

Operating Manual

CNC System STEPCRAFT M-Series



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Translation of the original
operating manual

Date of: 06-22-2020

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 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 to avoid serious personal injury.



Read the ENTIRE instruction manual 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.

SAVE ALL WARNINGS AND INSTRUCTIONS FOR FUTURE REFERENCE.

CONTENT

1. General Instructions	6
2. Safety Instructions and Protective Measures	6
2.1 General Safety Warnings for the Use of Power Tools.....	6
2.1.1 Additional Safety Instructions	8
2.2 Protective Measures.....	8
2.3 Personal Protective Equipment	8
2.4 Emergency Stop Switch	9
2.5 Residual Risk	9
2.6 Safety Symbols	9
3. Designation and Dimensions of the Machines	10
4. Description	10
4.1 Machine	10
4.2 Workplace	10
4.3 Intended Use of the Machine.....	11
5. Drawings	12
5.1 Machine	12
5.2 Control	12
5.2.1 Installation Motor Driver Board 4 th axis (optional)	13
5.2.2 Installation and Operation of the internal D-Series WinPC-NC module (optional item no. 12088 required).....	13
6. Assembly, Setup and Installation of the System	15
6.1 Environmental Conditions	15
6.2 Positioning the Machine	15
6.3 Layout Recommendation	16
6.4 Electrical Connection of the Machine	17
6.5 Tools and Accessories	17
7. Operation	19
7.1 Commissioning and safe Operation.....	19
7.1.1 Mechanical Axes Limitation	20
7.1.2 Emergency Stop.....	20
7.1.3 Semi Closed Loop System™ (optional)	20
7.1.4 Blockages due to Accidents or Malfunctions	20

7.2	Machine Table.....	20
7.2.1	MDF Machine Table with Aluminum T-slots	20
7.2.2	Aluminum T-Slot Table (optional)	21
7.2.3	90° T-Slot Table (optional)	21
7.2.4	Arbitrary Combination of the different machine table solutions	21
7.2.5	Freestyle Milling™	21
7.3	Clamping the Workpiece	21
7.4	System-guided Tools.....	22
7.5	Operation of the CNC System	22
8.	Technical Data	22
8.1	Dimensions and Weight	22
8.2	Other Specifications	23
8.3	Pin Assignment Mainboard / Optional Modules	23
8.3.1	Connector Parallel Port	23
8.3.2	Connector External Signals / Sub-D 15	24
8.3.3	Connector 4th Axis / Sub-D 9	24
9.	Transportation and Storage	24
9.1	Transport.....	24
9.2	Packaging	25
9.3	Storage	25
10.	Maintenance.....	25
10.1	General	25
10.1.1	Information on Lubrication of igus® dryspin Threaded Lead Screws	25
10.1.2	Information on Lubrication of optional HIWIN® Ball Screws	25
10.1.3	Bosch Rexroth Ball Bearing Guide	26
10.2	Recommended Maintenance Works.....	26
10.2.1	X-Axis	26
10.2.2	Y-Axis	26
10.2.3	Z-Axis.....	26
10.2.4	Control Housing	26
11.	Spare Parts	27
12.	Acoustical noise emissions of the machine	27
13.	Contact.....	27

14. EC-Declaration of Conformity according to EC machinery directive 2006/42/EC,
appendix II A28

1. General Instructions

These operating instructions explain the STEPCRAFT M-Series and inform you about the correct handling of the CNC system.

Please read these operating instructions as well as all accompanying documents in their entirety before commissioning of the system in order to become familiar with the characteristics and the operation of the product. The improper operation of the CNC gantry milling system can lead to damage to the product and property and can cause serious injuries, electric shock and / or fire.

It is imperative to adhere to the safety instructions listed in these operating instructions at all times.

Should any doubts or the need for further information arise, do not hesitate to contact us prior to the commissioning of the CNC system.

2. Safety Instructions and Protective Measures

2.1 General Safety Warnings for the Use of Power Tools

Work Area Safety

NOTICE	Keep work area clean and well lit. Cluttered or dark areas invite accidents.
CAUTION	Do not operate the power tool in explosive atmospheres, such as in the presence of flammable liquids, gases or dust. Power tools create sparks which may ignite the dust or fumes.
NOTICE	Keep children and bystanders at a distance while operating a power tool. Distractions can cause you to lose control and can result in accidents.
CAUTION	Operate the power tool only in interior spaces on a solid, horizontal table or workbench.

Electrical Safety

WARNING	Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with grounded power tools. Unmodified plugs and matching outlets will reduce the risk of electric defects and malfunctions.
WARNING	Do not expose power tools to moisture. The power tool is only suitable for indoor use. Water entering a laser tool will increase the risk of electric shocks.

Personal Safety

CAUTION	Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired and/or under the influence of drugs, alcohol or medication. A moment of inattention while operating a power tool may result in serious personal injury.
NOTICE	All persons who operate the power tool must have read and fully understood all relevant safety and operating instructions. Misunderstanding may result in personal injury.
CAUTION	Use personal protective equipment. Always wear eye protection. Protective equipment, such as a suitable dust mask or ear protection, reduces the risk of injuries.
NOTICE	Dress properly. Do not wear loose clothing or jewelry. Pin your hair above your shoulders so that it cannot get caught in the linear guides or moving parts.
CAUTION	This tool is controlled by a computer. During operation, it cannot be controlled directly. Lack of caution or expertise as well as program errors can lead to unexpected movements.
CAUTION	Do not touch the insertion tools or motors as they can heat up significantly during operation.
CAUTION	Never place any parts of the tool or accessories in the mouth as this can lead to serious injuries.

Use of the Power Tool

⚠ CAUTION	Do not alter or misuse the tool. Any alteration or modification is a misuse and may result in serious personal injury.
⚠ CAUTION	Disconnect the plug from the power source before you make any adjustments, change accessories, or store the tool. Such preventive safety measures reduce the risk of starting the power tool accidentally.
⚠ CAUTION	Store idle power tools out of the reach of children and do not allow persons unfamiliar with the laser tool or these instructions to operate the power tool. Power tools are dangerous in the hands of untrained users.
NOTICE	Use the power tools, accessories etc. in accordance with these instructions, taking into account the working conditions and the work to be performed. Use of the power tool for operations different from those intended could result in a hazardous situation with high probability of superficial injury.
NOTICE	Do not reach in the area of the rotating insertion tools. The proximity of the rotating tools to your hand may not always be obvious.
NOTICE	Never use dull or damaged insertion tools. Sharp bits must be handled with care. Damaged bits can snap during use. Dull bits require more force to cut the tool, possibly causing the bit to break.
NOTICE	The speed and feed of the bit when carving, routing or cutting is very important. Always observe the speed and feed for the particular bit recommended.
⚠ CAUTION	If the workpiece or bit becomes jammed or bogged down, turn the power tool "OFF" by the switch. Wait for all moving parts to stop and unplug the tool, then free the jammed material. If the switch to the tool is left "ON", the tool could restart unexpectedly causing serious personal injury.
NOTICE	Do not leave a running tool unattended, turn power off. Only when tool comes to a complete stop and is disconnected from the mains it is safe.
⚠ CAUTION	Do not touch the bit or collet after use. After usage bit and collet are too hot to be touched with bare hands.
NOTICE	Clean the tool's air vents every four hours by using compressed air. Excessive accumulation of powdered metal inside the motor housing may cause electrical failures.
NOTICE	Do not allow familiarity gained from frequent use of your rotary tool to become commonplace. Always remember that a careless fraction of a second is sufficient to inflict severe injury.
⚠ CAUTION	When using the end mills, V-bits or cutters, always have the workpiece securely clamped. Never attempt to hold the workpiece with your hands while using any accessories. These tools can jam easily in the material, and can kickback, causing loss of control resulting in serious injury.

Care of the Power Tools

NOTICE	Maintain the tools. Check for misalignment or binding of moving parts, breakage of parts and any other conditions that may affect the power tool's operation. If damaged, have the power tool repaired before use. Many accidents are caused by poorly maintained power tools.
NOTICE	Have your power tool serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the laser tool is maintained.

2.1.1 Additional Safety Instructions

⚠ CAUTION	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.
⚠ WARNING	<p>Some dust created by cutting, milling or other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are: Lead from nonferrous metals with lead content, carbonate from carbon fiber, arsenic and chromium from chemically treated lumber.</p> <p>Your risk from exposures to these varies, depending on how often you perform this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.</p>

2.2 Protective Measures

The M-Series has been constructed for advanced users and is only to be operated by technically skilled persons above the age of 16.

The CNC gantry milling system as well as associated tools, small parts and electrical components are to be stored outside the reach of children. The operator is solely responsible for understanding and reading the machine user guide and all relevant operating instructions in their entirety as well as for the storage of these documents in immediate vicinity of the machine.

The manufacturer's instructions concerning the CNC machine and the tools, such as the milling spindle, are to be adhered to.

The CNC gantry milling system is only to be used in a technically perfect condition which is to be ensured prior to each operation.

The emergency switch as well as, if applicable, additional safety devices, always need to be easily accessible and fully functional.

The use of liquids with the machine, such as the application of a coolant pump, is prohibited as it can damage the electronics.

The use of lubrication systems is allowed. Please take into consideration that in this case the MDF machine table is not used as its MDF panels can swell and, thus, be destroyed.

2.3 Personal Protective Equipment

When working with the CNC gantry system, the operator has to wear at least the following personal protective equipment and has to be compliant with the below-mentioned safety aspects:

- Safety goggles for protecting the eyes against flying chips etc.
- Ear protection for protecting the ears against sound and noise.
- No wearing of clothes which can get caught in the machine, such as ties, scarfs, wide sleeves etc. Additionally, jewelry and especially long necklaces and rings are to be dispensed with.
- Shoulder-length or longer hair is to be secured with a hairnet or a hat to prevent it from getting caught in the linear guides and / or rotating tools.

Prior to all adjustments to the machine, its control or system-guided tools, such as the milling motor, the Drag Knife or the Hot Wire Cutter, the plug is to be disconnected from the power source.

Never hold the workpiece to be processed with your hands. It is mandatory that the workpiece is securely fixed on the machine table. Otherwise there exists a high risk of injuries!

2.4 Emergency Stop Switch

The emergency stop is located in a separate housing with a magnetic disk and is firmly connected with the machine. In order to be able to intervene at all times, the emergency stop has to be positioned at a suitable place.

By pressing the emergency stop switch, the emergency stop is triggered. The control is interrupted. Additionally, the control software receives the signal to stop the operating process. The machine stops immediately.

ATTENTION! The emergency stop switch can only effect the stop of all components if these components are electronically connected with the emergency stop switch.

If you want to use a system-guided tool, such as a milling and drilling motor, that features a separate ON / OFF switch and that is NOT controlled via the PC, you have to make sure that it is expertly connected with the emergency stop switch, for example by use of the Switch Unit SE2300 for electric consumers (Item no. 10052). If you do not comply with these requirements, the system-guided tool will continue to run although you have activated the emergency stop switch leading to a high risk of personal injury and damage to property!

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

2.5 Residual Risk

Despite all safety precautions against the contact with rotating or hot tools and the protection from crushes, a residual risk remains due to a careless handling and automatic movements of the CNC system.

2.6 Safety Symbols

Symbol	Name	Explanation
	Symbol: Read manual	Alerts user to read manual BEFORE first commissioning
	Symbol: Wear ear protection	Alerts user to wear a hearing protector
	Symbol: Wear safety glasses	Alerts user to wear protective glasses
	Grounding symbol	Alerts user to ground the laser tool / electrical system
	General warning symbol	Alerts user to warning messages

3. Designation and Dimensions of the Machines

The STEPCRAFT M-Series is a CNC gantry milling system and available in the sizes M.500, M.700 und M.1000.

Machine Type	Dimensions	Working Space	Weight
STEPCRAFT M.500	L 726 x W 583 x H 646* mm	543 x 348 x 194 mm	28 kg
STEPCRAFT M.700	L 926 x W 713 x H 646* mm	743 x 479 x 194 mm	35 kg
STEPCRAFT M.1000	L 1226 x W 913 x H 646* mm	1044 x 679 x 194 mm	42 kg

* Machine height with extended Z-axis.

4. Description

4.1 Machine

The STEPCRAFT M-Series is a multifunctional CNC gantry milling system for the permanent and regular processing of wood, plastics and non-ferrous metals. The construction is based on aluminum extrusions specifically designed by STEPCRAFT which have a variety of functions such as guidance and dust protection. Due to their special design the aluminum extrusions ensure a high stability and tensional stiffness.

The machine has three axes which are offset by 90°. This way, it is possible to travel to any point within the working space. Each axis is equipped with up to two stepper motors and reference switches. The stepper motors drive the movable axes elements via the threaded spindle. The position of the axis is determined during the reference run, at the beginning of the job, with the aid of the reference switch.

The machine table consists out of white coated MDF panels with aluminum T-slots for the variable fixture of workpieces and accessories.

The STEPCRAFT CNC gantry milling system consists out of the following, sometimes optional, components:

- CNC gantry milling system M.500, M.700 or M.1000;
- electronic control unit in a separate sheet housing attached to the rear side of the CNC system with internal parallel module and connected USB or network module;
- system-guided tools such as a milling motor;
- PC incl. control software with clock/direction output signals such as WinPC-NC or UCCNC.

4.2 Workplace

The workplace needs to provide enough space around the CNC gantry milling system for the machine to work comfortably and to be able to fully use its traveling paths. Additionally, a safe distance to possibly nearby positioned machines is to be maintained.

The location of the machine as well as the workplace surrounding the machine has to be sufficiently illuminated.

The PC controlling the machine is to be placed in the vicinity of the machine in order to have both in clear view.

4.3 Intended Use of the Machine

The STEPCRAFT M-Series is constructed for a permanent and regular application in the industrial sector. Due to the torsional stiffness, a variety of different materials, such as wood and non-ferrous metals, can be processed.

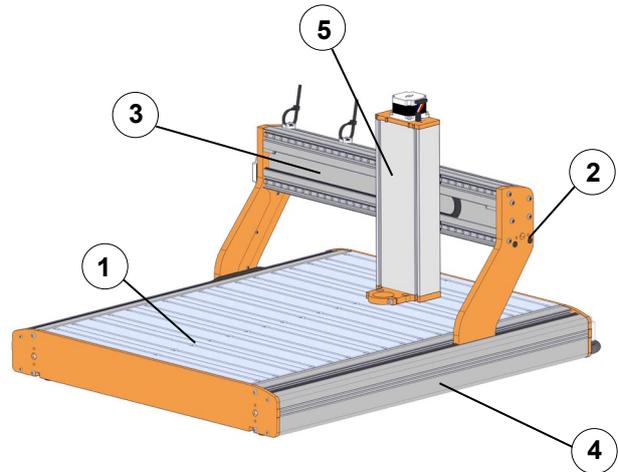
The following manufacturing processes and application are possible:

- machining manufacturing processes such as drilling, plotting / vinyl cutting, engraving and scratching;
- additive processes, such as 3D printing;
- all processes requiring 3D positioning such as measuring or dosing.

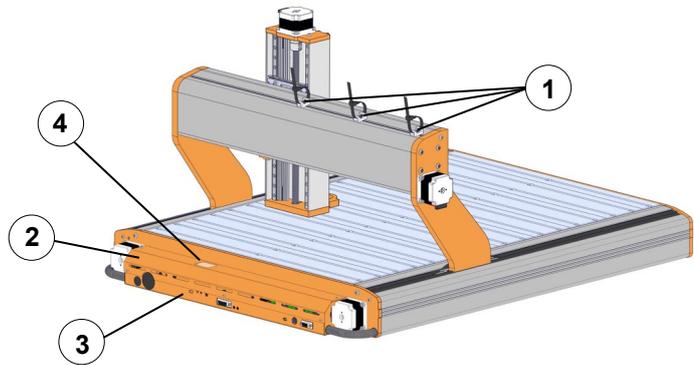
5. Drawings

5.1 Machine

- 1) Machine Table
- 2) Gantry
- 3) X-axis
- 4) Y-axis
- 5) Z-axis

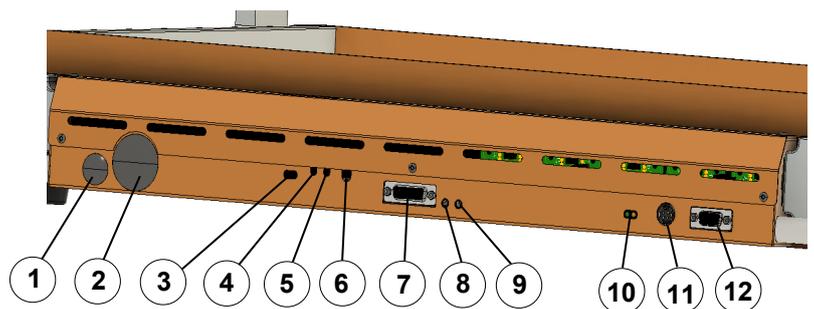


- 1) Flexi Guides™
- 2) Control electronics
- 3) Connection side
- 4) Vision panel status display UCCNC and D-Series WinPC-NC module



5.2 Control

- 1) Passage air hose for ATC (optional)
- 2) Passage vacuum hose
- 3) Status display WinPC-NC module
- 4) Grounding cable
- 5) USB cable
- 6) Connection emergency switch
- 7) Connection external signals (see chapter 8.3.2)
- 8) Jack socket 1 (for example for connection tool length sensor or 3D touch probe)
- 9) Jack socket 2 (see 8)
- 10) Status displays control (see chapter 6.4)
- 11) Power supply connection
- 12) Connection 4th axis (only usable together with the optional motor driver board 4th axis)



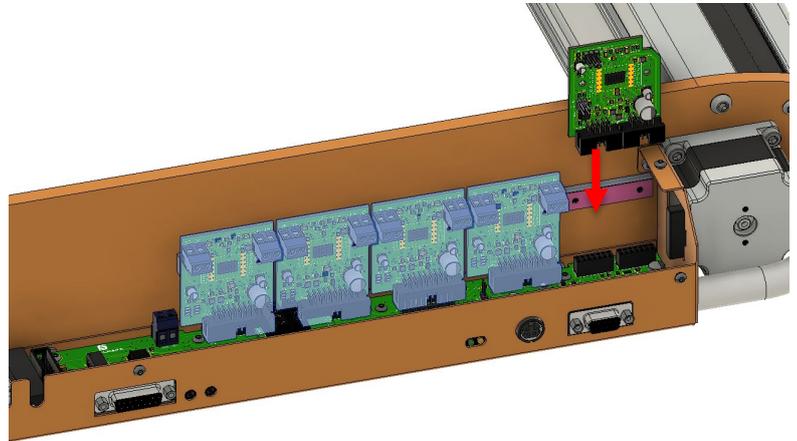
5.2.1 Installation Motor Driver Board 4th axis (optional)

Remove the control cover (part no. 10) and put it aside.

Insert the driver board into the designated slot.

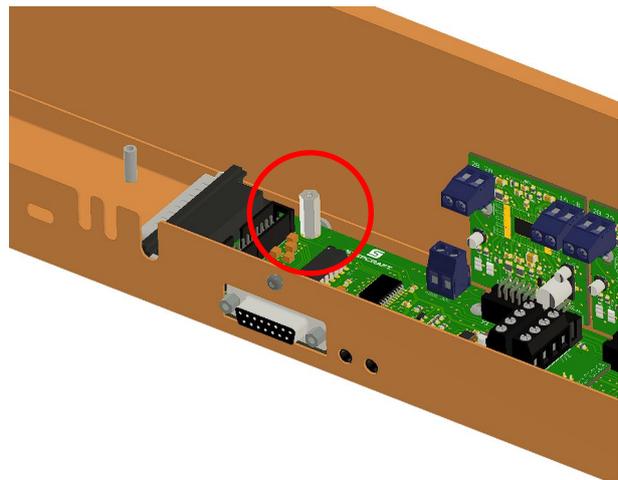
Afterwards, reinstall the control cover.

The 4th axis can now be operated on the respective slot. Please take into consideration that you may adjust your machine profile.

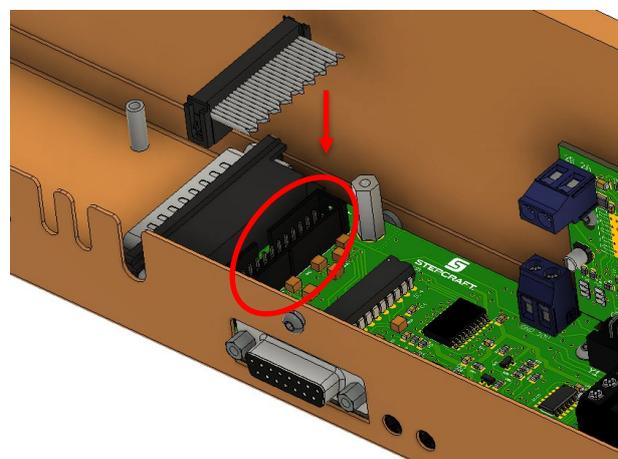


5.2.2 Installation and Operation of the internal D-Series WinPC-NC module (optional item no. 12088 required)

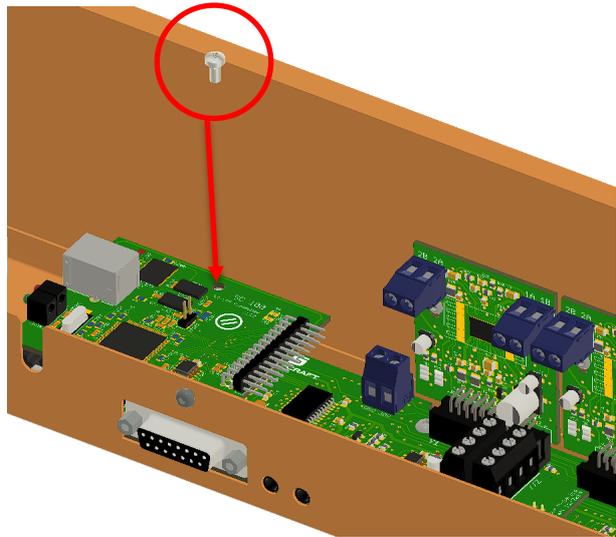
Remove the screw at the spot illustrated in the picture and replace it with the distance bolt M3 I-A x 18.



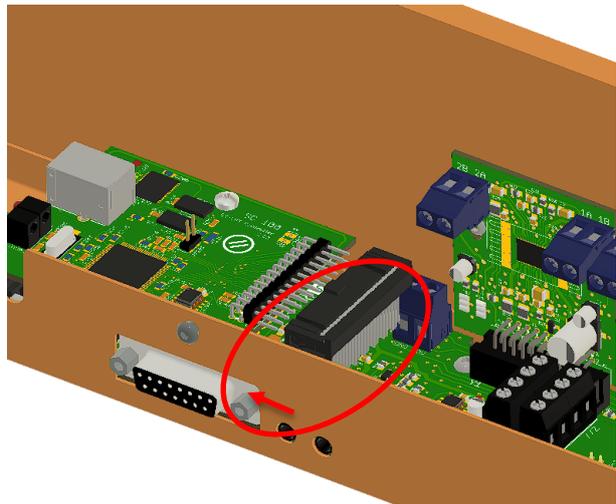
Connect the 26-pin flat ribbon cable with the socket on the mainboard.



Place the internal D-Series WinPC-NC module, as illustrated in the picture, and reinstall the screw removed in step 1.

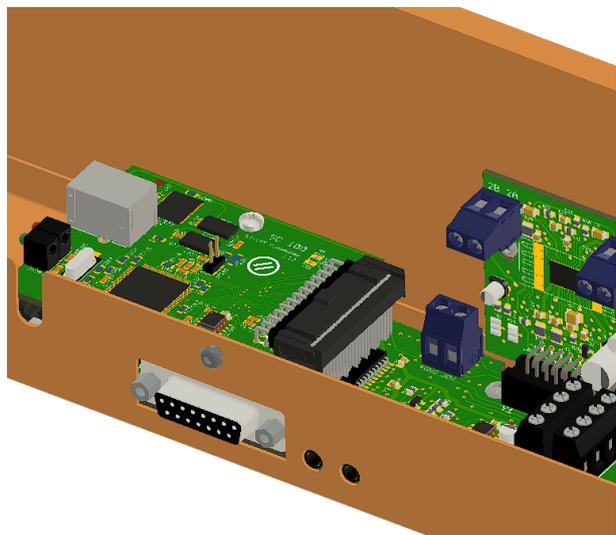


Connect the free end of the 26-pin flat ribbon cable with the connector on the WinPC-NC module.



Connect the USB cable with the module and guide it through the guide noses in the control box towards the outside.

The status displays of the internal D-Series WinPC-NC module can be seen through the vision panel in the control cover.



6. Assembly, Setup and Installation of the System

6.1 Environmental Conditions

The machine is solely suitable for the operation in dry, interior spaces.

Keep the environmental temperature of the machine dust-free. High dust exposure can cause damages to the system.

The humidity should be within normal limits for humidity indoors (40 to 60 %). Protect the machine against wetness and humidity.

The ideal environmental temperature for the system lies between 18°C to 25°C, respectively from 64°F to 77°F.

Particularly protect the electronics against overheating by avoiding direct sun radiation or indirect heating up nearby a radiator.

6.2 Positioning the Machine

Place the machine on a suitable table or on a machine stand. To provide a comfortable working height, we recommend a working height of approx. 840 mm. For a torsion-free stand, the surface of the machine stand needs to be solid and even. The machine is to be secured in a way that it cannot shift or fall down.

All movable parts of the machine must be able to operate collision-free.

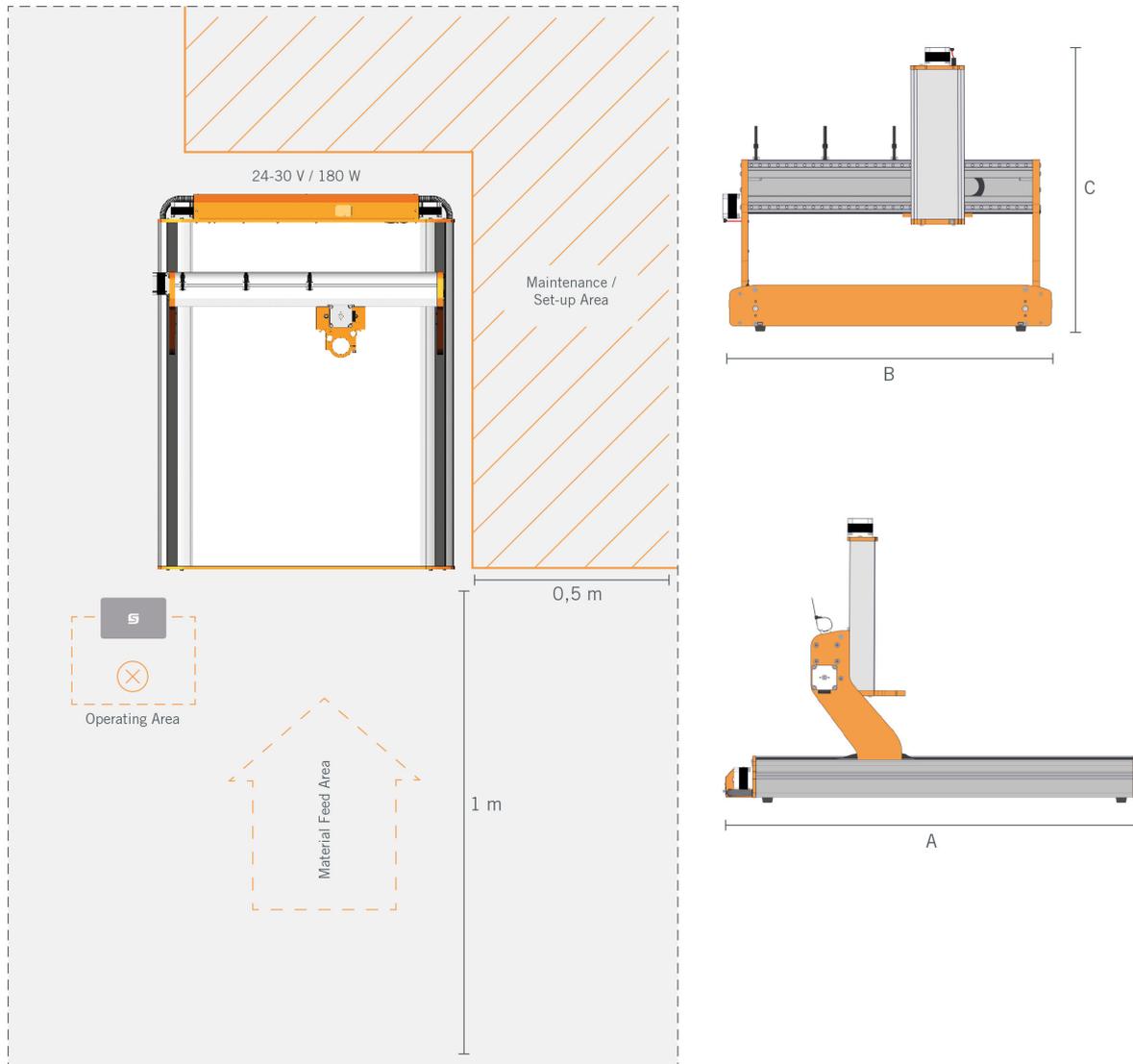
The routing of the tool's cables, such as with the milling motor, has to be effected in a way that the cable cannot be clamped between the guide ways of the machine. For this purpose, use the special Flexi Guides™ on the top of the X-axis.

The machine has to be easily accessible and operable. Especially the emergency switch has to be easily accessible at all times.

Take care to ensure a sufficient illumination of the machine's location and the workplace surrounding the machine.

The PC controlling the machine has to be placed in the vicinity of the machine to have both in clear view.

6.3 Layout Recommendation



Recommended work area:

- Material feed area: 1 m
- Maintenance / Set-up area: 0,5m
- Operating area

	Length (A)	Width (B)	Height (C)
M.500	726 mm	583 mm	646 mm
M.700	926 mm	713 mm	646 mm
M.1000	1226 mm	913 mm	646 mm

Connection on the rear side of the machine:

- Machine control 24 - 30V 180 W

Make sure that no chips can entry via the air inlets of the control attached to the rear side of the system, for example by bouncing off a wall!

6.4 Electrical Connection of the Machine

If you have purchased the machine as construction kit, the stepper motors as well as the reference switch and the emergency stop switch have to be connected according to the assembly manual.

Connect the power supply with its low-voltage plug to the power connector socket at the rear side of the machine. Due to reasons of reverse polarity protection, you have to connect the adapter plug with the machine before connecting the power supply with the power socket as the machine has no separate main switch. Make absolutely sure that the adapter plug is correctly aligned: The notch and the flattened insulation have to be inserted facing upwards.

The computer has to be connected to the CNC system via parallel port, USB or network interface. Please take the details regarding the respective connection from the control software you have bought.

The LED lights of the control board (see chapter 5.2, position 10) are visible from outside. They flash in case of:

Signal	Explanation
LED2 red	System ok / Power amplifier switched on/ emergency-stop switched off
LED6 yellow	Power on / 5V

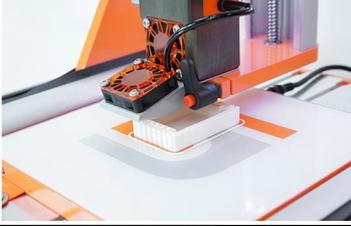
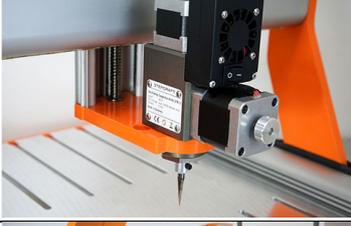
6.5 Tools and Accessories

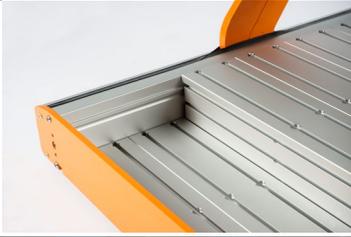
The machine features a 43 mm tool holder that can hold a variety of different tools. In addition to that, the machine is extendable with supplementary system accessories.

Follow strictly the separate operating manuals of the used tools and accessories!

Below you will find a selection of available tools and system accessories for your CNC machine. Please see our website (www.shop.stepcraft-systems.com) for our complete range of products.

Item	Item number	Picture
Milling Motor MM-800	11583	
Milling Motor MM-1000	10022	

<p>Milling Motor MM-1000 DI</p>	<p>11789</p>	
<p>Milling Spindle HF-500</p>	<p>10016</p>	
<p>Automatic Tool Changer</p>	<p>10011 for HF-500 10012 for MM-800/ MM-1000</p>	
<p>3D Print Head PH-40</p>	<p>10973</p>	
<p>Engraving Laser DL445</p>	<p>10018</p>	
<p>Oscillating Tangential Knife OTK-3</p>	<p>11024</p>	
<p>Aluminum T-slot table</p>	<p>12005 M.500 12006 M.700 12007 M.1000</p>	

Item	Item number	Picture
T-slot table 90°	11987 M.500 11988 M.700 11989 M.1000	
Clamping Set M6	10063	
Switch-Box	10101	
Switch Unit SE 2300 for external consumers	10052	
Tool Length Sensor TS-32	10103	

7. Operation

7.1 Commissioning and safe Operation

The machine and all connected components have to be wired correctly and be in perfect condition.

The operator must have completely read and understood the entire documentation of the M-Series and corresponding instructions. Furthermore, he must have been trained in operating the machine as well as its accessories and has to be familiar with the use of CNC gantry milling systems and CNC software.

The workplace needs to be compliant with the applicable regulations and provisions of the respective industry.

7.1.1 *Mechanical Axes Limitation*

All axes feature mechanical end stop according to EN 319/ ISO 13854 “Safety of machinery - Minimum gaps to avoid crushing of parts of the human body“, in order to avoid crushes.

7.1.2 *Emergency Stop*

The emergency stop is located in a separate housing with a magnetic disk and is firmly connected with the machine. In order to be able to intervene at all times, the emergency stop has to be positioned at a suitable place.

By pressing the emergency stop switch, the emergency stop is triggered. The machine stops immediately (see chapter 2.4) which can lead to step and data losses. A controlled stop of the machine can only be effected via the control software.

Only activate the emergency stop in case of emergency!

If you want to deactivate the emergency stop status, reactivate the control by turning the emergency stop switch to the right. The operating process has to be restarted.

7.1.3 *Semi Closed Loop System™ (optional)*

The optionally available Semi Closed Loop System™ upgrades your CNC system with an electronical monitoring of all stepper motors regarding possible step losses. If the Semi Closed Loop-System™ detects a deviation from the preplanned steps of the respective stepper motor, as in case of a collision or false settings, the emergency stop is automatically triggered and, thus, your workpiece protected from potential damage. You now have to identify and eliminate the cause of the step losses, for example a collision, too high a feed or a mechanical defect of the machine.

Press the emergency stop again to deactivate the emergency stop status.

After homing, the interrupted operation can be continued.

7.1.4 *Blockages due to Accidents or Malfunctions*

In case of an emergency stop all axis turn currentless and can only be moved manually with increased effort.

7.2 *Machine Table*

The machine table of the STEPCRAFT M-Series can be individually adjusted according to your needs and projects. For this purpose, the following machine table solutions are available.

7.2.1 *MDF Machine Table with Aluminum T-slots*

The MDF machine table with aluminum T-slots consists of individual MDF panels of 19 mm strength and aluminum T-slot profiles M6. The T-slots have a distance of 100 mm to each other and run in X direction.

The MDF machine table with aluminum T-slots can be inserted in the upper as well as in the lower guide slot of the Y-axis and, thus, allows a change of the passage height from 135 mm to 195 mm.

7.2.2 Aluminum T-Slot Table (optional)

The aluminum T-slot table consists of individual aluminum panels of 19 mm strength with integrated T-slots M6 in a distance of 50 mm. The individual T-slots run in X direction.

The aluminum T-slot table can be inserted in the upper as well as in the lower guide slot of the Y-axis and, thus, allows a change of the passage height from 135 mm to 195 mm.

7.2.3 90° T-Slot Table (optional)

The optional 90° T-Slot Table can be easily installed instead of one of the table elements of 100 mm width and makes working with your CNC system even more flexible.

Thanks to the integrated T-slots in the horizontal as well as in the perpendicular, the 90° T-slot table is perfectly suited for the vertical clamping of workpieces.

7.2.4 Arbitrary Combination of the different machine table solutions

The separately available machine table elements can be individually combined. Please see the „Configuration Help Machine Table STEPCRAFT M-Series“ for a comprehensive explanation.

7.2.5 Freestyle Milling™

A unique feature of the STEPCRAFT M-Series is Freestyle Milling™. With Freestyle Milling™, the machine table is removed completely so that the workpiece material under the machine can be processed. The maximum available milling depth is 25 mm.

Note: For the safe positioning of the machine when using Freestyle Milling™, we strongly recommend the use of the optional vacuum panels (item no. 12032, 12033, 12034).

7.3 Clamping the Workpiece

The workpiece can be secured directly on the machine table using clamping devices such as the clamping set.

If you want to mill through the material and produce cutouts, we recommend the use of suitable material as spoil board. It is placed under the workpiece and protects the machine table from potential damage.

The workpiece should be sufficiently clamped to prevent it from unintentional shifting during processing.

Never hold the workpiece with your hands during the operating process. There is a high risk of serious injury!

The maximum workpiece size results of the maximum clamping length and clamping width:

Machine type	Clamping length	Clamping width
M.500	650 mm	513 mm
M.700	850 mm	643 mm
M.1000	1150 mm	843 mm

7.4 System-guided Tools

System-guided tools can be clamped in the 43 mm Euro tool holder on the Z-axis.

The different tools can

- feature sharp, rotating insertion tools;
- have sharp, oscillating blades;
- emit class 4 laser beams;
- have sensitive probe tips;
- feature rotating housing parts.

Depending on the respective system-guided tool, you require (among others) 230 V, 24 V, additional signal or compressed air.

Please strictly observe the operating manual of the respective tools!

7.5 Operation of the CNC System

The entire CNC system is controlled and operated via computer.

The operator must have completely read and understood the entire documentation of the CNC control software before commissioning the CNC system.

For further questions regarding the applied control software, please contact the respective software manufacturer.

8. Technical Data

8.1 Dimensions and Weight

Machine type	Dimensions	Workspace	Weight
M.500	L 726 x W 583 x H 646*mm	543 x 348 x 135 / 205 mm	28 kg
M.700	L 926 x W 713 x H 646*mm	743 x 479 x 135 / 205 mm	35 kg
M.1000	L 1226 x W 913 x H 646*mm	1044 x 679 x 135 / 205 mm	42 kg

* Machine height with extended Z-axis.

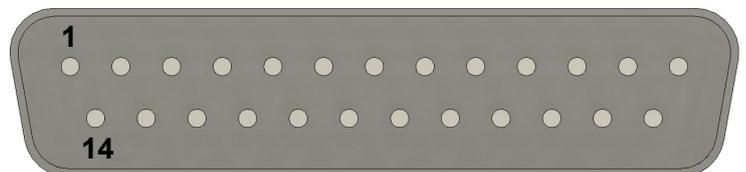
8.2 Other Specifications

	M.500	M.700	M.1000
Passage height	135 / 205 mm		
Repeatability	+/-0,025 mm (with opt. HIWIN® ball screws: +/-0,015 mm)		
Programmable resolution	0,00625 mm		
Backlash	< 0,05 mm (with opt. HIWIN® ball screws: < 0,03 mm)		
Max. feed diagonal travel X-Y	120 mm/s		
Max. feed individual axis	Up to 85 mm/s X-/ Y-axis, up to 50 mm/s Z-axis		
Spindle (lead screw)	igus® dryspin 12 x 5 mm (opt. HIWIN® ball screws 12 x 5 mm)		
Linear guide	Bosch Rexroth ball bearing guide		
Drive	Stepper motors: Sanyo-Denki NEMA 23		
Tool holder	Ø 43 mm (Euro neck, optional smaller diameters)		
Weight	28,0 kg	35,0 kg	42,0 kg
Input voltage	100 – 240 V		
Output voltage	24 – 30 V		
Power consumption	180 W		
Interface	USB / Parallel (LTP1) / Network RJ-45		

8.3 Pin Assignment Mainboard / Optional Modules

8.3.1 Connector Parallel Port

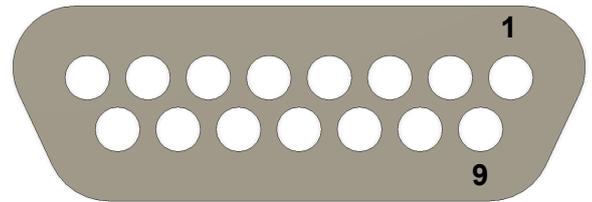
Signal	Pin
Relay 1	1
DirX	2
Step X	3
DirY	4
Step Y	5
DirZ	6
Step Z	7
Dir 4 th axis	8
Step 4 th axis	9
Tool length sensor	10
Error	11
Reference switch X/Y/Z	12
Reference switch 4 th axis	13
Relay 2	14
n.a. (in)	15
Relay 3	16
n.a. (out)	17
GND	18-25
PE	sched
5V VCC	



8.3.2 Connector External Signals / Sub-D 15

Connecting external devices with the mainboard.

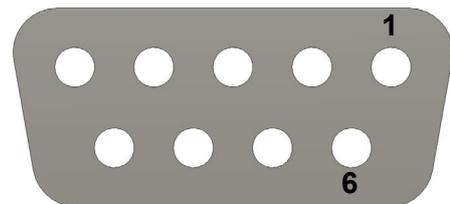
Signal	Pin	Input / Output
19V / 30V VCC	1	Output
GND	2	Output
+5V / VCC Logic	3	Output
Dir 4th axis	4	Output
Step 4th axis	5	Output
Relay 2	6	Output
PWM	7	Output
Tool length sensor	8	Input
19V / 30V VCC	9	Output
GND	10	Output
Disable	11	Input
End switch 4th axis	12	Input
Relay 1	13	Output
Relay 2	14	Output
Enclosure	15	Input
PE	shed	



8.3.3 Connector 4th Axis / Sub-D 9

Connecting motor and end switch of the 4th axis (optionally available).

Signal	Pin
Winding 1A	1
Winding 1B	2
n.a.	3
n.a.	4
End switch 4th axis	5
Winding 2A	6
Winding 2B	7
n.a.	8
GND	9
PE	shed



9. Transportation and Storage

9.1 Transport

If you want to transport the machine, please pay special attention to its dimensions. You might need additional people for transportation. Never load heavy loads above people!

Avoid a unilateral load of the machine frame!

To prevent torsion, the machine should only be transported (for example in case of Freestyle Milling™ on a construction site) with machine table installed.

9.2 Packaging

If you do not want to reuse the packaging material of the machine and its components, please separate it according to the disposal conditions on site and take it to a collection center for recycling or dispose of it.

9.3 Storage

If the machine or its components is not used for a longer period, please observe the following points regarding storage:

- Only store the machine and the components in closed rooms.
- Protect the machine and the components against humidity, wetness, cold, heat and direct sun radiation.
- Store the machine and its components dust-free and cover it if necessary.
- The storage place must not be subjected to vibrations.

10. Maintenance

10.1 General

Prior to commissioning the CNC gantry milling system it has to be ensured that the machine is in a technically perfect and well-maintained condition. Always ensure that the machine is set currentless if you want to perform adjustment or maintenance works. For this purpose, disconnect the power plug. Please make sure to set system-guided tools with own power supply currentless as well!

Sharp-edged cutting tools are to be dismantled. Clamped milling tools equal a high risk of injury.

Remove workpieces you have clamped onto the machine table including the individual clamping elements.

Only tools of high quality are to be used.

10.1.1 *Information on Lubrication of igus® dryspin Threaded Lead Screws*

Basically, igus® dryspin threaded lead screws do not require maintenance or lubrication. Nevertheless, we recommend the regular lubrication with a low-viscosity oil (for example sewing machine oil) for smooth running optimization and noise reduction.

We recommend the use of the STEPCRAFT Cleansing Oil (item no. 12051).

10.1.2 *Information on Lubrication of optional HIWIN® Ball Screws*

The ball screws have to be sufficiently lubricated to maintain their functionality. The required lubrication interval is determined by the environmental conditions. Generally, lubrication is required every 100 to 200 operating hours. A guideline for the lubrication interval is approx. 1 cm³ lubrication per ball screw nut.

With short stroke applications with one stroke below the double nut length, a sufficient lubricant supply of the nut is not ensured. In this case, the lubrication is to be applied to several spots on the nut.

We recommend the use of the STEPCRAFT Machine Lubricant (item no. 10050).

10.1.3 *Bosch Rexroth Ball Bearing Guide*

Bosch Rexroth ball bearing guides, like the igus® dryspin threaded lead screws, basically do not require maintenance or lubrication. Nevertheless, we recommend the regular lubrication with a low-viscosity oil (for example sewing machine oil) for smooth running optimization and noise reduction.

We recommend the use of the STEPCRAFT Cleansing Oil (item no. 12051).

10.2 Recommended Maintenance Works

The STEPCRAFT M-Series is to the greatest extent maintenance-free. Handle your CNC system with care to ensure a long service life. Regular maintenance has a substantial impact on the service life of your machine. Frequently clean the CNC system with a damp cloth.

10.2.1 *X-Axis*

igus® dryspin threaded lead screws (or optional HIWIN® ball screws) and Bosch Rexroth ball bearing guides are to be regularly checked, cleansed of dirt and lubricated if necessary. To better reach the lead screws, remove the two filler plugs at the gantry and guide the protection brushes through the opening to the outside.

10.2.2 *Y-Axis*

Move the gantry to the front. Remove the screws of the side covers and unscrew the four big screws at the front of the machine. Remove the aluminum covers. Take extra care to leave the cable routing undamaged! You can now clean and lubricate the guides and lead screws.

10.2.3 *Z-Axis*

Please maintain the Z-axis in the same way as the X-axis, with the difference that the maintenance interval is generally shorter due to the open position of the guides. To do this, move the Z-axis all the way up to maintain the upper part and all the way down to maintain the lower part.

10.2.4 *Control Housing*

Open the control cover and clean the electronics area underneath from dust and impurities.

11. Spare Parts

All parts of the machine and control can be purchased individually as spare parts.

Please contact us directly about this. You can find our contact details on the cover sheet or in chapter 13 of these instructions.

When ordering spare parts, please have the information on the model series, size and part or article number available in accordance with the building instructions.

12. Acoustical noise emissions of the machine

Measurement point	Empty run	Aluminum milling
1 m left	69 dB	95 dB
1 m right	69 dB	95 dB
front	69 dB	105 dB

13. Contact

Country of Purchase	STPCRAFT	Address	Phone No. / E-Mail	Management
Germany and rest of the world	STPCRAFT GmbH & Co. KG	An der Beile 2 58708 Menden Deutschland	+49 2373 179 11 60 info@stepcraft-systems.com	Markus Wedel, Peter Urban
USA and Canada	STPCRAFT Inc.	59 Field Street, Rear Building, Torrington, CT, 06790	+1 203 556 1856 info@stepcraft.us	Erick Royer

14. EC-Declaration of Conformity according to EC machinery directive 2006/42/EC, appendix II A



EC Manufacturer's Declaration of Conformity

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

Manufacturer: STEPCRAFT GmbH & Co. KG
Address: An der Beile 2, 58708 Menden, Germany
Type of product: CNC System M-Series
Type designation: STEPCRAFT M.500, M.700, M.1000

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

- **EU machine directive 2006/42/EC**
- **EC EMC directive 2014/30/EU**

Applied harmonized standards, whose references have been published in the Official Journal of the European Communities:

62841-1:2015 12000 EN 60204-1:2018
Safety of transportable motor-operated electric tools
Part 1: General requirements

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 device.

Menden, 18th of June 2020

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

Markus Wedel
Kaufmännischer Geschäftsführer

Peter Urban
Technischer Geschäftsführer