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Technical Changes

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1 General Information

For reasons of better legibility, gender-neutral form of address (e.g. "he/she") are not used in the operating manual. It is expressly stated that in all text passages where natural persons or groups of persons are mentioned, people of both sexes are always meant.

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.

1.1.1 Storage of the manual

This manual is an integral part of the machine and must therefore be kept in the direct vicinity of the machine and be accessible at all times.

1.1.2 Complementary documentation

Complementary documentation can be found on the supplied DVD.

Software manual
Trotec Laser GmbH JobControl®
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 Current**
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. DVD (with laser software, printer driver and operating manual)
3. Focusing tool(s) (according to lens order)
4. Cleaning kit for optics
5. Nozzles (2 pcs.: ø3 and ø7)
6. Lens: 2.0" (CO₂), 3.2" (fiber), 2.85" (flexx)
7. Ferromagnetic engraving table of multifunctional table concept (according to order)
8. Allen key kit (8-part)
9. Open-end wrench
10. Power cord 5 meters (according to order)
11. USB computer connection cable
12. RS232 cable (according to order)
13. Exhaust connection cable (according to order)

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.

<table>
<thead>
<tr>
<th>Serial number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model:</td>
</tr>
<tr>
<td>Year of manufacture:</td>
</tr>
</tbody>
</table>
2 Safety

TO AVOID POSSIBLE HARM READ AND FOLLOW THESE INSTRUCTIONS.

The machine is built at the time of it's 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 exclusively for laser cutting, engraving and marking of non-metal and material 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 "Materials" or contact your local Trotec representative, or our Technical Support.

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.
2.1.2 Improper use

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 risks in case of improper use are exclusively borne by the user. Non-observance of the operation, maintenance and service instructions described within this manual absolves Trotec from any liability in case of a defect.

2.1.3 Residual risk

Even if all safety regulations are observed, a residual risk remains during operation.

2.1.4 Machine modification

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.

2.1.5 Operating modes

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.
• Only non-metal and material according to the intended use of the machine must be used.

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

<table>
<thead>
<tr>
<th>Directive</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/42/EC</td>
<td>EC Machinery Directive</td>
</tr>
<tr>
<td>2014/30/EU</td>
<td>EMC Guideline</td>
</tr>
</tbody>
</table>

Applied harmonized standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61000-6-4:2007-02</td>
<td>Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.</td>
</tr>
<tr>
<td>ISO 13857:2008</td>
<td>Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limps.</td>
</tr>
<tr>
<td>EN 55011+A1:2016-05</td>
<td>Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement.</td>
</tr>
</tbody>
</table>
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 Products".

**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.

**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.
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 CO₂ 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.
- Always keep clean the machine and its components such as lens and mirrors.

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 CO₂ 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.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intended user group</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control/operation/other activities (e.g. troubleshooting, maintenance)</td>
<td>Qualified personnel or Trotec service technicians</td>
<td>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.</td>
</tr>
</tbody>
</table>
2.5 Machine identification (warning and safety stickers)

The warning and information labels are attached in the positions of the machine that could represent a source of danger during set-up and operation. Therefore, pay attention to the information on the labels.

**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.**

Safety and protection devices that are not installed or are not fully functional can lead to bodily injury and material damage.

- 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.
The machine is equipped with following safety devices:

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main switch</td>
<td>5</td>
<td>Interlock safety switch</td>
</tr>
<tr>
<td>2</td>
<td>Emergency stop button (only with temperature sensor option)</td>
<td>6</td>
<td>Side panel right (with interlock safety switch)</td>
</tr>
<tr>
<td>3</td>
<td>Temperature sensor reset button (only with temperature sensor option)</td>
<td>7</td>
<td>Side panel left (with interlock safety switch)</td>
</tr>
<tr>
<td>4</td>
<td>Key switch</td>
<td>8</td>
<td>Acrylic top lid</td>
</tr>
</tbody>
</table>

### 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 counterclockwise powers off the motor, laser source and electric system. Through the key switch, operation by non-authorized personnel can be prevented.
2.7.3 Temperature sensor

The temperature sensors ensure reliable temperature monitoring of the interior of the machine and are available as additional option.

If a preset temperature value is exceeded, an acoustic alarm continuously sounds to warn the operator of abnormal temperature trends during processing.

**Warning**

**Fire hazard**

The acoustic alarm upon startup of the machine indicates that the sensors are operating properly. However, the sensors do not guarantee fire prevention.

- The unit must not operate unattended despite the integrated temperature sensors.
- If the acoustic alarm does not sound when the machine is switched on, check the functionality of the sensors.
- In case of questions, contact our experienced Technical Support in your local area.

**Functional test of the temperature sensors**

When the machine with the temperature sensor option is activated, all sensors are checked for proper function, and you will hear an acoustic signal.

If you do not hear an acoustic signal, please check the cables, connections, etc., or contact your local Technical Support.

**Temperature sensor alarm acknowledgement**

Press the temperature sensor reset button to acknowledge the alarm.
2.7.4 Emergency stop button

The Emergency stop button, which is located above the operation panel, is present only if the machine is equipped with an optional temperature sensor.

When pressing an Emergency stop button, the electric circuit immediately shuts off.

The laser beam is interrupted, and all movements are stopped.

The function of the Emergency stop button is:

Firstly: To prevent any risks to the operating personnel.
Secondly: To avoid any damage to/destruction of the machine/material.

Emergency stop button acknowledge

1. Turn the Emergency stop button counterclockwise to unlock it (green marker is visible).
2. Reboot the laser system to acknowledge the laser fault.

2.7.5 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.

2.7.6 Acrylic top lid

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

2.7.7 Side cover

The side panels protect from laser light and must always be closed and properly attached.
2.7.8 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 CO₂ fire extinguisher ready at hand in the immediate vicinity of the device.

If a main laser beam comes into contact with inflammable material, e.g. paper, the latter may ignite, quickly leading to fire. Therefore, before switching on the laser and after deactivating the Standby-mode you must make sure that there is no inflammable material in the path of the laser beam.

Furthermore, gases formed beneath the material being processed may ignite, especially if the extraction requirements are not met.

The risk of flaming is increased in case of insufficient care and cleaning as well.

Additionally, regularly control the air cooling system on your laser. In particular, the filters and ventilators should be checked regularly for proper function to avoid defects caused by overheating.
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. The guideline VDI 2262 1-3 "Workplace air" provides, among other things, additional remarks.

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: \textit{Angle of incidence} = \textit{failure corner}

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Directed reflection: Reflected ray on smooth surface.</td>
</tr>
<tr>
<td>2</td>
<td>Directed reflection: Reflected ray on sloping surface.</td>
</tr>
<tr>
<td>3</td>
<td>Diffuse reflection: Reflected ray on rough surface.</td>
</tr>
<tr>
<td>4</td>
<td>Directed reflection: Horizontally reflected ray on smooth surface.</td>
</tr>
</tbody>
</table>
2.8.4 Information about 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

In case of malfunction

- In case of unusual operating states, open the acrylic top lid to stop working process or respectively press the Emergency stop button, if available and switch off the laser device.
- When appropriate disconnect the machine from the mains.
- Inform laser safety officer and supervisor.
- Follow the Operating manual.
- Have repair work performed by Trotec Laser GmbH service technicians only.
- In case of fire: Use only CO$_2$ fire extinguisher to quench the fire, insofar as this is possible without endangering yourself.

Notice

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

In case of accident, First Aid

- If due to laser irradiation eye injury has occurred (upon exceedance of the maximum allowable irradiation rate), the accident victim must immediately be presented to an ophthalmologist.
- Assumption of eye injury is justified whenever laser irradiation has occurred and the maximum allowable irradiation rate may have been exceeded.
- First aider must pay attention to self-protection.
- Power off the device.
- Remove injured person from the danger zone and provide First Aid.
- Call emergency doctor!
3 Technical Data

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

3.1 Dimensions and weight

<table>
<thead>
<tr>
<th>Description</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Length</td>
<td>1221 mm (48 inch)</td>
</tr>
<tr>
<td>B Width</td>
<td>830 mm (32.67 inch) / 790* mm (32.8 inch)*</td>
</tr>
<tr>
<td>C Height, closed with base frame</td>
<td>1055 mm (41.55 inch)</td>
</tr>
<tr>
<td>D Height, open</td>
<td>1750 mm (68.89 inch)</td>
</tr>
</tbody>
</table>

* Without exhaust hose connectors on the back and with the top lid open.

Weight (depends on the machine type): 235 bis 250 kg (518 to 551 lbs)
### 3.2 Electrical requirements of the machine

<table>
<thead>
<tr>
<th>Laser power</th>
<th>35–50 W (CO\textsubscript{2})</th>
<th>55–80 W (CO\textsubscript{2})</th>
<th>85–100 W (CO\textsubscript{2})</th>
<th>105–120 W (CO\textsubscript{2})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-50 W (fiber)</td>
<td>10-50 W (fiber)</td>
<td>10-50 W (fiber)</td>
<td>10-50 W (fiber)</td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>AC</td>
<td>AC</td>
<td>AC</td>
</tr>
<tr>
<td>Voltage</td>
<td>230VAC</td>
<td>230VAC</td>
<td>230VAC</td>
<td>230VAC</td>
</tr>
<tr>
<td>Fuse</td>
<td>8AT</td>
<td>10AT</td>
<td>12AT</td>
<td>12AT</td>
</tr>
<tr>
<td>115VAC</td>
<td>16AT</td>
<td>16AT</td>
<td>12AT</td>
<td>12AT</td>
</tr>
<tr>
<td>1200 W</td>
<td>1400 W</td>
<td>1900 W</td>
<td>1900 W</td>
<td>1900 W</td>
</tr>
</tbody>
</table>

*AC = air condition*

---

**Caution**

Inadequate or inappropriate power sources can lead to machine damage and are not covered by any liability.

Verify that the electrical outlet is capable of providing the proper voltage, frequency and amperage required by the laser machine described in this manual.

**Caution**

Electrical noise, unstable power supply as well as voltage spikes in power supply can cause interference and possible damage to the electronics of the laser machine.

**Notice**

Use an individual circuit for the laser machine and the PC and an individual circuit for the exhaust system. Install your computer to the same circuit as the laser machine to prevent electromagnetic interactions.

Furthermore it is highly recommended that you use a overvoltage protection switch to protect your computer equipment.

If electrical power fluctuations, brownouts or power outages are a problem in your area, an electrical line stabilizer, UPS (Uninterruptible Power Supply) or backup generator are required. When installing any of these devices, ensure that they meet the electrical requirements of the laser machine.
3.3 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 requirements for the exhaust system and recommended Trotec exhaust systems for standard applications depend on the working table installed in the machine.

**Recommended exhaust systems for Speedy serie:**

<table>
<thead>
<tr>
<th>Exhaust system</th>
<th>Speedy 100</th>
<th>Speedy 300</th>
<th>Speedy 360</th>
<th>Speedy 400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmos Nano</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(only Speedy 100 fiber)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmos Cube (Atmos Compact)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(without Speedy 100 flexx)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmos Mono</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>(without vacuum table)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Atmos Mono Plus</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>(without vacuum table)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Atmos Duo Plus</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vent Set 300</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(without vacuum table)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vent Set 400</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(without vacuum table)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Vent Set 500</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Technical Data

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.

Technical data of the corresponding exhaust systems:

<table>
<thead>
<tr>
<th>Exhaust system</th>
<th>Hose connection ø [mm] (inside diameter)</th>
<th>Volume flow [m³/h]</th>
<th>Pressure [Pa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmos Nano</td>
<td>45</td>
<td>200</td>
<td>8500 (230V)</td>
</tr>
<tr>
<td>Atmos Cube</td>
<td>80</td>
<td>250</td>
<td>8500 (230V) 5800 (115V)</td>
</tr>
<tr>
<td>(Atmos Compact)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmos Mono</td>
<td>70</td>
<td>320</td>
<td>8500 (230V) 5800 (115V)</td>
</tr>
<tr>
<td>Atmos Mono Plus</td>
<td>70</td>
<td>320</td>
<td>8500 (230V) 5800 (115V)</td>
</tr>
<tr>
<td>Atmos Duo Plus</td>
<td>70</td>
<td>(2x) 320</td>
<td>8500 (230V)</td>
</tr>
<tr>
<td>Vent Set 300</td>
<td>80</td>
<td>max. 1000</td>
<td>max. 2550</td>
</tr>
<tr>
<td>Vent Set 400</td>
<td>100</td>
<td>max. 1000</td>
<td>max. 3800</td>
</tr>
<tr>
<td>Vent Set 500</td>
<td>100</td>
<td>max. 1200</td>
<td>max. 7000</td>
</tr>
</tbody>
</table>

Requirements for the exhaust system:

<table>
<thead>
<tr>
<th>Machine</th>
<th>Volume flow [m³/h]</th>
<th>Pressure [Pa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speedy 100</td>
<td>200</td>
<td>1000</td>
</tr>
<tr>
<td>Speedy 300</td>
<td>200 (without table exhaust)</td>
<td>1000 (without table exhaust)</td>
</tr>
<tr>
<td></td>
<td>350 (with table exhaust)</td>
<td>1600 (with table exhaust)</td>
</tr>
<tr>
<td>Speedy 360</td>
<td>300 (without table exhaust)</td>
<td>2500 (without table exhaust)</td>
</tr>
<tr>
<td></td>
<td>400 (with table exhaust)</td>
<td>4200 (with table exhaust)</td>
</tr>
<tr>
<td>Speedy 400</td>
<td>400</td>
<td>4200</td>
</tr>
</tbody>
</table>

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.

3.4 Computer requirements

When using a more powerful computer, the graphics are generated and displayed faster, and the computing times and the times for data transfer to the laser are reduced.

The following recommendation represents the minimum requirements:

- Operating systems
  Windows Vista® 32/64-bit (with Service Pack 1 or later)
  Windows 7® 32/64-bit
  Windows 8® 32/64-bit
  Windows 8.1® 32/64-bit
  Windows 10® 32/64-bit
- Microsoft® .NET framework 3.5 or later
- Adobe® Reader 9.0 or later
- Local administrator privileges (for required software installations)
- 2 GHz processor or faster
- 2 GB RAM or greater (Windows Vista®, Windows 7 / 8 / 8.1 / 10)
- 80 GB hard driver or larger
- 1024 x 768 monitor resolution or greater
- True Color graphics card (24-bit color depth)
- 2 free USB interfaces
- DVD-ROM drive
### Technical Data

#### 3.5 Materials

<table>
<thead>
<tr>
<th>Material EN</th>
<th>Material DE</th>
<th>Cutting</th>
<th>Engraving</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CO₂</td>
<td>Fiber</td>
<td>Flexx</td>
</tr>
<tr>
<td>Metal</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Aluminum</td>
<td>Aluminium</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Aluminum, anodized</td>
<td>Aluminium, eloxiert</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Chromium</td>
<td>Chromium Verchromte Oberflächen</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Precious metal</td>
<td>Edelmetalle</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Metal foils up to 0.5mm (Aluminum, Brass, Copper, precious metal)</td>
<td>Metallfolien bis zu 0.5mm (Aluminium, Messing, Kupfer, Edelmetall)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>Edelstahl</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Metal, painted</td>
<td>beschichtetes Metall (lackiert)</td>
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<td></td>
<td>✓</td>
</tr>
<tr>
<td>Brass</td>
<td>Messing</td>
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<td>✓</td>
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</tr>
<tr>
<td>Copper</td>
<td>Kupfer</td>
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<td>Titanium</td>
<td>Titan</td>
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<td>✓</td>
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<tr>
<td>Plastic</td>
<td>Acrylnitril-ButadienStyrol-Copolymer (ABS)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Acrylic/PMMA, i.e. Plexiglas®</td>
<td>Acryl(PMMA), z.B. Plexiglas®</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Rubber</td>
<td>Gummi (Stempelgummi)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polyamide (PA)</td>
<td>Polyamid (PA)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polybutylene terephthalate (PBT)</td>
<td>Polybutylenterephthal (PBT)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polycarbonate (PC)</td>
<td>Polycarbonat (PC)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polyethylene (PE)</td>
<td>Polyethylen (PE)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polyester (PES)</td>
<td>Polyester (PES)</td>
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<td>✓</td>
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</tr>
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<td>Polyethylene terephthalate (PET)</td>
<td>Polyethyleneterephthal (PET)</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Polyimide (PI)</td>
<td>Polymid (PI)</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polyoxymethylene (POM) - i.e. Delrin®</td>
<td>Polyoxymethylen (POM) z.B Delrin®</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Polypropylene (PP)</td>
<td>Polypropylen (PP)</td>
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<td>Polyurethane (PUR)</td>
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<td>Foam (PVC free)</td>
<td>Schaumstoff (PVC frei)</td>
<td>✓</td>
<td>✓</td>
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</tr>
</tbody>
</table>
### Technical Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tr>
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<td>✓</td>
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</tr>
<tr>
<td>Markierungsmittel (auf Metall oder Keramik/Glas) z.B. markSolid</td>
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</tr>
</tbody>
</table>

### Warning

**Prohibited materials:**
- Leather and artificial leather that contains chromium (VI)
- Carbon fibers (Carbon)
- Polyvinyl chloride (PVC)
- Polyvinyl butyral (PVB)
- Polytetrafluorethylene (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.
## Machine overview

### 4.1 General overview

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acrylic top lid</td>
<td>13</td>
<td>Side panel left</td>
</tr>
<tr>
<td>2</td>
<td>Service plug connector</td>
<td>14</td>
<td>Cover for laser source and power supplies</td>
</tr>
<tr>
<td>3</td>
<td>Laser head</td>
<td>15</td>
<td>Connector for exhaust tube</td>
</tr>
<tr>
<td>4</td>
<td>Interlock safety switch</td>
<td>16</td>
<td>USB port for PC</td>
</tr>
<tr>
<td>5</td>
<td>Connector for rotary attachment</td>
<td>17</td>
<td>RS-232 port for PC</td>
</tr>
<tr>
<td>6</td>
<td>X-axis</td>
<td>18</td>
<td>Connectors for exhaust cable</td>
</tr>
<tr>
<td>7</td>
<td>Table</td>
<td>19</td>
<td>Type plate</td>
</tr>
<tr>
<td>8</td>
<td>Key switch</td>
<td>20</td>
<td>Main switch</td>
</tr>
<tr>
<td>9</td>
<td>Keypad</td>
<td>21</td>
<td>Mains connection</td>
</tr>
<tr>
<td>10</td>
<td>Interlock safety switch</td>
<td>22</td>
<td>Connector for JobControl®Vision</td>
</tr>
<tr>
<td>11</td>
<td>Front door</td>
<td>23</td>
<td>Fuse(s)</td>
</tr>
<tr>
<td>12</td>
<td>Side panel right</td>
<td>24</td>
<td>LED interior illumination</td>
</tr>
</tbody>
</table>
4.2 Front door

Loading and unloading of heavy and bulky parts or replacement of the table is very comfortable thanks to the front door that can be opened to up to 180°.

Notice
The door is interlocked, therefore it must be closed before any laser operation is possible.

4.3 Tables (multifunctional table concept)

Multifunctional base frame

The multifunctional base frame is bolted to the mounting frame, which is attached to the Z-axis.

Notice
All table variants rest on the base frame. With exception of the ferromagnetic engraving table which may also be placed directly on the mounting frame if there is no base frame present.

Ferromagnetic engraving table

The ferromagnetic construction allows mounting thin materials such as paper, films or foils with magnets to ensure an even and flat surface. An even working area is essential for achieving optimal results for laser engraving and marking applications.
Machine overview

Vacuum table

The vacuum table fixes various materials to the working table using vacuum. This ensures correct focusing over the entire surface, leading to better engraving results. In addition, it reduces the handling effort associated with mechanical mounting. The vacuum table is the ideal table for thin and lightweight materials, such as paper, foils and films, that generally do not rest flatly on the surface.

Aluminum slat cutting table

The cutting table with aluminum slats is ideal for cutting thicker materials (8 mm thickness and above) and for parts wider than 100 mm. The slats can be arranged individually, consequently the table can be adjusted to each individual application.

Acrylic slat cutting table

The cutting table with acrylic slats prevents reflection during cutting. This table is used in particular for cutting thicker materials (8 mm thickness and above) and for parts wider than 100 mm. The slats can be arranged individually, consequently the table can be adjusted to each individual application.
Aluminum cutting grid table

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

Acrylic cutting grid table

The special acrylic cutting grid table prevents reflection during cutting. It is therefore ideal for cutting acrylcs, laminates or plastic films with parts smaller than 100 mm, as these remain in a flat position after the cutting.

Notice

The equipment of the machine may vary depending on the model.

4.3.1 Additional tabletops

Honeycomb tabletop

The honeycomb tabletop is especially suitable for applications that require minimal reflection and optimum flatness of the material, e.g. cutting of membrane keyboards.

The honeycomb tabletop is an additional option for the vacuum and ferromagnetic engraving tables.

Available in following sizes:
- 0.5 inch nominal comb size
- 0.25 inch nominal comb size
### 4.3.2 Table placement

1. Place a suitable table on the multifunctional base frame.

2. Fixate the table by pressing the push buttons.

---

**Notice**

All table variants rest on the base frame. However the ferromagnetic engraving table may also be placed directly on the mounting frame without the base frame.

**Maximum material load is:**
- For static loads up to 220 lbs (100 kg).
- For dynamic loads up to 66 lbs (30 kg).

**Caution**

*Damage of the multifunctional base frame or impairment of the exhaust function.*

When workpieces are processed directly in the multifunctional base frame without a table, the base frame be damaged, and impairment of the exhaust function is possible.

Process workpieces only on suitable tables.
## 4.4 Lens(es)

<table>
<thead>
<tr>
<th>CO₂</th>
<th>Fiber</th>
<th>Flexx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5'' red</td>
<td>Part number: 85973</td>
<td></td>
</tr>
<tr>
<td>2.0'' black</td>
<td>(standard) Part number: 85974</td>
<td>2.0'' CL brown</td>
</tr>
<tr>
<td>2.0'' CL brown</td>
<td>Part number: 95909</td>
<td></td>
</tr>
<tr>
<td>2.5'' silver</td>
<td>Part number: 85975</td>
<td></td>
</tr>
<tr>
<td>4.0'' blue</td>
<td>Part number: 90026</td>
<td>3.2'' green</td>
</tr>
<tr>
<td>3.2'' green</td>
<td>Part number: 1380</td>
<td>2.85'' gold</td>
</tr>
<tr>
<td>2.85'' gold</td>
<td>(standard) Part number: 9567</td>
<td>5.0'' light blue</td>
</tr>
<tr>
<td>5.0'' light blue</td>
<td>Part number: 37781</td>
<td></td>
</tr>
</tbody>
</table>

### Notice

The equipment of the machine may vary depending on the model.
## 4.5 Nozzles

<table>
<thead>
<tr>
<th>Ø 3</th>
<th>Short nozzle with small hole.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 7</td>
<td>Short nozzle with big hole.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Transport temperature (ambiente temperature):</th>
<th>-10 °C to +40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity:</td>
<td>Maximum 70%, non-condensing</td>
</tr>
</tbody>
</table>

- Avoid high temperature fluctuations.

Storage conditions

<table>
<thead>
<tr>
<th>Storage temperature (ambiente temperature):</th>
<th>+0 °C bis +30 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity:</td>
<td>Maximum 60%, non-condensing</td>
</tr>
</tbody>
</table>

- 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 are permitted to transport and unpack the machine. To avoid falling off of any wooden parts or tipping of the machine, be very careful when opening the transport case.

**Notice**

Keep the original packaging case, in case of machine needs to be transported or relocate.

Dispose all waste according to the applicable waste disposal law.

**Caution**

The lens unit should be unpacked only after installation of the machine. The lenses are high-quality optical components which must be kept clean in order to ensure optimum marking results. Never touch the lenses with bare fingers.

**Steps:**

1. Position the transport case vertically on level ground (using a pallet truck or forklift).
2. Remove any vertical tightening straps.
3. First remove the top and afterwards the side plates of the transport case.
4. Slide out the two wooden rails in the form of ramps that are stored beneath the machine.
5. To secure the machine against moving, the wheels are locked using wooden blocks.  
   In order to remove those blocks, put the two wooden rails together, push the upper part of the rails under one side of the machine and press down the rail in order to reach a levering effect.
6. Pull out the blocks.
7. Repeat this procedure on the opposite side as well.
8. Now you can pull out the blocks.
5.8 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 |
| Relative humidity:                           | 45-65%, 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

Ensure there is shielding or sufficient clearance to or from the wall and neighboring objects.

6.4 Setup

Observe the following steps:

1. Transport the machine to the installation location according to the specifications stated in the chapter “Transport”.
2. Make sure all the packaging material has been removed.
3. Remove any transport protections.
4. Install the two exhaust connectors at the rear of the machine. They have been removed for safety reasons and for transport through doors.
5. The machine must stand upright.
6. Make sure the protective glass is intact.
7. Now connect the electrical components.
   - Mains connection
   - PC connection
   - Exhaust connection
8. Install the software and register your system during the installation process.
6.5 Connections

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

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USB port for PC</td>
<td>5</td>
<td>Mains connection</td>
</tr>
<tr>
<td>2</td>
<td>RS-232 port for PC</td>
<td>6</td>
<td>Fuse</td>
</tr>
<tr>
<td>3</td>
<td>Connector for exhaust connection cable</td>
<td>7</td>
<td>JobControl® Vision connector</td>
</tr>
<tr>
<td>4</td>
<td>Main switch</td>
<td>8</td>
<td>Exhaust connection</td>
</tr>
</tbody>
</table>
6.5.1 Mains connection

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

**Warning Current**

**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 type and region, the main fuses (6) are either covered or open next to the connector.

6.5.2 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.
6.6 Connection of additional components

6.6.1 Connecting an exhaust system from Trotec

**Warning Current**

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.

**Connecting:**

1. When using an original Trotec exhaust system, also connect this, using the exhaust connection cable included, to the exhaust cable connection on the laser.

2. Plug the ends of the exhaust hose into the exhaust nozzle that is intended for this purpose on the exhaust system and on the laser. The position of the connector depends on the type of the exhaust system.

3. Plug in the mains cable of your exhaust system into the mains socket.

Follow the operation and maintenance instructions in the Manual of the exhaust system.
7 Operation

Warning
Personal injury or damage to property due to improper operation.

Improper operation can lead to serious personal injury or damage to property.

- Work on the laser machine may only be carried out by authorized and instructed personnel familiar with the operation of the machine, observing all safety regulations.

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.

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 cause has been clarified!

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

7.2 Software

For information on how to use the software, please read the accompanying software manual, which can be found on the supplied DVD.

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.
Maschine einschalten:

1. Switch on the main power supply using the main switch on the rear of the machine.

2. Turn the key switch to the right and hold it against the spring force.

3. As soon as the machine starts, release the key switch.

4. The referencing process starts.

5. 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.
Operation

Maschine ausschalten:

1. Turn the key switch to the left.

2. 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 is the whole unit of the machine control. The keypad is a part of the control panel.

7.4.1 Keypad

1. Status indicator laser beam
   LED On: The machine is processing data.

2. Standby-button
   LED On: Standby-mode

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

4. Laser head control button X/Y
   - travel distance in X-direction
   - travel distance in Y-direction

5. Working table control button Z
   - Up-button
   - Down-button
   - automatic focusing (autofocus)

6. Exhaust-button
   LED On: Exhaust active

7. Shift-button
   second operating level

8. Status LEDs
<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green,</td>
<td>All covers are closed. Machine is ready.</td>
</tr>
<tr>
<td>flashing</td>
<td></td>
</tr>
<tr>
<td>slowly (0.5 Hz)</td>
<td></td>
</tr>
<tr>
<td>Green,</td>
<td>Minimum one cover is open.</td>
</tr>
<tr>
<td>flashing</td>
<td></td>
</tr>
<tr>
<td>fast (2 Hz)</td>
<td></td>
</tr>
<tr>
<td>Blue + green, permanent</td>
<td>Data available. Pause-mode active.</td>
</tr>
<tr>
<td>Green,</td>
<td>Job is running. Processing and receiving data.</td>
</tr>
<tr>
<td>permanent</td>
<td></td>
</tr>
</tbody>
</table>

10. Stop-button
   LED On: Pause-mode
### 7.4.1.1 Description

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Status indicator" /></td>
<td><strong>Status indicator</strong></td>
<td>LED On: The machine is processing or receiving data.</td>
</tr>
</tbody>
</table>
| ![Standby-button](image.png) | **Standby-button** | LED On: Standby-mode  
- Press this button to switch to the Standby-mode.  
- 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. |
| ![Home-button](image.png) | **Home-button** | LED On: Temporary change of home position.  
- Press the Home-button for 3 seconds to temporarily define the position of the laser head as home position (Marker in JobControl®).  
To deactivate the temporary home position press the shortcut Shift-button + Home-button. |
| ![Laser head control button X/Y](image.png) | **Laser head control button X/Y** |  
- Press one of these buttons to manually move the laser head to the right, left, front or back (travel distance in X/Y-direction).  
- Press two of the for Laser head control buttons X/Y simultaneously in diagonal direction to move the laser in diagonal direction (X+/Y+, X+/Y-, X-/Y-, X-/Y+).  
- 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. |
### Operation

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Image](image.png) | **Working table control button Z** | • Press one of these buttons to manually move the working table up or down (travel distance in Z-direction).
• Press the Shift-button together with the Up-button. The activation of the automatic focusing starts and the working table is moving automatically upwards.
• Press the Shift-button together with the Down-button. The working table is moving automatically downwards to the corresponding end position.

By simultaneous pressing of the Up-button + Down-button, the activation of the automatic focusing starts and the working table is moving automatically upwards.
Press any button in X-, Y-, or Z-direction to stop the automatically movement.

**Activation of the automatic focusing:**
The laser beam gets automatically focused on the work piece (depends on the selected lens). When there is no work piece on the working area, the focus is on the table or rather on the tabletop.

**Sonar Technology™ (option):**
Focusing on the material which is below the sensor.

**Caution**
If there is no material on the cutting table, it could lead to a collision of the laser head ("head crash").

Light barrier:
Focusing on the material which is close to the sensor.

→ For further information, see chapter "focusing" in this manual.

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Image" /></td>
<td><strong>Stop-button</strong></td>
<td>• Press this button to stop the current working process.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Image](image.png) | **Start/Pause/Repeat-button** | **Start:**
• Press this button to start a job. The job has to be on the plate in JobControl®.

**Pause:**
• Press this button to pause the job (LED On) which is currently being processed. Press this button again to continue the job (LED Off).

**Repeat:**
• Press this button after a job was finished to repeat the actual job. |
### Status LEDs

**Meaning of the LEDs:**

<table>
<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>

### Shift-button

Second operating level for further operation. Press the Shift-button simultaneously with the buttons below to activate the following function:

<table>
<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, up</td>
<td>Working table is moving automatically upwards and the activation of the automatic focusing starts.</td>
</tr>
<tr>
<td>Shift + Working table Z, down</td>
<td>Working table is moving automatically downwards to the corresponding end position.</td>
</tr>
<tr>
<td>Shift + Home</td>
<td>Deactivates temporary home position.</td>
</tr>
</tbody>
</table>

### Exhaust-button

- Press this button to switch the exhaust On/Off.

LED On: Exhaust active.
LED Off: Exhaust deactivated.

After the laser process is completed, the exhaust switches off after some seconds ("Time to hold" in JobControl®) automatically or when you press the button.
## 7.4.1.2 Shortcuts

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>Shift-button + Exhaust-button</td>
<td>Air assist On/Off.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Shift-button + Laser head control button X/Y</td>
<td>Laser head moves fast to corresponding end position (X- or Y-position).</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>Shift-button + Standby-button</td>
<td>Keypad locked/unlocked.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Shift-button + Working table control button Z (Up-button)</td>
<td>Working table is moving automatically upwards and the activation of the automatic focusing starts.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>Shift-button + Working table control button Z (Down-button)</td>
<td>Working table is moving automatically downwards to the corresponding end position.</td>
</tr>
<tr>
<td><img src="image6.png" alt="Image" /></td>
<td>Working table control button Z (Up-button + Down-button)</td>
<td>Working table is moving automatically upwards and the activation of the automatic focusing starts. (See chapter &quot;Description&quot;, &quot;Working table control button Z&quot;).</td>
</tr>
<tr>
<td><img src="image7.png" alt="Image" /></td>
<td>Shift-button + Home-button</td>
<td>Deactivate temporary home position.</td>
</tr>
</tbody>
</table>
### Operation

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>Laser head control button X/Y</td>
<td>Laser head moves diagonal to the according direction.</td>
</tr>
</tbody>
</table>

**Supplementary information:**

Press the shortcut below to switch on/off the LED interior lighting.

<table>
<thead>
<tr>
<th>Image</th>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Shift-button+ Stop-button</td>
<td>LED interior lighting On/Off.</td>
</tr>
</tbody>
</table>
7.5 Lense placement

1. Loosen lens by turning the clamping ring inwards.
2. Remove lens.
3. Check the lens for damage.
4. If necessary, clean both sides of the lens with cleaning liquid and cleaning tissue.
5. Insert the lens with the lettering facing up, either above or below the clamping ring depending on the lens type.
6. Fixate the lens with the clamping ring.

The following lenses must be inserted below the clamping ring:
- 1.5"
- 2.0"

Notice
All other available lenses must be inserted above the clamping ring.
7.6 Switch laser source manually

**Notice**

Only possible for flexx laser systems.

Switching between CO\textsubscript{2} laser source and fiber laser source is done either manually by pressing a shortcut on the control panel, or by making settings in JobControl\textregistered.  

Procedure for manual switching between CO\textsubscript{2} laser source and fiber laser source:

1) After referencing the machine, press "standby".

2a) Selection: CO\textsubscript{2} laser source  
Press the marked shortcut simultaneously to switch to the CO\textsubscript{2} laser source.

2b) Selection: fiber laser source  
Press the marked shortcut simultaneously to switch to the fiber laser source.
7.7 Focusing methods

Precise laser engraving depends on several factors. Apart from the right choice of lens, working tables and a corresponding exhaust system, correct focusing plays a key role.

The correct setting of the focus, which means the right distance between the laser head and the material to be engraved, is crucial for a perfect application result.

**Notice**
The machine described in these manuals is equipped either with light barrier focus or Sonar Technology™.

**Manual focus mode**
- Focus tool

**Automatic focus modes**
- Sonar Technology™ (automatic focusing with ultrasonic sensor)
- Software focus (JobControl®)
- Light bar focus

**Caution**
If workpieces with more than 66.14 lbs (30 kg) have been placed on the table, the table must not be moved up or down anymore as this might damage the mechanics of the machine.

It is mandatory to focus on the height of the material before loading material of 66.14 lbs (30 kg) and above.

**Notice**
Defects from head crashes (working head hits material or working table) are excluded from warranty.

**Notice**
The machine described in these manuals is equipped either with light barrier focus or Sonar Technology™.

**Notice**
The equipment of the machine may vary depending on the model.
7.7.1 Focus tool

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 workpiece, 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.

Notice
Using a flexx lens the focus point differs depending on the laser source.
Note when focusing using a focus tool, the standard focus tool supplied with a flexx lens is always adjusted for a fiber laser source. Therefore it must only be used in conjunction with a fiber laser source.

Having a machine with a CO₂ laser source use the software focus via JobControl®. A manual focusing via focus tool is not necessary. See chapter "Software focus (flexx lens)".
7.7.2 Sonar Technology™

Caution
If the ultrasonic sensor is heavily soiled, the laser head may be damaged if it therefore hits the material or the worktable.

1. Make sure that the ultrasonic sensor is clean.
2. Select the lens type in the menu bar of JobControl®.
3. Press the two keys from the Working table control button Z simultaneously for the laser beam to get automatically focused on the workpiece.

Focusing is then complete, and you can start the laser processing.

Notice
This focusing mode is especially well-suited for all sound-reflective materials.
7.7.3 Software focus

The following values must be entered in JobControl®:

- Table type
- Lens type
- Material thickness (exact measurement)
- Material process type

Caution

The values entered must match the material, table and lens in the machine in order to avoid a head crash.

When using spacer the total material thickness is determined by the thickness of the spacer and the material.

1. Click on the icon "Options" or go to Settings/Options in the menu.
2. Select "Accessories".
3. When you are using a cutting table enter the table type and the thickness of the table.
4. Select the lens type in the menu bar.
5. Click on the icon "Material database" or go to Settings/Material database in the menu.
6. Enter the material thickness.
7. Enter the process type.
8. Click on the icon "Focus laser". The working table moves automatically to the correct position (moves in Z direction).
Notice
Using a flexx lens the focus point differs depending on the laser source.

When carrying out a software focus, JobControl® is going to switch to the right laser source and adjusts the focus point difference automatically as soon the lens type and processing type per laser source get entered into the material database in JobControl®. Manually switching the laser source is therefore not necessary. Whenever the flexx lens and a CO2 laser source processing type gets selected, the table will drive down automatically ("standard" focus procedure).

7.7.4 Light barrier focus

1. Select the lens type in the menu bar of JobControl®.
2. Make sure that the lens that is installed in the laser head is selected.
3. At the same time, press the Away key + Down key to adjust the height of the machining table so that it moves upwards.
4. Press the Up-button + Down-button simultaneously for the table to move up.
5. As soon as the previously loaded material passes the light barriers, the upward movement of the table stops, and the table moves to the correct focus position.

Focusing is then complete, and you can start the laser processing.

Notice
The light barrier autofocus is ideal for flat opaque materials of unknown thickness.
This autofocus option will not work on transparent, rough or very thin material, which is thinner as the ruler itself.
7.8 Rotary attachment (option)

The Rotary attachment is used to engrave cylindrical workpieces. Upon selection of the option "Rotary attachment" in the JobControl® 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.

Rotary attachment with cones:
Engraving of cylindrical objects with a diameter of up to 270 mm, a length of up to 760 mm and a maximum weight of 3 kg.

Rotary attachment with rolls:
Engraving of cylindrical objects with a diameter of up to 180 mm, a length of up to 960 mm and a maximum weight of 10 kg.

Figure 1: Rotary attachment with cones
Figure 2: Rotary attachment with rolls

7.8.1 Installation and commissioning of the rotary attachment

1. A working table must be mounted and positioned at the lowest position. The laser machine must be switched off.
2. Place the rotary attachment onto the working table using the existing insertion handles.
3. Position the rotary attachment so that the brackets of the rotary snap to the ruler correctly.
4. Connect the connection cable of the rotary attachment to the connector on the left front side of the housing.
### 7.8.2  Mounting the work piece in the rotary attachment

1. Measure the diameter of the workpiece.
2. Adjust the height and angle of the system by loosening and fixing the levers.

![Figure 3: Levers for fixation of height and angle](image)

3. Loosen the slider by using the lever in order to clamp the workpiece between the two cones or rolls.

![Figure 4: Schieberegler inklusive Hebel](image)

4. Switch on the laser. The axis automatically moves over the middle of the rotary attachment.
5. Position the laser head over the workpiece at the position where you want to engrave.
6. Focus the object with the focus tool. The engraving area must be parallel to the X axis. If necessary, do this with the aid of the angle adjustment. Do not touch the lens holder.
7.8.3 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 JobControl® 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 (see Fig. 6). If the diameter has already been entered in the printer driver, the size is automatically transferred into JobControl.

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 Current
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.
## 8.2 Maintenance schedule

<table>
<thead>
<tr>
<th>System Components</th>
<th>Daily</th>
<th>Weekly</th>
<th>Half-yearly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens, mirror #4</td>
<td>✓✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirror #2 and mirror #3</td>
<td></td>
<td>✓✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasonic sensor (option)</td>
<td>✓✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working table and rulers.</td>
<td>✓✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vent slots of exhaust box. (inside the machine)</td>
<td>✓✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entire working area. General cleaning.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vent slots (backside of the machine)</td>
<td>✓✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spindles</td>
<td></td>
<td></td>
<td>Clean and grease.</td>
<td>✓✓</td>
</tr>
<tr>
<td>Cover of the laser source and housing.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside of the exhaust box.</td>
<td></td>
<td></td>
<td>✓✓</td>
<td></td>
</tr>
</tbody>
</table>

✓✓ 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 Exhaust box

When cleaning the machine, also clean the outside and inside of the exhaust box as well.

1. Remove the fixation screws of the exhaust box (8 screws).

2. Unscrew and remove and clean the guide plate inside the machine (3 screws).

3. Remove the exhaust box from the machine and clean it.

4. To clean the inside of the box, remove the exhaust connector (4 screws).

   The cleaning method depends on the material deposits (for example with the aid of a vacuum cleaner, wet cloth).
8.3.3 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 (Part number 69249)
- Lens cleaning liquid (Part number 69248)

8.3.4 Lens

**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 penetrations must not be used anymore.

**Step1: Preparation**

1. Blow away loose particles and dust by means of bellowsbellows or compressed air (according to ISO 8573:2010 class 1).
2. Get the cleaning liquid and cleaning tissues ready.
3. Move the table up and put a cloth under the lens holder (so that the lens will not be damaged if it falls out of holder by accident).
4. Loosen the lens by screwing the clamping ring inward.
5. Now remove the lens and check the surface.
Step 2: Cleaning with cleaning liquid and cleaning tissues

1. Remove the lens and rinse it with cleaning liquid to wash away coarse soiling.
2. Put some cleaning liquid onto the lens and leave the liquid for 1 minute to take effect.
3. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
4. Now carefully insert the lens with the lens holder into the laser head and fixate the clamping ring.

Notice
Trotec Laser GmbH recommends to use the following cleaning products, which are available as accessory parts:

- Lens cleaning cloth (part number 69249) and lens cleaning liquid (part number 69248).
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.
Reinigung der Spiegel #2 und #3

1. For cleaning of mirrors #2 and #3, you must first remove the right maintenance panel.
2. Do not remove the mirror #2. It must remain in the machine for cleaning.
3. The mirror #3 is attached by means of two Allen screws (1), which are located on the mirror holder. Open the screws and remove the lens holder together with the mirror.

   **Do not touch the milled screws (2) while doing this!**

4. Flush the mirror with cleaning liquid to wash away coarse soiling.
5. Put some cleaning liquid onto the mirror and leave the liquid for 1 minute to take effect.
6. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
7. Now carefully put back the mirror and fixate it with the two Allen screws.

Reinigung des Spiegels #4

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

   **Caution**
   Make sure that the mirror does not grind over the mirror holder, as it can be scratched very easily.

2. Flush the mirror with cleaning liquid to wash away coarse soiling.
3. Put some cleaning liquid onto the mirror and leave the liquid for 1 minute to take effect.
4. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
5. Now carefully re-insert the mirror and fixate it with the two knurled screws.

8.3.6 Ultrasonic sensor (Option Sonar Technology™)

The sensor can be cleaned either with a brush, or be wiped drily, with moisture or with mild detergents and a microfiber or anti-statics cloth. In case of stronger soiling, isopropyl or ethanol solution can be used.

Avoid long application time and long-term usage.
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

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too low engraving depth.</td>
<td>• Imprecise focusing.</td>
<td>• Check focus.</td>
</tr>
<tr>
<td></td>
<td>• Dirty optics.</td>
<td>• Clean optics.</td>
</tr>
<tr>
<td>Blurred edges.</td>
<td>• Imprecise focusing.</td>
<td>• Check focus.</td>
</tr>
<tr>
<td>Missing cut lines.</td>
<td>• Zero passes in material database.</td>
<td>• Increase the amount of passes in the JobControl® material database.</td>
</tr>
<tr>
<td></td>
<td>• Line thickness in CorelDraw too big.</td>
<td>• Reduce line thickness to the smallest possible value.</td>
</tr>
<tr>
<td></td>
<td>• Color was skipped in JobControl®.</td>
<td>• Set color to cutting in the JobControl® database.</td>
</tr>
<tr>
<td>Waviness of the lines.</td>
<td>• Lens is loose.</td>
<td>• Check lens and lens holder.</td>
</tr>
<tr>
<td>No visible marking result.</td>
<td>• Too low laser power.</td>
<td>• Increase power setting.</td>
</tr>
<tr>
<td></td>
<td>• Too high speed.</td>
<td>• Reduce speed.</td>
</tr>
<tr>
<td></td>
<td>• Not focused.</td>
<td>• Check focus.</td>
</tr>
<tr>
<td></td>
<td>• Wrong focus tool.</td>
<td>• Change focus tool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• When using autofocus, check the settings within the software (lens, material thickness, table).</td>
</tr>
</tbody>
</table>
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine details on stamps are engraved too thinly.</td>
<td>• Too steep shoulders.</td>
<td>• Choose other shoulder or edit (flat/medium/steep): Options/Process Options/Stamp.</td>
</tr>
</tbody>
</table>
| The size to be engraved or cut does not match the size in CorelDraw.   | • Raster correction ON in JobControl®.  
• Wrong size settings in the printer driver.  
• Wrong image position is selected in the layout tab (printing).  
• Wrong machine is selected in the JobControl®. | • Switch off raster correction in JobControl® (settings/advanced options/laser tab).  
• Use the same size as in CorelDraw.  
• Switch the layout settings to: as in document.  
• Select the proper machine in JobControl®. |
| Corners and angles are not cut or marked.                              | • Power too low.                                                                                                                                                                                           | • Increase the correction in JobControl® (Settings /Material Templates Setup - Correction).                                                                                                           |
| No referencing after commissioning.                                    | • Top, front or side door not closed.                                                                                                                                                                     | • Close doors.                                                                                                                                                                                         |
| No response upon switching on of the system.                           | • Fuse blown.  
• No electric power at power outlet.                                                                                                           | • Check fuses.  
• Check power outlet.                                                                                                                             |
| No communication with machine.                                         | • Invalid COM port selection.  
• Communication cable defect.  
• COM: port is in use by another program.                                                                                                         | • Change selection.  
• Check cable.  
• Close this program, or change the COM port.                                                                                                    |
| Connection to machine frequently interrupted.                          | • Electromagnetic emissions.                                                                                                                                                                                 | • Make sure that machine and computer are connected to the same electric circuit; the original cable lengths should not be exceeded.                                                             |
| Offsets between engraving jobs and cut lines.                          | • Speed too high.                                                                                                                                                                                           | • Reduce speed.                                                                                                                                                                                        |
| Other faults.                                                          |                                                                                                                                                                                                            | • Contact Technical Support.                                                                                                                                                                |
9.1.1 How to create a service file

1. Start the software JobControl®.
2. Position the job on the plate.
3. Run the job.
4. Go to “Settings” and select "Create Service file".
5. The window "Save Service File to" shows up. Select a directory to save the file into and click on "Save".
6. The window "Add Layout File" appears. Select the layout file that was sent to JobControl® and possibly caused a failure (e.g.: a CorelDraw file, Photoshop file, AutoCAD file,…).
7. Click on "Open".
8. The location to which the successfully created service file was saved appears on the screen.
9. Send the service file “SeviceLog.txt”, a screenshot of the error message and a detailed description to your sales representative or to techsupport@troteclaser.com.
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

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

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
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 Current
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. Turn the key switch to switch off the machine.
3. Switch off the main switch at the back of the machine.
4. Remove the exhaust system.
5. Disconnect all cables at the back of the machine.
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.

Use suitable tools if you have to disassemble the machine. All parts need to be sorted into the individual material types and be disposed of according to the regional directives on electronic and electric waste disposal.
<table>
<thead>
<tr>
<th></th>
<th>Appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Technical Data</td>
</tr>
<tr>
<td>✓</td>
<td>Conformity Declaration</td>
</tr>
<tr>
<td>✓</td>
<td>Acceptance report</td>
</tr>
<tr>
<td>✓</td>
<td>Response form</td>
</tr>
<tr>
<td>✓</td>
<td>Training verification form</td>
</tr>
</tbody>
</table>
## Speedy 360 flexx – Technical Specifications

### • Mechanics

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working area</td>
<td>32 × 20 in (813 × 508 mm)</td>
</tr>
<tr>
<td>Loading area</td>
<td>35 × 23.6 in (890 × 600 mm)</td>
</tr>
<tr>
<td>Max. height of work piece</td>
<td>1.5&quot;, 2.0&quot;: 8.2 in (210 mm) incl. working table / 11 in (280 mm) without working table</td>
</tr>
<tr>
<td></td>
<td>2.0&quot;: clearance lens, 2.5&quot;: 7.7 in (197,5 mm)</td>
</tr>
<tr>
<td></td>
<td>2.85&quot;: flexx lens: 7.4 in (188 mm)</td>
</tr>
<tr>
<td></td>
<td>3.2&quot;: 7 in (179 mm)</td>
</tr>
<tr>
<td></td>
<td>4.0&quot;: 6.2 in (159 mm)</td>
</tr>
<tr>
<td></td>
<td>5.0&quot;: 5.2 in (133 mm)</td>
</tr>
<tr>
<td>Working tables</td>
<td>Multifunctional table concept including aluminum cutting grid table, Rulers in inch or mm</td>
</tr>
<tr>
<td></td>
<td>Electronic, programmable Z-axis with servo motor</td>
</tr>
<tr>
<td>Speed of motion system</td>
<td>139 in/sec (355 cm/sec.) CO₂</td>
</tr>
<tr>
<td></td>
<td>78 in/sec (200 cm/sec.) fiber</td>
</tr>
<tr>
<td>Acceleration</td>
<td>5g</td>
</tr>
<tr>
<td>Motor</td>
<td>Brushless DC servomotor</td>
</tr>
<tr>
<td>Encoder</td>
<td>Increment measuring system</td>
</tr>
<tr>
<td>Lenses</td>
<td>Standard: 2.85&quot;: flexx lens</td>
</tr>
<tr>
<td></td>
<td>Optional CO₂: 1.5&quot;, 2.0&quot;, 2.0&quot;: clearance lens – 0.5 in (12.5 mm) more distance from the</td>
</tr>
<tr>
<td></td>
<td>material than standard lenses, 2.5&quot;, 4.0&quot;</td>
</tr>
<tr>
<td></td>
<td>Optional fiber: 3.2&quot;, 5.0&quot;</td>
</tr>
<tr>
<td>Addressable accuracy</td>
<td>5 μm</td>
</tr>
<tr>
<td>Repeat accuracy</td>
<td>± 0.0006 in (0,015 mm)</td>
</tr>
<tr>
<td>Accuracy to size of parts</td>
<td>Depending on material and process</td>
</tr>
<tr>
<td>Max. material load</td>
<td>Static: up to 220 lbs. (100kg) / Dynamic: up to 66 lbs. (30 kg)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>Surface exhaust via rear of the engraving cabinet, table exhaust with vacuum and cutting</td>
</tr>
<tr>
<td>Standard features</td>
<td>Sonar TechnologyTM, ergonomic access to working area, coaxial air assist incl. integrated</td>
</tr>
<tr>
<td></td>
<td>pump, InPack TechnologyTM, harsh environement protection kit, multifunctional table concept</td>
</tr>
<tr>
<td></td>
<td>incl. aluminum cutting grid table (black), laser pointer (655 nm, &lt;0.99mWcw), 2.85&quot; flexx</td>
</tr>
<tr>
<td></td>
<td>lens, nozzles (Ø3 mm und Ø7 mm), LED light, housing with lockable casters, incl. water-chiller</td>
</tr>
<tr>
<td></td>
<td>(if requested), 2 years warranty or 3 years extended warranty in combination with TroCare</td>
</tr>
<tr>
<td></td>
<td>USB connection, JobControl® Expert Software, UniDrive, iOS App</td>
</tr>
<tr>
<td>Optional</td>
<td>Rotary attachment, gas-kit light, temperature sensor incl. emergency stop button, ferromagnetic</td>
</tr>
<tr>
<td></td>
<td>engraving table, vacuum table, acrylic cutting grid table (white), aluminum slat cutting</td>
</tr>
<tr>
<td></td>
<td>table, acrylic slat cutting table, honeycomb cutting table top with 0.5 in (12.7 mm) or 0.25</td>
</tr>
<tr>
<td></td>
<td>in (6,4 mm) nominal comb size</td>
</tr>
<tr>
<td><strong>Job Control® Vision, UniDrive, MCO option for pad cutting</strong></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Honeycomb cutting table top with 0.5 in (12.7 mm) or 0.25 (6.4 mm) nominal comb size</td>
<td></td>
</tr>
</tbody>
</table>

**• Options**

<table>
<thead>
<tr>
<th>Rotary attachment</th>
<th>Cone, roll or combined version, tiltable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. workpiece length cones: 21.6 in (550 mm)</td>
<td></td>
</tr>
<tr>
<td>Max. workpiece length rolls: Ø ≥ 2.2 in (58 mm) = 26.7 in (679 mm), Ø ≤ 2.2 in (58 mm) = 29.3 in (745 mm)</td>
<td></td>
</tr>
<tr>
<td>Max. workpiece diameter cones: 8.1 in (207 mm), depending on inserted lens</td>
<td></td>
</tr>
<tr>
<td>Max. workpiece diameter rolls: 3.7 in (96 mm), depending on inserted lens</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JobControl® Vision</th>
<th>Registration mark detection and compensation system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. working area without camera: 32 × 20 in (813 × 508 mm)</td>
<td></td>
</tr>
<tr>
<td>Max. working area with camera: 31.5 × 20 in (801 × 508 mm)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vacuum table</th>
<th>Vacuum effect for fixation of thin or wavy materials</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Honeycomb cutting tabletop</th>
<th>Perfect in combination with vacuum table; 0.5 in (12.7 mm) or 0.25 (6.4 mm) nominal comb size</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ferromagnetic engraving table</th>
<th>Allows to mount thin materials such as paper, films or foils with magnets to ensure an even and flat surface. An even working is essential for achieving optimal results for laser engraving and marking applications</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Acrylic cutting grid table</th>
<th>For reflection-free cutting of tasks with parts smaller than 4 in (100 mm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Aluminum slat cutting table</th>
<th>Particularly suitable for cutting tasks of thicker materials and parts bigger than 4 in (100 mm); removable aluminum slats</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Acrylic slat cutting table</th>
<th>For reflection-free cutting for tasks with thicker materials and parts bigger than 4 in (100 mm); removable acrylic slats</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Gas-Kit light (for compressed air connection)</th>
<th>For control of compressed air (free of mechanical dust, water and oil) max. flow rate 150 l/min (40 gpm) with max. 10 bar (145 psi); max. limit 4 bar on working head, connection on the machine with external hose diameter of 0.23 in (6mm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UniDrive</th>
<th>Increased flexibility by the use of different operating systems e.g. MAC and multiple design stations, workflow optimization</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TroCAM</th>
<th>CAD / CAM software for perfect cutting results; including nesting-function, lead-in/lead-out, tool paths</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MCO</th>
<th>Multi-Color Option for stamp pad cutting</th>
</tr>
</thead>
</table>

**• Control System**

<table>
<thead>
<tr>
<th>Software</th>
<th>JobControl X Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser Power</td>
<td>Adjustable 0 – 100%</td>
</tr>
<tr>
<td>Interface hardware</td>
<td>USB</td>
</tr>
<tr>
<td>Interface software</td>
<td>ASCII, HPGL, JobControl</td>
</tr>
</tbody>
</table>
### Laser Equipment flexx

<table>
<thead>
<tr>
<th>Laser tube CO₂</th>
<th>Sealed-off CO₂ laser, maintenance-free Laser power: 40 - 120 W, air cooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength</td>
<td>10.6 µm</td>
</tr>
<tr>
<td>Laser tube fiber</td>
<td>Pulsed fiber laser, maintenance-free Laser power: 20 W, 30 W, 50 W</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1064 nm</td>
</tr>
</tbody>
</table>

#### Dimensions

<table>
<thead>
<tr>
<th>Width/depth/height</th>
<th>48 × 32.8 (30.7&quot;) × 41.5 in (1221 × 830 (790&quot;) × 1055 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* without exhaust hose connection on the back of the machine and open top lid</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 595 - 628 lbs (ca. 270 - 285 kg) – depending on laser power</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>Mandatory ambient temperature +15° C to +25° C or 59° F to 77° F Humidity 40% to max.. 70%, not condensing Dust-free environment (2nd degree according to IEC 60947-1)</td>
</tr>
</tbody>
</table>

#### Laser safety

<table>
<thead>
<tr>
<th>Laser class</th>
<th>CDRH laser safety; CE tested Laser class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlock</td>
<td>Duplicate interlock safety system</td>
</tr>
<tr>
<td>Loading lid</td>
<td>Front-side loading lid</td>
</tr>
</tbody>
</table>

#### Extraction System

<table>
<thead>
<tr>
<th>Minimum volume required (without piping/tubing)</th>
<th>350 m³/h @ 3.500 Pa Two connections DN 2.95 in (75 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>Atmos Duo Plus, Vent HP (or equivalent systems; for surface and table extraction)</td>
</tr>
</tbody>
</table>

#### Electrical Equipment

| Power consumption | Approx. 1.2 to 1.9 kW (depending on laser power) |

Subject to change without notice. Errors and omissions reserved. January 2019
EC–Declaration of Conformity
(Machine directive 2006/42/EG, appendix II A)

Manufacturer:
TROTEC Laser GmbH
Linzer Straße 156,
A-4600 Wels

Authorized person for the compilation of technical documentation:
Gerhard KREMPL, TROTEC Laser GmbH, Linzer Straße 156, A-4600 Wels

We hereby certify that

SPEEDY 360 flexx
Modell N° 8032 Speedy 360 flexx

in its conception, construction and form put by us into circulation is in accordance with all the relevant essential health and safety requirements of the EC machinery directive 2006/42/EEC.

Further valid guidelines/regulations for the product:
2014/35/EG Low Voltage Directive
2014/30/EG EMC Guideline

Applied harmonized standards:
- EN ISO12100:2011-03 Machine Safety
- EN ISO11553-1:2016 Safety of machinery – Laser processing machines
- EN 61000-6-4:2011-09 Electromagnetic Compatibility

Place, Date:
Wels, 7/15/2016

Personal data of the signer:
Georg ERNST, Head of Research and Development

Signature:
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)  Company stamp, Signature
Name, Position
Dear customer!

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

<table>
<thead>
<tr>
<th>Contact details</th>
<th>Machine data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Serial number:</td>
</tr>
<tr>
<td>Country:</td>
<td>JobControl® version:</td>
</tr>
<tr>
<td>Phone:</td>
<td>Driver version:</td>
</tr>
<tr>
<td>E-mail:</td>
<td>Layout Software:</td>
</tr>
<tr>
<td>Date:</td>
<td>Firmware version:</td>
</tr>
</tbody>
</table>

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.
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.

Signature Trainer

Signature Trainee