

ProtoMat S64/S104

Basic reference to the detailed
documentation

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	Translation of the German original document

General information

This basic reference contains the basic safety instructions and a selection of the information on the system.

The detailed documentation of this system and further documentation for the used software is supplied in PDF format on the data medium.

This document is intended for persons with basic knowledge of installation and operation of software-controlled systems. General knowledge of operational safety as well as basic knowledge of using PCs running Microsoft Windows® are required.

LPKF Laser & Electronics AG (abbreviated to LPKF in the following) reserves the right to make changes in respect to the content of this document. The figures in this document serve as basic understanding and can differ from the actual state of the system/product.

Structure of warning messages and safety notes

The safety notes and warning messages in this document identify hazards and risks and they are created in accordance with ANSI Z535.6-2011 and the standards series ISO 3864.

The warning messages are structured as follows:

- Warning sign (only for injuries)
- Signal word indicating the danger level
- Type and source of the hazard
- Consequences of non-observance
- Measures to avoid the hazard

+ SIGNAL WORD

Type and source of the hazard!

Consequences of non-observance.

- ▶ Measures to avoid the hazard.
- ▶ Further measure(s) to avoid the hazard.

Warning messages can also be embedded in the format of the surrounding text in order to avoid a *visual disruption* in a sequence. In this case, they are distinguished as follows:

Type and source of the hazard!

Consequences of non-observance.

- ▶ Measure(s) to avoid the hazard.

Warning messages are classified in hazard classes represented by the signal word. In the following, the warning messages are described in accordance to their hazard classes:

DANGER**Type and source of the hazard!**

This warning message indicates a hazard of high risk that causes death or serious injury if not avoided.

- Measure to avoid the hazard.

WARNING**Type and source of the hazard!**

This warning message indicates a hazard of medium risk that can cause death or serious injury if not avoided.

- Measure to avoid the hazard.

CAUTION**Type and source of the hazard!**

This warning message indicates a hazard of low risk that can cause minor or moderate injury if not avoided.

- Measure to avoid the hazard.

NOTICE**Type and source of the hazard!**

These messages contain information on possible property damage that causes no injury.

- Measure to avoid the hazard.

Text styles

Various text attributes, spelling, and text structures facilitate reading the document. The text attributes (highlightings) inside this document are defined as follows:

Attribute	Function
<i>italic</i>	highlighting elements of the user interface and of control elements of the system
bold	highlighting important information and keyboard input
Courier New	highlighting file names and file paths
[]	highlighting buttons of software user interfaces
key	highlighting keys

Tasks or procedures that are described in steps are compiled to sequences in this document. A sequence consists of at least three components: objective, step, and result.

Component	Description
	Indication of an objective. The sequence starts here.
1. 2. 3.	Indication of a sorted list of steps. The specified order must be observed.
	Indication of an intermediate result that is followed by further steps or the result.
	Indication of the result. The sequence is finished.
	Indication of a single step.

Additional information

The following symbols are used to indicate additional information:



This note indicates especially useful information.



Advanced information

This advanced information indicates special knowledge.



This symbol indicates an intermediate result.



This symbol indicates a final result.

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In our continuous effort to improve our documentation we are asking you to give us your feedback if you notice any discrepancy when working with the system/product, or if you have any comments or suggestions for improvement.

At the moment of packaging, the system/product has been equipped with the latest software version and with the software and hardware documentation currently valid. By now, new versions of the documentation as well as new software versions might be available.

For all the latest news and updates visit the support area of our homepage:
<http://www.lpkf.com/support>.

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This document describes systems that resemble each other. ProtoMat S64 and ProtoMat S104 are identically constructed, differing only in a few characteristics. The following always describes **the system**. For comprehensibility and practicability of the instruction steps, it does not matter which of the two systems is described. The characteristics that serve for differentiation are marked clearly in this document.

1 Scope of this basic reference

Please note that this basic reference does not replace the detailed documentation on the data medium.

Read the detailed documentation before working with the system.

Observe the information, instructions and safety instructions in the detailed documentation to ensure a safe and smooth operation of the system.

1.1 Overview of the supplied documentation

The following documentation is supplied in printed form:

Documentation	Description
Basic reference to the detailed documentation	Quick guide for first startup

Table 1: Overview of the printed documentation

The following documentation is supplied on the data medium:

Documentation	Description
Basic reference to the detailed documentation	Quick guide for first startup
User manual ProtoMat S64/S104	Documentation for the ProtoMat S64/S104
CircuitPro PM Compendium	Documentation of the software CircuitPro PM
How-to guide CircuitPro PM	First steps, practical tips and basics of the system software CircuitPro PM
Unpacking instructions	Instructions for unpacking the system

Table 2: Overview of the documentation on the data medium

2 Safety

This chapter provides an overview of all important safety aspects for protecting persons as well as for a safe and fault-free operation of the system/product. There are further warning messages in the sections of the individual lifecycle stages.

2.1 Basic hazards

Always comply with the warning messages listed here and in the individual sections of this documentation to reduce the risks of injuries and property damage and to avoid dangerous situations.

2.1.1 Mechanical hazards

WARNING

Risk of injury by moving components!

Moving components can cause serious injuries e.g. crushing injuries or cuts.

- ▶ Never grasp moving components when the system is operating.
- ▶ Never open any covers when the system is operating.
- ▶ Observe the follow-up time. Before opening the cover, ensure that no component is still moving.

WARNING

Risk of injuries by pressurized components!

Pressurized components (e.g. compressed-air supply) can move uncontrollably in case of improper handling or in case of a defect and can cause serious injuries.

- ▶ Depressurize the components before working on them. De-energize the residual energies.
- ▶ Always ensure that there is no unintended escape of compressed air.
- ▶ Defective components that are under pressure when operating the system have to be replaced immediately by sufficiently qualified personnel.

2.1.2 Electrical hazards

DANGER

Danger to life by electrical shock!

Touching energized parts causes a direct danger to life by electrical shock. Damage to the insulation or damaged individual parts can be dangerous to life.

- ▶ Use only the mains cable included in the delivery or a mains cable approved by LPKF.
- ▶ All work on energized components of the system must be performed by a qualified electrician.
- ▶ If the insulation is damaged, switch off the power supply immediately and initiate the repair.
- ▶ De-energize all energized components of the system or equipment, before working with them. Ensure that the system or equipment is de-energized for the whole time of the task.
- ▶ Never bridge or deactivate fuses.
- ▶ Always keep moisture away from energized parts because it can cause a short circuit.

2.1.3 Thermal hazards

CAUTION

Burn hazard by hot surfaces!

During processing, some system components can heat up so much that direct contact can cause burns.

- ▶ Always wear your personal protective equipment.

2.1.4 Hazards by materials or substances

WARNING

Health hazard by faulty extraction!

When processing materials, gases or dusts hazardous to health can be produced.

- ▶ Ensure that the extraction system is switched on and is working properly.
- ▶ Observe the maintenance intervals of the extraction system.
- ▶ Check the connection to the system regularly.

2.1.5 Other hazards

CAUTION

Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- ▶ Always ensure that the hoses and cables do not pose a tripping hazard.

2.2 Personnel requirements

WARNING

Accident hazard due to insufficiently qualified personnel!

Insufficiently qualified personnel cannot assess the risks of using the system/product and put themselves and others in danger.

- ▶ Allow only qualified personnel to use the system/product.
- ▶ Keep insufficiently qualified personnel out of the working area.

The different tasks described in this document require different qualifications of the persons who are to perform these tasks.

If no personnel qualifications are listed in the individual chapters of this document, the operating personnel is intended to perform the tasks.

Only persons who can be expected to perform the tasks reliably are authorized to perform the tasks. Persons whose ability to react is impaired e.g. by drugs, alcohol, or medicine, are not authorized.

This document uses the following qualifications for persons for the different tasks.

Qualified electrician

A qualified electrician is able to perform work on electrical systems and to detect and avoid possible dangers on his/her own based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations.

The qualified electrician has been trained for the special field where he/she works and knows the relevant standards and regulations.

Maintenance personnel of the operator

Maintenance personnel are those persons who are designated by the operator to perform simple maintenance tasks (e.g. cleaning the system/product, removing parts from the system/product). The operator has to ensure that the personnel is suited for performing the work.

The maintenance personnel is able to perform his/her work and to detect and avoid possible dangers on his/her own based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations.

The maintenance personnel has been trained for the special field where he/she works and knows the relevant standards and regulations.

Service personnel

Service personnel are persons who are authorized by the manufacturer LPKF for servicing the system/product. These tasks may only be performed by the LPKF Service.

Operating personnel

Operating personnel trained by the operator is able to perform his/her work and to detect and avoid possible dangers on his/her own based on the training performed by the operator, his/her professional training, and his/her know-how and experience.

The operating personnel has been trained by the operator for the special field where he/she works and knows the relevant standards and regulations.

2.3 Personal protective equipment

Personal protective equipment protects against health or safety risks when working with the system.

The individual sections of this manual each point out the personal protective equipment (PPE) that has to be worn during the different tasks of working on the system.

Description of the personal protective equipment

Safety glasses with side shields



Safety glasses with side shields serve for eye protection in case of flying debris and liquid splashes.



Respirator mask

Respirator masks protect against hazards from harmful substances in gases, vapors, and particles.



Safety shoes

Safety shoes protect the feet against crushing injuries, falling objects and from slipping on slippery surfaces.



Protective gloves

Protective gloves protect the hands against friction, abrasions, puncture hazards and deep cuts as well as when touching hot surfaces.

2.4 Intended use

The system has been developed especially for micro material processing and approved for the following processing procedures and materials:

Processing procedures

- Processing of single-sided and double-sided base material
- Processing of multi-layer material
- Processing of SMD solder paste stencils
- Processing of solder stop films
- Engraving of signs or housing panels (e.g. front or rear plates)
- Drilling of plane materials using drilling tools

Materials

- GFRP or CFRP base material
- PTFE or ceramic-filled base material
- non-ferrous metals like
 - aluminum acc. to DIN EN 573:EN AW-6012
 - brass acc. to DIN EN 1412:CW603N
- plastics like
 - polyoxymethylene
 - ABS copolymers
 - Necuron ®



The system may only be used for the processes and materials listed in this chapter. If in doubt, contact the LPKF Service for alternative materials or processes.

The system is designed for a service life of 10 years used in one-shift operation (8 hours a day, 5 days a week).

The system is intended for use in a laboratory environment.

Only control the system with the system software that is included in the scope of delivery. The system may only be operated with a sufficiently dimensioned extraction system that includes a fine particle filter and active carbon filter. LPKF recommends the LPKF extraction system with integrated HEPA filter and activated carbon filter.



In case of doubt contact the LPKF Service to receive more information on alternative materials or processing procedures.

Only control the system with the system software that is included in the scope of delivery.

The system may only be operated with an extraction system that is sufficiently dimensioned.



Contact the LPKF sales department or your local representative if you plan to use another extraction system.

Only use qualified and approved extraction systems.

Any other kind of use is considered as not intended . The manufacturer is not liable for any damage resulting from this, the operator alone bears the risk. Part of the intended use is also to follow the instructions for safety in this user manual with regard to operation and maintenance of the system.

Improper use

The system must not be used for processing highly combustible materials like e.g. paper or wood, sealed containers, hollow parts, textiles, or food.

Do not use the system with a different or modified software.

3 System description

The ProtoMat S64/S104 is a circuit board plotter for structuring single-layer and multi-layer circuit boards. The tool magazine can accommodate up to 20 different drilling and milling tools (ProtoMat S104 only, 15 tools for ProtoMat S64) that can realize among others the following applications:

- Processing of single-sided and double-sided circuit boards
- Processing of multi-layer PCBs
- Routing flexible and rigid-flex PCBs
- Processing of solder stop films
- Processing of SMD solder paste stencils
- Engraving of signs or housing panels
- Drilling of plane materials using drilling tools
- Milling of cut-outs and contour routing
- Processing 3D objects of up to 10 mm (~0.4 in) in height
- Applying solder paste with an integrated dispenser
- Processing of ceramic-filled base material
- Processing RF circuits (only ProtoMatS104 with corresponding RF tools)

The system is delivered with the user-friendly CircuitPro PM system software. The software allows importing the following data formats: CAM, Excellon, Gerber, GerberX, LMD, HPGL, DXF, Step, Igis, Sieb & Meyer, and ODB++

The data are prepared by CircuitPro PM and the toolpaths are computed automatically. The tools required for your project are predetermined and are picked up and adjusted automatically during processing:

- Isolation distances of 0.2 mm to 0.5 mm are produced using a Universal Cutter, smaller isolation distances of 0.1 mm to 0.15 mm using a Micro Cutter.
- Cylindrical tools with diameters of 0.8 mm - 3 mm are available for producing wide isolation distances and rub-outs.
- The drilling tools of 0.2 mm to 2.4 mm are used for drilling through the PCBs.
- Contour routing tools are available for cutting out PCBs and for producing drill holes > 2.4 mm.

The system is connected to the PC via a USB 2.0 interface. In preparation of the process the material to be processed is placed. For this, the system has a vacuum table with a processing area of (W x H x D) 330.5 × 249 × 8 mm (~13.0 × 9.8 × 0.3 in).

Once the data and the system are prepared the process is started and runs fully automatically. A stack light (optionally available) indicates the status of the system at any time of the process.

Further characteristics of the system are:

- Milling spindle with a rotation speed of 60 000 rpm (ProtoMat S64) or 100 000 rpm (ProtoMat S104).
- Integrated camera for recognizing fiducials to enable processing multilayer PCBs.
- Processing depth limiter that enables processing substrates with sensitive surfaces
- Copper thickness measurement to determine the copper layer on your base material (ProtoMat S104 only).
- Automatic control of the extraction system for switching on and off.

3.1 Technical data

General

Data	Value	Unit
IP Code (IEC 60529)	IP20	–
Service life	10	Years

Climatic conditions

Data	Value	Unit
Temperature range (operation)	20 to 25 (68 to 77)	°C (°F)
Temperature range (storage, transport)	-10 to 40 (14 to 104)	°C (°F)
Max. humidity, non-condensing	90	%

Electrical data

Data	Value	Unit
Power supply	100/240	V
	50/60	Hz
Nominal power	250	W
Stability	+/- 10	%

Mechanical data

Data	Value	Unit
Dimensions (width x height x depth)	680 × 560 × 800 (~26.7 × 22 × 31.5)	mm (in)
Weight (without packaging)	95 (~209.4)	kg (lbs)
Weight (with packaging)	135 (~297.6)	kg (lbs)

Load capacity

Data	Value	Unit
Min. distributed load	1.75	kN/m ²
Min. point load on an area of 0.0007068 m ²	0.0012	kN

Pneumatic data

Data	Value	Unit
Pressure	min. 6	bar
Standard volume flow	40 l/min @ 6 bar	Nl/min

Compressed-air purity acc. to ISO 8573-1:2010-04

Data	Value	Unit
Solid particles	5	Class
Water	4	Class
Oil	4	Class

Process data

Data	Value	Unit
Rotation speed range	S64: 10 000 to 60 000 S104: 10 000 to 100 000	min ⁻¹
Max. structuring area (x/y/z)	305 × 229 × 8 (~12.0 × 9.0 × 0.3)	mm (in)
Max. material dimensions (x/y/z)	330.5 × 249 × 8 (~13.0 × 9.8 × 0.3)	mm (in)
Travel speed	150 (diagonally) (5.9)	mm/s (in/s)
Drilling performance	100 strokes	min ⁻¹
Collet (1/8")	3.175 (0.125)	mm (in)
Resolution (x/y)	0.47 (0.02)	µm (mil)
Repeatability	± 5 (0.2)	µm (mil)
Accuracy of camera	1.8 (~0.07)	mm/pixel (mil/pixel)

Emissions

Data	Value	Unit
Sound pressure level LpA (EN ISO 3744)	< 70	dB (A)
Sound power level LwA (EN ISO 3744)	< 70	dB (A)
EMC emission class	A	–

Extraction system

Data	Value	Unit
Extraction air flow	at least 186	m ³ /h
Extraction fitting (Ø)	50	mm
Separation efficiency	> 98 (≤ filter class: at least E12)	%

3.2 Type label

The type label is located at the housing of the system. For information on identifying the system and the relevant equipment, specify the system model and the serial number on the type label when you contact the LPKF Service.

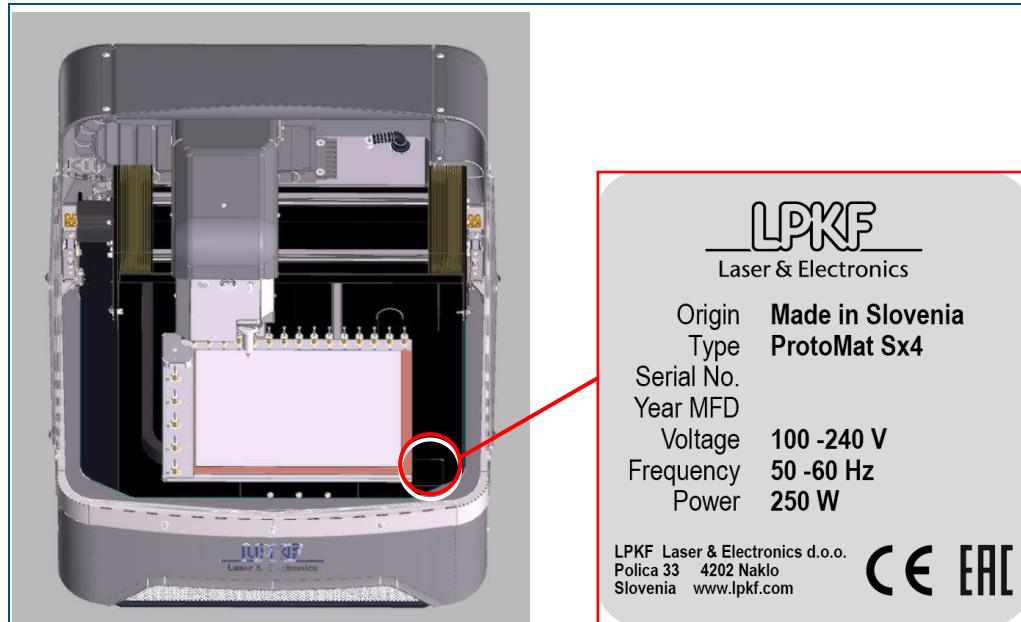


Fig. 1: Type label S64/S104

Name	Description
Origin	Country of origin
Type	System type
Serial No.	Serial number
Year MFD	Year of manufacture
Voltage	Operating voltage
Frequency	Line frequency
Power	Rated power consumption

Table 3: Type label S64/S104

3.3 Scope of delivery

- ProtoMat S64 or ProtoMat S104
- Data medium Documentation
- Data medium CircuitPro PM
- Basic reference ProtoMat S64/S104
- Accessories bag containing:
 - 1 × Mains cable US- C13, UL approved 125VAC/10A, length 2 m, color: black, UL File Number: E88265 E88265
 - 1× Mains cable 230 V Schuko plug IEC 60884
 - 1× Soft brush
 - 2× USB cable for ProtoMat, plug A-B 3 m with snap-on ferrite bead
 - 1× PVC hose connector for extraction system, ProtoMat S64/ S104 and ProConduct, PVC soft, black
 - 1× Unit for compressed-air connection, pneumatic tube 6 mm with 1/8" adapter
 - 1× Collet cleaning kit
 - 1 × Filter mat
 - 1 × Collet wrench
 - 1× Working-depth limiter
 - Lubricant, special plastic lubrication ISOFLEX Topas 5051
 - Lubricant, Ravenol precision mechanics oil
 - Screwdriver Torx 6
 - Screwdriver Torx 10
 - 1× Fuse
 - 1 × Cleaning device for tools

Data medium Documentation

- User manual ProtoMat S64/S104
- Basic reference ProtoMat S64/S104
- CircuitPro PM Compendium
- How-to guides CircuitPro PM
- Product catalog Rapid Prototyping
- Unpacking instructions

Data medium CircuitPro PM

- Software CircuitPro PM
- CircuitPro PM Compendium
- How-to guides CircuitPro PM

3.4 EC Declaration of conformity



EC Declaration of conformity according to machinery directive 2006/42/EC Annex II A

The manufacturer/distributor: **LPKF Laser & Electronics d.o.o.**
Polica 33
4202 Naklo, Slovenia

hereby declares that the following product
Product designation: **ProtoMat S64 & ProtoMat S104**
Product type: **Circuit board plotter**

conforms to the requirements of the directive stated above - including the amendments in force at the time of the declaration.

This declaration is only valid for the state of the product at the time of delivery. Any parts added by the user or other later modifications are excluded. The declaration becomes invalid if the product is modified after delivery.

The following harmonized standards were applied:

EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements.
EN 61000-6-1:2007	Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments.
EN 61000-6-3:2007/A1:2011	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments.

The following additional EC directives were applied:
EMC directive 2014/30/EU
Low voltage directive 2014/35/EU

The party authorised to compile the technical file: Matjaž Samarin

Location: Naklo (Slovenia)
Date: 26.2.2019



Mr. Boštjan Podobnik
(Managing director)



Fig. 2: Declaration of conformity (German)



Fig. 3: Declaration of conformity (English)

4 Transport and storage

This chapter contains important information on transport, packaging and storage of the system.

NOTICE

System damage by improper transport!

Improper transport can cause damage to the system.

- ▶ Transport the system cautiously to the place of installation.
- ▶ Observe the symbols on the packages.
- ▶ Remove the packaging only directly before system installation.

4.1 Transport inspection

Check the delivered goods immediately upon receipt for completeness and for transport damage.

If transport damage is evident, proceed as follows:

- ▶ Do not accept the delivery or only with reservations.
- ▶ Record the extent of damage on the transport documentation or on the delivery note of the transport company.
- ▶ Initiate a complaint.

4.2 Packaging

The packaging is chosen according to the transport conditions.

The packaging is to protect the system from transport damage, corrosion, and other kinds of damage until installation.

- ▶ Keep the packaging in its original form.
- ▶ Only remove the packaging just before installation.

Handling packaging material

- ▶ Dispose of the packaging material according to the current laws and local regulations.

NOTICE

Environmental hazard by wrong disposal of packaging!

Wrong disposal of packaging material can cause environmental hazards.

- ▶ Dispose of the packaging material environmentally friendly.
- ▶ Observe the local disposal regulations and hire a specialized company for the disposal, if necessary.

- ▶ The system may only be shipped in the original packaging of LPKF. Contact the LPKF Service if you need the packaging.

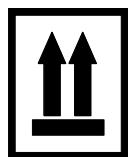
Symbols on the packaging

Observe the following symbols on the packaging when transporting the system:



Stacking limit

A maximum of 2 identical packages may be stacked.



Top

The arrowheads of the symbol indicate the top side of the package. These always have to point upwards, otherwise, the contents could be damaged.



Keep dry

Protect packages against moisture and keep them dry.



Fragile

Identifies packages with fragile or sensitive contents. Handle the package with care, do not drop, and do not subject it to shocks.

4.2.1 Unpacking the system

The following describes how to unpack the system. Observe also the unpacking instructions.

WARNING

Risk of injury by heavy load!

The system is heavy and bulky and must not be lifted by one person. Incorrect lifting can cause serious injuries, e.g. crushing injuries or spinal injuries.

- ▶ Always lift the system **with four persons** using the enclosed lifting device.
- ▶ Always wear the recommended safety shoes and protective gloves.

WARNING

Risk of injury by improper transport!

Incorrect transport using the enclosed lifting device can cause serious injuries. The lifting device serves only for lifting and putting down the system.

- ▶ Transport the system only with a sufficiently load-bearing means of transport.

The system weighs 95 kg (~209.4 lbs) and has to be lifted by four persons using the lifting device:

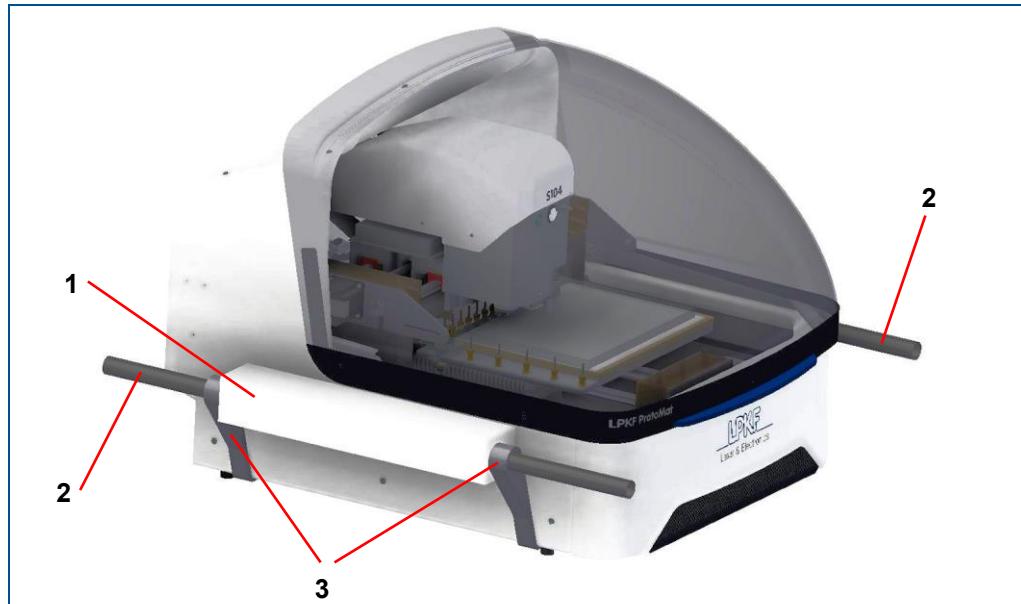


Fig. 4: System with lifting device

1 Foam damper

3 Transport sling

2 Steel rod

Ensure that the following prerequisites are fulfilled before performing the described tasks:

Prerequisites

- Wear protective gloves
- Wear safety shoes
- Work in a group of four.

Spare parts and auxiliaries

- Safety cutter
- Lifting device

■ Unpacking the system

1. Cut the black polyester straps that secure the transport box using a safety cutter and remove them.



Fig. 5: Polyester straps removed

2. Open the transport box.

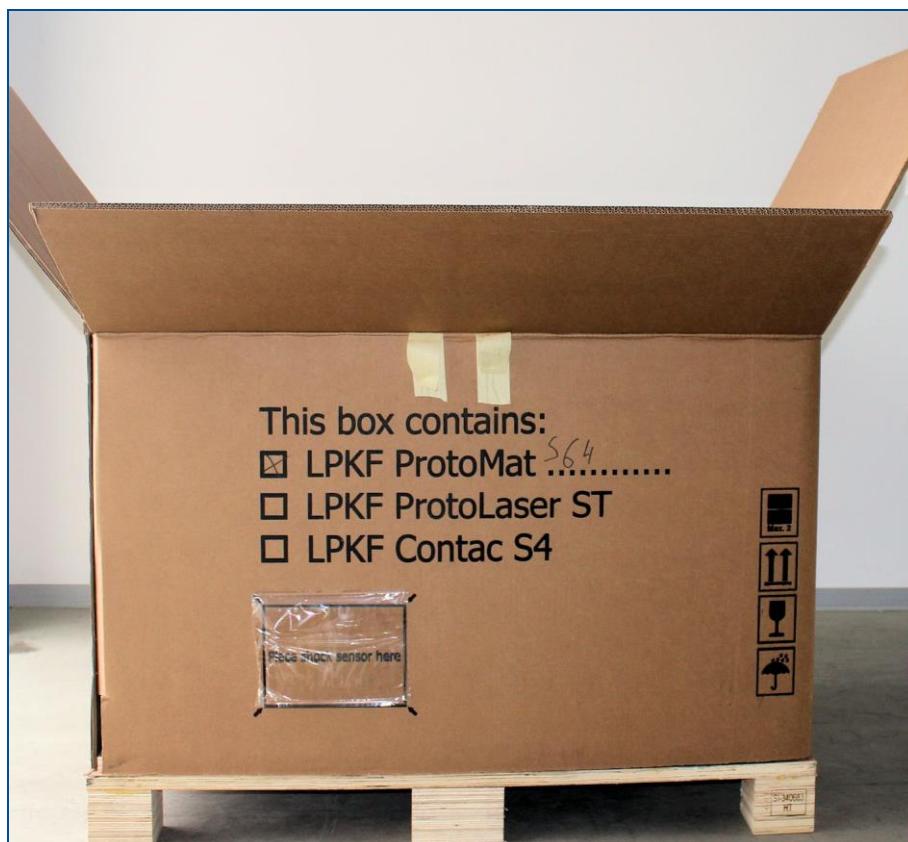


Fig. 6: Transport box opened

3. Remove the sheet of cardboard.



Fig. 7: Removing the sheet of cardboard

4. Remove the two steel rods for lifting the system.



Fig. 8: Removing the steel rods



Fig. 9: Steel rods

5. With the help of another person, pull the transport box upwards.
Put the transport box aside.
- Now, the padding material at the sides is accessible:

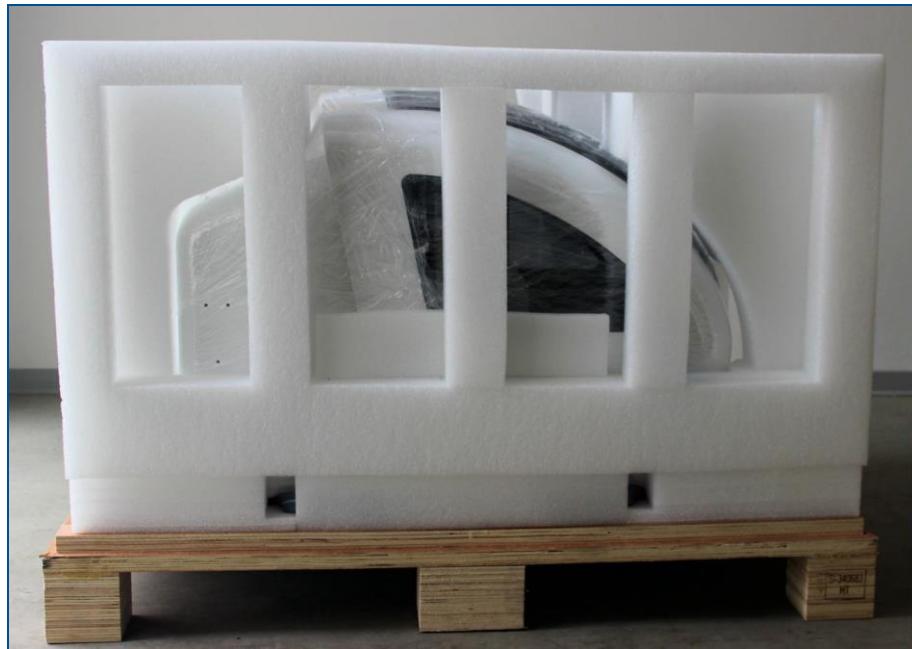


Fig. 10: Padding material

6. Remove the padding material at the sides successively.

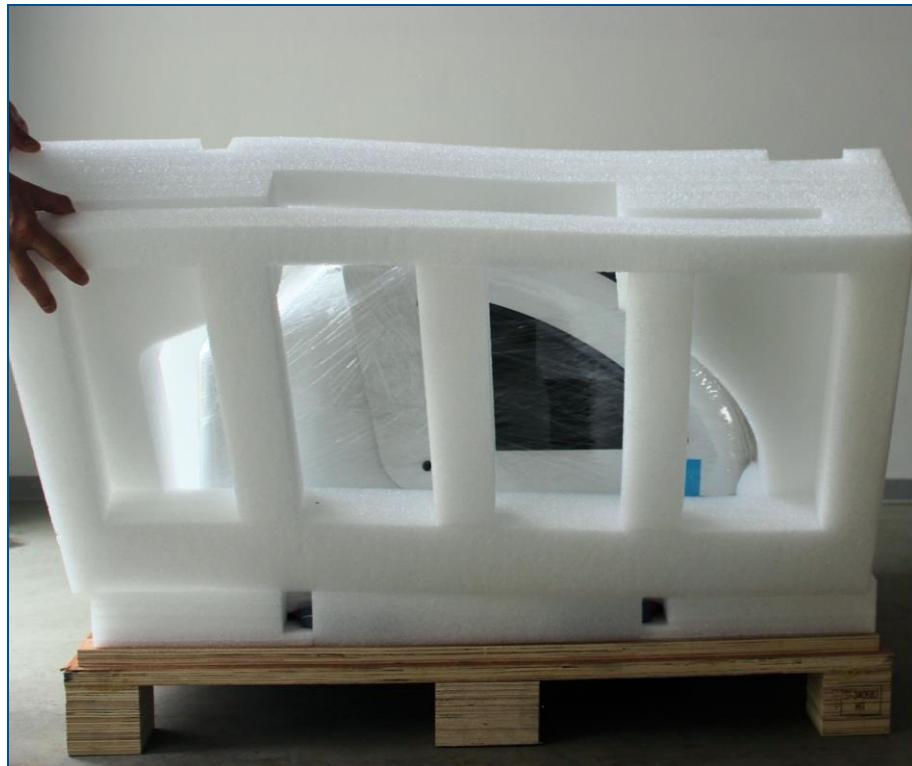


Fig. 11: Removing the padding material on the left side

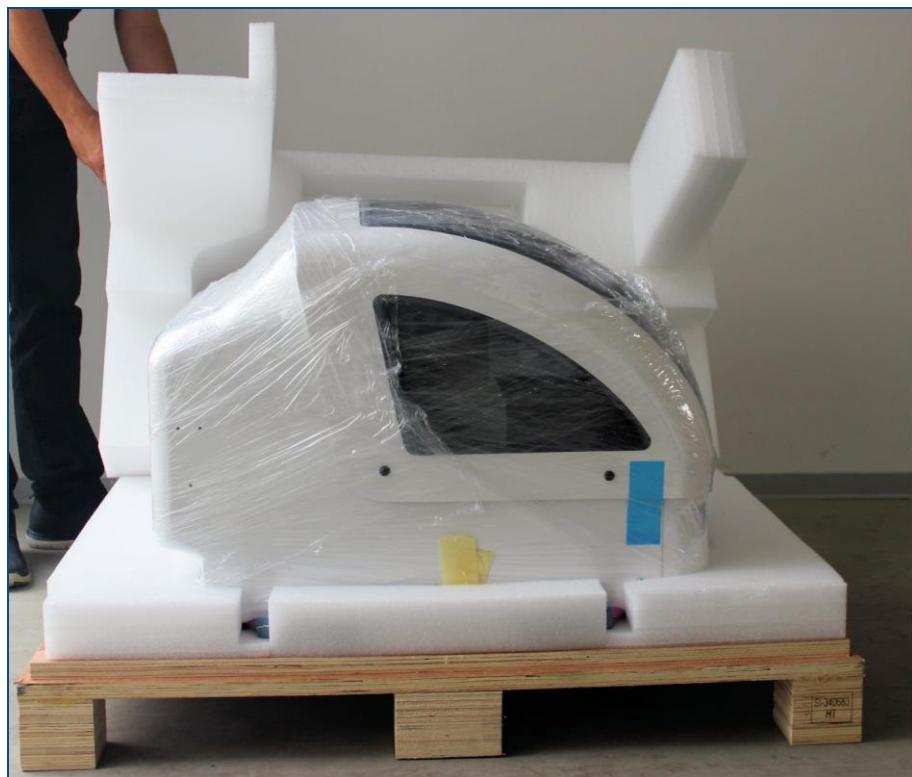


Fig. 12: Removing the padding material on the right side

Now, the system is accessible from both sides:



Fig. 13: System accessible

7. Pull out the four transport slings of the system.

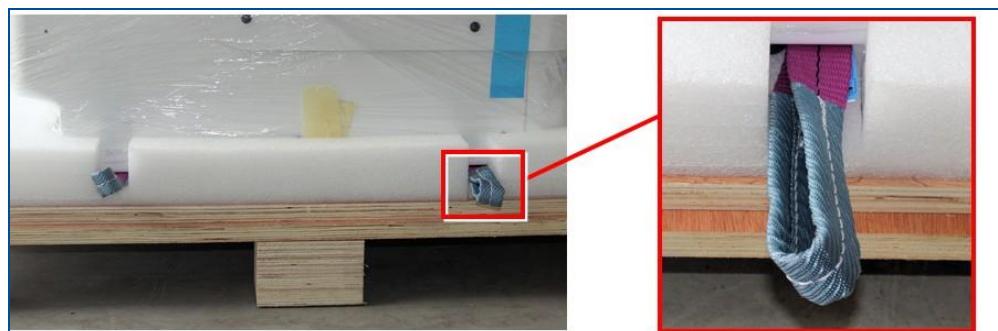


Fig. 14: Transport sling pulled out

8. Push the steel rod through the foam damper and through both of the transport slings on the left side of the system.

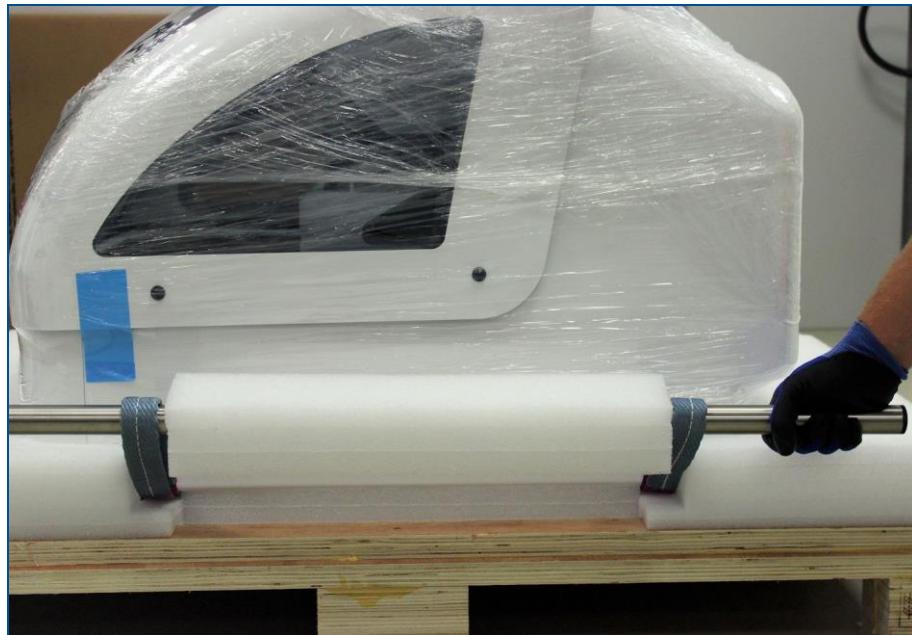


Fig. 15: Steel rod with foam damper

9. Repeat step 8 with the second steel rod on the right side of the system.
- The lifting device has been assembled.

WARNING! Risk of injury by heavy load!

The system is heavy and bulky and must not be lifted by only one person. Incorrect lifting can cause serious injuries, e.g. crushing injuries or spinal injuries.

- Always lift the system in a group of four using the enclosed lifting device.
- Always wear the recommended safety shoes and protective gloves.

10. Lift the system **in a group of four**, with each person holding one end of the rods.



Fig. 16: System lifted by a group of four

WARNING! Risk of injury by improper transport!

Incorrect transport using the enclosed lifting device can cause serious injuries. The lifting device serves only for lifting and putting down the system!

- Transport the system only with a sufficiently load-bearing means of transport.

11. Put the system onto a stable and even surface with an appropriate load-bearing capacity.
12. Remove the steel rods from the transport slings and the foam dampers.
13. Lift the front of the system slightly in a **group of two**.
14. Let a **third person** remove the front transport sling.
15. Repeat steps 14 and 15 at the rear of the system for the rear transport sling.
16. Save the lifting device for later use.



The system can be transported over short distances (e.g. within a room or a building) using a table trolley. Make sure that the table trolley has an appropriate load-bearing capacity.



- The system has been unpacked.

■ Removing the transport lock

1. Remove the foam pad beneath the processing head.

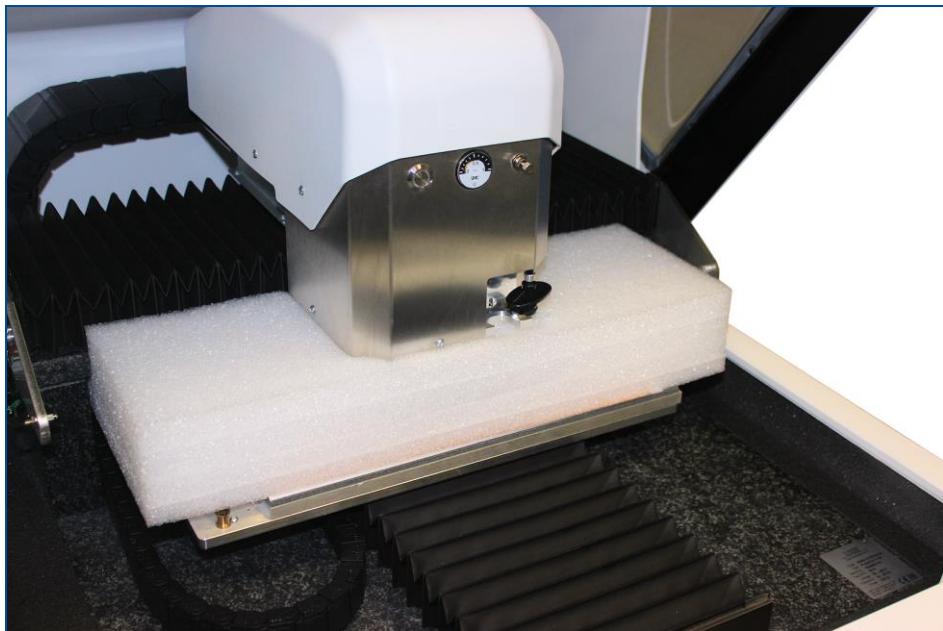


Fig. 17: Transport lock

2. Store the foam pad in the box for a possible transport of the system.

The transport lock has been removed.

4.3 Transporting the system

This chapter describes the transport over short distances and the preparations for a transport over long distances.

■ Preparing the system for transport

Ensure that the following prerequisites are fulfilled before performing the described tasks:

Prerequisites

- Safety shoes
- Protective gloves
- The collet is equipped with a tool.

Spare parts and auxiliaries

- Unpacking instructions

1. Switch off the system before transport.



Ensure that a tool is in the collet or a tool is in the tool magazine before switching off the system.

2. Disconnect all connections of the system (for an overview of the connections refer to page 39).
3. Install the transport lock beneath the processing head.
4. For transport over longer distances, pack the system in its original packaging.



For transport over short distances, the transport lock does not have to be installed and the system does not have to be packed.

The system has been prepared for transport.

■ Moving the system over a short distance

Ensure that the following prerequisite is fulfilled before performing the described tasks:

Prerequisite:

- The system has been prepared for transport.

1. Lift the system in a group of four using the lifting device.

WARNING! Risk of injury by heavy load!

The system is heavy and bulky and must not be lifted by one person. Incorrect lifting can cause serious injuries, e.g. crushing injuries or spinal injuries.

- ▶ Always lift the system **with four persons** using the enclosed lifting device.
- ▶ Always wear the recommended safety shoes and protective gloves when lifting the system.

2. Put the system down on a table trolley. Make sure that the table trolley has a sufficient load-bearing capacity!

WARNING! Risk of injury by improper transport!

Incorrect transport using the enclosed lifting device can cause serious injuries. The lifting device serves only for lifting and putting down the system!

- ▶ Transport the system only with a sufficiently load-bearing means of transport.

3. Move the system on the table trolley to the desired location.



All connections mentioned above have to be reconnected properly to the system before startup. Especially when connecting the extraction hose, you have to ensure a secure connection.

- The system has been moved over a short distance.

4.4 Storage

- ▶ Store the system in its original packaging according to the symbols on the packaging.
- ▶ Store the packages under the following conditions:
 - Do not store outdoors.
 - Store dry and dust-free.
 - Do not expose to aggressive substances.
 - Protect against sunlight.
 - Storage temperature: 15 °C - 35 °C (59 °F - 95 °F)
 - Relative air humidity: 60 % max, non-condensing.
 - If storing for more than 3 months, check the general condition of all components and the packaging on a regular basis.

When putting the system out of operation and into storage over a longer period, ensure that the storage room is clean, almost dust-free, and has a sufficient loadbearing capacity.

5 First startup

This chapter contains important information on first startup of the system.

5.1 Safety

Observe the following safety instructions for the first startup of the system:

WARNING

Accident hazard due to insufficiently qualified personnel!

Insufficiently qualified personnel cannot assess the risks of using the system and put themselves and others in danger.

- ▶ Allow only qualified personnel to use the system.
- ▶ Keep insufficiently qualified personnel out of the working area.

CAUTION

Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- ▶ Always ensure that the hoses and cables do not pose a tripping hazard.

NOTICE

Property damage by moisture during transport/storage!

When transporting or storing the system, moisture can cause damage to the system.

- ▶ Ensure that there is no moisture in the system.
- ▶ Before first startup of the system wait approx. 24 hours to allow the system to acclimatize.

5.2 Requirements of the place of installation

Before installing the system, the following requirements of the place of installation have to be ensured.

5.2.1 Climatic conditions

The following climatic conditions have to be ensured for operating the system:

Climatic conditions

Data	Value	Unit
Temperature range (operation)	20 to 25 (68 to 77)	°C (°F)
Temperature range (storage, transport)	-10 to 40 (14 to 104)	°C (°F)
Max. humidity, non-condensing	90	%

5.2.2 Minimum required space

System dimensions

Data	Value	Unit
Width	680 (~26.7)	mm (in)
Depth	800 (~31.5)	mm (in)
Height	560 (~22)	mm (in)

Minimum required space for operation and maintenance

Data	Value	Unit
Width	2200 (~86.6)	mm (in)
Depth	1400 (~55.1)	mm (in)
Height	750 (~29.5)	mm (in)

- Width 2200 mm (~86.6 in)
- Depth 1400 mm (~55.1 in)
- Height 750 mm (~29.5 in)

The area marked in red in the following figure is the safety zone. It must not be blocked by objects. In front of the system, at least 400 mm (15.8 in) of space should be available for operation and movement.

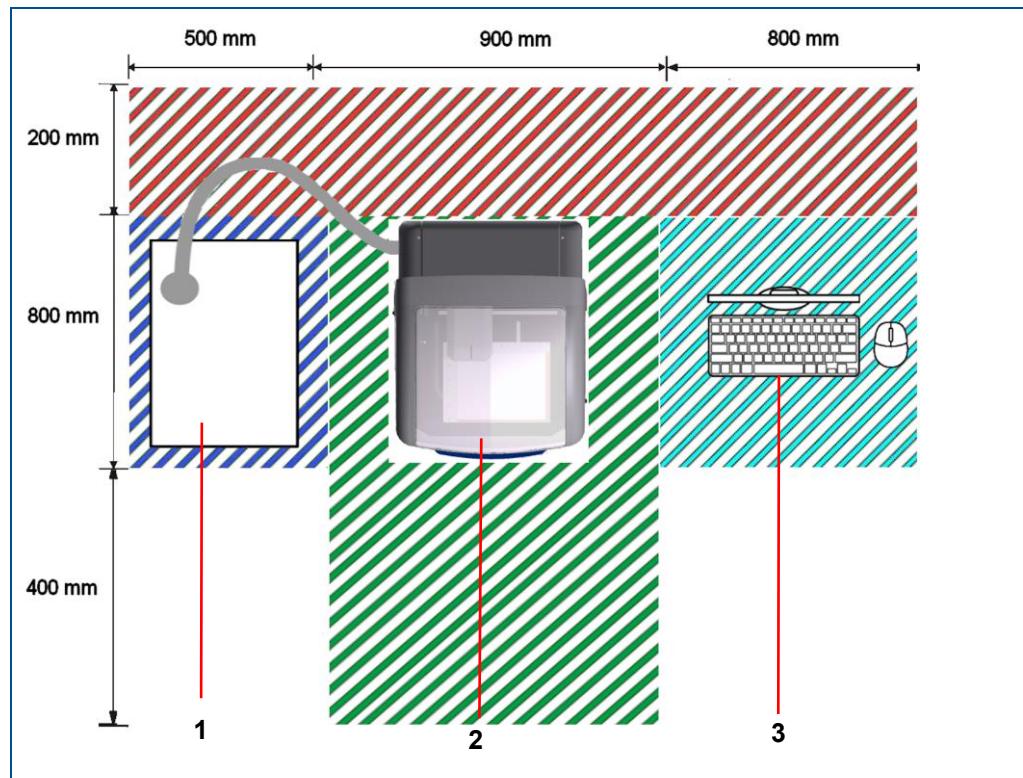


Fig. 18: Minimum required space

- 1 Extraction system
2 System

- 3 PC (recommended position for desk and PC)

5.2.3 Workplace of the operating personnel

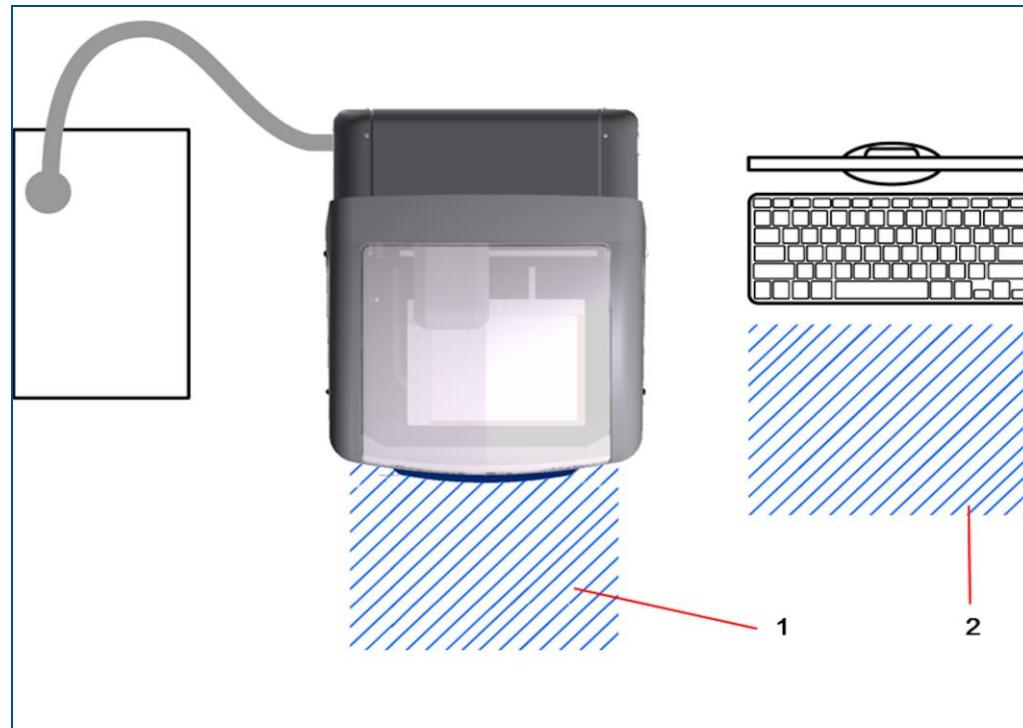


Fig. 19: Workplace of the operating personnel

1 System work station

2 PC work station

The system is designed exclusively for operation by a single person. The system is operated according to its intended use at the following work stations:

- **System work station**
The system work station is used for loading and unloading the system.
- **PC work station**
The PC work station is used for monitoring the production and for controlling the system.

5.2.4 Floor

WARNING

Risk of injury by loss of stability!

Loss of stability due to an improper floor or missing locks can cause uncontrollable movement or tipping of the system. This can cause serious injuries.

- ▶ Ensure that the floor has a sufficient load-bearing capacity for the system and is even.

The floor has to be leveled and antistatic and has to have a sufficient load-bearing capacity for the total weight of the system (95 kg, ~209.4 lbs).

5.2.5 The system's center of gravity

The following figure shows the center of gravity of the system:

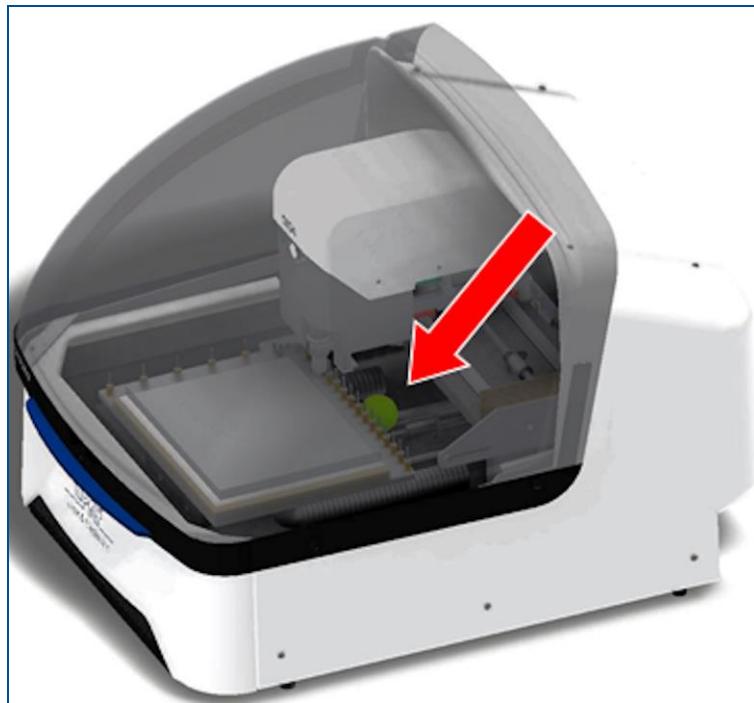


Fig. 20: Center of gravity of the system

5.2.6 Connections provided by the customer

The following connections have to be available for the first startup:

Electrical data

Data	Value	Unit
Power supply	100/240	V
	50/60	Hz
Nominal power	250	W
Stability	+/- 10	%

Pneumatic data

Data	Value	Unit
Pressure	min. 6	bar
Standard volume flow	40 l/min @ 6 bar	Nl/min

Compressed-air purity acc. to ISO 8573-1:2010-04

Data	Value	Unit
Solid particles	5	Class
Water	4	Class
Oil	4	Class

5.3 Preparations

Before the system is installed, you have to consider and ensure the following:

- A suitable extraction system has to be provided. LPKF recommends using the **JetStream iSeries AX079-25** extraction system. This is optionally available at LPKF.
- A PC has to be provided by the customer. For detailed information on system requirements refer to the user manual of CircuitPro PM.
- Provide sufficient space at the place of installation.
- Ensure tidiness and cleanliness at the place of installation.
- Provide the connection materials (hoses, tubes, cables etc.).
- The room has to be clean and almost dust-free.

5.4 Connecting the system

Once all preparations are concluded, the system is connected in the following order:

- Connecting the extraction system
- Connecting the compressed-air supply
- Establishing a connection between the camera and the PC (USB port)
- Establishing a connection between the system and the PC
- Connecting the system to the mains power supply
- Connecting the PC to the mains power supply

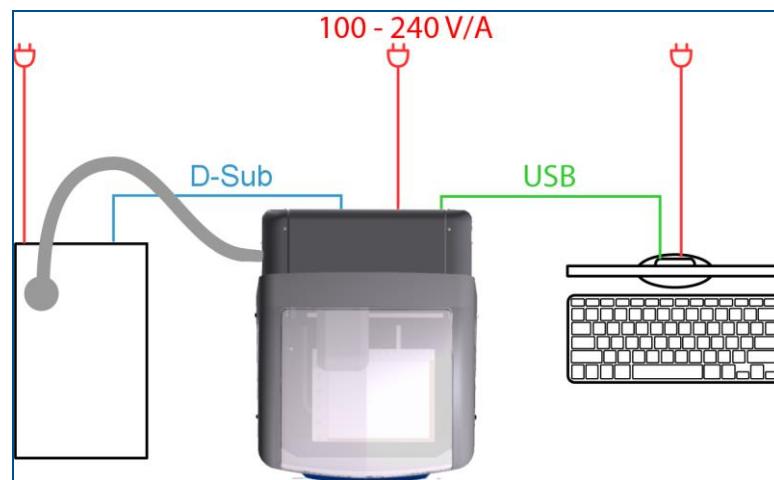


Fig. 21: Connecting the system



Ensure that all connected cables and hoses are kept away from the working area of the operating personnel. For example, lay them along the rear of the system so that they do not pose an obstacle for the operating personnel.

NOTICE**Property damage by improper startup of the extraction system!**

Improper installation and startup can cause damage to the extraction system.

- ▶ Observe the minimum clearance around the extraction system defined by the manufacturer.
- ▶ Use only sockets with protective earth conductor for connecting.
- ▶ Do not use extension cables.
- ▶ Do not bend the extraction hose.
- ▶ Do not block the air flow.

5.4.1 Connecting the extraction system

The extraction system is an optional accessory that can be ordered at LPKF. The following describes the required steps for connecting the JetStream iSeries AX079-25:

Material

The following material is required:



Fig. 22: Extraction hose



Fig. 23: Nozzle for extraction hose



Fig. 24: Mains cable



Fig. 25: Control cable

■ Connecting the extraction system

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the provided nozzle to the extraction hose.
2. Connect the end of the extraction hose that is now equipped with the nozzle to the extraction tube of the system.



Fig. 26: Extraction hose connected to the system

3. Connect the other end of the extraction hose with the extraction system.



Fig. 27: Connecting the extraction hose

4. Connect the male 25-pin D-sub connector with the system.

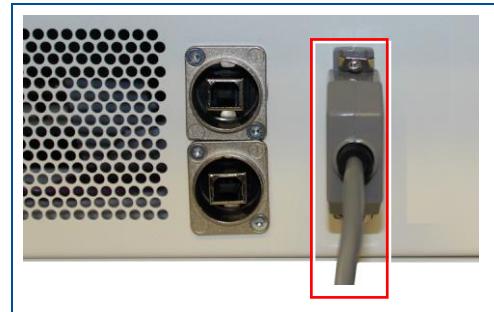


Fig. 28: Control cable

5. Connect the female 9-pin D-sub connector with the extraction system.

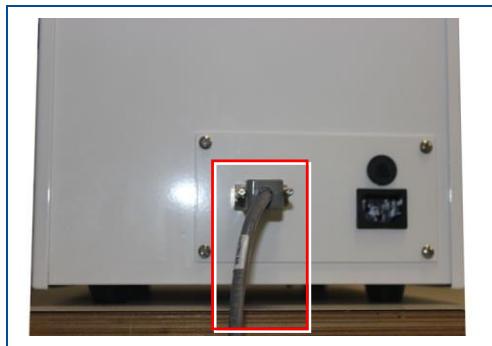


Fig. 29: Connecting the control cable

6. Connect the extraction system to the mains power supply.



Fig. 30: Connecting the mains cable

The extraction system has been connected.



LPKF recommends to set the extraction system to 70 %. You can adapt the run-down time of the extraction system according to your requirements. For further information refer to the user manual of the extraction system.

5.4.2 Connecting the compressed-air supply

The system is connected to the compressed-air supply via a pneumatic tube.

Material

The following material is required:



Fig. 31: Pneumatic tube

■ Connecting the compressed-air supply

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the pneumatic tube to the compressed-air connector G 1/4".



Fig. 32: Connecting the pneumatic tube to the system

2. Connect the pneumatic tube with the compressed-air supply (maximum pressure: 6 bar).

- The compressed-air supply has been connected.

5.4.3 Establishing a connection between the camera and the PC

The camera is connected to the PC via a USB cable.



Using a USB hub and/or extension cables can cause transmission problems. Connect the system directly with the PC.

Material

The following material is required:



Fig. 33: USB cable

■ Connecting the camera to the PC

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the B cable of the provided USB cable to the slot of the system.
2. Connect the A cable of the provided USB cable to the slot of the PC.



Fig. 34: Connecting the USB cable for the camera



Extending the USB cable can interfere with the camera image.

- The camera has been connected to the PC.

5.4.4 Establishing a connection between the system and the PC

The system is connected to the PC via a USB cable.

Material

The following material is required:



Fig. 35: USB cable

■ Connecting the USB cable

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the B cable of the provided USB cable to the slot of the system.



Fig. 36: Connecting the USB cable to the system

2. Connect the A cable of the provided USB cable to the slot of the PC.



Extending the USB cable causes transmission problems. The maximum cable length is 3 meters.

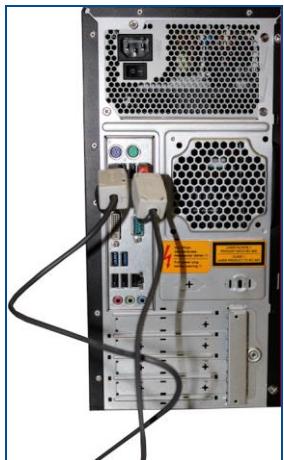


Fig. 37: Connecting the USB cable to the PC

- The USB cable has been connected.

5.4.5 Connecting the system to the mains power supply

The system is connected to the mains power supply using a mains cable.

Material

The following material is required:



Fig. 38: Mains cable

■ Connecting the mains cable

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the mains cable to the system.
2. Connect the mains cable to the earthed wall socket.



Ensure that the earthed wall socket is **always** accessible!

- The mains cable has been connected.

5.4.6 Connecting the PC to the mains power supply

The PC is connected to the mains power supply using a mains cable.

Material

The following material is required:



Fig. 39: Mains cable

■ Connecting the mains cable

CAUTION! Tripping hazard by hoses and cables!

Hoses and cables are routed to the system. If the hoses and cables are laid inappropriately they pose a tripping hazard for the operating personnel.

- Always ensure that the hoses and cables do not pose a tripping hazard.

1. Connect the mains cable to the PC.
 2. Connect the mains cable to the earthed wall socket.
- The mains cable has been connected.

5.4.7 Dummy tool

The system is equipped with a dummy tool for transport. It is in the collet and **must not** be removed manually! Once the system and the corresponding software are ready for operation, the dummy tool is ejected automatically when a processing job is started.

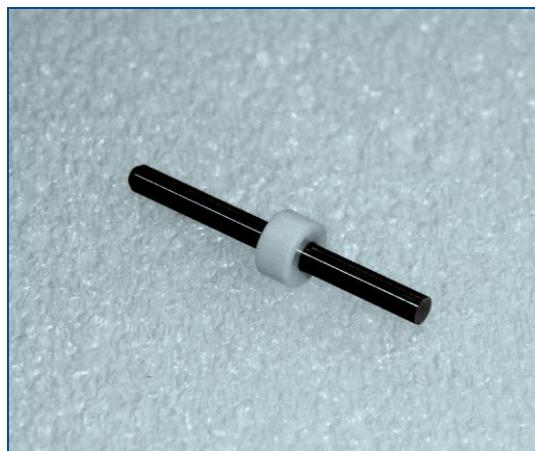


Fig. 40: Dummy tool

5.5 Software

The system software CircuitPro PM is used for preparing and converting the PCB layout data into a compatible file format (e.g. the LMD format), for further editing the data, and for controlling the system.

The system software imports your CAD data, aperture tables, and tool lists. The design rule check checks the conductive track width and the conductive track spacing, and lists the inconsistencies in the *Message* pane. At the same time, these are displayed graphically in the CAM view. Thus, you can correct the data before starting the actual production process. Additionally, the software serves as automated control of the system and enables direct access to all operation parameters.



For a detailed description of the system software refer to the software manual.

The following system requirements have to be met in order to install CircuitPro PM successfully:

Component	Minimum system requirements
CPU	2 GHz LPKF discourages the use of the following CPU because it causes problems: – Intel Xeon
RAM	2 GB
Memory requirements	2 GB
Graphics board	With 128 MB dedicated memory (non-shared memory) LPKF discourages the use of the following graphics boards because they cause problems: – Intel 82945G
Screen resolution	1024 x 768 pixels
USB port	2 x USB 2.0
Supported operating systems	Windows 7 (64bit)

Table 4: Minimum system requirements

Component	Recommended system configuration
CPU	Dual Core, 2.6 GHz LPKF discourages the use of the following CPU because it causes problems: – Intel Xeon
RAM	8 GB
Memory requirements	2 GB
Graphics board	With 1 GB dedicated memory (non-shared memory) LPKF discourages the use of the following graphics boards because they cause problems: – Intel 82945G
Screen resolution	1680 x 1050 pixels
USB port	2 x USB 2.0
Supported operating systems	Windows 7 (64bit), Windows 10 (64bit)

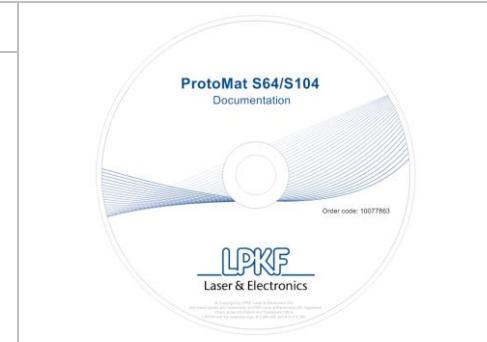
Table 5: Recommended system configuration



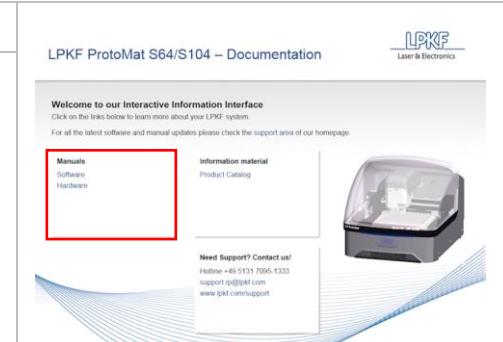
PCs with Intel Core i3/i5 or i7 processor of the 6th generation (Skylake) do not fully support the USB 2.0 interface of the installed camera. If problems arise while transmitting the camera image, LPKF recommends to use a USB 3.0 camera.

5.6 Reading the user manual

1



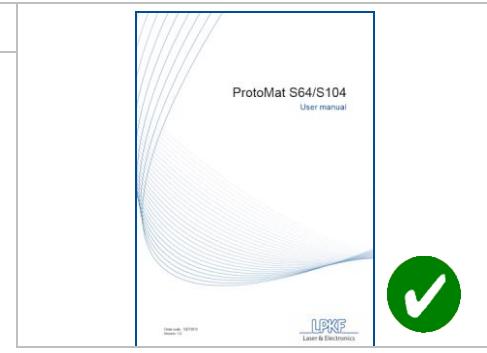
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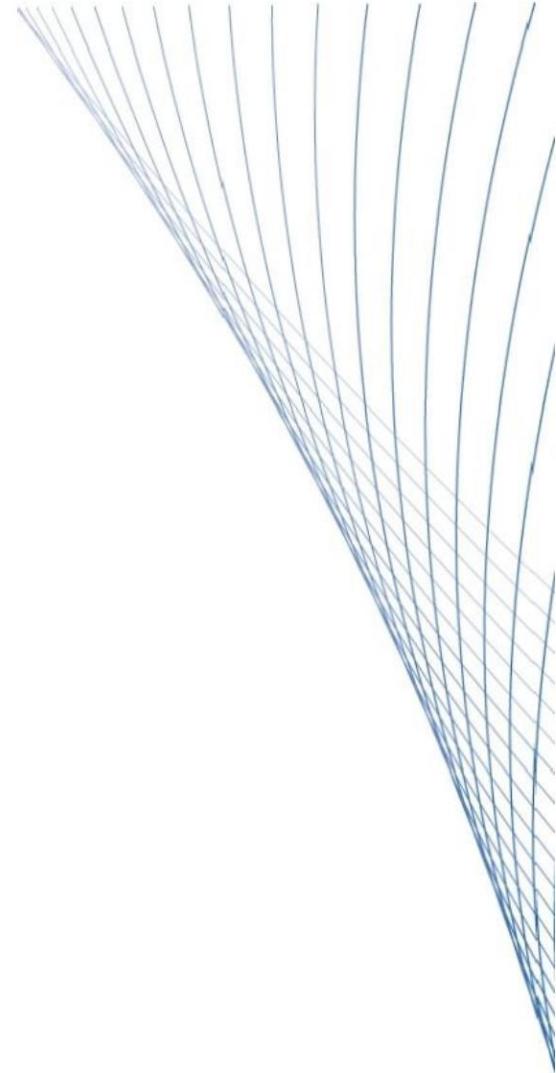
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CircuitPro PM

Compendium

Order code: 10046163

LPKF
Laser & Electronics



CircuitPro PM

**Compendium
Version 1.0
English**

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Translation of the German original document

Information about this document

General

This document contains all information for installation, putting into operation, operation, and maintenance or trouble-shooting of the system delivered. This document is intended for persons with basic knowledge of installation and operation of software-controlled machines. General knowledge of operational safety as well as basic knowledge of using PCs running Microsoft Windows® are required.

Availability

A complete and legible copy of this document must be available at the operation station. Any person who is authorised to operate the system must have read and understood this document. The facility owner is required to ensure that all safety measures listed in this document are observed.

Notations

Various text attributes, notations, and structures are used to facilitate reading and understanding the document. The text attributes (highlighting) inside this document are defined as follows:

Attribute	Function
Bold	Important information
<i>Italics</i>	Brand name
<i>Bold italics</i>	LPKF brand name
[...]	Button
\...\	Input/display field
<...>	Check box
{...}	Radio button
>...>...>	Menu trail
/.../	Reference to a number in the figure

Figures

Figures (photos or drawings) are displayed in a frame. Each figure has a numbered figure title, e. g. "Fig. 1: Overview". Numbers in the figure mark certain components or actions. Arrows in the figure show the direction of an action.

Tables

Data, facts, and important contexts are arranged in tables. Each table has a numbered table title, e. g. "Table 1: Scope of delivery". Every table has a highlighted header row containing the column headings.

Procedures

In this document, procedures or workflows are compiled to step-by-step operation sequences. An individual operation sequence consists of at least three components: Title, step, and result

Component	Description
■ title	Description of the objective of the procedure marked by a preceding "■"
1. step	Consecutively numbered sequence of an procedure
► intermediate result	Intermediate result of an operation step. The procedure continues.
◆ result	Result of the procedure marked by a preceding "◆"

Symbols and signal words

The following symbols are used to mark important information:

Symbol	Description
	Safety note WARNING – Hazard for persons CAUTION – Damage to the system
	Note A note is an information on the optimum usage of a feature.
	Tip A tip contains additional information.
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Standards

The following standards and guidelines were observed when creating this document:

Standard	Description
DIN 5008 2011-04	Rules for writing and layouting
VDI 4500 Bl.1,2 11-2006	Technical documentation - Definitions and legal basics
DIN EN 82079-1 2011-04	Preparation of instructions for use. Structuring, content and presentation. General principles and detailed requirements
DIN EN ISO 12100 2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction
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1 Function

The system software LPKF CircuitPro PM 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 PM 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).

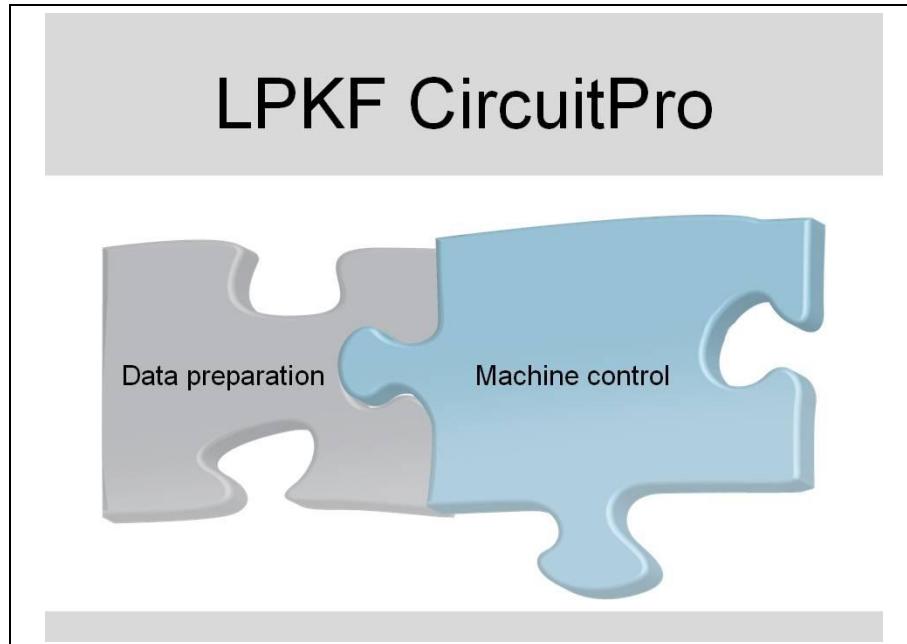
Use the “Design Rule Check” for checking the width and the spacing of the conductor tracks. Violations of the rules will be shown in the message view and graphically in the CAM View. Thus, you can make corrections before starting the production process.

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 PM 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.

Fig. 1: LPKF
CircuitPro PM



2 Safety notes

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

2.1 General safety notes



Note

The usage of the software CircuitPro PM 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 PM program.

3.1 System requirements

The following system requirements must be met for installing CircuitPro PM successfully:

Minimum system requirements for working with CircuitPro PM

Table 1: Minimum system requirements

Component	Minimum system requirements
CPU	Intel Core i5 LPKF discourages the use of the following CPU because it causes problems: <ul style="list-style-type: none">• Intel Xeon
RAM	2 GB
Memory requirements	2 GB
Graphics board	with 128 MB dedicated memory (non-shared memory) LPKF discourages the use of the following graphics boards because they cause problems: <ul style="list-style-type: none">• Intel 82945G
Screen resolution	1024 × 768 pixels
USB port	2 × USB 2.0
Supported operating systems	Windows 7 (64bit)

Recommended system configuration for working with CircuitPro PM

Table 2: Recommended system configuration

Component	Recommended system configuration
CPU	Intel Core i5 LPKF discourages the use of the following CPU because it causes problems: <ul style="list-style-type: none">• Intel Xeon
RAM	8 GB
Memory requirements	2 GB
Graphics board	With 2 GB dedicated memory (non-shared memory) LPKF discourages the use of the following graphics boards because they cause problems: <ul style="list-style-type: none">• Intel 82945G
Screen resolution	1920 × pixels
USB port	2 × USB 2.0

Supported operating systems	Windows 7 (64bit), Windows 10 (64bit)
-----------------------------	---------------------------------------

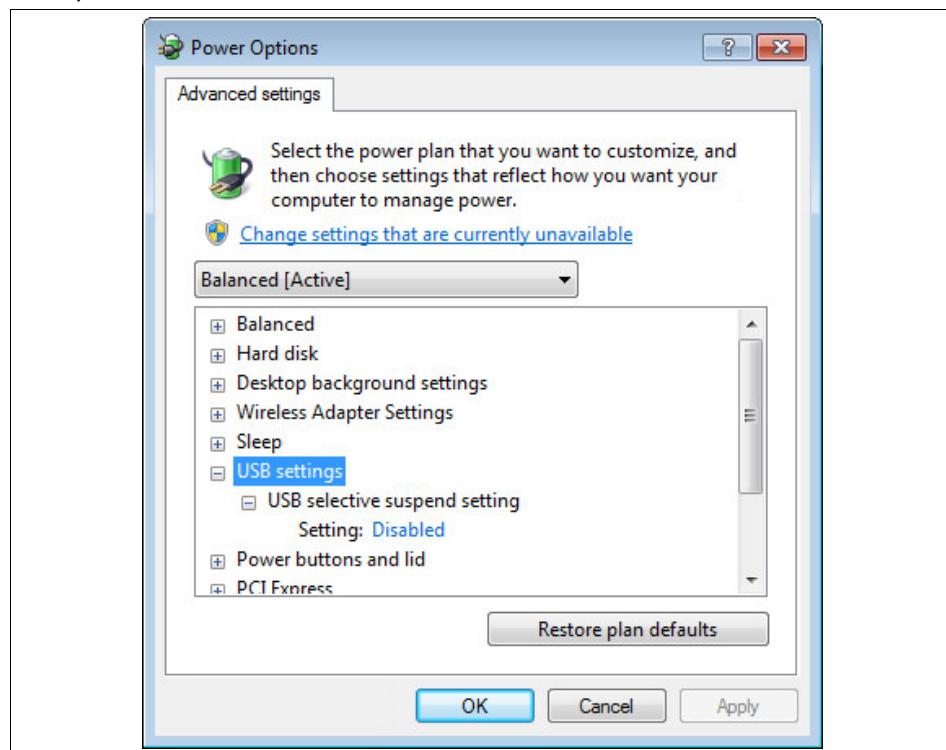
**Note**

PCs with Intel Core i3/i5 or i7 processor of the 6th generation (Skylake) do not fully support the USB 2.0 interface of the installed camera. If problems arise while transmitting the camera image, LPKF recommends to use a USB 3.0 camera.

3.1.1 Required setting in the Windows Power options

The USB power-saving function must be disabled to ensure stable operation of CircuitPro PM. The following figure shows the disabled power option as an example in Windows 7:

Fig. 2: Required setting in Power options



3.2 Installing and starting 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 damage to the machine caused by improper software installation.



Note

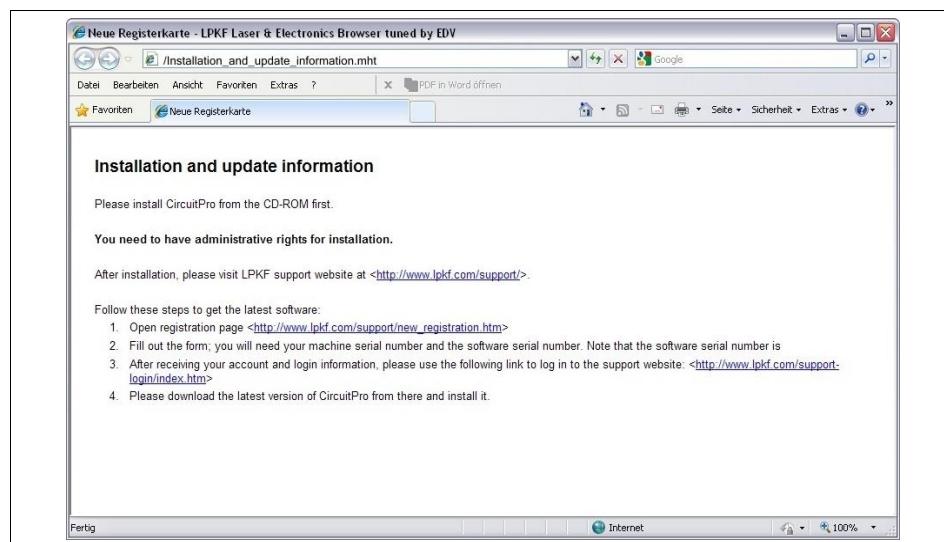
Make sure that the machine is not connected to the computer.

The USB cable must not be connected!

■ Installing CircuitPro PM

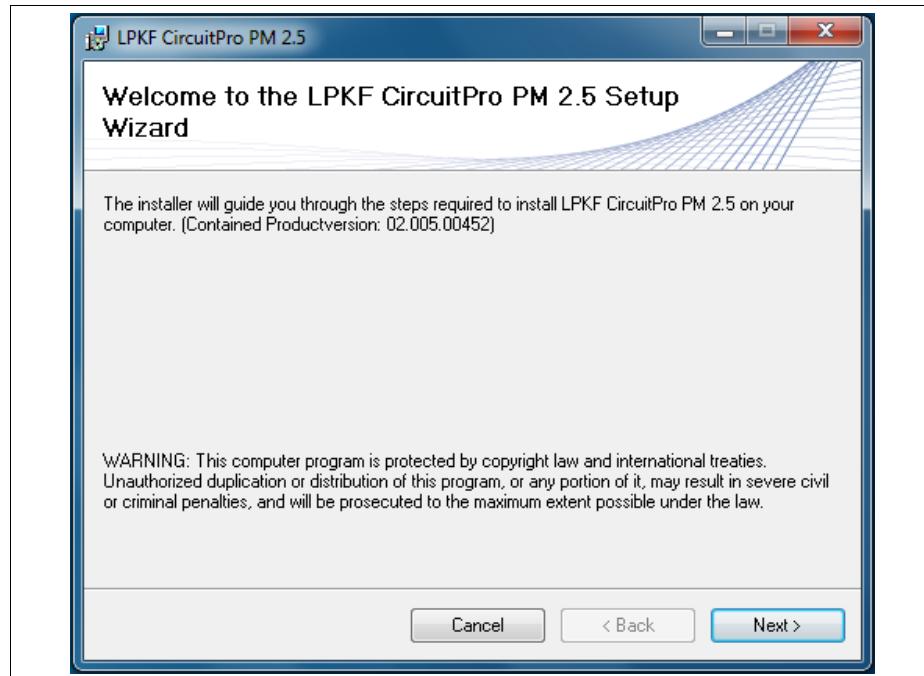
1. Switch on the PC.
 2. Open the CD ROM drive and insert the CD ROM "CircuitPro PM" into the drive.
- The CD ROM is read. The LPKF setup wizard starts automatically and the installation and update information is displayed in your browser's window:

Fig. 3: Installation and update information



3. Close the browser window displaying the installation and update information.

Fig. 4: LPKF setup wizard



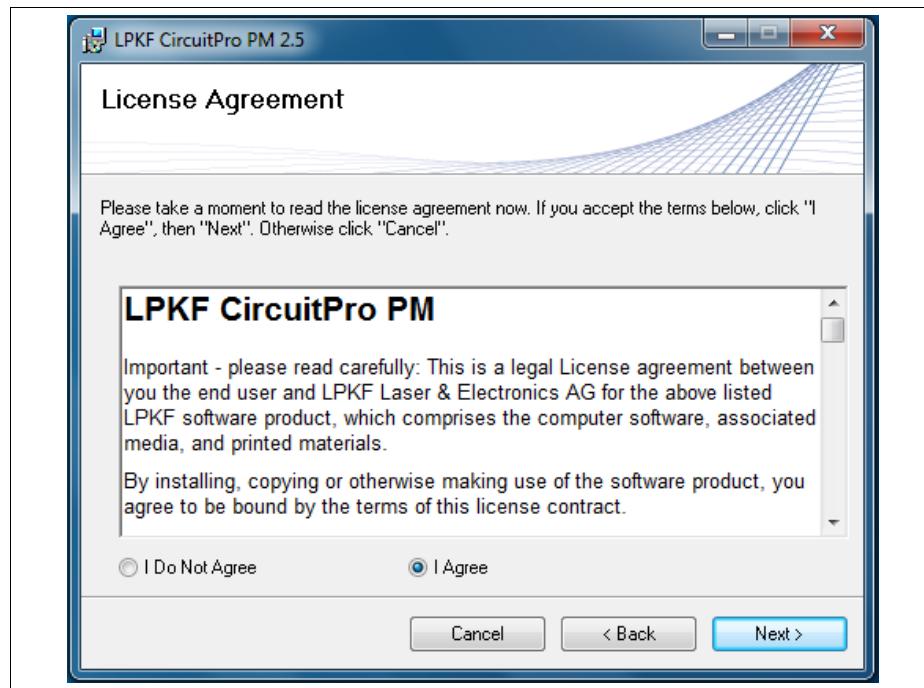
- Click on [Next] to start the installation procedure.



Note

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

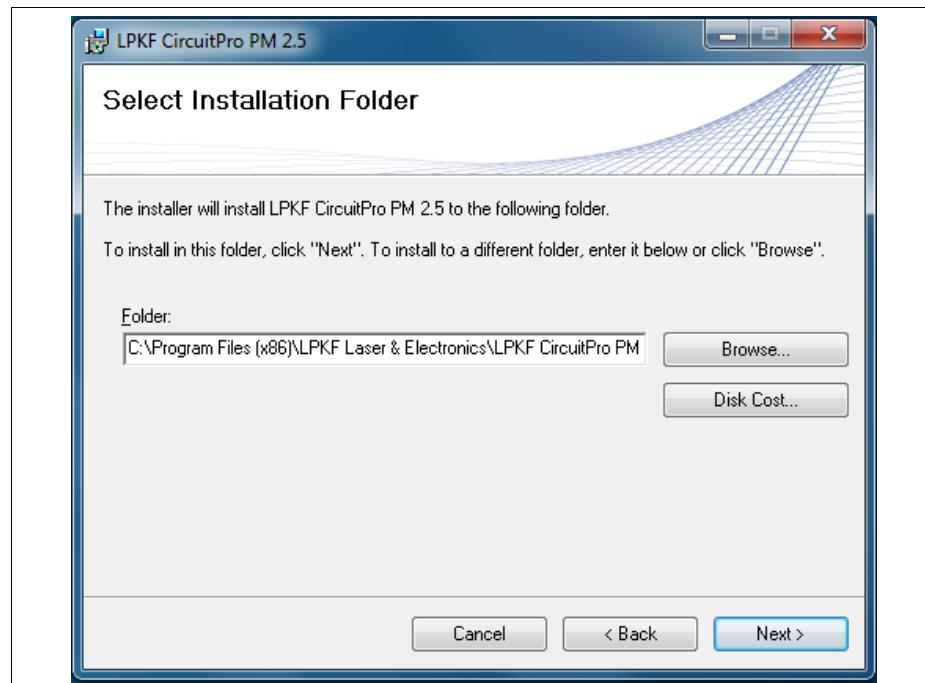
Fig. 5: License agreement



- Read the terms of the license agreement and select {I Agree}.
- Click on [Next].

- In the following step, you can choose the folder where CircuitPro PM is to be installed:

Fig. 6: Choosing the installation folder



When using Windows 8, the installation stores the program data by default in:

Note

C:\Program Files (x86)\LPKF Laser & Electronics\LPKF CircuitPro PM 2.x\.

When using Windows 7, the installation stores the program data by default in:

C:\Program Files (x86)\LPKF Laser & Electronics\LPKF CircuitPro PM 2.x\.

Click on [Browse] to install the program data in a folder of your choice.



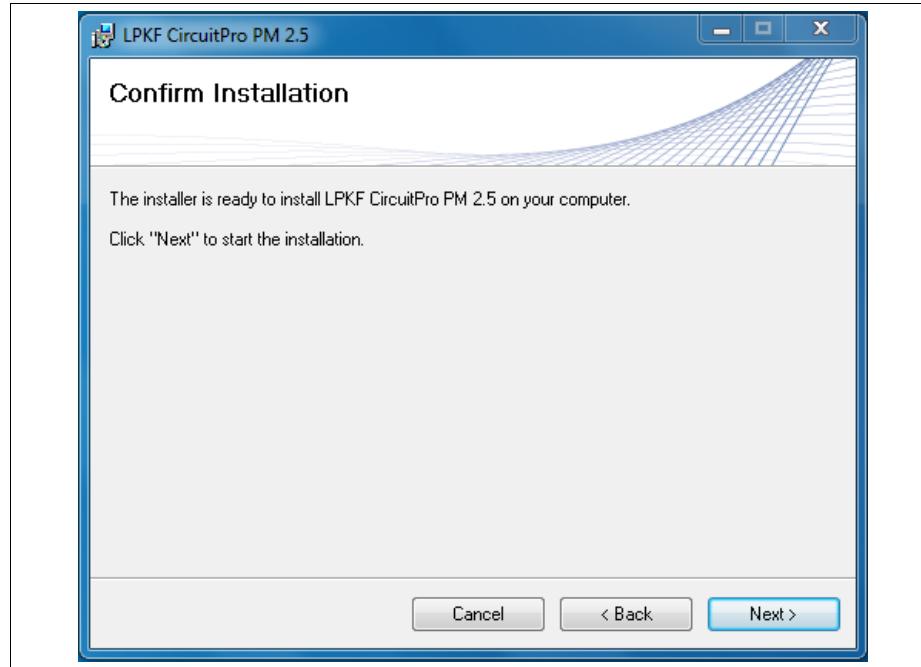
Click on [Back] to review the settings of the previous screens.
Click on [Cancel] to cancel the installation.

Note

7. Click on [Next].

➔ The dialog to confirm the installation is displayed:

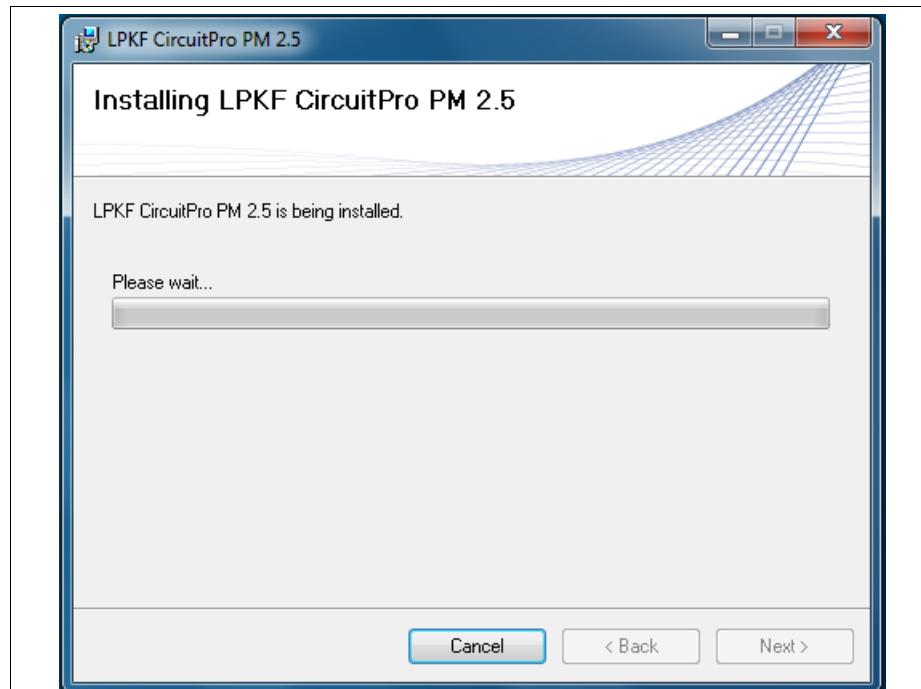
Fig. 7: Confirm installation



8. Click on [Next].

➔ The installation of CircuitPro PM is started:

Fig. 8:
Installation of
CircuitPro PM 2.3



- ⇒ The following warning message is displayed during the installation:

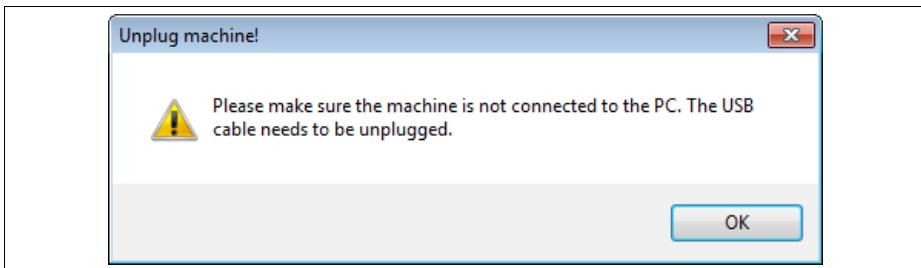
Fig. 9: User Account Control



9. Click on [Yes].

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

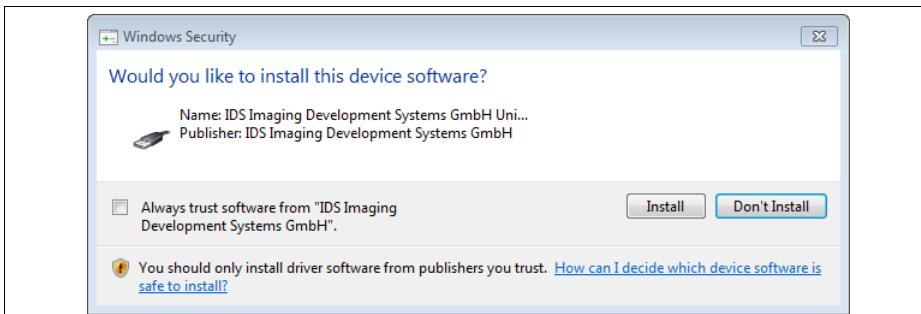
Fig. 10: Warning message



10. Acknowledge the warning message by clicking on [OK].

- ⇒ The following dialog is displayed during the installation:

Fig. 11: Driver installation



11. Click on [Install].



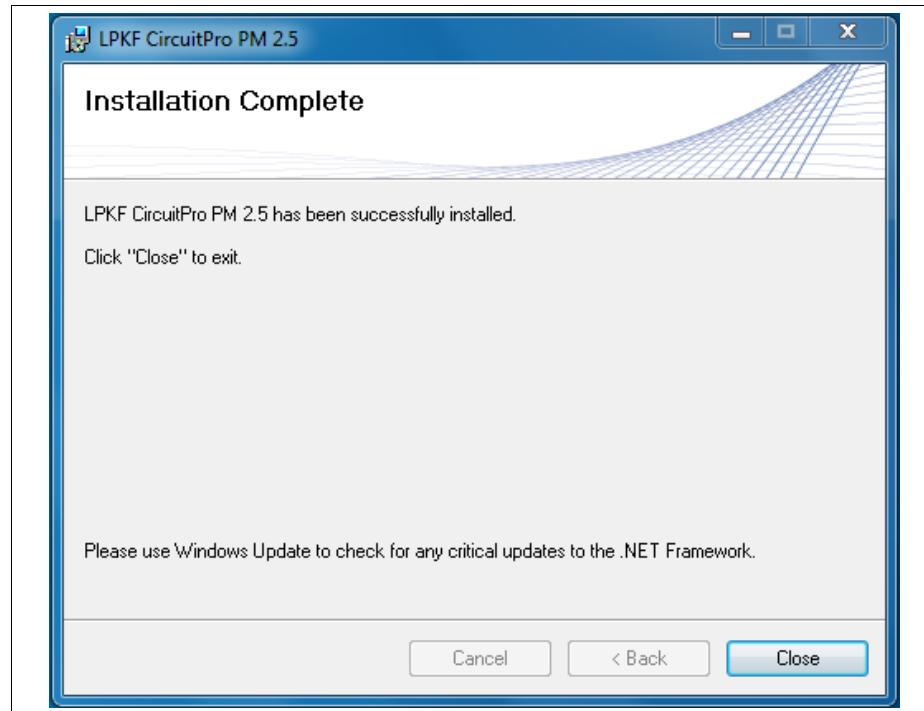
Note

LPKF recommends to install the camera driver even if the camera is not installed.

- ⇒ The camera driver is installed.

Fig. 12:
Installation
complete

► When the installation is complete, the following dialog is displayed:



12. Click on [Close] to exit the installation program.

- ◆ The CircuitPro PM program has been installed.



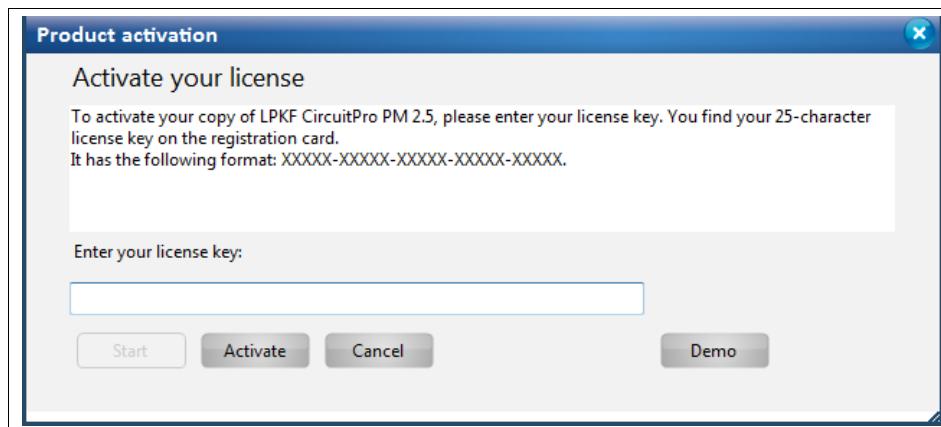
Note

A link to the CircuitPro PM program has been created on your desktop:



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

Fig. 13: Dialog Product activation



4. Enter your license key.



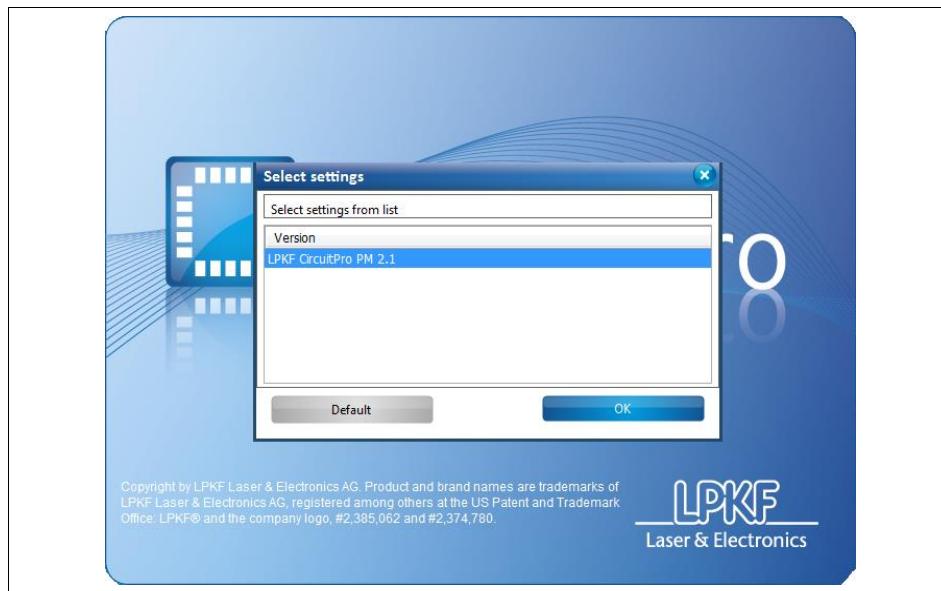
You can find your 25-character license key on the registration card.

Note

5. Click on [Activate]

- ➔ The following splash screen is displayed:

Fig. 14: CircuitPro PM splash screen




Note

If you already had installed a previous version of CircuitPro on your computer, you can decide at this point whether to use your previous configuration files. This means that settings that are stored in the following folder are also applied to currently installed version CircuitPro PM:

In Windows 7:

`C:\Program Files (x86)\LPKF Laser & Electronics\LPKF CircuitPro 2.X\config.`

These settings apply – among others – to the language setting and the machine configuration.

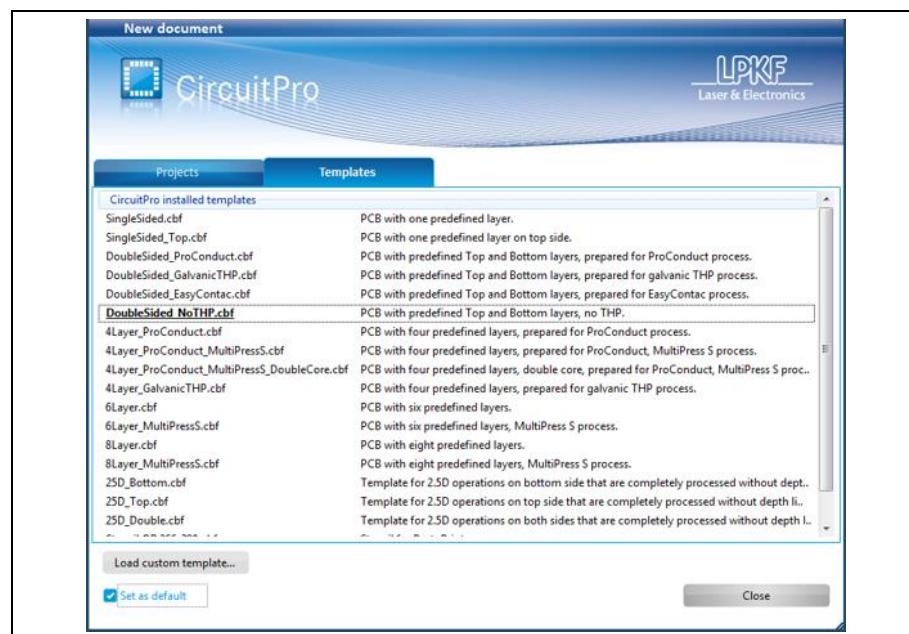
4. In the list “Version”, click on the CircuitPro version whose configuration settings you want to use and subsequently click on [OK].

Or

4. Click on [Default] if you want to use the default settings of CircuitPro PM.

► The following dialog is displayed:

Fig. 15: New document



5. Select a template file.

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



Tip

Language settings

CircuitPro PM is installed in English by default. If you want to change the language setting of CircuitPro PM, perform the following steps:

1. Click on Extras > Options.
2. Click on the row “Language” and change the value to the desired language.

3.3 Machine setup

After CircuitPro PM 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 PM.
- ➔ The equipment configuration wizard starts automatically.

**Fig. 16: Start-up screen
“Equipment configuration wizard”**



Note

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



Note

ProtoMat X60/H100

The machine-specific files (*.ini oder *.xml) have to be available at the first startup or after replacing the PC.

Ini file: Has been delivered together with the machine and is stored on the data medium of the machine. Or you can copy the ini file of an existing BoardMaster installation.

Xml file: Machine settings exported from CircuitPro PM.

2. Perform all the steps of the equipment configuration wizard and follow the corresponding instructions.
- ➔ The CAM view is displayed.
- ◆ The machine has been set up. The accompanying available equipment for producing PCB prototypes has been configured as well.

4 Structure of the user interface

The following pages describe in detail the structure of the CircuitPro PM user interface.

4.1 User interface

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

Fig. 17: CircuitPro user interface

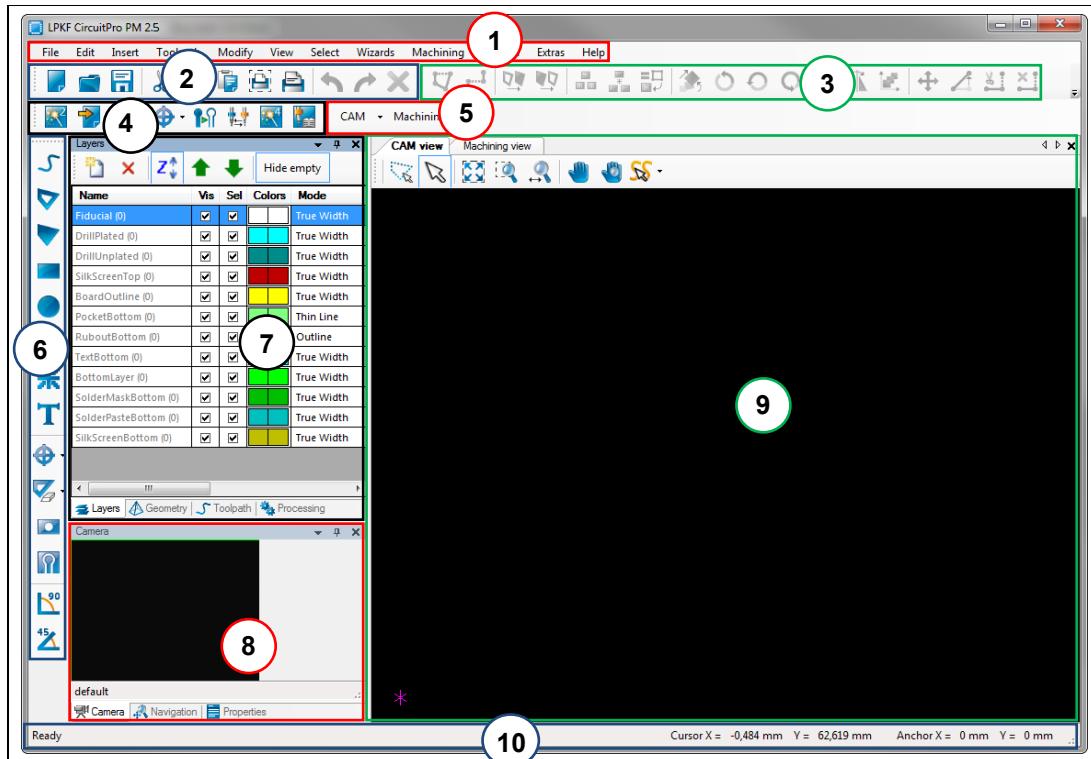


Table 3: User interface

No.	Pane	Name
/1/		Menu bar
/2/		“Standard” toolbar
/3/		“Modify” toolbar
/4/		“Prototyping” toolbar
/5/		“Layouts” toolbar
/6/		“Insert” toolbar
/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 Views

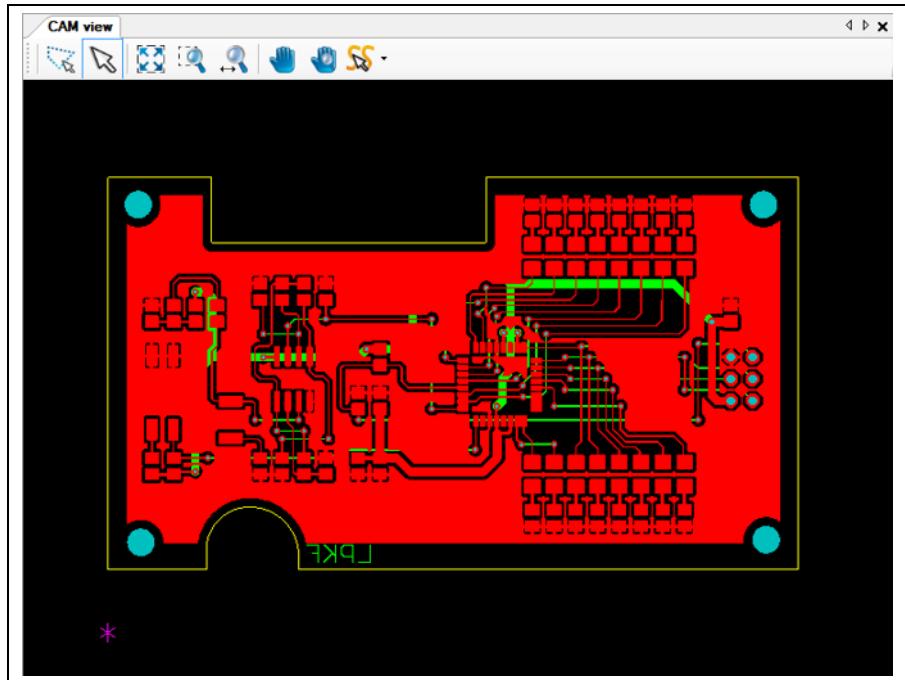
In the following, the different views in CircuitPro PM are described in detail.

4.2.1 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. 18: CAM View

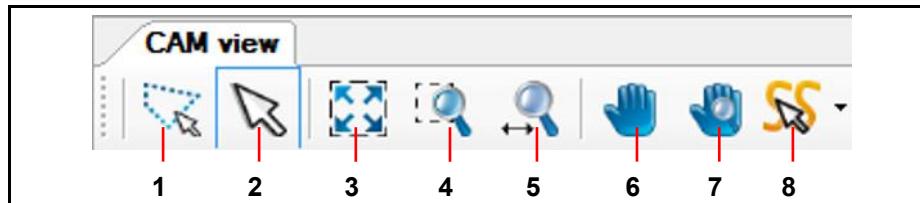


In this view you are able to regard both sides of the PCB. According to the colors in the pane "Layers" each object on the board is highlighted.

4.2.2 Toolbar CAM view

The toolbar “CAM view” provides following icons:

Fig. 19: Toolbar CAM view



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

Table 4: Toolbar CAM view

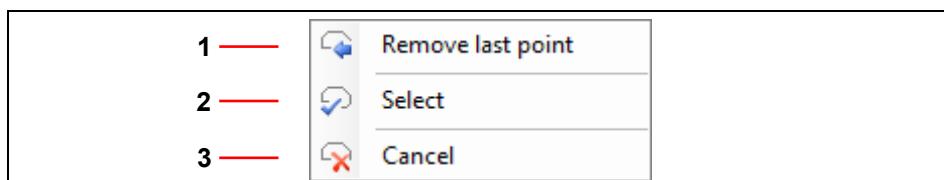
No.	Function description
/1/	Polygonal Selection: Click on this icon to select objects by drawing polygons. The context menu offers extended functions if this icon is enabled.
/2/	Selection: This arrow must be enabled to select or create objects in the CAM view.
/3/	Fit all: Click on this icon to fit the whole layout into the CAM view.
/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 an area in the layout again, this area will be zoomed in.
/8/	Set toolpath selection mode: Selects toolpaths within the created polygon. Three different modes are available: object, curve and element.

Context menu Polygonal selection

- Displaying the context menu Polygonal selection
- 1 Click on the icon [Polygonal selection].
- ➔ The polygonal selection is activated.
- 2 Right-click into the CAM view.

► The following context menu is displayed:

Fig. 20: Context menu “Polygona selection”



/1/ Remove last point

/2/ Select

/3/ Cancel

◆ The context menu Polygonal selection is displayed.

The following table contains a brief description of the context menu's functions:

Table 5: Context menu “Polygona selection”

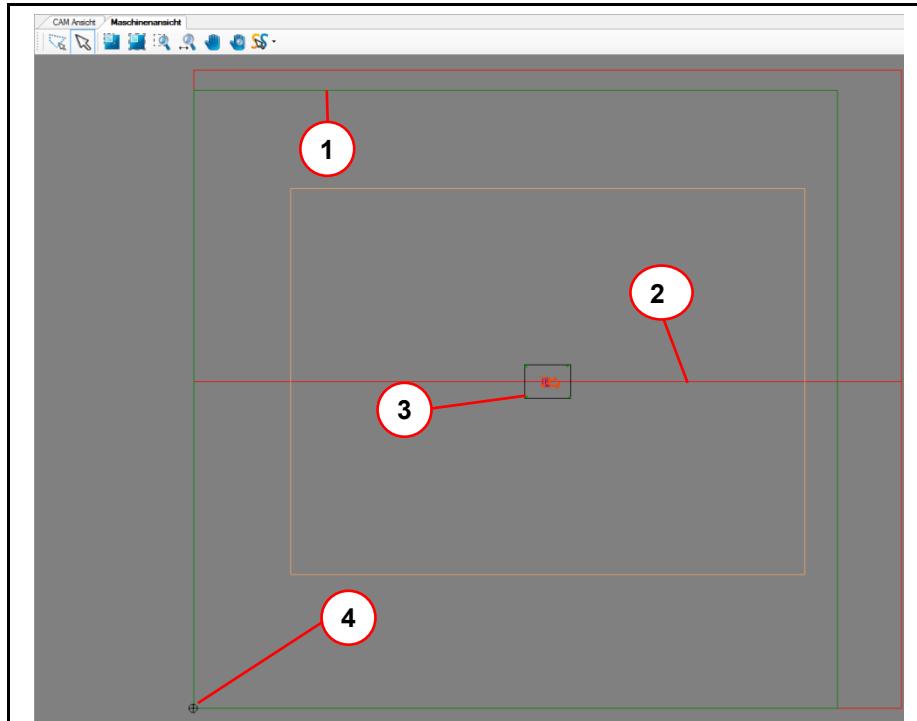
No.	Description
/1/	Remove last point: Removes the point added last to the polygon.
/2/	Select: Selects the objects within the polygon.
/3/	Cancel: Cancels the creation of the polygon.

4.2.3 Machining view ProtoMat X60

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on “Machining view” in the toolbar “Layout” to open this view:

Fig. 21:
Machining view
X60



/1/ Processing area

/3/ Object to be processed

/2/ Axis of reflection

/4/ Current head position

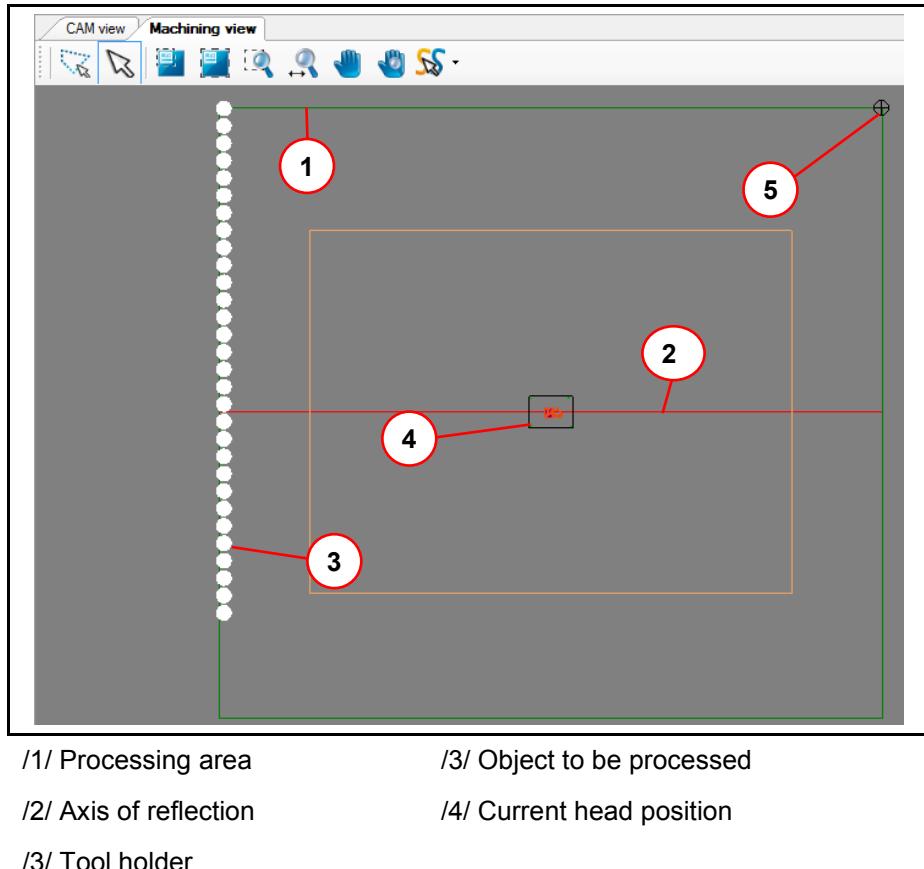
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.4 Machining view ProtoMat H100

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on “Machining view” in the toolbar “Layout” to open this view:

Fig. 22:
Machining view
H100



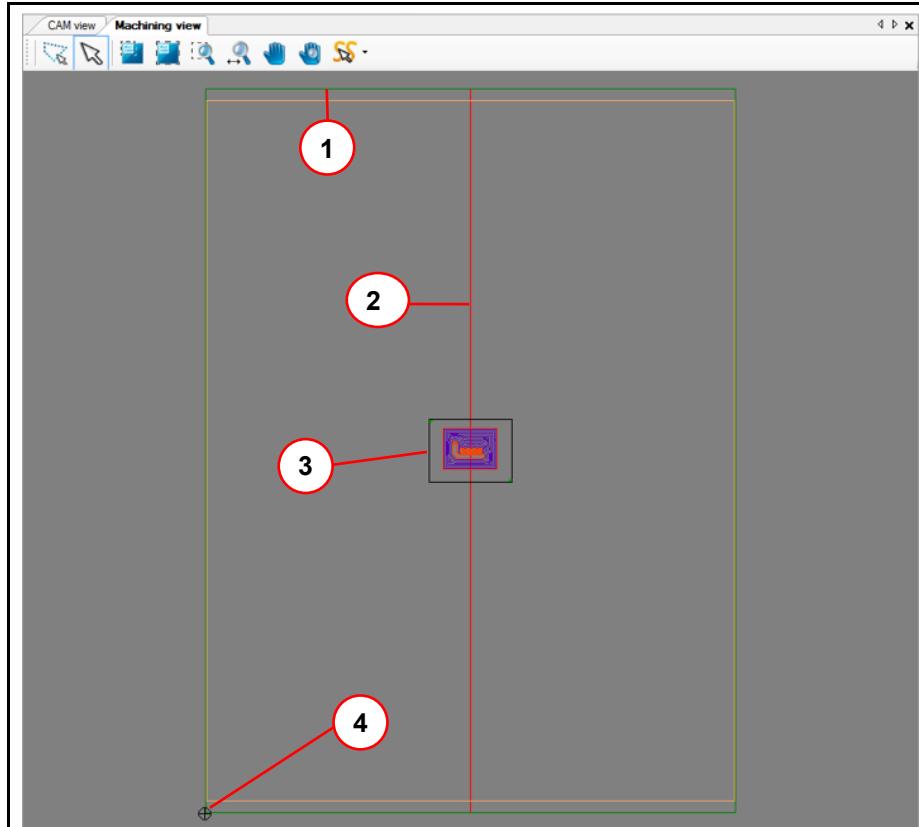
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.5 Machining view E33/E34/E44

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on “Machining view” in the toolbar “Layout” to open this view:

Fig. 23:
Machining view
E33



/1/ Processing area

/3/ Object to be processed

/2/ Axis of reflection

/4/ Current head position

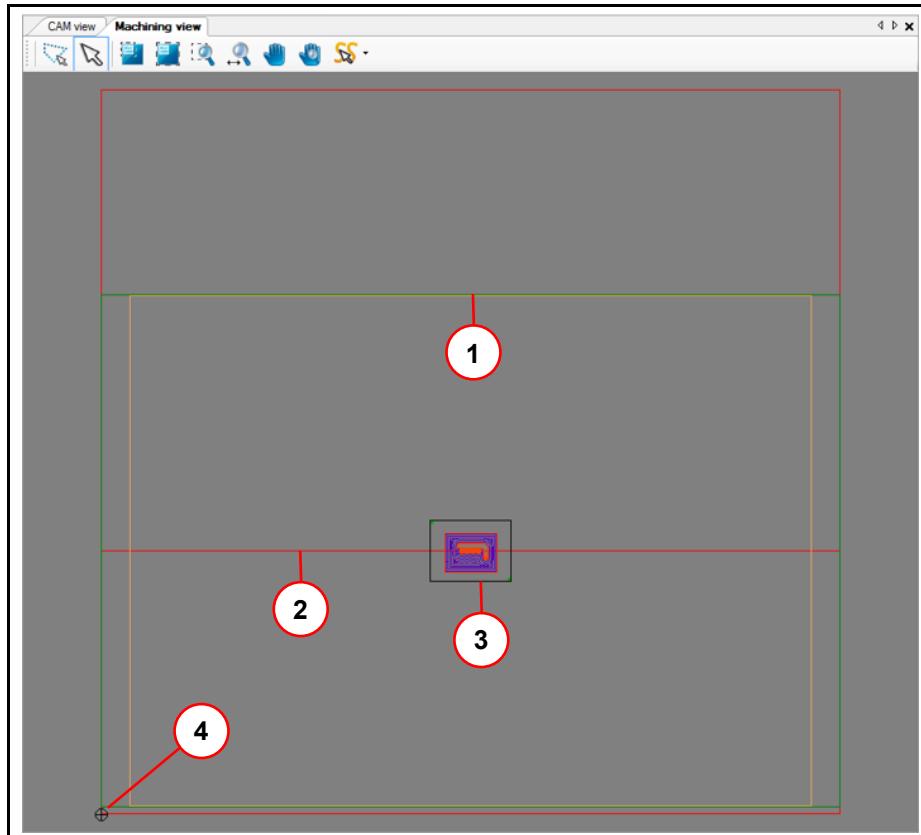
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.6 Machining view S43

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on “Machining view” in the toolbar “Layout” to open this view:

Fig. 24:
Machining view
S43



/1/ Processing area

/3/ Object to be processed

/2/ Axis of reflection

/4/ Current head position

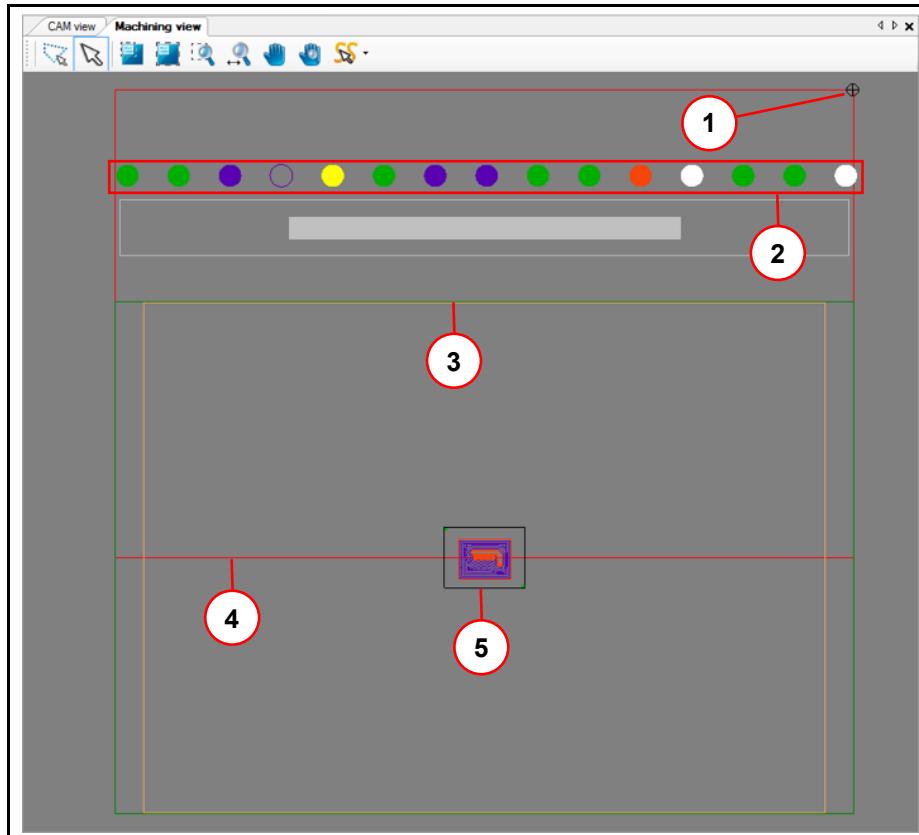
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.7 Machining view S63/S103

The machining view enables you to regard your process data.

Click on View > Machining 2D or click on “Machining view” in the toolbar “Layout” to open this view:

Fig. 25:
Machining view
S63/S103



/1/ Current head position

/4/ Axis of reflection

/2/ Tool holder

/5/ Object to be processed

/3/ Processing area

The tool magazine of the circuit board plotter can pick up to 15 different tools. According to the colors of the tool's distance rings of the LPKF tools, the circles in area /2/ are displayed in the same color.

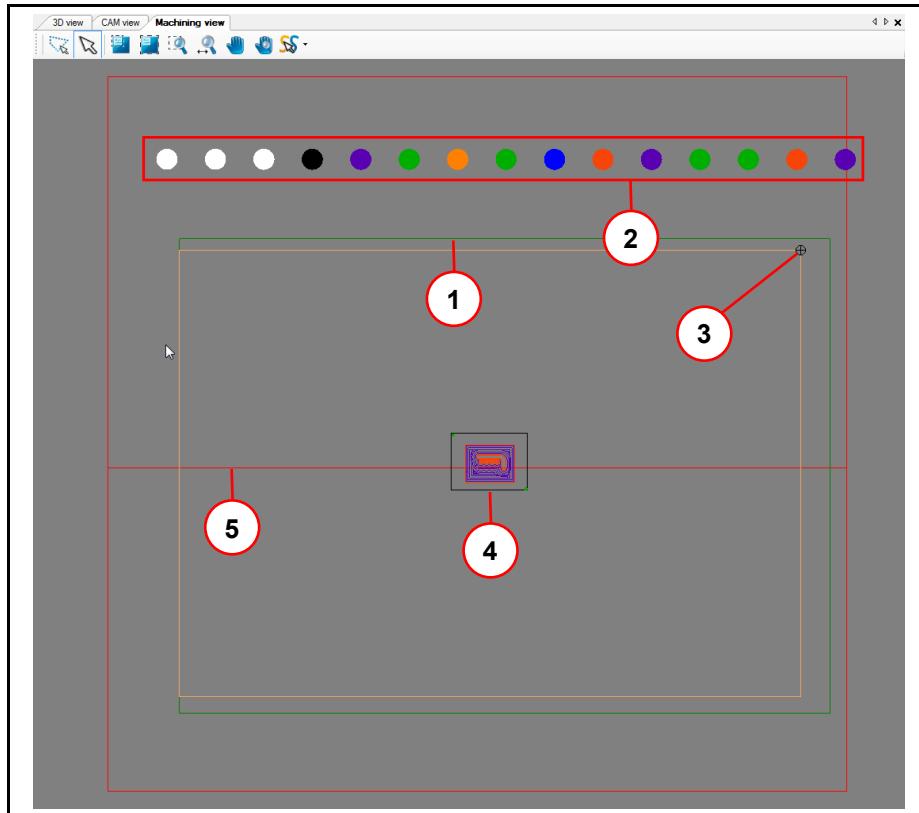
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.8 Machining view ProtoMat D104

The machining view enables you to regard your process data.

Click on View > Machining 2D to open this view or click on "Machining view" in the toolbar "Layout".

Fig. 26:
Machining view
D104



/1/ Processing area

/4/ Object to be processed

/2/ Tool holder

/5/ Axis of reflection

/3/ Current head position

The tool magazine of the circuit board plotter can pick up to 15 different tools. According to the colors of the tool's distance rings of the LPKF tools, the circles in area /2/ are displayed in the same color.

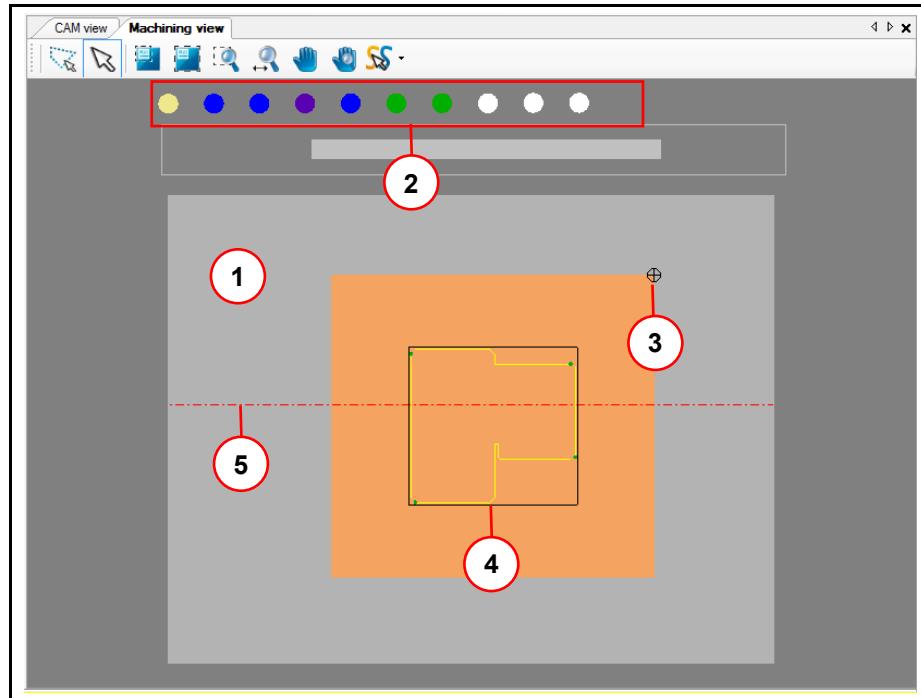
When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.9 Machining view ProtoMat S64/S104

The machining view enables you to regard your process data.

Click on View > Machining 2D to open this view or click on “Machining view” in the toolbar “Layout”.

Abb. 27:
Machining view



/1/ Processing area

/4/ Object to be processed

/2/ Tool holder

/5/ Axis of reflection

/3/ Current head position

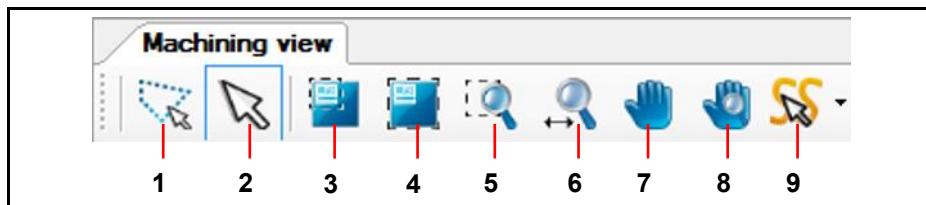
The tool magazine of the circuit board plotter can pick up to 15 (ProtoMat S64) or 20 (ProtoMat S104) tools. According to the colors of the tool's distance rings of the LPKF tools, the circles in area /2/ are displayed in the same color.

When you start the production of a board, the movement of the milling head, displayed as crosshairs, is shown in the machining view.

4.2.10 Toolbar Machining view

The toolbar “Machining view” provides following icons:

Fig. 28: Toolbar “Machining view”



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

Table 6: Toolbar “Machining view”

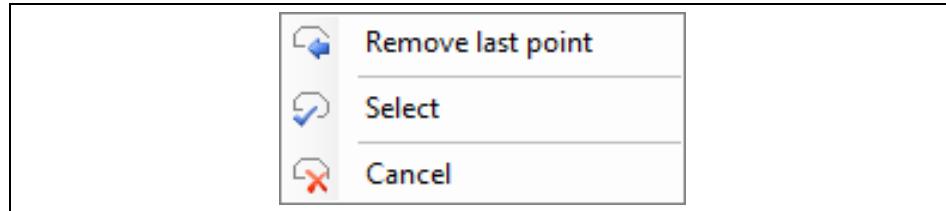
No.	Function description
/1/	Polygonal Selection: Click on this icon to select objects by drawing polygons. The context menu offers extended functions if this icon is enabled.
/2/	Select: This arrow must be enabled to select or create objects in the machine view.
/3/	Fit All only for Job Data: Only the job data is displayed. Other elements of the machining view are hidden.
/4/	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.
/5/	Zoom area: Click on this icon and select an area that will be zoomed in afterwards.
/6/	Zoom: Click on this icon and move your mouse to zoom in/out the layout.
/7/	Pan: Click on this icon to move your whole layout to a desired position.
/8/	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.
/9/	Set toolpath selection mode: Selects toolpaths within the created polygon. Three different modes are available: object, curve and element.

Context menu Polygonal selection

- Displaying the context menu Polygonal selection
- 1 Click on the icon [Polygonal selection].
- ➔ The polygonal selection is activated.
- 2 Right-click into the CAM view.

► The following context menu is displayed:

Fig. 29: Context menu "Polygonal selection"



◆ The context menu Polygonal selection is displayed.

The following table contains a brief description of the context menu's functions:

Table 7: Context menu "Polygonal selection"

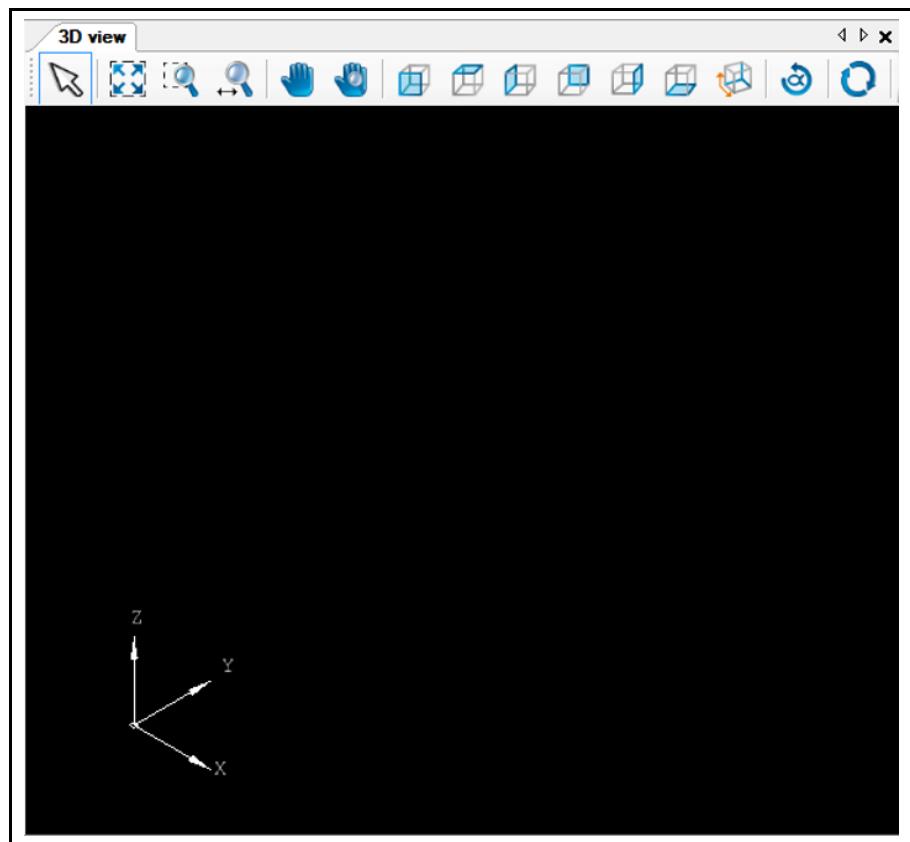
No.	Description
/1/	Remove last point: Removes the point added last to the polygon.
/2/	Select: Selects the objects within the polygon.
/3/	Cancel: Cancels the creation of the polygon.

4.2.11 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. 30: 3D View



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



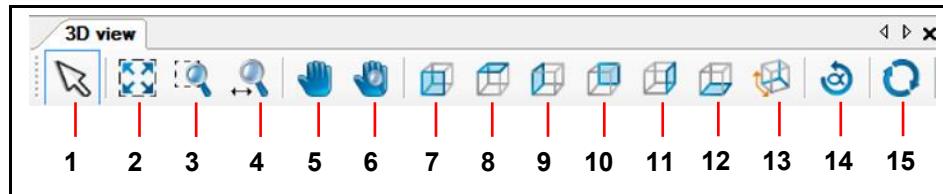
Note

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.

4.2.12 Toolbar 3D view

The toolbar “3D view” provides following icons:

Fig. 31: Toolbar “3D view”



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

Table 8: Toolbar “3D view”

No.	Function description
/1/	Selection: This arrow must be enabled to select or create objects in the 3D view.
/2/	Fit all: Click on this icon to fit the whole layout into the 3D 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 an area in the layout again, this area will be zoomed in.
/7/	Front view: Displays the front of the object.
/8/	Top View: Displays the top side of the object.
/9/	Left View: Displays the left side of the object.
/10/	Rear View: Displays the rear side of the object.
/11/	Right View: Displays the right side of the object.
/12/	Bottom View: Displays the bottom side of the object.
/13/	Axonometric View: Standard view that displays the object in a 30° angle.
/14/	Rotate: Click on this icon to rotate your object in any direction by using your mouse.
/15/	Reset View: Resets the current view of your object.

4.3 Toolbars

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

Fig. 32:
Toolbars



The following toolbars exist in CircuitPro PM:

- Standard
- Insert
- Modify
- Layouts
- Prototyping



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 PM.

- 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

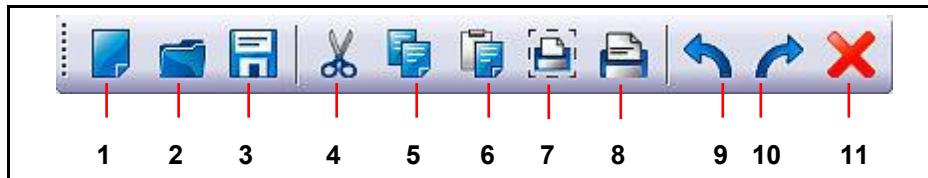
You can arrange the toolbar on the left, bottom, right or top of the user interface.

- 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. 33: Toolbar "Standard"



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

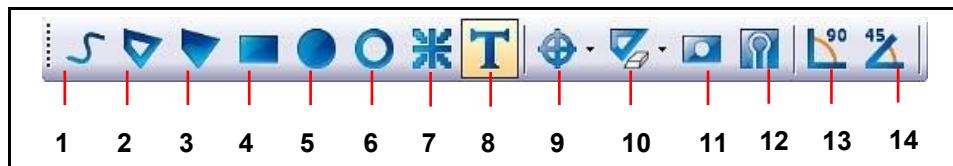
Table 9: Function description "Standard"

No.	Icon	Function description
/1/	New...	Creates a new document in CircuitPro PM. 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 PM 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. 34:
Toolbar
“Insert”



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

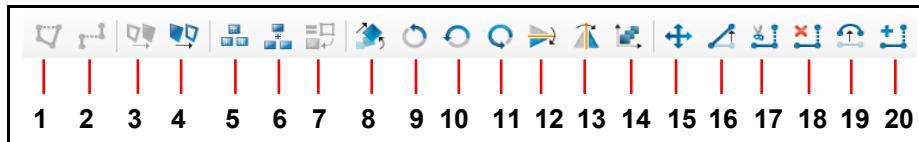
Table 10:
Function
description
“Insert”

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. 35: Toolbar „Modify“



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

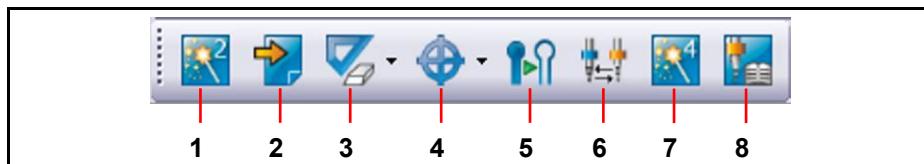
Table 11: Toolbar “Modify”

No.	Icon	Function description
/1/	Close open path	Closes an open path.
/2/	Combine open paths	Combines several open paths into a single open path.
/3/	Convert closed path to polygon	Converts the selected object to a polygon.
/4/	Convert polygon to path	Converts the selected object to a closed 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	Converts objects on the same layer that have the same form and size as the selected flash object into flash objects.
/8/	Transformation	Translates, rotates, scales and inverts objects and toolpaths.
/9/	Rotate objects 90° counter-clockwise around the anchor point	Rotates the selected object 90° counter-clockwise around the anchor point.
/10/	Rotate objects 180° around the anchor point	Rotates the selected object 180° around the anchor point.
/11/	Rotate objects 270° counterclockwise around the anchor point	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/	Step and repeat	The selected objects are duplicated with a defined distance, vector and count.
/15/	Move selected objects	Moves the selected object.
/16/	Move a point or segment	Moves a point or a segment.
/17/	Cut a point or segment	Cuts a point or a segment.
/18/	Delete a point or segment	Deletes a point or a segment.
/19/	Create or move an arc	Creates or moves an arc.
/20/	Add a point or segment	Adds a point or a segment.

4.3.4 Toolbar Prototyping

The toolbar “Prototyping” provides following icons:

Fig. 36: Toolbar “Prototyping”



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

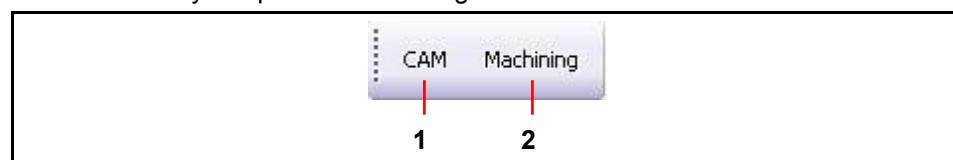
Table 12:
Function
description
“Prototyping”

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 isolation 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. 37: Toolbar “Layout”



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

Table 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 PM allows arranging 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 is displayed at the left bottom of the main window of CircuitPro PM.
2. Double-click on the title bar of the pane.
- The pane is now detached.
- ◆ You are able to maximize/minimize the pane and to arrange it as desired.

■ Fixing the pane

1. Click and hold the detached pane with the left mouse button.
2. Move the pane.
- In the main window of CircuitPro PM, icons appear at the top, bottom, right and left side.
3. Move the pane onto the icon at the desired window edge.



Be sure to place the cursor exactly on the icon before you release the left mouse button.

Note

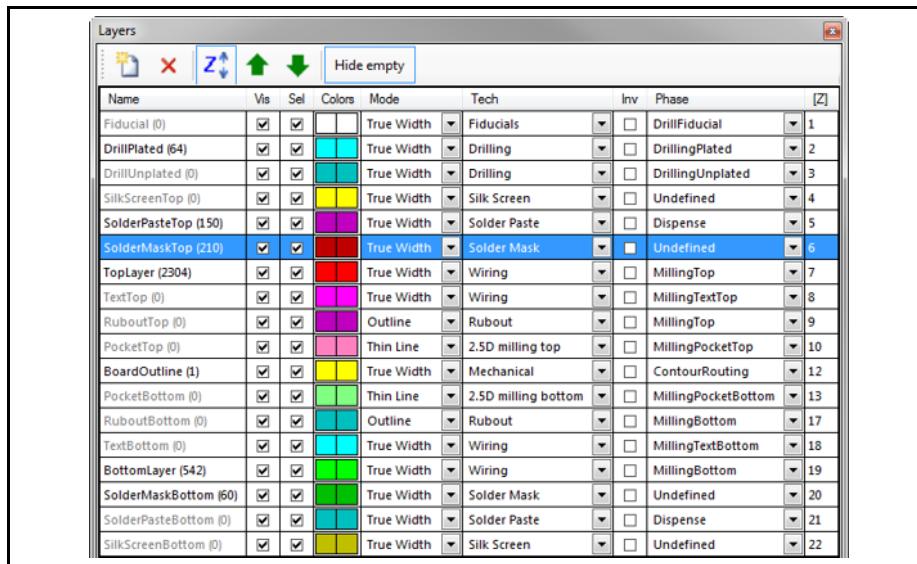
4. Release the left mouse button.
- ◆ The pane is now fixed at the desired position.

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. 38: Pane “Layers”



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

Table 14:
Columns in the
pane “Layers”

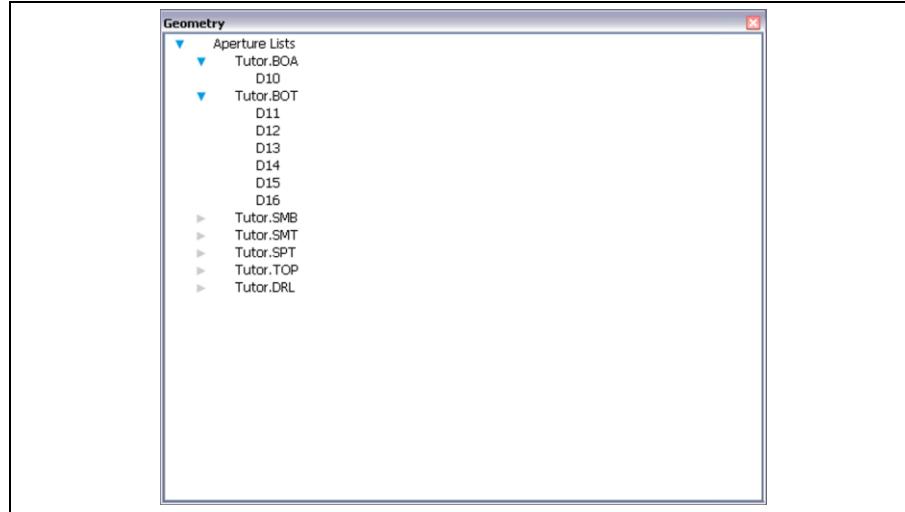
Column	Description
Name	Shows the name of the layer. The numbers shown in the brackets next to the layer name shows the number of the contained objects.
Visible	Shows/hides the corresponding layer in CAM View.
Selectable	Enable this function to make the layer selectable in CAM View.
Colors	In this column 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 PM names the aperture list after the file name by default.

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

Fig. 39: Pane “Geometry”

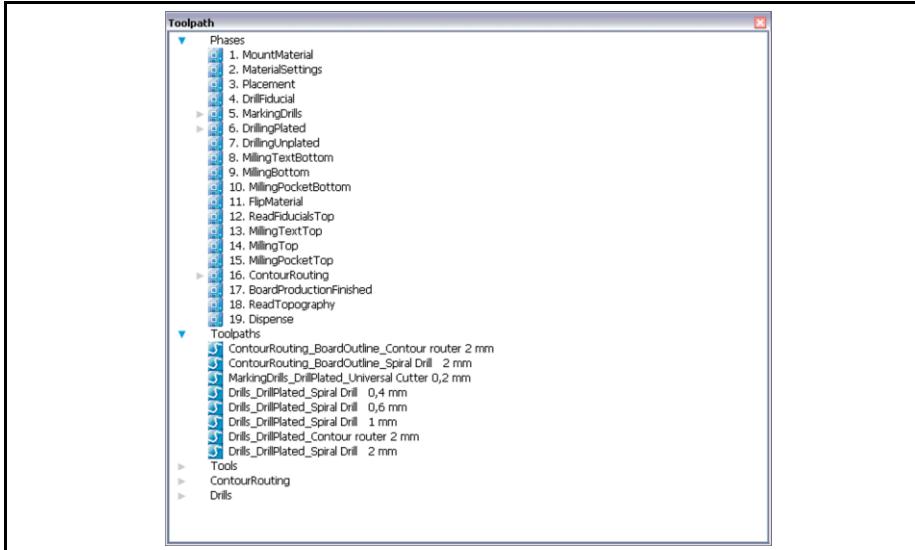


4.4.3 Toolpath

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

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

Fig. 40: Pane “Toolpath”



The phases are named after the production steps. After clicking on the arrow symbol to the left of a phase, the tools used for the 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.

Also note that in section "Select a Head" a laser head is available when using the ProtoMat D104.

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

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

Fig. 41: Pane "Processing"

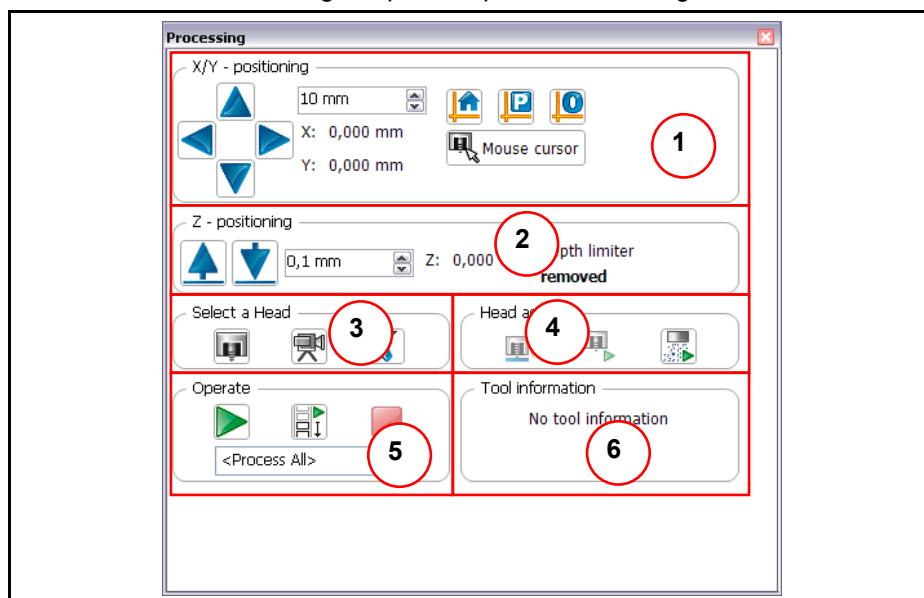


Table 15:
Processing

No.	Button	Description
X/Y - positioning		
/1/	 10 mm	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/		Enables moving the head to the position selected by mouse click in the machining view.

Table 15:
Processing

No.	Button	Description
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 a 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.
/3/		Select the laser 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.
/4/		Switches the suction on/off.
/4/		Executes the auto focus.
/4/		Decreases the brightness of the camera.
/4/		Increases the brightness of the camera.

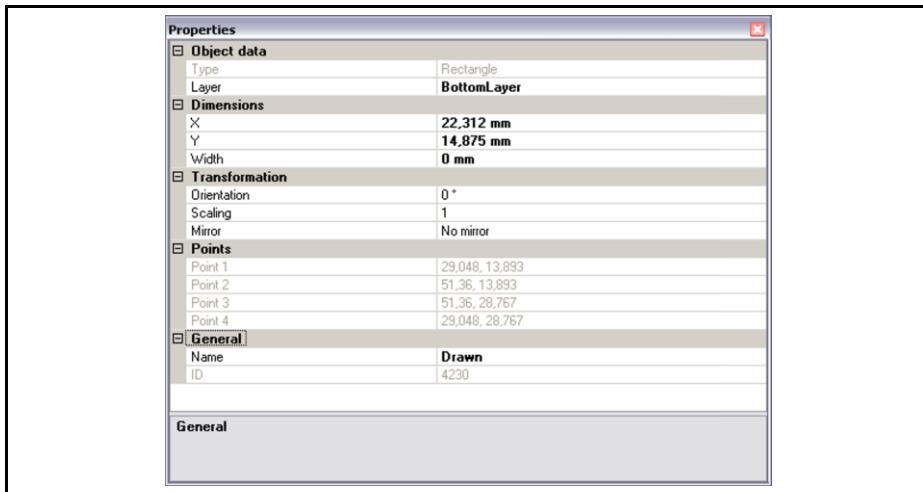
Processing		
/5/	 <Process All> ▾	Starts processing. Please note the phase that is selected in the field below.
/5/	 <Process Selected> ▾	Starts the processing of one or several selected toolpaths or phases. You can also access this function via the context menu by right-clicking on a selected toolpath or phase.
/5/	 MaterialSettings ▾	Starts processing from the selected phase in the field below. All subsequent phases are processed one after another.
/5/		Stops processing
Tool information		
/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. 42: Pane “Properties”

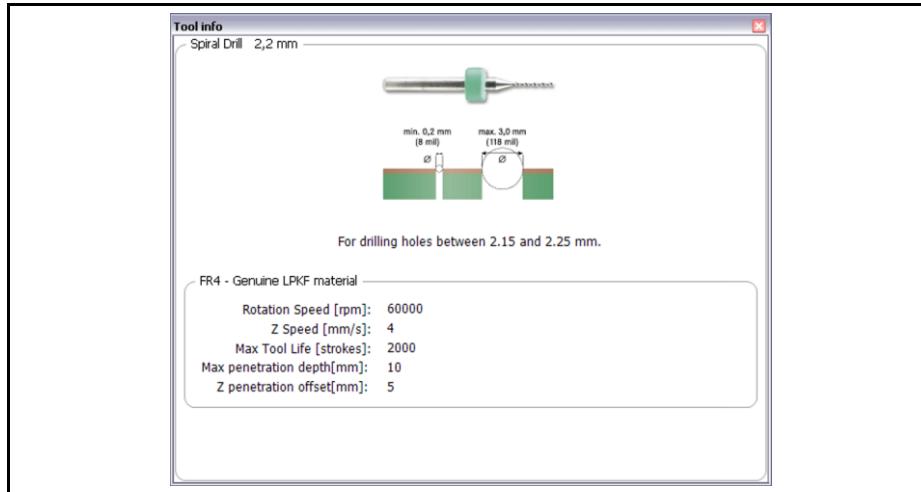


In this pane you find information about the tools, too. If you click on an aperture in the pane “Geometry”, you will get information about it, such as shape and diameter.

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. 43: Pane
“Tool info”

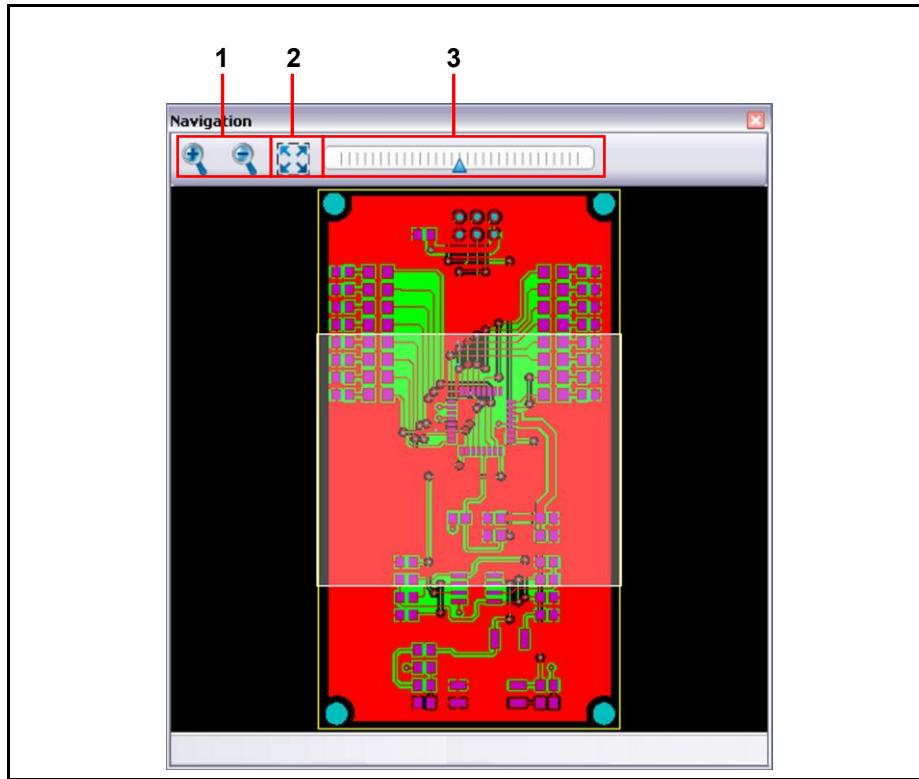


The tool information displayed here is identical to the information provided in the tool library.

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. 44: 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:

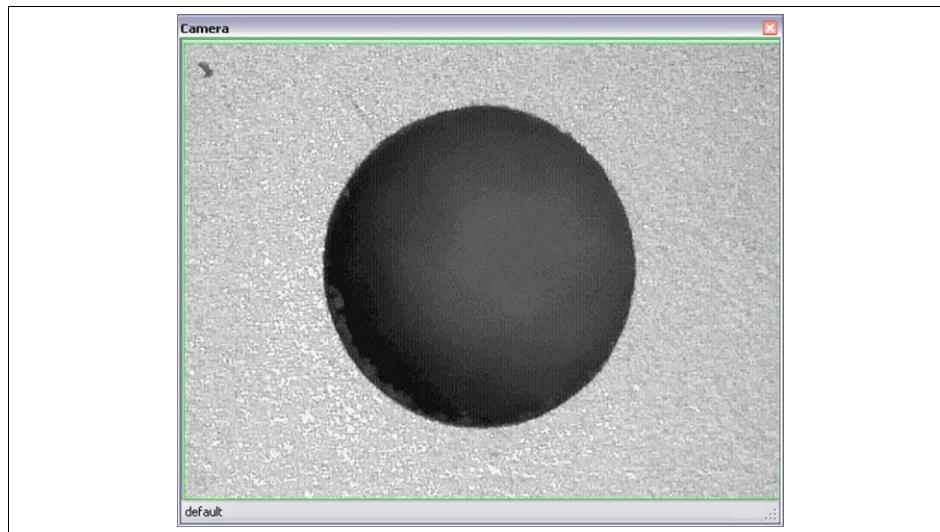
- Minimise/enlarge the area selected with the mouse by using the +/- magnifying glass icons /1/.
- Minimise/enlarge the area selected with the mouse by using the zoom bar /3/.
- Reset the zoom or adapt the layout to the CAM view by clicking on button /2/.

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. 45: 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. 46: Pane “Messages”



Table 16: Messages

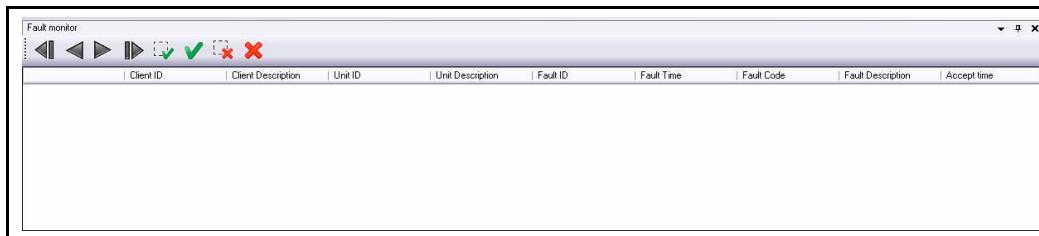
Type	Description
Errors	Errors are critical bugs. Click [Errors] in order to correct the errors. If the error recovery is not successful please call the LPKF Support.
Warnings	Warnings are input errors caused by the user. For example this may be information about cancelled or not properly executed actions.
Messages	Messages are statistical information of the program. This may be feedback from CircuitPro PM 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. 47:
Pane
“Fault
Monitor
”



The icons used signify the following:

Table 17: Error monitoring

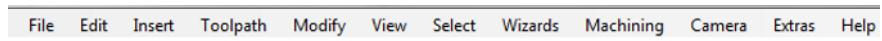
Icon	Description
	Displays the first error message.
	Displays the previous error message.
	Displays the next error message.
	Displays the last error message.
	Acknowledges the error message currently marked.
	Acknowledges all error messages.
	Deletes the error message currently marked.
	Deletes all error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

5 How to work with CircuitPro PM

The following chapter describes the usage of CircuitPro PM in detail.

Each menu and submenu of CircuitPro PM is listed accordingly.

Fig. 48: Menu bar
CircuitPro PM



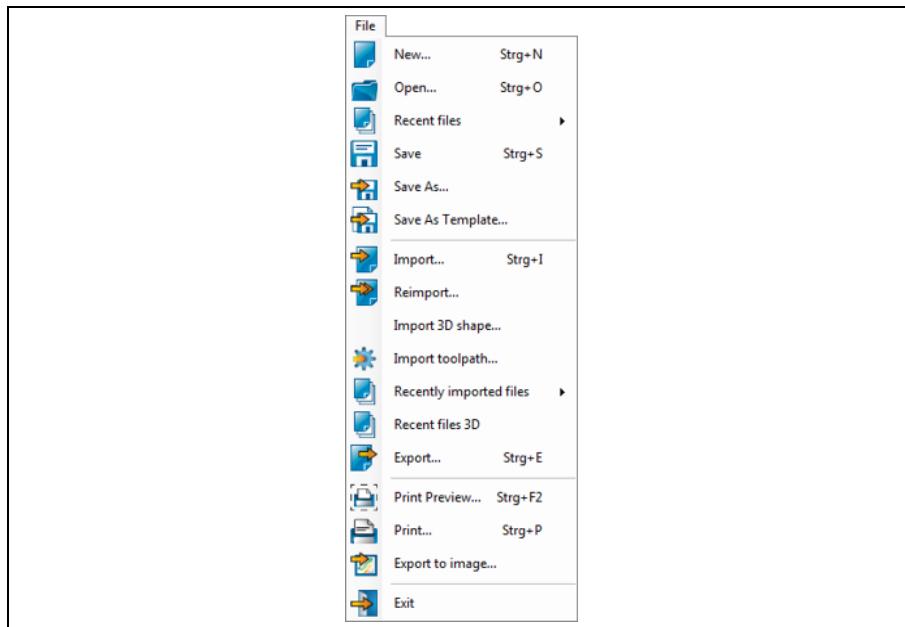
CircuitPro PM's menu bar contains following menu items:

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

5.1 Menu File

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

Fig. 49: Menu “File”



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

Table 18: “File” menu functions

Menu item	Description
New...	Creates a new document in CircuitPro PM. 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 PM document.
Recent files	Contains a list of the five CircuitPro PM 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 PM document.

Table 18: "File" menu functions

Menu item	Description
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 PM 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 PM.

5.1.1 New

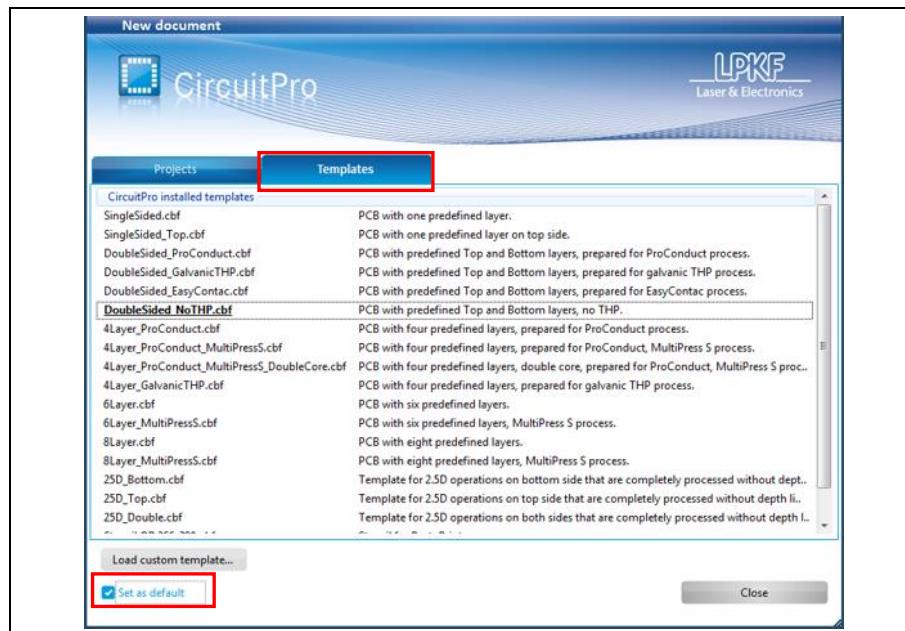
The menu item “New” lets you create a new document based on a template.

■ Creating a new document in CircuitPro PM

1. Click on File > New.
2. Select the tab “Templates”.

➔ The dialog of the templates available in CircuitPro PM is displayed:

Fig. 50: New document



3. Select a template.

◆ A new document is created based on the selected template.



Tip

If you want to define a template as default template, select the desired template and mark the check box “Set as default”. The corresponding template is underlined in the list of templates.

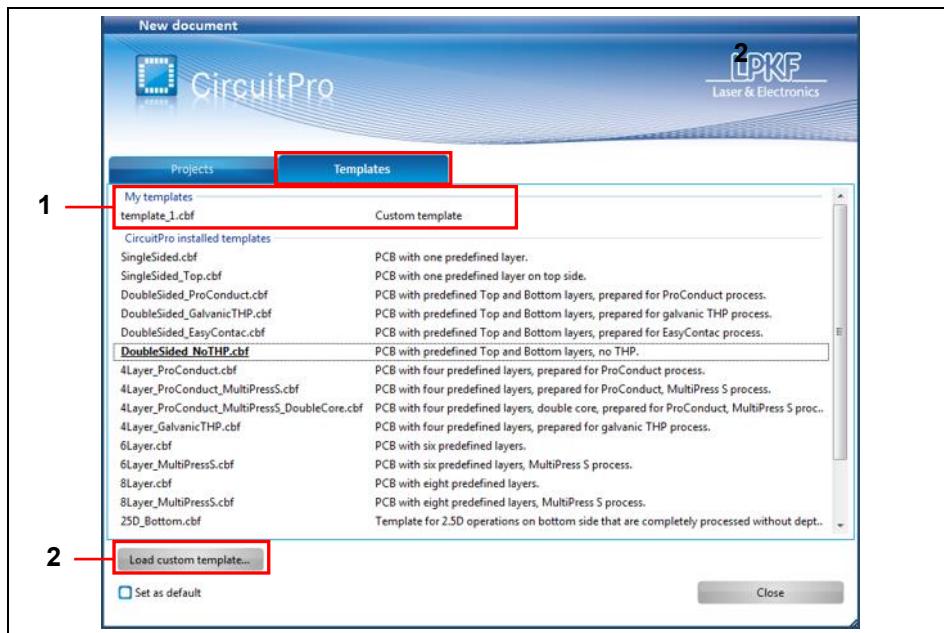


Tip

If you want to use none of the templates you can also start the project planning wizard. The wizard guides you through the steps to define your design.

- Loading a custom template
- 1. Click on File > New.
- 2. Select the tab “Templates”.
- ➔ The dialog of the templates available in CircuitPro PM is displayed:

Fig. 51: New document



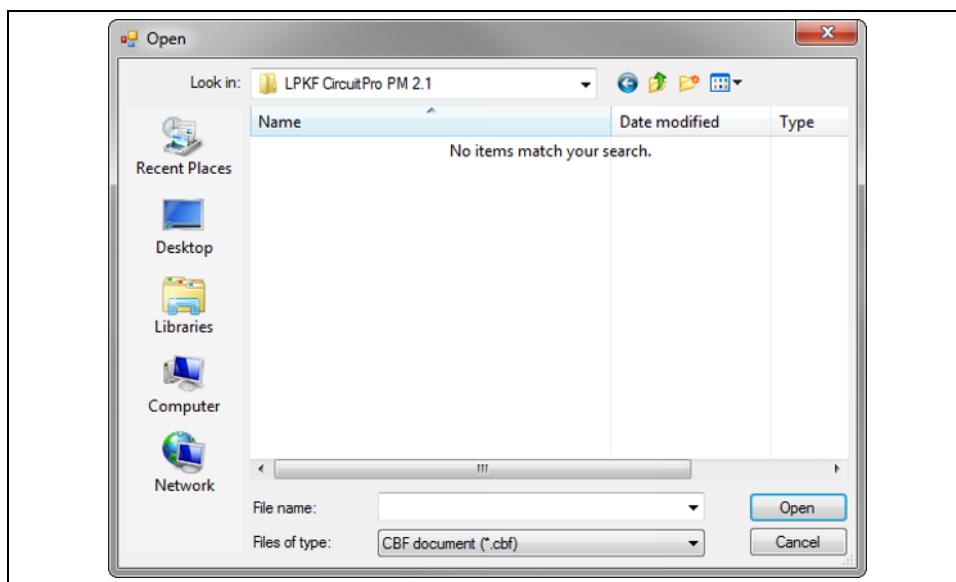
/1/ List of custom templates created previously

/2/ [Load custom template...] opens the file dialog “Open”

3. Click on a custom template /1/.
- ◆ A custom template is opened.
- Or
3. Click on [Load custom template...].

→ The following dialog is displayed:

Fig. 52: File dialog "Open"



4. Select the appropriate CBF file on your drive.
5. Click on [Open].
 - ◆ A custom template is opened.

5.1.2 Open

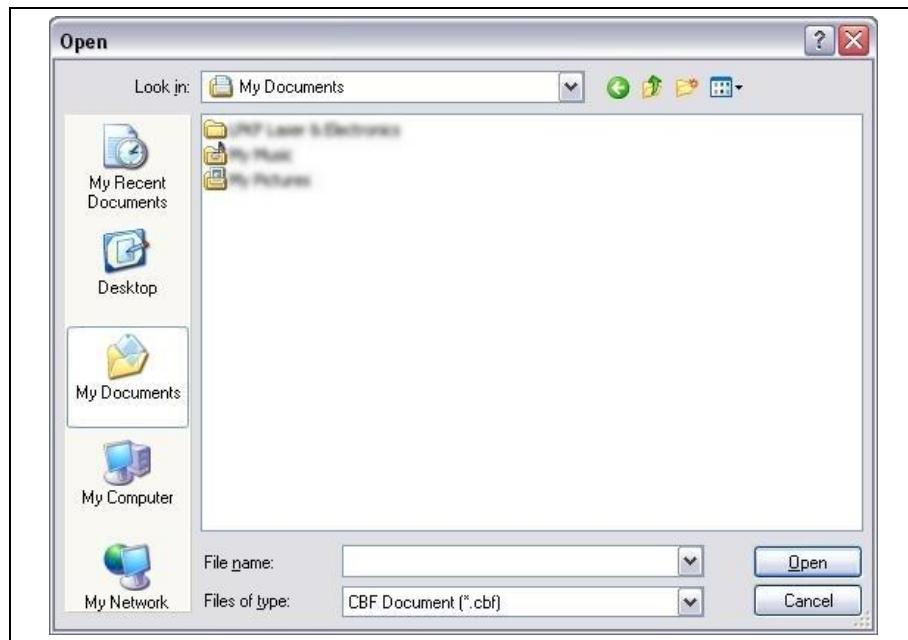
Use the menu item “Open” to open an existing CircuitPro PM document.

- Opening an existing document in CircuitPro PM

1. Click on File > Open.

► The following dialog is displayed:

Fig. 53: Open



2. Select the desired CBF document on your drive.
3. Click on [Open].

◆ The selected document is opened.

5.1.3 Recent files

This menu item shows the five files that have been opened/edited in CircuitPro PM most recently.

5.1.4 Save

Saves the document currently edited with all changes made under the same file name and in the same folder.

5.1.5 Save As

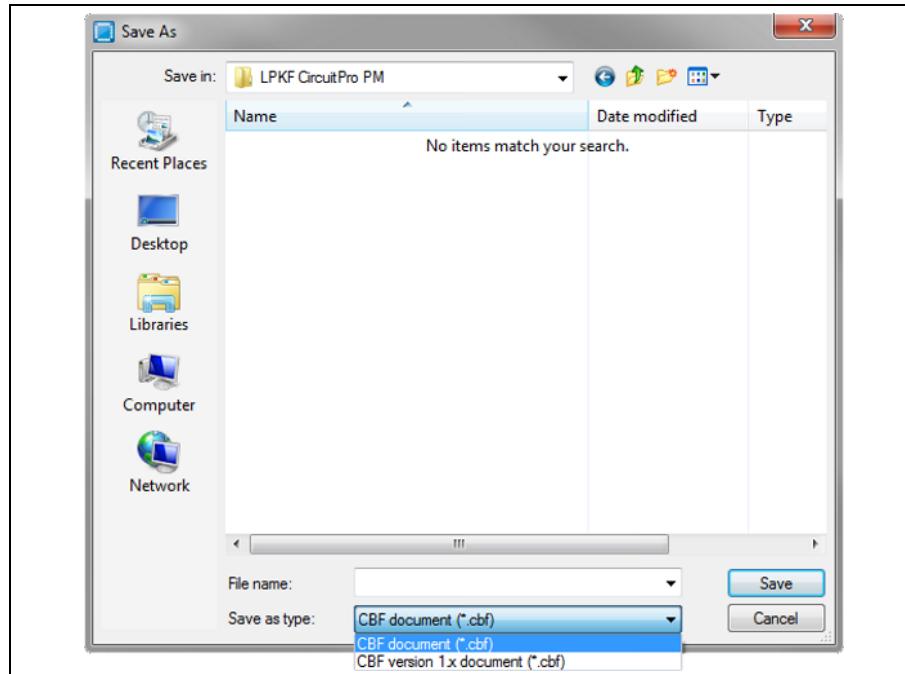
Use the menu item “Save As” to save the file currently edited under a new name or in a different folder.

- Saving a document (under a new name/in a different folder)

1. Click on File>Save As.

► The following dialog is displayed:

Fig. 54: Save As



2. Enter a file name.
3. Select the folder for saving the file.
4. Select the file type.



Note

CircuitPro PM (2.x) is downward compatible and can read and write files of older CircuitPro versions (1.x). However, CircuitPro (1.x) cannot read files of CircuitPro PM versions (2.x).

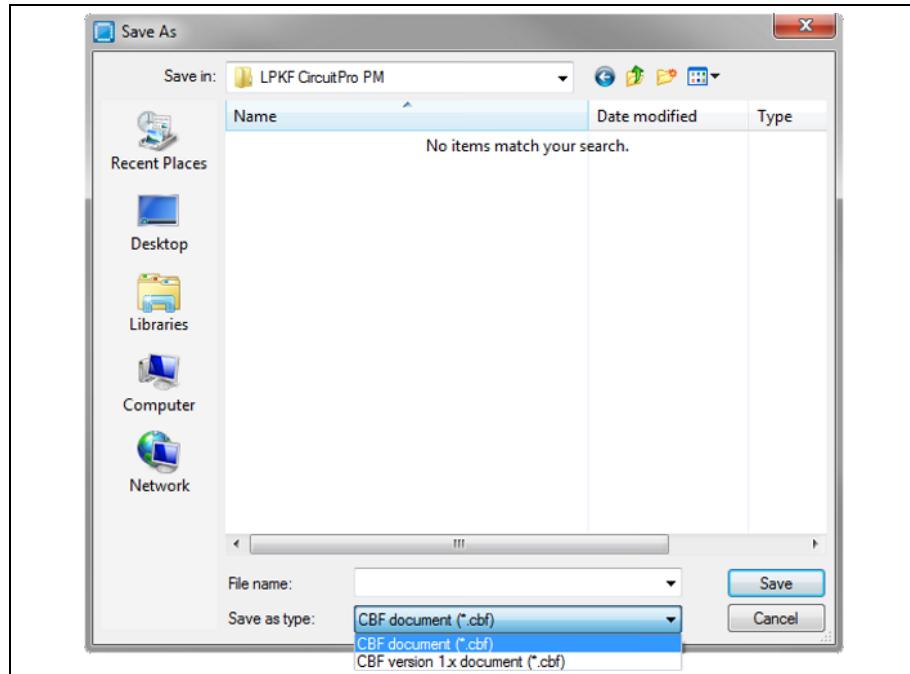
5. Click on [Save].
- ◆ The document is saved.

5.1.6 Save As Template

Use the menu item “Save As Template” to save the current document as a custom template in CircuitPro.

- Saving a document as a template
- 1. Click on File > Save As Template...
- ➔ The following dialog is displayed:

Fig. 55: Save As Template



2. Select the folder for saving the file.
3. Enter a file name for the template.
4. Select the file type.
5. Click on [Save].



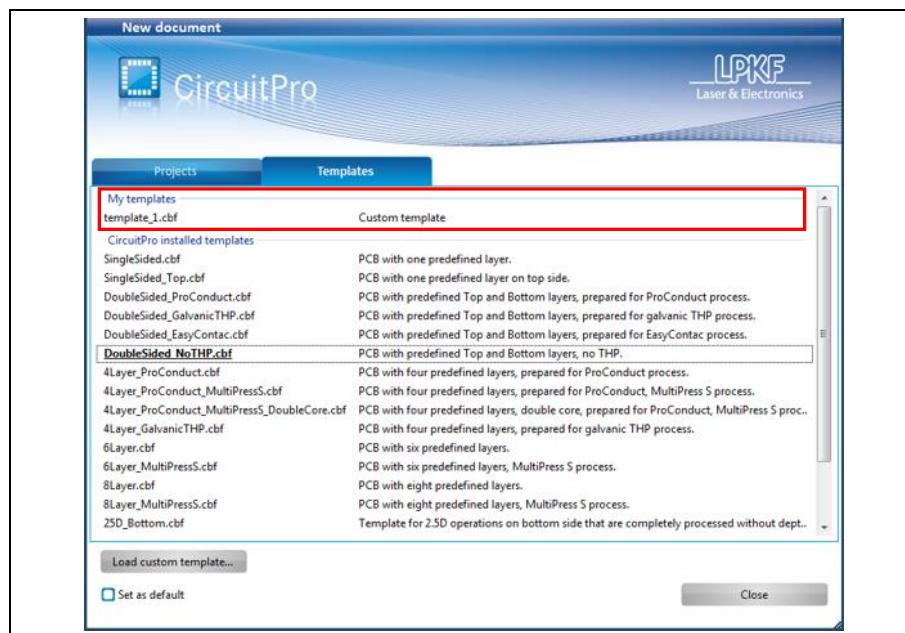
Note

CircuitPro PM (2.x) is downward compatible and can read and write files of older CircuitPro versions (1.x). However, CircuitPro (1.x) cannot read files of CircuitPro PM versions (2.x).

- ◆ The document is saved as a template.

If you subsequently create a new document via the menu item File > New, the dialog for selecting a template displays a section “My templates”:

Fig. 56: My templates



5.1.7 Import

The “Import” menu item lets you import CAD files of the following formats:

Table 19: Formats

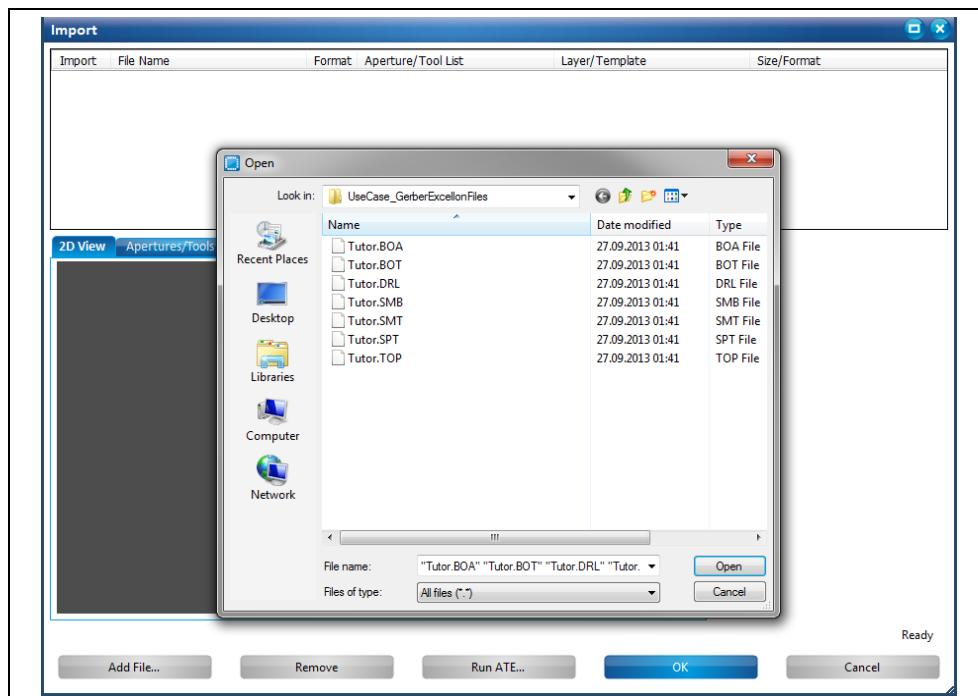
Format	Description	Extension
CAM	native data format of LPKF CircuitCAM	*.CAM
Excellon	data format used for drilling and milling on printed circuit boards	*.DRL / *.DRD
Gerber	data format used for printed circuit board image data	*.GBR
GerberX GerberX2	extended data format used for printed circuit board image data	*.GBX
JOB files	Data format for BoardMaster JOB files.	*.JOB
LMD	LPKF Mill Drill data format used for data transfer between LPKF software products	*.LMD
HPGL	data format used for drawings, formerly used to drive pen plotters	*.PLT
DXF	data format used for drawings from AutoCAD	*.DXF
Sieb & Meyer	data format used for drilling and milling on printed circuit boards	*.DRL / *.SM?
ODB++	data format used for printed circuit board image, drill data, netlists and component data	*.ZIP

■ Importing CAD files

1. Click on File > Import...

→ The import dialog is displayed:

Fig. 57:
File >
Import

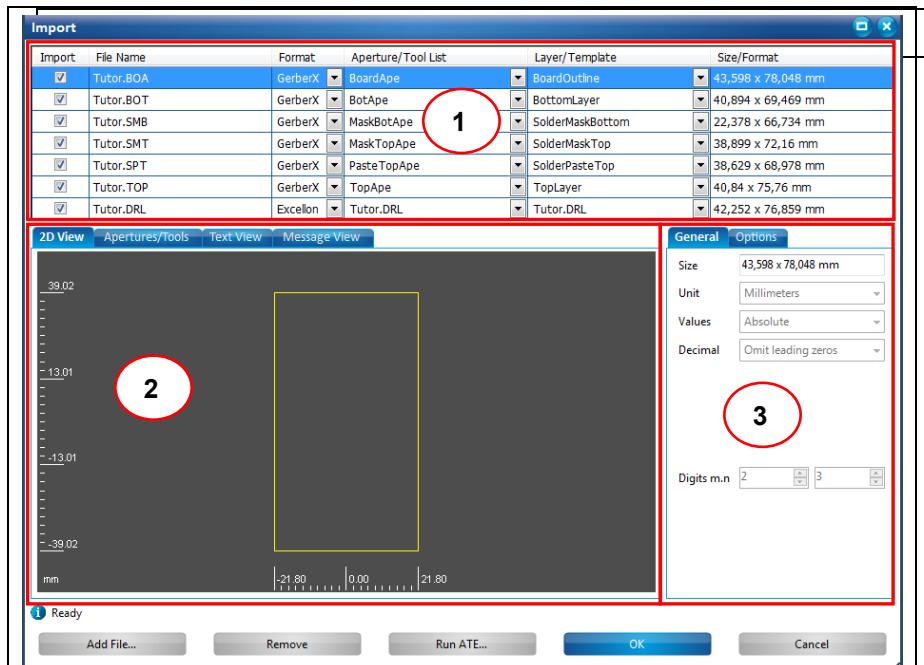


2. Select the desired file(s) on your drive.

3. Click on [Open].

→ The following contents are displayed corresponding to your imported file (Gerber in this case):

Fig. 58: Import



/1/ List of the imported data

/3/ Sub-tabs

/2/ Main tabs

4. Check the loaded data and modify if necessary.
 5. Click on [OK].
- The CAD files have been imported.

Section /1/ lists the files you imported. In this list, you define the layers in CircuitPro PM where each file's data are assigned to.

Section /2/ contains the tabs that display detailed information on the imported data. These are structured as follows:

- 2D view
- Apertures/Tools
- Text View
- Message View

Depending on the active tab, **section /3/** displays the following sub-tabs:

- General
- Options
- Attributes (only if the “Apertures/Tools” tab is active)



You can change the import settings for the individual file types via menu item Extras > Options Import / Export.

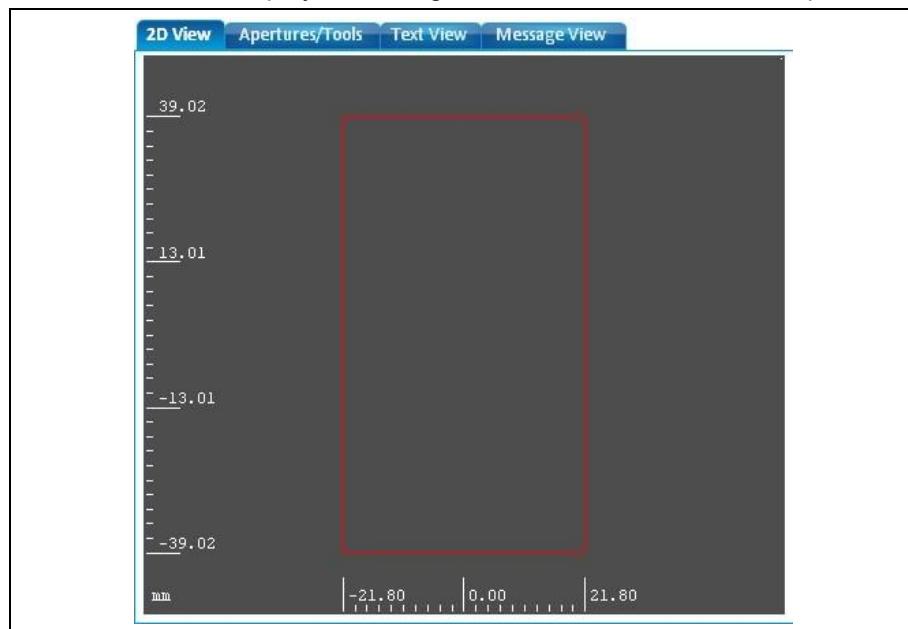
Note

The following pages show the contents of the tabs using Gerber files as examples. If you import other file formats, the contents of the tabs may differ.

2D View tab

The “2D View” tab displays the design and the dimensions of the imported file:

Fig. 59: 2D View



Apertures/Tools tab

The “Apertures/Tools” tab lists the apertures and tools required for the project.

Fig. 60:
Apertures/Tools

Image	Name	Mode	Rotation	a	b	c	d
●	D14	■	0 °	1			
●	D11	■	0 °	0,8			
●	D12	■	0 °	0,2			
●	D13	■	0 °	0,2			
●	D15	■	0 °	1			
●	D16	■	0 °	0,254			

The columns of this tab show the following:

Table 20:
Apertures and tools

Column	Description
Image	Shows the shape of the individual aperture.
Name	Shows the name of the individual aperture.
Mode	Shows whether the aperture is imported as a drawn ■ or flashed ■ object.
Rotation	Shows the angle by which the aperture is rotated (meaningless in case of a circle shape).
A-D	These columns contain the parameters defining the size and shape of the aperture. Depending on the aperture shape, not all parameter columns are used.

Text View tab

The “Text View” tab displays the ASCII text of the imported file.

Fig. 61: Text View

```

2D View Apertures/Tools Text View Message View
*$FSLAX23Y23*%
*$MOMM*%
*$ADD10C,0,100000*%
*$LNBboardOutline*%
*$LPD*%
G54D10*
X21749Y-38974D02*
X-21749Y-38974D01*
X-21749Y38974D01*
X21749Y38974D01*
X21749Y-38974D01*
M02*

```

Message View tab

The “Message View” tab contains system messages of CircuitPro PM about the operations performed during the file import:

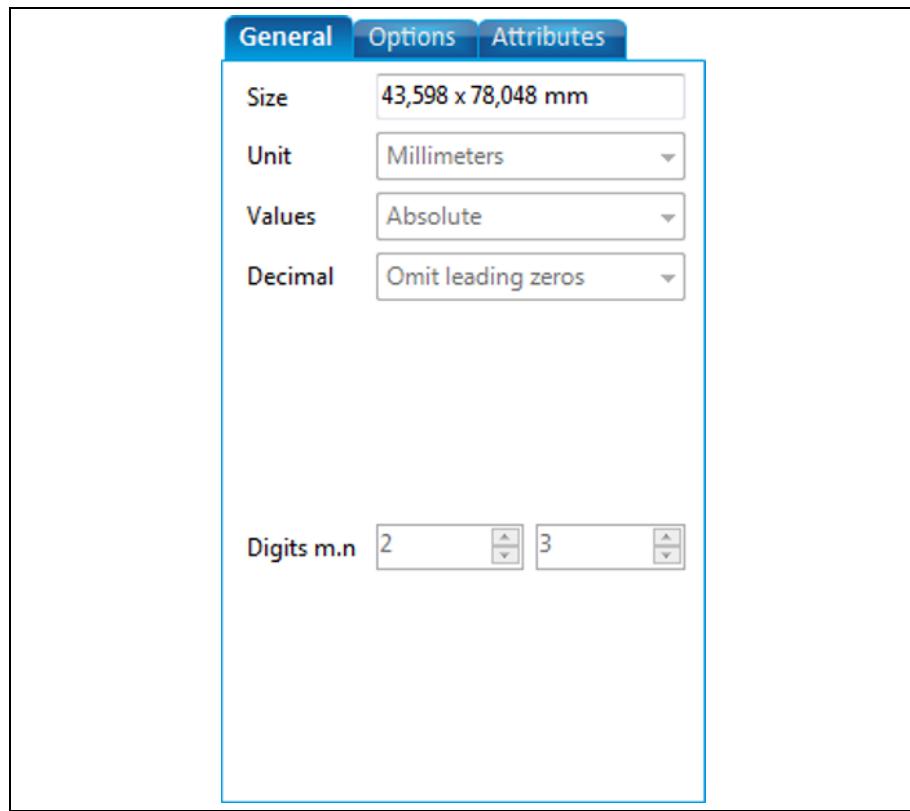
Fig. 62: Message View

Message	Referenced objects	Time (descending)	Status
Preview was built in 0,011 s.		09:02:53.41	
Data was loaded from "C:\Users\	\Docu...	09:02:53.19	
Data was loaded from "C:\Users\	\Docu...	09:02:53.18	
Data was loaded from "C:\Users\	\Docu...	09:02:53.16	
Data was loaded from "C:\Users\	\Docu...	09:02:53.15	
Data was loaded from "C:\Users\	\Docu...	09:02:53.15	
Data was loaded from "C:\Users\	\Docu...	09:02:53.15	
Data was loaded from "C:\Users\	\Docu...	09:02:53.10	
Import assignment found for "C:\Users\	...	09:02:53.05	
Import assignment found for "C:\Users\	...	09:02:53.04	
Import assignment found for "C:\Users\	...	09:02:53.04	
Import assignment found for "C:\Users\	...	09:02:53.02	
Import assignment found for "C:\Users\	...	09:02:52.99	

Data/Settings tab General

In the “General” tab, you can define the dimensions of the imported files:

Fig. 63: General



The following settings are possible:

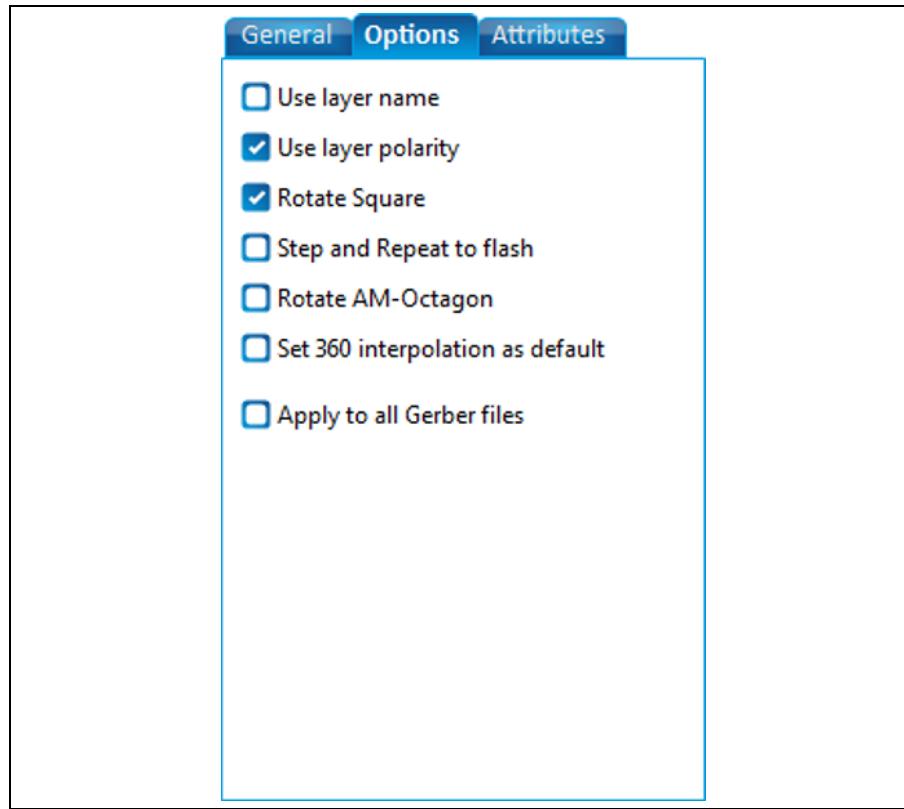
Table 21: General

Setting	Description
Size	Displays the overall size of the imported design.
Unit	Displays the unit of measurement
Values	Defines whether absolute or relative values are used.
Decimal	Defines whether leading or trailing zeroes are to be omitted.
Digits m.n	Defines the number of digits. m = digits before the decimal point n = digits after the decimal point

Data/Settings tab Options

The “Options” tab lets you select various options:

Fig. 64: Options



The following options can be activated:

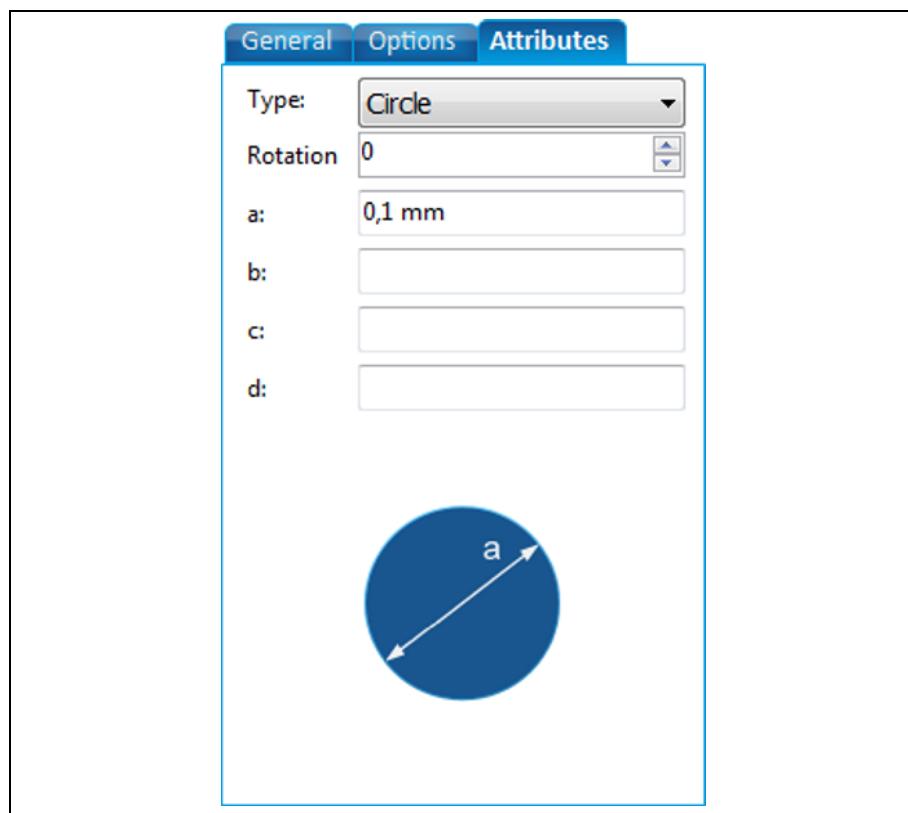
Table 22: Options

Setting	Description
Use layer name	Use the layer name defined in the Gerber file.
Use layer polarity	Activate/deactivate analysis of layer polarity during Gerber import.
Rotate Square	Activate/deactivate automatic rotation of square objects during Gerber import.
Step and Repeat to flash	Activate/deactivate combining object collections to flash objects for “Step & Repeat” commands (in the file) when importing Gerber files.
Rotate AM Octagon	Always align octagon edges to axes.
Set 360 interpolation as default	Activates the 360° interpolation for circles as default, irrespective of corresponding commands in the file.
Apply to all Gerber files	Applies the settings of this tab to all imported Gerber files

Data/Settings tab Attributes

The “Attributes” tab displays and lets you modify the properties of the apertures and tools:

Fig. 65: Attributes



The attributes define the following:

Table 23:
Attributes

Attribute	Description
Type	Defines the type of the aperture.
Rotation	Defines the rotation angle of the aperture.
A-D	These fields contain the parameters defining the size and shape of the aperture. Depending on the aperture shape, not all parameter fields are used.

5.1.8 Import 3D shape

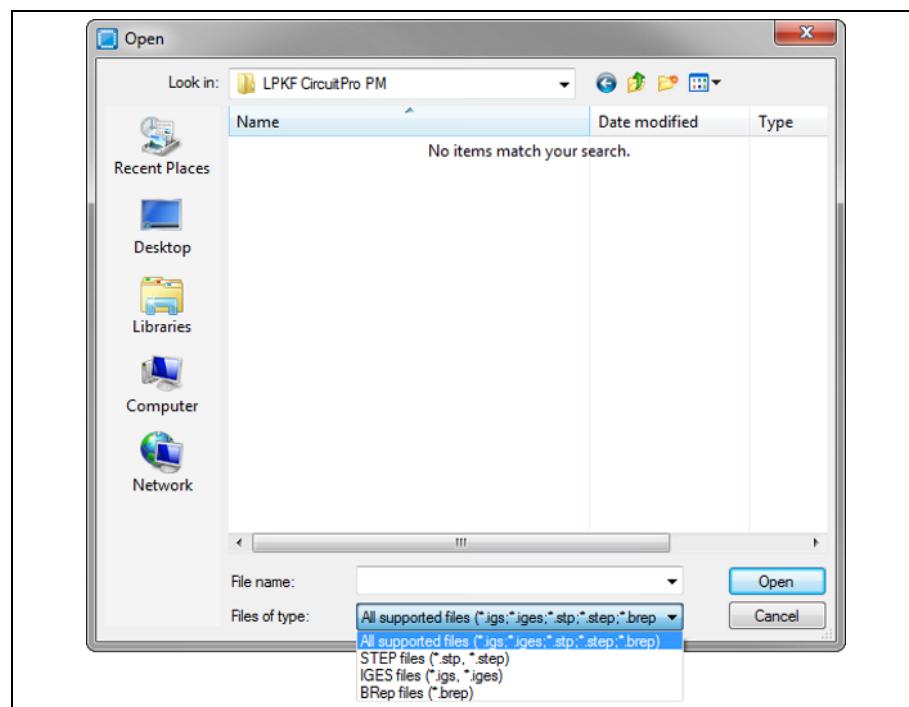
Use the menu item "Import 3D shape" if you want to import a file containing 3D shapes into CircuitPro PM.

The following file types containing 3D shapes can be imported:

- STEP files (*.stp, *.step)
 - IGES files (*.igs, *.iges)
 - BRep files (*.brep)
- Importing a 3D shape
1. Click on File > Import 3D shape...

→ The following dialog is displayed:

Fig. 66: Import 3D shape



2. Select the desired document (STEP or IGES) on your drive.
3. Click on [Open].

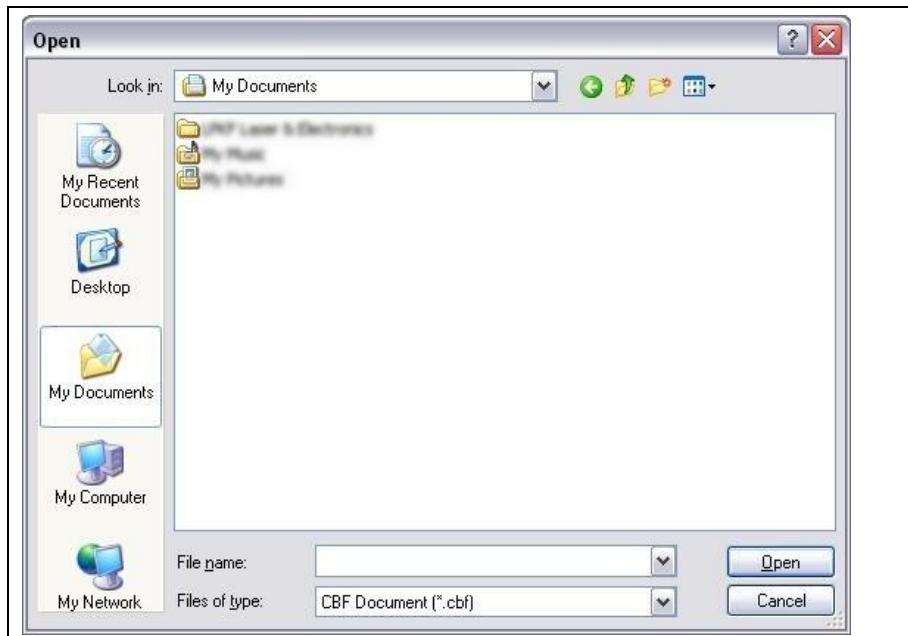
◆ The 3D shape is imported.

5.1.9 Import toolpath

Use the menu item “Import toolpath” to import toolpaths from other CircuitPro PM files (.cbf).

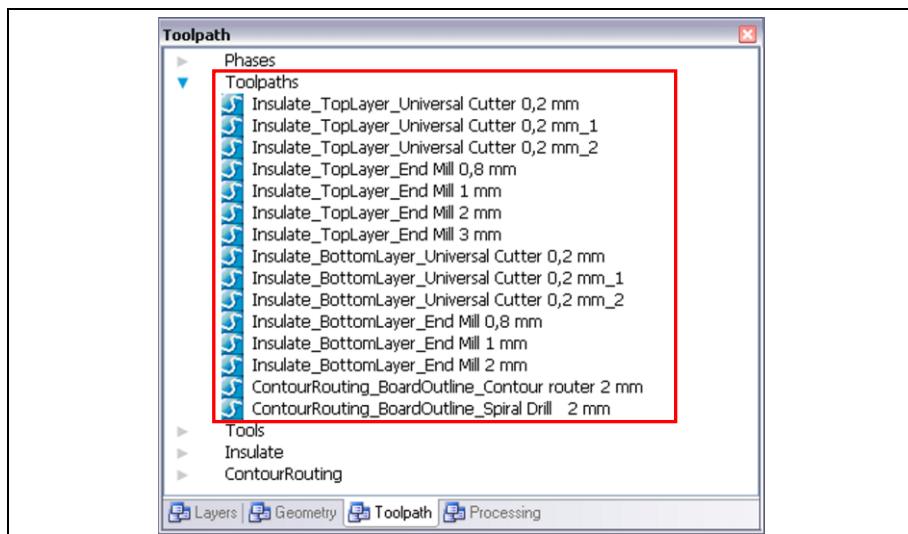
- Importing toolpaths
- 1. Click on File > Import toolpath...
- ➔ The following dialog is displayed:

Fig. 67: Import toolpath



2. Select the desired document on your drive.
 3. Click on [Open].
- ➔ The toolpaths of the document are imported and displayed in the “toolpath” pane:

Fig. 68:
“Toolpath” pane
with imported
toolpaths



- ◆ The toolpaths have been imported.

5.1.10 Recent files imported

This menu item shows the five files that have been imported into CircuitPro PM most recently.

5.1.11 Recent files 3D

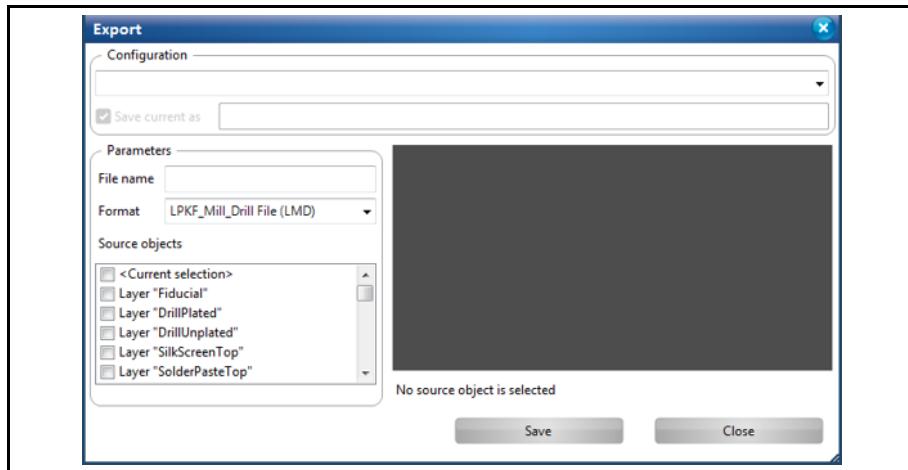
This menu item shows the five 3D files that have been opened/edited in CircuitPro PM most recently.

5.1.12 Export

Use the function “Export” to export toolpaths in CircuitPro PM to LMD files.

- Export toolpaths to LMD file
- 1. Click on File > Export...
- ➔ The following dialog is displayed.

Fig. 69: Export



2. Enter a file name in section “Parameters”.
3. Scroll down the list „Source objects“ until you see the phases of the current CircuitPro PM project.



In CircuitPro PM the toolpaths are assigned to the corresponding phases. You can check the assignments in the pane “Toolpath”.

Note

4. Tick the checkbox of these phases whose toolpaths you want to export.
5. Click on [Save].
- ➔ The toolpaths are exported in a LMD file. This file is saved in the folder of your current CircuitPro PM project.



Tip

Highlighting and exporting individual toolpaths

In the CAM/Machining view you are able to highlight the toolpaths to export or you click on the individual toolpaths in the pane “Toolpath”.

In the “Export” dialog, select “<Current selection>” in the list “Source objects”.

Click on [Save], to export the toolpaths.

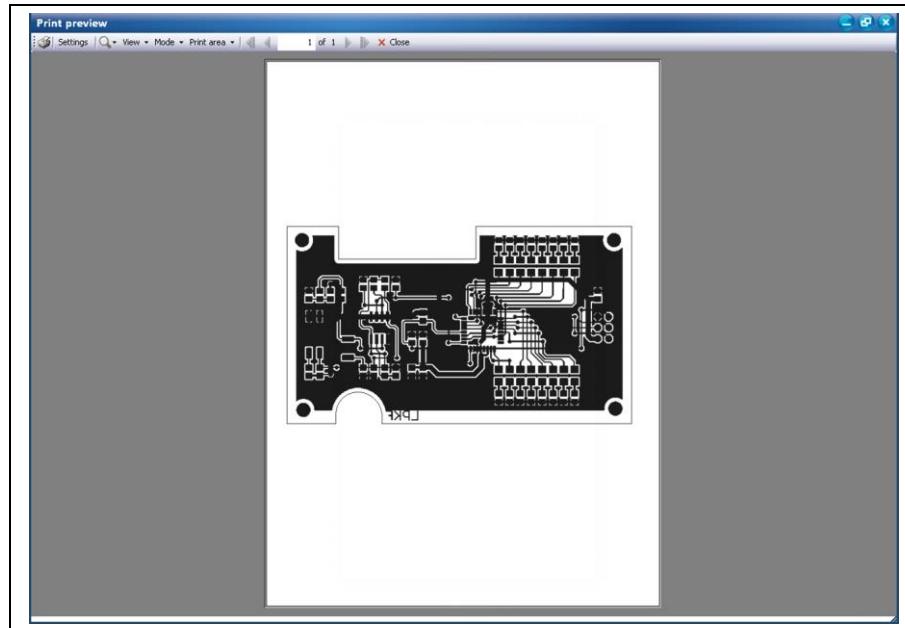
- ◆ The toolpaths have been exported.

5.1.13 Print preview

Before printing a document in CircuitPro PM, you can use the print preview to get an overview of the pages to be printed.

- Starting the print preview
- 1. Click on File > Print Preview...
- ➔ The following window is displayed:

Fig. 70: Print preview



The print preview has the following menu items:

Fig. 71: Menu items in Print preview

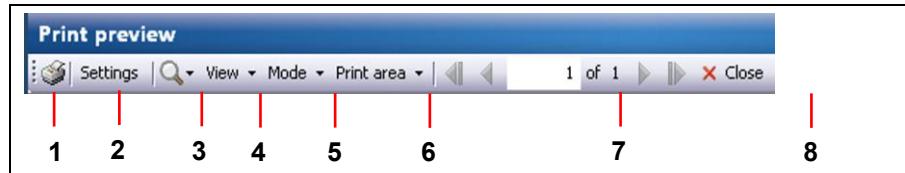


Table 24: Menu items in Print preview

No.	Icon	Description
/1/	Print	Starts the printing process.
/2/	Settings	Opens the printer setup dialog.
/3/	Lens	Zooms in or out of the page(s) to be printed.
View		
/4/	2D/3D	Offers the choice between the objects in 2D view and in 3D view.
Mode		
/5/	One Page	Displays only one page at a time of the document to be printed.
/5/	Two pages	Displays two pages at a time of the document to be printed.

Table 24: Menu items in Print preview

No.	Icon	Description
/5/	Three pages	Displays three pages at a time of the document to be printed.
/5/	Four pages	Displays four pages at a time of the document to be printed.
/5/	Six pages	Displays six pages at a time of the document to be printed.
Print area		
/6/	All visible	Restricts the print area to all visible objects.
/6/	View	Restricts the print area to the current view.
/6/	Full layout	Fits the print area to the full layout.
/6/	Selection	Restricts the print area to the current selection.
/7/	Page number	Displays the current page number.
/8/	Close	Closes the print preview.

2. Click on the print button /1/ in order to print the document.

Or

2. Click on [Close] in order to close the print preview window.

◆ The print preview window is closed.

5.1.14 Print

Use the menu item File > Print... if you want to print a document/artwork film in CircuitPro PM.

Use the different tabs to set your desired properties for a good printing result.

■ Printing a document/artwork film

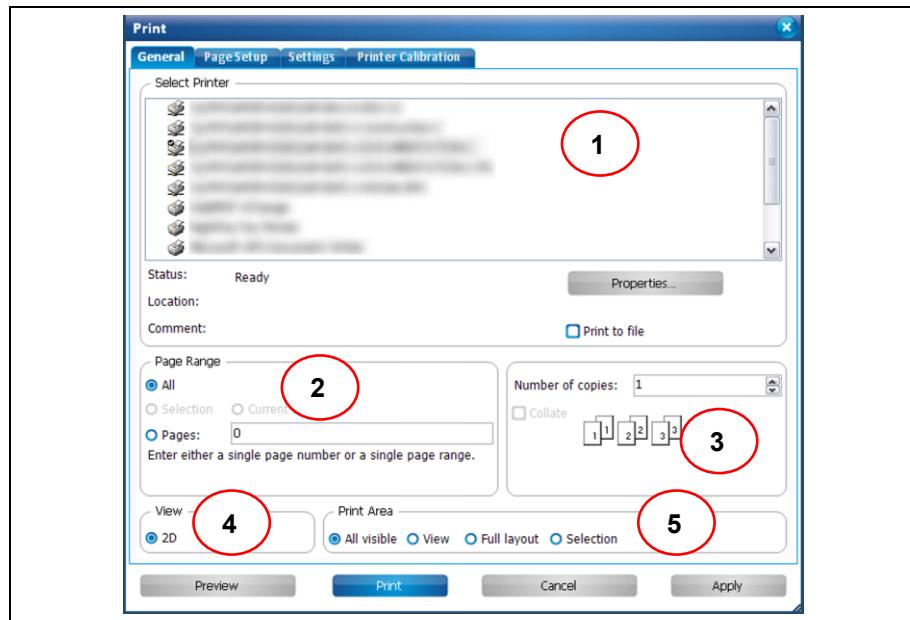
1. Click on File > Print...

⇒ The print dialog is displayed.

2. Take your desired settings in the individual tabs as explained below:

General tab

Fig. 72: Print >
General



/1/ Printer selection

/4/ View

/2/ Page Range

/5/ Print Area

/3/ Collate

Table 25: Print >
General

Section	Description
Printer selection	Select the printer for the print job in this section.
Page Range	Select the pages that are to be printed. If the radio button "Selection" is activated only the current selection in the view are printed.
Number of copies and collate	Enter the number of copies to be printed. If more than one copy is selected, the "Collate" check box is available. This setting is for printing all pages of one copy before printing the next copy.
View	Select the view that is to be printed.
Print Area	Print area defines whether the current view, the whole design, the selection, or everything is to be printed.
Button	Description
Properties	Opens the printer dialog to set the properties of the connected printer.
Preview	Creates a preview of the print job.
Print	Starts the printing process
Cancel	Closes the dialog.
Apply	Stores the settings.



Tip

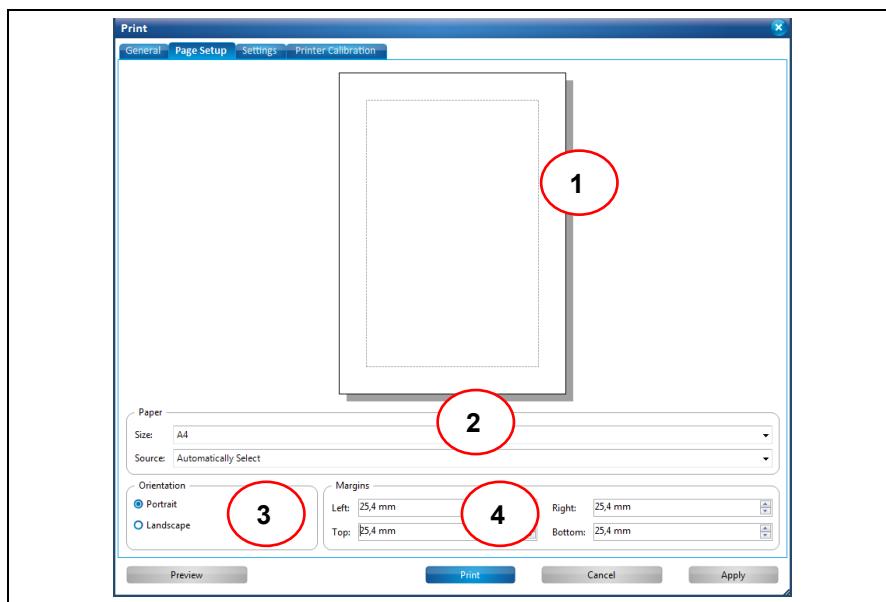
Printing an artwork film

To print an artwork film (for a later usage in LPKF ProMask/ProLegend), enter the following settings in your printer properties:

1. Click on [Properties...].
2. Enter the following settings in the upcoming dialog:
 - Print quality: high
 - Color: gray shades
 - Paper quality: fine/film
 - The document size must be equal to actual size. I.e. the option "reduce/enlarge the page" must be disabled.

Page Setup tab

Fig. 73: Print > Page Setup



/1/ Preview

/2/ Paper

/3/ Orientation

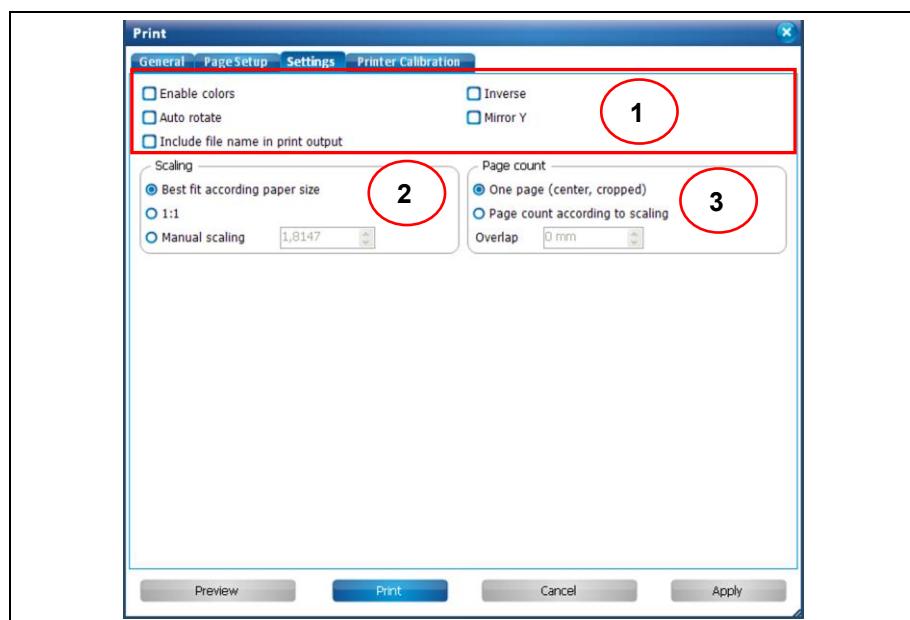
/4/ Margins

Table 26: Print > Page Setup

Section	Description
Preview	Displays an example sheet of the current settings.
Paper	Select the paper size and the paper source of the printer.
Orientation	Select the orientation of the pages: Portrait or Landscape.
Margins	Enter the page margins.

Settings tab

Fig. 74: Print >
Settings



/1/ Printing options

/3/ Page count

/2/ Scaling

Table 27: Print >
Settings

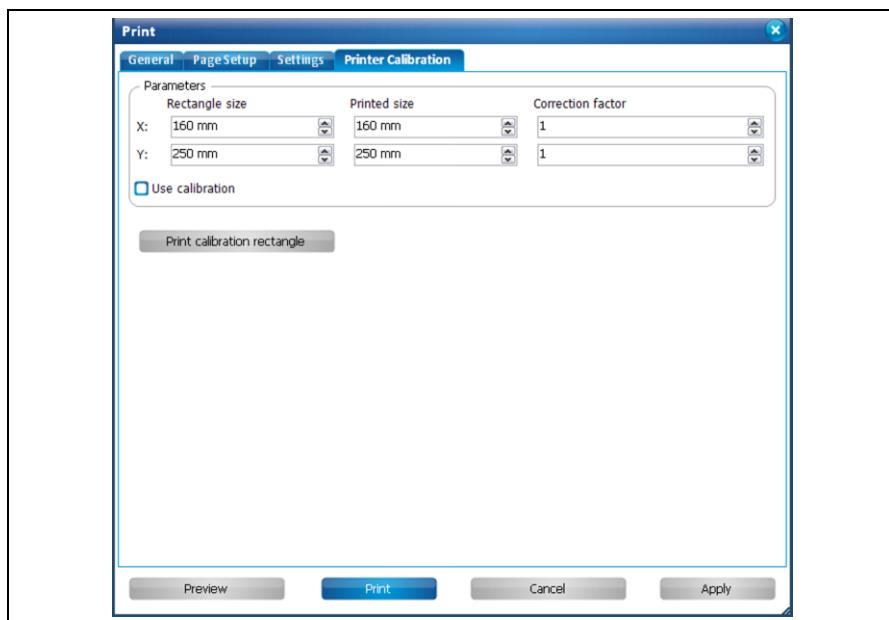
Section	Description
Printing options	<p>You can select the following options:</p> <ul style="list-style-type: none"> • Enable colors: Activate this option for color printing. • Auto rotate: Adjusts the page orientation to the orientation setting in the printer setup. • Include file name in print output: Prints the file name of the project on every page. • Inverse: This function creates an inverted view of the milling area. I.e., the surface that is milled when producing the circuit board (e.g. rubout area) remains blank and the remaining copper areas are printed. • Mirror Y: Mirrors the object to be printed on the Y axis.
Scaling	<p>You can choose between three options for scaling:</p> <ul style="list-style-type: none"> • Best fit according paper size: Select this option to have the print output scaled automatically to the paper size. • 1:1: If this option is selected, the print output has the actual size of the printed object. No scaling takes place. In case of large designs, these may be printed across several pages. In case of small designs, it can happen that details are printed so small that they become illegible. • Manual scaling: Enter a scaling value to scale the print output. If you enter e.g. "4" the output is enlarged by four. <p>If the scaling factor would result in a print output of more than 100 pages the scaling is aborted.</p>

Table 27: Print >
Settings

Section	Description
Page count	<p>One page: If the output is enlarged (e.g. requires 3 pages) only the center part is printed on a single page. The remaining parts are cropped.</p> <p>Page count according to scaling: The output is printed exactly (if e.g. 3 pages are required) as displayed in the preview. The output is not cropped or limited.</p>

Printer Calibration tab

**Fig. 75: Print >
Printer Calibration**



**Table 28: Print >
Printer Calibration**

Section	Description
Parameters	<p>Enter the parameters for printing a calibration rectangle:</p> <p>Rectangle size: Enter the size (X and Y values) of the calibration rectangle.</p> <p>→ Start a test print by clicking on [Print calibration rectangle].</p> <p>Printed size: Enter the actual size of the printed calibration rectangle.</p> <p>→ Use a ruler to measure the rectangle in the print output.</p> <p>Correction factor: This is computed automatically from the difference between the rectangle size and the actual printed size. You can also modify the factor manually.</p> <p>→ Activate the check box <Use Calibration> to apply the correction factor.</p>
Button	Print calibration rectangle

3. Click on [Print] in order to print the document.
- ◆ The document is printed.

5.1.15 Export to image

CircuitPro PM offers to export designs into image files. The following file formats are available:

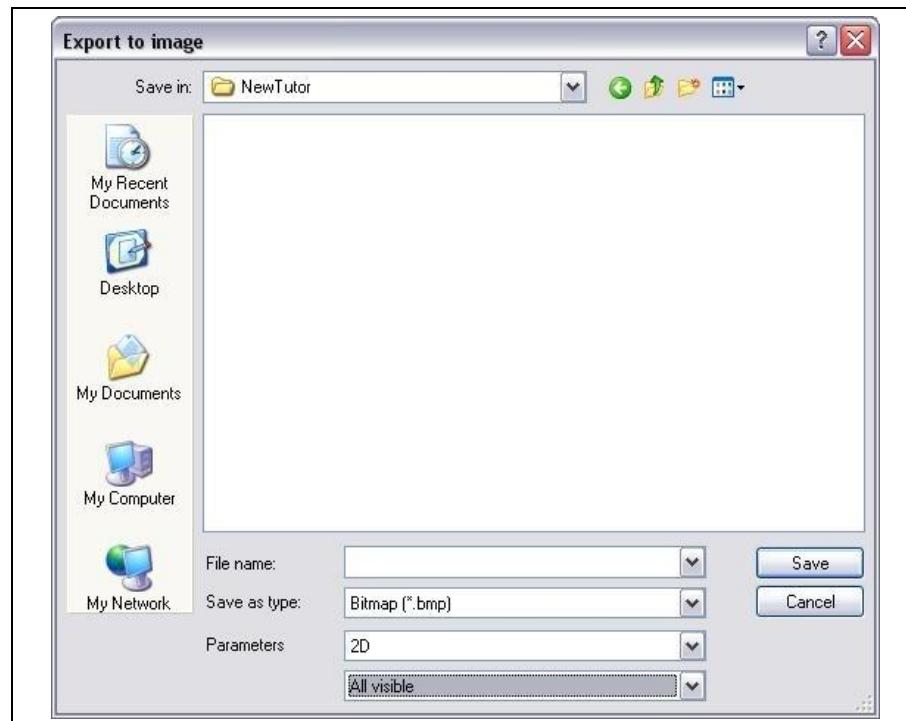
- Bitmap (*.bmp)
- JPEG (*.JPG, *:JPEG)
- Metafile (*.emf)
- Portable Network Graphics (*.png)

■ Exporting a design to an image

1. Click on File > Export to image...

► The following dialog is displayed:

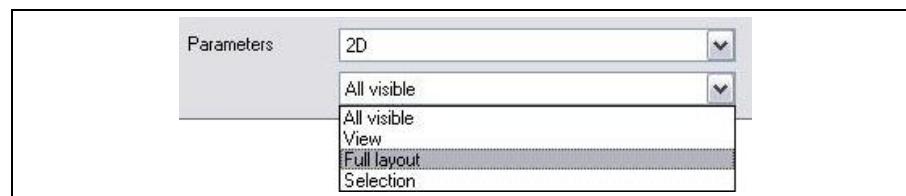
Fig. 76: Export to image



2. Select the file format for the image (bitmap, JPEG, metafile or Portable Network Graphics).
3. In the parameters field, select whether 2D graphics or 3D graphics are to be exported.

You can also select which area of the design are to be exported into the image file.

Fig. 77:
Parameters



**Table 29:
Parameters**

Selection	Description
All visible	Exports all visible objects of the 2D/3D view
View	Exports the current CAM view.
Full layout	Exports the whole design in 2D and 3D view
Selection	Exports only the objects selected in 2D/3D view.

4. Select the folder for saving the image.
5. Click on [Save].

◆ The design is exported and stored into an image file.

5.1.16 Exit

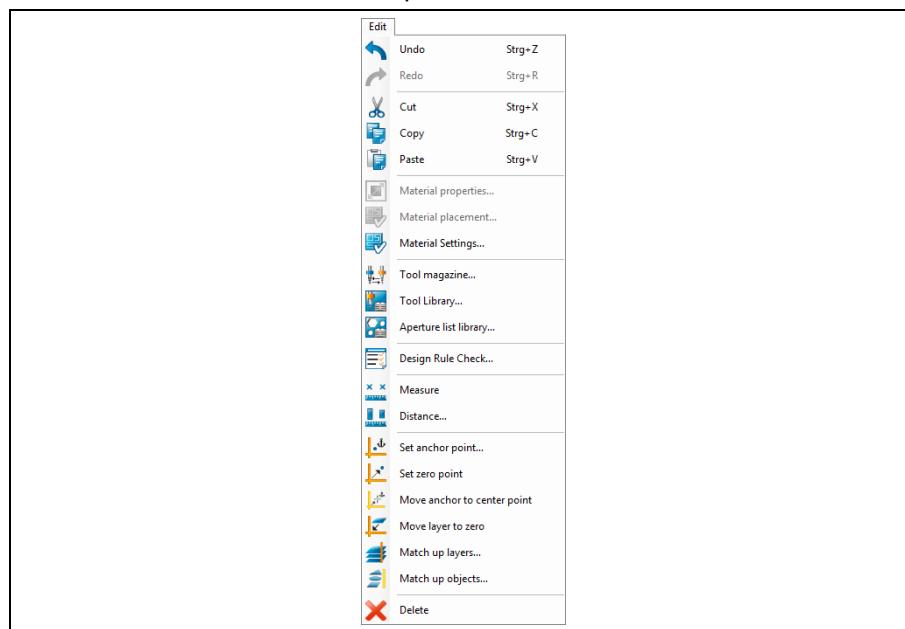
The menu item “Exit” closes the CircuitPro PM program. Just click on File > Exit.

5.2 Menu Edit

The “Edit” menu contains the functions for editing objects in CircuitPro PM.

Click on the menu item “Edit” to open the sub-menu:

Fig. 78: Menu “Edit”



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

Table 30: “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.

Table 30: "Edit" menu items

Menu item	Description
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 PM. 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.

5.2.1 Undo

Use this function to undo the last operation. By default, you can undo up to 10 operations.

If you want to increase the number of undo operations change the setting in menu Extras > Options > General > Undo/Redo level (see page 360).

5.2.2 Redo

Use this function to restore the operation undone last. By default, you can restore up to 10 undone operations.

If you want to increase the number of redo operations change the setting in menu Extras > Options > General > Undo/Redo level (see page 360).

5.2.3 Cut

Use this function to cut the selected object(s) and store it (them) in the clipboard.

5.2.4 Copy

Use this function to copy the selected object(s) and store it (them) in the clipboard.

5.2.5 Insert

Use this function to paste objects previously cut or copied from the clipboard to the current mouse position.



Note



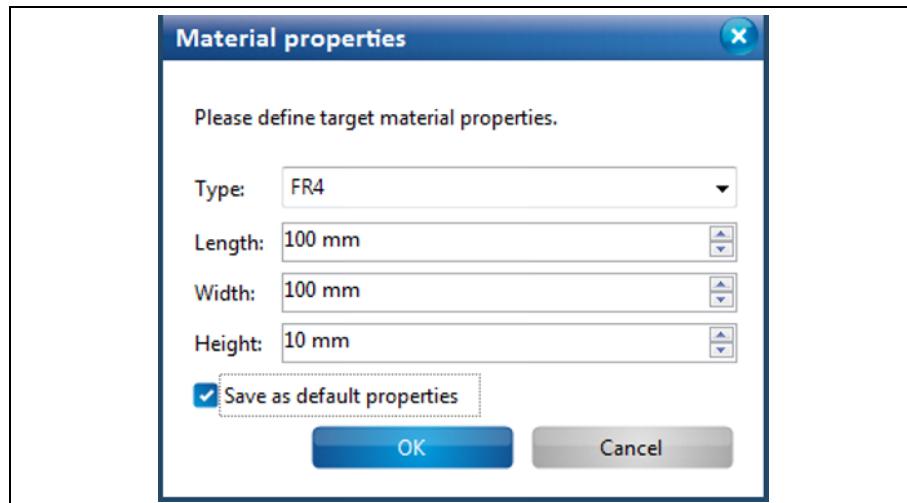
If you insert the copied object on the same layer the new object will be placed on the original object. In this case activate the button on the left. Now click and move the copied object to the desired position.

5.2.6 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. 79: Material properties



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

5.2.7 Material placement

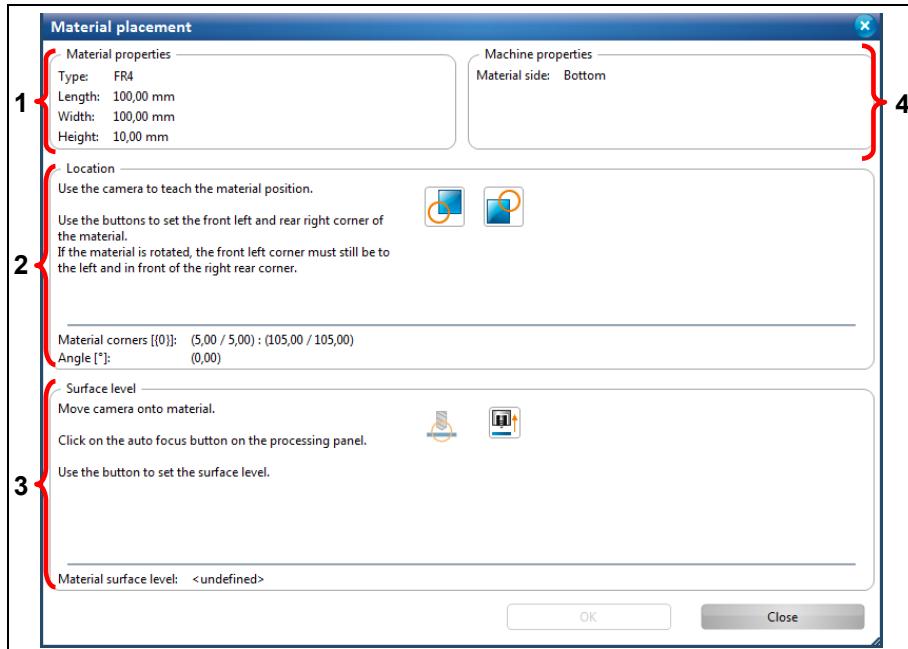
You can place the material in the machining view by using this dialog. You define the corners of the material as well as the surface height.

■ Placing the material

1. Click on Edit > Material placement...

→ The following dialog is displayed:

Fig. 80: Material placement



/1/ Material properties

/2/ Location

/3/ Surface level

/4/ Machine properties

The individual section contain the following information/functions:

Table 31: 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.

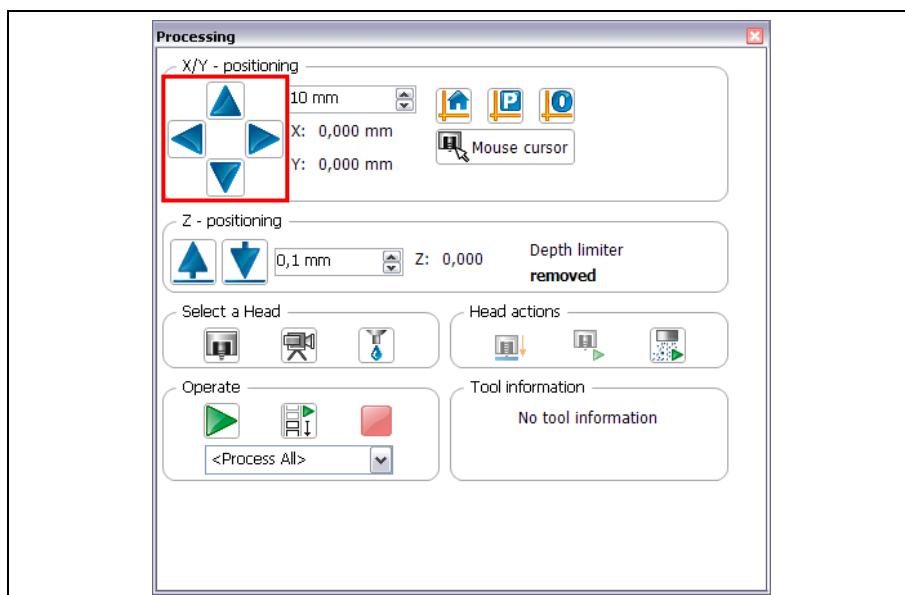
→ The dialog is closed.

◆ The material has been 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. 81: 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:



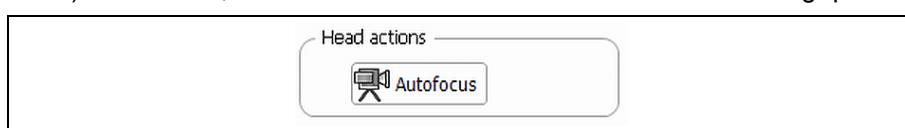
Tip

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:

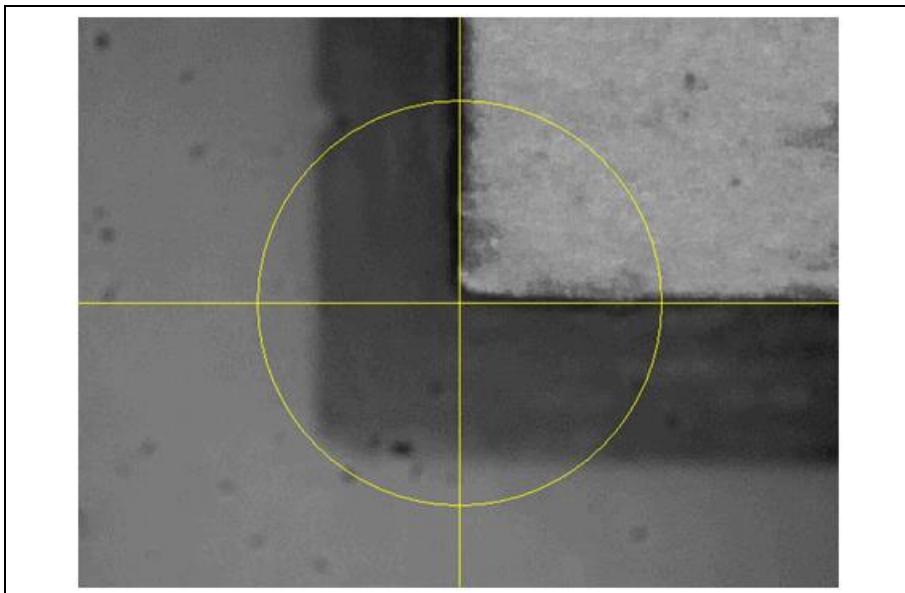
- a) To do this, click on the button "Autofocus" in the "Processing" pane:

Fig. 82:
Autofocus



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

Fig. 83: 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. 84: Message
for second
position



5. Confirm the message by clicking on “Yes”.
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:



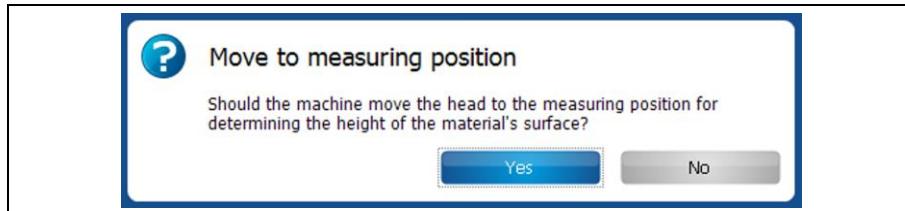
- ➔ The value was saved.
- ◆ The material corners have been set.

■ 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:

Fig. 85: Move to measuring position



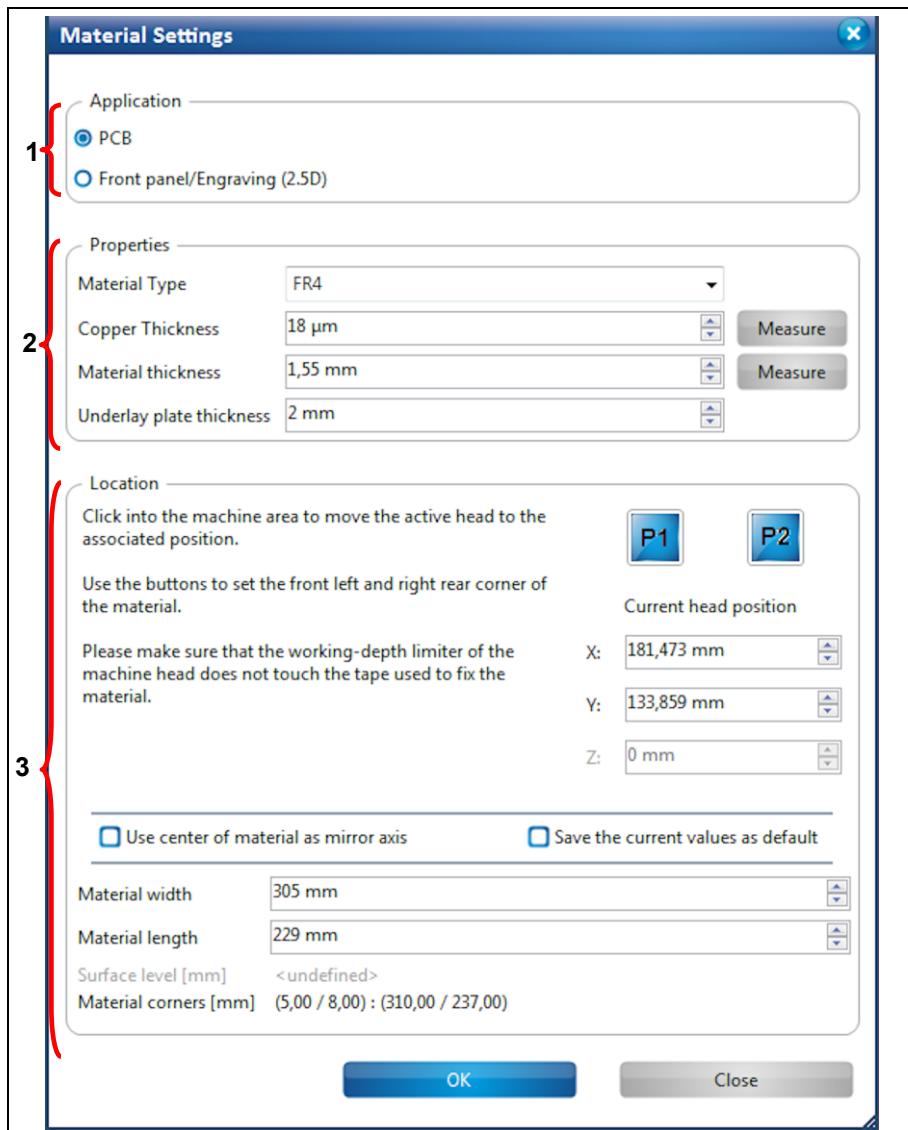
1. Confirm the message by clicking on "Yes".
2. Click on [Autofocus].
3. Now click on the button to set the material height:
 - ◆ The material height has been set.



5.2.8 Material Settings

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

Fig. 86: 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 aluminum)
- 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.



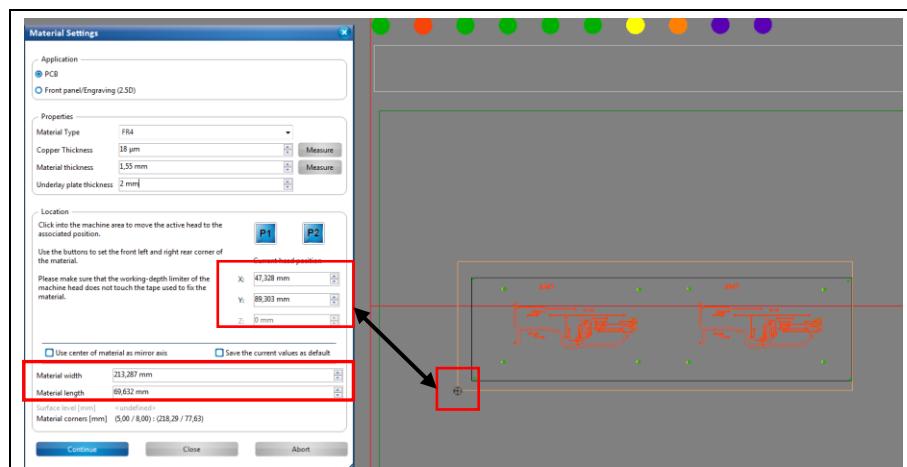
Note

If you are using a ProtoMat S64 or S104 two more check boxes are available. Enabling these, you can use the material center as axis of reflexion and save the current values as default values.

■ Defining the material area

1. 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.

Fig. 87: 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 [P1] to save the coordinates for the left front corner:

Fig. 88: Icon “P1”



- The coordinates of the material area are stored.
- 3. 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.
- 4. Click on [P2] to save the coordinates for the upper right corner.

**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.

5.2.9 Tool magazine ProtoMat D104

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 (Universal Cutter and Micro Cutter) or the milling depth (End Mill) of a tool,
- 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, the ProtoMat S103, and the ProtoMat D104.

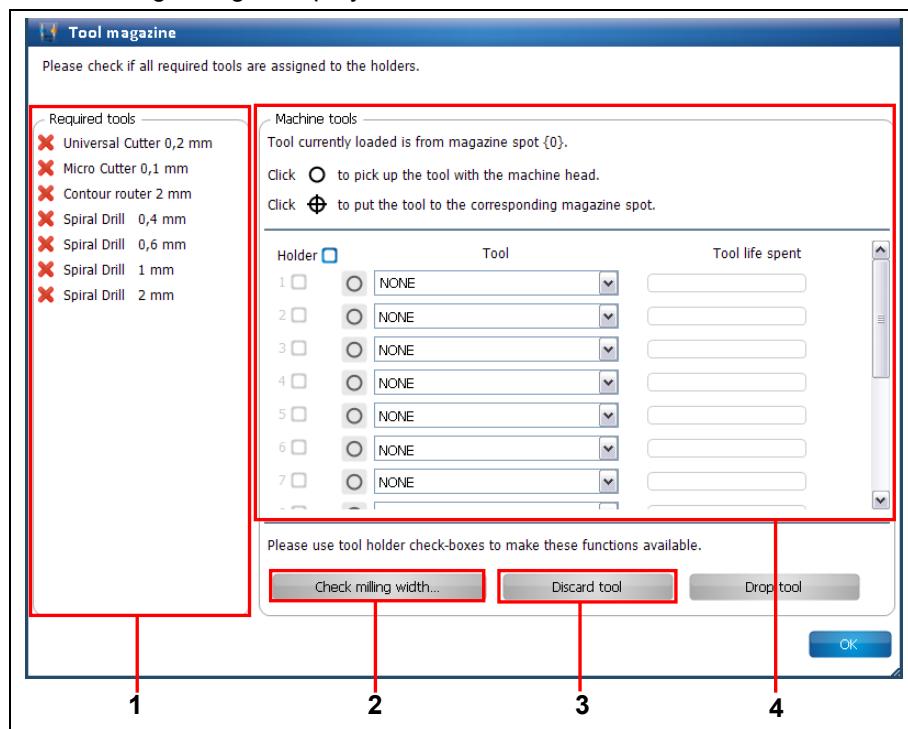
To open the dialog, select the milling head as active head and click on Edit > Tool magazine... or click on the following icon of the toolbar to open the dialog as an alternative:

Fig. 89: Tool magazine icon



The following dialog is displayed:

Fig. 90: Tool magazine S63/S103/D104



/1/ Required tools

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

/3/ Button "Discard tool"

/4/ Tools in the machine

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

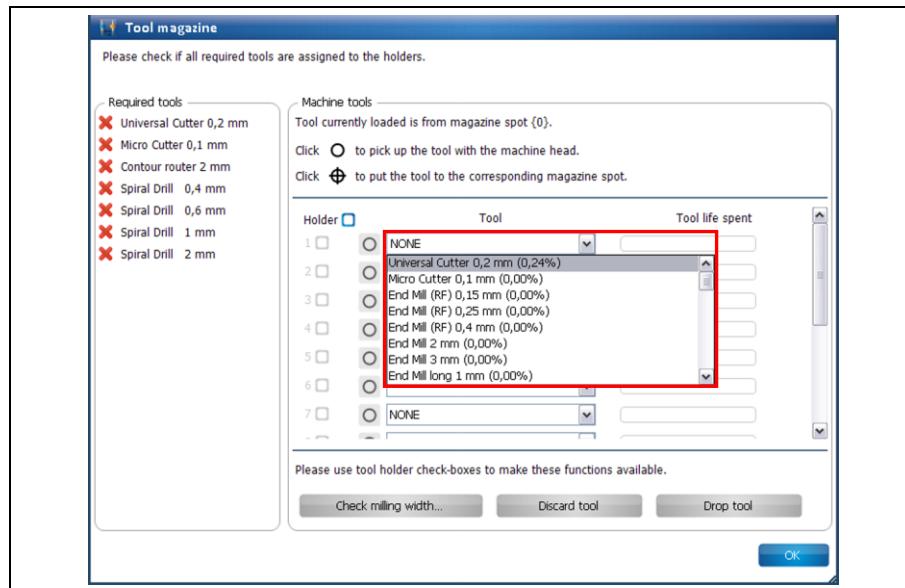
The required tools have to be inserted into the tool magazine manually. You can either

- 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:

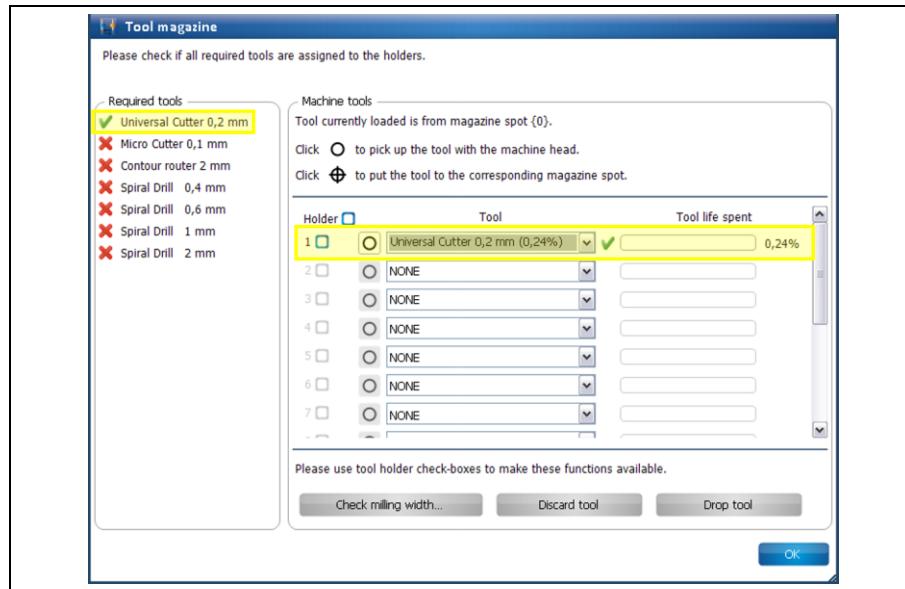
Fig. 91: Drop-down list of the tool holder



➔ 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):

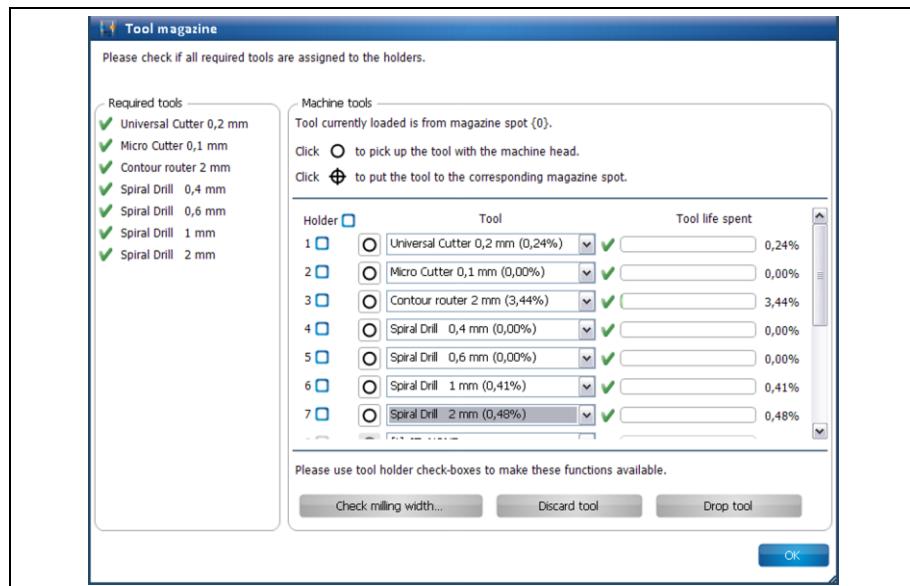
Fig. 92:
Assigning a tool



➔ 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. 93: Tool magazine loaded

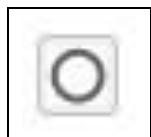


◆ The tool magazine is loaded.

■ Picking up a tool with the clamp

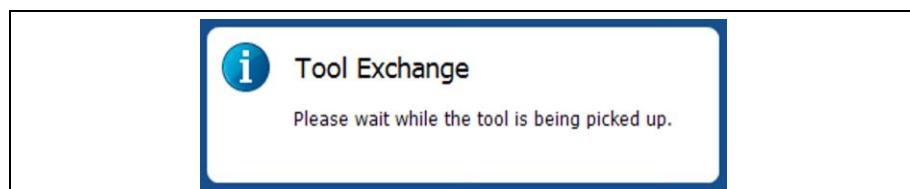
1. Click on the following button next to the drop-down list:

Fig. 94: Picking up a tool



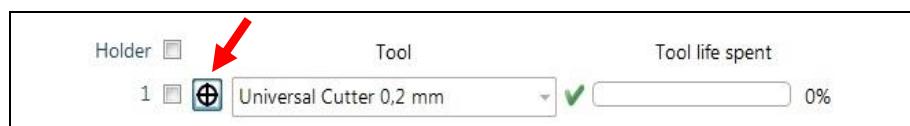
➔ The following message is displayed while the clamp picks up the tool:

Fig. 95: Message picking up tool



➔ The symbol on the tool's button changes:

Fig. 96: Tool currently in clamp



◆ Now, the tool is in the clamp.

■ Putting the tool back to its magazine position

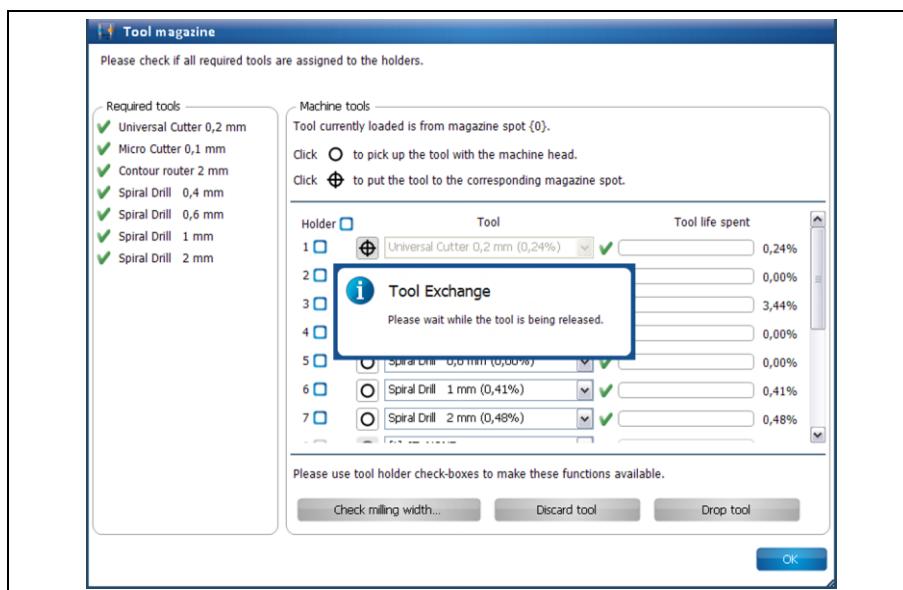
1. Click on the following button next to the drop-down list:

Fig. 97: Putting down a tool



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

Fig. 98: Message tool release



➔ The symbol on the tool's button changes:

Fig. 99: Tool not in clamp



◆ The tool is back at its corresponding magazine position.

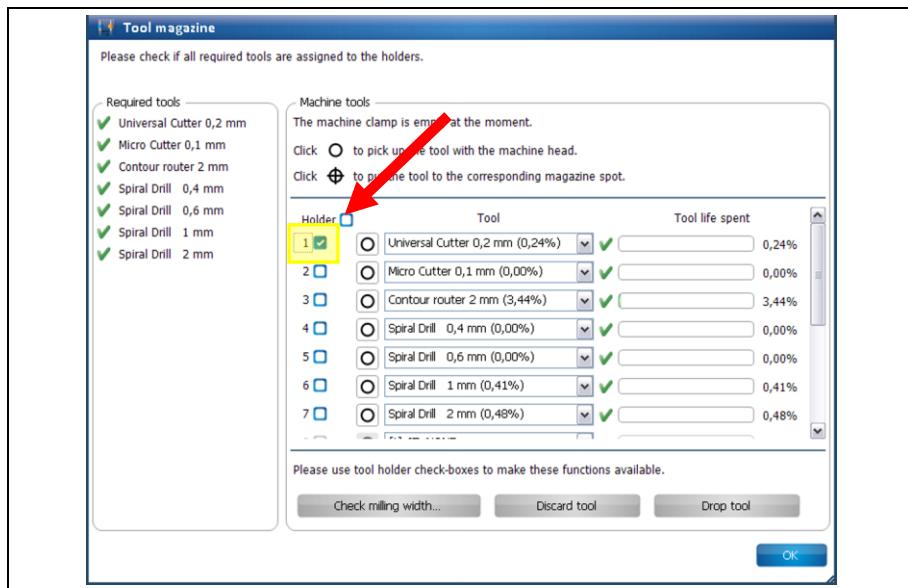
■ Checking the milling width (Universal Cutter)

A tool has to be in the clamp to enable checking the milling width (Universal Cutter) or the milling depth (End Mill) of a tool.

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

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. 100: Check box activated



→ The button "Check milling width..." is active.



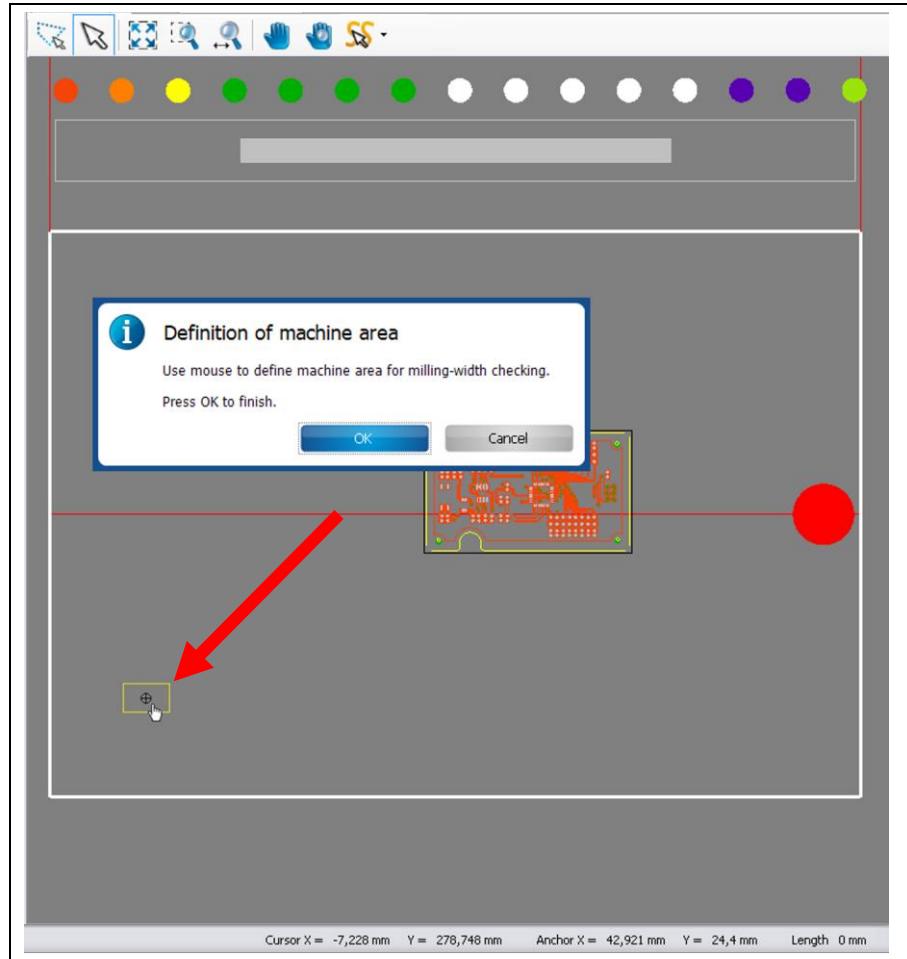
Note

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.

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

→ The following message is displayed:

Fig. 101: 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).



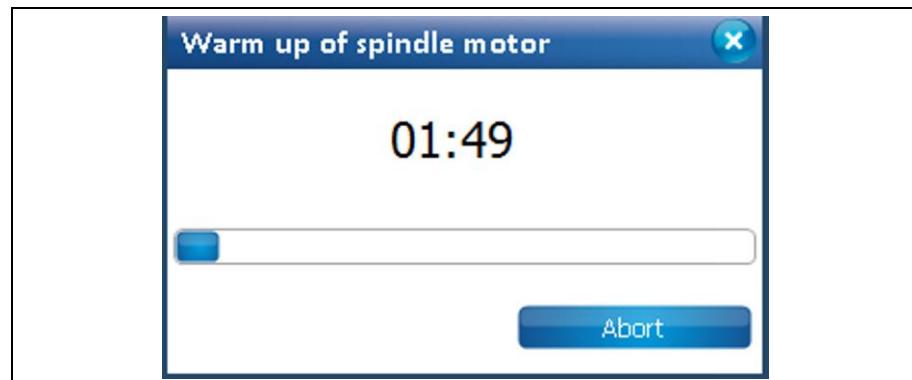
Note

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. 102: Warm-up of spindle motor

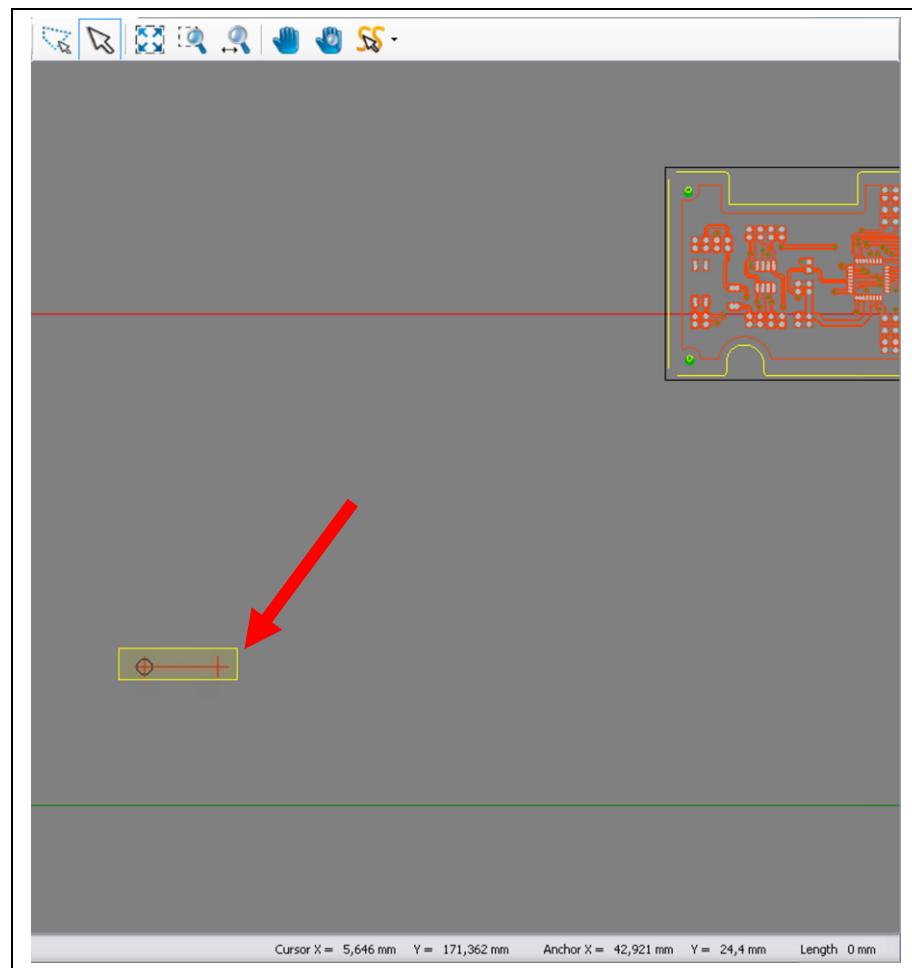


Note

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

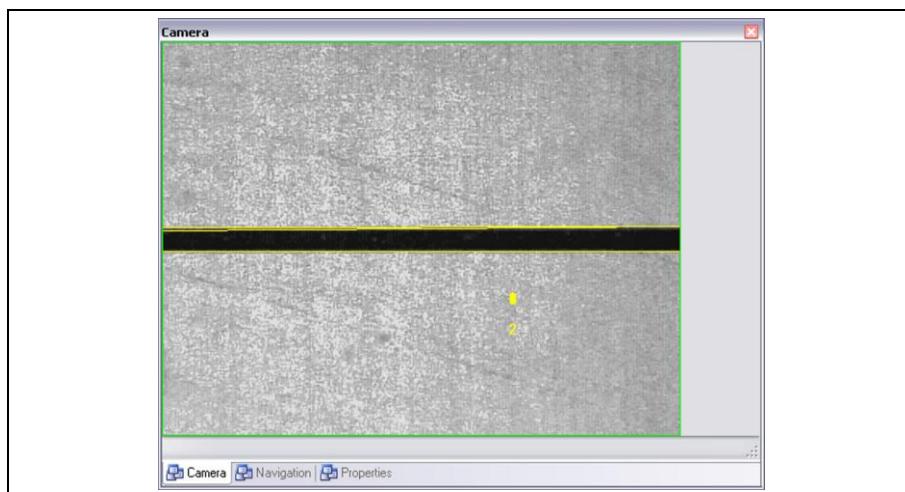
- The line to be milled is displayed in the machining view and the line is milled:

Fig. 103: Machining view with milled line



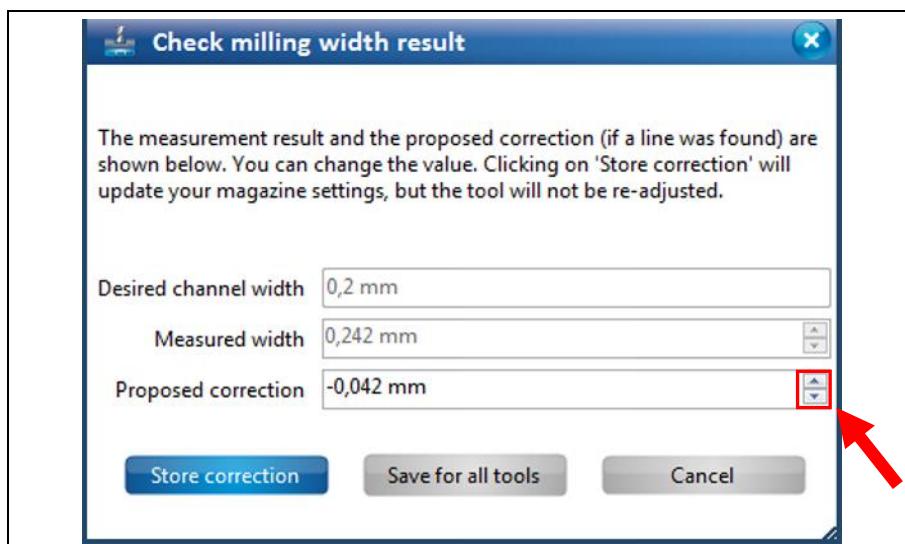
After the line has been milled the camera moves to the corresponding position. The “Camera” pane displays the line just milled:

Fig. 104:
“Camera” pane



➔ The dialog with the measurement results is displayed:

Fig. 105:
Measurement
results



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



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

Note

6. Increase or decrease the value of the proposed correction by using the two arrow buttons.
 7. To apply the proposed correction only for the current tool, click on [Store correction].
- ➔ The correction value for the current tool has been applied. The dialog is closed.

or

8. To apply the proposed correction for all tools of the same tool type, click on [Save for all tools].
→ The correction value for all tools of the same tool type has been applied.
The dialog is closed.



Note

In CircuitPro PM it is possible to apply the correction value for all tools of the same tool type. If you check the milling width with an Universal Cutter and if you click on the button [Save for all tools], the correction value is applied for all Universal Cutters.



Note

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



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.

- ◆ The milling width has been checked.

■ Checking the milling width (Micro Cutter)

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

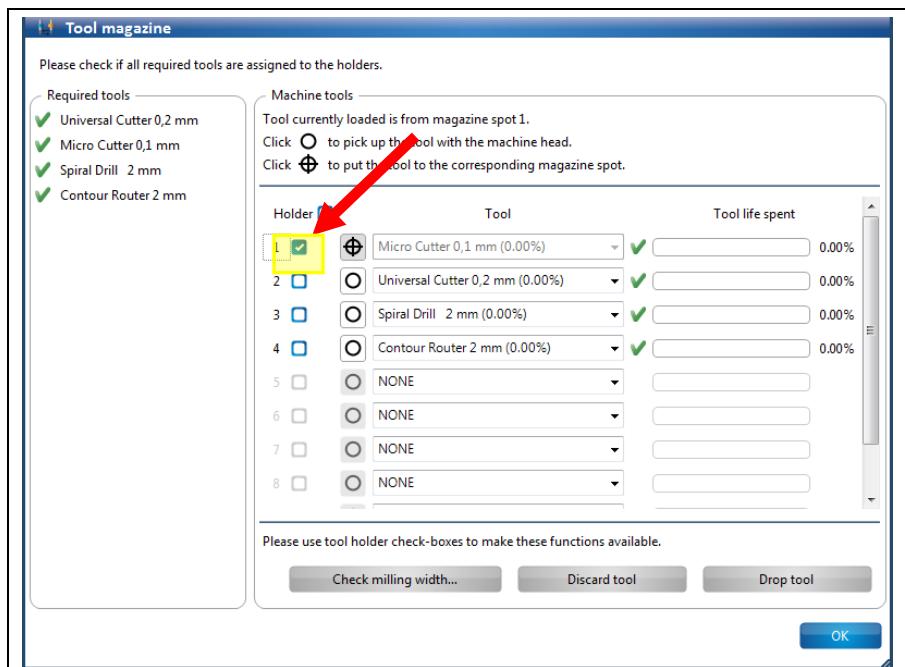
First, a short line is milled that is subsequently measured with the microscope.

1. Pick up the tool with the clamp (see procedure “Picking up a tool with the clamp”).

→ The tool is in the clamp.

2. Activate the check box of the tool currently in the clamp:

Fig. 106: Check box activated



→ The button “Check milling width...” is active.



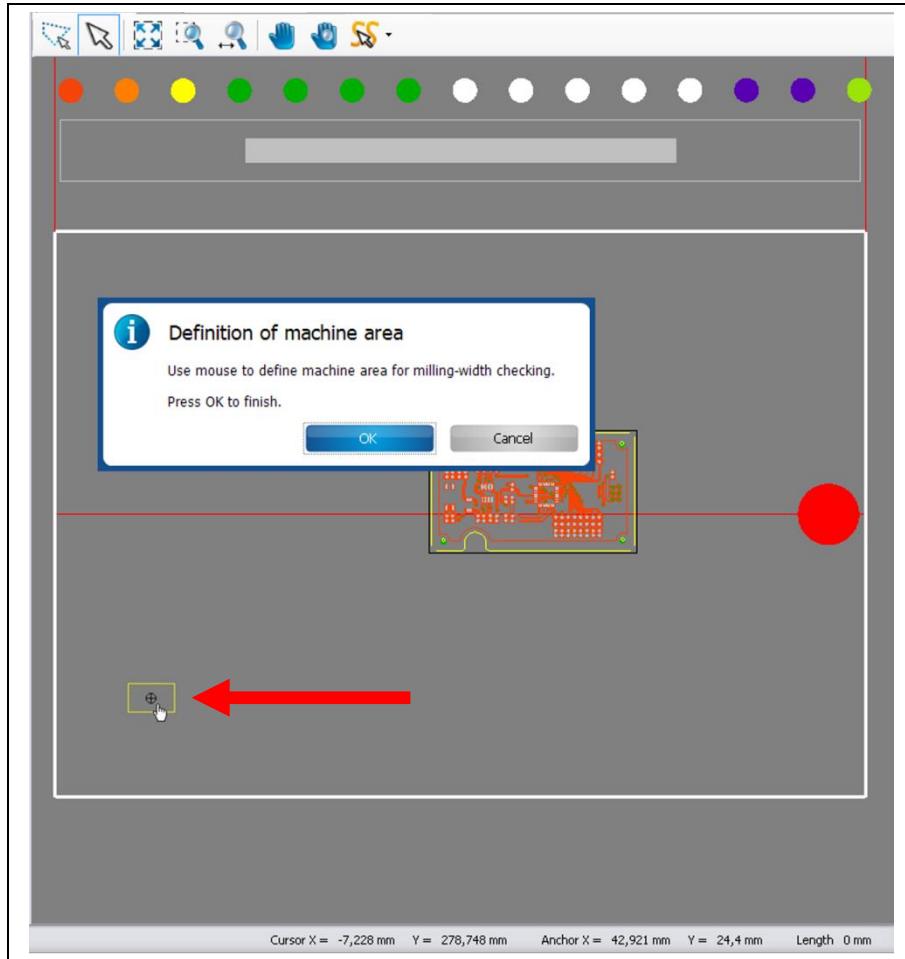
Note

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.

3. Click on [Check milling width].

→ The following message is displayed:

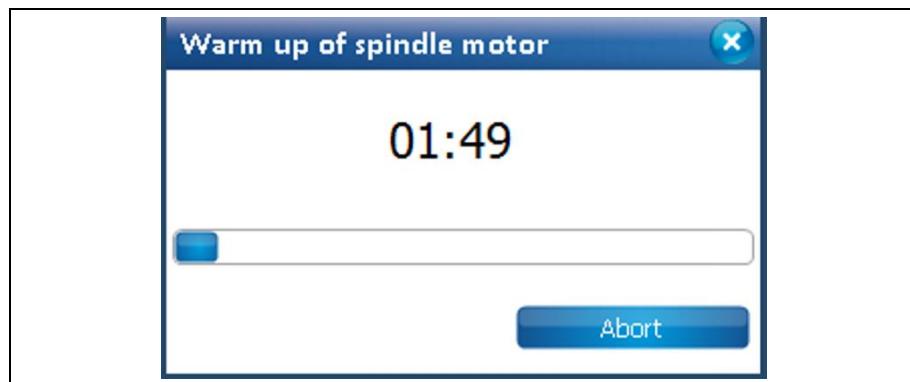
Fig. 107:
Definition of
machine area



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).
- 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. 108: Warm-up of spindle motor

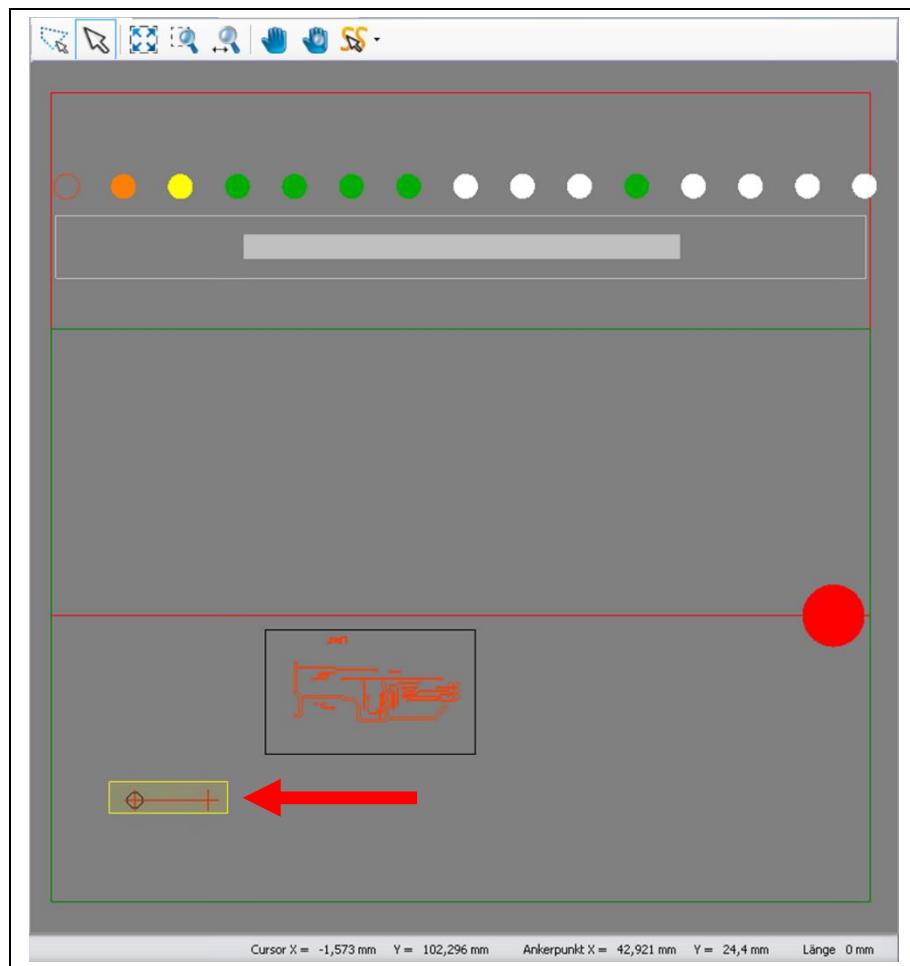


Note

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

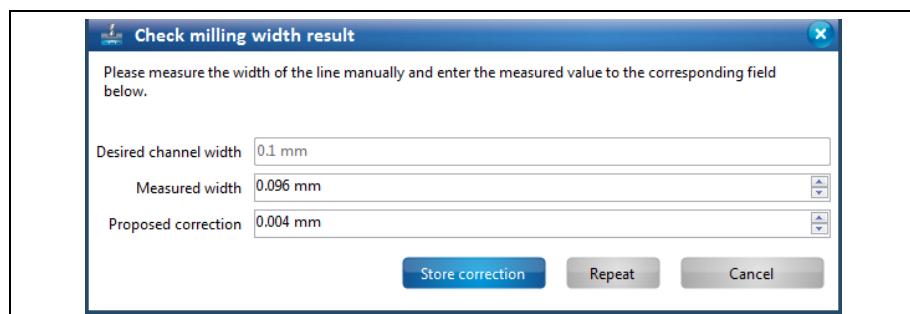
- ➔ The line to be milled is displayed in the machining view and the line is milled:

Fig. 109:
Machining view
with milled line



→ The dialog with the results is displayed:

Fig. 110: Results



Note

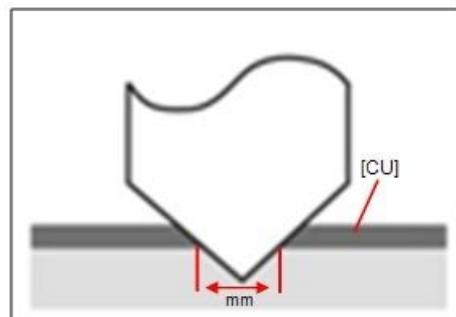
If the option **Adjust width manual for micro cutter** is set to **False**, the milling width is measured with the camera and measurement with the microscope is omitted. The option **Adjust width manual for micro cutter** can be found in Extras > Options under the item "Machine".

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. Enter the measured value into the field \ Measured width \.



Note

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



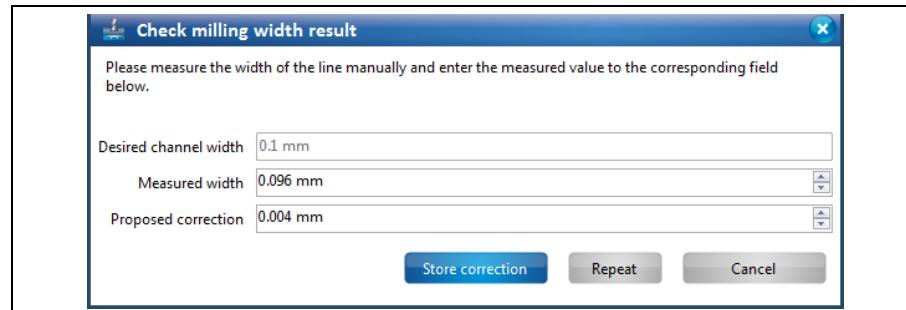
Note

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

8. Increase or decrease the value of the proposed correction by using the two arrow buttons.
9. To mill the line with the entered proposed correction, click on [Repeat].

- The new line is milled onto the base material with a slight offset and the dialog with the results is displayed:

Fig. 111: Results



10. Measure the milling width by using a microscope.
 11. Enter the measured value into the field \ Measured width \.
 12. Repeat steps 6 - 12 until the desired milling width is reached.
or
 9. Click on [Store correction] to apply the proposed value.
- The correction value for the current tool has been applied. The dialog is closed.



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

Note

- ◆ The milling width has been checked.

■ Discarding a tool

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



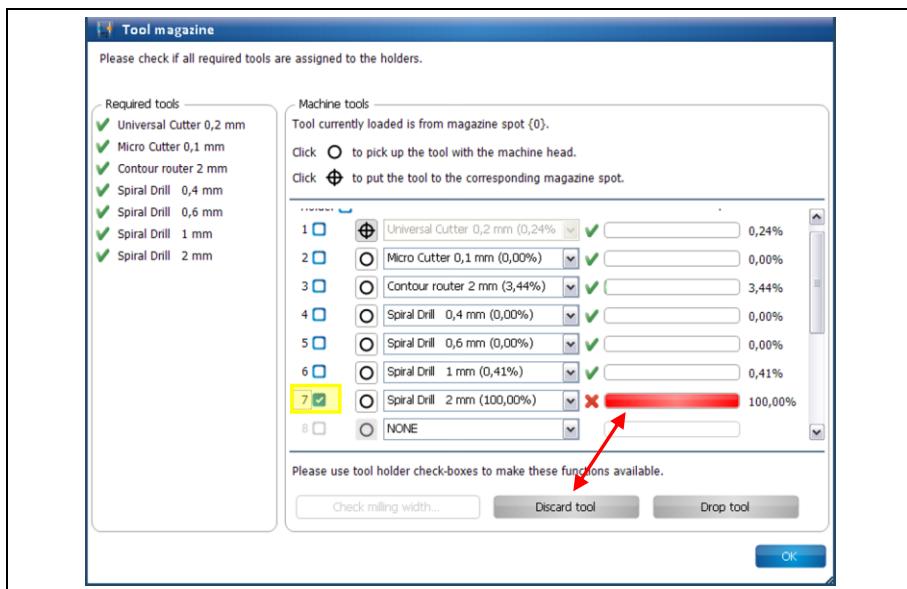
Please note that all information on the tool to be discarded will be deleted.

Note

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

➔ The button “Discard tool” is activated.

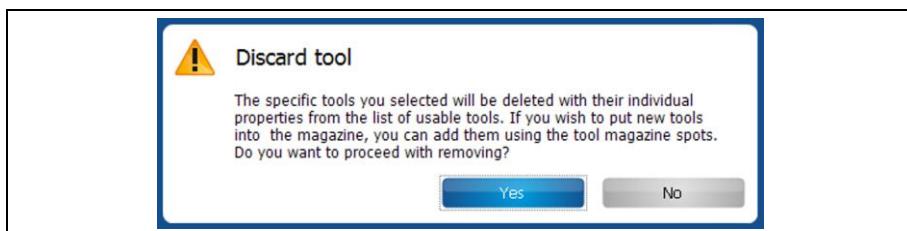
Fig. 112: Replace tool



2. Click on [Discard tool].

➔ The following message is displayed:

Fig. 113: Tool replacement



3. Confirm by clicking on [Yes].



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

Note

➔ 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.

5.2.10 Tool magazine ProtoMat S43/E33/E34/E44/X60 (manual tool change)

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

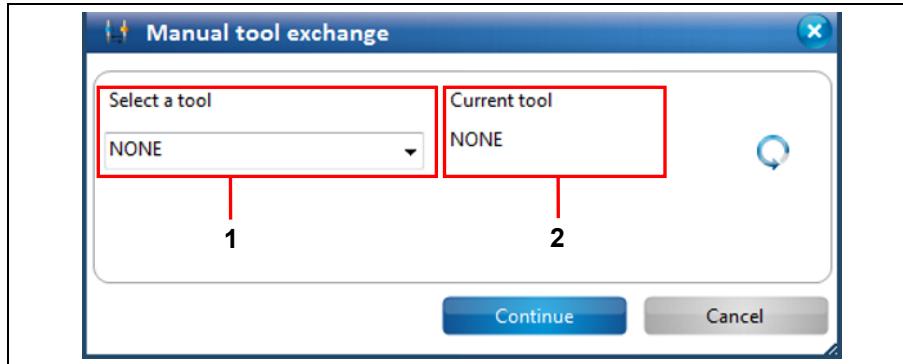
Click on Edit > Tool magazine... or the following icon of the toolbar to open the dialog:

Fig. 114: Tool magazine icon



The following dialog is displayed.

Fig. 115: 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. 116: Tool change



3. Mount the tool.

4. Click on [OK].

◆ The manual tool change is finished.

■ Measuring the milling width



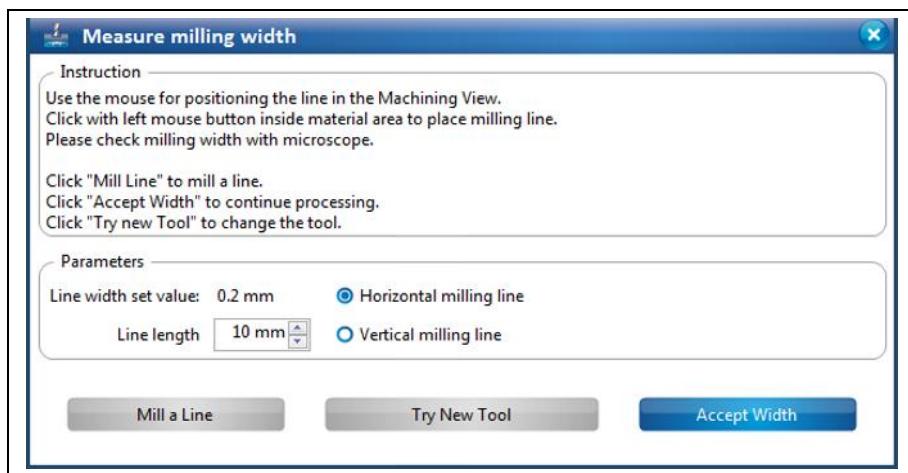
Please note, that you can only measure the milling width of a conical tool.

Note

1. Click on [Milling Width].

➔ The following dialog is displayed:

Fig. 117: Measure Milling Width

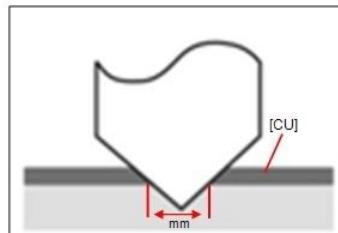


2. Click on the position in the Machining view where you want to mill the line.
 3. Enter the length of the line to be milled.
 4. Select an option:
 - Horizontal milling line
 - Vertical milling line
 5. Click on [Mill a Line].
- ➔ The line is milled at the selected position.
6. Measure the milling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



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

Note



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.

5.2.11 Tool magazine ProtoMat S63/S103/H100

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.

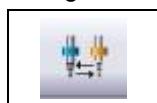


Note

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

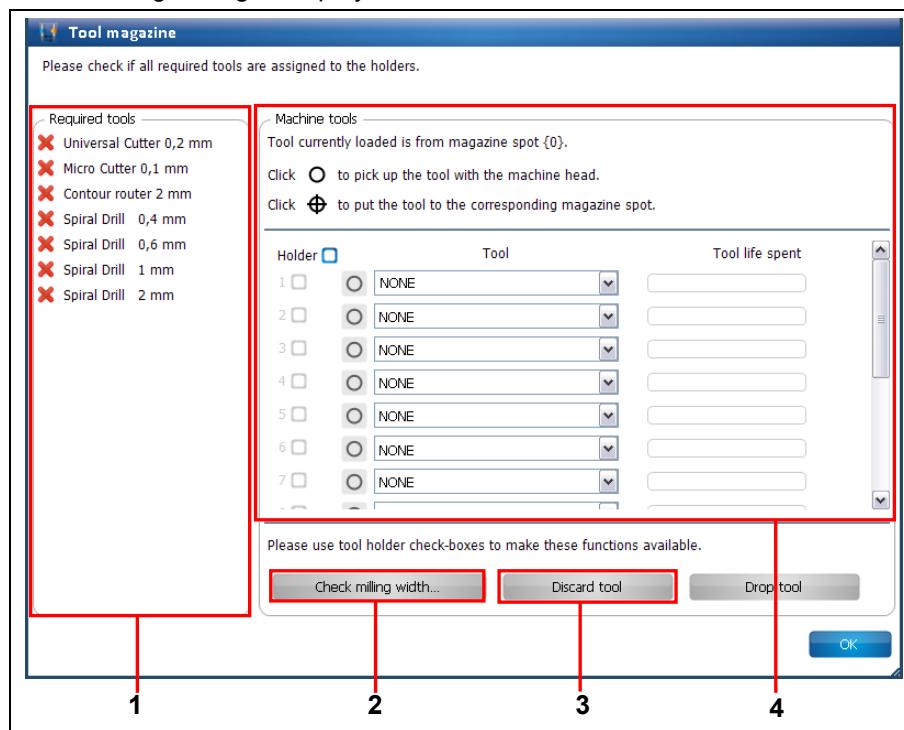
Click on Edit > Tool magazine... or the following icon of the toolbar to open the dialog:

Fig. 118: Tool magazine icon



The following Dialog is displayed:

Fig. 119: Tool magazine



/1/ Required tools

/2/ Button “Check milling width...”

/3/ Button “Discard tool”

/4/ Tools in the machine

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

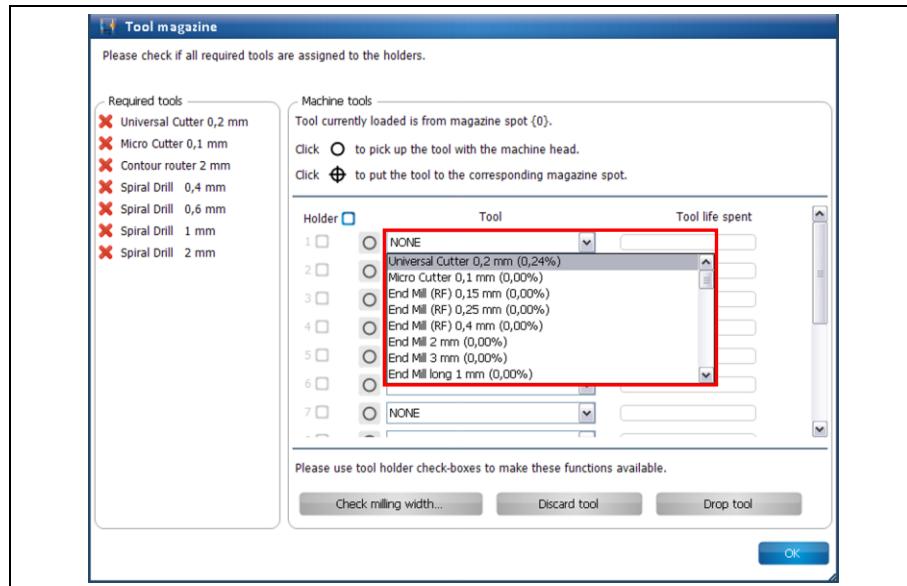
The required tools have to be inserted into the tool magazine manually. You can either

- 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:

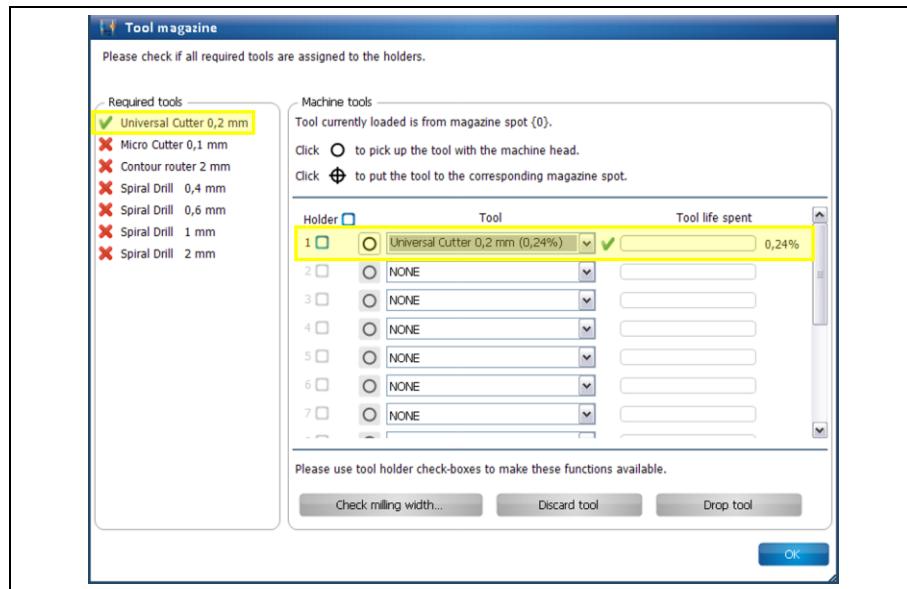
Fig. 120: Drop-down list of the tool holder



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

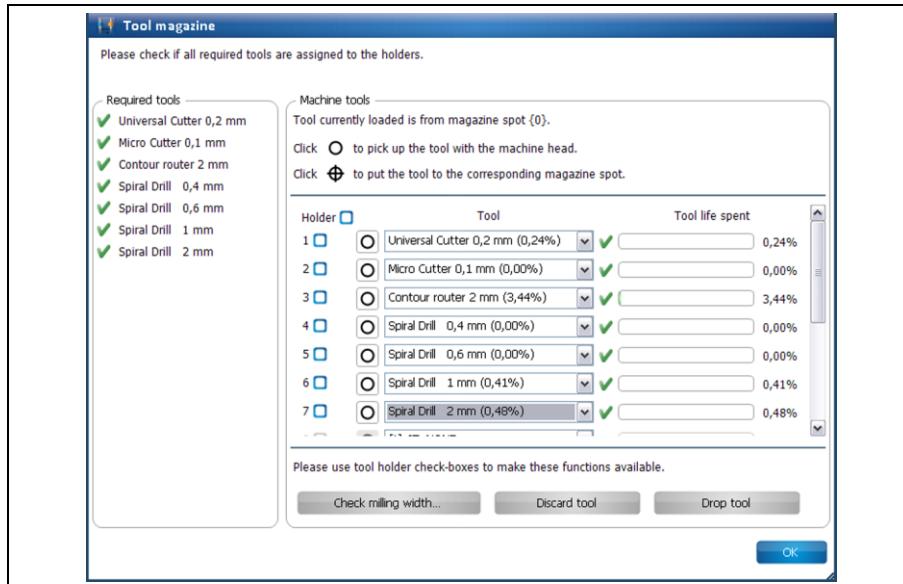
2. Select the required tool (in this case: Universal Cutter 0.2 mm, as in adjacent list):

Fig. 121: 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. 122: 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:
- The following message is displayed while the clamp picks up the tool:

Fig. 123: Message picking up tool



Fig. 124: Tool currently in clamp



- ◆ The tool is now in the clamp.

■ Putting the tool back to its magazine position

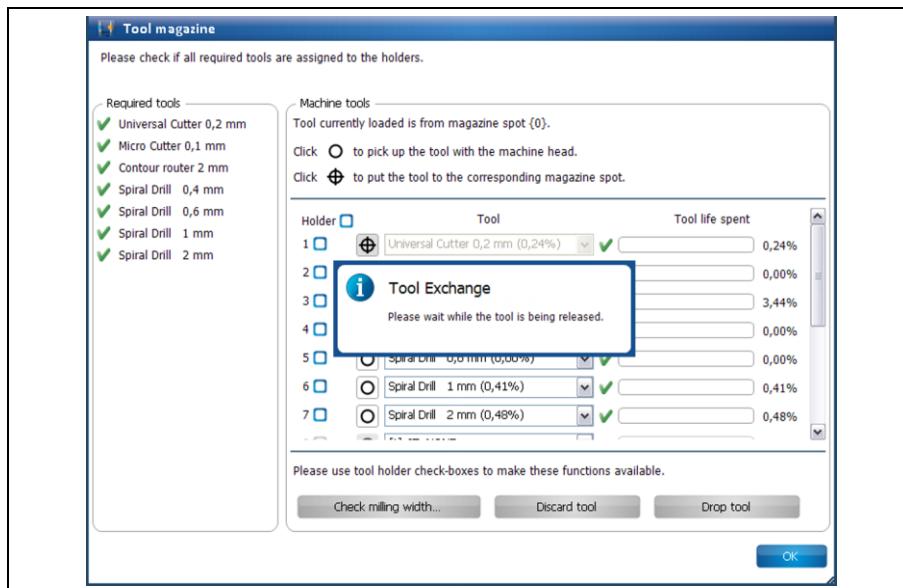
1. Click on the following button next to the drop-down list:

Fig. 125: Putting down a tool



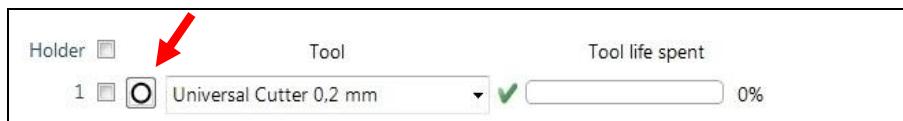
➔ The following message is displayed while the clamp puts down the tool:

Fig. 126: Message tool release



➔ The symbol on the tool's button changes:

Fig. 127: Tool not in clamp



◆ The tool is back at its corresponding magazine position.

■ Checking the milling width (Universal Cutter)

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

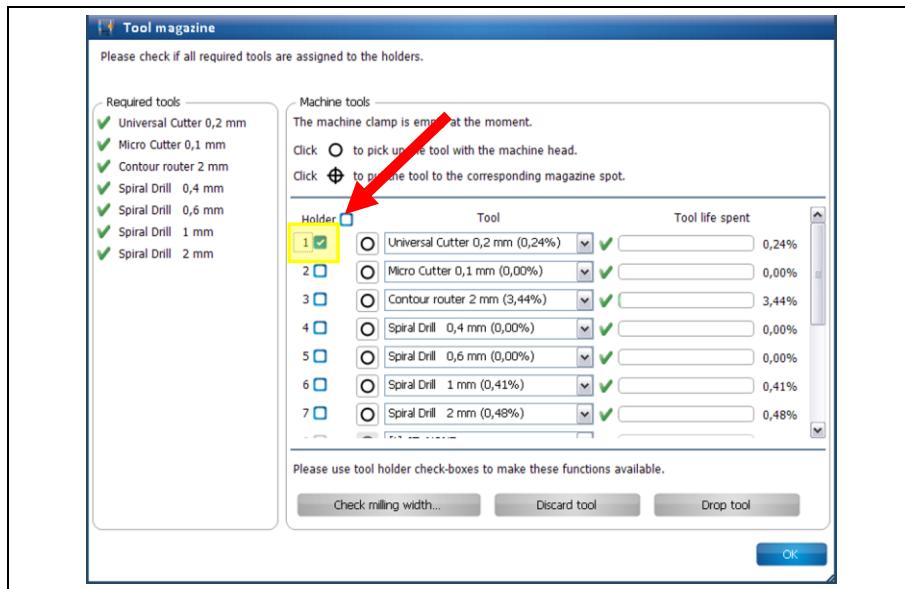
A short line is milled that is subsequently measured with the camera.

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. 128: Check box activated



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



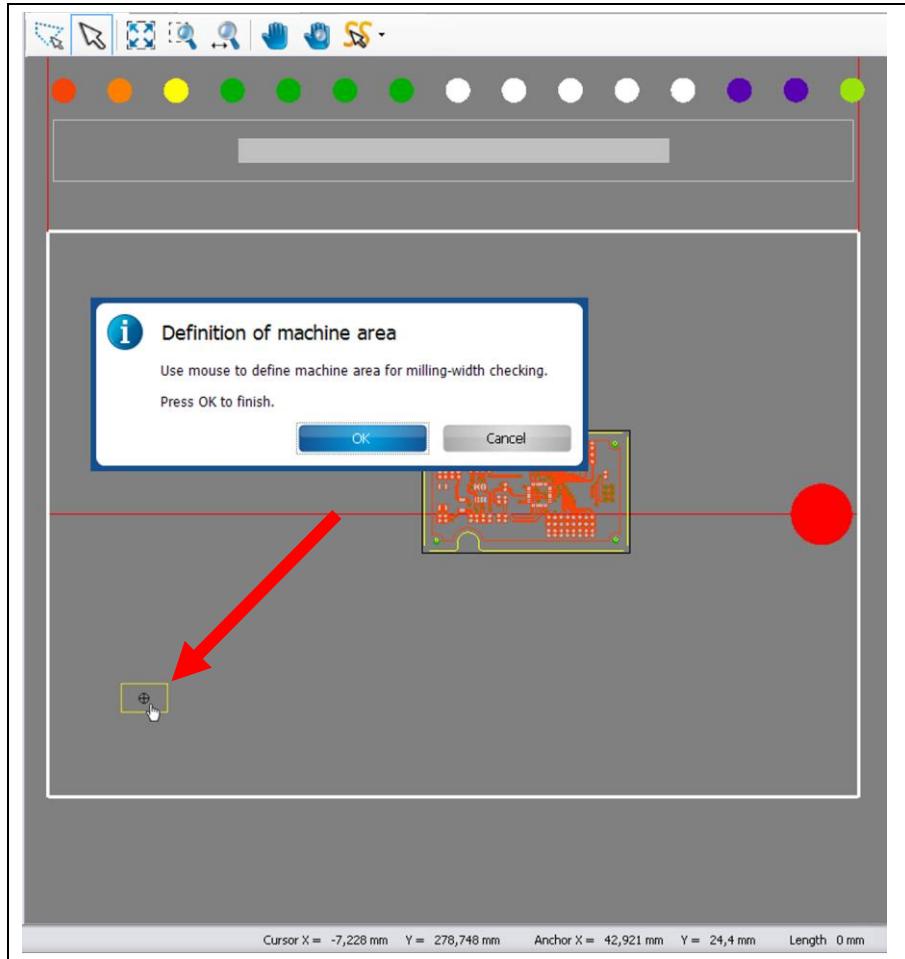
If a tool the milling width of which cannot be checked (e.g. Spiral Drill etc.) is in the clamp the button is not activated.

Note

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

→ The following message is displayed:

Fig. 129: 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).



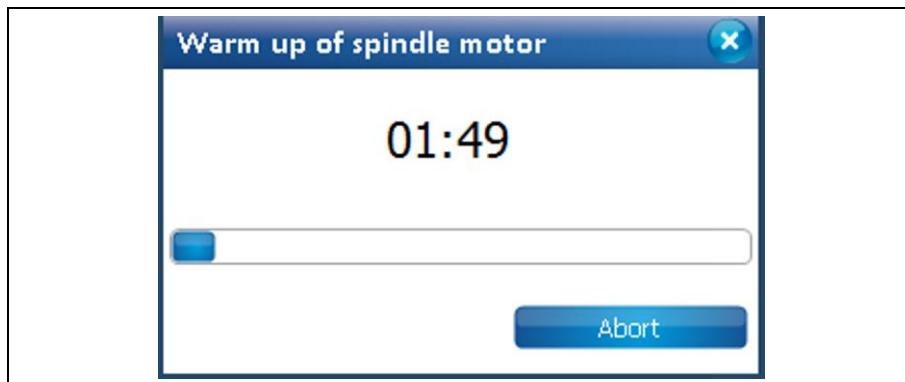
Note

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. 130: Warm-up of spindle motor

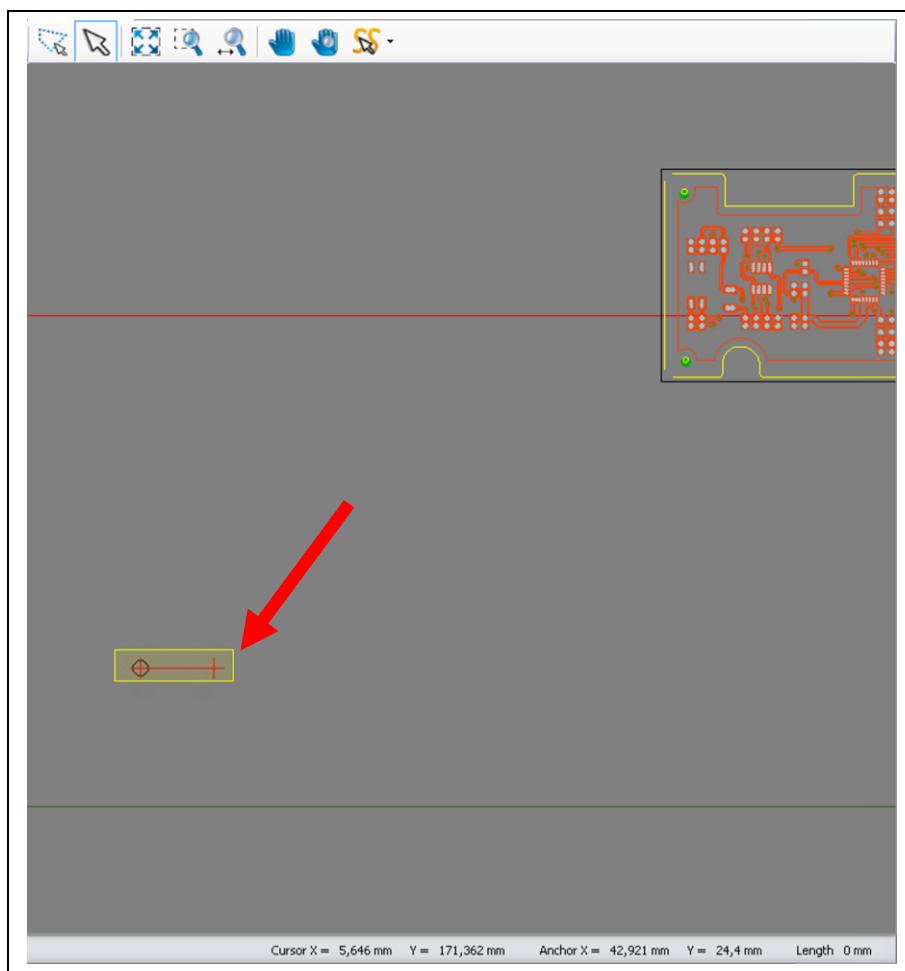


Note

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

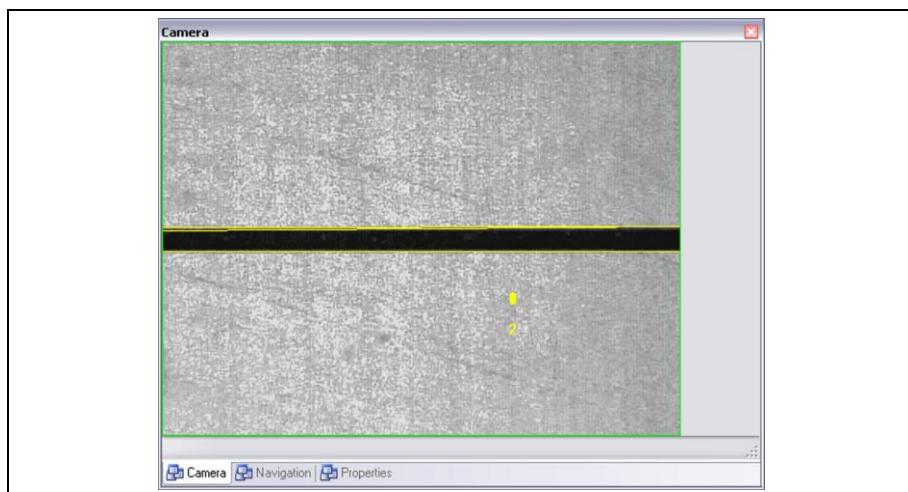
- ➔ The line to be milled is displayed in the machining view and the line is milled:

Fig. 131:
Machining view
with milled line



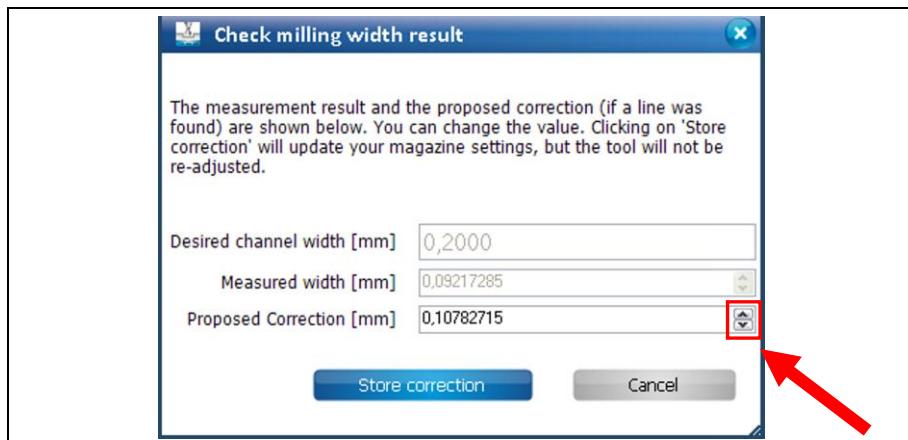
After the line has been milled the camera moves to the corresponding position.
The “Camera” pane displays the line just milled:

Fig. 132:
“Camera” pane



► The dialog with the measurement results is displayed:

Fig. 133:
Measurement
results



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

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



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

Note

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].

Note

- ➔ The dialog is closed.
- ◆ The milling width of the tool currently in the clamp was checked.



Note

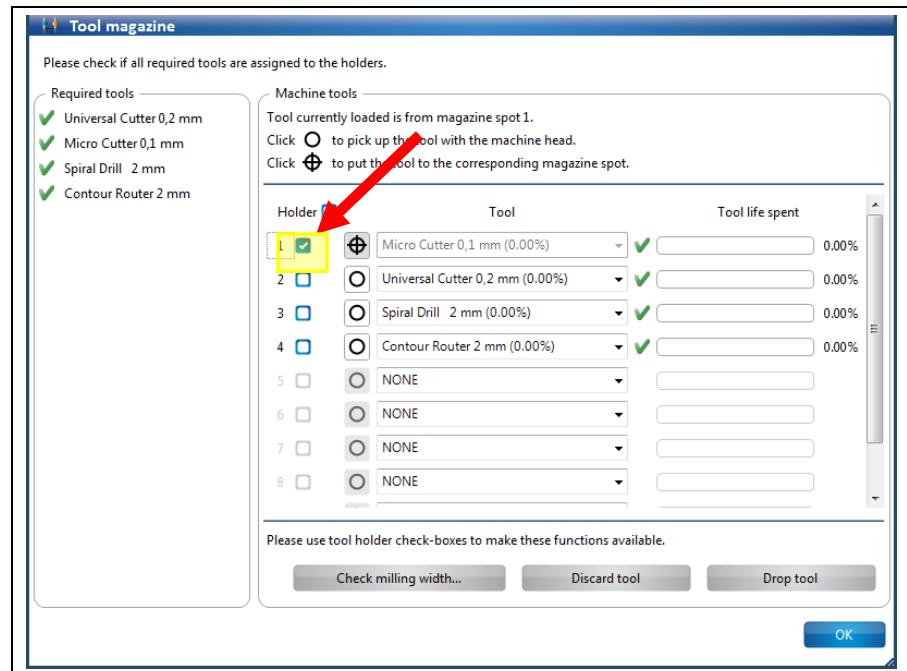
Please note that the tool has to be put back into the holder and picked up again in order to have the corrected settings be applied.

■ Checking the milling width (Micro Cutter)

A tool has to be in the clamp to enable checking the milling width of that tool. First, a short line is milled that is subsequently measured with the microscope.

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

Fig. 134: Check box activated



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



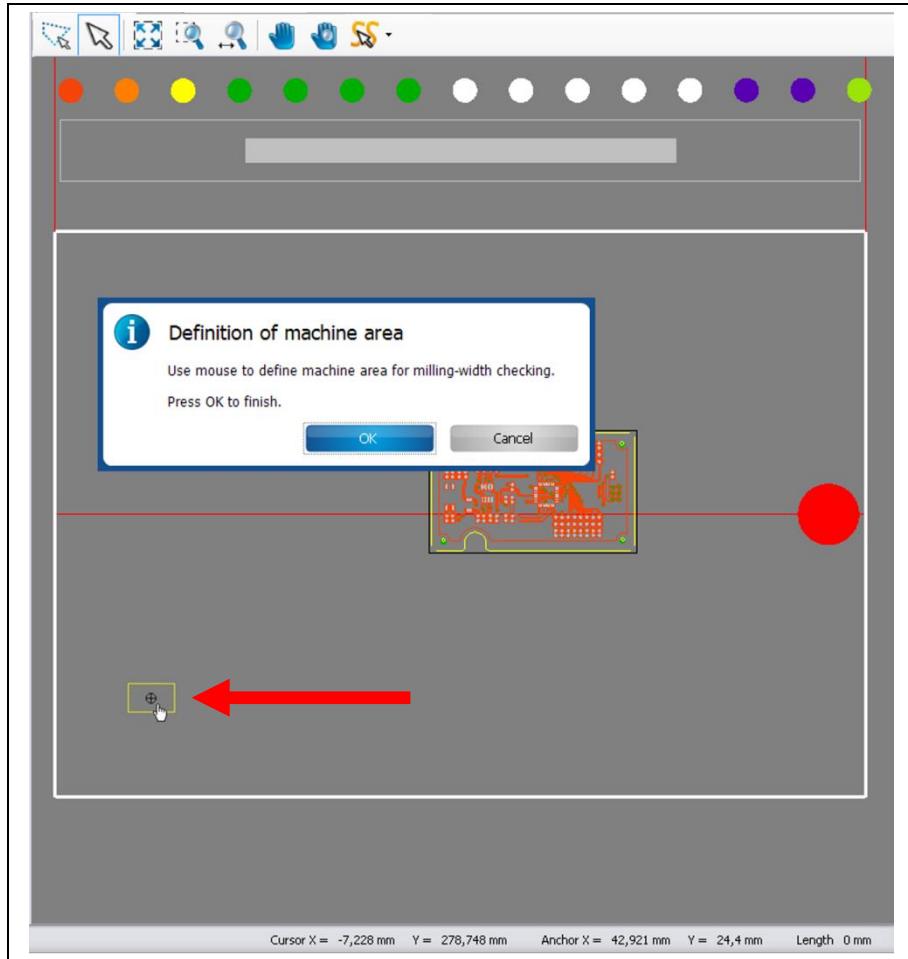
Note

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.

3. Click on [Check milling width].

→ The following message is displayed:

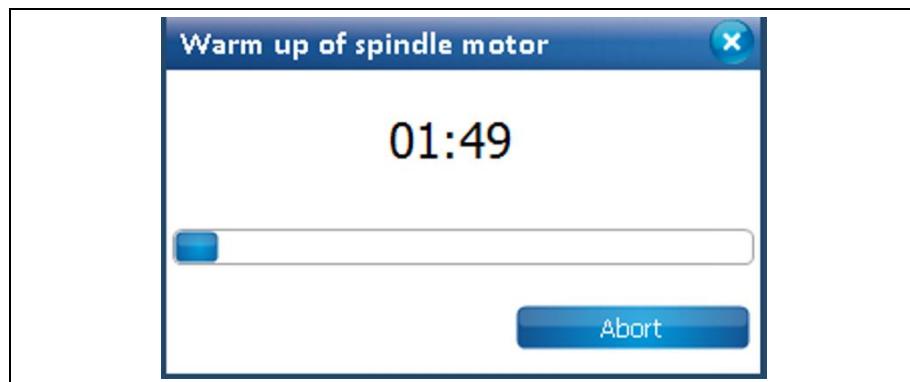
Fig. 135:
Definition of
machine area



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).
- 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. 136: Warm-up of spindle motor

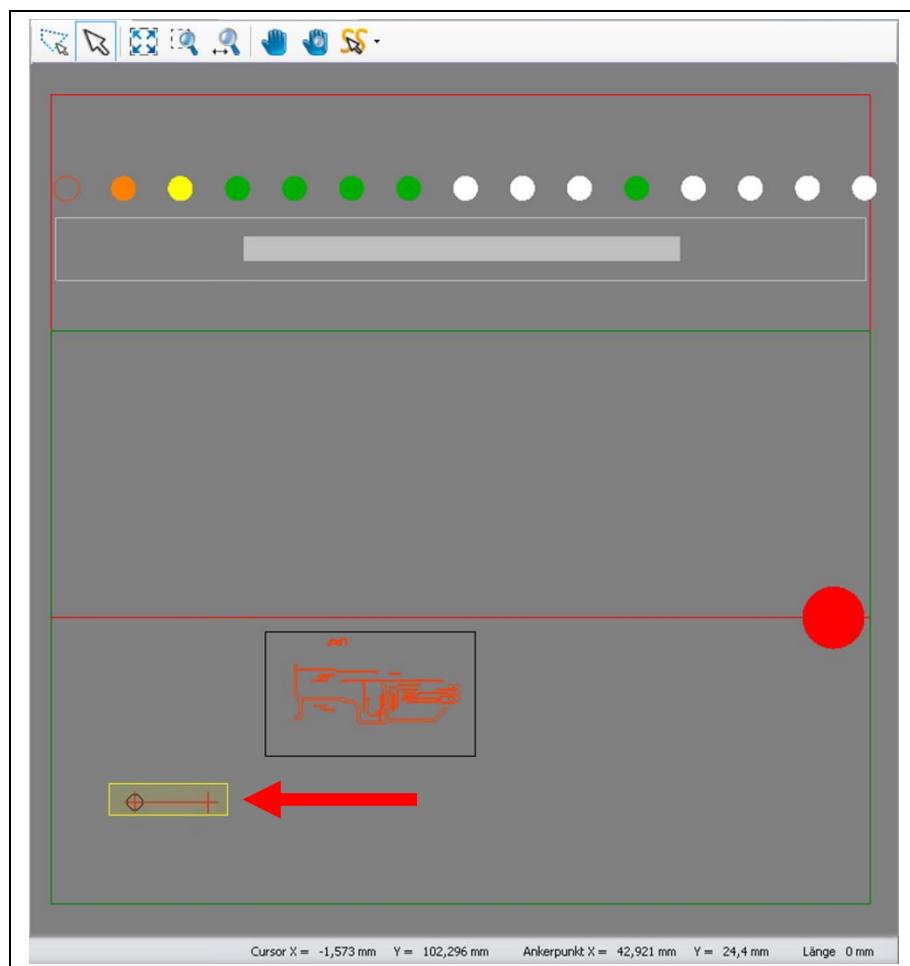


Note

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

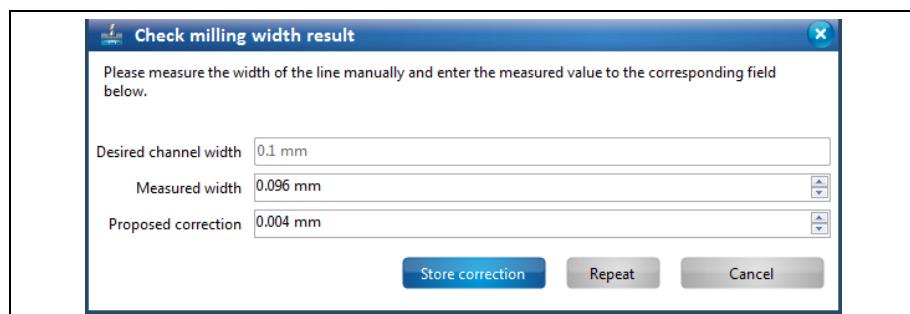
- The line to be milled is displayed in the machining view and the line is milled:

Fig. 137:
Machining view
with milled line



→ The dialog with the results is displayed:

Fig. 138: Results



Note

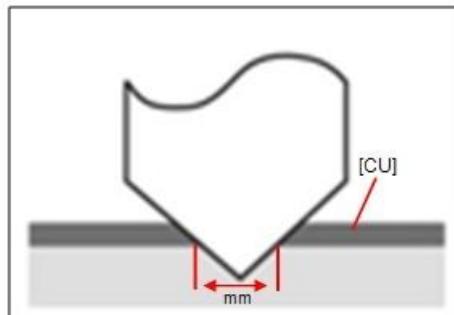
If the option **Adjust width manual for micro cutter** is set to **False**, the milling width is measured with the camera and measurement with the microscope is omitted. The option **Adjust width manual for micro cutter** can be found in Extras > Options under the item "Machine".

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. Enter the measured value into the field \ Measured width \.



Note

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



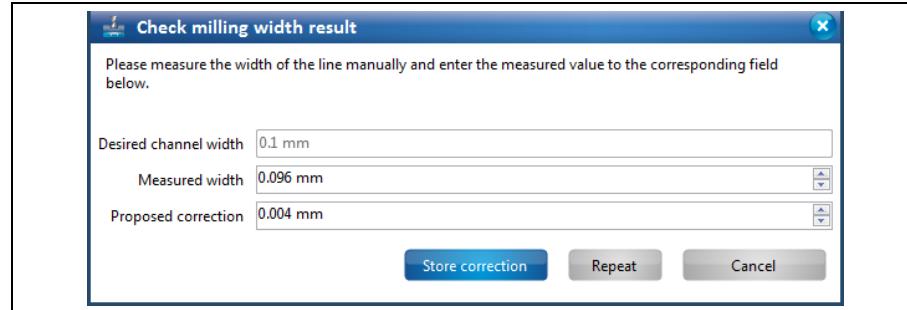
Note

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

8. Increase or decrease the value of the proposed correction by using the two arrow buttons.
9. To mill the line with the entered proposed correction, click on [Repeat].

- The new line is milled onto the base material with a slight offset and the dialog with the results is displayed:

Fig. 139: Results



10. Measure the milling width by using a microscope.
 11. Enter the measured value into the field \ Measured width \.
 12. Repeat steps 6 - 12 until the desired milling width is reached.
or
 9. Click on [Store correction] to apply the proposed value.
- The correction value for the current tool has been applied. The dialog is closed.



Note

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

- ◆ The milling width has been checked.

■ Discarding a tool

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



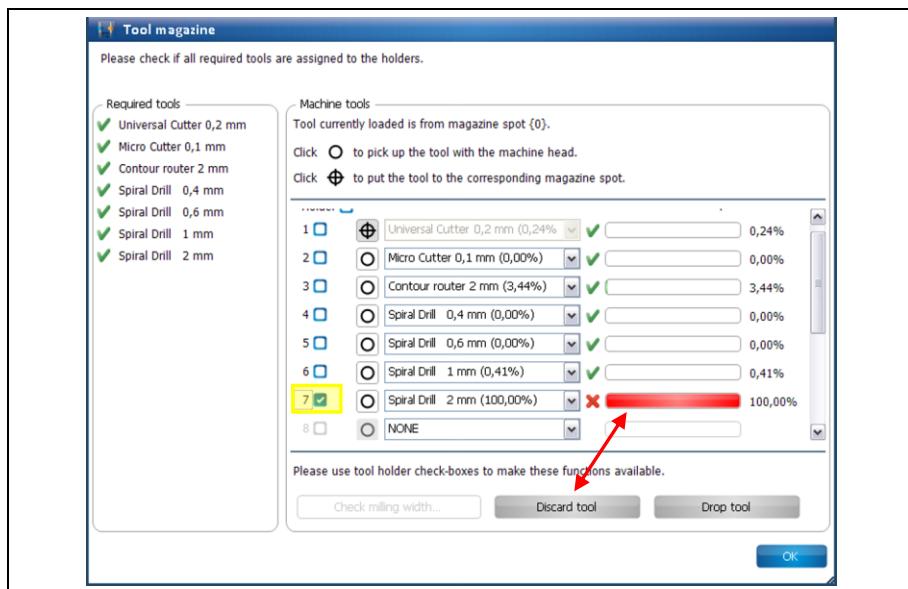
Please note that all information on the tool to be discarded will be deleted.

Note

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

→ The button “Discard tool” is activated.

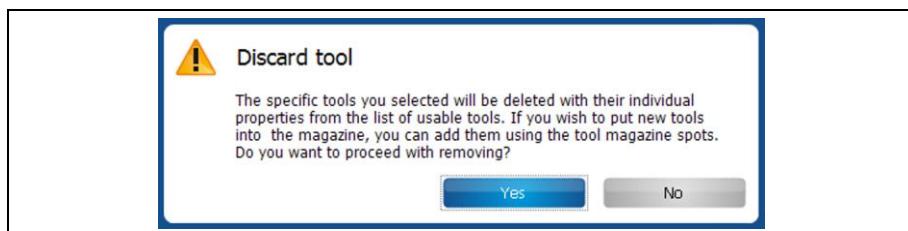
Fig. 140: Replace tool



2. Click on [Discard tool].

→ The following message is displayed:

Fig. 141: Tool replacement



3. Confirm by clicking on [Yes].



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

Note

4. Replace the old tool in the machine with a new one.

◆ The old tool is discarded.

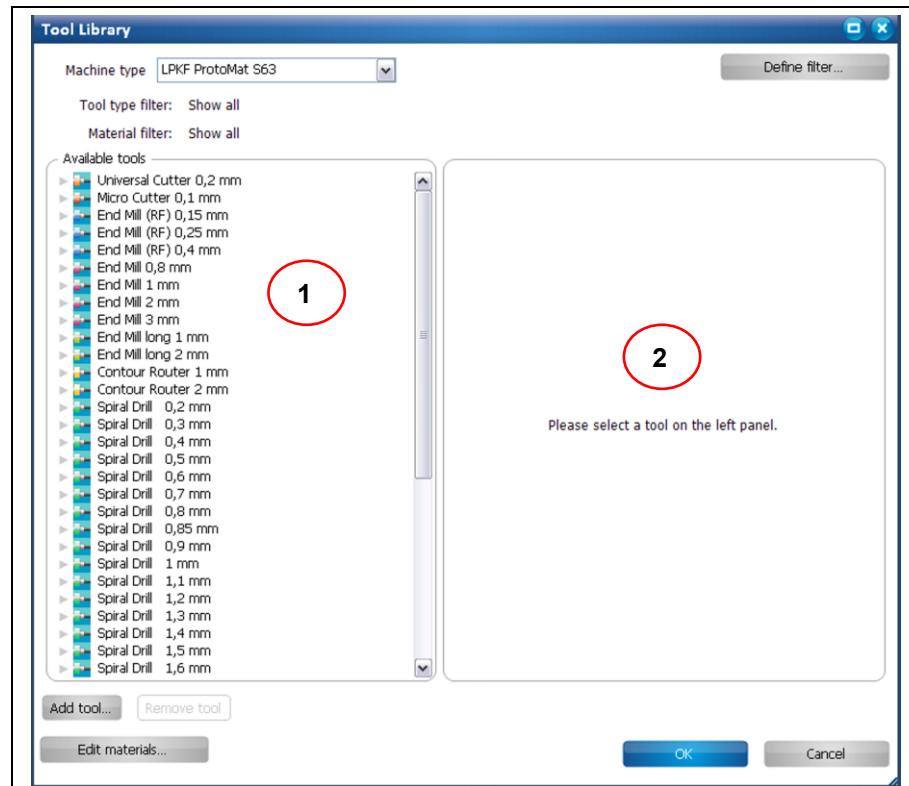
5.2.12 Tool library

The tool library contains the tools that you selected when setting up the machine (equipment configuration wizard).

The dialog allows the following operations:

- Adding new tools
- Deleting existing tools
- Defining filters for displaying the categories, tool types, and materials
- Adding new materials or delete existing ones

Fig. 142: Tool library



/1/ Display of available tools

/2/ Detailed information on the selected tool

- Displaying tool information
1. First select the type of your machine in the drop-down list \Machine type\.
 - ⇒ The tools which are assigned to your machine type are displayed in the section "Available tools".
 2. In section /1/, click on the tool whose detailed information you would like to view.
 - ⇒ In section /2/, now the relevant detailed information on the selected tool is shown with an image:

Fig. 143: Detailed information

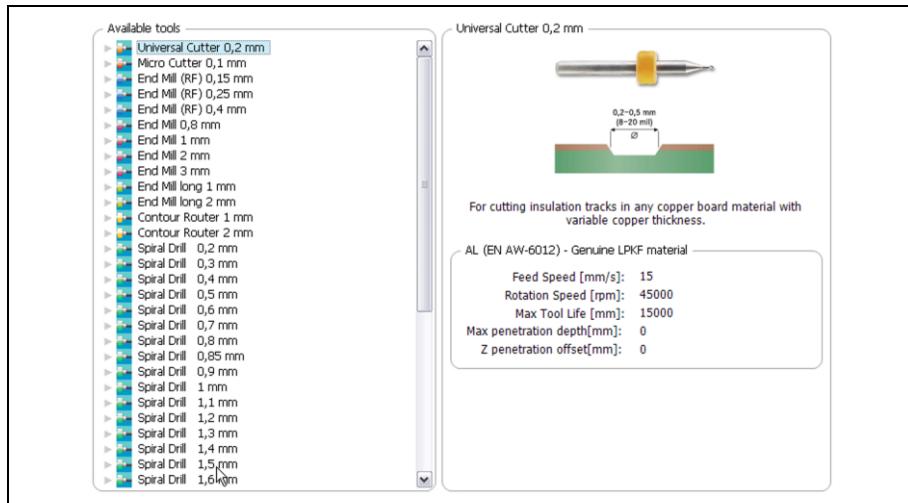
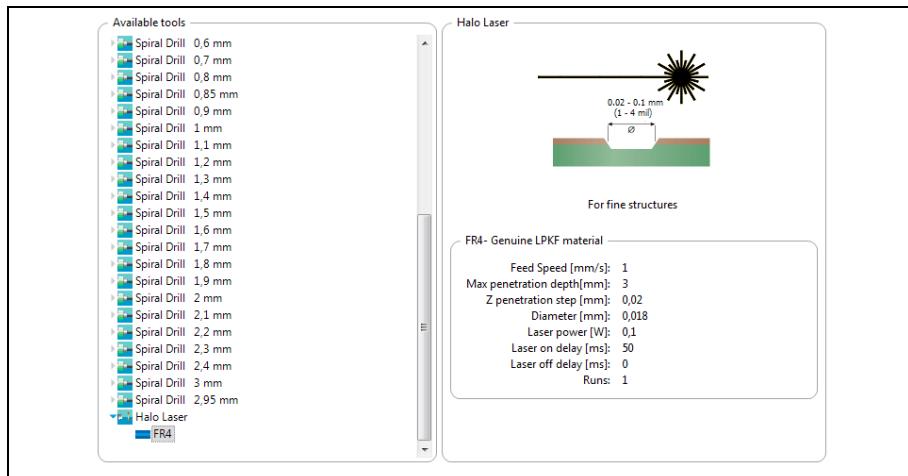


Fig. 144: Detailed information on the laser

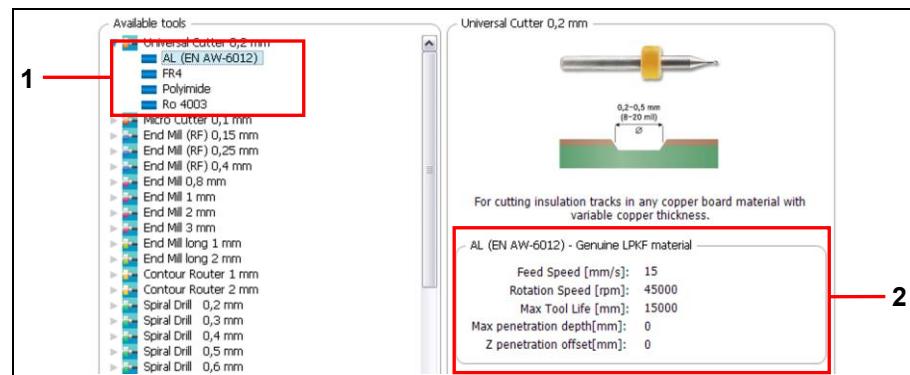


The materials which can be processed are listed under each tool.

3. Click on the arrow symbol next to the respective tool:

- The materials are listed and the following information is displayed in section /2/:

Fig. 145: Material display

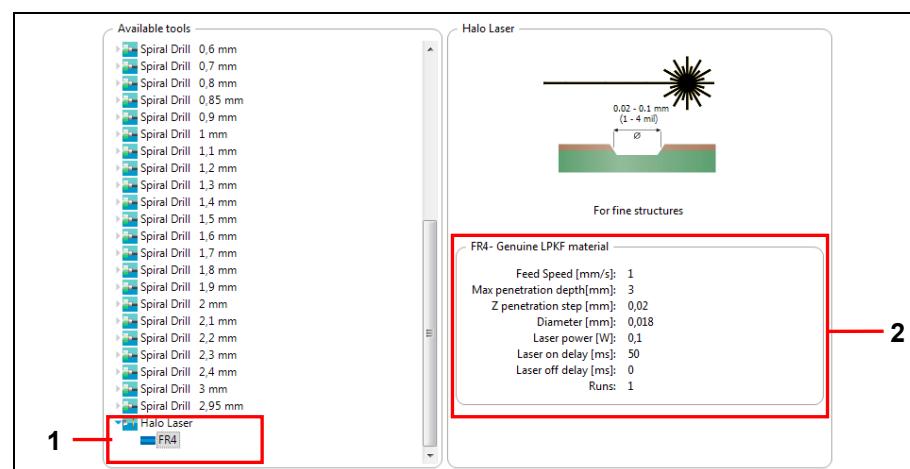


/1/ Material display

/2/ Detailed information on the materials

- Feed Speed
- Rotation Speed
- Maximum Tool Life
- Maximum penetration depth [mm]
- Z penetration offset [mm]

Fig. 146: Materialanzeige Laser



/1/ Material display

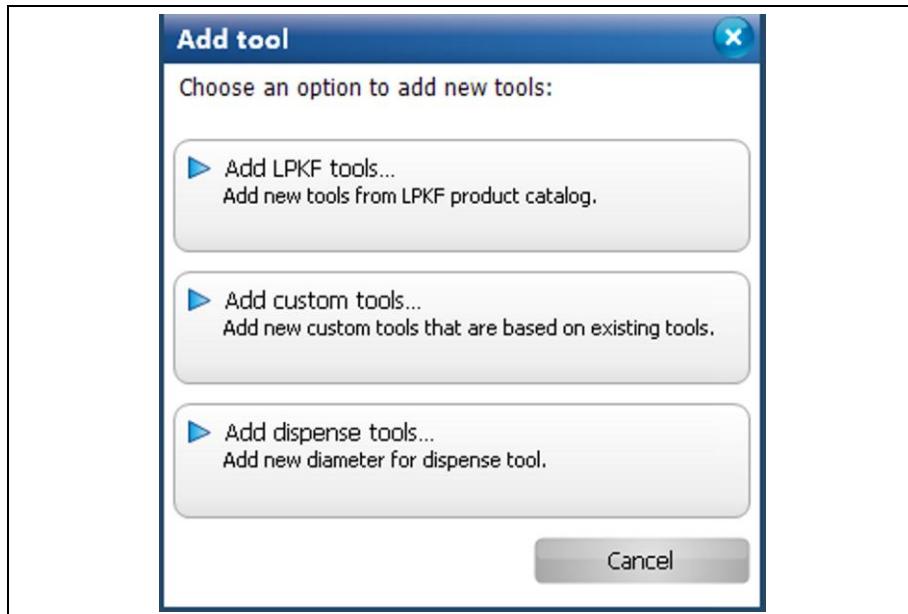
/2/ Detailed information on the materials

- Feed Speed [mm/s]
 - Maximum penetration depth [mm]
 - Z penetration step [mm]
 - Diameter [mm]
 - Laser power [W]
 - Laser on delay [ms]
 - Laser off delay [ms]
 - Runs
- ◆ The detailed information has been displayed.

- Removing an existing tool from the list
 1. In section /1/, click on the tool that you want to remove from the list.
 2. Click on [Remove tool].
 - ◆ The tool is removed from the list.

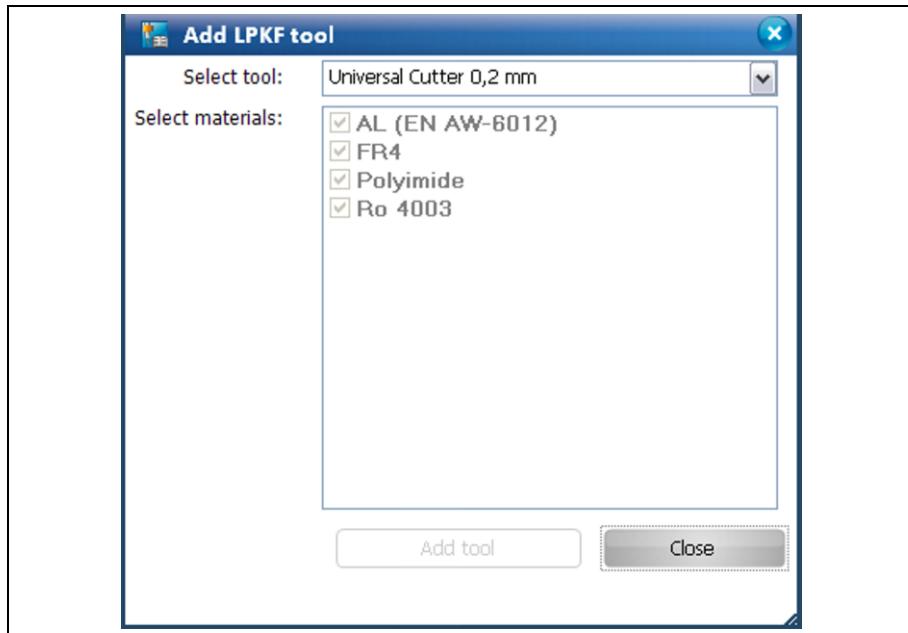
- Adding a new tool
 1. Click on [Add tool...].
 - ➔ The following dialog is displayed:

Fig. 147: Add tool



- Adding LPKF tools
 1. Click on "Add LPKF tools...".
 - ➔ The following dialog is displayed:

Fig. 148: Add LPKF tool

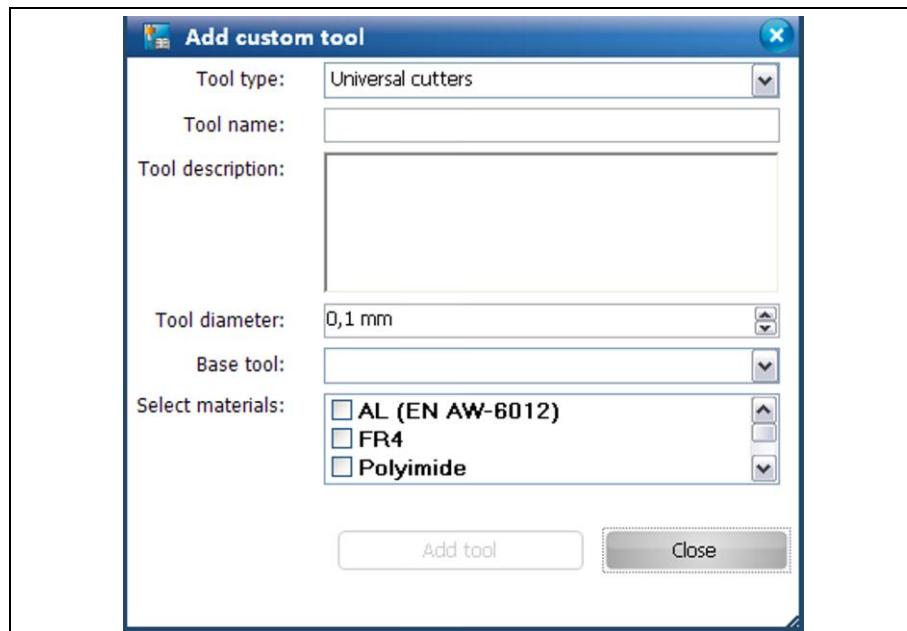


2. Select a tool from the list.
→ The associated materials are displayed in the list.
3. Click on [Close].
◆ The tool has been added.

- Adding custom tools
- 1. Click on “Add custom tools...”.

→ The following dialog is displayed:

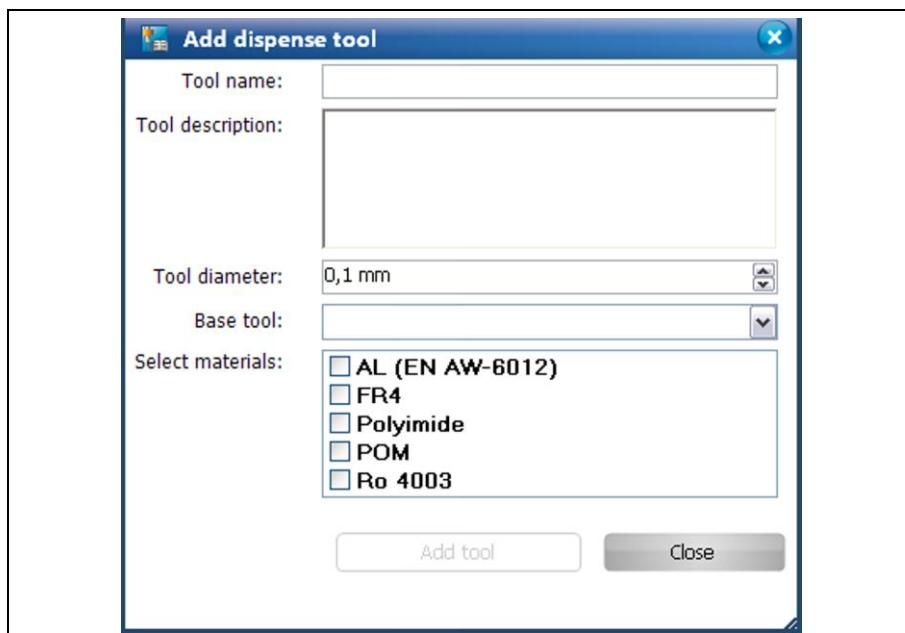
Fig. 149: Add custom tool



2. Select a tool type.
3. Enter a tool name.
4. If necessary, enter a tool description.
5. Set the tool diameter.
6. Select a base tool from the current list of available tools.
7. Click on the materials for which the tool is to be used.
→ The “Add tool” button is active.
8. Click on [Add tool].
→ The new tool appears in the tool list.
9. Click on [Close].
→ The dialog is closed.
- ◆ The custom tool has been added.

- Adding dispense tools
- 1. Click on “Add dispense tools...”.
- ➔ The following dialog is displayed:

Fig. 150: Add dispense tools



- 2. Enter a tool name.
- 3. If necessary, enter a tool description.
- 4. Set the tool diameter.
- 5. Select a base tool from the current list of available tools.
- 6. Click on the materials for which the tool is to be used.
- ➔ The “Add tool” button is active.
- 7. Click on [Add tool].
- ➔ The new dispense tool appears in the tool list.
- 8. Click on [Close].
- ➔ The dialog is closed.
- ◆ The dispense tool has been added.

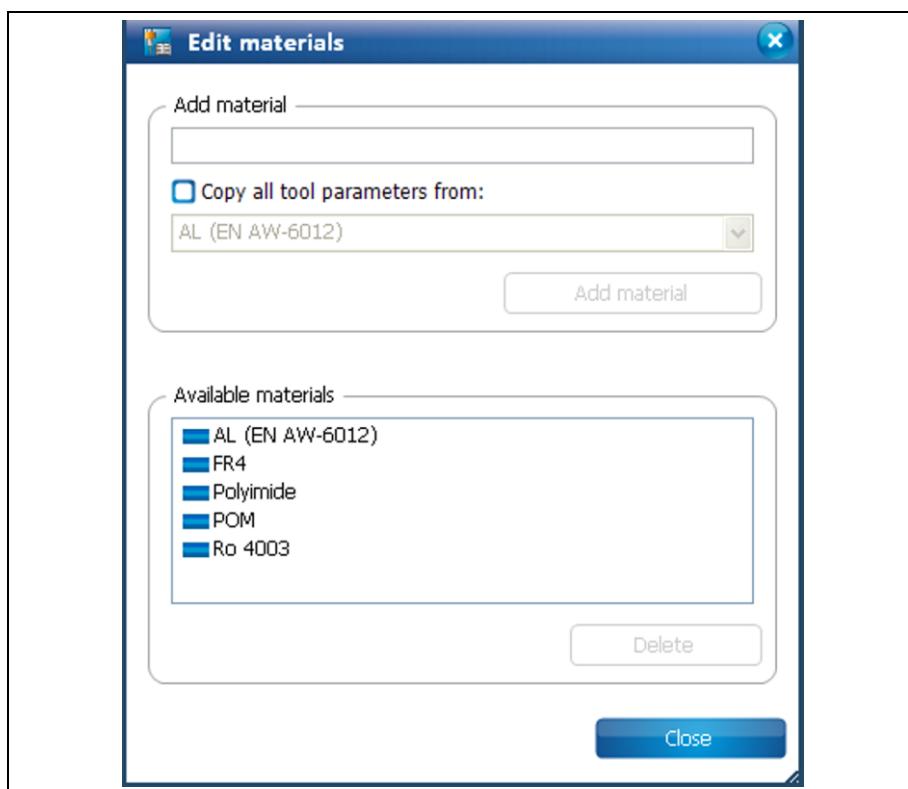
■ Editing materials

The dialog “Edit Materials” allows you to add new materials (optionally using tool parameters of other materials) or remove existing ones.

1. Click on [Edit materials...].

► The following dialog is displayed:

Fig. 151: Edit materials



In this dialog, the following options are available:

- Adding materials
- Adding materials with the tool parameters of materials already available
- Removing materials that are added individually.

■ Adding materials

1. Enter a name for the new material.

2. Click on [Add material].

► The material is displayed in the list “Available materials”.

3. Click on [Close].

► The dialog is closed.

◆ The new material has been added.

■ Add materials with the tool parameters of materials already available

If you want to add a new material that has the same tool parameters as a material already available, please follow these steps:

1. Enter the name for the new material.
2. Mark the checkbox <Copy all tool parameters from:>
3. Now select the material whose properties you would like to copy from the drop-down list.
4. Click on [Add material].
→ The new material, with the copied tool parameters, is added to the list of available materials.
5. Click on [Close].
→ The dialog is closed.
◆ The new material, with the tool parameters for materials already available, has been added.

■ Removing materials that are added individually

1. In the list of the available materials, please click on the material that has been added individually.



Note

Only materials that have been added individually can be removed. Default materials of the LPKF tools cannot be removed.

2. Click on [Delete].

→ The selected material is removed.

3. Click on [Close].

→ The dialog is closed.

◆ The material that has been added individually has been removed.

◆ Material editing is complete.

■ Defining filters

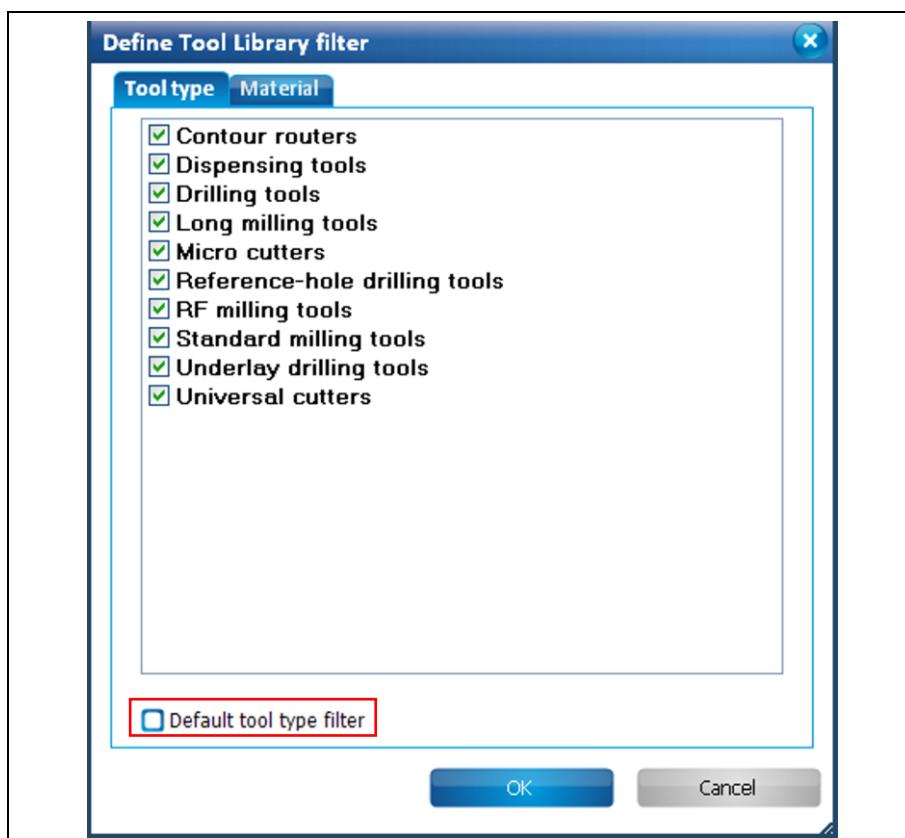
You can define one filter each for the tool types and materials. The filter is used to display only information significant for you.

The tabs “Tool type” and “Material” contain your customised entries.

1. Click on [Define filter...].

➔ The following dialog is displayed:

Fig. 152: Define filter



2. Click on the tool type/material that the filter shall apply to.



Note

Each tab offers the option to select the standard filter for the tool type or the material. These standard filters are defined by the system and cannot be modified.

3. Click on [OK].

➔ The changes were adopted and the dialog is closed.
◆ The filters are defined.

5.2.13 Aperture list library

A dialog to manage the apertures of the current project and the apertures and aperture lists in the aperture list library can be started by clicking on Edit > Aperture list library.



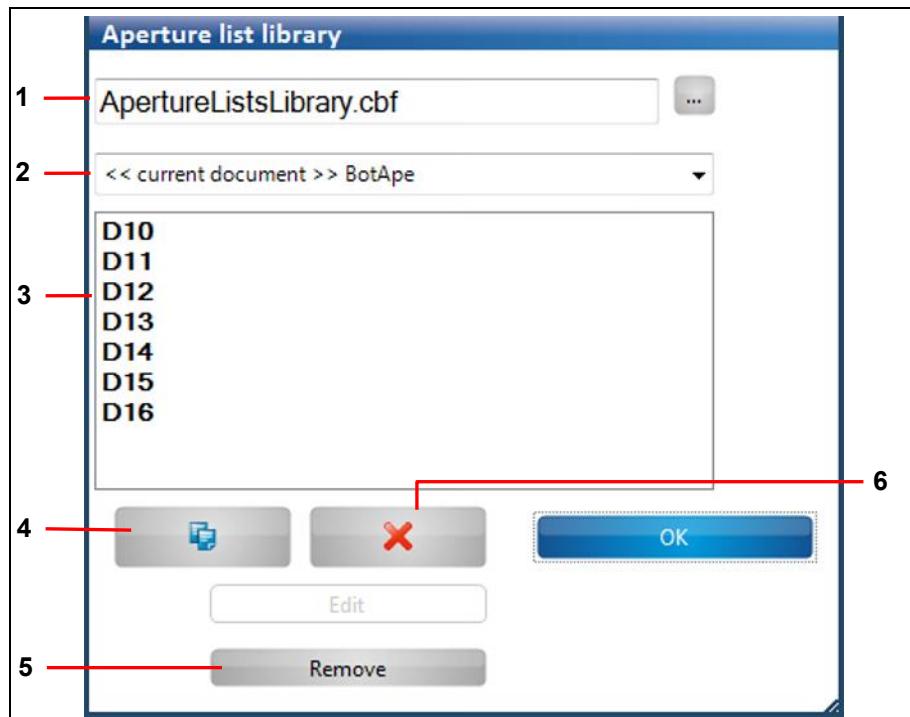
Note

Please note that CircuitPro PM automatically loads the *.cbf file "ApertureListsLibrary.cbf" when the aperture library is opened for the first time. CircuitPro PM displays a corresponding message.

When using Windows 7, the file "ApertureListsLibrary.cbf" is stored in folder C:\Users\User name\AppData\Local\LPKF Laser&Electronics\LPKF CircuitPro PM 2.x.

When using Windows 8, the file "ApertureListsLibrary.cbf" is stored in folder C:\Users\User name\AppData\Local\LPKF Laser&Electronics\LPKF CircuitPro PM 2.x.

Fig. 153: Aperture list library



/1/ File name

/4/ Copy

/2/ Aperture lists

/5/ Remove a single

/3/ Detail section: contains the individual apertures of the selected aperture list.

aperture

/6/ Remove aperture list

The following operations are available in the “Aperture list library” dialog:

- Copying aperture lists from the current project into the aperture list library (thus making them available in other projects).
- Copying aperture lists available in the aperture list library into the current project.
- Removing apertures from the library.

By default, the aperture library is stored as a *.cbf file.

You can also load custom *.cbf files in the dialog to edit the contained aperture libraries.

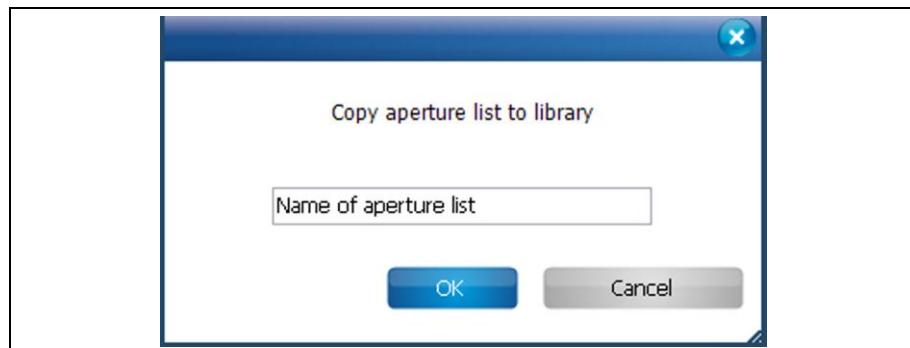


Note

Unless you open a new file in the “Aperture list” dialog, CircuitPro PM automatically loads the aperture library that was used last when opening the dialog.

- Copying an aperture list from the current project to the aperture list library
 1. Select the aperture list to be copied in /2/.
 2. Click on [Copy].
- The following dialog is displayed:

Fig. 154: Copy aperture list to library

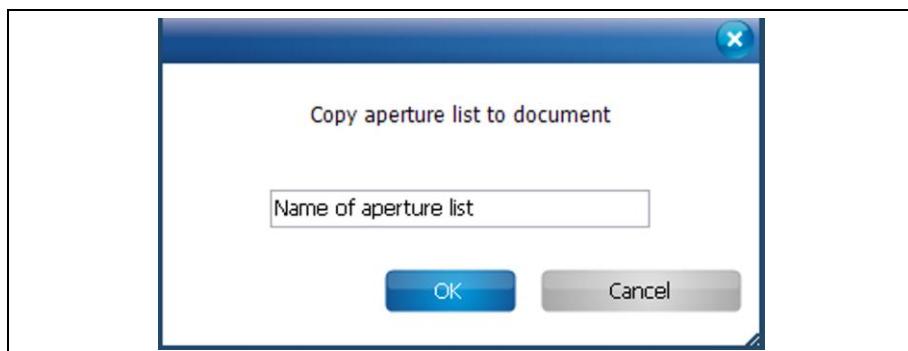


3. Enter a name for the aperture list to be created.
 4. Click on [OK].
- ◆ The aperture list is copied to the aperture list library.

- Copying an aperture list from the aperture list library to the current project
 1. Select the aperture list to be copied in /2/.
 2. Click on [Copy].

→ The following dialog is displayed:

Fig. 155: Copy aperture list to document



3. Enter a name for the aperture list to be created.
 4. Click on [OK].
- ◆ The aperture list is copied to the current project.

■ Removing an aperture list from the library



Note

Please note that only aperture lists that are not used in the current *.cbf document can be removed from the aperture list library.

1. Click on the aperture list in /2/ that you want to remove.
 2. Click on [Remove aperture list].
- ◆ The aperture list is removed from the library.

■ Removing an aperture from the aperture list



Note

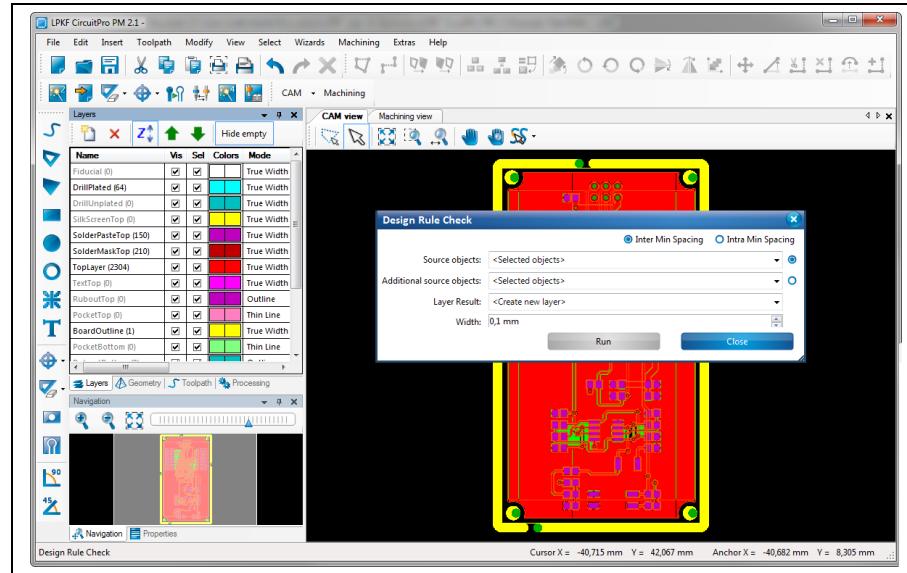
Please note that only apertures that are in a library's aperture list can be removed.

1. Click on the aperture in /3/ that you want to remove.
 2. Click on [Remove].
- ◆ The aperture is removed from the aperture list.

5.2.14 Design Rule Check

The design rule check helps you to check whether the design meets defined and recommended standards for producing circuit boards.

Fig. 156: Design rule check



You can check the following:

- Spacing between objects that are on different layers.
- Spacing between objects on the same layer.

This function enables you to check before isolation whether the object spacing matches the size of the tool used, thus ensuring flawless isolation.



Note

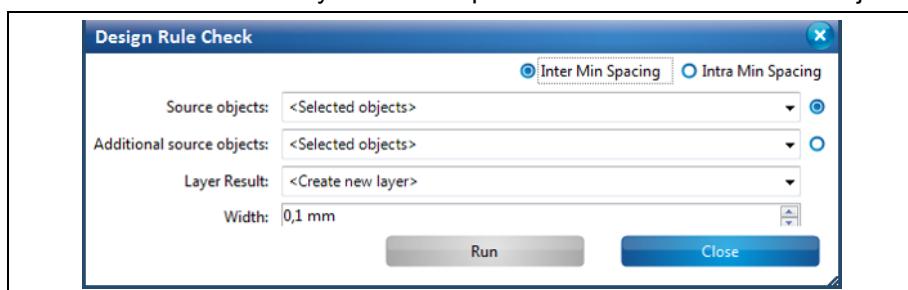
In order to check the object spacing, check the size of the tool you want to use for isolation first. You can find this information in the menu item "Technology dialog".

For more information on the menu item "Technology dialog" see the corresponding chapter.

- Checking the spacing between two layers

 1. Click on the first layer in the drop-down list “Source objects”.
 2. Click on the second layer in the drop-down list “Additional source objects”.

Fig. 157:
Checking the
spacing between
2 layers



3. Select a result layer.



It is recommended to create a new result layer.

Note

4. Enter the minimum spacing to check in millimetres.
 5. Click on [Run].
- The design rule check is started. A new result layer “DRC_Errors” is created in the “Layers” pane:

Fig. 158: Result
layer

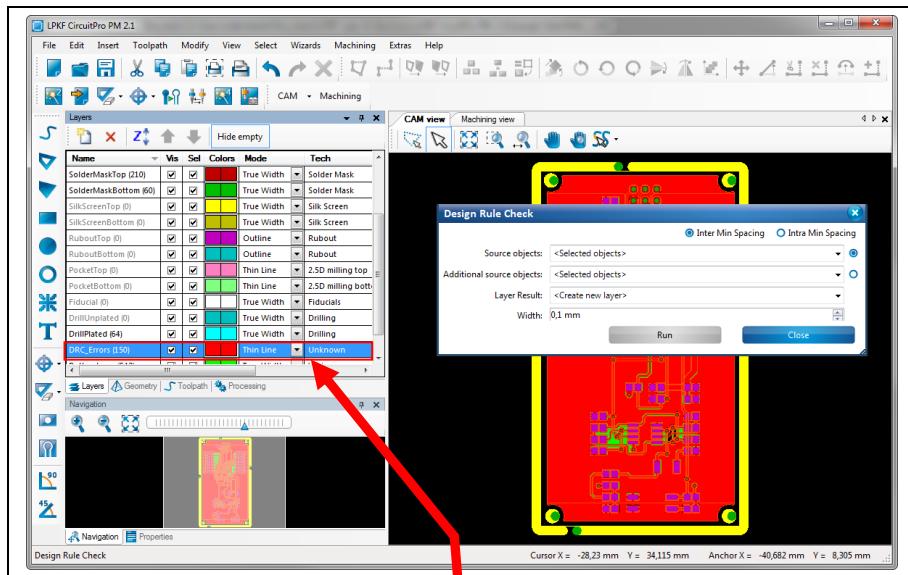
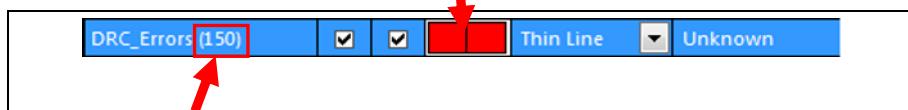


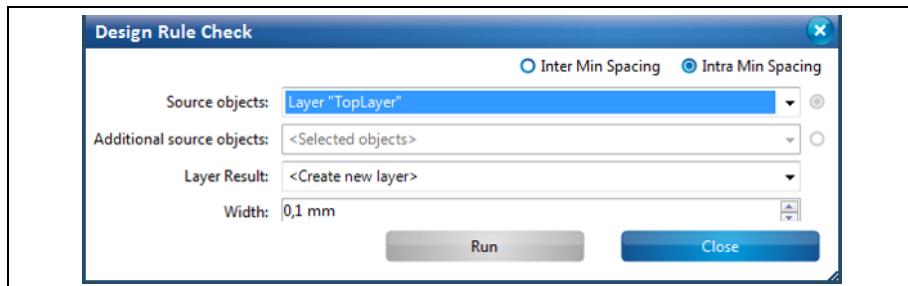
Fig. 159:
Violations count



- The number next to the layer name “DRC_Error” shows how often the design rules were violated
- ◆ The design rule check is finished.

- Checking the spacing within a layer
- 1. In the drop-down list “Source objects”, select the first layer whose object spacing you want to check.
- 2. Select a result layer.

Fig. 160:
Checking the
spacing within a
layer



It is recommended to create a new result layer.

Note

3. Enter the minimum spacing to check in mm.
 4. Click on [Run].
- The design rule check is started. A new result layer is created in the “Layers” pane:

Fig. 161: Result
layer

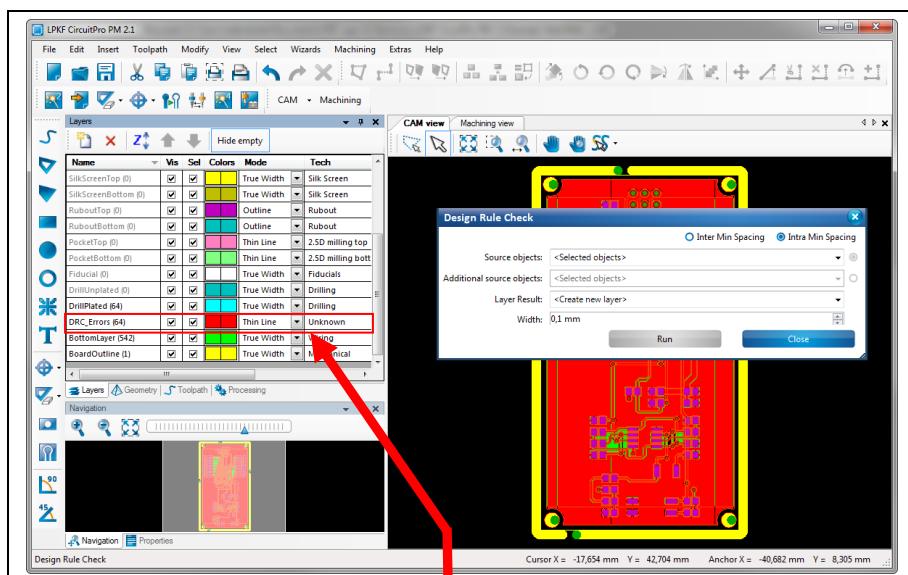
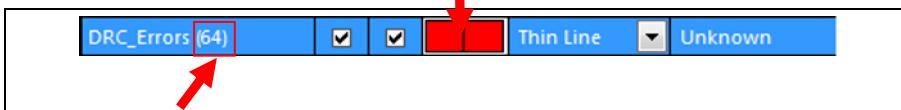


Fig. 162:
Violations count



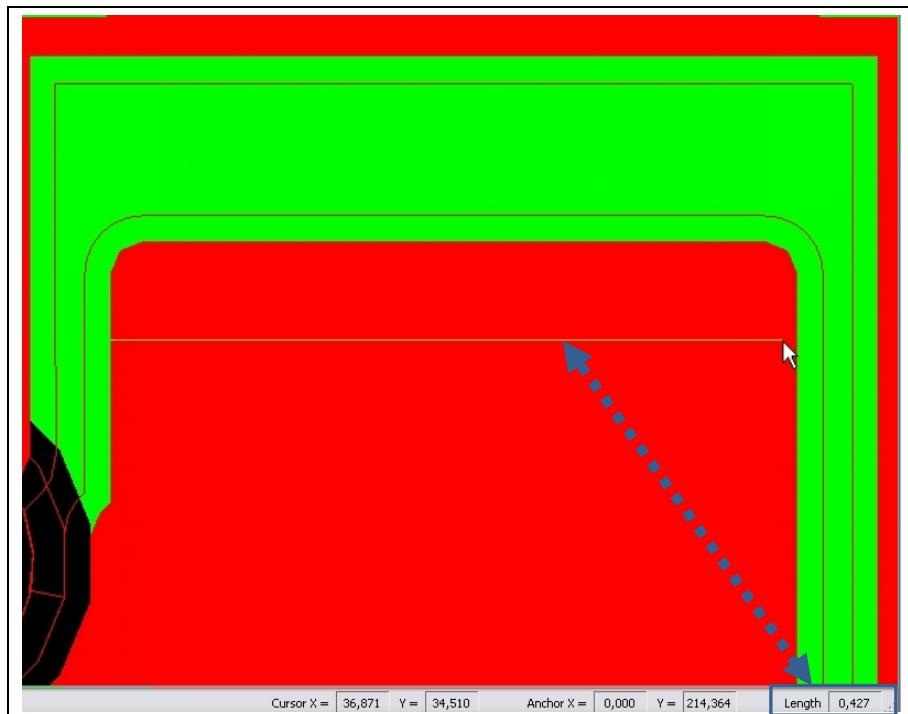
- The number next to the layer name “DRC_Errors” shows how often the design rules were violated.
◆ The design rule check is finished.

5.2.15 Measure

Use this function to measure the distance between two points.

- Measuring the distance between two points
- 1. Click on Edit > Measure.
- 2. In the graphical view (CAM view/3Dview/Machining view), click on the starting point from which to measure.
- 3. Move the mouse to the second point in order to measure the distance.
→ The mouse cursor draws a line.
- 4. Read the length of the line from the status bar of CircuitPro PM.

Fig. 163: Measure



- ◆ The distance between the two points is measured.

5.2.16 Distance

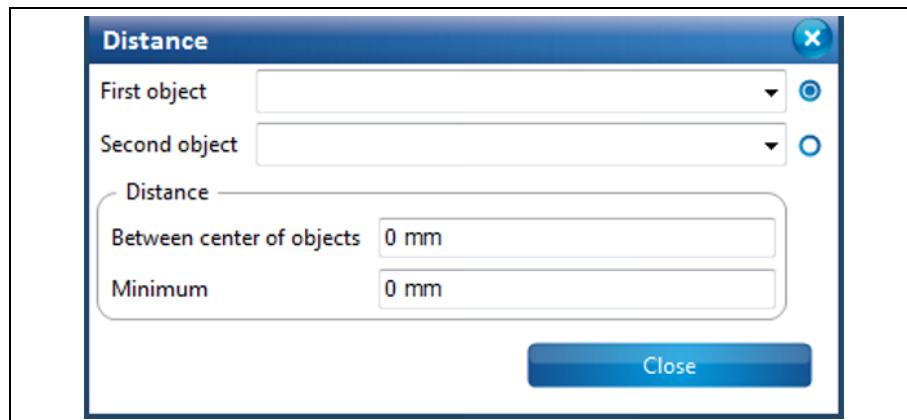
Use the “Distance” dialog to measure the distance between two objects that are on the same layer.

■ Measuring the distance between two objects

1. Click on Edit > Distance...

→ The following dialog is displayed:

Fig. 164: Distance



2. Select an object in the drop-down list “First object”.
3. Select the second object in the drop-down list “Second object”.



Tip

You can also click on the desired objects in the CAM view.

1. Click on the radio button of “First object” in the dialog.
2. Click on the desired object in the CAM view.
→ The name of the selected object is transferred to the “First object” field.
3. Repeat steps one and two for the “Second object” field.

→ The distance between the two objects is measured. Two distances are displayed:

- **Between center of objects:** This value is the distance between the center points of the objects.
- **Minimum:** This value is the shortest distance between the two objects.



Tip

If you do not know the name of an object, you can find it in the “Properties” pane.

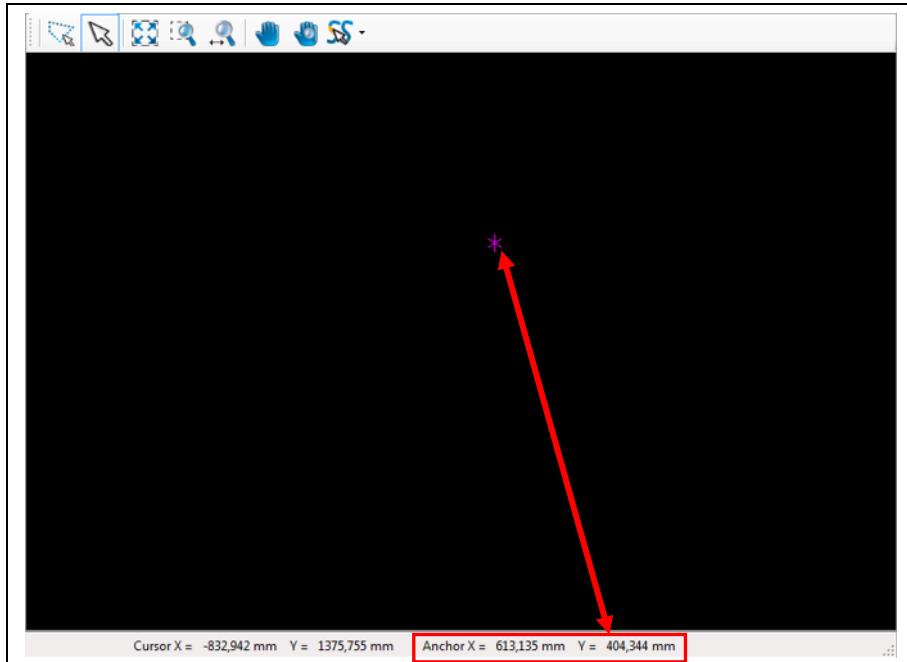
Select the object and click on the item “General” in the “Properties” pane. The name property of the selected object is displayed.

◆ The distance between the two objects was measured.

5.2.17 Set anchor point

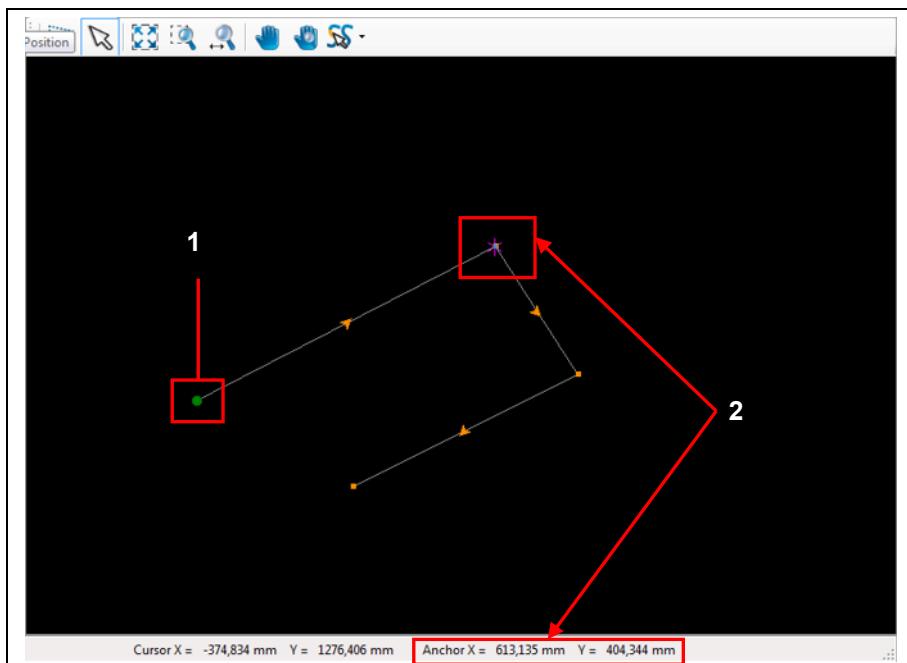
An anchor point is a reference point in the drawn object. In the CAM view, the anchor point is marked by a magenta-colored asterisk (see following figure).

Fig. 165: Anchor point in CAM view



Using the anchor point function, you can determine the object reference points. Click onto a reference point of the object and read the coordinates in the status bar of CircuitPro PM (Anchor point X and Y).

Fig. 166: Anchor point in object



/1/ Object reference point

/2/ Anchor point

You can change the position of the anchor point by entering new X and Y values and thus setting a new starting point for a drawn object.

- Setting an anchor point
- 1. Click on Edit > Set anchor point...
- ➔ The following dialog is displayed:

Fig. 167: Set anchor point

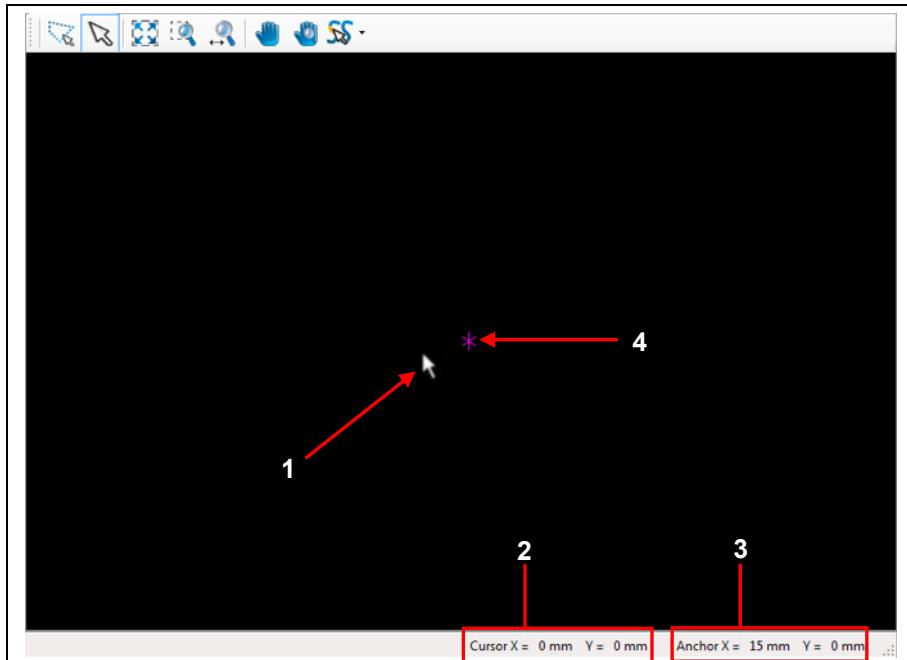


- 2. Enter the "X value" of the anchor point.
- 3. Enter the "Y value" of the anchor point.
- 4. Click on [Apply].
- ➔ The values of the anchor point are displayed in the status bar of CircuitPro PM.
- ◆ The anchor point is set.

5.2.18 Set Zero Point

The zero point is a reference point used for measured and computed values. You can shift the zero point in the CAM view. This moves the zero point to the current anchor point. Thus, you can start new measurements /computations from this new zero point.

Fig. 168: Set zero point on current anchor point



/1/ Cursor position=zero point
 /2/ X and Y value of the cursor position

/3/ X and Y value of the anchor point
 /4/ Position of the anchor point

- Setting the zero point
- 1. Click on Edit > Set zero point...
 - ◆ The zero point is moved to the current anchor point.

5.2.19 Move anchor to center point

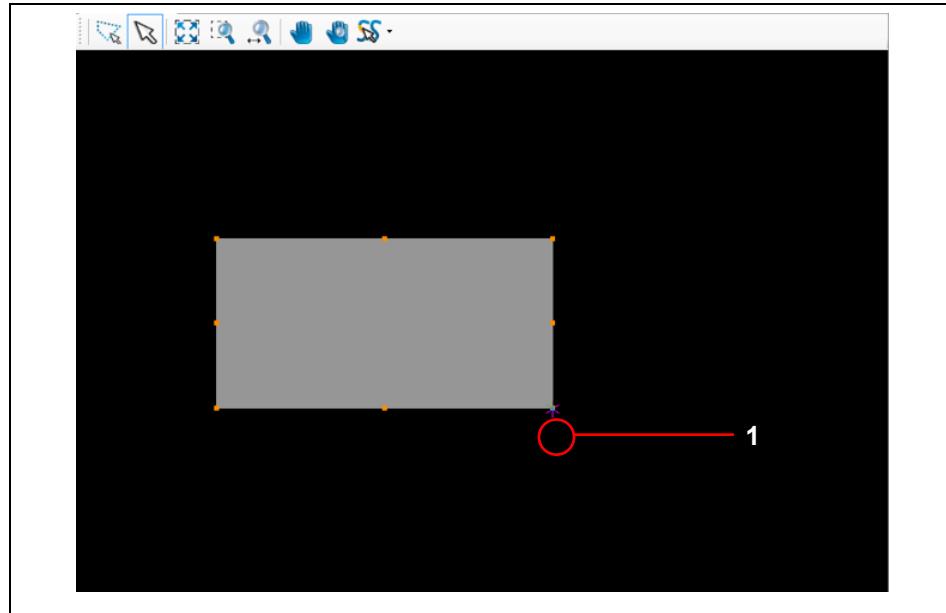
Using the function "Move anchor to center point", you can set the current anchor point to the central point of the object marked.

■ Setting the anchor to the central point

1. Mark the center point of the object to which you would like to move the anchor point.

➔ The object is marked:

Fig. 169: Mark object

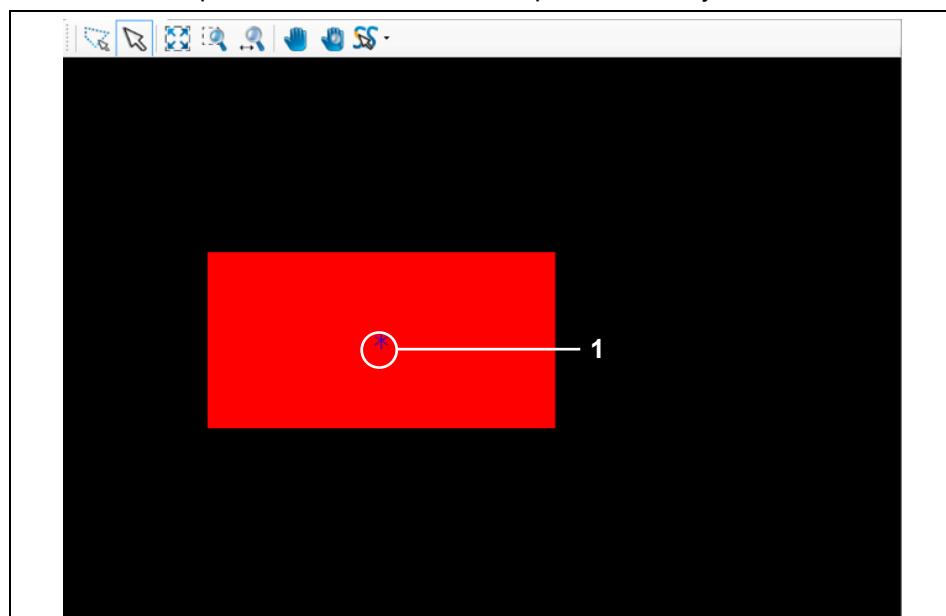


/1/ Current anchor point

2. Click on Edit > Move anchor to center point...

➔ The anchor point is moved to the center point of the object:

Fig. 170: Mark object



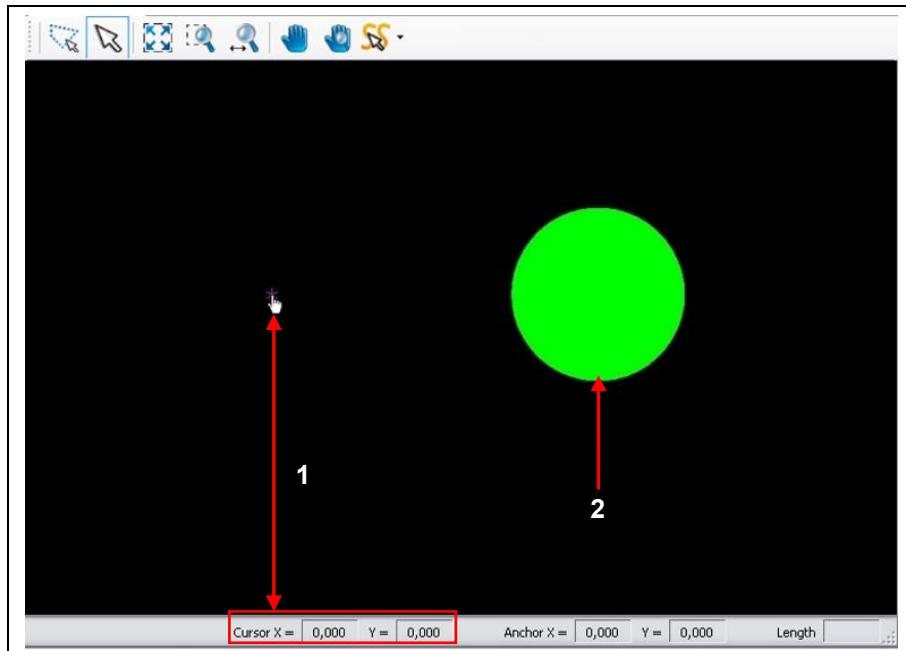
/1/ Moved anchor point

◆ The anchor point was moved to the center point.

5.2.20 Move layer to zero

Use “Move layer to zero” to move flash objects of a layer to the zero point of the layer:

Fig. 171: Move layer to zero



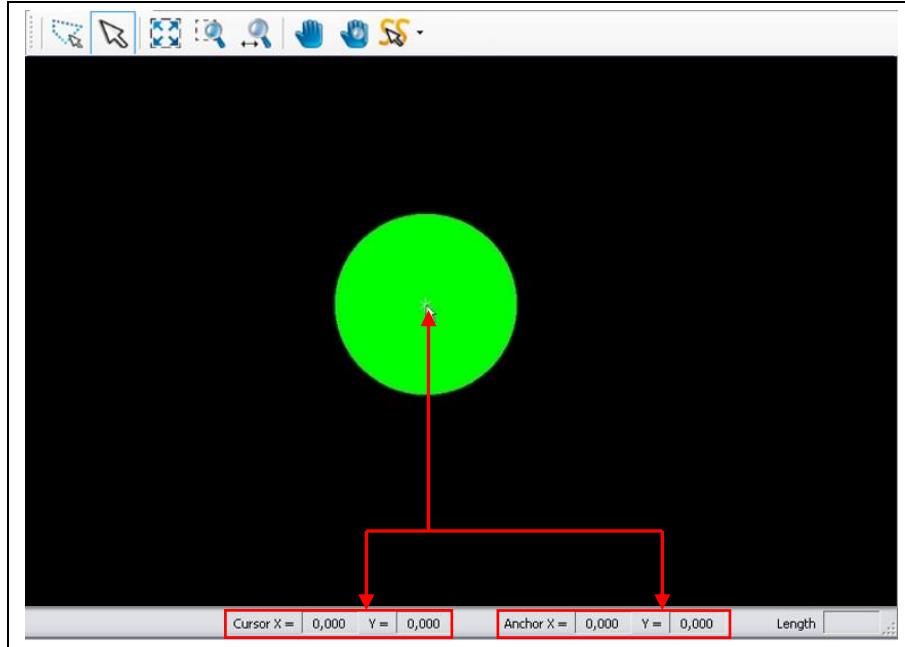
/1/ Cursor position=zero point

/2/ Object to be moved

- Moving a flash object to the layer's zero point
- 1. Select the flash object /2/ that you want to move to the layer's zero point /1/.
- ➔ The object is highlighted in grey.
- 2. Click on Edit > Move layer to zero.

► The flash object is moved to the layer's zero point:

Fig. 172: Flash object moved to the layer's zero point



◆ The flash object was successfully moved to the layer's zero point.

5.2.21 Match up layers

Use the function "Match up layers" to align flashed objects that are on different layers.



Note

Use "Draw to flash" in the "Edit" menu to convert objects into flash objects. For a detailed procedure see the corresponding chapter.

The selected object is moved to the center of the object that is on the reference layer. The center points of the two objects are aligned.

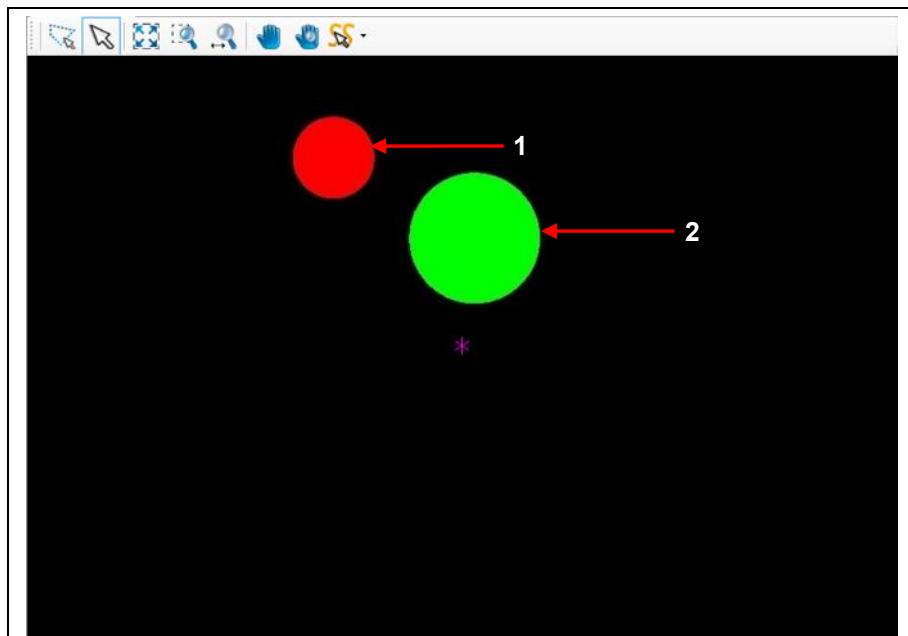


Note

Please note that the whole layer is moved together with the object to be aligned. Thus, all objects of the layer are assigned new coordinates.

The following figure shows two flash objects. They are on the layers "TopLayer" and "BottomLayer" and are to be aligned:

Fig. 173: Flash objects



/1/ Flash object on TopLayer

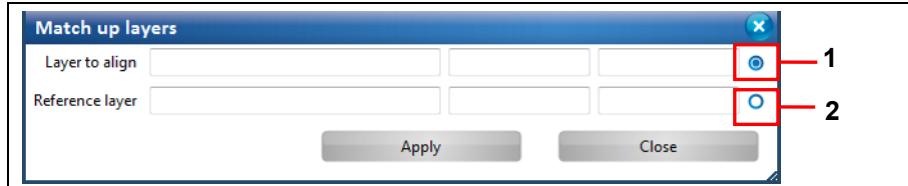
/2/ Flash object on BottomLayer

The center point of the flash object on TopLayer (see /1/) has the coordinates X=7 and Y=7.

The center point of the flash object on BottomLayer (see /2/) has the coordinates X=15 and Y=2.

- Matching up layers
- 1. Click on Edit > Match up layers...
- ➔ The following dialog is displayed:

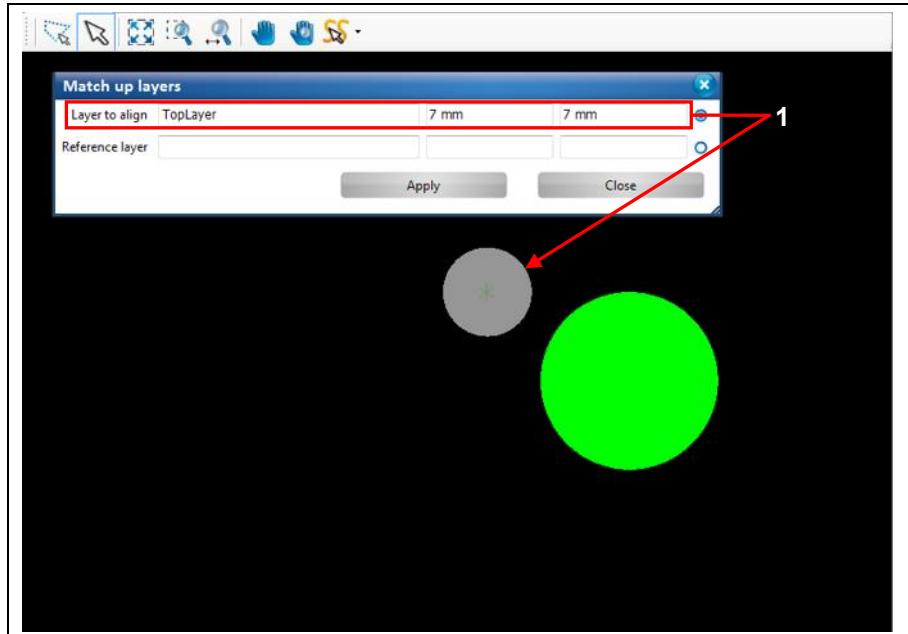
Fig. 174: Match up layers



/1/ Radio button for the layer to be aligned /2/ Radio button for the reference layer

2. Activate the radio button /1/ for selecting the layer to be aligned.
3. In the CAM view, click on the object whose center point is to be aligned to the reference layer.

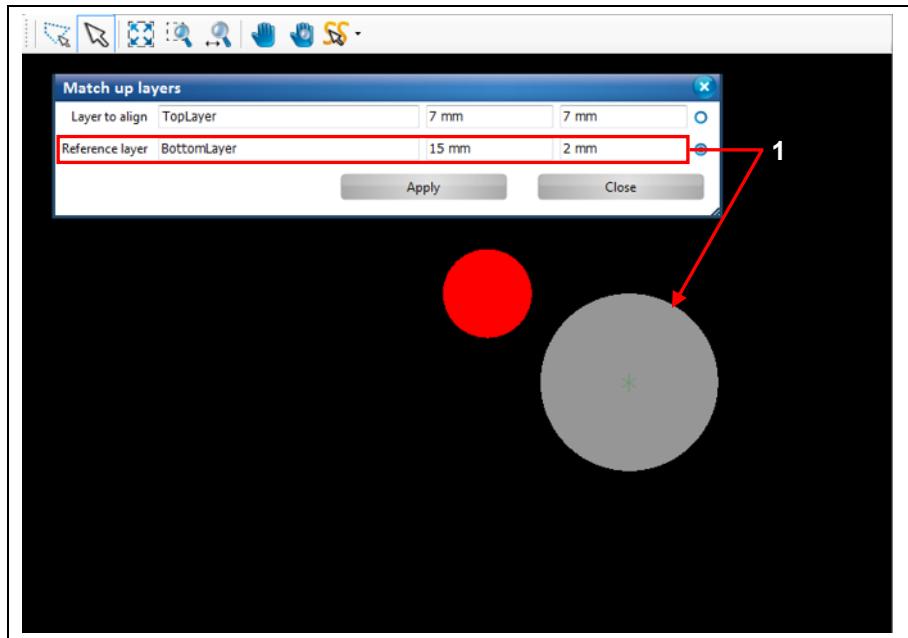
Fig. 175:
Selecting the
layer to be
aligned



/1/ Coordinates of the selected object and name of the layer

- ➔ The object is highlighted in grey. The coordinates of the object and the name of its layer are displayed in the dialog.
- 4. Activate the radio button /2/ (see figure above) for the reference layer.
- 5. Click on the object whose center point is to be used as the reference for the object to be aligned.

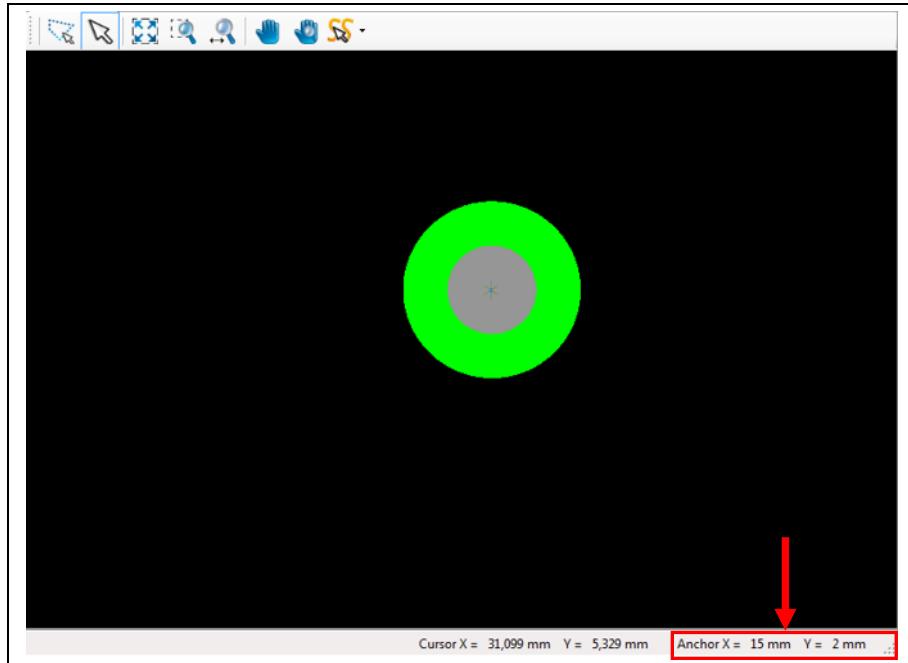
Fig. 176:
Selecting the
reference layer



/1/ Coordinates of the selected object and name of the layer

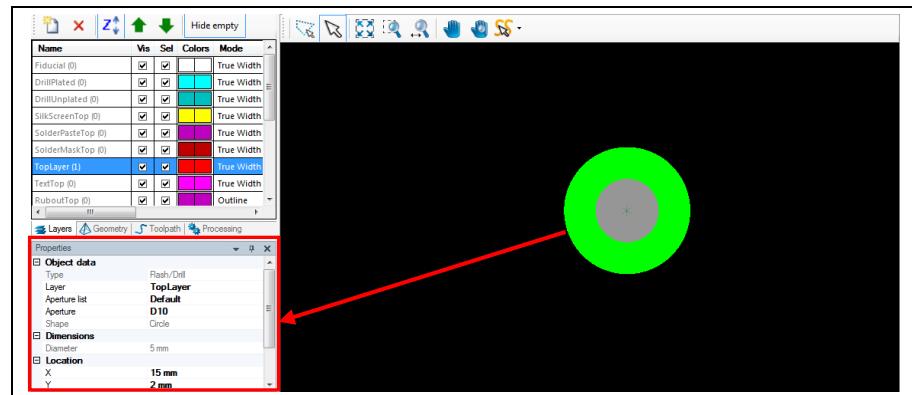
- ⇒ The object is highlighted in grey. The coordinates of the object and the name of its layer are displayed in the dialog.
- 6. Click on [Apply].
- ⇒ The layer to be aligned is aligned to the reference layer:

Fig. 177: Layer
aligned



The center points of both objects have the coordinates X=15 and Y=2. You can find these values in the status bar of CircuitPro PM and also in the “Properties” pane of each object:

Fig. 178:
Properties



- ◆ The layers have been aligned successfully.

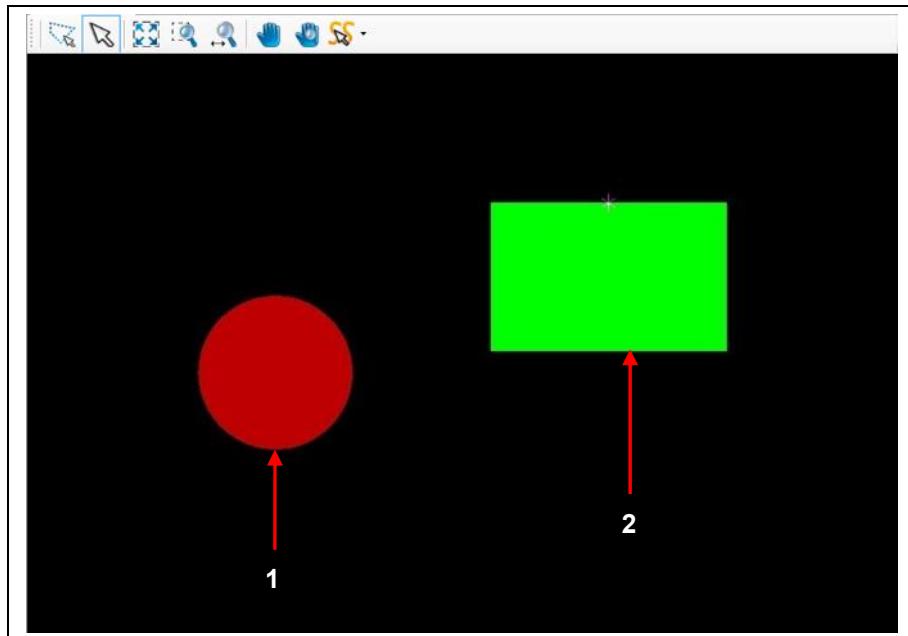
5.2.22 Match up objects

Use the function "Match up objects" to align any geometrical object (circle, rectangle, circle path, polygon etc.). The objects to be aligned do **not** have to be on the same layer.

This function places the object to be aligned on the center of the reference object.

The following figure shows a circle and a rectangle. They are on the layers "SolderMaskTop" and "BottomLayer" and are to be aligned:

Fig. 179: Drawn objects



/1/ Circle object on layer
"SolderMaskTop"

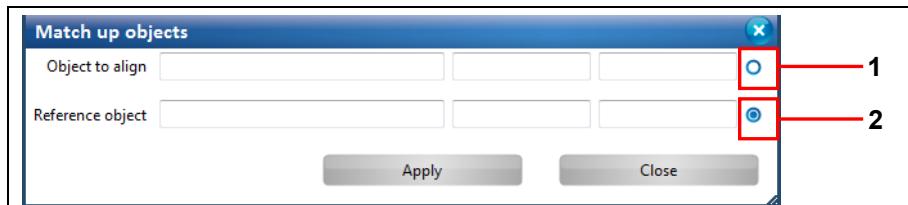
/2/ Rectangle object on BottomLayer

■ Aligning objects

1. Click on Edit > Match up objects...

→ The following dialog is displayed:

Fig. 180: Match up objects

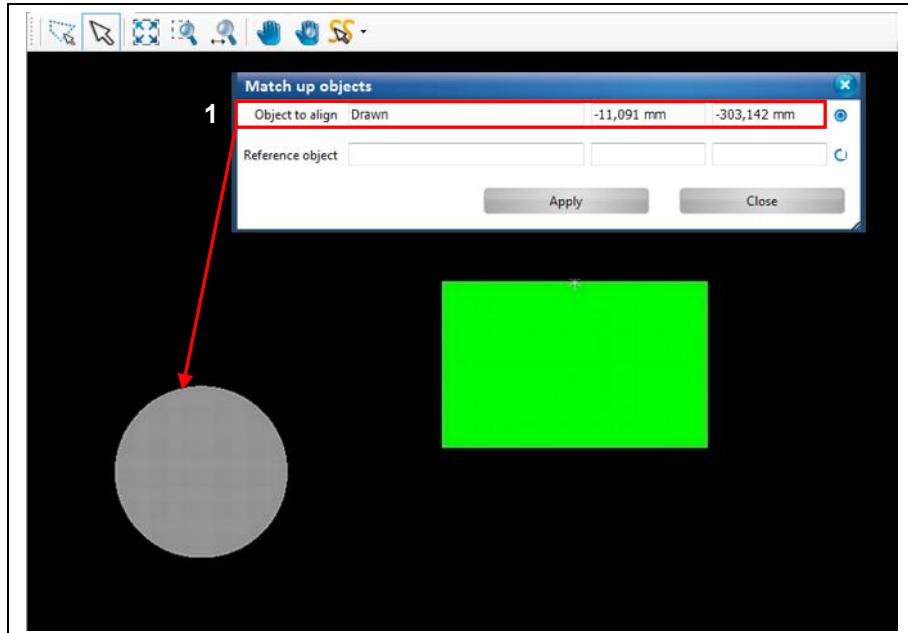


/1/ Radio button for the object to be aligned

/2/ Radio button for the reference object

2. Activate the radio button /1/ for selecting the object to be aligned.
3. In the CAM view, click on the object that is to be aligned:

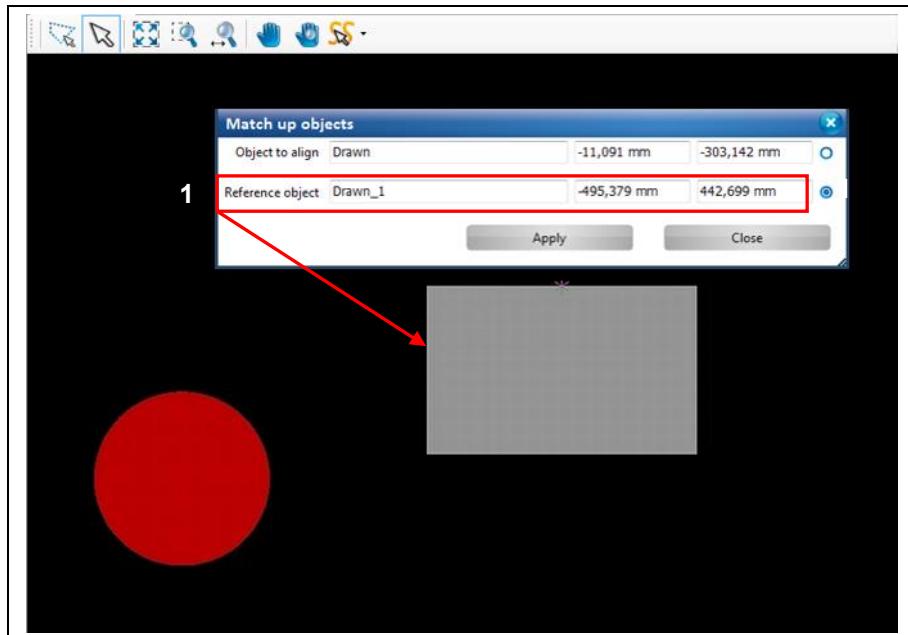
Fig. 181:
Selecting object
to align



/1/ Coordinates and name of the selected object

- ⇒ The object is highlighted in grey. The coordinates and the name of the object are displayed in the dialog.
- 4. Activate the radio button /2/.
- 5. Click on the object that is to serve as the reference object. The object to be moved will be centered on this object:

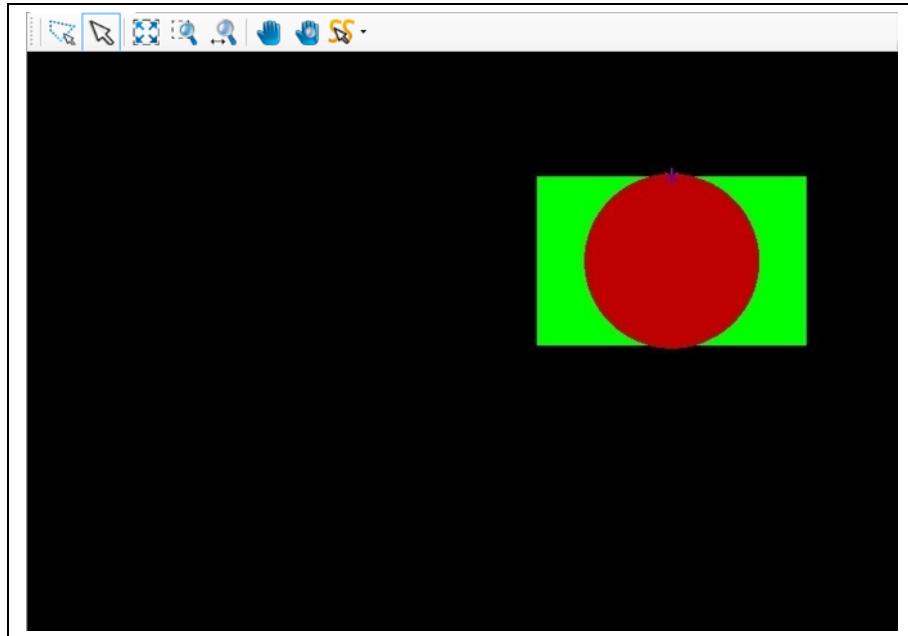
Fig. 182:
Selecting
reference object



/1/ Coordinates and name of the selected object

- ⇒ The reference object is highlighted in grey. The coordinates and the name of the object are displayed in the dialog.
- 6. Click on [Apply].
- ⇒ The object to be aligned is moved onto the center of the reference object.

Fig. 183: Object
aligned



- ◆ The operation "Match up objects" is finished successfully.

5.2.23 Delete

Use this function to delete the currently selected objects.

- Deleting selected objects in the CAM view

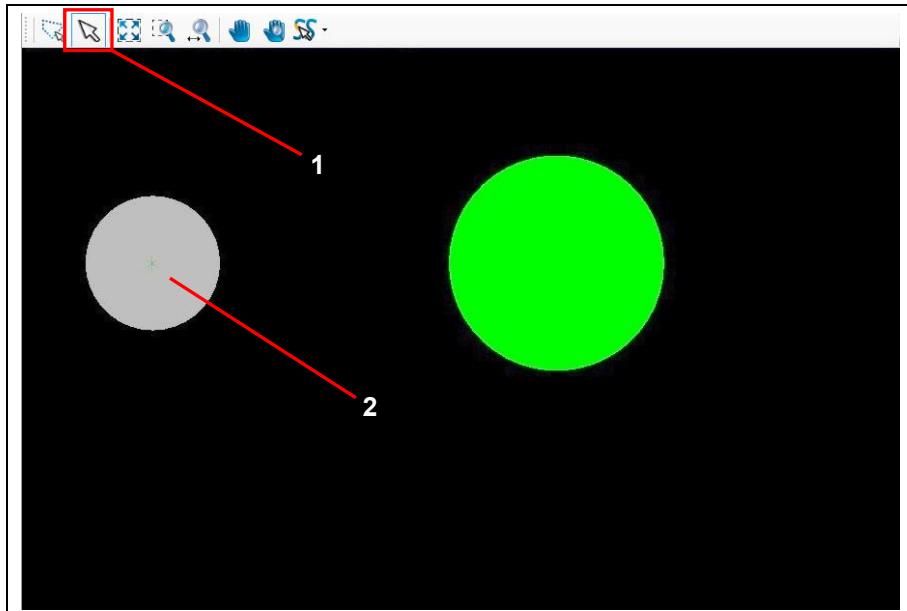


Please ensure that the selection mode (arrow icon /1/) is activated (see following figure).

Note

1. In the CAM view, click on the object to be deleted:

Fig. 184:
Selecting an
object for
deletion



/1/ Selection mode icon

/2/ Selected object

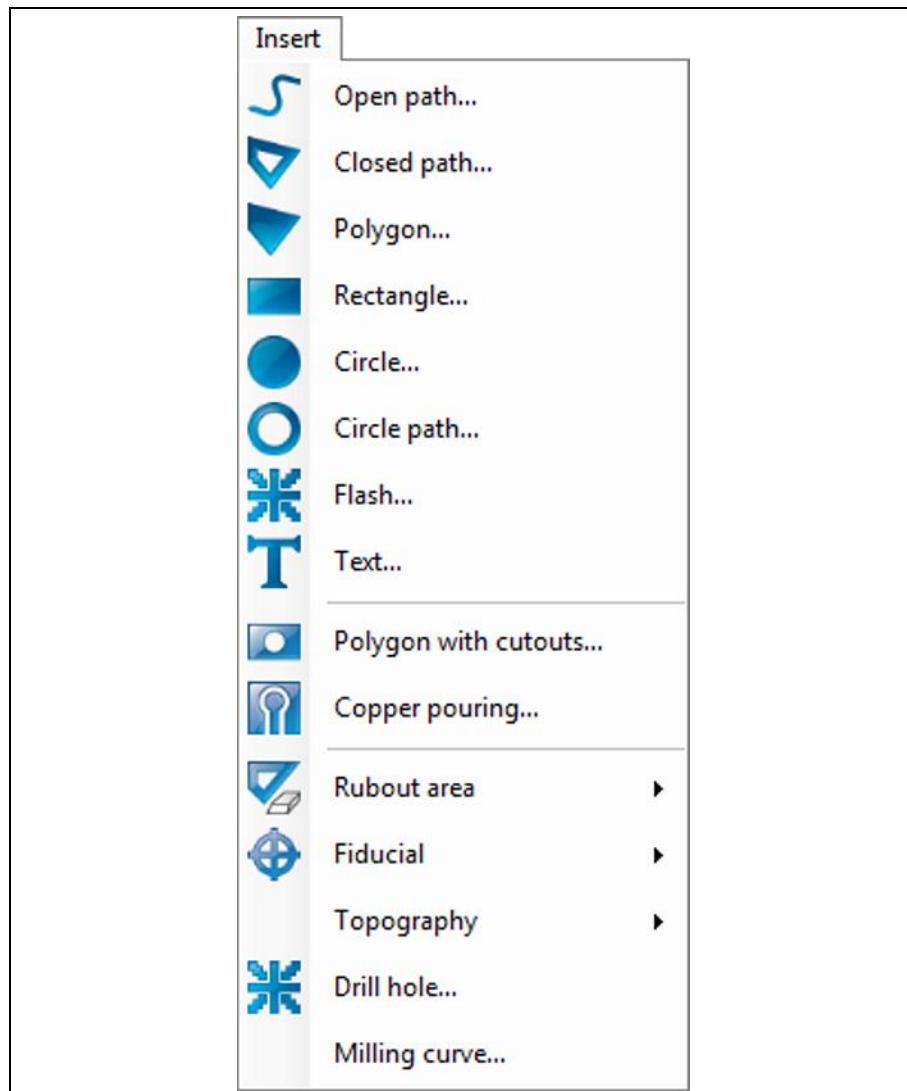
- ➔ The object is highlighted in grey.
- 2. Click on Edit > Delete.
- ◆ The selected object is deleted.

5.3 Menu Insert

The “Insert” menu contains several objects that can be created in the CAM view.

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

Fig. 185: Menu
“Insert”



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

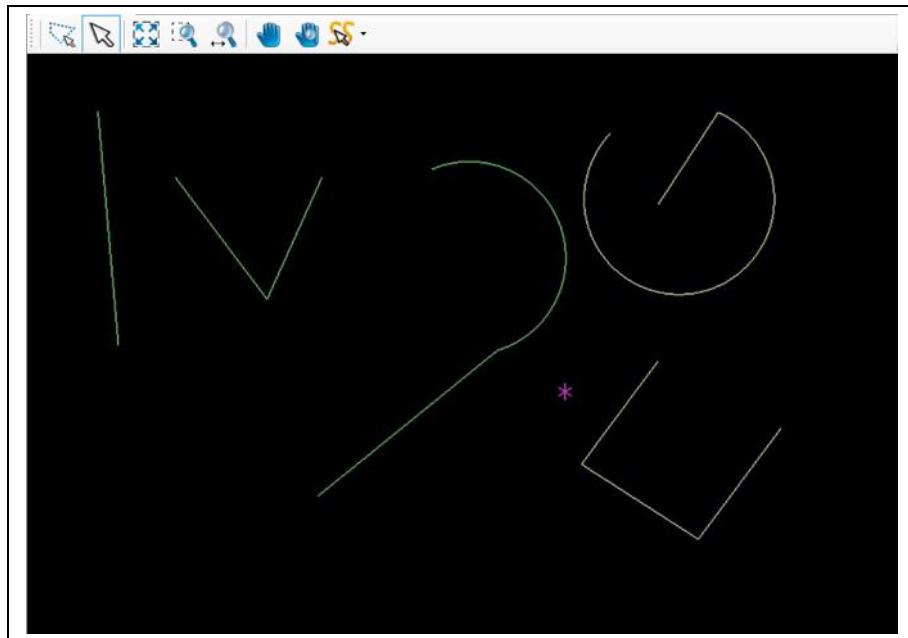
Table 32: "Insert" menu functions

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.
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 isolated 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.

5.3.1 Open path

The menu item “Open Path” lets you create any open path consisting of line segments and arcs. You can combine line segments and arcs thus forming the open path:

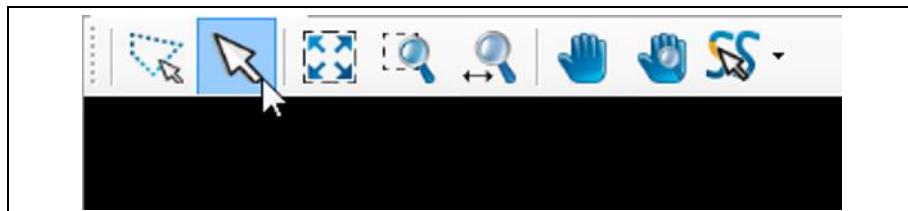
Fig. 186: Open path examples



There are different ways to create an open path:

- Entering the X and Y values of the segment in the dialog window.
- Moving the mouse pointer to the desired position in the CAM view thus drawing the segment/arc. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 187:
Selection mode
(arrow icon)
activated



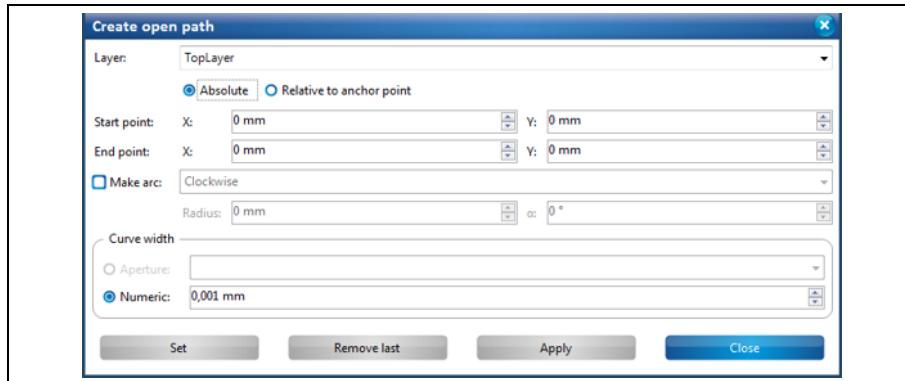
Note

You have to be in the CAM view of CircuitPro to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

■ Creating an open path with segments

1. Click on Insert > Open path.
- ⇒ The following dialog is displayed:

Fig. 188: Open path



2. In the drop-down list, select the layer where you want to create the open path.
3. Select either absolute or a relative start point by clicking on the corresponding radio button.



Note

The **absolute start point** is computed using the X and Y coordinates starting from the zero point .

If you want to create more than one open path you can make all paths start from the same starting point using the “Absolute” start point option.

The **relative start point** is variable. Once you have created a segment, the relative start point moves automatically to the end of this segment to serve as start point for the next segment to be created.

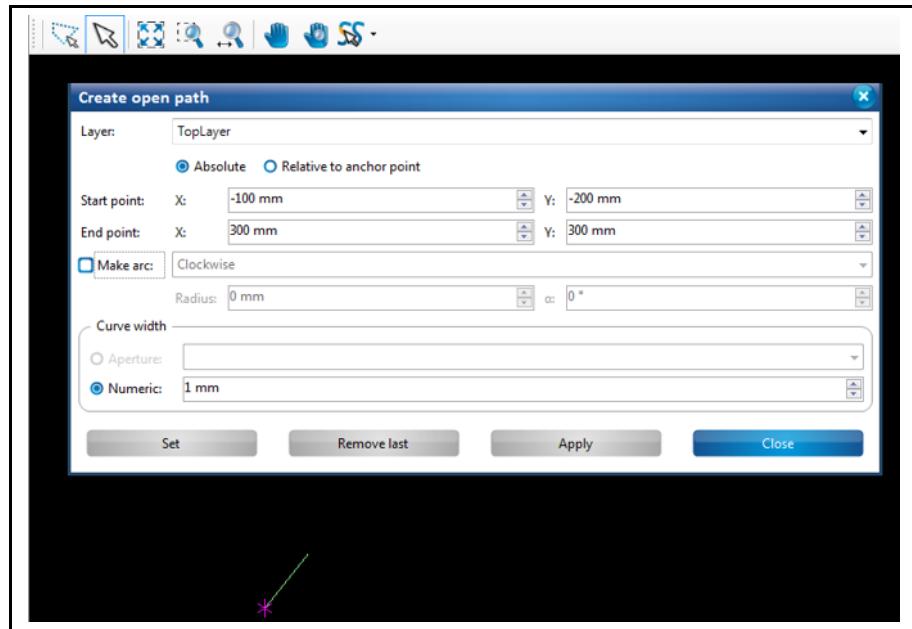


Note

Please note that the magenta-colored asterisk in the view always denotes the anchor point , not the zero point !

4. Enter the X and Y value of the start point in millimeters.
5. Enter the X and Y values of the segment.
6. Select the desired “curve width”:

Fig. 189: Creating a segment



Aperture:

- If your document contains an aperture list you can select an aperture for creating the open path.
- If no aperture list is stored in your document, a line without defined width is created.

Numeric:

- The “Numeric” option lets you define the line width in millimeters.
 - 7. Click on [Set].
- The segment is created.



Function of the “Apply” and “Set” buttons:

Note Once you have created a segment you can finish your entries using either [Apply] or [Set].

If you use [Set] you can still remove the segment by clicking on [Remove last]. You can add as many segments as you like.

If you use [Apply] for creating the segment, it **cannot** be removed afterwards. You also cannot add any more segments.

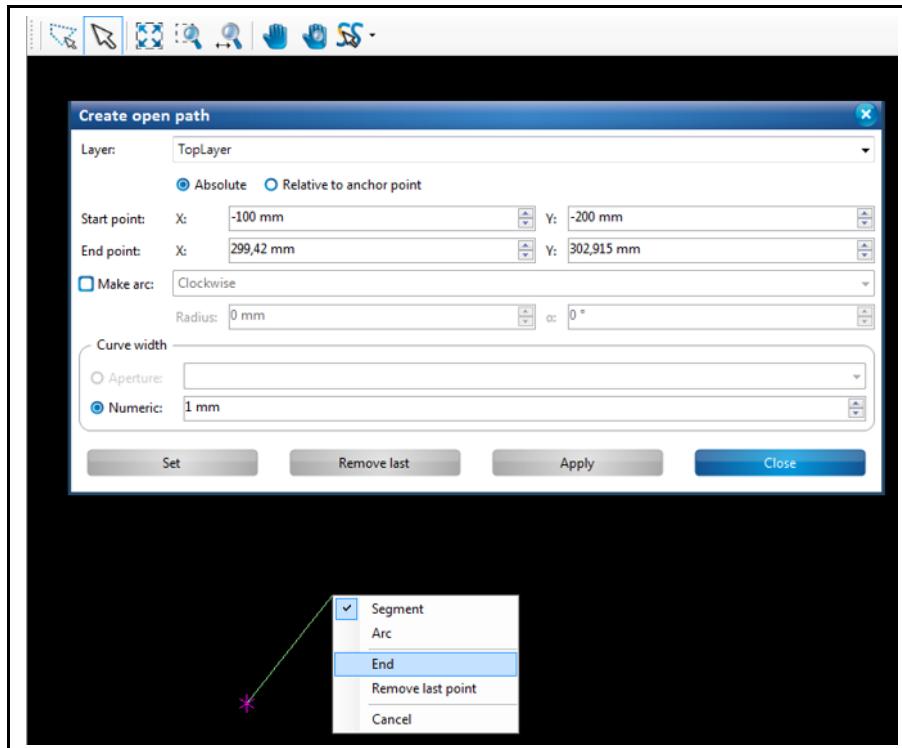
8. Repeat the above steps if you want to create another segment.
9. Click on [Apply] to create the open path.

Or

10. Press the right mouse button as an alternative.

→ The context menu is displayed:

Fig. 190: Creating a second segment



10. Click on “End” to finish creating the open path.

→ The open path is created.

11. Click on [Close] in the dialog.

→ The dialog is closed.

◆ The open path with segments is created.



Tip

Procedure without entering X and Y values:

You can also create segments in **CircuitPro** without entering coordinates. You can just use the mouse pointer.

1. Press the left mouse button at the desired start point of the segment in the CAM view.

2. Move the mouse pointer to the desired position in the CAM view.

3. Press the left mouse button.

→ The segment is created.

- A left-click corresponds to clicking the [Set] button in the dialog.
- Pressing the right mouse button opens the context menu and you can finish creating the path by clicking on “End”. This corresponds to clicking on [Apply] in the dialog.



If you want to abort creating the path press the ESC key.

Tip

■ Creating an open path with arcs and segments

You can combine as many line segments and arcs as you like when creating an open path. This example describes how to create an arc that combined with a line segment forms an open path.

1. Perform the steps 1 to 7 of “Creating an open path with segments”.

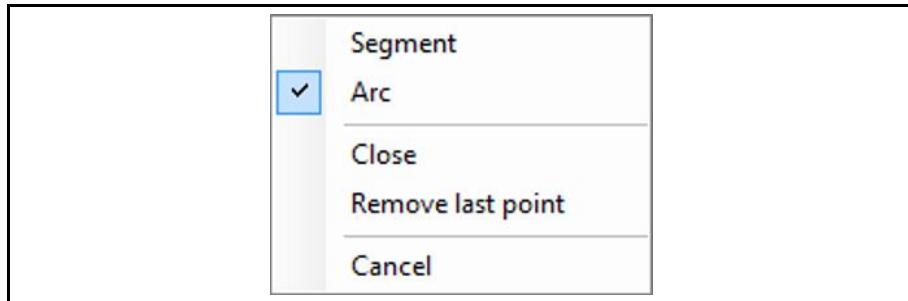
→ A line segment is created.

2. Activate the radio button “Make arc”

Or

2. Press the right mouse button and select “Arc” in the context menu.

Fig. 191:
Selecting “Arc” in
context menu



3. Select whether the direction of the arc should be “Clockwise” or “Counter-clockwise”.
4. Enter the radius of the arc.
5. Enter the opening angle of the arc.

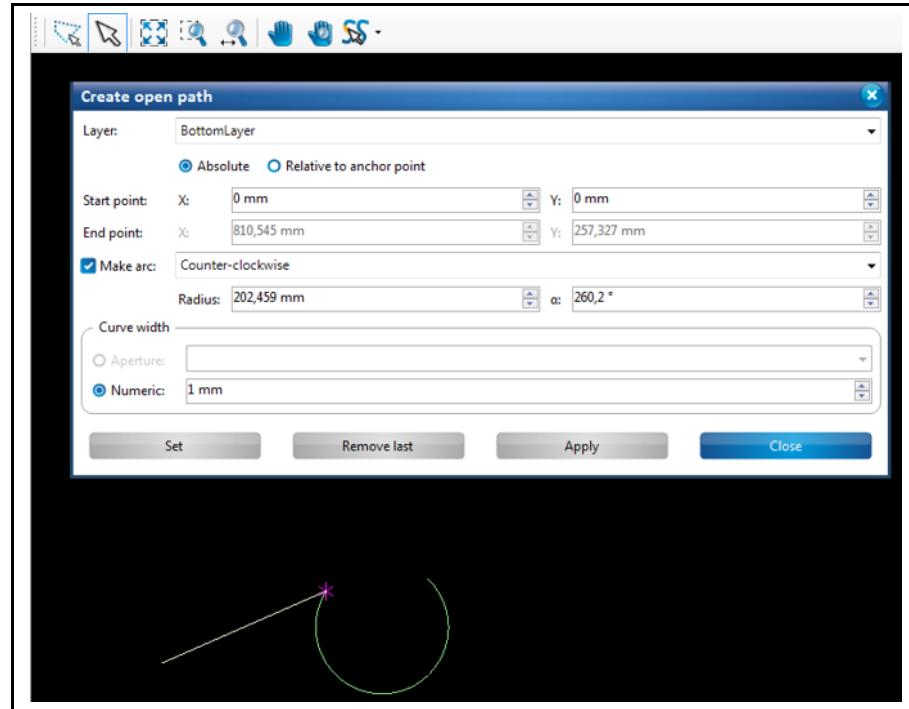


Creating arcs with the mouse pointer

1. Activate the “Arc” option in the dialog or in the context menu.
2. In the CAM view, click on the desired end point of the arc.
3. Drag the mouse to the left or to the right until the arc has the desired size.
6. Click on [Apply].

→ An arc is created:

Fig. 192: Creating an arc

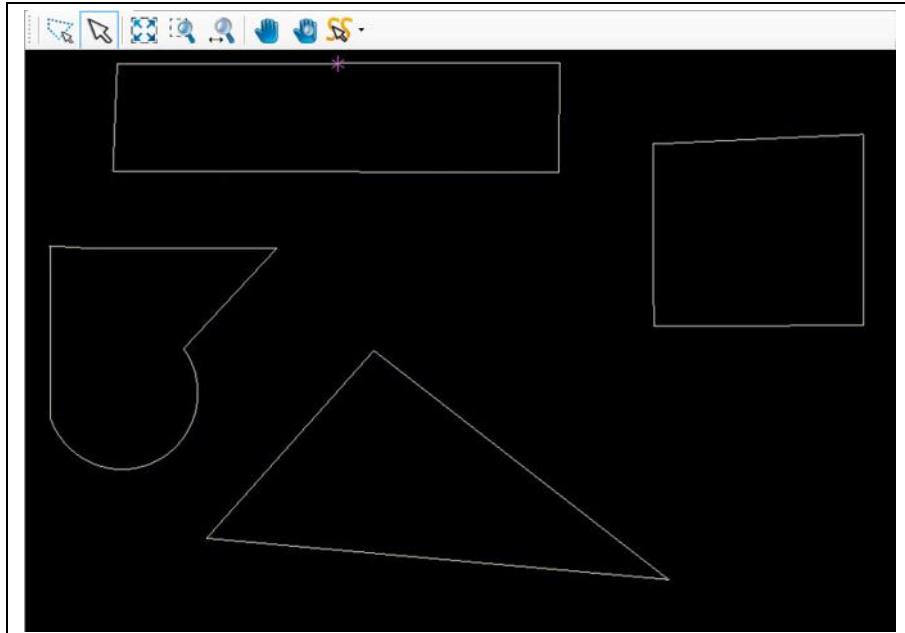


7. Click on [Close] in the dialog.
- The dialog is closed.
 ◆ The open path with an arc and a segment is created.

5.3.2 Closed path

The menu item “Closed Path” lets you create any closed path consisting of line segments and arcs. You can combine as many line segments and arcs as you like. Creating a closed path requires **at least two** segments or two arcs or one segment plus one arc. These form the closed path in the end.

Fig. 193:
Examples closed paths with segments and arcs



There are different ways to create a closed path:

- Entering the X and Y values of the segment in the dialog window.
- Moving the mouse pointer to the desired position in the CAM view thus drawing the segment/arc. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 194:
Selection mode (arrow icon) activated



Note

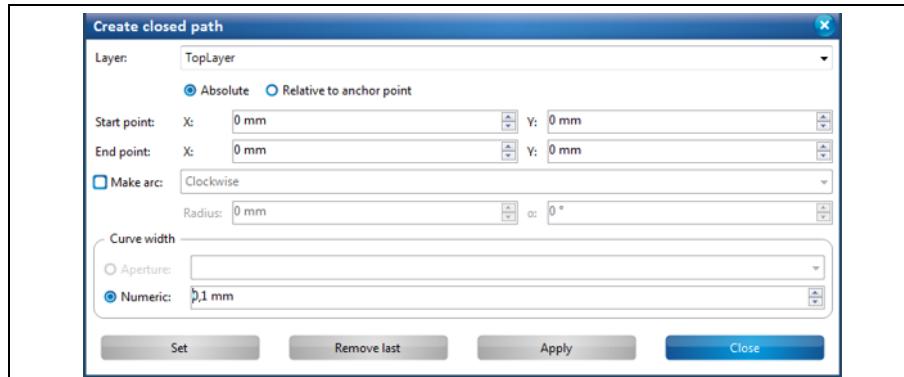
You have to be in the CAM view of CircuitPro PM to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

■ Creating a closed path with segments

1. Click on Insert > Closed path.

⇒ The following dialog is displayed:

Fig. 195: Closed path



2. In the drop-down list, select the layer where you want to create the closed path.
3. Select either absolute or a relative start point by clicking on the corresponding radio button.



Note

The **absolute start point** is computed using the X and Y coordinates starting from the zero point .

If you want to create more than one closed path you can make all paths start from the same starting point using the "Absolute" start point option.

The **relative start point** is variable. Once you have created a segment, the relative start point moves automatically to the end of this segment to serve as start point for the next segment to be created.

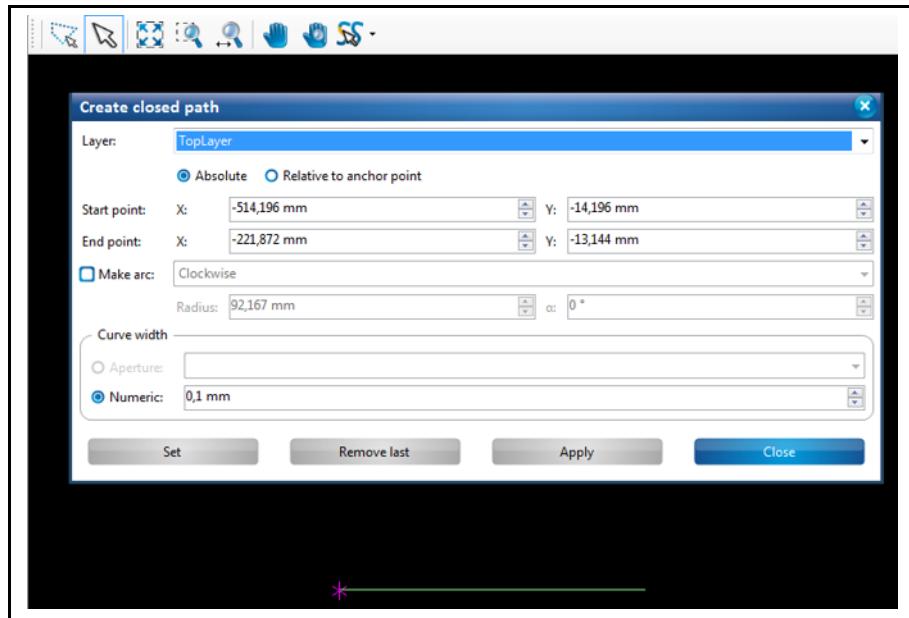


Note

Please note that the magenta-colored asterisk in the view always denotes the anchor point, not the zero point !

4. Enter the X and Y value of the start point in millimeters.
5. Enter the X and Y values of the segment.
6. Select the desired "curve width":

Fig. 196: Creating a segment



Aperture:

- If your document contains an aperture list you can select an aperture for creating the open path.
- If no aperture list is stored in your document, a line without defined width is created.

Numeric:

- The “Numeric” option lets you define the line width in millimeters.
 - 7. Click on [Set].
- The segment is created.



Note

Function of the “Apply” and “Set” buttons:

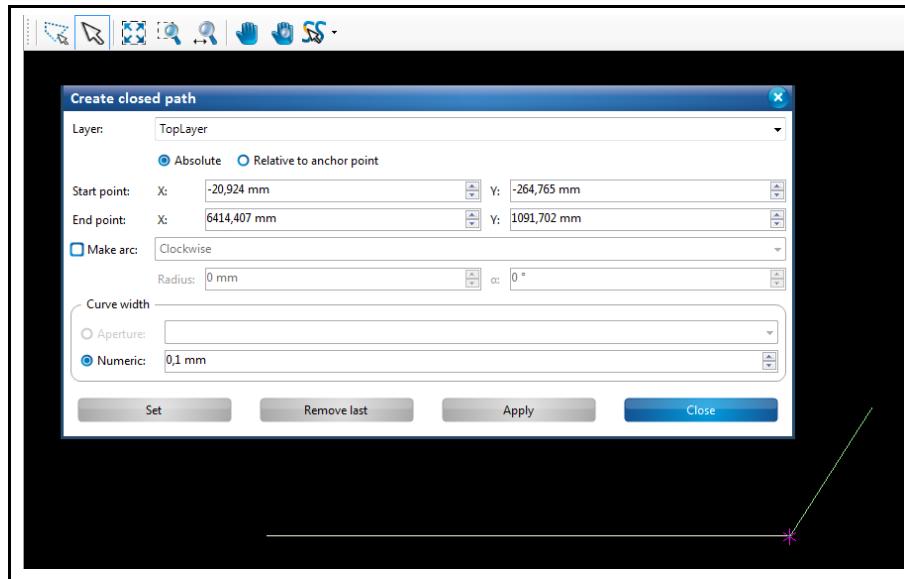
Once you have created a segment you can finish your entries using either [Apply] or [Set].

If you use [Set] you can still remove the segment by clicking on [Remove last]. You can add as many segments as you like.

If you use [Apply] for creating the segment, it **cannot** be removed afterwards. You also cannot add any more segments

-
8. Repeat the steps above to create at least one more segment for creating the closed path:

Fig. 197: Creating a second segment



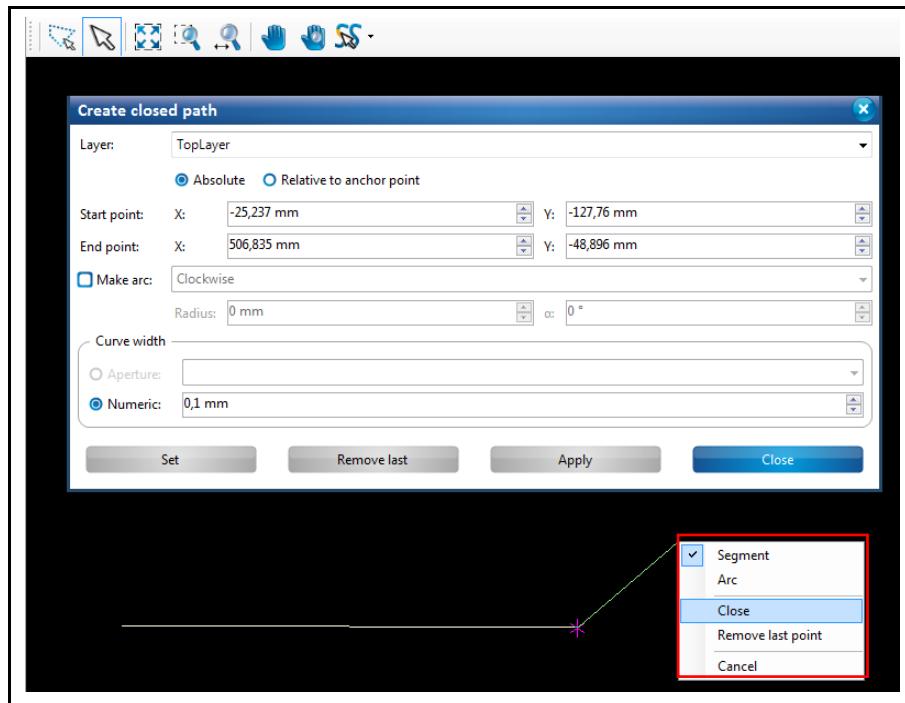
9. Click on [Apply] to combine the segments created to a closed path.

Or

10. Press the right mouse button as an alternative.

→ The context menu is displayed:

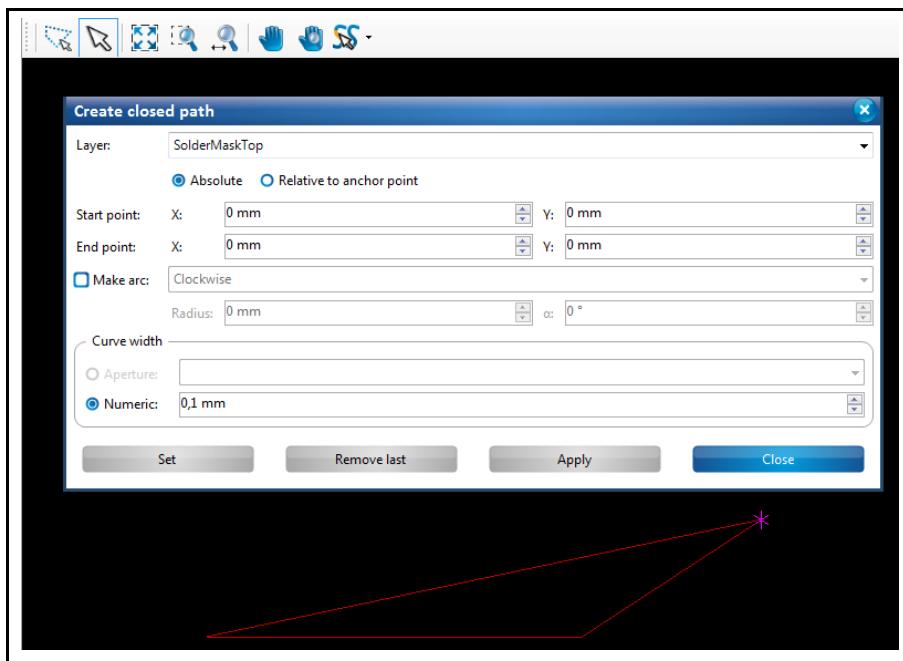
Fig. 198: Opening the context menu



10. Click on "Close" in the context menu.

→ The path is closed:

Fig. 199: Opening the context menu



11. Click on [Close] in the dialog.

- The dialog is closed.
 ◆ The closed path with segments is created.



Tip

Procedure without entering X and Y values:

You can also create segments in CircuitPro PM **without entering coordinates**. You can just use the mouse pointer.

1. Press the left mouse button at the start point of the segment.
 2. Move the mouse pointer to the desired position in the CAM view.
 3. Press the left mouse button.
- The segment is created.
- A left-click corresponds to clicking the [Set] button in the dialog.
 - Pressing the right mouse button opens the context menu and you can finish creating the path by clicking on "End". This corresponds to clicking on [Apply] in the dialog.



Tip

If you want to abort creating the path press the ESC key.

■ Creating a closed path with arcs and line segments

You can combine as many line segments and arcs as you like when creating a closed path. This example describes how to create an arc that combined with a line segment forms a closed path.

1. Perform the steps 1 to 7 of “Creating a closed path with segments”.

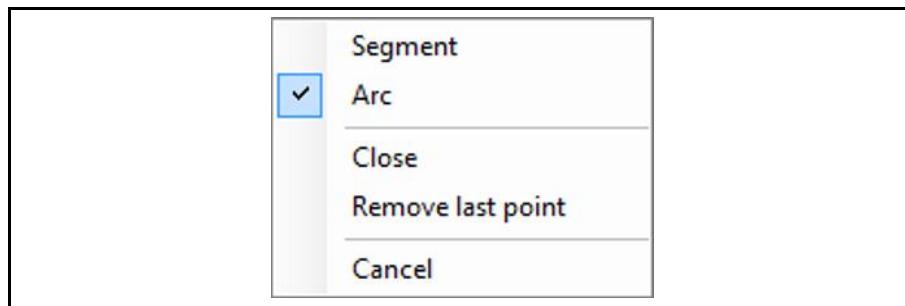
→ A line segment is created.

2. Activate the radio button “Make arc” in the dialog.

Or

2. Press the right mouse button and select “Arc” in the context menu.

Fig. 200:
Selecting “Arc” in
context menu



3. Select whether the direction of the arc should be “Clockwise” or “Counter-clockwise”.
4. Enter the radius of the arc.
5. Enter the opening angle of the arc.



Tip

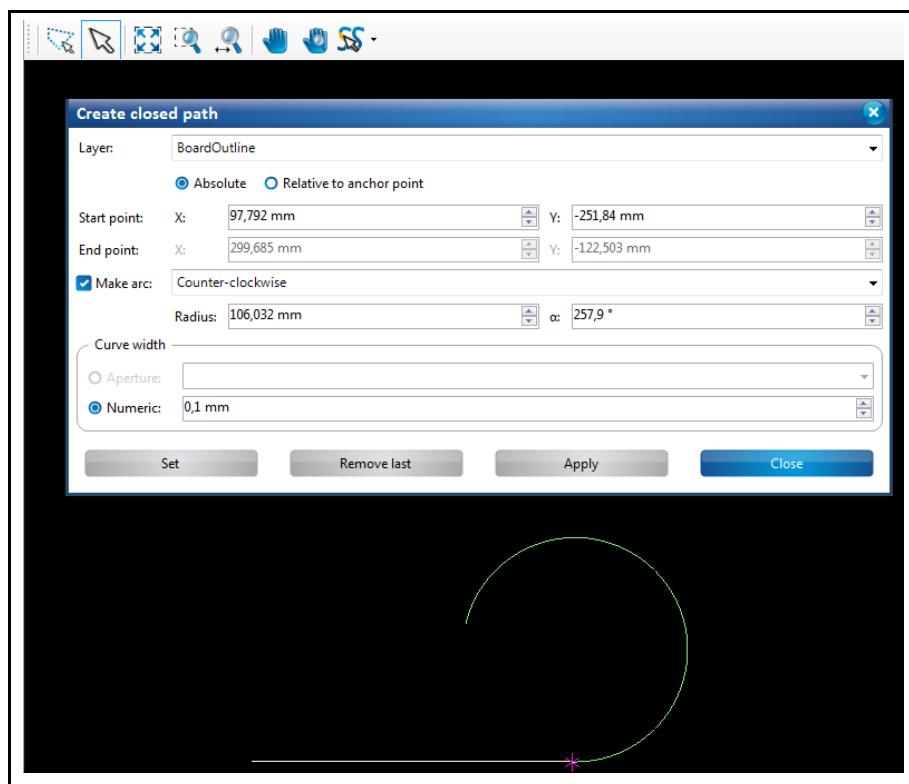
Creating arcs with the mouse pointer

1. Activate the “Arc” option in the dialog or in the context menu.
2. In the CAM view, click on the desired end point of the arc.
3. Drag the mouse to the left or to the right until the arc has the desired size.

6. Click on [Set].

→ An arc is created:

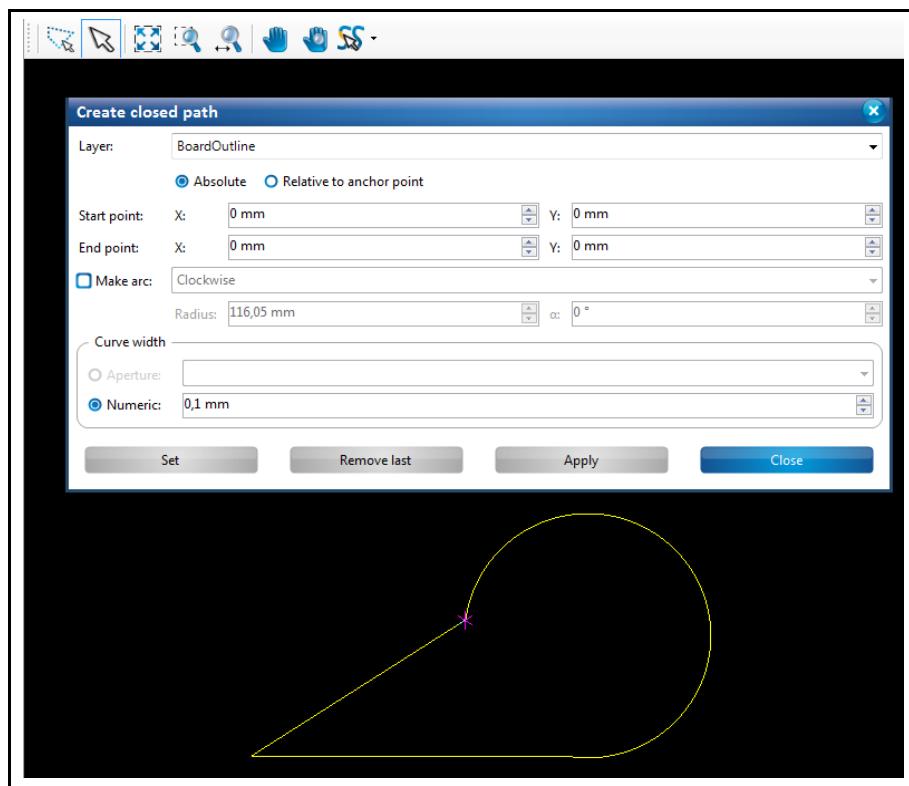
Fig. 201: Creating an arc



7. Click on "Apply" in the dialog or "Close" in the context menu.

→ The path is closed:

Fig. 202: Closing an open path

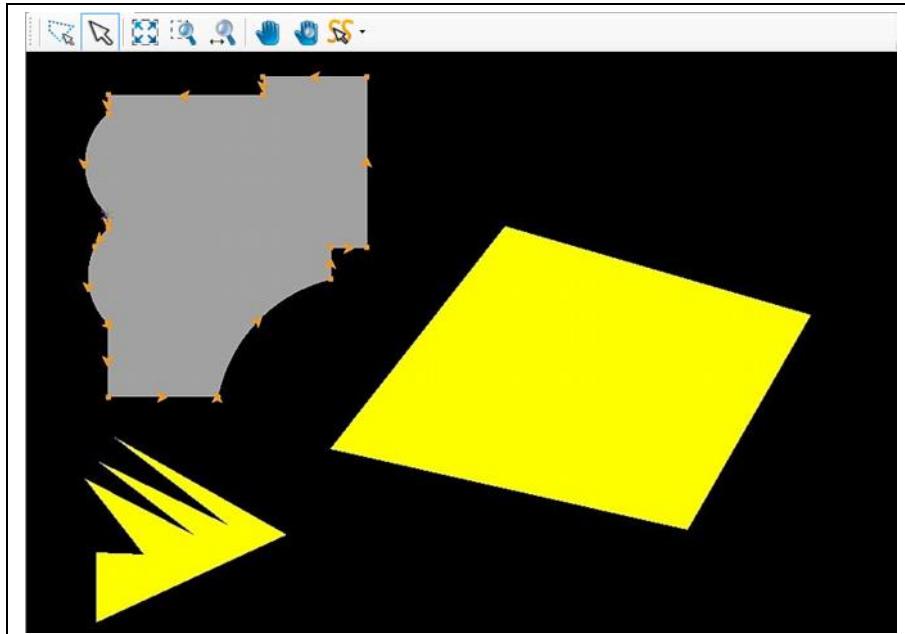


8. Click on [Close] in the dialog.
- The dialog is closed.
- ◆ The closed path with an arc and a segment is created.

5.3.3 Polygon

The menu item “Polygon” lets you create any polygon area using line segments and arcs. Creating a polygon requires **at least two** segments or two arcs or one segment plus one arc. These are connected in a final step forming the polygon surface area.

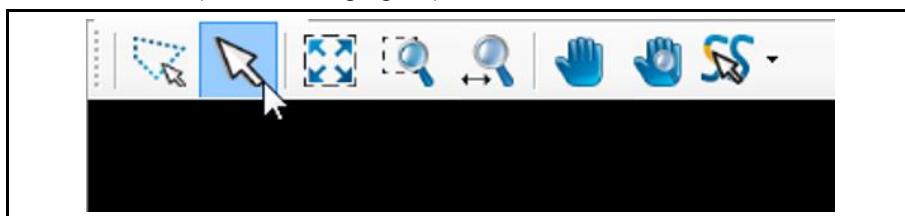
Fig. 203: Polygon



There are different ways to create a polygon:

- Entering the X and Y values of the segments in the dialog.
- Moving the mouse pointer to the desired position in the CAM view thus drawing a segment/arc. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 204:
Selection mode
(arrow icon)
activated



Note

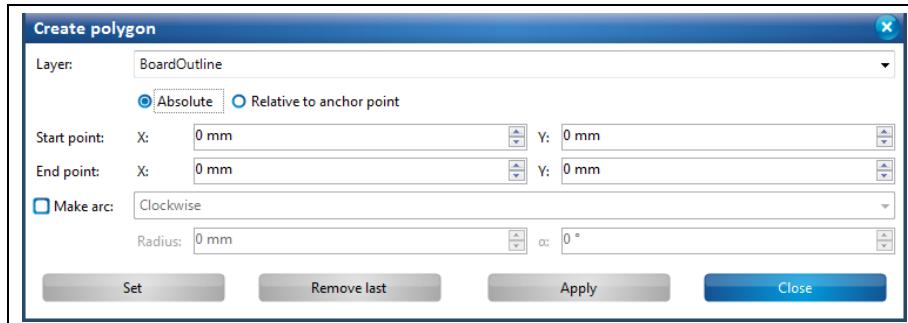
You have to be in the CAM view of CircuitPro PM to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

■ Creating a polygon with line segments

1. Click on Insert > Polygon.

➔ The following dialog is displayed:

Fig. 205: Polygon



2. In the drop-down list, select the layer where you want to create the polygon.
3. Select either absolute or a relative start point by clicking on the corresponding radio button.



Note

The **absolute start point** is computed using the X and Y coordinates starting from the zero point.

If you want to create more than one polygon you can make all polygons start from the same starting point using the “Absolute” start point option.

The **relative start point** is variable. Once you have created a segment, the relative start point moves automatically to the end of this segment to serve as start point for the next segment to be created.

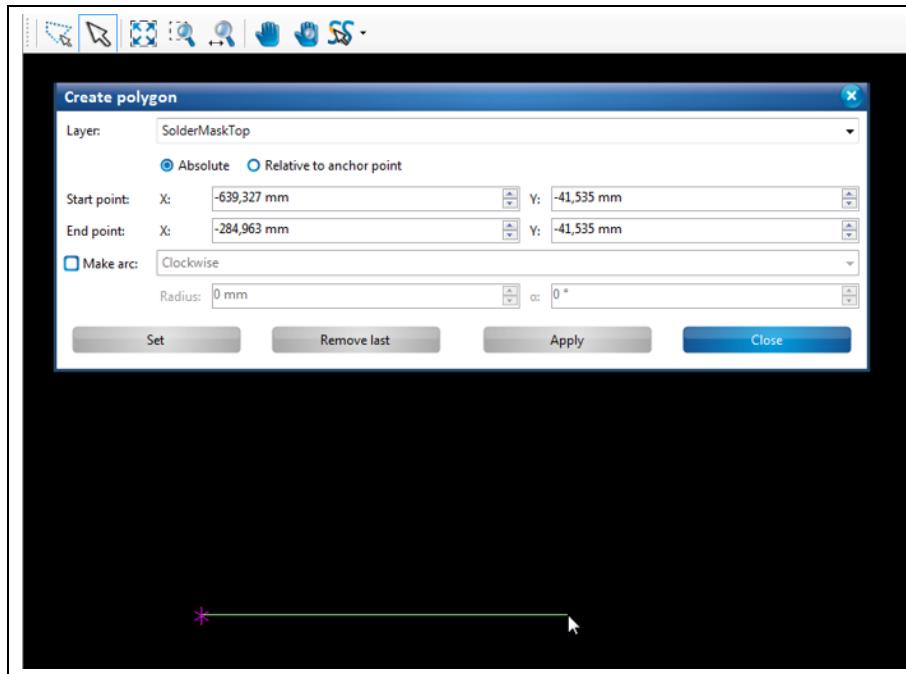


Note

Please note that the magenta-colored asterisk in the view always denotes the anchor point, not the zero point!

4. Enter the X and Y value of the start point in millimeters.

Fig. 206: Creating a segment



5. Enter the X and Y values of the segment.
 6. Click on [Set].
- The segment is created.



Note

Function of the “Apply” and “Set” buttons:

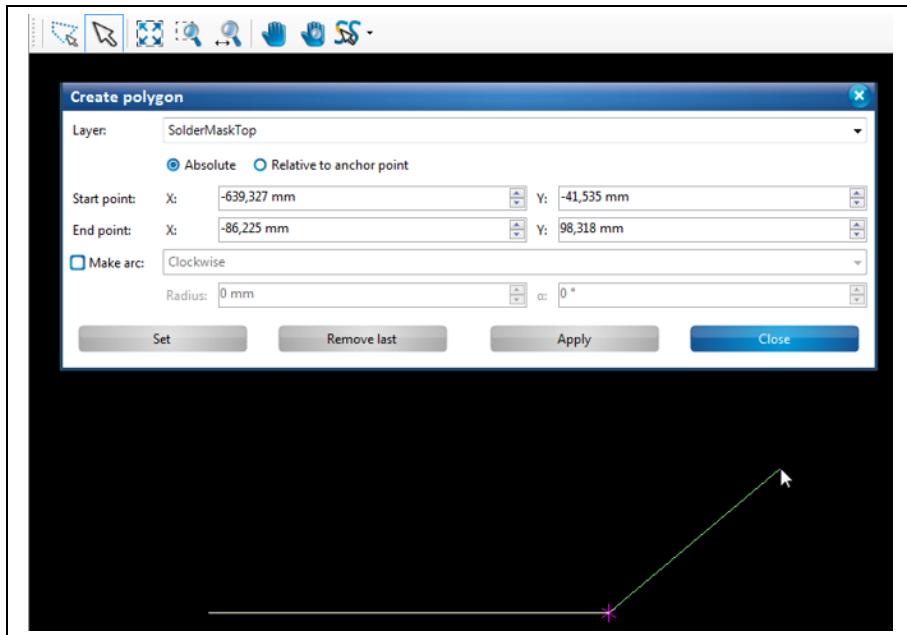
Once you have created a segment you can finish your entries using either [Apply] or [Set].

If you use [Set] you can still remove the segment by clicking on [Remove last]. You can add as many segments as you like.

If you use [Apply] for creating the segment, it can **not** be removed afterwards. You also cannot add any more segments.

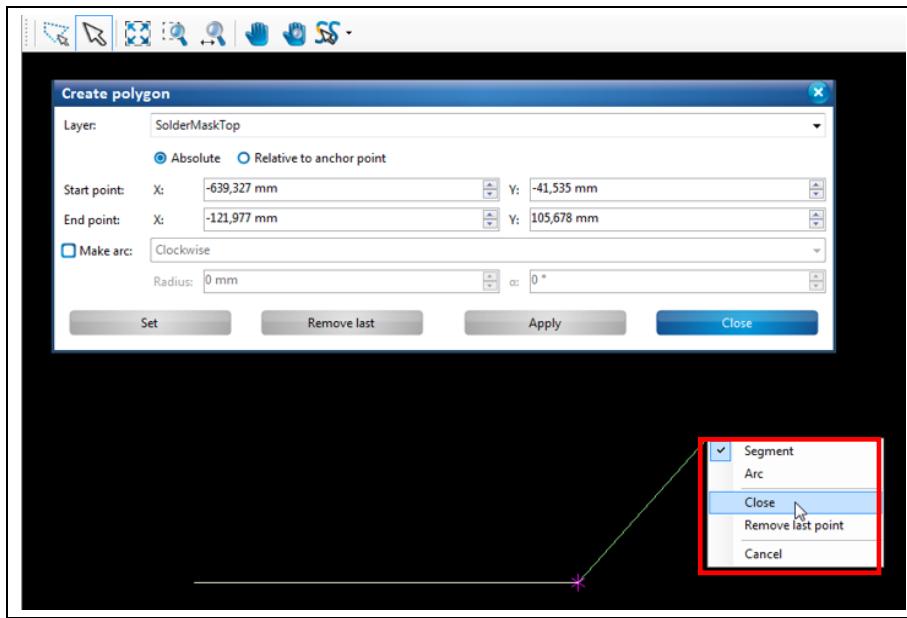
7. Repeat the steps above to create at least one more segment for creating the polygon area:

Fig. 207: Creating a second segment



8. Click on [Apply] to combine the segments created to a polygon area.
 - Or
 9. Press the right mouse button as an alternative.
- The context menu is displayed:

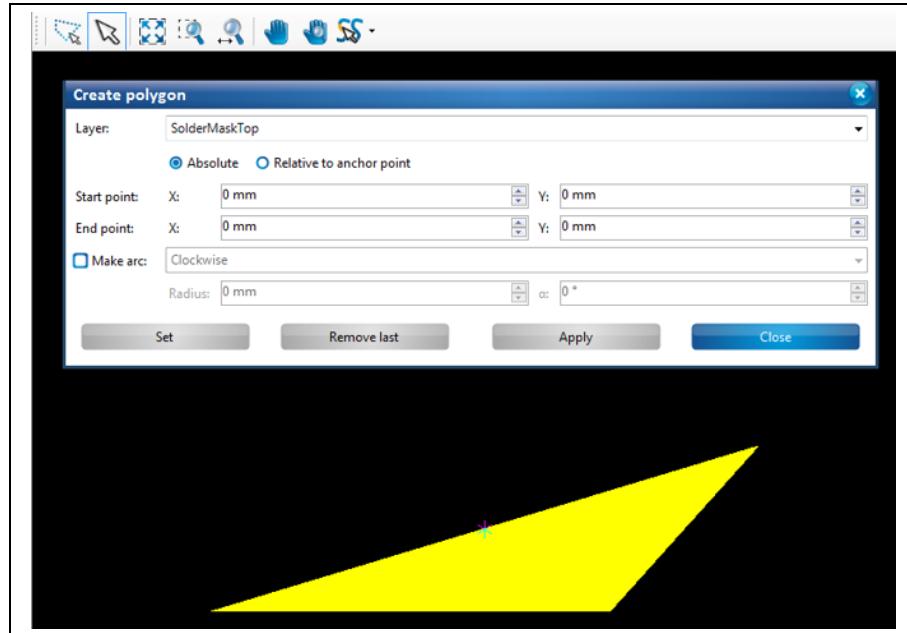
Fig. 208: Close polygon



9. Click on "Close" in the context menu.

→ The polygon is created:

Fig. 209: Polygon area



10. Click on [Close] in the dialog.

- The dialog is closed.
◆ The polygon is created.



Tip

Procedure without entering X and Y values:

You can also create segments in CircuitPro PM without entering coordinates. You can just use the mouse pointer.

1. Press the left mouse button at the start point of the segment.
2. Move the mouse pointer to the desired position in the CAM view.
3. Press the left mouse button.
→ The segment is created.
 - A left-click corresponds to clicking the [Set] button in the dialog.
 - Pressing the right mouse button opens the context menu and you can finish creating the polygon by clicking on "Close". This corresponds to clicking on [Apply] in the dialog.



Tip

If you want to abort creating the polygon press the ESC key.

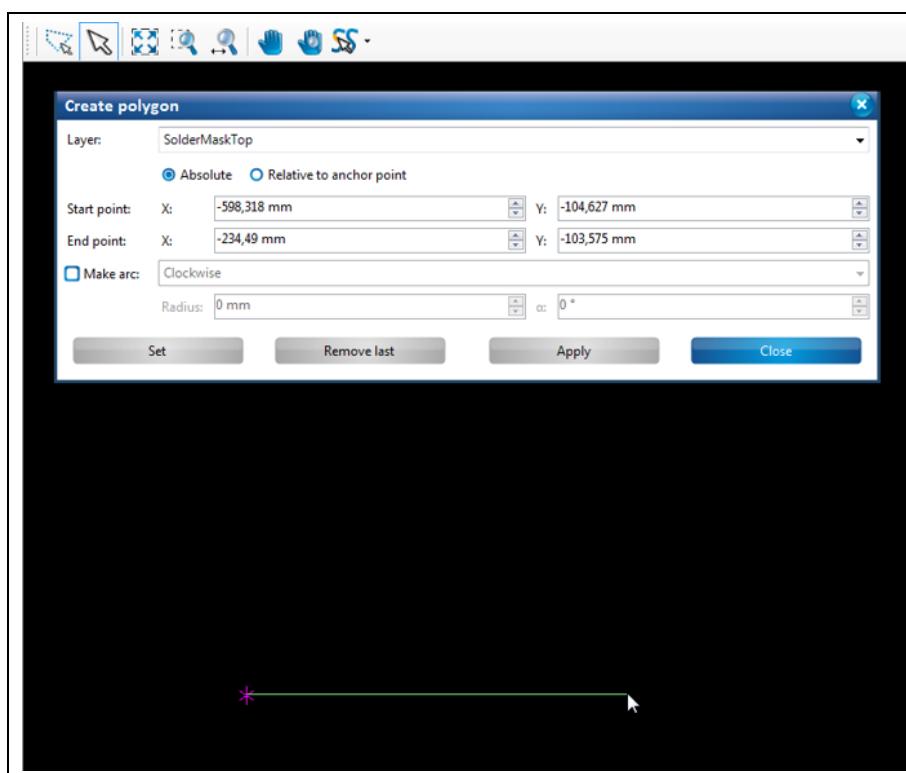
■ Creating a polygon with arcs and line segments

You can combine as many line segments and arcs as you like when creating a polygon. This example shows how to create a polygon area with two line segments and two arcs.

1. Perform the steps 1 to 7 of “Creating a polygon with line segments”.

→ A line segment is created.

Fig. 210: Creating a segment

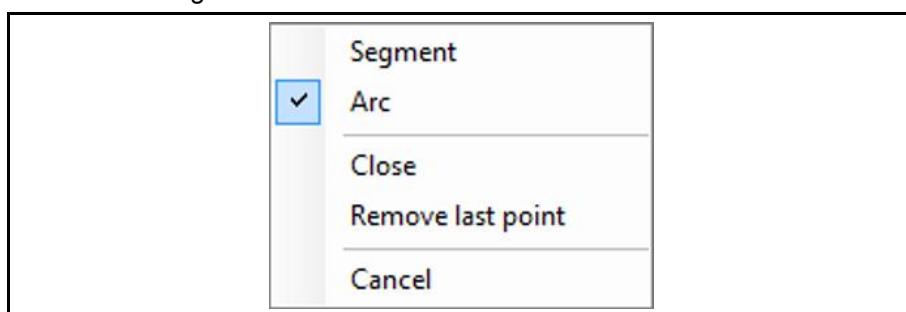


2. Activate the radio button “Make Arc” in the dialog.

Or

2. Press the right mouse button and select “Arc” in the context menu.

Fig. 211:
Selecting “Arc” in
context menu



3. Select whether the direction of the arc should be “Clockwise” or “Counter-clockwise”.
4. Enter the radius of the arc.
5. Enter the opening angle of the arc.



Tip

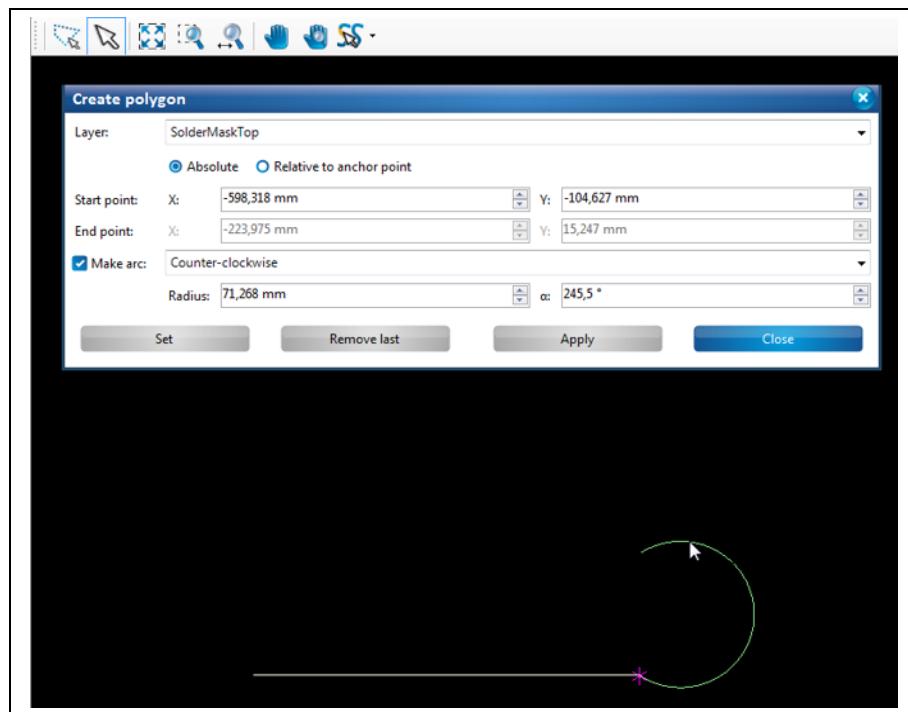
Creating arcs with the mouse pointer

1. Activate the “Arc” option in the dialog or in the context menu.
2. In the CAM view, click on the desired end point of the arc.
3. Drag the mouse to the left or to the right until the arc has the desired size.

6. Click on [Set].

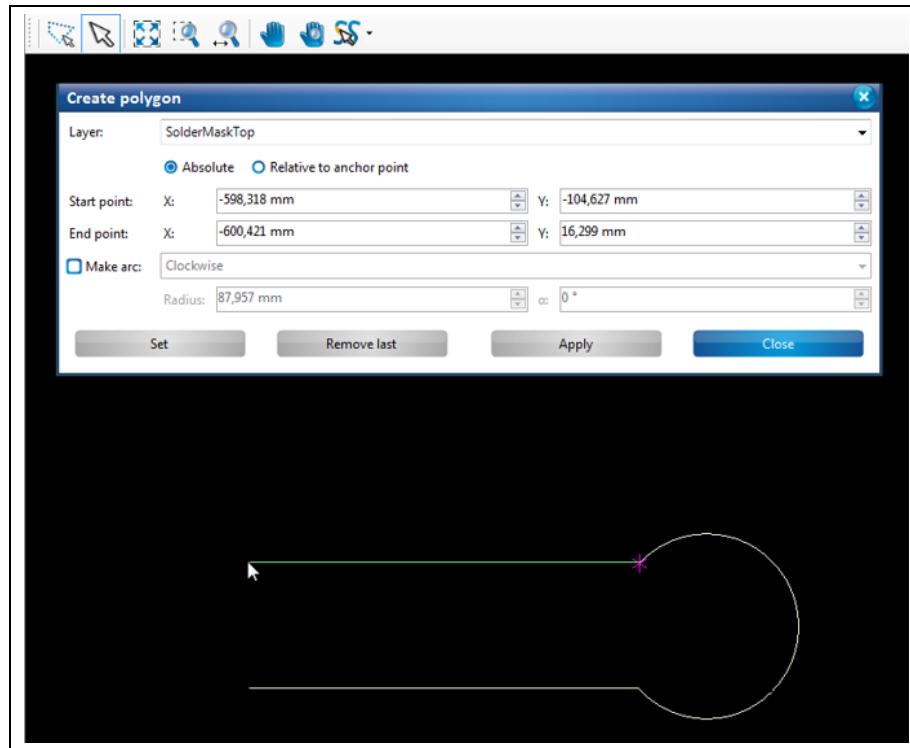
→ An arc is attached to the line segment:

Fig. 212: Creating an arc



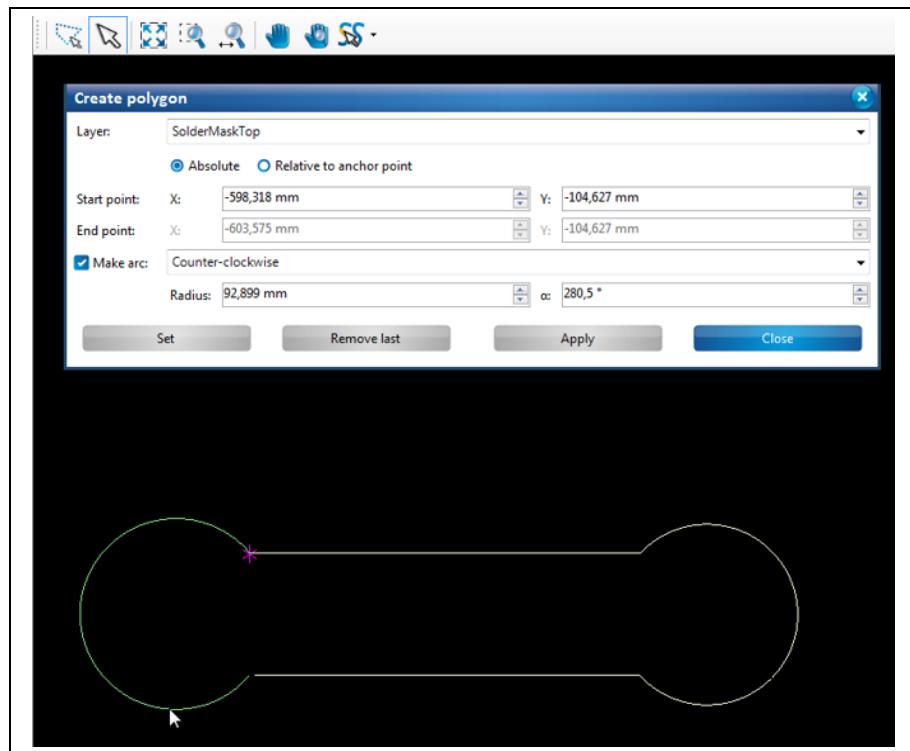
7. Create another line segment:

Fig. 213:
Attaching a
segment to an arc



8. Insert another arc:

Fig. 214:
Attaching an arc
to a segment



- To finish the polygon, click on "Apply" in the dialog or "Close" in the context menu.

Fig. 215:
Selecting “Close”
in context menu

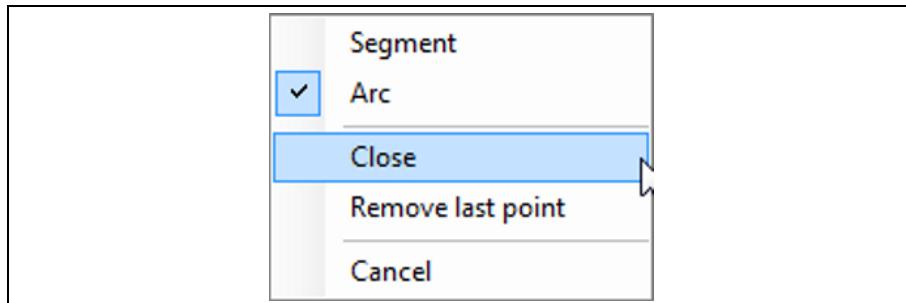
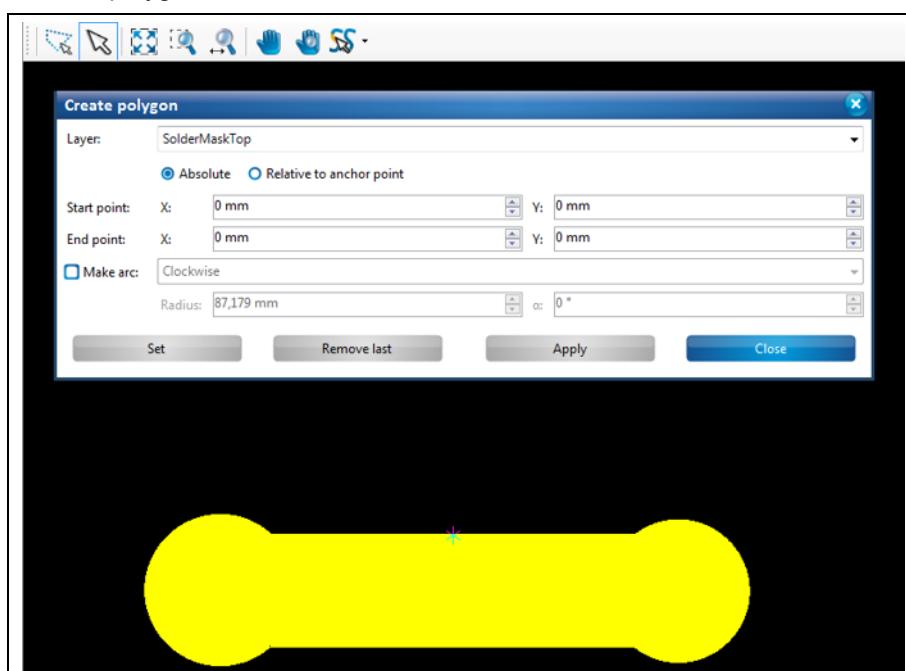


Fig. 216: Polygon
area



10. Click on [Close] in the dialog.

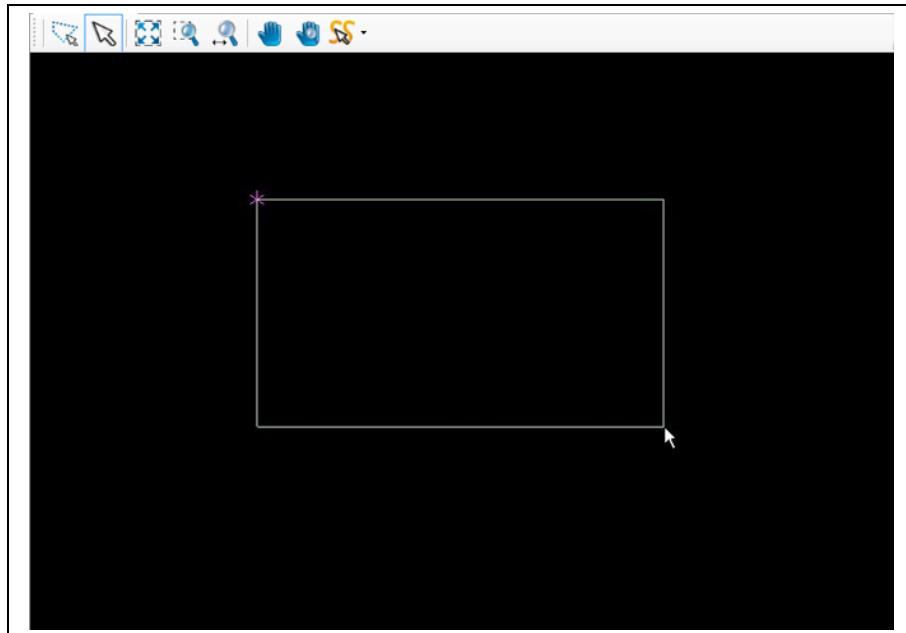
→ The dialog is closed.

◆ The polygon with two line segments and two arcs is created.

5.3.4 Rectangle

The “Rectangle” function lets you create rectangles of any size.

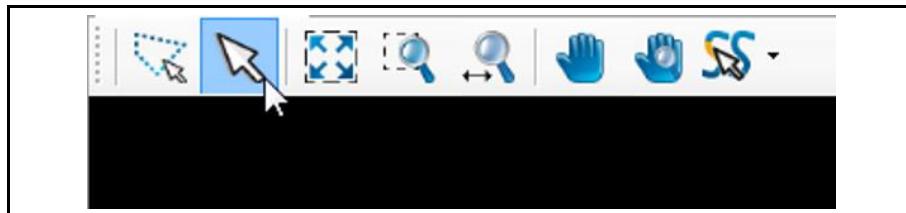
Fig. 217:
Rectangle



There are different ways to create a rectangle:

- Entering the X and Y values of the rectangle in the dialog.
- Moving the mouse pointer to the desired position in the CAM view thus drawing the rectangle. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 218:
Selection mode
(arrow icon)
activated



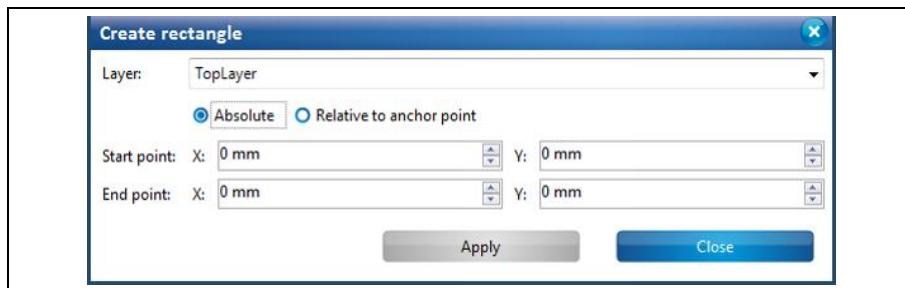
Note

You have to be in the CAM view of CircuitPro PM to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

■ Creating a rectangle

1. Click on Insert > Rectangle.
- ⇒ The following dialog is displayed:

Fig. 219: Create Rectangle



2. In the drop-down list, select the layer where you want to create the rectangle.
3. Select either an absolute or a relative start point and end point by clicking on the corresponding radio button.

**Note**

The **absolute start point** is computed using the X and Y coordinates starting from the zero point.

If you want to create more than one rectangle you can make all rectangles start from the same starting point using the "Absolute" start point option.

The **relative start point** is variable. Once you have created a rectangle, the relative start point moves automatically to the end of this rectangle to serve as start point for the next rectangle to be created.

**Note**

Please note that the magenta-colored asterisk in the view always denotes the anchor point, not the zero point!

4. Enter the X and Y value of the start point in millimeters.
5. Enter the X and Y value of the end point in millimeters.
6. Click on [Create].

**Tip**

You can also create the rectangle using the mouse by clicking on the desired start point in the view and drawing the rectangle.

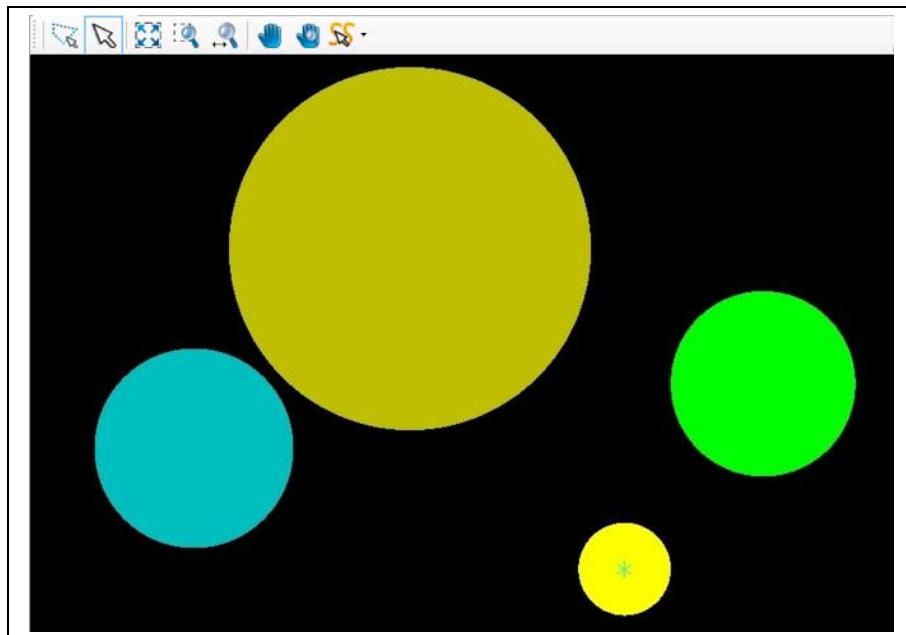
Please ensure that the selection mode (arrow icon) is activated.

7. Click on [Close].
- ◆ The rectangle is created.

5.3.5 Circle

The “Circle” function lets you create circles of any size.

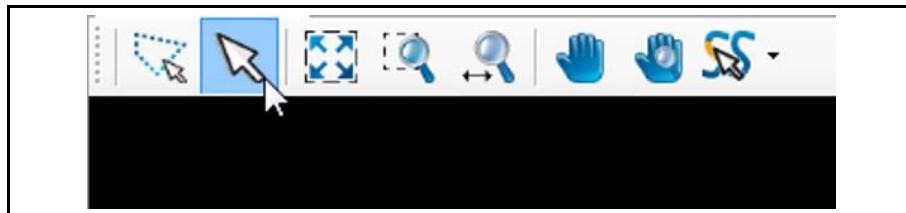
Fig. 220: Circles



There are different ways to create a circle:

- Entering the circle center and the diameter in the dialog.
- Moving the mouse pointer to the desired position in the CAM view thus drawing the circle. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 221:
Selection mode
(arrow icon)
activated



Note

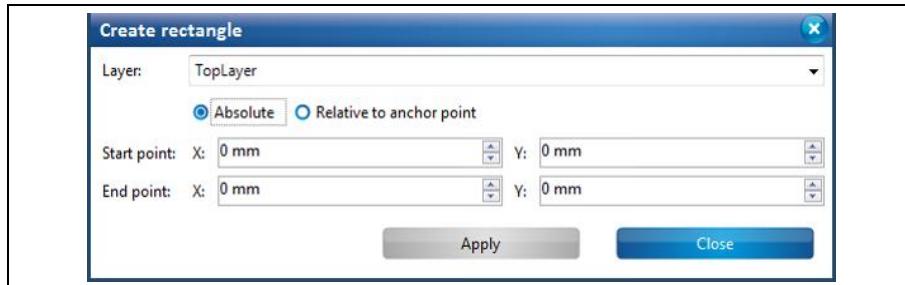
You have to be in the CAM view of CircuitPro PM to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

■ Creating a circle

1. Click on Insert > Circle.

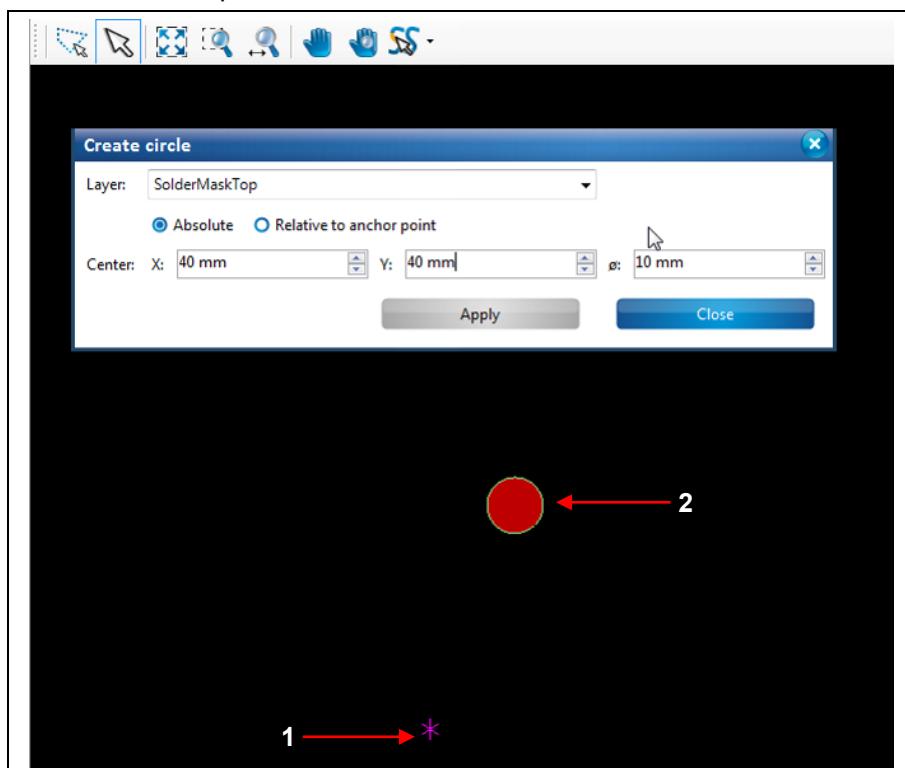
→ The following dialog is displayed:

Fig. 222: Create Circle



2. In the drop-down list, select the layer where you want to create the circle.
3. You can choose between the options “Absolute” and “Relative”:
 - **Absolute:** If “Absolute” is activated, the center point of the circle is computed using the X and Y coordinates starting from the zero point.
 - If, for example, the X and Y values are left at 0 mm and only a radius is entered, the center point of the circle is at the zero point.
 - If you enter an X and a Y value, the center point of the circle is computed from the zero point with the coordinates entered.

Fig. 223:
“Absolute”
option



/1/ Zero point = anchor point

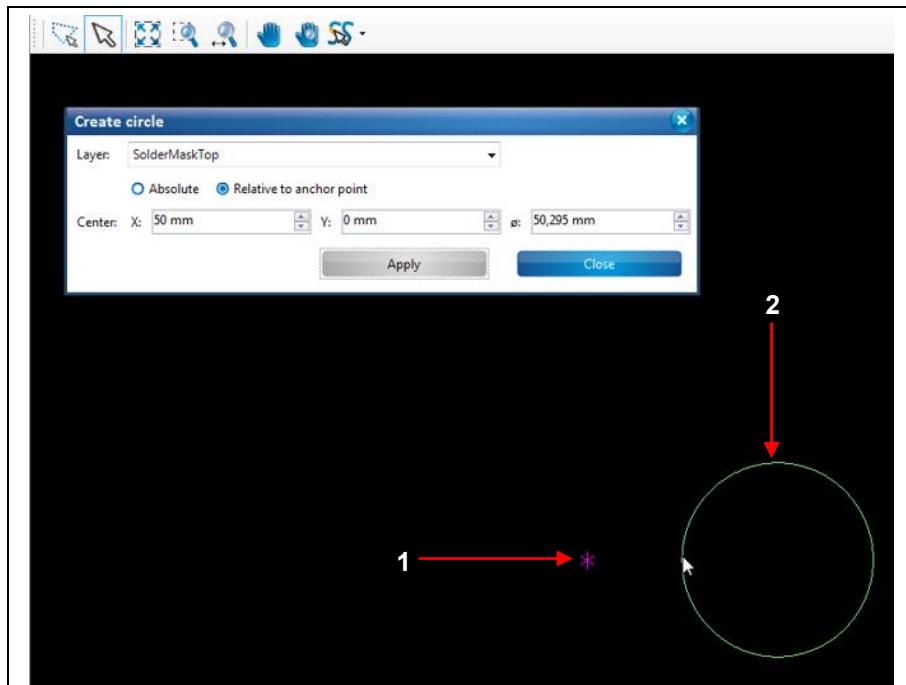
/2/ New circle (\varnothing 10 mm)

The figure above shows how a circle with a diameter of 10 mm is created. The center point of the circle (see /2/) is at the coordinates X=40 and Y=40 from the zero point (see /1/).

- **Relative to anchor point:** If the option “Relative to anchor point” is activated, the center point of the circle is computed using the X and Y coordinates starting from the anchor point.

- If, for example, the X and Y values are left at 0 mm and only a radius is entered, the center point of the circle is set to the current anchor point.
- If you enter an X and a Y value, the center point of the circle is computed from the current anchor point with the coordinates entered.

Fig. 224:
“Relative” option



/1/ Anchor point

/2/ New circle (\varnothing 50 mm)

4. Enter the X and Y value of the circle's center point in millimeters.
5. Enter the circle's diameter in millimeters.



You can also create the circle using the mouse by clicking on the desired center point in the view and drawing the circle.

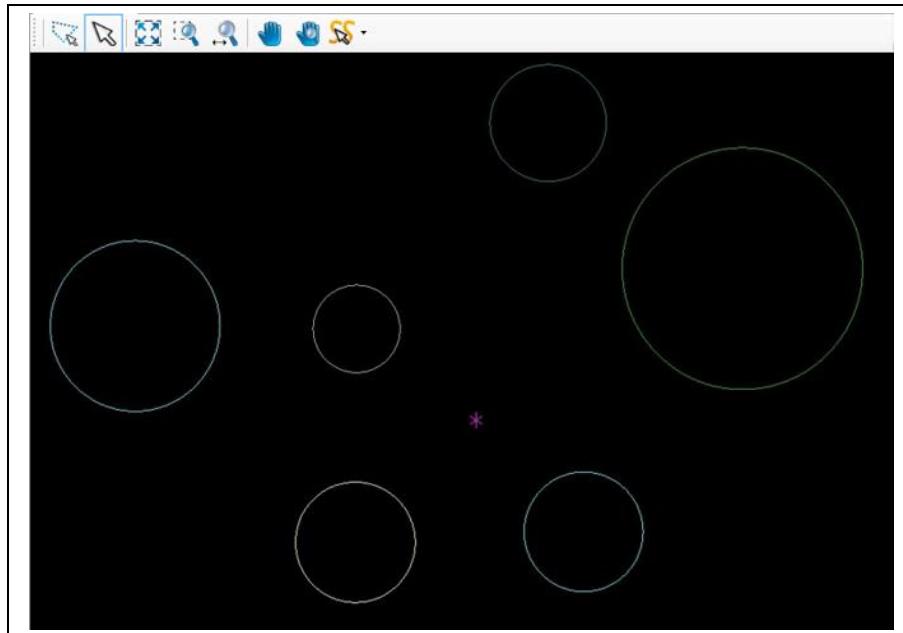
Tip

6. Click on [Apply].
 7. Click on [Close].
- ◆ The circle is created.

5.3.6 Circle path

The “Circle path” function lets you create circle paths of any size.

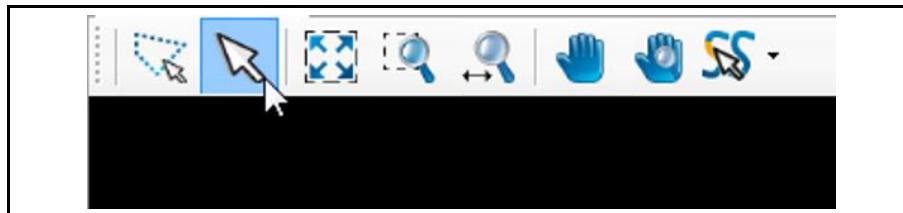
Fig. 225: Circle paths



There are different ways to create a circle path:

- Entering the circle center and the diameter in the dialog.
- Moving the mouse pointer to the desired position in the CAM view thus drawing the circle path. Please ensure that the selection mode (arrow icon) is activated (see following figure):

Fig. 226:
Selection mode
(arrow icon)
activated

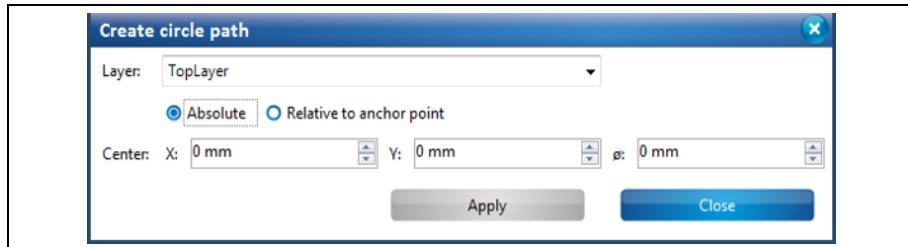


Note

You have to be in the CAM view of CircuitPro PM to be able to insert or modify geometrical forms (open paths, polygons, etc.) of the design!

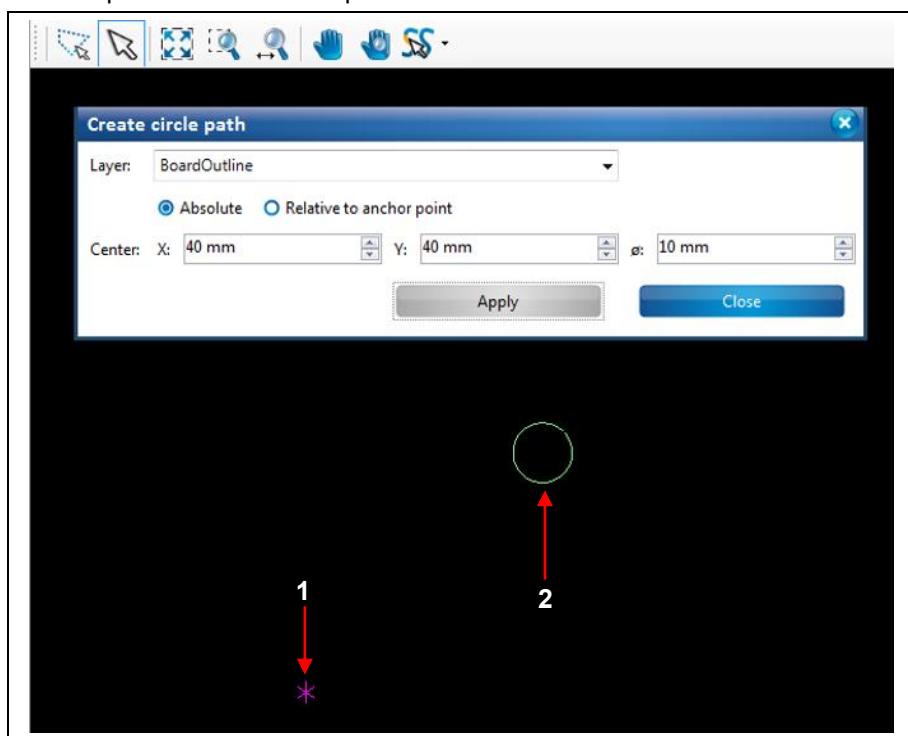
- Creating a circle path
- 1. Click on Insert > Circle path.
- The following dialog is displayed:

Fig. 227: Create circle path



2. In the drop-down list, select the layer where you want to create the circle path.
3. You can choose between the options "Absolute" and "Relative":
- **Absolute:** If "Absolute" is activated, the center point of the circle path is computed using the X and Y coordinates starting from the zero point.
- If, for example, the X and Y values are left at 0 mm and only a radius is entered, the center point of the circle path is at the zero point.
- If you enter an X and a Y value, the center point of the circle path is computed from the zero point with the coordinates entered.

Fig. 228:
"Absolute"
option

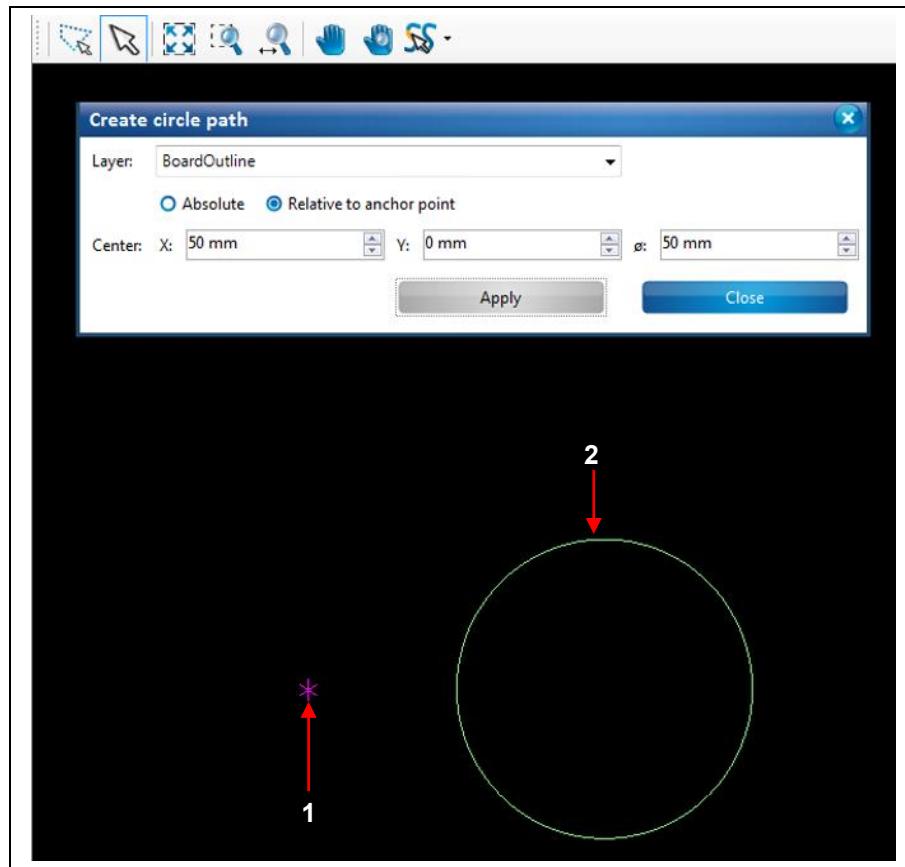


The figure above shows how a circle path with a diameter of 10 mm is created. The center point of the circle path (see /2/) is at the coordinates X=40 and Y=40 from the zero point (see /1/).

- **Relative:** If "Relative" is activated, the center point of the circle path is computed using the X and Y coordinates starting from the anchor point.

- If, for example, the X and Y values are left at 0 mm and only a radius is entered, the center point of the circle path is set to the current anchor point.
- If you enter an X and a Y value, the center point of the circle path is computed from the current anchor point with the coordinates entered.

Fig. 229:
“Relative” option



/1/ Anchor point

/2/ New circle path (\varnothing 50 mm)

4. Enter the X and Y value of the circle path's center point in millimeters.
5. Enter the circle path's diameter in millimeters.



Tip

You can also create the circle path using the mouse by clicking on the desired center point in the view and drawing the circle path.

6. Click on [Apply].
 7. Click on [Close].
- ◆ The circle path is created.

5.3.7 Flash

The “Flash” function lets you create flash objects on any layer.



Note

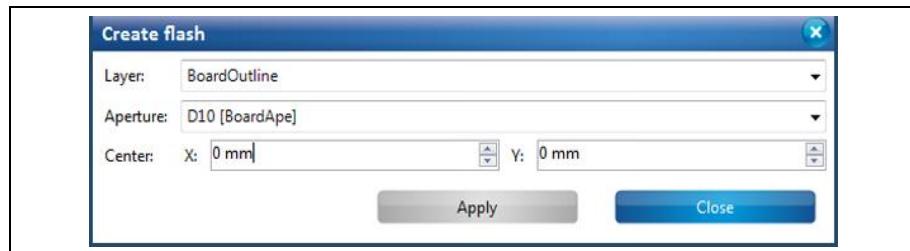
An aperture list library must be available for creating a flash object. For more information on the aperture list library see the corresponding chapter.

■ Creating a flash object

1. Click on Insert > Flash.

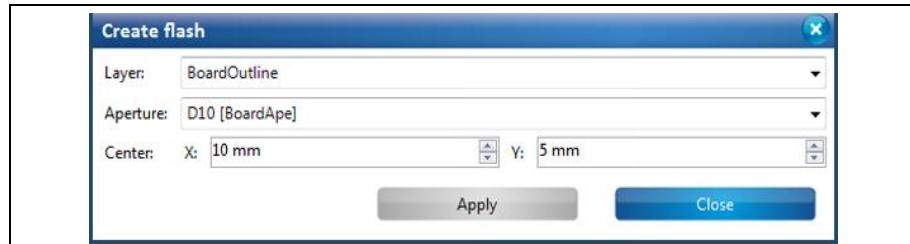
→ The following dialog is displayed:

Fig. 230: Create flash



2. In the drop-down list, select the layer where you want to create the flash object.
3. Select an aperture.
4. Enter the X and Y value of the flash center point in millimeters.

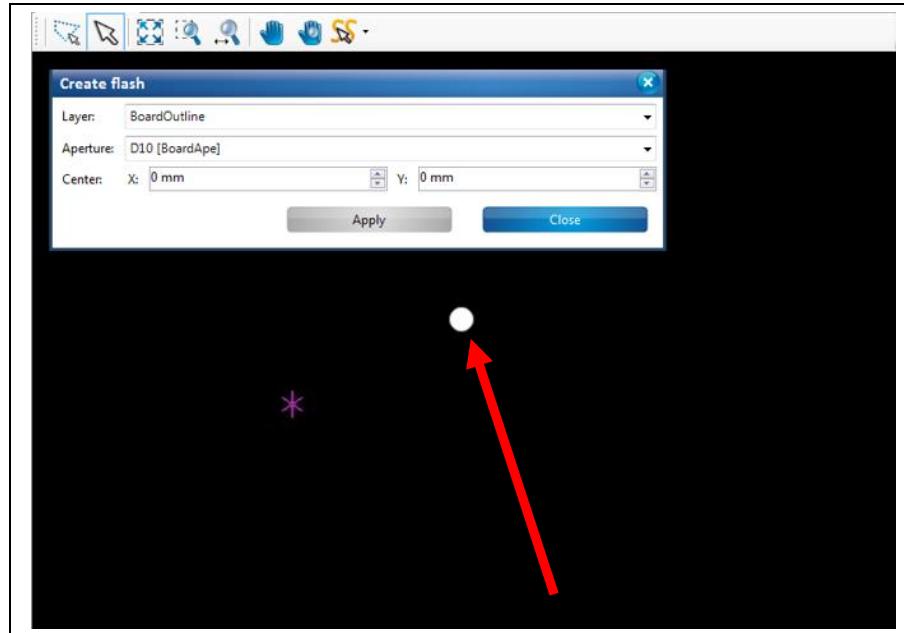
Fig. 231: Entering the flash coordinates



5. Click on [Apply].

→ The newly created flash object is displayed in the CAM view:

Fig. 232: New flash object



The flashed object is at 10 mm in X direction and 5 mm in Y direction from the zero point.



Note

The above figure shows the flash object at a much larger scale for better illustration. The anchor point (magenta-coloured asterisk) was set to the zero point in order to illustrate the coordinates of the flash object.

◆ The flash object is created.

5.3.8 Text

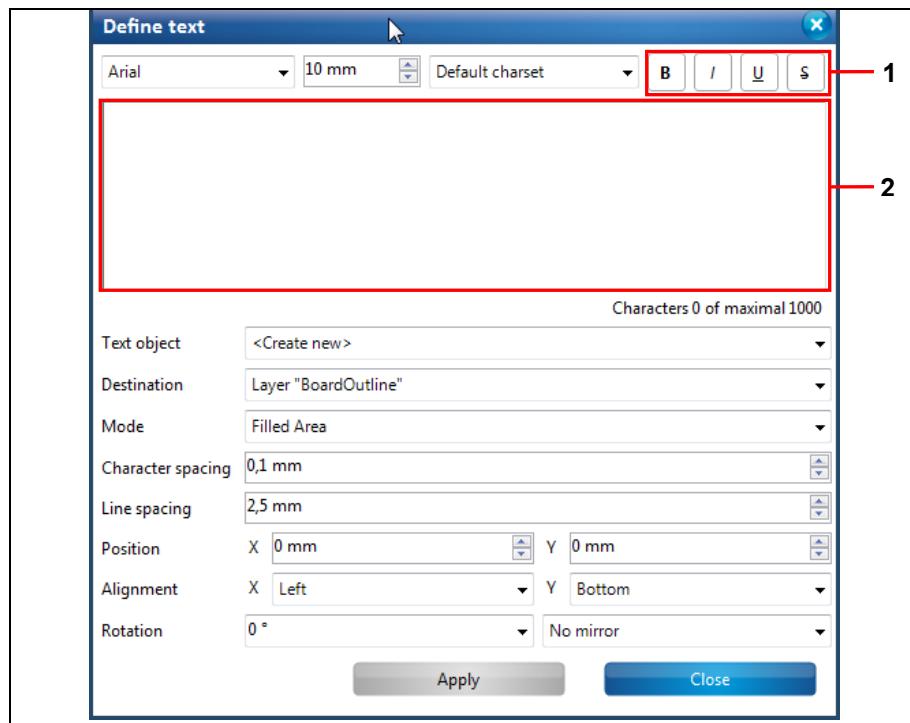
The “Text” function lets you create any text object on the layers.

■ Defining a text

1. Click on Insert > Text.

→ The following dialog is displayed:

Fig. 233: Define text



/1/ Text attributes

/2/ Input field

2. Enter your text into the input field /2/. You can enter a maximum of 1000 characters.
3. Format your text if necessary using the available text attributes under /1/:
 - Bold
 - Italic
 - Underline
 - Strike through



Note

Please note that you can only format the whole text and **not** individual characters or words (in case of multiple words).



Note

The entered text appears in the drop-down list \Text object\ If you would like to enter another new text, please select <create new> here.

4. In the drop-down list "Destination" select the layer onto which the text is to be placed.
5. Select the text font.

6. Select the mode:

- "Filled Area": The text's characters are complete.

LPKF CircuitPro

- "Outline": only the outline of the text's characters is created.

LPKF CircuitPro

7. Select the character spacing.

8. Select the line spacing.



Note

The input field only shows the entered text and the attributes (bold, italic, etc.) All other settings only become visible in the CAM view when you click [Apply].

9. Enter the X and Y coordinates of the text field.

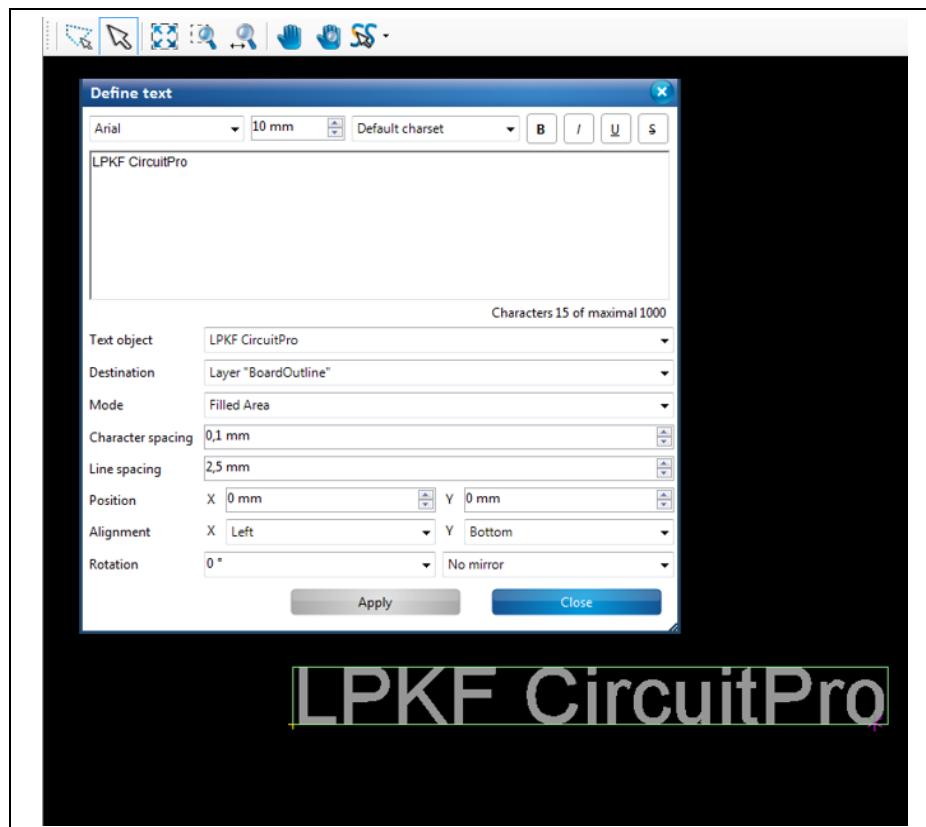
10. Determine the alignment of the text field.

11. Enter a value for rotating the text if necessary.

12. Click on [Apply].

→ The view changes as follows:

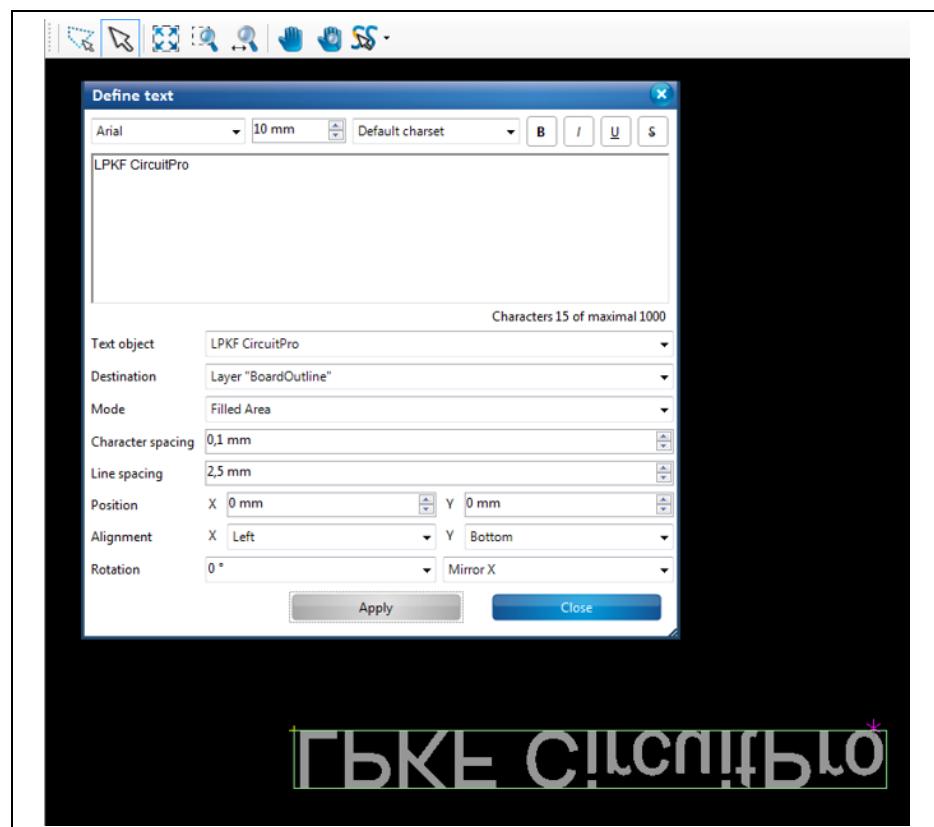
Fig. 234: Text rotated by 90°



13. If you want to mirror the text object along the X or Y axis, select the corresponding value in the drop-down list next to /Rotation/ and click on [Apply].

→ The view changes as follows:

Fig. 235: Text mirrored on the Y axis

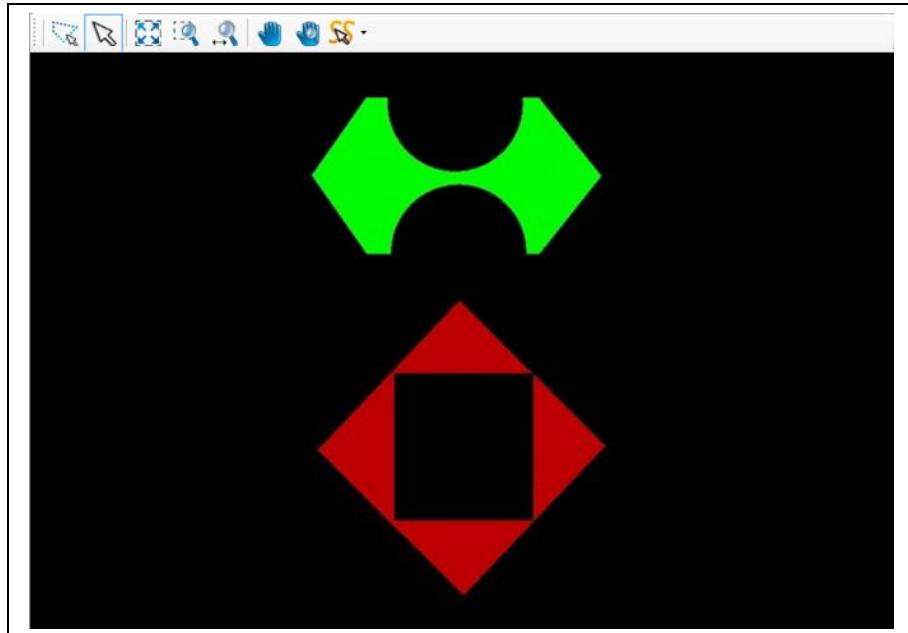


◆ The text is defined on the corresponding layer.

5.3.9 Polygon with cutouts

Use the function "Polygon with cutouts" to create cutouts of any form in a drawn polygon.

Fig. 236:
Polygons with
cutouts



To create a polygon as shown in the figure above, you need a simple polygon plus the geometric objects (rectangle, paths, circles etc.) that you want to cut from the polygon.



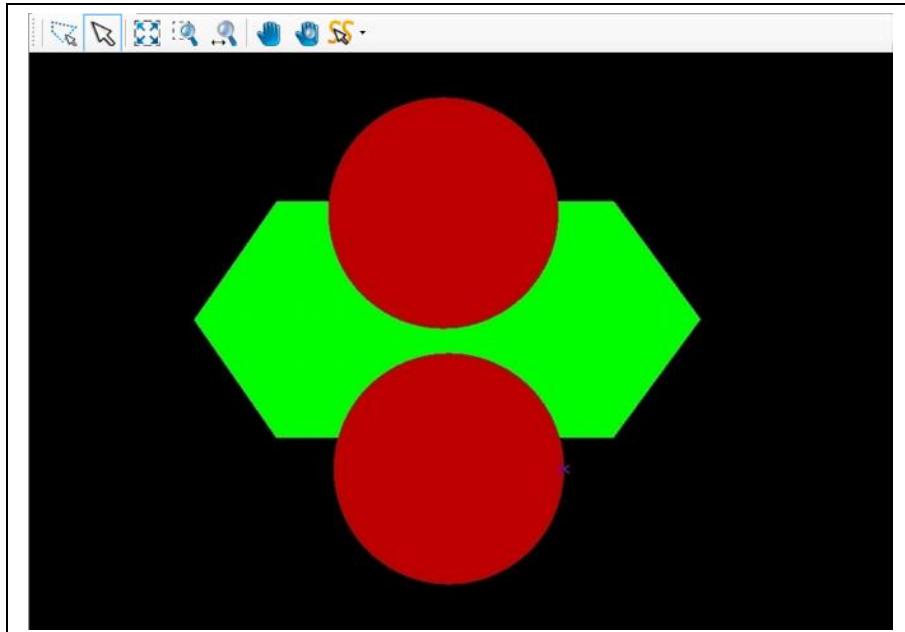
For the steps how to create a polygon see the corresponding chapter.

Tip

■ Creating a polygon with cutouts

The following steps show how to create a polygon with two circular cutouts. A polygon and two circles are needed for this:

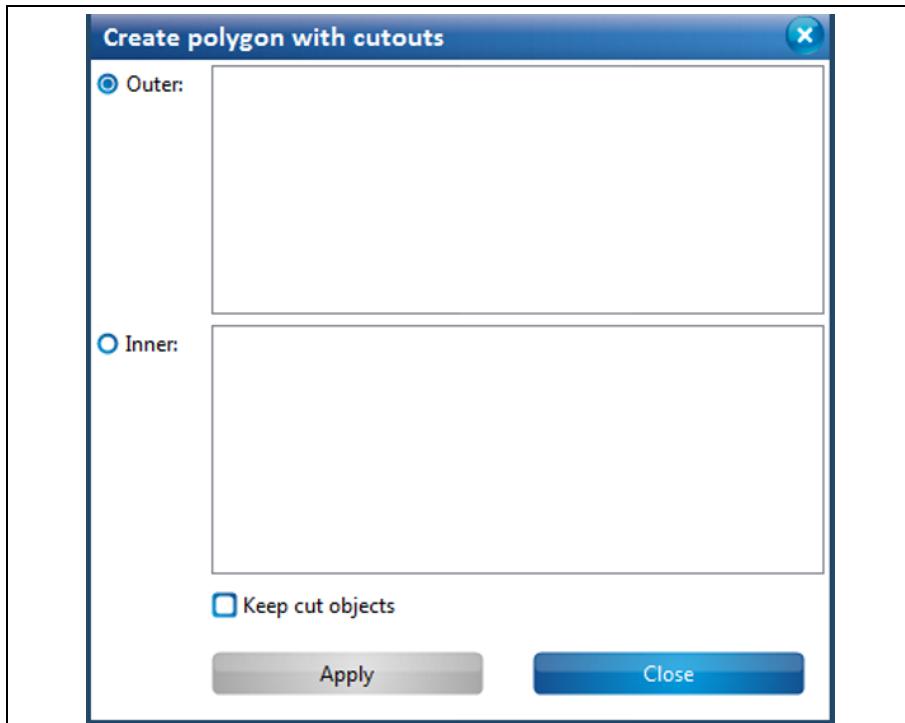
Fig. 237: Polygon and two circles



1. Click on Insert > Polygon with cutouts.

➔ The following dialog is displayed:

Fig. 238: Create polygon with cutouts

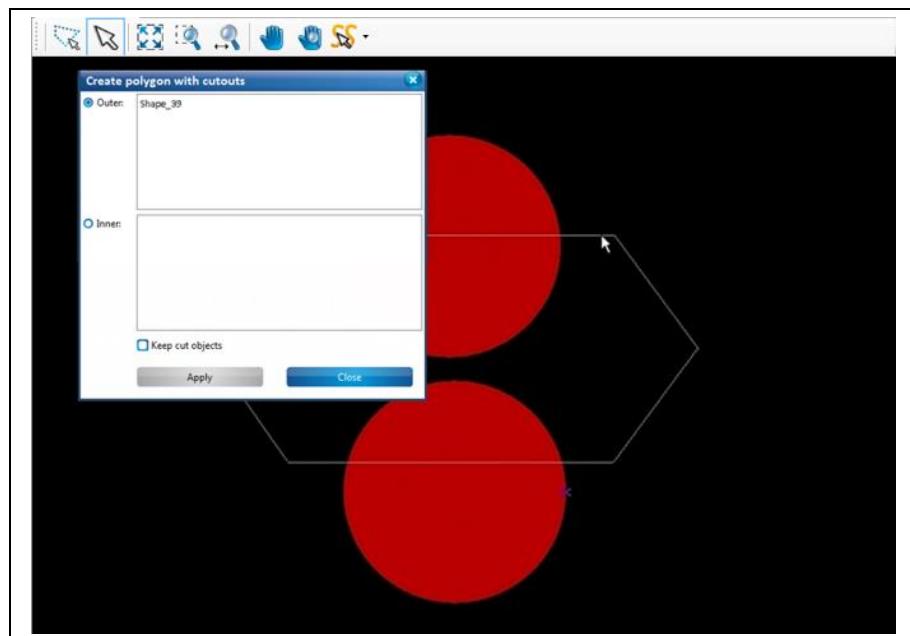


➔ The radio button {Outer} is active.

2. Select the polygon that shall remain.

→ The name of the polygon is displayed in \Outer\:

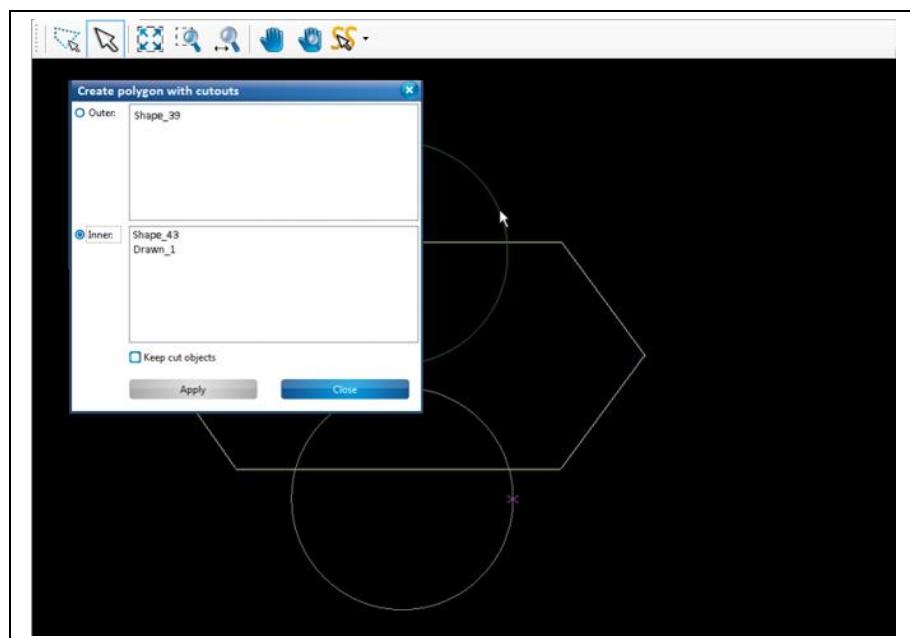
Fig. 239: Select polygon



3. Click on {Inner}.
4. Select the two circles.

→ The names of the circles are displayed in \Inner\:

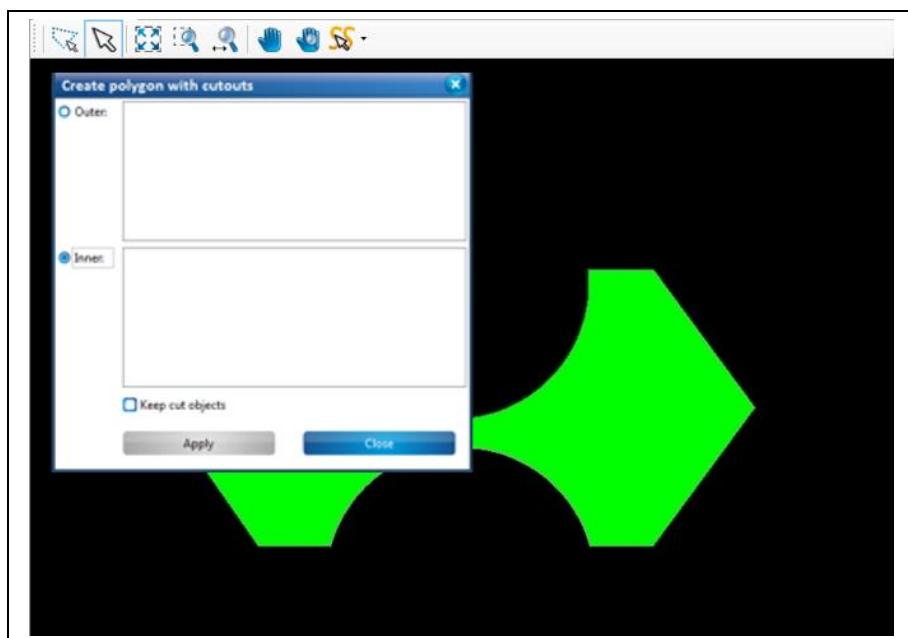
Fig. 240: Select circles



5. Click on [Apply].

→ The view changes as follows:

Fig. 241: Polygon with two circular cutouts



6. Click on [Close] in the dialog.

→ The dialog is closed.

◆ The polygon with cutouts has been created.



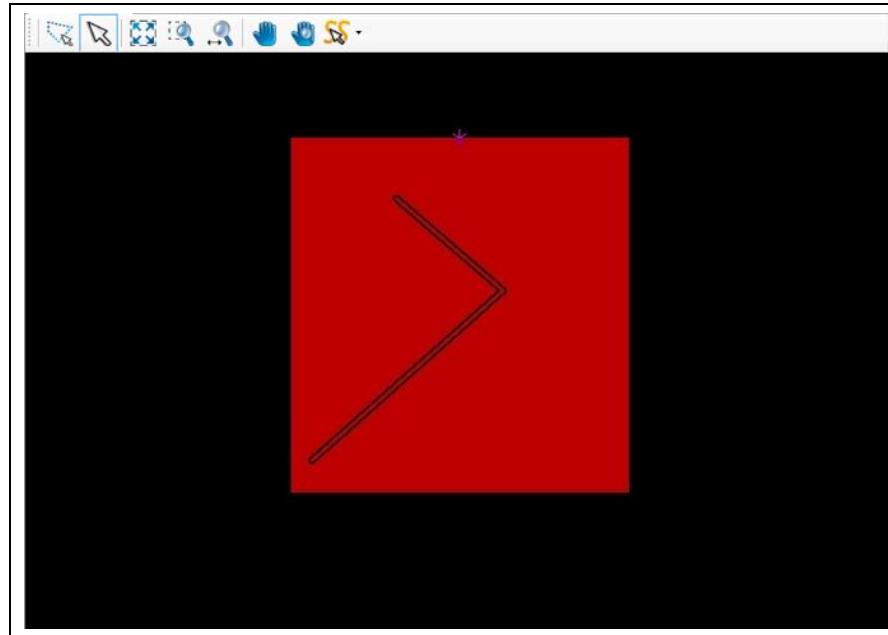
Tip

If you do not want the objects that are used for the cutout process (in this case, the circles) to be deleted, please select the option "Keep cut objects."

5.3.10 Copper pouring

Use the “Copper pouring” function to create isolated copper areas around conductive tracks.

Fig. 242: Copper pouring example



For creating a copper pouring around a conductive track as depicted in the figure above, you need

- a geometric shape (rectangle, circle, polygon) that represents the copper area and
- a path (closed or open) that represents the conductive track.



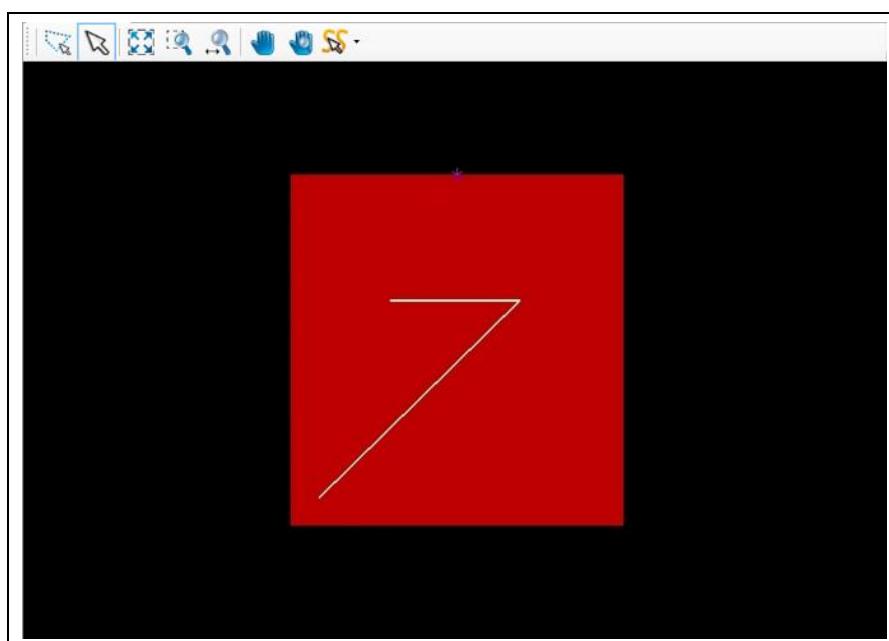
For information on creating geometric shapes and paths see the corresponding chapters..

Tip

■ Creating a copper pouring

In the following steps, a rectangular copper area is created around a conductive track. A rectangle and an open path are needed for this:

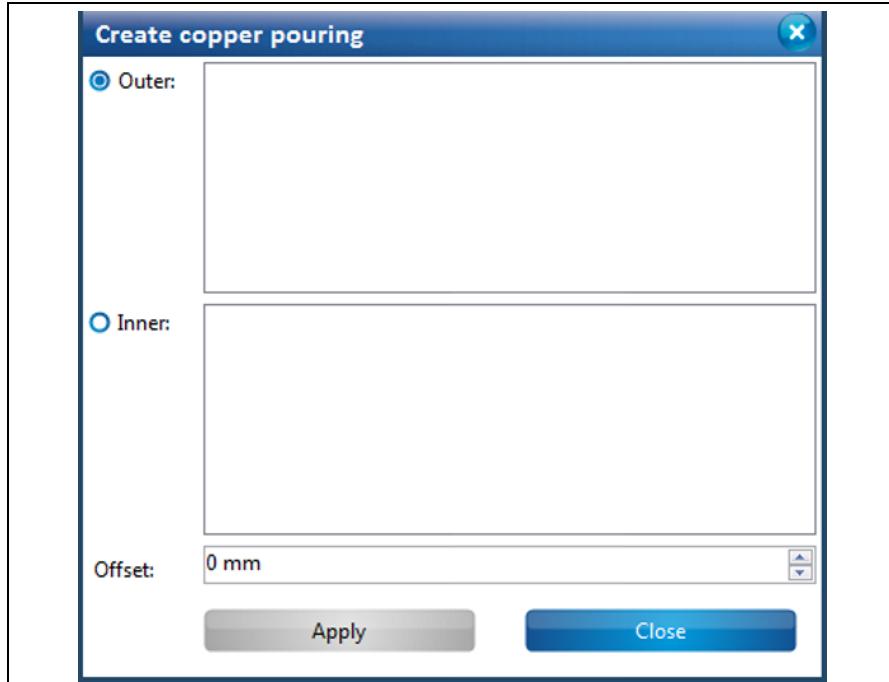
Fig. 243: Rectangle and open path



1. Click on Insert > Copper pouring.

► The following dialog is displayed:

Fig. 244: Create copper pouring

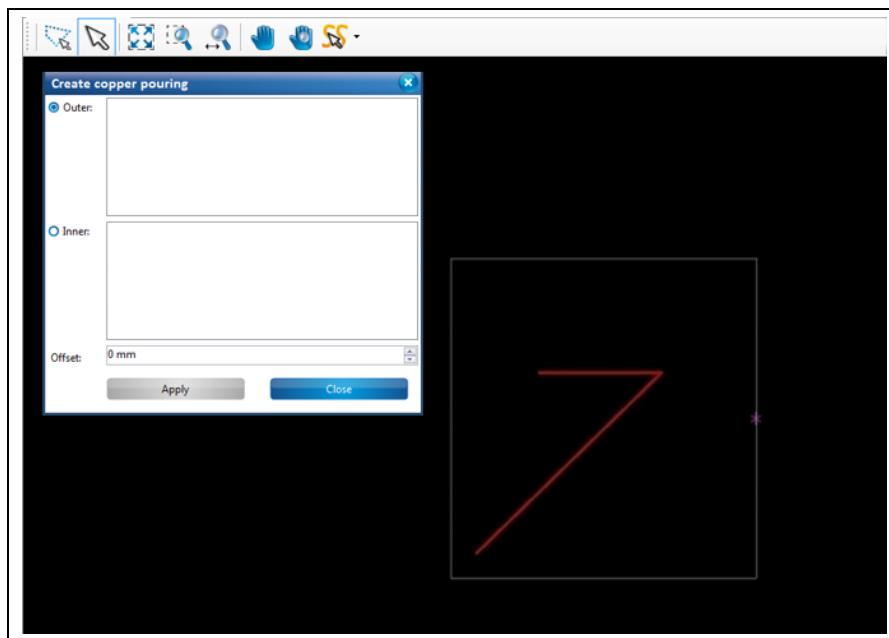


► The radio button {Outer} is active.

2. Select the copper area (the rectangle in this case).

⇒ The name of the rectangle is displayed in \Outer\:

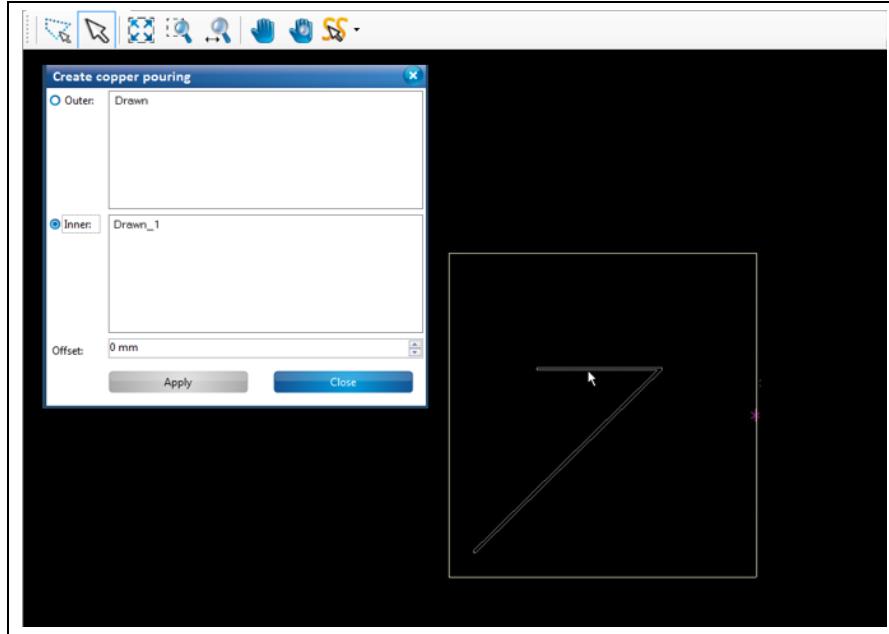
Fig. 245: Copper area (select rectangle)



3. Click on {Inner}.
4. Select the open path:

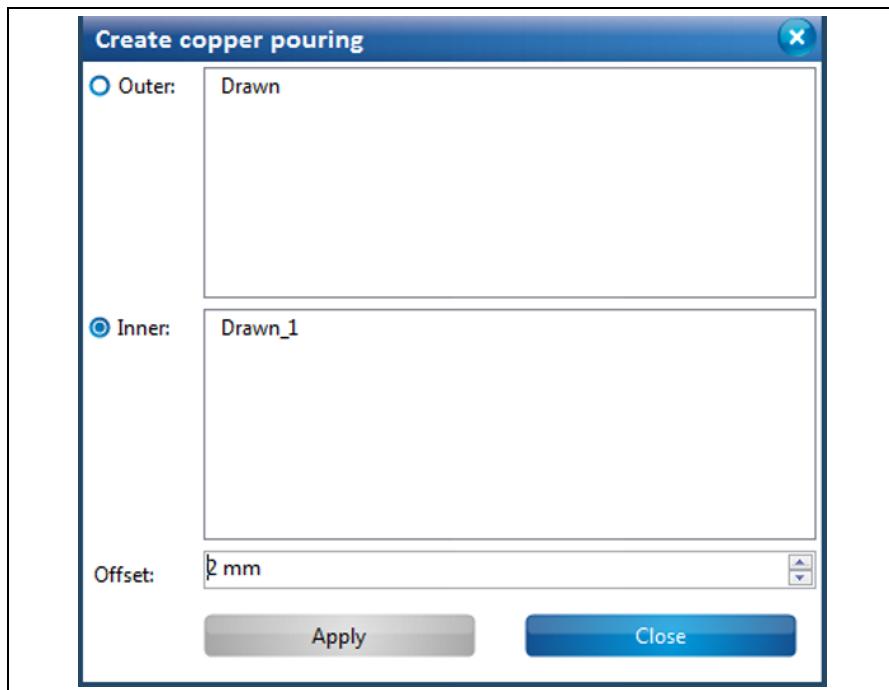
⇒ The name of the path is displayed in \Inner\:

Fig. 246: Selecting the open path



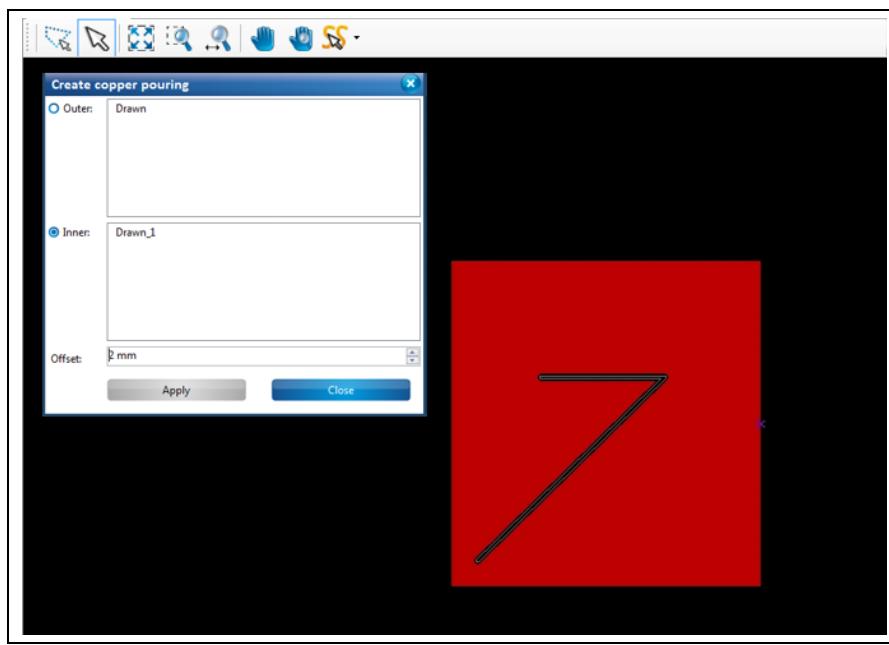
5. Enter the offset value for the copper area. This value represents the width of the isolation.

Fig. 247: Entering offset



6. Click on [Apply].
 ➔ The area next to the conductive track is removed according to the offset value:

Fig. 248: Isolated open path

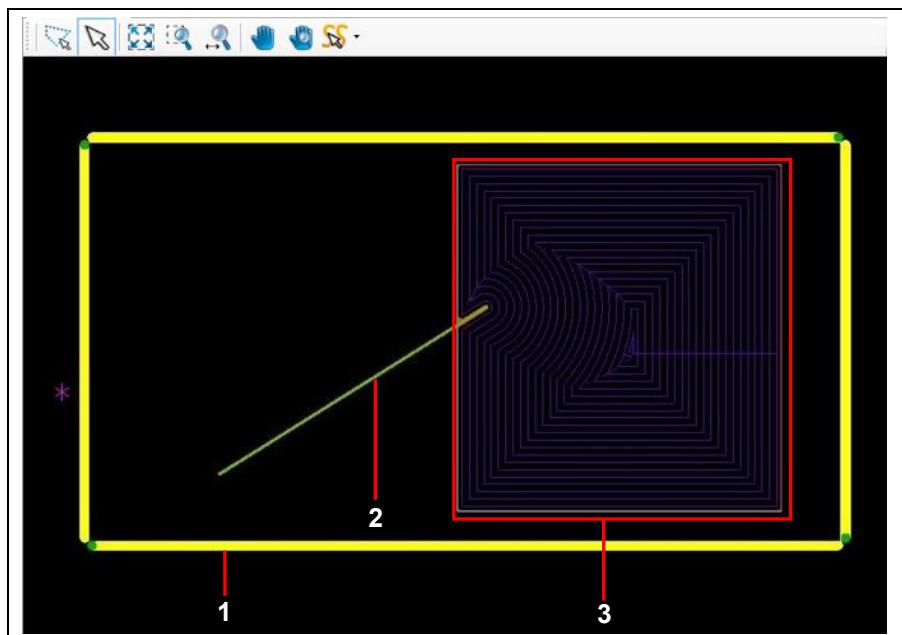


7. Click on [Close].
 ➔ The dialog is closed.
 ◆ The copper pouring is created.

5.3.11 Rubout area

Use the “Rubout” function to define areas of any shape for removal of unnecessary copper on the rubout layers, i.e., creating rubout areas. You can also create new rubout layers.

Fig. 249: Rubout example



/1/ Layer BoardOutline (display mode “Thin Line”)

/2/ Open path on BottomLayer

/3/ Rubout area with toolpaths visible

In order to create an area as depicted in the figure above, you need

- a defined BoardOutline (e.g. by creating a rectangle on the BoardOutline layer)
- at least one isolation object on the corresponding Top-/BottomLayer.



In CircuitPro PM, all rubout areas on the rubout layers are rectangular.

Note

■ Creating a rubout area

1. Click on Insert > Rubout area > RuboutBottom.



Note

The number of rubout layers depends on the type of circuit board (single-sided/multi-layer) that you want to produce. In case of a single-sided circuit board, CircuitPro PM creates only the RuboutBottom layer automatically. In case of a double-sided circuit board, two rubout layers are created: RuboutBottom und RuboutTop.

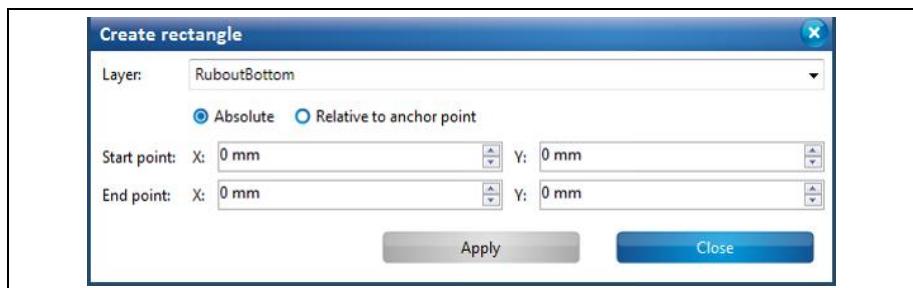


Note

You can create the rubout area on any rubout layer or all rubout layers depending on your project. You can also create a new rubout layer for the process. To do this, click on Click on Insert > Rubout > Create new layer.

➔ The following dialog showing the selected layer is displayed:

Fig. 250: Create rubout area



You can change the layer for creating the rubout area at any time.

Note

➔ Just click on the drop-down list and select the desired layer.

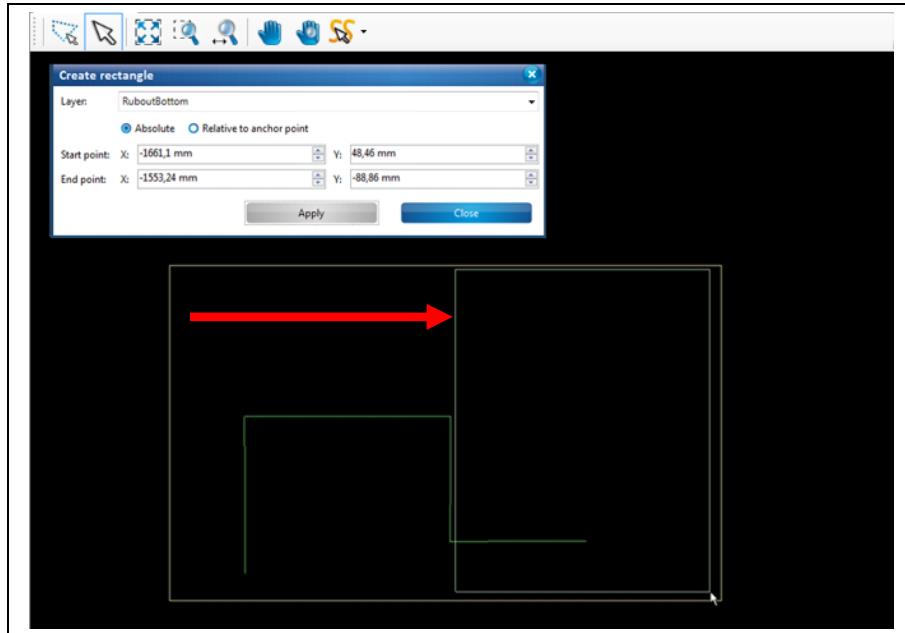
2. Create the rectangle for the rubout area.



Tip

For the steps how to create a rectangle see the corresponding chapter.

Fig. 251: Create rectangle



3. Click on [Apply].
→ The rectangle for the rubout area is created.
4. Click on [Close] in the dialog.
→ The dialog is closed.



For creating the toolpath, you have to go to the "Technology dialog".

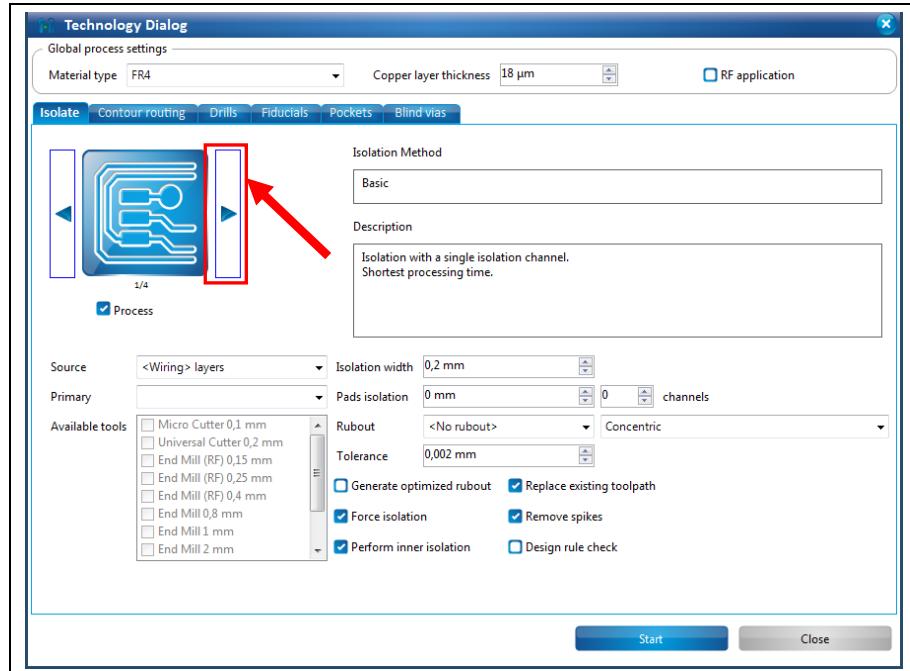
Note

For more information on the menu item "Technology dialog" see corresponding chapter.

5. Click on Toolpath > Technology dialog.

→ The following dialog is displayed:

Fig. 252:
Technology dialog



6. Click on the arrow buttons in the “Isolate” section until the isolation method “Partial rubout” or “Complete rubout” is displayed:

Fig. 253: Partial rubout

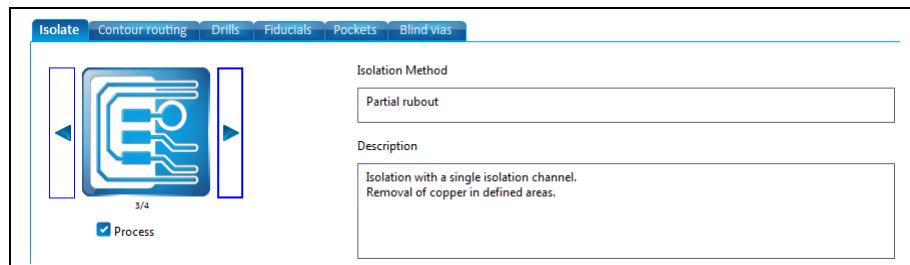
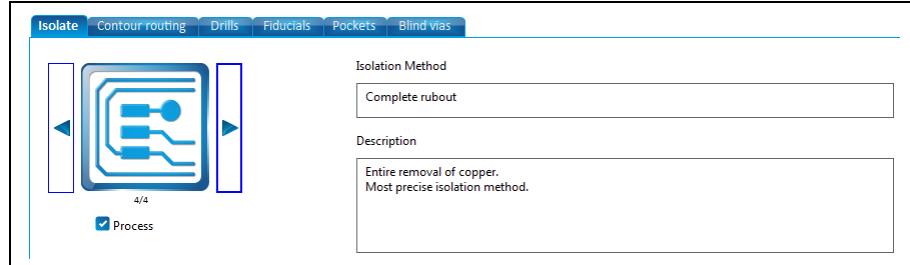


Fig. 254: Complete rubout



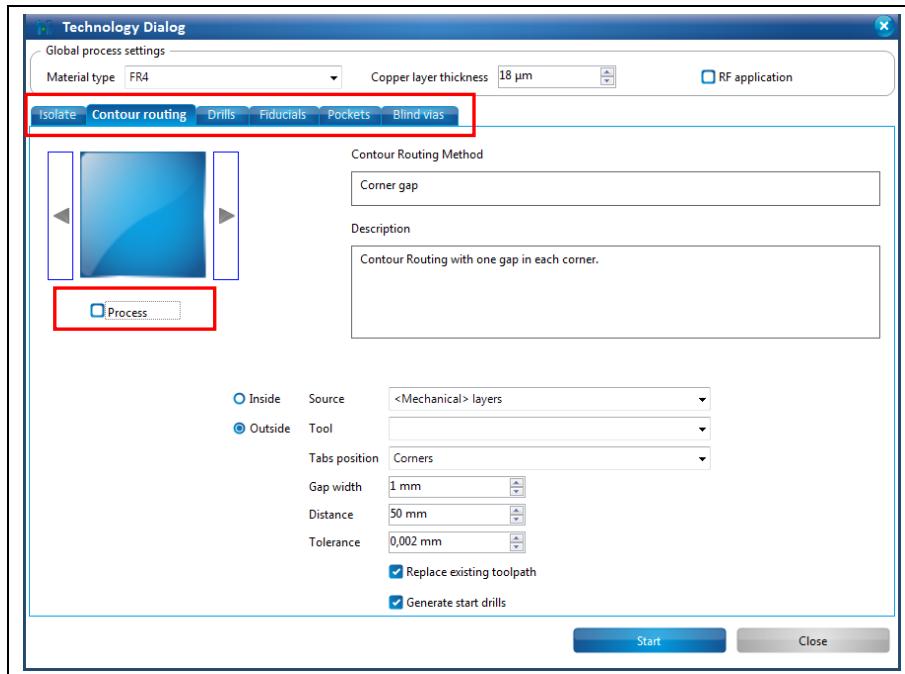
7. Select one of the two methods depending on your requirements.

**Note**

For more information on the settings in the “Technology dialog” see the corresponding chapter.

If you want to create only the toolpath for the rubout area, deactivate the other processing steps (contour routing, convert to toolpath) by removing the check marks next to the respective functions.

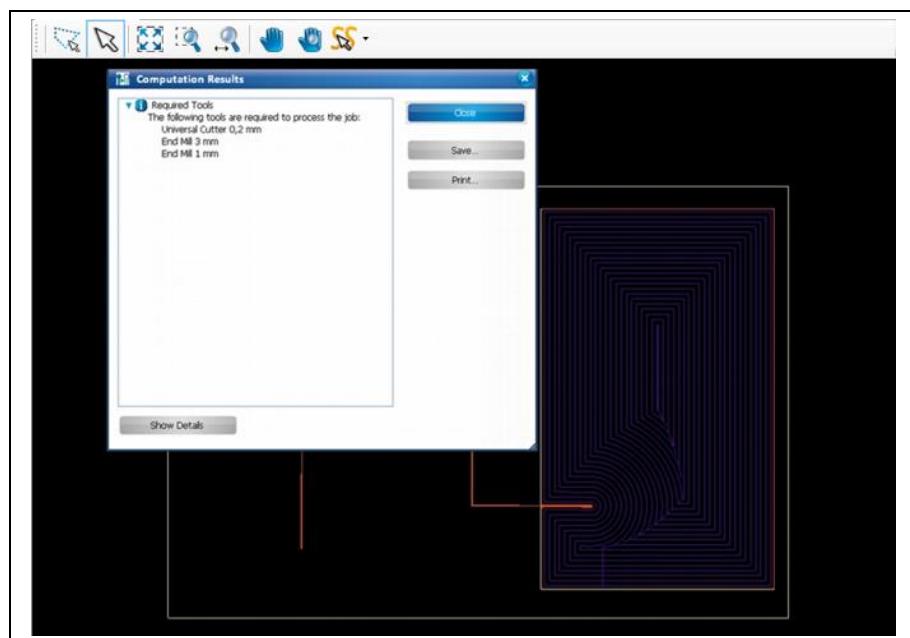
Fig. 255:
Deactivated
functions in the
Technology
dialog



8. Click on [Start].

→ The rubout area is created. The computation results are displayed.

Fig. 256: Rubout area computation results



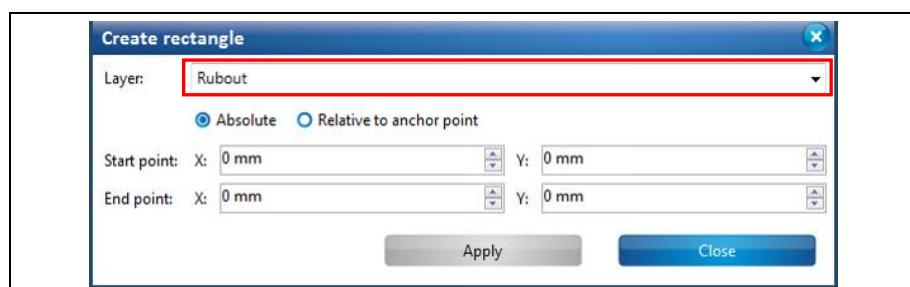
◆ The rubout area is created.

■ Creating a new rubout layer

1. Click on Insert > Rubout area > Create new layer.

→ The following dialog is displayed:

Fig. 257: Create new layer



The name of the layer is assigned automatically by CircuitPro PM.

Note

The first new layer is named "Rubout". For the following layers, the name has a counter that is incremented thus creating "Rubout_1", "Rubout_2" etc.

2. Perform the steps two to eight of "Creating a rubout area".

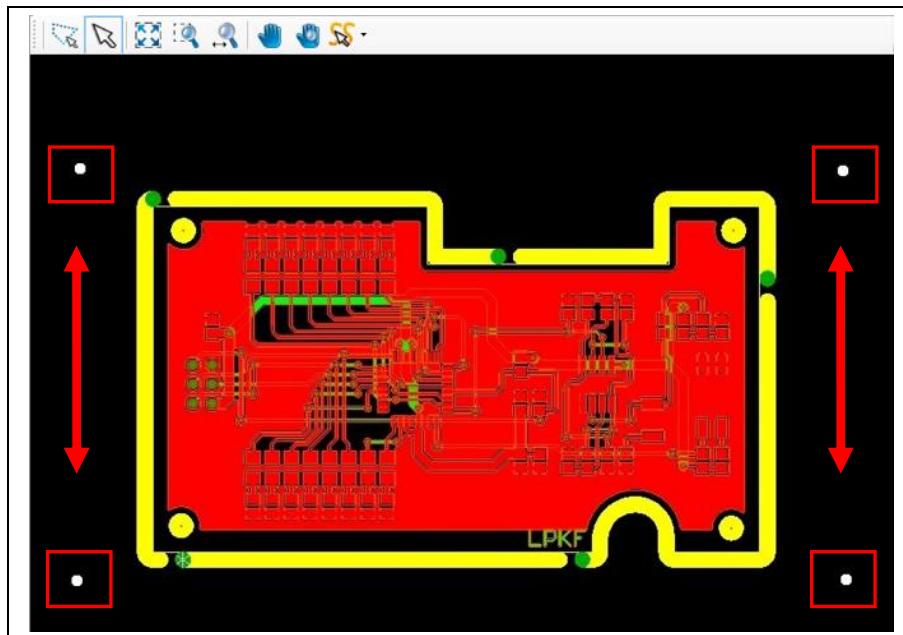
◆ A rubout area has been created on the new rubout layer.

5.3.12 Fiducial

Fiducials are optical marks on the surface of the circuit board that are used for aligning the circuit board. The fiducials are drilled into the board and are recognised by the cameras of the ProtoMat systems.

The sub-menu “Fiducial” lets you create fiducials and fiducial layers. The following figure shows four fiducials placed near the corners of the circuit board.

Fig. 258: Circuit board with fiducials



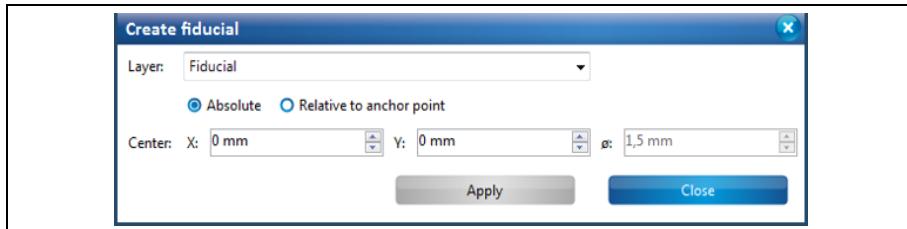
Note

Creating fiducials corresponds to creating circles in CircuitPro. For more information on the creating circles see the corresponding chapter.

■ Creating fiducials

1. Click on Insert > Fiducial > Fiducial.
- The following dialog is displayed:

Fig. 259: Create circle



Note

The “Fiducial” layer is automatically created. If you have created other fiducial layers, these are displayed in the drop-down list.

2. Click on the position in the CAM view where you want to place the fiducial.

Or

2. Enter the coordinates for the center point of the circle in millimeters and click on [Apply].



Note

Fiducials have a predefined diameter of 1.5 mm that cannot be changed.

- The fiducials are created.

3. Click on [Close] in the dialog.

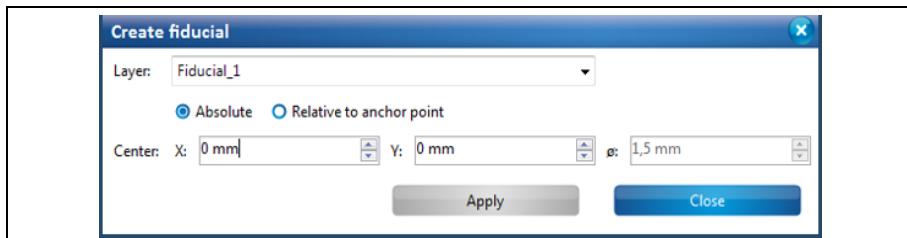
- ◆ The fiducials have been created.

■ Creating a new fiducial layer

1. Click on Insert > Fiducial > Create new layer.

- The following dialog is displayed:

Fig. 260: Creating a new fiducial layer



Note

The name of the layer is assigned automatically by CircuitPro.

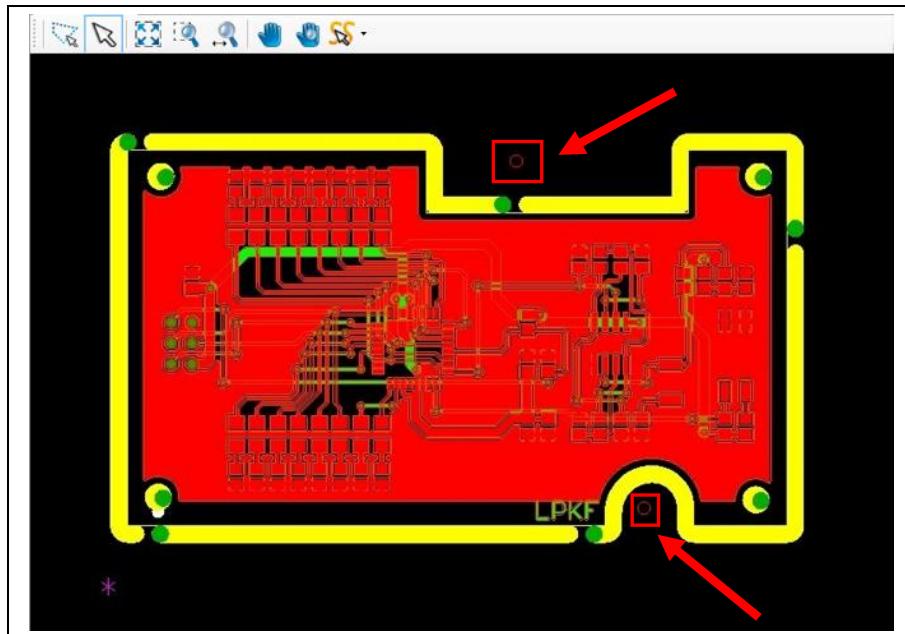
The first new layer is named “Fiducial_1”. For the following layers, the name counter is incremented thus creating “Fiducial_2”, “Fiducial_3” etc.

- ◆ The new fiducial layer has been created.

5.3.13 Topography

The menu item “Topography” lets you define points on a separate topography layer that is used for determining the topography. Determining the topography is required for setting a defined distance between the dispenser needle and the surface of the material during the dispense process.

Fig. 261: Circuit board with topography points



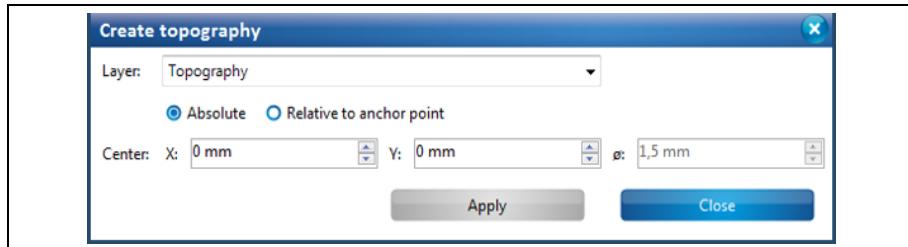
Defining topography points corresponds to creating circles in CircuitPro PM.

Note

For more information on creating circles see the corresponding chapter.

- Defining topography points.
- 1. Click on Insert > Topography > Topography.
- ➔ The following dialog is displayed:

Fig. 262: Defining topography points



CircuitPro PM automatically creates a topography layer where you can define the points.

Note

2. Click on the position in the CAM view where you want to define the topography point(s).
- Or
2. Enter the coordinates for the center point of the circle in millimeters and click on [Apply].



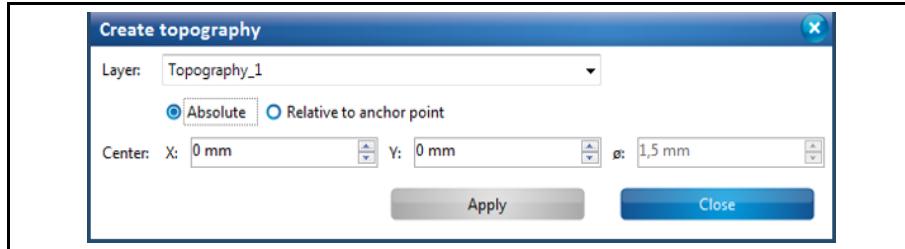
Topography points have a predefined diameter of 1.5 mm that cannot be changed.

Note

- ➔ The topography point(s) is (are) defined.
- 3. Click on [Close] in the dialog.
- ◆ The topography point(s) is (are) defined.

- Creating a new topography layer
- 1. Click on Insert > Topography > Create new layer.
- ➔ The following dialog is displayed:

Fig. 263: Create new layer



The name of the layer is assigned automatically by CircuitPro PM.

Note

The first new layer is named "Topography". For the following layers, the name has a counter that is incremented thus creating "Topography_1", "Topography_2" etc.

- 2. Click on [Apply] in the dialog.
- ◆ The topography layer is created.

5.3.14 Drill hole

Use the function "Drill hole" to insert holes of different sizes into your layout.

Fig. 264: Example
for drilling holes



The drill hole sizes correspond to the diameters of the available drilling tools.

Note



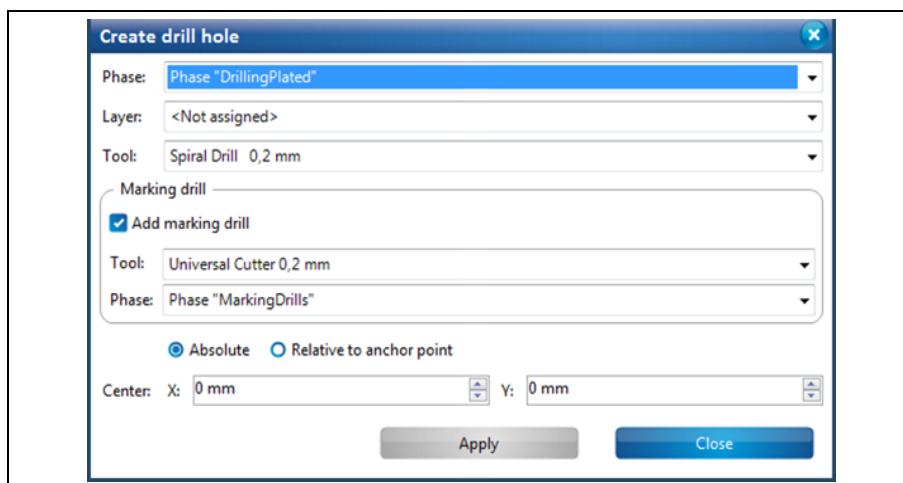
- Place the holes that will be used for through-hole contact on the layer "Drill Plated".
- Place all other holes on the layer "Drill Unplated".

Tip

■ Creating a drill hole

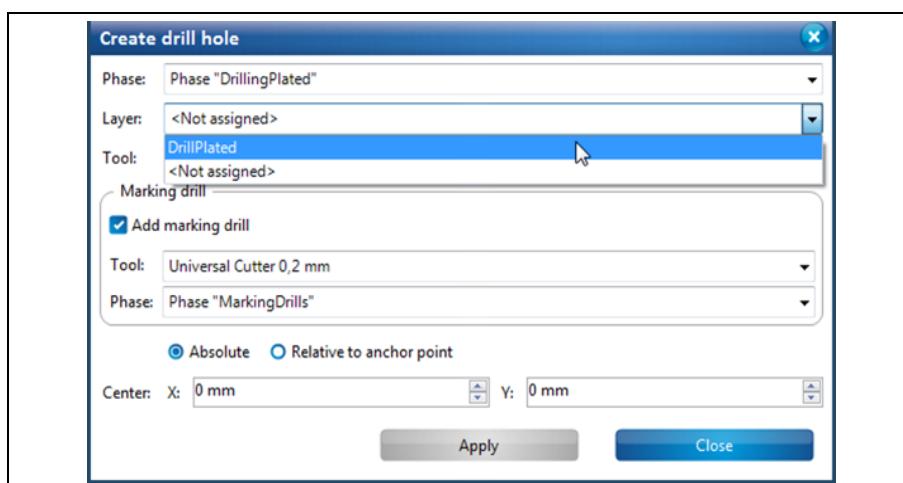
1. Click on Insert > Drill hole...
- The following dialog is displayed:

Fig. 265: Create drill hole



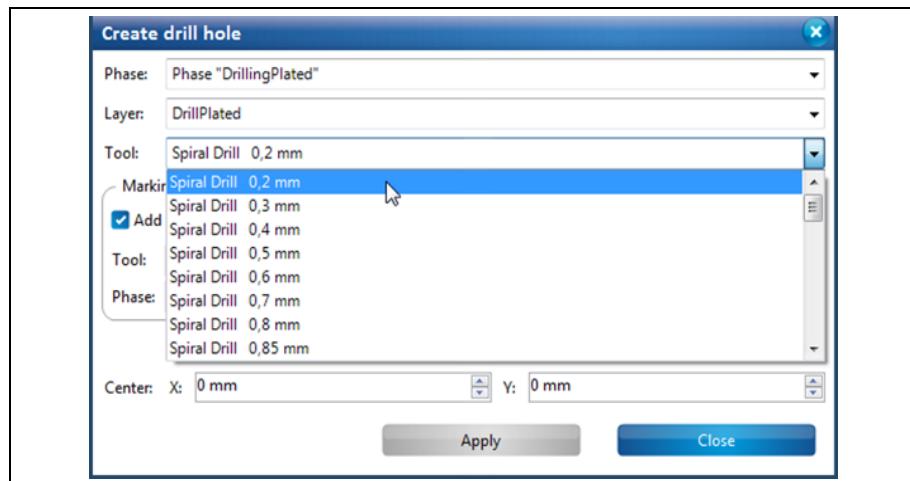
2. First select the phase in which the whole is to be drilled during processing.
3. In the drop-down menu \Layer\, select the layer in which the hole shall be drilled:

Fig. 266: Select layer



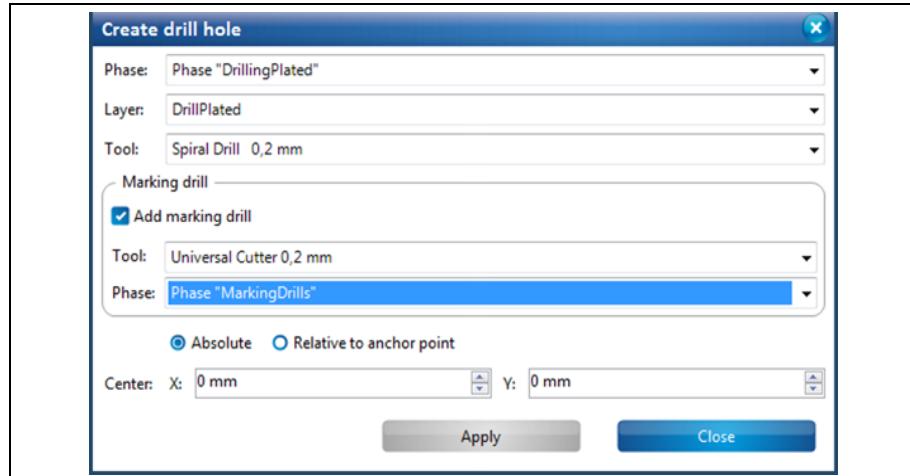
4. In the drop-down menu \Tool\, select the drilling tool which is to be used to drill the hole:

Fig. 267: Select tool



5. If you do not want to add marking drills, uncheck the option "Add marking drill" and continue with step 7.
 6. In the dropdown list select a tool and a phase, the marking drills should be generated within.

Fig. 268: Add marking drill



7. In the CAM view, click on where you would like to drill the hole.
 Or
 7. Enter the coordinates for the center point of the circle in mm and click on [Apply].



The hole diameters correspond to the diameters of the drilling tools.

Note

- ➔ The holes are positioned.
- 8. Click on [Close] in the dialog.
- ➔ The dialog is closed.
- ◆ The drill hole has been created.

5.3.15 Milling curve

Using the function “Milling curve” you can convert open/closed paths directly into milling curves or manually insert milling curves directly into the layout.



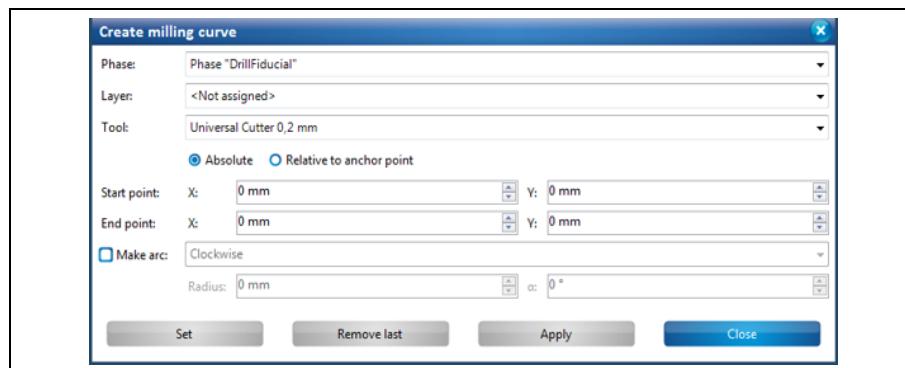
Note

The technology dialog, used to create toolpaths, does not convert paths directly into milling curves. Either isolation or contours are generated around the paths.

■ Creating a milling curve

1. Click on Insert > Milling curve...
- The following dialog is displayed:

Fig. 269: Create milling curve



2. First select a phase in the field \Phase\, in which the milling curve is to be created during processing.
3. Select the layer in the field \Layer\, on which the milling curve is to be created.
4. Select a tool in the field \Tool\, with which the milling curve is to be created.
5. Select either an absolute or a relative starting point by clicking on the corresponding setting.



Note

The **absolute start point** is computed using the X and Y coordinates starting from the zero point .

If you want to create more than one open path you can make all paths start from the same starting point using the “Absolute” start point option.

The **relative start point** is variable. Once you have created a segment, the relative start point moves automatically to the end of this segment to serve as start point for the next segment to be created.



Note

For more information on creating paths, please refer to the relevant chapters “Open path” and “Closed path”.

6. Enter the X and Y value of the starting point in mm.
7. Activate the radio button “Arc” if you want to create an arc.

8. Enter the radius and the angle of the arc.
 - Or
 8. Enter the X and Y coordinates of the segment.
 9. Click on [Apply].
- ◆ The milling curve has been created.



Tip

Procedure without entering X and Y values:

You can also create segments in CircuitPro PM without entering coordinates. You can just use the mouse pointer.

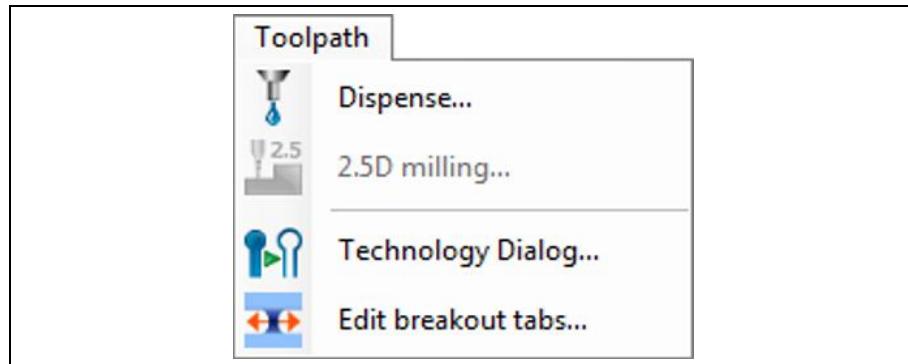
1. Press the left mouse button at the desired start point of the segment in the CAM view.
 2. Move the mouse pointer to the desired position in the CAM view.
 3. Press the left mouse button.
→ The segment is created.
- A left-click corresponds to clicking the [Set] button in the dialog.
 - Pressing the right mouse button opens the context menu and you can finish creating the path by clicking on "End". This corresponds to clicking on [Apply] in the dialog.
-

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. 270: Menu “Toolpath”



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

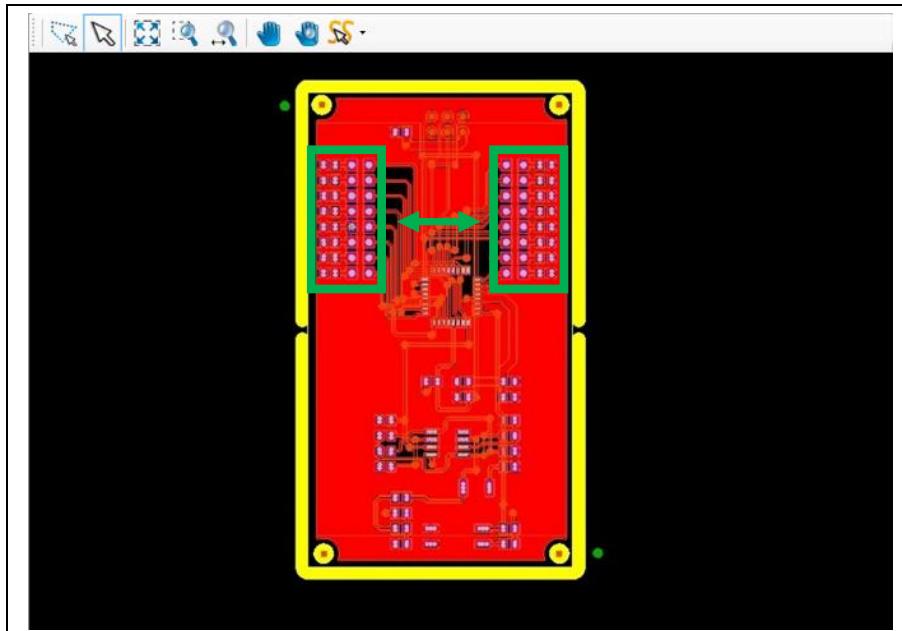
**Table 33:
“Toolpath” menu functions**

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

5.4.1 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. 271:Dispense paths created on pads



Note

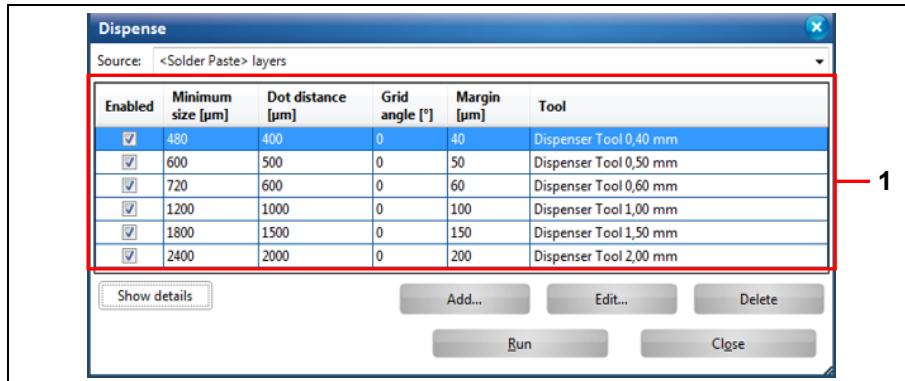
The dispenser has to be mounted on the machine in order to create solder paste dots on the circuit board!

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 dispense tools [Delete].

- Creating a new solder paste path on the pads
- 1. Click on Toolpath > Dispense.
- ⇒ The following dialog is displayed:

Fig. 272:
Dispense



/1/ List of the available dispense tools

The table contains following columns:

Table 34:
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.



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

Tip

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

**Note**

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

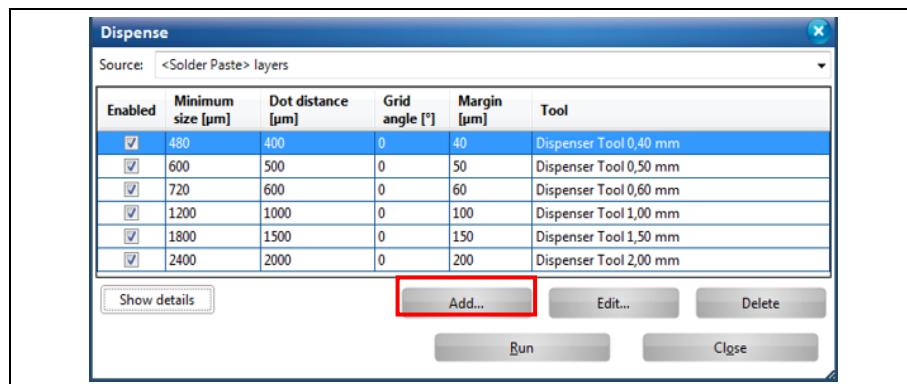
Several tools can be used for creating the solder paste paths.

4. Click on [Run].
 5. Click on [Close].
- ◆ The solder paste path is created on the corresponding pads.

■ Adding new parameter sets for existing tools

1. Click on [Add...] in the dialog.

Fig. 273: Adding solder paste path parameters



➔ The following dialog is displayed:

Fig. 274: Pad size parameters



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

**Note**

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

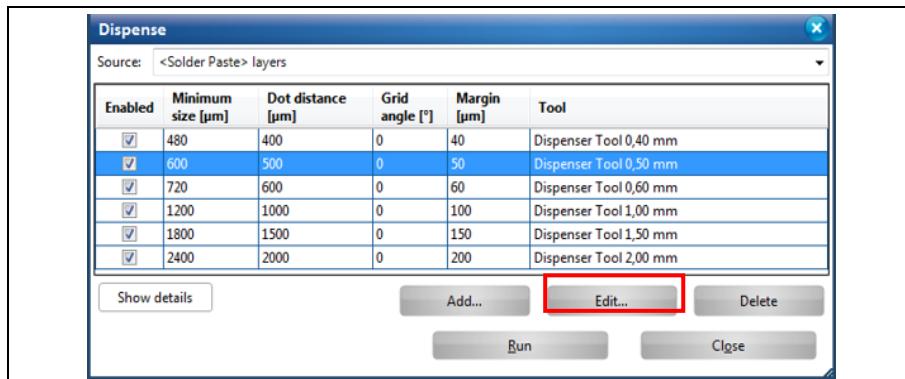
For more information on adding tools to the tool library see the corresponding chapter.

4. Enter the dot distance between the individual solder paste dots in µm.
 5. Enter a grid angle if necessary.
 6. Enter the margin width.
 7. 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

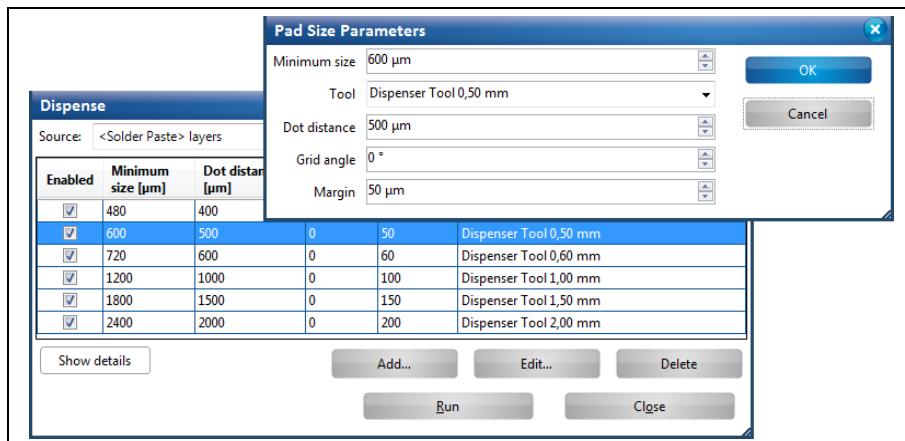
1. Select the row where you want to edit the parameters and click on [Edit...].

Fig. 275: Editing pad size parameters



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

Fig. 276: Pad size parameters



2. Modify the parameters as desired.

3. Click on [OK].

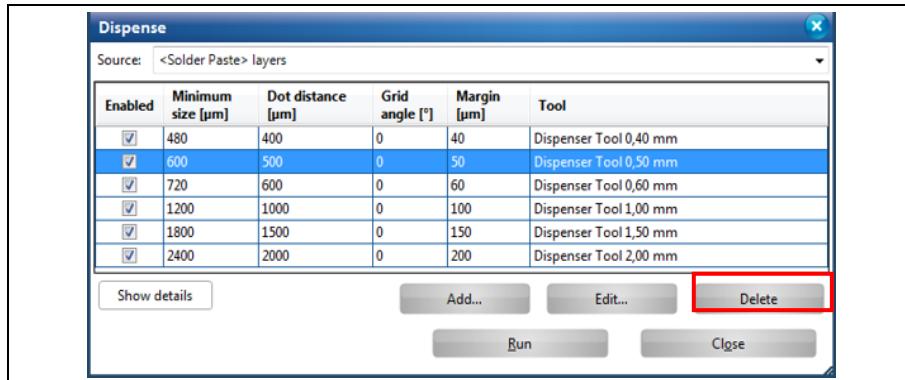
→ The dialog “Pad size parameters” is closed.

◆ 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. 277: Deleting pad size parameters

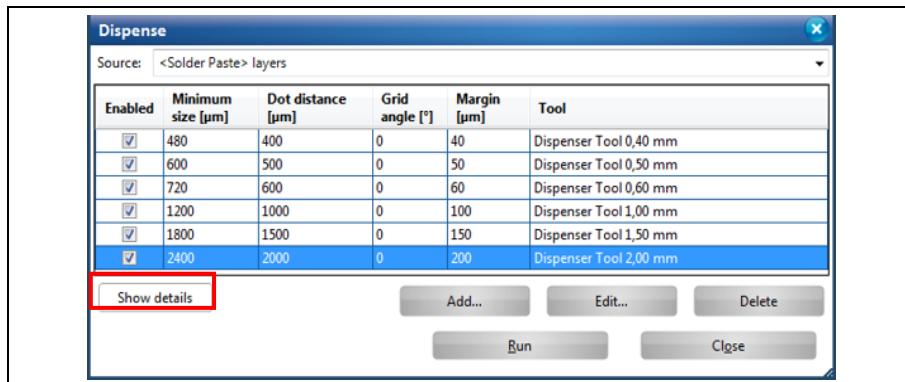


◆ The selected row of existing pad size parameters is deleted.

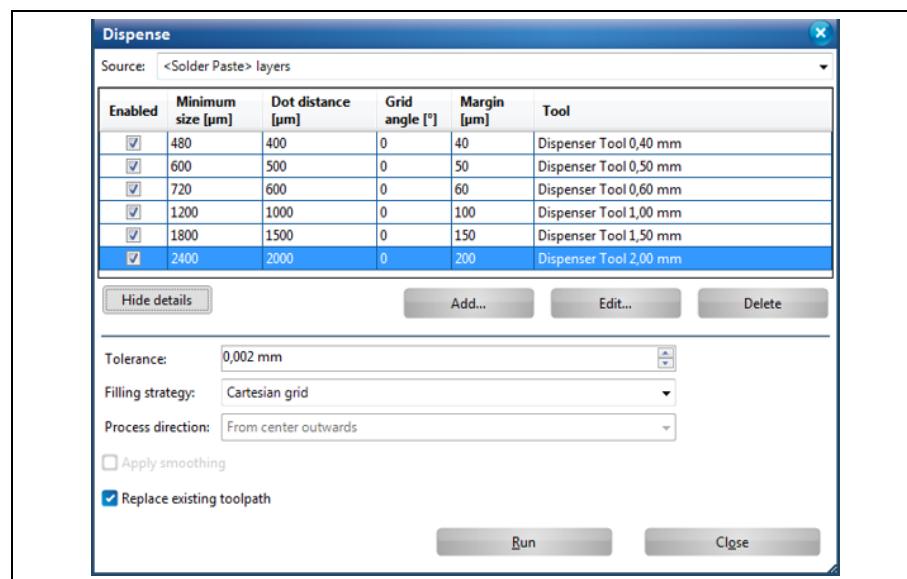
■ Showing details

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

Fig. 278: Show details



→ The view changes as follows:

Fig. 279: Details


The following global settings are possible:

Table 35: Global settings

Function	Description
Tolerance [mm]	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 [Run].

→ 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.

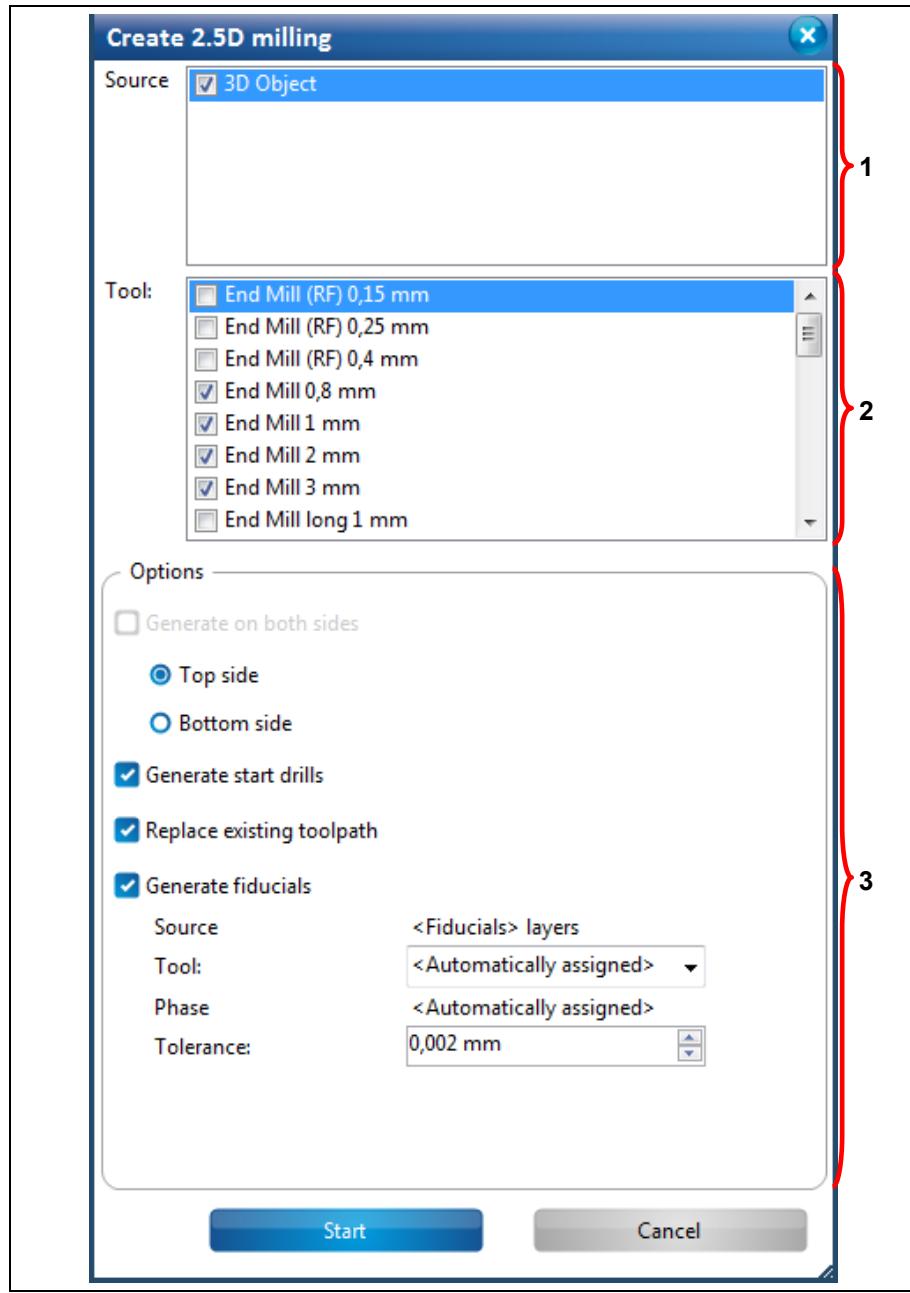
5.4.2 Create 2.5D milling

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 PM 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 displayed:

Fig. 280: Create 2.5D milling



/1/ Source

/3/ Options

/2/ Tool

The sections contain following information/options:

Table 36: 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 toolpath	Here you can specify if already existing toolpaths should be replaced.
Generate fiducials	Here you can specify if fiducials should be generated for the toolpaths. Source: Indicates the layer where the fiducials should be generated. Tool: Indicates the tool that should generate the fiducials. Phase: Indicates the phase where the fiducial should be generated. Tolerance: Indicates the tolerance that is used to calculate or check the position and the distances of the toolpaths.

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.



Note

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

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

5.4.3 Technology Dialog

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

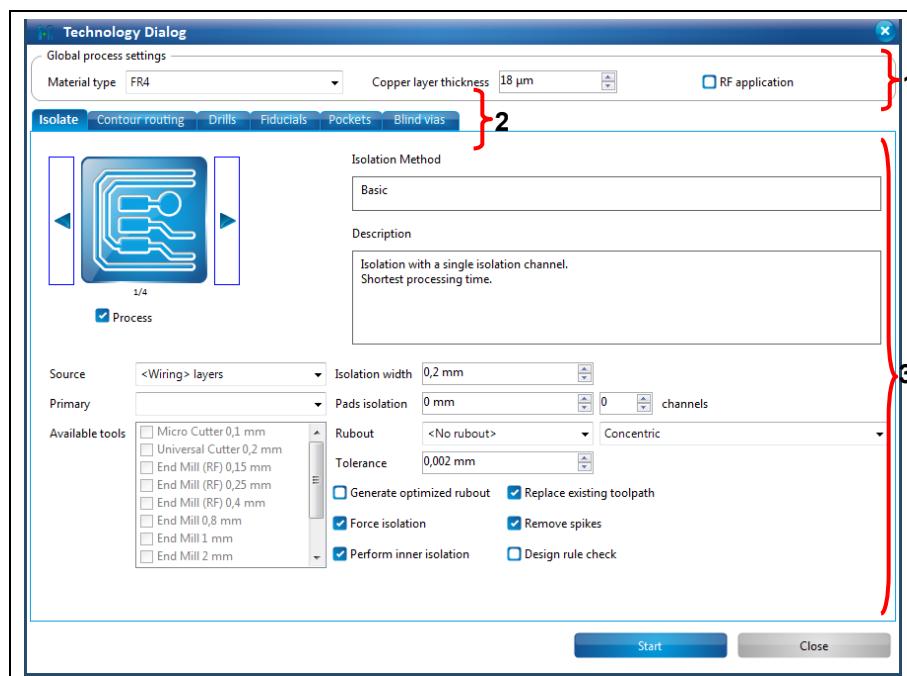
- Isolate
- Contour routing
- Drilling holes
- Drilling fiducials
- Milling pockets
- Blind Vias

■ Creating toolpaths

1. Click on Toolpath > Technology Dialog.

→ The following dialog is displayed:

Fig. 281:
Technology
Dialog



/1/ Global material and processing
settings

/2/ Tabs for further processing steps

/3/ Options

2. Select your material type in the corresponding drop-down list.
3. If your project is a radio frequency application, activate the corresponding check box <RF application>.



Note

If you process the project with the enabled option “RF application” the penetration depth of the cutter is optimized and the Universal Cutter is replaced by the End Mill (RF).

4. Activate the functions with check marks:

Isolate

The “Isolate” section offers four different isolation methods:

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

Fig. 282: Isolate

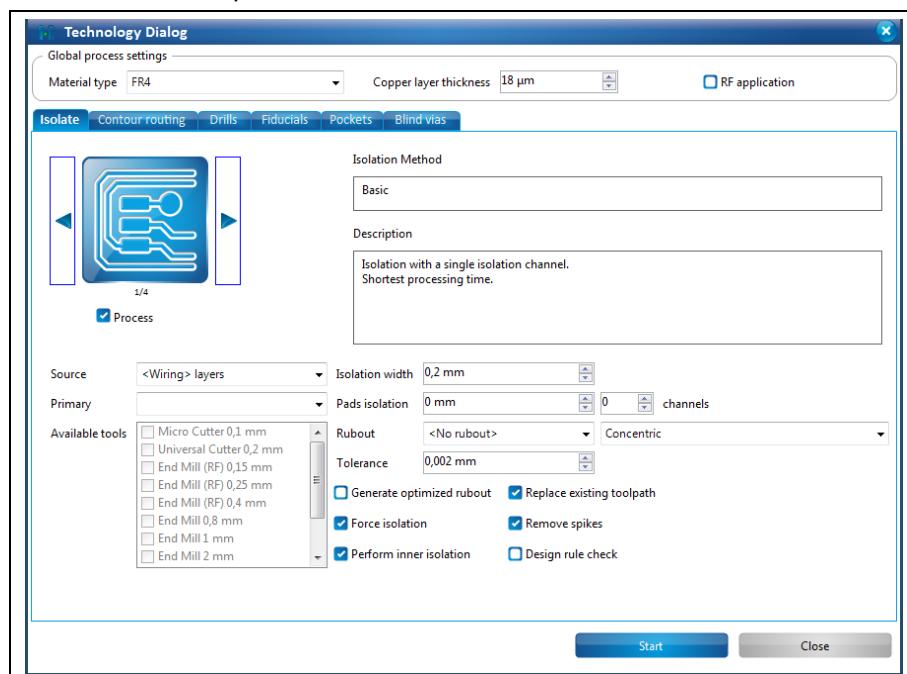


Table 37: Isolate

Function	Description
Source	Defines the layers where the isolation will be created.
Primary	Shows the tool that is used as primary tool for the isolation process.
Available tools	This list contains the tools that are used as default for creating the individual toolpaths.
Isolation width	Defines the width of the isolation channel in mm.
Pads isolation	Defines the width of the pads isolation if an isolation method with an extra pads isolation is selected.
channels	Defines the number of additional isolations.
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.
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 isolation	Creates isolation paths for each individual isolation object. This guarantees isolation of every object even if the distance between two objects is smaller than the tool diameter.
Perform inner isolation	Defines for closed paths whether the inner contour is to be isolated 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. 283: Contour Routing

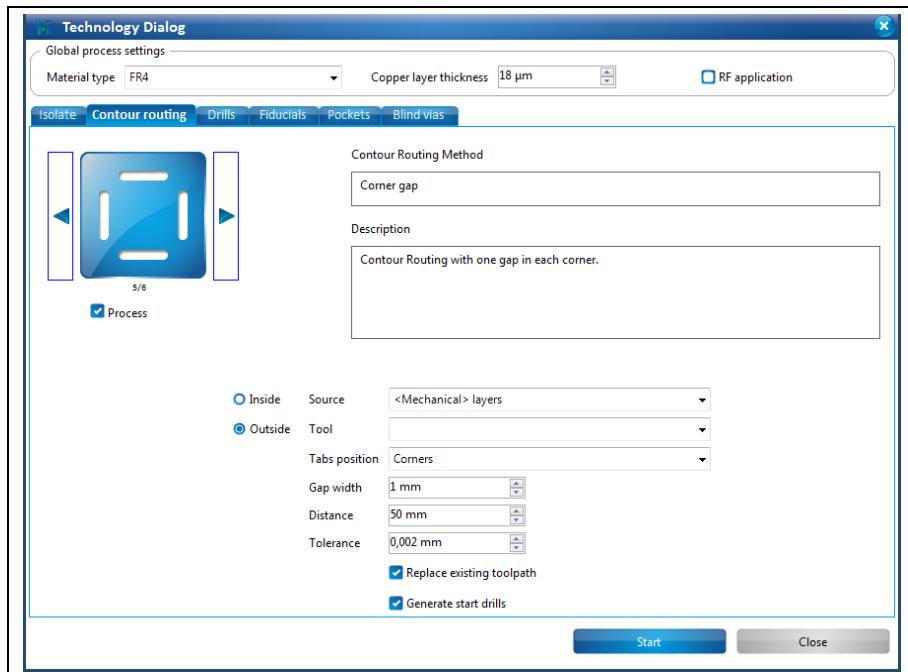


Table 38: Contour Routing

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.
Generate start drills	This option ensures that contour routing always starts with generating a start drill.

Drills

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

Fig. 284: Drills

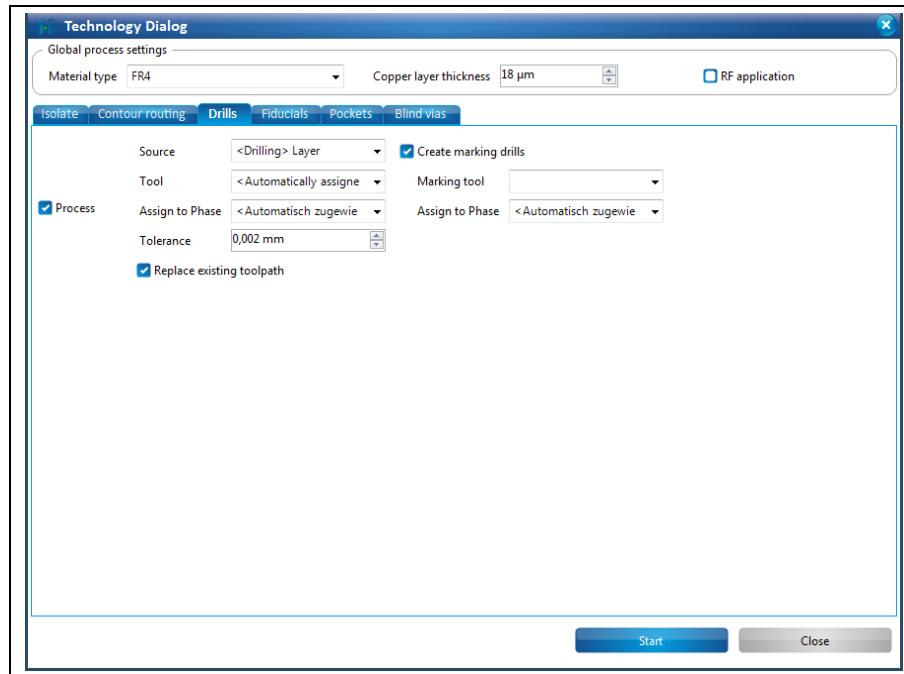


Table 39: Drills

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.
Assign to 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. 285:
Fiducials

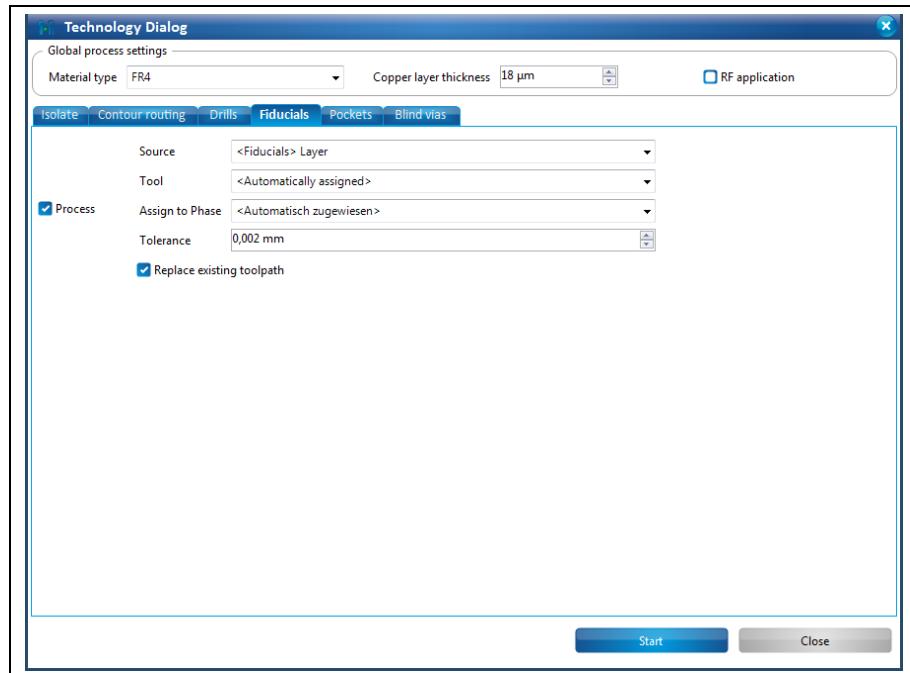


Table 40:
Fiducials

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. 286: Pockets

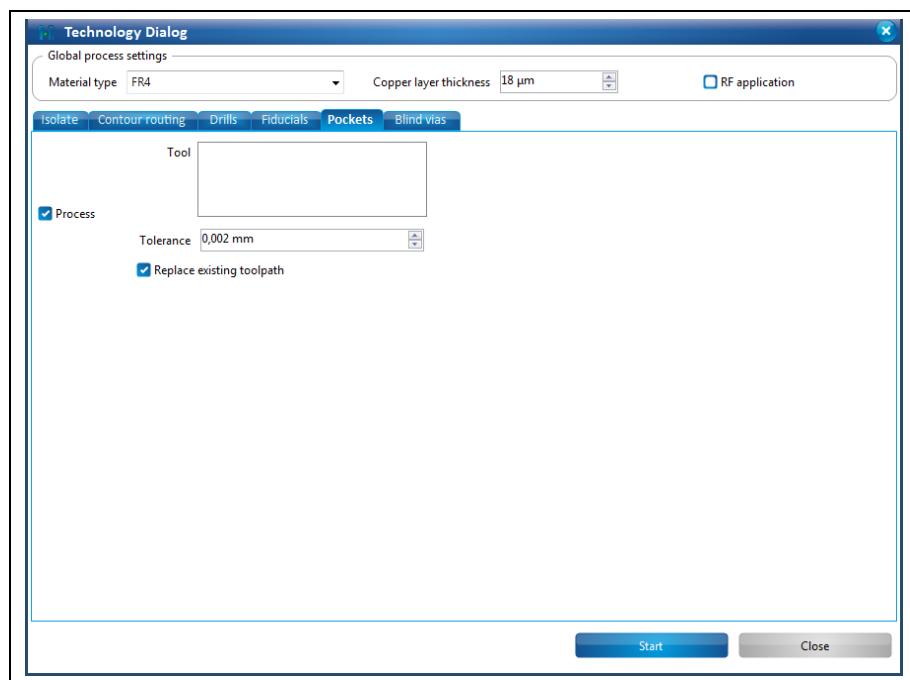


Table 41: Pockets

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.

Blind vias

The function “Blind vias” creates the toolpaths for blind vias in the PCB.

Fig. 287: Blind vias

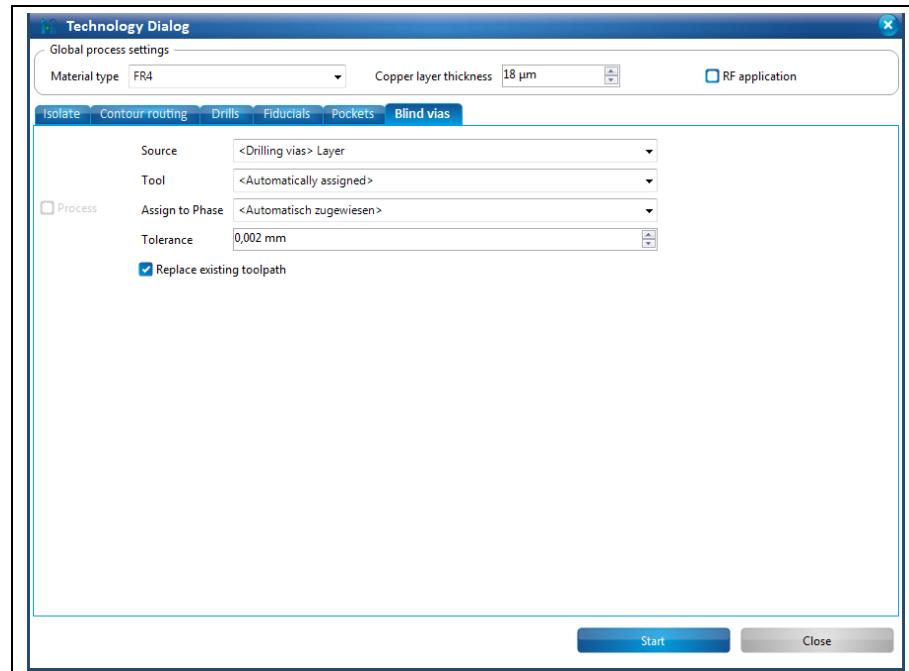
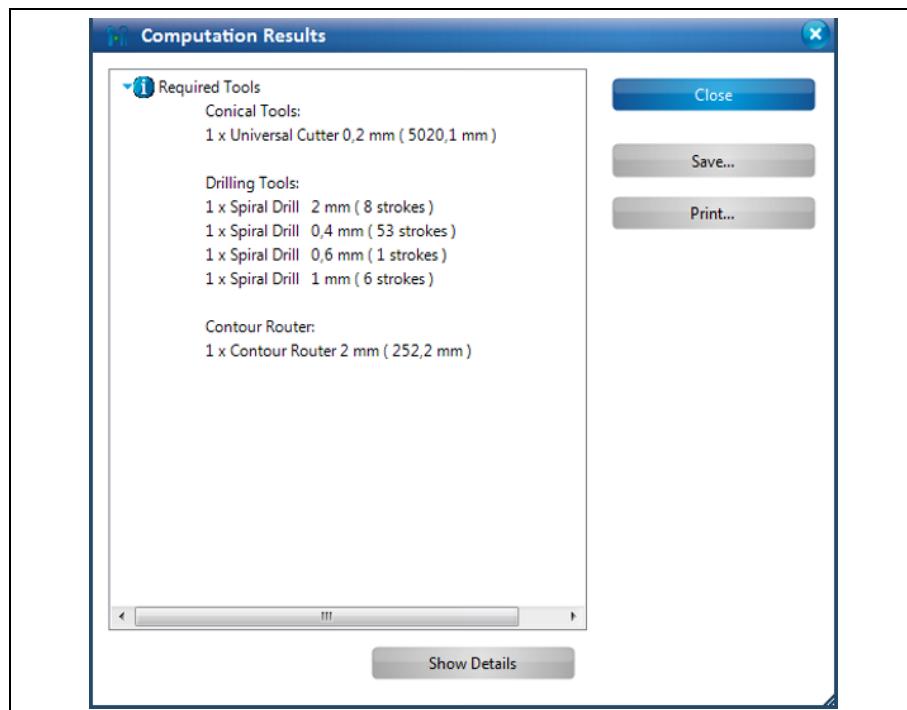


Table 42: Blind vias

Function	Description
Source	Defines the layer where the blind vias are created.
Tool	Defines the tool that is used for the blind vias.
Assign to phase	Defines the phase where the blind vias are created.
Tolerance	Defines the tolerance that is used for computing or checking the position and spacing of the toolpaths.

5. Click on [Start].
→ The following message is displayed:

Fig. 288:
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.

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

5.4.4 Edit breakout tabs

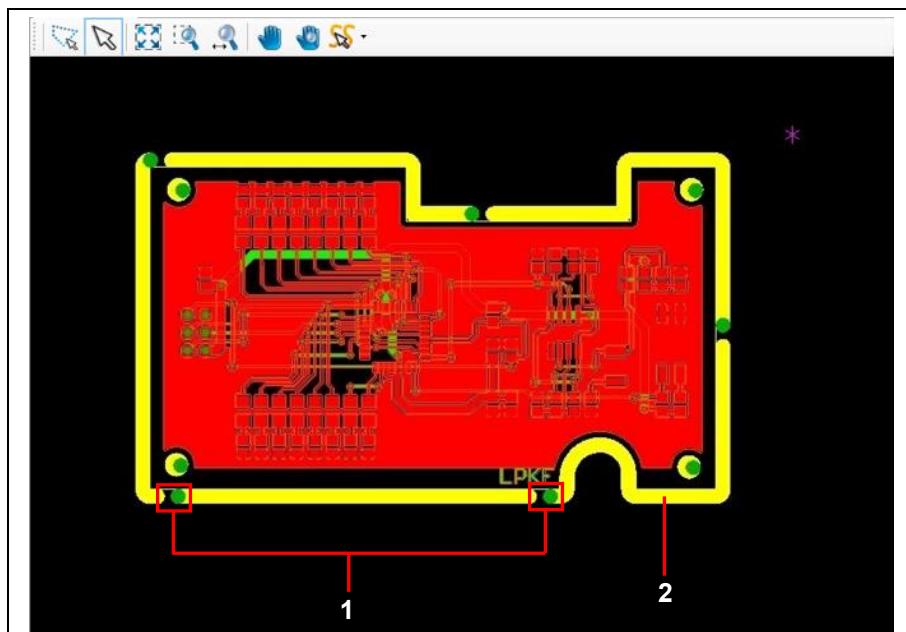
This function lets you modify the breakout tab positions in the contour-routing toolpath.

The circuit board milled through the whole material thickness during contour routing. When creating the toolpath, you can define tabs that keep the circuit board initially fixed to the material.

The dialog “Edit breakout tabs position” lets you

- edit,
- add or
- remove the positions of the tabs.

Fig. 289:
Contours of the
circuit board



/1/ Positions of the breakout tabs

/2/ Contours



The contours have to be already created in order to use this function.

Note

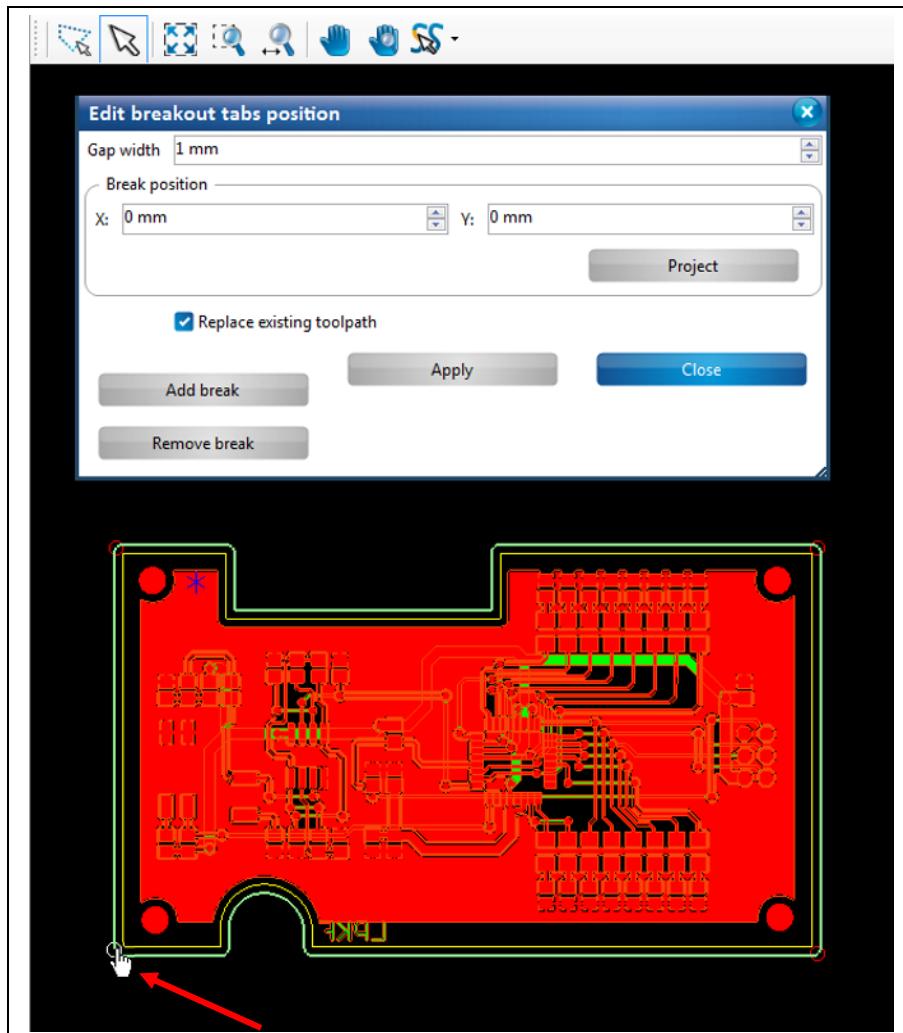


Ensure that the “Replace existing toolpath” check box is checked so that your changes are stored.

Note

- Editing a breakout tab position
- 1. Click on Toolpath > Edit breakout tabs...
- ➔ The display of the contours in the CAM view changes and the following dialog is displayed:

Fig. 290: Edit breakout tabs position

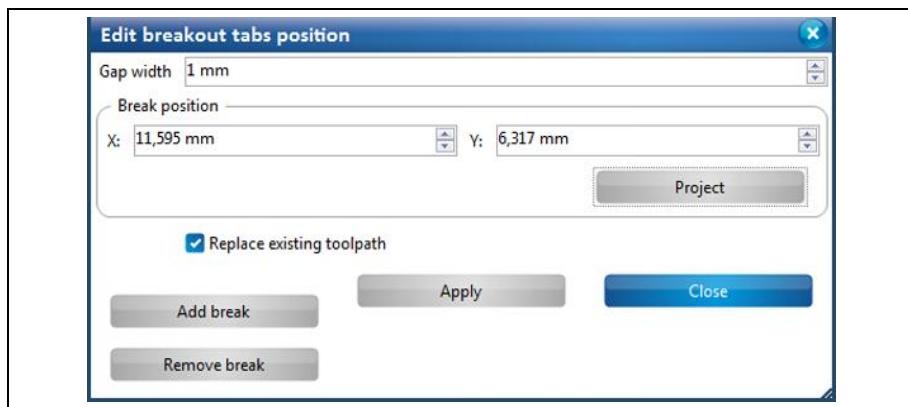


The circles on the contour lines in the CAM view represent the current positions of the breakout tabs.

2. Enter the gap width in mm.
3. Move the mouse pointer to the desired breakout tab position.
- ➔ The mouse pointer changes into a hand symbol.
4. While pressing the left mouse button, drag the circle to the position where you want to place the breakout tab.

⇒ The X and Y values of the breakout tab position change accordingly:

Fig. 291: X- and Y-values changed

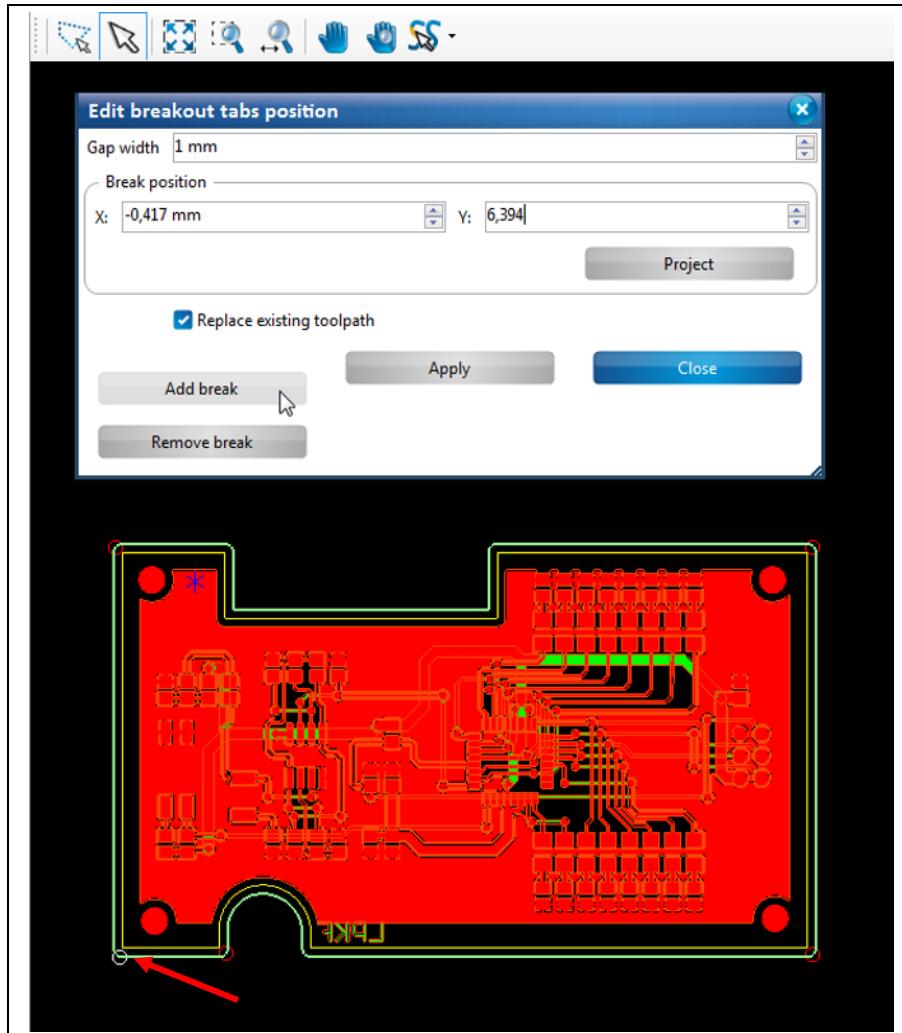


5. Release the left mouse button at the desired position.
- ⇒ The position of the breakout tab is changed.
6. Click on [Apply].
7. Click on [Close].
- ⇒ The dialog is closed.
- ◆ The breakout tab position is changed.

■ Adding a breakout tab

1. Click on [Add break] in the dialog:

Fig. 292: Add a breakout tab



➔ A new breakout tab (circle) is created.

**Note**

New breakout tabs are always created at the same position and must be moved to the desired position manually using the mouse.

2. Enter the gap width in mm.
3. Drag the circle with the mouse to the desired position.
4. Click on [Apply].
5. Click on [Close].

➔ The dialog is closed.

◆ A new breakout tab is created.

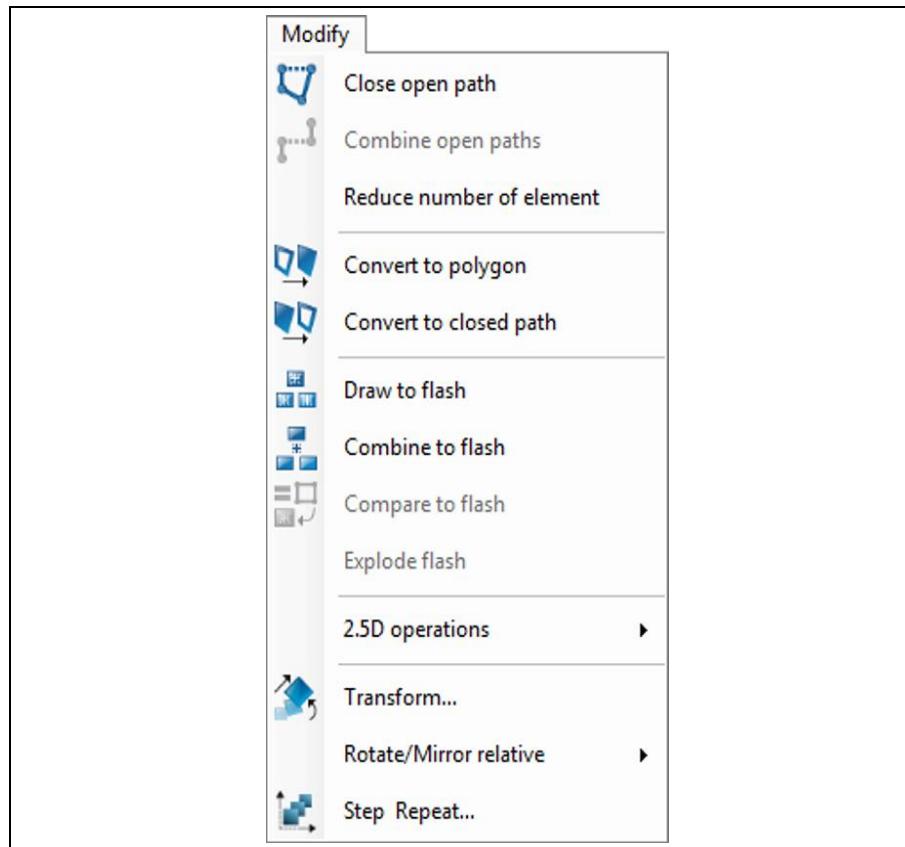
- Removing a breakout tab position
 - 1. Select the circle at the desired breakout tab position.
 - 2. Click on [Remove break].
 - ➔ The selected breakout tab is removed.
 - 3. Click on [Apply].
 - 4. Click on [Close].
 - ➔ The dialog is closed.
 - ◆ The breakout tab position is removed.

5.5 Menu Modify

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

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

Fig. 293: Menu “Modify”



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

**Table 43:
“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.
Reduce number of element	Reduces the number of elements for opened and closed paths and polygons.
Convert to polygon	Converts a closed path into a polygon.
Convert to closed 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 flash object.
Explode flash	Explodes complex flash objects into individual geometric forms.

Table 43:
“Modify” menu
functions

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

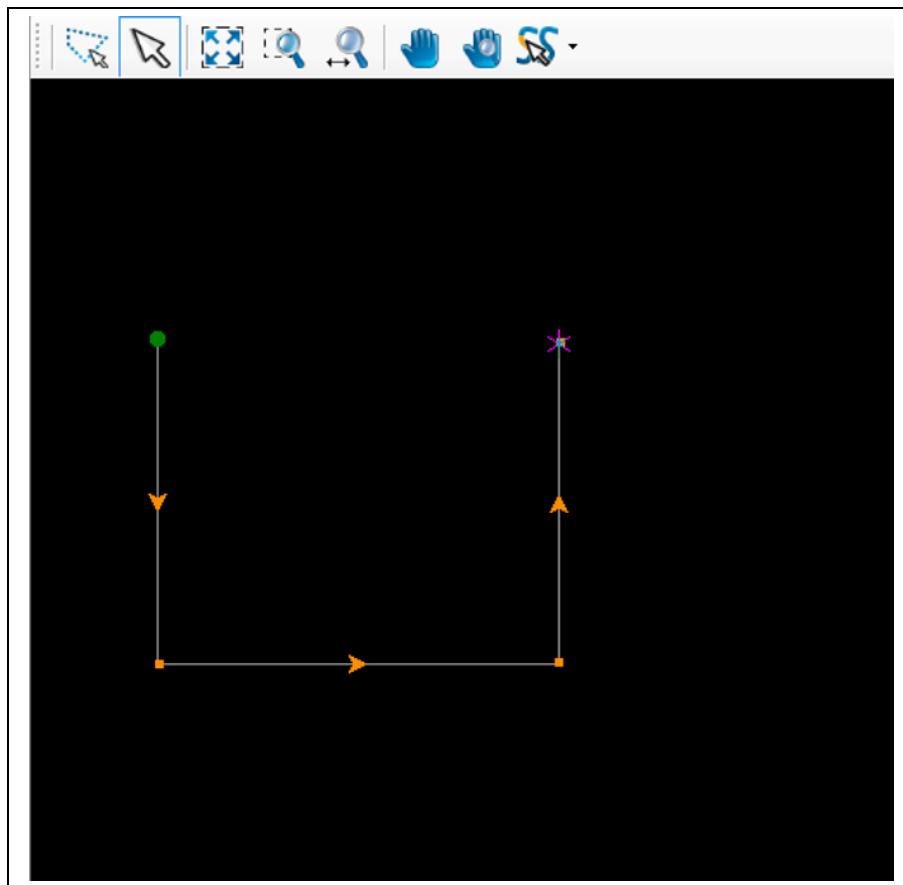
5.5.1 Close open path

Use the function “Close open path” to convert open paths into closed paths.

■ Closing an open path

1. Select the open path in the CAM view:

Fig. 294:Selecting an open path

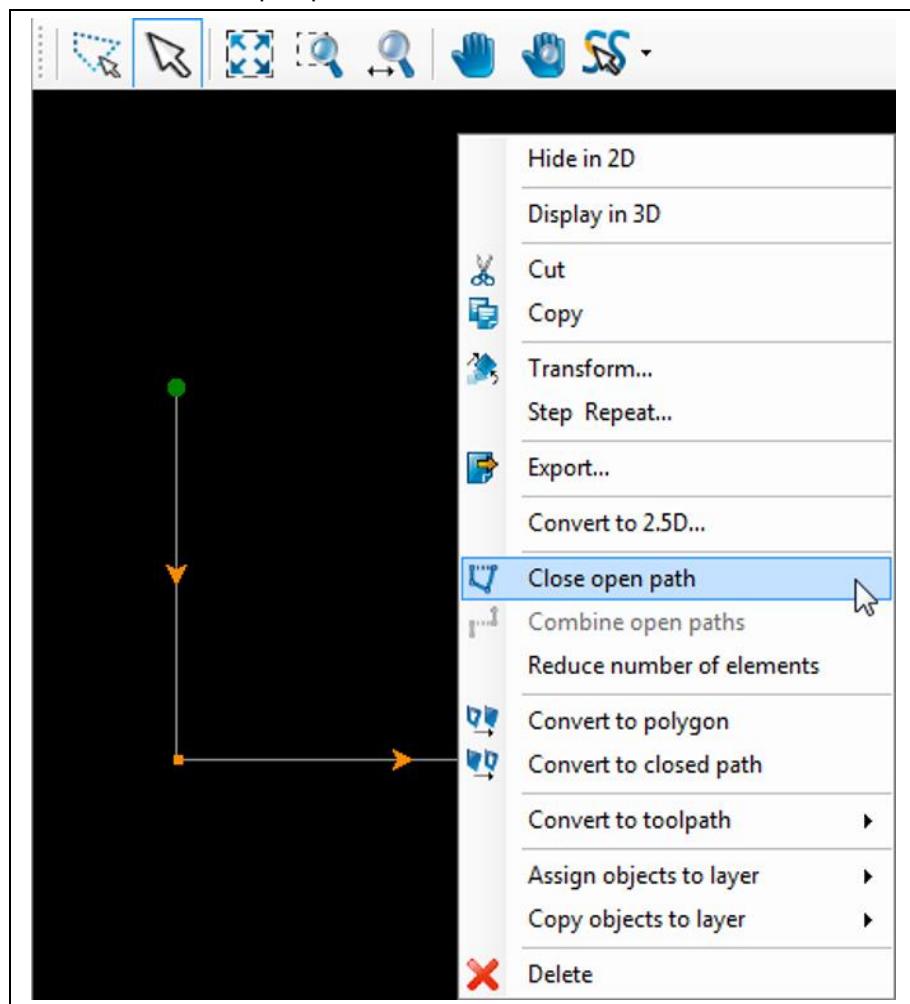


2. Click on Modify > Close open path.

Or

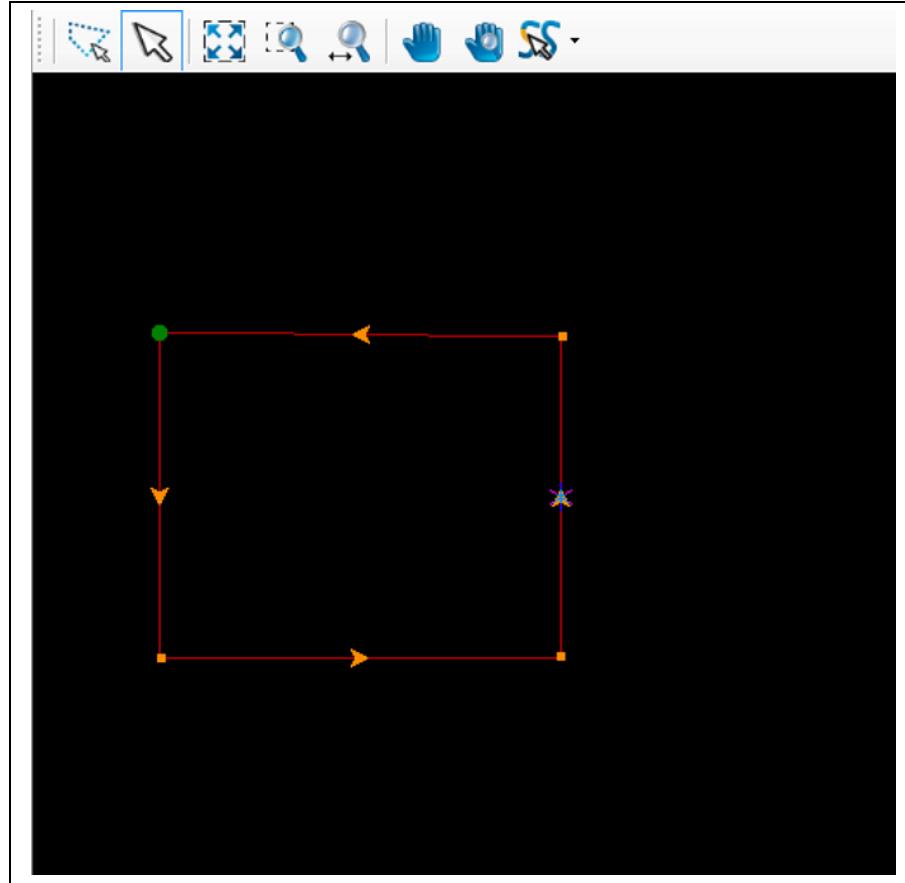
2. Click on "Close open path" in the context menu:

Fig. 295: Close open path



→ The open path is closed:

Fig. 296: Closed path



◆ The open path has been closed.

5.5.2 Combine open path

The function “Combine open paths” lets you combine two or more open paths into one open path.



Please note that the distance between the open paths must not be larger than the tolerance value set in the options.

Note

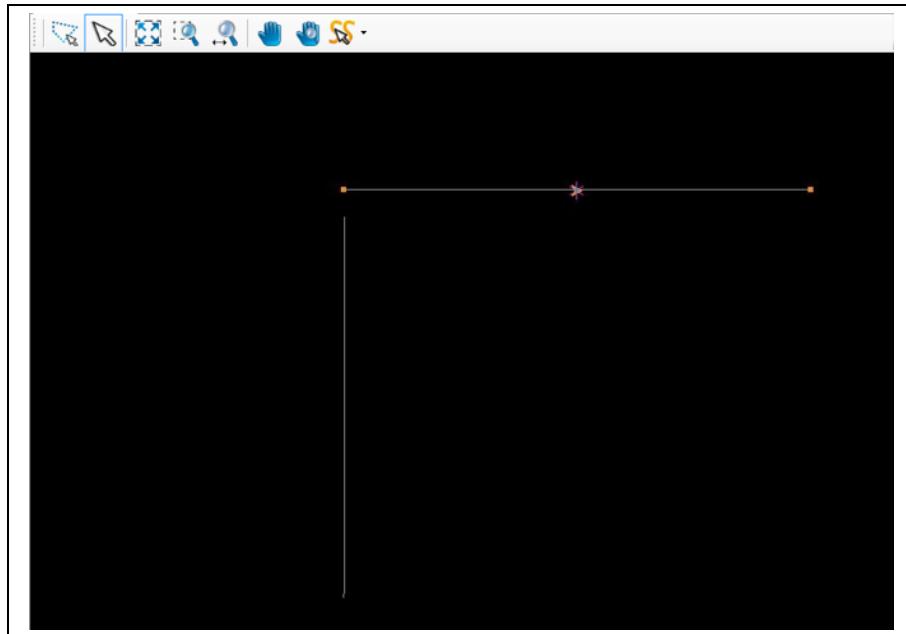
You can find the tolerance value in the branch “Miscellaneous” in the “Options” dialog (menu item Extras > Options).

If the distance is larger than the tolerance value, the open paths will **not** be combined!

■ Combining open paths

1. Select at least two open paths in the CAM view:

Fig. 297:Selecting open paths

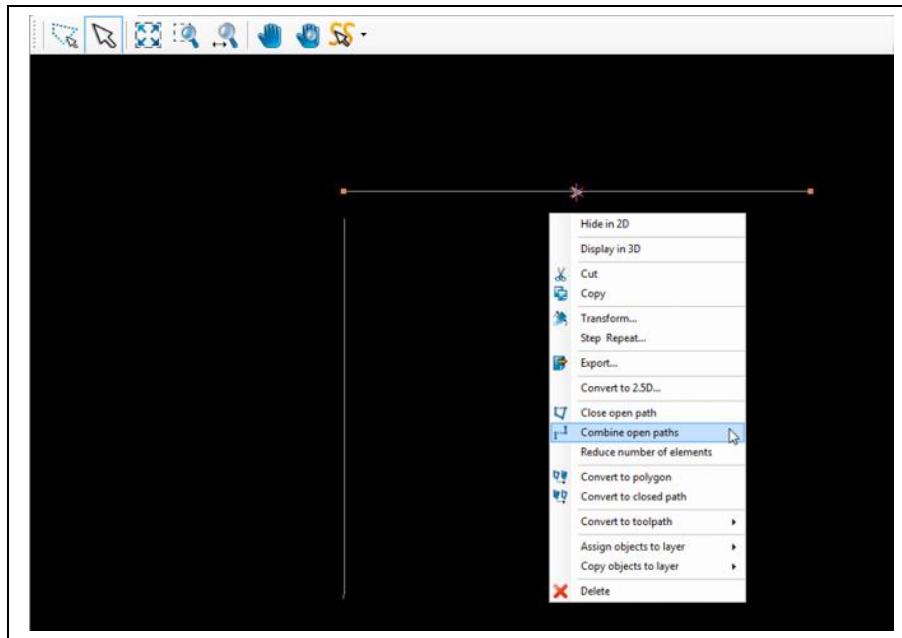


2. Click on Modify > Combine open paths.

Or

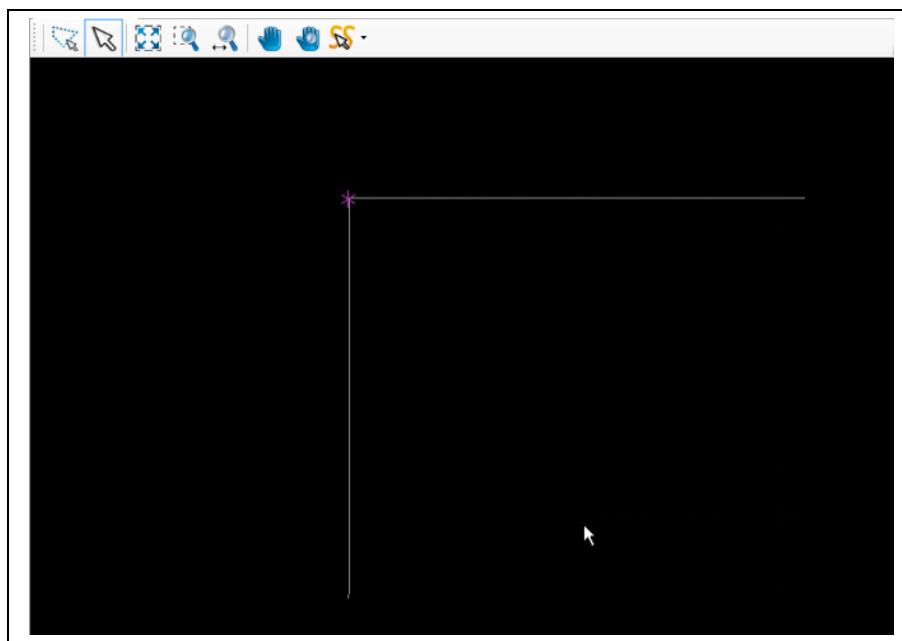
2. Click on “Combine open paths” in the context menu.

Fig. 298:
Combining open
paths



→ The two open paths are combined:

Fig. 299: Closed
path



◆ The open paths have been combined.

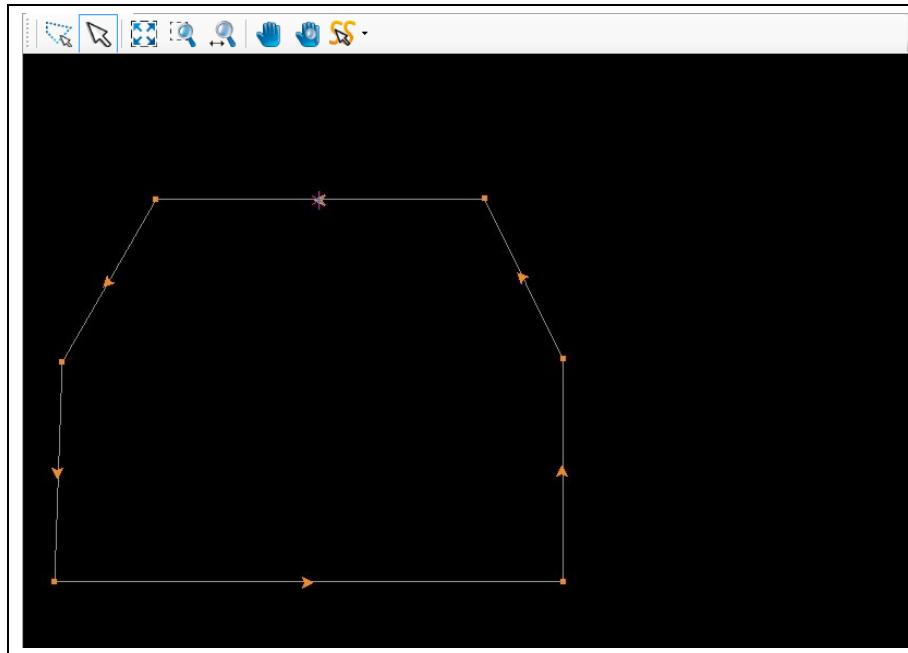
5.5.3 Convert to polygon

Use the function “Convert to polygon” to convert closed paths into polygon areas.

■ Converting to polygon

1. Select the closed path in the CAM view:

Fig. 300:
Selecting the
closed path

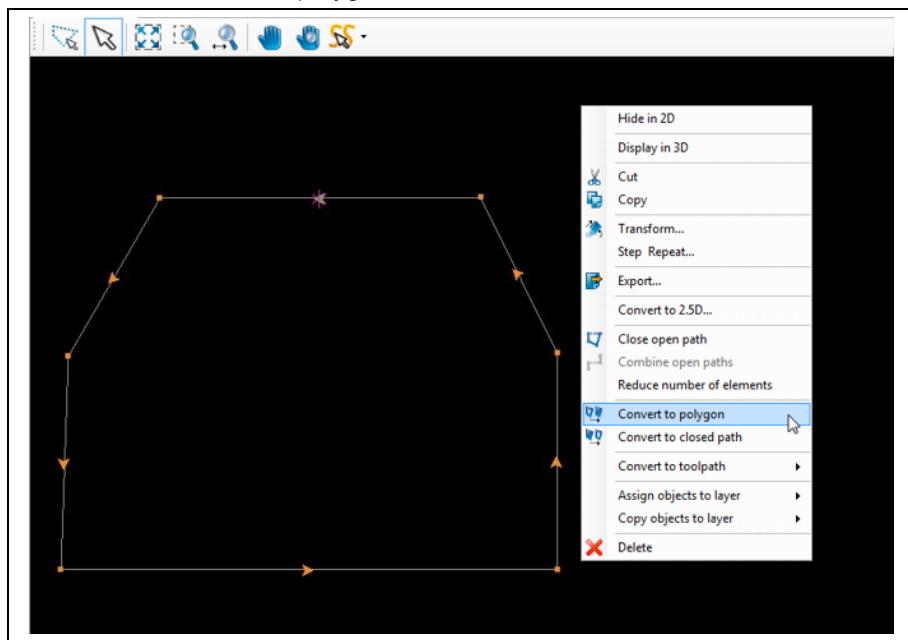


2. Click on Modify > Convert to polygon.

Or

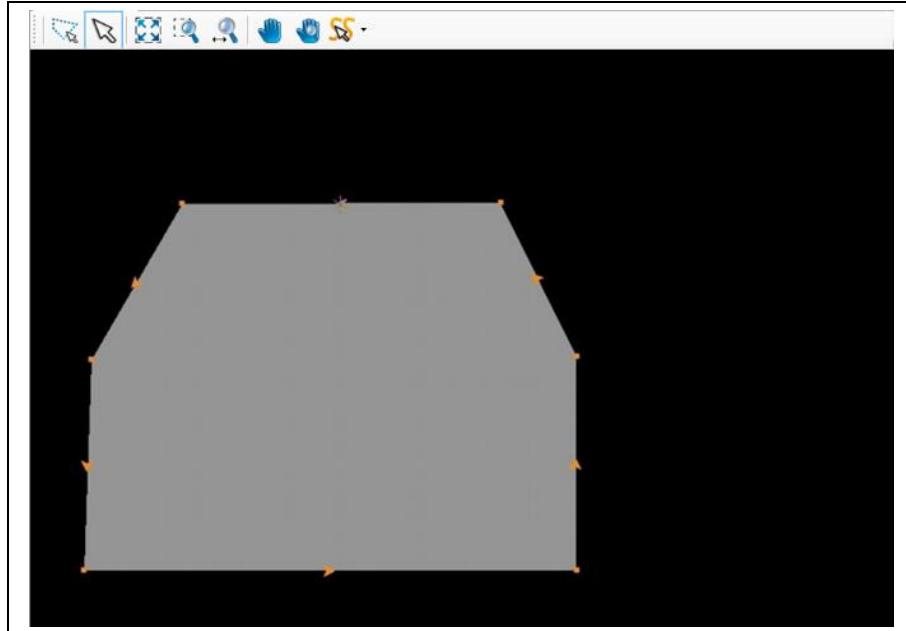
2. Click on “Convert to polygon” in the context menu.

Fig. 301: Convert
to polygon



→ The closed path is converted into a polygon:

Fig. 302: Polygon



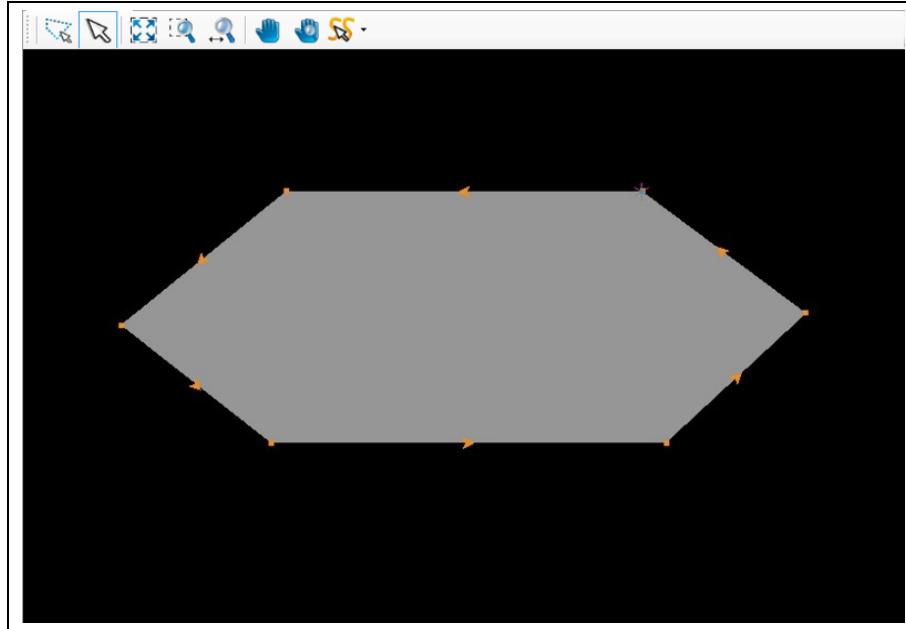
◆ The closed path has been converted into a polygon.

5.5.4 Convert to closed path

Use the function “Convert to closed path” to convert polygons into closed paths.

- Converting into a closed path
- 1. Select the polygon in the CAM view:

Fig. 303: Select polygon

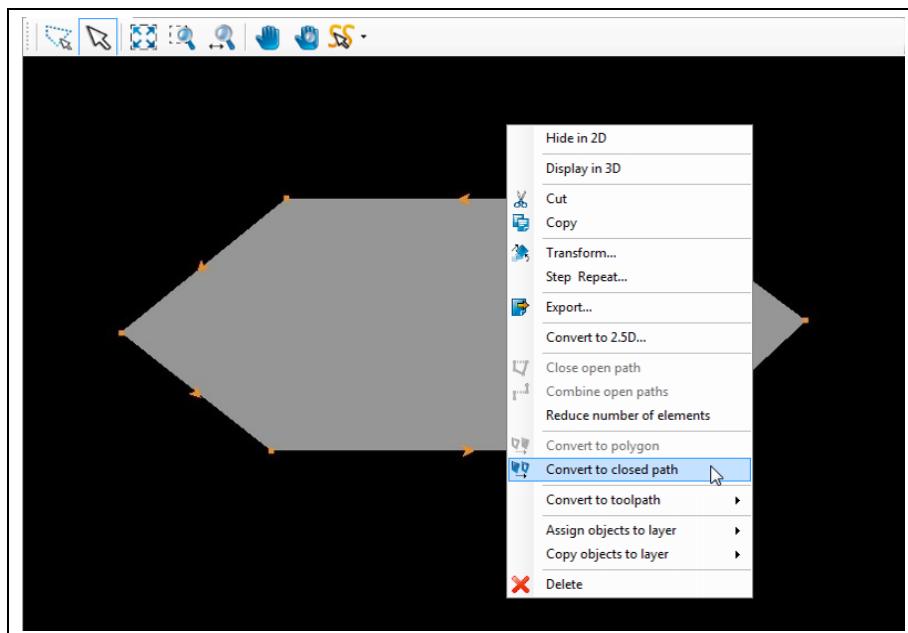


2. Click on Modify > Convert to closed path.

Or

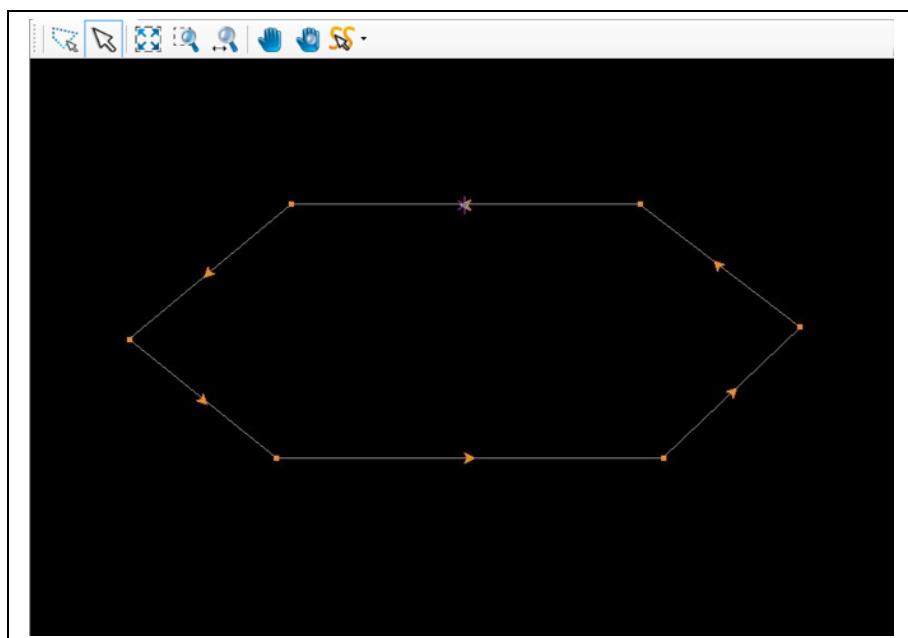
2. Click on “Convert to closed path” in the context menu.

Fig. 304: Convert to closed path



- ➔ The polygon is converted into a closed path:

Fig. 305: Closed path



- ◆ The polygon has been converted into a closed path.

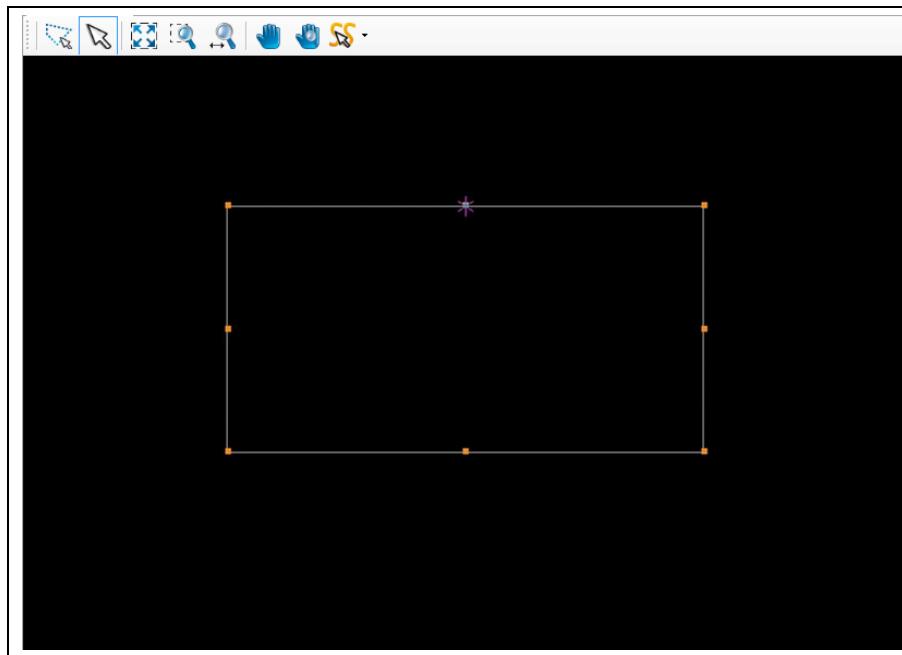
5.5.5 Draw to flash

Use “Draw to flash” to convert drawn objects (circles, circle paths, rectangles etc) into flash objects.

■ Converting a rectangle into a flash object

1. Select the rectangle in the CAM view:

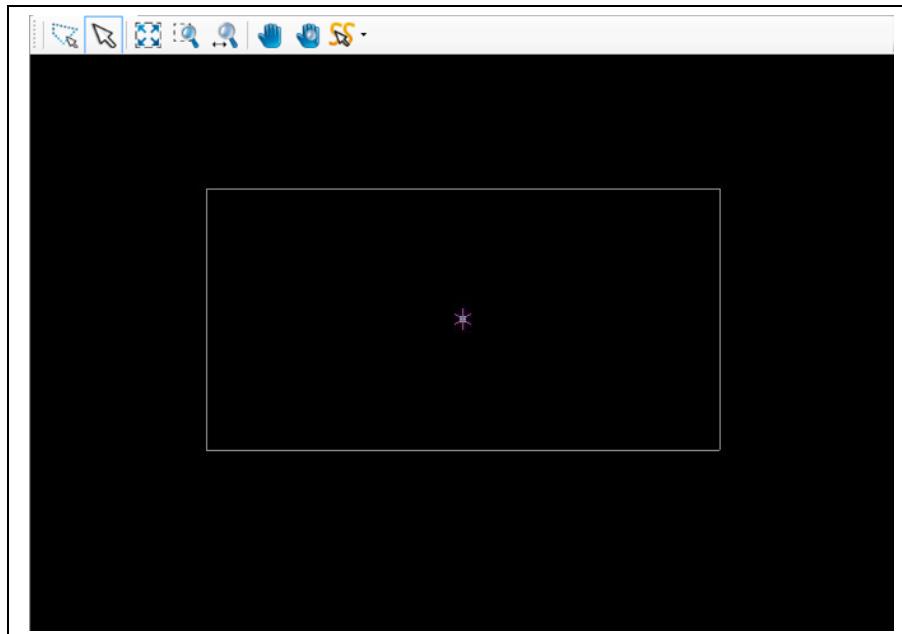
Fig. 306: Select rectangle



2. Click on Modify > Draw to flash.

➔ The rectangle is converted into a flash object. In addition, an aperture is created that is displayed in the “Geometry” pane.

Fig. 307: Flashed rectangle





Tip

You can see that an object is flashed by the defined center point of the object that is displayed after flashing.

The object type in the “Properties” pane is also changed to “Flash/Drill”.

- ◆ The rectangle is converted into a flash object.

5.5.6 Combine to flash

The function “Combine to flash” lets you combine two or more drawn objects to one flash object.

- Combining drawn objects to a flash object

1. Select the objects in the CAM view:

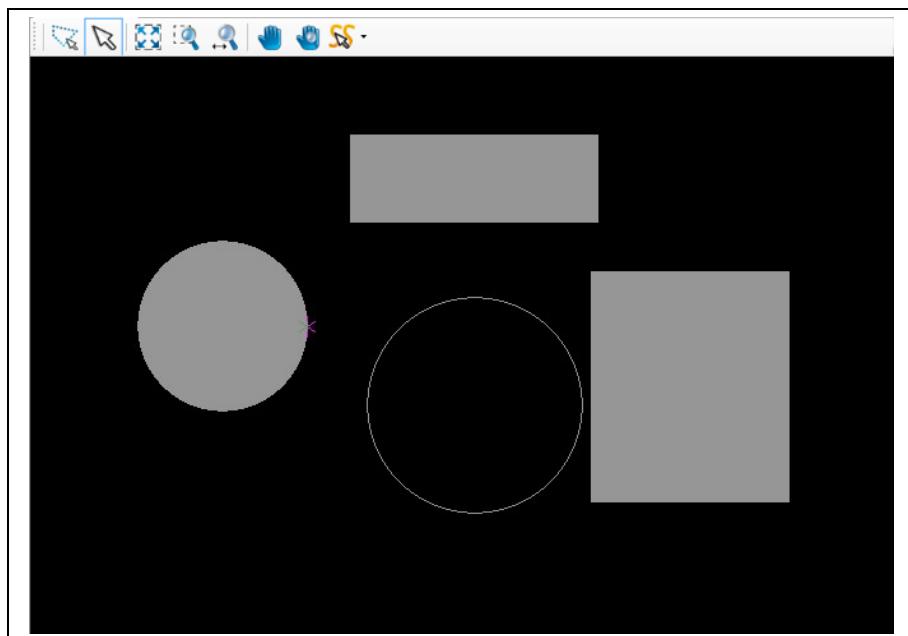


Note

The objects do **not** have to be on the same layer.

The flashed object is placed on the layer of the object drawn last.

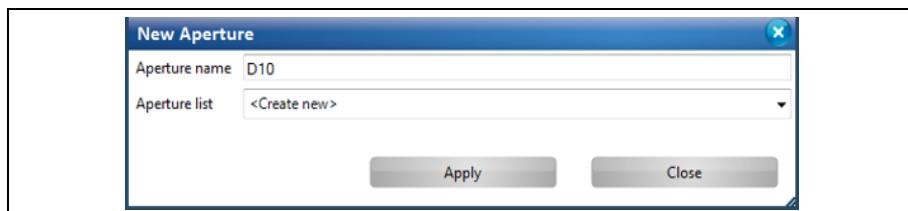
Fig. 308: Selected objects



2. Click on Modify > Combine to flash.

⇒ The following dialog is displayed:

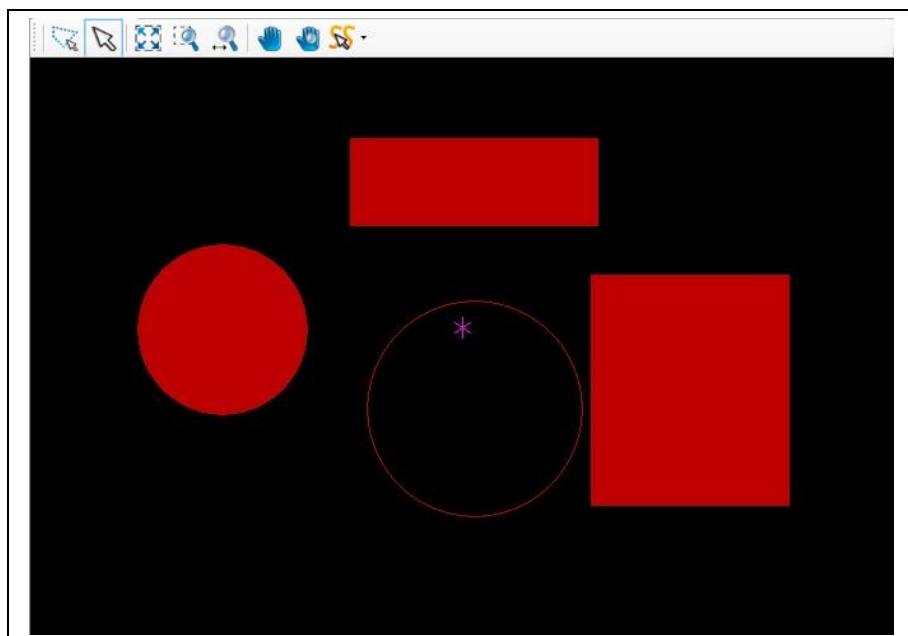
Fig. 309: New Aperture



3. Enter a name for the new aperture to be created.
4. Select an aperture list for the new aperture to be created.
5. Click on [Apply].

⇒ The selected objects are combined to a flash object:

Fig. 310: Objects combined to flash



- ⇒ A new aperture is created with the specified name in the selected aperture list.
- ⇒ The objects are now on the same layer and are combined to a flash object. The center point of the flash object is defined.
- ◆ The drawn objects are combined to a flash object.

5.5.7 Compare to flash

The function “Compare to flash” lets you convert objects of same shape (e.g. circles) into flash objects.

If the objects have small differences in size or angle, you can have these converted into flash objects as well by entering tolerance values for size and angle.



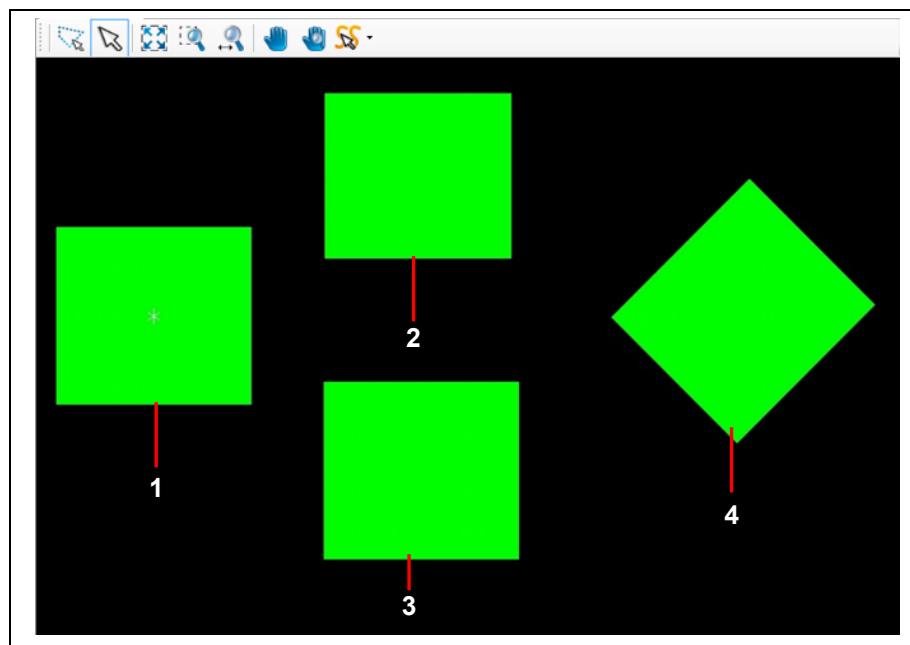
Note

If the sizes of the objects differ from the size of the flash object, the size is adjusted. Thus, the drawn objects have the same size as the flash object after converting to flash.

The following conditions must be met:

- The objects to be compared must have the same shape as the flash object.
- All objects must be on the same layer.

Fig. 311: Initial situation



/1/ flashed object (length 550 mm)

/2/ rectangle (length 500 mm)

/3/ rectangle (length 550 mm)

/4/ rectangle (length 550 mm, 45°)

All objects are on the same layer. The rectangles (see /2/ to /4/) are to be compared with the flash object and converted into flash objects.

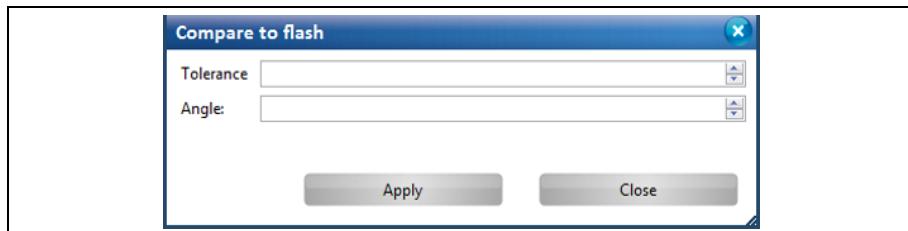
As the rectangles are not identical (rectangle /2/ is only 500 mm long and rectangle /4/ is rotated by 45°), using the function would only convert the identical rectangle /3/ into a flash object.

In this case, it is necessary to enter tolerances for size and angle.

■ Comparing rectangles with a flash object

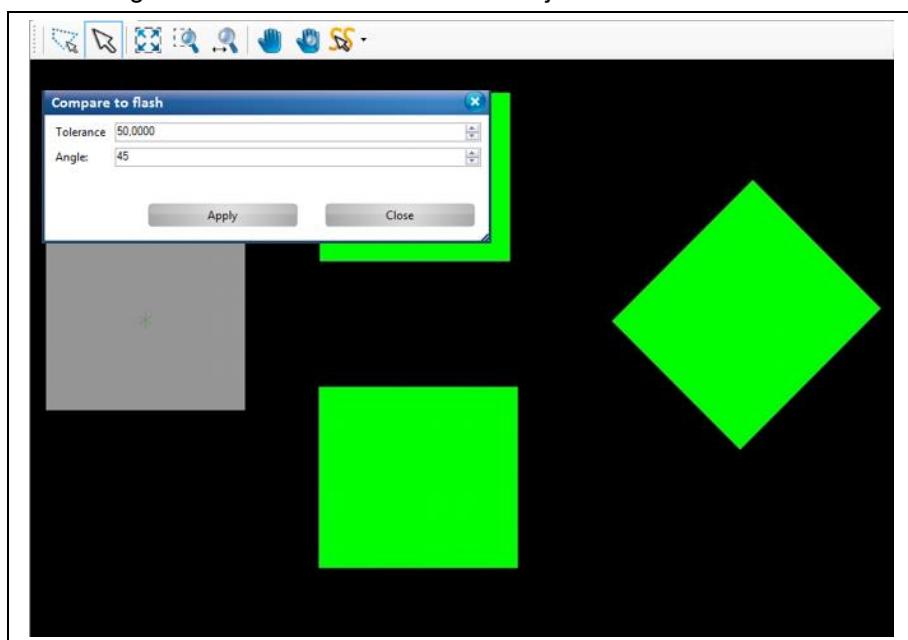
1. Select the flash object (see /1/).
 2. Click on Modify > Compare to flash.
- ➔ The following dialog is displayed:

Fig. 312:
Compare to flash



3. Enter the tolerance value.
➔ As the rectangle /2/ is 50 mm shorter than the flash object, enter at least "50" so that rectangle /2/ is also converted into a flash object.
4. Enter the angle.
➔ As the rectangle /4/ is rotated by 45°, enter at least "45" so that this rectangle is also converted into a flash object.

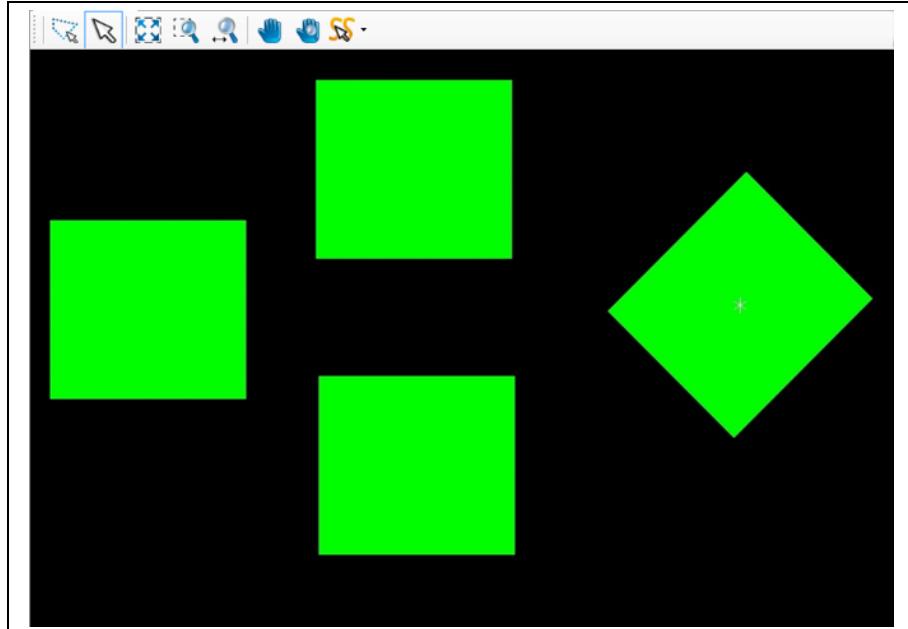
Fig. 313: Enter
values



5. Click on [Apply].

- The rectangles /2/ to /4/ are converted into flash objects:

Fig. 314: Flashed rectangles



- The “Properties” pane now shows all rectangles having the object type “Flash/Drill”. As soon as you select one of the rectangles the center point is also displayed.
- ◆ The rectangles were compared with the flash object and converted into flash objects.

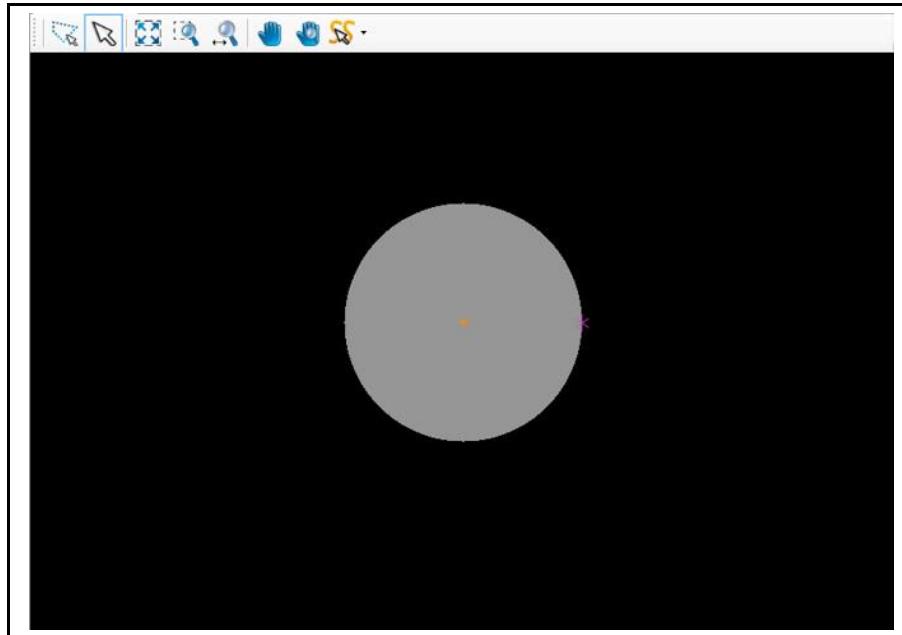
5.5.8 Explode flash

This function lets you convert flash objects back into their original object types.

■ Exploding a flash object

1. Select the flash object that you want to explode:

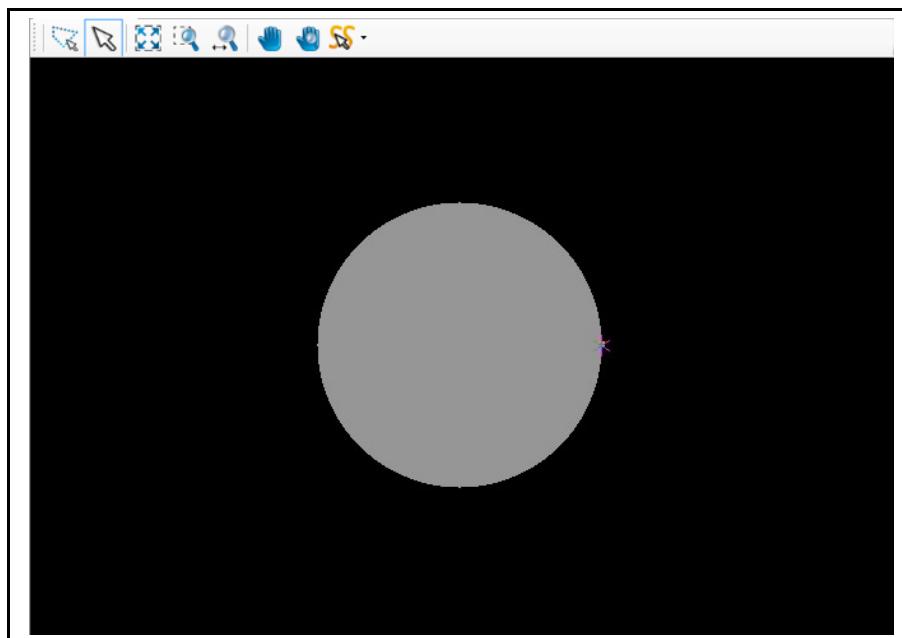
Fig. 315: Flash object



2. Click on Modify > Explode flash.

→ The flash object is converted into its original type, a circle.

Fig. 316: Circle



◆ The flash object is exploded.

5.5.9 2.5D operations

The 2.5D operations in CircuitPro PM can apply a Z depth to any drawn 2D object. Use these operations to create pockets in a circuit board.

You can also convert existing 2.5D objects in 2D objects.

The following operations are available:

- Convert to 2.5D
- Change Z value
- Convert to 2D

Convert to 2.5D/Blind-Via

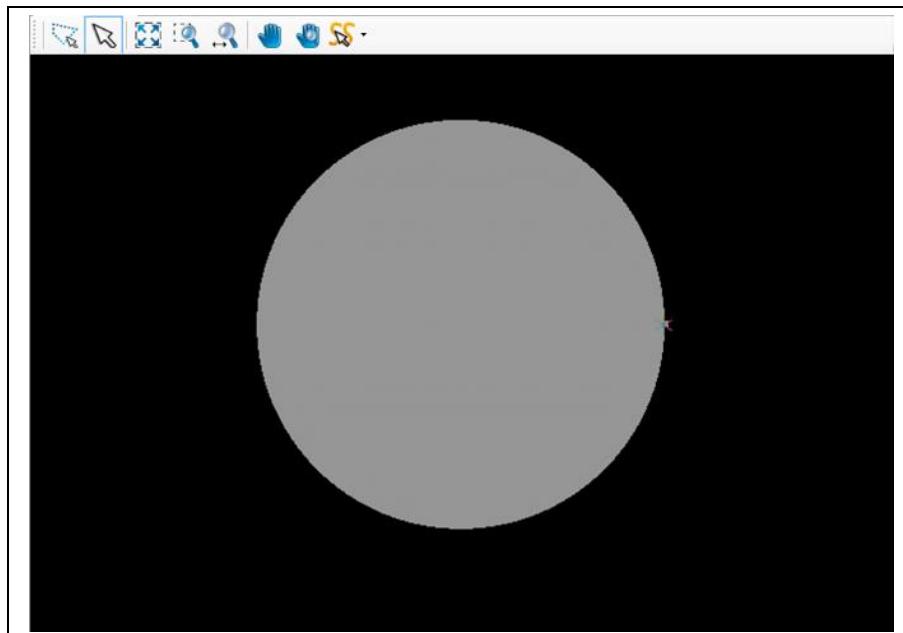
The objects that you convert to 2.5D objects are created on layers PocketTop or PocketBottom depending on the project type (single-sided or double-sided circuit board).

The objects that you convert to 2.5D objects are created on the layer PocketTop or PocketBottom depending on the project type (single-sided, double-sided, or multi-layer PCB). Blind vias and buried vias usually have their own layers.

■ Converting a drawn object into a 2.5D object

1. Select the object to be converted:

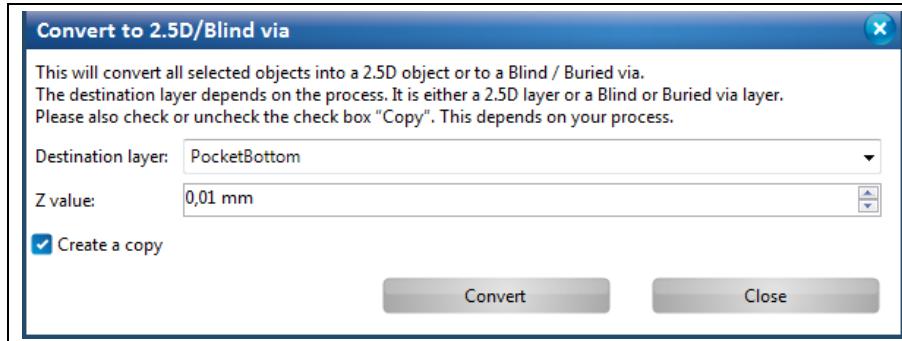
Fig. 317: Convert object



2. Click on Modify > 2.5D operations > Convert to 2.5D/Blind via...

➔ The following dialog is displayed:

Fig. 318: Convert into 2.5D



3. Select the destination layer (PocketBottom, PocketTop, Blind via Top or Blind via Bottom).
4. Enter the Z value of the object.



Note

Create a copy

If the option “Create a copy” is activated, the drawn 2D object is preserved on its source layer. The 2.5D object is created on the selected destination layer.

If you deactivate the option “Create a copy”, the drawn 2D object is **deleted** from its source layer. Only the newly created 2.5D object on the destination layer remains.

5. Activate/deactivate the option “Create a copy” as desired.
 6. Click on [Apply].
- The 2.5D object is created according to the selected option:

Fig. 319: 2.5D object with “Create a copy”

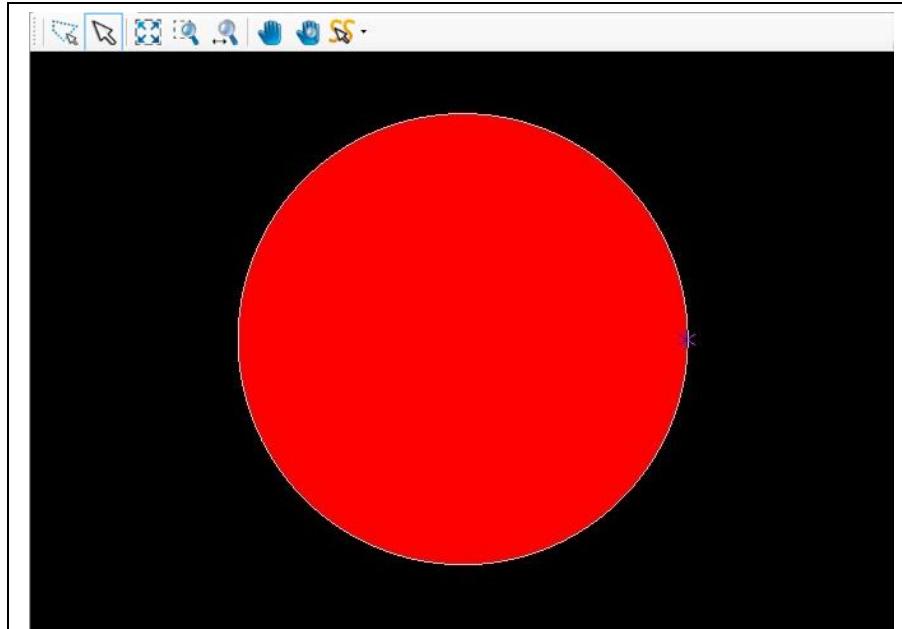
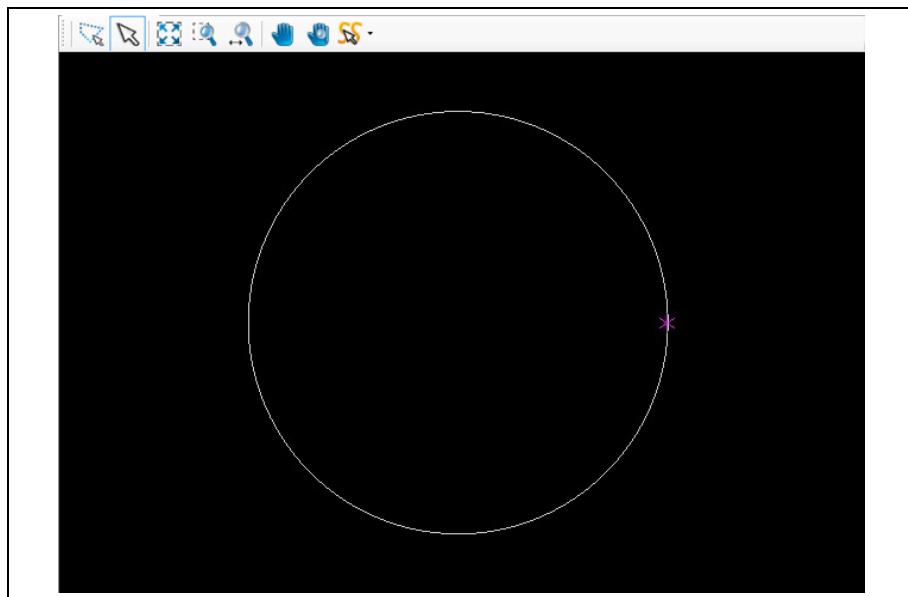


Fig. 320: 2.5D object without "Create a copy"



- ◆ The drawn 2D object is converted into a 2.5D object.



Note

Blind-Vias

You can change the settings for blind vias in the menu "Technology dialog" in the group "Blind vias". (See chapter 5.4.3)

Change Z value

If you want to change the Z value of a 2.5D object, you can use the function "Change Z value..." .

- Changing the Z value of a 2.5D object
 - 1. Select the 2.5 object whose Z value you want to change.
 - 2. Click on Modify > 2.5D operations > Change Z value
- ⇒ The following dialog is displayed:

Fig. 321: Change Z value



3. Enter the Z value.
 4. Click on [Apply].
- ⇒ The Z value of the object is changed. You can check this in the "Properties" pane of the 2.5D object.
5. Click on [Close].
- ◆ The Z value of the 2.5D object is changed.

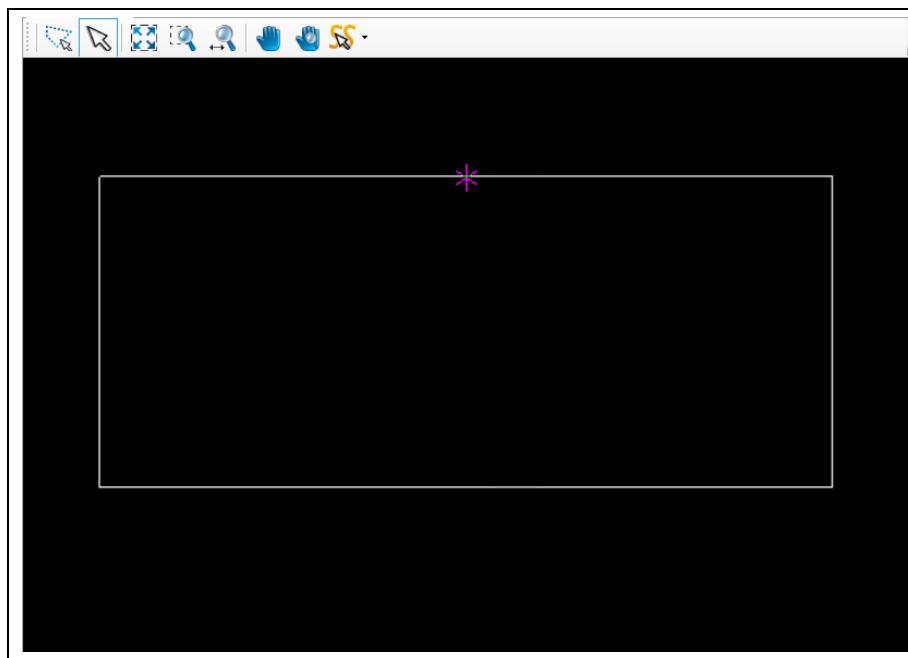
Convert to 2D

This function enables you to convert existing geometrical 2.5D objects in 2D objects.

- Converting a 2.5D object into a 2D object

1. Select the 2.5D object to be converted:

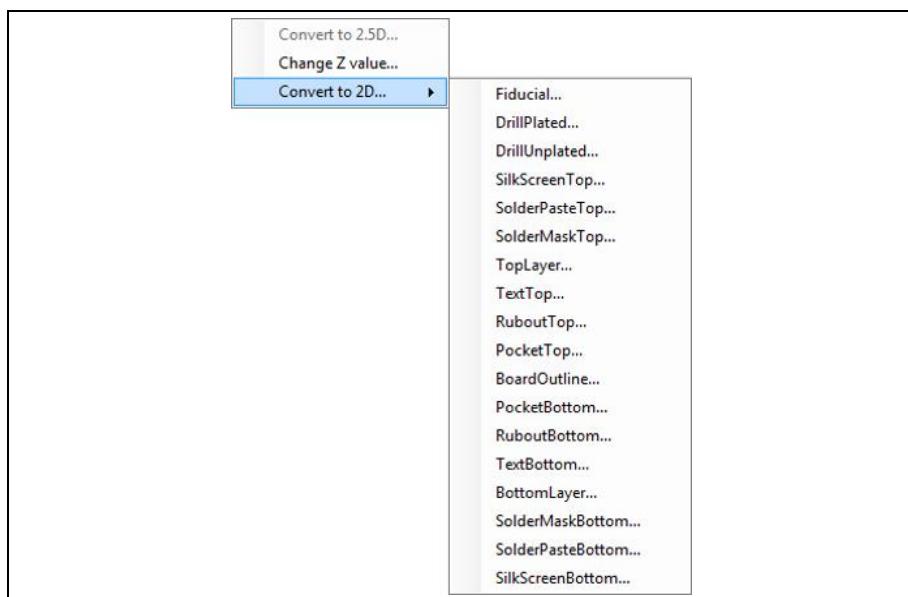
Fig. 322:
Selecting the
object



2. Click on Modify > 2.5D operations > Convert to 2D...

- ⇒ A drop down list containing all available layers, on which you can place your 2D object, is displayed:

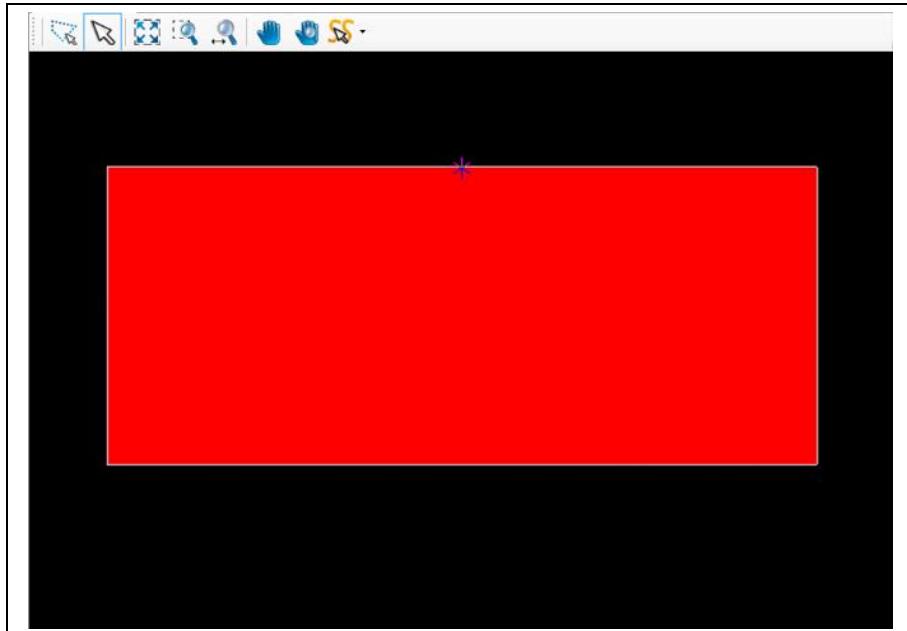
Fig. 323:
Selecting a
destination layer



3. Select the destination layer (in this case TopLayer).

→ The 2D object is created on the selected destination layer:

Fig. 324: 2D
object on
destination layer



◆ The 2.5D object has been converted into a 2D object.

5.5.10 Transform

The “Transform” dialog lets you perform the following operations on objects in the CAM view:

- Translate
- Rotate
- Scale
- Mirror

Tab Translate

The “Translate” function lets you move objects in the CAM view as follows:

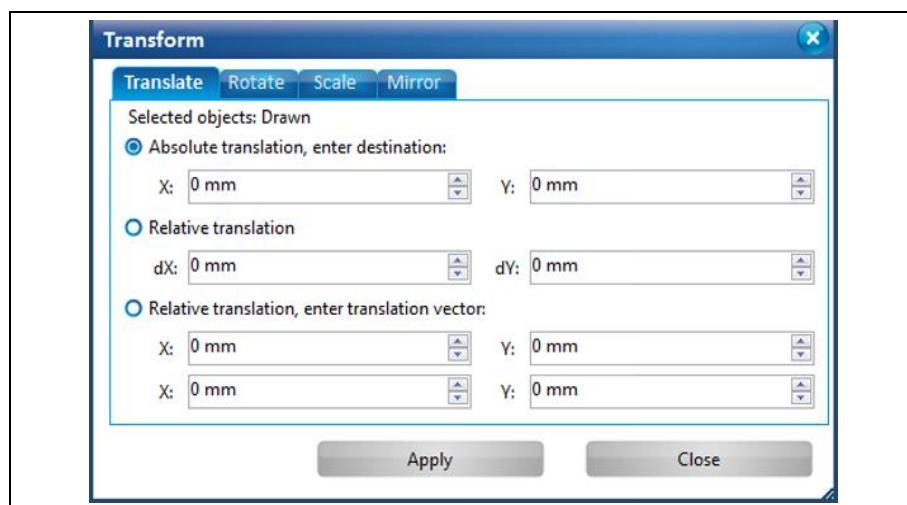
- Absolute translation a to a specified point from the zero point
- Relative translation of the object center
- Relative translation by entering a translation vector

■ Moving objects

1. Select the object to be moved.
2. Click on Modify > Transform...

➔ The following dialog is displayed:

Fig. 325:
Transform



3. Activate the desired option.
 4. Enter the absolute/relative X value.
 5. Enter the absolute/relative Y value.
 6. Click on [Apply].
 7. Click on [Close].
- ➔ The dialog is closed.
◆ The object is moved.

Tab Rotate

The “Rotate” function lets you rotate objects counter-clockwise in the following ways:

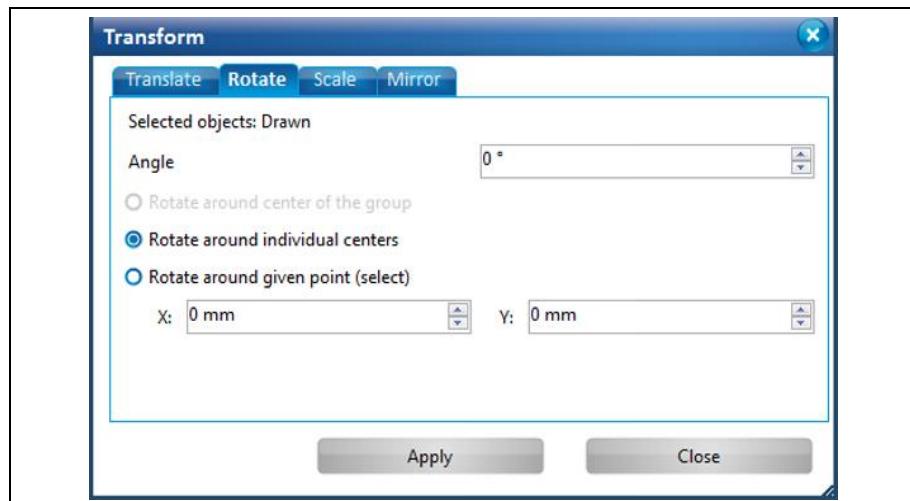
- Rotate around the center of the group (if more than one object is selected)
- Rotate around individual centers
- Rotate around given point (selected)

■ Rotating objects

1. Select the object or objects to be rotated.
2. Click on Modify > Transform...
3. Select the “Rotate” tab.

➔ The following dialog is displayed:

Fig. 326: Rotate



4. Enter the value of the angle.
5. Activate the desired option.



Note

If you activated the option “Rotate around given point” you have to enter the X and Y value of the point. As an alternative, you can set the desired point in the CAM view using the mouse. The object will be rotated around that defined point.

6. Click on [Apply].
 7. Click on [Close].
- ➔ The dialog is closed.
- ◆ The object is rotated.

Tab Scale

The “Scale” function lets you modify the size of the objects as follows:

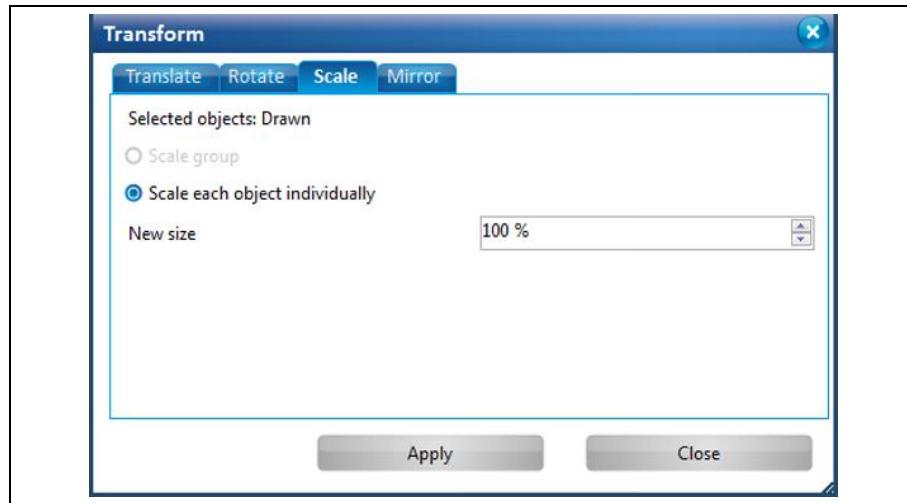
- Scale the group (if more than one object is selected)
- Scale each object individually

■ Scaling objects

1. Select the object or objects to be scaled.
2. Click on Modify > Transform...
3. Select the “Scale” tab.

► The following dialog is displayed:

Fig. 327: Scale



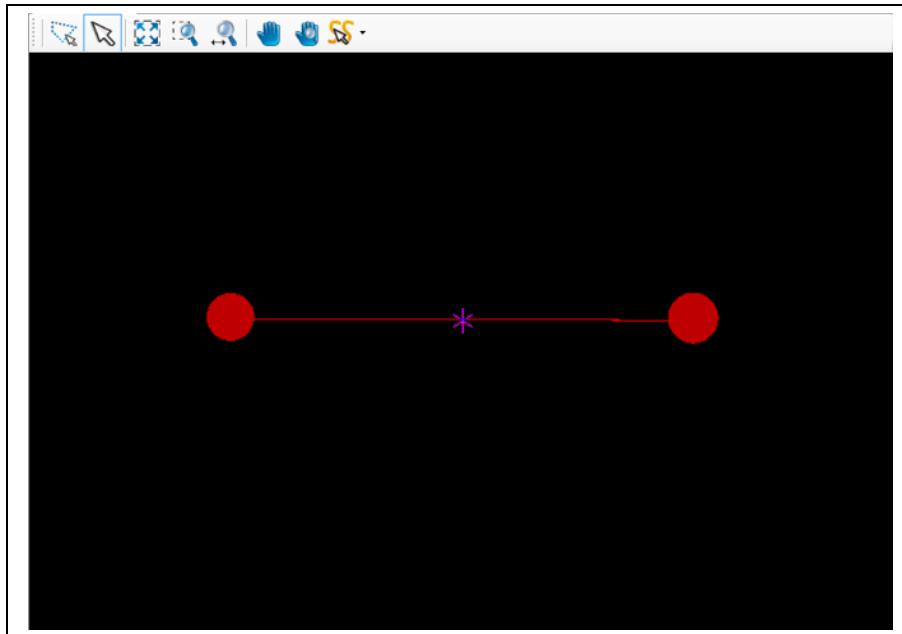
4. Activate the desired option.

- Scale group
- Scale each object individually

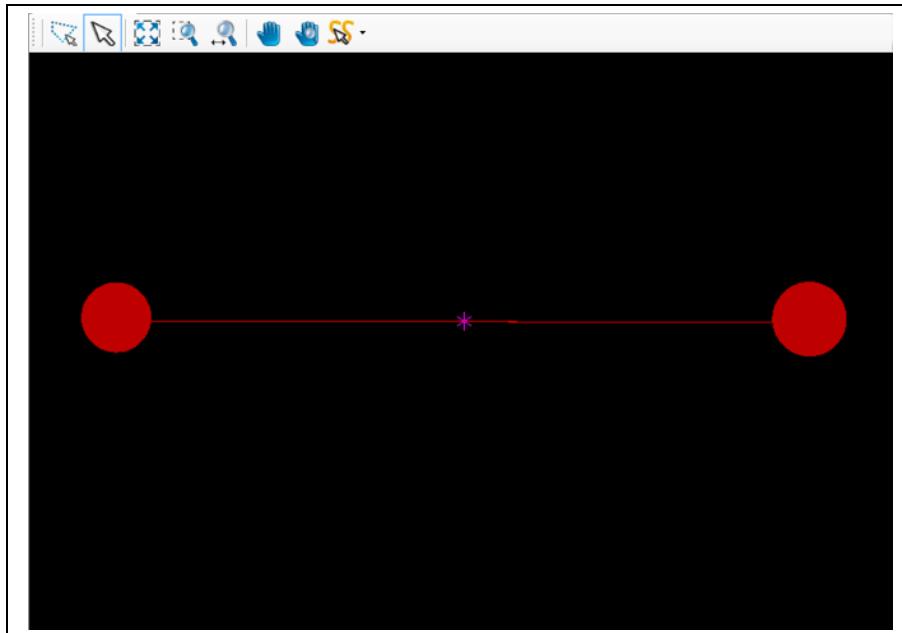
Example:

Your layout in the Cam view includes an open path and two circles:

Fig. 328: Example

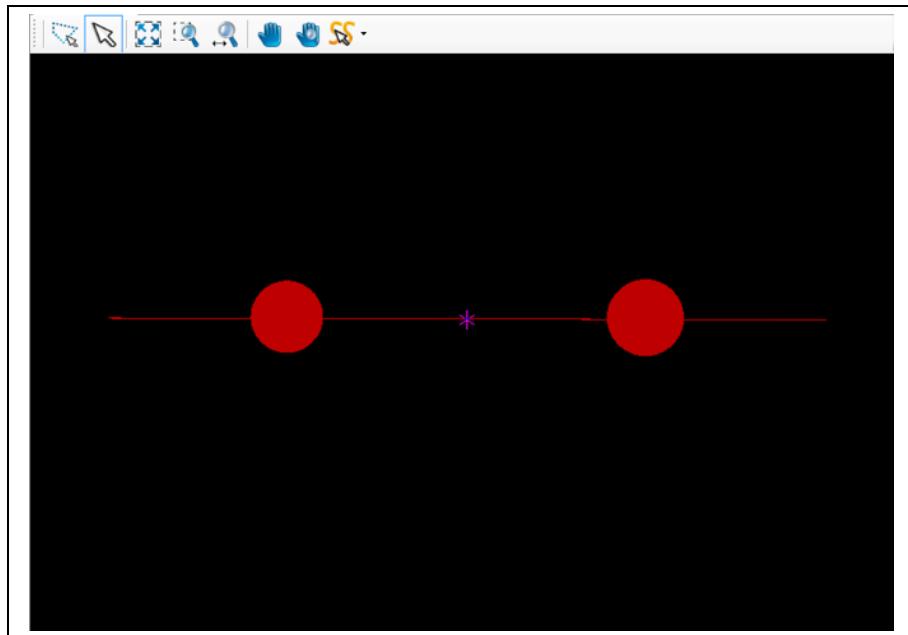


If you select all objects, activate the option “Scale group” and enter a new size of 200%, your layout will change as follows:

Fig. 329: Option
“Scale group”

If you select all objects, activate the option “Scale each object individually” and enter a new size of 200%, your layout will change as follows:

Fig. 330: Option
“Scale each
object
individually”



- ➔ The option “Scale each object individually” causes, that the objects’ positions are not recalculated when entering a new size. These objects remain in the original position and could therefore lead to an incorrect layout.

- 5. Enter a scaling factor in percent.
- 6. Click on [Apply].
- 7. Click on [Close].
- ➔ The dialog is closed.
- ◆ The object is scaled.

Tab Mirror

The “Mirror” function lets you mirror objects in the CAM view as follows:

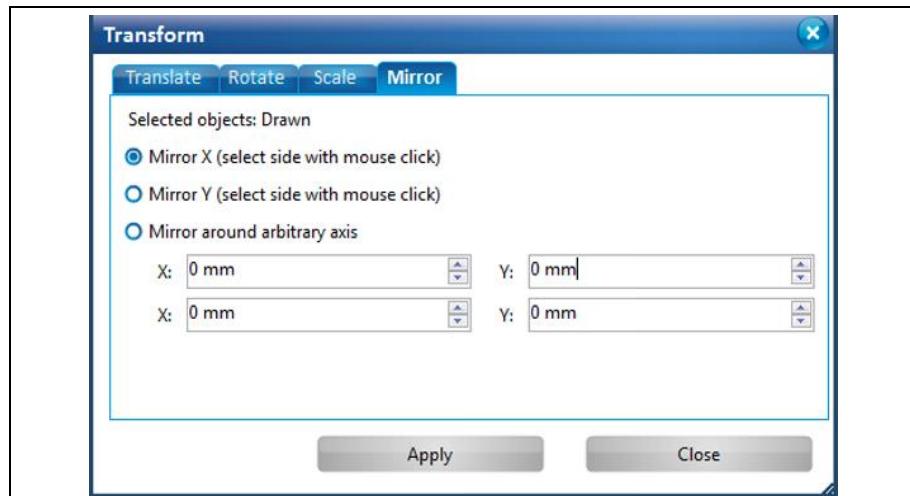
- Mirror along the X Axis
- Mirror along the Y Axis
- Mirror along an arbitrary axis

■ Mirroring an object

1. Select the object or objects to be mirrored.
2. Click on Modify > Transform...
3. Select the “Mirror” tab.

➔ The following dialog is displayed:

Fig. 331: Mirror



4. Activate the desired option.



Note

If you activate the option “Mirror X” or “Mirror Y”, you can use the mouse to select the X or Y axis in the CAM view along which the object is to be mirrored.



Note

If you activate the option “Mirror around arbitrary axis”, you can enter the X and Y values to define the arbitrary axis along which the object(s) is (are) to be mirrored.

As an alternative, you can use the mouse in the CAM view to set two points that define the mirror axis.

5. Click on [Apply].
 6. Click on [Close].
- ➔ The dialog is closed.
- ◆ The object is mirrored.

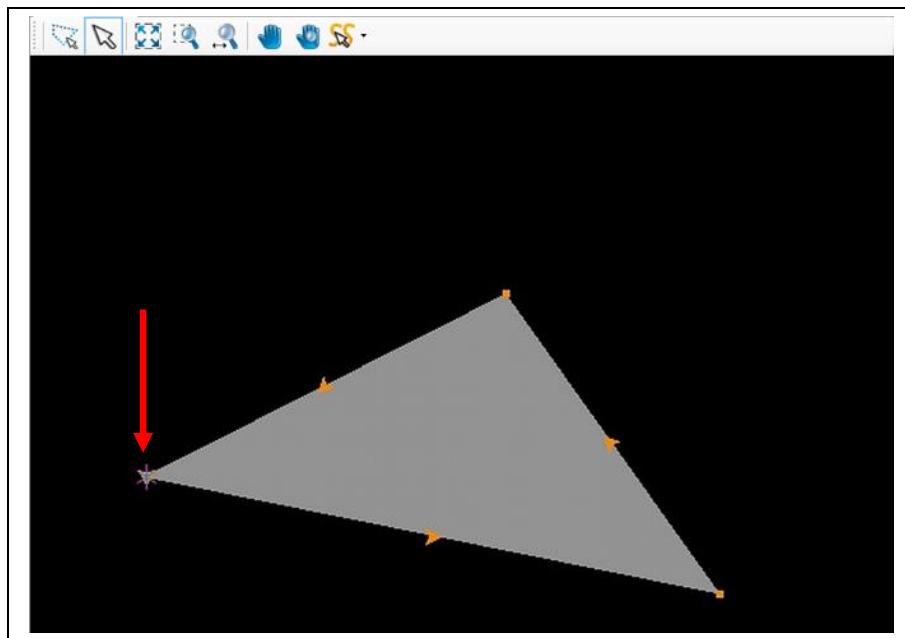
5.5.11 Rotate/Mirror relative

The “Rotate/Mirror relative” function enables you to rotate objects in the CAM view by 90° or mirror along the X or Y axis:

■ Rotating an object by 90°

1. Select the object to be rotated.
2. Click on the object's point around which the object is to be rotated:

Fig. 332: Rotate object by 90°



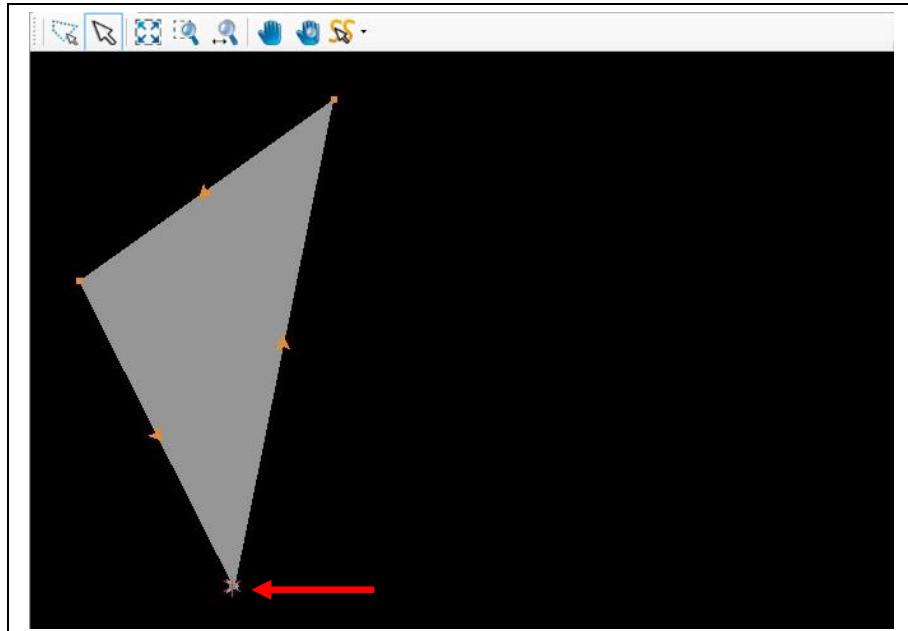
Note

CircuitPro PM rotates the object(s) around the current anchor point .

3. Click on Modify > Rotate/Mirror relative > Rotate 90°.

→ The object is rotated around the anchor point by 90°:

Fig. 333: Object rotated by 90°



◆ The object is rotated around the anchor point .by 90°.

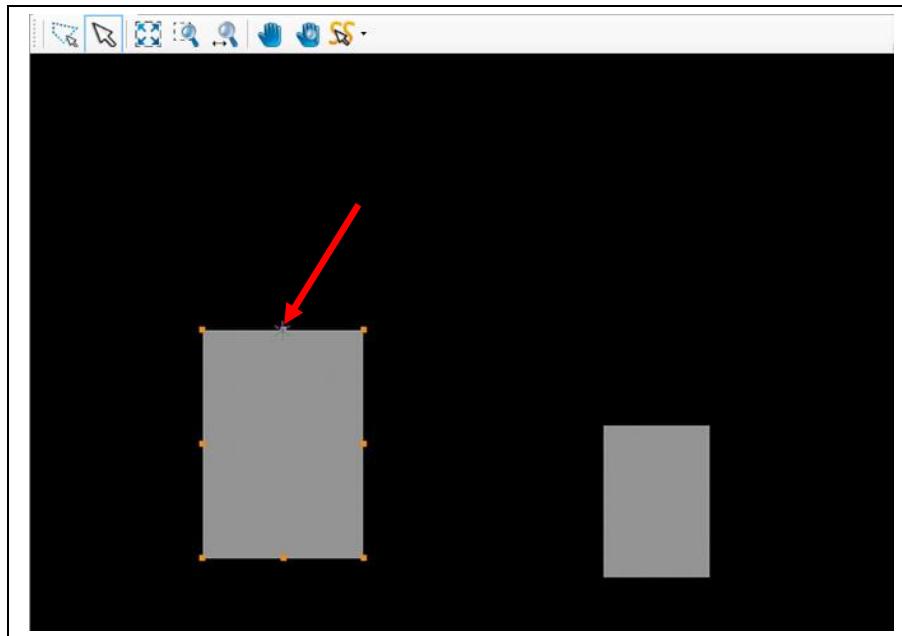


Note

The above steps apply to all rotate functions in the sub-menu
“Rotate/Mirror relative” accordingly.

- Mirroring objects along the X axis
- 1. Select the object or objects to be mirrored.
- 2. Click on the object point through which the mirror axis is to be placed.

Fig. 334: Mirror object



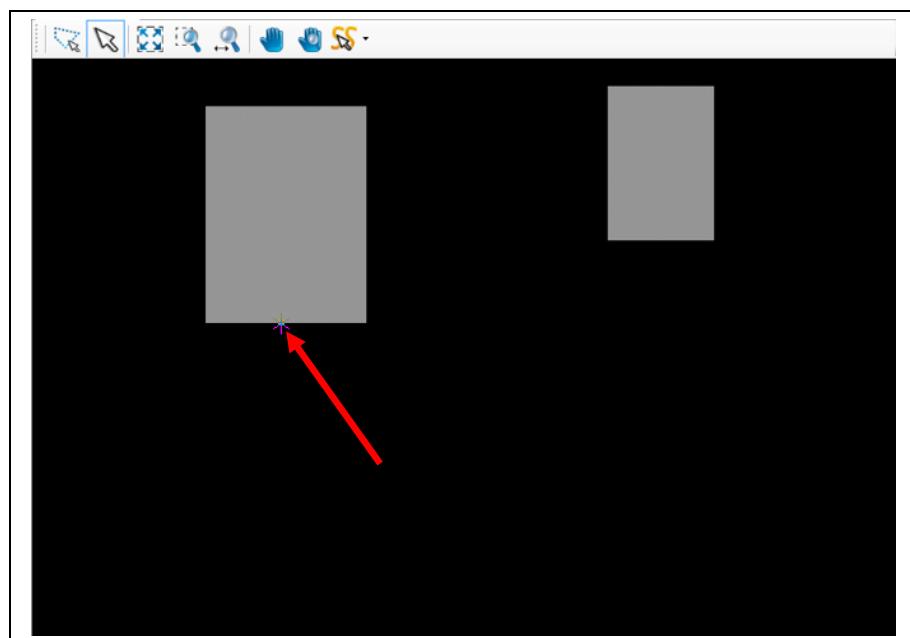
Note

The figure above shows the anchor point of the object marked with a red arrow. This is where CircuitPro PM places the mirror axis.

-
- 3. Click on Modify > Rotate/Mirror relative > Mirror X.

► The object(s) is (are) mirrored.

Fig. 335: Object mirrored



◆ The object(s) is (are) mirrored along the X axis.



Note

The above steps apply to the “Mirror Y” function in the sub-menu “Rotate/Mirror relative” accordingly.

5.5.12 Step Repeat

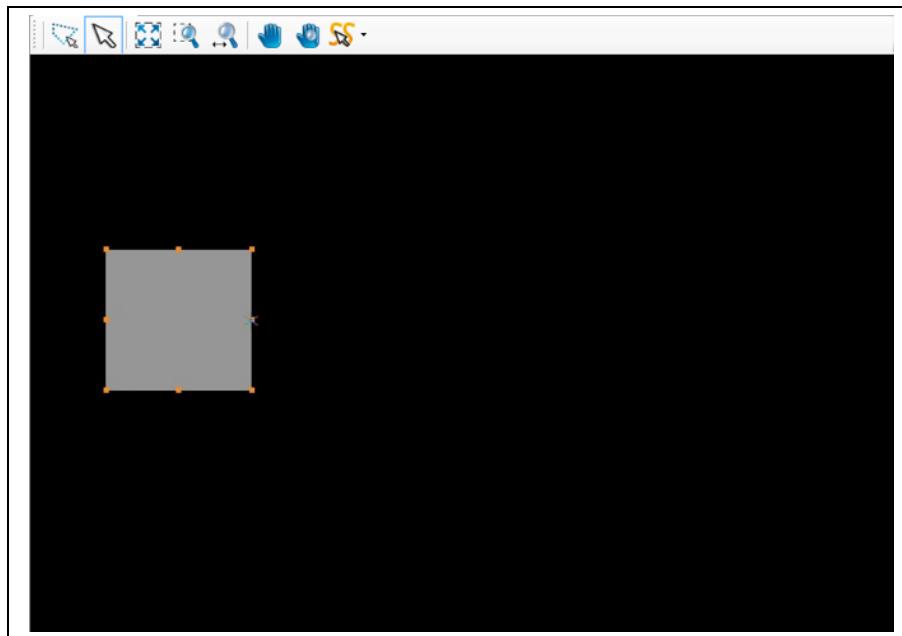
The “Step Repeat” function lets you multiply the selected object(s)

- by any number in X direction,
- by any number in Y direction
- using a defined step distance.

■ Multiplying an object

1. Select the object that you want to multiply.

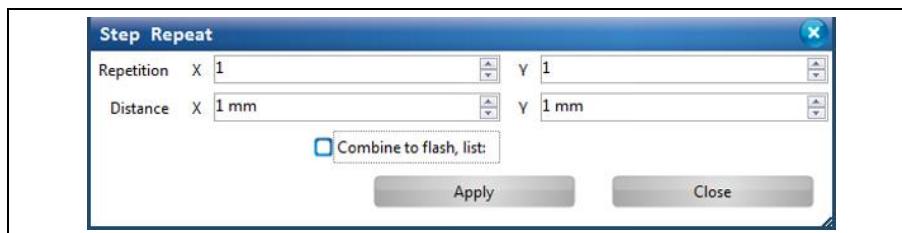
Fig. 336: Step and Repeat initial object



2. Click on Modify > Step Repeat...

➔ The following dialog is displayed:

Fig. 337: Step & Repeat dialog



In this example, the object is to be multiplied by three in X direction and by two in Y direction with a step distance of 300 mm in X and Y direction.

3. Enter the repetition values in X and Y direction.
4. Enter the step distance in X and Y direction in mm.

**Note**

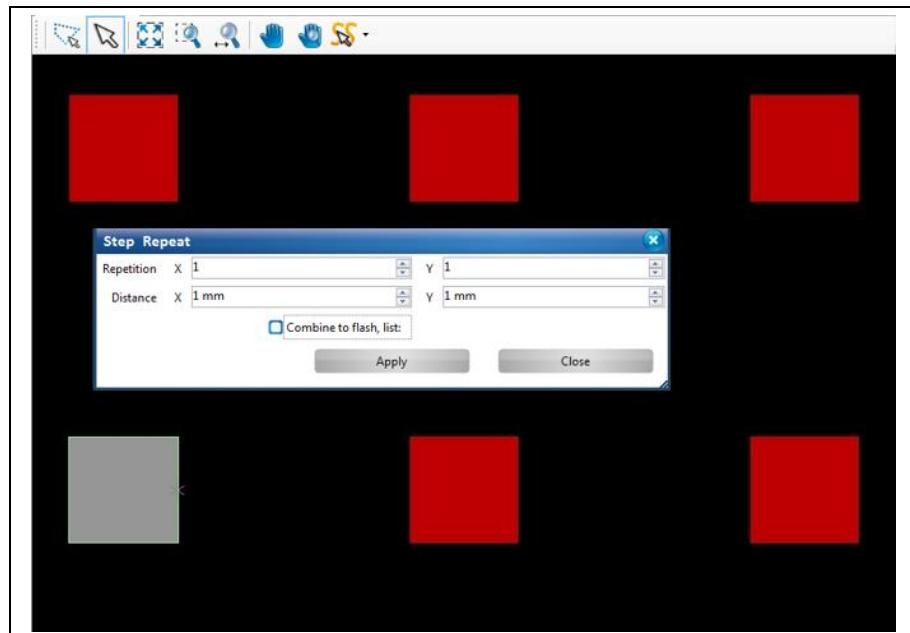
If you check the option “Combine to flash”, the object or group to be multiplied is converted into a flash object.

→ You can select an aperture size for conversion into flash objects. The aperture list is displayed when you activate the option.

5. Click on [Apply].

→ The object is multiplied:

Fig. 338:
Multiplied objects



6. Click on [Close].

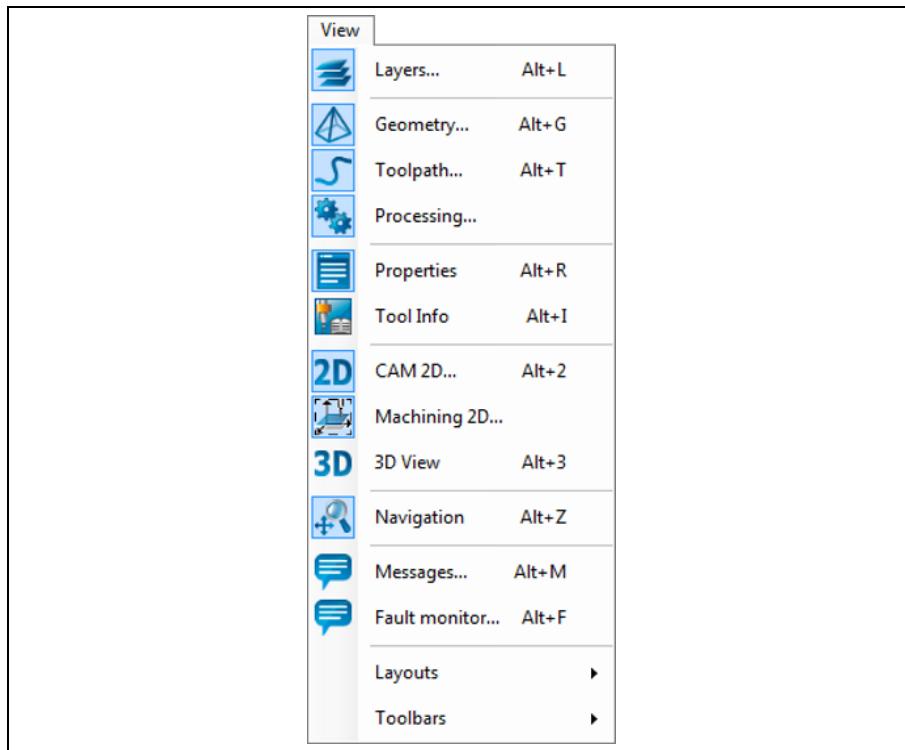
◆ The object is multiplied.

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. 339: Menu
“View”



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

Table 44:
Menu
functions
“View”

Menu item	Description	For more information, see chapter “Pane”
Layers...	Shows/hides the pane “Layers”.	see page 48
Geometry...	Shows/hides the pane “Geometry”.	see page 49
Toolpath...	Shows/hides the pane “Toolpath”.	see page 49
Processing...	Shows/hides the pane “Processing”.	see page 50
Properties	Shows/hides the pane “Properties”.	see page 52
Tool info	Shows/hides the pane “Tool info”.	see page 53
CAM 2D...	Opens the view “CAM 2D”.	see page 28
Machining 2D...	Opens the view “Machining 2D”.	see page 33, 34, 35, 36
3D View	Opens the view “3D View”.	see page 40
Navigation	Shows/hides the pane “Navigation”:	see page 54
Messages...	Shows/hides the pane “Messages”.	see page 56
Fault monitor...	Shows/hides the pane “Fault Monitor”.	see page 57
Layouts	Opens the sub menu “Layouts”. Here you can open the different views with the different panes: <ul style="list-style-type: none">• Standard CAM• Compact CAM• Machining	
Toolbars	Opens the sub menu “Toolbars”. Here you can activate/deactivate the visibility of the individual toolbars: <ul style="list-style-type: none">• Modify• STANDARD• Process• Insert• Custom• Status bar	

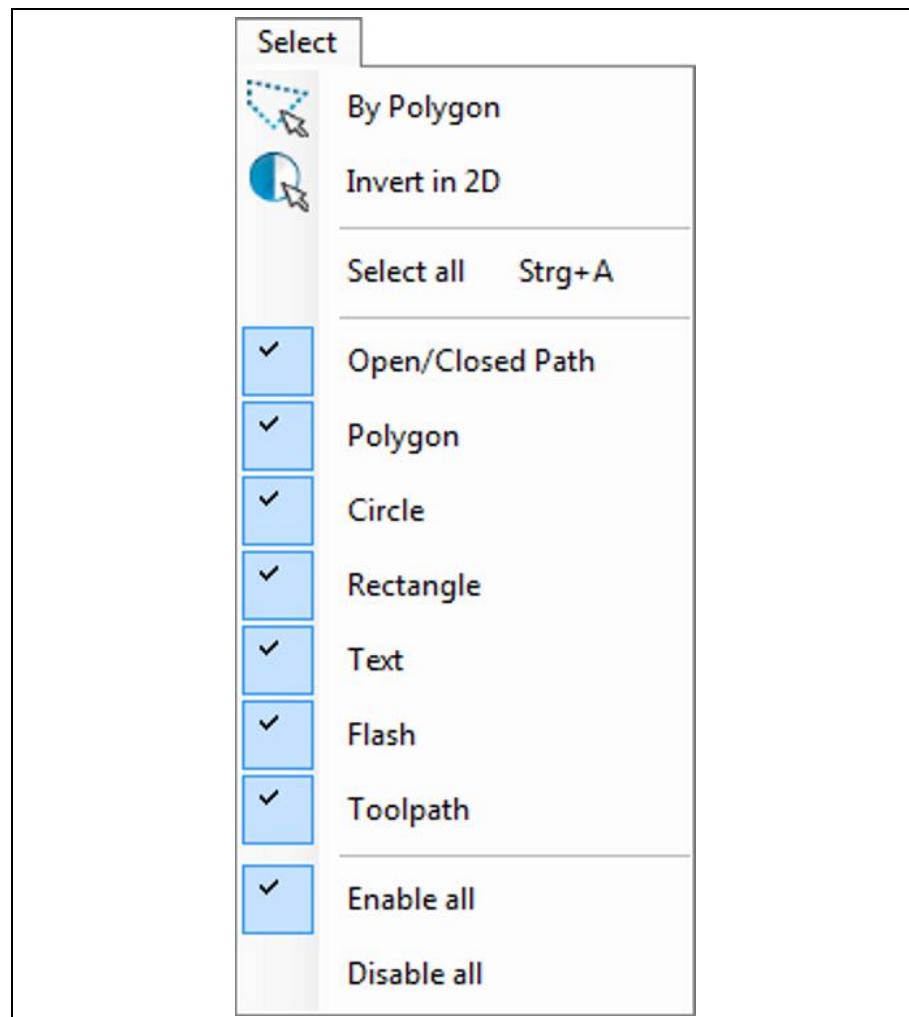
You find more information about the details of the different submenus in the corresponding topics of the chapter “Panes”.

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. 340: Menu “Select”



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

**Table 45: 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.
Circle	Selects circles.
Rectangle	Selects rectangles.
Text	Selects text objects.
Flash	Selects flash objects.
Toolpath	Selects toolpaths.
Enable all	Enables the selection of all objects.
Disable all	Disables the selection for all objects in the CAM view.

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. 341: Menu “Wizards”

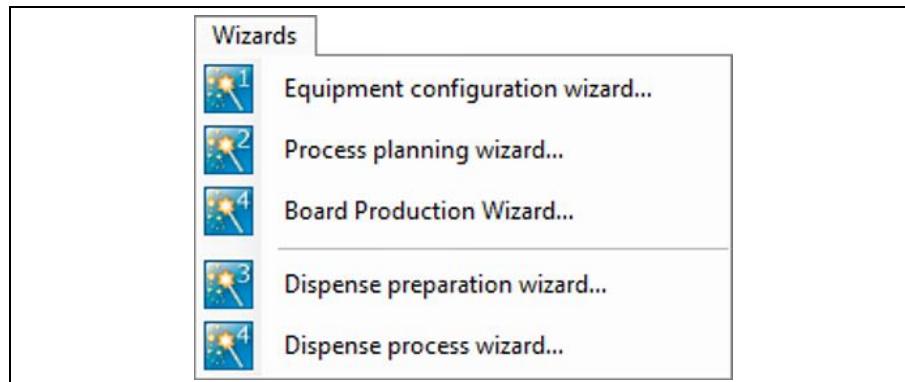


Table 46: Menu functions

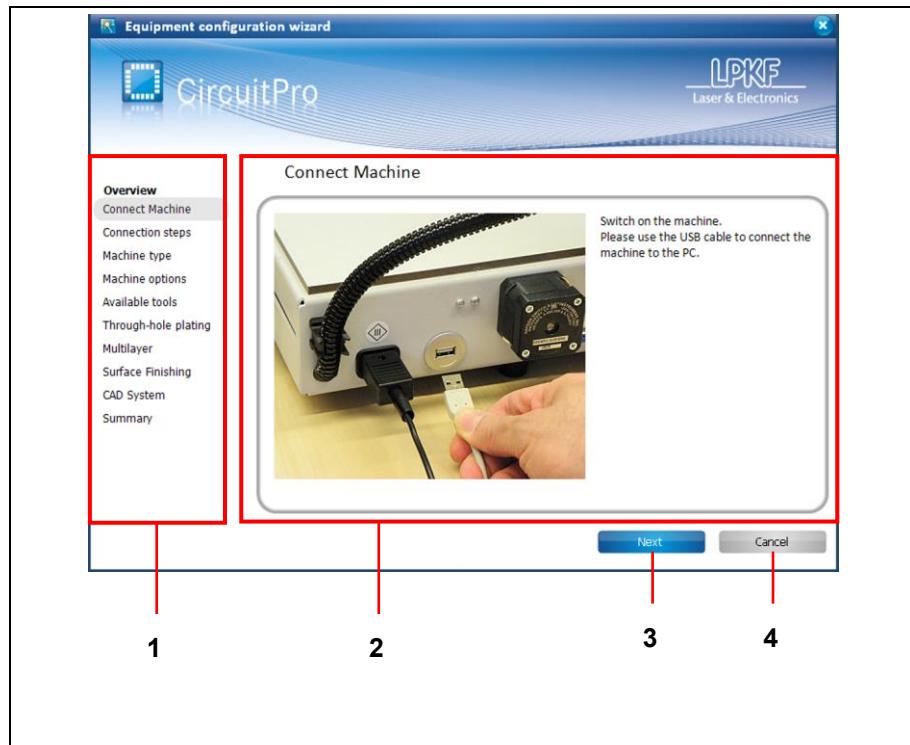
Menu item	Description
Equipment configuration wizard...	Use the Equipment configuration wizard to define the existing equipment for the manufacturing of PCBs.
Process planning wizard...	Use this wizard to set the properties of the prototype project (for example: double sided with through plating).
Board 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.

5.8.1 Equipment configuration wizard

The equipment configuration wizard starts automatically when the program is started for the first time. This is where you define the equipment you are going to use.

- Opening the Equipment configuration wizard dialog
- 1. Click on Wizards > Equipment configuration wizard...
- The dialog of the Equipment configuration wizard is displayed:

Fig. 342:
Equipment configuration wizard



/1/ List of configuration steps

/2/ Section for descriptions or configuration options

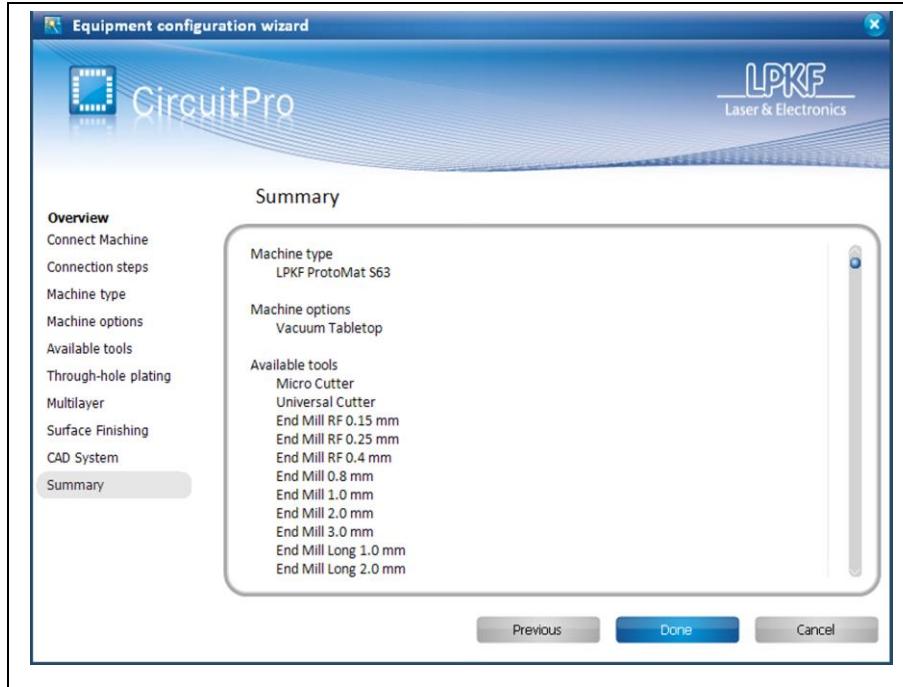
/3/ [Next] – Confirms the configuration step and switches to the next configuration step

/4/ [Cancel] – Closes the Equipment configuration wizard without saving the settings

2. Follow the prompts of the Equipment configuration wizard.

- In the final step, the Equipment configuration wizard displays a summary of the settings you entered.

Fig. 343:
Equipment
configuration
wizard - Summary



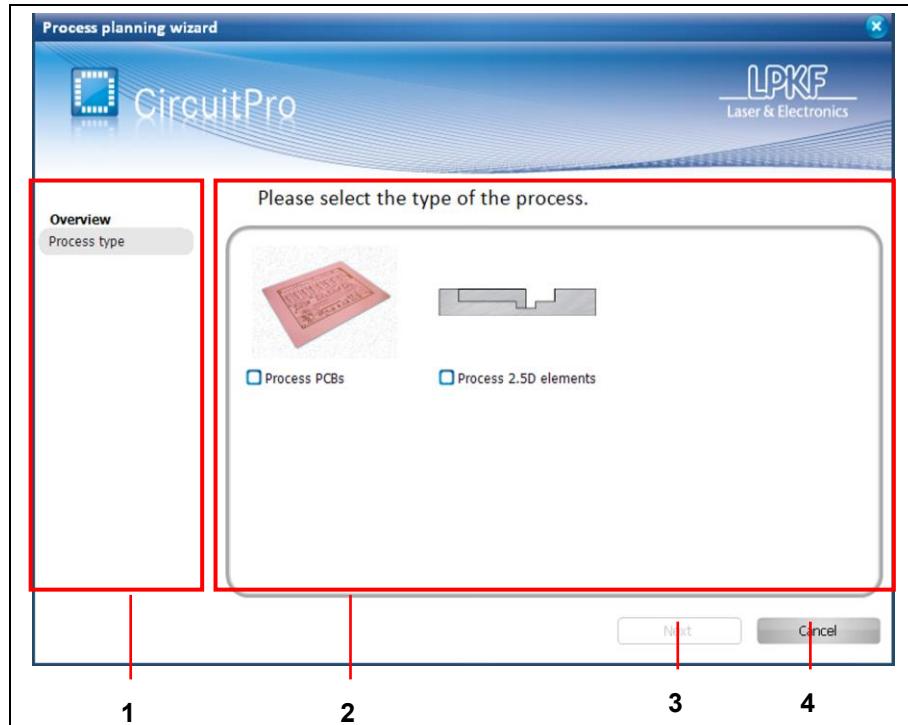
3. Click on [Done], to close the Equipment configuration wizard.
- ◆ The Equipment configuration wizard is finished.

5.8.2 Process planning wizard

Use the process planning wizard to define the process components you are going to use.

- Opening the Process planning wizard dialog
- 1. Click on Wizards > Process planning wizard...
- ➔ The dialog of the process planning wizard is displayed:

Fig. 344: Process planning wizard



/1/ Steps/Overview

/2/ Section for descriptions or configuration options

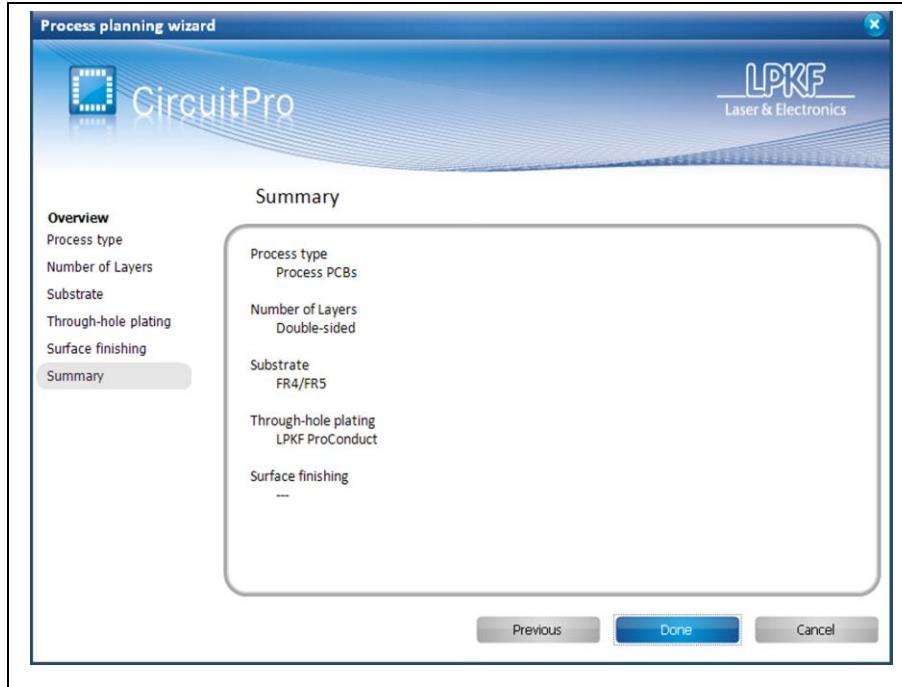
/3/ [Next] – Confirms the selection and switches to the next configuration step

/4/ [Cancel] – Closes the process planning wizard without saving the settings

2. Follow the prompts of the process planning wizard.

- In the final step, the process planning wizard displays a summary of the settings you entered.

Fig. 345: Process planning wizard - Summary



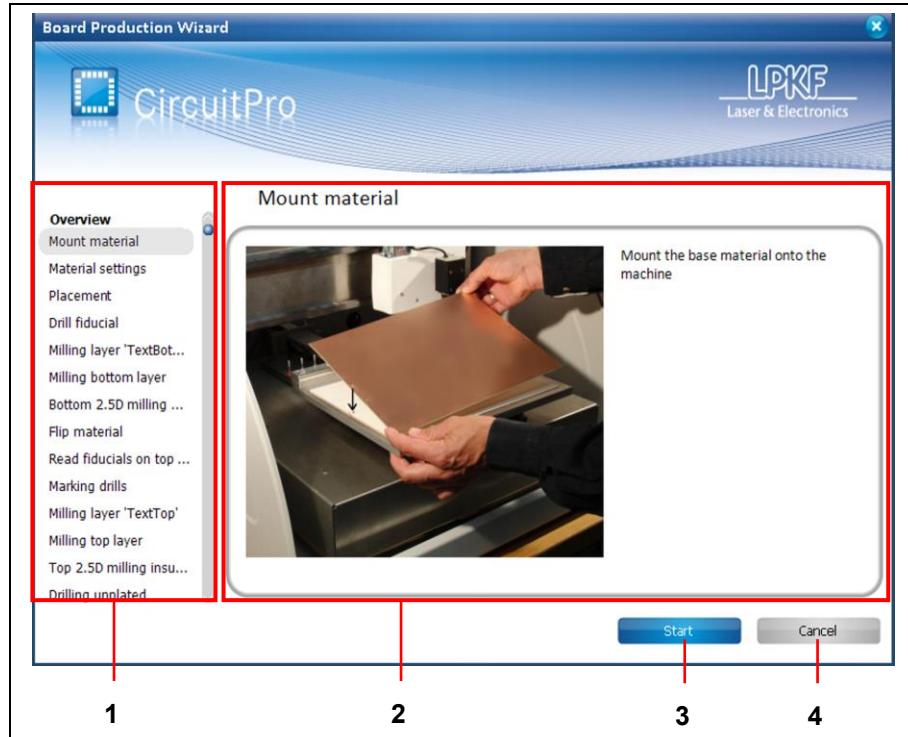
3. Click on [Done] to close the Process planning wizard.
- ◆ The Process planning wizard is finished.

5.8.3 Board Production Wizard

The board production wizard guides you through the board production process.

- Opening the Board Production Wizard dialog
- 1. Click on Wizards > Board Production Wizard...
- ➔ The dialog of the Board Production Wizard is displayed:

Fig. 346: Board Production Wizard



/1/ List of the production phases

/2/ Section for prompts and display of progress

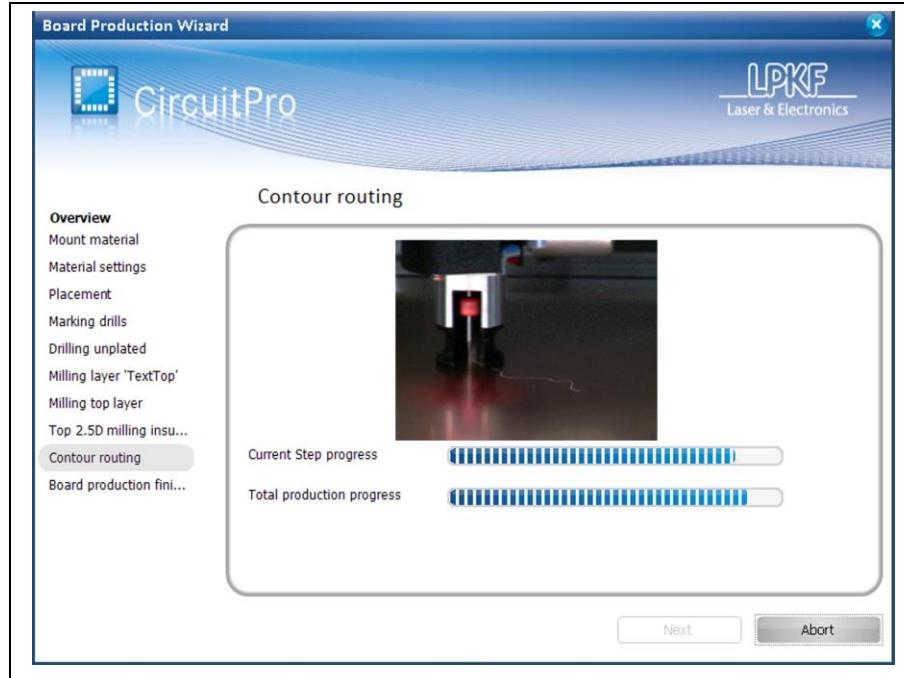
/3/ [Start] – Starts board production

/4/ [Cancel] – Closes the board production wizard and aborts the production process.

2. Follow the prompts of the board production wizard.

- The progress of the current phase and the overall progress are displayed during the whole process of board production.

Fig. 347: Board Production finished



3. Click on [Finish], to close the Board Production Wizard.
- ◆ The Board Production Wizard is finished.

5.8.4 Dispense Preparation Wizard

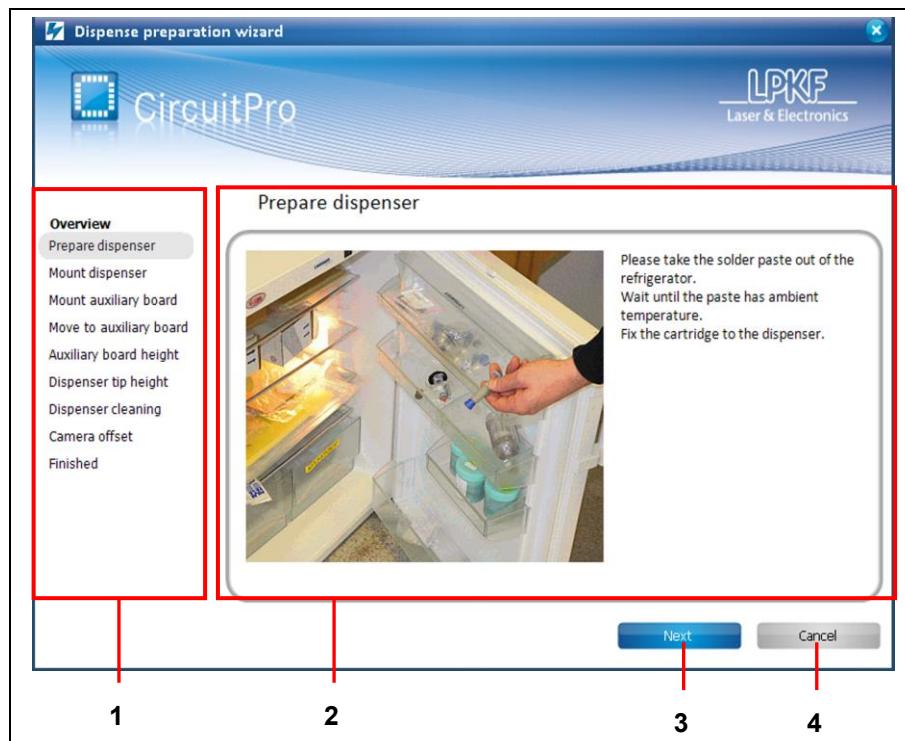

Note

Please note, that you can only use the Dispense preparation wizard with a ProtoMat S63/S103.

The dispense preparation wizard guides you through the steps for preparing the dispense process.

- Opening the dispense preparation wizard dialog
- 1. Click on Wizards > Dispense preparation wizard....
- ➔ The dialog of the dispense preparation wizard is displayed:

Fig. 348:
Dispense preparation wizard



/1/ List of the steps in preparing the dispense process

/2/ Section for prompts and display of progress

/3/ [Next] – Confirms the operation and switches to the next preparation step

/4/ [Cancel] – Closes the dispense preparation wizard without saving the settings

2. Follow the prompts of the dispense preparation wizard.


Note

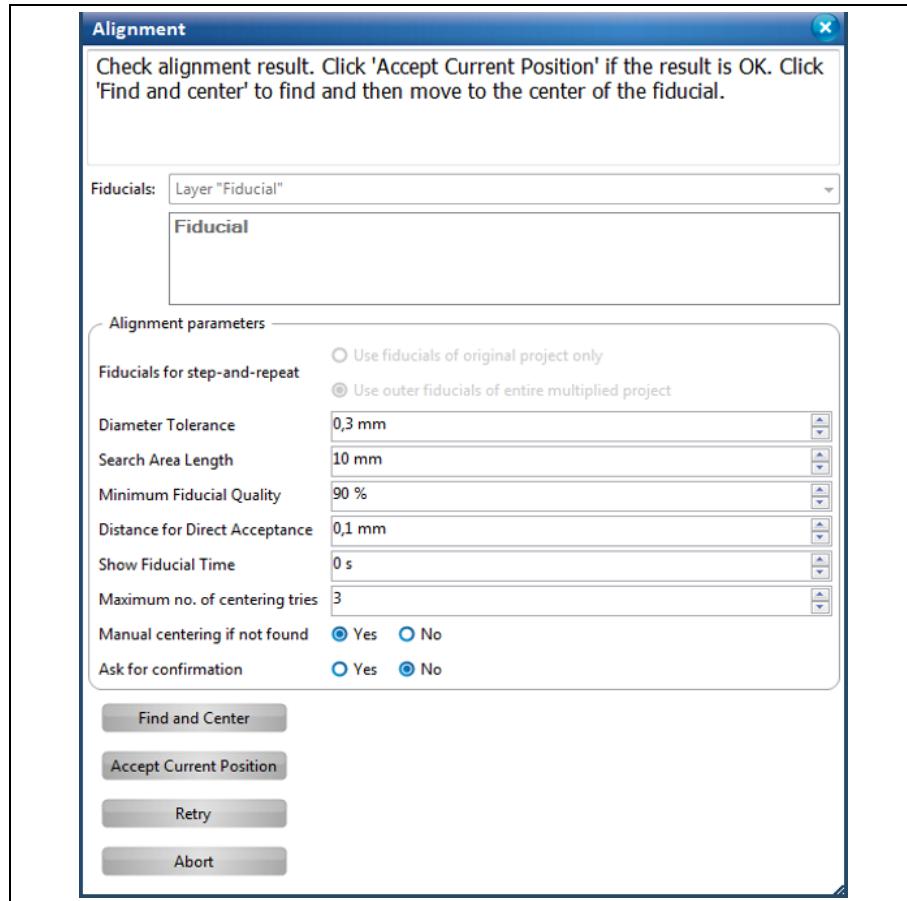
In order to determine the camera offset, 5 solder paste dots are applied. The last dot has a greater distance to the other dots. This last dot is used for measuring the offset. If this dot is not measured correctly the dispense process cannot be run correctly. Thus, it is essential that you check the camera image before confirming the offset in the wizard.

The following scenarios may occur when measuring the camera offset:

Scenario 1

- The camera finds the last applied dot and centers it in the camera image.
- 1. Click on [Accept Current Position] to apply the position.

Fig. 349: Fiducial recognized automatically



- ◆ The “Camera offset” phase is finished successfully.

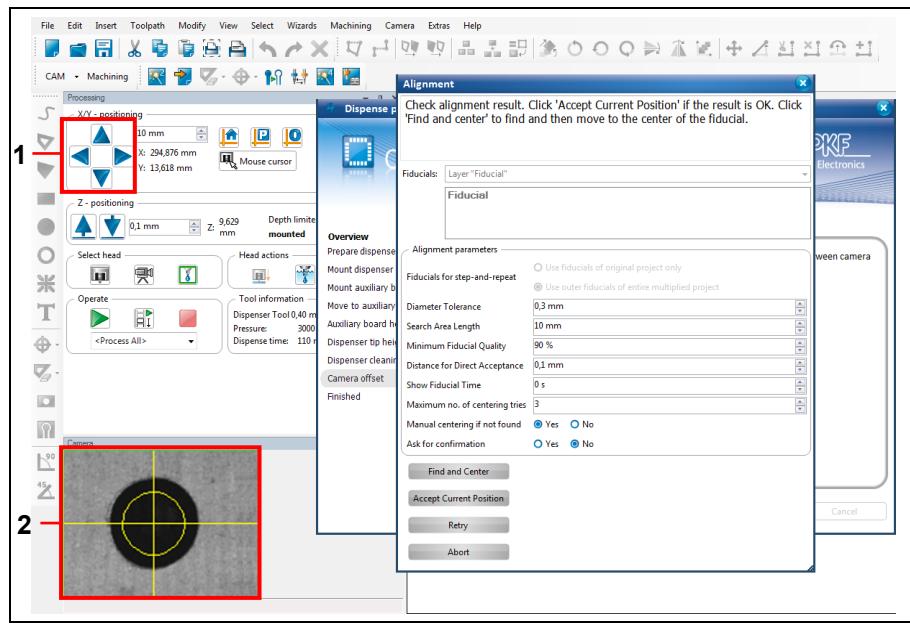
Scenario 2

- The camera finds the last applied dot but does not center it in the camera image.
- 1. Click on [Find and Center].
 - ⇒ The camera centers the dot.
- 2. Click on [Accept Current Position].
- ◆ The “Camera offset” phase is finished successfully.

Scenario 3

- The camera does not find the dot.
1. Use the X and Y buttons (/1) in the “Processing” pane to position the last applied dot approximately at the center of the camera image.
 2. Click on [Find and Center].
 - The camera centers the dot.
 3. Click on [Accept Current Position].

Fig. 350: Fiducial not recognized automatically



/1/ X and Y buttons

/2/ Camera image centered

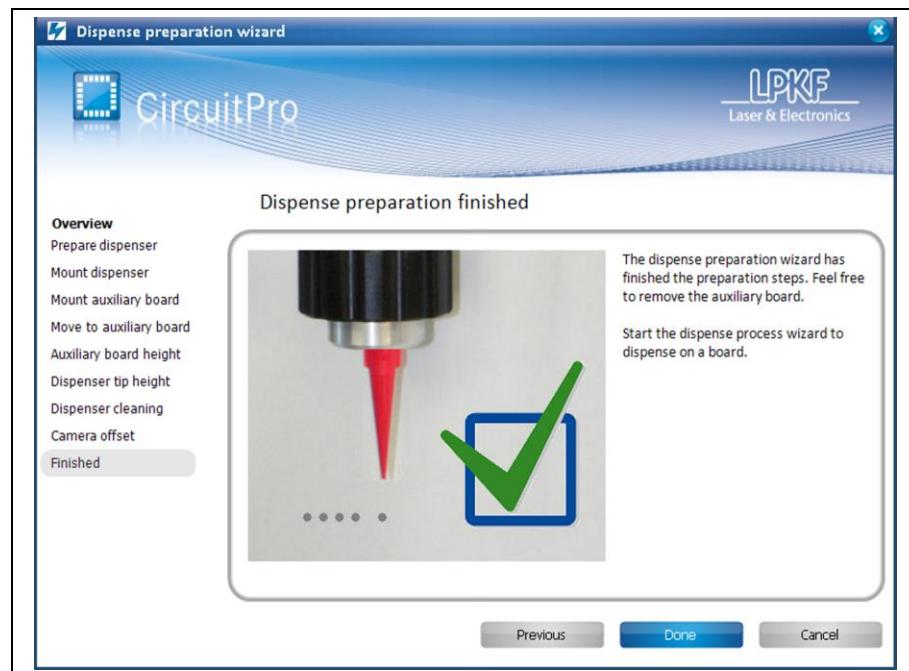
- ◆ The “Camera offset” phase is finished successfully.

Scenario 4

- The camera finds one of the first four dots.
- 1. Use the X and Y buttons (/1) in the “Processing” pane to position the last applied dot approximately at the center of the camera image.
- 2. Click on [Find and Center].
- ➔ The camera centers the dot.
- 3. Click on [Accept Current Position].
- ◆ The “Camera offset” phase is concluded successfully.

- 3. If the camera offset is successfully adjusted, follow the next instructions of the Dispense preparation wizard.
- ➔ The following view is displayed, if the Dispense preparation wizard is finished:

Fig. 351:
Dispense
preparation
wizard finished



- 4. Click on [Done], to close the Dispense preparation wizard.
- ◆ The Dispense preparation wizard is finished.

5.8.5 Dispense process wizard

The dispense process wizard guides you through the steps of the dispense process.

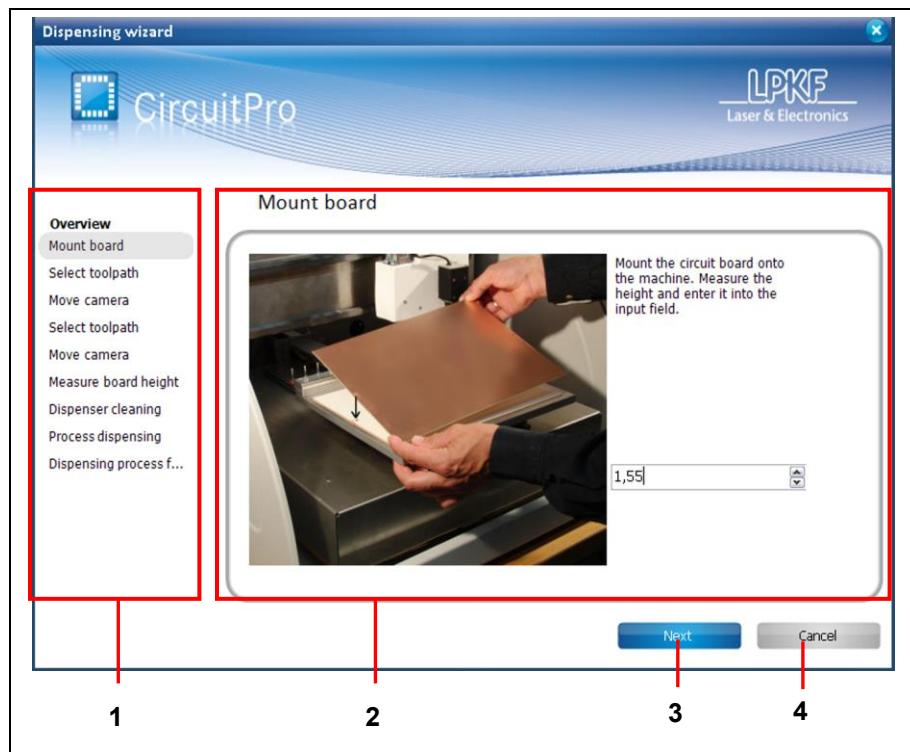


Beforehand you must have created the solder paste paths and passed through the Dispense preparation wizard.

Note

- Opening the dispense process wizard dialog
- 1. Click on Wizards > Dispense process wizard...
- ➔ The dialog of the dispense process wizard is displayed:

Fig. 352:
Dispense process wizard



/1/ List of process steps

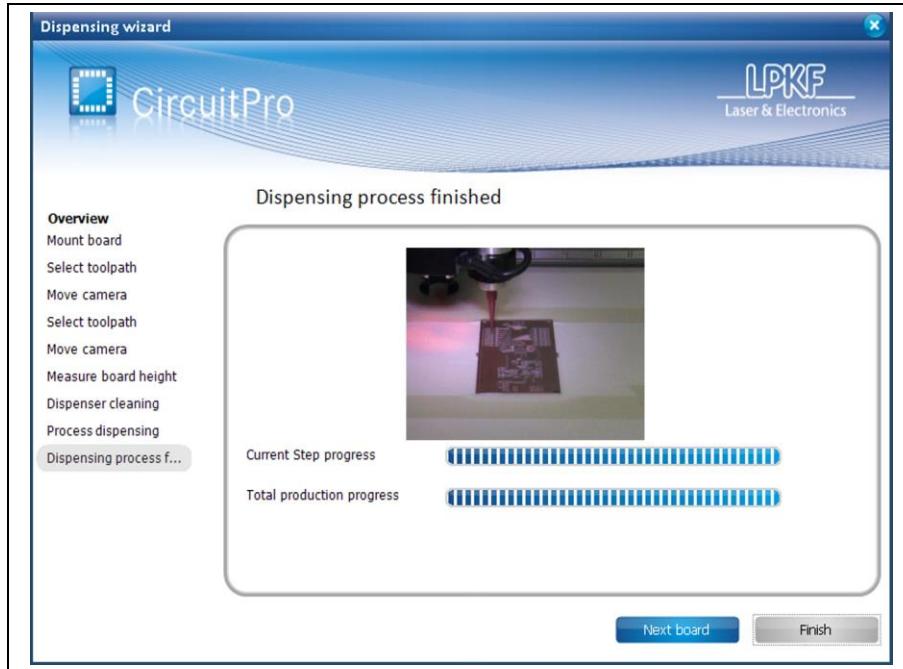
/2/ Section for prompts and display of progress

/3/ [Next] – Starts a new dispense process

/4/ [Finish] – Closes the dispense process wizard

2. Follow the prompts of the dispense process wizard.

Fig. 353:
Dispense process
wizard finished



3. Click on [Next board], if you want to dispense solder paste on another board.

Or

3. Click [Finish], if you want to close the Dispense process wizard.

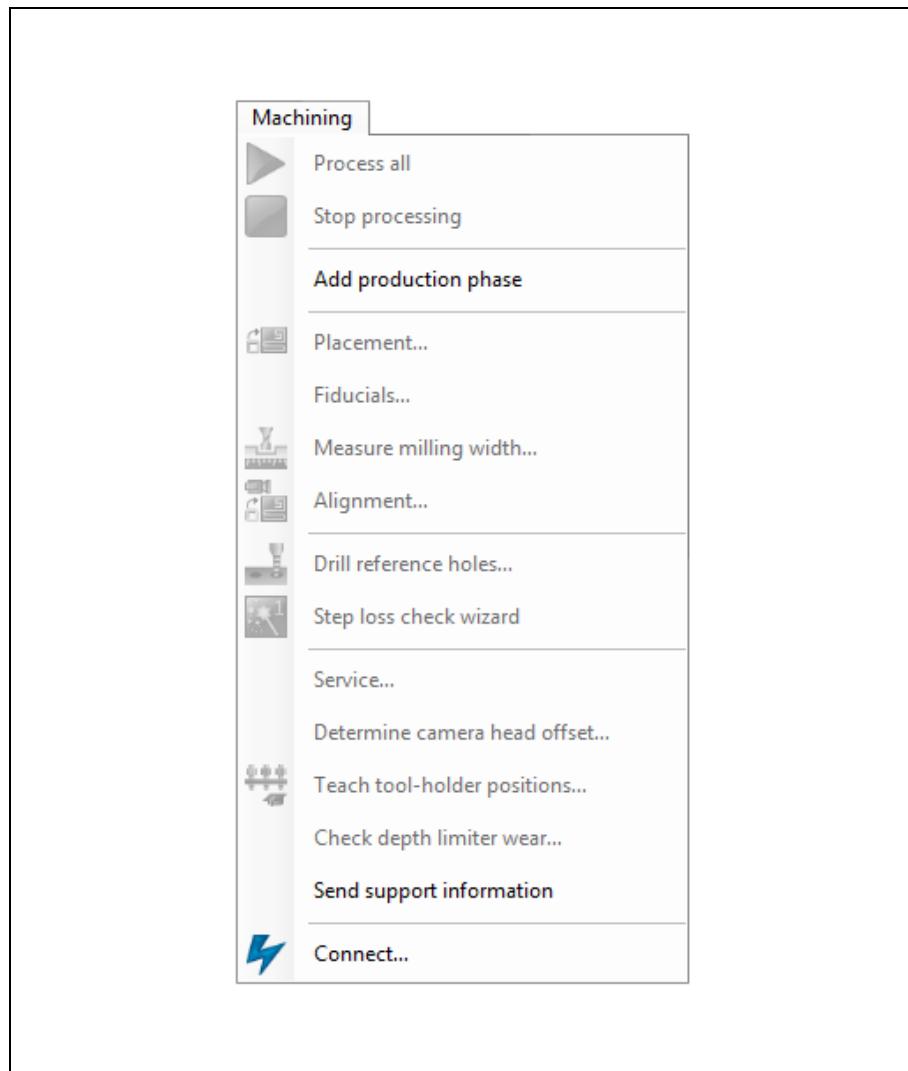
◆ The Dispense process wizard is finished.

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. 354: Menu
“Processing”



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

**Table 47: 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 (Universal Cutter and Micro Cutter): the current milling width is measured.
Alignment...	Opens the dialog “Alignment”.
Drill reference holes...	Opens the dialog “Drill reference holes”.
Step loss check wizard	Starts a wizard to set up the step loss check (ProtoMat D104). For more information refer to the TechNote “Installing the step loss check”.
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 positions...	Measures the tool position by camera.
Check depth limiter wear	Measures the wear of the working-depth limiter.
Send support information	Generates a zip file containing support information in case of a malfunction. You can send it directly to the LPKF Service via email.
Connect...	Opens the dialog “Connect...”. You can connect CircuitPro PM with a physically connected machine, disconnect a machine or switch between machines. You can also connect with a virtual machine.

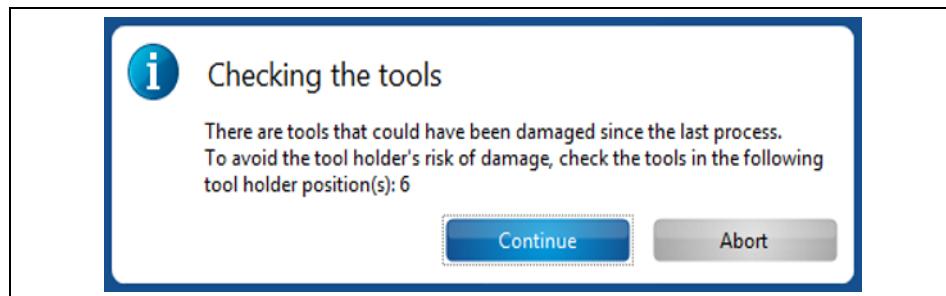
5.9.1 Process all

The menu item “Process all” starts the circuit board production. The individual production phases are processed one after the other.

Click on Machining > Process all to start the board production.

- Starting the process
- 1. Click on Machining > Process all.
- ➔ The following message is displayed:

Fig. 355: Check tools



2. Check the tools.
 3. Click on [Proceed] if the tools are operational.
or
 4. Click on [Cancel] if the tools are damaged and insert new tools.
- ◆ The processing has been started.

5.9.2 Stop processing

Use "Stop processing" in order to stop the current processing of the circuit board. The current phase is not completed. The milling head moves to the pause position.

To stop the machine processing the material, click on Machining > Stop processing.

If you want to resume processing the circuit board you have the following options:

- Restarting the whole phase where the process was interrupted [Resume].
- Continue the process from the selected phase onwards [Ignore].
- Cancel the process [Cancel].

Fig. 356:
Processing aborted



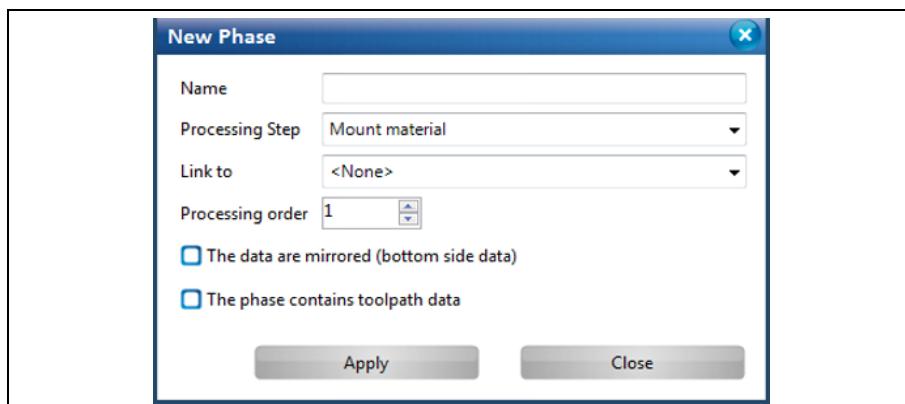
5.9.3 Production phase

You can create new production phases for the circuit board production. These will be displayed in the “Phases” branch in the “Toolpath” pane.

■ Creating a new phase

1. Click on Machining > Production phase...
- ➔ The following dialog is displayed:

Fig. 357: Create new Phase



2. Enter a name for the new phase.
3. Select a processing step.
4. Select a linked phase if necessary.
5. Select the processing order. This field defines when your newly created phase will be processed.



Note

Option “The data are mirrored (bottom side data)”

Activate this check box if the phase to be created shall be processed after the circuit board has been turned over. The data are mirrored to achieve this.



Note

Option “The phase contains toolpath data”

Activate this check box if the phase to be created shall contain toolpaths.

6. Click on [Apply].
- ➔ The new phase is created and is displayed in the “Toolpath” pane.
7. Click on [Close].
- ◆ The new phase has been created.

5.9.4 Placement

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

Click on Machining > Placement to open the dialog.

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

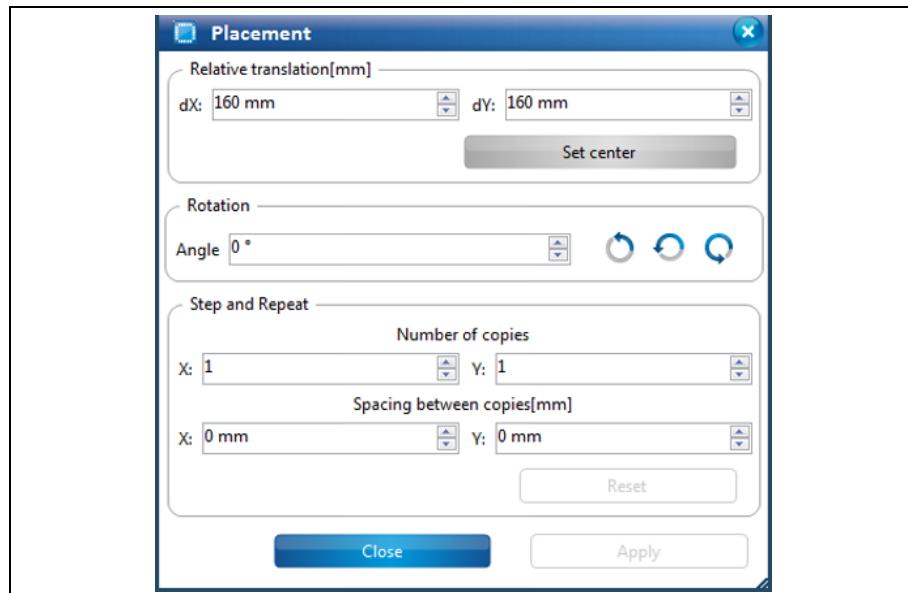


Please note that you can move the processing data only as a whole and not individual toolpaths etc.

Note

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. 358:
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 date are placed at the corresponding position.



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

Note

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].

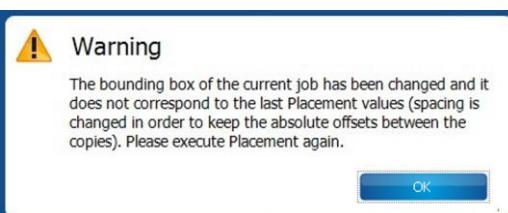
- ◆ The processing data are multiplied.



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.

5.9.5 Fiducials

Using the function "Fiducials," you can set the optical markings in the machining view of CircuitPro PM. 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 PM, 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.

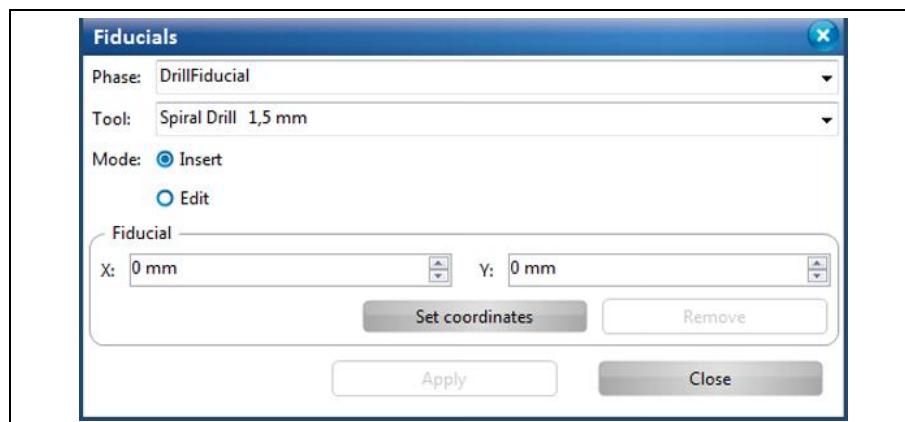
However, you can also work with two fiducials. In this case, these should be diagonally aligned to one another.

1. Click on Machining > Fiducials...

➔ The machining view of CircuitPro PM is activated.

➔ The following dialog is displayed:

Fig. 359:
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].

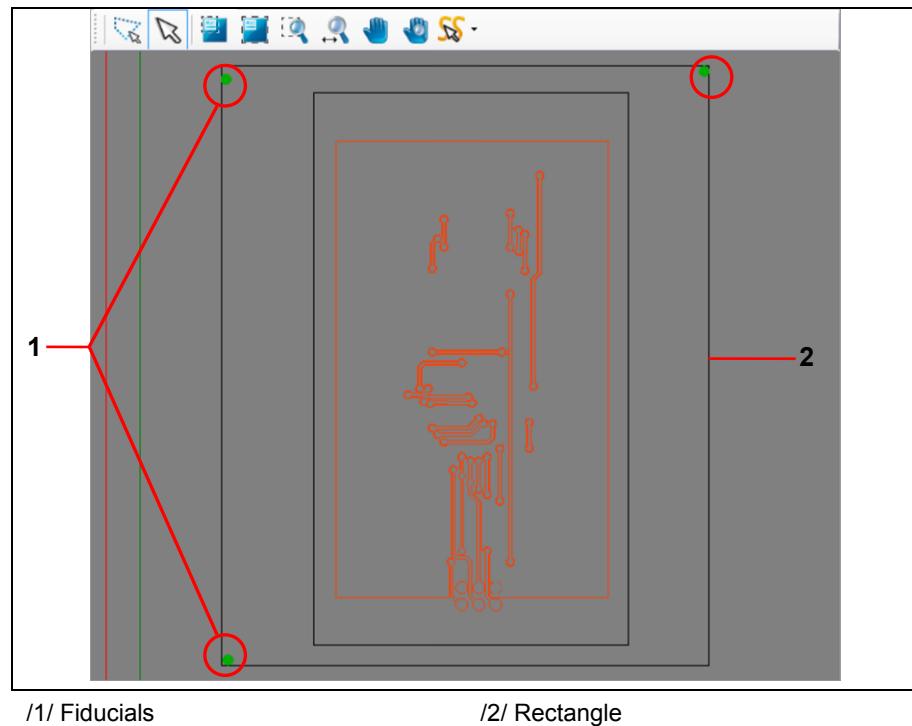
!!! If you have deleted the coordinates of the fiducial, the coordinates of the fiducial set previously are shown automatically!!!

→ 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. 360: Fiducial marks in the machining view.



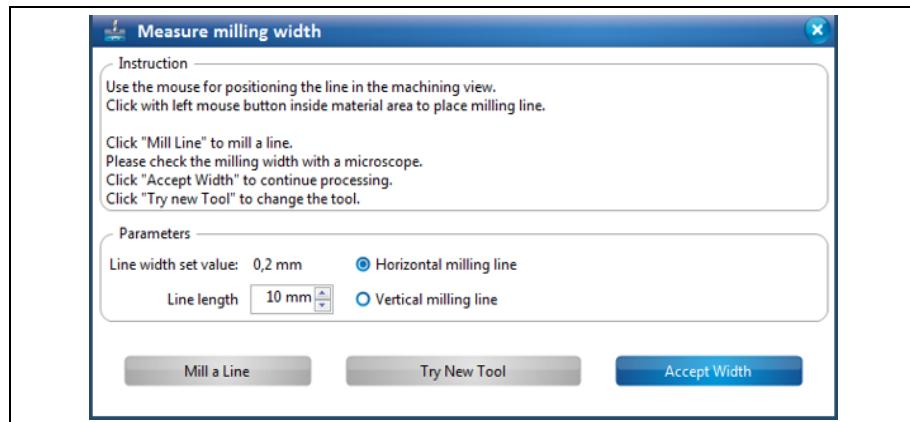
7. Click on [Close].
- ➔ The dialog is closed.
- ◆ The fiducials have been inserted.

5.9.6 Measure milling width ProtoMat E33/E34/S43/X60

The menu item “Measure milling width” lets you mill a line in the base material and measure the milling width with a microscope.

- Measuring the milling width
- 1. Click on Machining > Measure milling width...
- ➔ The following dialog is displayed:

Fig. 361: Measure milling width

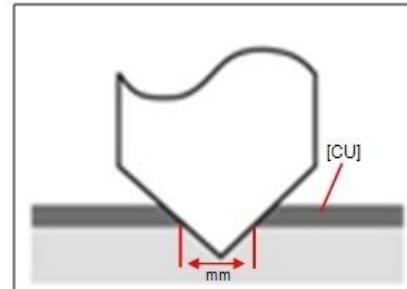


2. Click on the position in the Machining view where you want to mill the line.
3. Enter the length of the line to be milled.
4. Select an option:
 - Horizontal milling line
 - Vertical milling line
5. Click on [Mill a Line].
- ➔ The line is milled at the selected position.
6. Check the milling width with a microscope:



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

Note



7. Click on [Accept Width], if the milling width is okay.
or
7. Adjust the tool manually and mill a line again until the result of the milling width is okay.
or
7. Install a new tool.
8. Click on [Try New Tool].
9. Repeat the steps 1 to 6.
◆ The milling width has been measured.

5.9.7 Measure milling width ProtoMat S63/S103/H100

The menu item “Measure milling width” lets you mill a line in the base material and measure the milling width with the camera.



Note

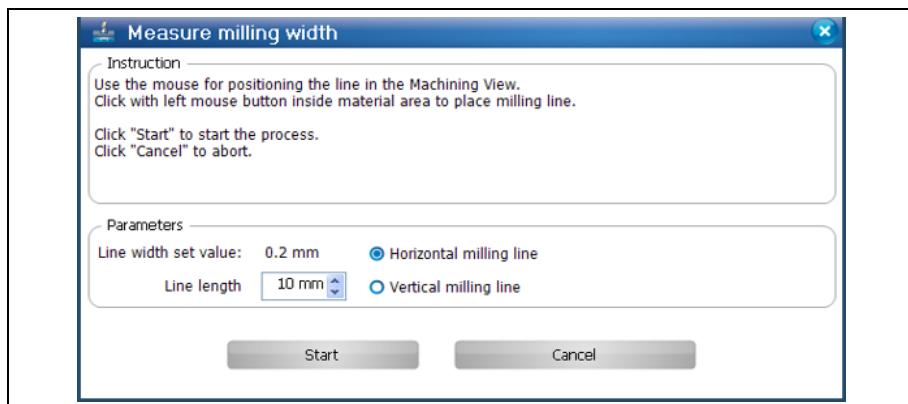
Measuring the milling width with the camera is only possible for lines that have been milled with a Universal Cutter. Lines that have been milled with the Micro Cutter are measured with a microscope (see 5.9.10 on page 313).

■ Measuring the milling width

1. Click on Machining > Measure milling width....

➔ The following dialog is displayed:

Fig. 362: 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:

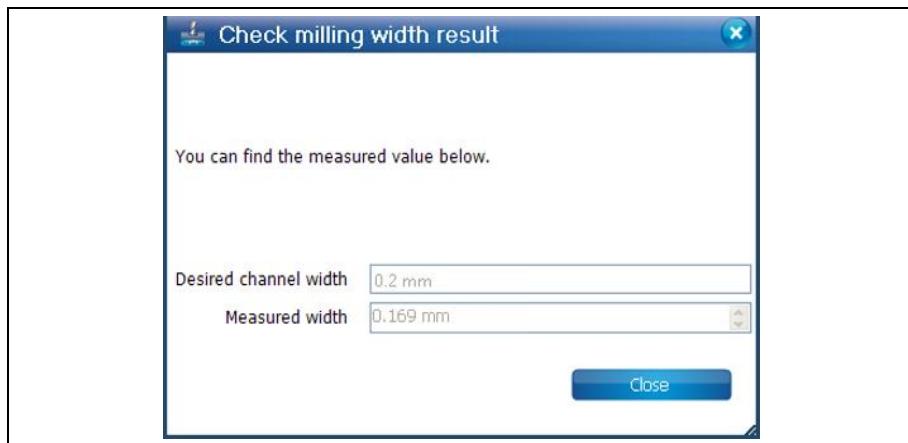
- Horizontal milling line
- Vertical milling line

5. Click on [Start].

➔ The line is milled at the selected position. The Camera pane displays the milled line.

➔ The following dialog with the measurement results is displayed:

Fig. 363: Result of milling width check



6. Click on [Close].

◆ The milling width has been measured.

5.9.8 Measure milling width ProtoMat E44

The menu item “Measure milling width” allows you mill a line in the base material and measure the milling width with the camera.



Note

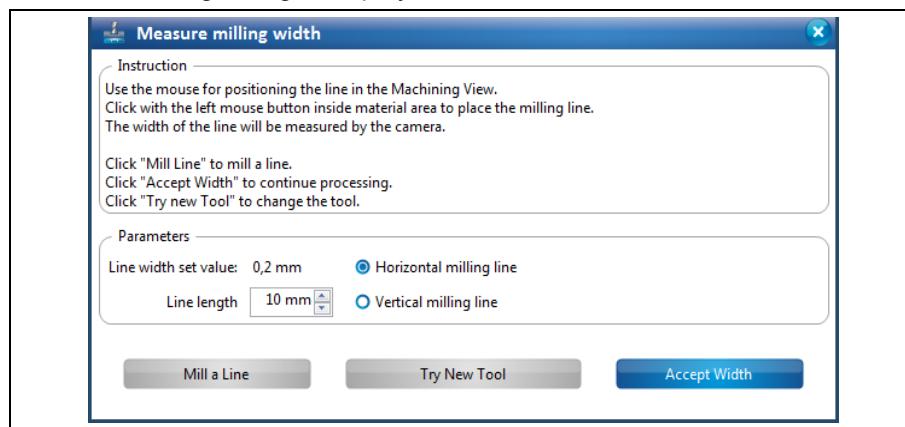
Measuring the milling width with the camera is only possible for lines that have been milled with a Universal Cutter. Lines that have been milled with the Micro Cutter are measured with a microscope (see 5.9.10 on page 313).

■ Measuring the milling width

1. Click on Machining > Measure milling width....

➔ The following dialog is displayed:

Fig. 364: 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:

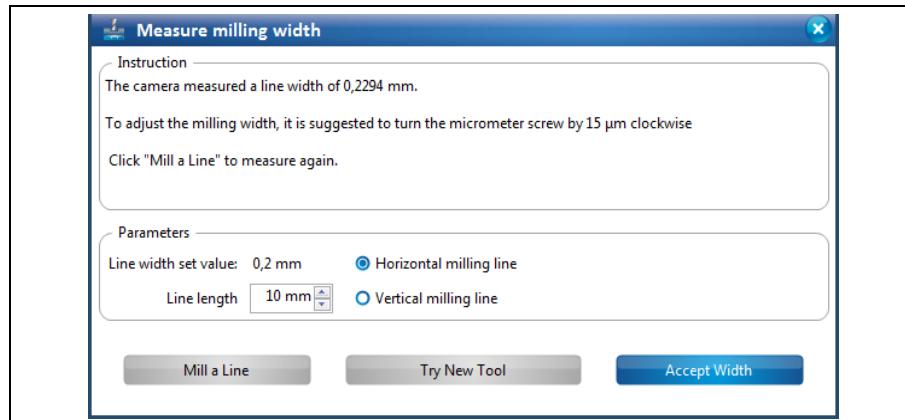
- Horizontal milling line
- Vertical milling line

5. Click on [Mill a Line].

➔ The line is milled at the selected position. The “Camera” pane displays the milled line.

➔ The following dialog with the measurement results is displayed:

Fig. 365: Result of milling width check



6. Click on [Accept Width].

◆ The milling width has been measured.

5.9.9 Measure milling ProtoMat D104

The menu item “Measure milling width” enables you to mill a line in the base material and measure the milling width with the camera.



Note

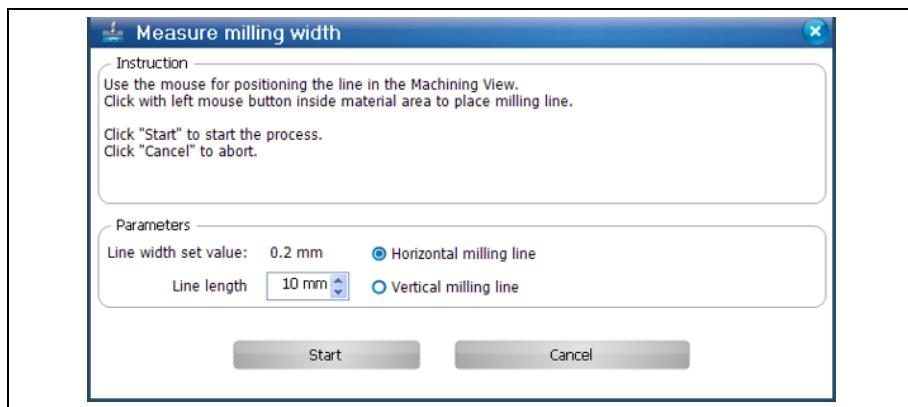
Measuring the milling width with the camera is only possible for lines that have been milled with a Universal Cutter. Lines that have been milled with the Micro Cutter are measured with a microscope (see 5.9.10 on page 313).

■ Measuring the milling width

1. Click on Machining > Measure milling width....

➔ The following dialog is displayed:

Fig. 366: 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:

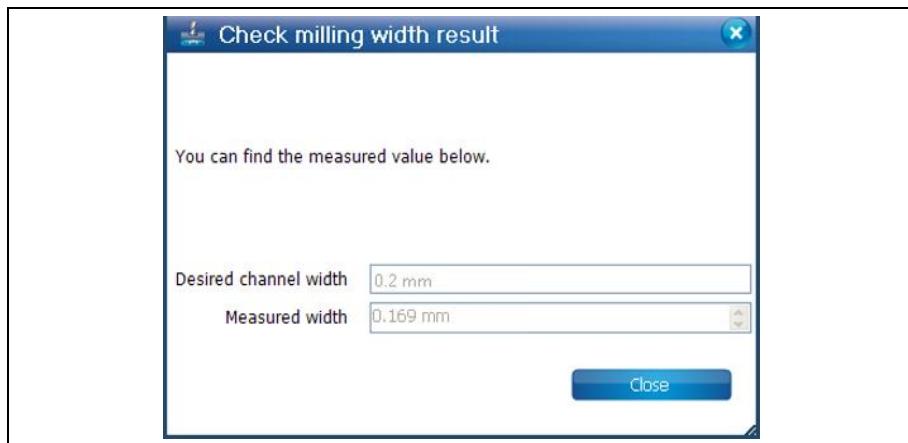
- Horizontal milling line
- Vertical milling line

5. Click on [Start].

➔ The line is milled at the selected position. The “Camera” pane displays the milled line.

➔ The following dialog with the measurement results is displayed:

Fig. 367: Result of milling width



6. Click on [Close].

◆ The milling width has been measured.

5.9.10 Measuring the milling width (Micro Cutter)

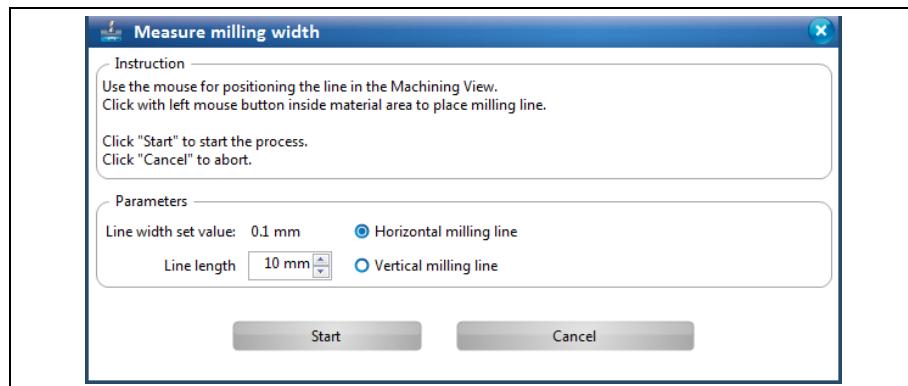
Use the function "Measure milling width" to mill a line into the base material which milling width is subsequently measured with the microscope.

■ Measuring the milling width

1. Click on Machining > Measure milling width....

➔ The following dialog is displayed:

Fig. 368:
Measuring the
milling width
(Micro Cutter)



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

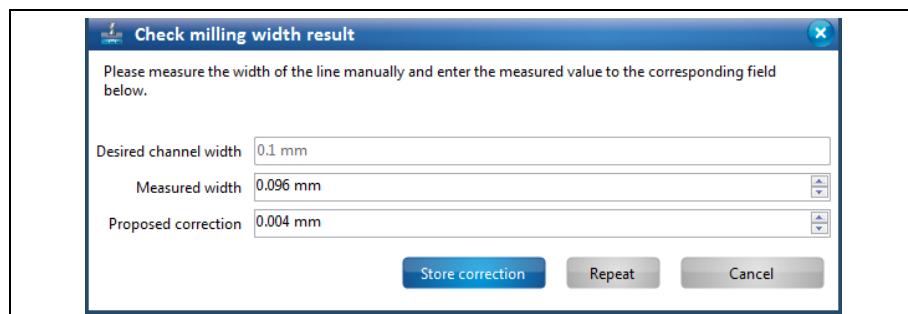
Vertical milling line

5. Click on [Start].

➔ The line is milled at the selected position.

➔ The dialog with the results is displayed:

Fig. 369: Results



Note

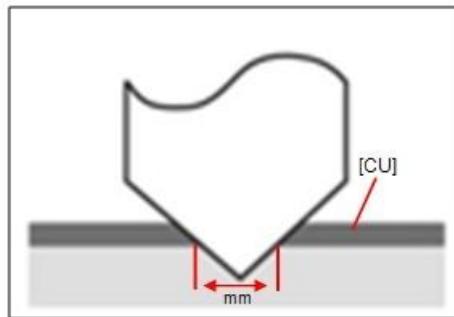
If the option **Adjust width manual for micro cutter** is set to **False**, the milling width is measured with the camera and measurement with the microscope is omitted. The option **Adjust width manual for micro cutter** can be found in Extras > Options under the item "Machine".

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. Enter the measured value into the field \ Measured width \.



Note

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

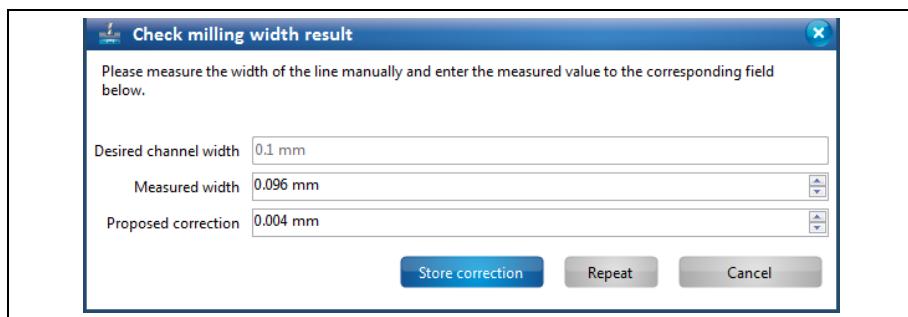


Note

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

8. Increase or decrease the value of the proposed correction by using the two arrow buttons.
 9. To mill the line with the entered proposed correction, click on [Repeat].
- The new line is milled onto the base material with a slight offset and the dialog with the results is displayed:

Fig. 370: Results



10. Measure the milling width by using a microscope.
 11. Enter the measured value into the field \ Measured width \.
 12. Repeat steps 6 - 12 until the desired milling width is reached.
or
 9. Click on [Store correction] to apply the proposed value.
- The correction value for the current tool has been applied. The dialog is closed.



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

Note

- ◆ The milling width has been checked.

5.9.11 Alignment (only if camera is present)

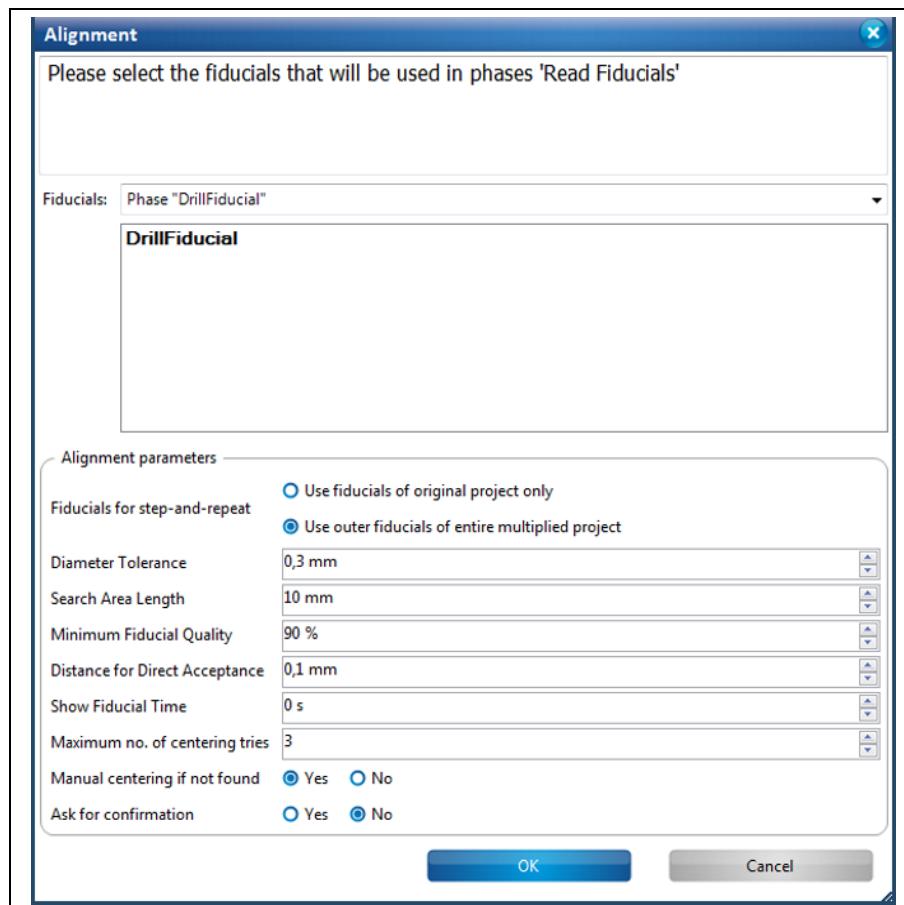
The dialog “Alignment” allows you modify the settings for the “ReadFiducials” phase.

- Modifying the settings for phase “DrillFiducial”

1. Click on Machining > Alignment.

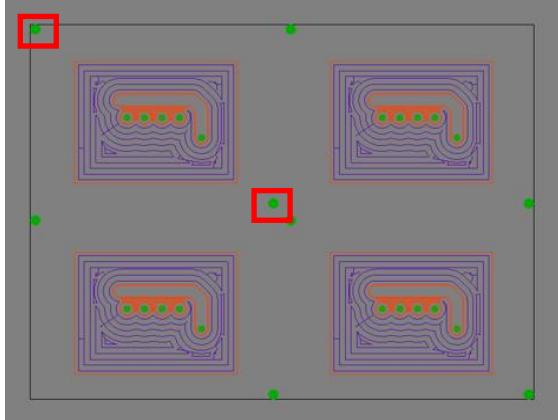
- ➔ The following dialog is displayed:

Fig. 371:
Alignment



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

Table 48:
Alignment

Option	Description
Fiducials for step-and-repeat	<p>If the project has been multiplied with “Step and Repeat”, the fiducials are multiplied as well.</p> <p>Use fiducials of original project only</p> 
	Use outer fiducials of entire multiplied project
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. This value is displayed either in percent (upper field) or in a score (lower field depending on the connected system).
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 “DrillFiducial” phase have been modified.

5.9.12 Drill reference holes

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



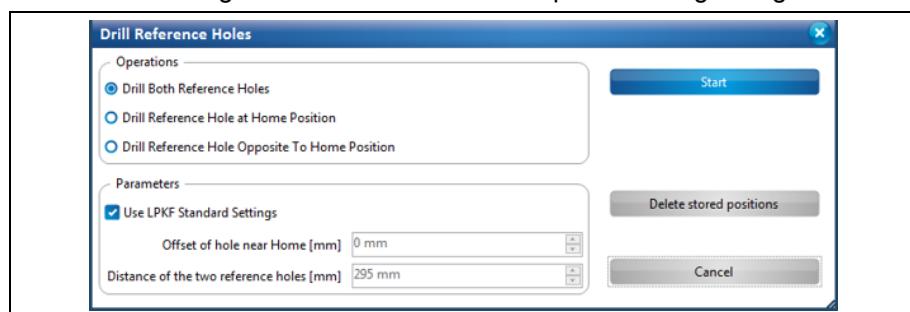
The reference hole system can be used for aligning the board if no camera is available.

Note

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

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

Fig. 372: 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.

5.9.13 Service

Only qualified personnel authorized by LPKF can activate the “Service” menu item by entering a password.

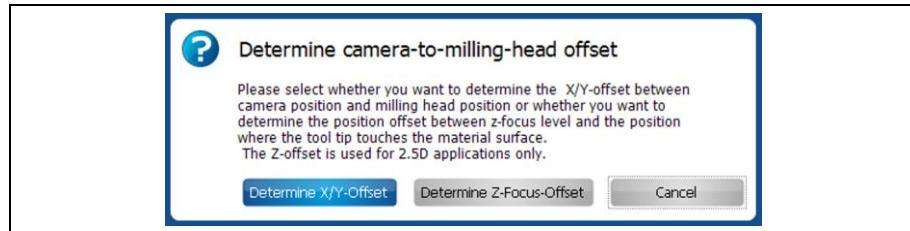
5.9.14 Determining the camera head offset

This function lets you measure the offset between the camera and the milling head.

Click on **Machining > Determine camera head offset...**

➔ The following dialog is displayed:

Fig. 373:
Determine
camera-to-
milling-head
offset



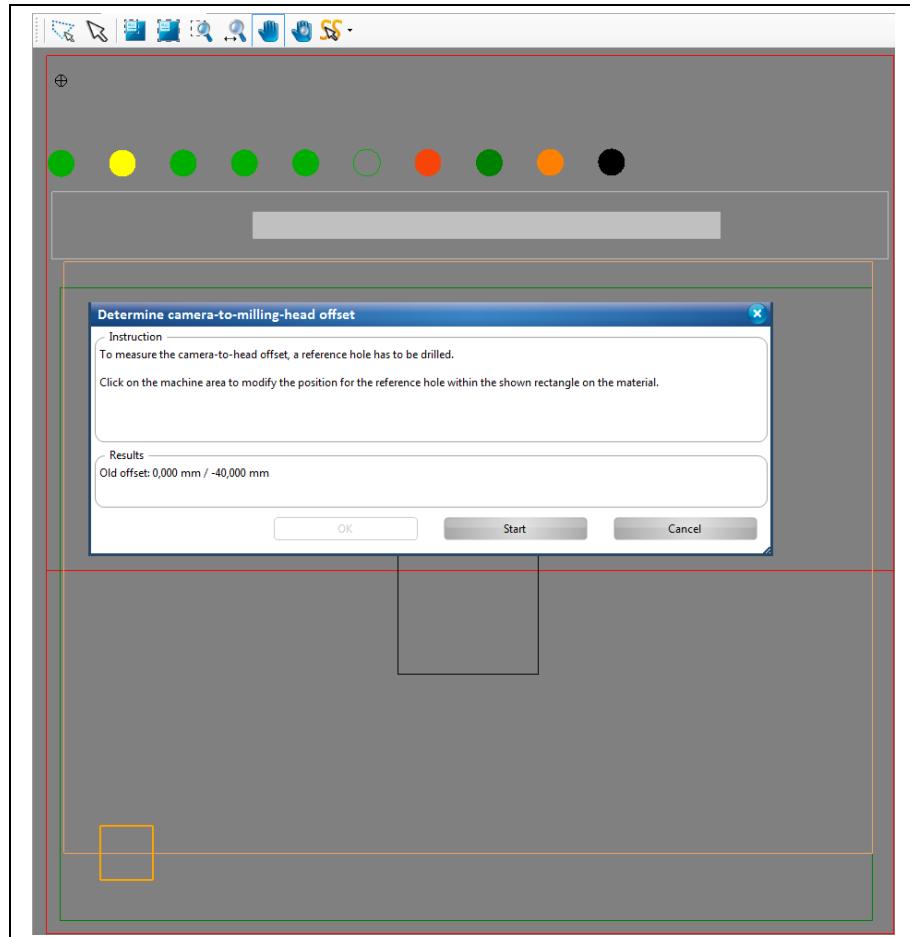
You can choose between determining the X/Y-Offset and the Z-Focus-Offset. The Z-Focus-Offset is used to determine the material height for 2.5D operations.

■ Determining the X/Y-Offset

1. Put the base material onto the table.
2. Click on [Determine X/Y-Offset].

➔ The following dialog is displayed in the machining view:

Fig. 374:
Determine
camera-to-
milling-head
offset

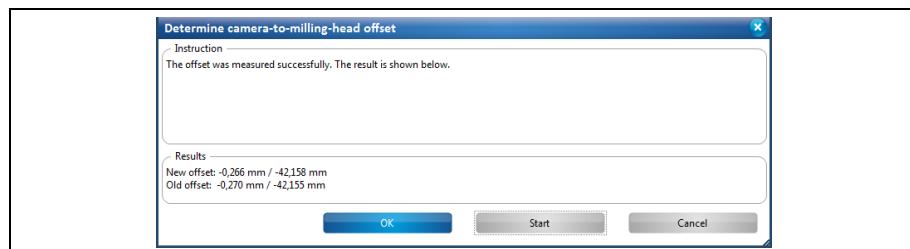


3. Follow the instructions in the dialog window.

4. Click on [Apply].

- ➔ A hole is drilled at the selected position. The camera moves to this drill hole and measures the position (see "Camera" pane).
- ➔ The following dialog is displayed:

Fig. 375: Offset determined



5. Click on [OK].

- ➔ The following dialog is displayed:

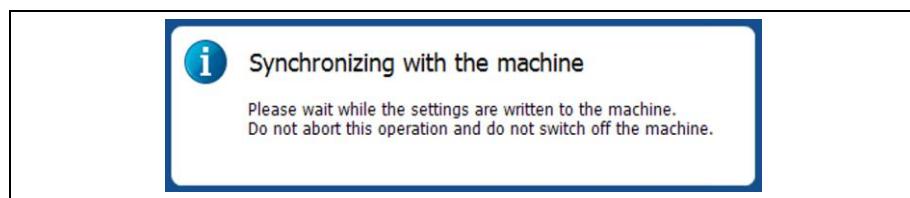
Fig. 376: Save results



6. Click on [Save].

- ➔ CircuitPro synchronizes the results with the machine. A corresponding message is displayed:

Fig. 377: Synchronizing the results



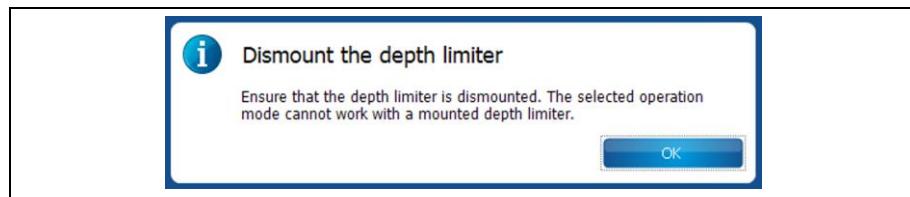
- ◆ The X/Y-Offset is determined.

■ Determining the Z-Focus offset

1. Click on [Determine Z-Focus-Offset].

- ➔ The following message is displayed:

Fig. 378: Dismount the depth limiter



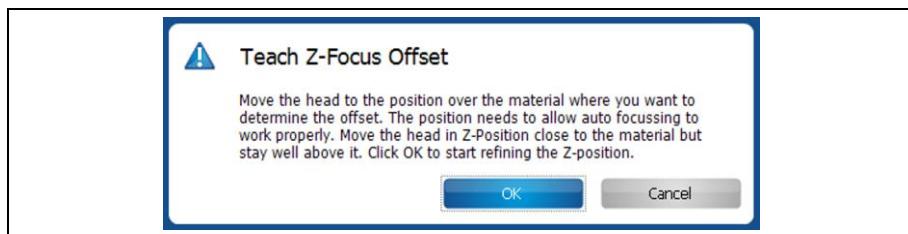
Note

 For more information about dismounting the depth limiter, please refer to the delivered ProtoMat S manual.

2. Confirm the message by clicking on [OK].

→ The following dialog is displayed:

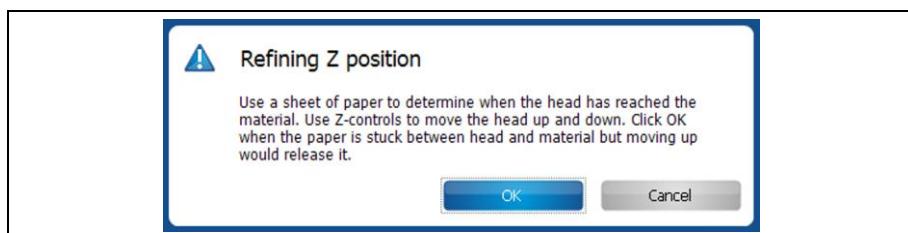
Fig. 379: Teach Z-Focus Offset



3. Follow the instructions in the dialog.
4. Click on [OK].

→ The following dialog is displayed:

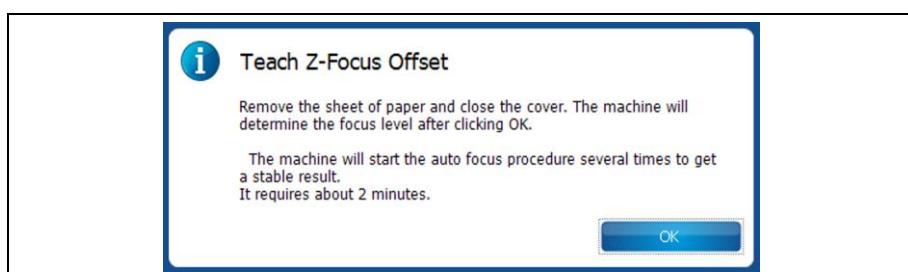
Fig. 380: Refining Z position



5. Follow the instructions in the dialog.
6. Click on [OK].

→ The following dialog is displayed:

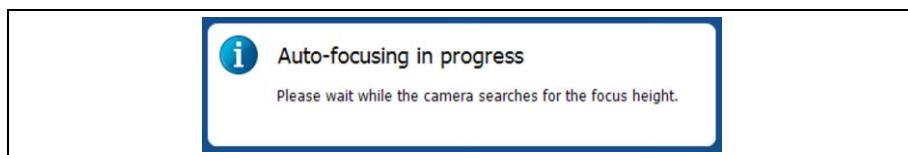
Fig. 381: Teach Z-Focus Offset



7. Follow the instructions in the dialog.
8. Click on [OK].

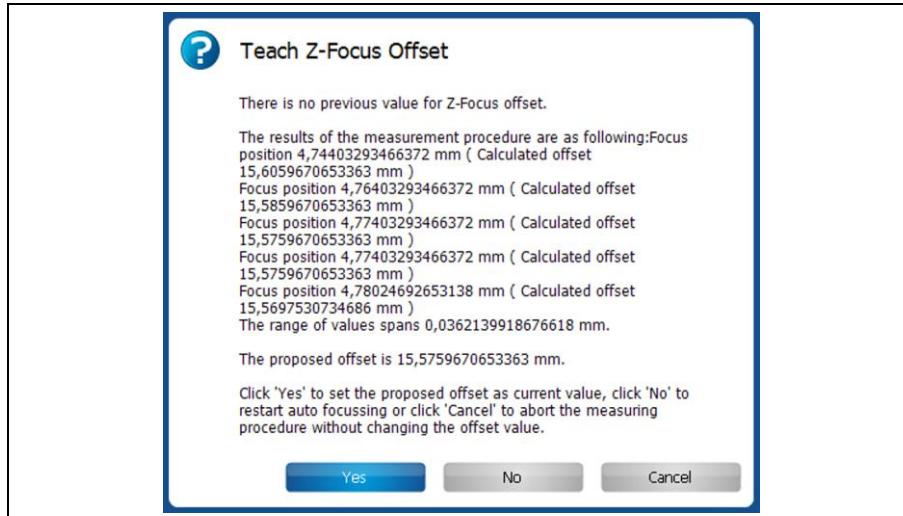
→ The following message is displayed:

Fig. 382: Auto-focusing in progress



→ The result of the measurement procedure is displayed:

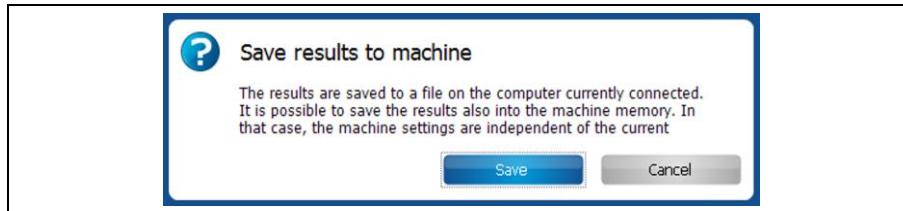
Fig. 383: Results



9. Follow the instructions in the dialog.
10. Click on [Yes] to set the proposed offset as current value.

→ The following message is displayed:

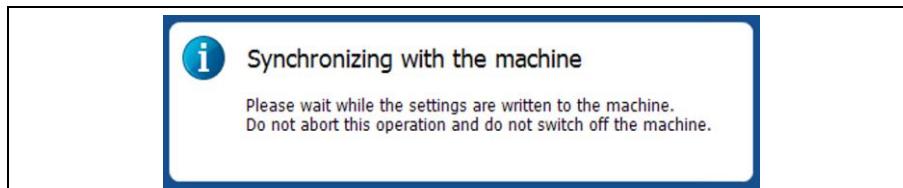
Fig. 384: Save results to machine



11. Click on [Save] to save the results into the machine memory.

→ The following message is displayed:

Fig. 385:
Synchronising
the results



◆ The Z-Focus offset is determined.

5.9.15 Teach tool-holder positions

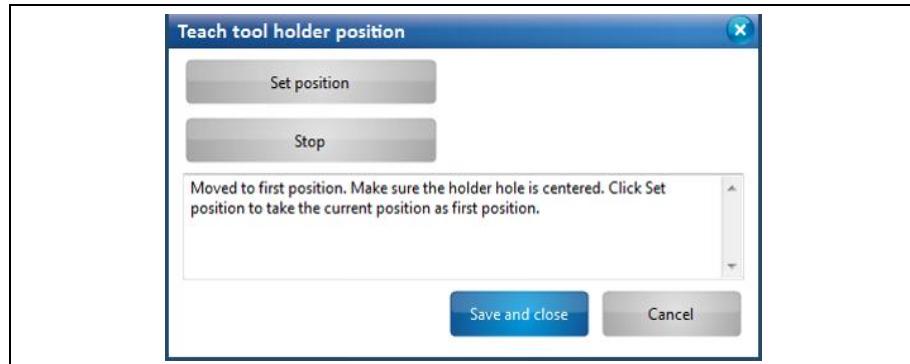
Use the menu item “Teach tool-holder positions” to measure the tool-holder positions of the ProtoMat machine.

■ Measuring tool-holder positions and storing to machine memory

1. Click on Machining > Teach tool-holder positions...

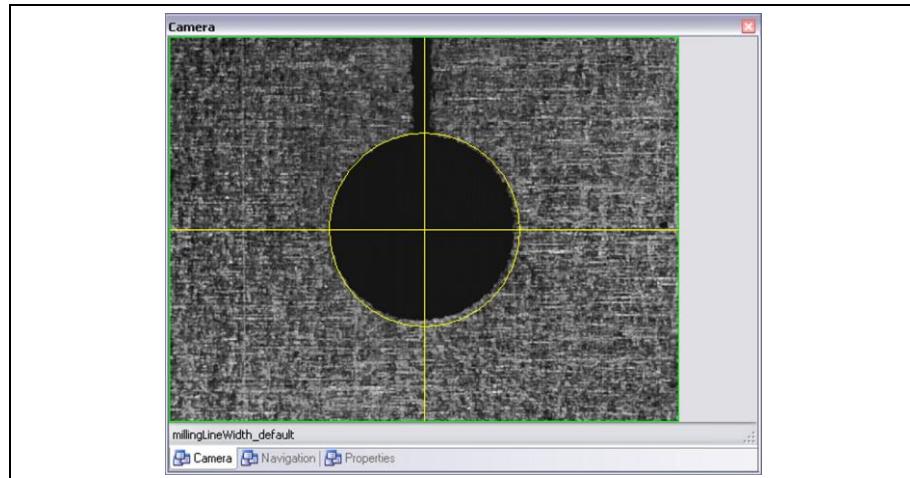
→ The following dialog is displayed:

Fig. 386: Teach Tool-holder Positions



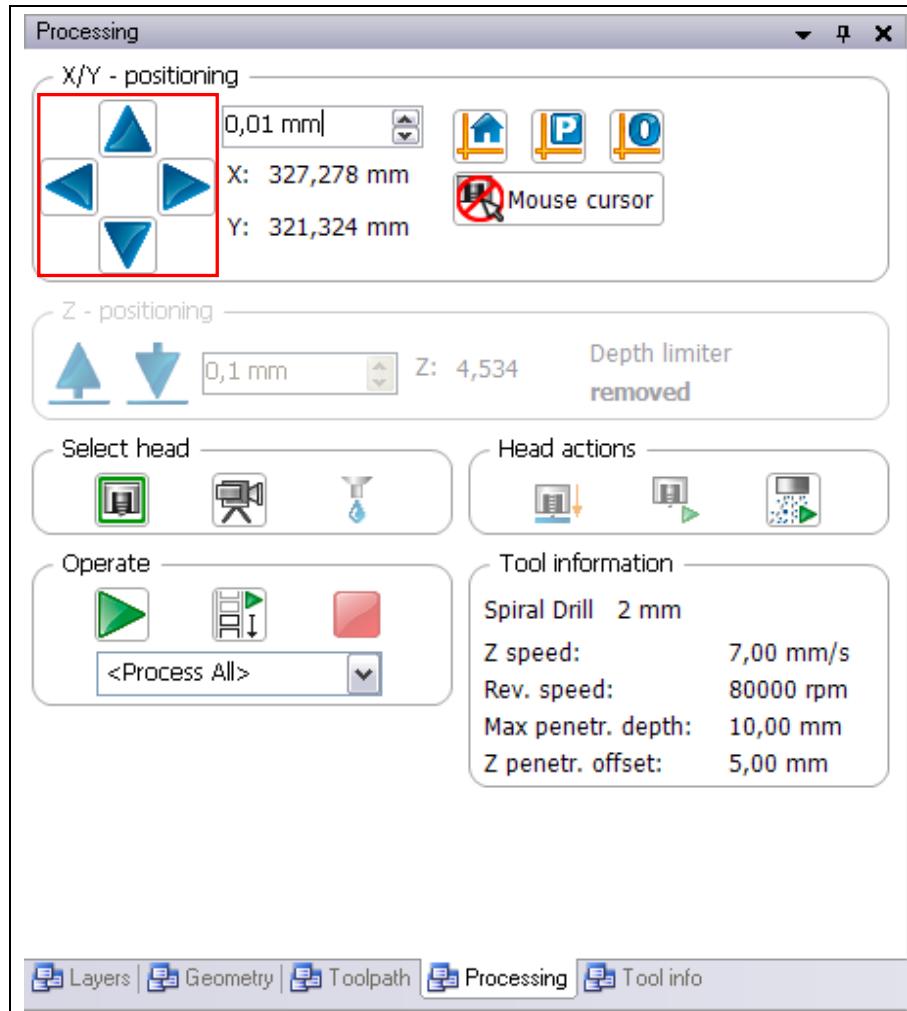
The processing head moves to the position of the first tool holder. The camera focuses automatically and displays the following image in the “Camera” pane:

Fig. 387: Camera image of tool-holder position



2. Move the cross-hairs to the center of the tool-holder position (black circle) using the X and Y buttons in the “Processing” pane:

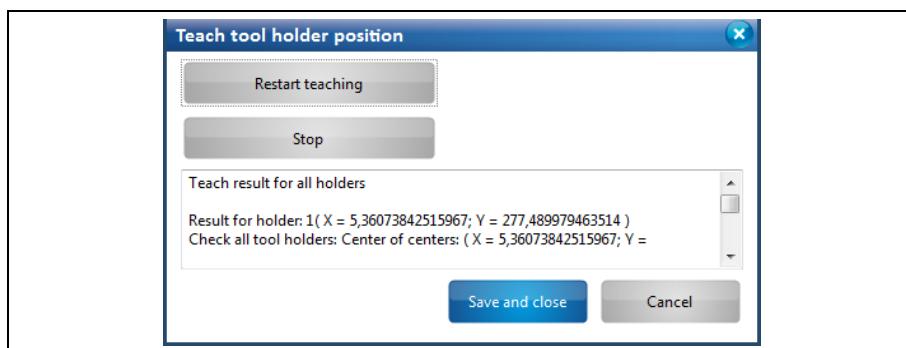
Fig. 388: X/Y buttons



3. Click on [Set current camera position as position of first holder].
→ The position is stored as the first position. The processing head moves to the position of the last tool holder.
4. Repeat step 2.
5. Click on [Set position].
→ The position is stored as the last position. The camera moves to all tool-holder positions one after the other.

⇒ The following dialog showing the results is displayed:

Fig. 389: Results

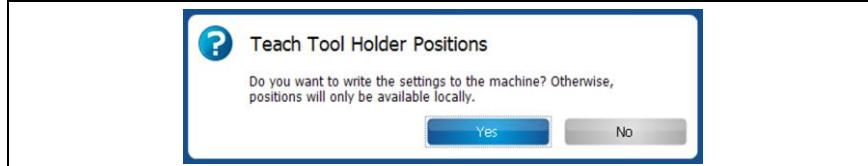


The dialog allows the following operations:

- Restart teaching the tool-holder positions [Restart teaching]
 - Stop the current operation (e.g. when storing or performing the measuring again) [Stop]
 - Store the measurement results [Save and close]
 - Abort all operations and close the dialog [Cancel]
6. Click on [Save and close].

⇒ The following message is displayed:

Fig. 390: Save results to machine



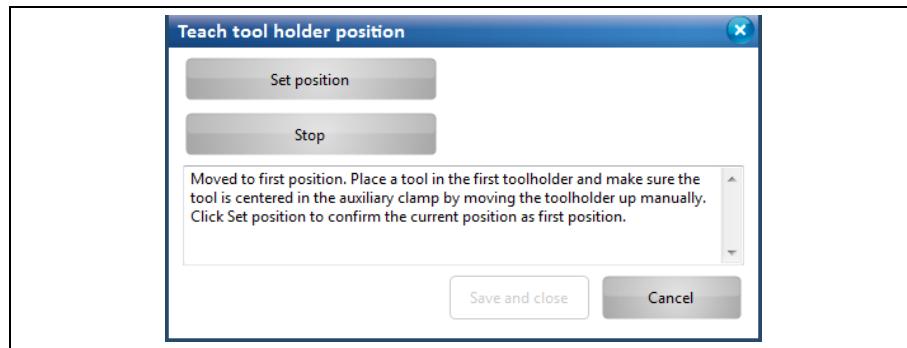
7. Click on [Yes] in order to store the results to the machine's memory.
- ⇒ CircuitPro PM synchronizes the measurement results with the machine's memory. A corresponding message is displayed.
- ◆ The tool-holder positions have been measured and stored to the machine's memory.

5.9.16 Teach tool-holder position H100

Use the menu item “Teach tool-holder positions” to measure the tool-holder positions of the ProtoMat H100 machine.

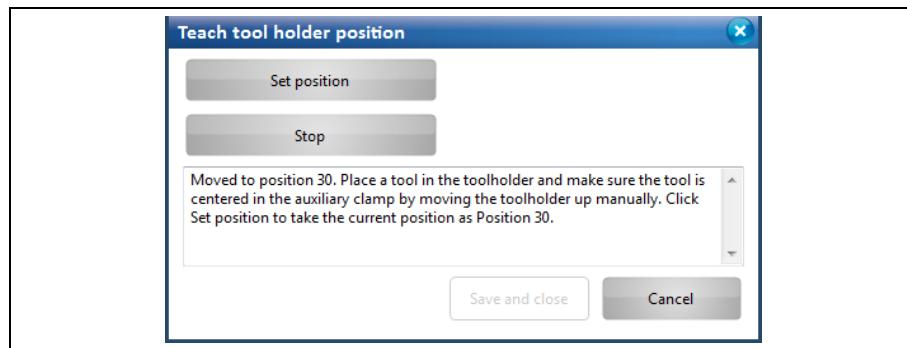
- Measuring tool-holder positions and storing to machine memory
- 1. Click on Machining > Teach tool-holder Positions.
- ➔ The processing head moves to the position of the first tool holder and the following dialog is displayed:

Fig. 391: Teach first tool-holder position



2. Insert a tool into the first tool-holder position.
3. Check whether the center of the auxiliary collet is centered on the tool's center by manually moving the tool magazine upwards.
4. If the auxiliary collet and the tool are not aligned to each other, move the processing head and repeat step 3.
5. Click on [Set position].
6. Click on [Save and close].
- ➔ The processing head moves to position 30 of the tool holder and the following dialog is displayed:

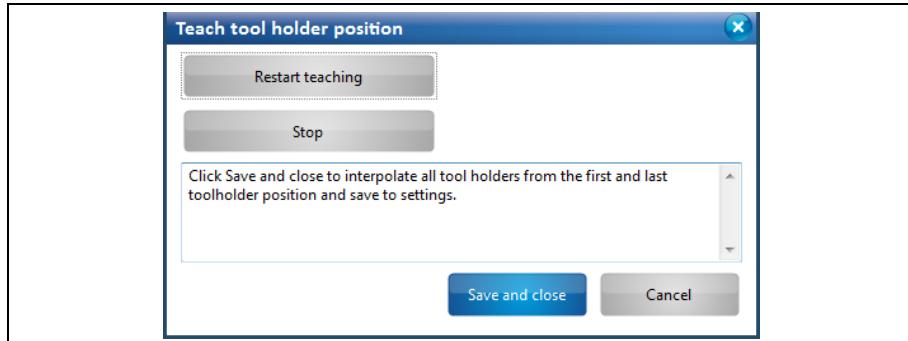
Fig. 392: Teach last tool-holder position



7. Insert a tool into position 30 of the tool-holder.
8. Check whether the center of the auxiliary collet is centered on the tool's center by manually moving the tool magazine upwards.
9. If the auxiliary collet and the tool are not aligned to each other, move the processing head and repeat step 8.
10. Click on [Set position].

► The following dialog is displayed:

Fig. 393: Results



This dialog allows the following operations:

- Restart teaching the tool-holder positions [Restart teaching]
 - Stop the current operation (e.g. when storing or performing the measuring again) [Stop]
 - Store the measurement results [Save and close]
 - Abort all operations and close the dialog [Cancel]
11. Click on [Save and close].
- CircuitPro PM calculates the tool-holder positions and saves the settings.
- ◆ The tool-holder positions have been measured and stored to the machine's memory.

5.9.17 Connect

The menu item “Connect” allows the following operations:

- Connect CircuitPro PM with an LPKF ProtoMat machine [Connect].
- Disconnect CircuitPro PM from the LPKF ProtoMat machine [Disconnect].
- If CircuitPro PM 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 PM

or

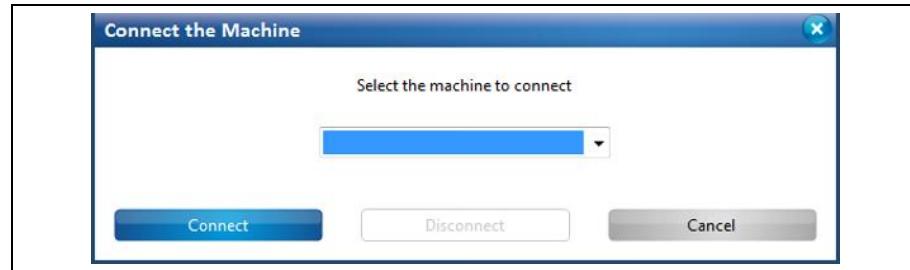
if you want to connect CircuitPro PM to a ProtoMat machine that differs from the one configured previously.

■ Connecting CircuitPro PM with an LPKF ProtoMat machine

1. Click on Machining > Connect...

➔ The following dialog is displayed:

Fig. 394: Connect the machine



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



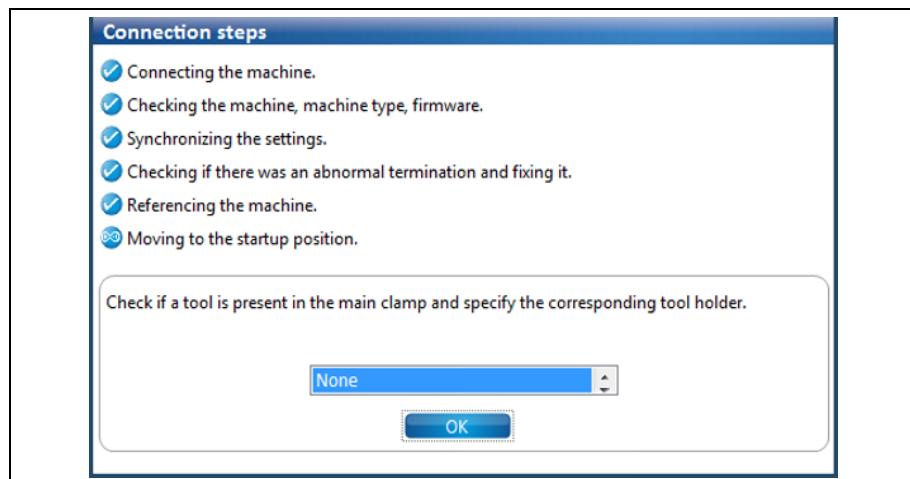
Tip

CircuitPro PM provides a virtual machine for simulating processes. You can connect CircuitPro PM 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. 395:
Connection steps



4. Check if a tool is clamped and specify the position of the tool magazine.
 5. Click on [OK].
- ◆ CircuitPro PM is connected to the LPKF ProtoMat machine.
- Disconnecting CircuitPro PM from the LPKF ProtoMat machine
1. Click on Machining > Connect...
 2. Click on [Disconnect].
- ◆ CircuitPro PM is disconnected from the LPKF ProtoMat machine.
- Switching CircuitPro PM 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 PM is switched to the other machine.

5.10 Menu Camera



The menu “Camera” is only visible if you are using a machine that is equipped with a camera.

Note

The menu “Camera” allows you to change the settings of the camera.

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

Fig. 396: Menu “Camera”



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

Table 49: Menu functions “Camera”

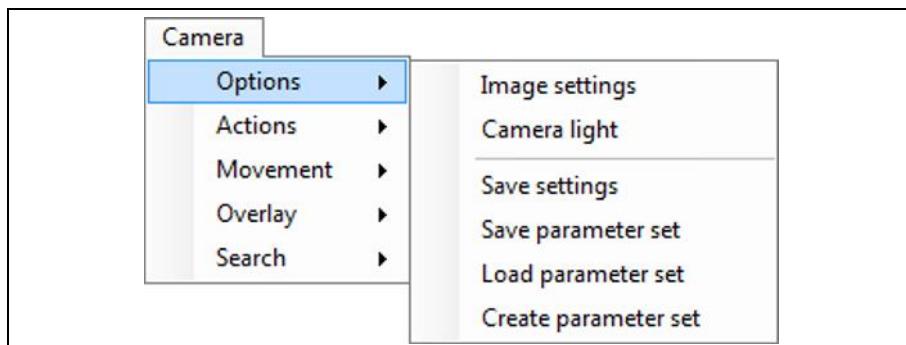
Menu item	Description
Options	Opens the submenu “Options”.
Actions	Opens the submenu “Actions”.
Movement	Opens the submenu “Movement”.
Overlay	Opens the submenu “Overlay”.
Search	Opens the submenu “Search”.

5.10.1 Options

The menu item “Options” allows you to modify the image acquisition settings of the camera.

Click on Camera > Options to open the following cascading menu:

Fig. 397: Camera > Options



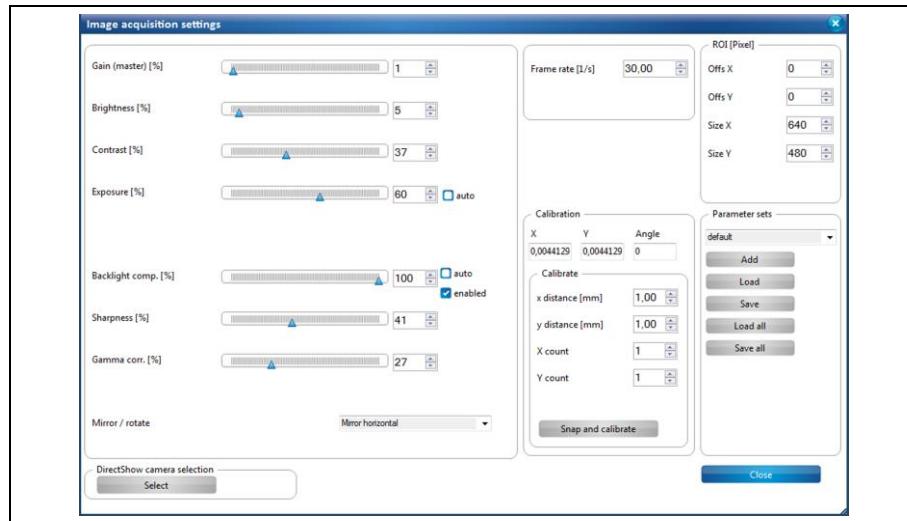
The following functions are available in the “Options” sub-menu:

- Image settings
- Camera light
- Save settings
- Save parameter set
- Load parameter set
- Create parameter set

5.10.1.1 Image settings

The sub-menu “Image settings” allows you to modify specific camera settings. Click on Camera > Options > Image settings to open the following dialog:

Fig. 398: Image acquisition settings



The following settings are available:

Table 50: Image acquisition settings

Setting	Description
Miscellaneous	
Gain (master)	Adjusts the signal amplification of the camera.
Brightness [%]	Adjusts the brightness of the camera image.
Contrast [%]	Adjusts the contrast of the camera image.
Exposure [%]	Adjusts the exposure time of the camera.
Backlight comp. [%]	Adjusts the backlight compensation.
Sharpness [%]	Adjusts the sharpness of the camera image.
Gamma corr. [%]	Adjusts the gamma correction of the camera image.
Mirror / Rotate	Allows to mirror and/or rotate the camera image.
Frame rate [1/s]	Sets the frame rate of the camera.
ROI [Pixel]	
Offs X	Adjusts the offset of the region of interest within the camera image in X direction.
Offs Y	Adjusts the offset of the region of interest within the camera image in Y direction.
Size X	Sets the size of the camera image in X direction in pixels.
Size Y	Sets the size of the camera image in Y direction in pixels.
Digital gain	Allows to enter a value for digital amplification of the camera image.
DirectShow camera selection	
Select	Allows to select the active camera.

Table 50: Image acquisition settings

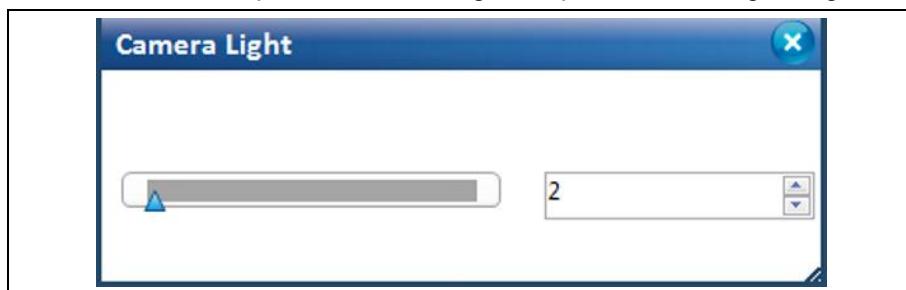
Setting	Description
Calibration	
X, Y, Angle	Shows the calibration factors of the camera.
Calibrate	
X distance [mm]	Sets the size of the object in X direction that is to be used for calibration.
Y distance [mm]	Sets the size of the object in y direction that is to be used for calibration.
Angle offset	Sets the angle of the objects that are to be used for calibration.
X count	Sets the number of objects in X direction that are to be used for calibration.
Y count	Sets the number of objects in Y direction that are to be used for calibration.
Snap and calibrate	Starts the calibration and computes the calibration factors.
Parameter sets	
Add	Adds camera parameter sets.
Load	Loads an existing camera parameter set or creates a new one.
Save	Saves the changed settings into the selected camera parameter set.
Load all	Loads all existing camera parameter sets into the drop-down list.
Save all	Saves the settings of all camera parameter set.

5.10.1.2 Camera light

The sub-menu “Camera light” allows you to change the brightness of camera light.

Click on Camera > Options > Camera light to open the following dialog:

Fig. 399: Camera light



You can change the brightness of the camera light as follows:

- Moving the slider using the mouse.
- Entering a value into the input field and confirming the value with the “Enter” key.
- Clicking on the scroll buttons.



The camera light value is automatically reset to 2 when the program is restarted.

Note

5.10.1.3 Save settings

The sub-menu “Save settings” allows you to save specific camera settings.

- Saving the camera settings
- 1. Click on Camera > Options > Save settings.
- ◆ The camera settings are saved.

5.10.1.4 Save parameter set

The sub-menu “Save parameter set” allows you to save specific camera settings.

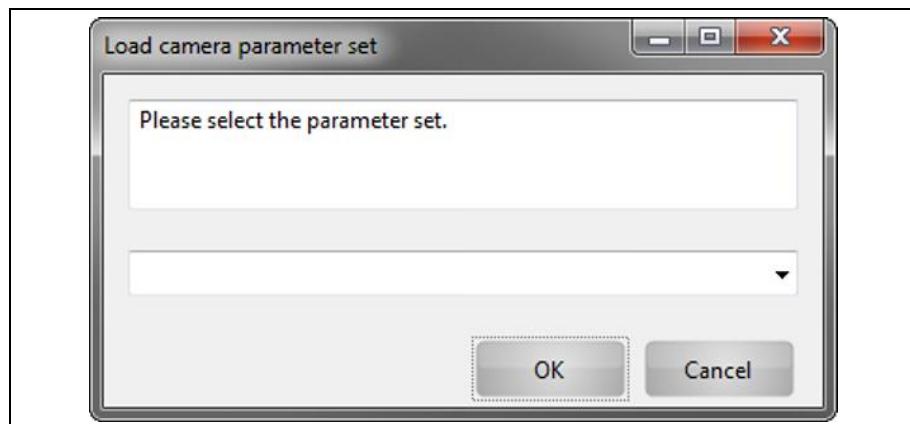
- Saving the current parameter set
- 1. Click on Camera > Options > Save parameter set.
- ◆ The parameter set is saved.

5.10.1.5 Load parameter set

The sub-menu “Load parameter set” allows you to select specific camera parameter sets.

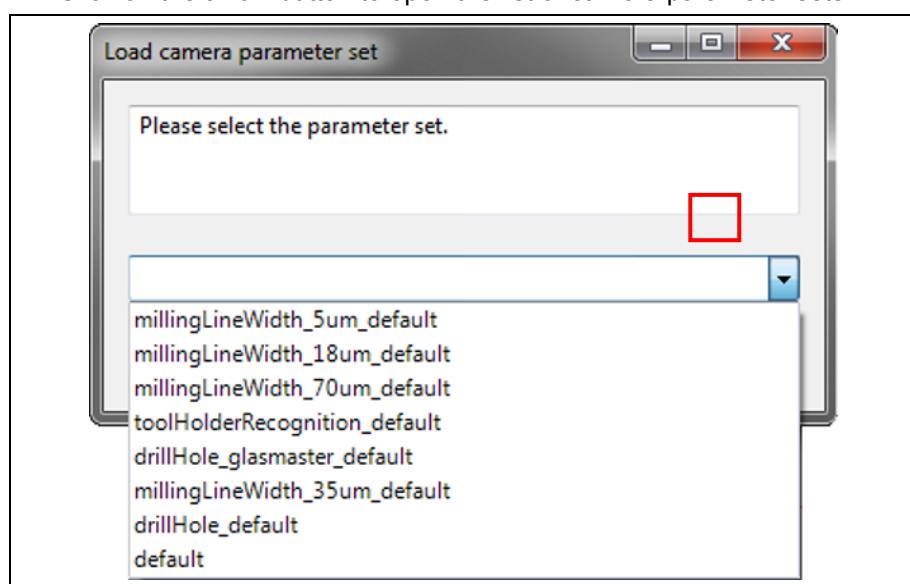
- Loading a camera parameter set
- 1. Click on Camera > Options > Load parameter set.
- ➔ The following dialog is displayed:

Fig. 400: Load parameter set



2. Click on the arrow button to open the list of camera parameter sets.

Fig. 401: Load parameter set - drop-down list



3. Select a camera parameter set:

The following pre-sets are available:

Table 51: Pre-sets

Pre-set	Description
drillHole_default	Pre-set for recognizing fiducials
millingLineWidth_5um_default	Pre-set for acquiring milled lines (5 µm copper thickness)
millingLineWidth_18um_default	Pre-set for acquiring milled lines (18 µm copper thickness)
millingLineWidth_35um_default	Pre-set for acquiring milled lines (35 µm copper thickness)
millingLineWidth_70um_default	Pre-set for acquiring milled lines (70 µm copper thickness)
toolHolderRecognition_default	Pre-set for teaching the tool-holder positions
drillHole_glasmaster_default	Pre-set for recognizing fiducials on the glass master
default	Pre-set with default settings



If you have created other camera parameter sets, these are also displayed in the drop-down list.

Note

4. Click on [OK].
- ◆ The camera parameter set is loaded.

5.10.1.6 Create Camera Parameter Set

The sub-menu “Create parameter set” allows you to create new camera parameter sets.

- Creating a camera parameter set
- 1. Click on Camera > Options > Create parameter set.
- ➔ The following dialog is displayed:

Fig. 402: Create parameter set



2. Select a camera parameter set type:

The following parameter set types are available:

Table 52: Create parameter set

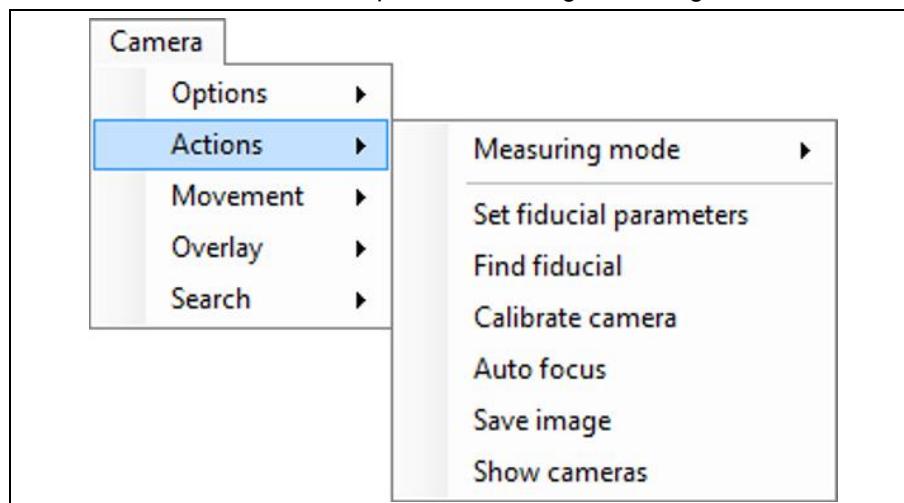
Parameter set type	Description
Select type of parameter set	
Active	Currently loaded parameter set
Fiducial Search	Parameter set for searching fiducials
Line Width Finder	Parameter set for measuring the width of a milled line
Tool Holder Recognition	Parameter set for teaching the tool-holder positions
Standard	Standard parameter set
Suffix used	User-defined suffix for the name
Full Name	Type name + user-defined suffix

3. Confirm by clicking on [OK].
 - Or
 3. Close the dialog by clicking on [Cancel].
- ◆ The camera parameter set has been created.

5.10.2 Actions

The sub-menu “Actions” allows you to perform specific camera actions.
Click on Camera > Actions to open the following cascading menu:

Fig. 403: Camera > Actions



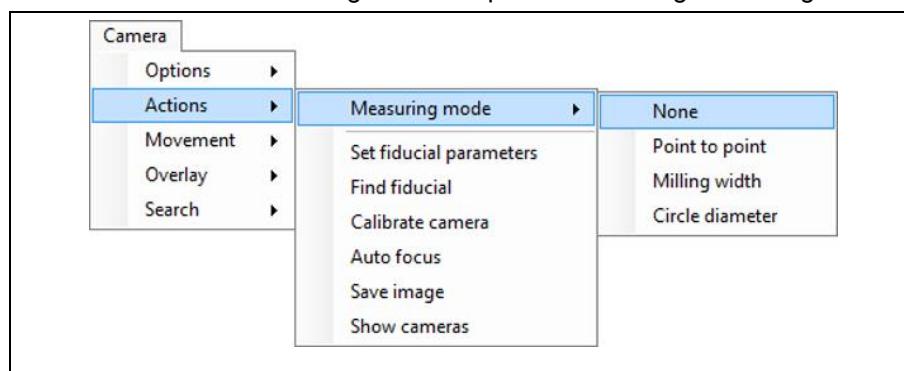
The following functions are available:

- Measuring Mode
- Set fiducial parameters
- Find fiducial
- Calibrate camera
- Auto focus
- Save image
- Show cameras

5.10.2.1 Measuring mode

The sub-menu “Measuring mode” allows you to perform measurements.
Click on Camera > Measuring mode to open the following cascading menu:

Fig. 404: Camera > Actions > Measuring mode



The following functions are available:

- None
- Point to point
- Milling width
- Circle diameter

None

This option deactivates all measurement options.

- Deactivating the measurement options
- 1. Click on Camera > Actions > Measuring Mode > None
- ◆ The measurement options are deactivated.

Point to Point

The “Point to Point” function lets you measure the distance between two points of your choice.

- Measuring point to point
 - 1. Click on Camera > Actions > Measuring Mode > Point to Point.
 - 2. In the camera pane, click on the point that you want to use as the starting point for the measurement.
 - 3. In the camera pane, click on the point that you want to use as the end point for the measurement.
- ➔ CircuitPro PM connects the two points with a line.



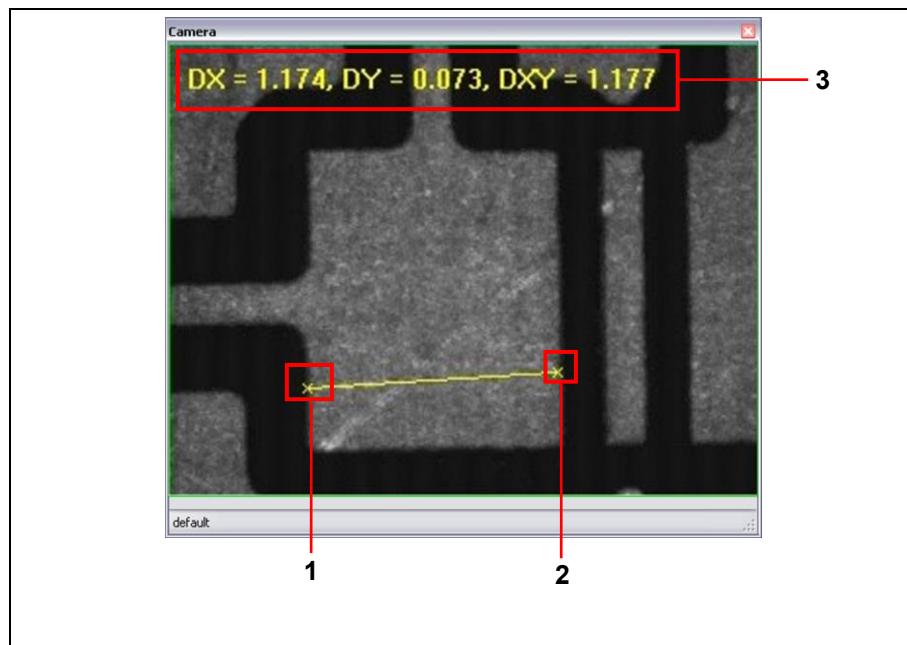
Note

The “Camera” pane displays the following values:

- Distance in X direction (DX)
- Distance in Y direction (DY)
- Direct distance (DXY)

► The “Camera” pane displays the following image:

Fig. 405: Point to Point



/1/ Starting point of the measurement

/3/ Measurement result

/2/ End point of the measurement

◆ The point-to-point measurement is finished.



For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

Note

Milling width

The “Milling width” function lets you measure the distance between two lines in the camera image.

- Measuring the width of the milled channel
- 1. Click on Camera > Actions > Measuring Mode > Milling width.
- 2. Mark one edge of the milled channel to be measured by clicking on two points of the edge.
- 3. Click on a point on the opposite edge of the milled channel to be measured.
- ➔ CircuitPro PM computes the perpendicular line. The length of the perpendicular line represents the width of the milled channel:

Fig. 406: Width of milled channel



/1/ Measurement result

/3/ Line on edge of milled channel

/2/ End point of the measurement

- ◆ The width of the milled channel has been measured.



Note

For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

Circle Diameter

The “Circle Diameter” function lets you measure the diameter of a circle in the camera image.

■ Measuring the diameter of a circle

1. Click on Camera > Actions > Measuring Mode > Circle Diameter.
2. In the camera pane, click on a point on the outer edge of the circle whose diameter you want to measure.
3. Repeat step 2 twice.



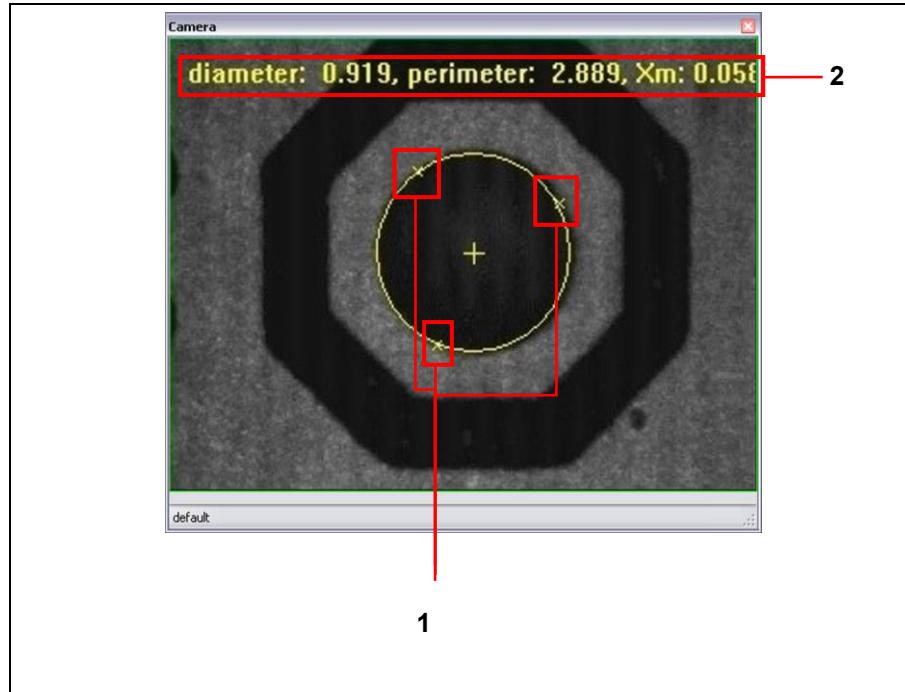
Select the points on the outer edge of the circle in such a way that they can form a virtual triangle (see following figure).

Tip

➔ CircuitPro PM connects the three points and computes the center, circumference, and diameter of the circle.

➔ The measurement results are displayed in the “Camera” pane:

Fig. 407: Circle Diameter



/1/ Measurement points

/2/ Measurement result

◆ The diameter of the circle is measured.



Note

For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

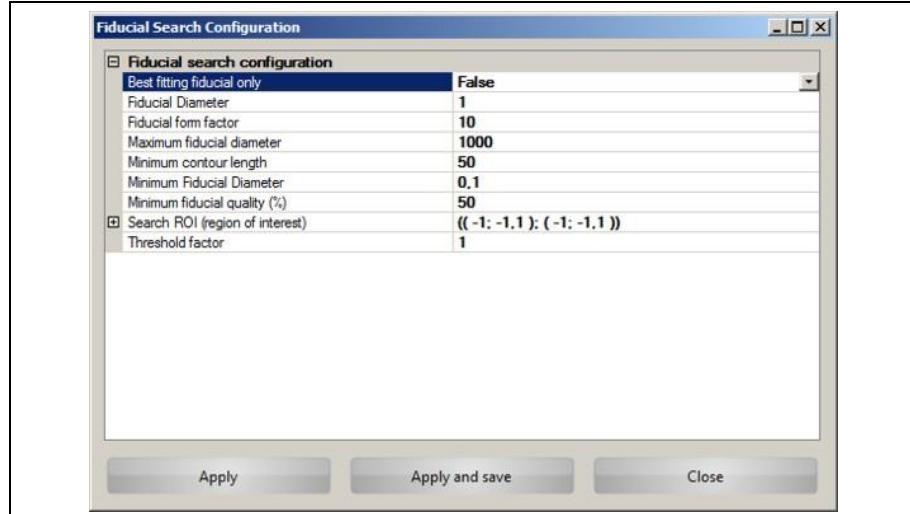
5.10.2.2 Set fiducial parameters

The sub-menu “Set fiducial parameters” allows you to set the fiducial parameters.

■ Setting the fiducial parameters

1. Click on Camera > Actions > Set fiducial parameters.

Fig. 408: Set fiducial parameters



The following settings are available in the “Fiducial search configuration” category:

Table 53: Set fiducial parameters

Property	Description
Fiducial search configuration	
Best fitting fiducial only	True: Display the fiducial that fits the settings best. False: Display all fiducials that meet the set limits.
Fiducial Diameter	Nominal diameter of the fiducial
Fiducial form factor	Factor for similarity to a circle
Maximum fiducial diameter	Maximum allowable diameter of the fiducial
Minimum contour length	Minimum contour length of an object in pixels required to be recognized as a fiducial
Minimum Fiducial Diameter	Minimum allowable diameter of the fiducial
Minimum fiducial quality (%)	Tolerance value in percent for the fiducial diameter
Search ROI	Allows you to define a region of interest, to search for fiducials.
Threshold factor	Factor for the brightness threshold to distinguish objects from the background.

Table 54: Buttons

Buttons	Description
Apply	Applies the settings in the current selected fiducial parameter set.
Apply and save	Applies and saves the settings for the next start of CircuitPro.
Close	Closes the dialog.

2. Modify the settings as desired.
 3. Click on [Apply].
- Or
3. Click on [Apply and Save].
 4. Click on [Close].
- The dialog is closed.
- ◆ The fiducial parameters have been set.

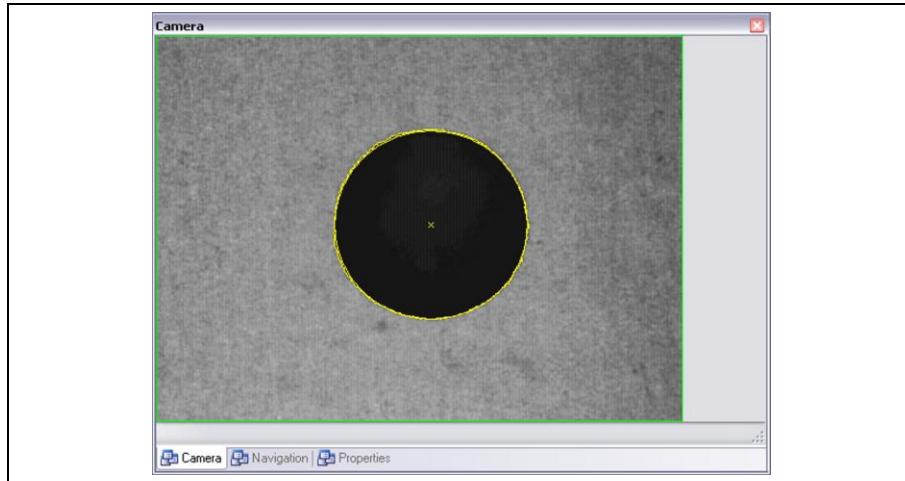
5.10.2.3 Find Fiducial

The “Find Fiducial” function lets you find fiducials in the camera image.

- Finding a fiducial
 - 1. Click on Camera > Actions > Find Fiducial
- The camera searches for fiducials. When the search is finished the results are displayed in a dialog:

Fig. 409: Fiducial search result


- The found fiducial is marked accordingly in the “Camera” pane:

Fig. 410: Fiducial marked


- ◆ The fiducial has been found.

**Note**

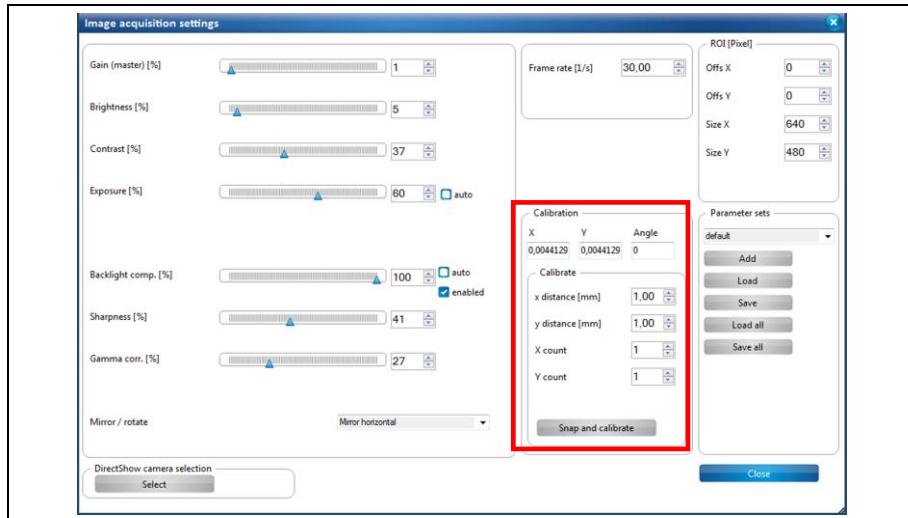
For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

5.10.2.4 Calibrate camera

The sub-menu “Calibrate camera” allows you to calibrate the camera.

- Calibrating the camera
- 1. Click on Camera > Actions > Calibrate camera.
- ➔ The following dialog is displayed:

Fig. 411:
Calibrate camera

**Note**

An object of defined size, e.g. a hole of known diameter, should be visible in the camera image for calibrating the camera.

Enter the diameter or the size of the object in the fields “X distance” and “Y distance” and click on [Snap and calibrate].

The “Calibration” group contains the following settings:

Table 55:
Calibration

Setting	Description
Calibration	
X, Y, Angle	Shows the calibration factors of the camera.
Calibrate	
X distance [mm]	Sets the size of the object in X direction that is to be used for calibration.
Y distance [mm]	Sets the size of the object in y direction that is to be used for calibration.
Angle offset	Sets the angle of the objects that are to be used for calibration.
X count	Sets the number of objects in X direction that are to be used for calibration.
Y count	Sets the number of objects in Y direction that are to be used for calibration.
Snap and calibrate	Starts the calibration and computes the calibration factors.

2. Modify the settings as desired.
 3. Click on [Snap and calibrate].
- ◆ The camera has been calibrated.

5.10.2.5 Auto Focus

The “Auto Focus” function starts the automatic focusing of the camera.

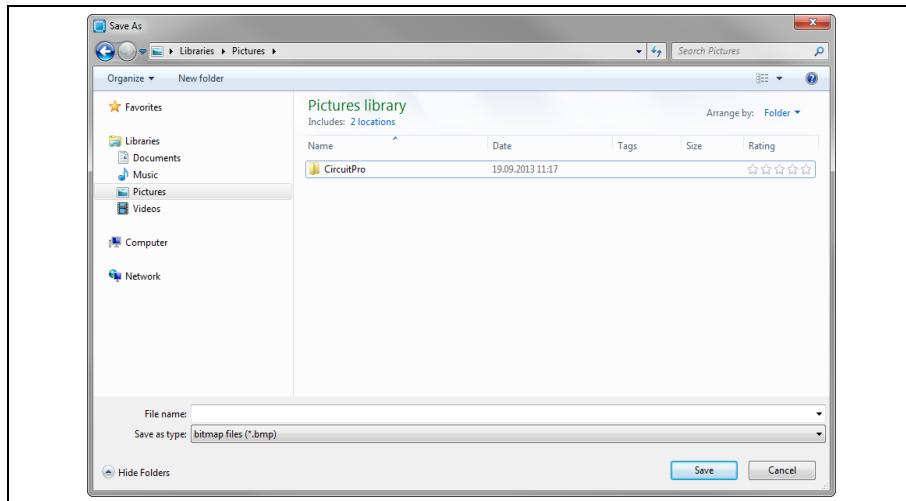
- Starting the automatic focusing procedure
 - 1. Click on Camera > Actions > Auto Focus.
 - ➔ The camera focuses automatically so that a crisp camera image is displayed.
- ◆ The automatic focusing procedure is finished.

5.10.2.6 Save image

The “Save image” function lets you save the current camera image.

- Saving the current camera image
- 1. Click on Camera > Actions > Save image.
- ➔ The following dialog is displayed:

Fig. 412: Save image



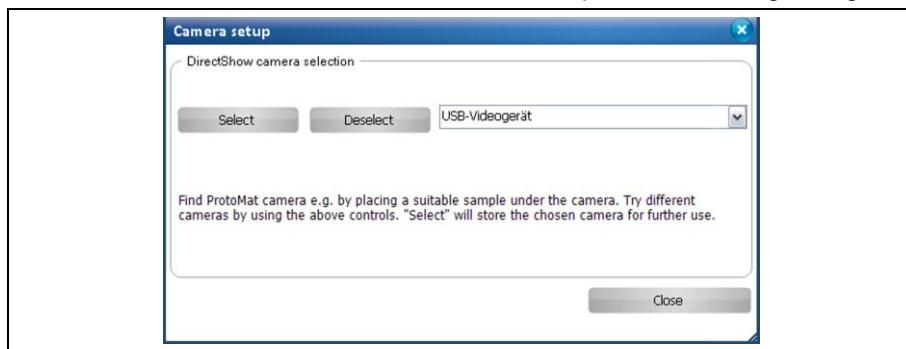
2. Enter a file name and select a folder.
 3. Click on [Save].
- ◆ The current camera image is saved.

5.10.2.7 Show cameras

The “Show cameras” function shows you all cameras that are available to you.

Click on Camera > Actions > Show cameras to open the following dialog:

Fig. 413: Select camera



- Selecting a camera

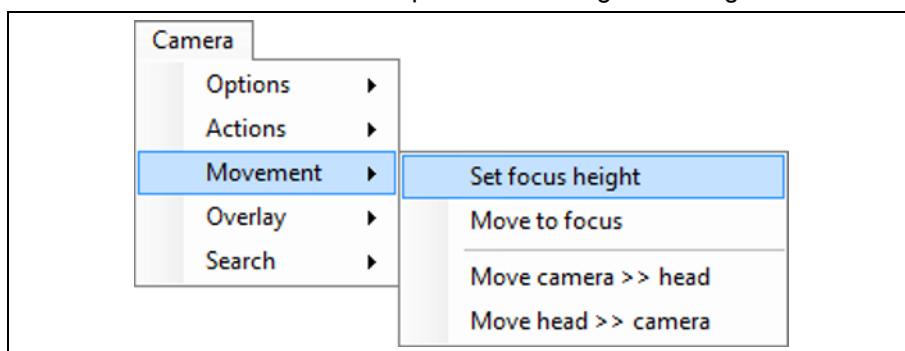
1. Click on the arrow button to open the drop-down list of the available cameras.
 2. Click on a camera in the drop-down list.
 3. Click on [Select].
 4. Click on [Close].
- ◆ The camera has been selected.

5.10.3 Movement

The menu item “Movement” allows you change height settings and move the camera and milling head.

Click on Camera > Movement to open the following cascading menu:

Fig. 414: Camera > Movement



The following functions are available:

- Set focus height
- Move to focus
- Move camera >> head
- Move head >> camera

5.10.3.1 Set focus height

The function “Set focus height” lets you set the current camera height as the focus height.



This function is best used after using the “Auto focus” function.

Tip

- Setting the current height as the focus height
- 1. Click on Camera > Movement > Set focus height.
 - ◆ The current height is stored as the focus height.

5.10.3.2 Move to focus

The function “Move to focus” lets you move the camera to the set focus height.

- Moving to the focus height
- 1. Click on Camera > Movement > Move to focus.
 - ◆ The camera moves to the set focus height.

5.10.3.3 Move camera >> head

The function “Move camera >> head” lets you move the camera to the current position of the milling head.



Tip

This function is useful for e.g. checking drilled holes.

- Moving the camera to the current position of the milling head
- 1. Click on Camera > Movement > Move camera >> head.
- ◆ The camera moves to the current position of the milling head.

5.10.3.4 Move head >> camera

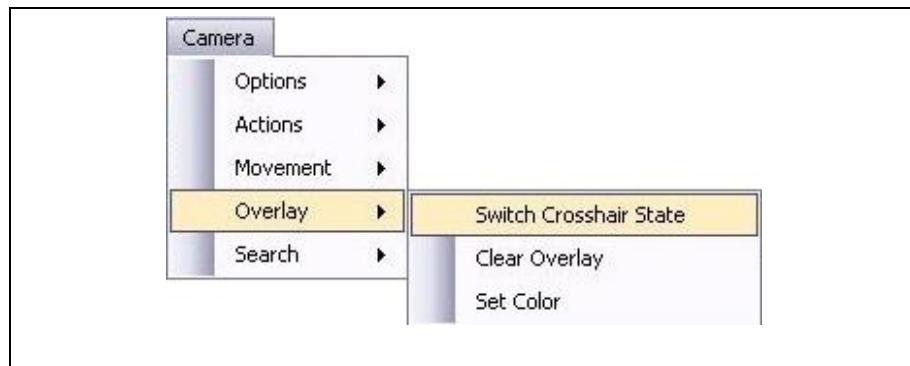
The function “Move head >> camera” lets you move the milling head to the current position of the camera.

- Moving the milling head to the current position of the camera
- 1. Click on Camera > Movement > Move head >> camera.
- ◆ The milling head moves to the current position of the camera.

5.10.4 Overlay

The menu item “Overlay” allows you to modify the settings for the camera pane. Click on Camera > Overlay to open the following cascading menu:

Fig. 415: Camera > Overlay



The following functions are available in the “Overlay” cascading menu:

- Switch Crosshair State
- Clear Overlay
- Set Color

5.10.4.1 Switch Crosshair State

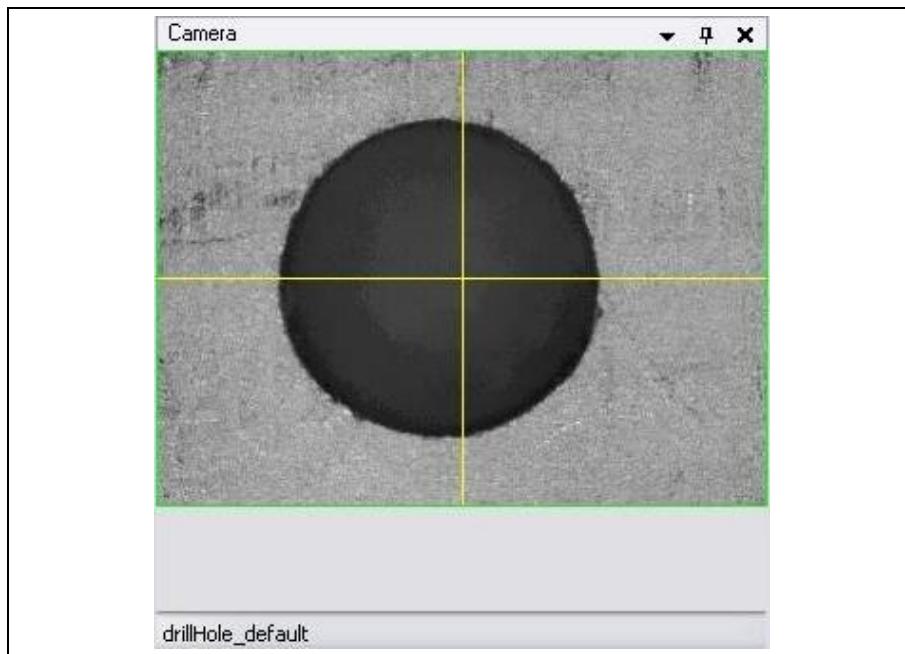
The “Switch Crosshair State” function lets you switch on or off the display of the crosshair in the “Camera” pane.

■ Switching the crosshair on/off

1. Click on Camera > Overlay > Switch Crosshair State.

⇒ The view in the “Camera” pane changes as follows:

Fig. 416:
Crosshair



- ◆ The crosshair serving as a centering aid is displayed/hidden in the “Camera” pane.

5.10.4.2 Clear Overlay

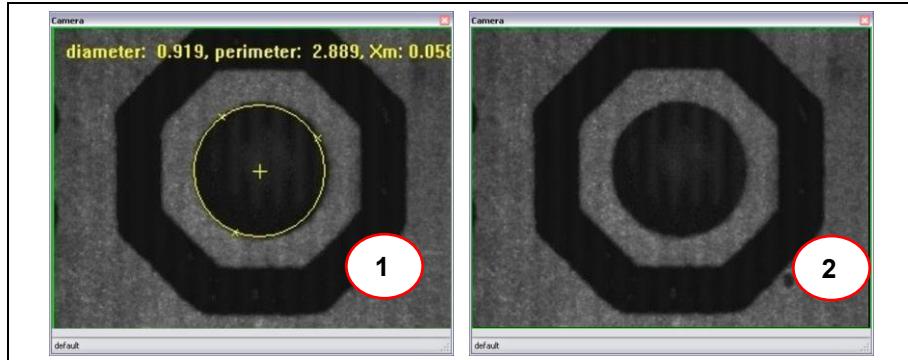
The “Clear Overlay” function lets you clear the camera pane of overlaid elements.

■ Clearing the camera image of overlays

1. Click on Camera > Overlay > Clear Overlay.

⇒ Overlaid elements are removed from the “Camera” pane:

Fig. 417: Clear Overlay



/1/ Camera pane with overlay

/2/ Camera pane without overlay

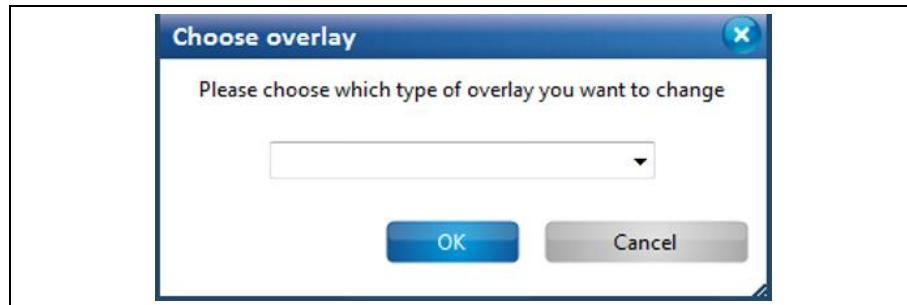
◆ The overlays are cleared.

5.10.4.3 Set color

The menu item “Set color” allows you to set the colors of the camera overlays.

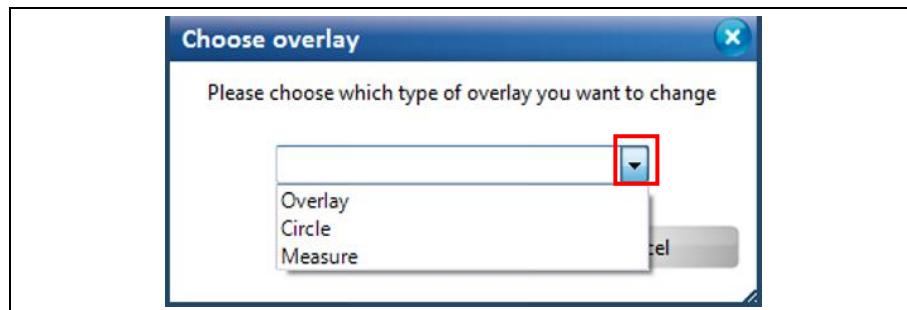
- Setting the overlay color
- 1. Click on Camera > Overlay > Set color.
- ➔ The following dialog is displayed:

Fig. 418: Set color



2. Click on the arrow to open the drop-down list of the settings:

Fig. 419: Set color available settings



3. Select a setting:

The following settings are available:

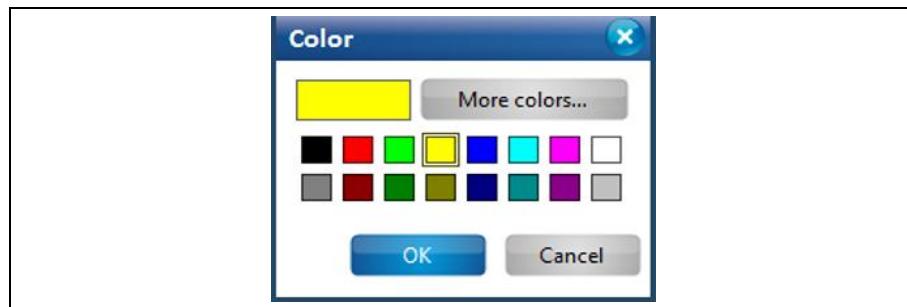
Table 56: Set color

Setting	Description
Overlay	Display color of the crosshair
Circle	Color for displaying the results of a fiducial search
Measure	Display color of the measure function

4. Confirm your selection by clicking on [OK].

- ➔ The following dialog for selecting the color is displayed:

Fig. 420: Color selection



5. Select a color.



Tipp

For a wider choice of colors click on [More colors...].

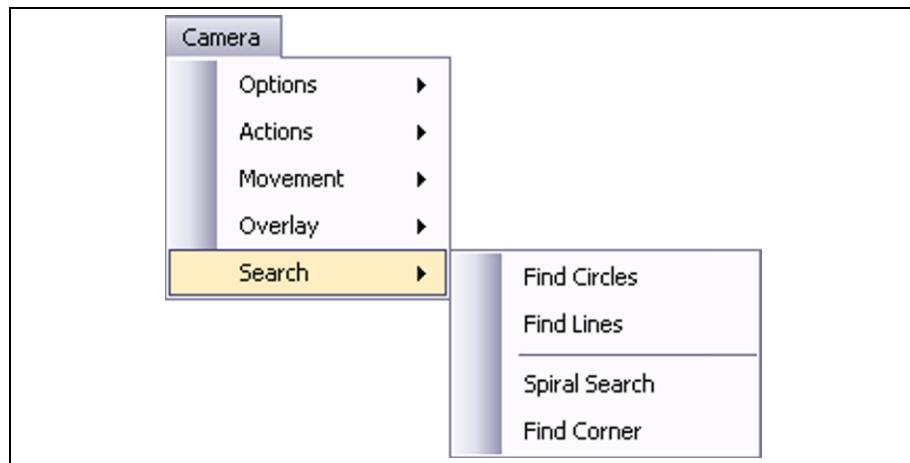
6. Click on [OK].
 ◆ The color has been set.

5.10.5 Search

The sub-menu “Search” allows you to set parameters the search functions and to perform search operations.

Click on Camera > Search to open the following cascading menu:

Fig. 421: Camera > Search



The following functions are available in the “Search” sub-menu:

- Find Circles
- Find Lines
- Spiral Search
- Find Corner

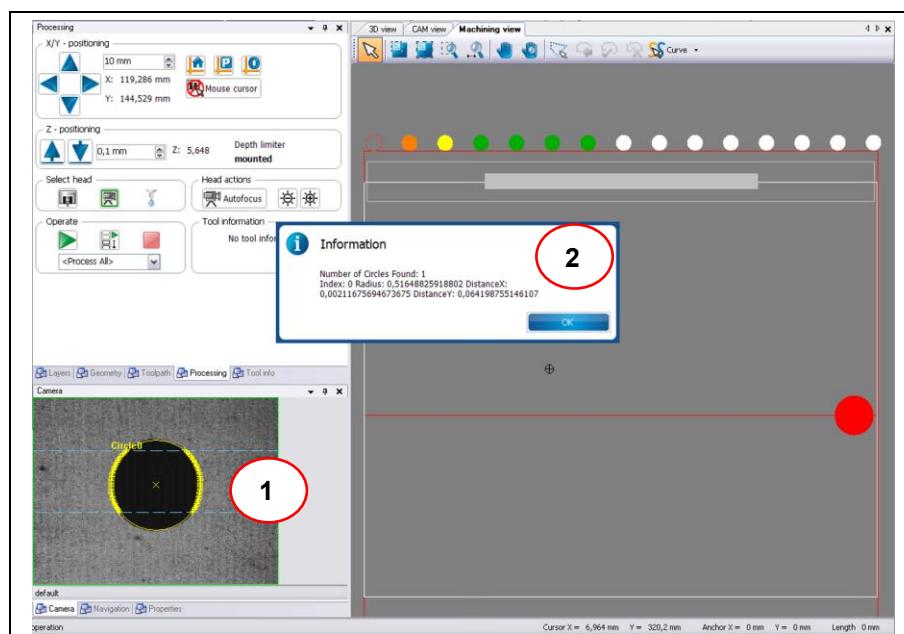
5.10.5.1 Find Circles

The “Find Circles” function lets you find circles in the camera image.

■ Finding circles

1. Click on Camera > Search > Find Circles.
- The number of circles found and their parameters are displayed in a dialog (/2). In addition, the circle is displayed in the camera pane (/1):

Fig. 422: Find Circles



/1/ Circle in camera pane

/2/ Message Find Circles Results

- ◆ The circles have been found in the camera image.



Note

For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

5.10.5.2 Find Lines

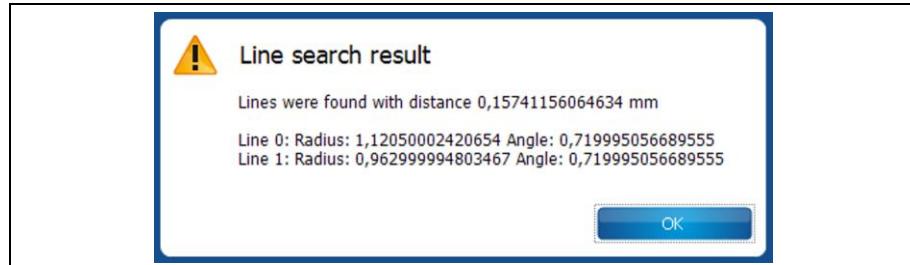
The “Find Lines” function lets you find lines in the camera image.

■ Finding lines

1. Click on Camera > Search > Find lines.

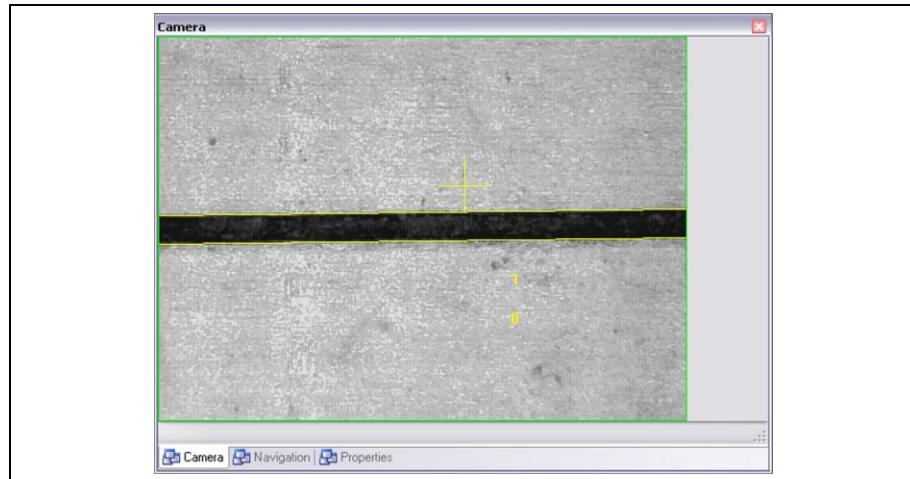
➔ The following message is displayed, showing the results if the line search and their parameters.

Fig. 423: Find Lines



➔ In addition, the line is displayed in the camera pane:

Fig. 424: Find Lines Camera pane



◆ The lines have been found in the camera image.



Note

For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

5.10.5.3 Spiral Search

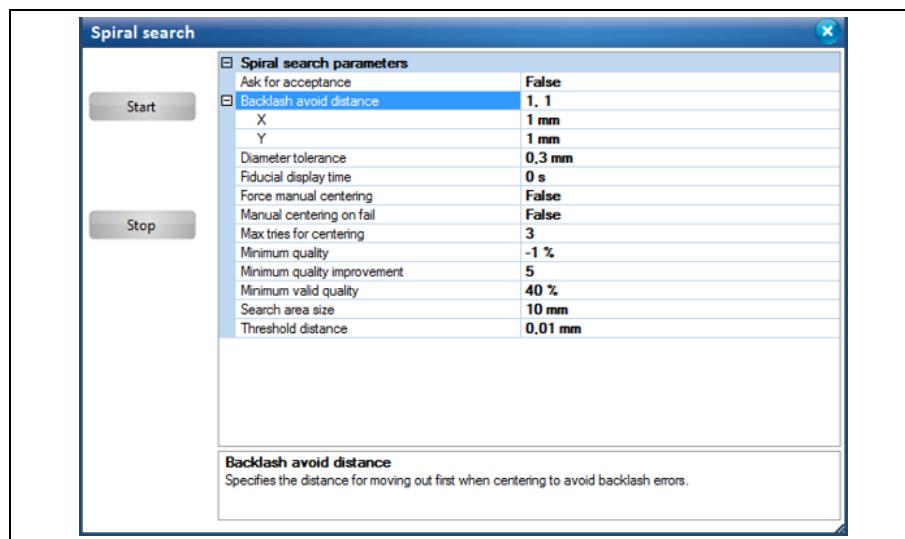
The “Spiral search” function lets you search in a spiral over an area to find fiducials.

■ Starting a spiral search

1. Click on Camera > Search > Spiral search.

⇒ The following dialog is displayed:

Fig. 425: Spiral Search



2. If necessary, modify the settings in category “Spiral search parameters”.

The following settings are available:

Table 57: Spiral Search

Setting	Description
Spiral search parameters	
Ask for acceptance	Specifies whether the user has to accept every found fiducial.
Backlash avoid distance	Specifies the distance that the camera head moves before centering the fiducial in order to avoid errors due to backlash.
X	Distance in X direction
Y	Distance in Y direction
Diameter tolerance	Specifies the allowable absolute size difference from the nominal diameter for the minimum and maximum recognized diameter.
Fiducial display time	Specifies the time the head rests over the fiducial after recognition.
Force manual centering	Specifies whether the dialog for manual centering is displayed even if a fiducial has been recognized.
Manual centering on fail	Specifies whether the dialog for manual centering is displayed if automatic centering has failed.
Max tries for centering	Specifies the maximum tries for centering until the fiducial is specified as not found.
Minimum valid quality	Defines the minimum quality that has to be

Table 57: Spiral Search

Setting	Description
	reached at the start of the spiral search.
Minimum quality improvement	Specifies the minimum quality improvement necessary for continuing the centering.
Search area size	Specifies size of the area around the start location where the fiducial is searched.
Threshold distance	Specifies the threshold distance for accepting the fiducial directly without further centering.

3. Click on [Start].

- The camera searches for fiducials in spirals. When a fiducial is found, the following message is displayed:

Fig. 426: Spiral Search Result - fiducial found

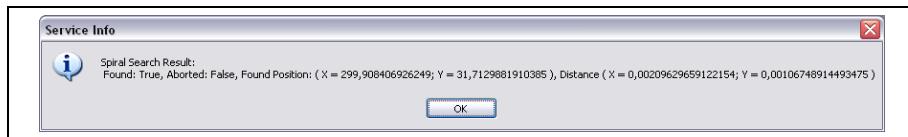


Fig. 427: Spiral Search Result - fiducial not found

- If no fiducial is found the following message is displayed:



Note

Fiducial not found

Check whether the camera head is really above the fiducials that are to be found. Otherwise move the head manually to that area and adjust the size of the search area "Search area size" if necessary.

- ◆ The spiral search for fiducials is finished.



Note

Click on Camera > Overlay > Clear overlay to clear the "Camera" pane of the overlays.

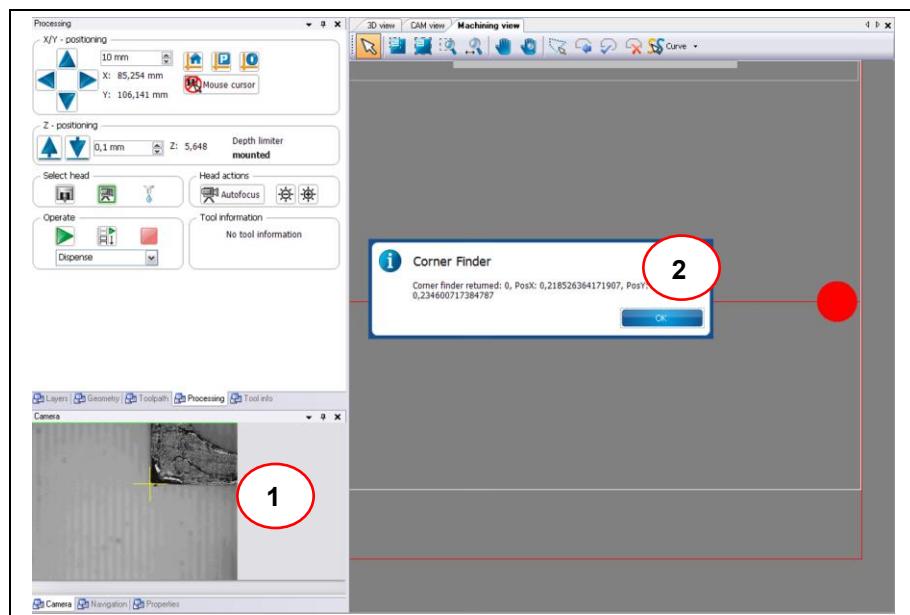
5.10.5.4 Find Corner

The “Find corner” function lets you find corners.

■ Finding a corner

1. Click on Camera > Search > Find corner.
- The number of corners found and their parameters are displayed in a dialog (/2). In addition, the corner is displayed in the camera pane (/1):

Fig. 428: Find corner



/1/ Corner in camera pane

/2/ Message Find corner

- ◆ The corners have been found in the camera image.



Note

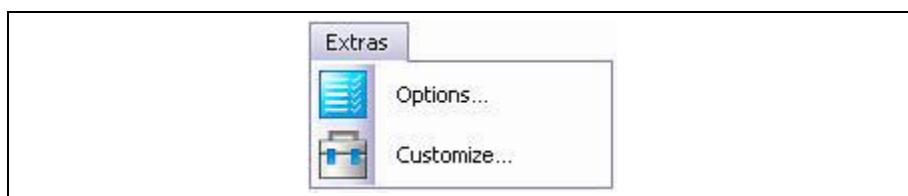
For removing the overlay items in the “Camera” pane, please click on Camera > Overlay > Clear overlay.

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. 429: Menu “Extras”



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

Table 58: Menu functions “Extras”

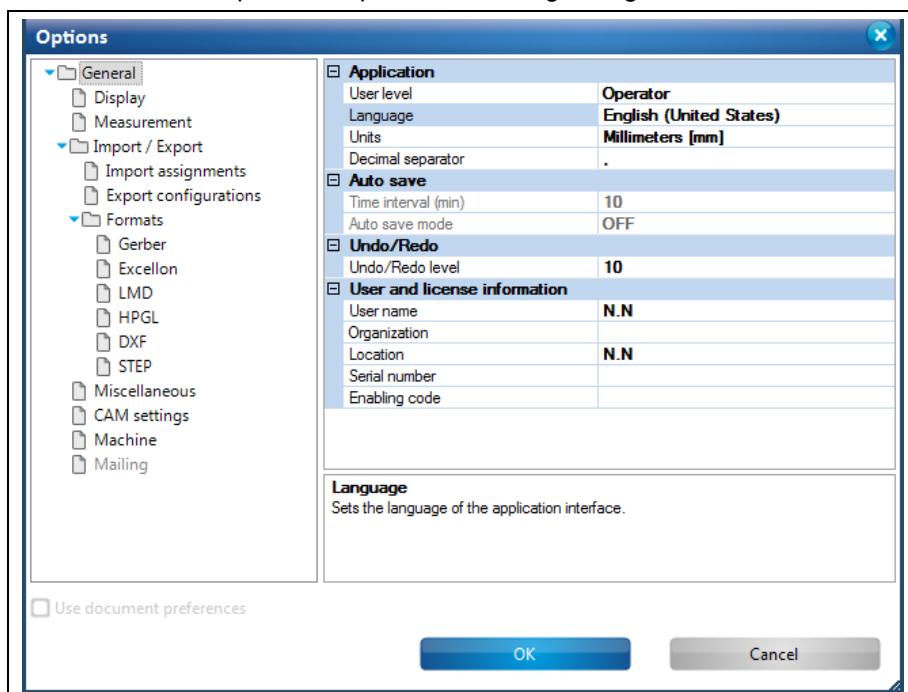
Menu item	Description
Options...	Opens the dialog “Options”.
Customize...	Opens the dialog “Customize”.

5.11.1 Options

The “Options” dialog allows you to modify specific program settings.

Click on Extras > Options to open the following dialog:

Fig. 430: Extras > Options



The following settings are available:

**Table 59: Options
“General”**

Property	Description
Application	
User level	Choice between “Operator”, “Advanced user”, and “Service”. For the corresponding permissions refer to table 61.
Use OS culture	Choice between “True” and “False”.
Language	Sets the language of the application interface. Choice is only available if “Use OS culture” is set to “False”. <ul style="list-style-type: none"> • Deutsch (Deutschland) • español (España) • suomi (Suomi) • français (France) • italiano (Italia) • 日本語 (日本) • polski (Polska) • português (Portugal) • русский (Россия) • slovenski (Slovenija) • svenska (Sverige) • English (United States) • 中文 (简体)
Units	Units used in the application. Choice is only available if “Use OS culture” is set to “False”. <ul style="list-style-type: none"> • Meters [m] • Centimeters [cm] • Millimeters [mm] • Micrometers [μm] • Inches [inch] • Mils [mil]
Decimal separator	Choice between dot (.) and comma (,) if “Use OS culture” is set to “False”.
Auto save	
Time interval (min)	Defines the time until a document is saved.
Auto save mode	Switches auto saving on or off
Undo/Redo	
Undo/Redo level	Undo/Redo level
User and license information	
User name	User name in the current application session
Organization	User organization of the current application runtime license.
Location	Organization location of the current application runtime license.
Serial number	Serial number of the current application runtime license

Table 59: Options "General"

Property	Description
Enabling code	Enabling code of the current application runtime license.

Table 60: Options "General" buttons

Button	Description
OK	Closes the dialog and stores the settings.
Cancel	Closes the dialog without storing the settings.
Check box	Description
Use document preferences	Activate this check box if you want to use the standard settings stored the document.

The user levels have the following permissions:

Tab. 61:
Permissions of
the user levels

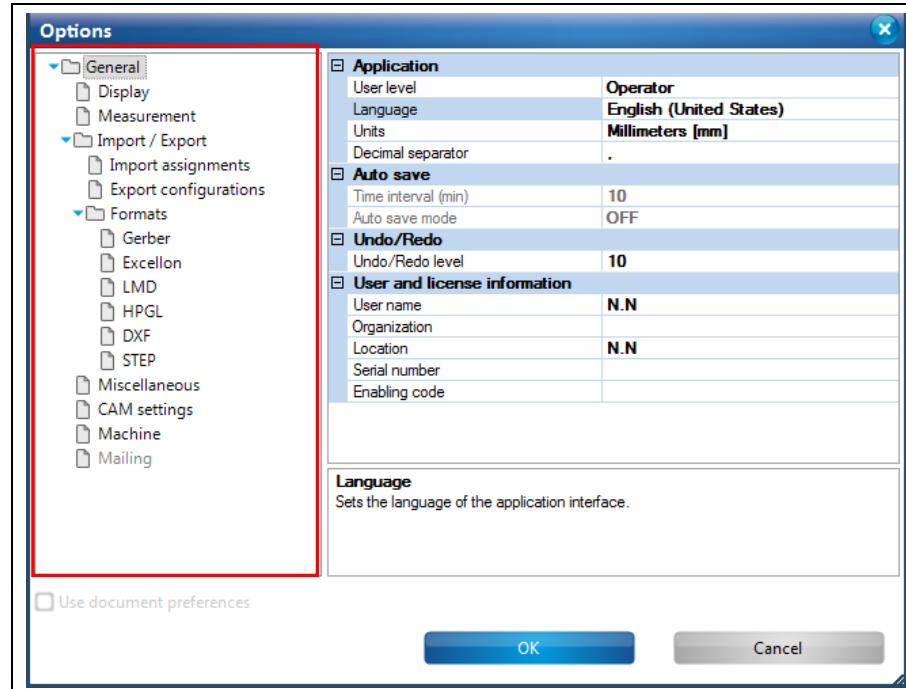
Action	Operator	Advanced user	Service
Import data	x	x	x
Edit data	x	x	x
Compute data	x	x	x
Processing jobs on machine	x	x	x
Creating/Editing templates		x	x
Editing the tool library		x	x
Changing the machine configuration		x	x
Teaching the tool magazine		x	x
Drilling reference holes		x	x
Calibrating the camera		x	x
Accessing the service menu			x

You can modify further settings in the following categories:

- Display
- Measurement
- Import/Export
 - Import Assignments
 - Export configurations
- Formats
 - Gerber
 - Excellon
 - LMD
 - HPGL
 - DXF
 - STEP
- Miscellaneous
- CAM settings
- Machine

Use the categories tree that is displayed in the left section of the dialog to navigate to the desired options (see the following figure).

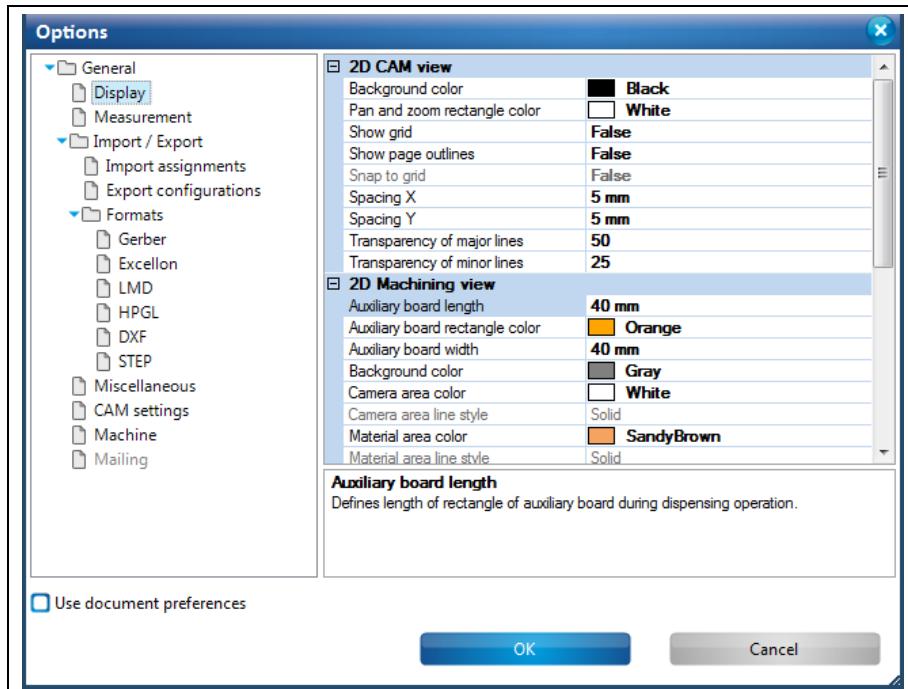
Fig. 431:
Categories tree



Display

Click on "Display" in the "Options" dialog to display the following view:

Fig. 432: Extras >
Options
"Display"



The following settings are available:

Table 62: Options
"Display"

Property	Description
2D CAM view	
Background color	Sets the background color of the CAM view.
Pan & zoom rectangle color	Sets the color of the visible-area rectangle in the Navigation view.
Show grid	Activates/deactivates grid in CAM view. Choice between "True" and "False"
Show page outlines	Display how the printed region will be divided into several pages.
Snap to grid	Sets whether the cursor "sticks to" grid nodes in CAM view or not (only active if "Show grid" is set to "True").
Spacing X	Sets the grid spacing in X direction in the CAM view.
Spacing Y	Sets the grid spacing in Y direction in the CAM view.
Transparency of major lines	Sets the transparency of the major lines
Transparency of minor lines	Sets the transparency of the minor lines.
2D Machining view	
Auxiliary board length	Defines the length of rectangle of auxiliary board during dispensing operation.
Auxiliary board rectangle color	Defines the color of the rectangle of the auxiliary board during dispensing operation.
Auxiliary board width	Defines the width of the rectangle of the auxiliary board during the dispensing operation.

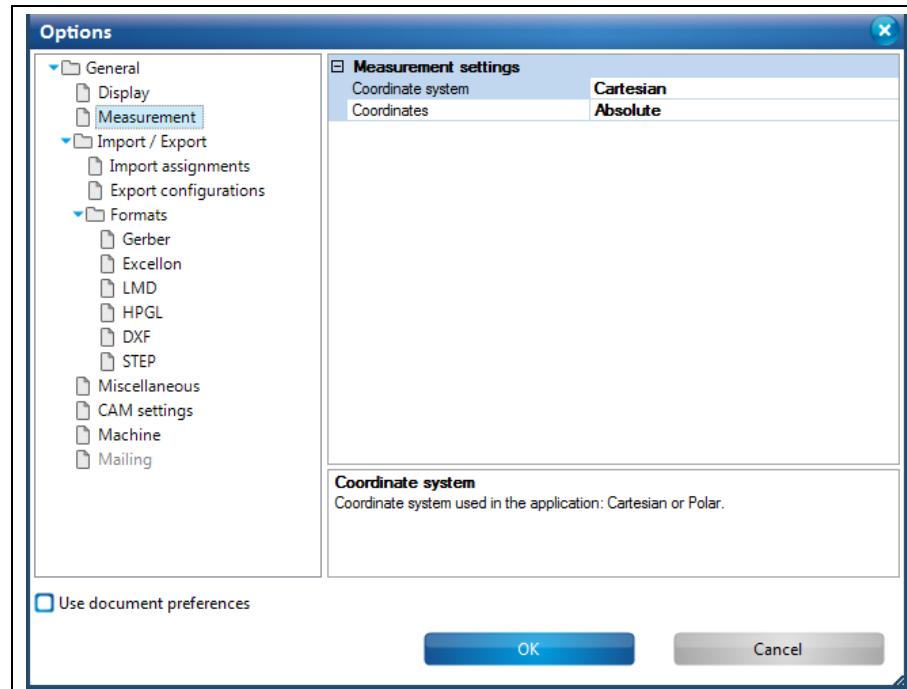
**Table 62:Options
“Display”**

Property	Description
Background color	Sets the background color of the 2D machining view.
Camera area color	Sets the display color of the camera area.
Camera area line style	Sets the line style of the boundary of the camera area.
Material area color	Sets the display color of the material area.
Material area line style	Sets the line style of the material area boundary.
Max processing area color	Sets the display color of the maximum processing area.
Max processing area line style	Sets the line style of the maximum processing area boundary.
Placement rectangle color	Defines the color for the rectangle of production data during placement operation.
Reference hole color	Sets the color of the positions where the reference holes have been drilled.
Show material	Activate/deactivate display of material area, max processing area and tool magazine.
Tool ramp color	Sets the color for the milling-width adjustment ramp.
Topography points color	Sets the color for displaying the points for a “Read topography” phase when the operation is active
Working area color	Sets the display color of the working area.
Working area line style	Sets the line style of the boundary of the working area.
3D View	
Background color	Sets the background color of the 3D view.
Common	
Dynamic highlighting	Sets the tracking mode of objects under the mouse cursor in graphic views, also known as dynamic highlighting.
Performance and quality settings	Sets the priority for speed versus precision.
Show jumps in toolpath	Activate/deactivate display of jumps between toolpath lines.

Measurement

Click on “Measurement” in the “Options” dialog to display the following view:

Fig. 433: Extras >
Options
“Measurement”



The following settings are available:

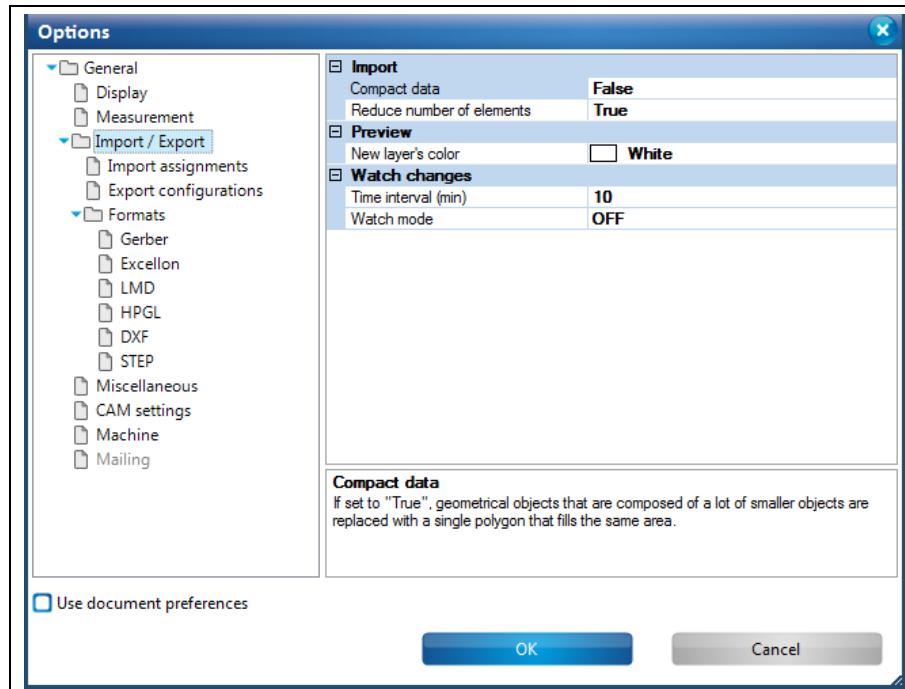
Table 63: Options
“Measurement”

Property	Description
Measurement settings	
Coordinate system	Coordinate system used in the application: Cartesian or Polar.
Coordinates	Input of coordinates in the application: absolute or relative values.

Import / Export

Click on “Import / Export in the “Options” dialog to display the following view:

Fig. 434: Extras > Options “Import / Export”



The following settings are available:

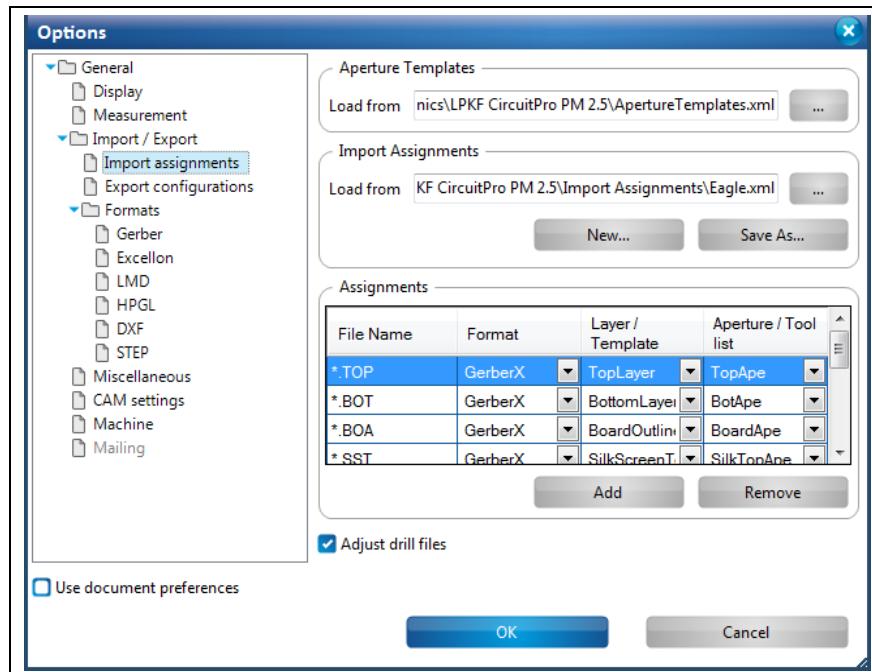
Table 64: Options “Import / Export”

Property	Description
Import	
Compact data	If set to “True”, geometrical objects that are composed of a lot of smaller objects are replaced with a single polygon that fills the same area.
Reduce number of elements	If set to “True”, the number of elements for open/closed paths and polygons is reduced.
Preview	
New layer's color	Preview color for objects that are assigned to the new layer.
Watch changes	
Time interval (min)	Defines the time interval for checking for changes in the source files.
Watch mode	If set to “ON”, the imported source file is periodically checked for changes according to the defined time interval.

Import assignments

Click on “Import assignments” in the “Options” dialog to display the following view:

Fig. 435: Extras > Options “Import assignments”



The following settings are available:

Table 65: Extras > Options “Import assignments”

Property	Description
Aperture Templates	Selects the path of an existing aperture template file.
Import Assignments	Selects the path of an existing assignments file. You can also select a new XML file by entering a new file name.

Fig. 436: Creating assignment rules

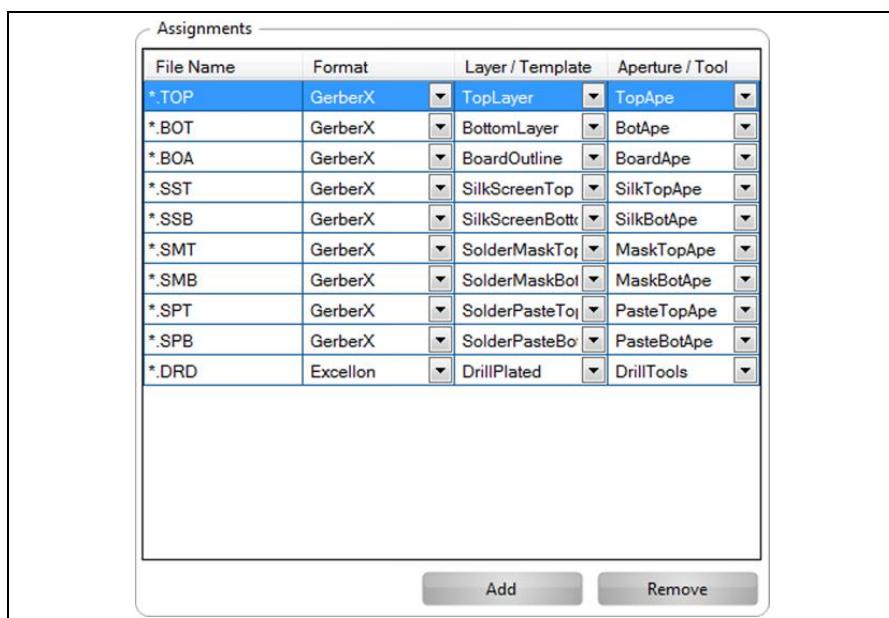


Table 66:
Columns

Column	Description
File name	Defines the file extension for assignment.
Format	Assigns the format for the import.
Layer/Template	Defines the destination layer for the import.
Aperture/Tool List	Defines the aperture / tool list.

 Table 67: Import
Assignments -
buttons

Button	Description
Add	Allows to create new assignment rules. These assignment rules are written to the selected XML file. Thus, you can define for example that imported files having specific file extensions are always assigned to a specific layer.
Remove	Removes the selected assignment rule(s).

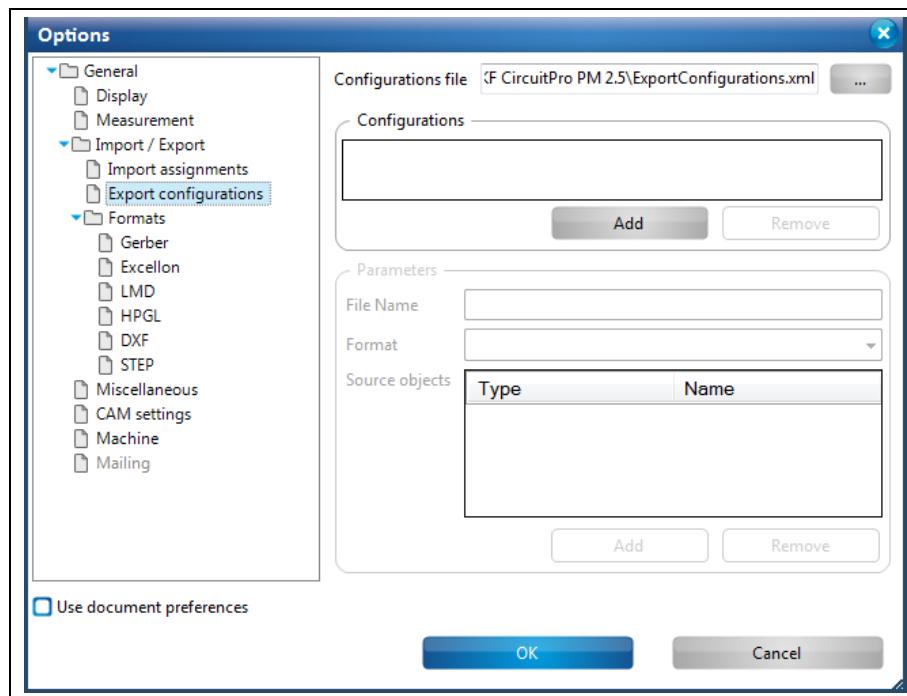
Table 68: Options

Options	Description
Adjust Excellon files	<p>This option affects the format settings of the Excellon file.</p> <p>CircuitPro PM automatically selects the settings that cause the best fit to those of the Gerber X data.</p> <p>Attention! If the Gerber X files contain further information (e.g. crosshairs or bounding box) except the PCB, the drill data could be scaled incorrectly. In such cases disable this option or adjust the format settings manually.</p>

Export configurations

Click on “Export configurations” in the “Options” dialog to display the following view:

Fig. 437: Export configurations



The following settings are available:

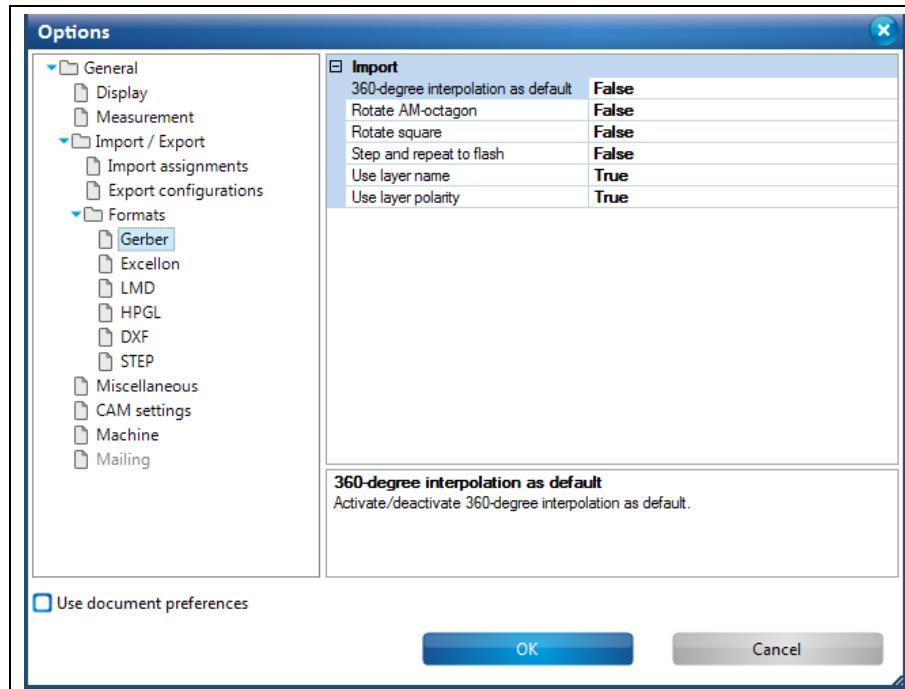
Table 69: Export configurations

Section	Description
Configurations file	Enter the path to the configuration file. You can select/change the path by clicking the button next to it.
Configurations	The available configurations that are located in the current configuration file are listed. You can add or remove configurations by clicking the buttons “Add” and “Remove”.
Parameters	
File Name	Enter the file name with which the file is to be exported.
Format	Enter the file format in which the file is to be exported.
Source objects	Enter the source objects which are to be exported in the file.

Gerber

Click on “Formats > Gerber” in the “Options” dialog to display the following view:

**Fig. 438:
Extras>Options
“Gerber”**



The following settings are available:

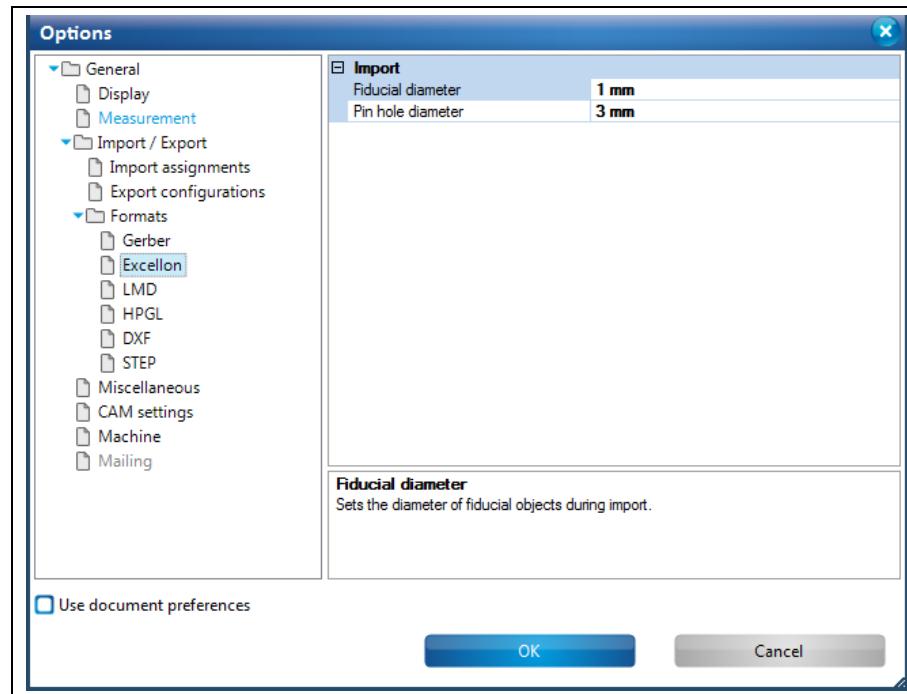
**Table 70:
Extras>Options
“Gerber”**

Property	Description
Import	
Set 360 interpolation as default	Activate/deactivate 360-degree interpolation as default.
Rotate AM octagon	Always align octagon borders to axes.
Rotate Square	Activate/deactivate automatic rotation of square objects during Gerber import.
Step and repeat to flash	Activate/deactivate combining object collections to flash objects for step-and-repeat commands.
Use layer name	Use the layer name defined in the Gerber file.
Use layer polarity	Activate/deactivate analysis of layer polarity during Gerber import.

Excelon

Click on “Formats > Excelon” in the “Options” dialog to display the following view:

Fig. 439:
Extras>Options
“Excelon”



The following settings are available:

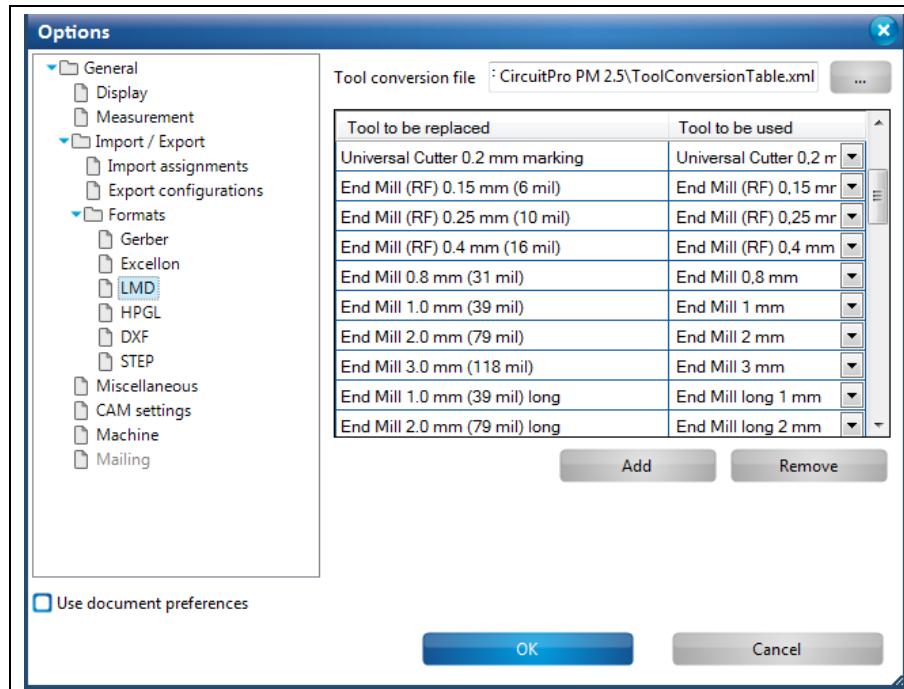
Table 71:
Extras>Options
“Excelon”

Property	Description
Import	
Fiducial diameter	Sets the diameter of fiducial objects when importing Excelon files.
Pin hole diameter	Sets the diameter of the pin hole when importing Excelon files.

LMD

Click on “Formats > LMD” in the “Options” dialog to display the following view:

Fig. 440: Extras > Options “LMD”



The following settings are available:

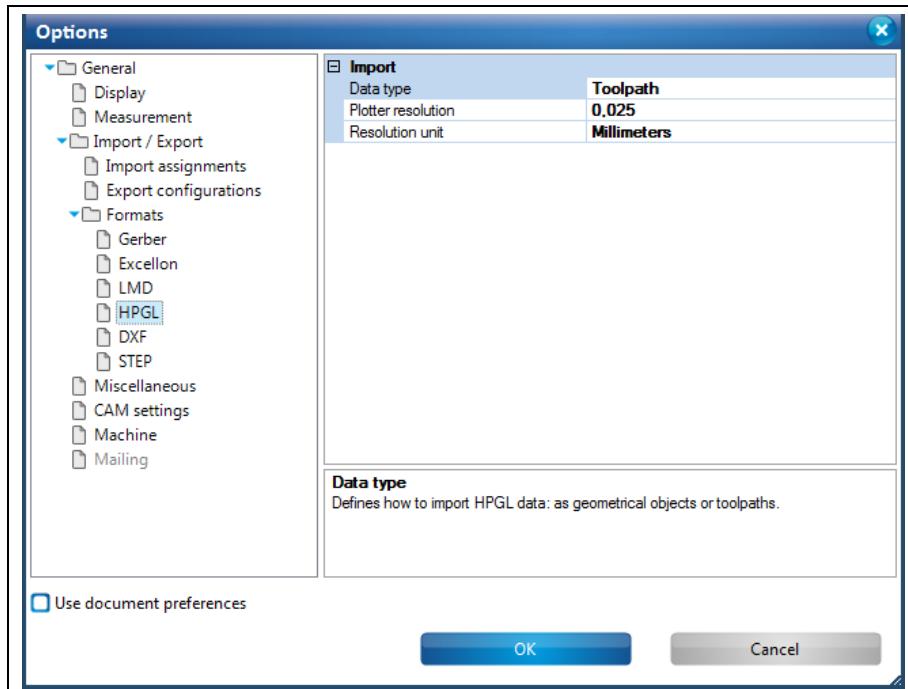
Table 72: Options “LMD”

Property	Description
Tools conversion file	Defines the path of the file for tool conversion. You can also select a new XML file by entering a new file name.
Tool to be replaced	Defines the tool to be replaced.
Tool to be used	Defines the tool to be used instead.

HPGL

Click on “Formats > HPGL” in the “Options” dialog to display the following view:

Fig. 441: Extras >
Options “HPGL”



The following settings are available:

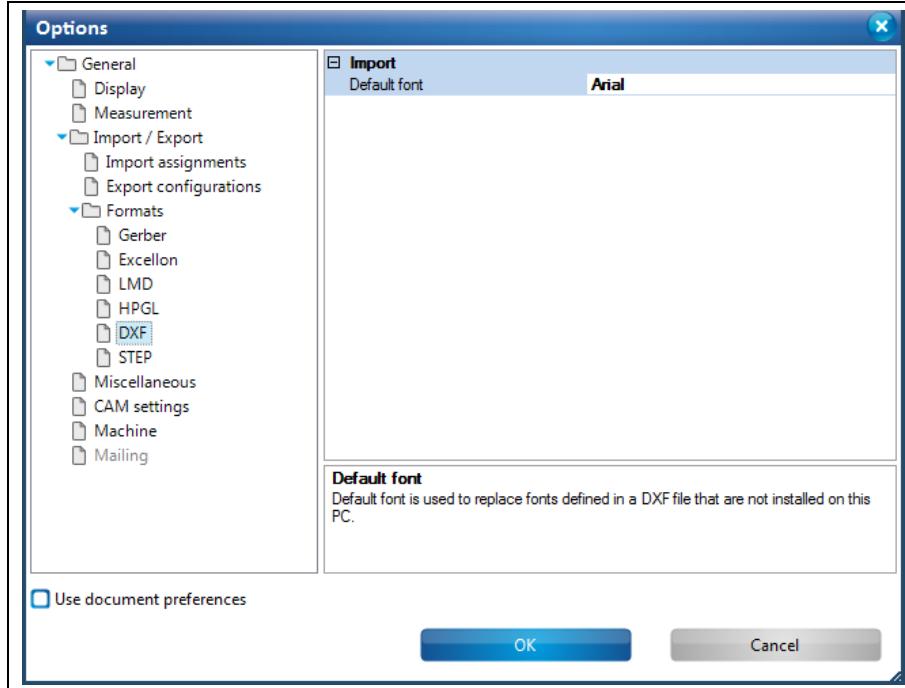
Table 73: Options
“HPGL”

Property	Description
Import	
Data type	Defines how to import the HPGL data: as geometrical objects or toolpaths
Plotter resolution	Defines the plotter resolution used by the HPGL file.
Resolution unit	Defines the resolution units (mm or inch).

DXF

Click on “Formats > DXF” in the “Options” dialog to display the following view:

**Fig. 442: Extras >
Options “DXF”**



The following settings are available:

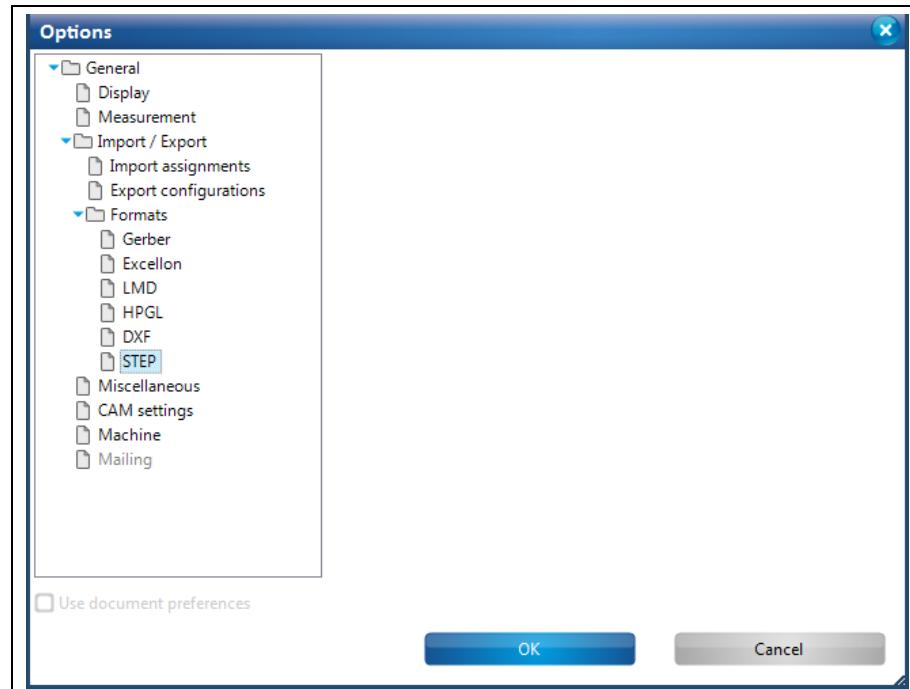
**Table 74: Options
“DXF”**

Property	Description
Import	
Default font	The default font is used to replace fonts defined in a DXF file that are not installed on this PC.

STEP

Click on “Formats > STEP” in the “Options” dialog to display the following view:

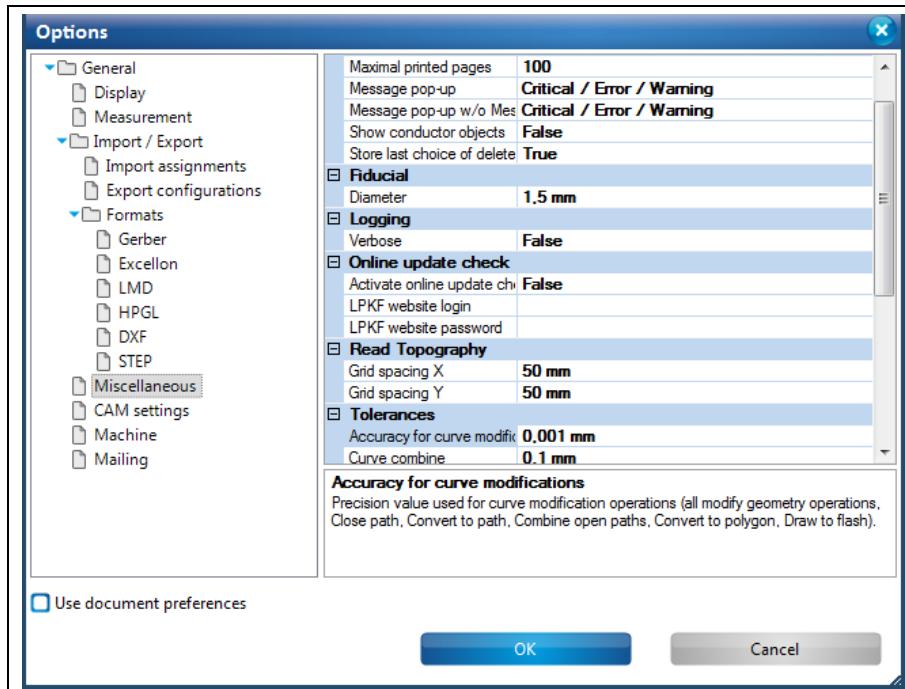
Fig. 443: Extras >
Options “STEP”



Miscellaneous

Click on "Miscellaneous" in the "Options" dialog to display the following view:

**Fig. 444: Extras >
Options
"Miscellaneous"**



The following settings are available:

**Table
75: Options
"Miscellaneous"**

Property	Description
Common	
Bounding box if number of objects greater	Show a bounding box when moving objects in the CAM view if the number of objects exceeds this value.
Maximal printed pages	Defines the maximal count of pages that can be printed.
Message pop-up	Sets the types of messages shown as pop-up message boxes (in addition to a record in the Message View).
Message pop-up w/o Message View	Sets types of messages shown as pop-up message box when the Message view is closed.
Show conductor objects	Activates/deactivates (default) the display of conductor objects in the Geometry data view.
Store last choice of delete object operation: with dependent objects or without.	Defines whether the last choice of the "delete object operation: with dependent objects or without" is stored. Used when the warning delete dialog is not shown.
Fiducial	
Diameter	Defines the diameter of fiducials.

Table
75: Options
"Miscellaneous"

Property	Description
Logging	
Verbose	If "Verbose" is set to true, the application diagnostic messages are listed in the Message View as "Service messages".
Read Topography	
Grid spacing X	Sets the spacing of the grid in X direction for the operation 'Read topography'.
Grid spacing Y	Sets the spacing of the grid in Y direction for the operation 'Read topography'
Tolerances	
Accuracy for curve modifications	Precision value used for curve modification operations (all modify geometry operations, Close path, Convert to path, Combine open paths, Convert to polygon, Draw to flash).
Curve combine	Defines the tolerance for the maximum distance between two objects that are to be combined.
Tool library	
Save tools inside document	True: All settings in the tool library are stored in the project's corresponding document file. False: All settings in the tool library are stored in the common "ToolLibrary.xml" file and are thus available to all projects.
Standard tool library file	Path of the standard tool library file (ToolLibrary.xml), used for new projects.
Tool instances library file	Path of the tool library file that contains descriptions of real machine tools.
Toolpath generation	
Circular arc approximation	Defines whether arc elements are approximated
Default spike angle	Sets the default spike angle for the isolation algorithm.
Default spike width	Sets the default spike width for the isolation algorithm.
Default tolerance	Sets the default tolerance for toolpath generation algorithms.
Max cutting link length	Defines the maximum length of a cutting link between toolpath sections.
Max joinable pin length	Defines the maximum pin movement length that is joined without jump to the adjacent curve.

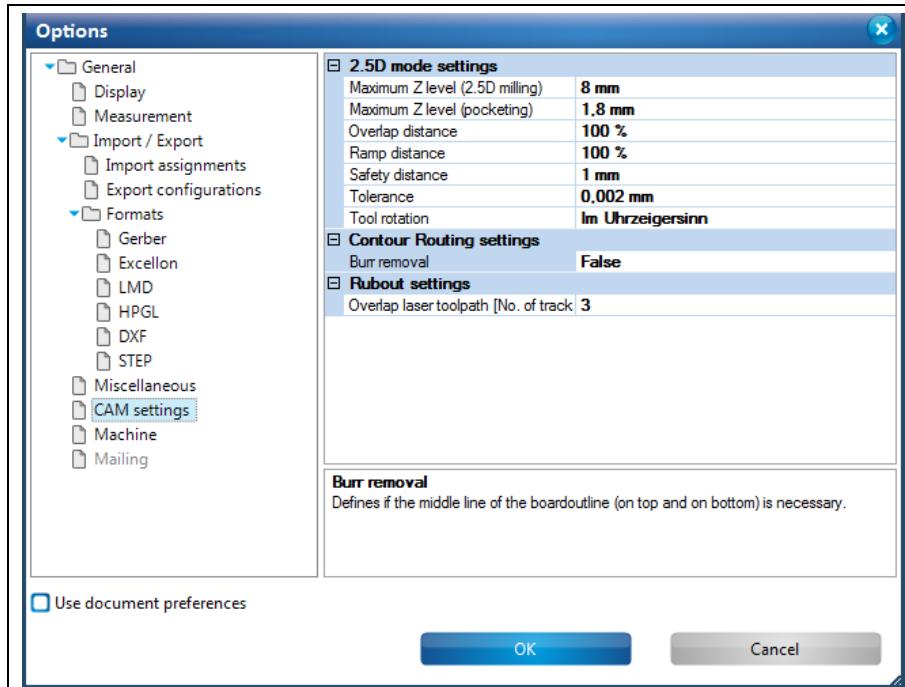
Table
75: Options
“Miscellaneous”

Property	Description
Maximum size of remaining part	Maximum size of remaining part

CAM settings

Click on “CAM settings” in the “Options” dialog to display the following view:

Fig. 445: Extras >
Options “CAM
settings”



The following settings are available:

Table 76:
Extras >
Options “CAM
settings”

Property	Description
2.5D mode settings	
Maximum Z level (2.5D milling)	Defines the maximum value for the Z level for 2.5D milling.
Maximum Z level (pocketing)	Defines the maximum value for the Z level for pocketing.
Overlap distance	Defines the additional distance that the tool moves at the end of a closed milling path to overlap the start. The value is in percent of the tool diameter. 0% means that start and end only touch.
Ramp distance	Defines the height to lift the tool above a surface already cut when the tool does a jump between cutting movements within a pocket.
Safety distance	Defines the height to lift the tool above the horizontal surface when the tool does a jump between cutting movements.

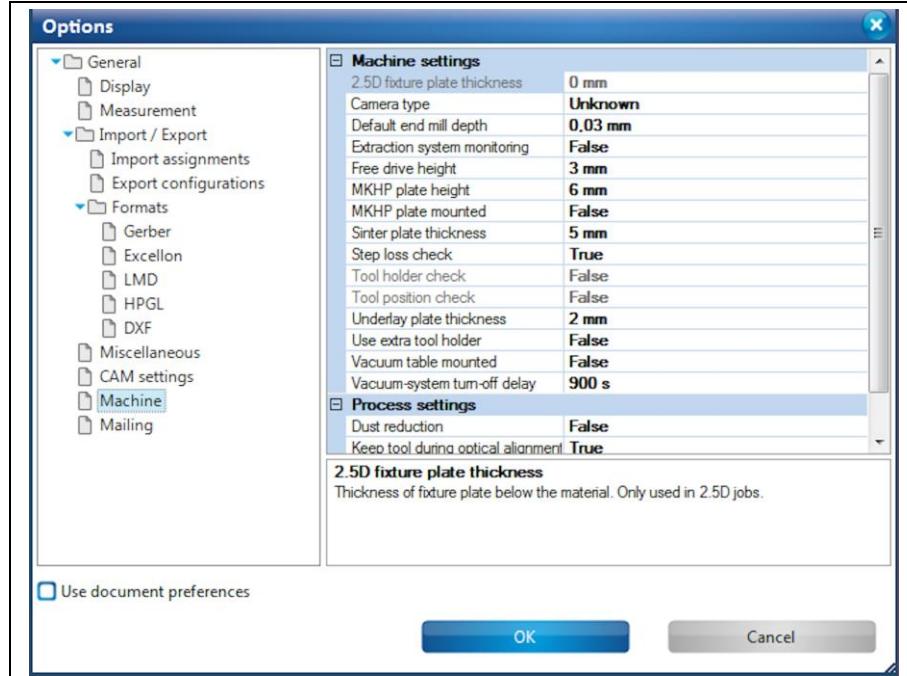
Table 76:
Extras >
Options "CAM"

Property	Description
Tolerance	Tolerance used for computation.
Tool rotation	Defines the direction of tool rotation.
Contour routing settings	
Burr removal	This function reduces burrs when contour routing. An additional toolpath is generated on the top and bottom sides.
Rubout settings	
Overlap laser toolpath [No. of tracks]	Defines the count of overlaps of laser toolpaths with milling toolpaths

Machine

Click on “Machine” in the “Options” dialog to display the following view:

**Fig. 446: Extras >
Options
“Machine”**



The following settings are available:

**Table 77:
Extras >
Options
“Machine”**

Property	Description
Machine settings	
2.5D fixture plate thickness	Thickness of fixture plate below the material. Only used in 2.5D jobs.
Camera lens type	If you are using an upgrade or replacement camera, you need to set your camera type here to work with the correct camera calibration parameters.
Default end mill depth	This is the default end mill depth. It is for uncalibrated end mills only. The real depth may vary up to $\pm 15 \mu\text{m}$.
Extraction system monitoring	If the extraction system is monitored, the machine stops processing if the extraction system is off. This is not possible with all types of extraction systems.
MKHP plate height	Defines the thickness of the MKHP plate.
MKHP plate mounted	Defines whether the MKHP plate is mounted or not.
Sinter plate thickness	Defines the thickness of the sinter plate.
Tool holder check	Indicates whether the tool holder check is activated. It checks whether there is a tool inserted into the tool holder. Not compatible with the tool position check.
Tool position check	Indicates whether the tool position check is activated. It checks whether the tools are inserted correctly into the tool holder. Not

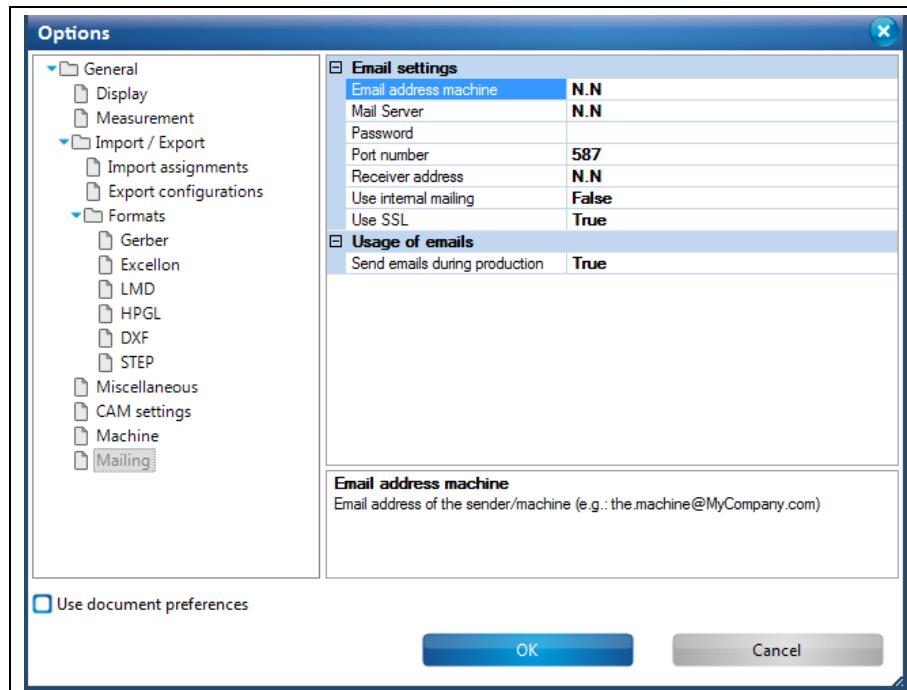
Table 77:
Extras >
Options

Property	Description
	compatible with the tool holder check.
Underlay plate thickness	Defines the thickness of the underlay plate.
Use extra tool holder	Some systems can be equipped with additional tool holders. Set to True to activate the use of additional tool holders. A password is required. It will be provided when you buy the tool holder.
Vacuum table mounted	Defines whether the vacuum table is mounted or not.
Vacuum-system turn-off delay	Defines the time that the vacuum system keeps running after end of processing.
Process settings	
Dust reduction	Reduces the dust produced during contour routing. This option will increase the processing time.
Keep tool during optical alignment	Determines whether the tool is kept in the clamp during optical alignments.
Pause process before removing a drill	Pauses the production, before removing a drill, so the drill can be cleaned i.e. chips can be removed, if necessary.

Mailing

In the dialog “Options”, click on the item “Mailing” display the following view:

Fig. 447: Extras >
Options “Mailing”



The following settings are possible:

**Table 78:
Options
"Mailing"**

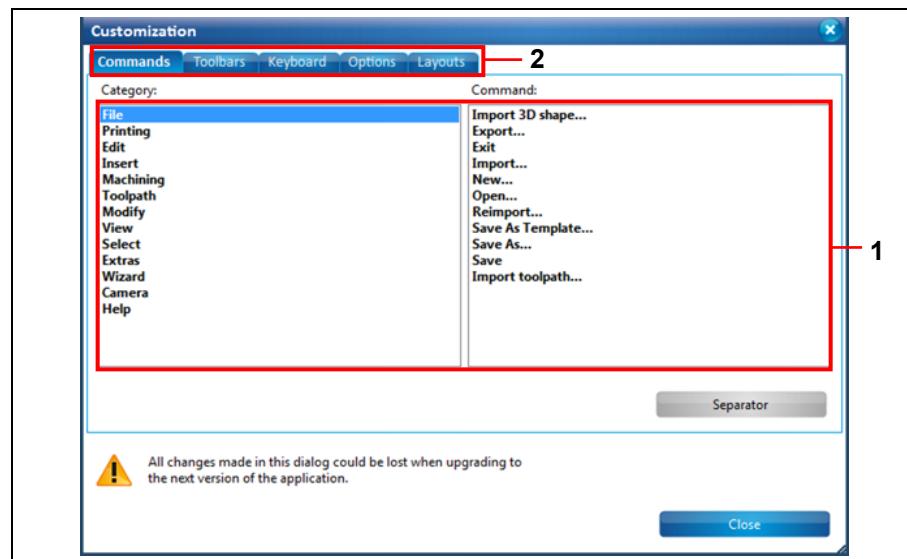
Setting	Description
E-mail settings	
E-mail address machine	The e-mail address that machine uses for sending an email (this address also receives the e-mail as Cc).
Receiver address	The address to which the e-mail is to be sent. E-mail addresses of several receivers are separated with a comma.
Use internal mailing	Set to True if the PC is associated with a local user profile and the company's mail server is used. If this value is set to False the values Port number, Use SSL and Password have to be entered. Note: At the moment, only the SMTP protocol is supported. Check whether it is available via your provider.
Mail Server	Either the mail server of your company or an external mail server.
Port number	The port number of the external mail server. (Refer to the provider to ask for the port number.)
Use SSL	Defines whether to encode the connection with SSL.
Password	Your password for the mail provider.
Usage of e-mails	
Send emails during production	If this option is active, the machine sends automatically emails on the status of the current production.

5.11.2 Customize

The menu item “Customize” allows you to adapt the operation of the program to your needs.

Click on Extras > Customize to open the following dialog:

Fig. 448: Extras >
Customize...



/1/ List of available settings

/2/ Tabs

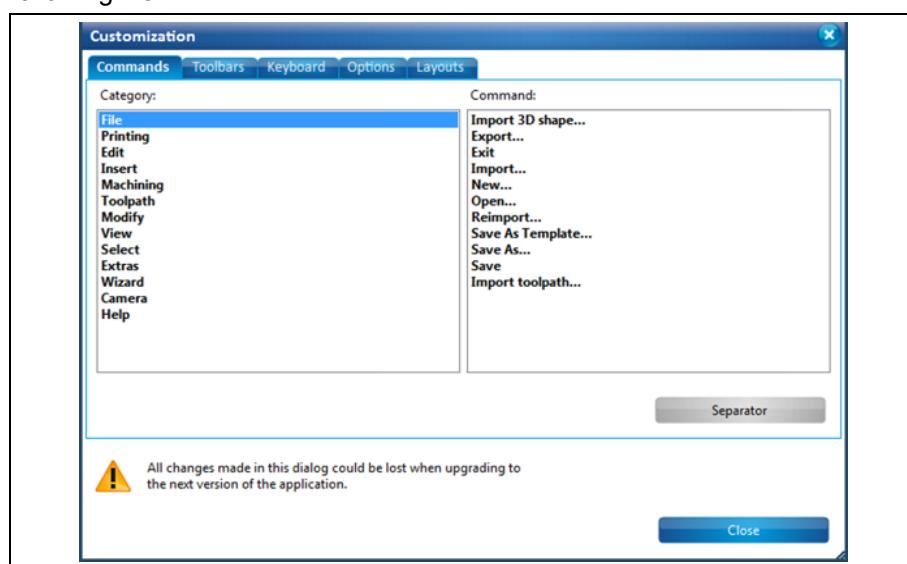
The dialog has 5 tabs with corresponding settings:

- Commands
- Toolbars
- Keyboard
- Options
- Layouts

Commands tab

Click on the “Commands” tab in the “Customization” dialog to display the following view:

Fig. 449: Extras >
Customize...>
Commands



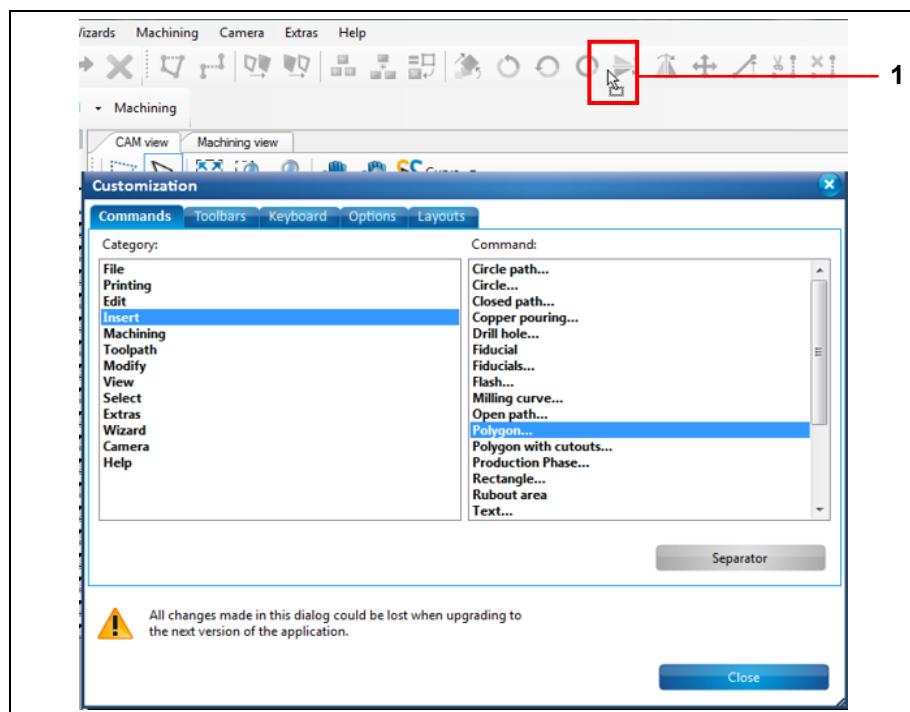
The “Commands” tab allows you to customize the toolbars to your needs. When you click on a category the corresponding command lists are displayed. You can drag and drop the commands to the desired position in any toolbar. Thus you can have fast and easy access to frequently used functions in the toolbar.

Example:

- Inserting the “Polygon” command into the toolbar
- 1. Click in “Category“ on “Insert”.
- ➔ The corresponding command list is displayed.
- 2. Click in “Command” on “Polygon”.
- 3. Drag the mouse pointer with the left mouse button pressed to the desired position in the toolbar.

→ The mouse pointer is displayed as follows:

Fig. 450: Inserting Polygon into the toolbar

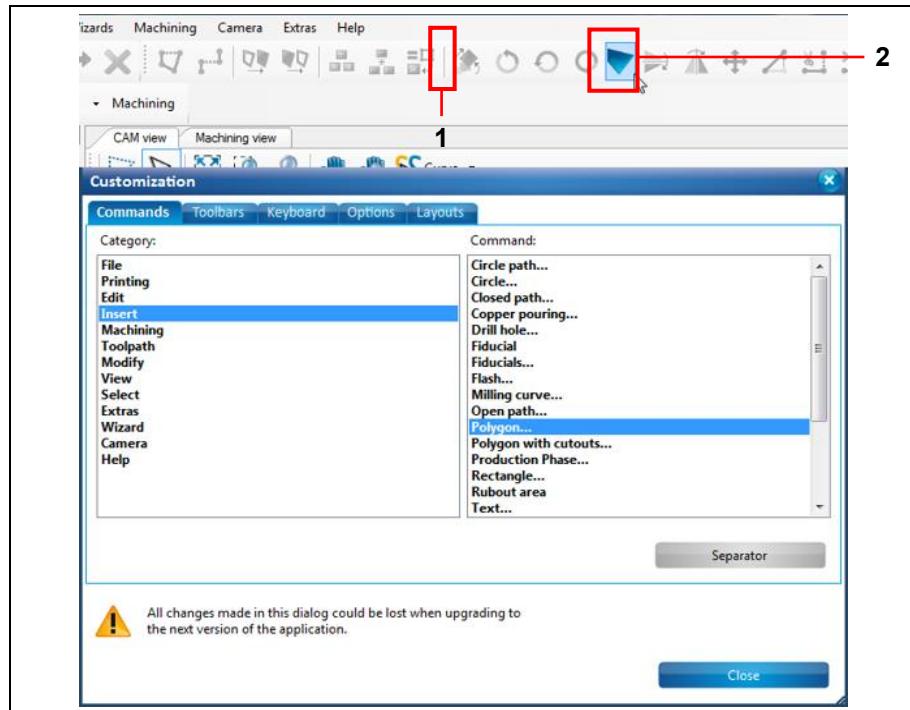


/1/ Mouse pointer with the left mouse button pressed

4. Release the left mouse button.

→ The "Polygon" icon is displayed at the desired position in the toolbar:

Fig. 451: Polygon icon in toolbar



/1/ Separator in toolbar

/2/ "Polygon" icon in toolbar



Tip

You can insert separators between the icons in the toolbar by using the [Separator] button and drag and drop.

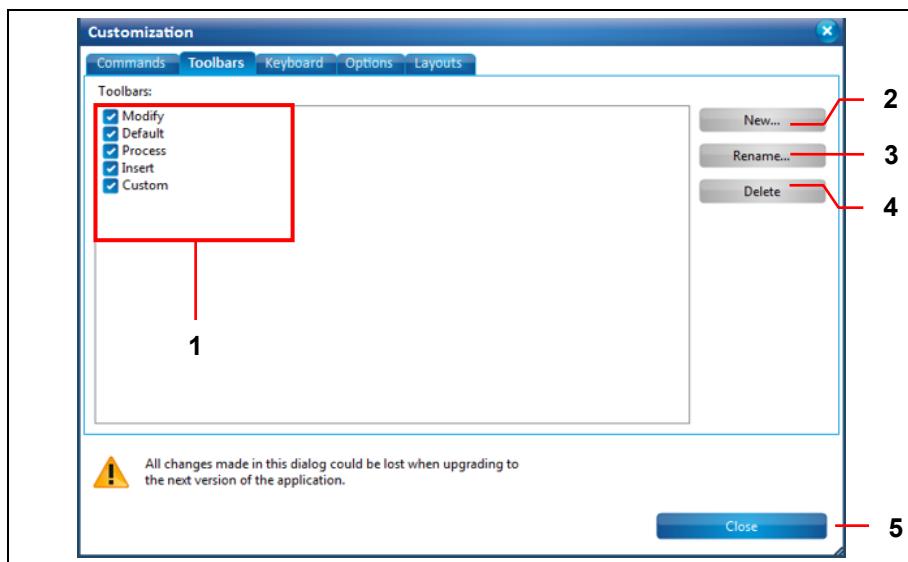
Click on [Separator] and drag the mouse pointer with the left mouse button pressed to the desired position in the toolbar.

- ◆ The “Polygon” command has been inserted into the toolbar.

Toolbars tab

Click on the “Toolbars” tab in the “Customization” dialog to display the following view:

Fig. 452: Extras >
Customize...>
Toolbars



/1/ Activation of the toolbars

/2/ [New...] - creates a new toolbar

/3/ [Rename] - renames the selected toolbar

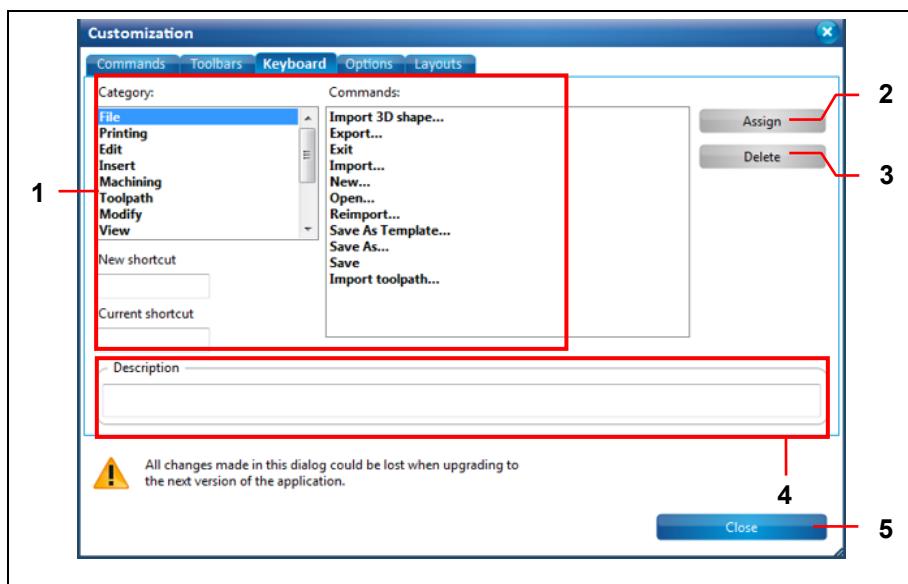
/4/ [Delete] - deletes the selected toolbar

/5/ [Close] - Closes the “Customization” dialog.

Keyboard tab

Click on the “Keyboard” tab in the “Customization” dialog to display the following view:

Fig. 453: Extras > Customize...> Keyboard



/1/ Lists the menu items with their sub-menus and their assigned keyboard shortcuts

/2/ [Assign] - assigns a new shortcut

/3/ [Delete] - deletes the shortcut

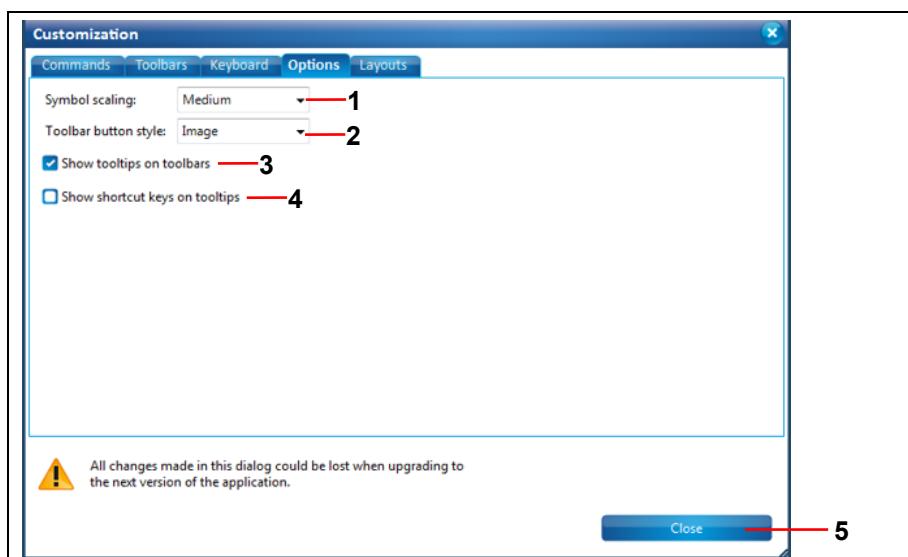
/4/ Description of the menu item currently selected in /1/

/5/ [Close] - Closes the “Customization” dialog.

Options tab

Click on the “Options” tab in the “Customization” dialog to display the following view:

Fig. 454: Extras > Customize...> Options



/1/ Setting for the icon size

/2/ Display mode of the toolbars (with/without text/icon)

/3/ Activate/deactivate display of tooltips in toolbars

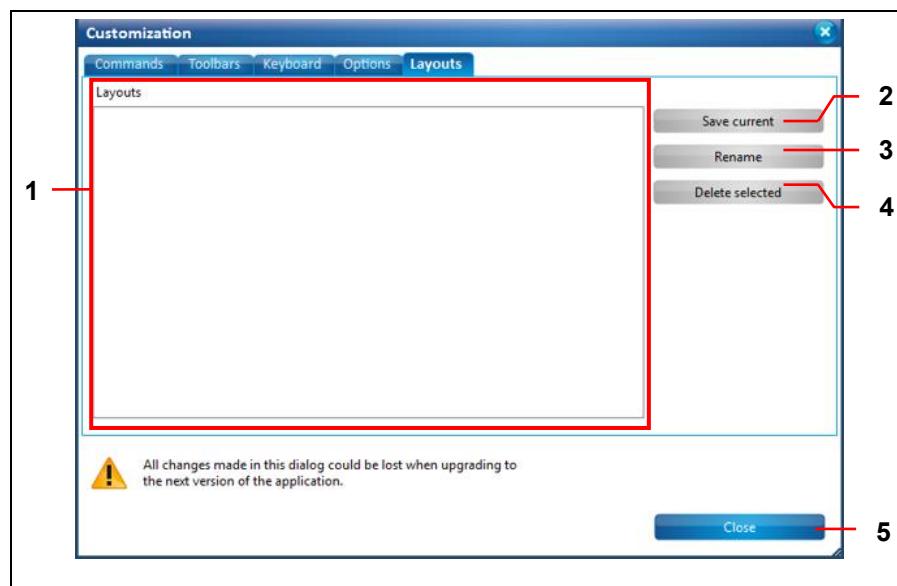
/4/ Activate/deactivate display of keyboard shortcuts in tooltips

/5/ [Close] - Closes the “Customization” dialog.

Layouts tab

Click on the “Layouts” tab in the “Customization” dialog to display the following view:

Fig. 455: Extras > Customize...> Layouts



/1/ List of existing layouts

/2/ [Save current] - saves the current layout under its current name

/3/ [Rename] - saves the layout under a new name

/4/ [Delete selected] - deletes the selected layout

/5/ [Close] - closes the “Customization” dialog

This view allows you to save the settings made in the other tabs under a new layout name.



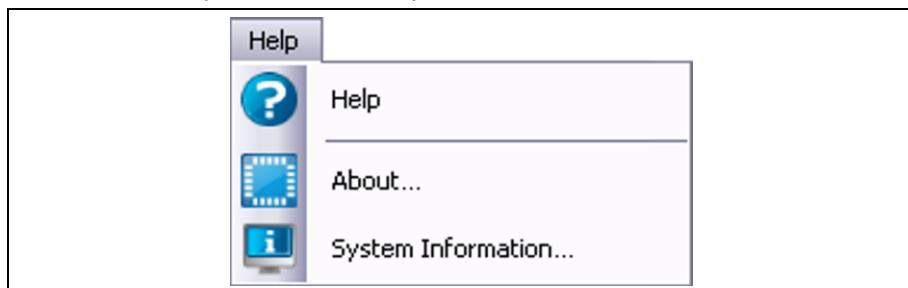
Note

You can find the layouts at View > Layouts where you can switch to the desired screen layout.

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. 456: Menu “Help”



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

Table 79: Menu functions “Help”

Menu item	Description
Help	Opens the CircuitPro PM offline help.
About...	Opens the dialog “About this program” that contains information about CircuitPro PM.
System information...	Contains information about the computer that CircuitPro PM is installed on.

5.12.1 Help

The menu item “Help” calls up the offline help of CircuitPro PM.

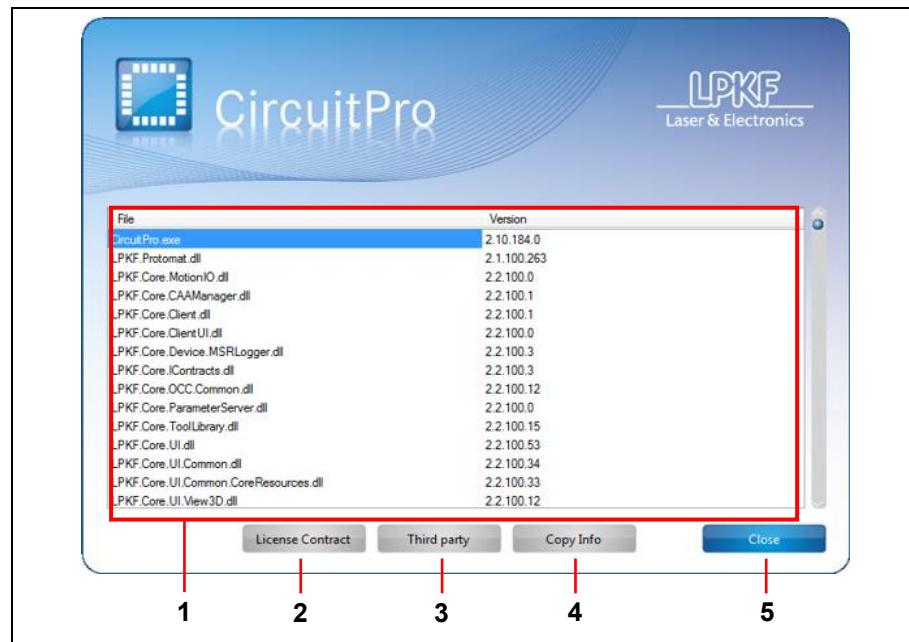
5.12.2 About

The menu item “About” contains information about the program.

1. Click on Help > About...

→ The following dialog is displayed:

Fig. 457: About this program



/1/ Program list including file name and version

/2/ Button [License Contract]

/3/ Button [Third party]

/4/ Button [Copy Info]

/5/ Button [Close]

- Click on [License Contract] to view the license contract.
- Click on [Third party] to view the list of third party licenses used by Circuit Pro PM.
- Click on [Copy Info] to copy the program list to the clipboard.
- Click on [Close] to close the dialog.

5.12.3 System information

The menu item “System information“ contains information about your computer. Click on Help > System information.

The following dialog is displayed:

Fig. 458: System information

System information	
Name	Value
CPU	
Address width	32
Clock frequency	1994 MHz
Description	x86 Family 6 Model 23 Stepping 6
ID	BFEFBFFF00010676
Manufacturer	GenuineIntel
Name	Intel Pentium
Number of cores	2
Type	3
RAM	
Capacity	4096 MB
Number of modu	2
GPU	
Chip type	GeForce 9200M GS
Current video mc	1280 x 800 x 4294967296 Farben
Description	NVIDIA GeForce 9200M GS
Is internal GPU	False
Memory	512 MB
Name	NVIDIA Gef

6 Appendix

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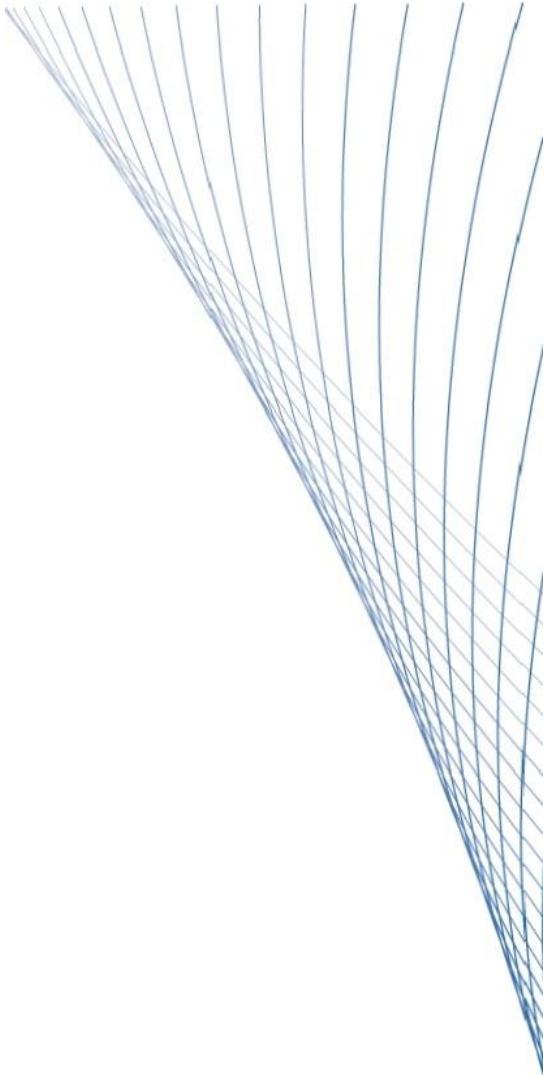
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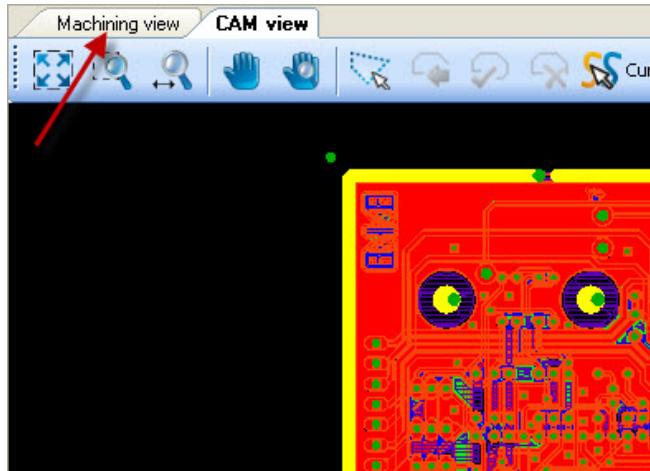
Board Production In CircuitPro

Requirements

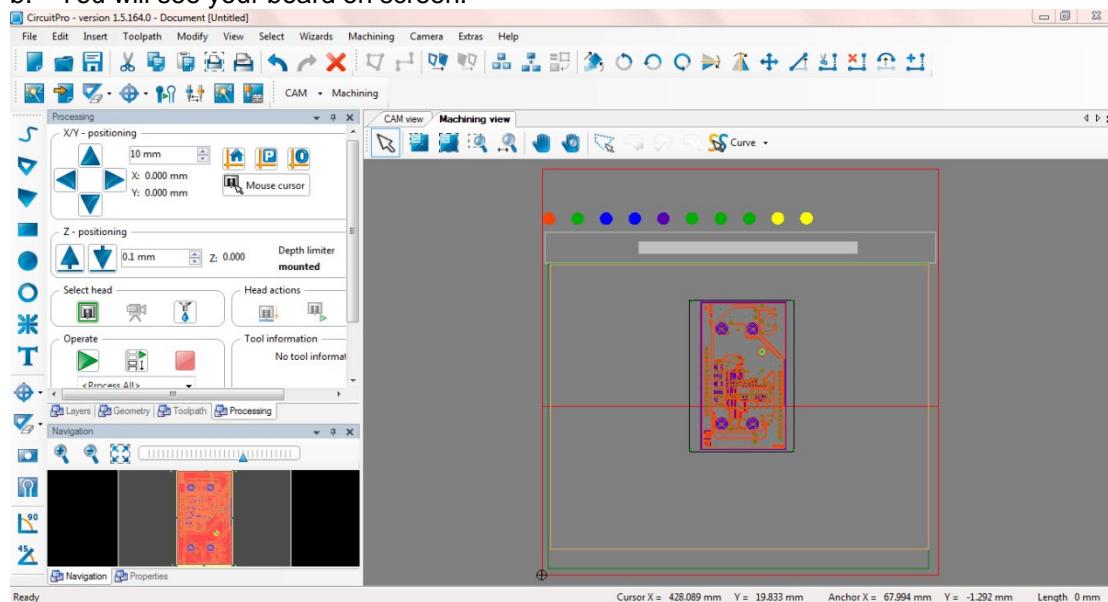
1. Circuit Pro version 1.5 revision 164 or higher
2. Generated tool paths (Processed Gerber or DXF file)
3. 1x piece of copper material
4. 1x set of tools (combo of contour routers, drills, end mills and universal cutters)

Process Steps

1. Switch to machine view
 - a. Press the Machine view tab.



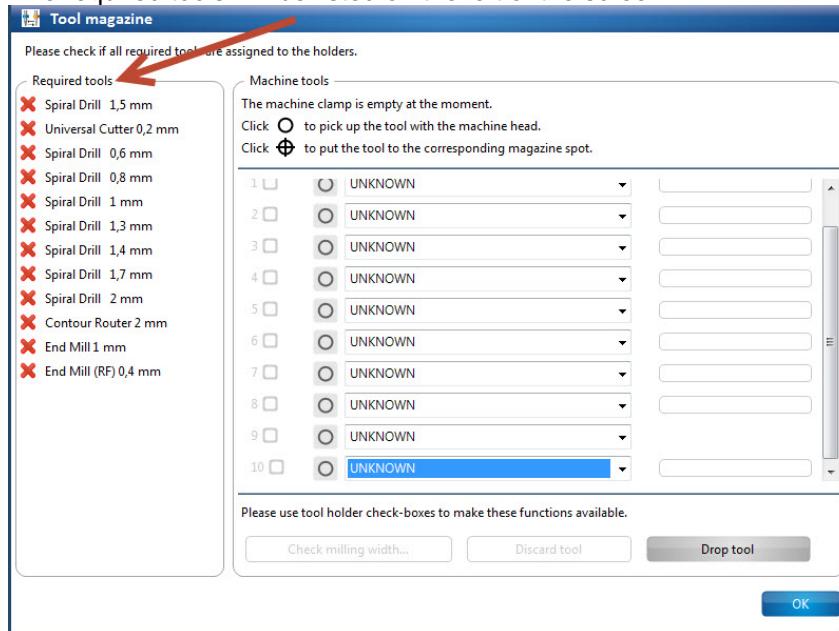
- b. You will see your board on screen.



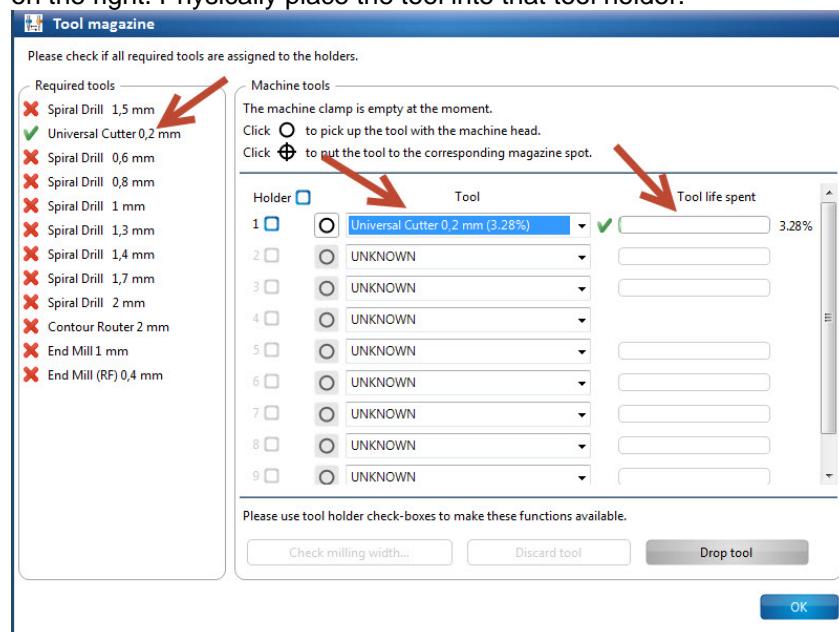
2. Load the toolbar if your system has one. If it does not please skip to step 3.



- Press the toolbox dialogue icon  , or go to the edit menu and select tool magazine.
- The required tools will be listed on the left of the screen.



- In each individual tool position dropdown menu on the left, select one of the tools that is listed on the right. Physically place the tool into that tool holder.



Note: As you assign each tool to a tool holder, the red "X" next to the tool column will change to a green "check". The software will also display the tool life that has been used.

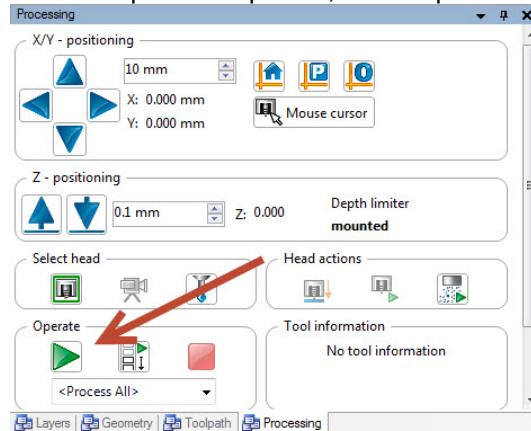
- d. Press the ok button.

Note: You will notice that the colors of the tool holders on the main layout screen will match the colored rings on the physical tools, as shown below.

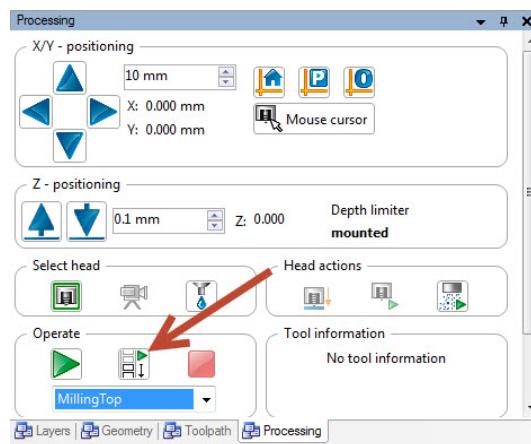


3. Start board production.

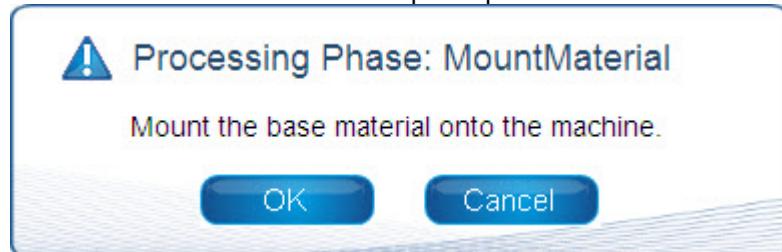
- a. Press the board production wizard icon in the phase dropdown, choose process all and press the green play button.



Note: If you wish to start on a different phase and would like to automatically continue to the next sequential phase, select the desired phase in the drop down menu and press the “start selected phase and all following phases” icon, as displayed below.



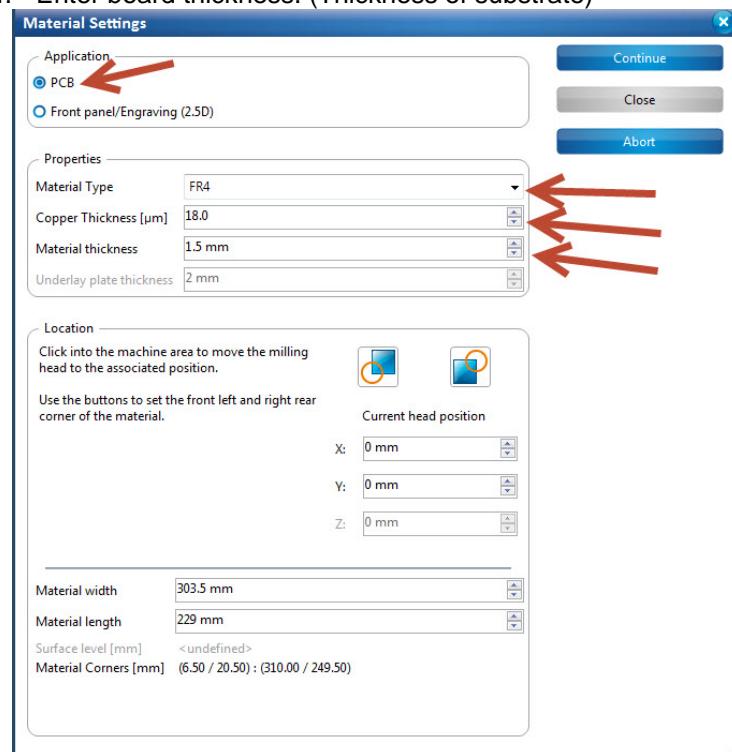
- b. Load material onto the tabletop and press ok.



Note: The machine will automatically move to the pause position.

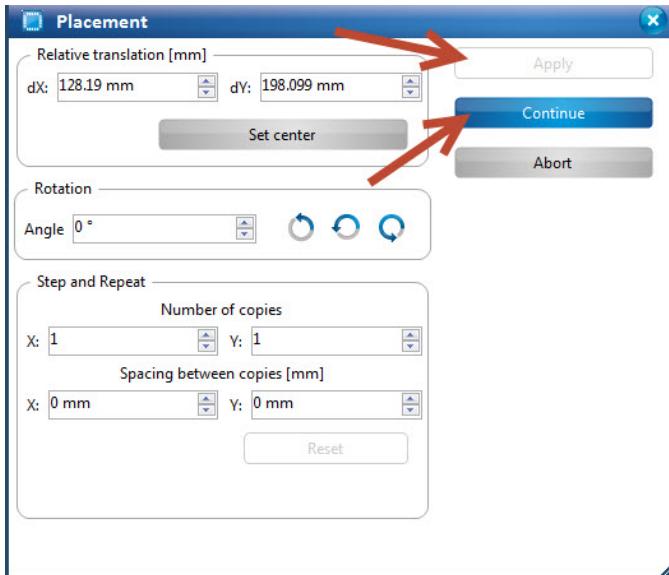
- c. Enter in the material settings.

1. Make sure that PCB is selected in the application field.
2. Select the material type.(Auto selected)
3. Enter the copper thickness.
 1. 18 micrometers is 1/2 ounce of copper.
4. Enter board thickness. (Thickness of substrate)



5. Press continue.

- d. If desired, move the board to the desired location.



1. Move the placement window off to the side.
2. Single click and drag your design to its new location.
3. Press the apply button.

Note: If you desire to create multiples of the same design, in the step and repeat section, enter how many designs you want on each axis. Enter the desired spacing between copies.

4. Press apply
 5. Press the continue button.
- e. The machine will now start creating your design.
- f. The machine will now go and pick up the 1.5mm drill to drill your fiducial holes if you are using them.

Note: A 3 minute motor warm-up is expected. This warm-up will happen on the first spinning of the motor each day, or after a prolonged idle period.

- g. The machine will now go and pick up the 0.2mm Universal Cutter and center punch all of the via holes.
- h. This machine will automatically transition to the drilling plated phase and drill all of your through holes.
- i. Once the drills are complete, the machine will move to the pause position and prompt you to carry out the galvanic plating (MiniContac or Contac plating system).



Processing Phase: DismountMaterial

Dismount the base material from the machine.

OK

Cancel

- j. Remove the material and press ok.

- k. Execute the plating process.



Processing Phase: ThroughHolePlating

Carry out the galvanic through-hole plating process.

OK

Cancel

- l. Press ok.

- m. After plating is complete, mount the material back onto the table top with the bottom side of the board facing up.



Processing Phase: MountMaterialBottom

Mount the base material onto the machine. Make sure the bottom side of the board faces upwards.

OK

Cancel

- n. Press ok.

- o. The machine will then execute reading the fiducials.

- p. Once the fiducials are read in, the machine will automatically transition to the milling bottom phase and start your circuit structuring and removal of excess copper.

- q. When the milling bottom phase is complete, the machine will move to the pause position.

- r. Flip the board over to the top side of the board.



Processing Phase: FlipMaterial

Flip the base material over around the machine symmetry axis.

OK

Cancel

Note: Always flip the board along the X axis. You will also see the display graphically flip the design to the top side.

- s. Press ok.

- t. The machine will now read the fiducials from the top side of the board.

- u. Once complete, the machine will automatically transition to the milling top phase and start your circuit structuring and removal of the excess copper.

- v. Once the milling top is complete, the machine will automatically transition to the cutting outside phase to cut your board out of the material.

Note: The machine will pick up either the 1.0mm or 2.0mm drill (depending on what was processed during the data preparation) and drill a starter hole for the contour router. Once complete, the machine will pick up the contour router and cut out your board.

w. Once the cutting out of the board is complete, the machine will move to the pause position.

x. Remove the board from the table top.

 Processing Phase: DismountMaterial

Dismount the base material from the machine.

OK

Cancel

y. The machine will now display the total time to create your completed board.

 Board production finished

Your board has been finished!

Duration: 12:26:31 AM

OK

z. Congratulations, you have created a PCB board.

Processing Gerber Files in CircuitPro

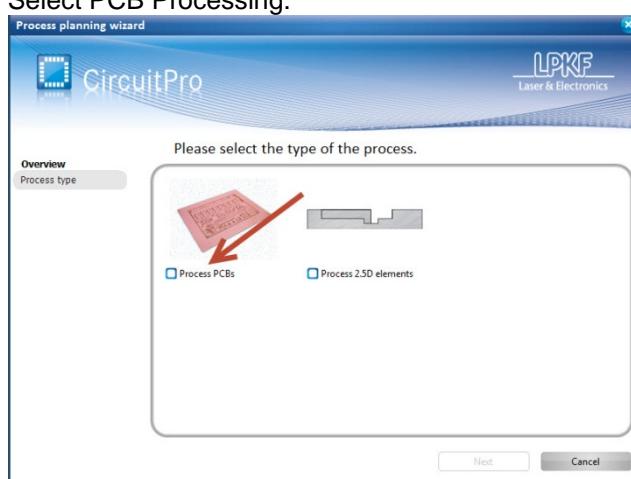
Requirements

1. Circuit Pro version 1.5 revision 164 or higher
2. Set of Gerber Files

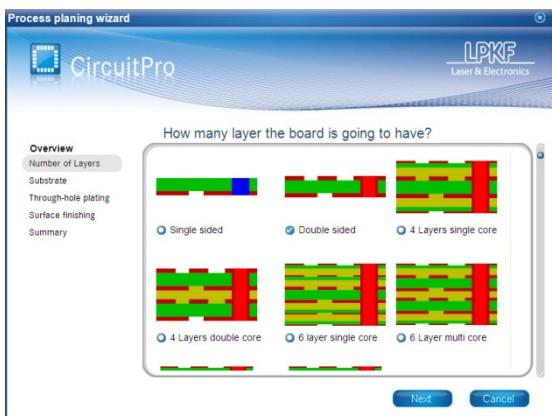
Process Steps

1. Execute Process Planning Wizard.

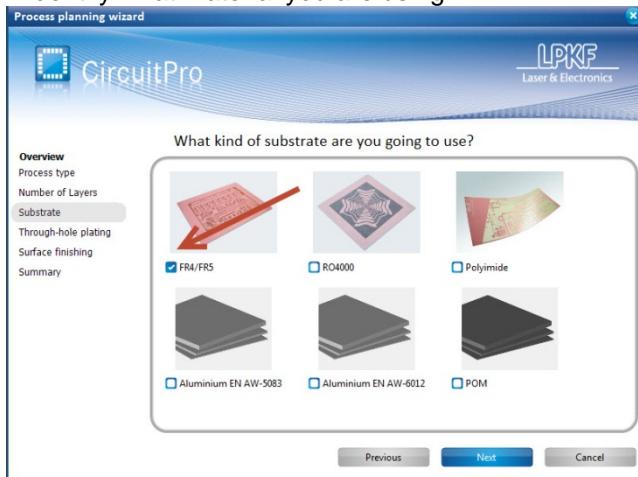
- a. Press the process planning wizard icon  , or go to the wizard menu and select process planning wizard.
 - b. Select PCB Processing.



- c. Select the amount of copper layers you are going to use.



- d. Identify what material you are using.



Note: Currently the only settings available are for FR-4 material. The data for other materials will be included in later revisions for Circuit Pro

- d. Identify which through hole plating method will be used.

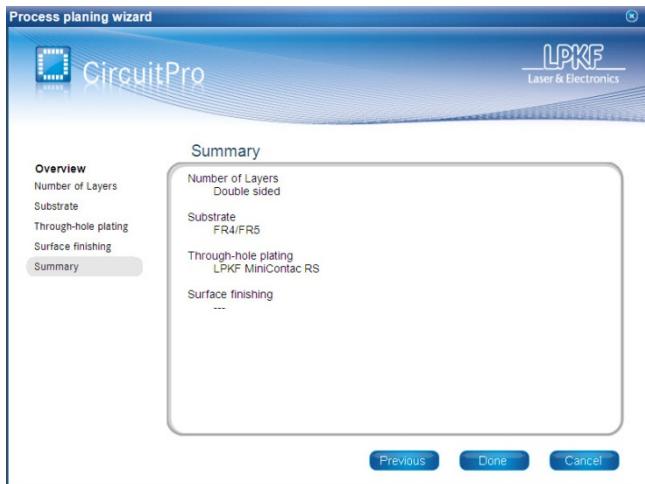


Note: The options will be presented based on what you told the system during the initial installation

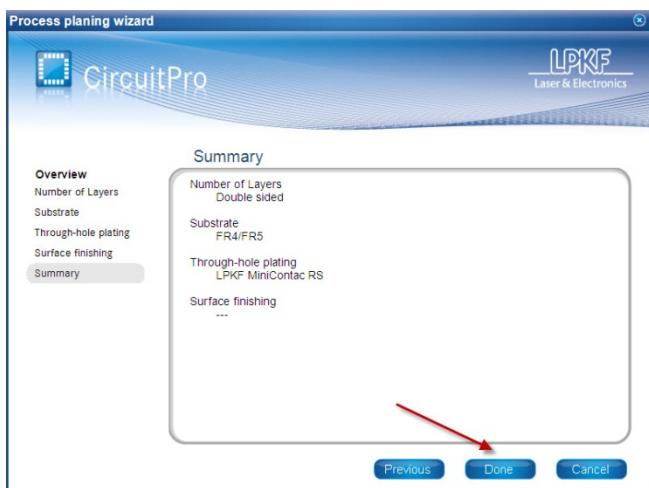
- e. Identify if you are using any surface finishing (Silkscreen or Soldermask)



f. Verify the configuration.



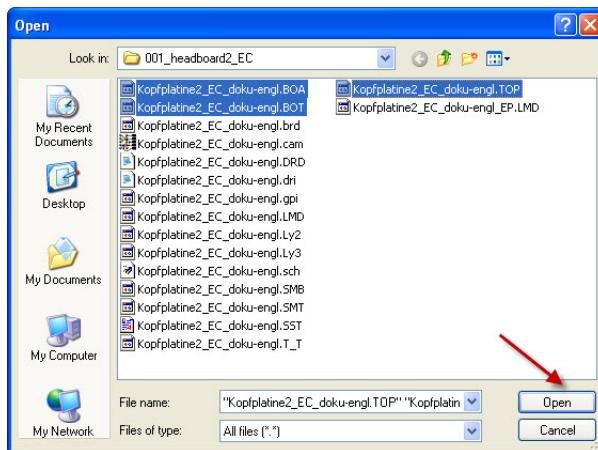
g. Press done.



3. Import Gerber files



- Press the import icon , or go to the file menu, then import.
- Find the location that has your Gerber files.
- Single click on the top layer. Hold the control key and single click on the board outline and bottom layers.
- Press open.



- Change the layers/template column to the desired layer you want each file to import to. (.BOT is bottom layer, .BOA is board outline, .TOP is top layer)

Import	File Name	Format	Aperture/Tool List	Layer/Template	Size/Format
<input checked="" type="checkbox"/>	Kopfplatine2_EC_doku-engl.BOA	GerberX	Kopfplatine2_EC_dok...	<input checked="" type="checkbox"/> BoardOutline	66.68 x 117.47 mm
<input checked="" type="checkbox"/>	Kopfplatine2_EC_doku-engl.BOT	GerberX	Kopfplatine2_EC_dok...	<input checked="" type="checkbox"/> Kopfplatine2_EC_doku-en...	65.81 x 116.61 mm
<input checked="" type="checkbox"/>	Kopfplatine2_EC_doku-engl.TOP	GerberX	Kopfplatine2_EC_dok...	<input checked="" type="checkbox"/> Kopfplatine2_EC_doku-en...	65.81 x 117.27 mm

- Press ok.

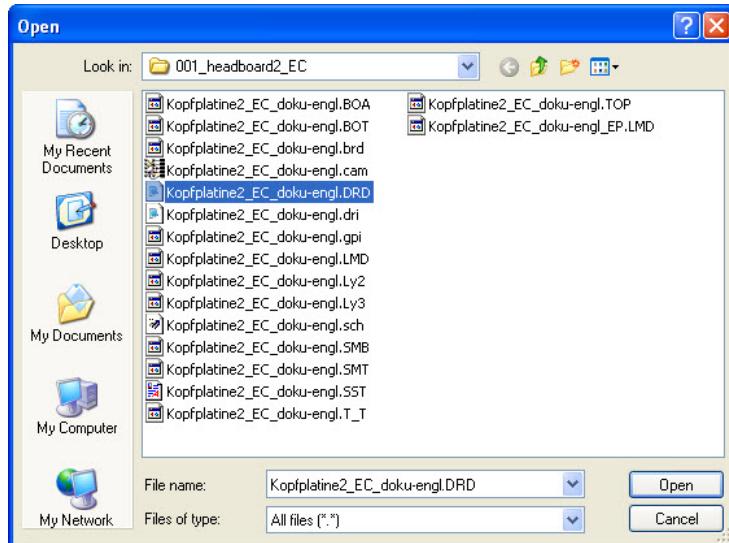
4. Import Drill file

Note: This step can be completed at the same time as importing the Gerber layers.

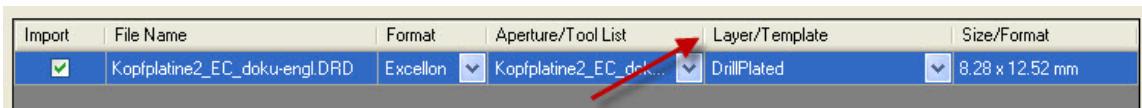


- Press the import icon , or go to the file menu, then import.
- Find the location that has your Gerber files.
- Single click on your NC-Drill file.

Note: In this document, the DRD file is the Excellon drill file. This may also be a text file, (.txt. extension) depending on your layout package.

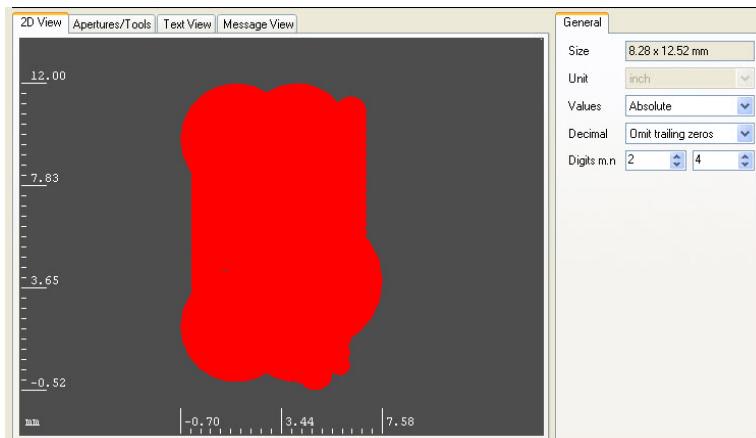


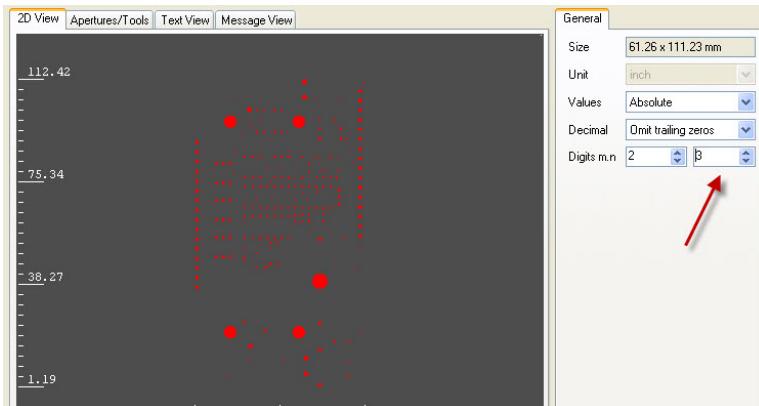
- d. Press open.
- e. Change the laser/template column to drill plated or drill unplated.



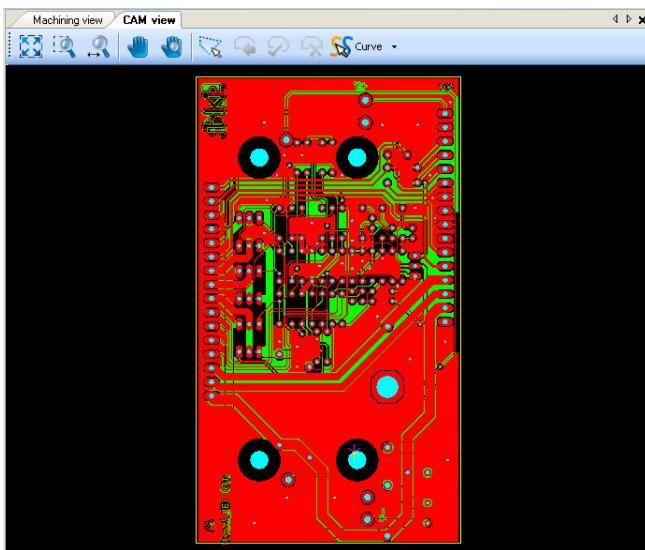
Note: This is determined if you are using a through-hole plating system. If so, use drill plated. If not, use drill unplated. This will also affect when the holes are drilled. Drill plated is drilled on the bottom side of the board. Drill unplated is drilled from the top side of the board. If this is a single sided board, use drill unplated.

- f. In the graphic display, the correct view of the drills, you should see the different sized apertures and the correct location of your drills.
- g. If the display is correct press open.
- h. If the graphic display is not correct, change the N digit from 4 to 3. This signifies how many zeros the software uses. This setting is normally either 2,4 or 2,3.



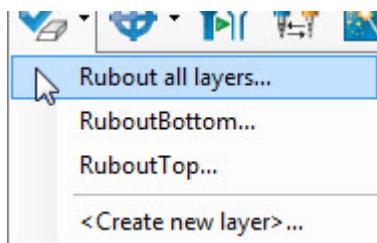


- i. Press open.
- j. Your design should be now displayed on screen.



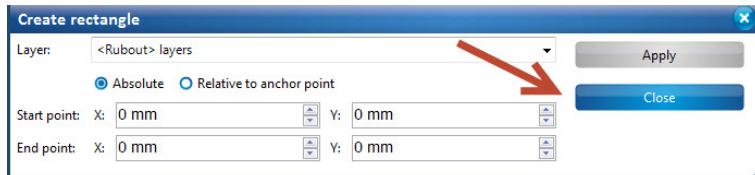
5. Establish rubout boundary. (If removing excess copper is desired)

- a. Press the rubout icon  , or go to the insert menu, select rubout, then all layers.
- b. Select all layers.



- c. Move the create rectangle window off to the side.

- d. Single click on one corner of the board, or desired location.
- e. Single click on the opposite corner of the board, or desired location
- f. Press the close button.



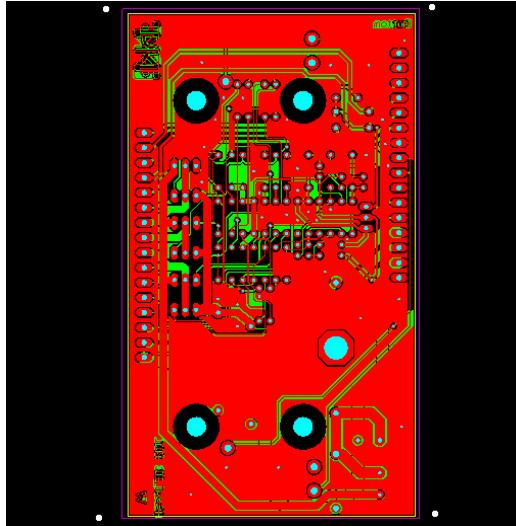
Note: You should see a rectangle outside of your board, or positions you selected. Circuit Pro will create your boundary on the rubout top and rubout bottom layer

Note: If you wish to create a rectangle by a specific size, you may use the coordinate system in the 'create rectangle' window.

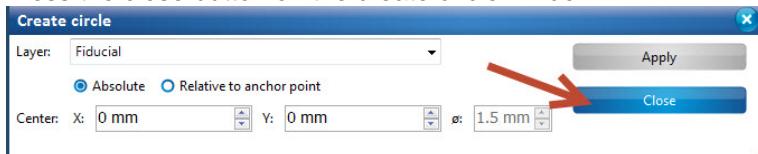
6. Insert Fiducials



- a. Press the add fiducial icon
- b. Move the create circle window off to the side.
- c. Left click where you want to place each fiducial hole. Best results are just off each corner of the board.



- d. Press the close button on the create circle window.

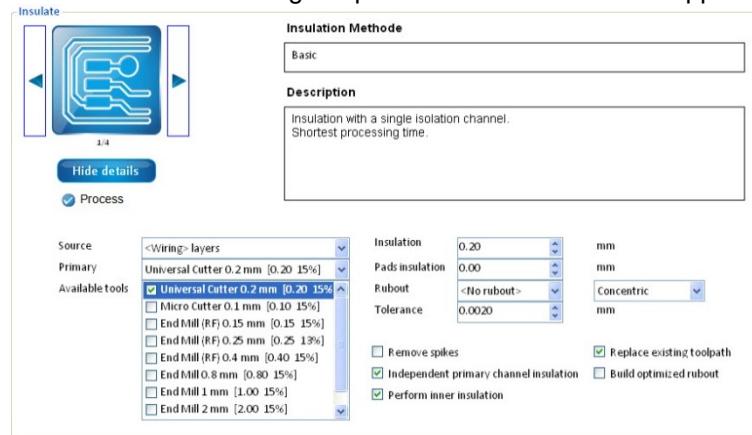


7. Create the tool pathways

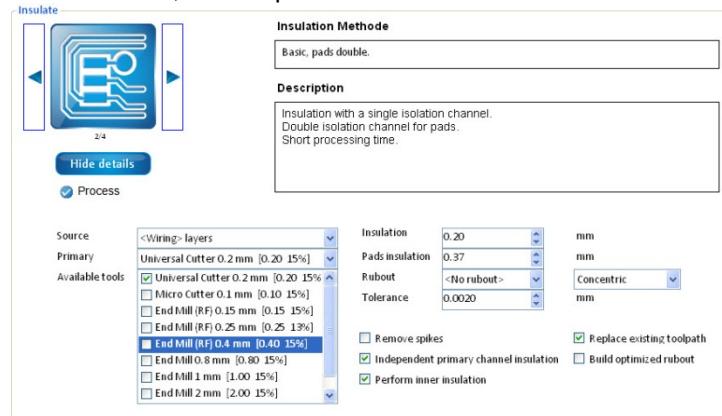
- a. Press the technology dialogue icon  , or go to the toolpath menu and select technology dialogue.

- b. Select insulation type.

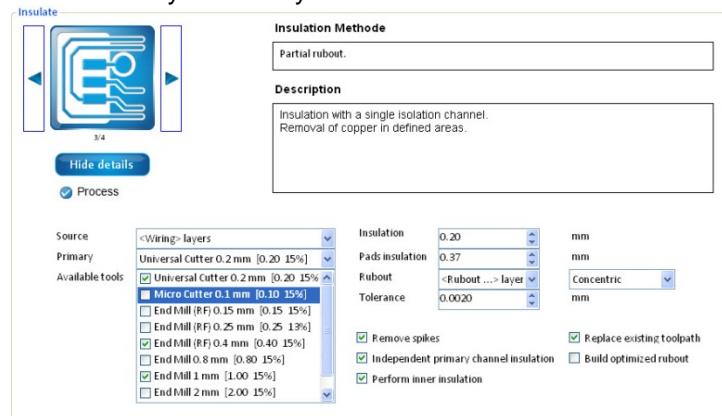
- i. Press the right arrow key on the screen to select which insulation type you desire.
ii. Basic insulation is isolating the pads and traces from the copper only.



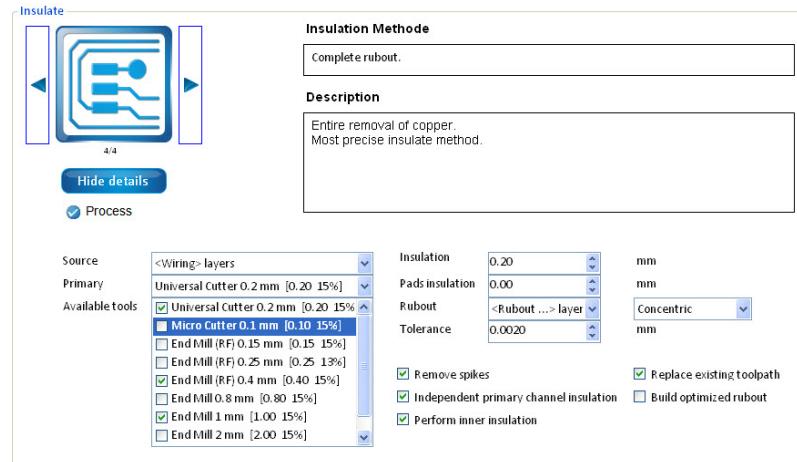
- iii. Basic Insulation, double pads isolates the traces and double isolates the pads.



- iv. Partial rubout will isolate the traces and pads and remove any excess copper within the rubout boundary inside of your board.



- v. Full rubout will isolate the traces and pads, along with removing the excess copper from the entire board.



- vi. Press the show details button.

Show details

- vii. Select the milling tools that you wish to use in the available tools drop down menu by checking/unchecking the tool name.

Note: *The primary tool is used to isolate your design from the ground plane. The tools in the check boxes are used for the copper removal.*

Note: *The best combination of tools for analog/digital designs are: Universal Cutter 0.2mm, the 0.4mm End Mill and the 1.0mm End mill.*

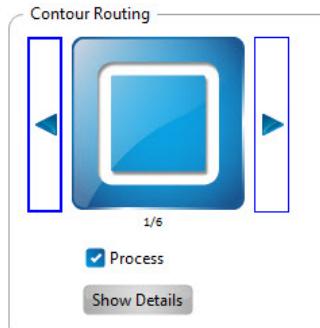
Note: *The best combination of tools for RF boards are: 0.25mm End Mill, 0.4mm End Mill and the 1.0mm End Mill. You will need to change the primary tool from the 0.2mm Universal Cutter to the 0.25mm End Mill.*

Note: *If your designs have smaller spacing requirements than 8 mils, use the 0.15mm (6 mil) End Mill, the 0.1mm (4 mil) End mill or the 0.1mm (4 mil) Micro Cutter. If your designs have larger areas of copper removal, add the 2.0mm End Mill or 3.0 mm End mill.*

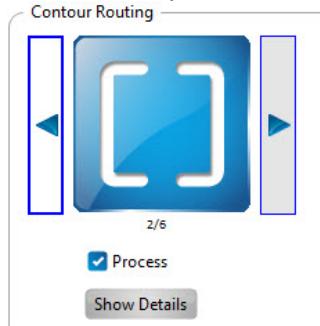
- viii. Press the hide details button.

Hide details

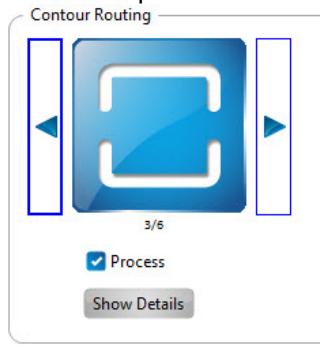
- c. Select the contour routing type.
- a. In the contour routing section, press the left arrow to select what option you would like to cut the board out.
 1. None. This will route along the outside of the board. No breakout tabs will be used



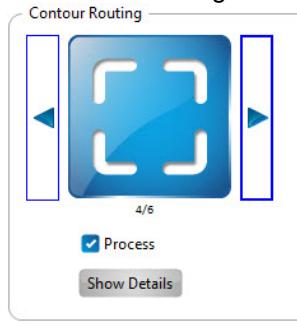
2. Horizontal Gaps. This will create breakout table on the top and bottom sides.



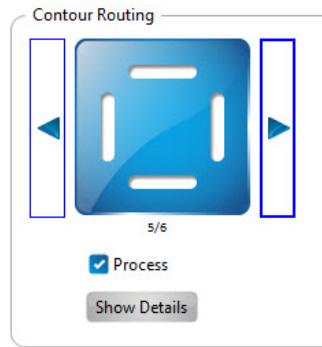
3. Vertical Gaps. This will create breakout tabs on the right and left sides.



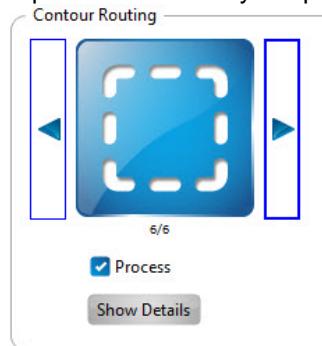
4. Four edges. This will route along the outside of your board leaving tabs in the center of each edge of the board.



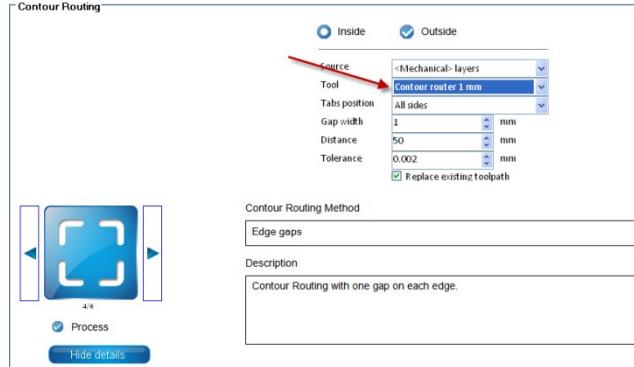
5. Four corners. This will route along the outside of your board leaving tabs in the corners.



6. Equidistant tabs. This will route along the outside of your board leaving tabs at equal distance that you specify.



- b. If desired, change the tool used during the contour routing.
- Press the show details button.
 - In the used tool dropdown menu, change the 2.0mm contour router to the 1.0mm contour router.



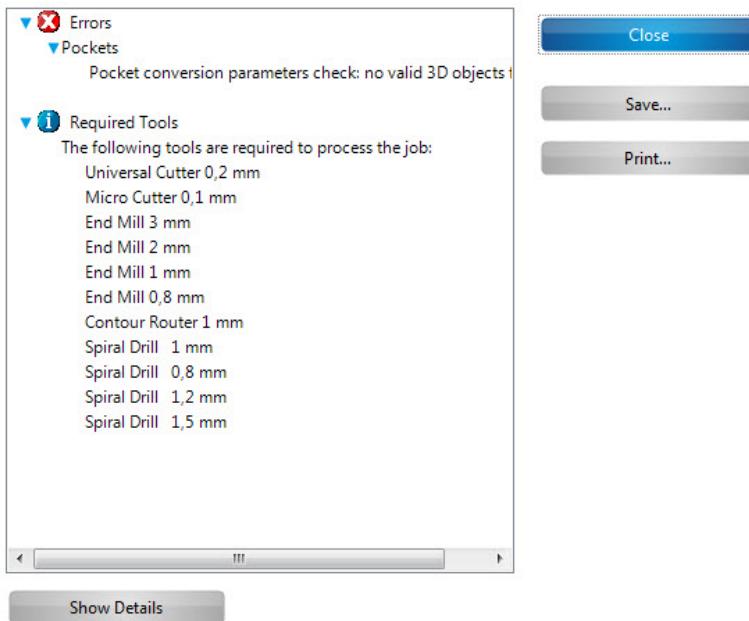
Note: If your design is larger than 2 x 3 inches, the 2.0mm contour router is recommended. If your design is smaller than 2 x 3 inches, the 1.0mm contour router is recommended.

Note: The 1.0mm contour router is also recommended if the board outline is not a traditional rectangle. This helps minimize the risk of a rounded corner.

d. Press the start button.



e. The software will now create all tool paths and identify all which drills shall be used. When finished, you will get a report of which tools are used.



f. Press close.

8. Process complete. Please follow the how to document for Circuit Pro operations for board production.

Import and Converting DXF files in CircuitPro

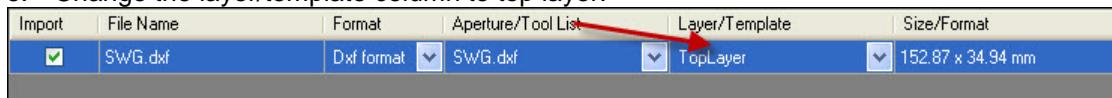
Requirements

1. Circuit Pro version 1.5 revision 164 or higher.
2. DXF File

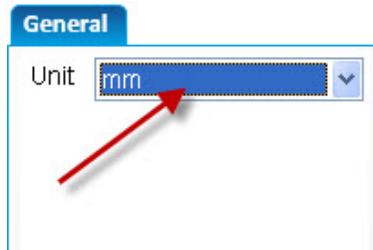
Process Steps

1. Import DXF files

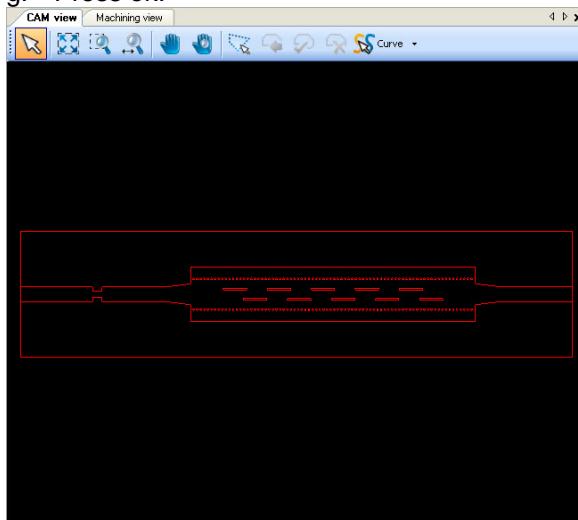
- a. Press the import icon  in the toolbar, or go to the file menu, then import.
- b. Find the location that has your DXF files.
- c. Single click on the DXF files.
- d. Press open.
- e. Change the layer/template column to top layer.



- f. Select the increment that the DXF file was originally drawn in.



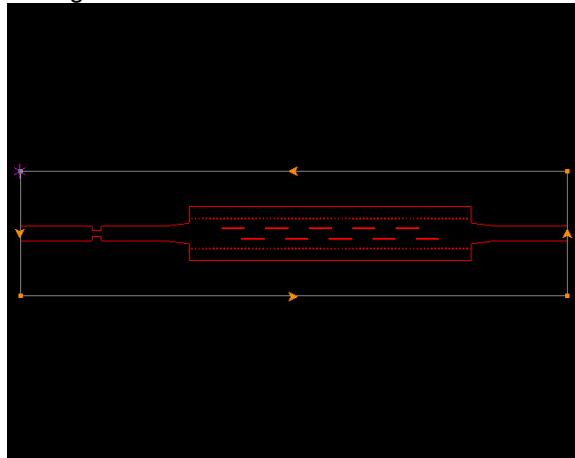
- g. Press ok.



2. Convert DXF file

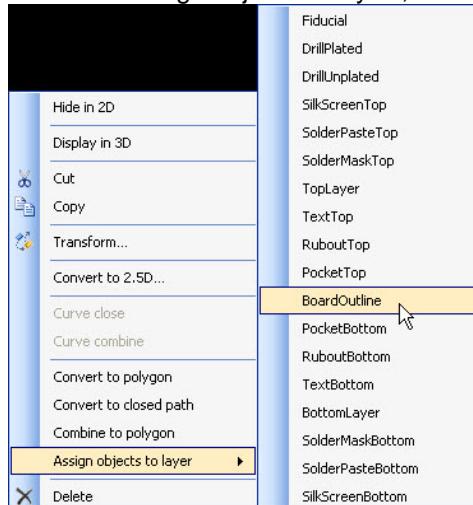
a. Board Outline

- i. Single click on the board outline.



- ii. Right click on your mouse

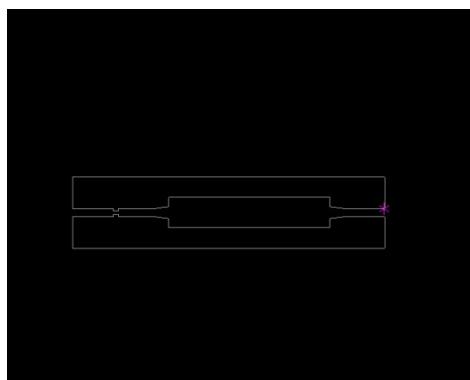
- iii. Select “assign objects to layer”, then board outline



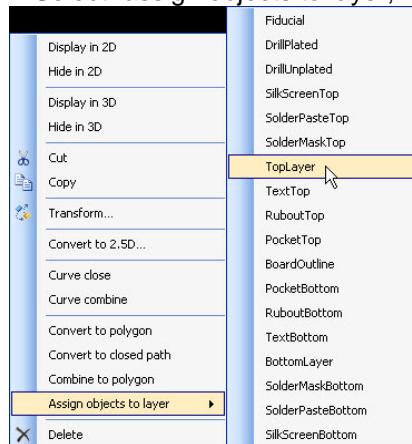
b. Top layer

- i. Highlight all traces that will go onto the top layer.

Note: You can also single click on the traces. Hold the control key down to select multiple items.



- ii. Right click on your mouse.
- iii. Select “assign objects to layer,” then top layer.



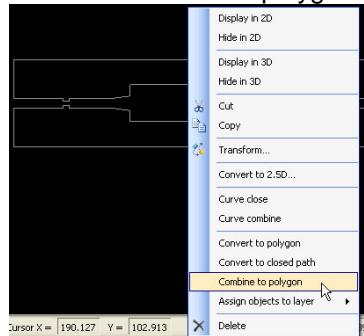
- iv. Repeat this process for all remaining objects

c. Convert trace/pads to whole objects

- i. Single left click on the top layer in the layers list.

Name	Vis	Sel	Colors	Mode	Tech	
Fiducial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		True	▼	Fiducial
DrillPlated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Drilling
DrillUnplated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Drilling
SilkScreenTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Silk Scr
SolderPasteTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Solder P
SolderMaskTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Solder M
TopLayer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Wiring
TextTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Wiring
RuboutTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	Outline	▼	Rubout
PocketTop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	Thin	▼	2.5D mil
BoardOutline	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	True	▼	Mechar
PocketBottom	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	■■■■■	Thin	▼	2.5D mil

- ii. Right click on your mouse.
- iii. Select “combine to polygon.”

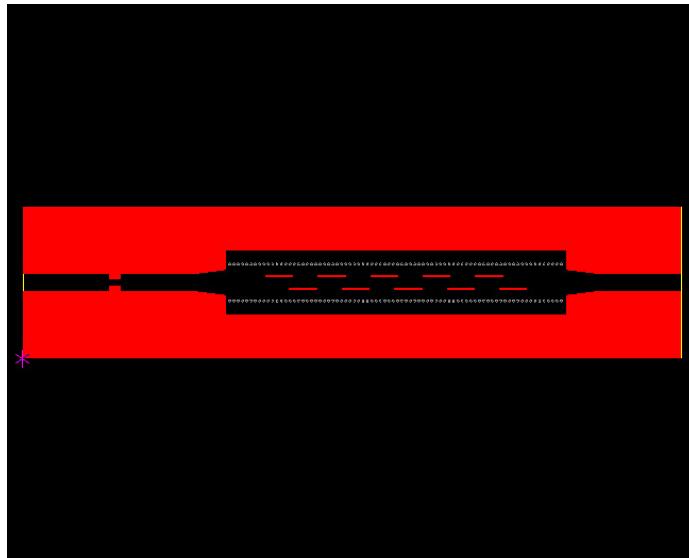


Note: This will combine all segments and fill the objects

- iv. Repeat this process for all remaining layers.

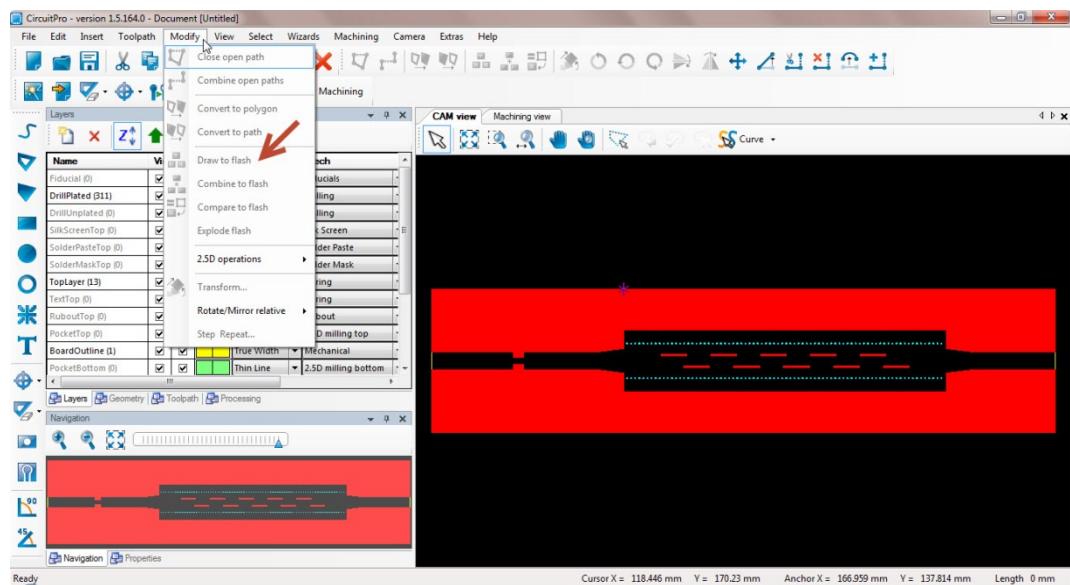
d. Convert drill holes

- i. Highlight all desired drill holes.



Note: You can also single click on the drill holes. Hold the control key down to select multiple items.

- ii. Go to the modify menu and select "draw to flash."



3. Assign toolpaths.

- a. Please see the "Processing a Board in CircuitPro (CAM only)" document, step 5.