Milling Circuit Boards with CircuitPro and S63 LPKF Machine

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Maestría en Ciencias en Ingeniería Electrónica
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Machine Setup

Figure: Hardware configuration

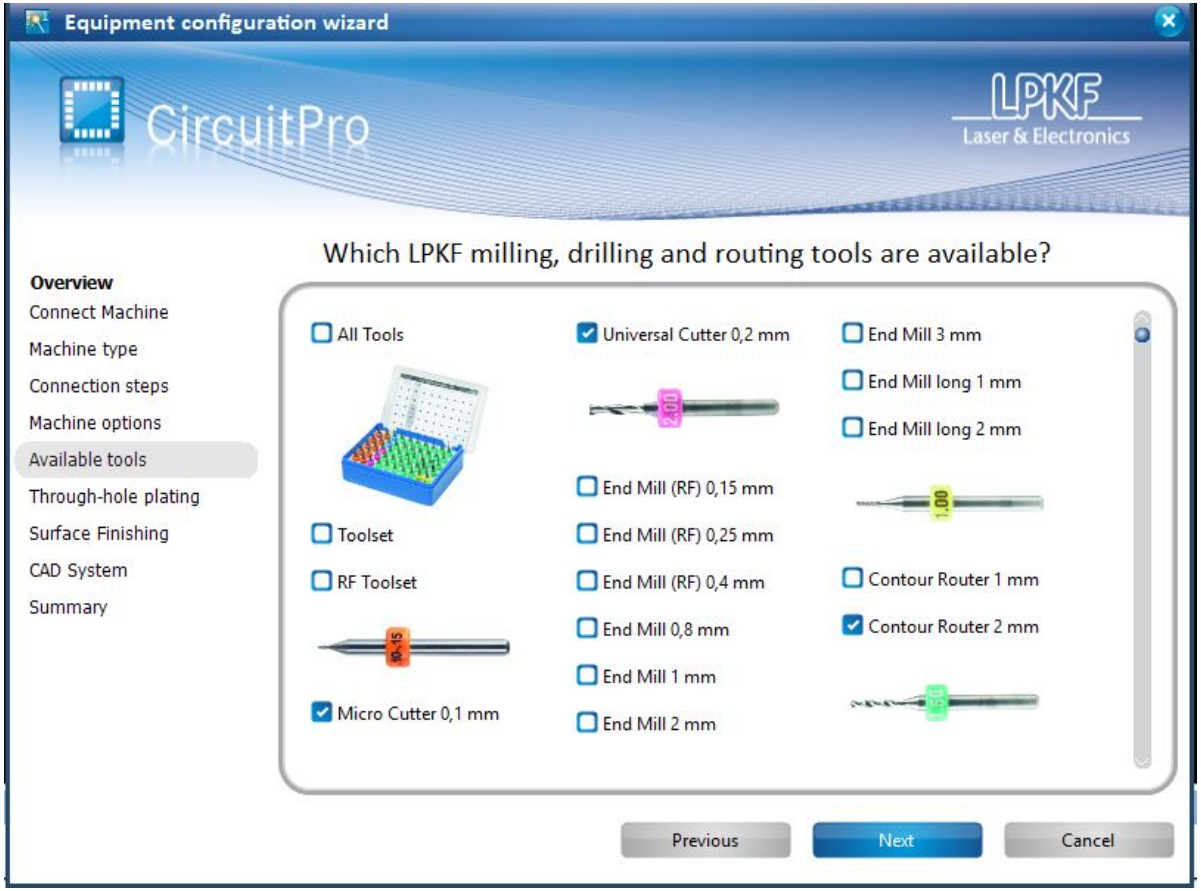
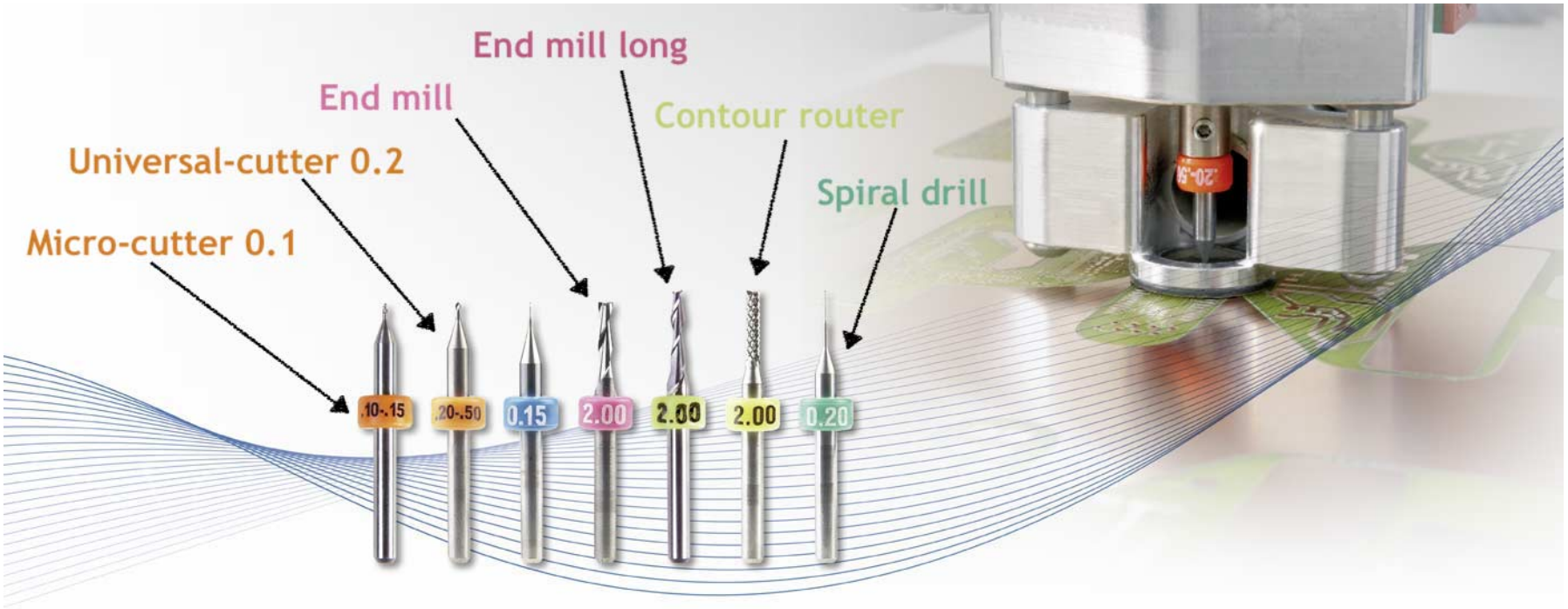
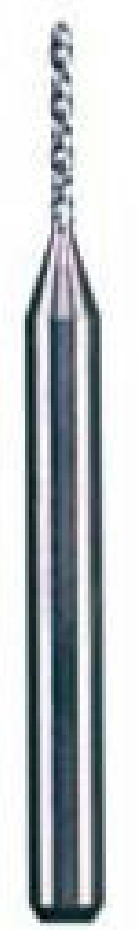


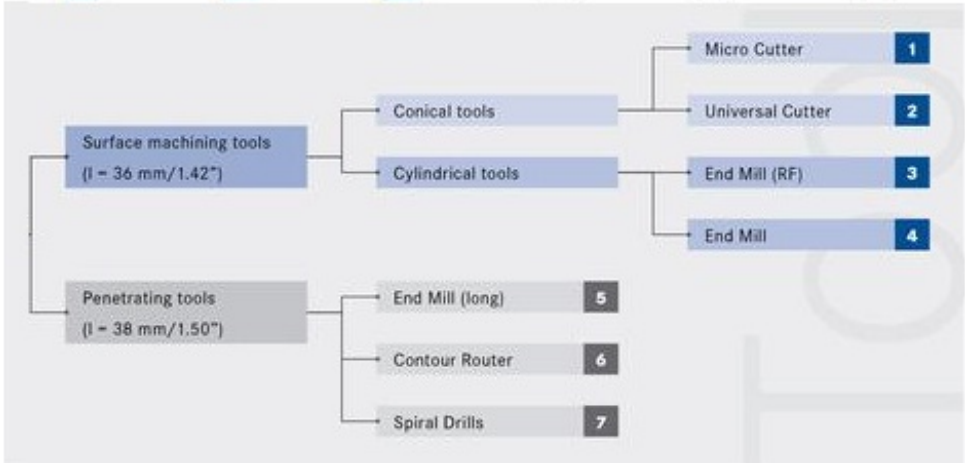
Figure: Tool selection window

Milling and Drilling Tools






38 mm (1.5")
36 mm (1.42")
.10-.15
.20-.50
0.15
2.00
2.00
2.00
0.20
1
2
3
4
5
6
7


Surface machining tools
(l = 36 mm/1.42")
Conical tools
Cylindrical tools
Micro Cutter 1
Universal Cutter 2
End Mill (RF) 3
End Mill 4
Penetrating tools
(l = 38 mm/1.50")
End Mill (long) 5
Contour Router 6
Spiral Drills 7

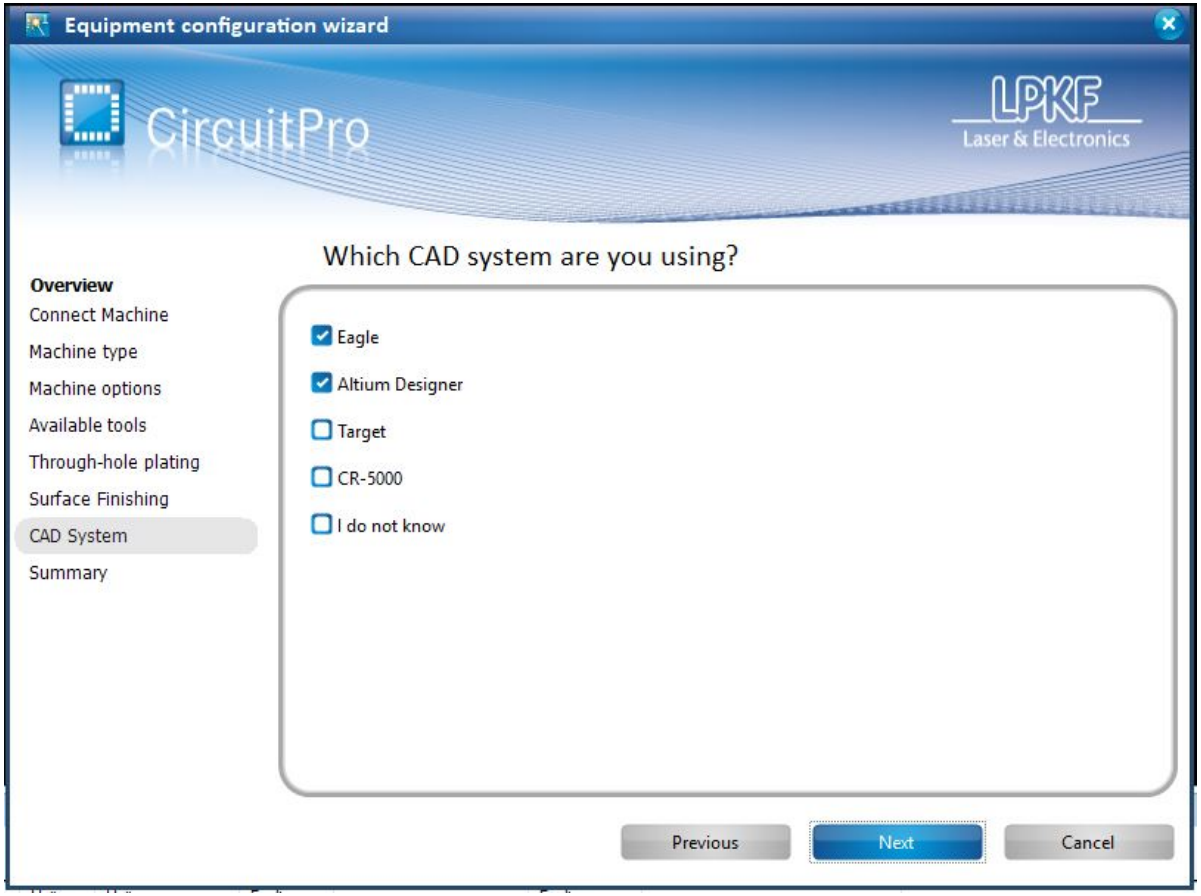


Figure: CAD Software Selection

GUI

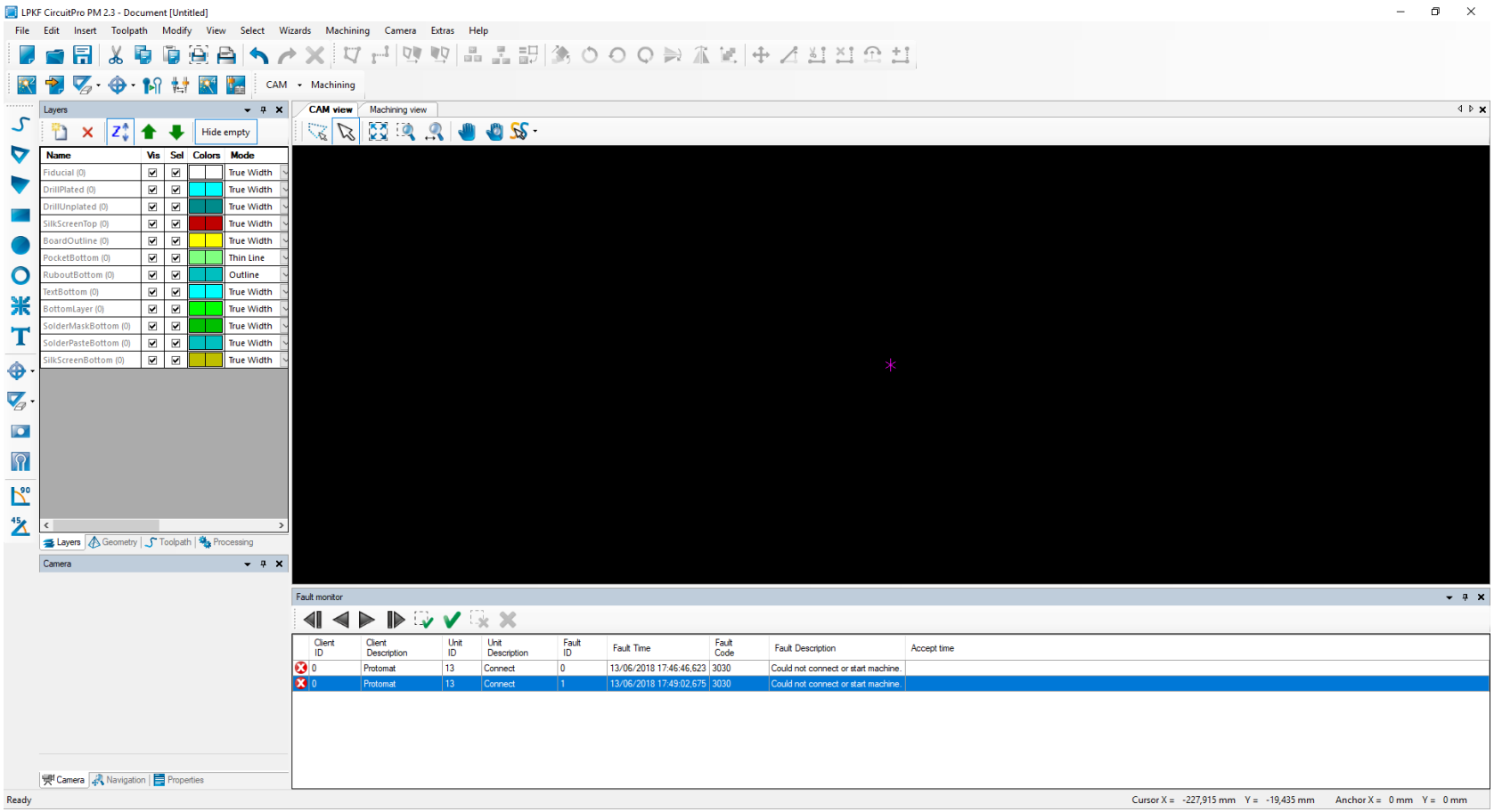


Figure: The CircuitPro Graphic User Interface

Project stages

Once the machine has been configured, most of the PCBs follow the next process:

- Load a template project **(Single Side, Double Side, ...)**
- Import the **Gerber** files
- Create the tool-paths and link the tools
- Board Production

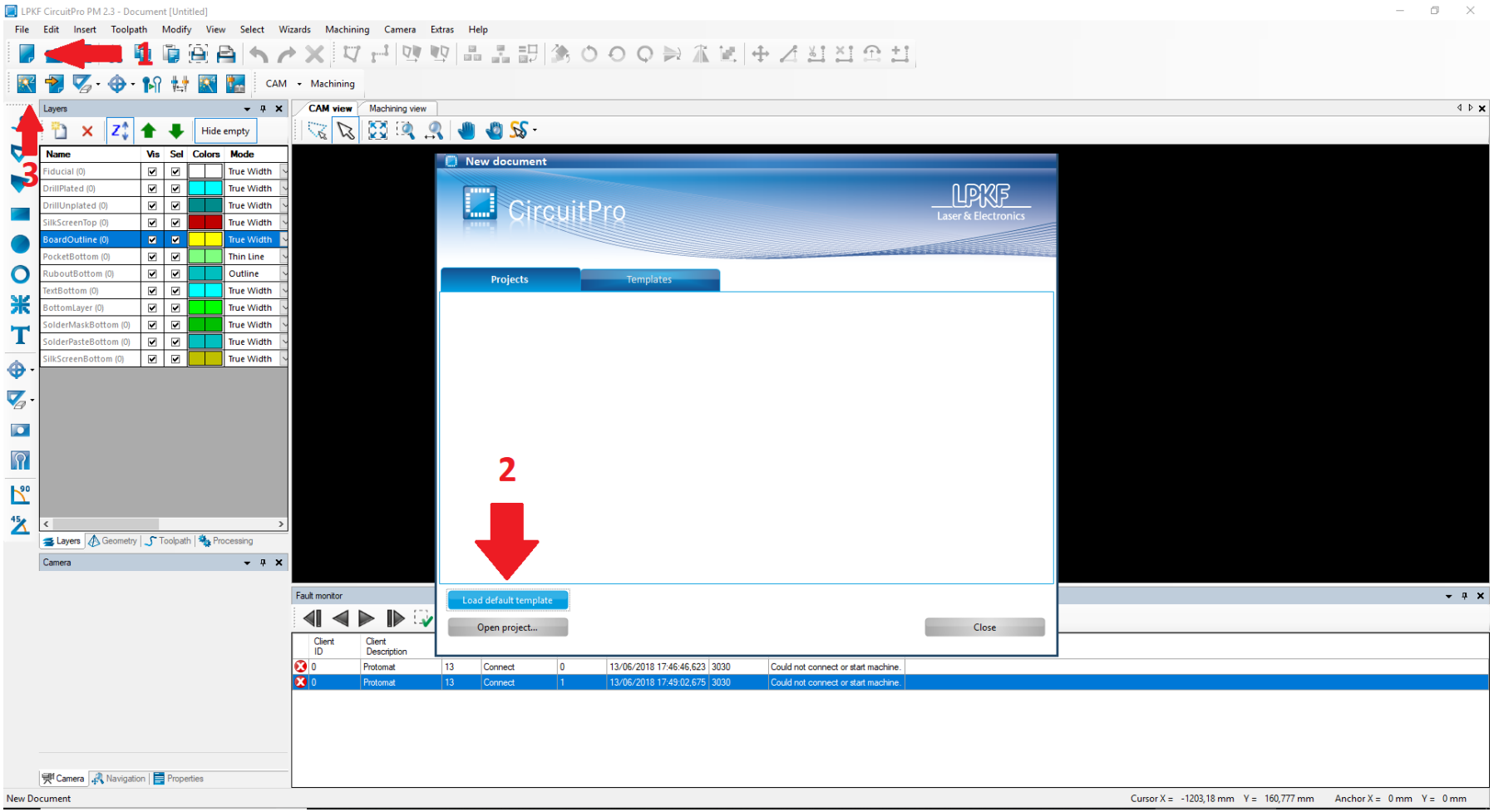


Figure: Load default template

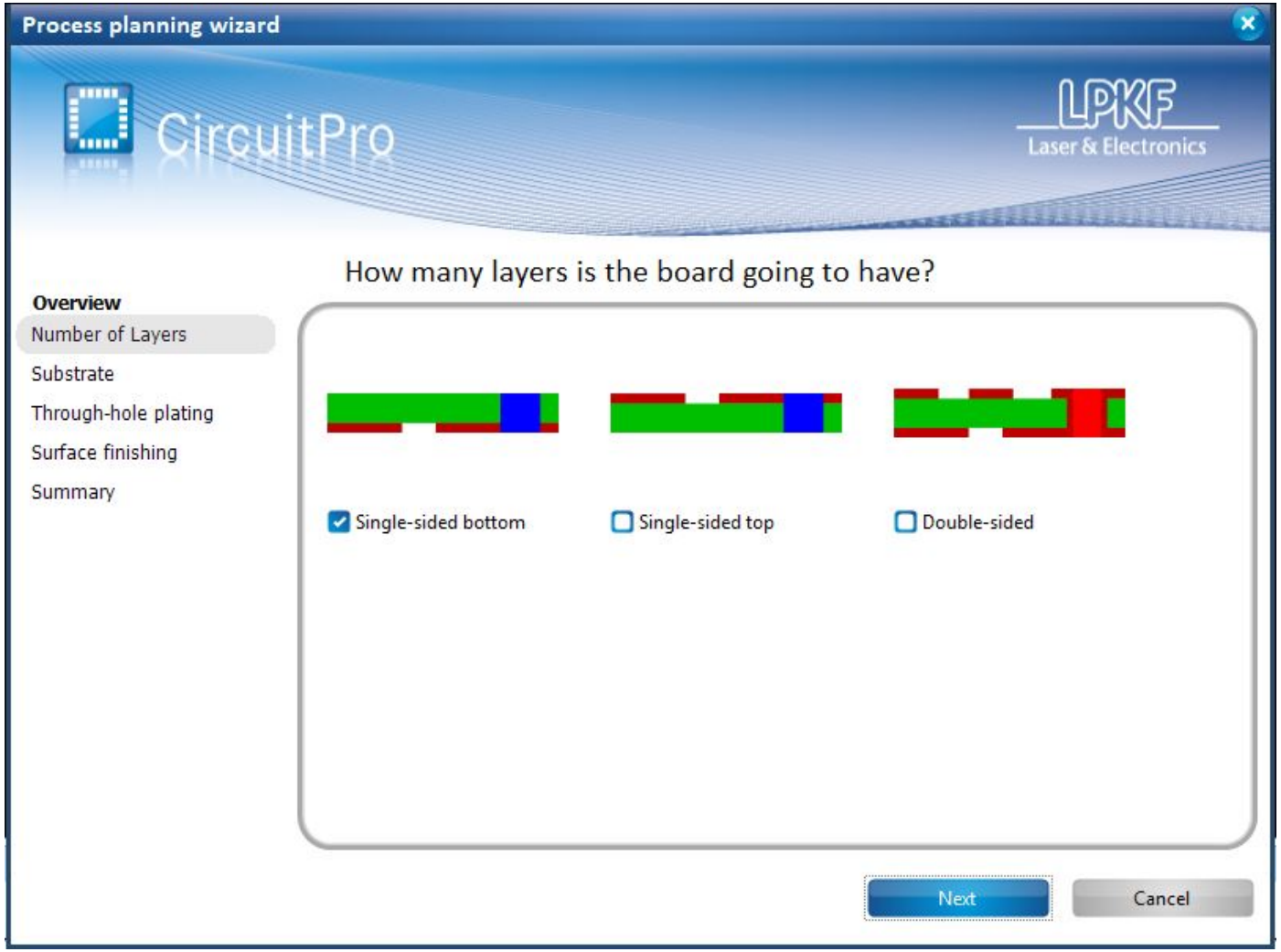


Figure: Layers on board selection

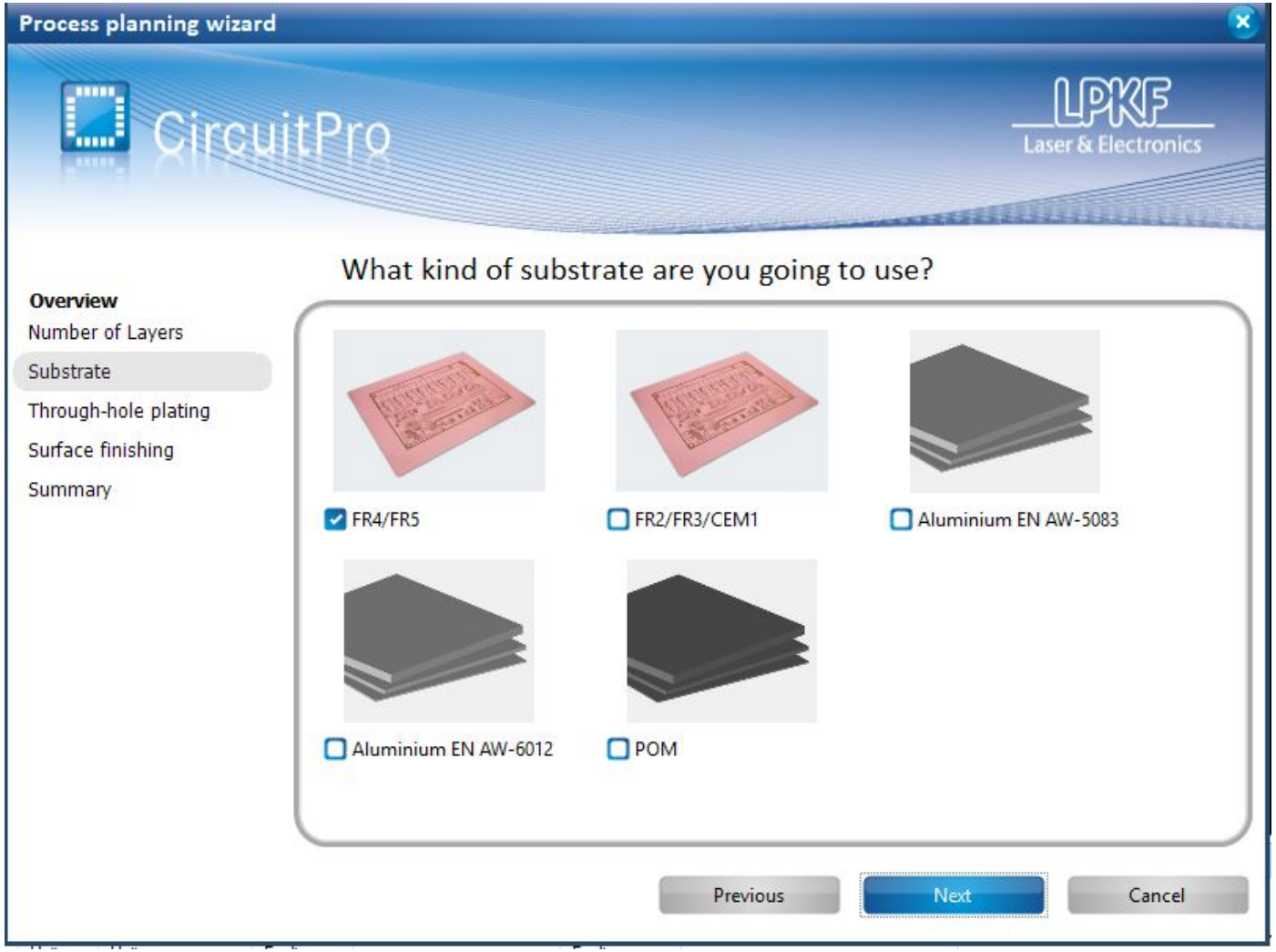


Figure: Material selection

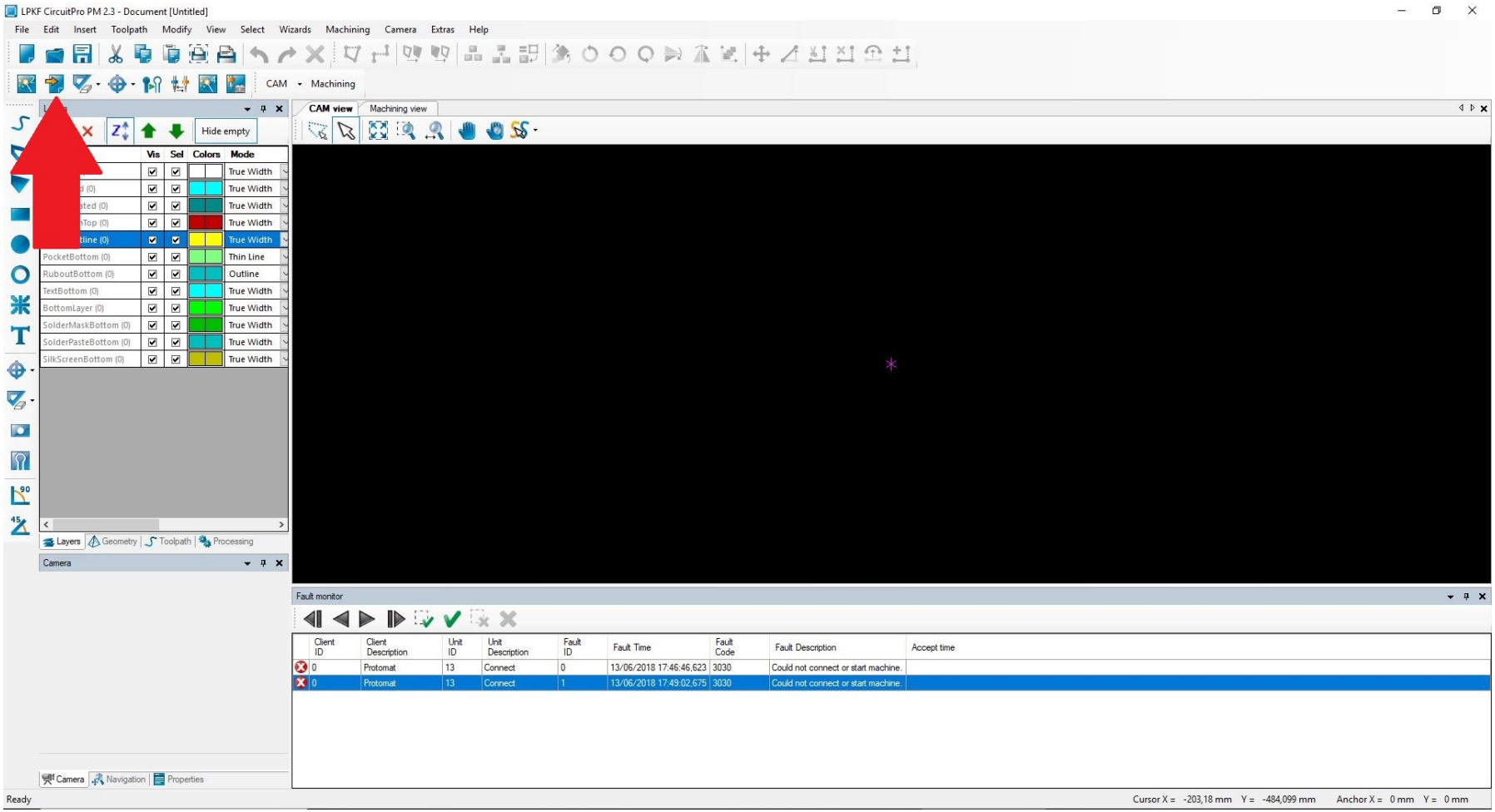


Figure: Layer files importing

Allowed files

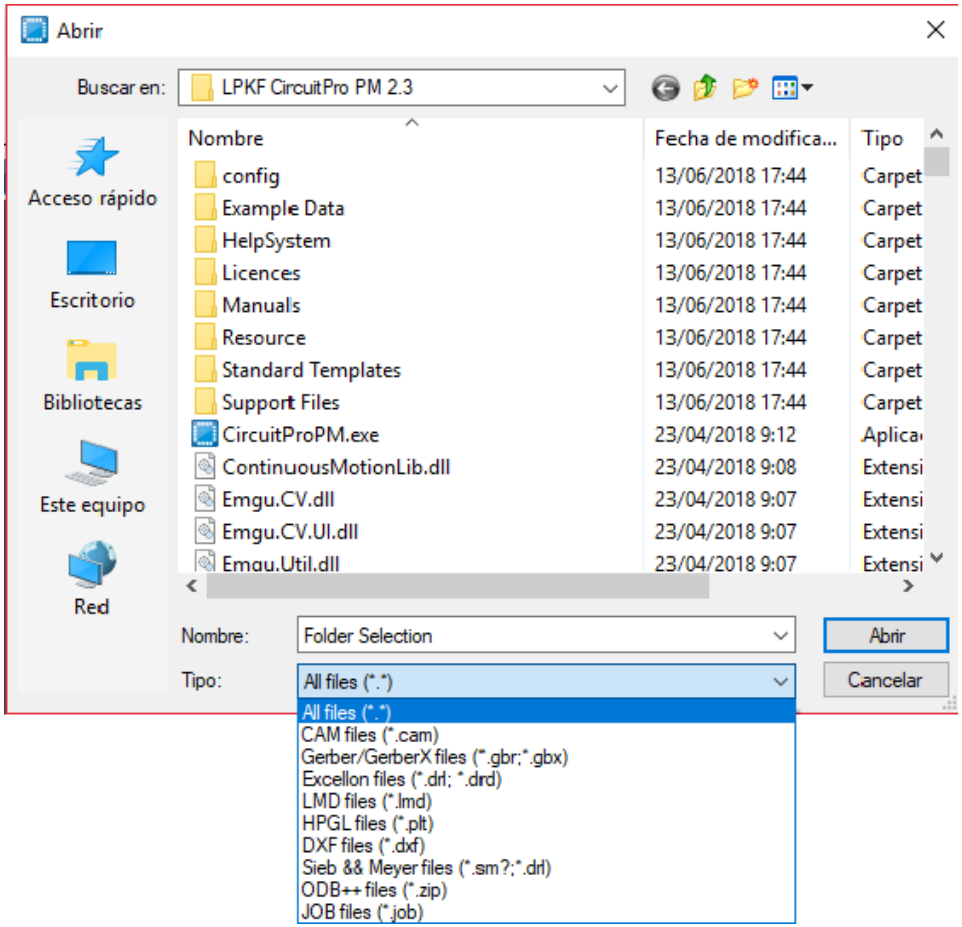


Figure: Supported files

The file extension depends on the CAD software used. For Altium, the layers generated are the KeepOut, Botton Layer and Top Layer, respectively (`*.GKO, *.GBL y *.GTL`).

Botton layer

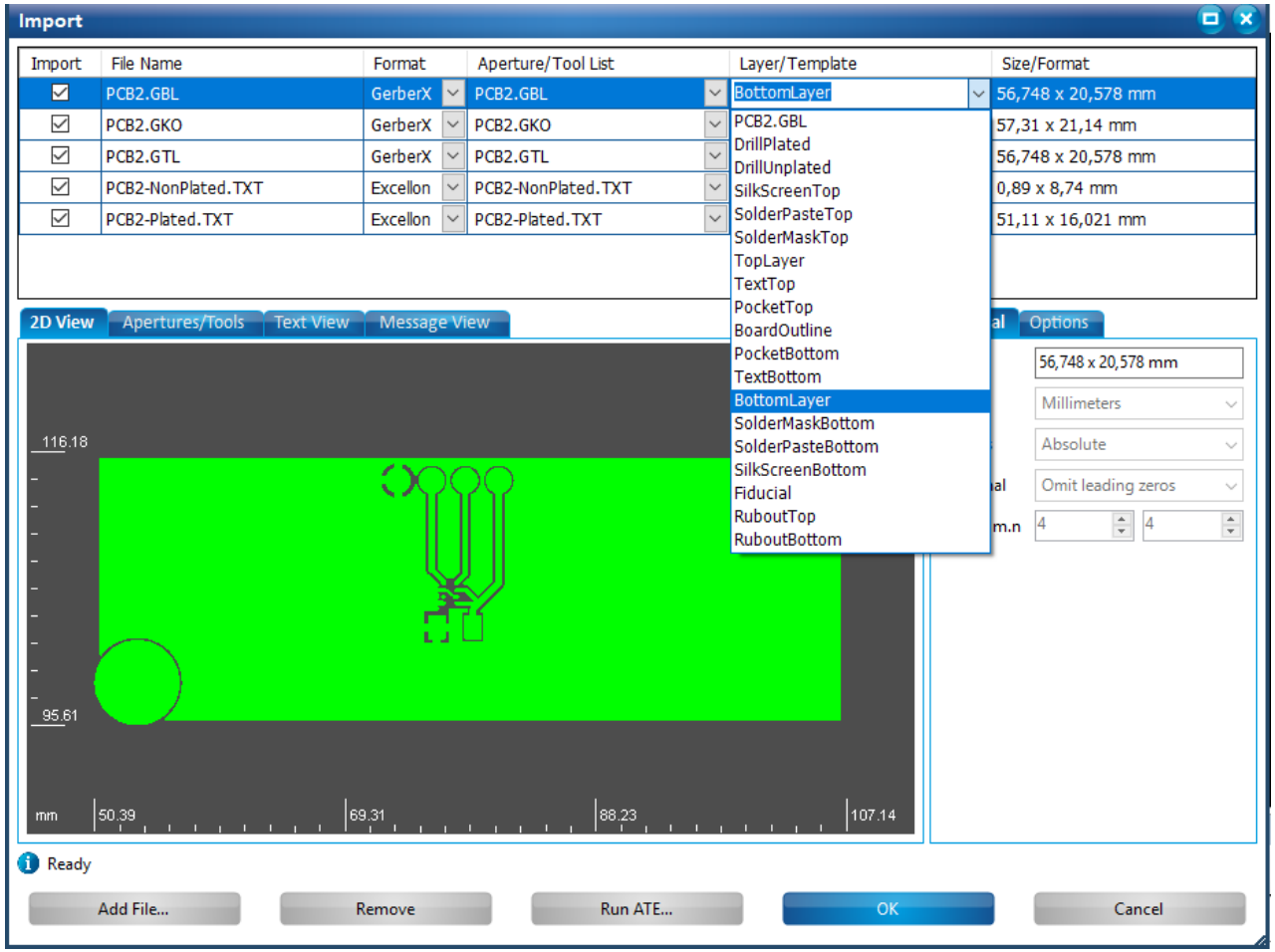


Figure: Botton layer file

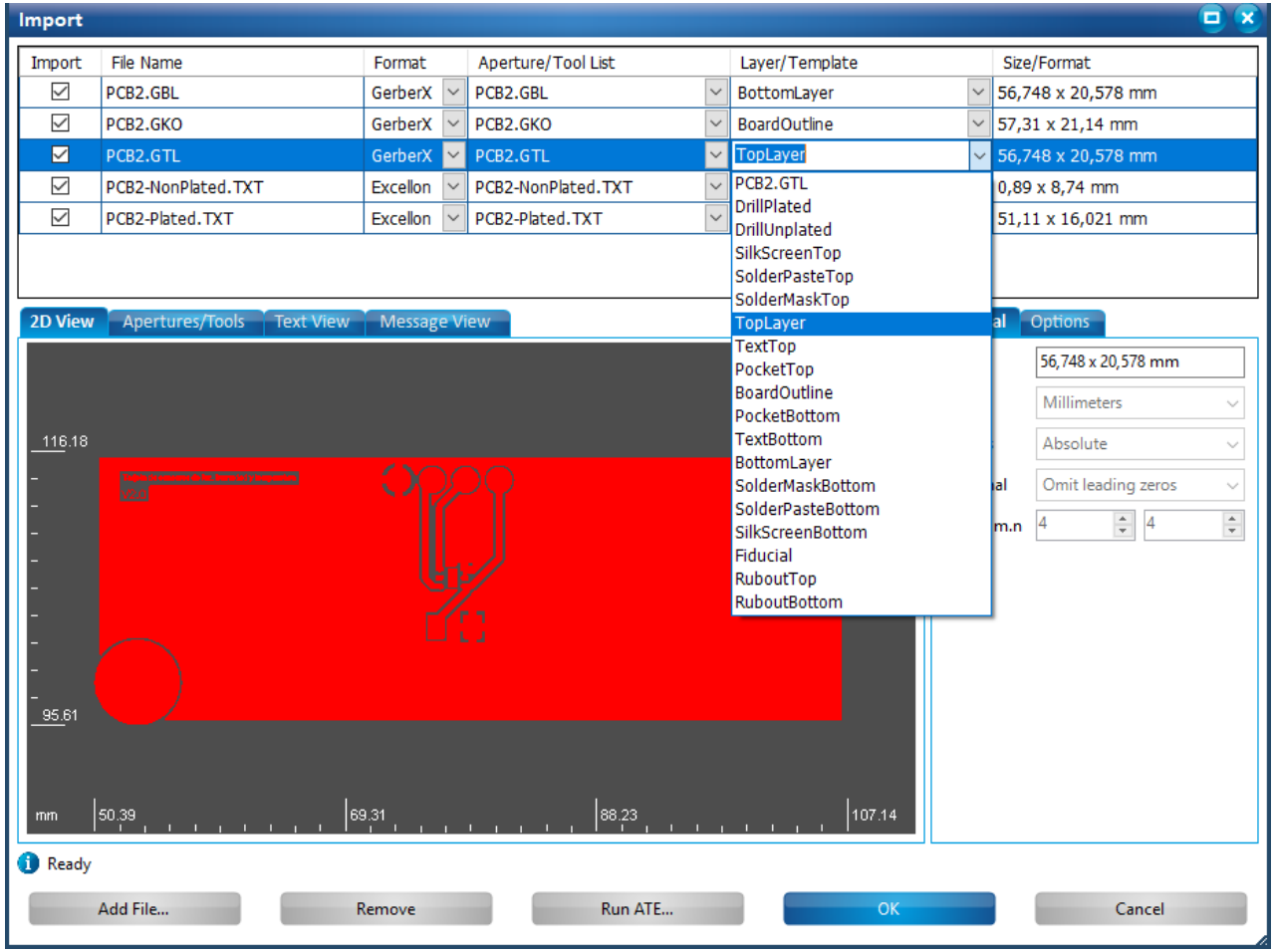


Figure: Top layer file

The Drill Layers

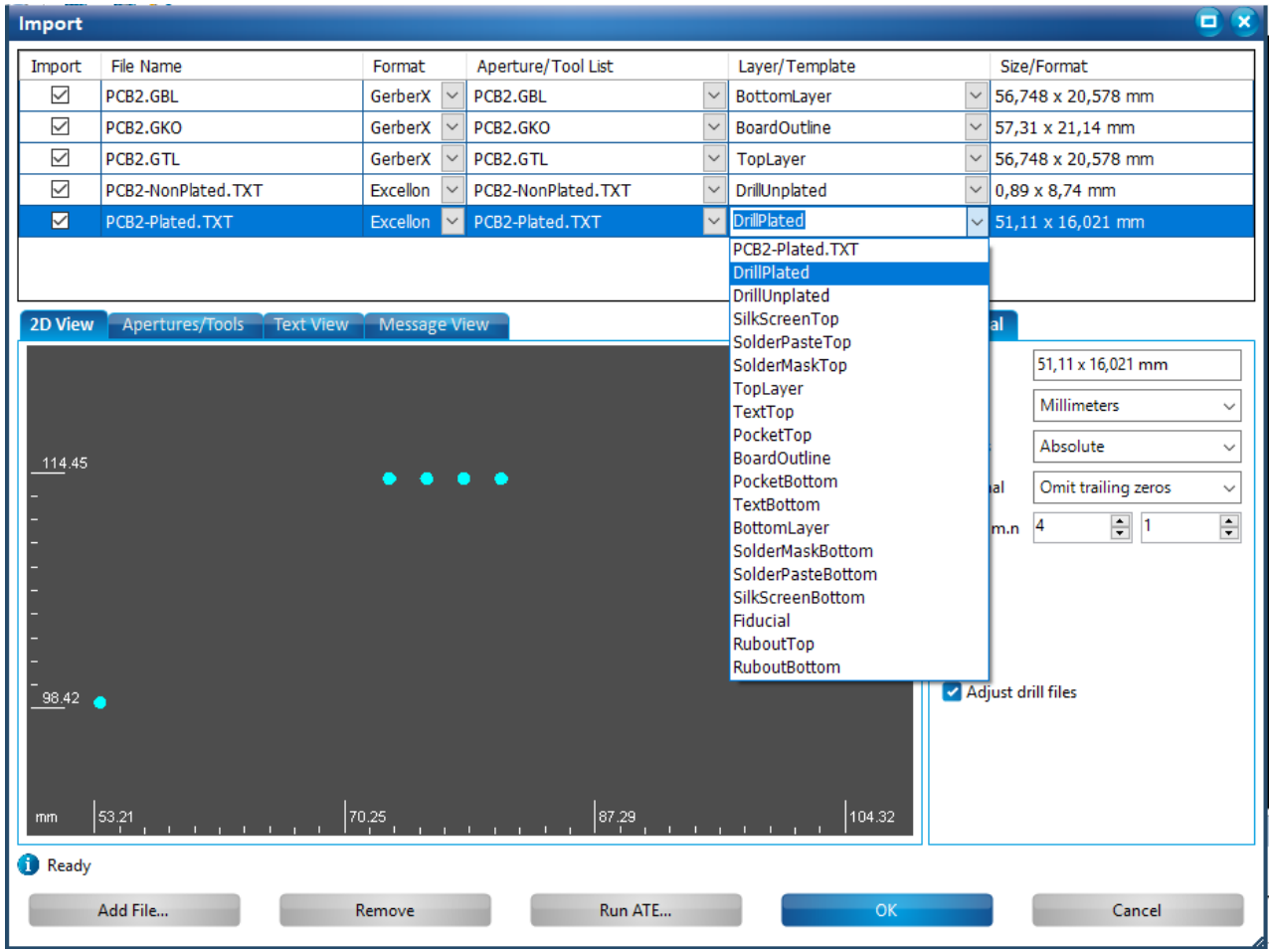
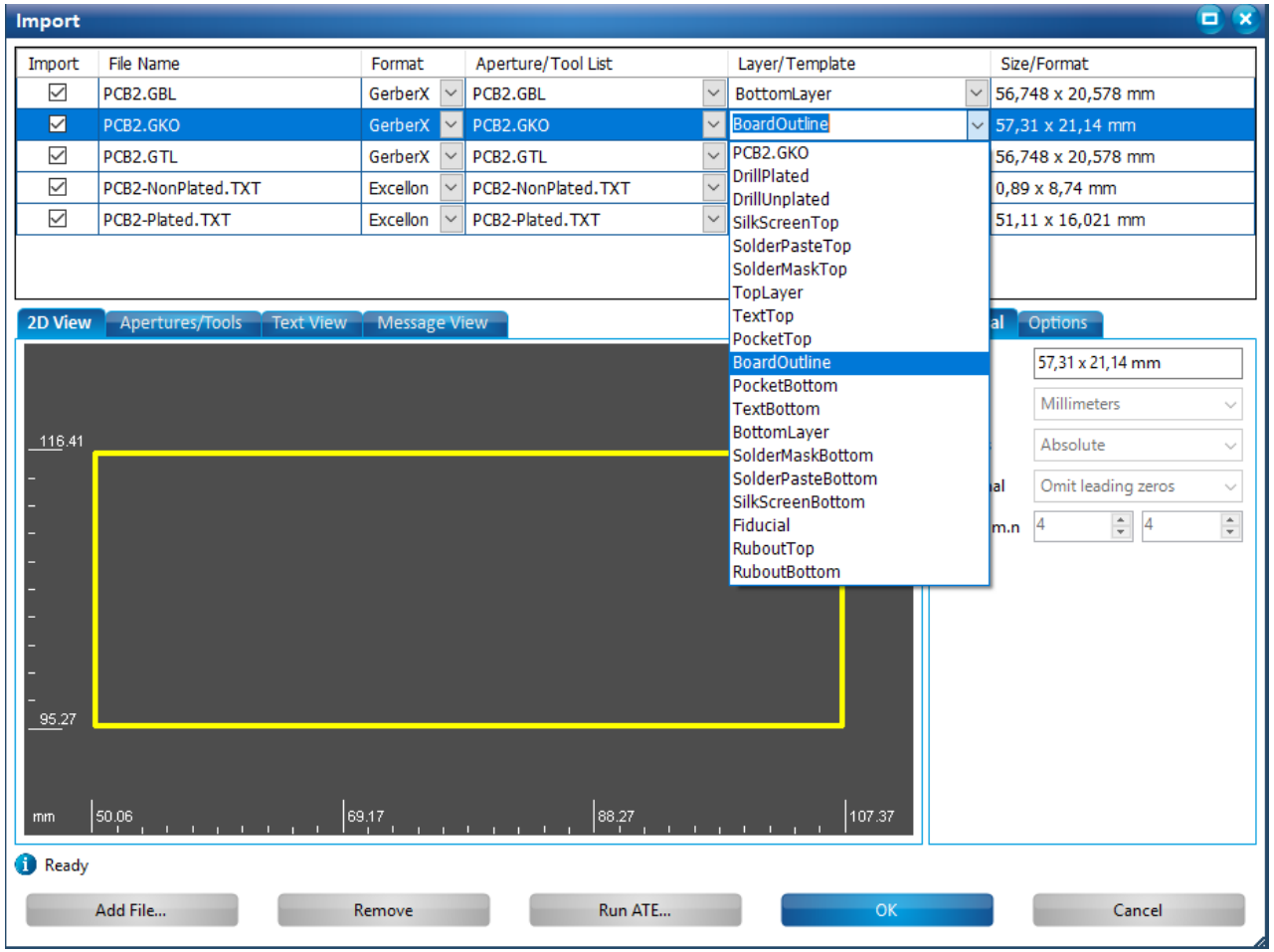
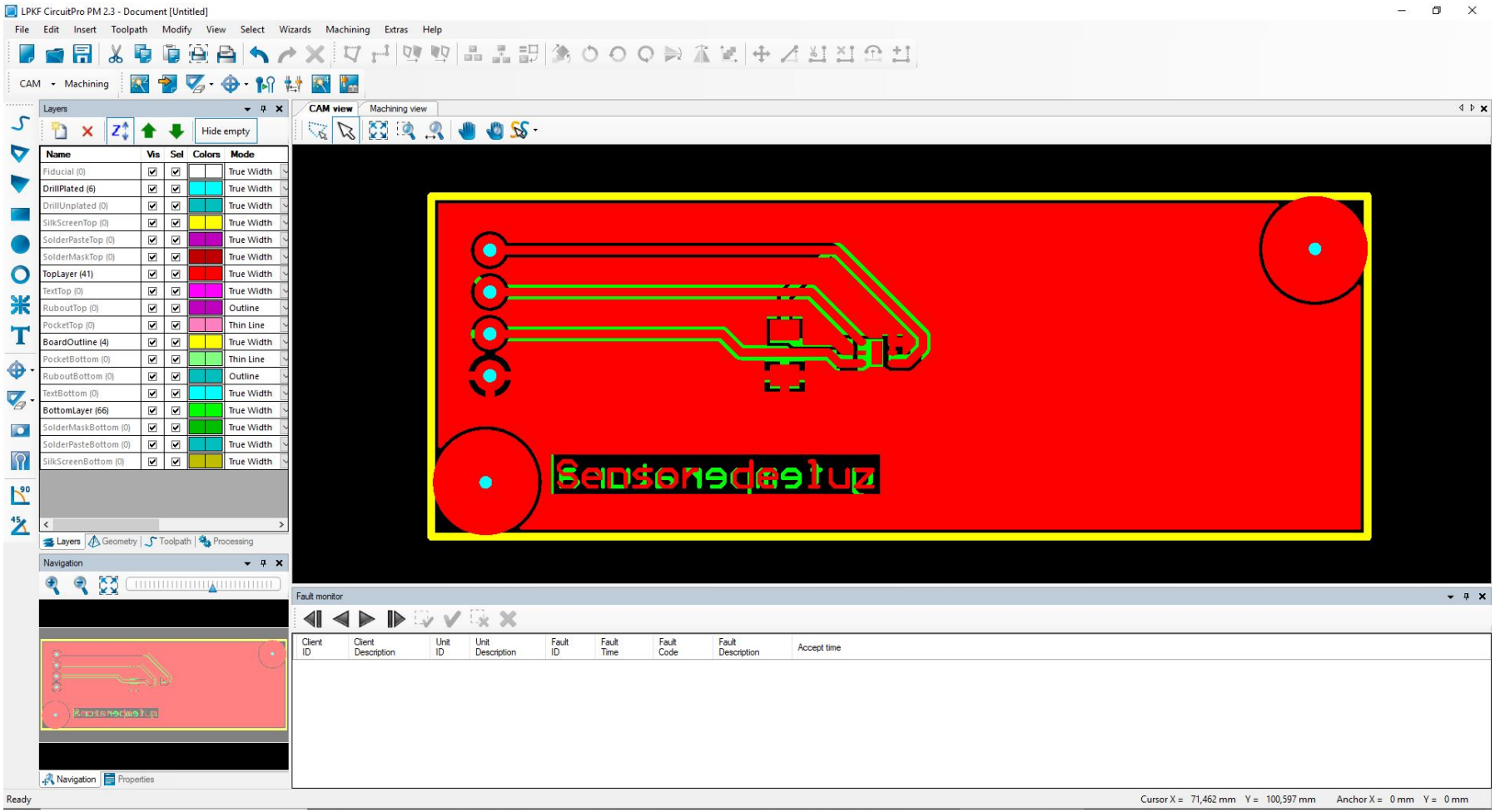


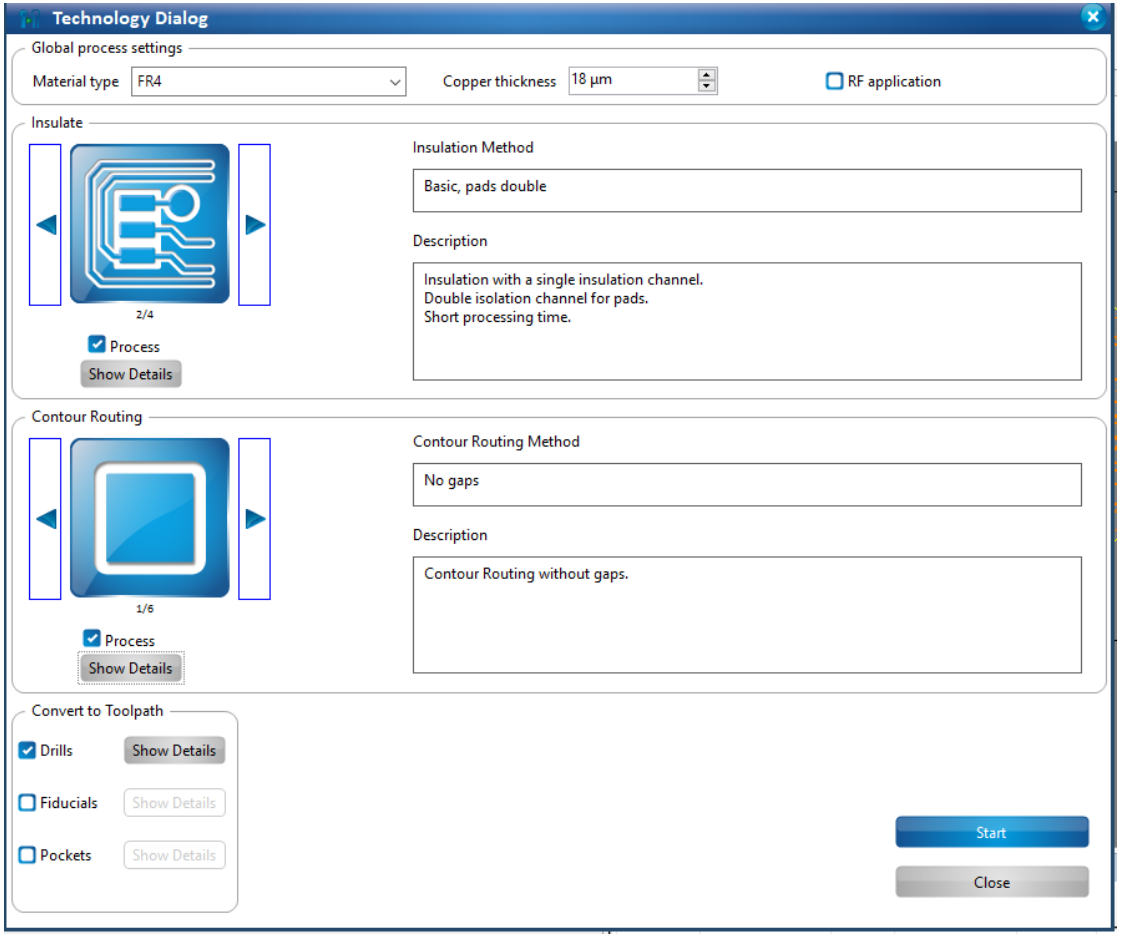
Figure: Drill layer importing

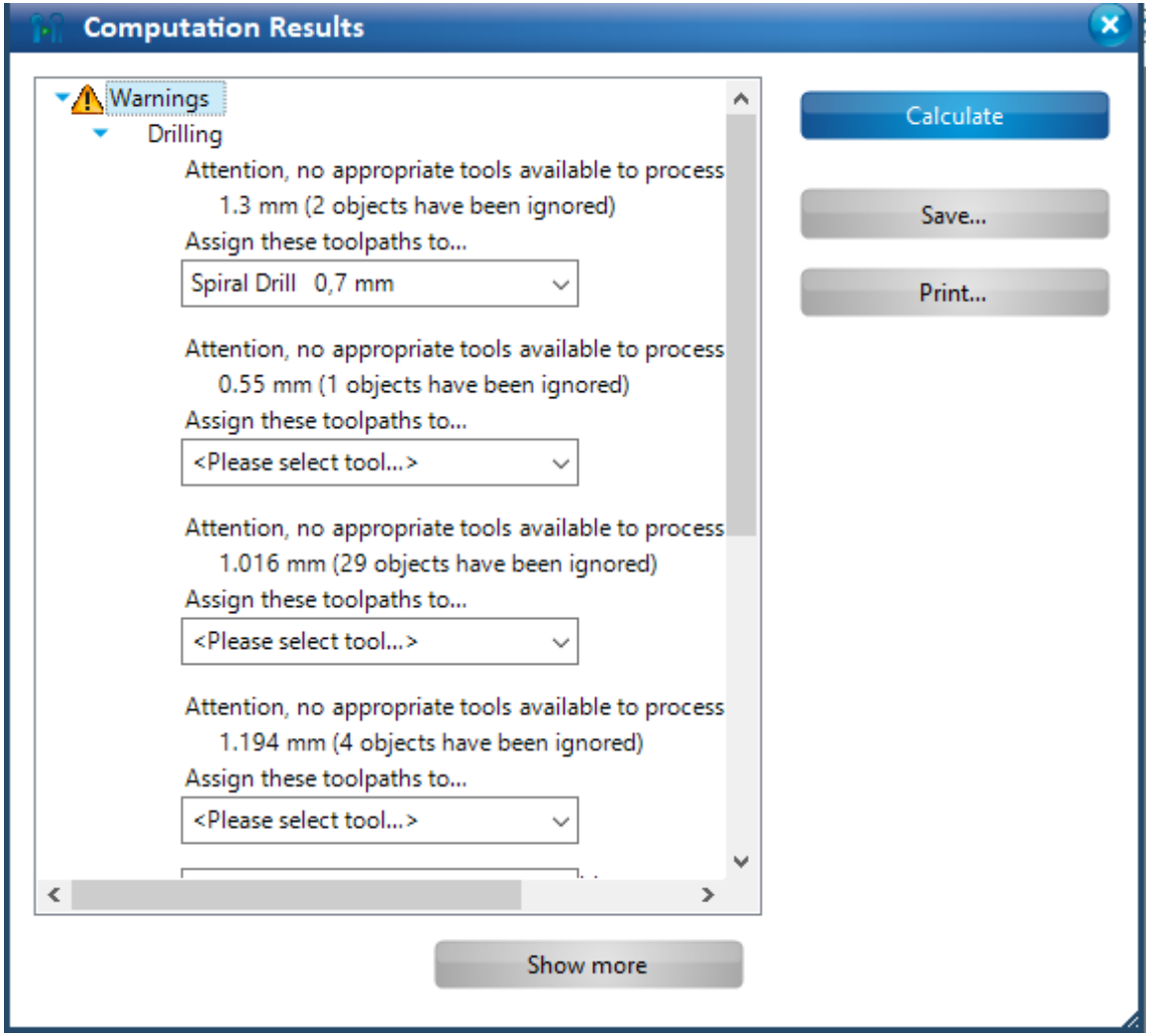
Capas de corte




LPKF CircuitPro PM 2.3 - Document [Untitled]
File Edit Insert Toolpath Modify View Select Wizards Machining Extras Help
CAM Machining
Layers
Hide empty
Name Vis Sel Colors Mode
Fiducial (0) True Width
DrillPlated (6) True Width
DrillUnplated (0) True Width
SilkScreenTop (0) True Width
SolderPasteTop (0) True Width
SolderMaskTop (0) True Width
TopLayer (41) True Width
TextTop (0) True Width
RuboutTop (0) Outline
PocketTop (0) Thin Line
BoardOutline (4) True Width
PocketBottom (0) Thin Line
RuboutBottom (0) Outline
TextBottom (0) True Width
BottomLayer (66) True Width
SolderMaskBottom (0) True Width
SolderPasteBottom (0) True Width
SilkScreenBottom (0) True Width
Layers Geometry Toolpath Processing
Navigation
Navigation Properties
CAM view Machining view
Fault monitor
Client ID Client Description Unit ID Unit Description Fault ID Fault Time Fault Code Fault Description Accept time
Ready
Cursor X = 71,462 mm Y = 100,597 mm Anchor X = 0 mm Y = 0 mm

Global Process Settings




Computation Results
Warnings
Drilling
Attention, no appropriate tools available to process
1.3 mm (2 objects have been ignored)
Assign these toolpaths to...
Spiral Drill 0,7 mm
Attention, no appropriate tools available to process
0.55 mm (1 objects have been ignored)
Assign these toolpaths to...
<Please select tool...>
Attention, no appropriate tools available to process
1.016 mm (29 objects have been ignored)
Assign these toolpaths to...
<Please select tool...>
Attention, no appropriate tools available to process
1.194 mm (4 objects have been ignored)
Assign these toolpaths to...
<Please select tool...>
Calculate
Save...
Print...
Show more

Until this point, every parameter on the PCB design was configured. Thus, the next step is to prepare the board production with the board production wizard from CircuitPro. This will guide through the production process and its necessary steps.

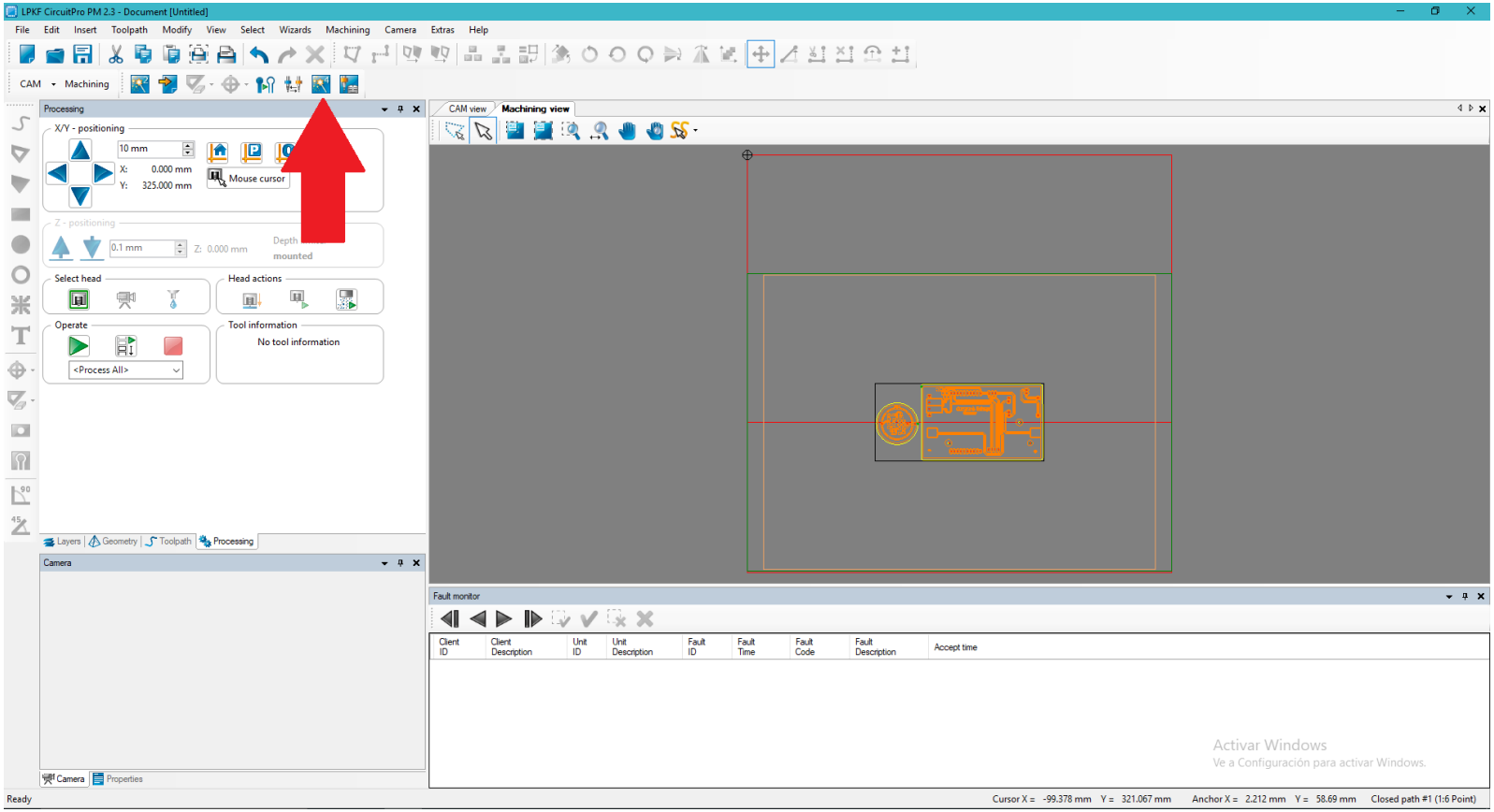
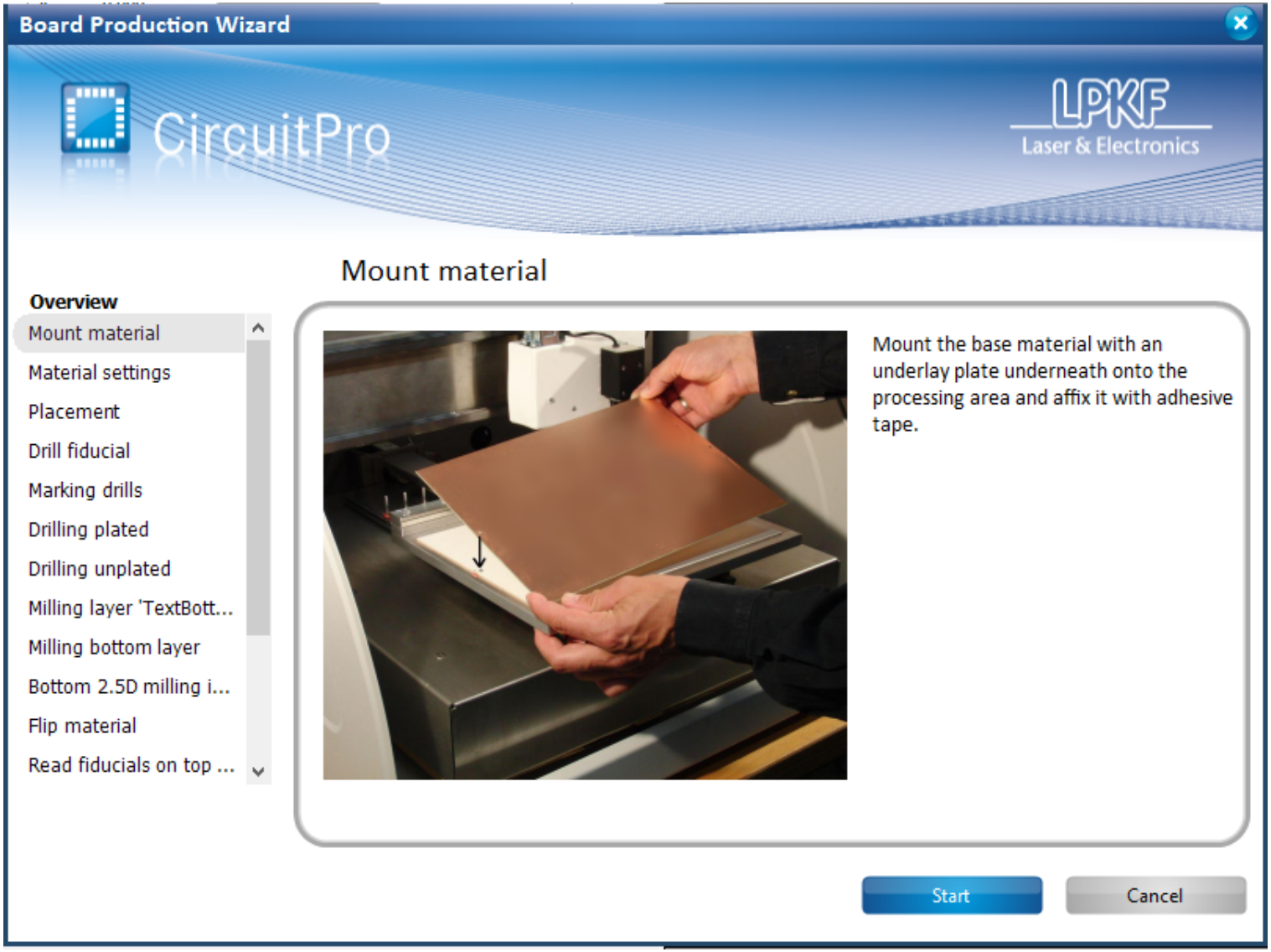
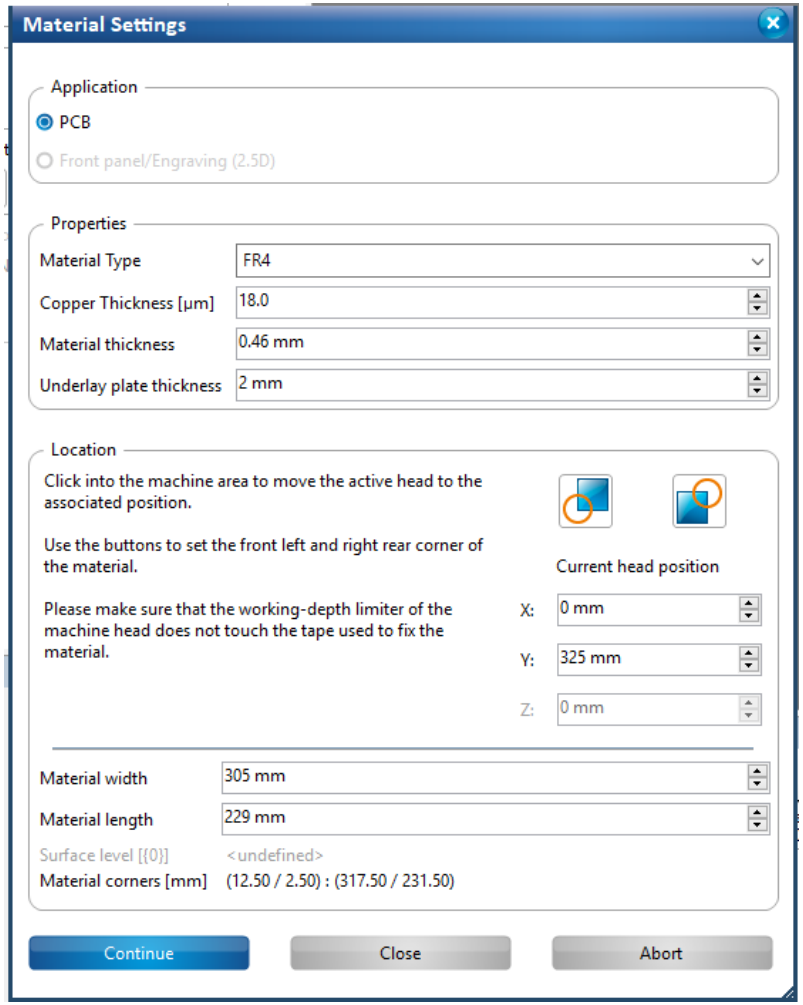
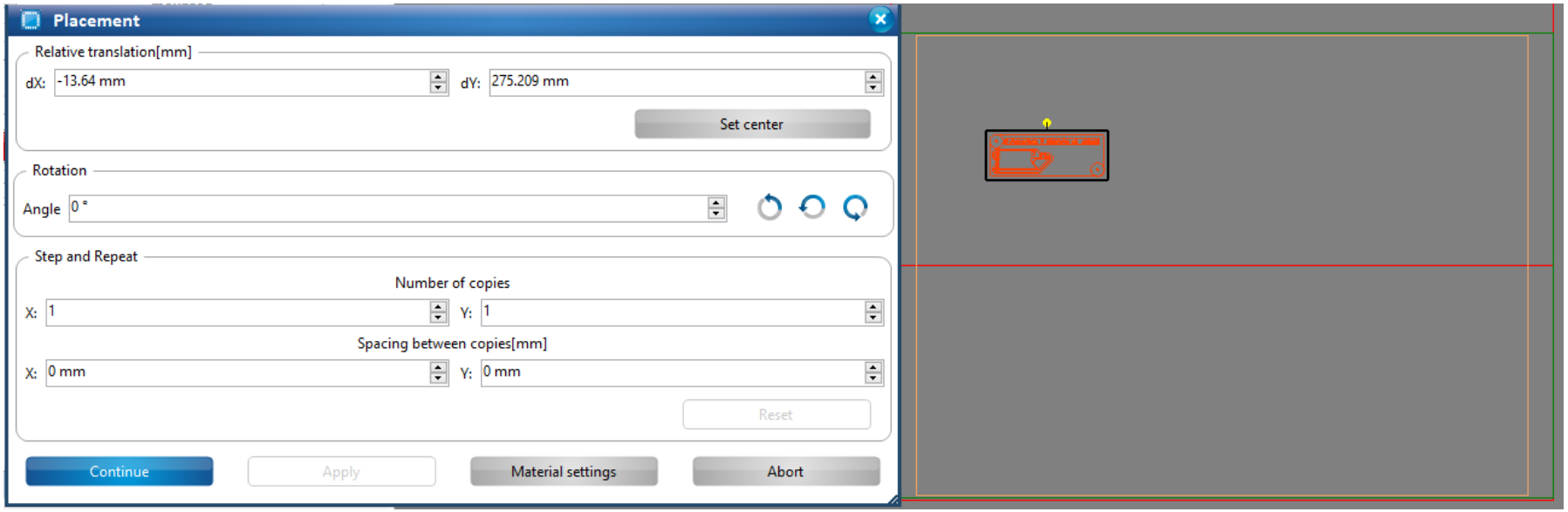


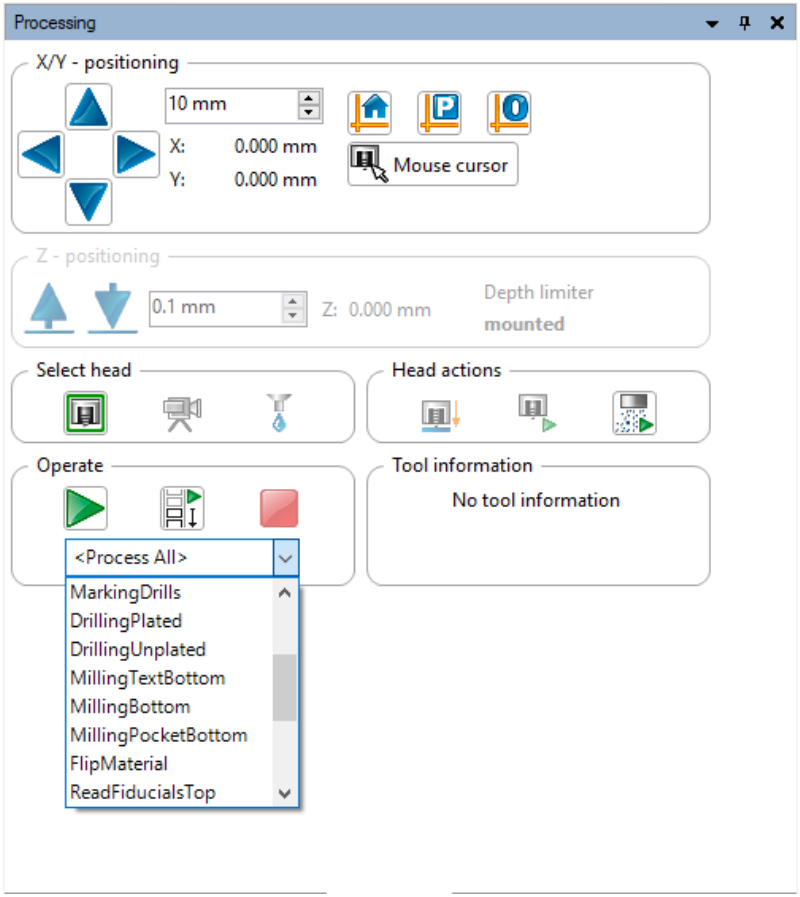
Figure: Board Production Wizard


Board Production Wizard
CircuitPro
LPKF
Laser & Electronics
Mount material
Overview
Mount material
Material settings
Placement
Drill fiducial
Marking drills
Drilling plated
Drilling unplated
Milling layer 'TextBott...
Milling bottom layer
Bottom 2.5D milling i...
Flip material
Read fiducials on top ...
Mount the base material with an underlay plate underneath onto the processing area and affix it with adhesive tape.
Start
Cancel


Material Settings
Application
PCB
Front panel/Engraving (2.5D)
Properties
Material Type
FR4
Copper Thickness [µm]
18.0
Material thickness
0.46 mm
Underlay plate thickness
2 mm
Location
Click into the machine area to move the active head to the associated position.
Use the buttons to set the front left and right rear corner of the material.
Please make sure that the working-depth limiter of the machine head does not touch the tape used to fix the material.
Current head position
X:
0 mm
Y:
325 mm
Z:
0 mm
Material width
305 mm
Material length
229 mm
Surface level [{0}]
<undefined>
Material corners [mm]
(12.50 / 2.50) : (317.50 / 231.50)
Continue
Close
Abort


Placement
Relative translation[mm]
dX: -13.64 mm
dY: 275.209 mm
Set center
Rotation
Angle 0 °
Step and Repeat
Number of copies
X: 1
Y: 1
Spacing between copies[mm]
X: 0 mm
Y: 0 mm
Reset
Continue
Apply
Material settings
Abort


Tool Exchange
Please remove the loaded tool and insert the following tool: Universal Cutter 0,2 mm
Click OK to continue without milling width adjustment.
Click Milling Width to adjust the milling width before milling.
Click Cancel to abort the production process.
OK
Milling Width
Cancel


Processing
X/Y - positioning
10 mm
X: 0.000 mm
Y: 0.000 mm
Mouse cursor
Z - positioning
0.1 mm
Z: 0.000 mm
Depth limiter
mounted
Select head
Head actions
Operate
Tool information
No tool information
<Process All>
MarkingDrills
DrillingPlated
DrillingUnplated
MillingTextBottom
MillingBottom
MillingPocketBottom
FlipMaterial
ReadFiducialsTop