



LPKF CircuitPro

Basic Manual

Order Code: 10000449

LPKF
Laser & Electronics



Laser & Electronics

CircuitPro 1.5

Basic Manual

Version 1.0

English

LPKF Laser & Electronics AG

Osteriede 7

D-30827 Garbsen

Germany

Phone +49-5131-7095-0

Fax +49-5131-7095-90

Email info@lpkf.com

Internet www.lpkf.com

Publisher **LPKF Laser & Electronics AG**
Osteriede 7
D-30827 Garbsen
Germany
Phone: +49-5131-7095-0
Fax: +49-5131-7095-90
Email: info@lpkf.com

Order code
File name CircuitPro 1.5_HB_V1.0_ENG.docx
Version 1.0
Creation date 2012-05-09 (yyyy-MM-dd)
Print date 2012-05-09 (yyyy-MM-dd)
Copyright © 2012 LPKF AG
This document and its contents in whole and in part are subject to copyright. The reproduction, translation or duplication of the contents as photocopy or any digital form requires written permission of LPKF AG.

Product and brand names
Product and brand names are trademarks of LPKF Laser & Electronics AG, registered among others at the US Patent and Trademark Office: LPKF® and the company logo, # 2,385,062 and # 2,374,780; Solarquipment®, # 3,494,986; ProConduct®, # 3,219,251; Allegro®, # 3,514,950.

General information




Procedure descriptions

For this manual step by step procedures or workflows are compiled to operation sequences. An individual operation sequence consists of at least three components Title+Step+Result.

Component	Description
■ Title	Short description of the expected result – characterized with a prefixed “■”.
1. Step	A consecutively numbered order of the individual work item of the described procedure.
➔ Partial result	Partial result of an operation step. The operation sequence is continuously progressed.
◆ Result	Result of the operation sequence - characterized with a prefixed “◆”.

Symbols and signal words

Inside this document the following symbols will be used to indicate important information:

Symbol	Description
	Safety instruction WARNING – dangerous hazard to people ATTENTION – a machine damage is possible
	Note The note will be used for any information about the optimal solution for a realisation of a specific function or operation.
	Note The memo will be used for any additional information about a function or operation step.
©	Copyright
®	Registered Trademark

Registered trademark

The LPKF logo and the LPKF product names are registered trademarks of LPKF Laser & Electronics AG.

Microsoft and *Windows* are brand names or registered trademarks of the Microsoft Corporation in USA and/or international.

All other brand names belong to the respective owner.

Standards

The following standards and guidelines had been pursued for the creation of this document:

Standard	Description
DIN 5008 05-2005	Rules for writing and layouting
VDI 4500 BI.1,2 11-2006	Technical documentation - Definitions and legal basics
DIN 66270 01-1998	Rate of software documents – Quality features
ISO/IEC 26514 11-2008	Requirements for designers and developers of user documentation
IEEE 1063 05-1987	Standard for Software User Documentation
ISO/IEC 9294 05-1990	Guidelines for the management of software documentation

Contents

1	Function	7
1.1	Documentation overview	8
2	Safety notes	9
2.1	General safety notes.....	9
3	Installation.....	11
3.1	System requirements	11
3.2	Installing the software	11
3.3	Machine setup.....	16
4	Using the software.....	19
4.1	Starting CircuitPro.....	19
4.2	User interface.....	20
4.2.1	Structure of the CircuitPro user interface	20
4.2.2	CAM View	22
4.2.3	Toolbar CAM view	23
4.2.4	Machining view E33.....	24
4.2.5	Machining view S43.....	25
4.2.6	Machining view S63/S103	26
4.2.7	Toolbar Machining view	27
4.2.8	3D View	28
4.2.9	Toolbar 3D view.....	29
4.3	Toolbars	30
4.3.1	Toolbar Standard	31
4.3.2	Toolbar "Insert"	32
4.3.3	Toolbar "Modify"	33
4.3.4	Toolbar Prototyping	34
4.3.5	Toolbar Layout.....	34
4.4	Panes.....	35
4.4.1	Layers	36
4.4.2	Geometry	37
4.4.3	Toolpath.....	37
4.4.4	Processing	38
4.4.5	Properties	41
4.4.6	Tool Info.....	41
4.4.7	Navigation.....	42
4.4.8	Camera (only if a camera is connected).....	43
4.4.9	Messages	44
4.4.10	Fault Monitor.....	45
4.5	Menus	46
4.5.1	Menu File	47
4.5.2	Menu Edit.....	49

4.5.2.1	Material properties.....	51
4.5.2.2	Material placement.....	52
4.5.2.3	Material Settings.....	56
4.5.2.4	Tool magazine ProtoMat E33/S43 (manual tool change)	58
4.5.2.5	Tool magazine ProtoMat S63/S103	60
4.5.3	Menu Insert.....	70
4.5.4	Menu Toolpath.....	71
4.5.4.1	Create 2.5D milling.....	72
4.5.4.2	Dispense.....	74
4.5.4.3	Technology Dialog.....	79
	Insulate	82
	Contour Routing	84
	Drills	85
	Fiducials	86
	Pockets	87
4.5.5	Menu Modify	87
4.5.6	Menu View	89
4.5.7	Menu Select.....	91
4.5.8	Menu Wizards.....	92
4.5.9	Menu Machining	93
4.5.9.1	Placement.....	94
4.5.9.2	Fiducials	96
4.5.9.3	Alignment (only if camera is present)	98
4.5.9.4	Drill reference holes.....	99
4.5.9.5	Connect	101
4.5.10	Menu Camera.....	102
4.5.11	Menu Extras.....	103
4.5.12	Menu Help	103
5	Appendix	105
5.1	List of figures.....	105
5.2	List of tables.....	107
5.3	Index	108

1 Function

The system software LPKF CircuitPro is a powerful application that combines two important components of PCB production: Editing of design data and machine control. The circuit board plotters made by LPKF are controlled with this application running on *Windows*[®] computers.

LPKF CircuitPro imports your CAD data, aperture and tool lists and guides you step by step through the production of your PCB. Design data will be split up into the separate work steps and prepared for the production process. The integrated wizards will guide you through the whole PCB production process. They will inform you whenever you have to take action (e.g. manual tool change or turning over the material for producing a double-sided PCB).

Use the “Design Rule Check” for checking the width and the spacing of the conductor tracks. Violations of the rules will be shown in the message view and graphically in the CAM View. Thus, you can make corrections before starting the production process.

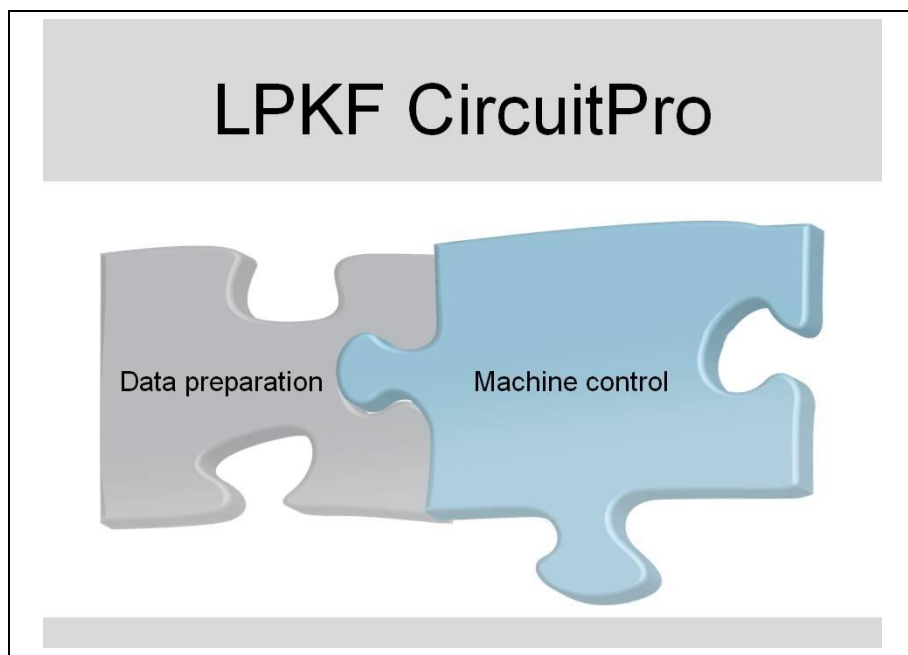
The current milling status and position are shown in the machining view, so that you can always keep an eye on the production process and progress.

LPKF CircuitPro allows you to create templates for solder resist masks and legend printing. Additionally the software supports the automatic tool exchange with tool adjustment (depending on the machine type).

The basic operation of the *Windows*[®] graphical user interface is not part of this manual. If you are not familiar with using *Windows*[®], please refer to the *Windows*[®] user manual and online help.

The scope of delivery of the CircuitPro application covers one machine license and multiple office licenses.

Fig. 1: LPKF
CircuitPro



1.1 Documentation overview

The following documents are included with CircuitPro:

- **CircuitPro Basic Manual:** This reference includes a short description of the most important functions in CircuitPro. The user interface is described in detail and the content of each menu item is explained.
- **CircuitPro Compendium:** This compendium contains a detailed description of all menu items and functions and serves as a reference. The manual is available as a PDF file on the supplied installation CD.
- **CircuitPro UseCases:** The use cases contain different tutorials for creating PCBs, engravings etc. Furthermore the basic CAM and machining operation steps are described. The corresponding tutor data is stored in: C:\My Documents\LPKF Laser & Electronics\ LPKF CircuitPro\Example Data.

2 Safety notes

The following chapter describes the most important safety notes while handling the software CircuitPro and the circuit board plotter.

2.1 General safety notes



Note

The usage of the software CircuitPro without the circuit board plotter has a low risk potential.



DANGER

Follow the safety notes!

If you do not follow the safety notes injuries or accidents may occur.

Read the manuals of the circuit board plotter and accordingly the control software carefully and follow the safety notes.



DANGER

Pay attention to a secure data transfer!

A malfunction or interruption of data transmission between the PC and the circuit board plotter can cause uncontrolled machine reactions.

Check the connection and replace defective or damaged cables immediately.



DANGER

Secure the machine against accidental switching on!

Personal injuries may occur during manual tool exchange or maintenance if the machine is accidentally switched on.

Always secure the machine against unauthorized use and accidental switching on.



CAUTION

Follow the safety regulations!

The non-observance of the operational and regulatory health and safety regulations can cause serious personal injuries.

Make sure that each operator knows the operational and regulatory health and safety regulations.



DANGER

Handling only by trained personnel!

Improper operation of the machine can cause serious personal injuries.

Instruct each user in handling the machine.

3 Installation

This chapter describes how to install the CircuitPro program.

3.1 System requirements

Following system requirements must be met for installing CircuitPro successfully:

Table 1: System requirements

Component	Minimum requirement
CPU	2 GHz
RAM	2 GB
Memory	2 GB
Graphic board	Dedicated with 128 MB memory (non-shared memory) Following graphic boards may cause problems: <ul style="list-style-type: none"> • Intel 82945G
Screen resolution	1024 x 768 pixel
USB port	2 x USB 2.0

3.2 Installing the software



ATTENTION

Improper installation causes machine damage!

An incorrect or incomplete installation of the software can cause damage to the machine.

LPKF assumes no liability for damages to the machine caused by improper software installation.



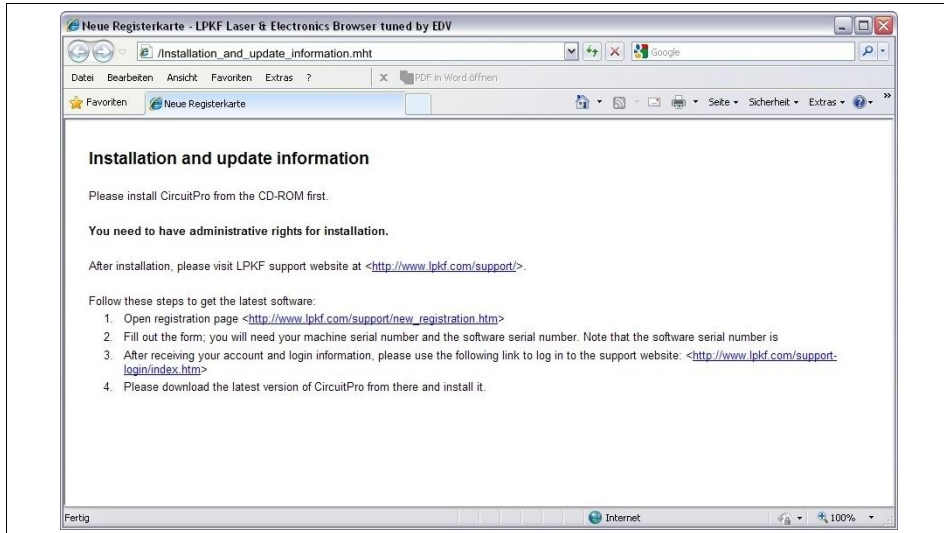
Note

Please make sure that the machine is not connected to the computer.

The USB cable must not be connected!

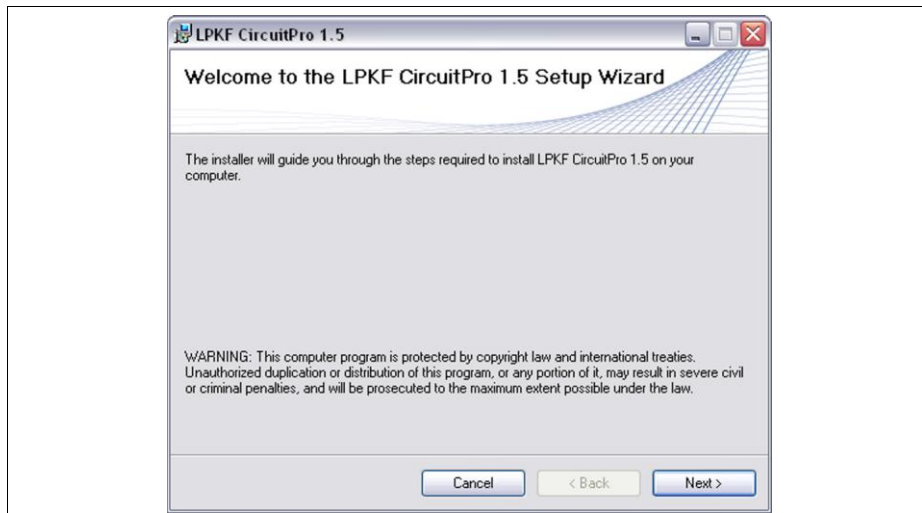
- Installing CircuitPro
 1. Switch on the PC.
 2. Open the CD-ROM drive and insert the CD-ROM "CircuitPro" into the drive.
- ➔ The CD-ROM is read. The setup wizard starts automatically and the installation and update information is displayed in your browser's window:

Fig. 2: Installation and update information



3. Close the browser window.

Fig. 3: LPKF setup wizard



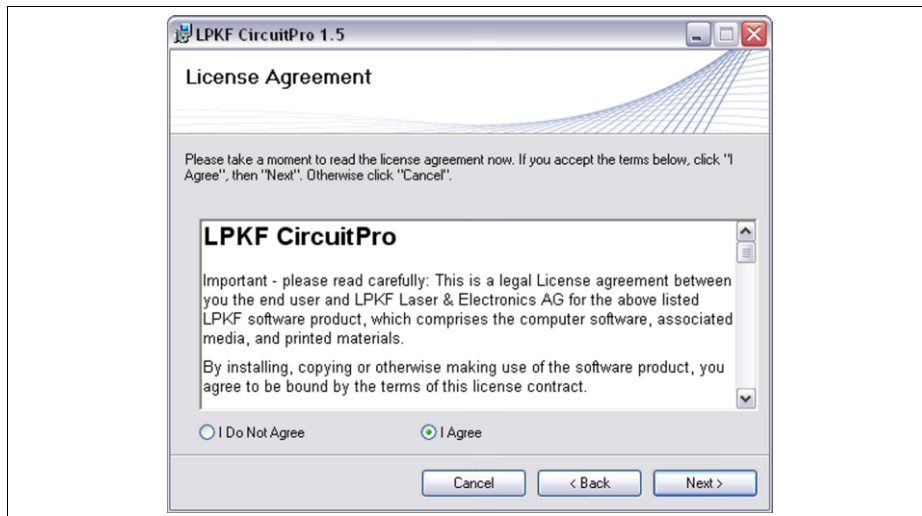
4. Click on [Next] to start the installation procedure.



Note

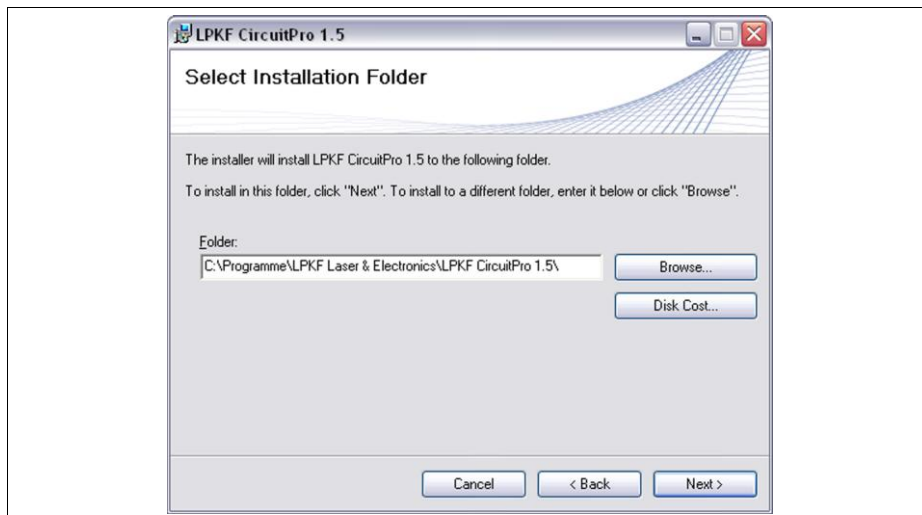
Navigating in the installation program is done by clicking on [Back] and [Next]. Click on [Back] go to the previous installation step. Click on [Next] go to the next installation step. The installation is aborted by clicking on [Cancel].

Fig. 4: License agreement



5. Read the terms of the license agreement and click on {I Agree}.
 6. Click on [Next].
- ➔ Choose the folder where CircuitPro is to be installed:

Fig. 5: Choosing the installation folder



Note

As default, the installation stores the program data in "C:\Programs\LPKF Laser & Electronics\LPKF CircuitPro 1.4\". Click on [Browse] to install the program data in a folder of your choice.

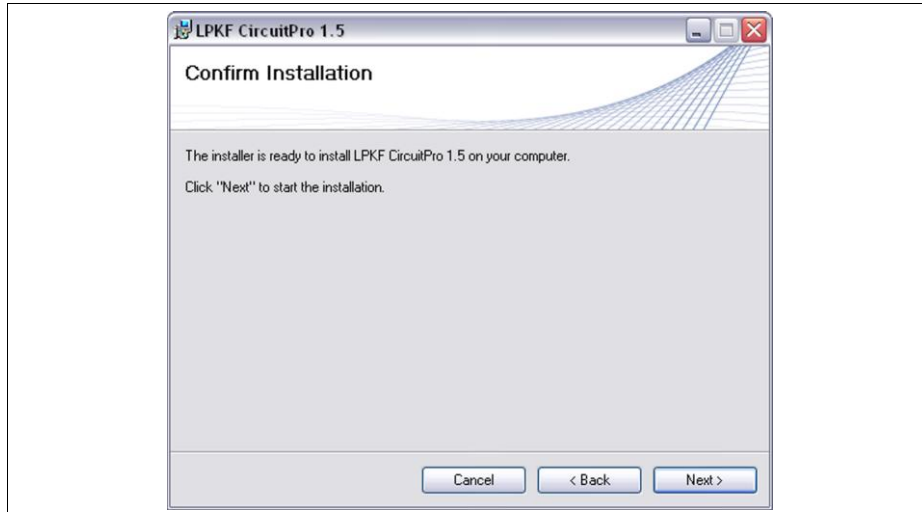


Note

Click on [Back] to review the settings of the previous screens. Click on [Cancel] to cancel the installation.

7. Click on [Next].
- ➔ The dialog to confirm the installation is displayed:

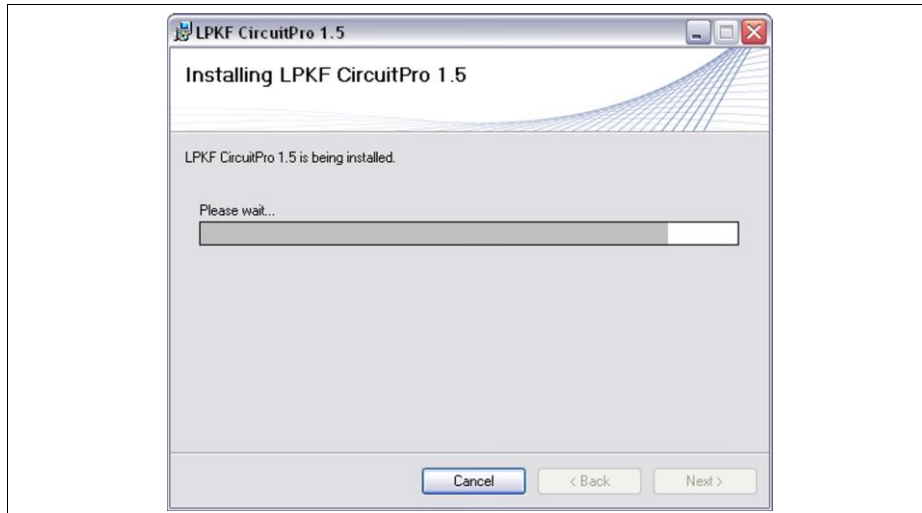
Fig. 6: Confirm installation



8. Click on [Next].

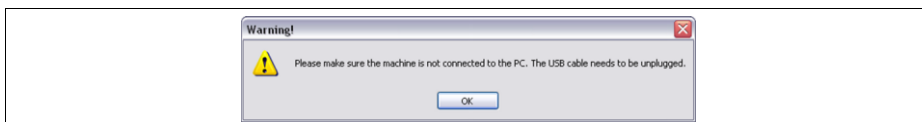
➔ The installation of CircuitPro is started:

Fig. 7: Installation of CircuitPro 1.5



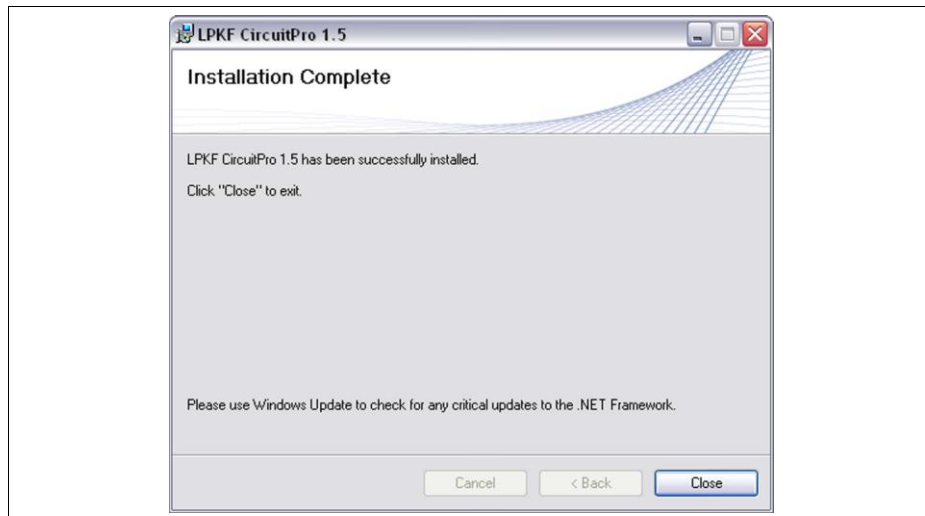
➔ The program is being installed on the PC. Progress of the installation is displayed. During the Installation the following warning message is displayed:

Fig. 8: Warning message



➔ When the installation is complete the following dialog is displayed:

Fig. 9:
Installation
complete



9. Click on [Close] to exit the installation program.
 10. Close the browser window showing the installation and update information.
- ◆ The CircuitPro program is installed.



Note

A link to the CircuitPro program was created on your desktop:



3.3 Machine setup

After CircuitPro has been installed on your PC, it has to be configured once for the machine and the accompanying equipment. The equipment configuration wizard helps you setting up the machine.

■ Setting up the machine

1. Start CircuitPro.

➔ The equipment configuration wizard starts automatically.

Fig. 10: Start-up screen "Equipment configuration wizard"



Note

You can also start the equipment configuration wizard manually. Click in the menu bar of CircuitPro on Wizards>Equipment configuration wizard...

2. Perform all the steps of the equipment configuration wizard and follow the corresponding instructions.

➔ After the machine and the equipment are successfully configured a dialog window is shown which offers you to use the configuration data of older CircuitPro versions.



Note

If you have already installed an older version of CircuitPro on your computer, you can decide if you want to work with the existing configuration files. This means, the settings under the path "C:\Programs\LPKF Laser & Electronics\LPKF CircuitPro 1.X\config" are used for the current installed version of CircuitPro 1.5. These settings include the language and the machine configuration.

3. Click on the respective CircuitPro version in the list "Version" of the dialog window, which you want to use. Then click on [OK].

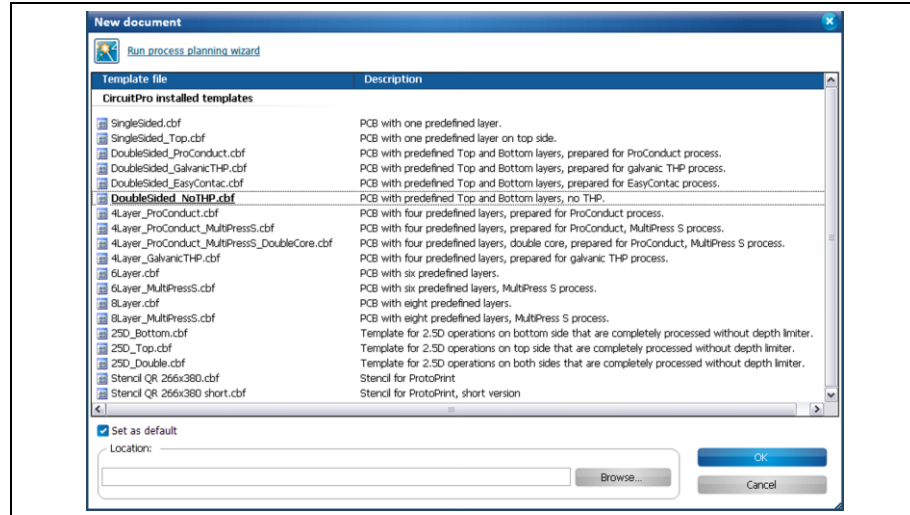
Or

3. Click on [Use default settings] to use the default settings of CircuitPro 1.5.

➔ Right after machine configuration you will be prompted to choose a template file.

➔ The following dialog is shown:

Fig. 11: New document



4. Select a template.

5. Click on [OK].

➔ The CAM view is shown.

◆ The machine is set up. The accompanying available equipment for producing PCB prototypes is also specified.



Tip

Language settings

If you want to change the language of CircuitPro, act as follows:

1. Click on Extras > Options.

2. Change the value to "False" in row "Use OS culture".

3. Click on the row "Language" and change the value into the desired language.

4 Using the software

The following chapter describes the usage of CircuitPro in detail.

4.1 Starting CircuitPro

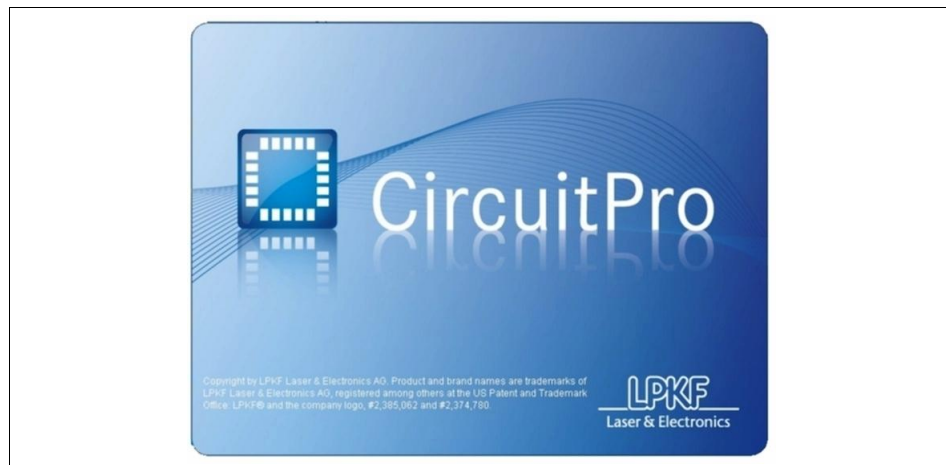


Note

The CircuitPro program must be fully installed and the machine must be connected correctly.

- Starting CircuitPro
 1. Switch on the machine.
 2. Boot the PC.
 - ➔ The PC boots and starts the operating system.
 3. Start CircuitPro.
 - ➔ The following splash screen is displayed:

Fig. 12:
CircuitPro splash
screen



- ◆ The CircuitPro program is started and the user interface is displayed.

4.2 User interface

The CircuitPro user interface is divided into several information and display panes that can be displayed or hidden as necessary.

4.2.1 Structure of the CircuitPro user interface

The user interface is structured as follows:

Fig. 13: CircuitPro user interface

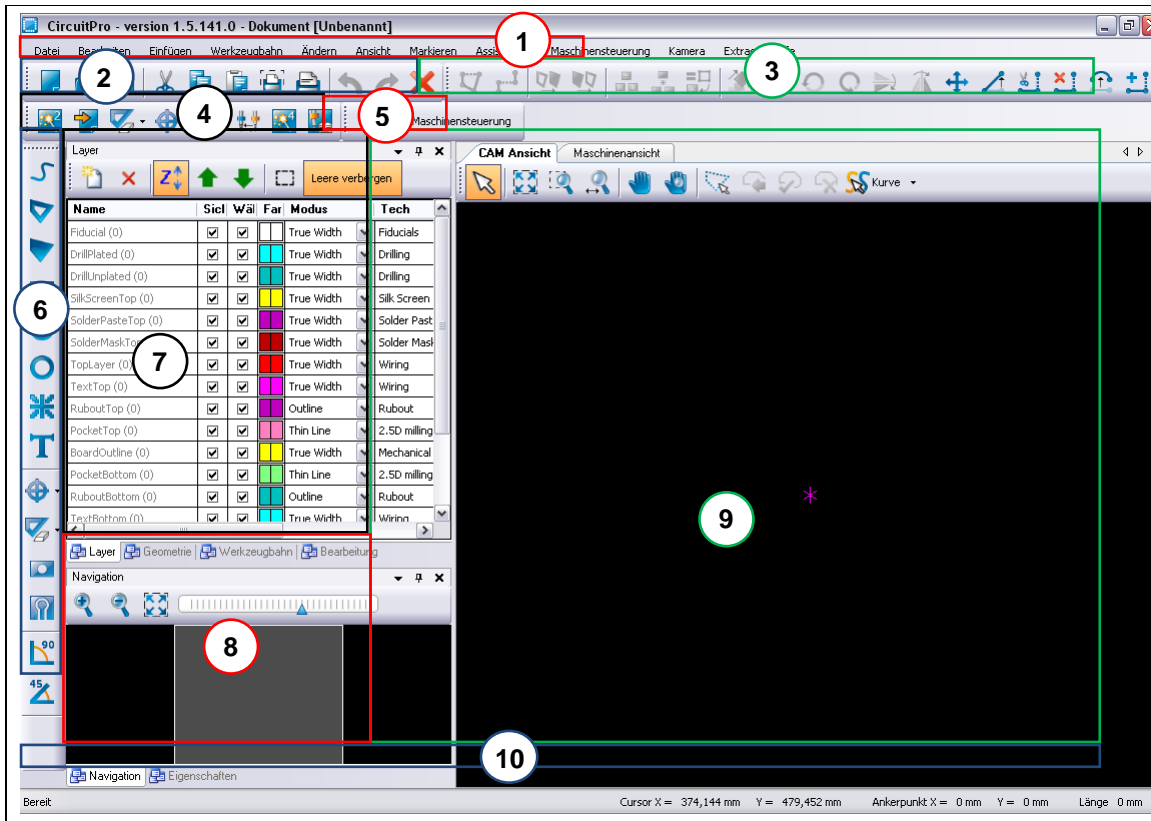


Table 2: User interface

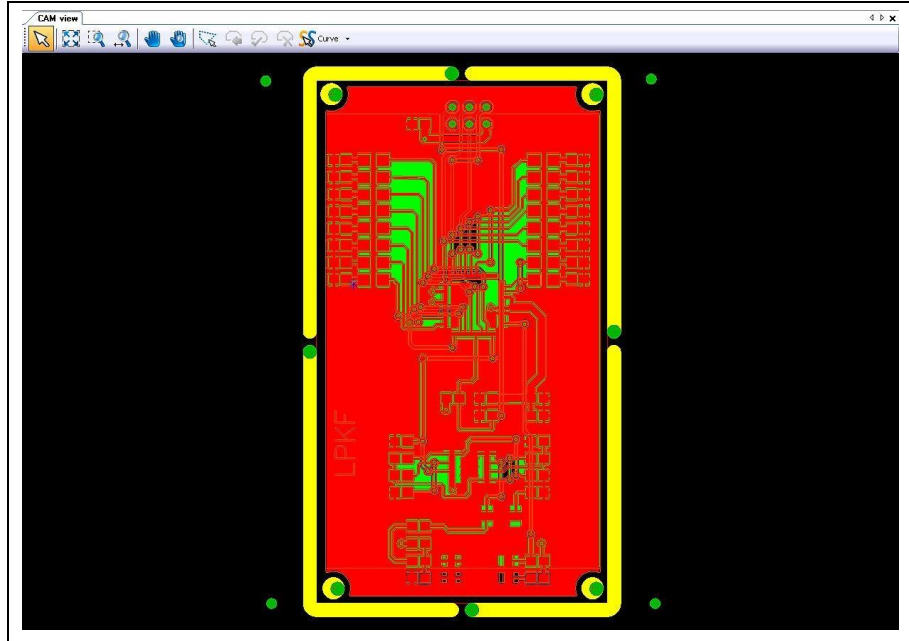
No.	Pane	Name
/1/		Menu bar
/2/		“Standard” tool bar
/3/		“Modify” tool bar
/4/		“Prototyping” tool bar
/5/		“Layouts” tool bar
/6/		“Insert” tool bar
/7/	Layers	The “Layers” pane contains a table listing the individual layers of the circuit board to be processed.
/8/	Navigation	The “Navigation” pane displays an overview of the project with a zoom rectangle.
/9/	CAM view	Editing pane displaying a 2D representation of the project.
/10/	Status bar	The status bar displays the coordinates of the current cursor position and of the anchor point. Measurement results are displayed in the “Length” field.

4.2.2 CAM View

The CAM View allows you to regard the object to be processed two-dimensional and the corresponding layers.

Move your cursor to menu View > CAM 2D... or click "CAM" on the toolbar "Layout" to open the following window:

Fig. 14: CAM View

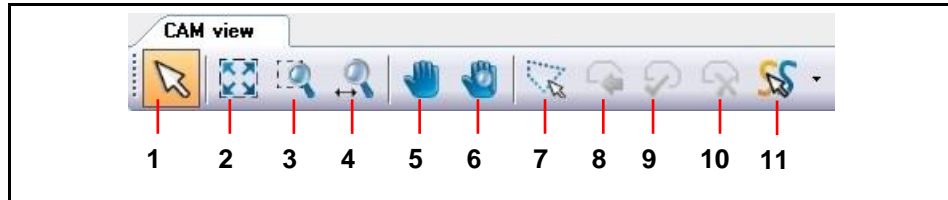


In this view you are able to regard both sides of the PCB. According to the colors in the pane "Layers" each object on the board is highlighted.

4.2.3 Toolbar CAM view

The toolbar “CAM view” provides following icons:

Fig. 15: Toolbar CAM view



The following table provides a brief description of the toolbar’s icons:

Table 3: Toolbar CAM view

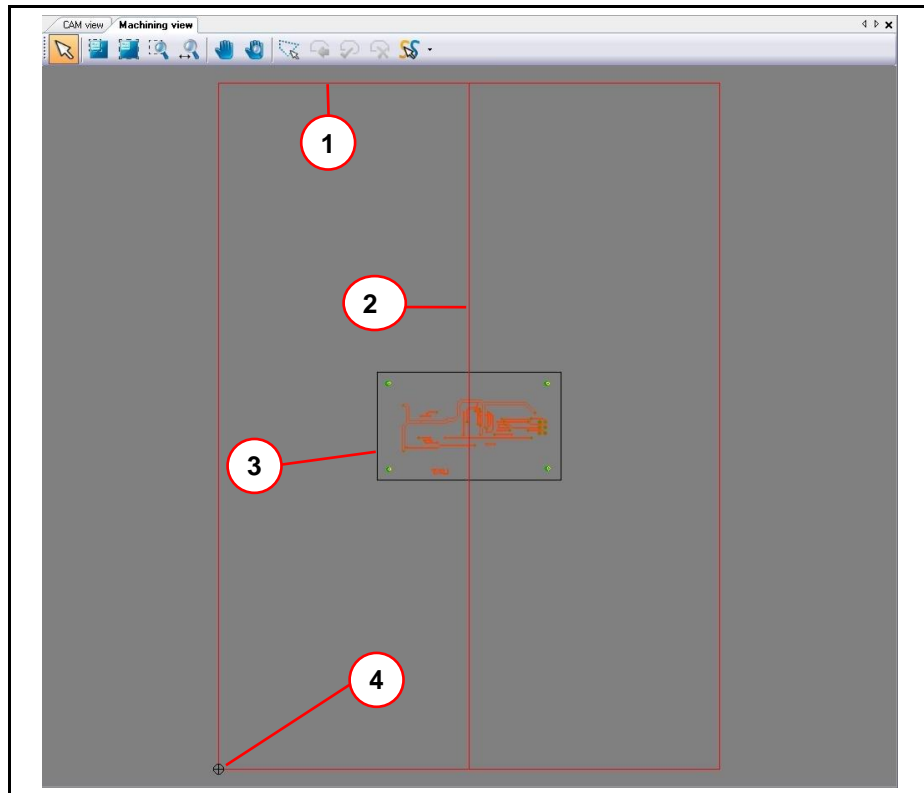
No.	Function description
/1/	Selection: This arrow must be enabled to select or create objects in the CAM view.
/2/	Fit all: Click on this icon to fit the whole layout into the CAM view.
/3/	Zoom area: Click on this icon and select an area that will be zoomed in afterwards.
/4/	Zoom: Click on this icon and move your mouse to zoom in/out the layout.
/5/	Pan: Click on this icon to move your whole layout to a desired position.
/6/	Global Pan: The currently zoomed area will be zoomed out by clicking on this icon. If you click on a area in the layout again, this area will be zoomed in.
/7/	Polygonal Selection: Click on this icon to select objects by drawing polygons.
/8/	Remove last point: Removes the last point in the polygon.
/9/	Select: Selects the objects within the polygon.
/10/	Cancel: Cancels the creation of the polygon.
/11/	Set toolpath selection mode: Selects toolpaths within the created polygon. Three different modes are available: object, curve and element.

4.2.4 Machining view E33

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on the button "Machining" to open the machining view.

Fig. 16:
Machining view
E33



/1/ Work area

/3/ Object to be processed

/2/ Axis of reflection

/4/ Current head position

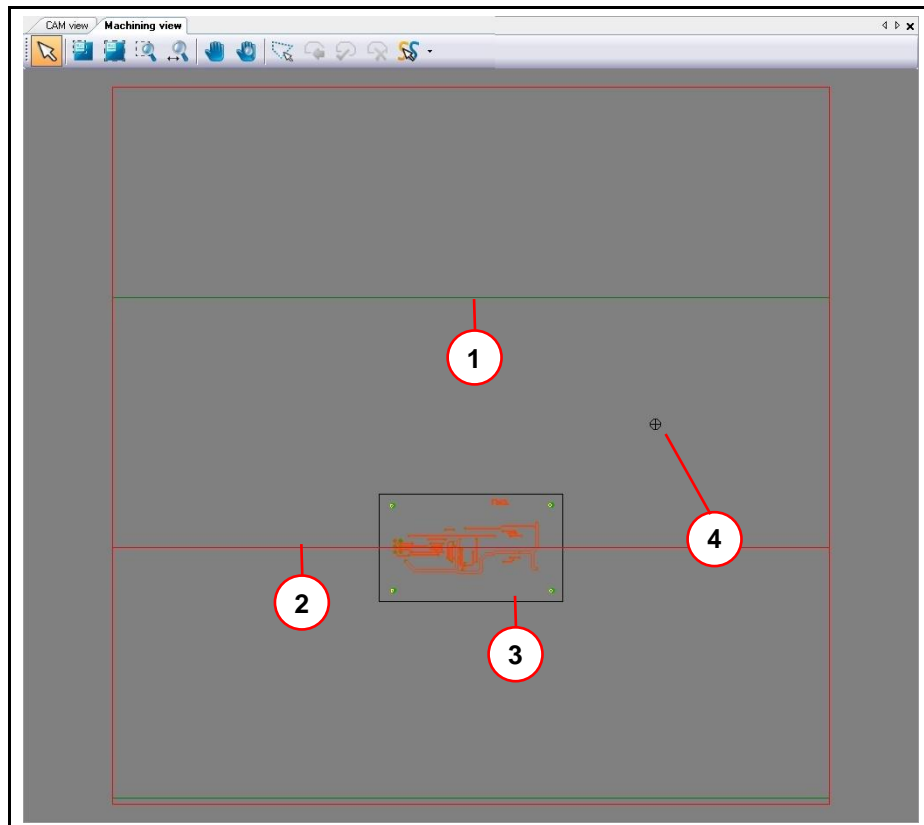
If you start the production of a board the machine head's movement, displayed as a cross line, is shown in the machining view.

4.2.5 Machining view S43

The machining view enables you to regard your process data.

Click on View > Machining 2D or on the button "Machining" to open the machining view.

Fig. 17:
Machining view
S43



/1/ Work area

/3/ Obejct to be processed

/2/ Axis of reflection

/4/ Current head position

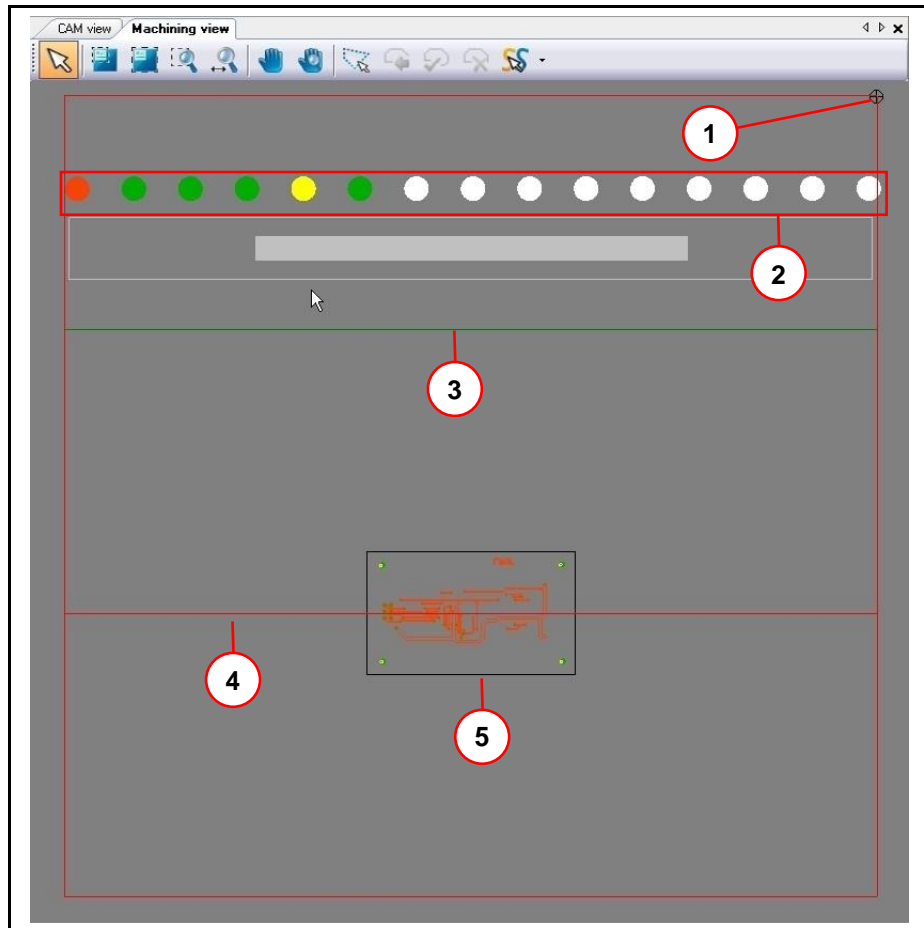
If you start the production of a board the machine head's movement, displayed as a cross line, is shown in the machining view.

4.2.6 Machining view S63/S103

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on the button "Machining" to open the machining view.

Fig. 18:
Machining view
S63/S103



/1/ Current head position

/4/ Axis of reflection

/2/ Tool holder

/5/ Object to be processed

/3/ Work area

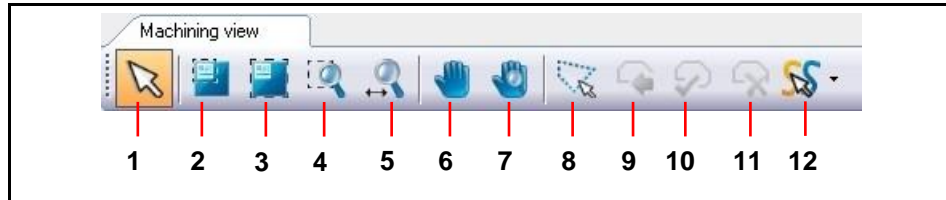
The tool holder of the ProtoMat S63/S103 can pick up to 15 different tools. According to the colors of the tool's distance rings, the circles in area /2/ are displayed in the same color.

If you start the production of a board the machine head's movement, displayed as a cross line, is shown in the machining view.

4.2.7 Toolbar Machining view

The toolbar “Machining view” provides following icons:

Fig. 19: Toolbar Machining view



The following table provides a brief description of the toolbar’s icons:

Table 4: Toolbar Machining view

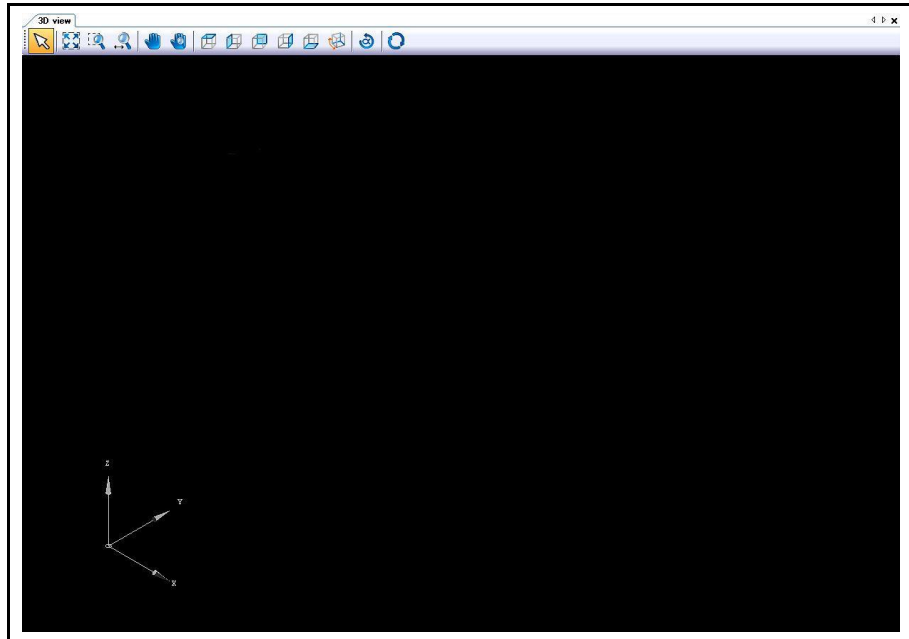
No.	Function description
/1/	Selection: This arrow must be enabled to select or create objects in the CAM view.
/2/	Fit All only for Job Data: Only the job data is displayed. Other elements of the machining view are hidden.
/3/	Fit All for both Job Data and Machine Area: Scales and fits in the layout so that the elements of the machining view stay visible.
/4/	Zoom area: Click on this icon and select an area that will be zoomed in afterwards.
/5/	Zoom: Click on this icon and move your mouse to zoom in/out the layout.
/6/	Pan: Click on this icon to move your whole layout to a desired position.
/7/	Global Pan: The currently zoomed area will be zoomed out by clicking on this icon. If you click on a area in the layout again, this area will be zoomed in.
/8/	Polygonal Selection: Click on this icon to select objects by drawing polygons.
/9/	Remove last point: Removes the last point in the polygon.
/10/	Select: Selects the objects within the polygon.
/11/	Cancel: Cancels the creation of the polygon.
/12/	Set toolpath selection mode: Selects toolpaths within the created polygon. Three different modes are available: object, curve and element.

4.2.8 3D View

The 3D View allows you to regard the object to be processed three-dimensional.

Click on View > 3D View to open the following window:

Fig. 1: 3D View



Once you have imported a three-dimensional object, it will be shown in this view.



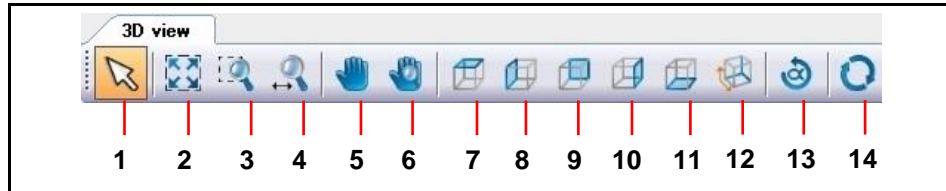
Note

Two-dimensional objects can also be shown in this 3D view. Therefore you have to highlight the corresponding toolpaths in the pane "Toolpath" and select "Display in 3D" in the context menu.

4.2.9 Toolbar 3D view

The toolbar “3D view” provides following icons:

Fig. 20: Toolbar 3D view



The following table provides a brief description of the toolbar's icons:

Table 5: Toolbar 3D view

No.	Function description
/1/	Selection: This arrow must be enabled to select or create objects in the CAM view.
/2/	Fit all: Click on this icon to fit the whole layout into the CAM view.
/3/	Zoom area: Click on this icon and select an area that will be zoomed in afterwards.
/4/	Zoom: Click on this icon and move your mouse to zoom in/out the layout.
/5/	Pan: Click on this icon to move your whole layout to a desired position.
/6/	Global Pan: The currently zoomed area will be zoomed out by clicking on this icon. If you click on a area in the layout again, this area will be zoomed in.
/7/	Top View: Displays the top side of the object.
/8/	Left View: Displays the left side of the object.
/9/	Rear View: Displays the rear side of the object.
/10/	Right View: Displays the right side of the object.
/11/	Bottom View: Displays the bottom side of the object.
/12/	Axonometric View: Standard view that displays the object in a 30° angle.
/13/	Rotate: Click on this icon to rotate your object in any direction by using your mouse.
/14/	Reset View: Resets the current view of your object.

4.3 Toolbars

CircuitPro's toolbars offer you a quick access to functions that are used most often.

Fig. 21:
Toolbars



The following five toolbars exist in CircuitPro:

- Standard
- Insert
- Modify
- Prototyping
- Layouts



Note

You are able to hide/display the toolbars. You can find this option under menu Tools > Customize... Go to tab "Toolbars" and enable/disable the corresponding checkboxes.

You can arrange the toolbars anywhere on the surface of CircuitPro.

- Changing the toolbar's position
 1. Move the cursor to the top of the toolbar which is marked with several points.
 - ➔ The cursor takes the shape of a cross.
 2. Hold the left mouse button.
 3. Move the toolbar to the desired location on the user interface.



Note

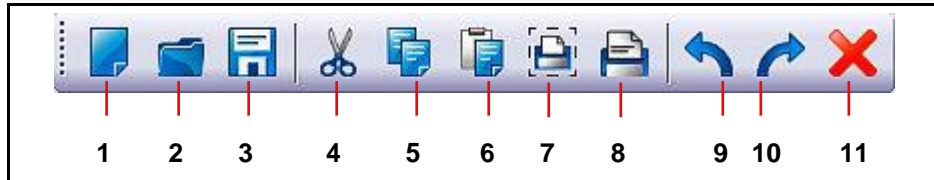
You can arrange the toolbar on the left, bottom, right or top of the user interface.

4. Release the left mouse button.
- ◆ The toolbar is now fixed at the desired location of the user interface.

4.3.1 Toolbar Standard

The toolbar "Standard" provides following icons:

Fig. 6: Toolbar "Standard"



The following table provides a brief description of the toolbar's icons:

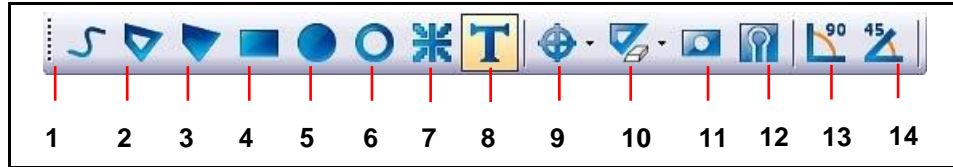
Table 7: Function description "Standard"

No.	Icon	Function description
/1/	New...	Creates a new document in CircuitPro. Either you are able to create a document based on a standard template or you browse your hard disk for own templates.
/2/	Open...	Opens an existing CircuitPro document.
/3/	Save	Saves the currently edited document with all changes under the same name and location.
/4/	Cut	Cuts a selected area in the document.
/5/	Copy	Copies a selected area in the document.
/6/	Paste	Pastes the previously cut or copied region.
/7/	Print Preview	Opens a print preview of the current document.
/8/	Print	Opens the print dialogue. Make your settings for printing here.
/9/	Undo	Undo the last action in the document.
/10/	Redo	Redo the previously undone action.
/11/	Delete	Deletes the previously selected objects on the layer.

4.3.2 Toolbar “Insert”

The toolbar “Insert” provides following icons:

Fig. 8: Toolbar “Insert”



The following table provides a brief description of the toolbar’s icons:

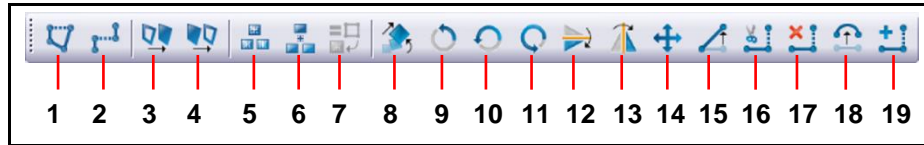
Table 9: Function description “Insert”

No.	Icon	Function description
/1/	Create open path	Creates an open path in the CAM View.
/2/	Create closed path	Creates a closed path in the CAM View.
/3/	Create polygon	Creates a polygon in the CAM View.
/4/	Create rectangle	Creates a rectangle in the CAM View
/5/	Create circle	Creates a circle in the CAM View.
/6/	Create circle path	Creates a circle path in the CAM View.
/7/	Create flash	Creates a flash in the CAM View.
/8/	Create text object	Creates a text in the Cam View.
/9/	Fiducial	Creates fiducials in the CAM View.
/10/	Rubout area	Creates a rubout area.
/11/	Create polygon with cutouts	Creates a polygon with cutouts in the CAM View.
/12/	Create copper pouring	Creates copper pouring.
/13/	Switch line mode to 90°	Enable the line mode, if you want to draw a horizontal line.
/14/	Switch line mode to 45°	Activate the line mode if you want to draw a straight line with a slope of 45°.

4.3.3 Toolbar “Modify”

The toolbar “Modify” provides following icons:

Fig. 22: Toolbar „Modify“



The following table provides a brief description of the toolbar’s icons:

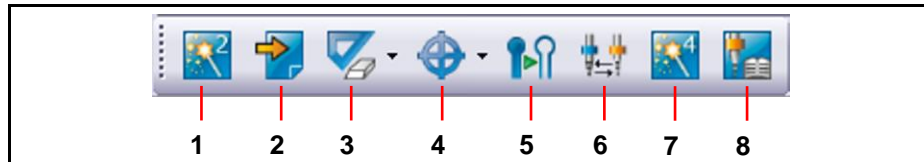
Table 10:
Function
description
“Modify”

No.	Icon	Function description
/1/	Close curve	Closes a curve.
/2/	Combine curve	Connects multiple points to a curve.
/3/	Convert curve to polygon	Converts the selected object to a polygon.
/4/	Convert curve to path	Converts the selected object to a path.
/5/	Draw to flash	Converts a drawn object to a flash.
/6/	Combine objects to flash	Connects objects to a flash.
/7/	Compare objects to flash	Compares objects with a flash.
/8/	Transformation	Translates, rotates, scales and inverts faces and toolpaths.
/9/	Rotate objects 90° counter-clockwise	Rotates the selected object 90° counter-clockwise around the anchor point.
/10/	Rotate objects 180°	Rotates the selected object 180° around the anchor point.
/11/	Rotate objects 270° counter clockwise	Rotates the selected object 270° counter-clockwise around the anchor point.
/12/	Mirror objects along x-axis	Mirrors the object at the anchor point along the x-axis.
/13/	Mirror objects along y-axis	Mirrors the object at the anchor point along the y-axis.
/14/	Move selected objects	Moves the selected object.
/15/	Move a point or segment	Moves a point or a segment.
/16/	Cut a point or segment	Cuts a point or a segment.
/17/	Delete a point or segment	Deletes a point or a segment.
/18/	Create or move an arc	Creates or moves an arc.
/19/	Add a point or segment	Adds a point or a segment.

4.3.4 Toolbar Prototyping

The toolbar “Prototyping” provides following icons:

Fig. 23: Toolbar “Prototyping”



The following table provides a brief description of the toolbar’s icons:

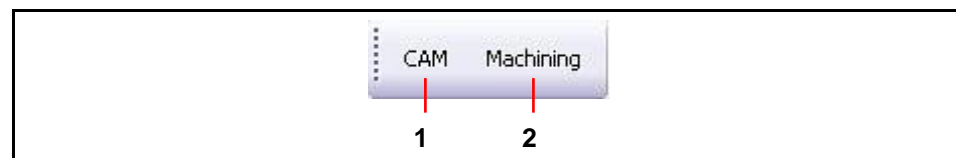
Tab. 11: Function description “Prototyping”

No.	Icon	Function description
/1/	Process planning wizard	Starts the process planning wizard.
/2/	Import	Imports all files of the formats CAM, Excellon, Gerber, GerberX, LMD, HPGL, DXF and Sieb & Meyer.
/3/	Rubout area	Inserts a rubout area in the CAM view.
/4/	Fiducial	Inserts fiducials in the CAM view.
/5/	Technology Dialog	Generates insulation and contour routing toolpaths.
/6/	Tool magazine	Opens the dialog to edit the contents of the tool magazine.
/7/	Board Production Wizard	Starts the Board Production Wizard.
/8/	Tool library	Opens the tool library.

4.3.5 Toolbar Layout

The toolbar “Layout“ provides following buttons:

Fig. 12: Toolbar “Layout”



The following table provides a brief description of the toolbar’s buttons:

Tab. 13: Toolbar “Layout”

No.	Icon	Function description
/1/	CAM	Distinction between the views CAM and Compact CAM. CAM: Displays all active views and panes. Compact CAM: Hides all views and panes except the CAM view and the panes “Navigation” and “Layers”.
/2/	Machining	Hides all views and panes except the machining view and the pane “Processing”.

4.4 Panes

CircuitPro allows the arrangement of several individual panes on your screen. These are:

- Layers
- Geometry
- Toolpath
- Processing
- Properties
- Tool info
- Navigation
- Camera
- Messages
- Fault Monitor

■ Arranging the panes

1. First, open the desired pane in the menu "View".
- ➔ The pane appears and is arranged on the bottom left of your screen.
2. Double-click on the title of the pane.
- ➔ The pane is now detached.
- ◆ You are able to maximize/minimize the pane and to arrange it like desired.

■ Fixing the pane

1. Click and hold the detached pane with the left mouse button.
2. Move the pane.
- ➔ In CircuitPro's main window appear icons on the top, bottom, right and left side.
3. Place the pane to one of the icons (top, bottom, left, right).



Pay attention to place the cursor exactly on the icon before you release the left mouse button.

Note

4. Release the left mouse button.
- ◆ The pane is now fixed on the desired position.

4.4.1 Layers

The pane “Layers” lists the required layers for your project. Depending on the template that you select at the beginning of your project, the number and type of the layers diversify.

Click on View > Layers to open the pane “Layers”:

Fig. 14: Pane “Layers”



The following table provides a brief description of the pane’s columns:

Table 15:
Columns in the
pane “Layers”

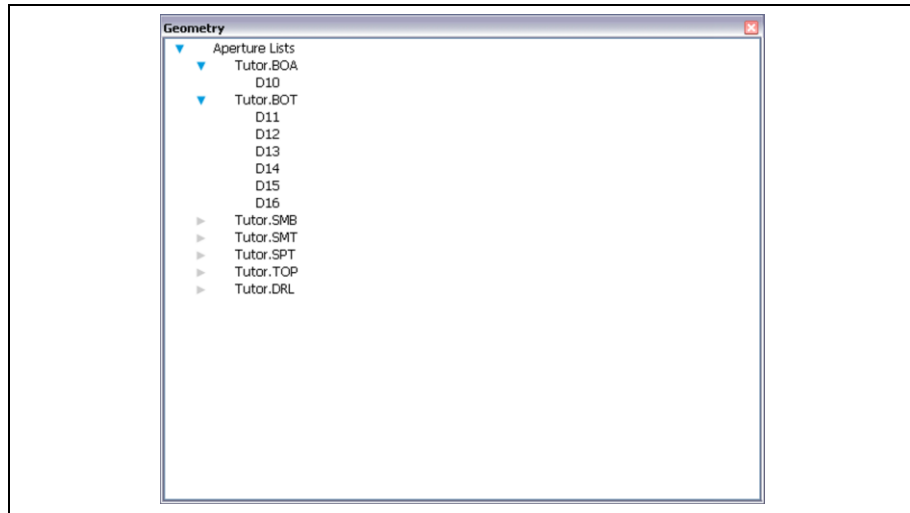
Column	Description
Name	Shows the name of the layer. The numbers shown in the brackets next to the layer name shows the number of the contained objects.
Visible	Shows/hides the corresponding layer in CAM View.
Selectable	Enable this function to make the layer selectable in CAM View.
Colors	In this column each layer is assigned to a colour. The layers’ colours shown in the CAM View match these colours in the column.
Mode	This list enables you to determine in which display mode the layer shall be shown.
Tech	Determine the layer’s processing goal in this column. I.e. for example, if you select the value "Solder Paste", you determine that this layer will be processed with solder paste later on.
Inverse	Mills the inside of the objects on the source layer. Example: In a letter or a number the inner area is milled.
Phase	Determines the phase in which the layer will be processed.
[Z]	Sorting function: sorts the layers by the display priority in Z direction.

4.4.2 Geometry

The pane “Geometry” lists all apertures, which were imported from the Gerber and Excellon files. CircuitPro names the aperture list after the file name by default.

Click on View > Geometry to open the pane “Geometry”.

Fig. 24: Pane “Geometry”

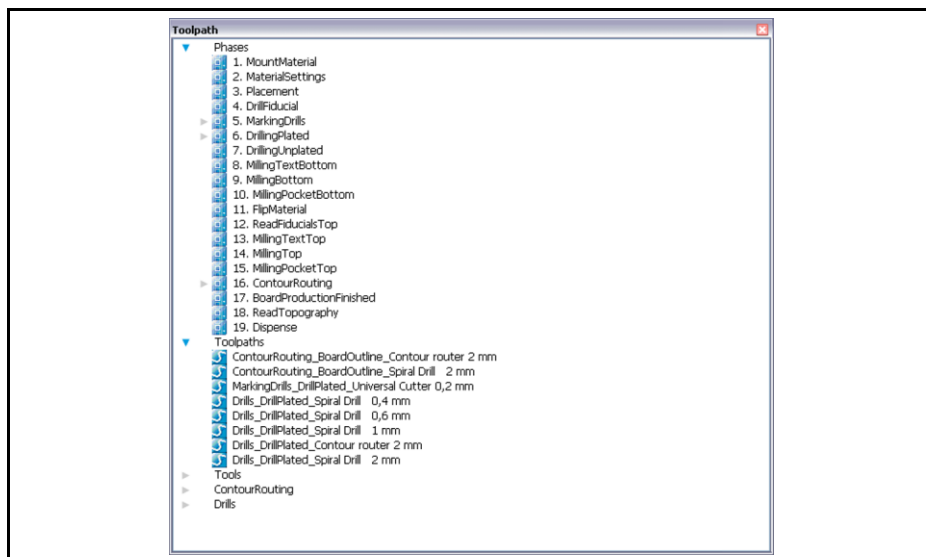


4.4.3 Toolpath

The pane “Toolpath” shows the board’s different production phases.

Click on View > Toolpath to open the pane “Toolpath”.

Fig. 16: Pane “Toolpath”



The phases are named after the production steps. By clicking on the arrow symbol the tools used for this phase are shown.

4.4.4 Processing



Note

Please note, that several functions in sections „Select a Head“ and „Head actions“ are not available when using the ProtoMat S43/E33.

In the "Processing" pane you can control the mill/drill head of the machine and determine its height.

Click on View > Processing to open the pane "Processing":

Fig. 17: Pane "Processing"

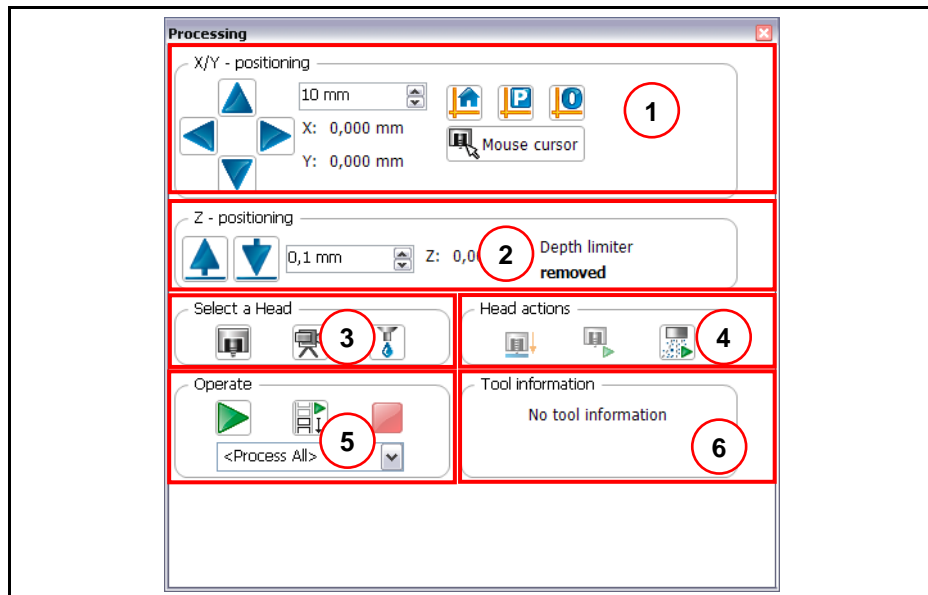


Table 18:
Processing

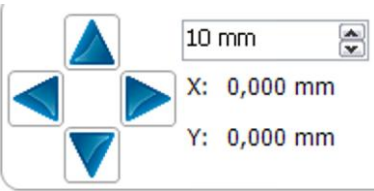















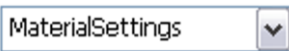

No.	Button	Description
X/Y - positioning		
/1/		Distance entry to move the machine head in X and Y direction. Enter the distance in the combo box and click on the arrow buttons. Each click moves the machine head at the specified distance in the preferred direction.
/1/		Move head to the basic position: Click on this button to move the machine head to the basic position.
/1/		Move head to the pause position: Click on this button to move the machine head to the pause position.
/1/		Move head to the zero position: Click on this button to move the machine head to the zero position.
/1/	 Mouse cursor	Enables moving the head to the position selected by mouse click in the machining view.
Z - positioning		
/2/		Distance entry to move the machine head in Z direction. Enter the distance in the combo box and click on the arrow buttons. Each click moves the machine head at the specified distance in the preferred direction.
Select head		
/3/		Select the milling head as the active head.
/3/		Select the camera head as the active head.
/3/		Select the dispenser head as the active head.
Head actions		
/4/		Moves the machine head upwards or downwards.
/4/		Switches the spindle on/off.
/4/		Clean dispenser. The button is only visible when the dispenser has been selected as the active machine head.

Table 18:
Processing

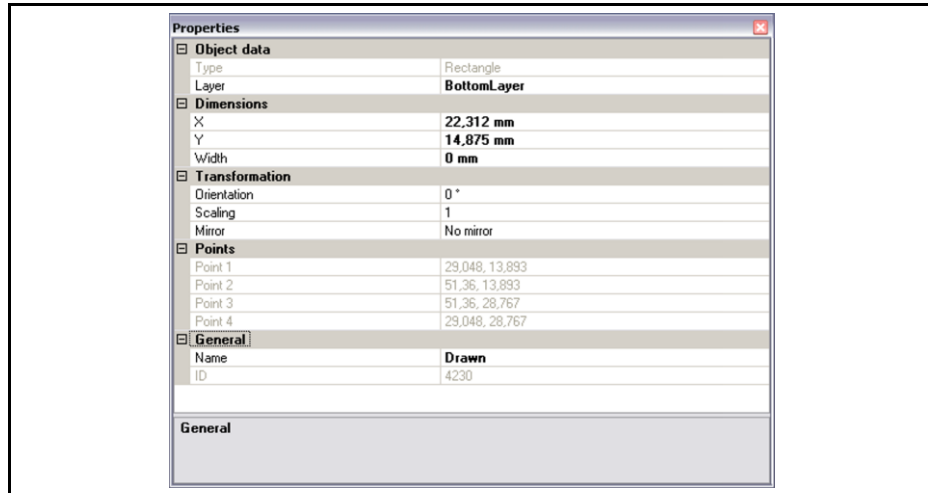
No.	Button	Description
/4/		Switches the suction on/off.
Process		
/5/	 	Starts processing. Please note the phase that is selected in the field below.
/5/	 	Starts processing from the selected phase in the field below. All subsequent phases are processed one after another.
/5/		Stops processing
Tool info		
/6/		Displays the tool information for the tool that is currently located in the clamp.

4.4.5 Properties

The pane “Properties” includes detailed information about the project.

Click on View > Properties to open the pane “Properties”:

Fig. 19: Pane “Properties”



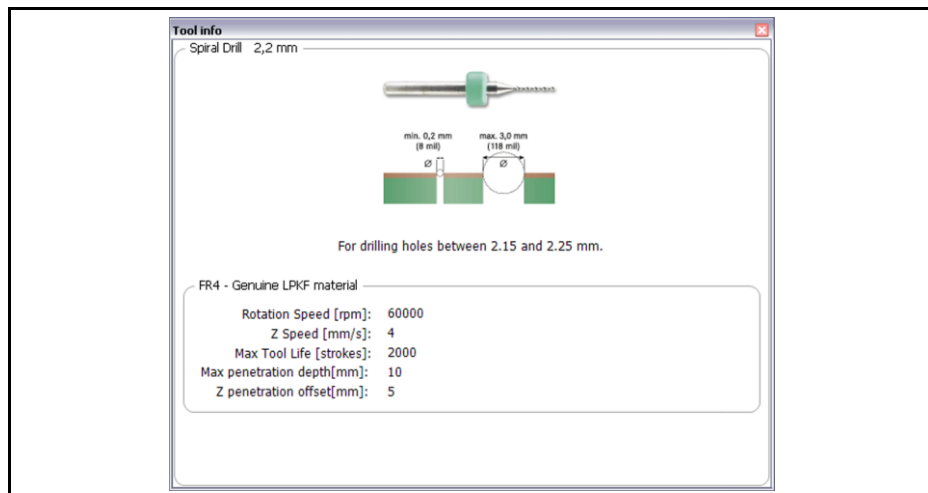
In this pane you find information about the tools, too. If you click on an aperture in the pane “Geometry”, you will get information about it, such as shape and diameter.

4.4.6 Tool Info

The “Tool Info” pane displays the parameters of the tool located in the clamp.

Click on display > Tool Info to open the “Tool Info” pane.

Fig. 20: Pane “Tool info”

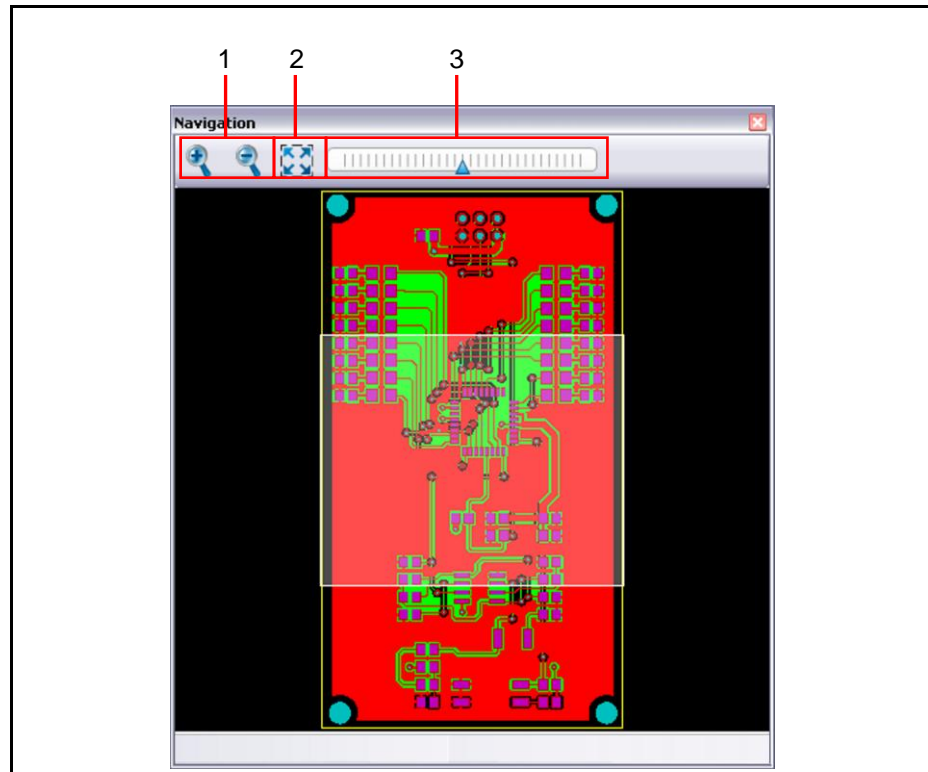


The tool information displayed here is identical to the information provided in the tool library.

4.4.7 Navigation

The pane "Navigation" is shown as soon as you have activated the CAM View or have clicked on View > Navigation:

Fig. 21: Pane "Navigation"



/1/ Magnifying glass icons

/3/ Zoom bar

/2/ Reset zoom

You see the object to be processed in small format in this pane. If you click on a certain position using the mouse, you can zoom in on this position by means of the zoom function.

The following functions are available:

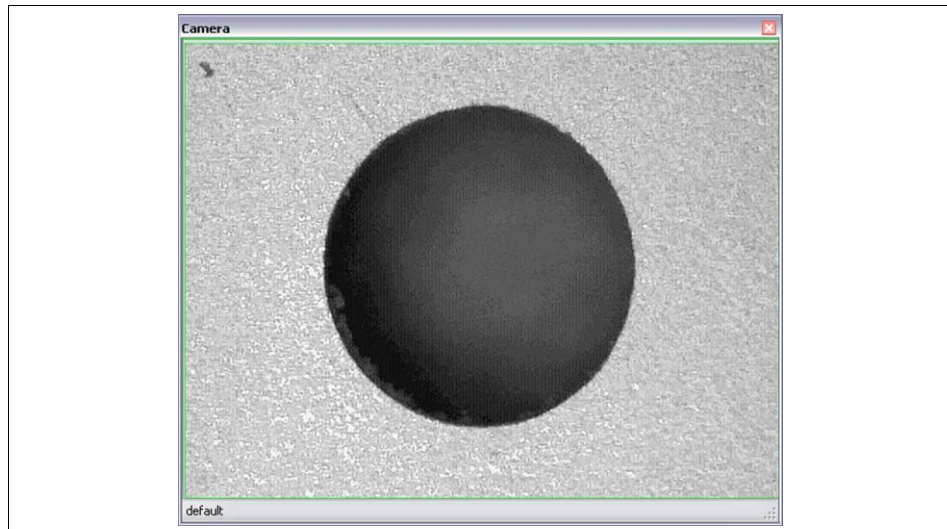
- Minimise/enlarge the area selected with the mouse by using the +/- magnifying glass icons /1/.
- Minimise/enlarge the area selected with the mouse by using the zoom bar /3/.
- Reset the zoom or adapt the layout to the CAM view by clicking on button /2/.

4.4.8 Camera (only if a camera is connected)

The pane "Camera" enables you to regard the object to be processed through the camera.

Click on View > Camera to open the pane "Camera".

Fig. 25: Pane "Camera"



Note

Please note that a camera image is only displayed when a camera is actually available. This must be installed and connected via USB properly.

4.4.9 Messages

Click on View > Messages to open the pane “Messages”. This pane contains information about:

Fig. 26: Pane “Messages”

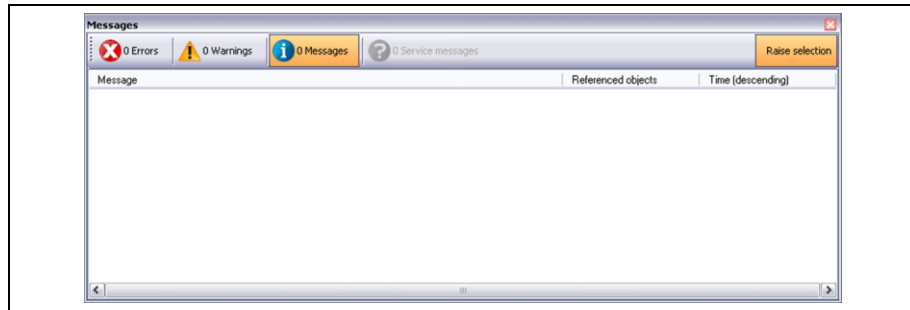


Table 22: Messages

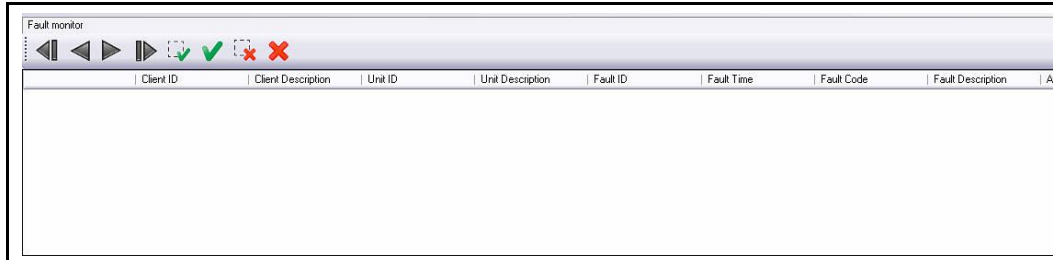
Button	Description
Errors	Errors are critical bugs. Click [Errors] in order to correct the errors. If the error recovery is not successful please call the LPKF Support.
Warnings	Warnings are input errors caused by the user. For example this may be information about cancelled or not properly executed actions.
Messages	Messages are statistical information of the program. This may be feedback from CircuitPro on certain actions performed, such as: “create new document”.
Service Messages	Service messages are displayed when the machine maintenance is due. Please contact the LPKF support.
Raise selection	Highlights the corresponding action in the CAM view. Example: You draw a rectangle. In the “Messages” pane appears a corresponding message (e.g. Rectangle Drawn_5 was created). Now if you click on the button “Raise selection” and hereafter on the message about the drawn rectangle, this rectangle is highlighted in the CAM view.

4.4.10 Fault Monitor

The machine errors which have occurred are listed in the “Fault Monitor” pane. This machine error must be rectified so that production can be continued.

Click on View > Fault Monitor to open the “Fault Monitor” pane:

Fig.23 :
Pane
“Fault
Monitor
”



The icons used signify the following:

Table 24: Error monitoring

Icon	Description
	Displays the first error message.
	Displays the previous error message.
	Displays the next error message.
	Displays the last error message.
	Acknowledges the error message currently marked.
	Acknowledges all error messages.
	Deletes the error message currently marked.
	Deletes all error messages.

4.5 Menus

This chapter describes each menu and the submenu of CircuitPro.

Fig. 27:
Menu bar
CircuitPro



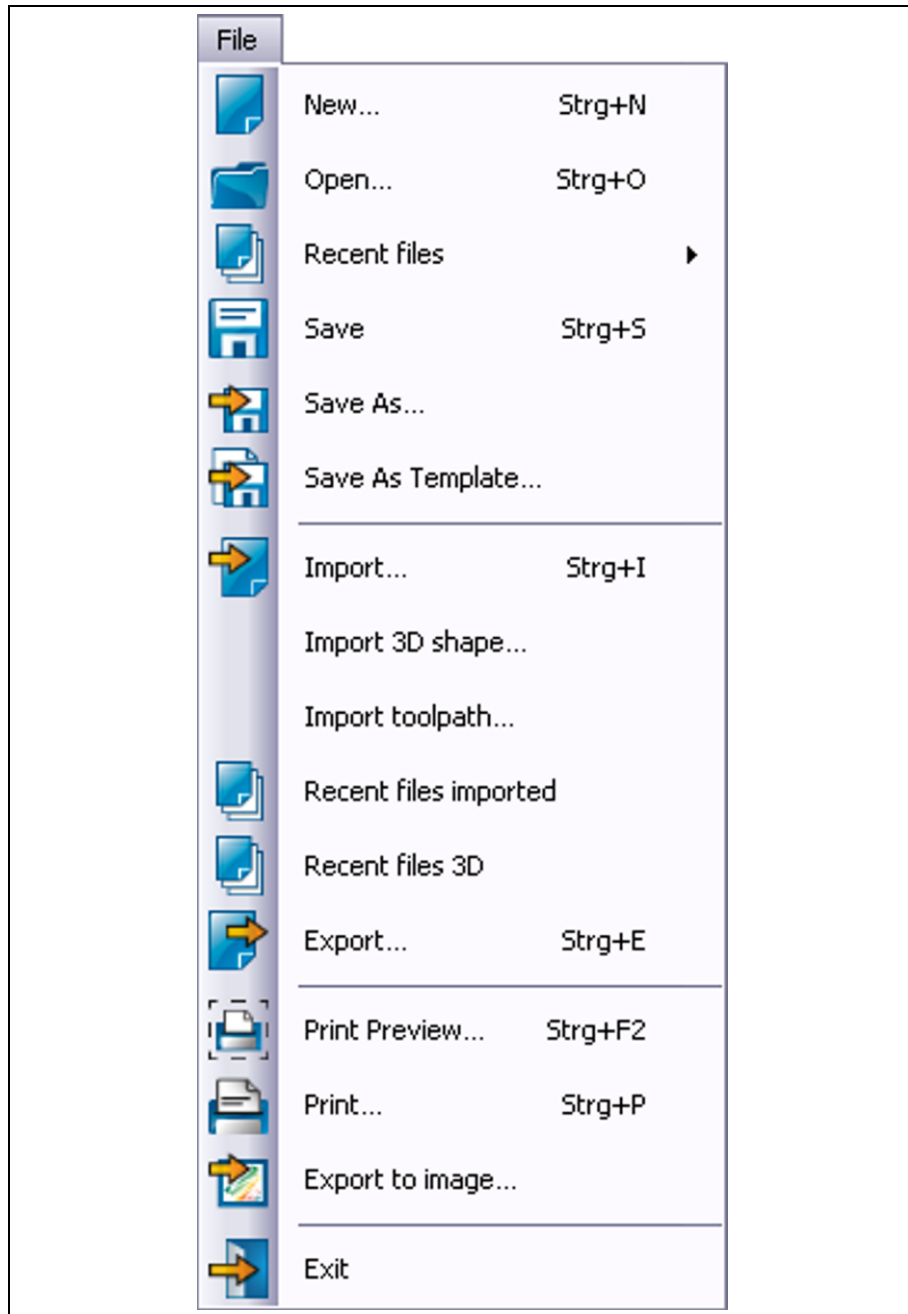
CircuitPro's menu bar contains following menu items:

- File
- Edit
- Insert
- Toolpath
- Modify
- View
- Select
- Wizards
- Machining
- Camera (only if a camera is mounted)
- Extras
- Help

4.5.1 Menu File

The “File” menu contains the standard file operations of CircuitPro.
Click on the “File” menu item to open the submenu:

Fig. 28: Menu “File”



The following table contains short descriptions of the functions of the individual menu items:

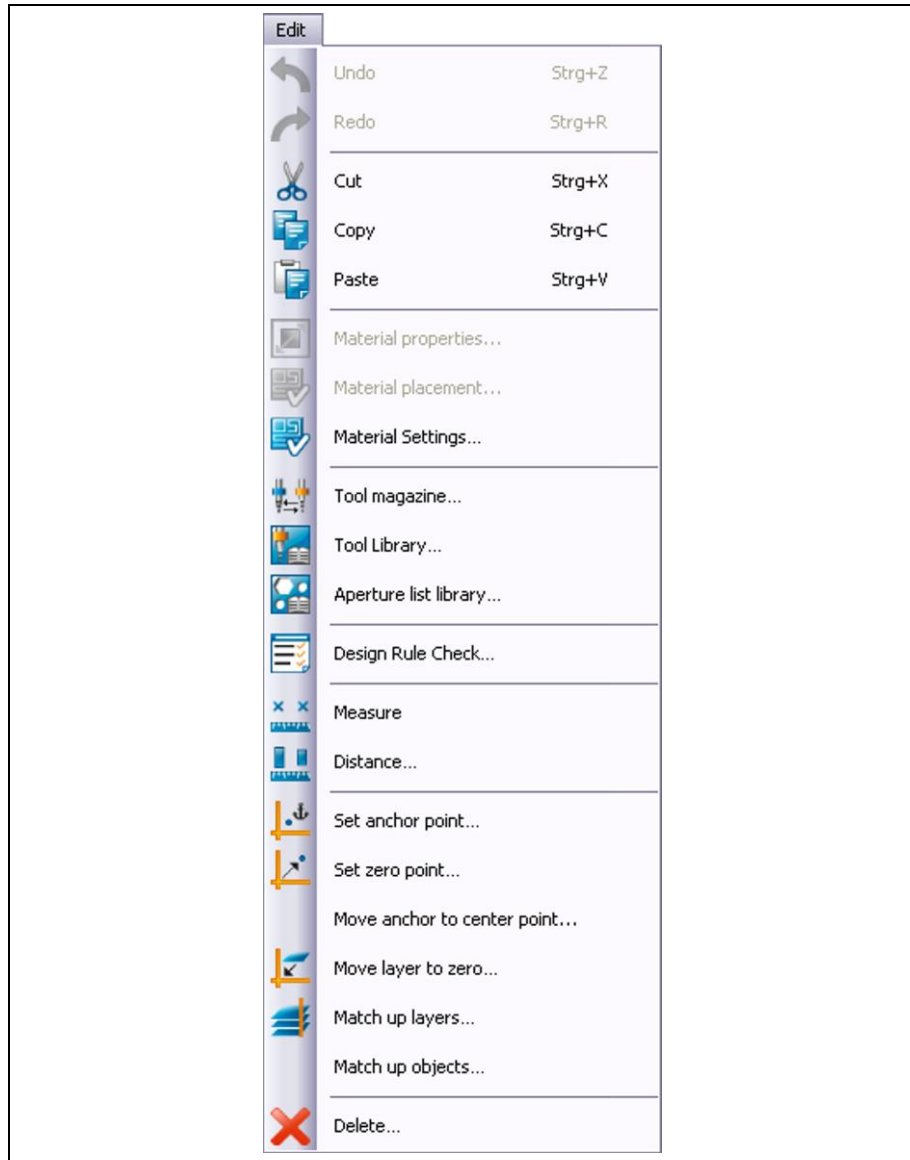
Table 25: "File" menu functions

Menu item	Description
New...	Creates a new document in CircuitPro. You can either select one of the standard templates for your new document or browse your disk drive for your own templates.
Open...	Opens a CircuitPro document.
Recent files	Contains a list of the five CircuitPro documents that have been opened/edited most recently.
Save	Saves the document currently edited with all changes made under the same file name and location.
Save As...	Saves the document currently edited with all changes made under the specified file name and location.
Save As Template...	Saves the current document as a template (file extension .cbf). Thus, it is displayed in the select template dialog.
Import...	Imports the following file formats: CAM, Excellon, Gerber, GerberX, LMD, HPGL, DXF, and Sieb & Meyer.
Import 3D shape...	Imports all 3D shapes in the STEP and IGES file formats.
Import toolpath...	Imports the toolpath data of an existing CircuitPro document.
Recent files imported	Contains a list of the five documents that have been imported most recently.
Recent files 3D	Contains a list of the CircuitPro 3D documents that have been opened/edited most recently.
Export...	Exports the toolpaths of the current document into an LMD file.
Print Preview...	Opens the print preview of the current document.
Print...	Opens the print dialog. Choose your settings for printing and start the print operation subsequently.
Export to image...	Exports the visual presentation or selected parts into an image file of the formats Bitmap, JPEG, or Windows Enhanced Metafile.
Exit	Closes CircuitPro.

4.5.2 Menu Edit

The “Edit” menu contains the functions for editing objects in CircuitPro.
Click on the menu item “Edit” to open the sub-menu:

Fig. 29: Menu “Edit”



The following table contains short descriptions of the functions of the individual menu items:

Table 26: "Edit" menu items

Menu item	Description
Undo	Undoes the last operation in the document..
Redo	Restores the operation previously undone.
Cut	Cuts the selected object(s) from the document and stores it (them) in the clipboard.
Copy	Copies the selected object(s) to the clipboard.
Paste	Inserts the object(s) previously cut/copied at the selected position/on the selected layer.
Material properties...	Defines the properties (such as type and size) of the material used for 2.5D operations.
Material placement...	Defines the height and the position of the material used (2.5D objects)
Material Settings...	Opens the dialog "Material settings" where you can enter the parameters of the base material used.
Tool magazine...	Opens the dialog "Tool magazine" dialog. Enter the various tools that are/will be in the machine's tool magazine in this dialog.
Tool Library...	Opens a dialog showing all available tools.
Aperture list library...	Opens a dialog showing all apertures of the current document.
Design Rule Check...	Opens a dialog for the setting options and starting the design rule check.
Measure	Activate this menu item to measure the distance between two points in the 2D/3D/Machining view. The values are shown in the status bar of CircuitPro . Press the ESC key on your keyboard to deactivate this function.
Distance...	Opens the "Distance" dialog. The dialog shows the exact distance between two objects.
Set anchor point...	Opens a dialog where you can define the coordinates of the anchor point.
Set zero point...	Moves the zero point to the current anchor point.
Move anchor to center point...	Moves the anchor point to the center point of a selected object.
Move layer to zero...	Aligns the objects of the selected layer to the zero point.
Match up layers...	Opens a dialog allowing to align the objects of two layers along a vertical line.
Match up objects...	Opens a dialog allowing to move a source object onto a target object.
Delete...	Deletes the selected object(s) of the layer.

4.5.2.1 Material properties

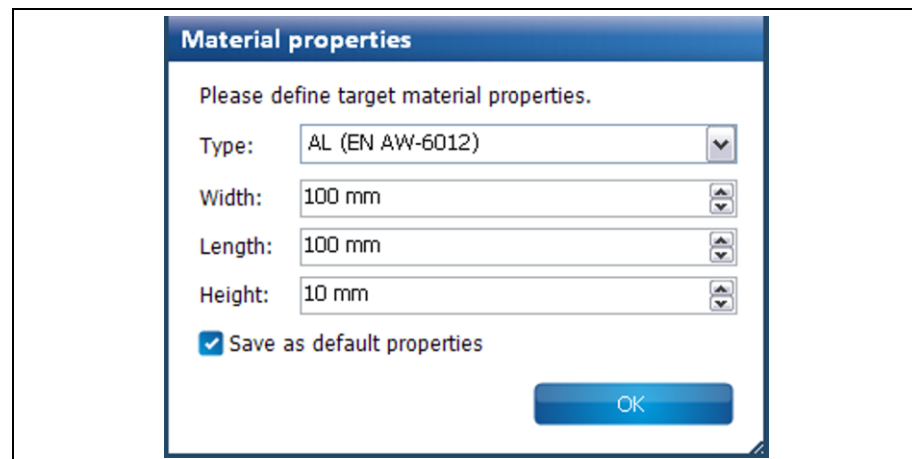
In the dialog “Material properties”, the properties of the 3D object to be processed can be determined.

■ Determining material properties

1. Click on process > Material properties.

➔ The following dialog is shown:

Fig. 30: Material properties



2. Select the material type in the field \Type:\.
3. Enter the material width (in mm) in the field \Width:\.
4. Enter the length of the material (in mm) in the field \Length:\.
5. Enter the height of the material in the field \Height:\.



Tip

If you use the same material frequently, you can also set the specified values as default properties and save them. Activate the checkbox “Save as default properties”.

6. Click on [OK] to adopt the values.
- ◆ The material properties have been determined.

4.5.2.2 Material placement

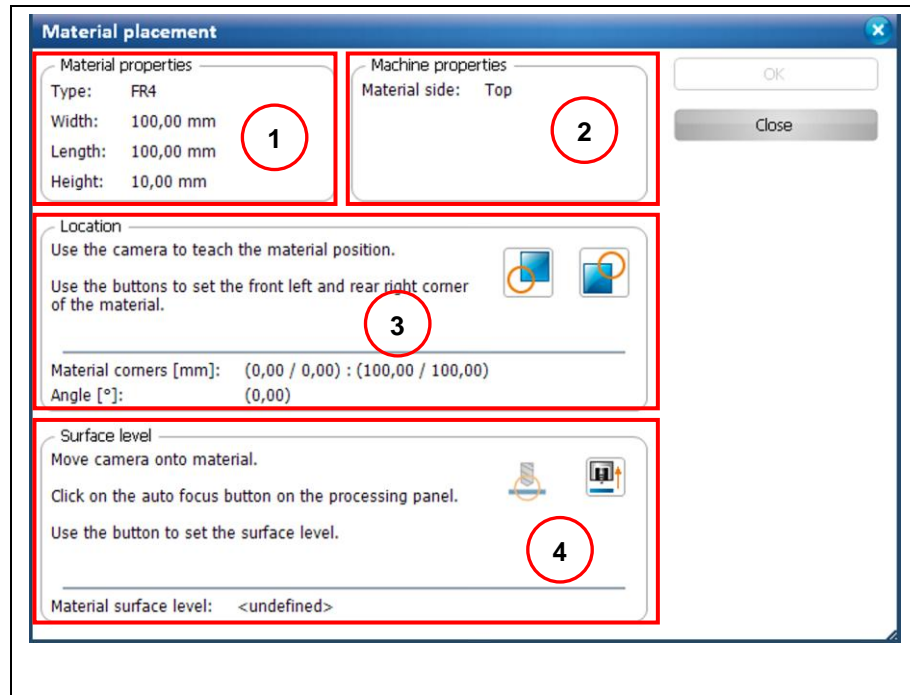
You can place the material in the machining view by using this dialog. You define the corners of the material as well as the surface height.

■ Placing the material

1. Click on Edit > Material placement...

➔ The following dialog is displayed:

Fig. 31: Material placement



/1/ Material properties

/3/ Location

/2/ Machine properties

/4/ Surface level

The individual section contain the following information/functions:

Table 27: Material placement

Section	Description
Material properties	In this section, the material properties of the material to be processed are displayed. You previously entered these properties in the dialog "Material properties".
Machine properties	In this section, the current material side to be processed, is displayed.
Location	In this section, the material corners are set. Please take the exact instructions from the following pages.
Surface level	In this section, please set the surface height. Please take the exact instructions from the following pages.

2. Modify the settings as required.

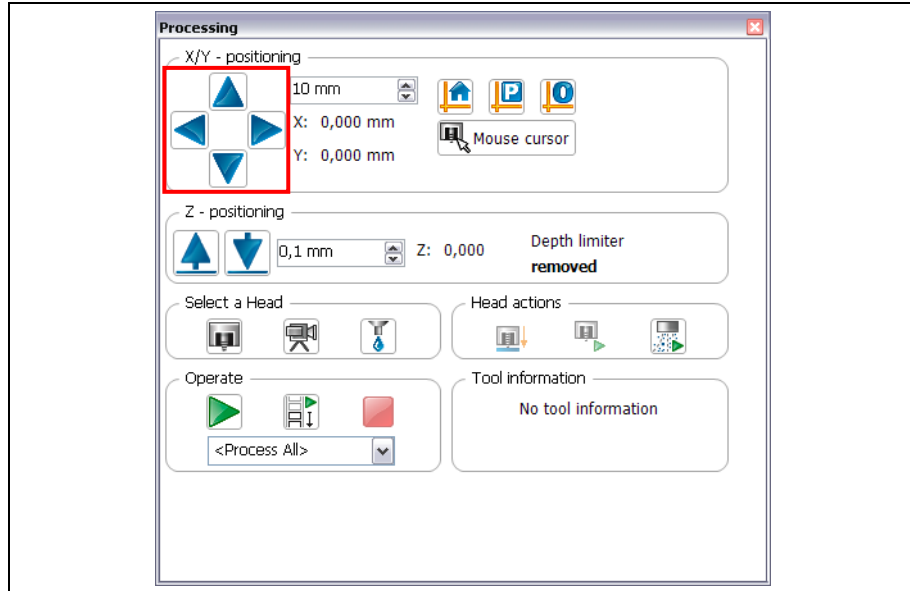
3. Click on [OK] to save the values.

➔ The dialog is closed.

◆ The material was placed.

- Set material corners
- 1. Move the camera head to the left, lower corner of your base material:
 - a) Click in the "Processing" pane.
 - b) Use the arrow buttons in the section "X/Y positioning" to move the camera head.

Fig. 32: Pane "Processing"



Note

The camera head is activated automatically. This can be recognised in the "Processing" pane by the green frame around the camera icon:

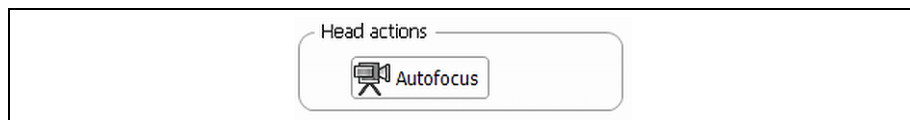


Tip

You can also click on the corner of your material in the machining view. The camera moves automatically to this position. Perform fine adjustment by using the X/Y buttons in the "Processing" pane.

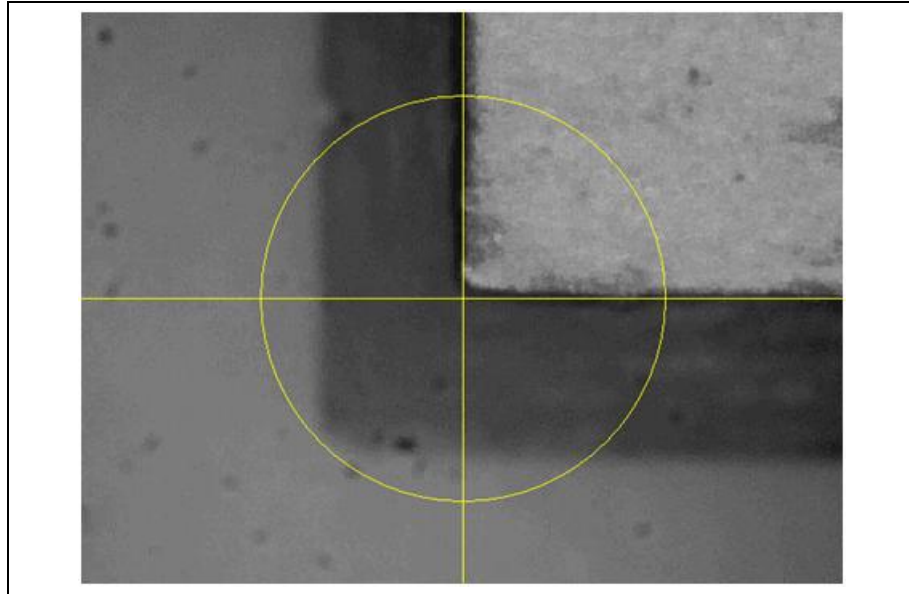
2. Perform autofocus for improved material alignment:
 - a) To do this, click on the button "Autofocus" in the "Processing" pane:

Fig. 33: Autofocus



3. Position the camera head so that the corner of your material is exactly at the crosshairs:

Fig. 34: Crosshair of the camera



Tip

If you use the dark/reflective base materials (for example, POM), the display of the camera image can be too dark for the material to be recognised.

In this case, turn the camera aperture to improve the incidence of light/lightness of the camera image.

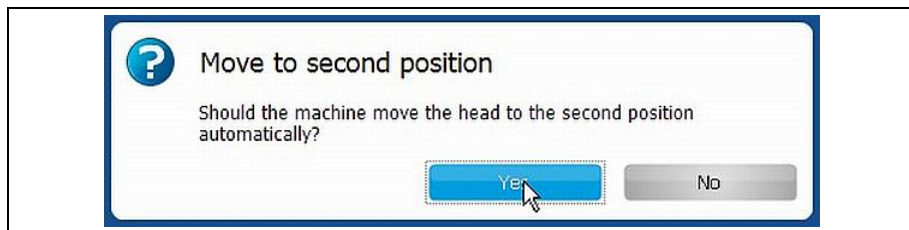
4. In the dialog "Material placement", click on the following icon:



➔ The value for the lower, left material corner was saved.

➔ The following message is displayed:

Fig. 35: Message for second position



5. Confirm the message by clicking on "Yes".

➔ The camera automatically moves in the opposite corner of the material.

6. Align the crosshairs with the material corner by using the X/Y buttons.

7. Click on the symbol for the upper, right-hand corner:



➔ The value was saved.

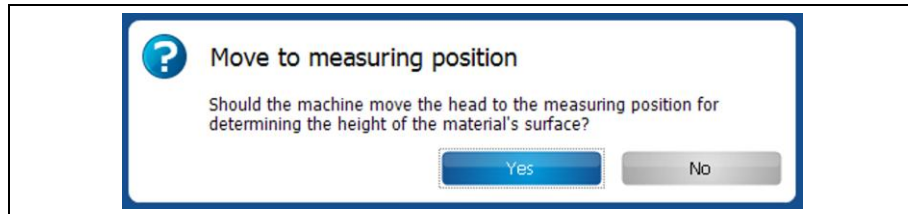
◆ The material corners have been set.

■ Setting the material height

In the next step, the Z height of the material must be determined.

➔ The following message is displayed after you have set the material corners:

Abb. 36: Zur
Messposition
verfahren



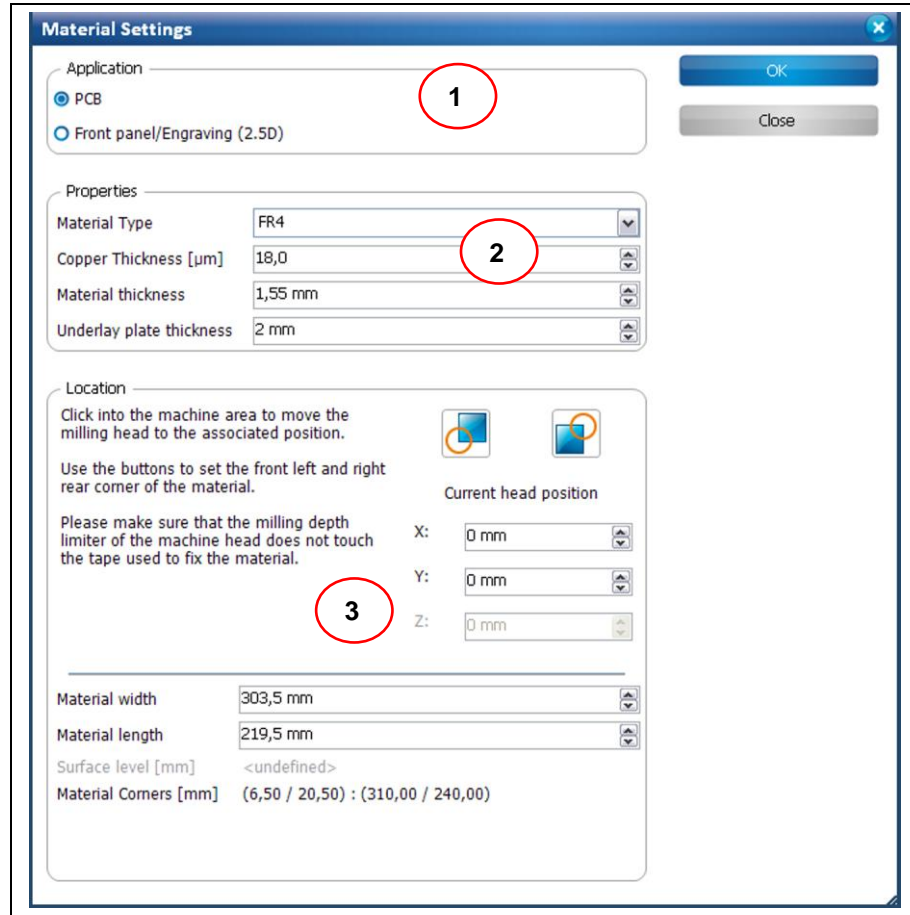
1. Confirm the message by clicking on "Yes".
 2. Click on [Autofocus].
 3. Now click on the button to set the material height:
- ◆ The material height was set.



4.5.2.3 Material Settings

Use this dialog to define the material properties of the object to be processed.

Fig. 37: Material settings



/1/ Application

/3/ Location

/2/ Properties

Section /1/ defines whether the material is used as a printed circuit board or as a front panel/engraving.

The properties of the material are defined in section /2/. This comprises:

- Material type (glass-reinforced epoxy laminate (FR4) or aluminium)
- Thickness of the copper layer in μm
- Material thickness in mm
- Thickness of the underlay in mm (none if vacuum table is mounted)

Section /3/ defines the location and size of the material area. In case of front panels/engravings, the Z height has to be determined by lowering the tool to the surface of the material. The following properties can also be defined:

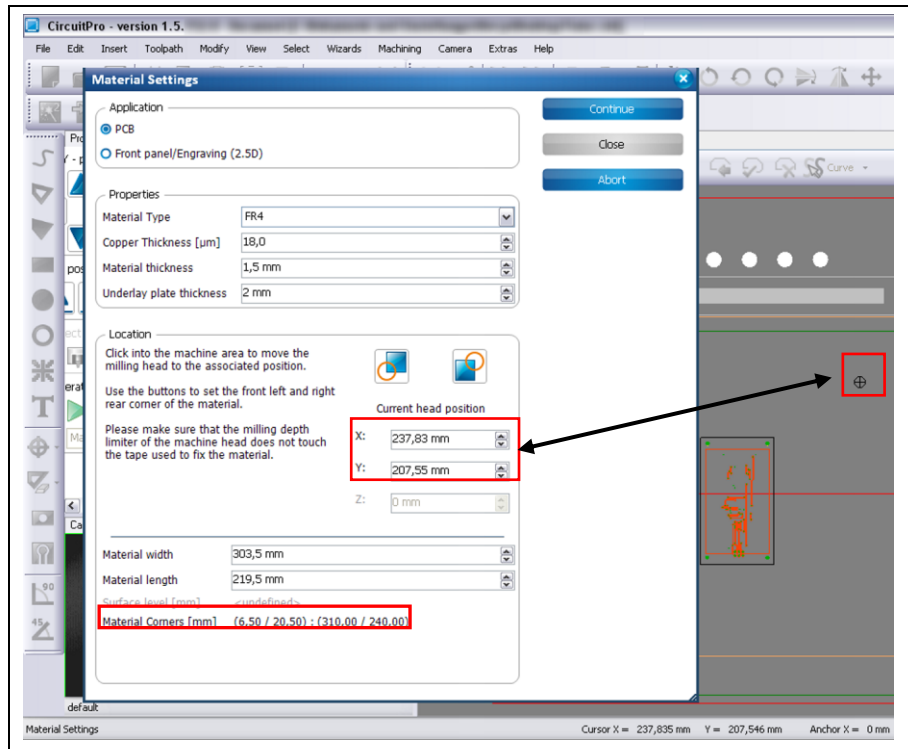
- Material width in mm
- Material length in mm

→ When the material area is defined, the resulting surface height and the coordinates of the material's corners are displayed.

■ Defining the material area

1. Click on the upper right corner of the working area in the machining view of the project.
- ➔ The milling head moves to this position. The X and Y coordinates of this position are displayed in the “Material settings” dialog.

Fig. 38: Material settings > coordinates



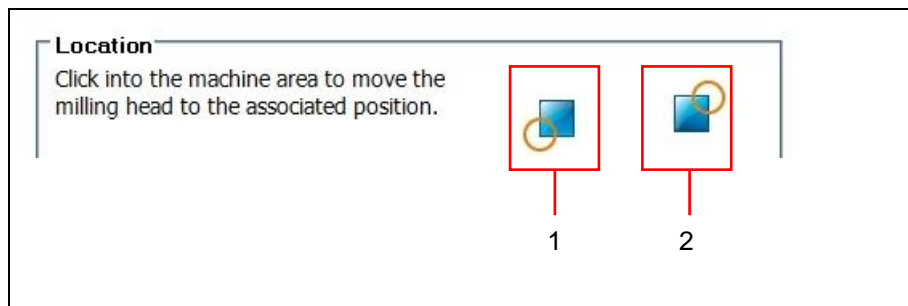
Note

If you have selected “Front panel/Engraving” in the “Application” section, you have to enter the Z coordinate at the material's corners.

→ Move the milling head downwards by changing the Z value until the tool touches the material. Follow the further instructions from step 2 onwards.

2. Click on the icon representing the right rear corner, see /2/ in the following figure:

Fig. 39: Material settings > Location



/1/ Left front corner

/2/ Right rear corner

- ➔ The coordinates of the material area are stored.
- 3. Click on the lower left corner of the working area in the machining view of the project.
- ➔ The milling head moves to this position. The X and Y coordinates of this position are displayed in the “Material settings” dialog.
- 4. Click on the icon representing the left front corner /1/.



Tip

After defining front left corner of the material area, you can also define the size of the material area by setting the “Material width” and “Material length”.

1. Follow the steps 3 and 4 of “Defining the material area”
2. Enter the values for \Material length\ and \Material width\ in millimetres.

→ The material area is adjusted automatically.

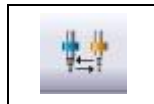
- ◆ The material area is defined.

4.5.2.4 Tool magazine ProtoMat E33/S43 (manual tool change)

The “Tool magazine” dialog moves the milling head to the zero position to allow a manual tool change.

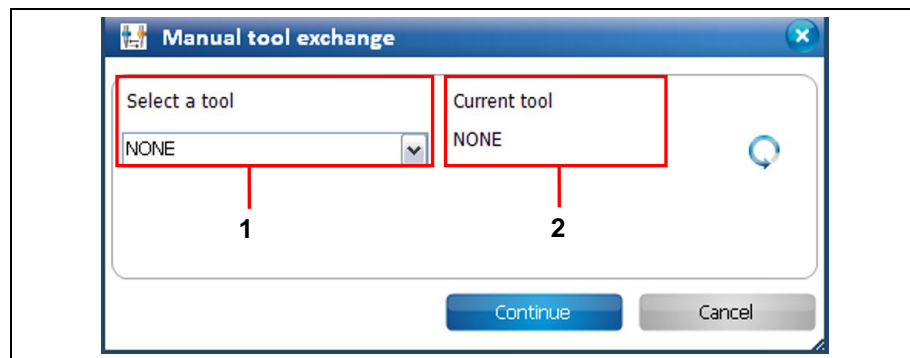
Click on Edit > Tool magazine... or the following icon of the toolbar to open the dialog:

Fig. 40: Tool magazine icon



The following dialog is displayed.

Fig. 41: Tool magazine dialog for E33 and S43



/1/ Tool selection list

/2/ Tool in clamp

- Performing a manual tool change
 1. Select the tool that you want to mount into the clamp from the tool selection list /1/.



This example uses the tool “Universal Cutter 0,2 mm”.

Note

2. Click on [Continue].
- ➔ The following message is displayed:

Fig. 42: Tool change



3. Mount the tool.
4. Click on [OK].
- ◆ The manual tool change is finished.

- Measuring the milling width

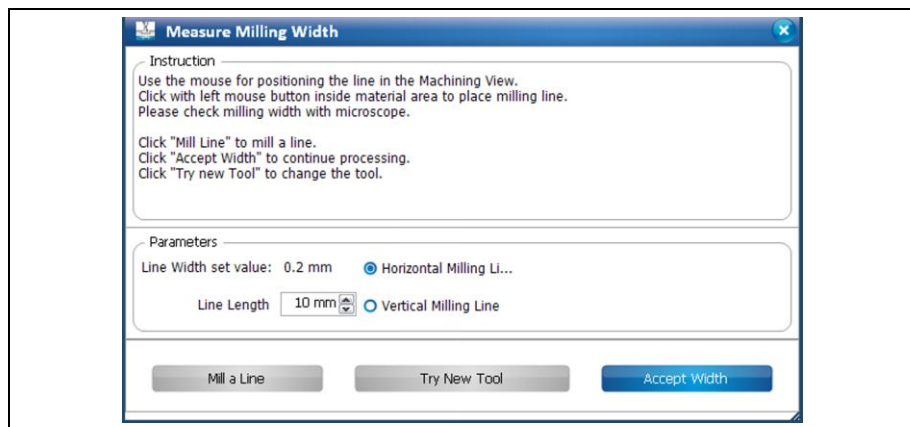


Please note, that you can only measure the milling width of a conical tool.

Note

1. Click on [Milling Width].
- ➔ The following dialog is displayed:

Fig. 43: Measure Milling Width



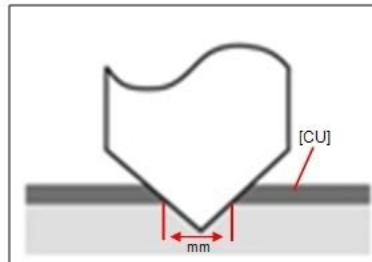
2. Click on the position in the Machining view where you want to mill the line.

3. Enter the length of the line to be milled.
4. Select an option:
 - Horizontal milling line
 - Vertical milling line
5. Click on [Mill a Line].
- ➔ The line is milled at the selected position.
6. Measure the milling width by using a microscope.



Note

To determine the correct milling width, put on the microscope at the lower, inner edges of the copper:



7. Click on [Accept Width], if the milling width is okay.
- If not
7. Adjust the tool manually and mill a line again until the result of the milling width is okay.
- ◆ The milling width is measured.

4.5.2.5 Tool magazine ProtoMat S63/S103

The tool magazine dialog lets you

- view a list of the tools required for the current project,
- view the tools currently present in the machine,
- load the tool magazine,
- view/put back the tool currently present in the clamp,
- pick up a tool with the clamp,
- check the milling width of a tool (only for Universal Cutter and Micro Cutter),
- view the current state of the tool life spent and
- replace an old tool with a new one.

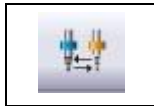


Note

The "Tool magazine" dialog offers these options only for machines with automated tool change. This comprises the ProtoMat S63 and the ProtoMat S103.

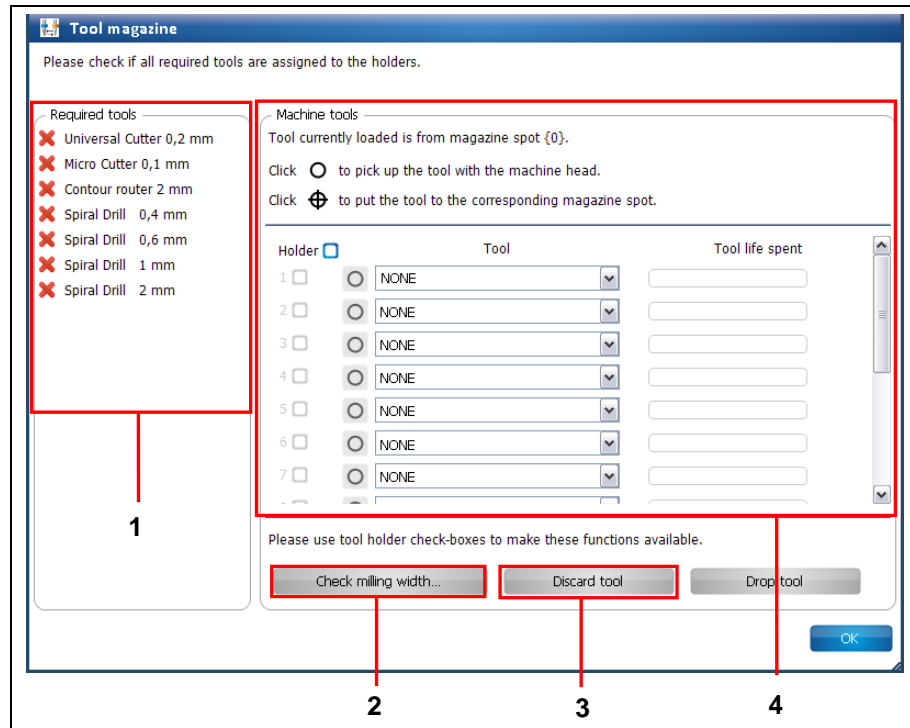
Click on Edit > Tool magazine... or the following icon of the toolbar to open the dialog:

Fig. 44: Tool magazine icon



The following Dialog is displayed:

Fig. 45: Tool magazine



/1/ Required tools

/3/ Button "Discard tool"

/2/ Button "Check milling width..."

/4/ Tools in the machine

It is necessary to load the tool magazine for processing a project. In section /1/, CircuitPro displays the tools that are required for processing the project.

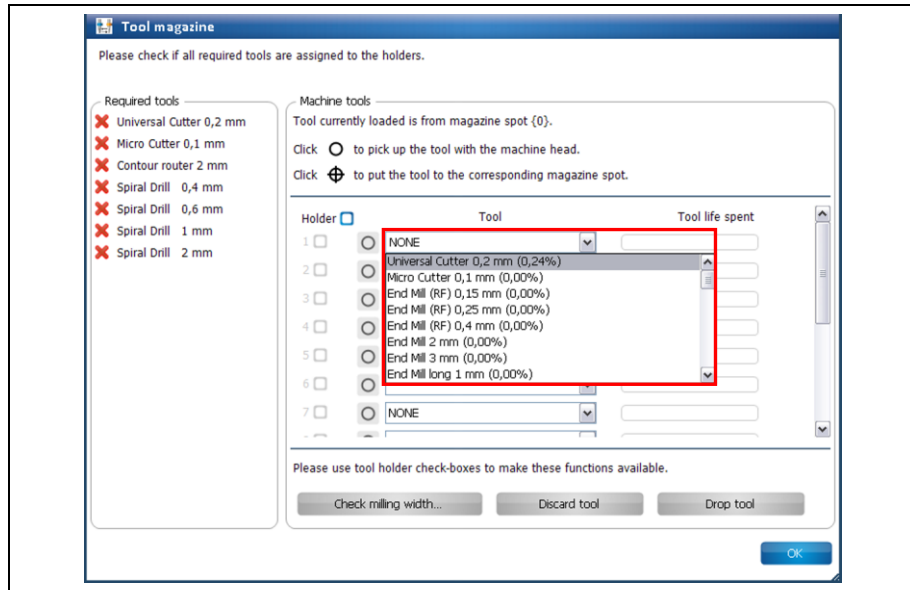
The required tools have to be inserted into the tool magazine manually. You can either

- insert the tools into the tool holders and then assign them to the tool holders accordingly in section /4/ or
- assign tools to the tool holders in the "Tool magazine" dialog and then insert the tools into the tool Holders according to the list.

■ Loading the tool magazine

1. Click on the drop-down list of the first tool holder:

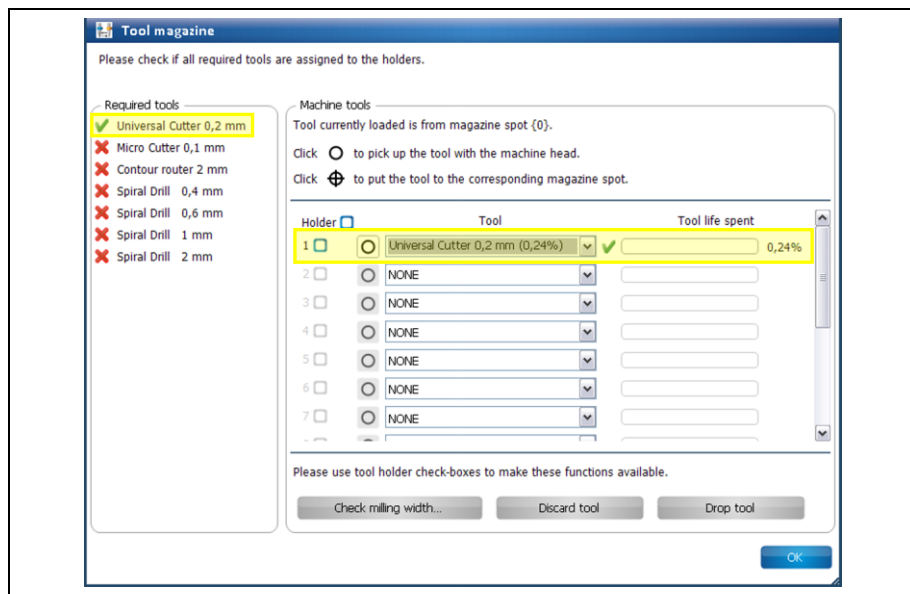
Fig. 46: Drop-down list of the tool holder



➔ A list of all tools that you can use with the machine is displayed.

2. Select the required tool (in this case: Universal Cutter 0.2 mm, as in adjacent list):

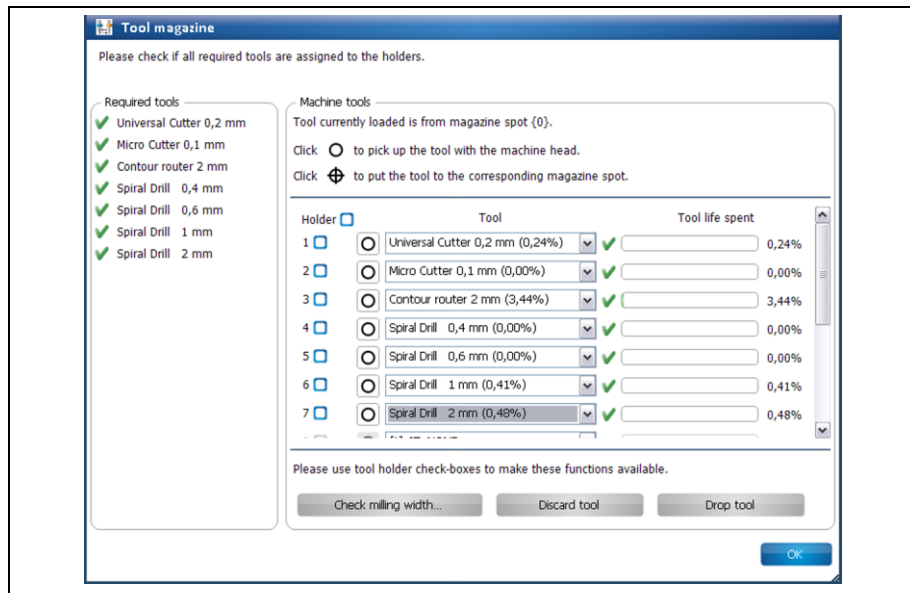
Fig. 47: Assigning a tool



➔ The tool is marked with a green check mark in the list of the required tools. Also, a green check mark is displayed next to the corresponding drop-down list and the tool life spent is displayed on the right.

3. Repeat above steps for all tools that are required for your project with the other tool holders.

Fig. 48: Tool magazine loaded

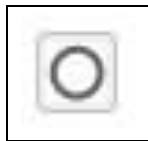


◆ The tool magazine is loaded.

■ Picking up a tool with the clamp

1. Click on the following button next to the drop-down list:

Fig. 49: Picking up a tool



➔ The following message is displayed while the clamp picks up the tool:

Fig. 50: Message picking up tool



➔ The symbol on the tool's button changes:

Fig. 51: Tool currently in clamp



◆ The tool is now in the clamp.

- Putting the tool back to its magazine position

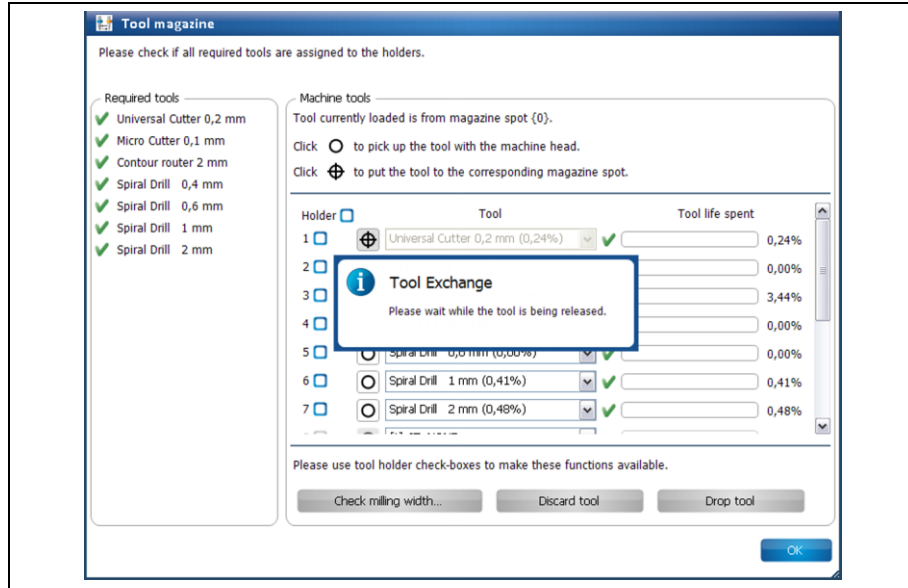
1. Click on the following button next to the drop-down list:

Fig. 52: Putting down a tool



- ➔ The following message is displayed while the clamp puts down the tool:

Fig. 53: Message tool release



- ➔ The symbol on the tool's button changes:

Fig. 54: Tool not in clamp



- ◆ The tool is back at its corresponding magazine position.

■ Checking the milling width

A tool has to be in the clamp to enable checking the milling width.

A short line is milled that is subsequently measured with the camera.

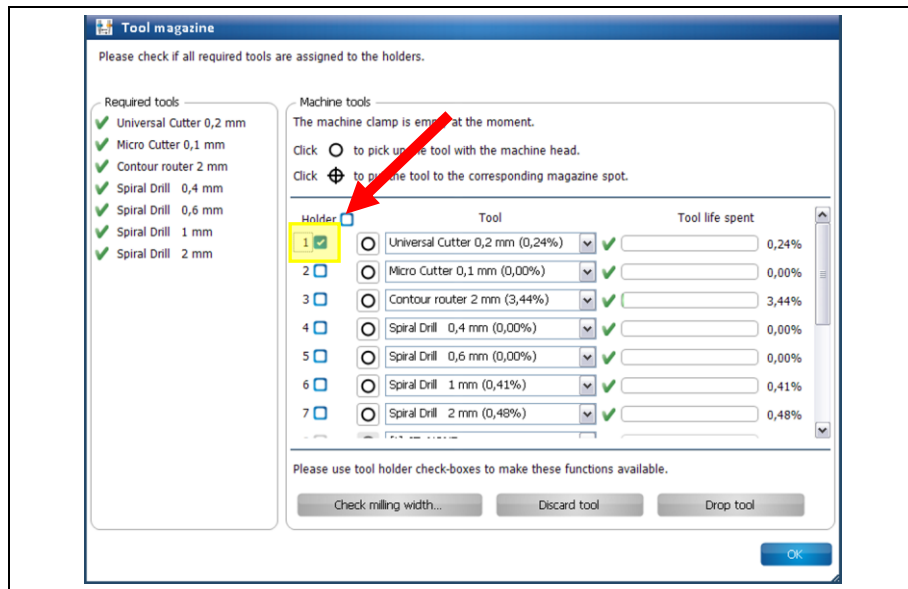


Please note that checking the milling width is only available for LPKF Universal Cutters and LPKF Micro Cutters.

Note

1. Pick up the tool with the clamp (see procedure “Picking up a tool with the clamp”).
- ➔ The tool is now in the clamp.
2. Activate the check box of the tool currently in the clamp:

Fig. 55: Check box activated



- ➔ The button “Check milling width...” is active.



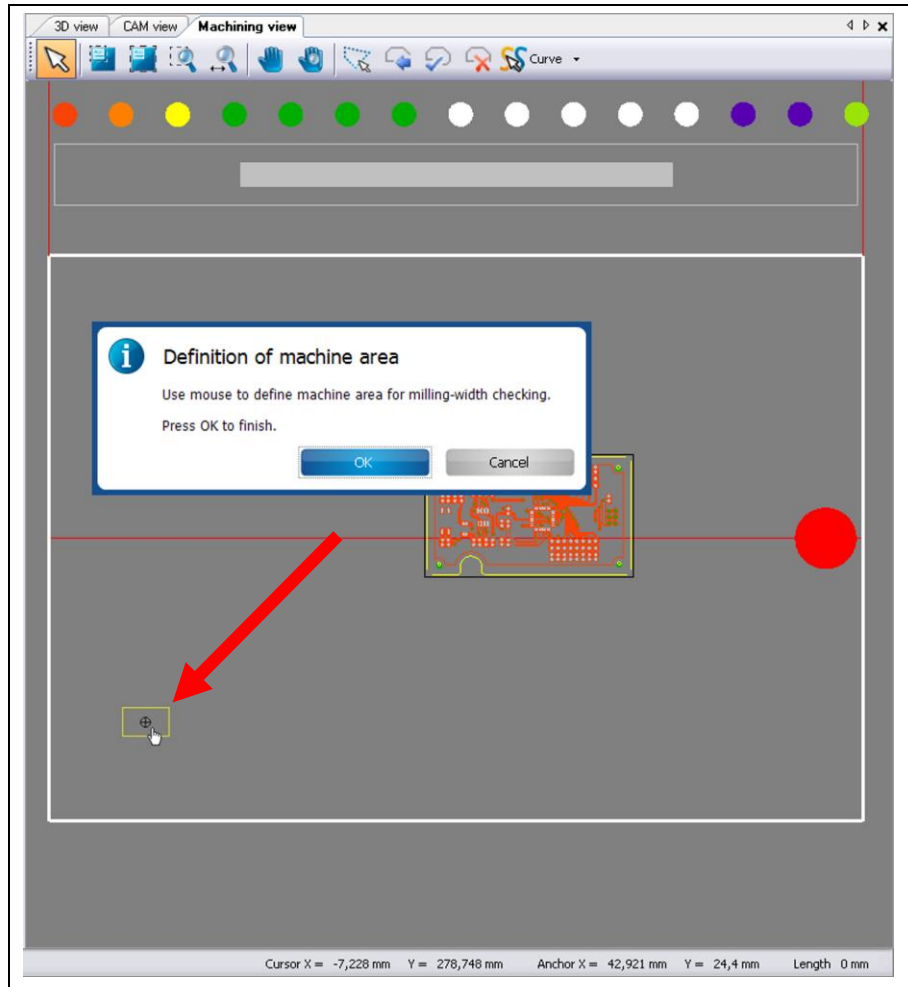
If a tool the milling width of which cannot be checked (e.g. Spiral Drill etc.) is in the clamp the button is not activated.

Note

3. Click on [Check milling width...].

➔ The following message is displayed:

Fig. 56: Defining a machine area



4. Click on a position outside the area to be used for the project (but inside the processing area) to mill a line (see figure above).

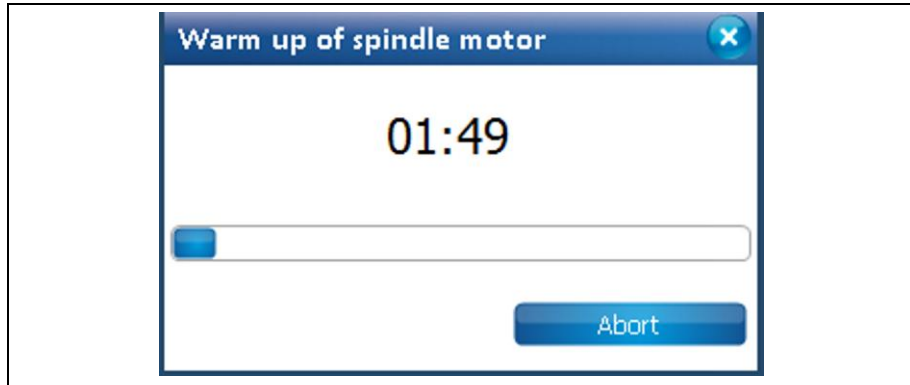


Note

Please make sure that the milled line is inside the working area of the camera so that the camera can measure the line.

- ➔ The milling head moves to the corresponding position in the processing area.
5. Click on [OK].
- ➔ The dust extraction of the machine is switched on, the milling head moves to the zero position and the spindle motor is warmed up:

Fig. 57: Warm-up of spindle motor

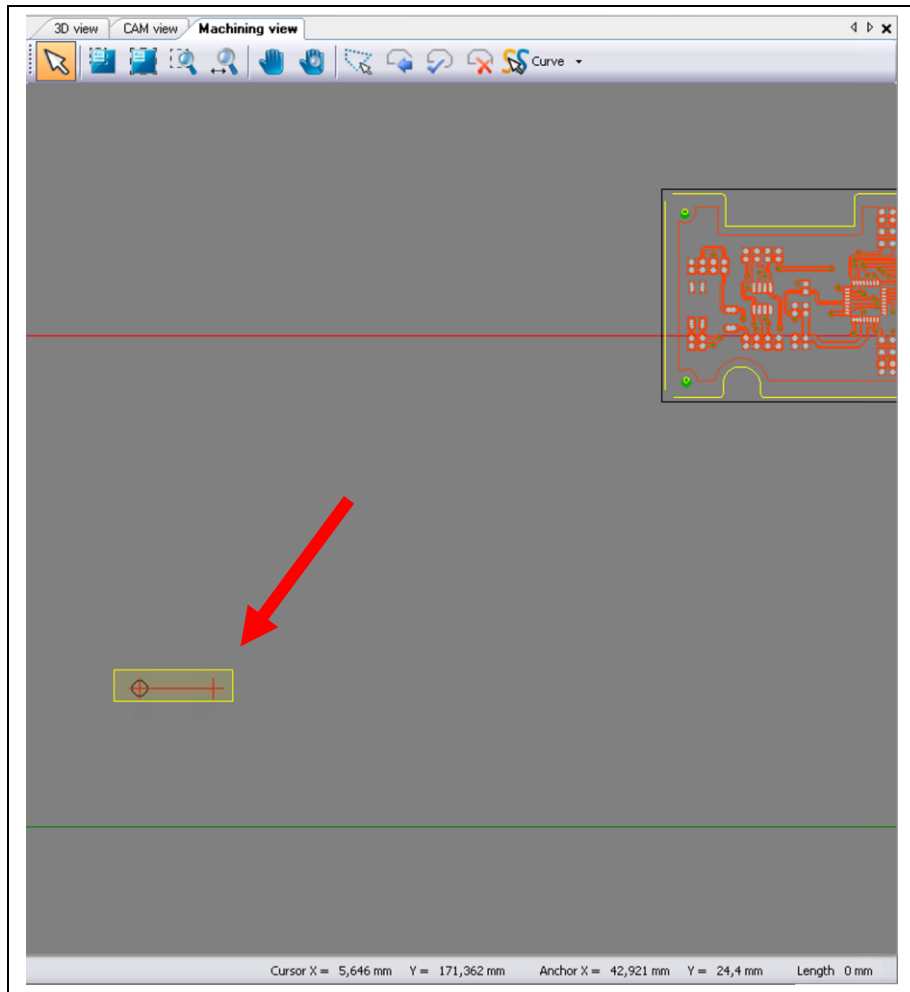


Note

The warm-up may already have taken place before, if the machine has already processed material after switching it on.

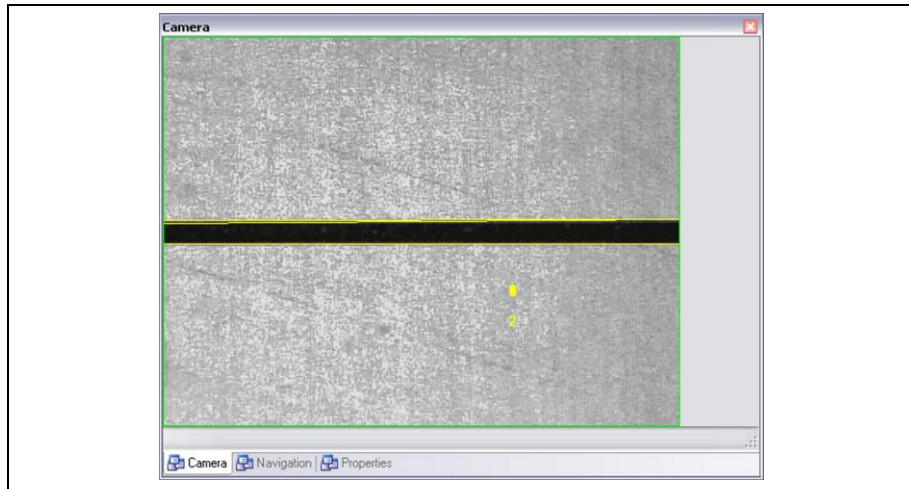
- ➔ The line to be milled is displayed in the machining view and the line is milled:

Fig. 58:
Machining view
with milled line



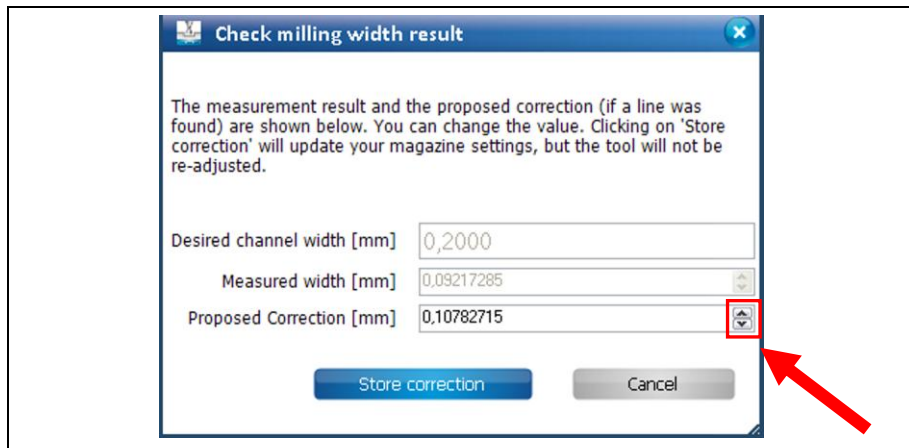
After the line has been milled the camera moves to the corresponding position. The "Camera" pane displays the line just milled:

Fig. 59: "Camera" pane



➔ The dialog with the measurement results is displayed:

Fig. 60: Measurement results



If there is a difference between the desired milling width and the measured width CircuitPro automatically proposes a correction value.

6. Click on [Store correction] to apply the proposed value.

You can manually enter a correction value if you do not want to apply the value proposed by CircuitPro.

7. Increase or decrease the value of the proposed correction by using the two arrow buttons.

8. Click on [Store Correction].

If you do not want to apply any correction click on [Cancel].

➔ The dialog is closed.

◆ The milling width of the tool currently in the clamp was checked.



Note

Please note that the tool has to be put back into the holder and picked up again in order to have the corrected settings be applied.

■ Discarding a tool

If the tool life of a tool is spent, the tool should be discarded to ensure optimum milling results.



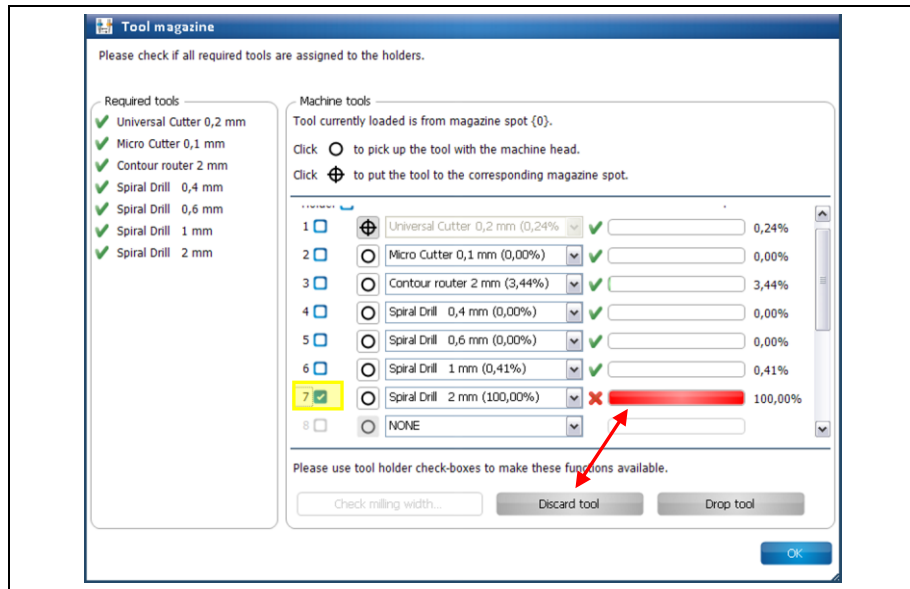
Note

Please note that all information on the tool to be discarded will be deleted.

1. Activate the check box of the tool to be discarded.

➔ The button “Discard tool” is activated.

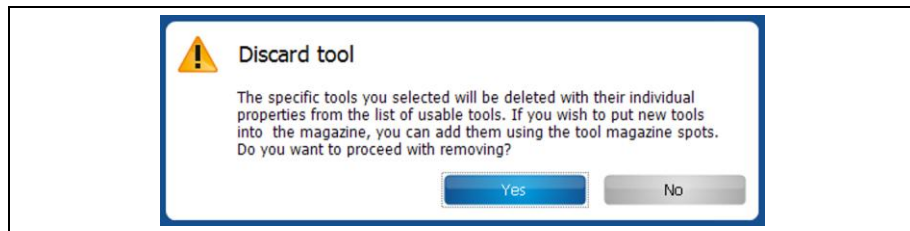
Fig. 61: Replace tool



2. Click on [Discard tool].

➔ The following message is displayed:

Fig. 62: Tool replacement



3. Confirm by clicking on [Yes].



Note

If the tool to be discarded is currently in the clamp, the tool is put back into its corresponding magazine position.

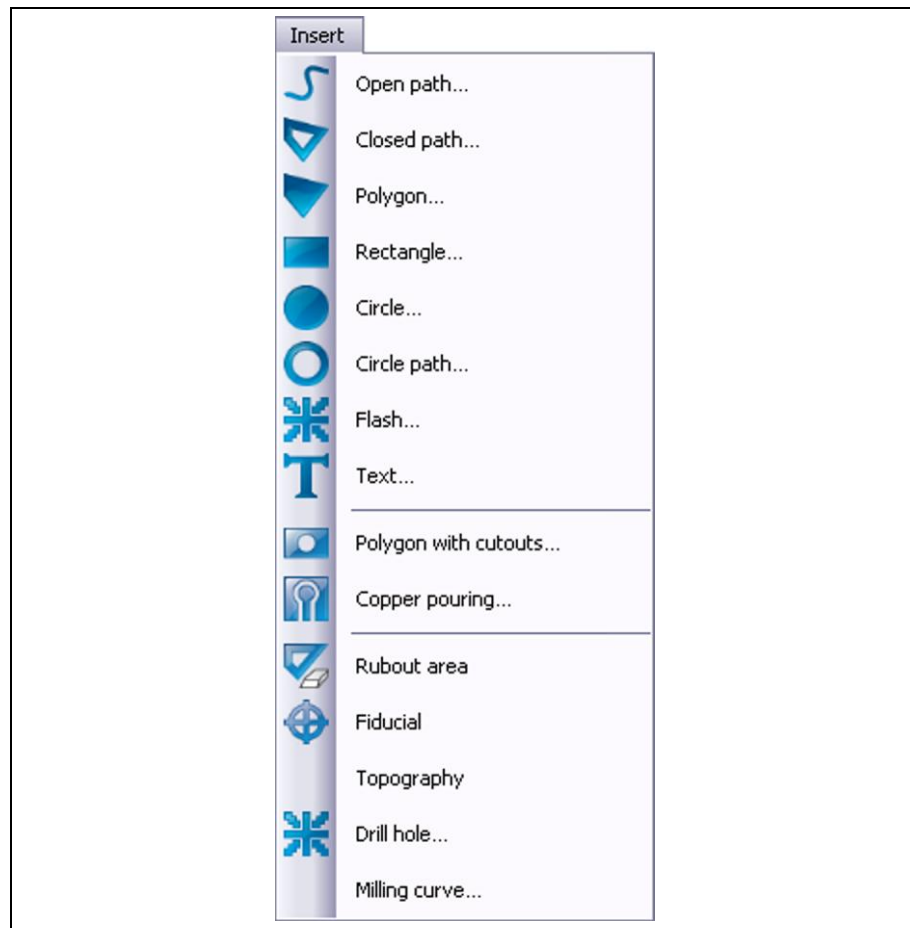
- ➔ A message is displayed which prompts you to discard the tool.
- 4. Replace the old tool in the machine with a new one.
- ◆ The old tool is discarded.

4.5.3 Menu Insert

The “Insert” contains the functions for creating objects in the CAM view.

Click on the “Insert” menu item to open the submenu:

Fig. 63: Menu “Insert”



The following table contains short descriptions of the functions of the individual menu items:

Table 28: “Insert” menu functions

Menu item	Description
Open path...	Creates an open path in the CAM view.
Closed path...	Creates a closed path in the CAM view.
Polygon...	Creates a polygon in the CAM view.

Table 28: "Insert" menu functions

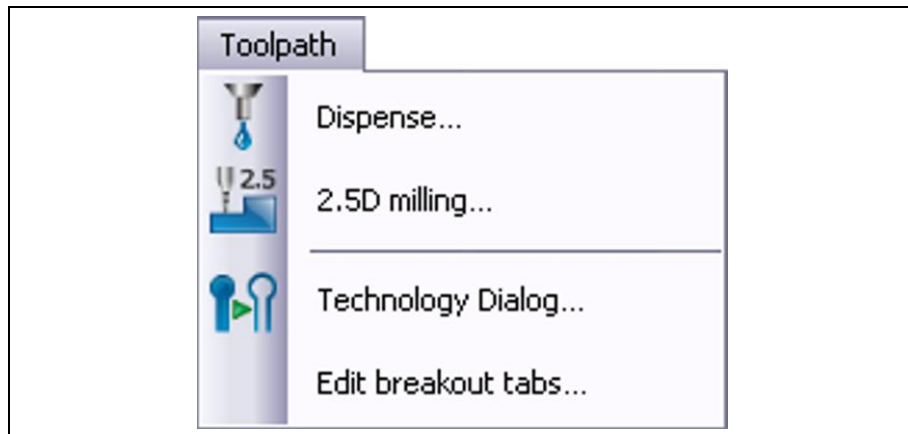
Menu item	Description
Rectangle...	Creates a rectangle in the CAM view.
Circle...	Creates a circle in the CAM view.
Circle path...	Creates a circle path in the CAM view.
Flash...	Creates a flash object in the CAM view.
Text...	Creates a text object in the CAM view.
Polygon with cutouts...	Creates a polygon with cutouts in the CAM view.
Copper pouring...	Creates an insulated copper area around conductive tracks.
Rubout area	Creates an area where all unnecessary copper is removed.
Fiducial	Creates fiducials in the CAM view.
Topography	Creates grid points for recognizing the board topography.
Drill hole...	Inserts drill holes in the CAM view.
Milling curve...	Inserts a toolpath in the CAM view.

4.5.4 Menu Toolpath

The "Toolpath" menu contains the functions for setting parameters and creating the paths for milling, routing, and dispensing solder paste.

Click on the "Toolpath" menu item to open the submenu:

Fig. 64: Menu "Toolpath"



The following table contains short descriptions of the functions of the individual menu items:

Table 29: "Toolpath" menu functions

Menu item	Description
Dispense...	Opens a dialog to create toolpaths for dispensing solder paste.
2.5D milling...	Creates toolpaths for 2.5D operations.
Technology Dialog...	Opens a dialog to create toolpaths for drilling and milling.

Table 29: "Toolpath" menu

Menu item	Description
Edit breakout tabs...	Opens a dialog to modify the breakout tabs in the contour-routing toolpath.

4.5.4.1 Create 2.5D milling

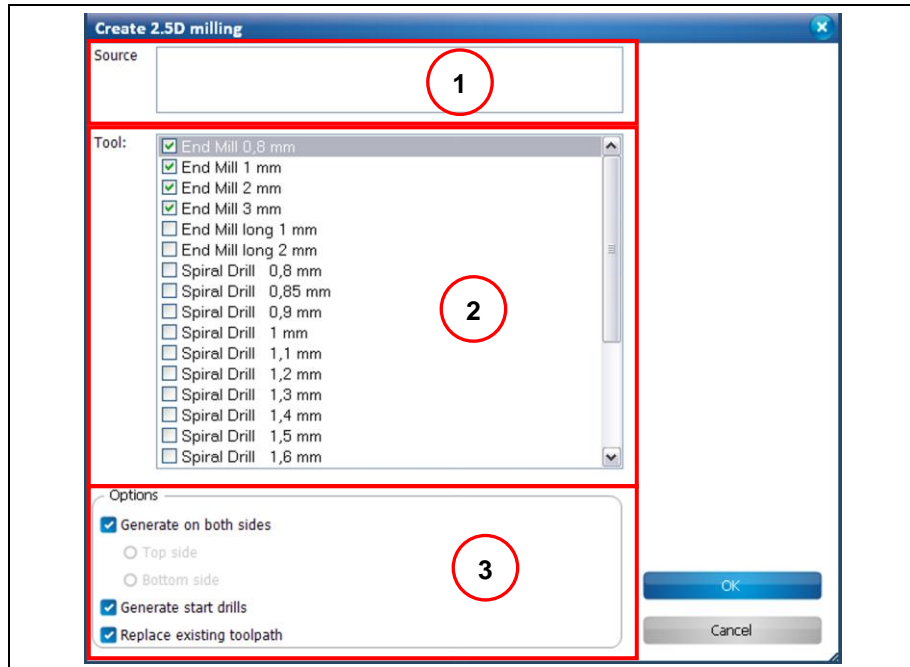
To create a 3D part you need to create 2.5D toolpaths with a defined Z value. After creating your design in the CAM view Circuit Pro generates the necessary 2.5D toolpaths to start the processing of your 3D part.

■ Creating 2.5D milling

1. Click on Toolpath > 2.5D milling...

➔ The following dialog is shown:

Fig. 65: Create 2.5D milling



/1/ Source

/3/ Options

/2/ Tool

The sections contain following information/options:

Table 30: Create 2.5D milling

Section	Description
Source	Here the source object is displayed, the toolpaths are created for.
Tool	This list shows all available tools to generate 2.5D toolpaths.
Options	
Generate on both sides	In case of a double-sided object you can specify if the toolpaths should only be created on the top or bottom side. By default the toolpaths are generated on both sides of an object.
Generate start drills	Here you can specify if start drills should be created. The start drills are used by the milling tools to start milling a line.
Replace existing	Here you can specify if already existing toolpaths should be

Table 30: Create 2.5D milling

Section	Description
toolpath	replaced.

2. Activate the tool's checkboxes that you want to use for creating the 2.5D toolpaths.
3. Enable/disable the options you need for creating the toolpaths.



Please note that at least one drilling tool must be enabled if you want to create start drills.

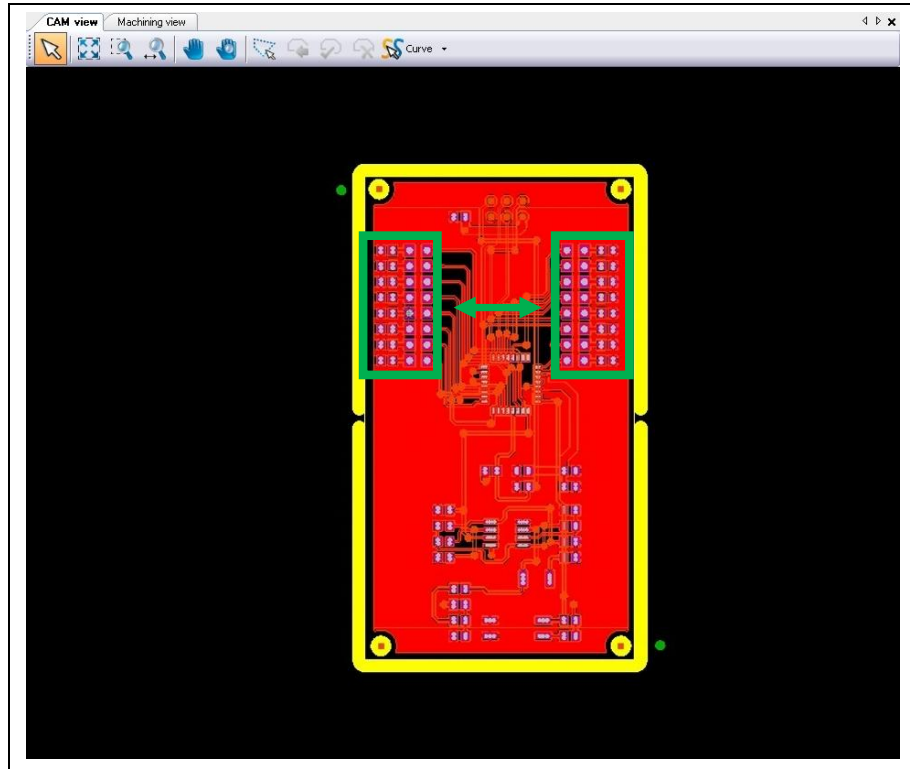
Note

4. Click on [OK].
- ◆ The 2.5D toolpaths are created.

4.5.4.2 Dispense

The “Dispense” function lets you create solder paste paths on a selected layer. Afterwards, You can place circuit components on the solder paste paths. Subsequently, the circuit boards can be soldered in a reflow oven (e.g. using the LPKF ProtoFlow).

Fig. 66:Dispense paths created on pads



The dispenser has to be mounted on the machine in order to create solder paste dots on the circuit board!

Note

This dialog “Dispense” allows the following operations:

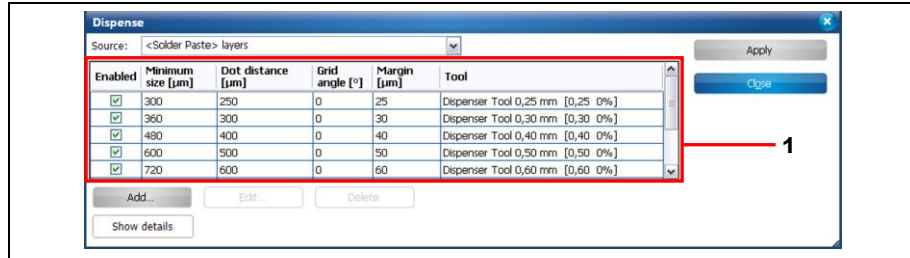
- Creating new solder paste paths on the pads
- Assigning new parameter sets to the dispense tools in the tool library [Add...]
- Edit the parameters of the dispense tools [Edit...]
- Edit details for creating solder paste paths [Show details]
- Delete dispenser tools [Delete].

■ Creating a new solder paste path on the pads

1. Click on Toolpath > Dispense.

➔ The following dialog is displayed:

Fig. 67: Dispense



/1/ List of the available dispense tools

The table contains following columns:

Table 31:
Dispense

Column	Description
Enabled	Activates/deactivates the corresponding dispense tool with a check mark.
Minimum size [µm]	Shows the minimum pad size of the pad to be filled in µm.
Dot distance [µm]	Shows the dot distance between the individual solder paste dots in µm.
Grid angle[°]	Shows the rotation of the solder dot grid on the pad.
Margin [µm]	Shows the minimum distance of the solder paste dots to the boundary of the pad in µm.
Tool	Shows the corresponding dispense tool.

2. In the “Source” drop-down list, select the layer where you want to create the solder paste path.



Tip

Create the solder paste dots on the designated solder paste layers (SolderPasteTop or SolderPasteBottom).

- In the list, select the dispense tools that you want to use.



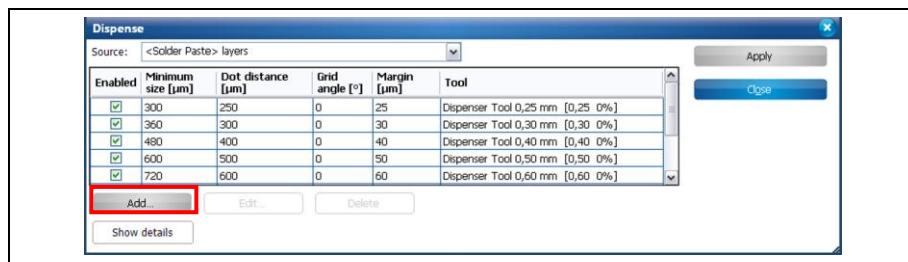
Take care that you have activated a suitable dispense tool for each pad size of your design.

Note

Several tools can be used for creating the solder paste paths.

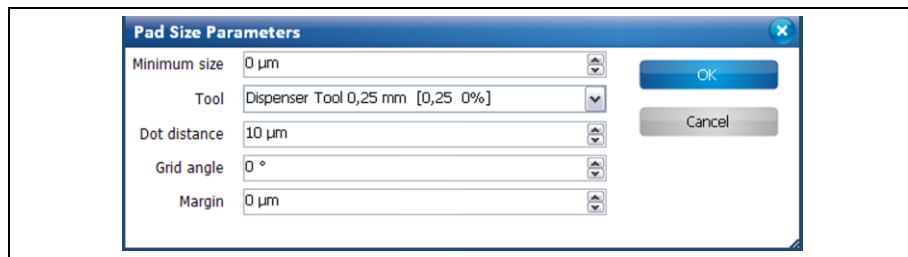
- Click on [Apply].
- Click on [Close].
- The solder paste path is created on the corresponding pads.
 - Adding new parameter sets for existing tools
- Click on [Add...] in the dialog.

Fig. 68: Adding solder paste path parameters



- ➔ The following dialog is displayed:

Fig. 69: Pad size parameters



- Enter the minimum pad size of the pad in µm.
- Select a dispense tool.



If the desired dispense tool is not in the list, you can create it in the tool library.

Note

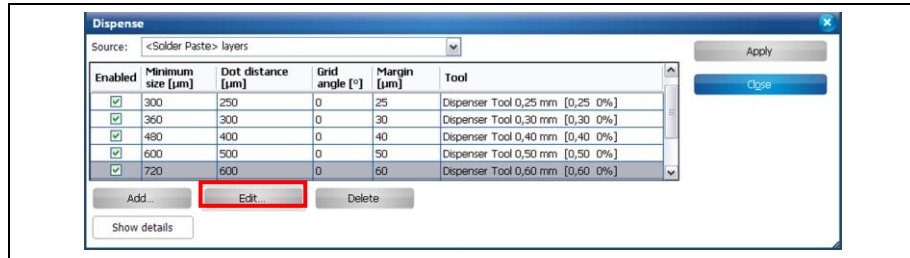
For more information on adding tools to the tool library see the corresponding chapter.

- Enter the dot distance between the individual solder paste dots in µm.
- Enter a grid angle if necessary.
- Enter the margin width.
- Click on [OK].
- The new pad size parameters are displayed in the list.
 - The new pad size parameters are added.

■ Editing existing pad size parameters

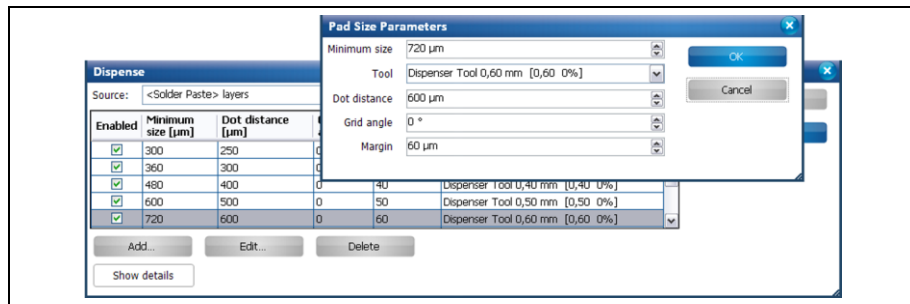
1. Select the row where you want to edit the parameters and click on [Edit...].

Fig. 70: Editing pad size parameters



- ➔ The dialog “Pad size parameters” with the details on pad size is displayed:

Fig. 71: Pad size parameters



2. Modify the parameters as desired.

3. Click on [OK].

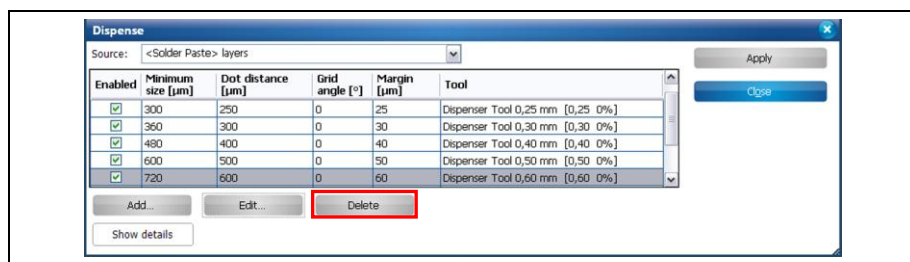
- ➔ The dialog “Pad size parameters” is closed.

- ◆ The existing pad size parameters are modified.

■ Deleting existing pad size parameters

1. Select the row that you want to delete and click on [Delete].

Fig. 72: Deleting pad size parameters

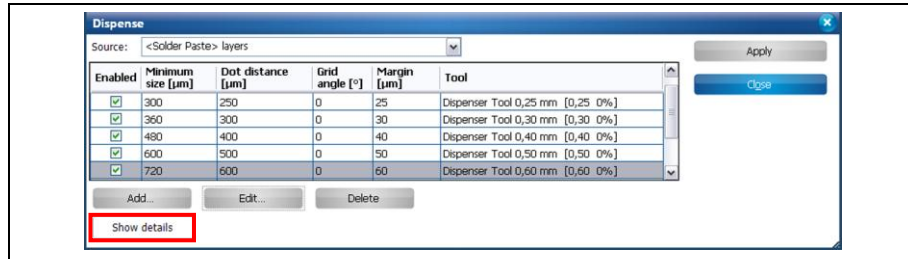


- ◆ The selected row of existing pad size parameters is deleted.

■ Showing details

1. Click on [Show details] to display the global settings for creating solder paste dots:

Fig. 73: Show details



- ➔ The view changes as follows:

Fig. 74: Details

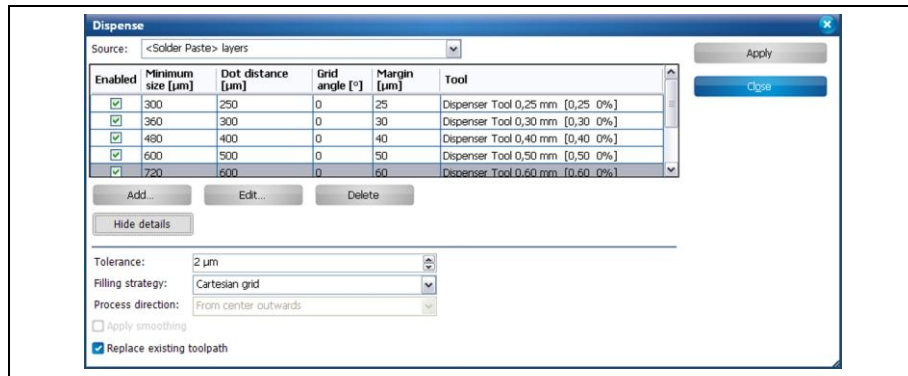


Table 32: Global settings

Function	Description
Tolerance [µm]	Defines the tolerance used when checking the distance of the solder dot to the pad boundary.
Filling strategy	If a pad is filled with more than one solder dot, the solder dots can be placed based on three filling strategies: <ul style="list-style-type: none"> • Cartesian grid • Hexagonal grid • Concentric
Process direction	Defines whether the pads are filled with solder paste "From center outwards" or "From boundary inwards". Filling "From center outwards" is only available if you have selected the "Concentric" filling strategy.
Apply smoothing	This option is only active if you have selected the "Concentric" filling strategy. The solder paste dots are dispensed uniformly.
Replace existing toolpath	Replaces the existing solder paste path by the newly created solder paste path in the CAM view. If the option is deactivated, the new solder paste path is created over the existing one.

2. Modify the parameters if necessary.
 3. Click on [Apply].
- ➔ The changes are stored.



Changes made in these fields are valid for all dispense tools.

Note

4. Click on [Close].
- ➔ The dialog is closed.
◆ The details were shown.

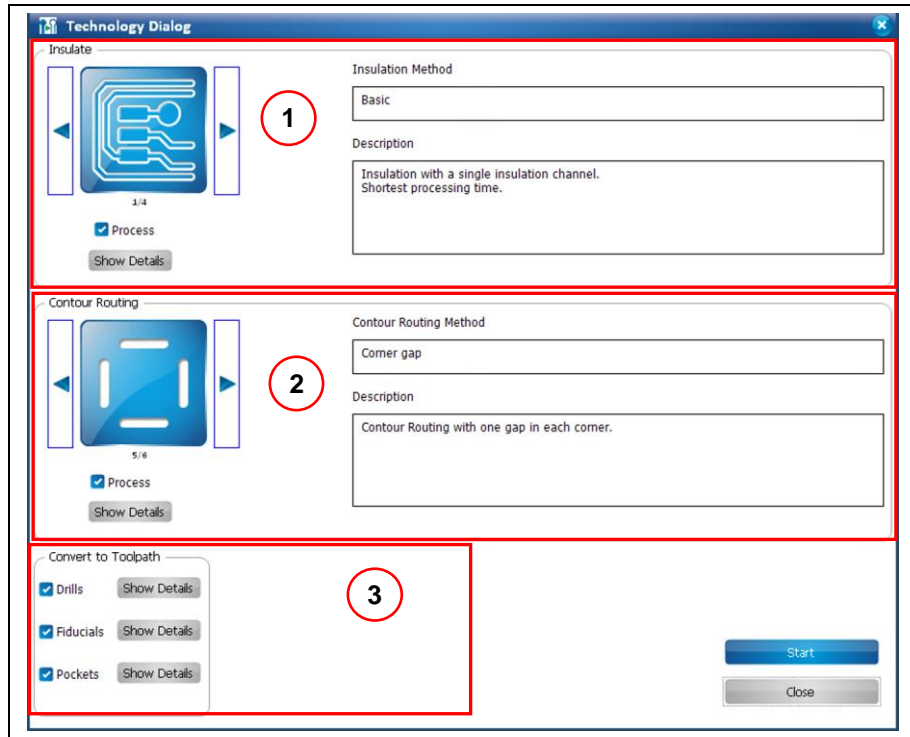
4.5.4.3 Technology Dialog

The technology dialog lets you create toolpaths that you can use in processing for the following steps:

- Insulate
 - Contour routing
 - Drilling holes
 - Drilling fiducials
 - Milling pockets
 - Creating toolpaths
1. Click on Toolpath > Technology dialog.

➔ The following dialog is displayed:

Fig. 75:
Technology
dialog



/1/ Insulation options

/2/ Contour routing options

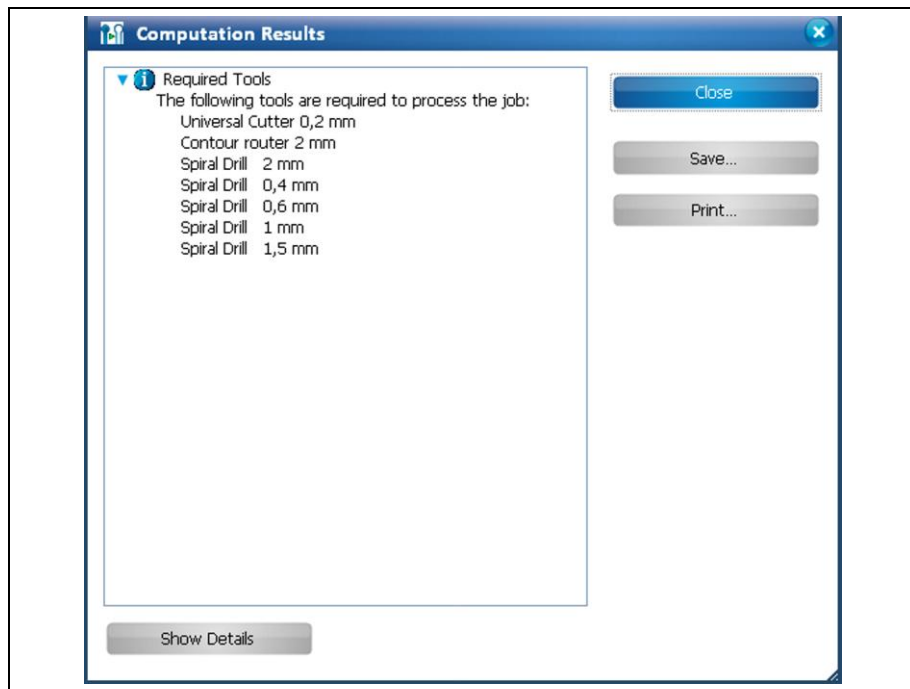
/3/ Options for creating holes, fiducials
and pockets

2. Activate the functions with check marks.

3. Click on [Start].

➔ The following message is displayed:

Fig. 76:
Computation
results





Note

The work steps and results of creating the toolpaths are listed in this dialog. If necessary, you can save or print its contents.

4. Click on [Close] in the dialog.
- The dialog with the computation results of the technology dialog is closed.
 - ◆ The toolpaths are created.

Insulate

The “Insulate” section offers four different insulation methods:

- **Basic:** Insulation with a single insulation channel and the shortest processing time.
- **Basic, pads double:** Insulation with a single insulation channel and a double insulation channel for pads. Processing take a little more time than the “Basic” method.
- **Partial rubout:** Insulation with a single insulation channel and removal of copper in defined areas.
- **Complete rubout:** Entire removal of unnecessary copper. This is the most precise insulation method.

Fig. 77: Insulate

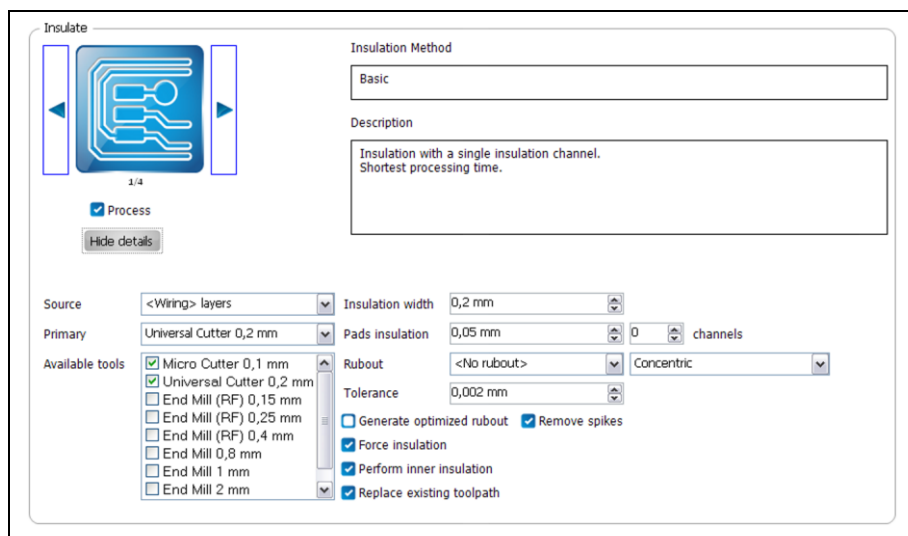


Table 33: Insulate

Function	Description
Source	Defines the layers where the insulation will be created.
Primary	Shows the tool that is used as primary tool for the insulation process.
Available tools	This list contains the tools that are used as default for creating the individual toolpaths.
Insulation width	Defines the width of the insulation channel in mm.
Pads insulation	Defines the width of the pads insulation if an insulation method with an extra pads insulation is selected.
Rubout	Defines whether and on which layer a rubout is performed. In addition, you can select how the rubout area is going to be processed.
Tolerance	Defines the tolerance used for computing and checking the positions and distances of the toolpaths.
Generate optimized rubout	Optimizes the toolpaths for rubout areas with regard to the number of tools used.

Table 33: Insulate

Function	Description
Remove Spikes	Automatically remove residual copper that remains as spikes (e.g. between two connecting conductive tracks). This prevents that the copper in these areas is pulled off unintentionally by the cleaning pad during the final cleaning process.
Force insulation	Creates insulation paths for each individual insulation object. This guarantees insulation of every object even if the distance between two objects is smaller than the tool diameter.
Perform inner insulation	Defines for closed paths whether the inner contour is to be insulated in addition to the outer one.
Replace existing toolpath	If a toolpath already exists, it is replaced by the newly created one.

Contour Routing

The “Contour Routing” section offers six different routing methods:

- **Basic:** Contour routing without gaps
- **Horizontal gaps:** Contour routing with gaps on front and rear side.
- **Vertical gaps:** Contour routing with gaps on left and right side
- **Edge gaps:** Contour routing with one gap on each edge
- **Corner gaps:** Contour routing with one gap in each corner
- **Equidistant gaps:** Contour routing with equally spaced gaps

Fig. 78: Contour Routing

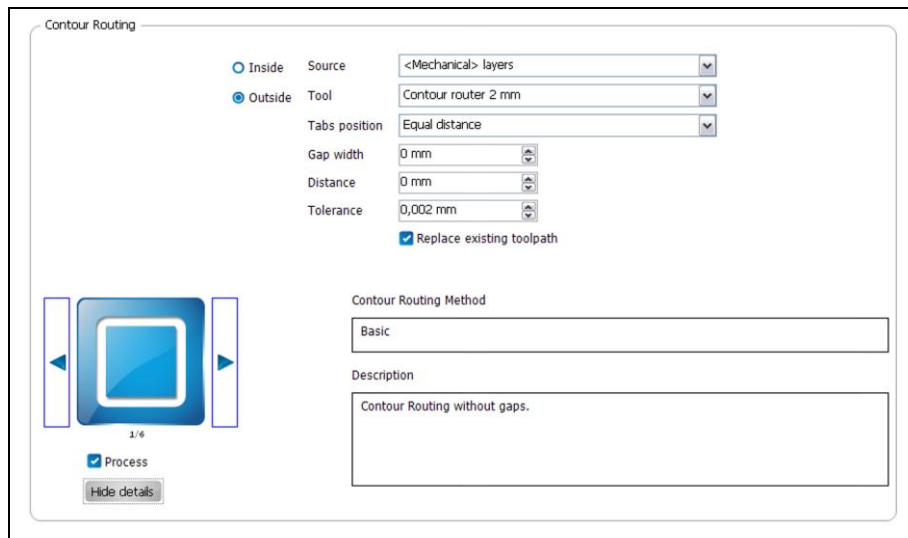


Table 34: Contour Routing

Function	Description
Inside	The toolpath is inside the drawn BoardOutline.
Outside	The toolpath is outside the drawn BoardOutline.
Source	Defines the layer(s) where the contour will be routed.
Tool	Defines the tool used for contour routing.
Tabs position	Defines the positions of the tabs, i.e. gaps in the routing.
Gap width	Defines the width of the tabs in mm.
Distance	Defines the distance of the tabs in mm. This value is only used in the “Equidistant gaps” routing method.
Tolerance	Defines the tolerance used for computing and checking the positions and distances of the toolpaths.
Replace existing toolpath	If a toolpath already exists, it is replaced by the newly created one.

Drills

The “Drills” options are for creating the toolpaths for holes in the circuit board.

Fig. 79: Drills

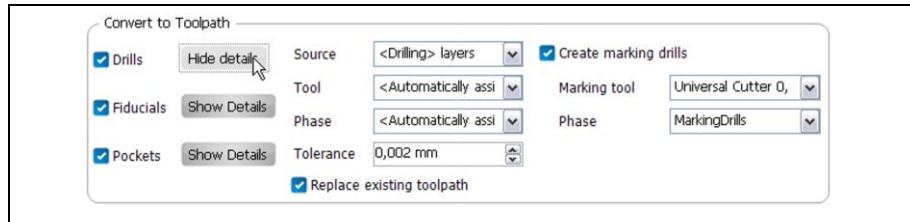


Table 35: Drills

Function	Description
Source	Defines the layer used for creating the holes.
Tool	Defines the tool used for drilling. → Usually, the tools are assigned to the holes automatically according to their diameters.
Assign to Phase	Defines the phase where the hole is created. → Usually, the holes are created in the phases “DrillingPlated” and “DrillingUnplated”.
Tolerance	Defines the tolerance used for computing and checking the positions and distances of the toolpaths.
Replace existing toolpath	If a toolpath already exists, it is replaced by the newly created one.
Create marking drills	
Marking tool	Defines the tool used for marking.
Phase	Defines the phase where the markings are created. → Usually, the markings are created in the phase “MarkingDrills”.

Fiducials

The “Fiducials” options are for creating the toolpaths for fiducial holes in the circuit board. The fiducials are used for correct alignment of the circuit board after it has been turned over for example.

Fig. 80: Fiducials

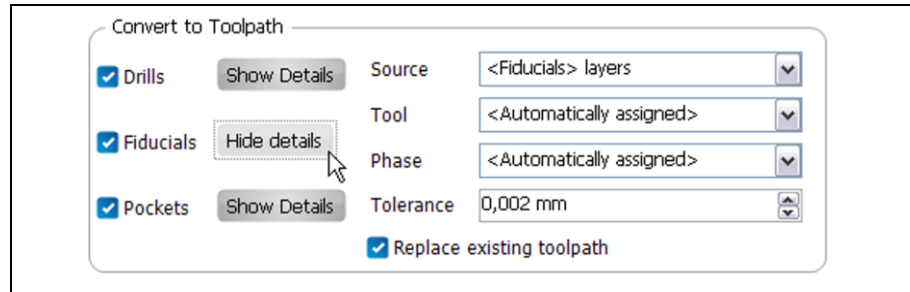


Table 36:
Fiducials

Function	Description
Source	Defines the layer used for creating the fiducials.
Tool	Defines the tool used for creating the fiducials. → The tool “Spiral Drill 1.5mm” is automatically used for creating the fiducials.
Assign to Phase	Defines the phase where the fiducials are created. → Usually, the fiducials are created in the phase “Drill Fiducial”.
Tolerance	Defines the tolerance used for computing and checking the positions and distances of the toolpaths.
Replace existing toolpath	If a toolpath already exists, it is replaced by the newly created one.

Pockets

The “Pockets” options are for creating the toolpaths for pockets in the circuit board.

Fig. 81: Pockets

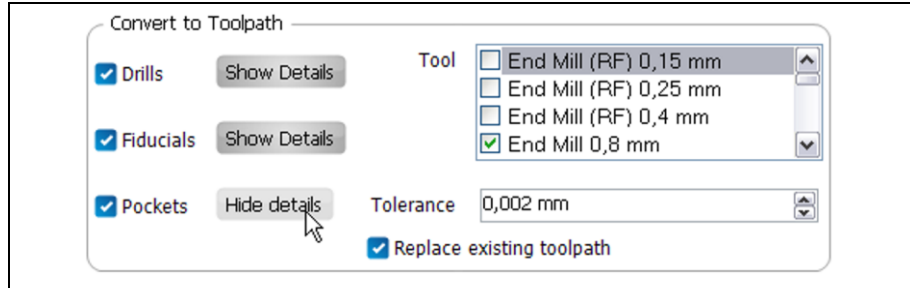


Table 37: Pockets

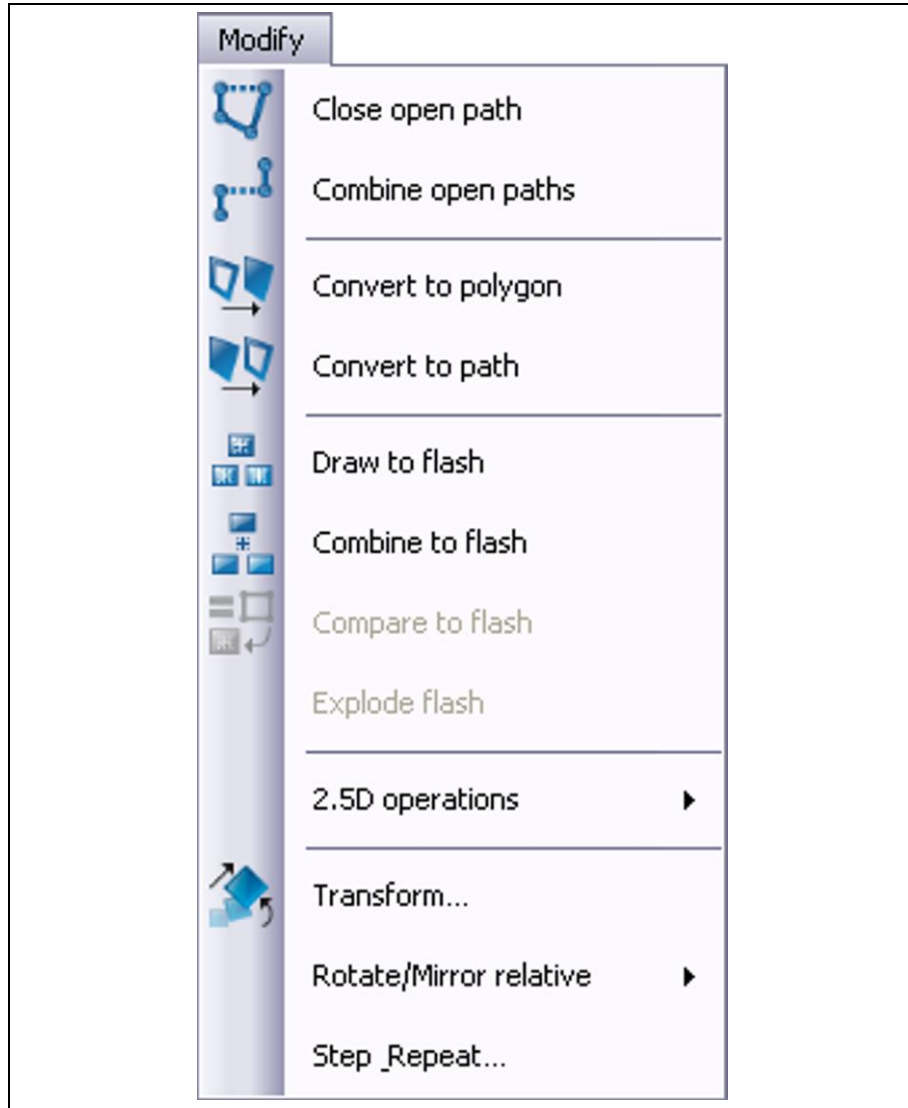
Function	Description
Tool	Defines the tool used for milling the pockets.
Tolerance	Defines the tolerance used for computing and checking the positions and distances of the toolpaths.
Replace existing toolpath	If a toolpath already exists, it is replaced by the newly created one.

4.5.5 Menu Modify

The “Modify” contains the functions to edit geometrical objects.

Click on the “Modify” menu item to open the submenu:

Fig. 82: Menu
"Modify"



The following table contains short descriptions of the functions of the individual menu items:

Table 38:
"Modify" menu
functions

Menu item	Description
Close open path	Closes an open path.
Combine open paths	Combines several open paths to a single open path.
Convert to polygon	Converts a closed path into a polygon.
Convert to path	Converts a polygon into a closed path.
Draw to flash	Converts a drawn object into a flash object and creates a new aperture.
Combine to flash	Combines objects to a flash object and creates a new aperture.
Compare to flash	Converts all objects that have the same form and size and are on the same as the selected

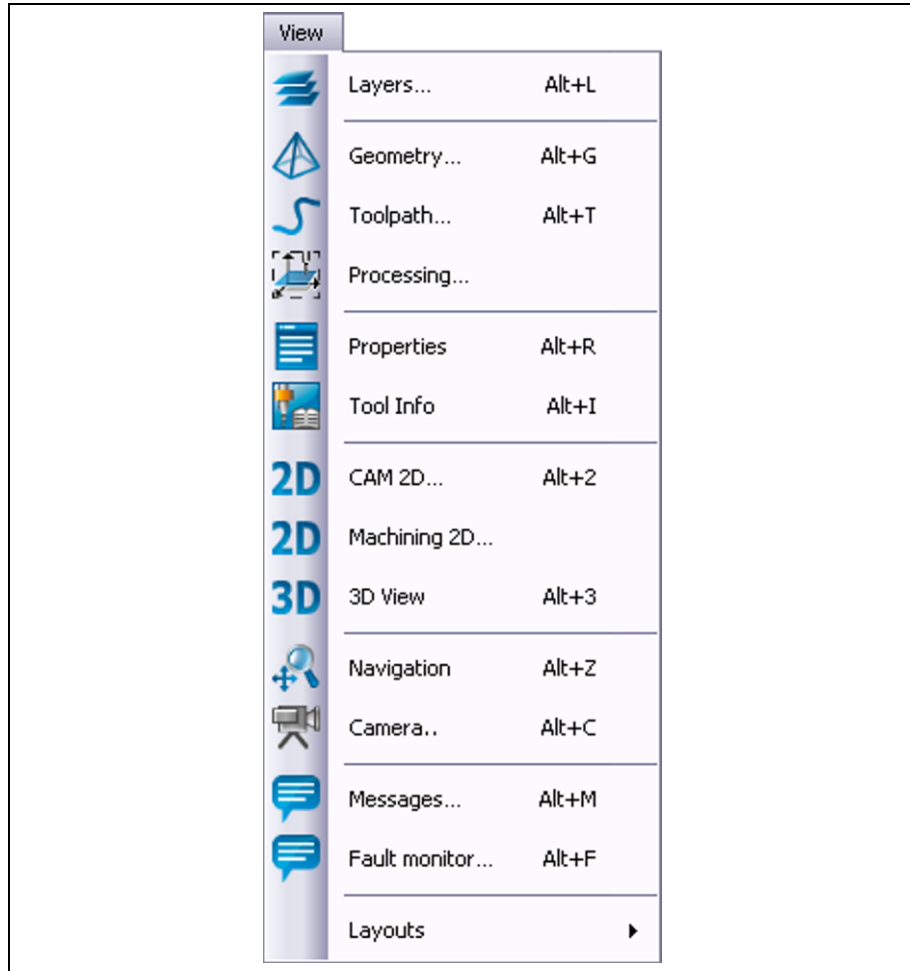
Table 38:
"Modify" menu
functions

Menu item	Description
	flash object.
Explode flash	Explodes complex flash objects into individual geometric forms.
2.5D operations	Opens the 2.5D operations sub-menu. Convert to 2.5D: This menu item applies a Z value to 2D objects thus converting them to 2.5D objects. Change Z value: This menu item allows you to change the Z value of a 2.5D object.
Transform...	Opens a dialog to translate, rotate, scale and invert objects.
Rotate/Mirror relative	Opens the Rotate/Mirror sub-menu. <ul style="list-style-type: none"> • Rotate 90° • Rotate 180° • Rotate 270° • Mirror X • Mirror Y
Step Repeat...	Opens a dialog to multiply the selected objects with a defined spacing and count in X and/or Y direction.

4.5.6 Menu View

The menu "View" allows you to show/hide the different panes and open the layouts.

Click on the "View" menu item to open the submenu:

Fig. 83: Menu
"View"


The following table provides a brief description of the menu item's functions:

 Table 39:
Menu
functions
"View"

Menu item	Description	Fore more information, see chapter "Pane"
Layers...	Shows/hides the pane "Layers".	4.4.1 Layers, on page 36
Geometry...	Shows/hides the pane "Geometry".	4.4.2 Geometry, on page 37
Toolpath...	Shows/hides the pane "Toolpath".	4.4.3 Toolpath, on page 37
Processing...	Shows/hides the pane "Processing".	4.4.4 Processing, on page 38
Properties	Shows/hides the pane "Properties".	4.4.5 Properties, on page 41
Tool info	Shows/hides the pane "Tool info".	4.4.6 Tool Info, on page 41
CAM 2D...	Opens the view "CAM 2D".	
Machining 2D...	Opens the view "Machining 2D".	
3D View	Opens the view "3D View".	
Navigation	Shows/hides the pane "Navigation".	4.4.7 Navigation, on page 42
Camera...	Shows/hides the pane "Camera".	4.4.8 Camera on page 43
Messages...	Shows/hides the pane "Messages".	4.4.9 Messages, on page 44
Fault monitor...	Shows/hides the pane "Fault	4.4.10 Fault Monitor, on page

Table 39:
Menu
functions

Menu item	Description	Fore more information, see chapter "Pane"
	Monitor".	45
Layouts	Opens the sub menu "Layouts".	

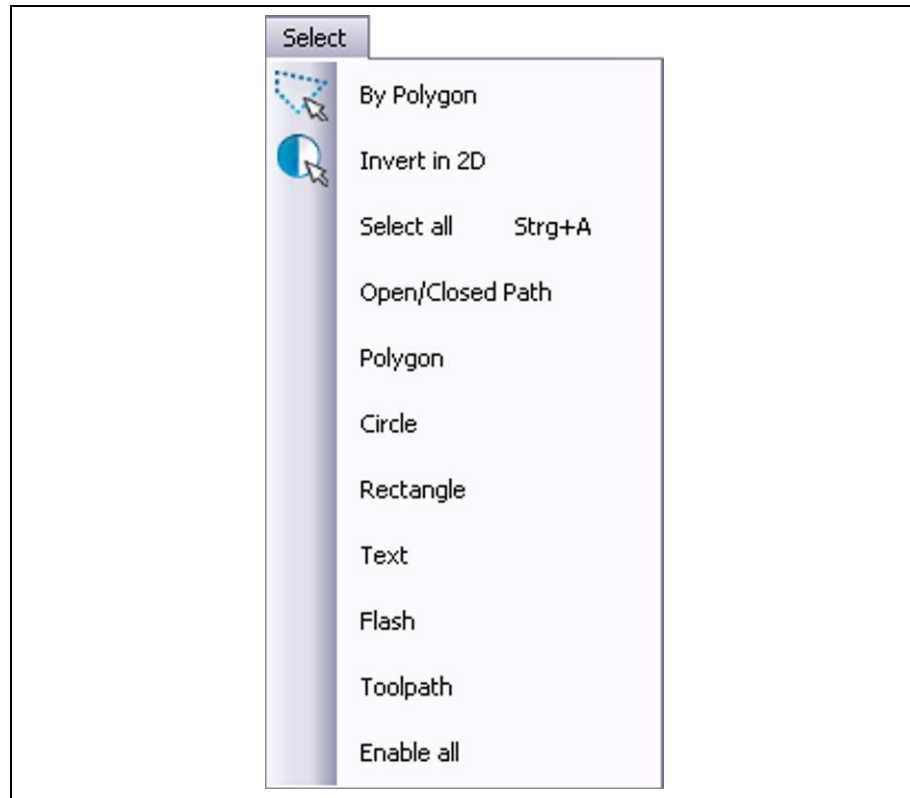
You find more information about the details of the different submenus in the corresponding topics of the chapter "XY".

4.5.7 Menu Select

The menu "Select" allows you to define the elements on the object which should be selected/highlighted by the mouse.

Click on the "Select" menu item to open the submenu:

Fig. 84: Menu
"Select"



The following table provides a brief description of the menu item's functions:

Table 40: Menu
functions
"Select"

Menu item	Description
By Polygon	Enable this option to create polygons by using your mouse and to select objects within the polygon.
Invert in 2D	Enable this option to invert your selection in the CAM View.
Select all	Selects all objects.
Open/Closed path	Selects open/closed path objects.
Polygon	Selects polygons.

Table 40: Menu functions "Select"

Menu item	Description
Circle	Selects circles.
Rectangle	Selects rectangles.
Text	Selects text objects.
Flash	Selects flash objects.
Toolpath	Selects toolpaths.
Enable all	Enables selection of all objects.

4.5.8 Menu Wizards

This menu contains several wizards to help you in PCB manufacturing. Click on the "Wizards" menu item to open the submenu:

Fig. 85: Menu "Wizards"



The following table provides a brief description of the menu item's functions:

Table 41: Menu functions

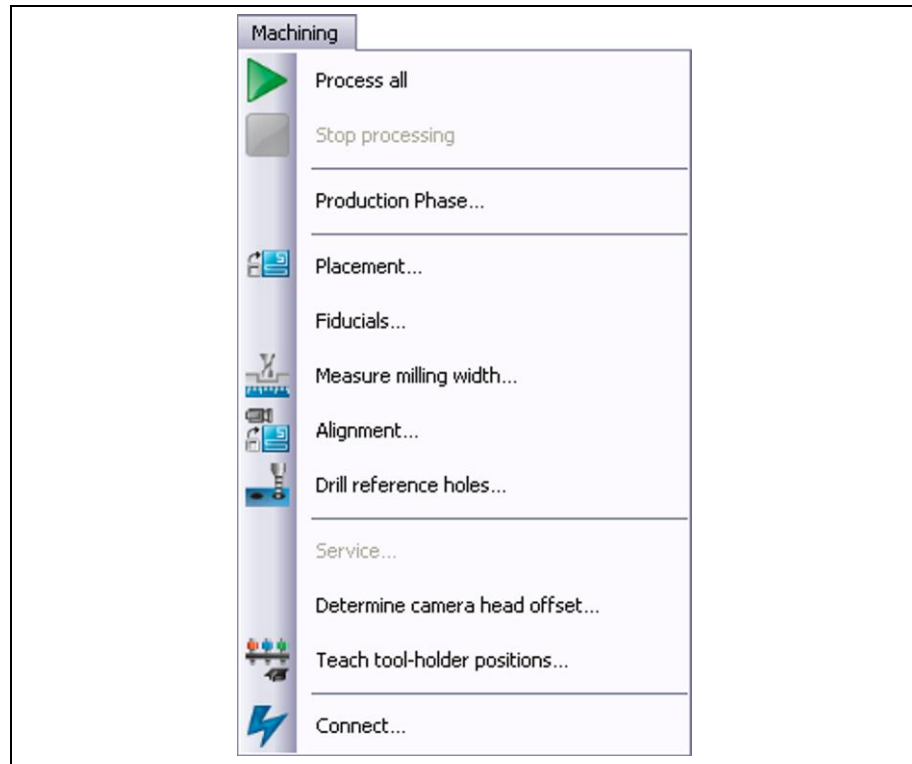
Menu item	Description
Equipment configuration wizard...	Use the Equipment configuration wizard to define the existing equipment for the manufacturing of PCBs.
Process planning wizard...	Use this wizard to set the properties of the prototype project (for example: double sided with through plating).
Board Production Wizard...	This wizard guides you through every step of the PCB manufacturing.
Dispense preparation wizard...	Starts a wizard, which guides through the preparation of a dispense process.
Dispense process wizard...	Starts a wizard, which guides through a dispense process.

4.5.9 Menu Machining

The menu “Machining” allows you to start/stop the processing and to make settings for the PCB processing.

Click on the “Machining” menu item to open the submenu:

Fig. 86: Menu “Processing”



The following table provides a brief description of the menu item’s functions:

Tab. 42: Menu functions “Machining”

Menu item	Description
Process all	Starts the production.
Stop processing	Stops the production.
Production phase...	Opens the dialog “Create new phase”. Then you can create a new production phase.
Placement...	Opens the dialog “Placement”.
Fiducials...	Inserts fiducials as toolpath in the machining view.
Measure milling width...	Only with conical surface milling tools: the current milling width is measured.
Alignment...	Opens the dialog “Alignment”.
Drill reference holes...	Opens the dialog “Drill reference holes”.
Service...	Access to service functions for service staff.
Determine camera head offset...	Starts a dialog, which guides you through the procedure to determine the camera head offset.
Teach tool-holder	Measures the tool position by camera.

Tab. 42: Menu functions "Machining"

Menu item	Description
positions...	
Connect...	Opens the dialog "Connect...". CircuitPro is connecting the machine.

4.5.9.1 Placement

Use "Placement" to move and/or multiply the processing data in the Machining view of CircuitPro.

Click on Machining > Placement to open the dialog.

The section "Relative translation" lets you move the whole circuit board design within the machining view.

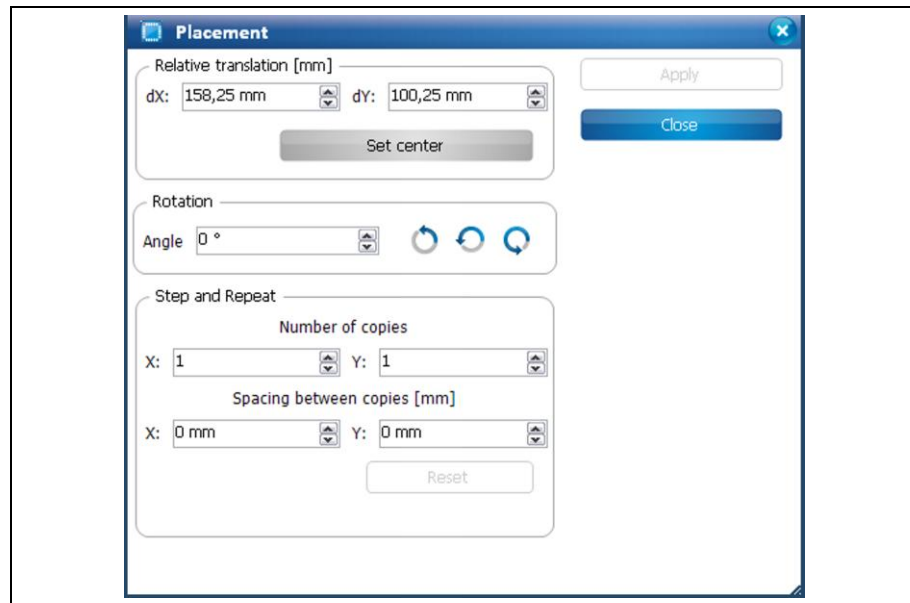


Note

Please note that you can move the processing data only as a whole and not individual toolpaths etc.

The "Step and Repeat" section lets you multiply the circuit board design as desired in X and Y direction with a defined step distance. Thus you can produce several circuits on one panel.

Fig. 87: Placement



- Moving the processing data (relative translation)
 1. Enter a dX value.
 2. Enter a dY value.
 3. Click on [Apply].



Tip

Procedure without entering X and Y values

You can also move the processing data in the Machining view using your mouse.

To do this, click on the processing data and while pressing the left mouse button drag the circuit frame to the position where you want to place the circuit design.

- ➔ The circuit board data are placed at the corresponding position.



Note

If you want to move the processing data to the center of the working area, click on [Set center].

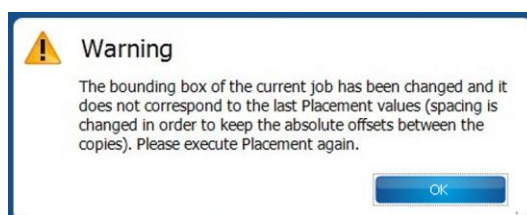
4. Click on [Close].
 - ◆ The processing data are moved.
- Rotating the processing data
 1. Enter the angle in the field \Angle\.
 2. Click on the buttons beside to rotate the processing data in the desired direction.
 - ◆ The processing data was rotated.
 - Multiplying the processing data
 1. Enter the number of circuits that are to be produced in X and Y direction.
 2. Enter the step distance of the circuits in X and Y direction.
 3. Click on [Apply].
 - ➔ The circuits are created according to the values entered.
 - 4. Click on [Close].
 - ◆ The processing data are multiplied.



Note

If you apply changes in the technology dialog that modify the bounding box of the current job (e.g. deactivating the contour routing or the fiducials) after having multiplied the circuit, you can adjust the job to the original placement values.

The following warning is displayed if the toolpaths are recomputed in the technology dialog prompting you to execute the placement again.



→ Click on [Reset] in the placement dialog. The current design is adjusted to the original placement values.

4.5.9.2 Fiducials

Using the function "Fiducials," you can set the optical markings in the machining view of CircuitPro. These fiducials are only inserted into the layout as toolpaths and are not present as geometrical objects. This means that in the CAM view of CircuitPro, the fiducials which were created by this function are not displayed.



Note

In order to be able to perform this function, you must first generate the toolpaths so that the layout can be displayed in the machining view.

Using the function "Fiducials" you can

- set the fiducials in the machining view,
- process the fiducials in the machining view and
- delete the fiducials in the machine view.

■ Inserting fiducials



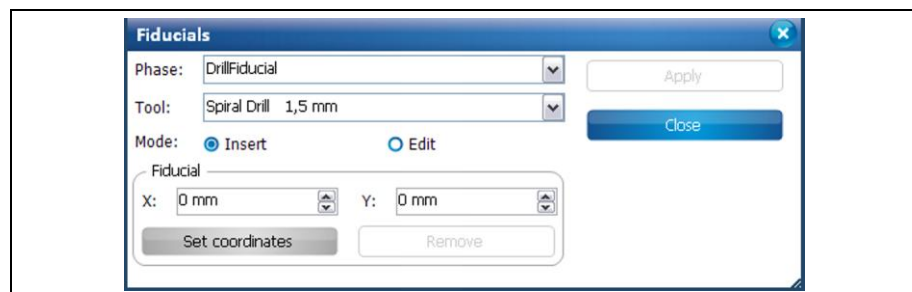
Tip

Ideally, set four fiducials in order to align the top and bottom side to each other.

However, you can also work with two fiducials. In this case, these should be diagonally aligned to one another.

1. Click on Machining > Fiducials...
- ➔ The machining view of CircuitPro is activated.
- ➔ The following dialog is displayed:

Fig. 88: Fiducials



2. Select the processing phase in the field \Phase\, in which the fiducials are to be generated.
3. Select the drilling tool in the field \Tool\ for generating the fiducials.
4. If not active, activate the mode {Insert}.

5. Enter the X and Y coordinates of the fiducials and click on [Set coordinates].
- Or
5. Using your mouse, on the machining view, click where you would like to place the fiducials.
- ➔ The fiducial is inserted in the appropriate position in the machining view.



Note

Editing the coordinates of the fiducials

If you would like to change the coordinates of a fiducial, proceed as follows:

1. Activate the mode "Edit".
→ The coordinates of the last fiducial set are shown.
 2. Change the coordinates and click on [Set coordinates].
or
 2. Select the fiducial and move this to the desired position in the machining view.
→ The coordinates have been edited.
-



Note

Delete fiducial

If you would like to delete a fiducial, proceed as follows:

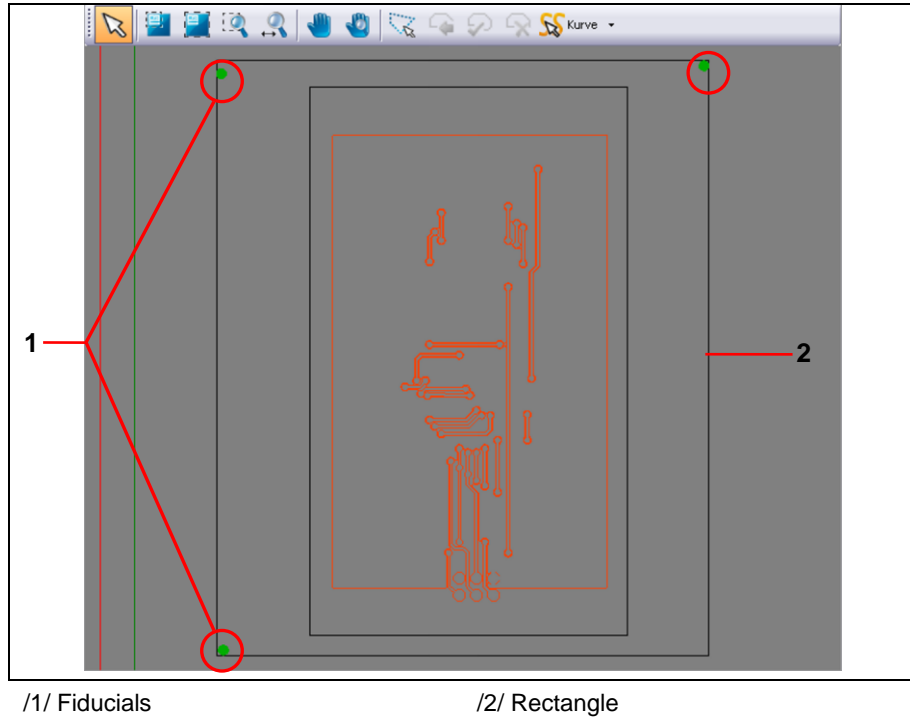
1. Activate the mode "Edit".
→ The coordinates of the last fiducial set are shown.
2. Select the fiducial to be deleted.
3. Click on [Remove].

!!! If you have deleted the coordinates of the fiducial, the coordinates of the fiducial set previously are shown automatically!!!

→ The fiducial has been deleted.

6. Please repeat step 5 until you have generated the desired number of fiducials.
- ➔ A rectangle, which highlights the position of the fiducials, is created around the layout:

Fig. 89: Fiducial marks in the machining view.



7. Click on [Close].

- ➔ The dialog is closed.
- ◆ The fiducials were inserted.

4.5.9.3 Alignment (only if camera is present)

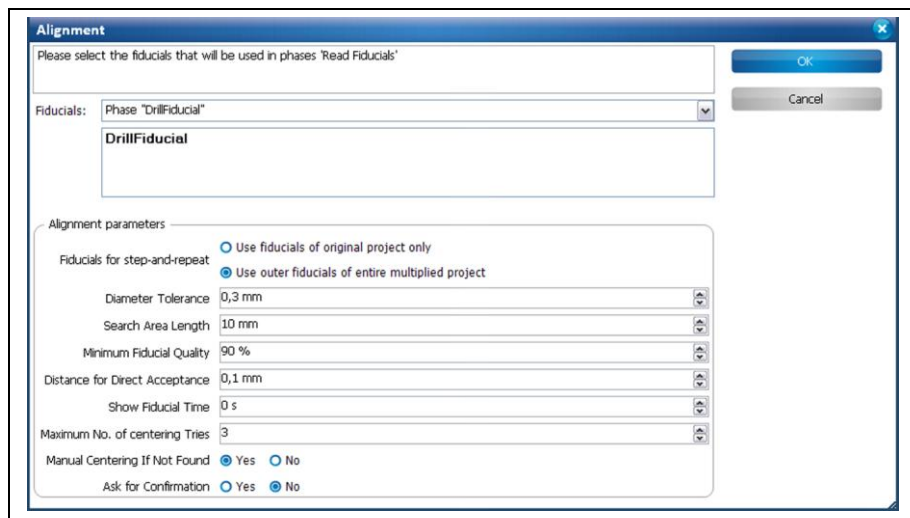
The dialog “Alignment” allows you modify the settings for the “ReadFiducials” phase.

- Modifying the settings for phase “ReadFiducials”

1. Click on Machining > Alignment.

- ➔ The following dialog is displayed:

Fig. 90: Alignment



2. Select the existing fiducials in the design that are to be used in the “DrillFiducials” phase.
3. Modify the individual parameters for the “ReadFiducials” phase as necessary.

Table 43:
Alignment

Option	Description
Fiducials for step-and-repeat	Use fiducials of original project only: If the circuit board is multiplied with “Step and repeat” the fiducials are multiplied as well. Use outer fiducials of entire multiplied project: If the circuit board is multiplied with “Step and repeat” the fiducials are not multiplied.
Diameter Tolerance	Defines the tolerance for the diameter of the fiducial.
Search Area Length	Defines the size of the search area.
Minimum Fiducial Quality	Defines the quality level that a found fiducial must meet in order to be centered.
Distance for Direct Acceptance	Defines how precisely the fiducial must be centered in the camera image.
Show Fiducial Time	Defines the time that the camera remains on a found fiducial before continuing the process.
Maximum No. of centering Tries	Defines the maximum number of tries to center a found fiducial in the camera image.
Manual Centering If Not Found	If no fiducial is found, a dialog for manual centering is displayed.
Ask for Confirmation	After finding and centering a fiducial, the fiducial must be confirmed.

4. Modify the settings as desired.
5. Click on [OK].
- ◆ The settings for the “ReadFiducials” phase are applied.

4.5.9.4 Drill reference holes

Use “Drill reference holes” to drill the holes for the reference pins.



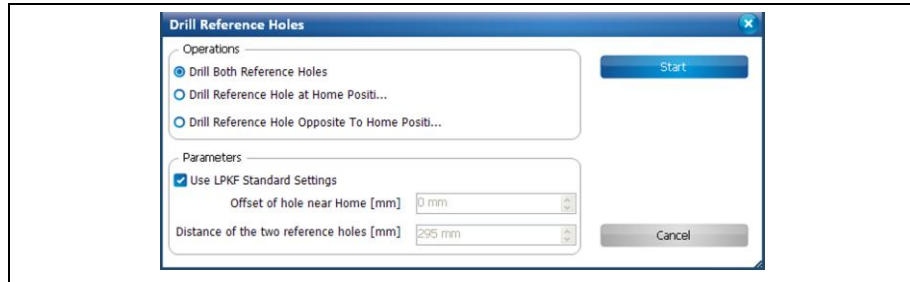
Note

The reference hole system can be used for aligning the board if no camera is available.

The reference hole system is not used if a vacuum table is mounted.

Click on Machining > Drill reference holes to open following dialog:

Fig. 91: Drill reference holes



There are three options for drilling reference holes to choose from:

- **Drill Both Reference Holes:** One reference hole is drilled at the home position and one opposite to the home position.
- **Drill Reference Hole at Home Position:** A reference hole is drilled at the home position.
- **Drill Reference Hole Opposite To Home Position:** A reference hole is drilled at the position opposite to the home position.

■ Drilling reference holes

1. Select the desired option for drilling the reference holes in the “Operations” section.



Note

The “Parameters” section contains LPKF standard settings. These settings are activated by default. If you want to use different values, remove the check mark at <Use LPKF Standard Settings>.

2. Enter the offset value and the distance between the reference holes in the “Parameters” section if necessary.
 3. Click on [Start].
- ➔ The milling head moves to the corresponding position(s) and drills the reference hole(s).



Note

The reference holes are drilled using a Spiral Drill 2.95 mm. This tool must be present in the tool magazine or, in case of machines without tool magazine, must be inserted manually into the clamp (when prompted).

- ◆ The reference holes are drilled.

4.5.9.5 Connect

The menu item “Connect” allows the following operations:

- Connect CircuitPro with an LPKF ProtoMat machine [Connect].
- Disconnect CircuitPro from the LPKF ProtoMat machine [Disconnect].
- If CircuitPro is currently connected to an LPKF ProtoMat machine: Select a different machine type [Switch To].



Note

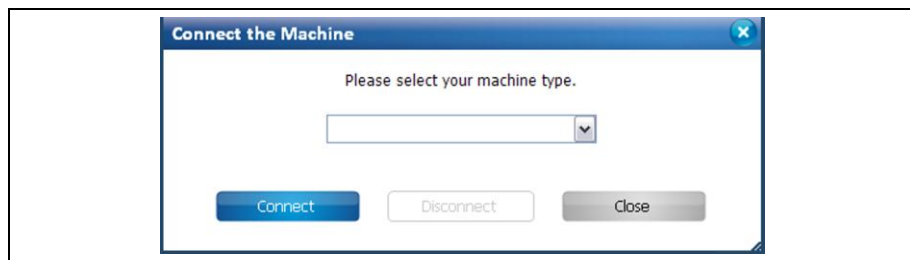
This step is only necessary if you switch on the ProtoMat machine after starting CircuitPro
or
if you want to connect CircuitPro to a ProtoMat machine that differs from the one configured previously.

- Connecting CircuitPro with an LPKF ProtoMat machine

1. Click on Machining > Connect...

➔ The following dialog is displayed:

Fig. 92: Connect the machine



2. Select your machine type in the drop-down list.



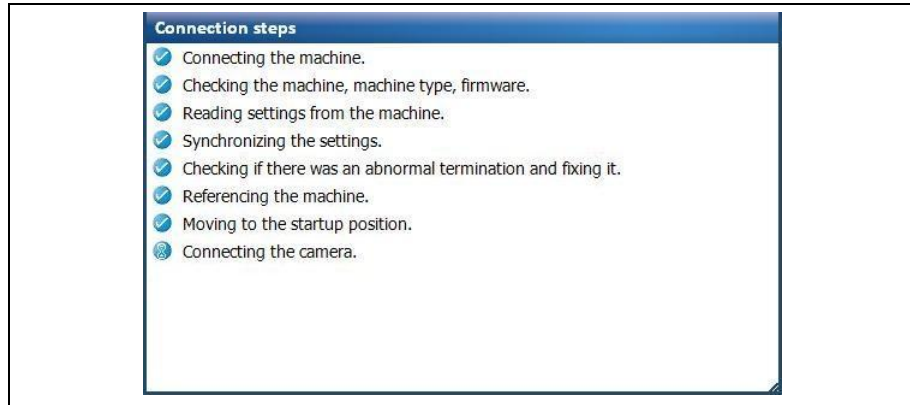
Tip

CircuitPro provides a virtual machine for simulating processes. You can connect CircuitPro to the virtual machine at any time, even when no real machine is connected to the PC.

3. Click on [Connect].

➔ The following message window is displayed:

Fig. 93:
Connection steps



- ◆ CircuitPro is connected to the ProtoMat machine.
- Disconnecting CircuitPro from the LPKF ProtoMat machine
 1. Click on Machining > Connect...
 2. Click on [Disconnect].
- ◆ CircuitPro is disconnected from the LPKF ProtoMat machine.
- Switching CircuitPro to a different LPKF ProtoMat machine
 1. Select the machine type in the drop-down list.
 2. Click on [Switch To].
- ➔ The message window for the connection steps is displayed.
- ◆ The connection of CircuitPro is switched to the other machine.

4.5.10 Menu Camera

The menu “Camera” allows you to change the settings of the camera.
Click on the “Camera” menu item to open the submenu:

Fig. 94: Menu
“Camera”



The following table provides a brief description of the menu item’s functions:

Tab. 44: Menu

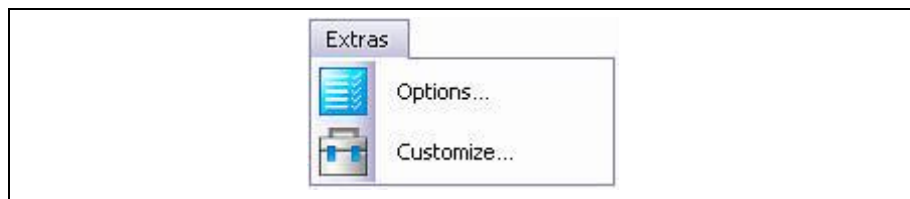
Menu item	Description

functions "Camera"	Options	Opens the submenu "Options".
	Actions	Opens the submenu "Actions".
	Movement	Opens the submenu "Movement".
	Overlay	Opens the submenu "Overlay".
	Search	Opens the submenu "Search".

4.5.11 Menu Extras

The menu "Extras" allows you to change the program settings.
Click on the "Extras" menu item to open the submenu:

Fig. 95: Menu "Extras"



The following table provides a brief description of the menu item's functions:

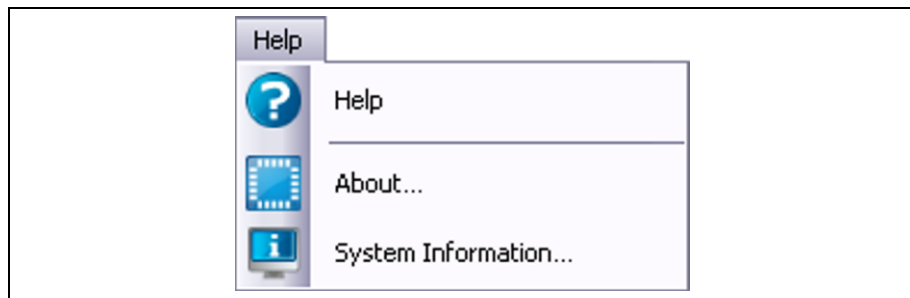
Table 45: Menu functions "Extras"

Menu item	Description
Options...	Opens the dialog "Options".
Customize...	Opens the dialog "Customize".

4.5.12 Menu Help

The menu "Help" provides information about the current software version.
Click on the "Help" menu item to open the submenu:

Fig. 96: Menu "Help"



The following table provides a brief description of the menu item's functions:

Table 46: Menu functions "Help"

Menu item	Description
Help	Opens the CircuitPro compendium.
About...	Opens the dialog "About this program" that contains information about CircuitPro.
System information...	Contains information about the computer CircuitPro is installed on.

5 Appendix

5.1 List of figures

Fig. 1: LPKF CircuitPro	7
Fig. 2: Installation and update information.....	12
Fig. 3: LPKF setup wizard.....	12
Fig. 4: License agreement	13
Fig. 5: Choosing the installation folder	13
Fig. 6: Confirm installation	14
Fig. 7: Installation of CircuitPro 1.5.....	14
Fig. 8: Warning message.....	14
Fig. 9: Installation complete	15
Fig. 10: Start-up screen "Equipment configuration wizard"	16
Fig. 11: New document.....	17
Fig. 12: CircuitPro splash screen.....	19
Fig. 13: CircuitPro user interface	20
Fig. 14: CAM View	22
Fig. 15: Toolbar CAM view	23
Fig. 16: Machining view E33.....	24
Fig. 17: Machining view S43.....	25
Fig. 18: Machining view S63/S103	26
Fig. 19: Toolbar Machining view.....	27
Fig. 20: Toolbar 3D view.....	29
Fig. 21: Toolbars.....	30
Fig. 22: Toolbar „Modify“	33
Fig. 23: Toolbar "Prototyping"	34
Fig. 24: Pane "Geometry"	37
Fig. 25: Pane "Camera"	43
Fig. 26: Pane "Messages".....	44
Fig. 27: Menu bar CircuitPro.....	46
Fig. 28: Menu "File".....	47
Fig. 29: Menu "Edit"	49
Fig. 30: Material properties	51
Fig. 31: Material placement	52
Fig. 32: Pane "Processing"	53
Fig. 33: Autofocus.....	53
Fig. 34: Crosshair of the camera	54
Fig. 35: Message for second position.....	54
Abb. 36: Zur Messposition verfahren.....	55
Fig. 37: Material settings.....	56
Fig. 38: Material settings > coordinates	57
Fig. 39: Material settings > Location.....	57
Fig. 40: Tool magazine icon.....	58

Fig. 41: Tool magazine dialog for E33 and S43	58
Fig. 42: Tool change	59
Fig. 43: Measure Milling Width	59
Fig. 44: Tool magazine icon.....	61
Fig. 45: Tool magazine	61
Fig. 46: Drop-down list of the tool holder.....	62
Fig. 47: Assigning a tool	62
Fig. 48: Tool magazine loaded	63
Fig. 49: Picking up a tool	63
Fig. 50: Message picking up tool	63
Fig. 51: Tool currently in clamp	63
Fig. 52: Putting down a tool	64
Fig. 53: Message tool release	64
Fig. 54: Tool not in clamp	64
Fig. 55: Check box activated	65
Fig. 56: Defining a machine area.....	66
Fig. 57: Warm-up of spindle motor	67
Fig. 58: Machining view with milled line.....	67
Fig. 59: "Camera" pane.....	68
Fig. 60: Measurement results	68
Fig. 61: Replace tool.....	69
Fig. 62: Tool replacement.....	69
Fig. 63: Menu "Insert"	70
Fig. 64: Menu "Toolpath"	71
Fig. 65: Create 2.5D milling	72
Fig. 66: Dispense paths created on pads	74
Fig. 67: Dispense	75
Fig. 68: Adding solder paste path parameters.....	76
Fig. 69: Pad size parameters.....	76
Fig. 70: Editing pad size parameters	77
Fig. 71: Pad size parameters.....	77
Fig. 72: Deleting pad size parameters.....	77
Fig. 73: Show details	78
Fig. 74: Details	78
Fig. 75: Technology dialog	80
Fig. 76: Computation results.....	80
Fig. 77: Insulate	82
Fig. 78: Contour Routing.....	84
Fig. 79: Drills.....	85
Fig. 80: Fiducials.....	86
Fig. 81: Pockets	87
Fig. 82: Menu "Modify"	88
Fig. 83: Menu "View".....	90
Fig. 84: Menu "Select"	91
Fig. 85: Menu "Wizards"	92
Fig. 86: Menu "Processing".....	93
Fig. 87: Placement.....	94

Fig. 88: Fiducials.....	96
Fig. 89: Fiducial marks in the machining view.....	98
Fig. 90: Alignment.....	98
Fig. 91: Drill reference holes.....	100
Fig. 92: Connect the machine.....	101
Fig. 93: Connection steps.....	102
Fig. 94: Menu "Camera".....	102
Fig. 95: Menu "Extras".....	103
Fig. 96: Menu "Help".....	103

5.2 List of tables

Table 1: System requirements.....	11
Table 2: User interface.....	21
Table 3: Toolbar CAM view.....	23
Table 4: Toolbar Machining view.....	27
Table 5: Toolbar 3D view.....	29
Table 7: Function description "Standard".....	31
Table 9: Function description "Insert".....	32
Table 10: Function description "Modify".....	33
Tab. 11: Function description "Prototyping".....	34
Tab. 13: Toolbar "Layout".....	34
Table 15: Columns in the pane "Layers".....	36
Table 18: Processing.....	39
Table 22: Messages.....	44
Table 24: Error monitoring.....	45
Table 25: "File" menu functions.....	48
Table 26: "Edit" menu items.....	50
Table 27: Material placement.....	52
Table 28: "Insert" menu functions.....	70
Table 29: "Toolpath" menu functions.....	71
Table 30: Create 2.5D milling.....	72
Table 31: Dispense.....	75
Table 32: Global settings.....	78
Table 33: Insulate.....	82
Table 34: Contour Routing.....	84
Table 35: Drills.....	85
Table 36: Fiducials.....	86
Table 37: Pockets.....	87
Table 38: "Modify" menu functions.....	88
Table 39: Menu functions "View".....	90
Table 40: Menu functions "Select".....	91
Table 41: Menu functions.....	92
Tab. 42: Menu functions "Machining".....	93
Table 43: Alignment.....	99
Tab. 44: Menu functions "Camera".....	102

Table 45: Menu functions "Extras"	103
Table 46: Menu functions "Help"	103

5.3 Index

- 2,5D
 - Material placement 52
- 2.5D
 - Create milling 72
- 2.5D milling 72
- 3D view
 - activate 89
- alignment 98
- CAM view 22
 - activate 34, 89
 - toolbar 23
- contour routing *see* Technology Dialog
- dispense
 - select head 38
 - tool list 75
- Drills *see* Technology Dialog
- engraving 56
- Equipment configuration wizard 16
- fiducial 86
- fiducial phase "DrillFiducials" 99
- Fiducials 96
- front panel 56
- Geometry
 - aperture list 37
- installation information 11
- insulate *see* Technology Dialog
- layer 36
- machining view
 - activate 34, 89
 - ProtoMat E33 24
 - ProtoMat S43 25
 - ProtoMat S63/S103 26
- Marking drills *see* Technology Dialog
- Material placement 52
- Material properties 51
- material settings 56
- pad size parameters
 - add 76
 - delete 77
 - edit 77
- phase
 - list 37
- placement 94
- pocketing *see* Technology Dialog
- polygon
 - selection 23
- reference hole
 - drill 99
 - reference hole 99
- rubout area 79
- Safety note 9
- setup wizard 11
- solder paste 74
- solder paste dot 74
- solder paste path 74
 - generate 75
- Technology Dialog 79
 - contour routing 84
 - Drills 85
 - insulate 82
 - Marking drills 85
 - pockets 87
- tool change
 - ProtoMat S43/E33 58
- tool holder
 - machining view 26
 - selection list 62
- tool life 60, 69
- tool magazine
 - machining view 26
 - ProtoMat S43/E33 58
 - ProtoMat S63/S103 60
- toolpath 28, 37, 71
 - create *see* Technology Dialog
 - selection mode 23
- work area
 - ProtoMat E33 24
 - ProtoMat S43 25
 - ProtoMat S63/S103 26

