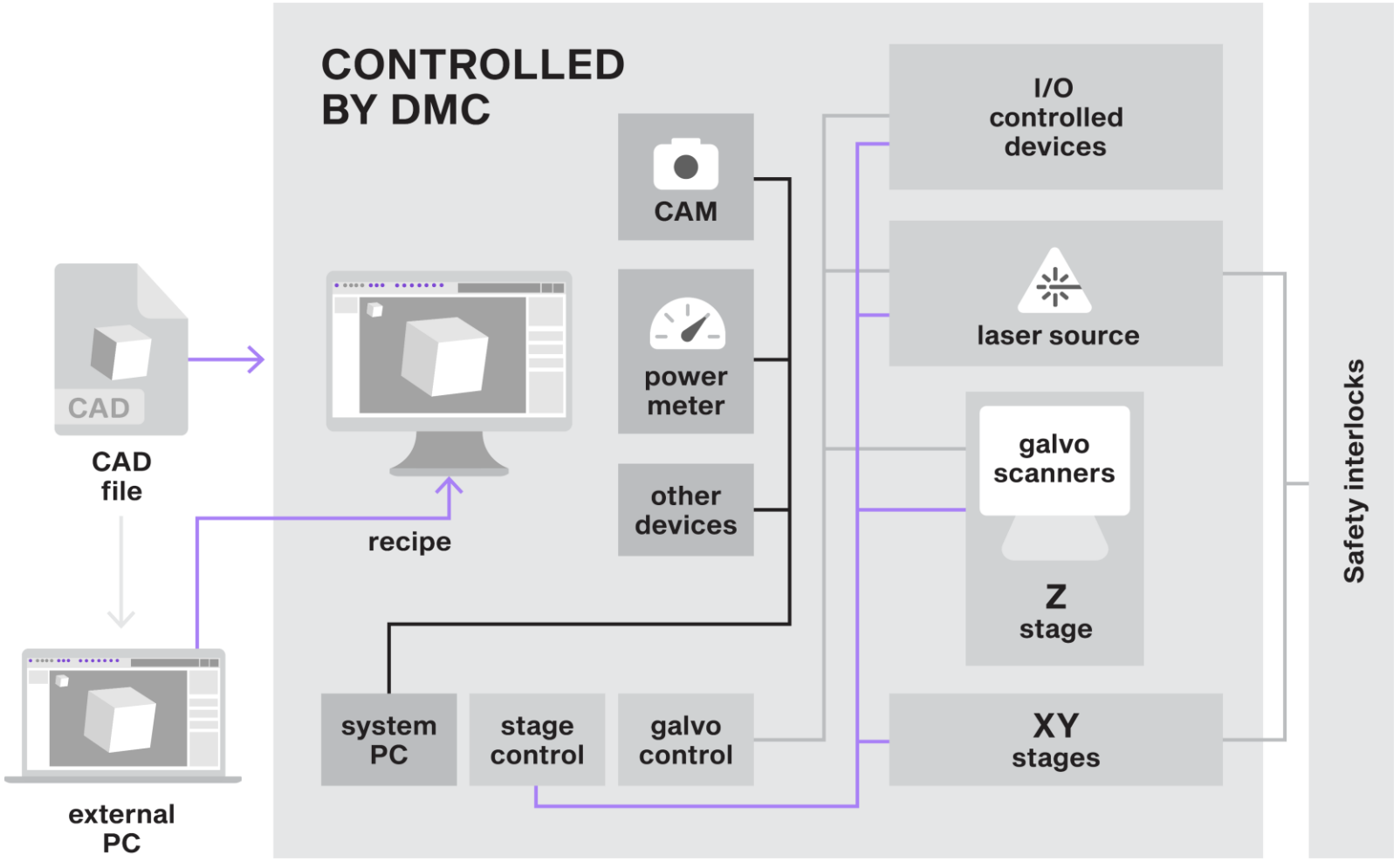
DMC Direct Machining Control

Software for Laser machines

directmachining.com

What is DMC?

DMC



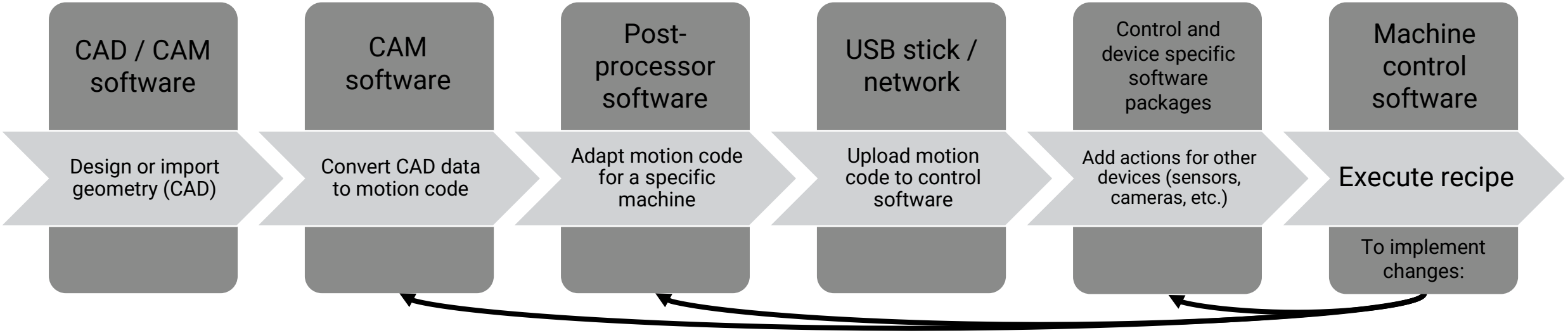
DMC software controls complete laser machine, including:

- Stages
- Scanners
- Laser sources
- Cameras
- Sensors
- Etc.

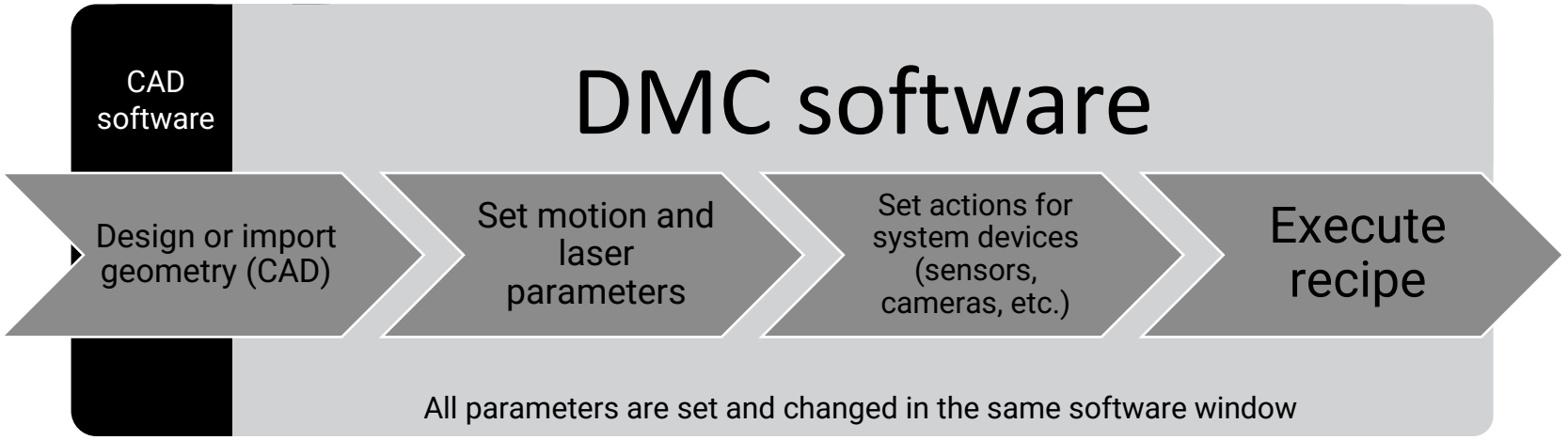
Which allows us to do:

- Alignment
- Calibration
- Stage + Scanner
- Automation

Traditional Workflow



Workflow With DMC



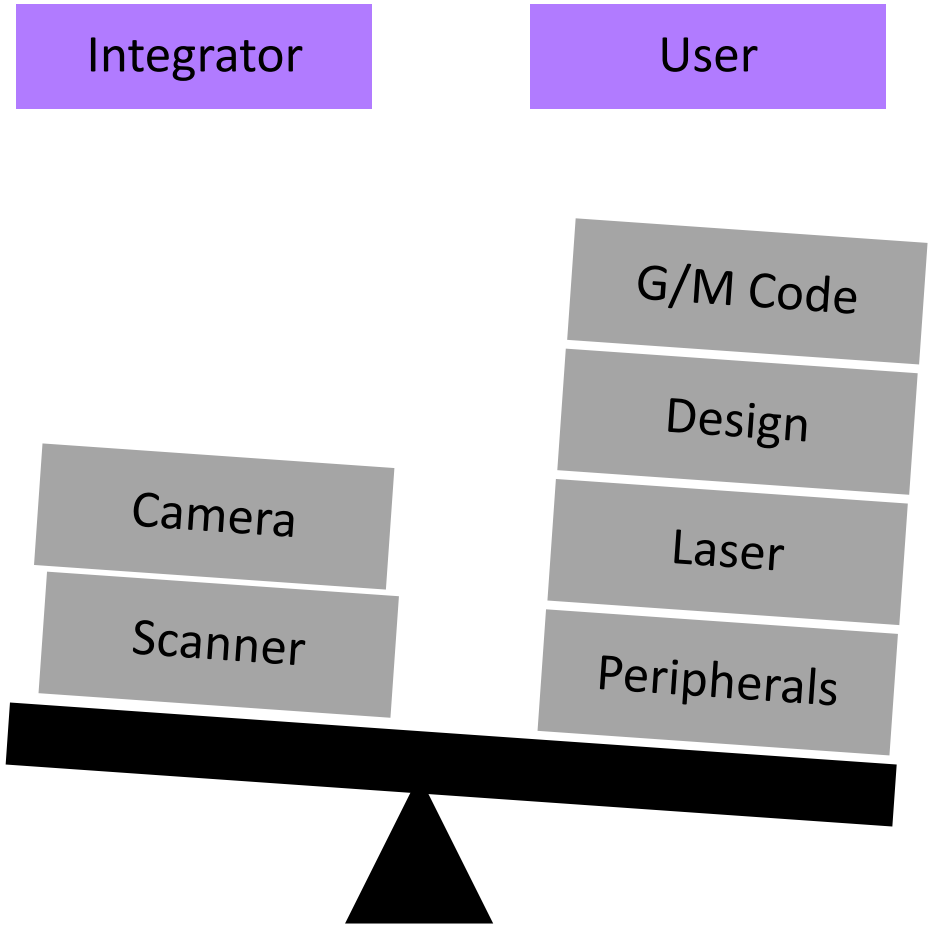
- Shorter preparation time
- Visual representation of recipe (What You See Is What You Get)
- Control of additional devices
- Easy to make changes
- No G/M code skills needed

Why choose DMC?

DMC

The tradeoff for the machine builder is either to spend a lot of time developing the custom solution that handles all aspects of the machine or burden the user with machine control.

DMC removes this tradeoff between time spent on the development and time spent using the machine by taking care of machine and process control part.



This results in:

- Reduced time to market
- Increased functionality
- Better usability
- One-Fits-All solution

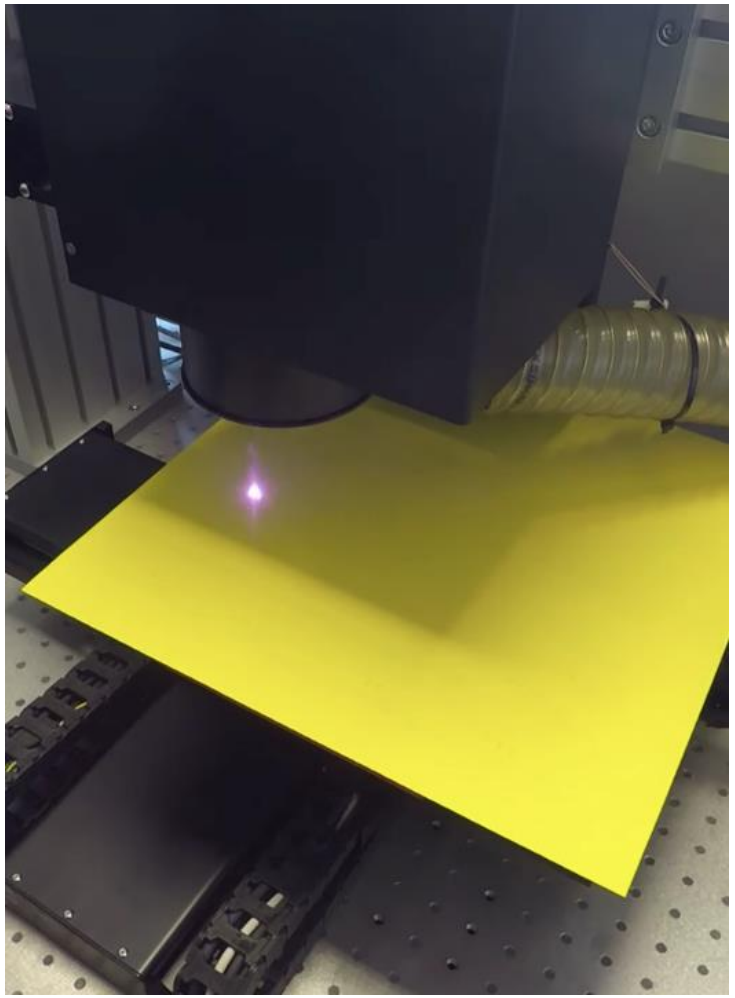
Our Unique Proposition

DMC

Laser application Comes first!

We always focus on the implementation of the laser application and everything else follows it.

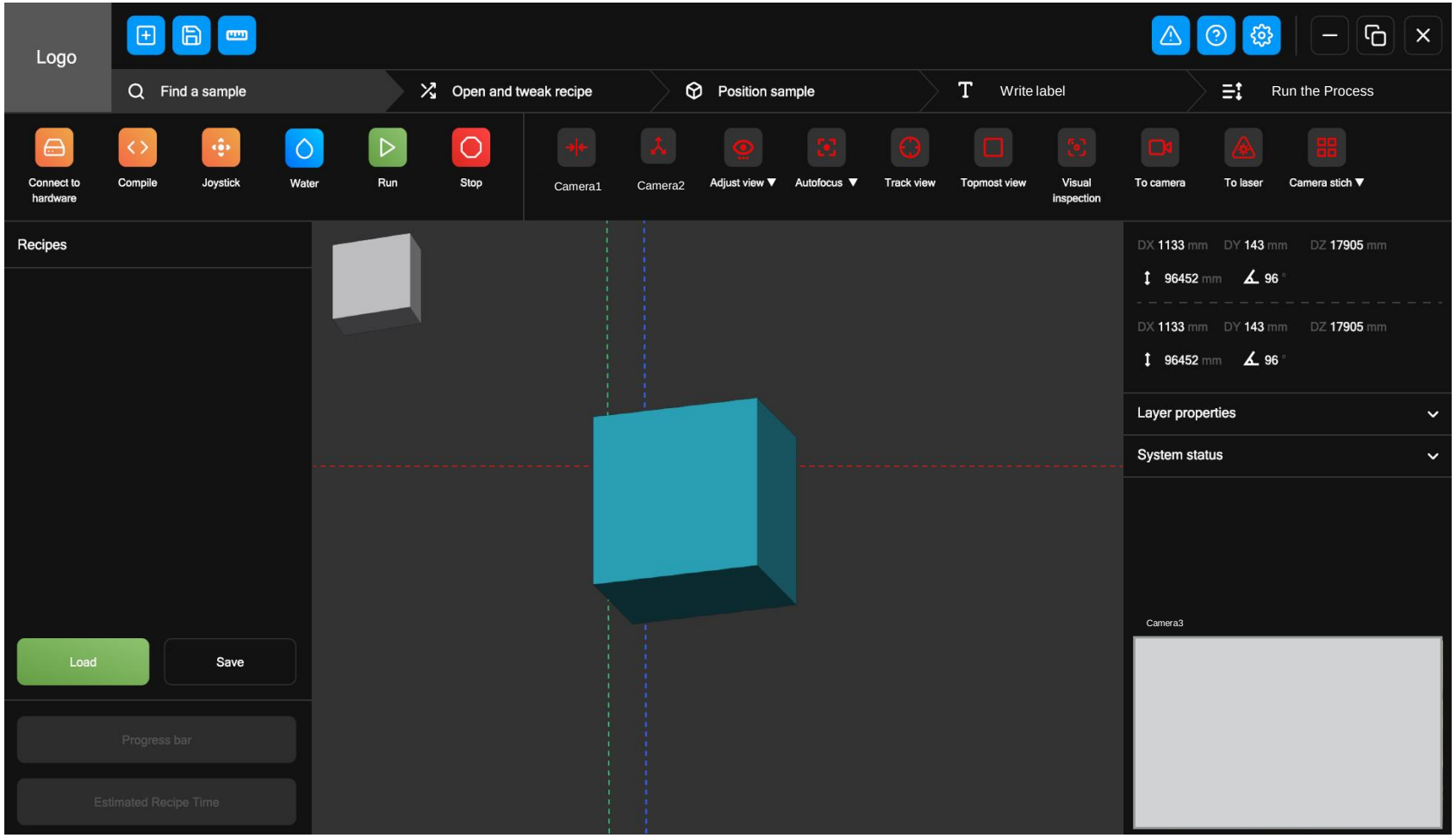
- Control of all the system
- Flexibility in hardware configuration
- Flexibility in process implementation
- Customization for the process and the machine



Customization Possibilities

Task optimized APP with DMC in the background

- Full DMC is perfect for application and process development
- After the development is done, a custom HMI can be created for intuitive use
- Application specific features
- Automation of the processes
- New hardware implementation
- Interfaces for external software
- Simple updates with DMC in the background



DMC Direct Machining Control

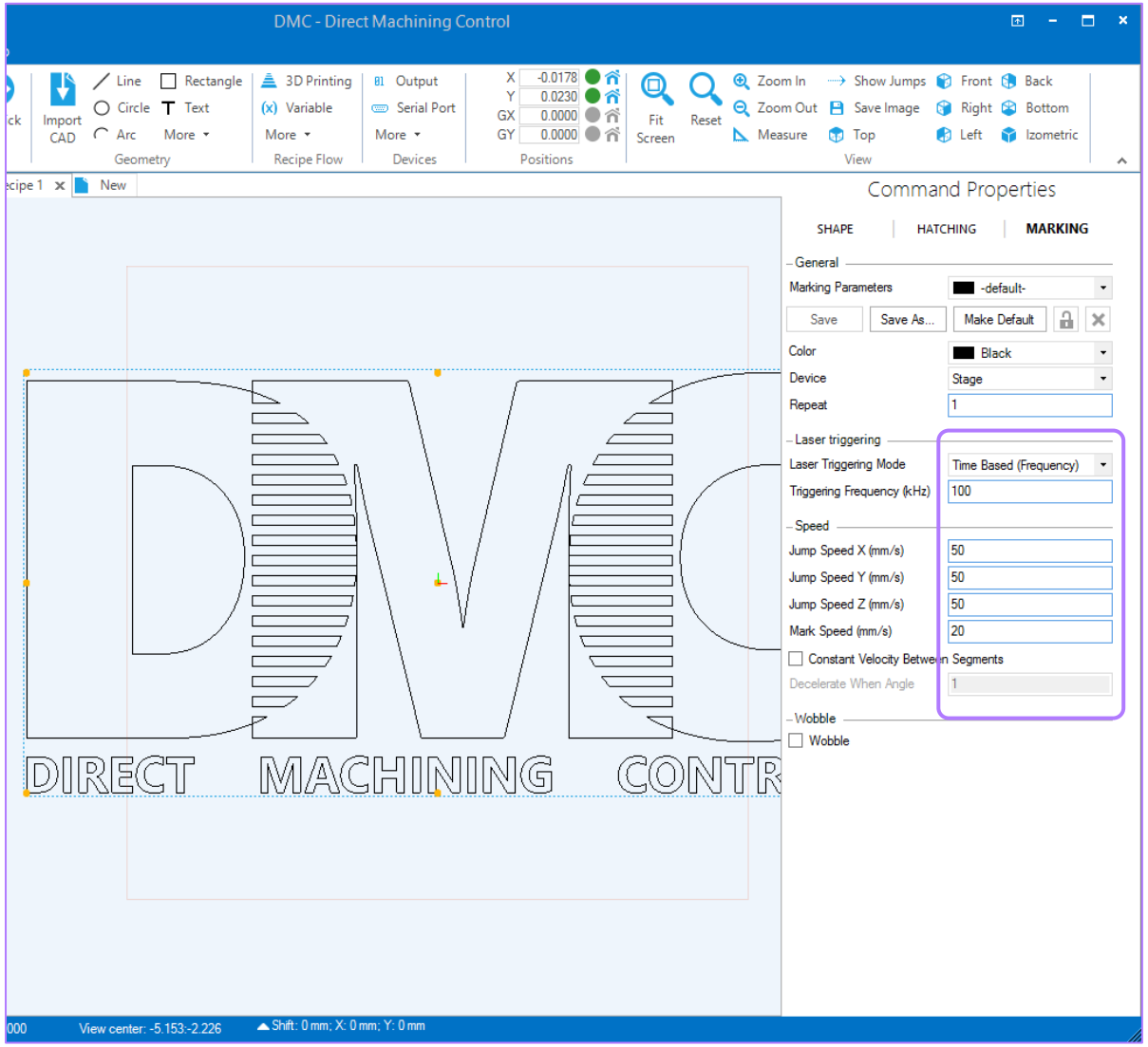
FEATURES

youtube.com/c/DirectMachiningControl

Stage Control

Motion path can be imported as CAD file (DXF, DWG, STL, STP, Gerber) or created by the user in DMC.

- DMC combines code generation and internal libraries of the stage controller to get the best result for specific actions.
- Each object in the recipe can have its own set of motion and laser triggering parameters.

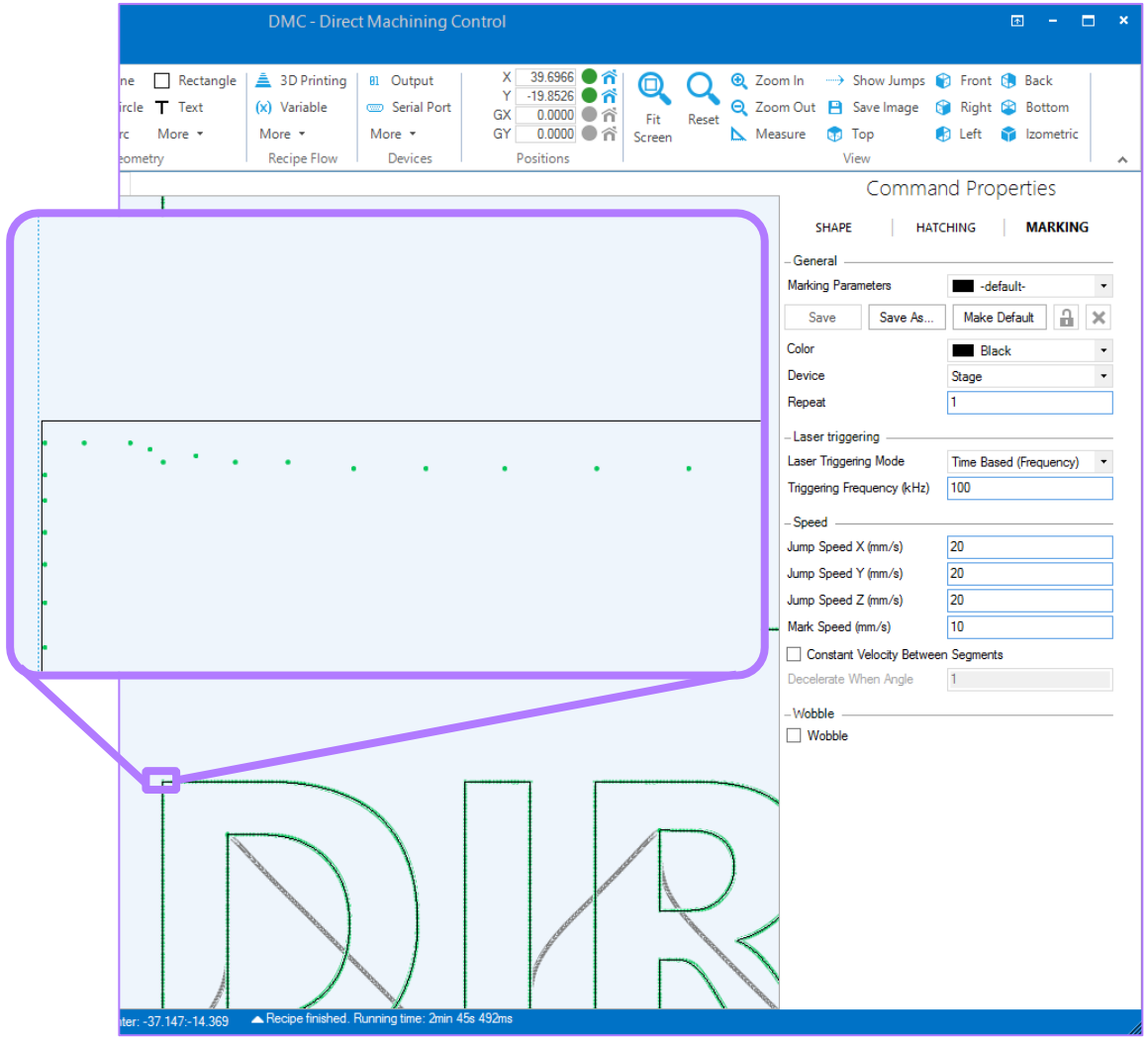


Position Monitoring

DMC

DMC can monitor stage encoder feedback to determine precise position every ms.

- This can be used to see how actual motion path corresponds to a designed motion path.
- Based on this data user can determine whether speed, acceleration or jerk should be reduced. Or whether there is still some margin left for faster motion.

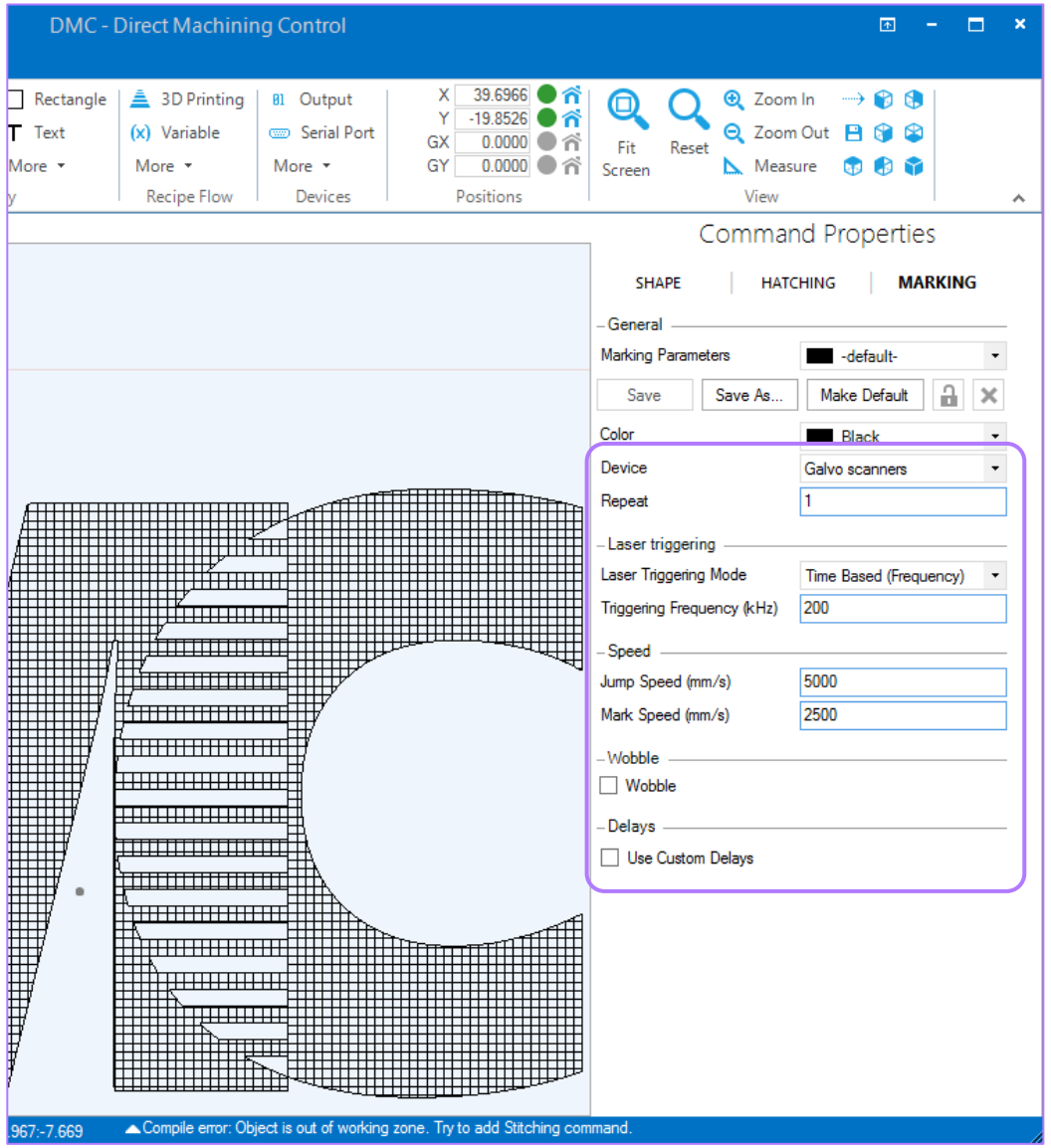


Galvo scanner control

DMC

DMC can also control galvo scanners, beam shaping units or SLMs.

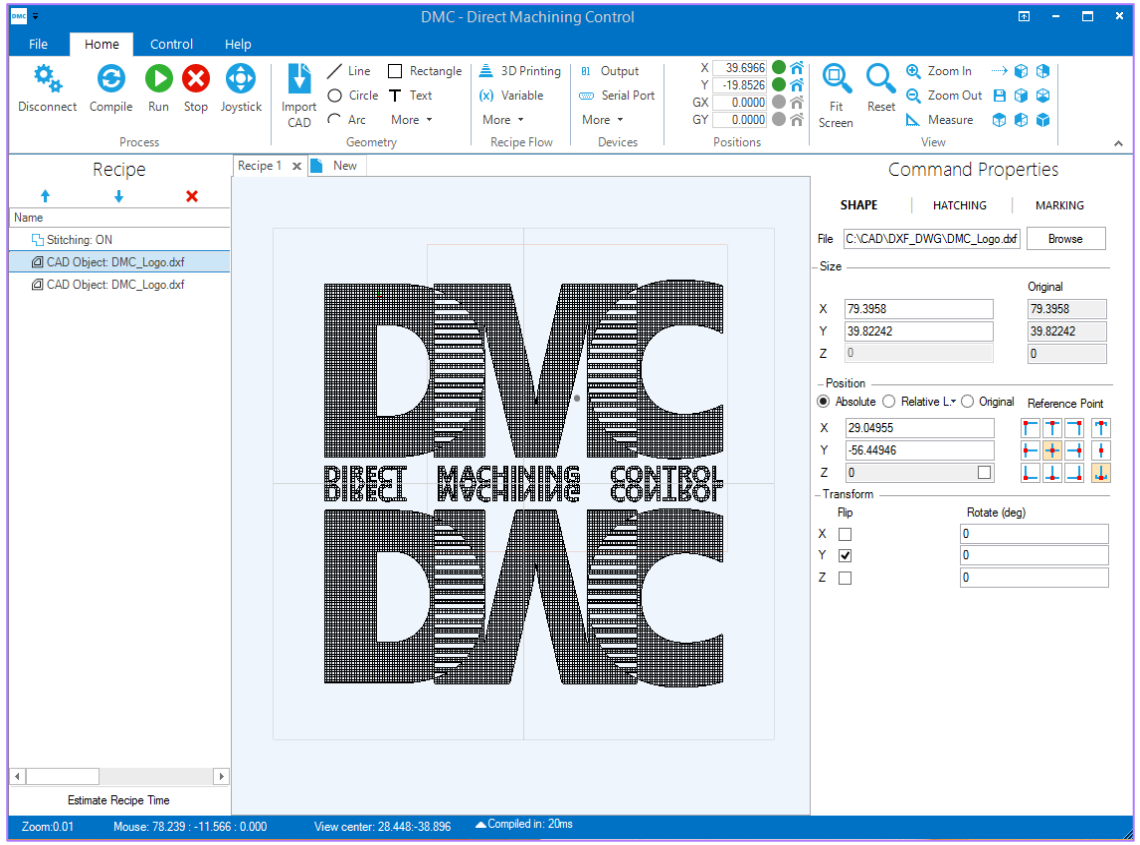
- Depending on galvo scanner controller it can be 2, 3 or 5 axes scanning.
- Galvo scanner can be calibrated using DMC special tools to build correction file for specific F-Theta lens.



Galvo + Stages

Automatic field of view extension moves stages to a position for galvo scanner to perform the motion.

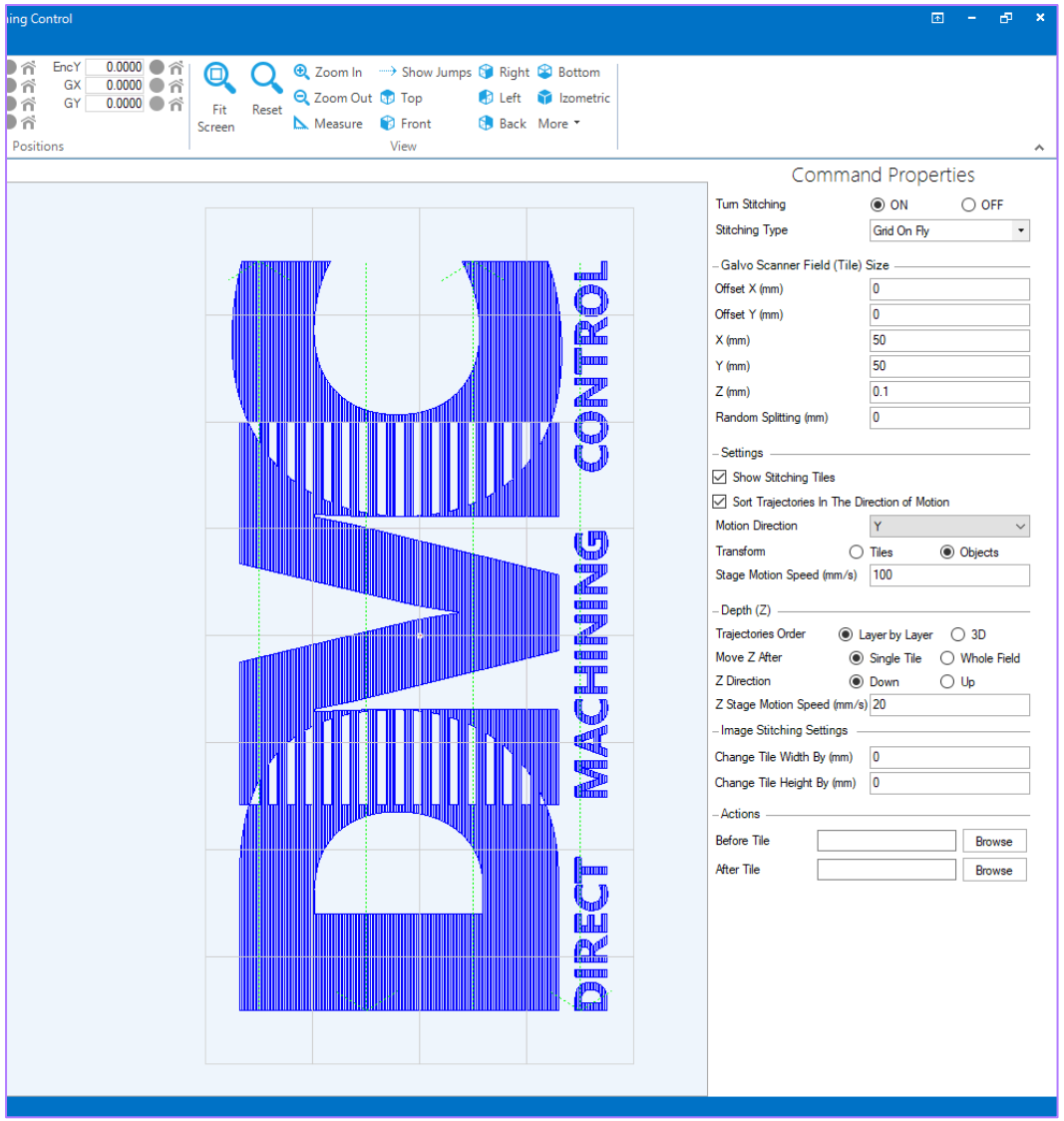
- Large objects can be split to tiles to machine with galvo scanners using stitching function.
- Stitching can also center each object in the center of galvo scanner field of view, i.e., in via drilling.
- DMC also supports infinite field technologies (IFOV & XLScan).



Adaptive Mark on Fly

Mark on Fly optimizes the procesing of big objects that can use stitching.

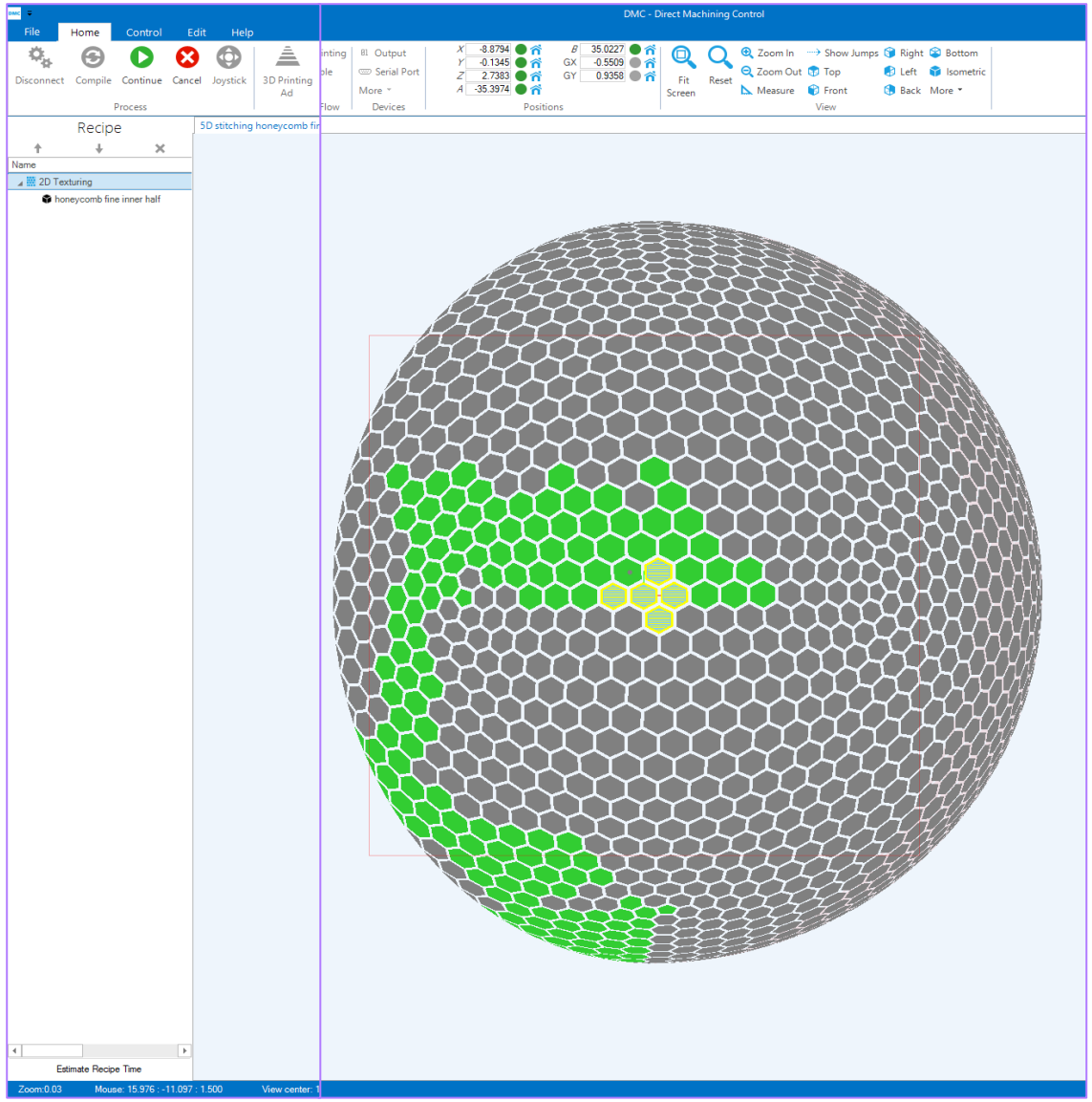
- With Mark on Fly stages are moving along the selected axis without stopping and galvo scanners do the processing.
- Adaptive Mark on Fly allows to vary speed of the processing depending on the details of the pattern. This increases processing speed even more.



5-axis Machine Control

5-axis module allows for simple machine control for 5D processes. The user only imports the shape, defines the process parameters and clicks Run – DMC handles all else.

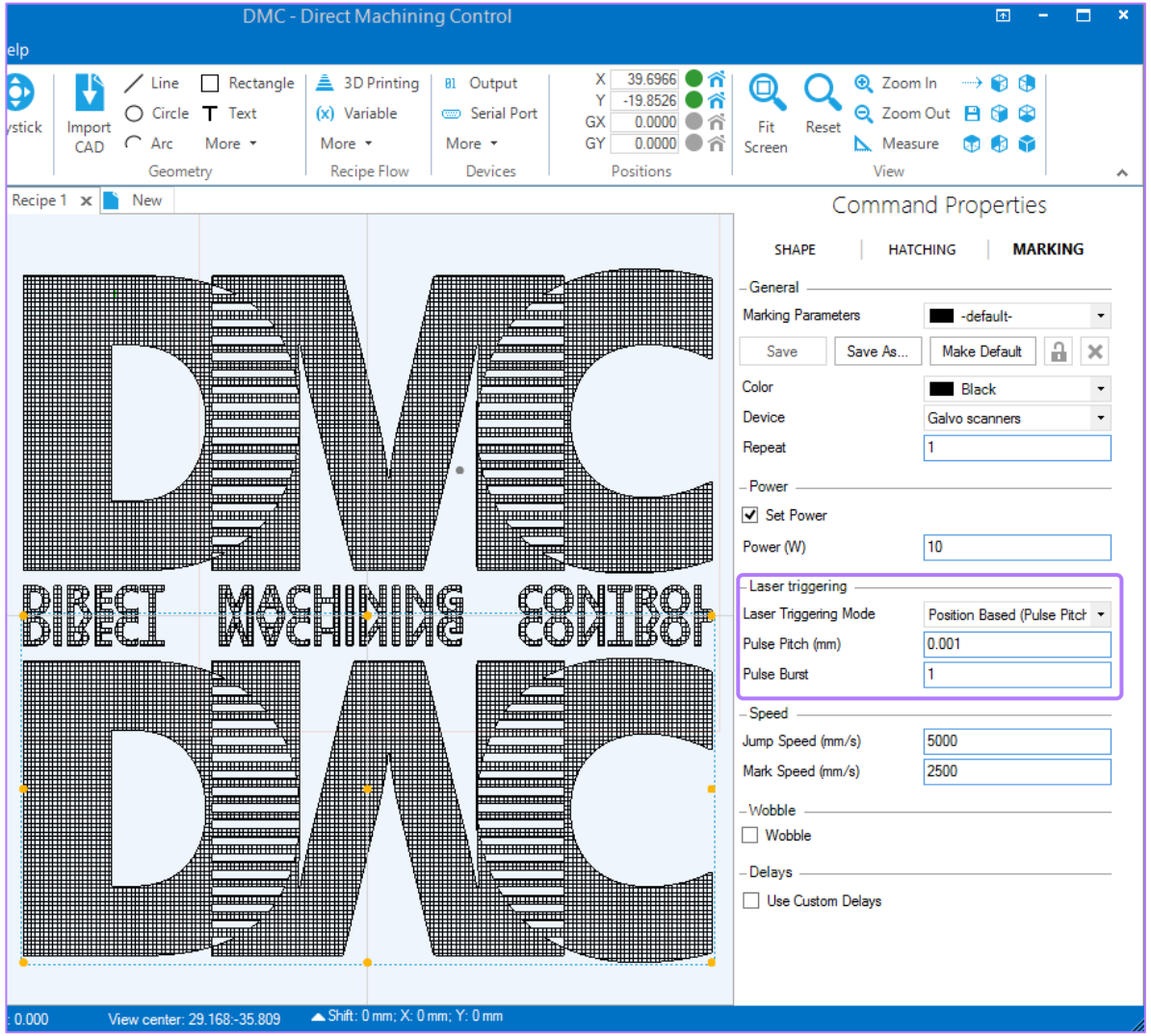
- 5-axis and texturing modules include 5-axis kinematics, alignment, projection, wrapping, texturing and other tools to take care of the whole process.



Laser Control

Laser triggering is defined by DMC and performed by stages or galvo controller according to their specification.

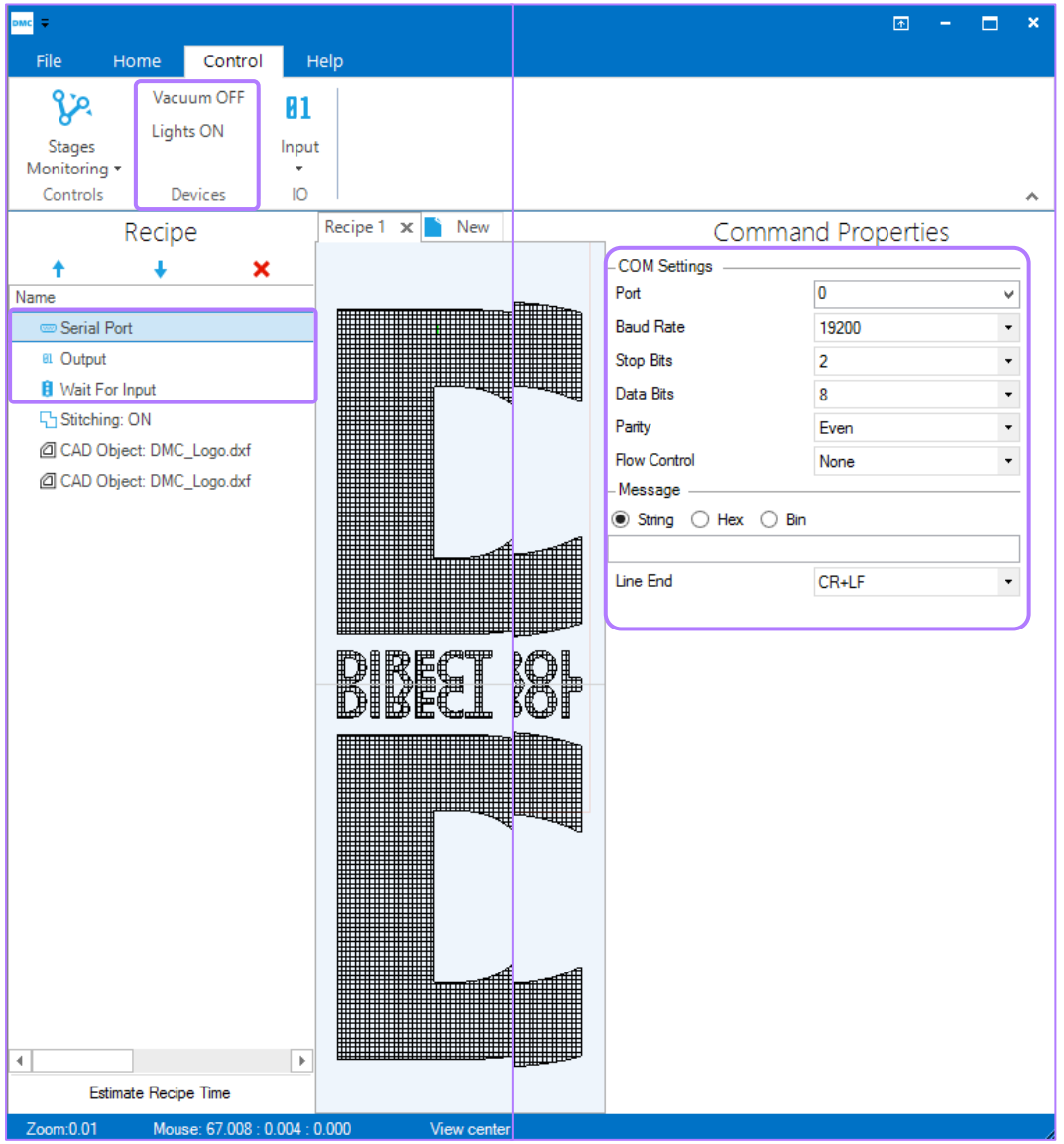
- For some lasers, power can be changed during the recipe, i.e., using high power at the start for rapid removal and low power at the end for nice surface finishing.
- Laser power and other parameters can be controlled via I/Os or via .dll libraries when available.



I/O, Serial, Telnet or DB Control

Software can control additional devices via digital and analog outputs, serial port and other protocols.

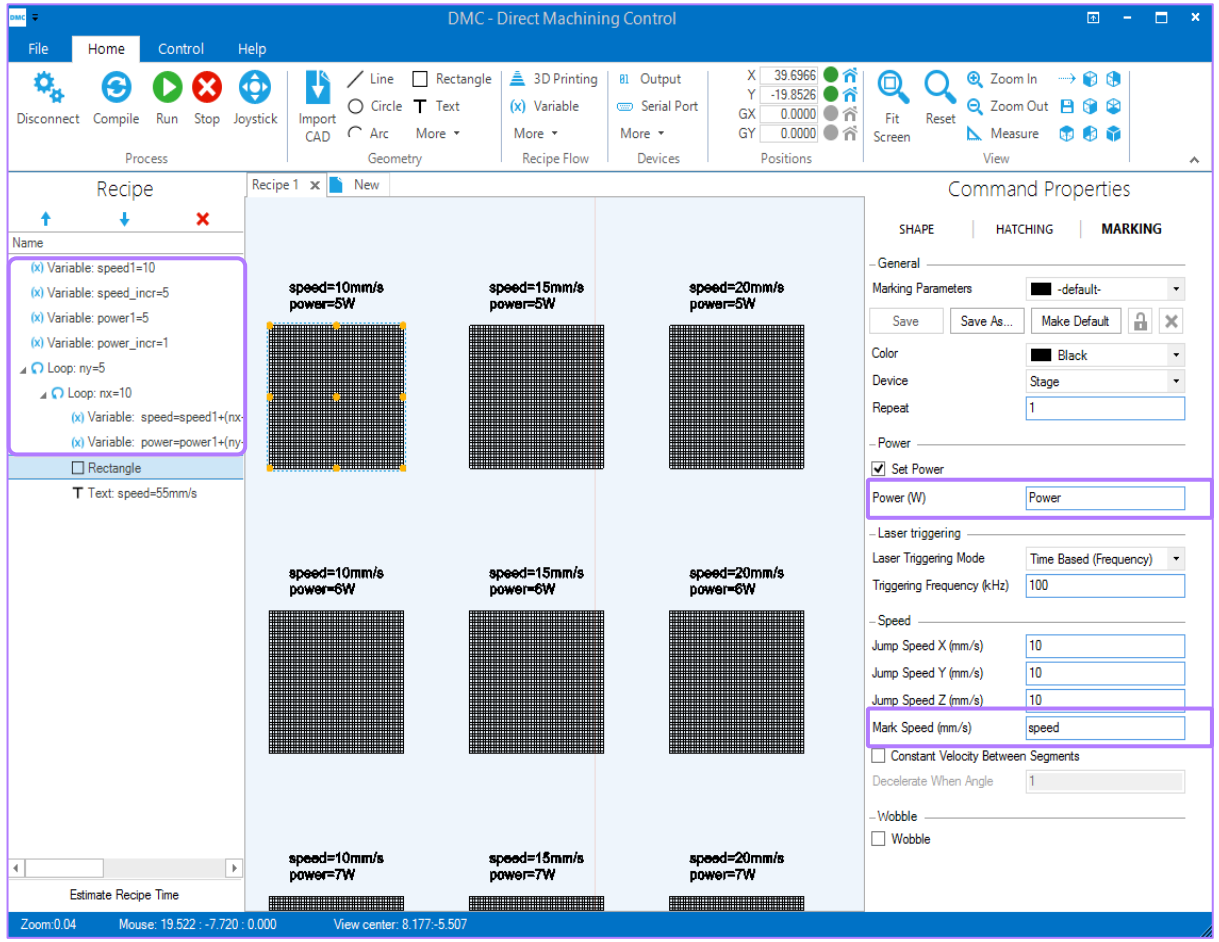
- That can be used to control vacuum chuck, lighting, locks, dust suction and other devices.
- Control can be executed during recipe (including wait-for-input feature) or via user created buttons in the GUI.



Variables, Loops and If

Every parameter in the recipe can be defined as a variable or calculated with a formula.

- Using variables, various parameters, like position, power, speed, etc. can be changed dynamically during recipe. And parameter change can be done in a single place to simplify workflow.
- Loops allows creating repetitive patterns or tasks like arrays of objects with different parameters.

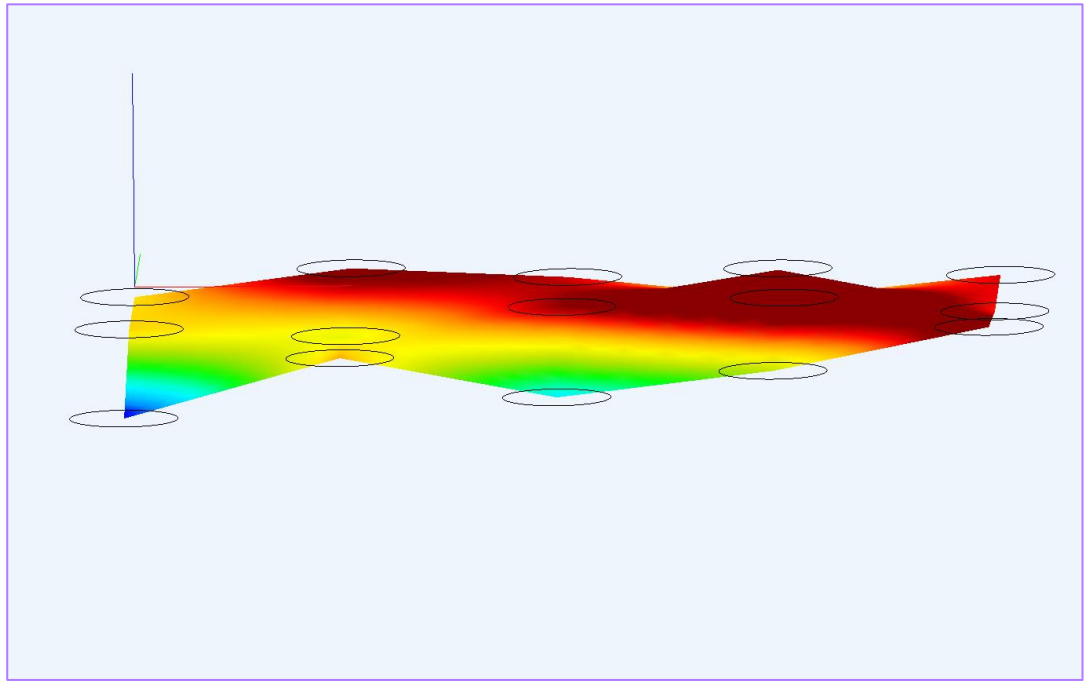


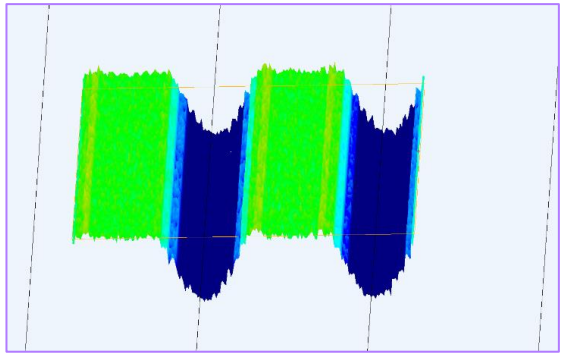
Sensors

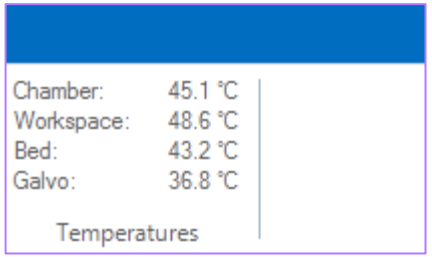
DMC

Support for some sensors, like displacement sensor, power meter, etc. are implemented in DMC.

- Support for specific sensors can be done on request.
- Sensors can be used in the recipe for finding focus position, tilting compensation, surface scanning, adjusting/locking laser power, collecting other data.



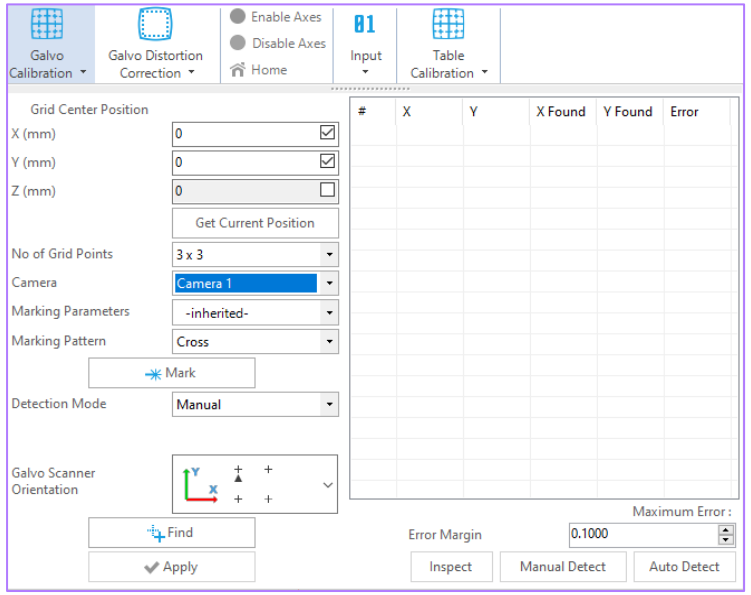


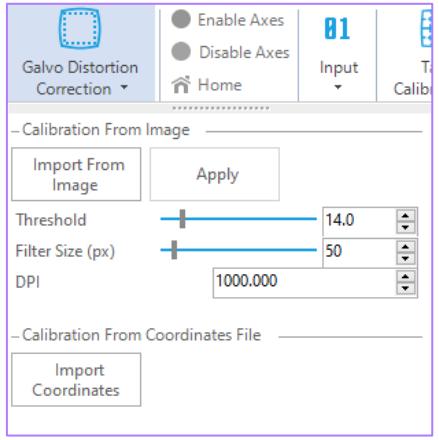


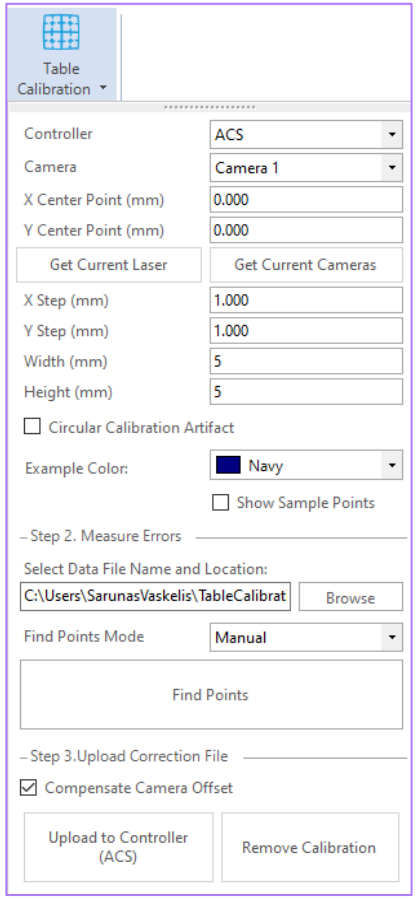
Calibration tools

DMC includes galvo scanner and stage calibration tools that use machine vision for automatic feature recognition.

- Galvo scanners are calibrated using camera and stages or from the scanned image.
- For stage calibration the user must use a precise calibration grid plate.
- Integrated calibration tools allow to reach very high precision.





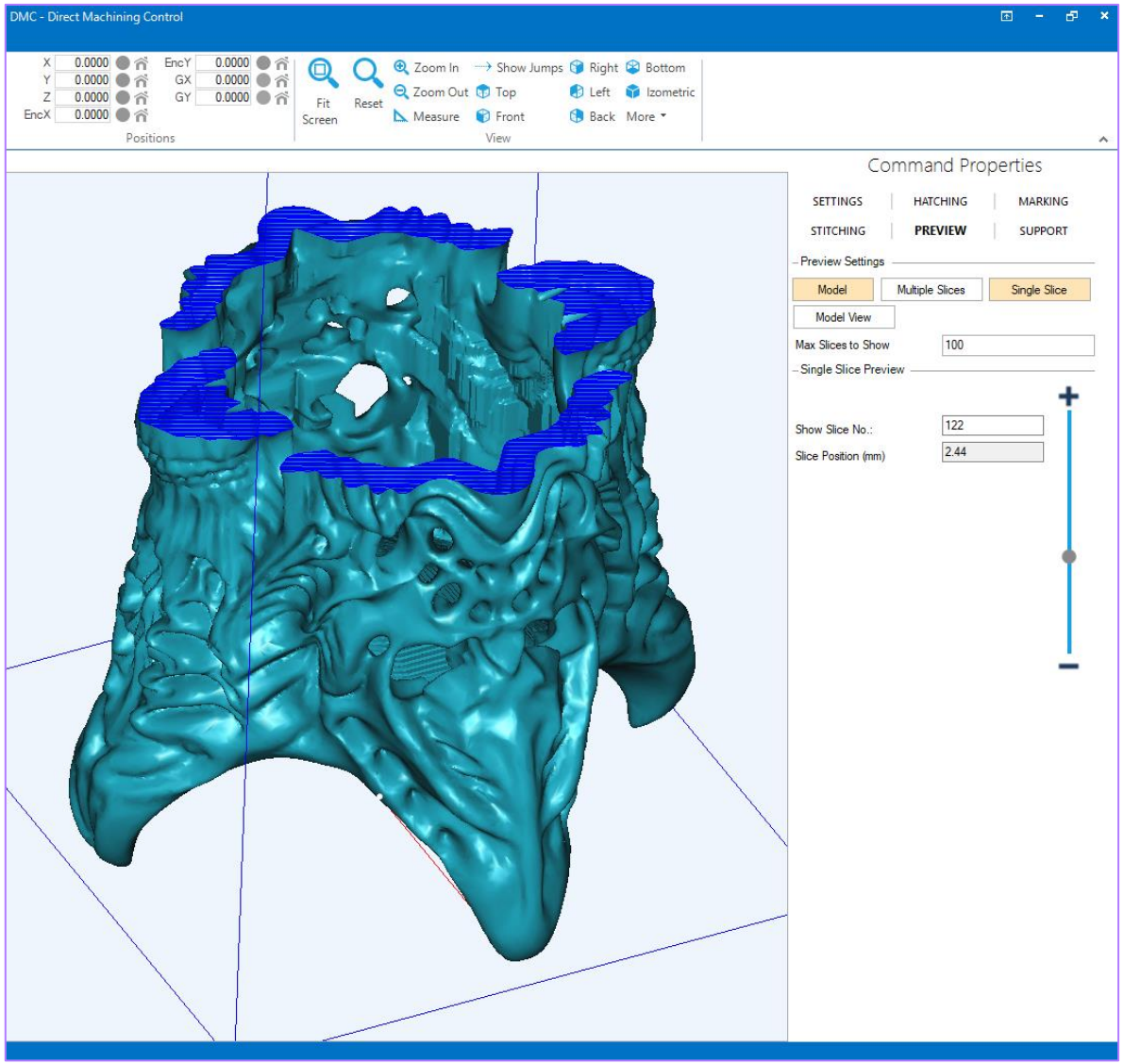


Additive Manufacturing

DMC

Fast Slicing and Hatching engine to prepare the CAD object for printing.

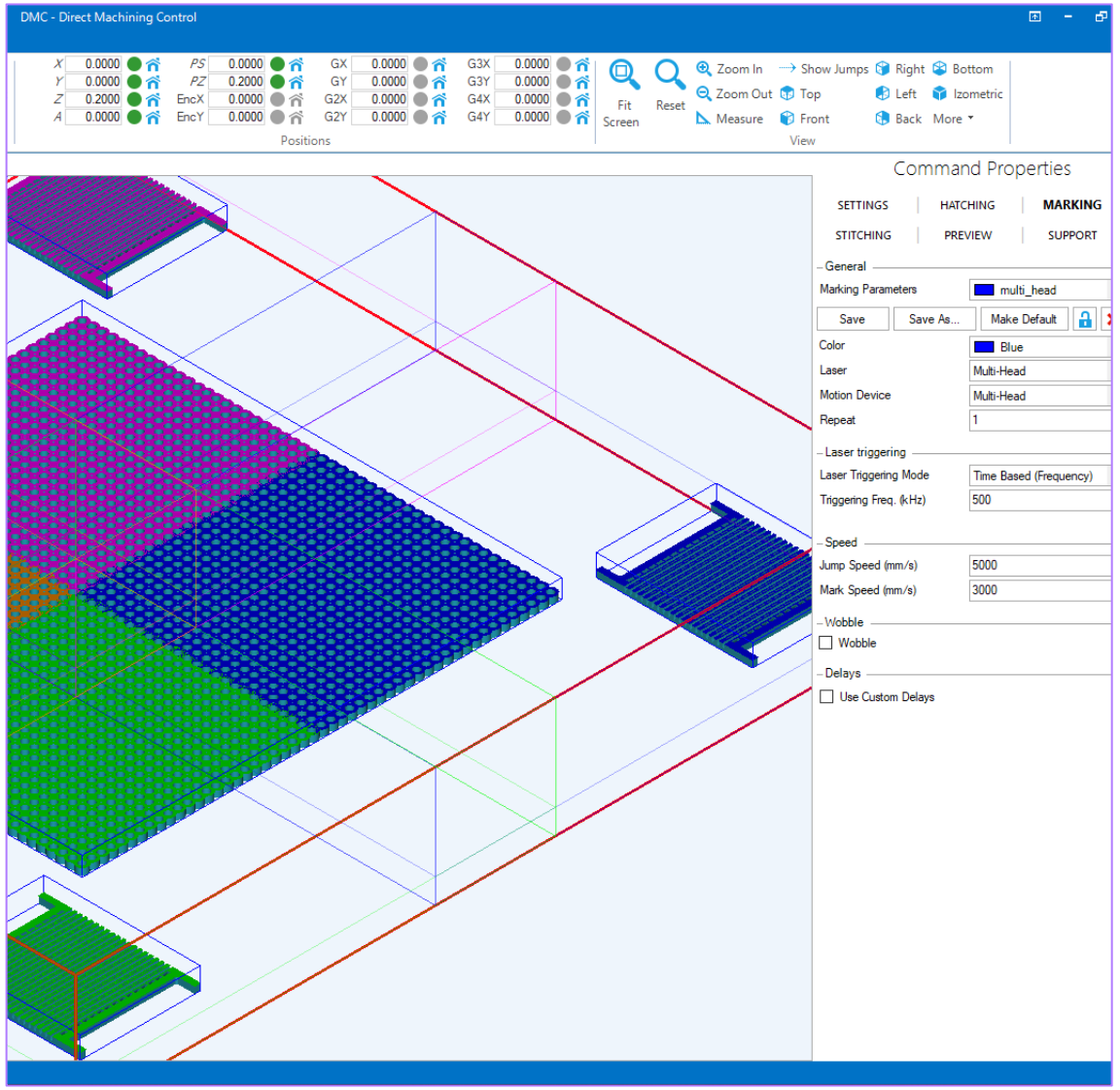
- Ability to define actions before/after each slice and flexibly configure the process and control all the machine.
- Ability to define actions for each slice individually as well as for groups of slices.
- Ability to read the sensor data and adjust parameters during the print.
- DMC can control Scanners, DLP, SLM and other devices.



Multi Galvo Scanner Control

Ability to control several galvo scanners simultaneously.

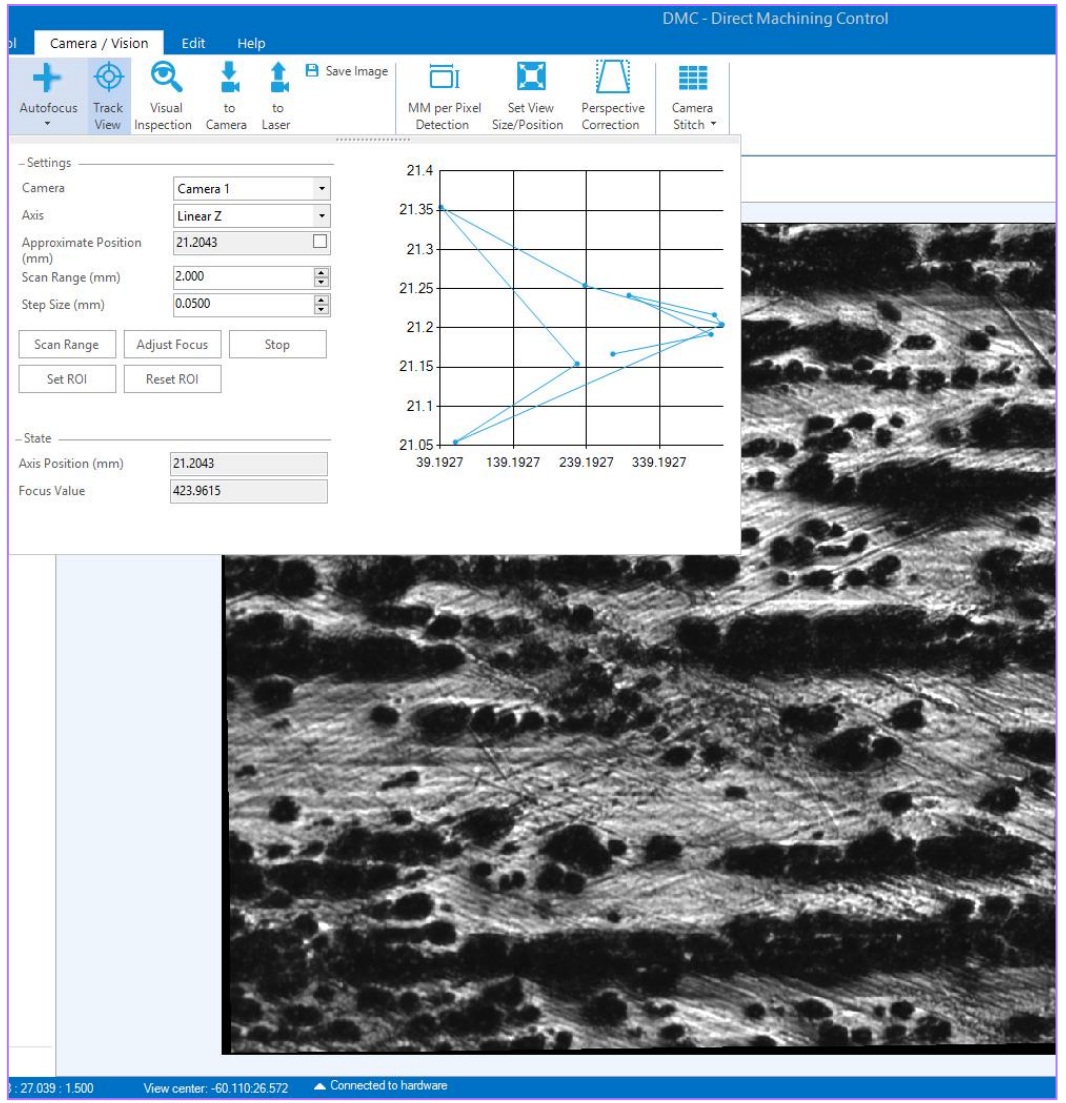
- If there is a need to do stitching, Random Splitting is available to reduce merging errors.
- DMC assigns tasks for each scanner automatically to produce the part efficiently.
- Multi Galvo Scanner Control can be combined with Marking on the Fly to achieve and even larger part manufacturing.



Cameras

Camera view is displayed in Preview window and calibrated to match coordinate system of positioning stages and/or galvo scanners.

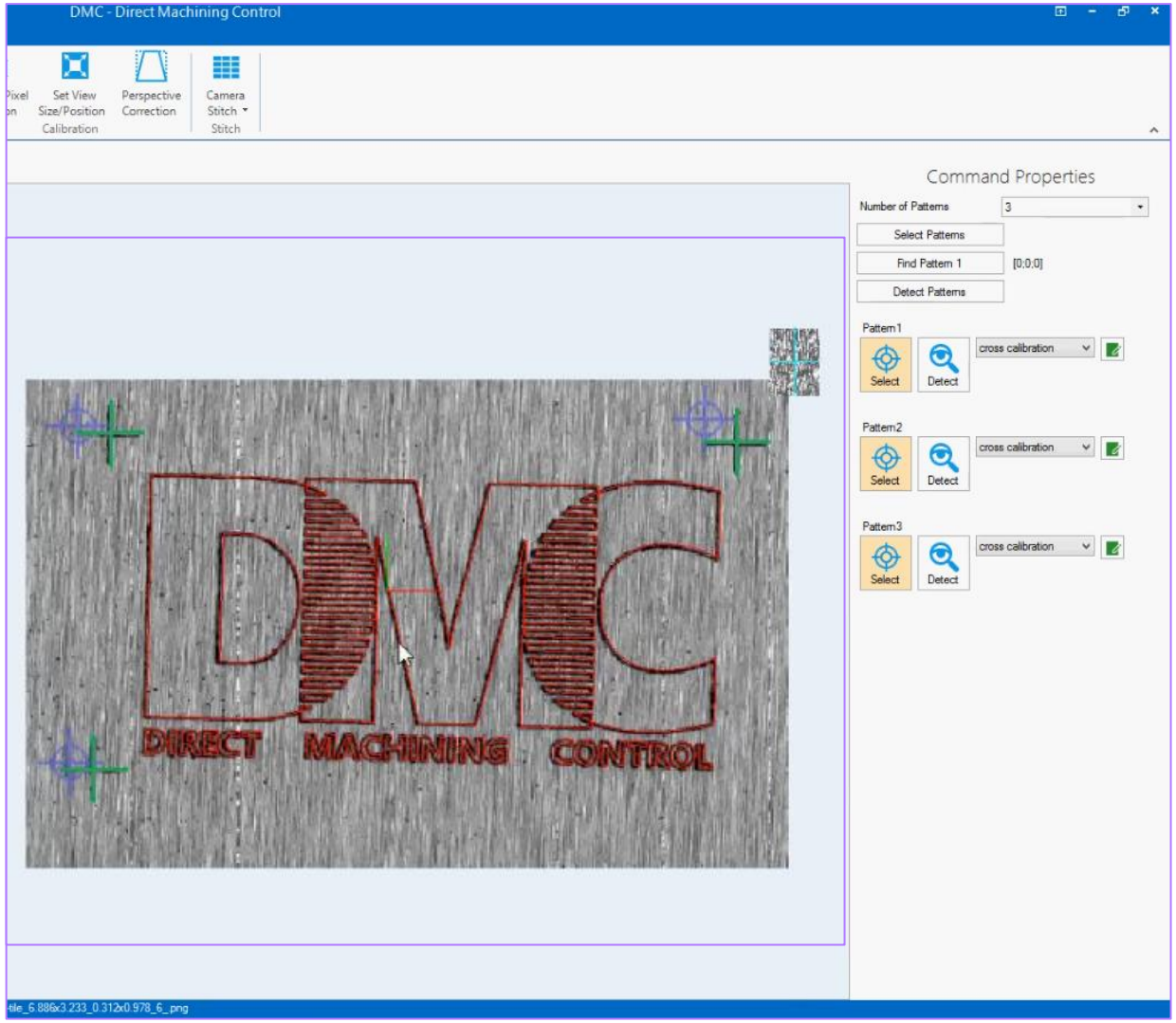
- Camera view can be used for finding focus (using autofocus function), recipe alignment on the sample and final inspection.
- Either coaxial (through focusing lens) or paraxial camera view can be used.
- Camera view can be stitched to a big picture with highest resolution.



Alignment

Visual alignment features are available with MV modules.

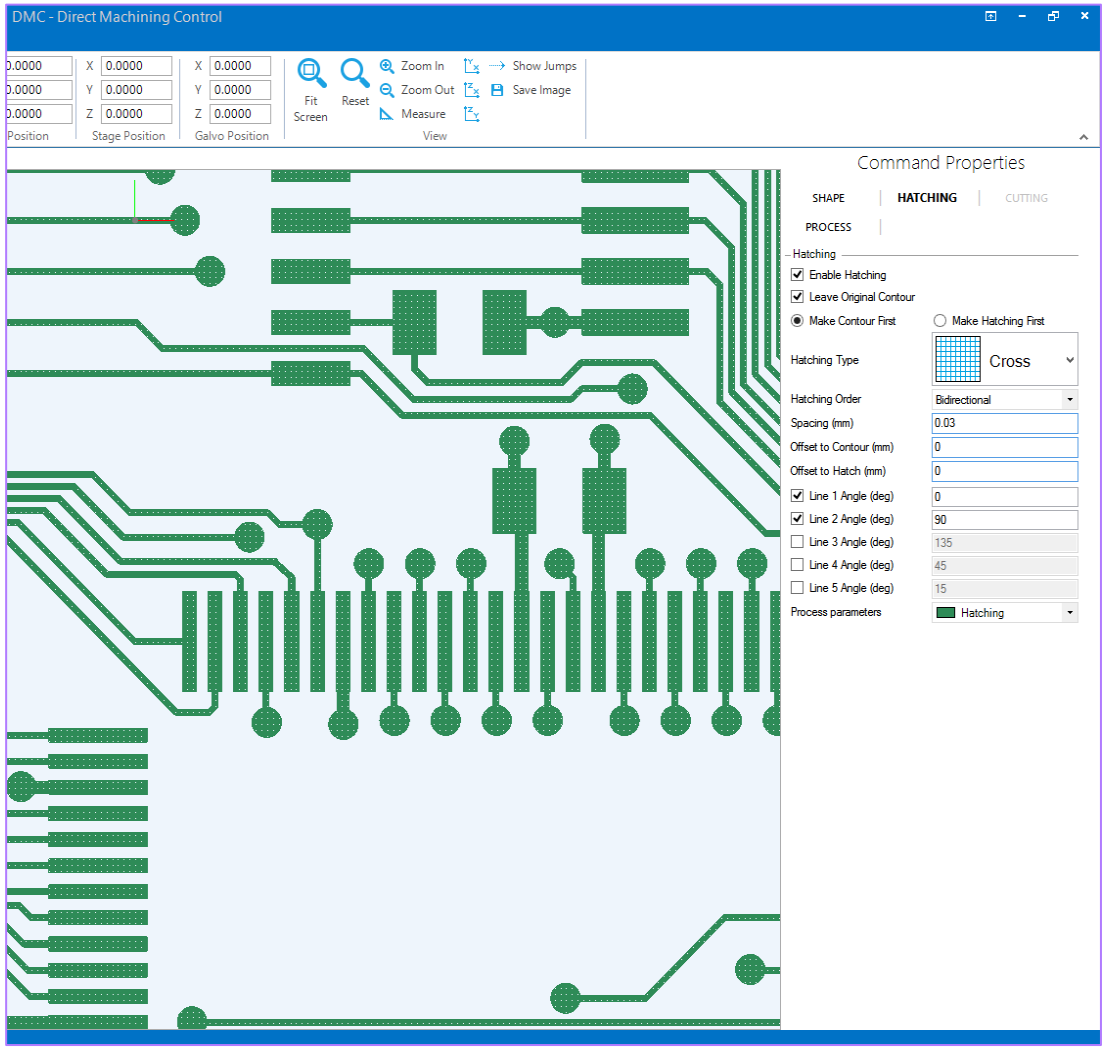
- Manual alignment can be done by manually positioning trajectories to match the sample.
- Semi manual alignment can be done by manually locating fiducials.
- Automatic alignment can be done by automatically detecting fiducials, edges, corners, circles of the object, grid, etc.



CAD File Import

Various CAD files can be imported to DMC for motion path generation: DXF, DWG, STL, STP, CLI, Gerber, NC Drill / Exelon and others.

- Large CAD files with millions of lines can be imported quickly.
- DXF and DWG files can be edited in DMC. User can delete or modify existing lines, arcs, etc. and add new ones.
- 3D files are sliced and prepared for 2.5D machining.

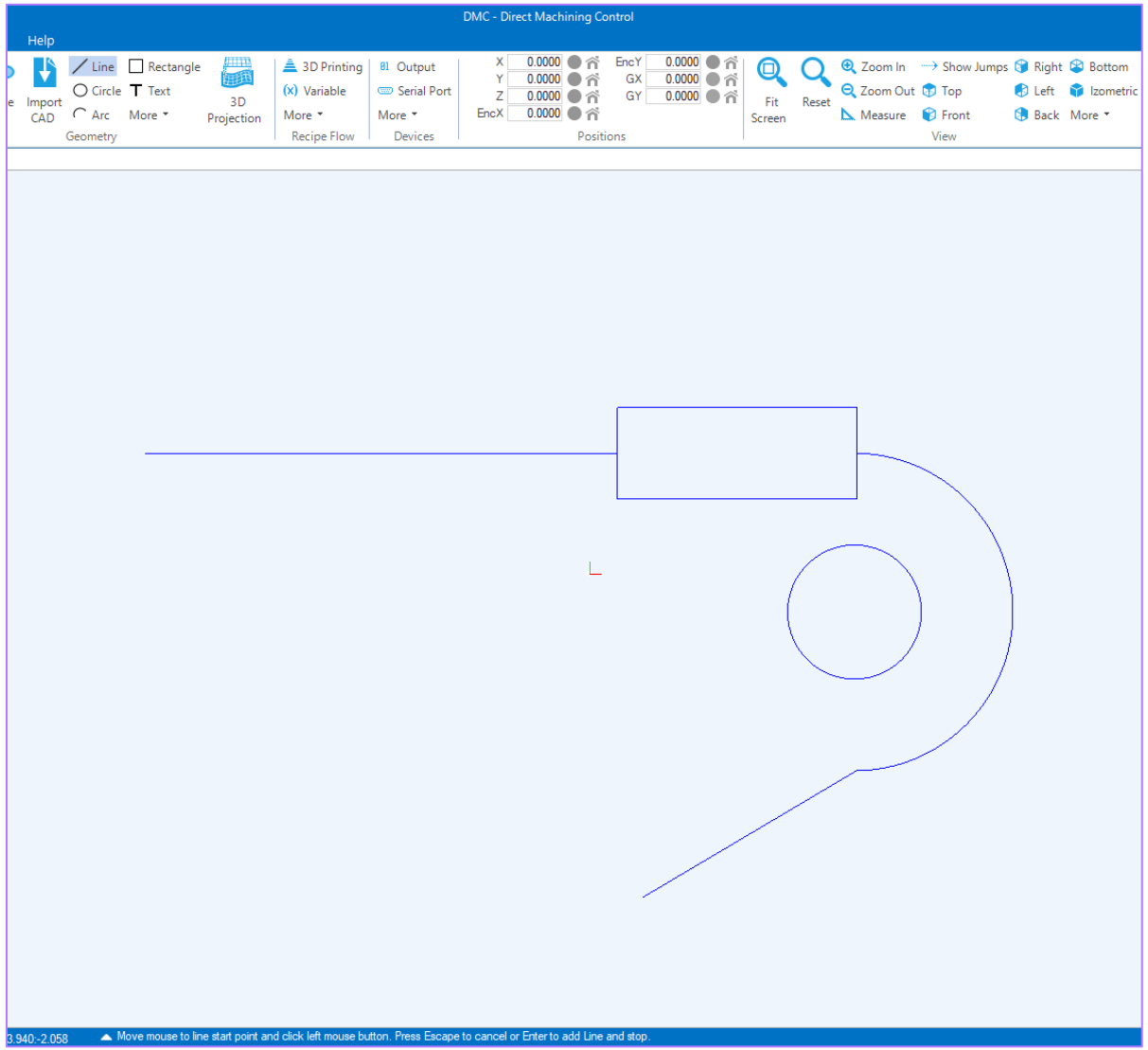


Drawing

DMC

Simple 2D and 3D objects can be drawn with built-in DMC drawing tools.

- A more sophisticated patterns can be created by using Loop and If tools.
- 3D objects can be made from the 2D objects using Extrude and Revolve operations, or by creating some sample shapes.
- CAD objects can also be edited in Edit mode.

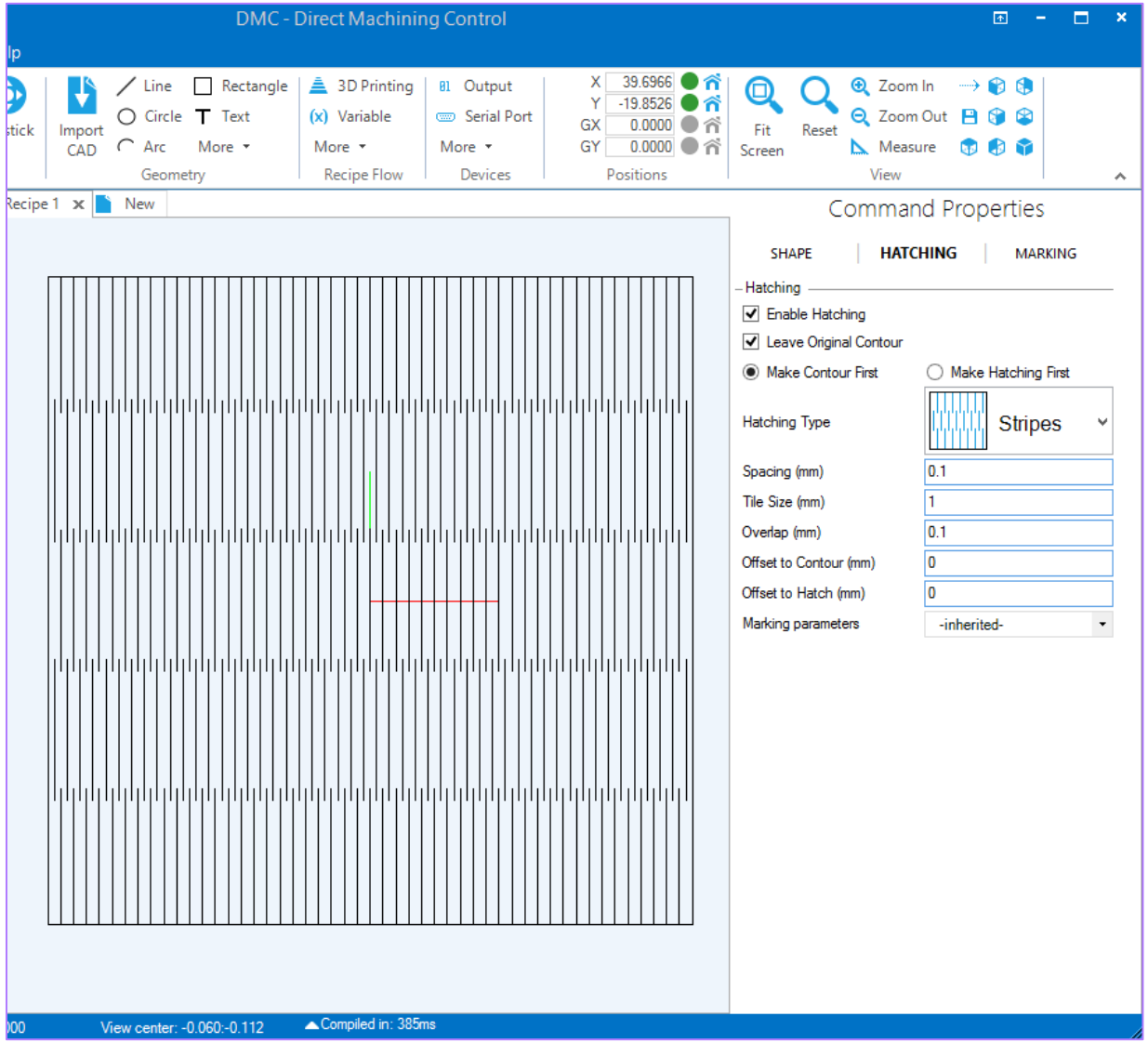


Hatching

DMC

All closed contours can be hatched to fill the volume.

- DMC hatching includes basic types like line, grid, contour hatching.
- Advanced hatching (chess, stripes, spiral and other) patterns can be used with PRO version.
- Custom hatching can be developed by DMC on request or by user using API for plugins (.NET C#).

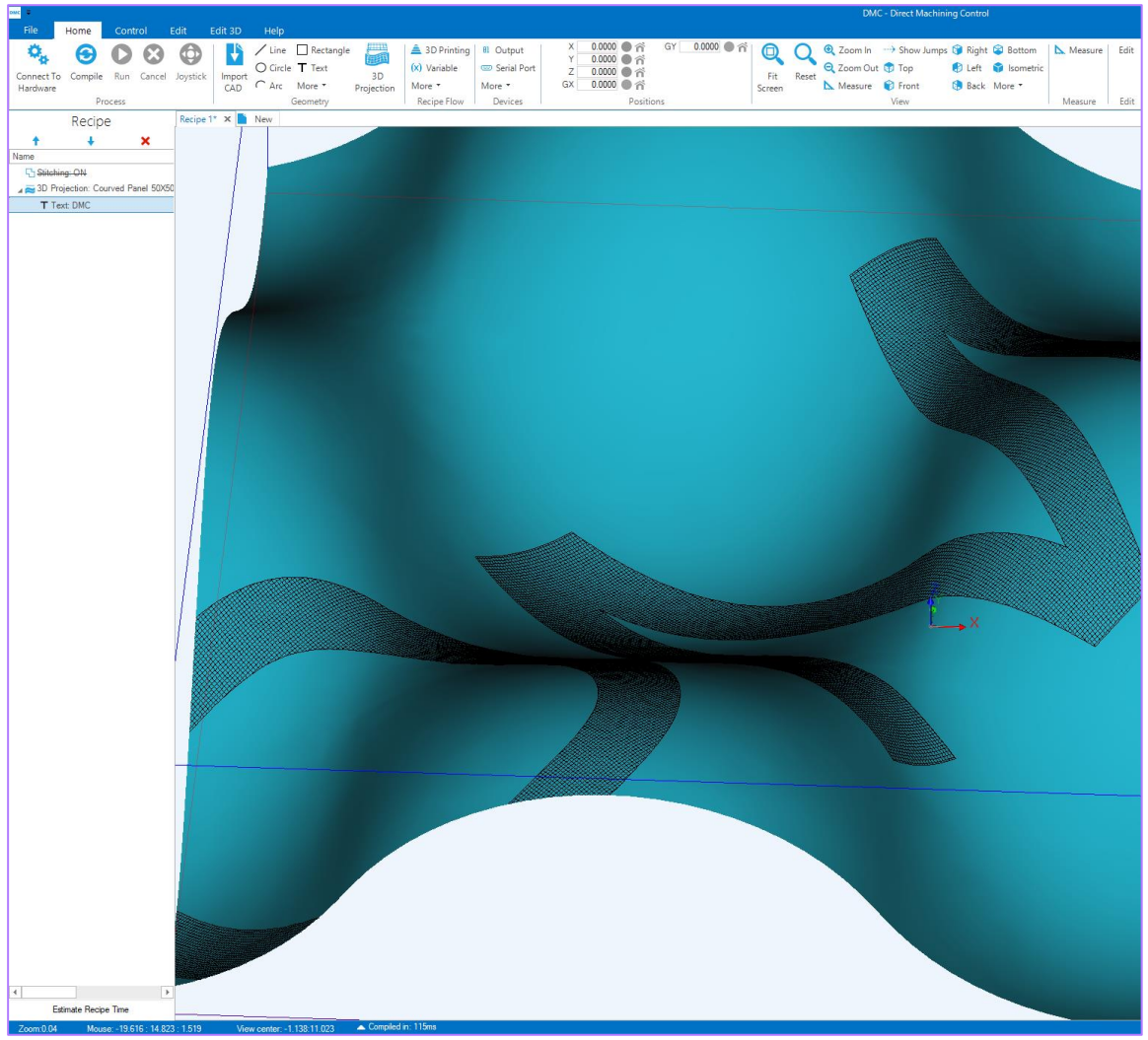


3D to 4D Processing

DMC

DMC has tools to put 2D patterns on 3D parts.

- 3D projection allows to project any 2D pattern on 3D files. Can be integrated with sensors for surface scanning.
- Wrapping tools allow to wrap 2D patterns on cylindrical objects to be done with rotaries.
- 3D stitching can allow to machine 3D patterns with 2D scanner and mechanical Z axis.

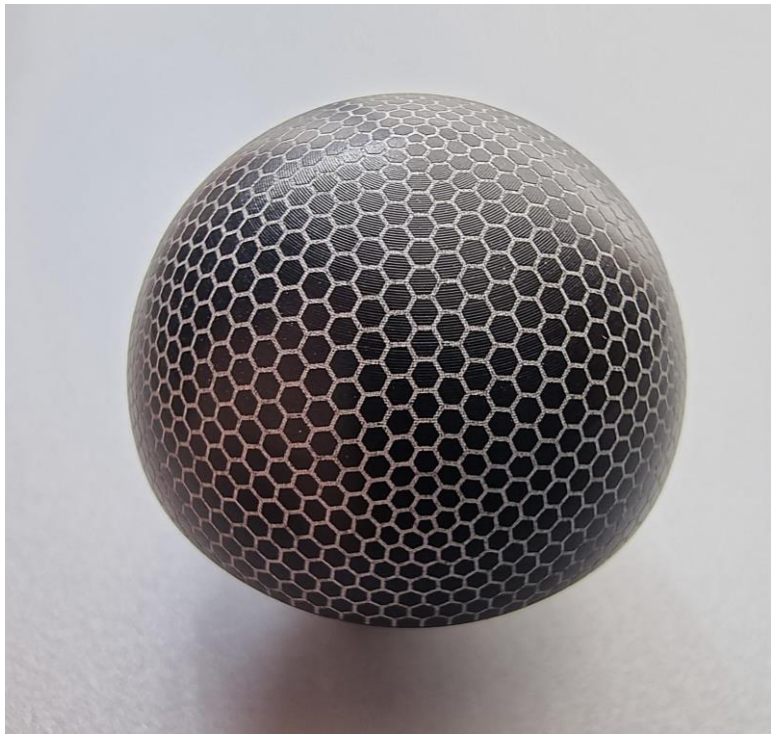


Applications: from 3D printing to 5axis texturing

DMC

SLS, SLM, 3D printing of metals, ceramics and plastics

Various electronics applications.

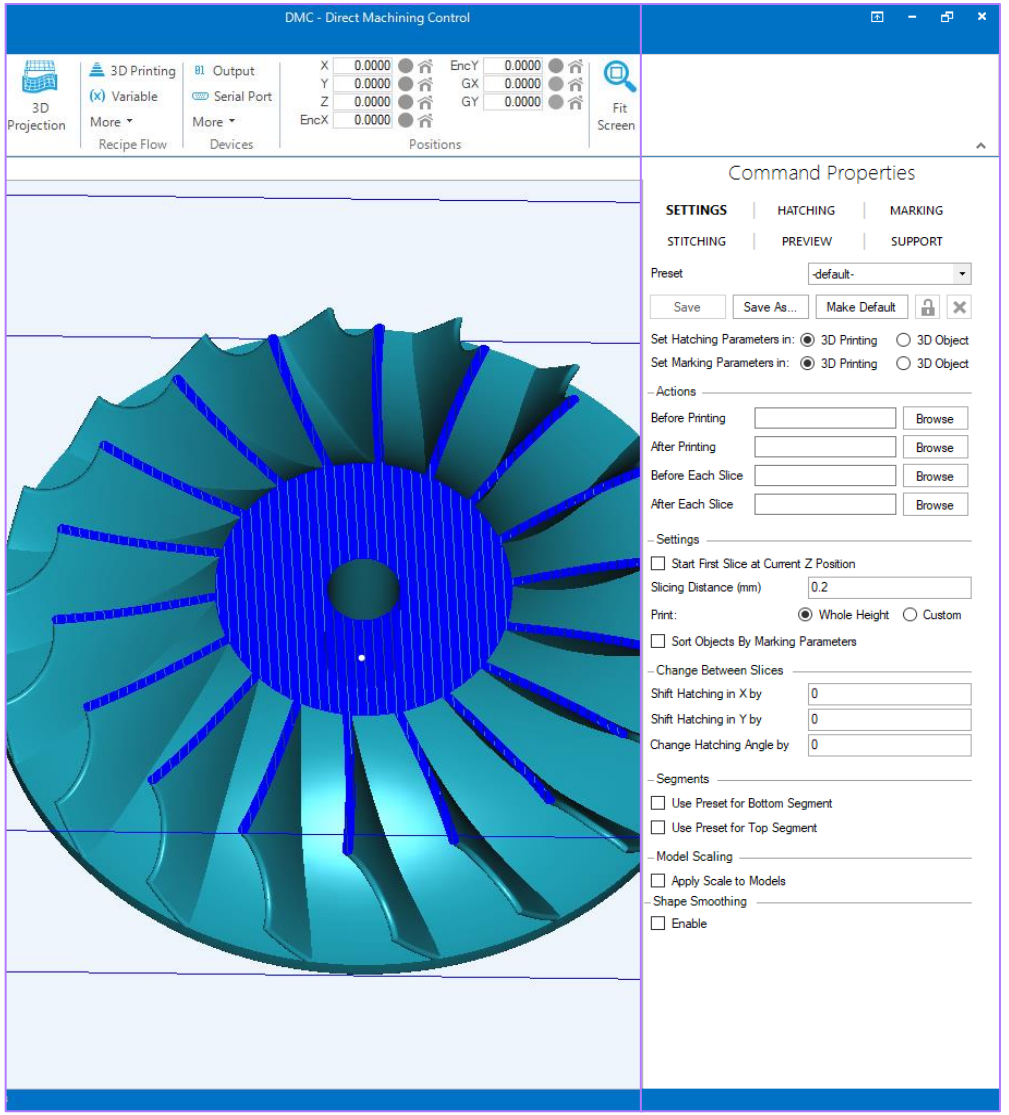


3D surface processing with 5 – 8 axis systems.

Additive Manufacturing

DMC controls whole Additive Manufacturing (3D printing) process from STL import to motion, heating, etc.

- 64-bit architecture and advanced algorithms provides industry leading slicing and hatching speed.
- Supports can be generated by DMC for overhangs of the part.
- Fixing tool allows compensation for incorrectly made models.

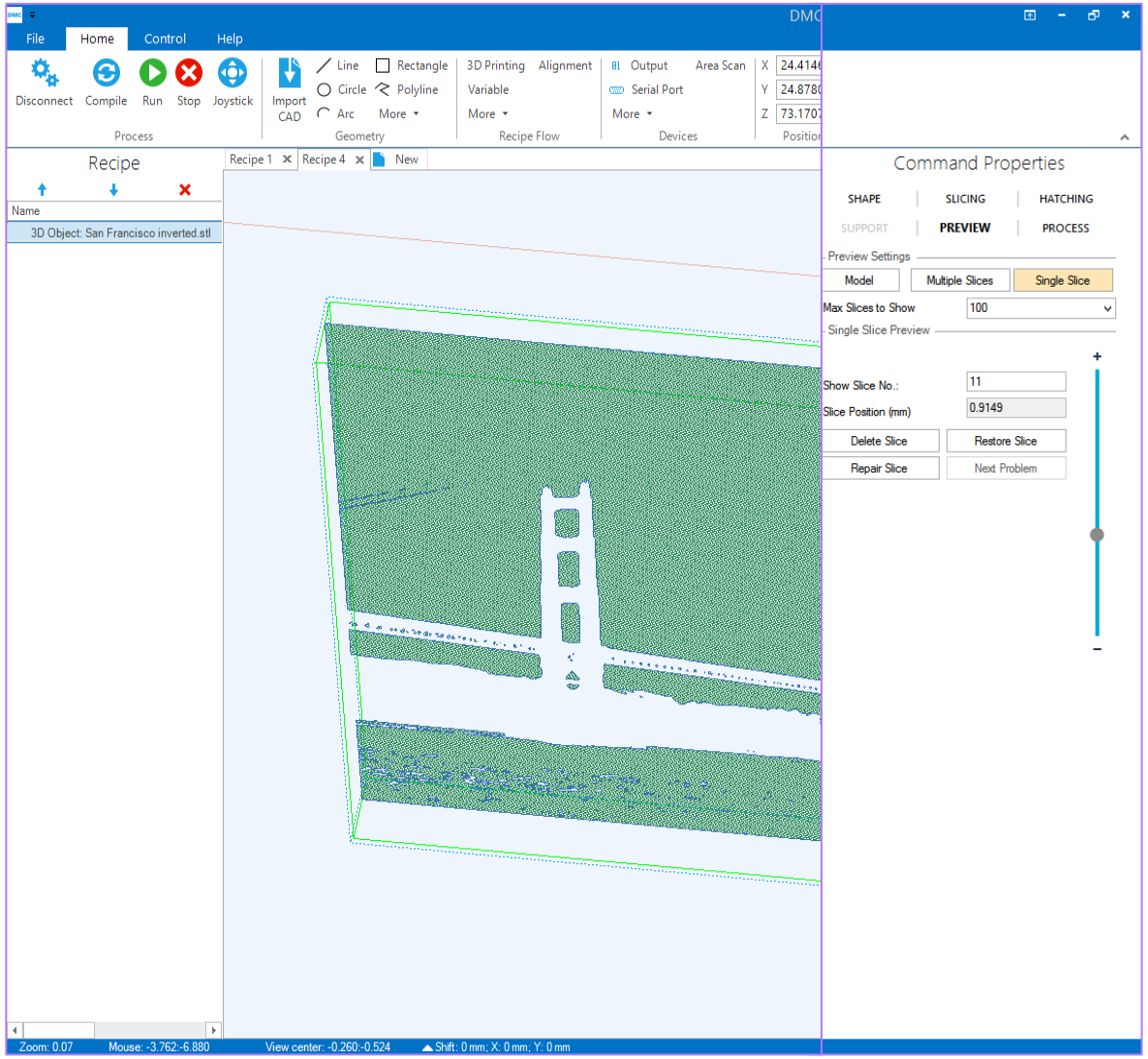


Engraving

DMC

2.5D engraving can be made with DMC using STL files.

- DXF and other 2D files can be used for engraving of simpler features.
- Different parameters for different stages of engraving process, allows speeding up the process while getting good surface finish.

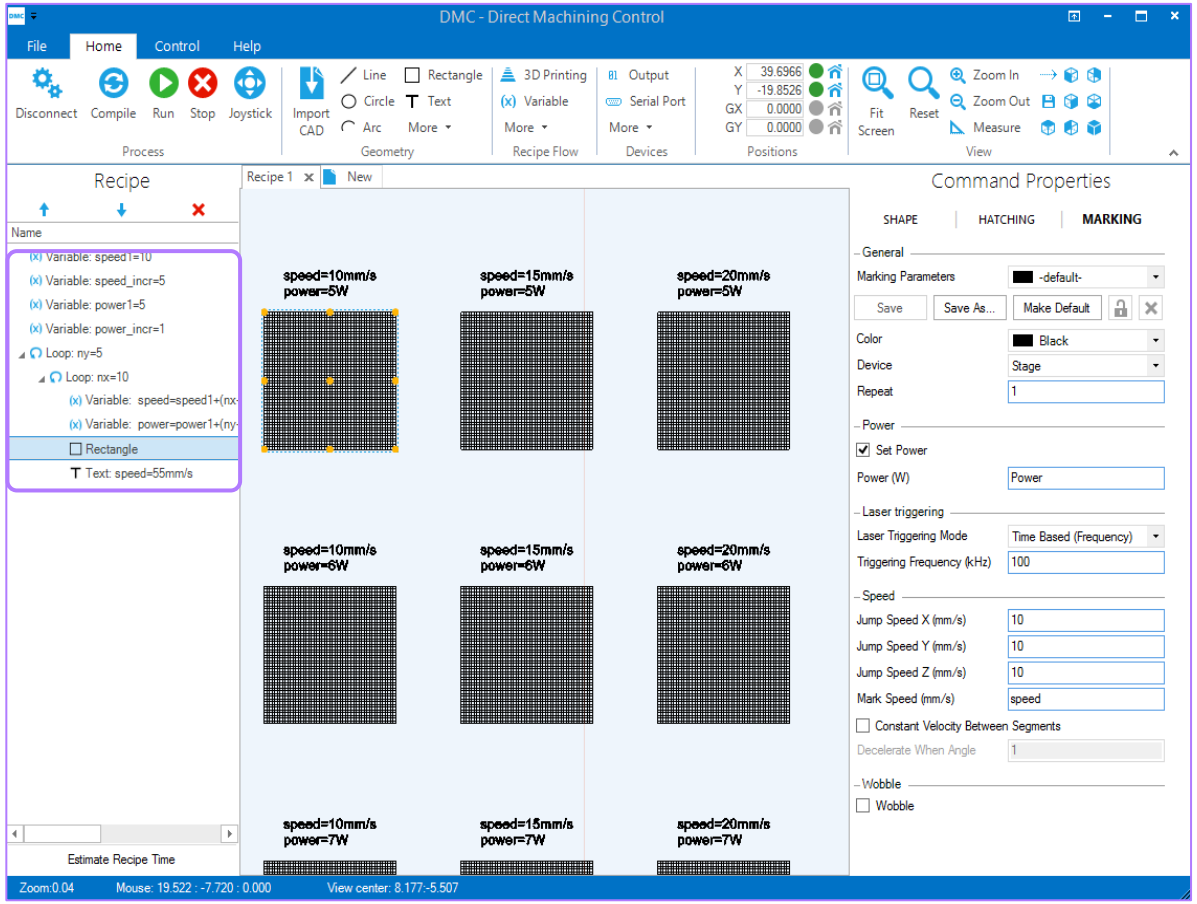


Laser Process R&D

DMC

DMC is a flexible tool to control different processes and different hardware, which is great in R&D environment.

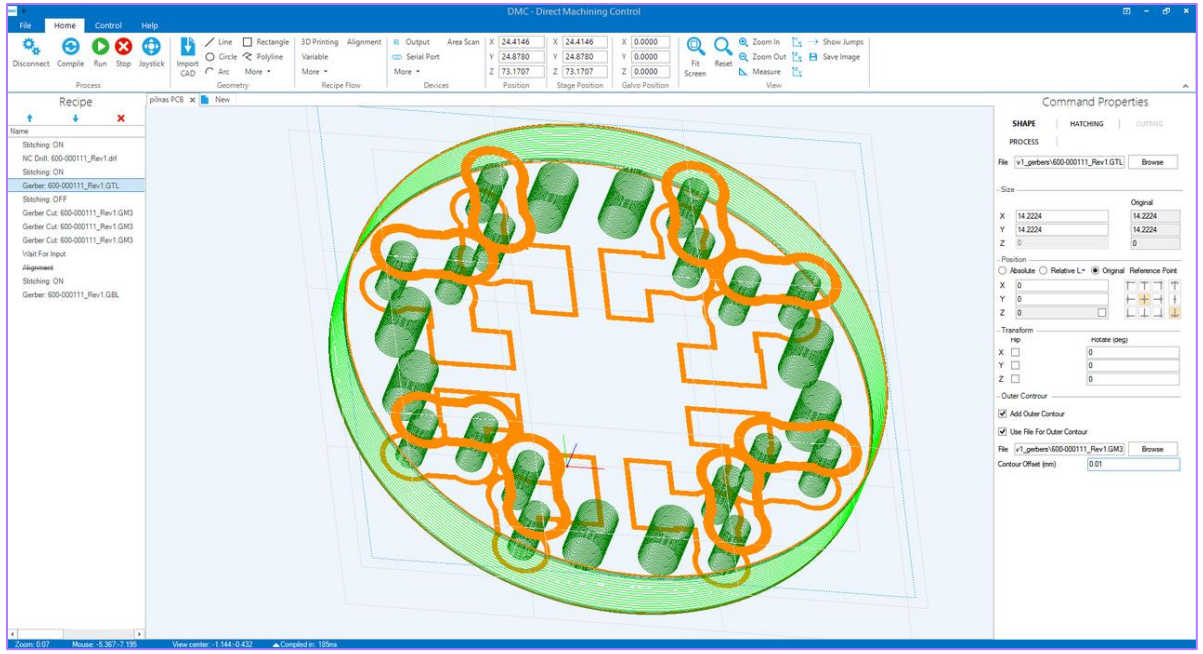
- Automation tools in DMC enables finding right parameters for the process easier. E. g. recipe on the right makes each rectangle with different parameters and parameters are written over it.
- Notice the length of the recipe (in purple).



PCB Processing

DMC supports Gerber and NC Drill / Excellon file import for PCB processing.

- PCB etching, drilling and cutting processes can controlled by DMC with a single recipe.
- Alignment features allows etching and drilling precisely where needed.
- Different parameters for different processes and their stages allows easy control of whole process.

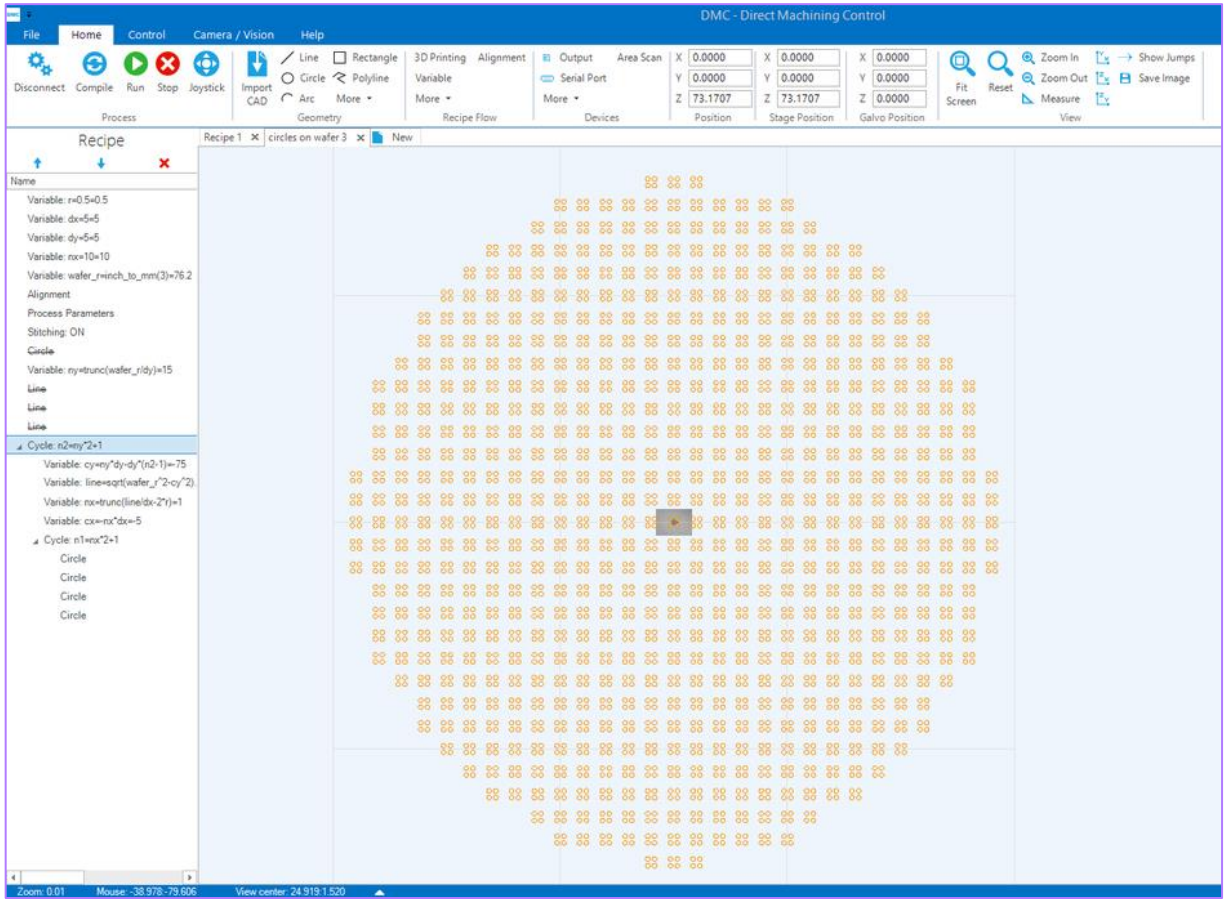


Other Applications

DMC

Flexible tools allow use of DMC in most of laser processing applications.

- 5-axis processing.
- Cutting.
- Semiconductor processing.
- Via drilling.
- Scribing.
- Refractive index modification.
- Many others.

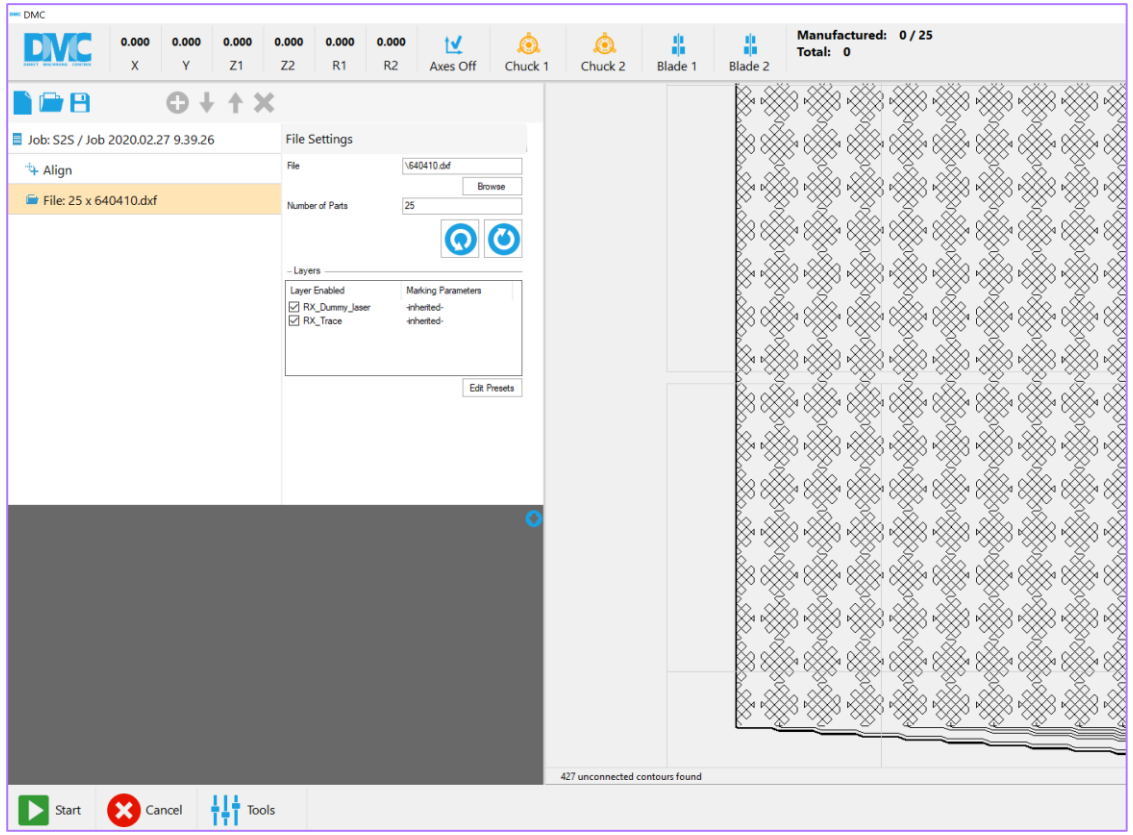


OEM

DMC

A special version of DMC for a specific application and machine can be prepared.

- OEM version can come with logos, icons, name and manual changes.
- GUI of the software can be changed to match specific needs. Source code for GUI and adaptation samples are provided on request.
- Additional functions can be added via plugins by user (.NET C#).
- DMC can be controlled remotely via Remote Control Module.



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Forget the most complicated part of the project.

We already took care of it!

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info@directmachining.com
+370 5 245 3707