

trotec

SpeedMarker 50 CL

Operating Manual



8062

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ENGLISH

/ SETTING NEW STANDARDS

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Content

1	General Information.....	8
1.1	Information about this manual.....	8
1.2	Storage of the manual.....	8
1.3	General instructions for using the manual.....	9
1.4	Explanation of symbols.....	9
1.5	Applicable health and safety requirements.....	10
1.6	Liability and warranty.....	13
1.7	Scope of delivery (standard configuration).....	13
1.8	Type plate.....	14
2	Laser machine hazards.....	15
3	Safety.....	18
3.1	General safety notes.....	18
3.1.1	Intended use.....	18
3.1.2	Improper use.....	19
3.1.3	Temporal limits of the machine.....	19
3.1.4	Machine modification.....	20
3.1.5	Emergency stop.....	20
3.1.6	Operating modes.....	20
3.1.7	Applicable safety regulations.....	20
3.2	Laser safety.....	21
3.2.1	Laser classification.....	21
3.3	Areas of responsibility.....	23
3.3.1	Operator's obligations.....	23
3.3.2	Responsibilities of the operating personnel.....	23
3.4	Requirements for operating an service personnel.....	24
3.5	Machine identification (warning and safety stickers).....	24
3.6	Secondary (indirect) hazards.....	26
3.6.1	Fire hazard.....	26
3.6.2	Gases, fumes and dust.....	26
3.6.3	Exhaust system.....	26
3.7	In case of emergency.....	27
4	Technical Data.....	28
4.1	Electrical requirements of the machine.....	28
4.2	Connecting a cooling unit from Trotec Laser GmbH.....	28
5	Before commissioning.....	29
5.1	Unloading, inspection and reporting faults.....	29

6	Transport and Storage.....	30
6.1	Transport conditions.....	30
6.2	Storage conditions.....	30
6.3	Place of storage.....	30
7	Setup and installation.....	31
7.1	Installation conditions.....	31
7.1.1	Temperature and relative humidity.....	31
7.2	Removal of packaging.....	31
7.3	Mechanical installation.....	34
7.3.1	Installation of the marking head.....	34
7.4	Electrical installation.....	36
7.4.1	Overview.....	36
7.4.2	Mains connection.....	36
7.4.3	Equipotential bonding.....	36
7.4.4	Ethernet interfaces.....	36
7.4.5	Overview laser rack interface (back side).....	37
7.4.6	Installation without a higher-level control system.....	39
7.4.7	Installation with a higher-level control system.....	40
7.5	Switching sequences.....	40
7.6	SpeedMark IOs.....	42
7.7	Cooling.....	44
8	Control of the set-up and installation.....	46
9	Operation.....	47
9.1	Marking software.....	47
9.2	Control panel.....	48
9.3	Power On/Off.....	48
9.4	Operation/Standby display.....	50
9.5	Checking the safety devices.....	50
9.6	Focusing.....	52
10	Maintenance.....	53
10.1	Safety notes.....	53
10.2	Changing of the laser source filter mat.....	53
10.3	Cleaning the optics.....	54
11	Troubleshooting.....	55
11.1	Error, cause and remedy.....	55
11.2	Possible error messages.....	56

12	Contact details.....	58
13	Disassembly.....	59
14	Disposal.....	60
15	Appendix.....	61
15.1	8062_Einbauerklärung_de.....	62
15.2	Datasheet.....	63

1 General Information

The SpeedMarker 50 CL is an incomplete machine within the meaning of the EC Machinery Directive. The SpeedMarker 50 CL is a high-quality Galvo marking laser. Using a Ceramic-Core laser source enables an extremely long service life with minimal maintenance. With the exception of the filter mats and the processing lens, the system is maintenance-free.

The combination of a high-quality Galvo scanner and a CO₂A laser machine enables short marking times with maximum marking precision. In combination with the marking software and the available interfaces, the result is a flexible and productive marking solution that meets the highest quality requirements.

This operating manual in accordance with the Machinery Directive Annex VI or Article 13 describes the conditions that must be met for the correct installation of the incomplete machine in order to complete it, in accordance with the Machinery Directive, without impairing the health and safety of people.

1.1 Information about this manual

**Read this manual completely and carefully before installation.
This manual is an integral part of the machine and must therefore
be kept in its immediate vicinity and be accessible at all times.**

This operating manual describes the correct installation and handling of the machine. Observe the safety notes and instructions, as well as the local accident prevention regulations and general safety instructions for the area of application. Before beginning any work on the unit, fully read the manual, in particular the chapter "Safety" and the respective safety notes. The contents must have been understood.



Information

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

The operator of the laser marking system is obliged to comply with the "applicable safety regulations" as described in the chapter "safety".

1.2 Storage of the manual

This operating manual is an integral part of completing this incomplete machine.

1.3 General instructions for using the manual

The operating manual informs you about the correct and safe use of this machine and shows you the step-by-step actions required for initial start-up. The operating manual also contains important information on maintaining the system.



Warning

Before commissioning and operating the unit, this operating manual must be read carefully and observed. Failure to observe the individually listed points in the operating manual may result in personal injury and/or property damage!

Operation of the unit is only permitted with machines and spare parts that are included in the scope of delivery or listed in the spare parts list.

Additional equipment must be matched to the basic machine, and safety and operability must be guaranteed (inquiries need to be made at the retailer or in the factory).

1.4 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.

1.5 Applicable health and safety requirements

OVERVIEW OF BASIC APPLICABLE HEALTH AND SAFETY REQUIREMENTS AND THEIR FULFILLMENT

According to Annex I of Machinery Directive 2006/42/EC

Basic health and safety requirements	Applicable/ valid	Fulfilled	Notes
1.1 General	-	-	-
1.1.2 Principles for the integration of safety	Yes	No	
1.1.3 Materials and products	Yes	No	
1.1.4 Lighting	Yes	No	
1.1.5 Machine design in terms of handling	Yes	No	
1.1.6 Ergonomics	Yes	No	
1.1.7 Operator stations	No		
1.1.8 Seats	No		
1.2 Control systems and command units	-	-	-
1.2.1 Safety and reliability of control systems	Yes	No	The external control system must meet the requirements
1.2.2 Controls	Yes	No	The external controls must meet the requirements
1.2.3 Start-up	Yes	No	The external start-up devices must meet the requirements
1.2.4 Shutdown	Yes	No	The external shutdown devices must meet the requirements

Basic health and safety requirements	Applicable/ valid	Fulfilled	Notes
1.2.5 Selection of control or operating modes	Yes	Partially	The external devices for selecting the control or operating mode must meet the requirements
1.2.6 Power supply disruption	No		
1.3. Protective measures against mechanical hazards	No	--	
1.4 Requirements for safety devices	-	--	
1.4.1 General requirements	Yes	No	
1.4.2 Special requirements for guards	Yes	No	
1.4.2.1. Fixed guards	Yes	No	A laser protection wall according to EN 60825:4 must be firmly connected to the laser system as protective housing
1.4.2.2. Movable guards with locking	Yes	No	Doors, flaps. etc. for loading would be such movable guards. These must be monitored with appropriate position limit switches (with locking) (these must also be safety-oriented for this laser machine). According to the Machinery Directive, a position limit switch with guard locking may be required depending on how the hazard behind it is accessed by workers
1.4.2.3. Adjustable guards restricting access	Yes	No	This could be e.g. laser shielding according to EN 12254. These must be constantly monitored and must not be permanently connected to the laser system, i.e. they must not form a protective housing.
1.4.3 Special requirements for other safety devices	Yes	No	
1.5.1 Electrical power supply	No		
1.5.2 Static electricity	No		
1.5.3 Non-electrical power supply	No		
1.5.4 Assembly error	No		
1.5.5 Extreme temperatures	No		
1.5.6 Fire	Yes	No	
1.5.7 Explosion	Yes	No	
1.5.8 Noise	No		
1.5.9 Vibrations	No		
1.5.10 Radiation	No		
1.5.11 Radiation from outside	No		
1.5.12 Laser radiation	Yes	No	

General Information

Basic health and safety requirements	Applicable/ valid	Fulfilled	Notes
1.5.13 Emission of dangerous materials and substances	Yes	No	Reference to DIN 60825:4 Annex D for laser protection walls and to OStrV (Optical Radiation Regulation) and TROS laser radiation
1.5.14 Risk of being trapped in a machine	No		
1.5.15 Risk of slipping, tripping and falling	No		
1.5.16 Lightning strike	No		
1.6 Maintenance	Yes	Partially	The safety instructions in the operating manual must be integrated into the operating manual for the complete system
1.7 Information	-	-	-
1.7.1 Information and warning signs on the machine	Yes	Partially	Safety stickers must be attached to the protective housing. If necessary, an additional emission lamp must be attached
1.7.2 Warning of residual risks	Yes	No	
1.7.3 Machine labeling	Yes	Partially	The labeling for lines to the external interfaces still needs to be attached
1.7.4 Operating manual	Yes	Partially	The relevant parts of the operating manual for the incomplete machine must be integrated into the operating manual for the complete system
2. Additional basic health and safety requirements for certain types of machines	No		
3. Additional basic health and safety requirements for eliminating the hazards posed by the mobility of machines	No		
4. Additional basic health and safety requirements for eliminating the hazards caused by lifting operations	No		
5. Additional basic health and safety requirements for machines that are intended for use underground	No		
6. Additional basic health and safety requirements for machines that pose a hazard due to the lifting of people	No		

1.6 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.

1.7 Scope of delivery (standard configuration)

- Mains cable
- Software and manuals on storage medium
- Lens cleaning tissues
- Key for Rack
- Key for PC
- Plug X11, X31, X71
- PC Recovery Stick
- Connection cable for exhaust system (optional)

The monitor, keyboard and mouse are not included in the standard scope of delivery.



Notice

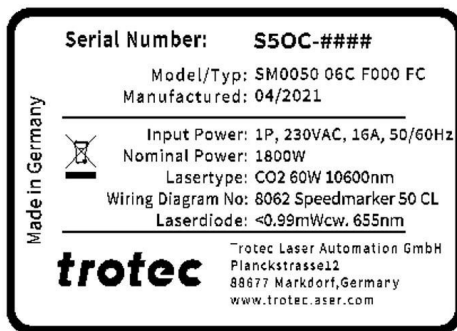
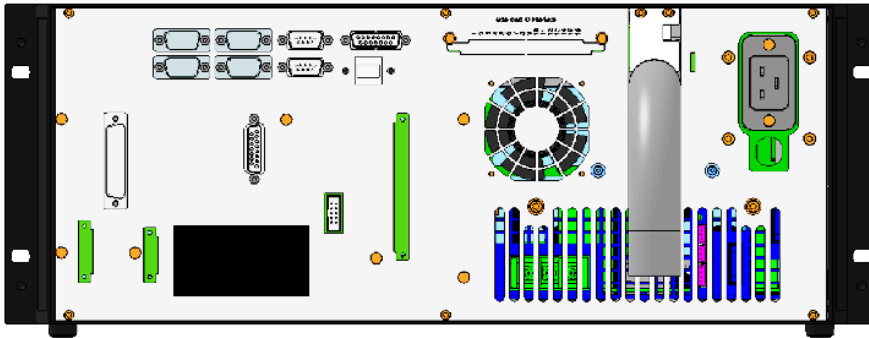
The system should be returned and transported in the original packaging.

General Information

1.8 Type plate

The data plate contains information about the serial number, manufacturer, date of manufacture, connection values and consumption data.

The data plate is located on the back of the laser rack.



Enter the serial number, model and year of manufacture for the machine here.

This data is important if there are problems with the machine and when ordering spare parts.

Serial number:	
Model:	
Year of manufacture:	

2 Laser machine hazards

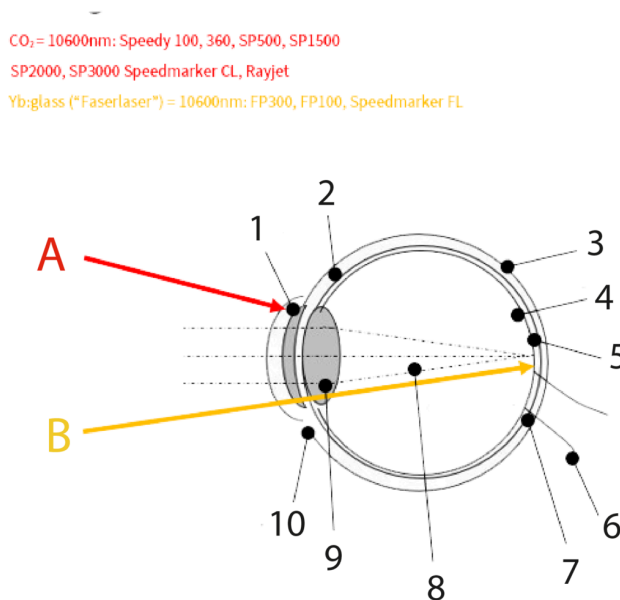
The following hazards may arise when working with laser machines:

EYE HAZARDS

Laser radiation damages the eye; depending on which wave length of the laser machine is used, different areas of the eye are primarily damaged.

The following laser sources are used at Trotec Laser GmbH:

- CO₂ = 10600nm: Speedy 100, 300, 360, 400 , SP500, SP 1500, SP 2000, SP 3000, SpeedMarker CL, Rayjet
- Yb:glass ("fiber laser") = 1064 nm This source is used in FP300; FP100; Speedmaker FL



A	CO ₂ beam heats/vaporizes the cornea	5	Choroid
B	Nd: YAG Nd:YVO, Yb:glass Vaporizes small retinal area PRO PULSE	6	Optic nerve
1	Cornea	7	Blind spot
2	Conjunctiva	8	Optical axis
3	Dermis	9	Lens
4	Retina	10	Iris

SKIN HAZARDS

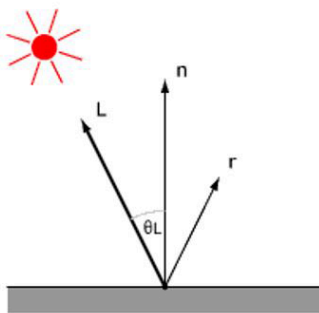
With class 4 laser machines, both direct radiation and indirect scattered radiation are dangerous and can cause skin and eye injuries.

Tissue changes dependent on temperature

Temperature in °C	Effect (tissue change)
< 40	Non-thermal effects
40-50	Enzymatic effects
60-65	Protein denaturation
80	Collagen denaturation
90-100	Tissue desiccation
> 300	Carbonation

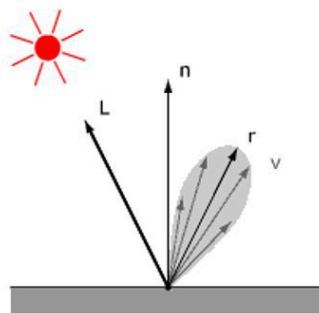
REFLECTION HAZARDS

The following types of reflection exist



reflective

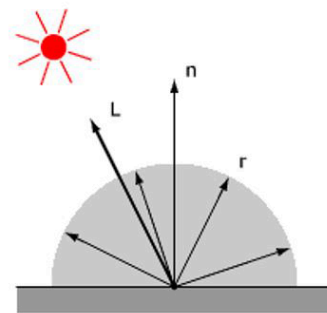
HIGH



directed

Reflection hazards

MEDIUM



diffuse

LOW

DANGER POSED BY A DEFECTIVE FIELD LENS

(Source DGUV technical committee information sheet no. FA ET 2)

INDICATORS ARE E.G.:

- Deterioration in the cutting result
- Emission of whitish or reddish dust in the area of the cutter head or the laser unit
- Lens fragments in the cutter head or in the beam guidance. Powdery deposits in the colors white, gray and red.

HAZARDS INCLUDE E.G.:

Thermal decomposition produces smoke from selenium and zinc oxides. It is deposited as a white powder. Elemental selenium can also be deposited as a gray or red powder. There is a risk of poisoning if inhaled or swallowed. Given that the smoke is deposited on cold surfaces near the evaporation, there is only a risk of inhaling the smoke in the immediate temporal and spatial vicinity of the incident.

For selenium and its inorganic compounds, including the oxides of selenium, a binding work limit (OEL) of 0.05 mg/m³ (inhalable fraction), short-term value category II, exceedance factor 1 is specified in the TRGS 900 "Occupational Exposure Limits".

For zinc oxide smoke, the Senate Commission for the testing of hazardous substances has published a MAK value (maximum workplace concentration) of 1 mg/m³ (alveolar fraction), short-term value category I, exceedance factor 1 in the 2007 list of MAK and BAT values.

Carcinogenic effect: The Senate Commission for the testing of health agents classified selenium and its organic compounds, including the oxides of selenium, in category 3B: suspected carcinogenic effect in the 2007 list of MAK and BAT values.

The coating of the lenses can contain thorium fluoride. Thorium is a radioactive element. The amount of thorium in the coating as well as the area of the lens surface affected by the decomposition result in radiation exposure, even in unfavorable cases, which is usually far below the limits of the Radiation Protection Ordinance.

PROTECTIVE MEASURES INCLUDE, FOR EXAMPLE:

- If you notice an unpleasant smell or unusual noises, switch off the machine using the "emergency stop" function
- Leave the area close to the machine (area of approx. 10m-20m around the machine) e.g. wait at least 30 minutes until the reaction has subsided
- Ensure that the area around the machine is well ventilated
- When approaching the machine, pay attention to the formation of odors
- Remove all lens fragments
- Clean the beam guidance and cutter head with a damp cloth and remove all powdery deposits (industrial vacuum cleaner class H)
- It is essential to use protective gloves and a filtering dust mask (FFP3) when cleaning
- Use protective gloves made of nitrile rubber or PVC

THE FOLLOWING MUST BE OBSERVED FOR DISPOSAL:

- All lens parts, cleaning cloths with powder residues and damaged protective equipment must be collected in a plastic bag
- The bag must be sealed airtight after completion of the work
- The bag must then be disposed of properly

3 Safety

We expressly point out that the incomplete machine 8062 SpeedMarker 50CL is a class 4 laser machine without additional safety devices!

This machine may only be put into operation when it has been determined that the additional safety devices or protective measures required in accordance with the EC Machinery Directive are being met.

READ AND FOLLOW THESE INSTRUCTIONS TO AVOID POSSIBLE DAMAGE.

At the time of its development and manufacture, the machine was built according to the applicable, recognized rules of technology and is considered to be operationally safe.

Dangers can be caused by the machine if:

- it is operated by inappropriately trained staff,
- staff have not been trained,
- the use is improper,
- it is used for purposes other than those intended.

This chapter provides an overview of all the important safety aspects that are required for optimal protection of people, as well as safe and trouble-free operation of the machine. Other chapters of this manual contain specific safety instructions for averting and avoiding danger.

3.1 General safety notes

3.1.1 Intended use

The SpeedMarker 50 CL is a Class 4 marking laser as per DIN EN 60825-1 "Safety of laser products". It is only intended for integration in a laser protective housing.

It is an incomplete machine within the meaning of the applicable Machinery Directive.

Commissioning may only take place after integration into a laser protective housing and after the safety circuits have been connected in accordance with regulations.

The machine is intended exclusively for laser marking using the marking software supplied.

The following points should also be observed as part of the intended use:

FURTHER LIMITS



Notice

- Only mark approved materials using suitable parameters.
- Perform maintenance and service according to the specifications in this operating manual.
- Use a suitable exhaust system to remove vapors, dusts or other reaction products.
- The machine may only be operated by suitably trained staff.
- Observe the applicable safety regulations and the procedures described in this operating manual.

If the intention is to use the system for other applications, Trotec Laser GmbH should be informed in advance.

3.1.2 Improper use

Any use of the machine in areas other than the intended use or described in this documents is deemed improper and is prohibited. The manufacturer does not assume any liability for resulting personal injury and/or property damage. The operator is solely liable for any damage caused by improper use.

Failure to observe the instructions for operation, maintenance and upkeep described by the manufacturer in this operating manual shall exclude any liability of the manufacturer in the event of a defect.

3.1.3 Temporal limits of the machine

The SpeedMarker 50 CL has a service life of 10 years. Once the service life has been reached, the SpeedMarker must be fully serviced to ensure continued safe operation.

Once the service life has been reached, all safety-relevant components must be replaced by a service technician from Trotec Laser GmbH and the general condition of the SpeedMarker 50 CL must be assessed.

The "ICL" interlock safety inputs are designed for a maximum of 4 million switching cycles.

The control board must then be replaced in order to guarantee the PL. The connection of the safety inputs is described in Chapter 7.4 Electrical installation.

The safety inputs of the emergency stop and the interlock have two channels and correspond to the performance level (PL) of standard EN ISO 13849-1:2015.

Performance Level (PL)	Average probability of a dangerous failure per hour (PFH _D) 1/h
a	$\geq 10^{-5}$ to $< 10^{-4}$
b	$\geq 3 \times 10^{-6}$ to $< 10^{-5}$
c	$\geq 10^{-6}$ to $< 3 \times 10^{-6}$
d	$\geq 10^{-7}$ to $< 10^{-6}$
e	$\geq 10^{-8}$ to $< 10^{-7}$

Source: Table 2 EN ISO 13849-1:2015

3.1.4 Machine modification

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.

The machine may only be operated with parts and original accessories from the manufacturer. Using third-party accessories and spare parts affects machine safety.

3.1.5 Emergency stop

The SpeedMarker 50CL has an emergency stop. This is intended to avert danger. The emergency stop of the SpeedMarker 50CL must be integrated into the emergency stop of the laser safety device. It switches off the laser power supply and galvo power supply. For connection of the emergency stop, see the "Electrical installation chapter.

3.1.6 Operating modes

NORMAL OPERATION

Normal operation exists after complete integration and compliance with the Machinery Directive.

SERVICE OPERATION

Service activities may be carried out only by authorized, trained service technicians.

If side panels and covers are removed and safety devices are bypassed, it can lead to direct and indirect scattered radiation. The service operation is therefore declared as laser class 4 and the appropriate precautions need to be taken (see "Laser classes").

3.1.7 Applicable safety regulations

The following guidelines and regulations are to be observed in order to avoid risks when operating Trotec laser systems. The following list is a non-exhaustive list.

APPLIED GUIDELINES AND HARMONIZED STANDARDS

2006/42/EC	Machinery Directive
DIN EN ISO 12100:2011-03	Safety of machinery – General principles for design – Risk assessment and risk reduction.
DIN EN 60204-1:2007-06	Safety of machinery – Electrical equipment of machines – Part 1: General requirements.
EN ISO 13849-1:2015	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design



Notice

Observe applicable safety regulations.

Instructions and directives in this manual may differ locally, regionally, and internationally. Therefore, observe the guidelines applicable to you, as well as the regulations of the Employers' Liability Insurance Association and its implementation.

The operator is responsible for the fulfillment of all safety requirements, as Trotec Laser GmbH has no influence on the correct use of the unit.

Adhere to official regulations for your operating location in accordance with the applicable local legal regulations (for accident prevention regulations or employee protection).

ADDITIONALLY APPLIED REGULATIONS

TROS laser radiation

Technical rule for the occupational health and safety ordinance on artificial, optical radiation - TROS laser radiation

3.2 Laser safety

3.2.1 Laser classification

The laser class according to EN 60825-1 describes the hazard potential emanating from accessible laser radiation.

The SpeedMarker 50 CL is a laser class 4 product and complies with the latest safety norms and regulations (DIN EN 60825-1).

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.

LASER PROTECTIVE HOUSING

The SpeedMarker 50 CL must be installed in a laser protective housing. When used as a laser system in production, this housing should be designed in such a way that the useful radiation of the CO₂ laser outside of the EGW (or maximum permissible radiation) falls below that corresponding to laser class 1. If necessary, the class 2 pilot laser can also penetrate beyond the laser protective housing.

The guards for the laser protective housing must be connected to the safety interface of the SpeedMarker 50CL. See the "Interface overview laser rack (rear)" chapter.

If there are covers attached to the housing that do not need to be monitored, they must be fastened in such a way that they can only be opened with a tool. Covers that are not monitored are only permitted if they are not required for maintenance or cleaning and have to be opened by the operator.

EMISSION WARNING LIGHT

The readiness for laser emission must be clearly and widely visible.

For this, you have the option to connect redundantly to interfaces X11 and X31. The “Shutter open” connection is described in the “Interface overview laser rack (rear)” chapter. This warning light is only required when operating laser class 4. If the SpeedMarker 50CL is integrated into a class 2 laser protective housing, this is not required.

OPERATOR’S OBLIGATIONS



Warning Laser

Operator’s obligations for the operation of class 4 laser machines (US: class IV):

- Adhere to official regulations for the operating location in accordance with the applicable local legal regulations (for accident prevention regulations or employee protection), e.g. TROS laser radiation for Germany.
- Mark the danger zone using warning lights and warning signs.
- Secure the danger zone against unauthorized entry.
- Wear suitable laser safety goggles within the danger zone, which are matched to the wavelength and power of the laser machine.

Compliance with the above points does not release the operator from compliance with the applicable standards and guidelines for operating class 4 laser systems.

Class 1

The accessible laser radiation of Class 1 laser systems does not pose any hazard for the skin or eyes.

In order to operate as a Class 1 laser system, the following points must be observed:



Notice

- The entire beam path should be shielded to prevent radiation.
- All covers with access to laser areas that can be removed without tools must be equipped with appropriate safety latches.

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.

The product uses a Class 2 pilot laser. In order to prevent irritation of the eyes during operation, the operator should not look directly at the laser source. Diffuse reflections of the pilot laser are absolutely harmless.

3.3 Areas of responsibility

3.3.1 Operator's obligations

The operator has the following responsibilities:

- It is the operator's responsibility to obtain information about and comply with any national legal requirements and official regulations (e.g. reporting requirements) for the operation of laser systems of class 4 or laser systems with a built-in laser source of class 4.
- Observe the safety notes and instructions, as well as the local accident prevention regulations and general safety instructions for the area of application.
- A suitable fire extinguisher must be located in the immediate vicinity of the laser machine, as the laser beam can ignite flammable material. If there are no reasons to the contrary from a fire expert, a CO₂ fire extinguisher is recommended to protect the laser unit in the event of a fire.
- The instruction must be carried out before starting the hazardous activity, e.g. after installing or relocating or before commissioning the laser system, and at least once a year. It must be carried out in a format and language that the employees can understand. Before significant changes in the working conditions and exposure situations, the employer must provide instructions on the new hazardous situation.
- The operator is advised to prepare in-house operating procedures, taking into account the professional or occupational qualifications of the respective staff deployed, and to have the receipt of such procedures or the manual or the participation in instruction / training sessions confirmed in writing.
- The relevant content of this operating manual must be incorporated into operating instructions in accordance with §12 Industrial Safety Regulation and TROS Laser Radiation Part 3.
- The responsibility for the various activities involved in the operation of the machine (such as installation, operation, maintenance and cleaning) must be clearly defined and complied with, in order to ensure that no unclear competencies regarding safety may arise.
- The maintenance and upkeep work specified in the manual must be carried out at regular intervals.
- For all work relating to installation, commissioning, set-up, operation, changing of operating conditions or procedures, maintenance, inspection and repair, any shutdown procedures indicated in the manual as necessary must be observed.
- Check and, if necessary, provide personal protective equipment (e.g. safety goggles according to laser power and wavelength).
- The operator is responsible for the safety-related condition of the machine.
- Flammable materials must not be stored in the working area or in the immediate vicinity of the machine.
- The operator must ensure cleanliness and accessibility on and around the machine through appropriate instructions and controls.
- The operator is responsible for the complete and safe integration of the SpeedMarker 50CL.

3.3.2 Responsibilities of the operating personnel

The operator has the following responsibilities:

- The operator is required to check the machine including its safety devices for any externally detectable damage and deficiencies before starting work, and to immediately report any changes (including irregularities of the operating behavior) that may affect safety. It is important to ensure that the machine is run only in flawless condition.
- The machine must not be left unattended during processing of materials (monitored operation).
- Switch off the machine described here at the main switch when it is not in use.

- Use the machine described here only with a lens inserted. A non-focused laser beam can be reflected out of the housing.
- This machine must be stopped immediately in the event of any malfunction.
- No operation that affects the safety of persons or the system is permitted.
- The machine and its components, such as the lens and mirrors, are to be kept clean at all times.



Caution

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

3.4 Requirements for operating an service personnel

The requirements for the operating and service personnel are:

- The personnel must have read and understood this manual and in particular the "Safety" section.
- The personnel must not be under the influence of drugs, alcohol or reactivity affecting medication when working on or with the machine.
- The personnel must be familiar with using the CO₂ fire extinguisher.
- The personnel must be trained in order to be qualified to operate the machine. If the personnel lack the necessary knowledge for working on or with the machine, they must first be trained and note down the training in the training verification form.

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.

3.5 Machine identification (warning and safety stickers)

The warning and information labels on the machine are attached to places where there may be a source of danger before commissioning or during operation. Pay special attention to these labels.



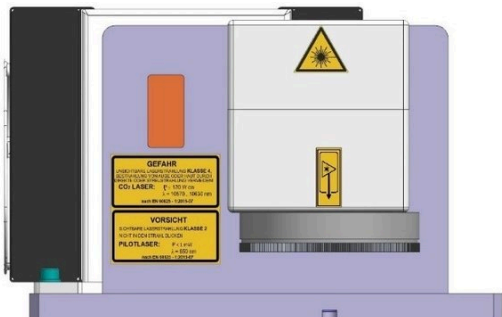
Caution

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.

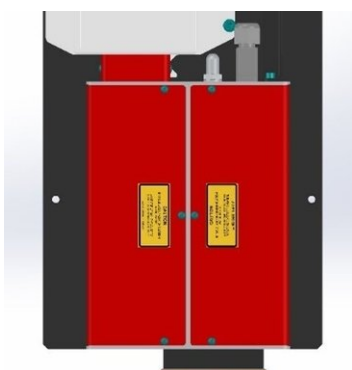
- Replace lost or damaged labels immediately.
- Contact your Trotec Laser GmbH dealer for details.

LABELS ON DELIVERY



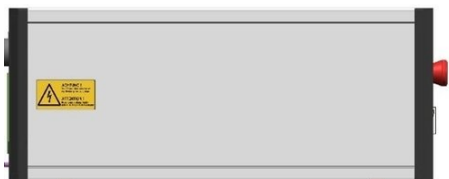
GEFAHR
 UNSICHTBARE LASERSTRAHLUNG **KLASSE 4**
 BESTRAHLUNG VON AUGE ODER HAUT DURCH
 DIREKTE ODER STREUSTRAHLUNG VERMEIDEN!
CO₂ LASER: $P \leq 120 \text{ W cw}$
 $\lambda = 10570 \dots 10630 \text{ nm}$
 nach EN 60825 - 1:2015-07

VORSICHT
 SICHTBARE LASERSTRAHLUNG **KLASSE 2**
 NICHT IN DEN STRAHL BLICKEN
PILOTLASER: $P < 1 \text{ mW}$
 $\lambda = 650 \text{ nm}$
 nach EN 60825 - 1:2015-07

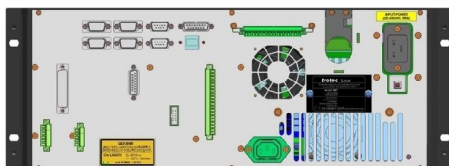


GEFAHR
 UNSICHTBARE LASERSTRAHLUNG **KLASSE 4**,
 WENN GEÖFFNET
 BESTRAHLUNG VON AUGE ODER HAUT DURCH
 DIREKTE ODER STREUSTRAHLUNG VERMEIDEN!
 nach EN 60825 - 1:2015-07

GEFAHR
 UNSICHTBARE LASERSTRAHLUNG **KLASSE 4**,
 WENN GEÖFFNET
 BESTRAHLUNG VON AUGE ODER HAUT DURCH
 DIREKTE ODER STREUSTRAHLUNG VERMEIDEN!
 nach EN 60825 - 1:2015-07



ACHTUNG !
 Vor Öffnen des Gerätes ist
 der Netzstecker zu ziehen
ATTENTION !
 Hazardous voltage inside
 Before opening disconnect mains



NENNSPANNUNGSBEREICH
 220-240VAC 50/60HZ

GEFAHR
 UNSICHTBARE LASERSTRAHLUNG **KLASSE 4**,
 WENN GEÖFFNET
 BESTRAHLUNG VON AUGE ODER HAUT DURCH
 DIREKTE ODER STREUSTRAHLUNG VERMEIDEN!
 nach EN 60825 - 1:2015-07

3.6 Secondary (indirect) hazards

3.6.1 Fire hazard



Warning **Fire hazard**

There is a risk of fire due to gases and the processing of easily flammable materials.

- Do not leave the machine unattended when in operation.
- Keep a fire extinguisher selected in accordance with the fire report to hand and mount it in the immediate vicinity of the machine.

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

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

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

Regularly check your air cooling system on the laser machine. The function of the filters and fans in particular should be checked regularly so that defects caused by excess temperature are avoided.

3.6.2 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.

3.6.3 Exhaust system

An essential point to complete the SpeedMarker 50CL is averting indirect hazards such as dust or pollutants.

For this purpose, an exhaust system tailored to the respective laser process must be used.

It is important to ensure the correct selection of filters and size of the activated carbon proportion.

Depending on the laser process, it may be necessary to guide the exhaust air outside and not return it to the room.

3.7 In case of emergency

IN CASE OF EMERGENCY

- Press the emergency stop to safely switch off the laser system.



Notice

The emergency stop button is not included in the scope of delivery and must be provided and connected by the integrator.

- If necessary, disconnect the machine from the main power supply.
- In the event of a fire: Only use a selected fire extinguisher if it is safe to do so.

WHAT TO DO IN THE EVENT OF MALFUNCTIONS

- In the event of unusual operating conditions, open the interlock circuit to stop the machining process.
- Inform the laser protection officer and your supervisor.
- Follow the instructions.
- Repair work must only be carried out by Trotec Laser GmbH service technicians.



Notice

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

WHAT TO DO IN THE EVENT OF AN ACCIDENT, FIRST AID

- If eye damage occurs due to laser radiation (if the MPD values are exceeded), the casualty must present to an ophthalmologist immediately, who can perform a fluorescence angiography if needed.
- The assumption of eye damage is justified if exposure to laser beams has occurred and the MPD values have been exceeded.
- First aiders must protect themselves.
- Switch off the machine.
- Rescue the injured person from the danger area and provide first aid.
- Call an emergency doctor!

4 Technical Data

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

4.1 Electrical requirements of the machine

Pay attention to the information and details in the data sheet for the power supply and power consumption.



Caution

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

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



Caution

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



Notice

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

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

If electrical power fluctuations, brownouts or power outages are a problem in your area, an electrical line stabilizer, UPS (Uninterruptible Power Supply) or backup generator are required. When installing any of these devices, ensure that they meet the electrical requirements of the laser machine.

4.2 Connecting a cooling unit from Trotec Laser GmbH

Observe the operating and maintenance instructions in the operating manual for your cooling unit.



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.

5 Before commissioning

- Read the operating manual and keep it accessible at all times
- The ambient temperature should be between +15°C and +35°C and the relative humidity should not exceed 60% (non-condensing). Failure to do so will result in damage.
- A laser system consists of high-quality electrical and optical components. Mechanical stress, vibrations and impacts must be avoided in any case.
- If the system was exposed to major temperature fluctuations, it must be brought back to room temperature before commissioning.
- In the case of air-cooled systems, ensure there is sufficient air supply to the 19 inch racks. Heat accumulation due to covered ventilation slots or filter mats can damage the system.
- Install the device in the installation location in accordance with the applicable regulations.
- The operator must have read and understood the operating manual, particularly the “Safety notes” chapter. It is recommended that the operator prepares internal instructions for safety and operation and confirms receipt of these instructions/this operating manual or participation in briefings/training in writing.
- Laser marking can produce gases, vapors and other reaction products on the material surface. An effective exhaust system is therefore required by the operator.

5.1 Unloading, inspection and reporting faults

In the event of transportation damage or incomplete delivery:

- Record all details in writing immediately.
- Note all claims on the transportation documents.
- Photograph any damage.
- Send report to Trotec Laser GmbH.

Nach dem Entladen:

- Remove all transport packaging.
- Check the delivery for completeness.
- Inspect the machine and machine components for transportation damage.

6 Transport and Storage

6.1 Transport conditions

- When transporting outside, always transport in a covered vehicle or one with sufficient weather-proofing.
- Protect the machine against transportation damage using straps and inserts, and leave sufficient distance between other transported items.
- Ambient temperature for transportation:
minimum temperature 10°C
maximum temperature 40°C
- Handle the machine and machine components with care.
- Do not place any heavy loads on the machine or machine components.
- Avoid heavy impacts.
- Take particular care when transporting electronic components.

Transport conditions

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

- Avoid high temperature fluctuations.

6.2 Storage conditions

- Store the machine and machine components in a dry location.
- Protect the machine and machine components against scratches.
- Take particular care when packing away electronic components.
- When storing for a long period, preserve bare metal parts (e.g. apply oil).

Storage conditions

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

- Avoid high temperature fluctuations.

6.3 Place of storage

Storage room or boxed with sufficient weatherproofing. The storage location must be free from corrosive elements, fumes and flammable materials.

7 Setup and installation

7.1 Installation conditions

7.1.1 Temperature and relative humidity

Operating temperature (ambient temperature):	+15 °C to +35 °C (59 °F to 95 °F)
Relative humidity:	max. 60%, non-condensing

AMBIENT CONDITIONS

- Sufficient lighting in the workplace.
- Dust-free environment (class 2 IEC60947-1).
- The environment must be EMC-shielded.
- No disruptive electrical installations, hoses and pipes.
- Fluctuation-free power supply.

INSTALLATION SITE

The installation site must:

- have a stable power supply.
- be vibration-free.
- have a sufficient air supply for the laser rack and the PC.

7.2 Removal of packaging

TRANSPORT INSPECTION AND DAMAGE REPORT

- Check the delivery immediately upon receipt for completeness and any transport damage.
- If there is externally visible transport damage, refuse delivery or accept it only with reservation.
- Note the extent of the damage on the carrier's transport documents / bill of delivery.
- Defects that are not immediately apparent must be reported immediately after detection, as claims for damages may be asserted only within the applicable complaint periods.

TRANSPORT IN THE CRATE



Warning

Risk of injury due to slipping unit and falling parts!

Improper procedure in transporting, loading and unloading the unit can lead to injury by falling parts and damage to the unit. Therefore:

1. Use a suitable forklift.
2. Only move the unit with the utmost care and caution.
3. Secure the unit against slipping sideways with belts and ropes.
4. Pay attention to the center of gravity when transporting. Risk of toppling!
5. Perform transport as gently as possible and avoid shocks.
6. Maintain sufficient distance to other objects.
7. Do not place heavy objects on the unit and its components.

Optimal transport temperature: +10 °C to +40 °C



Warning

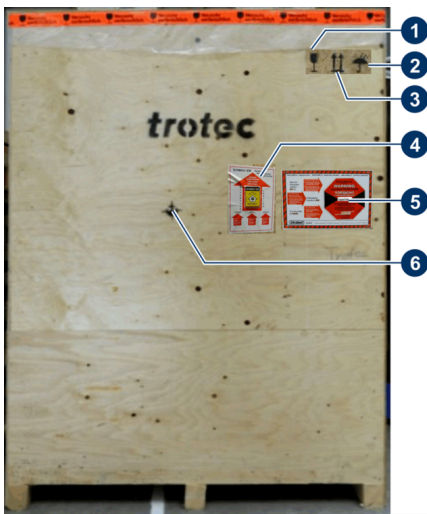
Risk of injury from falling parts!

Improper procedure in transporting the unit can lead to injury by falling parts and damage to the unit. Therefore:

1. Always secure the crate and pay attention to the center of gravity (6) in the crate.
2. Pay attention to symbols (1–3) for ambient conditions.
3. Unload crate with a suitable forklift.

The unit is shipped in a crate, unless otherwise contractually agreed, and must be transported in the original packaging.

The unit is shipped in a crate, unless otherwise contractually agreed, and must be transported in the original packaging.



No.	Designation
1	Symbol Fragile content
2	Symbol Protect against moisture
3	Symbol This way up
4	Tilt monitoring (TiltWatch), see label for description. If the indicator is red, the limit was exceeded at least 1x during transport. Check the contents for damage.
5	Shock indicator (ShockWatch), see label for description. If the indicator is red, the limit was exceeded at least 1x during transport. Check the contents for damage.
6	Symbol Center of gravity Must be observed during transport!

UNPACKING



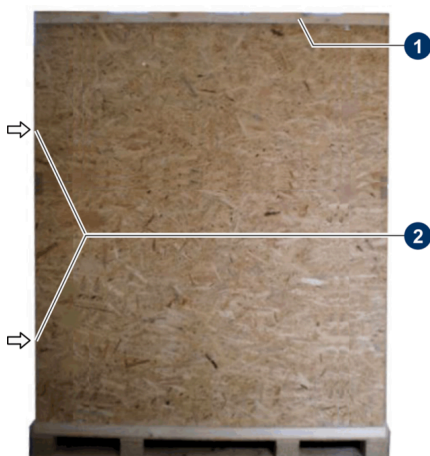
Warning

Risk of injury due to improper procedure!

Improper procedure in transporting the unit can lead to injury by falling parts and damage to the unit. Therefore:

1. Only allow qualified personnel to transport the unit.
2. Carefully open and remove the transport packaging with 2 people.
3. Put the packaging elements in a safe place.

The unit is shipped in a crate, unless otherwise contractually agreed, and must be transported in the original packaging.



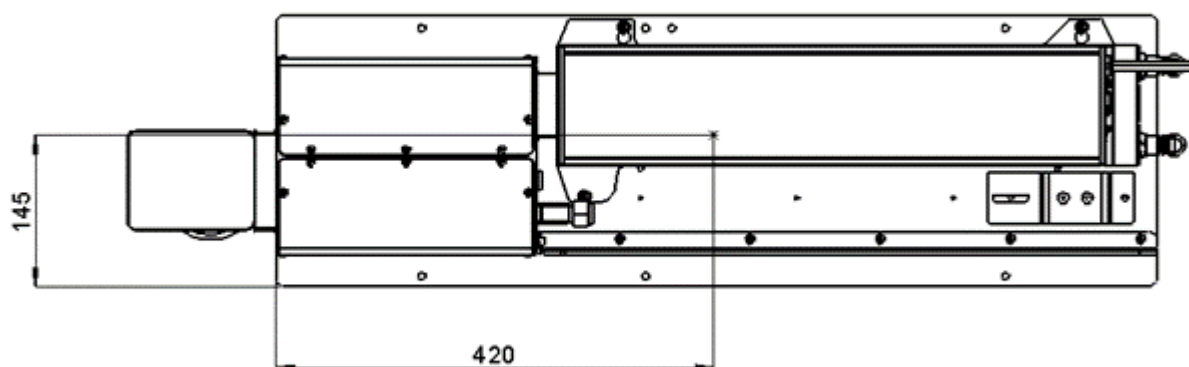
No.	Designation
1	Top
2	Screws for crosspieces
<ol style="list-style-type: none"> 1. Use a suitable forklift and place the crate down vertically on level ground at the installation site. 2. Remove top (1) and set aside safely. 3. Remove the screws (2) from the crosspieces. 4. Remove the side walls and set aside safely. 5. Remove the tensioning strap. 6. Remove the packaging film if necessary. 7. 2 people should carefully lift the laser unit and laser rack off the pallet. 	

7.3 Mechanical installation

7.3.1 Installation of the marking head

Correct, stable and reproducible alignment of the work head relative to the workpiece to be marked is a prerequisite for perfect marking results. Appropriate care must be taken when installing the work head.

CENTER OF GRAVITY

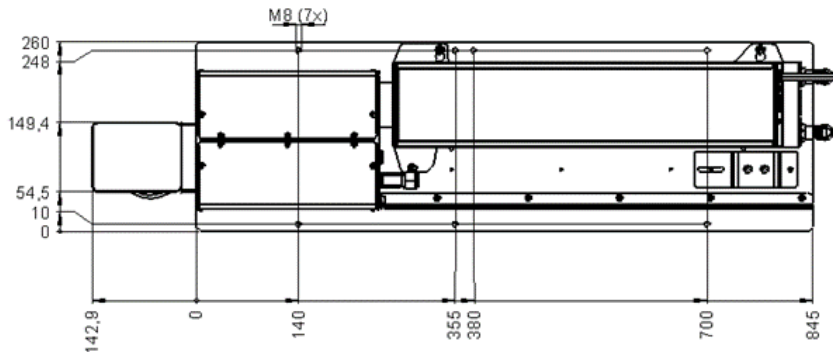


ATTACHMENT

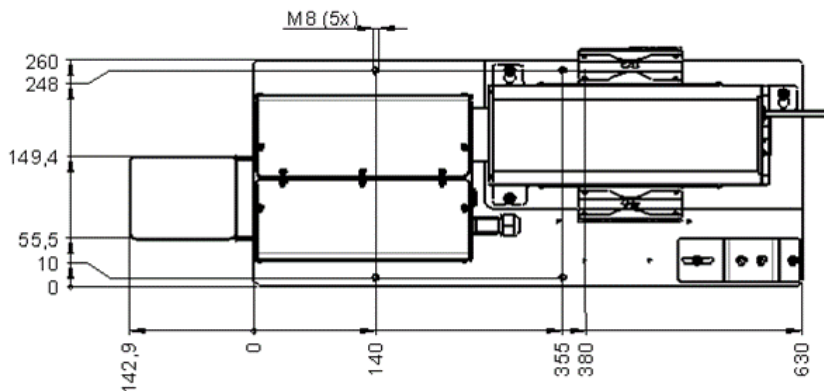
The laser assembly can be attached from below using the drilling template of the laser base plate with M8 screws or from above with M6 screws. It is important to ensure that the laser assembly is secure. Vibrations in the system should be avoided during operation. To avoid damage to the lens, the protective cap should remain on the lens during installation.

The following illustration shows the drilling template for the M8 threaded holes in the laser base plate, viewed from above, these are used to attach the laser assembly.

SpeedMarker with built-in laser source type TL4 and TL6:



SpeedMarker with built-in laser source Type TL2 and TL3:



ALIGNMENT

The focal plane lies parallel to the base plate of the work head. When installing the marking head, make sure that the base plate of the work head is aligned as parallel as possible to the planned working level. Otherwise, due to changes in the focus position, uneven results will be produced over the marking area. In order to adjust the focus position, it must be possible to vary the distance between the object to be marked and the work head.



Caution

In the case of an air-cooled laser source, care must be taken to ensure that sufficient dust- and oil-free ambient air is supplied.

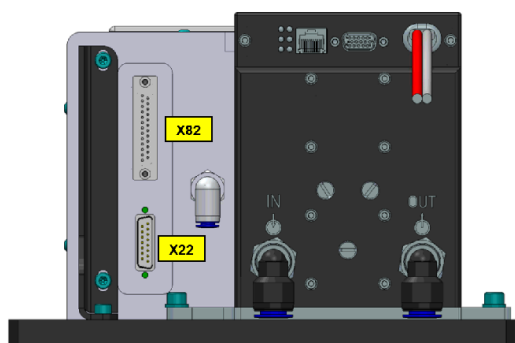
INSTALLATION OF THE LASER RACK

If possible, the laser rack and the PC should be placed next to or directly on top of one another, as the racks can be connected with the supplied cables.

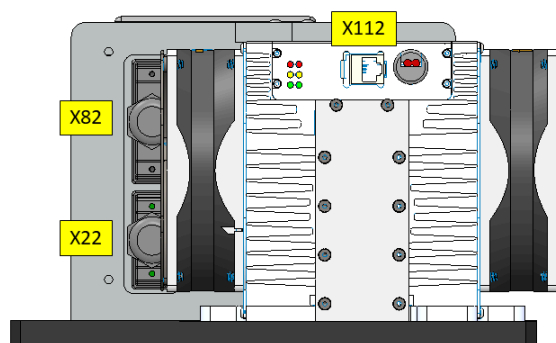
7.4 Electrical installation

7.4.1 Overview

SpeedMarker 50CL with built-in laser source Type TL4 and TL6:



SpeedMarker 50CL with built-in laser source Type TL2 and TL3:



Laser rack	
Power supply	230V AC, 50/60 Hz, 1/N/PE
Maximum power input	1800 W

7.4.2 Mains connection

The back of the laser rack has an IEC socket for the supplied IEC cable.

Before commissioning, it is essential to check whether the laser rack is configured for the existing mains voltage and frequency.

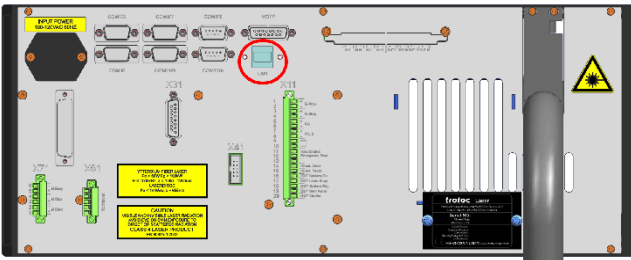
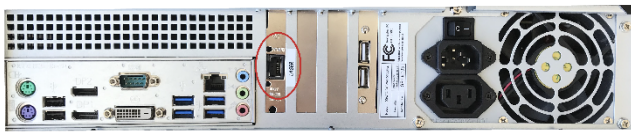
The configuration of the laser rack can be found on the data plate or the warning label above the IEC socket.

7.4.3 Equipotential bonding

Make sure that the laser head is connected to the machine earth plate with at least 4²mm CU.

7.4.4 Ethernet interfaces

The machine is connected to the Ethernet via a cable connection from the LAN interface on the back of the PC rack to the LAN interface on the laser rack.

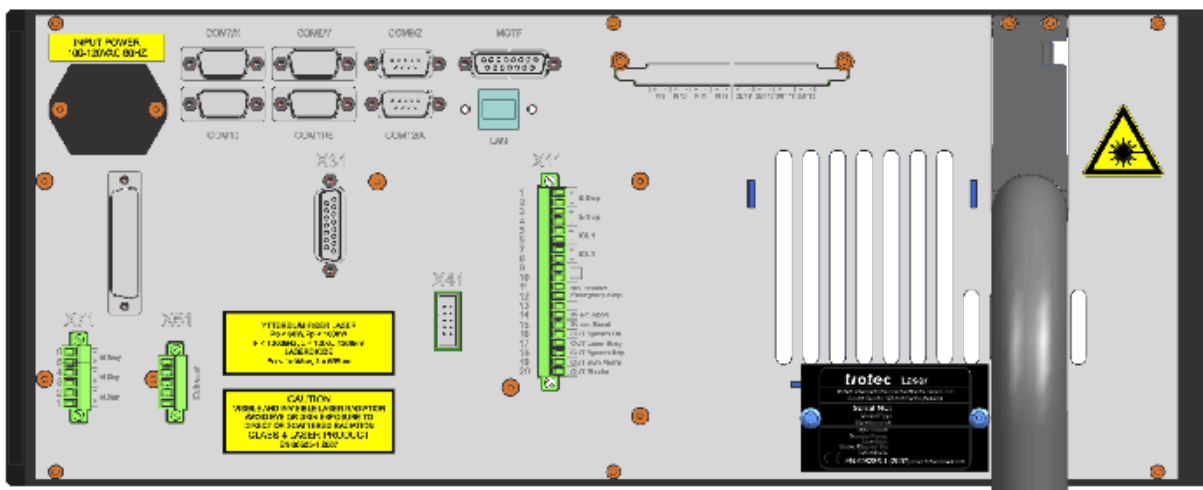


The machine is connected to the Ethernet via a cable connection from the LAN interface on the back of the PC rack to the LAN interface on the laser rack.

THE FOLLOWING IP ADDRESSES ARE RESERVED:

192.168.0.3	192.168.0.10	192.168.0.13	192.168.0.16	192.168.0.19
192.168.0.5	192.168.0.11	192.168.0.14	192.168.0.17	192.168.0.50
192.168.0.7	192.168.0.12	192.168.0.15	192.168.0.18	

7.4.5 Overview laser rack interface (back side)



The following connections are available on the laser rack:

X11 - Safety circuit (Emergency stop button / interlock safety switch / external messages)

The X11 connection enables the connection of external safety circuits, additional emergency stop circuits and external warning lights.



Warning

The digital 24V inputs should only be controlled by isolated contacts with the 24V pin 13 on X11. The input of signals with any other reference potential could result in damage to the respective inputs.

X31 – External panel

The X31 connection enables the connection of an external control panel like the one on the front of the laser rack. If no external panel is connected, the supplied plug with the bridges must be used.

X61 – Exhaust system

This connection is used to control, start and stop a Trotec exhaust system. Only the supplied original cable may be plugged in here.

X71 – Start / Stop

The X71 connection can be used to send a start or stop signal, or to receive a signal from the laser machine, via an external controller. The pin assignment can be found in “Interface pin assignment”.

“Busy” is an output of the laser machine that can be arbitrarily set via a script.

“Stop” is an external input whereby any running laser program is aborted immediately. It is not necessary to monitor this input in the script.

“Start” is an external input that can be monitored in the software in order to trigger a marking process. If the monitoring of the signal in a script is not active, the input has no effect on the program flow either.

For the “Start” and “Stop” signals, 24 VDC must be applied externally.

COM7/X: Connection X-axis

COM8/Y: Connection Y-axis

COM9/Z: Connection Z-axis

COM10: Reserved

COM11/B: Connection B-axis

COM12/A: Connection A-axis

LAN: Connection between PC and laser rack

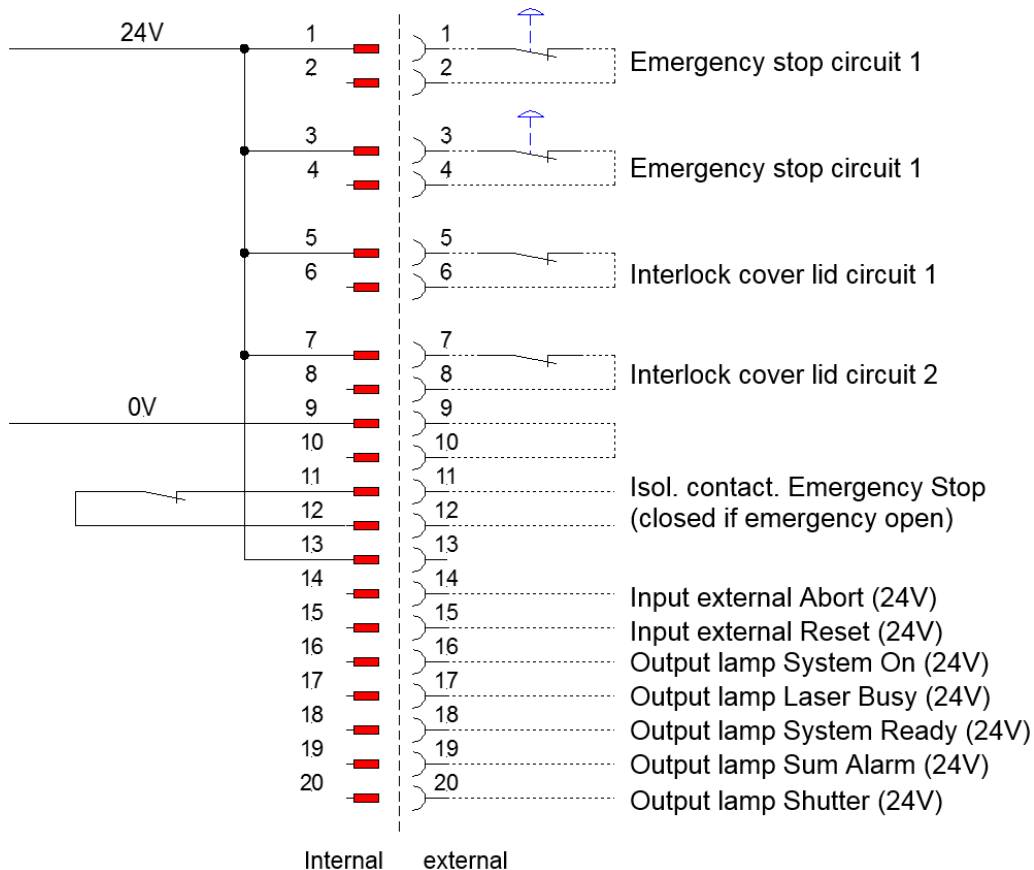


Warning

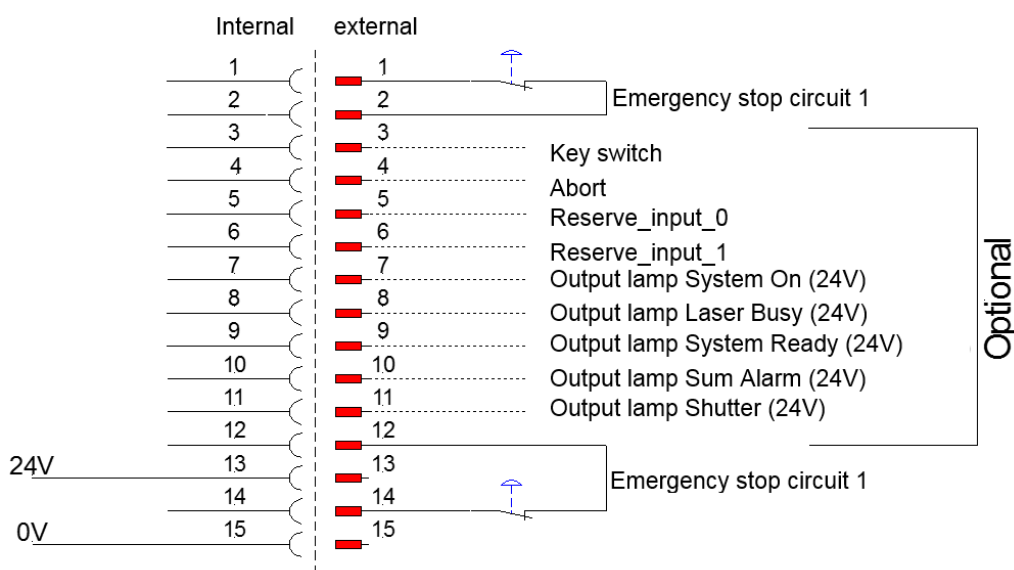
The maximum load of each of the digital 24V outputs on the interface is 100mA. A short circuit of the outputs must be avoided as it will damage the respective inputs.

7.4.6 Installation without a higher-level control system

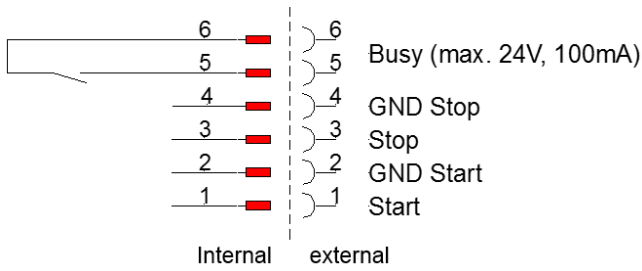
X11 - SAFETY CIRCUIT (EMERGENCY STOP / INTERLOCK / EXTERNAL MESSAGES)



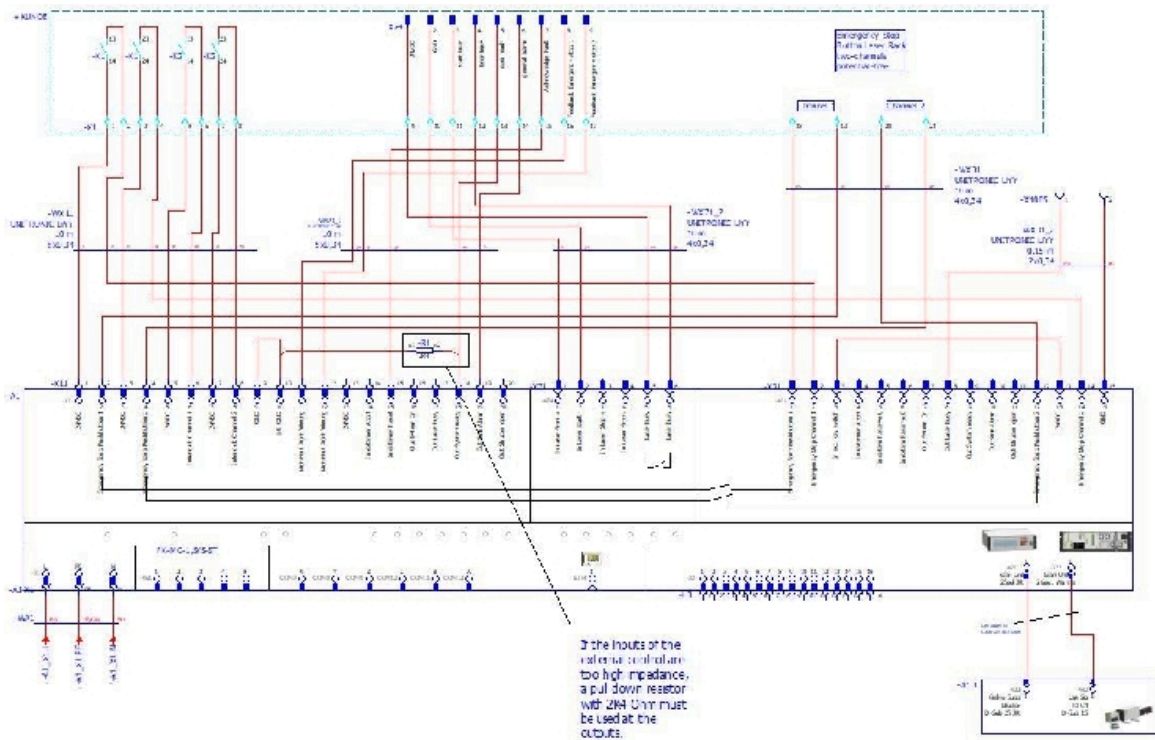
X31 - EXTERNAL PANEL



X71 – START / STOP



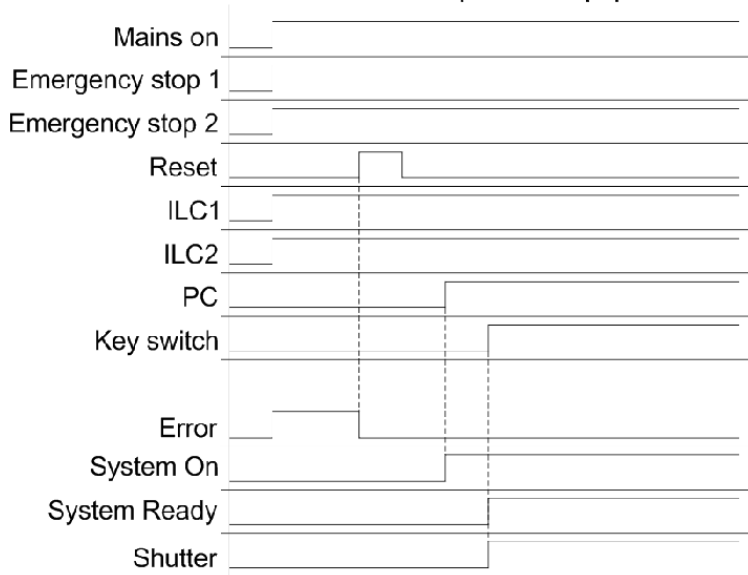
7.4.7 Installation with a higher-level control system



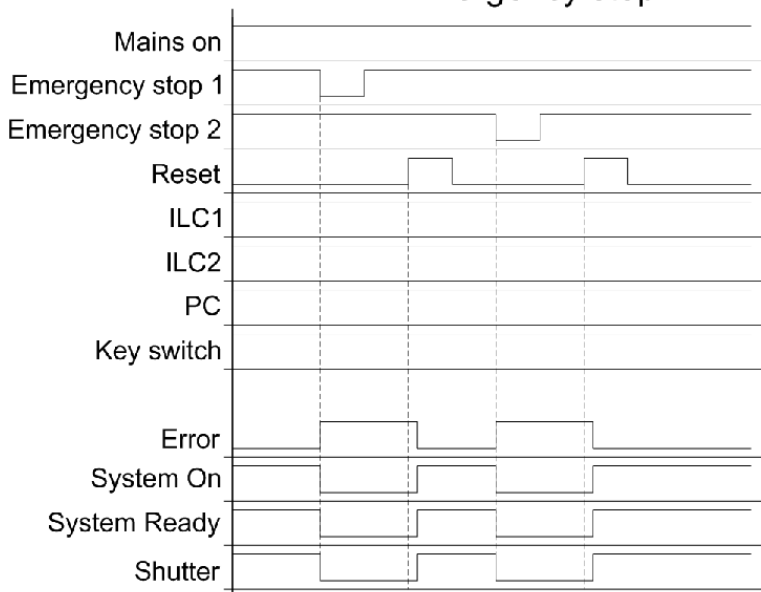
7.5 Switching sequences

Switching sequence diagrams for various standard processes are listed here, which show the interaction of the individual levels.

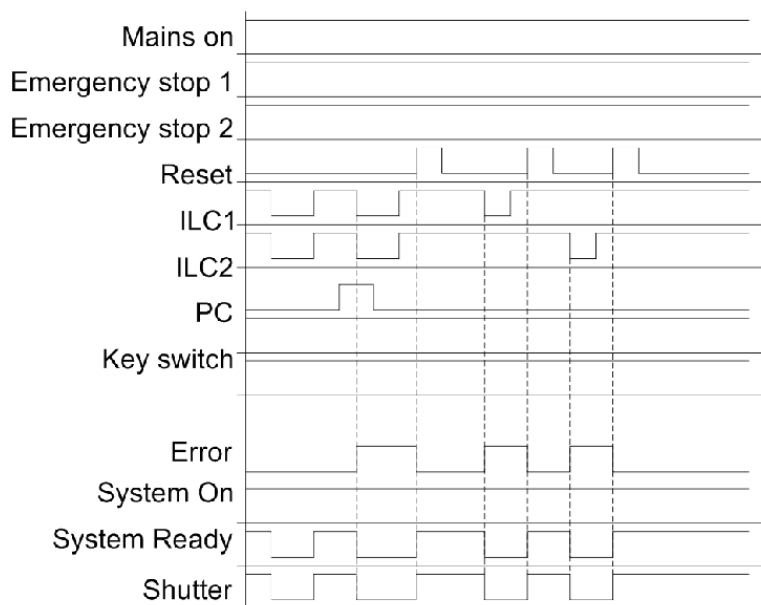
Standard power-up process



Emergency stop



ICL (interlock circuit loop)

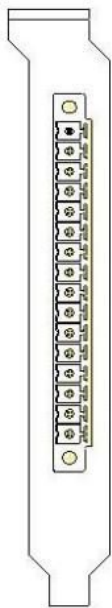


7.6 SpeedMark IOs

The SpeedMarker 50CL has 4 digital inputs and 4 digital outputs, which can be used freely in SpeedMark.

- The inputs must be supplied with a 5V - 24V potential.
- For "ON" the first PIN (e.g. PIN1) must be supplied with 24V and the second PIN (e.g. PIN2) has to go to ground in order to guarantee the potential.
- The software closes the contact to allow the signal to pass from the first PIN (e.g. PIN11) to the second PIN (e.g. PIN12).
- The outputs provide potential-free relay contacts.
- Addressing is done by the software. Please refer to the software manual for details.

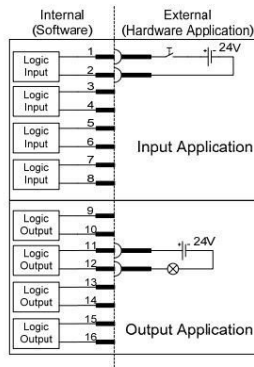
SPECIFICATION:



PIN	Print 1	Print 2*
1	IN9	IN13
2	IN9	IN13
3	IN10	IN14
4	IN10	IN14
5	IN11	IN15
6	IN11	IN15
7	IN12	IN16
8	IN12	IN16
9	OUT9	OUT13
10	OUT9	OUT13
11	OUT10	OUT14
12	OUT10	OUT14
13	OUT11	OUT15
14	OUT11	OUT15
15	OUT12	OUT16
16	OUT12	OUT16

* applicable when two IO prints are installed

Application example:



Input with a switch and external 24V source at input "IN9".

Supply of a lamp with 24V by activating "OUT12".

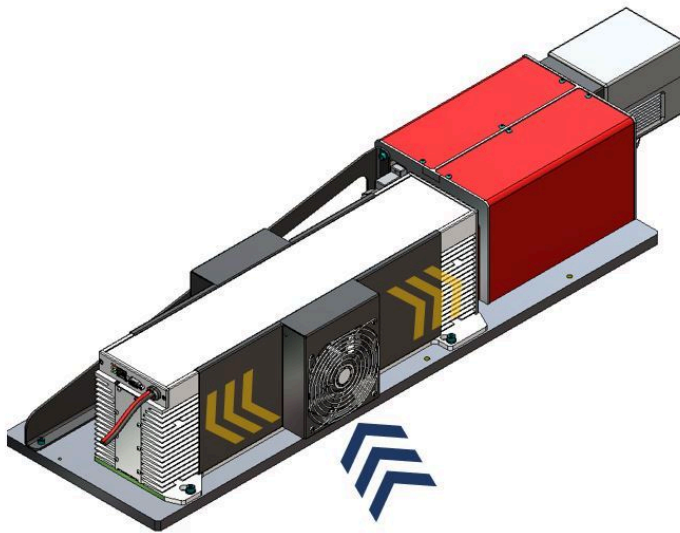
7.7 Cooling

AIR COOLING

The SpeedMarker 50CL is air-cooled with outputs of 30 watts, 45 watts and 60 watts.

In the case of air-cooled systems, it must be ensured that the laser protection cabin has a sufficient amount of fresh air at a temperature of 20-25°C. The humidity must not exceed 60% and no condensation may form on the laser system. The built-in fans each generate a volume flow rate of 5.38 m³/h. The air is extracted by the fans and blown over the cooling fins. (See image below)

The integrator must ensure an uninterrupted air flow. Under no circumstances should the warm exhaust air accumulate around the laser system.

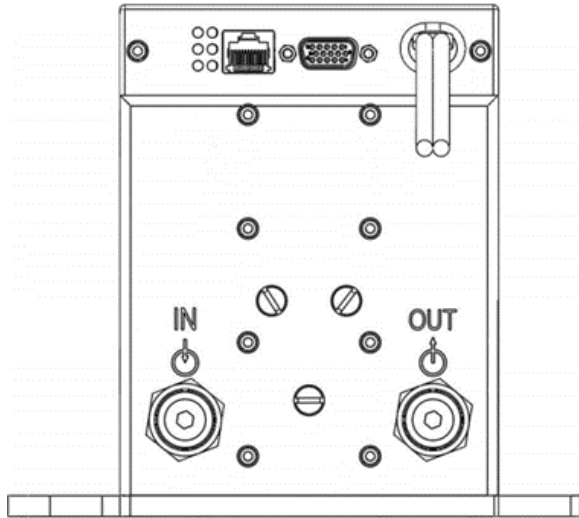


WATER COOLING SYSTEM

The SpeedMarker 50CL is water-cooled with outputs of 60 watts and 100 watts.

In the case of water-cooled systems, the water specification must be observed.

Flow rate	3.8-7.6 l/min
Water temperature	18°C - 24°C
Inlet water pressure	413kPa
Hardness	<250mg/l
Cooling capacity of the cooler	>1.5kW
pH	6 - 8
Max. particle size	<200 micrometers



Notice

No condensation allowed.

Polyethylene tubing with an external diameter of 0.5 inches is required for the “IN” and “OUT” connections. The cooling system can handle pressures of up to 4 bar (60 psi).

The following materials are used in the cooling circuit of the laser machine:

- Delrin®
- Copper
- Viton® rubber

The recommended coolant is distilled water. Additives should be used to control corrosion and prevent algae in the cooling water as recommended by the manufacturer of the cooler. Use good quality water such as distilled or deionized water to avoid limescale build-up. Keep the water concentration high (min 90%) in relation to the additives so as not to compromise the cooling capacity of the coolant.



Caution

- Keep the pH value of the coolant above 7 to avoid damaging the copper heat sinks.
- Never use tap water for cooling. The mineral content, temperature or pH value can cause damage.
- Never allow condensation to form on the laser machine.
- If condensation forms, do NOT operate the laser machine until it is dry again.
- If a water leak is detected on the laser machine, switch it off IMMEDIATELY!

8 Control of the set-up and installation

To ensure correct installation, the following points must be checked:

- Correct power supply connection values and appropriate fuses.
- Complete and correct execution of the mechanical and electrical installation.
- Check the mechanical and electrical installation for completeness and correct input voltages.
- Check the cleanliness of the optical components (free from dust and soiling).
- Remove the protective cover on the lens for focusing.
- Check the environmental conditions based on the technical specification.
- Observe laser safety regulations.
- Control of compliance with all laser safety measures. The unit may only be switched on if all precautions for laser safety have been checked by an authorized person and declared compliant.

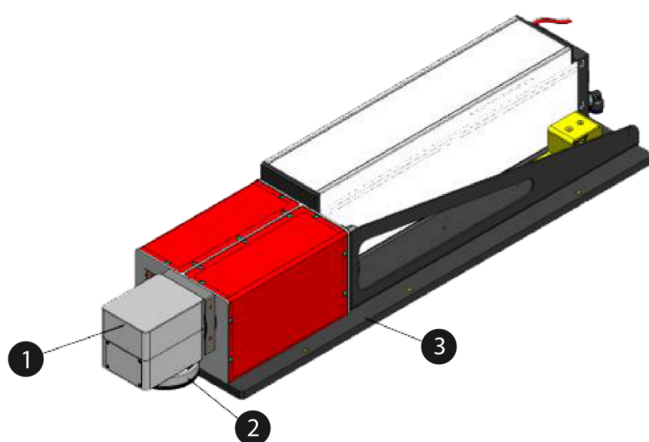
9 Operation



Warning Laser

When operating the laser system, the operator is exposed to laser class 4 within the laser protective housing. The direct and indirect scattered radiation is dangerous and can cause injuries to skin and eyes.

- During service and adjustment of the laser machine, the operator is exposed to laser class 4 radiation. Wear suitable laser safety goggles, which are matched to the wavelength and power of the laser machine, within the danger zone.
- See “Safety” chapter.

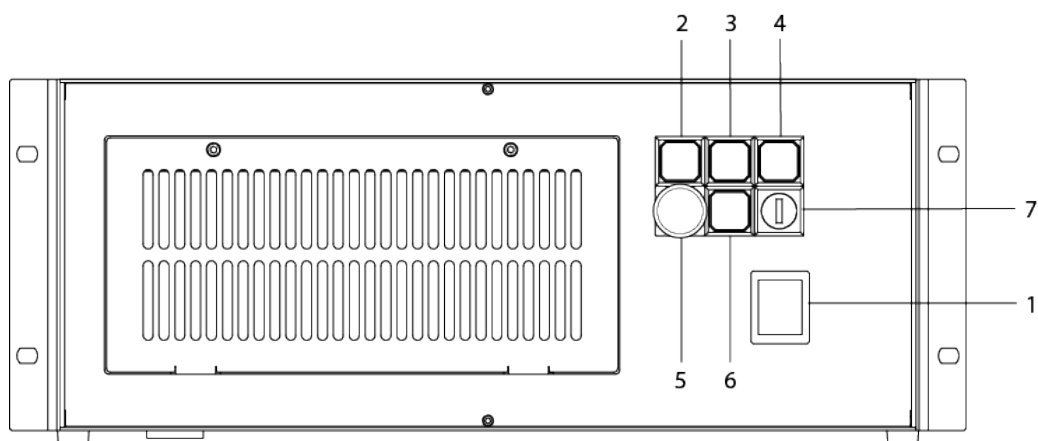


1	Galvo head
2	Lens unit
3	Laser base plate

9.1 Marking software

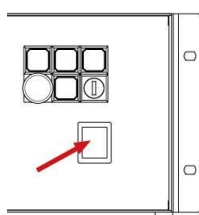
The installation and operation can be found in the separate SpeedMarkUserGuide_DE manual.

9.2 Control panel



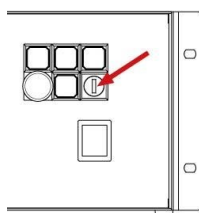
Number	Description	Types
1	Main switch	toggle switch
2	System ready	control lamp
3	Shutter	control lamp
4	Laser busy	control lamp
5	Emergency stop button	switch
6	Error reset	button
7	Key switch	switch

9.3 Power On/Off

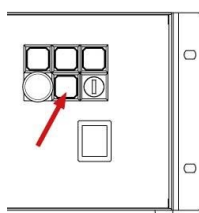


1. Press the main switch (1) on the laser rack.

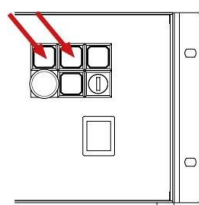
→ The shutter is closed. The main switch and the two status lamps on the marking head illuminate in yellow.



2. Put the key in the key switch (7) (vertically) and turn 90° to the right.



3. Press the Error reset button (6) to reset the system to its normal state.



4. The control lamps "System ready" (2) and "Shutter" (3) such as the status lamps on the marking head should now be illuminated. The laser is ready to start marking.



5. Start the PC.

6. Now start the marking software on the PC.

If an error occurs, the control lamp "Error reset" (6) lights up. By pressing this button, the error can be acknowledged and the system is ready to work again.

You can use only the key switch (7) to pause the laser.

The main switch (1) must be set to O to switch off the laser completely.

Operation

9.4 Operation/Standby display

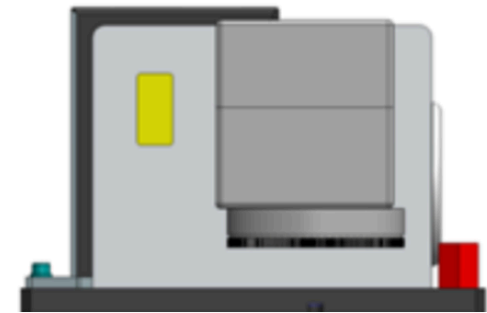
The laser system is equipped with a two-stage operation/standby display.

This is indicated by a separate display on the marking head and/or an illuminated warning light (shutter) on the laser rack.

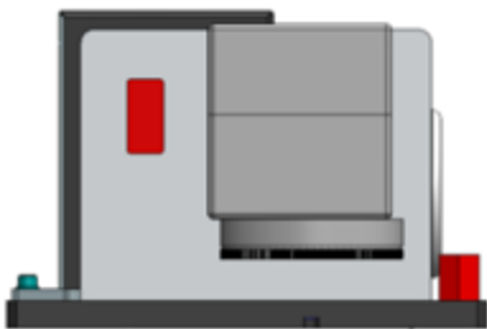
Meaning of the signal colors



Operation/Standby display – Machine is de-energized.



Operation/Standby display yellow – Shutter closed, no laser power is output.



Operation/Standby display red – Shutter open, output of laser power possible.



Warning Laser

When the machine is switched on or the safety lock (shutter) is open, there is a risk of laser radiation being emitted.

- Pay attention to the standby display.
- Laser marking head not open.

9.5 Checking the safety devices

EMERGENCY STOP

Check the function of the emergency stop once a month.

If the emergency stop doesn't work correctly, the SpeedMarker 50CL must be put out of operation immediately until the error has been eliminated.

MOVABLE GUARDS

The function of the interlock must be checked at the start of each shift.

When the movable guard is opened, the shutter must fall into the beam path.

The status of the shutter is displayed on the operation/emission display on the laser head.

If the shutter is not closed when the movable guard is opened, the SpeedMarker 50CL must be put out of operation immediately until the error has been eliminated.

9.6 Focusing

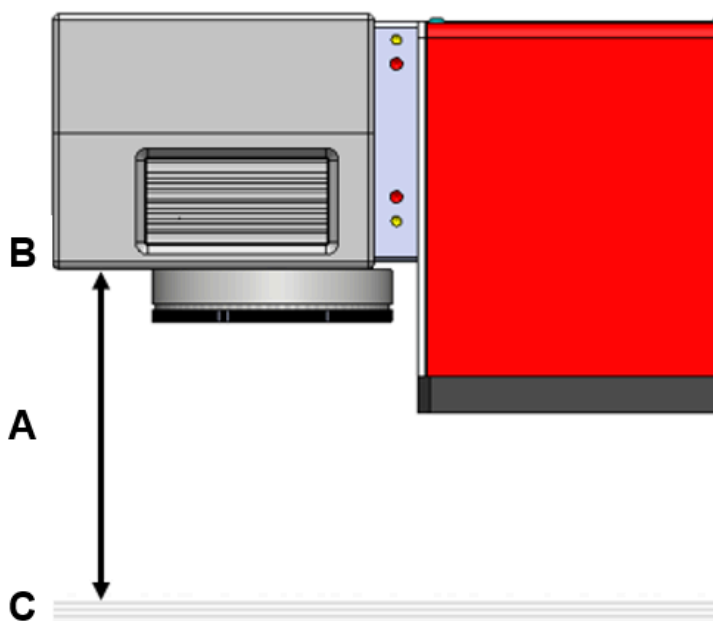


Notice

It is absolutely essential to maintain the correct focal distance for every laser marking process. Only when in focus will the laser beam achieve the power density necessary for permanent and clearly legible marking.

The correct focal distance between the marking head and the workpiece must therefore be set before each marking. An incorrect focal distance is the most common cause of poor or invisible marking.

The focal distance is measured **(A)** between the lower edge of the work head **(B)** and the surface of the workpiece **(C)**. The correct focal distance depends on the lenses used (focal length).



Focal length	Working distance (A)
F=100	102.6 mm
F=150	152.6 mm
F=200	205.6 mm
F=300	305.6 mm
F=400	404.6 mm

10 Maintenance

10.1 Safety notes



Caution

Before any maintenance work takes place, ensure that the power supply has been switched off and the system is de-energised.



Notice

All maintenance work must be carried out according to the safety regulations.

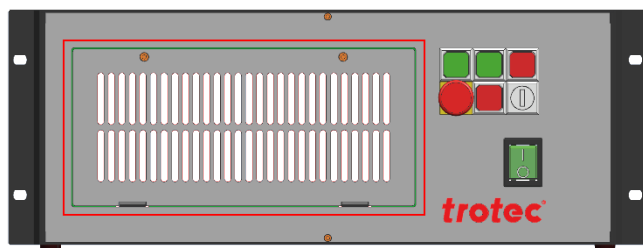
In order to ensure the maximum availability and lifetime of the system, we recommend you regularly check the filter system and ventilation and keep the surrounding area clean. Before switching on the system, make a visual inspection of the lenses.

10.2 Changing of the laser source filter mat

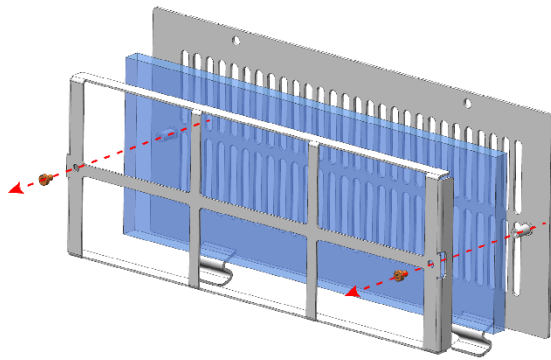
This laser system is equipped with air cooling. A filter mat is used to protect the electronic components from dust and impurities in the ambient air. This filter mat should be checked and replaced at regular intervals to ensure an optimal cooling situation.

The filter pad is located behind the ventilation slots on the front of the laser rack or on the Pc.

Filter pad on the laser rack:



1. Cover of the filter pad.



2. Remove both screws and open the cover. Change the filter pad.

10.3 Cleaning the optics

This system is fitted with high quality optical components, which under normal operating conditions are maintenance free for their lifetime. However, it may be necessary to clean output lenses, e.g. the scanner flat field lens (f-theta objective) if it becomes covered in dust or fumes.



Notice

Never touch the optical components with your fingers! Oily or dirty hands may damage the lens surfaces.

Do not use any tools or hard objects to clean the surfaces. Scratches cannot be repaired.

Laser optics are highly sensitive and their surfaces are not as hard as traditional glass. They can also be easily damaged by cleaning. It is therefore necessary to ensure that any dirt is removed using a suitable suction device and that the surrounding area is cleaned regularly.

Small bellows should be used to remove dust.



Notice

Do not use compressed air as it contains small quantities of oil and water.

To remove larger pieces of dirt, only use a lens cleaning cloth with high proof (at least 98%) alcohol.



Notice

Do not dip the cleaning cloth in the cleaning solution. This contaminates the solution and makes it unusable. Place drops of the solution on the cloth!

Apply the cleaning solution carefully in order to avoid scratching the surface of the lens.

Do not wipe the lens with a dry cloth. Do not touch the reverse side of the cloth. Dirt and sebum on the fingers can be transferred to the lens by the cloth and cause damage.

Distribute the cleaning fluid carefully using small circular motions. Start at the center of the lens and move outwards to the edge. Keep moving the cloth until the entire surface is clean.

Do not exert any pressure on the lens.

11 Troubleshooting

This chapter should assist maintenance personnel with the identification and resolution of operational faults based on error messages and symptoms.



Danger

Maintenance and repair work should only be carried out by Trotec Laser GmbH or one of its authorized personnel under observation of the safety regulations.

11.1 Error, cause and remedy

Problem	Possible cause	Remedy
Error message on loading the program.	Plug or cable installed incorrectly.	Check the plug and cable are installed correctly.
	Laser power supply switched off.	Turn on main switch.
	Software not installed correctly.	Re-install software.
	Software terminated irregularly.	Restart computer.
Laser will not switch on.	Plug or cable installed incorrectly.	Check the plug and cable are installed correctly.
	Laser power supply switched off.	Turn on main switch.
	Faulty fuse in laser power supply.	Replace fuse.
Status lamps on marking head remain yellow.	safety circuit not closed.	Check safety circuit If no safety circuit is connected, use bridging connector X11.
No impact from the laser beam on the material.	Laser not in focus.	Check working distance.
	Shutter closed.	Open shutter - if not possible check safety circuit.
	Incorrect laser parameters.	Check the parameters in the program. Use suitable parameters for the material and application.
Insufficient laser output.	Laser not in focus.	Check working distance.
	Incorrect laser parameters.	Check the parameters in the program. Use suitable parameters for the material and application.
Missing symbols.	Focusing lens dirty.	Clean focusing lens.
	Surface of the material dirty.	Clean material surface.
Other faults.		Contact Technical Support.

11.2 Possible error messages

The possible errors that the system can detect are listed here. These appear in the software as a message on the display. The reset signal (X11) or reset button on the laser rack is used to eliminate an error. The prerequisite for being able to reset the system is that the error or corresponding input signal has been eliminated.



Warning

System errors which cannot be reset or which indicate a hardware error should only be resolved by Trotec Laser GmbH trained service personnel.

Error message	Cause
Card is offline.	Software has lost the connection to the TLC2 controller.
Scanner not connected.	No connection to the galvanometer scanner.
Scanner X error.	The X-axis of the galvanometer scanner has detected an error.
Scanner Y error.	The Y-axis of the galvanometer scanner has detected an error.
Signal cable not connected.	No connection to the marking head.
External abort.	External abort signal detected on X11.
External stop.	External stop signal detected on X11.
Voltage error (15V).	+/- 15V power supply does not work correctly.
Voltage error (24V).	24V power supply does not work correctly.
Laser power supply error.	Laser source power supply defective.
Shutter error.	Shutter does not reach target position.
Hood contact was opened during marking.	ILC1 and ILC2 were opened during marking.
External combined alarm sounding.	External error signal detected on X11.
System locked by key switch.	The key switch on the laser rack is locked.
Laser temperature.	Beam source overheated.
Laser power.	24V power supply outside the permissible tolerance range.
Laser not ready for emission.	E.g.: key switch not turned.
Laser back reflection.	Back reflection of the laser beam.
Laser system error.	Laser power supply voltage is too high or too low.

Troubleshooting

Error message	Cause
Emergency stop.	Emergency stop button pressed.
Error.	+/-15V monitoring.
	24V laser monitoring.

Error message	Cause
	24V monitoring.
	Shutter temperature.
	Required shutter position.

12 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: +49 (0) 7544 9548 48

13 Disassembly



Warning

Danger of injury when disassembling the machine.

There is danger of injury when disassembling the machine.

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



Warning Current

Electric current.

The machine must be disconnected from the main power supply.



Notice

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

PROCESS:

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

14 Disposal



Disposal

Do not dispose of the machine with domestic waste!

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

In case of further questions, please ask your supplier.

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

15 Appendix

EC- Declaration of Incorporation

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

trotec
laser. marking cutting engraving

Manufacturer:

Trotec Laser Automation GmbH
Planckstr. 12
88677 Markdorf
Germany

Authorized person to compile the technical files:

Trotec Laser Automation GmbH
Planckstr. 12
88677 Markdorf
Germany

Description and Identification of the machine:

Product description	Laser engraving system
Model name	8062 SM50XXC 000
Serial number	S50C-####
Machine group	8062
Function	System for laser engraving

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

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

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

ISO 12100:2010-11	Safety of machinery – General principles for design – Risk assessment and risk reduction (ISO 12100:2010)
IEC 61000-6-2:2005-08	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 60204-1:2006/AC:2010	Safety of machinery – Electrical equipment of machines - Part 1: General requirements
IEC 60825-1:2015-07	Safety of laser products - Part 1: Equipment classification and requirements (IEC 60825-1:2007)

The specific technical documentation has been prepared in accordance with MRL 2006/42/EC Annex VII Part B and will be submitted electronically to a reasoned request by national authorities.

The industrial property rights remain unaffected!

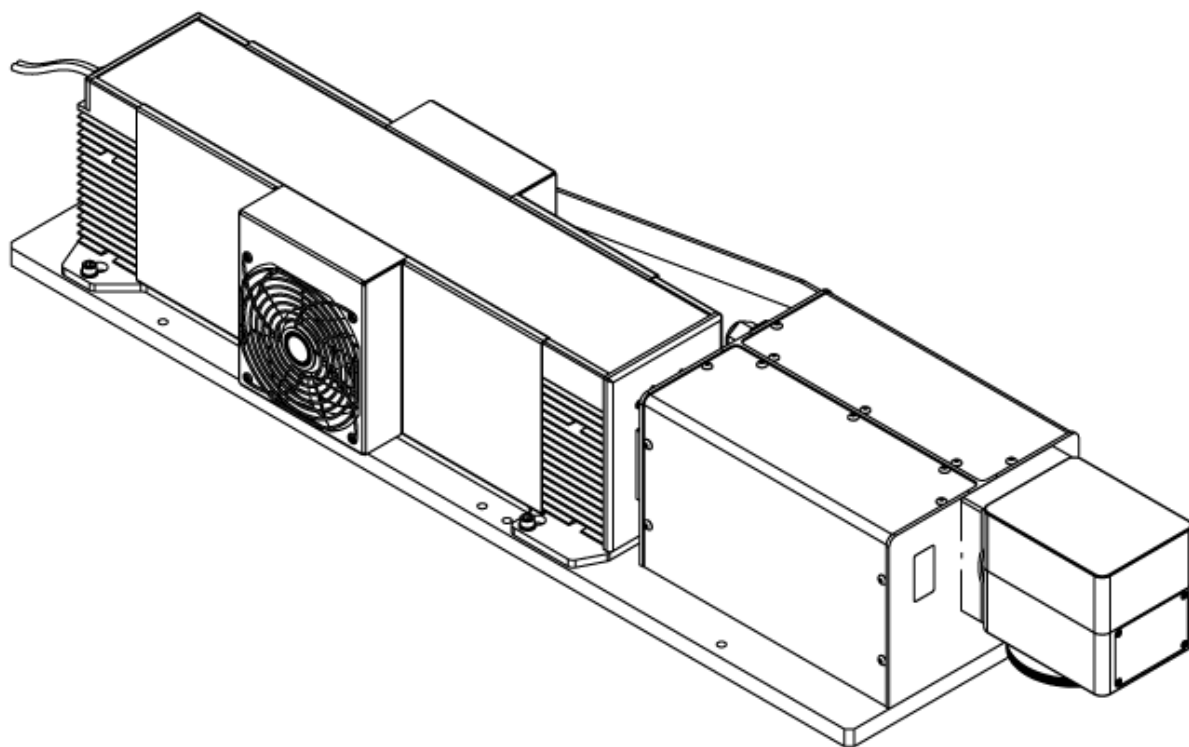
Important notice! The partly complete machinery must not be put into service until the machinery into which it is to be incorporated complies with the provisions of the EC Machinery Directive Appendix II 1A.

Markdorf, May 31, 2021

Date



i.A. Jochen Huber
Electrical engineering



SpeedMarker 50 CO2

Laser Marking System

Technical Data SpeedMarker 50 CO2 (8062)

Laser Head	SM 0050 04C XXX F00	SM 0050 06C XXX F00	SM 0050 06C XXX L00	SM 0050 12C XXX L00
Norm	CDRH Lasersafety; Laserclass 4 with EC-Declaration of Incorporation According to Machine Directive			
Software	Speedmark; Directmark Printerdriver			
Supported mono fonts	ISOCT, RomanS,SOKOL			
Supported fonts	all installed TrueTypeFonts			
Supported 1D barcodes	Australian Post; Codebar; Code 11; Code 128; Code 39; Code 93; DAFT; Deutsche Post; DPD; EAN-13; EAN-14; EAN-8; GS1; HIBC; ISBN; GS1; Pharmacode			
Supported 2D codes	Datamatrix; QR-Code; Aztec; Codeblock-F; GS1 Databar; HIBC; Maxi Code; PDF 417			
Supported image formats	BMP; JPG; DXF; PDF; EPS; PS; TSF; DWG;			
Laser source	Iradion CO2 CeramiCore®			
Beam quality	M ² < 1,2			
Power stability (typical)	better ± 5 %		better ± 3 %	
Rated laser power	45W	60 W	120 W	
Wavelength	10.600 nm			
Beam ellipticity	< 1,2:1			
Focus and pilot laser	Diode laser λ = 655nm, Laser class 2; 1mW			
Cooling	active fan cooling		water cooling	
Cable length to rack	2,5 m			
Protection level	IP 50			
Weight without lense	26 kg	33 kg	32 kg	
Typical water flow rate	-		1,8 gallons /minute	
Mini. required exhaust volume	400 m ³ /h @ 4200 Pa (without piping/tubing) - e.g Atmos Duo			

Lens Configuration	SM 0050 XXC F100	SM 0050 XXC F150	SM 0050 XXC F200	SM 0050 XXC F300	SM 0050 XXC F400	SM 0050 XXC F720
Marking field XxY(mm)	65x65	100x100	135x135	195x195	255x255	535x535
Working distance (mm)	103	153	206	306	405	723
Spotdiameter at working distance(mm)	0,160	0,237	0,319	0,473	0,626	1,145
Marking resolution (mm)	0,001	0,002	0,002	0,003	0,004	0,009
Max. marking speed (m/sec)	3,4	5,0	6,8	10,3	13,4	38,5
Max. positioning speed (m/sec)	6,8	10,0	13,7	20,5	26,8	77,1

Laser Rack

Interfaces	Ethernet, RS232, Laser-Interlock, Marking-Start (24 VDC), Marking-Stop (24 VDC),E-Stop, Error-Reset, Laser-Busy, optional digital I/O's (24 VDC),
Weight	25kg
Dimensions LxBxH	449x559x177
Power supply	230V AC, 50/60Hz, 1/N/PE
Power consumption	Max. 1800W
Cooling	active fan cooled
Protection level	IP 20

Laser Controller IPC

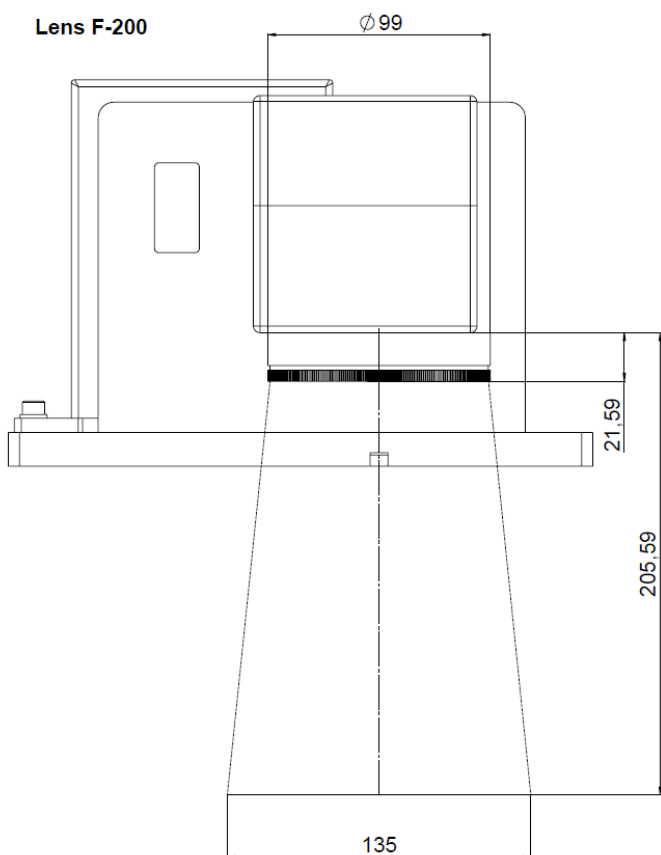
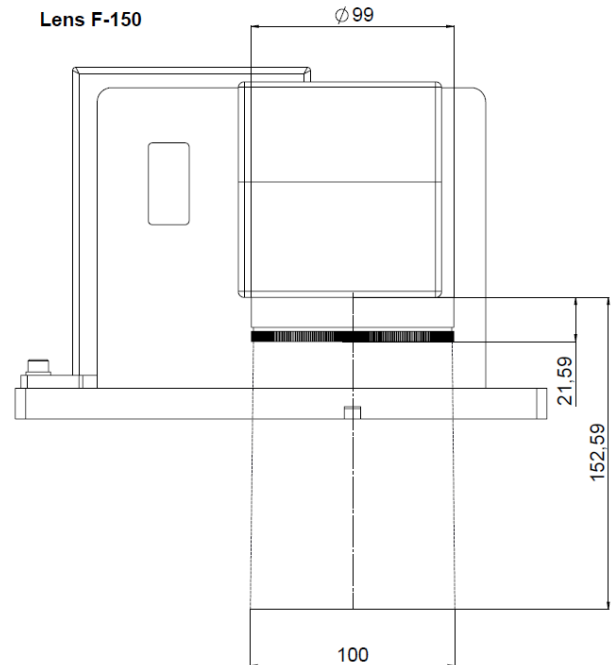
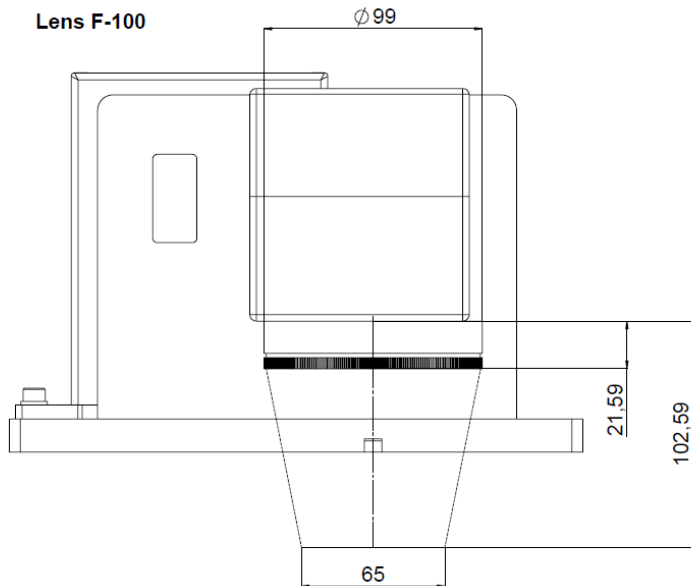
Weight	9 KG
Dimensions LxBxH	428x400x88,5
Power supply	115 - 230V AC, 50/60Hz, 1/N/PE
Maximum power consumption	Max. 500W
Cooling	active air cooled
Protection level	IP 20

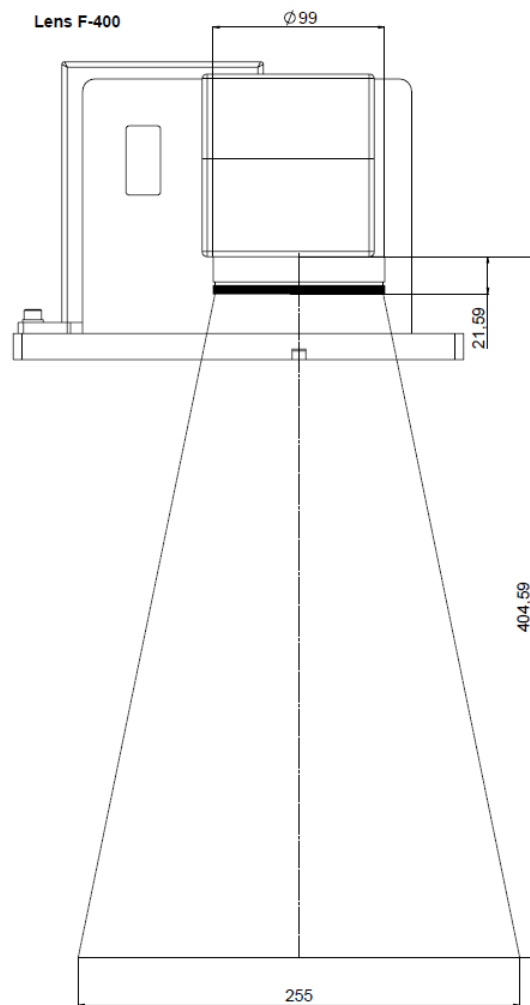
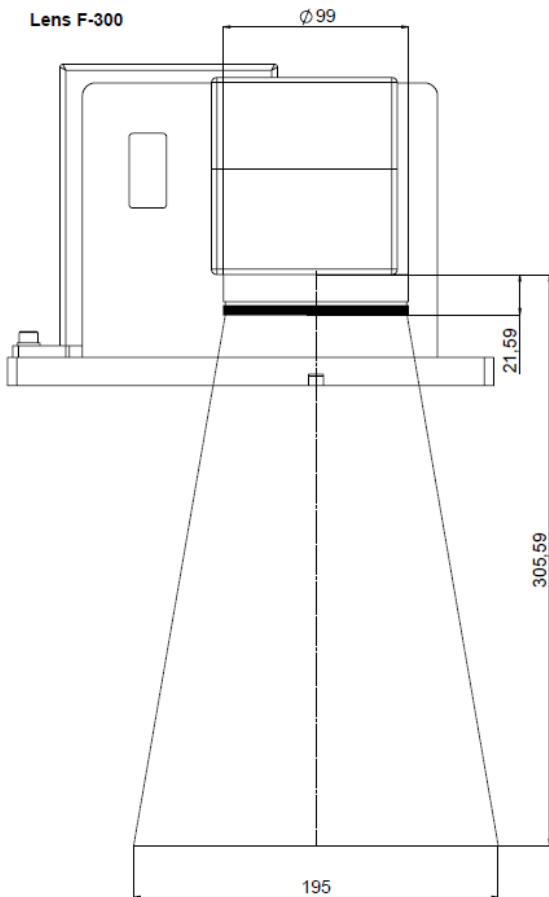
Ambient conditions

Operation	Temperature range +15 to +35° C; Relative humidity max. 60 %. Non-condensing
Storage	Temperature range +0 to +30° C; Relative humidity max. 60 %. Non-condensing
Transport	Temperature range -10 to +40° C; Relative humidity max. 70 %. Non-condensing

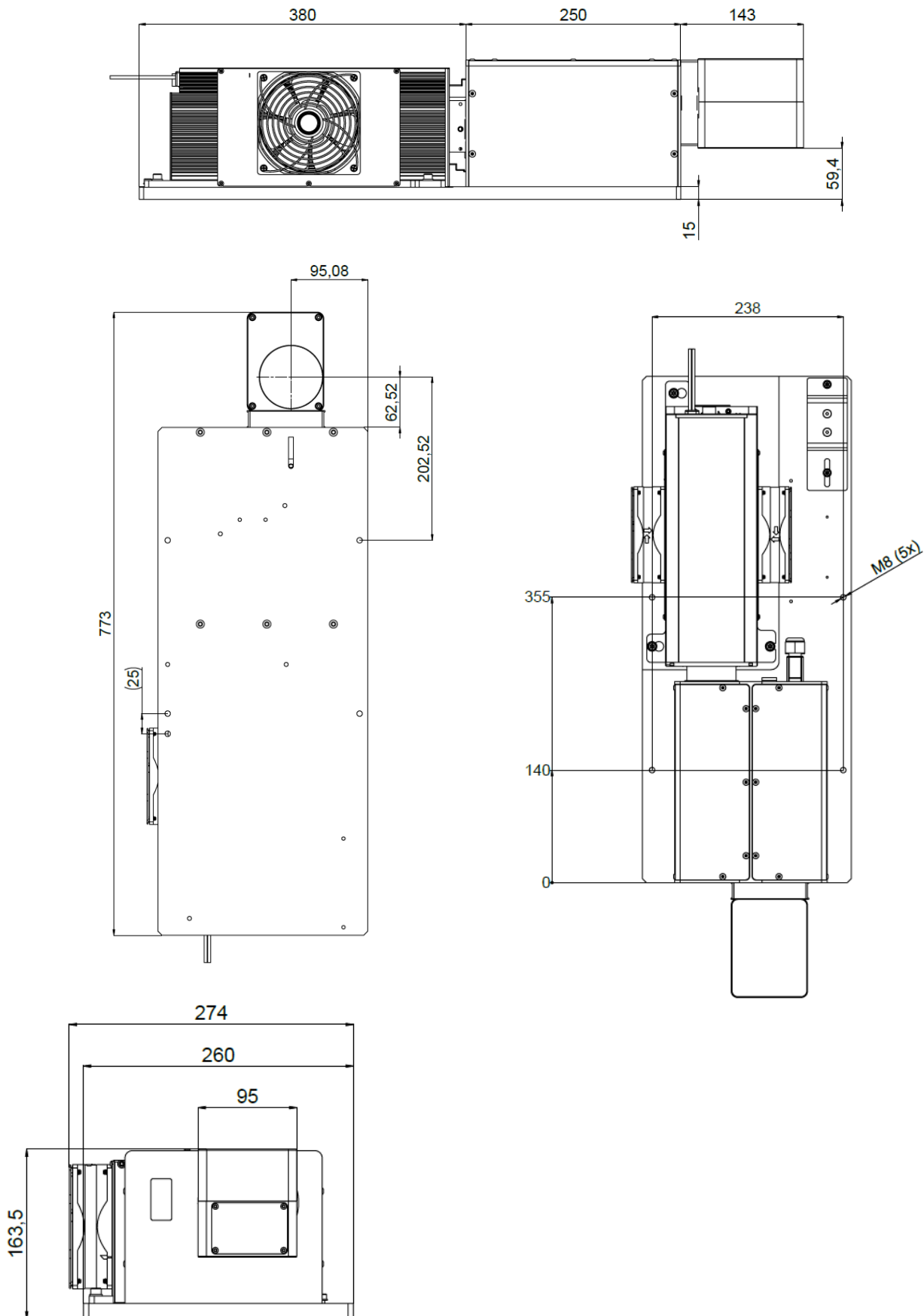
Machine dimensions

SM 050 CO₂ - laser marking head with lens configuration

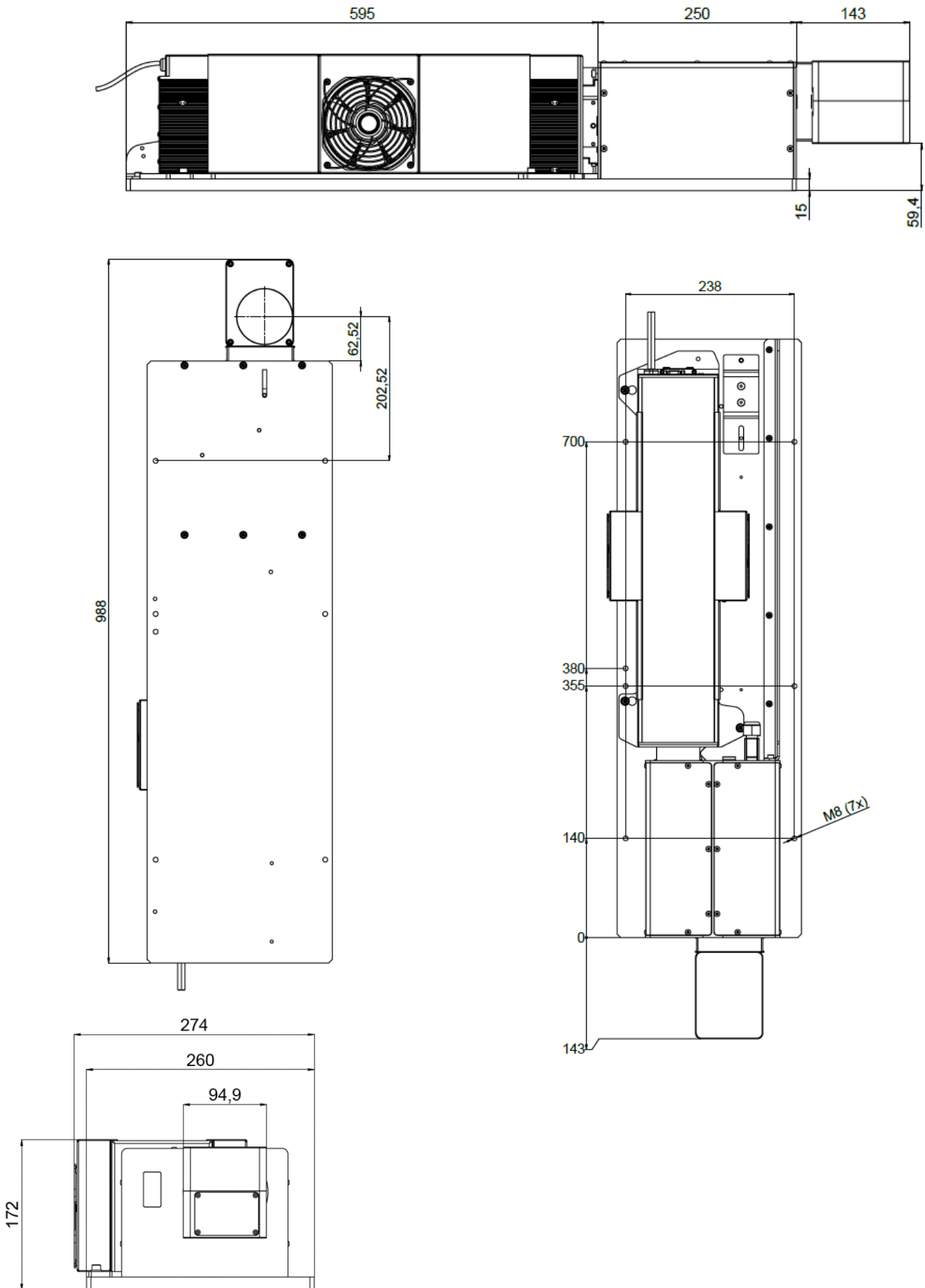




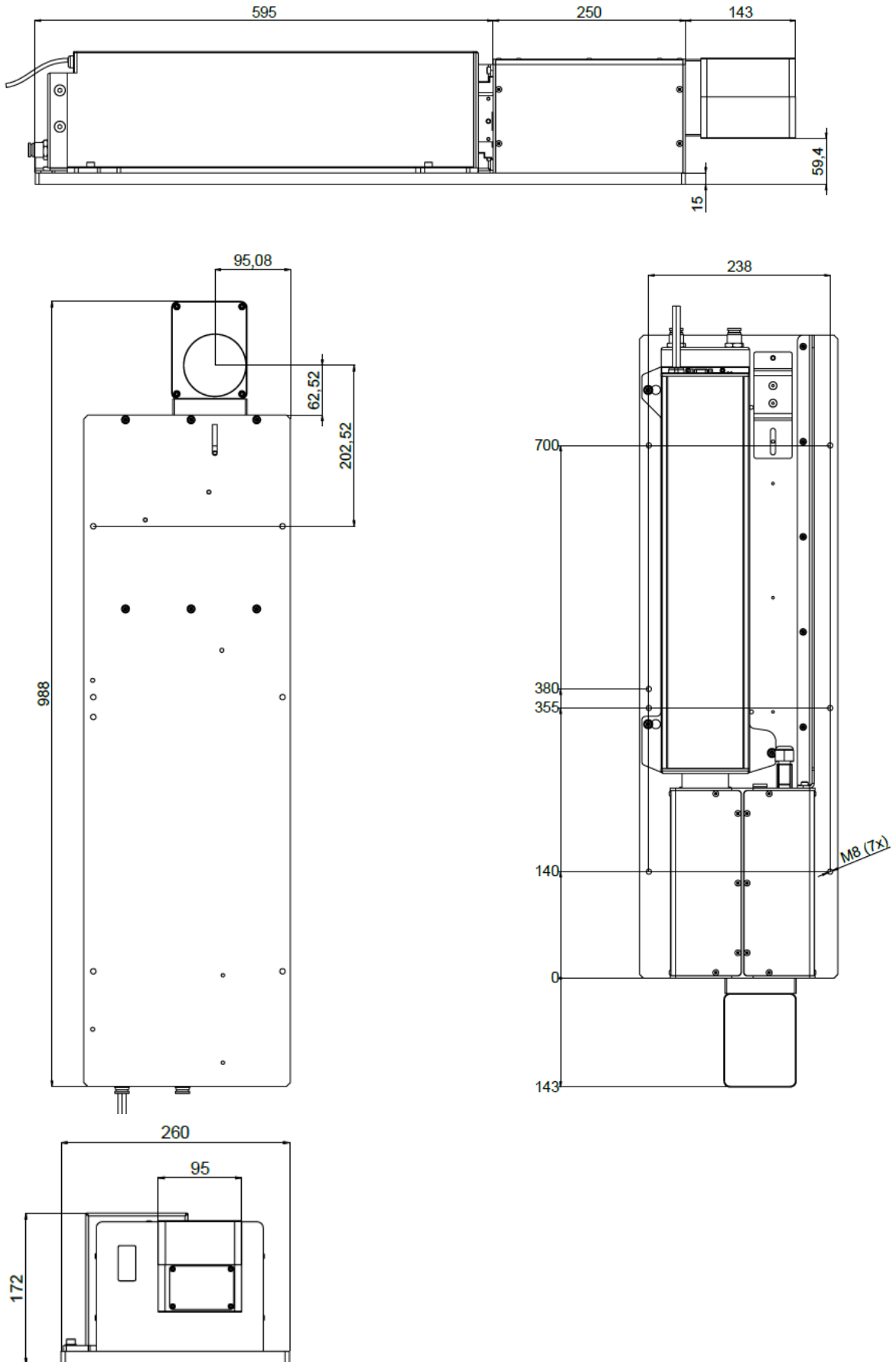
Laser marking head SM 0050 04C XXX F00 (without lenses)



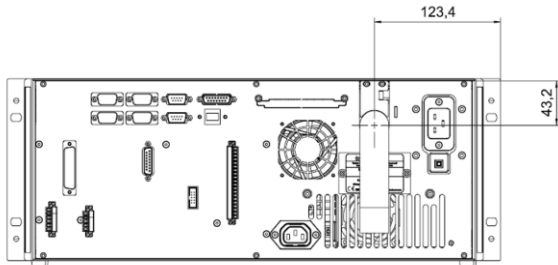
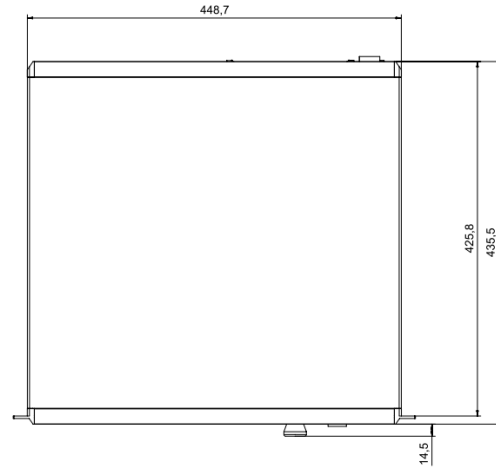
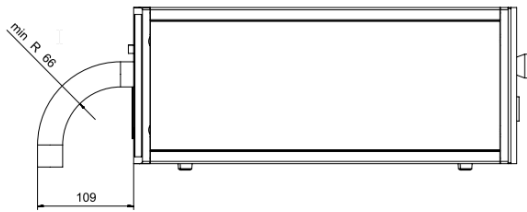
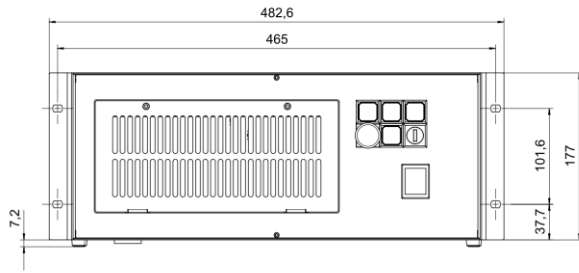
Laser marking head SM 0050 06C XXX F00 (without lenses)



Laser marking head SM 0050 06C XXX L00 / SM 0050 12C XXX L00 (without lenses)



Laser Rack



Laser Controller IPC

