

# rayjet

## R400

Operating manual



8060

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ENGLISH (Translation)

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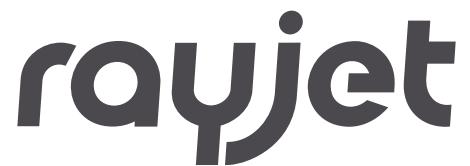
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## 1 General Information

For the sake of readability, gender-neutral endings are not used in this operation manual. It is hereby expressly stated that all parts of the text where natural persons or groups of persons are mentioned refer to people of all genders.

### 1.1 Information about this manual

**Before beginning any work on the machine, read this manual completely and carefully.  
Keep the manual for further consultation close to the machine.**

This manual describes how to operate the machine properly and safely. Be sure to follow the safety instructions given here, as well as any local accident prevention regulations and general safety regulations applicable to the field of usage. Before beginning any work on the machine, ensure that the manual, in particular the chapter entitled "Safety Information" and the respective safety guidelines, has been read in its entirety and fully understood.



#### Information

Supplementary documentation can be found on the supplied storage medium. You can also request this from the manufacturer.

## 1.2 Explanation of symbols

Important technical safety notes and instructions in this manual are indicated by symbols. It is important to observe and follow these notes and instructions on workplace safety. Avoid accidents, personal injury and material damage to property by acting with extreme caution.



### Danger

This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



### Warning

This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### Warning Dangerous electrical voltage

This symbol warns of potentially dangerous situations related to the electric voltage. Failure to observe the safety instructions leads to risk of serious injury or death. Particular care should be taken during maintenance and repair work.



### Warning Laser

This symbol warns of potentially dangerous situations related to the laser beam. Failure to observe the safety instructions leads to risk of serious injury.



### Caution

This symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



### Notice

This symbol indicates potential risks of damage to the supported product (or to property).

In addition, non-observance may result in damage, malfunction or failure of the machine.



### Information

This symbol indicates tips and information which must be observed for efficient and trouble-free handling of the product.



### Disposal

This symbol indicates notes regarding the professional disposal of the product or accessories.

### 1.3 Liability and warranty

Warranty periods specified in the manufacturers "warranty terms and conditions" shall be binding for the buyer. If no warranty periods are specified, the general terms and conditions of sale, delivery and payment apply.

All information, illustrations, tables, specifications and diagrams contained in this operating manual have been carefully compiled according to the current state of technology. No liability is accepted with regard to errors, missing information and any resulting damage or consequential loss.

Strict compliance with the safety procedures described in this operating manual and extreme caution when using the equipment are essential for avoiding and reducing the possibility of personal injury or damage to the equipment. The manufacturer shall not be liable for any damage and or faults resulting from nonobservance of instructions in this manual.

Nonobservance of the operation, maintenance and service instructions described within this manual absolves Trotec Laser GmbH from any liability in case of a defect.

Furthermore, Trotec Laser GmbH shall accept no liability whatsoever for damage caused by the use of non-original parts and accessories.

Additionally, Trotec Laser GmbH shall not be held responsible for any personal injury or property damage, of an indirect or specific nature, consequential loss, loss of commercial profits, interruption to business, or loss of commercial information resulting from use of the equipment described in this manual.

It is strictly prohibited to make any alterations, to prepare translations, decompile, disassemble, reverse engineer or copy the software.

Trotec Laser GmbH reserves the right to update any of the information, illustrations, tables, specifications and diagrams contained in this operating manual with regard to technical developments at any time without notice.

#### 1.4 Scope of delivery (standard configuration)

1. Laser machine
2. Data carrier (with laser software, printer driver and operating manual)
3. Power cable
4. USB computer connection cable
5. Grease gun (for lubricating the linear guides)
6. Cleaning kit for optics
7. Lens
8. Focus tool

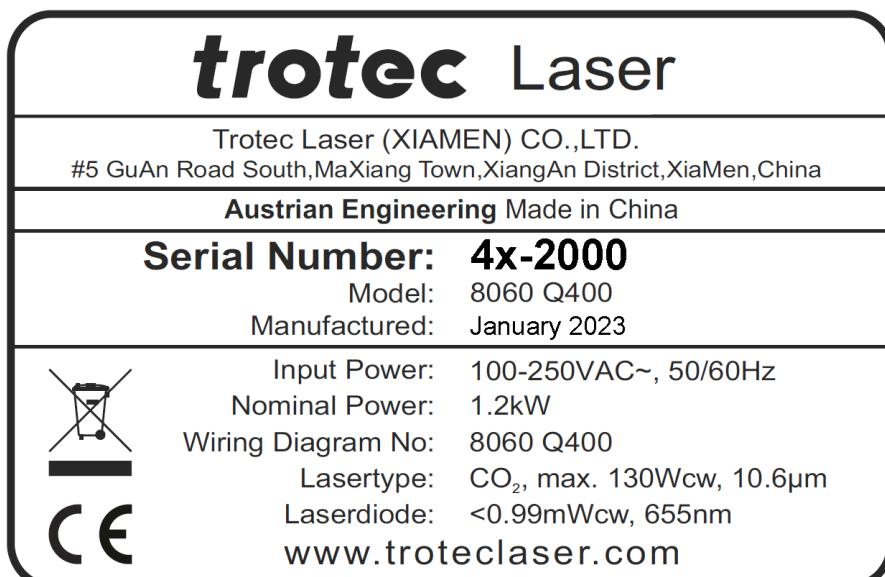
The actual scope of delivery may be different, depending on the special model, additional order options or newest technical changes.

## 1.5 Type plate

The type plate with the CE mark is located on the rear of the machine.

Enter the serial number, model and year of manufacture into your manual and always refer to them when contacting us for enquiries, troubleshooting or ordering of replacement parts.

Serial number:	
Model:	
Year of manufacture:	



## 2 Safety

### TO AVOID POSSIBLE HARM READ AND FOLLOW THESE INSTRUCTIONS.

The machine is built at the time of its development and production according to applicable, established technical rules and is considered to be safe to operate.

Dangers can be caused by the machine if the machine:

- is operated by unqualified personnel,
- the personnel have not been trained,
- the machine is used improperly or not as intended,
- or if the machine is used for other intended purposes.

This chapter provides an overview of all important safety aspects that are necessary for optimum protection of persons and safe and trouble-free operation of the machine. Other chapters of this manual contain specific safety notes for the avoidance and prevention of hazards.

### 2.1 General safety notes

#### 2.1.1 Intended use

**The machine described in this manual is intended for cutting, engraving and marking of materials according to the intended use of the machine, using the supplied software.**

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

Operate the machine only in technically flawless condition and when it fully complies with the EC Machinery Directive.

For material details see chapter "List of materials" or contact your local Trotec representative, or our Technical Support.

The machine may only be operated with a suitable and effective exhaust system.

The intended use of this machine also includes that all personnel involved in installation, set-up, operation maintenance and repair of the machine must have read and understood the operating manual and in particular the "Safety" section, and comply with the instructions.

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#### 2.1.2 Improper use

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Use of the machine for any purposes other than those intended or described in the present manual is regarded as improper and therefore prohibited. Trotec Laser GmbH will not accept any liability for damage caused by improper use. The operator is solely liable for all damages caused by improper use.

Non-observance of the operation, maintenance and service instructions described within this manual absolves Trotec from any liability in case of a defect.

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## 2.1.3 Residual risk

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Even if all safety regulations are observed, a residual risk remains when operating the machine.

The measures required to reduce all residual risks can be found in the following paragraphs of the chapter "[Safety](#)".

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## 2.1.4 Machine modification

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It is strictly prohibited to alter, refit or modify the machine in any way without the express consent of the manufacturer.

Likewise, it is strictly prohibited to remove, bridge or bypass any safety devices. Operating conditions and connection and setup values stated in the data sheet must be complied with at all times.

Operation of the system is permitted only with original parts and accessories by the manufacturer. Use of third-party parts affects machine safety.

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## 2.1.5 Operating modes

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### Normal operation

**For normal operation the following conditions must be met:**

- Intended use of the machine (see chapter "Intended use").
- Operation of the machine only by trained personnel.
- Full functional and mounted safety devices.
- Machine must be in technically flawless condition.
- Processing of permissible materials according to the material list.
- Maintenance and service are not included.



#### Notice

During normal operation it is not necessary to wear safety glasses.

### Service operation

Service activities may be carried out only by authorized, trained service technicians. If side panels as well as covers get removed and safety devices get bypassed, it can lead to direct and indirect scattered radiation.

The service operation is therefore declared as laser class 4 (US: class IV) and proper precautions need to be taken (see "Laser classification").

## 2.1.6 Applicable safety regulations

The following directives and guidelines must be observed to avoid hazards when operating Trotec laser systems:

### Guidelines/Regulations

2006/42/EC	EC Machinery Directive
2014/30/EU	EMC Guideline

### Applied harmonized standards

EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction.
IEC 60825-1:2014, EN 60825-4:2011	Safety of laser products - Part 1: Equipment classification and requirements.
IEC 60204-1:2005	Safety of machinery - Electrical equipment of machines - Part 1: General requirements.
ISO/DIS 11553-1:2009-03	Safety of machinery - Laser processing machines - Part 1: General safety requirements.
IEC 61000-6-4:2007-02	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.
ISO 13857:2008	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs.
EN 55011+A1:2016-05	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement.
IEC 60825-4:2012-01-01	Safety of laser products - Part 4: Laser guards



#### Notice

##### Safety norms and regulations.

The general guidelines and directives listed within this manual may differ according to locality, region or country.

Therefore, always observe the directives as well as the regulations of the institutions for statutory accident insurance association applicable to you. The operator is responsible for fulfilling all safety requirements, as Trotec Laser GmbH has no influence on the proper use of the machine.

Observe the official regulations for your business location in accordance with the applicable local legal regulations (on accident prevention regulations or employee protection), e.g. DGUV regulation 11 for Germany.

## 2.2 Laser safety

### 2.2.1 Laser classification

The laser safety class indicates the risk potential from accessible laser radiation.

The laser system is a Class 2 (US: Class II) laser marking system as per IEC 60825-1 "Safety of Laser Product".

The integrated laser source is a Class 4 (US: Class IV) laser marking system according to IEC 60825-1 and identified as such.

#### Class 2 (US: class II)

The accessible laser radiation of Class 2 (US: Class II) laser systems does not pose any hazard for the skin. Diffuse reflections as well as any short-term irradiation of the eyes (exposure time max. 0.25 seconds) also pose no risk due to the low output power. However, it is possible to suppress the natural eyelid closure reflex and stare into the class-2 laser beam for a time long enough for the eyes to get injured.



#### Warning Laser

##### Laser radiation of Class 2 (US: class II)

For Class 2 (US: class II) laser is short term exposure (up to 0.25 seconds) harmless to the eyes and can therefore be operated without additional protective measures. However it can cause irritation of the eyes if the natural avoidance reaction (staring into the laser beam deliberately) or eyelid closure reflex is suppressed.

- Do not suppress the eyelid closure reflex.
- Do not stare directly into the laser beam.
- Close eyes, turn away.
- Never look at the laser beam directly with an optical instrument, e.g. a lens.



#### Notice

It is the responsibility of the operator to comply with the national official and statutory regulations for the operation of a laser system with a build in laser source of class 4 (US: class IV).

## 2.3 Areas of responsibility

### 2.3.1 Responsibilities of the operating company

#### The operator has the following responsibilities:

- It is the responsibility of the operator to comply with the national official and statutory regulations for the operation of a class 4 (US: class IV) laser system or laser system with a build in laser source of class 4 (US: class IV).
- In addition to the safety notes and instructions stated in this manual, consider and observe the local accident prevention regulations and general safety regulations that apply at the operation site of the machine.
- A CO<sub>2</sub> fire extinguisher must always be at hand, as the laser beam can ignite flammable materials.
- If the machine is used industrially, the operator is subject to the legal obligations concerning industrial safety.
- All personnel involved in installation, set-up, operation, maintenance and repair of the machine must have read and understood this manual and in particular the "Safety" section. The personnel must be trained and informed about all the functions, potential dangers and safety issues of the machine on a yearly basis.
- The user is recommended to prepare company internal instructions considering the occupational qualifications of the personnel employed in each case, and the receipt of the instruction/this manual or the participation in the introduction/training should in each case be acknowledged in writing.
- Keep the manual in the immediate vicinity of the machine so that it is accessible at all times to all persons working on or with the machine.
- Authority for the individual activities relating to the application of the machine (e.g. installation, operation, maintenance and cleaning) must be clearly defined and observed, so that no unclear competencies result under the aspect of safety. This applies in particular to work to be performed on the electrical equipment that may only be performed by qualified specialists.
- Maintenance and repair work as specified in the manual must be carried out regularly.
- 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 manual must be observed.
- Provide appropriate personal protection equipment (e.g. protective goggles according to wavelength and laser power).
- The operator is responsible for the safety-related state of the machine.
- Do not store any flammable materials in the working area or in the immediate vicinity of the device. Particularly, residues of processed materials have to be removed to prevent any fire hazard.
- The operator must ensure cleanliness and accessibility at and around the machine by corresponding instructions and controls.

### 2.3.2 Responsibilities of the operating personnel

#### The operating personnel has the following responsibilities:

- Always wear personal protective equipment.
- It is the duty of the operating personnel to check the machine before start of work for externally visible damage and defects, and to immediately report any changes that appear (including behavior during operation) that may affect the safety of the machine. It must be made sure that the machine is operated only in perfect condition.

- The machine must not be left unattended while it is operating (supervised operation).
- Switch off the machine described herein at the main switch for periods of non-use.
- Operate the machine described here only with a lens in place. A missing lens may cause the unfocused laser beam to be reflected out of the housing.
- Stop this machine immediately in case of failure.
- No working methods are permitted that affect the safety of persons or of the machine.
- The machine and its components, such as the lens and mirrors, are to be kept clean at all times.



## Caution

The adjustment of the beam path may only be carried out by service personnel of Trotec Laser GmbH.

## 2.4 Requirements for operating an service personnel

**The requirements for the operating and service personnel are:**

- The personnel must have read and understood this manual and in particular the "Safety" section.
- The personnel must not be under the influence of drugs, alcohol or reactivity affecting medication when working on or with the machine.
- The personnel must be familiar with using the CO<sub>2</sub> fire extinguisher.
- The personnel must be trained in order to be qualified to operate the machine. If the personnel lack the necessary knowledge for working on or with the machine, they must first be trained and note down the training in the training verification form.

Activity	Intended user group	Definition
Control/operation/other activities (e.g. troubleshooting, maintenance)	Qualified personnel or Trotec service technicians	Qualified personnel are those who can judge the work entrusted to them and detect potential risks based on their occupational training, knowledge and experience as well as their understanding of the relevant regulations.

## 2.5 Machine identification (warning and safety stickers)

The warning and information signs are attached to the device at those places which could be a source of danger before commissioning or during operation. Therefore pay special attention to the information on the signs.

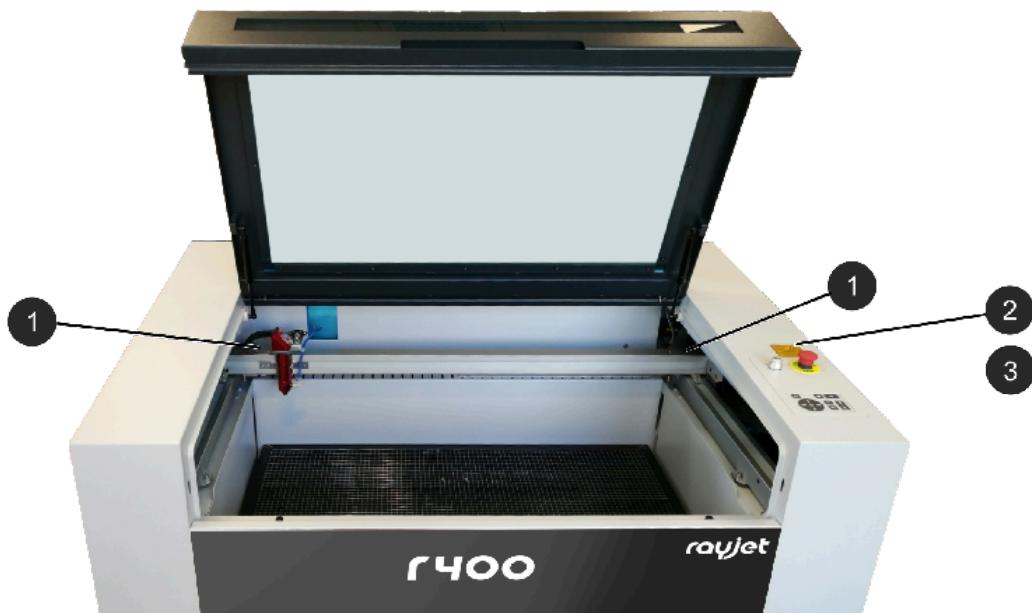


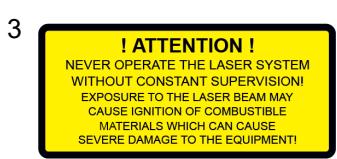
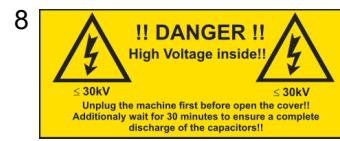
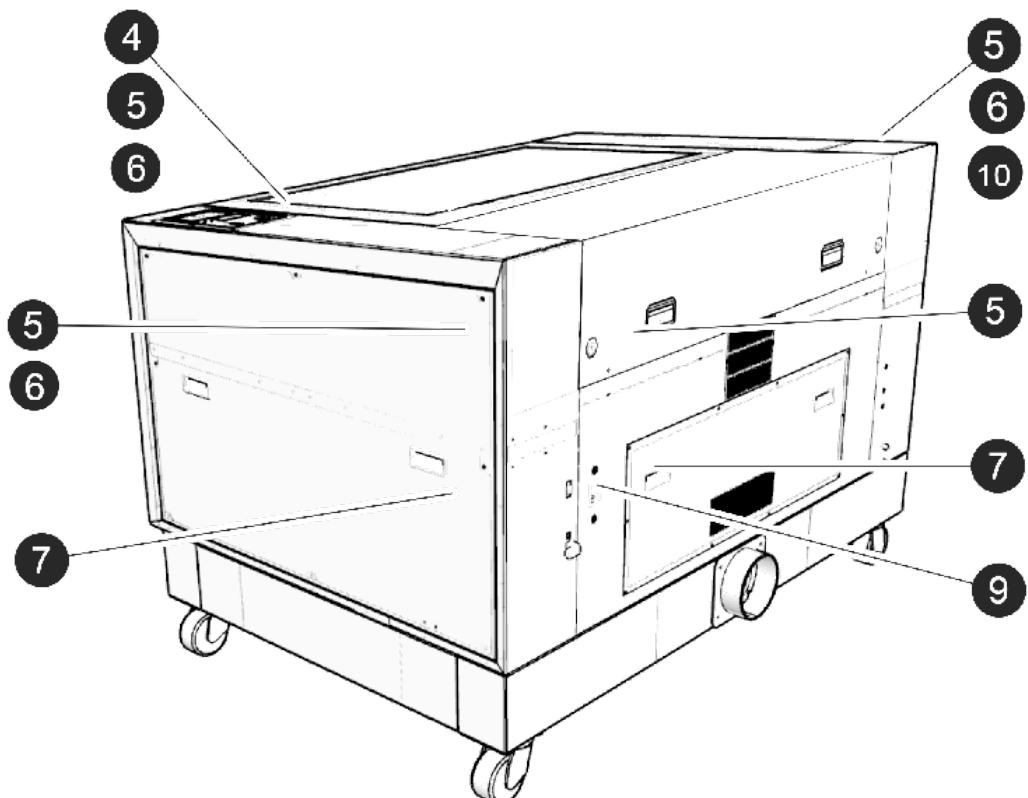
## Caution

### Lost or damaged warning and safety stickers.

If any warning and safety stickers are lost or damaged, the user is not able identify risks anymore, and there is danger of injury.

- Replace lost or damaged labels immediately.
- Contact your Trotec Laser GmbH dealer for details.





## 2.6 Safety devices



### Warning

#### Danger from laser beam.

Personal injury and damage to property may occur if the safety devices and protection devices are not fully functional.

- Do not remove, modify or deactivate the interlock safety switches or protective covers on the machine. Safety and protection devices must be fully functional at all times.
- In case of assumed or presumed damage of safety devices, disconnect the machine from the mains.
- Damaged safety and protection devices need to be replaced by a Trotec technician immediately.

## 2.7 Technical protective measures

### 2.7.1 Main switch

Pressing the main switch on the backside of the machine to disconnect the machine from the mains power supply.

### 2.7.2 Key switch

Turning the key switch to the "0" position powers off the motor, laser source and electric system. Operation of the machine by unauthorized persons can be prevented by removing the key switch.

### 2.7.3 Emergency stop button

Pressing the emergency stop button immediately switches off the circuit.

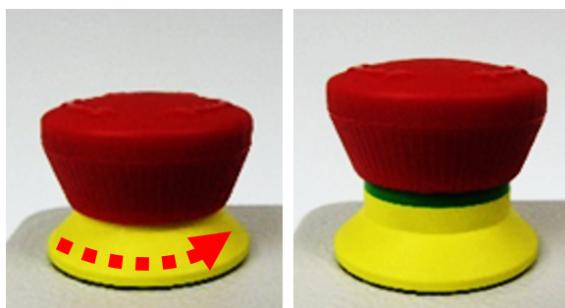
The laser beam is interrupted and all movements are stopped.

#### The task of the emergency stop switch is:

First priority: Prevention of danger to the operating personnel.

Second priority: Prevention of damage or destruction of the machine and/or material.

## Acknowledge the emergency stop switch



1. Turn the emergency stop switch counterclockwise to unlock it so that the green marking is visible.
2. Restart the laser system using the key switch.

---

### 2.7.4 Interlock safety switches

---

Interlock safety switch query the closed status of the acrylic top lid, side panels and front door. If the safety devices are open or not present, the laser cannot be operated. However, the pilot laser stays active.

---

### 2.7.5 Acrylic top lid

---

The type of acrylic top lid depends on the laser type. It protects the operator from uncontrolled emission of dangerous laser radiation.

---

### 2.7.6 Side cover

---

The side panels protect from laser light and must always be closed and properly attached.

---

### 2.7.7 In case of safety device malfunction

---

Actual or presumed damage to the safety devices can cause injury or damage. Following measures must be carried out.

1. Press the emergency stop button.
2. Disconnect the machine from the mains.
3. Contact our Technical Support in your local area.

## 2.8 Secondary (indirect) hazards

### 2.8.1 Fire hazard



#### Warning

##### Fire hazard

Fire hazard from gas and processing of inflammable materials.

- Do not operate the device without supervision.
- Keep CO<sub>2</sub> fire extinguisher ready at hand in the immediate vicinity of the device.

If a main laser beam hits easily flammable material, e.g. paper, this may ignite and a fire can quickly occur. Therefore, before switching on the laser, you should make absolutely sure that there is no easily flammable material in the beam path.

Furthermore, gases that can form below the material to be processed may ignite. Especially if the extraction requirements are not met.

Inadequate care and cleaning of the system increases the risk of flame formation.

Regularly check the cooling slots of the cooling system.

### 2.8.2 Gases, fumes and dust

Depending on the materials being processed and the parameters selected, laser processing may generate gases, fumes, aerosols or dust. Depending on the material, such by-products may be toxic. In individual cases, the reaction products may be electrically conductive dusts. If these enter electric systems, short-circuiting with personal injury and property damage may occur.

The operator is responsible for ensuring presence of a suitable extraction system and compliance with the relevant guidelines in order to protect persons and the environment. Find out about local guidelines.

The operator must also ensure that gases, fumes or dust do not settle on the processing lens. Any dirt accumulating on the processing lens can lead to loss of performance, poor processing results and damage to the device.

## 2.8.3 Reflection through materials



### Warning

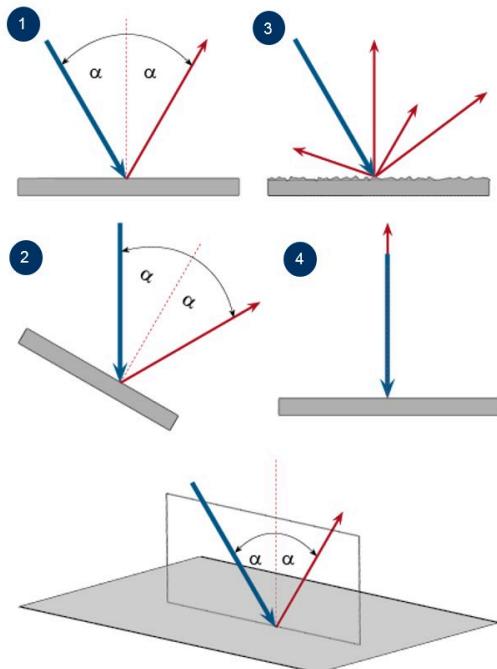
#### Danger from laser beam.

Invisible laser radiation of reflecting materials can cause serious injury or material damage.

- Only material according to the intended use of the machine may be used.
- Do not use material with high reflecting surfaces such as aluminum, chromium, precious metals, metal foils, stainless steel, brass, copper and titanium.
- Take special care with surfaces formed convex and concave.
- Do not leave or put objects on the work surface/working area.

## Laser beam reflection

The reflecting law is valid for the reflection of the laser radiation: **Angle of incidence = failure corner**



No.	Description
1	Directed reflection: Reflected ray on smooth surface.
2	Directed reflection: Reflected ray on sloping surface.
3	Diffuse reflection: Reflected ray on rough surface.
4	Directed reflection: Horizontally reflected ray on smooth surface.

---

## 2.8.4 Hazards due to damaged optics

---



### Warning

#### Damage to optics.

Soiled optics absorb laser radiation and can thus be destroyed. Broken or damaged lenses as well as thermal decomposition of lenses release particles which cause serious damage to the health.

- The passive reflectors and optics in the area of the laser beam guidance should be cleaned regularly.
- Special care is required when handling, attaching and cleaning these elements.
- Do not exert non-uniform pressure.
- Do not use tools or hard objects to clean the surface.
- Never touch the optics with your bare fingers.
- Never use cleaning tissues twice.
- When lenses get broken, damaged or thermal decomposed follow the protective measures.
- Disposal according to regulations and laws valid in the user's country.
- **Lenses with scratches or lenses with penetrations must not be used anymore!**

### Scratched or destroyed lens surface

Be aware that scratches in the coating may release small quantities of thorium, which may be harmful upon inhalation or swallowing.

### Thermal decomposition

Upon thermal decompositions, vapors of selenium oxide and zinc oxide are formed. Upon inhalation or swallowing there is danger of poisoning. Indicators for thermal decomposition of ZnSe include deposits in the form of red or white powder and an unpleasant odor.

### Broken lenses

When optical components of zinc selenide (ZnSe) are destroyed, toxic dusts and vapors are formed which must not be inhaled. The dust can additionally cause irritations of the eyes, skin and respiratory tract. If a lens has been destroyed during operations, care is to be taken during removal and cleaning.

---

## 2.8.5 Protective measures for damaged optics

---

#### Protective measures in case of thermal decomposition and scratched or broken lenses

- For disposal use a protective mask or respiratory filter to prevent inhalation or ingestion of thorium.
- Wash hands thoroughly after contact with a scratched coating.

#### Protective measures in case of a broken lens

- Upon perception of an unpleasant odor, switch off the machine.
- Hold your breath.
- Leave the area of the machine.

- Before approaching the system again, wait for at least 30 min until the reaction has abated.
- Wear proper protective clothing (respiratory protection, protective goggles, protective suit, rubber or plastic gloves).
- Provide ventilation.
- When approaching the system again, pay attention to odors.
- Remove all lens fragments.
- Avoid raising or dispersing dust.



## Disposal

The ZnSe dust and the lens are to be collected dryly and disposed of with fragments, broom, shovel and protective clothing into hermetically sealable containers or plastics bags as hazardous waste.

**Do not dispose of optical components as domestic waste, and do not let them enter the sewer or water bodies.**

**Dispose of according to regulations and laws valid in the users' country.**

## 2.9 In case of emergency

### What to do in the event of malfunctions

- In unusual operating conditions, open the lid to stop the machining process press the emergency stop button and switch off the machine.
- If necessary, disconnect the machine from the main power supply.
- Inform the laser protection officer and your supervisor.
- Repair work must only be carried out by Trotec Laser GmbH service technicians.
- In the event of a fire: Fight the fire with a CO<sub>2</sub>fire extinguisher as far as is possible without risk.



#### Notice

After a deletion, Trotec Technical Support must be involved before the system is put back into operation.

### What to do in the event of an accident, first aid

- If eye damage occurs due to laser radiation, the casualty must present to an ophthalmologist immediately.
- First aiders must protect themselves.
- Disconnect the device from the power supply and secure it against restarting
  - Remove the key switch.
  - Unplug the power cable.
- Rescue the injured person from the danger area and provide first aid.
- Call an emergency doctor!

### 3 Technical Data

→ The technical data sheet can be found in the appendix of this manual.

## 3.1 Exhaust system requirements



### Danger

#### Danger of emission of toxic gases, vapors or dust.

During laser operation, toxic aerosols may be produced.

- The laser system may be operated only with properly installed and operating exhaust system.
- Check with the material manufacturer for its toxic effect.



### Caution

The laser may only be operated with properly installed and operating exhaust system. Damage to the system, caused by the use of not any exhaust system or improper extraction equipment, will not be covered by any liability.

#### The following Trotec exhaust system meets the requirements:

- Vent Set for R & Q 400: (230V, 50Hz, Euro Plug), (115V, 60Hz, US Plug)
- or equivalent

The requirements for the exhaust system and recommended Trotec exhaust systems for standard applications depend on the working table installed in the machine.



### Notice

Connection has to be carried out by our Technical Support.

Observe instructions for operation and maintenance according to the operating manual of the exhaust system.

The monitoring point for flow rate and pressure is at the exhaust port at the laser machine. Pressure loss by hoses / pipes or filter parts of the exhaust system has to be determined and additionally calculated when selecting a proper exhaust system.

A powerful exhaust system keeps the lifetime of optics and mechanical components, the cutting quality and the laser power interacting with the workpiece from being impaired by fumes and dust accumulating in the machine.



## Notice

The exhaust power available for the application will be reduced by e. g. bends, small hose diameters and long hoses.

### You should therefore note the following:

- Avoid bends.
- Keep hose as short as possible.
- Use hose diameters as large as possible.

Applications generating large amounts of dust or fumes may require a stronger exhaust system.  
Use of separate exhaust systems for head and table exhaust may also be necessary.

In this case it is absolute necessary to consult your distributor.

### 3.2 Materials

List of material				
Material EN	Material DE	Cutting	Engraving	Marking
<b>Metal</b>				
Aluminum	Aluminium			
Aluminum, anodized	Aluminium, eloxiert			✓
Chromium	Chromium Verchromte Oberflächen			
Precious metal	Edelmetalle			
Metal foils up to 0.5mm (Aluminum, Brass, Copper, precious metal)	Metallfolien bis zu 0,5mm (Aluminium, Messing, Kupfer, Edelmetall)			
Stainless steel	Edelstahl			
Metal, painted	beschichtetes Metall (lackiert)		✓	
Brass	Messing			
Copper	Kupfer			
Titanium	Titan			

Plastic				
Acrylonitrile butadiene styrene (ABS)	Acrylnitril-ButadienStyrol-Copolymer (ABS)	✓	✓	
Acrylic/PMMA, i.e. Plexiglas®	Acryl(PMMA), z.B. Plexiglas®	✓	✓	
Rubber	Gummi (Stempelgummi)	✓	✓	
Polyamide (PA)	Polyamid (PA)	✓	✓	
Polybutylene terephthalate (PBT)	Polybutylenterephthalat (PBT)	✓	✓	
Polycarbonate (PC)	Polycarbonat (PC)	✓	✓	
Polyethylene (PE)	Polyethylen (PE)	✓	✓	
Polyester (PES)	Polyester (PES)	✓	✓	
Polyethylene terephthalate (PET)	Polyethylenterephthalat (PET)	✓	✓	
Polyimide (PI)	Polyimid (PI)	✓	✓	
Polyoxymethylene (POM) -i.e. Delrin®	Polyoxymethylen (POM) z.B Delrin®	✓	✓	
Polypropylene (PP)	Polypropylen (PP)	✓	✓	
Polyphenylene sulfide (PPS)	Polyphenylensulfid (PPS)	✓	✓	
Polystyrene (PS)	Polystyrol (PS)	✓	✓	
Polyurethane (PUR)	Polyurethan (PUR)	✓	✓	
Foam (PVC free)	Schaumstoff (PVC frei)	✓	✓	

Miscellaneous				
Wood	Holz	✓	✓	
Mirror	Spiegel			
Stone	Stein		✓	
Paper (white)	Papier (weiß)	✓	✓	✓
Paper (colored)	Papier (farbig)	✓	✓	✓
Food	Lebensmittel	✓	✓	✓
Leather	Leder	✓	✓	✓
Fabric	Textilien	✓	✓	
Glass	Glas		✓	
Ceramics	Keramik			✓
Cardboard	Karton	✓	✓	✓
Cork	Kork	✓	✓	✓
	Markierungsmittel (auf Metall oder Keramik/Glas) z.B. markSolid		✓	✓



## Warning

### Prohibited materials:

- Leather and artificial leather that contains chromium (VI)
- Carbon fibers (Carbon)
- Polyvinyl chloride (PVC)
- Polyvinyl butyral (PVB)
- Polytetrafluoroethylene (PTFE, Teflon)
- Beryllium oxide
- Materials containing halogens (fluorine, chlorine, bromine, iodine and astatine), epoxy or phenolic resins.

### Take care when processing the following materials:

- Manganese
- Chromium
- Nickel
- Cobalt
- Copper
- Lead
- any material with the naming addition “flame-retarding” since it might contain bromine.



## Warning

### Serious injury or material damage.

The use of prohibited or unreleased materials can cause serious injury or material damage and will not be covered under warranty.

Only use approved and released materials.



## Notice

Please contact our experienced application specialists or a sales partner near you, if:

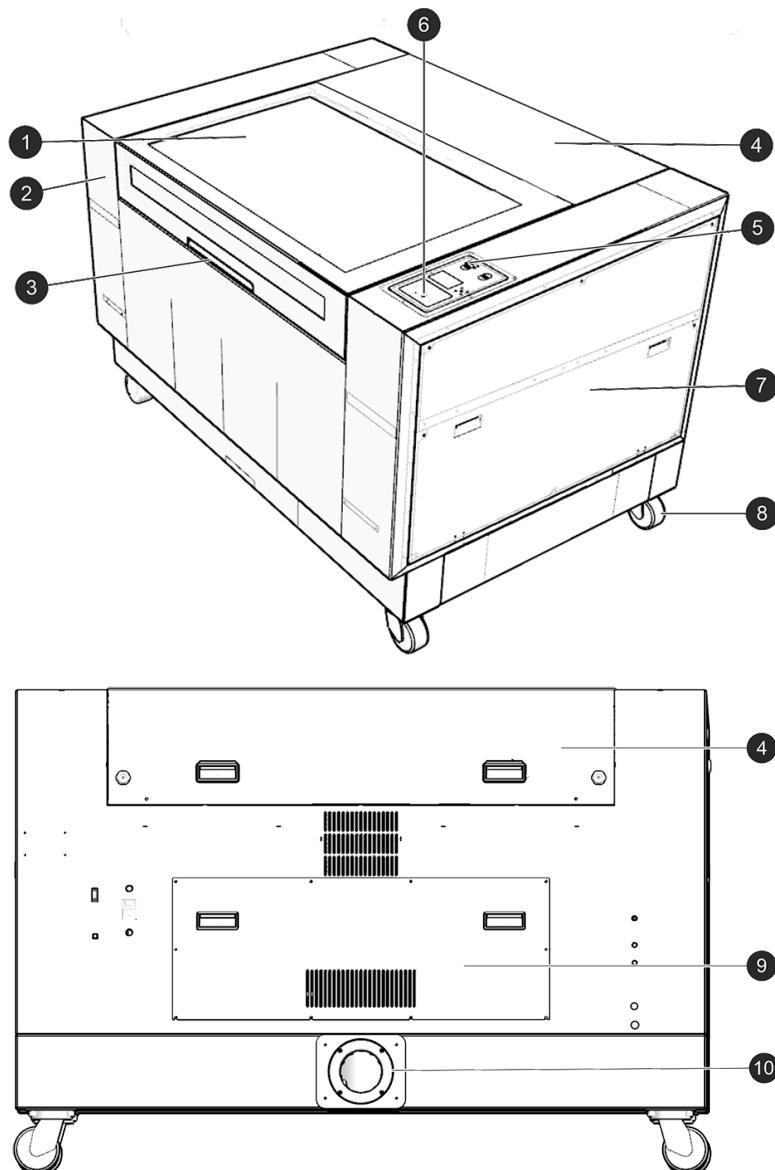
- You are unsure about the processing of a material.
- You have additions for further materials for us or in your opinion a material was not listed.

We recommend performing a material processing test with the above mentioned material, using the appropriate configuration.

Trotec Laser GmbH assumes no responsibility for any consequences of laser processing in any application, especially with medical or pharmaceutical applications.

## 4 Machine overview

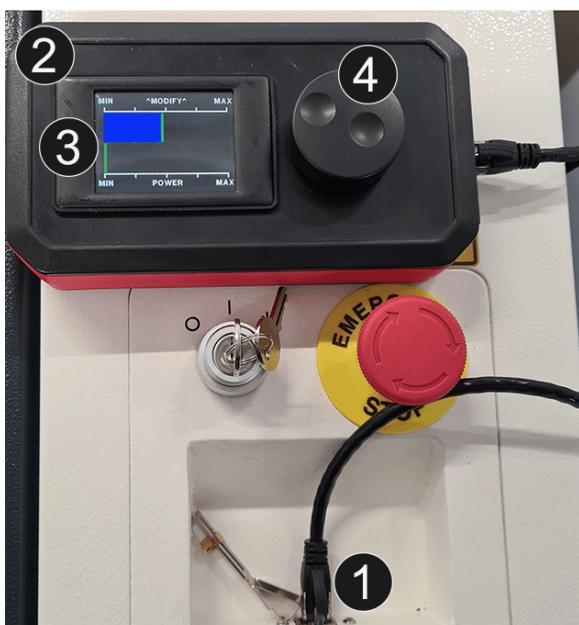
### 4.1 General overview



No	Description	No	Description
1	Acrylic top lid	6	Keypad
2	Table	7	Side panel for power supplies
3	access acrylic top lid	8	Rolls
4	Cover for laser source	9	Cover for cleaning opening
5	Emergency stop button	10	Cover/connection for exhaust tube

## 4.2 Laser power potentiometer

Using the Laserpower potentiometer (available as an option), you can electrically adjust the laser power during the engraving or cutting process. Adjustments of  $\pm 20\%$  are possible. This application can be used, for example, to increase the laser power when cutting outer contours, so that the job does not have to be started again.



- ❶ Connect the Laserpower potentiometer (DC sources only) with the supplied RJ45 cable.
- ❷ The bar graph shows the current laser power during cutting/engraving, the display is time-limited and is updated at short intervals. The flickering during processing corresponds to the current power.
- ❸ By default, this bar graph is always exactly in the middle when the machine is started up, on MODIFY. Modify means factor 1. The laser power corresponds to the power set in the software.
- ❹ Rotary wheel for regulation. One line on the bargraph 2 corresponds to about 5%. Four discrete steps can be made per side (MIN/MAX). By pressing the rotary wheel, the initial state is restored with factor 1. The settings are saved and will not be lost when the machine is restarted.

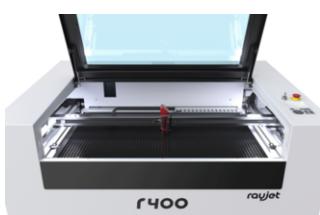
## 4.3 Tables

### Aluminum slat cutting table



The cutting table with aluminum slats is ideal for cutting thicker materials (from 8 mm thickness) and for parts over 100 mm wide. The lamellas can be arranged individually, so the table can be adapted to any individual application.

### Aluminum cutting grid table



This robust cutting table offers excellent stability and is particularly suitable for cutting tasks with work pieces smaller than 100 mm, as these remain in a flat position after cutting.

## 4.4 Lens(es)



2,0 inch (standard)



4,0 inch (option)

## 4.5 Nozzles



3mm diameter  
(0.12 inches)



7mm diameter  
(0.28 inches)

## 5 Transport

### 5.1 Safety notes



#### Warning

##### Risk of injury

There is risk of injury from falling parts during transport, loading and unloading of the machine.

- Follow the safety notes.

**Observe the safety notes to avoid damage to the machine from improper handling during transport:**

- Always move the machine with utmost care and attention.
- Transport the machine/machine components only in its original packaging.
- Take the machine's center of gravity into account when transporting it (minimize the risk of tipping over).
- Observe the packaging symbols (e.g. transport the machine only in upright position).
- Take measures to prevent the machine from slipping sideways, tipping or falling over.
- Transport the machine as carefully as possible in order to prevent damage.
- Avoid vibrations.
- When transporting the machine overseas, the device must be packaged airtight and protected against corrosion.
- When transporting outdoors, transport only in vehicles with roof or sufficient weather protection.
- Protect the machine against transportation damage using straps and inserts, and leave sufficient gaps to other transported items.
- Do not place any other loads or items on the machine or machine components.

### 5.2 Delivery state

Unless otherwise agreed, the machine is delivered in a wooden crate that contains the laser machine and additional accessories. Transport the machine only in its original packaging.



#### Caution

##### Risk of injury

There is risk of injury from falling parts during transport, loading and unloading of the machine.

- Follow the safety notes.

## Observe the packaging symbols:



Keep dry!



Fragile, handle with care.

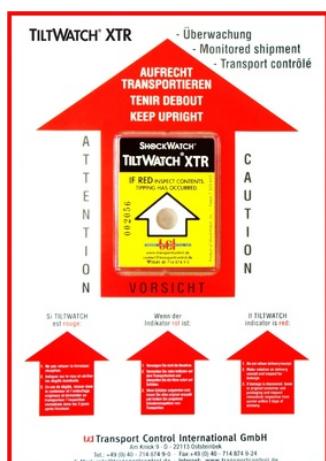


This way up!



Do not stack!

## Note the shockwatch sign:



## 5.3 Temperature and humidity

### Transport conditions

Transport temperature (ambiente temperature):	-10 °C to +40 °C (14 °F to 104 °F)
Relative humidity:	Maximum 70%, non-condensing

- Avoid high temperature fluctuations.

### Storage conditions

Storage temperature (ambiente temperature):	0 °C to +30 °C (32 °F to 86 °F)
Relative humidity:	Maximum 60%, non-condensing

- Avoid high temperature fluctuations.

#### 5.4 Required tools for unloading and transport

##### Required tools:

- Unloading - Forklift
- Transport - Pallet truck

#### 5.5 Place of storage

- Keep the machine sealed in its packaging until it is assembled or installed.
- The storage location must be dry, free of dust, caustic materials, vapors and combustible materials.
- Store in a storage room or packaged with adequate weather protection.
- Avoid exposure of the machine to shocks or vibrations.
- Avoid extreme temperature fluctuations.
- Take particular care when packing away electronic components.
- When storing for a longer period, apply a coat of oil to all bare-metal machine parts.
- Regularly check the overall condition of all parts and of the packaging.

#### 5.6 Transport inspection and reporting of defects

- Immediately after receipt inspect the delivery to ensure that it is complete and has not suffered any damage.
- If any transport damage is visible, do not accept the delivery, or accept it only with reservation.
- Record the scope of the damage on the transport documents or delivery note.
- For all defects that are not discovered upon delivery, be sure to report them as soon as they are detected, since damage claims must be filed within a certain period, as mandated by law.

#### 5.7 Unpacking the machine

Only trained and authorized personnel may transport and unpack the machine. To prevent wooden parts from falling or the machine from tilting, be very careful when opening the transport box.



##### Information

Only trained and authorized personnel may transport and unpack the machine. To prevent wooden parts from falling or the machine from tilting, be very careful when opening the transport box.



## Notice

Keep the original packaging in case the machine has to be transported. Dispose of all waste in accordance with current waste legislation.



1. Use a forklift truck to place the transport case on ground level.
2. First remove the top wooden cover and then the side plates of the transport box.
3. Remove the aluminium bag (for sea freight packaging).
4. Position the forks under the machine.  
Make sure that the machine rests completely.

5. Remove the machine from the transport box and position it at the desired location.



6. Remove the packing material.



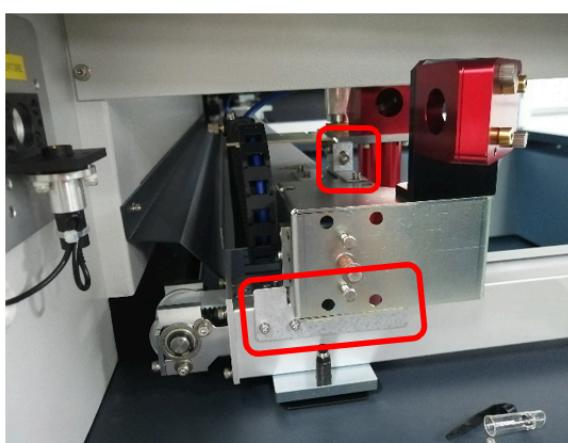
7. The machine must be adjusted and installed by a technician (see installation guide R400).

## 5.8 Transport protection for the axes



### Information

The illustrations used do not correspond to the original condition of the machine and are for information purposes only.



Remove the transport protectors marked in the picture, which fix the x-axis and y-axis. To do this, remove the two screws in each case.

## 5.9 Relocation of the machine

### Steps:

1. Switch off the machine.
2. Disconnect the power cable.
3. Remove the exhaust system.
4. Reposition the machine (e.g. with auxiliary equipment if necessary) and place it on a level, clean floor.
5. Adjust the machine.
6. Initial commissioning of the electrical system.
7. Carry out function test.



#### Caution

Transport the machine only in its original packaging. Ensure the wooden crates are properly secured otherwise the crates can slip, tip or fall over during transport.

Observe the corresponding safety norms and regulations from the chapters "Safety notes" and "Transport".

- When transporting over long distances, use transport boxes including transport securing.



#### Notice

If you would like to relocate the machine, contact our experienced Technical Support in your local area.

## 6 Setup and installation

### 6.1 For your safety



#### Notice

The setup has to be carried out by Technical Support.

### 6.2 Temperature and humidity

#### Ambiente conditions

Operating temperature (ambiente temperature):	+15 °C to +25 °C (59 °F to 77 °F)
Relative humidity:	45% to 65%, non-condensing

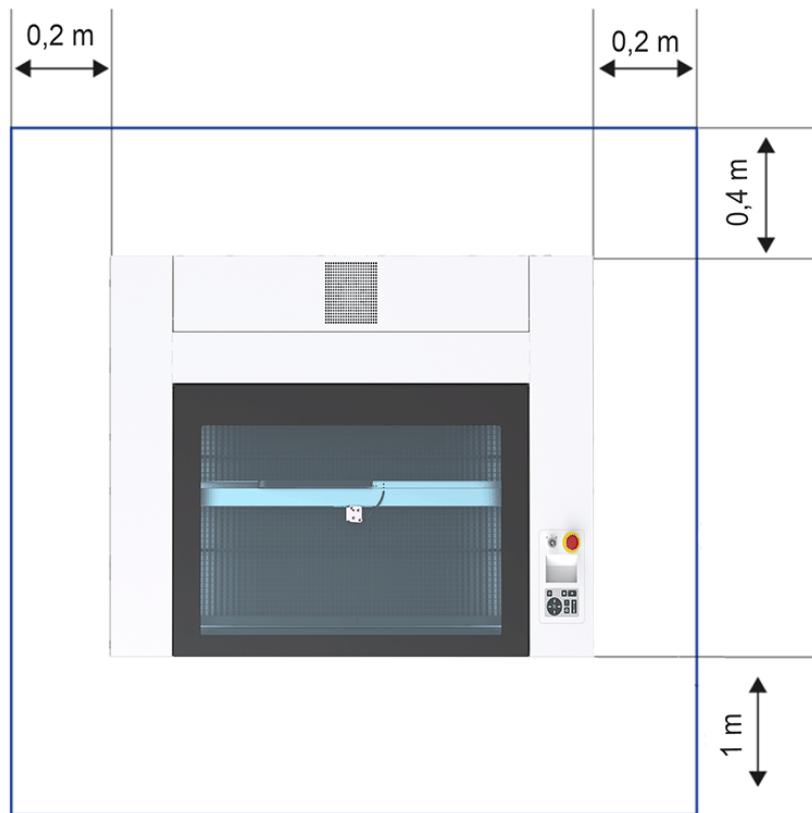
- If the system has been exposed to large temperature fluctuations, it must first be brought back to room temperature before commissioning.

#### Environmental conditions

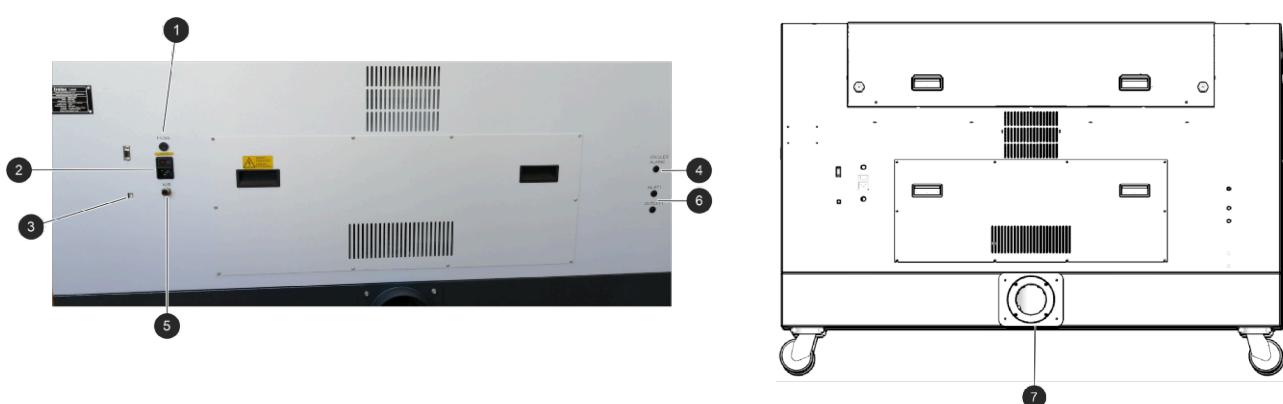
- Provide sufficient illumination at the workplace.
- Ensure a dust-free environment (II° according to IEC60947-1).
- Shielding from EMC.
- Freedom of interfering electrical installations, hoses and pipe lines.
- Power supply free of fluctuations.

### 6.3 Space requirements

Observe shielding or sufficient distance to the wall and adjacent objects.



## 6.4 Connections



No	Description	No	Description
1	Fuse	5	Connection for external compressor
2	Main connection with main switch	6	Connection for cooling water
3	USB connection for PC	7	Connection exhaust system
4	Chiller alarm		



## Caution

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

---

### 6.4.1 Mains connection

---

Connect the end of the mains connection cable to the main connection socket.



## Warning Dangerous electrical voltage

**Wrong voltage can cause damage to the machine.**

Do not operate the machine, if the mains voltage does not match the voltage required by the exhaust system, as this may cause damage to the machine.

Make sure that the mains voltage matches the voltage required by the exhaust system.



## Notice

Depending on the laser power and region, the main fuses are either covered or open on the back of the machine.

---

### 6.4.2 Connection the PC

---

1. Connect the laser to a free interface or USB port on your computer.
2. Connect the computer to the mains.
3. Switch on the computer.



## Notice

The air assist pump is integrated in the housing.

---

### 6.4.4 Connect the water cooling system

---



## Notice

The laser machine with RF laser source is air-cooled. A water cooler is not necessary and not included in the scope of delivery.

**Structure:**

- Water cooling systems A und B
- One cooling circuit INLET1 on the laser machine
- Two water hoses



## Notice

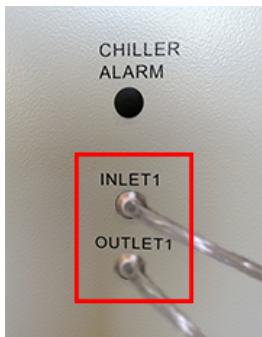
Always connect the INLET input to the water cooling system and the OUTLET output to the laser source.

The OUTLET in the cooling system is always the INLET on the laser source.

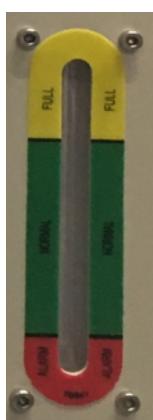
**Example:**

INLET A to OUTLET1

OUTLET A to INLET1



1. Connect the hoses from the water cooling system to the laser unit (see example).
2. Secure the hose connections with cable ties (on the machine and on the water cooling system).
3. Fill the system with normal water of at least 18°C (64,4°F).
4. Check the water level on the level indicator.



The water level must be within the green range.

5. Switch on the system and check the level indicator again.  
(When all hoses are completely filled, the water level may drop slightly.)
6. Check all hoses for leaks.
7. Connect the water cooling system cable to the cooling alarm connection.



## 7 Operation

### 7.1 Before commissioning

#### Check the following points before commissioning:

- Completeness and technically flawless condition of the machine and safety devices.
- Order and cleanliness at the workplace.
- Cleanliness of optical components (free of dust and dirt).
- Activated exhaust system.
- Complete electrical installation.
- Correct input voltage of the electrical installation.
- Environmental conditions according to technical specification.
- Compliance with all laser safety regulations and measures.
- Fulfill and compliance with all laser safety requirements according to chapter 2.

If errors or functional deviations should occur during the inspection of the listed points, the machine is not considered to be safe to operate and must not (no longer) be put into operation until the fault is corrected.

If you have any questions, contact our experienced Technical Support in your local area.

#### 7.1.1 Installation and replacement of the laser source

##### **Caution**



The laser source must be installed and replaced by a technician.

##### **Warning Dangerous electrical voltage**



**High voltage can cause serious injury or even death.**

The laser source may only be replaced and installed by trained, qualified and authorized personnel.

Observe general electrotechnical safety regulations.

Disconnect the power supply before opening. Wait at least 30 minutes before starting work on the laser source.

## 7.2 Software

For information on how to use the software, please read the accompanying software manual, which you will find on the storage medium provided.

## 7.3 Power On/Off



### Notice

In order not to restrict or obstruct the freedom of movement of the mechanics, no objects of any kind may be located in the machining area.

All safety protection covers have to be fully functional and closed.

### Switch on machine:

1. For water-cooled systems, first switch on the water cooling.
2. Switch on the main power supply using the main switch on the rear of the machine.



3. Turn the key switch to the right and hold it against the spring force.
4. As soon as the machine starts, release the key switch.
5. The referencing process starts.
6. A signal tone then sounds and the system is ready for operation.

:



### Notice

Additionally the ready-to-use state is indicated through the slow flashing of the green status LEDs.

### Switch off machine:

7. Turn the key switch to the left.





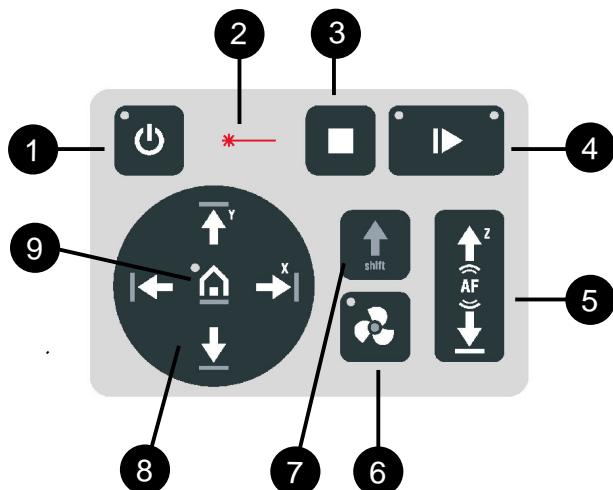
8. Use the main switch at the rear of the machine to turn off the main power.



## Notice

By switching off the mains, all processing data are lost.

### 7.4 Control panel



The control panel refers to the entire unit of the machine control system.  
The keypad is a component of the control panel.

- ① Standby-button.** LED On: Standby-Mode
- ② Status indicator laser beam.** LED On: The machine is processing data.
- ③ Stop-button**
- ④ Start/Pause/Repeat-button**

LED is flashing slowly green (every two seconds).	All covers are closed. Machine is ready.
LED is flashing fast green (twice per second).	Minimum one cover is open.
LEDs light up blue and green.	Data transfer complete. Pause-mode active. Job can be started.
LED lights up green.	Job is running.

## ⑤ Working table control button Z

- Up-button
- Down-button

**⑥ Exhaust-button.** LED On: Exhaust active

**⑦ Shift-button.** Second operating level

**⑧ Laser head control button X/Y**

- travel distance in X-direction
- travel distance in Y-direction

**⑨ Home-button.** LED On: Temporary change of home position.

### 7.4.1 Description

Image	Button	Description
	<b>Status indicator</b>	LED On: The machine is processing or receiving data.
	<b>Standby-button</b>	<p>LED On: Standby-mode</p> <ul style="list-style-type: none"> <li>• Press this button to switch to the Standby-mode.</li> <li>• Press the Standby-button while the working table is moving up or down (e.g. by focus automatically). The machine enters Standby-mode only after finishing the movement.</li> </ul>
	<b>Home-button</b>	<p>LED On: Temporary change of home position.</p> <ul style="list-style-type: none"> <li>• Press the Home-button for 3 seconds to temporarily define the position of the laser head as home position (Marker in the laser software).</li> </ul> <p>To deactivate the temporary home position press the shortcut Shift-button + Home-button.</p>

Image	Button	Description
	<b>Laser head control button X/ Y</b>	<ul style="list-style-type: none"> <li>Press one of these buttons to manually move the laser head to the right, left, front or back (travel distance in X/Y-direction).</li> <li>Press two of the four Laser head control buttons X/Y simultaneously in diagonal direction to move the laser head in diagonal direction (X+/Y+, X+/Y-, X-/Y-, X-/Y+).</li> <li>Press the Shift-button together with one any desired Laser head control button X/Y to move the laser head quickly to the corresponding end position.</li> </ul>
	<b>Working table control button Z</b>	Table moves up or down.
	<b>Stop-button</b>	<ul style="list-style-type: none"> <li>Press this button to stop the current working process.</li> </ul>
	<b>Start/Pause/Repeat-button</b>	<p><b>Start:</b></p> <ul style="list-style-type: none"> <li>Press this button to start a job. The job has to be on the plate in laser software.</li> </ul> <p><b>Pause:</b></p> <ul style="list-style-type: none"> <li>Press this button to pause the job (LED On) which is currently being processed. Press this button again to continue the job (LED Off).</li> </ul> <p><b>Repeat:</b></p> <ul style="list-style-type: none"> <li>Press this button after a job was finished to repeat the actual job.</li> </ul>

Image	Button	Description												
	<b>Status LEDs</b>	<b>Meaning of the LEDs:</b>												
		<table border="1"> <thead> <tr> <th>LED</th><th>Description</th></tr> </thead> <tbody> <tr> <td>Green, flashing slowly (0.5 Hz)</td><td>All covers are closed. Machine is ready.</td></tr> <tr> <td>Green, flashing fast (2 Hz)</td><td>Minimum one cover is open.</td></tr> <tr> <td>Blue + Green, permanent</td><td>Data available. Pause-mode active.</td></tr> <tr> <td>Green, permanent</td><td>Job is running. Processing and receiving data.</td></tr> </tbody> </table>	LED	Description	Green, flashing slowly (0.5 Hz)	All covers are closed. Machine is ready.	Green, flashing fast (2 Hz)	Minimum one cover is open.	Blue + Green, permanent	Data available. Pause-mode active.	Green, permanent	Job is running. Processing and receiving data.		
LED	Description													
Green, flashing slowly (0.5 Hz)	All covers are closed. Machine is ready.													
Green, flashing fast (2 Hz)	Minimum one cover is open.													
Blue + Green, permanent	Data available. Pause-mode active.													
Green, permanent	Job is running. Processing and receiving data.													
	<b>Shift-button</b>	Second operating level for further operation. Press the Shift-button simultaneous with the buttons below to activate the following function:												
		<table border="1"> <thead> <tr> <th>Button</th><th>Description</th></tr> </thead> <tbody> <tr> <td>Shift + Exhaust</td><td>Air assist On/Off.</td></tr> <tr> <td>Shift + Laser head X/Y</td><td>Laser head moves fast to corresponding end position (X- or Y-position).</td></tr> <tr> <td>Shift + Standby</td><td>Keypad locked/unlocked.</td></tr> <tr> <td>Shift + Working table Z, down</td><td>Working table is moving automatic- ally downwards to the corresponding end position.</td></tr> <tr> <td>Shift + Home</td><td>Deactivates temporary home position.</td></tr> </tbody> </table>	Button	Description	Shift + Exhaust	Air assist On/Off.	Shift + Laser head X/Y	Laser head moves fast to corresponding end position (X- or Y-position).	Shift + Standby	Keypad locked/unlocked.	Shift + Working table Z, down	Working table is moving automatic- ally downwards to the corresponding end position.	Shift + Home	Deactivates temporary home position.
Button	Description													
Shift + Exhaust	Air assist On/Off.													
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Shift + Standby	Keypad locked/unlocked.													
Shift + Working table Z, down	Working table is moving automatic- ally downwards to the corresponding end position.													
Shift + Home	Deactivates temporary home position.													
	<b>Exhaust-button</b>	<ul style="list-style-type: none"> <li>Press this button to switch the exhaust On/Off.</li> </ul> <p>LED On: Exhaust active.      LED Off: Exhaust deactivated.      After the laser process is completed, the exhaust switches off after some seconds ("Time to hold") automatically or when you press the button.</p>												

## 7.5 Changing the lens



1. Loosen the tube at the lower thread without removing the entire tube from the laser head.



2. Slide the tube upwards to expose the lens holder.

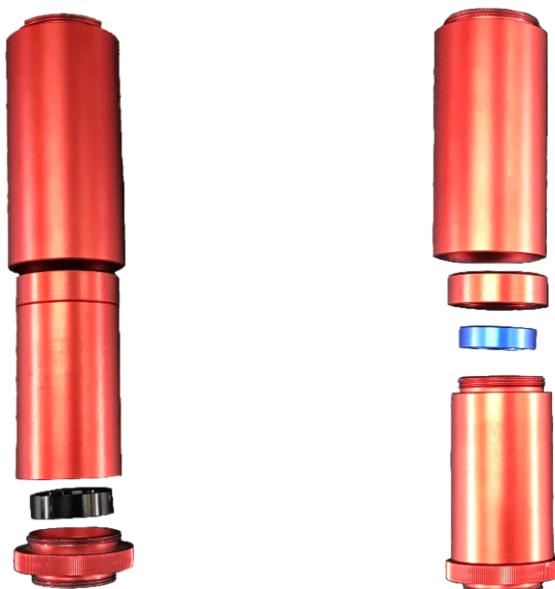


3. Here: Take the 2.0 inch lens out of its socket.  
You can clean or replace the lens.



4. Replace the lens and fix the tube to the lower thread.

## 7.6 Position of the lens



Assembly with a 2.0 inch lens

Assembly with a 4.0 inch lens

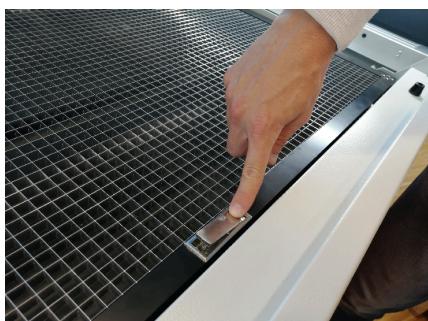


## Notice

Make sure that the lens is placed with the convex side facing upwards.



## 7.7 Table placement



1. Press the silver hidden handle to lift the table.



2. Remove the table including frame from the machine.



3. Insert the new table including frame into the machine.

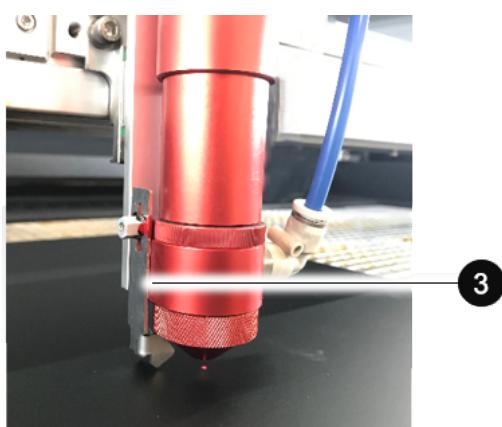
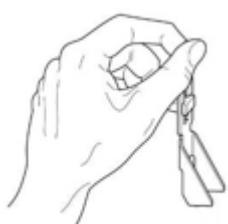
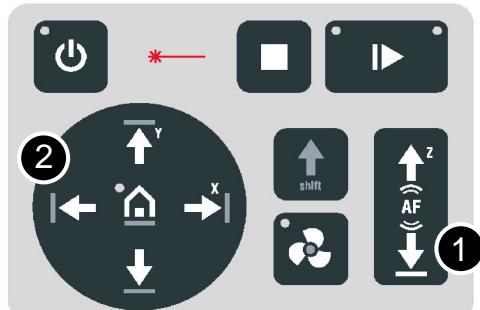


## Information

The slats and the frame are transported individually. The slats can be positioned individually in the frame as required.



## 7.8 Focusing



1. Move the processing head over the material to be engraved by means of the Laser head control button X/Y (2) on the keypad.

2. Hang the focus tool (3) on the allocated space on the laser head so that the focus tool can move unhindered.
3. Move the X-axis downwards by pressing the Working table control button Z (1).

4. Before the focus tool reaches the work piece, move the working table upwards very slowly and step by step by briefly tapping the Working table control button Z (1) until the focus tool tilts to the side or falls off its position.

Now the lens is focused onto the surface of the material.

## 7.9 Options

### 7.9.1 Rotary attachment (option)

The Rotary attachment is used to engrave cylindrical workpieces. Upon selection of the option "Rotary attachment" in the control software and entering the diameter of the object to be engraved, the image size will automatically be automatically adjusted to the diameter of the workpiece to be processed.



#### Caution

##### Damage to electronics.

Inserting or removing the Rotary attachment while the machine is turned on may irreparably damage the electronics.

Switch off the machine before inserting or removing the Rotary attachment.

**Chuck and workpiece size range**

Chuck Type	Diameter Range	Length Range
D150 chuck	80mm~150 mm	50mm~520mm
D100 chuck	30mm~100 mm	50mm~520mm
3-jaw chuck	5mm~33mm	30mm~515mm

#### Rotary attachment with cones:

Max. workpiece diameter: 5.9 inch (150 mm)

Max. workpiece length cones: 20.47 inch (520 mm)

Max. weight 1.600 g

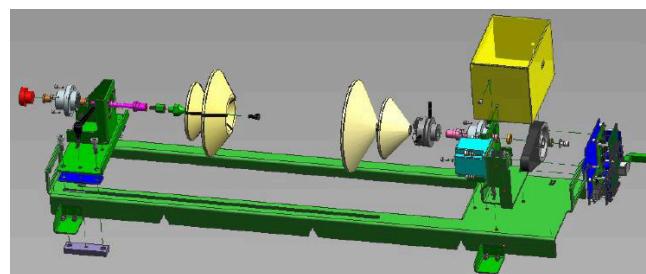
#### Included in scope of delivery:

Konus 5,9 inch (150 mm)

Konus 3,9 inch (100 mm)

Three-jaw chuck and counter bearing

0,04-2 inch (1-50 mm)



## Installation and commissioning



- ① Connection for the rotary attachment
- ② Metal bars
- ③ Table base frame



The machine must be switched off.



### Warning Dangerous electrical voltage

If the rotary attachment is connected during operation, the connections and the electronics will be damaged. Such damage is excluded from the warranty.

1. Place the rotary attachment on the base frame and the metal bars provided for this purpose using the insertion handles.
2. Pull the circular engraving device up to the inside front of the machine.
3. Connect the device with the connecting cable via the connector on the left side of the housing.

## Mounting the work piece

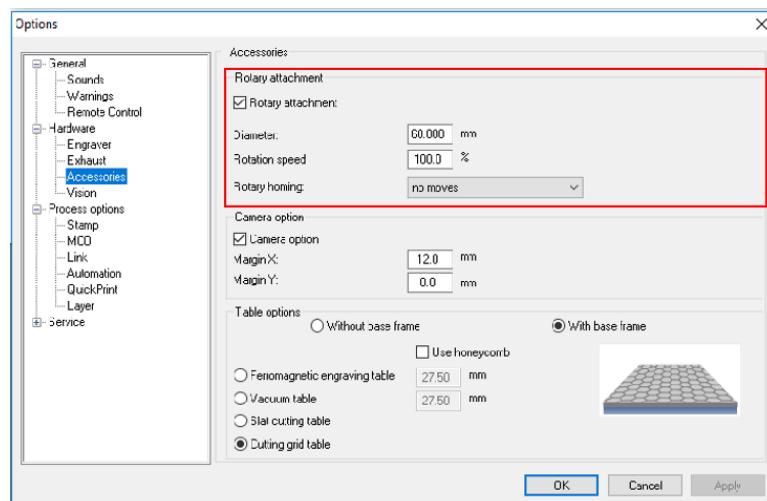
1. Loosen the slider by using the lever in order to clamp the workpiece between the two cones.



2. Switch on the laser. The axis automatically moves over the middle of the rotary attachment.
3. Position the laser head over the workpiece at the position where you want to engrave.
4. Focus the object with the focus tool. The engraving area must be parallel to the X axis.

## Engraving process

1. Create a graphic with the help of the graphics software. Select the printer driver and rotary attachment, and enter the diameter of the workpiece.
2. Perform the settings for size and orientation in the laser software menu "Plate" > "Setup Plate" and choose - if necessary - the engraving material. You can determine the orientation of the graphic on the workpiece with the option "Job Orientation".
3. In the menu "Settings" > "Options" > "Accessories", select the option "Rotary Engraving" and enter the diameter of the object. If the diameter has already been entered in the printer driver, the size is automatically transferred into the laser software.



"Engraving" settings

4. Double-click on the job in the waiting list to place it on the plate.
5. Position the laser head over the workpiece.
6. Start the engraving process.



### Notice

See the Software manual for additional functions.

When using the Rotary attachment, the autofocus is automatically deactivated.

## 8 Maintenance

### 8.1 Safety notes



#### Danger

**Improper maintenance can cause serious injury or damage.**

Maintenance may be carried out only by authorized, trained personnel who are familiar with how to operate the machine and in strict observance of all safety notes.



#### Danger

**Risk of fire or explosion.**

Improper handling of the machine may cause fire or explosion.

- For cleaning the machine, do not use explosive or flammable substances or cleaning agents.
- No flammable or explosive liquids may be stored in or near the machine.
- Always keep the system clean, and remove flammable parts from the working area or exhaust area.



#### Warning Dangerous electrical voltage

**Danger of electrical shock.**

Work on electrical fittings may be carried out only by qualified personnel and in strict observance of the safety notes.

Before any maintenance work takes place, disconnect the machine from the mains voltage and make sure the system is de-energized.

## IMPORTANT NOTE ON MACHINE SAFETY:



#### Notice

The safety devices of the laser system must be replaced due to component aging or corresponding (e.g. > 72,000 lid cycles / anno), the safety equipment of the laser system must be replaced by an authorized technician after 10 years at the latest, otherwise safety can no longer be guaranteed. Without measures, the operating license will expire.

### 8.2 Maintenance schedule

System Components	Daily	Weekly	Quarterly	Half-yearly	Yearly
Lens, mirror #2 and mirror #3	✓✓				
Mirror #1				✓✓	
Working table and rulers.	✓✓				

System Components	Daily	Weekly	Quarterly	Half-yearly	Yearly
Cleaning drawer	✓✓				
Vent slots of exhaust box. (inside the machine)	✓✓				
Entire working area. General cleaning.		✓			
Vent slots (backside of the maschine)				✓✓	
Spindles					Clean and grease.
Cover of the laser source and housing.		✓			
Axis rails in x and y-direction			Clean and lubricate		

✓✓ Check and clean whenever required.

✓ Clean whenever required.



## Notice

In order to ensure the maximum availability and lifetime of the system, we recommend that you regularly check the filter, ventilation and exhaust slots and keep the surrounding area clean. A visual inspection of the lenses is likewise recommended before switching on the system.

### 8.3 Cleaning

#### 8.3.1 Machine

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. Switch off and disconnect the machine from the mains.
3. Open the transparent acrylic top lid and front panel.
4. Thoroughly remove all loose dirt particles and deposits in the interior of the machine (e.g. with a vacuum cleaner or broom).
5. Clean the air guide plate and vent slots of the exhaust box inside the machine using a dry or damp cloth or brush.
6. Clean the cover of the laser source and vent slots at the back of the machine using a dry or damp cloth.
7. Clean the transparent acrylic top lid using a dry or slightly damp cotton cloth. Do not use paper towels as they could scratch the acrylic.

## 8.3.2 Optics in general

Trotec Laser GmbH recommends to use the cleaning set enclosed. Alternatively, use high-quality cotton swabs together with the provided cleaning liquid.

### Notice



The following cleaning products are available as accessory parts:

- Lens cleaning cloth
- Lens cleaning liquid

## 8.3.3 Lens



1. Remove the air assist hose.



2. Now remove the lens and check the surface. Here: 2.0 inch lens Remove loose particles and dust with a bellows or compressed air (ISO 8573:2010 Class 1).



3. Remove the lens and rinse it with cleaning fluid. Apply some lens cleaning fluid to the lens and let it soak in for 1 minute.



4. Clean the lens carefully and without pressure with the lens cleaning cloth.



5. Put the tube back on the laser head.



6. Insert lens.



7. Retighten the thread.



8. Reconnect the air assist hose.

#### 8.3.4 Mirror

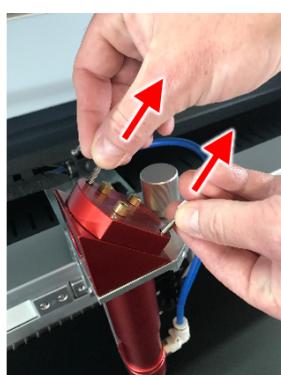


##### Caution

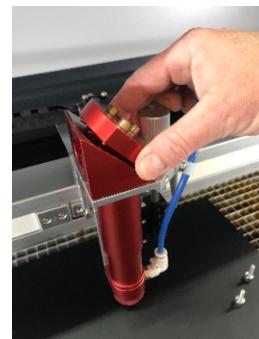
Make sure that you do not touch the mirror with your fingers, since this would greatly reduce the service life of the mirror.

Do not touch the mirror with your fingers or with tools, and never use a cleaning tissue twice, as the surface could easily be scratched.

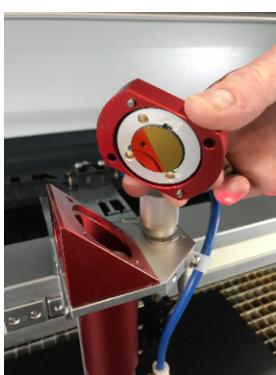
#### Cleaning mirror #3 on the working head



1. Unscrew the two screws by hand.



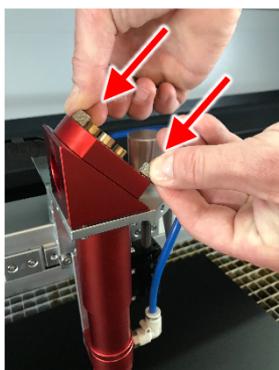
2. Loosen the mirror by wiggling it slightly.



3. Remove mirror.



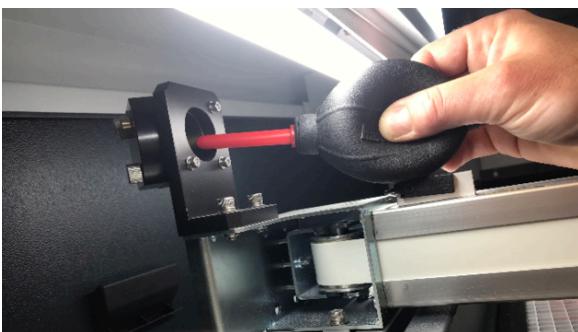
4. Clean the mirror carefully.



5. Mount the mirror again and fix it with screws.

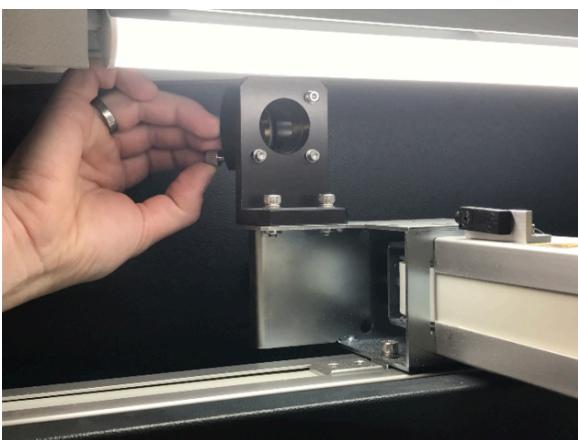
## Cleaning mirror # on the axis

Quick cleaning with low dirt



Remove loose particles and dust with a bellows or compressed air (according to ISO 8573:2010 Class 1)

Thorough cleaning for heavy dirt



1. Remove the screws from the mirror.



## 2. Remove the mirror.

Use a cleaning cloth with cleaning fluid to clean the mirror.

### 8.3.5 Motion system



#### Information

To ensure a long service life of the machine with high quality and performance, you should spend a few minutes per week (depending on the environment) on cleaning.

After cleaning the rails it is necessary to clean the table, the interior of the machine and the cleaning drawer.

### X-axis rail cleaning



1. Clean the entire length of the x-axis rail with a cleaning cloth and a cotton swab. Use a mild cleanser (Trotec) to clean the bearing - contact your local Trotec Service.



#### Notice

After cleaning is the ideal time to lubricate the axles.

## Y-axis rail cleaning



1. Clean the entire length of the y-axis rails with a cleaning cloth.

Perform this procedure on both sides.

---

### 8.3.6 Lubricating motion system

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#### Lubrication of the axis rails in x and y-direction

<b>Lubrication interval:</b>	<b>150 operating hours or 4 weeks</b>
Lubrication quantity:	0.2 cm <sup>3</sup> (2 strokes with grease gun)

#### Recommended lubricants

Producer	Type
HiWin	G05
Fuchs	RENOLIT LZR2H
Klüber	Microlube GL 261
Mobil	Mobilus EP2

#### Recommendation grease gun:

HiWin GN-80M with lubrication adapter

A3: Hollow mouthpiece with lubrication adapter

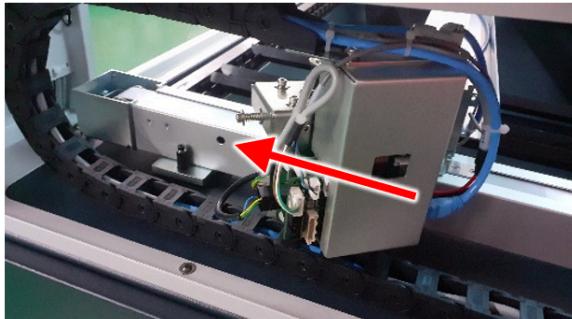
For ball lubrication nipples roof DIN 3402, outside diameter 6mm.



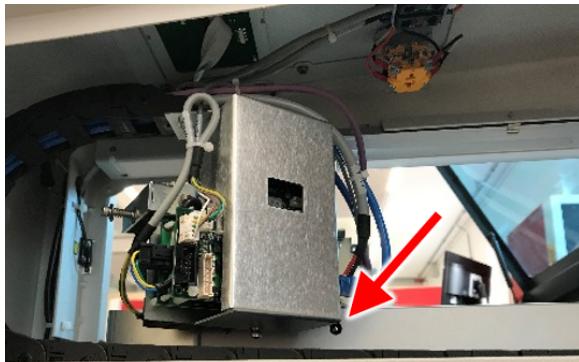
## Notice

Switch off the machine and disconnect it from the main power supply. Then lubricate the motion system.

### Position 1 of 3: Lubricate y-axis at front position



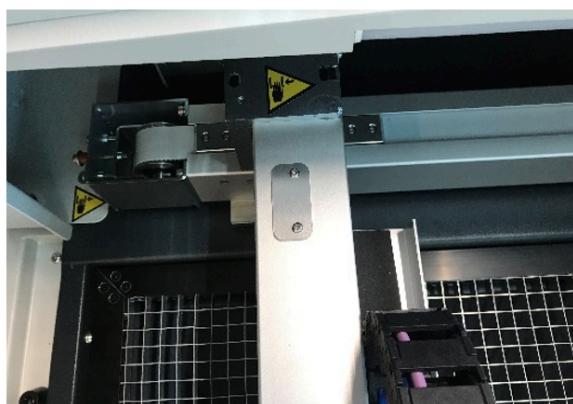
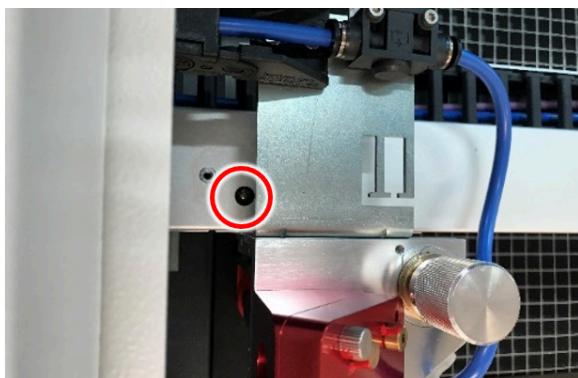
- Remove the right side cover.
- Move the x-axis to the far left (front of the working table).
- Lubrication nipple should be accessible and concentric with hole.
- Press two pump strokes of the grease gun into the lubrication nipple.
- If required: Remove excess grease with paper towel.
- Replace the side cover.



## Position 2 of 3: Lubricate x-axis



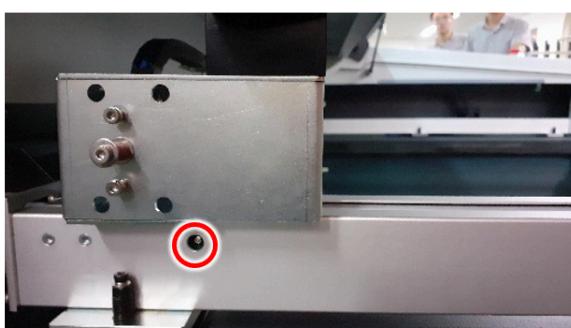
- Carefully remove the cover plate with an Allen key (SW 2 mm).
- Slide the working head to the left until the lubrication nipple and hole are concentric.
- Press two pump strokes of the grease gun into the lubrication nipple.
- If required: Remove excess grease with paper towel.
- Move the working head slightly to the side.
- Replace the cover plate.



## Position 3 of 3: Lubricate y-axis at rear position



- Remove the left side cover.
- Move the x-axis to the far left (back of the working table).
- Lubrication nipple should be accessible and concentric with hole.
- Press two pump strokes of the grease gun into the lubrication nipple.
- If required: Remove excess grease with paper towel.
- Replace the side cover.



## 9 Troubleshooting

This chapter should enable the maintenance personnel to identify and resolve operational faults based on error messages and symptoms.



### Warning

#### Risk of fire from incorrect parameter settings.

Laser operation with incorrect parameter settings such as power settings, speed or frequency can result in flame formation.

- Laser operation permitted only under supervision.



### Caution

System failures that cannot be remedied can cause damage to the machine.

- Disconnect the machine from the mains and contact your local Technical Support.

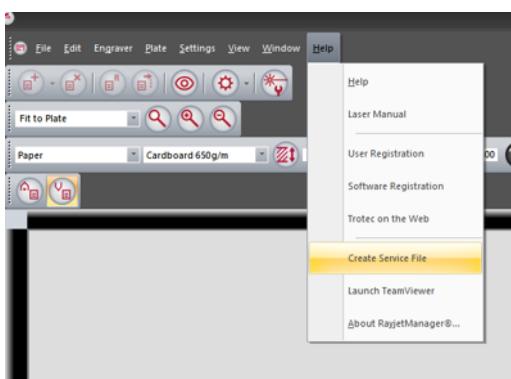
### 9.1 Error, cause and remedy

Problem	Possible cause	Remedy
<b>Too low engraving depth.</b>	<ul style="list-style-type: none"><li>• Imprecise focusing.</li><li>• Dirty optics.</li></ul>	<ul style="list-style-type: none"><li>• Check focus.</li><li>• Clean optics.</li></ul>
<b>Blurred edges.</b>	<ul style="list-style-type: none"><li>• Imprecise focusing.</li></ul>	<ul style="list-style-type: none"><li>• Check focus.</li></ul>
<b>Missing cut lines.</b>	<ul style="list-style-type: none"><li>• Zero passes in material database.</li><li>• Line thickness in CorelDraw too big.</li><li>• Color was skipped in the software.</li></ul>	<ul style="list-style-type: none"><li>• Increase the amount of passes in the material database.</li><li>• Reduce line thickness to the smallest possible value.</li><li>• Set color to cutting in the database.</li></ul>
<b>Waviness of the lines.</b>	<ul style="list-style-type: none"><li>• Lens is loose.</li></ul>	<ul style="list-style-type: none"><li>• Check lens and lens holder.</li></ul>
<b>No visible marking result.</b>	<ul style="list-style-type: none"><li>• Too low laser power.</li><li>• Too high speed.</li><li>• Not focused.</li><li>• Wrong focus tool.</li></ul>	<ul style="list-style-type: none"><li>• Increase power setting.</li><li>• Reduce speed.</li><li>• Check focus.</li><li>• Change focus tool.</li><li>• When using autofocus, check the settings within the software (lens, material thickness, table).</li></ul>

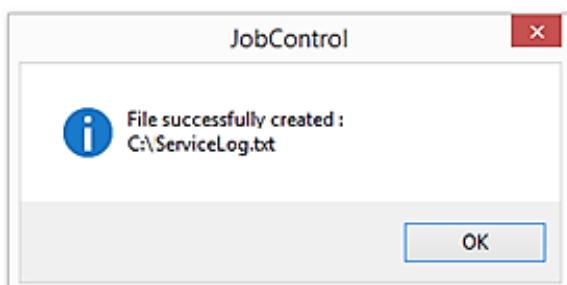
Problem	Possible cause	Remedy
<b>Fine details on stamps are engraved too thinly.</b>	<ul style="list-style-type: none"> <li>Too steep shoulders.</li> </ul>	<ul style="list-style-type: none"> <li>Choose other shoulder or edit (flat/medium/steep): Options/ Process Options/Stamp.</li> </ul>
<b>The size to be engraved or cut does not match the size in CorelDraw.</b>	<ul style="list-style-type: none"> <li>Raster correction ON in the software.</li> <li>Wrong size settings in the printer driver.</li> <li>Wrong image position is selected in the layout tab (printing).</li> <li>Wrong machine is selected in the software.</li> </ul>	<ul style="list-style-type: none"> <li>Switch off raster correction in the software (settings/ advanced options/laser tab).</li> <li>Use the same size as in CorelDraw.</li> <li>Switch the layout settings to: as in document.</li> <li>Select the proper machine in the software.</li> </ul>
<b>Corners and angles are not cut or marked.</b>	<ul style="list-style-type: none"> <li>Power too low.</li> </ul>	<ul style="list-style-type: none"> <li>Increase the correction in the software (Settings / Material Templates Setup - Correction).</li> </ul>
<b>No referencing after commissioning.</b>	<ul style="list-style-type: none"> <li>Top, front or side door not closed.</li> </ul>	<ul style="list-style-type: none"> <li>Close doors.</li> </ul>
<b>No response upon switching on of the system.</b>	<ul style="list-style-type: none"> <li>Fuse blown.</li> <li>No electric power at power outlet.</li> </ul>	<ul style="list-style-type: none"> <li>Check fuses.</li> <li>Check power outlet.</li> </ul>
<b>No communication with machine.</b>	<ul style="list-style-type: none"> <li>Invalid COM port selection.</li> <li>Communication cable defect.</li> <li>COM: port is in use by another program.</li> </ul>	<ul style="list-style-type: none"> <li>Change selection.</li> <li>Check cable.</li> <li>Close this program, or change the COM port.</li> </ul>
<b>Connection to machine frequently interrupted.</b>	<ul style="list-style-type: none"> <li>Electromagnetic emissions.</li> </ul>	<ul style="list-style-type: none"> <li>Make sure that machine and computer are connected to the same electric circuit; the original cable lengths should not be exceeded.</li> </ul>
<b>Offsets between engraving jobs and cut lines.</b>	<ul style="list-style-type: none"> <li>Speed too high.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce speed.</li> </ul>
<b>Errorcode 124</b>	<ul style="list-style-type: none"> <li>Interlocks open during the referencing process.</li> </ul>	<ul style="list-style-type: none"> <li>Restart the machine (key switch).</li> </ul>
<b>Other faults.</b>		<ul style="list-style-type: none"> <li>Contact Technical Support.</li> </ul>

## 9.2 How to create a service file

- Start the software RayjetManager.



2. Go to "Help" and select "Create Service file".



3. The window "Save Service File to" shows up. Select a directory to save the file into and click on "Save".
4. The window "Add Layout File" appears. Select the layout file that was sent to RayjetManager and possibly caused a failure (e.g.: a CorelDraw file, Photoshop file, AutoCAD file,...).
5. Click on "Open".
6. The location to which the successfully created service file was saved appears on the screen.
7. Send the service file "ServiceLog.txt", a screenshot of the error message and a detailed description to your sales representative or to [techsupport@troteclaser.com](mailto:techsupport@troteclaser.com).

## 10 Contact details

### Technical Support

In case of questions, contact our experienced Technical Support in your local area.

For global service contact numbers and further information please see our website, section "Support":  
[www.troteclaser.com](http://www.troteclaser.com)

When calling, please make sure that the machine is in your immediate vicinity, and that you have the following information ready (see response form):

- At which working process did the problem occur?
- What you have done so far to correct the problem.
- Serial no (see type plate).
- Error code.

### Local Offices / Sales

Our store locator and detailed information on our offices in your area can be found on our website in section "Contact", "Local Office": [www.troteclaser.com](http://www.troteclaser.com)

### Technical Documentation

For feedback or to suggest changes to this manual, contact:

Technical documentation: +43 (0) 7242 239 - 7000

E-Mail: [technical.documentation@troteclaser.com](mailto:technical.documentation@troteclaser.com)

## 11 Disassembly



### Warning

**Danger of injury when disassembling the machine.**

There is danger of injury when disassembling the machine.

Always wear suitable protective clothing (e.g. safety goggles, safety shoes, safety gloves).



### Warning Dangerous electrical voltage

**Electric current.**

The machine must be disconnected from the main power supply.



### Notice

- Always use suitable tools to disassemble the machine.
- Mind the springs.
- Follow chapter "Disposal".

### Process:

1. Remove all workpieces from the system.
2. Switch off the main switch at the back of the machine.
3. Remove the exhaust system.
4. Disconnect all cables at the back of the machine.
5. Disconnect the air assist and water cooling system.
6. Remove the glass laser source.

## 12 Disposal



### Disposal

**Do not dispose of the machine with domestic waste!**

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

In case of further questions, please ask your supplier.

In case of disassembly, use suitable tools to dismantle the unit into individual parts. Sort the individual parts and have them disposed of professionally. Legal regulations must be adhered to.

## 13 Appendix

## Acceptance report

Dear customer!

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.

Please check applicable items:

- 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 notes discussed.
- Trial run performed.
- Deficiencies determined.

The machine with the machine designation:

has been checked according to the listed items and has been handed over properly.

---

City, Date

---

(Instructed person)  
Name, Position

---

Company stamp, Signature

## Response form

Dear customer!

In case of any trouble with the machine, please provide the following information and additionally create a service file.

### Contact details

Name: \_\_\_\_\_  
Country: \_\_\_\_\_  
Phone: \_\_\_\_\_  
E-mail: \_\_\_\_\_  
Date: \_\_\_\_\_

### Machine data

Serial number: \_\_\_\_\_  
JobControl® version: \_\_\_\_\_  
Driver version: \_\_\_\_\_  
Layout Software: \_\_\_\_\_  
Firmware version: \_\_\_\_\_

Description of the problem

Does an error message show up on the PC , and if so, which?

What happened before the error occurred? (Thunder and lightning, Windows-Update...)

What attempts were made to solve the problem?

Please send the information to your sales representative, to your local support or to following e-mail address: [techsupport@troteclaser.com](mailto:techsupport@troteclaser.com).

## Training verification form

Trainee: \_\_\_\_\_

Trainer: \_\_\_\_\_

Date of Training: \_\_\_\_\_

The employee named above was instructed in the operation of the .....  
laser system. Especially the following topics were covered:

- Machine function
- Danger areas
- Warnings
- Position of the Emergency stop button
- Personal protective equipment
- Operating equipment
- Workflow
- Setting-up
- Startup and Shutdown
- Reporting of unexpected working results and actions to be taken.
- Reporting of failure and actions to be initiated.
- Responsibility for troubleshooting.
- Operating manual and it's storage location for inspection.

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Signature Trainer

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Signature Trainee

# EC-Declaration of Conformity

According to Machine Directive 2006/42/EC, Annex II 1. A



## Manufacturer:

Trotec Laser GmbH  
Freilinger Straße 99  
4614 Marchtrenk  
Austria

## Authorized person to compile the technical files:

Trotec Laser GmbH  
Freilinger Straße 99  
4614 Marchtrenk  
Austria

## Description and Identification of the machine:

Product description	Laser cutting and engraving system
Model name	Q400
Serial number	Q4#-####
Machine group	8060
Function	System for laser cutting and laser engraving

## It is declared expressly that the machine fulfills all of the following applicable EC directives and regulations:

2006/42/EC	EC Machine Directive 2006/42/EC
2014/30/EU	Directive 2014/30/EU Electromagnetic Compatibility

## Reference to the harmonized standards in accordance with article 7 (2):

ISO 12100:2010-11	Safety of machinery – General principles for design – Risk assessment and risk reduction( ISO 12100:2010 )
IEC 55011:2018-05	Industrial, scientific and medical equipment – RF-disturbance – Limits and methods of measurements
IEC 60825-1:2015-07	Safety of laser products - Part 1: Equipment classification and requirements ( IEC 60825-1:2007 )
IEC 61000-6-2:2005-08	Electromagnetic compatibility ( EMC ) - Part 6-2: Generic standards – Immunity standard for industrial environments
ISO 11553-1:2008	Safety of machinery – Laser processing machines - Part 1: General safety requirements ( ISO 11553-1:2005 )
IEC 60204-1:2006/AC:2010	Safety of machinery – Electrical equipment of machines - Part 1: General requirements

## Further Reference to the harmonized standards in accordance with article 7 (2):

IEC 60825-4:2012-01-01	Safety of laser products - Part 4: Laser guards
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Trotec Laser GmbH  
Linzer Strasse 156, A-4600 Wels  
T e l . 0 7 2 4 2 / 2 3 9 - 0  
W w w . t r o t e c l a s e r . c o m

Marchtrenk, 28. Oktober 2020

City, Date

i.A. Hagen Strasser  
Head of Research and Development

## 8060 R400 – Technical Specifications

### Mechanics

Working area	1030 mm x 630 mm (40.55 x 24.8 inches)
Loading area	1130 mm x 690 mm (44.45 x 27.17 inches)
Work piece table	Aluminium cutting grid table or aluminium slat cutting table Software controlled Z-axis with servo motor
Max. Z-height	200 mm (7.87 inches)
Max. cutting speed	0.7 m/sec. (27.56 in/sec.)
Acceleration	15m/s <sup>2</sup> (590 in/sec <sup>2</sup> )
Max. engraving speed	2 m/sec. (78.74 in/sec.)
Motor	Servo motors
Encoder	Incremental
Optical elements	Mirrors, lens air-flushed for soil-protection
Lenses	2.0", 4.0"
Max. material load	Max. 20 kg
Laser class	Class 2 – Safe operation thanks to the closed housing secured with interlocks

### Features standard and accessories

Software	Rayjet® Manager printer driver, Rayjet® Manager laser software Compatible with standard graphic and CAD software like Corel Draw, Adobe Illustrator, ... Ruby® ab Version 2.5
InPack Technology™	Protection of moving parts against dust
Air-Assist	Coaxial air assist incl. integrated pump
Laser pointer	655nm, <0,99mWcw
Laser source	Adjusted and reviewed laser source integrated
Water-cooling	DC-Version includes the chiller within the scope of delivery 16 l/min
Connection for exhaust	Adjustable cabinet exhaust, adjustable table exhaust Ports: 1 x 90 mm (3.5 in) outer diameter
Additional standard features	Kill and key switch, LED-lighting, electrical Z-axis, OptiMotion™, air-cooled optics, 2.0" lens, air-assist nozzle (Ø3mm und Ø7 mm), focus-tool, aluminium cutting grid table, laser class 2, CE certification, RJ45-connection for external variable power meter

**Options and optional accessories**

Working table	Aluminium slat cutting table
Lenses	4.0" lens
Exhaust / Vent-Set	External ventilator incl. accessories (hoses, hose clamps)
Rotary attachment	Conus 150 mm: Objects with Ø 80-150 mm and length 50-520 mm Conus 100 mm: Objects with Ø 30-100 mm and length 50-520 mm Three-jaw chuck and counter bearing: Objects with Ø 5-33 mm and length 30-515 mm Max. weight: 1.600 g
External variable power meter	Adjust the laser power in a range of ± 20% on the fly

**Control system**

Laser power	Adjustable from 0-100%
Hardware-interface	Connection to the PC via USB 2.0-Interface

**Laser equipment and power**

Laser source	Sealed CO <sub>2</sub> DC laser source water-cooled Laser power: 100 W Sealed-off CO <sub>2</sub> RF CeramiCore® laser source air-cooled Laser power: 60 W
Water-cooling	16 l/min
„Ready-for-RF“-upgrade kit	Set to upgrade to a sealed-off CO <sub>2</sub> RF CeramiCore® laser source air-cooled Laser power: 60 W

**Dimensions and weight**

Width x Depth x Height	1550 mm x 1080 mm x 1080 mm (61.02 x 42.52 x 42.52 inches)
Weight	Approx. 300 kg
Ambient conditions	Mandatory ambient temperature 59° to 77° F or +15° to +25° C Humidity 40% to max. 70%, not condensing Dust free environment (2nd degree according to IEC 60947-1)

**Safety and environment**

Laser class	CDRH laser safety laser class 2
Interlock	Dual-channel interlock safety system
Certificates	CE

**Electrical**

Power consumption laser	100 – 250V, ~ 1200 W
Power consumption chiller	~ 900 W