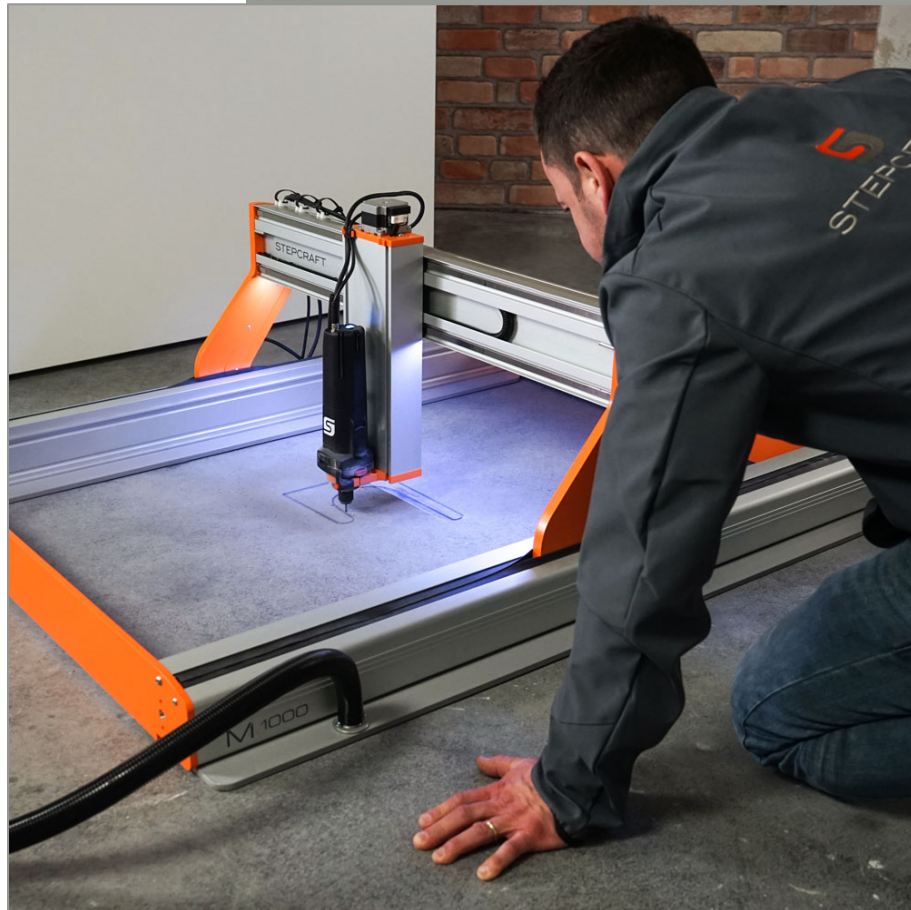


Operating Manual Freestyle Milling™

CNC System STEPCRAFT M-Series



Call for consumer information

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Translation of the original operating
manual Freestyle Milling™

Date of: 08-25-2020

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.

WARNING

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.

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1. Introduction

This operating manual explain the STEPCRAFT M-Series and inform you about the correct handling of the CNC system in the operating mode *Freestyle Milling*[™].

The *Operating Manual Freestyle Milling*[™] are an addition to the operating instructions of the M-Series. Both instructions have to be read and understood in their entirety before using the CNC system for *Freestyle Milling*[™]. All safety instructions and protective measures listed in the STEPCRAFT M-Series operating manual still apply. The improper handling and operation of the CNC system can lead to damage to the product and property and can cause serious injuries, electric shock and / or fire.

This operating manual extends the safety instructions and protective measures from the STEPCRAFT M-Series by the safety instructions and notes for the operating mode *Freestyle Milling*[™].

Always adhere to the safety instructions and protective measures listed in the operating manual of the STEPCRAFT M-Series and in the operating manual for Freestyle Milling[™].

Should you have any doubts or are in need for further information, 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.
HINWEIS	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, considering 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.

2.2 Additional Safety Instructions for Freestyle Milling™

The improper operation of the product can lead to damage to the product and property and can cause serious injuries, electric shock and / or fire.

The following instructions apply in addition to the normal operation of the CNC system and must be adhered to when using the CNC machine in the operating mode *Freestyle Milling™*.

⚠ WARNING	People are not allowed to stay in the immediate danger zone of the machine. The minimum distance to the CNC system has to be at least 3 m measured on the ground. Only for hanging up and hanging down the machine are two people allowed to approach the machine, simultaneously on the left and on the right, in safety clothing.
⚠ WARNING	The machine operator and assistants have to wear safety clothing. This includes safety shoes, safety goggles, gloves, helmet, and ear protection.
⚠ WARNING	Non-machine operators have to stay outside of the safety distance of 3 m and must wear ear protection, and, if necessary, safety goggles.
⚠ WARNING	People that have not yet reached the age of 14 are not allowed into the audience area.
⚠ WARNING	The machine is not to be left unattended during operation (start of the vacuum cleaner, milling spindle). The emergency stop of the machine has to be easily accessible at all times

⚠ WARNING	The machine together with the installed safety kit is never to be unattended while hanging on a workpiece surface, even when the machine is not in operation. The CNC system must be immediately hung down and safely placed on an even surface.
⚠ WARNING	The vacuum cleaner must be safeguarded against unintentional switch off. The vacuum cleaner as well as the electrical connecting cable and the plug in the wall socket must be in the machine operator's field of vision.
⚠ WARNING	The vacuum panels have to be always operated with the air regulation to control the vacuum and the cooling air.
⚠ WARNING	The vacuum cleaner has to be exclusively in operation for the vacuum panels. The parallel operation of the vacuum panels with a vacuum cleaner is not permissible.
⚠ WARNING	Never close the air regulation by more than 90%. Many vacuum cleaners are cooled by the drawn in air. The interruption of the cooling air due to a fully closed air regulation can lead to overheating and, thus, to a permanent defect of the vacuum cleaner. Additionally, there exists the danger of fire.
⚠ WARNING	Depending on the workpiece material to be processed, a high dust formation can occur. If necessary, doors and windows have to be closed.
⚠ WARNING	Under no circumstances, people or other creatures are allowed to linger or walk under the machine while it is hanging on the wall or attached to the ceiling. There exists a high risk of personal injury!
⚠ WARNING	The machine is not to be used for vertical resp. overhead application without the safety kit for the vacuum panels. There exists a high risk of personal injury and damage to property!
⚠ WARNING	The vacuum panels have to be attached to the CNC system while the machine is in the horizontal and placed on a solid surface. Falling parts can cause serious injury.

2.3 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 in form of a droplet lubrication 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. STEPCRAFT recommends the usage of the aluminum T-slot table (item no. 12005, 12006, 12007).

2.4 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!

2.5 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!

2.6 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.

2.7 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. Preparations for Freestyle Milling™

3.1 Installation of the Vacuum Panels


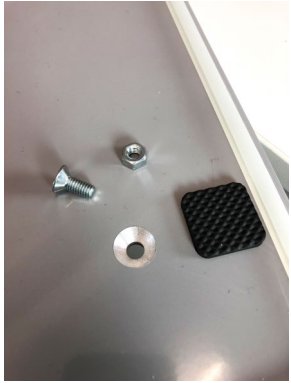

NOTICE	The functionality and completeness of the vacuum panels, the CNC machine and the safety kit have to be checked and secured prior to every usage. Pay special attention to the vacuum panel's sealings to prevent a loss of vacuum.
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In the operating mode *Freestyle Milling™*, the machine is secured on the workpiece.

During the milling process it has to be ensured that the developing milling / weight forces and vibrations do not cause the machine to deviate from its original position on the workpiece as this would result in deficient milling results.

For the fixation of the machine we strongly recommend the use of the STEPCRAFT vacuum panels (item no. 12032, 12033 and 12034).

To install the vacuum panels, please proceed as follows:

Pos.	Explanation	Image
1	Place the machine on its side and remove the machine feet (part 40) and the corresponding hexagon head screw (part 74).	
2	Prepare the installation of the vacuum panels. For this purpose, insert the countersunk head screws M6 into the designated holes and screw the nuts about two turns onto the thread.	
3	Slide the vacuum panels into the Y profile, position them in the center and tighten the countersunk head screws M6.	

3.2 Suitable Workpiece Surfaces

For the use of the vacuum panels, the workpiece surface has to feature the following technical characteristics:

- Evenness (unevenness max. +/- 1 mm at a length of 1.000 mm)
- Air impermeability
- Surface texture (max. average surface finish Ra 500 µm, for comparison: mirror surface < 0,1 µm, drilling / milling between 1 to 50 µm)


3.3 Installation of the Machine Safety Kit


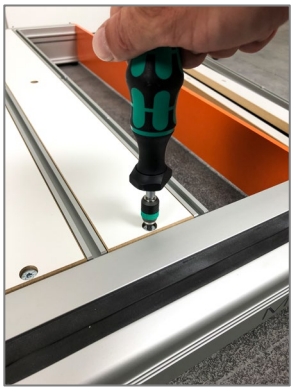

If you want to apply Freestyle Milling™ other than to an even, horizontal surface (such as floors or tabletops), the machine safety kit must be used.

The safety kit features the following parts:

- 2x ring eyelet with threaded pin M6
- 2x ring eyelet with through-hole 6,3 mm
- 2x threaded bolt BM M6 x 60 mm
- 3x nut M6
- 4x snap hook
- 2x steel rope with eyelet at the beginning / end, length 1 m

For the assembly, please proceed as follows:

Pos.	Explanation	Image
1	To secure the machine on a vertical surface, remove the screws (part 72) M6 x 40 mm (one screw on the left and one screw on the right) which connect the front panel (part 1) and the Y-axis (part 12) (see assembly stage 2.2 of the construction manual).	
2	Screw both ring eyelets with threaded pins into the holes of the front panel.	
3	For the overhead securing of the machine, additionally remove the screws (part 72) M6 x 40 mm (one screw on the left and one screw on the right), which connect the rear panel (part 2) with the Y-axis (part 12) (see assembly stage 2.1 of the construction manual). Notice: The overhead operation of the machine is theoretically possible, but STEPCRAFT strongly advises against this operating mode of Freestyle Milling™ as the danger of personal injury and damage to the property is too high!	

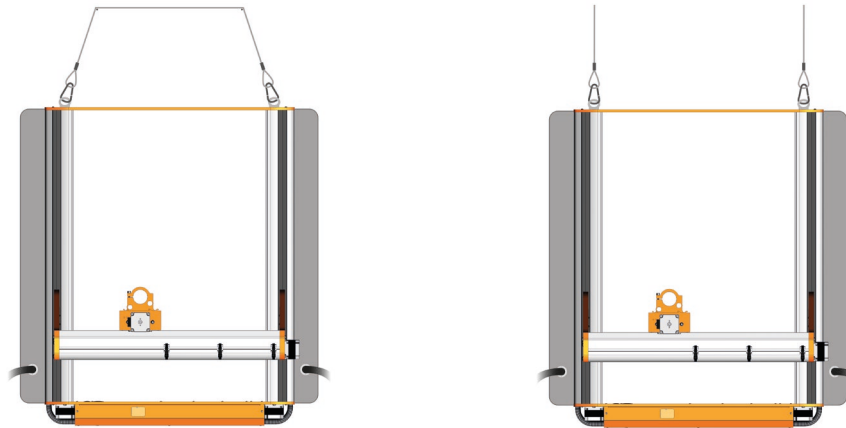
Pos.	Explanation	Image
4	Screw the threaded pins into the holes of the rear panel. For this purpose, counter-tighten two nuts to screw in the threaded pin with a spanner SW 10 until only 15 to 17 mm of the thread protrude. Remove the nuts and place the ring eyelet with through-hole over the threaded pin. Secure the ring eyelet with a nut.	
5	Remove the machine table. Only remove as many panels as are necessary in respect to the workpiece resp. its dimensions. The remaining panels, which are tightening with screws, stabilize the machine frame.	
9	For the operation of the machine on a vertical wall, secure the steel rope with two snap hooks on the holding eyelets at the front panel. Note: For overhead operation, it is mandatory to attach the second holding rope to the rear panel.	

3.4 Attaching the Machine to the Workpiece (General Information)

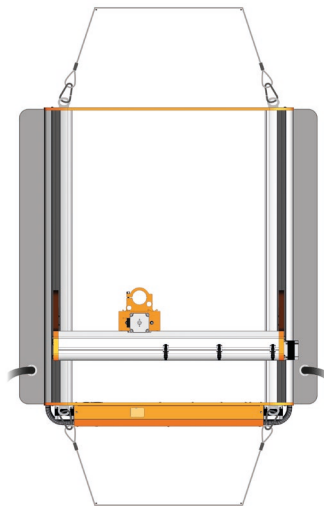
There are three applications for Freestyle Milling™ gibt es insgesamt drei Einbausituationen:

- The CNC system is placed on the workpiece surface (standard), as for example on a tabletop or on a parquet floor. The CNC system only has to be secured against shifting. By use of the vacuum panels on a suitable workpiece surface, this will effected safely and securely.

- The CNC system is secured vertically on a surface, as for example a plastered brick wall or a wall paneling out of wood. The CNC system must be secured against shifting as well as against falling down, for example due to an unexpected interruption of the power supply or a technical defect, to prevent personal injury or damage to property. The safety kit has to be installed on the front panels with one or two ropes (schematic view):



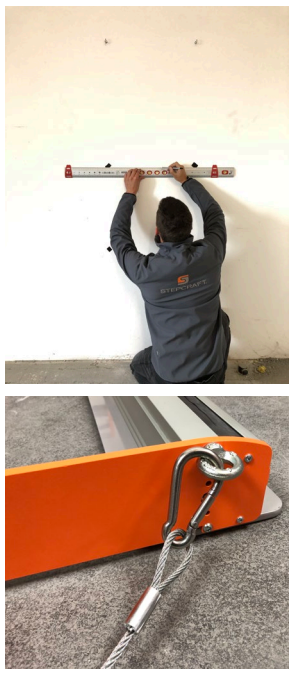


- The CNC system is secured over the head on a ceiling, as for example on a concrete ceiling or an even ceiling paneling. The CNC system must be secured against shifting as well as against falling down, for example due to an unexpected interruption of the power supply or a technical defect, to prevent personal injury or damage to property. The safety kit has to be installed on the front and on the back panel with one rope for each panel (schematic view).






Notice: The overhead operation of the machine is theoretically possible, but STEPCRAFT strongly advises against this operating mode of Freestyle Milling™ as the danger of personal injury and damage to the property is too high!

3.5 Securing the Machine on a Wall (Example)

For Freestyle Milling™ on a vertical surface, proceed as follows:

Pos.	Explanation	Image
1	<p>Mark the position and the size of the milling area on the wall (for example with masking tape). Based upon these marks, mark the drill holes for the wall hooks of the safety kit. Additionally, draw a horizontal line for horizontal alignment of the CNC system.</p> <p>Tip: To define the position of the wall hooks, attach the steel rope to the machine while it is standing on the floor. Measure the distance from the drill holes to the machine. The drill holes should at least have a distance of 2/3 of the machine width.</p>	
2	<p>Drill the safety drill holes into the walls. Take care to use screws and plugs suitable for the composition of the wall, for example special cavity fixings for drywalls. Take care to use adequately dimensioned screws.</p> <p>Notice: The ready-to-use machine weights up to 60 kg!</p>	
3	<p>Check the stability of the fastening. Use two persons to carefully hang up the machine on the safety hooks. Manually exercise pressure on the steel rope for test purposes to secure the hold of the machine.</p>	

Pos.	Explanation	Image
4	Use a square to horizontally position the machine at the previously drawn line.	
5	Once again, test the correct position of machine by means of the markings illustrating the size of the milling area. Every position inside the rectangle must be reachable with the end mill.	
6	<p>Turn on the vacuum cleaner of the vacuum pump and close the air regulation to 80%. Visually check if the vacuum panel's sealings closely and consistently fit the underground. Test the firm fixation of the machine by trying to move the machine to the left or to the right or to lift it off the wall.</p> <p>Notice: Only when the machine is securely attached to the wall / the workpiece, you can proceed with preparing the CNC system for the upcoming job (homing, clamping the milling motor and the end mill etc.).</p>	

4. Instructions on Freestyle Milling™

You can start with preparing your CNC system for the upcoming job as soon as the machine is securely attached to the workpiece.

The following instructions apply in addition to the normal operation of the CNC system and must be adhered to when using the CNC machine in the operating mode *Freestyle Milling™*.

- People are not allowed to stay in the immediate danger zone of the machine. The minimum distance to the CNC system has to be at least 3 m measured on the ground. Only for hanging up and hanging down the machine are two people allowed to approach the machine, simultaneously on the left and on the right, in safety clothing.
- The machine operator and assistants have to wear safety clothing. This includes safety shoes, safety goggles, gloves, helmet, and ear protection.
- Non-machine operators have to stay outside of the safety distance of 3 m and must wear ear protection, and, if necessary, safety goggles.

- People that have not yet reached the age of 14 are not allowed into the audience area.
- The machine is not to be left unattended during operation (start of the vacuum cleaner, milling spindle). The emergency stop of the machine has to be easily accessible at all times.
- The machine together with the installed safety kit is never to be unattended while hanging on a workpiece surface, even when the machine is not in operation. The CNC system must be immediately hung down and safely placed on an even surface.
- The vacuum cleaner must be safeguarded against unintentional switch off. The vacuum cleaner as well as the electrical connecting cable and the plug in the wall socket must be in the machine operator`s field of vision.
- The vacuum panels have to be always operated with the air regulation to control the vacuum and the cooling air.
- The vacuum cleaner has to be exclusively in operation for the vacuum panels. The parallel operation of the vacuum panels with a vacuum cleaner is not permissible.
- Never close the air regulation by more than 90%. Many vacuum cleaners are cooled by the drawn in air. The interruption of the cooling air due to a fully closed air regulation can lead to overheating and, thus, to a permanent defect of the vacuum cleaner. Additionally, there exists the danger of fire.
- Depending on the workpiece material to be processed, a high dust formation can occur. If necessary, doors and windows have to be closed.
- Under no circumstances, people or other creatures are allowed to linger or walk under the machine while it is hanging on the wall or attached to the ceiling. There exists a high risk of personal injury!
- The machine is not to be used for vertical resp. overhead application without the safety kit for the vacuum panels. There exists a high risk of personal injury and damage to property!
- The vacuum panels have to be attached to the CNC system while the machine is in the horizontal and placed on a solid surface. Falling parts can cause serious injury!

5. Additional Maintenance Works

When processing concrete, stone, plastered walls and similar materials, very fine dust develops that can interfere with the CNC system.

Please make sure to perform maintenance works more intensive and in shorter intervals.

6. Contact

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