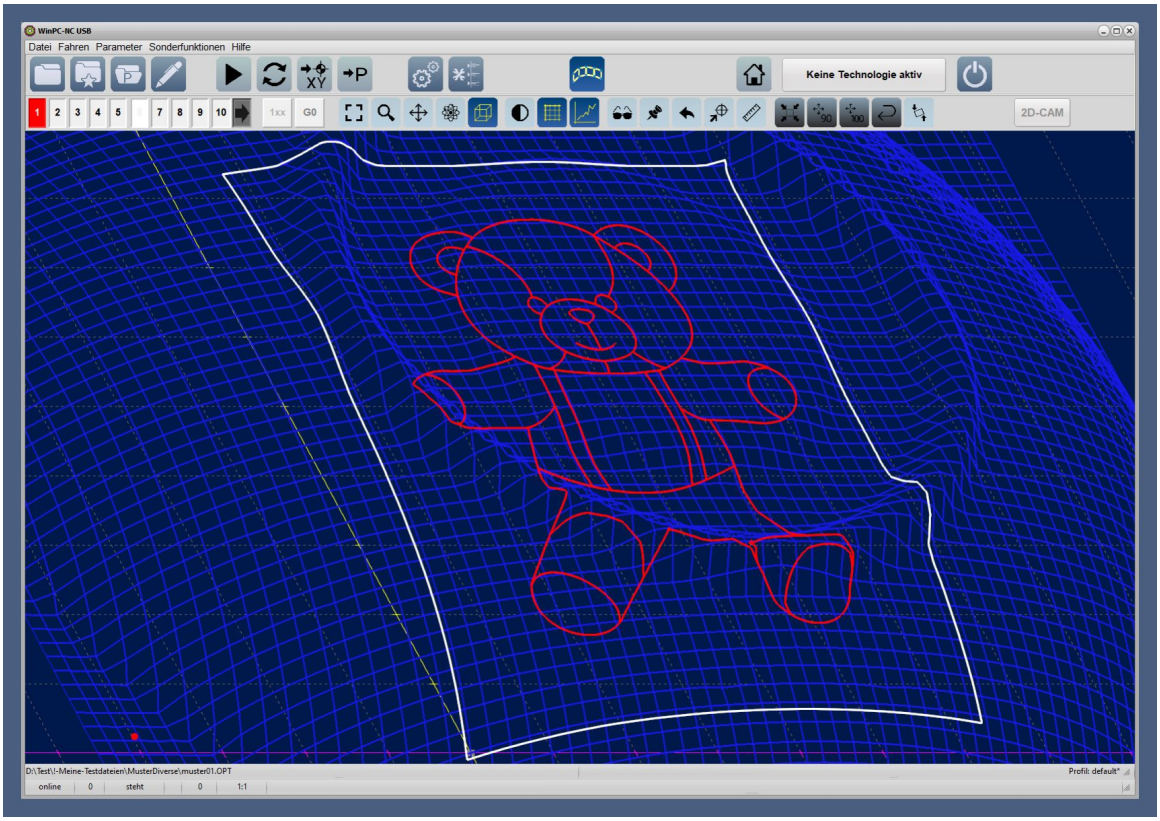
Hard- und Software Burkhard Lewetz

Technical Software Engineering

How does it work …
… with *WinPC-NC* ?

Scanning of non-planar surfaces and projection of milling or engraving data on it

	Light
✓	**USB**
✓	**Professional**



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From version V4.1 *WinPC-NC USB* and *Professional* can scan a surface and record the different Z-heights in a table and matrix and later project the path data for milling and engraving onto it. The measured Z-heights are then taken into account and compensated for in the next step.

This makes it possible to machine non-planar surfaces and even to compensate for a machine bed that is not completely flat during a job.

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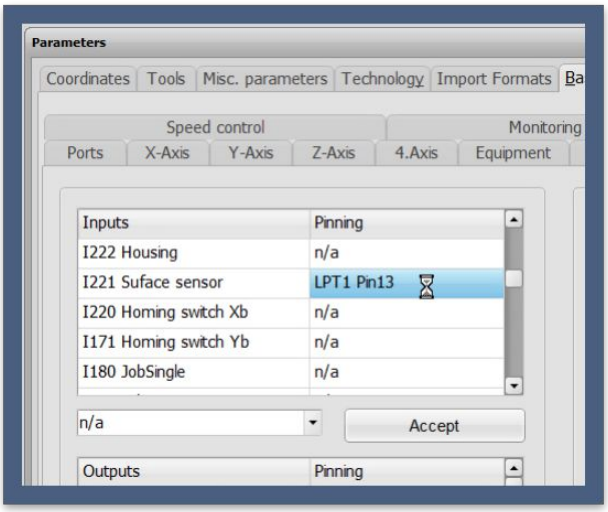
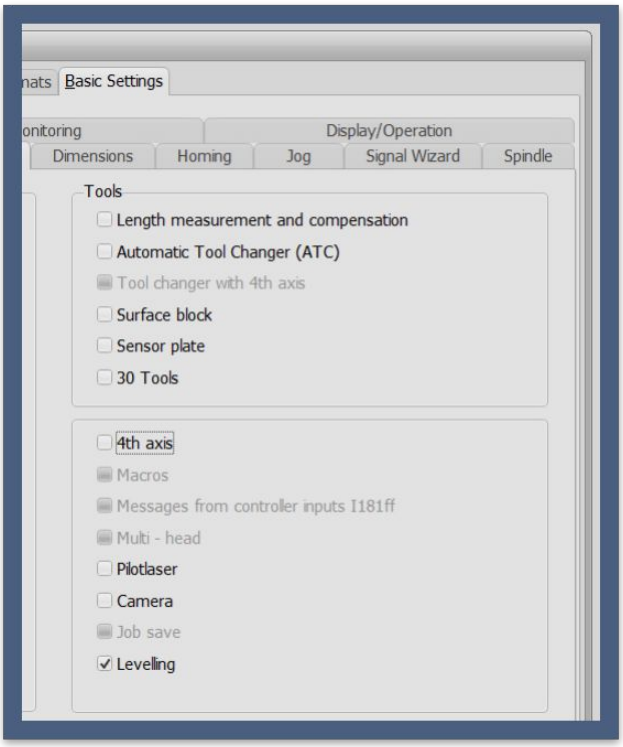
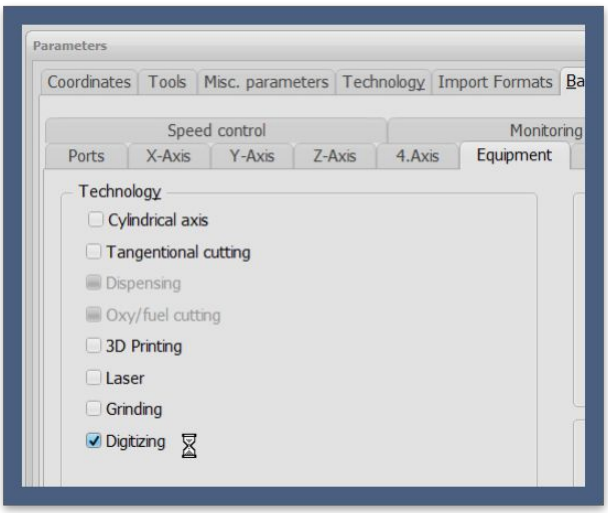
1. Parameters and enabling the function

The function for scanning is called DIGITIZING in ***WinPC-NC*** and must be enabled in the parameters under *Equipment*, just as the definition of a probe signal in the *Signal Wizard* is needed. The height projection function must also be enabled here, otherwise the corresponding dialogs will not appear at all. It may be necessary to restart ***WinPC-NC***.

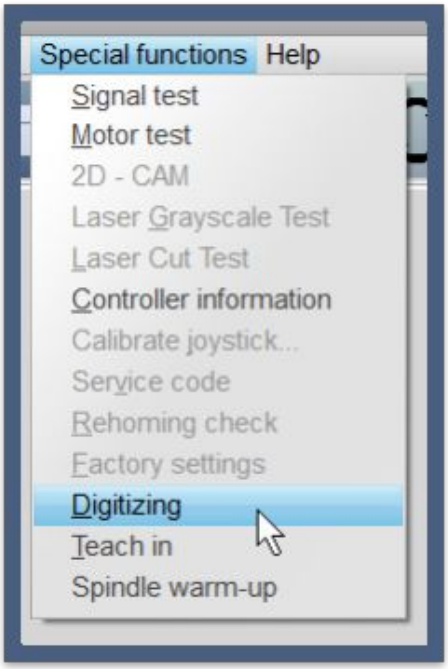


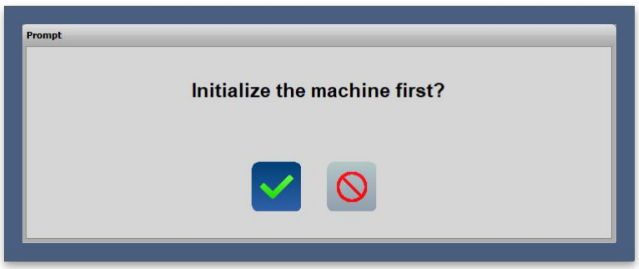




2. Scanning the surface

To do this, the DIGITIZING function must be opened and the desired surface scanned. A reference run must be carried out on the machine beforehand, because the scanned interpolation points are always stored in absolute machine coordinates and the scanned surface cannot be moved to a different position later on.

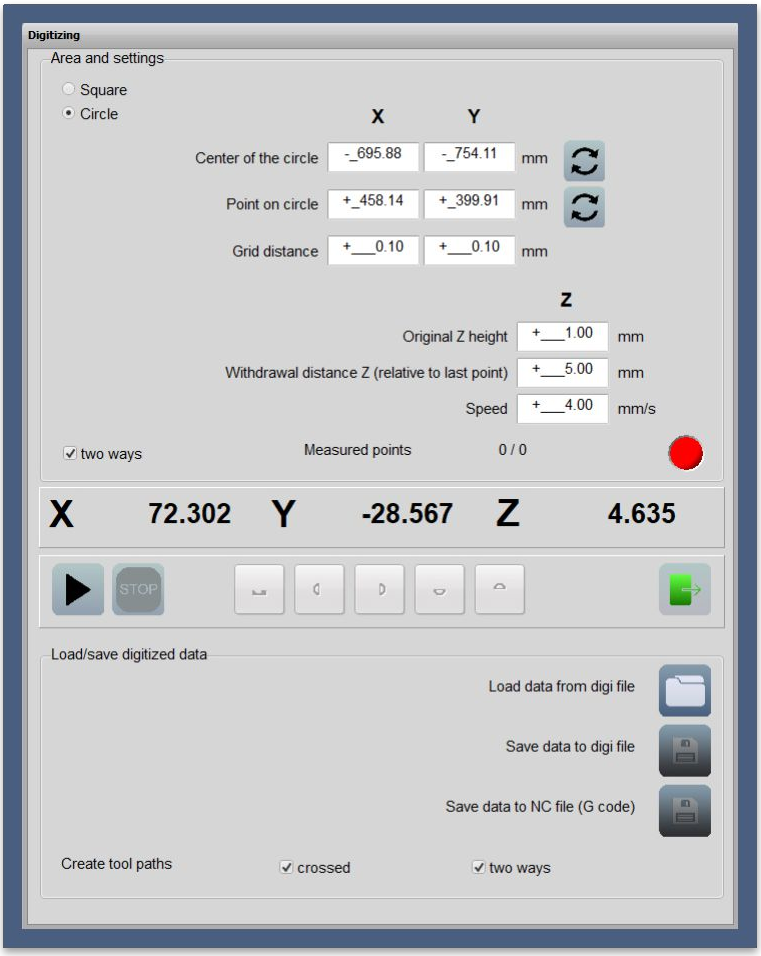




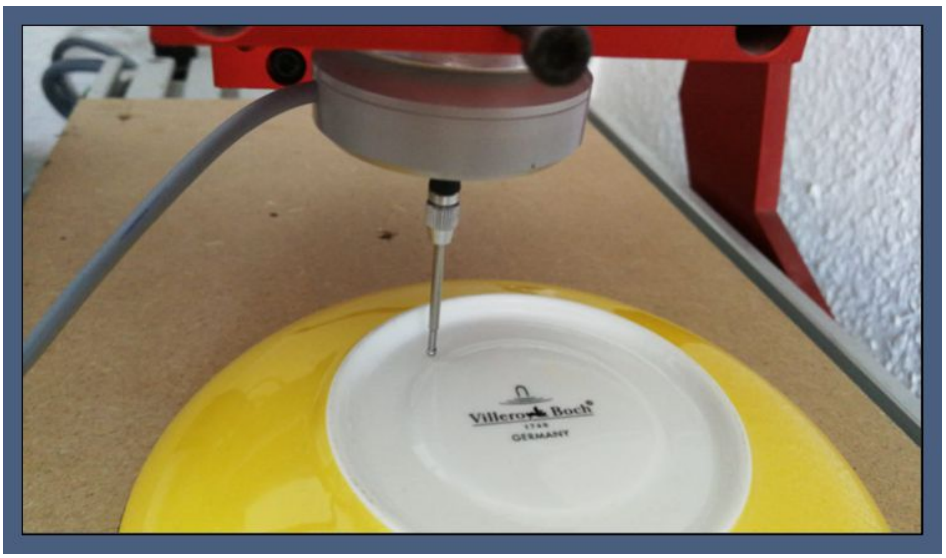
The function DIGITIZING opens the following dialog.

At the top left you can choose whether a rectangle or a circle is to be scanned.

The window of the DIGITIZING function consists of different components. In the upper area, all entries are to be made that define the measuring area and the type of measurement. In the lower area the processing and storage of the data takes place after the measurement.



Square/circle	Defines the area to scan
Left lower corner **Upper right corner**	Defines a rectangle in absolute machine coordinates, in where the surface measurement takes place. Both corners can also be approached manually.
Center and point on circle	Sets the circle center and any point on the circle. Both points can be be approached manually in a comfortable way
Grid distance	The measuring distance defines the distance between two successive measuring series for both axes.
Original height Z	Defines the first Z-height with which the measurement starts in the lower left corner.
Withdrawal height ZZ	Defines how far the Z-axis moves up again after the measurement in order to approach the next measuring point.
Measured point X/Y	Shows during the measurement how many measuring points are approached and how many are already measured.
LED	Indicates the status of the measuring probe as a test indicator. It is easy to check the function by hand. The LED must be black and light up red when pressed or triggered.
Two ways Forward/Reverse	Defines whether the measurement is performed bidirectionally or always in one direction only. For machines with backlash, it is recommended to always perform the measurements unidirectionally.
Start/Stop	Starts or stops the measurement process



The measuring process starts in the lower left corner of the measuring field and scans the pattern line by line at the defined distance. The scanning always takes place along the X-axis and approaches the end position in the upper right corner. The current axis positions are displayed online in the position field.

3. Creating a MES file

After the measurement, the data can be further processed with various functions. However, it is recommended to save the currently valid data as a measured value file (*.MES) before each processing step in order to be able to load it again in case of operating errors. The saving and loading of the measured value file is simply done with the corresponding buttons and the selection of the desired file name.

For the postprocessing of the measured values the following function buttons are available

Creates a negative of the digitized pattern, i.e. an original becomes a shape or vice versa

Copies the pattern, mirrors it on the right edge and joins it seamlessly

Copies the pattern, mirrors it on the left edge and joins it seamlessly

Copies the pattern, mirrors it on the upper edge and joins it seamlessly

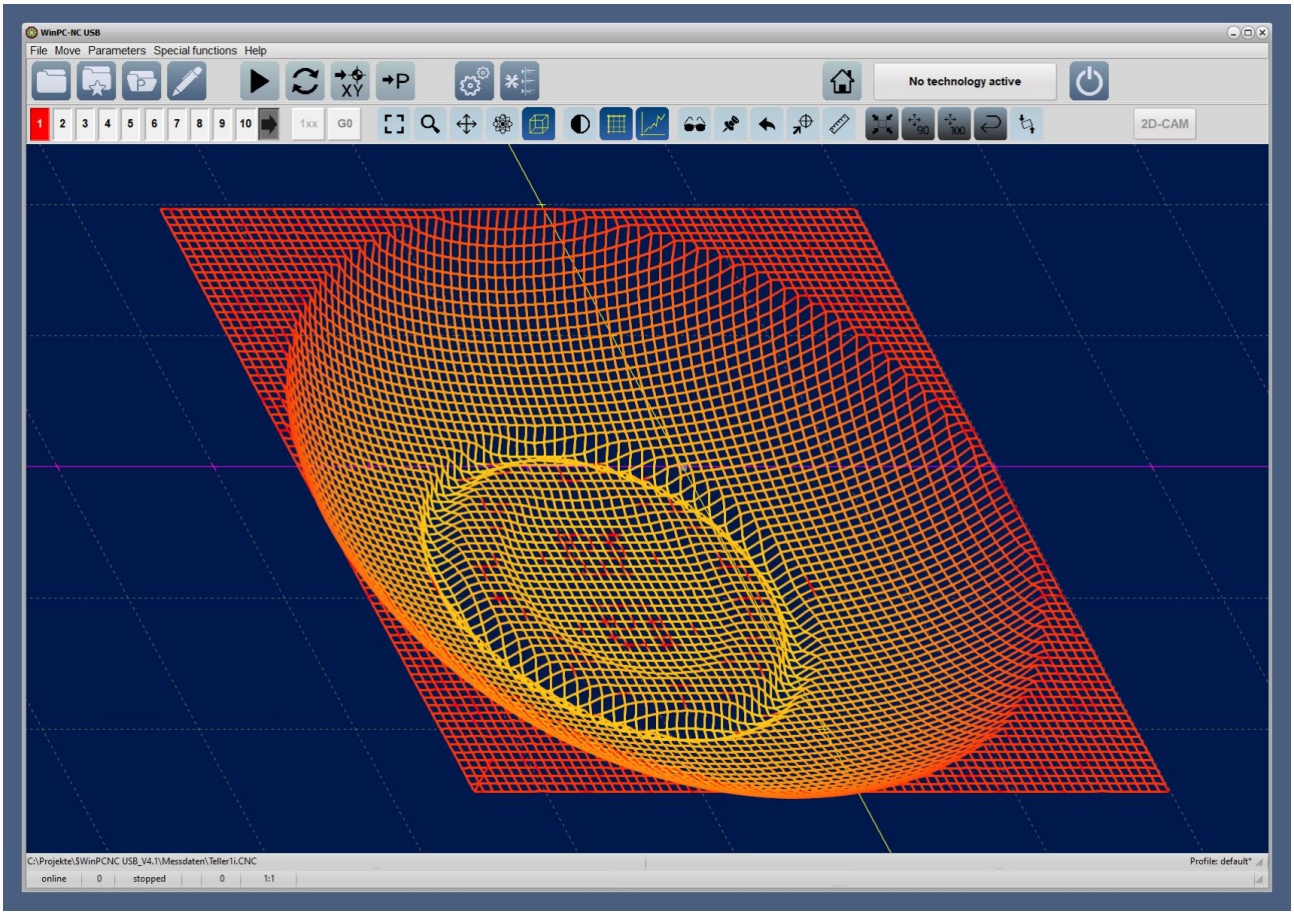
Copies the pattern, mirrors it on the lower edge and joins it seamlessly

Copying, mirroring and appending is especially useful for symmetrical parts in order to only have to digitize one part. In the example with our plate, only a quarter of the surface was measured and the data was then duplicated and mirrored twice.

Saving the measurement data as an executable CNC program is also possible and can be useful for reproducing parts. Here you can influence the output of the data with two further setting options.

Crossed	Causes ***WinPC-NC*** to mill the data first along the X axis only and in a second pass along the Y axis. With crosswise finishing the surface becomes especially clean and fine.
Two ways	Specifies whether the milling is performed bidirectionally or always in one direction. For machines with backlash, it is recommended to always perform the milling unidirectionally.

The following image shows the scanned plate inverted as a CNC file in the 45 degree view and can be used, for example, for a reproduction of the original part.

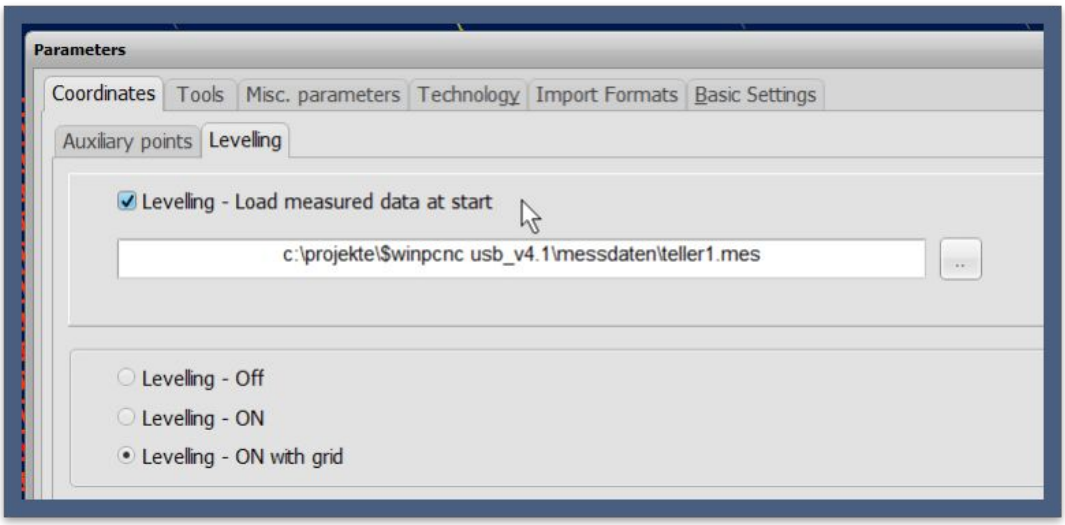


For the function LEVELLING & PROJECTION described here, however, only the MES file with the saved measured values is necessary and usable.

4. Configuration for permanent or situation-related loading of the MES file.

In order to permanently compensate a non-planar working surface of a machine, the entire surface can be measured once in a suitable grid and then permanently stored in ***WinPC-NC***.

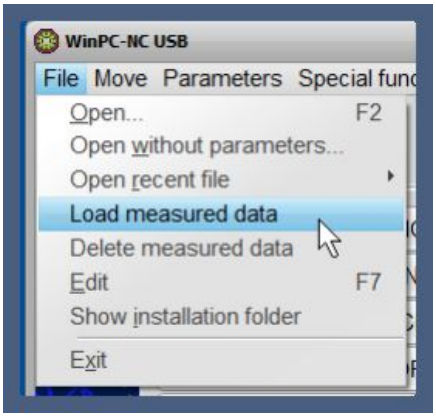
From then on, the MES file defined in this way is automatically loaded when ***WinPC-NC*** is started and is always active and in every subsequent job. The definition is done under Parameters-Coordinates-Levelling and with the selection of the respective MES file the automatic and permanent loading can also be activated at once.



As further setting options, there is a field with the specification whether the projection is to be switched off permanently, switched on permanently and switched on with grid display. The switching on/off of the projection is later also easily possible with a button in the button line, whereby the color of the button and symbols marks the current condition.

If the MES file is not to be stored permanently and automatically, then it can also be loaded situation-related and only the current job can be processed with a projection.

For this the individual loading or also removing or unloading is possible over the file dialog.

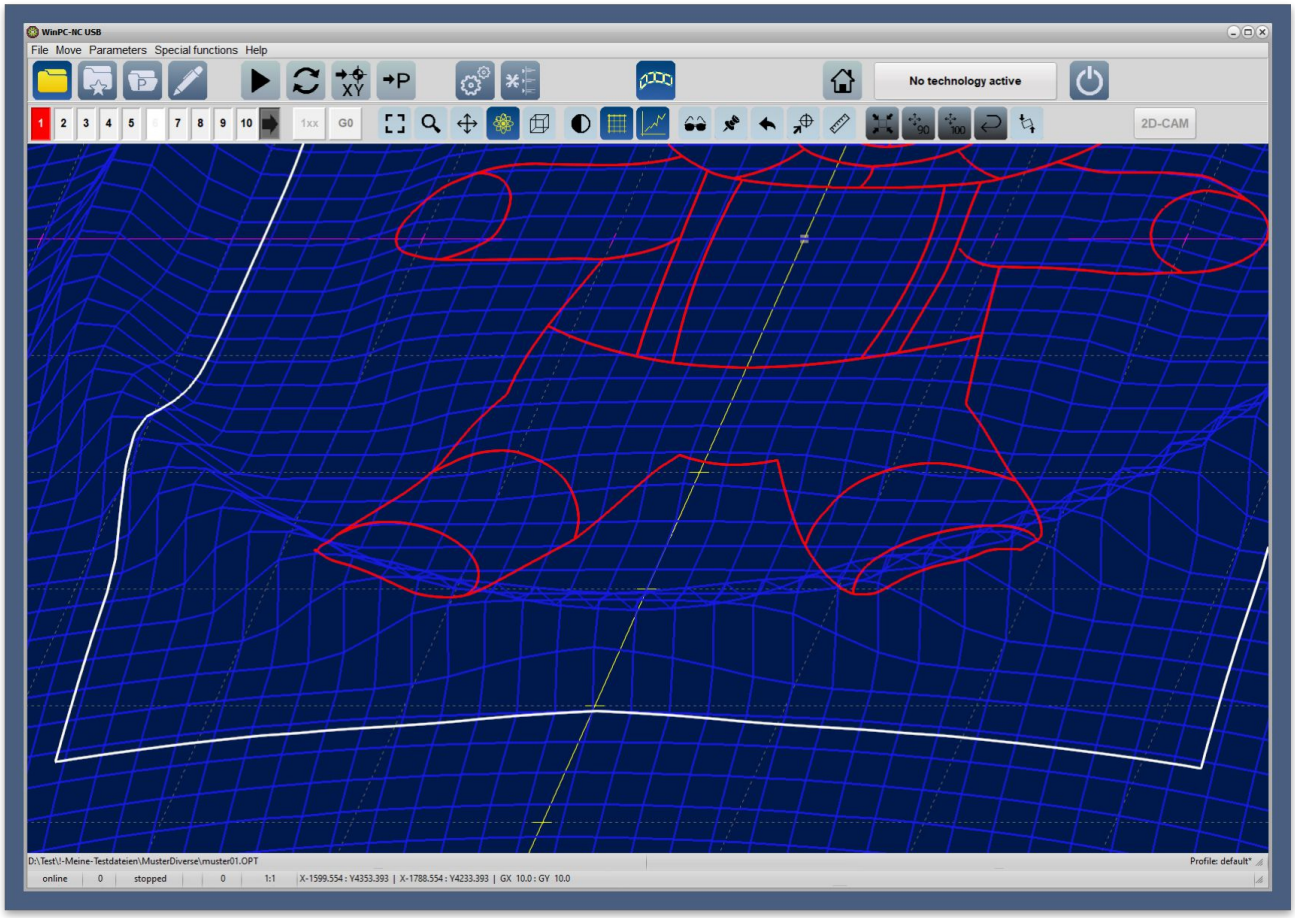


5. Open the NC file that is to be projected

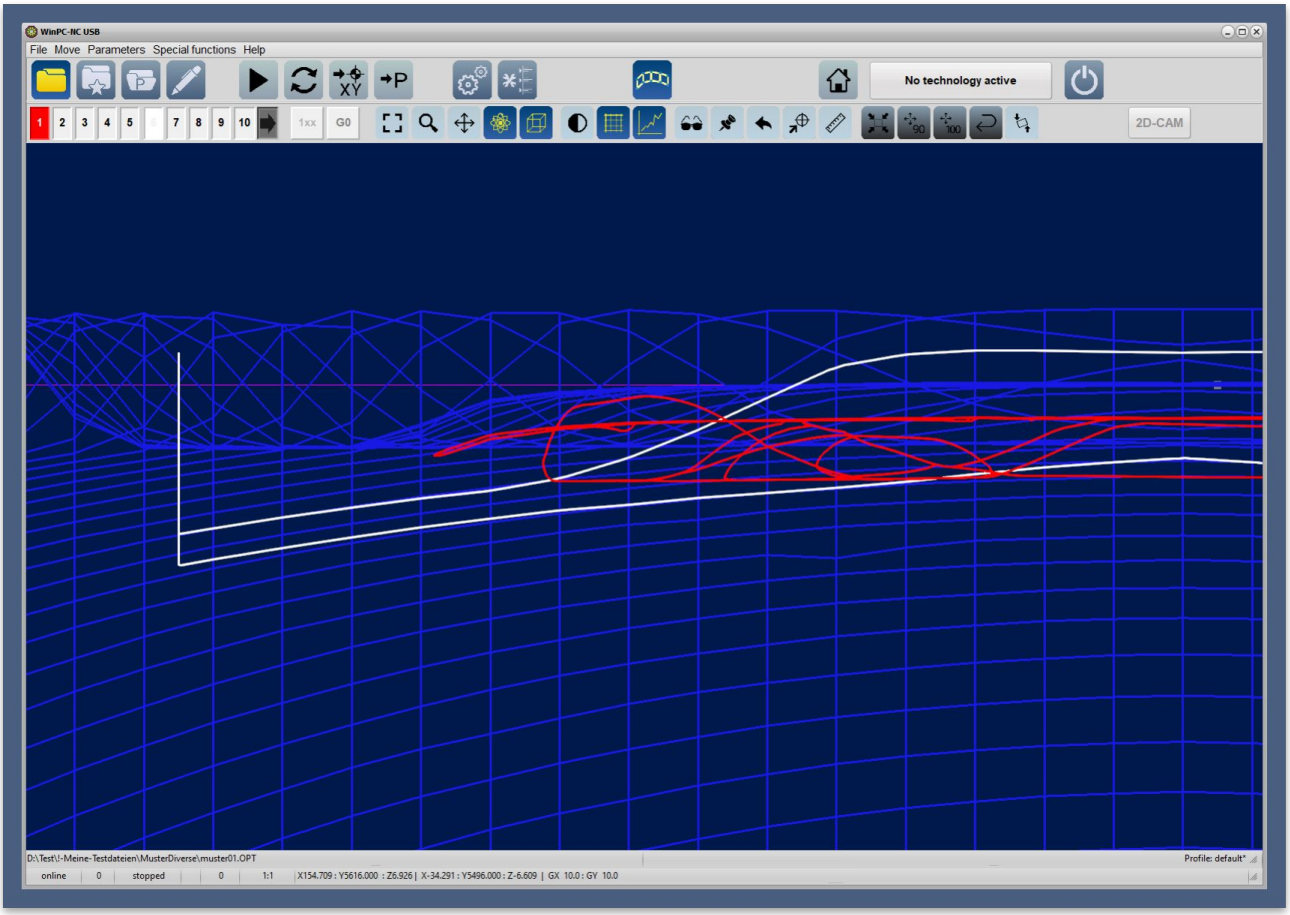
Loading the NC file to be executed is done as usual, it does not matter which of the files, NC file or MES file is loaded first.

After both files are loaded, depending on the display settings, the MES file is displayed as a blue grid and the NC file in the selected colors. In the first view from above, you will not recognize any projected Z height differences, these will only become clearly visible in the perspective view or with the orbit function.

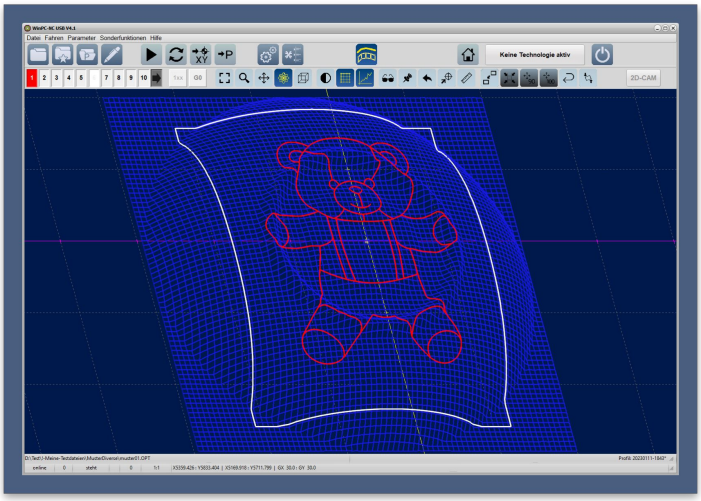
Internally ***WinPC-NC*** recalculates the NC data, divides long vectors into smaller sections depending on the measurement grid and interpolates the resulting Z-heights based on the four surrounding measurement values. As a result, you will see the milling or engraving paths directly on the scanned surface or with the set plunge depth lying below it.



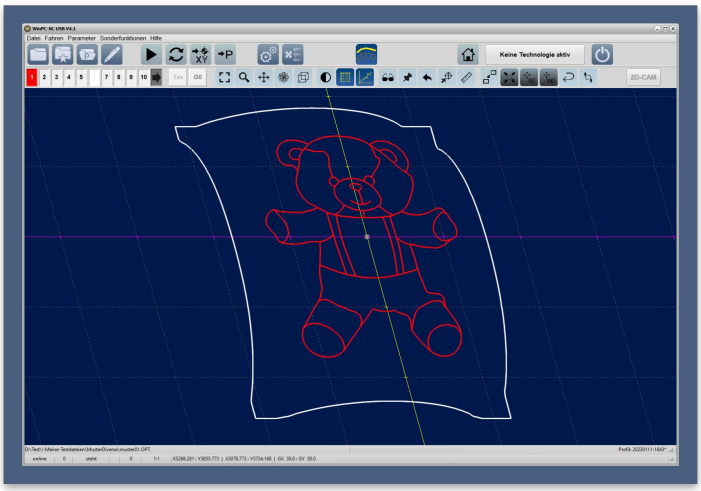
When viewing the data from the side, you can see the corrected heights and plunge depth even more clearly.


WinPC-NC USB
File Move Parameters Special functions Help
No technology active
2D-CAM
D:\Test\!-Meine-Testdateien\MusterDiverse\muster01.OPT
Profile: default*
online
stopped

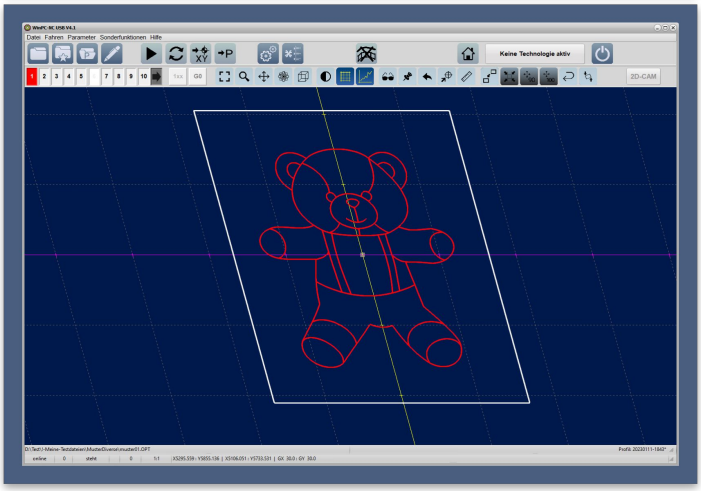
6. Switch levelling on/off and graphical display



Projection of NC data with grid



Projection of NC data, no grid



Projection and levelling disabled

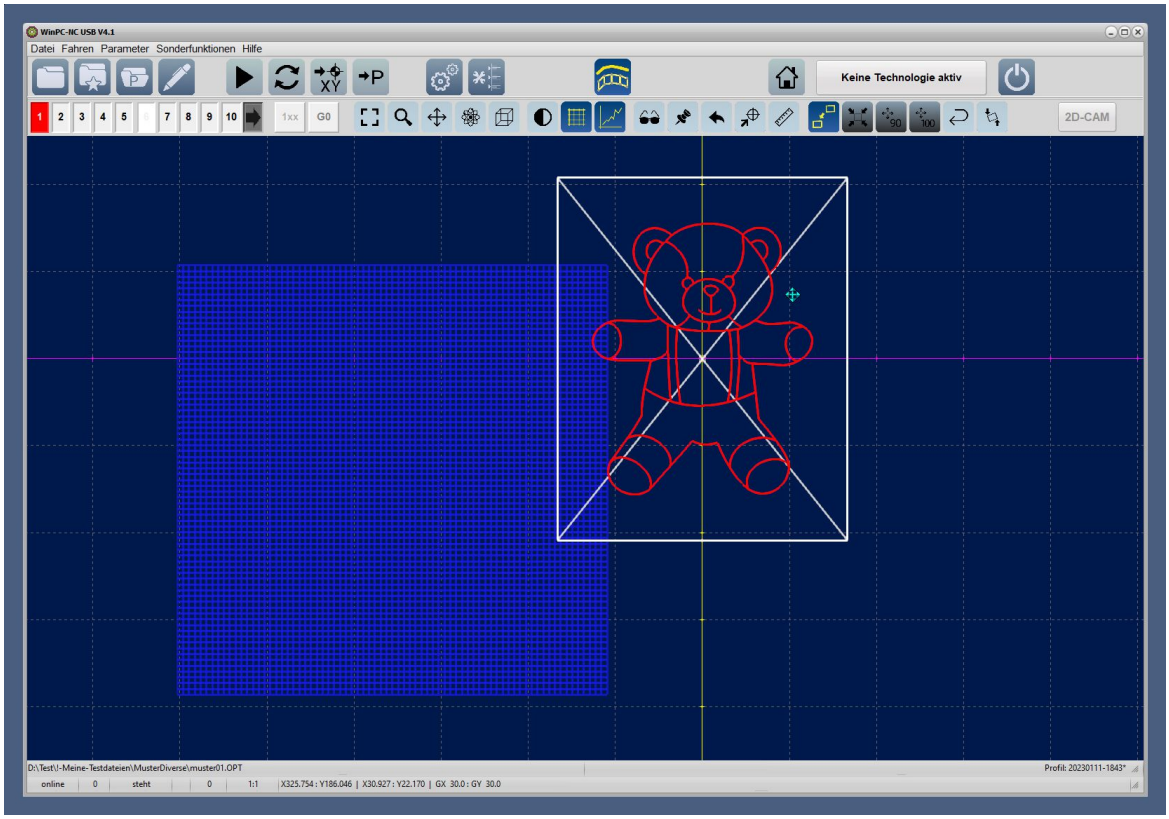
7. Setting up the job with zero point determination

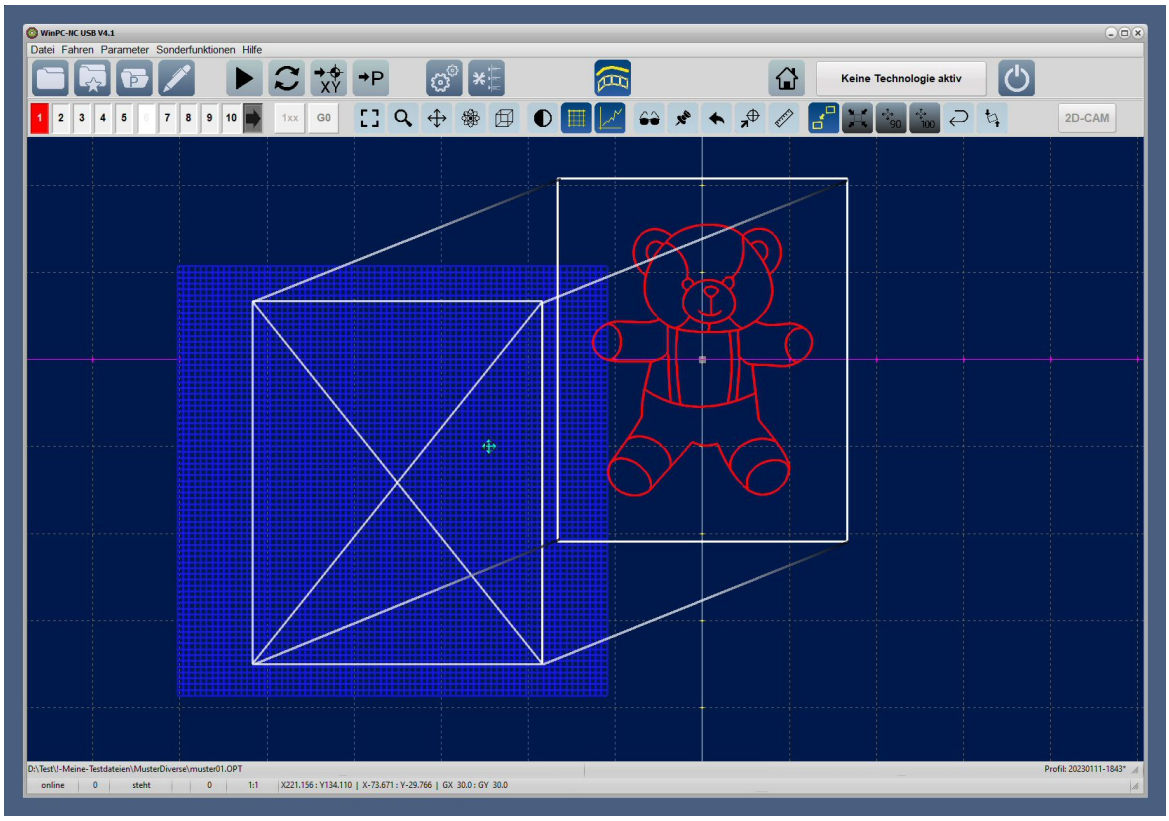
The preparation and setup of the following job is done analogously to the previous procedure. One determines the XY zero point of the NC data and moves at this with the Z axis on contact of the workpiece surface. Here the Z zero point is defined and ***WinPC-NC*** immediately also adjusts the MES data and the scanned surface to this new Z zero point by moving and converting the entire MES surface in height accordingly.

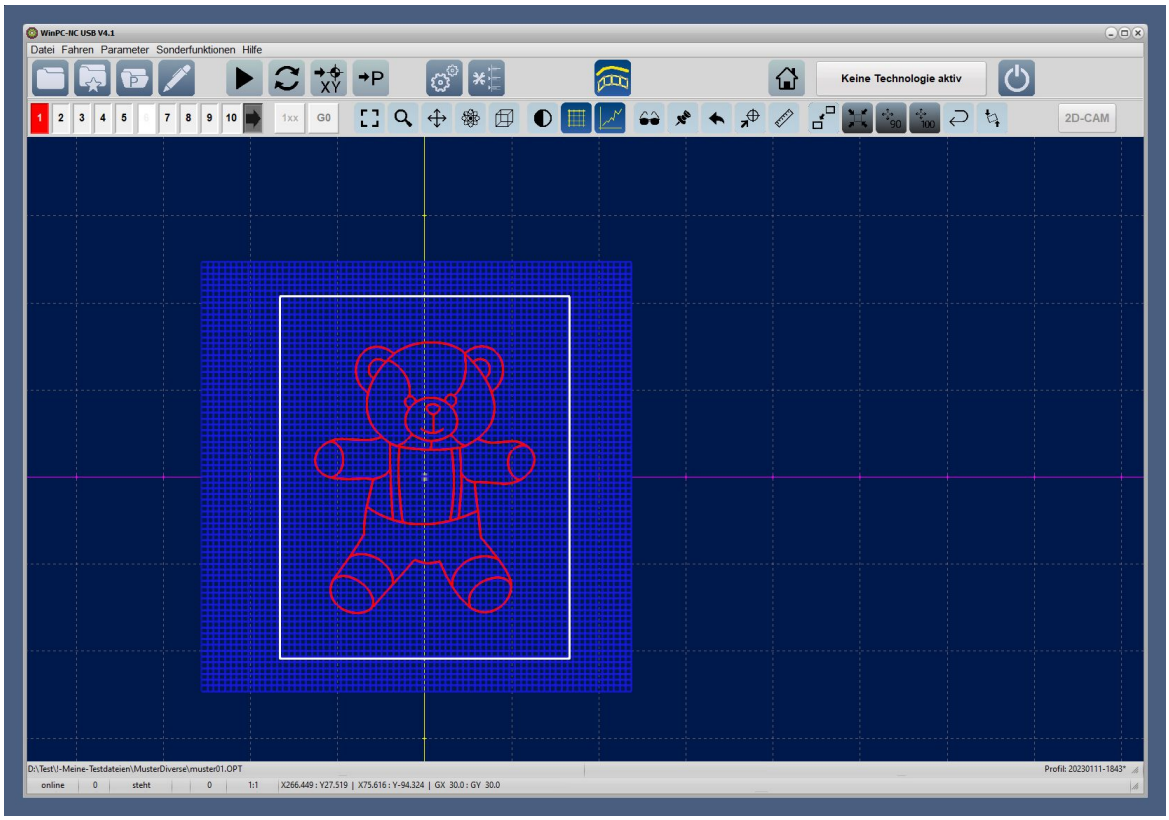
The result is the display of the MES grid at the XY zero point exactly at the height of the Z zero point and the set piercing depths project into the measured surface.

So you don't have to worry about the correct height and adjustment of the measured data anymore. Also the defined flight altitude or the safety distance is calculated upwards from the measuring plane and subsequently driven.

The graphic data can also be moved very easily with the new shift function in the work area of the machine and thus placed exactly on the measuring surface. By clicking the move button above the graphic, the mouse cursor changes and the graphic is marked with a white frame. Afterwards the frame can be moved to the new target position and with releasing the mouse the NC data are moved and the new XY zero point is calculated.




WinPC-NC USB V4.1
Datei Fahren Parameter Sonderfunktionen Hilfe
Keine Technologie aktiv
2D-CAM

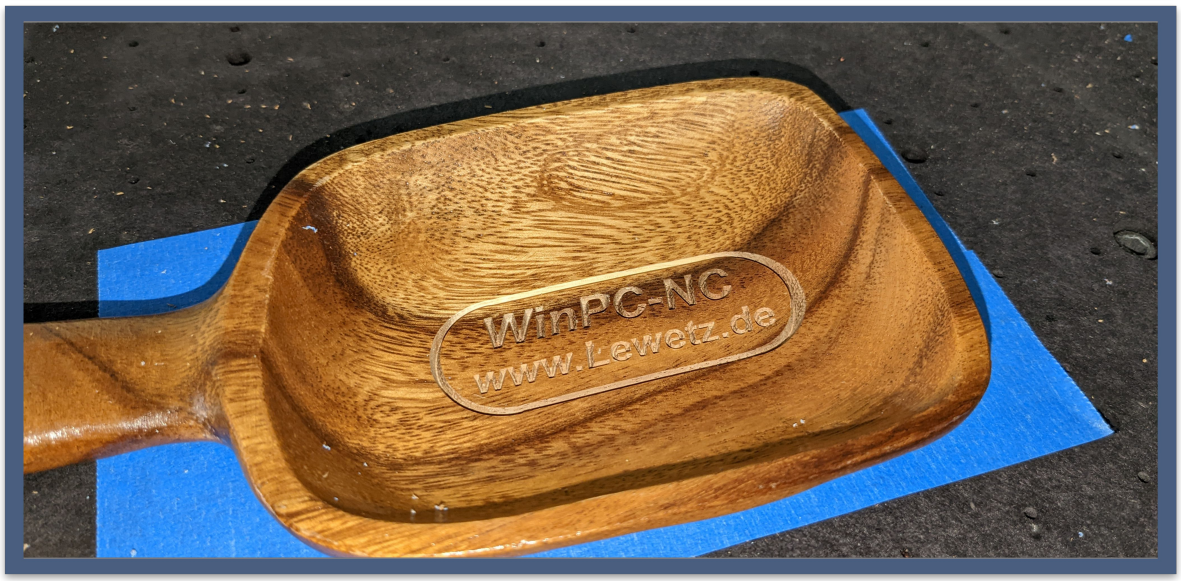

WinPC-NC USB V4.1
Datei Fahren Parameter Sonderfunktionen Hilfe
Keine Technologie aktiv
2D-CAM

8. Execution of the job

The execution of the job prepared in this way is done with the *Start* command or button and ***WinPC-NC*** traces all paths and vectors in 3D movements on the measured and stored workpiece, thus executing the intended projection of the data on the non-planar workpiece or machine table.

9. Pictures of a first job

We scanned and engraved our ***WinPC-NC*** logo on a small wooden nuts cup



Projection of engraving data on the wooden cup in touch optimised display