

ProfiDoit

Profiler Do It

Manual

Version: 0.86.9

By

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PEOPWA

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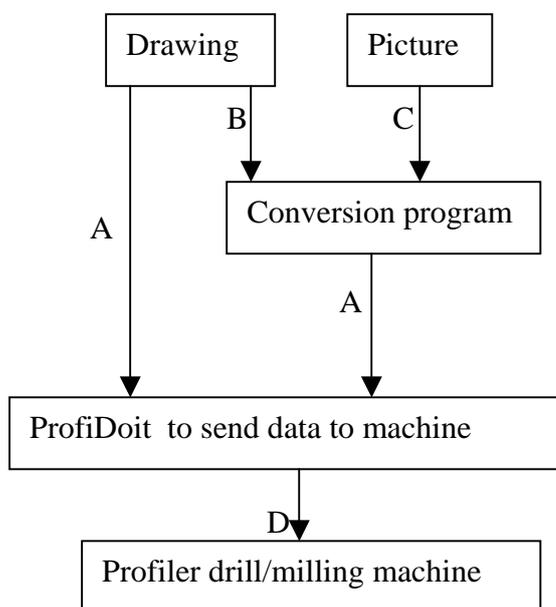
ProfiDoit (Profiler Program).

1. Introduction.

ProfiDoit is written to control the Profiler engine (Franklin Industries BV., Belgium) using a subset of the original Profiler commands.

The program processes a limited number of different file formats to produce 2D (2 dimensional) and 3D (3 dimensional) results.

2D or 3D drawings or pictures are generated in a large number of different file formats, so the first step is to convert a file format to one of those ProfiDoit can process.



- A. Files of type: .plt, .cbr, .c3d, .cnc, .col, .out these are processed by ProfiDoit.
- B. Files from CAD-programs: .DXF, .DWG.
- C. Picture files: .bmp, .jpg.
- D. Commands to control the Profiler.

Responsibility and safety.

In the program lots of checks are performed to check if dimensions, distances and speeds may be executed with the used tools and materials. However it still is the responsibility of the user to be sure that the given values and the consequences are correct and safe. The author of this program cannot be made responsible and/or liable for incorrect use of this program in combination of the Profiler or other similar machines.

Purpose of the program.

Control of the Profiler (Franklin Industries BV. Belgium) and the processing of HPGL-files (Hewlett Packard Graphic Language) and Gerber-274x-files for milling printed circuit boards (pcb's).

As there are many different types of HPGL-files a choice had to be made which ones to process by this program.

- a. From ACAD (AutoCad) exported HPGL-files of the type HP-7475 plotter are read and processed (HPGL-acad, see appendix E).
- b. Files processed by the program BOcnc (HPGL-lin, see appendix F).
- c. Files generated by the program B2G in g-code (see reference 2).
- d. Files generated by Eagle.cad and the Profiler plugin (.col or .out)
- e. Files generated by this program (HPGL-lin).

For milling and drilling printed circuit boards the program processes files produced with the program Eagle.cad with the plugin Pcb2Profiler.

Version 0.86 of the program accepts the simple (ASCII) files of the type .cbr (2D) , .c3d (3D) and .cnc (3D), only the subset of the Profiler commands in appendix G is used. No binary files are accepted or processed.

Files of the type **DWG** or **DXF** need to be converted by an external program in HPGL of G-code files. See appendix E and F.

Picture files (.bmp, .jpg) need to be converted to 3D-files in g-code of the type .cnc. See reference 2.

Pcb-files of the type .col and .out generated by Eagle.cad and the Pcb2Profiler plugin.

Small variations in material height may be compensated automatically.

The purpose of program is to manufacture wood, synthetic material and soft metals. The program may also be used to manufacture and mill PCB's (printed circuit boards).

The program is tested with the following hardware and Microsoft operating systems:

- a. Windows-98*, 250Mhz-processor Pentium II and 512Mb ram. The Profiler is directly connected to a serial port.
- b. Windows-ME*, 900Mhz Pentium III processor and 1Gb ram.
- c. Windows XP-pro*, 3Ghz Pentium 4 processor and 1.5Gb ram.

In case b and c the Profiler was connected through a Prolific-USB-serial converter.

* Trademarks of Microsoft.

The program is written in Borland Delphi Personal version 7.0.

Main properties of the program.

The commands in the input file are checked for:

- a. Presence in the processing table Profiler commands. Not all Profiler commands are incorporated in the processing table. Commands unknown to the program are collected in a log-file and a warning message is generated.
- b. Given input values at a command. In case a value is outside the dimensions of the used material a warning message is displayed and a scaling factor is applied.
- c. Commands in the object-file are processed sequentially.
- d. In the program a differentiation is made between tools as “drill” and “mill”.(see definitions). Movements and speeds are adopted to the properties of these tools and used materials, including the instructions of the object-file.
- e. Files of the type HPGL-lin en HPGL-prof may contain comment lines (#)

See example file in Table D.

Independent scaling of XY and Z dimensions of the object.

While processing an object-file the program may be interrupted and the present conditions stored in a "project"-file. At a later moment the program and object conditions may be "reloaded" and processing continued.

Definitions.

The zero point of the reference point in the Profiler work area is the point to which the machine is "homed". Front left side (front down side; lower left corner).

All dimensions, positions and orientations of the used material, are calculated from this point. (scale, offset and orientation of material).

All dimensions and positions of the object need to be within the used material (scale and offset object).

The orientation of the object is calculated from the reference point of the Profiler (front lower left corner) (orientation object).

All dimensions are in mm with a resolution of 0.025 mm (1 plot unit = 1/1000 inch), speeds in mm/s with a resolution of 0.1 mm/s.

The following definitions are valid for the procedures in this program.

A "**drill**" is used to drill holes and as a result a drill uses only a vertical speed which in downwards direction can be adjusted.

A "**mill**" is used to process an area (smoothing a surface, grooving, edge) and consequently has horizontal speeds in the work area. A mill has principally a low vertical speed.

"**Free space**" is defined as the space between tool tip and the material surface.

Program installation.

The program is distributed as ProfiDoit.zip. The program is small and up to now not registered in Windows. Before you unzip the ProfiDoit.zip file delete any previous version of the program and its Prof directory(see appendix H) and save valuable data files from the DATA directory elsewhere as the new version may overwrite these data files.

You have to unzip the ProfiDoit file in a directory of your choice. In this directory the program is stored and two subdirectories (DATA and Prof) are created (see appendix H). The DATA directory contains the files to be processed and comes with a number of demo-files (see appendix H). The Prof directory contains the files with data for tools, materials and configuration of the program. Changes to data used in the program are stored by the program in these files, don't change these files with a word processor.

At first start up.

When the program is started the configuration file (ProfiDoit.ini) is loaded. In this file is the communication port to the Profiler set. The program checks if this port is registered in the operating system and can be opened for communication with the Profiler. In case this port is not found in the computer system or can't be opened, an error message (Fig. 1.1) is displayed and the program can be continued (press 'YES') without connection to the Profiler or is terminated (press 'No').

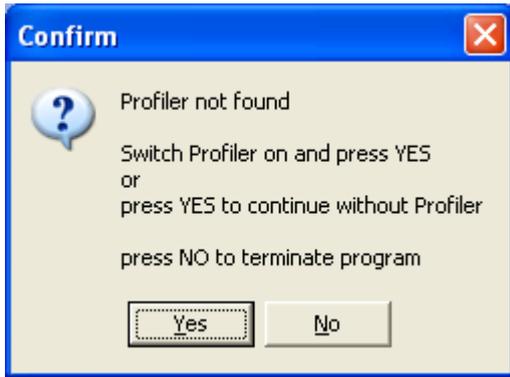


Fig. 1.1 Start up error message. (fig-0-0525)

To set the communication port: select “Settings” in the menu bar then select “Miscellaneous” . The Profiler screen opens. Select “Serial ports” and under “Profiler” select the serial port. Only ports registered in the system are displayed.

2. Screens.

1. **Main screen** (fig. 3.1.6).

During the execution of commands to the Profiler the data in this screen are continually updated. Tools, material, object dimensions and positions are displayed. Offsets for material and object may be entered.

2. **Preview** (fig 3.2.1).

Here the object-file is plotted and the position at the Profiler and the material is visible and can be adjusted.

3. **Settings** (fig. 3.3.1).

In this screen tool properties are entered.

4. **Profiler** (fig 3.4.1).

The limit values of the Profiler, the engine and a number of other adjustments are entered and/or changed.

5. **Materials** (fig 3.5.1).

6. **Error messages** (appendix A).

As soon as a value given for an item exceeds the limit of that item a warning is generated.

Dimensions of the material have to be within the limits of the Profiler.

An object needs to fit within the dimensions of the material.

A tool needs adequate space between machine head and material.(free space.) As a consequence there need to be enough space between tool tip and Profiler work area. With a tool inside the material the lowest manufacturing speed is used, while outside the material the maximum speeds of the machine may be used for moving to a new tool position.

In principle a drill has no horizontal speed ($\text{Tool-xy} = 0$) and a mill has a low vertical speed.

7. Limits.

The following properties have fixed limit values build in.
See 3.4 Profiler – 1. Fixed values.

8. Tables.

- A. Error messages.
- B. Tool types.
- C. Material types.
- D. HPGL-lin demo file.
- E. Example ACAD-conversion.
- F. Example BOcnc conversion.
- G. Subset of Profiler commands used in program.
- H. Program directories and files.

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3.1 Main screen (Fig 3.1.6.).

1. Purpose.

All relevant actions of the Profiler are displayed in this screen.
The processing of a file can either be stopped (interrupted) or continued.
Position of the tool and the moving speeds are displayed.

The screen is divided in several functional blocks:

The Profiler control block (see fig.2).

The input file data block (see fig. 4).
The material data block (see fig.5).
The processing data block (see fig. 6).

2. Menus.

Horizontal :

File --- File open.
Project --- To store and reload processing data.
Settings --- Machine settings.
Exit --- Quits program and saves relevant data.
Help --- (splash screen).

Vertical :

File:

New --- Resets program data and asks for a file to open.
Open --- Asks for filename and opens the file.
Save as --- If an output format is given object-data are saved (see Profiler screen).
Close --- Closes an open object file.
Exit --- Quits program and saves relevant data in the configuration file.

Project:

Save --- Stores present processing data in a project-file.
Reload --- Get stored conditions and restores processing data.

Settings:

Tools --- Displays tool data, this data can be edited.
Miscellaneous --- Profiler screen, opens Profiler data screen.
Materials --- Materials input screen.
Plot commands --- Opens selection box with a number of Profiler control commands in the main screen.

The Profiler control block (Fig. 3.1.1).

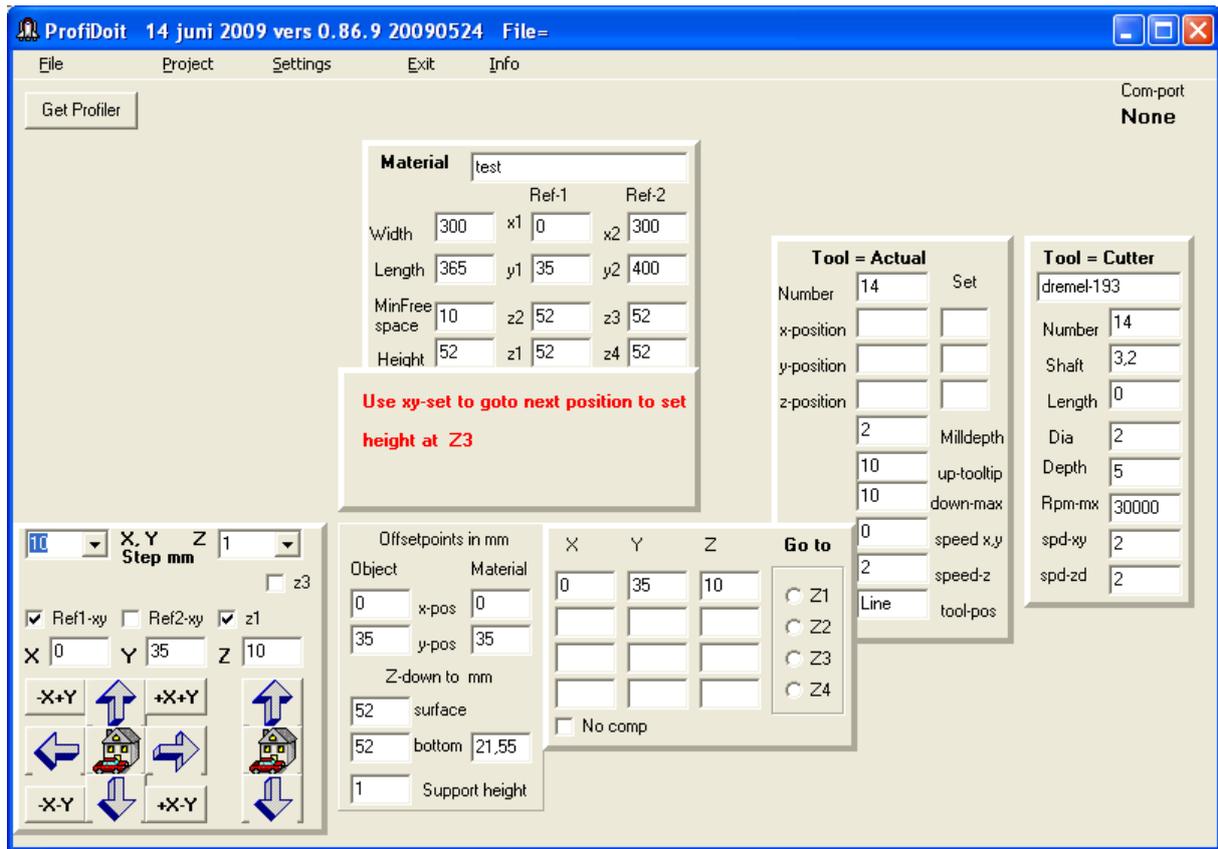


Fig. 3.1.1 Profiler control panel. (f1-0090614)

The present selected tool data will appear, Material settings panel and the Profiler control panel (lower left) are visible.

Profiler control panel.

To establish communication with the Profiler use the “**Get Profiler**” button.

If Profiler communication is established, the buttons in this panel are used to set the profiler **X, Y** and **Z** values. Step values (**X, Y and Z step**) are selected in mm.

The set reference checkboxes (**Ref1-xy** and **Ref2-xy**) are used to set the offset values for material (**Ref1-xy**) and the dimensions of the material (**Ref2-xy**). See material data block If an object file is loaded (**Set-obj**) appears and the object offsets can be set.

Height and material settings.

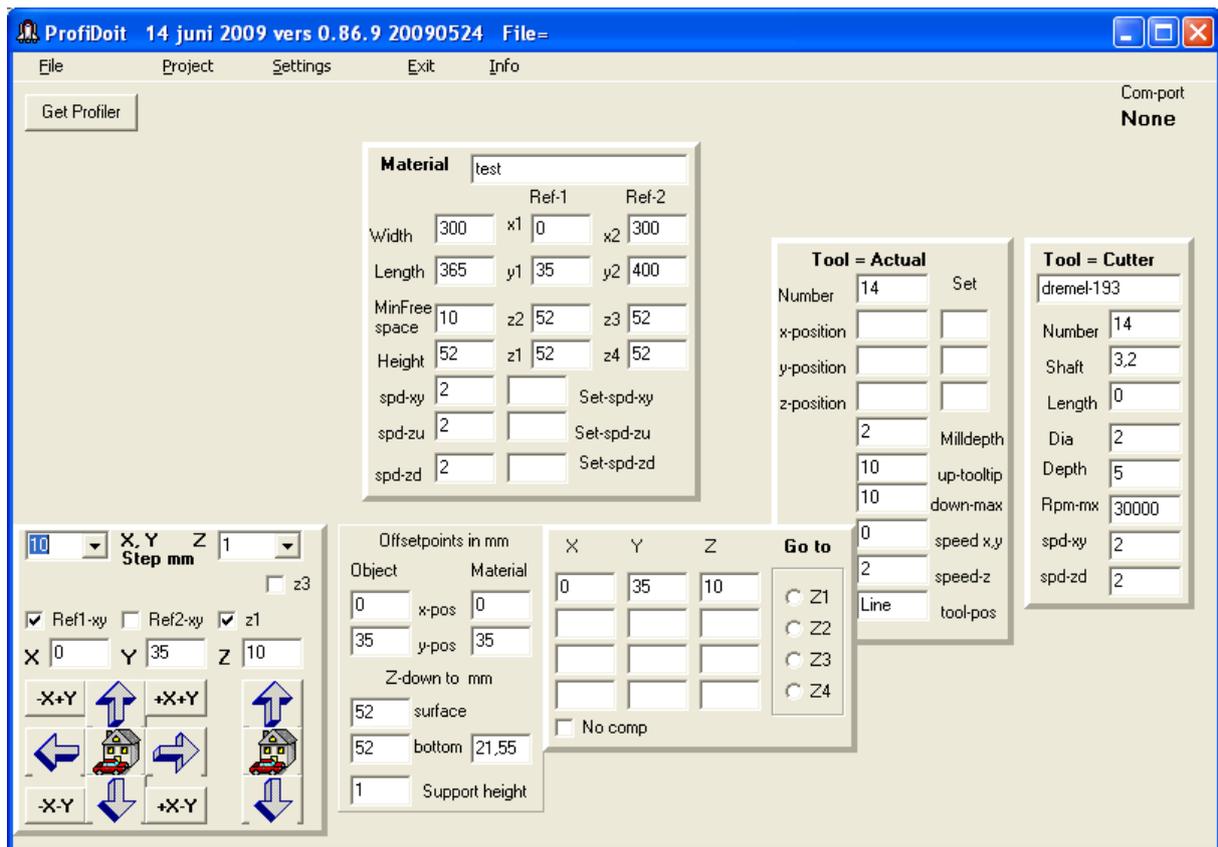


fig. 3.1.2 Materials and height settings (f2-090614)

As soon as Z1 is set the Z3 corner will appear.

Z1, z2, z3, z4 are used to set the z-position and the material height at 4 corners. If the material is not flat the values of the z position will vary. These z-values are used to correct the tools z-position so that the object depth will be kept constant with varying material heights.

Z1 is the front left corner height, **z2** the back left corner, **z3** the back right corner and **z4** then front left corner material height. How these values are used is set in the profiler screen with the z-compensation item. In the XYZ-Goto block the values set for Z are displayed together with the xy-positions. The GOTO z1...z4 sends the Profiler to that position and a new value for the z may be set. The type of compensation (no, x, y, xy) is calculated from the z-values and shown in the checkbox.

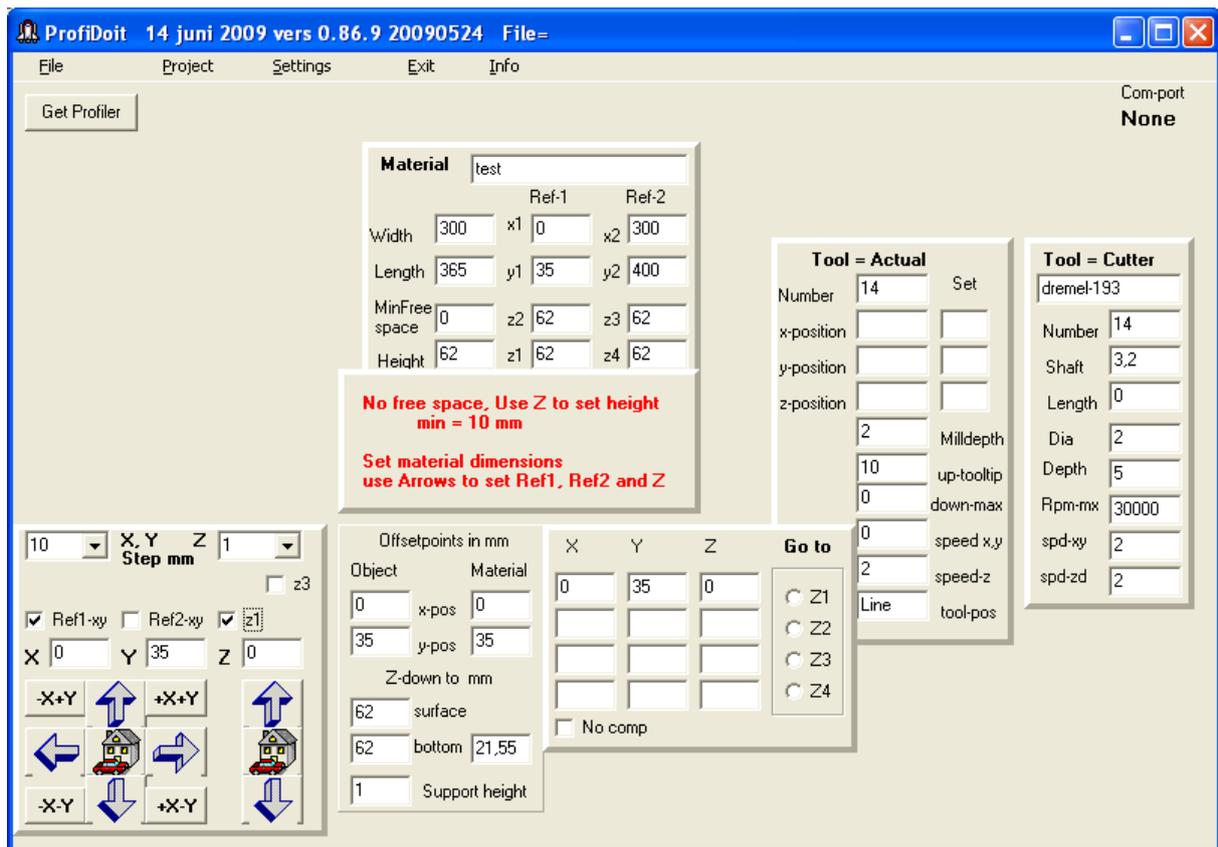


fig 3.1.3 Warning messages. (f3-090614).

While entering data, the data is checked if the values are in range, if not, a warning message (in red) is displayed. A mouse click in the free area of the screen does the message disappear. The minimum free space is set in the Miscellaneous page.

Get Profiler.

The communication port is opened using this button. The communication port to be used with the Profiler is set in the Profiler screen (see SETTINGS, Miscellaneous). The port name is displayed and a button “EMERG” will appear. Pressing this button will abort the processing and the program can not be continued.

If the port is opened the program tries to make contact with the Profiler and the result is visible at the button "No Profiler" changing to “Profiler ready”(fig.3.1.4).

At the same time at the right side of the display the Profiler status panel and the actual tool position panel appear.

A “PARK” and “Log off” button appear. The “PARK” moves the Profiler into the park-position, giving the user space to set the material. “Log off” is used to keep a log of the important processing data in the log-file.

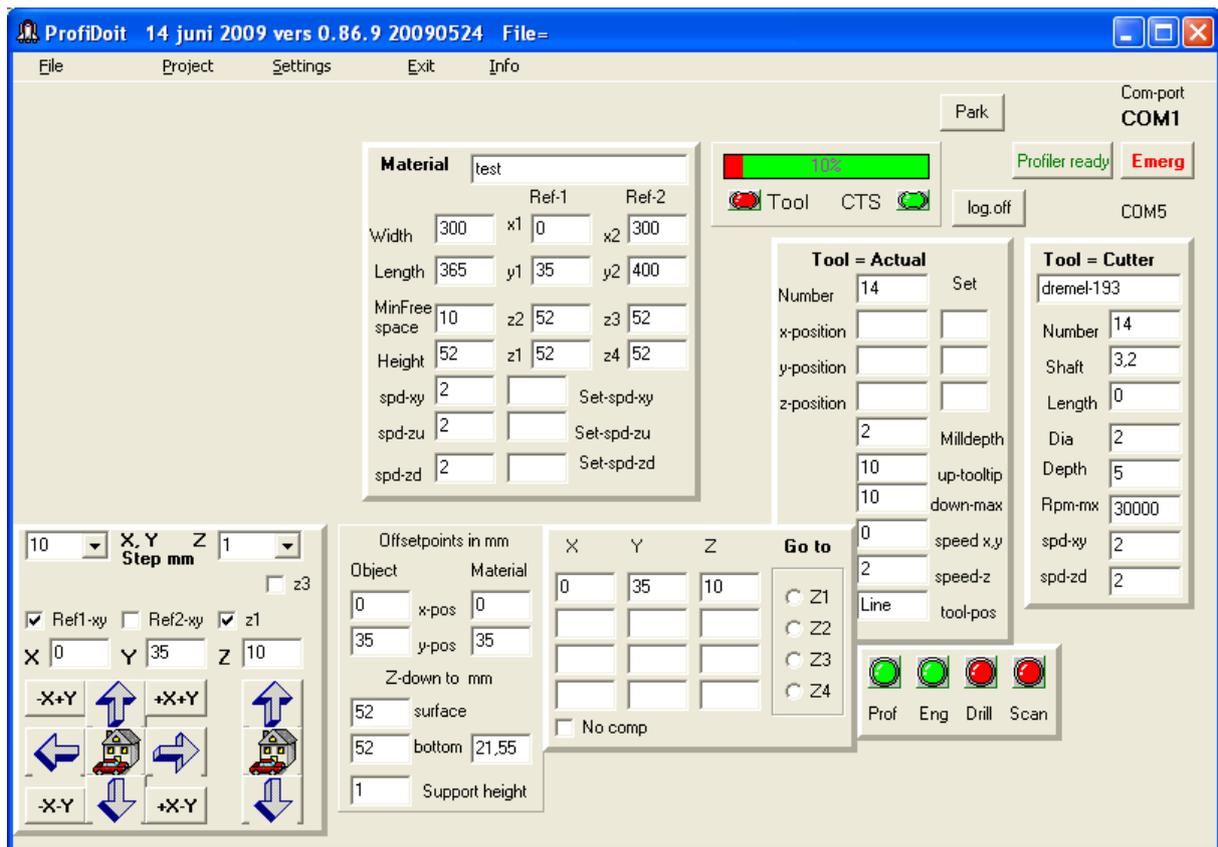


Fig.3.1.4 Profiler communication ready and actual tool settings. (f4-090614)

The Profiler Status panel.

When processing a data file, the progress bar displays how the communication is progressing. The CTS*-led displays if the Profiler is busy (red) or ready (green) to receive the next command.

The Tool-led indicates the up (red) or down (green) position of the drill head.

“Tool actual” shows the actual tool positions, speeds and settings.

* CTS is a RS232 communication line, the led shows the status of this line.

The input file data block (Fig. 3.1.5).

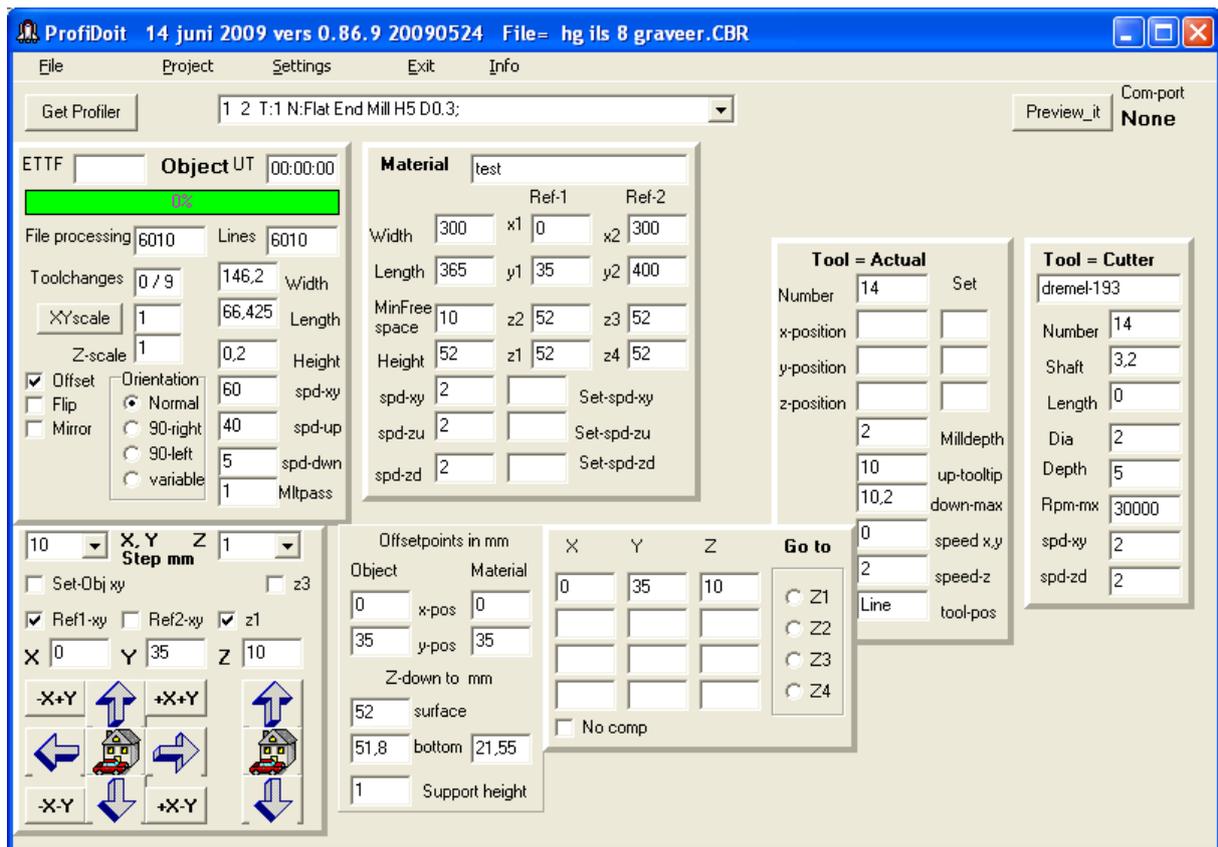


Fig. 3.1.5 Object file loaded.(f5-090614)

Selecting an object file in the file menu.

There are two options:

Open: these are files with one command per line, the file types are .plt, .cbr, .c3d, .cnc, .col and .out.

Open_Acad-hpgl: these files contain one line and are read by a different routine to get the commands separated.

The object file is read and the width, length and height of the object are calculated and displayed. If no height is found, e.g a 2D-object, it will be requested. The number of lines in the object file and progress of processing the object file, the estimated time to process (ETTF) and the used time (UT), the number of tool changes in the object file and the moving speeds are shown.

If the object-file is a pcb-file (extension .col or .out) then the tool messages found in this file are displayed at the top of the screen in a pull-down list. At the same time a pcb-tool conversion table is created in the tool input screen as the pcb-tools are different from the tool numbers used in the program.

Pressing the "Profiler ready" button starts reading the object file and transfer of commands to the Profiler. While reading the object file the button displays "Plotting" and a second button appears displaying "Stop". If "Stop" is pressed the button changes to "Continue". Pressing "Continue" continues processing the selected data file, while pressing "Plotting" starts processing the data files from the beginning.

Object-height.

When an object has no height e.g a 2D-object, than the height is requested. The height is maximal equal to the height of the material.

Orientation object, Offset, Flip, Mirror (see definitions).

To change these data see also the Preview-screen.

Variable orientation will ask a positive angle..

Invert.

This tick-box appears when a 3D file is opened. When ticked the Z-axis will be processed upside down.

Autoscale.

This button automatically adjusts the scale value. The object is enlarged or reduced in size depending on material dimensions.

There are 2 scale fields, XY-scale and Z-scale, both are initially set to 1.0. But an objects area may be enlarged or reduced in size, without the need to enlarge or reduce its height. So the Z-scale is independent of the XY-scale.

The material data block (Fig. 3.1.6).

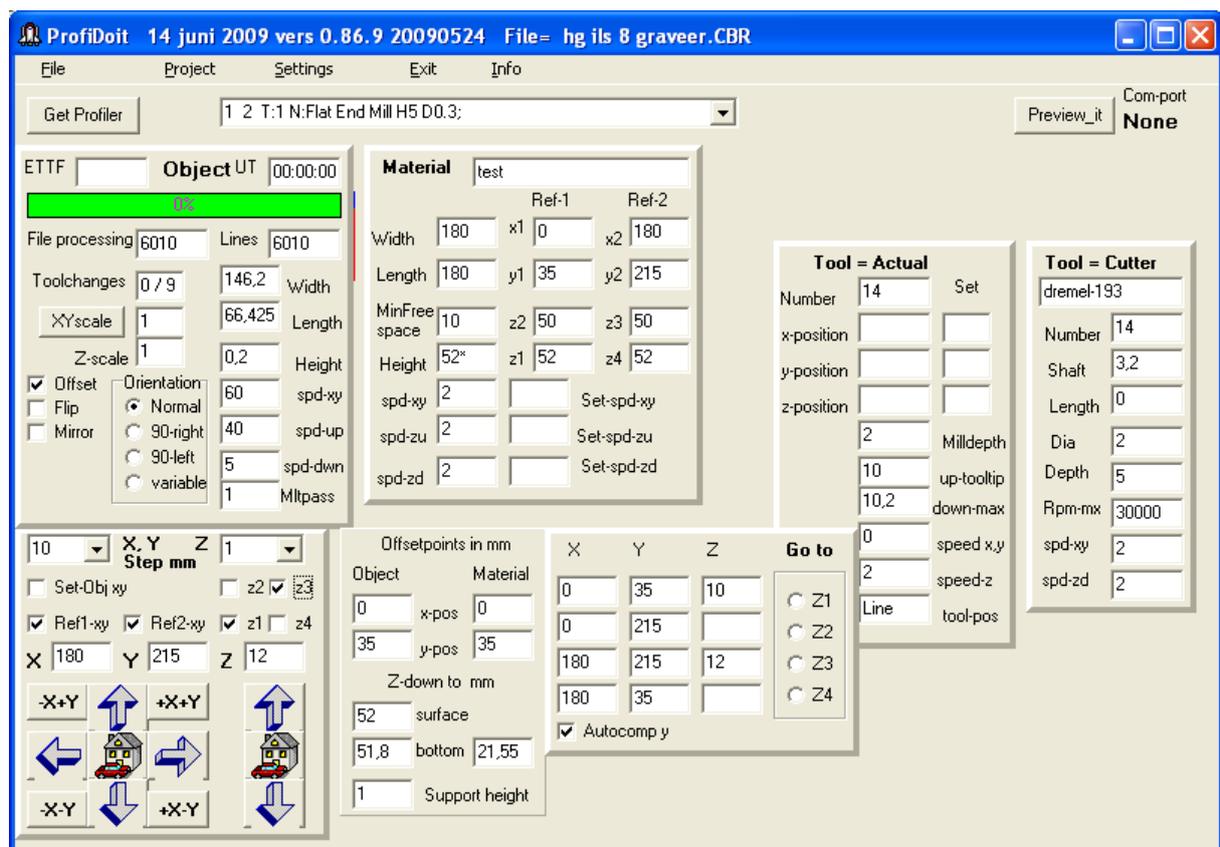


Fig.3.1.6 Material dimensions and offsets. (f6-090614)

When in the Profiler control panel the box “Ref1-xy“ is ticked, the material data block appears.

Use the Profiler control panel to set **X**, **Y** and **Z** values, then tick the “**Ref1-xy**” box. The material panel shows the **Ref-1** and **Ref-2** settings and the xy-dimensions of the material are calculated as the difference of Ref-2 and Ref-1.

The Z-value is used to calculate the material height and the “**Free space**” between tool tip and the material surface.

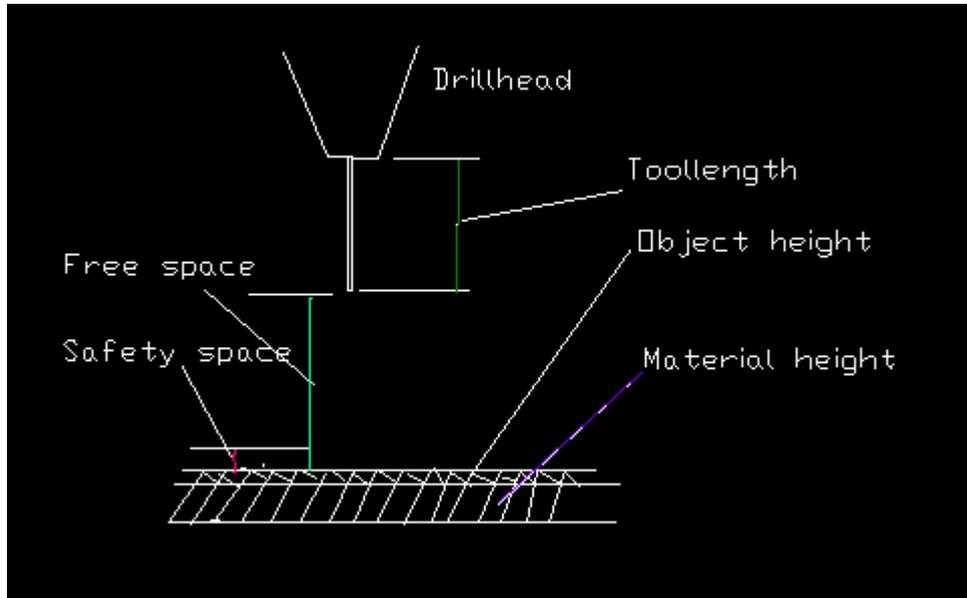


Fig. 3.1.7 Space dimensions (tooldrill-0623)

The material height may be set directly by entering the height manually. To manoeuvre the tool safely at least a 3 mm free space is advised.

This safety margin is set as Z-distance in the Profiler screen.

As materials may not be flat, the heights at four corners (z_1 , z_2 , z_3 , z_4) may be entered using the Z-control setting. How the height differences are used to correct the z-position of the tools is defined by the Z-compensation entry in the Profiler screen.

The offset panel displays the offsets for material (**Ref1-xy**, **Ref-1**) and object (**Set-obj**) within the material area.

Set-spd-xy, Set-spd-zu and Set-spd-zd.

XY-speed as well Z up/down speed may be adjusted. If the value is larger than the values given at object or tool an error message requesting for permission to overwrite the object and tool values is displayed. When processing a file the new speed is used at the next plot command.

Tool changes.

When set the program will go to the tool change position and display a message and ask permission to continue. The number of tool changes found and done are displayed and the tool data from the object file is shown in the push-down line.

The processing data block (Fig. 3.1.8).

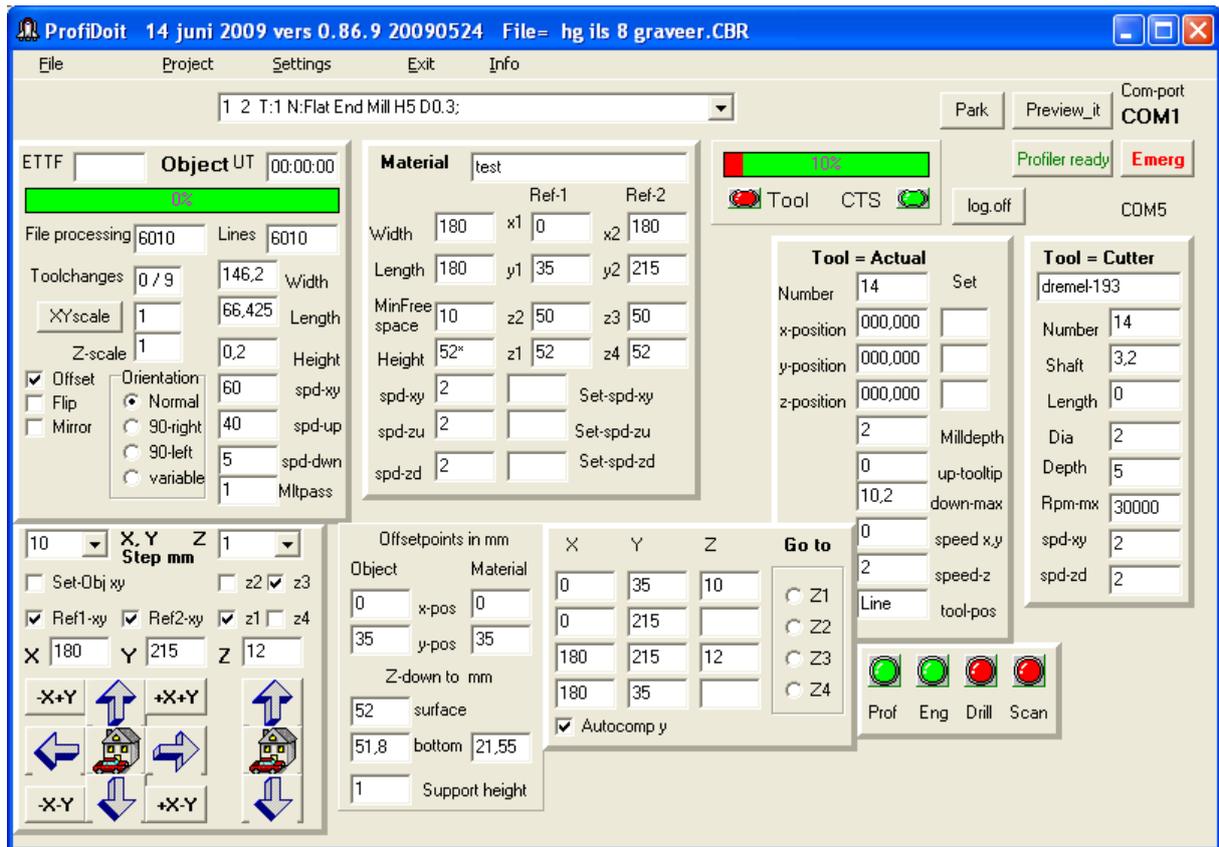


Fig. 3.1.8 Full display of the data processing. (f7-090614)

Preview_it.

Starts the preview screen and the present object file is plotted..

3.2 Preview (Fig. 3.2.1).

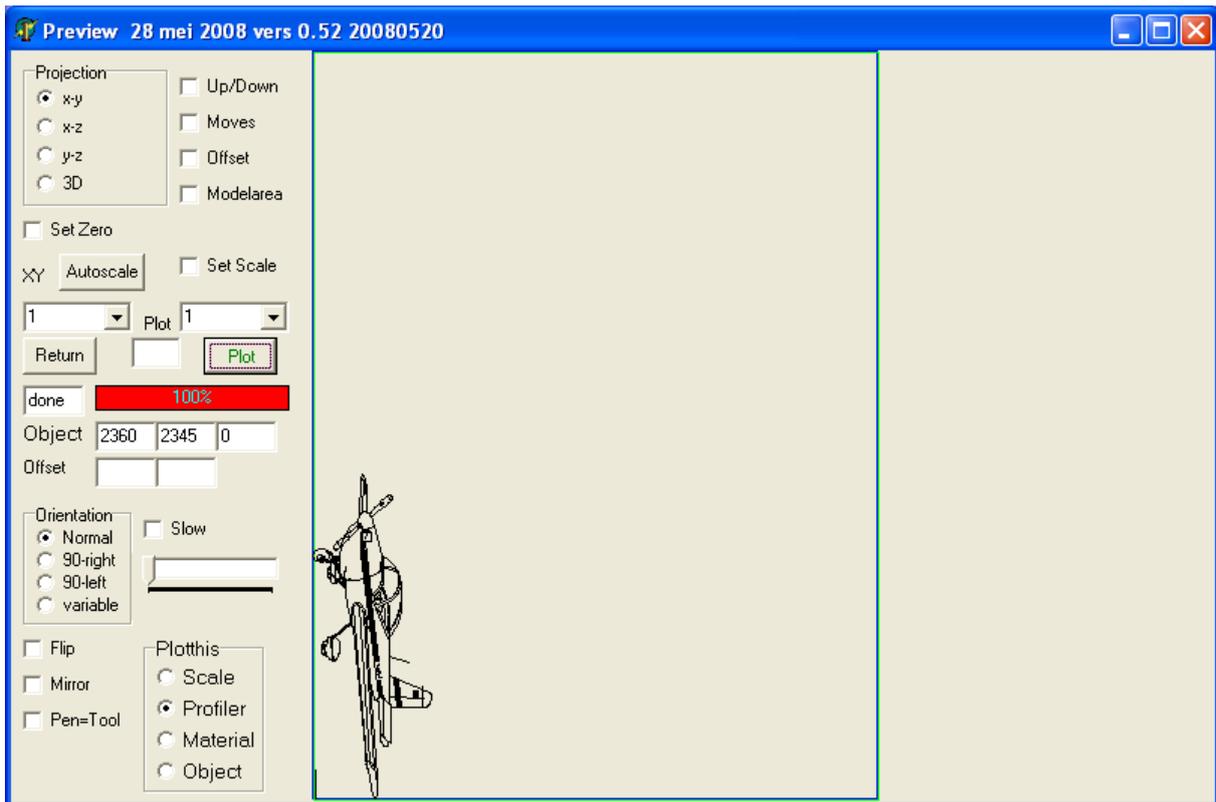


Fig. 3.2.1 Preview screen. (fig-7-0525)

In the centre are a progress bar and a line counter displaying the part of the object file being processed.

1. Plot.

Plots the object file using the settings in this screen. A plotted object can be moved (dragged) by holding down the left mouse key. The object contour is shown and moved, the offset of the object is calculated and displayed. Use **“Plot”** to show the object instead of the contour. An object can't be moved outside the material. An error message requesting to reduce the object size is displayed.

2. Return.

Returns to main screen.

3. Projection.

In this selection menu select the method how the object will be displayed.

x-y this is the standard display along the x-, y-axis.

x-z displays along the x-, z-axis. Displays height variations in the in object.

y-z displays along the y-, z-axis. Displays height variations in the in object.

3D three dimensional display of material and object.

4. Orientation object (see definitions).

The orientation determines rotation of the object with respect to the reference point of the Profiler.

Normal = no rotation.

90-right = 90 degrees right.

90-left = 90 degrees left.
Variable is under construction.

5. Flip.

The object is flipped. The upper side gets under and reversed.

6. Mirror.

The object is drawn as mirror image.

7. Pen = Tool.

The line thickness in the drawing resembles the diameter of the used tool.
It shows how much material is removed by the tool.

8. Invert.

When a 3D object is loaded the object may be inverted. The Z-axis is calculated upside down.

9. Plot this.

Scale.

Drawing area is scaled.

Profiler.

Contour of Profiler with inside the position of material and object on the drawing area is displayed.

Material.

Contour of material in the drawing area with inside the object.

Object.

The object covers the whole drawing area.

10. Autoscale.

When an object is smaller/larger than the material autoscale will adjust the scaling factor.

11. Scale.

The whole displayed figure may be enlarged or reduced. The scaling factor is selected from a selection table.

12. XYscale.

Displays the calculated scaling factor of the object from the main screen.

13. Up/down.

When the up/down box is ticked, all up/down movements of the machine are displayed. The red line is the down move, the green the up move. For visibility the green line is moved 2 pixels to the right.

The length of the line corresponds to the length of the move.

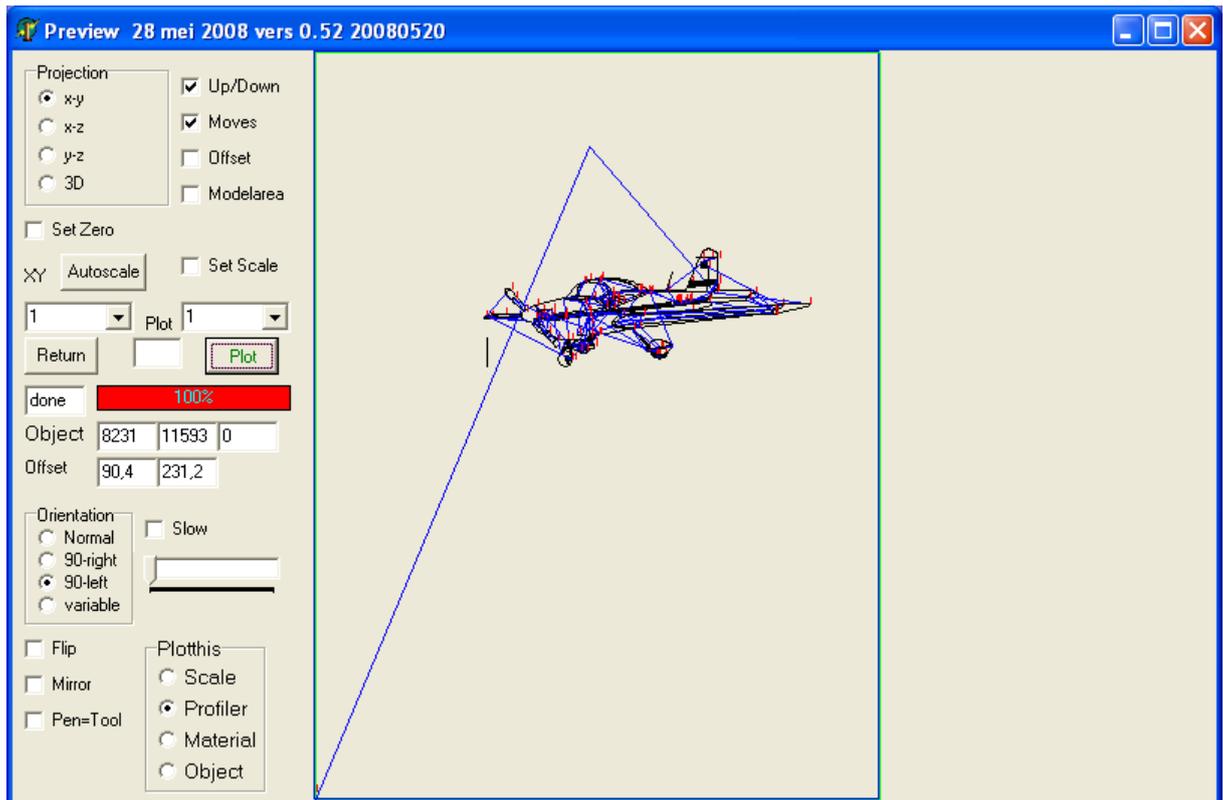


Fig. 3.2.2 Movements, orientation, offsets after dragging and plot . (fig-8-0525)

14. Moves.

Normally in the plot only movements of the tool in the material are displayed. However sometimes its important to view also all movements of the machine outside the material. When the moves-box is ticked, all movements of the machine outside the material are displayed in blue lines.

15. Slow.

Plotting normally goes very fast. To be able to follow all movements the slow-box is ticked and with the slider the displayed speed is controlled. Press **“Plot”** to start plotting.

16. Offset.

In most cases the object in the object-file has an offset, which may be outside the material or even the Profiler area. Ticking the offset box calculates this offset and corrects the plotting, manufacturing of the object by setting this offset to zero. The offset set in the main screen is not reset to zero as this is the user defined offset.

17. Model area.

This box draws a square area around the object indicating which part of the material is used by the object.

18. Set-zero.

If the mouse is dragged (left mouse button down) over the plot area a contour of the model is displayed and the object is plotted at this position, the offsets are calculated and stored for use in the main screen.

19. Save plot.

When an output format (see screen Profiler) is given, the plot as it is, is copied to a file.

20. Set scale.

21. Toolnumber.

Displays tool number e.q. pen color used.

3.3 Settings screen (Fig. 3.3.1).

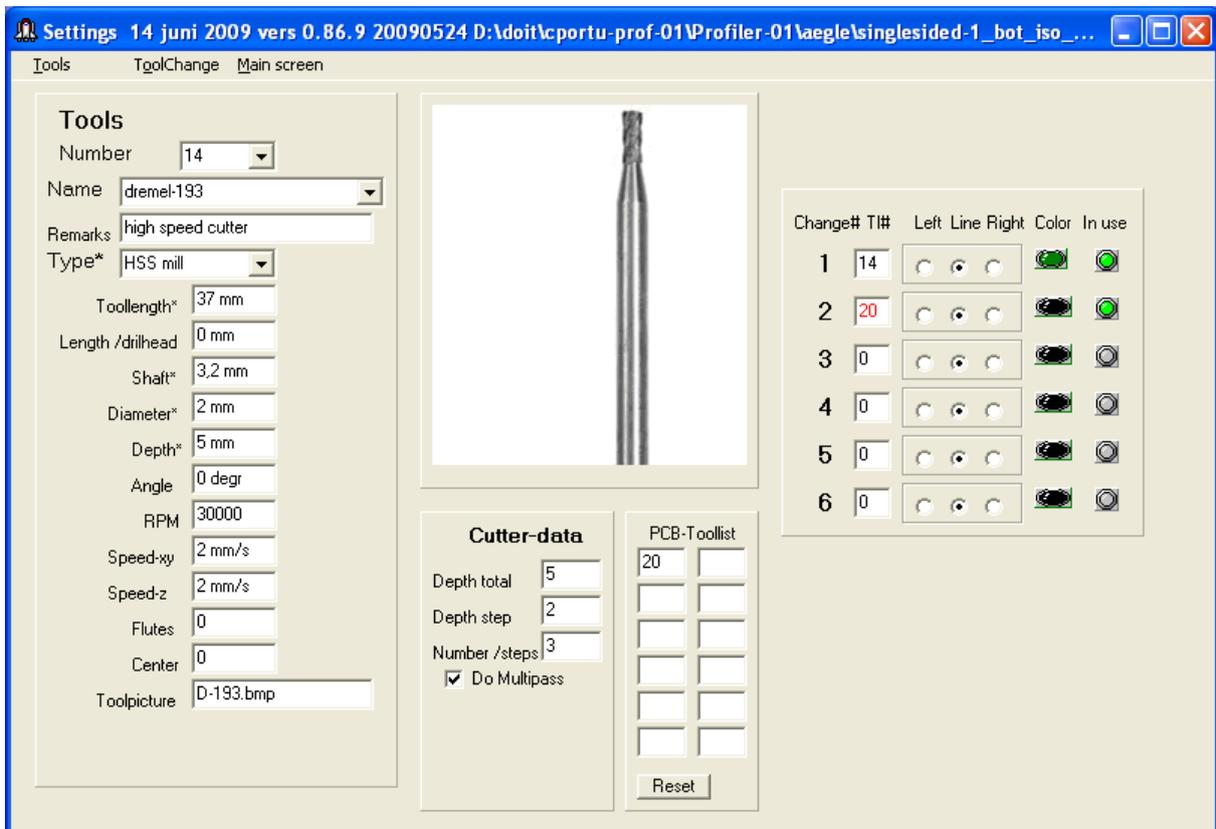


Fig. 3.3.1 Tools and pens. (f8-090614)

In this screen the dimensions, speeds etc for the tools are entered.
All dimensions are in mm, speeds in mm/s.

For the processing of the material with different tools the graphical “pen” is matched with a “tool”. The line color for the pen is selected. In “in use” the number of tools used in the object is indicated.

Menus.

Horizontal menu:

Tools --- Displays tool data.

Pen/Tool --- See below.

Main screen --- Returns to main screen.

Vertical menu:

Tools:

Use this --- Use these data in main screen.

Edit --- Edit the tool data.

New --- New tool data.

Save --- Save data in tool table.

Delete --- Delete data from tool table.

1. Tools.

Number.

Every tool is indicated by a number. The number is checked when entered.

If already in use the tool data are displayed. The max. number is set to 100.

Name.

The tool name is free to choose.

Type.

The tool type is selected from the table. Some commands are interpreted differently depending on the tool type (see remarks drill versus mill).

Length/drill head.

This is the length the tool protrudes from the drill head. This length is used to calculate the free space between material and tool tip.

Shaft.

Shaft of the tool has to fit in drill head.

Diameter.

Diameter of the work area of the tool. This is the diameter of the hole or width of the milled groove.

Depth.

The maximum depth for a drill- or flute height of a mill.

RPM (Revolutions Per Minute).

The optimum rpm for this tool. The value is always less than that of the machine limits.

Speed-xy.

Maximum horizontal moving speed of the tool. The value is always less than that of the machine limits.

Speed-z.

Maximum vertical moving speed of the tool. The value is always less than that of the machine limits.

Flutes.

Number of cutting edge of mill.

Center.

Mill has cutting edges into the center.

Toolpicture.

File name of the tool picture in the Toolfig-directory (appendix H).

2. **Cutter-data.** Not shown in Fig.9 (under construction).

Depth total. Max depth for tool

Depth step. Depth per processing step

Number / steps. Calculate number of processing steps for this object

Multi pass. Use this multi processing (pass) facility.

3. **Pen and tool.**

See Preview screen for explanation. There is a maximum of 6 pen/tools.

Tools are selected by number or name from the selection boxes.

(the use of “left, line, right “ is under construction).

Pen color is selected using the “color” button from the standard color panel.

“In use” indicates the tools/pens are used in the object.

4. **Pcb toollist**

When processing a pcb-file then tools number from this file and the numbers used in the program differ. In this list a conversion table is build which will be used in the tool change mechanisme.

5. **Main screen.**

Returns to main screen.

3.4 Profiler (Fig. 3.4.1).

Menus:

Engine ---- engine data

Serial ports --- Communication port to Profiler and Control unit.

Options --- A large number of settings explained below.

Outputformat --- for file with processed data.

Z-compensation --- x, y, xy and area compensation methods.

Main screen ---- return.

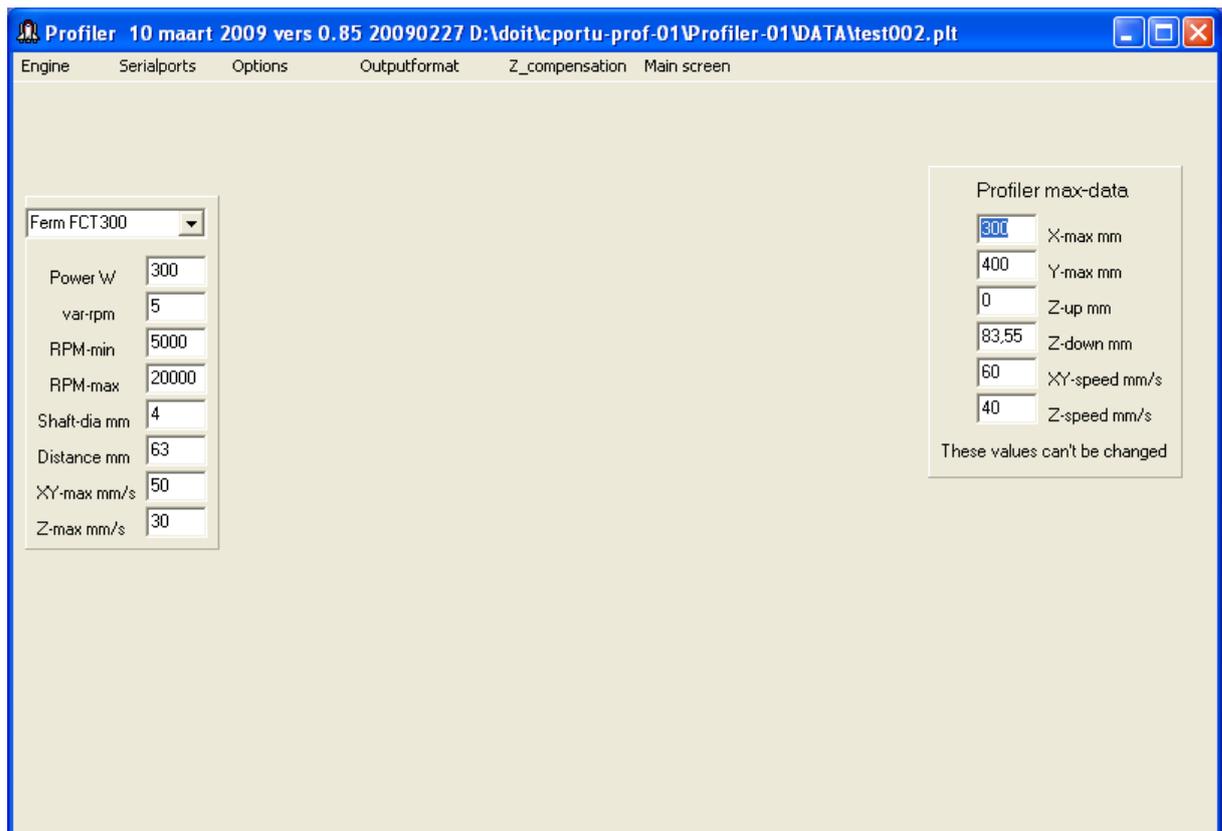


Fig.3.4.1 Profiler screen engine data. (f9-090310)

Horizontal menu bar: Engine, Serial ports, Tool change, Output format, Distance, Wait, Main screen.

1. Fixed values.

Here are the fixed values of the Profiler specifically to my machine. These are the absolute and maximum values used by my Profiler and are used in many tests and checks (dimensions and speeds) in the program. Values are specific for my configuration (Profiler and drill engine). They could be different with e.g another drill (e.g Kress, Proxxon etc.).

X-max	300	mm (width).
Y-max	400	mm (length).
Z-up	0	mm (position drill head in "home").
Z-down	83.75	mm (position drill head at work area).
XY-speed	60	mm/s (maximum horizontal moving speed).
Z-speed	40	mm/s (maximum vertical moving speed).

2. Engine (Drill engine).

The given values in () are valid for my machine. In the engine-database the data of several engine may be stored. (Ferm FCT300, Kress 1050 FME etc).

Name.

Name of the used drill engine (e.g Ferm FCT300).

Power.

Engine power consumption.

Var-rpm.

Number of steps of speed control (e.g. Ferm FCT300 has 5 steps).

RPM-min.

Lowest rpm of the machine.

RPM-max.

Highest rpm of the machine.

Shaft-dia.

Maximum diameter of the shaft of the tool to fit in the machine (4.0 mm).

Distance.

Free space between drill head and work area (83.5 mm).

XY-max.

Maximum horizontal speed. Always below Profiler maximum speed.

Z-max.

Maximum vertical speed. Always below Profiler maximum speed.

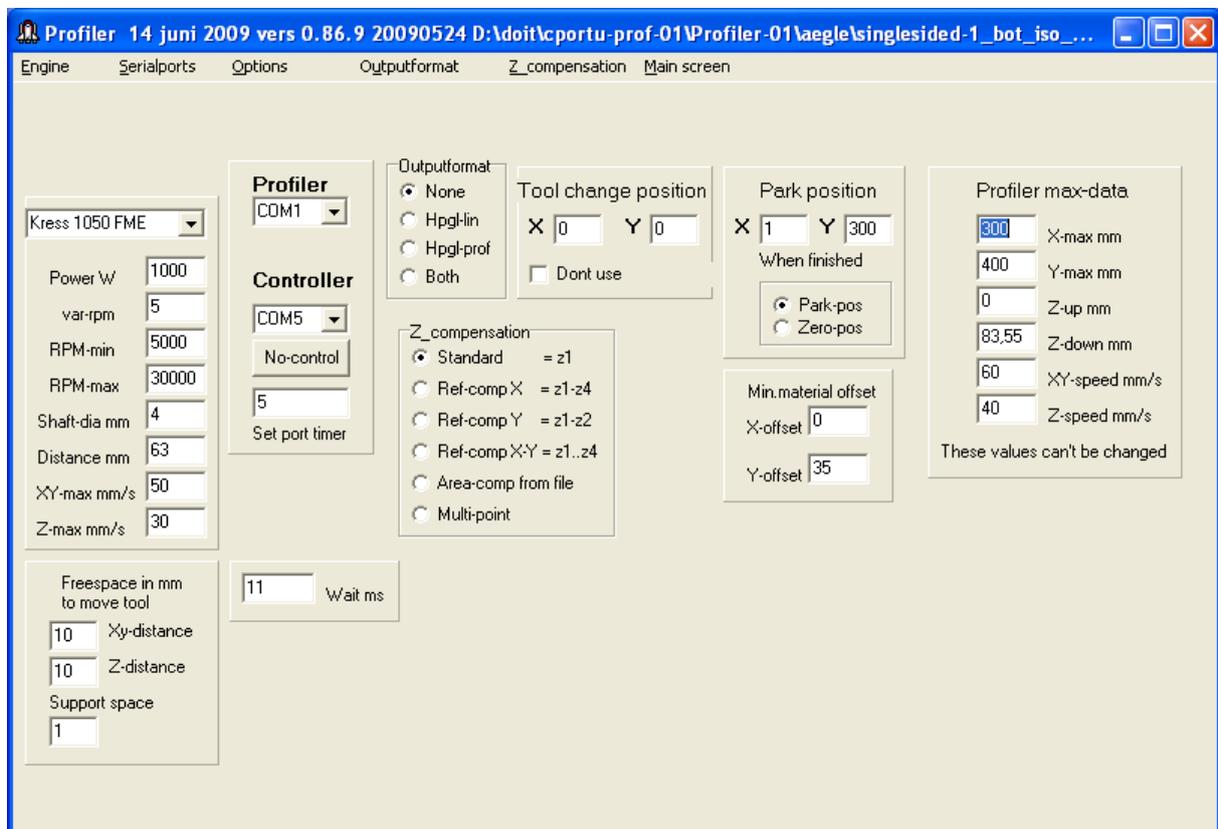


Fig. 3.4.2 Profiler communication ports and distances for speed calculation. (f9-090614)

3. Profiler comm port.

Serial communication port connected to the Profiler. The program detects all present serial ports. Also those that are connected to USB-port by an USB-serial converter, registered in the operating system.

When in the configuration file the use of the **Profiler control unit** is enabled the communication port for the controller unit is selected in this item.(see ProfiDoit control unit manual).

4. Free space-distance.

Minimum distance between tool tip and material for a save speed change.

When changing the xy-speed the tool tip needs to be at least minimal 3 mm above the material.

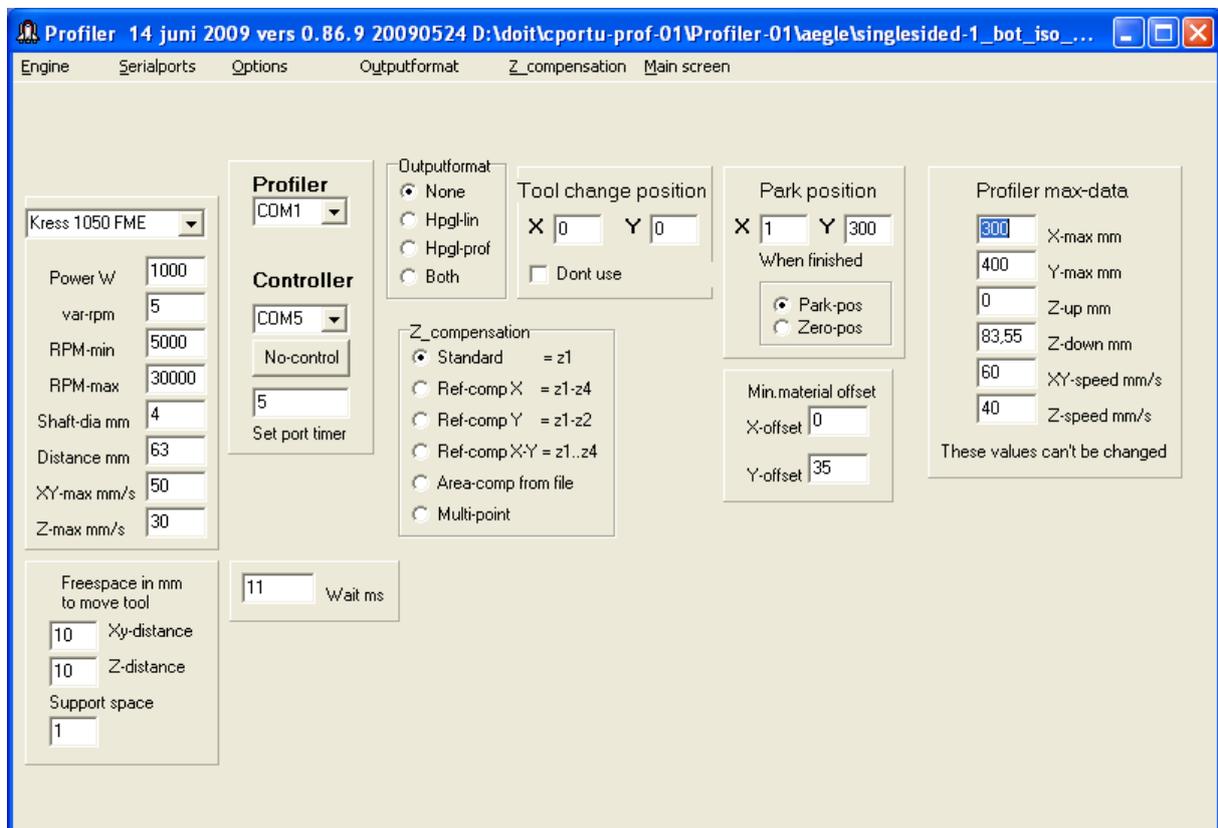


Fig. 3.4.3 Tool change, wait and output format. (f10-090614)

5. Tool change position.

The tool change position may be any place within the work area of the Profiler. If in the object file the commando "SP" - select pen- is detected, the program goes to the "tool change position" and waits for confirmation of the tool change. After that the program continues from the last work position of the object.

6. Output format.

To save plotted data, the output format is selected.

7. Wait.

Wait time between commands. Gives the mechanical part of the mill time to stabilize.

When milling there are horizontal forces in the whole construction. A 100ms wait before the next command levels these forces.

8. Park position.

Position where the Profiler head is going after processing, giving the user space to change the material.

9. Material offset.

An offset in y-direction for the workarea.

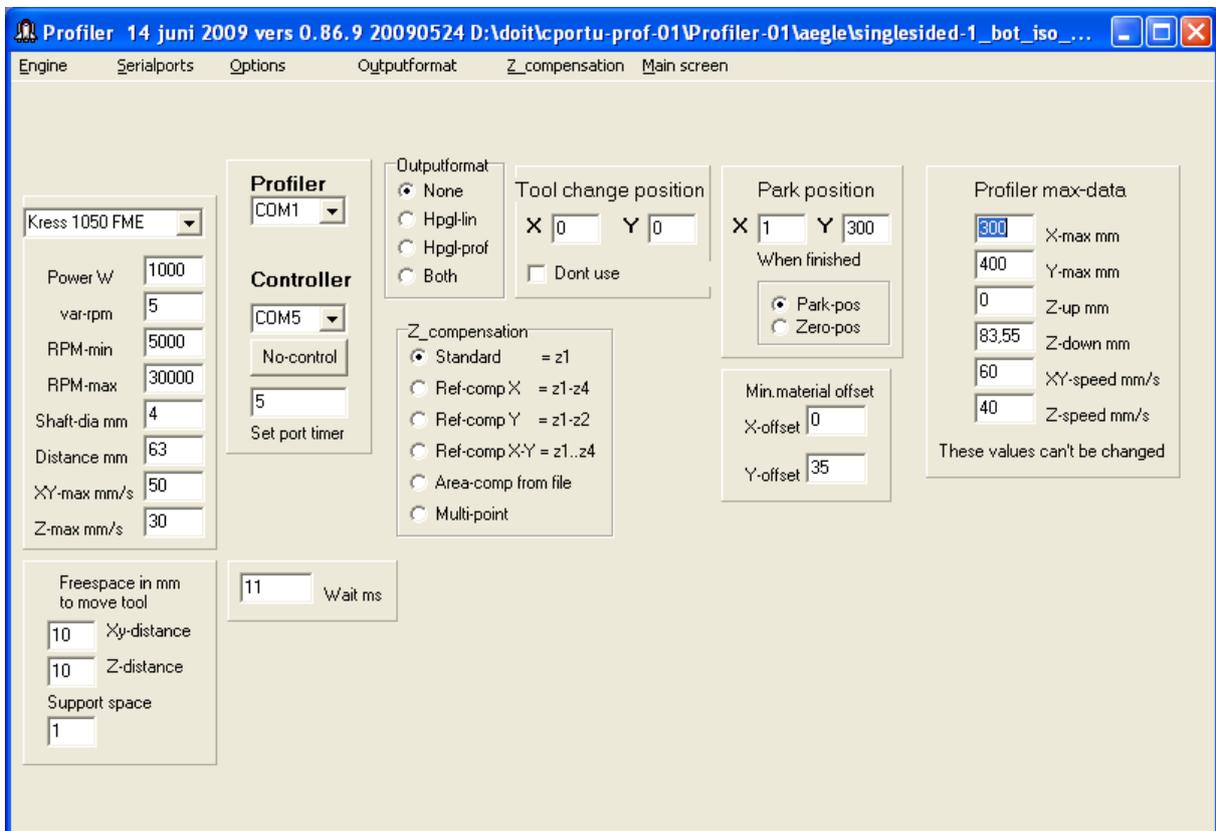


Fig. 3.4.4 Z-compensation. (f10-090614)

10. Z-compensation.

When for a material the height of more than 1 corner is given, the z-position of the tool tip may be corrected for the height differences of the given corners. The compensation is done by linear interpolation over the xy-distance the tool is displaced.

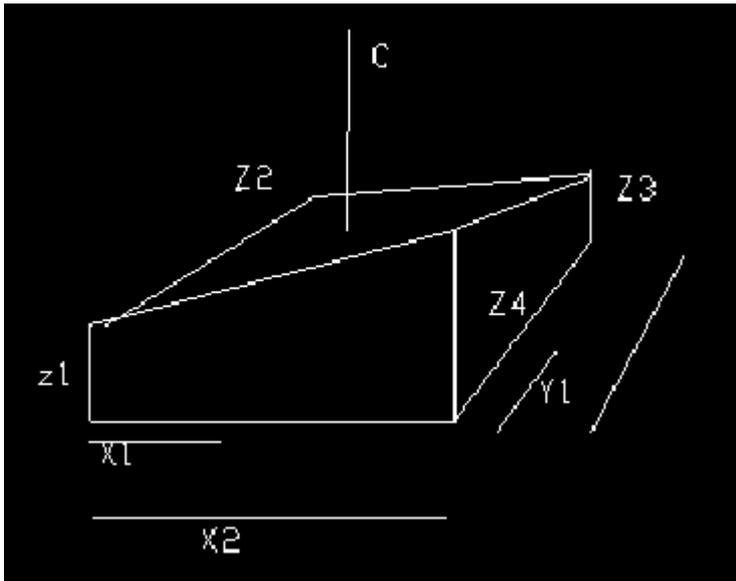


Fig. 3.4.5 Slanted area compensation. (z1-z4-t2-0804)

Area compensation can be done if the ProfiDoit control unit with scan micro switch setup is used.(see ProfiDoit Control Unit documentation).

11. Main screen.

Returns to main screen.

3.5 Materials

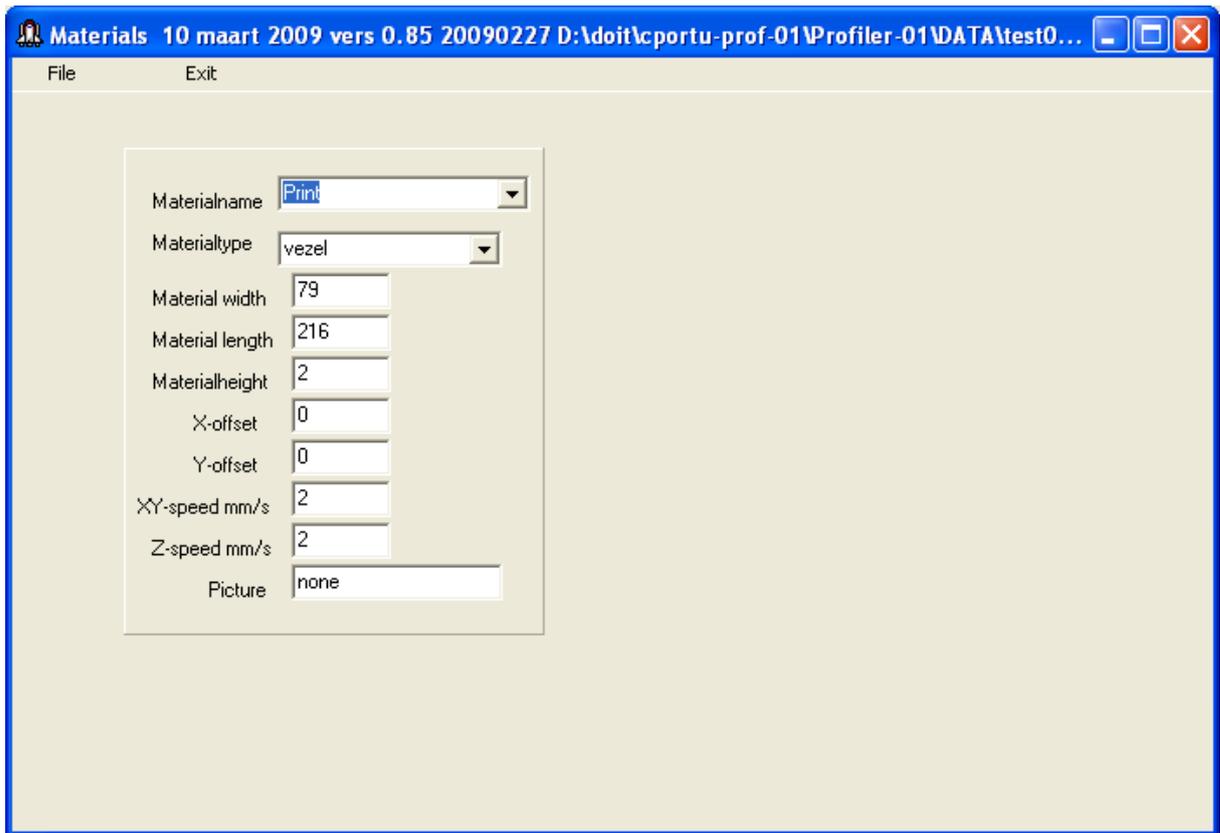


fig. 3.5.1 Material database screen (f11-090310)

Vertical menu:

Material:

- Use this --- Use these data in main screen.
- Edit --- Edit the material data.
- New --- New material data.
- Save --- Save data in material table.
- Delete --- Delete data from material table.

3.6 References.

1. Elektuur nr 519 january 2007 pag.14.

Elektor nr 536 june 2008 pag. 66.

2. www.elektor.nl/ forum/profiler.

A. Millingtips in Elektor Profiler forum.

<http://www.wisent.nl/info/freestips/index.html>

<http://www.stanford.edu/group/prl/documents/>

B. Wat plaatjes kijken (Looking to Profiler pictures).

Part 1: <http://www.elektor.nl/forum/forum/actuele-projecten/wat-plaatjes-kijken.220781.lynkx>

Part 2: <http://www.elektor.nl/forum/forum/actuele-projecten/wat-plaatjes-kijken-part-2.336989.lynkx>

And Zeigt her eure Arbeiten (Looking to Profiler pictures):
[http://www.elektor.de/forum/foren-ubersicht/foren-zu-elektor-projekten/zeigt-her-eure-arbeiten--\).290177.lynkx](http://www.elektor.de/forum/foren-ubersicht/foren-zu-elektor-projekten/zeigt-her-eure-arbeiten--).290177.lynkx)

- C. 3D program by Lukacs Sudar: B2G converts bitmap to g-code.
<http://www.inf-el.com/cnc/cnc.htm>
 - D. Colidrive struikelt bij 3D. By Vibo (28-03-2008).
 - E. BOcnc from www.bocnc.de/bocncV2.htm.
Or see Werner.Stratman@skydsl.de.
3. Franklin Industries BV. Belgium.
www.Colinbus.com and www.Colinbus.com/Profiler

A. Table error messages.

The error messages are complex numeric codes, which are decoded by the error message routine and displayed as readable messages.

- 0. Number to big
- 1. Not in range
- 2. Outside material
- 3. Too fast
- 4. Not a class
- 5. Already in use
- 6. Too long for
- 7. Too wide for
- 8. Too high for
- 9. Too fast for
- 10.
- 11. Object
- 12. Tool
- 13. Material
- 14. Engine
- 15. Profiler
- 16. Drill
- 17. Cutter
- 18. Free space
- 19. Speed.
- 20. Out of range...set range

Only part of the list is shown here.
For translation purpose the list is separated from the program.

B. Table Tool-type.

- 1. Drill bits
- 2. Milling tool
- 3. Engraving tool

4. PCB engraving tool
5. Flat end mill
6. Contour router
7. Bull nose
8. HSS mill
9. Tungsten carbide mill
10. Spherical
11. Tapered flat
12. Tapered bull nose
13. Tapered spherical
14. Bore
15. Tap
16. Sink
17. Center drill
18. Ream
19. Other

C. Table Material-type.

1. Wood soft.
2. Wood hard.
3. Metal aluminium.
4. Metal Copper.
5. Metal iron soft.
6. Metal iron hard.
7. Print board soft.
8. Print board glassfiber.
9. Plastic soft.
10. Plastic hard.
11. Acryl (Plexiglas).
12. Paper/carton.
13. Other.

D. HPGL-lin demo file.

Demo file, drills holes at XY coordinates 10,10 and 20,10 and 30,10 mm. The horizontal speed is 30 mm/s. The down speed of the drill in the material is 1 mm/s. Comment lines start with # .

```
# Plotter file hppl-lin
#E:\poorten2\plotter-ser\test002.plt
# Date: 04 October 2007 11:17
# pennumber 0
SP0;
PU;
VS 30.0;
# move down speed
@ZD 1.0;
# move 10, 10 mm
PA 400,400;
#move to drill hole
PD;
```

```

# up position
PU;
# start volgende
# move 20, 10 mm
PA 800,400;
#move to drill hole
PD;
# up position
PU;
# start volgende
# move 20, 10 mm
PA 1200,400;
#move to drill hole
PD;
# up position
PU;
# move to
PA 0,0;
#end*

```

E. Example ACAD conversion.

Start the program AutoCAD in this example AutoCAD 2000.

With: File → Open Select a data file, the file type needs to be DWG or DXF .

After the file has been opened and displayed at the screen

File → Plot Select the correct plot-device e.g 7475A.

The plotter papersheet has to be set to A4 for correct measurement conversion.

Check if measurement output is set to 1 mm = 1.0 plotter units.

Tick the box "Plot to file" , the file is put in the selected directory and has the extension .plt.

F. Example BOcnc conversion (ref. 2E).

After start of the program open the file with "Datei → Openen". Pay attention to open the correct file-type "Datei-type CAD (.DWG)"

Then with "Datei → Export (*.plt)" Save the file.

G. Subset of Profiler commands used in program.

```

<esc>BT: Output total dram in bytes.
<esc>LI: Start DCC mode =1.
<esc>LM : Start HPGL-line mode =2.
<esc>LO : Return to local mode = 0.
<esc>MD : Output current system mode.

```

```

DF Default restore.
OA Output actual position.
OC Output commanded position.
OF Output scale factors.
OI Output identification.
PA Plot absolute.
PD Pen down.
PR Plot relative.
PU Pen up.

```

SP Pen select.
VS Velocity select.

@HM Home all axis.
@HZ Home z-axis.
@WT Wait msec.
@XX Reset system.
@ZA z-move absolute.
@ZD z-down velocity.
@ZR z-move relative.
@ZU z-up velocity.

<esc>.) Plotter off command returns to DCC mode.

H. Program directories and files.

Your directory	Directory of your choice.
Data	Directory containing data files (see below).
Prof	Directory containing configuration and tool data.
Toolfigs	Directory containing figures of the tools.
Project	Directory for the project files.
Logfiles	Directory of the log-files.
Areafiles	Directory of the area scan data files (see also “Control-unit”).
ProfiDoit.exe	The program itself.

DATA	Directory.
Afzuiger-proef-onder-grofr.c3d	3D test by Vibo (see ref. 2D).
Clock.cnc	B2G files by J.Mazurek.(see ref . 2C). This is a very large file with 160.000 lines.
Eagle.cnc	idem.
Gaatje-ZA.plt	Z-axis absolute position test file.
Gaat-PU-PD.plt	Test file for pen up (PU) and pen down (PD).
Hg ils 8 graveer.CBR	Used in tests (see ref. 2B).
T3.c3d	Part of a 3D-file by Vibo.(see ref. 2D).
Test002.plt	2D drawing used to test program.
Unsuplog.log	Log file of unsupported commands.

Logfiles	
Log-“date”.log	Log file of processing by date.

Prof	Directory
Matlist.txt	List of materials and properties.
ProfiDoit.ini	Program configuration file.
Toollist.txt	List of tools and tool properties .

Program version: 0.86.9 text update: 20090615 .

ProfiDoit Control Unit

A simple control unit for the Profiler.
Version: 086.9

By

P. van der Wal

PE0PWA

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Control unit for Profiler.

Introduction

The purpose of the control unit is to switch the power to the Profiler and drill engine on and off under control of the ProfiDoit program.

When changing a tool the distance between tool tip and material has to be measured to assure the correct tooling depth of the new tool. This distance can be measured using the control unit's input from a micro switch.

The surface area of the material is often not flat. To compensate for this rawness the flatness of the surface area may be measured and stored in a file. The area scan is done using a micro switch mounted in the drill head.

Tool to PCB distance measurement, so the tool will be milling/drilling at the desired depth.

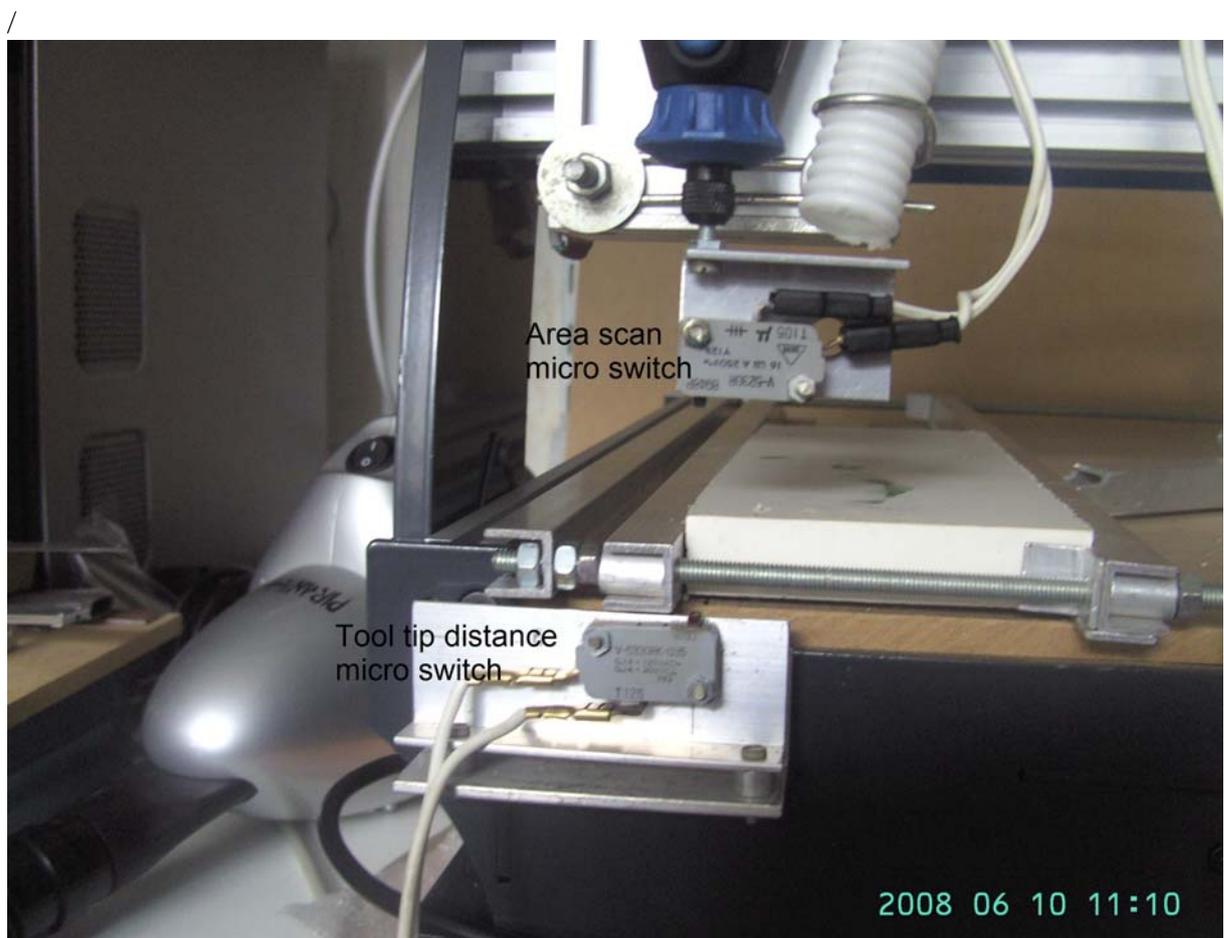


Fig.1 Position of the micro switches. (Bild-0203a)

Installation.

The serial port to be used by the control unit must be enabled in the program configuration file (see below).

When ProfiDoit is started and the serial port is enabled but the control unit is not connected or switched off a warning message is displayed and the program will continue with the control unit and control functions disabled.

The control unit is connected by a serial port to the pc running the ProfiDoit program. Led indicators at the control unit display the status of the on/off control and the micro switches. (Fig.2).

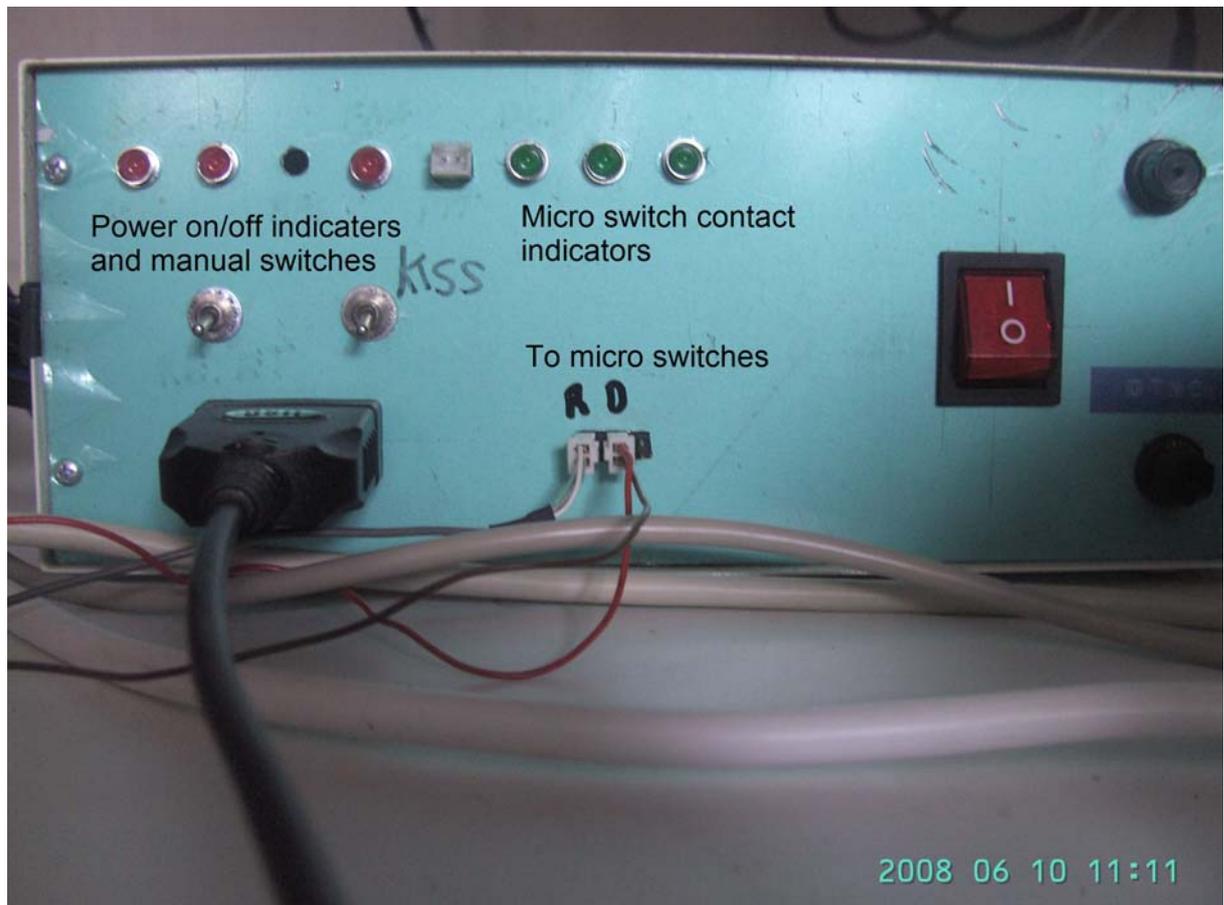


Fig.2 Control unit cabinet. (Bild-204a)

In the ProfiDoit program the serial port to be used by the control unit is set in the "Miscellaneous" screen at the item "Controller". (Fig.3).

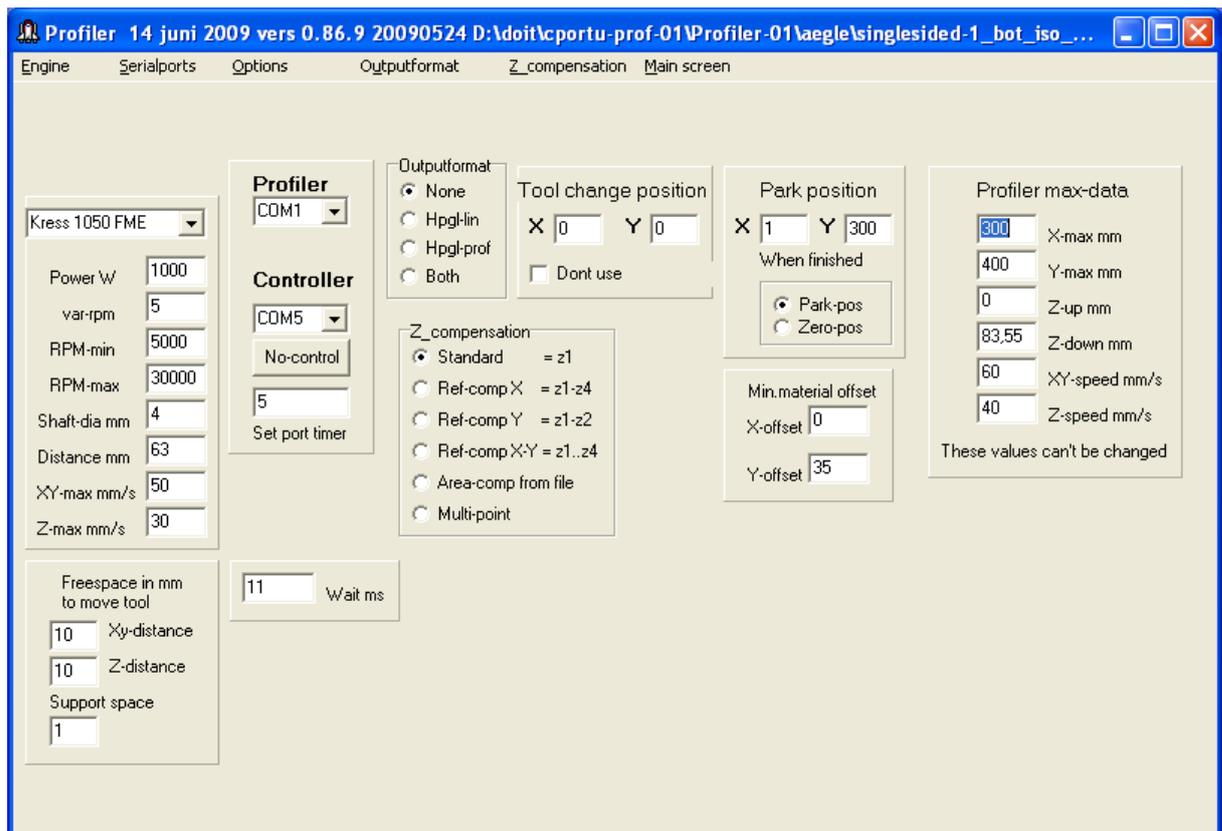


Fig.3 Screen "Miscellaneous", the item "Controller" (f10-090614)

If the control unit is found at that port the on/off controls are set to OFF. At the same time in the main screen a panel with 4 leds is shown. (Fig.4).

The two green leds, in the panel left, are the power switches for resp. Profiler (Prof) and Mill/Drill engine(Eng). Clicking the led will switch the power OFF (green) or ON (red). The two red leds, in the panel right, are the micro switch indicators. The left one is the tool tip distance micro switch led (Drill) (green = no contact) used when tool change is enabled in the main program. The right led (Scan) opens the area scan screen.

Usage:

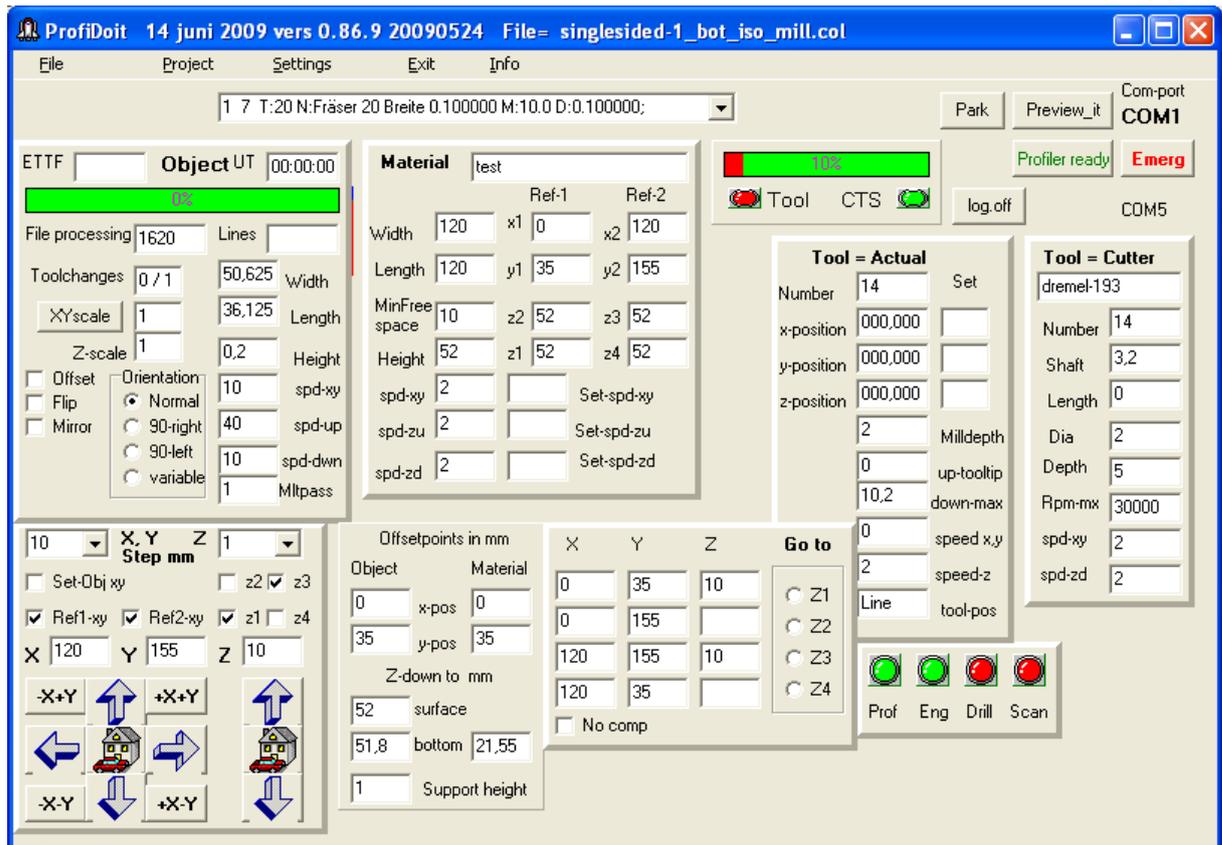


Fig.4 Panel with power – and micro switch led indicators. (f11-090614)

Power on/off.

Clicking the led (Eng) will switch the power OFF (green) or ON (red) to the drill/mill engine. When using the tool tip distance detection at tool change the power to the drill engine will automatically be switched off. After measuring the distance and confirmation by the user the power will switch on again.

Tool tip distance.

When in the "Miscellaneous" screen the tool change item is set, the program will notify the user to change the tool. At that moment the user is asked for automatic tool tip distance measurement. If so the program positions the drill/mill above the micro switch and starts lowering the tool in small increments till the micro switch is pressed and the indicator led (Drill) is lit. The program lifts the tool 2 mm and starts lowering the tool in 1 step increments to ensure a clean 1-unit resolution measure. The position of the micro switch is set in the area scan screen.

The measured distance is used to calculate the correct position of the tool in the continued processing.

In the main screen clicking the right led (Scan) in the panel start the area scan screen.(fig.5).

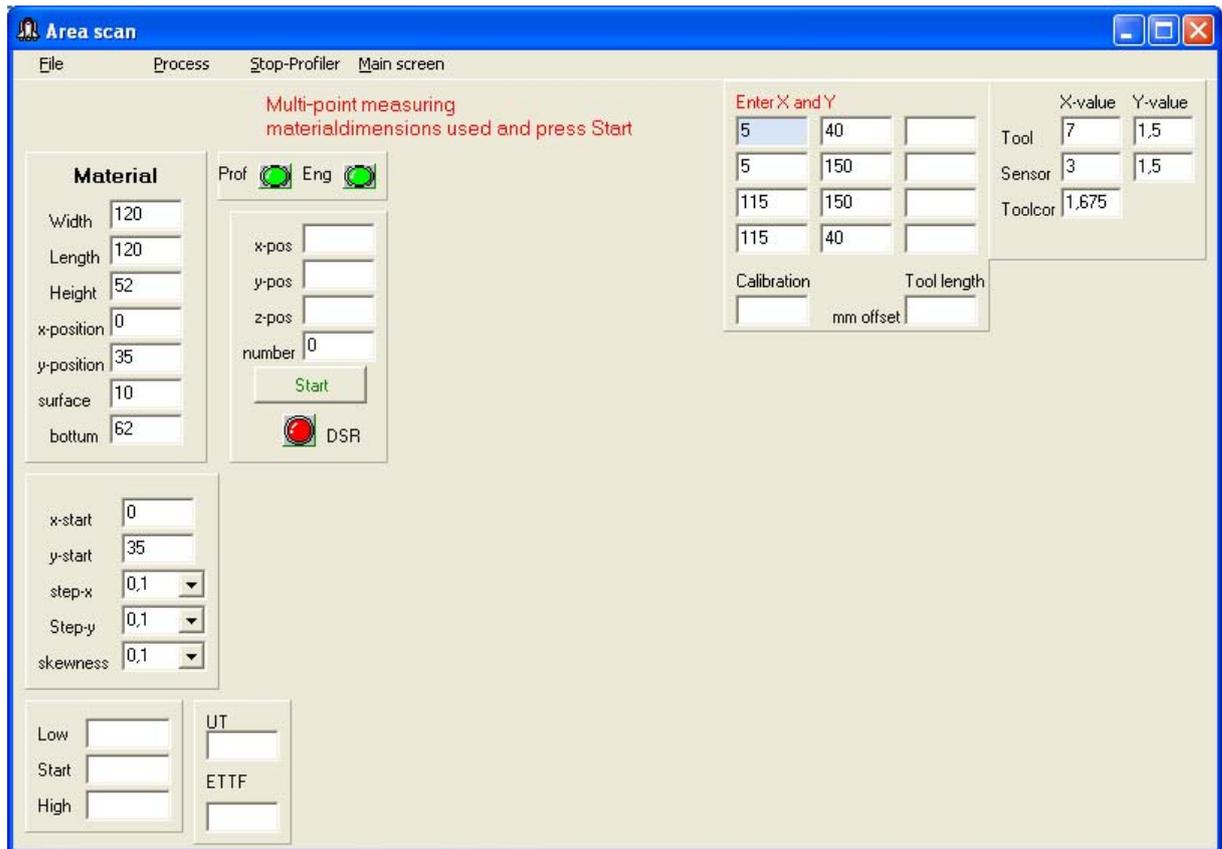


Fig.5 Multipoint scan. (f12-090614)

Menu item **“Process”** you select the type of scan or calibration you want to do.

1. Multipoint
2. Areascan
3. Tool calibrate
4. Sensor calibrate
5. Pcb scan

Sensor calibration measures the height of the sensor mounted at the drill/mill engine to the fixed mounted micro switch, **tool calibration** measures distance of the tool in the drill head to the fixed mounted micro switch.

The positions of the micro switches to move to is set in the panel in the upper right corner. There is difference in the vertical switch points of the switches which is corrected by setting the “tool correction”.

Multipoint calibration measures the height at the corner points (x, y) set in the main screen as z1 .. z4. First it calibrates the sensor to the fixed switch and moves then to the corner positions to measures at the given points (z-points from main screen or directly entered here) . Then asks if the tool is mounted and starts tool calibration and a checkbox next to tool length appears, check this box if the measured data is to be used in processing the object file.

Pcb-scan is used to measure directly the tool length using the copper plating of then pcb as contact area and the position of the object as measuringpoints The tool length values are sent to the main screen and used to calculate the tools z-position. (Fig.6)

After selecting the processing type a START button appears, the PROF and ENG leds will be green (= OFF), the input switch used in detection is shown (DSR, CTS or RLSD).

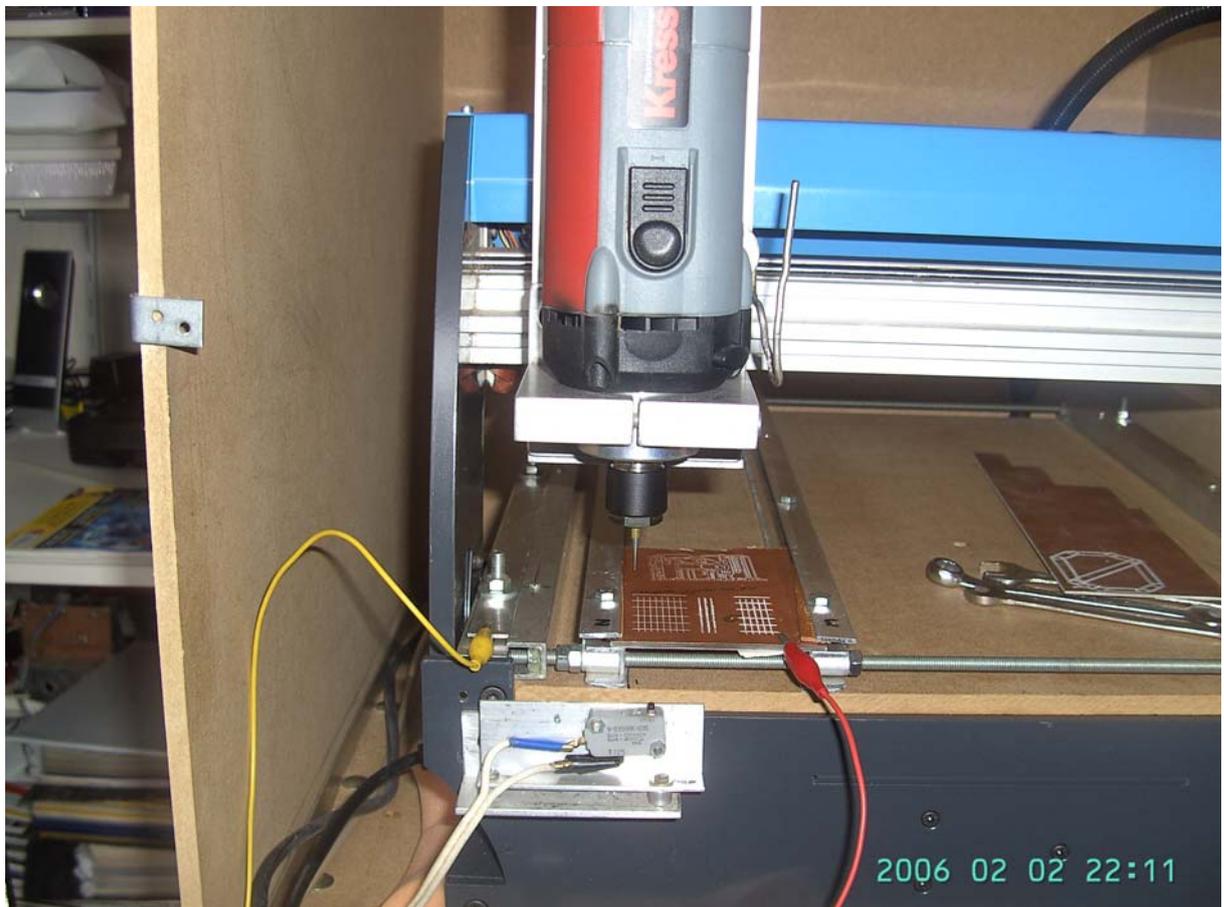


Fig.6 PCB calibrate scan, pcb is insulated from AL-frame by pertinax strips.

The red and yellow wires connect to the 3rd input (RLSD-pin) at the control unit.

Area scan.

Be sure to have the area scan micro switch mounted in the drill head and connected to the control unit.

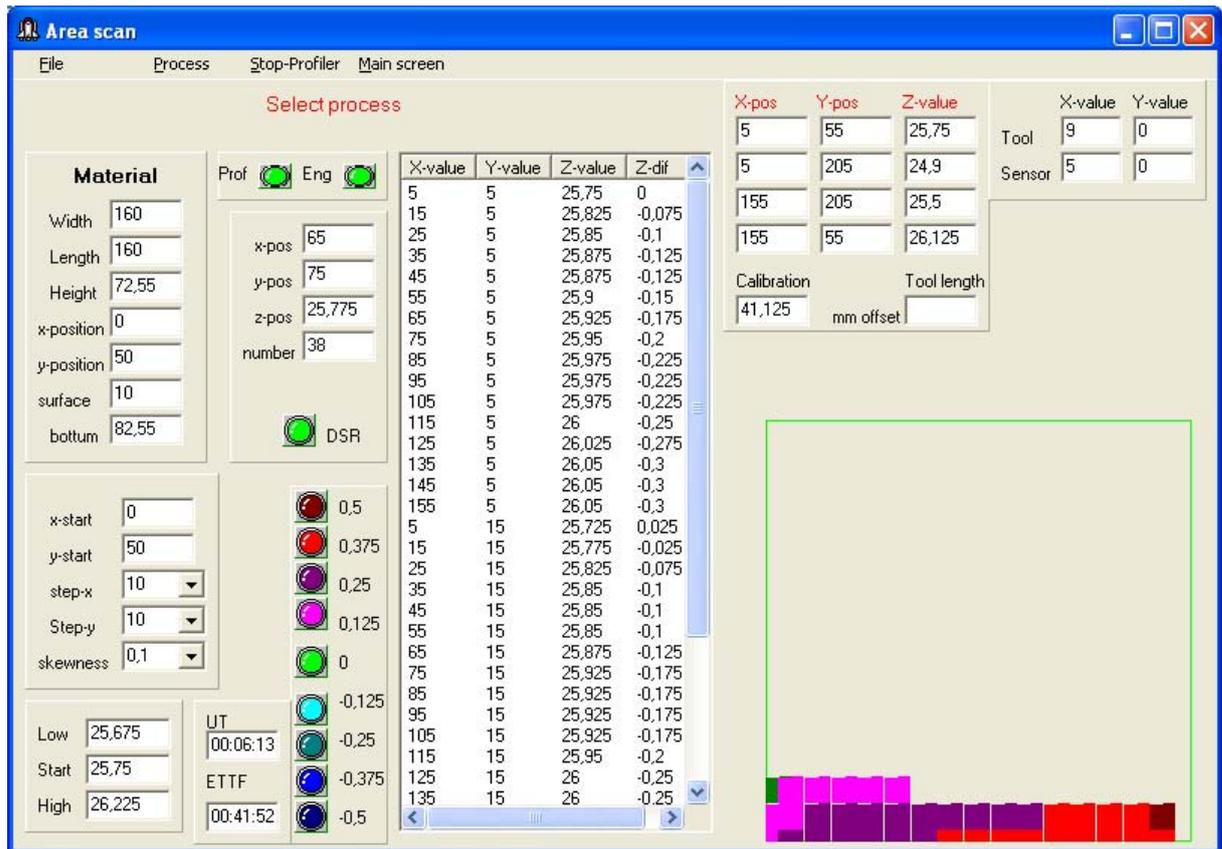


Fig.7 Area scan screen. (c3-090311)

The screen shows the material dimensions as set in the main screen (upper left panel) and the position of the drill head (upper right panel).

In the left middle panel the step value for the x and y axes are set. The skewness is the expected rawness of the surface.

The right color bar shows the color used in the plot to indicate the variation of the surface flatness towards the first starting point.

The colors may be changed by clicking the colored button and selecting a new color from the color panel.

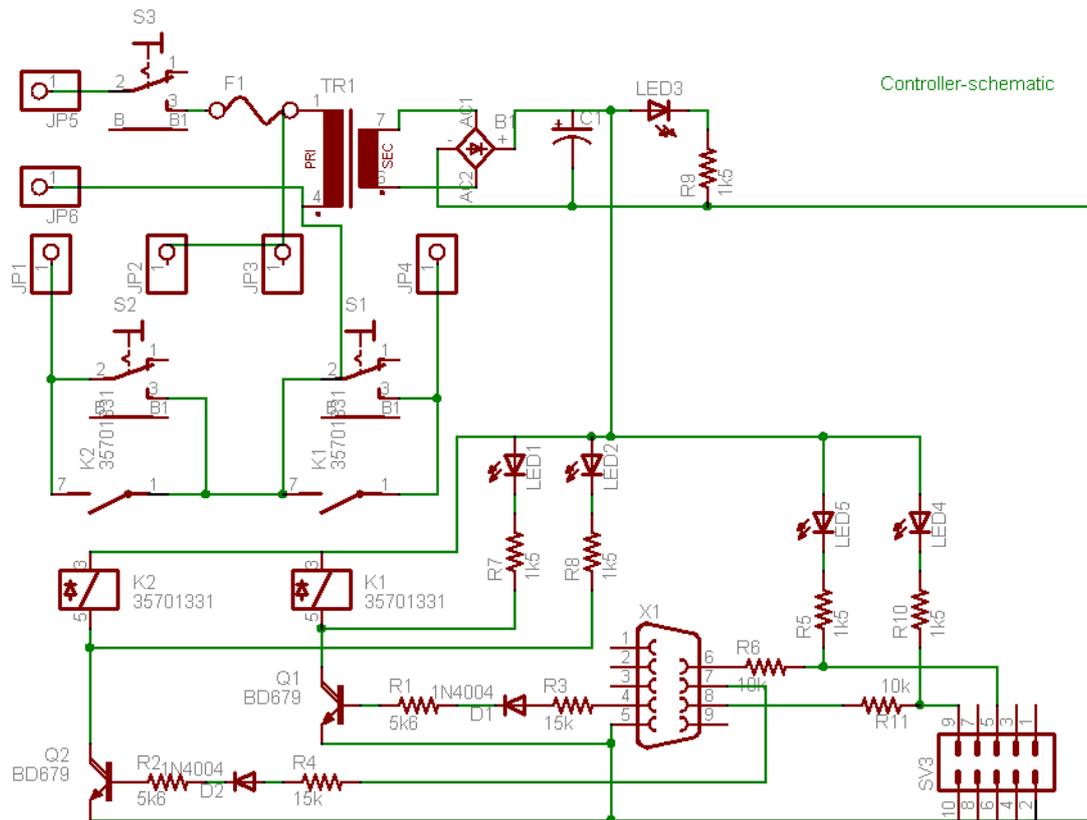
The values at the color buttons changes automatically with the skewness value.

The lower left panel show the measured start value and the min and max value measured.

UT is the used time, is running time of the scanning process.

ETTF is the estimated duration time of the scan.

Schematic of the external controller..



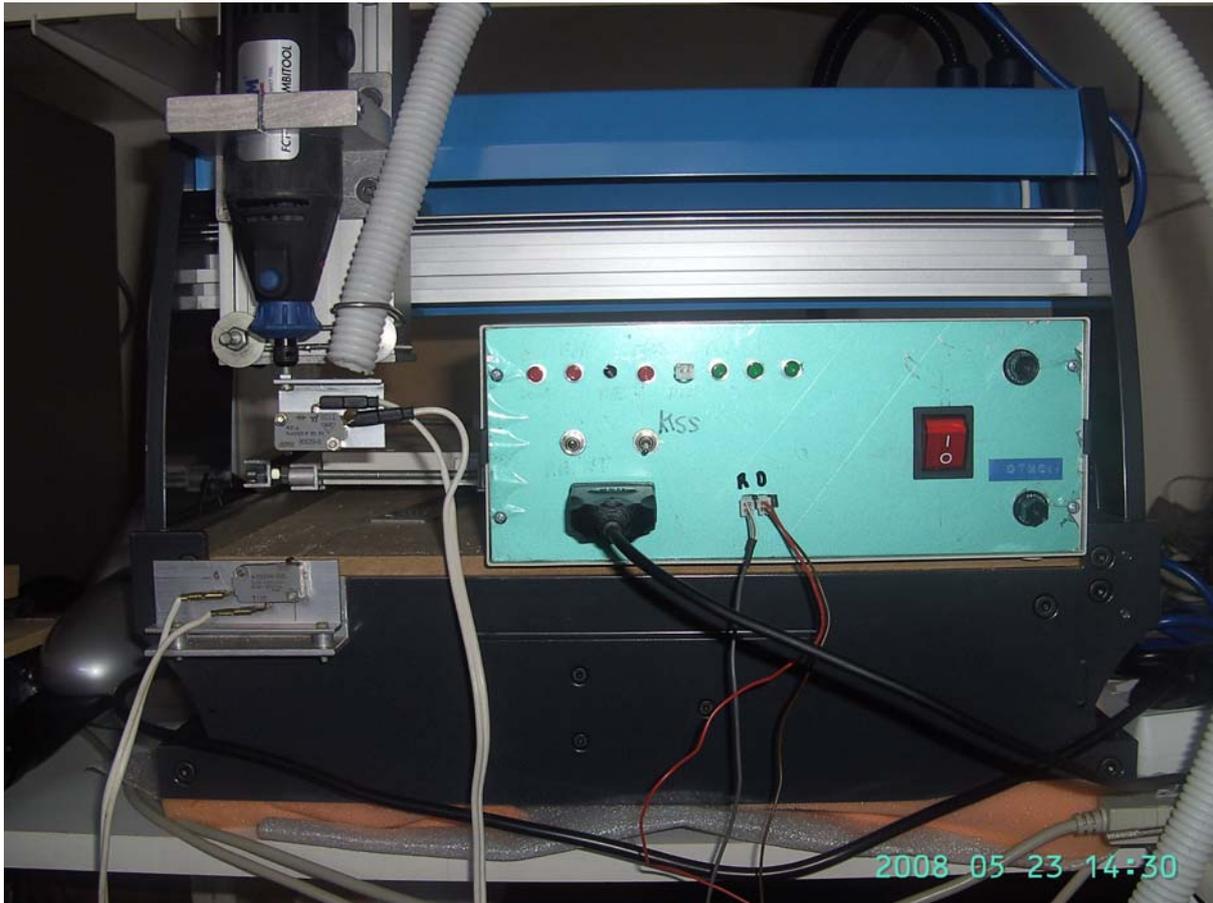
Schematic diagram of the external controller. (schem-0515)

- JP5,JP6 Mains power.
- JP1,JP2 Profiler power connector.
- JP3,JP4 Ferm drill power connector.
- X1 RS232 connector to computer system.
- Sv3 Connector to micro switches.
- Q1,Q2 BD679 transistor.
- K1,k2 Relays 12V to switch the 220V connectors on/off.

Eagle CAD version 4.15.

Resume.

A second serial port is used to send and receive data from the external controller. If the controller comm. port is set to COM0 no controller is present and display of controller settings and programming is disabled. Setting the comm. port to a port not connected to the controller will lead to a program crash and the system may be halted.



Micro switch for tool length detection mounted at Profiler chassis.
Micro switch for material area detection mounted in drill head.
Controller unit box with USB-serial converter.

When a tool is changed the drill head is at the zero-position (if set in the program) and the user is asked if the program should check the tool length. If yes the drill head is lowered in small steps till the micro switch is pressed by the tool tip. The tool is raised 2 mm and the tool is lowered in 1 unit steps to accurately determine its length. Accuracy 1 is Profiler step unit.

If the material area detection is used, the drill head is positioned above the material and a same procedure is applied as in determining the tool length. The data is used to calculate exact drill/mill depth. Accuracy 1 is Profiler step unit.

Specifications of the controller.

RS232 serial port connections.

Profiler power on/off pin 7 = RTS.
Drill engine power on/off pin 4 = DTR

Tool length switch pin 8 = CTS.
Area scan switch pin 6 = DSR
Pcb scan pin = RLSD

Power on/off relais switch current max. 5 A.
Input voltage and current to switch relais 10 V by 1 mA
Output voltage and current to RS232 10V by 1 mA
Max length in tool length test 65 mm
Min length in tool length test 5 mm
Max area height in area scan test 30 mm

Configuration file example.

```
# Profiler Profplot @vers 0.55 20080618
# D:\Prof\ProfiDoit.ini
# Date: 18 juni 2008 15:41
#
Profiler
4 # comport
Controler
-1 # comport controller            Controller not present, if 5 then serial port
Engine                            number 5 and controller in main screen is
Ferm FCT300 #                    enabled
5 # steps
```

In this example the controller port is set to -1 to disable the controller functions in ProfiDoit. Changing this value to 0 or a real port number enabled the controller functions.

File: control-090615 update: 090615