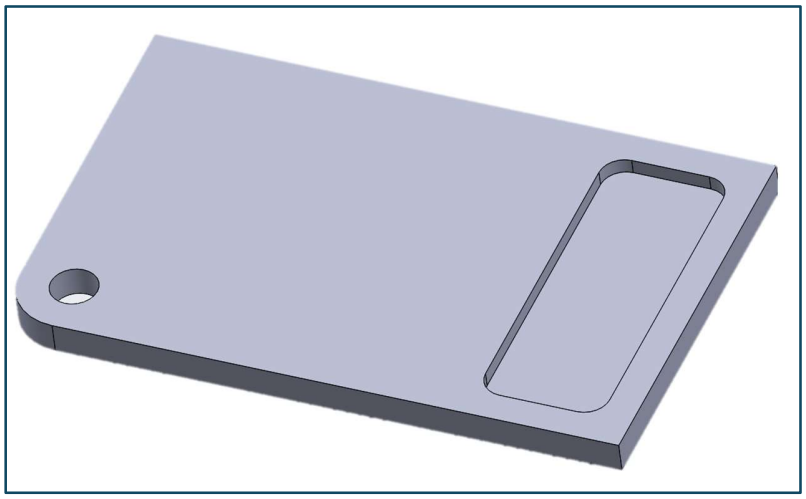


Chapter 3

Alphacam

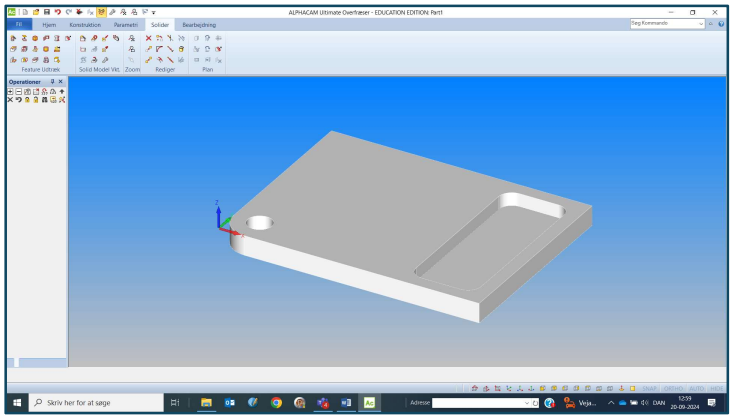
3D object for Alphacam

The 3D object created in SolidWorks is ready to be transferred to the Alphacam CAM program.



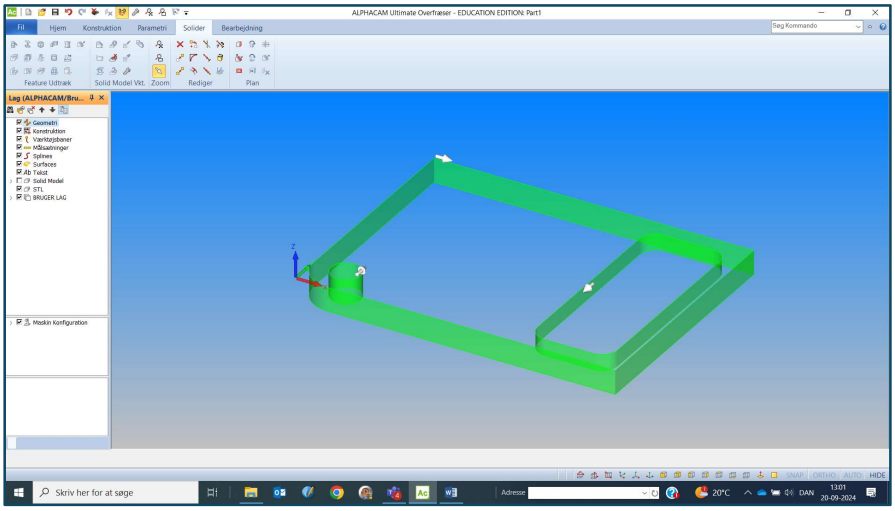
Importing object with Alphacam

The model is placed correctly in relation to the coordinate system.



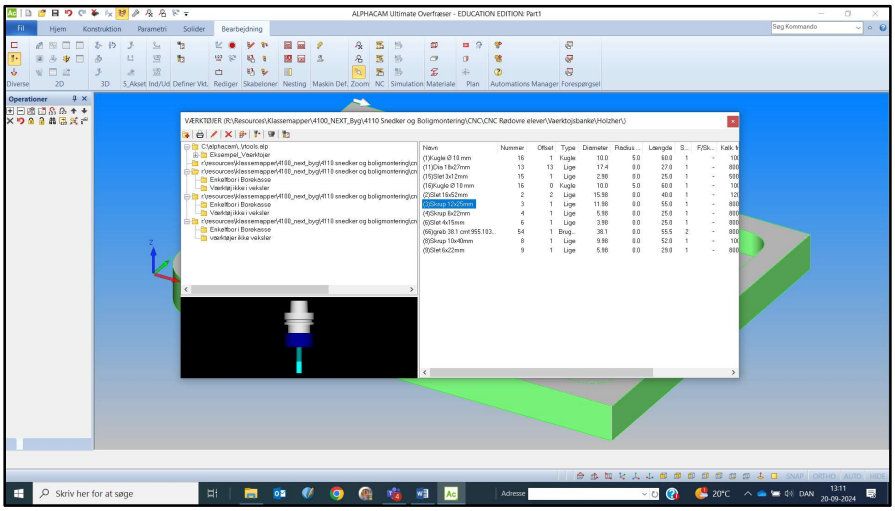
Extraction of geometry

Geometry is extracted from the model (green band).



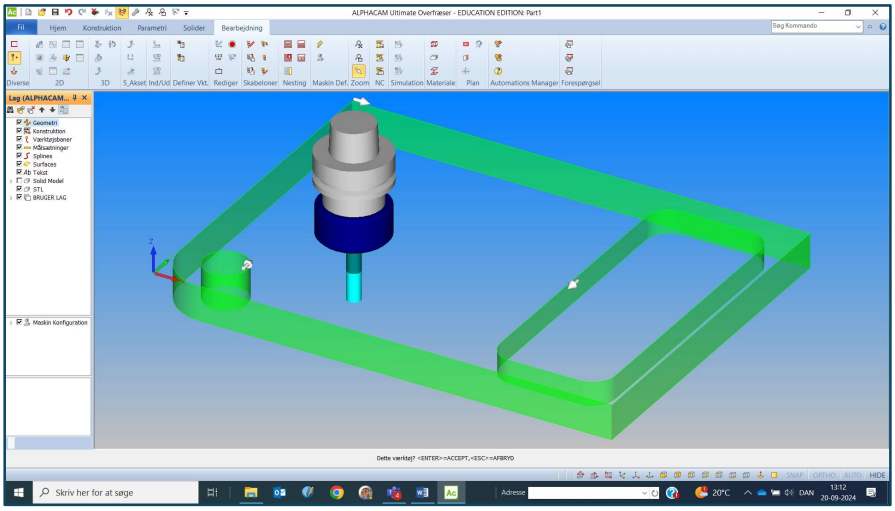
Tools

Suitable tools are selected for milling



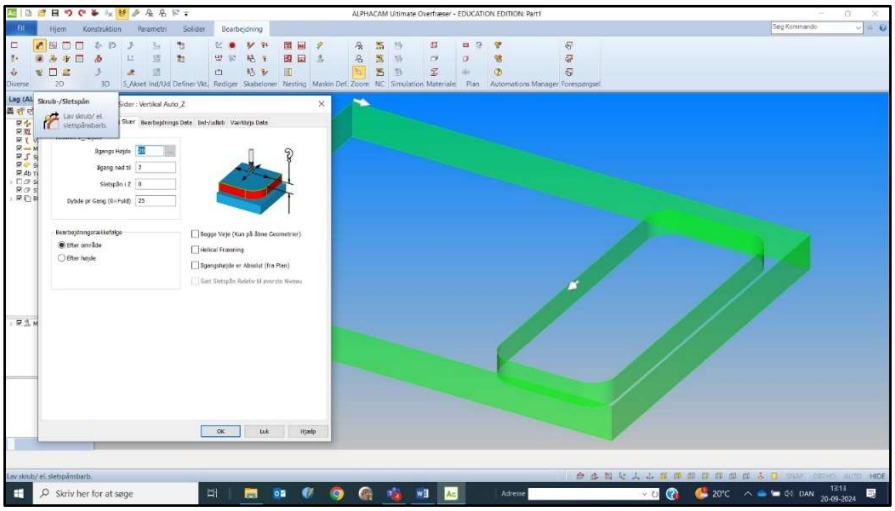
Application of the Router Tool

The tool is placed in the milling area.



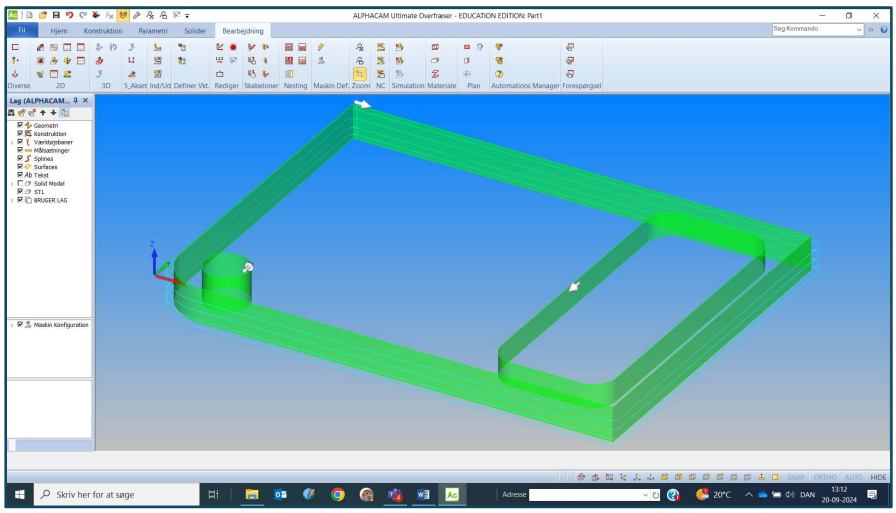
Milling settings

Certain settings are made in relation to the requirements of the machine and milling.



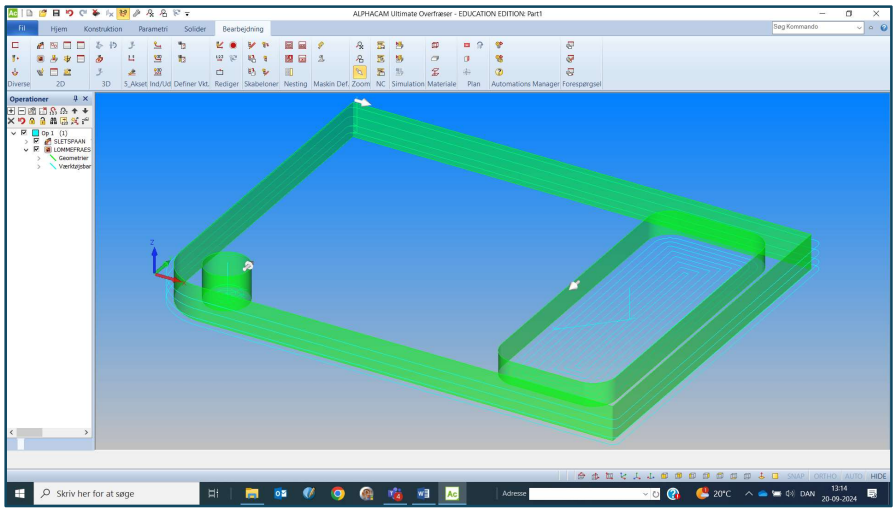
Cutting Path Calculation

The program calculates and lays out milling paths corresponding to the input and geometry.



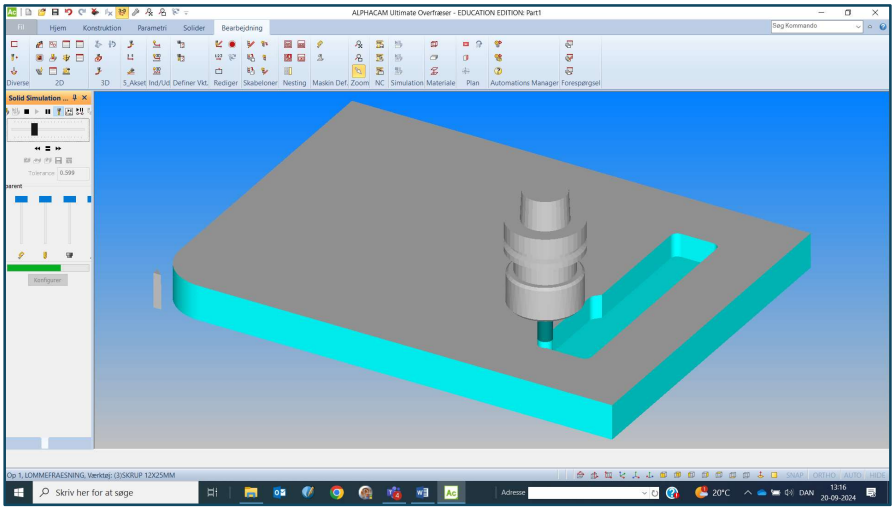
Pocket Milling

Other types of machining can be added, such as pocket milling.



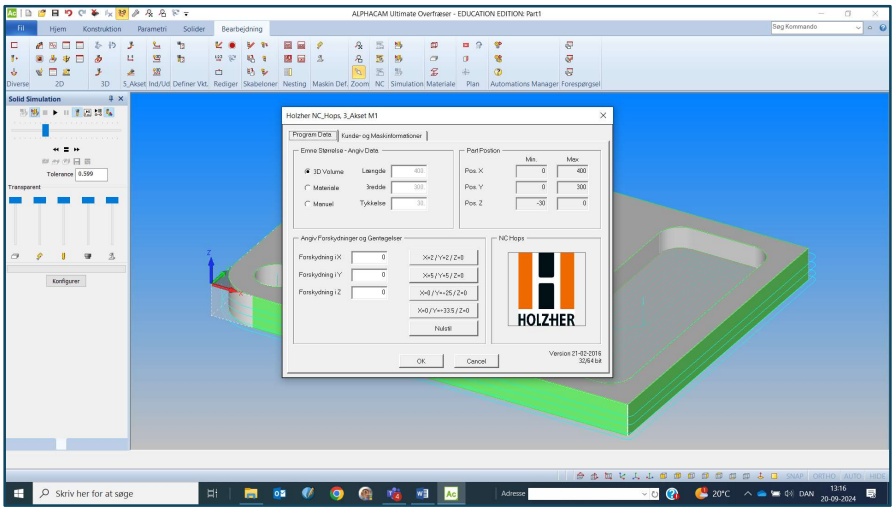
Simulation

To be sure of what you have programmed, you can also simulate the milling.



Posting NC Code/G Code

Finally, you post the program itself, or save the NC code as the same as G-codes.



Chapter 4

AutoCad 2024 – 2025

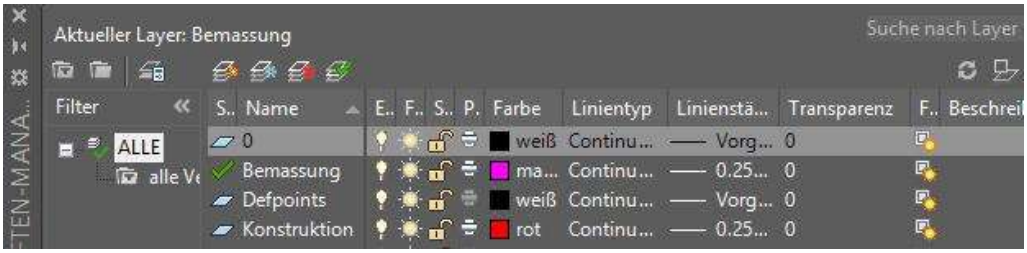
Tasten: ESC Canceling current commands.

F8 Horizontal or vertical lines on/off

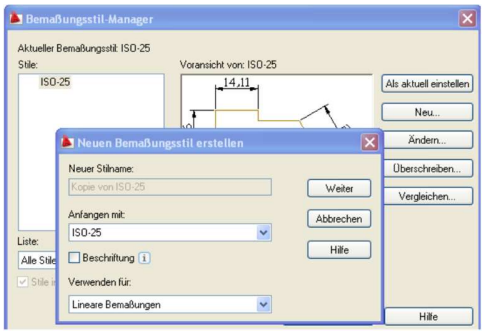
Strg + a , + c , + v , +p , + z …

Overview:

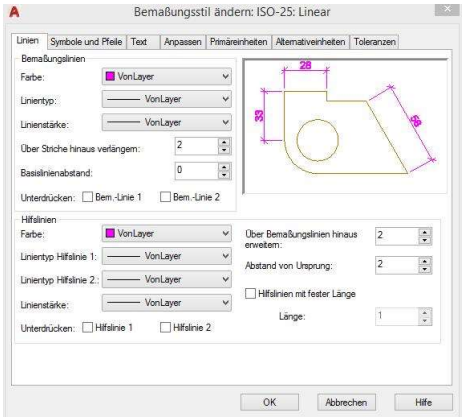
1. Creation of layers to define line types in the drawing: Format
   → Layer → New : designation, color, line type, line thickness.



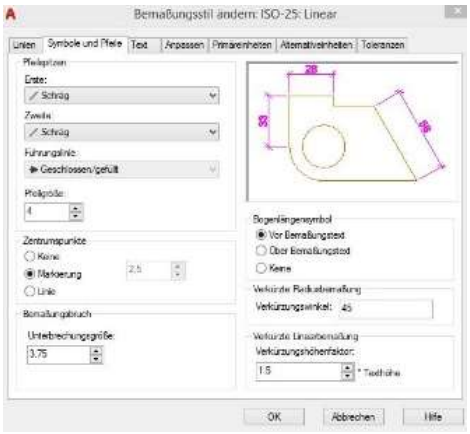
2. **Set up dimensioning style for linear dimensioning** : format → style of measurement → **ISO-25** marking (blue background) → Use for → linear measuring → Button : New



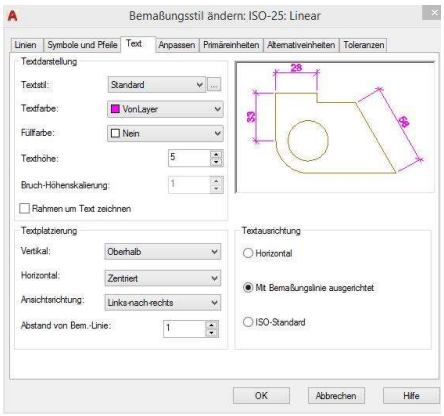
3. **First setting Lines**



4. **Symbols and arrows**



5. **Text**



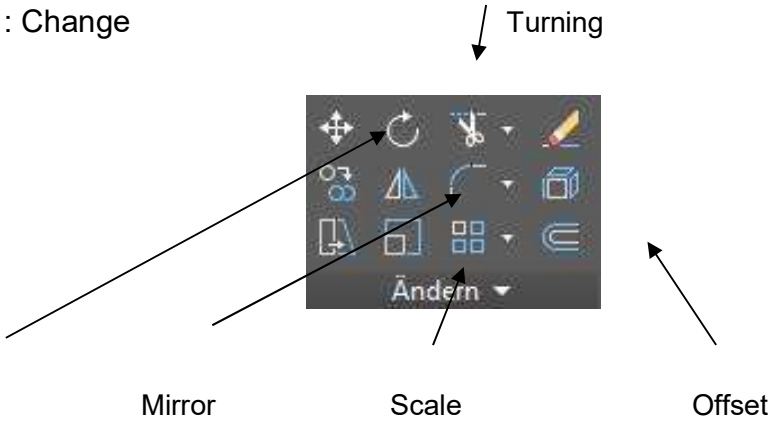
6. **Fitting**

Global scaling factor 1.

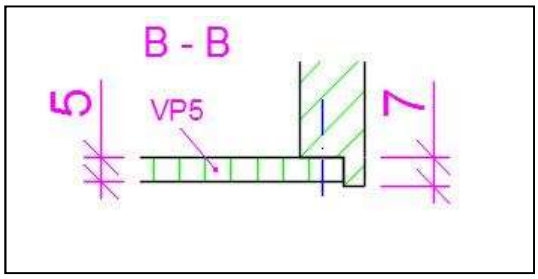
Only change for drawings on a scale e.g. 1 : 10, 1 : 50…

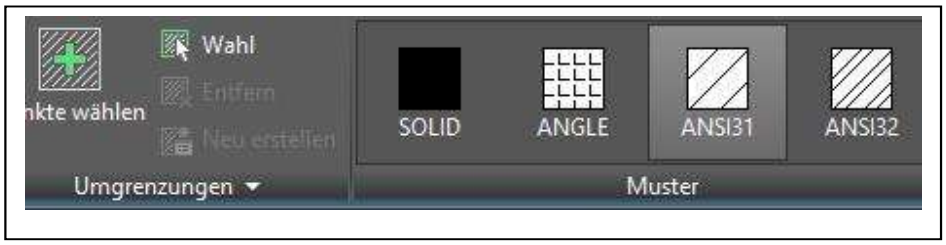
7. **Fourth setting**: **Primäreinheiten** : Primary units : Set accuracy to 0

8. **Toolbox** : Change



9. **Hatching of areas**
   Example hatching: Tool

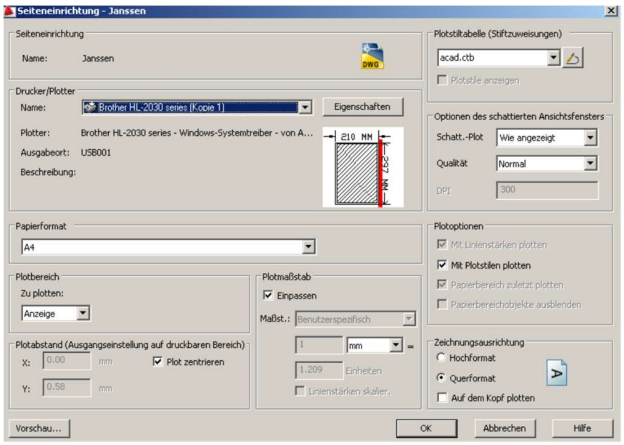




10. **Set up for printing/plotting**

File → Page Setup Manager → Set name → z.B. A4 Hoch →

Set plotter → z.B. Plotter W13 → Set paper format → Assign plot style table → **MONOCROME.CTB** → Hook on PASS IN and PLOT DISTRIBUTION

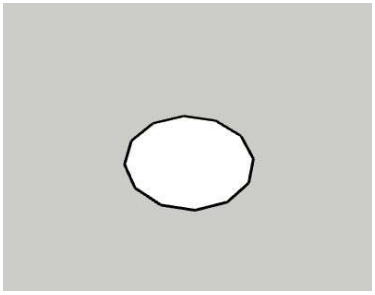


Chapter 5

SKETCHUP

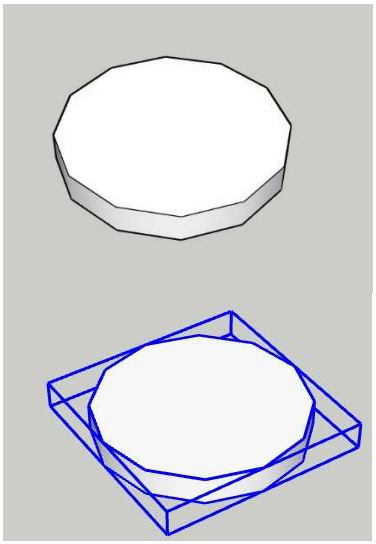
Creating a 3D model in the sketchup program

1. Create a circle using the arc tool: 



   a. Clck to create the center of the circle.
   b. Press TAB key = (in the lower right corner, the distance entry is activated) and enter 30 mm – Enter – a line is created.
   c. Move the mouse = Create a circle (enter 360) the angle of the arc creates a circle.

2. Drag the circle up in the Z axis by 25 mm. 



   a. Click, drag and move up
   b. TAB - enter height (25 mm). Press enter.

3. Select the object and Group. 

   a. Black arrow tool – select objects.
   b. Right mouse button on the object – create Group.

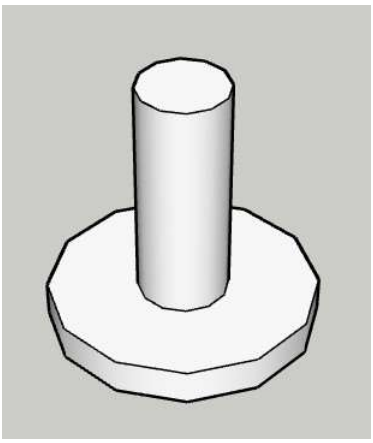
4. Create a second circle smaller than the center of the previous circle.

   a. Click on the area where the center of the circle should be positioned.

   b. Press TAB key = (in the lower right corner, the distance writing is activated) and enter 10mm – Press Enter – a line will be created.

   c. Move the mouse to create a circle (enter 360) and the angle of the arc creates a circle – Press Enter.

5. Drag the circle up the Z axis, 50 mm.



   a. Click, drag and move the circle upwards.

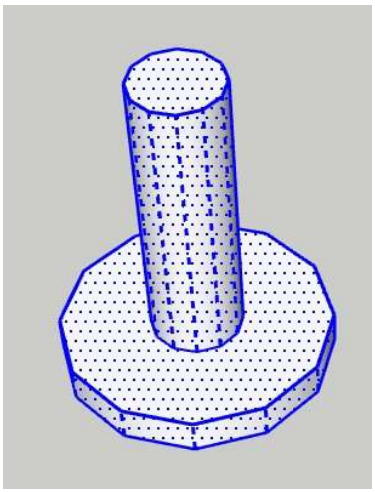
   b. TAB – Enter a height of 50mm and press Enter.

6. Creating a group

   a. Black arrow tool – select  objects.

   b. Right mouse button on an object – create group.

7. Breaking the object – to prepare for the 3D model 



   a. Black arrow tool – select both objects.

   b. Right mouse button on the objects – break

8. Create a group

   a. Black arrow tool – select objects.

   b. Right mouse button on the object – create group.

   c. The whole object is one group = both cylinders will be printed together and connected.

9. Download from Warehouse – plugin – solid inspector 2 to Sketchup.

10. Check curves

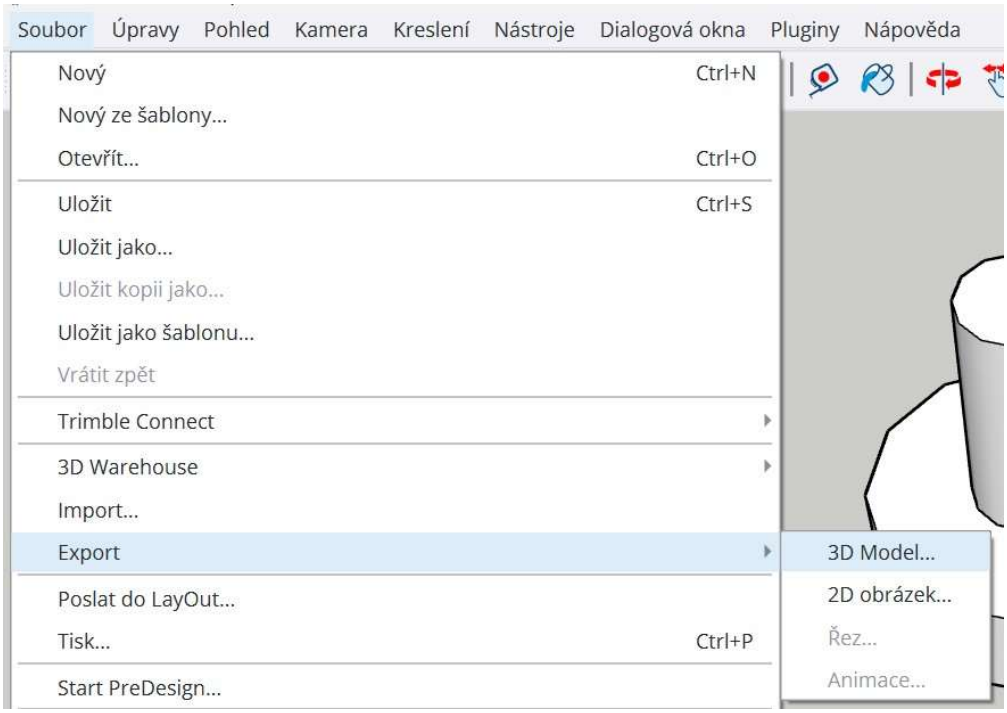
   a. Select the model.

   b. Click on the solid inspector. 

   c. If it reports an error – select Fix.

11. Export to STL format.

a. File – export – 3D - .STL



The model is ready to be inserted into a program that works with a 3D printer (slicer), we use PrusaSlicer.

Open the program, click on the cube and find the program (model) that I created

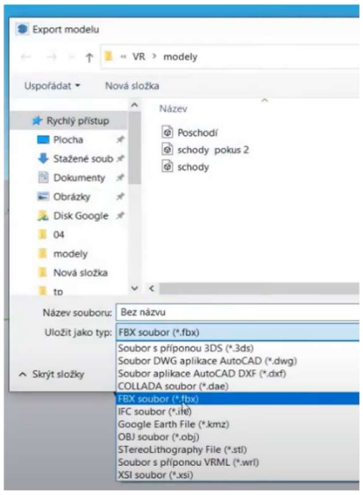
- Place the model on the base, it must be orange.
- In the upper right corner set the type of plastic used for printing.
- Select the structure from which the model will be made (percentage of filling).
- Save the program and copy an SD card.
- Insert the SD card in the 3D printer, start the program and wait for it to print.

Chapter 6

Virtual Goggles: 3D Modelling

1) Check the model in the 3D modeling program. Correct mapping, direction of normals and scales.

2) Export in standardized formats FBX, OBJ, 3DS. Possibly a format supported by the Unity engine. Photo 1



3) Project settings in Unity. Import Oculus/Meta SDK package for Oculus Quest glasses support. Switch the target device to Android.

4) Import the 3D model into Unity (Drag and drop method). Possibility of adjusting the scale, recalculating normals, creating unwrap mapping for calculating baked shadows.

5) Create a scene. Set up scene lighting, adjust materials and environment. For static scenes, calculate baked light. Insert a „prefab camera“ from the Oculus/Meta package.

Photo 1

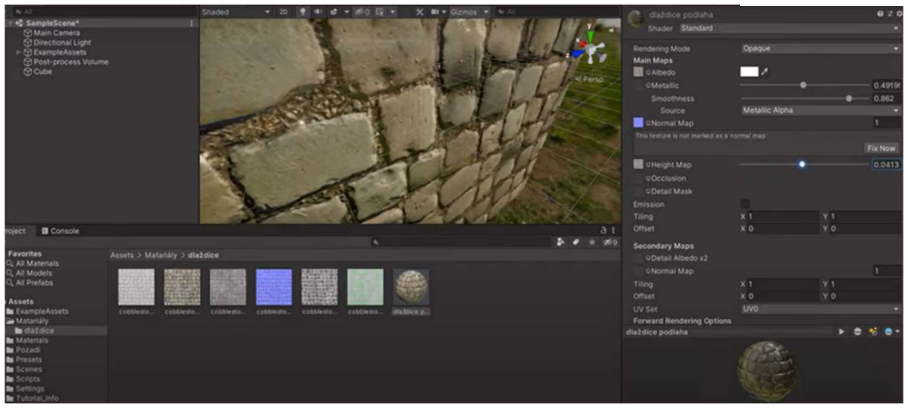


Photo 2 – environment in unity where new material is created.

6) Export the application in Unity as an *.apk* file.

7) Download the application for installing *.apk* applications into the glasses. For example, the SideQuest application. Then install the created *.apk* file using the application.

8) Launch the application in the glasses. It is usually found in applications from unknown sources.

Chapter 7

WOODWOP 8

Defining the Object and Placement

The three main axes X, Y, and Z are perpendicular to each other.

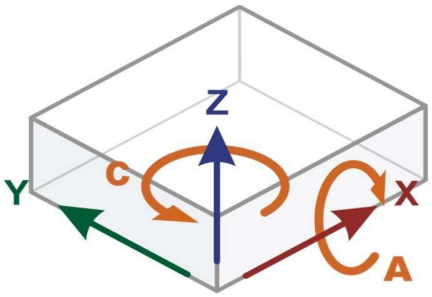
Z-Axis: runs perpendicular to the clamping surface of the workpiece. The positive direction runs from the workpiece to the tool.

X-Axis: runs horizontally and is parallel to the clamping surface of the workpiece. The direction runs from the view from the machine front edge to the right/left.

Y-Axis: is determined by the right-handed coordinate system.

Rotations around the coordinate axes:

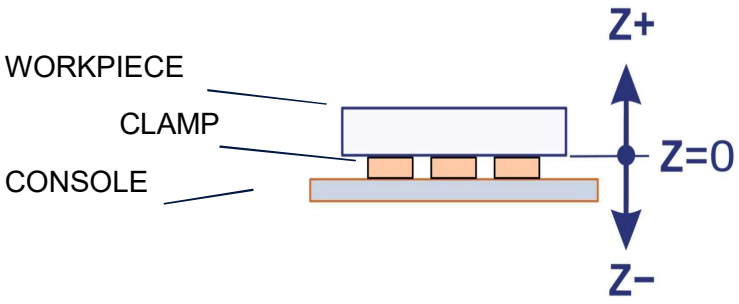
Rotation A: Rotation around the X-axis
Rotation C: Rotation around the Z-ax



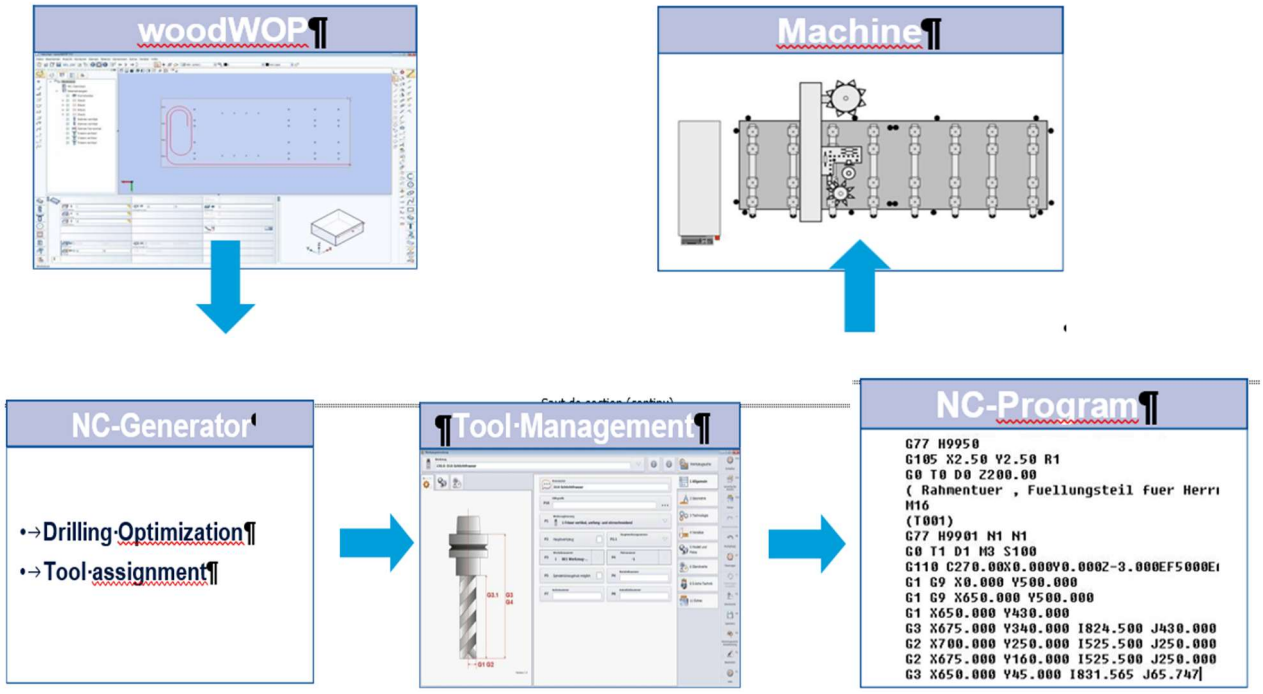
Z-Position

- Workpiece bottom or top of the clamping device corresponds to **Z =**
- Tools that reach negative Z-measures can enter the area of the clamping devices (e.g., vacuum cups).

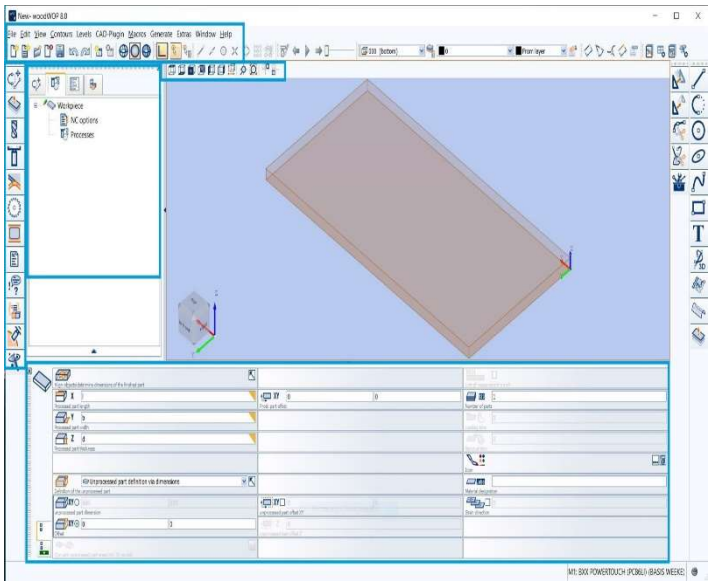
The clamping devices are damaged if they are in the tool's milling/drilling path.



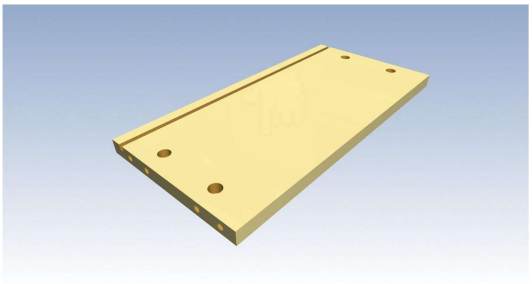
Transfer for Operation

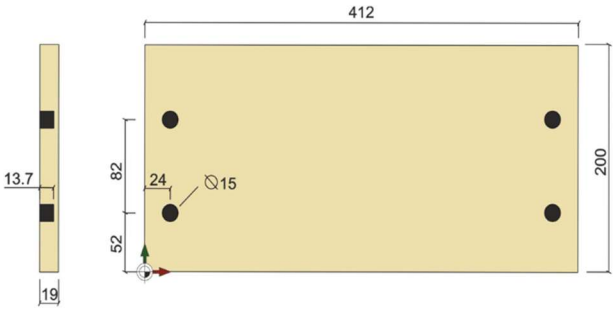


1 Menu- and Toolbar
2 View options workpiece
3 Tool boxes
4 Editor field for contours, macros and variables
(e.g. drilling, starting points)
5 Technologie settings
(e.g. depth, toolno.)
6 Workpiece view



Program Creation: Step-by-step

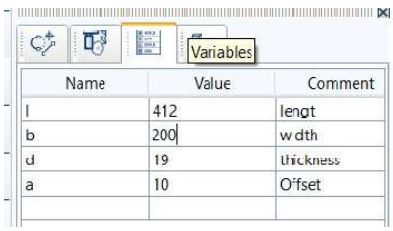




Definition of workpiece:

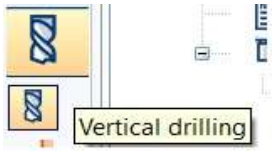
The workpiece macro will be created automatically at the beginning of the macro list. The dimensions of the workpiece and any offsets are entered in macro dialog box.

If you want the program to include variables (e.g. length,width…), they must be defined in the variable table.



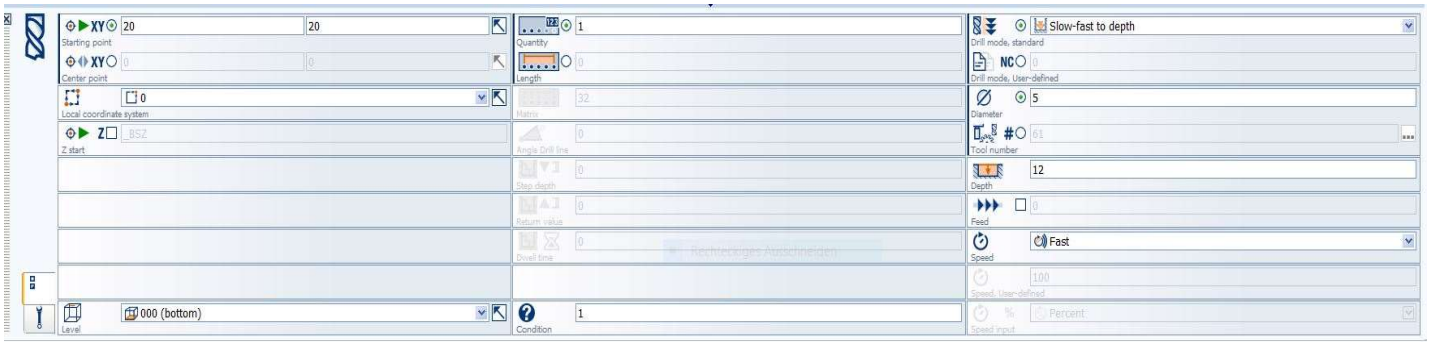
Vertical Drilling

This macro is used to program vertical holes and hole series



All programmed dimensions always refer to the workpiece zero point.
This means that finished part dimensions are always programmed.

The parameters are managed in the window below:
Fill in the values for position, hole series and process technology

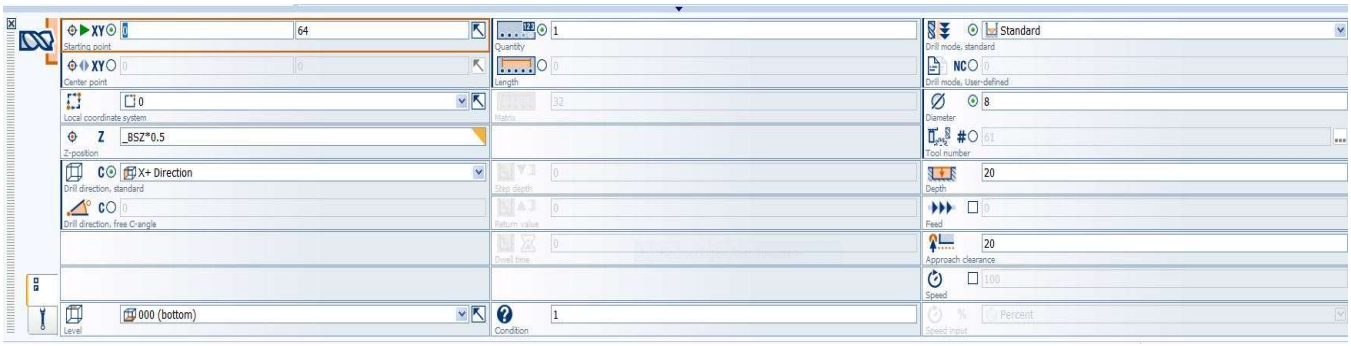


Horizontal Drilling

This macro is used to program horizontal holes and hole series

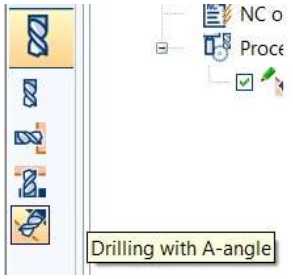
The parameters are managed in the window below:

Fill in the values for position, hole series and process technology



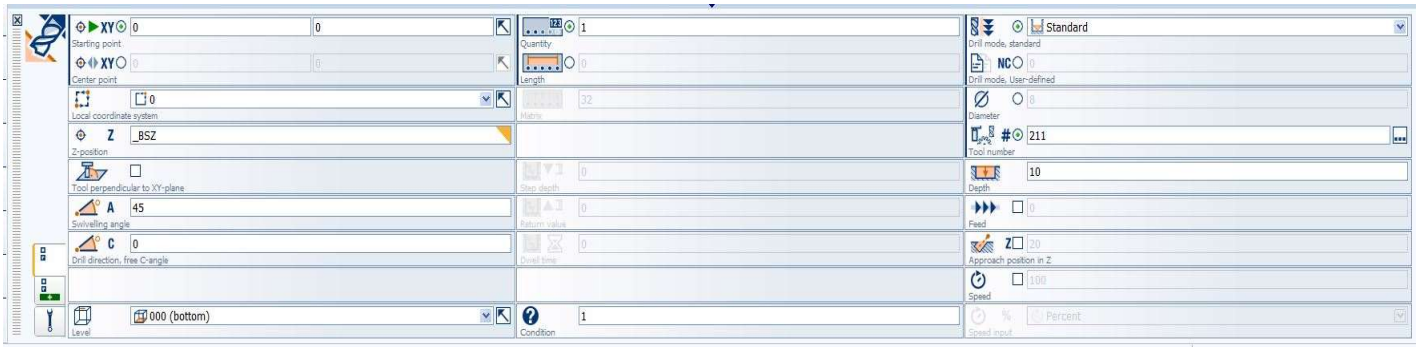
Drilling with angle

This macro is used to program horizontal holes that are executed under an A angle



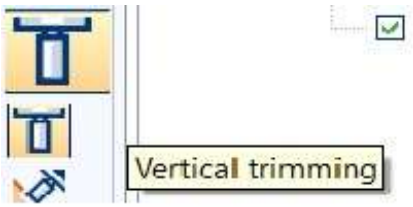
The parameters are managed in the window below:

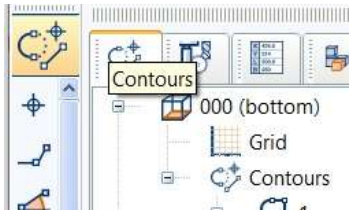
Fill in the values for position, A - angle and process technology - *check with "view options" if you choose the right angle!*



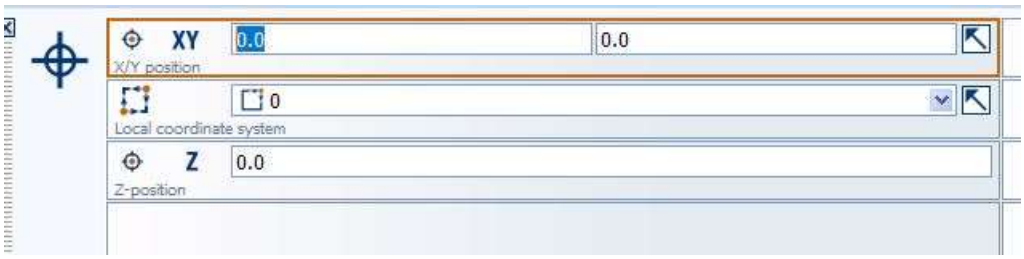
Vertical Trimming

This macro is used to define vertical trimming processes on contour elements





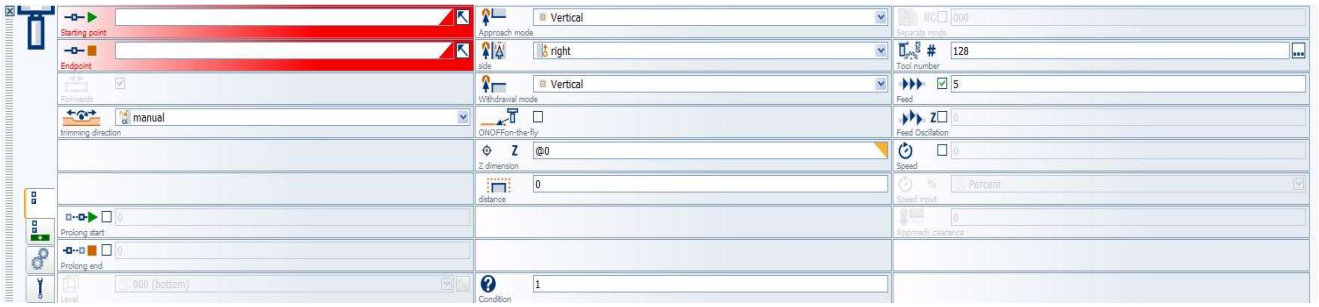
Before you can trim a contour, you have to create a geometry for contours The toolbar on the left contains various geometric construction commands that can be used with personal dimensions.



The parameters are managed in four sets:

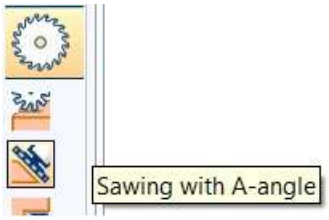
- Contour and process technology
- Advanced process technology
- Drive parameters
- Additional parameters

‘



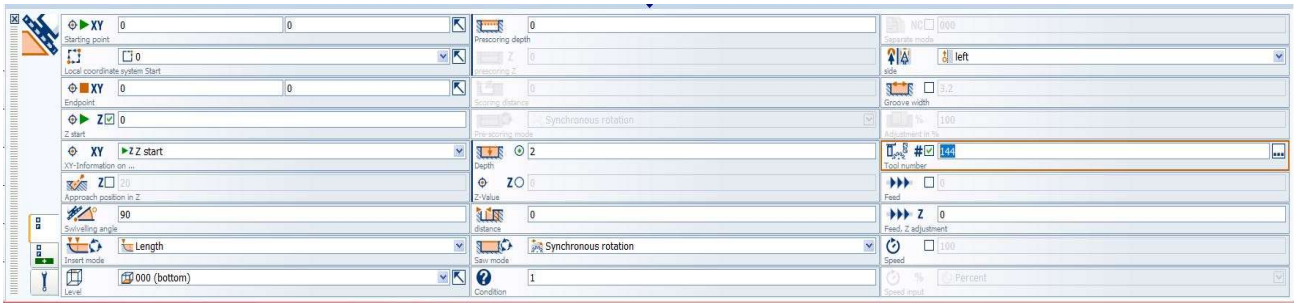
Sawing with A-angle

This macro is used to program swivelled saw cuts (e.g. miter cuts)



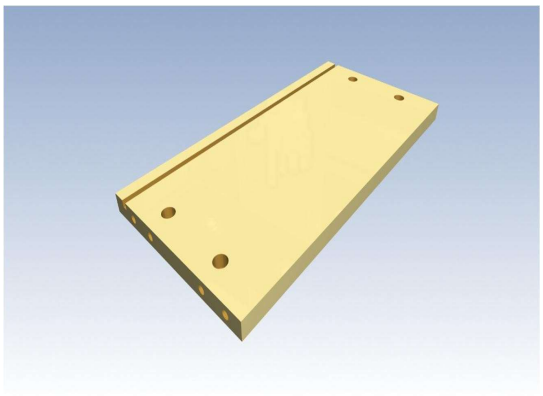
The parameters are managed in the window below:

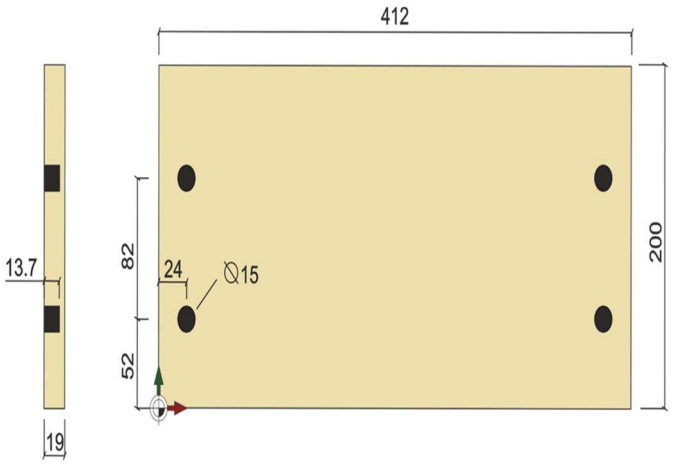
Fill in the values for position, A - angle and process technology - *check with “view options” if you choose the right angle!*



Step-by-step program creation

Exercise 1

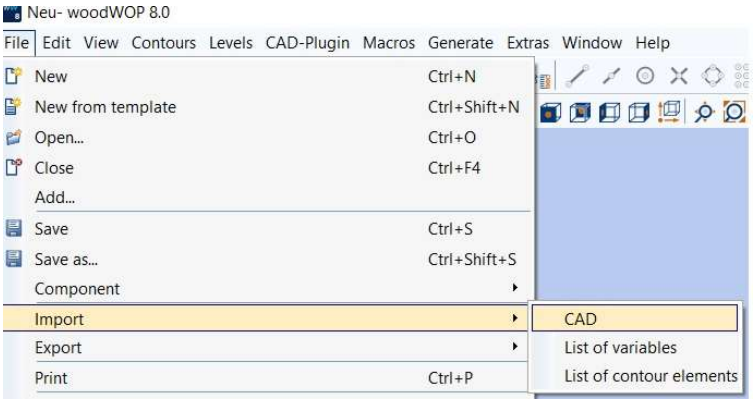




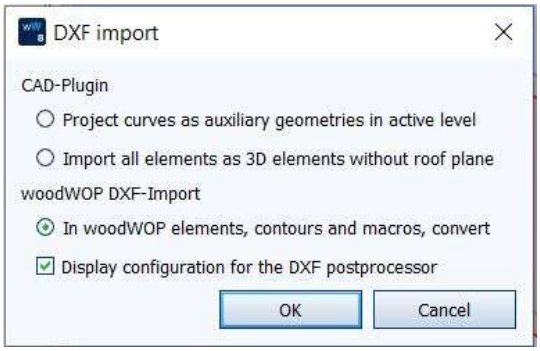
Create a program for the shown workpiece
Add 8mm as “Offset”
Trim this shelf with a router bit, tool no. **128**
save your program

CAD/CAM Transfer:

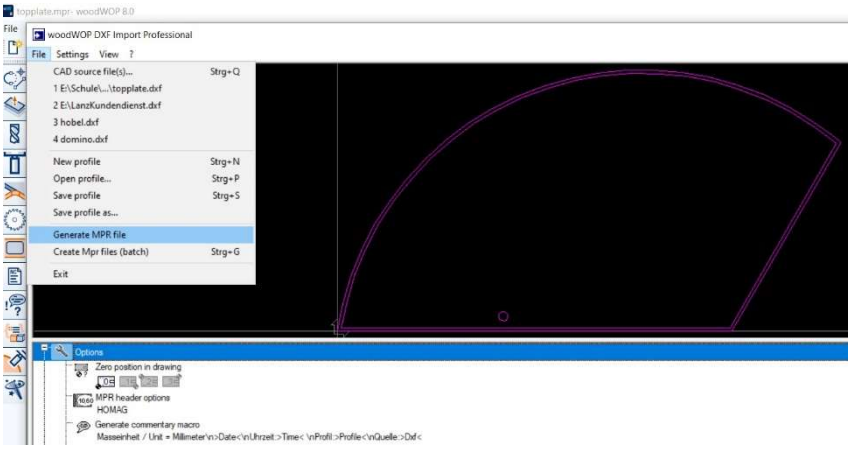
The DXF import uses a conversion profile to convert CAD elements such as lines, circles, etc. into woodWOP macros. The prerequisite for this is that these elements are on correctly named drawing layers.



Choose “Import” and “CAD” a select the file you want to transfer.

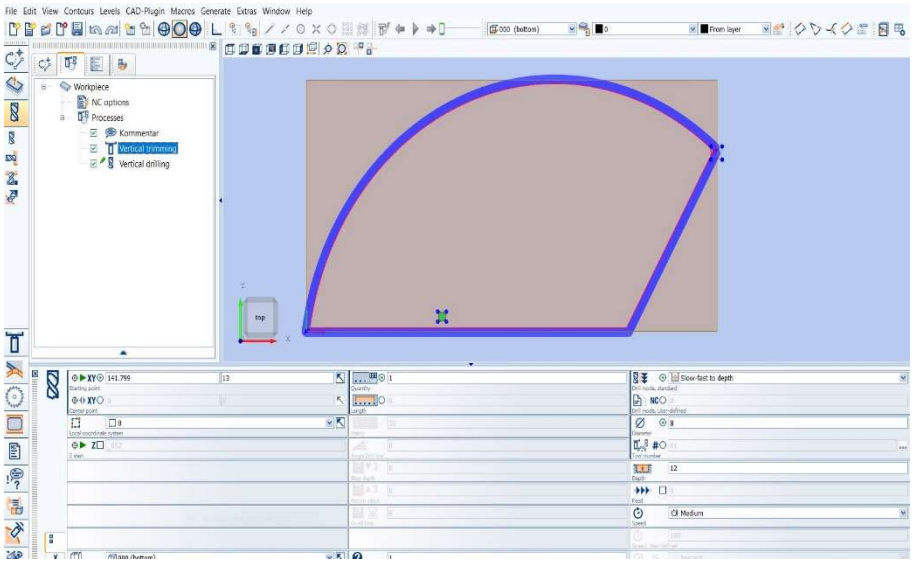


Be sure that all the layer names in your CAD are according to the defaults from HOMAG



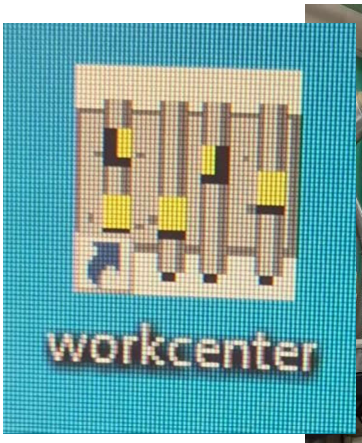
Generate a WoodWOP program (mpr file).

Customize your parameters fort he transferred macros(e.g. speed, tool no.)



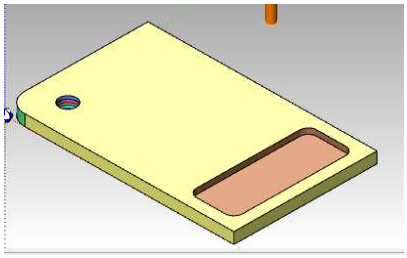
Chapter 8

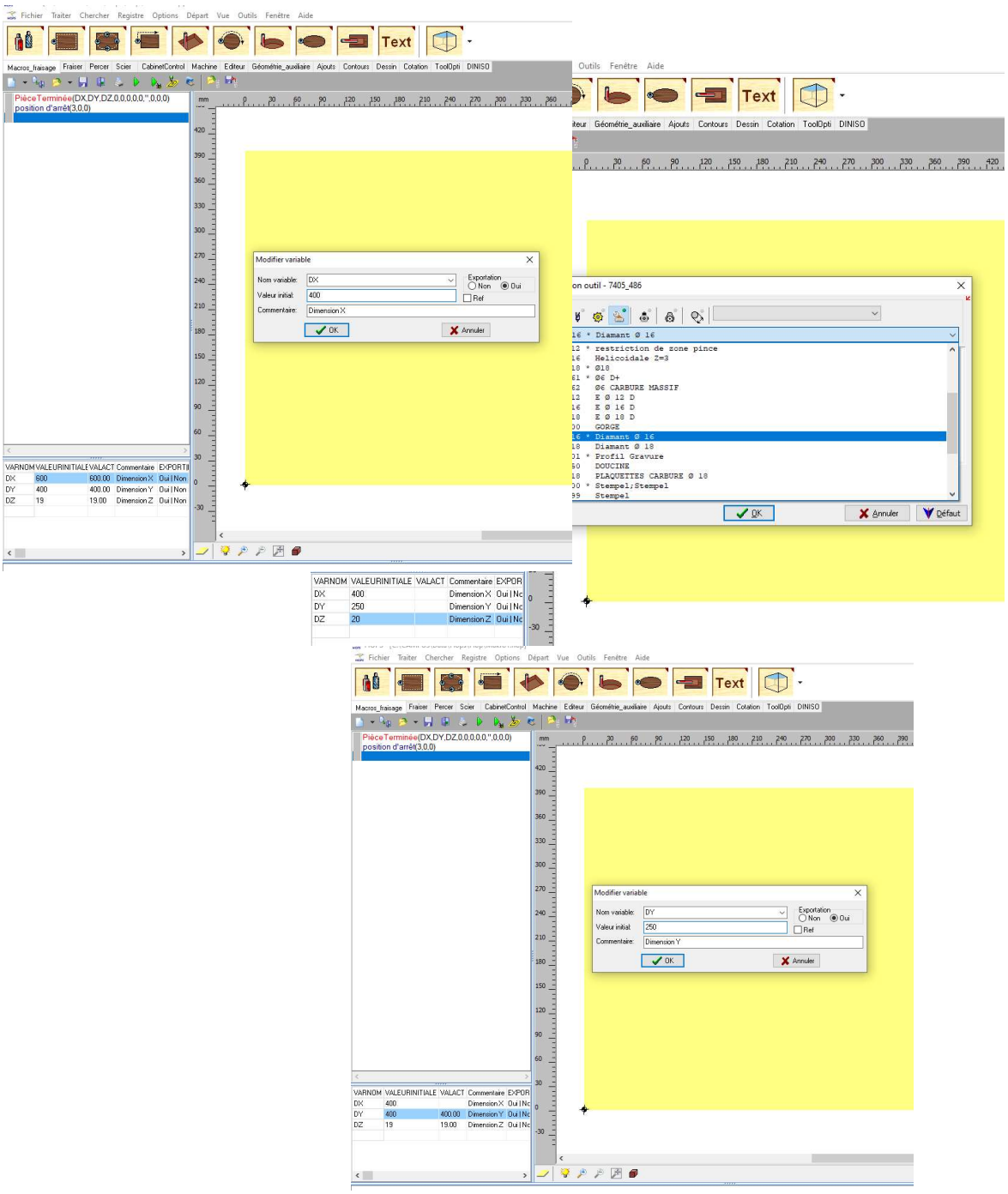
WORKCENTER CAM: Programming for Holzer CNC



The final piece will have a round corner, a hole and a pocket with rounded corners.

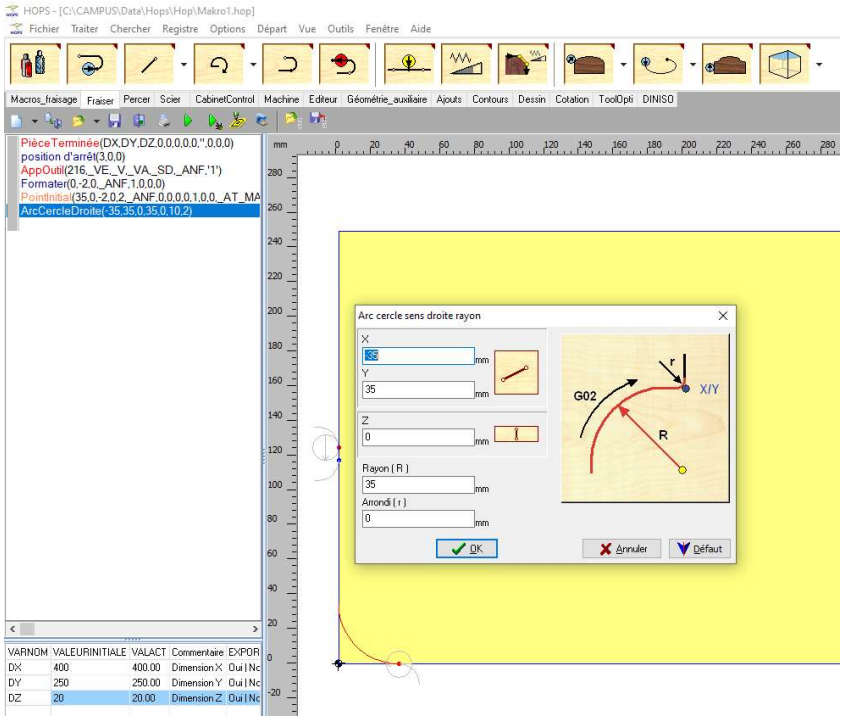
First give the final size from the piece you want to make: Length, width, and thickness.





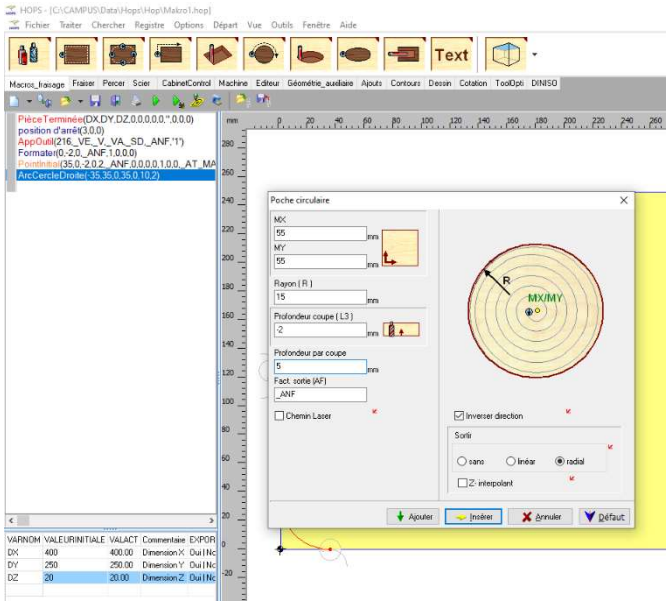
Then choose the tool to make the outside form.

For the round corner you give the begin point, the rounded corner and the end point.

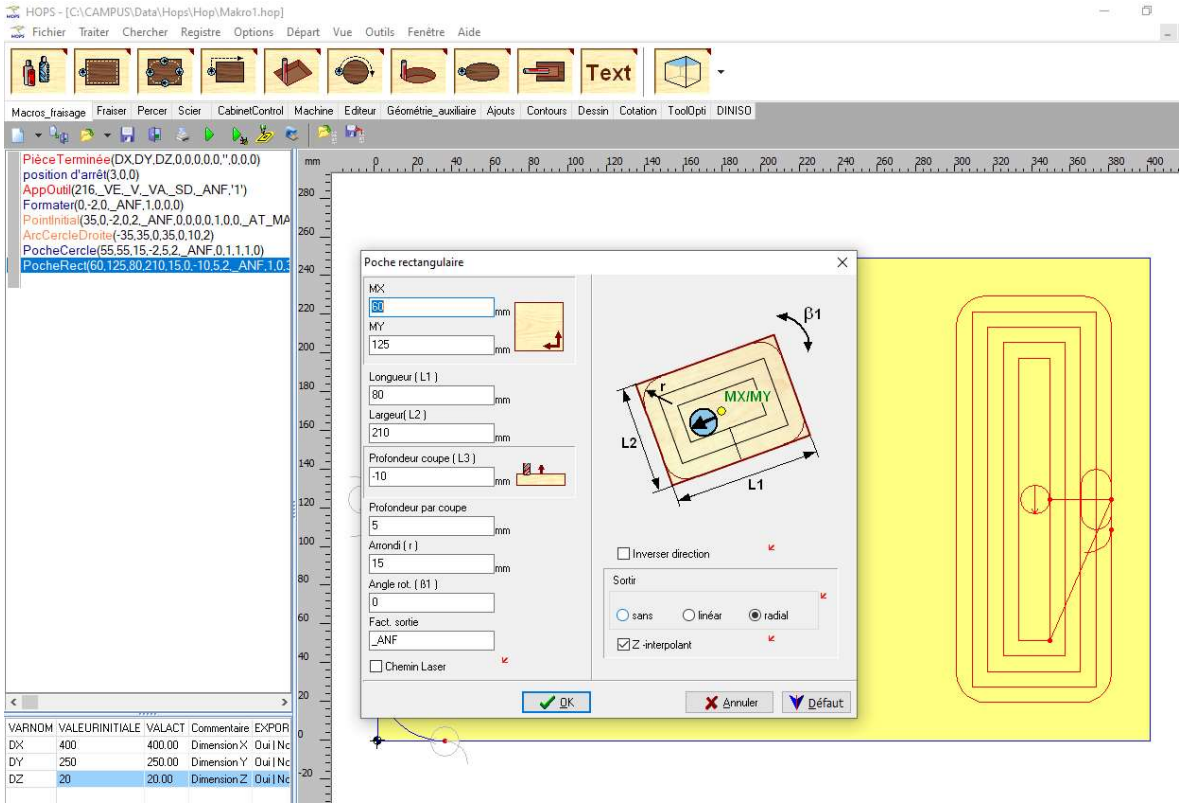


For the hole you take the rounded pocket .

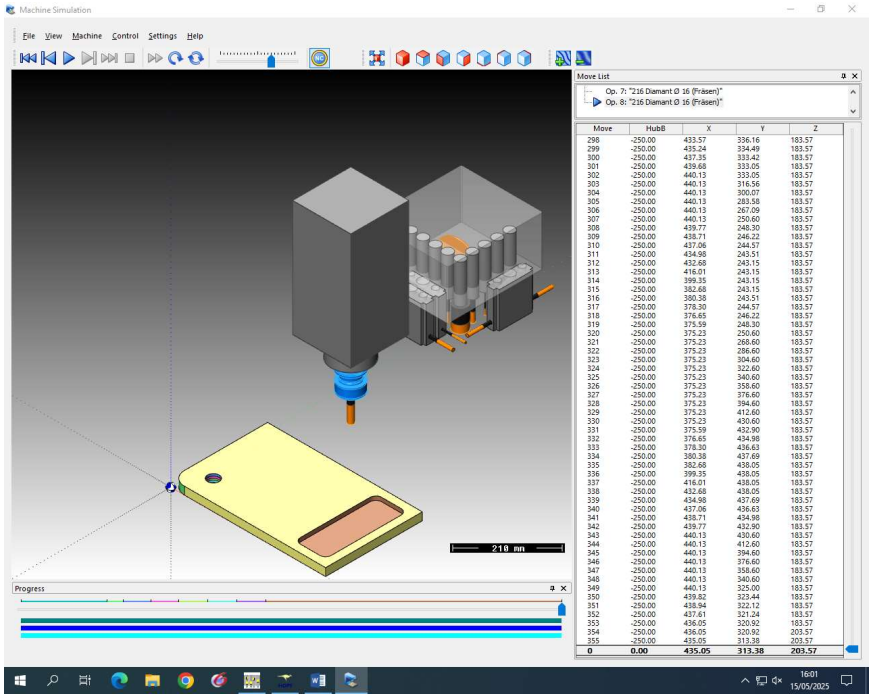
Give the center measurement, the radius and the deepness.



And for the square pocket you give the center measurement, the size (length, width, deepness and the corner radius).

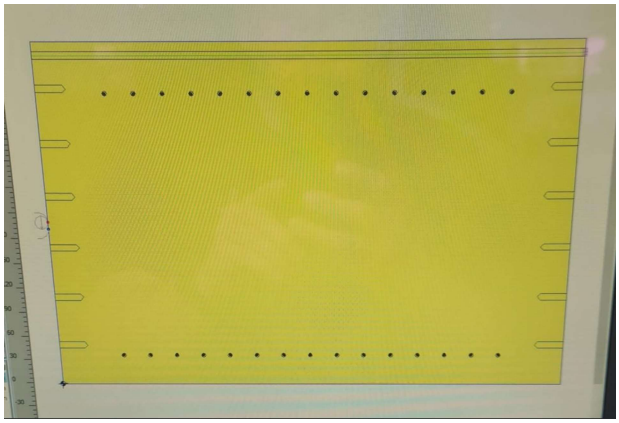


To control you can simulate the result.

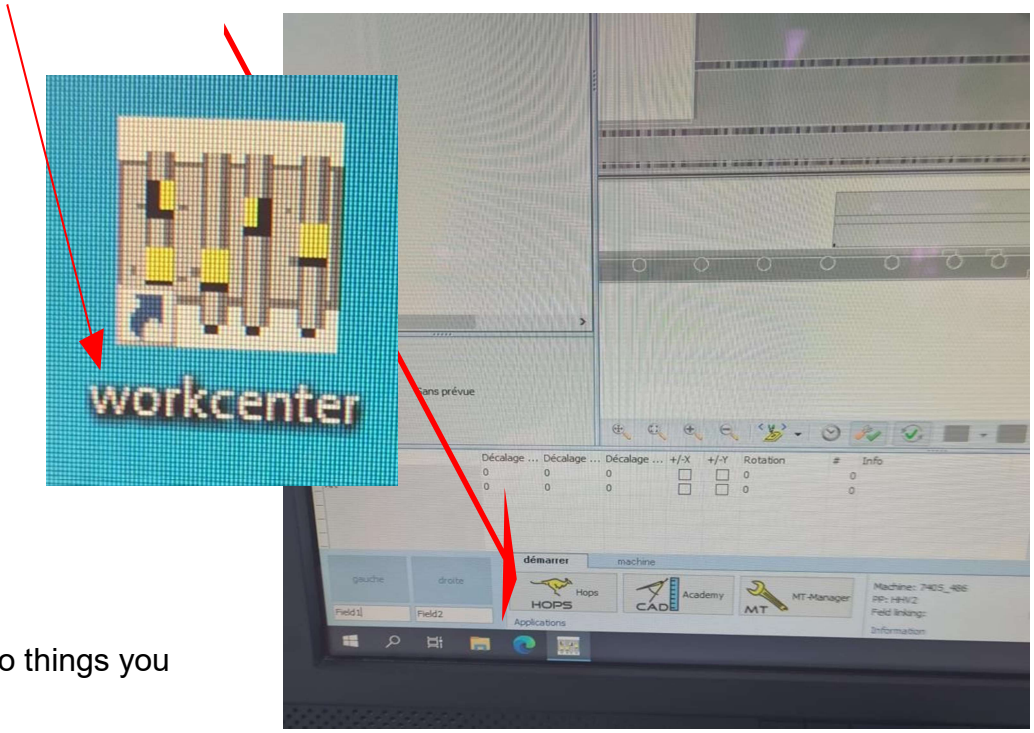


Exercice:

- This will be our finish piece with:
- Dowel holes on the edge
- 32 system drilling holes on the face
- A 8x10 mm groove on the back side of the piece

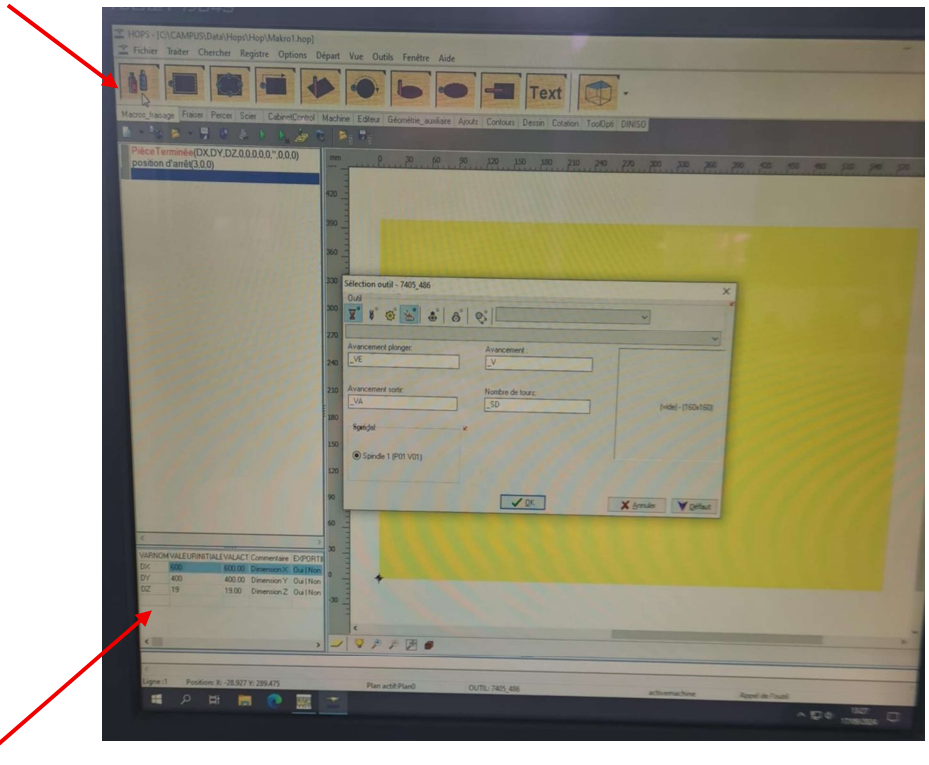


First, we open WorkCentre and then HOPS program which is the part of the hardware for programming the CNC manually.



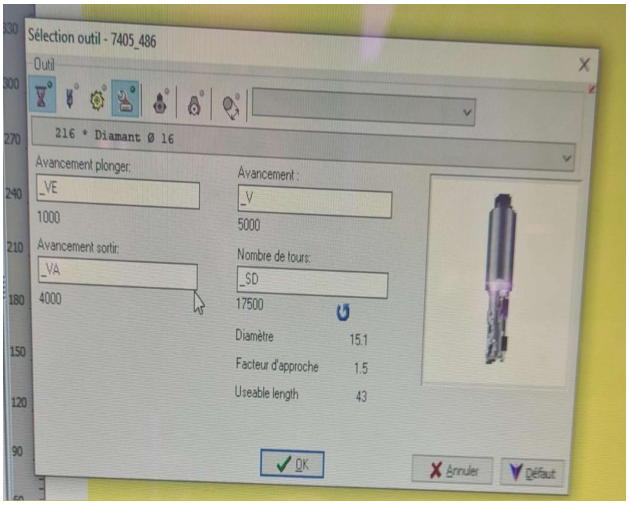
The first two things you have to do:

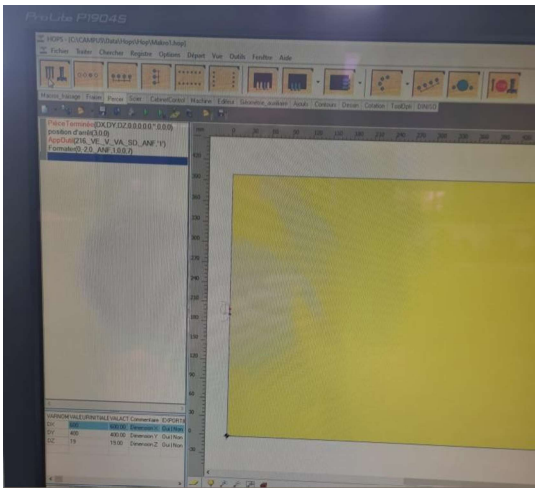
1. Chose the tool you need.

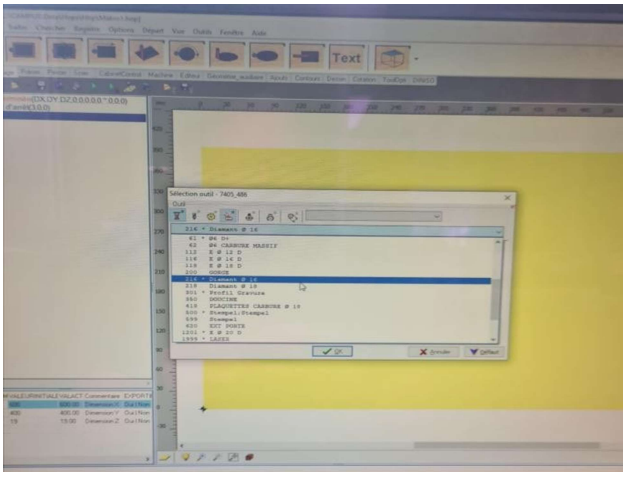


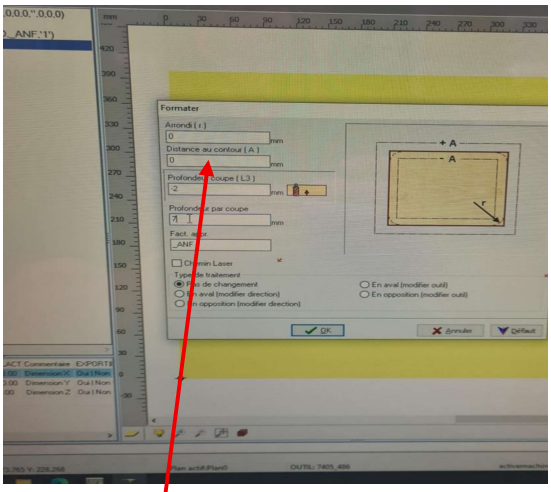
2. Enter the size of the wood.

The first work that we want the machine to do is to format the piece on the right size: - In the case we have a laminate panel. We use a diamond tool.

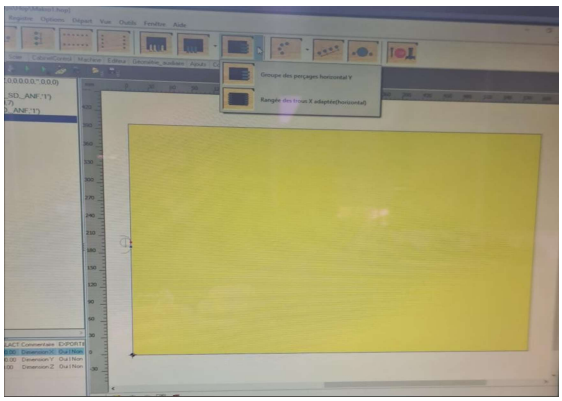


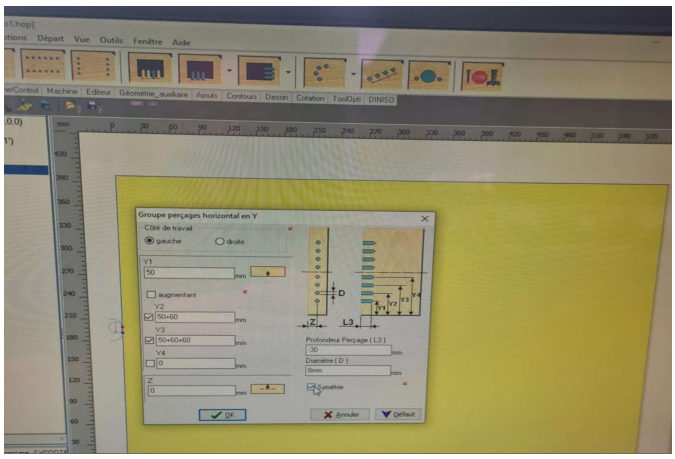






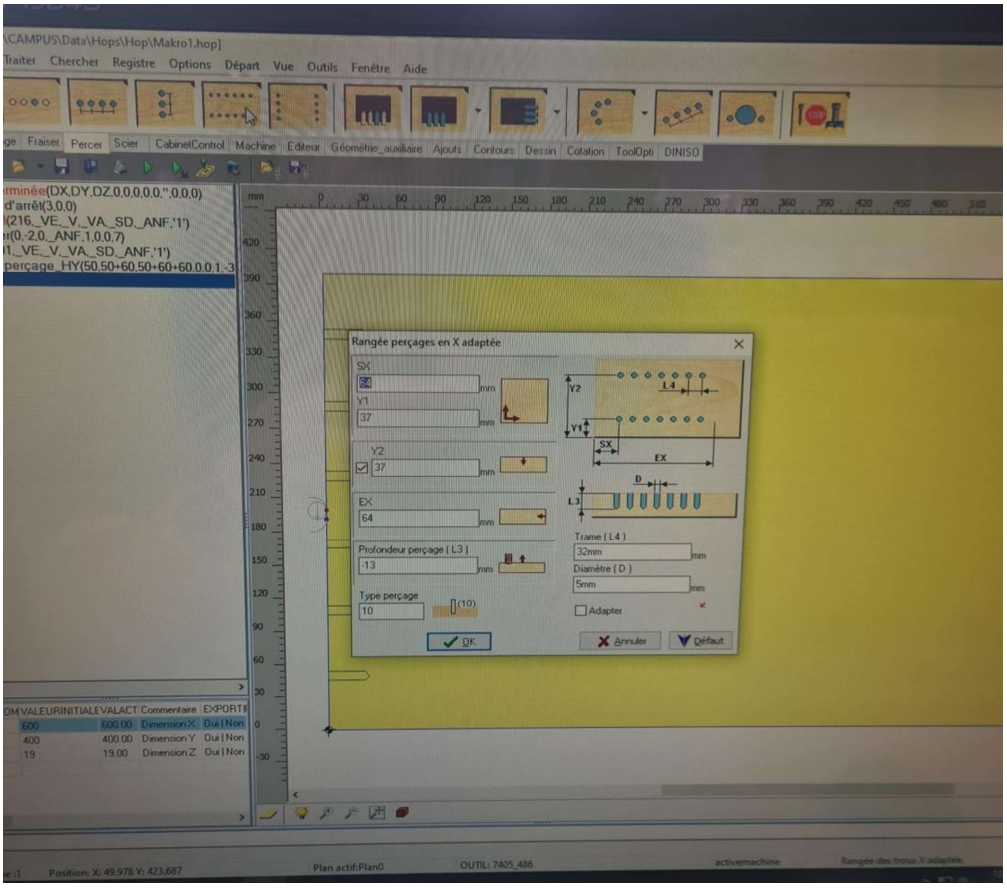
- Information about the work square or rounded corner.
- Depth
- Depth direction

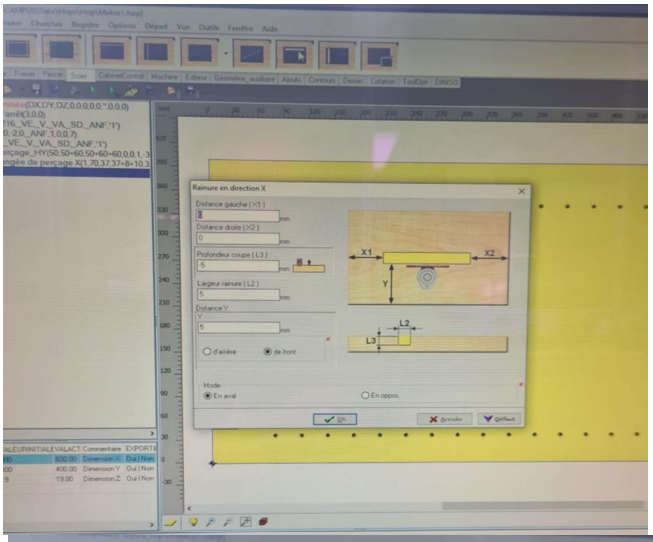


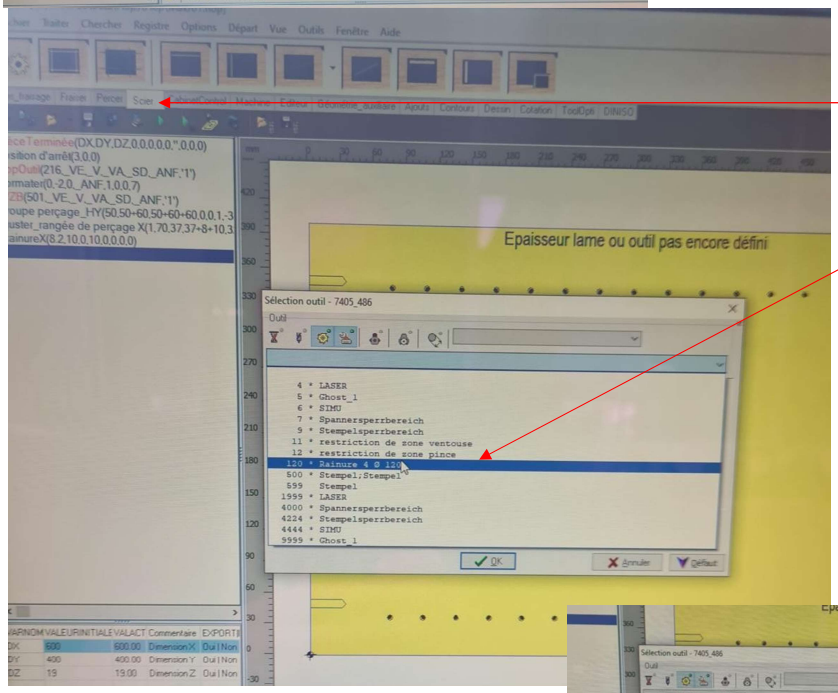


1. Take the side drilling and then:
   - Distance from the edge.
   - Distance between the different holes, (the best is to add all the different measurements, so you make no mistake).

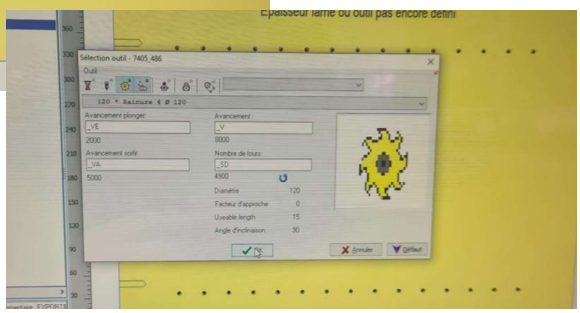
2. Same work for the shelves drilling.



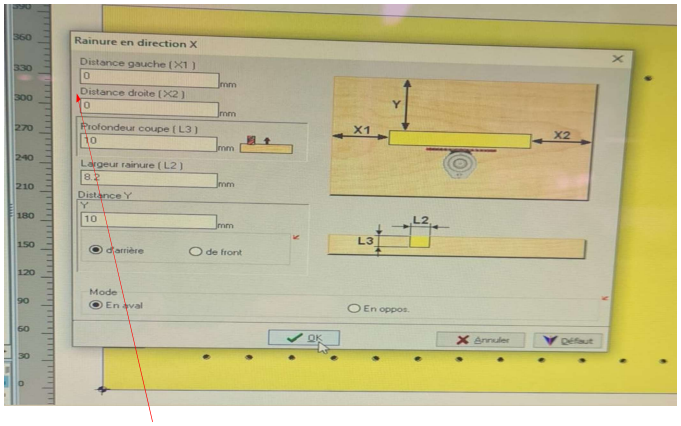




For the groove you must choose sawing and the saw.



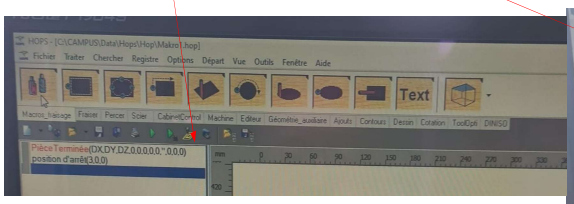
For the end point left and right

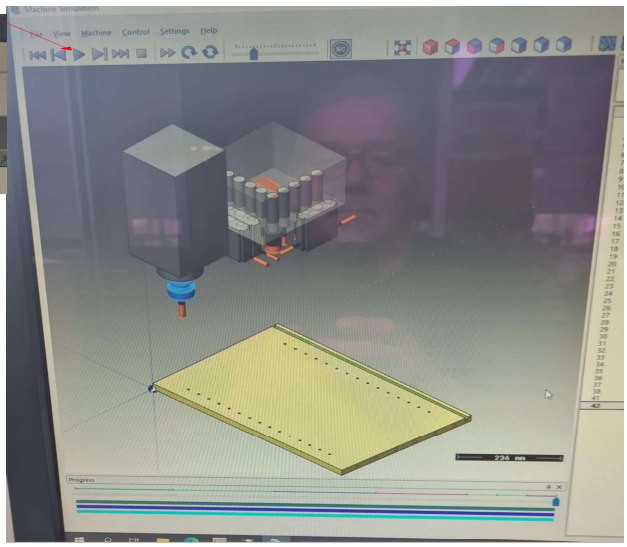


- Deepness for each Cut
- Total deepness
- Width from the groove
- Distance from the edge

When you have finished the work, control by making a simulation.

Press the blue play button to run the simulation.

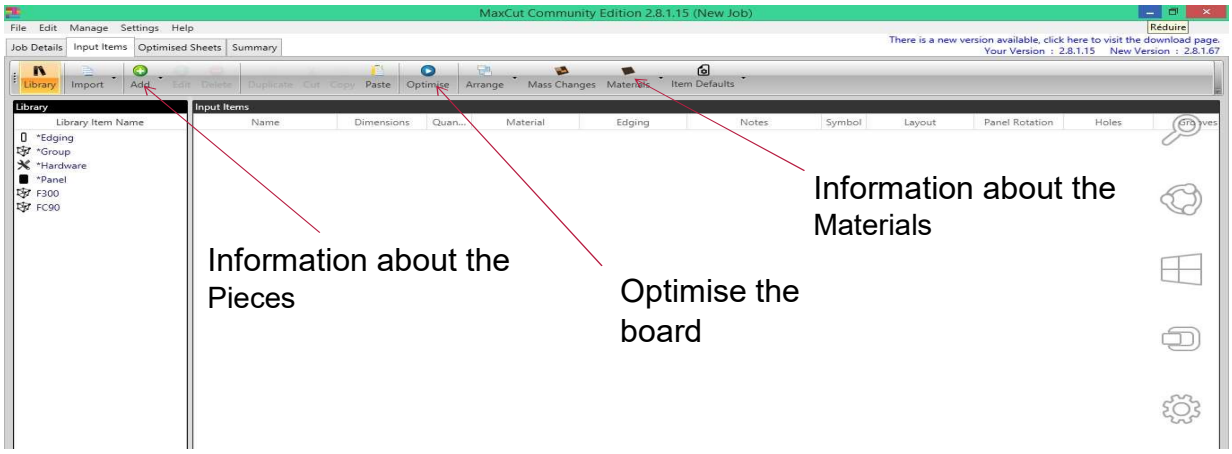


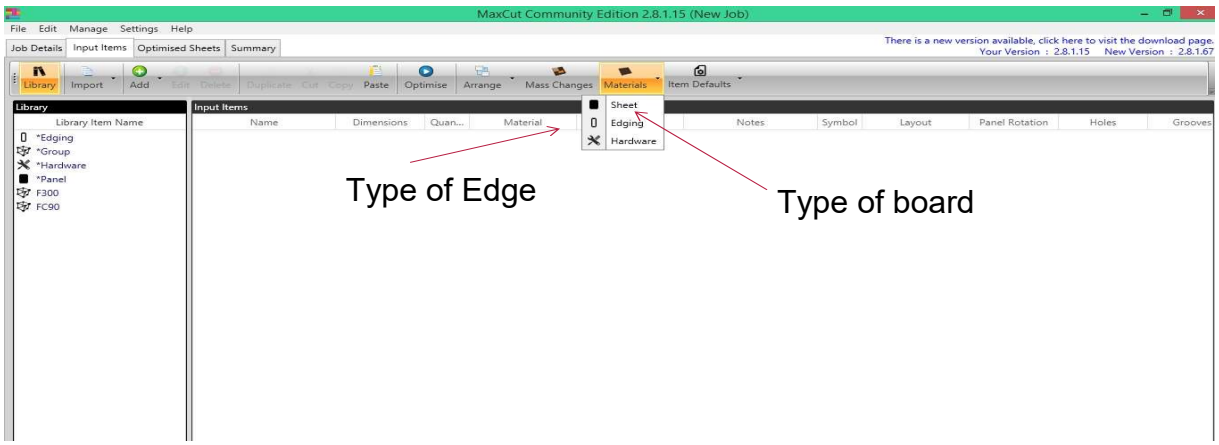


Chapter 9

MAXCUT: Panel Optimization Software

Different information to fill out



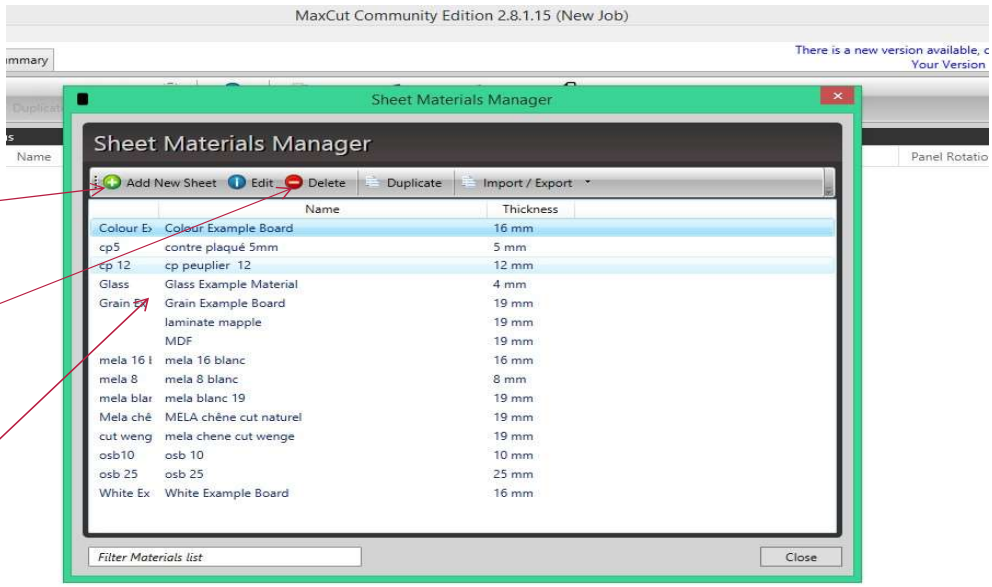


Add or control the different board:

Add a new boards

Take of a board

Different board

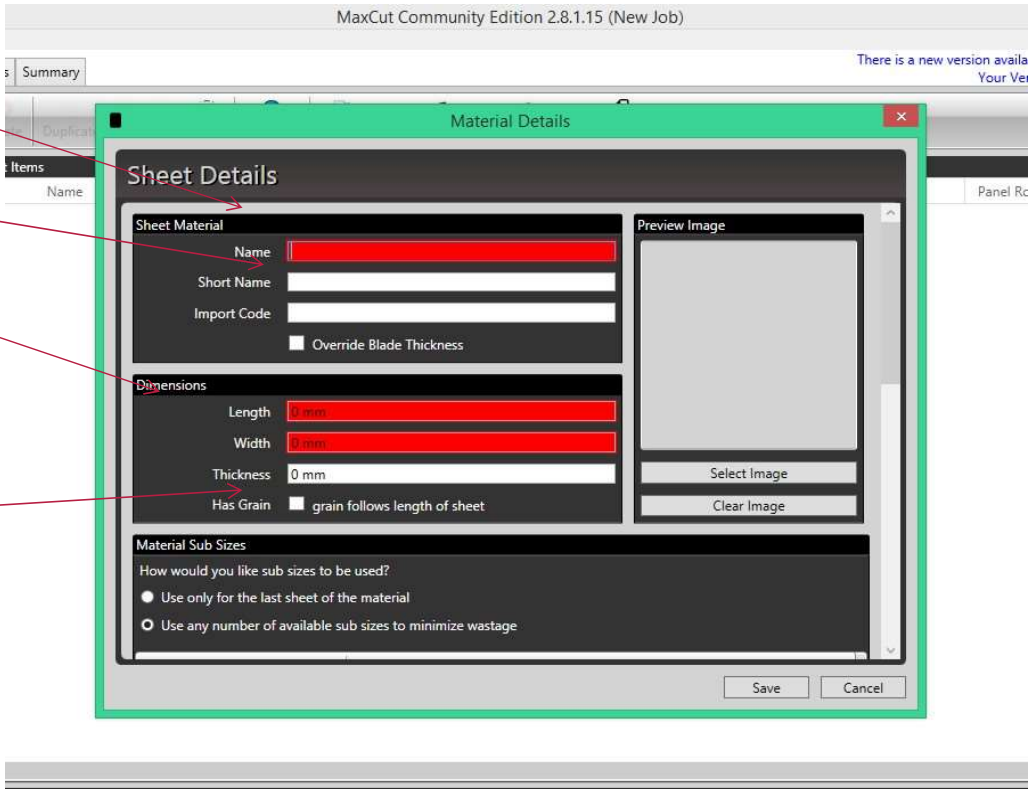


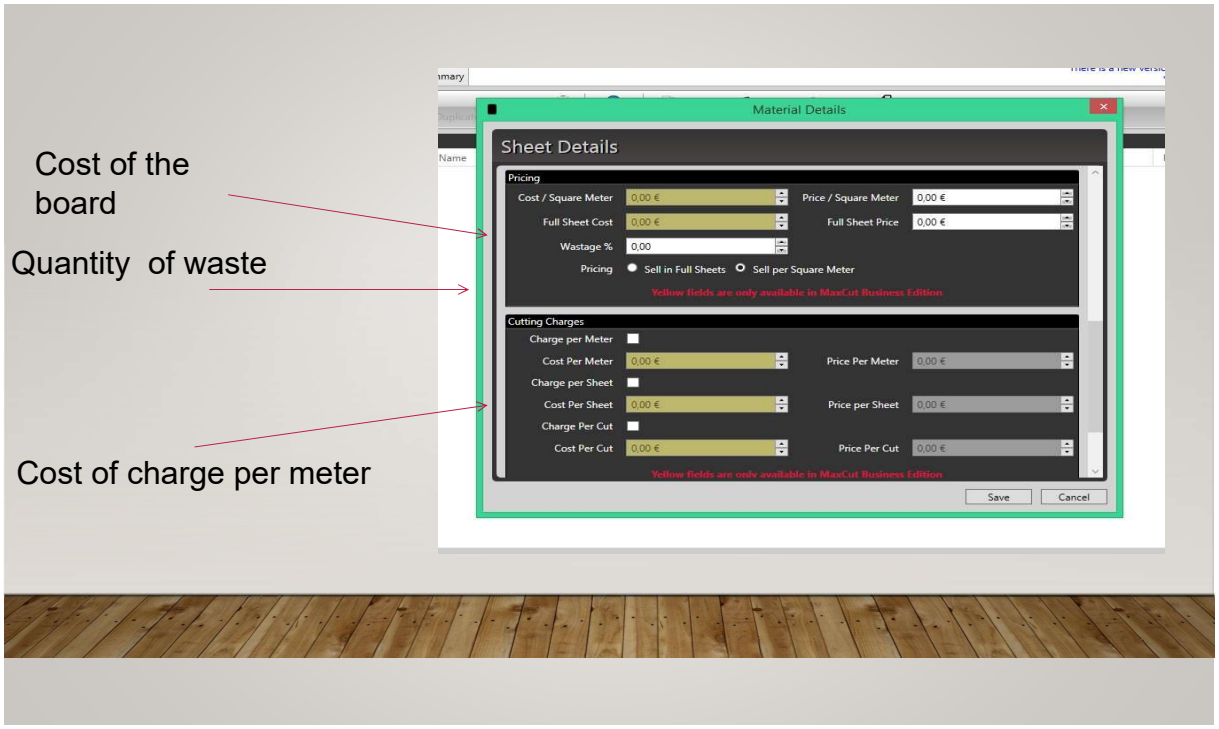
Name of the board with the thickness

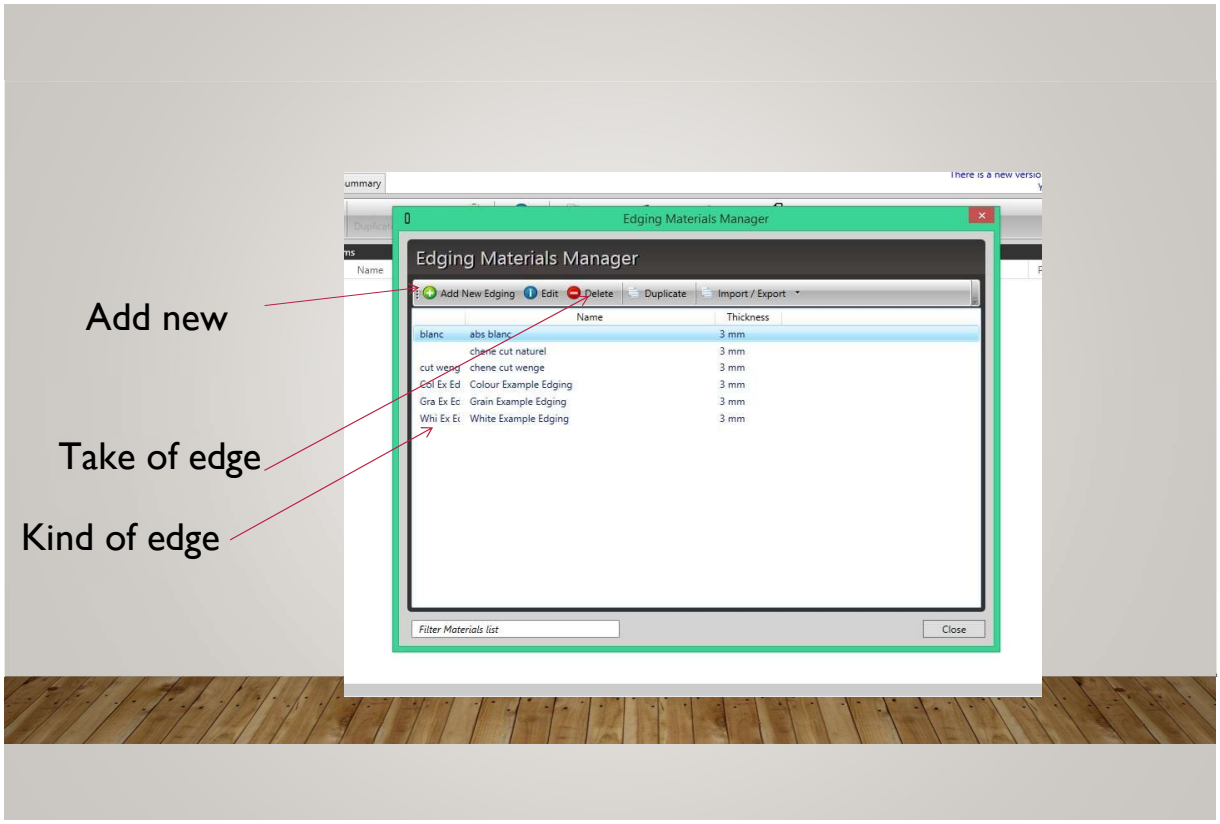
Usual name with thickness

Dimensions

Does the board have a grain way or not




Cost of the board
Quantity of waste
Cost of charge per meter
Material Details
Sheet Details
Pricing
Cost / Square Meter
Price / Square Meter
Full Sheet Cost
Full Sheet Price
Wastage %
Pricing
Sell in Full Sheets
Sell per Square Meter
Yellow fields are only available in MaxCut Business Edition
Cutting Charges
Charge per Meter
Cost Per Meter
Price Per Meter
Charge per Sheet
Cost Per Sheet
Price per Sheet
Charge Per Cut
Cost Per Cut
Price Per Cut
Yellow fields are only available in MaxCut Business Edition
Save
Cancel

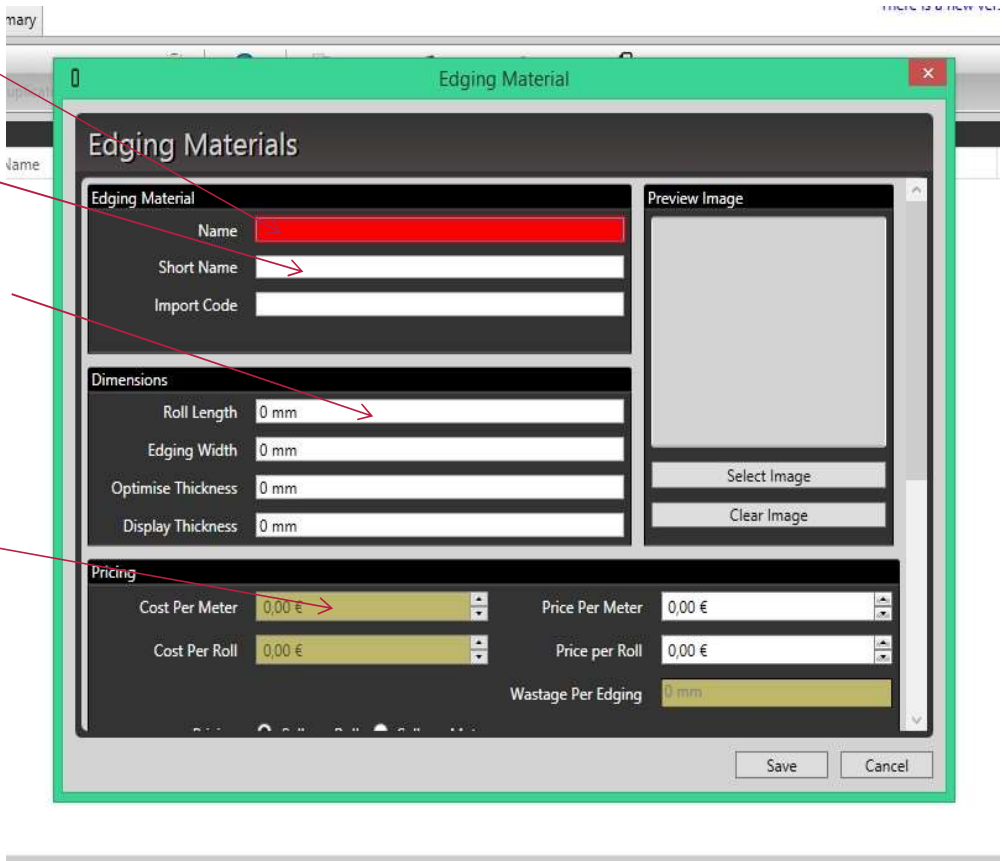

Add new
Take of edge
Kind of edge
Edging Materials Manager
Edging Materials Manager
Add New Edging
Edit
Delete
Duplicate
Import / Export
Name
Thickness
blanc
abs blanc
3 mm
chene cut naturel
3 mm
cut weng
chene cut wenge
3 mm
Col Ex Ed
Colour Example Edging
3 mm
Gra Ex Ec
Grain Example Edging
3 mm
Whi Ex Ec
White Example Edging
3 mm
Filter Materials list
Close

Sort of Edge

Edge Name

Dimension of the Edge

Price of the Edge

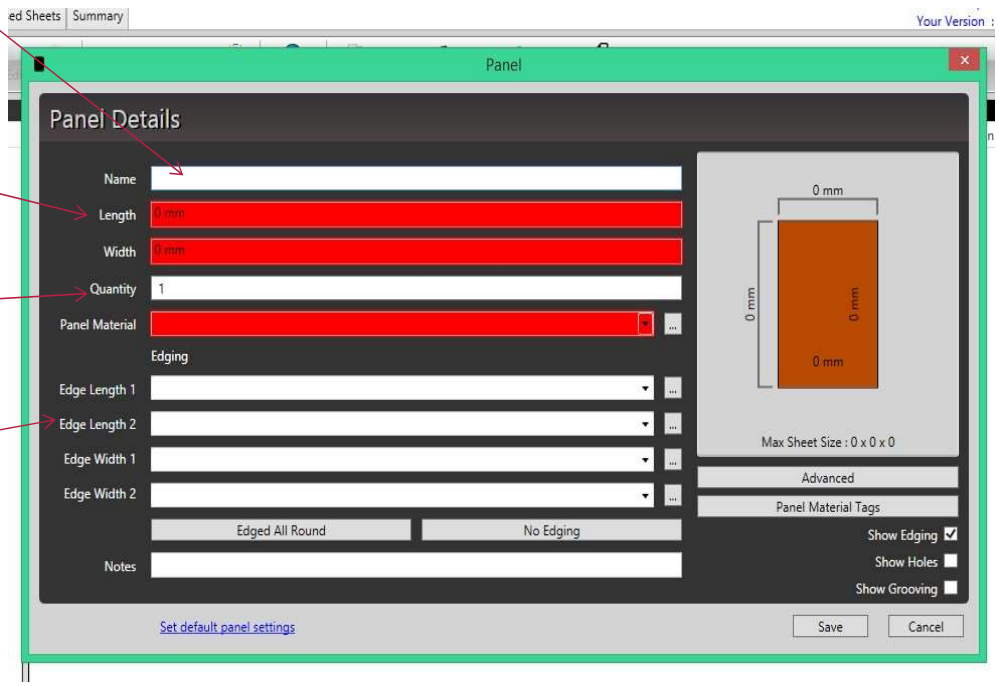


Pieces Name

Dimension

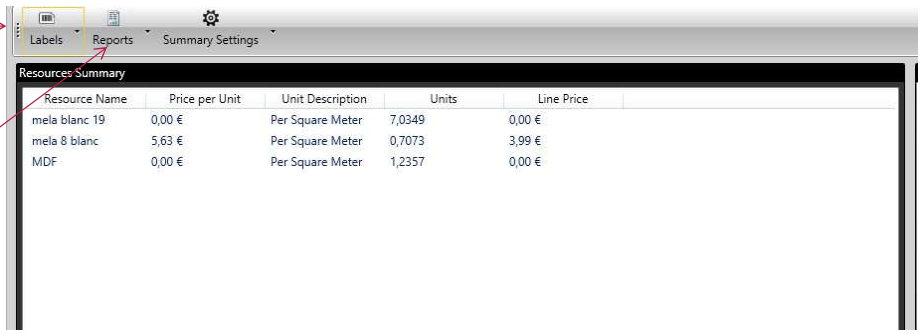
Number

Witch Edge has an Edge or not



Print out the label

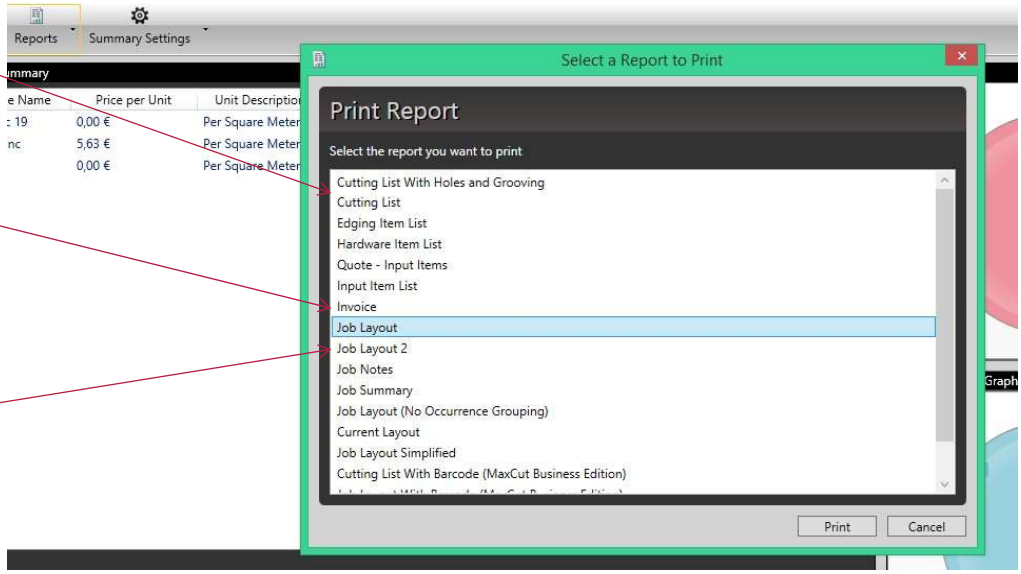
Print out the Cutting plan

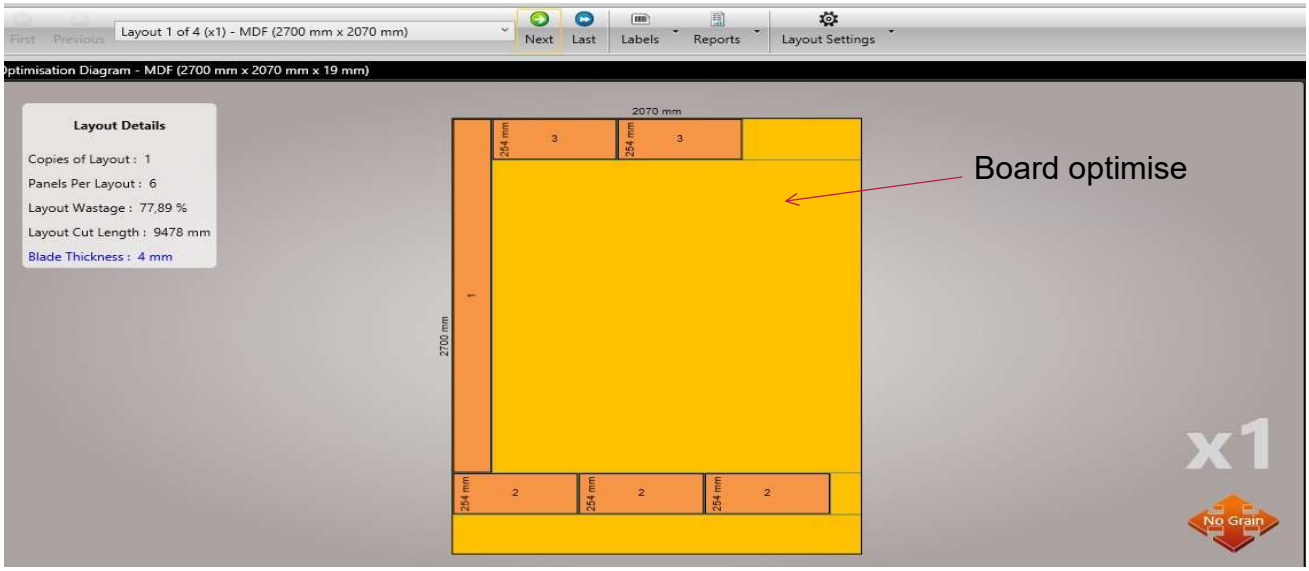


Cutting list

Invoice

Job layout



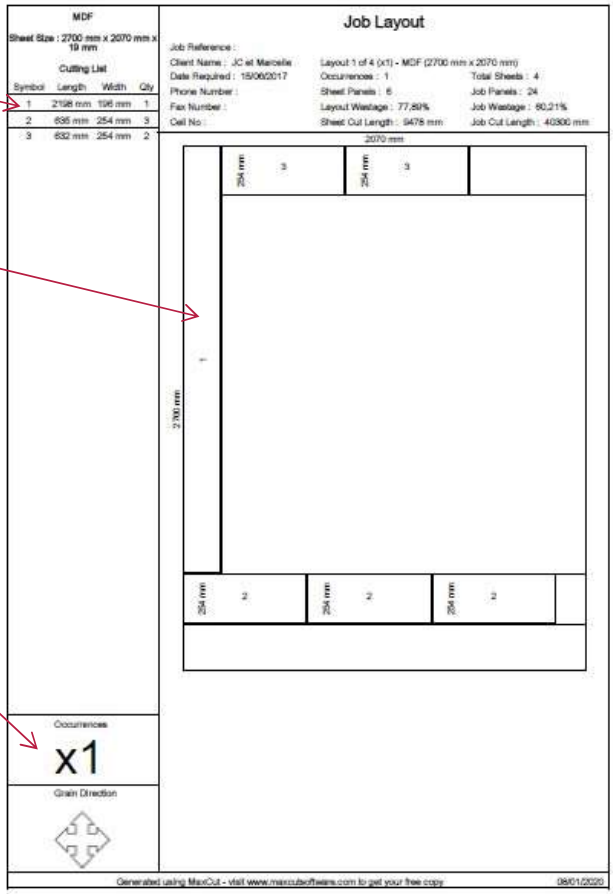


Board optimise

Size of the pieces

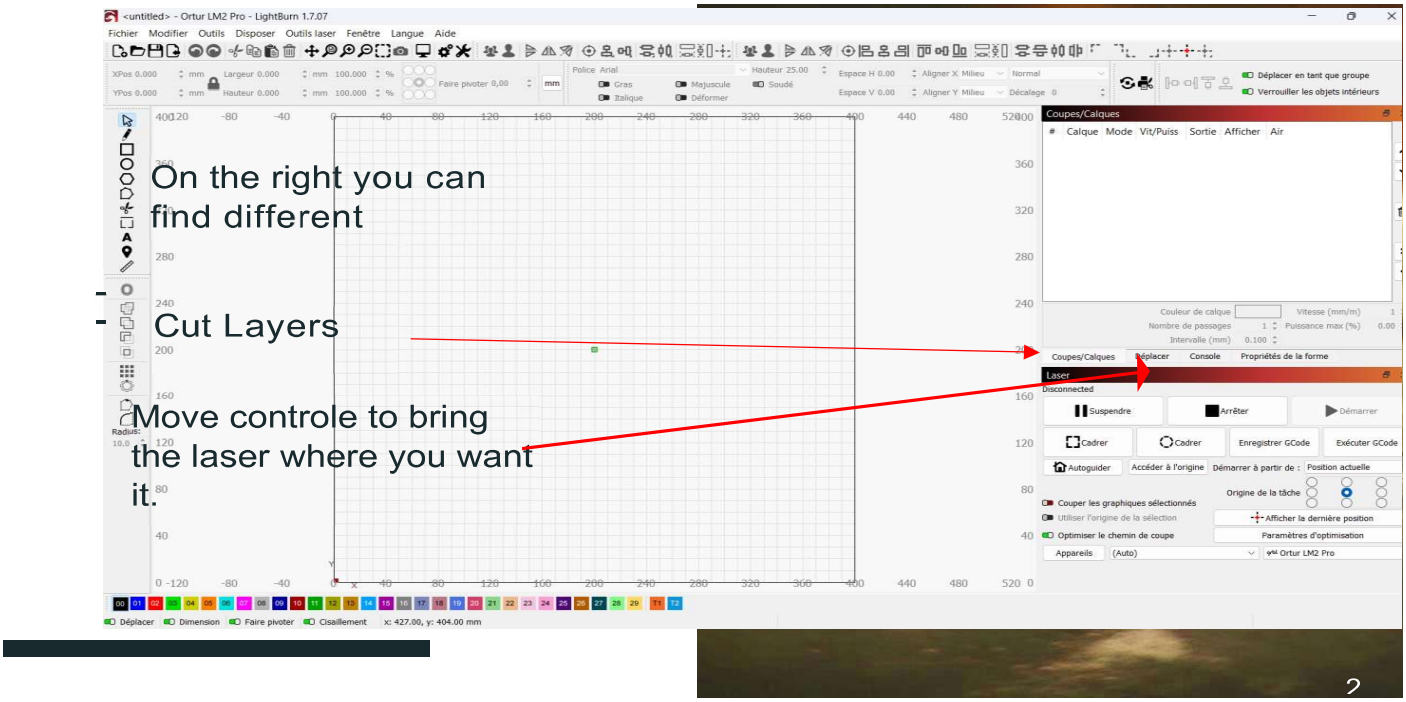
Plan to know how to cut the panels

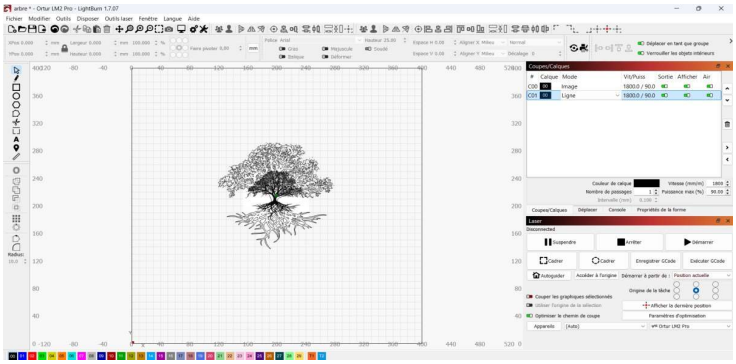
How many panels you have to cut the same way.



Chapter 10

LIGHTBURN: Laser Cutting and Engraving



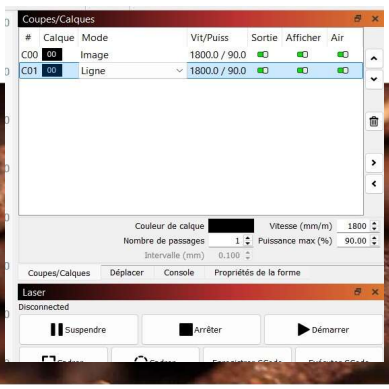


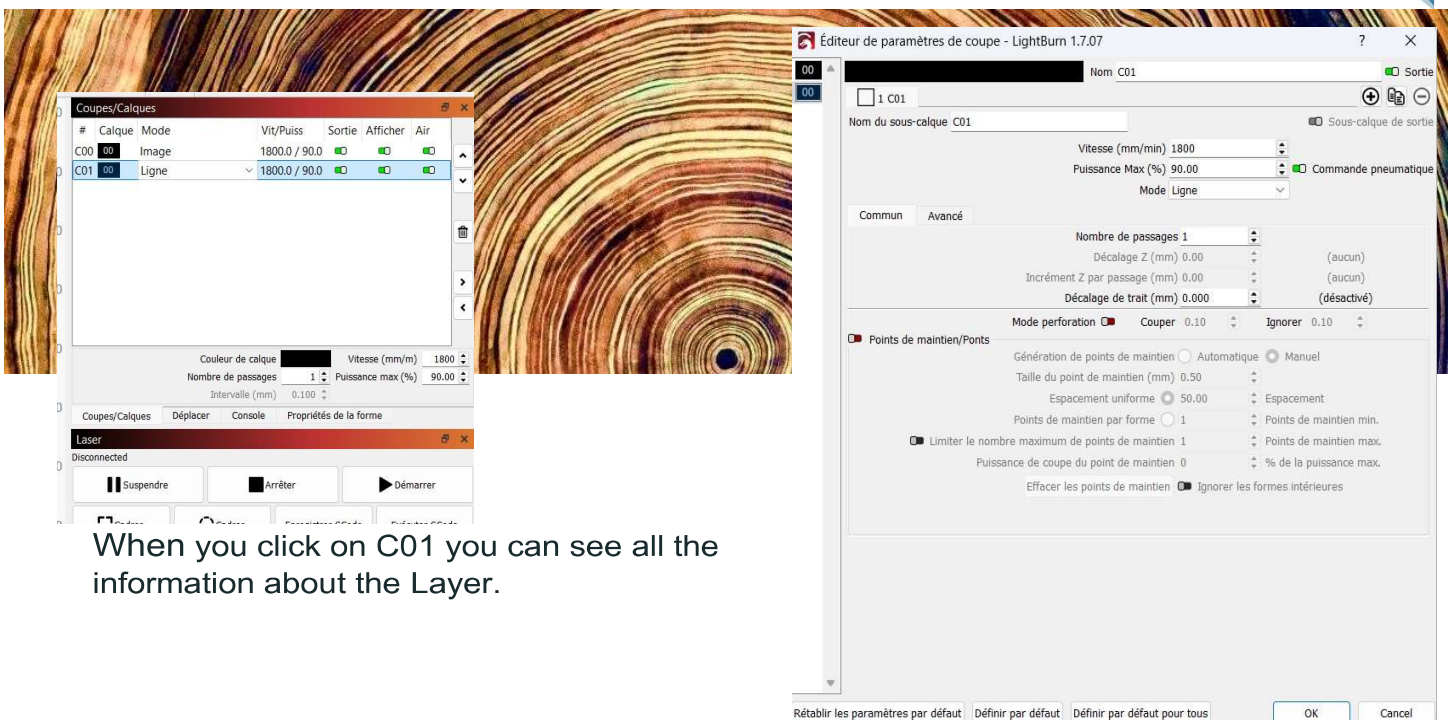
For the picture you have different layers.

Layer 1 Picture.

Layer 2 line.

For each you have to chose the speed and the power





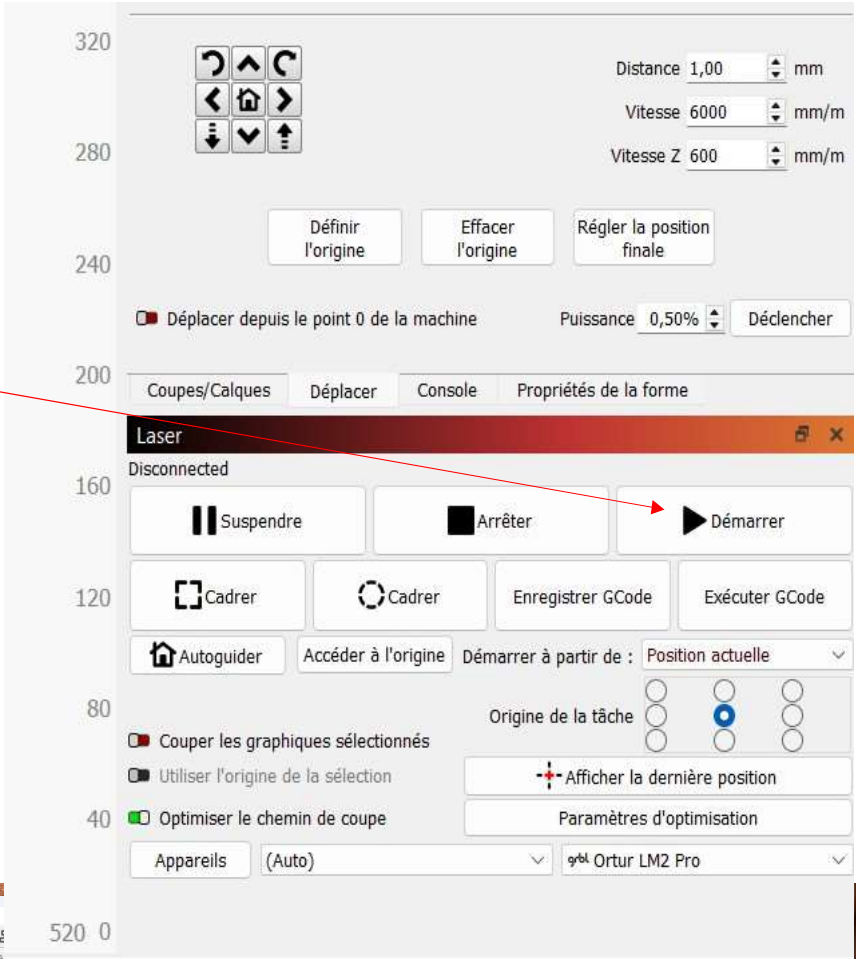
When you click on C01 you can see all the information about the Layer.

When you go to move it's possible to bring the laser exactly where you want.

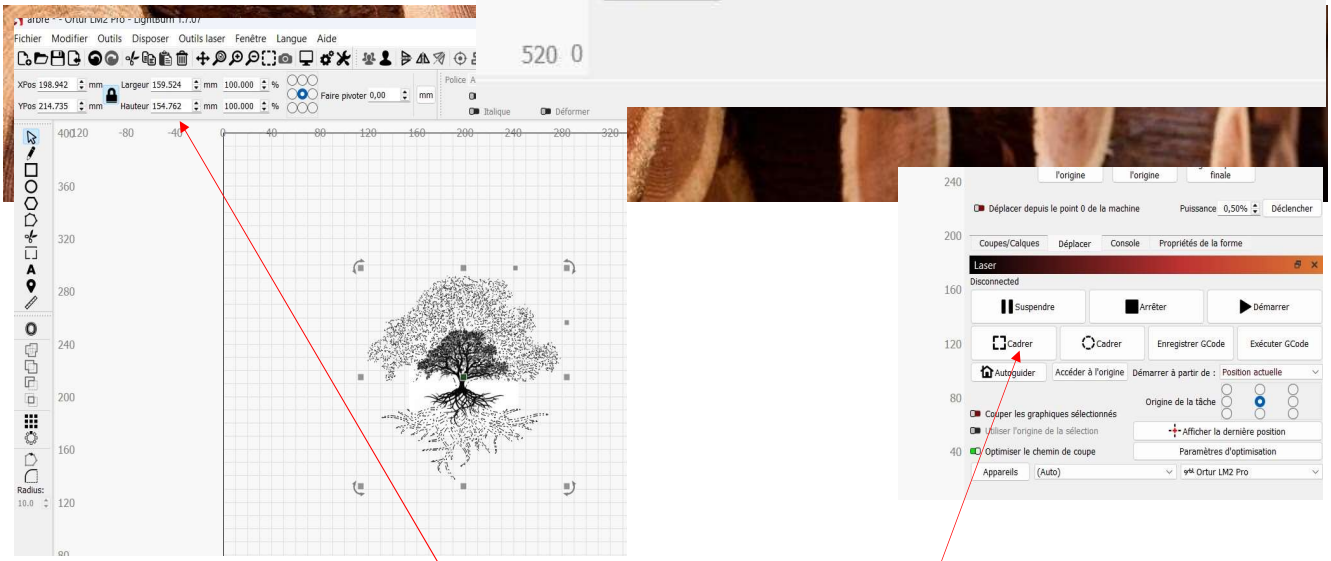
Distance for each move

Chose the place you are as the origine

Put the laser on to see if you are on the right place.



Begin the Work



See the size of the work.

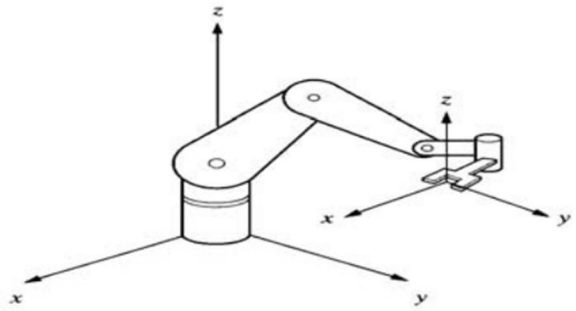
Control if you have enough place.

Chapter 11

Robot ARM

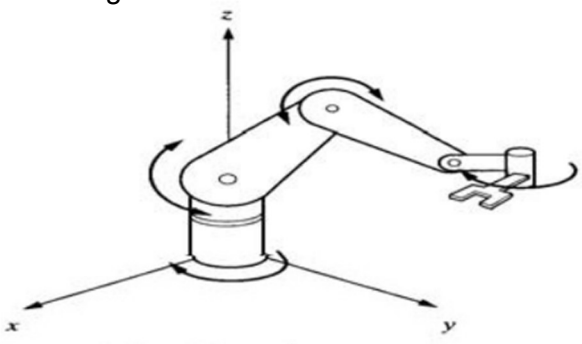
The robot and its axes can be controlled according to World, Axis and Tool Coordinate Systems.

- Maailmakoordinaatistossa liikkeet lasketaan robotin oman origon suhteen.



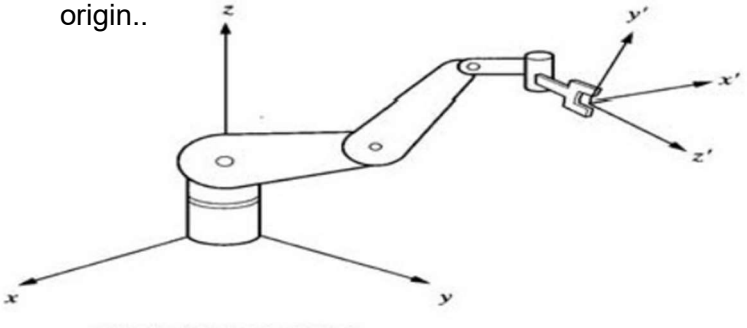
World reference frame

- In the world coordinate system, movements are calculated relative to the robot's own origin..



Joint reference frame

- In the tool coordinate system, movements are calculated according to the tool origin..



Tool reference frame

(Pictures: Introduction to robotics, Saeed B Niku 2010)

Fanuc hand controller for moving the robot arms. In order to move the robot and its axes, the SHIFT button on the controller and the dead man's switch on the back of the controller must be pressed simultaneously.

Chapter 12

SHAPER Origin Drawing Transfer

Create a Drawing

Origin uses the vector data from SVG files plot toolpaths for a user to follow when cutting. You can design these SVG files in a wide variety of design software packages, including many common 2D and 3D design suites, e.g. Autodesk Fusion.

Apply the Shaper Tape

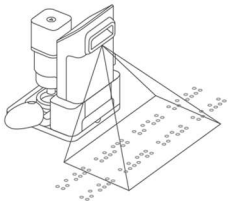
Use the ShaperTape to digitally augment your workspace and to track its position while you are working.

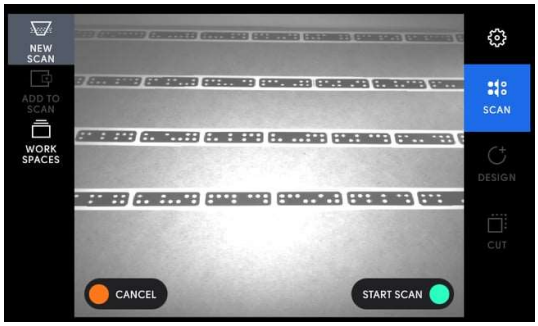
Before you begin your project, you will need to apply ShaperTape to your worksurface or surrounding coplanar material. For best results, tear off strips of tape measuring no longer than 900mm in length. lay the tape out so that there is no more than 50-80mm of space between each strip.

We find that laying ShaperTape out in roughly parallel lines is easiest, but there is no need to be precious about this, as the strips do not need to be exactly parallel or exactly uniform in length. The orientation of tape in reference to your workpiece (parallel/perpendicular/diagonal) is not critical, and should be adapted to suit your project. However, no tape should overlap.

Scan your workspace

Origin uses ShaperTape to understand its position on your workpiece. After you have added tape you will need to scan your workpiece before adding designs and cutting.



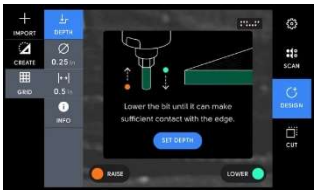


When ready, tap the Start Scan button to begin scanning. Origin's camera is in front of the tool underneath the handle. Move the machine around the workspace so that the camera sees all dominos. Dominos will turn blue once Origin has registered them. If a domino is ripped, damaged, or can't be scanned, it will remain black.

Creating a Grid

- In order to create a new Grid, Origin will need to plunge so that a bit can rest up against the side of your material. For the most accurate grid, we recommend you use the opposite end of your engraving bit for probing.

Note: The spindle should not be powered on at any point during this procedure!



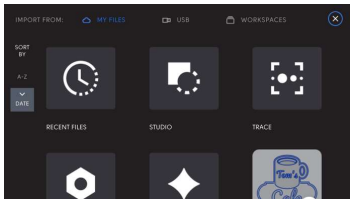
- To create a New Grid, enter Design Mode and tap the Grid Tool on the left-hand side of the screen.

- Using the green handle button, lower your bit so that it can make contact with the edge of your workpiece and tap 'Set Depth' on the screen.

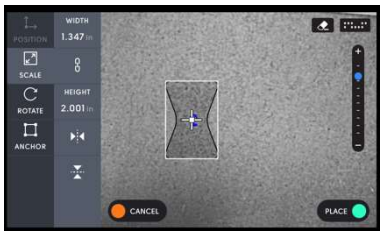
- Your first two probe points will define your Grid's X axis. Move your tool to the edge of your workpiece that you want to index against and tap the green handle button.

- Probe your third point to specify your Y axis. Origin will default to an appropriate edge, based on the direction you move from your second probe to your third probe point

- Tap My Files to import a design that is stored in your Shaper Account. Tap USB to add a design from a USB drive.

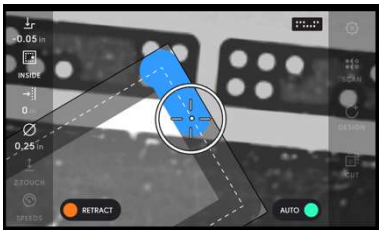


- After selecting your file, you'll see it overlaid on your Workspace. Move Origin around to manually adjust where it gets placed. The white square represents the current location of your bit.



Mill the contour

Start the the machine and move the Origin along your path, following the direction of the arrow and cut line dashes. Origin will suggest paths that
are conventionally cut rather than climb cut to ensure cut quality.

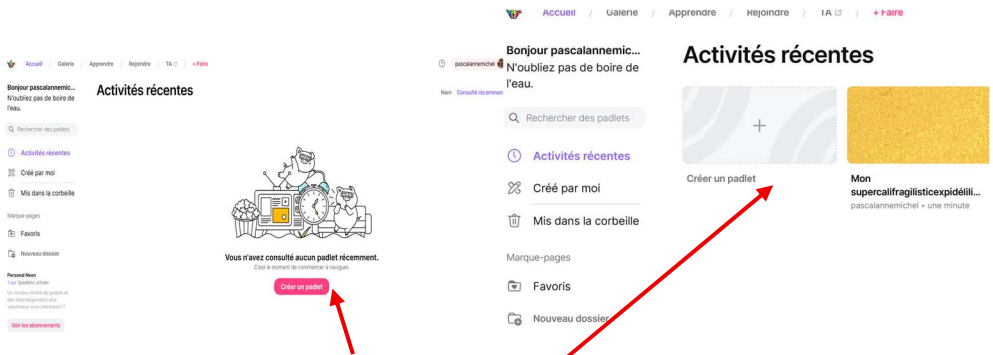


Chapter 13

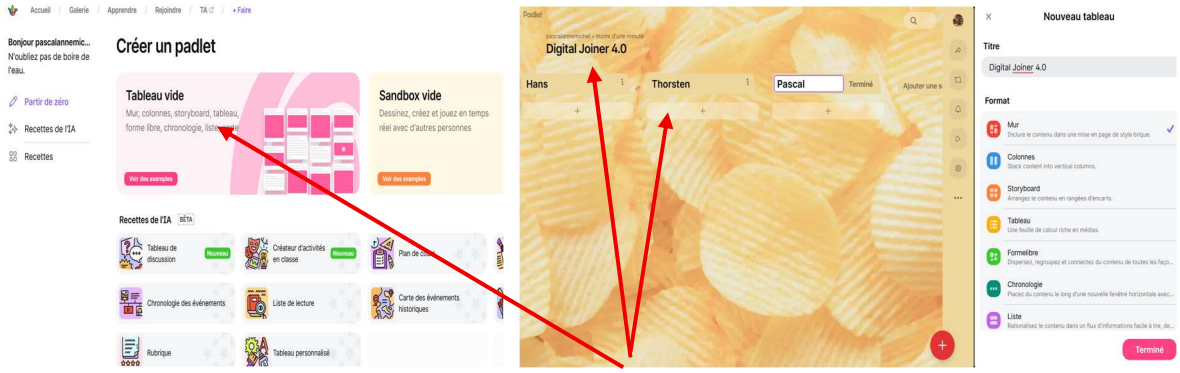
Padlet

Padlet is a digital diary that you can use when you want to stay in contact with the students during the work periods

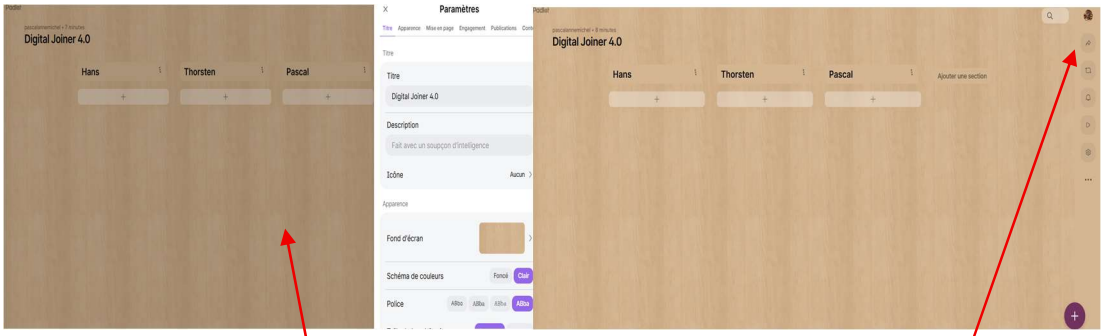
First you have to subscribe or to connect if you have still an account.



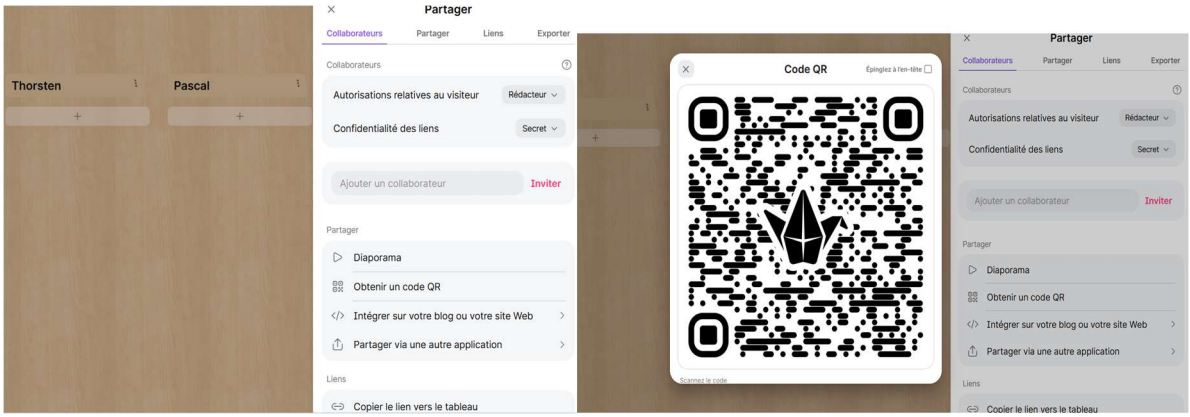
Than you begin with create Padlet



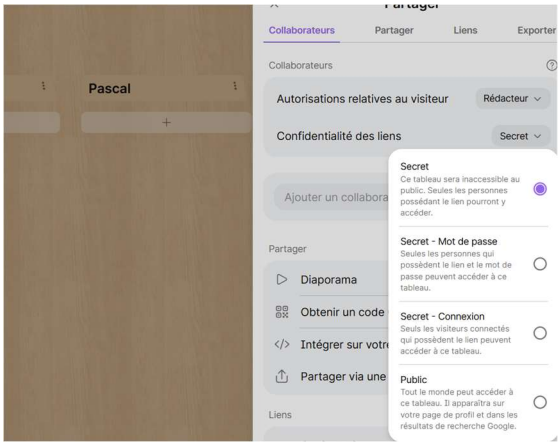
Than you chose the kind of wall you want and how many column and give him a name.



We can say the back ground and after we can say how to spread it.



You can have a QR Code for the spreading or send a link (https://padlet.com/pascalannemichel/digital-joiner-4-0-x8ee0mj6y0grb8pg)



It is also possible to protect it with a secret code.