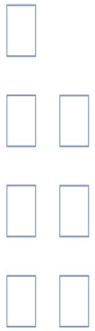


# Low Power Integrated Marking Module

## Quick Start

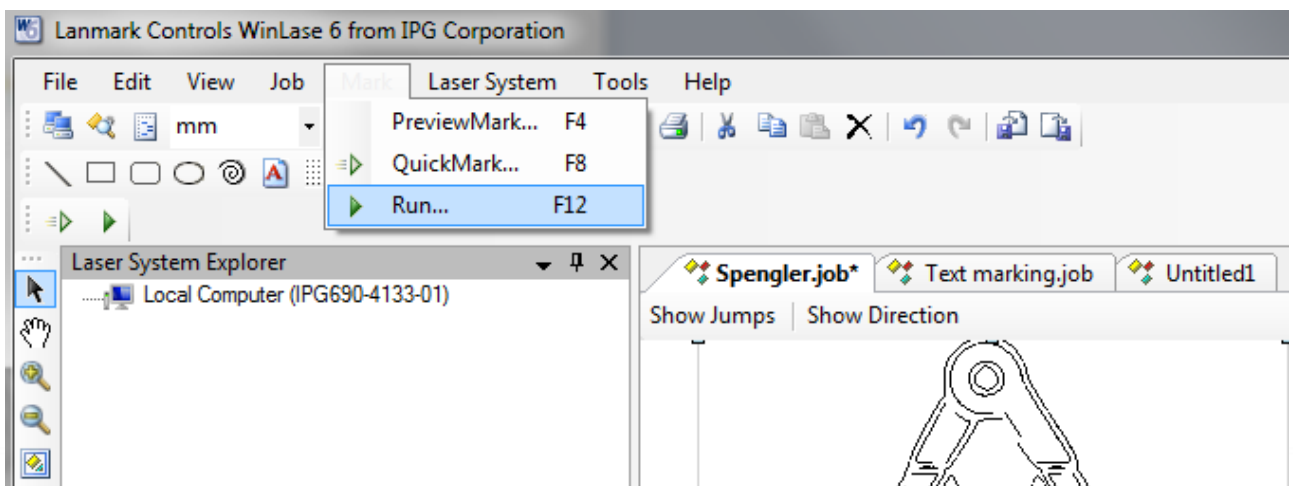


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IPG Photonics  
Confidential  
Information

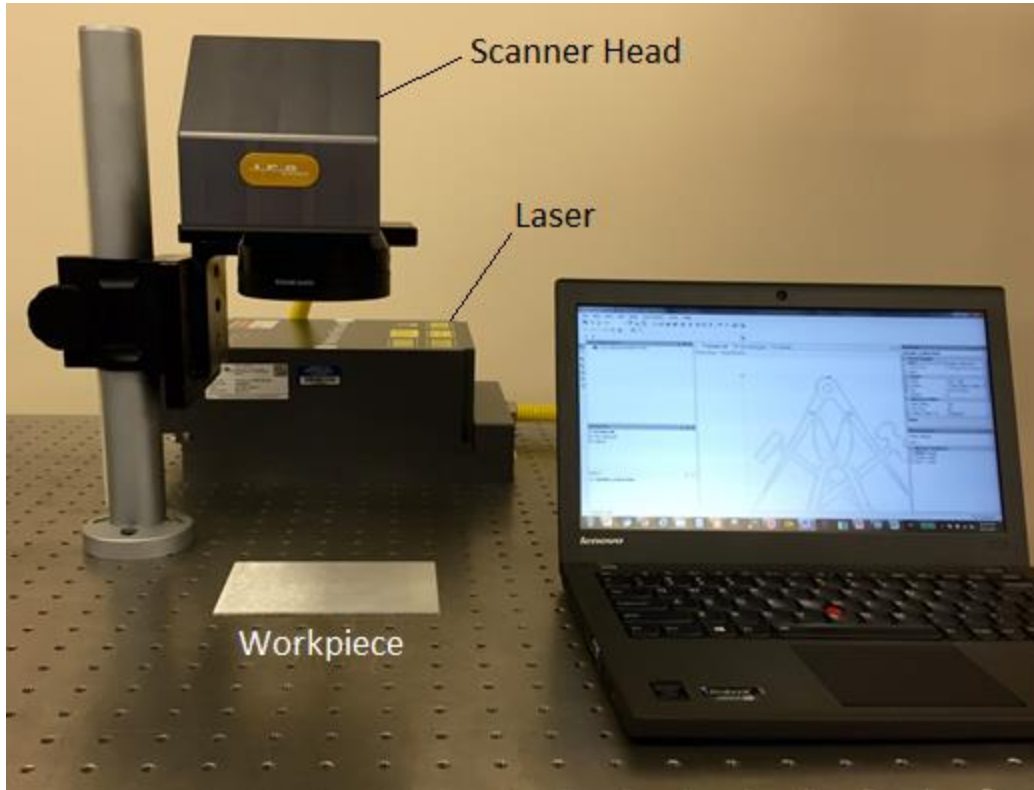
# Introduction

- The Laser Marker Module is a versatile tool that works for a wide variety of materials, including metals, ceramics and plastics.
- Using Winlase software, the marking process can be set up quickly and easily. The artwork can be created by using the drawing tools on Winlase or by importing file formats like:
  - .dxf (drawing interchange format with vector information)
  - .bmp (bitmap images)
  - .hpgl (printer control file format typically used for plotters)
- The user interface of the marker is also included in Winlase. After creating the process file, the marking job is sent to the scanner using the controls in the Mark-menu:



# Set Up Overview

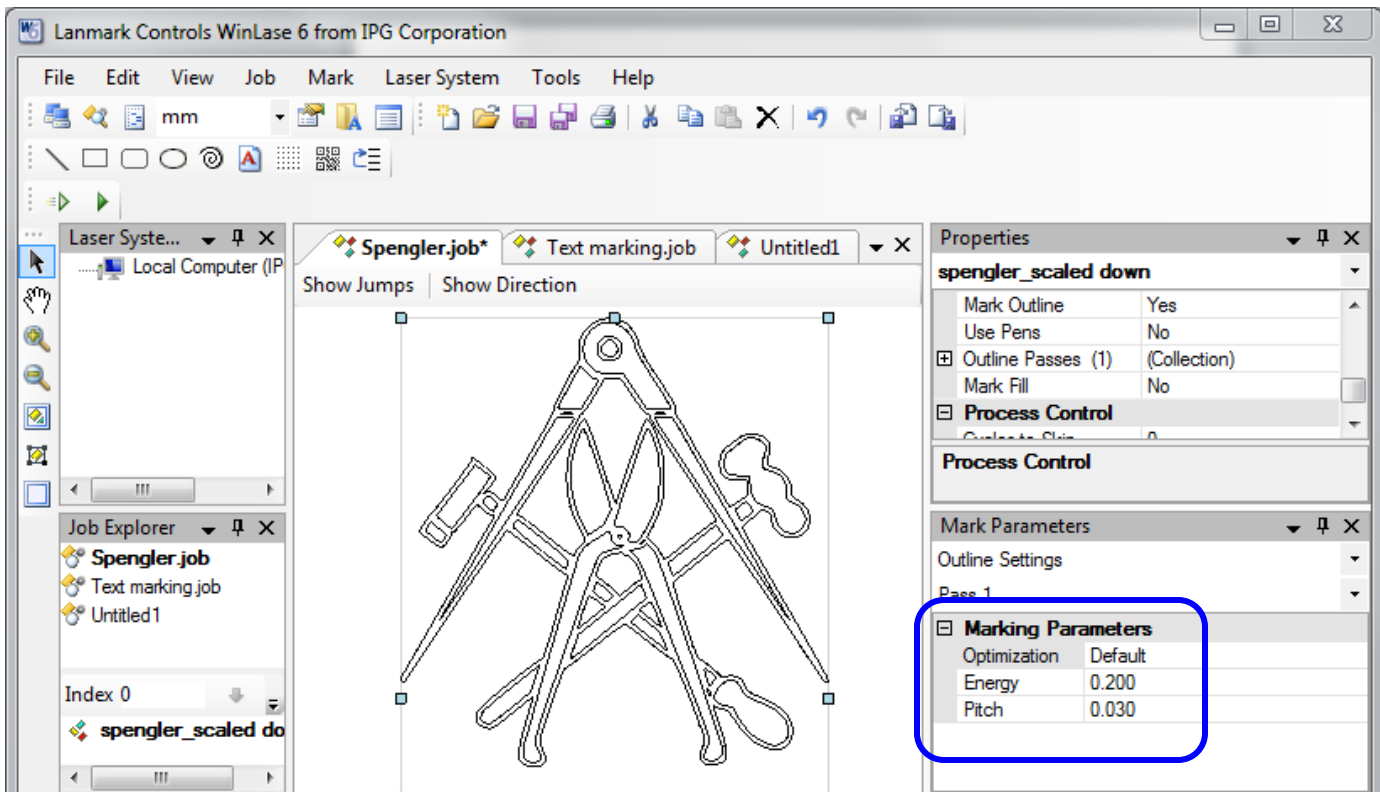
- Winlase-software is used to control both the laser power and the scanner functions



- A fume extractor or a vacuum system is recommended, to remove the gases / particles released during the marking process

# Process Parameters

The most important process parameters can be found in “Marking Parameters” window:



## 1. Optimization – three options under the drop menu:

- **Speed:** This option can be used in applications where the minimizing the cycle time is important. Depending on the material and the file, the marking finish may not be the best possible.
- **Quality:** This option is good for applications, where the marking finish and good contrast are critical. Cycle time is longer, compared to the “Speed” option.
- **Default:** a compromise between the aforementioned two options.

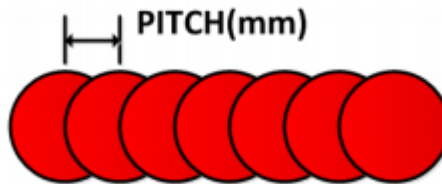
# Process Parameters

## 2. Energy

- Referring to the **energy per laser pulse**. Adjustment range 0-1.0 mJ.
- See page 9 for recommended settings for different materials.

## 3. Pitch

- Pitch is used to adjust the **overlapping of the pulses** on the marking:



- This parameter can be used to modify the contrast of the marking, or to create various dot patterns in the engraving (continuous line vs. perforated line):



**Pitch >> Spot Diameter \***



**Pitch < Spot Diameter \***

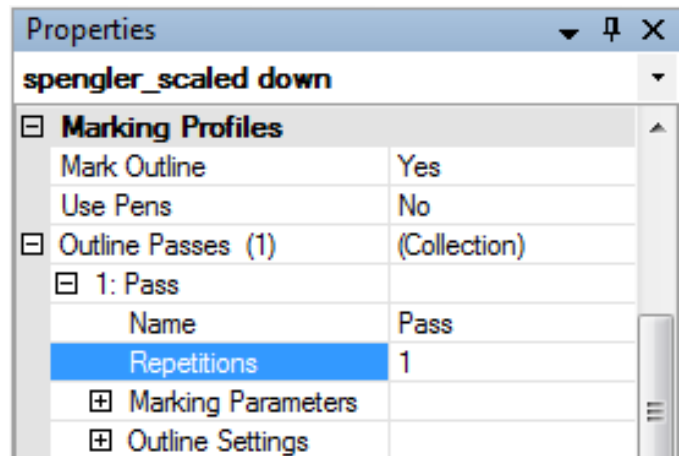
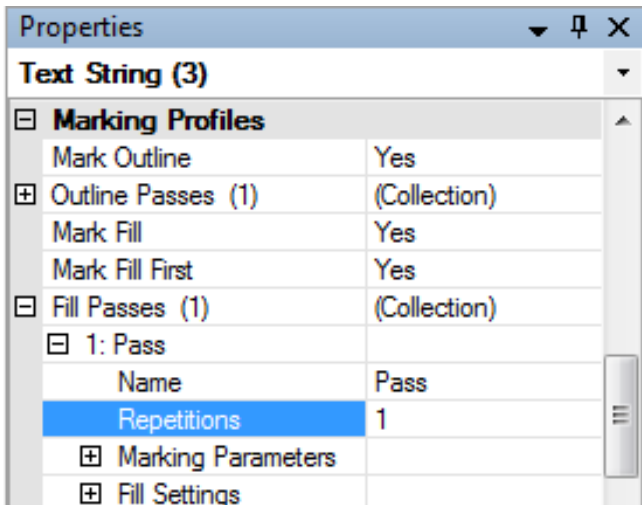
\* Spot diameter is 10-40  $\mu\text{m}$ , depending on the focal length of the scanner lens.

# Fine Tuning the Process

Once the aforementioned marking parameters have been optimized, the marking quality can be fine tuned by modifying the following settings:

## 1. Repetitions

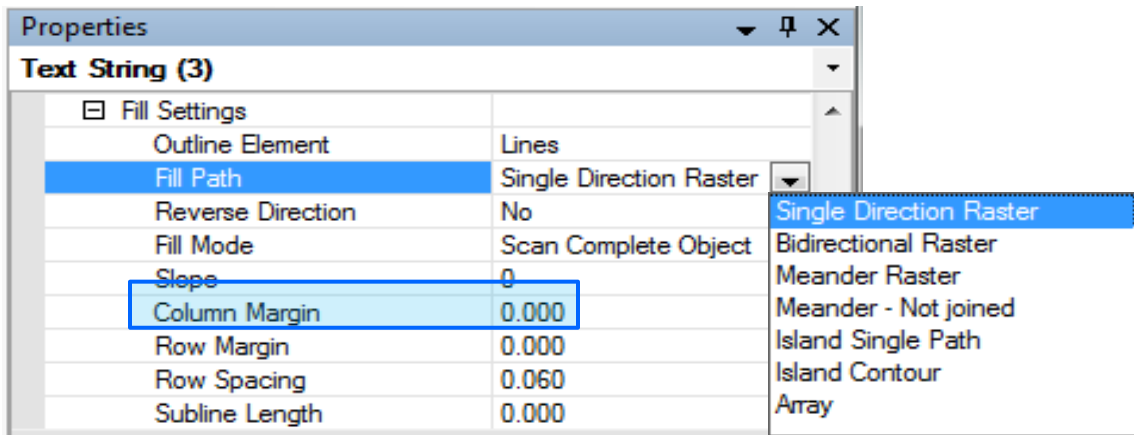
- Sometimes running multiple passes at lower power result in a better result than a single pass at higher power.
- When marking reflective metals, like copper, additional passes can be used to improve the contrast of the marking, if the pulse energy has already been maximized.
- The number of passes can be modified in the Properties / Marking Profiles-window (Fill Passes / Outline Passes → Repetitions)



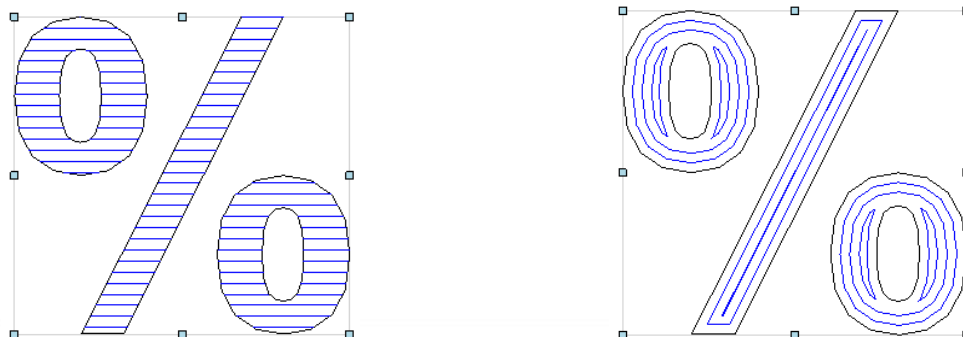
# Fine Tuning the Process

## 2. Fill Path and Spacing

- “Mark Fill” option (under the Marking Profiles-menu) can be used to create various raster fill patterns for closed boundaries, like text objects.
- The desired fill pattern can be chosen under Fill Settings → Fill Path
- The contrast of the marking can be modified by varying the spacing of the fill pattern



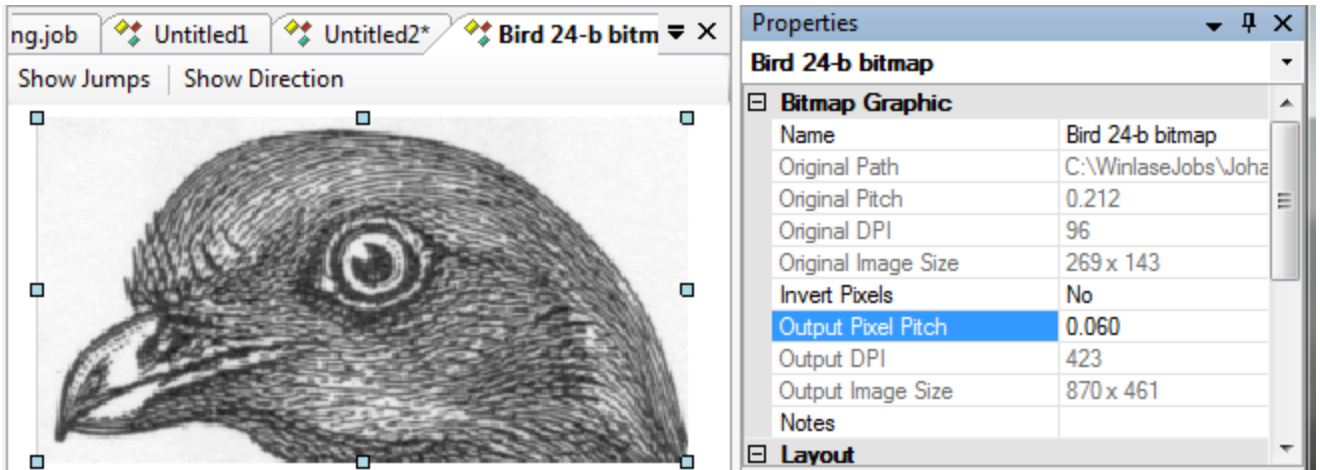
Raster fill examples showing “Single Direction Raster” and “Island Contour” fill patterns:



# Fine Tuning the Process

## 3. DPI / Output Pixel Pitch

- When using a bitmap image for marking, the resolution (dpi value) of the marking job can be modified by varying the “Output Pixel Pitch” value under Bitmap Graphic-settings:





# Marking Parameters for Various Materials

Suggested marking parameters for the scan lens with 163 mm focal length

Material	Stainless Steel			Raw Aluminum		
Process Description	Vector Engraving	Bitmap Raster	Raster Fill*	Vector Engraving	Bitmap Raster	Raster Fill*
Energy (mJ)	0.2	0.4	0.3	0.3	0.35	0.3
Pitch (mm)	0.035	0.04	0.03	0.035	0.04	0.03
Repetitions	2-3	4	4	2	2	2-3

Material	Copper			Brass		
Process Description	Vector Engraving	Bitmap Raster	Raster Fill*	Vector Engraving	Bitmap Raster	Raster Fill*
Energy (mJ)	0.45	0.5	0.45	0.35	0.45	0.4
Pitch (mm)	0.035	0.04	0.03	0.035	0.04	0.03
Repetitions	3	4	3-4	3-4	4	4

Material	Zirconium			Cardboard		
Process Description	Vector Engraving	Bitmap Raster	Raster Fill*	Vector Engraving	Bitmap Raster	Raster Fill*
Energy (mJ)	0.15	0.15	0.1	0.12	0.1	0.12
Pitch (mm)	0.035	0.04	0.03	0.035	0.04	0.03
Repetitions	1-2	2	2	2	1	1-2

\* Raster Fill Pattern Spacing 0.060-0.090 mm

