

OPERATION MANUAL

8013 Trotec FineMarker Hybrid



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TROTEC cannot be held responsible for any direct or indirect damages, which result from using or working with the products electric circuits or software described herein. The apparatus must be used only by trained and skilled personnel. Before use the manual should be read and followed carefully.

Furthermore TROTEC reserves the right to change or alter any product described herein without prior notice.



In case of failure, please check the device first according to section 6.2 Tips for Troubleshooting. If unsuccessful, please note all data of the device (year of manufacture, software version, etc.) and call us from a telephone next to the switched on device.

For queries or technical problems please contact your dealer or TROTEC directly at the above address.

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1 GENERAL

1.1 Operation Manual Use – General Information

Caution:

Please read and follow this Operation Manual carefully, before installation and operation. Damage to persons and/or material can result from not following individual points of the Operation Manual!

Operation of the system is only permitted with equipment and spare parts supplied or listed in the spare parts and consumables lists.

Auxiliary equipment must be adjusted to the base machine (any queries to dealer or manufacturer).

The following symbols are used for easier understanding of the Operation Manual:



If the Operation Manual is not observed, this area represents a particular danger for the operating personnel or the personnel responsible for maintenance.



Caution: This component is under voltage. In these areas strictly observe the safety instructions regarding electricity. Care is to be taken in particular during maintenance and repair work.



Caution: In this area pay attention to the possible dangers of the laser beam.



Note or information on individual components of the device, that simplify the use or make it more understandable.



1.2 Designated Use

The TROTEC laser engraver, FineMarker Hybrid, is used for engraving and cutting of signs, stamps and suchlike.

A wide variety of materials can be processed on the laser engraver. Please have a look at the Material table on page 53 for further details.

Many metals and most plastics will show interaction with the laser beam. However, very clean metallic surfaces which are highly polished and pure could show NO reaction. This is due to too high reflectivity at 1064nm wavelength which is given especially for silver and copper.



The working process must only be performed with a perfectly adjusted machine (see also Section 4 OPERATION).



For cutting applications with 45 W and more the use of the cutting table is absolutely necessary.



Use of the system in other areas is against the designated use. The manufacturer does not admit liability for damage to personal and/or equipment resulting from such use.



The system must only be operated, maintained and repaired, by personnel that are familiar with the designated field of use and the dangers of the machine!



Non-observance of the instructions for operation, maintenance and repair described in this Operation Manual excludes any liability of the manufacturer if a defect occurs.



Caution when processing conductive materials (carbon fibers,...)! Conductive dust or particles in the ambient air might damage electrical components and lead to short circuits. Bear in mind that those defects are NOT warranted.

1.3 Disposal remarks



Do not dispose the machine with domestic waste!

Elektronic devices have to be disposed according to the regional directives on electronic and electric waste disposal.

In case of further questions, please ask your supplier. He might take care of proper disposal.





1.4 Technical Data / Device Specification

Mechanic

Working area	720 x 430 mm 28.5" x 17"
Max. size of work piece	750 x 440 mm
Max. height of work piece	165 mm 6.5"
Max. processing speed	355 cm/sec. 140 inches/sec (Strong) 200 cm/sec. 78 inches/sec (Medium)
Motor	Brushless DC Servo motor
Encoder	Increment
Work piece table	Solid metal (magnetic)
Max. load of work piece	20 kg 44 lb
Lens	Hybrid Special Lens (2.85")

Features

Electro-Optic Autofocus, Red dot Laser Pointer, Coaxial Air Assist,
Magnetic Working Table, Harsh Environment Protection Kit, Cover strips for exhaust

Optional available:

Honeycomb Cutting Table, Rotary Attachment, Air Assist including Compressor, storage rack

Control system

Laser power	Adjustable from 0 - 100%
Interface Hardware	RS-232-C, 115k, USB 460k
Interface Software	AD-Logic System, ASCII- HPGL

Laser Equipment

Laser tube	<ul style="list-style-type: none">• Diode-pumped Nd:YVO₄ laser, maintenance free• Sealed off CO₂ Laser (45 Watt), maintenance free
Wavelengths	Nd:YVO ₄ : 1064 nm (NIR); CO ₂ : 10600nm

Cooling system

Cooling System	Air-cooled
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Electricity

Electricity	Single phase 230V/50Hz/10amps; 115V/ 60 Hz/20amps; 2.0 kW
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Dimensions

Width/depth/height	1130 mm x 980 mm x 1060 mm / 44.5" x 39" x 42"
Weight (approx.)	app. 228 kg
Packaging (weight; width/depth/height)	app. 125kg, 1400 x 1030 x 1340 mm ³

Ambient conditions and exhaust

Ambient conditions and exhaust	Operating temperature +15 to +25° C humidity 40% to max 70%, not condensing, min. exhaust volume 200 m ³ /h
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Laser Safety

Laser class	CDRH Laser Safety; Laser Class 2 CE tested
Interlock	Duplicate Interlock safety system

SUBJECT TO CHANGE WITHOUT PRIOR NOTICE!



1.5 Manufacturer's Label

The Manufacturer's Label is located on the back side of the machine (see picture below).



It is recommended to enter data such as serial number and year of manufacture data sheet below so that you always have this data handy if you have problems with your device or require spare parts.

trotec Laser		
Trotec Produktions- und Vertriebs Ges.m.b.H Linzer Straße 156, 4600 Wels, Austria		
Serial No:		
Model / Typ:		
Manufactured:		
	Input Power:	
	Nominal Power:	
	Lasertype:	
	Wiring Diagram No:	
	Laserdiode:	<0,99mWcw, 655nm
  EN 60825-1 (2007) www.troteclaser.com		





1.6 EU – Declaration of conformity

The manufacturer

TROTEC Produktions- u. Vertriebs GmbH.
Linzer Strasse 156,
A-4600 Wels, OÖ.,
AUSTRIA

hereby declares that the following product

TROTEC 8013 Finemarker Hybrid
Model N° 8013 Finemarker Hybrid

has demonstrated conformity to the following guidelines:

2006/42/EG Directive for Machines
2006/95/EG Low Voltage Directive
2004/108/EG EMC Guideline

Applied during design and construction of this product:

- EN ISO12100 Machine Safety
- EN 60335-1/2007 Safety of Household and similar Appliances
- EN 55014-1/2006, EN 55014-2/1997 Electromagnetic Compatibility
 - EN 60204-1 Machine Safety – electr. Equipment
- EN 60825-1/2007, EN 60825-4/2006 and EN 60825-14/2006
Safety of Laser Equipment
- EN 60950/2006 Safety of Electric Devices for Informatics including
electric Office Machines
 - EN 55022/2008, EN 55024/2003 Electromagnetic Compatibility

Wels,

Trotec Produktions u. Vertriebs Ges.m.b.H



2 SAFETY

Please read this chapter before operating or servicing a Trotec FineMarker Hybrid laser system!

2.1 General Safety Information

All personnel involved in installation, set-up, operation maintenance and repair of the machine, must have read and understood the Operation Manual and in particular the "Safety" section. The user is recommended to generate company-internal instructions considering the professional qualifications of the personnel employed in each case, and the receipt of the instruction/Operation Manual or the participation at introduction/training should be acknowledged in writing in each case.

Safety-conscious Working

The machine must only be operated by trained and authorized personnel.

The scopes of competence for the different activities in the scope of operating the machine must be clearly defined and observed, so that under the aspect of safety no unclear questions of competence occur. This applies in particular to activities on the electric equipment, which must only be performed by special experts.

For all activities concerning installation, set-up, start-up, operation, modifications of conditions and methods of operation, maintenance, inspection and repair, the switch-off procedures that may be provided in the Operation Manual must be observed.

Safety Information for the User and/or Operating Personnel

- No working methods are permitted that affect the safety of the machine.
- The operator must also ensure that no unauthorized persons work with the machine (e.g. by activating equipment without authorization).
- It is the duty of the operator, to check the machine before start of work for externally visible damage and defects, and to immediately report changes that appear (including behavior during operation) that affect the safety.
- The user must provide that the machine is only operated in perfect condition.
- The user must guarantee the cleanness and accessibility at and around the machine by corresponding instructions and controls.
- Principally, no safety components may be removed or disabled (already here we emphasize the imminent dangers, for example severe burns, loss of eye-sight). If the removal of safety components is required during repair and service, the replacement of the safety components must be performed immediately after completion of the service and repair activities.



- Preparation, retooling, change of work piece, maintenance and repair activities must only be performed with equipment switched off, by trained personnel.
- It is forbidden to perform unauthorized modifications and changes to the machine. It is emphasized, that any unauthorized modifications to the machine are not permitted for safety reasons.

2.2 Laser Safety Information



To assess the potential dangers laser systems pose, they are classified into 5 safety classes: 1, 2, 3a, 3b and 4. Trotec FineMarker Hybrid is a device of **class 2 (USA: Class II)**. This is guaranteed by the protective housing and the safety installations.

Please note that improper operation of the device can override the status of safety class 2 and can cause the emission of harmful radiation.



This laser system contains a **Nd:YVO4 laser** and a carbon dioxide (CO₂) laser source of class 4 that emits **intensive** and **invisible** laser radiation. Without safety precautions the direct radiation or even diffuse reflected radiation is dangerous!



Without safety precautions, the following risks exist with exposure to laser radiation:

Eyes:	Burns to the retina for NIR (Near Infra Red) LASER
	Burns to the cornea for CO ₂ Laser
Skin:	Burns
Clothing:	Danger of fire



Never try to modify or disassemble the laser and do not try to start up a system that had been modified or disassembled!



Dangerous radiation exposure can result from the use of operation or adjustment equipment other than that described here, and if different operational methods are performed.



Service technicians using the service plug are required to wear standard laser safety glasses for **NIR (Near Infra Red) LASER** lasers (wavelength 1060 nm) and for CO₂ lasers (wavelength 10.6 µm)



Dangerous radiation exposure can result from the use of materials other than described in Section 1.2 (Designated Use) and the material table in 6.1 Material table:



In case of using highly reflecting materials like

- blank or polished metals
- metals with very high reflectivity like copper, brass, gold, silver
- any materials with highly reflecting coatings
- other highly reflecting materials,

especially in combination with high laser power, low processing speed and/or work pieces with curved or inclined surfaces, laser radiation might be reflected towards the protection cover. With a very low probability this protection cover could be damaged if the reflected radiation is FOCUSED onto the surface of the protection cover.

Therefore visual inspection for point-like defects on the protection cover should be done if the aforementioned conditions are given.

The loss of yellow color on the protection cover indicates a damage of the protecting layer. If you detect such effects, immediately turn off the laser machine and take care to get a new protection cover.

Also other components inside the machine may be damaged if the aforementioned conditions are given.

To improve laser safety an optional "Laser Protection Cover" is available on request.



2.3 Safety Precautions when Operating the Device

In your FineMarker Hybrid, a closed safety system is integrated which immediately switches off the power to the laser tube when the protection cover is opened. Consequently an incomplete engraving can occur if the cover is opened during operation. Therefore, first press the "PAUSE" button, if you want to interrupt an engraving process.

Please remember the following safety precautions when working with this device:

A fire extinguisher must always be handy as the laser beam can ignite flammable materials. Do not store any flammable materials in the inside of the device or in the immediate vicinity of the device. Particularly leftovers of produced materials have to be removed to prevent fire hazard.

Unsupervised operation of the system is not permitted.

Because of their low absorption many metals, in particular un-coated aluminum, copper, silver and gold cannot be processed with the laser and lead to high reflections of the laser beam. Such materials must not be inserted into the beam, as a directed reflection could destroy the protection cover.

Adjustment of the beam path must be performed only by especially trained personnel. An improper setting can lead to uncontrolled emission of the laser radiation.

Before processing materials the user must verify, whether harmful materials can be generated and whether the filter equipment of the exhaust system is suitable for the harmful materials. We emphasize that it is the responsibility of the user, to consider the national and regional threshold values for dust, fogs and gases when selecting the filters and the exhaust system. (The values for the maximum workplace concentration must not be exceeded.)

Please refer to the manual of the exhaust system on how and in what intervals you need to replace filters.

PVC (polyvinyl chloride) must under no circumstances be processed with the laser.

Should you have further questions before starting work, please contact your dealer or TROTEC.



2.4 Warning and Information Labels



The warning and information labels are attached in such positions of the device that could represent a source of danger during set-up and operation. Therefore, follow the information on the labels. If labels are lost or damaged, they must be replaced immediately.











3 BEFORE OPERATION

3.1 Unpacking

You receive your FineMarker Hybrid packed in a cardboard box or wooden box, which contains the laser and additional accessories. The following steps give you an overview of the unpacking and assembly of the laser. Please follow these steps carefully.



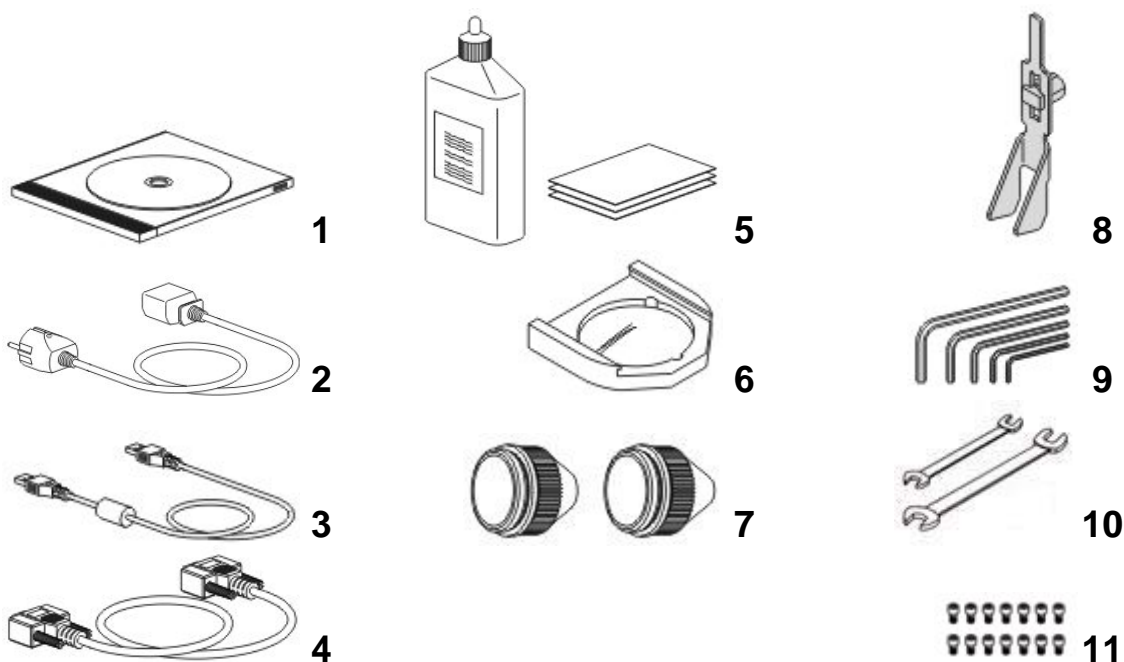
Keep the packing box. You will require it in case of a return.
Dispose all waste according to the applicable waste disposal law.

1. Remove the cover. Please do not forget to store this box in a dry place.
2. Carefully remove the foam material, which protects the viewing window of the cover, and the tape that holds this cover in place.
3. Open the front door and remove the accessories box located under working table, which contains all accessory parts required for the installation of the laser machine.
4. Lift the laser machine out of the box. For this you will require two to three persons.
5. Open the accessories box.



3.2 Contents of Delivery

- Transport and service packaging
- Laser including optics
- Stand
- Accessories box, which contains the following parts:
 1. CD TROTEC software / printer driver incl. Operation Manual
 2. Mains cable
 3. Computer connection cable USB
 4. Computer connection cable serial (optional)
 5. Cleaning kit for optics
 6. Additional lenses (optional)
 7. Air assist nozzles(s) (optional)
 8. Focus tool(s)
 9. Allen key set 1.5 - 10 mm
 10. Open end wrenches
 11. Screws for assembly



3.3 Location

Before you install the laser system, you should select an appropriate location. Follow the guidelines shown below:



Avoid locations where the system is exposed to high temperatures, dust and high humidity. (The humidity must not exceed 70% and the temperature must not be close to the dew point.)



Avoid locations, where the system is exposed to mechanical shocks.



Fuse protection:

Do not connect other devices via the laser fuse, as the laser system requires the full amperage.



Avoid locations with poor air circulation.



Select a location, whose room temperature is between 15 °C and 25 °C (59° – 77° F). Avoid higher ambient temperatures and strong exposure of the machine to the sun. Use blinds, if required.



Select a location close to ventilation (if available).



Select a location that is not more than 2.50 m away from your computer (max. cable length to avoid disturbing interferences).



Try to place a working table or a place to put things next to it. This shall avoid, that the machine is misused as a table.



3.4 Electrical – Requirements



Make sure that your electrical outlet is capable of providing the proper voltage, frequency and amperage that the laser system requires.

We recommend having individual circuits for
Lasermachine and PC
Extractor

Recommended fuse 16A (230V), 20A (115V).

Please install your computer to the same circuit as the laser marker to prevent electromagnetic interactions.

DAMAGES FROM AN INADEQUATE OR INAPPROPRIATE POWER SOURCE ARE NOT COVERED UNDER WARRANTY.

Noisy or unstable electricity as well as voltage spikes can cause interference and possible damage to the electronics of the laser system. It is better to connect the laser system to a dedicated electrical line.

It is highly recommended that you use a surge suppression plugs to protect your computer equipment.

If electrical power fluctuations, brown outs or constant power outages are a problem in your area, an electrical line stabilizer, UPS (Uninterruptible Power Supply) or backup generator might be required. If installing any of these devices, make sure that they meet the electrical requirements of the laser system.

It is your responsibility to provide a suitable electrical supply.



3.5 Exhaust System – Requirements



To guarantee the right ventilation during the engraving of rubber, an exhaust system with a minimum suction power of **300 m³/h** is required. The device must be equipped with a fine dust filter (generation of rubber dust) as well as an activated carbon filter (neutralization of smells). A good filtering of the outgoing air is also required when cutting plastics or engraving wood. If only anodized plates are engraved, the suction power can be reduced. Connection - see section 3.7.3 Connecting the Exhaust System.



Do not start the machine without an adequate exhaust system.

3.6 Computer – Requirements



The following recommendation represents the **minimum requirements**. When using a more powerful computer the graphics are generated and displayed faster and the computing times and the data transfer to the laser are reduced. To use the newest software version, you might have to abide other requirements.

- Windows 7® 32/64-bit or
Windows Vista® 32/64-bit (with Service Pack 1 or later) or
Windows® XP 32/64-bit (with Service Pack 2 or later)
- 512 MB of RAM, 400 MB of hard disk space
- Pentium® 1 GHz processor or AMD Athlon™ XP
- 1024 x 768 or better monitor resolution
- 24-bit color depth graphics card
- 1 free USB interface
- Serial port RS232 for troCAM
- CD drive
- Mouse



3.7 Connections



Perform the connections exactly in the order described, otherwise electrostatic charging can damage your computer and/or the electronics of the laser system.

3.7.1 Connecting the Mains

Connect one end of the mains cable with the connection socket **(1)** at the rear side of the laser device (see Figure below) and the other end with a protected power outlet.



Mains voltage and operating voltage must correspond (AC 230 V/50 Hz or AC 115 V/60 Hz) – see information label beside the connection socket.

Under no circumstances switch on the device if the voltages do not correspond.



INPUT POWER
100-120VAC 60HZ

INPUT POWER
220-240VAC 50HZ



The main fuses **(2)** are located below the connection socket and are accessible from the exterior.



3.7.2 Connecting the Computer



The computer must be switched off and connected to the mains voltage.

Connect the laser (see Figure below) to a free serial interface **(1)** or USB port **(2)** on your computer.



3.7.3 Connecting the Exhaust System

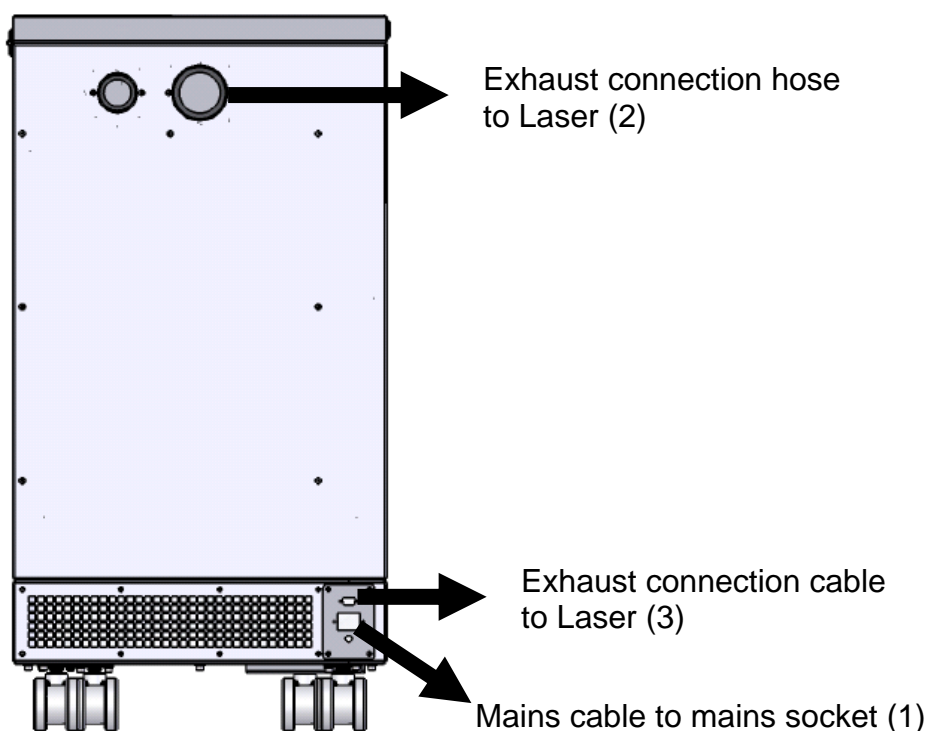
- Connect your exhaust system to the mains socket (1).



Make sure that the mains voltage corresponds with the voltage allocated for the exhaust system.

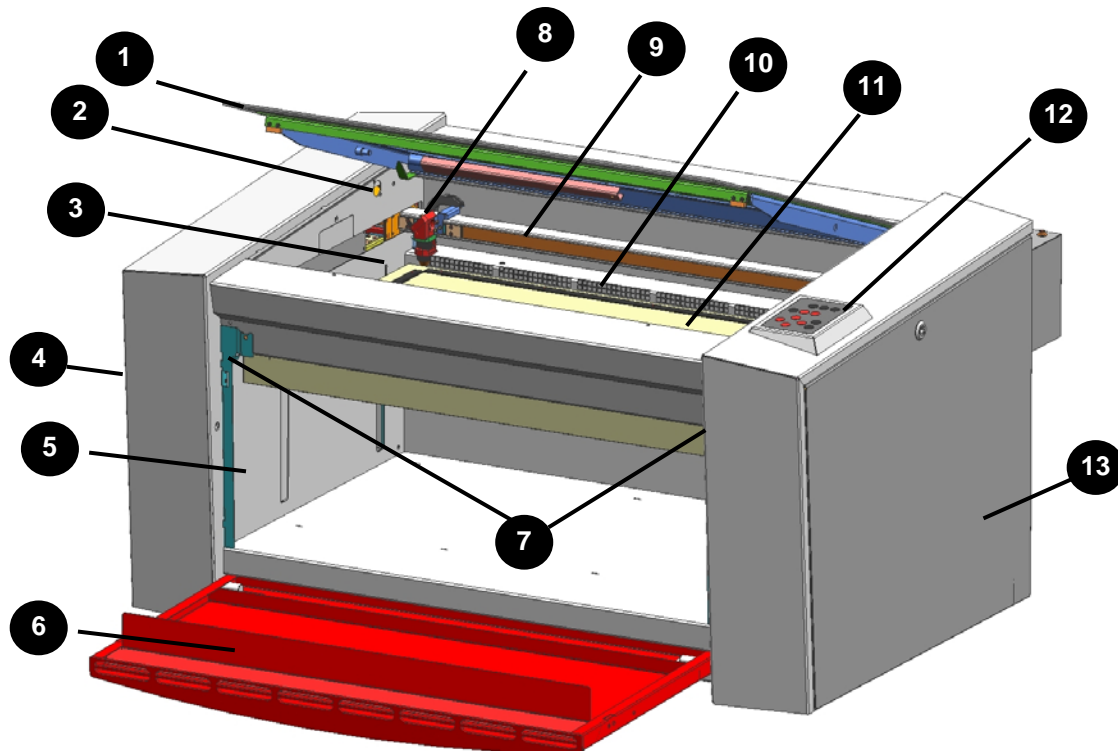
- Plug the ends of the exhaust duct into the allocated connection (2). The position of the connector depends on the type of exhaust system.
- When using the TROTEC exhaust system, also connect it with the cable included to the remote control connector of the laser (3).

Also follow the operation and maintenance instructions in the Operation Manual of the exhaust system.

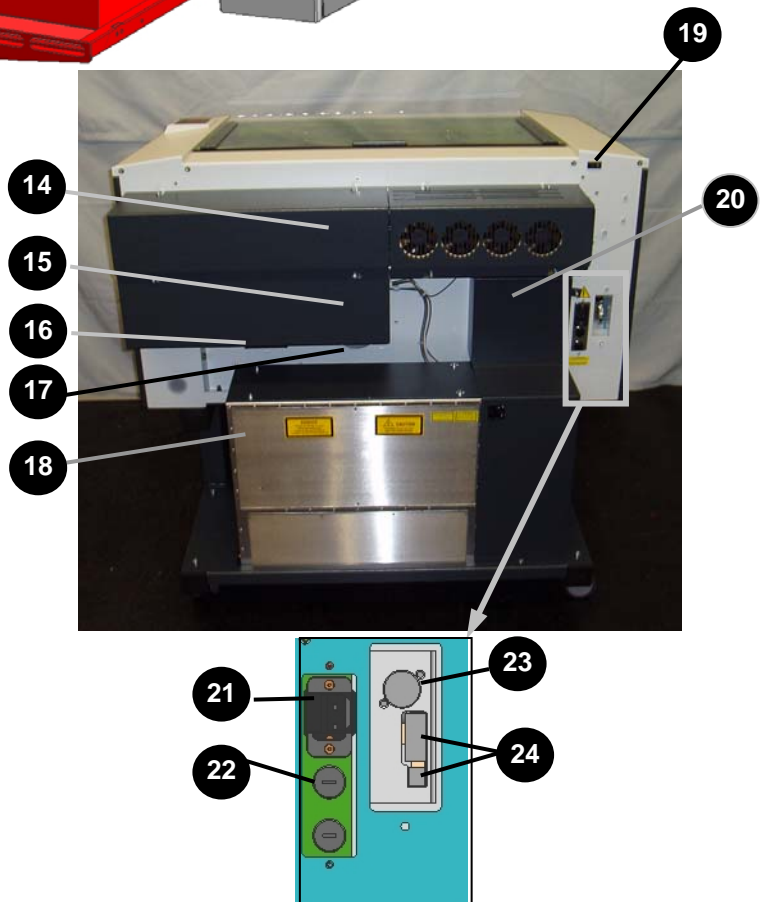


4 OPERATION

4.1 Machine view and connections



- 1 Top lid
- 2 Service socket
- 3 Autofocus sensor
- 4 Service access panel
- 5 Connection Socket for Rotary
- 6 Front lid
- 7 Interlocks front lid
- 8 Focusing head
- 9 X-axis
- 10 Ruler
- 11 Working table
- 12 Keypad
- 13 Maintenance panel
- 14 Laser source CO₂
- 15 Laser collimator cover NIR
- 16 Manufacturers label
- 17 Exhaust hose connector
- 18 Laser Module (Rack) NIR
- 19 ON/OFF Switch
- 20 Power supply
- 21 Power socket
- 22 Fuse(s)
- 23 Exhaust connection cable
- 24 PC connection cable (USB/Serial)



1 Top lid



If the Top lid is opened, no data is processed. After closing the Top lid, the device is not ready to process commands for 5 seconds. If the protection cover is opened during operation, the motion system is stopped and laser source is turned off.



Please note, that the laser tube is switched off **immediately** and consequently the result of the engraving is incomplete. During processing of commands the protection cover must only be opened after pressing the "Pause" button.

2 Service Socket



Used for the service plug, which is required for maintenance and adjustment work.



This service plug bypasses the safety installations and the laser becomes laser class 4. Bypassing by authorized personnel only.

3 Light Barriers – Autofocus sensor



Used for the automatic focusing of the work piece (optional).

4 Service Access Panel



Only to be opened by trained technical service personnel.

5 Connection Socket for Rotary Attachment



Connector for the rotary attachment (option).
Supplies the rotary attachment with the required electric signals.



6 Front lid (opened in the shown picture)



If the front lid is opened, no data is processed. After closing the front lid, the device is not ready to process commands for 5 seconds. If the front door is opened during operation, the motion system is stopped and laser source is turned off.



Please note, that the laser tube is switched off **immediately** and consequently the result of the engraving is incomplete. During processing of commands the protection cover must only be opened after pressing the "Pause" button.

7 Interlocks front lid



These interlocks turn the motion system and laser source off as soon as the front lid is opened.

8 Focusing head



The lens that focuses the laser beam onto the material is mounted inside the focusing head.

9 X axis



The motion system is that part that performs the mechanical movements in X direction (horizontal) and Y direction (vertical). The X axis is visible in the working area.

10 Ruler



Used to align material and measure it.

11 Working Table



The work pieces to be processed are put onto the working table. To facilitate orientation, a horizontal and a vertical ruler are located on the working table. The table is ferromagnetic for easier fixation of work pieces.

12 Keypad



The Keypad contains multiple buttons and displays for controlling the device.
See section 4.3 Keypad for further information.



13 Maintenance Panel



Has to be opened with a 10mm Allen key to maintain optics.

14 Laser source CO2

15 Laser collimator cover NIR

16 Manufacturer's Label



Shows important data of the machine like serial number or manufacturing date.

17 Exhaust hose connector

18 Laser module (Rack) NIR

19 ON/OFF Switch

20 Power Supply



Changes the main power to power types suitable for the mechanic and electronic parts of the machine.

21 Power Socket



To connect the main power according the information on the manufacturers label.

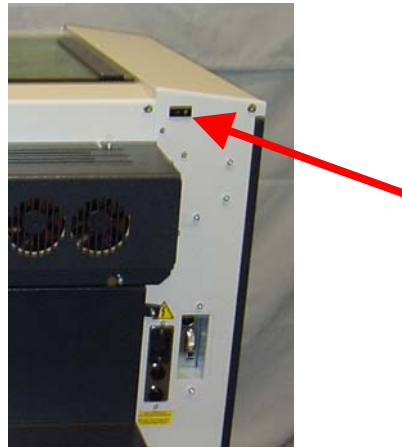
22 Fuse(s)

23 Exhaust connection cable

24 PC connection cable (USB/Serial)



4.2 ON/OFF Switch



Switches the mains supply ON/OFF.

The following conditions must be fulfilled for correct start up:

- unrestricted freedom of motion of the mechanics
- no materials under the working table
- protection covers closed

If the top lid or any other interlock secured cover (mainenance panel, front lid) is open, an acoustic signal sounds and the status display (9, below) flashes fast in green.

If all interlock-secured covers are closed, immediately after being switched on, the device starts the referencing process. When the referencing process is completed correctly, an acoustic signal sounds and the device is ready for operation. The readiness for operation is additionally displayed by green (slow) flashing of status display (9).



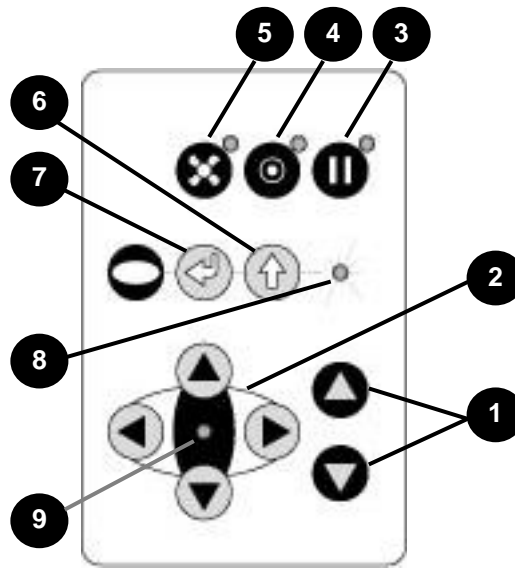
Before switching on the device, the user must make sure that no objects of any kind are located inside the operating space, which could limit or obstruct the mechanics of the device.



When switching off the mains supply, all processing data is lost.



4.3 Keypad



1 POSITIONING KEYS Z

When pressing one of these two keys the working table moves in Z direction (upwards or downwards).



Use these positioning keys to move the work piece manually.

When both keys are pressed simultaneously, the material is focused automatically (only with light barriers = option).

Before the autofocus- move is started, the head is moved backward in line with the light barriers. If the light barrier is broken, e.g. by an air assist nozzle, the upward move will ne suppressed to prevent a collision between the nozzle and the table.

By pressing the “Shift” key and a Z- positioning key an automatic move to the corresponding end- positions is performed:

Shift + Down: the table moves down to the lowest possible position

Shift + Up: the table moves up to the autofocus- position.

Note: Shift + Up will cause the head moving backwards to the light barriers (according simultaneous pressing of both z-keys).

If any of positioning keys X and Y are pressed, no moves in Z are possible.

An automatic move of the Z- axis can be stopped by pressing of the positioning keys (1 or 2).



2 POSITIONING KEYS X/Y

Use the positioning keys to manually move the lens holder into the indicated directions.



When you press two keys simultaneously, the lens holder moves diagonally.

When you press the "Shift" key and one of the positioning keys simultaneously, a movement to the corresponding end position is performed.

If all panels are closed, the movement is done with the maximum velocity, if opened, the speed is 1/4th of the maximum.

While the Z- axis is in movement (e.g. autofocus), no cursor moves in X and Y axis are performed.

The status display (9) of the device is located in the center of the key pad.

3 PAUSE



Used to stop the current working process (key lights up). As soon as the last processing command is finished, the motion system moves to the top-left position.

If this key is pressed a second time, the key illumination goes off, the interrupted working process is continued.

4 STANDBY



Switches the device into Standby mode (Laser ready, illumination off) – key lights up.

By pressing the key again the device is switched back to Ready mode.

If the Standby button is pressed while the Z- axis is in an automatic move (e.g. autofocus), the Standby mode is entered after finishing the Z- axis- move (Z- axis move can be stopped by pressing any of the Z- axis keys).

5 EXHAUST



Used to manually switch the exhaust system on and off.

The key illumination shows the status of the exhaust system. When the key is illuminated, the exhaust system is switched on.

After completing the engraving process, the exhaust system can only be switched off after some seconds (follow-up time).



6 “SHIFT” (TEST) key for 2nd function key level

For additional Operations. When this key is pressed together with the following keys, the functions indicated are activated:

- Exhaust (5):
Air assist on/off
- Pause (3)
Stops the job program immediately
- Positioning keys X/Y/Z (2):
These keys drive the laser head to the end position
- Repeat
Tests the laser source for proper function (acoustic signal sounds simultaneously)

7 START (REPEAT)



By pressing “Start (Repeat)”, the jobs which are currently positioned on the selected plate in the Trotec JobControl are started. If the jobs have been processed before, they will be reset automatically.

8 STATUS INDICATOR LASER BEAM



Indicates, that a laser beam is currently being emitted.

9 STATUS DISPLAY



Indicates the current status of the device.

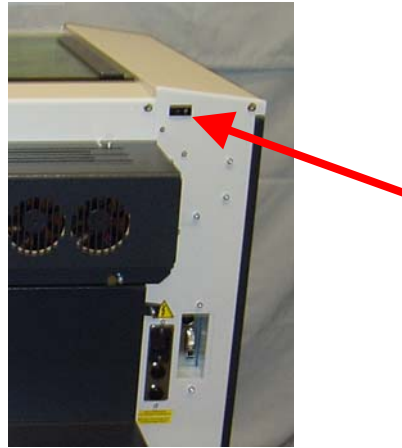
green, flashing slowly (0.5 Hz)	9	Machine is ready
green, flashing fast (2 Hz)	9	Cover has been opened
green permanent light / Pause mode	9	Data available in the machine
red permanent light	8	Laser beam is being emitted
green/red flashing alternately	8+9	Cover open during switch-on process, simultaneously acoustic signal - no referencing



4.4 First Steps

To prepare your laser for the first tests, perform the following steps:

1. Switch machine on with the ON / OFF switch.



2. The working table automatically references in X/Y/Z direction.
3. Open the protection cover and place work piece on the working table.



Usually you position the work piece into the upper left-hand corner of the working table against the horizontal and vertical rulers. However, any other position on the working table is also possible.



Work pieces, which are larger than 29" x 17" / 726 mm x 432 mm can be processed provided they can be installed and the protection cover can still be closed properly. Do not try to manipulate the safety system to install larger work pieces on the system. This could lead to exposure to laser radiation.

4. Focusing the Laser Beam

For the laser beam in your laser system to be able to engrave and cut precisely, the energy is focused with a lens system, which is mounted on the motion system in a lens holder.



The focusing point of the laser beam (for the standard-combi lens, which is part of the delivery) is located 7.24 cm (2.85 inch) below the lens.

For optimal processing the surface of the material that you want to engrave or cut, must be adjusted to this point.

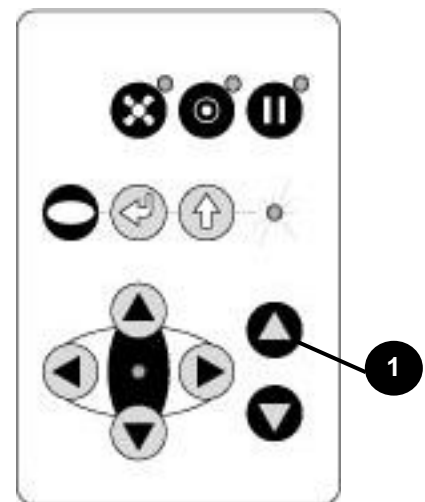


There are three methods to focus the laser beam:

- A:** Manual focusing
- B:** Focusing by software
- C:** Automatic focusing by means of light barriers (optional)

To **A** – Manual focusing:

- A1. Move the processing head over the material to be engraved by means of the positioning keys X/Y
- A2. Hang the focus tool on the external ring of the working head so that the focus tool can move unhindered. Move the working table upwards by pressing the Z positioning key. While doing this carefully observe the focus tool.



Before the focus tool reaches the work piece, move the working table upwards only very slowly and step by step by briefly tapping the positioning key, until the tool tilts to the side. Now the lens is focused onto the surface of the material.



To **B** – Focusing by software:

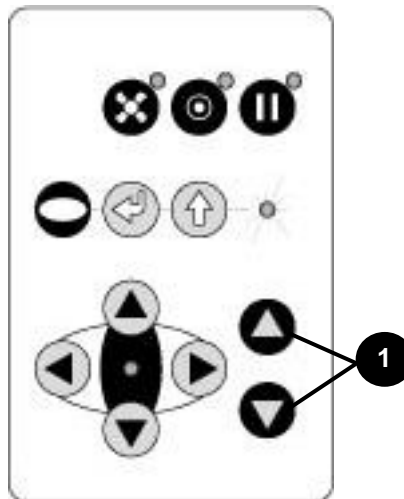
- B1. Click the icon “focus laser” in the Trotec JobControl
The working table moves in Z direction.
The following values are used to determine the focus position and therefore always have to be checked before using this focus option:
- material thickness (specify the value as accurate as possible)
 - table height (check if right table is selected in Options)
 - lens type (specify the according lens)

To **C** – Automatic focusing by means of light barriers (optional):



The automatic focusing is only possible if the work piece is thicker than the rulers.

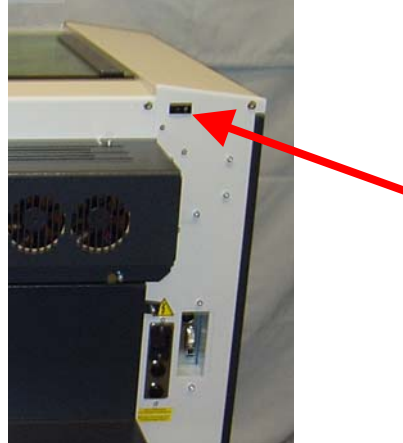
- C1. By pressing the two keys for Z positioning of the working table simultaneously, the laser beam is automatically focused onto the work piece (If you don't have the autofocus-option, the table will go down to Z = 0).



4.5 First Samples

The following steps describe, how to successfully produce a first pattern. Please follow the individual steps:

1. First switch on the computer, then the Laser.



2. Put the object into the laser and move into the desired position on the working table. Usually the object is positioned in the upper left-hand corner. Use the rulers to determine the dimensions of the object to be engraved.
3. With the positioning keys the lens is positioned over the material to be engraved. You focus with the help of the focus tool or by auto focus (see page 34 ongoing).



4. Generate a graphic with the help of your graphics software. The size of the graphic does not matter as the printer driver adjusts it to the work piece automatically if requested.



Also consult the Software Manual for further information.

5. Select "File Print", to access the printer driver, where you can perform work piece and material settings as well as specify a job name or a job number. This file is automatically transferred into TROTEC JobControl.
6. After the material, the working direction, die orientation of the work piece and the orientation of the plate have been specified in the TROTEC JobControl under "Plate, Setup Plate", the job can be positioned on the plate with a double-click. If necessary, the job can be positioned at any position on the plate by dragging with the mouse. The position of the job corresponds with the engraving position on the working table.

Make sure that on engraving flammable materials the air assist is on (e.g. rubber engraving)!

7. Establish a connection with the engraver by clicking on the button "Establish Connection" in JobControl.
8. Switch on the exhaust system. When using an original TROTEC exhaust system with installed connection cable, this happens automatically – check only, whether in the indicator "Exhaust Ready" is green in the Engraver Control of the JobControl.
9. Finally press the START button (green arrow) in the Control of the JobControl, to start the engraving process.
10. While the laser is working, you can generate the next graphic.
11. When the working is complete, the JobControl offers you the following possibilities:
 - delete the job
 - Job Reset and placing back in to the waiting list for later repeat of the working.
 - Job Reset and immediate repeat



4.6 Rotary Attachment



The rotary option in the printer driver is used in combination of the rotary attachment, to process cylindrical objects.

To compensate for the different diameters of different objects, the image must be adjusted. This is performed automatically by the printer driver, by selecting the rotary option and entering the diameter of the object to be processed.

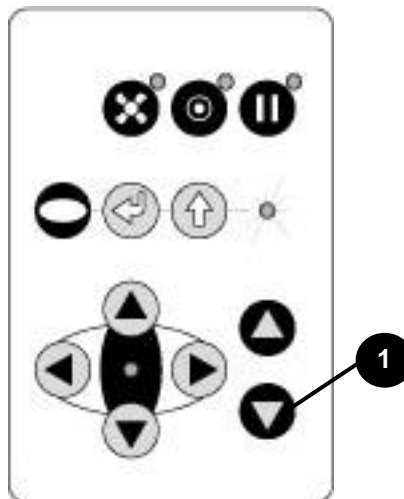


Never plug or unplug the rotary attachment while the machine is turned on. If this is not observed, there insists the danger of irreparable damage on the prints!

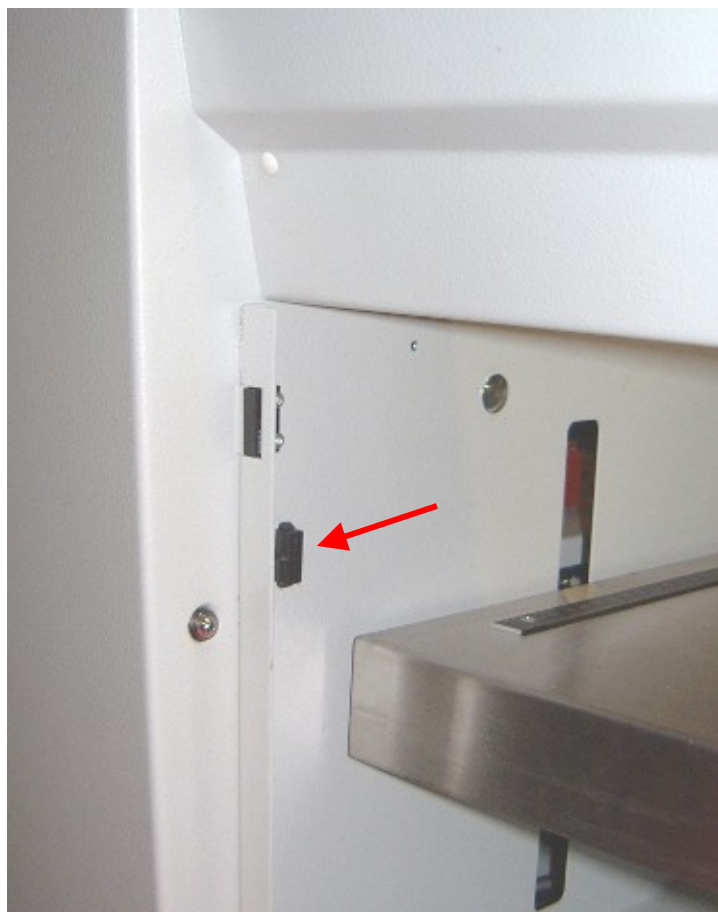
The rotary attachment is available with cones and with rolls. The rotary with cones permits processing of cylindrical objects with a diameter of up to 165 mm, a length of up to 485 mm and maximum weight of 3 kg. The rotary with rolls permits processing of cylindrical objects with a diameter of up to 73 mm, a length of up to 680 mm and maximum weight of 10 kg.

To install and set-up the rotary attachment proceed as follows:

1. Move the working table to the lower position, switch off the laser and open the top lid.

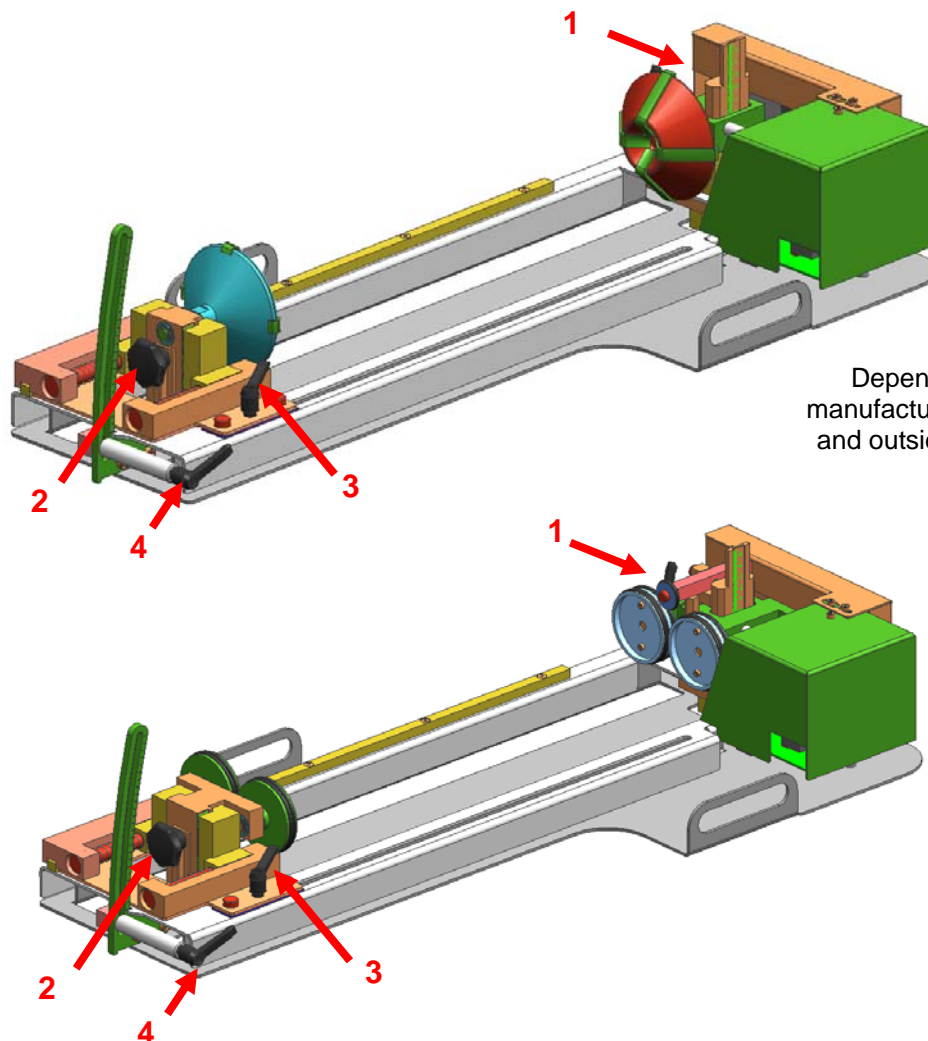


2. Put the rotary attachment onto the working table and connect the rotary attachment to the working table. Before you fix the rotary attachment, align it so that its sides are parallel to the rulers. The rulers offer a visual aid for placing the graphic.
3. Connect the rotary attachment via the control cable with the connector of the motion system. The connector is located inside the left front of the interior.



Mounting the work piece:

4. Before you mount the object into the rotary attachment, measure the diameter of the object at the position to be processed with a sliding caliper or a similar tool. Write down this value.
5. Adjust the height by loosening and fixing of lever 1 and screw 2 to make the work piece fitting into the rotary attachment.
6. When using a rotary attachment with cones, fix the slider of the rotary with lever 3 until the work piece is fixed between the two cones. When using a rotary attachment with rolls, adjust the slider of the rotary with lever 3 until the work piece fits on it, and then place the work piece on the rolls.



Note:
Depending on date of
manufacturing the inside-
and outside cones might
be exchanged

7. Now check if the work piece is horizontal and, if necessary, adjust the level by lever 1 on the right side or lever 4 or screw 2 on the left side.
8. Now switch on the laser and wait until the referencing is finished. Position the working head over the object at the position, where you want to engrave. Now focus



the object with the focus tool. If the object slopes too much in the area to be engraved, the rotary attachment can be tilted, so that the surface of the object is running again parallel with the X axis of the motion system. To do this, lift the right-hand side of the rotary attachment and place a wedge under it. Take care not to lift the rotary attachment too high, as it can touch the lens holder.

Engraving:



Also consult the Software Manual for further information.

9. Generate a graphic with the help of your graphics software. The size is not important, as the graphic can be adjusted to the dimensions of the work piece by the printer driver.
10. Then perform the settings for size and orientation in the JobControl under "Plate, Setup Plate" and, if necessary, select the material. Please note especially, that you can determine the orientation of the graphic on the object with "Job Orientation".
11. In the "Options" menu of the JobControl select "Rotary Engraving Attachment" and enter the diameter of the object.
12. Double-click on the previously generated job in the waiting list to place it on the plate.
13. Use the mouse to drag the job to the position of the plate, at which the desired engraving area is located on the object. Use the rulers in the machine and in JobControl for orientation and move the lens holder directly over the desired position, after you have connected the computer with the laser, and position the job on the screen according to the position of the lens.
14. Establish the connection to the laser.
15. Switch on the exhaust system (only necessary if you do not use an original TROTEC exhaust system).
16. Activate the START button in the Engraver Control of the JobControl and start the engraving process.



4.7 Tips and Tricks for Laser Engraving



The engraving depth can easily be varied through the laser power or the speed. To increase the engraving depth, reduce the speed or increase the power setting. This way you increase the amount of energy per area unit. Engraving too deep, however, reduces the quality of the details. With coated materials the required power depends of the kind and thickness of the coating. With power set too high the individual lines become too thick and a sharp picture cannot be achieved. The resolution of the graphics should usually be at 500 dpi. The dpi setting (number of laser dots per inch) depends on the material. The lower this setting is, the lower the resolution of the engraved picture will be. This, however, reduces flaming and increases the energy of a pulse, which can improve the overall result (e.g. when engraving some sorts of plastic materials).



Protection foil:

Remove the protection foil from the engraving area. However, leave the protection foil on the area that is not engraved, to avoid scratching of the material.



Plastics:

Plastics for engraving are available in many different colors and thicknesses and with many different coatings and surfaces. The majority of available plastics can be well engraved and cut with the laser. Plastics with a micro-porous surface seem to give the best result, because less surface material needs to be removed. As most plastic materials have a low melting point, a low ppi setting should be selected to reduce the danger of melting.



Acrylic:

There are two different types of acrylic – cast and extruded. The cast acrylic becomes white or mat after engraving, the extruded acrylic remains clear. Use extruded acrylic for engravings that are filled with paint and cast acrylic for normal engravings. Cast acrylic can be best engraved without protection foil. It is better to engrave the entire surface with a low energy setting.





Engraving photographs:

Engraving photographs can be quite a challenge at the beginning. But as soon as you understand the basics it will become easier for you. Scan the desired picture with a resolution of 300 dpi. Adjust brightness and contrast so that lighter colors become lighter and darker colors become darker. The photo might look better if you use a filter, which sharpens the contours. The next step is the selection of a raster. Usually the software offers a selection of different rasters with a specified number of lines per inch and different raster angles. Use a raster with between 20 and 100 lines per inch. Increasing the number of lines per inch decreases the size of the points. Try which raster you think looks best. With one material large dot look better, with another material smaller points look better. If you cannot select rasters with your software, the machine will select the raster automatically.

4.8 Tips and Tricks for Laser Cutting



Distance to the Surface of the Work piece

If you want to achieve very good results, when laser-cutting acrylic or wood, we recommend, that the plate be attached at least some millimeters above the engraving table. By doing this the smoke and the melting residuals underneath the plate can escape unhindered. A slight moistening of the plate will reduce the area of heat influence. Generally the protection foil should be removed, except when there is considerable development of fumes. During laser cutting the Hz setting (pulses per second) should be set to low, in particular for flammable materials.



Multiple cutting (insert logo)

Often a clearer contour can be achieved by cutting twice rather than cutting only once.



4.9 Tips and Tricks for the Production of Rubber Dies



The various mixtures and densities of rubber plates cause a slightly varying engraving depth. The settings in the overview table give a good indication. Since engraving a standard rubber material requires a relatively high laser power, the laser power is principally set to 100% and only the speed is varied.

Due to their lower density, so-called micro porous rubber materials allow a significantly higher engraving speed. Test the rubber first, to find out the correct speed setting.

The TROTEC JobControl software simplifies the creation of a stamp significantly. Mirroring as well as converting is performed automatically and a cone-shaped shoulder is generated around each letter. Due to the wider base the letters are stabilized during stamping and therefore the imprint becomes clearer. If you engrave rubber dies without using this option, the letters will have no shoulders making them very thin and unstable.

To avoid flaming, we recommend a low HZ setting near 1000 Hz for cutting the rubber die. The laser pulses are set apart from each other and their edges just touch. This results in a perforation. The rubber die stays connected to the rubber plate but can be torn off easily. The advantage of this method is that there is practically no further risk of deformation or melting of the material. Furthermore, the entire plate can be removed from the laser at one time instead of having to collect all dies individually.

Engraving rubber produces a considerable amount of dust. Therefore a well-dimensioned exhaust system and its regular maintenance are very important. The appropriate Trotec exhaust system is absolutely recommended.



5 MAINTENANCE

5.1 Cleaning the System



Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.



Before starting cleaning and maintenance work always switch off the device and unplug the mains plug.



You should check at least once a day, whether dust has accumulated in the engraving system. In case of soiling the machine must be cleaned.

The cleaning interval strongly depends on the material that is being processed and the operating time of the device. Please bear in mind that only a clean machine guarantees optimal performance and reduces the service costs.



CAUTION: Always keep the system clean, as flammable parts in the working area or exhaust area rise the fire hazard.

General Cleaning:

1. Move the working table into a position in which it is easiest for you to clean the surface with a window cleaning agent and paper towels.
2. Make sure, that the device is switched off and unplugged. Open the protective cover.
3. Thoroughly remove all loose dirt particles and deposits in the interior of the machine.
4. Clean the cover of the laser tube.
5. You can clean the viewing window with a cotton cloth. Do not use paper towels as they could scratch the acrylic.



5.2 Cleaning the Optical Parts



Trotec recommends to use following cleaning material:

Lens tissues
Lens cleaner

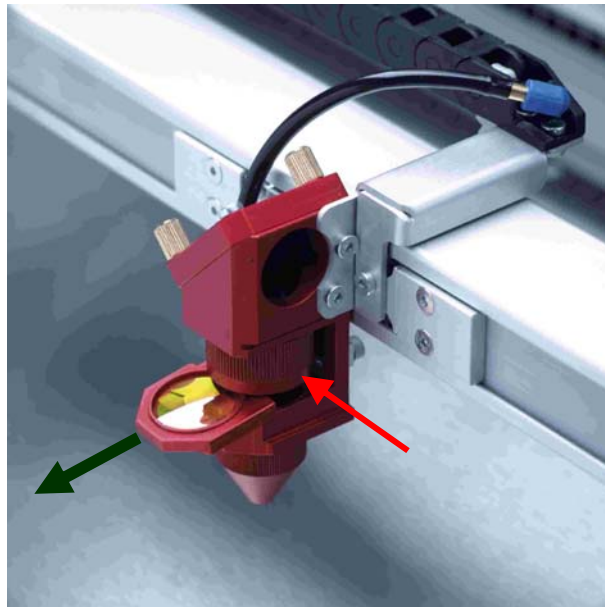
Part number 69249
Part number 69248

The lens has a durable multi-coating and won't be damaged by correct and careful cleaning. You should inspect the mirrors and the lens according the maintenance plan. If you discover a veil of haze or dirt, you must clean them.

Follow the instructions below for the cleaning of optical parts:

5.2.1 CLEANING THE LENS

1. Move the working table to a distance approx. 10 cm under the lens holder.
2. Move the working head into the center of the working surface and put a cloth under the lens holder (so that the lens is not damaged if it accidentally falls out of its holder).
3. Now you can remove the lens by turning the fixing ring and pulling the lens assembly to the front.



4. Remove the coarse dust as good as possible by blowing air onto the lens surface.
5. Check the surface and if necessary clean the lens with the lens cleaning liquid and lens tissue.



6. Hold the lens assembly by its edge with a lens cleaning tissue and use a drop of lens cleaning liquid from the little bottle which you received as an accessory delivered with the laser. While holding the lens on an angle, flush both surfaces of the lens, to wash away coarse soiling.
7. Put the lens on a clean lens cleaning tissue. Put some lens cleaning liquid on one side of the lens. Leave the liquid to take effect for approximately one minute and then gently wipe it away with lens cleaning tissues soaked with lens cleaning liquid.
8. Finally, dry this side of the lens with dry lens cleaning tissues and repeat the cleaning process on the other side of the lens.



Never use a cleaning tissue twice. Dust accumulated in the cleaning tissue could scratch the lens surface.

9. Examine the lens. If it is still soiled, repeat the cleaning process until the lens is clean.
10. Carefully insert the lens holder with lens into the working head.



The rounded side (= convex) of the lens is facing upwards. This is guaranteed by the design of the lens holder.

11. Fix the lens holder carefully with the fixing ring.



5.2.2 CLEANING THE MIRRORS #2 AND #3



There are two mirrors in the operating area of the laser, which may have to be cleaned if they are soiled. To clean the mirrors, follow the instructions below.

MIRROR #2

1. The mirror #2 is located on the right-hand side of the machine. To be able to access mirror #2, you must remove the right maintenance panel.

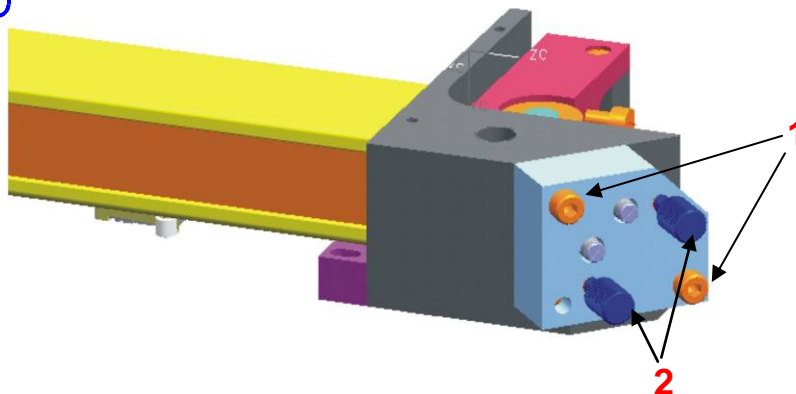


The laser must be switched off before the panel is removed!

2. The mirror #2 is attached by means of two Allen screws (1), which are located on the mirror holder. Open the screws and remove the lens holder together with the mirror. Do not touch the milled screws while doing this (2).



Make sure that you do not touch the mirror surface with your fingers as this reduces the mirror's working life significantly.



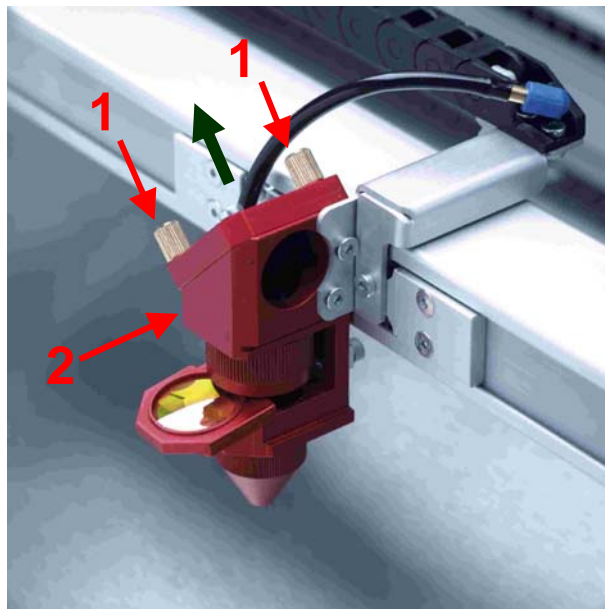
3. Use a drop of lens cleaning liquid from the accessories box and, while holding the mirror on an angle, flush the surface of the mirror, to wash away coarse soiling.
4. Put the mirror on a working surface. Put some drops of lens cleaning liquid on the mirror and leave the liquid take effect for approximately 1 minute.
5. Use a folded piece of lens cleaning tissue soaked with lens cleaning liquid and wipe gently over the mirror only once. Use a fresh lens cleaning tissue soaked with lens cleaning liquid each time and again wipe over the mirror only once. Then wipe the mirror dry with a new dry lens cleaning tissue. Never use a cleaning tissue twice, as it could carry dust particles, which can scratch the mirror surface.
6. Examine the mirror and repeat the cleaning process, if necessary.
7. Replace the mirror and fix it again with the two Allen screws.

MIRROR #3

1. While holding the mirror, loosen the two knurled screws (1) and lift the mirror from the mirror holder (2).



Pay attention that the mirror doesn't grind over the mirror holder, as it can be scratched very easily.



2. Use a drop of lens cleaning liquid from the accessories box and, while holding the mirror on an angle, flush the surface of the mirror, to wash away coarse soiling.





3. Put the mirror on a working surface. Put some drops of lens cleaning liquid on the mirror and leave the liquid to take effect for approximately 1 minute.
4. Use a folded piece of lens cleaning tissue soaked with lens cleaning liquid and wipe gently over the mirror only once. Use a fresh lens cleaning tissue soaked with lens cleaning liquid each time and again wipe over the mirror only once. Then wipe the mirror dry with a new dry lens cleaning tissue. Never use a cleaning tissue twice, as it could carry dust particles, which can scratch the mirror surface.
5. Examine the mirror and repeat the cleaning process, if necessary.
6. Re-insert the mirror into the mirror holder by setting it straight onto the holder and tightening the knurled screws.





5.3 Maintenance Plan

	daily	weekly	monthly	yearly
Laser				
Lens, mirror 3	Check Cleaning if required			
Mirror 2		Check Cleaning if required		
Working table and rulers		Cleaning		
Cover of the laser tube and housing		Cleaning		
Entire working area – general cleaning		Cleaning		
Exhaust System				
Bag filter	According to the operation manual of the exhaust system			
Filter mat				
Particle filter				
Activated carbon filter				

For detailed information on the maintenance activities on exhaust systems please refer to the respective manual.



6 ADDITIONAL INFORMATION

6.1 Material table

Legend:			
Quality:		Process:	
Perfect	+++	Annealing	A
Working well	++	Engraving	E
No good quality	+	Cutting	C
Quite bad	+ -	Color Change	CC
Not reacting	-	Thermark	T
Back reflection (in rare cases)	?	not applicable	n/a

	FineMarker Hybrid	
	Quality	Process
Metals:		
Aluminium:	++	E
Aluminium anodized:	++	E
Brass:	++	E
Brass polished:	++	E
Chromate:	++	A / E
Copper:	++	E
Copper polished:	++	E
Gold:	++	A / E
High-speed steel:	++	A / E
Silver:	++	E
Stainless steel brushed:	++	A / E
Stainless steel polished:	++	A / E
Titanium:	++	A / E
Nonmetals:		
Ceramic:	+ -	CC
Food:	++	E
Glass:	++	E
Leather:	++	E / C
Mirror:	++	E
Paper:	++	E / C
Plastics:	++	E / C / CC
Rubber:	++	E / C / CC
Stone:	++	E
Wood:	++	E / C



Caution when processing conductive materials (carbon fibers,...)! Conductive dust or particles in the ambient air might damage electrical components and lead to short circuits. Bear in mind that those defects are NOT warranted.


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6.2 Tips for Troubleshooting

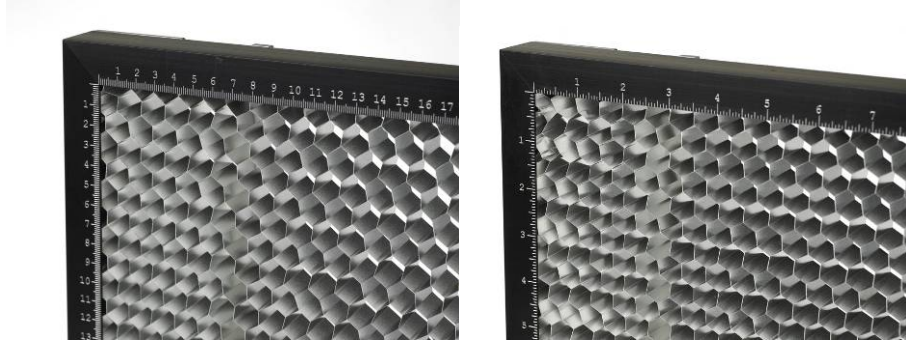
- The machine does not react after activating the "ON" key.
 - Check the mains connection.
 - Check the main fuses. They are located next to the mains connection socket. Replace defect fuses with fuses of the same type and value.
- No referencing is performed after switching on the machine.
No acoustic signal can be heard.
 - Check if the top lid and other interlock-secured covers (front lid, maintenance panel) are tightly closed.
- The following error message is displayed when trying to establish a connection between JobControl and the machine:
"Could not build up connection to the laser."
 - Check the cable connection between computer and machine.
 - Make sure that you are actually using the correct serial interface COM 1 to COM 10 of your computer and that it is functional.
 - Check the interface selection in "Options" in the "Settings" menu of JobControl.
- After starting a job the exhaust system is not switched on.
 - Check whether the exhaust system is connected with the mains socket.
 - Check the cable connection between the machine and the exhaust system.
- A job, which was created with the graphics software, does not appear in the JobControl waiting list.
 - Check whether the sorting function "Kind" and "Resolution" are activated in the waiting list.
 - Make sure that the directory "Spool" has been created in the directory of JobControl ("TROTEC") and that the correct path to this directory has been set under "Options" in the "Settings" menu.
- A job transferred to JobControl does not contain any graphics,
 - Use the "Fit to page" option in the printer menu of your graphics software.



7 APPENDIX

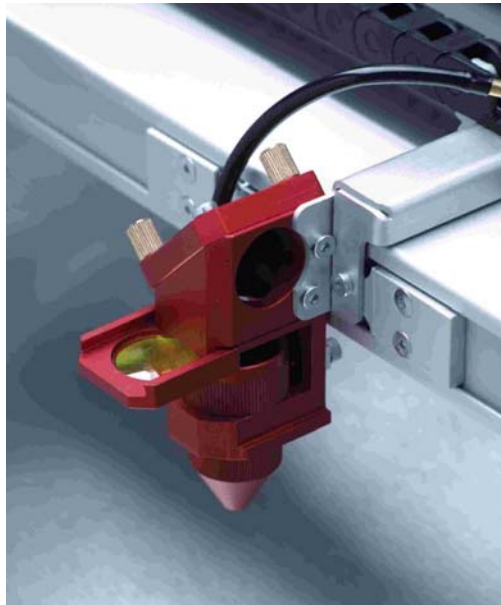
7.1 Options

Cutting table: Honeycomb table especially for cutting tasks, is placed onto the standard table, during cutting the residuals of the material fall through the honeycombs onto the table, reverse side of the material remains clean, cutting lines are cleaner.



2" lens:

This lens is a good compromise between engraving and cutting. To install this lens remove the 1.5" lens and move the fixing ring all the way down, turn it round (so that the thread is on the lower side). Then insert the lens like shown in the picture and tighten the fixing ring.

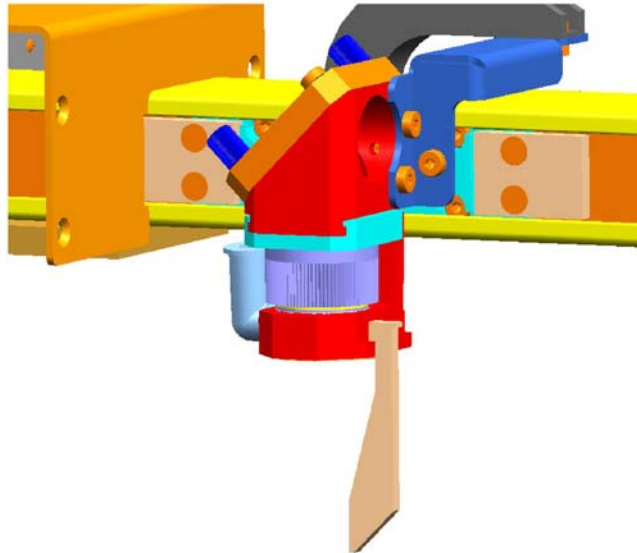


In the Trotec JobControl the lens must be selected under Settings>Options>Engraver or in the symbol bar "Laser Position" to make the autofocus work correctly.



2.5" lens:

This lens is the best choice for cutting thicker materials. It is not used for rubber stamp making, as the energy density is strongly reduced compared to the 1.5" lens.



To be able to work with this lens a longer focus tool is needed. Also in JobControl the 2.5" lens must be selected under "Settings > Options > Engraver" or in the symbol bar "Laser Position" to make the autofocus work.



Caution: When working with the 2.5" lens the standard nose cone **MUST NOT** be used, as the diameter of the hole is too small to let the beam through. Use no or the longer 2.5" nose cone.





7.2 Acceptance report

Dear customer!

Please check applicable items:

We request your confirmation of properly completed transfer of the machine

Please transmit a copy of this document – filled out and signed by an authorized company representative – to an employee of our sales affiliate for forwarding to the manufacturer.

- ☐ Machine parts checked for shipping damage
- ☐ Machine parts checked against delivery note
- ☐ Setup of the machine discussed
- ☐ Startup of the machine discussed
- ☐ Operation of the machine discussed
- ☐ Maintenance of the machine discussed
- ☐ Electrical voltage checked
- ☐ Safety Instructions discussed
- ☐ Trial run performed
- ☐ Deficiencies determined

Thank you very much.

The machine with the

machine designation: Finemarker-Hybrid

has been checked according to the listed items and has been transferred properly.

City, Date

Company stamp / Signature





7.3 TRAINING SCHEDULE

Employee/Trainee:

Trainer:

Date of Training:

The above mentioned Employee received instruction on the operation of the Finemarker-Hybrid Lasersystem.

Especially the following topics are covered:

- Machine Function
- Danger Area
- Warnings
- Interlock System
- Taking into Service and Shutdown
- Work Flow
- Announcement of unexpected working result and the resulting procedure
- Announcement of Failure and instituting Procedure
- Responsibility on remedial measure
- Operation Manual and its depository for inspection
- Cleaning and Maintenance

.....
Signature of Trainer

.....
Signature of Trainee





7.4 Response Form

If you face any trouble with the machine, please provide the following information and add a Servicefile (procedure is described on the following pages).

Date	
------	--

Machine Details

Serialnumber	
JobControl Version	
Driver Version	
Layout Software	
Firmware Version	

Contact Details

Name	
Country	
Phone Number	
Email address	

Problem Description

--

Does an Error message show up on the PC, if so which one?

--

What happened before the error showed up? (Thunder&Lighting, Windows-Update,...)

--

What was tried to solve the problem?

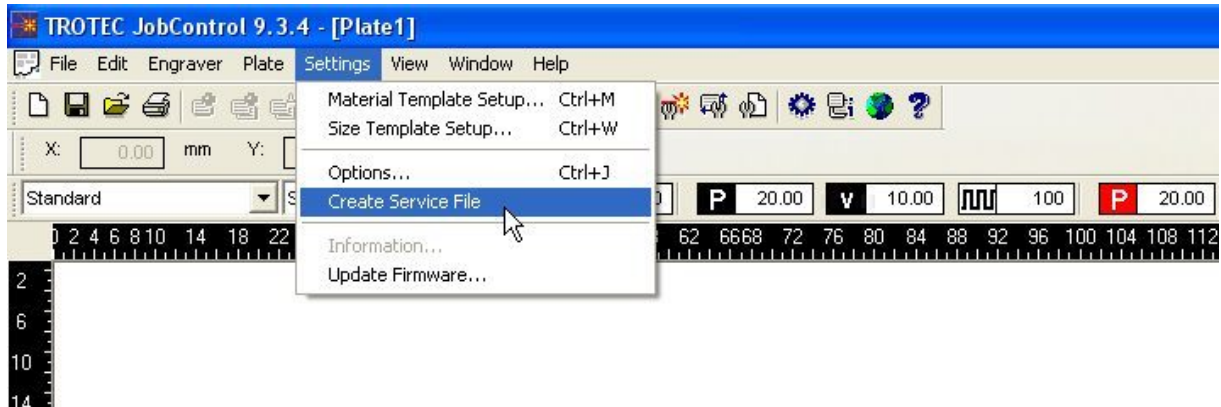
--

Please send the information to your sales representative or to techsupport@troteclaser.com.

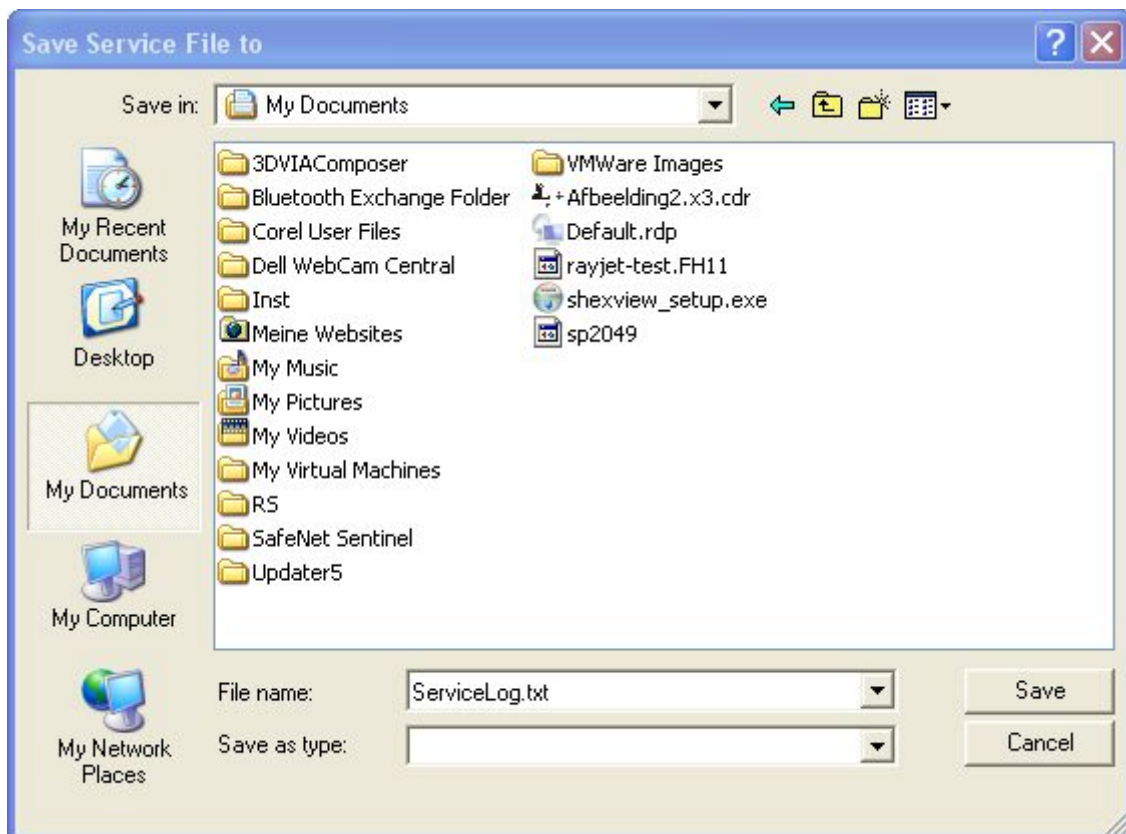


7.5 How to create a Service File

1. Start JobControl and go to Settings> Create Service File.

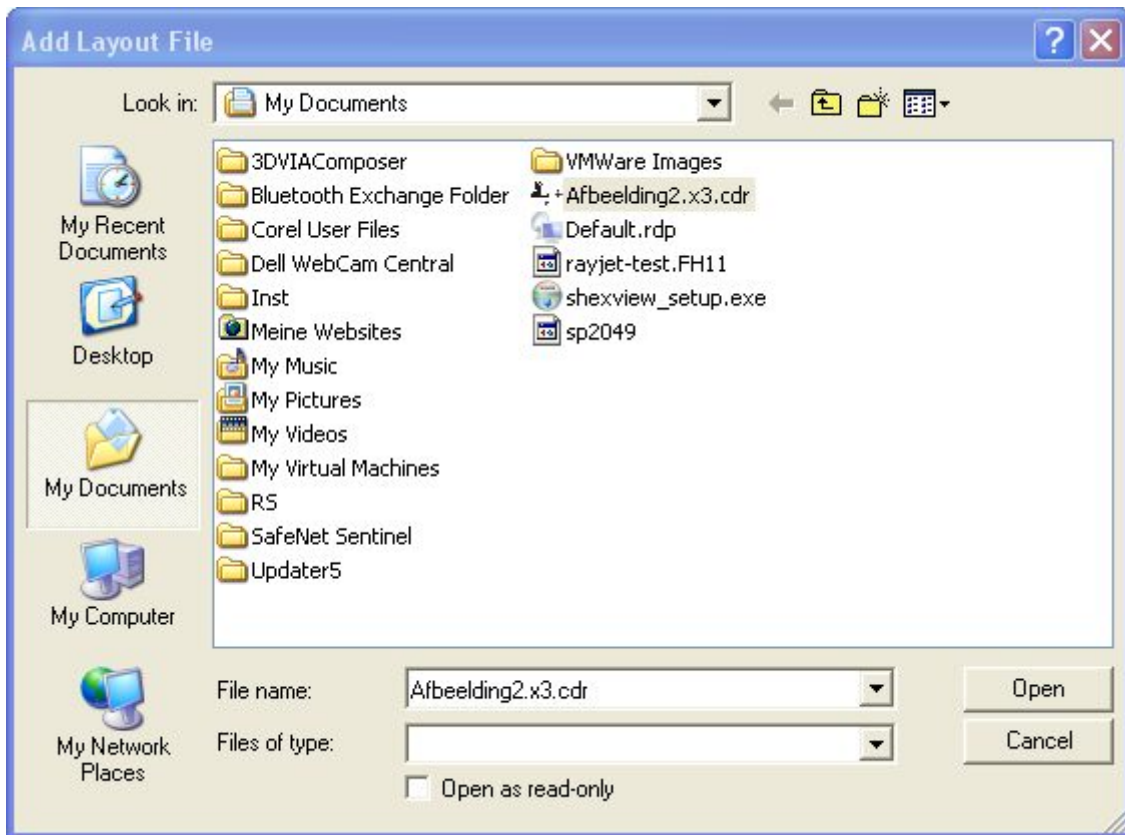


2. The window „Save Service File to“ shows up. Please select a directory to save the file and click on „Save“.

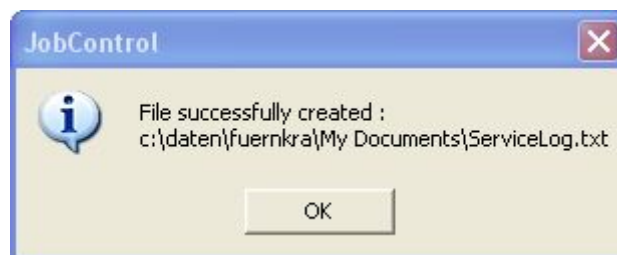


APPENDIX

- The window „Add Layout File“ shows up. Please select the layout file, which was sent most recently to JobControl and possibly caused a failure (example: Corel file, Photoshop file, AutoCAD file,...). Click on „Open“.



- The following window confirms, that the Service File (ServiceLog.txt) was created successfully.



- Please send the Service File to your sales representative or to techsupport@troteclaser.com.

