

# OPERATION MANUAL

## 8013 FineMarker Hybrid

### Hardware



1.1 Issue 10/05

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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 6.1 - Tips for Troubleshooting. If unsuccessful, please note all data of the device (Serial number, 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.

# Operation Manual FineMarker Hybrid

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## SECTION 1 – GENERAL

- 1.1 General Information
- 1.2 Designated Use
- 1.3 Technical Data / Device Specification
- 1.4 Manufacturer's Label
- 1.5 EU Conformity Declaration
- 1.6 Warranty Regulations

## Operation Manual FineMarker Hybrid

### 1.1 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.

**(30/11)**

Reference to several parts, which are described in more detail on a different page of the Operation Manual. The first number indicates the page, the second number indicates the part number on this page.

## Operation Manual FineMarker Hybrid

### 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 such as rubber, acrylic, coated metal, tin, special steel, elox-aluminum, cork, cardboard, glass, leather, marble, several plastics and wood can be processed on the laser engraver.



The engraving process must only be performed with a perfectly adjusted machine (see also Section 4 – Operation).



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.

# Operation Manual FineMarker Hybrid

## 1.3 Technical Data / Device Specification

### 8013 FineMarker Hybrid

#### Mechanic

Working area	727 x 434 mm / 29" x 17"
Max. size of workpiece	750 x 440 mm
Max. height of workpiece	165 mm / 6.5"
Max. engraving speed	200 cm/sec. / 78 inches
Cutting speed	depending on material, thickness, laserpower
Motor	Brushless DC Servo motor
Encoder	Increment
Workpiece table	Solid metal (magnetic)
<b>Max. load of workpiece</b>	<b>20 kgs</b>
<b>Lens</b>	<b>Hybrid Special Lens (2.85")</b>

#### Features

**Electro-Optic Autofocus , Red dot Laser Pointer, Coaxial Air Assist, Magnetic Working Table, Harsh Environment Protection Kit,**

#### **Optional available:**

**Honeycomb Cutting Table, Rotary Attachment, Air Assist including Compressor, cover strips for exhaust, storage rack**

#### Control system

Laserpower	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"> <li>• Diode-pumped Nd:YAG laser, maintenance free</li> <li>• Sealed off CO<sub>2</sub> Laser (45 Watt), maintenance free</li> </ul>
Wavelengths	Nd:Yag : 1064 nm; CO <sub>2</sub> : 10600nm

#### Cooling system

Cooling System	Air-cooled
----------------	------------

#### Electricity

Electricity	Single phase 230V/50Hz or 115V/ 60 Hz; 2.0 kw 9 amps
-------------	--

#### Dimensions

Width/depth/height	1128 mm x 990 mm x 1060 mm / 44" x 39" x 42"
Weight (approx.)	approx. 160 kgs
Packaging	50 kg, L1400 mm x B1030mm x H1340mm

#### 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 <sup>3</sup> /h
--------------------------------	--

#### Laser Safety

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

SUBJECT TO CHANGE WITHOUT PRIOR NOTICE !

## Operation Manual FineMarker Hybrid

### 1.4 Manufacturer's Label

The manufacturer's label is located on the back of the device (see Figure below).



Figure 1

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

# Operation Manual FineMarker Hybrid

TROTEC LASER ENGRAVER		
Modell:	Typ:	8013 Finemarker Hybrid
Seriennummer:	Serial No:	FM-0158
Baujahr:	Manufactured:	October/2005
Stromaufnahme:	Input Power:	110 -120VAC~, 16A, 60Hz
Hersteller:	Manufacturer:	TROTEC Produktions u. Vertriebs Ges.m.b.H Linzerstraße 156, 4600 Wels AUSTRIA
CO <sub>2</sub> -Laser, max. power 75Wcw, wavelength 10,6µm Laserdiode max.power < 3mWcw, wavelength 635nm		
Nd:YVO <sub>4</sub> -Laser, max. power 10Wcw, wavelength 1064nm, max. pulse energy 0.5mJ, pulse duration 8ns, max. rep. rate 140kHz EN 60825-1 (2003)		
CE		www.troteclaser.com

## Operation Manual FineMarker Hybrid

### 1.5 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:

98/37/EEC Directive for Machines Annex IIA  
73/23/EEC Low Voltage Directive  
89/336/EEC EMC Guideline and  
92/31/EEC Amendment

Applied during design and construction of this product:

- EN 60335-1 Safety of Household and Similar Appliances
- EN 55014/1993 Electromagnetic Compatibility
  - EN 55014/1995
  - EN 60204-1 Machine Safety
  - EN 60825-1/2001 Safety of Laser Equipment
- EN 60950/A1+A2 Safety of Electric Devices for Informatics Including Electric Office Machines
  
- EN 55022/94 and EN 50082-2/95 Electromagnetic Compatibility



Wels, 1st November, 2004

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

# Operation Manual FineMarker Hybrid

## 1.6. Warranty Regulations

**LIMITED WARRANTY TERMS AND CONDITIONS FOR TROTEC FINEMARKER SERIES**

Trotec Produktions- und Vertriebs GmbH, Wels (hereinafter referred to as "Trotec") grants the purchaser at his discretion a claim within the terms of the following warranty obligations in addition to the statutory warranty claims against the seller.

**Beginning and duration of warranty:**

1. The warranty period shall begin with the date of invoice by Trotec. No extension of the original warranty period occurs by any substitute deliveries or repairs for warranty reasons.
2. Warranty is granted for the following period of time:

12 Months	Housing, print (CPU, motor main, axis), power supply, control board, compressor for air assist, belts, all mechanic components, laser assembly <sup>1</sup>
3 Months	Optics <sup>2</sup> (lens, mirror, beam combiner),

1... 12 month or 5000 working hours on diode pump module, whatever comes first  
 2... No warranty for optics will apply, however, if such has to be replaced because of inadequate or incorrect cleaning (e.g. scratching during cleaning). Typical picture of optics damaged as a result of improper cleaning: shooting through the mirror or lens.

**Precondition for warranty**

1. The commissioning and the user's training is performed by an authorized Trotec partner or by Trotec itself.
2. The machine is the property of the first user.
3. The user operates the machines in the environment as defined by Trotec (e.g. room temperature, fuse protection, etc.) as well as with a suction system supplied by Trotec. The predefined minimum requirements must be fulfilled when using any other suction system.
4. Immediate detailed notice of defects in writing to Trotec and/or the authorized Trotec partner.

**Content and scope of warranty**

1. Defects that occur within the warranty period are remedied by Trotec by replacement of the defective parts. Exchanged parts become Trotec's property. Working time of trotec technicians and travel costs are excluded.
2. In the event of unrepairable relevant defects, Trotec shall have the right to avoid any claim to recede of the contract by effecting a gratuitous replacement.

**Exclusion of warranty**

1. Improper commissioning and installation.
2. Improper operation or use, inadequate or improper maintenance, use of unsuitable accessories or operating material.
3. External influences, e.g. damage during transport, surges, damage to surface, damage by weathering or other natural phenomena.
4. Repairs or interferences by unauthorized third parties.
5. Use of not original Trotec spare parts.

**Miscellaneous provisions**

1. Wels shall be place of performance and place of jurisdiction for all claims arising from the warranty obligation. Austrian law applies exclusively.
2. Trotec shall not assume any liability for loss of profit, turnover, goodwill or expected savings or for any direct or indirect damage or for claims made by third parties against the customer from use of, or the inability to use, the product.
3. In the event that individual provisions of the present warranty obligation should be or become legally ineffective for any reason whatsoever, then this shall not affect the validity of the other provisions herein.
4. In the case of warranty, both the costs for the part as well as the freight costs (standard freight) will be borne by Trotec.
5. In general the terms of businesses of Trotec are valid which you can see on the webpage [www.troteclaser.com](http://www.troteclaser.com).

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[www.troteclaser.com](http://www.troteclaser.com)

Effective from 13<sup>th</sup> of April 2004

## SECTION 2 – SAFETY

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

- 2.1 General Safety Information
- 2.2 Laser Safety Information
- 2.3 Safety Precautions when Operating the Device
- 2.4 Warning and Information Labels

### 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.

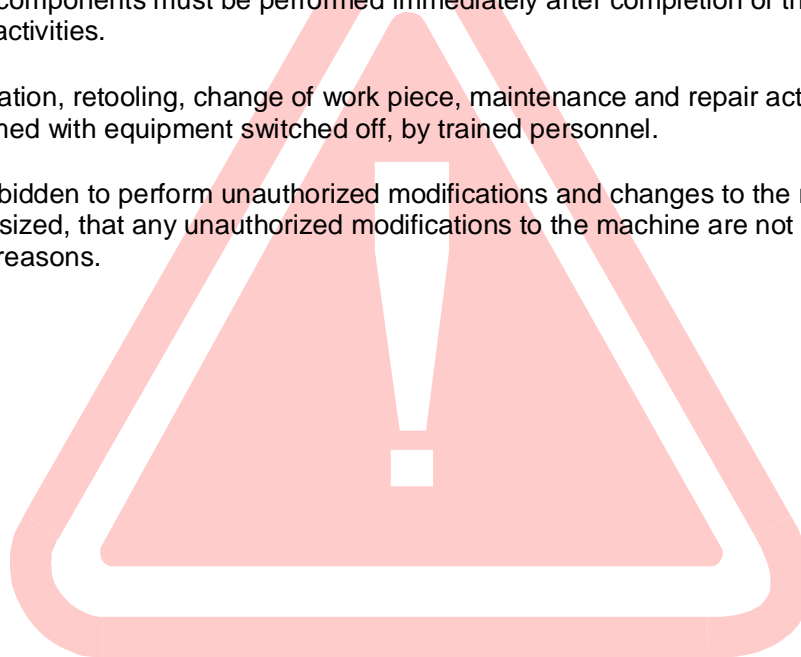
For all activities concerning installation, set-up, start-up, operation, modifications of conditions and methods of operation, maintenance, inspection and repair, the switch-off procedures that may be provided in the Operation Manual must be observed.

#### **Safety Information for the User and/or Operating Personnel**

- No work methods are permitted that affect the safety of the machine.

## Operation Manual FineMarker Hybrid

- 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.



## Operation Manual FineMarker Hybrid

### 2.2 Laser Safety Information

To assess the potential dangers laser systems pose, they are classified into 7 safety classes: 1, 1M, 2, 2M, 3R, 3B and 4. 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.

#### Class IIM laser products



Designation “M” indicates the use of magnification optics. The magnification collects additional laser radiation into the eye. Designed for benefit of expanded beams. Class 2M is for visible wavelengths safe for momentary viewing (up to 0,25 seconds) without optical aids



This laser engraving system contains a carbon dioxide (**CO<sub>2</sub>**) laser 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 cornea for **CO<sub>2</sub>** lasers  
 Eyes: Burns to the retina for **Nd:YAG** lasers  
 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 **CO<sub>2</sub>** lasers (wavelength 10.6 μm).



Service technicians using the service plug are required to wear standard laser safety glasses for **Nd:YAG** lasers (wavelength 1064nm).

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### 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.

#### **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 engraver 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 engraver.

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

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### 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.





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## SECTION 3 – BEFORE OPERATION

- 3.1 Unpacking the FineMarker Hybrid
- 3.2 Contents of Delivery
- 3.3 Location
- 3.4 Exhaust System – Requirements/Connection
- 3.5 Computer Requirements
- 3.6 Connection of the FineMarker Hybrid

## Operation Manual FineMarker Hybrid

### 3.1 Unpacking the FineMarker Hybrid

You receive your FineMarker Hybrid packed in a box, that 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.

1. Remove the cover. Please do not forget to store this box in a dry place.

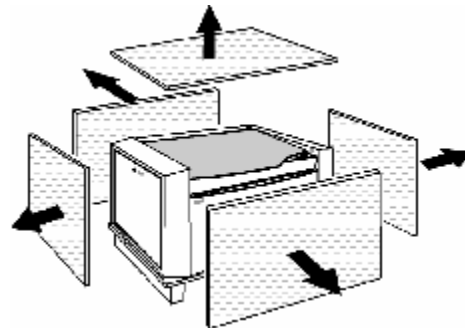


Figure 5

2. Carefully remove the foam material, which protects the viewing window of the cover, and the tape that holds this cover in place.

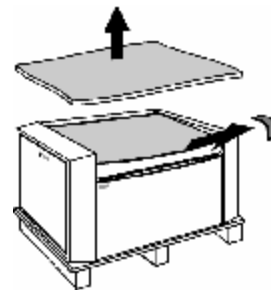


Figure 6

3. Open the front door and remove the accessories box located under engraving table, which contains all accessory parts required for the installation of the laser engraver.

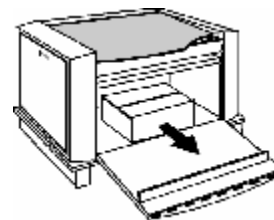


Figure 7

## Operation Manual FineMarker Hybrid

4. Lift the laser engraver out of the box.  
For this you will require two persons.  
Position the laser engraver on a stable table or the delivered stand (optional).

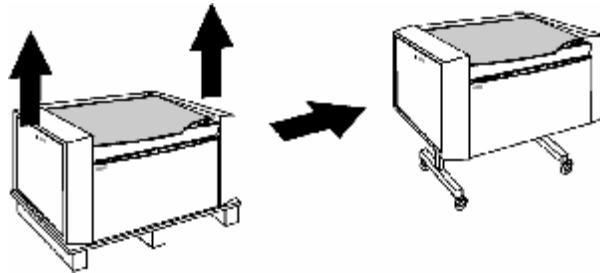


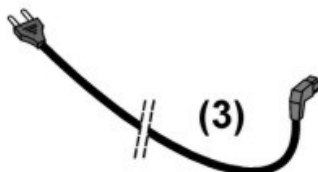
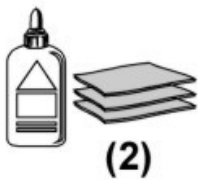
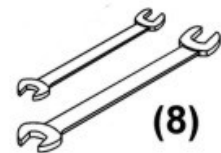
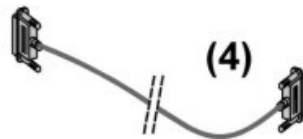
Figure 8

5. Open the accessories box.

### 3.2 Contents of Delivery

- Transport and service packaging
- Laser engraver including all optics
- Stand
- Accessories box, which contains the following parts:
  - Operators manual on CD also including:
    - TROTEC Manager software/Engraver driver software (1)
    - Lens cleaning tissues / Optics cleaning liquid (2)
    - Mains cable (3)
    - Computer connection cable (4)
    - Focussing gauge 1.5" (6)
    - Allen key set 1.5 - 10 mm (7)
    - Screws for assembly (9)

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### 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 engraver system requires the full amperage.



Avoid locations with poor air circulation.



Select a location, whose room temperature is between 15 °C and 25 °C. Avoid higher ambient temperatures and strong exposure of the engraver 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 FineMarker Hybrid is misused as a table.

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### 3.4 Exhaust System – Requirements



To guarantee the right ventilation during the engraving of rubber, an exhaust system with a suction power of minimum **300 m<sup>3</sup>/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 elox plates are engraved, the suction power can be reduced.  
Connection - see section 3.7.3



Do not start the FineMarker Hybrid without an adequate exhaust system.

### 3.5 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.

- Pentium 2000 or more powerful PC-compatible computer
- 256 MB RAM
- 60 GB hard disk
- a CD drive
- VGA color monitor
- mouse
- 1 free serial (RS232) or USB interface for the laser engraver
- Microsoft Windows XP/2000/NT
- Windows-compatible graphics software (ACAD, Corel Draw version 9 or higher or equivalent)

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### 3.6 Connecting the FineMarker Hybrid



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

#### 3.6.1 Connecting the Mains

Connect one end of the mains cable with the connection socket 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.





The main fuses of the FineMarker Hybrid are located inside the connection socket and are accessible from the exterior.

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### 3.6.2 Connecting the Computer



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

Connect the laser engraver (see Figure below) to a free serial interface on your computer. For this use the cable and, if required, the adapter from the accessories box.



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### 3.6.3 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).

- When using the TROTEC exhaust system, also connect it with the cable included to the remote control connector of the FineMarker Hybrid (3).

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



Figure 12, cable connections

## SECTION 4 – OPERATION

- 4.1 Power ON/OFF
- 4.2 Control Panel
- 4.3 First Steps Before Engraving
- 4.4 First Engraving Tests
- 4.5 Rotary Engraving Attachment
- 4.6 Tips and Tricks for Laser Engraving
- 4.7 Tips and Tricks for Laser Cutting
- 4.8 Tips and Tricks for the Production of Rubber Dies

## Operation Manual FineMarker Hybrid

### 4.1 Power ON/OFF



#### 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 engraving table
- protection cover closed

Immediately after being switched on, the device starts the referencing process. If 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 (10).



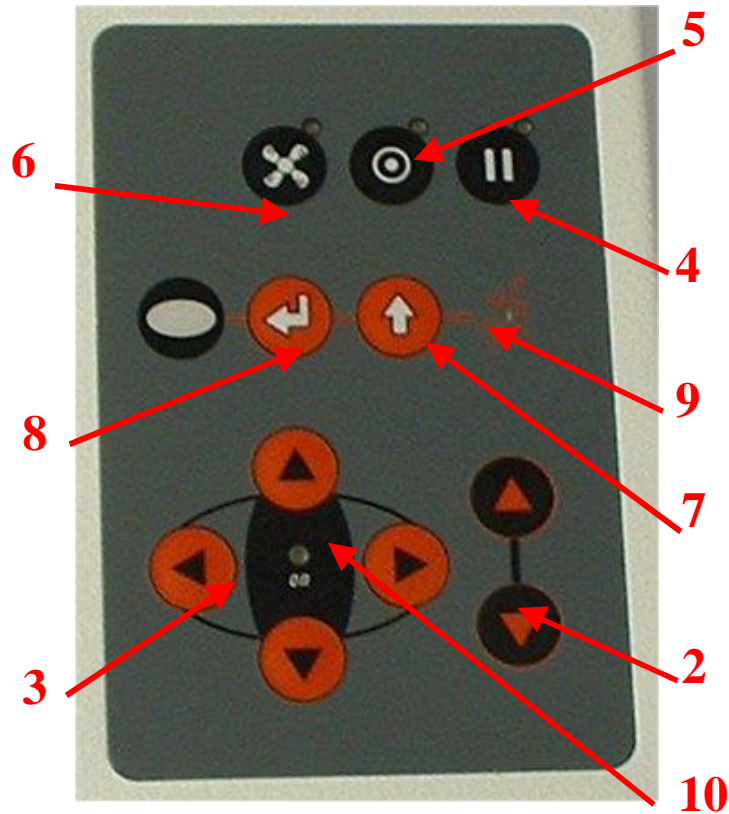
Before switching on the device, the user must make sure that no objects of any kind are located inside the operating space, which could limit or obstruct the mechanics of the device.



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

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### 4.2 Control Panel



## 2 POSITIONING KEYS Z

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



Use these positioning keys to move the workpiece manually.

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

Before the autofocus- move is started, the head is moved backward in line with the light barriers to detect whether a longer nozzle is mounted to the head or not. If so, the upward move is suppressed to prevent a collision with the nozzle and the table.

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By pressing the "Test" key and a Z- positioning key an automatic move to the corresponding end- positions is performed:

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

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

Note: Test + Up will cause the "nozzle test movement" (head moves backward).

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 any of the Z- axis keys (Up / Down).**

### 3 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 "Test" keys 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 possible velocity, if opened, the speed is 1/4<sup>th</sup> of the maximum.

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

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

### 4 PAUSE



Used to stop the current working process (key lights up).

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

## Operation Manual FineMarker Hybrid

### 5 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 (eg. 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).

### 6 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 (after running time).

### 8 REPEAT (SERVICE)



By pressing repeat, the jobs which are currently positioned on the selected plate in the Trotec manager are started.  
If the jobs have been processed before, they will be reset automatically.

### 7+ 8 TEST / REPEAT (SERVICE)



The keys "Test" and "Service" pressed simultaneously fire a laser test pulse. This is used for maintenance and only works with the door closed or with the service plug defeating the interlocks.



As in this case an increased danger of laser radiation exists, an acoustic signal sounds.

## Operation Manual FineMarker Hybrid

### 9 STATUS INDICATOR LASER BEAM



Indicates, that a laser beam is currently being emitted.

### 7+ 4 TEST / PAUSE

By pressing test+pause the buffer memory in the machine is emptied.

### 10 STATUS DISPLAY (indicates the current status of the device):

green, flashing slowly (0.5 Hz)	<b>10</b>	FineMarker Hybrid is ready
green, flashing fast (2 Hz)	<b>10</b>	Cover has been opened
green permanent light / Pause mode	<b>10</b>	Data available in the FineMarker Hybrid
red permanent light	<b>9</b>	Laser beam is being emitted
green/red flashing alternately	<b>9</b> <b>+</b> <b>10</b>	Cover open during switch-on process, simultaneously acoustic signal - no referencing

## Operation Manual FineMarker Hybrid

### 4.3 First Steps Before Engraving

To prepare your laser engraver for the first engraving/cutting tests, perform the following steps:

1. Switch FineMarker Hybrid on with the ON / OFF switch.
2. The working table automatically references in X/Y/Z direction.
3. Open the protection cover and place workpiece on the engraving table.



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



Workpieces, that are larger than 730 x 436 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 workpieces on the system. This could lead to exposure to laser radiation.

#### 4. Focussing the Laser Beam

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



The focussing point of the laser beam (for the high-resolving lens, that is part of the delivery) is located 3.81 cm (1.5 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 focussing
- B:** Focussing by software

## Operation Manual FineMarker Hybrid

**C:** Automatic focussing by means of light barriers

**A – Manual focussing:**

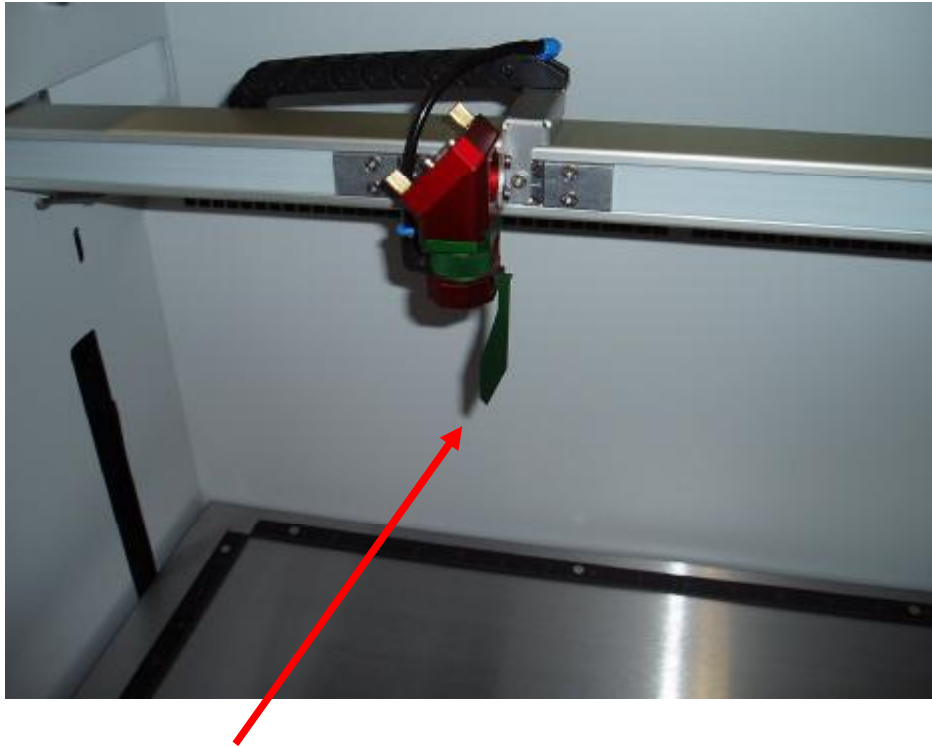
A1. Move the processing head over the material to be engraved by means of the positioning keys X/Y



height adjustment via Z positioning keys

A2. Hang the focussing tool on the external ring of the working head so that the focussing tool can move unhindered. Move the working table upwards by pressing the Z positioning key. While doing this carefully observe the focussing tool.

## Operation Manual FineMarker Hybrid



Before the focussing tool reaches the workpiece, 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 focussed onto the surface of the material.

### B – Focussing by software:

- B1. Click the icon “focus laser” in the Trotec manager  
The working table moves in Z direction, The thickness of the material, that was entered, is used as target value for the focussing (see also description of the software).

### C – Automatic focussing by means of light barriers:



The automatic focussing is only possible if the workpiece is thicker than the rulers.

## Operation Manual FineMarker Hybrid

- C1. By pressing the two keys for Z positioning of the working table simultaneously, the laser beam is automatically focussed onto the workpiece.



Figure 25

## Operation Manual FineMarker Hybrid

### 4.4 First Engraving

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

1. First switch on the computer, then the FineMarker Hybrid.
2. Put the object to be engraved into the laser and move into the desired position on the engraving 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 focussing tool or by auto focus (see pages 41-43).
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 workpiece automatically if requested.



Pos. 5 – 7 and 12 also see Operation Manual Part B – Software

5. Select "File Print", to access the FineMarker Hybrid printer driver, where you can perform workpiece and material settings as well as specify a job name or a job number.

This file is automatically transferred into the TROTEC Manager.

6. After the engraving material, the engraving direction, the orientation of the workpiece and the orientation of the plate have been specified in the TROTEC Manager 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 engraving table.

**Make sure that on engraving flammable materials the air assist is on!**

## Operation Manual FineMarker Hybrid

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

## Operation Manual FineMarker Hybrid

### 4.5 Rotary Engraving Attachment



The rotary engraving option in the FineMarker Hybrid printer driver is used in combination of the rotary engraving attachment, to engrave cylindrical objects.

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



The rotary engraving attachment permits engraving of cylindrical object with a diameter of up to 175 mm and a length of up to 300 mm.

Two attachment parts are delivered with the rotary engraving attachment. A rubber cone that is attached to the motor side, and a metal cone that is attached to the adjustable side of the rotary engraving attachment. These attachment parts are designed to hold wine glasses, cups etc.

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

1. Move the working table to the lower position, switch off the laser and open the protection cover of the laser engraver.



## Operation Manual FineMarker Hybrid

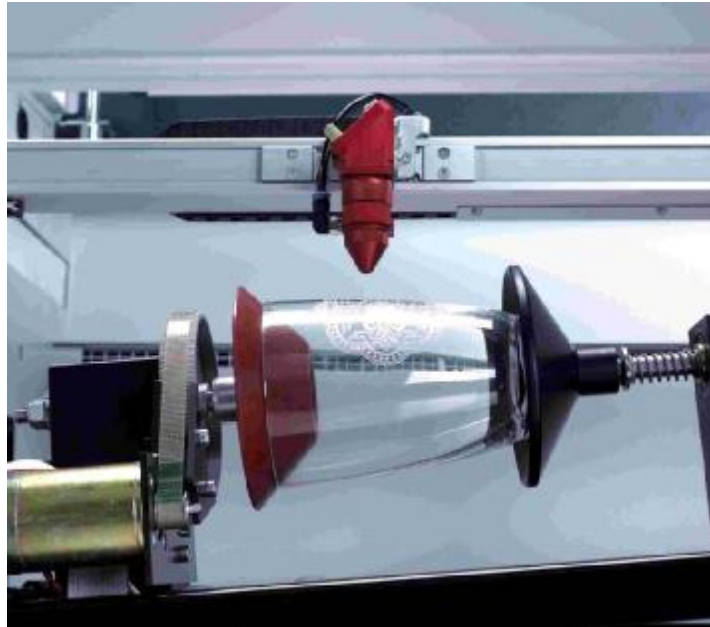
2. Put the rotary engraving attachment onto the working table and connect the rotary engraving attachment to the working table. Before you fix the rotary engraving attachment, align it so that its sides are parallel to the rulers. The rulers offer a visual aid for placing the graphic.
3. Connect the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



### Mounting the workpiece:

4. Before you mount the glass into the rotary engraving attachment, measure the diameter of the glass at the position to be engraved with a sliding caliper or a similar tool. Write down this value.
5. Press the open end of the glass against the left-hand side of the rotary engraving attachment. Loosen the lever (arrow) of the adjustable side of the device and move the device to the left, until the glass is held by both disks. Now fasten the lever at the adjustable end to fix the setting.

## Operation Manual FineMarker Hybrid



6. Now switch on the laser and wait until the referencing is complete. Position the working head over the glass at the position, where you want to engrave. Now focus the object with the focussing tool. If the glass slopes too much in the area to be engraved, the rotary engraving attachment can be tilted, so that the surface of the glass is running again parallel with the X axis of the motion system. To do this, lift the right-hand side of the rotary engraving attachment and place a wedge under it. Take care not to lift the rotary engraving attachment too high, as it can touch the lens holder.

### Engraving:



Pos. 8 – 14 and 17 see also Operation Manual Part B – Software

7. Generate a graphic with the help of your graphics software. The size is not important, as the graphic is adjusted to the dimensions of the workpiece by the printer driver.
8. Then perform the settings for size and orientation in the Manager under "Plate, Setup Plate" and, if necessary, select the engraving material. Please note

## Operation Manual FineMarker Hybrid

especially, that you can determine the orientation of the graphic on the glass with "Stamp Orientation".

9. In the "Options" menu of the Manager select "Rotary Engraving Attachment" and enter the diameter of the glass.
10. Place the previously generated engraving job into the waiting list with a double-click.
11. Use the mouse to drag the job to the position of the plate, at which the desired engraving area is located on the glass. Use the rulers of the FineMarker Hybrid and the Manager for orientation and move the lens holder directly over the desired position, after you have connected the computer with the laser engraver, and position the job on the screen according to the position of the lens.
12. Establish the connection to the engraver.
13. Switch on the exhaust system (only necessary if you do not use an original TROTEC exhaust system).
14. Activate the START button in the Engraver Control of the Manager and start the engraving process.

## Operation Manual FineMarker Hybrid

### 4.6 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.

## Operation Manual FineMarker Hybrid



### 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 points look better, with another material smaller points look better. If you cannot select rasters with your software, the FineMarker Hybrid will select the raster automatically.

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### 4.7 Tips and Tricks for Laser Cutting



#### Distance to the Surface of the Workpiece

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.

## Operation Manual FineMarker Hybrid

### 4.8 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 microporous rubber materials allow a significantly higher engraving speed. Test the rubber first, to find out the correct speed setting.

The TROTEC Manager 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 very low HZ setting for cutting the rubber die. If the Hz setting is further reduced, the laser pulses are set so far apart from each other that 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.

## SECTION 5 – MAINTENANCE

- 5.1 Cleaning the System
- 5.2 Cleaning the Optical Parts
- 5.3 Maintenance Plan
- 5.4 Test Pulse

## Operation Manual FineMarker Hybrid

### 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.

#### General Cleaning:

1. Move the engraving 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.

## Operation Manual FineMarker Hybrid

### 5.2 Cleaning the Optical Parts

The lens has a durable multi-coating and cannot be damaged by correct and careful cleaning. You should inspect the mirrors and the lens at least once a week. If you discover a veil of haze or dirt, you must clean them.

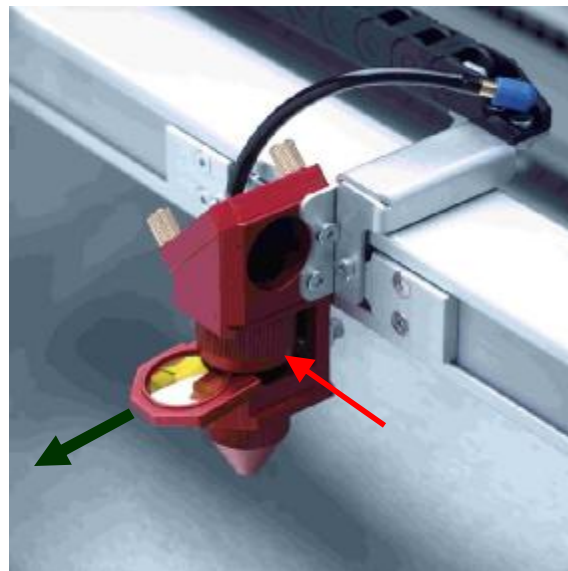
Follow the instructions below for the cleaning of optical parts:

Please use trotec lens cleaner and tissue ONLY!

Part Number	Description
69249	LENS TISSUE
69248	LENS CLEANER

#### CLEANING THE LENS

1. Move the engraving 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.



lens fixing ring

4. Remove the coarse dust by blowing air onto the lens surface.

## Operation Manual FineMarker Hybrid

5. 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.
6. 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.
7. 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.

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



Ensure, that the rounded side (= convex) of the lens is facing upwards

10. Carefully assemble the lens in reverse order.

## Operation Manual FineMarker Hybrid

### CLEANING MIRRORS #3



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

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.

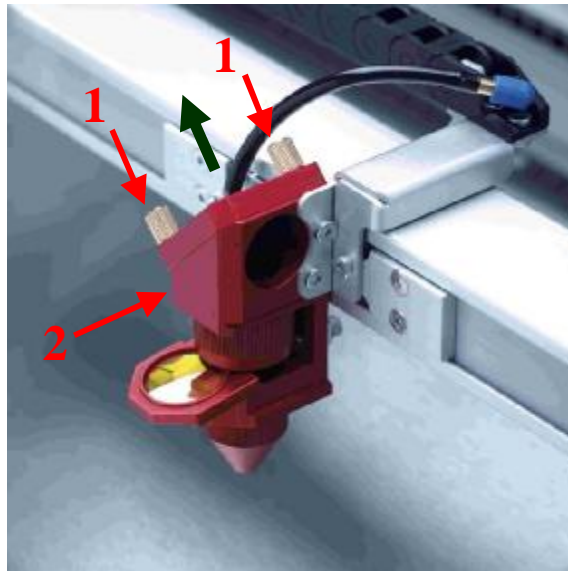


Figure 34

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

## Operation Manual FineMarker Hybrid

mirror dry with a new dry lens cleaning tissue. Never use a cleaning tissue twice, as it could carry dust particles, that 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 screw.

## Operation Manual FineMarker Hybrid

### 5.3 Maintenance Plan

	daily	weekly	monthly	yearly
<b>Laser</b> □				
Lens, mirror 3	Check Cleaning if required			
Engraving table and rulers	Cleaning			
Cover of the laser tube and housing			Cleaning	
Entire working area – general cleaning			Cleaning	
<b>Exhaust System</b>				
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 manuals.

## SECTION 6 – ADDITIONAL INFORMATION

- 6.1 Tips for Troubleshooting
- 6.2 Training Program
- 6.3 Support Sheet

## Operation Manual FineMarker Hybrid

### 6.1 Tips for Troubleshooting

- ⌋ FineMarker Hybrid does not react after activating the "ON" key.
  - Check the mains connection.
  - Check the main fuses of the FineMarker Hybrid. 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 FineMarker Hybrid. An acoustic signal can be heard.
  - Check whether the door of the FineMarker Hybrid is tightly fastened.
  
- ⌋ The following error message is displayed when trying to establish a connection between the Manager and FineMarker Hybrid:  
"Could not build up connection to the laser engraver."
  - Check the cable connection between computer and FineMarker Hybrid.
  - Make sure that you are actually using the correct serial interface COM 1 or COM 2 of your computer and that it is functional.
  - Check the interface selection in "Options" in the "Settings" menu of the Manager.
  
- ⌋ After starting a job the exhaust system is not switched on.
  - Check whether the exhaust system is connected with the mains socket and whether the mains switch is set to "On"
  - Check the cable connection between FineMarker Hybrid and the exhaust system.
  
- ⌋ A job, which was created with the graphics software, does not appear in the waiting list of the Manager.
  - Check whether the sorting function "Kind" and "Resolution" are activated in the waiting list.
  - Make sure that the directories "Archiv", "Spool" and "Work" have been created in the directory of the Manager ("TROTEC") and that the correct paths to these directories have been set under "Options" in the "Settings" menu.
  
- ⌋ A job transferred to the Manager does not contain any graphics,
  - Use the "Fit to page" option in the printer menu of your graphics software.

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### Test pulse

- to select the CO2 laser source
  - Press standby
  - Press **both x-keys simultaneously to select CO2**
  - Press **both test / repeat keys simultaneously**
- to select the ND:YAG laser source
  - Press standby
  - Press **both y-keys simultaneously to select ND:YAG**
  - Press **both test / repeat keys simultaneously**



The keys "Test" and "Service" pressed simultaneously fire a laser test pulse. This is used for maintenance and only works with the door closed or with the service plug defeating the interlocks.



As in this case an increased danger of laser radiation exists, an acoustic signal sounds.

## Operation Manual FineMarker Hybrid

### 6.2 Training Program

#### TRAINING SCHEDULE

Customer no.		Company, City	
Machine/Type			
Serial No.			
Operating System/ Version			
DTP Program / Version			

CHAPTER 1 <input type="checkbox"/>	<b>SAFETY</b> <ul style="list-style-type: none"> <li>• Laser safety</li> <li>• Safety, information and warning labels</li> <li>• Interlock system</li> </ul>
CHAPTER 2 <input type="checkbox"/>	<b>INSTALLATION</b> <ul style="list-style-type: none"> <li>• Installation of the system</li> <li>• Installation of the exhaust system</li> <li>• Installation of the printer driver and the Manager</li> </ul>
CHAPTER 3 <input type="checkbox"/>	<b>SOFTWARE (incl. Corel Draw® version 9 or higher)</b> <ul style="list-style-type: none"> <li>• Fonts, fillings, outlines, ....</li> <li>• Introduction printer driver and Manager Positioning, selecting material, defining the engraving parameters speed and power raster engraving, cutting, bitmaps, job list, Archive/Spool/Work sub-directories</li> </ul>
CHAPTER 4	<b>ENGRAVING TRIALS</b> <ul style="list-style-type: none"> <li>• Handling the engraver</li> <li>• Setting the focus position</li> <li>• Parameters for different materials</li> <li>• Handling the rotary engraving attachment (optional)</li> </ul>

## Operation Manual FineMarker Hybrid

### TRAINING SCHEDULE

CHAPTER 5 <input type="checkbox"/>	<b>CLEANING AND MAINTENANCE</b> <ul style="list-style-type: none"> <li>• General cleaning of the system</li> <li>• Cleaning the optics</li> <li>• Cleaning the exhaust system and replacing the filters</li> <li>• Observance of the maintenance intervals</li> </ul>
CHAPTER 7 <input type="checkbox"/>	<b>ELECTRONICS</b> Explanation of the electronics (prints) Explanation of the fuses <input type="checkbox"/> <input type="checkbox"/>
CHAPTER 8 <input type="checkbox"/>	<b>LASER SOURCE</b> <ul style="list-style-type: none"> <li>• Description and attachment</li> </ul>
CHAPTER 9 <input type="checkbox"/>	<b>BEAM ALIGNMENT</b> Adjusting the deflection mirror 2 <input type="checkbox"/> <input type="checkbox"/>
KAPITEL 10 <input type="checkbox"/>	<b>ADJUSTING ENGRAVING TABLE AND RULERS</b> Explanation of the adjustment of the rulers and the engraving table. <input type="checkbox"/>

- Training performed in .....
- Training, test and installation at customer, location

Remarks:	
----------	--

CUSTOMER

TECHNICAL SUPPORT

DATE / SIGNATURE

DATE / SIGNATURE

## Operation Manual FineMarker Hybrid

### 6.3 Support Sheet

#### Customer Data

Date		Customer no.	
Company		Contact person	
Adress		Phone Fax e-mail	

Problem	.. Engraver	.. Manager	.. Printer Driver
<b>Engraver model</b>		Serial #	

<b>Failure description (how can the problem be reprocessed)?</b>

<b>Error Message</b>

<b>Workpiece</b>		<b>Mode</b>		<b>Material</b>	
------------------	--	-------------	--	-----------------	--

<b>Operating System</b>	
-------------------------	--

Graphicscard		Network	
Main Memory		Hard Disk	

## Operation Manual FineMarker Hybrid

DTP Program		Version	
-------------	--	---------	--

<b>Remarks</b>

## Processing

Received by		Date	
Forwarded to		On	
Solved by		Close Date	