

→ SpeedMark Tutorial 6

Material Parameter Assistant

SpeedMark Tutorial 6 for SpeedMarker Series | V001_SM-Tutorial (08/2015)
ENGLISH



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1 Objectives of this tutorial

This tutorial will show how to:

- Background information regarding laser parameters and materials
- Project templates for laser parameter finding - available with SpeedMark 3.4

Requires:

SpeedMarker 100, 300, 700 or 1300
20 W preferred (parameters will change for more or less watts)
F160 lens
SpeedMark 3.4 or higher
Parts of different materials (steel, polycarbonate, aluminum, anodized aluminum, ...)



Figure 1: SpeedMarker series



2 Laser parameters for material processing

Depending on the laser application (annealing, engraving, polishing, colour change,...) and on the material (metal, plastics,...) finding the appropriate material parameters is always a considerable part while working with the laser – especially for new materials and new applications.

For processing materials with a laser there are multi-dimensional material parameters:

- a) Basic laser parameters:
 - a. Average laser power
 - b. Speed of the laser
 - c. Frequency of the laser pulses (with different resulting peak powers depending on the frequency)
- b) Additional parameters/settings that lead to different marking results (examples):
 - a. Z-offset from the focal plane (for annealing)
 - b. Filling parameters like hatching distance
 - c. Different dithering algorithms for bitmaps
 - ...

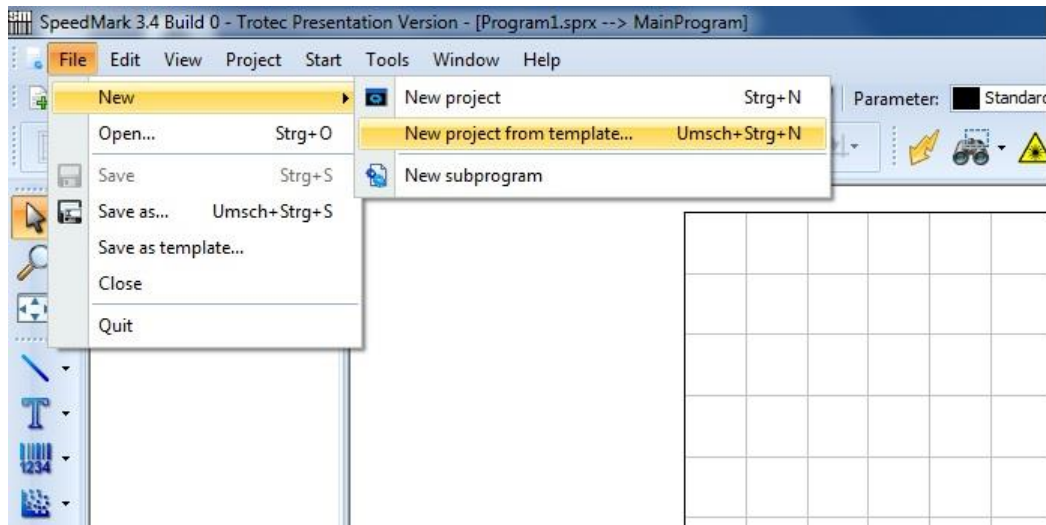
3 Projects templates for parameter finding in SpeedMark

With SpeedMark 3.4 additional project templates for material parameter finding have been implemented. These templates focus on the basic laser parameters:

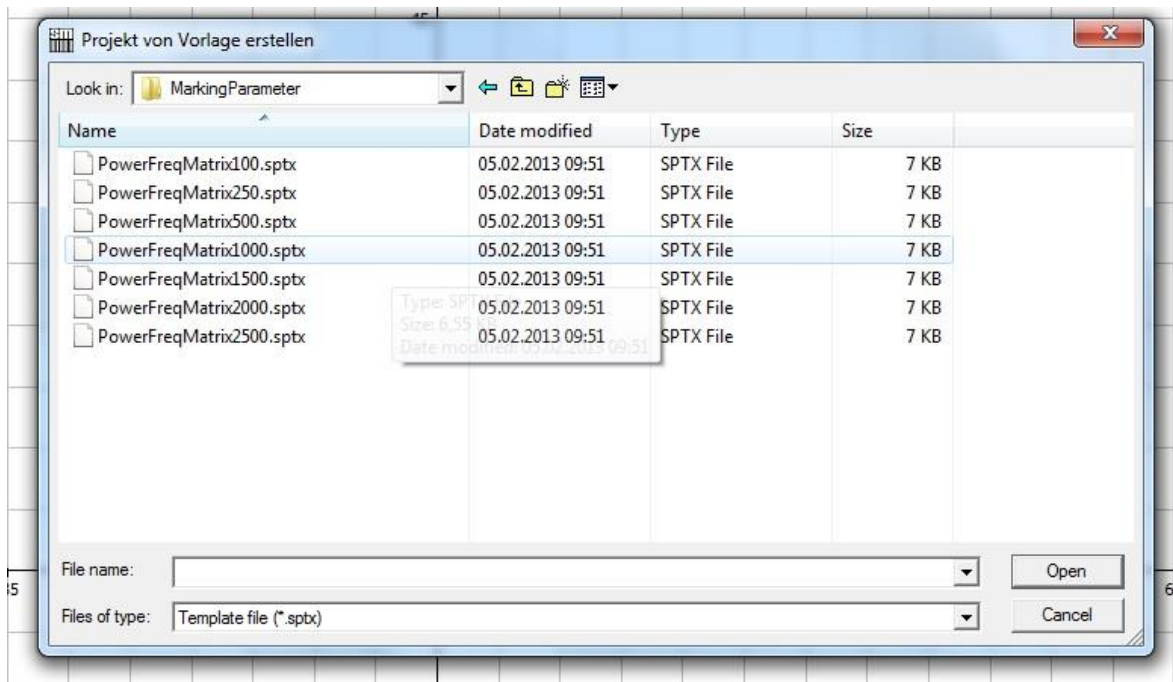
- Average laser power
- Speed of the laser
- Pulse repetition rate (frequency) which results in different peak power per pulse.
The higher the frequency the more pulses per second but the lower the peak energy.



In the "file menu" click on "New" and then on "New project from template" (s. below):

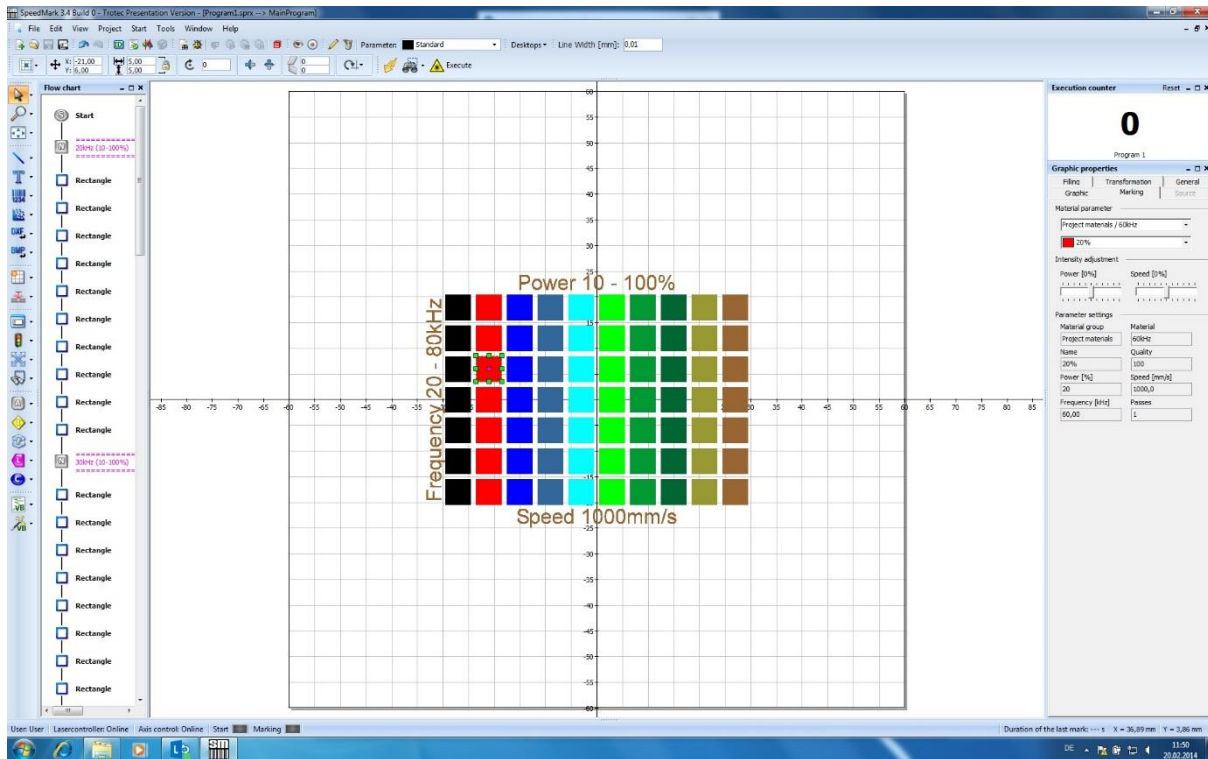


A window with a list of predefined project templates will appear:



These project templates belong to the standard installation of SpeedMark 3.4 and higher and contain a power frequency matrix with a designated speed. Project templates for speeds from 100 mm/s to 2500 mm/s are available as default.

These templates help to mark a raster / matrix on a work piece and to find the best laser parameter:



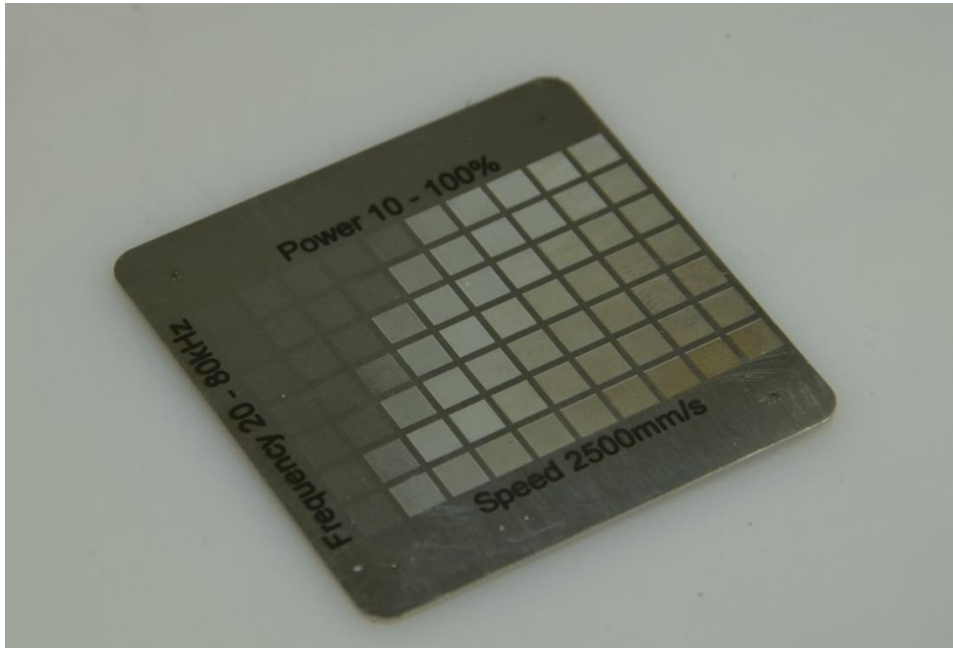
From the left side to the right side, the power is increasing from 10 to 100 %. From the bottom to the top frequency is increasing from 20 to 80 kHz. The different presented colors of the squares represent the same power. For all these predefined templates, the hatching distance (distance of the filling lines of the squares) are set to 0,05 mm.

Try to mark different templates on different materials and observe the results.

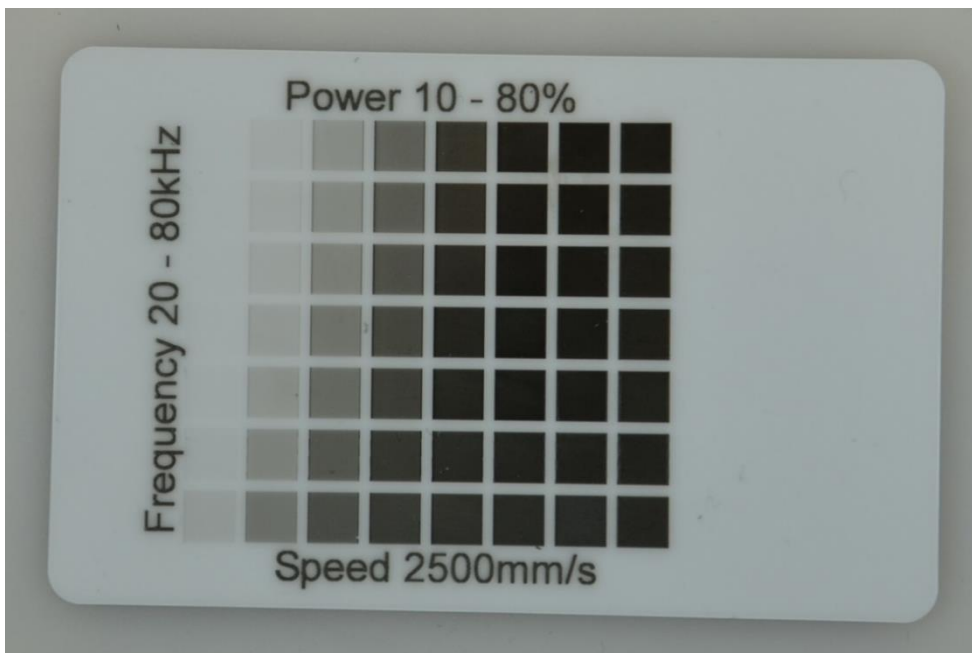


4 Results of material parameter templates

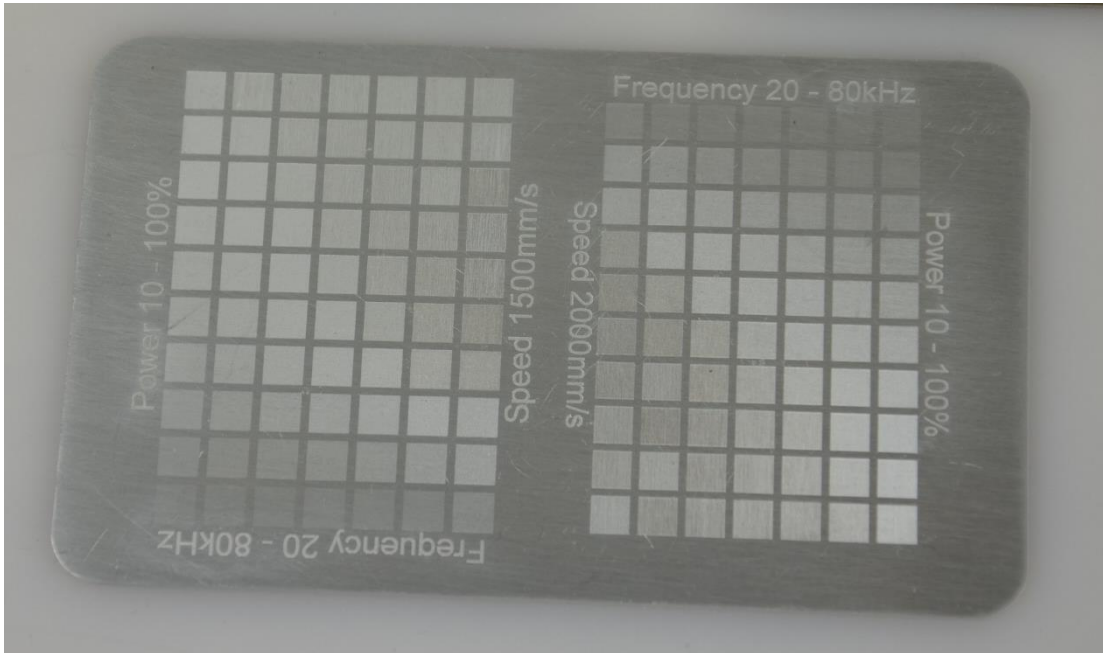
4.1 Polishing of Steel (20 W)



4.2 Color change of Polycarbonate (20 W)

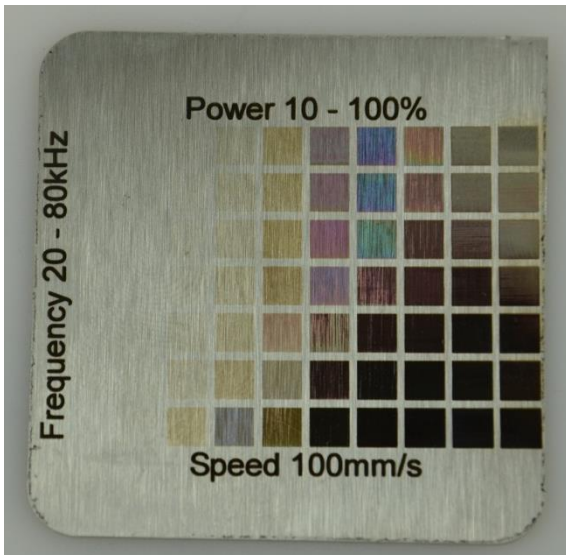


4.3 Polishing of Aluminum (20 W)

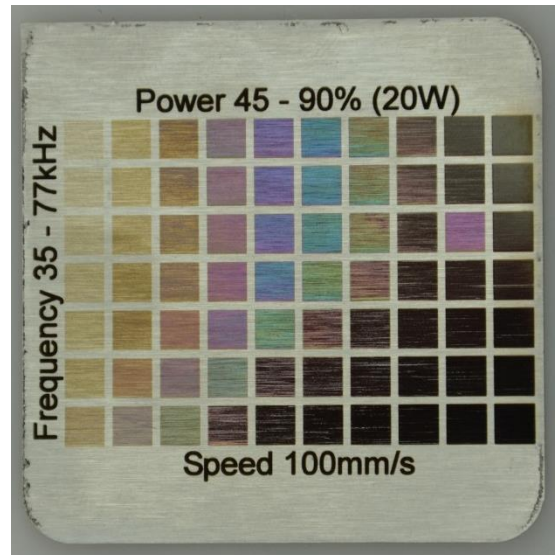


4.4 Annealing of steel (20 W)

5 mm out of focus; hatching distance: 0,02 mm



5mm out of focus, hatching distance 0,02 mm



5 Modification of templates and additional laser parameters

Based on these predefined templates, it is easy to create new templates just by modifying the parameters of the project. Try to do tests with the following examples:

- For annealing processes work out of focus (5 mm offset for F-160 lens). Try different offsets.
- Smaller range of power and frequency with smaller steps (e.g. 45% power to 90% power instead of 10% to 100%)
- Matrix with changing laser power and changing speed but constant frequency per matrix,
- Use of a certain part of the predefined matrix by deactivating certain elements / areas in the default matrix
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Subject to technical changes.

