REPORT: X- and V-shapes cutting in brass plates by Laser-MicroJet®

For Anonymous

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1. TASK

The aim of the application is to cut V- and X-shapes on a brass plate of about 400µm in thickness. The cutting pattern is a matrix of ten by ten parts which are to be grooved on the front side. The groove depth is of about half of the thickness of the plate.

The specific requirements are:

- The alignment with respect to centering pins which are on the backside of the plate;
- The quality of the outside edges;
- The quality of the inner edges (for the grooves);
- The accuracy with respect to the dimension (especially with the angles and radii);
- The process time that shall be as low as possible.

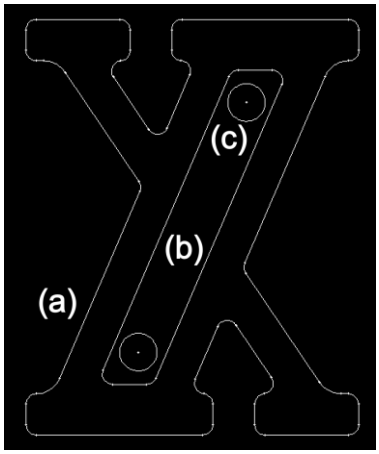

Figure 1: Example of the X-shape, showing the contour (a) to be cut using the Laser MicroJet® technology, as well as the groove (b) and the centering pins (c).

Release of application report			
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2. RESULTS

There have been several steps in the development of this application. Only the final results are presented here. Further development steps might be required in order to improve the quality of the groove (done by hatching).

Four successive steps are needed to process the parts, as follow:

- Hatching of the groove;
- Finishing pass of the contour of the groove at low speed;
- Cutting of the outer contour of the part in a multi-pass strategy;
- Finishing pass of the outer contour at low speed, including a starting hole.

A finishing pass for both the inner and the outer contours is required to achieve a smooth edge and vertical side quality (no burrs and low roughness).

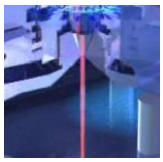
A multi-pass strategy is required for the outer contour, in order to remove the extra material at the entering location of the laser beam.

Below are summarized the laser parameters used:

✓ Specific parameters

	Hatching	Inner Finishing	Outer multi-pass	Outer Finishing
Cutting speed	50 mm/s	0.5 mm/s	5 mm/s	0.5 mm/s
Internal power	11 W	11 W	23 W	23 W
Thickness to be cut / hatched	200 µm	200 µm	400 µm	400 µm
Number of passes	25	1	5	1
Off-set	-0.02 mm	-0.02 mm	0.03 mm	0.02 mm

✓ General parameters

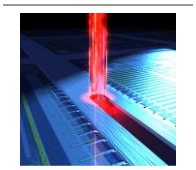


MICROJET® PARAMETER

Nozzle diameter	40 *µm*
MicroJet® diameter	> 40 *µm*
Water pressure	400 *bar*

LASER PARAMETER

Laser type	L101G
Wavelength	532 *nm*
Pulse frequency	6 *kHz*
Average power	Cf. above
Pulse width	150 *ns*



CUTTING PARAMETER

Cutting speed	Cf. above
Number of passes	Cf. above
Overall speed	3 *min/shape*

We present below some illustrations of the cutting tests made with the Laser MicroJet® technology.

Figure 2: Back side of a X-shape.

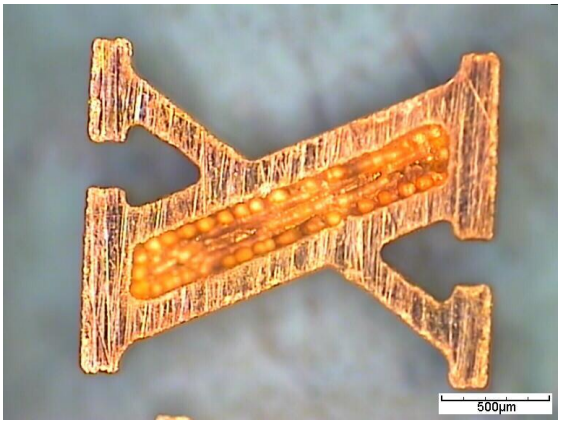


Figure 3: Front side of a X-shape.

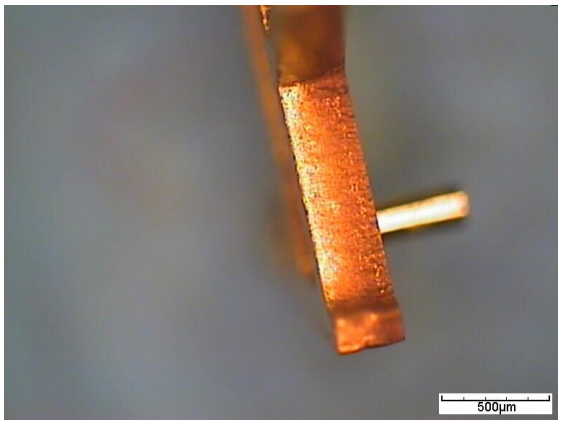


Figure 4: Side of a X-shape.

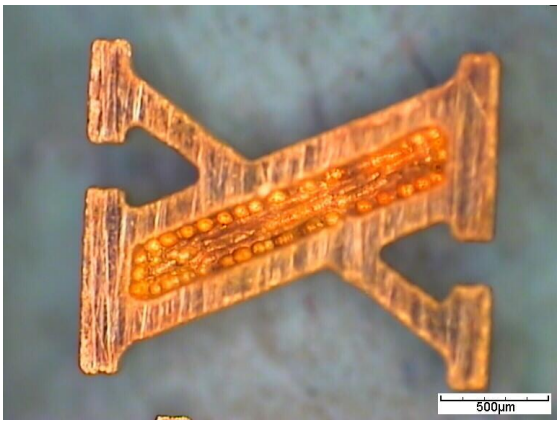


Figure 5: Bottom groove view of a X-shape.

3. CONCLUSION

The cutting tests have been performed with a SYNOVA DCS 150. This machine is based on the MicroJet® technology and combines the advantages of the high energy pulsed 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 the sample from particle contamination, advantages that are essential for processing any kind of materials.

These tests show:

- ✓ A short process time;
- ✓ The ability to be centered with respect to blind pins over long distances along two directions;
- ✓ A very good outer edge quality regarding both the low burr level and the roughness of the side surface;
- ✓ The ability to follow accurately the outer contour , even on small radii and angles;
- ✓ The ability of processing the groove.

We thank you for your interest in our technology and we hope our results meet your requirements.