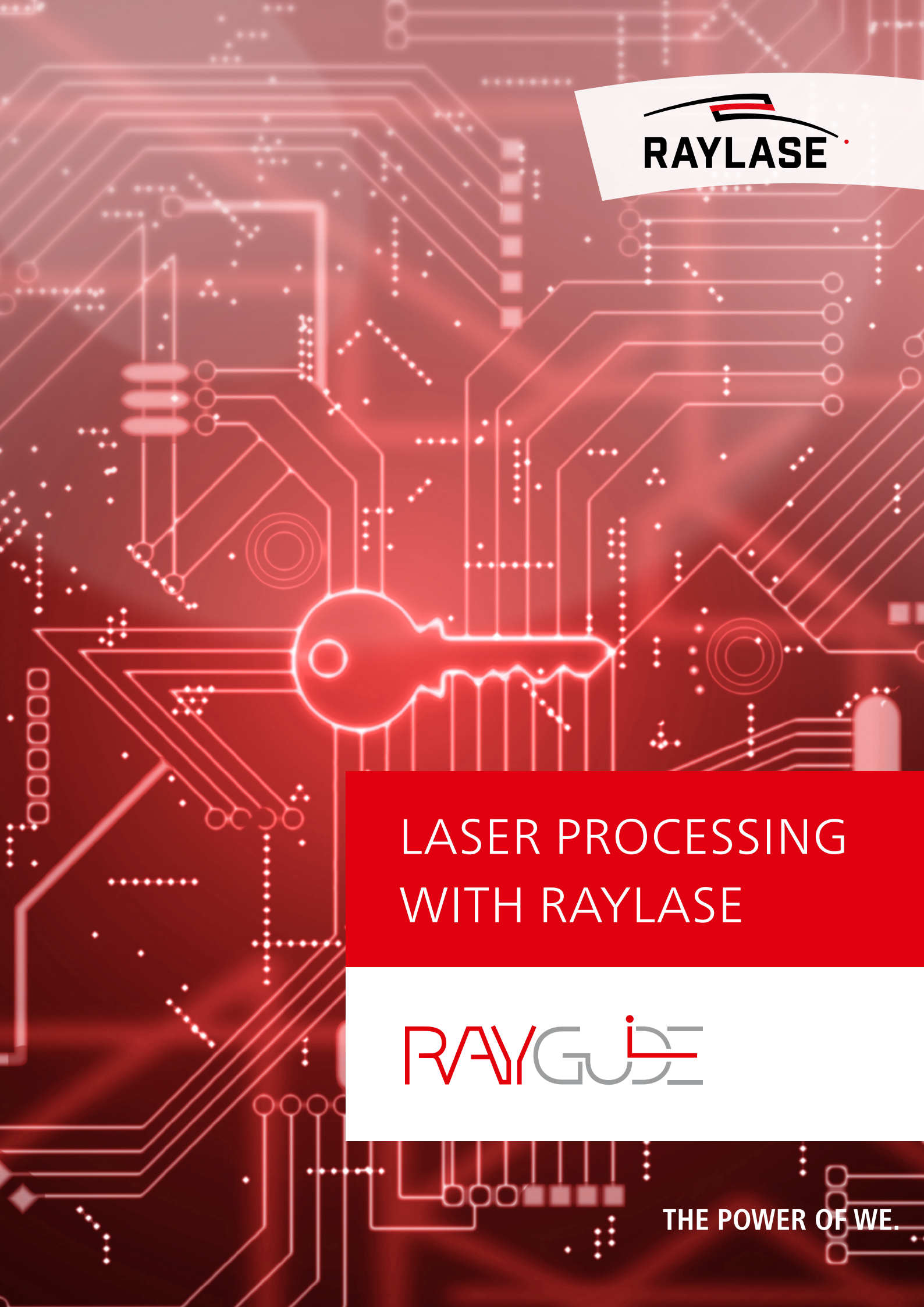
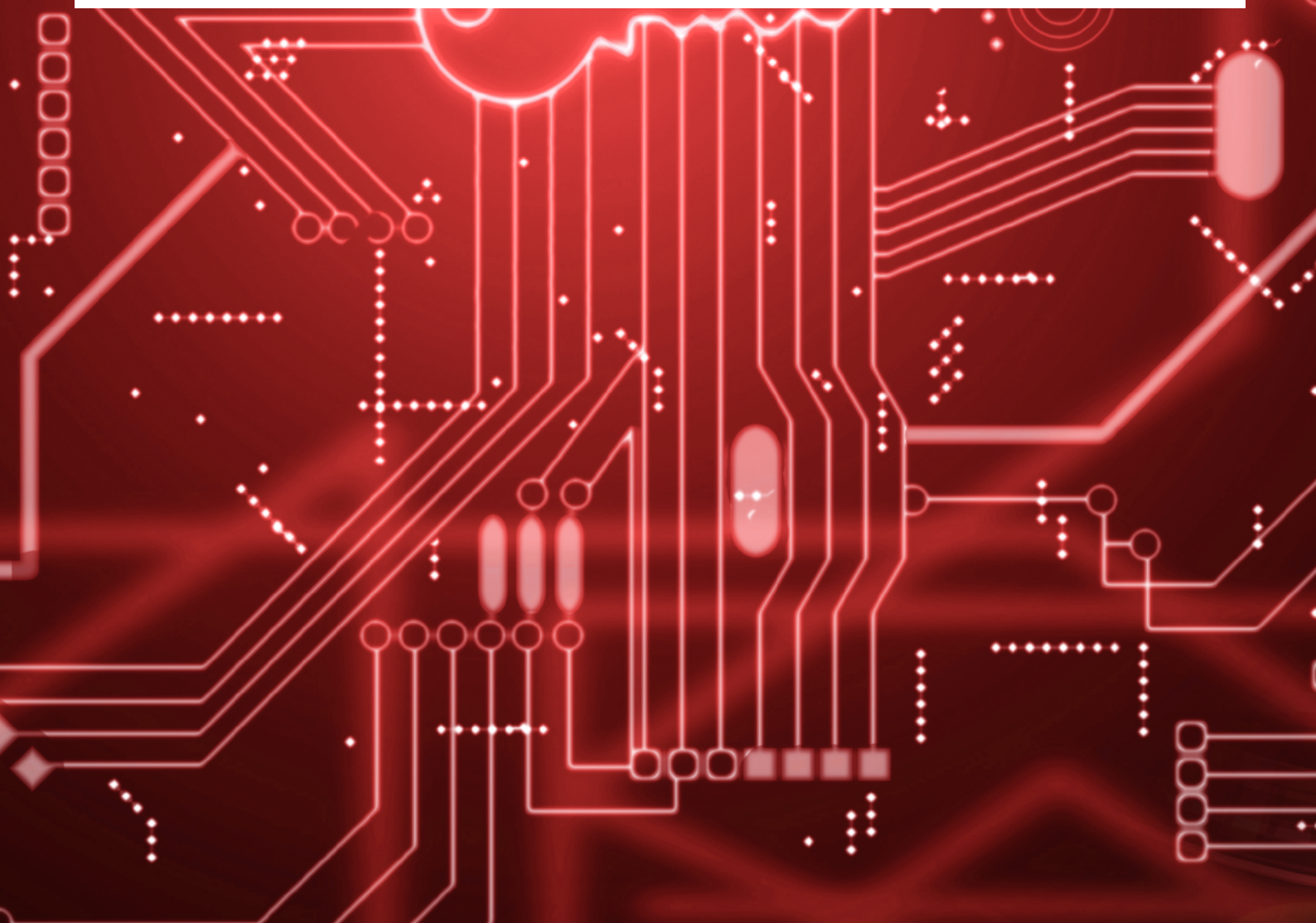

RAYLASE
LASER PROCESSING
WITH RAYLASE
RAYGUIDE
THE POWER OF WE.

RAYGUIDE is the modern laser processing software, developed by RAYLASE for end-users and programmers with the goal to increase usability and decrease programming complexity. RAYGUIDE comes with all fundamental tools to setup and calibrate the galvo-scanner-system, create laser processing jobs and execute them with all required automation including a continuously expanding range of features and functions. RAYGUIDE utilizes the full feature capacity of the SP-ICE-3 control card to complete a powerful laser processing package.

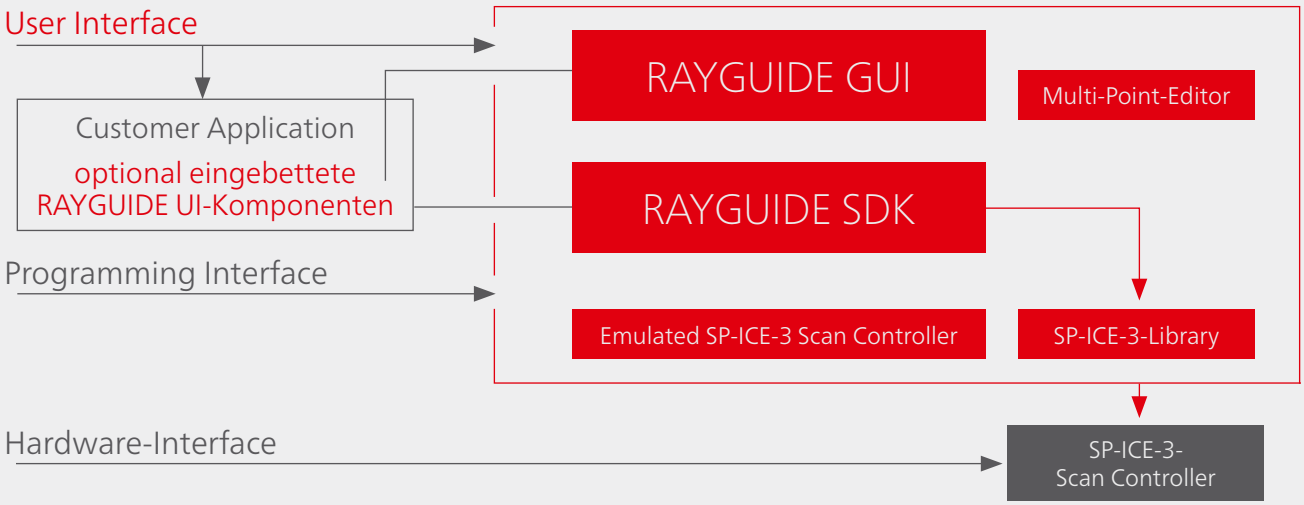


1

Basic Interface Structure

Vision: *The API should contain all functions of the GUI and support them with easily adaptable sample code.*

- RAYGUIDE RAYGUIDE user Interface for quick and easy interaction.
- RAYGUIDE programming library for highest level of automation and integration.



RAYGUIDE API:

Available as RAYLASE SDK License for programming your own application.

- Help yourself to the extensive toolbox of the RAYGUIDE functions and use them adapted to your specific application.
- RAYGUIDE API offers complete range of functions as the RAYGUIDE GUI.
- Create your laser process job programmatically or just modify jobs created by RAYGUIDE GUI as required to automate your process.
- Supported by sample codes and tutorials, it was never easier to benefit from the powerful predefined functions and integrate them into your system HMI.
- The API programming take place in .NET enviroment.
- The corresponding libraries are also available as NuGet package, so that they can be directly integrated into the programming environment.

```
// 1. Create the API:
using ( MarkerAPI markerAPI = new MarkerAPI() )
{

    // 2. Create and assign the devices:

    // 2.a) Create the SP-ICE-3 device:
    IDeviceManager deviceManager = markerAPI.DeviceManager;
    deviceManager.AddDevice( "my SP-ICE-3 card", typeof( SPICE3Device ) );
    BaseScanController scanController = (BaseScanController)deviceManager.GetDevice( "my SP-ICE-3 card" );
    scanController.IPAddress = "169.254.0.98"; // <= put your SP-ICE-3 card's IP address here
    scanController.EnableLogging = true;
```

2

Features For Basic Process Tasks

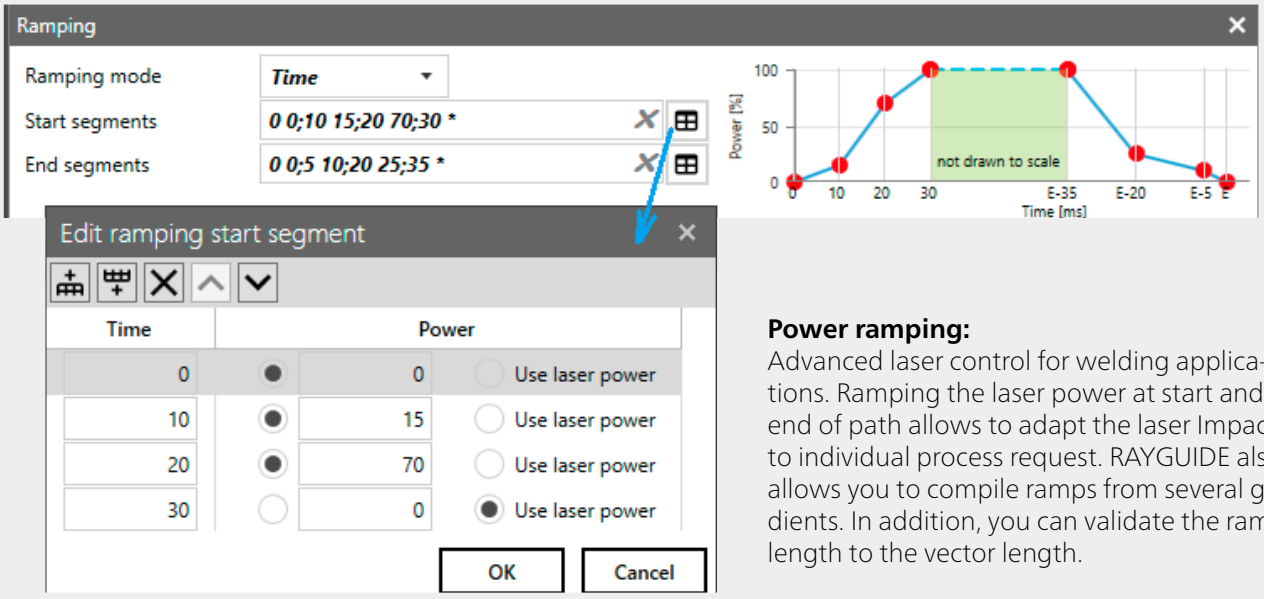
Vision: *The graphical user interface of RAYGUIDE should impress by an self-explanatory and easy usage, and a fresh look & feel.*

2.1 | Laser-Process-Parameters

To maintain the best process results, RAYGUIDE in combination with the SP-ICE 3 scan controller card supports the basic process parameters and advanced features such as:

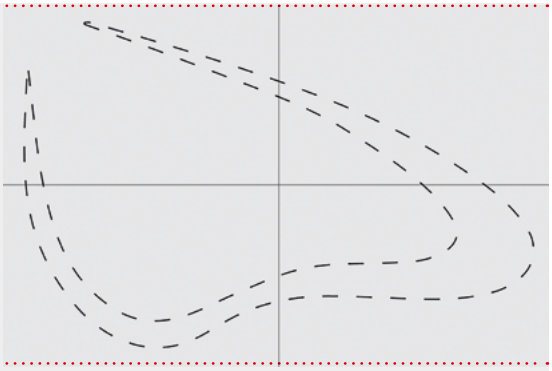
Velocity based power correction:
Enables scan controller to automatically adjust laser power depending on the actual process speed to achieve constant laser power density on the material. This option can be activated individually for each pen used.

Skywriting:
Creates sharp corners and avoids energy burn-in at the beginning/end of the vector due to the advanced synchronization of laser and deflection unit.

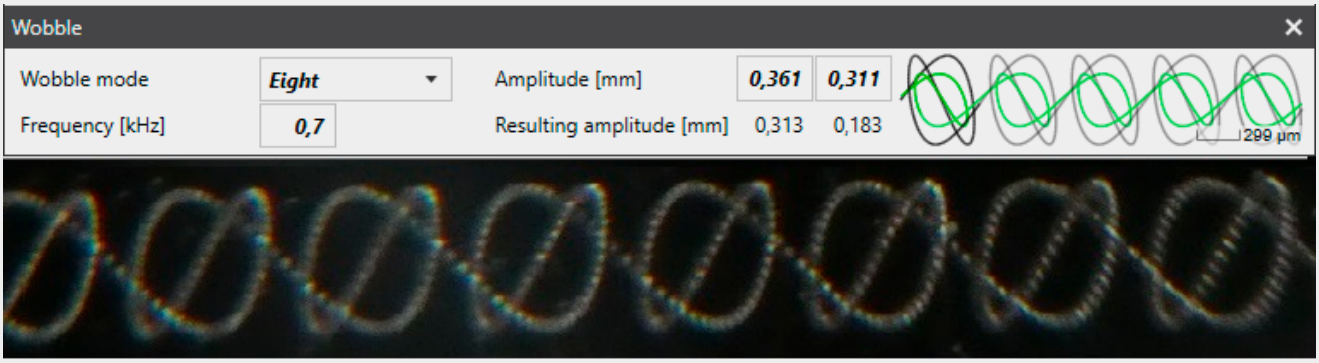


Power ramping:
Advanced laser control for welding applications. Ramping the laser power at start and end of path allows to adapt the laser Impact to individual process request. RAYGUIDE also allows you to compile ramps from several gradients. In addition, you can validate the ramp length to the vector length.

Dashed Line:
Enables to structure vector path with regular or non-regular gaps, independent to the style of the contour, e.g., scribing of easy-opening packaging.



Wobble:
Predefined geometries such as circles, 8 and Lissajous figures are available. Shape preview function eliminates trial and error approach to parametrize chosen wobble shape. In addition, the resulting wobble amplitude get displayed and pop up warnings will indicate if the actual parameters would overburden the deflection unit.



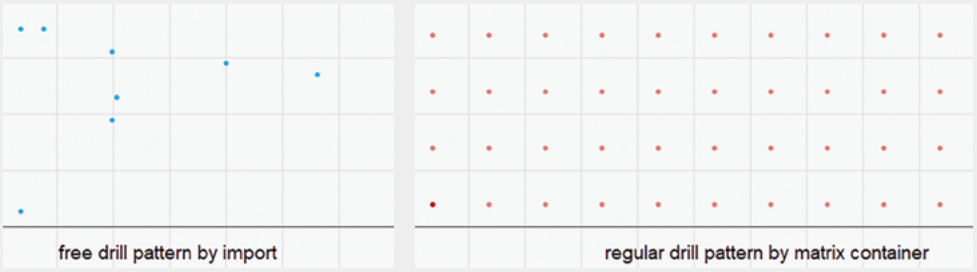
Support of New Laser Models:
Some current lasers require new control options to optimally design the respective processes.

- **IPG YLS AMB Laser / Coherent Highlight ARM** – Definition of two independent power channels plus seperate power ramping.
- **IPG YLPN / JPT MOPA** – Control of optical pulse width (APD Mode).
- **nLight AFX** – Control of beam shape mode.

2.2 | Drill Pattern

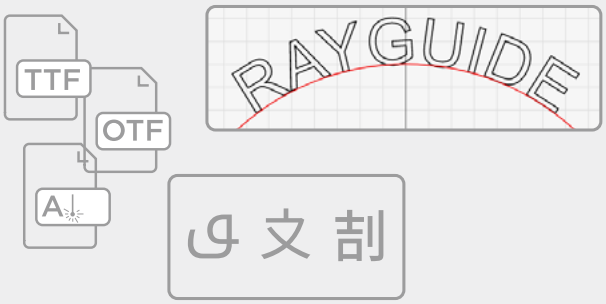
Drill points can be defined by number of pulses or laser on duration.

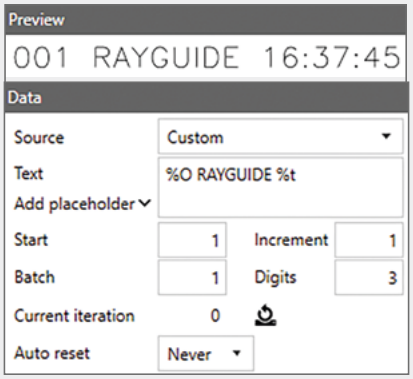
Variable drill pattern can be imported by coordinate table while homogeneous drill pattern can be generated by matrix copy container.



2.3 | Text Objects

- TrueType fonts, OpenType fonts and special laser stroke fonts can be used.
- arious variable sources of text content are available to create, for example, date and time stamps, serial numbers, or the combination of both.
- Optionally, the text automatically fits into a predefined placeholder, regardless of the content or font.

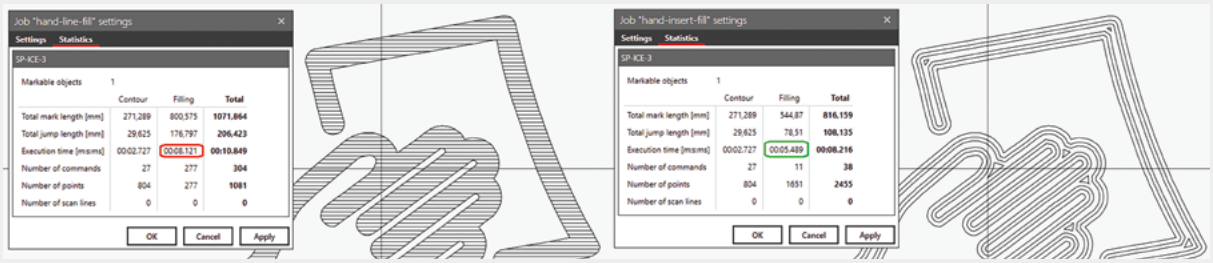




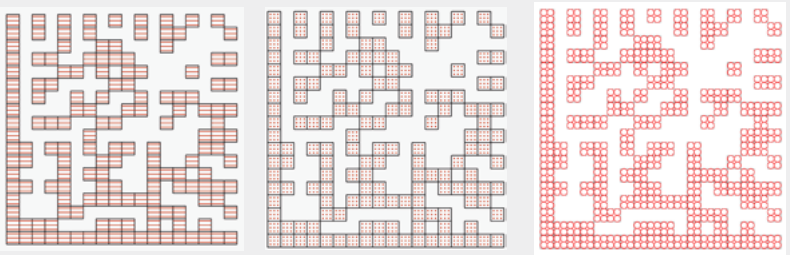
- Configure its processing direction in regular writing direction or opposite.
- Text can also be arranged radial or stacked.
- The UTF16 encoding also allows the transfer of special characters as they can occur in some languages (Japanese, Chinese, Arabic).

2.4 | Filling Structures

- Choose the optimal filling structure to realise short process times. For example, “contour filling” can be faster than “hatch filling”. Or with a “drill point filling” other optical effects can be achieved than with a “hatch filling”.

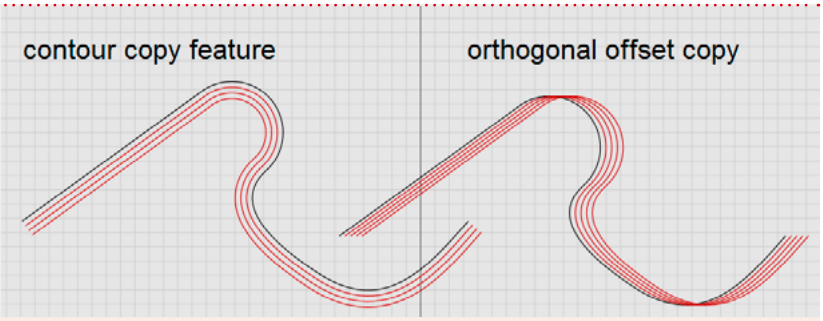


- Simply fill codes with a defined number of fill lines or dots or circles, which are evenly distributed in the code cell by RAYGUIDE.



- Assign filling to individual paths of a graphic.

- Realise special parallel contour lines using fill options.

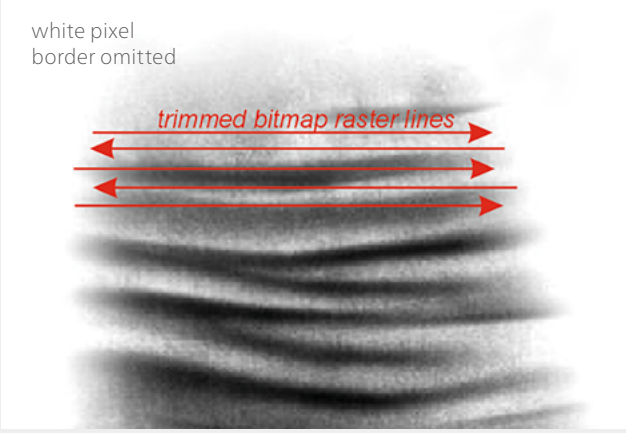


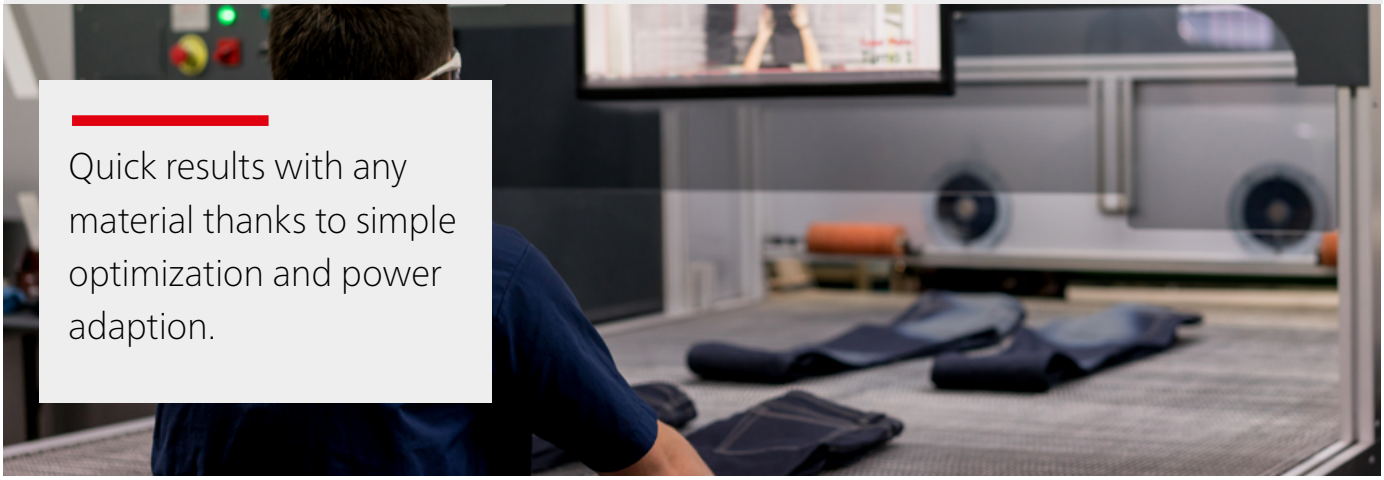
Additional useful options for fillings:

- Processing of the filling itself can be automatically sorted to optimise the process time.
- Fill structures can be stacked.
- Save fill patterns as template for re-usage.

2.5 | Bitmap Marking

- Select from 2 available process modes: Point-and-Shoot or Sprint-Mode.
- Execute bitmap lines alternative horizontally or vertically, which, depending on the bitmap, reduces the number of line breaks, which in turn saves process time.
- Easy Power Scaling to achieve fast result depending on the target material.
- Faster processing by trimming the raster to the minimal necessary.



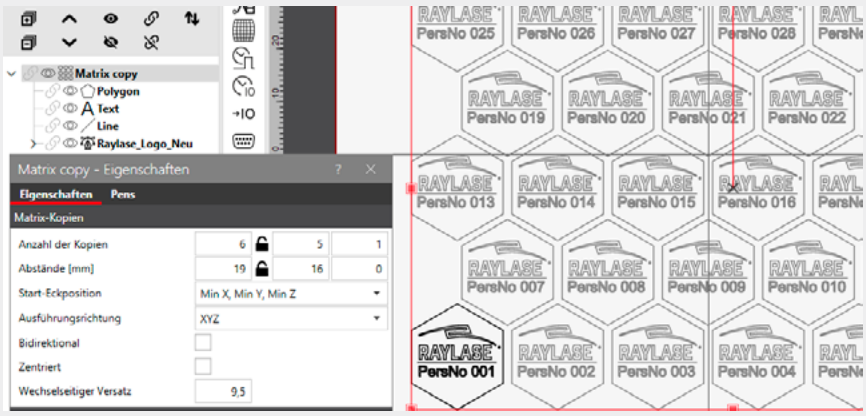


Quick results with any material thanks to simple optimization and power adaption.

2.6 | Multiplying Container

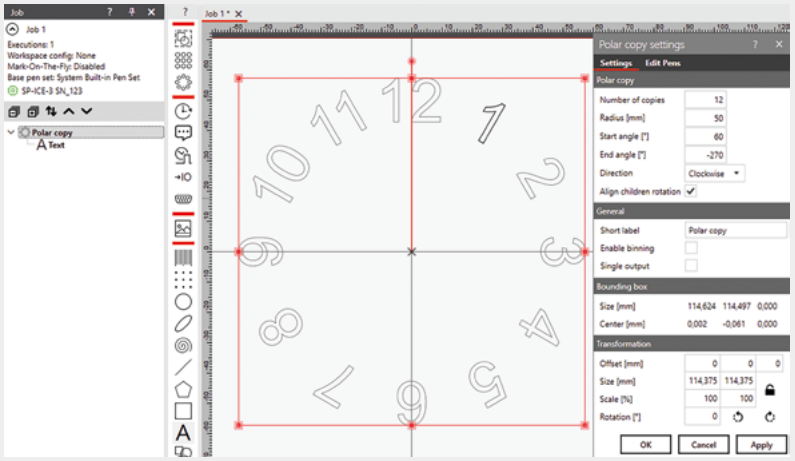
Matrix.Copy-Container

- Polar.Copy container arranges its content in columns/rows. The process sequence can be set flexible..
- By means of the parameter "alternation offset", lines can be shifted in relation to each other and thus, for example, create honeycomb patterns.
- This makes it easy, for example, to apply serial numbers to several objects with defined increments.



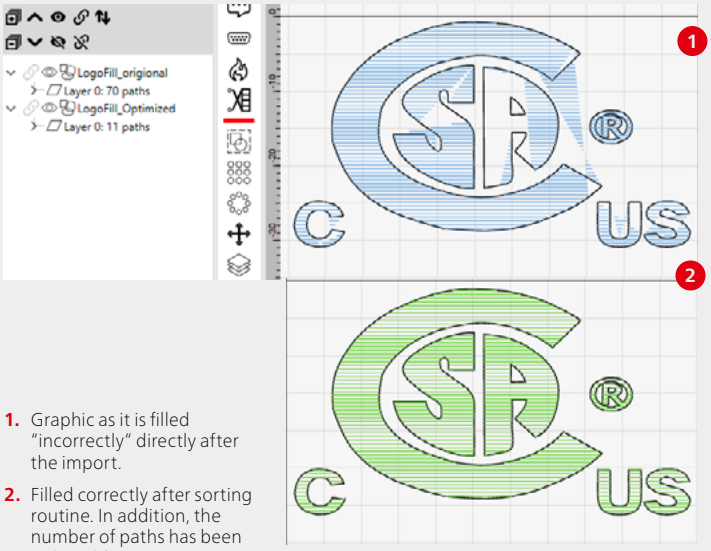
Polar.Copy-Container

- Polar.Copy container arranges its contents along a circular line.
- Option to aligning its elements ("children") in the case that they should point to the centre.



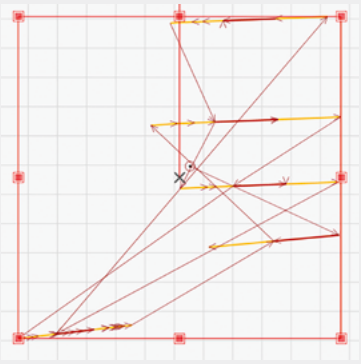
2.7 | Comprehensive Vector Editing

- Edit imported graphic files to align with laser-marking requirements.
- Convert layout object defined by content (e.g., text) into real vector-based objects.
- Optimize marking order easily in job tree by drag & drop.
- Combine or split vector objects.
- Save process time by automatically sorting the vector order with a click to optimise the processing sequence. In addition, you could unite contiguous paths and close gaps in order to fill layouts (correctly).

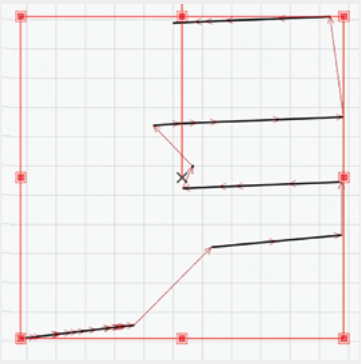


1. Graphic as it is filled "incorrectly" directly after the import.
2. Filled correctly after sorting routine. In addition, the number of paths has been reduced from 70 to 11.

- Easily assign common properties to a selection of several objects (e.g., number of passes).

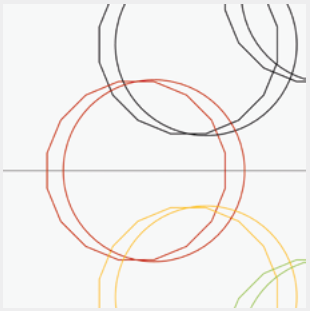


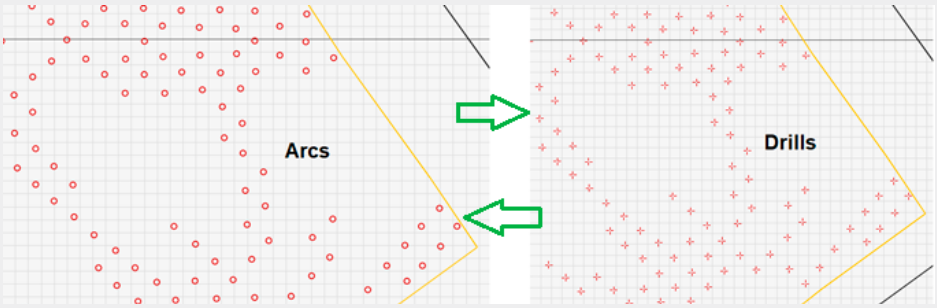
Before sorting routine



After sorting routine

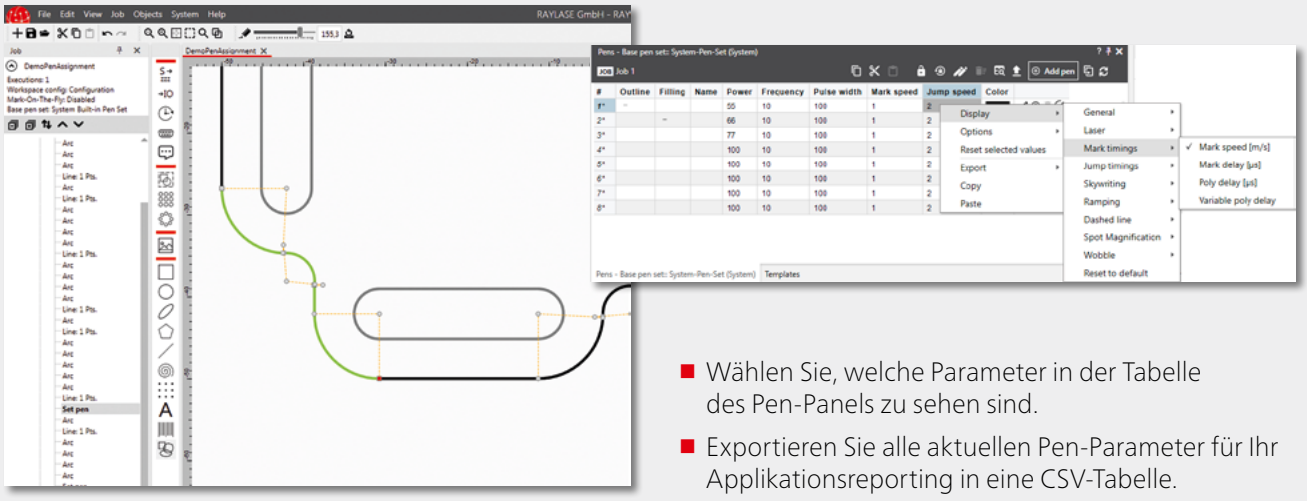
- Convert geometric elements as needed (e.g., arcs to polylines, circles to points etc.).





2.8 | Pen Management and Pen Assignment

- Address all marking quality related features by pen.
- Pen and layout objects are managed independently.
- Unlimited number of pens available.
- Change purposeful individual parameters in a selection of multiple pens.
- Save important pen parameters in the pen library.
- Conveniently assign pens at up to very granular levels: per object, per layer, per path, within a path.

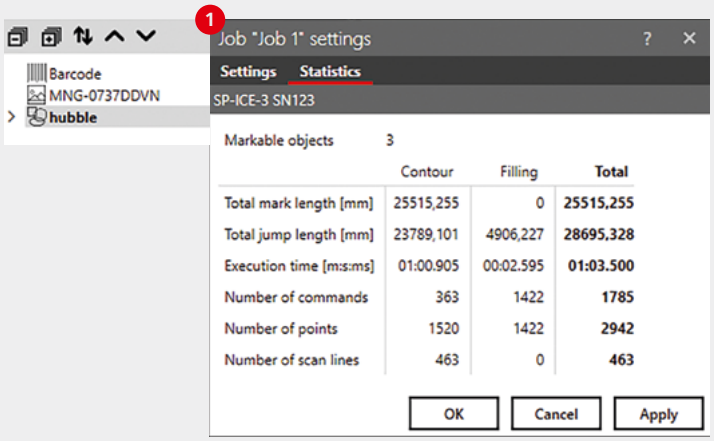


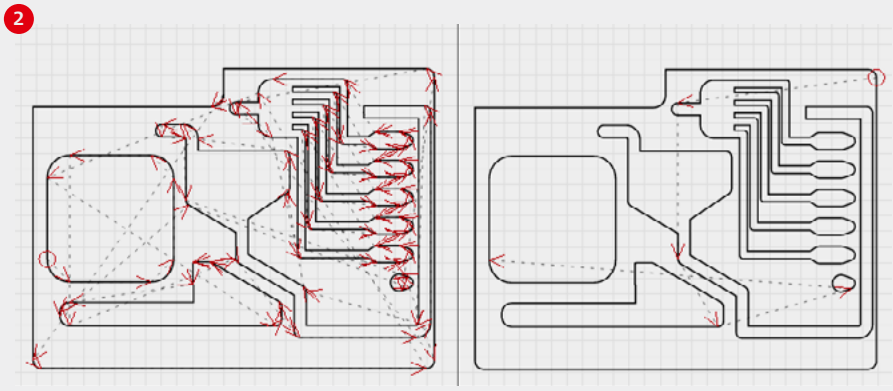
- Wählen Sie, welche Parameter in der Tabelle des Pen-Panels zu sehen sind.
- Exportieren Sie alle aktuellen Pen-Parameter für Ihr Applikationsreporting in eine CSV-Tabelle.

2.9 | Job Analytics

1. Job statistics provide valuable information before execution, such as calculated process times. Detect immediately how changes in parameters or sequence affect the process duration.

2. View options (show jumps, show vector tips) allow a fast insight of the process sequence of the layout and its possible potential for improvements.



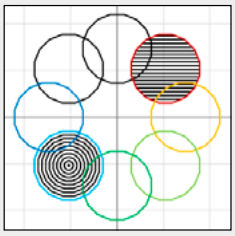


In this sample one might detect fast if there is a potential to optimize process sequence (left before and right after optimization).

2.10 | Using Visible Pointer

Many lasers are equipped with a visible pointer that allows you to verify and adjust the processing position of layouts in advance.

Select from various options to choose what part or how a layout object should be displayed:

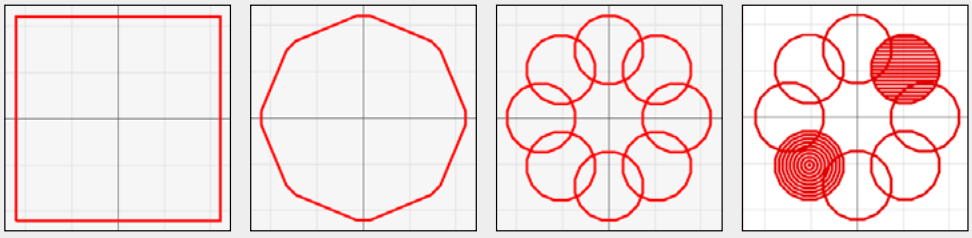


Rectangle: very quick and simple overview

Envelope: quick but somewhat more detailed overview

Contour: detailed display of layout position and space requirements

All: Compared to the contour, also includes the display of fill structures



Rectangle preview | Envelope preview | Contour preview | All preview

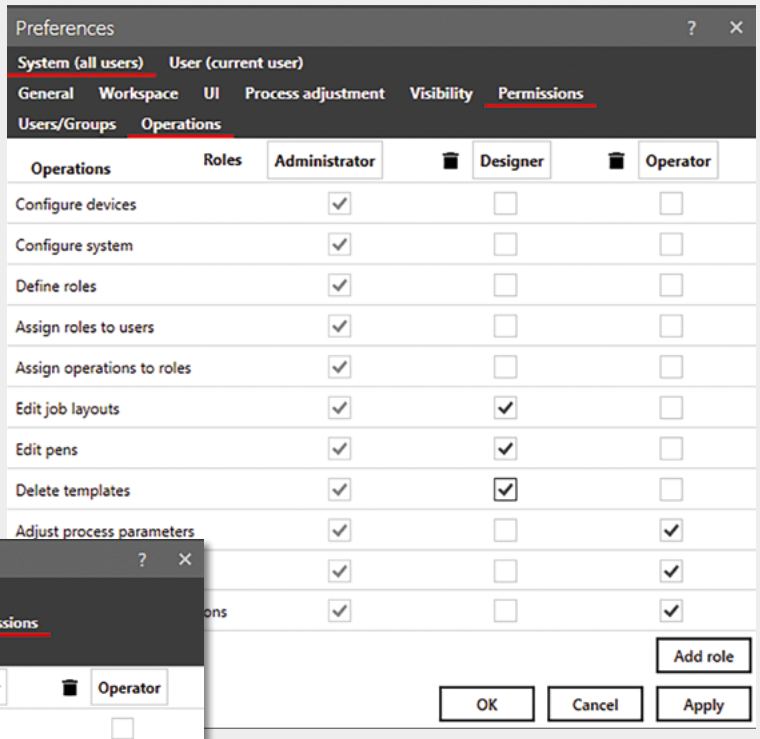
Point: Useful to fit contours to component geometry by displaying discrete geometry points.

Unique feature: edit the layout while the preview is running, e.g., by adjusting its position and move it to the desired position. Detailed editing is also possible. Even a change from one to another object is possible without interrupting the preview.

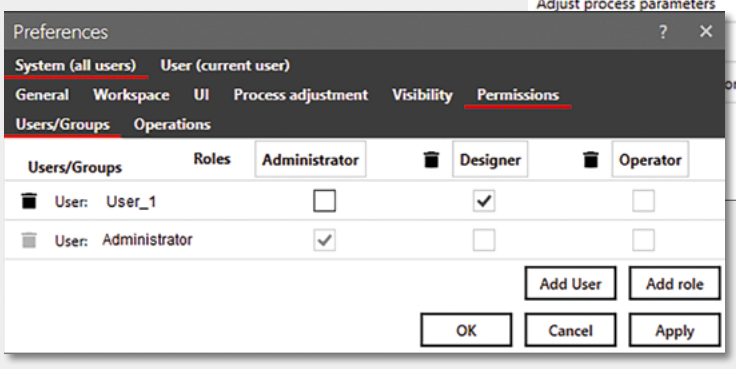
2.11 | User Permissions

Convenient task management and always up to date thanks to easy user assignment.

- Allow system owner to establish different user permissions.
- No additional user management needed since RAYGUIDE uses Windows user/user groups.
- Flexible assignment of user roles and their allowed actions.
- If editing is restricted, the related dialogs become read only for reviewing.



Covenient and flexible set up of different user profiles possible



3

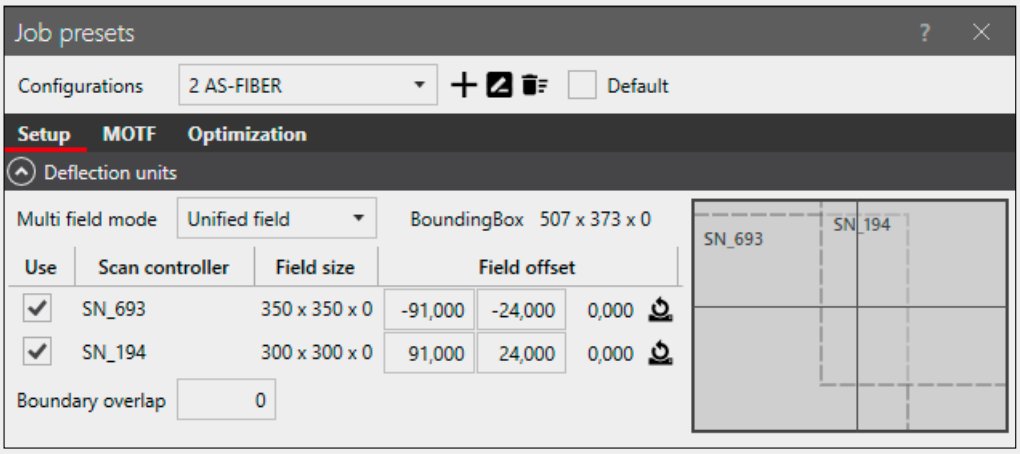
Features For Demanding Process Requirements

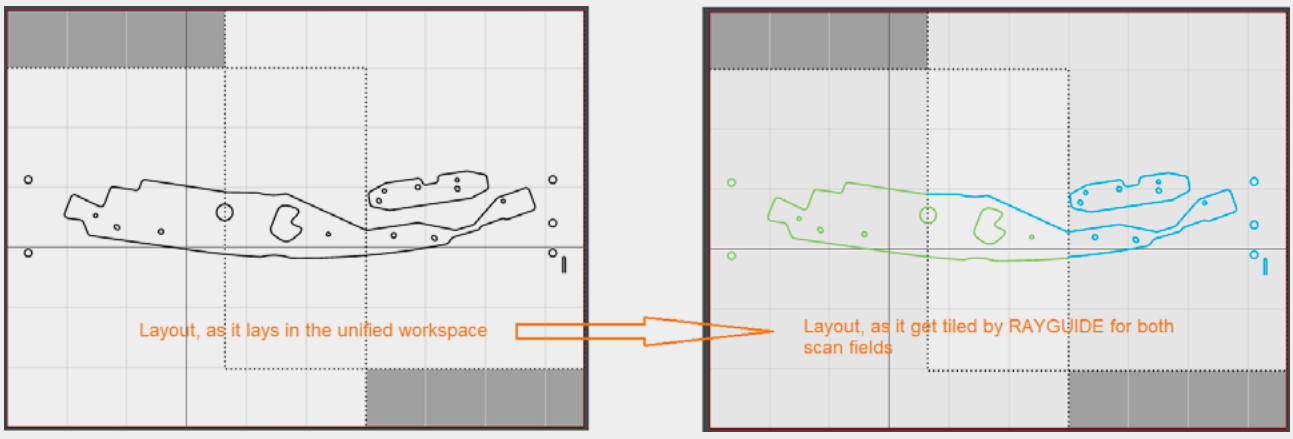
3.1 | Multiple Scan Field Management

Define the arrangement of the scan fields as specified by the machine setup, so that the display in the viewport reflects reality.

Drei Varianten stehen für die Nutzung von Mehrfach-Scanfeldern zur Auswahl.

- **Unified:** Use the scan fields provided by multiple deflection units as a contiguous workspace. With combined scan fields, RAYGUIDE automatically splits spanning graphics, but tries to avoid separating laser paths where possible.
- **Intersected:** Divide the processing task among several deflection units covering a superimposed working area to save process time.
- **Individual:** Execute the same job in parallel on several deflection units synchronised.

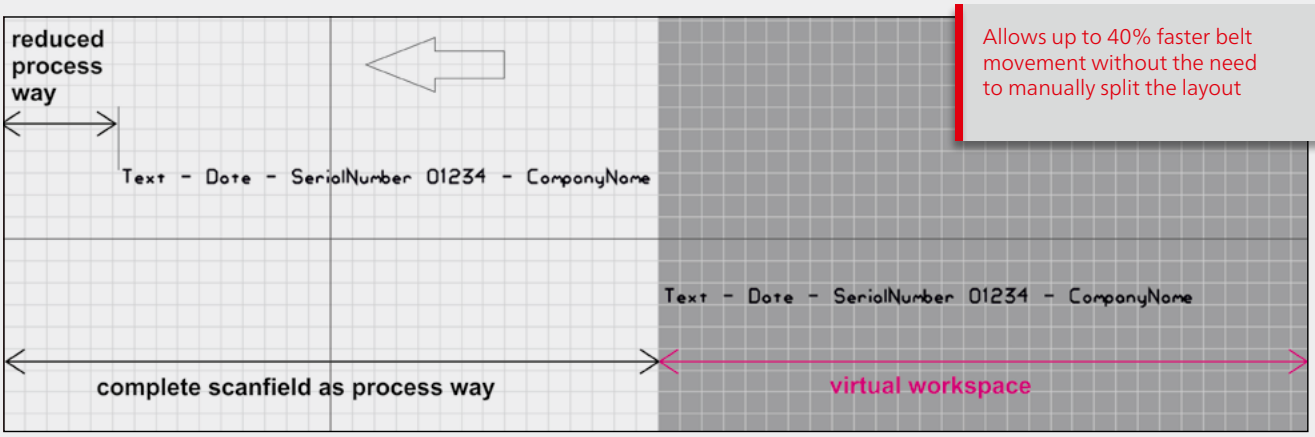




The example shows a contour that extends over both scan fields. However, only the laser paths that do not lie completely in one of the two scan fields are cut.

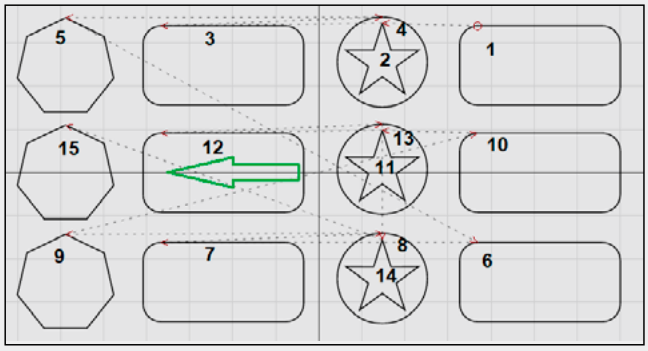
3.2 | Marking-On-The-Fly (MOTF)

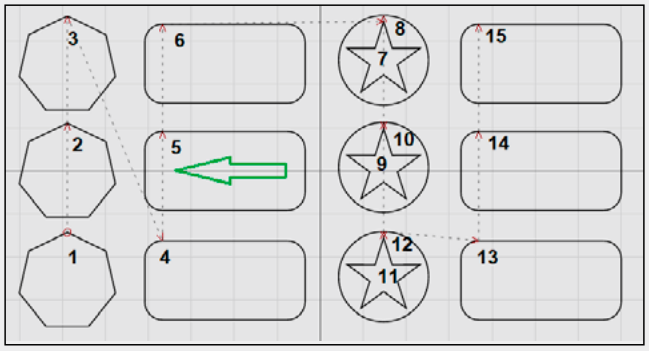
Define the **"virtual workspace"** to also place objects outside the scan field to achieve the maximum possible process way in the field.



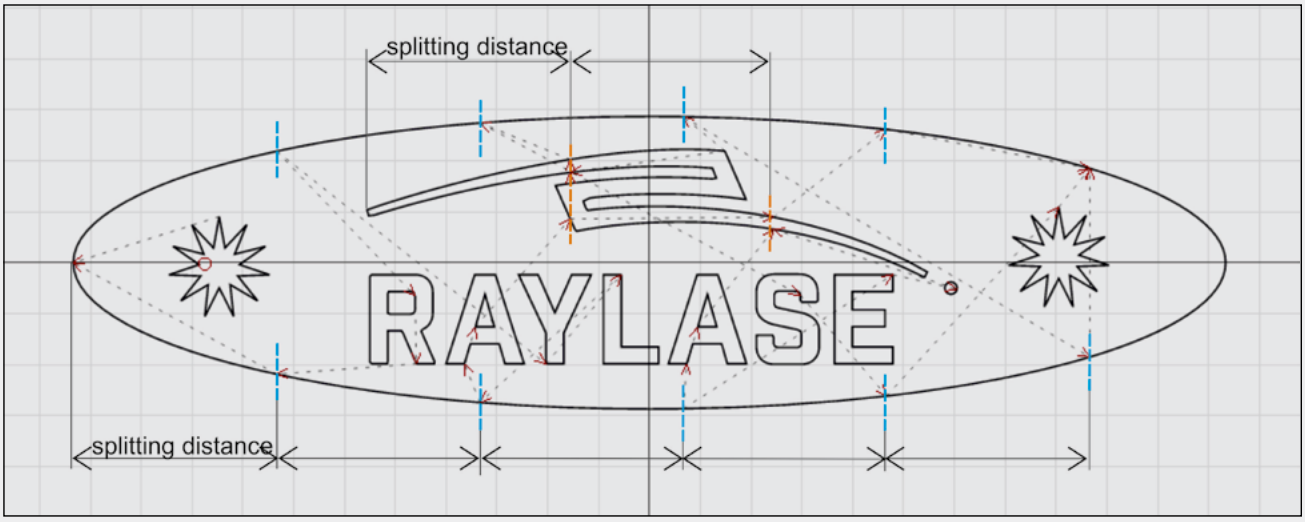
Allows up to 40% faster belt movement without the need to manually split the layout

By means of **automatic sorting**, the paths are processed in the sequence required by the direction of belt movement for a fast belt speed:





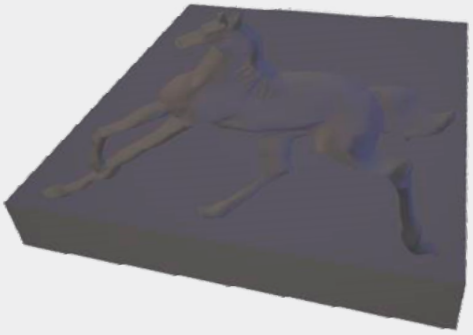
Only necessary paths that exceed the limit that have been set shall be "split" accordingly:

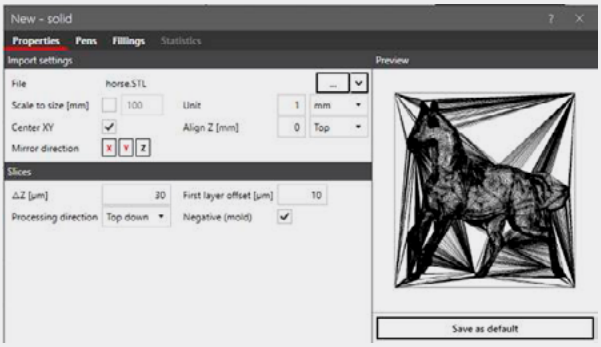


- Use the simulation encoder to evaluate the maximum belt speed.

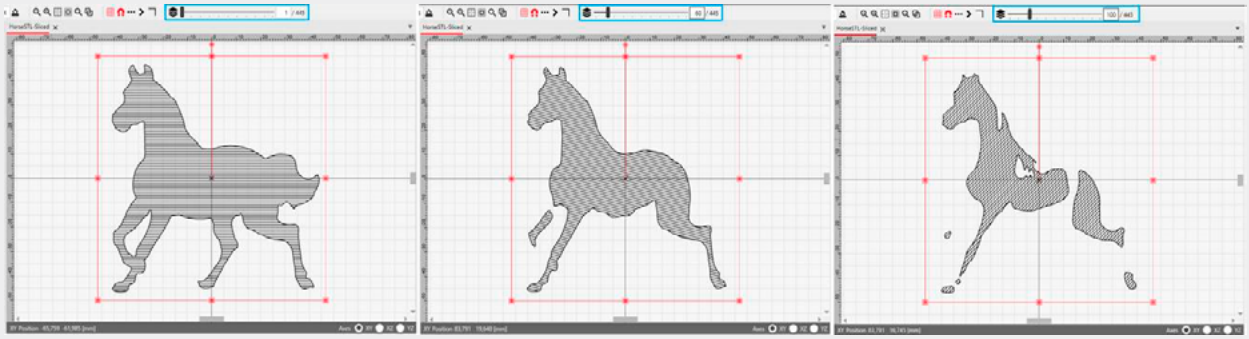
3.3 | Processing 3D solids for deep engraving processes

Import 3D solids whose shape is to be engraved into the material. The software automatically determines the slices based on your specifications and processes them one after the other in the corresponding focus positions. Provide the 3D solids as positive or negative volumes defined in STL file format.



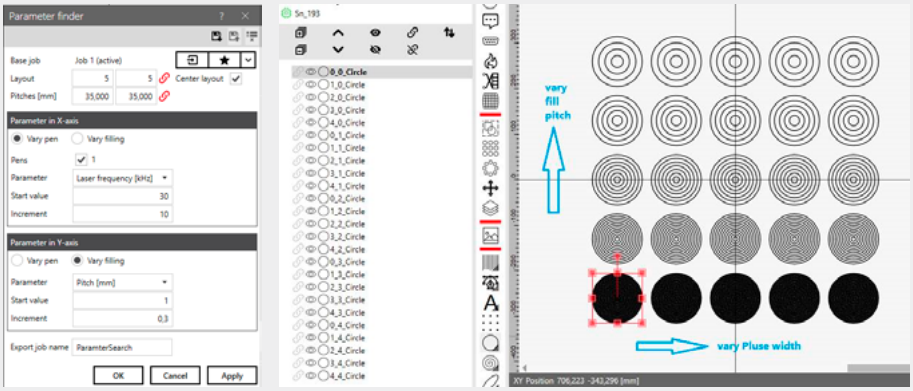


To optimize the process, one can combine each slice with a sequence of several passes with different process parameters. Using the "slice-navigator" you can track the changes of the slice shapes for each focus position.



3.4 | Parameter finder

To quickly determine the desired process parameters for the desired process result, a matrix of parameter variations can be generated. Parameters concerning the deflection unit (speeds, skywiriting) as well as those concerning the laser (power, frequency) can be varied. The fill pitch can also be changed incrementally. You are free to choose the geometry with which you want to design the parameter search. Finally, simply save the appropriate parameters in your pen library for further use.

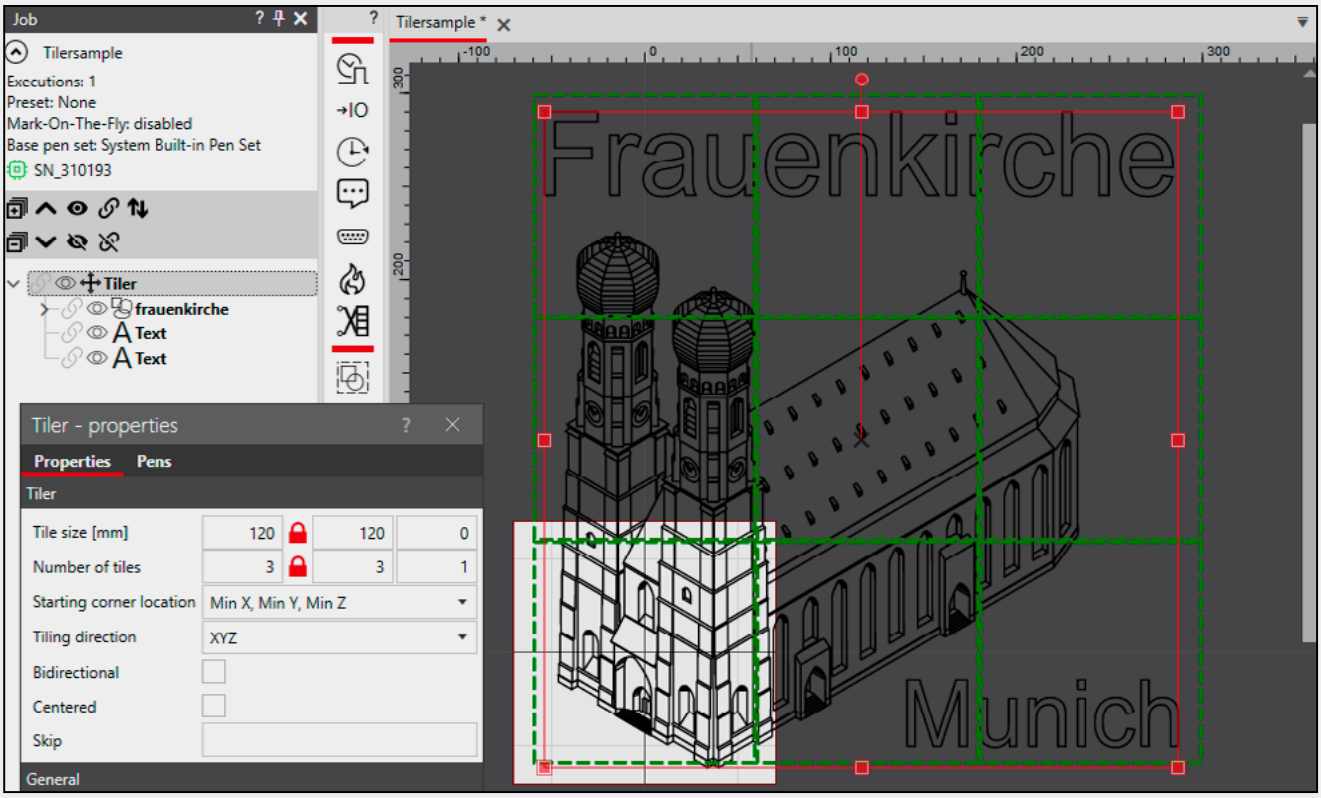


3.5 | Sequences and Z-Shifter-Container

- By means of a sequence, you define a process succession where the process parameters for a layout object can be changed in several repetitions to achieve the desired effects on the material.
- hatch filling can be offset and/or rotated per sequence to avoid scoring during deep engraving.
- Layout objects that are placed in the Z-shift-container pass through several focus positions in which they are executed, for example, to get engraved into the material depth.

3.6 | Processing Oversized Graphics

- The tiler-container allows you to process layouts that are larger than the scan field.
- By using the container property, even several layout objects that have been put together are split up as one overall image.
- Empty segments can be omitted.
- The process sequence of the tiled segments can be set flexible.
- Place IO automation objects in the container to synchronize the laser process with PLC-controlled axis movement.



3.7 | Solar-Wafer Plug in

Import module: Using a special import function, individual line elements are combined to form a dashed-line dash patterns with varying dash lengths are also permitted. Due to the associated elimination of many delay times and the optimised use of the SKYWRITING function, the process times can be reduced by up to 60% with improved marking results at the same time.

Designer module: Create the wafer design directly in RAYGUIDE and react flexibly to layout adjustments. The special jerk-limited control that can be activated in this module enables perfect precision (in the µm range) even at the highest process speeds.

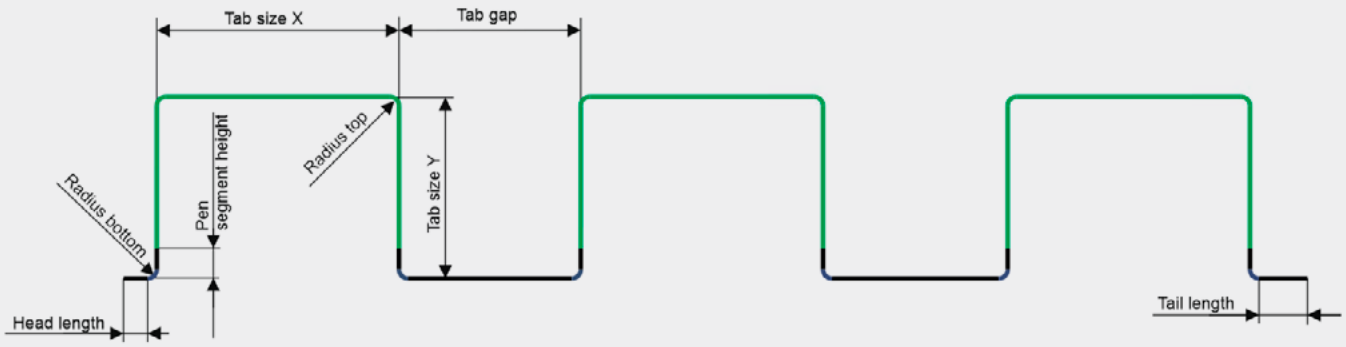
Common DXF Import: 25.654 single pathes

Dashed Wafer Import: 965 dashed pathes
Up to 60% faster processing!

3.8 | Electrodes-Tab Designer Plug-In

This PlugIn is dedicated to the eletromobility application "Cutting of battery foil".

Quickly generate a cutting geometry of a chain with several electrode tabs according to your dimensional specifications directly in RAYGUIDE. You can also specify the height at which the geometry is to switch between two sets of cutting parameters if the cut take place on both coated and uncoated film.

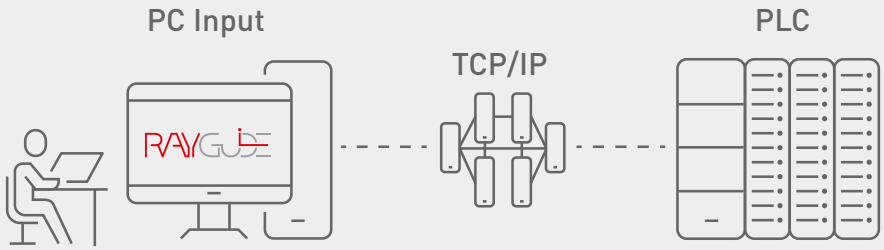


4

Features For Automation

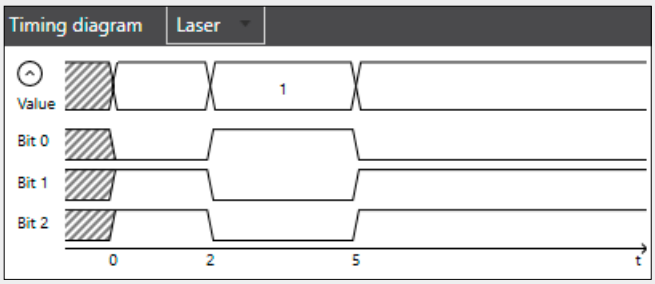
4.1 | PLC-Command-Interface

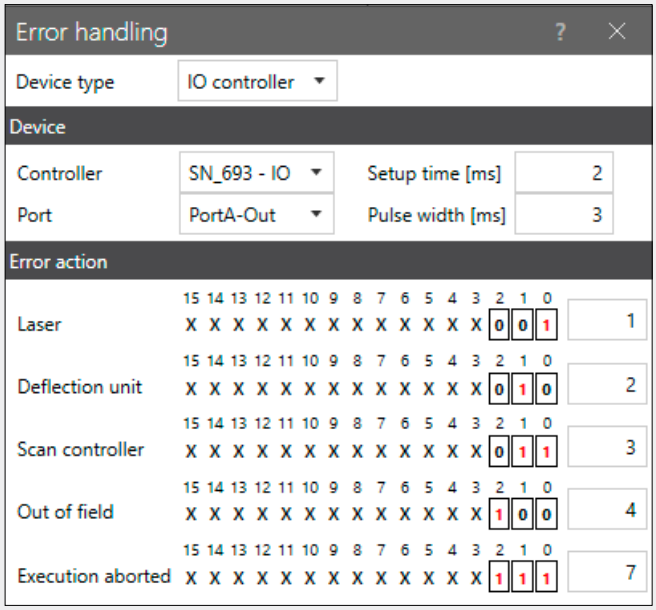
- Remote control of the RAYGUIDE GUI from your PLC via TCP/IP connection using appropriate commands.
- Submit transformations to adapt the position of the geometry to the component position.
- Switch the laser job remotely according to actual part.



4.2 | Automated Communication Of System Malfunctions

- Enables the monitoring of the deflection unit status, and in case of malfunction, forwards the information via IO to external PLC.
- Other system errors such as laser alarms, abort events or control card error messages can also be automatically communicated to an external monitoring centre.

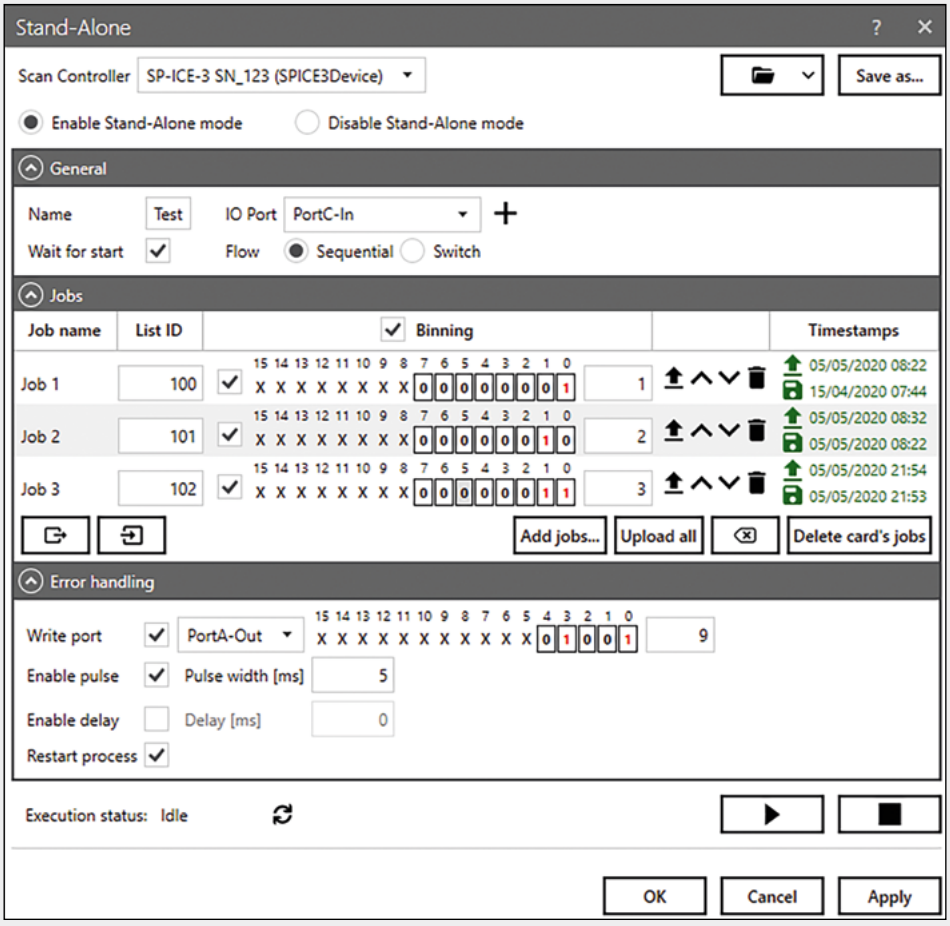




4.1 | Setting Up Stand-Alone Control Card Operation

By preparing the stand-alone mode of the control card, the job execution can be directly synchronized between PLC and scan controller.

- Select and upload multiple jobs in just two steps to the scan controller.
- Easily assign the binning conditions and maintain the job overview by using the csv-export/import option.
- The time stamp display makes any job content that has been updated since the last download noticeable.
- Define the desired action in case of an error event. This includes the option to return to the start trigger without the need to reinitialize the card after an abort.
- Using a previous stored configuration, it is easy to clone the stand-alone setup onto another SP-ICE-3 scan controller.



5

Further Advantages of RAYGUIDE

5.1 | GUI Multitasking

- Full access to all job dialogues and thus the currently used process parameters, while job is running.
- Create and edit other jobs is possible, even while one job is executed.

5.2 | Virtual Scan Controller

- Design and evaluate laser process jobs using the emulated SP-ICE 3 scan controller without a physical scan controller connected.

5.3 | Intergrated Multi-Point-Editor

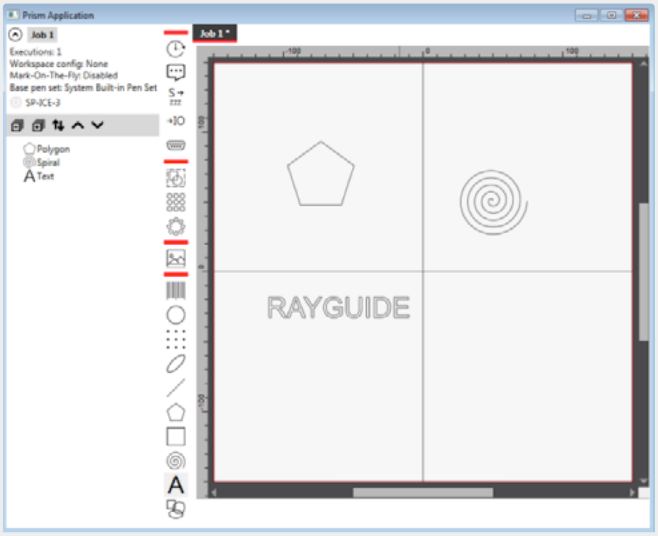
- Ease & Improve field calibration with the powerful Multi Point Editor Tool integrated within RAYGUIDE.

5.4 | Customer Plug Ins

- Use RAYGUIDE as master UI and embed your individual machine feature controls.
- Allows additional hardware controls.
- Allows user to embed specific graphic items.

5.5 | Embedded GUI

- Embed RAYGUIDE as part of your machine HMI which will be the master UI.
- Use only the parts of RAYGUIDE GUI needed.
- Save development time when using ready programmed controls.
- Work with the widely used Microsoft WPF tool to embed RAYGUIDE.



Dialogue with embedded RAYGUIDE instance

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