REPORT: Watch hands made of Brass cutting by laser MicroJet®

for Anonymous

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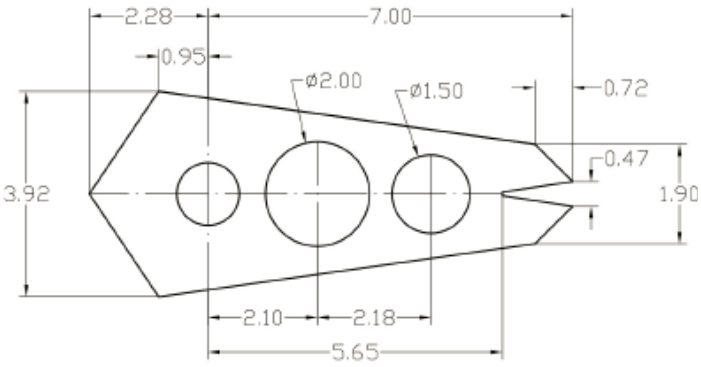
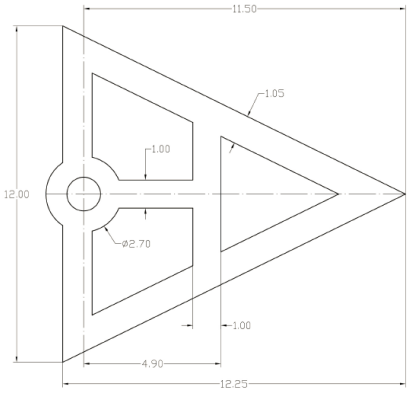
OBJECTIVE

The Laser-MicroJet® technology has been tested for cutting two different watch hands in 0.14 mm and 0.2 mm thick brass plates. The aim was to optimize the quality and the cutting speed.



PICTURE 1: Drawing 1 #45047

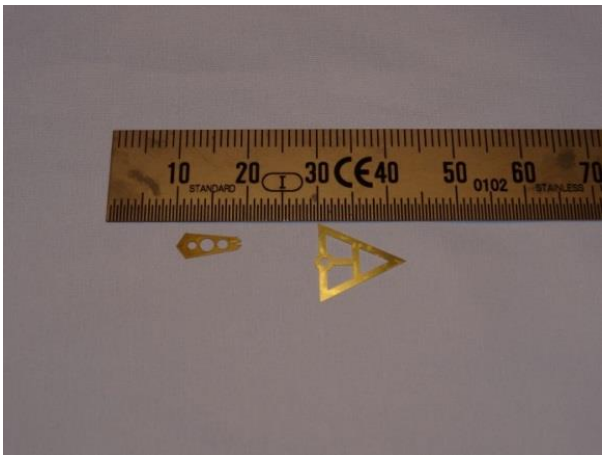


PICTURE 2: Drawing 2 #44153

SAMPLE DESCRIPTION

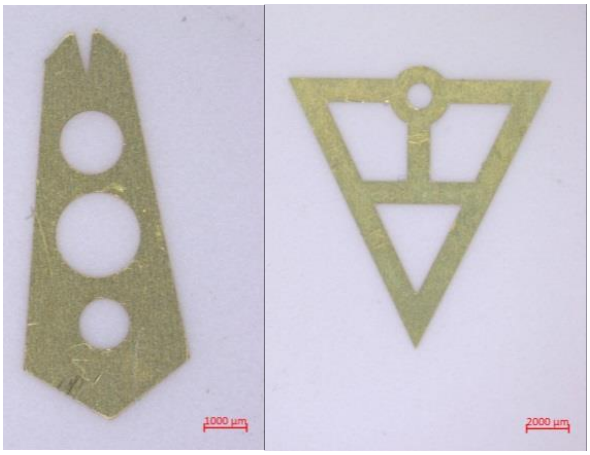
SAMPLE	Drawing	1	2	
	Material	Brass	Brass	
	Thickness	0.14	0.14	mm
	Quantity	3	3	pieces

Release of application report			
Project Leader		Responsible Application Group	
Name:	Florent Bruckert	Name:	Benjamin Carron
Date:	09.11.2015	Date:	09.11.2015
Visum:	FBR	Visum:	BC



PICTURE 3: Macroscopic view of the two shapes after processing, Drawing 1 at the left and Drawing 2 at the right

PICTURE 4: Overview of the production

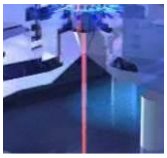


PICTURE 5: Overview of the two sample shapes

PROCESS: INSTRUMENT & TEST PARAMETERS

For these experiments, the LCS300, Nd:YAG laser, has been selected as the most suitable machine configuration available in the lab.

In the tables below, the optimized processing parameters used in the experiments are summarized:

	**SYSTEM**	Machine	LCS300
		Fixing type	Clamped
	**PARAMETERS FOR MICROJET®**	Nozzle diameter	50 *µm*
		Protect gas	He
		Rate of flow	0.9 *L/min*
		Waterjet pressure	350 *bar*
		Working distance	10 *mm*
	**LASER PARAMETERS**	Laser type	L51G
		Wavelength	532 *nm*
	Laser Setting 1	Laser frequency	6 *kHz*
		Pulse width	90 *ns*
		Power in water Jet	7 *W*
	Laser Setting 2	Laser frequency	15 *kHz*
		Pulse width	120 *ns*
		Power in water Jet	18 *W*
	Laser Setting 3	Laser frequency	12.5 *kHz*
		Pulse width	120 *ns*
		Power in water Jet	27 *W*
	Laser Setting 4	Laser frequency	6 *kHz*
		Pulse width	120 *ns*
		Power in water Jet	5 *W*
	Laser Setting 5	Laser frequency	15 *kHz*
		Pulse width	300 *ns*
		Power in water Jet	28 *W*

To carry out this test we have used a single-pass strategy. A single-pass strategy consists in cutting the piece only once on the same contour. The single-pass strategy uses also the start-hole strategy. It consists in drilling a hole in order to then beginning the single-pass strategy in this hole to facilitate the single pass cutting. Every cutting time shown in this report include the time to drill the start hole.

The following tables list the cutting parameters used during the cutting of the six pieces:

TABLE 1: Process parameters

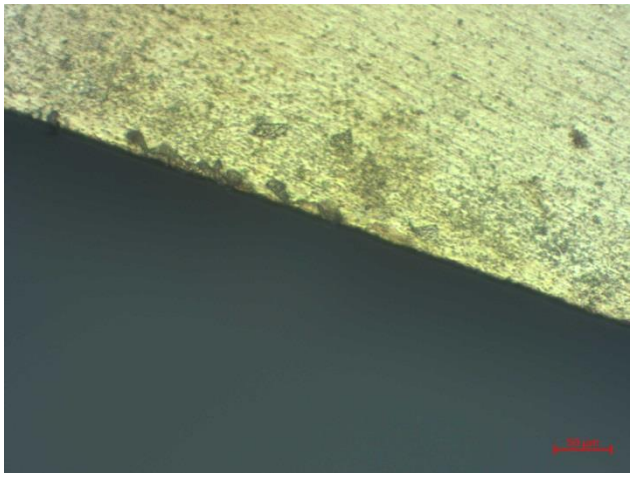
Sample reference	1	2	3	4	5	6
Drawing	1			2		
Laser setting	1	2	3	4	3	5
Cutting speed [mm/s]	0.8	3	5	0.8	5	8
Cutting time	1 min 03 s	24 s	19 s	1 min 57 s	25 s	19 s

RESULTS

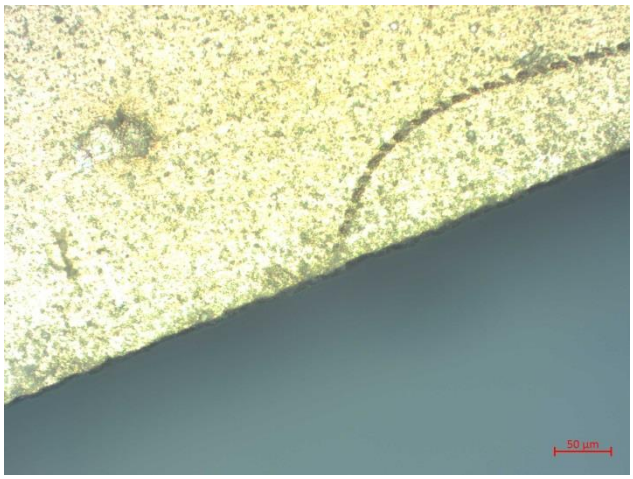
The following pictures show an overview of the cutting quality obtained with the LaserMicroJet®:

DRAWING 1

Sample 1:



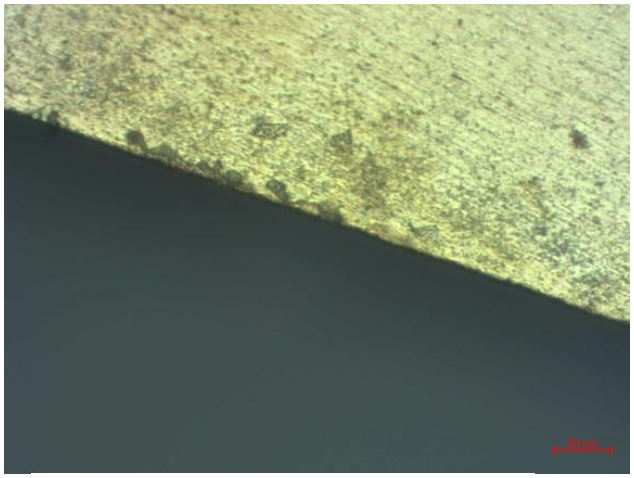
PICTURE 6: Sample 1 front side



PICTURE 7: Sample 1 front side

PICTURE 8: Sample 1 edge

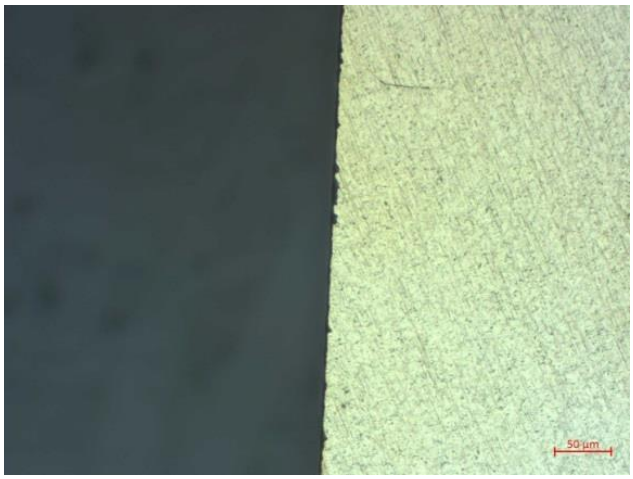
Sample 2:



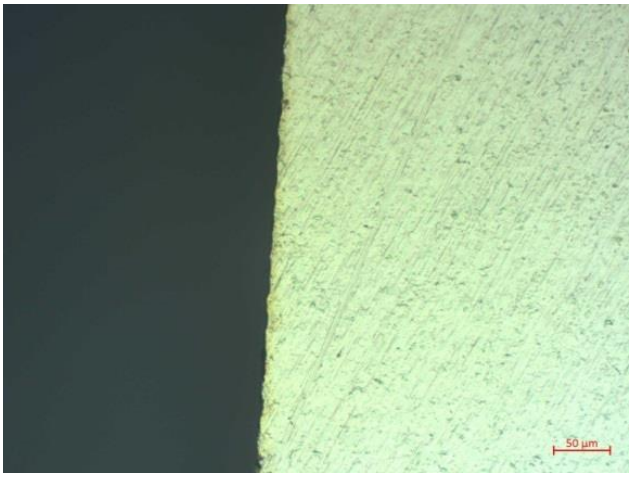
PICTURE 9: Sample 2 front side

PICTURE 10: Sample 2 edge

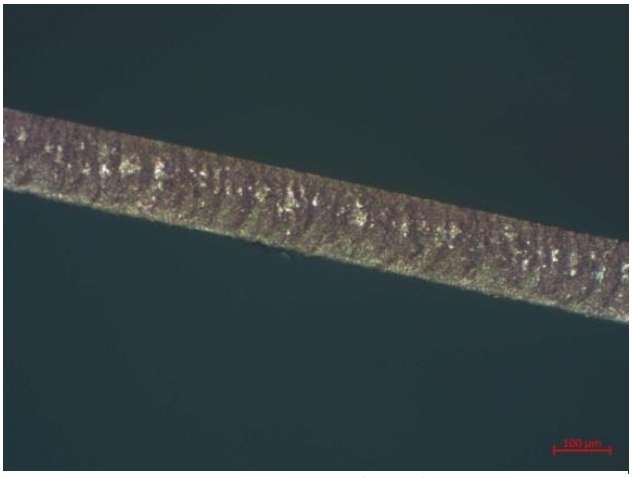
Sample 5:



PICTURE 11: Sample 5 front side



PICTURE 12: Sample 5 back side



PICTURE 13: Sample 5 edge

Conclusion

Two different watch hands made of brass were investigated on SYNOVA LCS 300.
This machine is based on the MicroJet® technology and combines the advantages of a high energy pulsed fiber laser with a hair-thin water jet. While the laser is used for material ablation, the water jet is used for guiding the laser light, cooling the edges and preventing particle contamination, advantages that are essential for metals cutting with high quality.

The tests show that:

- These 2 watch-hand shapes made of brass can be cut less than 20 seconds (maximum speed).
- A higher average power (and RR) leads to a higher cutting speed but results in relative cutting quality degradation.

We are open to further discuss your needs regarding:

- The use of a specific bridge can lead to a general better cutting quality
- Further tests are needed to reach a better quality according to your needs.
- The edge roughness (currently 0.5 mm).

We thank you for your interest in our technology and we hope our results meet your requirements. Our sales agent will contact you soon to obtain a feedback about the analysis of these results and to discuss with you the further steps.