



www.geminaerotools.com

Gemini Aero Cutter

A versatile, portable and user-friendly grbl / grblHAL interface
All in one in the same software to drive your favorite CNC : hot wire cutting, laser and milling

User manual

v1.0.0.8

Update : 2025.05.14

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Main features :

- Ultra light, versatile and portable grbl / grblHAL controler for Windows 7 to 11, 32 and 64 bits
- Reliable and professional made, digitally signed by certified organization (Certera Code Signing CA)
- Handle CNC 3 axis milling (XYZ) / laser (XY or XYZ) and 2+2 axis (XYZA) hot wire foam cutting
- Designed for grbl 1.1 & 1.2 (firmwares provided for Arduino and MKS Gen V1.0) and grblHAL (firmware provided for BTT SKR Pico V1.0)
- Compatible with grbl 0.9 (but 1.1/1.2 recommended)
- Supports all common GCode commands (G0, G1, G2, G3, G4, G10, G28, G90, G91, etc., M0, M2, M3, M4, M5, etc.)
- Dual synchronized drawings (X/Y and A/Z or X/Z)
- Machine & Work origins and coordinates (with user defined offset)
- Automatic machine axis and working area identification on connection
- Automatic drawings autoscale on machine boundaries
- Software hold if machine limits reached
- Advanced grbl settings interface
- Automatic Gcode format recognition and translation (U->A, V->Z)
- Keep trace function
- Macro recorder
- grbl firmware uploading tool
- Syntax-highlighted GCode editor and creator

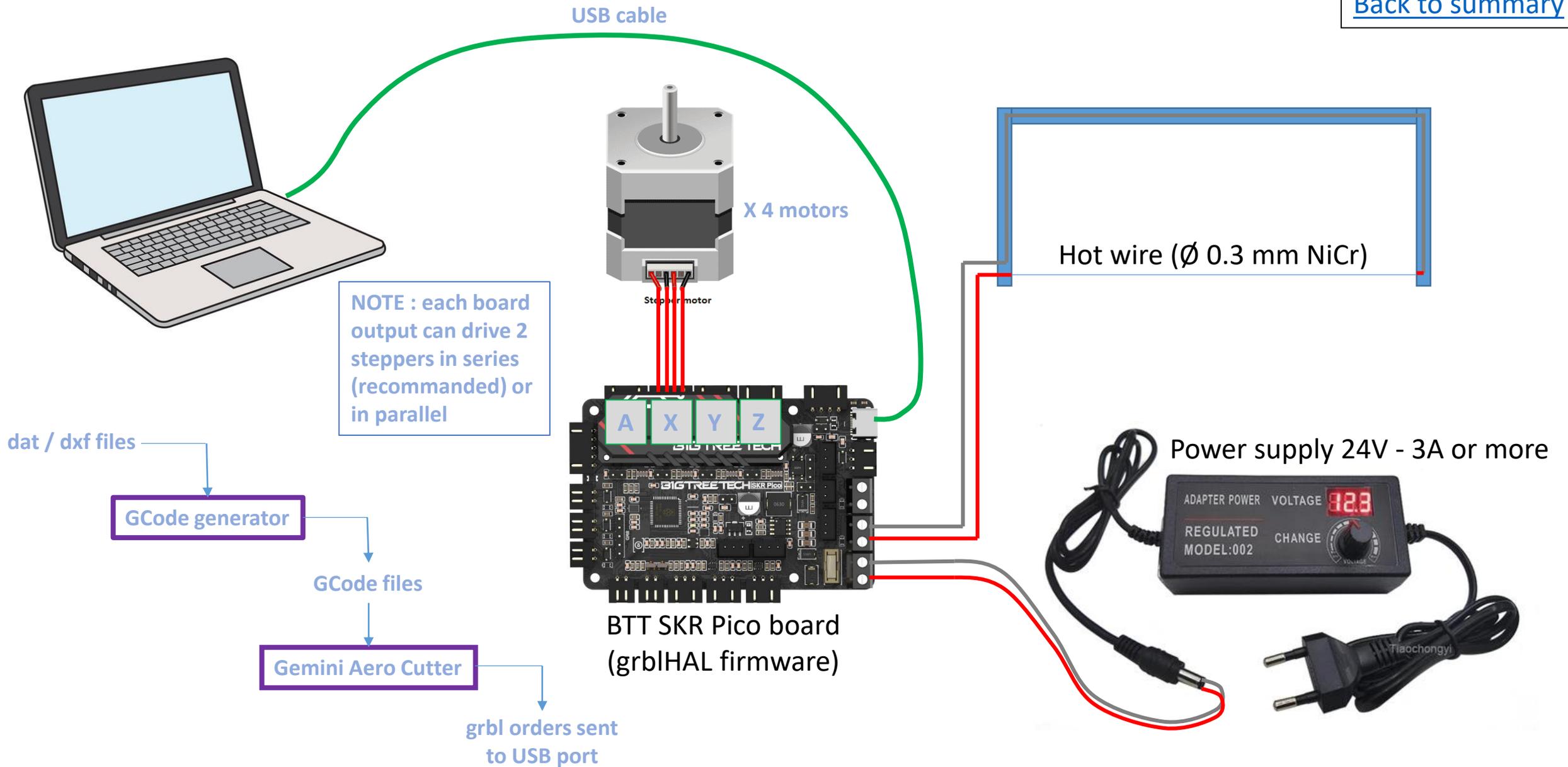
Gemini Aero Cutter is natively multi-language
If you need a new language and can help us in translation, please send a [request form](#)

Recommended GCode generators :

- Gemini Aero Foam (4 axis hot wire foam cutting) : <https://www.geminaerotools.com/geminaerofoam.html>
- DesKAM2000 (milling and laser, abandonware but very well made and easy to use, works perfect in WinXP compatibility mode) : <https://icedrive.net/s/NTRjxtTNtZf8aYw55wF7D7ARFV2B>
- Estlcam (milling and laser, very similar to DesKam with great modern UI) : <https://www.estlcam.de>
- KrabsCAM (milling, freeware, very great) : <https://github.com/mkrabset/krabzcam>

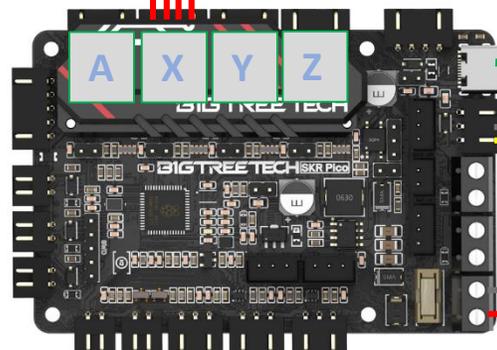
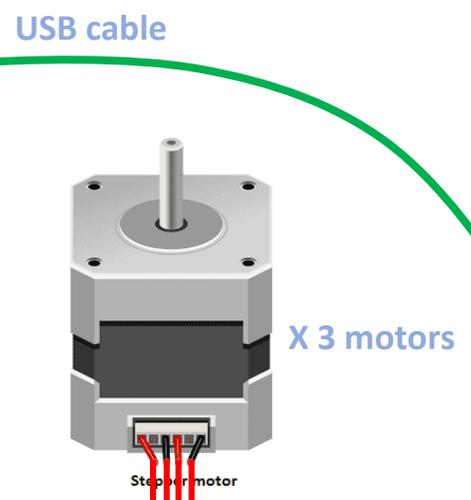
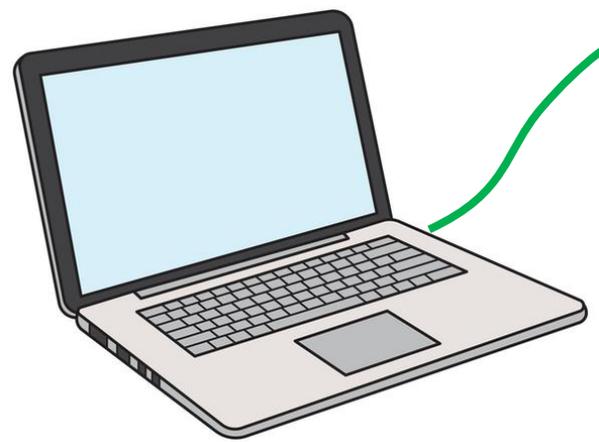
Typical CNC configuration : SKR Pico + hot wire

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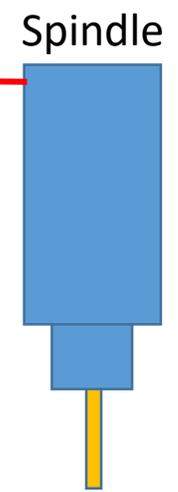
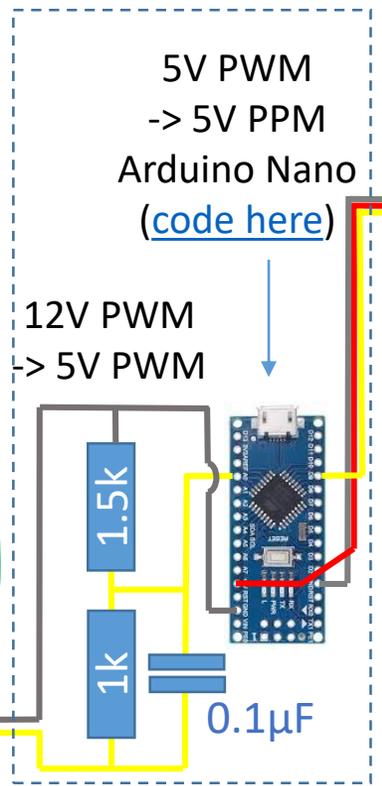


Typical CNC configuration : SKR Pico + milling

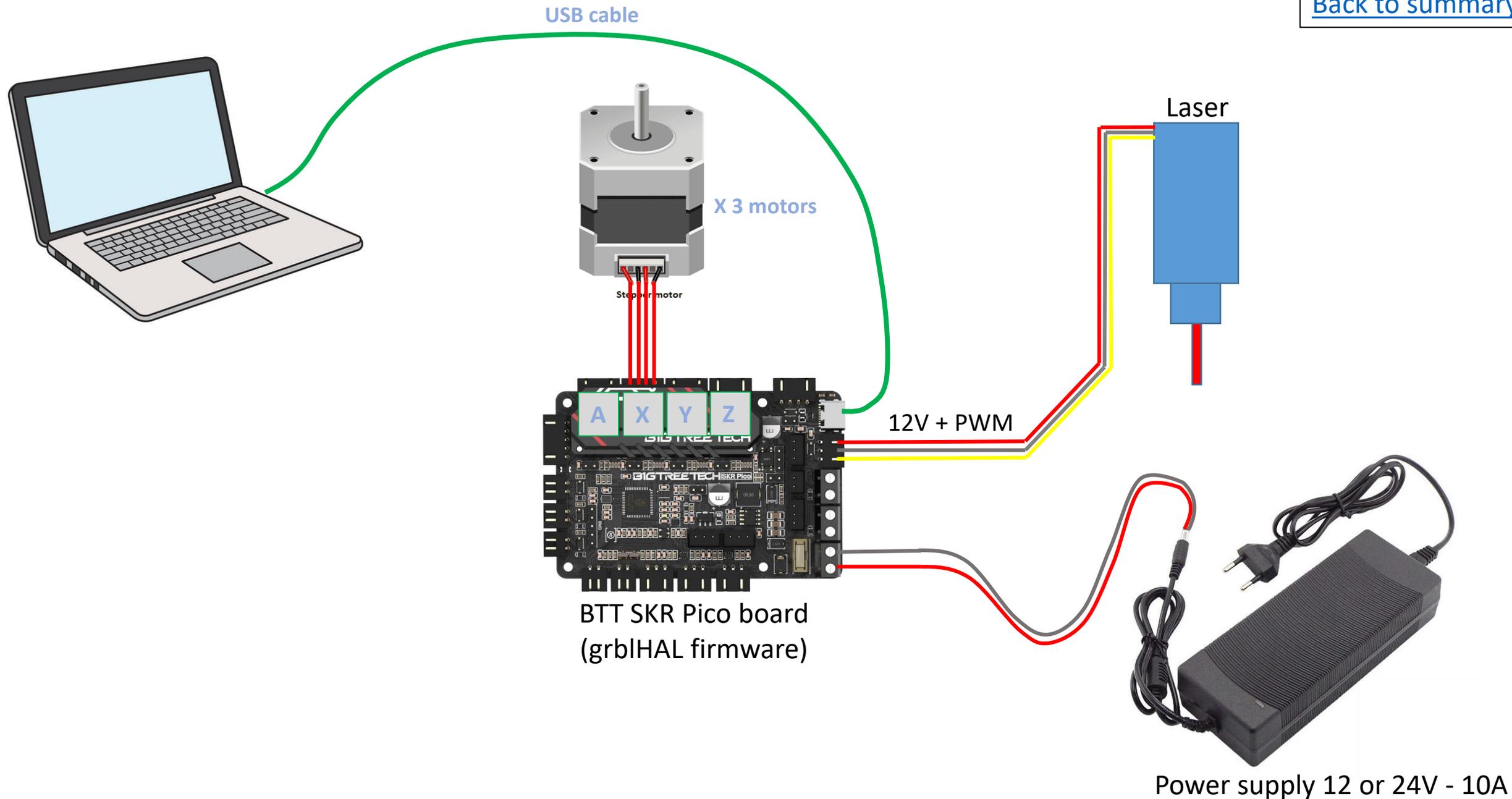
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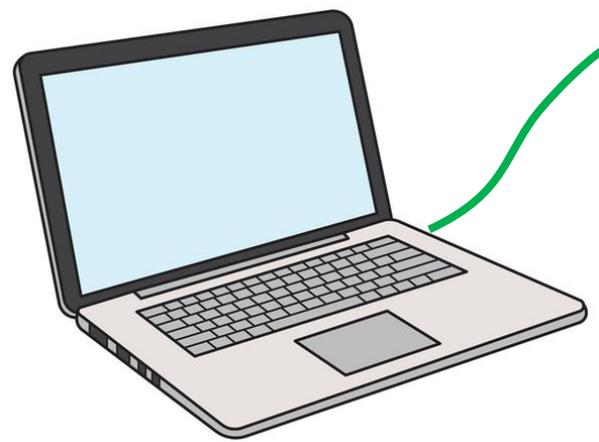
BTT SKR Pico board
(grblHAL firmware)



Power supply 12 or 24V - 10A or more



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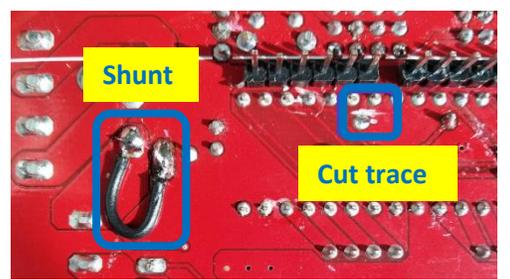


USB cable

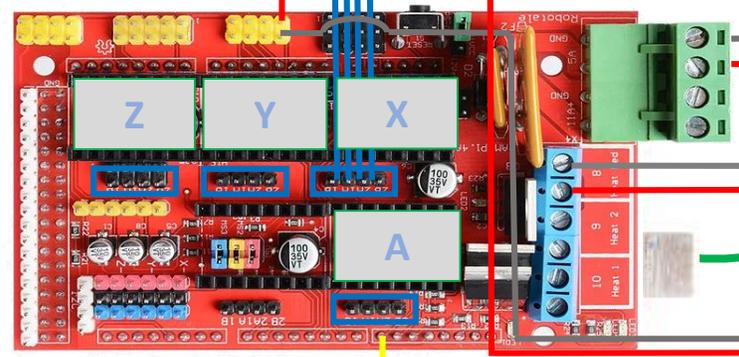


X 3 or 4 motors

Stepper motor



Ramps 1.4 & 1.5 power supply modification (one supply for both motors and hot wire)



M2560 (Arduino firmware) + Ramps
Recommended motor drivers : TMC2225 (32 μ Steps)



Power supply 12 or 24V

Hot wire

Arduino 5V PWM -> PPM → Spindle Laser

5V PWM

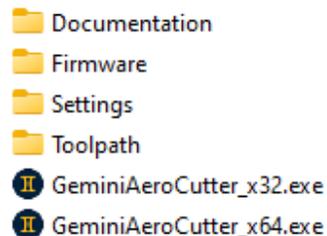
Installation

Prerequisite : Windows 7 to 11 with .NET framework 4.5 or higher.

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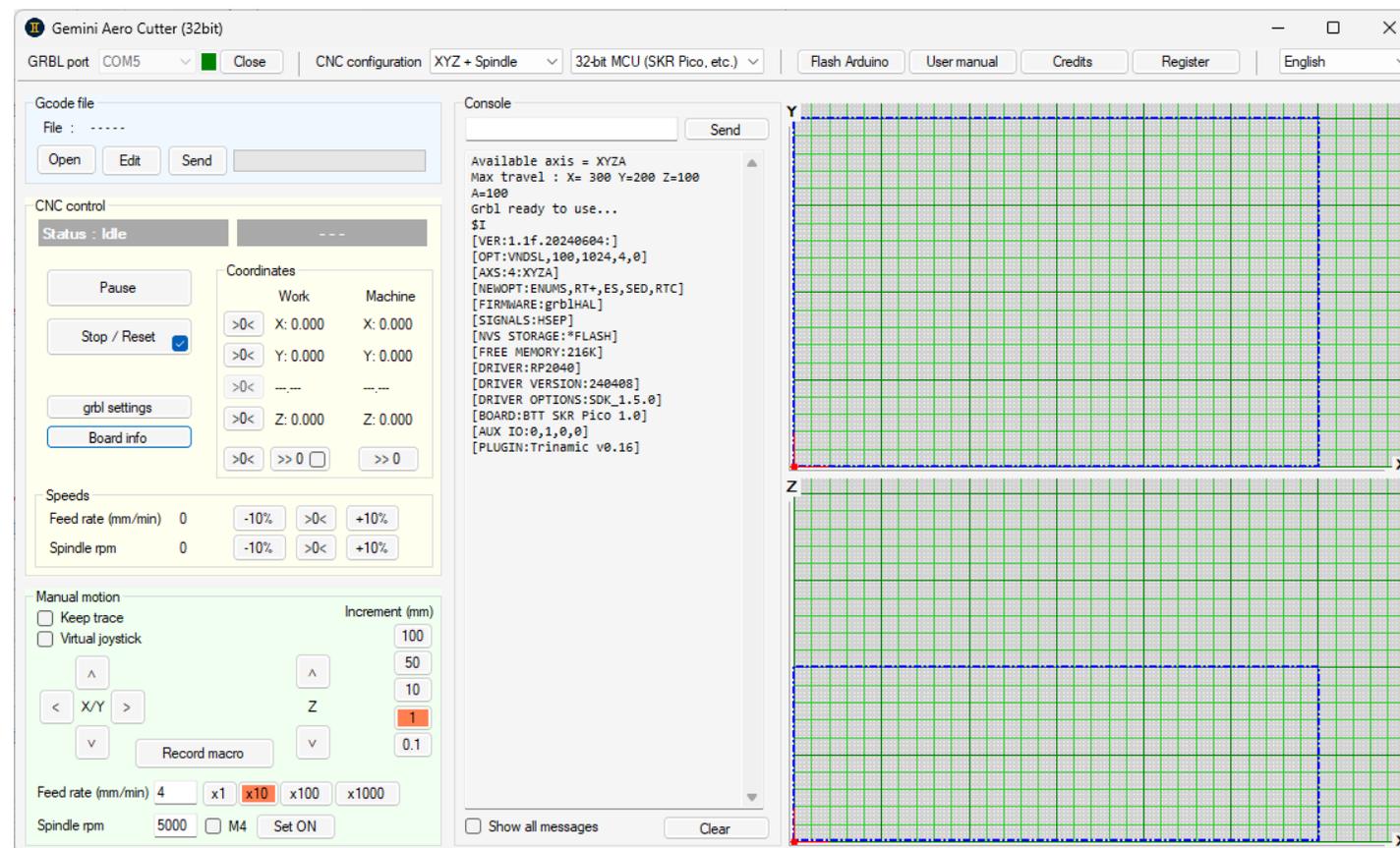
Create a folder (preferably at the root of the disk) on a physical drive (HDD, SSD or USB key) of your choice .

Extract the zip on these folder :



Some anti-virus can make a false virus detection, please ignore it !

Launch GeminiAeroCutter.exe :



In demo mode :

- all functions are available except saving edited GCode
- a reminder message appears every 20 lines of GCode sent

Go to <https://www.geminiaerotools.com/geminiaerocutter.html>

At the end of this page, you will find a PayPal button to buy a licence (credit card or PayPal)

You will received your licence by mail (as it is generated manually, it can take up to 1-2 working days)

Launch Gemini Aero Cutter

Click « Register » to open the registering form :



Copy and paste all the informations of the licence in the registering form :

www.geminiaerotools.com'." data-bbox="27 534 290 805"/>

Click « Unlock application »

Enjoy 😊

Main interface (hot wire mode)

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Most menus and buttons are self-explanatory 😊

Configure user interface for CNC

User text commands interface.
Motion mode (G90 = absolute, G91 = relative) and feed rate (F) must be specified, separately or in the same line of order.
Example : G90 G01 X30 F500
(go to absolute coordinate X = 30 mm at 500 mm/min)

Toolpath

Language

Machine boundaries (use "grbl settings" to change values according to your CNC)

Work origin (= machine origin at startup)
To set new work origin : manual move axis, then click « >0< »)

Stop motion

Pause / resume motion

Hold current position on Stop (otherwise, by default, grbl cuts motor power and current position can be lost)

Configure grbl board

Values can be changed via keyboard or mouse scroll

The screenshot shows the Gemini Aero Cutter (64bit) software interface. At the top, there are dropdown menus for GRBL (COM5), MCU (32-bit), and Config (XYZA + HotWire). A language dropdown is set to English. The main interface is divided into several sections:

- GCode file:** Shows the current file 'ClarkY_full_addon_GeminiAeroFoam.nc' with icons for file operations.
- CNC Control:** Includes a status bar (Idle), control buttons (stop, resume, refresh), and a coordinates table:

	Work	Machine
>0<	X: 0.000	X: 0.000
>0<	Y: 0.000	Y: 0.000
>0<	A: 0.000	A: 0.000
>0<	Z: 0.000	Z: 0.000
>0<	>> 0	>> 0
- Speeds:** Controls for Feed rate (mm/min) and HotWire power, each with -10%, >0<, and +10% buttons.
- Manual motion:** A joystick interface with directional buttons and an increment selector (set to 50 mm).
- Console:** A text area for grbl messages, currently showing 'Available axis = XYZA', 'Max travel : X= 350 Y=200 Z=200', 'A=350', and 'Grbl ready to use...'. A 'Show all messages' checkbox is at the bottom.
- Graphics:** A 3D view showing a toolpath on a grid. The axes are labeled X, Y, and Z. A callout box explains graphics interaction: 'Zoom : mouse scroll', 'Pan : left mouse click + drag', and 'Zoom all : mouse right click'.

Feedback console

Show all grbl messages

Graphics interaction :
Zoom : mouse scroll
Pan : left mouse click + drag
Zoom all : mouse right click

Main interface (milling and laser mode)

A 4 axis CNC board can be used to 3 axis milling, by selecting the appropriate configuration

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G1,G2 and G3 toolpath demonstration

Tool trajectory during operation. The distance between points is a function of the speed of movement.

The screenshot displays the Gemini Aero Cutter (64bit) software interface. At the top, it shows the configuration 'XYZ + Spindle'. The GCode file section includes a file browser and a play button. The CNC control panel features buttons for 'Hold:0', 'STOP', and 'Reset', along with a coordinate table:

	Work	Machine
X	26.256	36.256
Y	-0.353	9.647
Z	-1.000	9.000

Below the coordinates are speed controls for Feed rate (300 mm/min) and Spindle rpm (1000). The Manual motion section includes a joystick and a 'REC' button. The console window shows the following GCode:

```
Available axis = XYZA
Max travel : X= 350 Y=200 Z=200
A=350
Grbl ready to use...
G91 G1 Z+10 F400
G91 G1 X+10 F400
G91 G1 Y+10 F400
G10L20 P0 X0 Y0 Z0
GrblHAL 1.1f ['s' or '$HELP' for help]
Start sending to grbl, 10:11:34
(Created 21:43:33 30/06/2024 from G0G1G3_test)
(Post = grbl milling)
(Tool 0 = Bit D1 L10)
N0000 G90
N0001 T0 M06 M03 S24000
N0002 G00 X0.0000 Y0.0000 Z3.0000
F300.00
N0003 G00 X17.5000 Y15.0000
N0004 G01 Z-1.0000 F300.00
N0005 G02 X17.5000 Y15.0000 I-2.5000
J0.0000
N0006 G00 Z3.0000
N0007 G00 X5.0000 Y-0.5000
N0008 G01 Z-1.0000 F300.00
N0009 G01 X0.0000
N0010 G02 X-0.5000 Y0.0000 I0.0000
J0.5000
N0011 G01 Y5.0000
N0012 G02 X-0.4160 Y5.2774 I0.5000
J0.0000
N0013 G01 X9.5840 Y20.2774
N0014 G02 X10.0000 Y20.5000 I0.4160
J-0.2774
N0015 G01 X20.0000
N0016 G02 X20.3536 Y20.3536 I0.0000
J-0.5000
N0017 G01 X30.3536 Y10.3536
N0018 G02 X30.5000 Y10.0000 I-0.3536
J-0.3536
```

The toolpath visualization shows a 2D XY view with a red trajectory and a 3D XZ view showing the tool's vertical movement.

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Keyboard can be used for jogging :

- CTRL + arrows for X/Y (laser, milling) or X+A and X+Z (hotwire)
- CTRL + PageUp/Dn for Z (milling)
- W (Azerty) or Z (Query) + arrows for hotwire X/Y
- X + arrows for hotwire A/Z

Tool trajectory during jogging

Return to work origin at working (G1) or fast (G0) speed

Set the work origin at the current position

Draw the tool trajectory during jogging

Axis will move as long the button is pressed

Macro recorder :

- click on button
 - use jog or user text commands to do what you want
 - click a second time to save to disk
- You can now re-use it as a normal toolpath, for example to cut blocks.

The screenshot displays the Gemini Aero Cutter software interface. At the top, it shows the machine configuration: GRBL, COM5, 32-bit MCU, and XYZ + Spindle. The main control panel includes a GCode file field, CNC status (Idle), and a control area with buttons for stop, reset, and settings. A coordinates table shows Work and Machine coordinates for X, Y, and Z axes. Below this are speed controls for feed rate and spindle rpm. The manual motion section features a virtual joystick and a macro recorder button (REC). A 2D plot on the right shows the tool trajectory during jogging, with a red square indicating the current position and a red line showing the path. A console window on the right displays the GCode commands being executed.

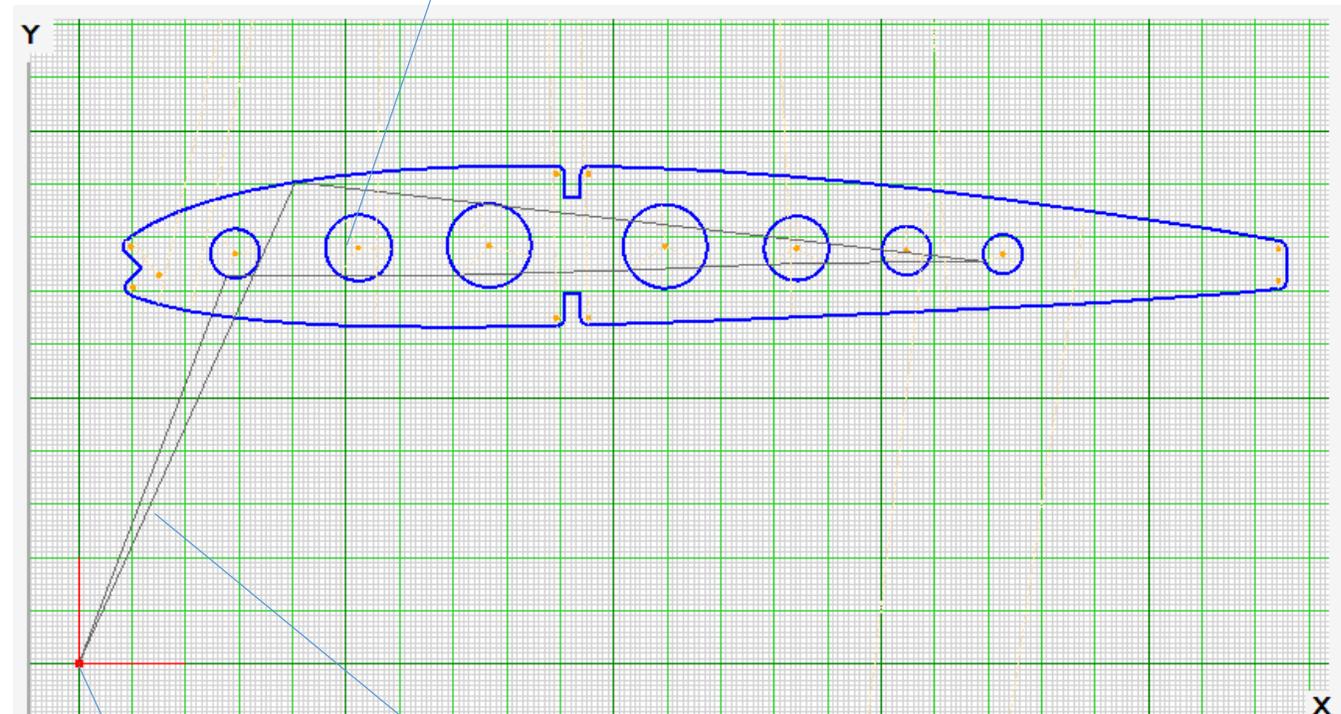
	Work	Machine
X	0.000	50.000
Y	0.000	50.000
Z	0.000	50.000

```
Available axis = XYZA
Max travel : X= 350 Y=200 Z=200
A=350
Grbl ready to use...
G28
G91 G1 Z+50 F4000
G91 G1 X+50 F4000
G91 G1 Y+50 F4000
G10L20 P0 X0 Y0 Z0
F400
G91 G1 Z-10 F400
G91 G1 Y+30 F400
G91 G1 X+30 F400
G91 G1 Y-30 F400
G91 G1 X-30 F400
G91 G1 Z+10 F400
```

Mouse right click on button(s) to edit value(s)

- NotePad like text editor with copy / cut / paste abability (ctrl + c / x / v)
- Syntax-highlighted text
- Instantaneous graphics redraw
- Can be use to make a simple GCode program from scratch
- Simulate the Gcode with the « Simu » button

```
GCode editor
(Project Lalysée_découpeCnc)
(Created by Estlcam version 11 build 11.242)
(Machining time about 00:02:21 hours)
(Required tools:)
(End mill 3mm)
M03 S24000
G00 Z5.0000
(No. 1 Trou: Contour interieur 1)
G00 X27.6116 Y72.6998
G00 Z0.5000
G01 Z0.0000 F600 S24000
G01 Z-1.0000
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G01 Z-2.0000 F600
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G01 Z-3.0000 F600
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G00 Z5.0000
(No. 2 Trou: Contour interieur 2)
G00 X48.8351 Y72.9216 Z5.0000
G00 Z0.5000
G01 Z0.0000 F600
G01 Z-1.0000
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
G02 X48.8351 Y72.9216 I-6.2121 J0.4072
G01 Z-2.0000 F600
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
G02 X48.8351 Y72.9216 I-6.2121 J0.4072
G01 Z-3.0000 F600
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
```



G2 and G3 arc centers
in orange points

Working origin

G0 rapid motions are
shown in thin grey lines

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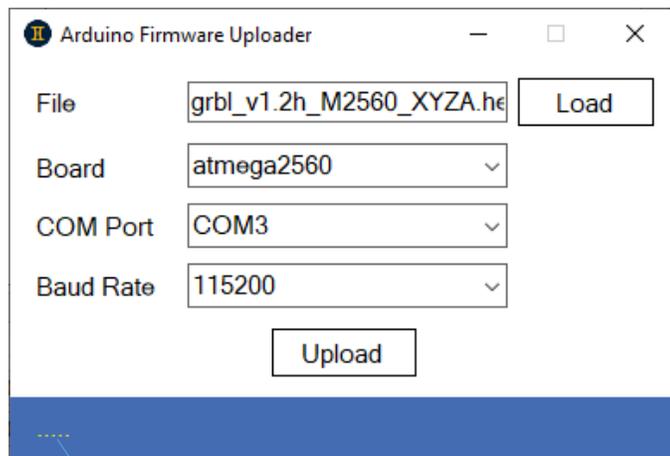
grbl 1.1/1.2 with Arduino UNO (laser and milling) and M2560 (laser, milling, hot wire) boards :

- connect board to USB port
- launch Gemini Aero Cutter
- click on "Flash Arduino" button



- set the appropriate parameters
- Click on "Upload" button
- board is now in working mode

If GRBL port is open, click on the disconnect button before uploading firmware



Status operation

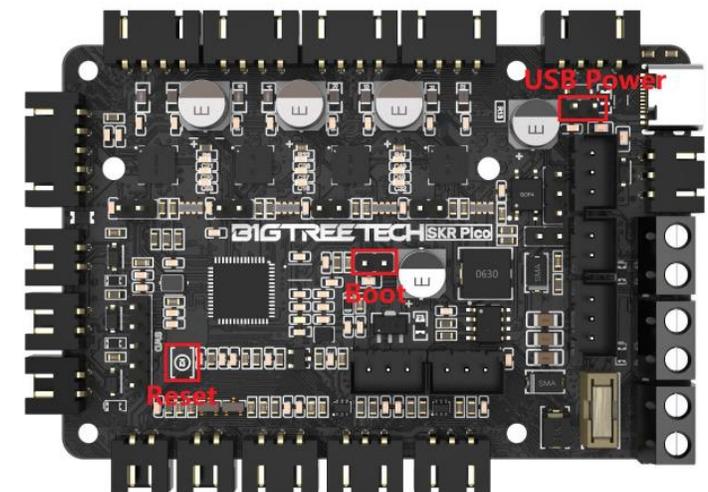
IMPORTANT (for all boards) : always connect the USB port of the board to the PC BEFORE powering the board0

grblHAL with BTT SKR Pico V1.0 board :

- plug jumper caps on Boot and USB Power
- connect the board to USB port
- a new USB flash drive (called RPI-PR2) is added to computer
- copy the pre-built grblHAL.uf2 file on this drive
- the board will automatically reboot
- unplug the Boot and USB caps (USB can temporary stay in place to test the board without powering it by the external power supply, but must be removed for using)
- click the Reset button or unplug / reconnect the board
- board is now in working mode

For who needs a custom grblHAL firmware, you can use this web builder : <http://svn.io-engineering.com:8080/?driver=RP2040>

Driver:
Board:



List of settings is automatically read on the board, and can be saved to (and loaded from) disk.
Each value modification (use enter key to confirm) is automatically sent to board and identified in red.

ID	Value	Unit	Name
\$0	10	microsecond (10 = default)	Step pulse length
\$1	87	millisecond (0-255)	Step idle delay
\$2	1;0;0;0	0 = normal / 1 = reverse	Step pulse mask (X;Y;Z;A)
\$3	0;0;0;0	0 = normal / 1 = reverse	Axis direction mask (X;Y;Z;A)
\$4	0	0 = normal / 1 = reverse	Step enable
\$5	0	0 = normal / 1 = reverse	Limit pins
\$6	0	0 = normal / 1 = reverse	Probe pin
\$10	1	see Grbl documentation	Status report mask
\$11	0.020	mm	Junction deviation
\$12	0.002	mm	Arc tolerance
\$13	0	0 = mm / 1 = inches	Feedback units
\$20	0	0 = disable / 1 = enable	Soft limits (req. homing)
\$21	0	0 = disable / 1 = enable	Hard limits
\$22	0	0 = disable / 1 = enable	Homing cycle (req. lim. sw.)
\$23	0;0;0;0	0 = normal / 1 = reverse	Homing direction mask (X;Y;Z;A)
\$24	25.000	mm/min	Homing feed rate
\$25	250.000	mm/min	Homing seek rate
\$26	250	microsecond	Homing debounce delay
\$27	5.000	mm	Homing pull-off
\$30	12000	% (0-100)	Spindle max rpm
\$31	550	% (0-100)	Spindle min rpm

Load settings from disk Save settings to disk Restore initial settings

The configuration of the SKR Pico offers a few additional settings :

\$140	500	mA	X axis current
\$141	500	mA	Y axis current
\$142	500	mA	Z axis current
\$143	500	mA	A axis current
\$150	16	8, 16, 32 or 64	X axis micro-steps
\$151	16	8, 16, 32 or 64	Y axis micro-steps
\$152	16	8, 16, 32 or 64	Z axis micro-steps
\$153	16	8, 16, 32 or 64	A axis micro-steps

- stepper current is set programmatically by the \$140-\$143 parameters (instead of pots like on Pololu drivers).
CAUTION : never leave these values at 0, otherwise the current will not be regulated and can damage board (max continuous current for the TMC2209 drivers is 2 A) and also steppers. A good starting point is 500 mA, then adjust it depending if your CNC loose its position at idle or loose steps during fast motion.
- micro-stepping is also set programmatically, by the \$150-\$153 parameters (instead of jumper caps like on RAMPS or MKS boards).
Default value is 16, but you can go up to 32 or 64 (and even 128 or 256, but not necessary) with the built-in TMC2209 to improve resolution with direct belt drive systems. **NOTE** : this function works only if SKR Pico board is powered by external supply (i.e. drivers are powered) AND USB cap is removed (otherwise the board will use the default value of 16 microsteps and will have inappropriate motions !).

NOTE : \$1 must be set to 255 (i.e. motors keep their torque at idle) for belt drive CNC
\$2 is generally set to 0;0;0;0
\$4 must be set to 0 (normal step)

Despite of your efforts, some bugs or crash can occurs, nobody is perfect... ☹️

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If the case, Gemini Aero Cutter will automatically create a file « errorlog.txt » in the working directory of the application.

You can open submit it via :

- the contact form : <https://www.geminaerotoools.com/contact.html>
- or in the « Bug reports » section the forum : <https://geminaerotoools.webboard.org>

Don't forget to give some explanations (context, screenshots, etc.) to help us solving it !

Subject : Other

Name : Your name

Email : name@domain.com

Country :

Message : (please don't forget to provide your full coordinates for a licence key request)

Your Message : ...

Contents of errorlog.txt file : ...

Security check : 4

Send

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Gemini Aero Tools

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