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SP3000

Operation Manual

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ENGLISH

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Translated manual

Technical Changes	Technical specifications are subject to change without notice. Trotec Laser GmbH reserves the right to improve or modify any of the products without prior notice.
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CONTENT

1 General

1.1 Information about this manual

PLEASE READ THIS MANUAL CAREFULLY BEFORE USE
KEEP THE MANUAL FOR FURTHER CONSULTATION

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 Operation Manual Trotec JobControl®	JobControl_Operationmanual_x.x.x_Vx.x
Pre-installation Guide	SP3000_Preinstallation Guide_EN

1.2 Explanation of symbols

Important technical safety notes and instructions in this manual are marked with symbols. These instructions for workplace safety must be complies with and followed. Here special attention must be paid in order to avoid accidents, injury to persons or material damage.

DANGER
This symbol indicates information noncompliance wherewith result in death or serious injury.

WARNING
This symbol indicates information noncompliance wherewith may result in death or serious injury.

WARNING
This symbol warns of potentially dangerous situations related to electric voltage. Failure to observe the safety instructions leads to risk of serious injury or death. Care is to be taken in particular during maintenance and repair work.

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

Notice **Material damage**
This symbol indicates information noncompliance wherewith may lead to material damage, functional failures and/or machine breakdown.

Info **Info**
This symbol marks tips and information which are to be observed to ensure efficient and failure-free operation of the machine.

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 operation 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 operation 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 non-observance of instructions in this manual.

Non-observance of the operation, maintenance and service instructions described within this manual absolves Trotec 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.

Any software forming part of this equipment may be used only for the purposes for which it was supplied by Trotec Laser GmbH. It is strictly prohibited to make any alterations, to prepare translations, decompile or disassemble the software.

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

1.4 Scope of delivery (standard configuration)

1. Laser machine
2. Travelling exhaust
3. Operator console
4. Dell Tower PC for the operator console (according to order)
5. DVD (with laser software, printer driver and operation manuals)
6. Focusing tool(s) (according to lens order)
7. Cleaning kit for optics
8. Nozzles (2 pcs.: ø3 and ø7)
9. Lens: 2.5” (standard) and 3.75”, 5.0" (or according to order)
10. Multifunctional table concept (according to order)
11. Allen key kit
12. Open-end wrench
13. Power cord 5 meter (according to order)
14. USB computer connection cable
15. RS232 cable (according to order)
16. Exhaust connection cable (according to order)
17. Exhaust (according to order)
18. Cooling system (according to order)
19. Compressed air connection "Eurokupplung" (one hand universal quick lock coupling)

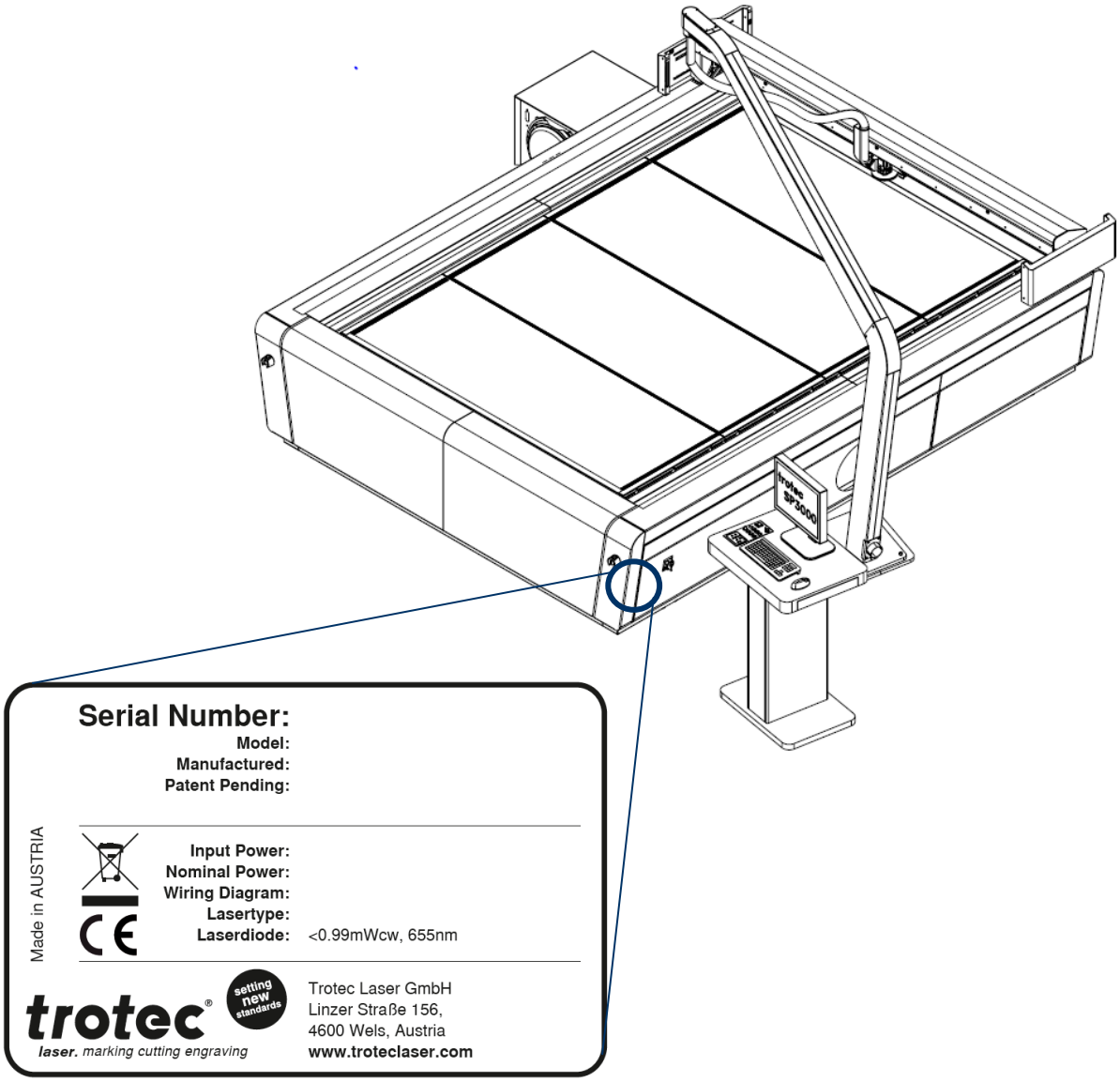
The actual scope of delivery may be different, depending on the special model, additional order options or newest technical changes.

1.5 Type plate

The type plate with the CE mark is located close to the main switch on the right hand side of the machine.

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

Serial number: _____
Model: _____
Year of manufacture: _____



2 Safety

At the time of the development and production of the machine, it was built in accordance with recognized technological regulations and is therefore considered operationally safe.
However, hazards may arise if the machine is used improperly, operated by untrained personnel or employed for purposes other than those it was designed for.

The present chapter provides an overview of all important safety considerations necessary to ensure safe and trouble-free operation of the machine. Other chapters of this manual contain specific safety instructions which are marked with symbols in order to avert dangers.

2.1 Safety principles

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 salesperson or Trotec 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 Operation 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 will not accept any liability for damage caused by improper use. The risks in case of improper use are exclusively borne by the user.

2.1.3 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.

2.1.4 Operating modes

2.1.4.1 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.

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

2.1.4.2 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:

EN 60825-1	Safety of Laser Products - Part 1: Equipment Classification and Requirements
EN 60950	Information Technology Equipment – Safety
EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; General Requirements
EN 60204-1	Electrical equipment of machines
BGV B2	Laser Radiation
UL 60950	Standard for Safety for Information Technology Equipment
UL 31011-1	Electrical Equipment for Laboratory Use – Part 1: General
21 CFR 1040.10	Performance Standards for Light-Emitting Products – Specific Laser Products
21 CFR 1040.11	Performance Standards for Light-Emitting Products – Specific-Purpose Laser Products

Info 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.

2.2 Laser safety

2.2.1 Laser classification

The here described machine is equipped with an enclosed laser pointer and a sealed carbon dioxide laser source that emits invisible and intense laser radiation with a wavelength of 10.6 microns.

Laser classification according to DIN EN 60825-1 "Safety of Laser Products":

-	SP3000 laser machine	Class 2 (US: Class II) in the working area and operating range, due to the key safety devices and enclosed laser pointer (normal operation)
-	Laser source	Class 4 (US: Class IV)
-	Enclosed laser pointer	Class 2 (US: Class II)

WARNING
Laser radiation of Class 2 (US: class II)
For Class 2 (US: Class II) laser is short term exposure (up to 0.25 sec) 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 beam deliberately) or eyelid closure reflex is suppressed.

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

WARNING
Laser radiation of Class 4 (US: class IV)
Exposure to laser radiation of Class 4 (US: Class IV) can cause injury to the eyes and skin.

- The skin and eyes must not be exposed to direct or reflected or scattered radiation.
- Wear suitable laser safety protection glasses.
- When dealing with Class 4 (US: Class IV) laser machines, it is necessary to appoint a trained laser safety officer to evaluate potential hazards and to ensure that appropriate control measures are implemented.

Info 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).

2.2.1.1 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 sec) 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 beam for a time long enough for the eyes to get injured.

2.2.1.2 Class 4 (US: class IV)

Class 4 (US: class IV) high powered lasers (visible or invisible) considered to present potential acute hazard to the eye and skin for both direct and scatter (diffused) conditions.

Also have potential hazard considerations for fire (ignition) and byproduct emissions from target or process materials. It is the responsibility of the operator of the machine to take appropriate measurements to eliminate any dangers such as fire or explosions through the laser beam.

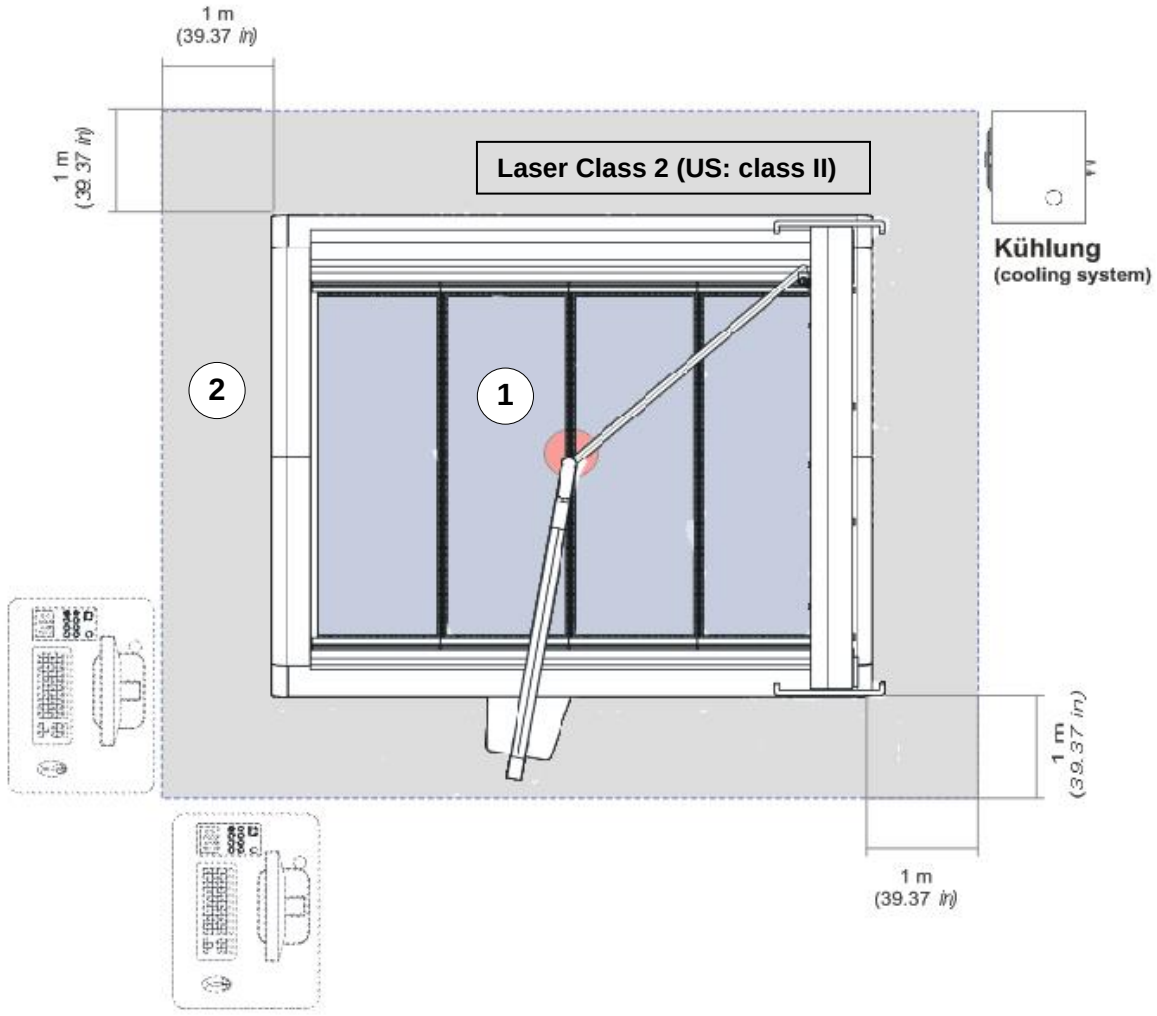
2.2.1.3 Precautions when dealing with a class 4 (US: class IV) laser machine

When dealing with class 4 (US: class IV) laser machine follow the following precautions:

- According to BGV B2 „Laser Emission“, a competent laser safety officer has to be appointed in writing to evaluate potential hazards and to ensure that appropriate control measures are implemented.
- The laser controlled area shall be posted with appropriate warning signs or warning lamps and the area shall be defined to contain the laser radiation.
- The laser controlled area must be protected against unauthorized access.
- The operator of class 4 (US: class IV) laser systems always has to wear appropriate safety glasses.
- An indicator (typically a light) to provide a warning of laser emission in advance of and during the emission time.

Compliance with the points above does not absolve the operator from meeting the relevant standards and guidelines for the operation of a class 4 (US: class IV) laser system.

2.2.2 Laser and working area



No	Name	Description
1	Laser area (working surface / operating range of the laser)	The laser area is a defined area in which the value of the maximum permissible exposure (MPE: 1000W/M²) of laser radiation may exceed or may leak laser radiation. The laser area of the SP3000 results from the working surface and the circular area of approx. ø 5cm (1.97 inch) below the laserhead.
2	Working area of the operator	The safe working area of **laser class 2 (US: class II)** results from the space requirements of the machine and its components and a distance of 1 meter (39.37 inch). During normal operation it is not necessary to wear safety glasses.

2.3 Area of responsibility

2.3.1 Responsibilities of the operator

The operator has the following responsibilities:

- It is the responsibility of the operator to comply with the national official and statutory regulations for the operation of a class 4 (US: class IV) laser system or laser system with a build in laser source of class 4 (US: class IV).
- In addition to the safety notes and instructions stated in this manual, consider and observe the local accident prevention regulations and general safety regulations that apply at the operation site of the machine.
- A **CO_2 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 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.

2.4 Operating and service personnel requirements

The operating and service personnel requirements 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 reaction-impairing medication when working on or with the machine.
- The personnel must be familiar with using the **CO_2 fire extinguisher.**
- The personnel must be trained in order to be qualified to operate the machine. If the personnel lack the necessary knowledge for working on or with the machine, they must first be trained and note down the training in the training verification form.

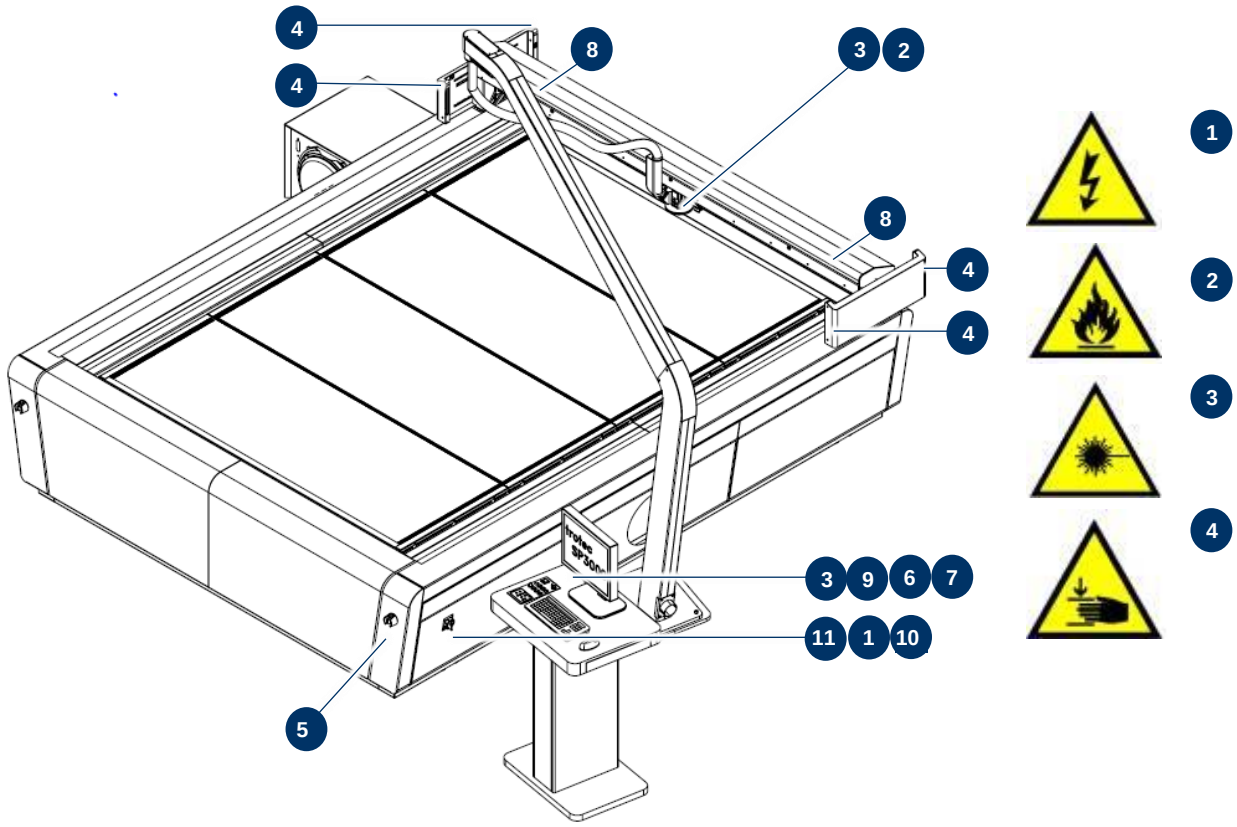
Activity	Intended user group	Definition
Control/ operation/ other activities (e.g. troubleshooting, maintenance)	Qualified personnel or Trotec technicians	Qualified personnel are those who can judge the work entrusted to them and detect potential risks based on their occupational training, knowledge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

2.5 Warning and information labels

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.

Notice

Lost or damaged warning and information labels
If any warning and information labels are lost or damaged, the user is not able identify risks anymore, and there is danger of injury.
- Replace lost or damaged labels immediately.
- Please contact your Trotec dealer for details.



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For normal operation mode outside of the safety enclosure in area ELV is obeyed, if enclosure is closed and used as intended:

Laser class 1
No special protection measures!

For adjustment operation mode:
CAUTION - visible laser radiation of pilot laser
Laser class 2
Do not stare into beam!
P ≤ 1mW; λ = 650nm

For service or maintenance operation mode or when safety enclosure open or interlocks defeated:
CAUTION-invisible laser radiation of processing laser
Laser class 4
Avoid eye and skin exposure to direct or scattered radiation!
Po ≤ 200 W, cw; λ = 10200-10800 nm

per DIN EN 60825:-1:2007

6

LASERPOINTER

Pmax < 0,99mW cw
λ = 655nm

7

Co2 - LASER
Pmax = xxxW cw
λ = 10.6µm

8

CAUTION
INVISIBLE LASER RADIATION
CLASS 4, WHEN OPENED AND SAFETY INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

9

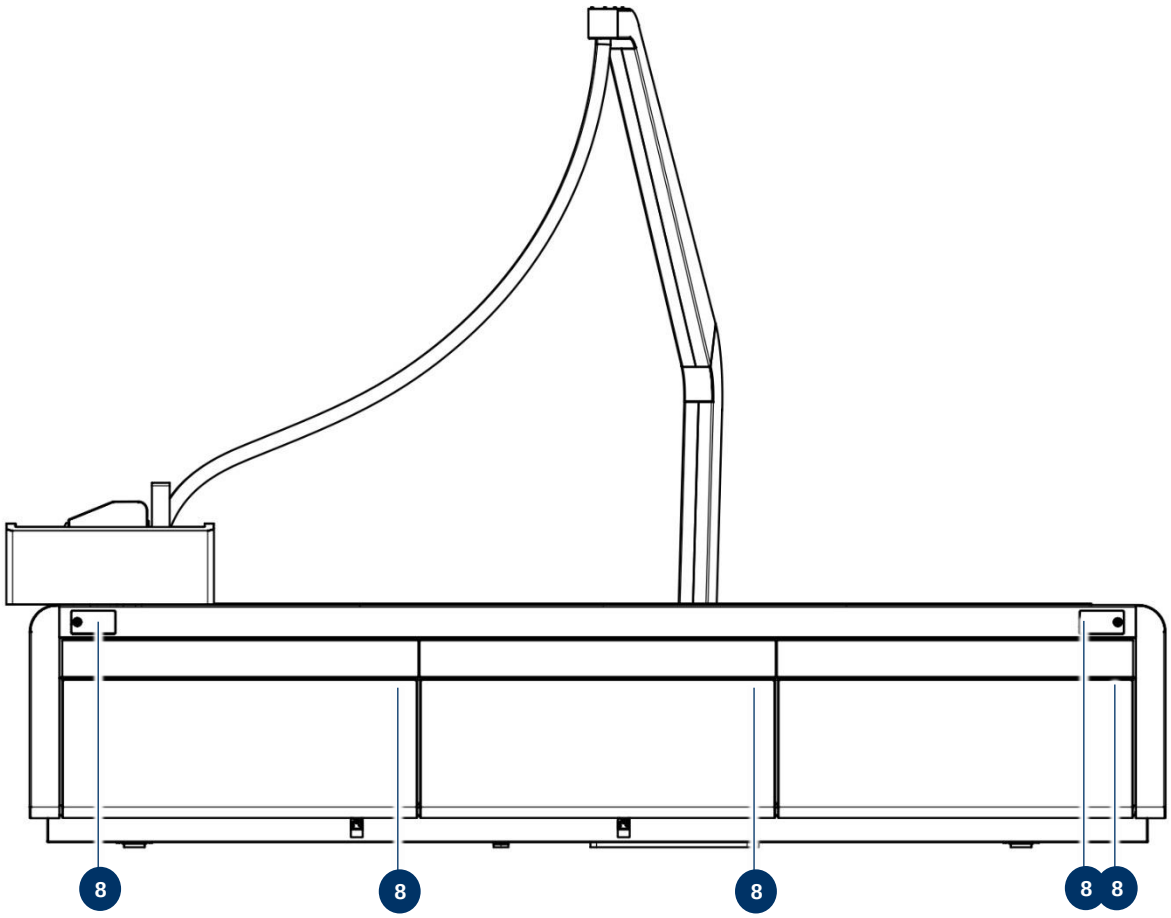
NEVER OPERATE THE LASER SYSTEM WITHOUT CONSTANT SUPERVISION
EXPOSURE TO THE LASER BEAM MAY CAUSE IGNITION OF COMBUSTIBLE MATERIALS WHICH CAN CAUSE SEVERE DAMAGE TO THE EQUIPMENT

10

HAZARDOUS VOLTAGE INSIDE
DISCONNECT POWER BEFORE OPENING

11

INPUT POWER
xxx-xxxVAC xxHZ



8

CAUTION
INVISIBLE LASER RADIATION
CLASS 4, WHEN OPENED AND
SAFETY INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

2.6 Safety devices

WARNING

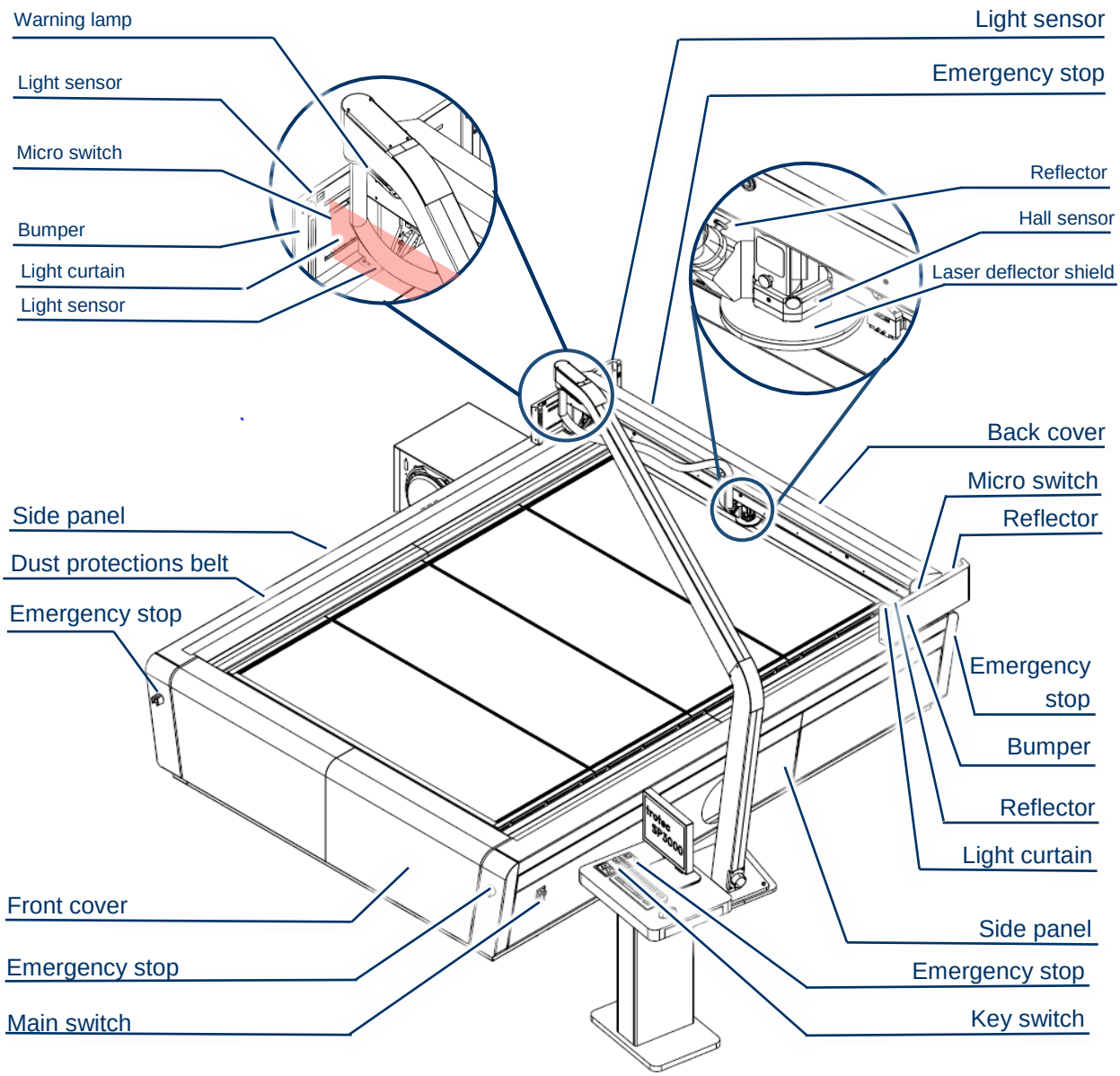
Danger from laser beam

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 safety interlock switches or protective covers on the machine. Safety and protection devices must be fully functional at all times.
- In case of assumed or presumed damage of safety devices, disconnect the machine from the mains.
- Damaged safety and protection devices need to be replaced by a Trotec technician immediately.

2.6.1 Overview

The machine is equipped with the following safety devices:



2.6.2 Main switch

Turn the main switch anticlockwise to disconnect the machine from the mains power supply.

2.6.3 Key switch

Turning the key switch powers off the motor, laser source and electric system, and prevents unauthorized operation.

2.6.4 Emergency stop button

The machine has five emergency stop buttons.
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 device is:
Firstly: to prevent any risks to the operating personnel.
Secondly: to avoid any damage to/destruction of the machine/material.

2.6.5 Casing elements, side panel and covers

Casing elements, covers and side panels protect from laser light and must always be closed and properly attached.

2.6.6 Warning lamp

The warning lamp sends out visual and acoustic signals.

Status		Description
Red	flashing	-Interlock-mode: Error
Red + accustic signal	flashing	-Faulty safety devices
Yellow	permanent	-Busy-mode: data processing or receiving -Testpuls-mode: carrying out a test pulse
Yellow - green	permanent	-Pause-mode
Green	permanent	-Idle-Mode: machine is ready -Fully functional safety devices

2.6.7 Bumper and micro switch

The spring-loaded bumper and corresponding micro switch provide object detection.
If an object gets detected the safety circuit is interrupted and subsequently the movement of the axis, the current job processing and the laser emission stop immediately.

2.6.8 Light curtain

The light curtain provides access detection for hazardous areas. It is located in front of the X-axis and is 16 cm (6.29 inch) high.
If an object gets detected the safety circuit is interrupted and subsequently the movement of the axis, the current job processing and the laser emission stop immediately.

2.6.9 Laser deflector shield and hall sensor

The laser deflector shield absorbs a majority of scattered or reflected radiation in the area of the laser beam output and is therefore mandatory during operation.

The presence of the magnetically fixed laser deflector shield is monitored via hall sensors. If the laser deflector shield was removed on purpose or due to collision with a work piece, the safety circuit is interrupted and subsequently the movement of the axis, the current job processing and the laser emission stop immediately.

2.6.10 Light sensor and reflector

The light sensor and reflector provide access detection for hazardous areas. If an object gets detected the safety circuit is interrupted and subsequently the movement of the axis, the current job processing and the laser emission stop immediately.

2.6.11 In case of safety device malfunction

In case of actual or presumed damage to the safety devices:

- Press the emergency stop button
- Disconnect the machine from the mains
- Please contact your local Trotec Support

2.7 In case of an emergency

2.7.1 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 protection officer and supervisor.
- Follow the operating instructions.
- Have repair work performed by Trotec service technicians only.
- **In case of fire**: Use only **CO_2 extinguisher** to quench the fire, insofar as this is possible without endangering yourself.

2.7.2 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 physician!

2.8 Specific hazards

2.8.1 Fire hazard

WARNING

Fire hazard

Fire hazard from gas and processing of inflammable materials.

- Do not operate the device without supervision.
- Keep CO_2 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 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 so as 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.

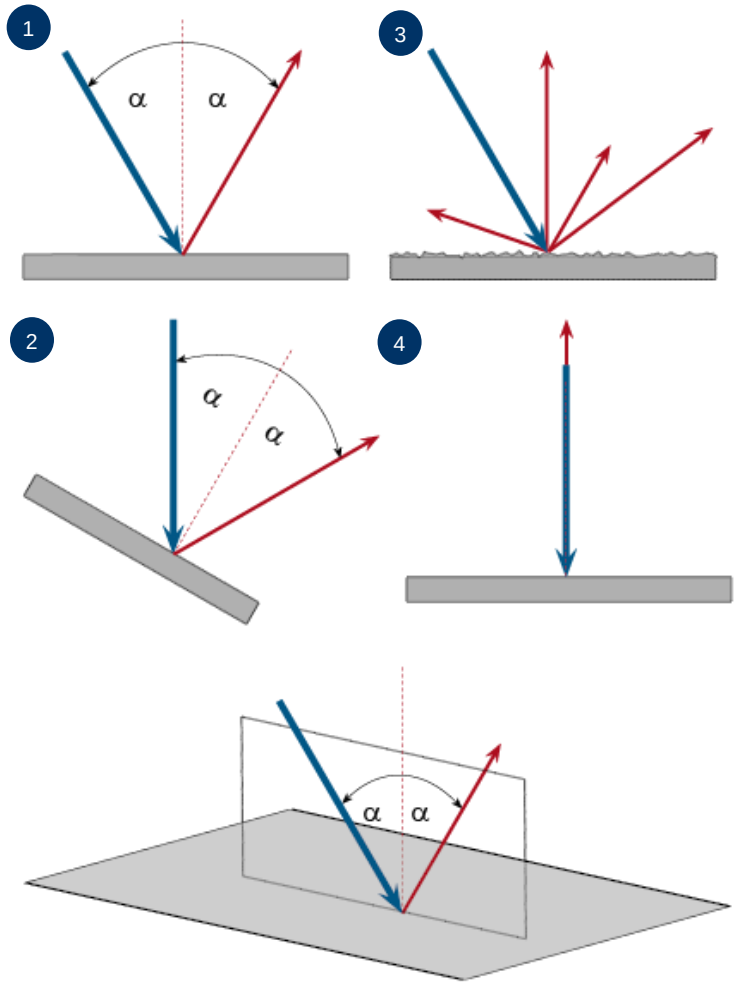
2.8.3 Reflecting material

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

2.8.3.1 Laser beam reflection

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



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

2.8.4 Optical components

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 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 users' country.
- **Lenses with scratches or penetrations must not be used anymore!**

2.8.4.1 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.

2.8.4.2 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.

2.8.4.3 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.

2.8.4.4 Protective measures

→ 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.

2.8.4.5 Disposal

The ZnSe dust and the lens are to be collected drily 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.

3 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

SP 3000
Modell N° 8034 SP 3000

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.

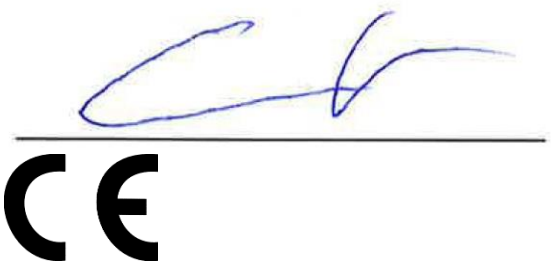
Further valid guidelines/regulations for the product:
2006/95/EG Low Voltage Directive
2004/108/EG EMC Guideline

Applied harmonized standards:
- EN ISO12100 Machine Safety
- EN 60335-1/2007 Safety of Household and similar Appliances
- EN 55014-1/2006, EN 55014-2/1997 Electromagnetic Compatibility
- EN 60204-1 Machine Safety – electr. Equipment
- EN 60825-1/2007, EN 60825-4/2006 and EN 60825-14/2006 Safety of Laser Equipment
- EN 55022/2008, EN 55024/2003 Electromagnetic Compatibility

Place, Date:
Wels, 29th September 2016

Personal data of the signer:
Georg ERNST, Leiter Forschung und Entwicklung

Signature:



CE

4 Technical Data

4.1 Data sheet

Mechanics	
Working area	2.210 x 3.210 mm (87 x 126 in)
Loading area	2.500 x ∞ mm (98 x ∞ in)
Max. height of work piece	50 mm (1.96 in)
Working head	Software controlled z-axis
Working table	Slat cutting table, aluminum cutting grid table, acrylic cutting grid table or honeycomb cutting table
Max. processing speed	1 m/s (40 ips) (standard); 2 m/s (79 ips) (optional)
Acceleration	10 m/s² (393 ips²)*
Motors	Brushless DC servo motors
Encoder	Incremental measuring system
Optical elements	Telescope, lens and all mirrors air-flushed protected from soiling
Lens	2.5" (standard); 3.75“, 5.0" (optional)
Accuracy	+/- 0,1 mm (0.004 in), over the whole working area
Addressable accuracy	0,001 mm (0.00004 in)
Accuracy to size of parts	According to material and process
Maximum material load	200 kg (440 lbs.), load over the whole working area
InPack Technology™	Protects working head and all moving parts from dust; harsh environment protection kit included
Exhaust	Table exhaust for entire working area
Gas-Kit	Control of compressed air and process gas with max. 6 bar (87 psi), built in filter-unit (free of mechanical dust, water and oil, max. flow rate 240 l/min, max. input 10 bar (145 psi), hose diameter 6 mm (0.23 in))
Software	JobControl® Expert
Interface	USB, RS-232 / ASCII, HPGL, AD-Logic System
Operating console	Keypad, safety-switch, system turnkey; workspace for mouse, keyboard, monitor, drawer for tools; PC and Monitor not included

* Depending on configuration

Laser	
Laser system	Sealed-off CO_2 laser
Laser power	60, 100, 200 and 400 watts
Cooling	Water cooled
Wavelength	10,6 µm

Options	
JobControl® Vision	Camera compensation system for print & cut applications
Travelling exhaust	Exhaust mounted to working head
Digital table exhaust	Digitally controlled sectioning of table exhaust; 4 exhaust sections
Chiller	For all power levels
Sonar Technology™	Ultrasonic-based autofocus system
TroCAM Basic / Advanced	CAD / CAM software for perfect cutting results; nesting-function, lead-in/lead-out, tool paths, etc. included
TroCare	Comprehensive package of technical services

Dimensions (W x D x H) & Weight	
Machine	3.076 x 3.914 x 1.230 mm (121 x 154 x 49 in) 1.600 kg (3.530 lbs.)
Chiller	720 x 835 x 930 mm (117 x 33 x 37 in) (400 watts model) 130 kg (287 lbs.) (400 watts model)
Operating console	800 x 600 x 1.126 mm (32 x 24 x 45 in) 40 kg (88 lbs.)
Travelling exhaust	2.082 x 714 x 2.852 mm (82 x 29 x 113 in) 165 kg (363 lbs.)

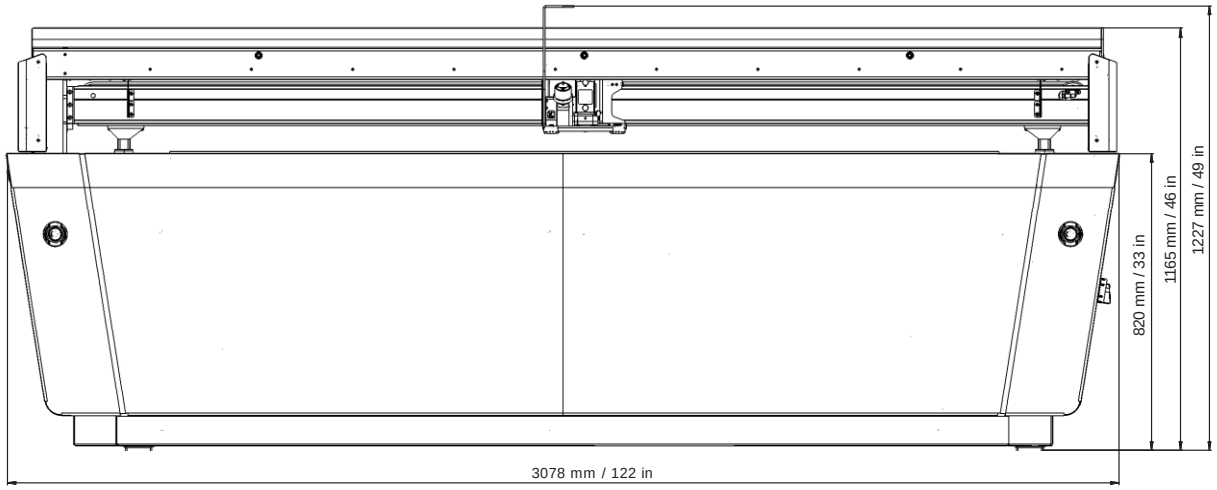
Safety	
Laser class	Fully enclosed beam path CDRH laser class 4 laser; can be operated like laser class 2 in standard operation mode
Laser safety	Fully enclosed beam path as well as active laser deflector shield at working head
Mechanical safety	Light barriers and safety bumpers for beam path and gantry
Interlock	Encoded duplicate interlock safety system
Ambient conditions	Mandatory ambient temperature +15° to +25° C or 59° to 77° F Humidity 40% to max. 70%, not condensing Dust free environment (2nd degree according to IEC 60947-1)
Certificates	CE compliant

Electrical & Exhaust	
Exhaust working point	Min. 2.500 m³/h at 800 Pa (Min. 1.200 cfm at 8.900 in H_2O) (Table exhaust) Min. 100 m³/h at 4.450 Pa (Min. 60 cfm at 17.865 in H_2O) (Travelling exhaust) Minimum requirement for acrylic cutting; Depending on application
Voltage & power consumption (Machine without chiller	3x400V (3xL+N+PE) 50/60Hz, max. 1,6 kW (60 watts) 3x400V (3xL+N+PE) 50/60Hz, max. 3,1 kW (100 watts) 3x400V (3xL+N+PE) 50/60Hz, max. 4,5 kW (200 watts) 3x400V (3xL+N+PE) 50/60Hz, max. 8,4 kW (400 watts)

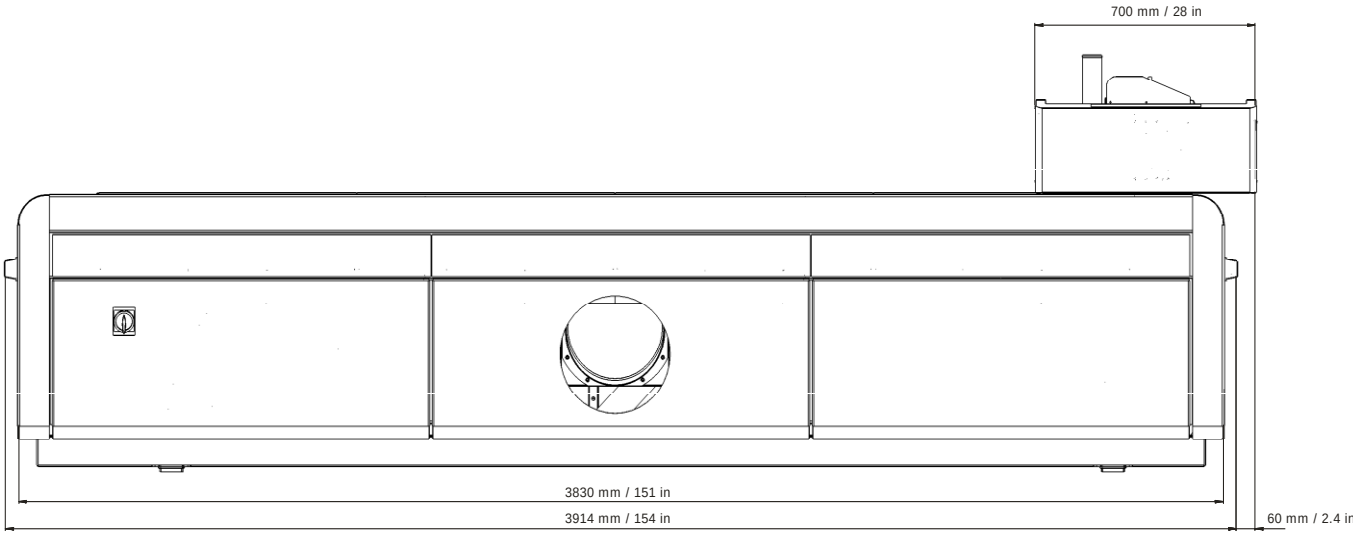
4.2 Dimensions and weight

4.2.1 Machine dimensions and weight

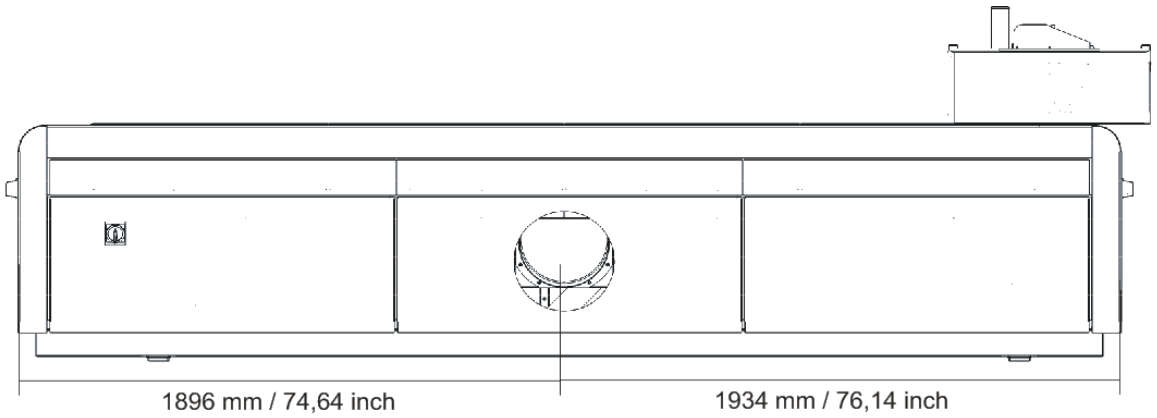
4.2.1.1 Front view



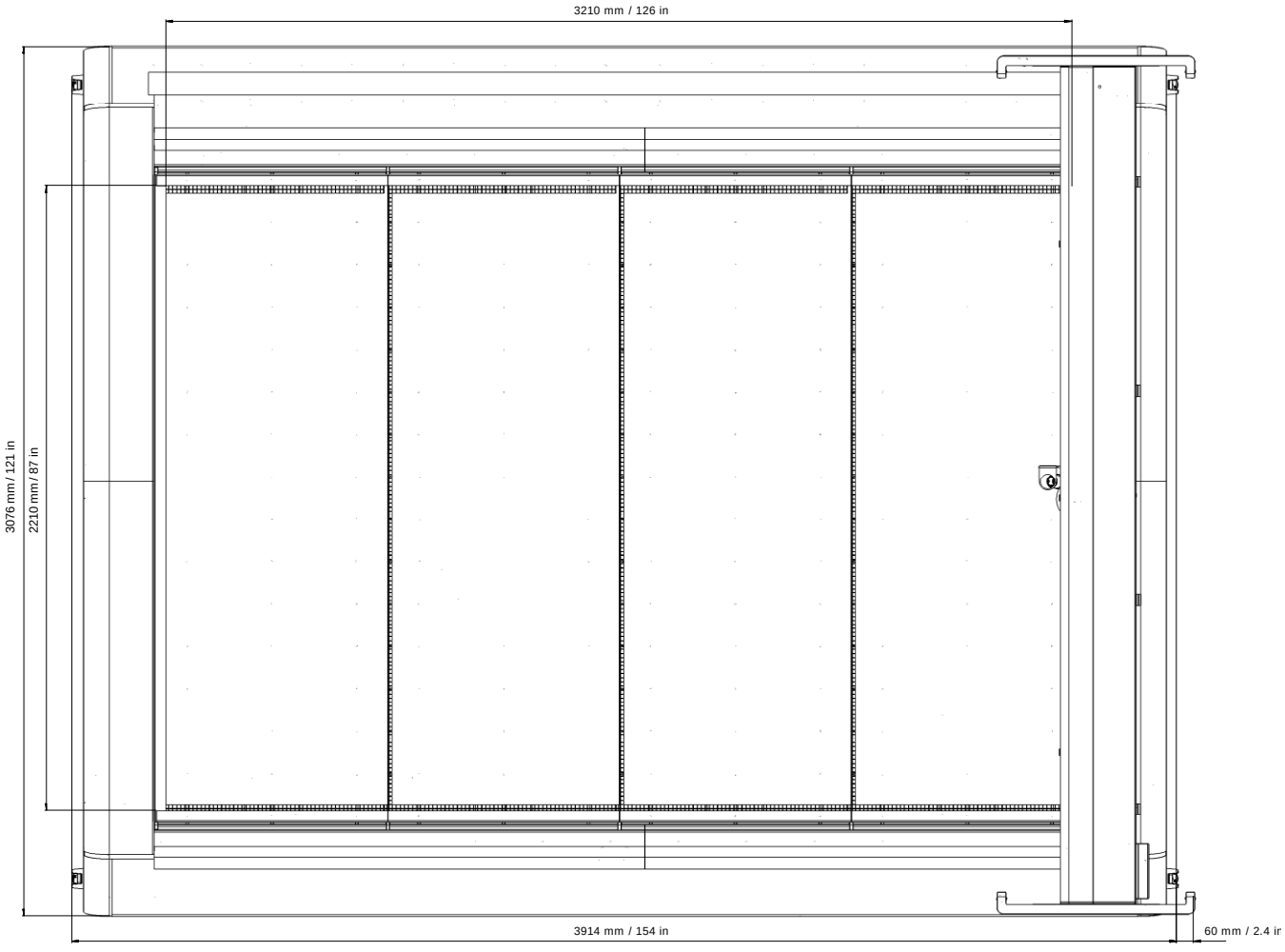
4.2.1.2 Side view



4.2.1.3 Side view (exhaust connection)



4.2.1.4 Top view

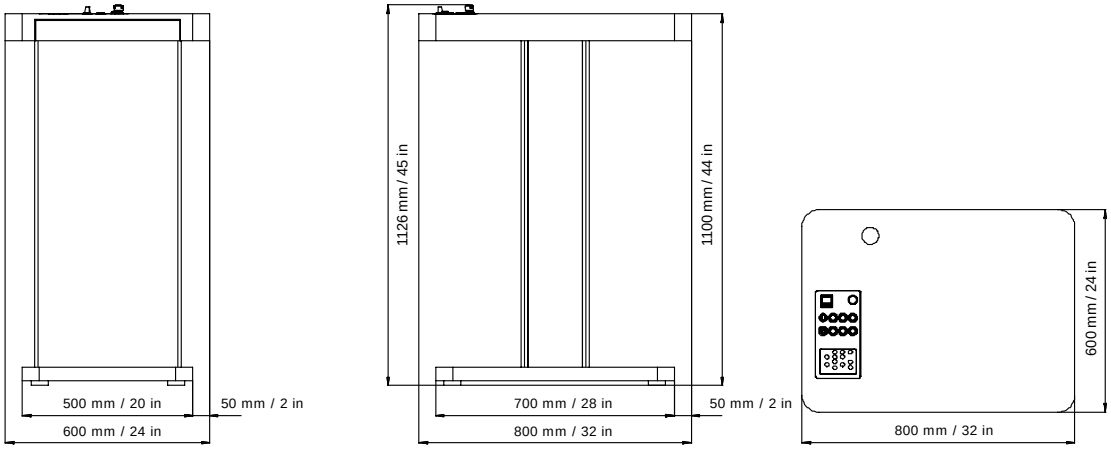


4.2.1.5 Weight

The weight of the machine is 1.600 kg (3.530lbs).

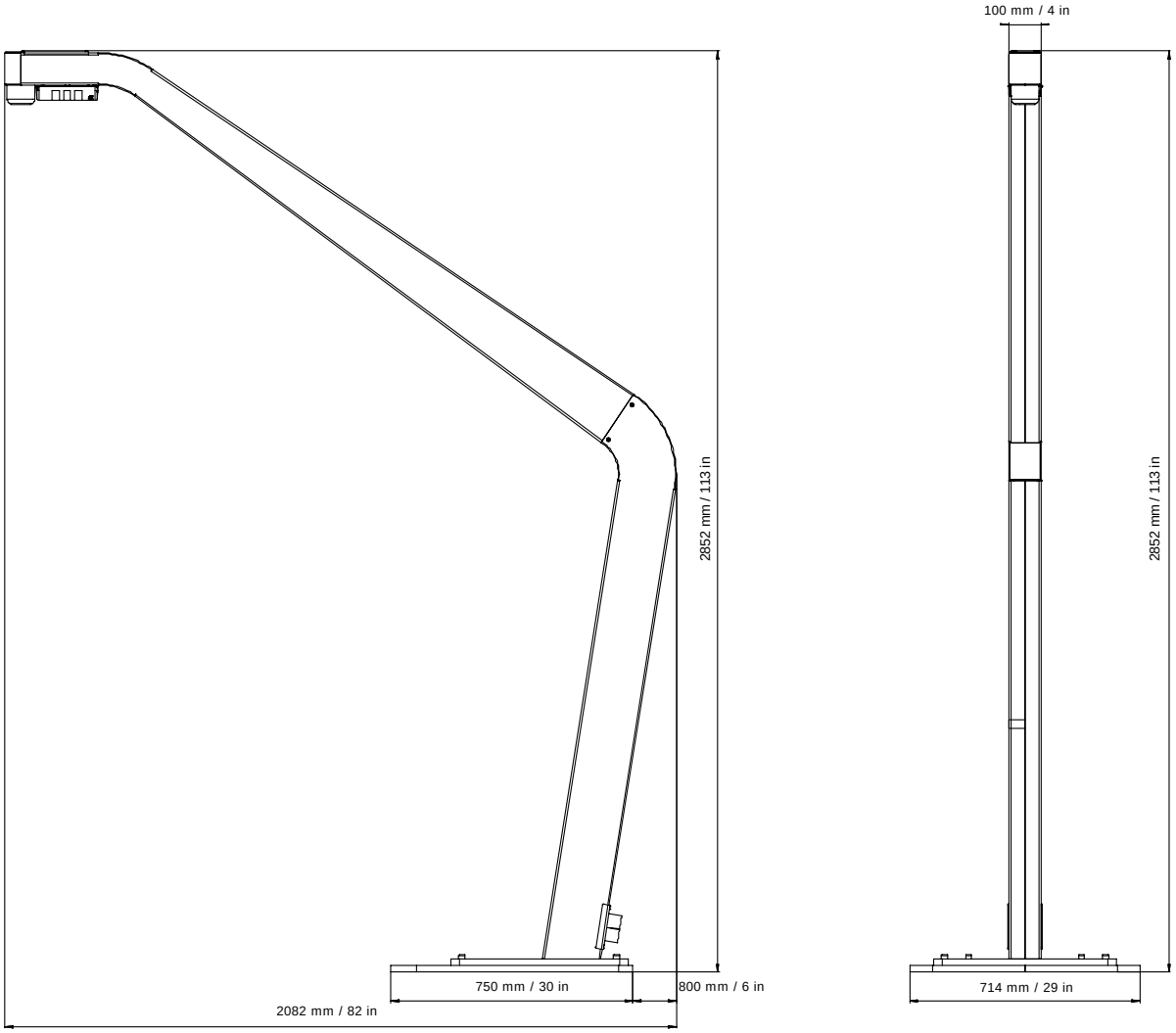
4.2.2 Operation panel exterior dimension

4.2.2.1 Side, front and top view

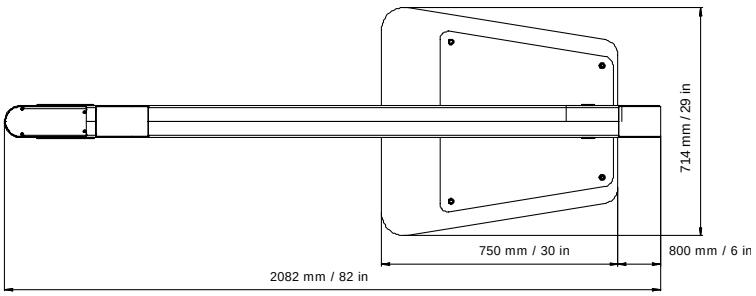


4.2.3 Travelling exhaust exterior dimensions

4.2.3.1 Front –and side view



4.2.3.2 Top view



4.2.4 Exhaust with sound-insolating enclosure (optional)

	Außenabmessung
VENT SP3000 Set:	
VENT 100 (l x b x h) (without sound-insulating enclosure)	363 x 371 x 357 mm (14,29 x 14,60 x 14,06 inch)
VENT 1500 (l x b x h) (with sound-insulating enclosure):	969 x 754 (with rotary handle) x 1076 mm (38,15 x 29,69 (with rotary handle) x 42,36 inch)

4.3 Materials

Material	Cutting CO_2	Engraving CO_2
Plastik		
Acrylonitrile butadiene styrene (ABS)	✓	✓
Acryl/PMMA (Plexiglas®, Altuglas®, Perspex®)	✓	✓
Laminate	✓	✓
Rubber	✓	✓
Polyamide (PA)	✓	✓
Polybutylene terephthalate (PBT)	✓	✓
Polycarbonate (PC)	✓	✓
Polyethylene (PE)	✓	✓
Polyester (PES)	✓	✓
Polyethylene terephthalate (PET)	✓	✓
Polyimide (PI)	✓	✓
Polyoxymethylene (POM) - Delrin®	✓	✓
Polypropylene (PP)	✓	✓
Polyphenylene sulfide (PPS)	✓	✓
Polystyrene (PS)	✓	✓
Polyurethane (PUR)	✓	✓
Foam	✓	✓

Material	Cutting CO_2	Engraving CO_2
Additional		
Wood	✓	✓
Mirror	-	-
Stone	-	✓
Paper (white)	✓	✓
Paper (colored)	✓	✓
Food	✓	✓
Leather	✓	✓
Fabric	✓	✓
Glass	-	✓
Ceramics	-	-
Cork	✓	✓

WARNING

Prohibited materials:

Carbon, polyvinyl chloride (PVC), polyvinyl butyral (PVB), polytetrafluorethylene (PTFE, Teflon®), carbon fiber, beryllium oxide and materials containing halogens (fluorine, chlorine, bromine, iodine and astatine), epoxy-based or phenolic resins

Take care when processing the following materials:

Manganese, chromium, nickel, cobalt, copper and 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.

Info

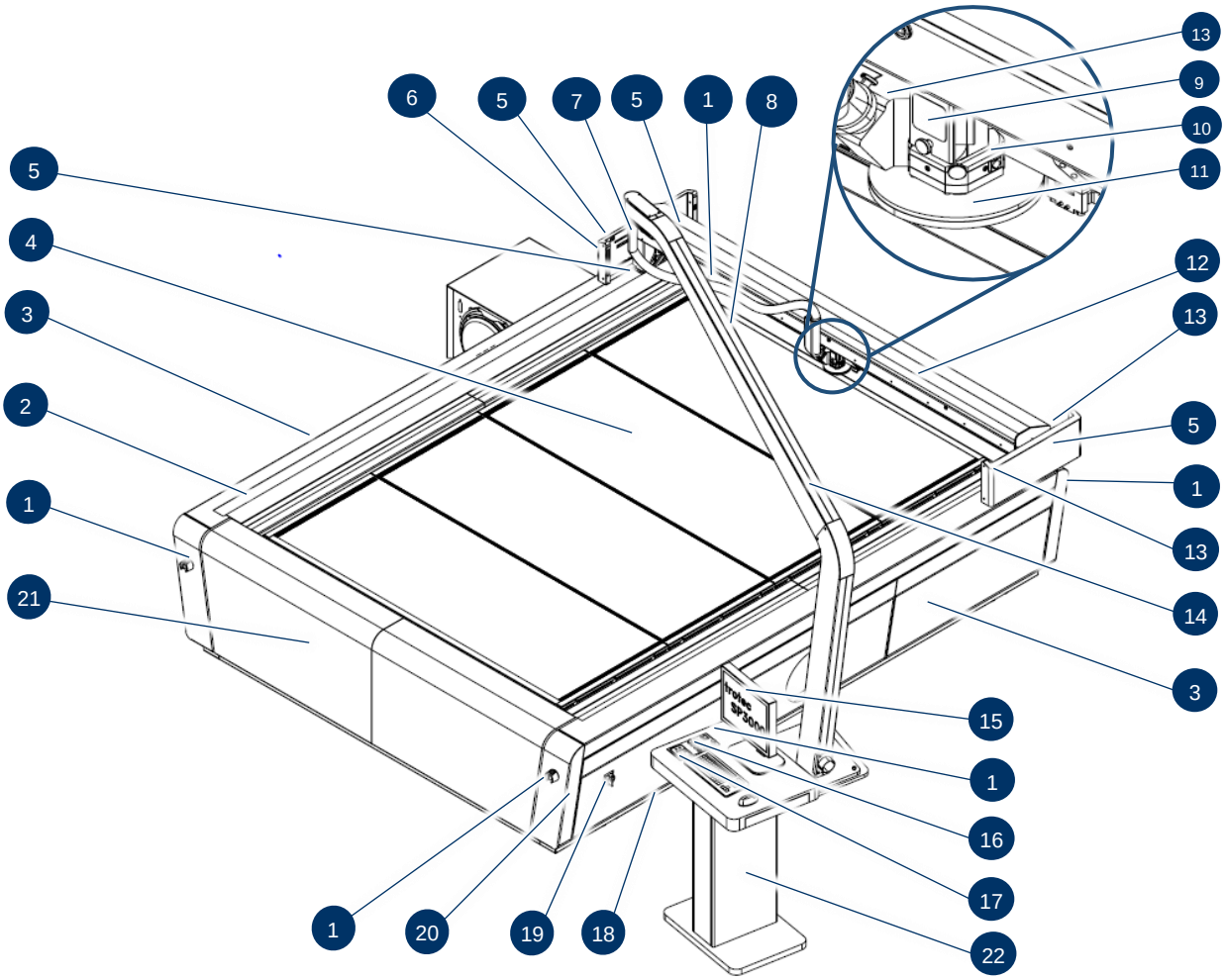
For any material not listed above please contact our application specialists or sales office in your area.

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

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

5 Machine overview

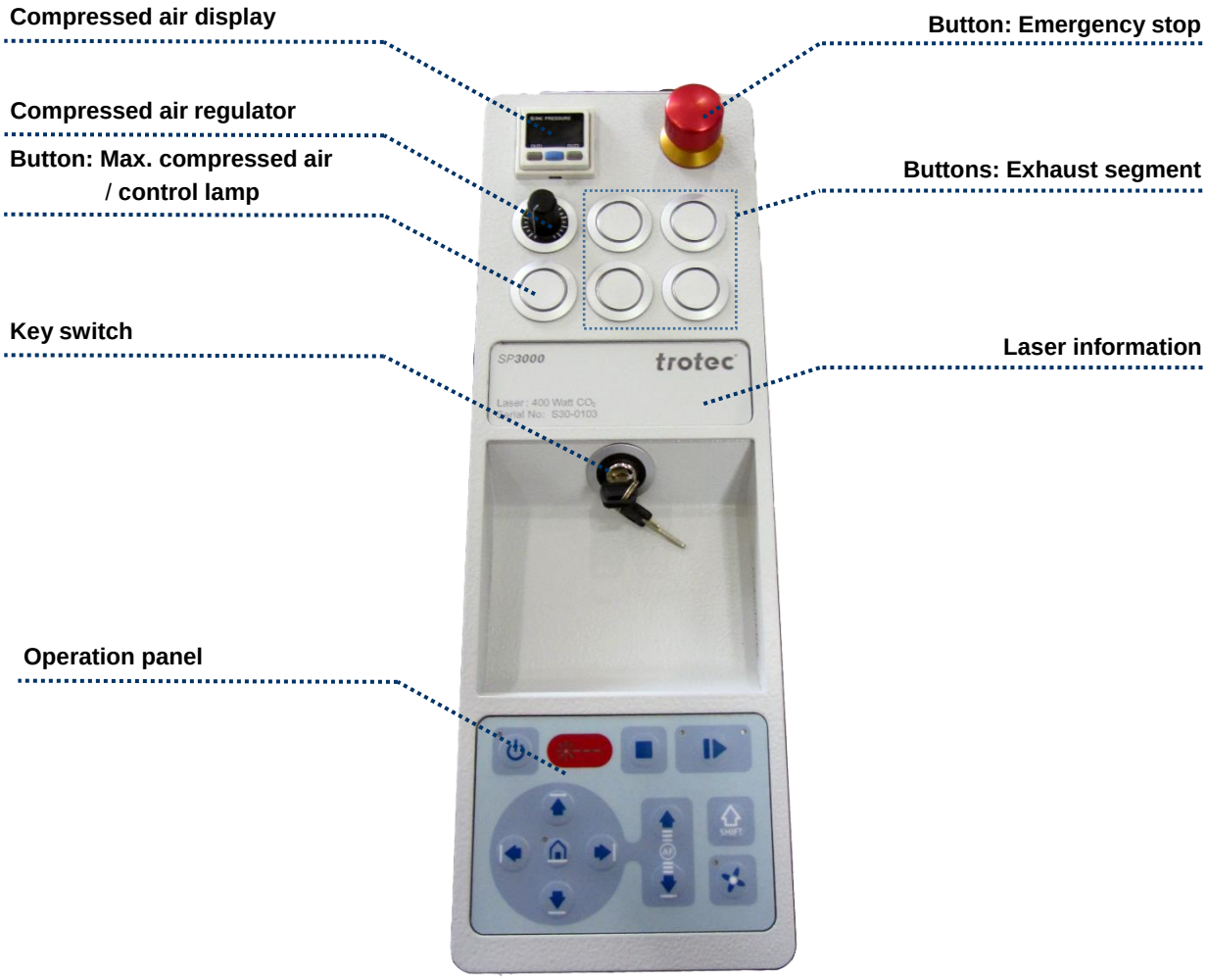
5.1 General overview



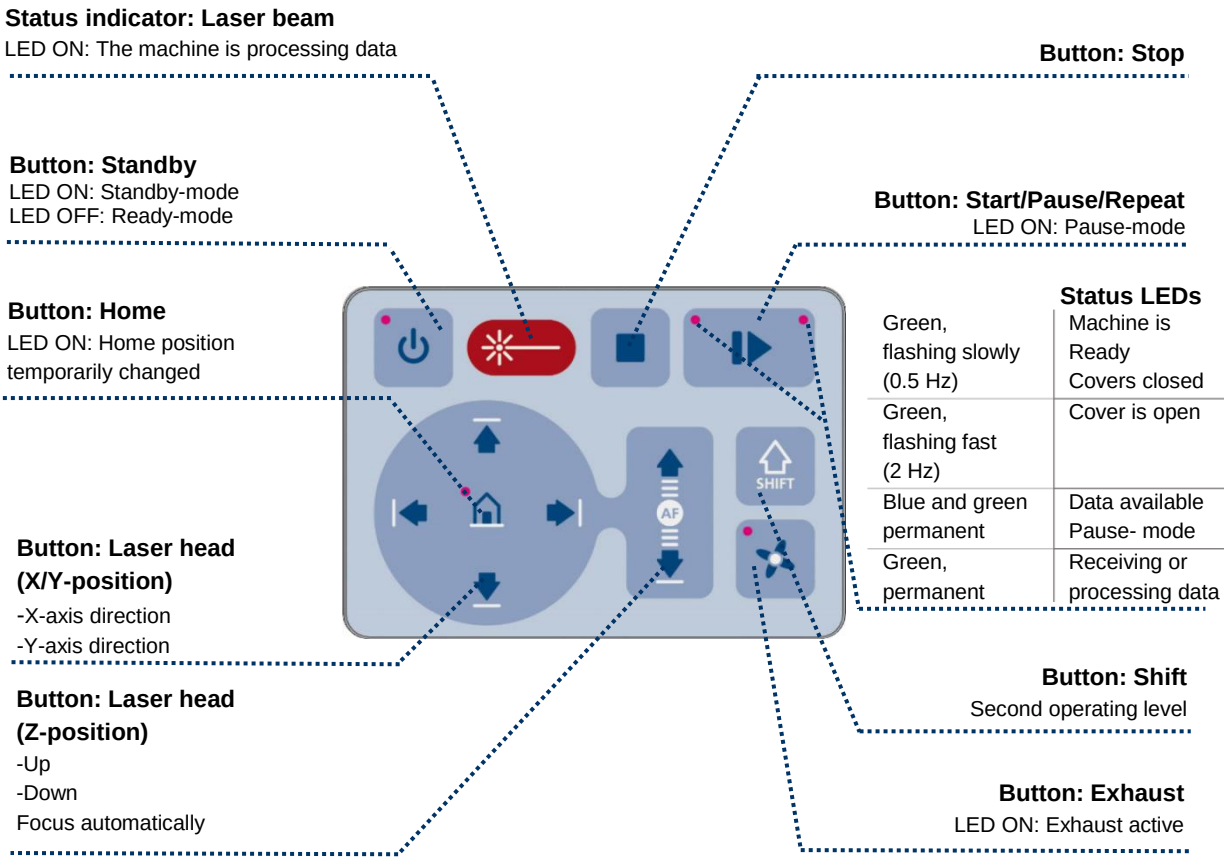
No	Description	No	Description
1	Emergency stop button	**12**	X-axis
2	Dust protection belt	**13**	Reflector
3	Side panel	**14**	Traveling exhaust
4	Tables	**15**	Monitor
5	Light sensor	**16**	Key switch
6	Bumper	**17**	Keyboard
7	Warning lamp	**18**	Connection cables (mains, exhaust and cooling system)
8	Head exhaust hose	**19**	Main switch
9	Laser head	**20**	Type plate
10	Hall sensor	**21**	Front and back cover
11	Laser deflector shield	**22**	Operating console

5.2 Operating elements

5.2.1 Operating elements overview



5.2.2 Operation panel



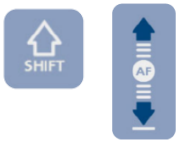
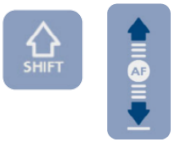
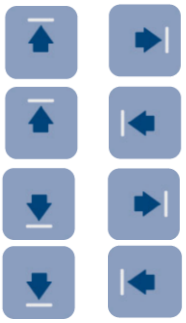
Description		
	**Status indicator: Laser beam**	LED ON: The machine is processing or receiving data.
	**Button: Standby**	LED ON: Standby-mode LED OFF: Ready-mode Press the button to switch to Standby-mode. Press the button again to switch back to Ready-mode. When the button is pressed while the laser head is moving up or down (e.g. during autofocus), the machine enters Standby-mode only after finishing the movement.
	**Button: Home**	LED ON: Home position temporarily changed Press the button for 3 sec. to temporarily define the position of the laser head as home position. (Marker in JobControl®) To deactivate the temporary home position, press Shift + Home.
	**Button: Laser head (X/Y-position)**	Press the button to manually move the laser head to the right, left, front or back. Press two of the four X/Y position keys simultaneously to move the laser head diagonally. Press Shift together with one of the X/Y position keys to move the laser head quickly to the corresponding end position.
	**Button: Laser head (Z-position)**	Press the button to manually move the laser head up or down. (Z-position) Press Shift together with the Z-position up key to move the laser head to the corresponding end position. To stop the movement press any Z-position key. **With option Sonar Technology™:** By simultaneous pressing of the two keys for Z-positioning laser head keys, the laser beam gets automatically focused on the workpiece. Press Shift together with the Z- position down key to move the laser head into the autofocus positon. To stop the movement press any Z-position key. For further information see chapter “Focusing”.

	**Button: Stop**	Press the button to stop the current working process.
	**Button:** **Start/Pause/Repeat**	Press the button to start the job which is currently on the plate in JobControl®. If a job is currently being processed, press the button to pause the job (LED ON). Press the button again to continue the interrupted working process (LED OFF). Press the button after a job was finished to repeat the actual job positioned on the plate in JobControl®.
	**Status LEDs**	Indicates the current status of the machine: Green, flashing slowly (0.5 Hz) – Machine is ready. All covers close Green, flashing fast (2 Hz) – Cover is open Blue and green, permanent – Data available Pause- mode Green, permanent – Receiving or processing data
	**Button: Shift**	For second operating level. Press the button together with any of the following keys to activate the following functions: **Shift functions:**

Shift + Exhaust	Air assist on/off
Shift + Laser head (X/Y-position)	Laser head moves quickly to corresponding end position (X- or Y-position)
Shift + Standby	Keypad locked/unlocked
Shift + Laser head UP	Laser head moves up to the corresponding end position
Shift + Laser head DOWN	Laser head moves down in the corresponding end position **With option Sonar Technology™:** Laser head moves into the autofocus position
Shift + Home	Deactivated temporary home position

	**Button:** **Exhaust**	Press the button to switch the exhaust on or off. LED ON: Exhaust activated LED OFF: Exhaust deactivated After completing the engraving process, the exhaust system can be switched off only after a few seconds more (follow-up time).

5.2.2.1 Keyboard shortcuts

Shortcuts		
	Shift + Exhaust	Air assist on/off
	Shift + Laser head (X/Y-position)	Laser head moves quickly to corresponding end position (X- or Y-position)
	Shift + Standby	Keypad locked/unlocked
	Shift + Laser head (Z-position) "UP"	Laser head moves up to the corresponding end position
	Shift + Laser head (Z-position) "DOWN"	Laser head moves up to the corresponding end position **With option Sonar Technology™:** Laser head moves into the autofocus positon
	Shift + Home	Deactivate temporary home position
	Laser head (Z-position) "UP"+"DOWN"	**With option Sonar Technology™:** Working Table moves up, into autofocus position (focusing automatically)
	X/Y position laser head + X/Y position laser head	Laser heads moves diagonally in the corresponding direction

5.2.3 Compressed air display

Display of the compressed air pressure.

By pressing the SET-button the output values can be switched between bar or psi. The arrow buttons have no functionality.

5.2.4 Compressed air regulator

By turning the compressed air regulator the pressure can be adjusted.

Notice If the pressure of the compressed air is set too high, it can cause damage to the machine.

- The supplied pressure of the extern connected compressed air must not exceed 10 bar.
- The maximum compressed air pressure during operation must not exceed 6 bar.

5.2.5 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.

5.2.6 Emergency stop button

When pressing an emergency stop button, the electric circuit immediately shuts off. The laser beam is interrupted, and all movements are stopped.

Notice Do not use the emergency stop button for the standard switch off procedure.

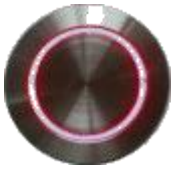
5.2.6.1 Emergency stop acknowledgement

1. Turn the emergency stop button counterclockwise to unlock it.
2. Reboot the laser device to acknowledge the laser fault.

5.2.7 Exhaust segment button

The table exhaust system is divided into four independent segments.
By pressing one of the four exhaust segment buttons, the vaccum of the respective section can be activated or deactivated. The working area which is free of material must not be covered.

5.2.8 Max. compressed air / control lamp



Max. compressed air button: by pressing the button the maximum air pressure gets switched on. This remains active as long as the button is pressed. The supply of the maximum compressed air is used for example for blowing of any flame formation.
Control lamp: ON, whenever an exhaust or cooling system is not connected or not active and therefore the interlock is not closed.

5.3 Tables (multifunctional table concept)

5.3.1 Cutting tables

5.3.1.1 Aluminum slat / Acryl slat cutting table

The cutting table with aluminum slats is mainly used for cutting thicker materials (up to 8 mm thickness) and for parts wider than 100 mm. Acrylics can be cut with no reflections by exchanging the aluminum with acrylic slats. One can reduce the number of supporting points by removing slats individually, depending on the
job.

5.3.1.2 Aluminum cutting grid table

This robust, universal cutting table is characterized by extremely stable combs and a long lifetime. It is particularly suitable for cutting tasks with parts smaller than 100 mm, as these remain in a flat position after the cut. Compared to the cutting table the aluminum cutting grid table has more supporting points.

5.3.1.3 Acrylic slat cutting table

The universal cutting table for the reflection-free cutting of thin acrylics with a thickness up to 8 mm. Like with the aluminum cutting grid table parts smaller than 100 mm remain in a flat position after the cut.

5.3.1.4 Honeycomb cutting table

This processing table is especially suitable for applications that require minimal back reflections and optimum flatness of the material, like for example cutting films.

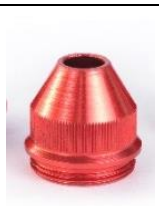
5.4 Lenses

Lenses (incl. focus tool) available:

	2,5” (Standard)		3,75"
	5,0"		

5.5 Nozzles

Nozzles available:

	Ø 3 Short, small diameter (Standard)		Ø 7 Short, big diameter (Standard)

6 Transport, unloading and packaging

6.1 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 instructions.

Observe the safety instructions 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.

6.2 Delivery state

Unless otherwise agreed, the machine and additional accessories get delivered in wooden crates.

Please refer to the "Pre-installation Guide" for further information.

Notice Keep the original packaging.

.

6.3 Temperature and humidity

Ambient temperature for transportation	-10 °C to 40 °C (-50 °F to 104 °F)
Humidity	max. 85% (non-condensing)

6.4 Required tools for unloading and transport

	Unloading the packaged machine parts	**Transport the unpacked machine parts**
Type	forklift	pallet truck
Weight	weight ≥ 1.5 t	weight ≤ 1.5 t
Fork extension	approx. 2 m (78.74 inch)	approx. 2m (78.74 inch)

6.5 Relocation of the machine

Notice 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.

If you want to relocate the machine, please contact your local Trotec Support.

7 Setup and installation

7.1 Safety notes

WARNING
Risk of injury

Improper assembly or setup can cause serious injury or damage.

- Work 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 instructions..

WARNING
Risk of injury

An incomplete, faulty or damaged machine can lead to serious physical injury or property damage.

- Assemble and install the machine only if the machine and its parts are complete and intact.

DANGER
Electric current

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

Note the following:

- If the system has been subject to significant temperature fluctuations, it must be brought back to room temperature before being commissioned.
- A laser system consists of high-quality electrical and optical components. Mechanical stresses, vibrations and impacts must always be avoided
- Ensure that there is sufficient distance to neighboring machines, walls or other fixed equipment.
- Keep the work area orderly and clean.
- Before assembling and installing the machine, check it to make sure it is complete and in good condition.

7.2 Operating environment

7.2.1 Temperature and humidity

Operating temperature:	15 °C to 25 °C (59 °F to 77 °F)
Air humidity:	40% – 70% (non-condensing)

7.2.2 Subsoil conditions

Conditions:

- Planarity ±5 mm (±0.1969 inch)
- Solid, firm and vibration-free soil
- Easy-care and clean floor
- Bearing capacity of the subsoil ≥1000kg/m² (10KN/m²)
- Machine point load 500kg/m² (5KN/m²)
- No special substrate preparation required

7.2.3 Environmental conditions

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

7.3 Setup and installation

The setup has to be carried out by Trotec technicians only.

7.4 Connections

7.4.1 Connecting the mains

Wrong voltage can cause damage to the machine

Do not operate the machine, if the voltages do not match, as this may cause damage tot he machine.

- The mains and operating voltage, as stated next to the connecting sockets must match.

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

7.4.2 Operating console connection

The connection has to be carried out by a Trotec technician.

7.4.3 Connecting a Trotec exhaust system

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 tot he machine.

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

The connection has to be carried out by a Trotec technician.

Follow the operation and maintenance instructions in this manual of the exhaust system.

7.4.4 Connecting a Trotec cooling system

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 cooling system, as this may cause damage tot he machine.

- Make sure that the mains voltage matches the voltage required by the cooling system.

The connection has to be carried out by a Trotec technician.

Follow the operation and maintenance instructions in this manual of the cooling system.

8 Operation

8.1 Before operation

WARNING

Risk of injury

Improper operation may lead to severe physical injury or property damage.

- Work 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 instructions.

Before commissioning, the following points need to be checked:

- Check the machine and its safety devices to ensure that they are in working order, in technically flawless condition and complete.
- Keep work area orderly and clean. Source of accidents!
- Ensure that the optical components are free from dust and dirt.
- Activate the extraction system.
- Ensure that the electrical installation is complete and the input voltage is correct.
- Check the environmental conditions using the technical specification.
- Familiarize yourself with the laser safety regulations.
- Fulfil all laser safety requirements.
- The system may be switched on only when all provisions for complying with laser safety have been checked by an authorized person and confirmed to have met the standards.

8.2 Software

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

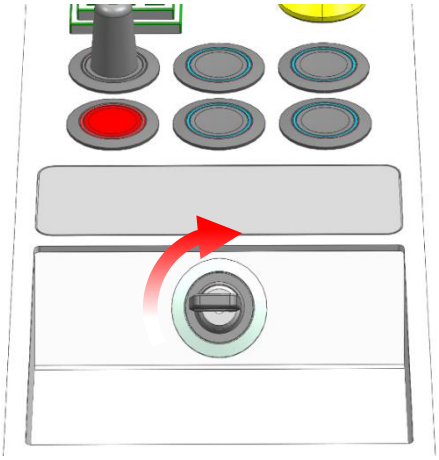
8.3 Power ON/OFF

8.3.1 Power ON

1. Ensure that no objects of any kind are present inside the processing area that could limit or obstruct the freedom of movement of the mechanics of the device.
2. Ensure that all safety devices are present and fully functional and the side panels are closed.
3. Turn on the cooling system by clockwise turning the main switch located at the back of the system to the right.

4. Switch on the compressed air supply.

5. Turn on the main power of the machine by clockwise turning the main switch. The main switch is located at the right front side of the machine



6. Turn the key switch clockwise and hold against the spring force. As soon the machine is started, release the switch. The switch returns to its initial position.

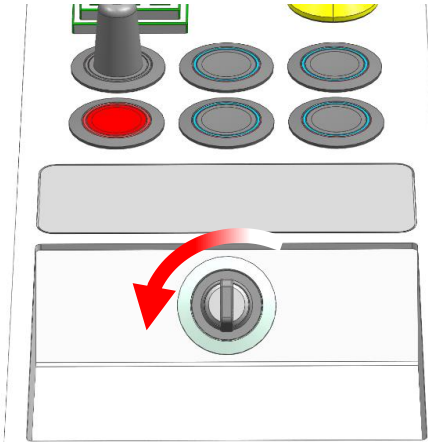
Info Only if the cooling system was switched on beforehand, the safety circuit gets closed and the machine can be turned on.

7. The machine starts the referencing process approx. 25 seconds after switching it on.

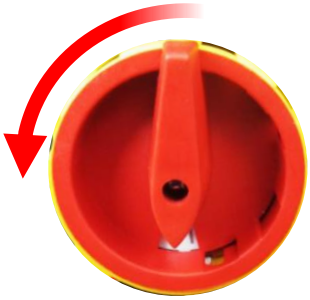
8. As soon the referencing process is correctly completed and an acoustic signal sounds, the machine is ready for operation.

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

8.3.2 Power OFF

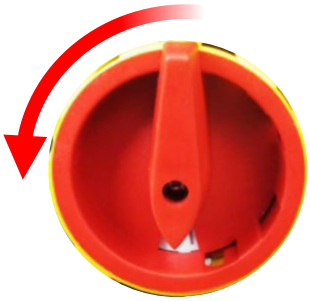


1. Turn the key switch counterclockwise.



2. Turn off the main power of the machine by turning the main switch counterclockwise. The main switch is located at the right front side of the machine.

Info By switching off the mains, all processing dat lost.



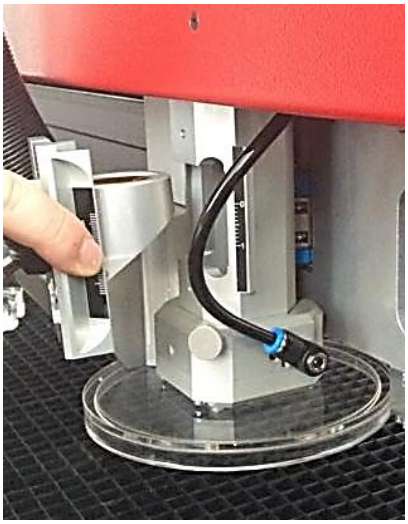
3. Switch off the compressed air supply.

4. Turn off the cooling system by counterclockwise turning the main switch located at the back of the system.

5. Clean the machine and ensure that no objects of any kind are present inside the processing area.

8.4 Lens placement

1. Blow away loose particles and dust by means of a bellows or compressed air (according to ISO 8573:2010 class 1).
2. Unscrew the lens fixation screws. (2 screws)



3. Carefully take out the lens.
4. Check the lens for damage.
5. If necessary, clean the lens with cleaning liquid and cleaning tissue (see chapter “Cleaning the optics”)
6. Check the lens once more for damage.
7. Insert the lens.
8. Fixate the lens with the fixation screws.(2 screws)

8.5 Table placement

Notice **Damage to 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 can be damaged, and impairment of the exhaust function is possible.

- Process workpieces only on suitable tables.

1. The working area offers space for four tables. Place the suitable tables on the multifunctional base frame.

Info Two person are required for the placement of a table.

2. Fixate the two outside tables by inserting a fixation strip at the side.
3. For more details about available table varieties see chapter "Tables".

8.6 Focusing methods

8.6.1 Overview

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.

→ **Manual focus mode**

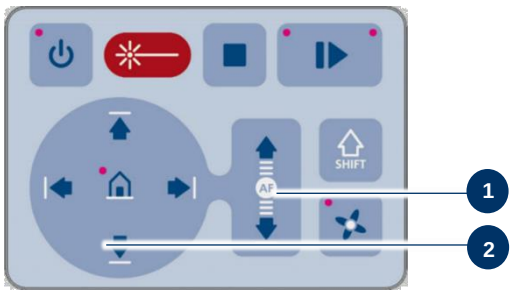
- Focus tool

→ **Automatic focus modes**

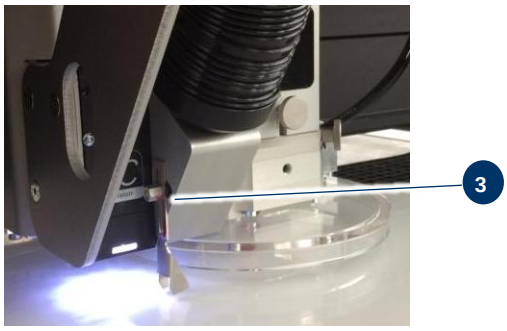
- Software focus (JobControl®)
- Sonar Technology™ (automatic focusing with ultrasonic sensor)

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

8.6.2 Focus tool



1. Move the processing head over the material to be engraved by means of the X/Y position keys (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 laser head (Z position) key (1).
4. Before the focus tool reaches the work piece, move the working table downwards very slowly and step by step by briefly tapping the laser head (Z position) key (1) until the focus tool tilts to the side or falls off its position.

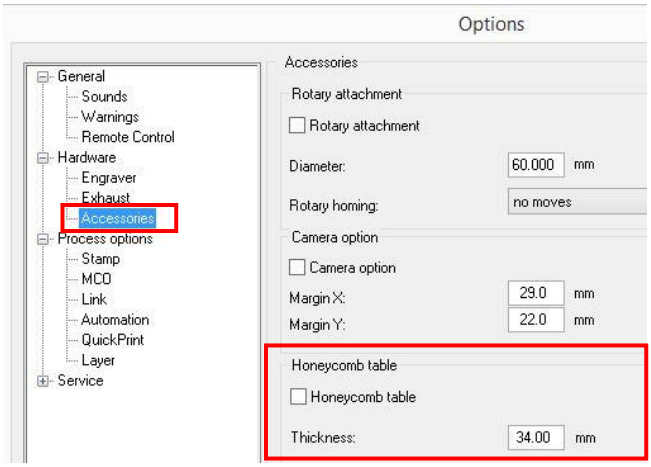
   Now the lens is focused onto the surface of the material.

8.6.3 Software focus

The following values must be entered in JobControl®:

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

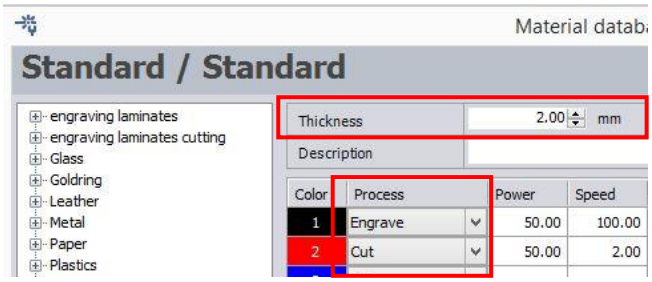
Notice The values entered must match the material, table and lens in the machine in order to avoid a head crash.
When using spacer the total material thickness is determined by the thickness of the spacer and the material.



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 got to Settings/Material database in the menu.

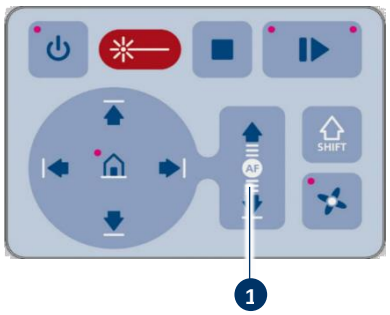


6. Enter the material thickness.
7. Enter the process type.

8. Click on the icon “Focus laser". The working table moves automatically to the correct position (moves in Z direction).

8.6.4 Sonar Technology™

Notice Strong contamination of the ultrasonic sensor can lead to defects from head crashes (working head hits material or working table).



5. Make sure that the ultrasonic sensor is clean.
6. Select the lens type in the menu bar of JobControl®.
7. Press the two Z-positioning keys (1) simultaneously for the laser beam to get automatically focused on the workpiece.

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

Info This focusing mode is especially well-suited for all sound-reflective materials.

9 Maintenance

9.1 Safety notes

WARNING

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 instructions.

WARNING

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

Danger of electrical shock

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

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

9.2 Maintenance schedule

System Components	Daily	Weekly	Monthly	Yearly
Laser				
Entire working area - general cleaning	Clean whenever required			
Lens and protective glas	Check Clean whenever required			
Laser deflector shield and nozzle	Check Clean whenever required			
Laser head exhaust	Check Clean whenever required		Every 6 month: Check Clean whenever required	
Vent slots (inside the machine)	Check Clean whenever required			
Safety devices	Check Clean whenever required			
Ultrasonic sensor (Option)	Check Clean whenever required			
JobControl® Vision safety glass (if available)		Check Clean whenever required		
Compressed air system				
Maintenance unit	According to the operation manual of the compressed air system			
Exhaust System				
Bag filter	According to the operation manual of the exhaust system			
Filter mat				
Particle filter				
Activated carbon filter				
Cooling system				
Pump filter	According to the operation manual of the compressed air system			
Condense heater				
Cooling liquid				
Pump				

Info 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.

9.3 Cleaning the machine

1. Move the X-axis into a position in which it is easiest for you to clean the surface and interior of the machine with a window cleaning agent and paper towels.
2. Switch off and disconnect the machine from the mains.
3. Remove the tables.
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 vent slots of the exhaust box inside the machine using a dry or damp cloth, broom or vacuum cleaner.
6. Clean the cover elements and panels using a dry or slightly damp cotton cloth. Do not use paper towels as they could scratch the acrylic.

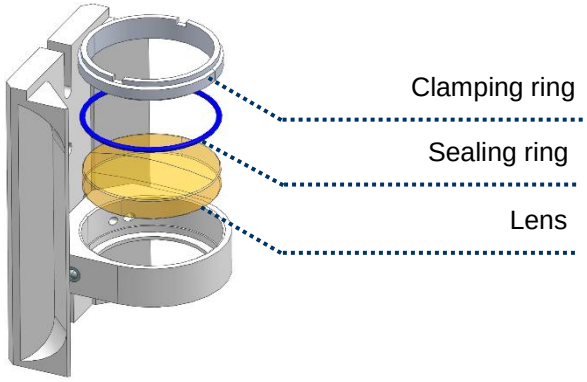
9.4 Cleaning the optics

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

Info The following cleaning products are available as accessory parts:

- Lens cleaning cloth (Part no. 69249)
- Lens cleaning liquid (Part no. 69248)

9.4.1 Lens design

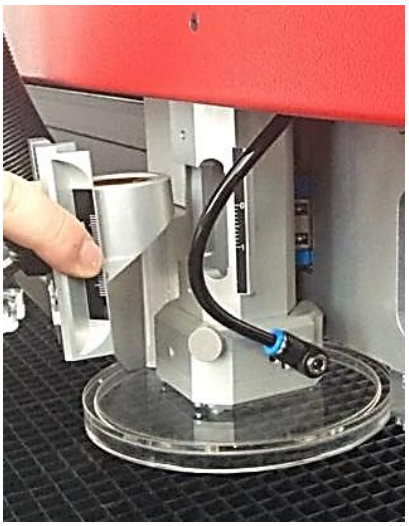


9.4.2 Cleaning the lens

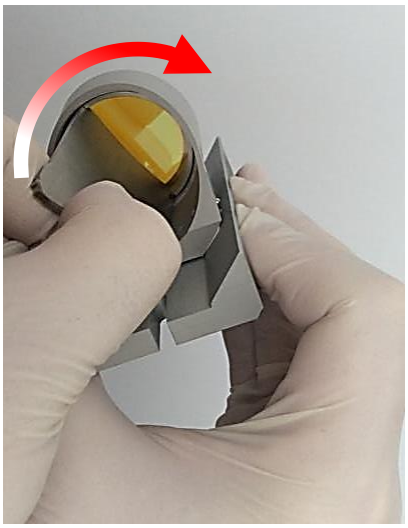
WARNING
Zinc selenide lens, telescope and laser exit window
Soiled optics absorb laser radiation and can thus be destroyed. Broken or damaged lenses as well as thermal decomposition of lenses release particles which cause serious damage to the health.

- The passive reflectors and optics in the area of the 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 (wear cloves).
- 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 users' country.
- **Lenses with scratches or penetrations must not be used anymore!**

1. Blow away loose particles and dust by means of a bellows 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. Unscrew the lens fixation screw.(1 screw)

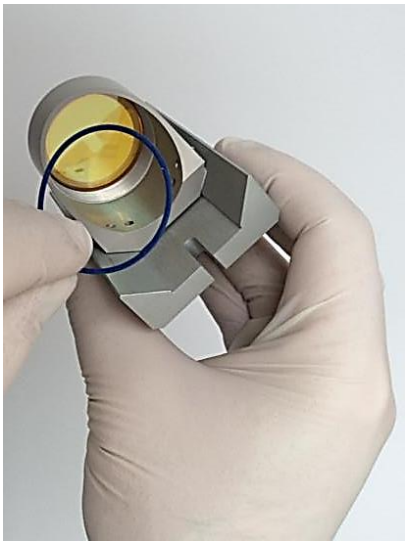


5. Carefully take out the lens. (2 screws)

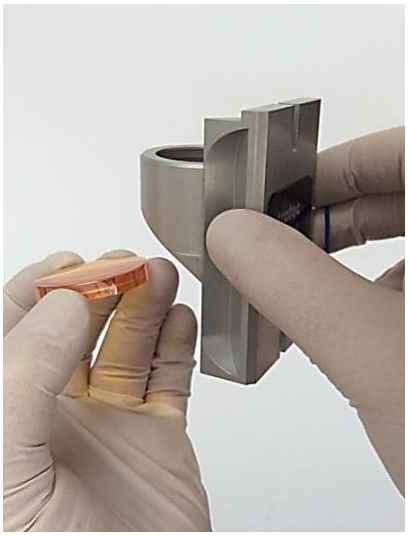


6. With the aid of the supplied key tool loosen the clamping ring by rotating it clockwise.

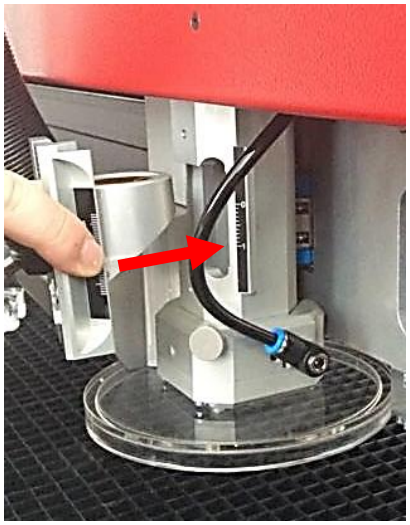
Key tool



7. Remove the clamping and sealing ring.

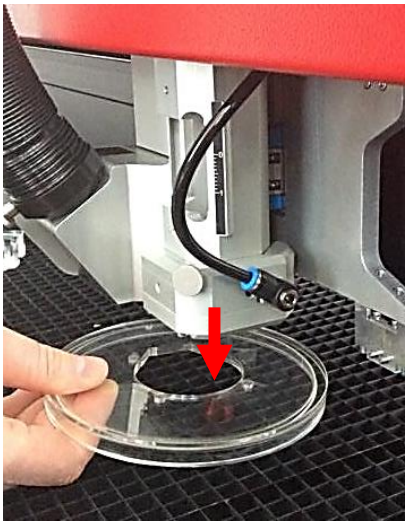


8. Carefully remove the lens and rinse it with cleaning liquid to wash away coarse soiling.
9. Check the lens for sign of damage.
10. Put some cleaning liquid onto the lens and leave the liquid for 1 minute to take effect.
11. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
12. Now carefully insert the lens with the convex side up into the lense holder.
13. Insert the sealing and clamping ring and fixate the clamping ring using the key tool.

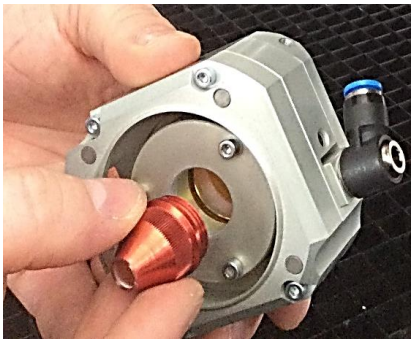


14. Carefully insert the lens with the lens holder into to laser head and fixate it with the lense fixation screws. (2 screws)

9.4.3 Cleaning the laser deflector shield and nozzle

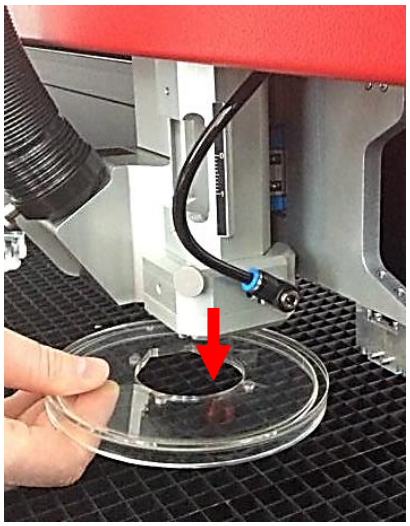


1. Take off the magnetically fixed laser deflector shield.
2. Clean the laser deflector shield with a dry or damp cloth on both sides.



3. Turn the nozzle clockwise to be able to take it out.
4. Fix back the laser deflector shield on the laser head.

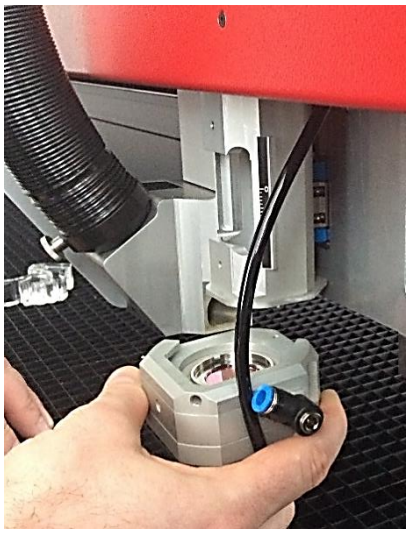
9.4.4 Cleaning the protective glas



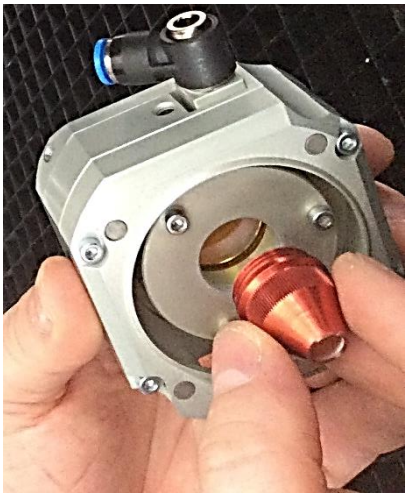
1. Take off the magnetically fixed laser deflector shield.
2. Clean the laser deflector shield with a dry or damp cloth on both sides.

3. Unplug the air assit hose..

4. Remove the fixation screw. (1 screw)



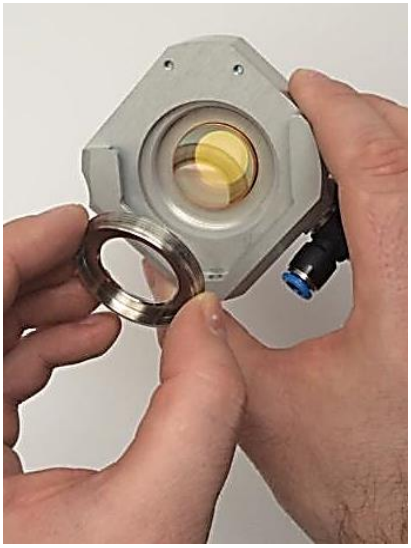
5. Carefully take off the protective glass housing.

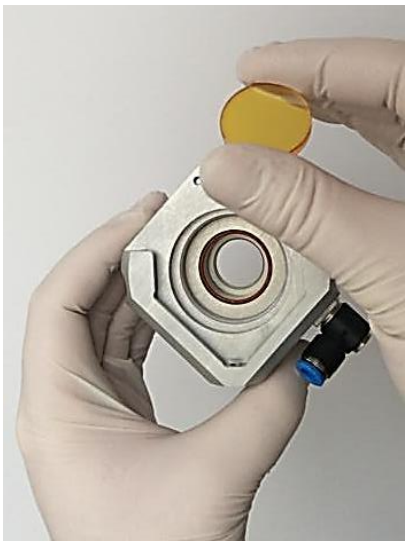


6. Turn the nozzle clockwise to be able to take it out.

7. With the aid of the supplied key tool loosen the clamping ring by rotating it clockwise.

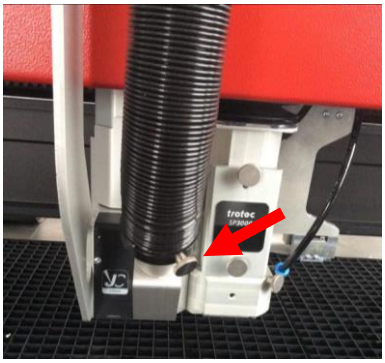
Key tool



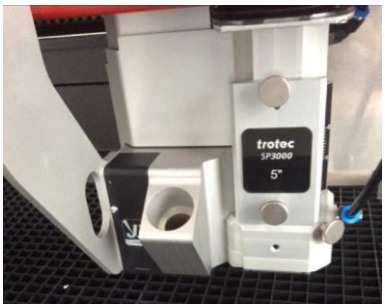


8. Remove the clamping ring.
9. Take out the protective glass.
10. Clean the protective glass with a dry or damp cloth on both sides.
11. If necessary take out the sealing ring and clean the housing with a dry or damp cloth.
12. Insert the sealing ring again.
13. Now carefully insert the protective glass and clamping ring and fixate the clamping ring using the key tool.
14. Fix back the protective glass housing on the laser head.

9.5 Cleaning the head exhaust



1. Loosen the fixation screw and remove the exhaust hose. (1 screw)



2. Clean the air flow duct and connection point.

9.6 Cleaning the vent slots of the table exhaust

1. Move the table into a position in which it is easiest for you to clean the slots of the table exhaust inside the machine.
2. Switch off and disconnect the machine from the mains.
3. Remove the tables.
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 vent slots of the exhaust box inside the machine using a dry or damp cloth, broom or vacuum cleaner.

9.7 Cleaning the 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.

10 Troubleshooting

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

DANGER
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.

Notice System failures that cannot be remedied can cause damage to the machine.
- Disconnect the machine from the mains and contact your local support team.

10.1 Errors, cause and resolutions

Problem	Possible Cause	Resolution
Too low engraving depth	Imprecise focusing Dirty optics	Check focus Clean optics
Blurred edges	Imprecise focusing	Check focus
Missing cut lines	Zero passes in material database Line thickness in Corel Draw too big Color was skipped in JobControl®	Increase the amount of passes in the JobControl® material database Reduce line thickness to smallest possible value Set color to cutting in the JobControl® database
Waviness of the lines	Lens is loose	Check lens and lens holder
No visible marking result	Too low laser power Too high speed Not focused Wrong focus tool	Increase power setting Reduce speed Check focus Change focus tool When using Auto focus, check the settings within the software (lens, material thickness, table)

Problem	Possible Cause	Resolution
Fine details on stamps are engraved too thinly	Too steep shoulders	Choose other shoulder or edit (flat/medium/steep): Options/Process Options/Stamp
The size to be engraved or cut does not match the size in Corel Draw	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 Corel draw 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 startup	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

Problem	Possible Cause	Resolution
Offsets between engraving jobs and cut lines	↱ Speed too high	↱ Reduce speed
Other faults		↱ Contact Trotec support

11 Contact details

11.1 Technical Support

In case of questions, contact our experienced local technical support team.

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):

- **What happened and what you were doing when the problem arose.**
- **What you have done so far to correct the problem.**
- **Serial no (see type plate)**
- **Error code**

11.2 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

11.3 Technical Documentation

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

Technical documentation: +43 (0) 7242 239 - 7000
E-mail: techsupport@troteclaser.com

12 Disassembly

Info The disassembly of the machine described within this manual may only be carried out by Trotec support technicians. Please contact your local Trotec Support.

13 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.

14 Appendix

14.1 Acceptance form

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.

Thank you very much.

Please check applicable items:

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

The machine with the machine designation:

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

City, Date

Instructed person:

Name/position

Company stamp / Signature

14.2 Training verification form

Employee/Trainee: .....

Trainer: .....

Date of Training: .....

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

1. Machine Function
2. Danger Areas
3. Warnings
4. Position of **Emergency Stop** Button
5. Personal Protective Equipment
6. Operating Equipment
7. Work Flow
8. Setting Up
9. Taking into Service and Shutdown
10. Reporting of Unexpected Working Results and Actions to Be Taken
11. Reporting of Failure and Actions to Be Initiated
12. Responsibility for Troubleshooting
13. Operation Manual and its Storage Location for Inspection

....

Signature of Trainer Signature of Trainee

14.3 Response form

In case of any trouble with the machine, please provide the following information and additionally create a service file (the procedure for creation of a service file is described on the following pages).

Date	

Machine Details

Serial Number	
JobControl® Version	
Driver Version	
Layout Software	
Firmware Version	

Contact Details

First Name	
Last Name	
Country	
Phone	
Email	

Problem Description

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

What happened before the error occurred? (Thunder & Lightning, Windows-Update, …)

What attempts were made to solve the problem?

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

14.4 How to create a service file

1. Start JobControl®.

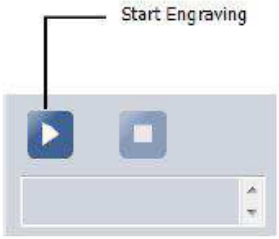
2. Position the job that may cause the error on the plate.

   This can be done by either:

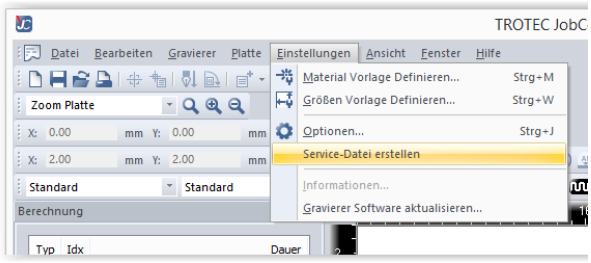
   double clicking on the job in the queue

   single-clicking the job in the queue and dragging it onto the plate

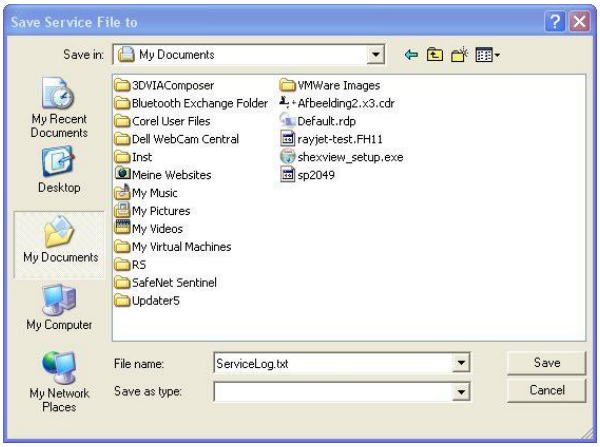
   single-clicking the job in the queue and then clicking on the icon “Position Job”



3. Run the job and leave the job on the plate.

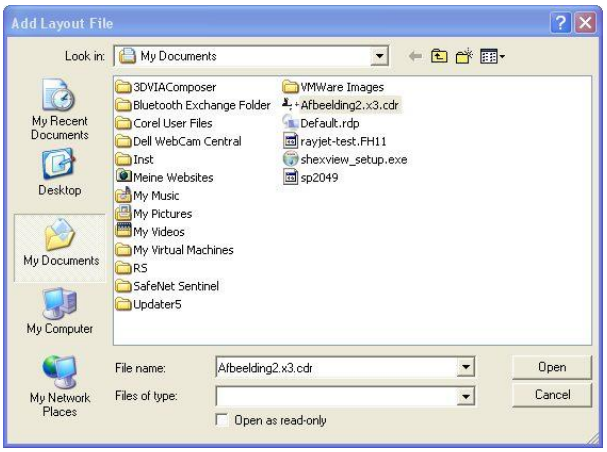


4. Go to “Settings” > “Create Service File”.

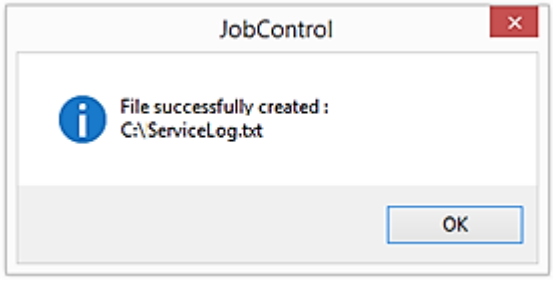


5. The window „Save Service File to” shows up.

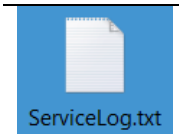
6. Please select a directory to save the file into and click on „Save”.



7. The window „Add Layout File” appears.
8. Select the layout file that was sent to JobControl® and possibly caused a failure (e.g.: a CorelDraw file, Photoshop file, AutoCAD file,…). Now click on „Open”.



9. The following window shows the location to which the successfully created service file was saved.



10. Send the service file “SeviceLog.txt” together with a screenshot of the error message and a detailed description to your sales representative or to techsupport@troteclaser.com.