Laser engraving unit
User manual

https://www.cnc-step.com/

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Short description

The case contains the complete electronics to place the laser module in service, as well as the complete laser engraving device, which are necessary to use our laser engraving device. A High-Z portal machine with computer and appropriate CAM/CNC-control-software KinetiC-NC, ConstruCam-3D, etc.) is necessary to put the machine into service. This manual describes the installation, start up and service of our laser engraving device.

Content

1 GENERAL 4
1.1 Description of symbols 4
2 FUNCTION OVERVIEW 5
3 SECURITY MEASURES 6
3.1 Organizational safety precautions 6
3.2 Selection and qualification of personnel, basic duties 6
3.3 Safety guidelines 7
3.4 Safety references on distinct operational phases 7
3.5 Safety devices 9
3.6 Potential dangers for persons 10
3.7 Operator obligations 10
4 STARTUP 11
4.1 Installation/assemblage 11
4.2 Power supply 12
4.3 Assignment of connections 13
4.4 Startup 14
5 CLEANING AND MAINTENANCE 16
5.1 Works on the inside housing 16
6 TECHNICAL DATA 17
6.1 Limit values 17
6.2 Electrical connection values 17
6.3 Casing dimensions Laser Head 17
7 DELIVERY CONTENTS LASER ENGRAVING DEVICE 18

1 General

The engraving device was designed on the basis of the strict observance of standard regulations and guidelines and has been tested insensitively and carefully. However, we provide no guarantee of fault-free operation. The manufacturer ensures that the engraving device in connection with the most suitable mechanical components, used within the meaning of the description and user manual are suitable for their designated use. The possibility is excluded of any liability whatsoever being assumed for damages, claims or costs, indirect and direct Consequential damage or other damage, from lost profit, operational disruptions and stoppages, loss of business information and so on. The engraving device is an application, that only works in conjunction with a portal unit and appropriate software. It is no self-contained machine or handheld device.
Since errors can never be completely avoided, we are grateful for tips and suggestions for improvement.

1.1 Description of symbols

HINT: Special instructions relating to the effective use of the equipment

ATTENTION! General and additional information or instructions and prohibitions for avoiding damage.

Instructions or restrictions designed for the protection of personnel and safety of the device

Not to be used by persons with pacemakers
This sign stands for activities involving a high risk for persons with pacemakers.

Warning of hazardous electrical voltage
This sign stands for activities involving system components carrying live voltage.

Warning of hot surface
This sign stands for activities where hot items need to be handled.

Laser Radiation Warning - Avoid irradiation of eyes and skin by beam- or scattered radiation.
This sign stands for activities where special protection measures are required.

2 Function overview

The laser engraving device produces a laser beam. By pulse-widthmodulation (PWM Signal output via CAM-software) the power of the Laser can be controlled.

For the usage of the laser engraving device a safeguarding by three functions exists in order to prevent unintentional activation of the laser.

- Delay. Delays the start of the laser by 5 seconds after applying the supply voltage and allows the power supply to stabilize.
- Overtemperature. The laser shuts off when it reaches a temperature outside the normal state.
- Interlock. Active monitoring of the interlock loop allows instantaneous shutdown of the laser as soon as the loop opens, e.g. through door contact.
- To acknowledge an automatic shutdown in "standard" mode, the "start" contact must be opened and closed again. This restores the laser to the operating state.
- In "ARM" mode, acknowledgment will be automatic as soon as the error has been rectified.
- Several LEDs permanently indicate the current state of the system.

3 SECURITY MEASURES

3.1 Organizational safety precautions

- Always keep this user manual at hand when working on the machine. (in the tool compartment or container provided for this purpose)!
- Further to this installation manual, personnel must also comply with general and specific statutory regulation on accident prevention and environmental protection! Give adequate instructions to the operating staff.
- Please add instructions including the information on the responsibilities of supervision and obligations to report for the observance of operational specifics, e.g. concerning labour organizations, operational sequences and appointed personnel.
- In order to reduce risks to your staff, personal protective equipment must be used if this is necessary or deemed to do so by regulations. In accordance with the corresponding rules and regulations, the user must make sure the operating personnel is provided with the required personal safety equipment and makes use of it!
- In regular intervals, please check that personnel are conscious of safety and the hazards involved in their work and are taking account of the Operating Instructions.
- The personnel should not have long hair, loose clothing or jewellery including rings. Injury may result for example from hair being caught up in the machinery or from rings catching on moving parts.
- Personnel entrusted with work on the machine must observe all safety notes and hazard warnings!
- Ensure that all safety and danger hints on the machine are clearly readable!
- Maintain a clean and orderly work area
- In case of safety-relevant changes, the machine/ plant or its operation must be stopped immediately and the malfunction should be reported to the concerned site/person!
- Do not change or modify the machine in any way that might affect safety, unless such change or modification has been approved by the manufacturer
- Spare parts and accessories must satisfy the requirements specified by the manufacturer. This is always guaranteed with **original** spare parts.
- Described intervals for regular maintenance work or such intervals specified in the Operating Instructions must be observed!
- Workshop equipment appropriate for the task is necessary for the execution of maintenance work.

Hint: Please note the manufacture‘s documentation of our supplying company!

Hint: Please also note the additional safety instructions for the device in the following sections.

3.2 Selection and qualification of personnel, basic duties

- Assign a machine operator regarding public laws and establish a procedure for him to inform a third person of unfavourable safety conditions!
- Employ only trained and instructed staff and set out clearly the individual responsibilities of the personnel for operation, set-up, maintenance and repair!
- Work on / with the machine / unit may only be carried out by reliable personnel. (Statutory minimum age limits must be observed)!
- Please secure that only personnel, who are accordingly assigned for work on the Unit, are deployed (trained laser protection officer)!

- Personnel to be trained, taught, instructed or those placed in an apprenticeship may only work on the system whilst under the constant supervision of an experienced person!
- Any work on the system may only be carried out by qualified and authorized personnel.

3.3 Safety guidelines

All unauthorized modifications to the unit or the usage of any spare parts or replacement parts not approved by CNC-STEP GmbH & Co.KG can lead to the warranty being affected.

The application is equipped with a forced-air ventilation system. The heat-generating components can reach temperatures over 70°C when using in normal operating condition. Allow adequate ventilation. Ventilation openings must not be sealed, covered or dirty. In order to ensure the safety of the components, please use supplied cable for our laser unit. (LPT-Cable).

This laser is a laser class 4. It is intended solely for integration into end systems and may not be used alone. In its delivery state it may not fulfil all or any applicable standards issued for the operation of Class 4 lasers.

All safety precautions must be taken before commissioning. Prevent any eye or skin contact with the laser radiation. The workspace must be protected so that no laser radiation can leave and cause danger outside of it. Use protective elements that are suitable for a wavelength range of 400-500nm.

Relevant, but not exclusive, standards:

DIN EN 12254:2010-07
DIN EN 60825-1:2015-07
DIN EN 60825-4

Do not cover the back of the laser at any time. You must leave at least 10cm clearance, so the flow of air is not interrupted. A reduced flow of air can lead to overheating and to insufficient air pressure between Laser and the material.

Take all necessary precautions on Class 4 lasers before putting the laser into operation. The user is responsible for the safe operation.

3.4 Safety references on distinct operational phases

In normal operation

- Before operating the machine, ensure that only authorized personnel are present within the working range!
- Any working methods that might endanger safety are to be avoided!
- Take precautions to ensure that the unit is only used when in safe and reliable state!
- Operate machine only when all protective devices and safety-conditioned devices, like detachable protective devices, emergency-off- devices, exhaust, are available and are functional
- The operator is obliged to check the machine for visible damage and faults at least once per shift. You must immediately report any changes (including changes in the working characteristics) to the organization or person responsible! Instantly stop the device!
- If changes to the normal operations are discovered the machine should be taken out of operation. Have the faults rectified immediately!
- Observe instructions for switching the plant on and off, running up of plant, control displays in accordance with the operating instructions.

Hint: Please note the additional safety instructions in the following sections!

Setup, maintenance, repair, disposal

- Specified implementation also includes adhering to the operating and maintenance conditions stipulated by the manufacturer! These activities must be carried out by qualified personnel only.
- Inform operating personnel about the special- and maintenance work before the beginning of work! Name a supervisor!
- Please note that the switch-on and switch-off processes must be ensured according to the operating and maintenance manual and instructions for maintenance work!
- Secure a wide area around the maintenance area as far as is necessary!
- If the machine / unit is completely switched off for maintenance and repair work, ensure that it is protected from unexpected start up, for example by securing the main switch or displaying a warning sign on the main switch.
- When carrying out installation work above your head, use appropriate and safe climbing aids and working platforms. Wear a safety harness when carrying out maintenance work at greater heights!
- All handles, steps, railings, landings, platforms, ladders have to be kept free of dirt!
- Check the tightness of all threaded connections and take up slack if necessary after maintenance.
- If it is necessary to disassemble safety features during maintenance or repair work, these features must be reassembled and tested immediately following the completion of such work.
- Provide a safe and environment-friendly disposal of consumables, ancillary materials and replaced parts!
- For incorporation into a machine you can look up the Safety and protection requirements according to the declaration of incorporation at following Link (Annex: Essential Health and Safety requirements): http://data.europa.eu/eli/dir/2006/42/oj

Hint: Please also note the additional safety instructions in the following sections!

WICHTIG: Operating without suction can lead to deposits in form of dust and vapor. These deposits lead to damage on the portal machine!

SPECIAL DANGERS

Laser beams

- Work on laser equipment or operating materials may only be carried out by a skilled worker, in accordance with the guidelines for accident prevention regulations for laser systems with appropriate safety equipment (laser safety curtains, safety glasses, and housings with laser protection glass).

Electrical energy

- Work on electrical equipment or operating material may only be carried out by a qualified electrician according to electrical principles or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

- To guarantee health and safety, people with pacemakers are not allowed to enter the switch cabinet area!

- Machines and unit parts which must undergo inspection, maintenance and repair work must be disconnected from the mains supply, if specified. Before starting any work, you must check the de-energized parts for the presence of power and earth or short-circuit them in addition to insulating adjacent live parts and elements.
- Use only original fuses with the specified current rating. Immediately switch off the installation if disturbances in the supply of electric energy occur!
- Inspect/check electrical equipment of machine regularly. A damaged mains cable should be replace immediately!

- If repairs must be performed on live parts a second person must be present who can in an emergency stop any dangerous movements with the emergency stop switch or activate the main isolator disconnect switch to cut the voltage secure the working area with a red-and-white safety chain and a warning plate. Use insulated tools only!

Hint: Please also note the additional safety instructions in the following sections!

Gas, dust, sparking

- Carry out welding and grinding work on the machine only if this has been authorized, as there may be a risk of explosion and fire. Before welding, flame-cutting and grinding, clean machine and its surroundings, free from dust and combustible material and ensure sufficient ventilation (Risk of explosion)! Observe all national regulations if work is to be carried out in narrow rooms!

Hydraulics, Pneumatics, Steam

- Thermal influences (laser beam) can evolve toxic and irritant vapours.
- Work on hydraulic equipment must be undertaken only by persons with special qualification and experience in hydraulics!
- Check all pressure lines, hoses and screw connections regularly for leaks and visible damage. Eliminate any faults immediately! Spurting hydraulic fluid may cause injury and fire.
- Parts of the system and pressure lines which are to be opened (hydraulic, pneumatic, and delivery lines) must be depressurized according to assembly descriptions before repair work is started.
- Hydraulic- and pneumatic lines are to be laid out and mounted in an expert way. Do not confuse the connections! Fittings, length and quality of the piping must correspond to requirements.

Oils, grease and other chemical substances

- Thermal influences (laser beam) can evolve toxic and irritant vapours.
- When handling oil, grease and other chemical substances, observe the product-related safety regulations!
- Take care when handling hot functional fluids and consumables (risk of burning or scalding).

3.5 Safety devices

- Power cord plug, key switch (Computer Password) and in connection with Zero3 emergency stop monitors correct start up.
- INTERLOCK LOOP

3.6 Potential dangers for persons

Remaining hazardous areas

- All safety components regarding the machine are based on years of experience and according to the relevant standards. Nevertheless, dangers handling the equipment cannot be completely excluded.
- The operating and service personnel should know remaining, possible dangers und and pay them close attention, in order to reduce risks to personnel, disadvantages regarding the machine and other property.
- Safety-devices are only fully effective if properly used. You must be particularly careful when using program types with reduced safety facilities (Setup, maintenance and repair).

3.7 Operator obligations

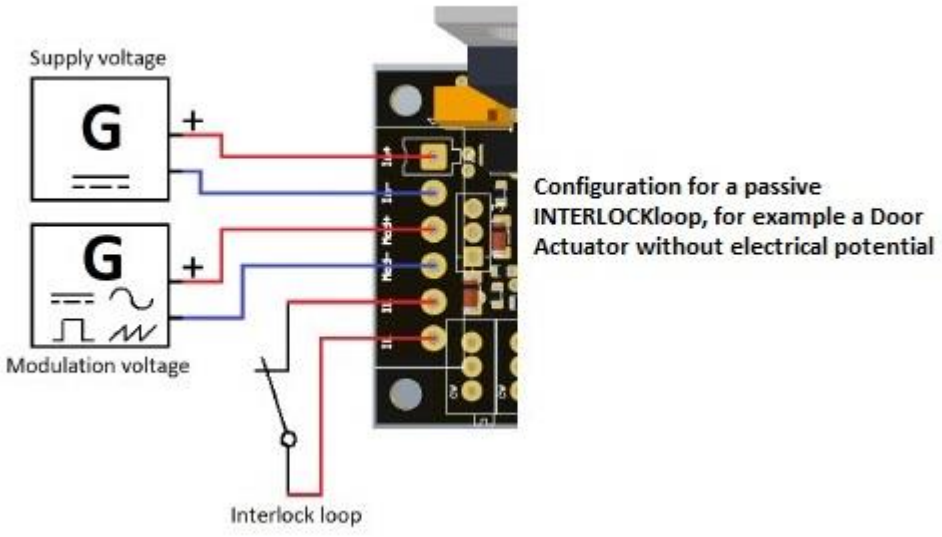
- The plant safety can only then be successful, if all necessary measures are applied. The user of the device is obliged to plan these measures and to make sure that they are taken.
- The operator is obliged to maintain the safety obligations and periphery of the device as in the moment of entering service.
- Ensure through appropriate in-house regulations and controls that the workplace is always clean. Furthermore, the operator must ensure that users know application-specific regulations and protective measures and train their staff to have a security-conscious behaviour.
- The granting of occupational safety for the user and operating staff is listed in the accident prevention rules. You need to acquire these locally because they vary.

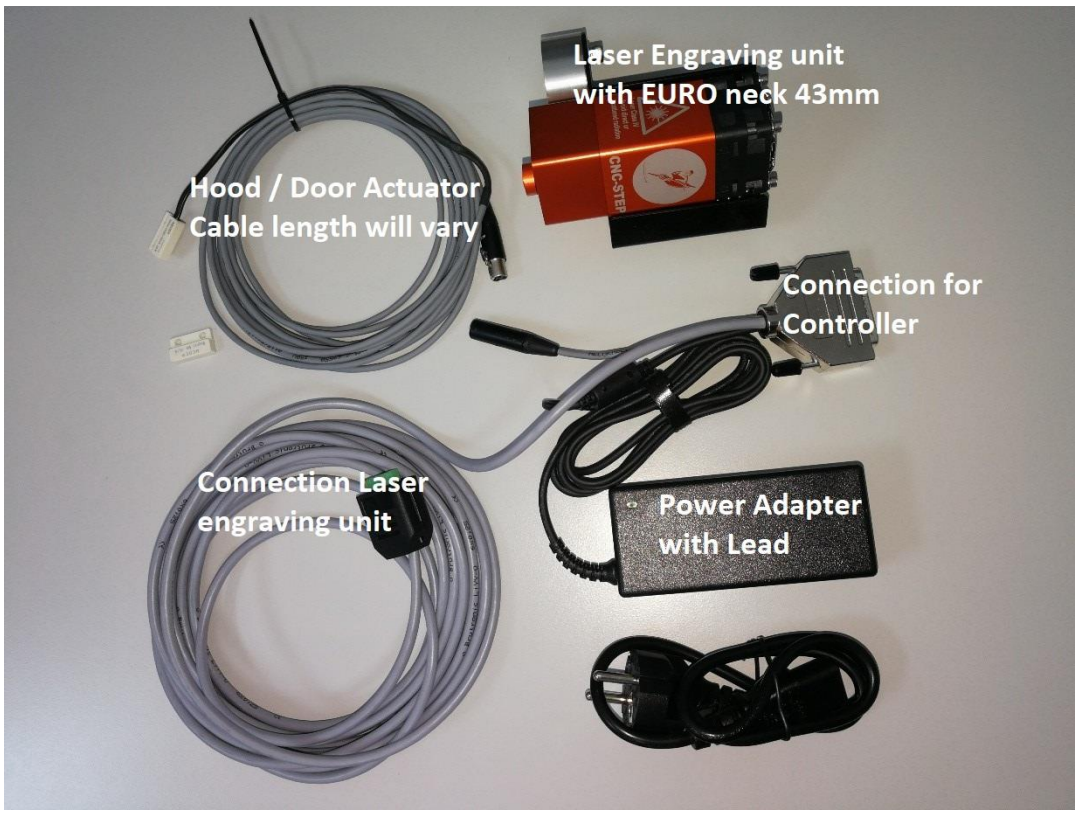
4 Startup

4.1 Installation/assemblage

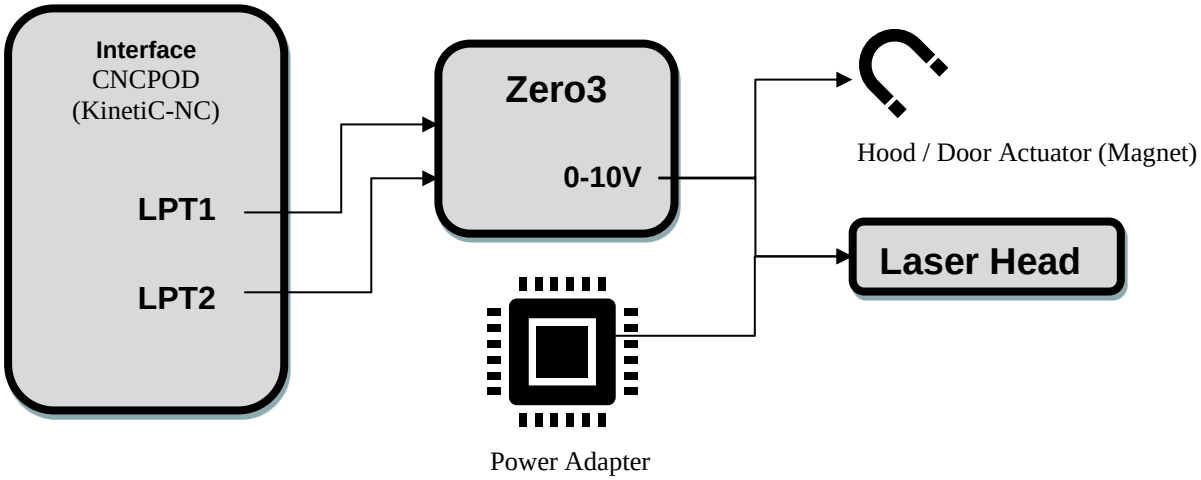
Make sure that the ventilation slots are not covered to ensure enough ventilation. Furthermore, the laser head must be fixed into the designated 43mm EURONECK-mounting device (interface socket facing to one side).

The laser connecting hub connecting CNCPOD with the laser head must be laid collision-free! Mechanical stresses on the connecting hub are to be avoided. The Hood / Door activator must be laid according to standards to ensure a conform usage of the Laser. The Laser is not operative until the Hood / Door activator is closed.





By means of appropriate measures (casing, protective barriers, suction...) it must be assured that the laser head is free of chips, dust and liquids (oil, cooling water). Metal chips and cooling water can lead to short circuits. Dust can affect the ventilation and cause overheats. Both can lead to irreparable damages and fire hazards.



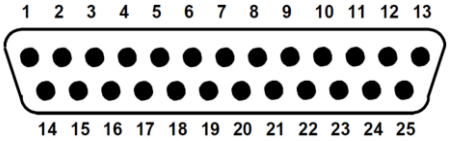
4.2 Power supply

The Laser Head includes a universal power supply and can connect to line voltage in the range of 115 up to 240V alternating voltage, if there were no changes made to the mains voltage. The electricity supply of the Laser Head is achieved by a separate Power adapter.

4.3 Assignment of connections

- By using non-compatible connections, parts of the control system can get damaged or destroyed.
- Furthermore the efficiency of the system can hereby be reduced and safety functions, the protection of Body and life, could be disabled.

- The Plug should only be disconnected or connected with switched off control system!



LPT pin contact strip 25 pol. Sub-D for Controller

Pin No.	Description		Pin No.	Description
1	N.C.		14	N.C.
2	N.C.		15	N.C.
3	N.C.		16	N.C.
4	N.C.		17	PWM Signal
5	N.C.		18	N.C.
6	N.C.		19	PWM Signal ground
7	N.C.		20	N.C.
8	N.C.		21	N.C.
9	N.C.		22	N.C.
10	N.C.		23	N.C.
11	N.C.		24	N.C.
12	N.C.		25	N.C.
13	N.C.			

The connection of the computer is made by using a 25-pole SUBD-plug (LPT= parallel port) on the rear of the Controller.

4.4 Startup

The back of the laser has a 6-PIN connector. The Connection is for Power, INTERLOCK and modulation.

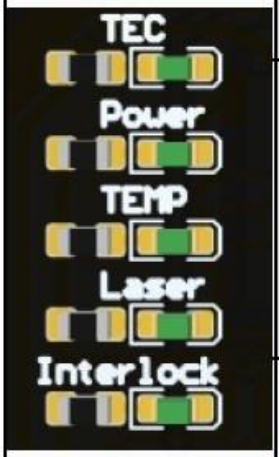
After connecting the power, the “LASER”-LED will start blinking. The Laser will then go into operation and is waiting for the modulation Signal in the factory-pre-set “ARM” mode.
Before finally put into operation, again please check if all plugs are properly connected and if all locking screws are tightened. After that you can turn on your computer, install and start appropriate software.

- **Laser Radiation Warning - avoid irritation of eyes and skin by direct and scattered radiation.** Use safety glasses to protect your eyes from scattered radiation caused by the laser.

- **Beware! Laser safety glassed don’t protect from the direct effect of laser beams!**

- Setup the machine parameters using the software-supplement sheet.
- Check the LEDS on your Laser engraving unit

LED-Display

Display	LED	Condition	Description
	TEC	OFF	TEC is not in use
	Power	OFF	No power available
		on	Power available
	TEMP	OFF	Temperaturesensor not connected or broken cable
		on	Temperaturesensor connected and in operation range
		Blinking	Temperature has reached critical Value and is therefore deaktivated. Wait until Laser has cooled down.
	Laser	OFF	Laser is deactivated
		on	Laser is active
		Blinking	Startup sequence is running
	Interlock	OFF	INTERLOCK Loop is closed
		Blinking	Interlock is open causing an error

- Before first commissioning, make sure that, there are no objects in the working area that are exposed directly to laser beams. Close the covers and make sure that nobody has entered the danger zone.
- In case something does not work as expected, the machine must be stopped immediately, and the connections and software-settings should be checked.

The machine is now ready for operation!

5 Cleaning and maintenance

In most cases all components work maintenance-free. For correct functioning and safe operation it is necessary to regularly check the cables for proper condition and the unobstructed air supply regarding the ventilation slots on the housing.

Procedure

- Turn the controller off by turning the main power switch off and unplugging the power cord on Top of the Laser.
- Wait at least 2 minutes in order to, allow excess energy stored in the capacitors to discharge.
- Also check the power supply cords for external damage. Damaged or brittle lines have to be exchanged immediately.

- Check the ventilation slots of the laser unit. They have to be free of chips and dust. Hoover the ventilation slots if necessary. Regarding the laser unit, please use dry, oil-free compressed air in order to get rid of stubborn deposits.
- Using compressed air could cause damages. Please use a brush when getting rid of stubborn dirt.
- If necessary clean the housing outside with a slightly damped cloth. The use of very aggressive detergents should be avoided. If any liquid enters the equipment housing, please DO NOT start and operate the machine, instead get a specialist to check it.
- If cleaning with compressed air, please only use dry and oil-free air.

5.1 Works on the inside housing

In most cases you won't need any maintenance on the inside housing. Only the manufacturer or authorized workshops are allowed to carry out repairs.

Opening the casing is therefore prohibited.

6 Technical data

The Laser engraving unit is equipped with a Laser diode Class 4.

6.1 Limit values

Following parameters mustn't be exceeded in order to prevent damages on the:

Parameter	**min.**	**max.**	**Unit**
Mains voltage	-	264	Vac
Power consumption	-	5,0	Aac
Voltage on LPT Pin17	-0	+5,0	V
Storage temperature	-10	+85	°C

6.2 Electrical connection values

Parameter	**min.**	**max.**	**Unit**
Mains voltage +10% -15%	115	240	Vac
mains frequency	47	63	Hz
Power consumption (with power supply, without ext. consumer)	0,0	0,25	Aac
Ambient temperature during operations	0	+40	°C
Level logical 0 for XLR Pin2	-0,5	0	V
Level logical 1 for XLR Pin1	+0,1	+5	V

6.3 Casing dimensions Laser Head

parameters	**typ.**	**Unit**
length(without plug connector und control elements)	40	mm
width	62	mm
height	111	mm
weight (without cable)	0,5	kg

7 Delivery contents laser engraving device

- 1x Laser engraving unit (Diode Laser Class 4)
- 1x Connection cable with Power Adapter and Hood / Door Actuator
- 1x Meder Magnet to activate Interlock
- 1x Hood / Door Actuator with variable Cable length
- 1x Bracket with Laser unit for EURO Neck 43mm (Laser unit is mounted on Bracket)