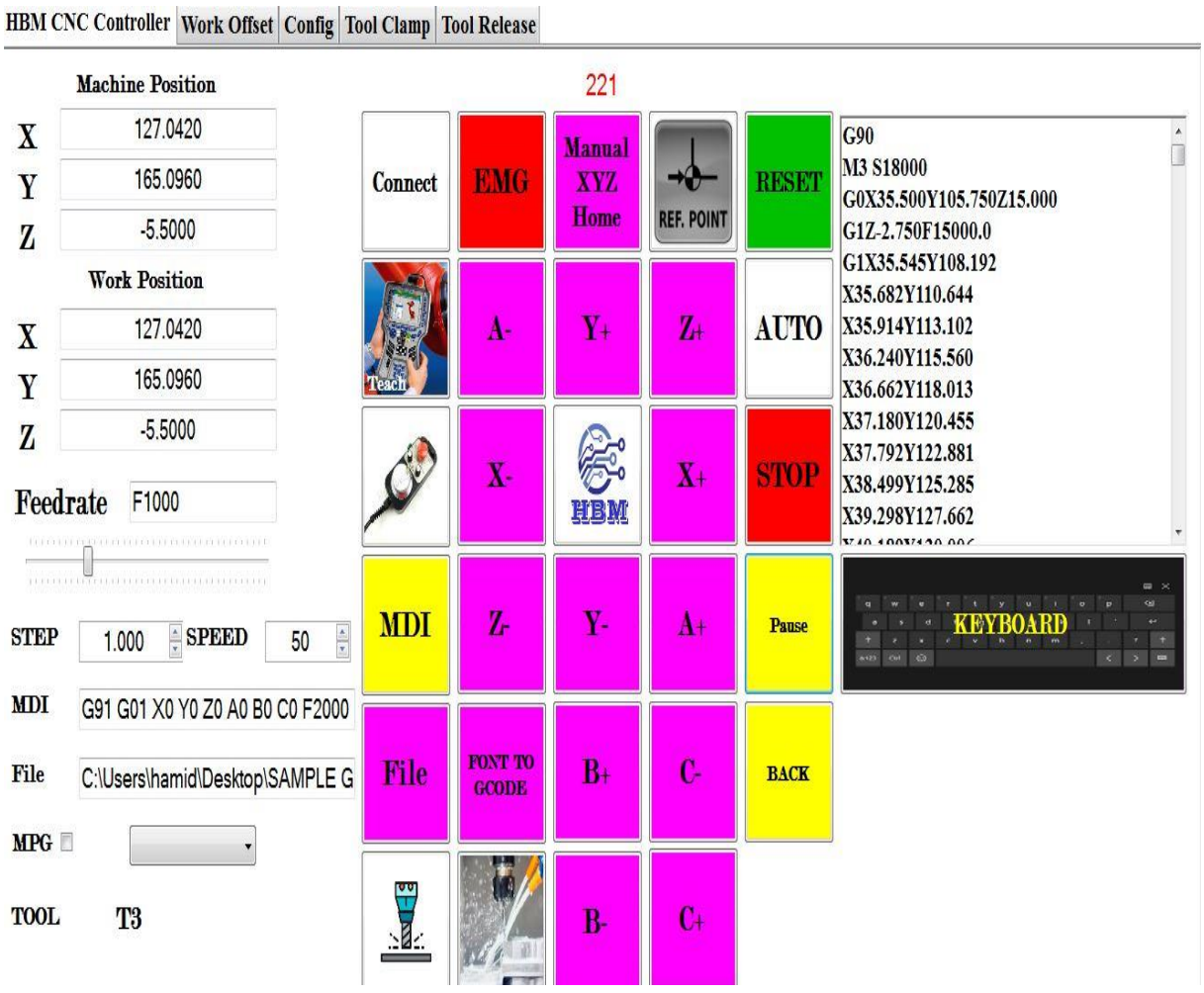
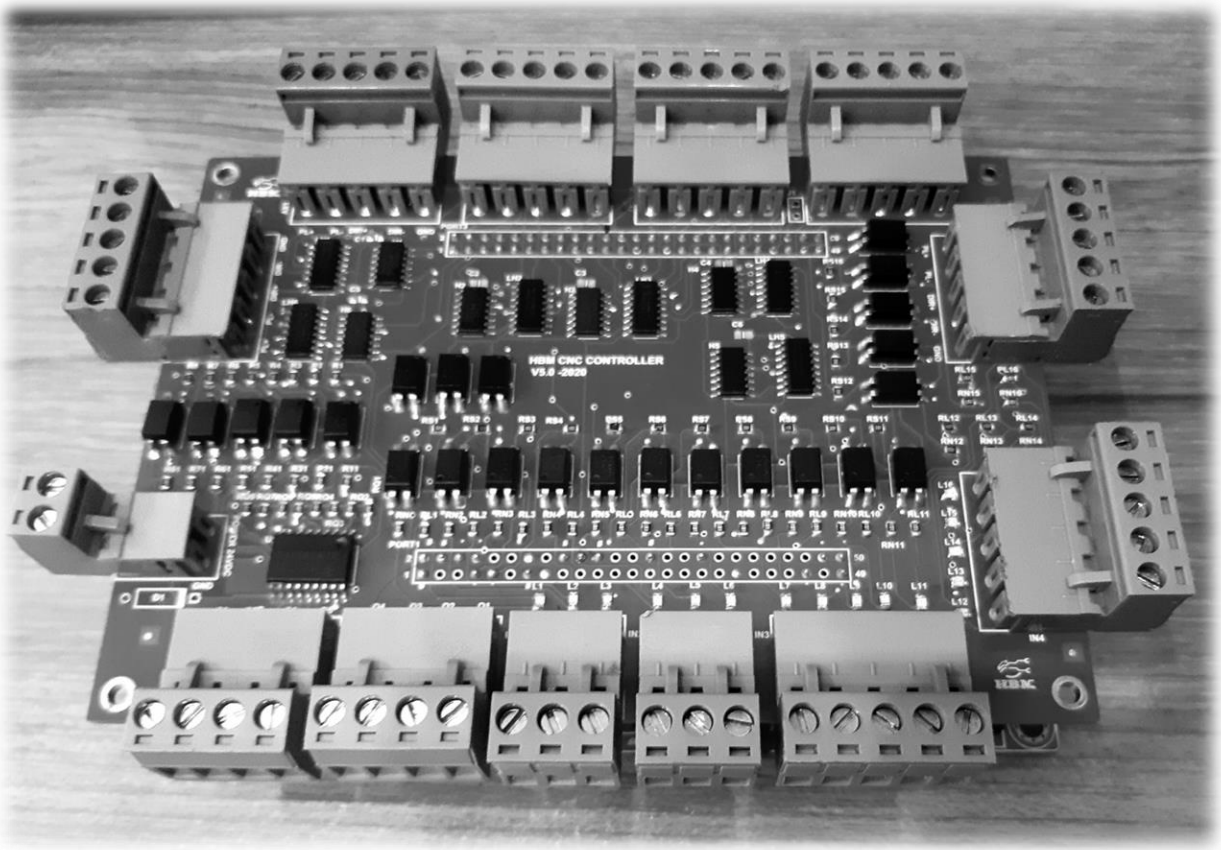
HBM CNC CONTROLLER

User manual

Version 6.1

2021





تماس با ما:

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کنترلر های HBM با طراحی منحصربه فرد گزینه ای مناسب و اقتصادی جهت دستگاه های فرز ، برش ، لیرز ، کاربردهای رباتیک ، ماشین آلات مخصوص و ... بشمار می آید. قابلیت های متمایز این کنترلر از جمله تعداد محورهای کنترلی حداکثر 6 محور ، کنترل و ارسال G CODE از طریق شبکه Ethernet ، پردازش مستقل از PC ، ورودی و خروجی های برنامه پذیر دیجیتال ، آنالوگ و پروتکل مدباس، نصب و راه اندازی آسان، محیط گرافیکی و سیمولیشن 3D مسیر حرکت در کمتر کنترلی به صورت یکجا مشاهده میشود .

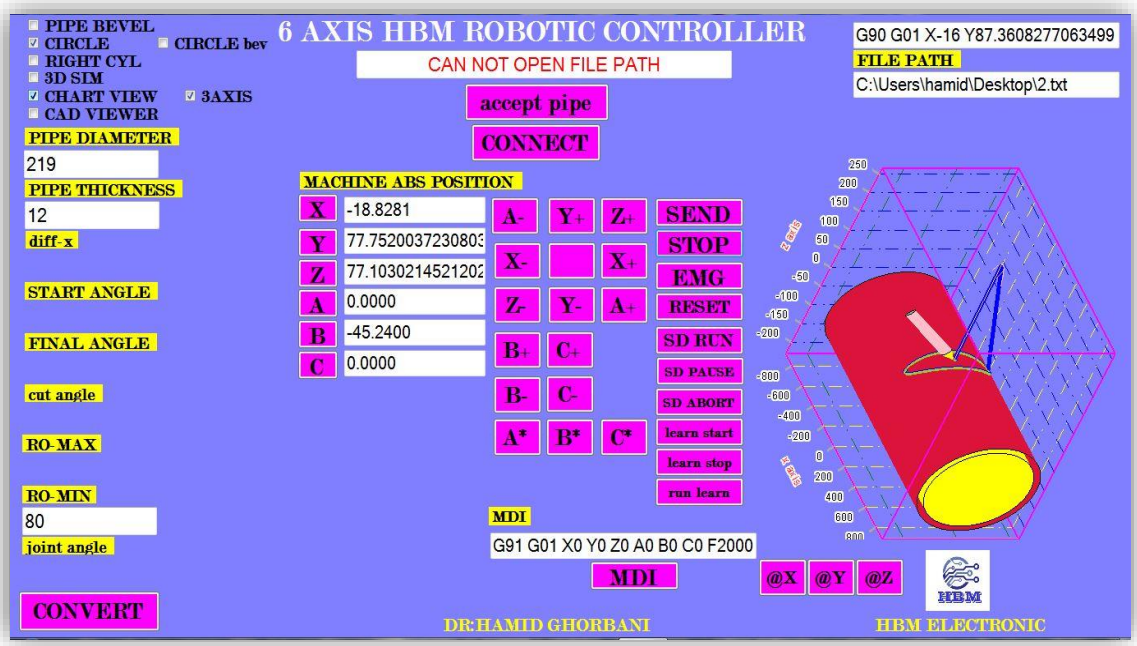
مشخصات فنی کنترلر HBM **:**

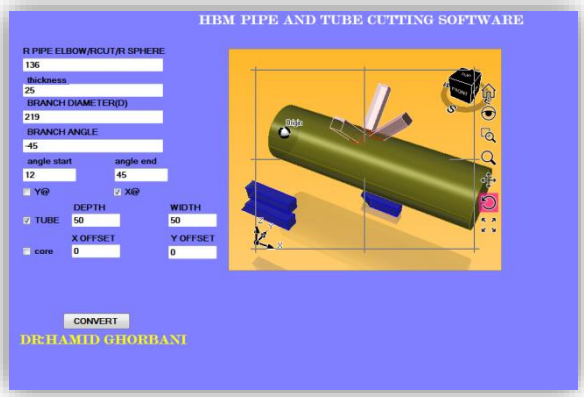
حداکثر تعداد محور ها	**6**
حداکثر نرخ پالس	**100 Khz**
تعداد محور همزمان	**3**
تعداد ورودی دیجیتال	**16**
نوع ایزولاسیون هر ورودی دیجیتال	**اپتوکوپلر**
تعداد خروجی دیجیتال	**8**
جریان هر خروجی دیجیتال	**300mA**
نوع ایزولاسیون هر خروجی دیجیتال	**اپتوکوپلر**
تعداد خروجی آنالوگ	**2**
ولتاژ خروجی آنالوگ	**0v…10v**
پشتیبانی از هندویل	✓
نوع ارتباط با کامپیوتر	**LAN**
بیشترین طول کابل ارتباطی	**30m**
ولتاژ و جریان تغذیه برد IO	**24v-1A**
ولتاژ و جریان تغذیه برد CPU	**5V-1A**
ابعاد کنترلر	**14cm x 10cm**

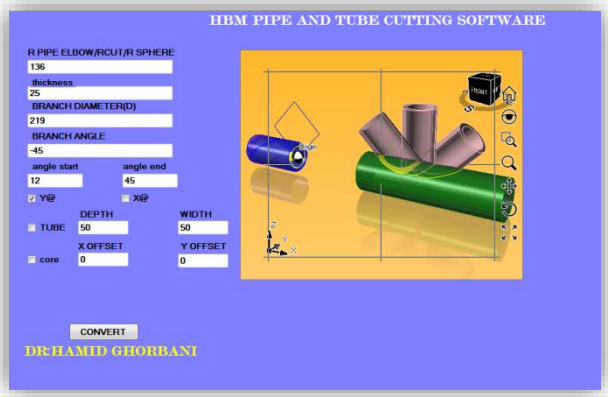
OPTION **های کنترلر** HBM **:**

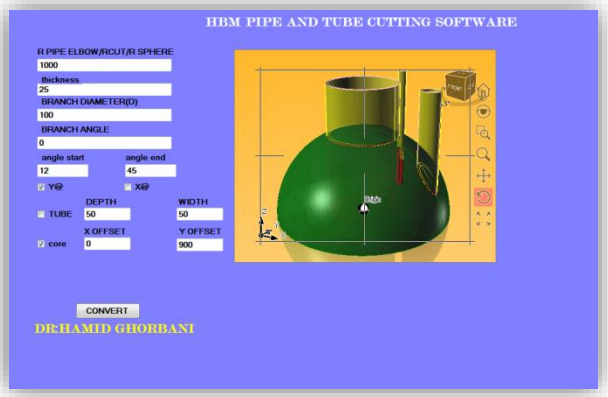
مد آموزش مسیر حرکت Teach in	**کنترلر دارای مد حرکت آموزش مسیر ابزار بوده و قابلیت ذخیره موقعیت تمام محورها در هر لحظه و ثبت اطلاعات و اجرای مجدد آن در هر زمان دلخواه را دارا میباشد. این مد در کاربردهای رباتیک و یا تکرار یک مسیر تجربی بدون نیاز به برنامه نویسی مورد استفاده قرار میگیرد.**
اپلیکیشن ریموت کنترل اندروید	**با استفاده از این ویژگی امکان کنترل توسط موبایل و یا تبلت وجود خواهد داشت.**
نرم افزار برش لوله 3D profile cutting controller Mode	**امکان برش لوله ، Tube و... را با تمام امکانات مورد نیاز به کاربر داده میشود.**
نرم افزار حکاکی HBM Engraving	**امکان حک فونت و اشکال مانند حکاکی فلز را فراهم میکند .**
استفاده از معادلات Kinematics	**معادلات Kinematics پرکاربردی مانند H- Bot/CoreXY ، Morgan Scara Linear , delta و ... در کنترلر پیاده سازی شده و قابلیت انتخاب دارد.**
کنترل از طریق شبکه Modbus	**امکان کنترل درایو و سایر تجهیزات تحت شبکه مدباس**
قابلیت اجرای برنامه بدون نیاز به PC	**این امکان وجود دارد که برنامه مورد نظر خود را در SD CARD کنترل ذخیره نمایید و کنترلر در این حالت فایل برنامه موجود در SD CARD را اجرا مینماید .در نتیجه نیاز به PC وجود نخواهد داشت . بیشترین کاربرد این قابلیت در ماشین هایی است که به صورت سری کاری برنامه ثابتی را اجرا مینمایند .**

محیط مد 3D profile cutting controller Mode :



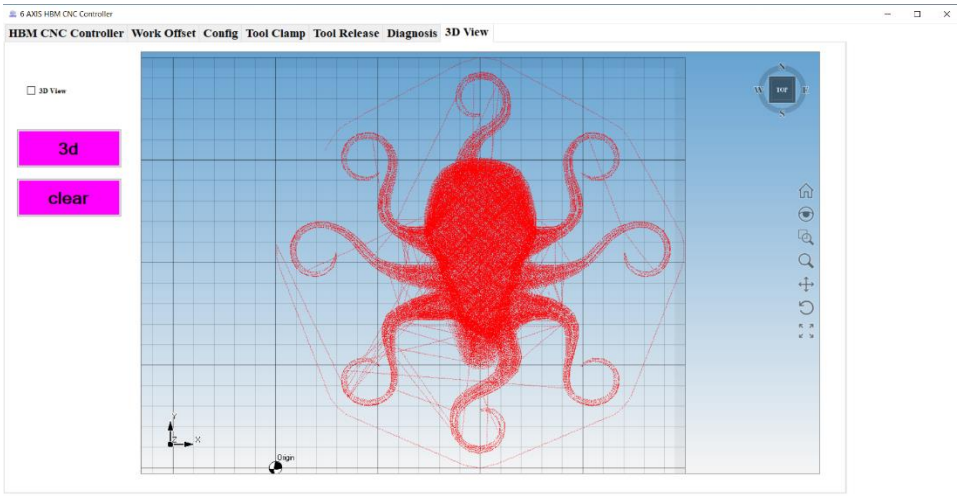


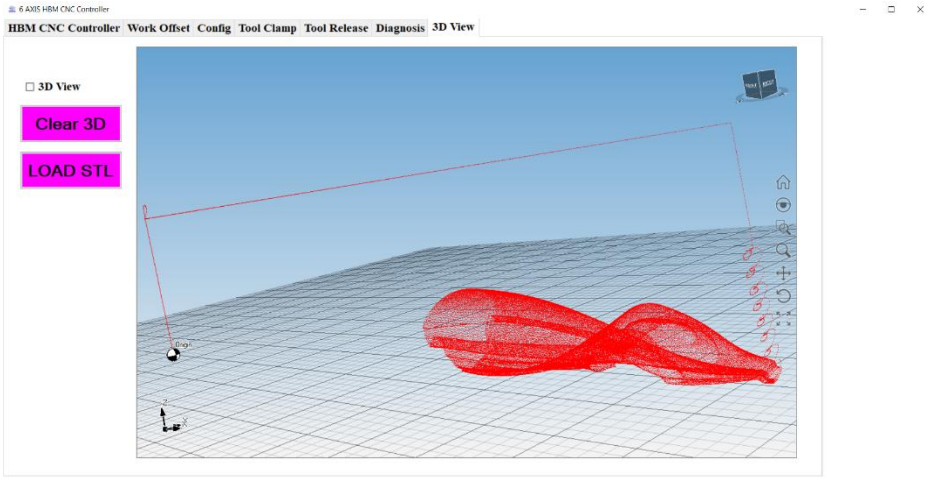


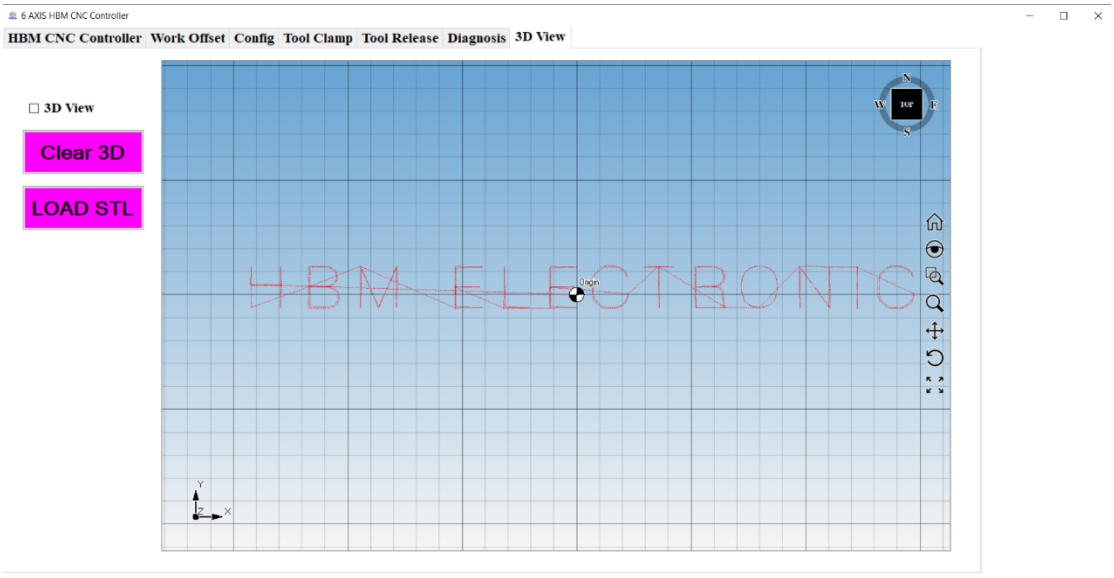


نمایش Simulation مسیر ابزار :

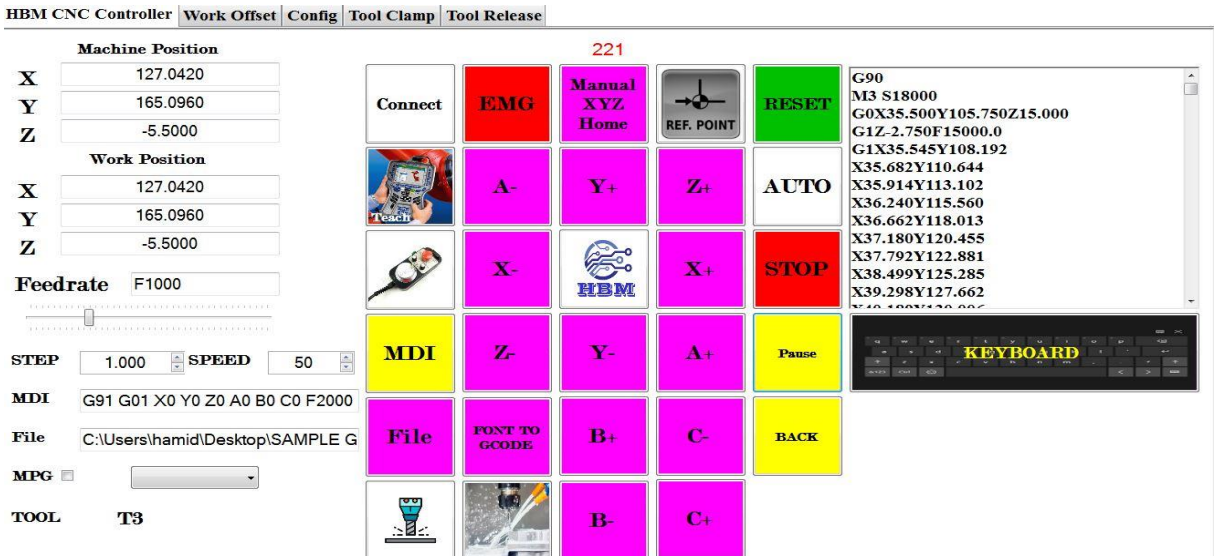
امکان مشاهده Real Time مسیر حرکت ابزار و زمان نمونه برداری 1 میلی ثانیه فراهم است.







محیط کاربری کنترلر:



معرفی کلیدهای کنترلر :

جهت ارتباط با کنترلر در ابتدای اجرای نرم افزار این کلید مورد استفاده قرار میگیرد.

کلید **Emergency** نرم افزاری کنترلر است .

جهت رفرنس دستی محورها در صورت نیاز بدون حرکت محور مورد استفاده قرار میگیرد .در این حالت کد **G28.3 X0 Y0 Z0** به کنترلر ارسال میگردد.

در صورت تعریف لیمیت سوییچ و پارامترهای رفرنس حرکت محور به سمت رفرنس ماشین صورت میپذیرد .در این حالت **G28.2** به کنترلر ارسال میگردد.

RESET جهت RESET نرم افزار کنترلر مورد استفاده قرار میگیرد.

جهت اجرای مد آموزش و ذخیره تمام حرکات محور و ذخیره در فایل دلخواه مورد استفاده قرار میگیرد. با اولین کلیک فرایند آغاز میگردد و با کلیک مجدد اتمام فرایند صورت میپذیرد.

HBM حرکت تمام محورها به سمت مبدا سیستم انتخاب شده (G54-G59)

AUTO اجرای برنامه در مد اتومات پس از انتخاب فایل G CODE .

STOP توقف کامل برنامه در مد اتومات .

Pause توقف برنامه و اجرای مجدد برنامه از محل توقف .

BACK کلید BACK که در دستگاه های برش کاربرد زیادی دارد . با استفاده از این کلید برنامه در جهت برگشت به ابتدای فایل اجرا میگردد و در صورت نیاز در هر نقطه با زدن کلید PAUSE متوقف میگردد و با کلیک مجدد BACK مجددا برنامه مطابق روال عادی تا انتهای فایل اجرا خواهد گردید.

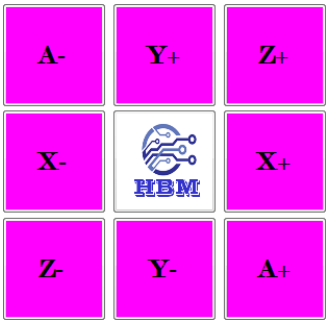
MDI ارسال GCODE دلخواه به کنترلر .

انتخاب فایل دلخواه G CODE .

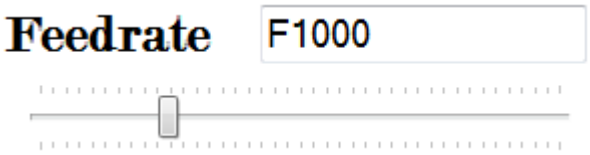
آپشن تبدیل فونت های دلخواه به G CODE که در کنترلرهای حکاکی HBM مورد استفاده قرار میگیرد.

کلید فعال و غیرفعال کردن چرخش اسپیندل با سرعت تعیین شده .

روشن و خاموش کردن پمپ آب صابون



کلیدهای حرکتی کنترلر که مقدار حرکت با پارامتر STEP تعیین میزان حرکت



FEEDRATE تعیین سرعت حرکت محورها

تعیین میگردد.حداکثر مقدار 1000 میباشد.

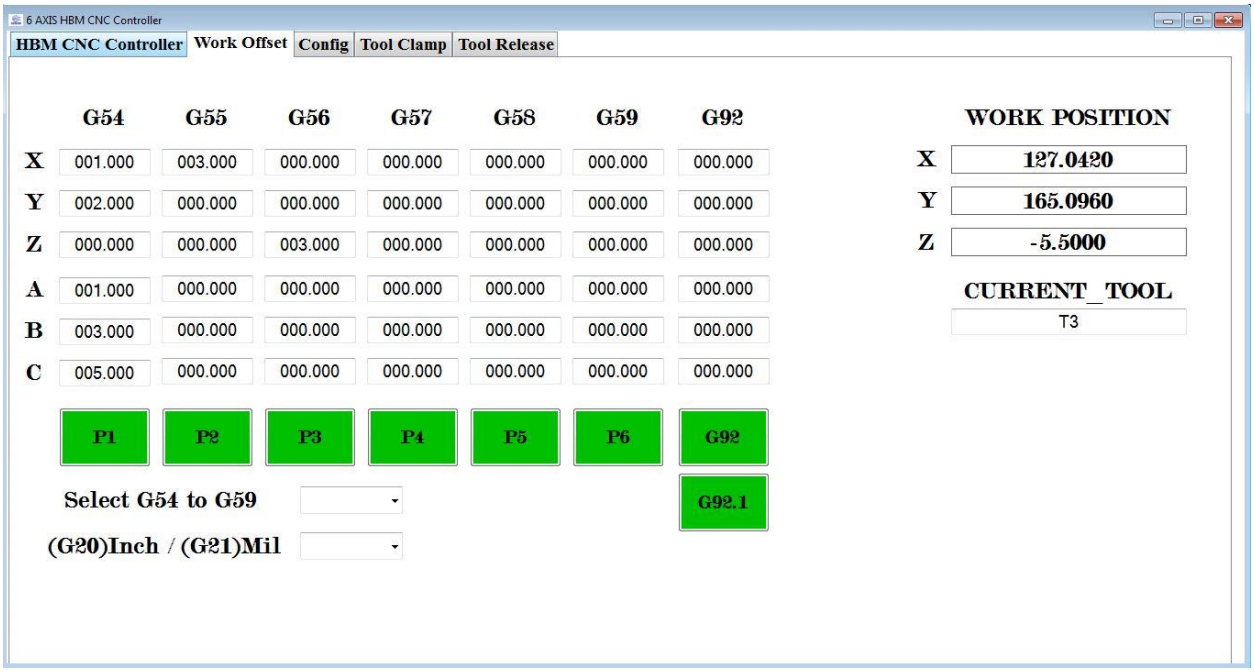
تعیین سرعت چرخش اسپیندل :

فعال کردن ارتباط هندویل و تعیین پورت USB کارت

هندویل:

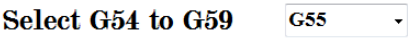
فعال و غیرفعال کردن مد هندویل در صورت وصل بودن هندویل به کنترلر .

تنظیمات WORK OFFSET و TOOL OFFSET :

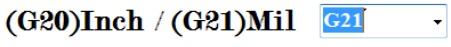


مقادیر G54 تا G59 به صورت اتوماتیک در کنترلر ذخیره میگردد و با زدن کلیدهای P1 تا P6 اعمال میگردد.

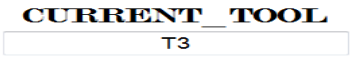
انتخاب G54-G59



انتخاب مد INCH یا Millimeter

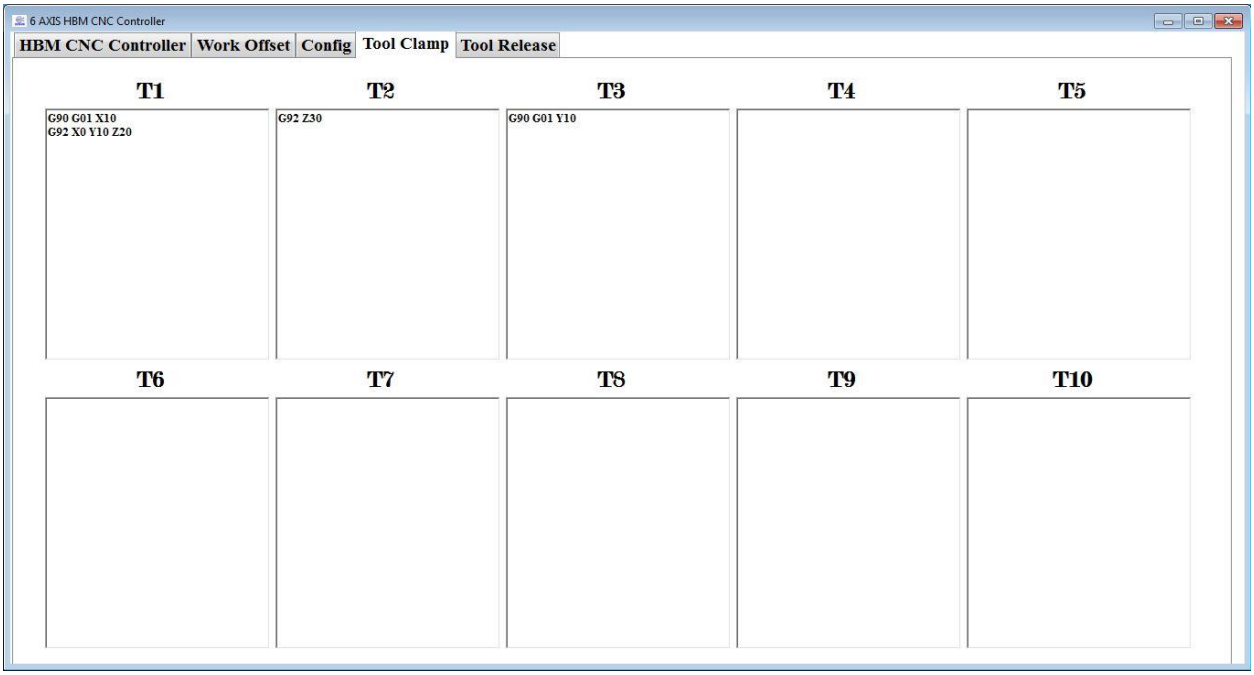


نمایش و یا تغییر شماره ابزار :



برنامه ریزی TOOL Change به صورت Macro :

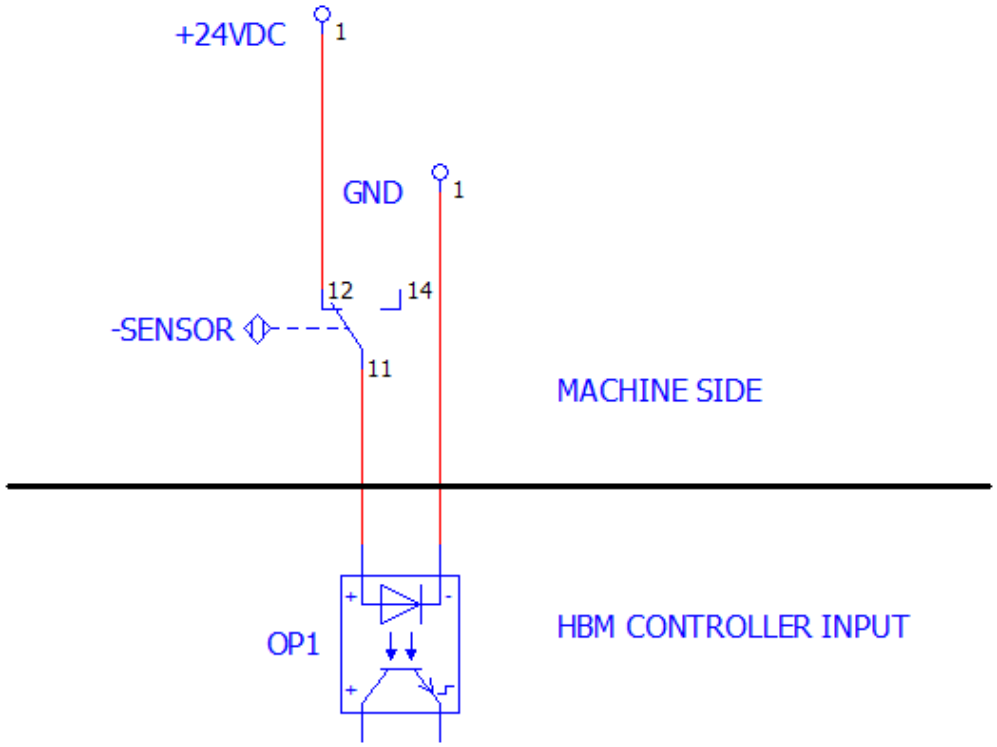
در حال حاضر با استفاده از منوی Tool clamp و Tool Release امکان برنامه نویسی 10 ابزار وجود دارد .



سخت افزار کنترلر:

ورودی های دیجیتال:

در حالت استاندارد 16 ورودی دیجیتال به صورت PNP در کنترلر تعریف شده است.که با تغییرات تنظیمات کنترلر امکان تعریف ورودی های جهت کاربردهای مختلف وجود دارد.



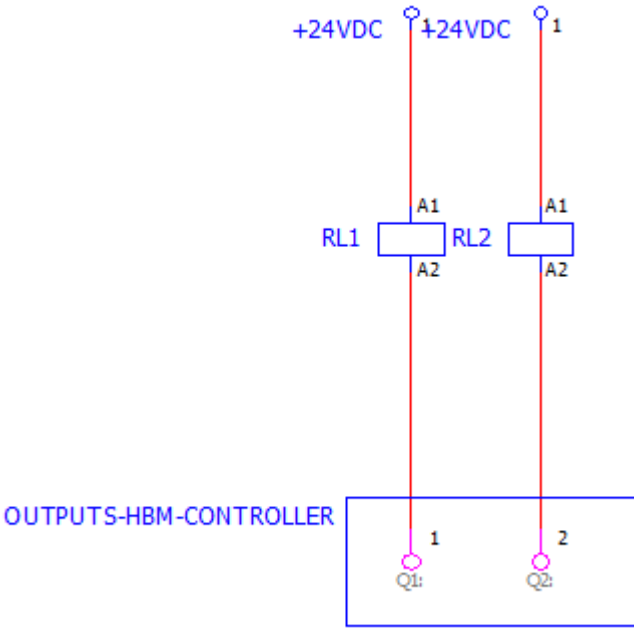
I1	X-, X0	لیمیت منفی جهت منفی محور –X و رفرنس محور X0
I2	X+	لیمیت سوییچ جهت مثبت محور +X
I3	Y-,Y0	لیمیت منفی جهت منفی محور –Y و رفرنس محور Y0
I4	Y+	لیمیت سوییچ جهت مثبت محور +Y
I5	Z-,Z0	لیمیت منفی جهت منفی محور –Z و رفرنس محور Z0
I6	Z+	لیمیت سوییچ جهت مثبت محور +Z
I7	Start	اجرای برنامه به صورت اتومات
I8	Pause	توقف اجرای برنامه
I9	Emergency	کلید قطع اضطراری

I10	Reset Controller	ریستارت کنترلر در زمان بروز خطا
I11	Servo alarm	ورودی مشکل و خطای درایو که سبب توقف کنترلر میگردد.
I12	Cut on/off	روشن و خاموش کردن CUT برش
I13	Torch1 Up	فرمان حرکت به سمت بالا تورچ 2
I14	Torch1 Down	فرمان حرکت به سمت پایین تورچ 2
I15	Torch2 Up	فرمان حرکت به سمت بالا تورچ 2
I16	Torch2 Down	فرمان حرکت به سمت پایین تورچ 2

- جدول فوق تعریف ورودی های استاندارد کنترلر در مد برش پلاسما است و تمام ورودی ها قابلیت تغییر و کاربردهای متفاوت را دارند.

خروجی های دیجیتال:

در حالت استاندارد 8 خروجی دیجیتال به صورت NPN در کنترلر تعریف شده است.که هر خروجی حداکثر 300 میلی آمپر جریان دهی دارد .



Q1	Preheat	خروجی پیش گرم برش
Q2	Cut/Arc strike	خروجی برش در هوا گاز یا سیگنال استارت سورس پلاسما
Q3	Torch1 Up	فرمان حرکت به سمت بالا تورچ 1
Q4	Torch1 Down	فرمان حرکت به سمت پایین تورچ 1
Q5	Ignition	سیگنال خروجی جهت سیستم جرقه زن
Q6	Torch2 Up	فرمان حرکت به سمت بالا تورچ2
Q7	Torch2 Down	فرمان حرکت به سمت پایین تورچ 2
Q8	THC Mode	فعال سازی مد کنترلر ارتفاع (THC)

- جدول فوق تعریف ورودی های استاندارد کنترلر جهت کنترلر در مد برش پلاسما است است و تمام ورودی ها قابلیت تغییر و کاربردهای متفاوت را دارند.

خروجی آنالوگ:

خروجی های Q7 و Q8 قابلیت استفاده به صورت آنالوگ و PWM را دارند .

نکته: توضیحات نحوه راه اندازی در بخش Config ارایه شده است.

ارتباط با محورها:

کانکتورهای کنترلر محورها با نام های AX1 تا AX6 نامگذاری شده اند.

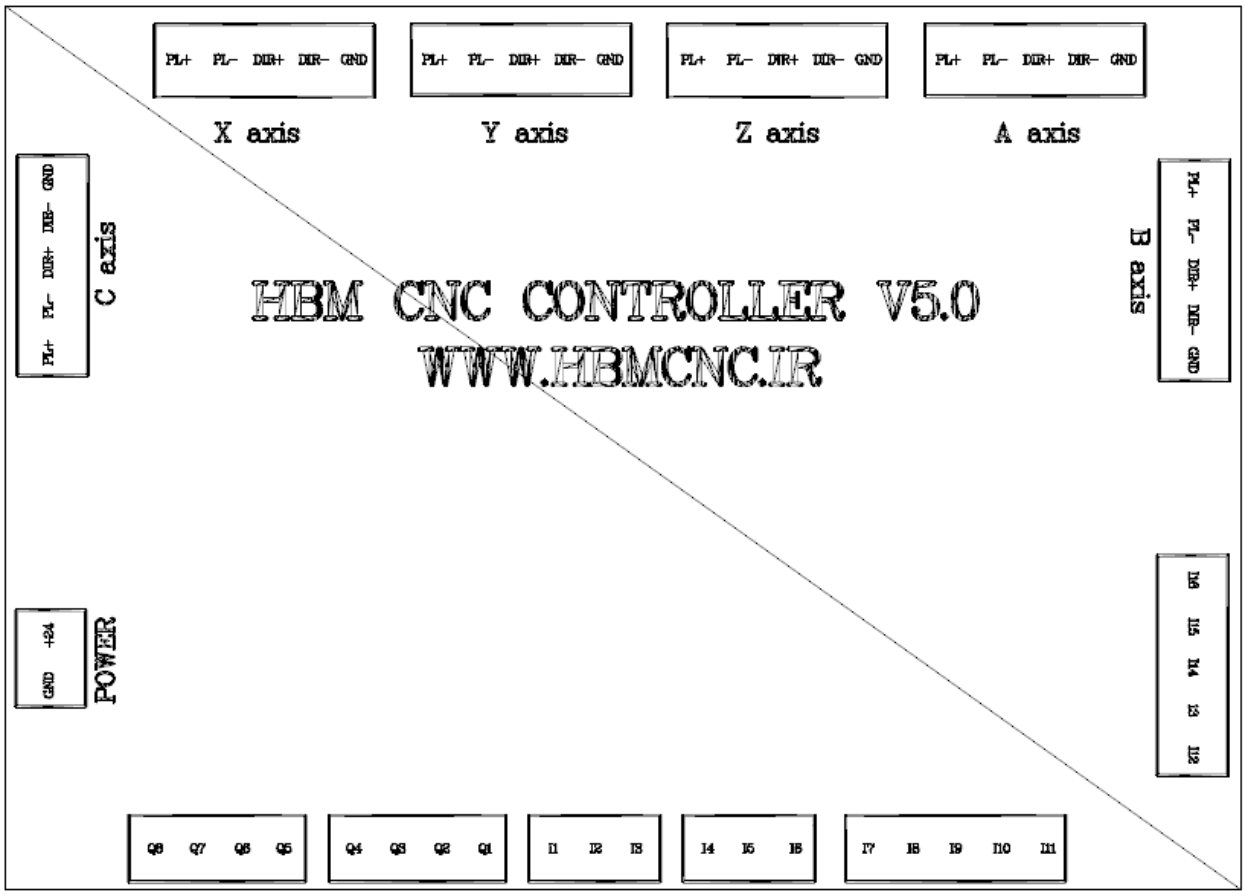
پین های ارتباطی هر محور به صورت زیر تعریف شده است :

PULSE+, PULSE- : مقدار حرکت و سرعت را به صورت پالس تعیین میکنند .خروجی Line drive با حداکثر جریان 20 میلی آمپر را داراست .

DIR+, DIR- : جهت حرکت محور را تعیین میکند. خروجی Line drive با حداکثر جریان 20 میلی آمپر را داراست .

GND : پین اتصال زمین جهت ارتباط GND کنترلر با GND درایو .

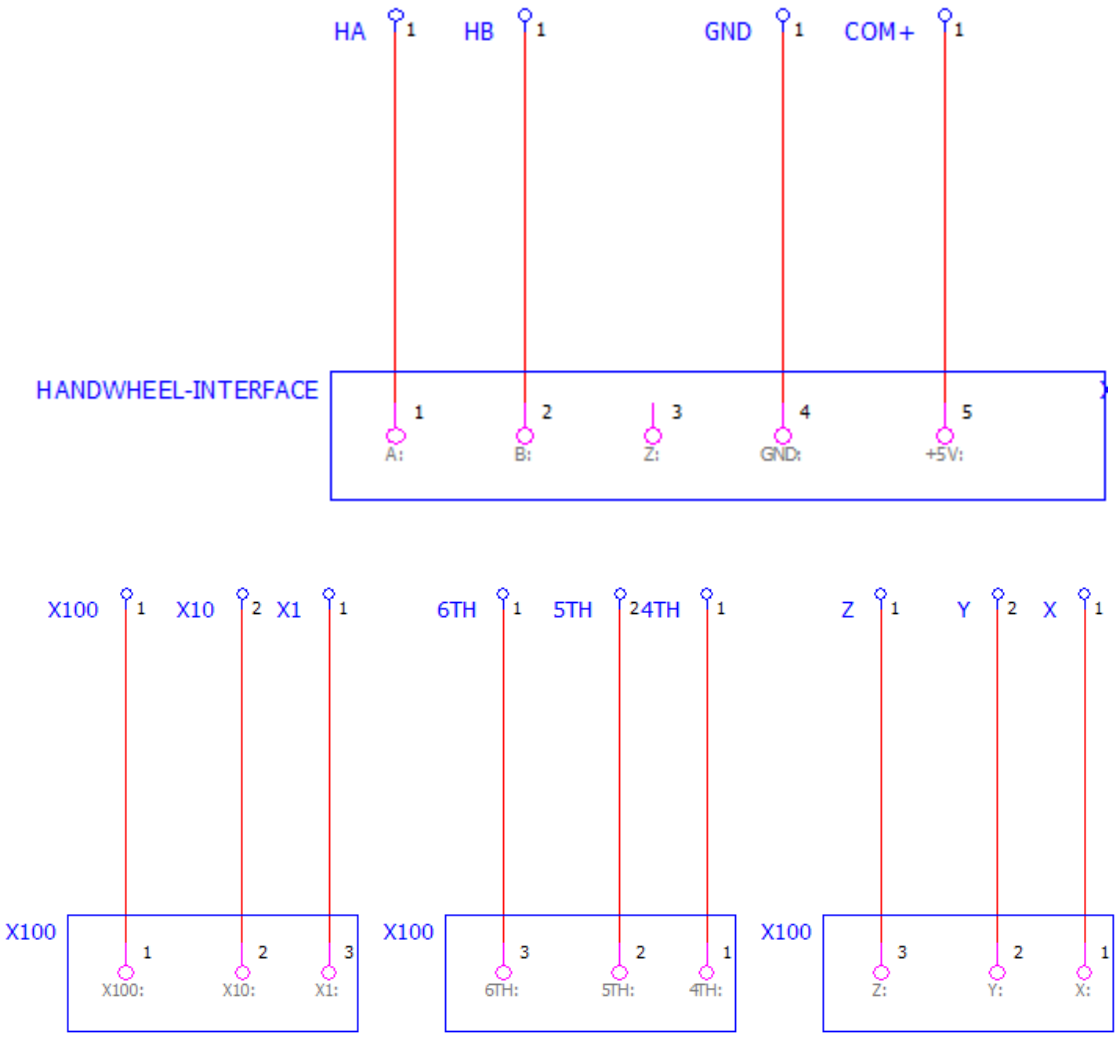
راهنمای کانکتورهای کنترلر:



هندویل:

کارت هندویل به صورت جداگانه از طریق پورت USB به PC وصل میشود که سیم بندی آن مطابق شکل زیر میباشد:

این کارت قابلیت ارتباط به هندویل های حداکثر 6 محور را داراست.

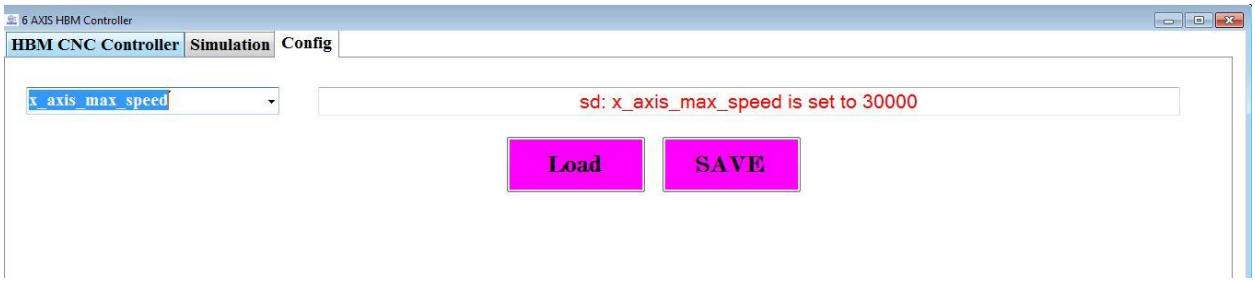


تعریف پارامترهای کنترلر از طریق فایل Config :

تنظیم پارامترهای کنترلر و تغییرات سخت افزاری مورد نیاز از طریق تغییر منوی config در نرم افزار مطابق تصویر زیر صورت میپذیرد.

گزینه load : جهت مشاهده تنظیمات فعلی پارامتر مربوطه

گزینه save : جهت وارد نمودن پارامتر جدید و ذخیره آن در کنترلر



تعریف سرعت محورها و پارامتر محورها:

نکته:

محورهای X,Y,Z,A,B,C در فایل CONFIG به ترتیب با نام های alpha,beta,gamma,delta, epsilon,zea شناخته میشوند .با اضافه کردن علامت ! به انتهای پین مربوط جهت حرکت محور عوض میشود.

Motion control

You set the acceleration value by modifying the `acceleration` value in your configuration file :

```
acceleration                    3000            # Acceleration
in mm/second/second.
```

The units is millimeters per second per second, which means how many “millimeters per second “worth of speed is added every second.

`3000` is a pretty common value for a 3D printer or laser cutter, since they have very little mass to move.

`200` is a common value for CNC mills or routers since they have much more mass to move, and have to apply forces to their tool.

There is no mathematical/easy way of determining a perfect value: you are going to need to try values and find the one that works best for you.

If you feel like your machine is too slow, you increase acceleration. If your machine starts losing steps, losing it's position, or shakes too much, you reduce acceleration.

Note that you do not need to reset your HBM CNC to try new values. You can start a “job”, and while the job is executing, try new values using the `M204` M-code. For example, `M204 S2000` sets acceleration to 2000 (it takes a few seconds for this to take effect after the command is sent).

Maximum speeds

Where speeds are concerned, HBM CNC makes the distinction between two very important things: axes and actuators.

An actuator and an axis are two different things. An actuator is the thing that the motor causes to move directly. The axes are pretty much the coordinate system for the “tool”, and the system the Gcode uses.

On a cartesian machine, they are the same thing. But on a linear delta machine for example, they are different.

On a linear delta, the actuator is the linear axis that moves along a tower, while the axis (or effector) is the thing at the end of the arms that moves the tool.

In HBM CNC , you can set maximum speeds for both of those systems separately.

Setting a maximum speed ensures that HBM CNC will never go higher than that speed for that axis or actuator. This is useful if the machine would “skip” steps or have other problems if a too high speed was required, which is the case in most machines.

To set the maximum speed for an axis, edit the `max_speed` configuration option for that axis :

```
x_axis_max_speed            30000      # mm/min
```

The units for the speed limit is millimeters per minute.

To limit the speed for an actuator, set the `max_rate` for that actuator :

```
alpha_max_rate       30000.0         # mm/min
```

All options

There are all the options related to motion control

Option	Example value	Explanation
default_feed_rate	4000	Default rate for G1/G2/G3 moves in millimetres/minute. This is overrided by the first `F` (feedrate) parameter after reset, and never used again.
default_seek_rate	4000	Default rate for G0 moves in millimetres/minute
mm_max_arc_error	0.01	Arcs are cut into segments (lines), This is the maximum error for line segments that divide arcs
mm_per_line_segment	5	Lines can be cut into segments (generally not useful with cartesian coordinates robots), this sets the maximum length of any given segment. Segments longer than this will be cut into several segments.
delta_segments_per_second	100	Instead of cutting lines into segment based on a distance, cut them based on time : segments will be cut so that HBM CNC executes -about- `delta_segments_per_second` segments each second. This is mostly useful when using `linear_delta` arm solutions.
planner_queue_size	32	Defines how many blocks (line segments) are stored in RAM for look-ahead acceleration calculation. **Do not change this unless you know exactly what you are doing**, the reason why is increasing the size of the queue makes it take up more RAM space and can result in HBM CNC running out of RAM, depending on your configuration and how much the rest of your modules take up space.
acceleration	3000	Acceleration in millimetres/second/second. Higher values make your machine faster and shakier, lower values make

Option	Example value	Explanation
		your machine slower and sturdier. This is generally proportional to the weight of the tool you are trying to move.
alpha_acceleration		Acceleration in millimetres/second/second for the alpha actuator (X axis on cartesian), do not set on deltas
beta_acceleration		Acceleration in millimetres/second/second for the beta actuator (Y axis on cartesian), do not set on deltas
gamma_acceleration		Acceleration in millimetres/second/second for the gamma actuator (Z axis on cartesian), do not set on deltas
junction_deviation	0.05	Similar to the old “max_jerk”, in millimeters. Defines how much the machine slows down when decelerating proportional to the vector angle of change of direction. See here and here. Lower values mean being more careful, higher values means being faster and have more jerk
z_junction_deviation	0	Junction deviation for **Z only** moves, `-1` uses junction_deviation, `0` disables `junction_deviation` on z moves. Do not set this value if you use a delta arm solution.
minimum_planner_speed	0	Sets the minimum planner speed in millimetres/sec. This is the lowest speed the planner will ever set a move to. Not generally useful.
microseconds_per_step_pulse	1	Duration of step pulses to the stepper motor drivers, in microseconds. Actual step pulse is generally 2us above this (so 1 will actually be 2-3us). Setting this over about 8us will cause severe issues with step generation
base_stepping_frequency	100000	Base frequency for stepping, higher values gives HBM CNC movement. Do not modify unless you know exactly what you are doing, 100khz is the only officially

Option	Example value	Explanation
		supported value.

تغییر جهت حرکت محورها:

محورهای X,Y,Z,A,B,C در فایل CONFIGبه ترتیب با نام های alpha,beta,gamma,delta, epsilon,zea شناخته میشوند .با اضافه کردن علامت ! به انتهای پین مربوط جهت حرکت محور عوض میشود.

alpha_dir_pin	0.5!	# Pin for alpha stepper direction, add '!' to reverse direction

تعریف LIMITو رفرنس محور:

Configuration

The config settings for Endstops are as follows :

~ Option	~ Example value	~ Explanation
endstops_enable	true	The endstop module is enabled if this is set to true. All of it's parameters are ignored otherwise.
corexy_homing	false	Set to true if this machine uses a `corexy` or a `h+bot` arm solution
delta_homing	false	Set to true if this machine uses a `linear_delta` arm solution
rdelta_homing	false	Set to true if this machine uses a `rotary_delta` arm solution
scara_homing	false	Set to true if this machine uses a `scara` arm solution
alpha_min_endstop	`1.24^`	Alpha (X axis or alpha tower) minimum limit endstop. Set to `nc` if not installed on your machine.

alpha_max_endstop	`1.25^`	Alpha (X axis or alpha tower) maximum limit endstop. Set to `nc` if not installed on your machine.
alpha_homing_direction	home_to_min	In which direction to home. If set to `home_to_min`, homing (using the `G28` G-code) will move until it hits the minimum endstop and then set the current position to `alpha_min`. If set to `home_to_max`, homing will move until it hits the maximum endstop, and then set the current position to `alpha_max`
alpha_min	0	This gets loaded after homing when alpha_homing_direction is set to `home_to_min` and the minimum endstop is hit. **NOTE** the homing offset is added to this set with M206 Xnnn
alpha_max	200	This gets loaded after homing when alpha_homing_direction is set to `home_to_max` and the maximum endstop is hit.
alpha_max_travel	500	This determines how far the X axis can travel looking for the endstop before it gives up
beta_min_endstop	`1.26^`	Beta (Y axis or beta tower) minimum limit endstop. Set to `nc` if not installed on your machine.
beta_max_endstop	`1.27^`	Beta (Y axis or beta tower) maximum limit endstop. Set to `nc` if not installed on your machine.
beta_homing_direction	home_to_min	In which direction to home. If set to `home_to_min`, homing (using the `G28` G-code) will move until it hits the minimum endstop and then set the current position to `beta_min`. If set to `home_to_max`, homing will move until it hits the maximum endstop, and then set the current position to `beta_max`
beta_min	0	This gets loaded after homing when beta_homing_direction is

		set to `home_to_min` and the minimum endstop is hit.
beta_max	200	This gets loaded after homing when beta_homing_direction is set to `home_to_max` and the maximum endstop is hit.
beta_max_travel	500	This determines how far the Y axis can travel looking for the endstop before it gives up
gamma_min_endstop	`1.28^`	Gamma (Z axis or gamma tower) minimum limit endstop. Set to `nc` if not installed on your machine.
gamma_max_endstop	`1.29^`	Gamma (Z axis or gamma tower) maximum limit endstop. Set to `nc` if not installed on your machine.
gamma_homing_direction	home_to_min	In which direction to home. If set to `home_to_min`, homing (using the `G28` G-code) will move until it hits the minimum endstop and then set the current position to `gamma_min`. If set to `home_to_max`, homing will move until it hits the maximum endstop, and then set the current position to `gamma_max`
gamma_min	0	This gets loaded after homing when gamma_homing_direction is set to `home_to_min` and the minimum endstop is hit.
gamma_max	200	This gets loaded after homing when gamma_homing_direction is set to `home_to_max` and the maximum endstop is hit.
gamma_max_travel	500	This determines how far the Z axis can travel looking for the endstop before it gives up
homing_order	XYZ	Optional order in which axis will home, default is XY home at the same time then Z, then A,B,C. If this is set it will force each axis to home one at a time in the specified order. For example `XZY` means : `X` axis followed by `Z`, then `Y` last. **NOTE** If an axis is not specified here then it will not

		be homed at all. If ABC are set they must also be specified if they need to be homed.
alpha_limit_enable	false	If set to true, the machine will stop if one of the alpha (X axis or alpha tower) endstops are hit
beta_limit_enable	false	If set to true, the machine will stop if one of the beta (Y axis or beta tower) endstops are hit
gamma_limit_enable	false	If set to true, the machine will stop if one of the gamma (Z axis or gamma tower) endstops are hit
alpha_fast_homing_rate_mm_s	50	Speed, in millimetres/second, at which to home for the alpha actuator (X axis or alpha tower)
beta_fast_homing_rate_mm_s	50	Speed, in millimetres/second, at which to home for the beta actuator (Y axis or beta tower)
gamma_fast_homing_rate_mm_s	4	Speed, in millimetres/second, at which to home for the gamma actuator (Z axis or gamma tower)
alpha_homing_retract_mm	5	Distance to retract the alpha actuator (X axis or alpha tower) once the endstop is first hit, before re-homing at a slower speed.
beta_homing_retract_mm	5	Distance to retract the beta actuator (Y axis or beta tower) once the endstop is first hit, before re-homing at a slower speed.
gamma_homing_retract_mm	1	Distance to retract the alpha actuator (Z axis or gamma tower) once the endstop is first hit, before re-homing at a slower speed.
alpha_slow_homing_rate_mm_s	25	Speed, in millimetres/second, at which to re-home for the alpha actuator (X axis or alpha tower) once the endstop is hit once.
beta_slow_homing_rate_mm_s	25	Speed, in millimetres/second, at which to re-home for the beta actuator (Y axis or beta tower) once the endstop is hit once.
gamma_slow_homing_rate_mm_s	2	Speed, in millimetres/second, at

		which to re-home for the gamma actuator (Z axis or gamma tower) once the endstop is hit once.
endstop_debounce_count	100	Debounce each limit switch (not homing endstops) over this number of values. Set to `100` if your endstops are too noisy and give false readings. Used for limit switches only
endstop_debounce_ms	1	Debounce each homing endstop for this number of miliseconds. Set to 1 if your endstops are too noisy and give false readings. Used for homing only
alpha_trim	-0.1	DELTA ONLY Software trim for alpha (X axis or alpha tower) stepper endstop (in millimetres). When the endstop is hit, the axis will move this distance towards the endstop (negative values move endstop away from the endstop)
beta_trim	-0.1	DELTA ONLY Software trim for beta (Y axis or beta tower) stepper endstop (in millimetres). When the endstop is hit, the axis will move this distance towards the endstop (negative values move endstop away from the endstop)
gamma_trim	-0.1	DELTA ONLY Software trim for gamma (Z axis or gamma tower) stepper endstop (in millimetres). When the endstop is hit, the axis will move this distance towards the endstop (negative values move endstop away from the endstop)
move_to_origin_after_home	false	If set to true, once homing is complete, the machine will move to it's origin point
home_z_first	false	Set to true to home the Z first, otherwise Z homes after XY

Homing

You use the `G28` command to home your machine.

For example :

```
G28.2 Z0
```

will home the Z axis.

And :

```
G28.2
```

will home all axes which have endstops enabled (all three by default).

If your axis is moving away from the endstop when homing, you need to invert your min and max endstops, or invert the direction of the axis, depending on your preference.

تعریف لیمیت محورها:

Limit switches

Endstops may be configured to act as limit switches, during normal operations if any enabled limit switch is triggered the system will halt and all operations will stop.

To enable enstops as limit switches the following config options can be used, they are disabled by default.

```
alpha_limit_enable                          true            # set to true to
enable X min and max limit switches
beta_limit_enable                           true            # set to true to
enable Y min and max limit switches
gamma_limit_enable                          true            # set to true to
enable Z min and max limit switches
```

When one axis is enabled both min and max endstops will be enabled as limit switches, setting an endstop pin to nc will disable it.

Retract

After homing the axis is usually left triggering the endstop, this would prevent that axis from moving, so when limit switches are enabled after homing the axis will back off the endstop by the `*.homing_retract_mm` amount.

The downside is if you home to 0 and at 0 the endstop is triggered going to 0,0 will cause a limit switch to fire. The workaround is to set homing offset to -5 (eg `M206 X-5 Y-5`) or enough to back off the endstop so when you go to 0,0 it does not trigger the endstop.

That way you can home, and safely go to 0 without triggering a limit switch event. An alternative is to set min/max X/Y to -5 rather than 0.

تعریف لیمیت نرم افزاری محورها:

Soft endstops

Soft(ware) endstops is a feature that allows the board to refuse any command that would put it outside the bounds of the work area.

Note that this feature only functions once the machine has been homed (until then it can't know where it is). After the machine has been homed this feature needs to be enabled using the `M211 S1` M-code, and can be disabled using the `M211 S0` M-code.

The configuration is as such :

```
soft_endstop.enable         true         # Enable soft endstops
soft_endstop.x_min          1            # Minimum X position
soft_endstop.x_max          999          # Maximum X position
soft_endstop.y_min          1            # Minimum Y position
soft_endstop.y_max          499          # Maximum Y position
soft_endstop.z_min          1            # Minimum Z position
soft_endstop.z_max          199          # Maximum Z position
soft_endstop.halt           true         # Whether to issue a HALT state when
hitting a soft endstop (if false, will just ignore commands that would exceed
the limit)
```

تغییر رفرنس :

Changing the origin

The homing position, or origin, is the 0,0 position relative to which the machine moves.

On a delta, the homing position (origin) is automatically the center of the bed.

On a cartesian, however, the homing position (origin) is the point at which the end stops are hit, generally a corner of the machine.

You might want to have a different origin point though.

For example, if your X axis is homing to the max endstop, and that endstop is 200mm away from the machine origin, you can make sure the machine knows where that endstop is relative to your origin point by setting :

```
alpha_max   200
```

If your X axis is homing to the min endstop, your work area is 200mm wide, and you want the origin point to be the center of the work area, you can set the origin point to the center of the work area by doing :

```
alpha_min   -100
```

By default, the machine will home, and set the current position as configured, but will not move to 0,0 after homing. If you want to move to the origin after homing, you need to set `move_to_origin_after_home` to true.

تنظیمات مورد نیاز تعریف خروجی های Q8,Q7 **جهت فعال سازی اسپیندل :**

Analog Spindle Config

```
spindle.enable                                  true
spindle.type                                    analog   # set the spindle
type to analog, can also be used for ESC spindles controlled by a PWM
spindle.max_rpm                                 24000    # set the max
spindle speed that is achieved at 100% PWM
spindle.pwm_pin                                 2.4      # Q8-PWM
spindle.pwm_period                              1000     # the PWM frequency
spindle.switch_on_pin                           2.5      # Q7-ENABLE
```

تعریف ZProbe **جهت تنظیم اتومات ابزار و یا سطح در محور :**

Configuration

Add the following to the config file :

```
gamma_min_endstop           nc                  # normally 1.28. Change to nc
to prevent conflict, not needed on Azteeg X5

zprobe.enable               true                # set to true to enable a
zprobe
zprobe.probe_pin            2.11!^              #I16- pin probe is attached
to if NC remove the !, Azteeg X5 this is 1.29
zprobe.slow_feedrate        5                   # mm/sec probe feed rate
```

```
#zprobe.debounce_ms          1                   # set if noisy
zprobe.fast_feedrate         100                 # move feedrate
zprobe.probe_height          5                   # how much above bed to start
probe NB only needed for G32 on delta
zprobe.return_feedrate       0                   # feedrate after a probe,
default 0 is double of slow_feedrate (mm/s)
zprobe.max_z                 200                 # maximum default travel for
the probe command, will use gamma_max if not defined
```

First test the zprobe with `M119`, make sure that the probe is 1 when triggered and 0 when not triggered.

`G30` will probe from the current position until it hits the bed and the probe triggers, it will report the distance traveled then return to where it started.

`G30 Znnn` will probe until it hits the bed then sets Z to nnn (by doing G92 Znnn), this can be used to set the nozzle height if nnn is the probes Z offset from the nozzle in the Z direction.

`G30 Fxxx` will run the probe at xxx mm/min overriding the slow_feedrate.

`G38.2` and `G38.3` (for probing in X and Y) are also implemented as documented here **NOTE** probing in X or Y on a delta is not recommended due to non linear movement issues.

G codes

G-Code	Description	Example
G0	Move to the given coordinates. To the contrary of G1, if there is a tool it will most of the time be off during this kind of move. This is a “go to” move rather than a “do while going to” move. The F parameter defines speed and is remembered by subsequent commands (specified in millimetres/minute) (command is modal)	`G0 X10 Y5 F100`
G1	Move to the given coordinates, see above for difference with G0. Takes the same F parameter as G0. (command is modal)	`G1 X20 Y2.3 F200`
G2	Clockwise circular motion : go to point with coordinates XYZ while rotating around point with relative coordinates IJ (command is not modal)	`G2 X10 J5`
G3	Counter-clockwise motion : see above (command is not modal)	`G3 Y5 X10 I2`
G4	Dwell S<seconds> or P<milliseconds>, In grbl mode P is float seconds to comply with gcode standards	`G4 P1000`
G10	Do firmware extruder retract	`G10`
G11	Do firmware extruder un-retract	`G11`
G10 L2 G10 L20	set workspace coordinates	`G10 L2 P1 X0`
G17	Select XYZ plane (command is modal)	`G17`
G18	Select XZY plane (command is modal)	`G18`
G19	Select YZX plane (command is modal)	`G19`
G20	Inch mode : passed coordinates will be considered as Inches, so internally translated to millimeters (command is modal)	`G20`
G21	Millimeter mode (*default*) : passed coordinates will be considered as millimeters (command is modal)	`G21`
G28	Home The given axis, or if no axis specified home all axis at the same time (edge) **NOTE** in CNC/mode this is move to park position, use `$H` to home	`G28`
G28.1	Set Predefined Position - This position will be returned to by G28.2	`G28.1`
G28.2	Move to Predefined Position - This perform a rapid move to the Predefined position set by G28.1	`G28.2`
G28.3	Manual Homing - This allows you to set a home position manually without moving to limit switches	`G28.3`
G28.4	Manual Homing based on actuator position- This allows you to set a home position manually based on actuator position (used for rotary	`G28.4`

G-Code	Description	Example
	delta)	
G28.5	clears the homed flag for the specified axis, or all if not specifed	`G28.5` `G28.5 Z0`
G28.6	shows the homing status of each axis	`G28.6`
G30	Simple Z probe at current XY, reports distance moved down until probe triggers. optional F parameter defines the speed of probing, zprobe.slow_feedrate is used when not supplied	`G30`+`G30 F100`
G31	Depends on levelling strategy selected, see ZProbe	`G31`
G32	Uses Z probe to calibrate delta endstops and arm radius, use R parameter to select only arm radius calibration and E to select only endstop calibration. I to set target precision, J to set probe_radius, K to keep current endstop trim settings. In Zgrid module, it starts the grid probing	`G32`+`G32 R`+`G32 E`+`G32 EK`+`G32 I0.02`
G38.2 G38.3	Standard probe commands implemented as documented here	`G38.2 Z`+`10`
G53,G54-G59.3	use workspace coordinates	`G54`
G90	Absolute mode (*default*) : passed coordinates will be considered absolute (relative to 0.0.0) (command is modal)	`G90`
G91	Relative mode : passed coordinates will be considered relative to the current point (command is modal)	`G91`
G92	Set global workspace coordinate system to specified coordinates	`G92 X0 Y0 Z0`
G92.1	clear the G92 and G30 Znnn offsets	`G92.1`

تنظیمات استاندارد کنترلر در فایل Config:

```
# HBM ELECTRONIC -WWW.HBMCNC.IR

# NOTE Lines must not exceed 132 characters, and '#' characters mean what
follows is ignored

## Robot module configurations : general handling of movement G-codes and
slicing into moves

# Basic motion configuration

default_feed_rate                           4000            # Default speed
(mm/minute) for G1/G2/G3 moves

default_seek_rate                           4000            # Default speed
(mm/minute) for G0 moves

mm_per_arc_segment                          0.0             # Fixed length
for line segments that divide arcs, 0 to disable

#mm_per_line_segment                        5               # Cut lines
into segments this size

mm_max_arc_error                            0.01            # The maximum
error for line segments that divide arcs 0 to disable

                                                            # note it is
invalid for both the above be 0

                                                            # if both are
used, will use largest segment length based on radius



# Arm solution configuration : Cartesian robot. Translates mm positions into
stepper positions

alpha_steps_per_mm                          43               # Steps per mm
for alpha ( X ) stepper

beta_steps_per_mm                           43               # Steps per mm
for beta ( Y ) stepper

gamma_steps_per_mm                          80             # Steps per mm
for gamma ( Z ) stepper



# Planner module configuration : Look-ahead and acceleration configuration

acceleration                                3000            # Acceleration
in mm/second/second.
```

```
#z_acceleration                         500             # Acceleration
for Z only moves in mm/s^2, 0 uses acceleration which is the default. DO NOT
SET ON A DELTA

junction_deviation                      0.05            #

#z_junction_deviation                   0.0             # For Z only
moves, -1 uses junction_deviation, zero disables junction_deviation on z
moves DO NOT SET ON A DELTA



# Cartesian axis speed limits

x_axis_max_speed                        30000           # Maximum speed
in mm/min

y_axis_max_speed                        30000           # Maximum speed
in mm/min

z_axis_max_speed                        30000             # Maximum
speed in mm/min



# Stepper module configuration

# Pins are defined as  ports, and pin numbers, appending "!" to the number
will invert a pin

alpha_step_pin                          0.4             # Pin for alpha
stepper step signal

alpha_dir_pin                           0.5             # Pin for alpha
stepper direction, add '!' to reverse direction



alpha_current                           1.5             # X stepper
motor current

alpha_max_rate                          30000.0         # Maximum rate
in mm/min



beta_step_pin                           0.6             # Pin for beta
stepper step signal

beta_dir_pin                            0.7           # Pin for beta
stepper direction, add '!' to reverse direction



beta_current                            1.5             # Y stepper
motor current
```

```
beta_max_rate                                30000.0          # Maxmimum rate
in mm/min



gamma_step_pin                               0.8              # Pin for gamma
stepper step signal

gamma_dir_pin                                0.9             # Pin for gamma
stepper direction, add '!' to reverse direction



gamma_current                                1.5              # Z stepper
motor current

gamma_max_rate                               30000.0            # Maximum
rate in mm/min




# A axis

delta_steps_per_mm                     100     # may be steps per degree for
example

delta_step_pin                               2.0              # Pin for delta
stepper step signal

delta_dir_pin                                2.1             # Pin for delta
stepper direction



delta_current                                1.5              # Z stepper
motor current

delta_max_rate                               30000.0            # mm/min

delta_acceleration                           500.0            # mm/sec²



# B axis

epsilon_steps_per_mm                   100     # may be steps per degree for
example

epsilon_step_pin                              2.2              # Pin for
delta stepper step signal

epsilon_dir_pin                               2.3              # Pin for
delta stepper direction
```

```
epsilon_current                         1.5             # Z stepper
motor current

epsilon_max_rate                        30000.0           # mm/min

epsilon_acceleration                    500.0           # mm/sec²


# C axis

zeta_steps_per_mm                   100     # may be steps per degree for
example

zeta_step_pin                           4.29             # Pin for delta
stepper step signal

zeta_dir_pin                            4.28            # Pin for delta
stepper direction



zeta_current                            1.5             # Z stepper
motor current

zeta_max_rate                           30000.0           # mm/min

zeta_acceleration                       500.0           # mm/sec²




## Network settings

network.enable                          true            # Enable the
ethernet network services

network.webserver.enable                true             # Enable the
webserver

network.telnet.enable                   true             # Enable the
telnet server

network.ip_address                      false             # Use dhcp to
get ip address

# Uncomment the 3 below to manually setup ip address

network.ip_address                      192.168.43.222   # The IP
address
```

```
network.ip_mask                                 255.255.255.0   # The ip mask

network.ip_gateway                              192.168.3.1     # The gateway
address

#network.mac_override                            xx.xx.xx.xx.xx.xx  # Override
the mac address, only do this if you have a conflict



# Serial communications configuration ( baud rate default to 9600 if
undefined )

uart0.baud_rate                                 9600            # Baud rate for
the default serial port







################INPUTS



# Endstops I1/I2/I3/I4/I5/I6

endstops_enable         true

alpha_limit_enable              true

alpha_min_endstop                               0.26v

alpha_max_endstop                               1.25v

alpha_homing_direction          home_to_min

alpha_min         0

alpha_fast_homing_rate_mm_s         50

alpha_homing_retract_mm             5

alpha_slow_homing_rate_mm_s         25



beta_limit_enable               true

beta_min_endstop                              0.24v

beta_max_endstop                              0.23v

beta_homing_direction           home_to_min
```

```
beta_min          0

beta_fast_homing_rate_mm_s          50

beta_homing_retract_mm        5

beta_slow_homing_rate_mm_s          25


gamma_limit_enable            true

gamma_min_endstop                            1.31v

gamma_max_endstop                            2.8v

gamma_homing_direction        home_to_min

gamma_min         0

gamma_fast_homing_rate_mm_s         50

gamma_homing_retract_mm             5

gamma_slow_homing_rate_mm_s         25


####

#switch START alarm uart    I7

switch.START.enable                          true

switch.START.input_pin                       1.29v

switch.START.output_on_command               M602    #START


#switch PAUSE alarm uart  I8

switch.PAUSE.enable                         true

switch.PAUSE.input_pin                      0.10v

switch.PAUSE.input_pin_behavior             toggle

switch.PAUSE.output_on_command               M600    #PAUSE

switch.PAUSE.output_off_command              M601   #RESUME
```

```
#EMG STOP  I9

kill_button_enable                          true             # set to true to
enable a kill button

kill_button_pin                             0.11v          # kill button pin.
default is same as pause button 2.12 (Add ^ for external buttons)

#kill_button_toggle_enable        true                # allows for latching
estop button




#switch RESET CONTROLLER I10

switch.reset.enable                true                      # Enable this
module

switch.reset.input_pin             2.13v                     # Pin where reset
button is connected

switch.reset.output_on_command     reset                     # Command to
reset the board



#switch SERVO ALARM alarm uart  I11

switch.SERVO.enable                         true

switch.SERVO.input_pin                      2.12v

switch.SERVO.output_on_command              M700    #SERVO ALARM




#switch CUTT/ARC STRIKE ON OFF     I12

switch.I12.enable                true                     # Enable this
module

switch.I12.input_pin             2.11v                    # Pin where pause
button is connected

switch.I12.output_on_command     M11                   # Suspend command

switch.I12.output_off_command    M12                    # Resume command

switch.I12.input_pin_behavior    toggle                   # This pin toggles
between it's on and off states each time it is pressed and released
```

```
#switch T1UP     I13

switch.I13.enable                true                      # Enable this
module

switch.I13.input_pin             2.11v                     # Pin where pause
button is connected

switch.I13.output_on_command     M13                    # Suspend command

switch.I13.output_off_command    M14                     # Resume command

switch.I13.input_pin_behavior    toggle                    # This pin toggles
between it's on and off states each time it is pressed and released



#switch T1D     I14

switch.I14.enable                true                      # Enable this
module

switch.I14.input_pin             2.11v                     # Pin where pause
button is connected

switch.I14.output_on_command     M15                    # Suspend command

switch.I14.output_off_command    M16                     # Resume command

switch.I14.input_pin_behavior    toggle                    # This pin toggles
between it's on and off states each time it is pressed and released



#switch T2UP     I15

switch.I15.enable                true                      # Enable this
module

switch.I15.input_pin             2.11v                     # Pin where pause
button is connected

switch.I15.output_on_command     M21                    # Suspend command

switch.I15.output_off_command    M22                     # Resume command

switch.I15.input_pin_behavior    toggle                    # This pin toggles
between it's on and off states each time it is pressed and released



#switch T2D     I16
```

```
switch.I16.enable                true                    # Enable this
module

switch.I16.input_pin             2.11v                   # Pin where pause
button is connected

switch.I16.output_on_command     M23                  # Suspend command

switch.I16.input_pin_behavior    toggle                  # This pin toggles
between it's on and off states each time it is pressed and released




################outputs

# Q1

switch.Q1.enable                           true            # Enable this
module

switch.Q1.input_on_command                 M9

switch.Q1.input_off_command                M10

switch.Q1.output_pin                       0.18



# Q2

switch.Q2.enable                           true            # Enable this
module

switch.Q2.input_on_command                 M11

switch.Q2.input_off_command                M12

switch.Q2.output_pin                       0.17



# Q3

switch.Q3.enable                           true            # Enable this
module

switch.Q3.input_on_command                 M13

switch.Q3.input_off_command                M14

switch.Q3.output_pin                       0.15
```

```
# Q4

switch.Q4.enable                        true            # Enable this
module

switch.Q4.input_on_command              M15

switch.Q4.input_off_command             M16

switch.Q4.output_pin                    0.16



# Q5

switch.Q5.enable                        true            # Enable this
module

switch.Q5.input_on_command              M19

switch.Q5.input_off_command             M20

switch.Q5.output_pin                    2.7



# Q6

switch.Q6.enable                        true            # Enable this
module

switch.Q6.input_on_command              M21

switch.Q6.input_off_command             M22

switch.Q6.output_pin                    2.6



# Q7

switch.Q7.enable                        true            # Enable this
module

switch.Q7.input_on_command              M23

switch.Q7.input_off_command             M24

switch.Q7.output_pin                    2.5



# Q8
```

```
switch.Q8.enable                          true              # Enable this
module

switch.Q8.input_on_command                M25

switch.Q8.input_off_command               M26

switch.Q8.output_pin                      2.4
```

Pin connections :

Inputs	
I1	0.26
I2	0.25
I3	0.24
I4	0.23
I5	1.31
I6	2.8
I7	1.29
I8	0.10
I9	0.11
I10	2.13
I11	2.12
I12	2.11
I13	0.22
I14	0.21
I15	0.20
I16	0.19

Outputs	
Q1	0.18
Q2	0.17
Q3	0.15
Q4	0.16
Q5	2.7
Q6	2.6
Q7	2.5
Q8	2.4

AXIS	
AX1-PULSE	0.4
AX1-DIR	0.5

AX2-PULSE	0.6
AX2-DIR	0.7
AX3-PULSE	0.8
AX3-DIR	0.9
AX4-PULSE	2.0
AX4-DIR	2.1
AX5-PULSE	2.2
AX5-DIR	2.3
AX6-PULSE	4.29
AX6-DIR	4.28

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