

FilChaudNX

by CNCFAB.fr

2D AND 4 AXIS CNC HOT WIRE CUTTING SOFTWARE



Users Guide of the
→ 2D DESIGN AND
CUTTING WINDOW

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1. Compatibility and setting up a machine

Please see the “Users Guide of the 4 Axes windows, machine and material parameters windows”

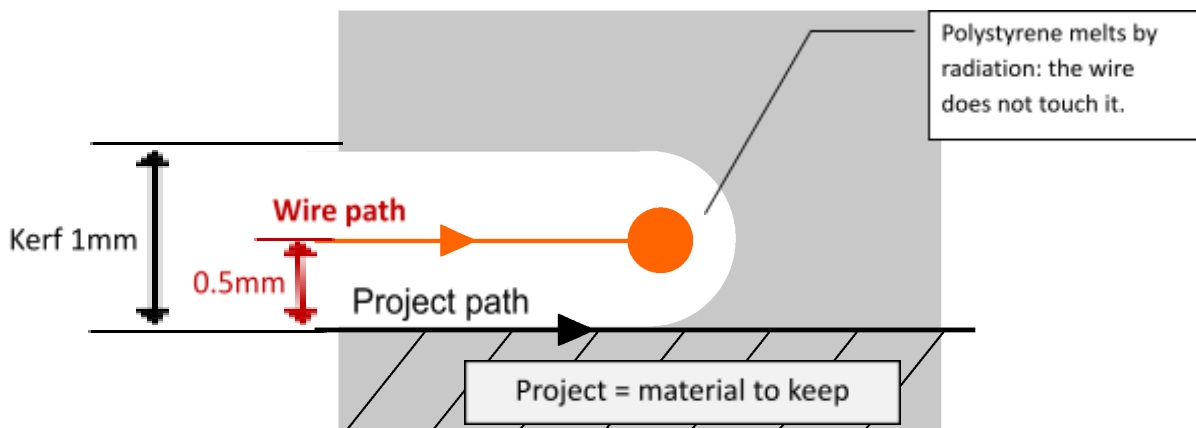
2. Functioning principles

Cutting and respect of the project:

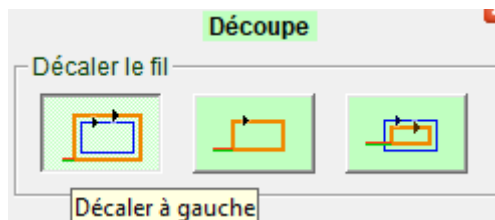
A heating wire heats and melts the polystyrene in its path, making a cut. Its path is represented flat (in 2D), as if looking from the end of the wire. The cutting speed is constant. It is 4mm/s by default (modifiable in the settings if needed).

You must adjust the heating according to the type of polystyrene to have a groove of a given width (1mm wide by default, modifiable in the settings). This allows cutting by radiation: the wire does not touch the polystyrene, which melts first.

The software then allows the wire to be shifted by half of the kerf to comply with the project.



The wire offset is chosen just before starting a cut:



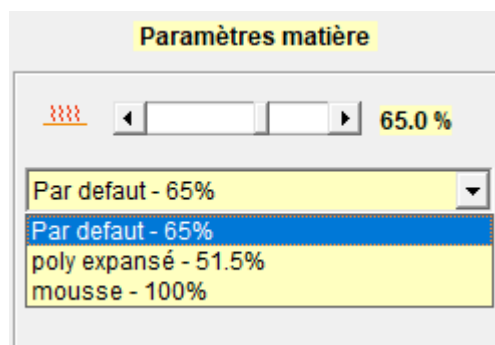
3 possibilities, depending on the project:

- offset to the left of the oriented path, the most classic case
- no offset
- offset to the right of the oriented path, for example in the case of stencils

Heating and materials:

The heating of the wire is expressed as a percentage.

A heating value must be defined for each material used, then stored in the software.

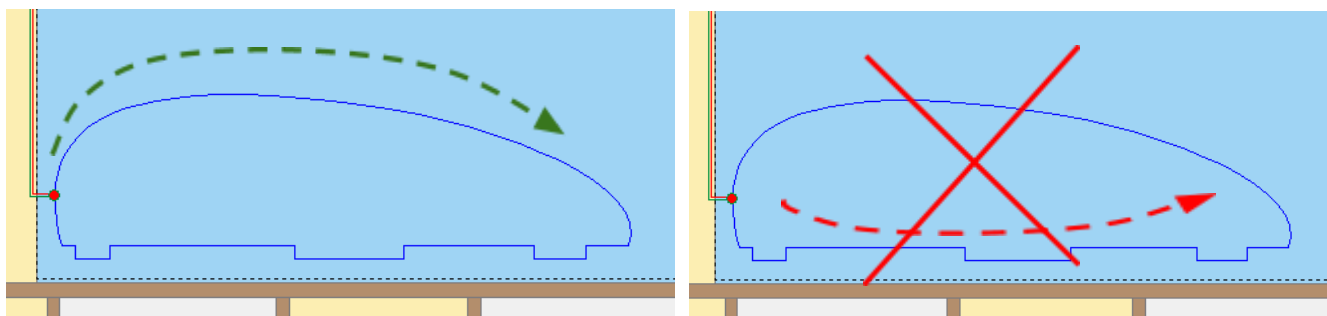


So, when the same material is used again, its heating is directly accessible in a drop-down list.

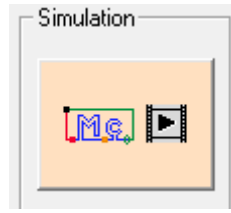
The ideal heating is the one for which the wire makes a kerf of 1mm in the material (by default, or another value if the parameters have been modified), at the cutting speed of the machine (set by default at 4mm/s but modifiable in the settings). The procedure for determining this heating value is detailed below.

Cutting direction:

By default, the cut must be in a clockwise direction, to cut the bottom last and thus prevent the cut from falling into the groove made by the wire.

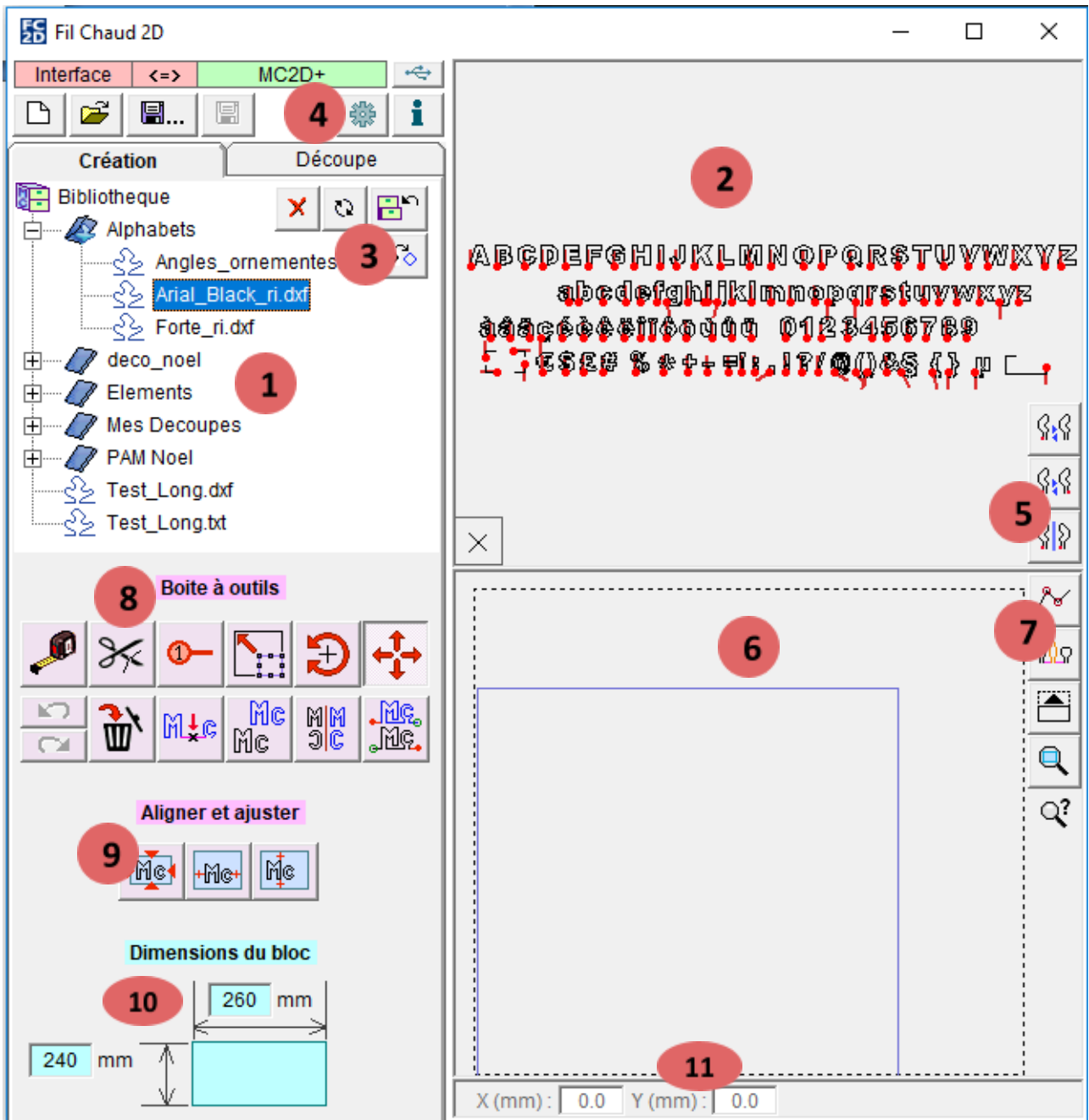


The direction of cutting can be tested using the simulation button which allows you to see the movement of the wire:



3. Create a project

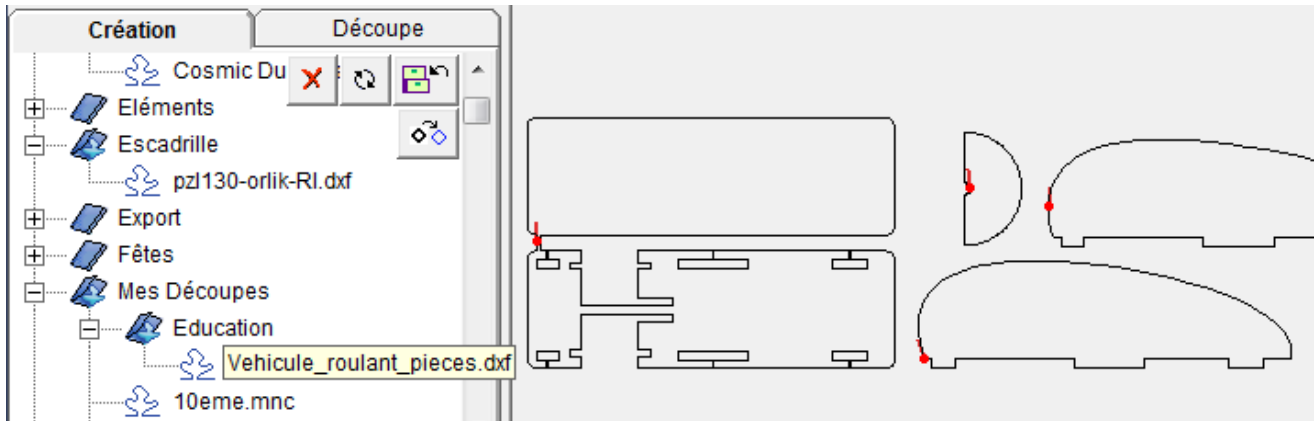
Project window interface



1. Library of projects and paths.
2. Viewing the file selected in the library (1).
3. Library file management and image vectorization.
4. Machines parameters and software settings.
5. Orientation of the file viewed in (2).
6. Visualisation of the current project. The blue rectangle represents the polystyrene block.
7. Display of points, different paths, zoom tools.
8. Project design tools.
9. Adjustment tools.
10. Enter the dimensions of the polystyrene block.
11. Manual entry frames and selection dimensions.

The library and paths files

The library displays all files of known type that are present in the user's MesDocuments\FilChaudNX\Bibliotheque folder.



The file formats displayed by the library are:

- **.dxf** : exchange format between computer-aided drawing software, this is the preferred format
- **.mnc** : this is the recording format for a MiniCut2d project, if the project is made up of several distinct paths, they are displayed individually but also in grouped form,
- **.dat** : wing profile format used in aeromodelling,
- **.txt** : with the structure below
- **.plt** : plotter format,
- **.eps** : PostScript format.

Noticed :Any path (even curve) is made up of a set of points which follow one another. The wire will pass from one point to another to make the cut.

FilChaudNX can read **text files (.txt)** containing point coordinates, which can be written manually with Windows Notepad or created with other software. One file can contain multiple paths.

To be usable, these files must have the following structure:

Path1 (There must be a letter at the beginning of the word).

x1:y1 (coordinates of the first point of Path1, separated by a double point)

x2:y2...

Path2

x1:y1 (coordinates of the first point of Path2)

x2:y2..... (to close a path, you must put the first point back at the end)

The library has buttons that allow:

- to put a file in the Windows trash,
- to refresh the display of files,
- to add to the library a file located elsewhere on the computer (for example on the desktop or in My Documents).



WARNING: Importing directly from an external device (usb key, etc.) sometimes cause a problem. It is better to import from the computer's hard drive (Windows Desktop or My Documents directory).

FilChaudNX is also capable of vectorizing image files (.jpg, .png, .bmp) to transform them into cuttable paths.

Access to vectorization is done using the button  and will be detailed further below.

When you click on a file, the paths it contains are displayed in the viewing frame on the right. Paths can be open or closed.

The red dot and small segment  indicate the start and direction of the path.

It may happen that the paths are reversed (especially on closed paths). You must then use the buttons located to the right of the window to modify the orientations:

- The first button is used to hide/show the orientation
- The second button allows you to reverse the direction of travel.
- The third button allows you to make a mirror



Using these buttons does not modify the source file but allows you to drag a path into its block that conforms to what was planned.

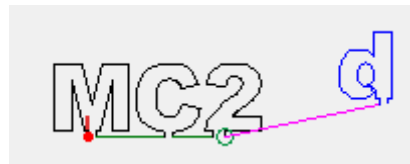
The paths

The design of a path to cut can be done before using FilChaudNX, for example in CAD software with a recording in .dxf format. In this case, FilChaudNX will essentially be used to position the path in the block and to control the cutting.

But FilChaudNX also has project creation tools that allow you to manipulate existing paths.

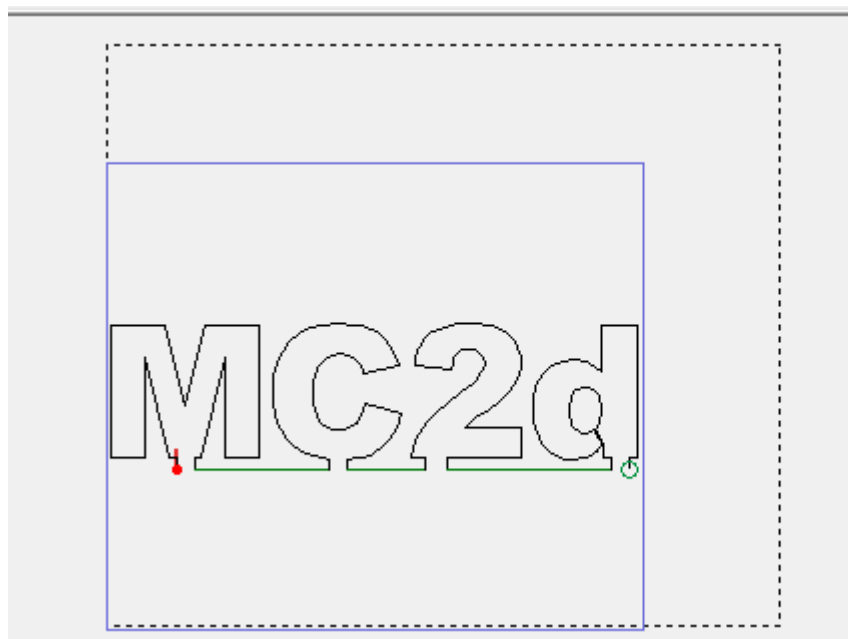
Add a path to the project can be done in two ways:

- Double-click on the path in the top frame. The path then automatically aligns with those already present (useful for lettering for example).
- Or click on the path in the top frame and drag it into the bottom frame. The path automatically connects to the start or end of the project based on its location. Sometimes you have to drop at a wrong location but with the good connection, and then select it and move it to the good location.



The project display frame shows:

- the useful area of the machine (dotted rectangle),
- the block of material (blue rectangle),
- the paths that have been slipped into the block (in black),
- the junctions between the paths (in green),
- the starting point (in red),
- the end point (green circle).



The four buttons on the right help with visualisation:

- the first allows you to display the points of the paths (useful for the Measure and Cut tools which only work on the points),
- the second allows you to change the color of one path on two (useful after using the Cut tool),
- the third allows you to enlarge the working window on the project,
- the fourth allows you to zoom in on the block of material.



The image located below the buttons is clickable and displays a cheat sheet on how refocusing + zoom works, which is as follows:

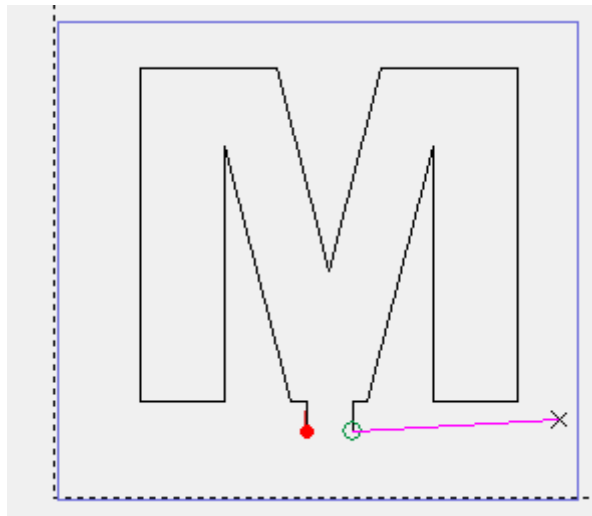
- right-click on the location you want to display in the center of the window,
- zoom using the up and down arrows on the keyboard (mouse wheel not working).

Noticed :right-clicking is required to activate zoom.

The frame surrounding a cross allows you to add points to the project.

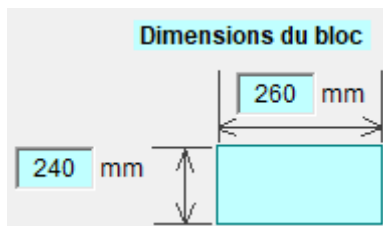


Simply click on the cross and drag the mouse within the project, to the side where you want to add the point:



Block size

The size of the polystyrene block or sheet is adjusted in the fields located at the bottom left. Please note, **validation of the values entered must be done by pressing the TAB key or the Enter key.**



Selection tools

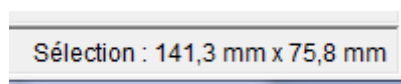
The toolbox on the left contains three tools for selection : the stretch tool, the rotate tool and the move tool.



Once one of these tools is activated, **the selection is made :**

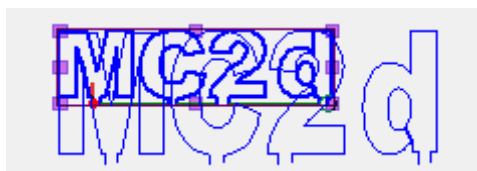
- either by clicking on a single path : single selection,
- either by creating a frame by clicking+drag around the paths to select,
- pressing the Ctrl key during selection operations allows you to add or remove selections from the current selection.

The dimensions of the selection are indicated in the bottom bar on the right:

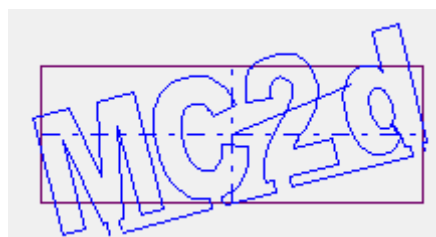


This is a very important information that allows you to easily obtain the dimensions of the project.

The stretch tool is used by dragging the bounding box handles:



The rotate tool is used by clicking inside the selection and dragging around the center:



The move tool is used by clicking inside the selection and dragging.

Important :

All of these tools can be used with numerical values that must be entered in the fields located in the lower bar:

Stretching: X (%) : 100,0 Y (%) : 100,0

Rotation : Angle (°) : 0,0

Move : X (mm) : 0,0 Y (mm) : 0,0

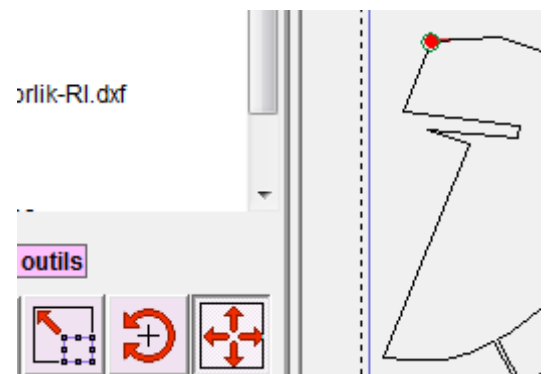
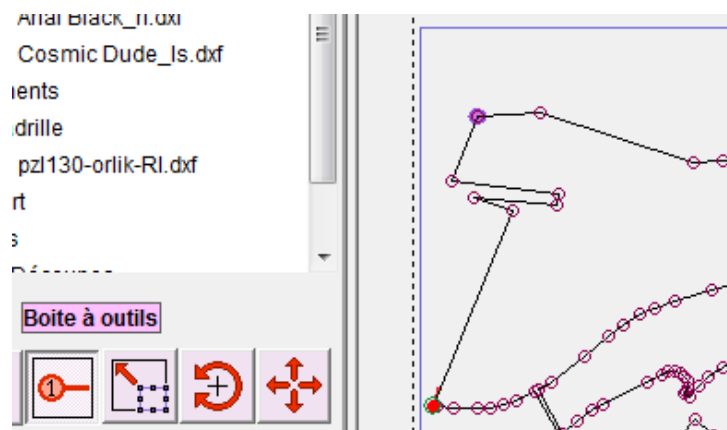
This allows you to obtain precise positions that can be controlled with the “Meter” tool described later.

Redefine the first point

It is possible to modify the location of the first point of a path using the dedicated tool:



Select the tool and simply click on the new first point:



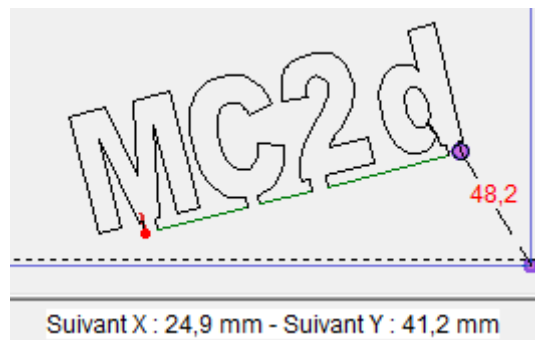
Measure and cut

Be careful, these tools only work by passing the cursor over the points which constitute the path of the wire (not on the vertex between the points).



The first button is the measurement tool: it allows you to know the horizontal (along X), vertical (along Y) and diagonal distances (displayed in the figure) between two points. The points taken into account are:

- the points of the paths,
- the angles of the block,
- the angles of the useful area.



This tool allows in particular the precise positioning of paths.

The second button allows you to cut a path in two in order to distort it or keep only one end. Its use automatically causes the colors of the paths to alternate.



For example, it can be used to obtain an arc from a complete circle, or to remove a part from a path that contains several.

Undo, redo, delete



The left arrow is used to undo the last action.

The arrow pointing to the right is used to redo the action that has just been cancelled.

The trash can button is used to delete the paths that are selected in the project. The same result is obtained by using the Del key on the keyboard.

Additional tools



The first button is used to insert a point between two selected paths. The point itself becomes a path and can therefore be moved to deviate from the path of the wire.

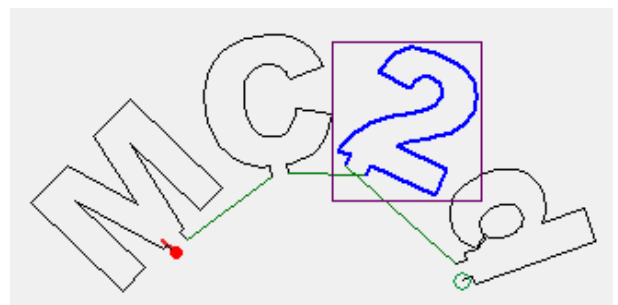
The second button is used to duplicate the selected paths.

The third button is used to mirror the selected paths.

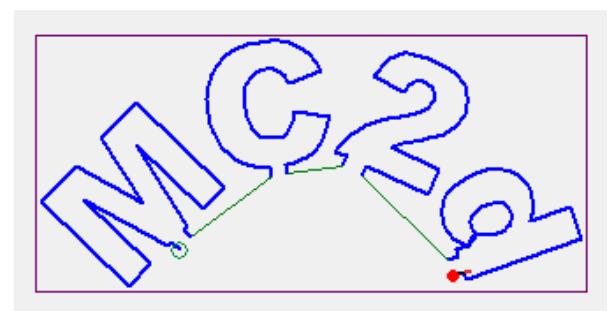
The fourth button is used to reverse the direction of the selected paths. If we want to reverse the entire project, we must select all the paths.

Examples:

- The direction of "2" has been reversed by mistake, the green arrival and departure paths intersect. You will have to click on the inversion tool again to restore the situation.



- Reversal of the direction of the entire project, the path now begins on the right and ends on the left.



Block adjustment tools



Be careful, these buttons remain pressed when you click on them. To remove their effect, you must click a second time.

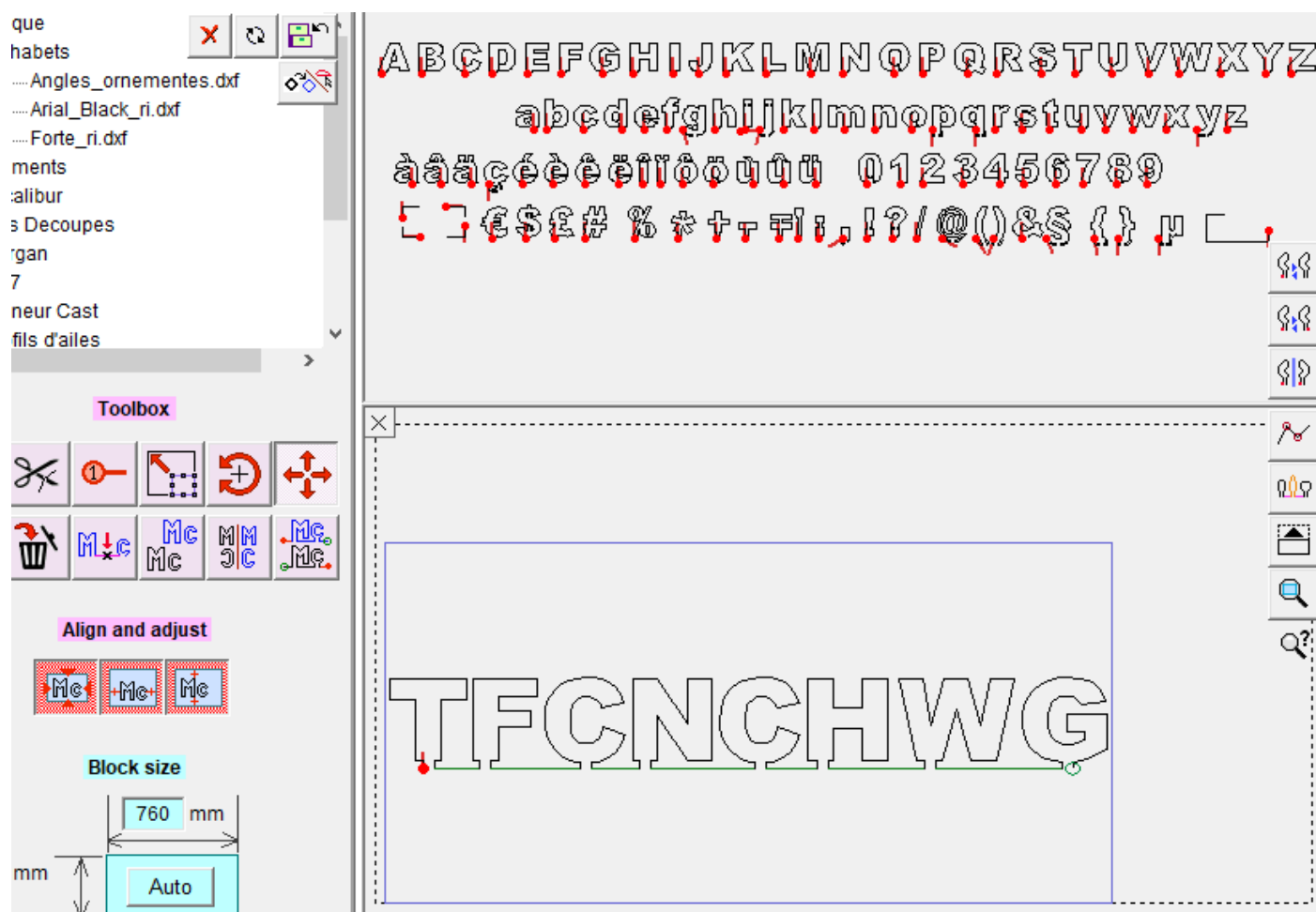
The first is used to fit the project into the dimensions of the block: the project is stretched so that it can fit into the block with a small margin around it. The project is not moved, to center it in the block you must use the other two buttons.

The second button is used to center the project horizontally in relation to the block.

The third is used to center the project vertically in relation to the block.

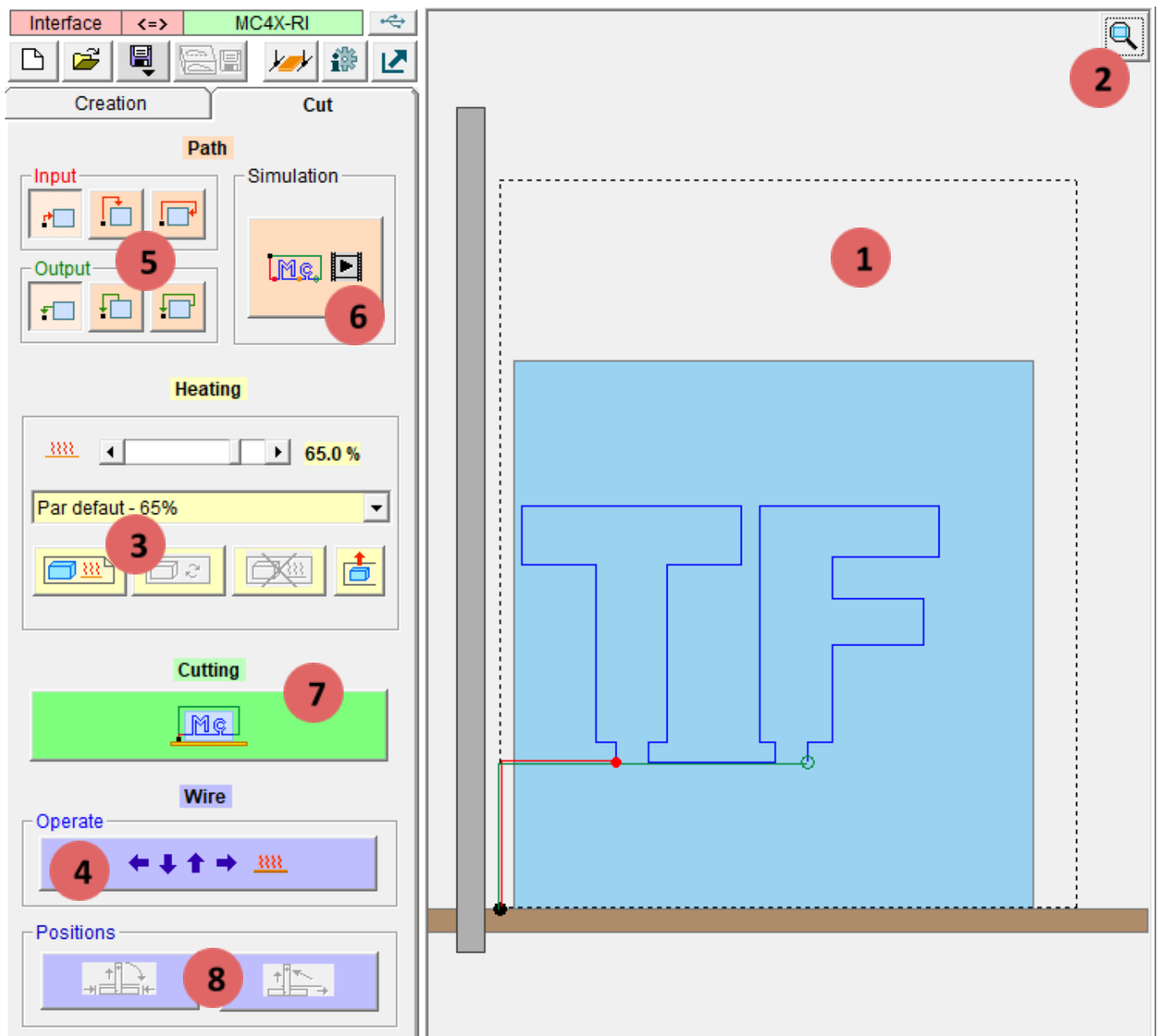
You can test the following actions :

- Click on the 3 buttons
- Select the Arial_Black_ri.dxf file in the viewer
- Double-click on the letters => auto-adjustment to the size of the bloc



4. Cut

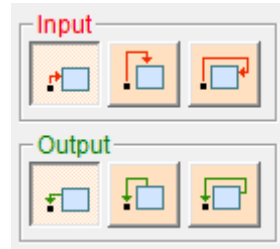
Cutting window interface



1. Visualisation of the machine, the block and the paths.
2. Zoom in on the block.
3. Memorization of the ideal heating for each material.
4. Access to manual control of the wire and heating.
5. Choice of entry and exit paths.
6. Simulation of wire movement in the block.
7. Access to choice of wire offset and launch of cutting
8. These functions are specific to some CncFab machines and are no longer active in FilChaudNX.

Entry and exit paths

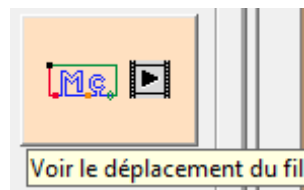
The first thing to do is to finalise the wire path. To do this, you must define your entry and exit paths using the buttons below:



The choice of these paths depends on the project and the location of the entry and exit points of the cutting path.

Simulation

Once the paths are ready, click on the simulation button and check that the movement of the wire follows the path you have planned (clockwise):



Press the button again to stop the simulation.

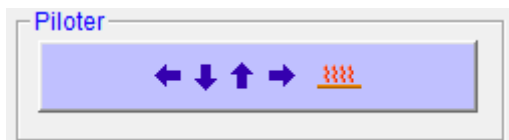
If the wire does not go in the right direction, you must return to the Creation tab and reverse the direction of travel of the entire cut by selecting all the paths in a frame and clicking on the reversal of direction of travel button .



We then return to the Cutting tab, check the input and output and simulate again.

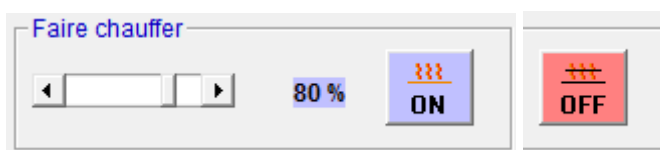
Manual piloting

To determine the ideal heating of a material, go to the manual wire movement frame by clicking on the button below:

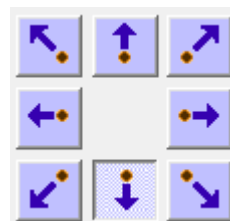


Here are the different features of this framework:

The slider below allows you to adjust the wire heating value. The button on the right allows you to start or stop heating. There is a wire temperature delay that appears when the heater is turned ON.



The eight arrows opposite indicate the direction in which the wire will move. Be careful, the plate moves in the opposite direction of the wire. If no arrow is pressed, the movement does not take place.



The movement is started by clicking on the green light and stopped by clicking on the red light:



You can change direction or heating value while moving.

A golden rule:

You must always look carefully at the wire when it enters the material or when you modify its heating, otherwise one day it will be too cold and you will break it.

This is valid for manual control or when cutting a project.

If you follow this golden rule, you will never have to change your wire because you will have time to stop it with the emergency stop button or in the software.

When you want to return to the origin vertically or horizontally, simply use the two buttons below (**only for some of CncFab machines**) :

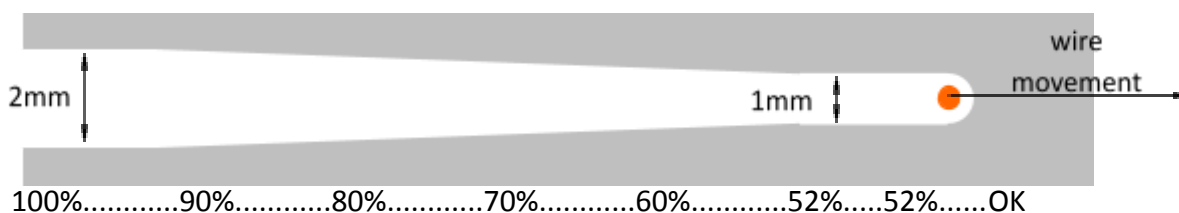


Determining the ideal heating

The principle is as follows:

We heat the wire to 100%, then we move it manually in the material that we are currently testing.

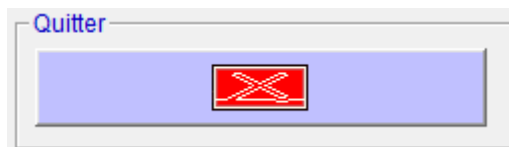
Heating is gradually reduced during movement, until you obtain a stabilised kerf approximately 1mm wide (or the value specified in the parameters if it has been changed).



Heating: 100%.....90%.....80%.....70%.....60%.....52%.....52%.....OK

When the value is found, we bring the wire out upwards to be able to remove the polystyrene block, then we stop the movement and heat.

Once the heating value has been found, leave the frame of manual movements:

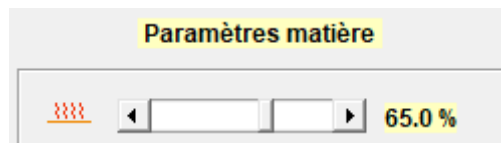


Be careful not to let the wire heat up to 100% for longer than necessary, most polystyrene cuts at less than 80% heat.

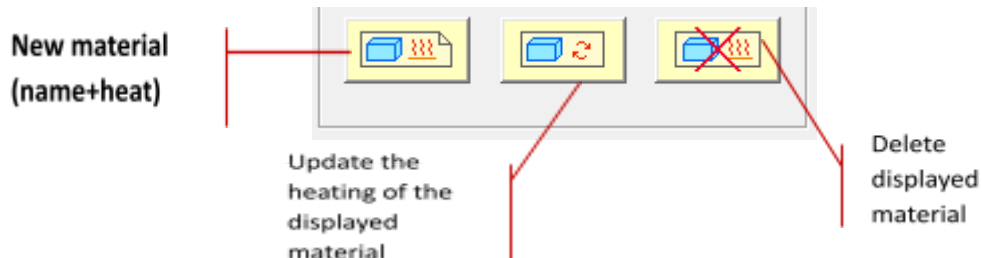
Always turn off the heating and movements when the machine is not under supervision.

Memorization

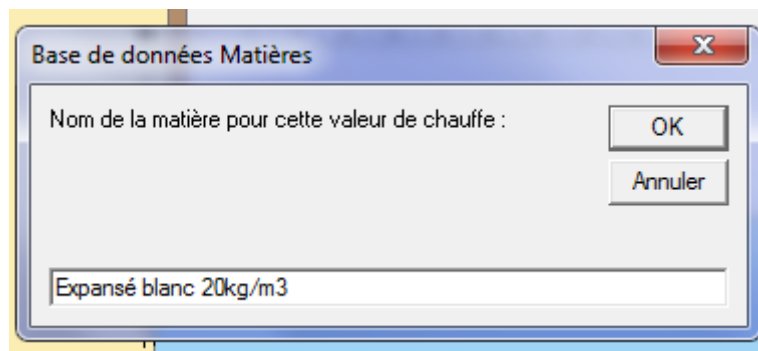
The heating value can be found in the “Material parameters” frame:



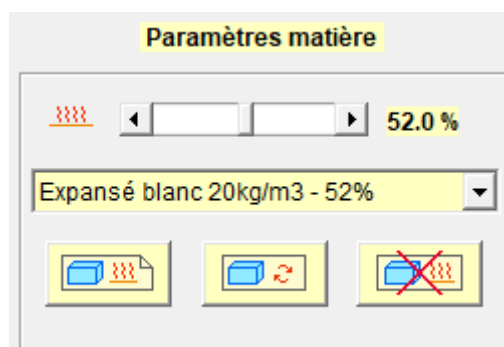
You must now memorise this value and the name of the material by clicking on the first yellow button:



An input window allows you to enter an explicit (but keep it short) name:



Your new material appears in the drop-down list (and it is stored in the “FilChaudNX.ini” file):



It will be available during subsequent uses of the software.

If you want to correct the heat value without changing the name, use the second button.

The third yellow button is used to delete the material from the material database.

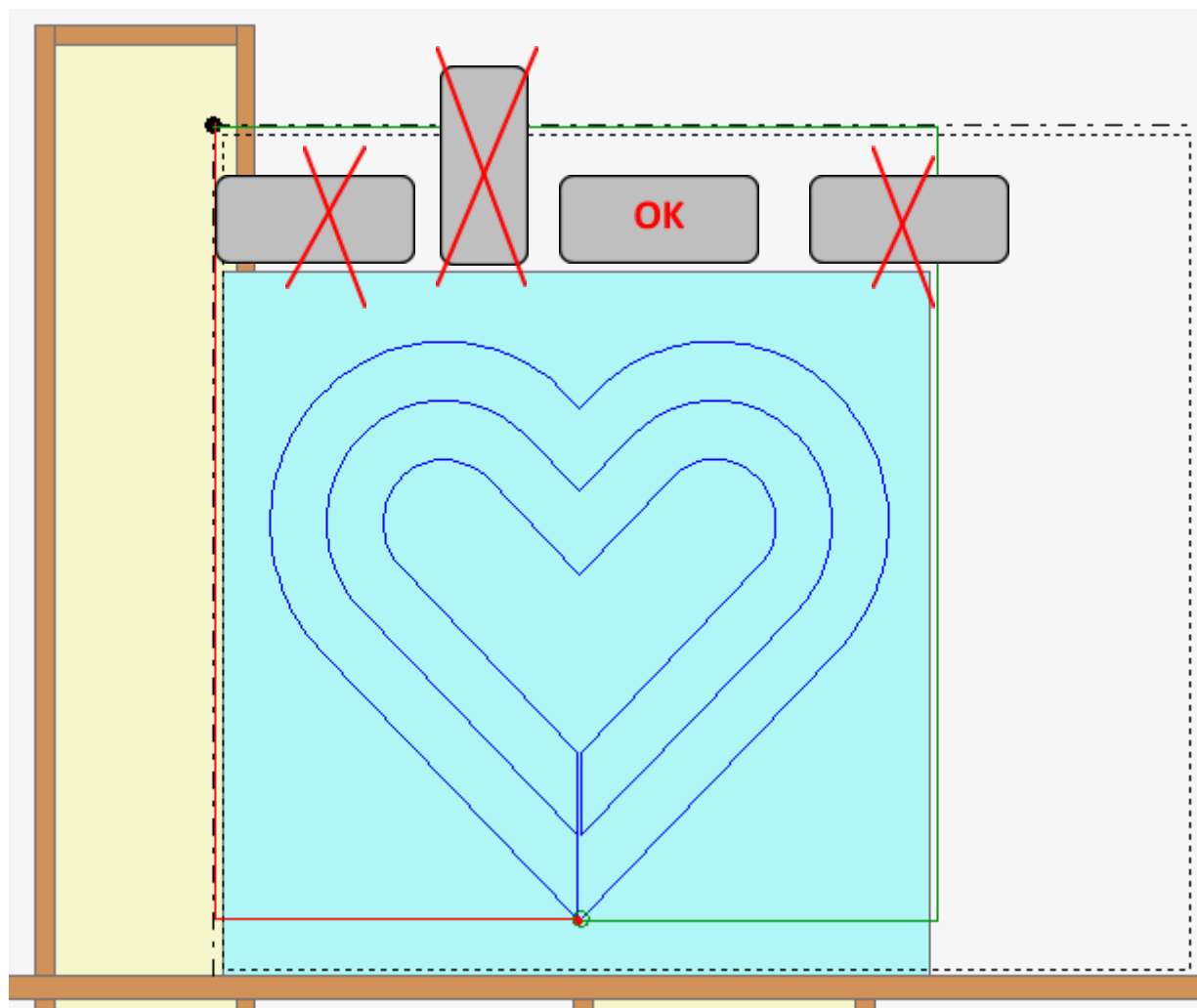
Start of cutting

Place a polystyrene block of sufficient size on the plate.

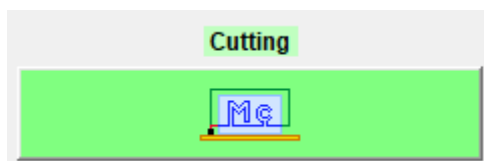
The wire must be at the origin of the machine.

If it is sheet polystyrene, hold it vertical in one or two combs.

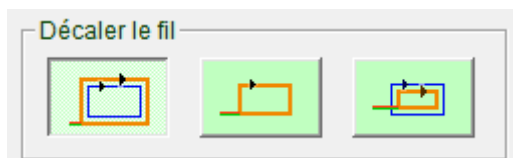
For block materials, it is advisable to stabilize them by placing a small ballast on them in a judiciously chosen location so that the wire does not touch it (example in the figure below).



Then click on the button to access the cutting launch procedure:



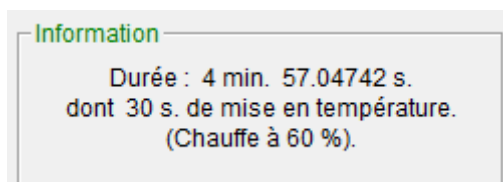
Choose the wire offset if you want to cut next to the path to account for the wire path kerf.



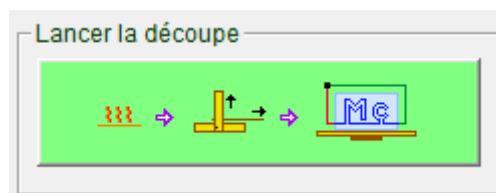
Then choose the approach speed and the return speed: either rapid (large dotted lines) or cutting speed (small dotted lines). Be careful, when fast you have to be sure not to cross the material.



Check the cutting time and the heating value:



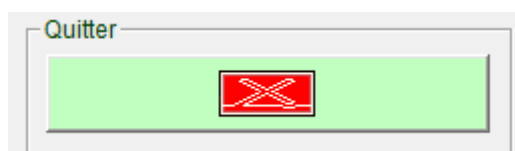
Start cutting by pressing the green button:



The machine will first preheat the wire, and then the cutting will begin.

Do not touch the wire, the machine (except the emergency stop button if necessary) or the polystyrene until cutting is complete.

Once the cutting is finished, you can restart a cutting with another piece of polystyrene, or exit the cutting frame by clicking on the cancel button:



Tips and tricks for cutting

- **Heating stabilisation path:**

During preheating, the wire stores a little heat which it releases at the start of cutting before stabilising its temperature. The kerf at the start of the cut is therefore often a little wider than expected.

To give the wire time to stabilise before starting the project path, you can add a little path (vertex) in the material before the project (with the tool for adding points by drag and drop).

- **Dynamic heating adjustment:**

The ideal heating value is sensitive to the temperature of the room. From one season to another, there may be a difference of a few percent.

It is possible to correct the heating during cutting to take this variation into account without stopping the wire. To do this, once cutting has started, click on the padlock at the bottom of the cutting frame, which will activate the modification slider.



Warning: change slowly, percent by percent, especially in the event of a drop! Apply the golden rule: keep your eyes on the wire while changing the heater.

Once the heating has been corrected, lock the cursor again by clicking on the padlock.

Stopping during cutting

Stopping during cutting can be done in two ways: pressing the emergency stop button on the machine or clicking on the “Stop” button on the cutting frame:



We then access the “Stop/Resume” frame:

The “Information” section indicates the segment on which cutting stopped.

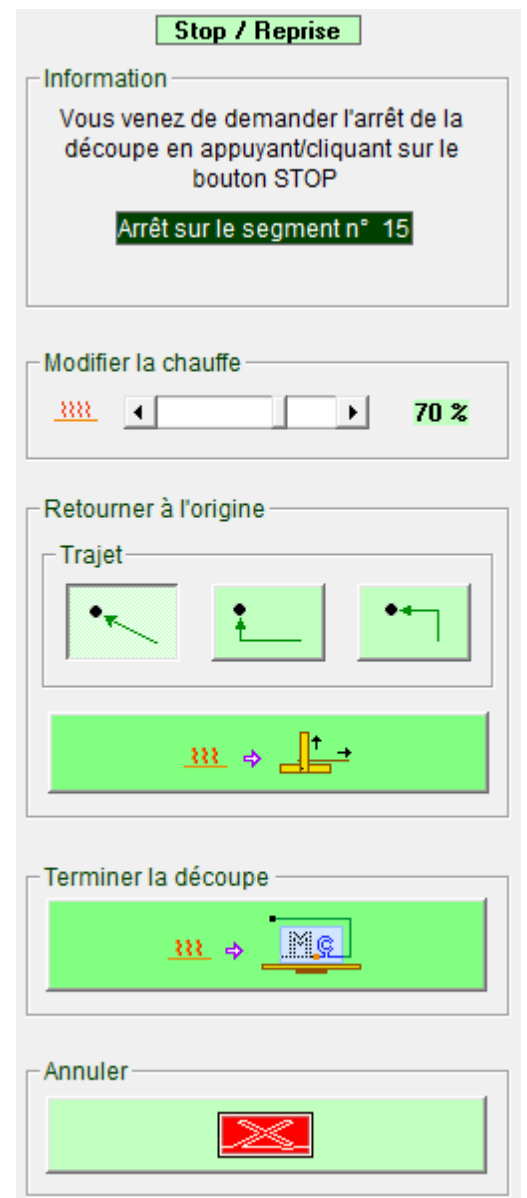
The next one allows you to modify the heating value if you want to resume cutting with a different value (in the event of an error in calibrating the material).

The next one is used to bring the wire back to the origin.

Choose the return path: diagonally, from the left or from the top, then start the return movement by clicking on the large button.


The “Finish cutting” button allows you to resume cutting where it left off. The software first heats the wire.

The last button allows you to simply cancel the entire cut.



5. Supplements

Vectorize an image

Access to the vectorization window is done using the button  from the library.

The image can be loaded from a file or pasted from the Windows clipboard using the two buttons in the “Image” frame:

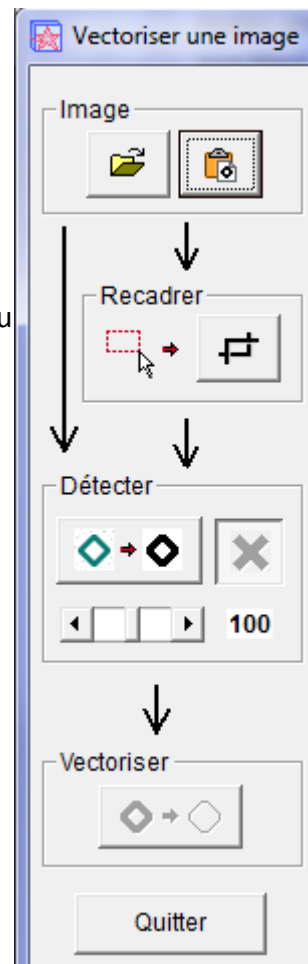
An image whose largest side is around 1200 pixels is a good compromise for obtaining quality vectorization.

Image may need cropping. To do this, simply draw the frame with the mouse around the part to keep and click on this cropping button:

Once the image has been cropped, click on the drawing detection button. The slider allows you to change the sensitivity for low contrast images.

You can restart the detection several times by clicking on the red cross, until you obtain the desired result.

We can then launch the vectorization which will smooth the exterior contour of the drawing and transfer it to the path visualisation window which is visible in the background.



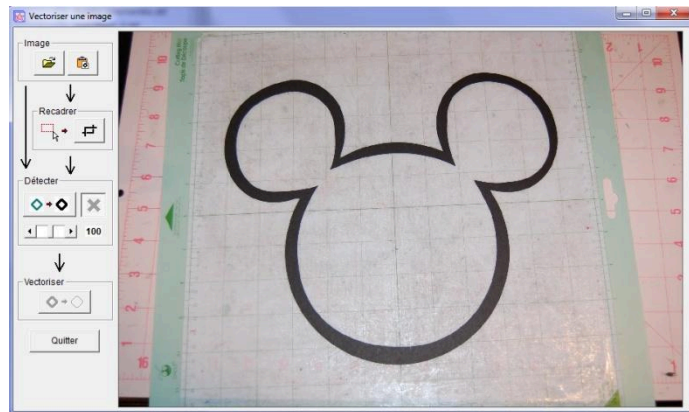
Example of vectorization

The project is to cut out the characteristic silhouette of Mickey's head.

I launch a search in Google Images with the keywords "silhouette" and "mickey" and the filter "large" to favor images allowing good vectorization.



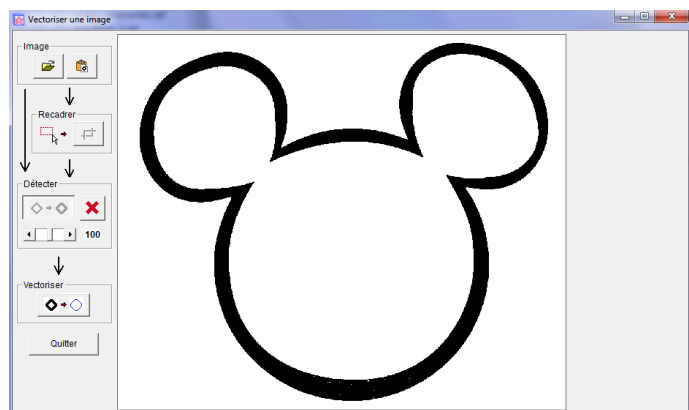
I choose an image whose external contour suits me, I display it in real size, I copy it (right click + "copy image"), I paste it in the vectorization window.



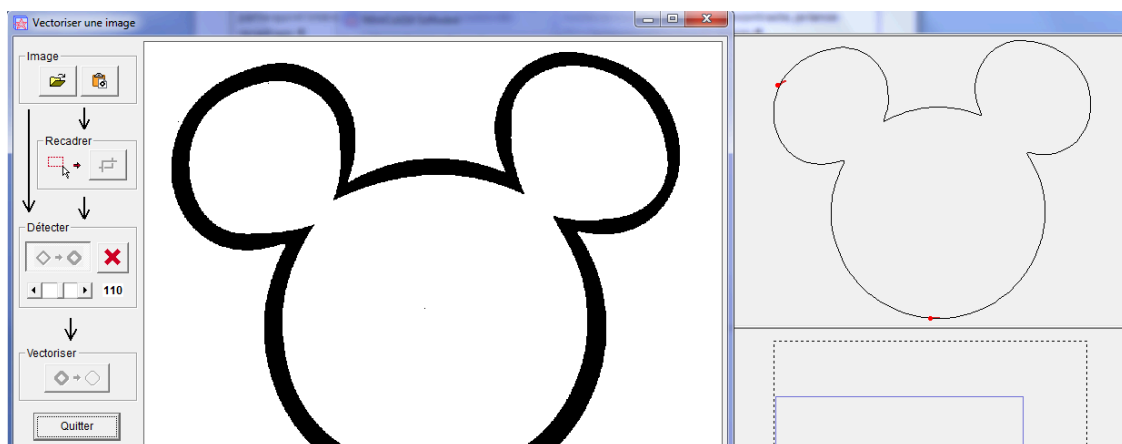
I draw a box directly on the image to isolate the part that interests me and I click on the crop button.



The contrast of my image is strong (black on white), no need to touch the contrast slider, I launch the drawing detection directly.

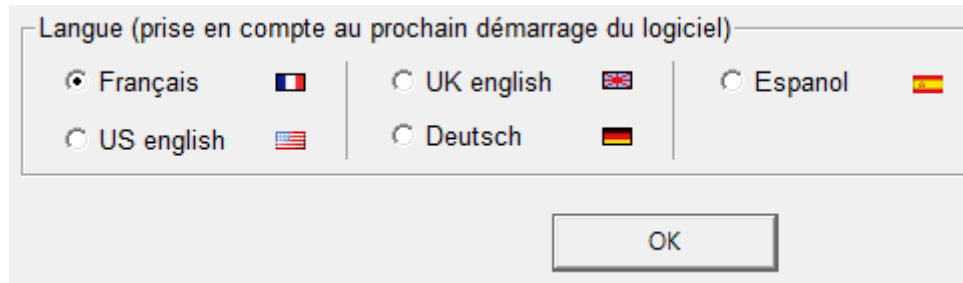


If I have too many white points on my drawing, I move the cursor to the right and restart the drawing detection. I can then click the "Vector" button and the path appears in the background. I can click "Exit".



Change language

To change the software language, click  to access the language frame.



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