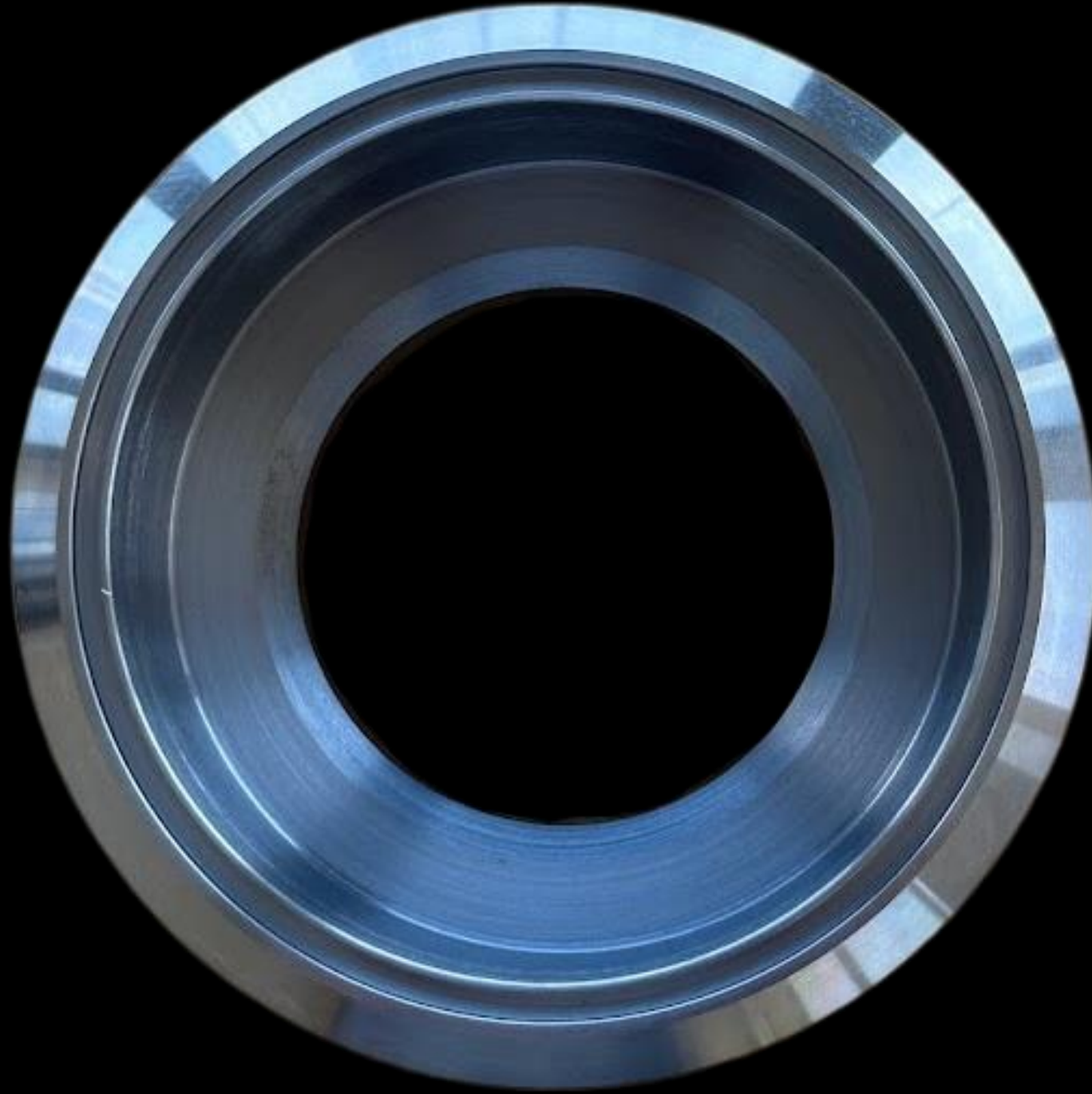




Samurai 120H Technical document



Samurai Machine tools



Health & Safety

WARNING / DANGER

THIS MACHINE IF USED INCORRECTLY HAS THE POTENTIAL TO CAUSE SERIOUS INJURY, PROPERTY DAMAGE, OR DEATH

When assembling the machine, the machine owner must ensure all guidelines stated in the manual provided are followed.

The machine owner holds full responsibility to ensure the party involved in connecting electronic components has a full understanding of the risks and procedures involved.

The machine owner must practice common sense when handling or using Samurai machines.

Failure to adhere to these guidelines can result in serious injury, damage to personal / business property, or in extreme cases, death.

- CAUTION!** - Indicates a hazard with low level of risk which, if not avoided can result in minor injury or damage
- WARNING!** - Indicates a hazard with a medium level of risk which, if not avoided can result in serious injury, property damage or death
- DANGER!** - Indicates a hazard with a high level of risk which, if not avoided can result in serious injury, property damage or death

Refer to the manual provided with your machine for full health and safety information



Electronics

3 Options

There are 3 electronics options for the Samurai 120. Either none, Mach 4, or NK530M.

If you are unsure which one to pick, Mach 4 will be the best option for you.

If you want to retrofit your own stepper motors and controller to save money, none is the best option.

If you want the latest and greatest, fully integrated cnc controller then the NK530M is the choice.

None

With this option, the machine still includes some basic electronic components, these will need to be wired to work with your cnc controller. It is only recommended to choose this option if you have an understanding of electronics. There are many resources available to learn basic cnc electronics, and all that's needed to have a working cnc machine is a simple 3 axis stepper system.

Included electronics:

- 1.2kW AC Servo motor with 240VAC Single/3 phase drive.
- NPN Inductive proximity sensors 6-36v (X, Y, Z, Spindle orient)
- Regulated Spindle fan 12v 1A
- Drawbar solenoid valve 12v
- Air blast solenoid valve 12v

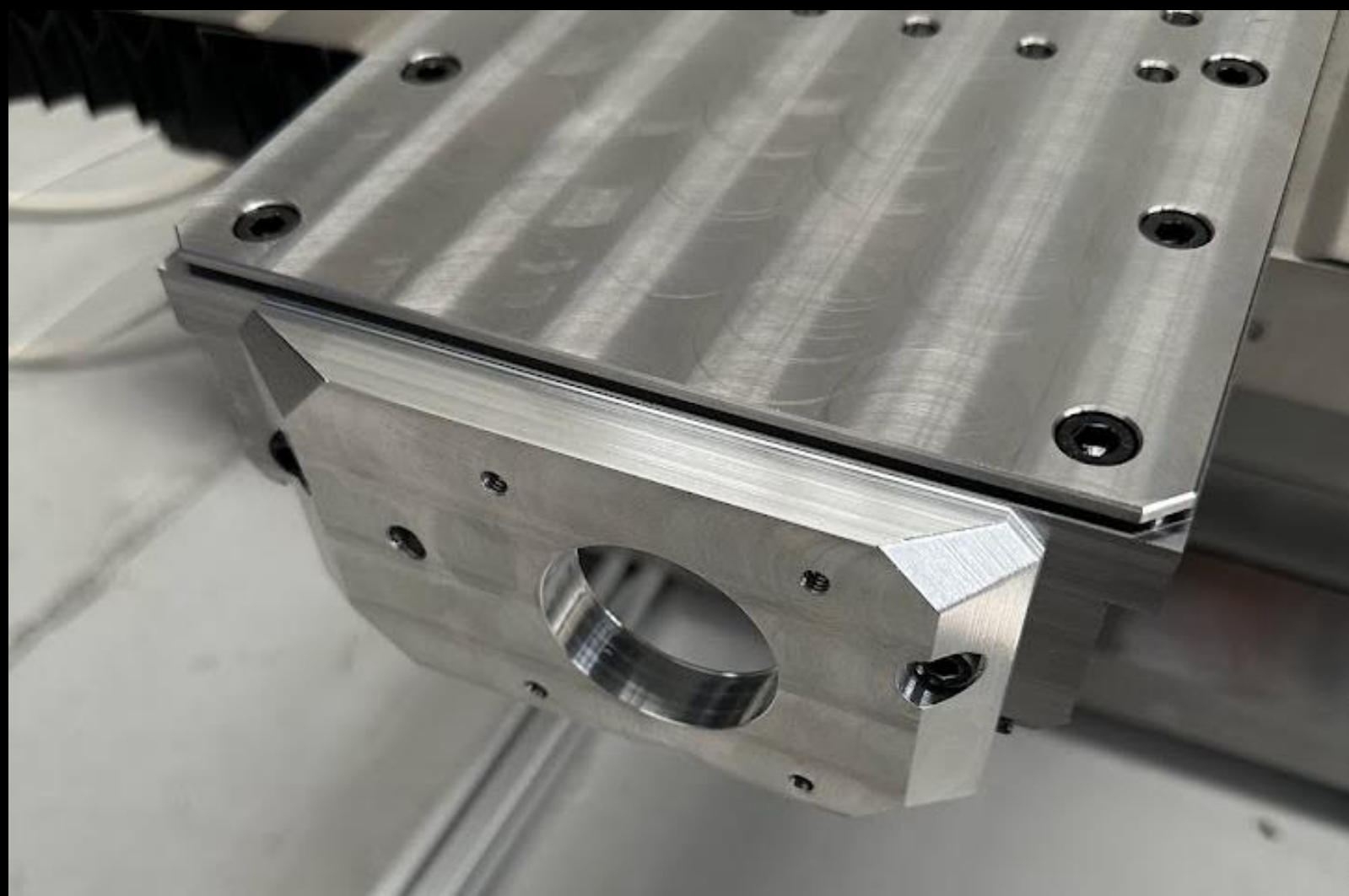
Included electronics with each ATC:

- iHSV57 180W Servo 24-48v
- iHSV57 100W Servo 24-48v
- NPN Inductive proximity sensors 6-36v (Carousel home, ARM home)

This picture shows how the machine will look without a motor attached.

The interface is NEMA 23 with an 8mm plum coupling on the ballscrew.

The bore diameter is 38.1mm.





Electronics

Correct use of product

It is very important that this machine is setup and used correctly otherwise it may cause damage or harm. There are many factors involved in getting this machine to perform to an acceptable standard for a machine tool but here is a list of basic things that need to be considered for safety / durability reasons:

- Spindle running temperature must not exceed 70°
- Spindle drive and the rest of the machine must be **ground (earthed)**
- The spindle **must not** be able to rotate while the drawbar is activated and vice versa
- Tools must be **gently** inserted into the taper to prevent damage
- Machine must not exceed values stated in the specification
- While operating the machine you must not exceed values stated in the specification
- The spindle must not be rotated without a tool
- The machine should never be run into the ends of travel (hard stop)

More information regarding this machine can be found in the manual.

Mach 4

With the Mach 4 option, you will have everything needed to get your new machine working and making parts, excluding a windows computer.

All the hard work of setting the configuration files e.c.t has been done for you, all you need to do is go to the support page to download the files and instruction manuals.

NK530M

For more information on this controller please contact us. Most customers who choose this controller also choose most options.



Detailed Specifications

Specifications

METRIC – Spindle

Max RPM - 6400
Max Torque – 5.5nm
Max Power - 1.2Kw
Cylinder Pressure - 7 - 8 Bar
Air Blast Max pressure - 3 Bar
Tool Clamp force - 1000N
Runout - 0.025mm at 100mm
Tramming references tolerance - +/-0.02mm over 100mm
Bolt Hole spacing tolerance - +/-0.02mm
Spindle weight - 8kg
Spindle material - EN3B
Spindle heat treating – none
Spindle grinding - none
Outside dimensions - 215x130x125mm
Pulley - HTD 5M 22T 15mm
Main bearing - SKF Explorer 3208 angular contact
Secondary bearing – SKF 7206 angular contact
Lubricant – Kluber ISOFLEX NBU15
Clamp type - BT30 45° Petal Clamp
Cylinder thread - 3/8" BSP
Cylinder hose diameter - 8mm
TSA Hose diameter - 4mm
RPM Sensor – 2 tick / rev
Piston – SDA80-10mm

METRIC - AIRTAC Solenoid Valve

Voltage – DC12V
Type - 5 Port 2 Position
Orifice size - 12mm
Thread size - 1/8" BSPT
Pressure range - 1.5 - 8 Bar
Temperature range - 5 - 50°C
Protection - IP65
Max frequency - 5 cycles/s
Min activation time - 0.05 second

METRIC - Water filter regulator

Pump type - Single stage
Regulating pressure - 2 - 8 Bar
Thread size - 1/4" BSP
Particulate filtration - 40µm
Max flow rate - 750L / min
Size - 15.5 x 4.1cm





Detailed Specifications

Specifications

METRIC – Spindle head

Main material – 6082 Aluminium

Dimensions – 320x130x300mm

Weight – 14kg

Spindle servo – 80ST-M04030

Spindle servo torque – 4nm

Spindle servo RPM – 3000

Spindle servo power – 1.2kw

Spindle servo shaft diameter – 19mm

Spindle servo mounting bolts – M6

Spindle servo cooling – active air

Servo pulley – 48T HTD 5M 15mm width

Pulley ratio: 2.1818

Spindle belt – 400mm 5M HTD 10mm width

Belt tension adjustment method – manual slider

Cooling – Regulated fan

Temperature Sensor placement – Spindle servo mount

Fan Angle – 45°

Fan speed – 3000RPM

Max Flow rate – 110CFM

Fan input – 12v 0.8A

Fan noise value – 46.5DBA

Fan working life – 80,000 hours

Spindle cover Logo LED – 12v

Coolant threads – 3/8" BSP

Coolant locations – 2 side – 6 under

Air hose diameter – 8mm

Coolant port 1 hose diameter – 12mm

Coolant port 2 hose diameter – 8mm

Air hose brand – Festo

Air fittings brand - Festo

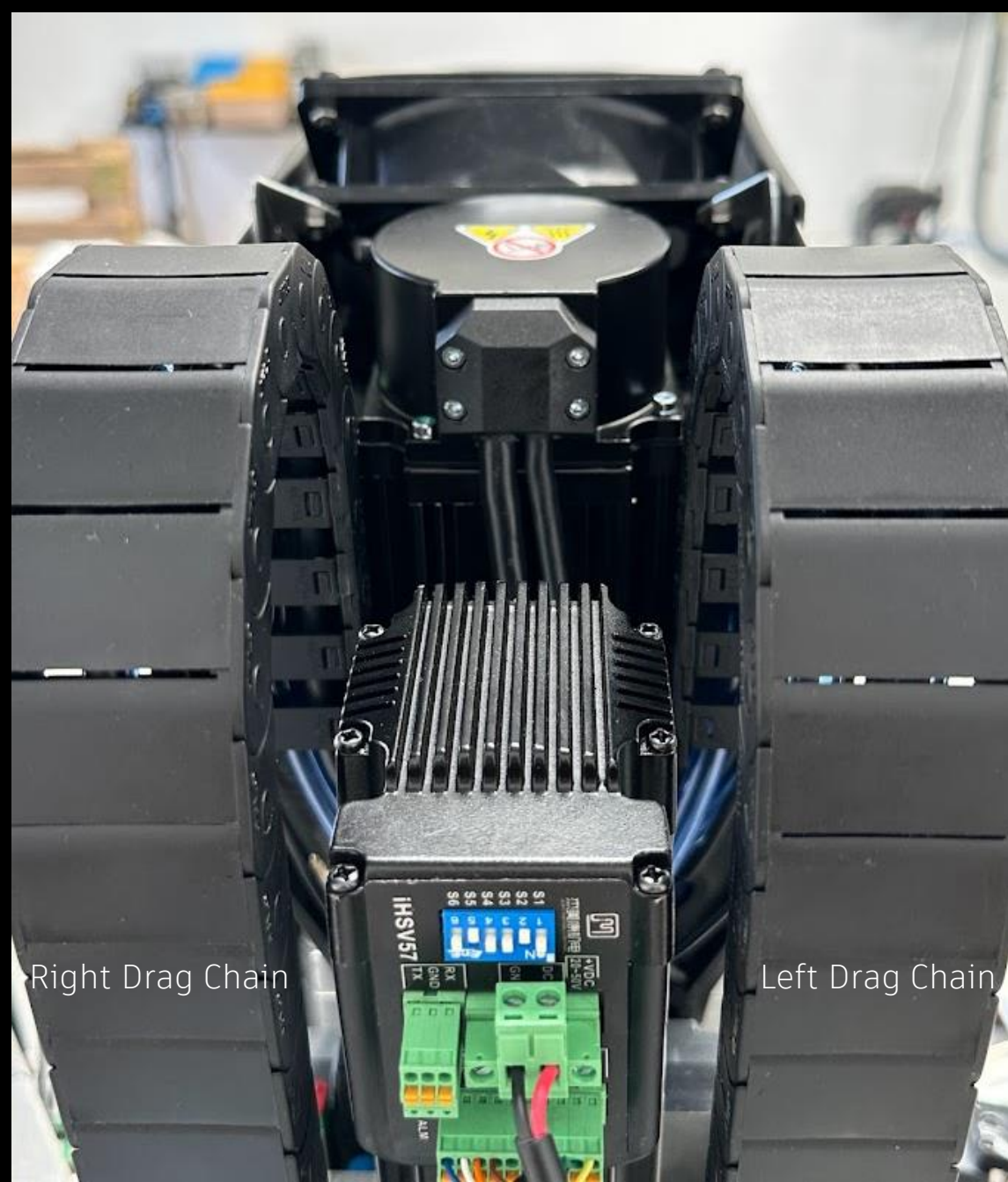
Left drag chain – servo encoder, drawbar & air blast air-line, coolant port 2 line, spindle rpm sensor

Right drag chain- servo power, coolant port 1 line, 12v cable

Spindle head mounting bolts – 5x M8

Sheet metal threads – 4x M3

Tramming method – shim, manual adjustment



Right Drag Chain

Left Drag Chain

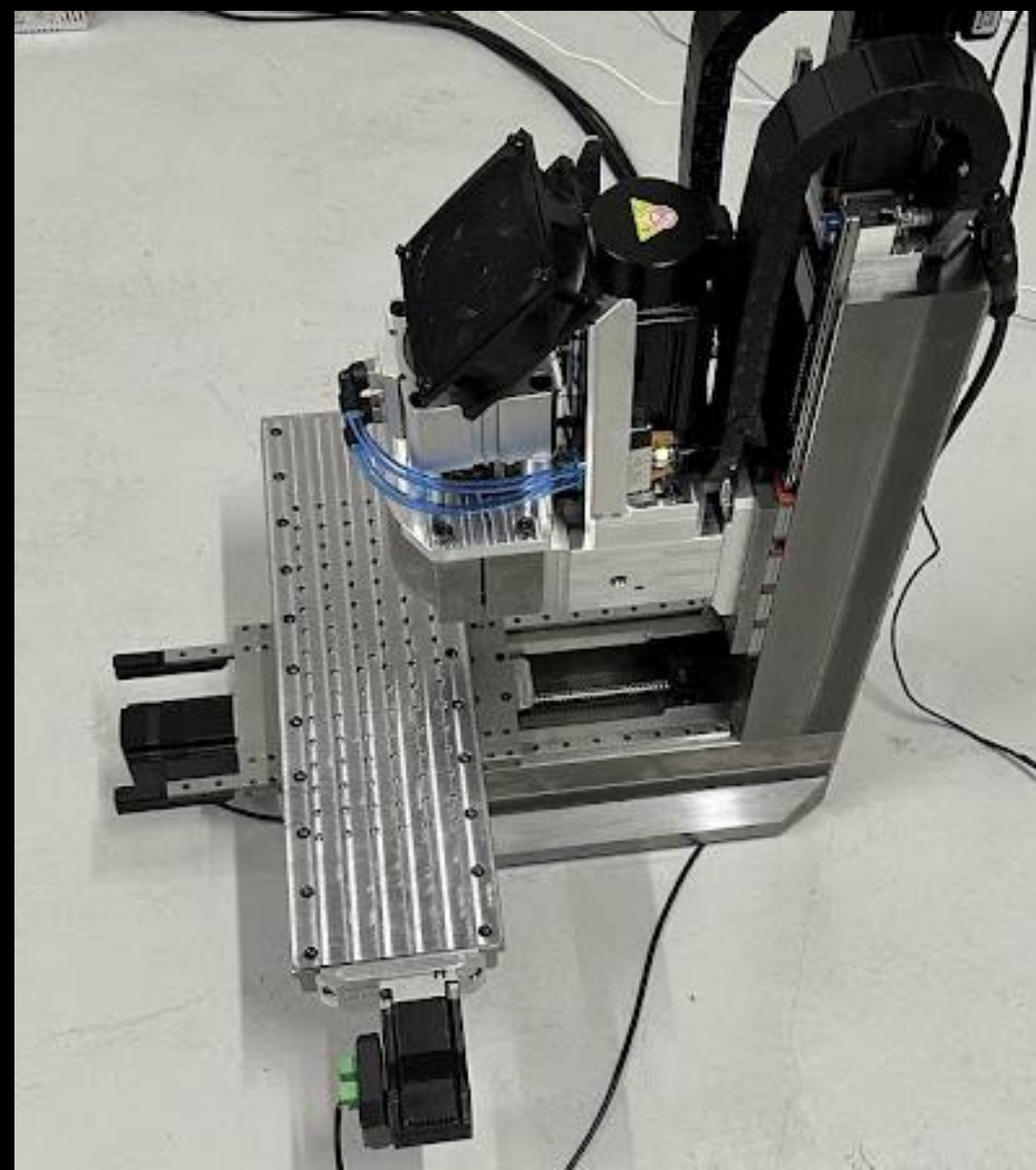
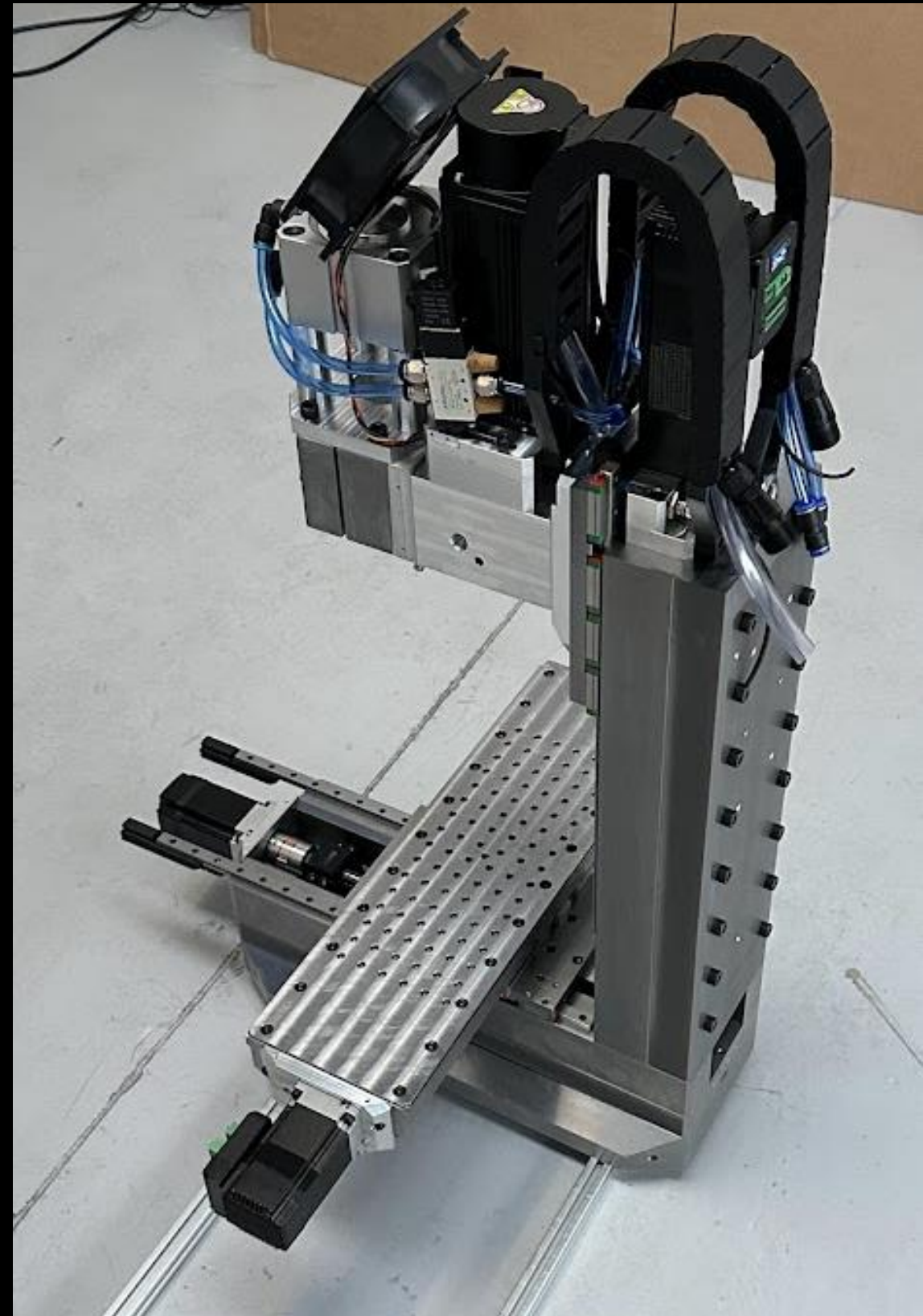


Detailed Specifications

Specifications

METRIC – Frame

- Material – EN3B
- Width – 150mm
- Design – 3 piece structure
- Assembly – 6mm dowel, M8 bolt
- Linear rail groove width – 12.06mm
- Servo mount interface – Nema 23
- Homing repeatability – 0.015mm
- Homing sensor - 12mm NPN NC
- Rail alignment method – held to reference edge
- Ground terminal – M4
- Sheet metal threads – M3
- Electronics mounting – 3x M8





Detailed Specifications

Specifications

METRIC – ATC

Pockets – 14

Main Arm material – EN3B

Carousel material – 6082

Attachment mechanism material – titanium*

Toolholder gripper – plastic compliant mechanism

Alignment method – Software align (no physical alignment required)

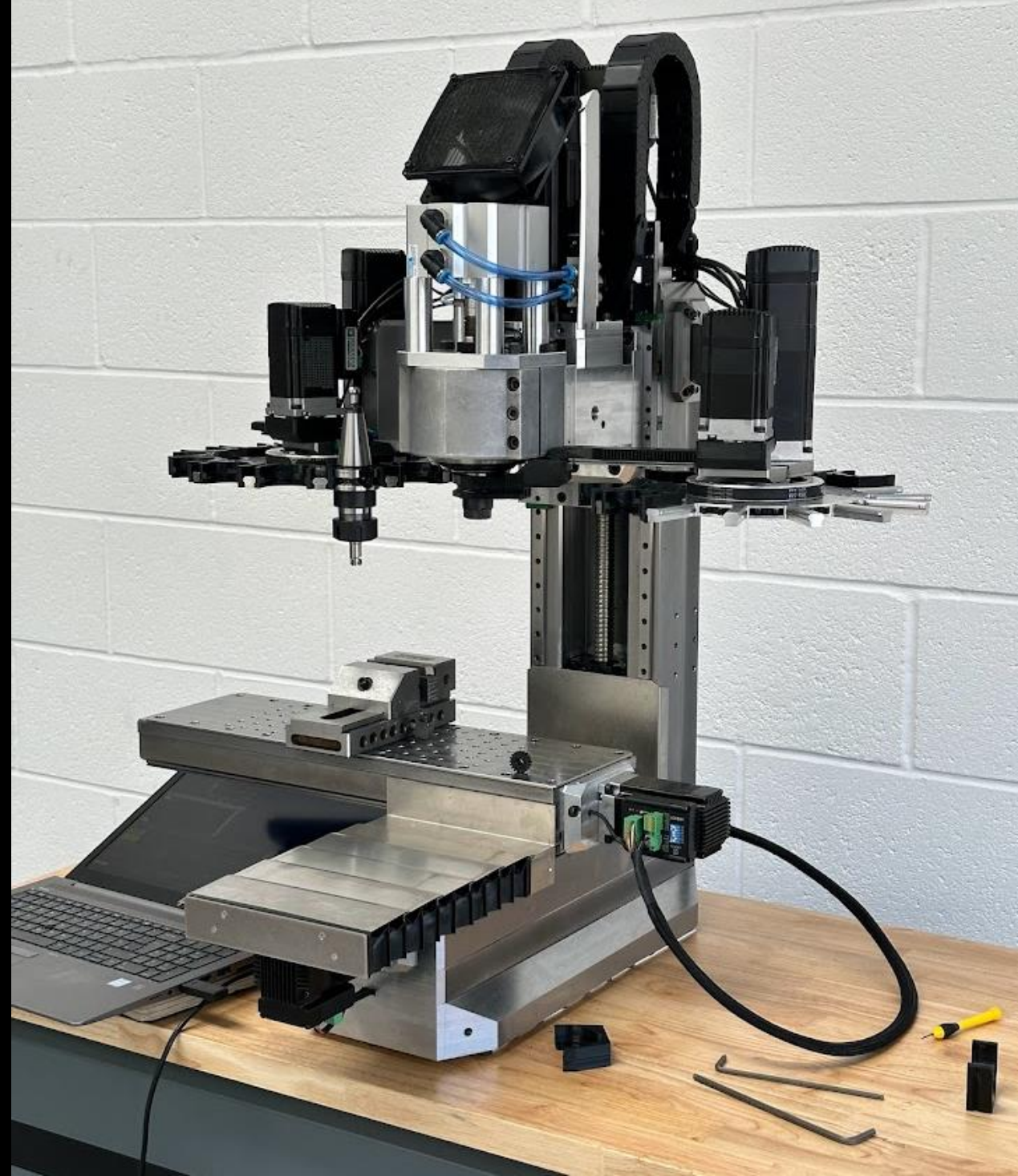
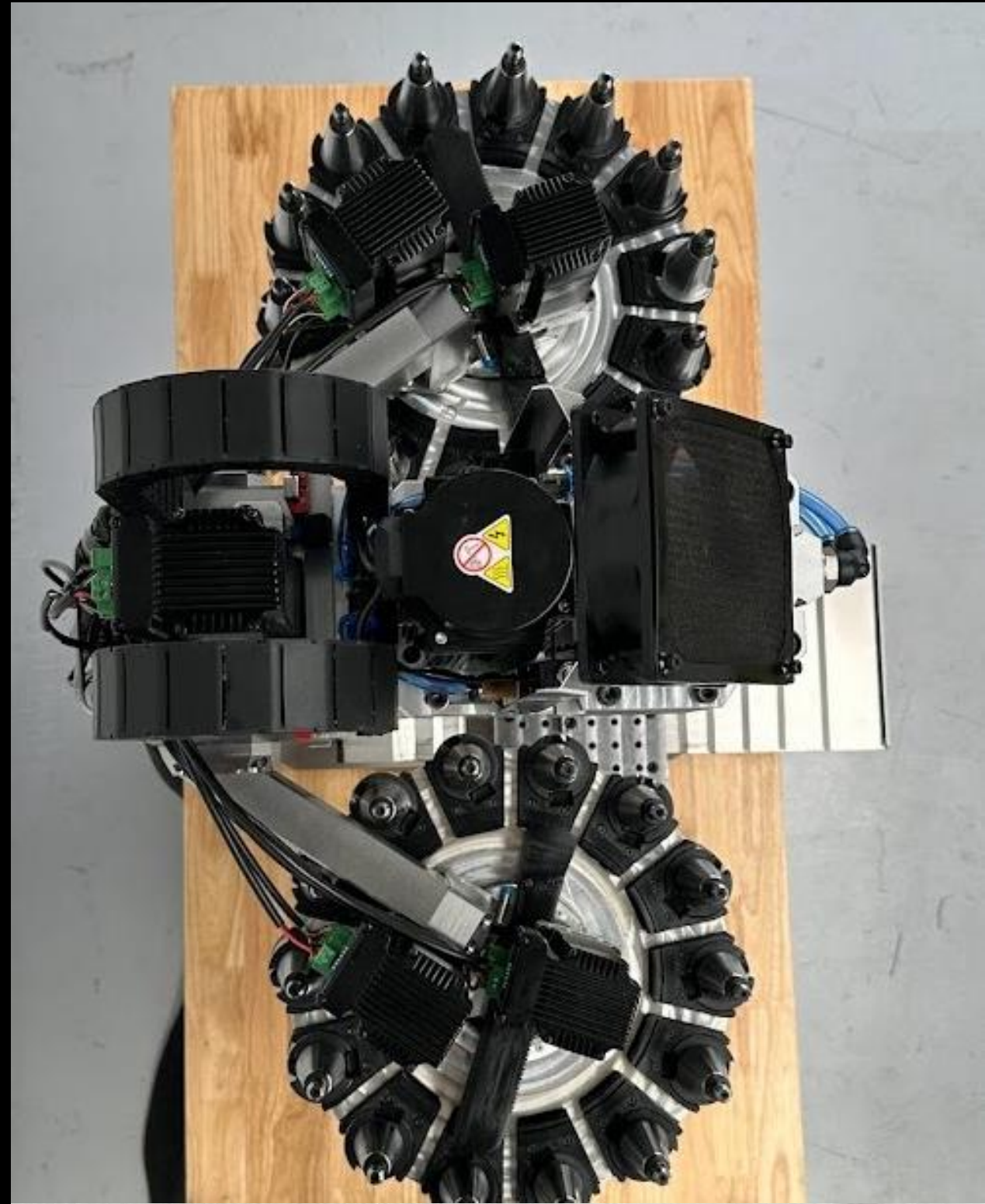
Attachment to column – 6mm dowel, M6 x4

Arm drive – Module 1 rack and pinion

Carousel drive – HTD 5M 385 10mm width belt

Carousel sensor – 12mm NPN NC

ARM sensor – 8mm NPN NC



More information on setting up the ATC can be found in the assembly manual

*Titanium will be used on the production machines. The images and videos show the prototype ATC which uses 3D printed components



Machine Alignment Report

Test Name	Axis	Plane	ISO230-4			DN Solutions			Samurai			DN Comparison	ISO Comparison
			Measured	Over 100mm		Measured	Over 100mm		Measured	Over 100mm			
Checking Straightness of motion	X	YX	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
		ZX	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
	Y	YX	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
		YZ	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
	ZX	YZ	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
		ZX	0.01	500	0.002	0.005	300	0.0017	0.004	200	0.0020	1.200	1.000
Squareness between X Y		XY	0.02	500	0.004	0.01	300	0.0033	0.01	150	0.0067	2.000	1.667
Squareness between Y Z		YZ	0.02	500	0.004	0.015	300	0.0050	0.02	150	0.0133	2.667	3.333
Squareness between Z X		ZX	0.02	500	0.004	0.015	300	0.0050	0.03	160	0.0188	3.750	4.688
Squareness between spindle X Y (tram)		ZX	0.02	300	0.0067	0.01	300	0.0033	0.01	100	0.0100	3.000	1.500
		YZ	0.02	300	0.0067	0.01	300	0.0033	0.01	100	0.0100	3.000	1.500
Parallelism of axial movement to the table surface		X	0.025	650	0.0038	0.025	650	0.0038	0.05	320	0.0156	4.063	4.063
		Y	0.02	650	0.0031	0.02	650	0.0031	0.025	150	0.0167	5.417	5.417
Parallelism of Z axis movement to spindle center		XZ	0.015	300	0.005	0.01	300	0.0033	0.02	150	0.0133	4.000	2.667
		YZ	0.015	300	0.005	0.015	300	0.0050	0.03	150	0.0200	4.000	4.000
Parallelism of X axis to reference tslot					0.04	780	0.0051	0.03	220	0.0136	2.659		
Runout of spindle taper		Nose	0.01			0.005			0.01	0	0.0100	2.000	1.000
		At 300	0.02	300	0.0067	0.012	300	0.0040	0.025	100	0.0250	6.250	3.750
Spindle Axial movement			0.01			0.005			0.015				
Bidirectional accuracy of positioning		X	0.025	500	0.0050	0.008	770	0.0010	0.04	320	0.0125	12.031	2.500
		Y	0.022	650	0.0034	0.007	410	0.0017	0.03	180	0.0167	9.762	4.924
		Z	0.025	1025	0.0024	0.008	510	0.0016	0.03	240	0.0125	7.969	5.125
Bidirectional repeatability of positioning		X	0.015	500	0.0030	0.005	770	0.0006	0.02	320	0.0063	9.625	2.083
		Y	0.012	650	0.0018	0.004	410	0.0010	0.02	180	0.0111	11.389	6.019
		Z	0.015	1025	0.0015	0.005	510	0.0010	0.02	240	0.0083	8.500	5.694
Circular deviation of the path over 360°		CCW	0.05	200	0.025	0.01	200	0.0050	0.01	50	0.0200	4.000	0.800
		CW	0.05	200	0.025	0.01	200	0.0050	0.01	50	0.0200	4.000	0.800
		Bi-D	0.05	200	0.025	0.01	200	0.0050	0.01	50	0.0200	4.000	0.800

*Data gathered from this test shows what's possible with the correct assembly. Incorrect assembly may lead your machine to have different alignment specs so its very important to follow the assembly manual or watch the assembly video on YouTube



Axis Drive System

Standard System

The Samurai 120 default axis drive system has been optimised for a combination of high performance during high feed milling, and end milling operations.

Ballscrew configuration:

X axis	:	SFU1605-4	C7
Y axis	:	SFU1605-4	C7
Z axis	:	SFU2005-4	C7

Calculated axis force:

90% efficiency		Torque	
X axis	:	1356N	100%
Y axis	:	1356N	100%
Z axis	:	2171N	300%

Axis motor configuration:

X axis	:	iHSS57-36-10 100W 1.2 n·m
Y axis	:	iHSS57-36-10 100W 1.2 n·m
Z axis	:	iHSV57-30-18-36-SC 180W 0.64 n·m with brake

Axis resolution*:

X axis	:	0.005 mm
Y axis	:	0.005 mm
Z axis	:	0.005 mm

*Axis resolution can be increased or decreased by changing micro step settings. The default setting is a balance between precision and speed.

Optional System

If your application requires higher axis force for cutting slower with larger tools, it is recommended to use a different configuration.

Optional Ballscrew configuration:

X axis	:	SFU1604-3	C7
Y axis	:	SFU1604-3	C7
Z axis	:	SFU2004-3	C7

Calculated axis holding force:

90% efficiency		100% torque	
X axis	:	1696N	
Y axis	:	1696N	
Z axis	:	4241N	

Optional axis motor configuration:

X axis	:	iHSS57-36-10 100W 1.2 n·m
Y axis	:	iHSS57-36-10 100W 1.2 n·m
Z axis	:	iHSV57-30-30-36-SC 180W 3 n·m with brake

Axis resolution*:

X axis	:	0.001 mm
Y axis	:	0.001 mm
Z axis	:	0.001 mm

An example for using a different configuration would be the requirement for larger tools, such as drills.

Different configurations can also be combined, such as 5mm lead ballscrew with iHSS57 closed loop stepper for a balance between holding torque and speed, with the downside being vibration / noise caused by the stepper.

It is also possible to use different pitch ballscrews and (or) different type of motor for Z compared with XY. It is recommended that the X and Y axis use the same components.



Upgrades

Standard Motion System

To keep costs low, the standard machine uses low-cost motion components. Samurai selected a reliable supplier who can deliver repeatable quality while keeping costs 1/5th Hiwin or other equivalent.

Upgraded Motion System

If your application demands higher precision, accuracy, or durability it is recommended to use industrial grade components.

These are available as an option with the Samurai 120H machine, the industrial machines including them as standard.

To upgrade to higher quality components please contact Samurai Machine tools with your specific requirements.

Axis lubrication

The standard method for grease application is manual, requiring partial disassembly. Automatic grease lubrication options are available.

3, 4th, 5th Axis

The Samurai 120 is a 3-axis machine, that has been designed with enough Z clearance to allow for 4th or 5th axis upgrades. The Samurai branded 4th or 5th axis tables will be available 2024.

ATC

The Samurai Type 1 ATC is available to purchase with your new machine, additionally it can be purchased later. The dual ATC can also be purchased separately allowing you to add tooling capacity at a more appropriate time.



Using our machining center to verify component alignment



Images documenting the Samurai 120 Manufacturing process



Images





Images





Images



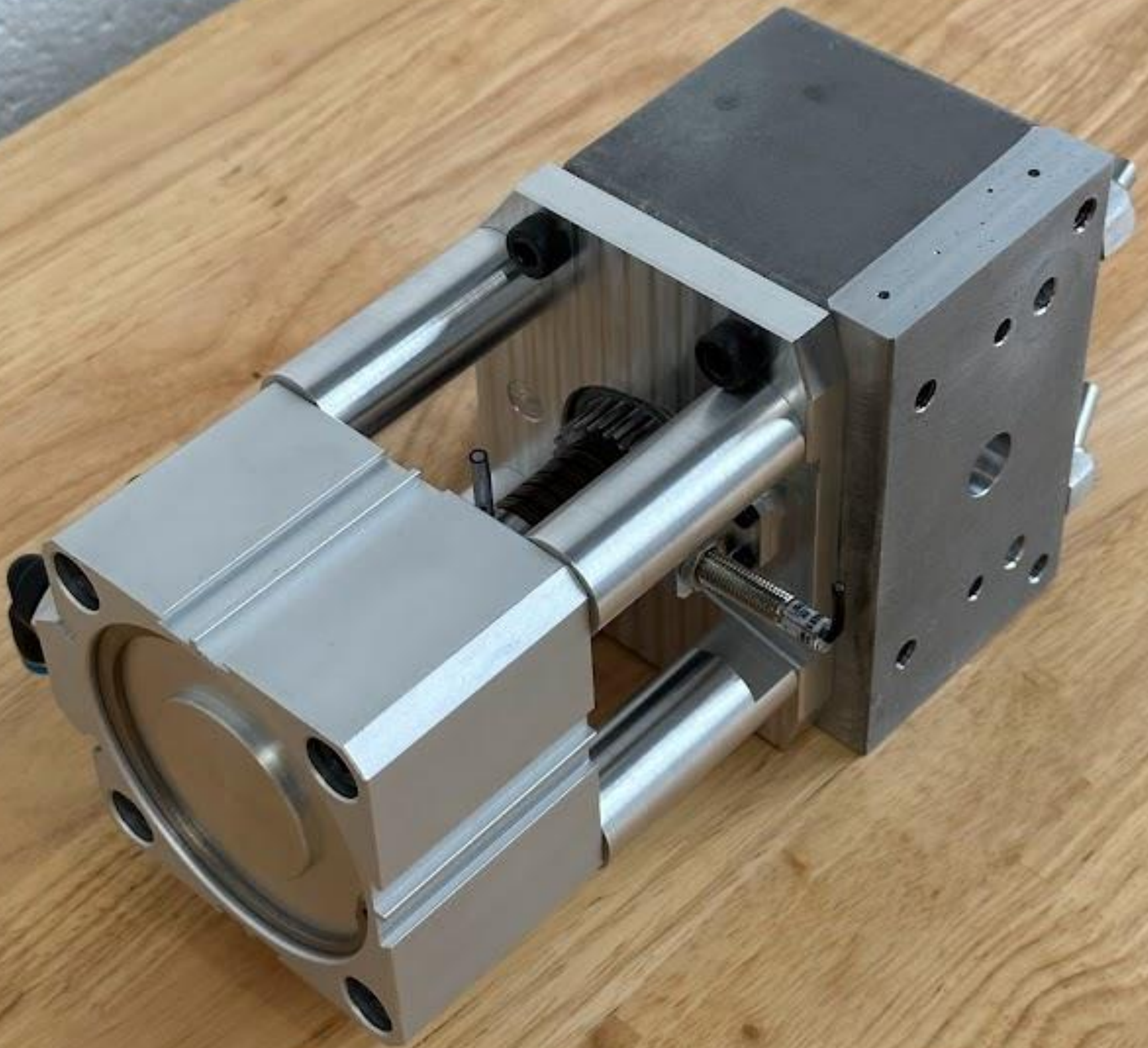


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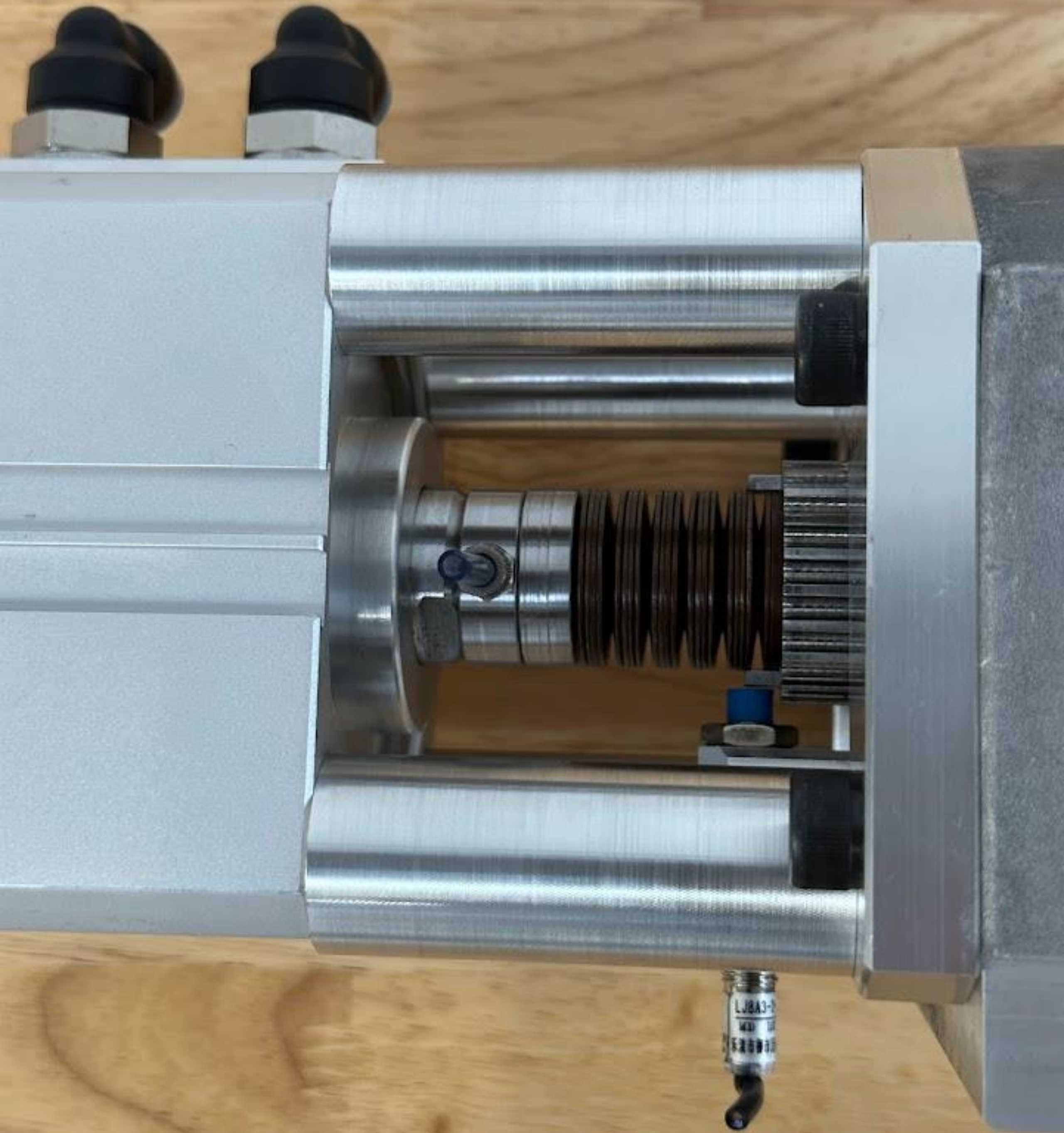


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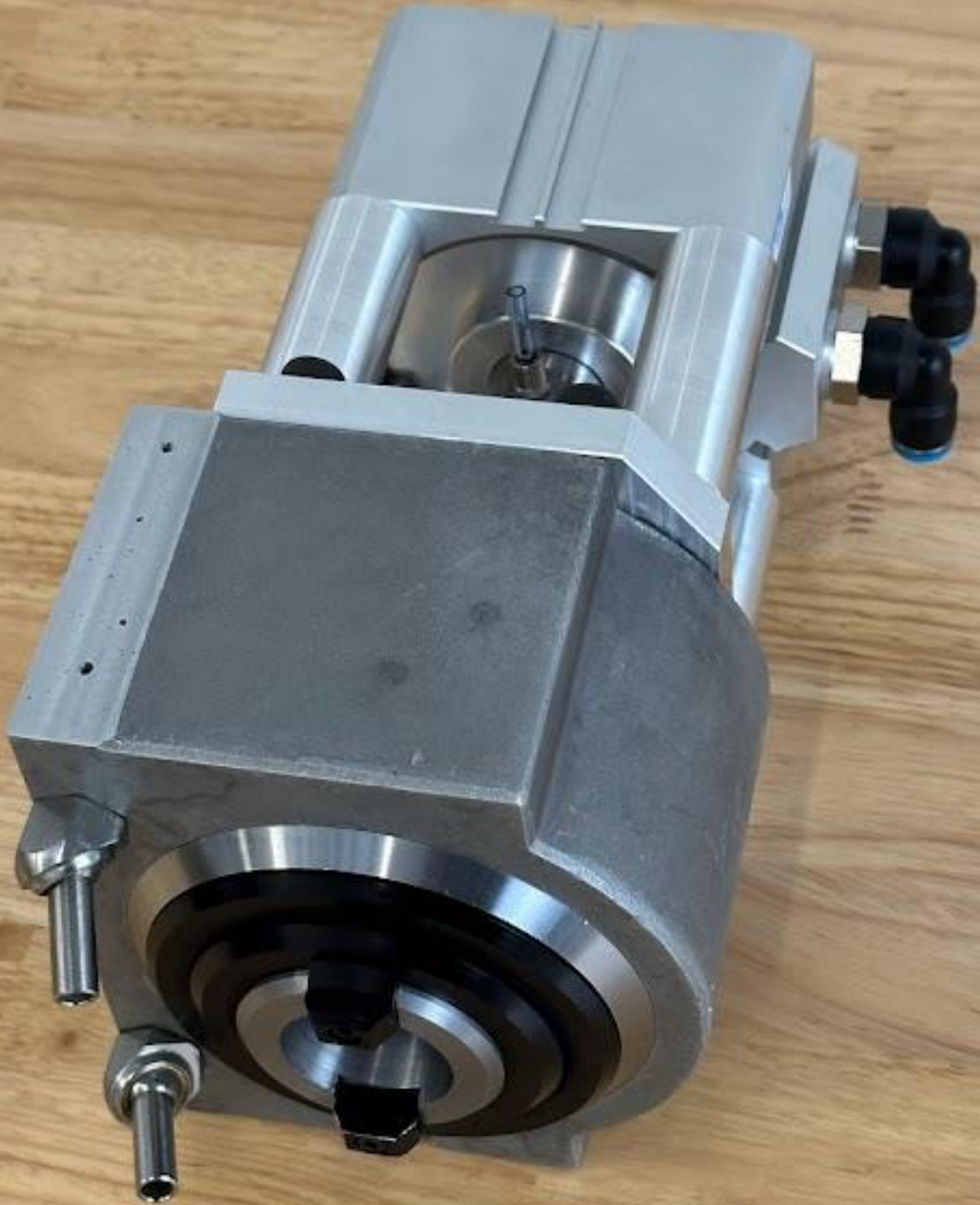


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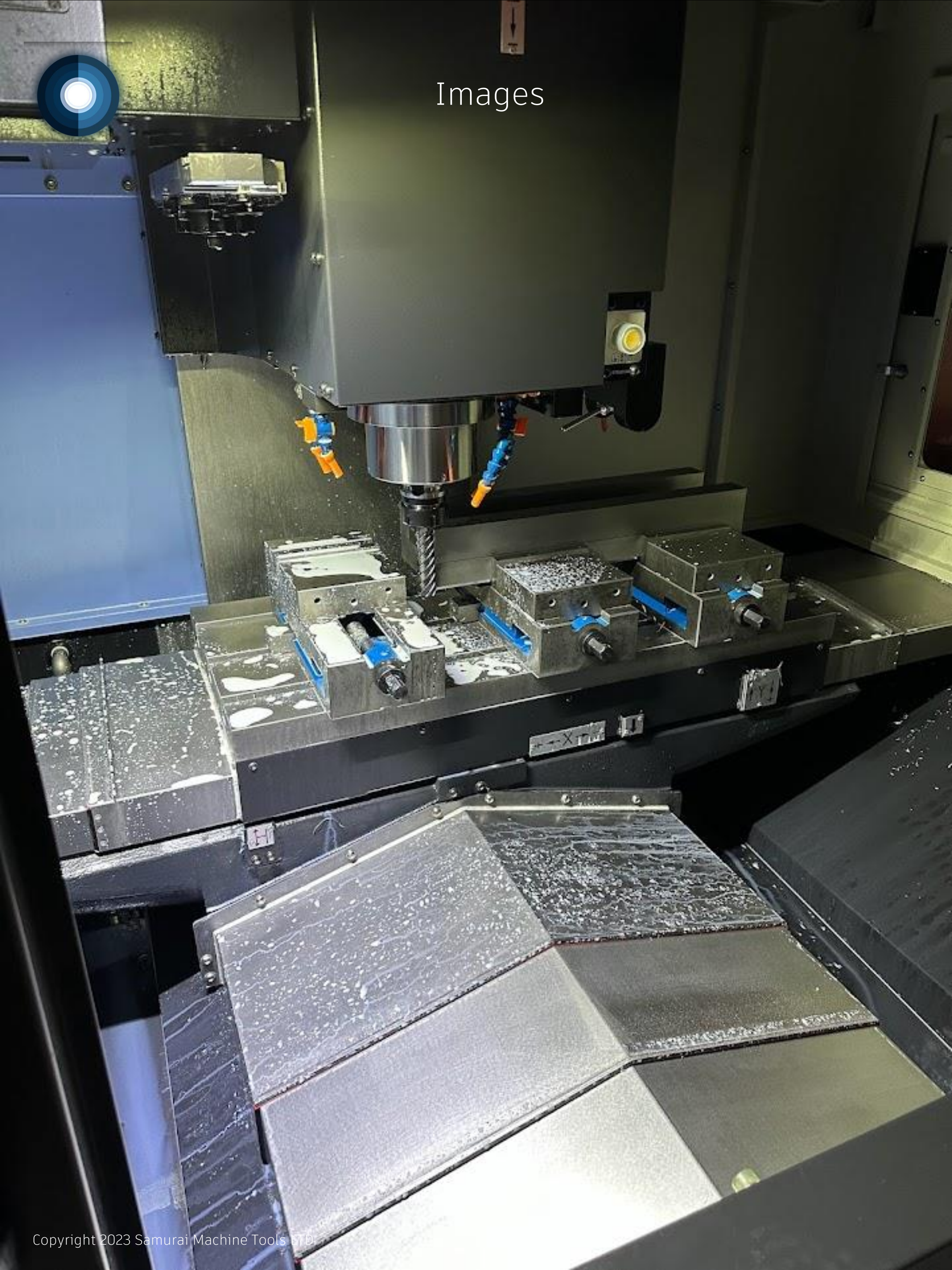
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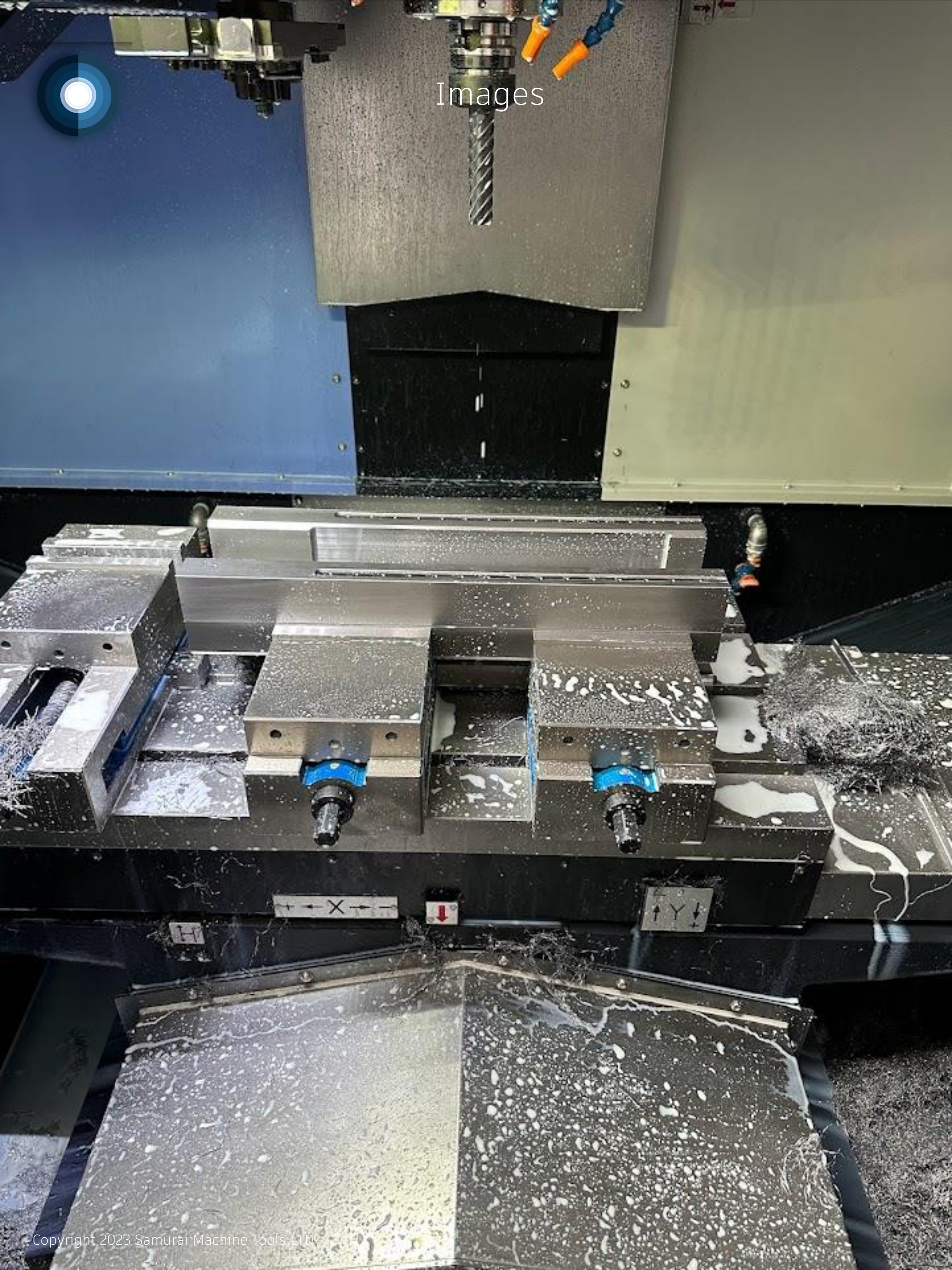




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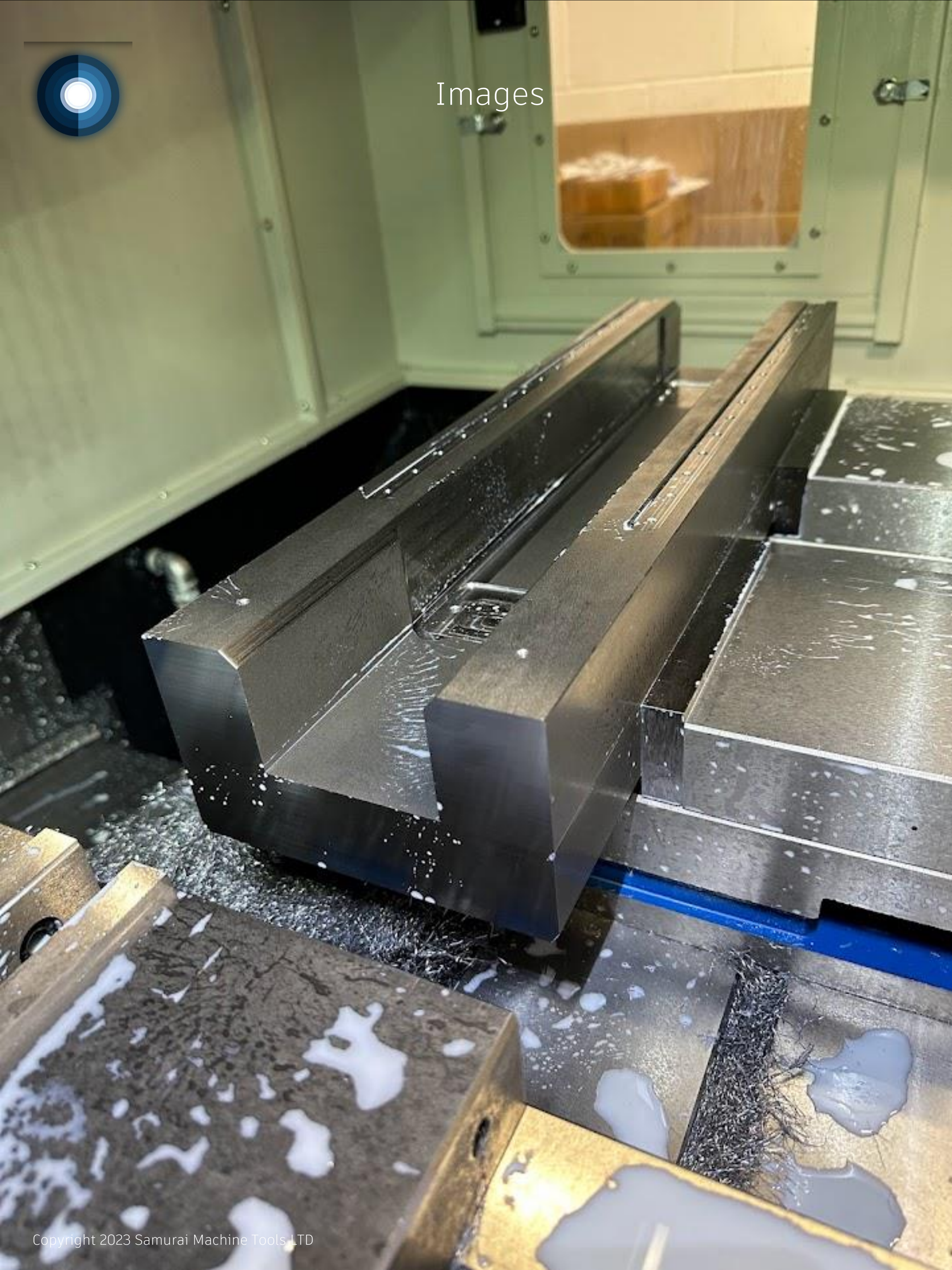


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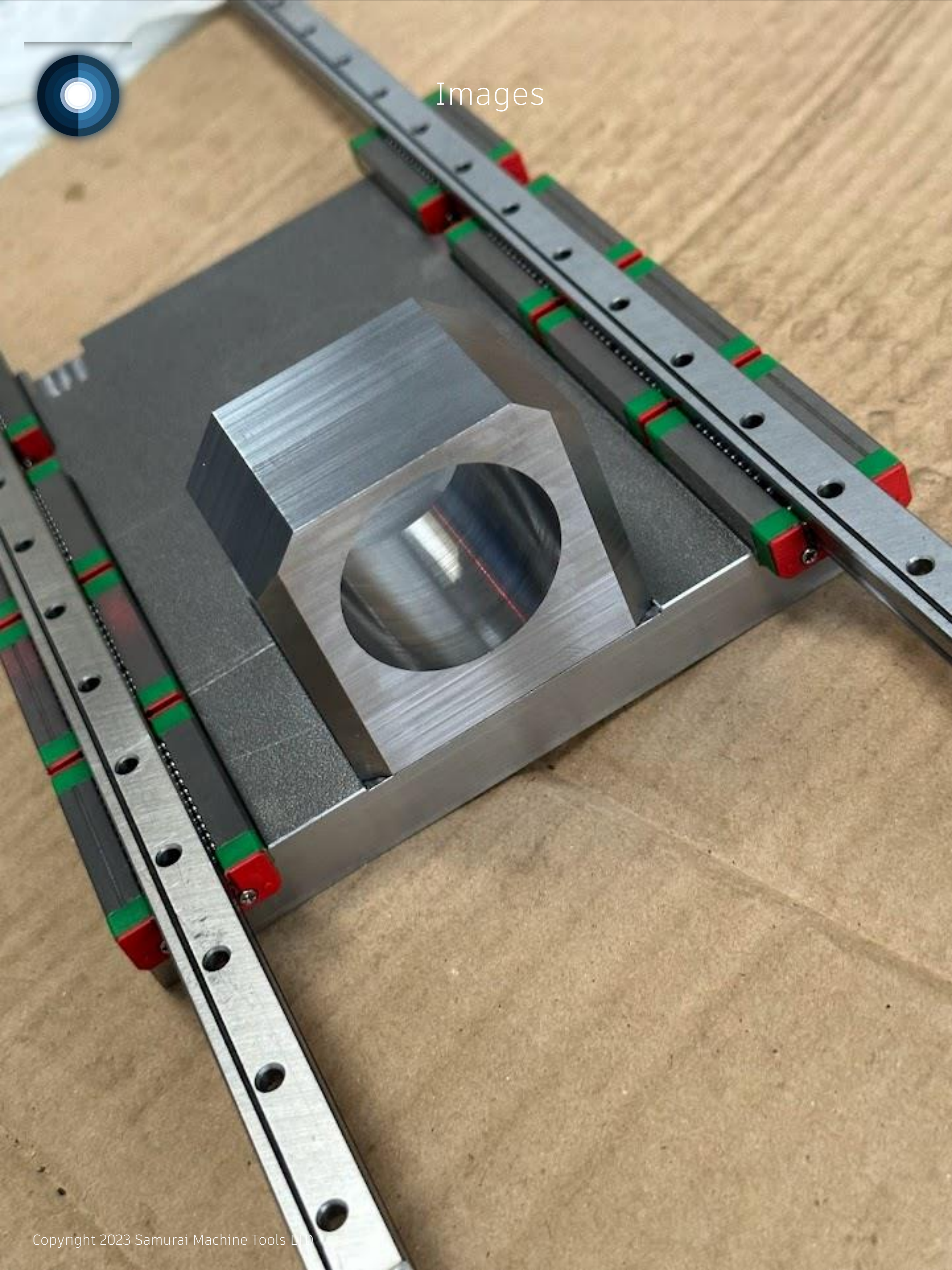


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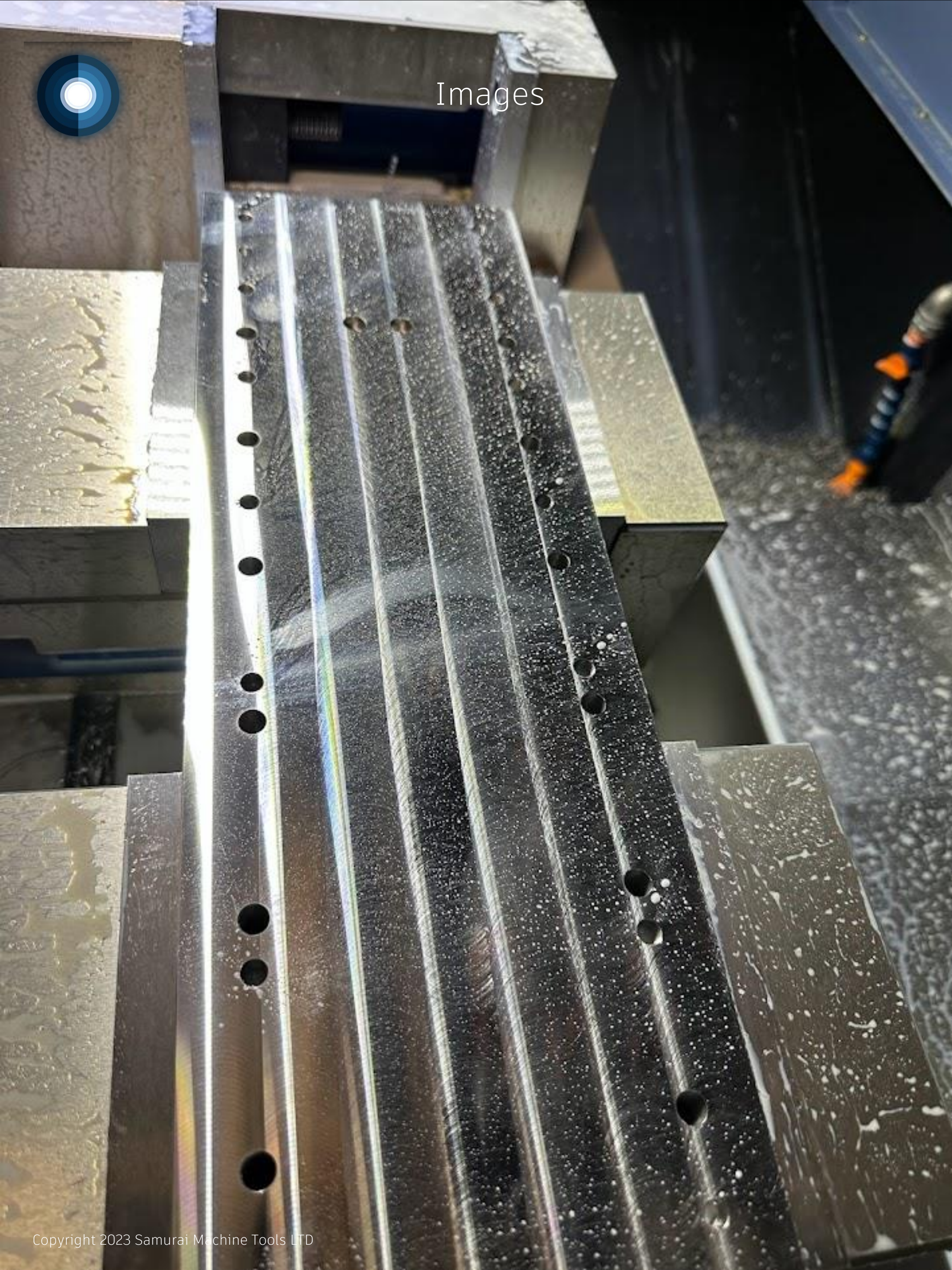
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Ben. Zer.

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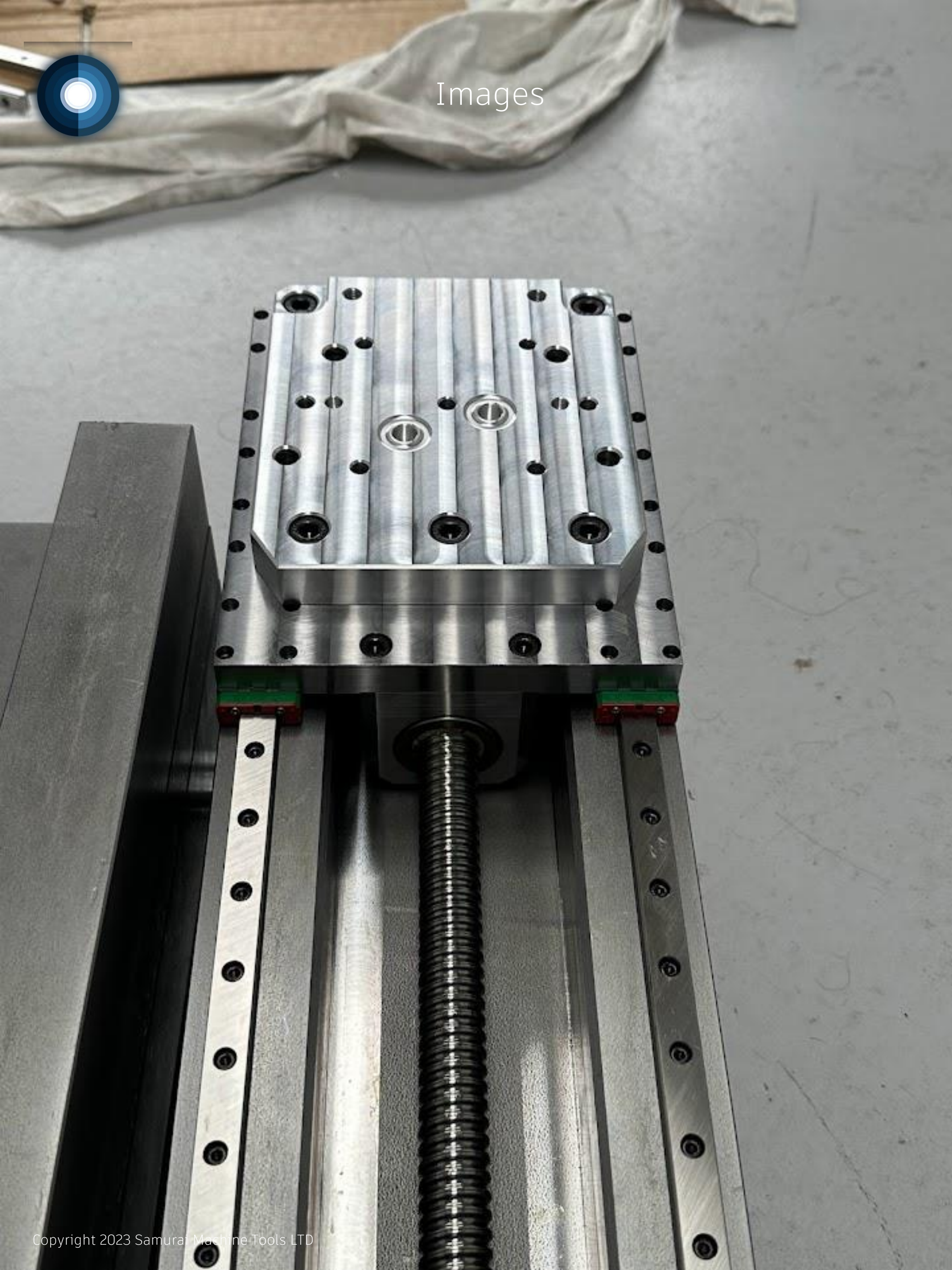


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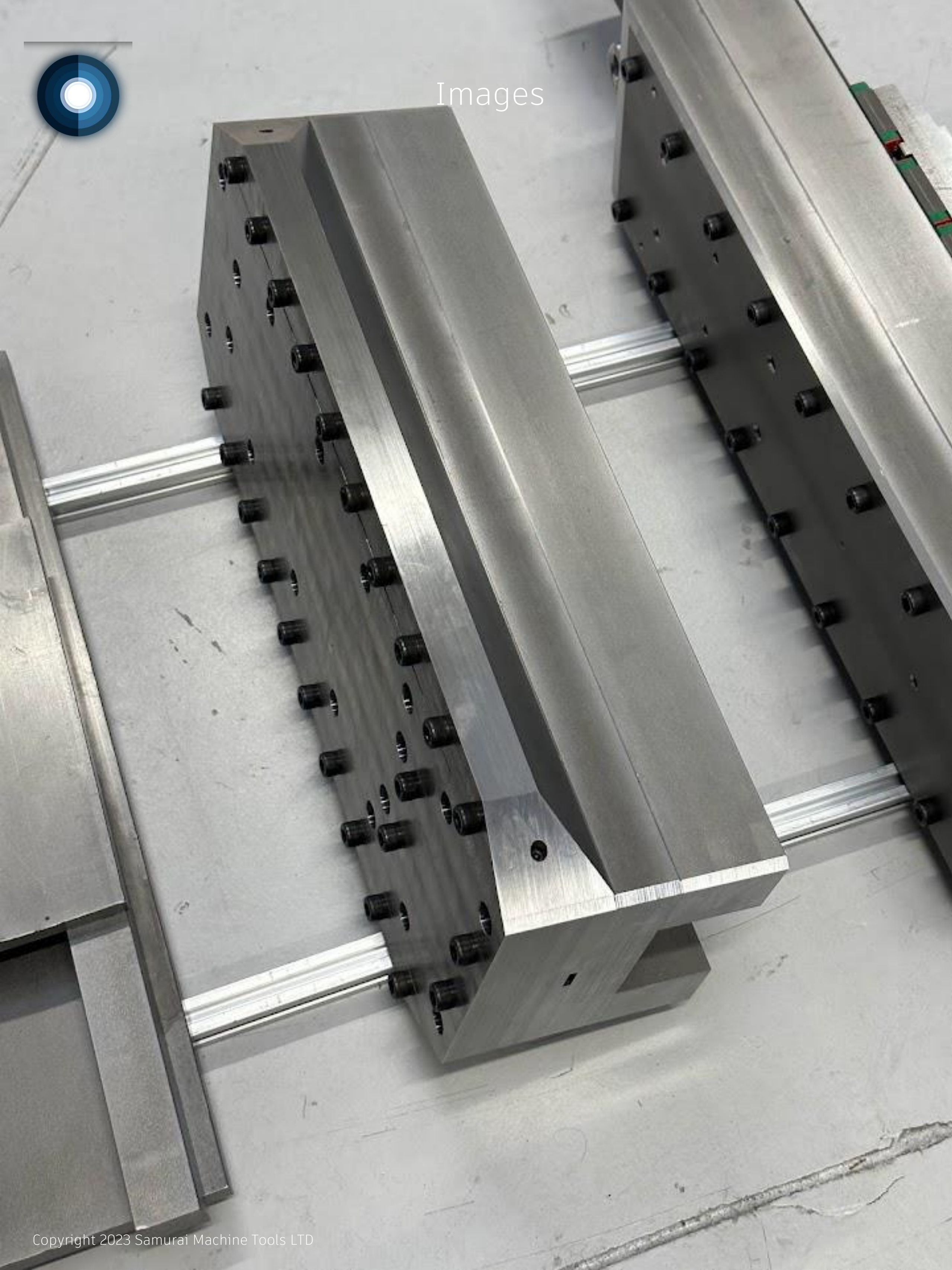


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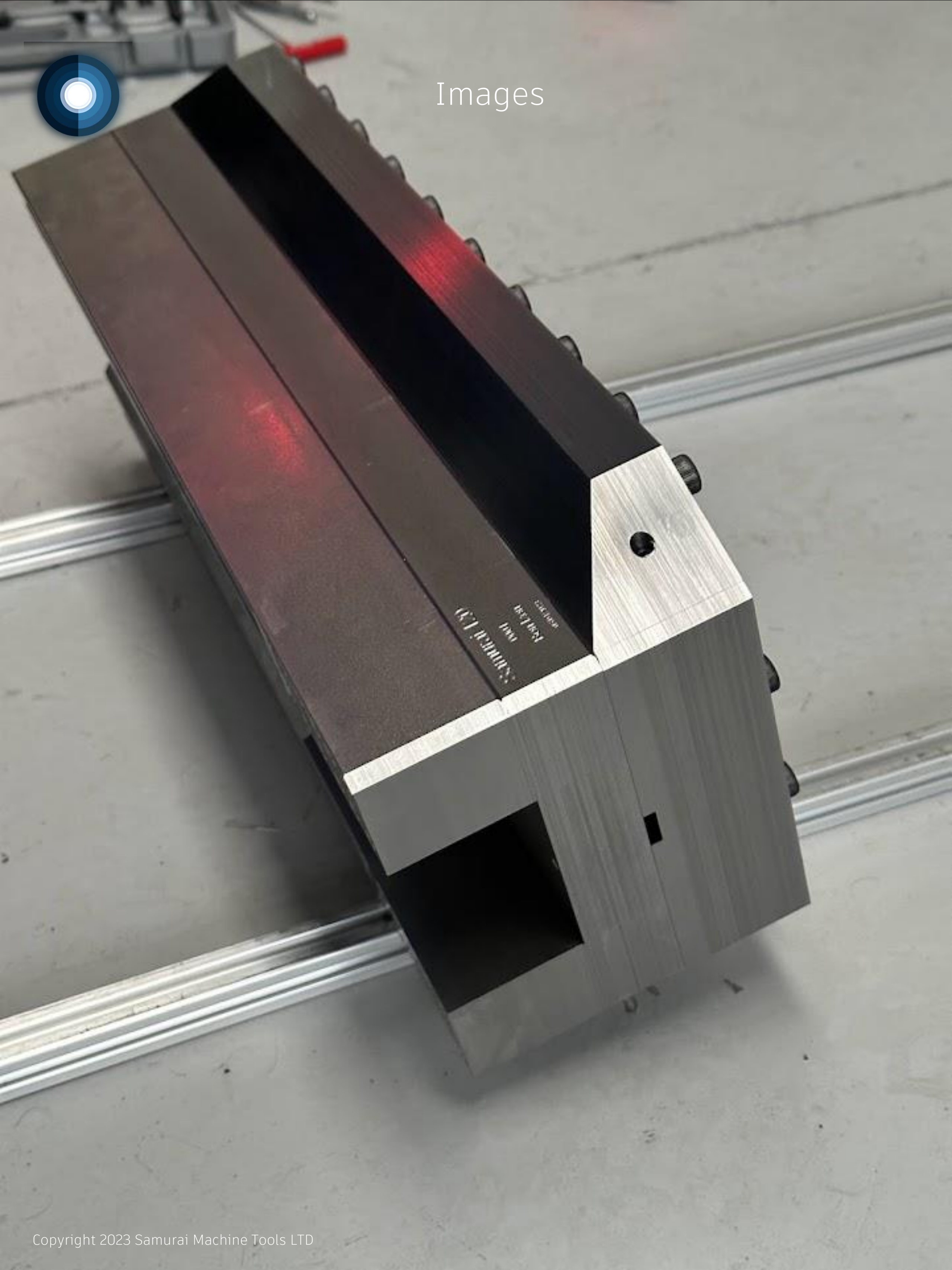


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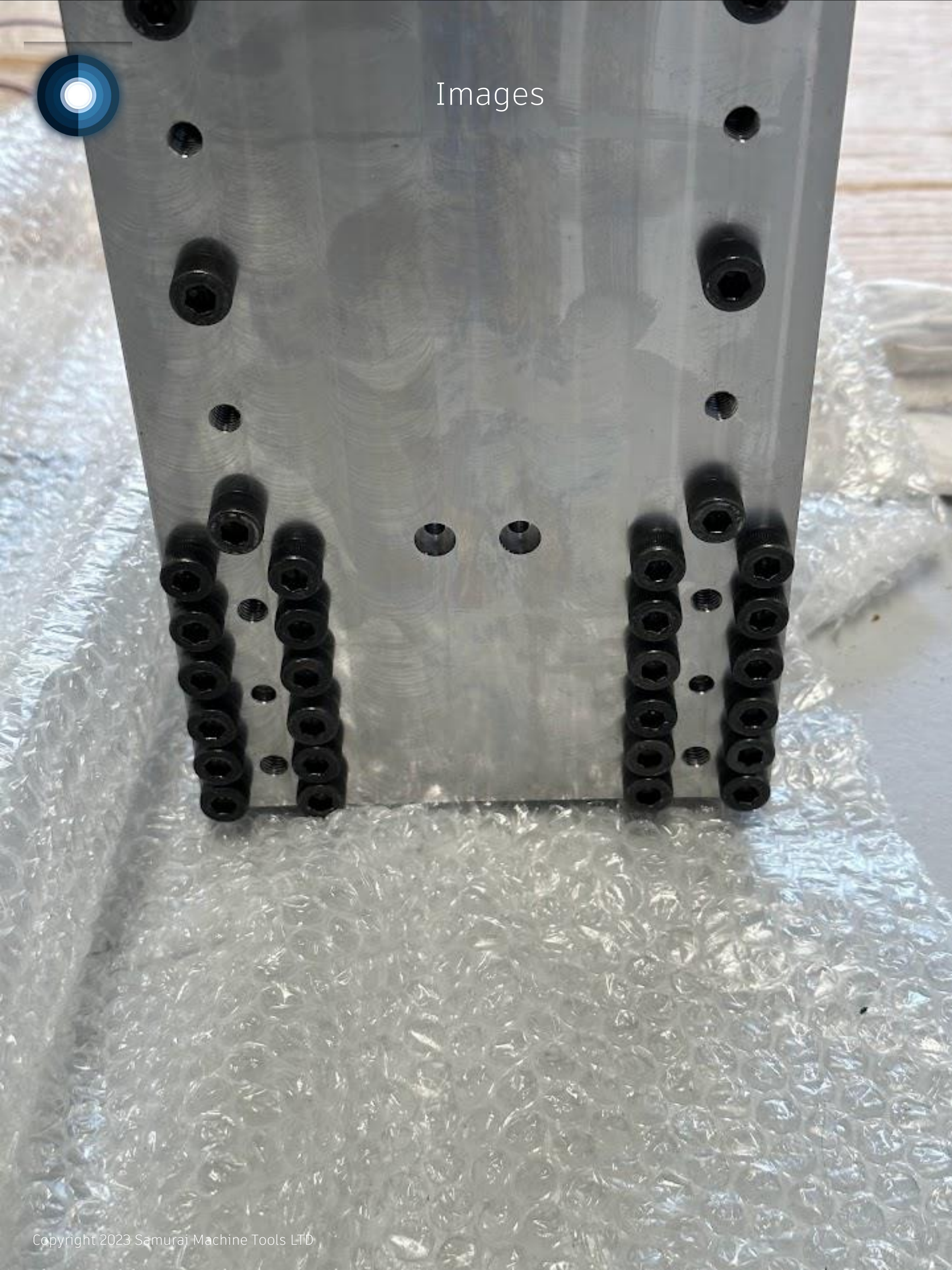


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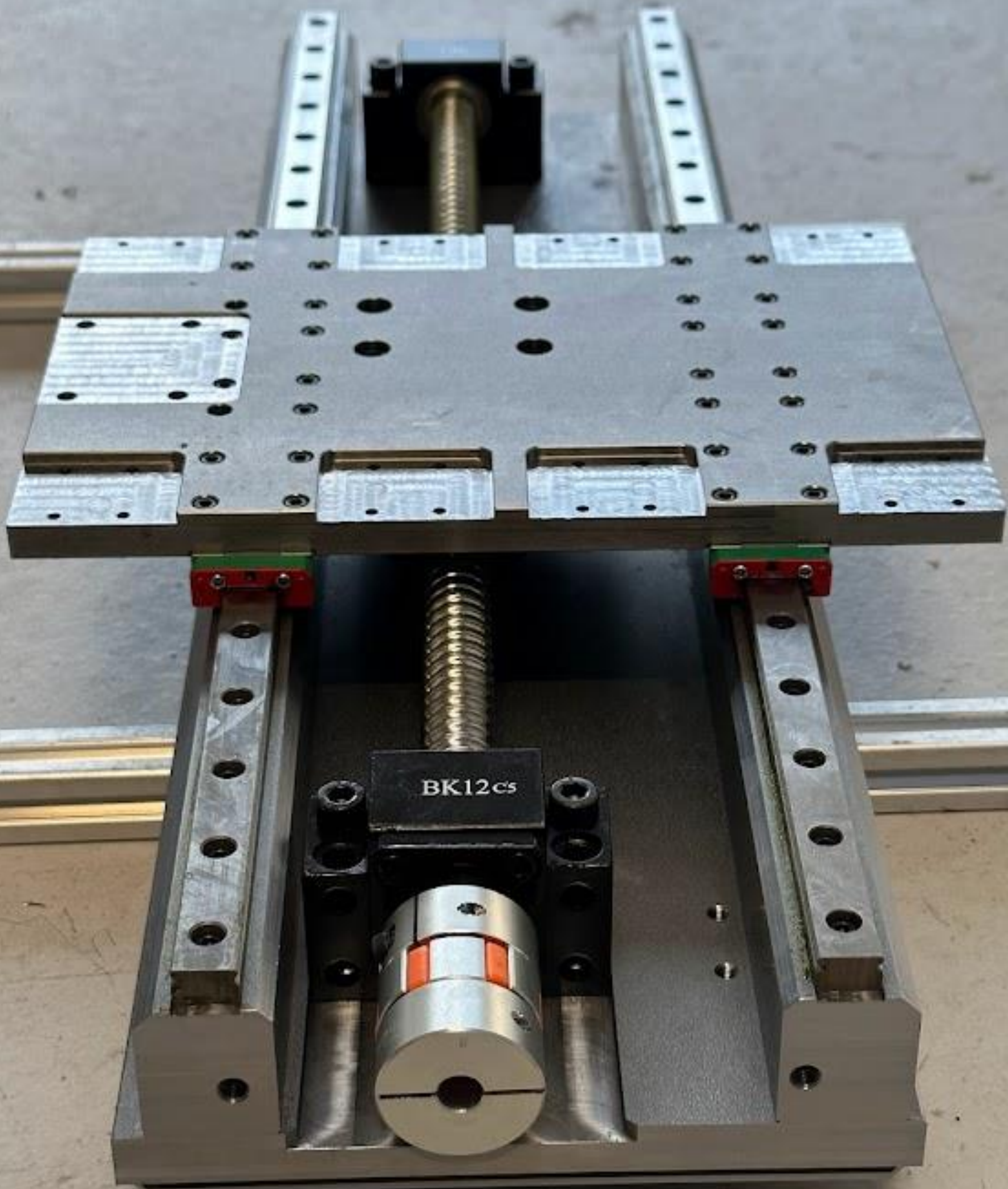


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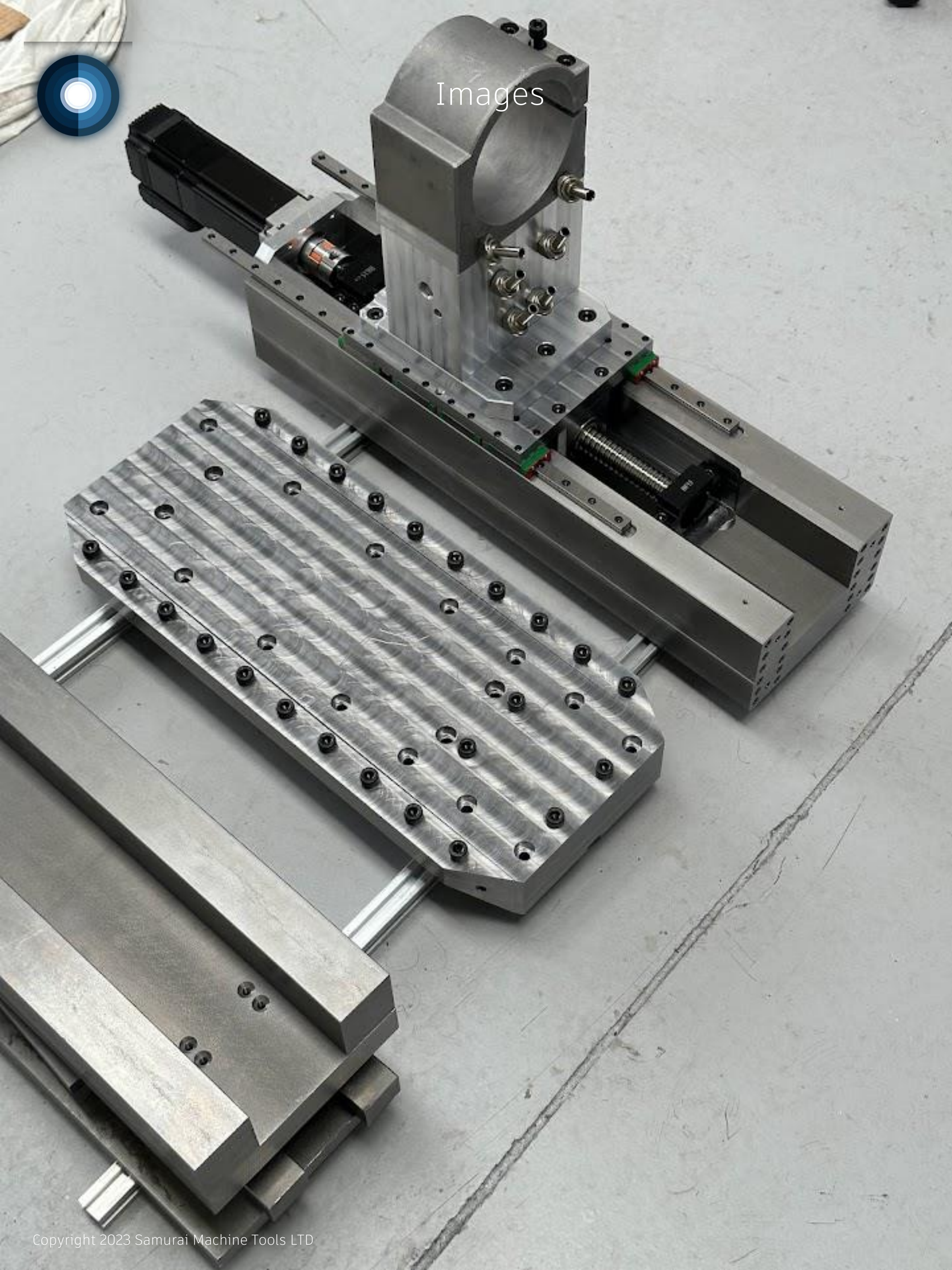




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Unibody Machine Vice
6"

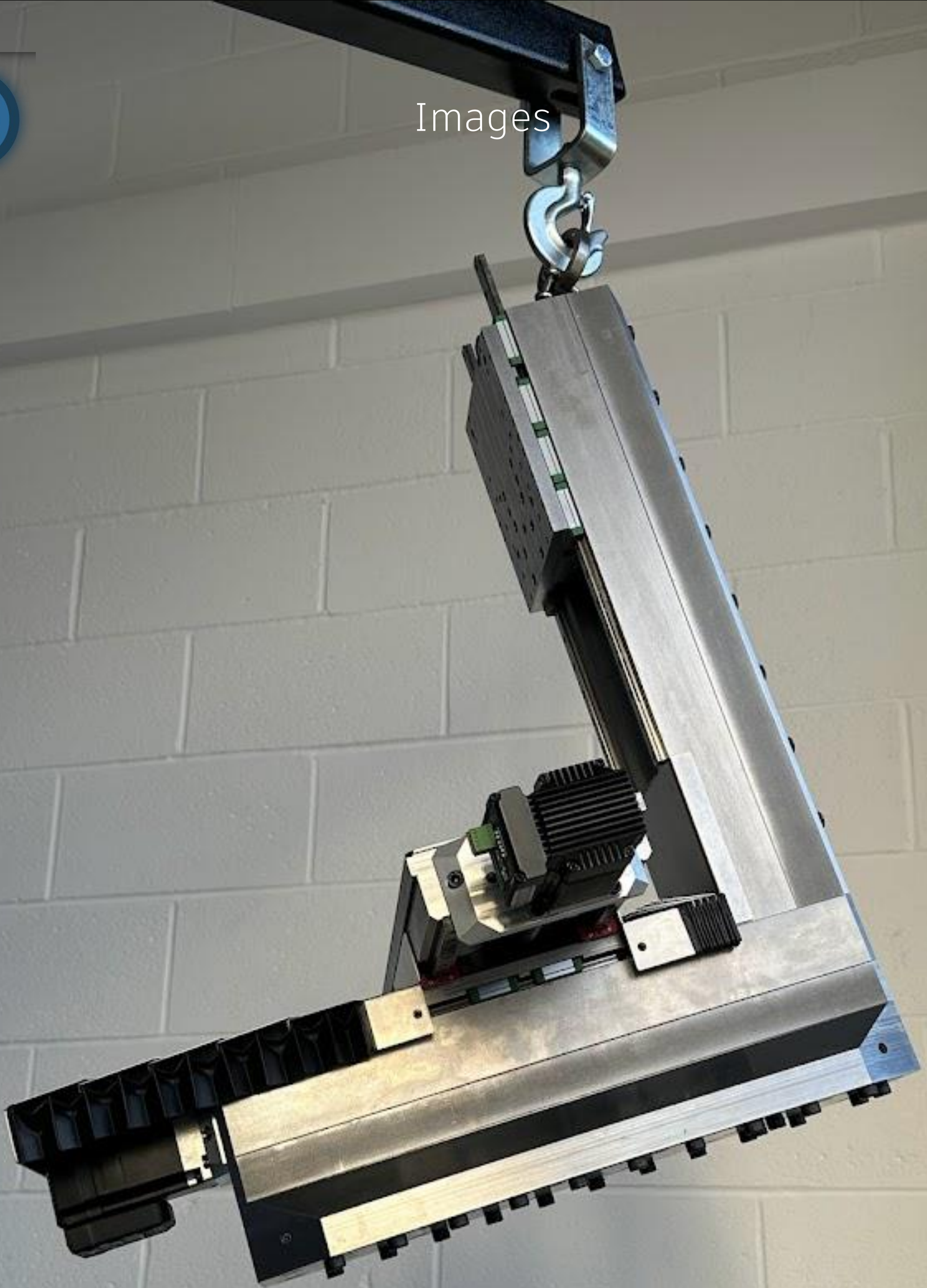
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Samurai 120
5014
Samurai



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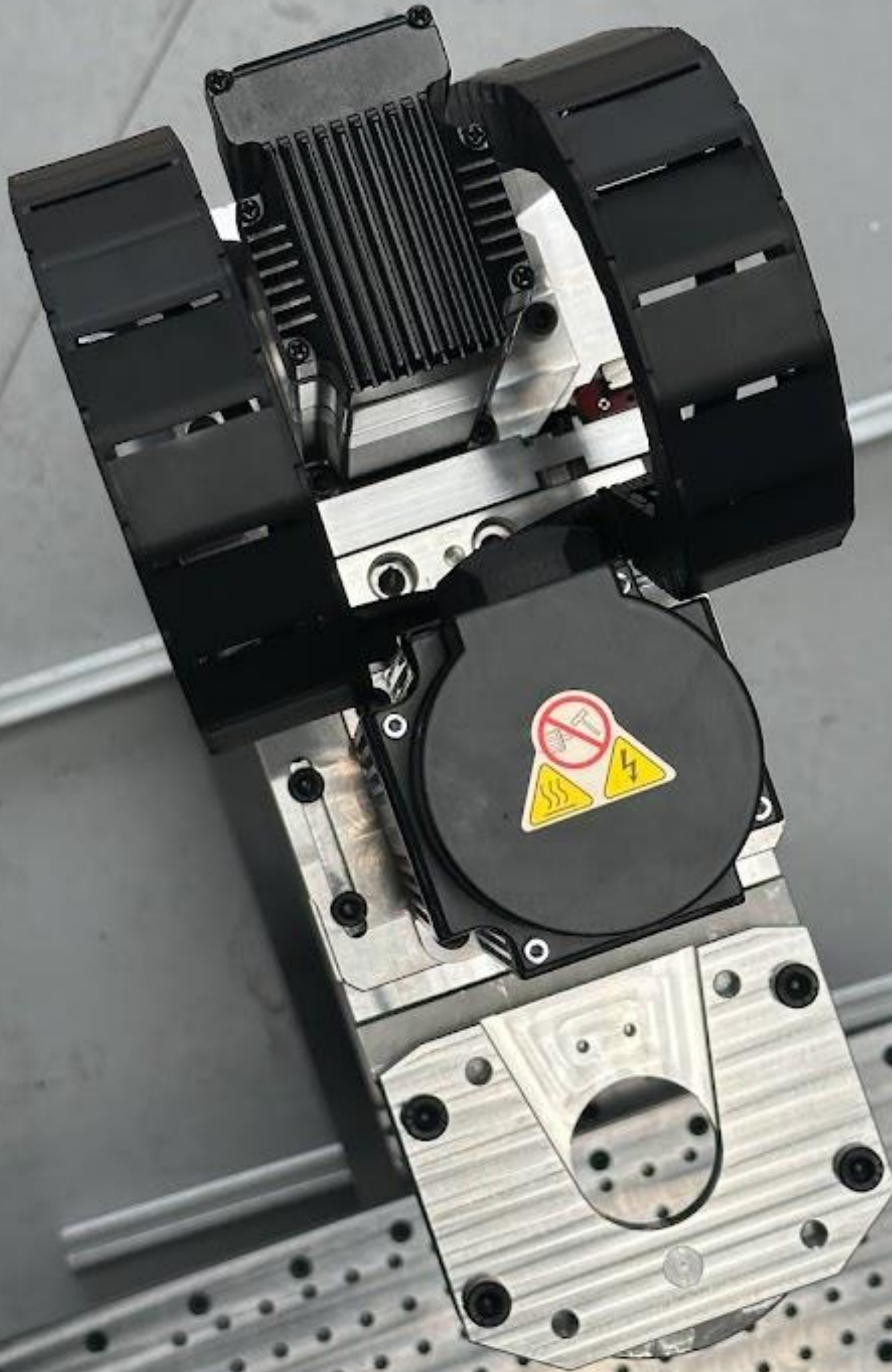


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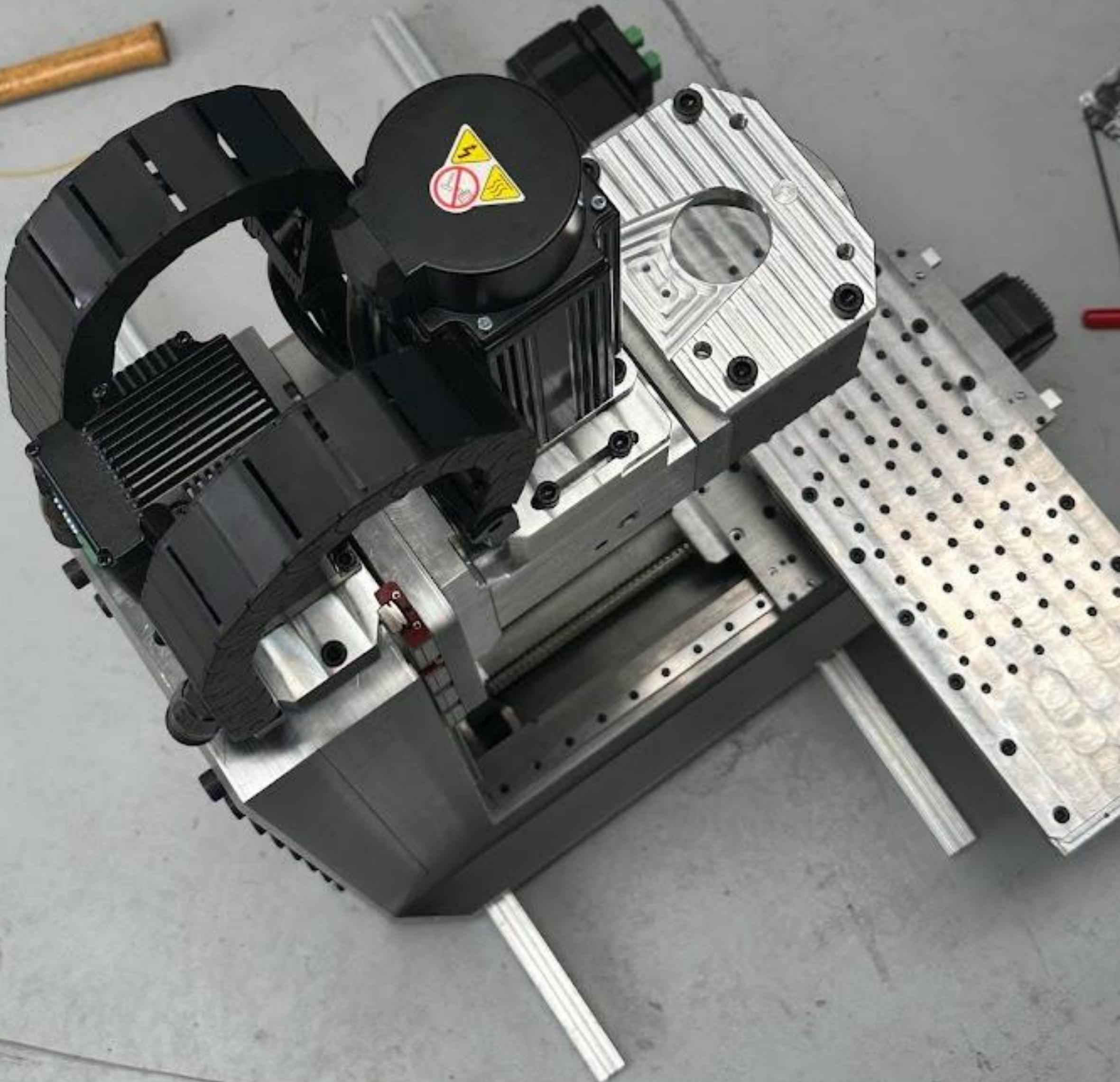


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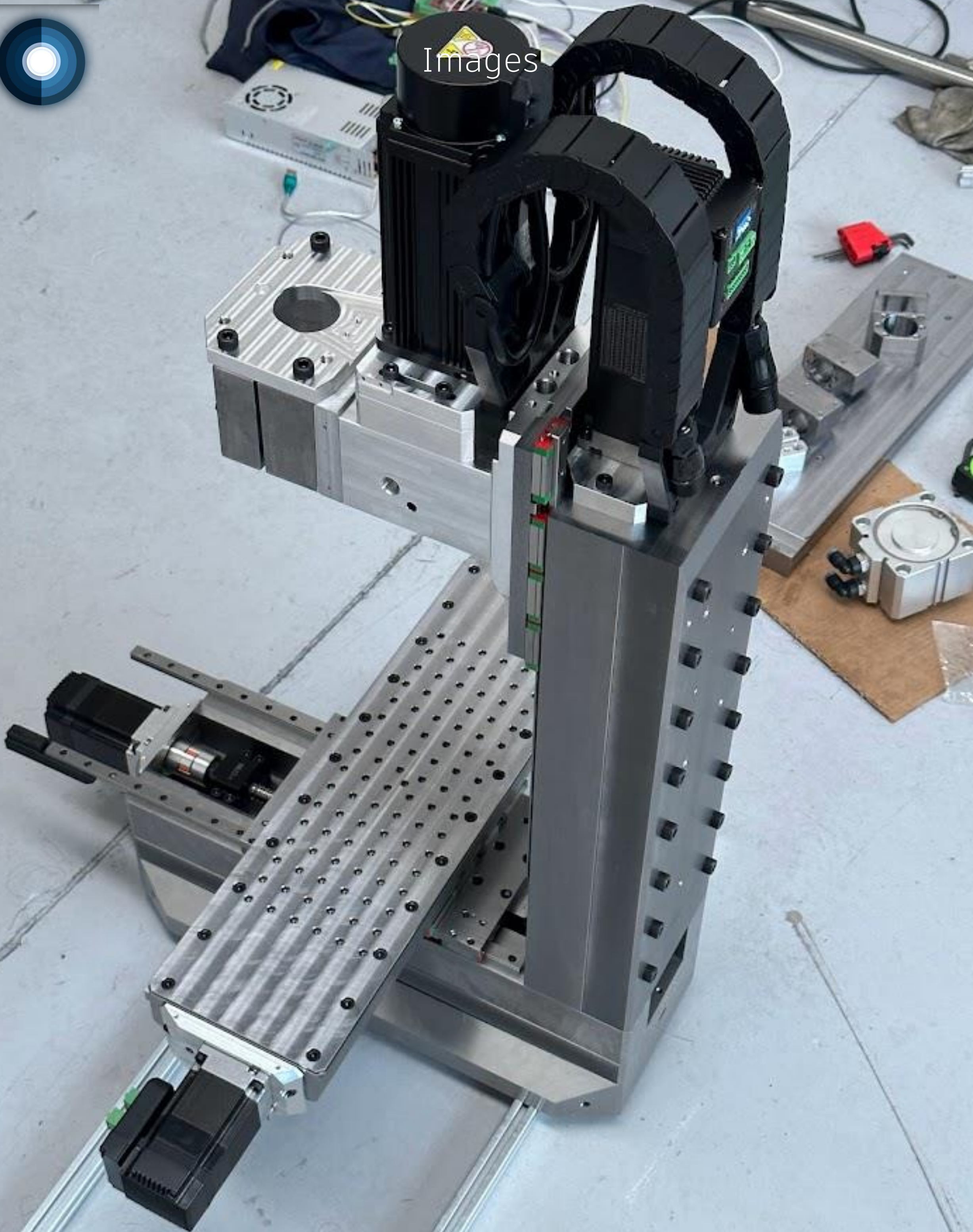


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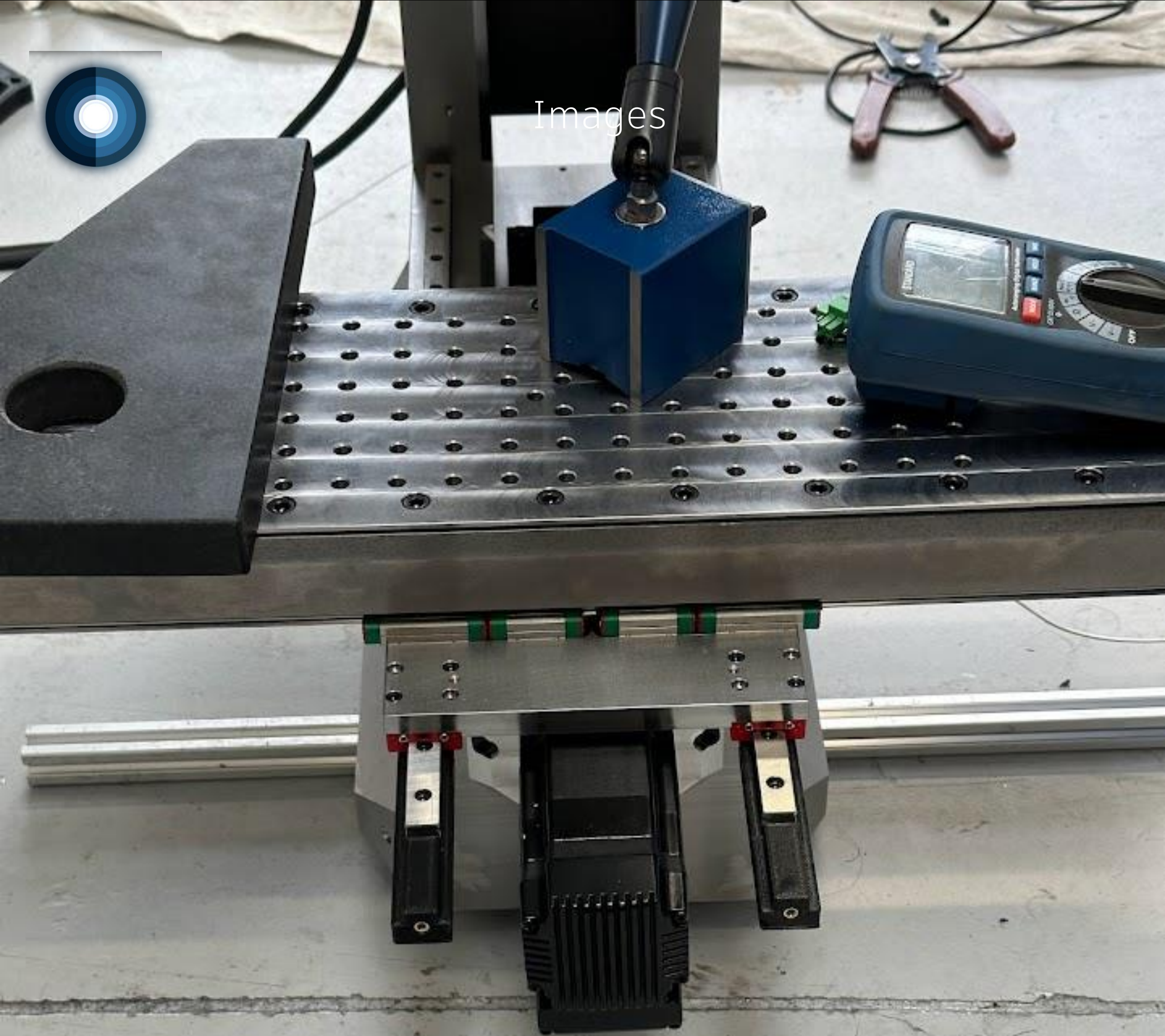
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Pulse/rev Table	
Pulse/rev	Sw1
Default	on
800	on
1600	off
Sw2	on
Sw3	on
Sw4	on

近开
6-36VDC
300mA



Images





Images



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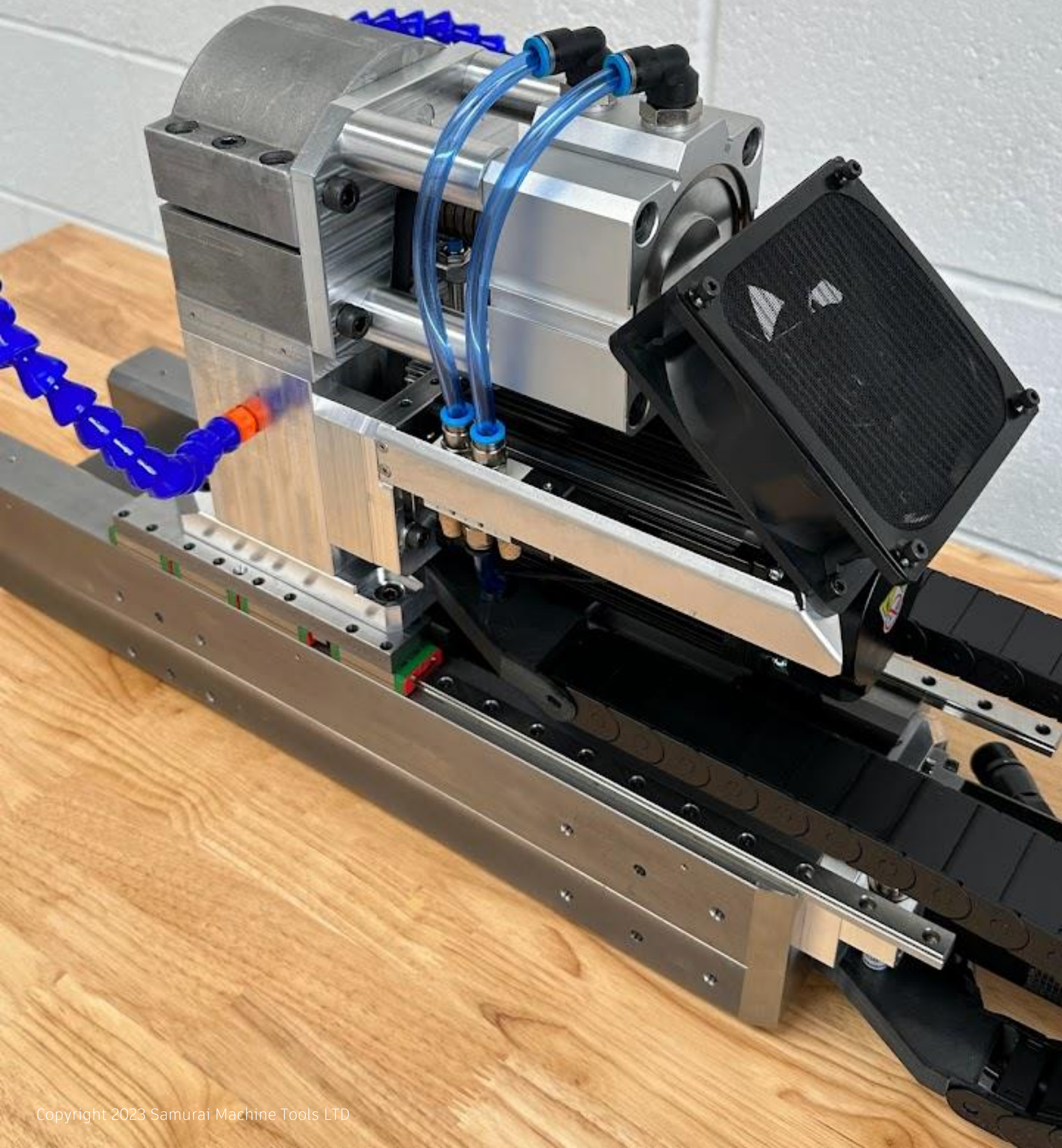


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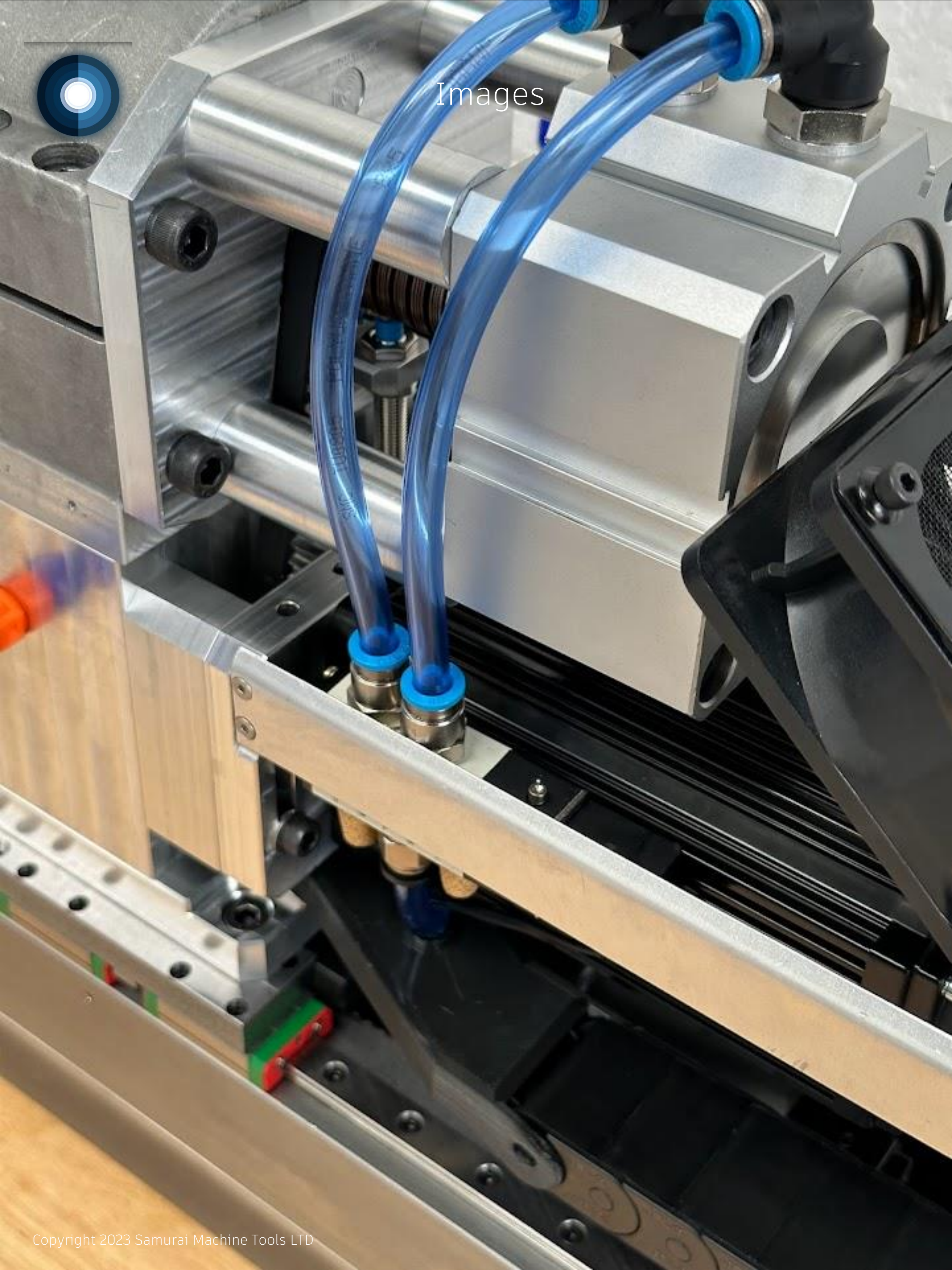


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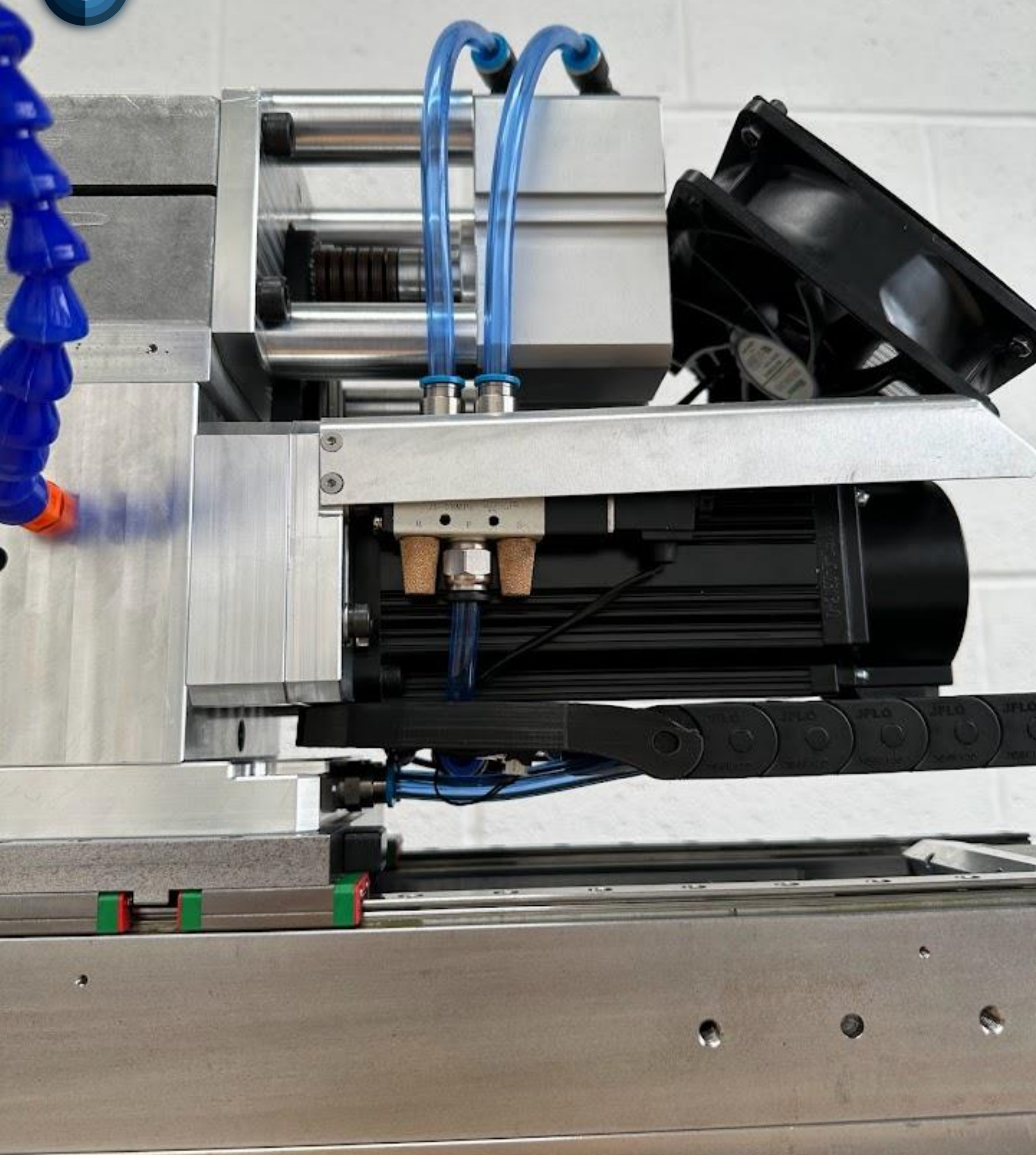


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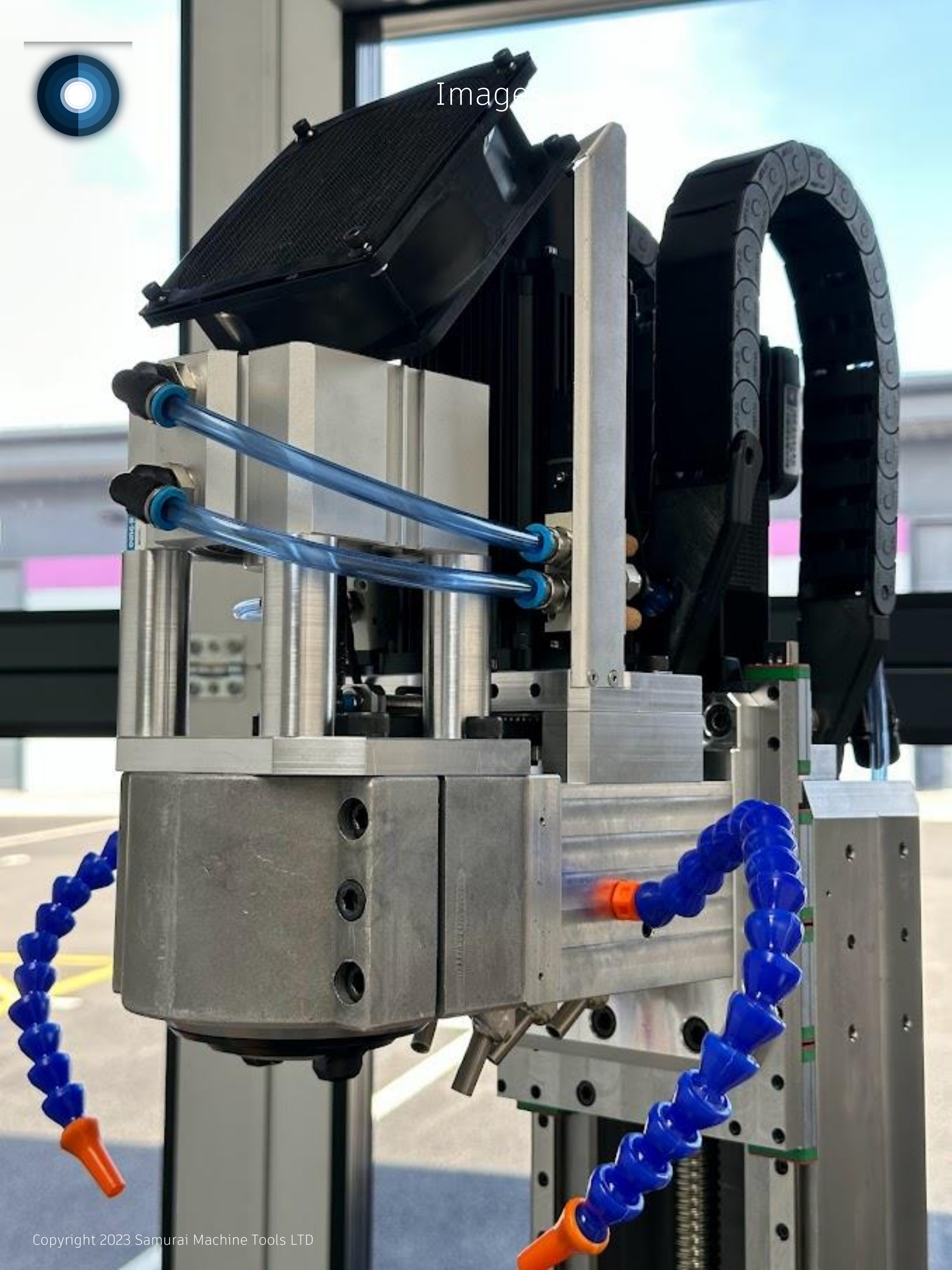


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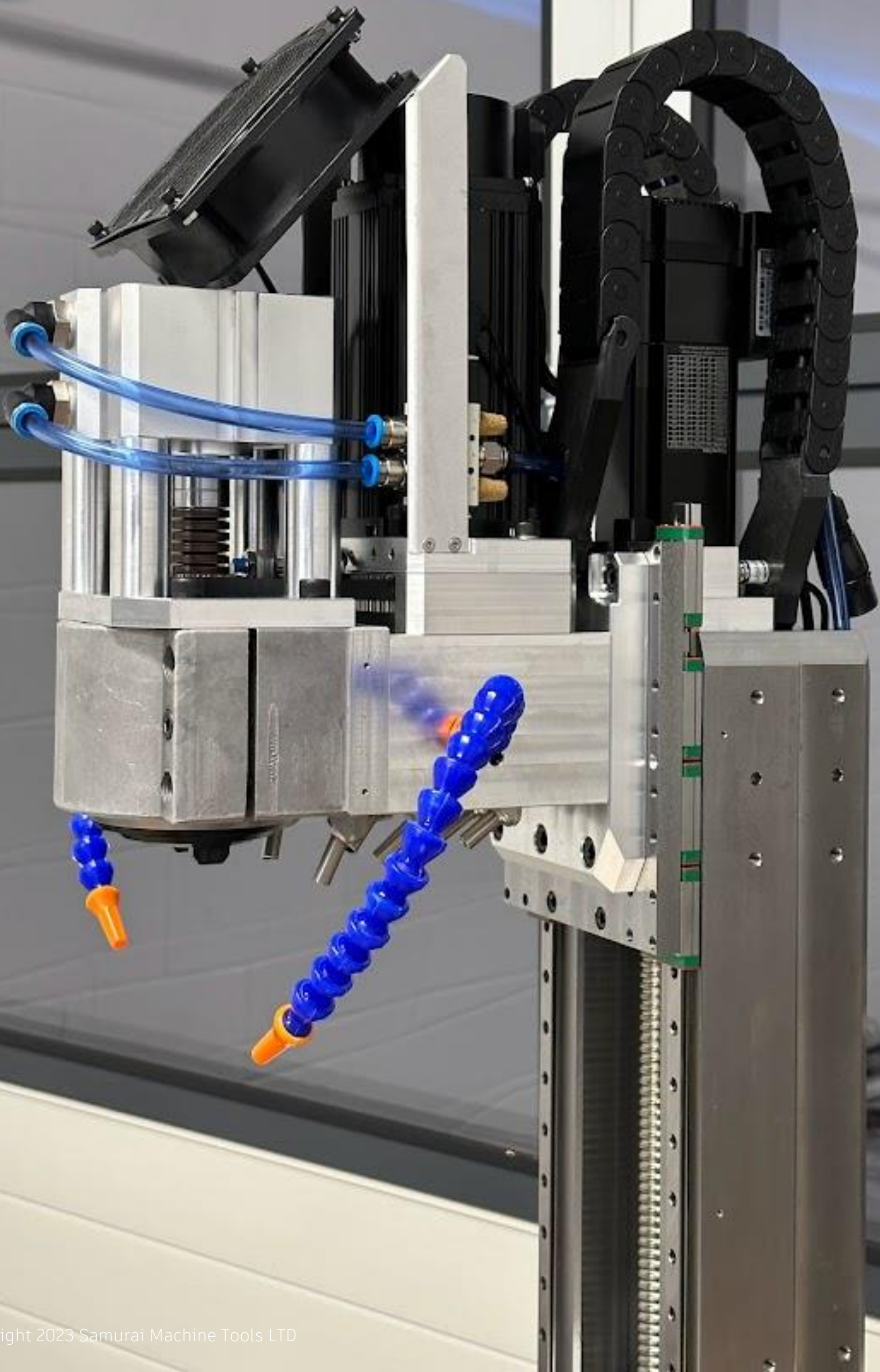


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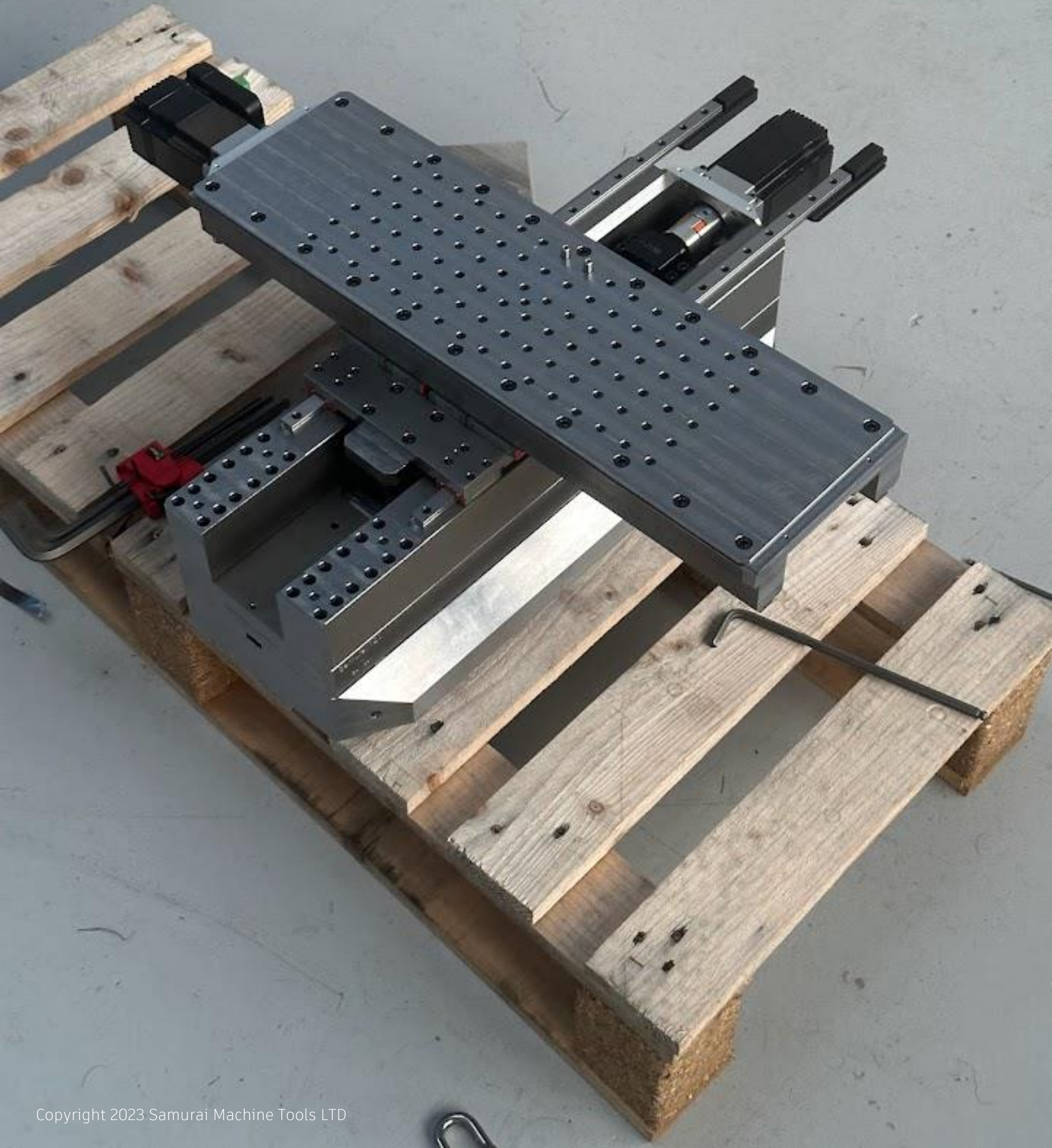




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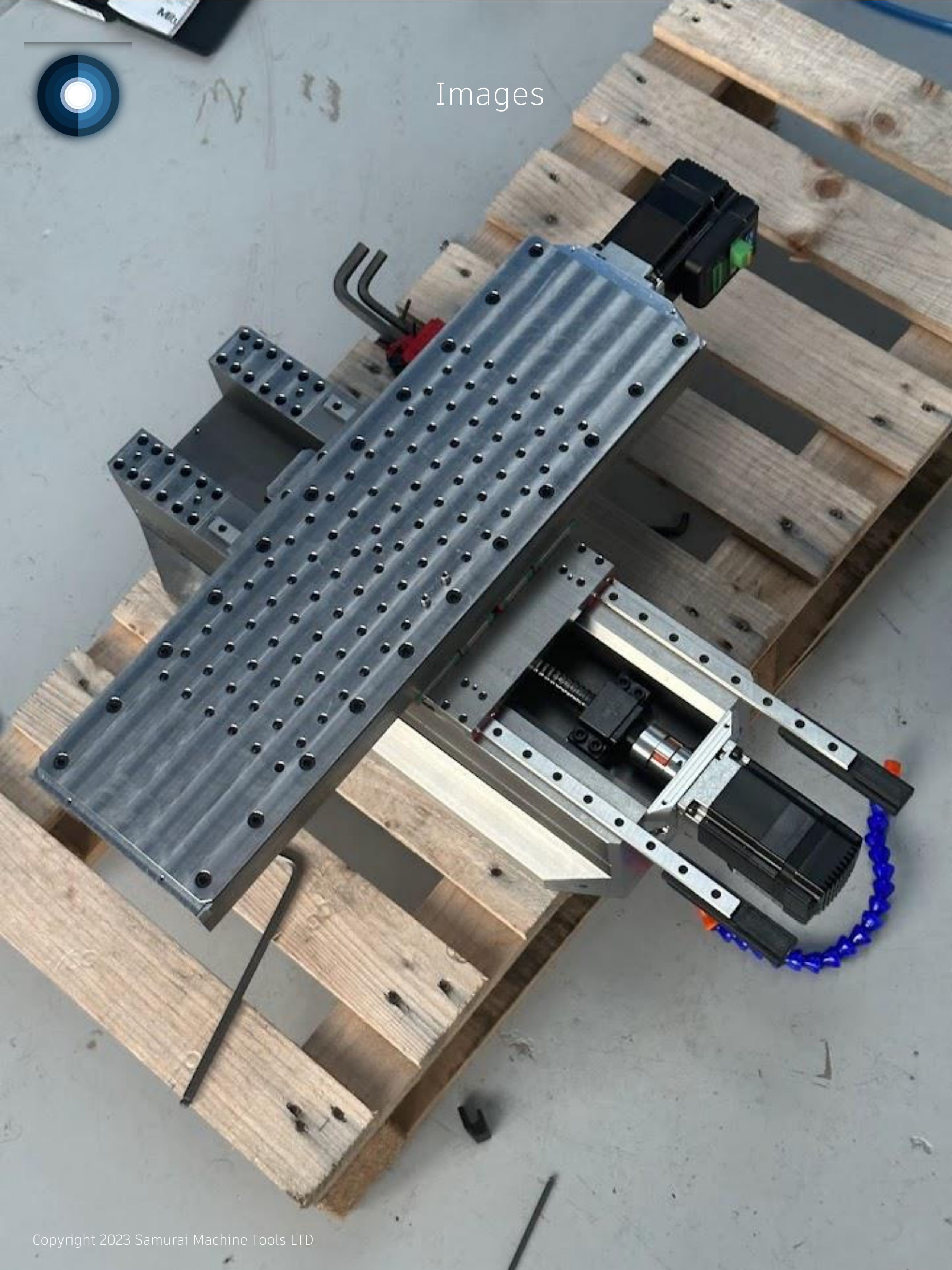


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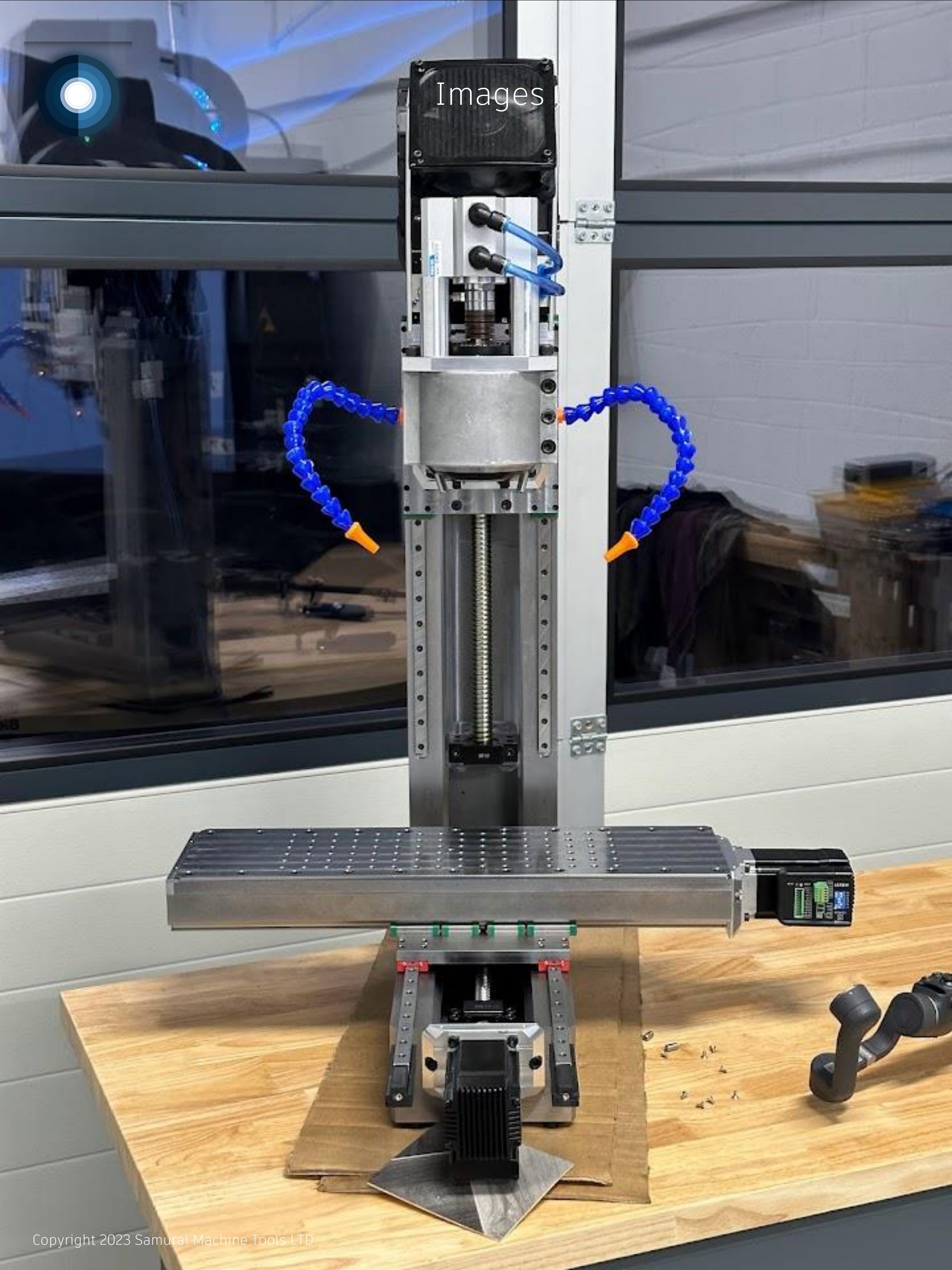


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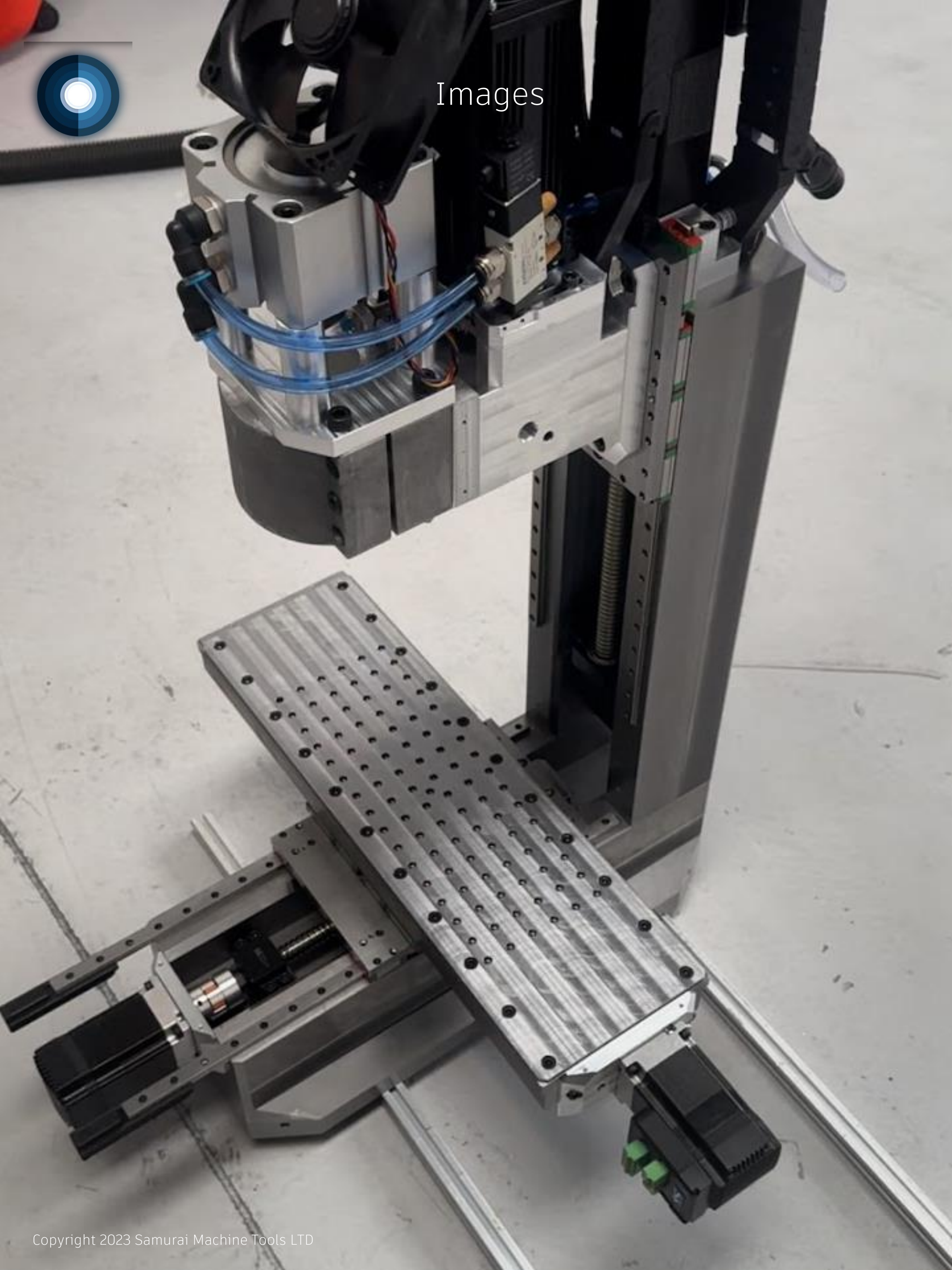


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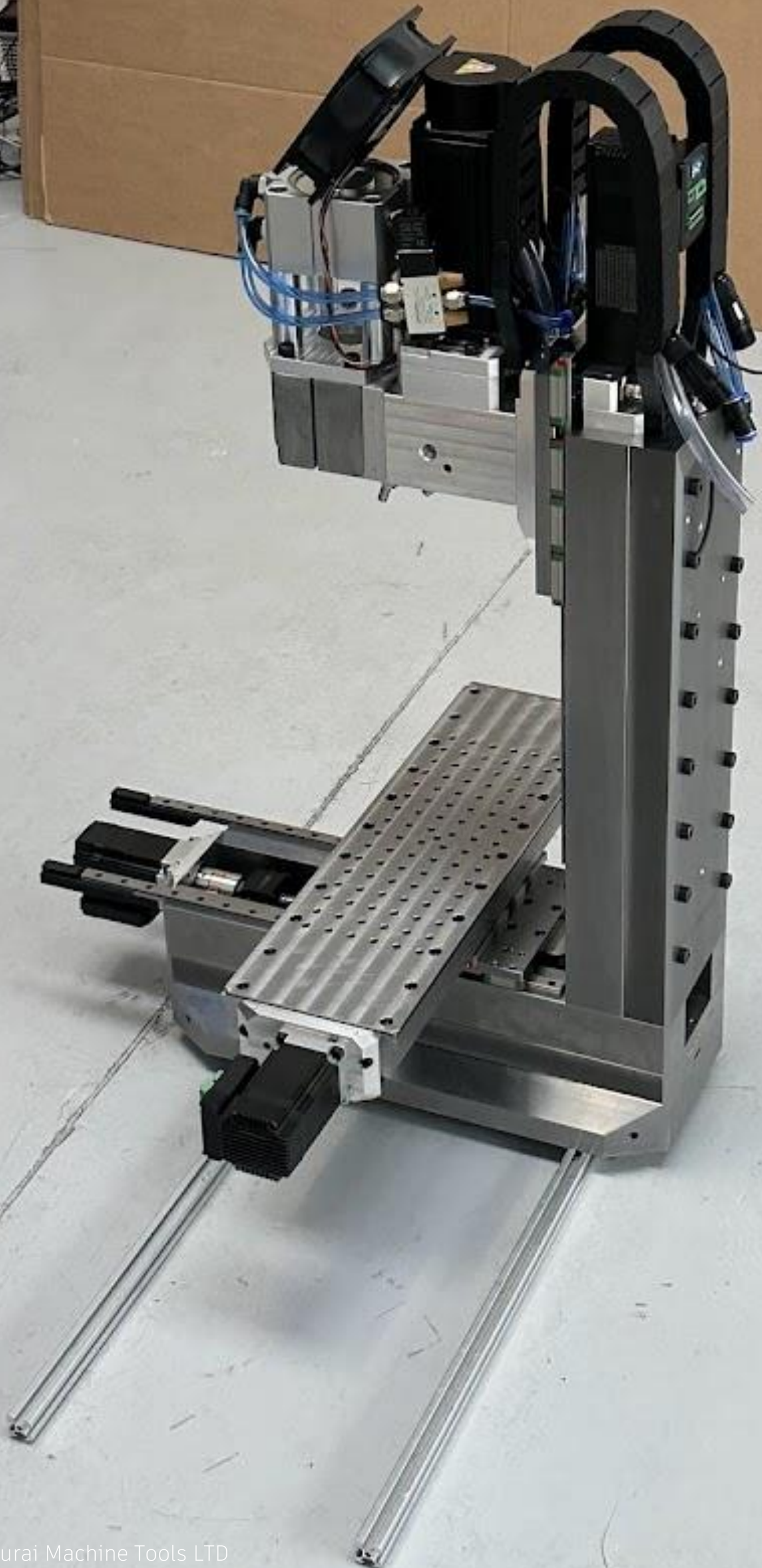


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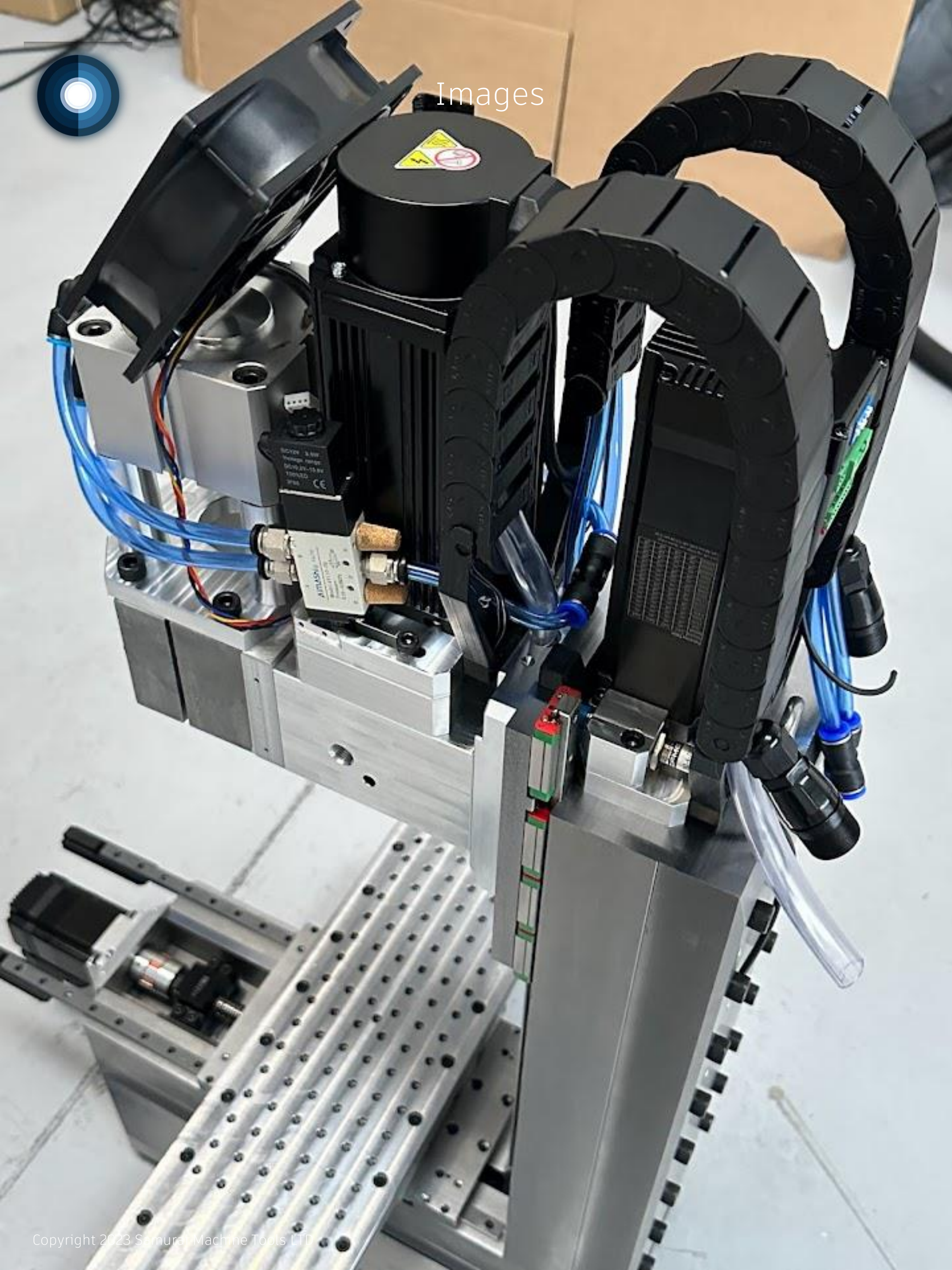




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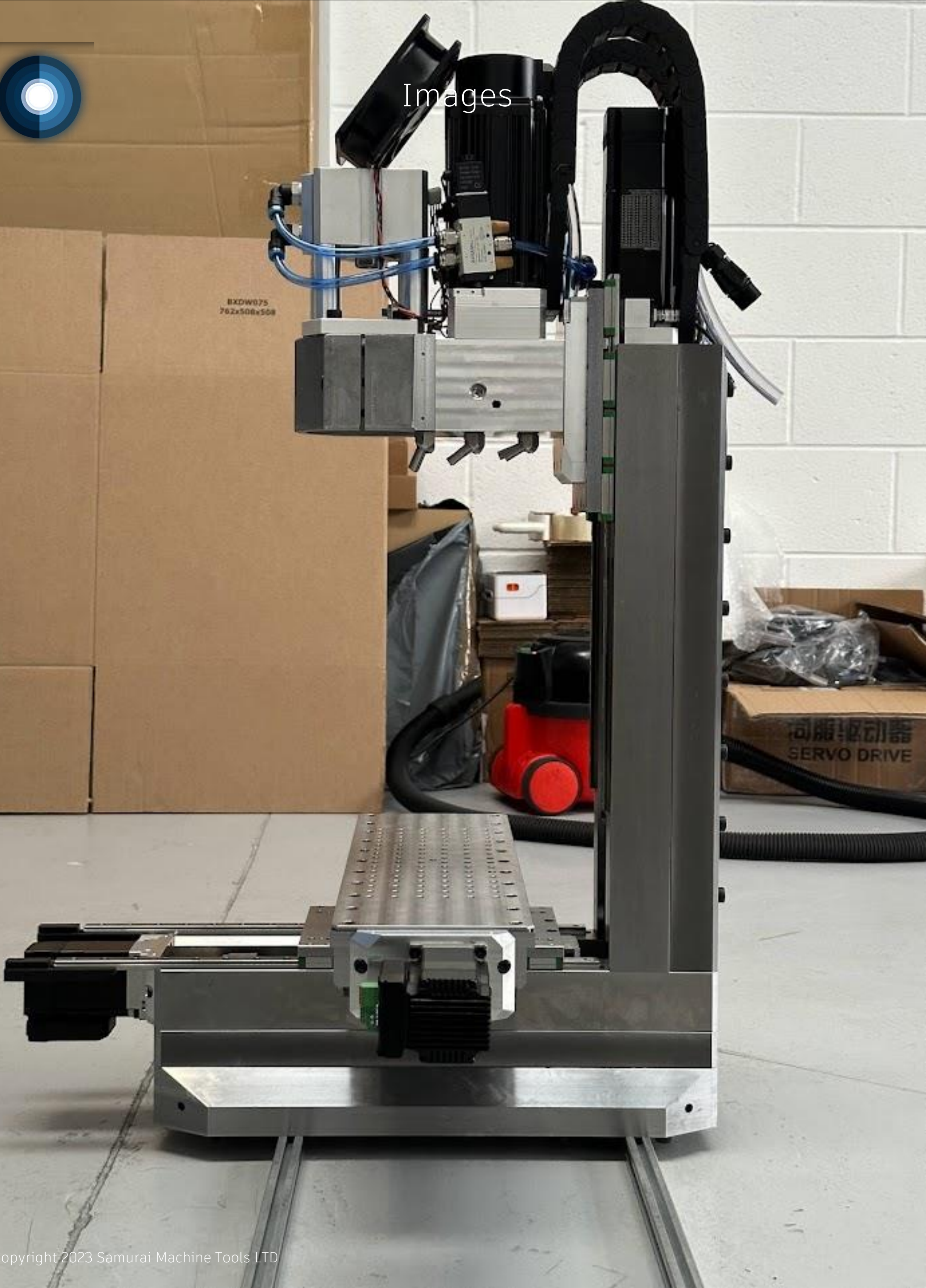


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BXDW075
762x508x508

伺服驱动器
SERVO DRIVE



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Images





Images

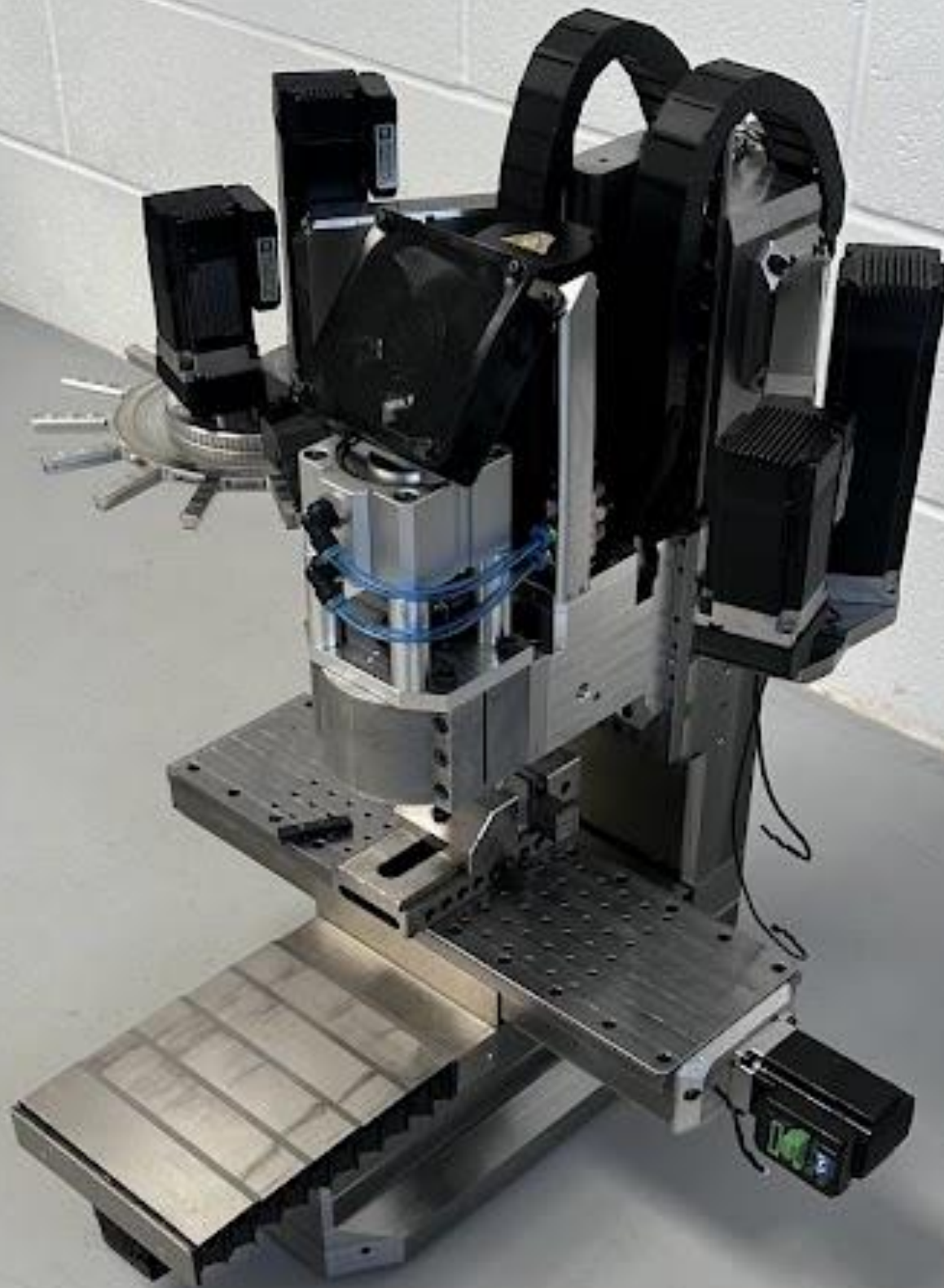




Images



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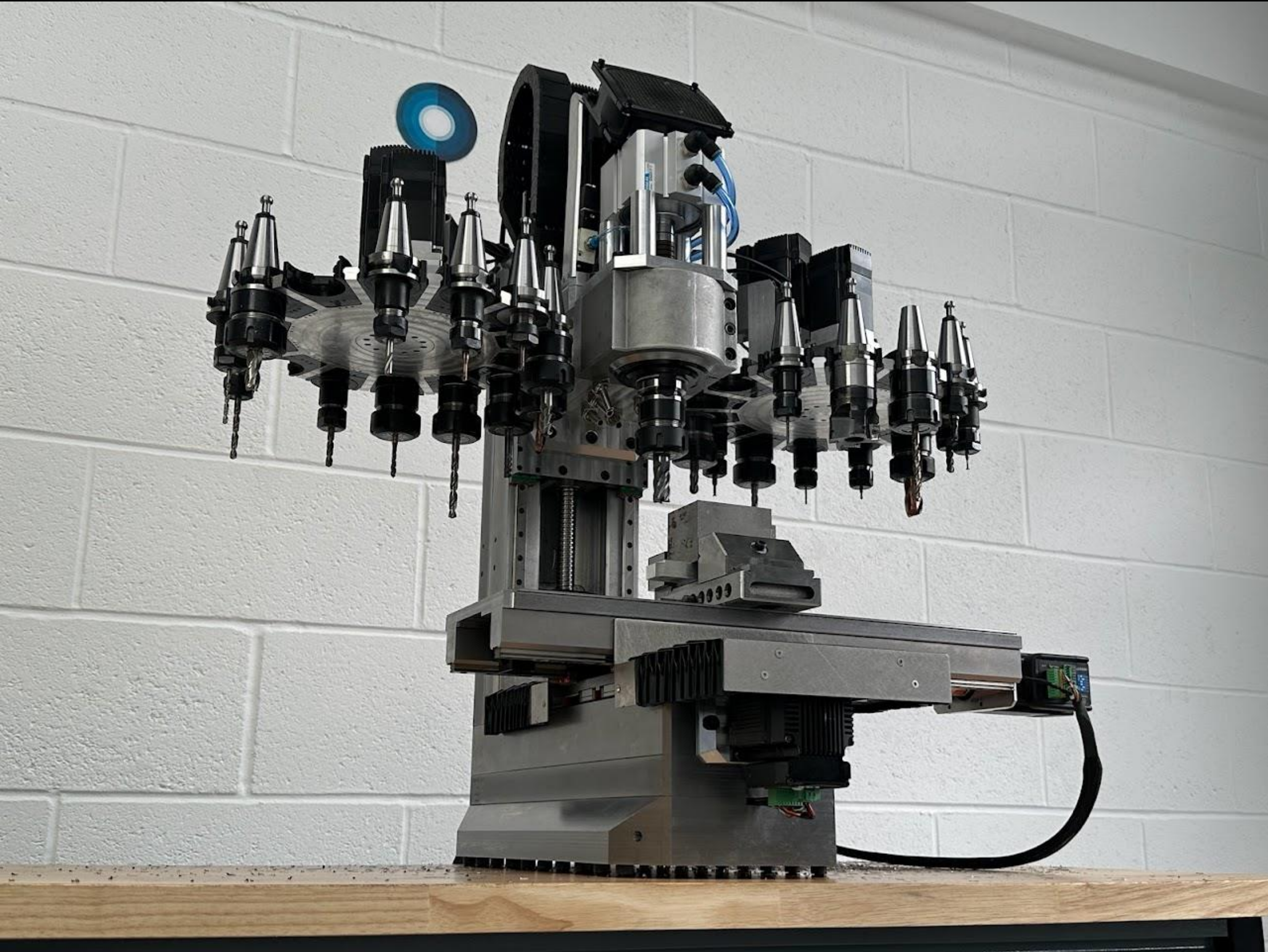


Images





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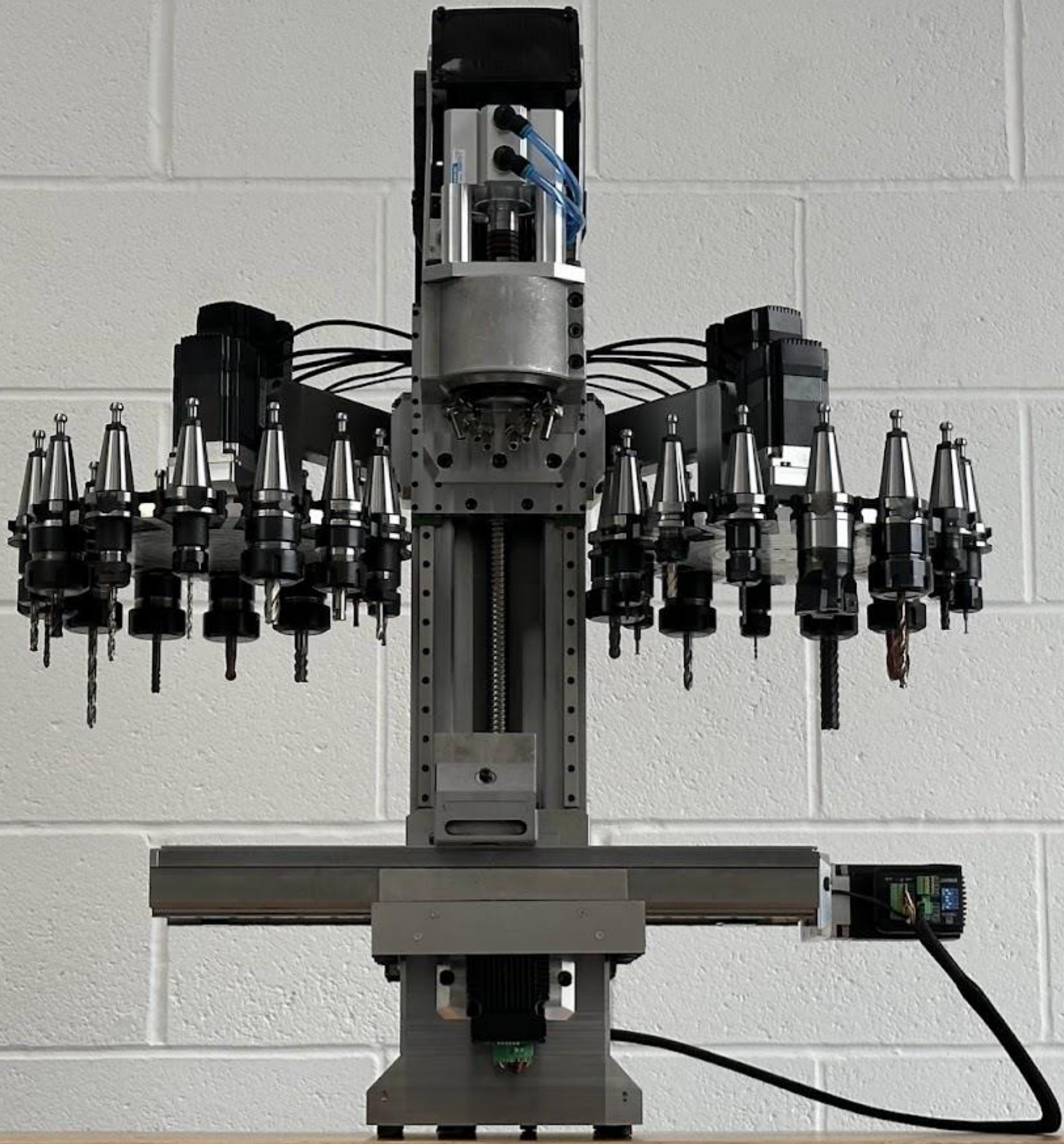


Images





Images





Standard / Optional Specifications

Various optional features are available to satisfy specific customer needs.

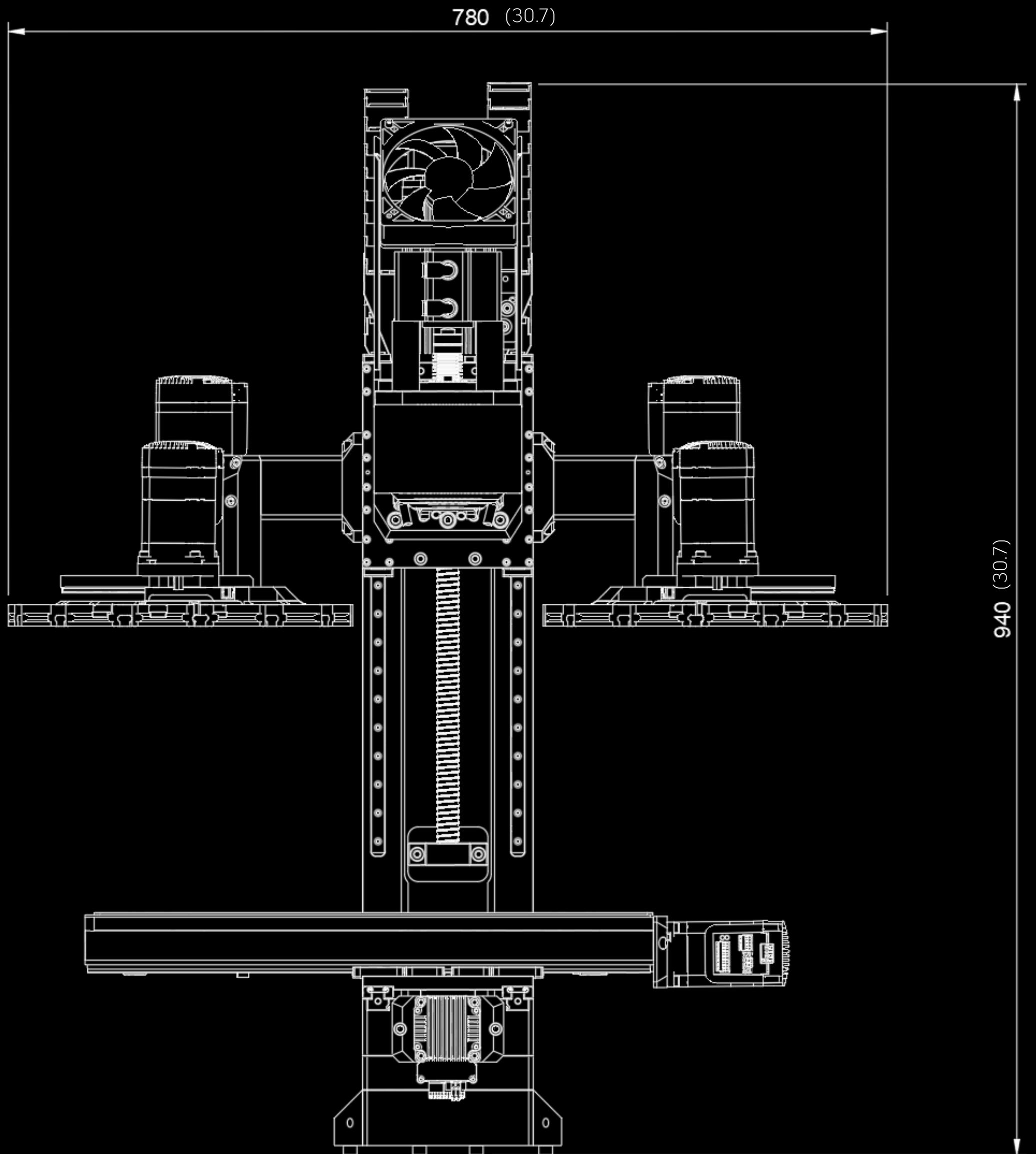
Description	Features	120	
ATC	Single ATC	○	
	Dual ATC	○	
	None	•	
Axis drive system	Motor	Integrated servo	○
		Integrated closed loop stepper	○
	Ballscrew	5mm lead	•
		4mm lead	○
Spindle	16 position rotation lock		○
	6400 r/min 5.5 n·m		•
	5100 r/min 7.1 n·m		○
Coolant	Stainless steel jet nozzle		○
	Loc line plastic nozzle		○
Sheet metal	Y axis shielded way cover protection		•
	Full coolant proof protection		○
Base	Base plate		○
Lubrication	Manual grease application		•
	Automatic grease lubrication system		○
Motion components	Generic manufacturer C7		•
	Hiwin / THK C3-5		○
Axis	3 axis		•
	4 axis		○
	5 axis		○

* Please contact Samurai Machine tools to select detail specifications

• Standard
○ Optional

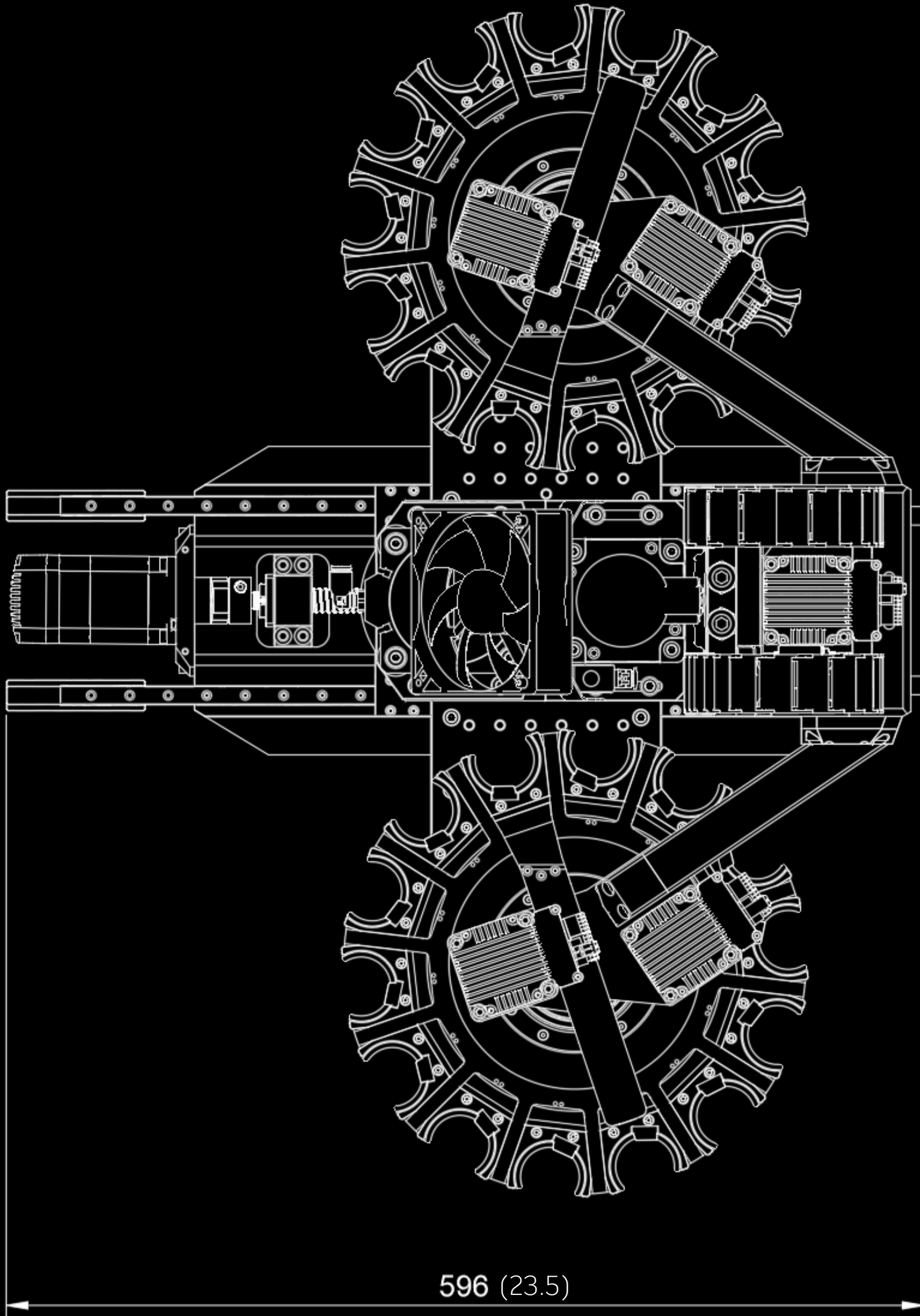


Dimensions



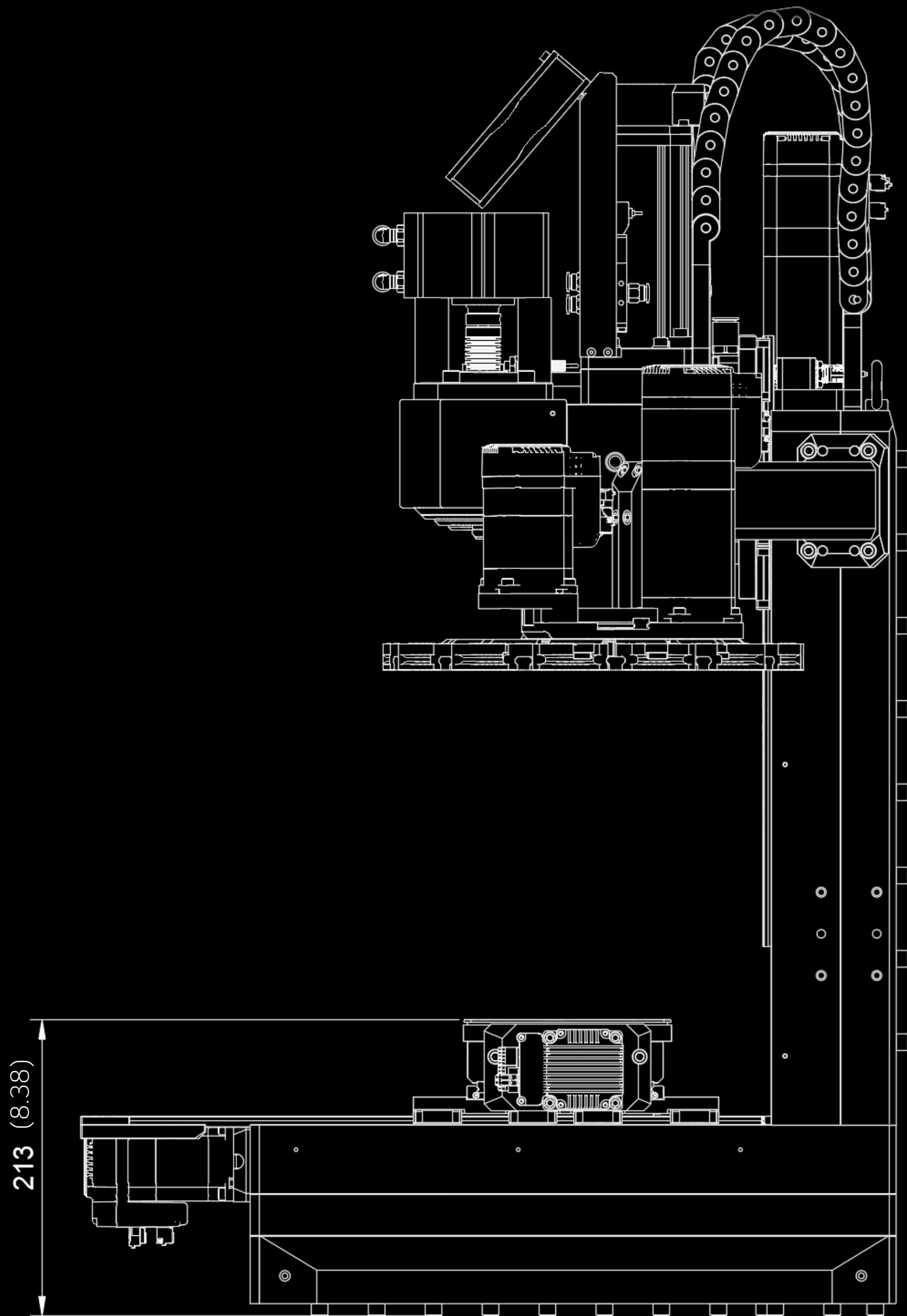


Dimensions





Dimensions





Machine Specifications

Description		Unit	120	
Travels	Travel distance	X axis	mm (inch)	320 (12.6)
		Y axis	mm (inch)	180(7.08)
		Z axis	mm (inch)	240 (9.44)
	Distance from spindle nose to table top		mm (inch)	350 (13.77)
Table	Table size		mm (inch)	490 x 150 (19.3 x 5.9)
	Table loading capacity		Kg (lb)	25 (55)
	Table surface type		mm	M6 + 6H8 dowel 20x20
Spindle	Max. spindle speed		r/min	6400
	Taper		-	BT30
	Max. spindle torque		N · m (ft-lbs)	5.5 (4)
	Max. spindle power (5min/continuous)		kW (Hp)	1.2/0.4 (1.6/0.54)
Feedrates	Rapid traverse rate	X axis	m/min (ipm)	15 (590)
		Y axis	m/min (ipm)	15 (590)
		Z axis	m/min (ipm)	15 (590)
Automatic tool changer	Tool storage capacity		-	28
	Max. tool diameter		mm (inch)	50 (1.97)
	Max. tool length		mm (inch)	175 (6.9)
	Max. tool weight		kg (lb)	1.2 (2.64)
	Tool selection		-	Fixed pocket
	Tool change time (Tool-to-tool)		sec	2.3
	Tool change time (Chip-to-chip)		sec	4.0
Power requirements	Machine power supply	Rated voltage	VAC	220
		Rated capacity	kVA	2.5
	Compressed air supply		bar (psi)	7-8 (101-116)
Machine dimensions	Height		mm (inch)	940 (30.7)
	Length		mm (inch)	596 (23.5)
	Width		mm (inch)	780 (30.7)
	Weight		kg (lb)	180 (400)

* For more details please contact Samurai Machine tools

* Specifications and information contained within this catalogue may be changed without prior notice.