2D Mill Manual for DOS

Part 1|
Fundamentals and Preparation

TU Wien / E2642 / Institut für Kunst und Gestaltung / Abteilung Modellbau Karlsplatz 13 A-1040 Wien

http://kunst2.tuwien.ac.at/

2 D Mill - Overview

Materials

Plastic E.g. :

- Acrylic glass max. 10mm
- Polystyrene max. 5mm
- PE - Foil max. 2mm

WOODEN SURFACES e.g.:

- Paperwood bis max. 10mm
- Balsa wood
- MDF bis max. 10mm

The following materials may not be used at all:

acrylic glass XT, grey cardboard, fine cardboard (cardstock), bristol paper

Milling Table Surface

1000 x 600 mm

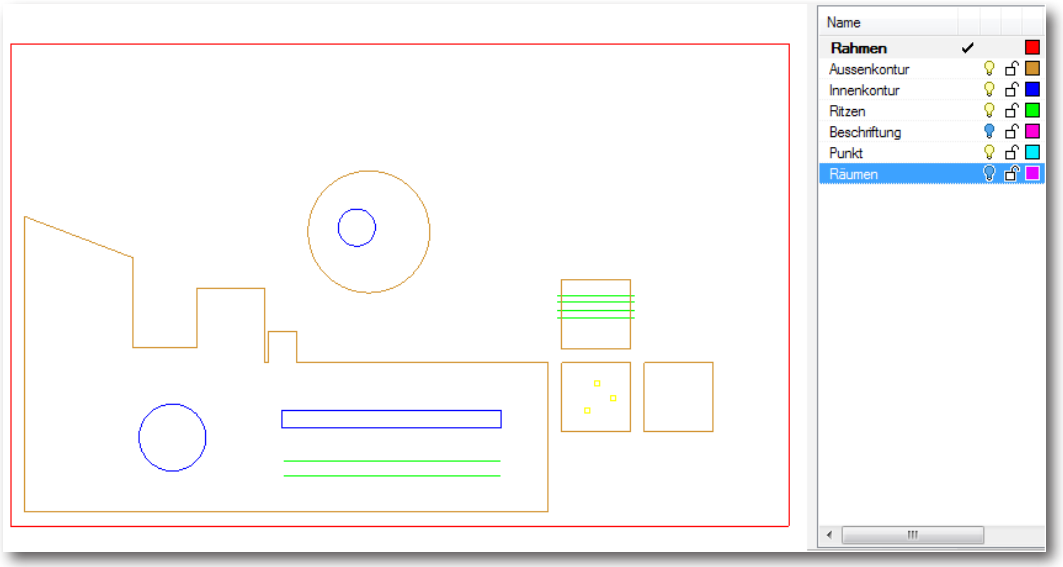
Milling Work Area

990 x 590 mm = maximum work surface area

Data Format

- CAD - 2D Drawing in dxf-Format

Drawing Preparation



Drawing Preparation

1. Drawing in mm (in the right scale)
2. The drawing must be located on 0 on the z- axis.
3. Draw a frame in the size of the sheet materials you are using and place the drawing in the frame.
4. Work surface area: 1000 x 600 mm (max. Size of the sheet materials Milling area: 990 x 590 mm)

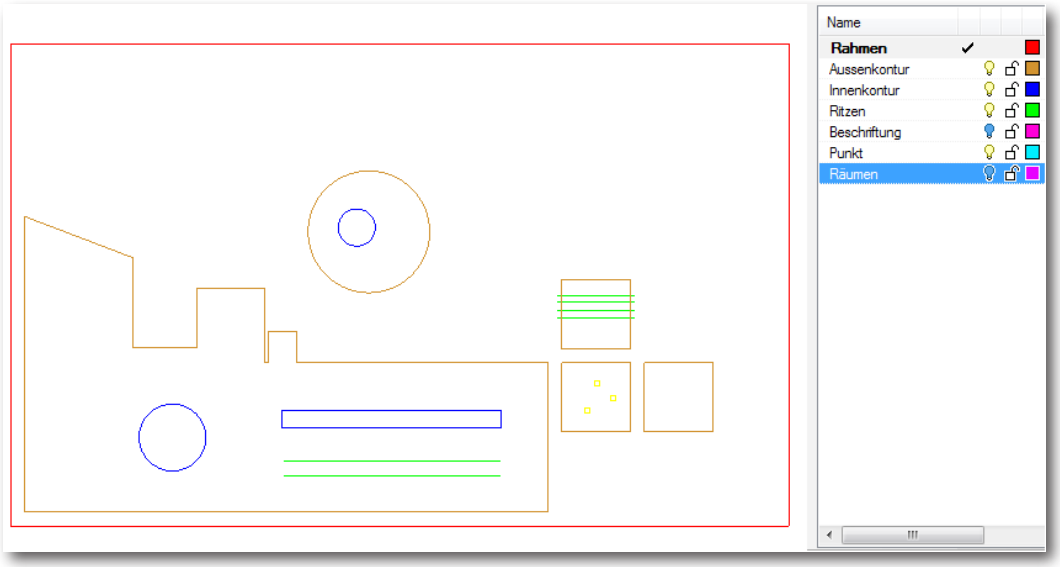
   Since the sheet material is held by the vaccum exhaust of the vacum table, it is advisable to cover the not used milling area with the rubber mat. Futhermore put tape around the edges of you sheet material.
5. No double lines (ensure a clean drawing).
6. No splines, only lines, polylines or arcs.
7. Take the milling tool diameter into account and leave enough space in between the different parts to be milled.
8. Make a separate dxf file for each material thickness.
9. The file name may only contain 8 characters and no spaces or symbols.

Order (Carving and Cutting)

All Milling Procedures (e.g. inner contour, outer contour) must be on separate layers.The milling operations always begin with the milling of the inner contours.

1. Carving
2. Inner
3. Outer
4. Frame

Drawing Preparation



Frame

Maximum Size of the sheet material (max 1000 x 600mm)

Outer Contours

Keep a minimum of 10mm margin to the frame (the margin betwee different parts may vary).

e.g. Milling diameter = 1mm : Margin of 5mm
Milling diameter = 3mm : Margin 10mm

Inner Contours

e.g. hole of 3mm diameter - milling tool diameter of less than 3 mm

e.g. thin „valleys“ with margins that are smaller than the milling tool diameter can‘t be milled.

Carving

Polylines to be carved must be closed if possible. If polylines extend to the edge of the outer contour, then the polylines must be drawn 2mm over the edge.
e.g. see the green lines in the image.

Holes

A dot or circle may be drawn depending on the diameter.

e.g. 3mm circle : draw dot, and use a milling tool of 3mm diameter.

e.g. 5mm circle : draw a circle, that can be milled with a milling tool of 3mm diameter.

2D Mill Manual

Part 2|
Operation of the milling machine

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1. Import the dxf- file

Step 1

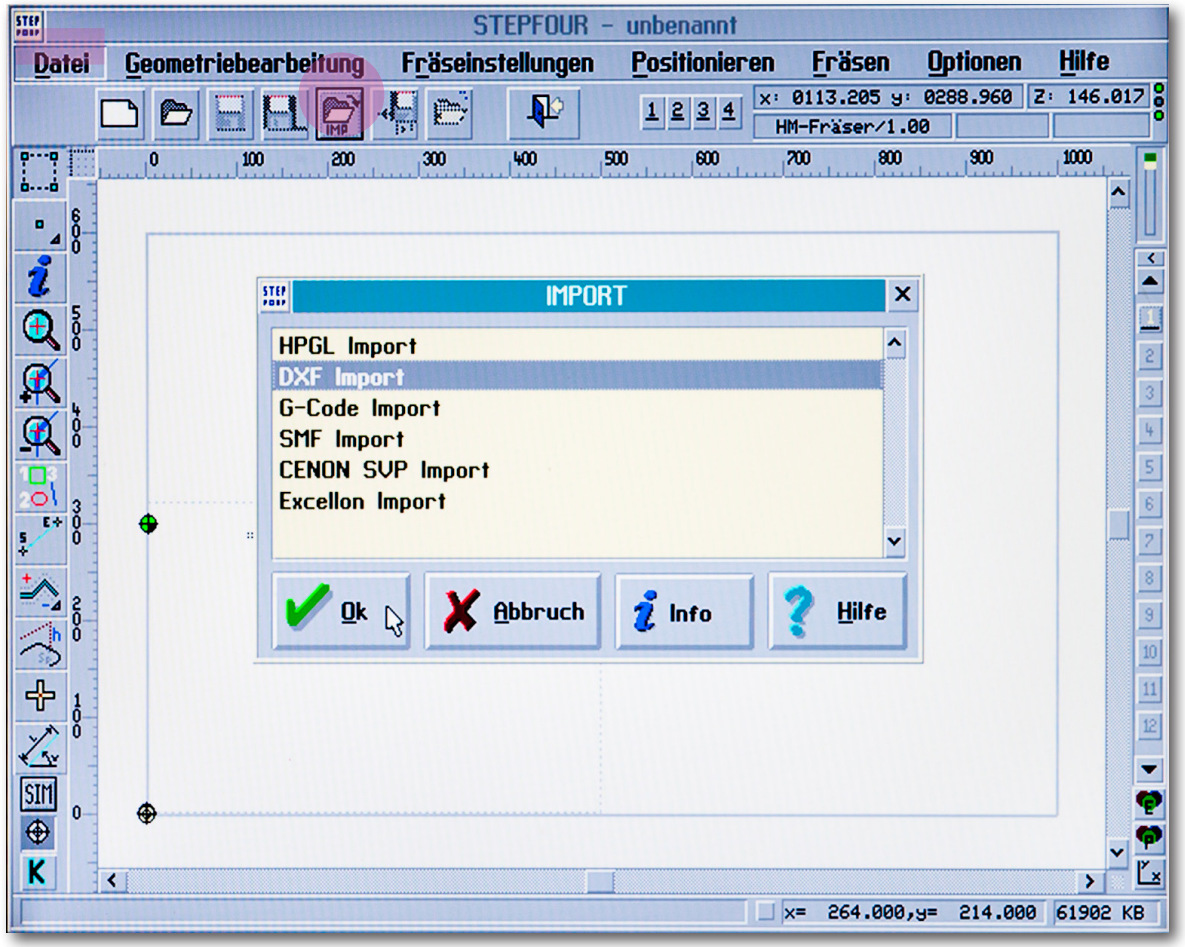
1. Insert the USB stick before turning the computer on

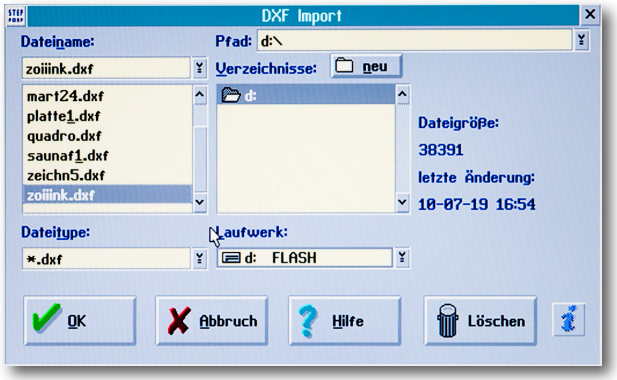
Step 2

1. File (Datei) ► Import
2. Select DXF import
3. OK

Step 3

1. Drive: d: FLASH
2. Select file name.
3. OK





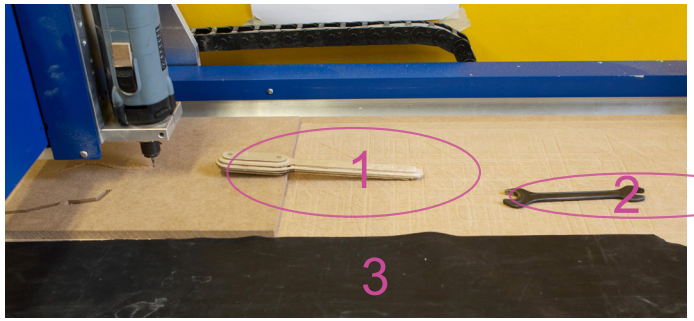
Step 4

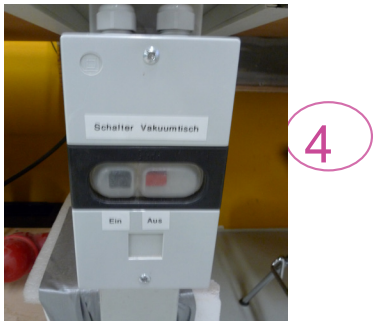
1. Verify 1 unit (Einheit) = 1mm
2. OK

2. Changing the Milling Tool

Overview

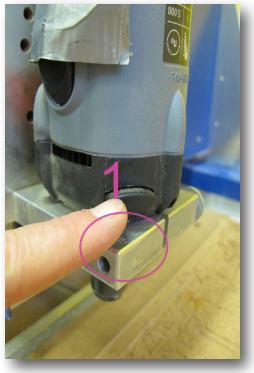
1. Wood piece to hold small parts
2. Screw wrench to (un-)screw the cap nut onto the screw thread
3. Rubber mat to cover the not used milling work area
4. Switch the vacuum cleaner (under the table) on „Manuel“ to turn on the vacuum table

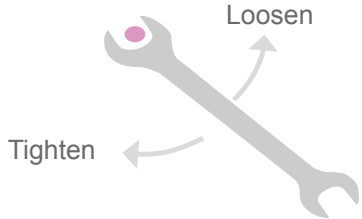




Changing the Mill tool

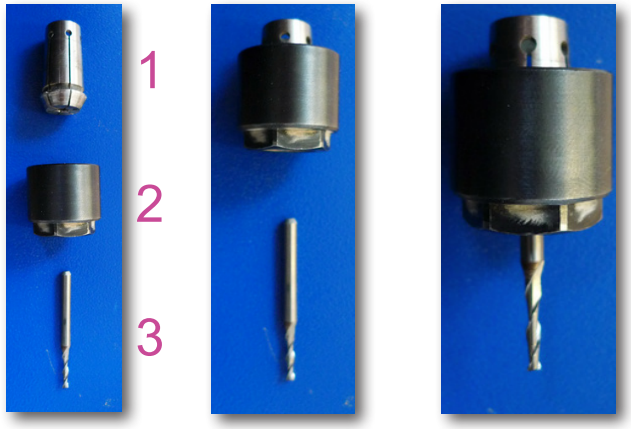
1. Screw or unscrew the cap nut onto the Screw Thread
2. Using the wrench, turn towards or away from yourself (see image below).
3. When turning down there is a double safety, therefore turn twice with the wrench.





Collet Chuck and Milling cutters

1. Collet chuck – Cap nut - End Mill



Buying a Milling cutter

Milling cutters can be bought at the vending machine:

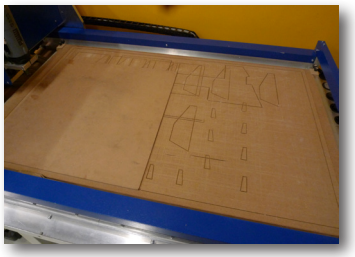
1. Slowly insert 3x2€ coins one after another.
2. Pull out the drawer with the desierd milling cuter size (pull once until you feel a resistance, then slightly push the drawer back before pulling it out completely) Now you can take out the box containing the milling cutter.

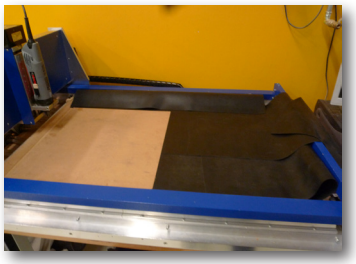
3. Mounting the material onto the vacuum table

Function of the vacuum table

The material that shall be milled is sucked down and fixed on the milling table through negative pressure. (It is not allowed to use screws). If the workpiece is smaller than the milling area, the remaining part of the milling table has to be covered with the black rubber mats, to produce efficient suction.

Important: The zero-point on the top side of the material has to be set AFTER the vacuum pump has been turned on !!! Height difference through suction !!!





Switching on the vacuum pump

As seen in the picture

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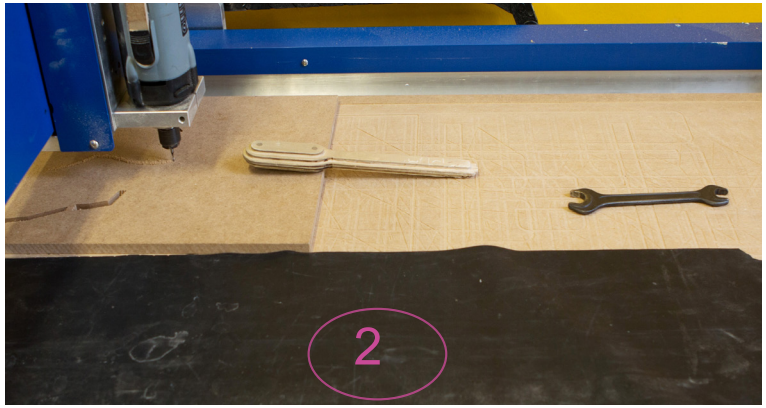
Overview of the related equipment to the vacuum table

1. On/Off Switch for the vacuum pump, mounted on the table leg
2. Rubber mat for covering the unused parts of the milling area
   ► (to guarantee the most efficient suction of the vacuum table)



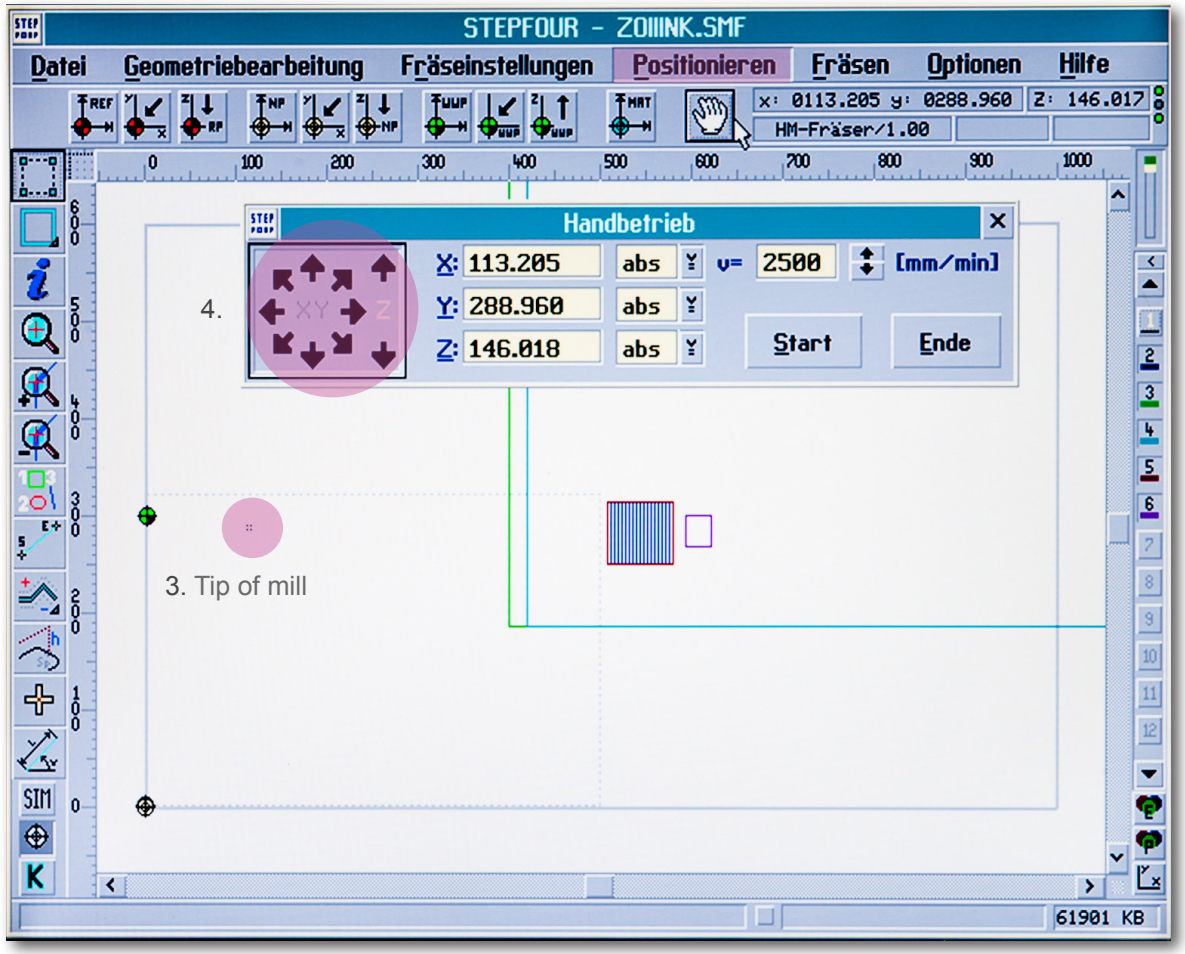
Set zero-point on the top side of the workpiece

see point 5 of this manual.

4. Drawing and Material Set-up

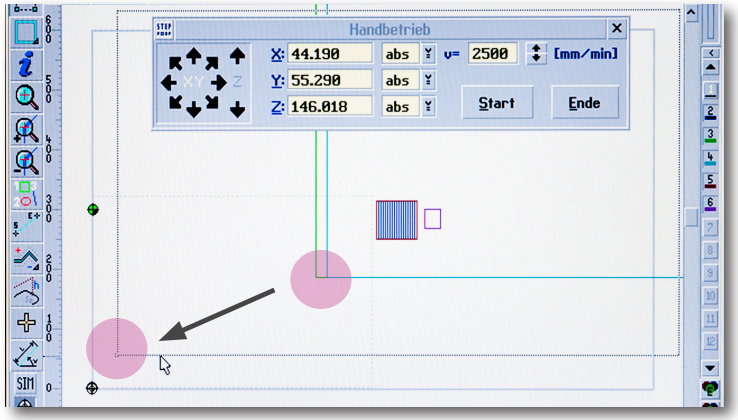
Step 1

1. fix the Material on the Table in the Working area
2. Positionieren (Positioning) - Doubleclick - Click Handtool
3. The Point will show in the Screen the position of the Milling tip
4. Move the Milling Tool over the Left down corner of the material using the Driving console.



Step 2 - Positioning the drawing

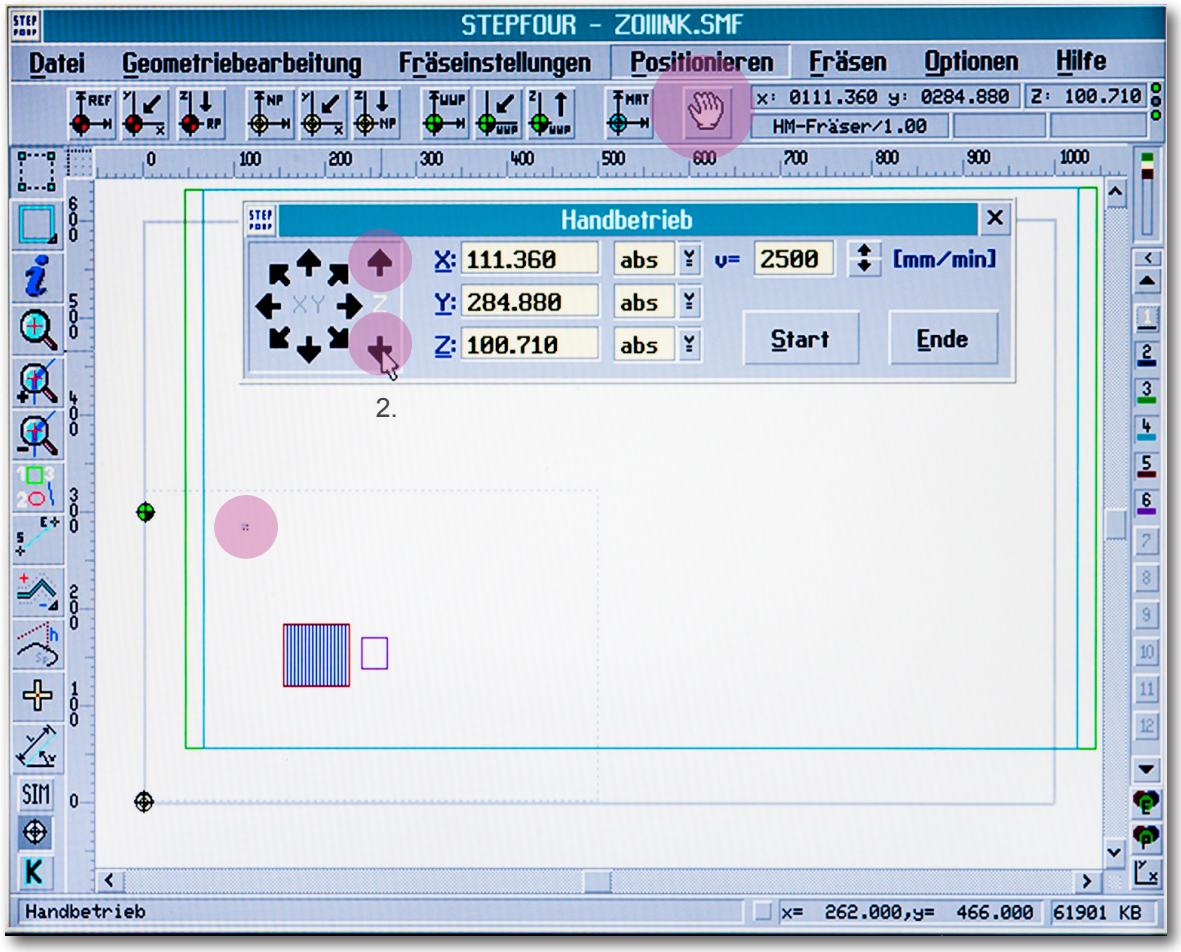
1. Click on the Marking- icon
2. Make all the layers visible and Group the Drawing
3. Grab the Drawing and place it over the Tool Point
4. The drawing should be exactly placed over the material



5. The Zero Point on Z- Axis

Step 1

1. Position – Double click – Click : Handbetrieb (Manual Operation)



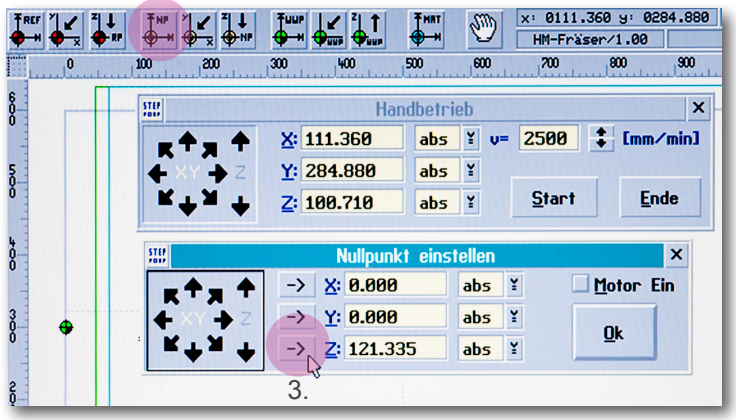
Step 2

1. Move the mill over the sheet material.
2. Holding the mouse button, move downwards in the Z direction.
3. Come to a halt just before the material.
4. Place a piece of paper between the mill and the sheet material.
5. Continue downward with the arrow key on the keyboard.
6. Shift the paper back and forth until it gets stuck between the mill and the sheet material.

Step 3 - Installing Zero Point

1. Click the yellow icon “NP.”
2. The window “Nullpunkt einstellen” (installing the Zero point) will open up.
3. Click on the arrow next to Z.
4. Click OK.
5. Using the manual operation, go back upward on the Z axis.
6. Press PRINT.

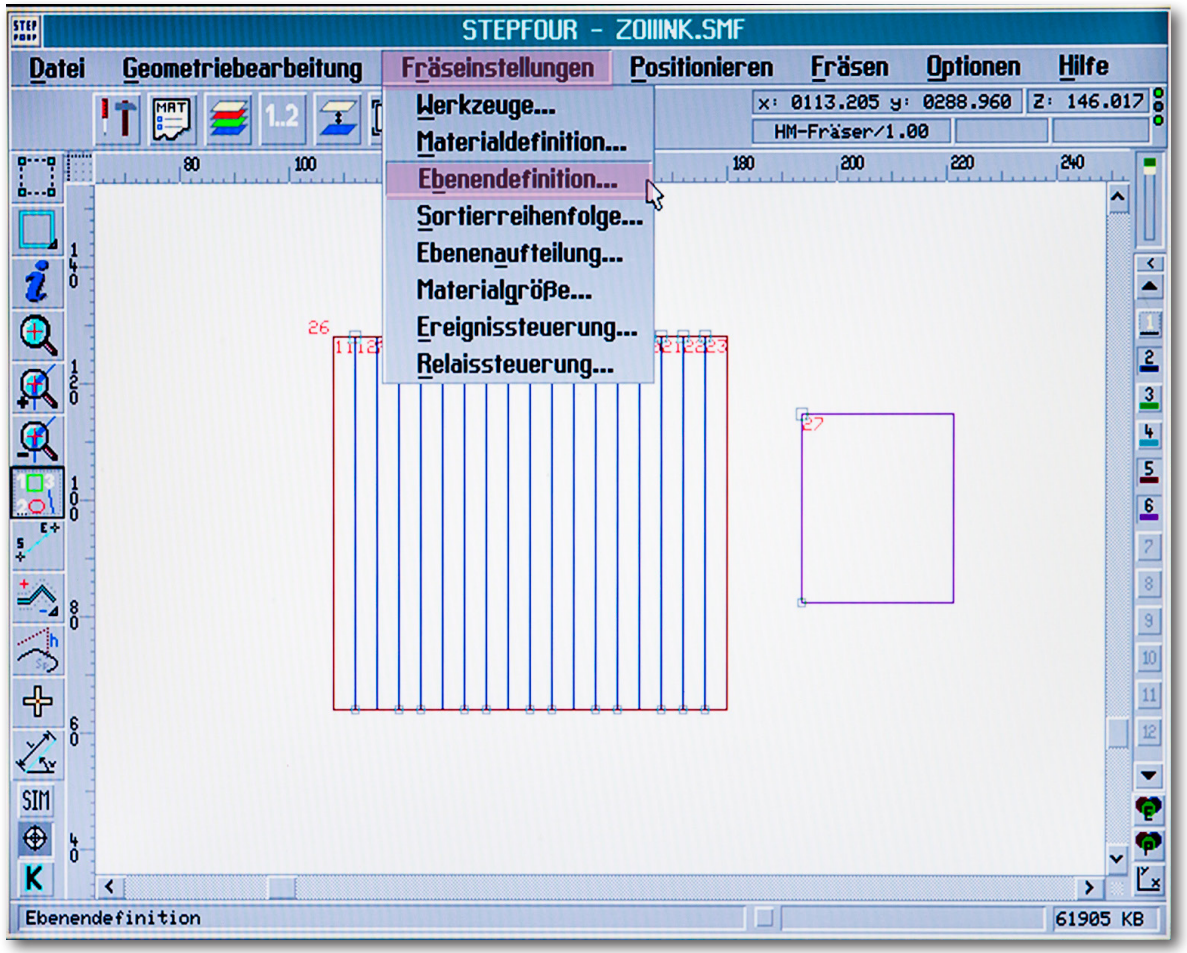
1.



6. Layer Definition (Installing the milling tools)

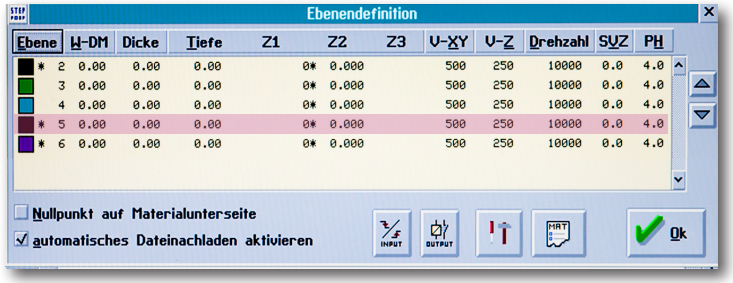
Step 1

1. Milling installation (Fräseinstellungen) - double click - click layer definition (Ebenendefintion)



Step 2 - Defining the Layers

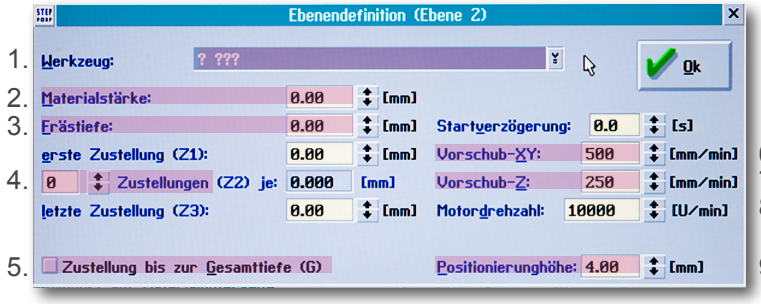
1. Double click on the layer.



Step 3

See the table on the following page for the points below : 1, 4, 6, 7, 8

1. Select tool - diameter of the milling tool
2. Material thickness
3. Milling depth : material thickness + 0.3 mm (except when carving).
4. Preparation - 1x (until 3mm, from 4mm multiple preparations)
5. Preparation until the complete depth - check the box.
6. Progressive Feed XY - Milling Speed
7. Progressive Feed Z - Immersion speed into the Material
8. Adjust motor rotation number - directly on the milling spindel
   polystyrene step 1-2/ Wood step 4-6 / Plexiglass step 3-6
9. Positioning Height- Pathway over the material.



7. Material/ Milling Options / Preparation-XY/ Layer Definition

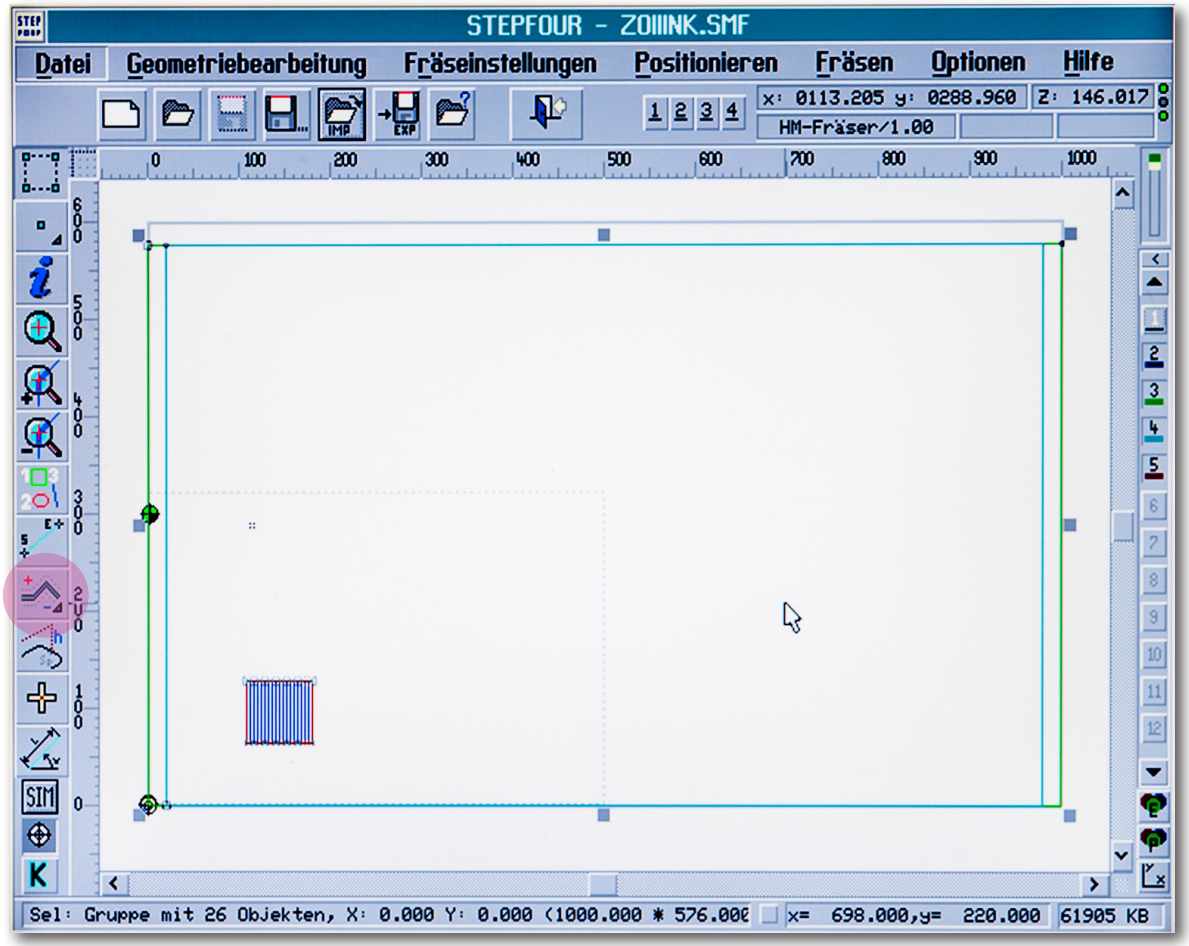
For Carving select the Milling Depth you want instead of the Total Depth of the material.
Normally between 0.2 mm and 1 mm , for each material thickness and Milling Tool diameter

	Material	Dicke in mm	Fräser Durchmesser	Zustellungen	Vorschub-XY	Vorschub-Z	Motordrehzahl
Wood							
	MDF (braun)	1	ab 1,0	1	550	250	4 bis 5
		2	ab 1,5	1	500	250	4 bis 5
		3	ab 1,5	1	500	250	5 bis 6
		5	ab 2,0	2	600	250	5 bis 6
		10	ab 3,0	3	500	250	5 bis 6
	Fiber Board	2	ab 1,5	1	650	250	5 bis 6
	(brown+tartan)	3	ab 2,0	1	650	250	5 bis 6
		5	ab 3,0	1 bis 2	650	250	5 bis 6
	Balsa Wood (soft)	3	ab 2,0	1	700	250	5 bis 6
		5	ab 3,0	1	700	250	5 bis 6
		10	ab 3,0	2	700	250	5 bis 6
Plastic							
	Plexiglas GS	1	ab 1,0	1	600	250	5 bis 6
	(No XT)	2	ab 1,5	1	600	250	5 bis 6
		3	ab 1,5	1	600	250	5 bis 6
		5	ab 2,0	2	650	250	6
	Polypropylen	0,5	ab 0,8	1	500 bis 700	250	2
		1	ab 1,0	1	500 bis 700	250	2
	Polystyrene	0,5	ab 0,8	1	550 bis 750	250	1 bis 2
		1	ab 0,8	1	550 bis 750	250	1 bis 2
		1,5	ab 1,0	1	550 bis 750	250	1 bis 2
		2	ab 1,0	1	500 bis 700	250	1 bis 2
		3	ab 1,5	1	550 bis 650	250	1 bis 2
		5	ab 2,0	1 bis 2	550 bis 750	250	1 bis 2

8. Contour Definition (Inner Contour / Outer Contour)

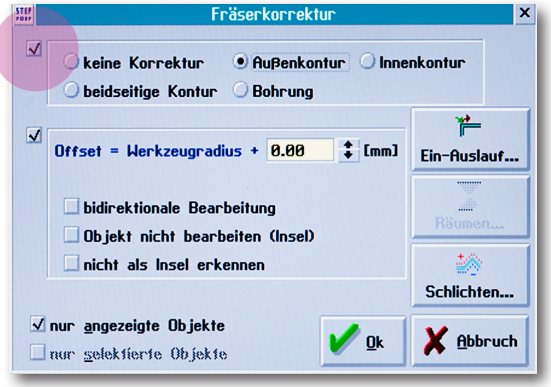
Step 1

1. Click the Icon.
2. Click the number in the tool bar on the right to make the layer visible or invisible.
3. Pull the window from left to right over the drawing.
4. The „Fraesenkorrektur“ (Milling Correction) window will open up.



Step 2

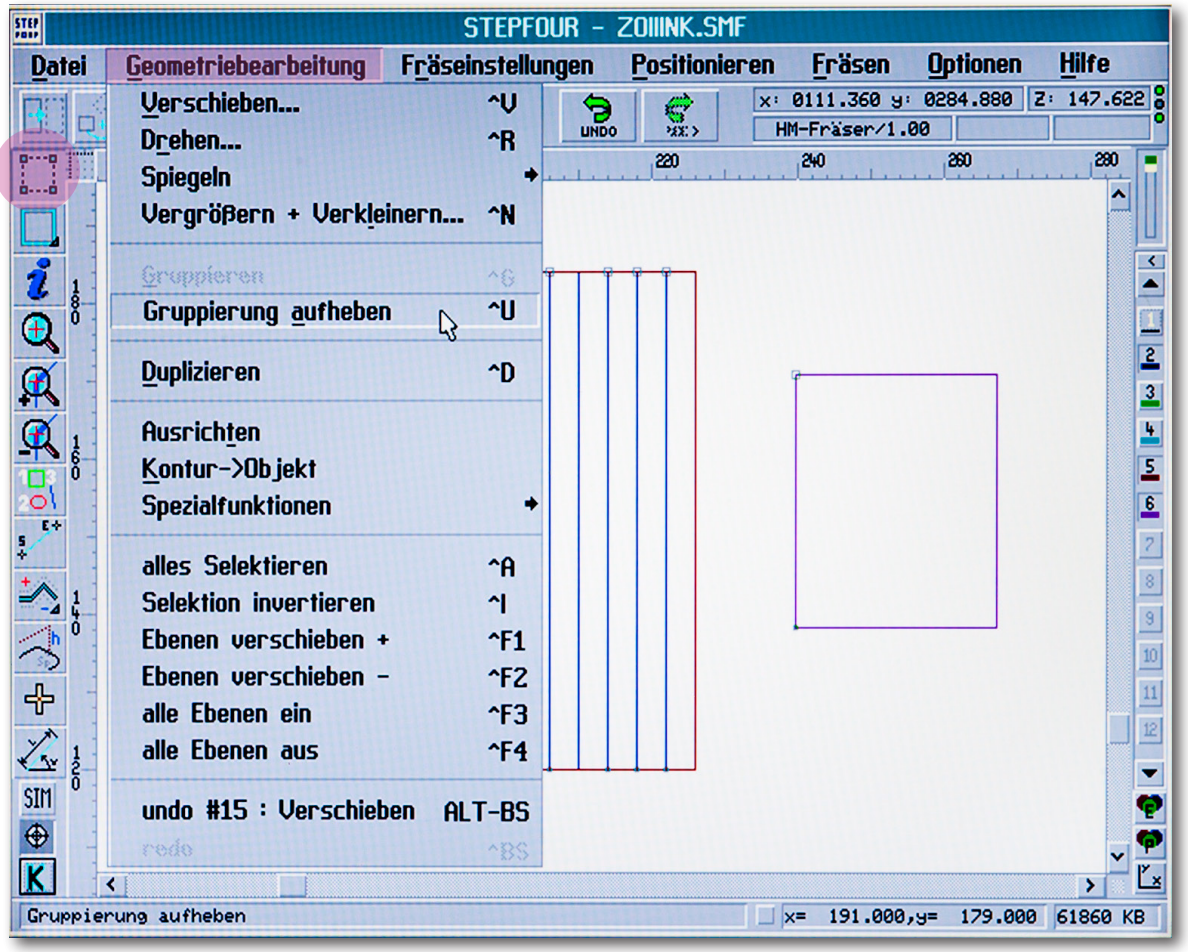
1. Tick the box.
2. Select outer- or inner- contour
3. OK.



Step 3

1. Verify:
   - \+ outer contour (Außenkontur)
   - \- inner contour (Innenkontur)
   - x carving / milling on the line

9. Functions to edit your drawing



Undo the Group

1. Select the Marking icon.
2. Select the drawing.
3. Edit the Geometry (Geometriebearbeitung) - Double click
4. Undo the group. (STRG + U)
5. Group objects (STRG + G)

Shifting the layers

1. Select the marking icon.
2. Select the Polylines.
3. With „ STRG + F1“ to go up and with „STRG + F2“ to go down.
4. Don‘t forget to group the drawing again.

Rotating the drawing

1. click the marking icon.
2. Select the drawing.
3. double click - Geometriebearbeitung
4. Select the angle and click ok.

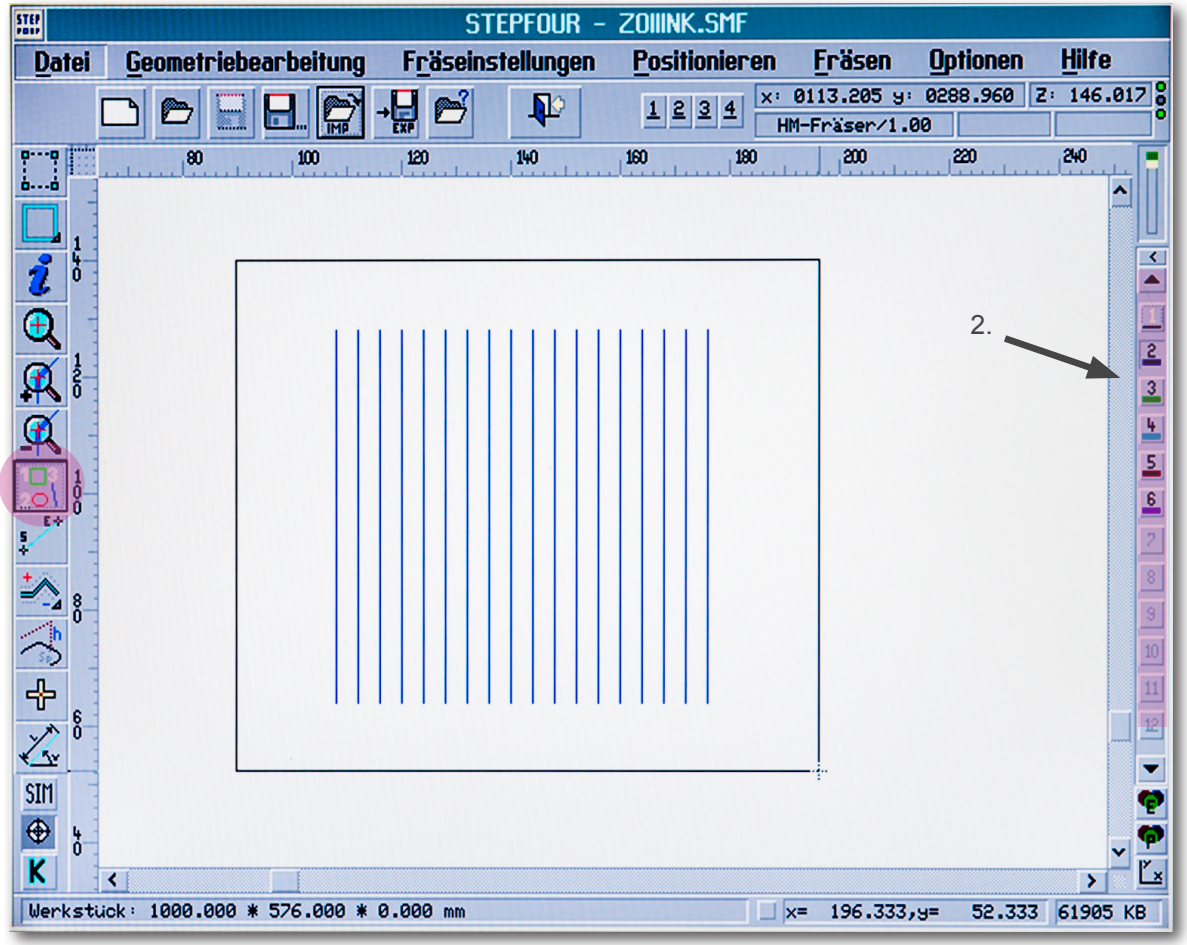
Undo

1. click - Geometriebearbeitung
2. If you deleted something by mistake, you can recover it by clicking undo.

10. Milling Order of Operations

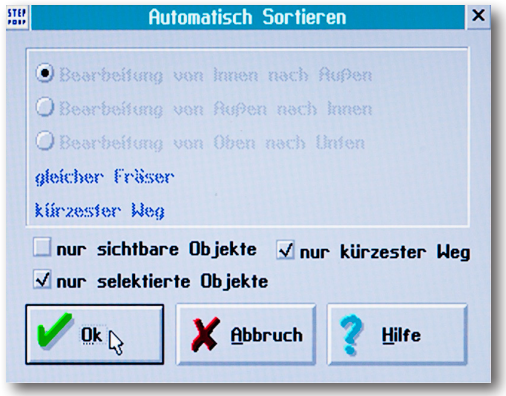
Step 1

1. Click the symbol
2. Click the number in the tool bar on the right to make the layer visible or invisible.
3. Start from the inner contours and go outwards.
4. Pull the window from right to left over the drawing.



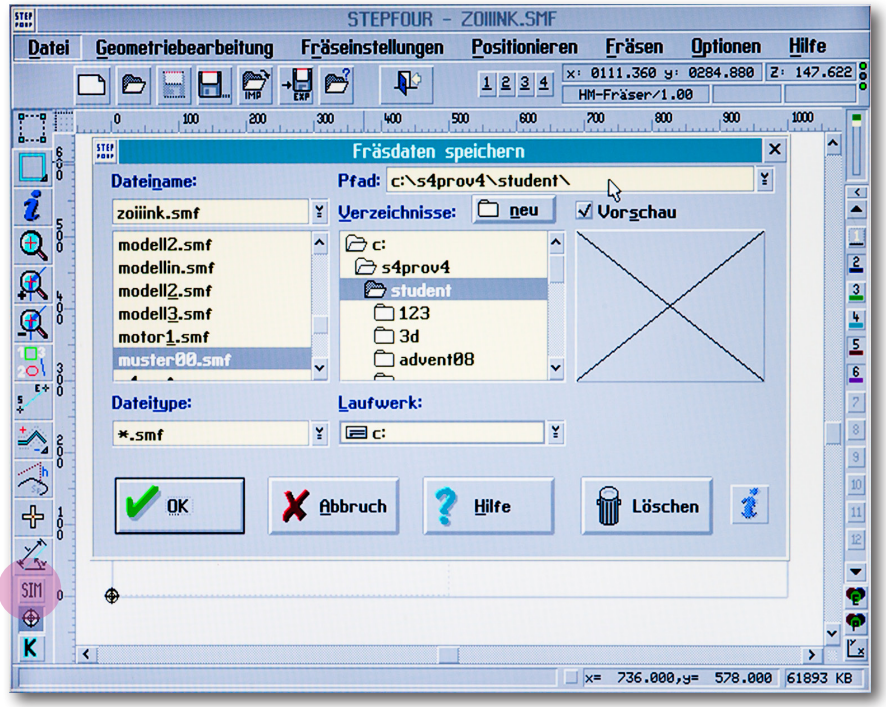
Step 2- Automatic Sorting

1. Select „nur kuerzester Weg“ (only shortest way).
2. OK.



11. Saving As...

1. File – Double click.
2. Save As – choose a folder.
3. Click- OK.



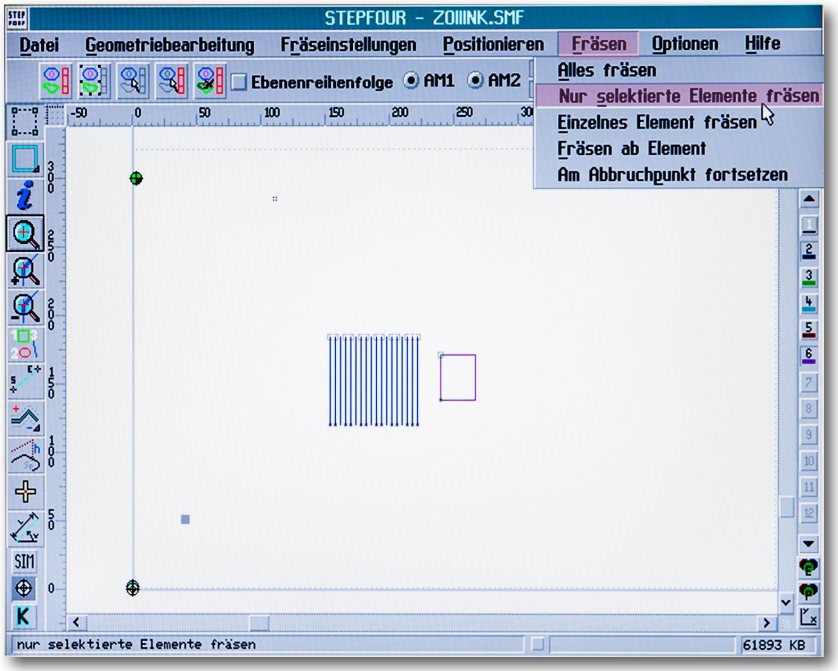
12. Simulation

Before you start milling, make sure the simulation-mode of the program isn‘t activated. If the SIM-button in the bottom left corner is underlayed in a dark grey, it means the simulation-mode is activated.In this case only the cursor on the display would move when you start the milling-job and not the actual cnc-mill. **To deactivate left-click the SIM-button once.**

13. Milling

Start

1. Click the Marker Icon (see above).
2. Pay attention to the order.
3. Right Column ► by clicking the layers can be made visible/ invisible.
4. Select the Object to be milled.
5. Double-click Milling ► “Nur Selectierte Elemente Fraesen” (Only mill the selected elements).



Pause / Stop

1. F10 – Pause
   Milling spindle will turn off – the milling cutter will resume the milling operation from the same spot when turned back on.
2. ESC- Cancel
   Complete Cancellation.