DrufelCNC

User’s manual

DrufelCNC, 2022

Contents

Annotation

This document is the user guide for the DrufelCNC software. The information contained in this document may be modified by employees of the company with the subsequent notification. Your changes are reflected in the document version.

The company does not guarantee the absence of errors or typographical errors in this document, but will work to eliminate them, and will also be grateful to everyone who finds them and points to them.

Comments and suggestions to this document are accepted by
email: support@drufelcnc.com.
website: http://drufelcnc.com

Document version - V.1.18.

NOTICE OF LIABILITY

Using any CNC machine is a dangerous operation. All precautions must be taken, as the machines may turn on at any time, the software MAY malfunction at any time, any user of the Software must understand and take this into account, and must immediately uninstall the Software and not proceed with the installation if they are not fully understand all the consequences of the use, as well as the fact that in case of misuse, the wrong code, unexpected movement or any damage caused by the aforementioned consequences mi, there is no legal protection.

1. Installing DrufelCNC

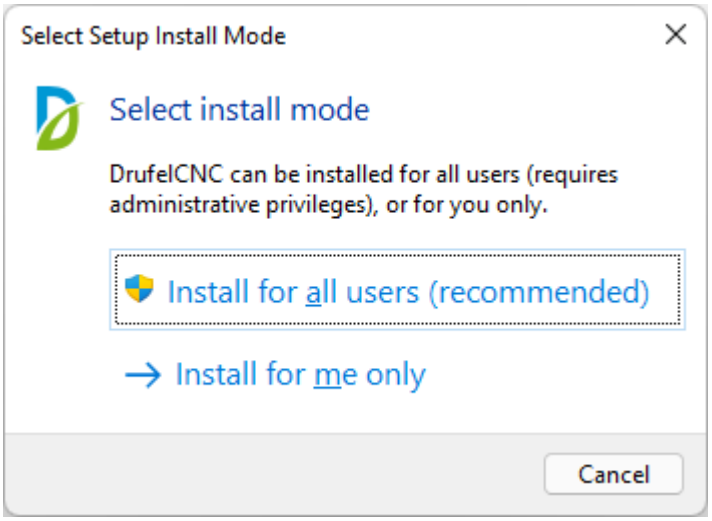
To install the program, you need to download the installation files on the official website www.drufelcnc.com. You can use one of the following files:

- **DrufelCNC_installer_x64.exe**, **DrufelCNC_installer_x32.exe** - this installation file will automatically install DrufelCNC on your computer documentation and examples of G-codes;
- **DrufelCNC.zip** - archive with DrufelCNC x32 and x64 with examples and documentation.

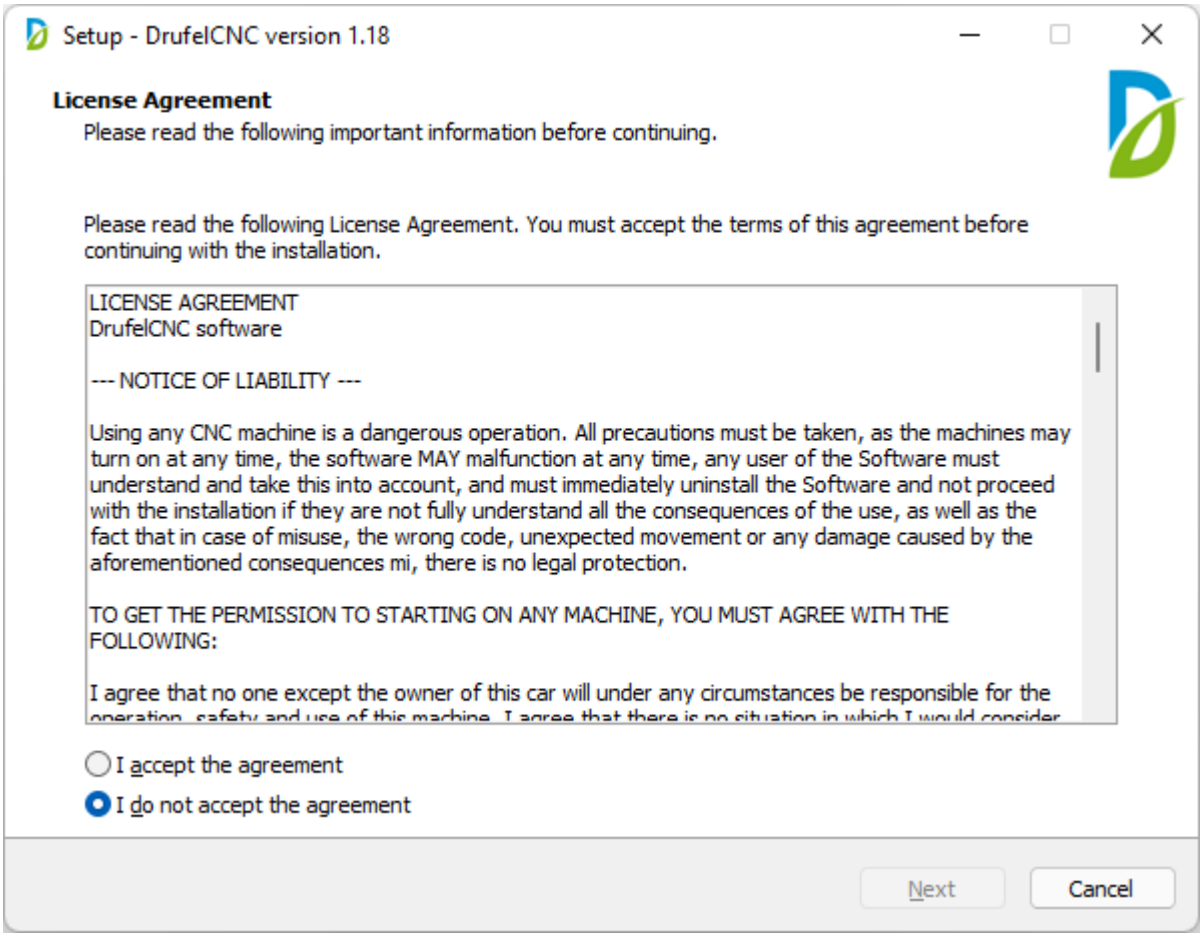
Run the desired file and follow the installation instructions.

Description of the installation process

1. *Start the installation process.* In this installation window you need to select the program installation mode.



2. *License Agreement.* The License Agreement installation window contains the text of the license agreement for the use of the DrufelCNC software product. Please read the agreement and select "I accept the terms of the license agreement". To continue the installation, click "Next". During the entire installation process, to return to the previous installation step, click the Back button. To exit the installer, click "Cancel".

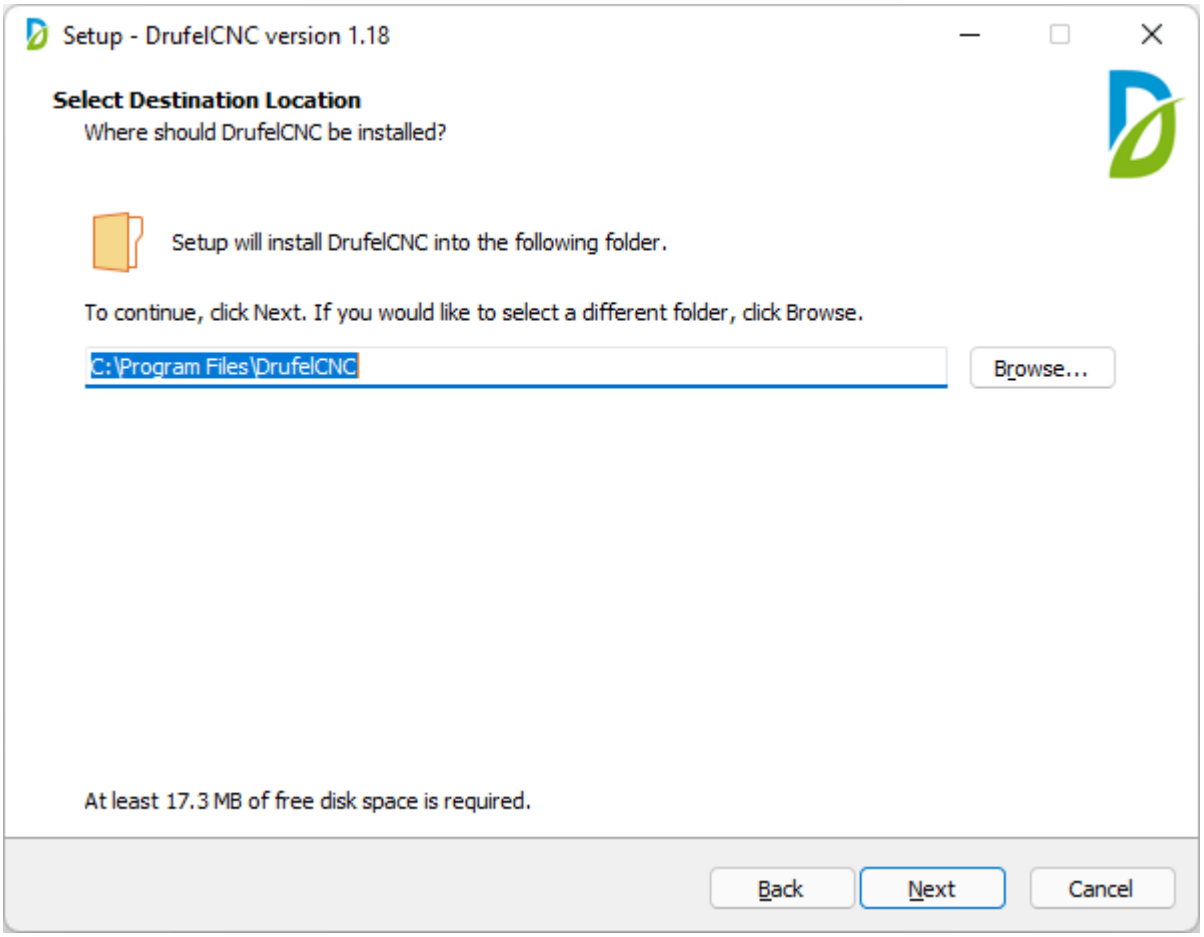


3. *Select the directory in which the installation will be made.* At this stage of the installation, you must specify the directory in which DrufelCNC will be installed.

The default installation directory is "C:\Program Filies\DrufelCNC".

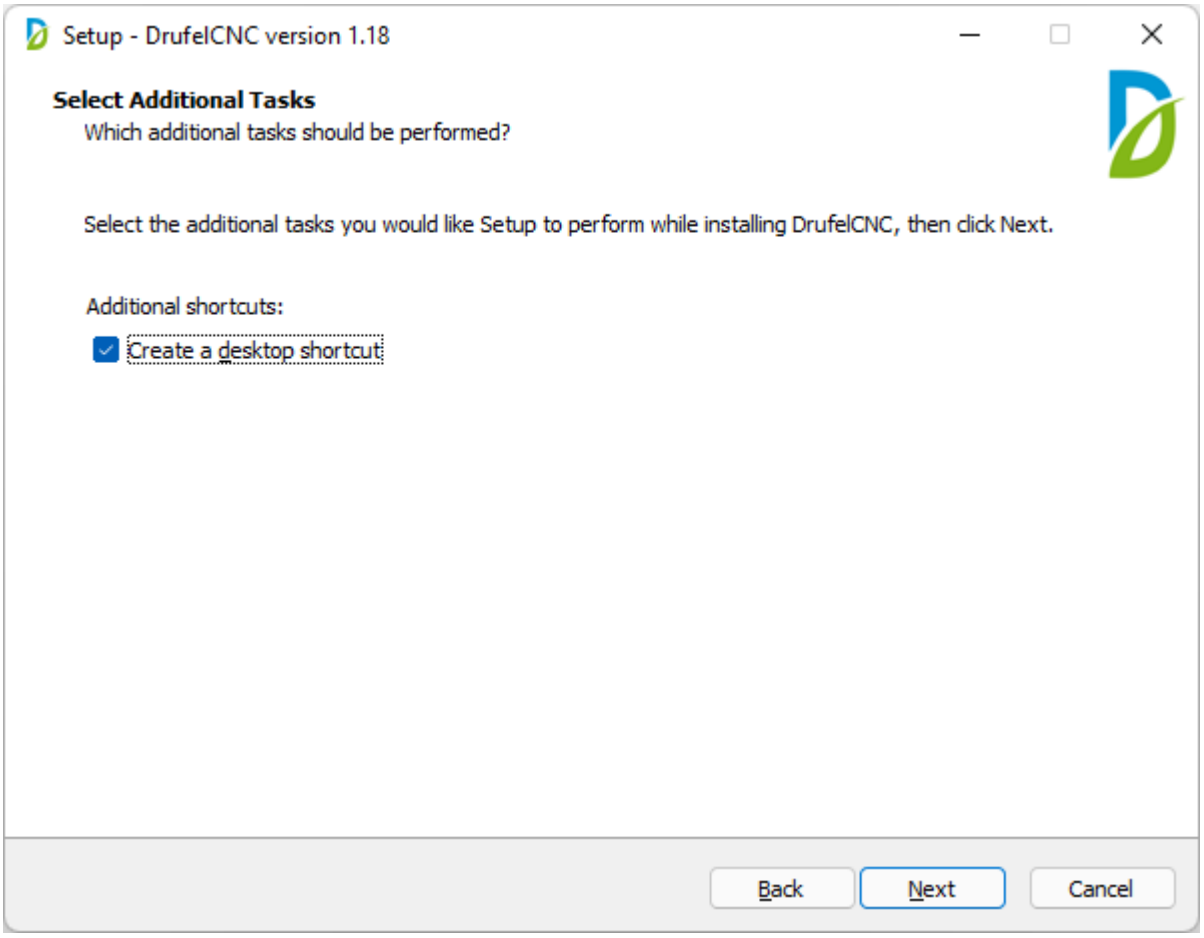
If you wish, you can specify any other path. Depending on the version of Windows, the default path may be different.

To continue the installation, click "Next".

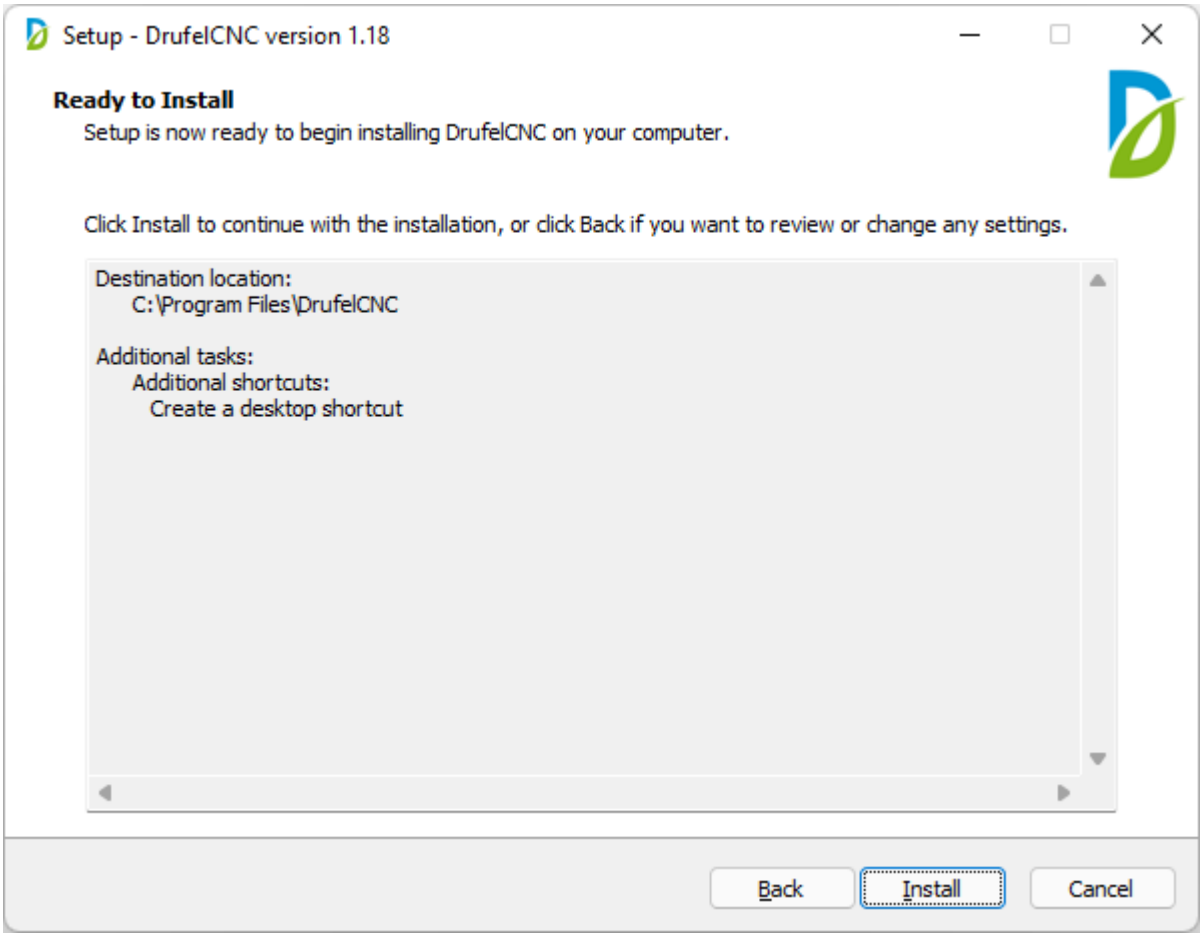


4. *Selection of additional installation parameters.* At this stage of installation, it is necessary to determine the need to create program shortcuts on the desktop. By default, a program shortcut will be created.

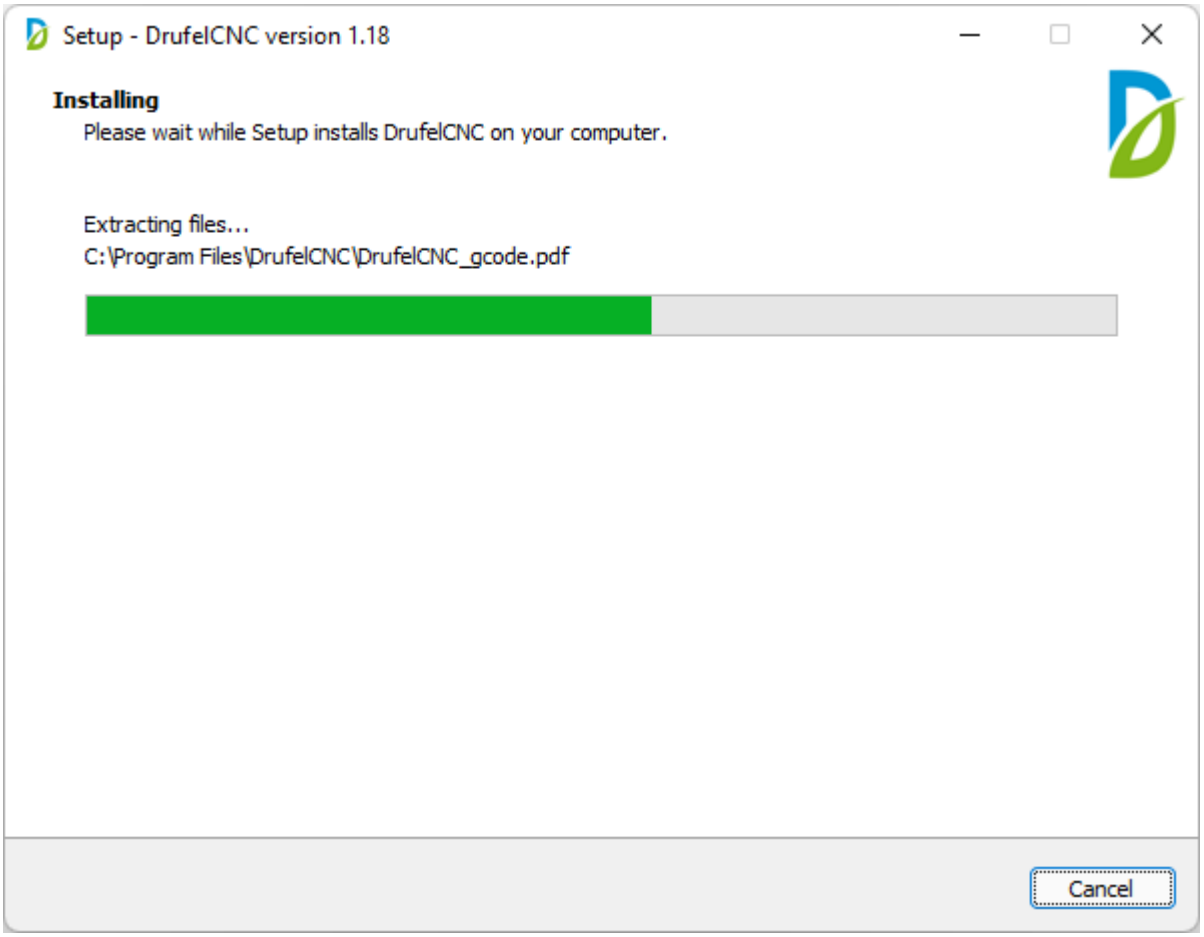
To continue the installation, click “Next”.



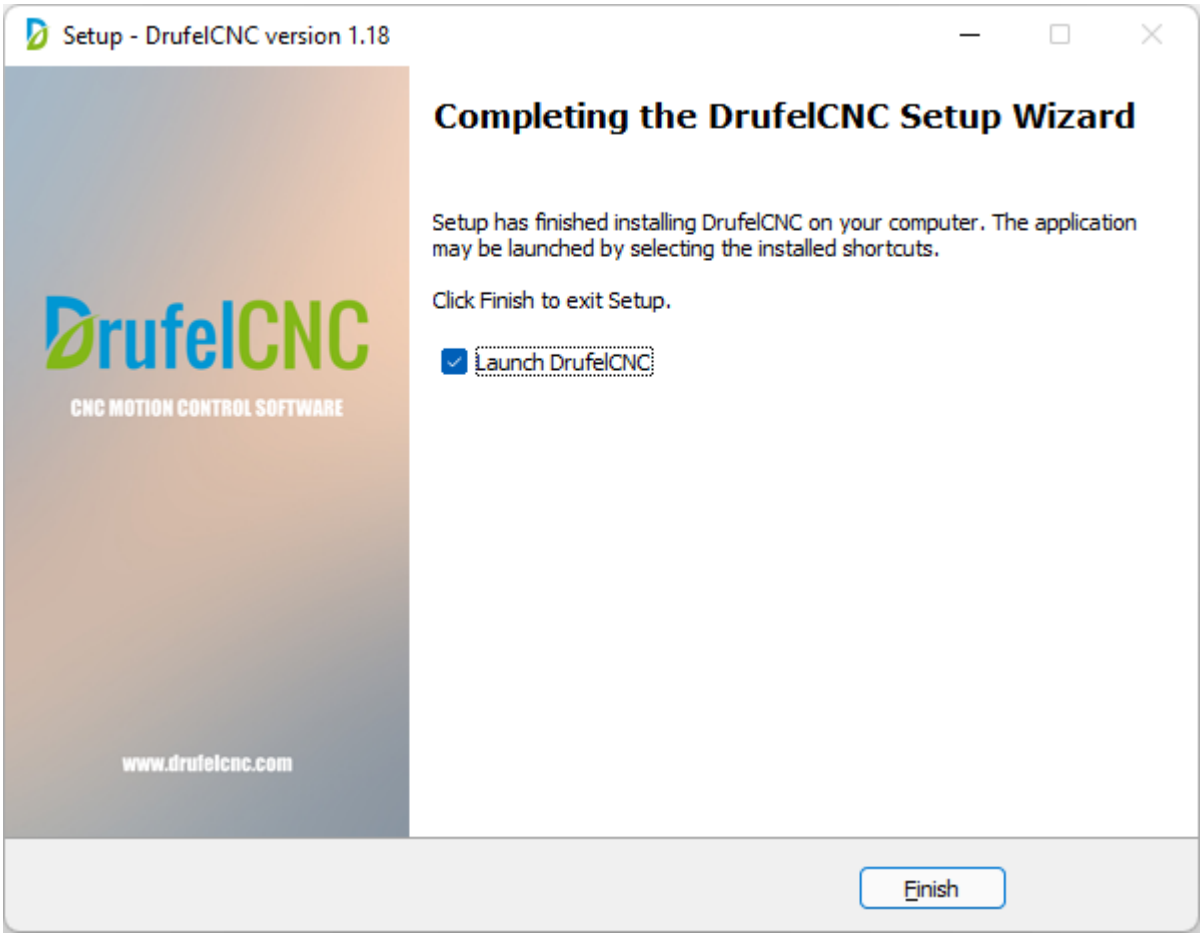
5. *Preparing for installation.* A window with information about the selected installation type, selected components and installation directory will be displayed. Check the information and click "Install".



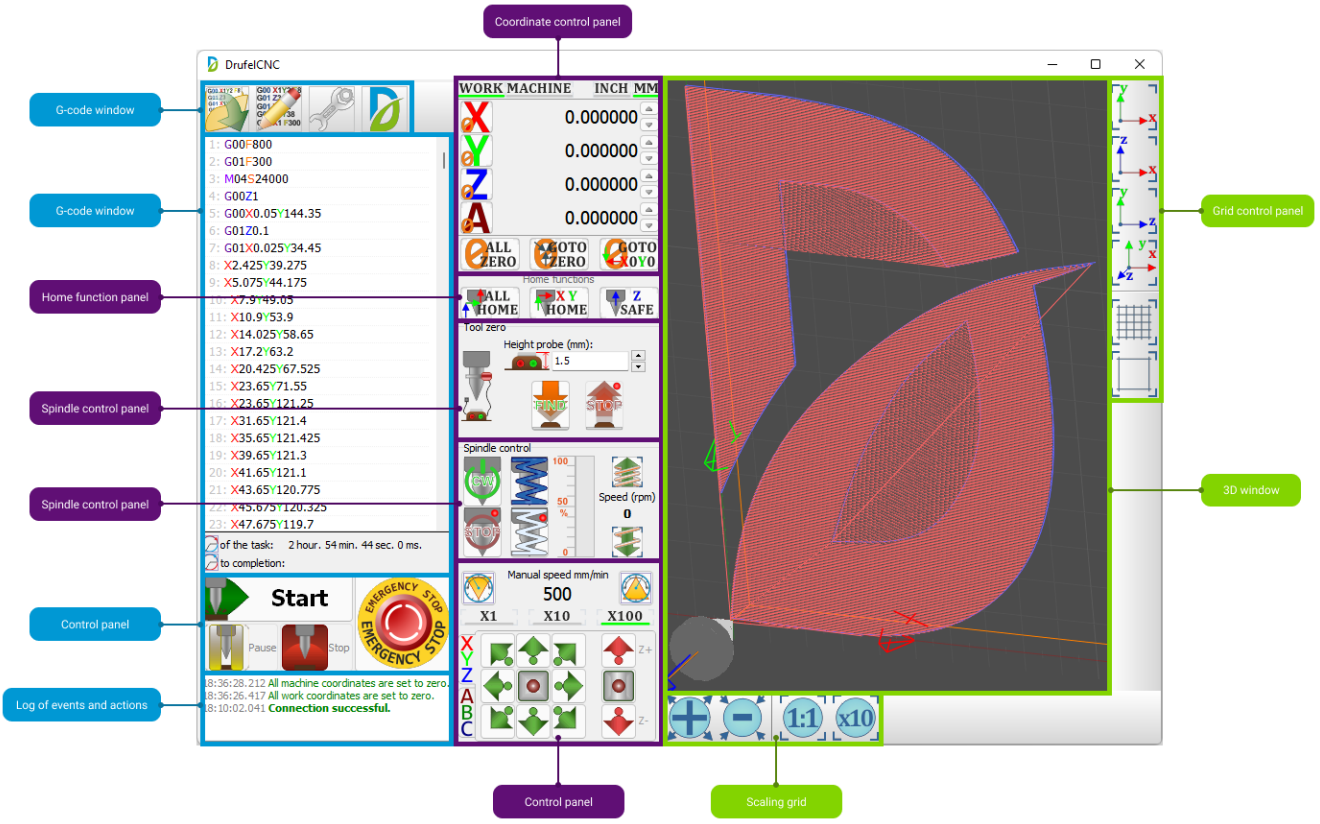
6. *Copying files.* The process of copying the necessary files will start.



7. *The final stage of installation.* At the last stage, the installation program will report the result and will offer to start the programs depending on the type of installation selected earlier. By default, you can run the program. To complete the installation, click “Finish”.



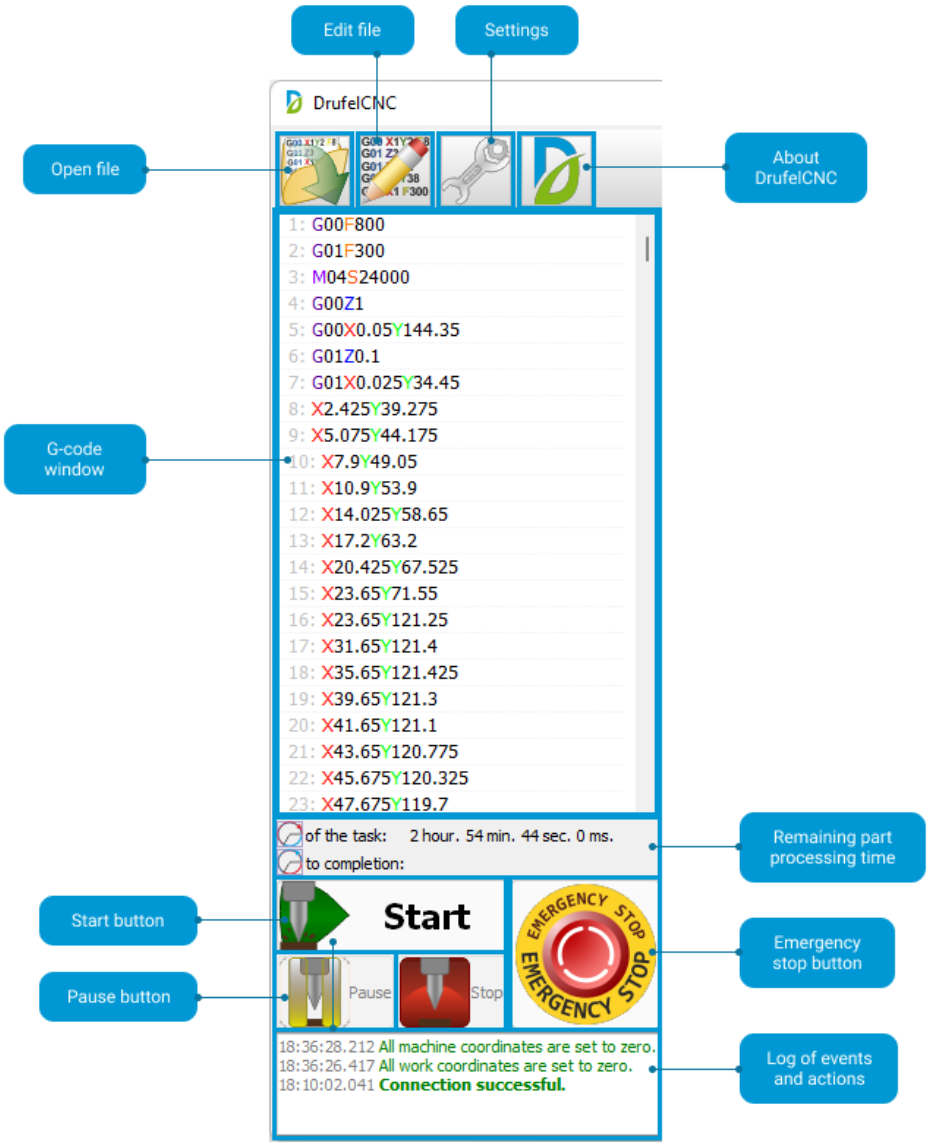
2. DrufelCNC interface



The DrufelCNC interface can be divided into three blocks:

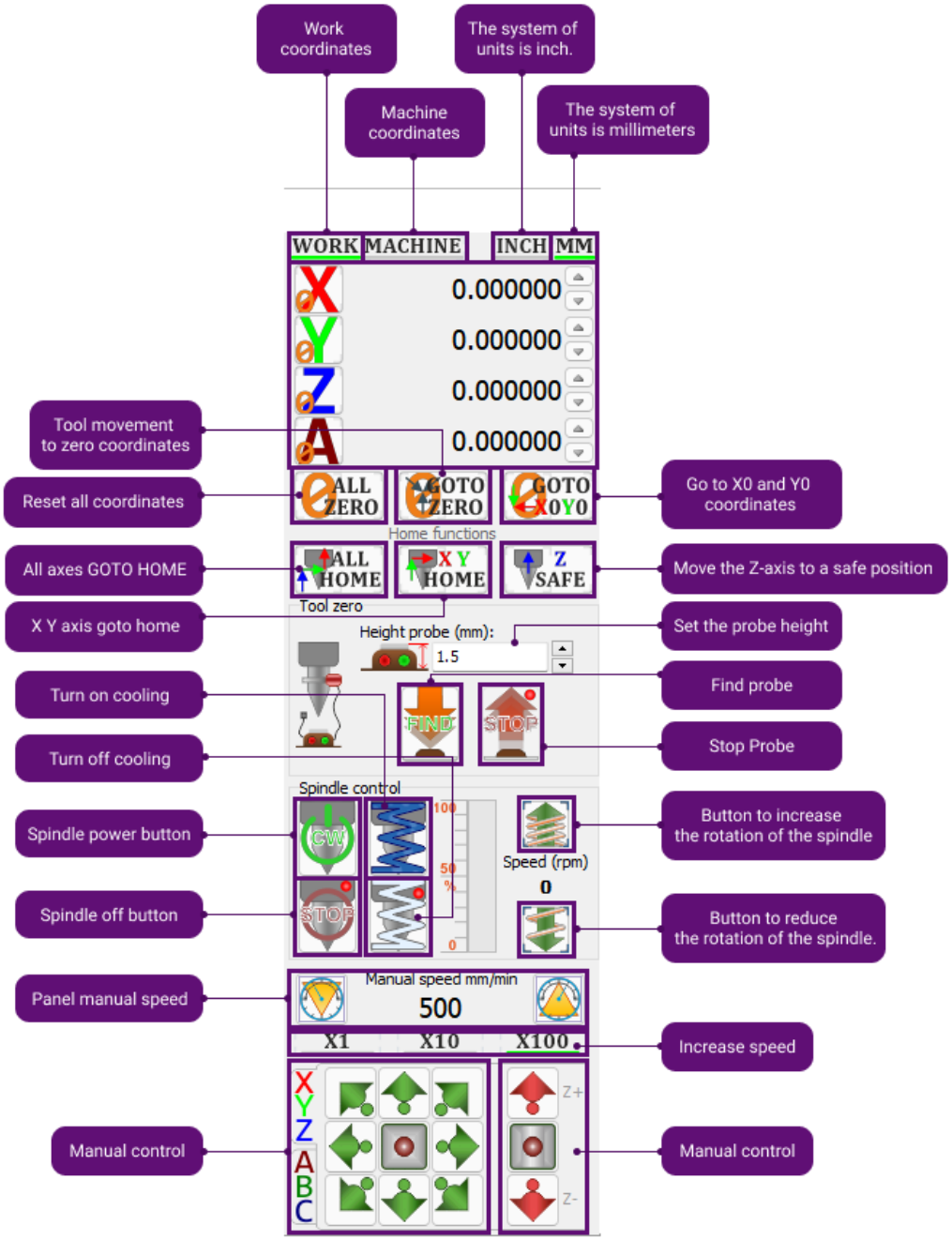
- G-code window
- Base functions
- 3D window

2.1. G-code window



Functions	Description
Open file	Open file button
Edit file	Edit g-code file button
Settings	Function setting button
About DrufelCNC	DrufelCNC information button
G-code window	Display of G-code
Start	Start button
Pause	Pause button
Remaining time part	Remaining part processing time
Emergency stop	Emergency stop button
Log of events and actions	Log of events and actions

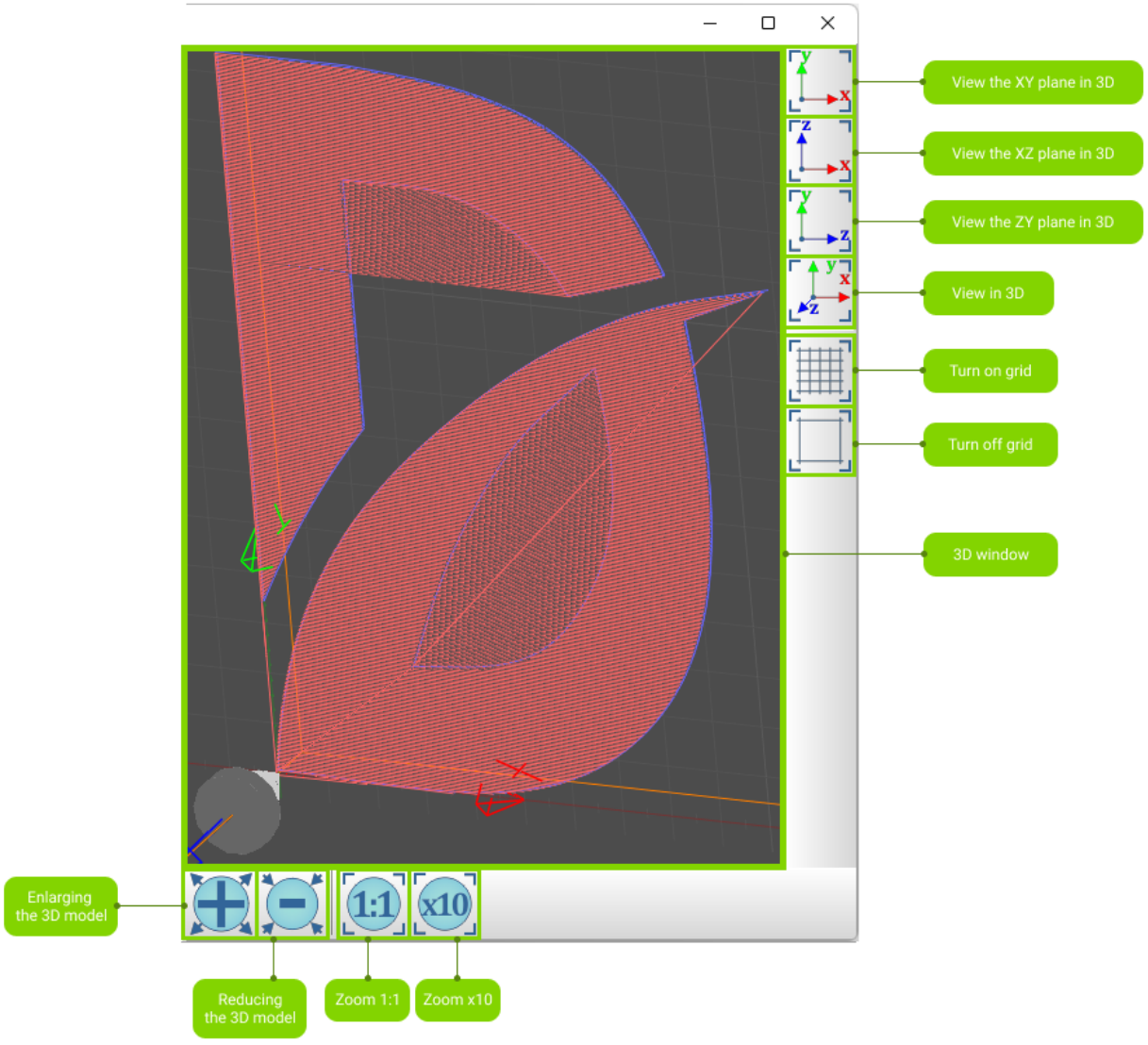
2.2. Base functions



Functions	Description
Work coordinates	Activating work coordinate mode
Machine coordinates	Activating machine coordinate mode
Inch	Activating inch mode
Millimeters	Activating millimeter mode
All zero	Reset all coordinates
Go to home	Tool movement to zero coordinates
Go to X0 Y0	Go to X0 and Y0 coordinates
All home	All axes GOTO HOME

X Y home	X Y axis goto home
Z safe	Move the Z-axis to a safe position
Set the probe height	Set the probe height
Find probe	Find probe
Stop Probe	Stop Probe
Button to increase the rotation of the spindle	Button to increase the rotation of the spindle
Button to reduce the rotation of the spindle.	Button to reduce the rotation of the spindle.
Spindle power	Spindle power button
Spindle off	Spindle off button
Turn on cooling	Turn on cooling button
Turn off cooling	Turn off cooling button
Panel manual speed	Panel manual speed
Manual control axes	Manual control axes
Manual control z axes	Manual control z axes
Increase speed	Increase speed
Decrease in spindle rotation	Button to reduce the rotation of the spindle
Increase spindle rotation	Button to increase the rotation of the spindle
Stop Probe	Stop Probe button
Find probe	Find probe button
Set the probe height	Probe height button

2.3. 3D window



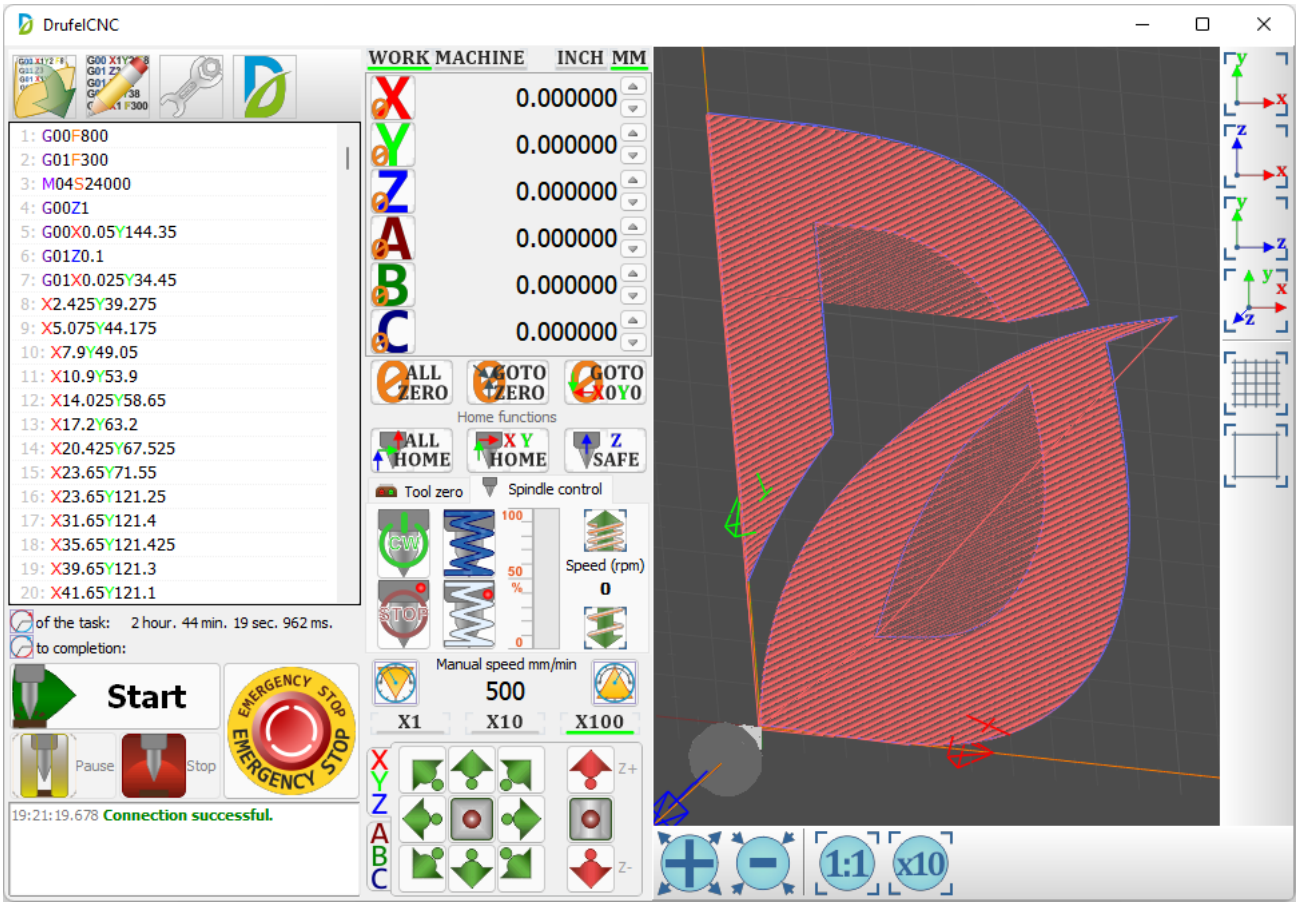
Functions	Description
Scale 3D model	Scale 3D model button
Reducing the 3D model	Reducing the 3D model button
Zoom 1:1	Zoom 1:1 button
Zoom x10	Zoom x10 button
3D window	Display of 3D-model
Turn off grid	Turn off grid button
Turn on grid	Turn on grid button
View in 3D	View in 3D button
ZY plane in 3D	View the ZY plane in 3D
XZ plane in 3D	View the XZ plane in 3D
XY plane in 3D	View the XY plane in 3D

3. Run the program

To run the program, use the version depending on the bitness of your operating system:

- DrufelCNCx32.exe - version for 32-bit operating systems
- DrufelCNCx64.exe - version for 64-bit operating systems

The main window of the program.

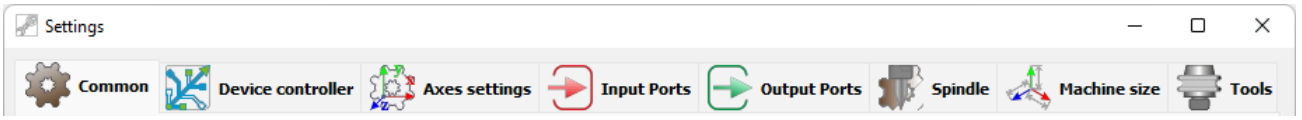


In the lower left corner displays the status of the connection to the USB controller, and other informational messages.

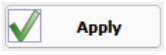
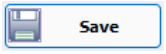
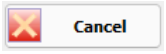
4. Customization

To configure DrufelCNC you must click on the button with the image of the key.

Next, the settings window will open, go to the settings section that interests you.



Use the following buttons to apply and change settings.

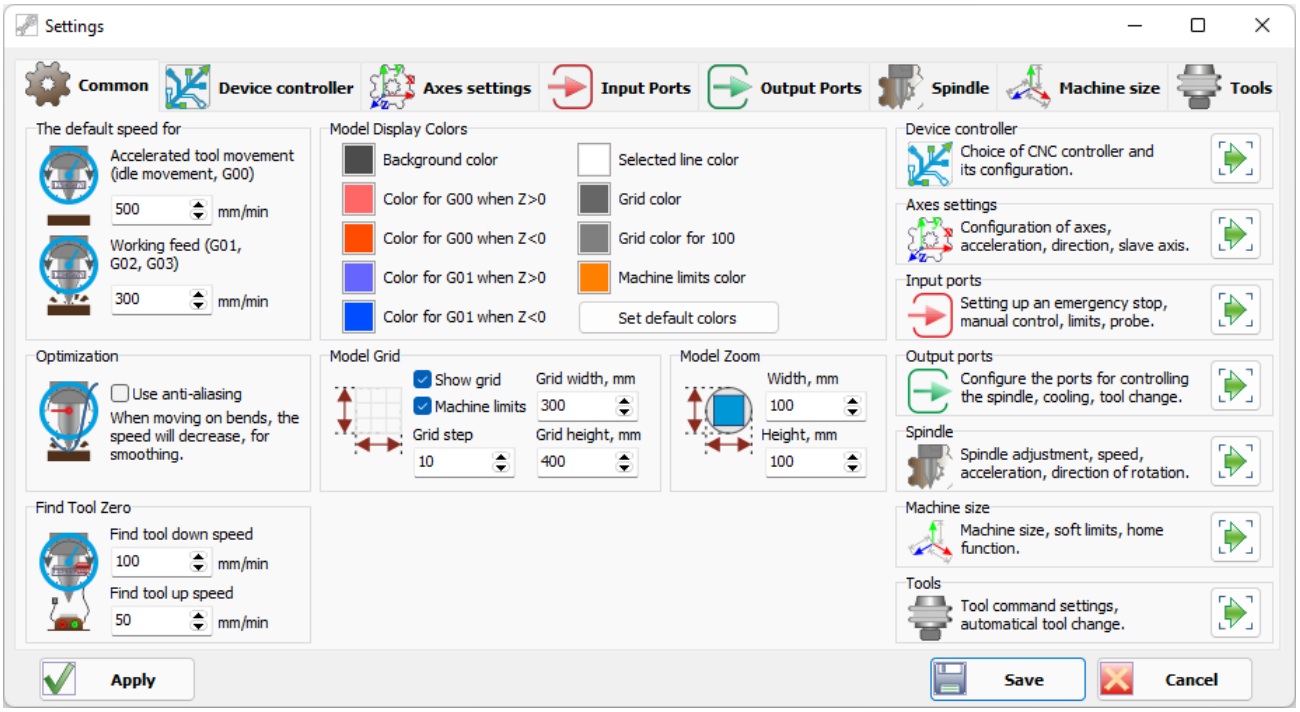
	Apply settings without closing the settings window.
	Saving settings.
	Cancel changes to settings.

Settings are stored in directories, depending on the access rights to write the storage:

- **%ProgramFiles%**\DrufelCNC
- **%ProgramData%**\DrufelCNC
- **%LocalAppData%**\DrufelCNC

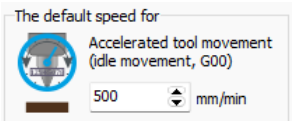
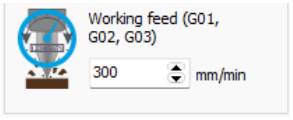
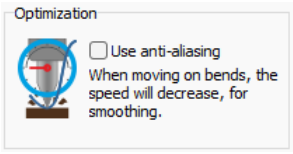
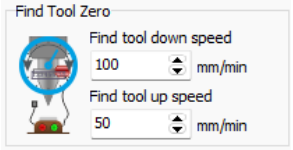
4.1. Common

In the common tab, you can set the default movement speed settings, model display settings.



4.1.1. Default speed settings

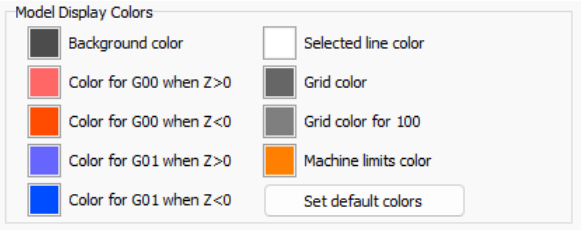
Select the speed settings you want to change and enter a new speed.

	Default speed for G00 commands. If no speed for G00 is specified in the G code file, then G00 commands will use that speed.
	Default speed for G01, G02, G03 commands.
	When moving along curved vectors, the speed of movement will decrease.
	Z-axis down speed before touching the probe when searching for tool zero, and up speed after touching the probe.

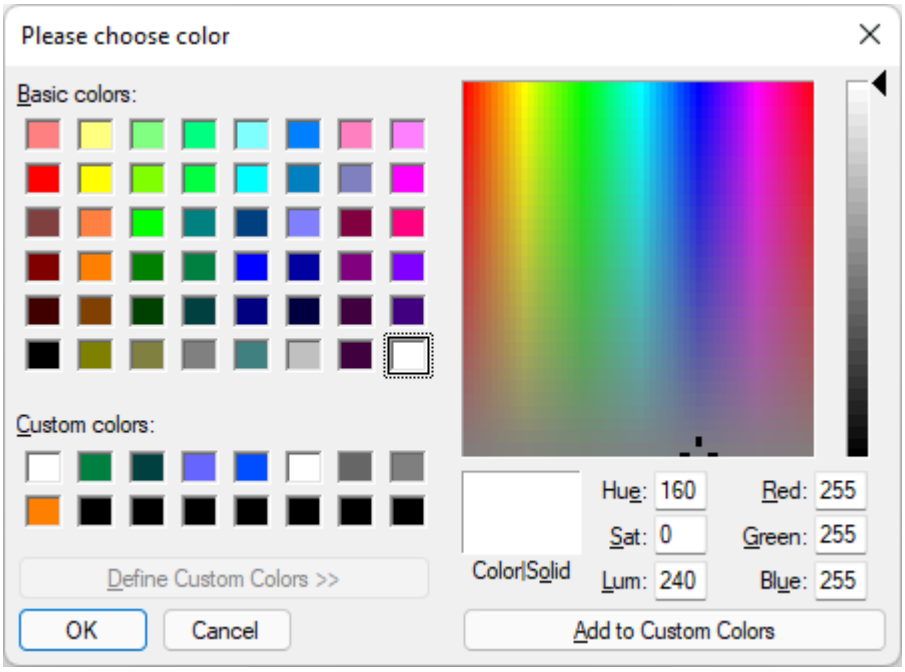
4.1.2. Model display colors

To change the display color of the model, set the color for the corresponding items.

To select a color, click on the square with the color.

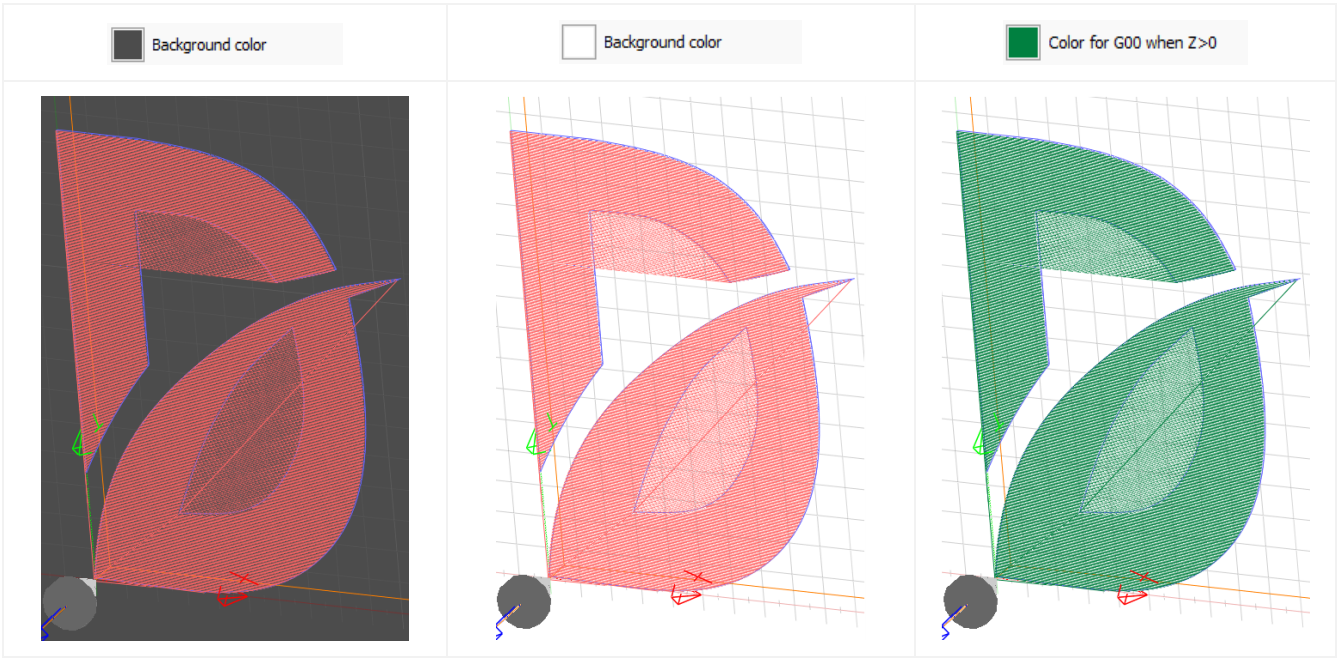


Next, a color selection window will open, select a color and confirm your choice.



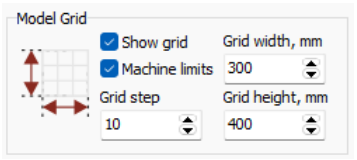
Click on the **Set default colors** button to reset the model display to the default settings.

Examples of model display color settings.

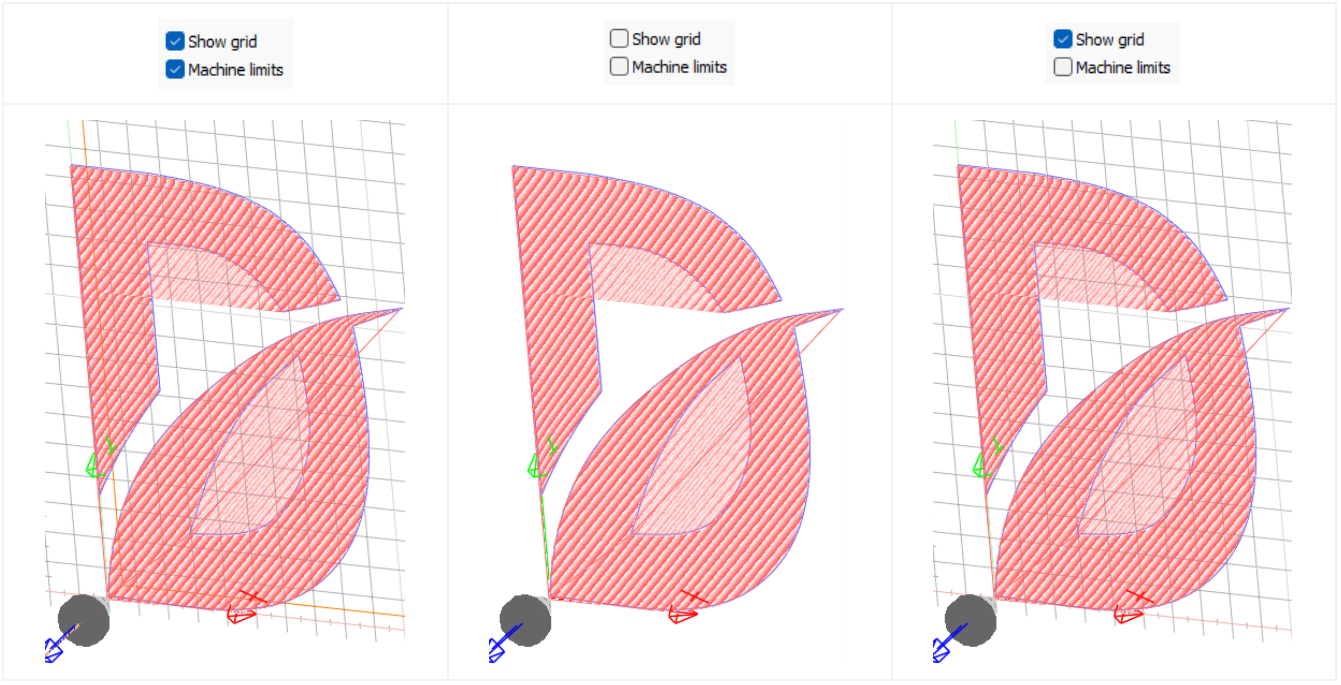


4.1.3. Model grid

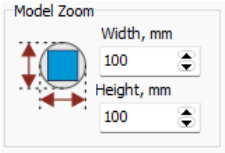
You can customize the display of the grid and machine coordinate limits. And also hold down the grid spacing and grid sizes by default.



Examples of model grid settings.

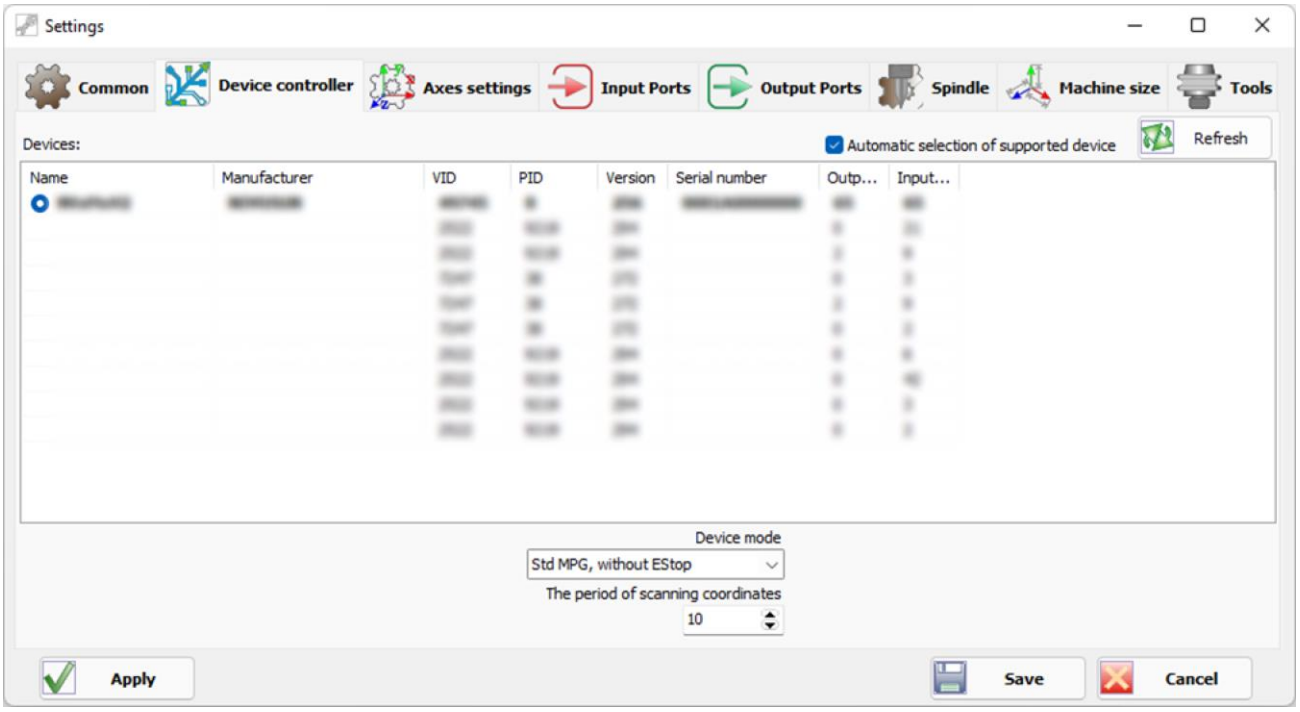


If necessary, you can change the dimensions of the model that will be displayed in the window by default at a standard scale.



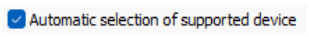
4.2. Controller Configuration

The Device Controller tab displays a list of connected supported controllers.



In the hardware section, you must select a controller by setting a point in the radio button block opposite the controller.

If you want the search and connection to a supported controller to happen automatically, check the checkbox Automatic selection of supported device.

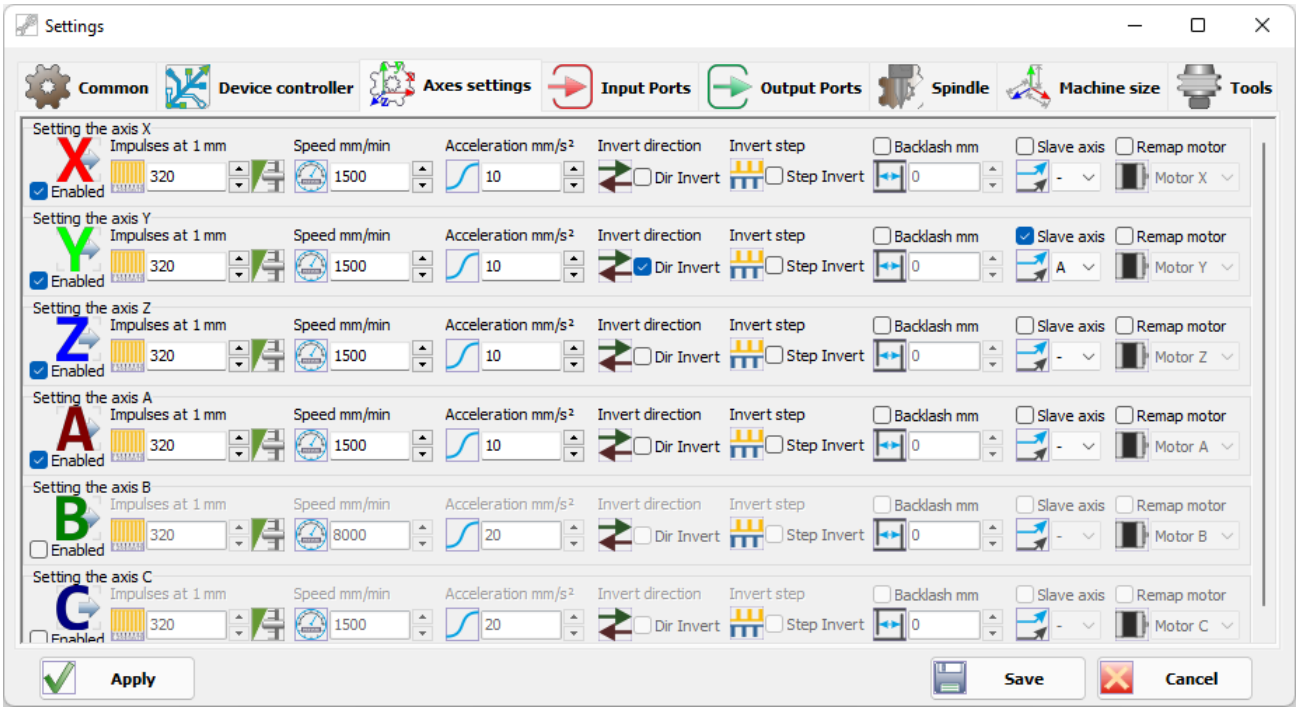


To confirm the controller selection, **Apply** or **Save** the settings.

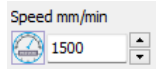
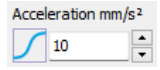
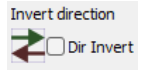
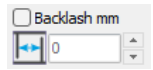
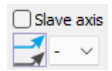
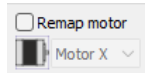
Depending on the version of the controller, you can select **Device mode**. A description of the **Device mode** for a specific controller is found in the documentation for the controller.

4.3. Axis Settings

To configure a stepper motor or servo drive, go to the Axis Settings tab.

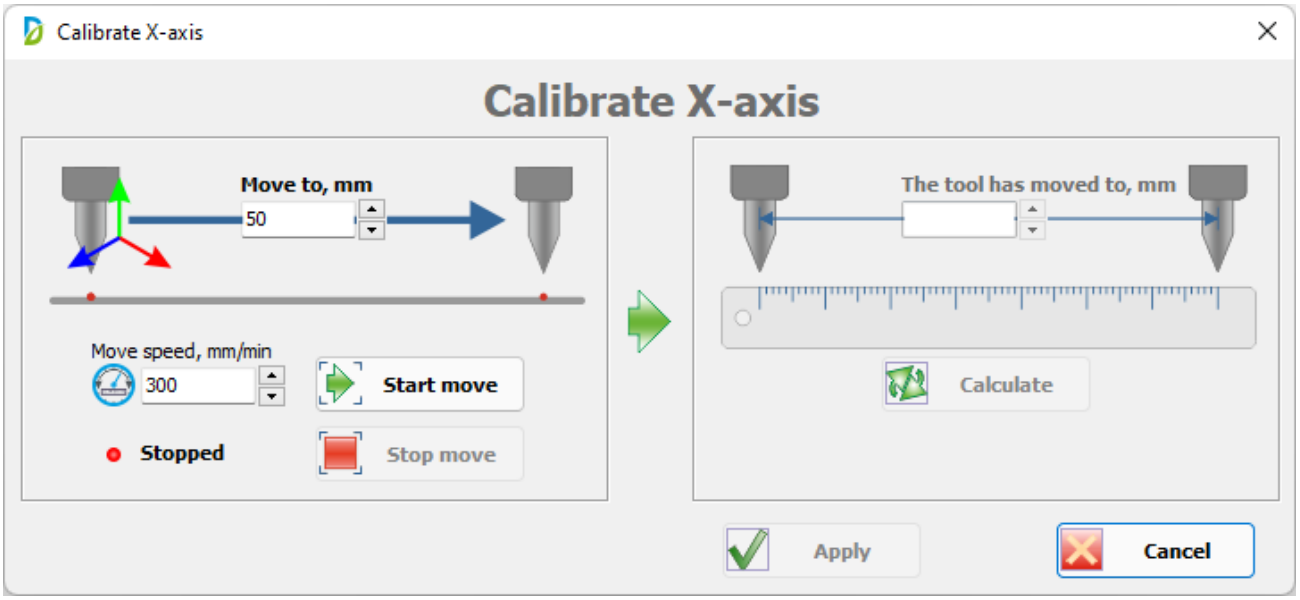


Set the required number of pulses for each axis. If necessary, specify the subordination of the axes and change the direction of movement.

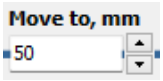
	Enables the axis to be displayed in the coordinate list.
	Impulses per mm. You can use the calibration function to calculate.
	Maximum speed of the axis movement.
	Smooth acceleration of the axis movement.
	Invert the direction of movement of the axis.
	Invert the step signal when moving.
	Backlash of the ball screw.
	Slave axis moves in the same way.
	Remap the motor axis output.

4.3.1. Calibrate axis

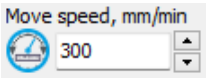
By clicking on the calibration button for a specific axis, the axis calibration window will open. This window is for calculating the number of pulses per mm.



In the "Move to" field, enter a value for the distance by which you want to move the tool.



In the "Move speed" field, set the speed of movement.

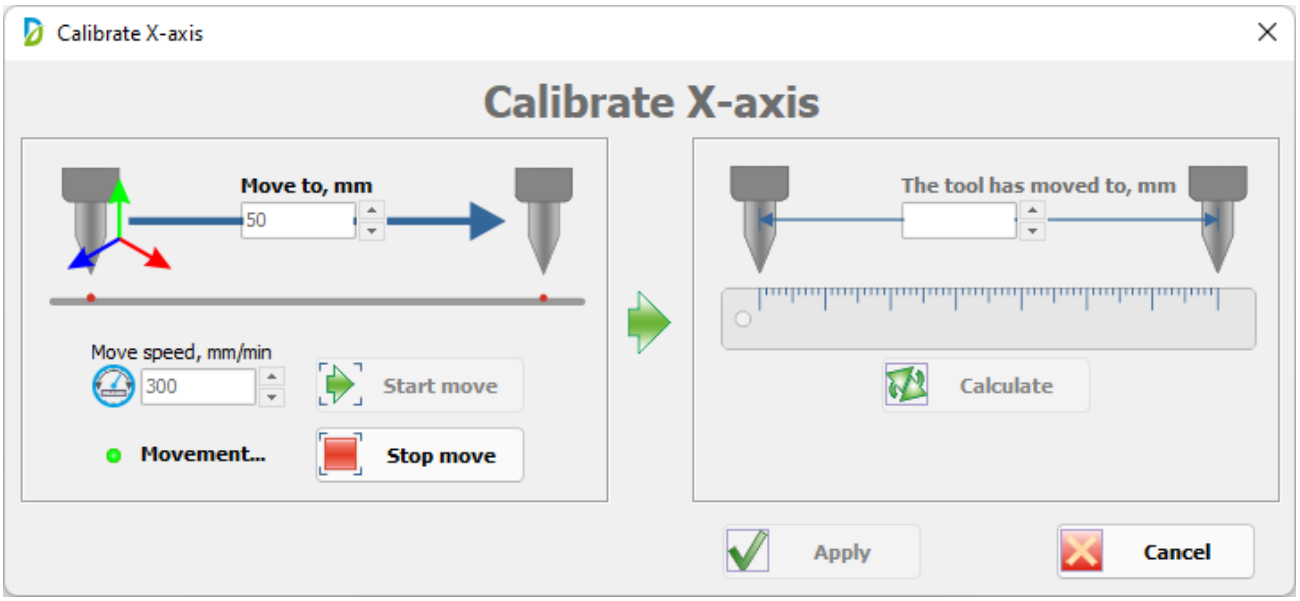


Attention! This speed must be slow! This is necessary so that you can quickly respond to an emergency and not damage the machine.

After that click on the "Start move" button.

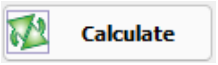
To cancel the movement, click "Stop move".

After pressing the button, movement will begin for the specified segment.

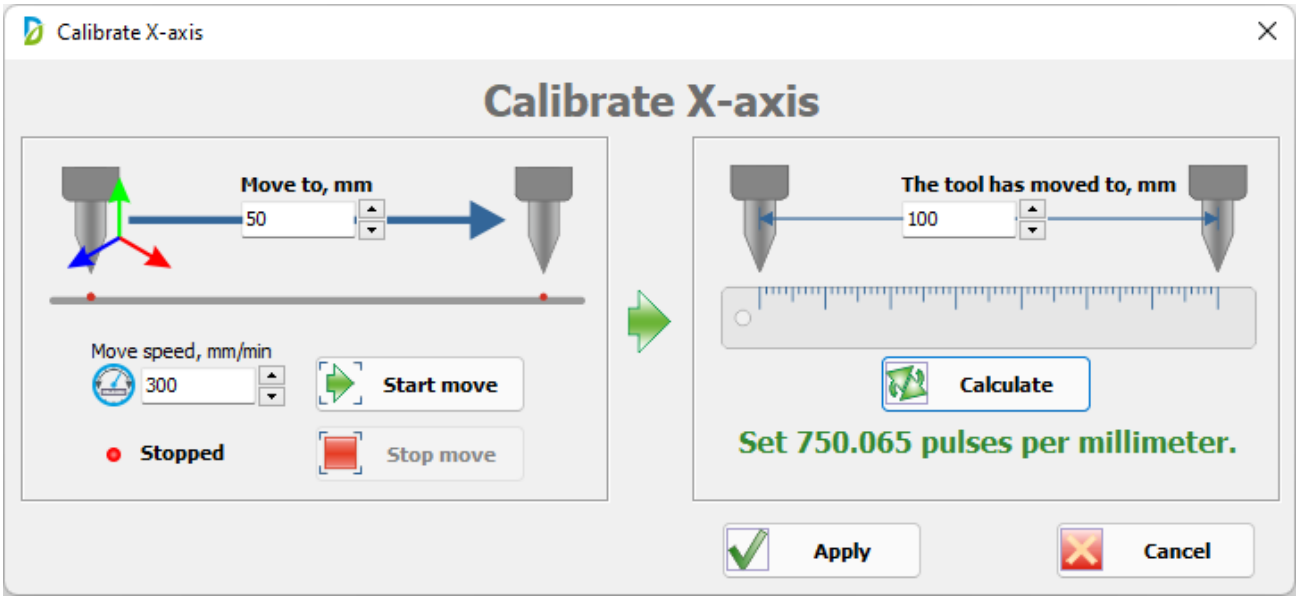


After the tool has finished moving, use the ruler to measure the actual distance the tool moved. Enter this value in the "The tool has moved" to field.

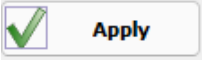
Click the "Calculate" button.



After pressing, the number of pulses per 1 mm will be calculated that you need to set for the axis to be calibrated.

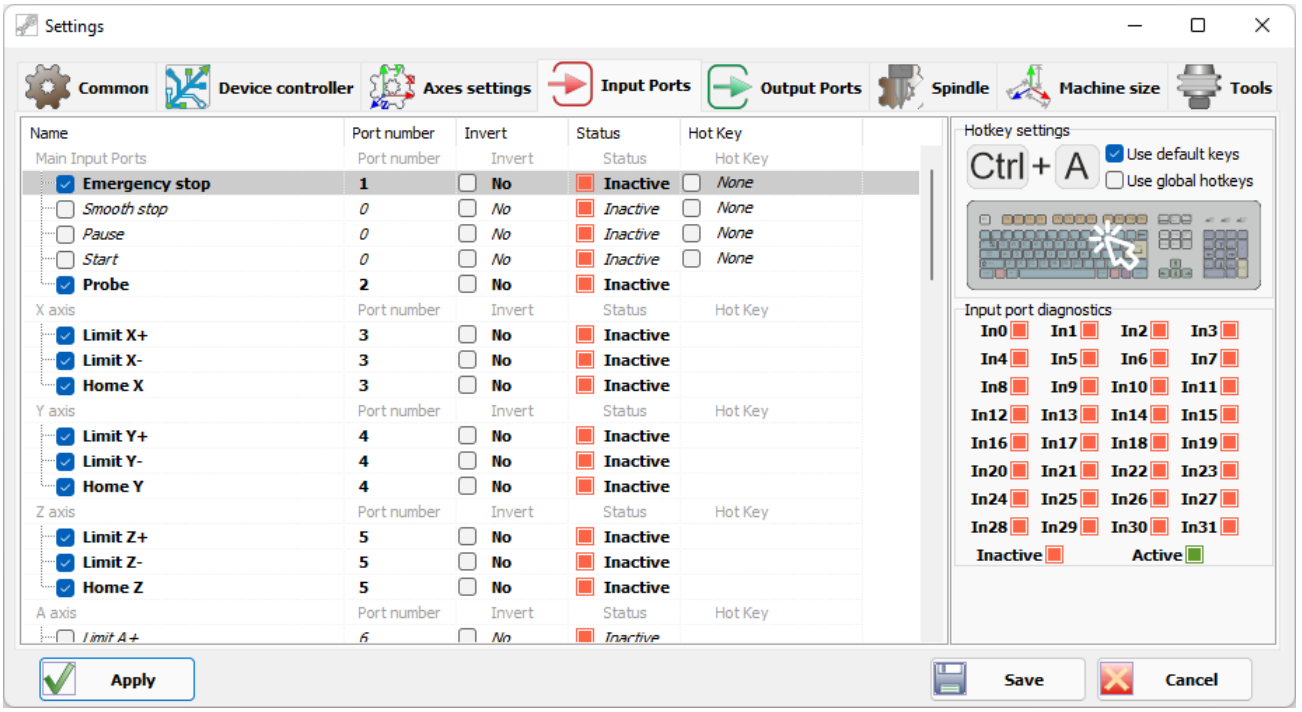


Click the "Apply" button to apply the calculation results.

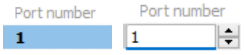


4.4. Configure Input Ports

To configure input ports, go to the Input Ports tab.



Set the input port numbers according to the configuration of the machine and the CNC controller.



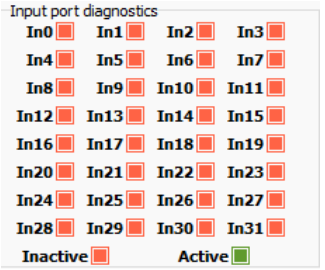
Check the checkbox in front of the port name to enable that port to work.

Check on checkbox "Invert" if the port status needs to be inverted.

Save the settings.

4.4.1. Input port diagnostics

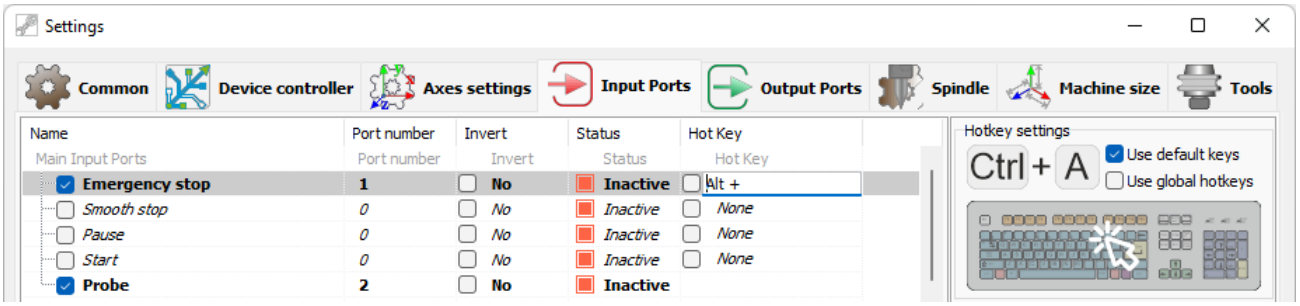
This panel displays the current state of the controller input ports.



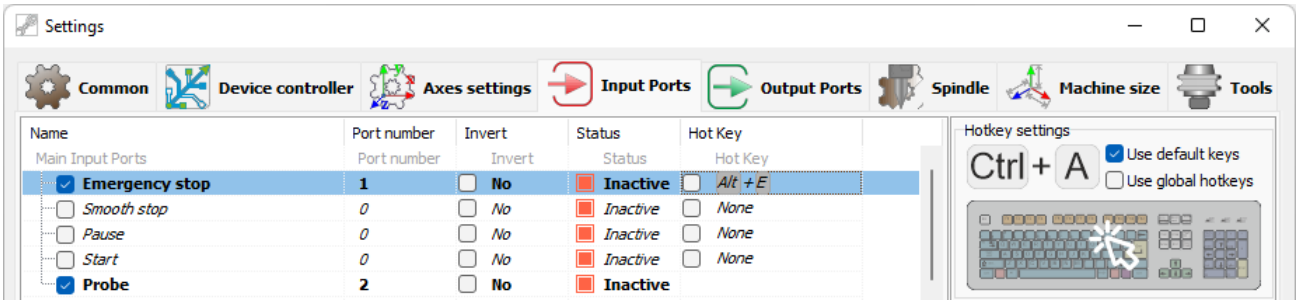
	A red LED indicates there is no signal on the input port.
	A green LED indicates signal is present on the input port.

4.4.2. Hot keys

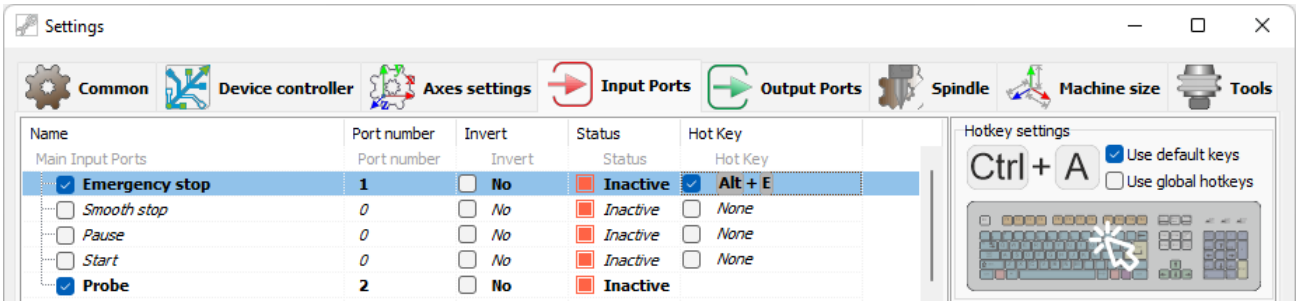
In order to set your hot keys, you need to click on the Hot Key column of a specific input port.



Next in this field you must specify your keyboard shortcut that you want to use.

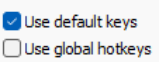


Check on the checkbox next to the text description of the hotkey to activate the hotkey.



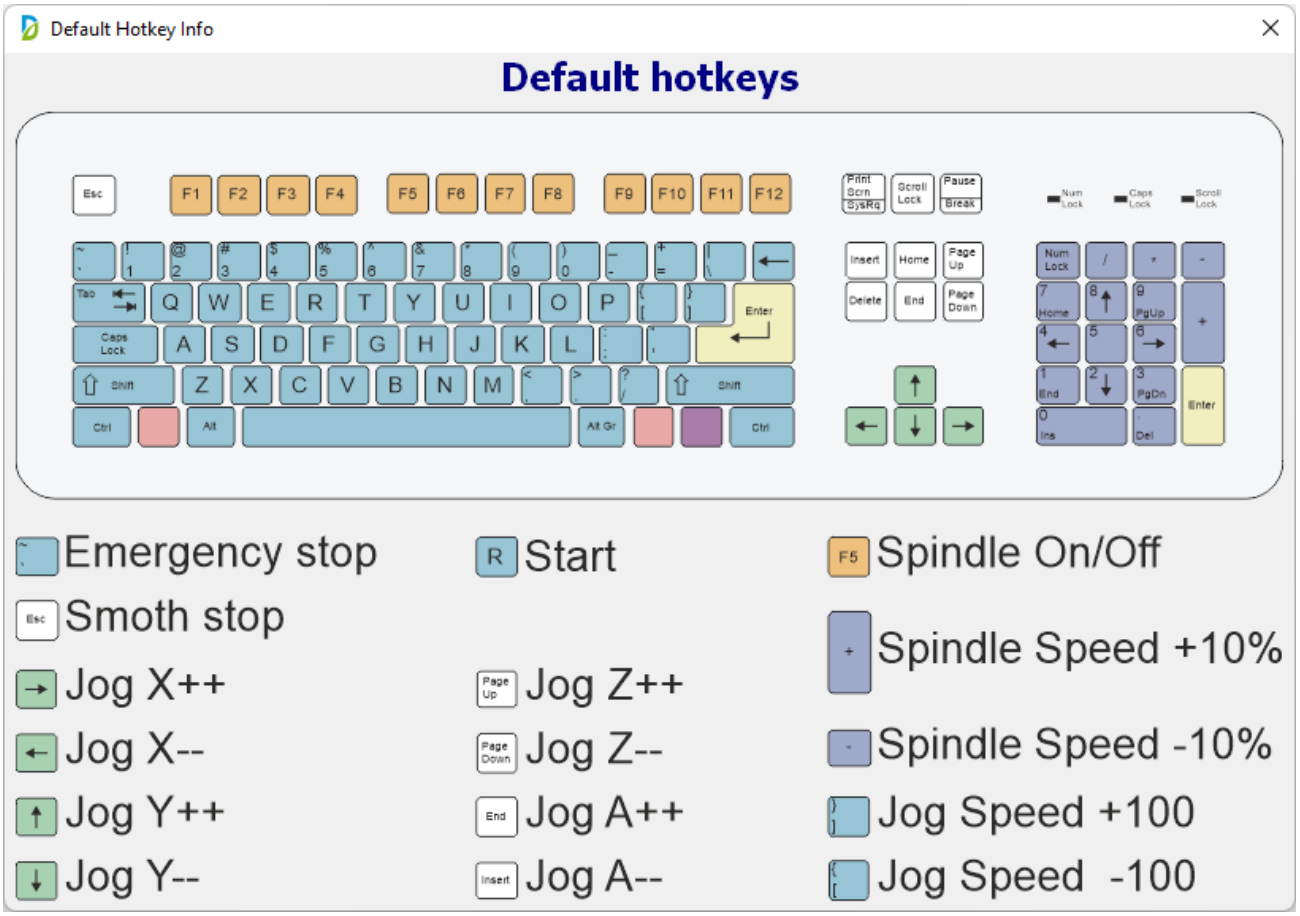
"Use global hotkeys" - this function in which if the DrufelCNC window is not active, then hotkeys will still go to DrufelCNC.

"Use default hotkeys" - this function for hotkeys will work according to the default hotkeys list.



To view the default hotkeys, click on the picture of the keyboard.

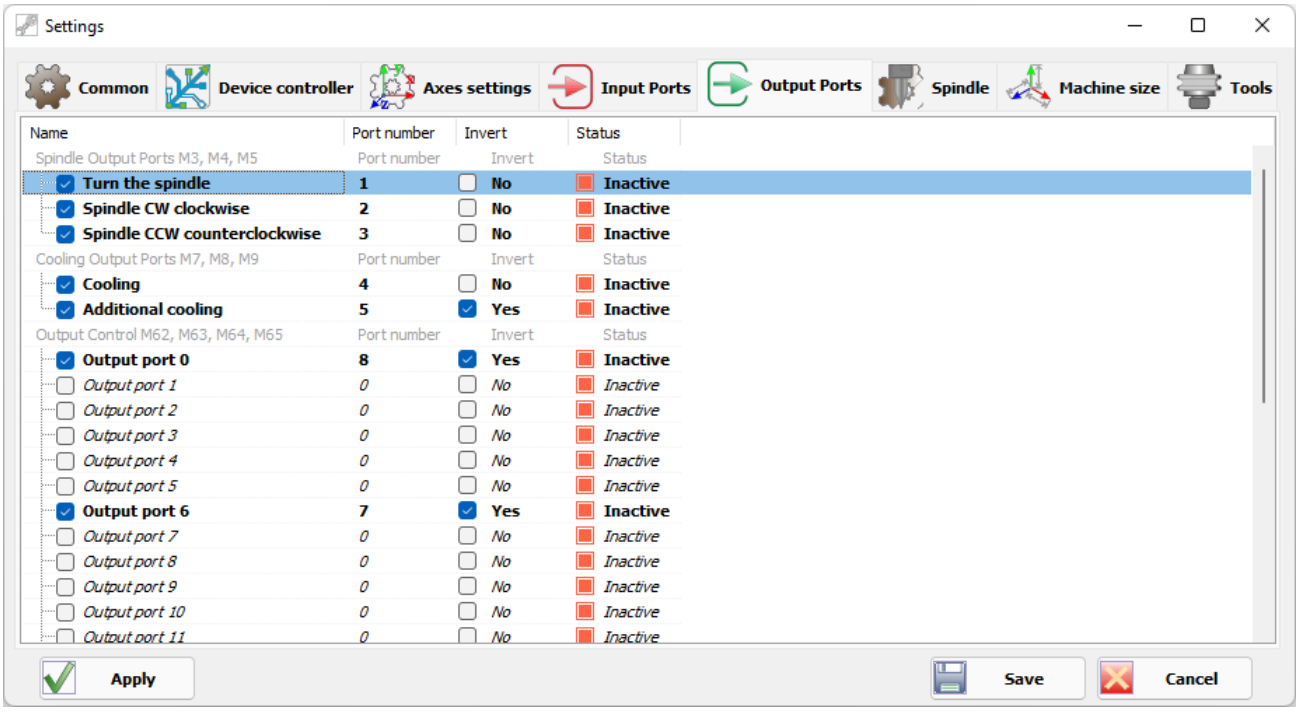
A window will open with information about the default hotkeys.



Attention! Custom shortcuts take precedence over the default keys.

4.5. Configuring output ports

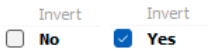
To configure output ports, click the Output Ports tab.



Set the output port numbers according to the configuration of the machine and the CNC controller.

Check the checkbox in front of the port name to enable that port to work.

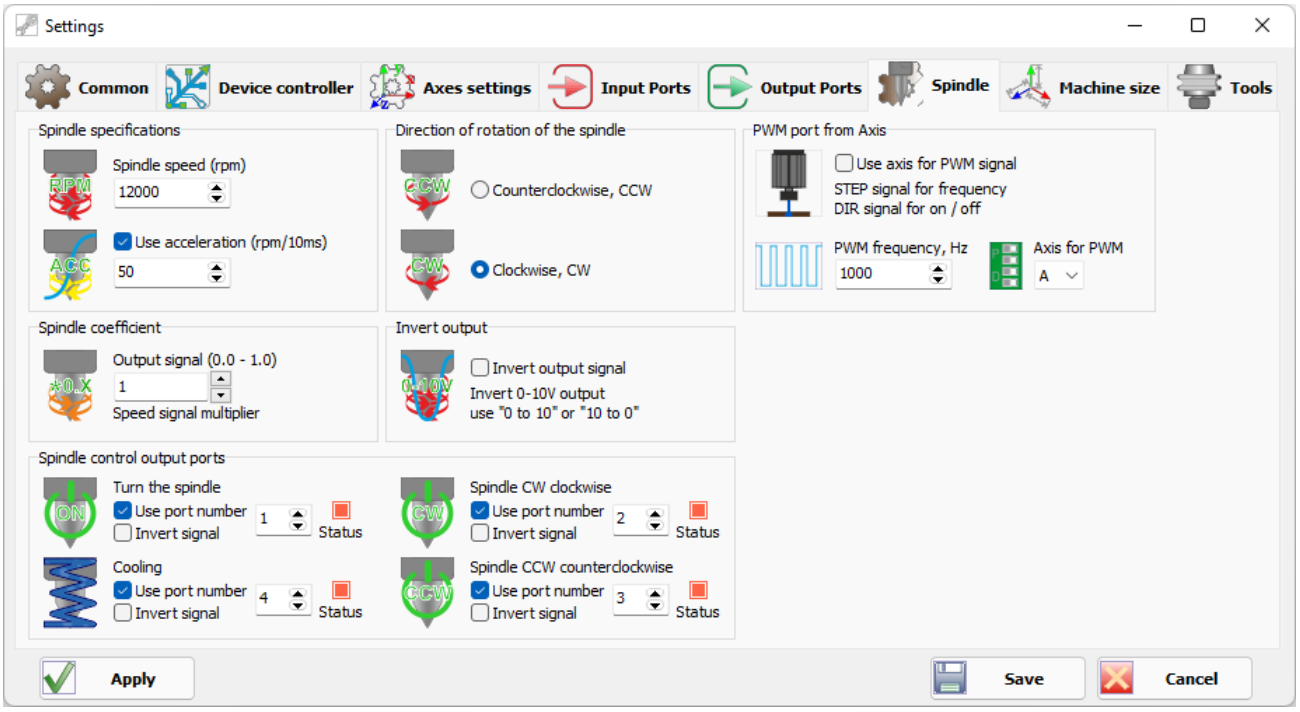
Check on checkbox “Invert” if the port status needs to be inverted.



When you start DrufelCNC, all output ports are initialized to inactive status.

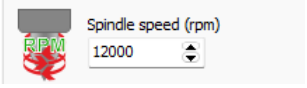
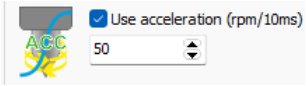
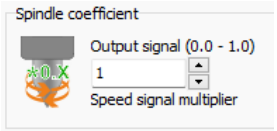
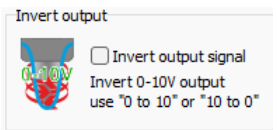
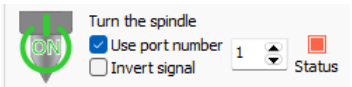
4.6. Spindle adjustment

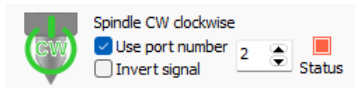
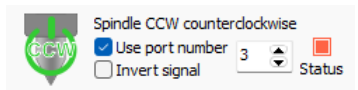
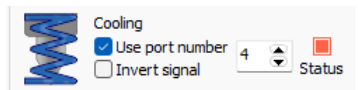
To configure the spindle parameters, you need to go to the “Spindle” tab.



Set the speed and acceleration parameters according to the spindle specification. Set the default spindle rotation direction.

Set the spindle coefficient. Save the settings.

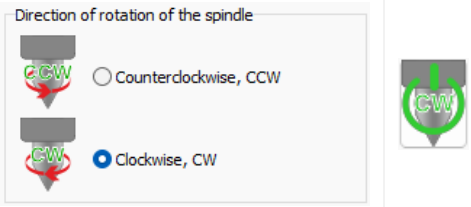
	**Spindle speed** - the nominal number of revolutions per minute for your spindle.
	**Acceleration** – when the spindle is turned on, the spindle rotation speed will be smoothly set in accordance with the specified acceleration.
	**Spindle coefficient** - if you need to calibrate the output value of the port 0-10V then change this multiplication factor.
	**Invert output signal** - invert the output voltage of the port 0-10V.
	Output port to turn on off the spindle.

	Output port to turn on off the spindle clockwise.
	Output port to turn on off the spindle counterclockwise.
	Output port to turn on off cooling.

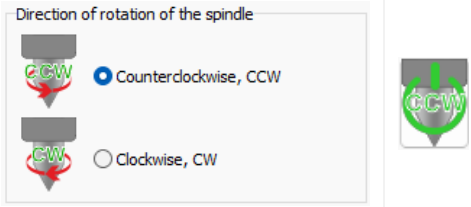
With this **Counterclockwise/Clockwise** setting, you can set the direction of rotation of the spindle when you press the "Turn the spindle" button in the main window.

If you have not configured the output ports "Spindle CW" and "Spindle CCW", then the button "Turn the spindle" is labeled "ON".

If you have configured the output ports "Spindle CW" and checked "Clockwise, CW", then the button "Turn the spindle" is labeled "CW".

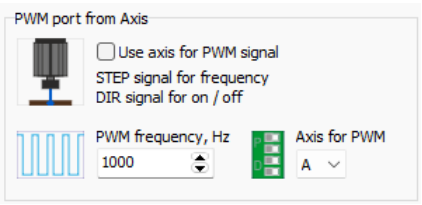


If you have configured the output ports "Spindle CCW" and checked "Counterclockwise, CCW", then the button "Turn the spindle" is labeled "CCW".

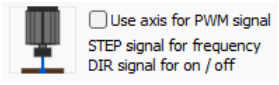
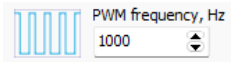
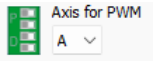


4.6.1. PWM port from axis

If a PWM port is required, then the output of one of the axes can be used for the PWM signal source.

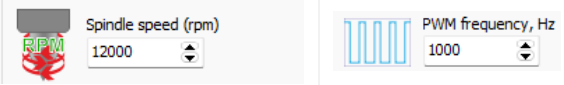


Set the checkbox "Use axis for PWM signal", select "Axis for PWM" and set the maximum frequency in the input field "PWM frequency, Hz".

	Use the STEP signal of the selected axis as a PWM port.
	The maximum frequency of the PWM port.
	Selected axis output for the PWM port.

To change the PWM frequency, use M-code **M3** or **M4** with **S**, **M3S1000**.

The "**PWM frequency**" setting has a linear relationship with the "**Spindle speed**" setting.



For example, if "Spindle speed" = 12000 rpm and "PWM frequency" = 1000 Hz, then with M3S1000 the output frequency will be

PWM_output = S*PWM_frequency/Spindle_speed

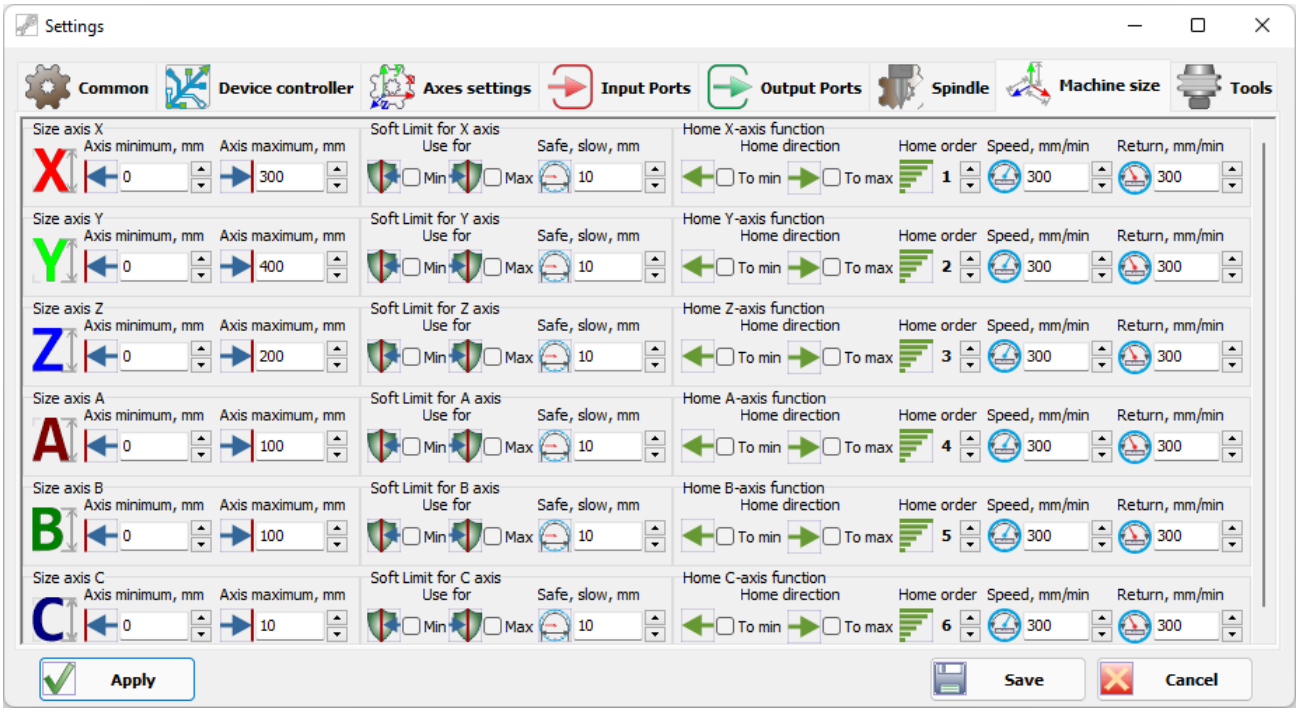
1000*1000/12000 = **83** Hz

Calculation examples

M3S9000	9000*1000/12000 = **750** Hz
M3S3000	3000*1000/12000 = **250** Hz
M3S12000	12000*1000/12000 = **1000** Hz

4.7. Machine size

With these settings you can customize the machine dimensions, soft limits, home function.

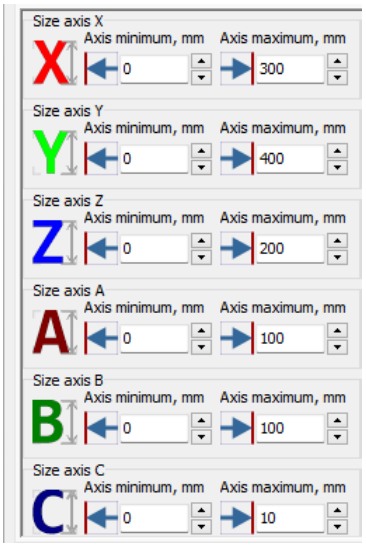


These settings are used to display machine limits in the 3D model window. For the operation of safe limits and the operation of the HOME function.

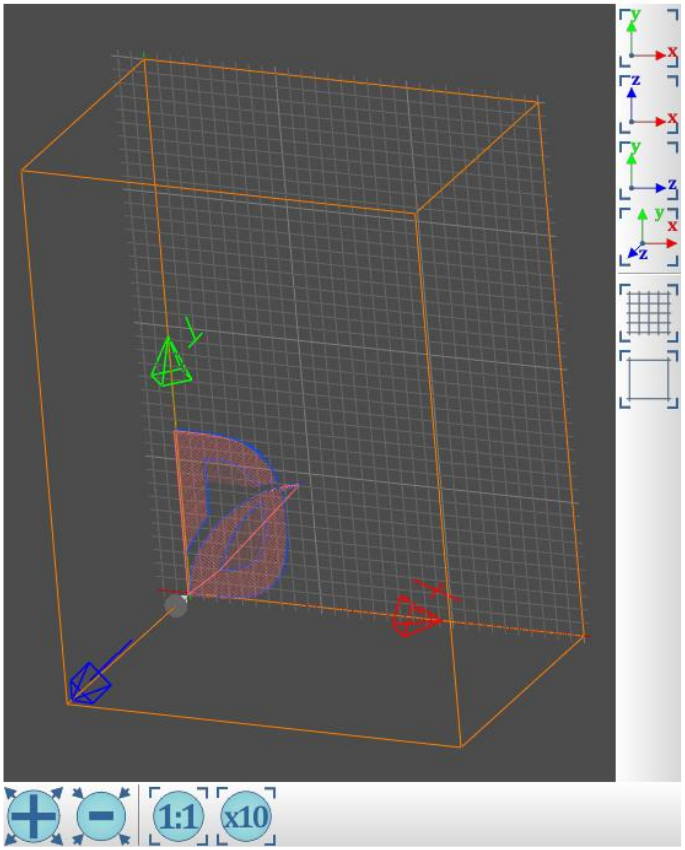
4.7.1. Size axis

Set the min / max limits for your machine.

Attention! The limits are specified in machine coordinates. The difference between the min and max should be the actual axis length of your machine.

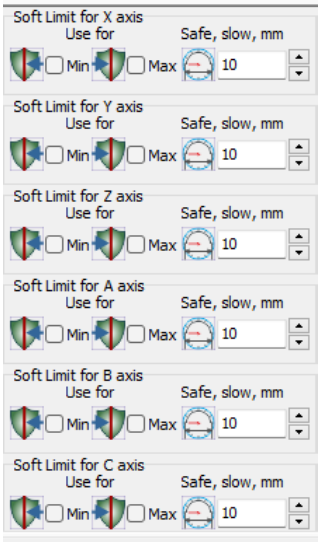


According to these settings in the 3D model window, the dimensions of the axis will be displayed as a quadrilateral in each plane.



4.7.2. Soft limit

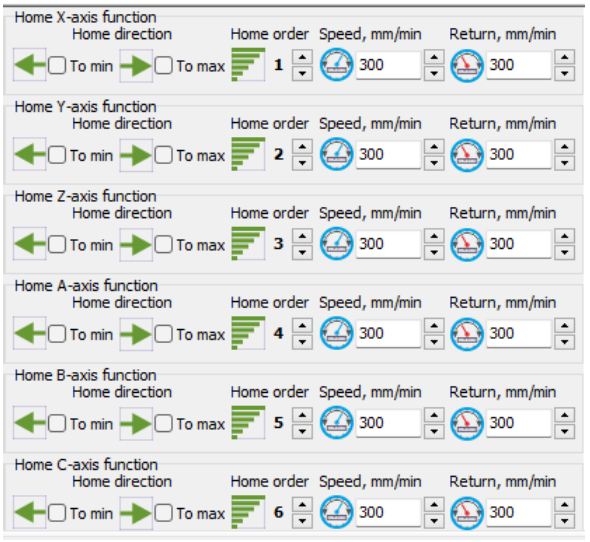
If you want the tool to stop when it reaches the minimum and maximum of your axis, use the appropriate constraints. These settings are designed to not damage your machine.



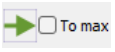
	When the minimum limit of your axis is reached, the tool movement will stop and prevent it from moving towards the minimum.
	When the maximum limit of your axis is reached, the tool will stop moving and prevent it from moving towards the maximum.
	If the specified value remains before reaching the minimum or maximum, the tool speed is reduced to the minimum.

4.7.3. Home function

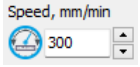
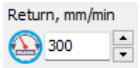
With these settings you can set the driving direction, priority and speed.



These settings are for buttons on the main window.

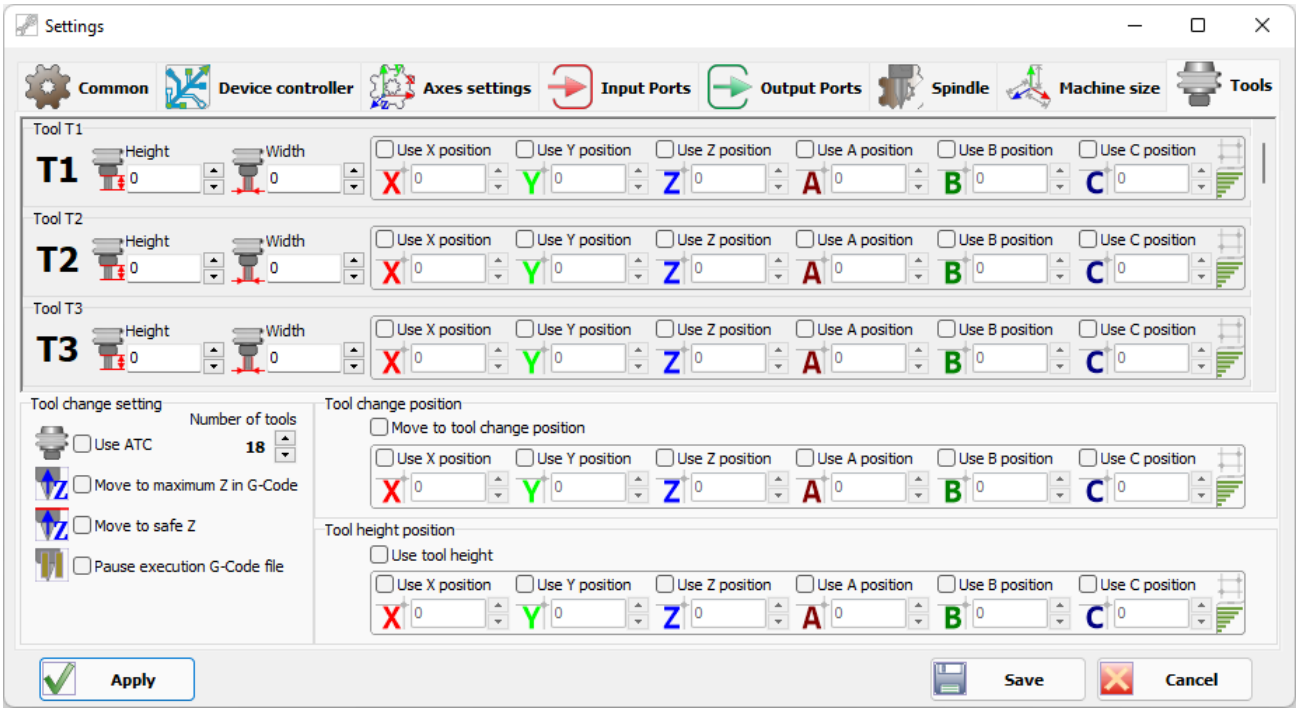
	when searching for the home position, the instrument will move to the minimum.
	when searching for the home position, the instrument will move to the maximum.

Attention! If you have turned on both the "To min" and "To max" settings, then when searching for the home position, the instrument will first move to the minimum and then to the maximum.

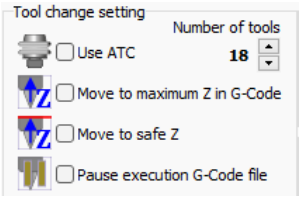
	Allows you to specify the order in which the search for the home position is performed for each axis. **1** - will be executed very first; **6** - will be executed most recently;
	Is the speed of the tool when searching for the home position.
	Is the return speed of the tool when searching for the home position.

4.8. Tools

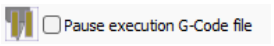
On the tools tab, you can set the parameters of each tool, set the actions on the M-code M6. All settings are set in machine coordinates, the unit of measurement is millimeters.



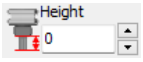
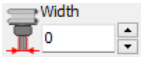
Tool Change Setting.



Use ATC	Use automatic tool change.
Number of tools 18	The number of tools to be used.
Move to maximum Z in G-Code	When an M6 command is encountered, the tool will move up the Z axis to the maximum Z axis value in the G-code file.
Move to safe Z	When an M6 command is encountered, the tool will move up the Z axis to the safe position. The home function must be configured.

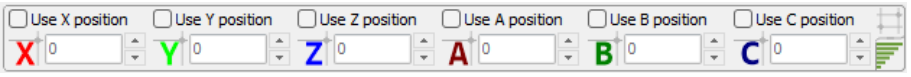
	When an M6 command is encountered, execution of the G-code file will be paused.

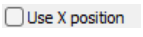
Tool Options.

	Tool number. The number of the instrument is assigned in order starting from 1. The number of instruments is specified in the corresponding field.
	Tool height. Used in tool height compensation in G43 when no Z compensation value is specified.
	Tool width. Has informational value.

Use these buttons to switch between tool coordinates and movement order.

Position coordinates.



	Check checkbox if the coordinate of the selected axis is used.
	Tool coordinate in the selected axis. Machine coordinate system is used.

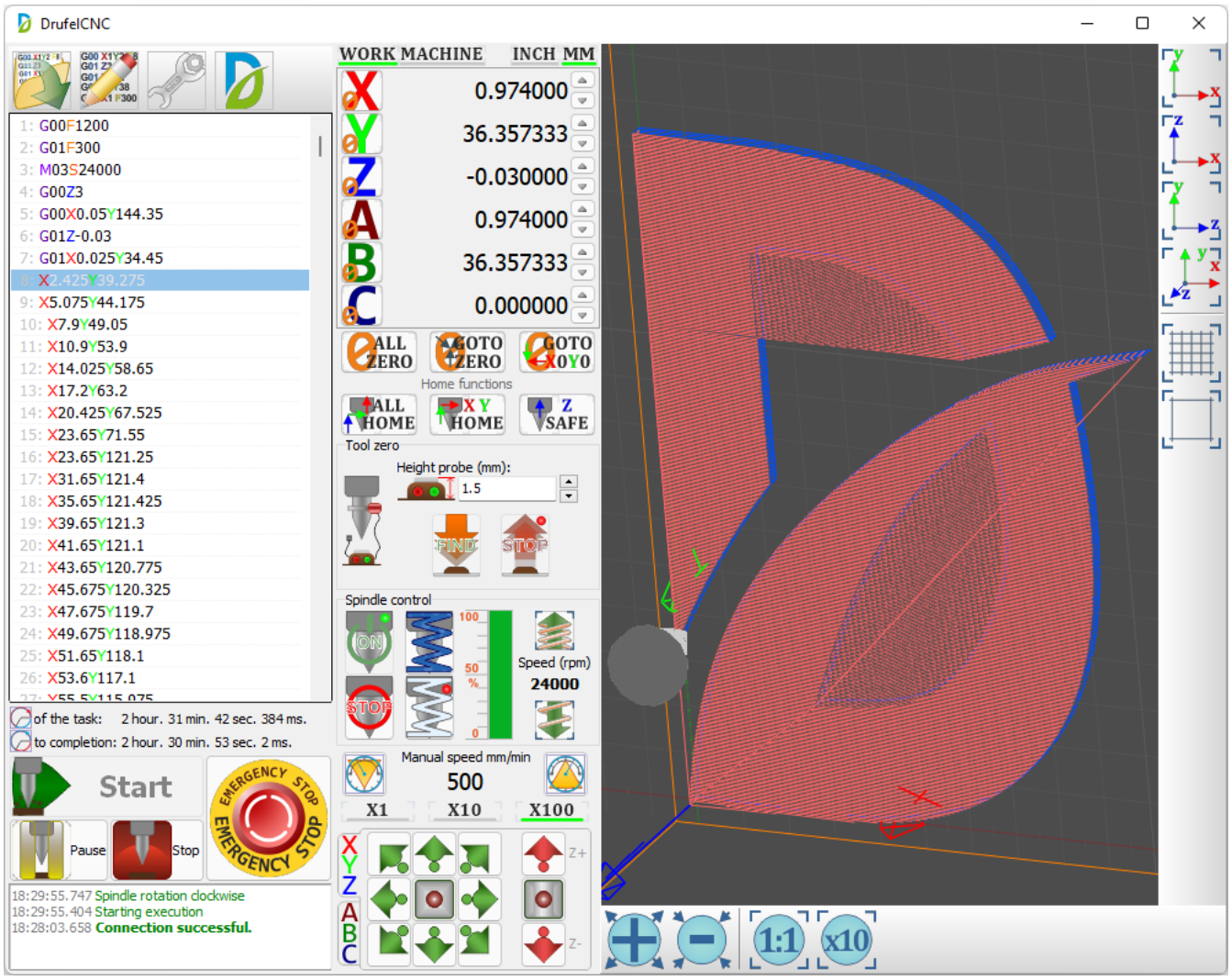
Movement order.

	Axis movement order. It takes values from **1** to **6**. You can also set "**-**" if you need not to use the coordinate.

5. Run the control program (G-code)

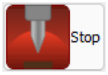
To run the control program in the language of G-code, you must click on the button with the image of the folder, then select the file or press edit button and write G-code manually.

If the file is recognized successfully, the three-dimensional model of the file will be displayed in the right part of the main window.

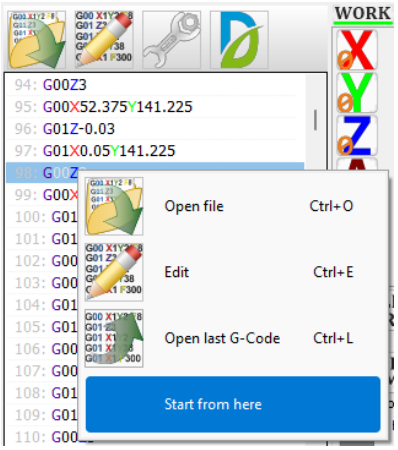


Use the following buttons to control the execution of the G-code file.

Start	Starting the execution of the G-code file.

	Pause the execution of the G-code file. During the pause, it is possible to move the axes, change the coordinate values.
	Stop executing a G-code file.
	Emergency stop.

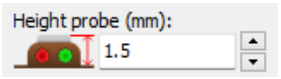
To start executing a G-code file from a specific line, highlight the line, open the mouse menu and click on the "Start from here" item.



6. Search tool zero

Tool zero search function, sets the Z-axis coordinate according to the beginning of the cutting part of the tool.

To begin searching for a tool zero, set the height of the probe used.



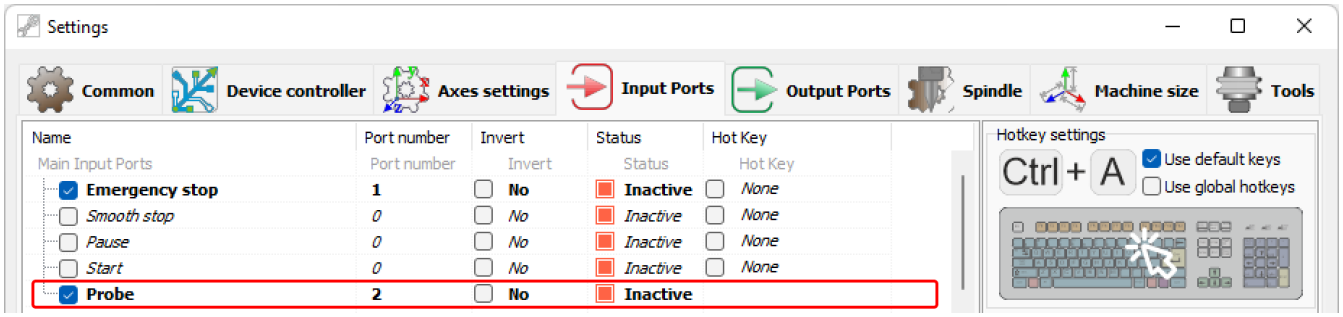
Press this button to start searching for tool zero.
Wait until the end of the process.

First you need to configure the input port number for the probe. The Z axis is assigned according to the value found and the height of the probe.

After completing the tool zero search, the tool will return to its original position.

To cancel the tool zero search, click this button.

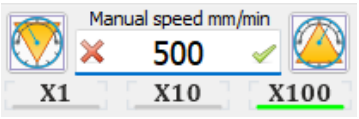
For the tool zero search to work correctly, you must set the input port number in accordance with the port number on the controller where your probe is connected. Set “Invert” so that the “Status” in the normal state of the Probe is “Inactive”.



7. Manual control

Manual control is available for the X, Y, Z, A, B, C axes. Manual control works if Emergency stop is inactive, G-code file execution is not running, or G-code file execution is paused.

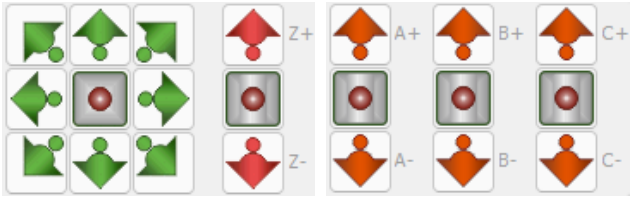
This field sets the speed of movement of the instrument during manual operation. C



	Speed decrease button.
	Speed increase button.
X1	1% of the set speed or minimum speed.
X10	10% of the set speed.
X100	100% of the set speed.

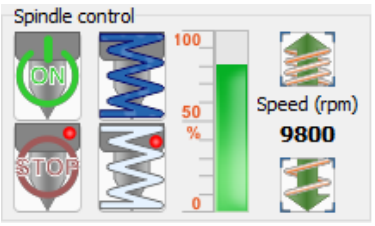
The current % speed is highlighted in green.

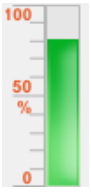
For manual control, press the corresponding joystick button.



8. Spindle control and cooling

In the main window, you can turn the spindle on and off, change the spindle speed, turn the cooling on and off.



	Spindle turn on button.
	Spindle off button.
	Button to increase the rotation of the spindle.
	Button to reduce the rotation of the spindle.
	To set the spindle speed, click on the progress bar area.
	Cooling turn on button.
	Cooling off button.

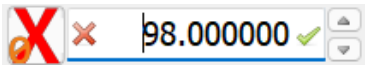
To control the spindle correctly, set up the output ports. Set the rated speed of the spindle.

9. Coordinates

Work coordinates and machine coordinates are available for display. Coordinates can be displayed in millimeters or inches.

To reset the axis coordinate to zero, click on the corresponding button depending on the selected axis.

If you need to change the value of the current coordinate, click on it. You will see a field for entering a new value for the coordinate.



	In the field that appears, enter a new value and click this button.
	To cancel the entry, click this button.
	Use the buttons to set more accurate coordinates.

To set the values of the remaining coordinates, use the same action algorithm.

Under the coordinates, a panel with auxiliary buttons is displayed.

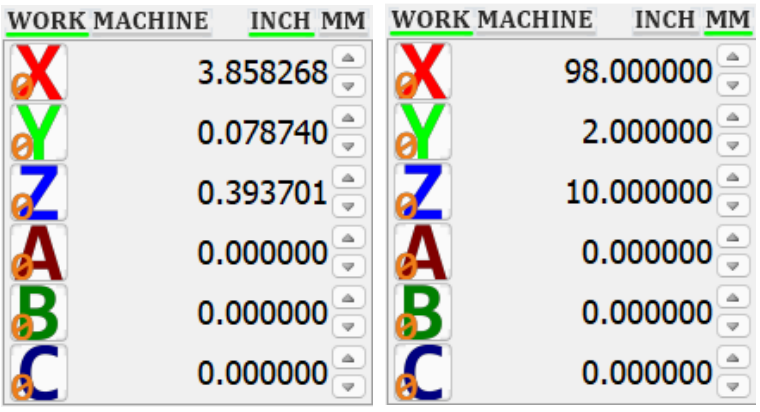
	To reset all **selected** coordinates, click on the button.
	To move the tool to zero **work** coordinates, click on the button.
	To go to the **work** coordinates X0 and Y0, click on the button.
	Movement to the home position on all axes depending on the settings.
	Movement to the home position on X and Y axes depending on the settings.
	Movement to the home position on Z axes, only moves up.

9.1. Measurement system

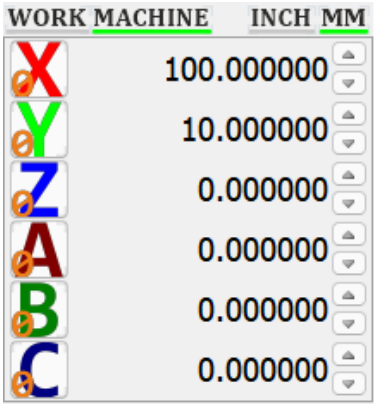
The default system of units is millimeters. To set the units in inches, click.

To set the system of units in millimeters, click.

The current coordinate system is highlighted in green.



9.2. Machine coordinates

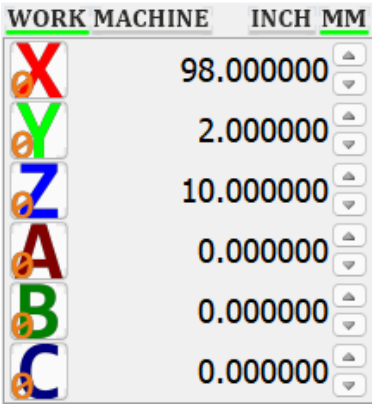


The machine coordinates are the actual coordinates of your axes.

These coordinates are used to define the limits and dimensions of the machine.

If machine coordinates are activated for display, they are highlighted in green.

9.3. Work coordinates



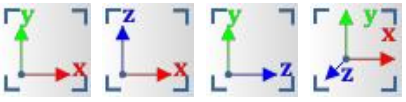
Work coordinates are relative to machine coordinates.

These are the coordinates at which the g-code is executed by default.

If work coordinates are activated for display, they are highlighted in green.

10. Display 3D model

The code you downloaded is displayed as a 3D model on the right side of the application window. To rotate the 3D model, move the mouse pointer to the display area of the 3D model. Right-click and hold to move the mouse pointer. You can also use additional buttons.

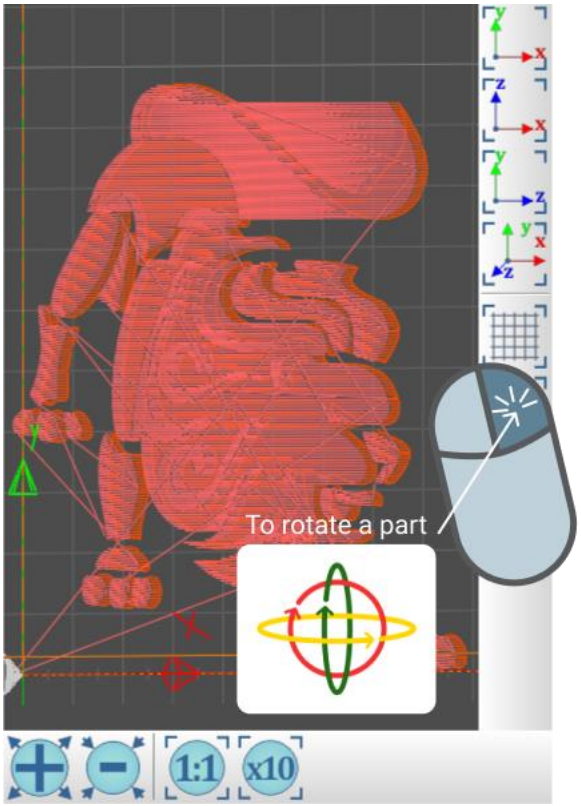


To zoom the 3D model, use the mouse wheel or buttons.

To move the model in the plane, use the left mouse button.

	To turn on the grid, click on the button.
	In order to turn off the grid, click on the button. Grid enabled by default.

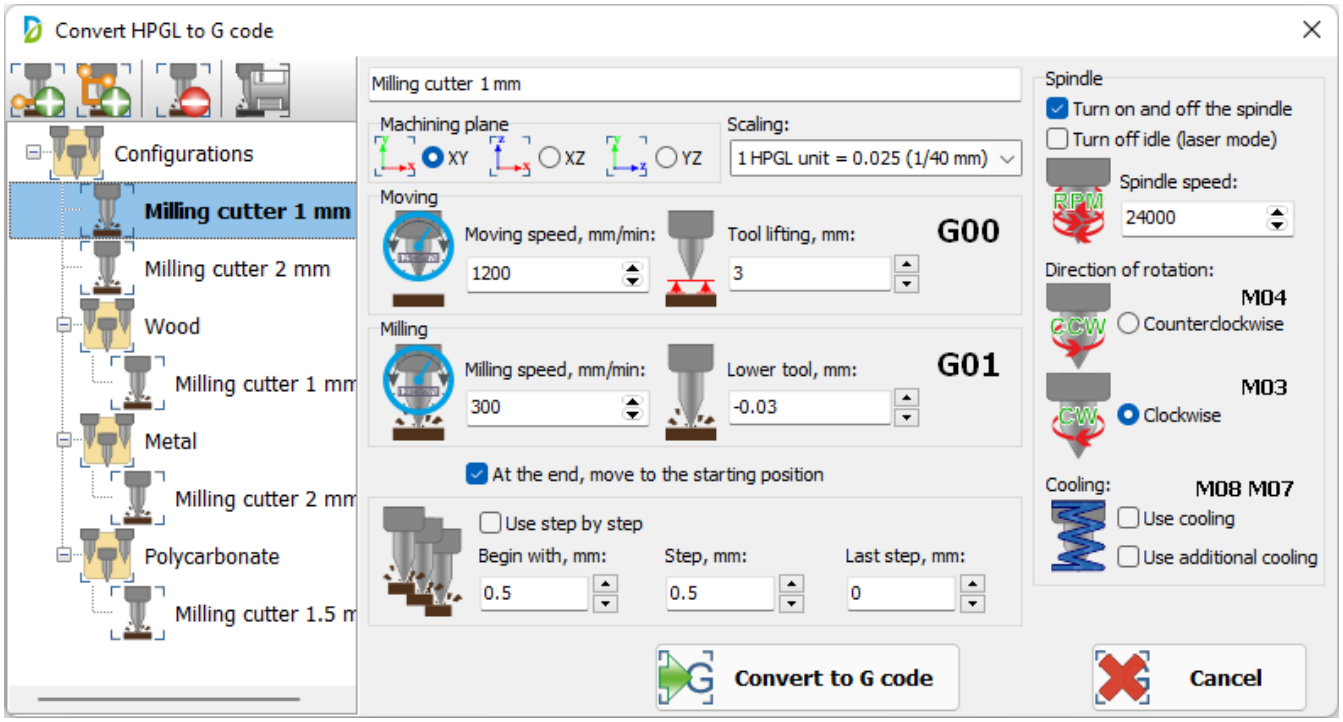
You can rotate the model by holding down the right mouse button.



11. Opening HPGL files

To open files in HPGL format, you must click on the button with the image of the folder, then select the HPGL file.

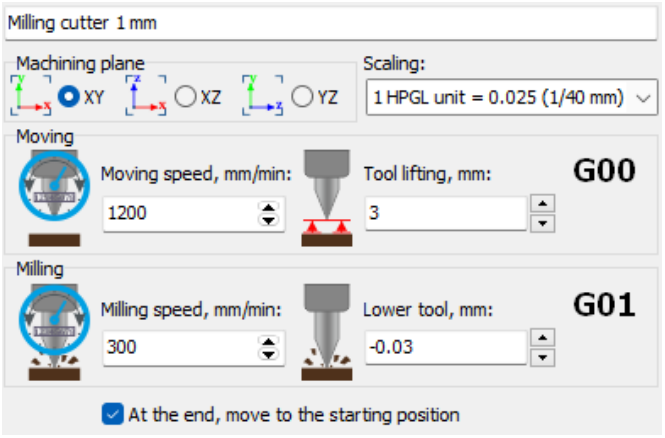
In the window that opens, you must select the parameters for converting HPGL to G-code.

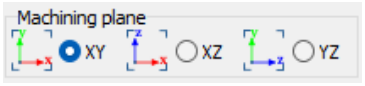
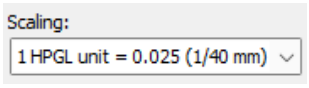
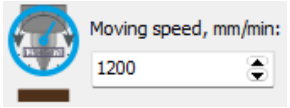
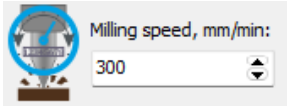
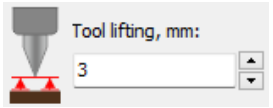
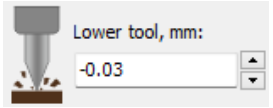


After successful conversion, you will see a three-dimensional model of the file.

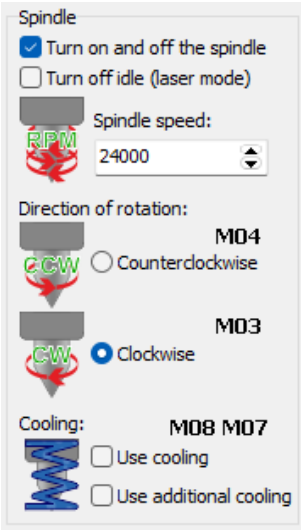
	Add template.
	Add child template.
	Delete template.
	Save templates.

11.1. Basic parameters of the HPGL file converter



	The plane in which the HPGL file will be executed.
	The scale corresponds to one HPGL unit per millimeter.
	Tool travel speed without milling. Moving between milling areas.
	The speed at which the tool moves when milling. Model milling speed.
	Tool position when moving to the milling area.
	Tool position when milling the model.

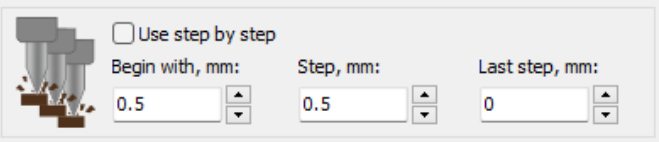
11.2. Spindle settings of HPGL file converter

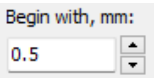
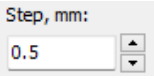
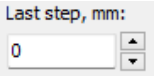


Turn on and off the spindle	The spindle will turn on when the HPGL file starts executing, the spindle turns off when the HPGL file finishes executing.
Turn off idle (laser mode)	The spindle will only work when milling. This setting is suitable for laser or plasma operation.
Spindle speed: 24000	The spindle speed while executing the HPGL file. When using a laser, sets the laser power.
M04 Counterclockwise	The direction of rotation of the spindle is counterclockwise when executing the HPGL file. Corresponds to command M04.
M03 Clockwise	The direction of rotation of the spindle is clockwise when executing the HPGL file. Corresponds to command M03.
Cooling: M08 M07 Use cooling Use additional cooling	Cooling will be turned on before executing the HPGL file. Corresponds to commands M08 and M07.

11.3. Use step by step

With the help of "Use step by step" you can set up step-by-step milling (cutting) of models. This will reduce the negative impact on the cutter.

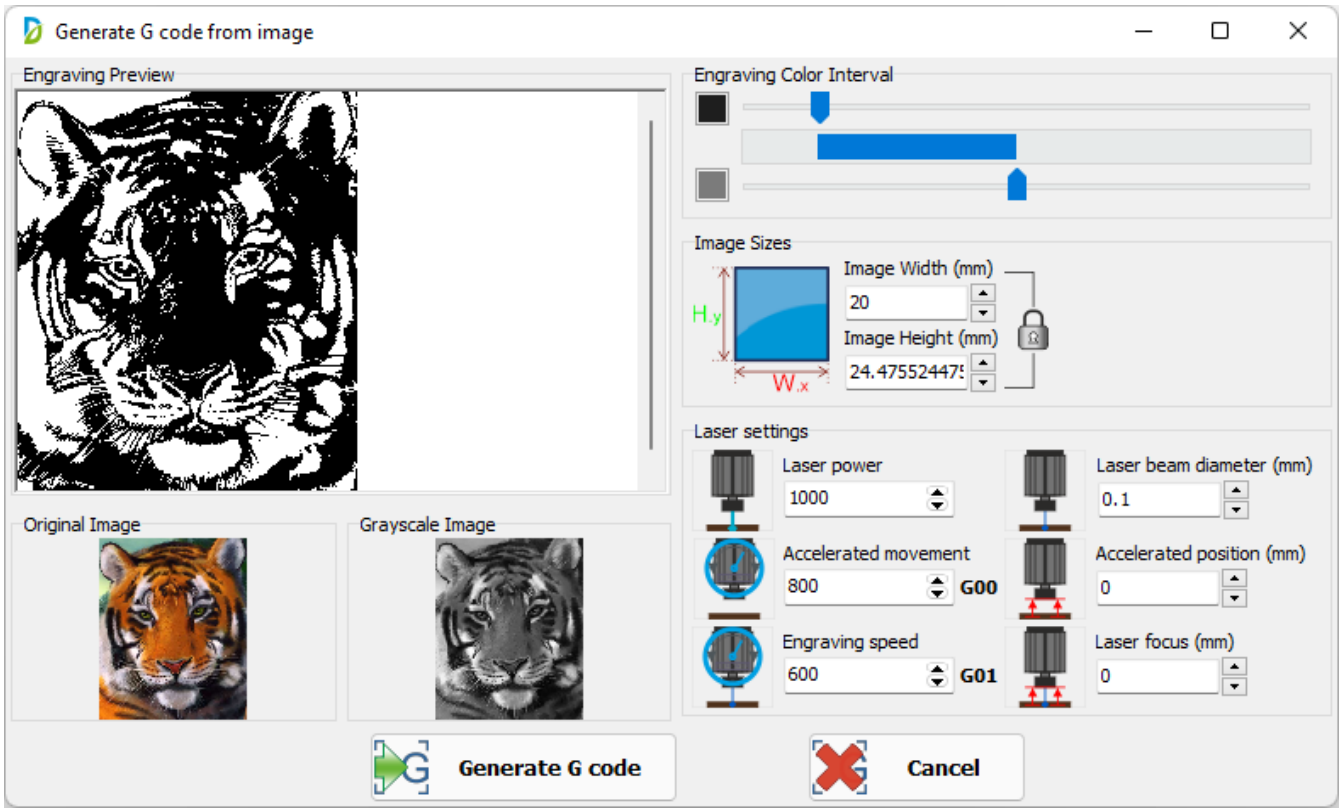


	After this axis position, the step milling algorithm will start. For example after Z = 0.5 mm.
	The cutter will move this distance after each cycle through the entire HPGL file. For example, 0.5 mm.
	If necessary, you can set a fixed distance for the last step.

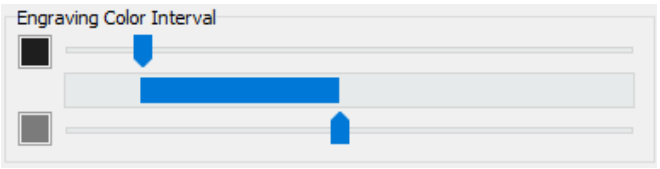
12. Generating a G-code from an image

To open a file in the format (png, jpeg, gif, bmp), you must click on the button with the image of the folder, or select the necessary file and transfer it to the G-code field.

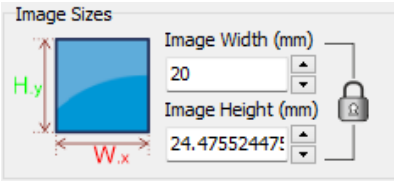
In the window that opens, you must select the options for converting the image into a G-code.



In the engraving color interval block, you can adjust the color interval.

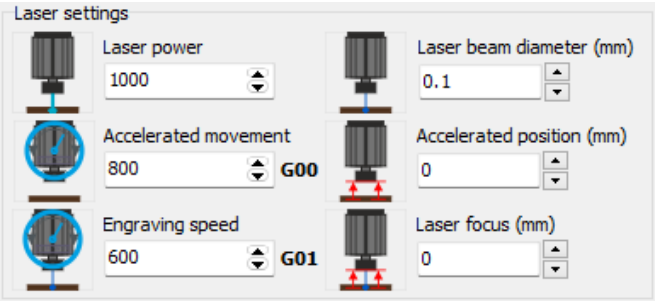


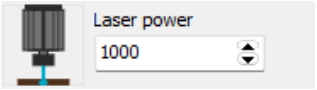
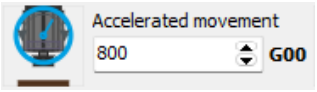
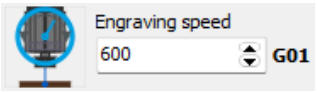
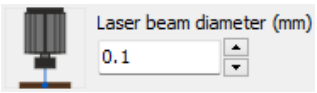
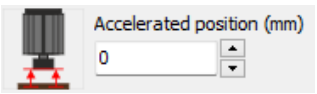
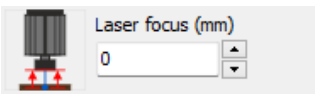
In the Image Sizes block, you can adjust the image size.



	Proportional image resizing.
	Not proportional image resizing.

In the Laser Settings block, you can configure the laser settings.



	Laser power setting.
	Accelerated motion setting (G00).
	Engraving speed setting.
	Laser beam diameter adjustment (mm).
	Accelerated position adjustment (mm).
	Laser focus adjustment.