IMPORTANT: Read before using

Operating/Safety Instructions

Laser DL445

Call for consumer information

Customers from outside the U.S.

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Translation of Original Operating/Safety Instructions

Date of: 06-19-2019

NOTICE

All instructions, warranties and other collateral documents are subject to change at the sole discretion of STEPCRAFT GmbH & Co. KG. For up-to date product literature, visit *www.stepcraft.us* for customers from North America and Mexico or *www.stepcraft-systems.com* for customers from the rest of the world and click on the service & support tab for this product.

Meaning of Special Language

The following terms are used throughout the product literature to indicate various levels of potential harm when operating this product: The purpose of safety symbols is to attract your attention to possible dangers. The safety symbols, and their explanations, deserve your careful attention and understanding. The safety warnings themselves do not eliminate any danger. The instructions or warnings they give are not substitutes for proper accident prevention measures.

NOTICE	Procedures, which if not properly followed, create a possibility of physical property damage AND a little or no possibility of injury.
CAUTION	Procedures, which if not properly followed, create a probability of physical property damage AND a possibility of serious injury.
WARNING	Procedures, which if not properly followed, create a probability of property damage, collateral damage, serious injury or death OR create a high probability of superficial injury.
	Safety Alert: Indicates caution or warning. Attention is required in order to avoid serious personal injury.

⚠WARNING Read the ENTIRE instruction manual in order to become familiar with the features of the product and how to operate them. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury, electric shock and/or fire.

This is a sophisticated hobby and semi-professional product for advanced craftsmen with previous experience in the operation of tools such as electric drills, routers and computerized tools like CNC routers or 3D printers. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in personal injury or damage to the product or other property. This product is not intended for use by children. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of STEPCRAFT GmbH & Co. KG or STEPCRAFT, Inc. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

Age Recommendation: For advanced handcrafters ages 18 and above. This is not a toy.

SAVE ALL WARNINGS AND INSTRUCTIONS FOR FUTURE REFERENCE.

Should you encounter any doubts or require any further information, please do not hesitate to contact us before commissioning of the laser tool. Our contact details can be found on the front page of this manual.

The term “laser tool” in the warnings refers to your laser controller and the laser head itself hereafter referred to as STEPCRAFT diode laser “DL445”.

General Laser Tool Safety Warnings

Work Area Safety

NOTICE	**Keep work area clean and well lit.** Cluttered or dark areas invite accidents.
⚠CAUTION	**Do not operate laser tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** Laser tools create laser beams which may ignite the dust or fumes.
NOTICE	**Keep children and bystanders at a distance while operating a laser tool.** Distractions can cause you to lose control and can result in accidents.

Continued on next page

Electrical Safety

⚠WARNING	**Laser tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs.** Unmodified plugs and matching outlets will reduce the risk of electric defects and malfunctions. **Do not expose laser tools to damp, rain or wet conditions.** The laser head is only suitable for indoor use. Water entering a laser tool will increase the risk of electric defects. **Do not abuse the cord / hose. Never use the cord/hose for carrying, pulling or unplugging the laser tool. Keep cord/hose away from heat, oil, sharp edges or moving parts.** Damaged or entangled cords/hoses increase the risk of electric defects and malfunctions.

Personal Safety

⚠WARNING	**The laser tool is a class 4 laser.** **You are only allowed to operate the laser tool if you have a sufficient specialized and safety knowledge: You must know the physical properties as well as the biological effects of laser radiation, the legal bases and rules of technology, the laser classes and their respective limit values and dangers (direct / indirect), the selection and implementation of safety measures and the dangers of a laser system/tool.**
⚠CAUTION	**Stay alert, watch what you are doing and use common sense when operating a laser tool. Do not use a laser tool while you are tired and/or under the influence of drugs, alcohol or medication.** A moment of inattention while operating laser tools may result in serious personal injury.
NOTICE	**All persons who operate the laser tool must have read and fully understood all relevant safety and operating instructions.** Misunderstanding may result in personal injury.
⚠WARNING	**Use personal protective equipment. Always wear eye protection**. **Protect your skin, keep yourself well covered**.
NOTICE	**Prevent unintentional starting. Ensure the key-operated switch is in the off-position before connecting the laser tool to the main board of the CNC router, picking it up or carrying the tool.**
⚠WARNING	**Remove any reflective material from the work area underneath the laser head. A t-slot aluminum table has to be fully covered with a wood plate. Reflective material can cause uncontrolled scattered radiation.**
⚠CAUTION	**Use an exhaust air hose (optional part) to direct the fumes from the laser controller immediately to an outside area. Ensure that the hose is properly connected.** Use of an exhaust air hose can reduce dust-related hazards.

Laser Tool Use and Care

⚠WARNING	**Only connect the laser tool with the CNC machine when it is dead.** Connecting the laser tool when the machine is under power can result in damage to the laser electronics.
⚠CAUTION	**Disconnect the plug from the power source (mainboard of CNC router) or from the laser controller before making any adjustments, changing accessories, or storing laser tools.** Such preventive safety measures reduce the risk of starting the laser tool accidentally.
NOTICE	**Do not force the laser tool. Use the correct feed and power for your application.** The correct laser tool will do the job better and safer at its dedicated rate for which it was designed.
NOTICE	**Do not use the laser tool if the key-operated and/or internal emergency switch cannot be turned on and/or off.** Any laser tool that cannot be controlled with the switches is dangerous and must be repaired.
⚠CAUTION	**Store idle laser tools out of the reach of children and do not allow persons unfamiliar with the laser tool or these instructions to operate the laser tool.** Laser tools are dangerous in the hands of untrained users.
NOTICE	**Maintain laser tools. Check for misalignment or binding of moving parts, breakage of parts and any other conditions that may affect the laser tool's operation.** If damaged, have the laser tool repaired before use. Many accidents are caused by poorly maintained laser tools.
⚠WARNING	**Use the laser tool in accordance with these instructions, taking into account the working conditions and the work to be performed.** Use of the laser tool for operations different from those intended could result in a hazardous situation with high probability of superficial injury.

Continued on next page

Service

NOTICE	**Have your laser tool serviced by a qualified repair person using only identical replacement parts.** This will ensure that the safety of the laser tool is maintained.

Safety Rules for Laser Tools

NOTICE	**Make sure that the laser tool cannot cut its own hose, therefore never install the hose across the machine table.** Cutting a "live" wire may lead to malfunctions.
NOTICE	**Use clamps or another practical and secure way to support the workpiece and secure it to the machine table.** Holding the workpiece with your hands leaves it unstable.
⚠ CAUTION	**Always turn key-operated switch from the laser controller off before making any adjustments or attaching any accessories.** You may unexpectedly cause the tool to start leading to serious personal injury.
⚠ WARNING	**Visual protection brush must touch the workpiece material during operation to avoid scattered radiation.**
⚠ WARNING	**Never bridge the safety system manually on purpose. Use of the laser tool for operations different from those intended could result in a hazardous situation with high probability of superficial injury.**
⚠ WARNING	**Always wear safety goggle when laser tool/system is not covered in an enclosure with laser light impermeable housing walls and doors. Using personal safety devices and working in safe environment reduces risk of injury.**
⚠ WARNING	**This is not a handheld tool. The laser is designed to be system-guided and must be operated in a CNC router or 3D desktop system. Operation of the laser tool handheld may result in serious personal injury.**
⚠ WARNING	**Choose your workpiece carefully before cutting or engraving. It is not allowed to use mirroring workpieces like metal sheets to avoid scattered laser light that could result in a hazardous situation with high probability of superficial injury.**
⚠ CAUTION	**The power and feed of the laser tool when carving or cutting is very important, especially when the material has the ability to burn.** Always observe the workpiece material and do not leave the machine unattended during operation.
⚠ CAUTION	**If the workpiece or laser head becomes jammed or bogged down, turn the laser tool "OFF" by the key-operated switch before detaching the laser head.** If the key-operated switch to the laser tool is left "ON" the tool could restart unexpectedly causing serious personal injury.
NOTICE	**Do not leave a running tool unattended, turn key-operated switch off and pull out the key.** Only when tool comes to a complete stop and is disconnected from the mains is it safe.
	Clean the tool's air vents every 10 hours by using compressed air. Excessive accumulation of fumes inside the laser head housing may cause combustible deposits.
NOTICE	**Do not allow familiarity gained from frequent use of your laser tool to become commonplace.** Always remember that a careless fraction of a second is sufficient to inflict severe injury.
⚠ WARNING	**This product is not intended for use as a medical equipment, in human or veterinary medical applications. Serious personal injury may result.**
⚠ WARNING	**Do not alter or misuse tool. Any alteration or modification is a misuse and may result in serious personal injury.**

Safety Rules for System-guided Tools

⚠ CAUTION	**The laser tool must be controlled by a control software of a CNC router. Therefore, the power supply of the laser has to be properly connected to the external output of the main board of the CNC router via a 15-pin D-Sub cable.** Prior to each commissioning of the laser tool the key-operated switch and emergency button functionality has to be checked. Malfunction may result in serious personal injury.
NOTICE	**Do not leave a running CNC system and laser tool unattended, turn key-operated switch from the laser controller off, pull out the key, turn power off from the CNC router.** Only when a CNC router or laser tool come to a complete stop and are disconnected from the mains are they safe.

Continued on next page

Additional Safety Warnings

NOTICE	Depending on the application field of the machine (private or commercial), observe the applicable occupational safety and health, safety and accident prevention and environmental regulations, too.
NOTICE	**Personal protection devices like protective gloves will further enhance your personal safety.**
NOTICE	**Develop a periodic maintenance schedule for your tool.** When cleaning the laser tool be careful not to disassemble any portion of the tool since internal wires may be misplaced or pinched and the safety system may be exposed. Certain cleaning agents such as gasoline, carbon tetrachloride, ammonia, etc. may damage the surface.
⚠WARNING	**Some fume created by laser cutting and engraving contains chemicals known to cause cancer, birth defects or other reproductive harm.** Your risk from exposures to these varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area and use of a proper installed exhaust air hose.

Symbols

IMPORTANT: Some of the following symbols may be used on your tool. Please study them and learn their meaning. Proper interpretation of these symbols will allow you to operate the tool better and safer.

Symbol	Name	Designation/Explanation
V	Volts	Voltage (potential)
A	Amperes	Current
Hz	Hertz	Frequency (cycles per second)
W	Watt	Power
Kg	Kilograms	Weight
Min	Minutes	Time
S	Seconds	Time
mm	Length, Height, Width	Size in millimeter (metric)
inch	Length, Height, Width	Size in inch
Ø	Diameter	Size of drill bits, end mills, etc.
…/min	Revolutions or reciprocation per minute	Revolutions, turns, etc. per minute
V→, V↓	Feed	Horizontal / vertical speed in millimeter per second
0	Display off position	Zero speed / revolution per minute
15, 45, 75, 99	Display selector settings	Speed / revolution per minute as percentage share of the max. speed / revolution. Higher number means greater speed. 99 equal the max. revolution per minute.
→	Arrow	Action in the direction of an arrow
	Warning symbol	Alerts user to warning messages
	CAUTION flammable	Alerts user not to touch the surface – danger of burns
	DANGER – Fire hazard	Use extreme caution when cutting flammable materials such as wood or acrylic
	CAUTION laser beam	Laser radiation – Avoid eye or skin exposure to direct or scattered laser light
	DANGER of serious personal injury	DO NOT view directly into the beam of the laser diode pointer (Blue Dot Pointer).
	DANGER of serious personal injury	DO NOT expose skin into the beam of the laser diode pointer (Blue Dot Pointer).
	Wear eye protection symbol	Alerts user to wear protective glasses
	Wear hand protection symbol	Alerts user to wear protective gloves
	Grounding symbol	Alerts user to ground the laser tool / electrical system
	Wear ear protection symbol	Alerts user to wear a hearing protector
	Read manual symbol	Alerts user to read manual BEFORE first commissioning
	Unplug symbol	Alerts user to unplug the device BEFORE servicing the laser tool
	Disposal symbol	Instructions for disposal of WEEE by users of the European Union

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1 FIRE WARNING

Your laser system uses a high intensity beam of light that can generate extremely high temperatures when it comes into contact with the material being engraved, marked or cut. Some materials are extremely flammable and can easily ignite and burst into open flame setting the machine afire. This open flame is very dangerous and has the potential to destroy not only the machine, but the building in which it is housed.

Experience shows that vector cutting with the laser has the most potential to create an open flame. Many materials are susceptible to igniting, but acrylic, in all its different forms, has been shown to be especially flammable when vector cutting with the laser.

Please read the following warnings and recommendations and follow them closely at all times!

- Stay with the laser. Never operate the laser system while unattended.
- Clean around the machine and keep the area free of clutter, combustible materials, explosives or volatile solvents such as acetone, alcohol, or gasoline.
- Be prepared with a fire extinguisher. Always keep a properly maintained and inspected fire extinguisher on hand.
- STEPCRAFT recommends a Halotron fire extinguisher or a multi-purpose dry chemical fire extinguisher. The Halotron extinguishers offer certain advantages should you ever need to use an extinguisher. The Halotron extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.
- Use vacuum assist. Always use the system's vacuum assist feature when cutting.
- Use caution when cutting. Many materials have the potential to suddenly burst into flames when cut with a laser – even materials that may be very familiar to the user. Always monitor the laser head when it is operating.
- Clean the laser. A buildup of cutting and engraving residue and debris is dangerous and can create a fire hazard in its own right. Keep your laser system clean and free of debris. Regularly remove the Vector Cutting Table to clean any small pieces that have fallen through the grid.

2 GENERAL INSTRUCTIONS

2.1 INFORMATION AND EXPLANATIONS ON THE OPERATING INSTRUCTIONS

Thank you for purchasing a STEPCRAFT laser tool. This manual is intended to familiarize you with your STEPCRAFT laser tool (hereafter referred to as DL445) and its control system, providing you with all the necessary information you will need in order to operate it safely and professionally.

⚠WARNING 	**Please read this manual thoroughly and carefully prior to the first use of your STEPCRAFT DL445.** Operate the device and the desktop 3D-system only when you are sure that you have understood these instructions in their entirety. Hereby you minimize the risk of injury and / or prevent property damage.

Should you encounter any doubts or require any further information, do not hesitate to contact us. Our contact information can be found on the front page of this manual.

Keep this manual always in close proximity to the STEPCRAFT DL445 for future reference.

We cannot be held accountable either for any kind of injury and / or property damage resulting from improper handling of the machine, deviating from the recommended use of the STEPCRAFT DL445 or from failure to follow the safety regulations properly (see page 2 cont.).

We reserve the right to further develop the laser head as well as the controller.

2.2 Description of Components

STEPCRAFT DL445 consists of the laser head with the firmly attached cabling and a matching control unit with a vacuum pump integrated. The laser head has a 43-mm collar as well as an active air cooling and vacuum system. The outside fan of the head feeds the inside of the laser head with sealing air to protect the laser lenses against contamination, thus the integrated vacuum pump of the controller evacuates the inside of the laser head from gases of burning. The visual protection brush eliminates scattered laser light.

The ready-to-use unit consists of the following components:

1. Laser head
2. Controller with integrated exhauster
3. Connection cable D-Sub 15-pin male-female
4. Vacuum tube (optional)
5. Operating & safety instructions

For more information on optional accessories, see item 4.5 of this manual.

2.3 Intended Use

The STEPCRAFT DL445 is an engraving and cutting laser for easy-to-cut workpiece materials and has been developed for private users (e. g. model designers). It is not suitable for the commercial sector. Basically, it is designed for the usage with a CNC router but the DL445 is specifically designed for installation and connection to the STEPCRAFT machine series - Plug & Play.

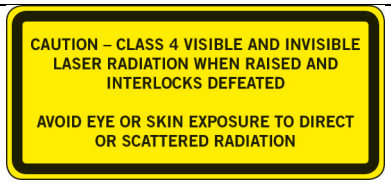
2.4 Safety Features and Regulatory Compliance

STEPCRAFT has incorporated specific nine-level safety features into the model DL445 in order to meet the requirements of 21 CFR 1040 and the International Standard IEC 60825-1. These safety features include:

- Safety switch to ensure the mounting position; wrong mounting position / switch off leads to an immediate deactivation of the laser beam (1. interlock system).
- Key-operated switch for controller box
- Emergency switch for controller box
- Cabinet design of laser head with visual protection brush, which encloses the laser diode and serves as a radial visual sight protection of its beam path to avoid scattered radiation.
- Operating LED indicator on the front of the laser head illuminates red when laser beam is active.
- Toggle signal to verify an active computer connection, a disconnection between laser controller and the CNC control software will deactivate the laser beam immediately (2. interlock system).
- Laser operation only possible after software request of positive job status signal (3. interlock system).
- Safety goggles to avoid eye exposure to direct or scattered radiation.
- Fine particulate air filter to reduce fine dust pollution.

21 CFR 1040 and IEC 60825-1 require that certification, identification, and warning labels be placed on laser products.

Reproductions of labels on the STEPCRAFT DL445 Laser tool follow, with their locations specified:

No.	Label	Explanation	Location
1		Certification/Identification Plate	on the rear of the laser controller
2		Fire Safety Label	on the right-side cover of the laser controller. Do not cover this label at any time.
3		Laser Class Label	on the left-side cover of the laser controller Do not cover this label at any time.
4		Defeatably-interlocked Protective Laser Head Safety Label	on the laser head (top position)
5		Warning Logotype	on the laser head (top position)
6		Protective glasses	on the laser head (top position)
7		Aperture Safety Label	on the laser head (bottom position)

3 Design and Function of the Laser Tool

WARNING 	**Disconnect the DL445 from the mainboard source before making any adjustment.** Such preventive safety measures reduce the risk of starting the tool accidentally.

1 = fan for laser diode sealing air

2 = exhaust air hose

3 = operating LED

4 = integrated switch for zero point sensor and positioning beam

5 = visual protection brush to avoid scattered radiation

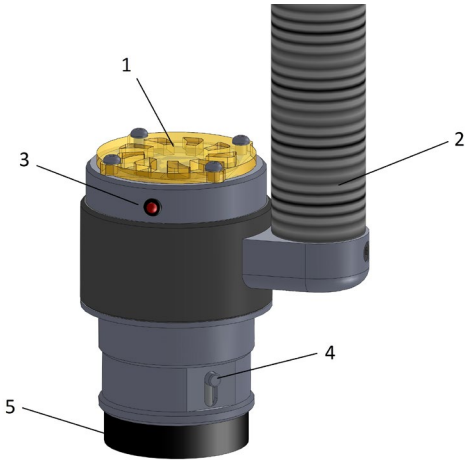
6 = mounting position safety switch

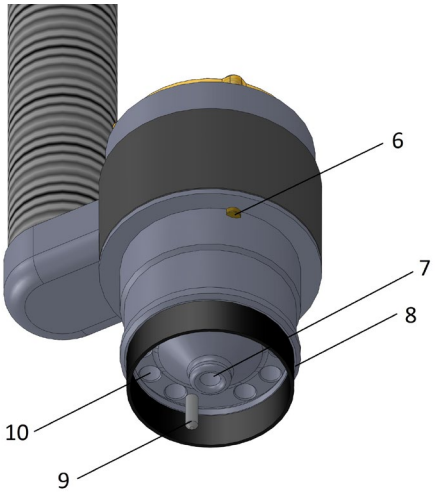
7 = **aperture - laser radiation is emitted from here. CAUTION!**

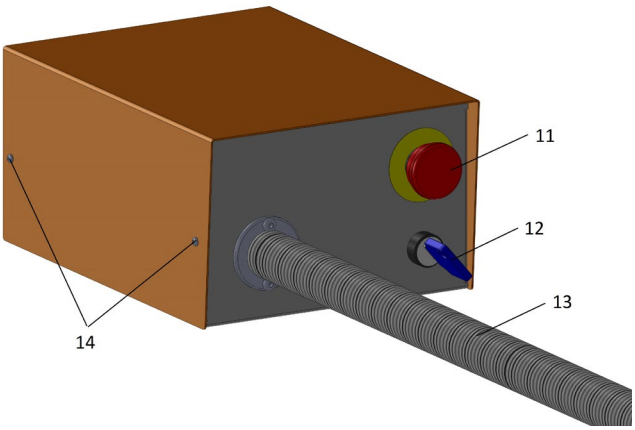
8 = visual protection brush to avoid scattered radiation

9 = slider for integrated switch for the zero point sensor

10 = smoke suction channels







11 = emergency switch

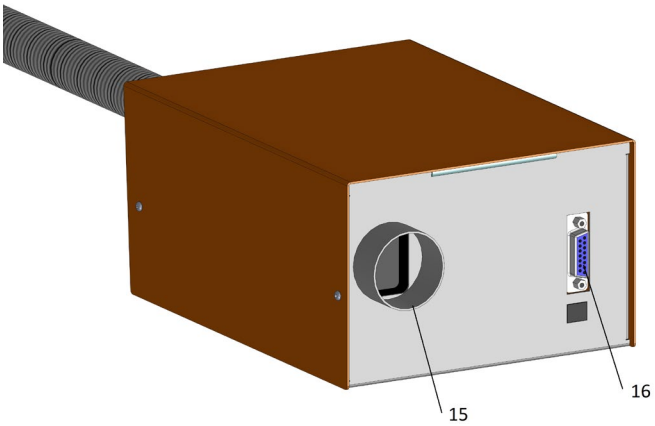
12 = key-operated switch

13 = exhaust air hose

14 = screws to remove the case cover to change the filter cartridge

15 = exhaust air hose connector

16 = D-Sub-15 connector



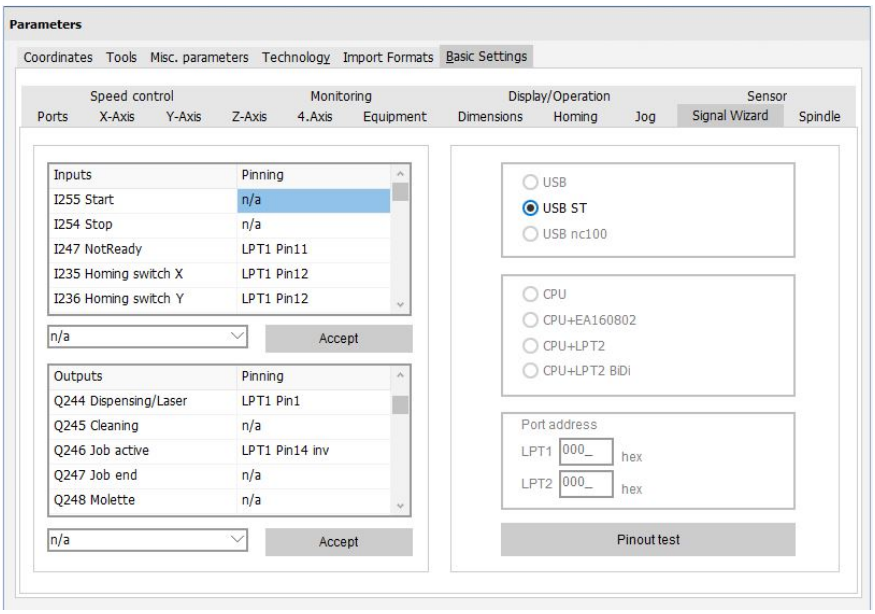
4 SETUP

WARNING	Always turn off the key-operated switch before handling or configuring the laser tool.

4.1 WINPC-NC

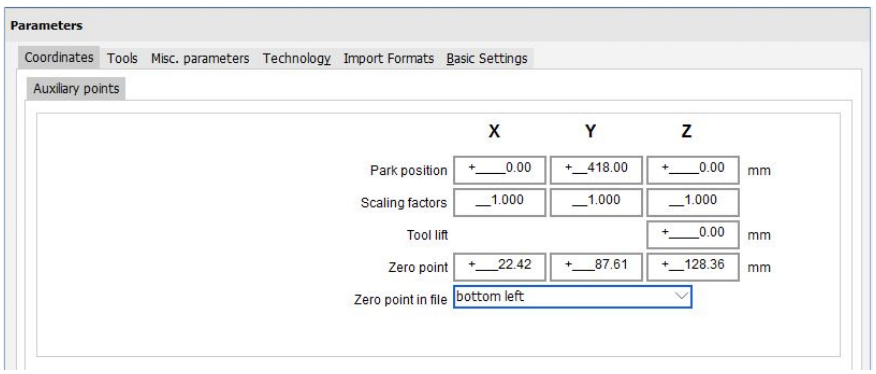
For the effective and save commissioning of the DL445 with WinPC-NC various parameters have to be set correctly.

- *Parameters / Basic Settings / Signal Wizard*

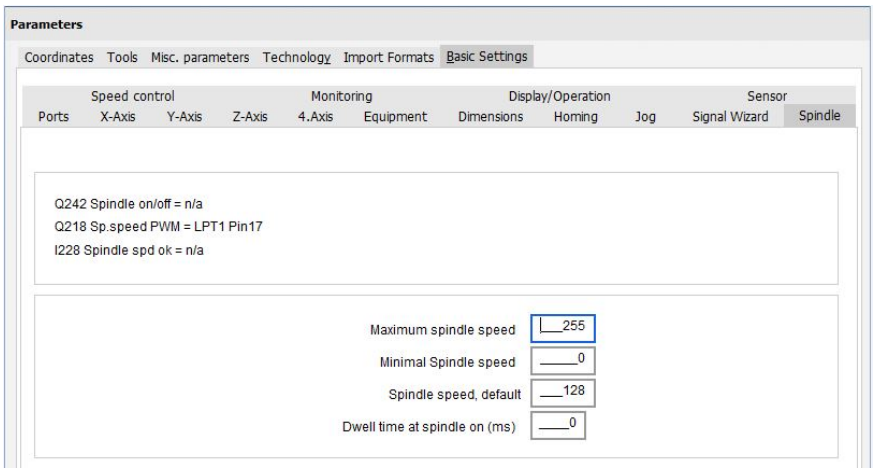


Pos.	Description	In-/Output WinPC-NC	Pinning	Inverted
1	Emergency Switch	I247 NBereit	LPT1 Pin11	No
2	Integrated Tool Length Sensor	I221 Taster	LPT1 Pin10	No
3	Laser on/off	O242 Laser	LPT1 Pin1	No
4	Job Active	O246 Job läuft	LPT1 Pin14	Yes
5	Toggle Signal	O219 Toggle/Bereit	LPT1 Pin16	No
6	Power (PWM)	O218 Drehzahl PWM	LPT1 Pin17	No

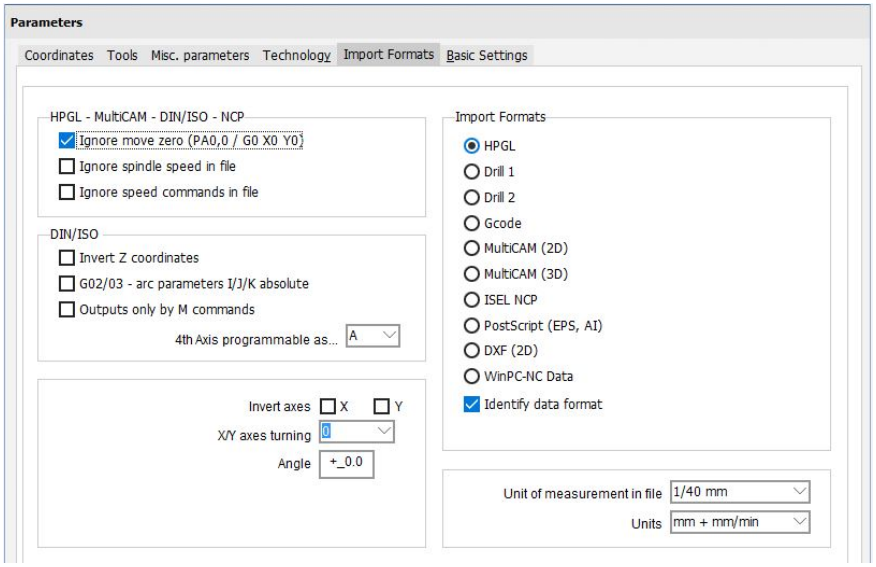
- *Parameters / Coordinates / Tool lift* to zero.



- *Parameters / Basic Settings / Spindle / Maximum spindle speed* to 255 (equals maximum of 100 %), *Spindle speed, default* to 128 (equals 50 % of maximum output) and *Dwell time at spindle on (ms)* to zero.

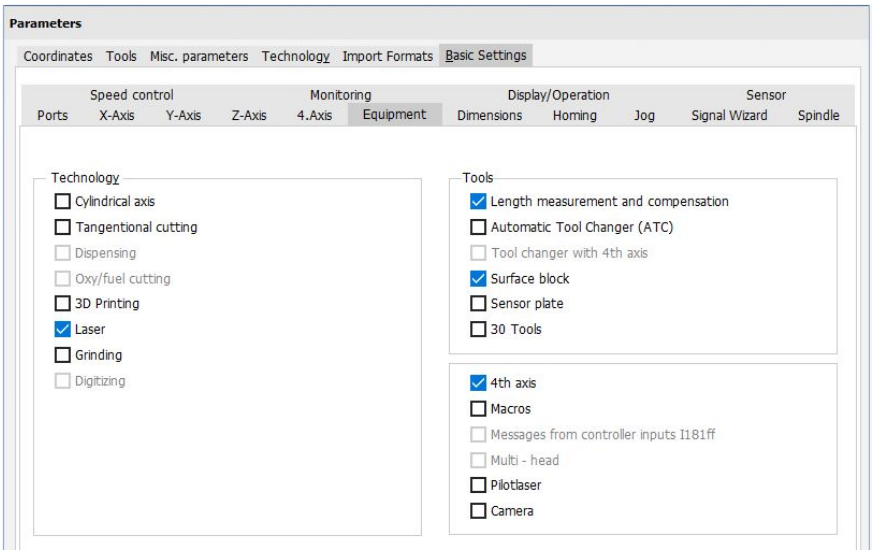


- *Parameters / Import Formats / Units* has to be set to *mm + mm/min*.

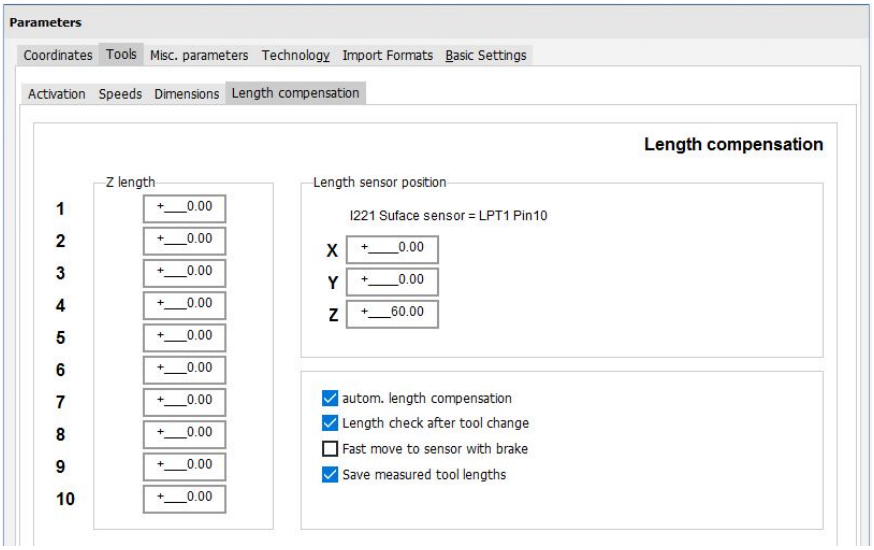


- The zero point sensor needs to be activated. Proceed as follows:

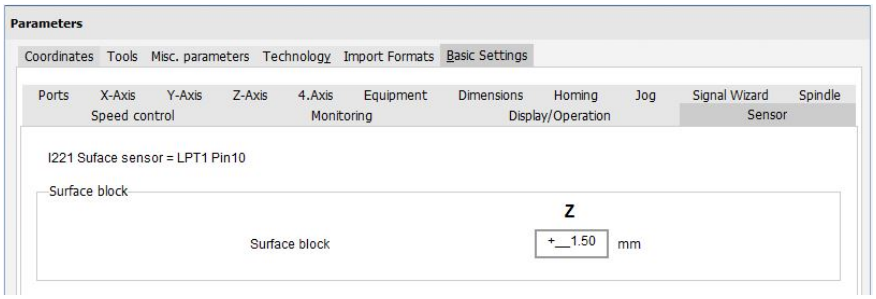
    1. Mark checkboxes at: *Parameters / Basic Settings / Equipment / Surface Block* and *Length measurement and compensation.*



2. Close WinPC-NC and restart the program.
3. Mark checkboxes at: *Parameters / Tools / Length compensation / autom. length compensation*, *Length check after tool change* and *Save measured tool lengths.*



- *Parameter / co-ordinates / surface block* to +1,5 mm, check height visually. **CAUTION: Visual protection brush has to touch the surface to avoid scattered radiation. Verify and adjust carefully!**

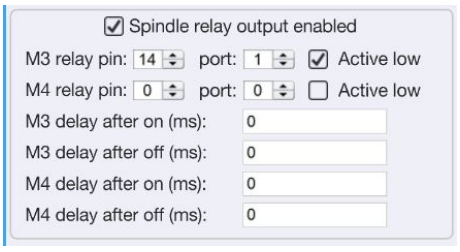


- In case a standard tool length sensor is in operation, the sensor has to be disconnected from the mainboard. Otherwise the integrated zero point sensor of the DL445 will not work.

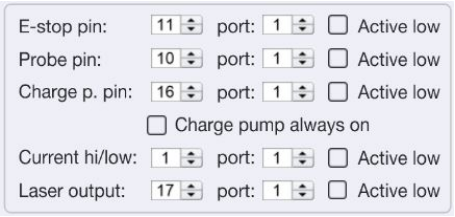
4.2 UCCNC

For the effective and save commissioning of the DL445 with UCCNC various parameters have to be set correctly.

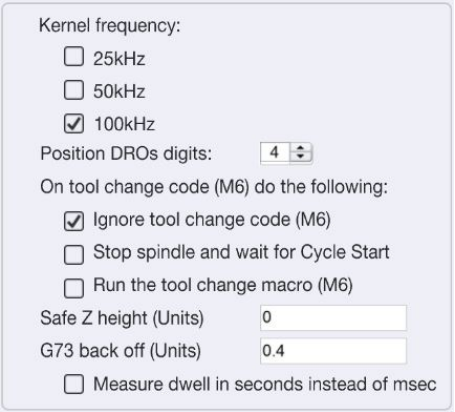
- Configuration / axis setup / laser /



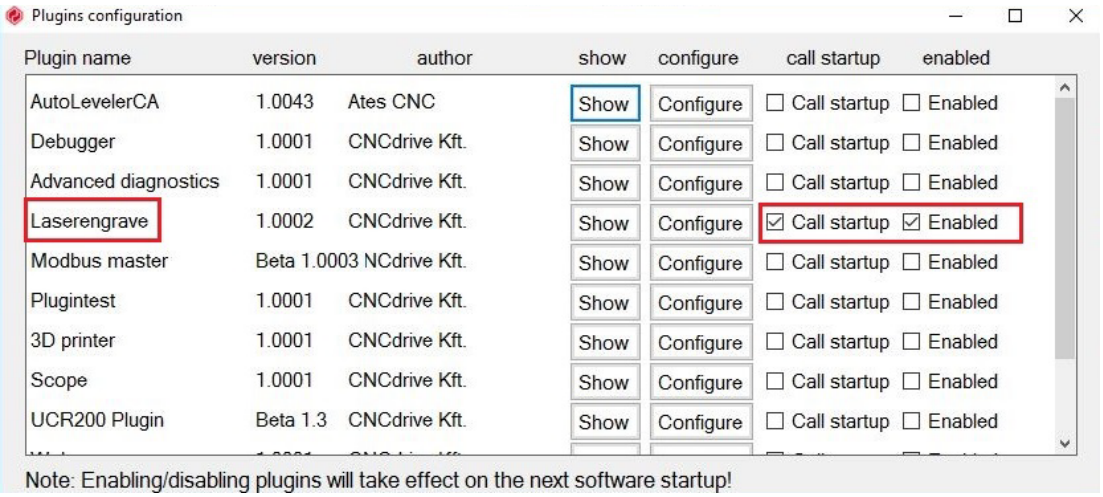
- Configuration / I/O setup /



- Configuration / General settings



- Enable the laser plugin: Configuration / General settings / Configure plugins and restart UCCNC



- In case a standard tool length sensor is in operation, the sensor has to be disconnected from the mainboard. Otherwise the integrated zero point sensor of the DL445 will not work.
- To activate the zero point sensor the following macro for the M31 command has to be enabled:

```
double Zmin = -100; //Max.Z depth
double Feedrate = 250; //Feedrate for probing
double retractheight = 10; //The retract height
double newZ = 1.7; //The new Z DRO value after probing

exec.Code("G31 Z" + Zmin + "F" + Feedrate); // Start probing

while(exec.IsMoving()){} // Wait while there is motion

exec.Wait(200);  //Safety wait for the UC100 syncronisation

exec.ChangeaxisDROvalue(2, newZ.ToString()); //Change the DRO value
```

```
exec.Wait(200);  //Safety wait for the UC100 syncronisation

if(!exec.Ismacrostopped()) // If tool change was not interrupted with a stop only then validate new tool number
{ double Zup = exec.GetZmachpos() + retractheight; //Calculate the new coordinate for the retract of Z axis
exec.Code("G00 G53 Z" + Zup); //Retract the Z-axis
while(exec.IsMoving()){} // Wait while there is motion
}
```

The default height setting of double newZ (bolt letters) is 3 mm. **CAUTION: The visual protection brush has to touch the surface to avoid scattered radiation. Verify and adjust carefully!**

The macro is available as downloadable file at

<https://www.stepcraft-systems.com/service/m31-uccnc.txt>.

4.3 Environmental Requirements

Make sure that there is sufficient room around the system so that you can work comfortably and the machine can fully extend its traversing paths. Maintain a sufficient safety distance from other machines.

Humidity should be within the usual levels for indoor environments. Protect the laser against moisture and humidity. The ideal temperature of the system is between 18 ° C and 25 ° C.

Especially protect the electronics from overheating by avoiding exposure of the laser head and the controller to direct sunlight or close proximity to a heater.

Provide adequate lighting for the location of the machine and the work places surrounding it.

Position the PC controlling the machine in its near proximity in order to have both of them in clear view. All the instructions relevant to the machine and its components must be always kept nearby and within reach.

4.4 Emergency Stop

The emergency-stop switch is located on the front of the machine (see figure in item 3.1 STEPCRAFT 3D Desktop Operating Instructions). An additional emergency button is located at the device front of the DL445.

Pressing the switch triggers an emergency stop of the machine´s operation. Simultaneously, the power supply to the controller is interrupted. In addition, the control software receives a signal to stop the operation. The machine will stop immediately.

⚠ **CAUTION**	**The emergency stop switch can only lead to a cessation of all components when they are properly connected to the emergency stop functionality of the mainboard.**

⚠ **WARNING**	**If you are using third-party products, such as another CNC router mainboard, you are solely responsible for connecting the emergency stop functionality properly to the DL445 controller. Otherwise a danger of personal injury or damage to property arises!**

If you have any further questions, please do not hesitate to contact us!

For further information on the emergency-stop switch, refer to item 0 of this manual.

4.5 Optional Accessories and Software

If you wish to use accessories not manufactured or sold by STEPCRAFT, make sure to check their compatibility with your system prior to its first application.

- Exhaust air hose (available at STEPCRAFT)
- Software, e. g. picture converter for laser engraving like Image2gcode (various manufacturers)

When in doubt, contact the manufacturer.

5 Operator Control / Laser

5.1 Operator

The improper operation of the laser tool can cause serious injury and / or property damage.

Read and observe the major accident prevention regulations!

Each user must have read and understood the available instructions for the entire system (CNC router, laser tool, control software) before proceeding to operate the device for the first time.

5.2 LASER HEAD

⚠WARNING 	**CAUTION laser light then in operation! Supervising red operating LED at the laser head.** **Avoid eye or skin exposure to direct or scattered laser light. This poses a serious risk of injury!** **Use personal protective equipment. Always wear eye protection. Protect your skin, keep yourself well covered.**

Attach the laser head to the 43 mm Euro-tensioning system of the STEPCRAFT machine or the adequate CNC router.

Be aware of the mounting position safety switch. Only when head is mounted correctly the safety switch is pressed down.

NOTICE: Wrong mounting position / switch off leads to a deactivation of the laser tool operation.

⚠WARNING	**Never bridge the safety system manually on purpose. Use of the laser tool for operations different from those intended could result in a hazardous situation with high probability of superficial injury.**

5.3 LASER CONTROLLER

Connect the controller to the system output of your STEPCRAFT 3D system using the supplied 15-pin D-Sub connection cable. Set the controller up in such a way that the flexible hose with the exhaust cannot be crushed.

NOTICE: If you have a CNC-router from a different brand check the external documentation to connect the laser to the data output of the specific CNC-router (see also item 7.3).

The controller and the laser head use the voltage supply of the CNC router mainboard (5 Volts). If the mainboard of the specific CNC router provides more than 5 volts contact the manufacturer.

NOTICE: An additional power supply is not necessary.

NOTICE: Prevent unintentional starting. Ensure the key-operated switch is in the Off-position before connecting the laser tool to the main board of the CNC router, picking it up or carrying the tool.

After connecting the laser controller turn the key-operated switch in the On-position.

5.4 CNC ROUTER / CONTROL PROGRAM

The laser tool must be controlled by control software of a CNC router. Therefore, the CNC router must be ready for operation, the CNC control program must be started.

The power and feed of the DL445 is only controlled by the CNC control program. A manual control is not possible. The CNC control program must start a laser job. Without an active job signal the laser cannot be operated.

5.5 EMERGENCY-STOP SWITCH

The emergency-stop switches are located on the front of the STEPCRAFT 3D system / the individual CNC router and at the front of the laser controller. Additionally the CNC control software provides software emergency-stop, too. Pressing either one of the emergency buttons leads to an emergency stop of the machine and the DL445. The machine will stop immediately. The laser will shut off immediately too.

Actuate the emergency-stop switch only in emergency situations.

NOTICE: Actuating the emergency-stop will result in immediate machine shutdown and can cause step and data losses.

Controlled cessation of the machine´s operation can only be effected by the control software.

To cancel the emergency stop status, turn the emergency-stop switch to the right. Then the control is re-enabled. The work process must be restarted.

The entire system is controlled and operated by the PC.

⚠ CAUTION	**Prior to first usage, read the manual of your control software thoroughly and carefully, making sure that you have understood everything.**

For questions regarding the control software, please contact the respective software developer.

5.6 START A JOB

For this first job you need to prepare a test file for the control software of the router. This program moves the laser tool within a square (dimension 40 x 40 mm). The operating LED indicator at the front of the laser head illuminates red when starting the job. End of pass LED indicator is off due to shutdown of the laser diode.

NOTICE: With the power setting of 10% the laser diode will not operate to avoid dangerous situation during this test job. Regardless the LED indicator indicates an active job.

```
G21; set units to millimeters
G91 ; use relative coordinates
M3 ; set job signal to active
M10 Q128; laser start with 50 % power
G1 F500.000 Y40.00000 ; feed with 500 mm/min.
G1 F500.000 X40.00000 ; feed with 500 mm/min.
G1 F500.000 Y-40.00000 ; feed with 500 mm/min.
G1 F500.000 X-40.00000 ; feed with 500 mm/min.
M11 ; laser stop
M5 ; set job signal to inactive
M30 ; program end
```

Prepare the file with an ASCII-editor on your computer, for example notepad.exe, and save it as “laser-test.nc” file. The NC-file is available as downloadable file, too, at

<https://www.stepcraft-systems.com/service/laser-test.nc>.

General settings for approximate power in NC-program:

Power setting	**Speed range**
Q64	25% of the maximum power (minimum value to start-up)
Q128	50% of the maximum power
Q192	75% of the maximum power
Q255	100% of the maximum power (maximum value for operation)

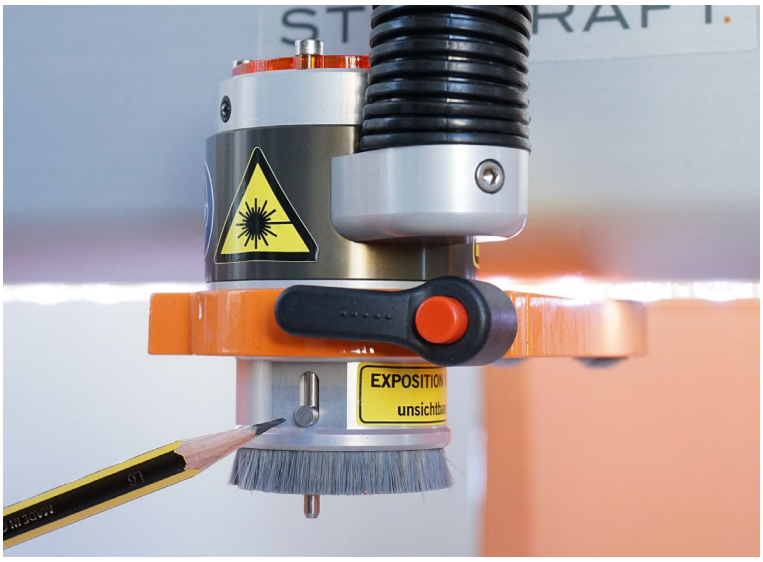
To start the job the following steps are necessary:

1. Start the control software of the CNC router / STEPCRAFT Desktop 3D System.
2. Mount the laser on the tensioning system of the machine.
3. Start the homing sequence of the CNC router / STEPCRAFT Desktop 3D System.
4. Clamp workpiece on spoil board on machine table (non-reflective material, ideally wood).
5. Load the “laser-test.nc” file.
6. Jog the gantry to the middle position of axis X and Y.
7. Switch on the DL445 controller with the key-operated switch.

8. Enable integrated zero point sensor (middle positon) to enable positioning laser, position of laser head approx. 20mm above workpiece to focus positioning laser beam clearly. The positioning laser is a class 2 laser with far less power (comparable to a laser pointer).

9. Jog the gantry to the effective X Y position and save this position as zero position (X, Y) of the imaginary workpiece.

10. Enable integrated zero point sensor (bottom position).



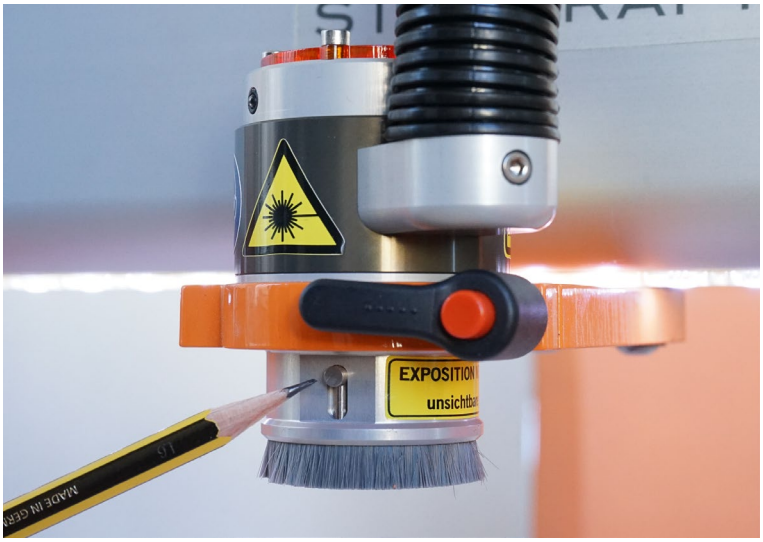
11. Start the tool length measurement procedure in the CNC control program:

    WinPC-NC: \ Manual movement \ Move to block – zero-point Z

    UCCNC: Specific button on main screen 

    The laser head moves slowly further down until it reaches the zero position Z.

12. Disable integrated zero point sensor.



13. Jog to zero position Z of the work piece and check the Z height. Do corrections If the brushes do not touch the workpiece surface slightly (see section 4.1 or 4.2 regarding the parameters surface block (WinPC-NC) or double newZ (UCCNC). Repeat step 11 and 13 after manual movement of the Z-axis to a higher position and saving of the new parameter value.

⚠WARNING	**Visual protection brush must touch the workpiece material during operation to avoid scattered radiation.**

14. Start the program, the laser should start, the operating LED indicator on the front of the laser head illuminates red and the machine drives a square of 40 mm by 40 mm. After completing the square, the laser turns off (LED off) and the program ends. Now the laser tool is ready to operate.

5.7 Testing the laser Emergency-stop Functionality

The testing of the emergency-stop functionality is mandatory.

NOTICE: Do not use the laser tool if the key-operated and/or internal emergency switch cannot be turned on and/or off. Any laser tool that cannot be controlled with the switches is dangerous and must be repaired.

⚠ CAUTION	**The laser tool must be controlled by the control software of a CNC router.** Prior to each commissioning of the laser tool the key-operated switch and emergency button functionality has to be checked. Malfunction may result in serious personal injury.

For testing the emergency-stop functionality with the control software of the machine or the emergency buttons of the CNC router or the laser controller simply start the job in section 0 again. We recommend doing three passes to check every emergency button.

During every operation press one of the emergency buttons. The machine must stop immediately and the operating LED indicator at the front of the laser head must be off (indication of inactivity).

NOTICE: For questions regarding the control software, please contact the respective software developer.

5.8 Power, Feed and Cycle Settings

Depending on the application the operator has at least three parameters to adjust to achieve best cutting or engraving result possible.

Many applications will provide the best performance at lower feeds with maximum power and multiple cycles but for certain materials and applications you need to proceed at higher feeds, less power and only one cycle. The combination of these three parameters is versatile. A laser test run for the specific application is mandatory. Simply imagine that the residual moisture content in one single sheet of plywood can vary and this already could influence the laser engraving result significantly.

To aid you in determining the optimum operational feed / power / cycle for different materials, we have compiled a table. By referring to this table, you can discover the recommended parameters for each type of workpiece material. Examine this table properly and become familiar with it.

Ultimately, the best way to determine the correct power / feed / cycle adjustments for work on most material, is to practice on a piece of scrap, even after referring to the chart. You can quickly learn that a slower or faster feed is more effective, just by observing what happens during processing a pass or two at different feeds. When working with acrylic, for example, start at a higher rate of power and lower the feed until you observe that the plastic gets cut with a nice sharp edge. Secondly try higher feeds again with two or more cycles.

Some rules of thumb in regard to power / feed / cycles / type of material:

1. Cutting of dark colored material is easier compared to brighter material due to higher light absorption.
2. Material with low melting points typically need less power / cycles.
3. Engraving must be done in one single pass.
4. Check the material composition. Every material has its own characteristics and some materials are hard to cut.
5. The laser is not intended for and will not cut metals.
6. When working with thin materials like paper, card stock and vinyl sheet material, a faster feed rate and lower power will yield better results.
7. Be careful with some plastics and foams, as they can emit hazardous fumes when the laser beam makes contact.

If the laser tool is not performing as you think it should, perhaps you should be using an adjustment in power / feed / cycle setting.

Internal material number	Material	Test with 100% power			Comments
		Feed (mm/s)	Cycles	Cutting result based on marks 1 (excellent) to 6 (inadequately)	
420000	Acrylic glass 3 mm black opaque	5	10	1	
410000	Acrylic glass 3 mm orange opaque	-	-	6	Only engraving possible
430000	Acrylic glass 3 mm orange transparent	1	6	4	Slow
110000	Corrugated board stripes coarse	12	2	1	
100000	Corrugated board stripes fine	13	2	1	
320000	Decoflex veneer, ash	7	5	3	
280000	Decoflex veneer, beech	7	5	3	
270000	Decoflex veneer, birch (rotary veneer)	7	5	3	
300000	Decoflex veneer, cherry tree	-	-	6	Only engraving possible
310000	Decoflex veneer, mahogany	7	5	3	
260000	Decoflex veneer, maple	7	5	3	
290000	Decoflex veneer, oak	7	5	3	
610000	Foamboard white core 5 mm	-	-	6	Only engraving possible
600000	Foamboard, black, black core 5 mm	22	4	2	Foam is shrinking
300000	Forex Classic rigid foam board	7	5	3	
10000	Grey cardboard smooth 1,5 mm	-	-	6	Only engraving possible
20000	Grey cardboard smooth 2,0 mm	-	-	6	Only engraving possible
30000	Grey cardboard smooth 2,5 mm	-	-	6	Only engraving possible
n.a.	Kraftplex 0,8 mm	6	3	1	
n.a.	Kraftplex 1,5 mm	5	5	1	
n.a.	Kraftplex 3 mm	2	5	3	
690000	Laser fiberous material 1,5 mm	-	-	6	Only engraving possible
680000	Leather fibre material coated 1,5 mm	-	-	6	Only engraving possible
340000	Natural cork, polished, 5,0 mm	-	-	6	Only engraving possible
360000	Natural cork, unpolished, 2,0 mm	-	-	6	Only engraving possible
400000	Precision acrylic glass opaque 1 mm	5	10	3	
470000	Solid rubber fine scoring mat 3 mm	-	-	6	Only engraving possible
450000	Sponge rubber 2 mm	10	5	3	Material is shrinking
440000	Sponge rubber colored 2,0 mm	20	2	3	Material is shrinking
640000	Wool felt 1 mm black	-	-	6	Unsuitable material
650000	Wool felt 1 mm white	20	5	5	Black edges

⚠ CAUTION	**Not every material is suited for laser engraving / cutting. For example, the thermal processing of PVC has serious effects on health because toxic gases and hydrochloric acid are emitted during laser engraving / cutting of the PVC. Before processing the material please contact its manufacturer to make sure if the material is suited for thermal processing.**
HINWEIS	The table expresses a guideline only; the optimum working power/feed/cycle depends on the condition of the laser as well as on composition/quality of workpiece material.

6 BASIC SETUP FOR THE CAM-CNC PROCESS

6.1 CUTTING (OUTLINE)

- Load DXF-file with specific outline in a CAM program of your choice
- Define a tool “laser” in the tool library with a diameter of 0.1 mm and an infeed depth per cycle of 0.01 mm. Depending on the workpiece material (see section Power, Feed and Cycle Settings) the specific power and feed settings have to be done. The parameter “revolution per minute” equals power of laser diode and should be between 20% (value 51) and 100% (value 255). The parameter “horizontal feed speed” equals feed of the laser and should be between 1mm and 50mm per second.
- The quantity of cycles will be calculated by the CAM program automatically with the setting of the workpiece thickness, e. g. a thickness of 0.04 mm equals to 4 cycles of 0.01 mm each cycle.
- Make sure to set safety and travel heights to zero to keep the laser head down on the workpiece surface to avoid scattered radiation.
- Generate the toolpath, save the G-Code created, send to machine control software and start the job.

6.2 ENGRAVING (PICTURE)

- Before starting the engraving process, you need to calibrate the laser parameters. Each workpiece material requires different feed and power rates to achieve a reasonable result. Therefore STEPCRAFT recommends two test scenarios: Black contrast feed test and grey-scale test.
- The idea behind the black contrast feed test is to evaluate proper black burning on the specific workpiece material. In this scenario the laser head burns multiple lines with a width of 0.4mm. Each line is generated with maximum laser beam power and continuous increasing feed rates from 6 to 44mm/s. If the laser head moves very slow each line will be dark black. As soon as the beam moves faster the burning color is getting brighter and brighter. The ideal feed for the workpiece material chosen is the black made with the highest feed possible. The NC-file is available as downloadable file at <https://www.stepcraft-systems.com/service/black-contrast-feed-test.nc>.
- After evaluation of the correct feed setting the grey-scale test serves to determine the outcome of various grey colors by changing the power setting of the laser.

  This picture illustrates a perfect result. To evaluate the correct bandwidth of power for the laser beam and the material chosen a basic test file is available as downloadable NC-file at

  <https://www.stepcraft-systems.com/service/grey-scale-test.nc>.

  The laser tool generates a test picture of 10 squares, each square with a size of 10 by 10 mm. First square will be burned with 20%, last one with 100% power. You can easily edit the file to your parameters of choice (jump marker “##”). The feed rate value has to be taken from the previous test.
- Load the specific jpeg-file into picture converter like Image2gcode or the UCCNC laser plugin. A well suited and pretty picture is available as downloadable file at

  <https://www.stepcraft-systems.com/service/marilyn.jpg>.

  This high-contrast picture with a good mixture of various grey colors can be reproduced easily.
- Set available parameters. The following parameters should be adjustable to receive a reasonable result: workpiece width, workpiece height, keep aspect ratio, horizontal or diagonal scan distance, feed rate, origin point and bandwidth of laser power. You have already evaluated feed rate and bandwidth of power, all other parameters depending on your personal choice.

- Create G-Code, send to machine control software and start the job.

7 TECHNICAL SPECIFICATIONS

7.1 DIMENSIONS AND WEIGHT OF THE LASER HEAD

- Type of the diode: LED diode
- Wave length: 445 nm (blue light)
- Maximum performance: 3.0W
- Performance range: 0.8 – 3.0W
- Cutting gap: approx. 0.1mm
- Height: 83 mm
- Diameter: 55 mm
- Clamping neck: 43 mm (Euro neck)
- Hose length: approx. 1m / 3 feet

7.2 OTHER CHARACTERISTICS OF THE LASER TOOL

- Laser class: 4
- Weight (laser tool): 2,36 kg
- Housing (head): Aluminum 7075 anodized,
- Operating Voltage: 15 – 30V (operation with other machines than Stepcraft)
- Additional features: Sealing and vacuum air integrated

7.3 PIN ASSIGNMENT OF THE INTERFACE (15-PIN D-SUB INPUT SIGNALS)

Pin no.	Function	Pin no.	Function
1	VCC 30V	10	GND
2	GND	11	Emergency Switch
3	+ 5 Volt	12	n. a.
4	n. a.	13	Laser on/off
5	n. a.	14	Toggle Signal
6	Job Active	15	n. a.
7	Power (PWM)		
8	Integrated Tool Length Sensor		
9	VCC 30V		

7.4 SPARE PARTS

The fine particle filter can be purchased separately.

Our contact details can be found on the front page of this manual.

8 TRANSPORT / STORAGE

8.1 TRANSPORT

Please make sure that the laser is not exposed to heavy shocks during transport. This can lead to unwanted vibrations. If necessary, transport the device in suitable containers.

8.2 PACKAGING

If you do not want to re-use the packaging material of the laser and the control unit, remove it properly and according to disposal conditions at the site and carry it to the recycling or disposal unit.

8.3 STORAGE

In case of prolonged downtime of the laser and the control unit please observe the following storage conditions:

- Store the device and its components in an indoor environment.
- Protect from moisture, humidity, cold, heat and direct sunlight
- Store in a dust-free environment, cover if necessary
- The storage site should be free of any vibrations.

9 MAINTENANCE INFORMATION

9.1 SERVICE

To ensure continued enjoyment of your STEPCRAFT DL445, handle it carefully.

Regular maintenance positively affects the life expectancy of the device.

⚠WARNING	**Preventive maintenance performed by unauthorized personnel may result in misplacing of internal wires and components which could cause serious hazard.** We recommend that all tool service be performed by a STEPCRAFT service facility.

⚠WARNING 	**To avoid injury from unexpected starting, always remove D-sub cable from the controller.**

9.2 CLEANING

⚠WARNING 	**To avoid accidents always disconnect the laser controller from the CNC router mainboard before cleaning or performing any maintenance.** The tool may be cleaned most effectively with compressed dry air. **Always wear safety googles when cleaning tools with compressed air.**

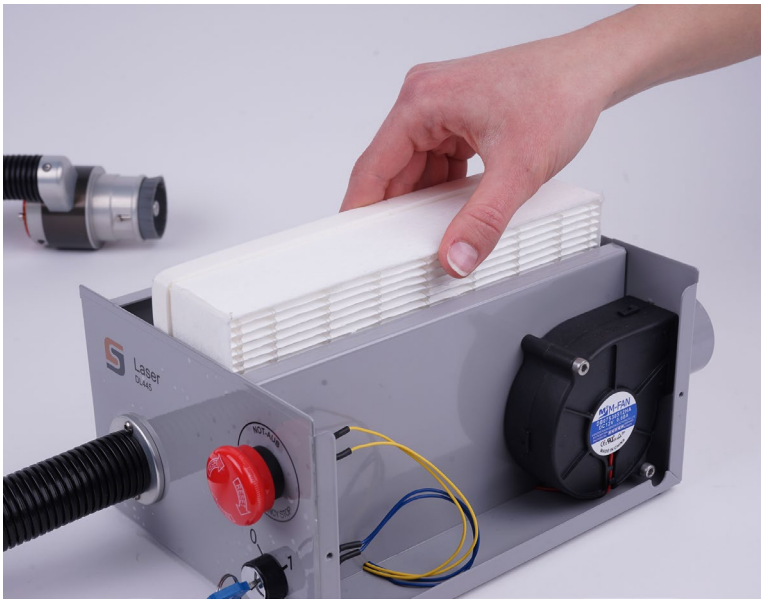
Make sure to carry out the maintenance/care work every 4 working hours. Depending on the accumulation of fume, the laser's interior has to be cleaned by gently using of compressed air.

Ventilation openings and switch levers must be kept clean and free of foreign matter. Do not attempt to clean by inserting pointed objects through openings.

Make sure that no coarse chips and as little dust as possible is entering the ventilation system.

Every three months the fine particulate air filter has to be checked to insure the reduction of the fine dust pollution.

- Untighten the screws (pos. 14, see section 3) to remove the case cover to check the filter cartridge
- If filter cartridge is black from the side opposite the internal fan and the amount of exhaust air during operation is little compared to a new fine particulate air filter you have to change the cartridge. The spare part is available at STEPCRAFT. Please contact your local reseller.



⚠ CAUTION	**Certain cleaning agents and solvents damage plastic parts and/or the coating.** Some of these are: gasoline, carbon tetrachloride, chlorinated cleaning solvents, ammonia and household detergents that contain ammonia.

⚠ CAUTION	**To continue using the tool in unmaintained condition will permanently damage your tool.**

10 Failure

10.1 Response to Malfunctions

⚠ CAUTION	**If a failure occurs on the device that could cause personal injury or property damage, stop the operation immediately using the emergency-stop switch!**

NOTICE: For less serious malfunctions, stop the machine / device normally using the controller. If you cannot fix the malfunction yourself, please contact us, specifying the fault, which has occurred.

Our contact details can be found on the front page of this manual.

11 ANNEX

11.1 WARRANTY AND SERVICE CONTACT INFORMATION

Country of Purchase	STEPCRAFT	Address	Phone no. / E-mail address
United States of America	STEPCRAFT Inc.	59 Field Street, Rear Building, Torrington, CT, 06790	+1 203 556 1856 info@stepcraft.us
Germany	STEPCRAFT GmbH & Co. KG	An der Beile 2 58708 Menden Germany	+49 2373 179 11 60 info@stepcraft-systems.com
Rest of the world	Local distributor STEPCRAFT GmbH & Co. KG	see https://www.stepcraft-systems.com/en/retail An der Beile 2 58708 Menden Germany	see https://www.stepcraft-systems.com/en/retail +49 2373 179 11 60 info@stepcraft-systems.com

11.2 MANUFACTURER

STEPCRAFT GmbH & Co. KG
An der Beile 2
58708 Menden
Germany

Phone: +49 (0) 2373 – 179 11 60
E-mail: info@stepcraft-systems.com
Website: www.stepcraft-systems.com

11.3 IDENTIFICATION PLATE

The type plate can be found at the rear of the laser controller:

Example:

11.4 COPYRIGHT

11.5 LIMITED WARRANTY

What this warranty covers

STEPCRAFT GmbH & Co. KG (“STEPCRAFT”) warrants to the original purchaser that the product purchased (the “product”) will be free from defects in materials and workmanship at the date of purchase.

What is not being covered

This warranty is not transferable and does not cover (i) cosmetic damage, (ii) damage due to acts of God, accident, misuse, abuse, negligence, commercial or improper use, installation, operation or maintenance, (iii) modification of or to any part of the product, (iv) attempted service by anyone other than a STEPCRAFT authorized service center, (v) products not purchased from an authorized STEPCRAFT dealer, or (vi) products not compliant with applicable technical regulations.

OTHER THAN THE EXPRESS WARRANTY ABOVE, STEPCRAFT MAKES NO OTHER WARRANTY OR REPRESENTATION AND HEREBY DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARICULAR PURPOSE. THE PURCHASER ACKNOWLEDGES THAT HE ALONE HAS DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER`S INTENDED USE.

Purchaser´s remedy

STEPCRAFT´s sole obligation and purchaser´s sole and exclusive remedy shall be that STEPCRAFT will, at its option, either (i) service, or (ii) replace any product determined by STEPCRAFT to be defective. STEPCRAFT reserves the right to inspect any and all product(s) involved in a warranty claim.

SERVICE OR REPLACMENT AS PROVIDED UNDER THIS WARRANTY IS THE PURCHASER´S SOLE AND EXCLUSIVE REMEDY.

Limitation of liability

STEPCRAFT SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITIS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY, REGARDLESS OF WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY, EVEN IF STEPCRAFT HAS BEEN ADVISED OT THE POSSIBILITY OF SUCH DAMAGES. Further, in no event shall the liability of STEPCRAFT exceed the individual price of the product on which liability is asserted. As STEPCRAFT has no control over usage, setup, final assembly, modification or misuse, no liability shall be assumed or accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. If you as the purchaser or user are not prepared to accept the liability associated with the use of the product, the purchaser is advised to return the product immediately in new and unused condition to the place of purchase.

Law

These terms are governed by German law (without regard to conflict of law principals).

This warranty gives you specific legal rights additional to other rights you may have. STEPCRAFT reserves the right to change or modify this warranty at any time without notice.

Warranty services

Questions, assistance, and service

Your local STEPCRAFT store and / or place of purchase cannot provide warranty support or service. Once assembly, setup or usage of the products has been started, you must contact your local distributor or STEPCRAFT directly. This will enable STEPCRAFT to better answer your question and help you in the event that you may need any assistance. For questions or assistance, please visit our website or call us in order to speak to a product support representative (see contact details 11.1).

Inspection or services

If this product needs to be inspected or serviced and is compliant in the country you live and use the product, please use the STEPCRAFT online service request submission process found on our website or call STEPCRAFT. Pack the product securely using a shipping carton. Please note that original boxes may be included but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as STEPCRAFT is not responsible for merchandise

unit it arrives and is accepted at our facility. When calling STEPCRAFT, you will be asked to provide your complete name, street address, email address and phone number where you can be reached during business hours. When sending products to STEPCRAFT, please include your contact details and a list of the items included as well as a brief summary of the problem. A copy of your original sales receipt must be included for warranty consideration. Be sure your name and address are clearly written on the outside of the shipping carton.

Warranty requirements

For warranty consideration, you must include your original sales receipt verifying the proof-of-purchase date. Provide warranty conditions have been met, your product will be serviced or replaced free of charge. Service or replacement decisions are at the sole discretion of STEPCRAFT.

NON-warranty service

Should your service not be covered by warranty, service will be completed and payment will be required without notification or estimate of the expense unless the expense exceeds 50% of the retail purchase cost. By submitting the item for service, you are agreeing to payment of the service without notification. Service estimates are available upon request. You must include this request with your items submitted for service. Non-warranty service estimates will be billed a minimum of ½ hour of labor. In addition, you will be billed for return freight. STEPCRAFT accepts money orders cashier´s checks as well as credit cards and PayPal payment. By submitting any item to STEPCRAFT for service, you are agreeing to STEPCRAFT`s Terms and Conditions found on our website (see contact details on front page).

ATTENTION: STEPCRAFT service is limited to product compliant in the country of use and ownership. If received, a non-compliant product will not be serviced. Further, the sender will be responsible for arranging return shipment of the unserviced product through a carrier of the sender´s choice and at the sender´s expense. STEPCRAFT will hold non-compliant product for a period of 60 days from notification after which it will be discarded.

11.6 Instructions for disposal of WEEE by users of the European Union

	This product must not be disposed of with other waste. Instead, it´s the user´s responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste of electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensures that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local office, your house-hold waste disposal or where you purchased your product.

11.7 RoHS, 2002/95/EG

We confirm that the STEPCRAFT HF-laser complies with the RoHS, 2002/95/EC.

11.8 EC-DECLARATION OF CONFORMITY

EC Manufacturer's Declaration of Conformity

in terms of the directive 2006/42/EC, appendix II part 1 A

Manufacturer:	STEPCRAFT GmbH & Co. KG
Address:	An der Beile 2, 58708 Menden, Germany
Type of product:	Diode Lasr
Type designation:	DL445

Hereby we declare that the product named above is consistent with the following relevant regulations:

- IEC 60825-1:2014 Safety of laser prodcts - Part 1: Equipment classification and requirements
- EC EMC directive 2004/108/EC
- The machine observes the protection targets of the EC low voltage directive (LVD) 2006/95/EC.

Representative for the compilation of the technical documentation is the signatory of this declaration.

This declaration becomes void if not authorized modifications are made to the product.

Menden, June 9th, 2017

STEPCRAFT GmbH & Co. KG,
An der Beile 2, 58708 Menden

Markus Wedel
Managing Director

Peter Urban
Technical Director