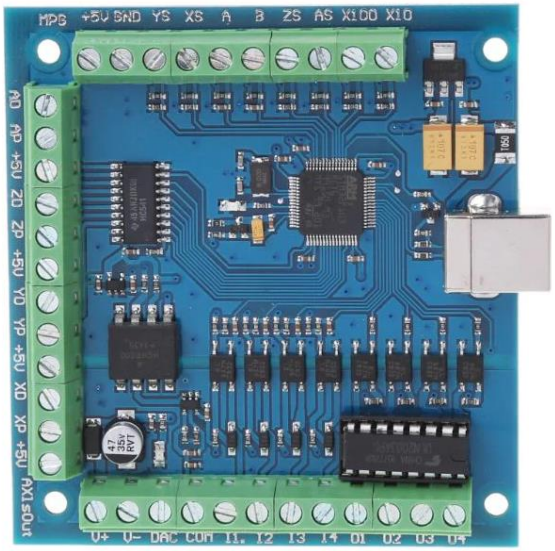
DrufelCNC

DrufelCNC USB Motion Card (STB4100) Installation Manual



DrufelCNC, 2021

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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: social@drufelcnc.com. Document version - V.1.17.

NOTICE OF LIABILITY

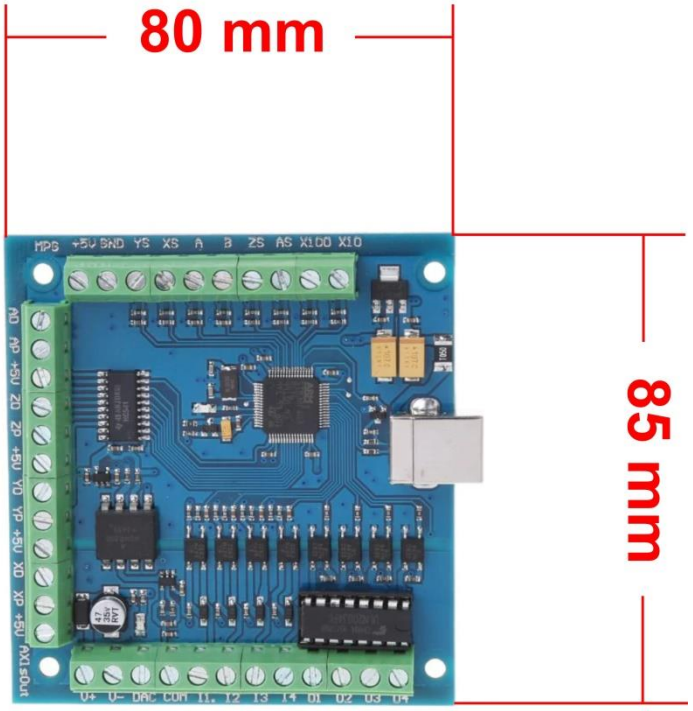
Using any CNC machine is a dangerous operation. All precautions must be taken, as the machines may turn on at any time, the software MAY malfunction at any time, any user of the Software must understand and take this into account, and must immediately uninstall the Software and not proceed with the installation 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. Features

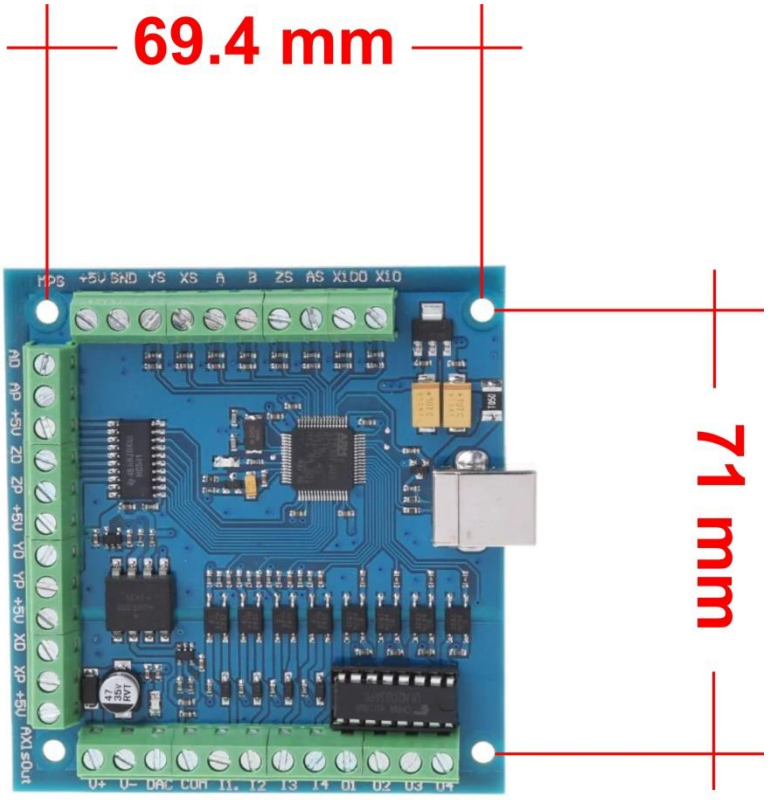
- Support for CNC controlled 4-Axis, can connect five stepper motor drivers or servo drives.
- Maximum step-pulse frequency is 100KHz,which is suitable for the servo or stepping motor.
- 4 general-purpose opto-couplers isolation input : can connect the limit switch, emergency stop switch, auto tool zero, home switch etc.
- Support for connecting electronic handwheel.
- Have 0-10V signal output, you can use mach3 software to control the spindle motor speed.
- 4 general-purpose isolated relay drive output interface, can drive four relays for controlling the spindle starts, forward rotating and reverse rotating, pumps or other device.
- 1 status LED, indicate connection status on the board.
- Support for the operating system Windows XP, Windows 7 (32 / 64bit), Windows 8, Windows 10.
- Applicable to all versions of DrufelCNC software.

2. Appearance

The products overall size is 80mm*85mm.

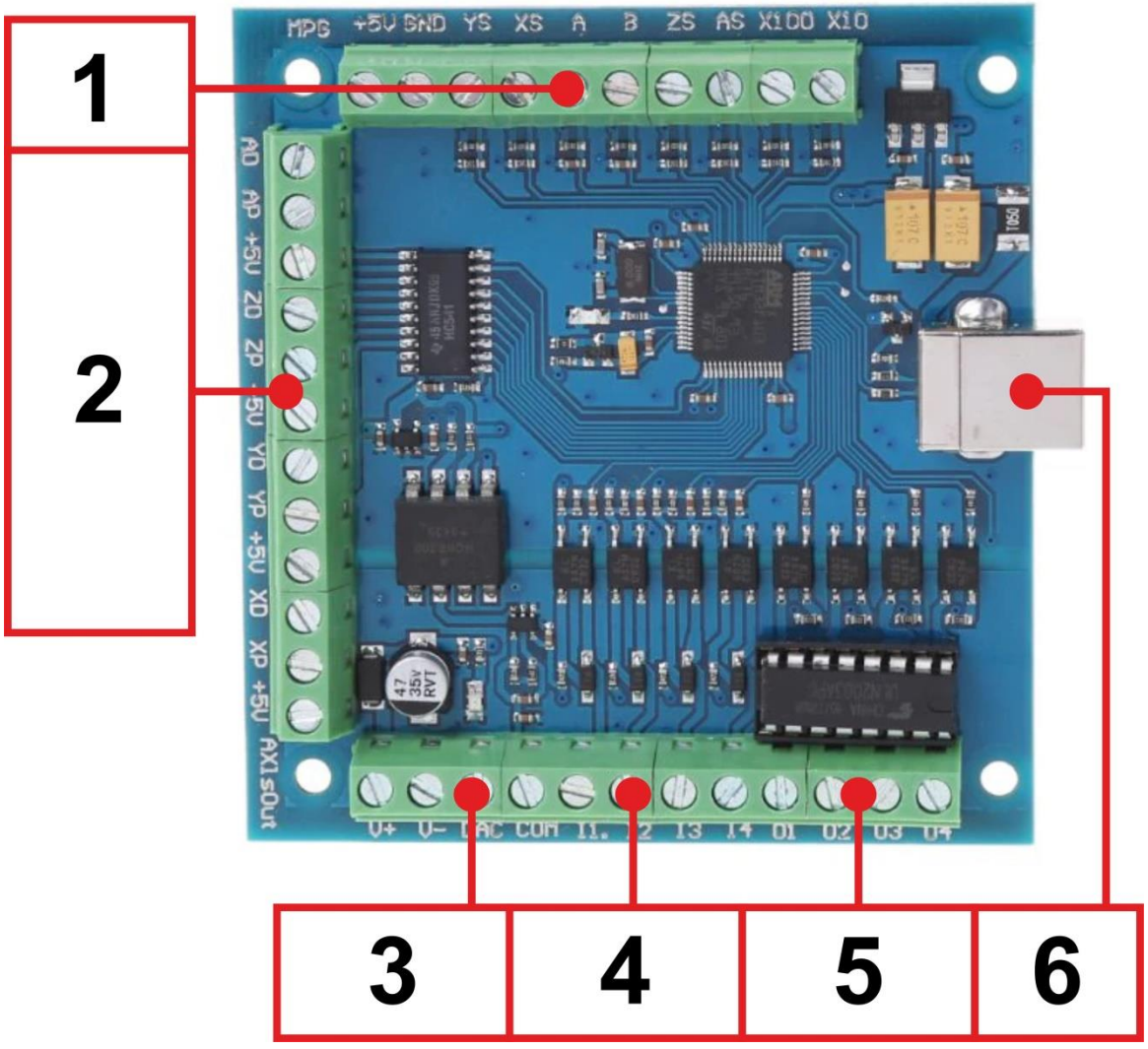


The bottom install size is 69.4mm*71mm.



3. Product connection define and method

The controller connection includes a power supply interface, a USB connection interface, an MPG interface, a Stepper / Servo control output interface, a spindle control output interface, Estop and a limited switch input and tool settings interface and so on.



1 – MPG Interface.

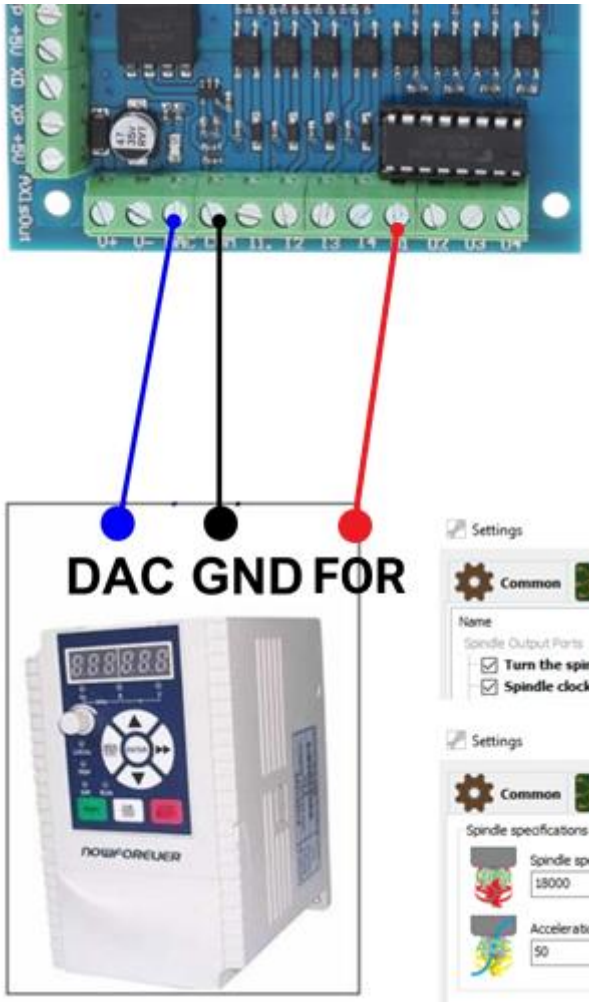
2 - Stepper motor control interface.

Mark	Description
+5V	+5V Driver signal common
XP	X Axis Pulse signal

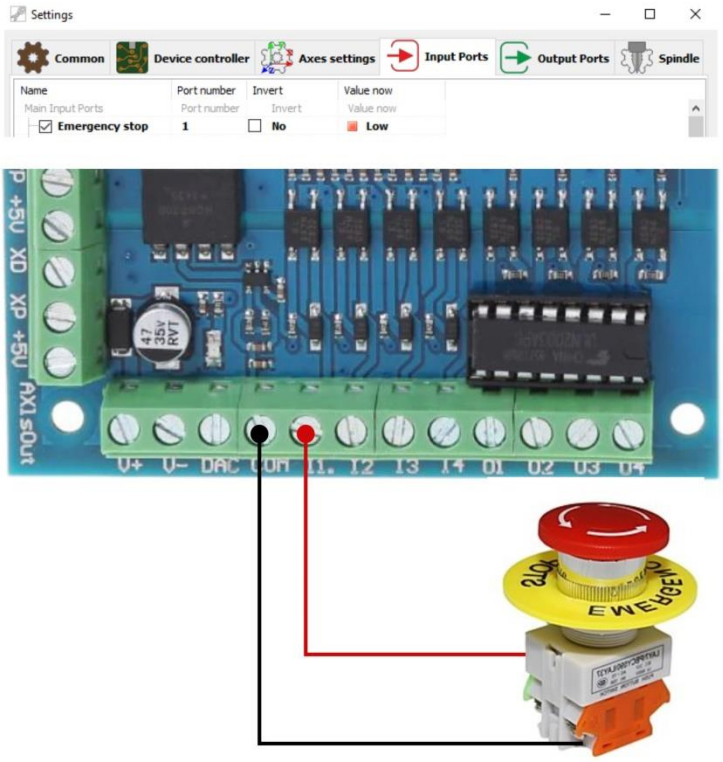
XD	X Axis Direction signal
YP	Y Axis Pulse signal
YD	Y Axis Direction signal
ZP	Z Axis Pulse signal
ZD	Z Axis Direction signal
AP	A Axis Pulse signal
AD	A Axis Direction signal
BP	B Axis Pulse signal
BD	B Axis Direction signal
EN	All Axis Enable signals
Mark	**Description**
V+	Positive power supply 12-24V
V-	Negative power supply 0V
FWD	Inverter Control signal: Start/Forward
AVI	Inverter Control signal:0-10V Speed control signal
GND	GND=V-=0V
PWM	PWM Signal
Mark	**Description**
COM	COM=V-=GND=0V
I1	Input signal interface 1
I2	Input signal interface2
I3	Input signal interface3
I4	Input signal interface 4
I5	Input signal interface 5
O1	Output signal interface 1
O2	Output signal interface 2

O3	Output signal interface 3
O4	Output signal interface 4
Mark	**Description**
12-24V LED	Power input indication LED
PWR LED	USB power indication LED
MPG	MPG Hand wheel interface

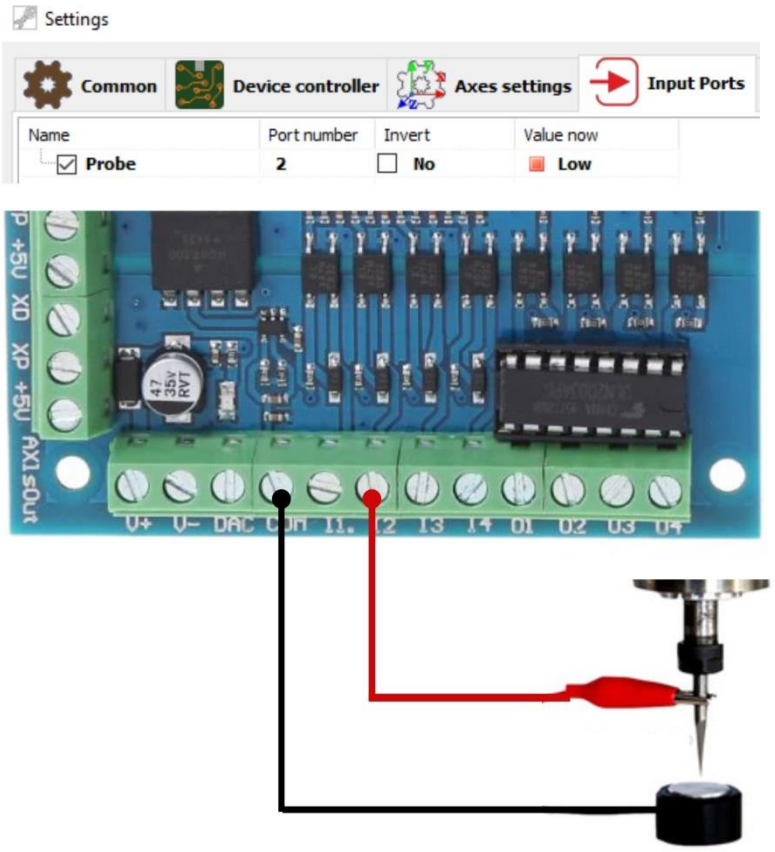
3 - Spindle Control Output Port.



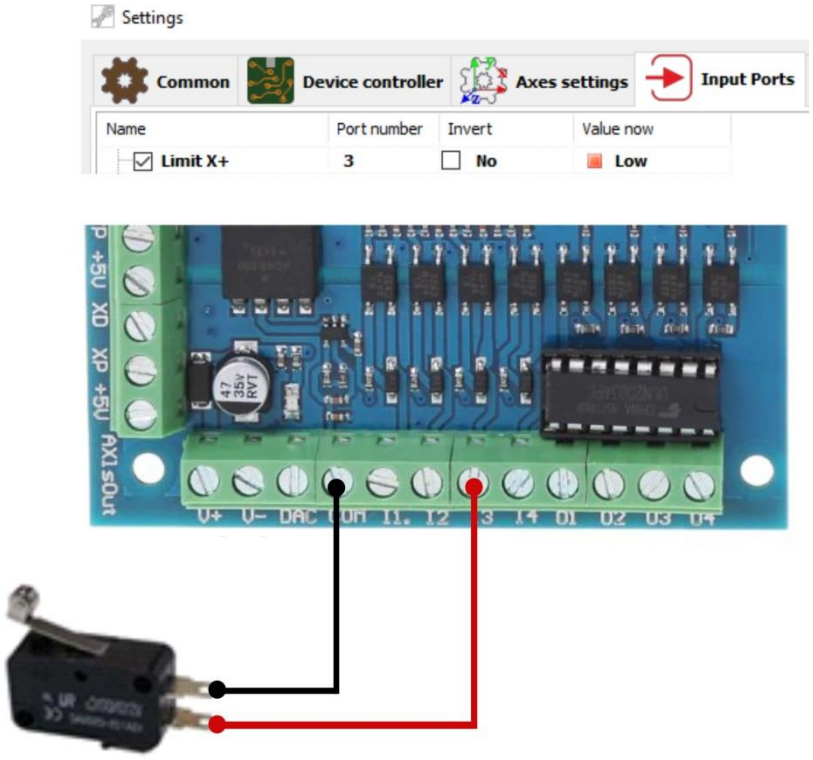
4 - Input Ports. Estop input connection



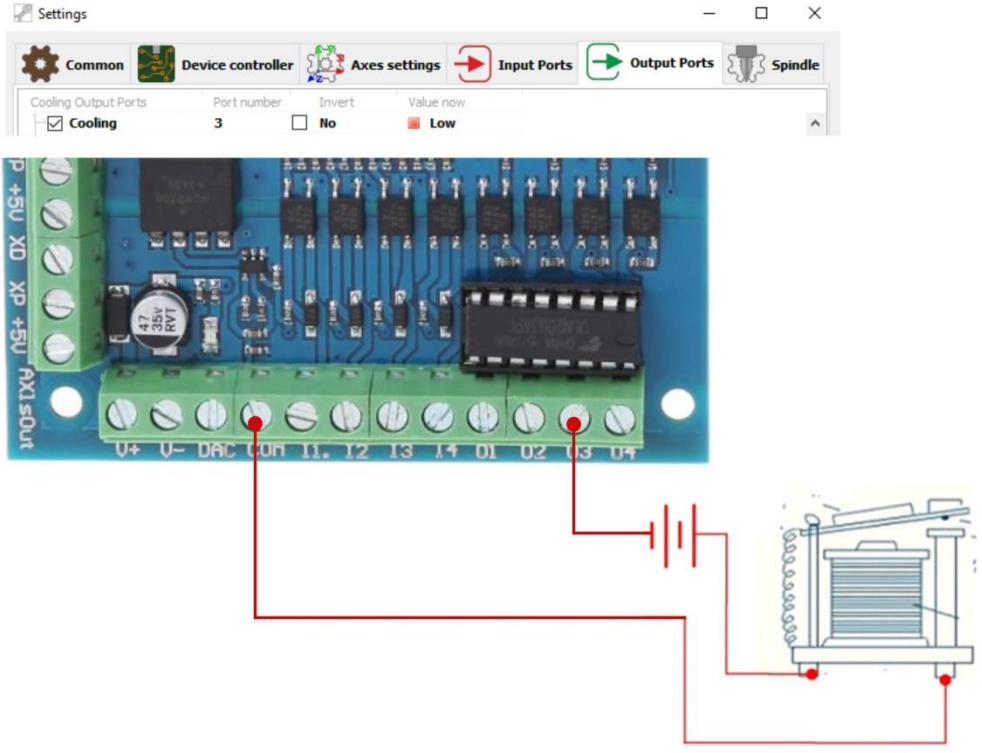
Probe input connection



End switch input connection

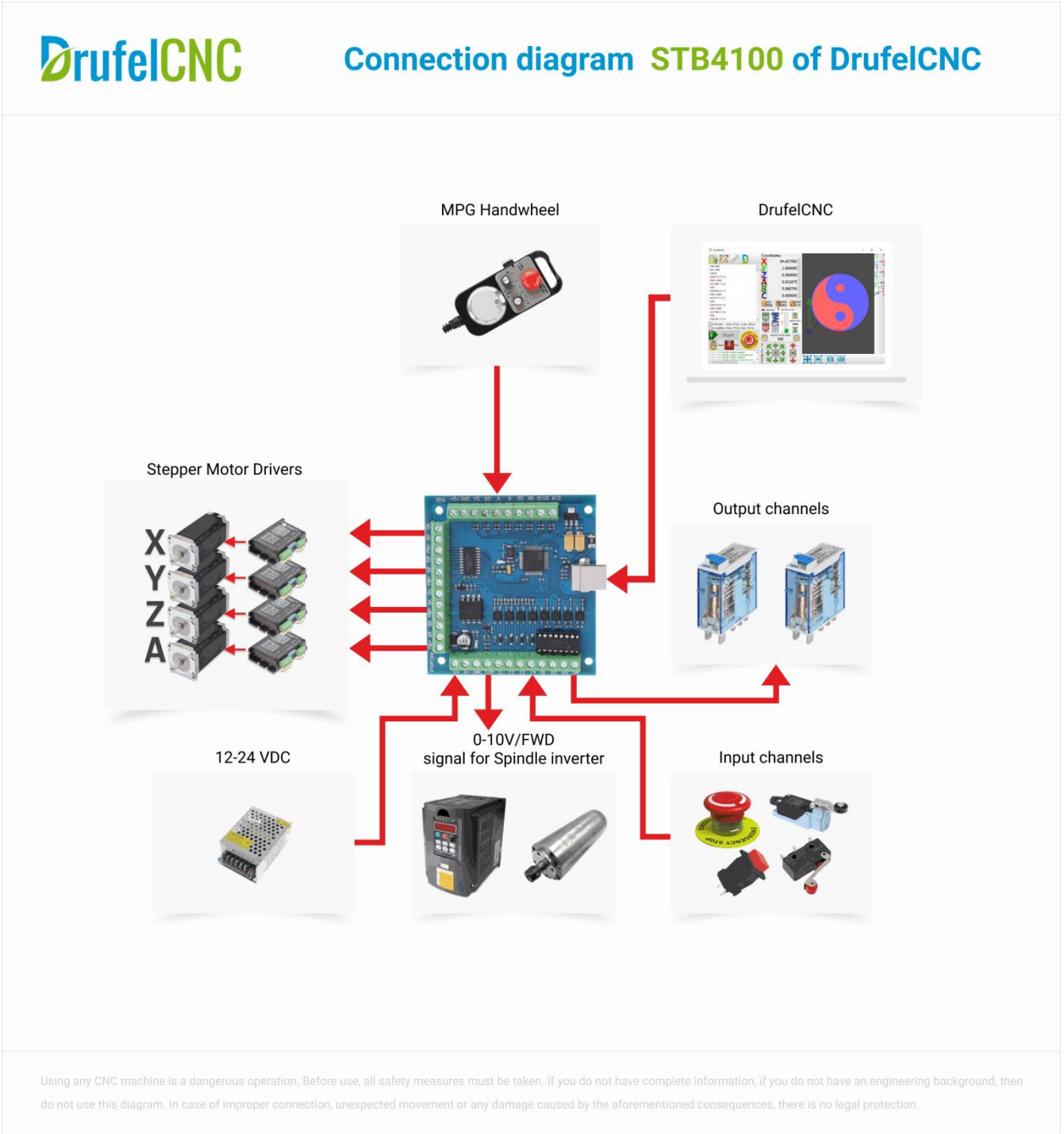


5 - Common IO output interface

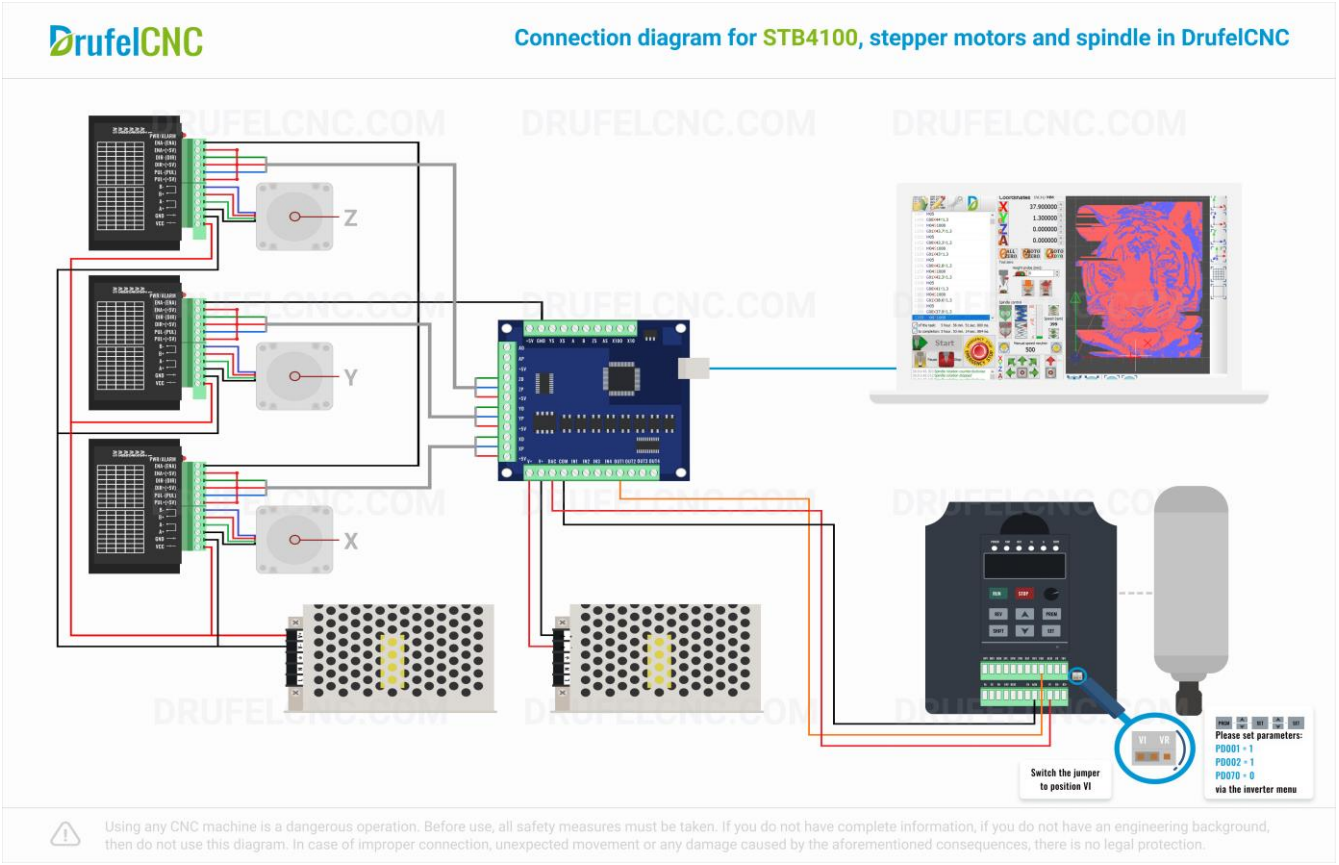


6 - USB Port.

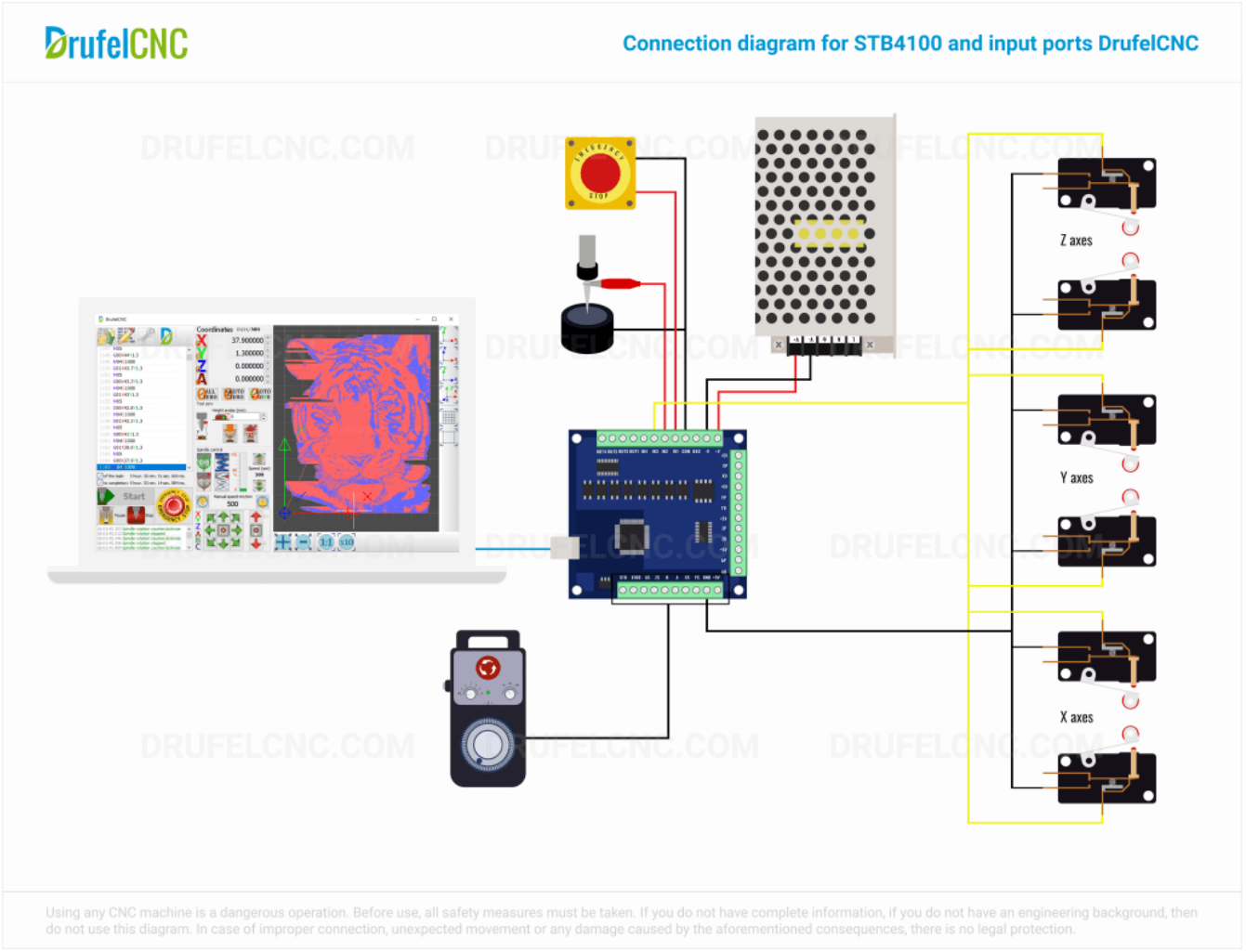
4. Basic connection diagram



5. Connection diagram stepper motors and spindle



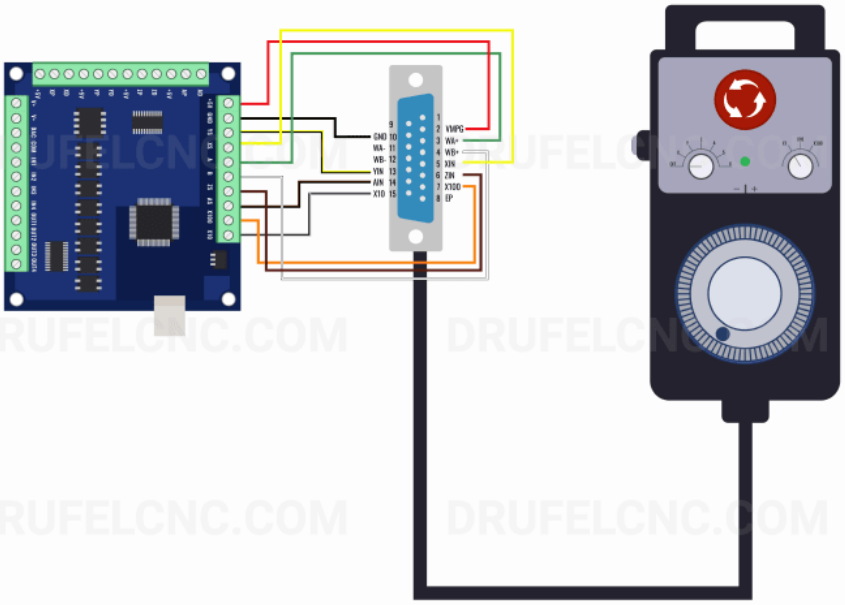
6. Connection diagram input ports



7. Connection diagram MPG

DrufelCNC

Connection diagram MPG to STB4100



Using any CNC machine is a dangerous operation. Before use, all safety measures must be taken. If you do not have complete information, if you do not have an engineering background, then do not use this diagram. In case of improper connection, unexpected movement or any damage caused by the aforementioned consequences, there is no legal protection.

8. Installing DrufelCNC

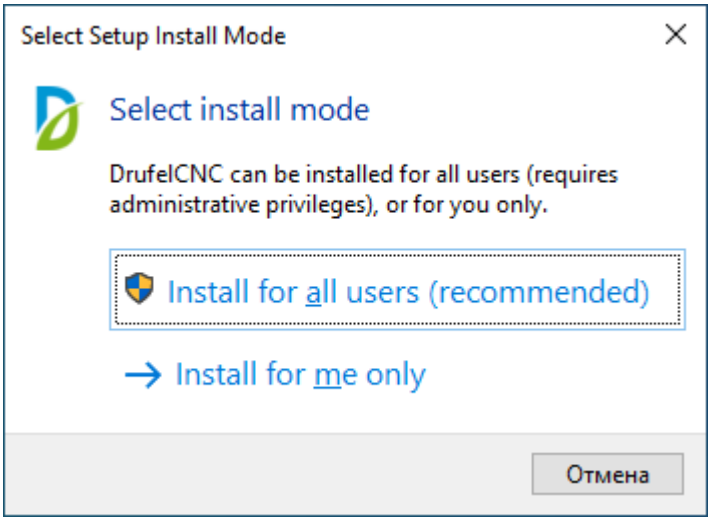
To install the program you need to download the installation files on the official website www.drufelcnc.com. You can use one of the following files:

- 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.

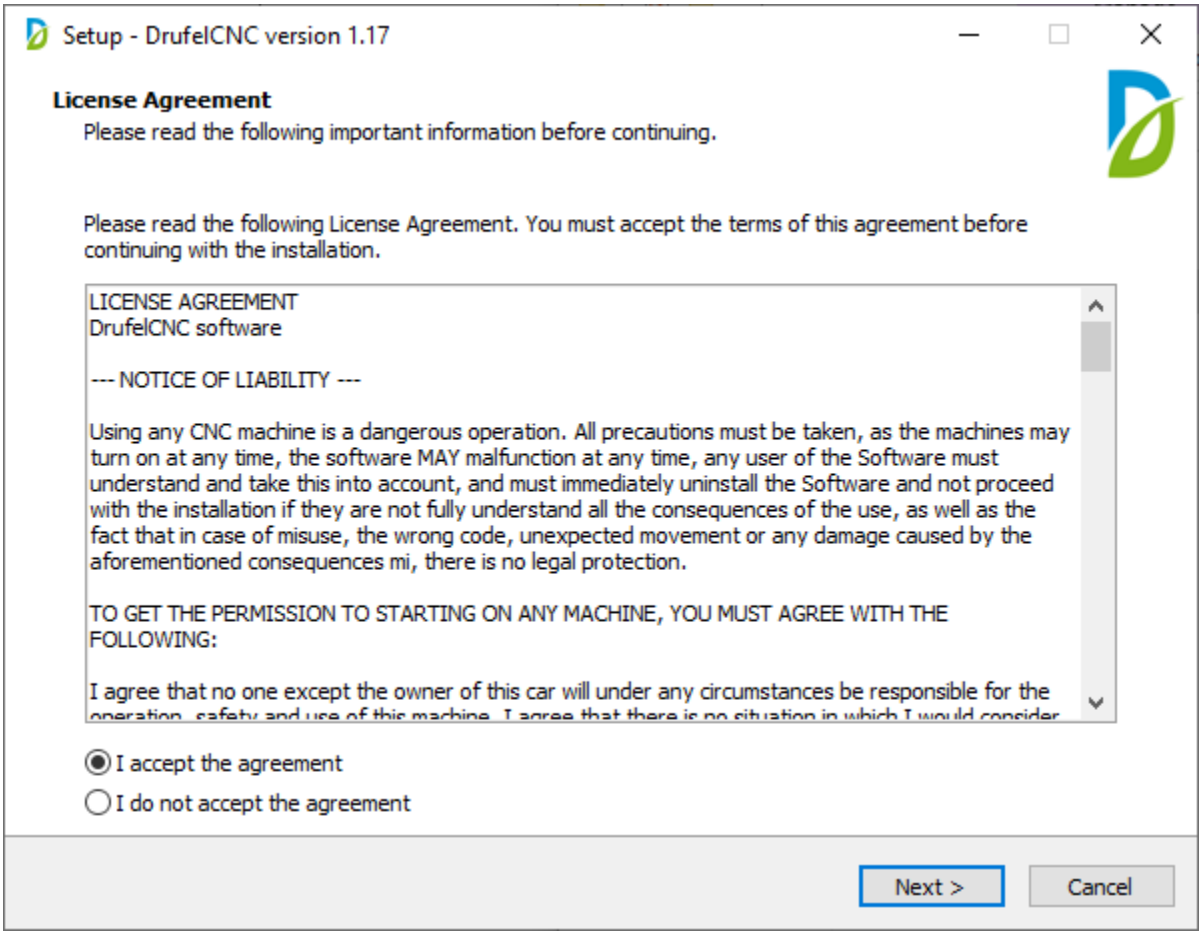
Run the desired file and follow the installation instructions.

Description of the installation process

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

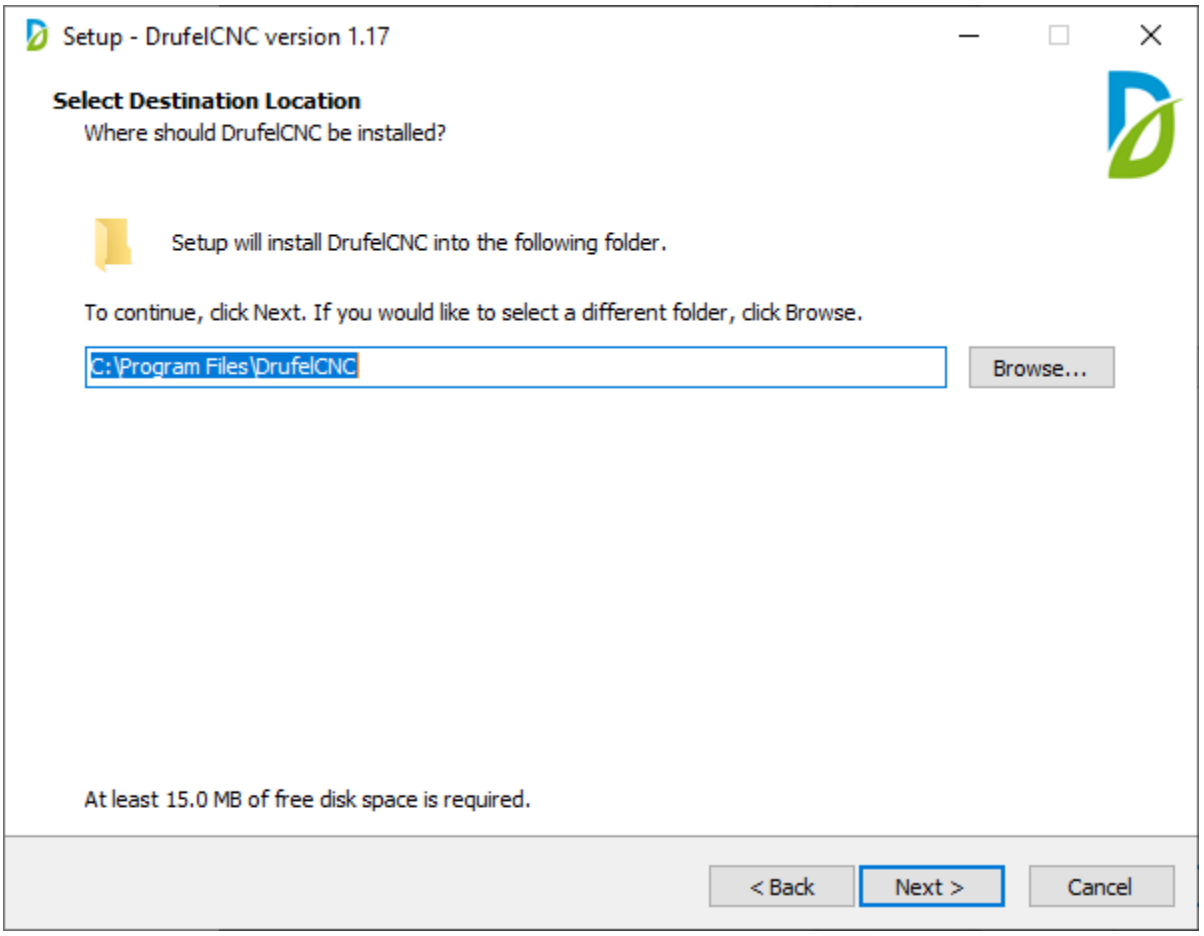


2. *License Agreement.* The License Agreement installation window contains the text of the license agreement for the use of the DrufelCNC software product. Please read the agreement and select "I accept the terms of the license agreement". To continue the installation, click "Next." During the entire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

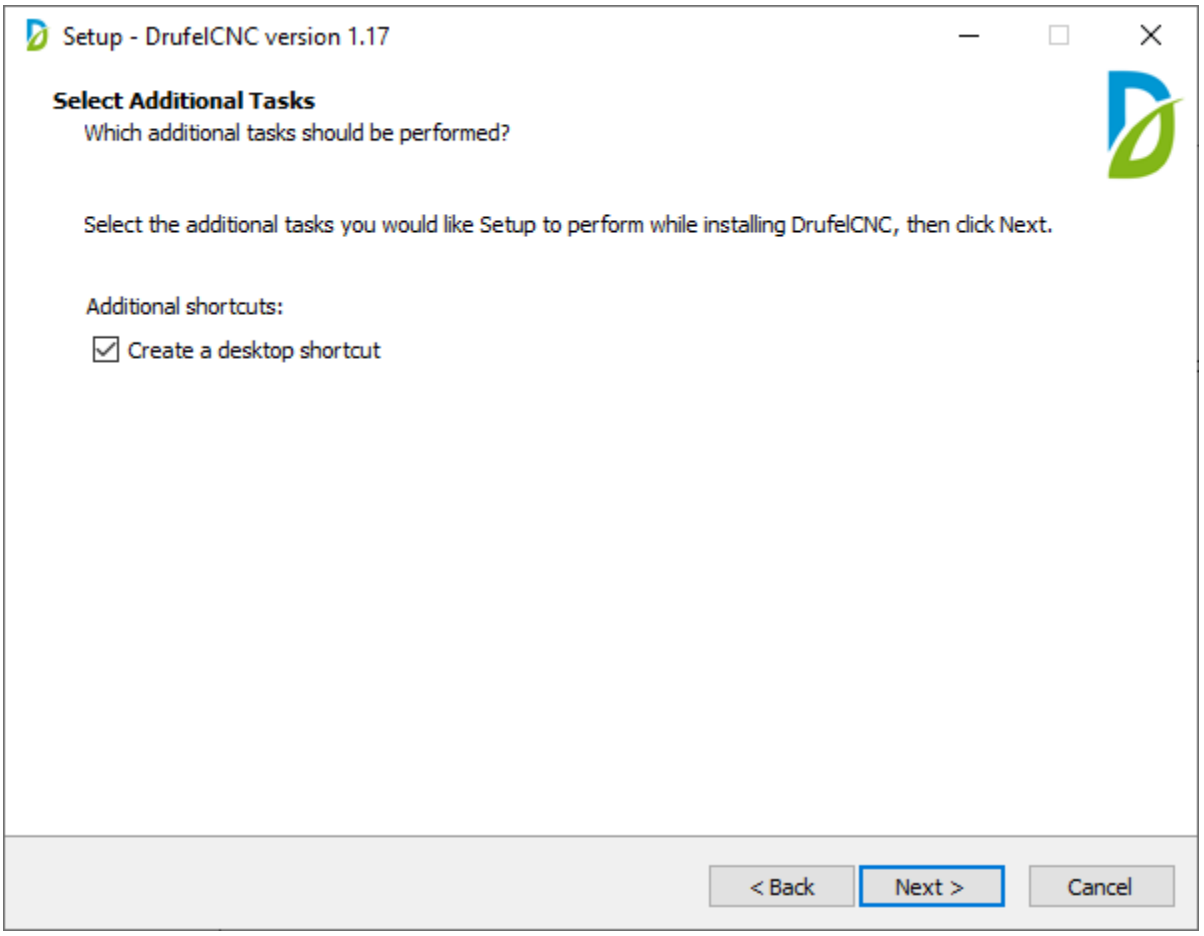


3. *Select the directory in which the installation will be made.* At this stage of the installation, you must specify the directory in which DrufelCNC will be installed. The default installation directory is "C:\Program Filies\DrufelCNC".

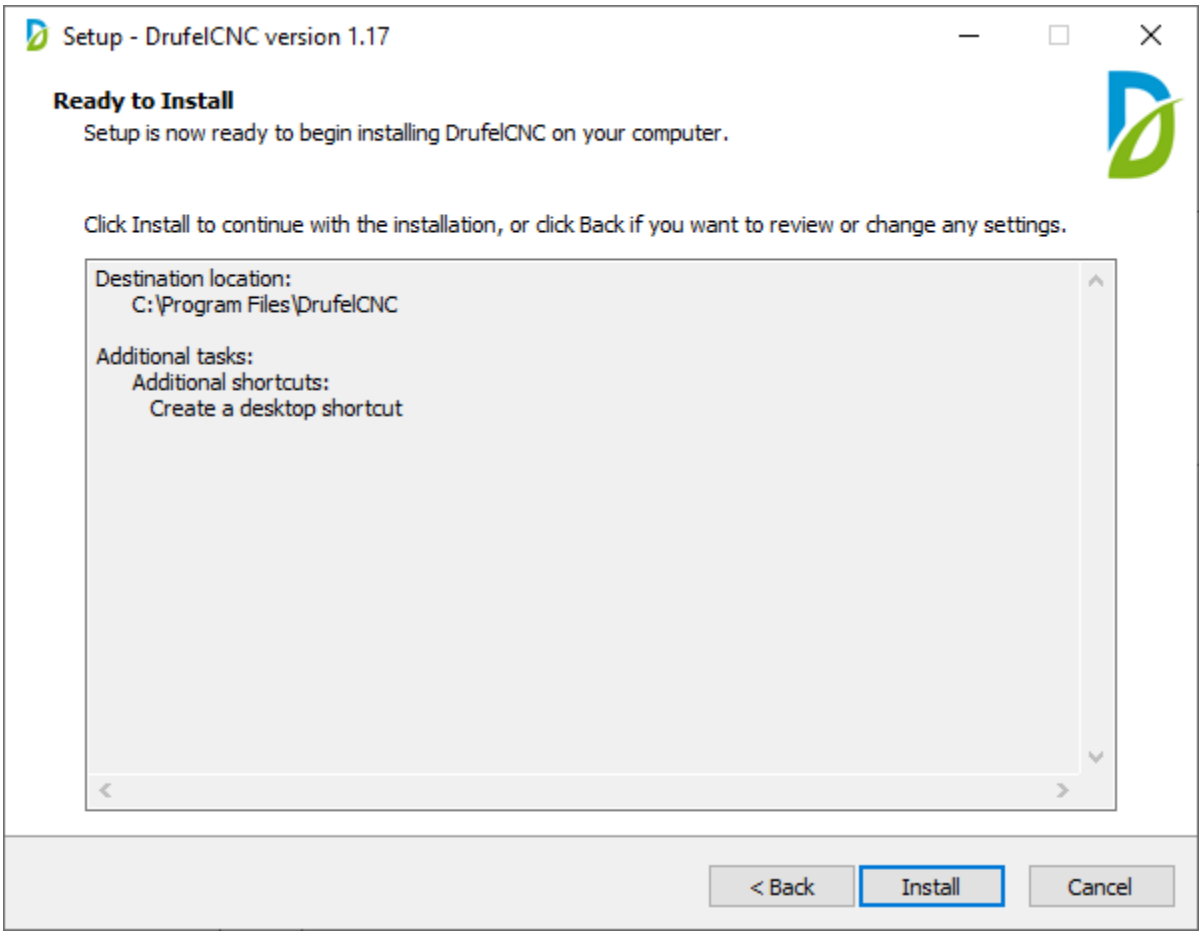
If you wish, you can specify any other path. Depending on the version of Windows, the default path may be different. To continue the installation, click "Next."

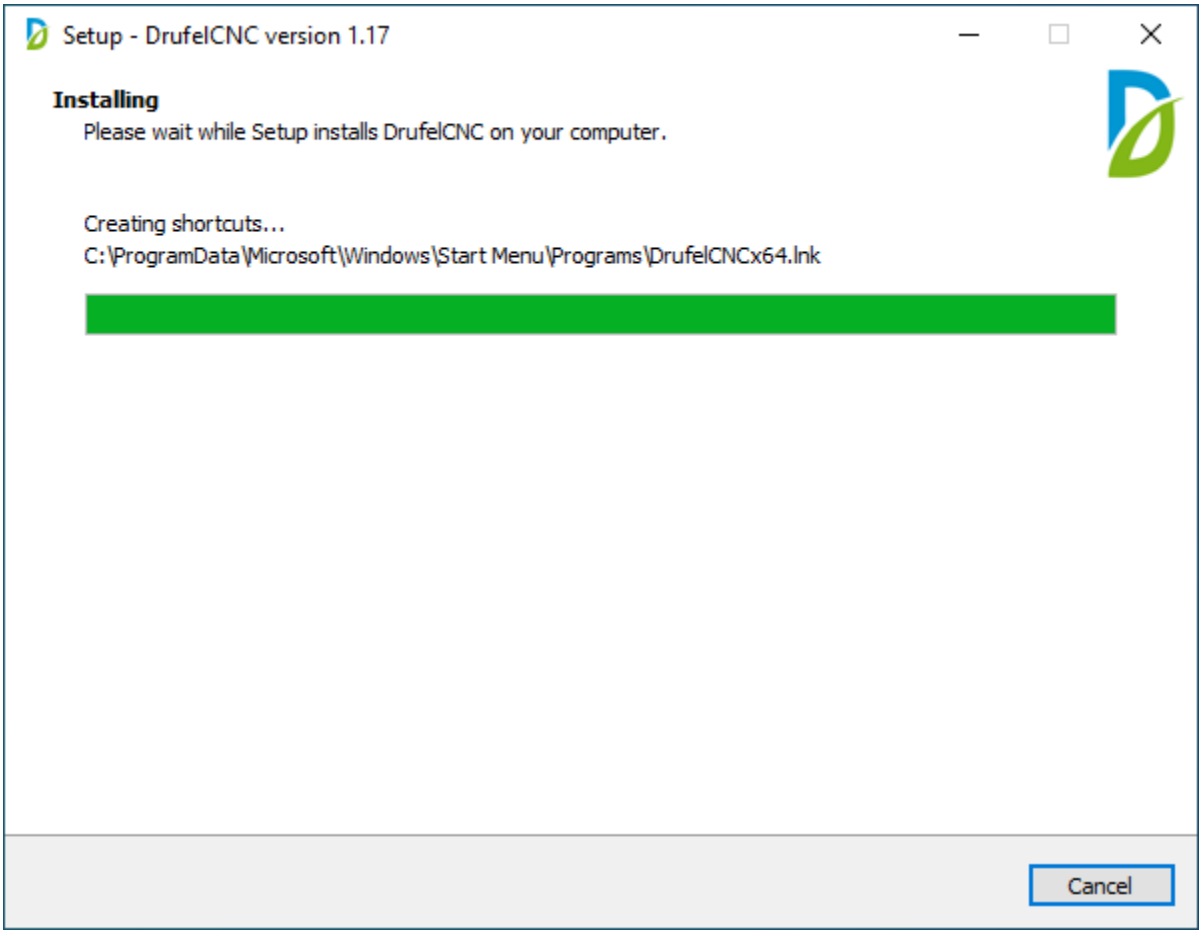


4. *Selection of additional installation parameters.* At this stage of installation, it is necessary to determine the need to create program shortcuts on the desktop. By default, a program shortcut will be created. To continue the installation, click "Next."

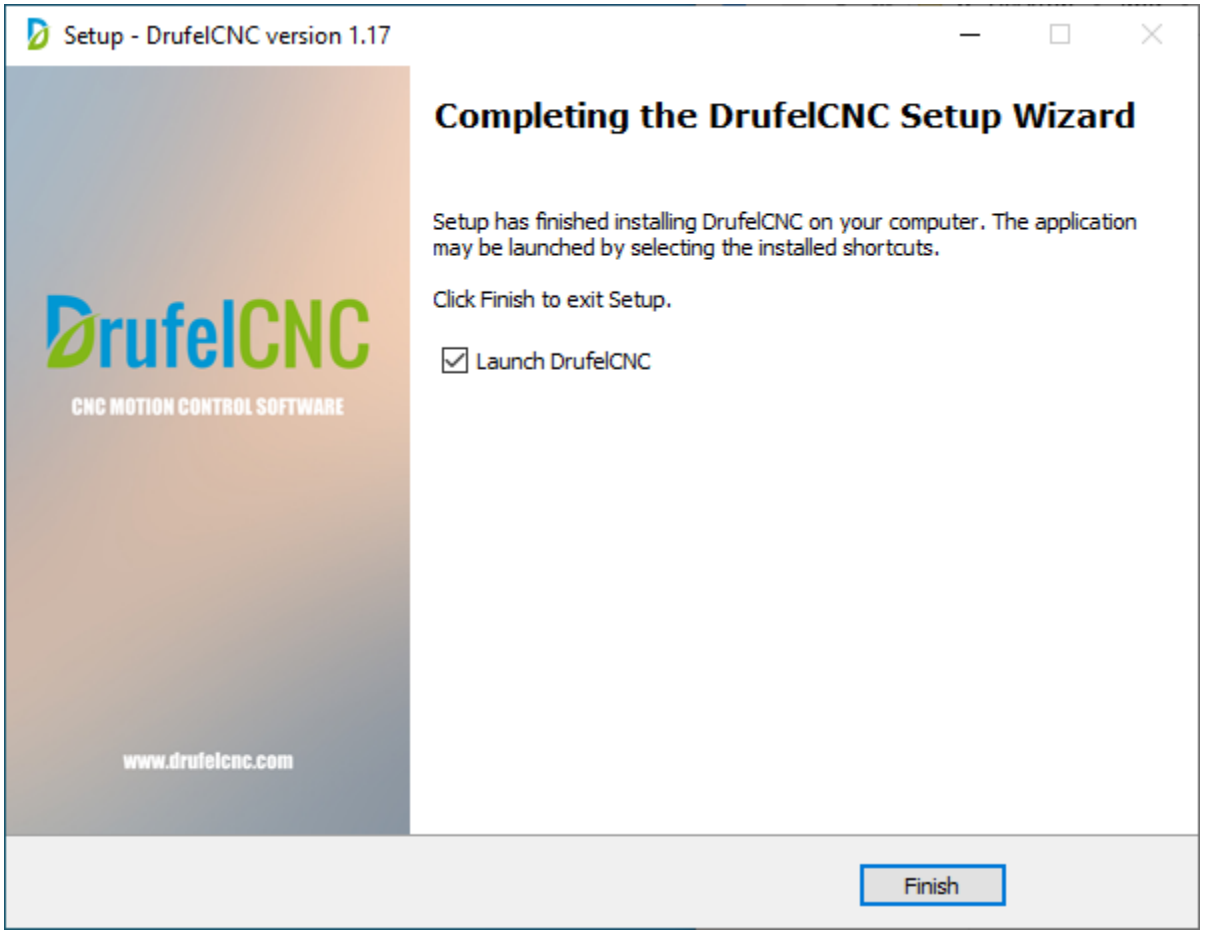


5. *Preparing for installation.* A window with information about the selected installation type, selected components and installation directory will be displayed. Check the information and click "Install."

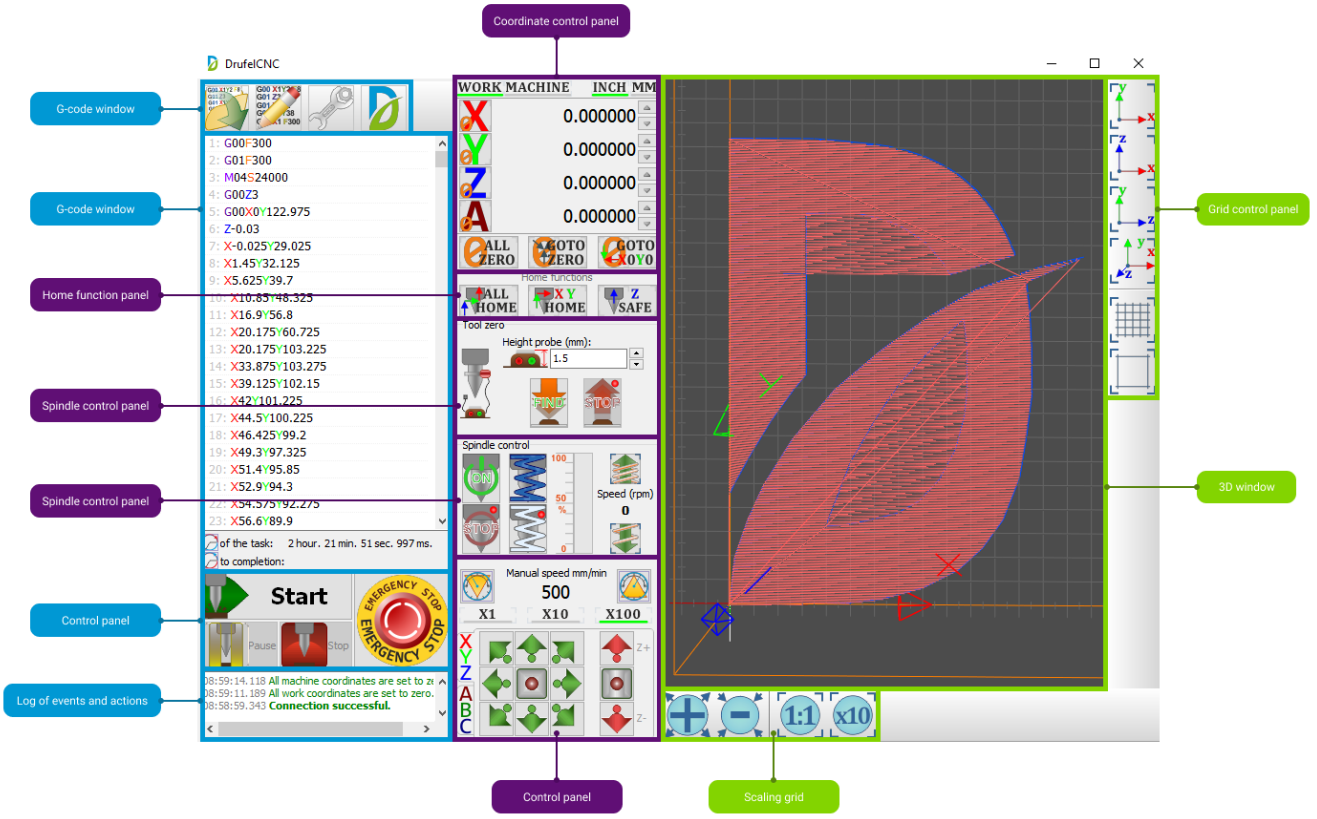

Setup - DrufelCNC version 1.17
Ready to Install
Setup is now ready to begin installing DrufelCNC on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\Program Files\DrufelCNC
Additional tasks:
Additional shortcuts:
Create a desktop shortcut
< Back
Install
Cancel


Setup - DrufelCNC version 1.17
Installing
Please wait while Setup installs DrufelCNC on your computer.
Creating shortcuts...
C:\ProgramData\Microsoft\Windows\Start Menu\Programs\DrufelCNCx64.lnk
Cancel

6. *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.



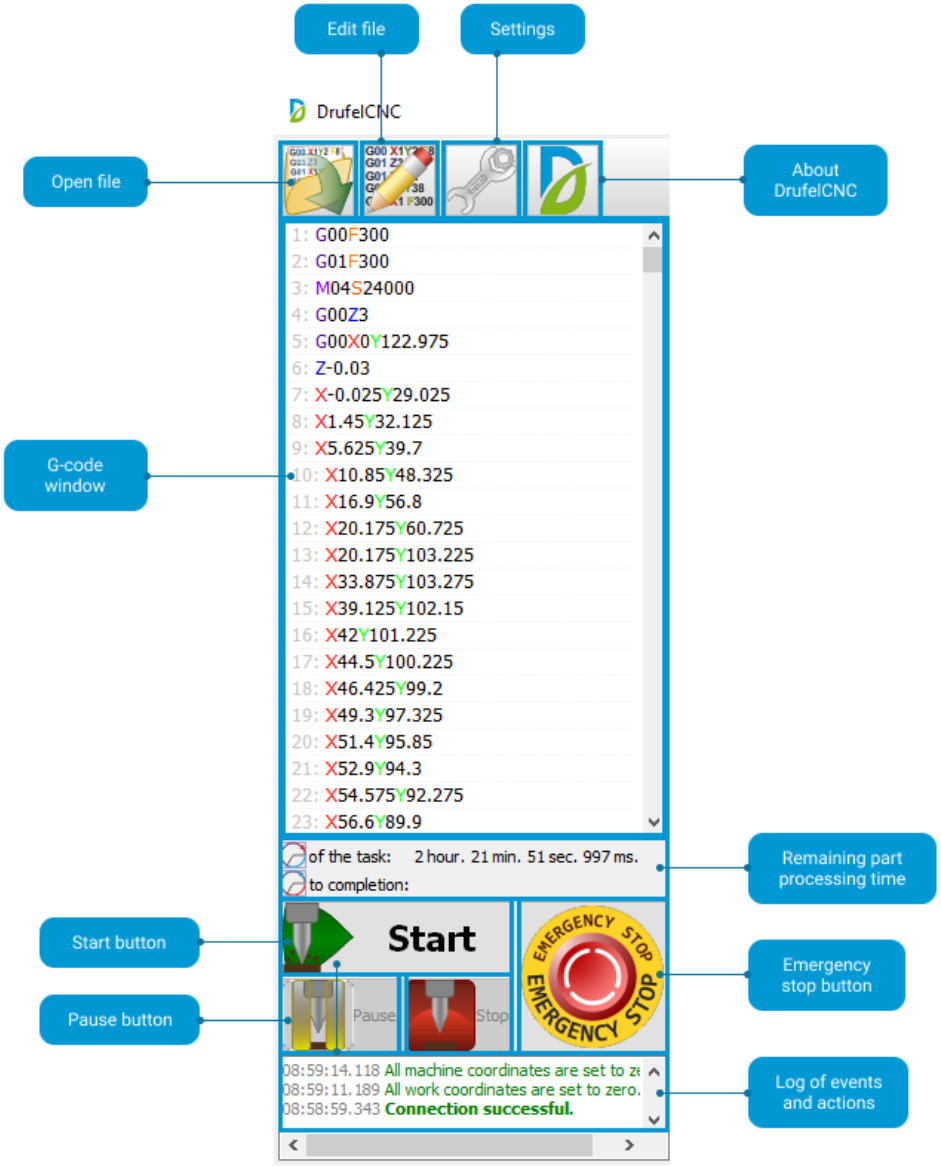
9. DrufelCNC interface



The DrufelCNC interface can be divided into three blocks:

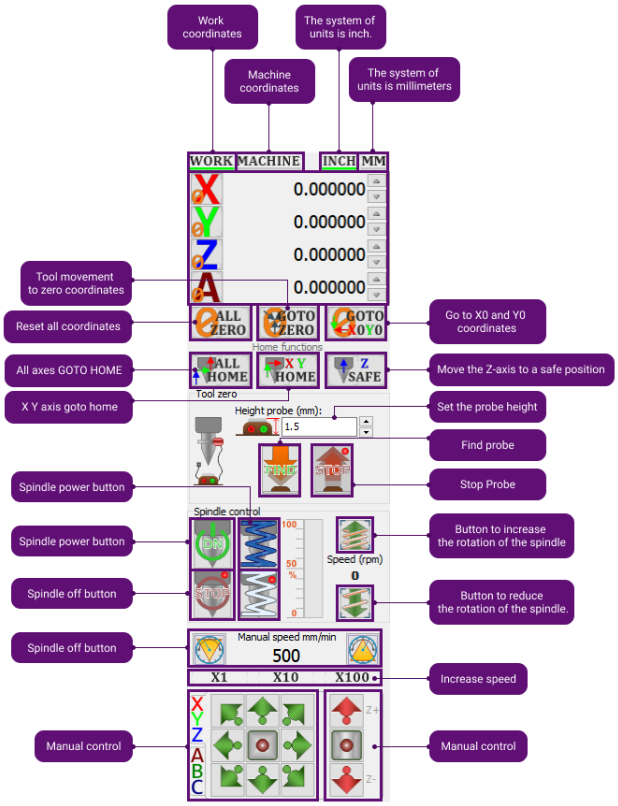
1. G-code window
2. Base functions
3. 3D window

G-code-window:



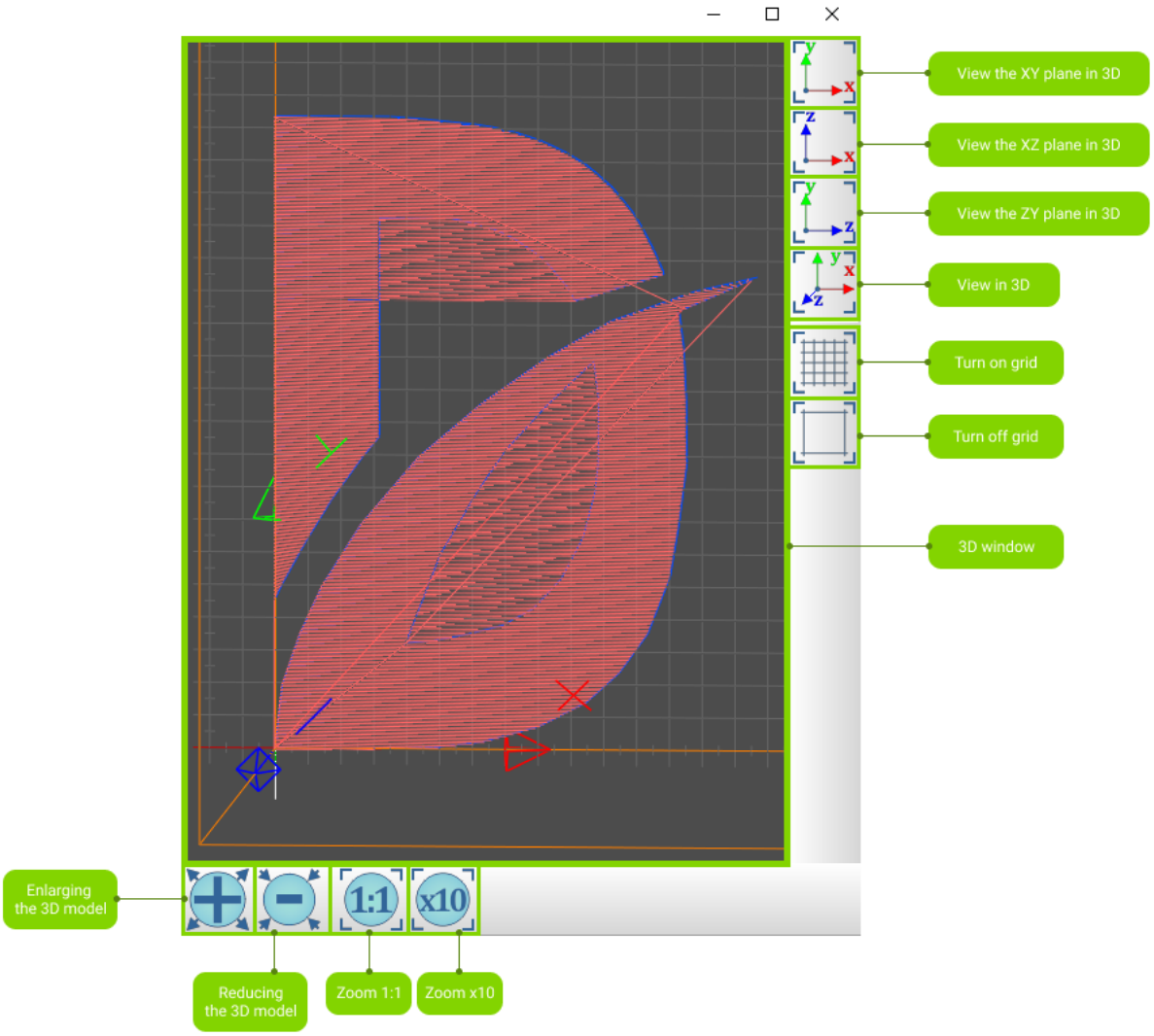
Functions	Description
Open file	Open file button
Edit file	Edit g-code file button
Settings	Function setting button
About DrufelCNC	DrufelCNC information button
G-code window	Display of G-code
Start	Start button
Pause	Pause button
Remaining time part	Remaining part processing time
Emergency stop	Emergency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

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

3D window:



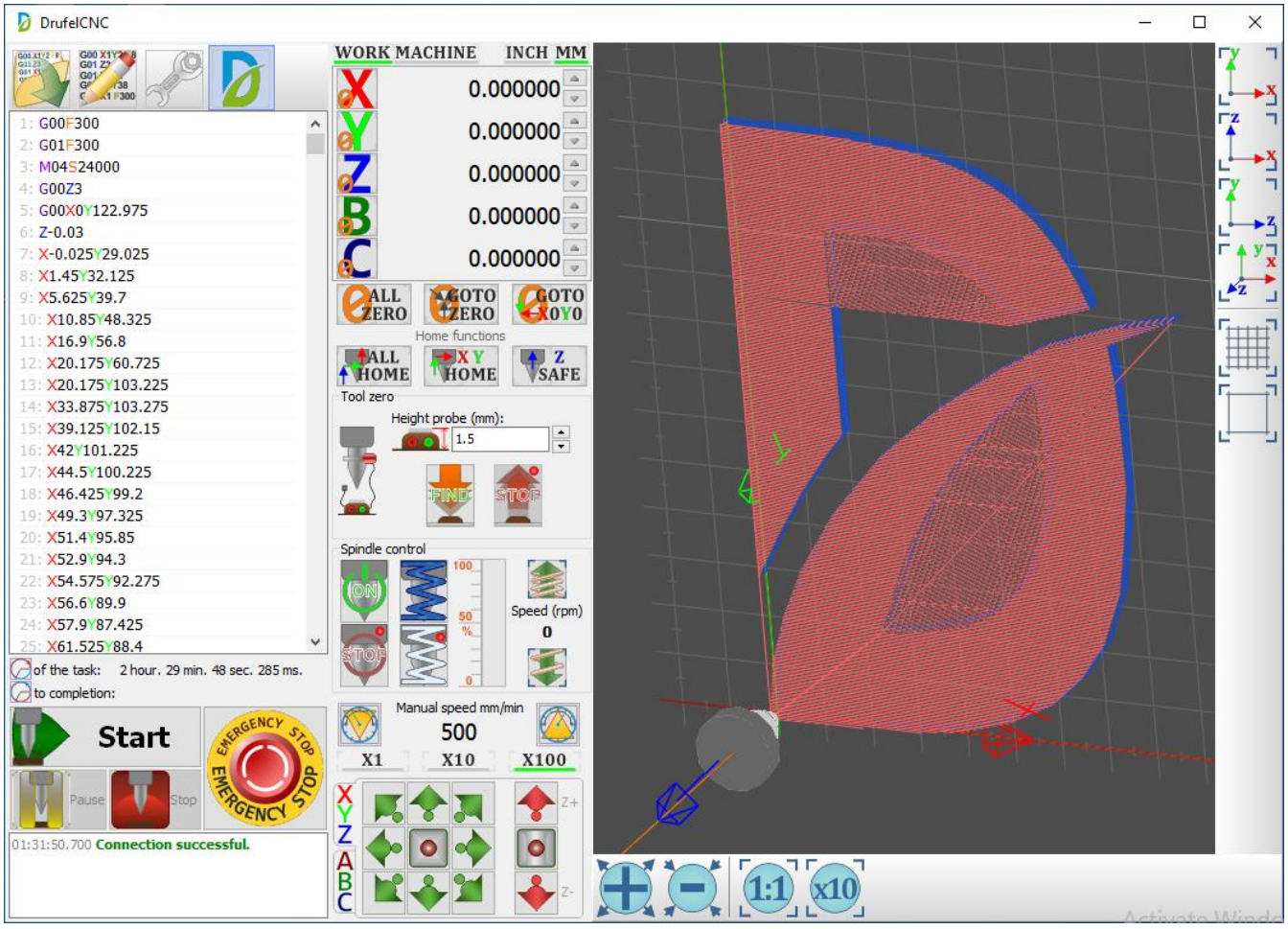
Functions	Description
Scale 3D model	Scale 3D model button
Reducing the 3D model	Reducing the 3D model button
Zoom 1:1	Zoom 1:1 button
Zoom x10	Zoom x10 button
3D window	Display of 3D-model
нTurn off grid	Turn off grid button
Turn on grid	Turn on grid button
View in 3D	View in 3D button
ZY plane in 3D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

10. 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.



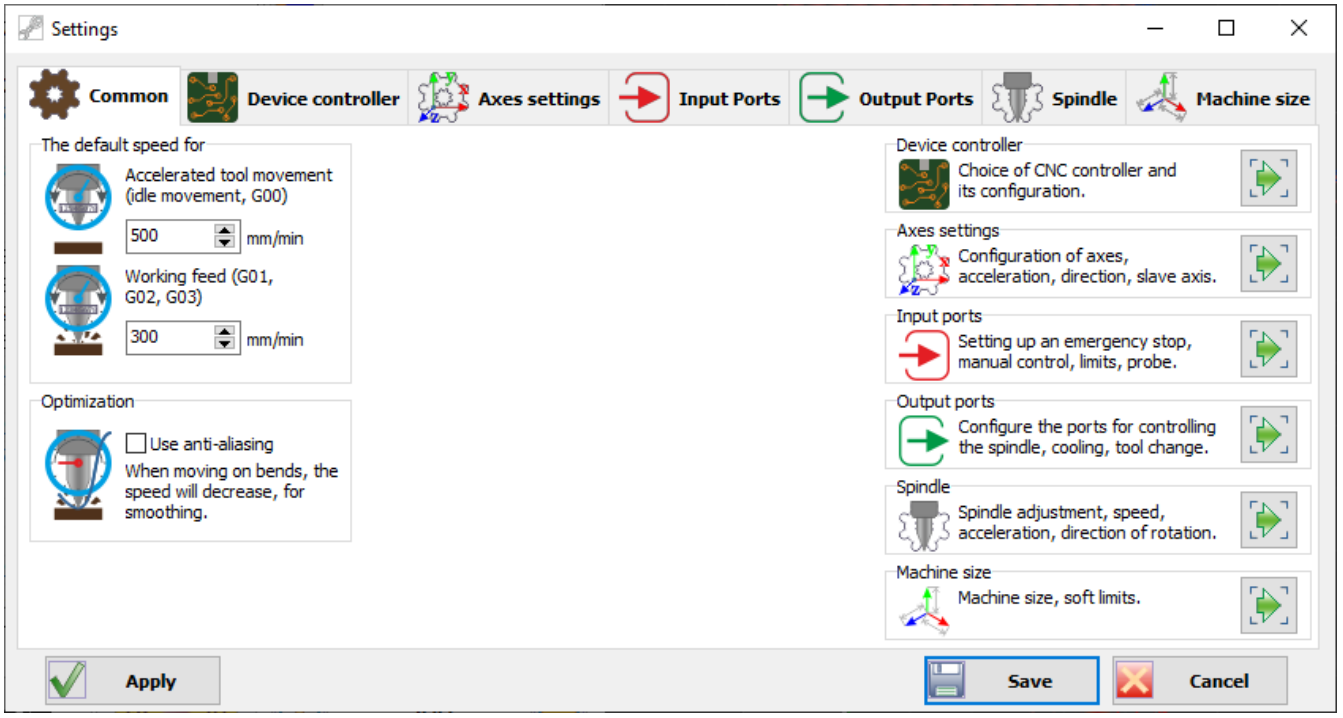
In the lower left corner displays the status of the connection to the USB controller, and other informational messages.

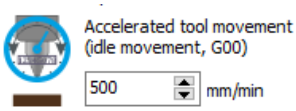
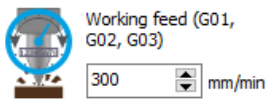
11. Customization

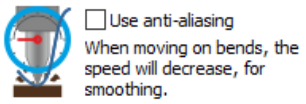
To configure DrufelCNC you must click on the button with the image of the key . Next, go to the section of settings that interests you.

11.1.Common

In the common tab, you can set values for accelerated tooth movement (idle movement, G00), working feed (G01, G02, G03) and use anti-aliasing.

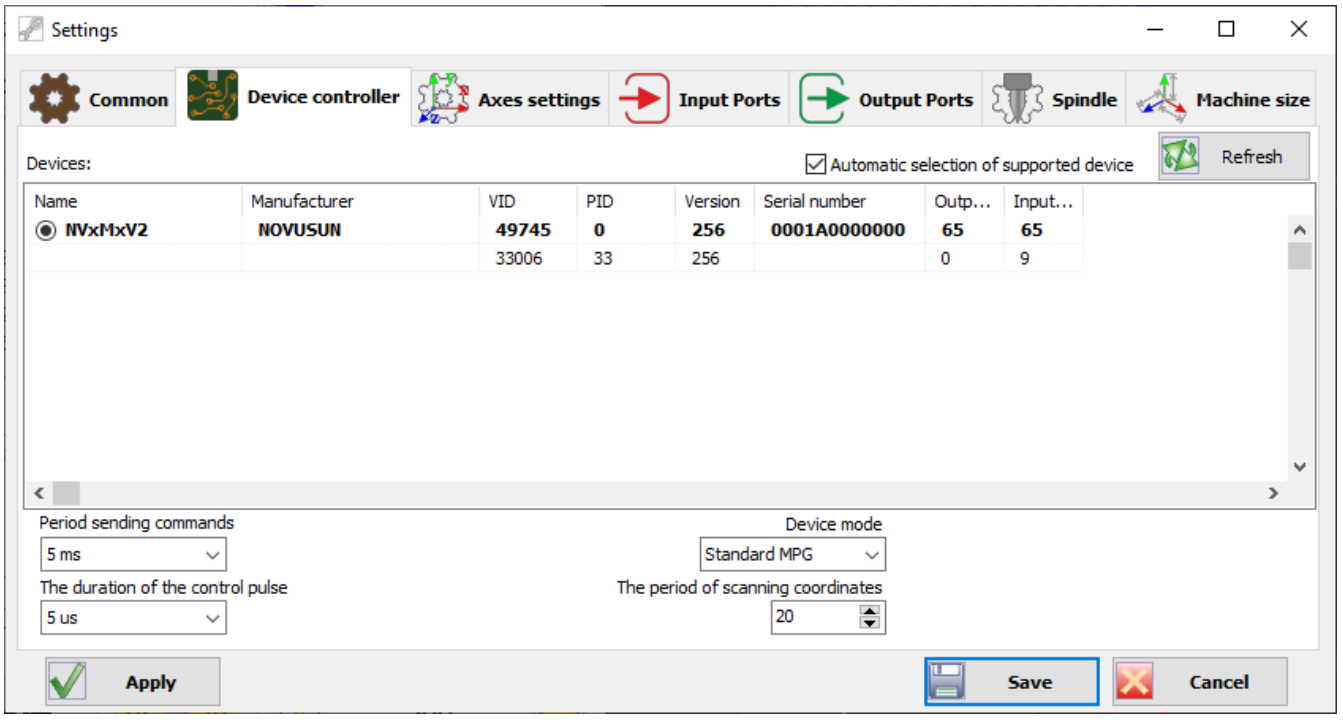


	Default speed for G00 commands. If no speed for G00 is specified in the G code file, then G00 commands will use that speed.
	Default speed for G01, G02, G03 commands.

	When moving along curved vectors, the speed of movement will decrease.

11.2.Controller Configuration

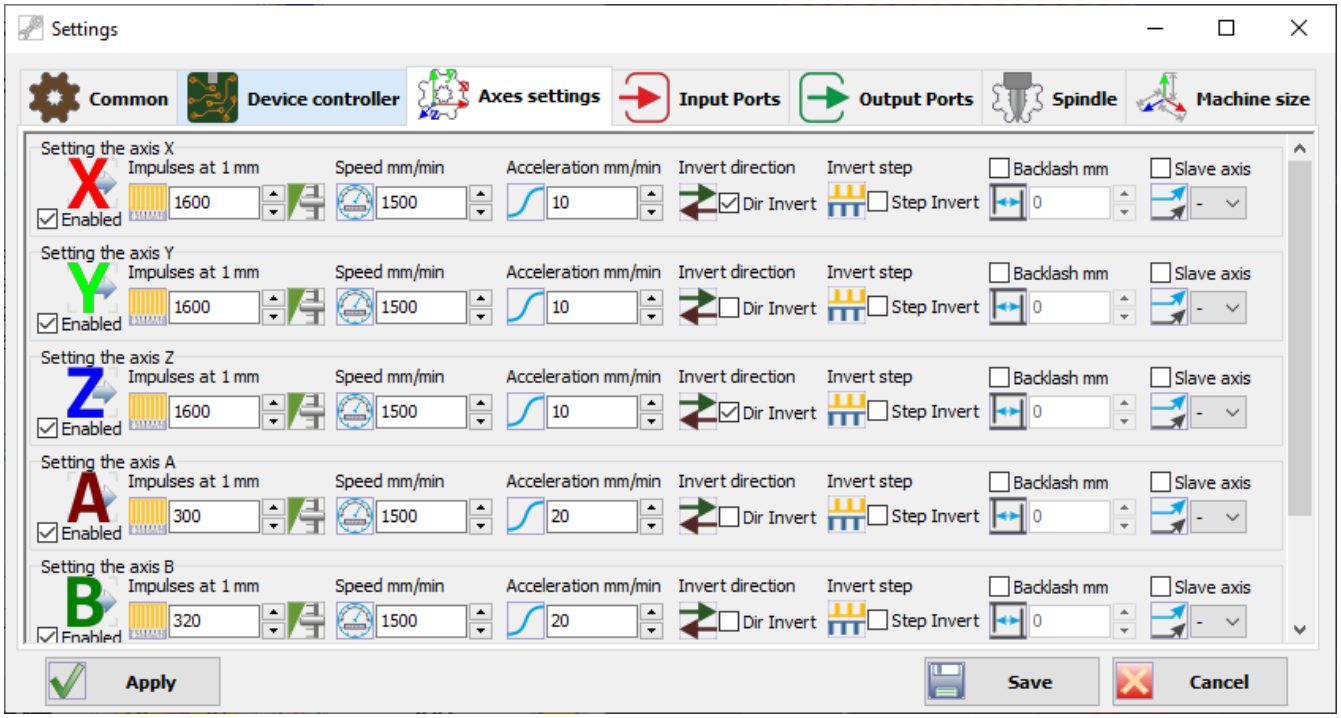
In the window that opens, go to the «Device Controller» tab.



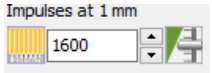
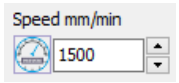
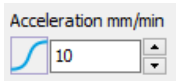
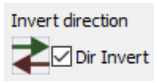
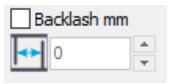
In the hardware section, you must select a controller by setting a point in the radio button block opposite the USB controller. Save the settings.

11.3. Axis Setup

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



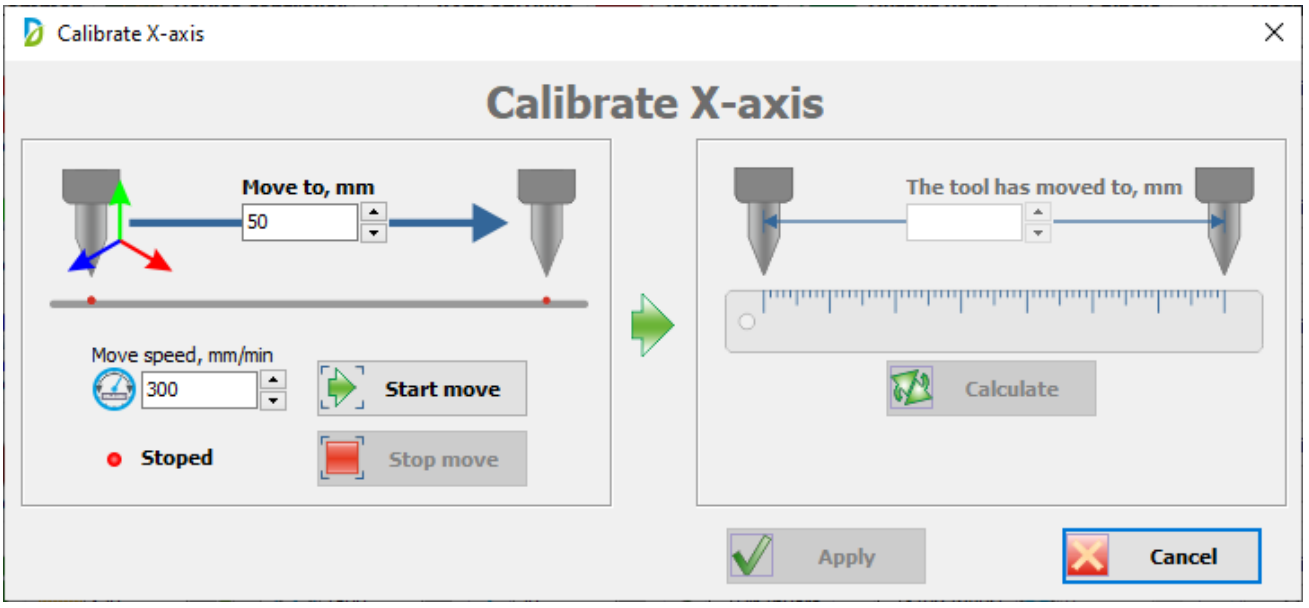
Set the required number of pulses for each axis. Save the settings. If necessary, specify the submission of the axes. Use the inversion setting to change the direction of rotation of the motor.

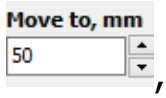
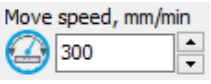
	Enables the axis to be displayed in the coordinate list.
	The number of pulses per millimeter. You can use the calibration function to calculate.
	Maximum speed of the axis movement.
	Smooth acceleration of the axis movement.
	Invert the direction of movement of the axis.
	Invert the step signal when transmitting the axis movement commands.
	Backlash of the ball screw.

	A slave axis can be defined for an axis. Then, the slave axis will move along with the current.

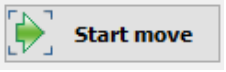
11.3.1. Calibrate axis

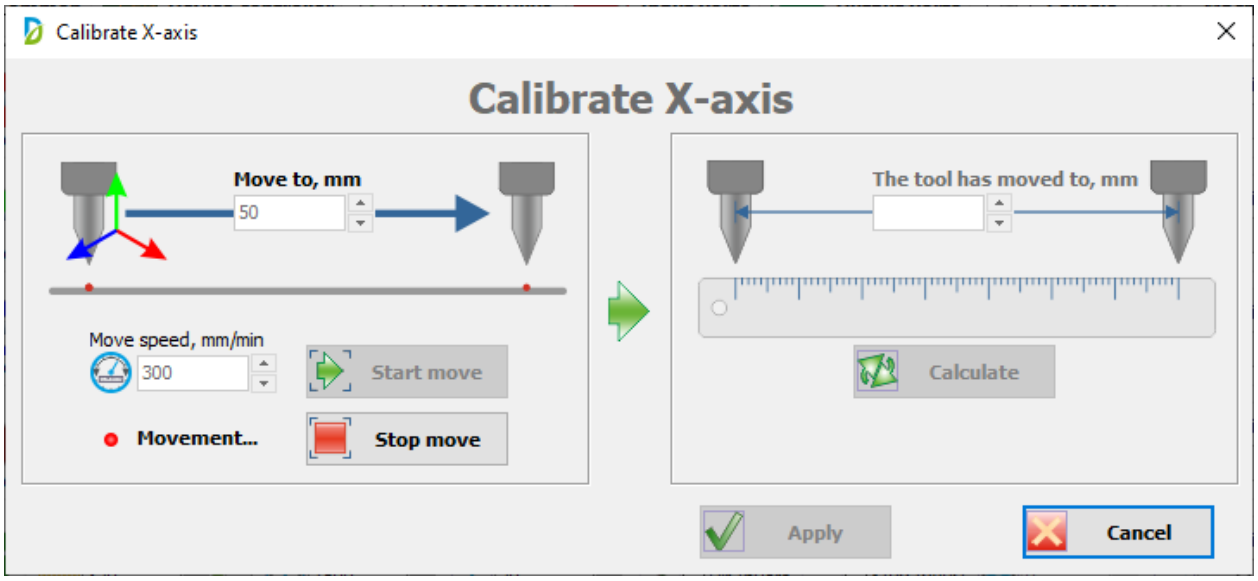
By clicking on the calibration button for a specific axis, the axis calibration window will open. This window is for calculating the number of pulses per mm.



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.

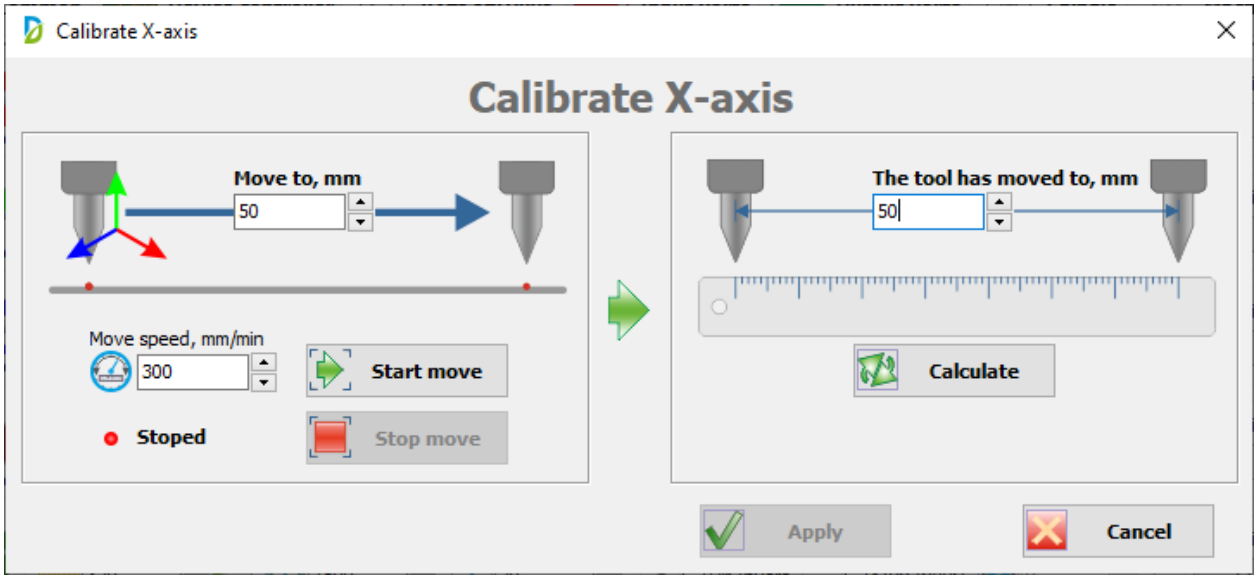
Attention! This speed must be slow! This is necessary so that you can quickly respond to an emergency and not damage the machine.

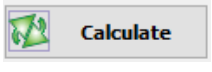
After that click on the «Start move»  button. After pressing the button, movement will begin for the specified segment.

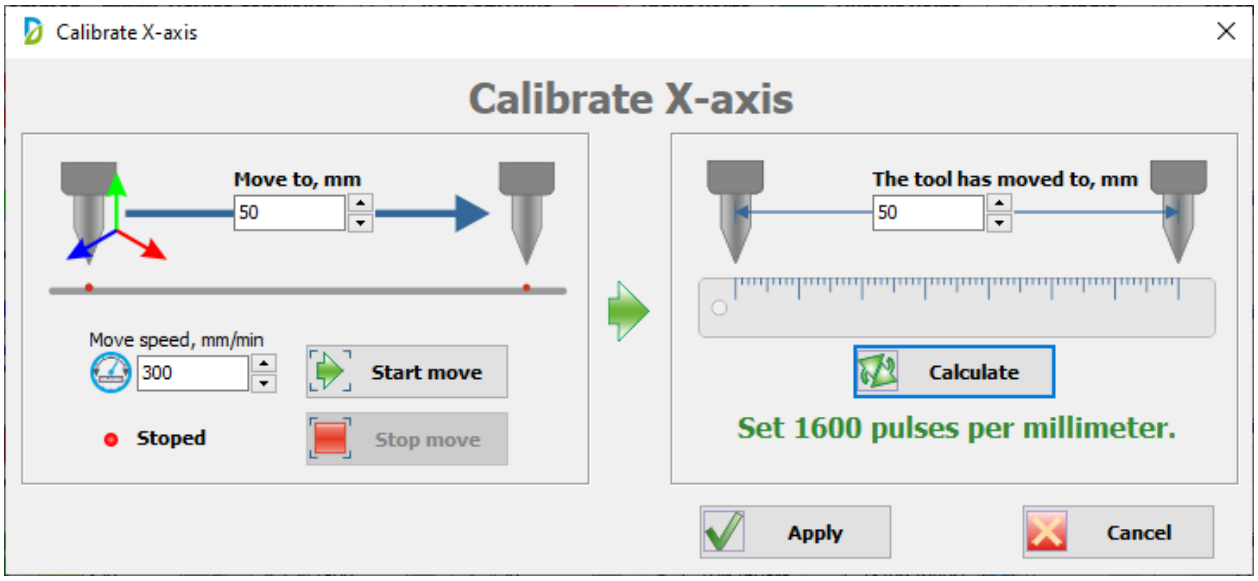


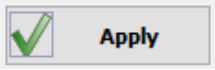
After the tool has finished moving, use the ruler to measure the actual distance the tool moved.

Enter this value in the «The tool has moved» to field.



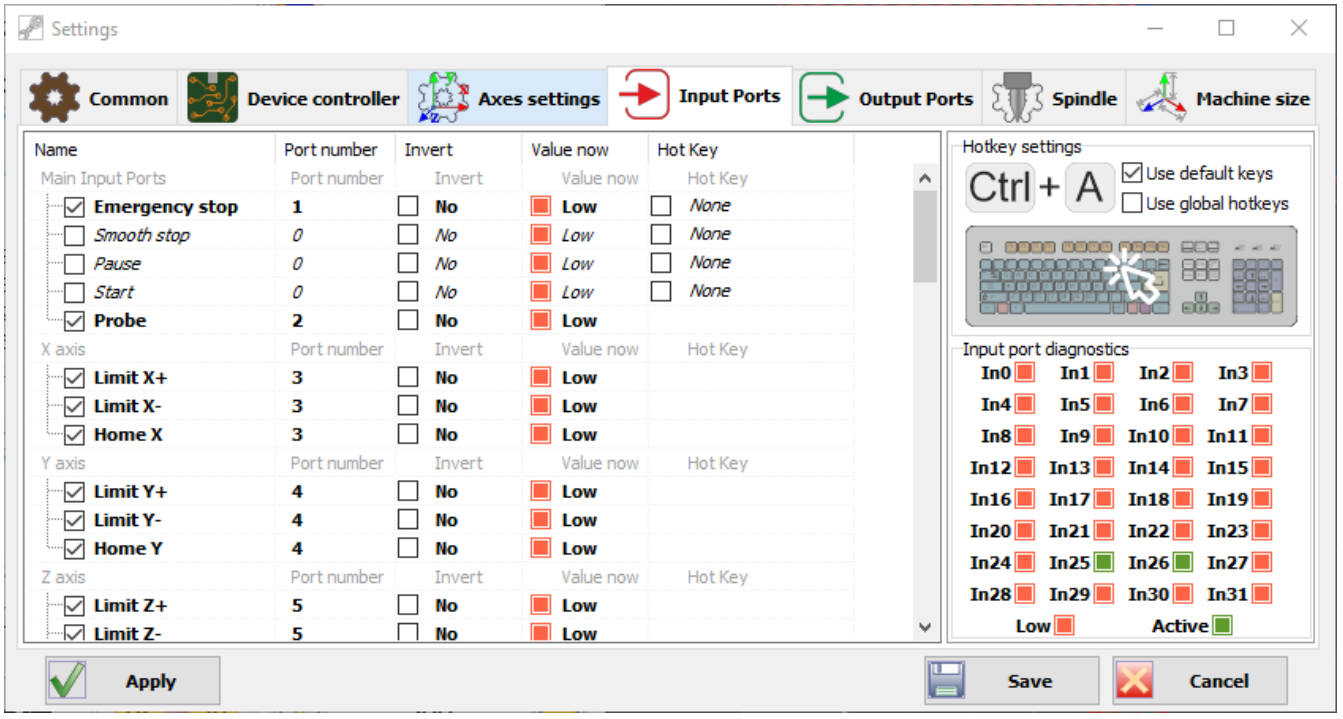
Click the «Calculate»  button. After pressing, the number of pulses per 1 mm will be calculated that you need to set for the axis to be calibrated.



Click the «Apply»  button to apply the calculation results.

11.4. Configure Input Ports

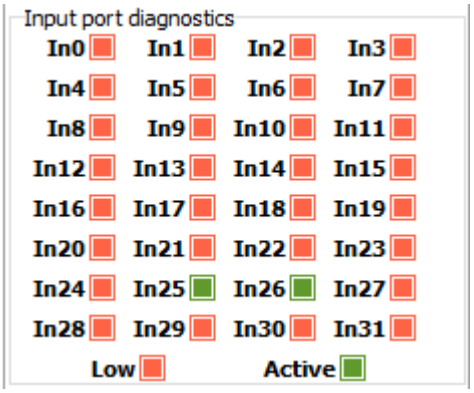
To configure input ports, go to the Input Ports tab.



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

11.4.1. Input port diagnostics

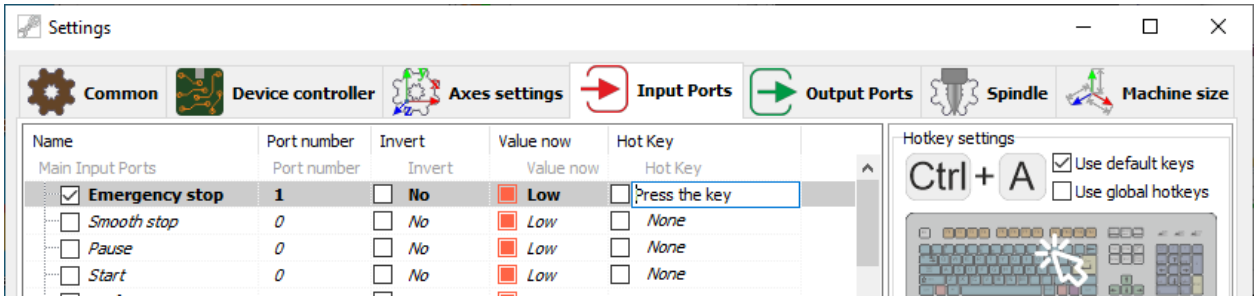
This panel displays the current state of the controller input ports.



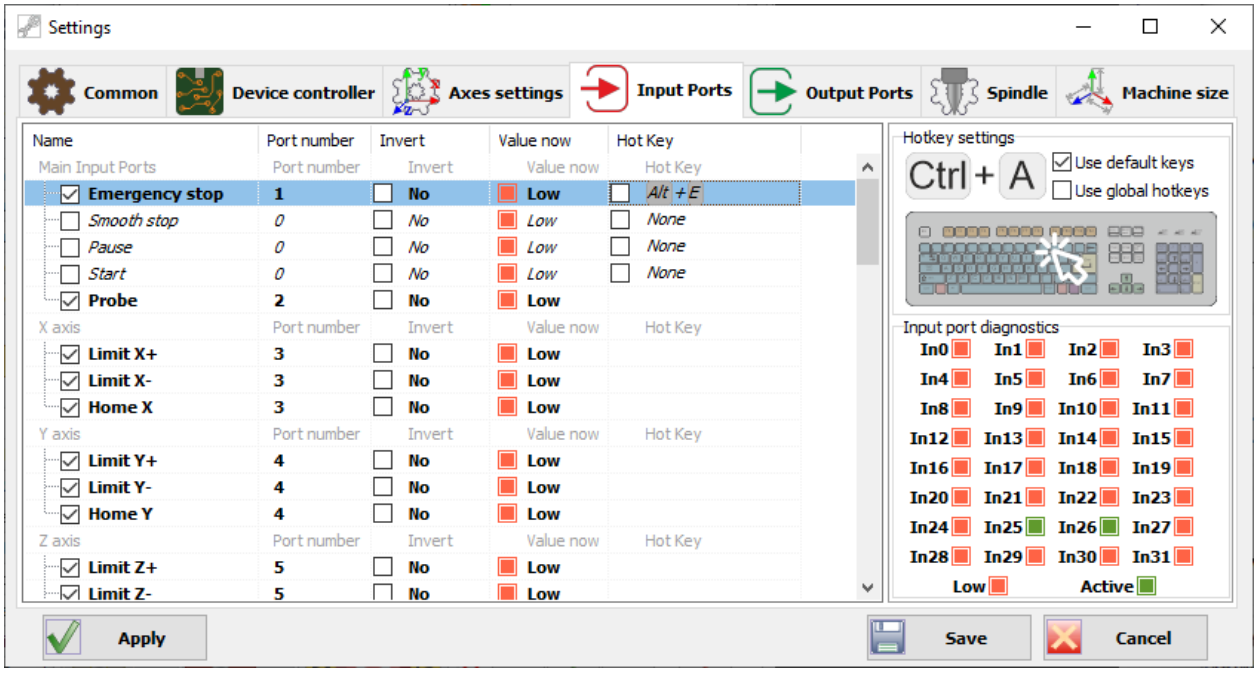
A red LED indicates ■ there is no signal on the input port.
A green LED indicates ■ signal is present on the input port.

11.4.2. Hot keys

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

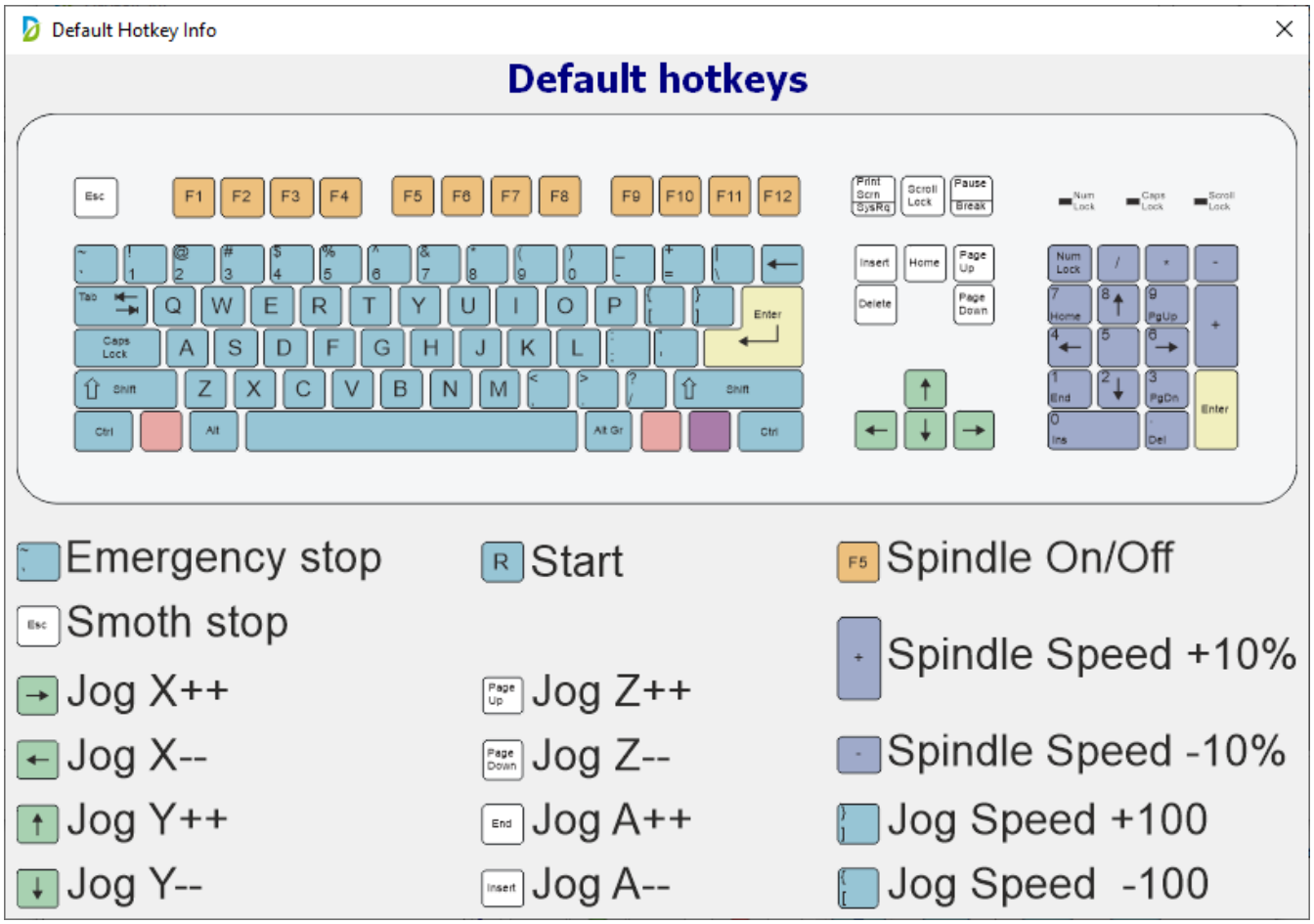


Next in this field you must specify your keyboard shortcut that you want to use.



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

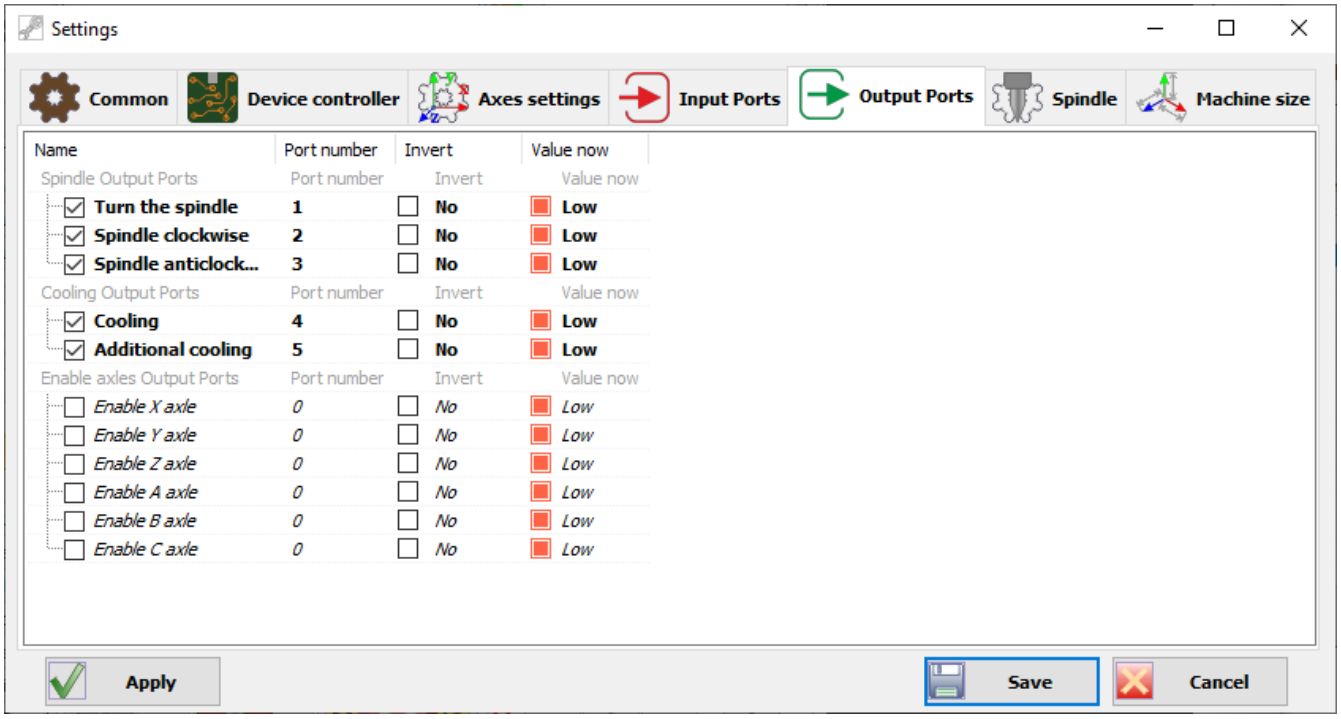
«Use default hotkeys» - this function for hotkeys will work according to the following list:



Attention! Custom shortcuts take precedence over the default keys.

11.5.Configuring output ports

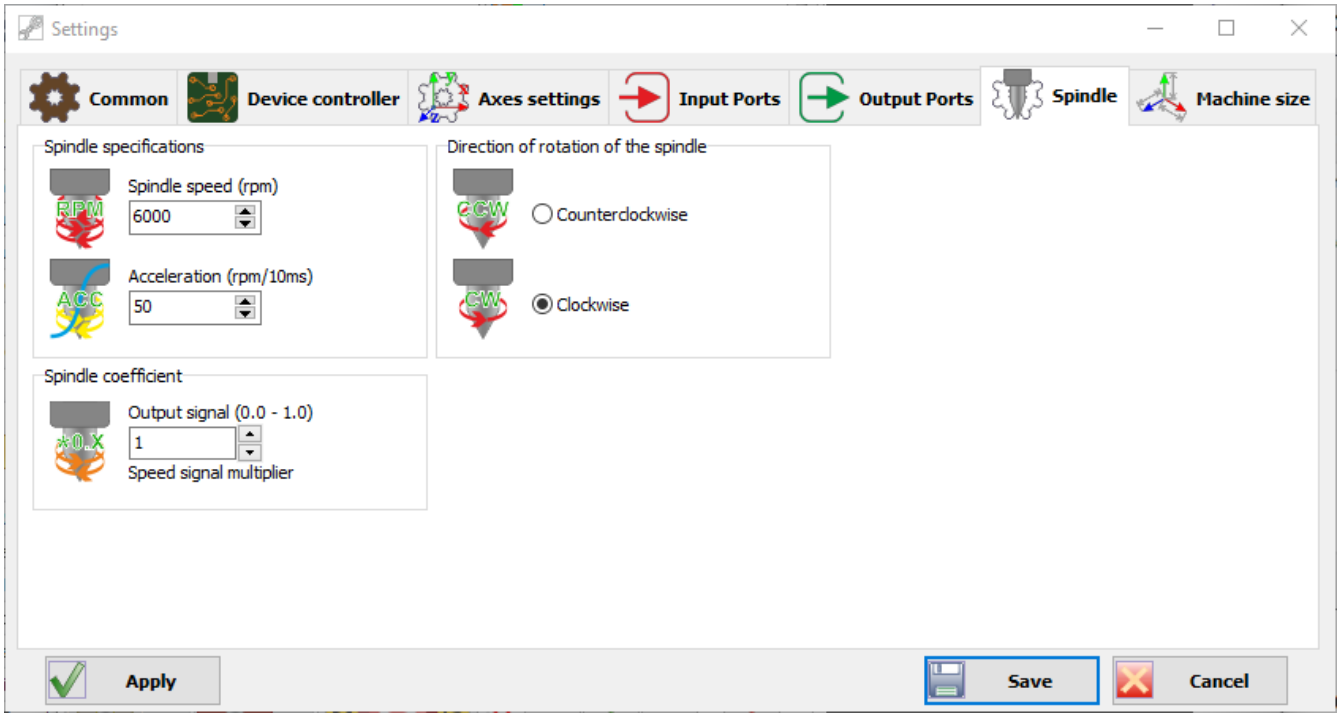
To configure output ports, click the Output Ports tab.



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

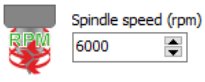
11.6.Spindle adjustment

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

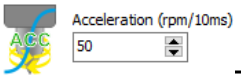


Set the speed and acceleration parameters according to the spindle specification. Set the default spindle rotation direction.

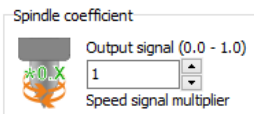
Set the spindle coefficient. Save the settings.

Spindle speed 

- the nominal number of revolutions per minute for your spindle.

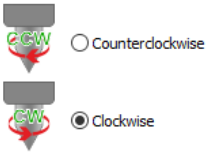
Acceleration 

– 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.

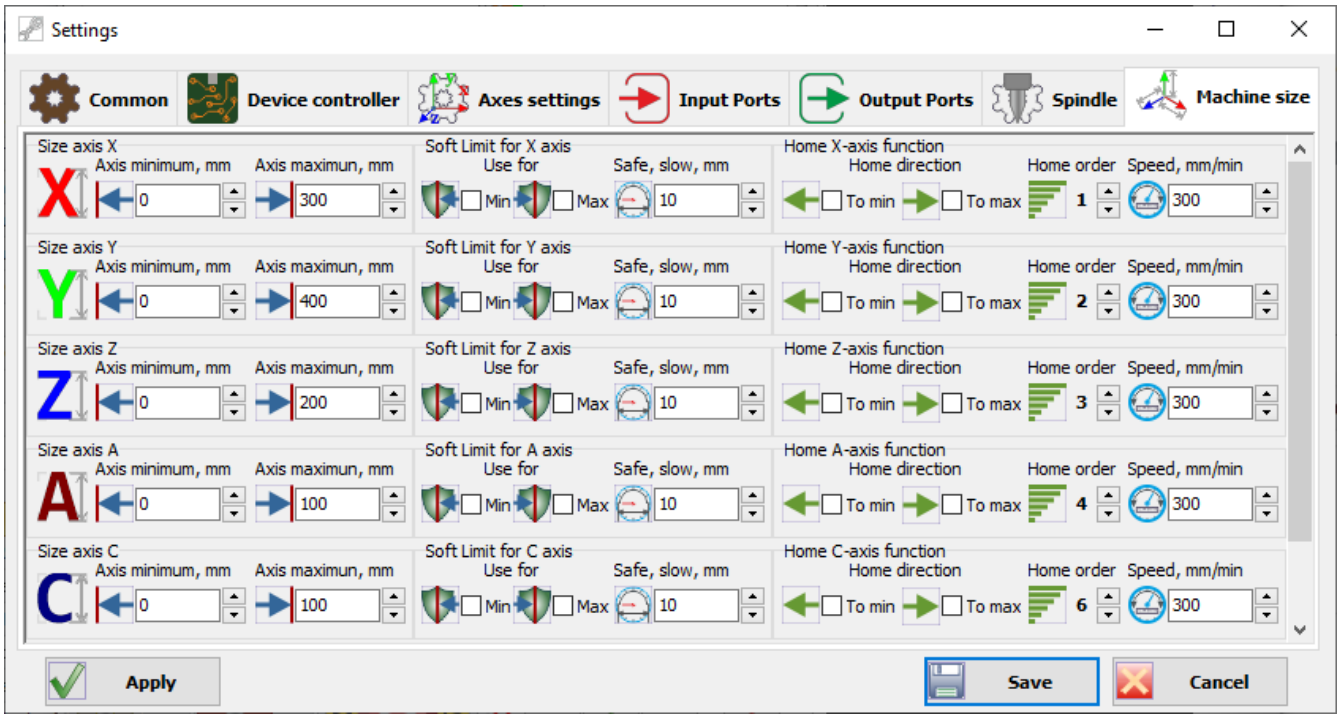
With this **Counterclockwise/Clockwise** setting,



you can set the direction of rotation of the spindle when you press the «Turn the spindle» button in the main window.

11.7.Machine size

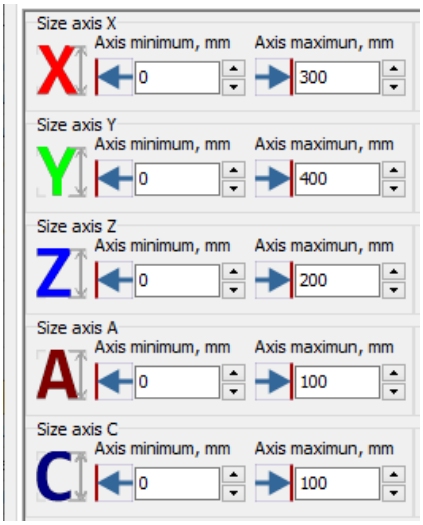
With these settings you can customize the machine dimensions, soft limits, home function.



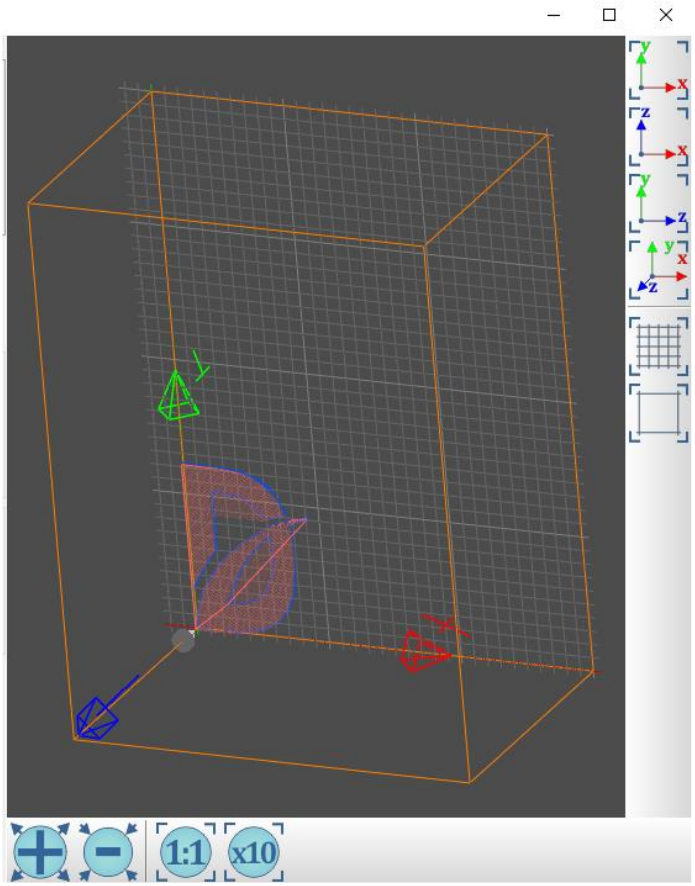
11.7.1. Size axis

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.

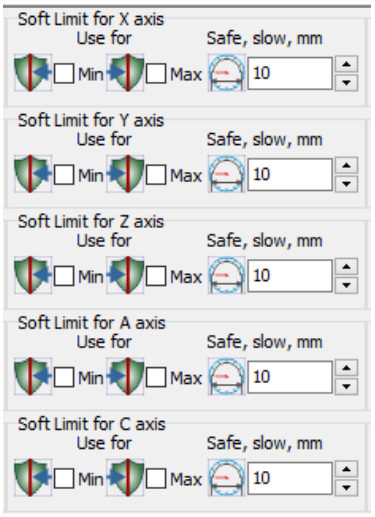


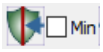
According to these settings in the 3D model window, the dimensions of the axis will be displayed as a quadrilateral in each plane.



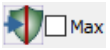
11.7.2. Soft limit

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.

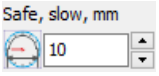




- when the minimum limit of your axis is reached, the tool movement will stop and prevent it from moving towards the minimum.



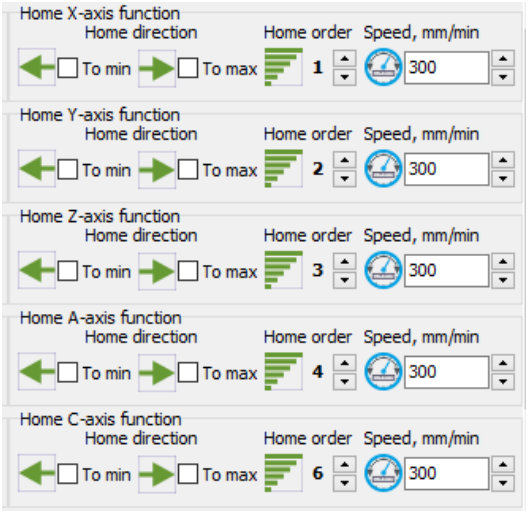
- when the maximum limit of your axis is reached, the tool will stop moving and prevent it from moving towards the maximum.



- if the specified value remains before reaching the minimum or maximum, the tool speed is reduced to the minimum.

11.7.3. 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.

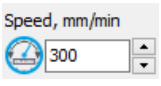
- when searching for the home position, the instrument will move to the maximum.

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.

home order = 1 will be executed very first.

home order = 6 will be executed most recently.

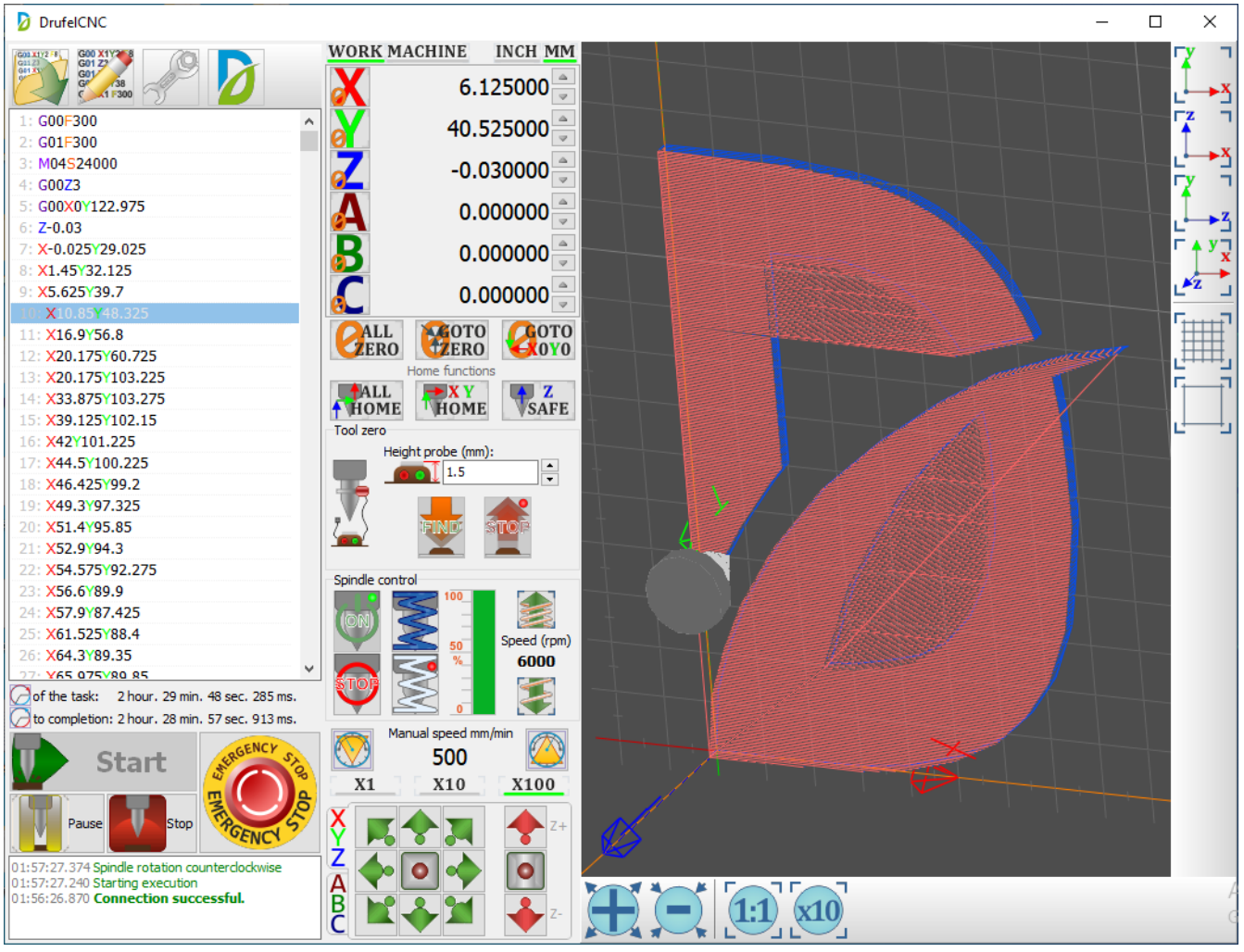


is the speed of the tool when searching for the home position.

12. 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.

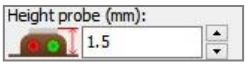
If the file is recognized successfully, the three-dimensional model of the file will be displayed in the right part of the main window.



To start processing, click "Start"

.

13. Search tool zero

To begin searching for a tool zero, set the height 

of the probe used. Next, click

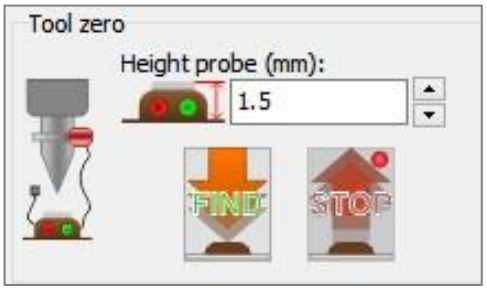
. Wait until the end of the process.

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.

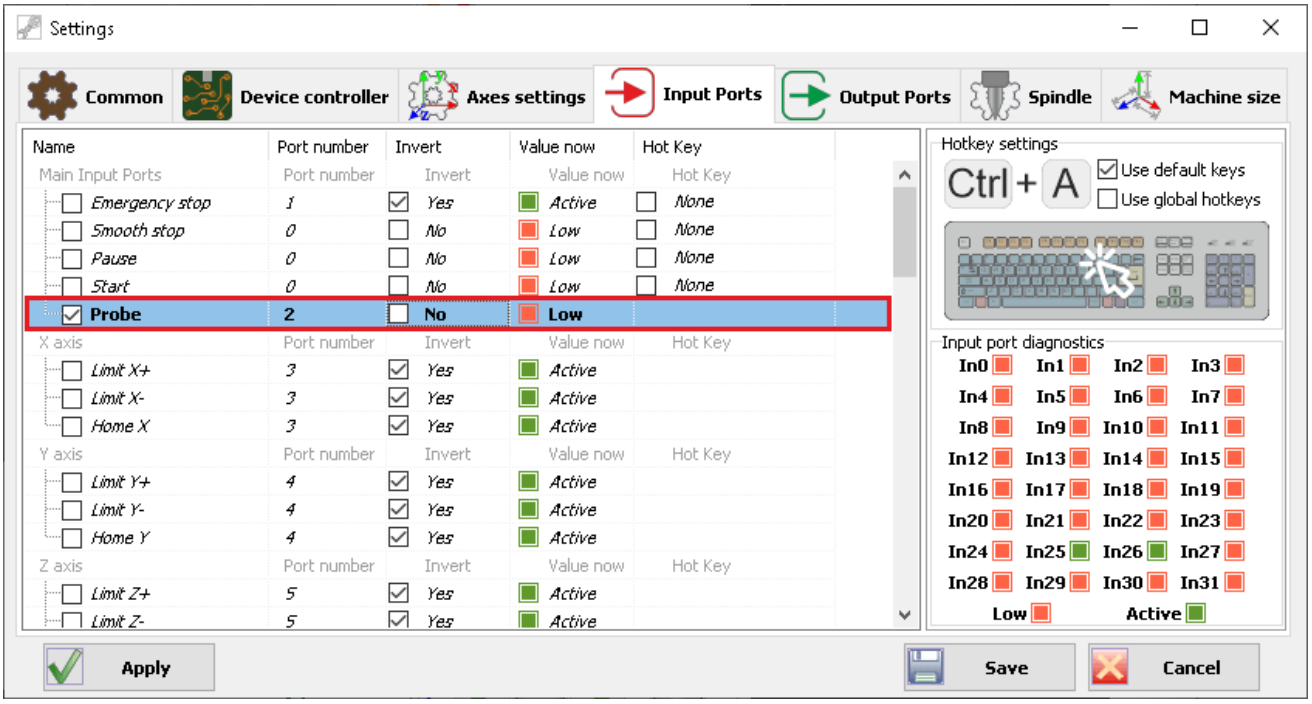
After completing the tool zero search, the tool will return to its original position.

To cancel the tool zero search, click

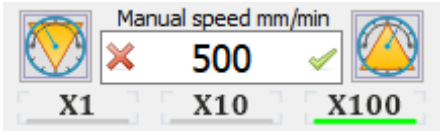
.



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 "Value now" in the normal state of the Probe is "Low".



14. Manual control

This field 

sets the speed of movement of the instrument during manual operation.

- Speed reduction button.

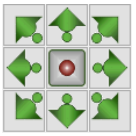
- Speed increase button.

X1 - 1% of the set speed or minimum speed.

X10 - 10% of the set speed.

X100 - 100% of the set speed.

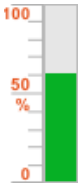
The current speed is highlighted in green (X100).

For manual control, press the corresponding joystick button 

15. Spindle control and cooling

- Spindle power button.

- Spindle off button.



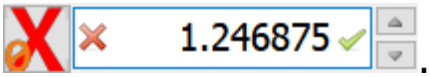
To set the spindle speed, click on the progress bar area.

- Button to increase the rotation of the spindle.

- Button to reduce the rotation of the spindle.

16. Assignment of coordinates

To reset the x-axis, click the button . To reset the remaining coordinates, click on similar buttons.

To set your own X coordinate axis, click the digital value of the X coordinate axis. 

. In the field that appears, enter the desired value and click on the button ✓. To cancel the entry, click ✕.

Use the buttons to set more accurate coordinates . To set the values of the remaining coordinates, use the same action algorithm.

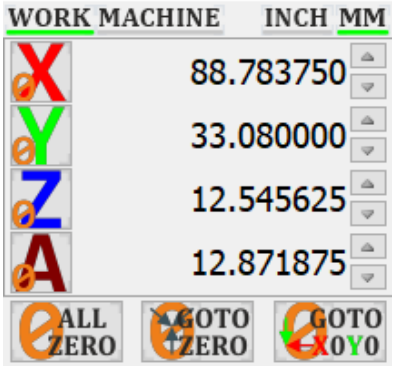
To reset all coordinates, click on the button

.

To move the tool to zero coordinates, click

. To go to the coordinates X0 and Y0, click on the button

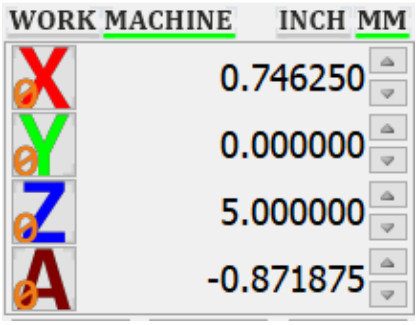
.



16.1. Measurement system

The default system of units is millimeters. To set the units in inches, click INCH MM. To set the system of units in millimeters, click INCH MM. The current coordinate system is highlighted in green.

16.2. Machine coordinates

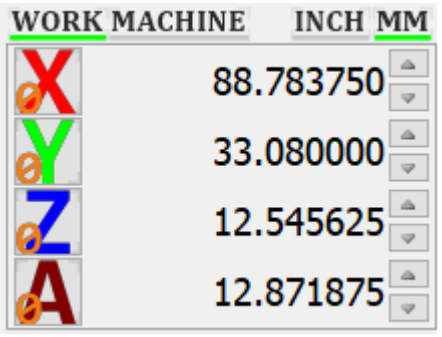


The machine coordinates are the actual coordinates of your axes.

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 MACHINE.

16.3. Work coordinates



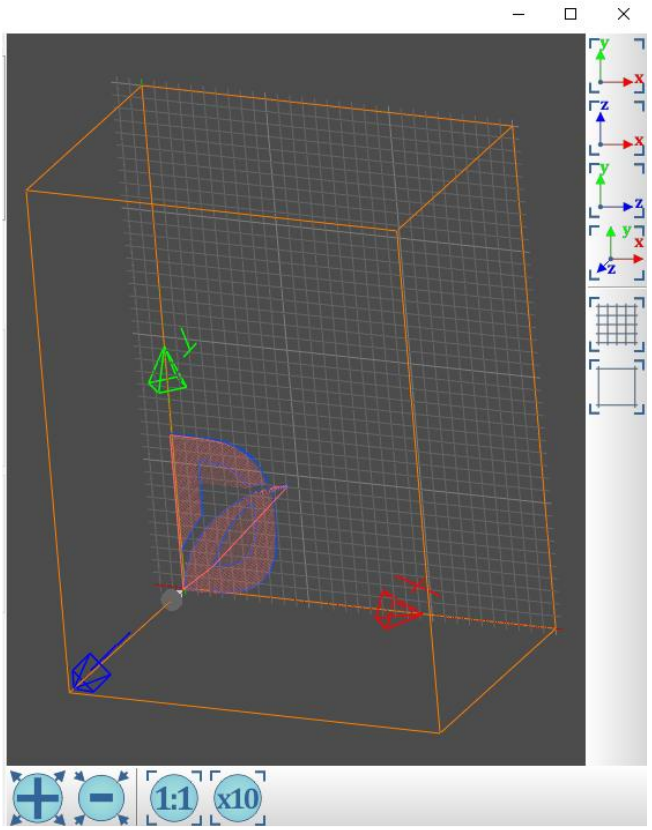
Work coordinates are relative to machine coordinates.

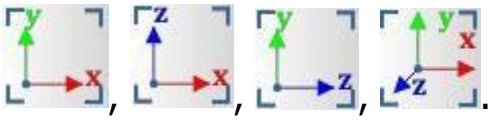
These are the coordinates at which the g-code is executed by default.

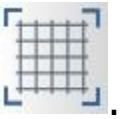
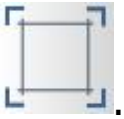
If work coordinates are activated for display, they are highlighted in green WORK.

17. Display 3D model

The code you downloaded is displayed as a 3D model on the right side of the application window.



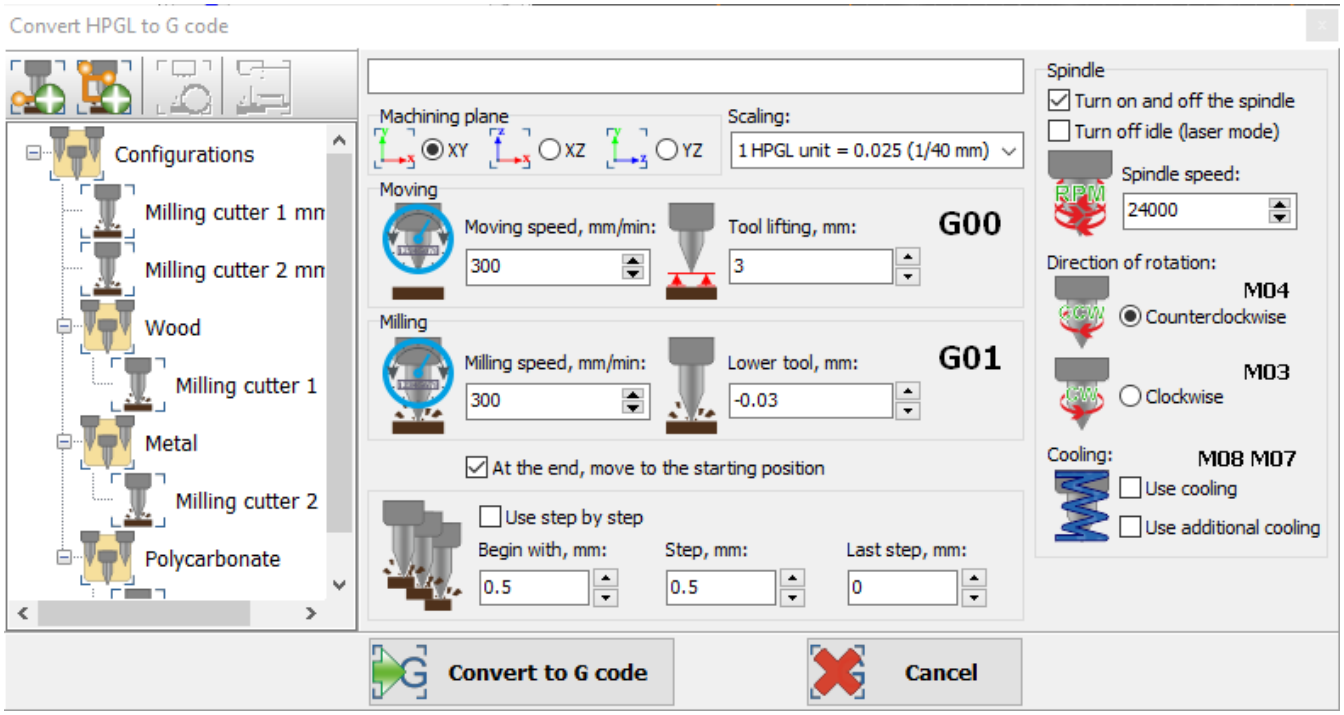
To rotate the 3D model, move the mouse pointer to the display area of the 3D model. Right-click and hold to move the mouse pointer. You can also use additional buttons.  . To zoom the 3D model, use the mouse wheel or . To move the model in the plane, use the left mouse button.

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

18. Opening HPGL files

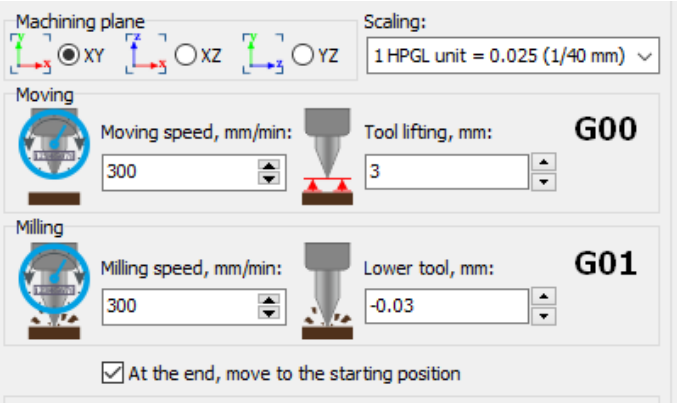
To open files in HPGL format, you must click on the button with the image of the folder , then select the file.

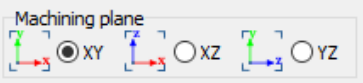
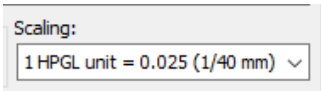
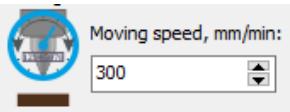
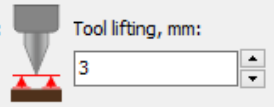
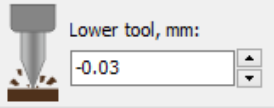
In the window that opens, you must select the parameters for converting HPGL to G-code.



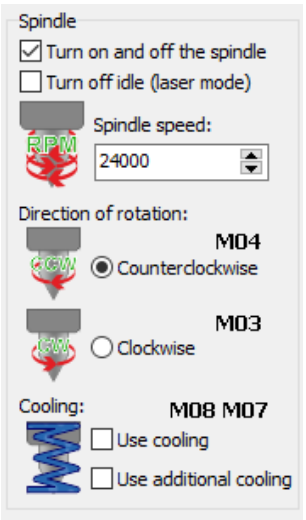
After successful conversion, you will see a three-dimensional model of the file.

19. 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.

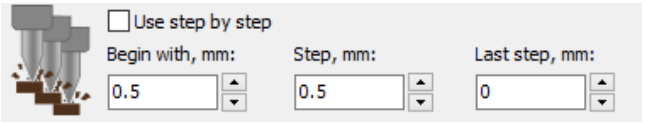
19.1. Spindle settings of HPGL file converter

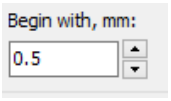
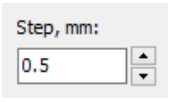
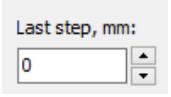


Turn on and off the spindle	The spindle will turn on when the HPGL file starts executing, the spindle turns off when the HPGL file finishes executing.
Turn off idle (laser mode)	The spindle will only work when milling. This setting is suitable for laser or plasma operation.
Spindle speed: 24000	The spindle speed while executing the HPGL file. When using a laser, sets the laser power.
Direction of rotation: 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.

19.2. 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.

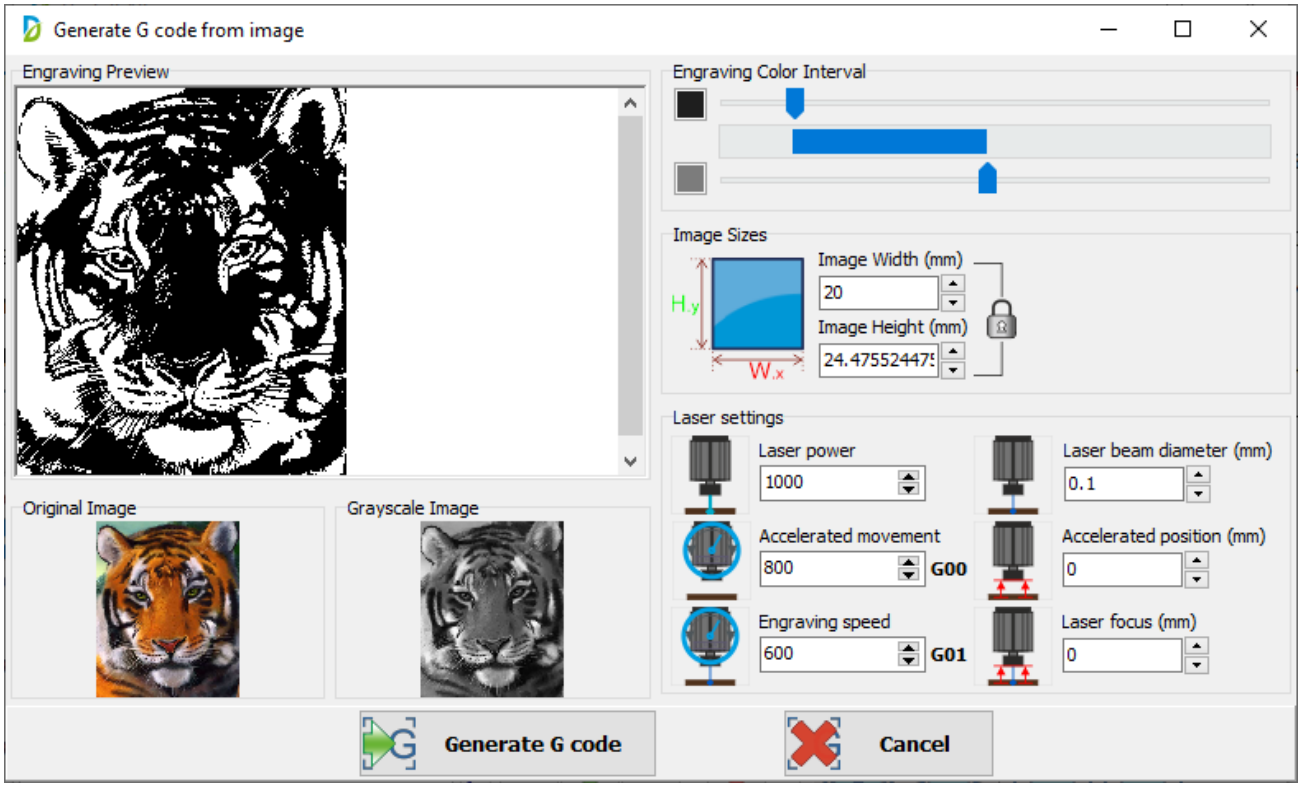


	After this axis position, the step milling algorithm will start. For example after Z = 0.5 mm.
	The cutter will move this distance after each cycle through the entire HPGL file. For example, 0.5 mm.
	If necessary, you can set a fixed distance for the last step.

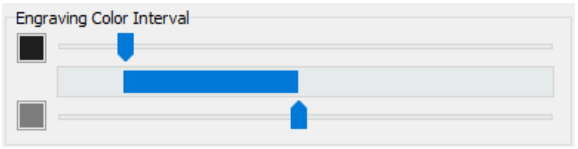
20. Generating a G-code from an image

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.

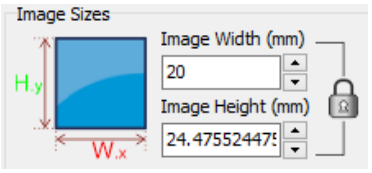
In the window that opens, you must select the options for converting the image into a G-code.



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



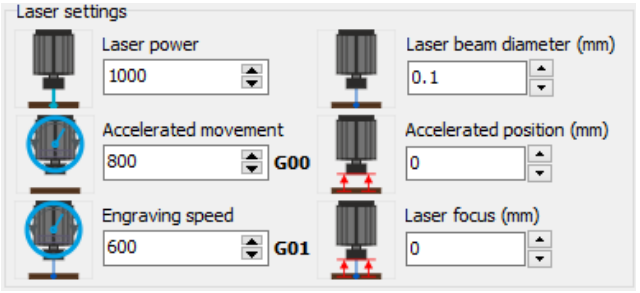
In the Image Sizes block, you can adjust the image size.



- 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

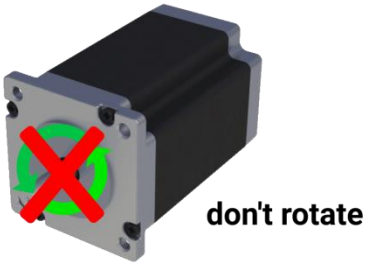
- laser beam diameter adjustment (mm)

- accelerated position adjustment (mm)

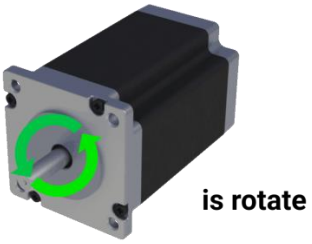
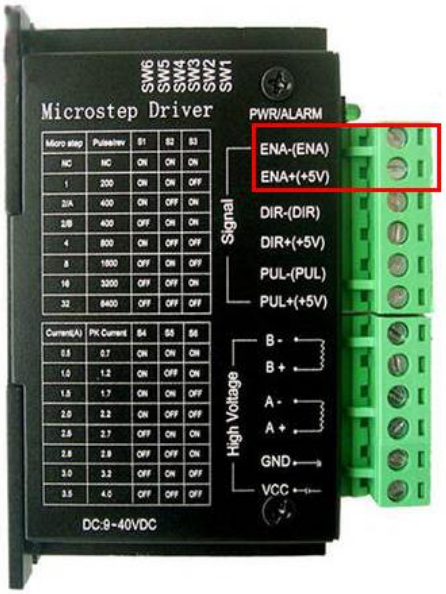
- laser focus adjustment

21. Stepper motors

If your stepper motors don't rotate



Turn on Step Invert ☑ Step Invert



If you doubt the correct connection of ENA + ENA- then temporarily do not connect it. Make sure your motors spin. The default ENA port is activated on most stepper motor drivers.