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The laser machine
as an alternative to a
mechanical engraving
machine

Laser engraving and mechanical engraving are common and popular methods to engrave the surfaces of various materials. Both methods offer particular advantages. To make your business future-proof, it makes sense to offer different technologies. It's a way of differentiating yourself from the competition.

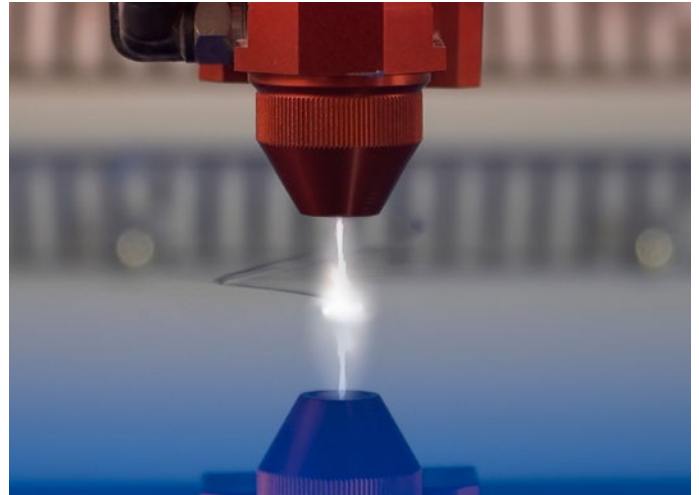
The laser machine as an alternative to a mechanical engraving machine



What's the difference between a laser engraver and a mechanical engraving machine?



In the mechanical engraving process, a milling cutter moves over the surface of the clamped workpiece. The rotary motion of the milling cutter removes material from the surface. Mechanical forces act on the workpiece.



By contrast, laser engraving is contactless. The material is heated very strongly by the incident laser beam. During this process, the surface of the material is vaporized or burned. The laser beam removes a layer where it hits the material. This creates a contrast or, in the case of multi-layer materials (e.g. paper, acrylic), the color underneath appears. This is how a motif becomes visible. A permanent and abrasion-resistant laser engraving is created. If the laser hits the material with more power, more material is removed and the engraving can also be felt. It can therefore be experienced haptically.

Here's a comparison of these technologies, including their respective advantages and disadvantages on the following points:

- **Application options**
- **Running costs**
- **Operation**
- **Throughput**

1 / Application options

Mechanical engraving machine

The mechanical engraving machine impresses with the processing of metals and with deep engraving. For example, letters or ornaments are milled out of metal. Plastic layered materials can also be engraved in this way. Metal surfaces offer a particular advantage in mechanical engraving: The deep machined lettering or decorations can be designed with color to increase the contrast. Additionally, metals can be drilled and cut.



Metal engraving

Laser engraving machine

A laser engraving machine offers significant advantages when it comes to the variety of materials that can be used. The laser machine can process an infinite number of materials: wood, glass, paper, textiles, metals, stone, acrylic, leather and much more. In addition, a laser machine can cut as well as engrave. You'll find a complete list of materials on our website: What materials can a laser machine process? <https://www.troteclaser.com/en-gb/learn-support/faqs/suitable-materials-for-laser-cutting-marking-engraving>

Laser technology scores with maximum precision: Laser technology makes it possible to engrave the finest details and smallest lettering, and to cut filigree and complex geometries.

It's also possible to realize photo engravings with the laser machine. Photo engraving is a popular application for personalized items made of acrylic, leather, aluminum or wood.



Engraving and cutting fine details on paper



Photo engraving on acrylic



Glass engraving

The versatility of a laser machine makes it easy to expand your product portfolio. On the one hand, you can work with a great variety of materials, on the other, you can engrave highly detailed designs, cut the most filigree motifs and incorporate photo engraving for personalization.

Orders that had to be outsourced or turned down in the past can be implemented simply and quickly with the laser machine. From your customer's point of view, this makes you faster and more flexible, and the profit goes into your pocket.



2 / Running costs

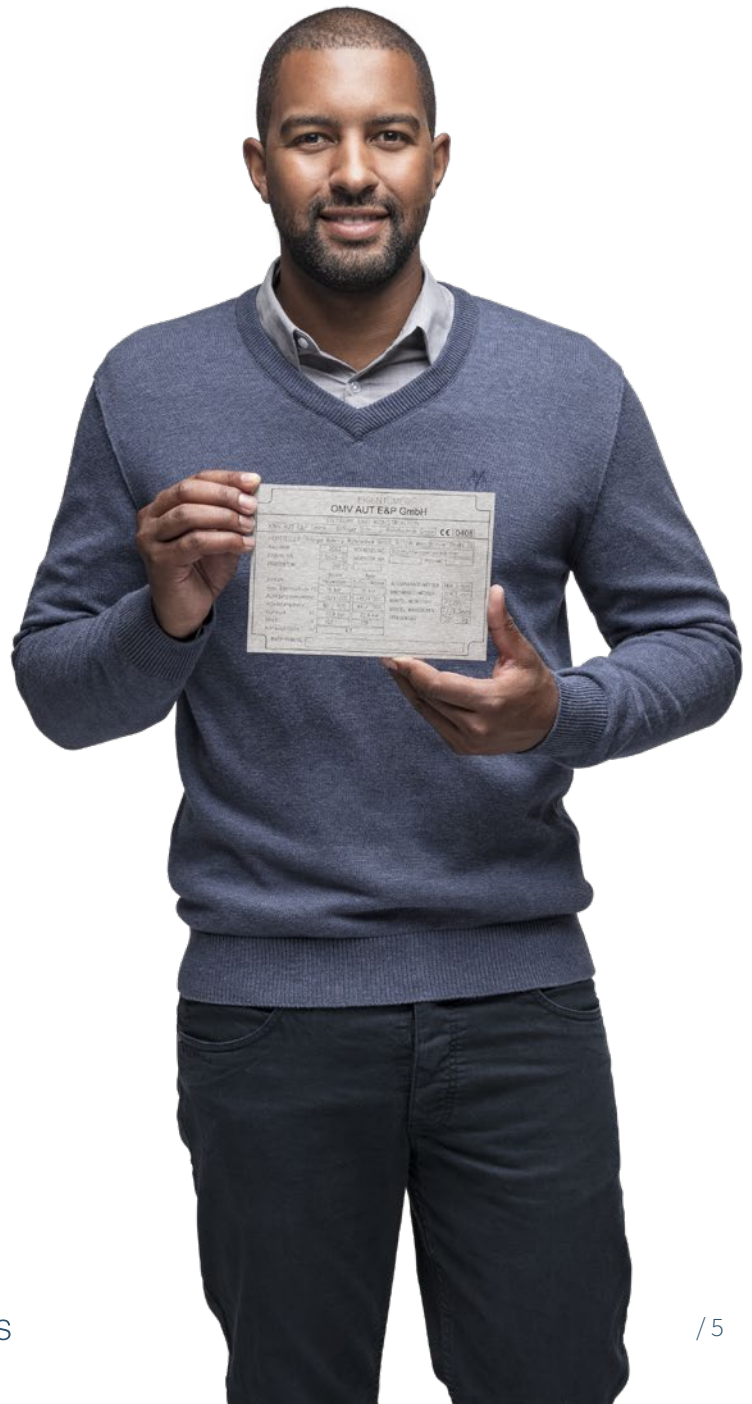
Mechanical engraving

In mechanical engraving, a separate tool head is required for different materials, geometries and material thicknesses. The milling head wears down and needs to be changed regularly. This incurs costs that must be included in the overall calculation.

Laser engraving

Laser processing is contactless. The laser beam is the universal "tool" for all geometries and material thicknesses. Tool or grinding costs are eliminated.

Due to the laser's contactless processing, there is also no need for clamping or any other type of fixing, unlike with mechanical engraving. This saves time and money in material preparation. Below you'll find a calculation for wood and metal.



3 / Operation

Operating a mechanical engraving machine requires special knowledge and experience. A laser machine, on the other hand, is very easy to operate. In the development of its laser machines and software, Trotec makes sure that every laser user can achieve perfect results quickly and easily. In addition, Trotec's in-house academy offers regular training courses.

4 / Throughput

Two examples serve to show how quickly a workpiece can be processed with a mechanical engraving machine and with a laser machine. The duration of the entire production process is taken into account, rather than just the processing time itself. This is because the entire production process, including the preparation time, impacts on the utilization of the machine and therefore on the number of orders that can be processed daily.



Application: Personalization of a wooden board



Mechanical engraving on wood



Laser engraving on wood

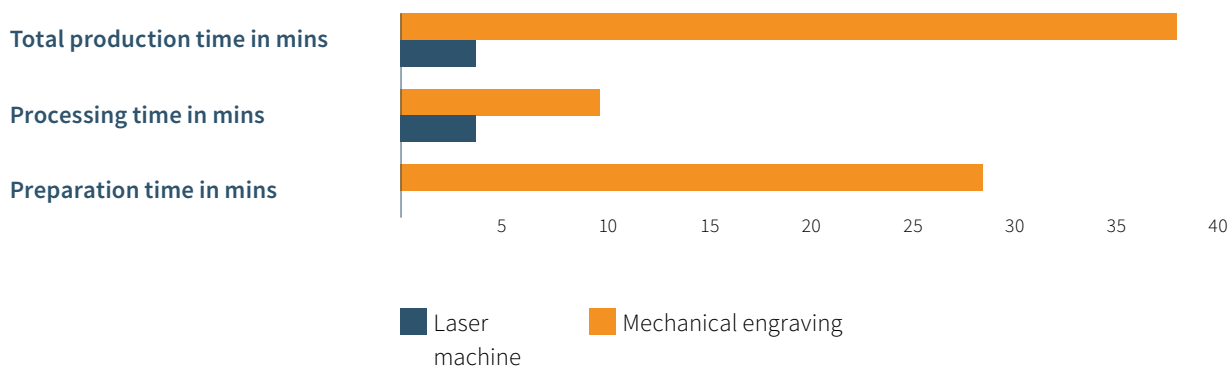
Apart from the optical differences, the total production time when using a mechanical engraving machine vs. a laser machine plays a major role.

With using a laser machine, the processing time is four minutes for laser engraving and laser cutting. With mechanical processing, the engraving runtime including cutter change for milling out the bite contour is 28 minutes. In this application, mechanical processing takes seven times longer than laser engraving.

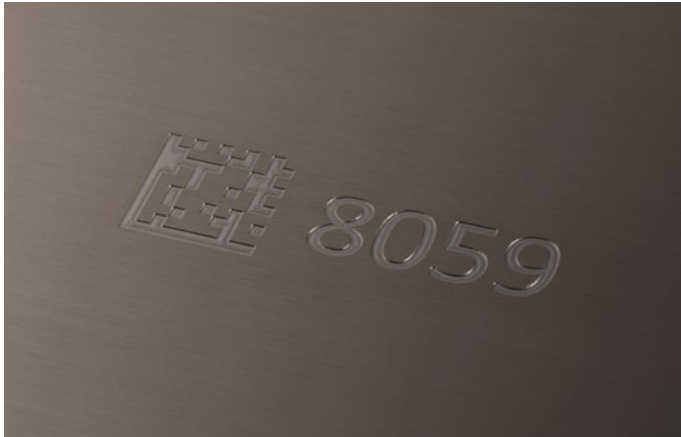
Mechanical engraving additionally requires ten minutes preparation time for programming, set-up, blanking and cutter grinding. Preparation time is eliminated when using a laser machine due to its contactless processing. The total production time of 38 minutes for mechanical engraving is therefore 9.5 times longer than laser processing, which takes a total of four minutes.

	Laser machine	Mechanical engraving
Preparation time in mins	0	10
Processing time in mins	4	28
Total production time in mins	4	38

Comparing processing times



Application: Metal engraving/metal marking



Mechanical engraving on metal



Laser marking on metal

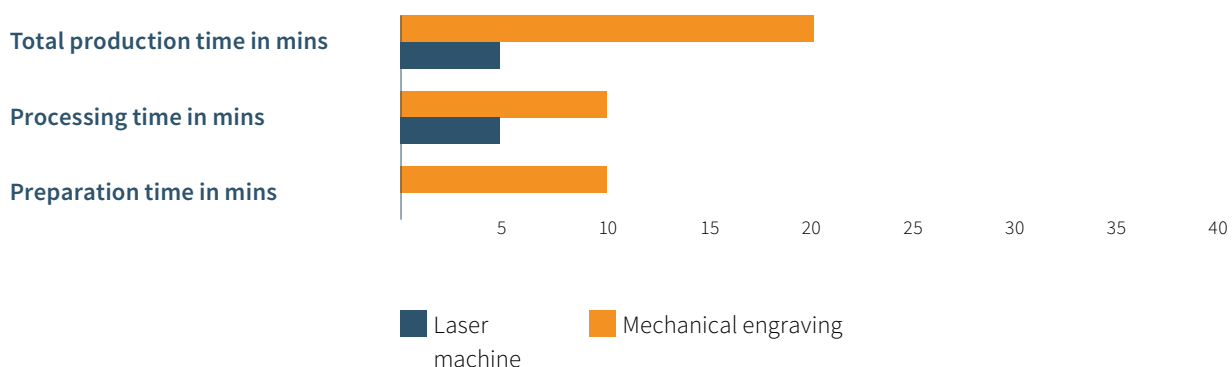
Analogous to the above example, we compared the processing time of metal engraving.

The processing time for laser processing is five minutes when laser marking. In mechanical processing, engraving takes ten minutes. For this application, mechanical processing takes twice as long as laser engraving.

Mechanical engraving additionally requires five minutes preparation time for programming, blanking and cutter grinding. Preparation time is eliminated when using a laser machine due to its contactless processing. The total production time of mechanical engraving is 20 minutes, which is four times longer than laser processing, which takes five minutes overall.

	Laser machine	Mechanical engraving
Preparation time in mins	0	10
Processing time in mins	5	10
Total production time in mins	5	20

Comparing processing times



Each technology – laser engraving and mechanical engraving – has its legitimate applications. The laser machine can optimally complement a mechanical engraving machine and offer new possibilities. To sum up, the differences between the two technologies are as follows:

Application options	Laser engraving	Mechanical engraving
Engraving letters	✓	●
Engraving small details and logos	✓	●
Photo engraving	✓	●
Cutting filigree geometries	✓	●
Cutting and drilling metals	●	✓
Variety of materials	✓	●
Durability of the engraving	✓	✓

Time and cost savings	Laser engraving	Mechanical engraving
Tool wear	✓	●
Preparation: Clamping/fixing	✓	●
Ease of use	✓	●
Throughput	✓	●

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