trotec
laser. marking cutting engraving

SP3000

Operating manual

8034

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ENGLISH (Translation)

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laser. marking cutting engraving

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Content

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 Complementary documentation

Complementary documentation can be found on the supplied DVD.

Software manual Trotec Laser GmbH JobControl®	JobControl Operationmanual
Pre-installation guide	SP3000 Pre-installation guide

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)

- Laser machine
- boom for travelling exhaust
- Operating console
- Dell Power PC for the operating console (according to order)
- DVD (with laser software, printer driver and operating manual)
- Fokus tool(s) (according to lens order)
- Cleanin kit for optics
- Nozzles (2 pieces: ø3 and ø7 mm)
- Lens: 2.5" (standard), 3.75", 5.0" (or according to order)
- Multifunctional table concept (according to order)
- Allen key set
- Open-end wrench
- Power cord 5 meters (according to order)
- USB computer connection cable
- RS232 serial computer connection cable (according to order)
- Exhaust connection cable (according to order)
- Exhaust system (according to order)
- Cooling system (according to order)
- Compressed air connection "quick coupling" (one hand universal quick lock coupling)

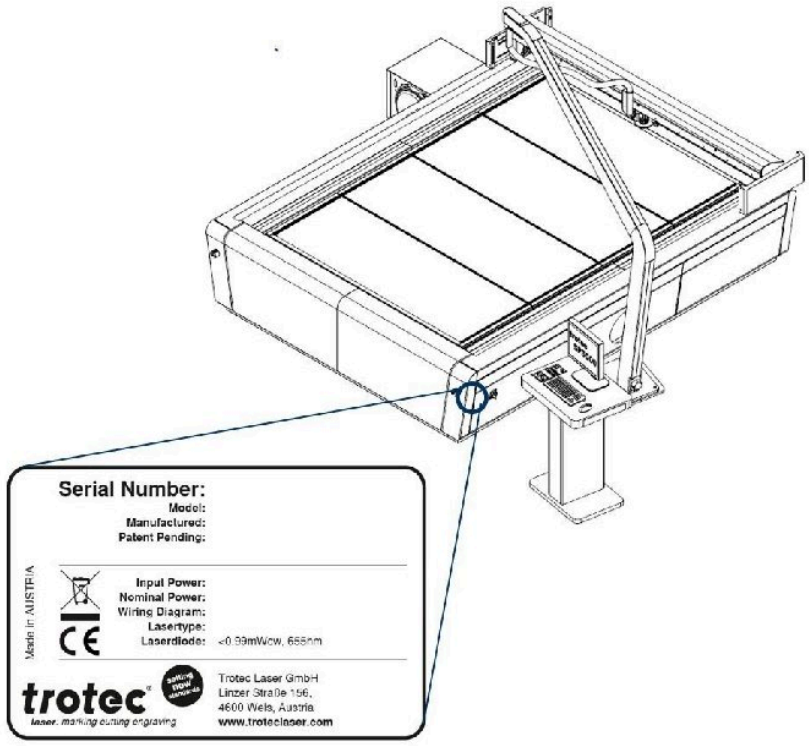
The actual scope of delivery may deviate from the explanations and illustrations described here in the case of special versions, the use of additional order options or due to the latest technical changes.

1.5 Type plate

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

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

Serial number:	
Model:	
Year of manufacture:	



2 Safety

TO AVOID POSSIBLE HARM READ AND FOLLOW THESE INSTRUCTIONS.

The machine is built at the time of 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 Safety principles

2.1.1 Intended use

The machine described in this manual is intended exclusively for laser engraving and laser cutting, of material according to the intended use of the machine using the supplied software.

For material details see chapter "Materials" or contact your local Trotec representative, or your local Technical Support.

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.

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 Manual and in particular the "Safety" section, and comply with the instructions.

Organisational measures:

- Personal protective equipment
- Inspection of the laser protection wall
- Laser safety instructions/laser safety training
- Monitoring by Laser Safety Officer

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 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

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.

Warning

In normal operation, the Z-axis position may only be operated in focus.

– **The distance in Z between the laser deflector shield and the material surface must not exceed 3 mm.**

Otherwise there is a risk of reflected or vagabonding radiation escaping beyond the laser deflector shield.

Caution

At larger distances, the emission of emissions (reflected radiation) cannot be completely excluded.

In order to avoid any resulting dangers, the operator must take suitable measures for shielding such as laser safety enclosures (see chapter Laser Classes), personal protective equipment, ... for the user.

Notice

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

However, secondary radiation may penetrate from the safety plate if necessary. If visible, this secondary radiation can cause glare to employees. The pilot laser is also a possible source of glare. Glare is usually reversible.

- Observe organizational measures (knowledge transfer during enrolment).
- Avoid reflected radiation or radiation from the pilot laser by turning away.
- If reflected radiation enters the eye, close eyes intentionally immediately and turn away.

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").

2.2 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

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.

Warning Laser

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.

Notice

Laser classification

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).

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.

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.

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

Warning Laser

Obligations of the operator for the operation of class 4 lasers (US: class IV):

- Observe official regulations for the business location in accordance with the applicable local legal regulations (on accident prevention regulations or employee protection), e. g. DGUV regulation 11 for Germany.
- According to DGUV regulation 11 "Laser radiation", as well as national regulations: Written appointment of a competent laser safety officer for compliance with the relevant regulations.
- Mark the danger zone as such by attaching warning lights and warning signs on the outside.
- Protect the danger zone against unauthorized access.
- Wear appropriate laser safety glasses within the danger zone that are matched to the wavelength and power of the laser.
- Install an additional and well visible warning light to warn the operator of the presence of laser radiation.

Compliance with the points above does not absolve the operator from meeting the relevant standards and guidelines for the operation of a Class 4 laser system.

Laser safety enclosure

The enclosure of the beam path corresponds to test class T3 according to IEC 60825-4 "Classification of laser guards".

Recommendations for test class T3:

- Continuous monitoring of the transparent laser guards made of PC and PMMA for shielding the laser radiation. During visual inspection, special attention should be paid to discoloration or turbidity during operation.
- Check the minimum protection duration of the laser guards of 10 seconds by means of a suitability test.

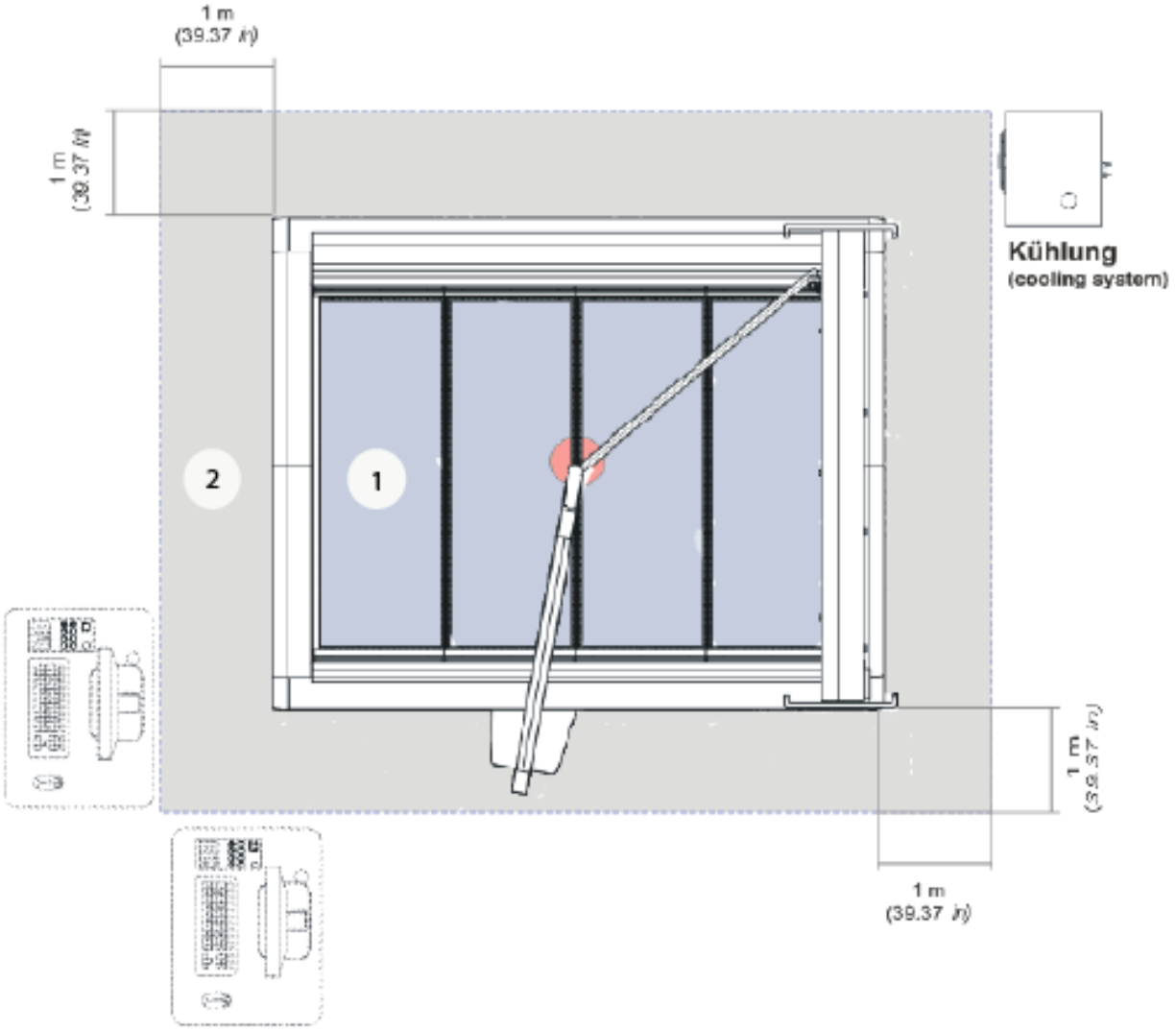
Transparent laser guards in the SP series are the laser deflector shield made of PC and additionally in the SP4000 the laser protection fence made of PMMA.

Transparent laser guards: laser deflector shield made of polycarbonat (PC)

Procedure for deviations:

- If a turbidity of the transparent laser deflector shield made of PC is detected during continuous monitoring, there is a danger of indirect radiation.
- Laser guards for shielding the laser radiation.
- Test the minimum protection duration of the laser deflector shield of 10 seconds by means of a suitability test.

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 consists of the working surface and the operating range of the laser circular area of approx. ø 5cm (1.97 inch) below the laserhead.
2	Working area of the operator	The safe working area (laser class 2 ; US class II) consists of the space requirements of the machine and a distance of min. one meter (39.37 inch) around the machine.

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 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 Operating and service personnel requirements

The requirements for the operating and service personnel are:

- The personnel must have read and understood this manual and in particular the "Safety" section.
- The personnel must not be under the influence of drugs, alcohol or reactivity affecting medication when working on or with the machine.
- The personnel must be familiar with using the CO_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 service technicians	Qualified personnel are those who can judge the work entrusted to them and detect potential risks based on their occupational training, knowledge and experience as well as their understanding of the relevant regulations.

2.5 Machine identification (warning and safety stickers)

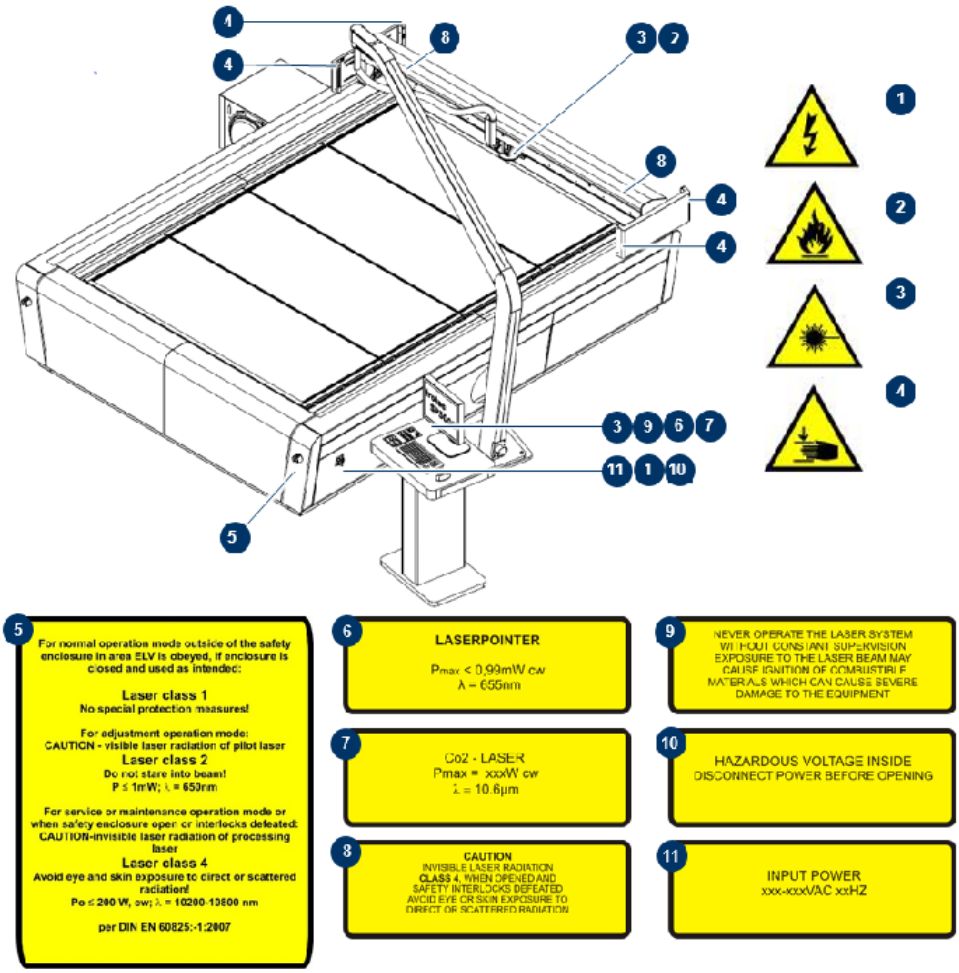
The warning and information labels are attached in the positions of the machine that could represent a source of danger during set-up and operation. Therefore, pay attention to the information on the labels.

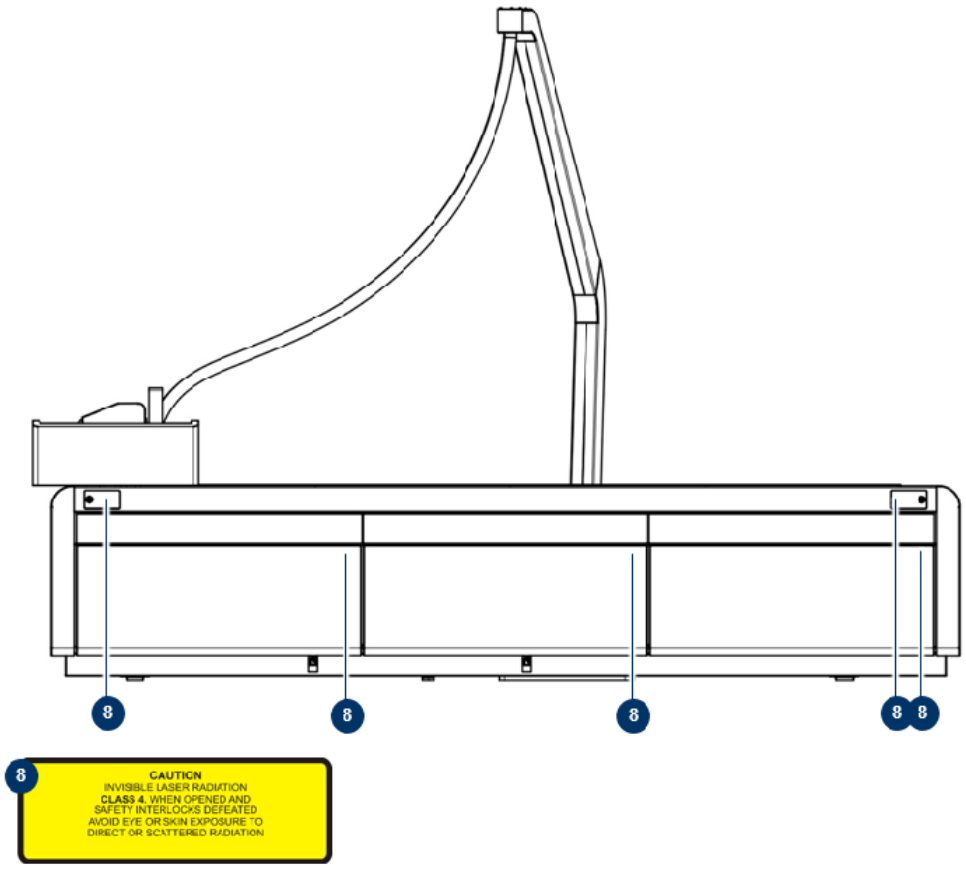
Caution

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.




8
8
8
8
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

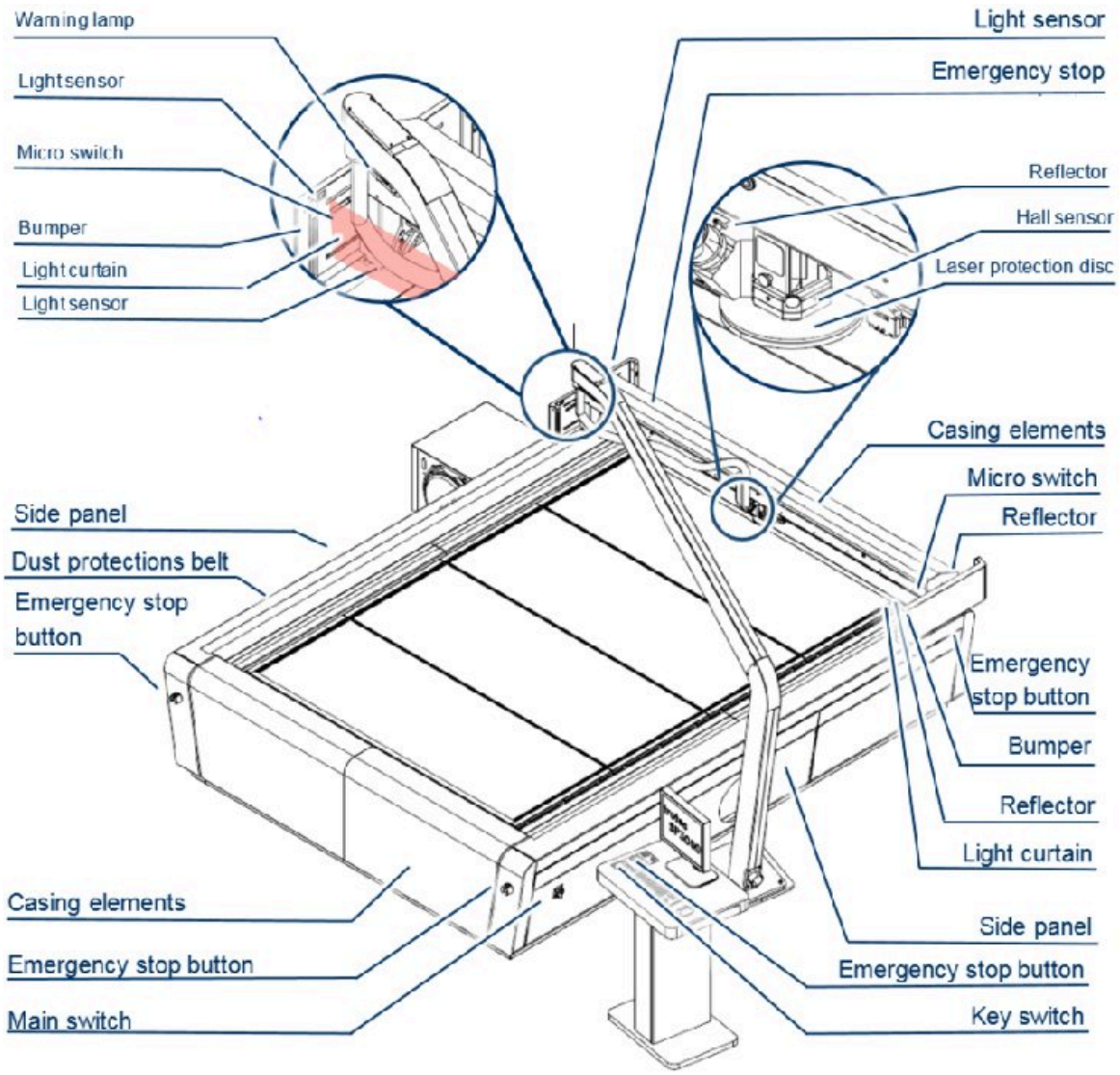
Warning

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 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:



2.6.1 Main switch

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

2.6.2 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.

2.6.3 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 laser stop device is:

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

2.6.4 Casing elements, side panel and covers

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

2.6.5 Warning lamp

The warning lamp sends out visual signals.

RED		GREEN		Yellow		Description
flashing	permanent	flashing	permanent	flashing	permanent	
	✓					Open Interlock
✓						Error
			✓		✓	Busy-mode: data processing or receiving
			✓	✓		Pause-mode
			✓			Idle-mode: machine is ready. Fully functional safety devices.
		✓				Referencing
					✓	Test pulse

Notice

If no LED is lit, the machine is in Standby-mode.

2.6.6 Safety bumper and micro switch

The spring-loaded safety 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.

2.6.7 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.

2.6.8 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.

2.6.9 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.

2.6.10 In case of safety device malfunction

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.

2.7 Tests to be carried out

Requirement

The test described below concerns the sensors installed on the machine and must be carried out by a person instructed by Trotec before each shift, at the latest after 8 hours of operation, to ensure the correct functioning of all safety-relevant components.

Should errors or functional deviations occur as a result of the test, the machine is deemed not to be ready for operation and must not be put into operation until the cause has been clarified!

Non-observance can lead to injuries or damage to the machine!

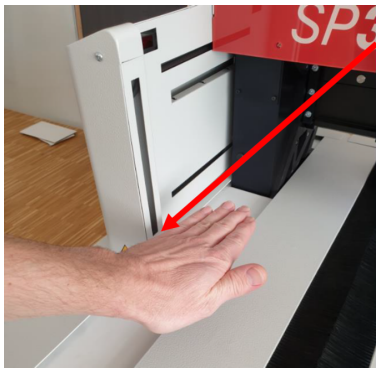
If you have any questions, contact our experienced Technical Support in your local area.

General test procedure for sensors

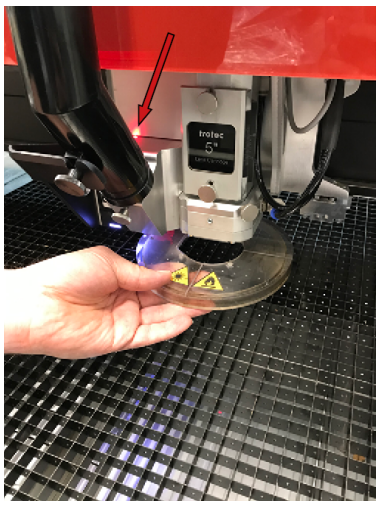
1. Switch on the machine and have it referenced.
2. Check the corresponding sensors (see table) by manual interruption.
3. The indicator lamp must light up red during the entire duration of the test!

4. Remove the hand from the sensor area to release it again.
5. The display of the signal lamp must light green! In addition, an acoustic warning signal must sound within 5 seconds.

The following sensors must be tested:

Sensors	Sensor area	
	Illustration	Interrupt/ release
a) Light curtain	 	• Interrupt: Move flat hand slowly from the bottom edge to the top edge. • Release: Once at the top, remove the hand from the sensor area.
b) Infrared light barrier: x-portal on the top of the frontside		• Interrupt: Cover opening of the sensor. • Release: Release opening of the sensor again.

Sensors	Sensor area	
	Illustration	Interrupt/ release
c) Infrared light barrier: x-portal on the top of the backside		• Interrupt: Cover opening of the upper sensor on the back of the portal. • Release: Release opening again.
d) Infrared light barrier: x-portal on the bottom of the backside		• Interrupt: Cover opening of the lower sensor on the back of the portal. • Release: Release opening again.
e) Infrared light barrier: y-portal		• Interrupt: Press in the left cover strip to a depth of approximately 5 cm. • Release: Release cover strip again.

Sensors	Sensor area	
	Illustration	Interrupt/ release
f) Safety bumper left		• Interrupt: Move safety bumper from the rest position to the stop. • Release: Let out the safety bumper and let it swing back into its resting position. • Repeat the test in the other direction (must be done on each side).
g) Safety bumper right		• Interrupt: Move safety bumper from the rest position to the stop. • Release: Let out the safety bumper and let it swing back into its resting position. • Repeat the test in the other direction (must be done on each side).
h) Laser protection disc		• Interrupt: Remove laser protection disc. • Control lamp must light red. • Release: Replace laser protection disc. • Red control lamp must go out.

2.7.1 Mechanical and electrical brake test of the x portal

The test described below applies to the axes of the machine in the y-direction and x-direction.
In this chapter, the axes are referred to as "portals".

The test must be carried out weekly by a person instructed by Trotec to ensure the correct functioning of all safety-relevant components.

Should errors or functional deviations occur as a result of the test, the machine is deemed not to be ready for operation and must not be put into operation until the cause has been clarified!

Non-observance can lead to injuries or damage to the machine!

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

Test setup

- Reference the machine so that the portal is located in the y-direction at the reference point.
- Position the test block approximately 100 cm in front of the rear edge of the working area.
  The test block can be selected individually. A cardboard box was used in the illustration.

Figure 1: Positioning of the test block.

- Position the portal at the center of the working area.
  The holder for the exhaust and the locking of the x-axis should be in one line.

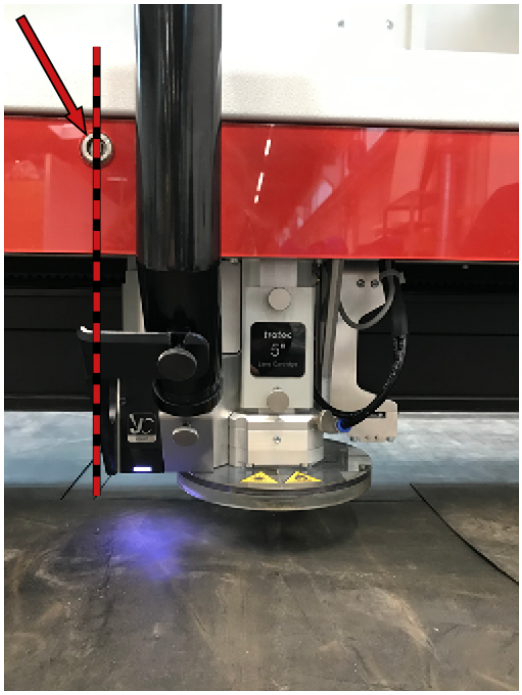


Figure 2: Exhaust holder and locking are one line.

Test procedure

- Move portal in rapid traverse in y-direction.

– To do this, press the shortcut *shift-button* + *laser head control button Y+* (see chapter Shortcuts).

Correct functioning: Automatic motor braking of the portal is initiated.
Distance between holder for head exhaust tubing and test block must be at least 20 mm!

Figure 3: Distance after successful check.

Requirement

The correct function of all emergency stop buttons must be checked monthly (see maintenance schedule)!

Should errors or functional deviations occur as a result of the test, the machine is deemed not to be ready for operation and must not be put into operation until the cause has been clarified!

Non-observance can lead to injuries or damage to the machine!

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

General test procedure for emergency stop buttons:

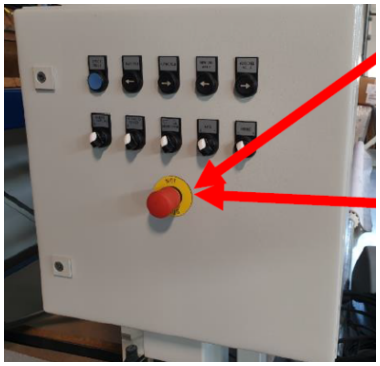
The machine can be referenced before starting the test. However, this is not mandatory.

1. Set the main switch to position "1".

2. Perform test - see description below.
3. With correct function: Main switch drops to position "+".

4. Move main switch to the initial position "0".
5. Return main switch to position "1" and continue the test series or further processing.

Testing of the following emergency stop buttons:

Sensors	Sensor area	
	Illustration	Interrupt / release
a) Operating console		• Trigger emergency stop button. • Actuator must engage in the tripping position! • Unlock the emergency stop button again.
b) Machine (4 in total)		• Trigger emergency stop button. • Actuator must engage in the tripping position! • Unlock the emergency stop button again. • **Repeat this procedure for all 4 emergency stop buttons of the machine!**
c) Conyeyer (option)		• Trigger emergency stop button. • Actuator must engage in the tripping position! • Unlock the emergency stop button again.

2.8 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!

2.9 Secondary (indirect) hazards

2.9.1 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 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.

2.9.2 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.

2.9.3 Reflection through materials

Warning

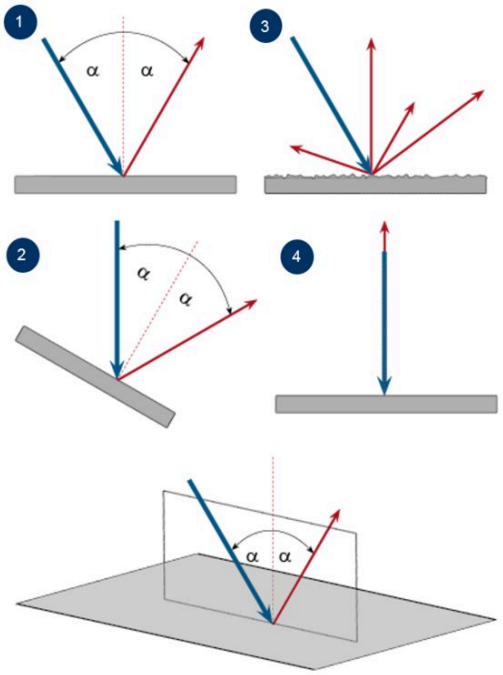
Danger from laser beam.

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

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

Laser beam reflection

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



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

2.9.4 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.

3 Technical Data

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

3.1 Exhaust system requirements

Danger

Danger of emission of toxic gases, vapors or dust.

During laser operation, toxic aerosols may be produced.

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

Caution

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

The 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 SP-Serie:

Exhaust system	SP500	SP1500	SP2000	SP3000	SP4000
Atmos Duo Plus	✓				
Vent Set 300					
Vent Set 400	✓ (without vacuum table)				
Vent Set 500	✓				
Vent Set 1500		✓			
Vent Set 3000			✓	✓	

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:

Exhaust system	Hose connection ø [mm] (inside diameter)	Volume flow [m³/h]	Pressure[Pa]
Atmos Duo Plus	70	(2x) 320	8500 (230V)
Vent Set 300	80	max. 1000	max. 2550
Vent Set 400	100	max. 1000	max. 3800
Vent Set 500	100	max. 1200	max. 7000
Vent Set 1500	200	max. 2500	max. 5460
Vent Set 3000	80	max. 600	max. 4360
	200	max. 2500	max. 5460

Requirements for the exhaust system:

Machine	Volume flow [m³/h]	Pressure [Pa]
SP500	400	3900
SP1500	3500	500
SP2000	min. 2500 (with table exhaust)	800 (with table exhaust)
	min. 100 (traveling exhaust)	4450 (traveling exhaust)
SP3000	max. 1200	max. 7000
SP4000	max. 2500	max. 5460

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

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

Notice

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

You should therefore note the following:

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

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

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

3.2 Materials

Material	Cutting CO_2	Engraving CO_2
Plastics		
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:

– 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:

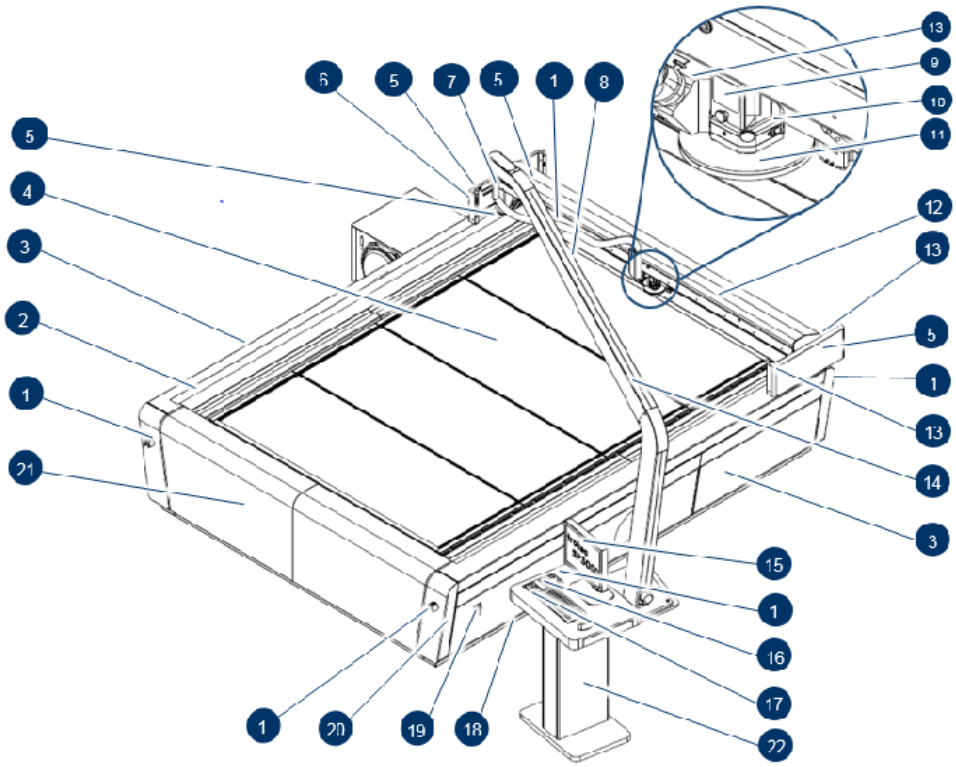
– You are unsure about the processing of a material.
– You have additions for further materials for us or in your opinion a material was not listed.

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

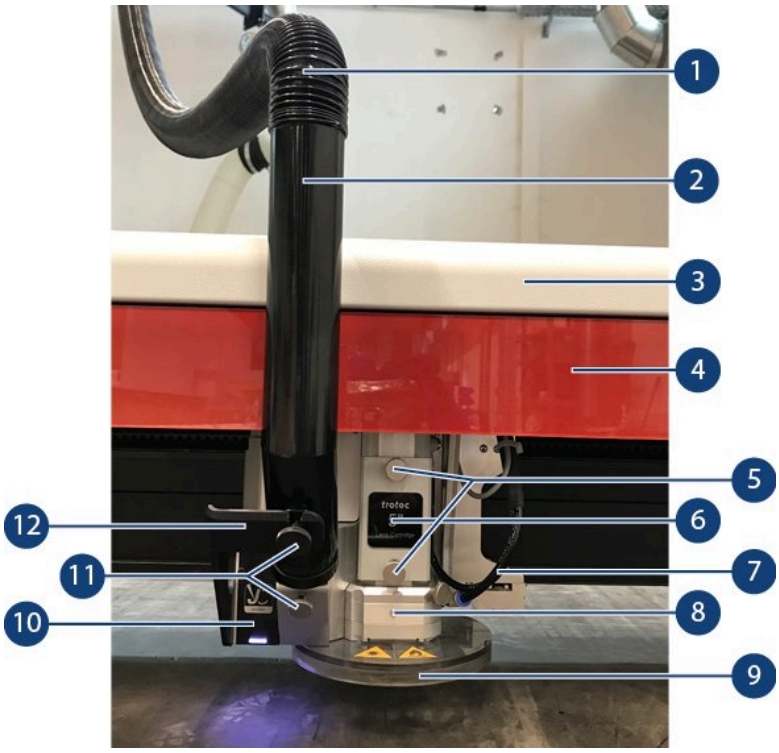
Trotec Laser GmbH assumes no responsibility for any consequences of laser processing in any application, especially with medical or pharmaceutical applications.

4 Machine overview

4.1 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	Safety bumper	17	Keyboard
7	Warning lamp	18	Connection cables (mains, exhaust and cooling system)
8	boom for travelling exhaust (incl. head exhaust tubing)	19	Main switch
9	Laser head	20	Type plate
10	Hall sensor	21	Front and back cover
11	Laser protection disc	22	Operating console



Number	Description
1	head exhaust tubing
2	piping for head exhaust system
3	lid x-Achse
4	cover
5	screws for lens holder
6	lense holder
7	additional exhaust hose
8	exhaust shoe (removable)
9	laser protection disc
10	JC® camera
11	screws for exhaust tubing
12	holder for exhaust tubing

4.2 Tables (multifunctional table concept)

Aluminum slat cutting table/Acrylic 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.

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.

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.

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.

4.3 Lens(es)

Lenses (incl. focustool) available:

2.5" (standard)

3.75"

5.0"

4.4 Nozzles

Ø 3 mm
Short nozzle.
Small diameter.
(standard)

Ø 7 mm
Short nozzle.
Bigger diameter.
(standard)

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 and additional accessories get delivered in wooden crates.

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

Caution

Keep the original packaging.

5.3 Temperature and humidity

Transport conditions

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

- Avoid high temperature fluctuations.

Storage conditions

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

- Avoid high temperature fluctuations.

5.4 Required tools for unloading and transport

	Unloading the packaged machine parts	Transport the unpacked machine parts
Type	Forklift	Pallet truck
Weight	Weight ≥ 1,5t	Weight ≤ 1,5t
Fork extension	approx. 2m (78.74 inch)	approx. 2m (78.74 inch)

5.5 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

Notice

The setup has to be carried out by Technical Support.

6.1 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 notes.

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.

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.

6.2 Operating environment

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.

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.
- Punktbelastung Maschine 500kg/m² (5KN/m2)
- Power supply free of fluctuations.

6.2.1 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.

6.3 Connections

6.3.1 Grid connection

Warning Current

Wrong voltage can cause damage to the machine.

Do not operate the machine, if the voltage do not match, as this may cause damage to the 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.

6.3.2 Operating console connection

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

6.3.3 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.

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

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

6.3.4 Connecting a cooling unit from Trotec Laser GmbH

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.

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

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

7 Operation

7.1 Before commissioning

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.

Caution

Risk of injury from laser beam in the room during assembly work.

During assembly work in the laser area, uninvolved third parties (e.g. employees of external companies) may be injured by laser radiation.

– Shield the machine for the time of installation with laser protection walls (e.g. plywood panels or PC walls which can withstand the maximum laser power of the system) or with suitable shields for laser workstations.
– Keep uninvolved third parties away from the laser area.

Check the following points before commissioning:

- Completeness and technically flawless condition of the machine and safety devices.
- Order and cleanliness at the workplace.
- Sensors and protective covers (especially laser shield) for optical damage such as discoloration, scratches, ...cleanliness of optical components (free of dust and dirt).
- 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

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.

Notice

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.

Power Off

1. Turn the key switch counterclockwise.

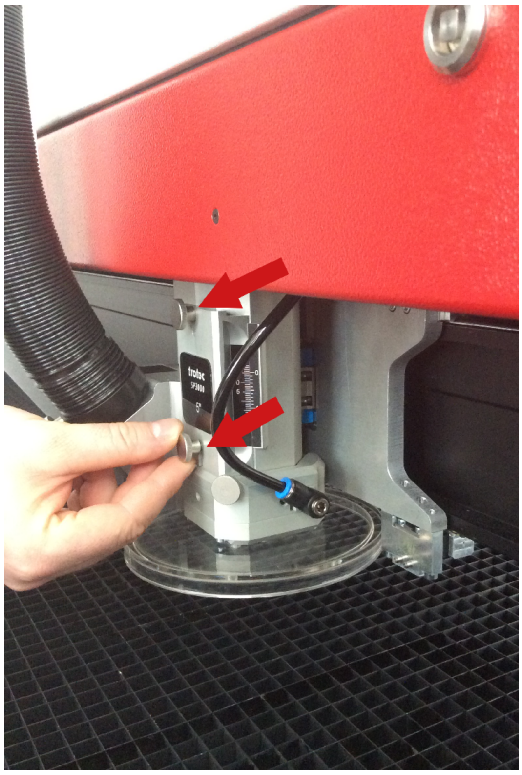
2. Turn off the main power of the machine by turning the main switch counterclockwise. The main switch is located at the right front side of the machine.

Notice

By switching off the mains, all processing data are 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.

7.4 Lense 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 teh fixation screws. (2 scews)

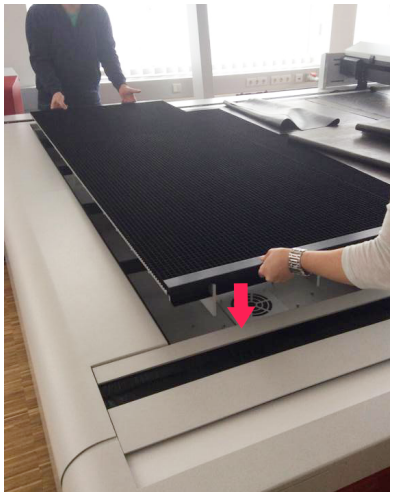
7.5 Table placement

Notice

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.

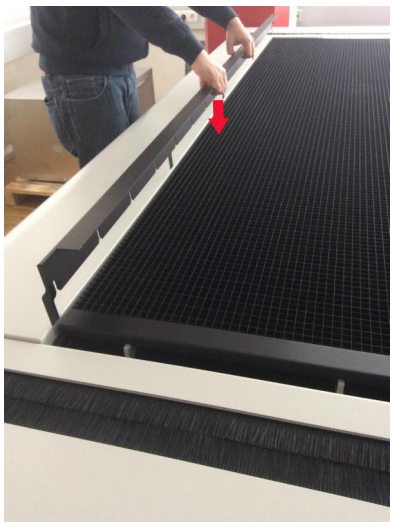
– Process workpieces only on a suitable and inserted table variant.



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

Notice

Two people are required for the placement of a table.



2. Fixate the two outside tables by inserting a fixation strip at the side.

   For more details about available table varieties see chapter "Tables".

7.6 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

Notice

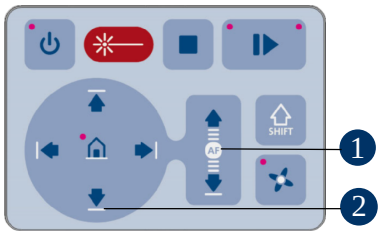
If workpieces with more than 66.14 lbs (30 kg) have been placed on the table, the table must not be moved up or down anymore as this might damage the mechanics of the machine.

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

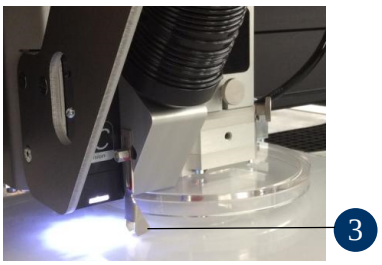
Notice

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

7.7 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.



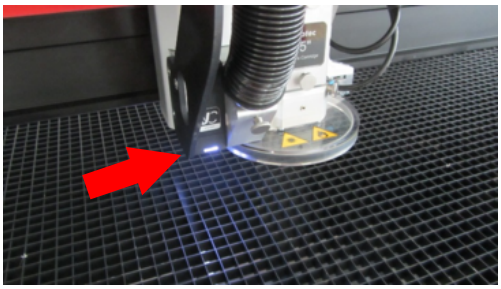
2. Hang the focus tool (3) on the allocated space on the laser head so that the focus tool can move unhindered.
3. Move the X-axis downwards by pressing the Working table control button Z (1).
4. Before the focus tool reaches the work piece, move the working table downwards very slowly and step by step by briefly tapping the Working table control button Z (1) until the focus tool tilts to the side or falls off its position.

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

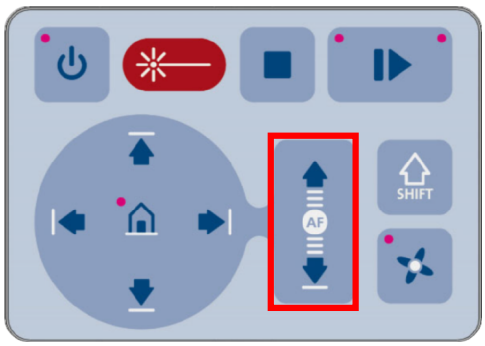
7.8 Sonar Technology™

Caution

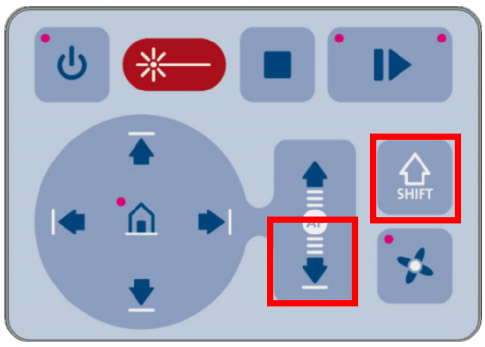
Strong contamination of the ultrasonic sensor can lead to defects from head crashes (working head hits material or working table).



Make sure that the ultrasonic sensor is clean.



Version1: Press the two Laser head control buttons Z simultaneously for the laser beam to get automatically focused on the work piece.



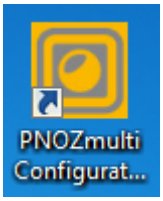
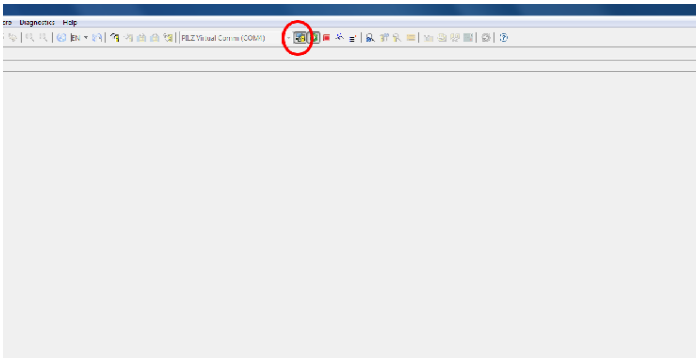
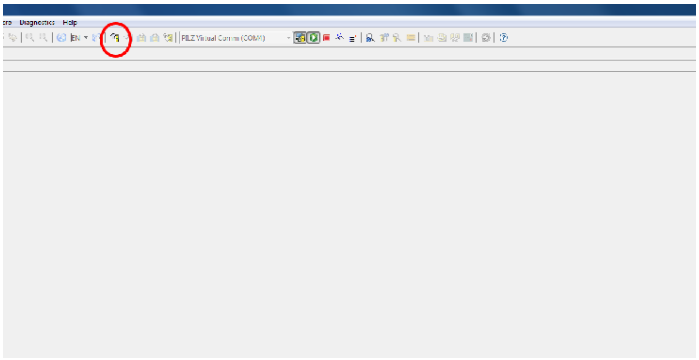
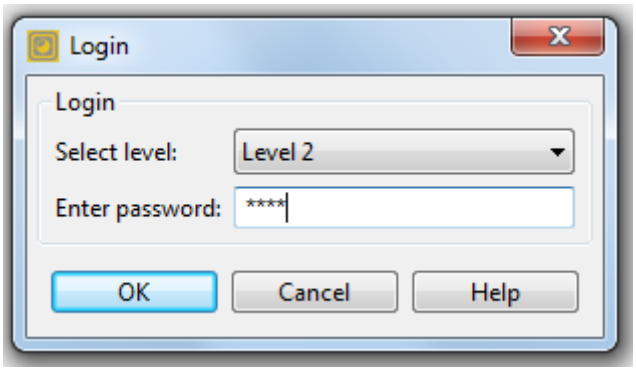
Version 2: Press the Shift-button and the Laser head control button Z down.

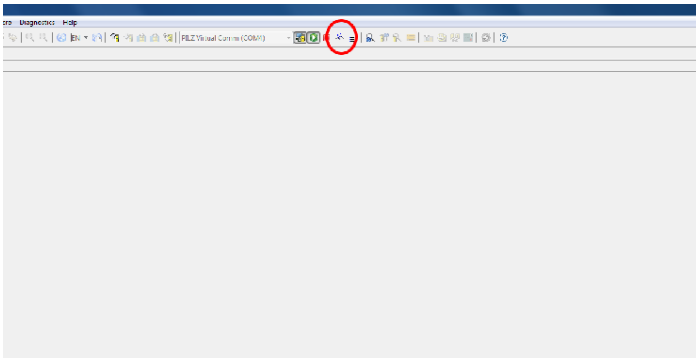
Notice

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

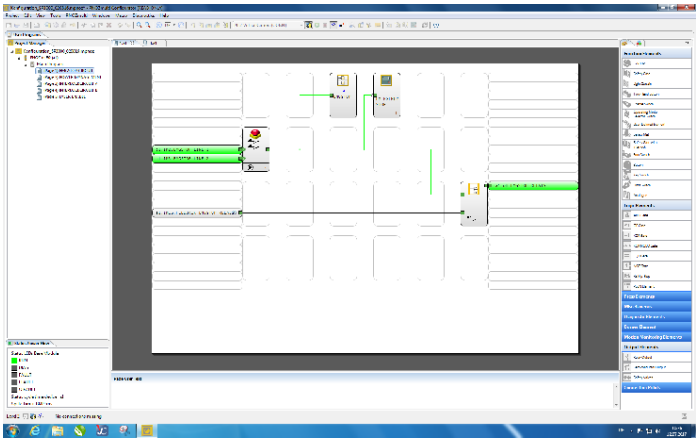
7.9 Software: Safety analysis

Normal operation

	Click to run the software.
	Select the icon to connect to the module.
	Load the Software module by pressing the icon.
	Select Level 2 and enter the password "DIAG".

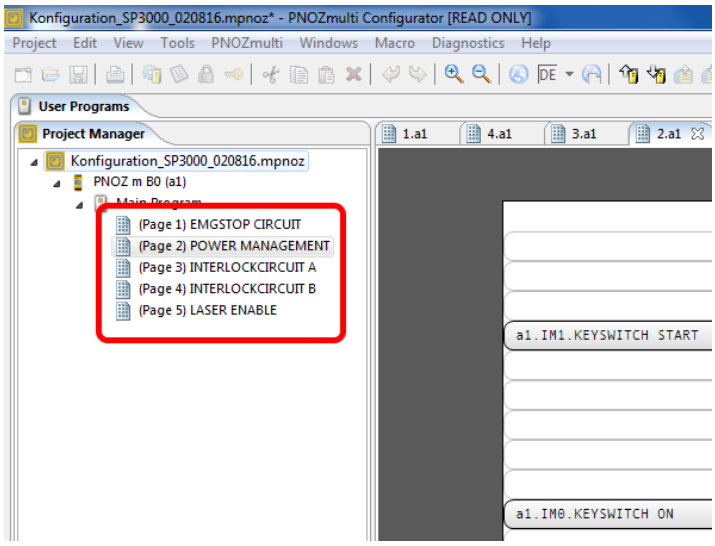


Activate "Dynamic Program Display" by pressing the icon.



If the dynamic display is now activated, all active inputs and outputs as well as sensors are shown in green in the live-mode.

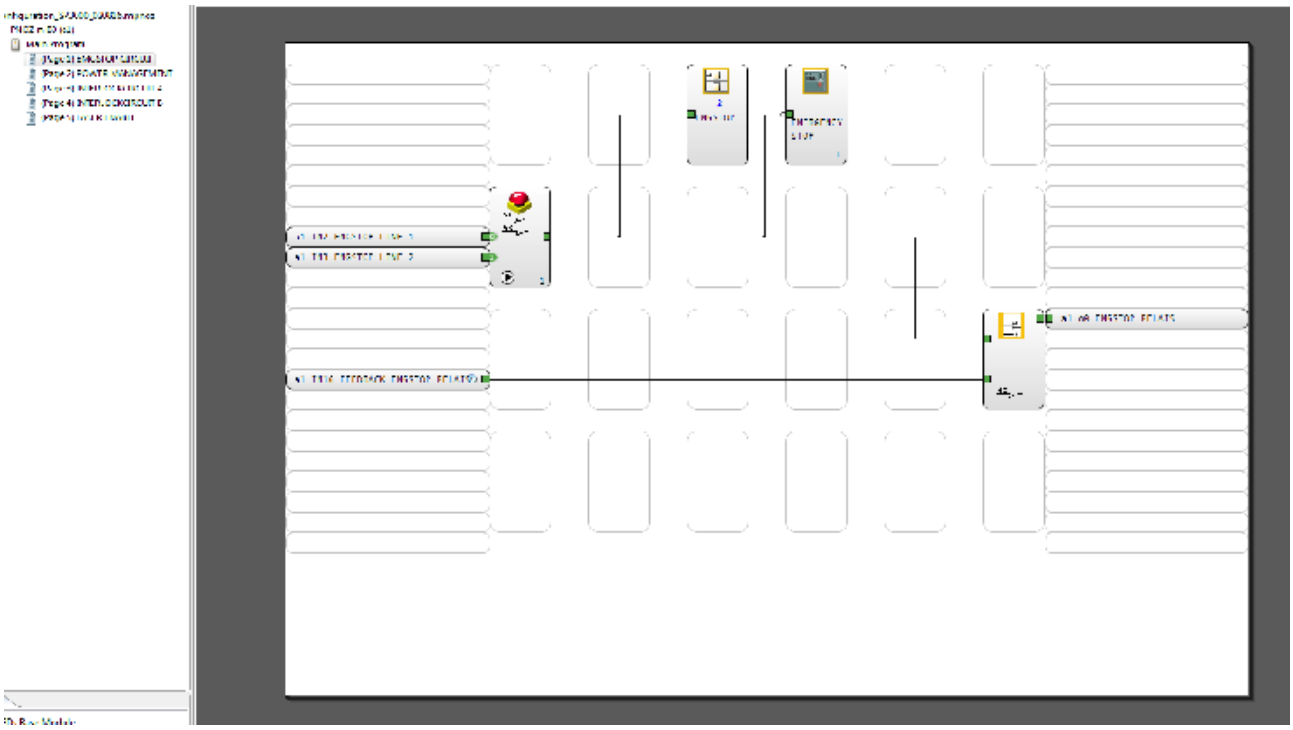
Überwachungsfunktionen



On the left side the functions are shown in 6 pages.

Page 1: EMGSTOP CIRCUIT

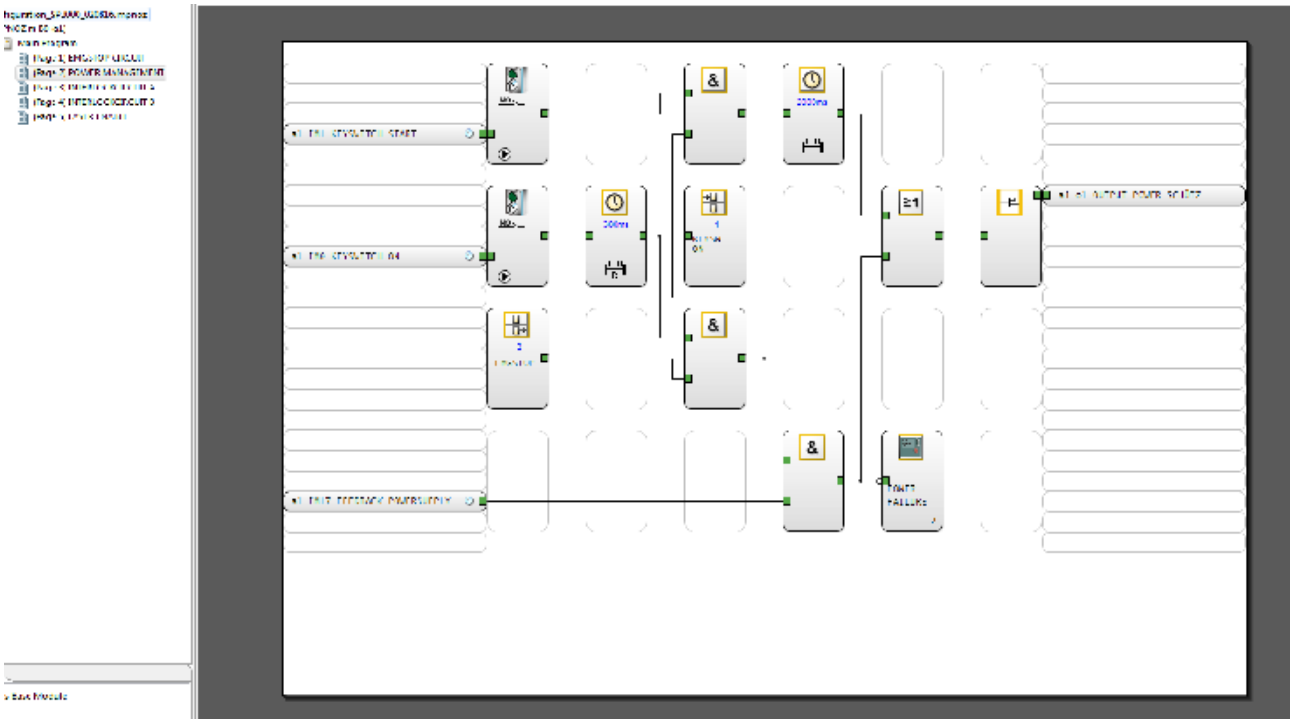
Click on page 1 to see the Emergency circuit:



Two EMERGENCY lines are connected to the machine by means of each EMERGENCY STOP button, as shown on the left-hand side of the device. If both signals are synchronized, the signal is forwarded to the relay module at the right edge; this output directly switches the safety relay 30A3 In the electric tub. If none of the emergency buttons is actuated the LED "In1", "In2" and "out" should light! The input "Feedback EMGSTOP-RELAIS" on the left side is used to monitor whether the safety relay 30A3 has actually switched. If it's not switched, the line is highlighted in green and the output on the right is no longer released.

Page 2: POWER MANAGEMENT

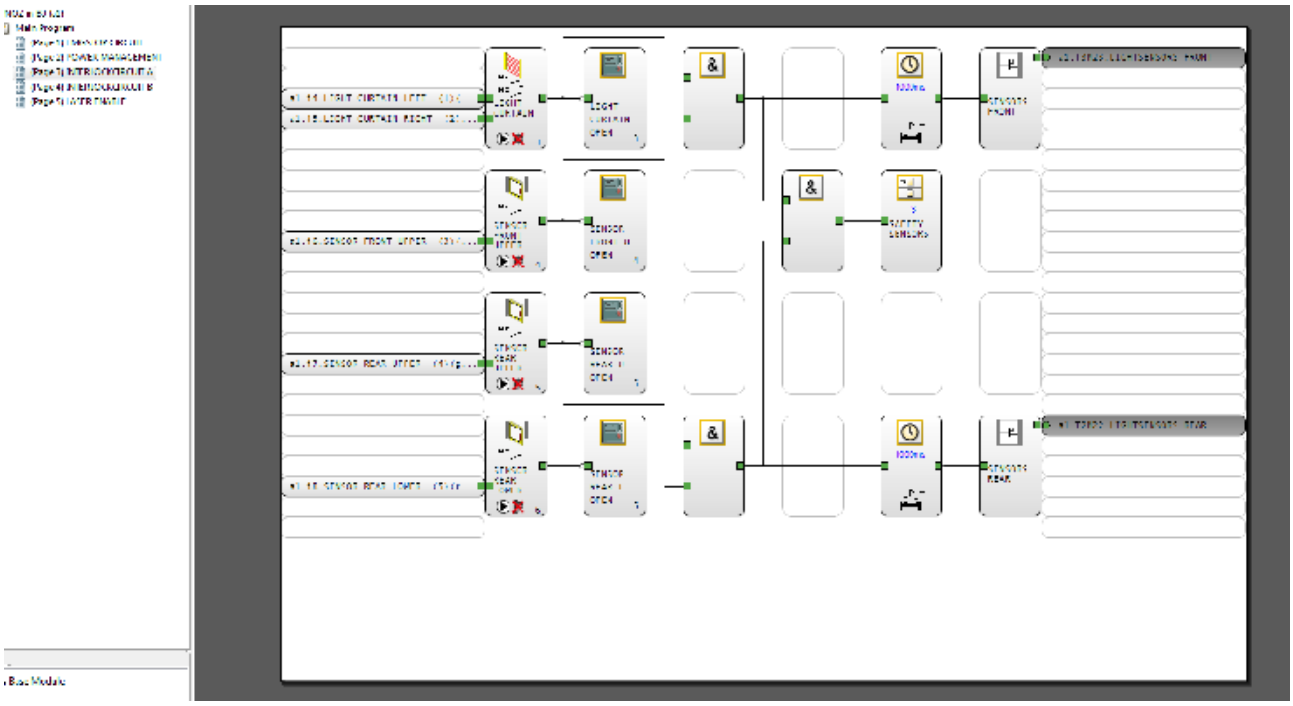
Click on page 2 to see the POWER MANAGEMENT:



The key switch is shown at the top on the left: By turning the switch on the console the "Keyswitch on" signal is first set. The output "Output Power Schütz" is set for 2 seconds by turning the switch again. The system monitors the left incoming signal "Feedback Powersupply" of 30A1 (voltage monitoring laser power supplies). If the signal does not appear within 2 seconds the contactor drops again and the machine switches off.

Page 3: INTERLOCKCIRCUIT A

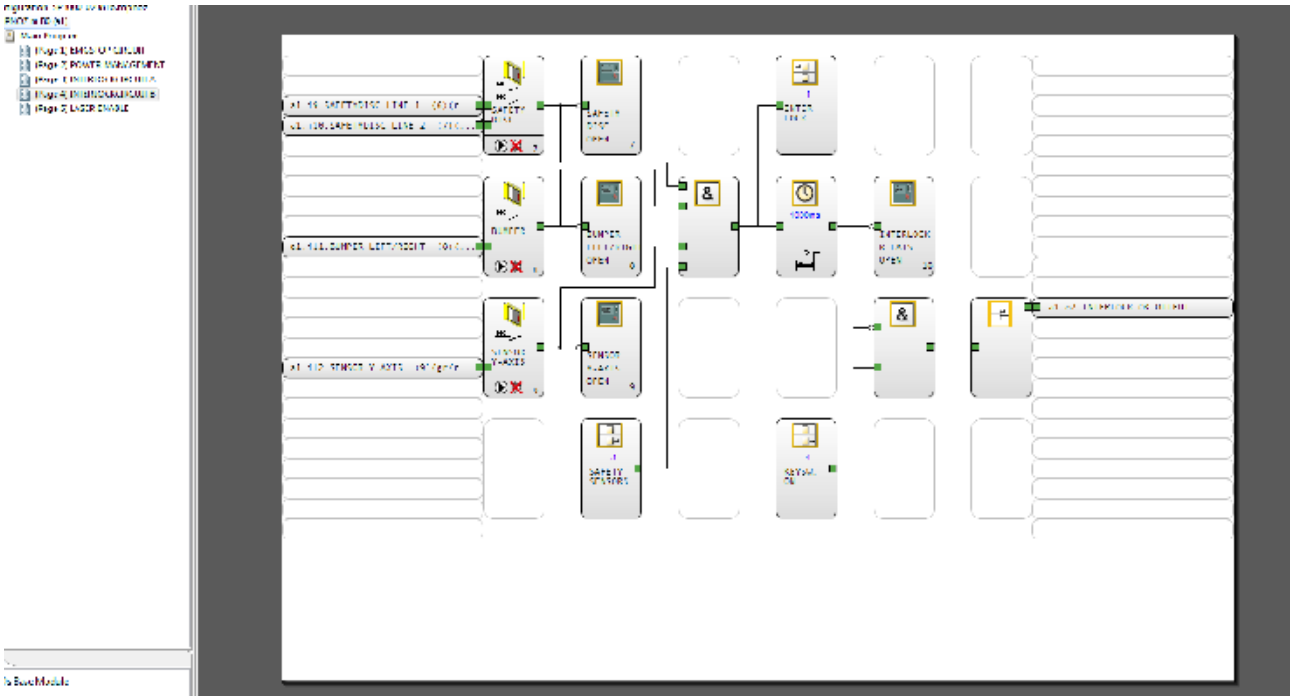
Click on page 3 to see the INTERLOCKCIRCUIT A:



The incoming sensor inputs can be controlled on each side. In the upper left corner the light curtain is monitored in two directions. The inputs of the infrared light barriers of the X-axis are shown below.

Page 4: INTERLOCKCIRCUIT B

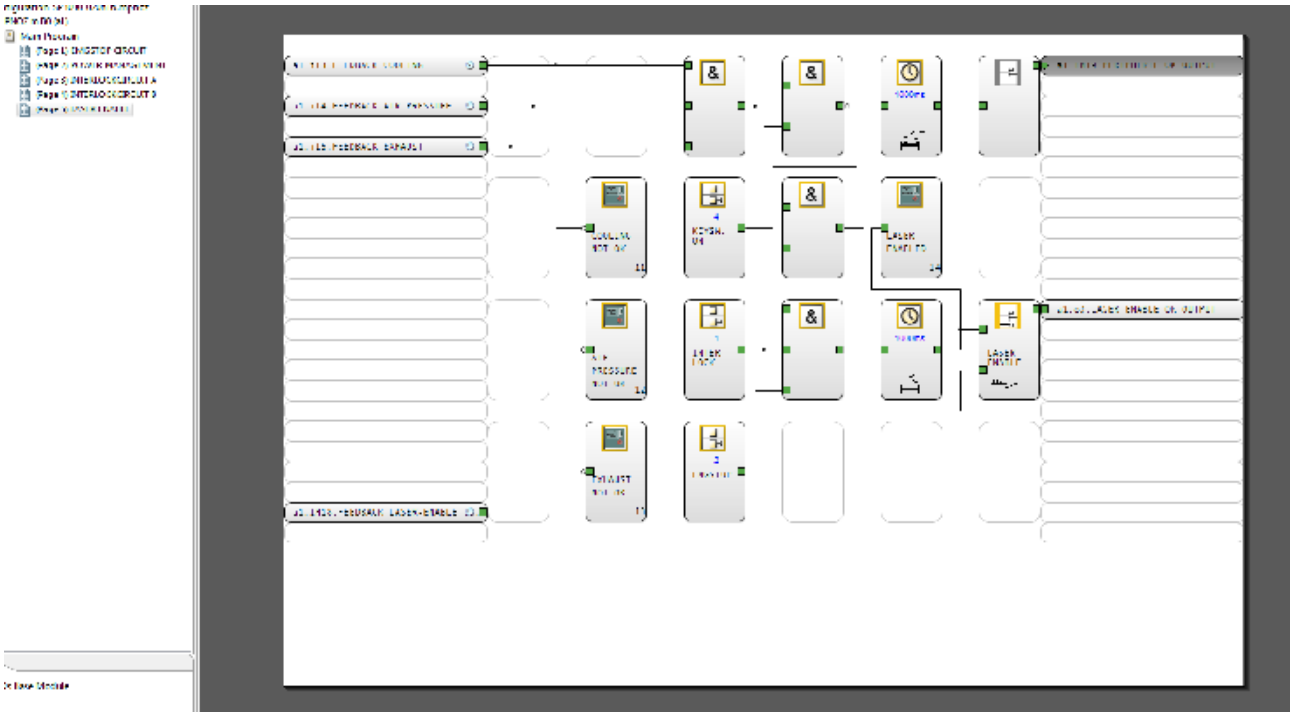
Click on page 4 to see the INTERLOCKCIRCUIT B:



The remaining incoming sensor inputs can be controlled here. On the upper left, the safety monitor is monitored in two directions. The input of the roller lever switches of both bumpers is shown below. Below is the input of the infrared light barrier of the y-axis. The right output goes to the warning display on the console. When all sensors are ok and closed, the output should no longer be set and the LED on the console will go out. As an example, you can see from the upper picture that the two inputs of the safety device are not active. Consequently the safety device is not mounted or defective.

Page 5: LASER ENABLE

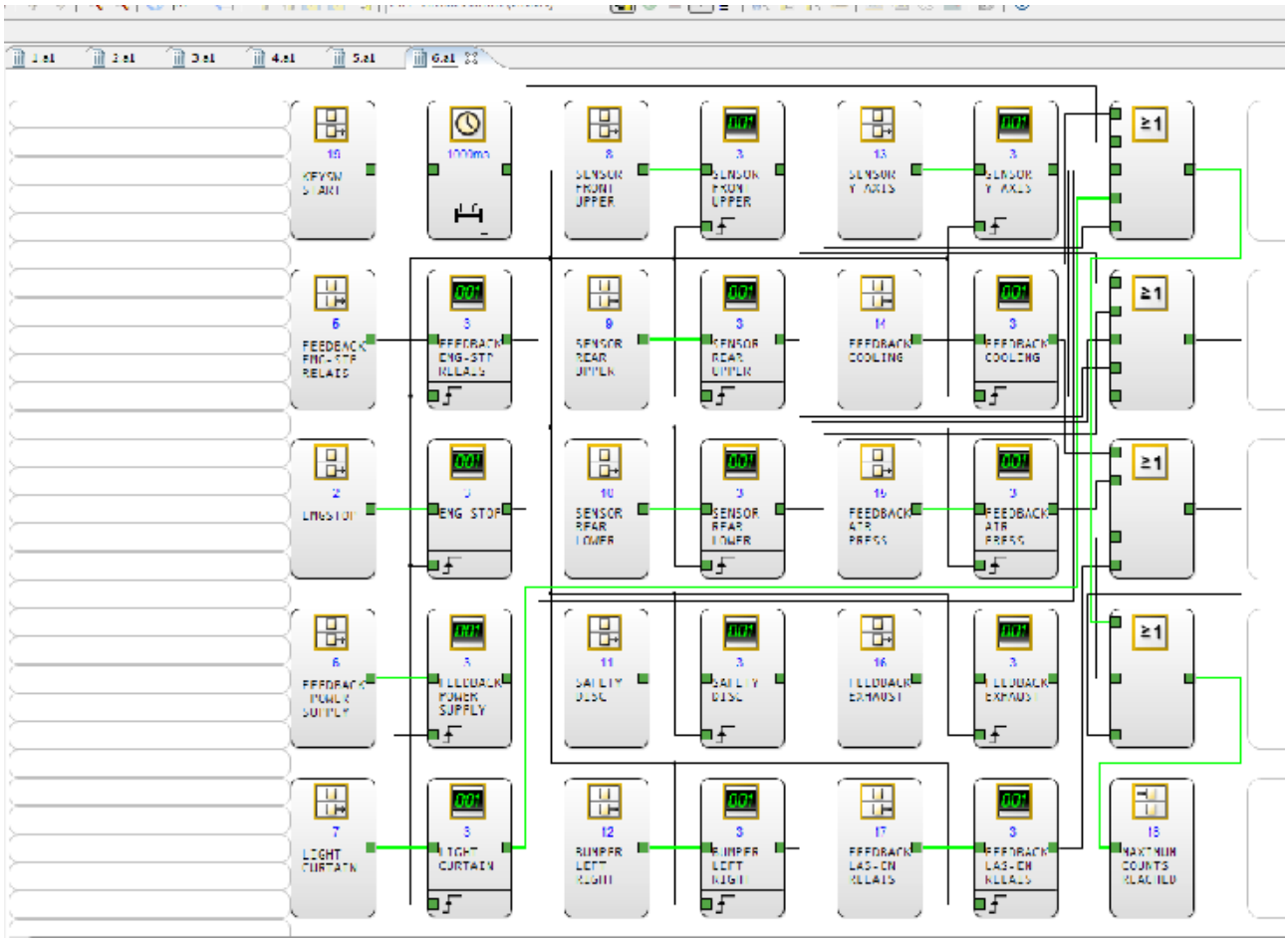
Click on page 5 to see the LASER ENABLE circuit.



In the upper left corner, the presence of cooling, air pressure and suction is monitored Below is the acknowledgment input of the safety relay 30A4, which monitors whether the safety relay has actually switched, as long as it has been actuated by the right-hand output "LASER ENABLE OUTPUT". The feedback line should not be set if the safety relay has tripped correctly. The output "LASER ENABLE OUTPUT" is the output that actually enables the laser source to emit la-ser emissions, the output is only switched when all sensors are working correctly and the feedback messages are all available. This output directly switches the safety relay 30A4 in the electric circuit, at which the LED "In1", "In2" and "Out" should light up when the enable is completed!

Page 6 DIAGNOSIS

Click on page 6 to see the DIAGNOSIS circuit.



All the sensors installed in the machine are shown here and are provided with a counter. These counters count the triggering events at the input and then set the output to High after 3 trips! In the normal operation of the machine, no sensors are normally switched without external influences, but in the event of a fault, individual counter outputs should be activated accordingly, the error can easily be located in the sensor.
In the upper example, it can be seen that the output of the light curtain was set during normal operation, although the light curtain was not triggered by external influences. Thus, the light curtain can be uniquely identified as an error source.

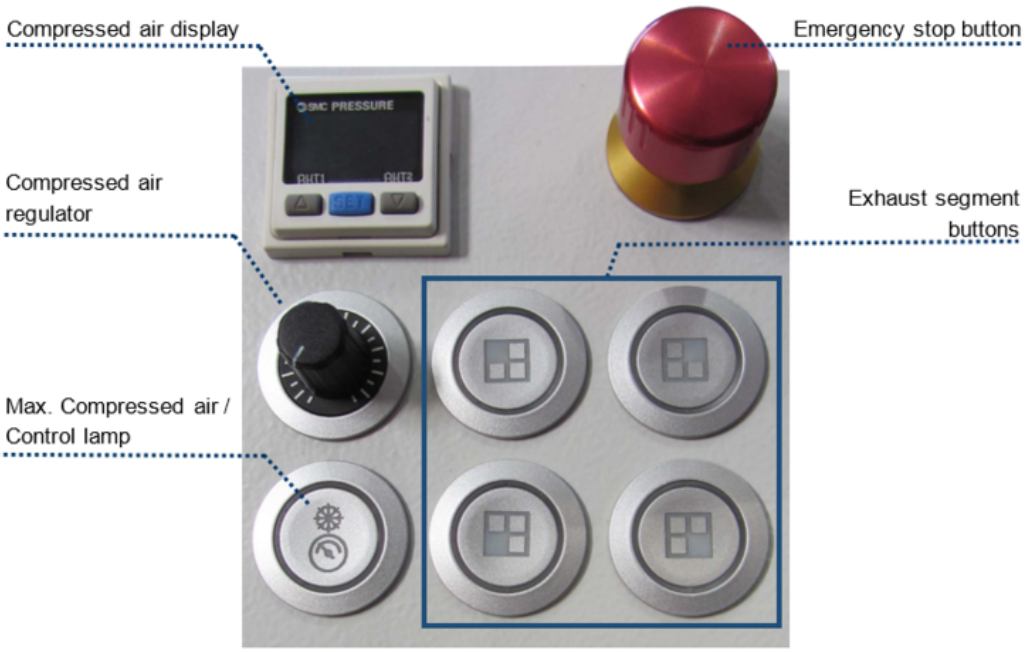
To reset all the diagnostic counters simply turn the key switch to the "START" position!

8 Control panel

The control panel is the whole unit of the machine control.

The keypad is a part of the control panel.

8.1 Control panel



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.

Compressed air regulator

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

Caution

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

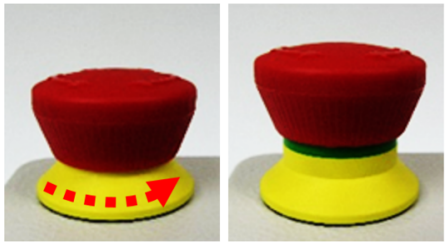
- The supplied pressure of the external connected compressed air must not exceed 10 bar.
- The maximum compressed air pressure during operation must not exceed 6 bar.

Maximum compressed air / Control lamp

Maximum compressed air:
By pressing the button the maximum air pressure gets switched on. This remains activated as long as the button is pressed. The supply of the maximum compressed air is used for example for blowing of any flame formation.

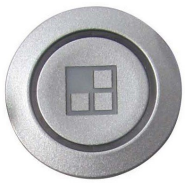
Control lamp:
Shines when the safety circuit (cooling system, compressed air, safety bumper, laser deflector shield, etc.) is not closed. Then the safety circuit is not active.

Emergency stop button acknowledge



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

Exhaust segment button



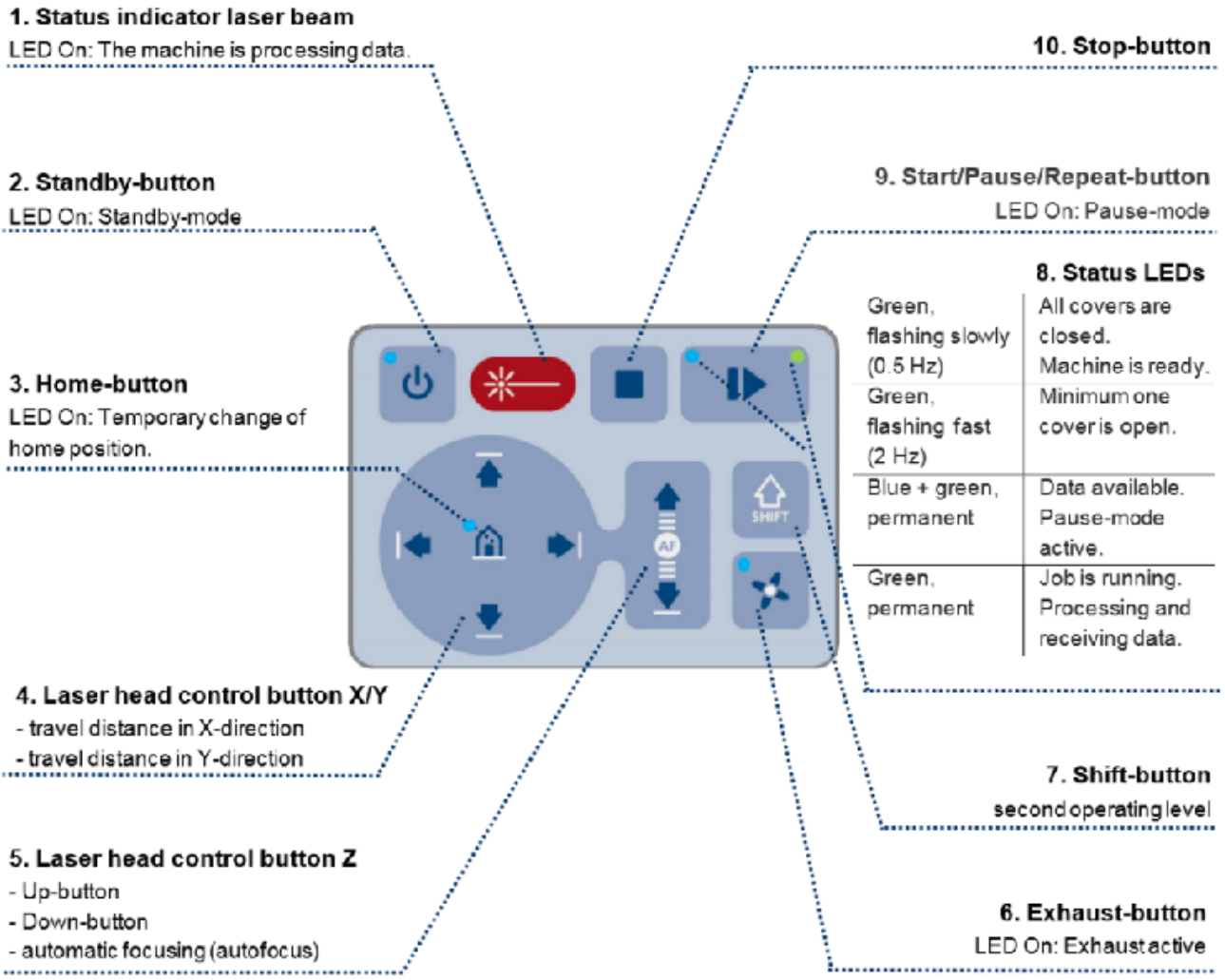
The table exhaust system is divided into four independent segments. By pressing one of the four exhaust segment buttons, the vacuum of the respective section can be activated or deactivated. The working area which is free of material must not be covered.

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.

→ The key switch from the control panel is varies and depends on each machine.

8.2 Keypad



8.2.1 Description

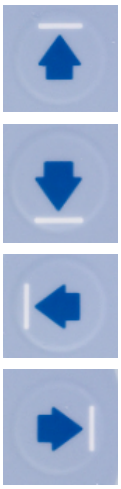
Image	Button	Description
	**Status indicator**	LED On: The machine is processing or receiving data.
	**Standby-button**	LED On: Standby-mode • Press this button to switch to the Standby-mode. • Press the Standby-button while the laser head is moving up or down (e.g. by focus automatically). The machine enters Standby-mode only after finishing the movement.
	**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**	• 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.

Image	Button	Description
	**Laser head control button Z**	• Press one of these buttons to manually move the laser head up or down (travel distance in Z-direction). • Press the Shift-button together with the Up-button. The laser head is moving automatically upwards to the corresponding end position. • Press the Shift-button together with the Down-button. The laser head is moving automatically downwards and the activation of the automatic focusing starts. By simultaneous pressing of the two Laser head control buttons Z (Up-button + Down-button), the laser head is moving automatically downwards and the activation of the automatic focusing starts. 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"). → For further information, see chapter "focusing" in the Operating manual.
	**Stop-button**	• Press this button to stop the current working process.
	**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.

<table>
<tr><th>Image</th><th>Button</th><th>Description</th></tr>
<tr><td>  </td><td>Status LEDs</td><td>Meaning of the LEDs:

<table>
<tr><th>LED</th><th>Description</th></tr>
<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>
</table>
</td></tr>
<tr><td> 
</td><td>Shift-button</td><td>Second operating level for further operation. Press the Shift-button simultaneous with the buttons below to activate the following function:

<table>
<tr><th>Button</th><th>Description</th></tr>
<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 + Laser head Z, up</td><td>Laser head is moving automatically upwards to the corresponding end position.</td></tr>
<tr><td>Shift + Laser head Z, down</td><td>Laser head is moving automatically downwards and the activation of the automatic focusing starts.</td></tr>
<tr><td>Shift + Home</td><td>Deactivates temporary home position.</td></tr>
</table>
</td></tr>
<tr><td>  </td><td>Exhaust-button</td><td>• 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.</td></tr>
</table>

8.2.2 Shortcuts

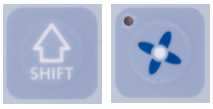
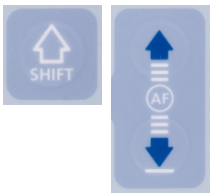
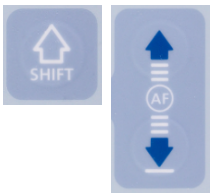
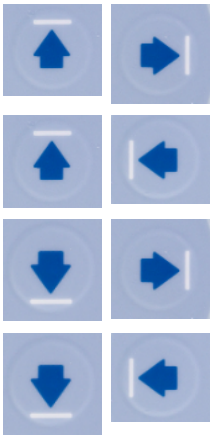
Image	Button	Description
	Shift-button + Exhaust-button	Air assist On/Off.
	Shift-button + Laser head control button X/Y	Laser head moves fast to corresponding end position (X- or Y-position).
	Shift-button + Standby-button	Keypad locked/unlocked.
	Shift-button + Laser head control button Z (Up-button)	Laser head is moving automatically upwards to the corresponding end position.
	Shift-button + Laser head control button Z (Down-button)	Laser head is moving automatically downwards and the activation of the automatic focusing starts.
	Laser head control button Z (Up-button + Down-button)	Laser head is moving automatically upwards and the activation of the automatic focusing starts. (See chapter "Description", "Laser head control button Z").
	Shift-button + Home-button	Deactivate temporary home position.

Image	Button	Description
	Laser head control button X/Y	Laser head moves diagonal to the according direction.

9 Maintenance

9.1 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.

9.2 Maintenance schedule

	Daily	Weekly	Monthly
Laser			
Entire working area	Clean whenever required		
protection disk	Continuous monitoring. Exchange in case of turbidity and/or ageing or at least after 5 years.		
Lens and protective glas	Check Clean whenever required		
Laser deflector shield and nozzle	Check Clean whenever required		

	Daily	Weekly	Monthly
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	
Test			
Several sensors	Before each shift start, latest after 8 hours of operation: Check		
Emergency stop button (operating console, machine, conveyor)			Check according to the emergency stop button test in the manual.
X-gantry		Check according to the brake test in the manual.	
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			

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.

9.3 Cleaning

9.3.1 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.

9.3.2 Optics in general

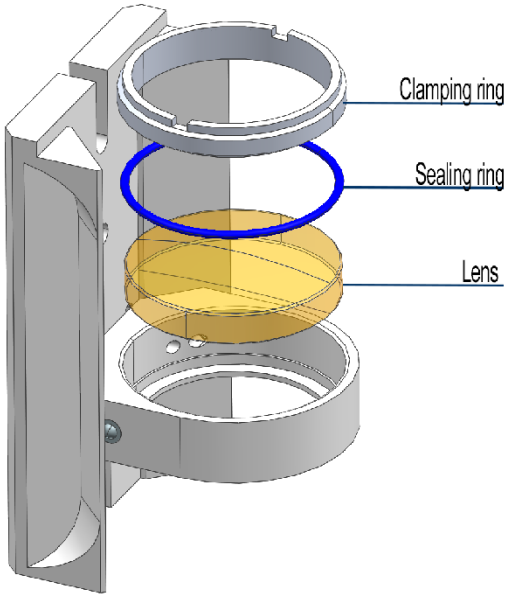
Trotec Laser GmbH recommends to use the cleaning set enclosed. Alternatively, use high-quality cotton swabs together with the provided cleaning liquid.

Notice

The following cleaning products are available as accessory parts:

- Lens cleaning cloth (Part number 69249)
- Lens cleaning liquid (Part number 69248)
- Bellows (Part number 80779)

9.3.2.1 Lens composition



9.3.2.2 Lens

Warning

Zinc selenide lens, telescope and laser exit window.

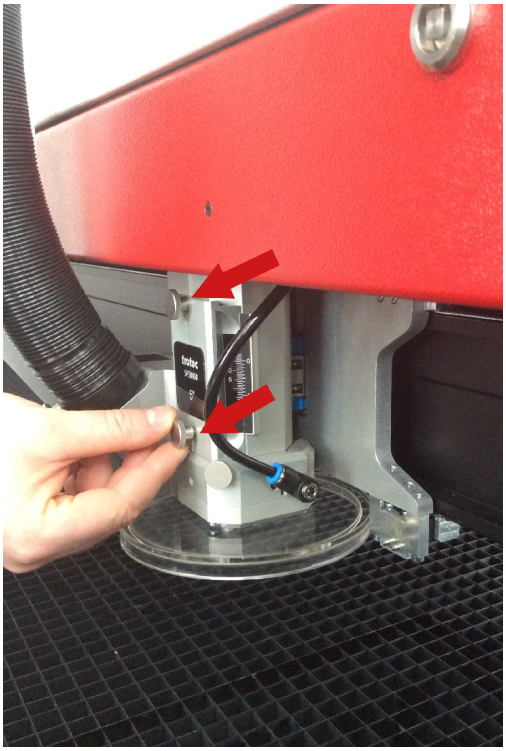
Soiled optics absorb laser radiation and can thus be destroyed. Broken or damaged lenses as well as thermal decomposition of lenses release particles which cause serious damage to the health.

- 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 user's country.
- Lenses with scratches or penetrations must not be used anymore.

1. Blow away loose particles and dust by means of bellows or compressed air (according to ISO 8573:2010 class 1).

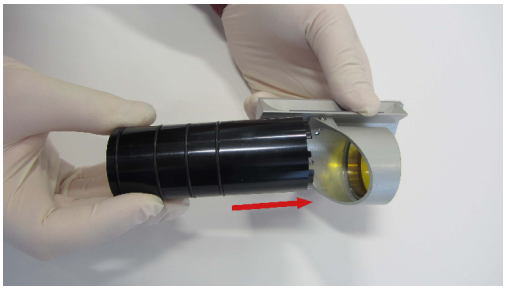
   Get the cleaning liquid and cleaning tissues ready.

2. Move the table up and put a cloth under the lens holder (protection from breaking the lens).

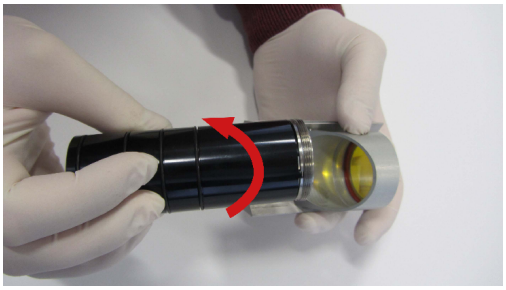


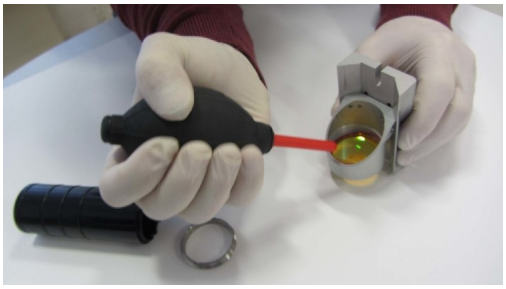
3. Unscrew the lens fixation screw.
   (2 screw)

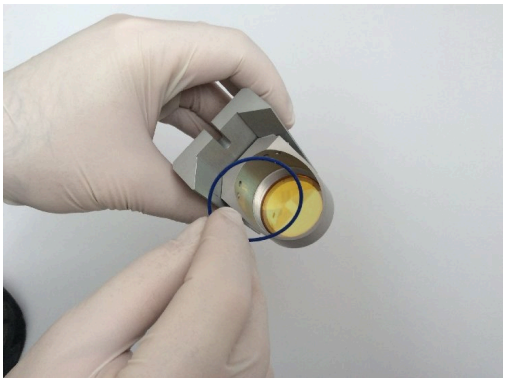
4. Carefully take out the lens.



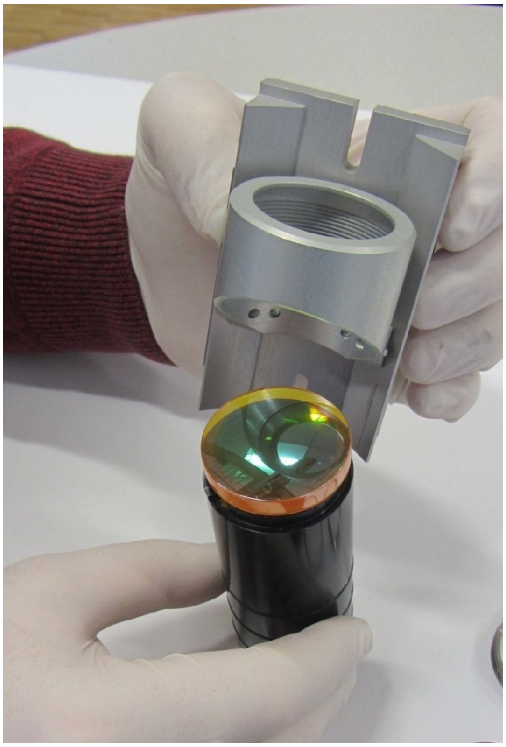
5. With the aid of the optics set loosen the clamping ring by rotating it counterclockwise.



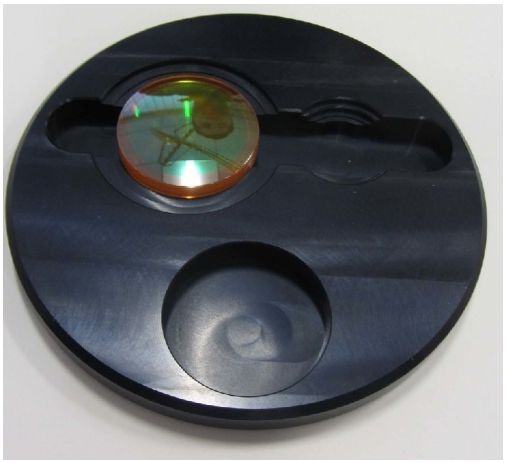




6. Remove the clamping and sealing ring.



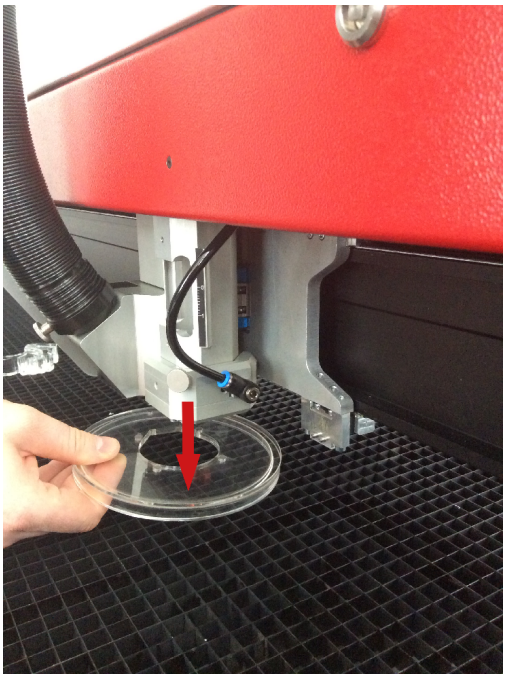
7. Carefully remove the lens and rinse it with cleaning liquid to wash away coarse soiling.
8. Check the lens for sign of damage.



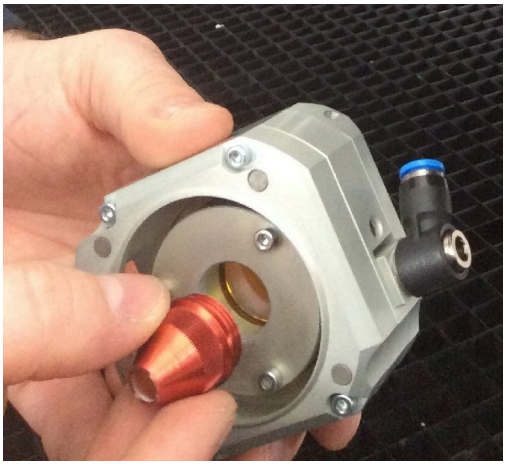
9. Put some cleaning liquid onto the lens and leave the liquid for 1 minute to take effect.
10. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
11. Now carefully insert the lens with the convex side up into the lense holder.
12. Insert the sealing and clamping ring and fixate the clamping ring using the key tool.

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

9.3.2.3 Cleaning the nozzle

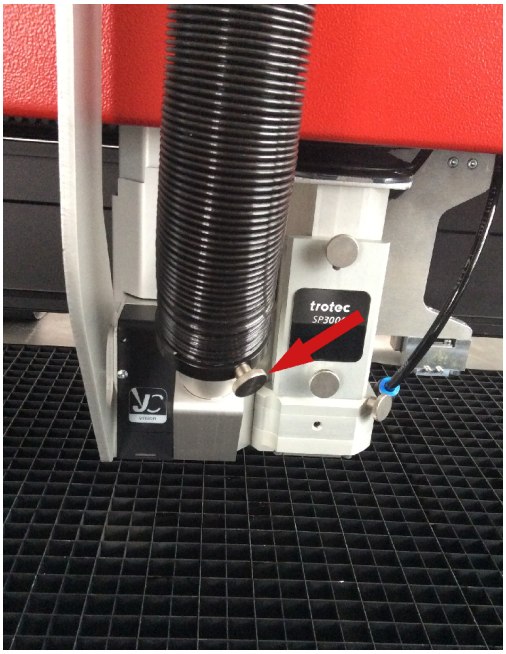


1. Take off the magnetically fixed laser deflector shield.
2. Clean the laser deflector shield with a dry or damp cloth on both sides.



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

9.3.3 Cleaning the laser head exhaust



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

	2. Clean the air flow duct and connection point.

9.3.4 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.

9.3.5 Ultrasonic sensor (Option Sonar Technology™)

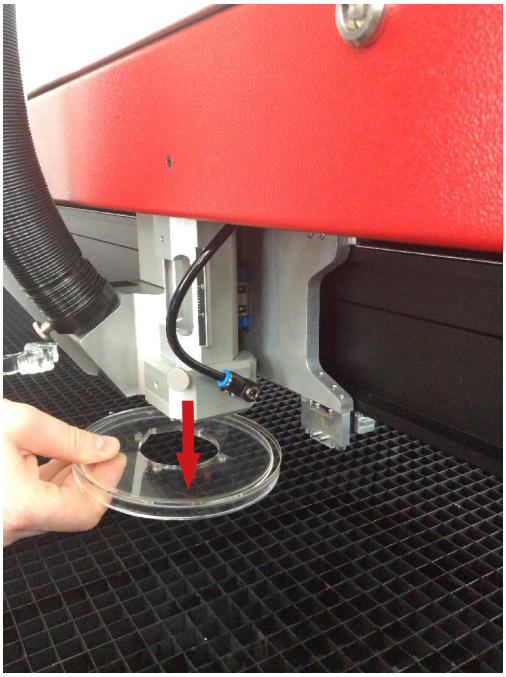
The sensor can be cleaned either with a brush, or be wiped dryly, with moisture or with mild detergents and a microfiber or anti-statics cloth.

In case of stronger soiling, isopropyl or ethanol solution can be used.

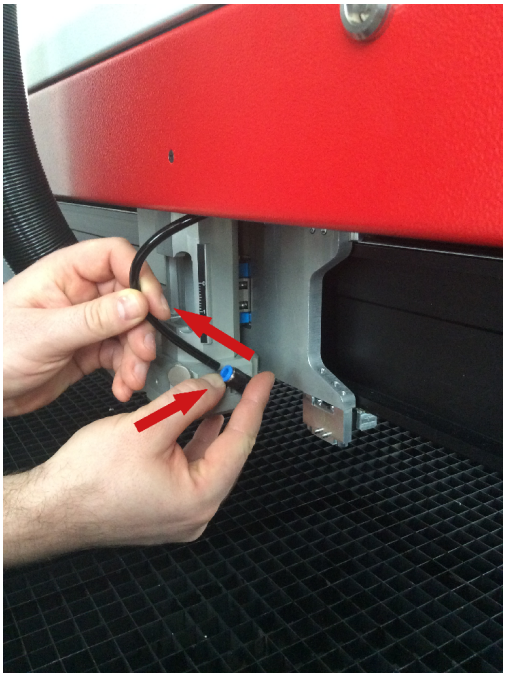
Notice

Avoid long application time and long-term usage.

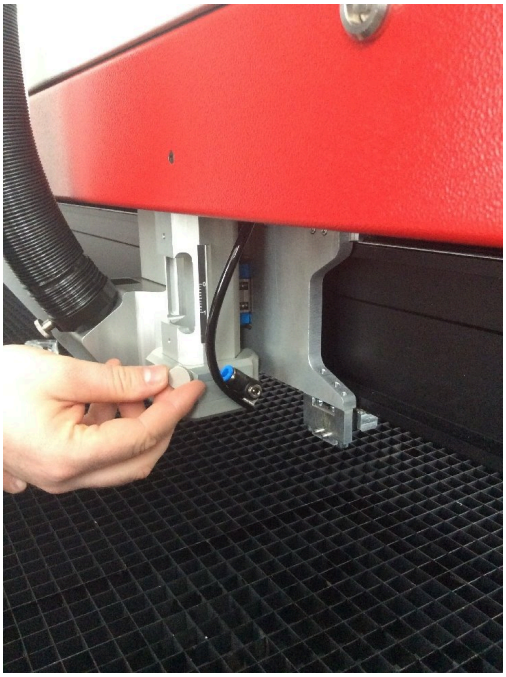
9.3.6 Cleaning the protective glass 2,5 inch



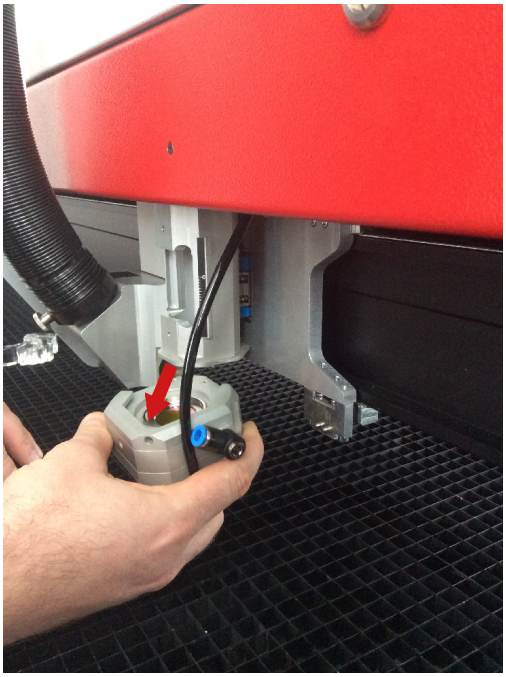
1. Take off the magnetically fixed laser deflector shield.
2. Clean the laser deflector shield with a dry or damp cloth on both sides.



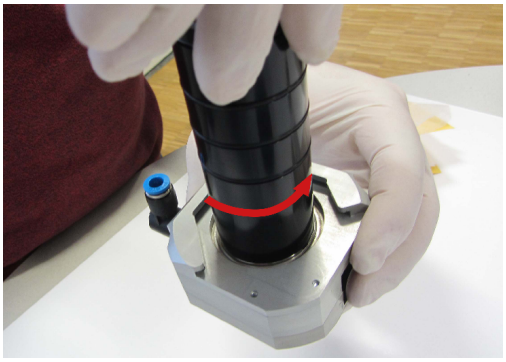
3. Unplug the air assist hose by pressing the blue clamping ring.



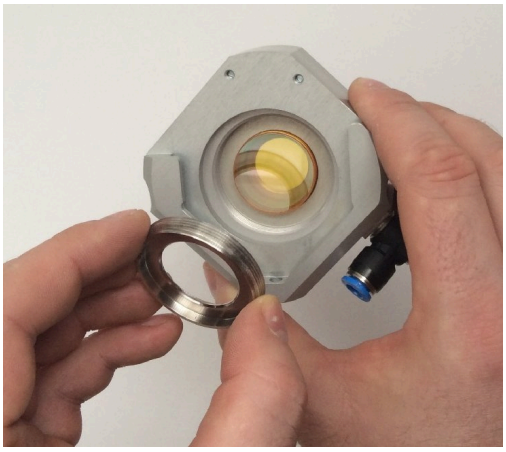
4. Remove the fixation screw.



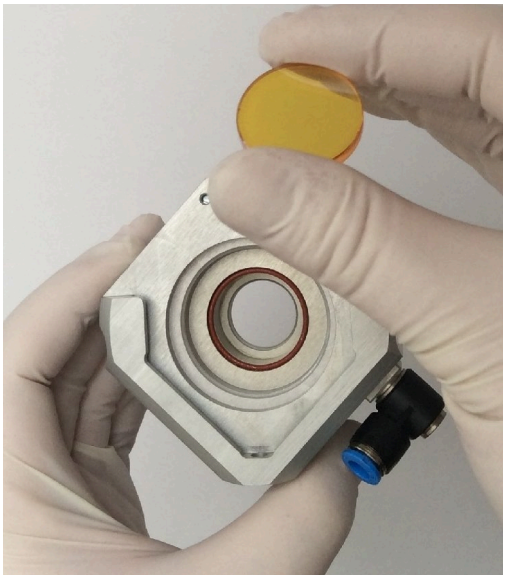
5. Carefully take off the protective glass housing.



6. Loosen the clamping ring with the aid of the supplied tool by rotating it counterclockwise.

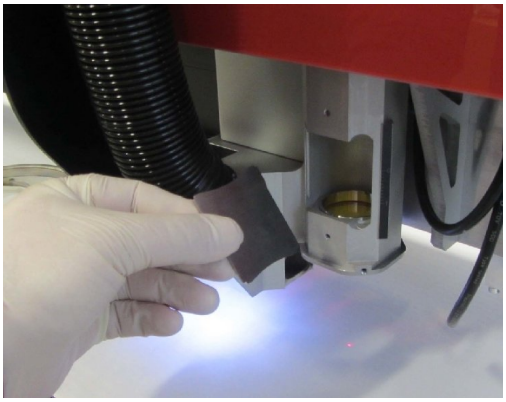


7. Remove the clamping ring.
8. Take out the protective glass.

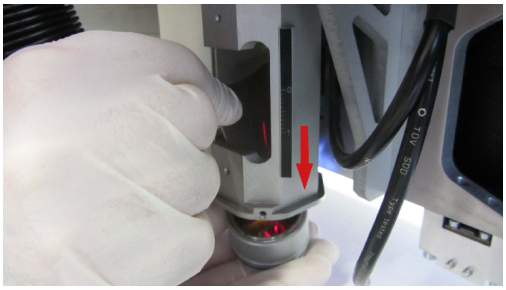


9. Clean the protective glass with a dry or damp cloth on both sides.
10. Insert the sealing ring again. Now carefully insert the protective glass and clamping ring and fixate the clamping ring using the optic set.
11. Fix back the protective glass housing on the laser head.

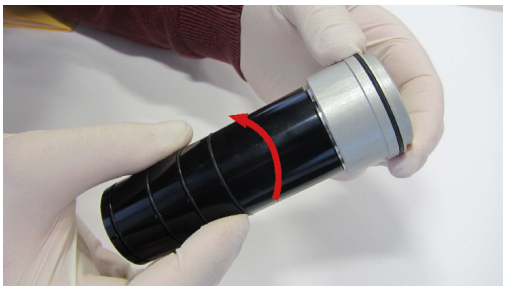
9.3.7 Cleaning the protective glass 5,0 inch



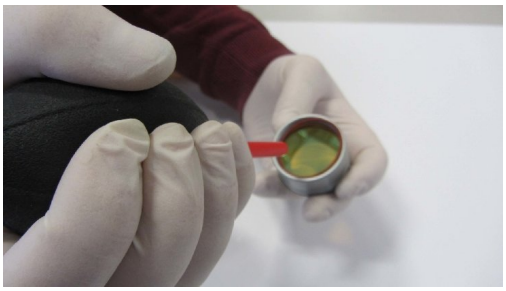
1. Loosen the protective glass holder with the aid of the supplied key tool by pressing it down.



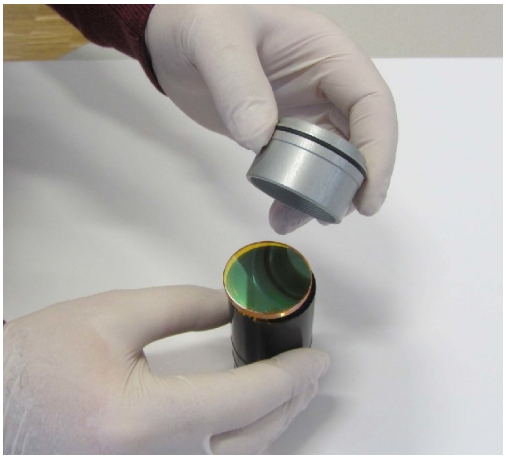
2. Carefully remove the protective glass housing from the processing head.



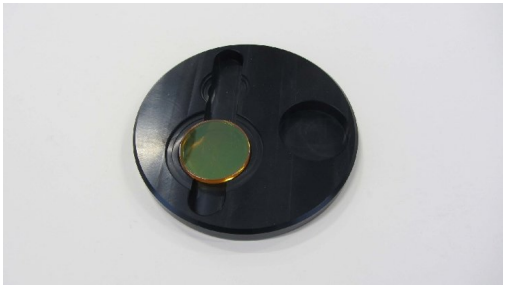
3. Loosen the clamping ring with the aid of the supplied optics set by rotating it counterclockwise.



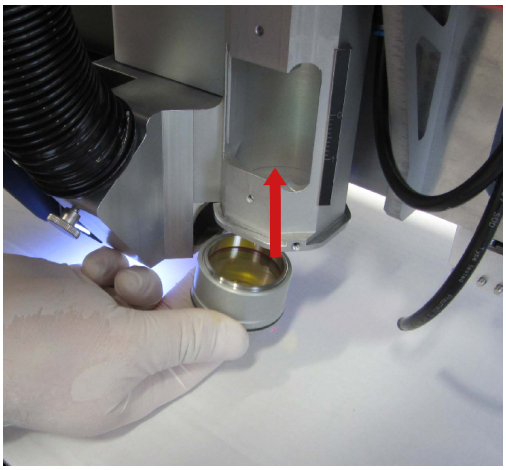
4. Remove the sealing ring.



5. Carefully remove the protective glass and rinse it with cleaning liquid to wash away coarse soiling.
6. Check the protective glass for sign of damage.



7. Put some cleaning liquid onto the lens and leave the liquid for 1 minute to take effect.
8. Soak a cleaning tissue with cleaning liquid and carefully wipe off the surface.
9. Insert the protective glass and the sealing ring.



10. Carefully remove the protective glass holder to the processing head.

10 Troubleshooting

10.1 Error, cause and remedy

Problem	Possible cause	Remedy
Too low engraving depth.	• Imprecise focusing. • Dirty optics.	• Check focus. • Clean optics.
Blurred edges.	• Imprecise focusing.	• Check focus.
Missing cutting line.	• Zero passes in material database. • Line thickness in CorelDraw too big. • Color was skipped in JobControl®.	• Increase the amount of passes in the JobControl® material database. • Reduce line thickness to the 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 autofocus, check the settings within the software (lens, material thickness, table).
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 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 comissioning.	• Top, front or side door not closed.	• Close doors.

Problem	Possible cause	Remedy
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 cutting line.	• Speed too high.	• Reduce speed.
Other faults.		• Contact Technical Support.

11 Contact details

Technical Support

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

For global service contact numbers and further information please see our website, section "Support": **www.troteclaser.com**

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: **techsupport@troteclaser.com**

12 Disassembly

Notice

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

Please contact your Trotec representative or our Technical Support in your area.

13 Disposal

Disposal

Do not dispose of the machine with domestic waste!

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

In case of further questions, please ask your supplier.

Use suitable tools if you have to dissemble 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

- ✓ **Technical Data**
- ✓ **Conformity Declaration**
- ✓ **Acceptance report**
- ✓ **Response form**
- ✓ **Training verification form**

Technical Datasheet

trotec® setting new standards
laser. marking cutting engraving

SP3000
Laser Cutting System

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 safety 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)

Machine exterior dimensions

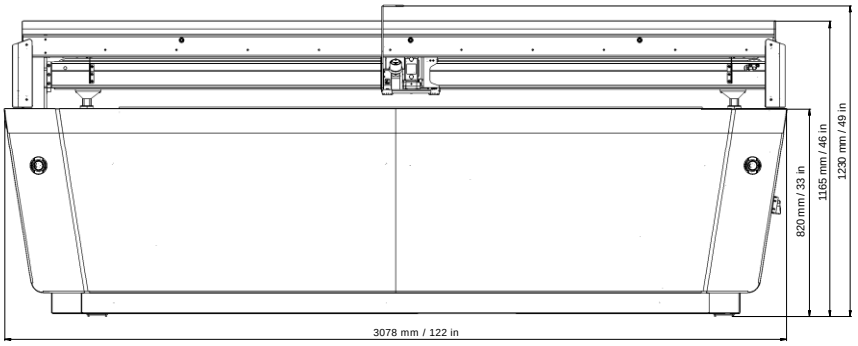


Figure 1: Front view

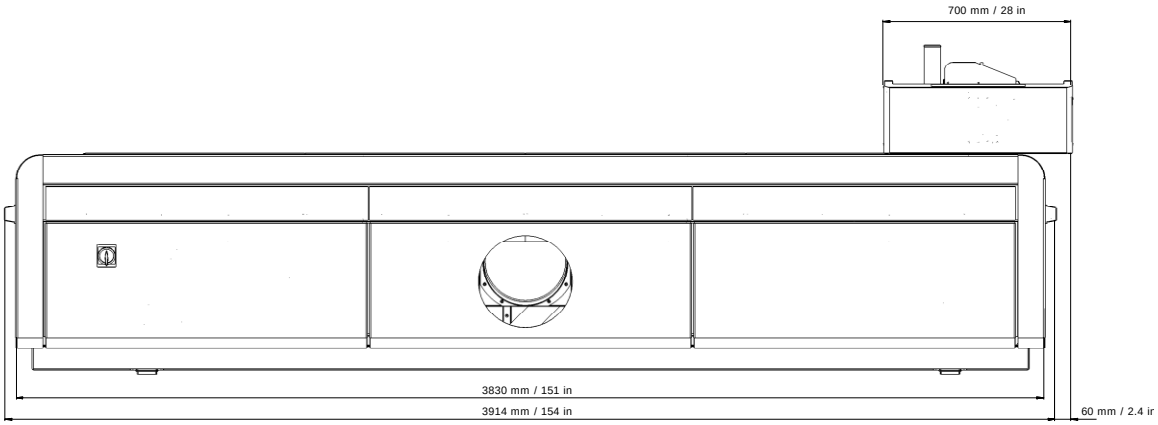


Figure 2: Side view

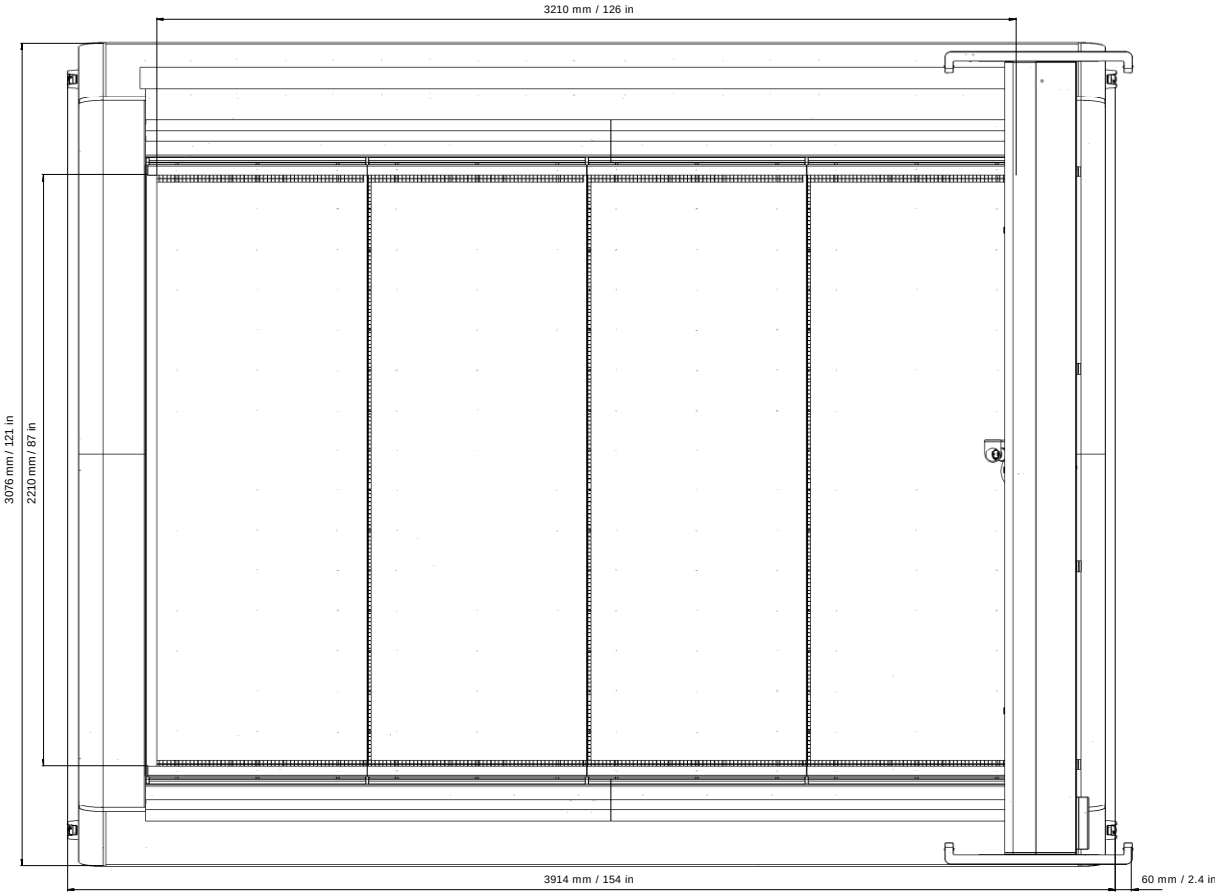


Figure 3: Top view

Operating console exterior dimensions

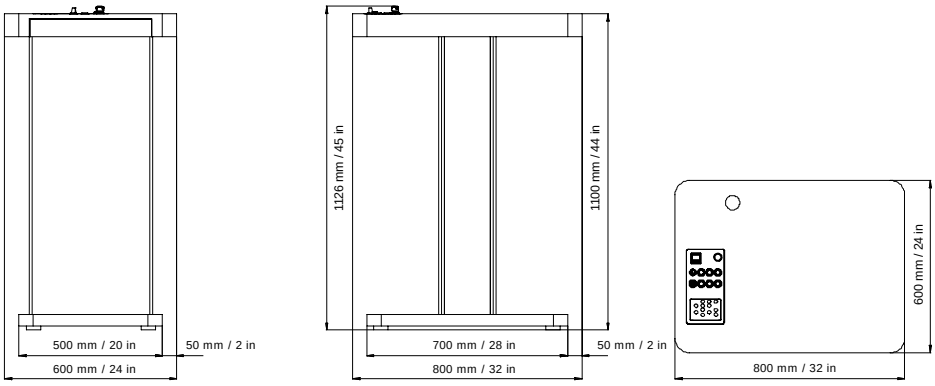


Figure 1: Side, front & top view

Travelling exhaust exterior dimensions

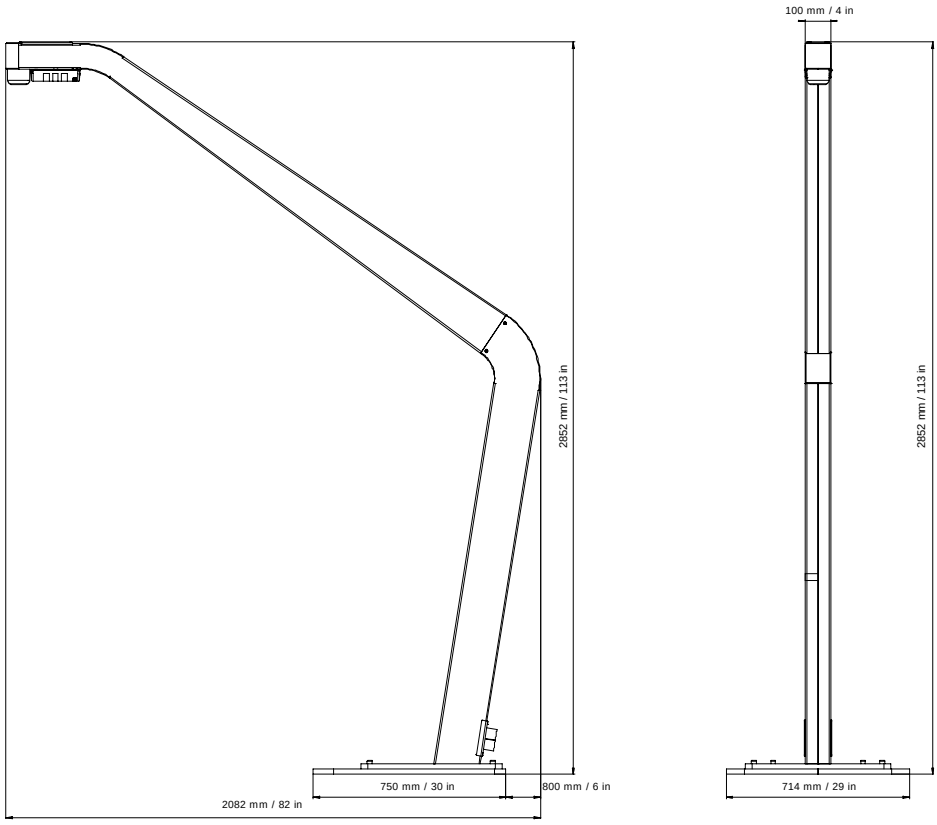


Figure 1: Front and side view

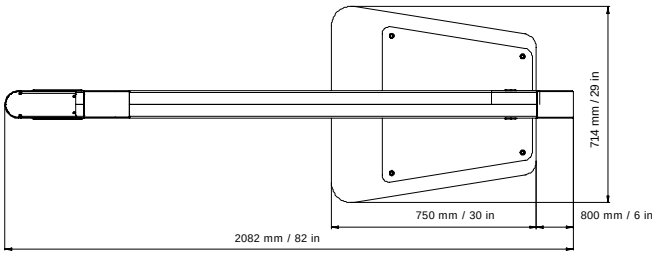


Figure 2: Top view

Subject to change without notice.
Errors and omissions excepted.
June 2016

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:
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 60204-1:2011-01 Machine Safety – electr. Equipment
- EN 60825-1:2015-07, EN 60825-4:2011-12 Safety of Laser Equipment
- 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:

CE

Acceptance report

trotec
laser. marking cutting engraving

Dear customer!

We request your confirmation of properly completed transfer of the machine. Please transmit a copy of this document - filled out and signed by an authorized company representative - to an employee of our sales affiliate for forwarding to the manufacturer.

Please check applicable items:

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

The machine with the machine designation:

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

City, Date	(Instructed person) Name, Position	Company stamp, Signature

Response form

Dear customer!

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

Contact details

Name: _____
Country: _____
Phone: _____
E-mail: _____
Date: _____

Machine data

Serial number: _____
JobControl® version: _____
Driver version: _____
Layout Software: _____
Firmware version: _____

Description of the problem

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

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

What attempts were made to solve the problem?

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

Training verification form

trotec
laser. marking cutting engraving

Trainee: _____

Trainer: _____

Date of Training: _____

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

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

_____ _____

Signature Trainer Signature Trainee