

**trotec**

# ***Trotec eBook Tips & Tricks for Working with a Laser***



**Handbook for engravers**

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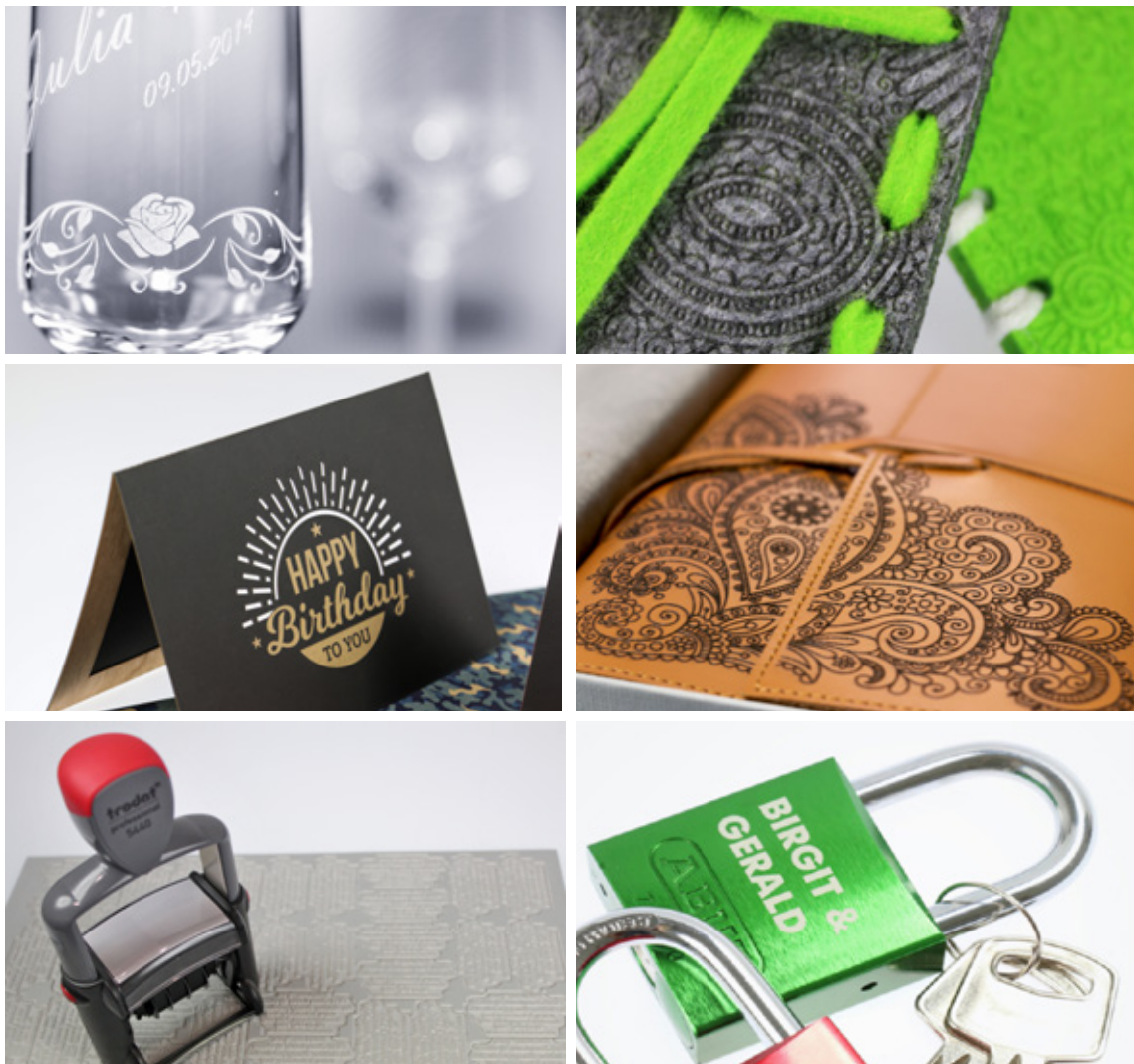
## Introduction

This document is aimed at new laser users, new employees in laser companies and as a reference work for all laser users who would like to try out a new material. This guide provides an overview of everything that can be processed with a laser and gives tips and tricks on the respective materials, on the JobControl® laser software, on CorelDraw® and other tips on how to use the laser.

### What can a laser do?

With an advanced laser engraver, you can process a variety of different materials. Wood, glass, leather, acrylic, natural rubber or stone are just a few of the wide range of materials used in applications, such as signs, stamps, promotional items and many more. With the wide range of laser engraving and marking systems offered by Trotec, you are ideally equipped for the future of your business!

Here are a few examples of our favorite applications:



A range of different laser applications



## **Laser sources and your options**

### **CO<sub>2</sub> and fiber lasers**

The devices from the Speedy flexx series are equipped with a CO<sub>2</sub> and a fiber laser. Select a CO<sub>2</sub> laser with a power level between 25 to 250 Watt and combine it as desired with a 10, 20, 30 or 50 Watt fiber laser. Use both laser sources in a single job without having to manually change the laser source, lenses or focus. The patented JobControl® laser software makes it possible. Simply assign the desired laser source to each color of the graphic.

### **flexx function**

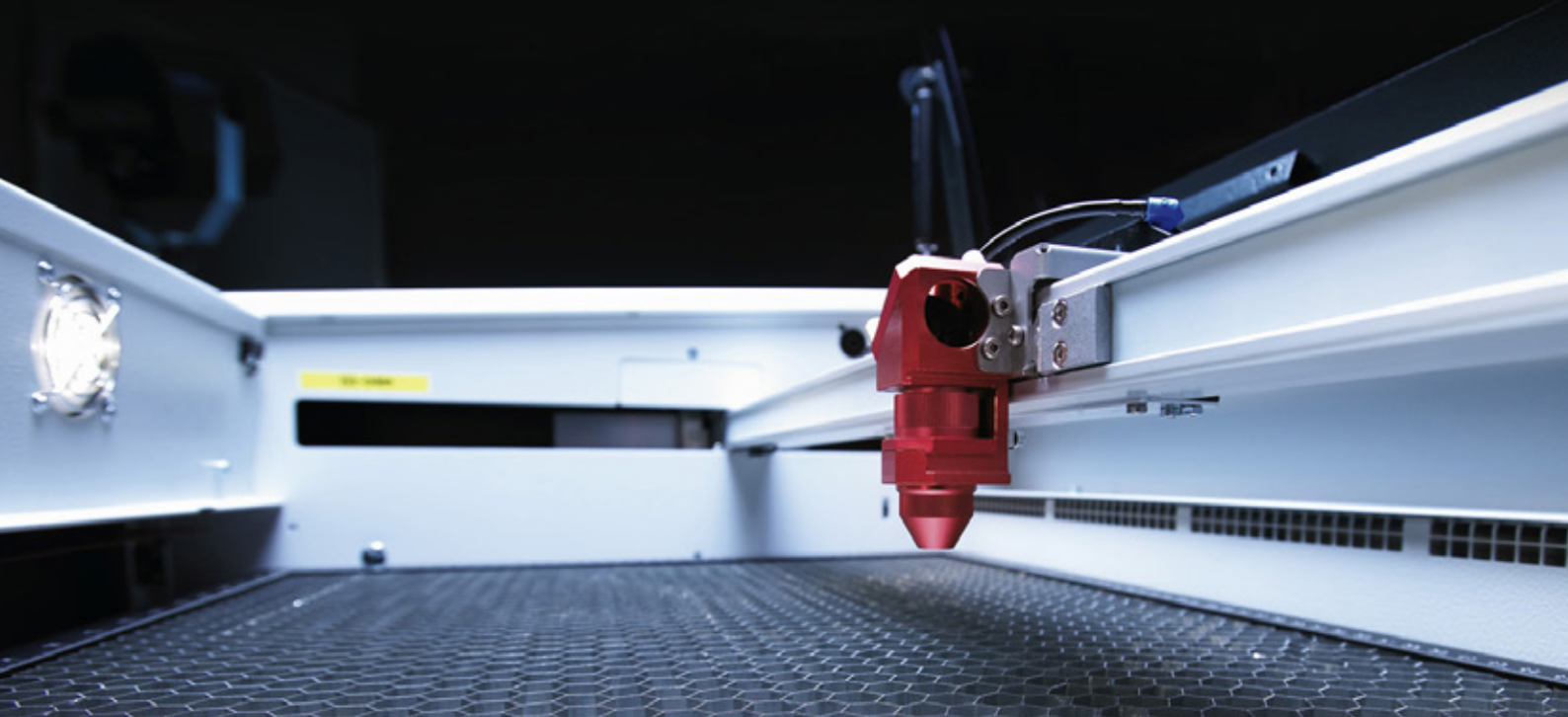
Thanks to the flexx function developed by Trotec, both laser sources can even work together on a single job. In other words only a single process has to be initiated to process two materials. The CO<sub>2</sub> laser for example can be used to engrave leather, while the fiber laser can mark metal parts. Likewise you can control both laser sources independently of each other. This feature is patented. In general all organic materials or non-metals can be processed with the CO<sub>2</sub> laser and all metals (even precious metals like gold and silver) can be processed with the fiber laser. Plastics are an exception. They can be processed both with the CO<sub>2</sub> as well as the fiber laser. In the Materials chapter, you will find a summary table which shows in detail which substances can be processed with which laser source.

### **Differing architectures of laser plotters and galvo lasers**

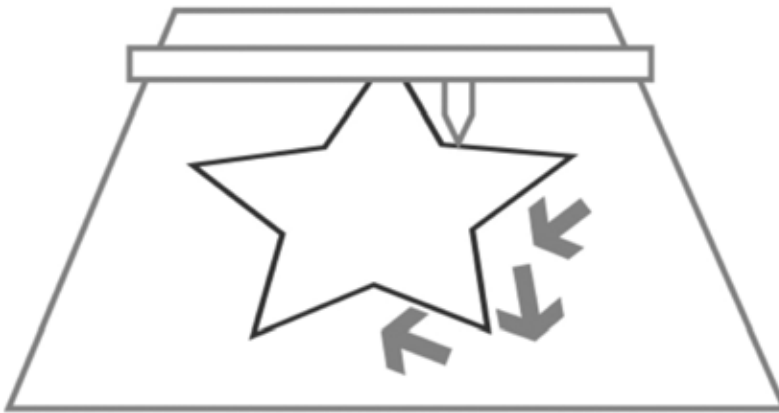
The main difference between flatbed lasers and galvo lasers is the manner in which the laser beam is directed onto the material. With flatbed lasers, the laser beam is deflected along the X and Y axes by means of fixed mirrors. At the end, the beam is focused by a lens and thus applied vertically onto the material. The plotter system is installed in a housing. The larger the machine, the larger the processing area.

In galvo systems, the laser emits onto 2 rotatable, highly dynamic mirrors of low inertia. These are moved by galvanometer drives. Since hardly any masses are accelerated, the laser beam can thus be guided over the workpiece at extremely high speeds with high precision and repeatability. The marking field size is defined by the deflection angle and the focal length of the optics.

In this document we deal with the Speedy flatbed lasers.



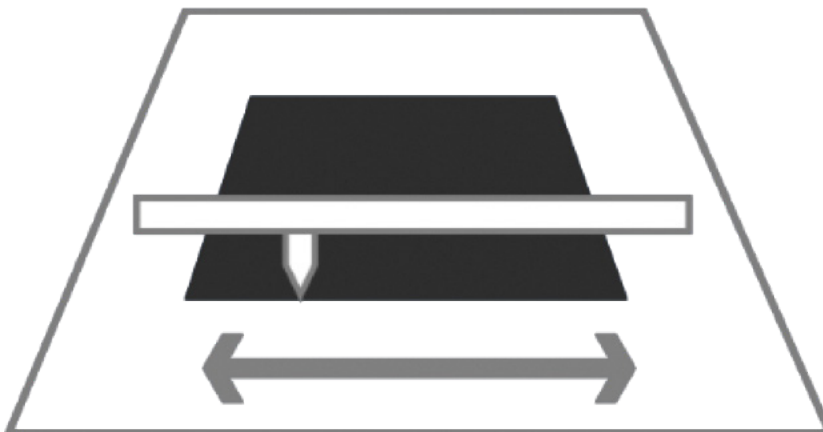
## **How does the laser work?**



Laser cutting process

### **Process: Vector cutting**

- The processing head moves along a specific path (vector)
- Cutting paths are vector lines, arcs or beziers
- Vectors are processed one after the other
- Control via speed, power and Hz (frequency)
- „Slower“ X-axis and Y-axis movement
- Depending on the laser power set, the material is either cut through or scored out.



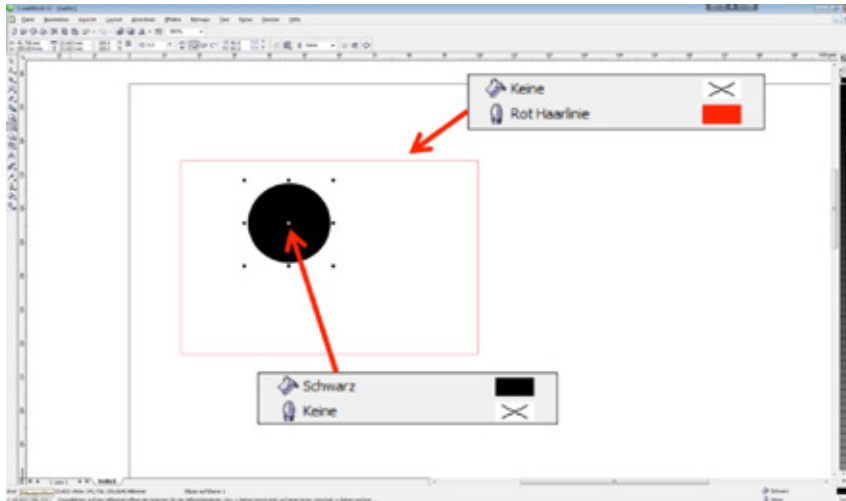
Laser engraving process

### **Process: Raster engraving**

- Similar to a printer
- The processing head moves along on the X-axis from left to right and back
- Graphics are traversed row by row
- Graphics are rasterized bitmaps
- Settings are via DPI (dots per inch) and PPI (pulses per inch)
- Very fast X-axis, slow Y-axis motion

## How to create a file for the laser

In order for the laser to know which lines of the graphics need to be cut and which must be engraved, they must be set in the graphics as follows.



Cutting lines are mostly red, engraving elements black. However, you can define any color available in JobControl® for cutting or engraving.

### Cutting lines:

- Must always be vectors
- Line width = hairline or 0.001 mm

### Engraving area:

- Vectors and pixel graphics

! Would you like to work with different laser parameters in a single processing step, for example to produce different engraving depths or effects? JobControl® can fill different laser parameters with up to 16 colors. Simply use the Trotec color palette to mark the areas in CorelDraw®.



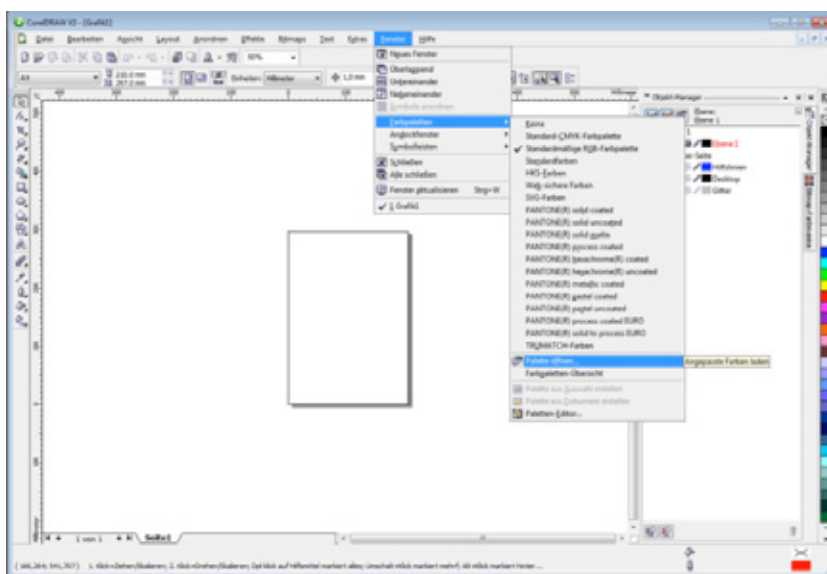
Overview of materials in JobControl®

## Import Trotec color palette

As already mentioned in the previous chapter, the laser needs accurate color information in order to be able to process the data. To make creating these settings as quick and easy as possible, we have prepared a ready-made color palette, which you can import into your vector program in two easy steps, for example into Corel Draw®. You can find the color palette on the CD delivered with your laser. It is also available for download at [www.troteclaser.com](http://www.troteclaser.com).

### Step 1

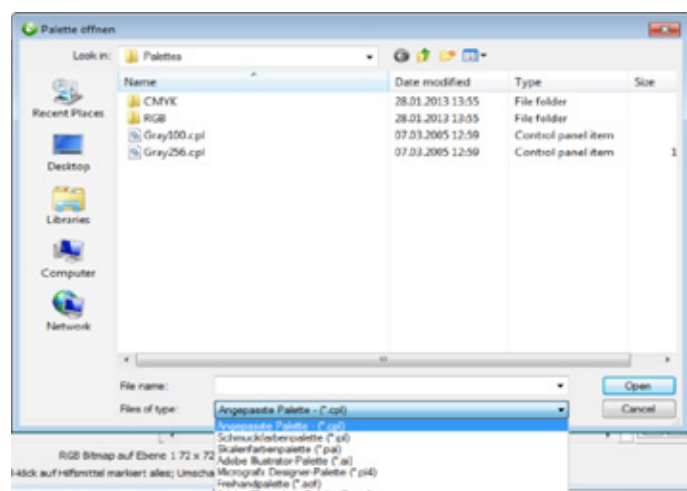
In the menu item “Window” under “Color palette” click on “Open color palette”. This will open a window where you can select the palette.



Overview of materials in JobControl® (may differ from the version of Corel-Draw® used)

### Step 2

Change the file type to \*.cpl in the dropdown menu at the bottom of the window and choose the Trotec color palette. The Trotec color palette enables clear communication between the vector program, e.g. CorelDraw® and the JobControl® laser software. In this way you can process your workpiece using 16 different laser parameters in a single processing step.



Importing a new color palette - Step 2

## Materials

Here you will find processing tips and tricks for many materials. We have selected the most common and popular materials. This information has been compiled from years of experience of our employees and trial and error. It will help you to develop a bit of an instinct and experiment, in order to create your own perfect laser settings, as each material reacts differently to laser processing.

- ! Do you want to process other materials and do not know which parameters to use?  
No problem: On page 51 you will find instructions on how to find laser parameters yourself
- quickly and easily.



Various laminates



## Overview of materials for laser processing

The following table gives an overview of which materials can be processed with a Trotec laser.

Material	Laser source		Machinability	Process
	CO <sub>2</sub>	Fiber		
Laminates	✓	✓*	✓✓✓	Engraving, cutting, marking * Color change on black base material
Acrylic	✓	✓*	✓✓✓	Engraving, cutting *soak-dyed acrylic
Natural rubber	✓		✓✓	Engraving, cutting
PVC	<b>NO!</b>	<b>NO!</b>	<b>✗</b>	Must not be processed! Laser processing produces dioxin and hydrochloric acid!
Thermoplastics (PC, PI)	✓	✓	✓✓✓	Cutting, marking
Thermoplastics (PMMA, ABS, PP, PE, POM, PA, PES)	✓	✓	✓✓✓	Cutting, engraving, marking
Thermoplastics (PS, PETG)	✓			Engraving, cutting
Thermoplastics (PI)	✓		✓✓✓	Cutting
Thermoplastics (PBT, PPS)		✓	✓✓✓	Marking
Ceramics	✓	✓	✓	CO <sub>2</sub> engraving, color change with fiber laser
Paper	✓		✓✓✓	Engraving, cutting
Foamed plastics	✓		✓✓✓	Engraving, cutting
Textiles	✓		✓✓	Engraving, cutting
Leather(ette)	✓		✓✓✓	Engraving, cutting
Glass	✓		✓✓✓	Engraving
Wood	✓		✓✓	Engraving, cutting
MDF	✓		✓✓✓	Engraving, cutting

Material	Laser source		Machinability	Process
	CO <sub>2</sub>	Fiber		
Veneer	✓		✓✓✓	Engraving, cutting
Plywood	✓		✓✓✓	Engraving, cutting
Fiber glass	✓		✓✓	Engraving, cutting
Stone	✓		✓✓	Engraving
Aluminum		✓	✓	Engraving
Anodized aluminum	✓	✓	✓✓✓	Engraving
Polished / unpolished brass		✓	✓✓✓	Engraving
Hard metal		✓	✓✓	Polishing
Chrome		✓	✓✓	Engraving
Polished / unpolished copper		✓	✓✓	Engraving
Gold		✓	✓✓✓	Engraving
Silver		✓	✓✓✓	Engraving
Platinum		✓	✓✓	Engraving
High-speed steel (HSS)		✓	✓✓✓	Annealing / engraving
Brushed / polished stainless steel		✓	✓✓✓	Annealing / engraving
Carbon	<b>NO!</b>	<b>NO!</b>	✘	Must not be processed!
Titanium		✓	✓✓✓	Annealing / engraving

- ✓✓✓ Easy to process, even at high speed
- ✓✓ Easy to process
- ✓ Difficult to process
- ✘ Cannot be processed

**Note:** Laser marking results on plastics using a fiber laser depend on the pigmentation of the material. Results may vary.

## Trotec Materials

With the launch of our extensive line of laser and engraving materials, Trotec has introduced a game changing concept: a single source for low-cost, high quality materials, industry-leading laser equipment, and technical applications support from experts with a knowledge of the systems you are using and the materials you are processing. Our comprehensive line of laser and engraving materials includes laserable wood panels (including MDF and plywood), acrylic sheets in more than 100 colors and finishes, a broad range of laminates (including multi-layer engraving materials for laser or milling), laser-optimized paper, and more. In addition to the convenience of a singlesource solution, using our materials and products provides a number of benefits.



You can quickly and easily purchase our high-quality laser and engraving materials in our web shop at

**[www.trotec-materials.com](http://www.trotec-materials.com)**.

In our web shop you will find a comprehensive assortment of products, up-to-date information about our materials, usage and processing tips, and practical sample instructions.



Count on fast delivery.



Have a complete overview of your online orders.



Order around the clock.



Benefit from the tips and tricks from our experts.



Learn exclusively about new products and offers.



Collect TroPoints and receive your discount.

## TroLase engraving laminates (2-ply plastics)

Laminates are particularly well suited to creating all kinds of signs. When the cover layer is removed by the laser beam, the other colored carrier layer appears. That way both colors stand out from each other and the engraving is visible. Combining multiple laminates on top of each other is also recommended for creating special effects and individualizing your sign. There's no limits to your design! For example, create a name tag from TroLase. Watch this application video for inspiration.

### Selecting the correct table

The best possible processing of engraving material already begins with the selection of the optimal table. We recommend using the aluminum grid table or the acrylic cutting grid table. To optimize the vacuum, simply cover the free surfaces. That fixes the laminate in the right place during laser engraving.

### Engraving direction: from bottom to top

Engraving laser materials from bottom to top is recommended since the exhaust hose is above (in back of) the machine. It helps ensure that the already laser engraved areas remain clean and the core layer is not discolored. This is especially relevant when processing laminates with a light carrier layer and dark cover layer.

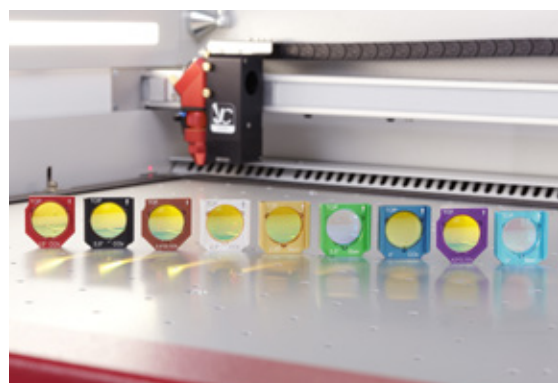
Process	Power	Speed	PPI/Hz	Auto	Passes	Air Assist	Z-Offset	Direction	Advanced
grave	18.00	20.00	500 PPI	<input type="checkbox"/>	1	On	0.00	Top down	Custom
t	100.00	0.90	1000 Hz	<input type="checkbox"/>	1	On	0.00	Top down	Default
p	---	---	---	<input type="checkbox"/>	---	---	---	Bottom up	---
p	---	---	---	<input type="checkbox"/>	---	---	---	Top down (Alternat	---
d	---	---	---	<input type="checkbox"/>	---	---	---	Bottom up (Alternat	---

### Resolution: 500 dpi

Choosing the correct resolution is also crucial for the results with material, graphic and processing time all playing an important role. For processing TroLase, a medium resolution of 500 dpi is recommended for achieving optimal results. It allows the finer details in the workpiece to be engraved. However, don't forget: the higher the resolution, the longer the processing time.

### Use the 2" lens

Our experts recommend the 2" lens for engraving laminates. Using this allows both small, delicate details in the workpiece to be worked as well as engrave large surfaces in top quality. The reason for this is that the universal lens has a longer focal length than a 1.5" lens but is still small enough to engrave the details. Thicker laminates can also be cut with the focus length.





## Use the large nozzle

For processing TroLase, use the large nozzle. If the Air Assist is too strong, the engraving takes on a light gray effect. A moderate Air Assist is also necessary for the life span of the lens since smaller dirt particles do not reach the lens on the air flow.

## Laser engraving for large surfaces: De-focusing recommended

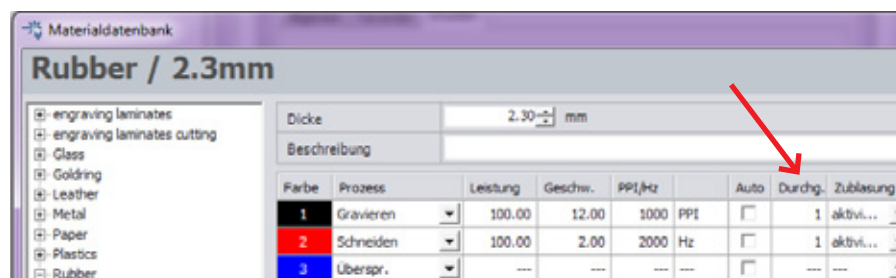
For laser engraving large surface areas with laser, intentional de-focusing is usually better suited than processing the material “in focus”. Set the z offset to between 2 and 7 mm, depending on the power of your machine and the graphic, in order to achieve a more even result. By de-focusing, the grooves are avoided and the end result has a smoother surface. The lens plays a role here as well: for large surfaces, it’s best to use lenses with larger focal lengths. For very fine details (e.g., a 4 point font), we recommend not using any z offset.

## “Two is better than one”

Engrave high-quality workpieces twice, in order to prevent discoloration and to increase the contrast of the engraving:

1. Remove top layer
2. Cleaning

In JobControl® you can select how often a work step is repeated:



JobControl® you can select how often a process is repeated

## Multiple cutting passes

For some materials 2-3 cutting passes at low power are better than 1 pass at a power level that is too high. Avoid sticky edges and unsightly bulges of material along the cutting edge.

## Dark laminate with a bright top layer

Are you familiar with this problem? You are engraving the bright top layer of a dark laminate, then cut the workpiece and by cutting it the remaining bright top layer gets dirty.

### Tip

Our tip: Engrave the desired motif and then apply masking tape or painter’s masking tape, this protects the light-colored material during the cutting process and you can simply pull off the resulting dust along with the tape.

## **How to clean laminates after laser processing**

If smoke residue occurs on the workpiece during laser processing, we recommend that you clean them off using a damp cloth. Nano sponges (often referred to as dirt erasers) can also be very helpful when cleaning laminates.



Cast acrylic is poured as a liquid mass between two glass plates. The result is a homogeneous, tension-free material with equal mechanical properties in directions x and y. Due to this manufacturing process, however, the thickness tolerance is significantly higher and is approx.  $\pm 15\%$ , which must be observed for applications with plug connections. The manufacturing process for cast acrylic is more expensive which is why it costs more than extruded acrylic.

Laser cutting cast acrylic creates burr-free cuts on both sides. Laser engraving also yields better results than with extruded acrylic - a perfectly white engraved image results.

Extruded acrylic is produced through an extrusion process that presses an acrylic mass through a nozzle with the desired thickness. This manufacturing method gives the extruded acrylic different mechanical properties in the x and y directions. In addition, it has a lower thickness tolerance of  $\pm 5\%$  and is thus very well suited to applications with plug connectors. When extruded acrylic is cut with a laser, it creates a flame polished cutting edge that is less sharp on one side. Extruded acrylic is cheaper to produce, and is thus cheaper as a series production. As a rule, extruded acrylic requires less laser power than for cast acrylic in the same sheet thickness. Laser engraving on extruded acrylic is not recommended because the result is only a matte gray.

### Laser power level

The laser power needed for cutting acrylic depends on the thickness of the acrylic sheet and the desired productivity. For a productive work method, we recommend a laser power of 60 watts or more.

The rule of thumb is: 10 watt laser power per 1 mm sheet thickness for a high cutting quality (Up to a thickness of 20-25 mm)

### Selecting the correct lens

Selecting the correct lens plays an essential role when cutting acrylic. The thicker the material, the longer the focal length of the lens should be.

Material thickness	Speedy Series	SP Series
thin acrylic sheets < 5mm	2" lens	2.5" lens
thick acrylic sheets > 5 mm	2,5" lens or more	5" lens



## Move the focal point to the material interior

We recommend moving the focal point to the interior of the material when it is more than 6 mm thick to achieve an even, homogeneous cut.

The following guiding values apply: Move focus to about 1/3 of the thickness of the material.  
For 6 mm acrylic, it would be a z value of -2 mm

## Selecting the nozzle and setting the Air Assist

When cutting acrylic, you should definitely use the nozzle with the large diameter and – if controllable – lessen the Air Assist to a max. of 0.2 bar. That gives the material enough time to cool off - and glass-clear edges result. In contrast, if a nozzle with the small diameter is used or the air pressure is too high, the result is a dull, milky cutting edge because the material cools off too quickly.

## Selecting the correct table

Selecting the right cutting table is an equally important criterion for achieving perfect results in acrylic. There are several versions, depending on the size of your application. We recommend the acrylic slat cutting table or the acrylic cutting grid table depending on the size of the application.

The acrylic slat cutting table prevents kick-back during cutting and is thus especially suitable for cutting thicker acrylic sheets (6 mm or more) and for parts that are cut larger than 100 mm. Smaller parts can tip and are thus not suitable for this table design.

For parts smaller than 100 mm, the acrylic cutting grid table or the acrylic grid overlay on the vacuum table are suitable since the parts remain in a flat position after cutting. However, this work area is only recommended for acrylic up to 8 mm thick. For thicker acrylic, you should always use the other version.

Cutting table	Material thickness	Size of parts
Acrylic slat cutting table	Acrylic sheets > 6 mm thick	Parts that are cut wider than 100 mm
Acrylic grid cutting table	Acrylic sheets < 8 mm thick	Parts that are cut smaller than 100 mm

## Parameters for laser cutting acrylic

Acrylic, as a material, requires a higher frequency when laser cutting it compared to wood, for example. The higher frequency brings the energy evenly into the material. This causes an even melting of the cutting edges which creates a glass-clear, flame-polished edge. For GS materials, we recommend a frequency of 5,000-20,000 Hz, for cutting XT materials, a frequency of a max. of 5,000 Hz.

If the frequency is too low, fine ridges, so-called chatter marks, become visible on the cutting edges. To counteract these, increase or lower the frequency of the cutting speed. However, if the cutting speed is too slow, this can lead to a cutting kerf below - which increases the risk of fire.

Figuring out the perfect parameters is very important, in other words, when working with acrylic to work safely and efficiently.

### When engraving acrylic, the principle applies: less is more.

The best results are achieved when only the surface of the acrylic is scratched, creating a white engraved image. If too much power is used, the engraving results may be deep, however, they will no longer be white.

### Engraving on the reverse side:

Engraving the acrylic on the back gives the final result a higher quality and the engraving is better protected against external influences. Even with printed acrylic, the product looks better when printed on the back.

**Tip**      **Caution: Don't forget to mirror the job!**

You can do this either in the graphics program or simply directly in the printer setting when you send the job to the laser.

## Graphic and software settings for acrylic processing

Minimum number of nodes

The careful preparation of the graphics can also significantly improve quality when working with acrylic. First, the number of nodes in the cutting contour needs to be reduced to a minimum. This allows the laser to process homogeneously without unnecessary stops.

## Optimal selection of the cutting start point

The definition of the cutting start point is also essential. When the laser cuts into the material, it is visible at this point and cannot be avoided. Start points that are on a straight line or in the middle of a curve are especially noticeable. That's why a start point should always be placed in an unnoticeable corner.

The thicker the acrylic being used, the better it is to define the start point outside the actual graphic. This is a so-called lead-in. The lead-in should be about 3-8 mm outside the finished contour and go to the actual contour in a straight line. You can draw this lead-in easily with your graphic program, or use our supplementary software package TroCAM as part of the work preparation.

## **Defining the cutting sequence**

The cutting sequence for individual objects can also have an influence on the quality for larger quantities. If many small objects are being cut in the area, the material heats up relatively strongly at this spot, and the risk of fire increases. If you want to cut many small graphics from one large sheet, we recommend that you arrange the individual parts so that the material can cool off in between cuts. The cutting sequence is visible in the graphic program (CorelDraw, Adobe Illustrator) in the level window and is always processed from down to up.

## **Warning: Ignition is possible**

A powerful exhaust system is important when cutting acrylic. Acrylic is prone to flame formation when gases are not extracted efficiently. Never leave the machine unattended!



## Wood

Not all wood is created equal. Countless types of wood are available for sale, all of which in turn are processed and refined in a wide variety of ways. It is therefore very hard to make sweeping statements. Nevertheless, we have tried to summarize the most important tips and tricks for you.

**Tip** Trotec also offers a wide range of wood suitable for laser processing.



### Overview of suitable wood types

Soft woods	These types of wood, such as balsa wood or poplar, require a lower laser power level and can be engraved and cut faster. Engraving produces less contrast (it is lighter).
Hard woods	These types of wood, such as oak or cherry, are examples of dense woods, which require a higher laser power level for cutting and engraving. The engraving itself becomes more contrasting than on soft wood.
Coniferous woods	These types of wood, such as larch or fir, are not suitable for laser engraving. They usually have a large number of uneven grains, which are usually very hard. On the other hand, the surrounding wood („non-graining“) is rather soft, which makes it difficult to find the right parameters.



Veneers	These are made of real wood and therefore show the same engraving properties as solid wood panels.
Plywood	This consists of at least three layers of wood whose grain is glued and pressed at an angle of 90°. Plywood is available in various types of wood and is offered in different thicknesses. The type of glue is important for laser processing, especially during cutting. Choose white-glued plywood panels or plywood panels made specifically for laser processing.
MDF (Medium density fiberboard)	MDF is a homogeneous wood-based material made of finely defibrated, mainly bark-free, softwood, which is gently pressed in the longitudinal and transverse directions. The surface and edges are smooth and firm. So MDF can be easily engraved and cut. However, it should be noted that the cutting edges become very dark during laser processing.

**A rule of thumb for laser engraving:** Hard woods result in dark, soft woods in lighter, engravings.

**A rule of thumb for laser cutting:** The drier and more resin-free the wood, the brighter the cutting edge.

#### Determining the engraving parameters

With the grayscale matrix you can quickly and easily determine the desired engraving parameters for yourself.

**Tip** The more you defocus (z-offet: approx. 0.5 - 2 mm), the darker the engraving of the wood will be. Defocussing the laser beam increases the laser spot size, decreases the performance density and burns more wood instead of letting it pass directly into the gaseous form. The disadvantage is that details can be lost.

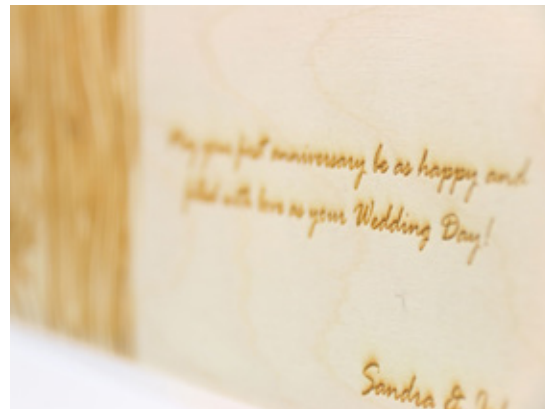
When cutting wood please be aware that the material tends to get marked easily by smoke residues. Therefore, it is important to work at high speed (about 1-2%, depending on the material). Optimal results are achieved at low frequency, with a small lens and nozzle and activated Air Assist. As for almost all cutting projects, a honeycomb table is required (depending on application size). With the Speedy 360 and 400 or higher, you additionally have the opportunity to work with external Air Assist (recommended are 3 bar).

## Engraving - how to create high contrasts

When you engrave soft wood, e.g. poplar, you will achieve a deep engraving with relatively low contrast. Here we recommend that you defocus, which adds contrast to the engraving. In general, contrast levels in wood engravings can be influenced by defocussing, depending on the type of wood and the lens, it should be possible to defocus by 5 to 10 mm without any problems. The finer the details, the shorter the focal length of the lens should be. As a rule 1.5" or 2" lenses are suitable for almost any laser engraving on wood.



Engraving on wood picture frames



Detailed lettering engraved on wood

## Masking tape

Apply masking tape to the desired processing surface and you can engrave and cut through the tape without problems. Then just pull it off and remove unsightly traces of smoke residues at the same time. When selecting masking tapes ensure that they are made of PVC-free material and removable. Masking tapes are available from different manufacturers, such as 3M. For smaller areas you can also use commercial painter's masking tape from your local hardware store. When selecting masking tapes ensure that they are made of PVC-free material and removable.

## Relief engraving on wood

Wood is a great material for relief engraving. In a relief engraving, grayscales are converted into different laser power levels, which produces three-dimensional engraving. You can engrave in several passes with relatively high performance, and then perform one or two cleaning passes to remove the smoke residue.

## Inlays in wood

Wood inlays (intarsia) are also particularly popular with wood. In an inlay, different woods are laid on a flat surface in such a way that a smooth surface is created, which now contains differently colored and differently structured inlays. Usually the base material is engraved first, and then the material to be laid (usually veneer) is cut and inserted. For the veneer, make sure that the width of the laser beam (cutting gap) is adjusted. This means that the carrier must be slightly larger.

## **Paper & cardboard**

There are countless types of paper – with and without coating – in addition there are different types of cardboard, corrugated cardboard, dyed or multi-layered and many more.

**Tip** In the Trotec online shop for materials you will find LaserPaper for various types of paper for laser processing.

### **Small lens for small details**

In order to best recreate detailed images on paper, we recommend that you work with a 1.5" or 2" lens. The smaller laser spot makes particularly precise and fine engravings possible.

Individual invitation on multi-layered paper  
The effect is created by removing a layer of paper.



## Work in focus

In general, it can be said that the focus must be perfect, in order to achieve perfect results. We recommend that you do not set the focus until the vacuum table is switched on, so that the paper is resting on it as firmly as when you are processing it with the laser.

## Vacuum and adhesive tape

A vacuum table also helps to ensure that the paper lies flat on the table and that resulting vapors are extracted. In addition, it can be helpful to fix the paper in place with adhesive tape. If you are not working with a vacuum table but with a honeycomb table, then the Air Assist can help reduce the amount of smoke residue that builds up along the cutting gap.

## Which resolutions do I use with paper?

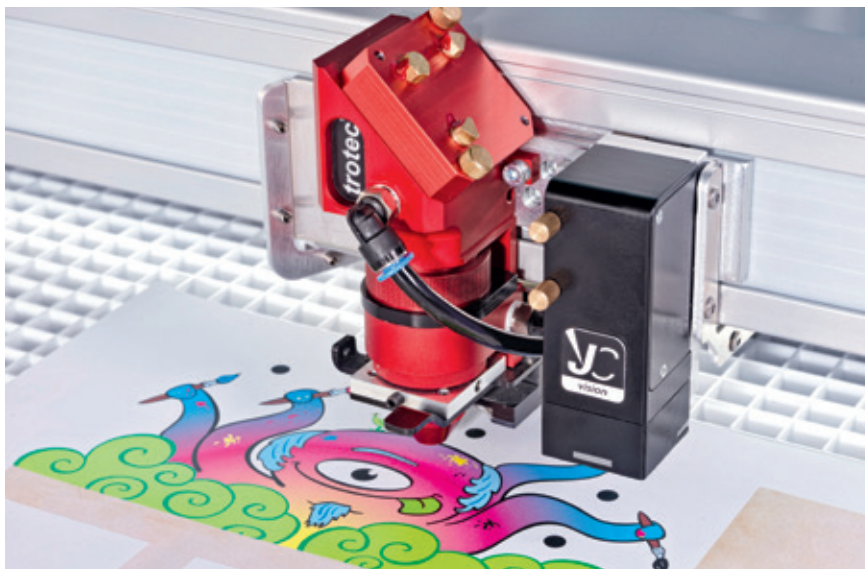
The resolution always depends on your application. When you want to process „normal“ engraving jobs, use „500dpi resolution“ and „Air Assist On“. This will combine very good quality with a fast working speed. You can adjust both parameters in JobControl® via the material database.

For photo engravings on paper, we recommend reducing the resolution to 250-333 dpi, as the screen points appear slightly enlarged on paper in any case and would overlap, if a higher resolution was used.

If you only want to cut the paper, set the resolution to 1000dpi.

## JobControl® Vision – Precise laser cutting of printed paper types

When printed material is to be cut, JobControl® Vision helps to compensate for distortions. Pass marks are printed on the edge of the design. The camera attached to the laser's processing head 'reads' the pass marks prior to cutting and compares the 'read' positions with the positions provided for in the original file. Adjustments are made automatically for any deviation found and no manual alignment is therefore required.



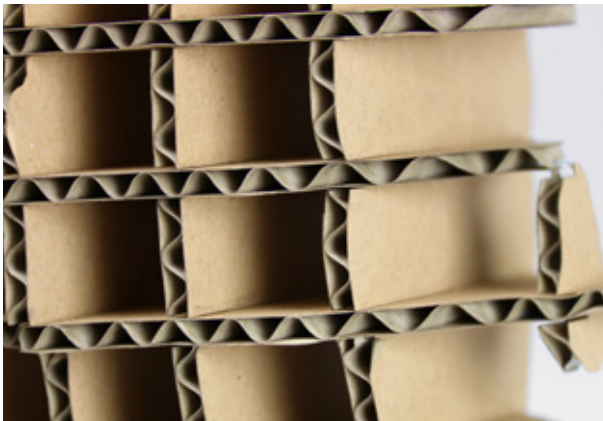
JobControl Vision® camera mounted on a Speedy laser head

## **Fading colored paper**

Colored paper can be made to look faded at low power levels and white areas can thus be created. If the paper should turn yellowish or brownish, too much power was used and the paper was burnt.

## **Removal of one or more layers in multi-layered papers**

In multi-layered papers one (or more) layers can be removed. Depending on the type of paper the parameters vary but it can be said, that higher power levels are required than for fading paper.



3D objects can be created by assembling or gluing together for example corrugated cardboard.





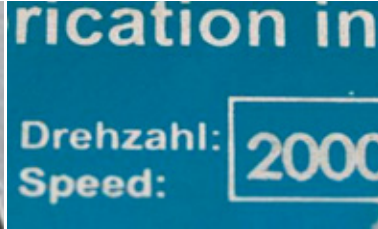



## **Metal**

The perfect tool for metal marking in terms of productivity and quality is the fiber laser. Unlike marking using a CO<sub>2</sub> laser and marking paste, no preparation or follow-up is required when using the fiber laser. The marking result is uniform and very precise even for fine details.

Moreover, you can use certain parameter settings on the fiber laser to achieve other effects. For instance, the anneal marking can produce either a rich black or a white color. The metal engraving gives a depth to the metal that is extremely long-lasting and also counterfeit-proof. Trotec offers a large portfolio of metals including cutting services.






It is important to distinguish between different processes when marking metal with a fiber laser:

		
Engraving	Annealing	Coating ablation
		
<ul style="list-style-type: none"> <li>- Metal is partially vaporized during the process</li> <li>- This creates a depression</li> <li>- Very durable marking</li> <li>- High energy is required</li> </ul>	<ul style="list-style-type: none"> <li>- Stainless steel, titanium,...</li> <li>- Local temperature rises to just below the material's melting point</li> <li>- An oxide layer is created just below the material's surface</li> <li>- The surface is not damaged</li> <li>- High contrast marking of material</li> </ul>	<ul style="list-style-type: none"> <li>- Anodized aluminum, painted metal, foil</li> <li>- Top layer is removed</li> <li>- High contrast Marking of material</li> <li>- High speed during marking</li> </ul>

### Cleaning with a sponge and water

Smoke residues on the material surface are the result of rapid temperature rises during engraving and explosive vaporization. Consequently, engravings appear hazy. The edges of the engraving look washed out and the quality of the engraving seems inferior.

		
Without cleaning	Cleaned with a sponge and then air-dried	Cleaned with a cloth
<p>For perfect results, the engraved workpiece must be cleaned with water and a sponge and then air-dried.</p>		

## Rubber

### Direction of engraving and extraction

When processing stamp rubber, a lot of dust is created. It is, therefore, important that you engrave bottom up, so that dust and rubber parts are removed by the exhaust system and do not affect the rest of the engraving process. Please open the throttle, so that the exhaust system can operate at maximum.

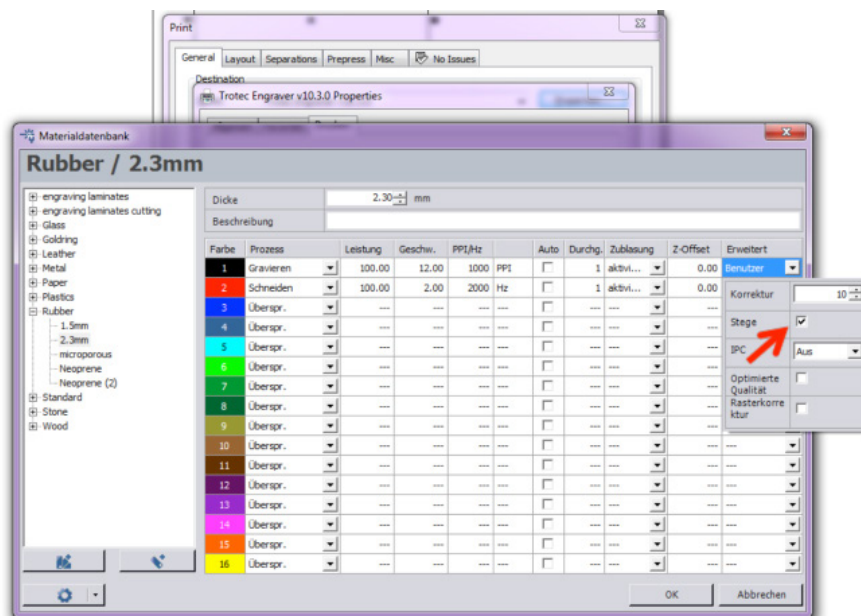
To see more information about the throttle, please turn to page 43.

### How deep does the engraving need to be to produce a clean impression?

The parameters for Trodat Aero rubber stamps are stored in the JobControl® material database. In this parameter, the engraving depth is set automatically. If you use another rubber stamp, make sure that the engraving depths of stamps are about 1.1 mm for a good impression.

### Webs

Do you want to engrave a whole plate with stamp designs? Then use the “web” function in JobControl®. Small connections between the stamp motif and the base plate are created automatically. You can break out individual parts easily from the plate as a whole without losing the other parts.



Activate the “web” check box




Webs on the stamp rubber hold individual stamp plates in place



## Flanks for a beautiful stamp imprint

Flanks, also called shoulders, can be set in JobControl® depending on the respective application.

Different shoulders or flanks and their advantages

Steep	Medium	Flat
		
<p>Many elements in a confined space - there is a danger that flanks may overlap.</p>	<p>Generally well-suited to standard applications</p>	<p>Frames or tables Whenever a lot of material is removed around an element and the element may otherwise become a little unstable</p>

## **Delrin**

Delrin is used for the production of seal presse. A frequently encountered problem with seal presses is that thin paper is easily cut because Delrin edges are often too sharp.



Embossing on paper



Seal press

### **Defocusing**

One of the problems with seal presses may be that the press cuts through the paper. Our tip: Set the laser to be out of focus by around 2 mm (= z-axis offset by 2mm). Embossing results remain the same, however, the seal's edges become more rounded and the process is therefore more gentle for paper.

### **Text size**

Text or graphic elements should be at least 0.5 mm in size or no less than a five-point font. When using paper grades that are significantly heavier than 80 g/m<sup>2</sup>, the size of the graphic elements should also be increased.

### **Engraving depth**

The engraving depth should be at least 0.25 mm, however, a maximum depth of 0.50 mm must not be exceeded. Values smaller than the minimum depth lead to weak or illegible imprints, while values exceeding the maximum depth may tear the paper at certain points. Minimum and maximum depths can be set indirectly via laser parameters.



## **Glass**

With a CO<sub>2</sub> laser engraver, you can laser engrave flat materials such as window glass or mirrors, round workpieces such as wine or champagne glasses, and conical items like bottles.

Cheaper, cast glasses are a good choice because they generally have lower lead content and are more homogeneous structure. Expensive, hand-blown glasses or crystal glasses may have stresses in the material that are aggravated by the heat during laser engraving, which may cause the glass to fracture.



### **Wet paper for white engravings**

Using a moist paper towel helps prevent the engraving area from becoming rough, and leads to a clear, white engraving result.

Before you start engraving, apply a moist single-layer paper towel to the glass. Make sure there are no air bubbles or overlaps. This would affect the engraved image. Then switch the Air Assist to OFF to avoid premature drying of the paper during engraving. After engraving, the residue easily wipes off, also cleaning the engraving area is cleaned.

In addition to moist paper towels, application tape can also be used to prevent the surface from roughening. With application tape, however, the engraving color is rather grayish and not bright white. As with the paper towel method, make sure that no air bubbles and overlaps are formed when you apply the tape. After engraving, clean the glass to remove any adhesive residue.



Wedding glasses with fine engraving

### Photo engravings on glass

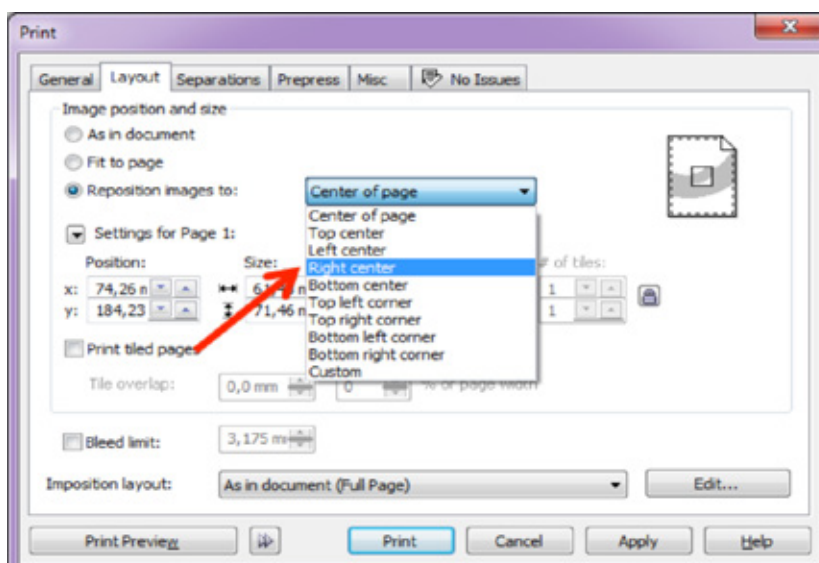
Photo engravings on glass are usually most beautiful when you send them to the laser with 500 dpi. Use the 'ordered dithering' rasterizing function, to adapt image data perfectly to the material. In addition, we recommend a 70% gray setting rather than black, whereby lower temperatures act on the glass and results are even better. Please note that these settings are only suitable for photos. For small images, such as logos or texts, 1000 dpi and full black are suitable.

### Inexpensive glasses

Inexpensive glasses are easier to process because they have a more homogeneous, uniform structure. Consequently, inexpensive, cast glasses are preferable to hand-blown crystal glasses.

### Working with the rotary attachment

In order for the printing process to begin exactly where the laser pointer is, please enter "Positioning: middle right" in the print dialog.



Settings in the print dialog "Position Right Middle"

## Leather

For an optimal engraving result activate „Air Assist“ and work with 500 ppi resolution. Both parameters can be adjusted in the material database in JobControl®.

### Warning: PVC free leatherette

Please note that leatherette often contains PVC compounds and therefore cannot be laser processed. There is a danger that harmful gases may be released.



Engraving and cutting of leather causes no problems at all

### Genuine leather

Genuine leather is a natural material and there are countless types and all react differently. Therefore, it is difficult to establish common rules for the laser processing.

### Some points should be observed in any case:

- If genuine leather is deforming during laser processing, we recommend to reduce the laser power.
- You want to clean the finished workpiece? Since it is a natural material, we can not recommend any cleaner. Aggressive cleaning agents may dry out the area or form spots on the leather. If you want to use a cleanser, please test on an inconspicuous area or, even better, on a test strip.

### Imitation leather

- Imitation leather usually has a fabric layer and is therefore form stable and easier to handle.
- It can be easily cleaned with a damp sponge or tissue.
- When engraving imitation leather, you can achieve a bright color change by defocusing. Defocus can be set via the Z-Offset in JobControl®.

## **Masking tape**

As already mentioned previously, masking tape can be very helpful when processing delicate materials. This is also the case with natural leather. When applying the masking is tape it is important to:

- Cover the entire engraving or cutting area
- Apply the tape without air inclusions or wrinkles
- Use a squeegee to press down firmly on the material

You can apply the tape just before cutting or engrave through it immediately, depending on the motif you choose. Particularly for very fine motifs, it is advisable to apply the tape only after the engraving process. In general, it can be said that relatively little power is required for engraving leather, in order to achieve best results.

## Stone

As with wood and paper, here, too, you cannot really speak of 'stone' as a singular type of material. In general dark, regular stones are very well suited for engraving, for example:

- Slate
- Granite
- Dark marble
- Salt crystals



### Polished or natural

The surface of the stones does not have to be polished, natural stone structures are also well-suited to laser processing.

### Synthetic resin for contrasts

In order to achieve a stronger contrast, you can fill the engraving with resin or varnish. Especially with polished stones, the engraving has a rougher surface to which color or rather resins can adhere.

### Photo engraving on stone

As stones have an uneven surface, they are best suited for coarsely rasterized images (250-333 dpi). Very fine and detailed images may be difficult under certain circumstances, however, this very much depends on the structure of the stone.

### Change Z-offset value

A change in the Z-value can significantly improve the result of your engraving in many cases. The most striking thing is to try offset values of +1 mm and -1 mm and compare the results. For very hard stones, it may be better to choose a negative offset value, as this will allow more power to enter the engraving area.





Engraved and polished granite slab



Photo engraving on a stone slab

## Textiles

The term textiles covers a wide range of materials. Here, too, we have of course tried to gather the most important tips for you. As the industry continues to develop new blends and finishing techniques, a myriad of different materials and laser processing options now exist.

### Laser engraving dark natural textiles

Dark denim or cotton fabrics can be easily “bleached” by laser engraving. It is important to use a low laser power (up to approx. 20% at 100 watts) and to engrave without Z offset depending on the material.

Caution: If you use too much laser power or the resolution is too high, the fabric may tear or the fibers may dissolve, immediately or after the first wash at the latest. Depending on the graphic, a resolution of 250 to 500dpi is suitable.



## **Laser engraving light natural textiles**

In order to achieve a dark laser engraving on light textiles, deliberate defocusing is required, i.e. a Z offset of approx. 2 to 20 mm is used depending on the material. The further the lens is from the material, the larger the laser spot.

## **Laser cutting natural textiles**

Use a frequency of 1000 to 3000 Hz for cutting. To avoid dark edges, we recommend switching on Air Assist during the cutting process and using the nozzle with the smallest diameter.

We have prepared a small selection of our favorite textiles here:

### **Fleece and Softshell**

Both materials are very well suited for processing. For perfect engraving results, we recommend that you use a 4 inch lens and work with a resolution of 250 dpi.

### **Jeans**

Denim material also delivers beautiful engraving results or rather it can be faded. The engraving area turns white, once the material has been cleaned of smoke residues. The easiest option is to put the item into the washing machine after laser processing.

### **Felt (synthetic fibers)**

Felt made from synthetic fibers can be processed very well with the laser. During cutting the fibers seal themselves ("agglutinate") along the cutting edge and this prevents fraying. Art felt is also suitable for engraving, as you can see on this picture:



Pattern engraved on felt

## **Microfiber (e.g. Alcantara)**

The microfiber material, which looks like artificial suede, is perfect for engraving and cutting. One advantage is that cutting edges are sealed (this is true for almost all man-made textiles). The material washes well and can look incredibly like real leather.

## **LaserFlex - as easy as ironing**

LaserFlex is a high quality, multi-layered polyurethane film that has been specifically designed for processing with the laser. Finish textiles with designs of your choice, logos and lettering with a screen-like finish. Optimal laser settings vary depending on the laser power level and the speed of your laser plotter. We recommend processing from the bottom up while using the highest possible exhaust power level. This way any dust produced is no longer drawn across the already laser processed area. We also recommend that you work with a vacuum table, as the wafer-thin film may otherwise arch slightly.



Other tips and tricks

# Other tips and tricks

## Hardware

### How to select the correct focus lens

Best results with laser engraving or cutting are achieved by using different lenses. Just as different camera lenses are used for close-ups or wide-angle shots. The decision, which lens should be used, depends on a number of factors:

- Material type
- Detailing and resolution of graphics (dpi)
- Thickness of the material
- Viewing distance

**!** A general rule of thumb is: The more detailed the graphics, the shorter the focal length used during laser engraving. The thicker the material to be laser cut, the greater the focal length.

The depth of focus (focus tolerance) in turn indicates the range where the laser beam is optimally focused. The longer the focal length, the longer the depth of focus, i.e. the depth of focus of a 5 inch lens is about twice as long as that of a 2.5 inch lens. That is why, for example, the resultant cutting edge of thicker materials is straighter with a 5 inch lens than when using a 2.5 inch lens.

### Technical information

At the same time the diameter of the laser beam focus increases in size the bigger the focal length of the focusing lens is (in a 5.0 inch lens it is twice as big as that of a 2.5 inch lens, i.e. there is a linear correlation). As a result, the laser's performance (wattage) is distributed over a larger area. This decreases the intensity (power per unit of surface area) and with it the laser's maximum resultant temperature across the (enlarged) focus area. The use of a lens with a larger focal length might therefore represent an advantage when working with materials which are sensitive to temperature (e.g. laminates). The larger focus diameter means a bigger line width. This allows filling lines to be further apart and thus to be more quickly laser engraved.

**!** Find out how you can increase the life of your lenses through regular maintenance from page 57 onwards in our Lens cleaning guide.



Here we have summarized all lenses for our Speedy lasers along with optimal application areas.

Lens	Application areas for engraving / marking	Application areas for cutting
1.5 inch CO <sub>2</sub>	Graphics with fine details, (> 500 dpi resolution), Stamps with fine writing	Low laser power levels, thin materials (e.g. paper), Acrylic < 6 mm, Wood of medium hardness < 8 mm.
2.0 inch CO <sub>2</sub>	Graphics with medium details and resolution (500 dpi resolution; with reduced sharpness to 100 dpi resolution), standard engravings	Medium laser power levels, Acrylic < 8 mm, Wood of medium hardness < 12 mm.
2.5 inch CO <sub>2</sub>	Graphics with less detail, low resolution (<500 dpi). Engravings on heat-sensitive materials (e.g. laminates), when large areas are to be removed completely.	High laser power levels, Acrylic < 12mm, Wood of medium hardness < 15mm Delivers better edge quality during laser cutting than lower focal lengths
2.5 inch CO <sub>2</sub> Clearance Lens	Used exclusively for cutting	See 2.5 inch lens. Increases the distance between laser head and material. Especially useful when an increased distance is required due to the nature of the material and the graphics.
2.85 inch flexx	Standard lens for the Speedy flexx series. Permeable both for CO <sub>2</sub> lasers as well as fiber lasers. Both beam sources can be used without changing the lens. Other features as for the 2.5 inch CO <sub>2</sub> lens and the 3.2 inch fiber lens	Features as for 2.5 inch CO <sub>2</sub> lens and 3.2 inch fiber lens
3.2 inch fiber	Standard lens for fiber lasers with an extremely small focal diameter. Graphics with fine details, (> 500 dpi resolution)	
3.75 inch CO <sub>2</sub> rotary attachment	Special lens for SP500 rotary attachment. Allows processing of circular engraving objects that are less than 50 mm in diameter	This lens is not used for laser cutting
4.0 inch CO <sub>2</sub>	Fire engraving of wood, laser engraving of graphics with low detailing using high laser power levels	Foam rubber
5.0 inch CO <sub>2</sub>	Is not used for laser engraving	High laser power levels, Acrylic < 25 mm, Wood of medium hardness < 20 mm Delivers better edge quality during laser cutting than lower focal lengths

Lens	Application areas for engraving / marking	Application areas for cutting
5,0 inch fiber	Lens for a fiber laser, when materials are to be marked that are not absolutely flat. The larger focal length offers greater tolerance when focusing.	
7.5 inch CO <sub>2</sub> (for SP1500)	Is not used for laser engraving	High laser power levels, Acrylic < 40 mm Delivers better edge quality during laser cutting than lower focal lengths

Please keep in mind that not every lens is available for every device. We are happy to advise you.

## Exhaust system

A good exhaust system is essential for the safe and clean operation of your laser device. Dust and gas must be removed from the processing area. Furthermore, an exhaust system filters out smells produced during laser processing. In addition, exhaust systems ensure the quality of your laser engraved end products. The correct removal of dust and gases protects your materials from contamination.

A detailed overview of which Trotec exhaust system is best suited for each device can be found on our website [www.troteclaser.com](http://www.troteclaser.com). Of course your local contact person will also be happy to advise you on which system best suits your needs.

**!** **Tip: In order to direct the exhaust system's extraction performance onto the processing surface, simply cover the slits with magnetic strips or adhesive tape.**






Atmos exhaust systems are available in a range of sizes to match your needs

## The correct throttle setting for your application

The Trotec air throttle regulates the airflow between the exhaust system and the 75 mm suction connections on the Speedy 300, Speedy 360, Speedy 400 or SP500 when using a vacuum table. By reducing airflow into this port, the table's extraction power level is automatically increased and higher vacuum pressure is thus created or rather the removal of vapors via the table is increased. This leads to an improved hold of films, paper and other thin materials. In addition, the cut quality of acrylic or other plastics is increased as resulting fumes are extracted immediately, which results in clear and shiny cutting edges.

Setting the throttle is very simple:

closed	partially open	open
		
<p>Full exhaust performance on the vacuum table No exhaust performance via the exhaust slits in the processing area</p>	<p>The less you open the throttle, the more pressure acts on the vacuum table and the fewer fumes are removed via the Speedy's back wall</p>	<p>Exhaust performance at the table and in the processing area is normal, as if no throttle had been installed</p>
<p>Ideal: Cutting</p>	<p>Ideal: Combined engraving and cutting with low dust generation</p>	<p>Ideal: Engraving with high dust generation (e.g. stamp rubber)</p>

## The Trotec table concept - offers the right table for every application

Depending on the application, it may be necessary to adjust the processing table. For example, foils or paper require a vacuum table with high exhaust power levels, in order to achieve optimum results. When cutting acrylic, however, as few contact points as possible are desirable, in order to avoid back reflections - here an acrylic cutting grid or lamella cutting table would be suitable. In the following paragraphs we have summarized all of the tables and matching applications.

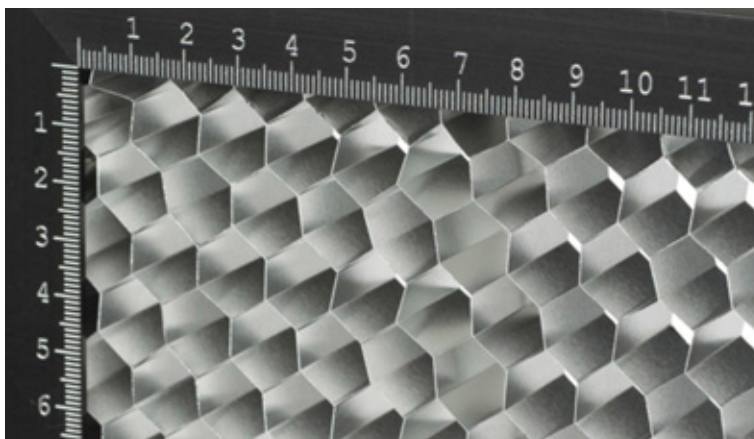
The ideal table for every application can be selected and replaced easily.

### **Engraving or standard table:**

In laser engraving, cutting or marking the evenness of the processing table is an essential criterion for optimal results, since it is a prerequisite to achieving correct focus across the entire surface. Consequently, the processing table is very robust and perfectly flat as well as being ferromagnetic across its entire surface. This means that you can easily fix thin materials, such as paper or foils in place using magnets.

### **Honeycomb table top:**

- With small honeycombs: The fine honeycomb table provides greater stability thanks to more support points. Furthermore, very small parts, for example in model construction applications, can be processed more successfully using the fine honeycomb top as parts cannot fall between individual honeycombs as easily.
- With large honeycombs: The honeycomb table with large honeycombs has the advantage that the material rests on fewer points and therefore fewer back reflections arise. Due to the large distances between individual honeycombs this table does not offer as much stability as the fine honeycomb table and you should therefore avoid placing heavy materials on the large honeycombs, as this can cause damage.



Detailed view of the honeycomb table

## **Vacuum table**

The vacuum table fixes the material on the working area by means of a negative pressure. The advantages: precise focusing over the entire area, even better engraving results and very efficient handling, since no manual fixing is necessary. The vacuum table is the ideal choice for thin and lightweight materials (paper, foils, ...) that can be challenging to place in a flat position on the surface.

## **Aluminum grid table**

The robust universal cutting table offers high stability and is particularly suitable for cutting tasks. It is especially for parts that are smaller than 100 mm, because they remain flat in position after cutting.



Lamellae can be removed individually and reinserted flexibly

## **Acrylic grid table**

The acrylic grid table prevents back reflections during cutting, making it the best choice for working on acrylic, laminates, plastic films and parts smaller than 100 mm. Each processed piece remains flat in position after cutting.



Acrylic cutting grates for perfect results in the processing of acrylic

## **Ferromagnetic engraving table**

Thanks to the ferromagnetic construction, you can easily fix thin materials such as paper or foils with magnets. In addition, an absolutely flat working area ensures optimum results in laser engraving and laser marking.

## **Honeycomb cutting support**


The honeycomb cutting support is perfectly suited for applications that do not require back reflections and best flatness. As it is the case, for example, when cutting paper and foils. Please note we recommend using the honeycomb cutting support in combination with the vacuum table.



## **JobControl®**

### **Materials database**

You will find a wide selection of pre-tested laser parameters in the Trotec JobControl® software. Choose between 52 different materials and thereby save time testing for optimum parameters. JobControl® gives you the opportunity to export and import parameter files. This has the advantage that you can import pre-tested parameters into your database at a click of the mouse, which not only saves you time but also avoids mistakes.

 **Are you already familiar with our sample database, which contains many creative ideas and examples for working with the laser? At [www.troteclaser.com](http://www.troteclaser.com) you will find templates and the corresponding JobControl® files for free download. Let yourself be inspired and discover more application options with which you can expand your portfolio.**

### **Exporting a parameter file**

Furthermore, it is also possible to export the entire materials database, individual groups of materials or single materials, in order to secure them for example on an external drive or to use them at another workstation.

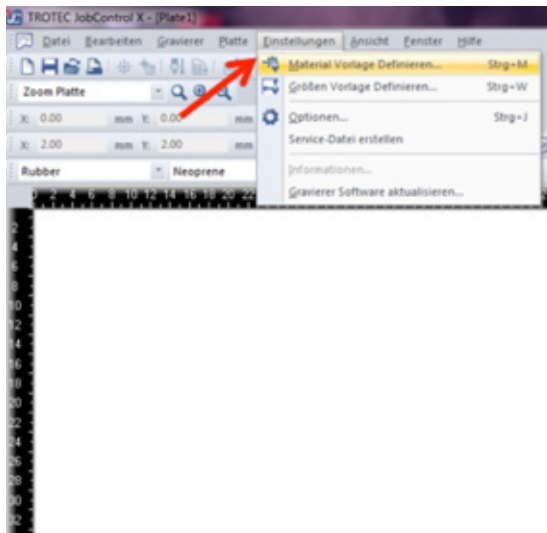
JobControl® files are stored in an .xml format and reimported. In order to export a file follow the step-by-step instructions:

#### **Export the entire materials database, a material group or a single material**

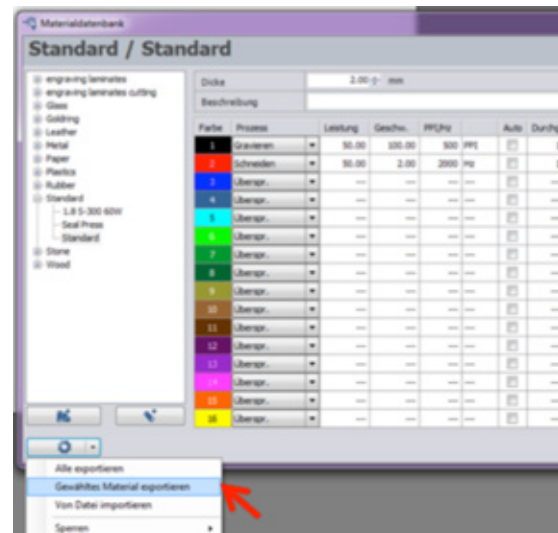
- Open JobControl® X on your computer
- Select "Settings"
- "Define material template (Ctrl + M)"
- The materials database opens

You can also open the materials database by double clicking the processing area.

- Highlight the materials group
- Use the left mouse button to click on the arrow of the “Settings” symbol
- The selection window opens
- Now choose whether to
  - export the entire materials database, i.e. “Export All”
  - export the selected materials group, i.e. “Export the Selected Group”
- A dialog box opens and you can save the exported material data as an .xml file on your desktop or in a directory of your choice
- Click “Save”



JobControl® Settings → Material template definition



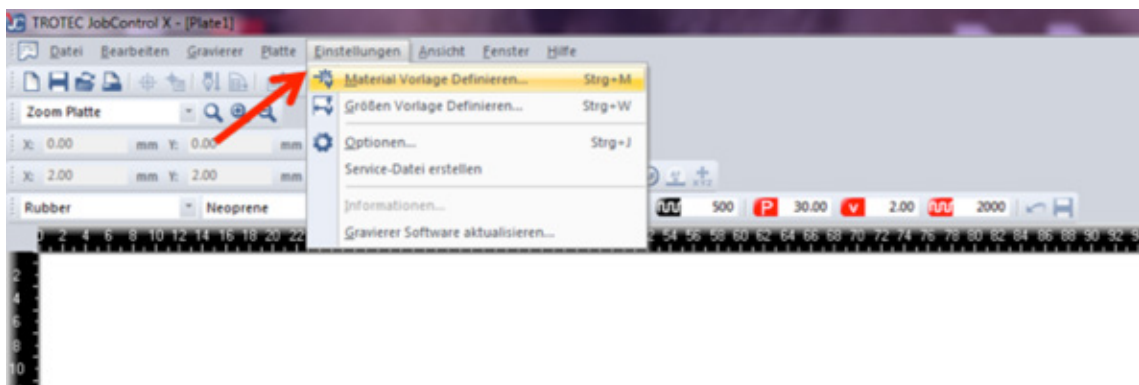
Export the desired material or even the whole database

**!** **Tip:** When exporting multiple files, we recommend that you rename them accordingly, in order to be able to identify them more easily when importing them again at a later date.

## Importing a parameter file

It is as easy to import of parameters as it is to export them, simply follow the steps and JobControl® will be ready to start laser processing immediately.

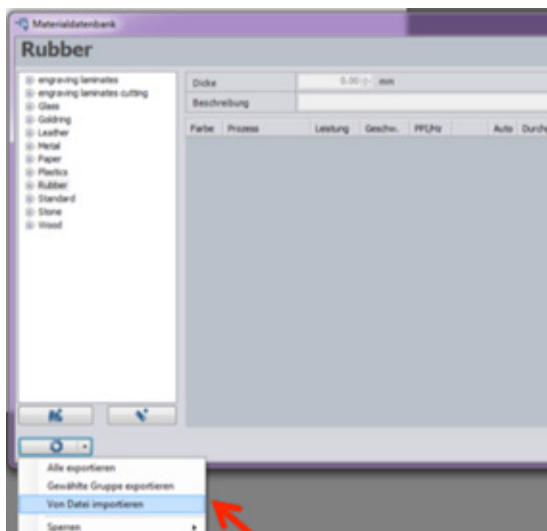
- Open JobControl® on your computer
- Select “Settings”
- Define material template (Ctrl + M)



JobControl® Settings → Define material template

With a double-click on the processing surface, the material database opens.

- The JobControl® X materials database opens
- Create a new materials group by clicking on “Create Material Group” and
  - thereby creating said group in your directory (option 1)
  - Highlight a pre-existing materials group, into which you want to save your file to be imported (option 2)
- Now with the left mouse button click on the arrow of the “Settings” icon
- The selection window opens
- Click on “Import from File”



Import new parameters, for example from our pool of sample patterns available online at [www.troteclaser.com](http://www.troteclaser.com)

Select your file and click on “Open”

- Another dialog box opens and the materials designation of the file to be imported is shown

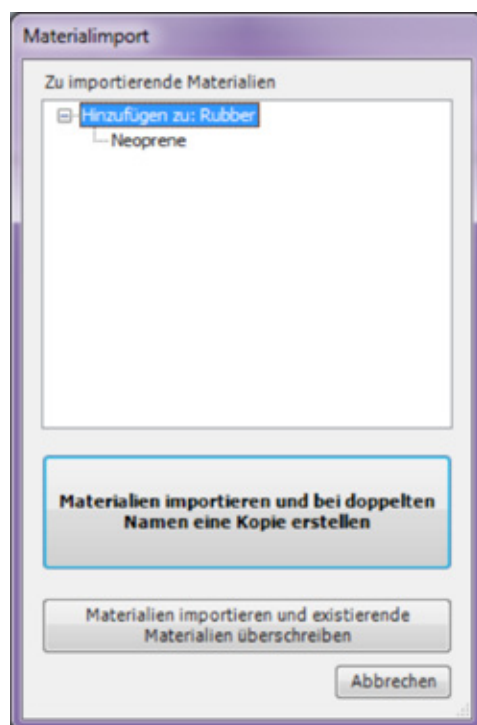
- Now you can choose, whether

a) to import the desired material and create a copy using the same material designation or

(b) whether to import the desired material and replace an existing file with same material designation



**Tip: Select option a) in order not to lose existing settings, you can always administer changes to the materials database in JobControl® X manually at any time**



- the desired materials setting are now imported into the materials database and displayed by

JobControl® X

- in order to save changes in the materials database, click on “OK”

- the .xml file held on the desktop can now be deleted (data is secured in JobControl®.)

Determine where your new parameters are to be stored

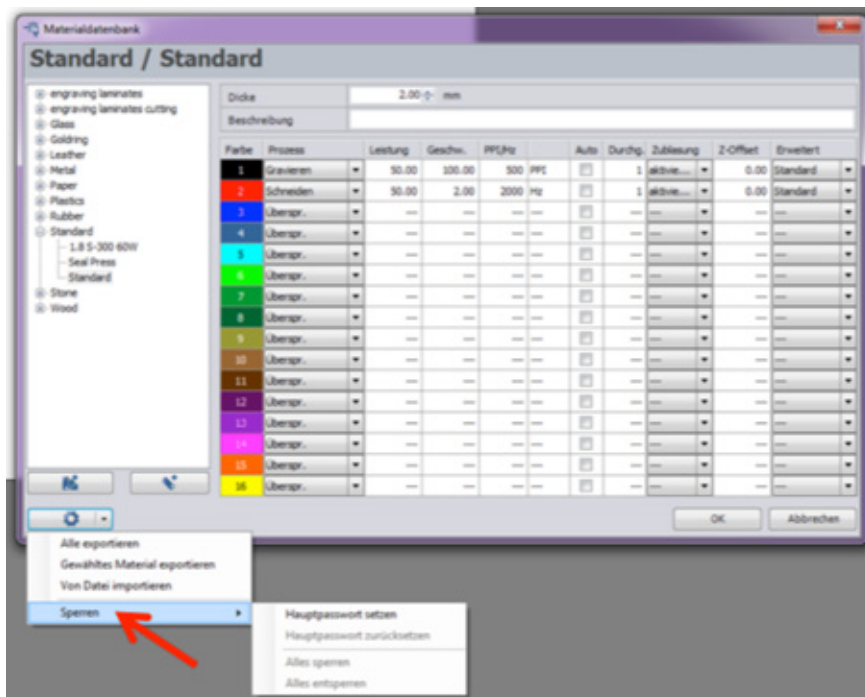


**Tip: When dealing with multiple files upload each file into the desired materials group separately and only click OK once the upload is complete.**

## Password protected materials

Has this happened to you? You have unintentionally overwritten the parameters in JobControl® and cannot remember the original values. No problem: As administrator you can password-protect individual materials or entire material groups.

- Use the left mouse key to click on the arrow of the „Settings“ symbol
- The selection box opens → now select „Lock“
- “Set main password”
- With this function you as administrator can lock material groups or individual materials and / or unlock them, locked data is identified with a lock symbol
- Click on “OK” to save the changes



Lock materials or groups

## JobControl® functions that make laser processing even easier



**Standard:** The most commonly used engraving and cutting process.



**Photo-optimized:** Optimizes high resolution images to maximum quality. A third-party image editing software is thus not required because the image is automatically rasterized.





**Stamp:** Your layout is automatically mirrored and inverted, stamp edges can also be optimized. The webs function, in which the cutting line is automatically interrupted, so that the cut stamp plate remains connected to the raw material, further facilitates production.



**Seal press:** Is used in the production of laser engraved and cut seals for seal presses. Automatically creates positive and negative die plates to match the selected paper thickness as well as cutting lines and the positioning nose.



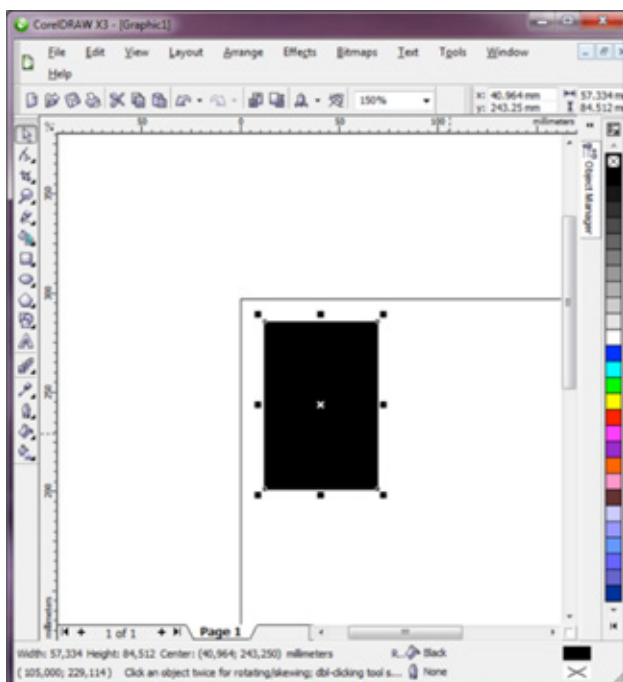
**CutJob:** Only cutting lines are recognized.

## ***How do I find the perfect laser parameters?***

In the Materials chapter from page 9 we have compiled tips and tricks for the most popular materials. Of course, there are also materials that we have not yet tested ourselves. We recommend you use the following tool to test out the appropriate parameters:

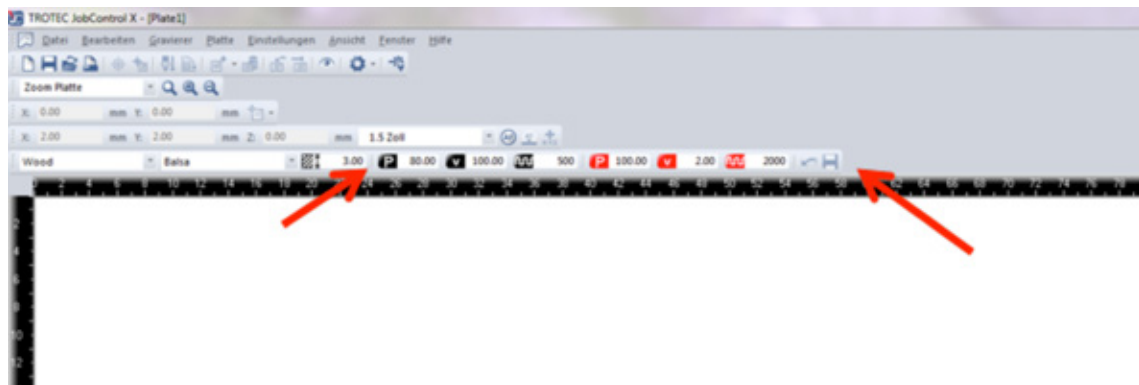
### **Engraving**

In order to find the best possible engraving parameters for an unknown material, draw a black contourless rectangle in CorelDraw®. The size of the field is dependent on the size of the material - as a standard size 50 x 50 mm is recommended.



Engraving template to test parameters

Send the field at low power (about 10-20%), maximum speed and 500 dpi to the laser. As soon as you then start the job, the bidirectional communication between the laser and JobControl® allows you to change the parameters during the engraving process. If no result is visible at low power, you can directly adjust both the power and speed in JobControl®. We recommend to double the power level as a first step. Depending on how the result looks, double or reduce the power level to until you find the best settings for you.



You can change the parameters 'on the fly,' simply by entering the values in the edit line and pressing Enter

## Determination of parameters with the grayscale matrix

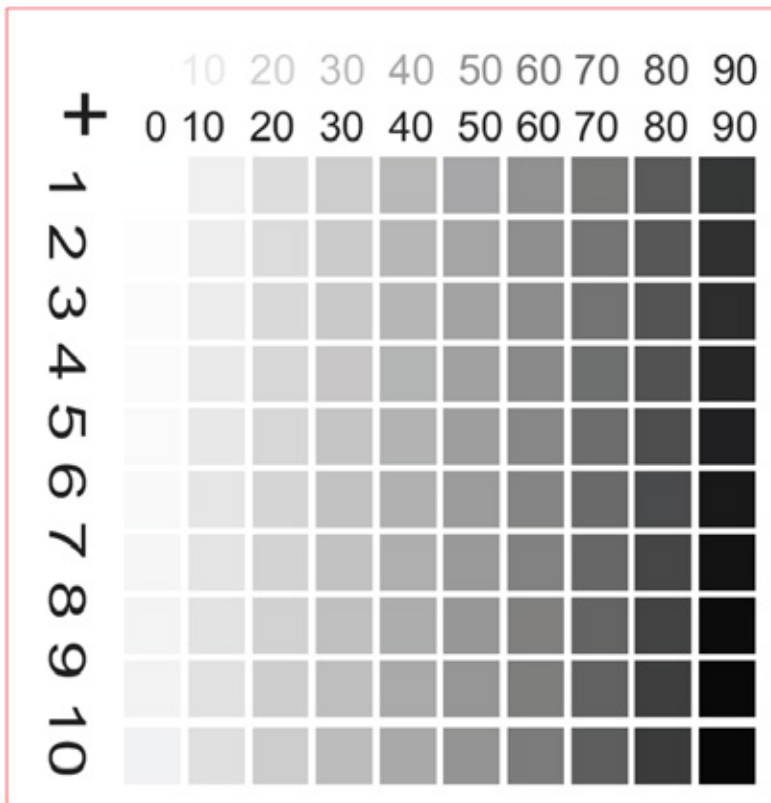
The test matrix consists of 100 different shades of gray. Using the Relief function in the JobControl® printer driver, the appropriate parameters can easily be determined.

The laser output is also adjusted according to the black tone. When a 100% black box is engraved, 100% of the set output can be used. If a 50% black box is engraved, this is engraved with 50% of the set output. The laser output is linear to the black tones, therefore the desired color tone can be selected using the test matrix engraving and the corresponding values can be directly transferred to the parameter database.

The speed of the machine always remains constant.

Paste the picture into your graphics program. In the printer settings of the JobControl® printer driver, set the process type to Relief. Select the resolution according to the material that you want to test; in the case of wood, for example, between 333 DPI and 500 DPI.

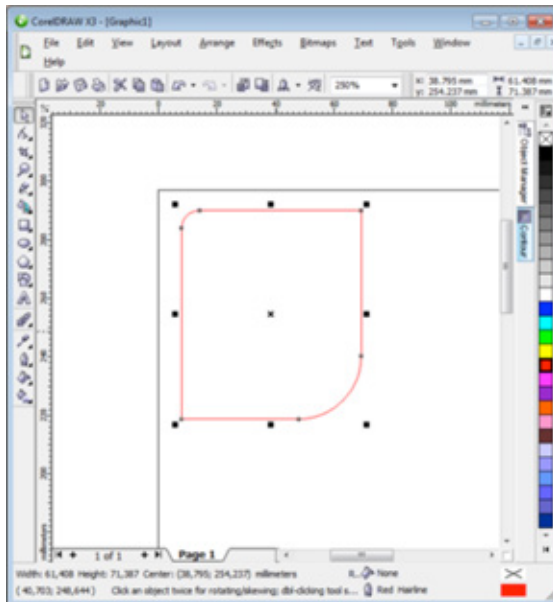
**Tip** For a laser output on a machine of 100 watts or more, start with P=80% output and v = 100% speed.  
For a laser output on a machine between 40 and 100 watts, start with P=100% output and v = 100% speed.  
For a laser output on a machine below 40 watts, start with P=100% output and v = 50 - 80% speed.  
Select your desired color tone from the 100 different parameters of the engraved matrix and save it in your JobControl® database.



The selected parameter for P in this example is 80+7 i.e. 87% of the preset P-value (output).

## Cutting

The following graphic is advisable, in order to test cutting parameters:



The rectangle with two differently rounded corners offers the advantage that both straight cutting lines as well as more complex shapes are possible with the tested settings.

Template to test cutting parameters

### Tip

Thanks to the new OptiMotion™ function, determining cutting parameters with the new Speedy400 is child's play. Define the right speed at 100% power simply by means of a long straight line. If the parameter cuts through at the selected speed, you can adopt this setting for any cutting application on this material - whether large, angular shapes or detailed, small circular geometries. Just make sure that you adjust the frequency accordingly at high speeds (e.g. to 2000Hz or 3000Hz) to obtain a uniform cutting line.

# Shortcuts – key combinations

Everyone knows Copy and Paste nowadays. Other keyboard shortcuts and combinations can also help to make your everyday life easier and save you time. Here we have compiled a small selection of the most important key combinations for you and listed them on the following pages.

## JobControl®

Keyboard shortcuts	Description
F1	Help
Ctrl + - or Ctrl + +	Zoom out or in
Ctrl + 0 or Shift + F4	Zoom on plate
Alt + 0 or F4	Zoom on job
F8	Marker to laser
Ctrl + N	New plate
Ctrl + O	Open plate
Ctrl + S	Save plate
Ctrl + P	Print
Ctrl + A	Select all jobs
Ctrl + R	Reset selected jobs
Ctrl + G or F12	Start
Ctrl + F	Pause
Ctrl + E	Stop
Ctrl + D	Duplicate job (either on the plate or in the queue)
Remove	Delete selected jobs
Ctrl + delete	Delete selected marker
Ctrl + M	Open materials database
← (back)	Job back in queue
Ctrl + space bar	Rotate job



## CorelDraw®

### Align and arrange objects

Keyboard shortcuts	Description
C	Align object(s) centrally and vertically
E	Align object centrally and horizontally
P	Align object centrally on the page
L or R	Left-aligned or right-aligned
T or B	Align at the top or bottom
Shift + A or Shift + P	Distribute distances vertically or horizontally between objects

### Text

Keyboard shortcuts	Description
Ctrl + B	Bold
Ctrl + I	Italics
Ctrl + U	Underlined
Ctrl + 4 or Ctrl + 6	Increase or decrease font size by one increment
Ctrl + L or Ctrl + R	Left-aligned or right-aligned
Ctrl + F12	Spell checker

### F-keys

Keyboard shortcuts	Description
F1	Help
F2	Jump to zoom tool once
F3	Reduce size of drawing
F4	Show all objects
F5	Draw lines and curves (freehand mode)
F6	Rectangle tool
F7	Circle / ellipse tool
F8	Text tool
F9	View full page
F10	Node edit (anchor)
F11	Color gradient
F12	Contour pen

## Finishing

### **Lens cleaning**

Clean optics are a prerequisite for perfect engraving and cutting results. Certain materials, such as wood or stamp rubber, create more dust during engraving than other applications. Depending on the respective application optics should be cleaned at regular intervals. This ensures the longevity of the laser as well as consistently high quality of engraving.

#### **How does that work?**

It is really easy to keep optics in good condition. A brief check of the lens and the mirror on the processing head should be part of your daily laser care routine. It is best to check the side mirrors once a month. Depending on the material used these intervals may have to be shortened. Thanks to proprietary Trotec InPack technology™ lenses and mirrors are protected from dust. This reduces the amount of cleaning required enormously.

#### **Step 1 - Blow away loose particles (dust, fluff)**

A small bellows helps to remove lint and dust. Alternatively, you can of course also use the laser's compressed air supply. If the optics are still dirty, just continue with step 2.

#### **Step 2 – clean with cleaning fluid and cloths**

Carefully remove the optics from the laser device. Rinse the lens with cleaning fluid and place it on a clean cloth. Now wet the lens surface with cleaning fluid and leave to soak in for about a minute. Then dampen a cloth and wipe down the surface of the lens without exerting any pressure on it. If the lens or mirror is still dirty, simply repeat the process. That's it!



Lens cleaning

**Optics: More sensitive than glass**

It is very important to treat the optics extra carefully. Never use any kind of tool, which could scratch the surface. We recommend that you use the cleaning liquid and cloths supplied in the accessory box.

## **General cleaning**

You should check at least once every day, whether dust has accumulated inside the engraving system. In case of soiling, the machine must of course be cleaned. How often you clean the machine does of course depend on the type of materials that are processed.

**CAUTION:** Due to a lack of cleaning, flammable components may build up in the interior and in the exhaust area and significantly increase the risk of fire.

- Bring the engraving table into a position where you find it easy to clean the surface with window cleaning agents and paper towels.
- Make sure that the appliance is switched off and unplugged. Open the lid.
- Remove all loose debris and deposits carefully from the machine's interior.
- Clean the laser tube cover.
- You can clean the viewing window with a cotton cloth. Do not use paper towels, as these could scratch the acrylic.

**Vacuum cleaner**

Do you work with rubber or other materials that cause a lot of dust? A vacuum cleaner helps to remove dirt and dust particles from the machine and saves a lot of time!

# Appendix

## ***Important links***

### ***Tips for laser users:***

<https://www.troteclaser.com/en/knowledge/tips-for-laser-users/>

### ***Tips about Trotec materials***

<https://www.trotec-materials.com/material-usage-hints>

### ***Download laser parameters***

<https://www.troteclaser.com/en/knowledge/laser-parameters/>

### ***Samples (incl. instructions and files):***

<https://www.troteclaser.com/en/knowledge/do-it-yourself-samples/>

### ***Step-by-step instructions for laser material applications:***

<https://www.trotec-materials.com/trainings>

### ***Trotec Youtube channels with numerous tips & tricks:***

Trotec International (Englisch): <https://www.youtube.com/user/TrotecLaserEngraving>

Trotec Kanada (Englisch, Französisch): <https://www.youtube.com/user/TrotecLaserCanada>

Trotec USA (Englisch): <https://www.youtube.com/user/lasersRfun>

Trotec DACH (Deutsch): <https://www.youtube.com/channel/UCUOhdSL5iRIRXYQuKC3XAFQ>