

UPX400

**Ultra-high precision wire-cut
electrical discharge machines**



SKÄRPVERKTYG AB

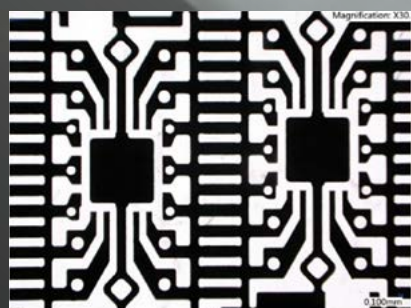
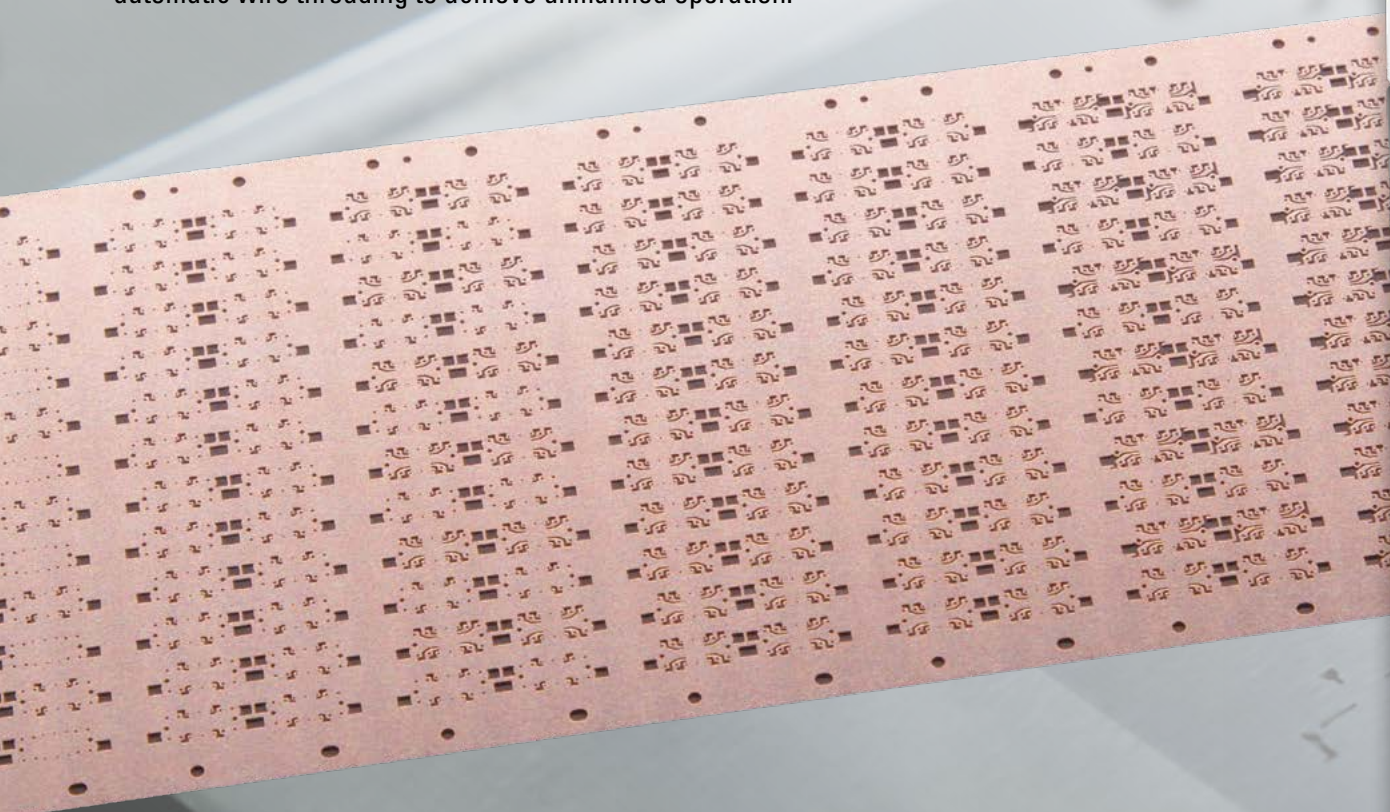


MAKINO

Promise of Performance

Ultra-precision machining, accurate to every micron!

UPX machine tools adopt high-rigidity design and ultra-high frequency digital power supply, delivering unparalleled machining performance FSC ultra-high precision adjustment, positional accuracy throughout process $\pm 0.002\text{mm}$ Ultra-high stability, multi-cavity mould core with special-shaped holes, size deviation $< 0.002\text{mm}$ PVG function, precise control of the arc corner size and cylindricity, to ensure the punching accuracy of the strip Ultra-fine machining surface, doubling the life of the punch and optimising the economic benefits High-precision wiring mechanism, precise control of fine angles Uninterrupted automatic wire threading to achieve unmanned operation.



Strip name:	SOP lead frame
Product specification:	14 feet x 12 rows
Strip material:	Copper alloy (C194)
Strip thickness:	0.2 mm
Strip width:	83 mm
Mould process:	24 sets of cavities/injection
Strip shape tolerance:	$\leq \pm 0.02 \text{ mm}$

The mould processing result is the measured value of the customer's workshop, which is related to the workshop environment and measuring equipment.

The illustration shows an SOP lead frame product, which has been approved by the user. All interpretation rights are owned by Makino Machine Tool (China) Co., Ltd.



The double screen, illustrated, is an optional item

Ultra-precise positioning accuracy

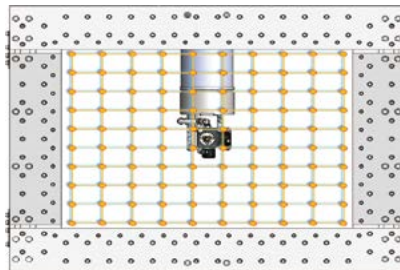
The ultra-precise position of the stamping mould, especially the cumulative error of the cavity of the stripper plate and that of the lower template, places strict requirements on the machine tool. With its high-rigidity design and ultra-high-precision FSC control, Makino solves the problem of discrete displacement of super-large and ultra-wide templates, porous and multi-cavity. FSC control can calibrate the positioning accuracy of the equipment on the work table or even the spatial position, and perfectly present the grid matrix.

Space customisation

Eliminates deformation errors caused by temperature differences between the measurement chamber and the processing chamber. You can use the [space customisation] function to perform user-defined adjustments based on the measurement results.

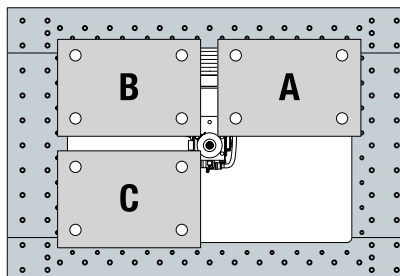
FSC precision correction

F S C is an effective means of improving the positioning accuracy of machine tools. It makes a matrix precision correction for each position inside the machine tool trajectory, eliminates the straight-ness and parallelism errors of the machine tool's advancing axis, and accurately locates each position.

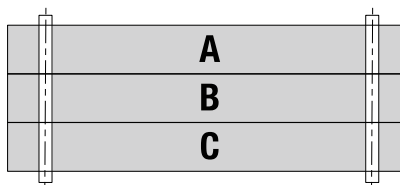


Precision pin hole positioning

At different positions in the processing area, the processing of positioning pin holes can maintain good dimensional accuracy and verticality, allowing the pins to slide with a gap of 2 μm/side.

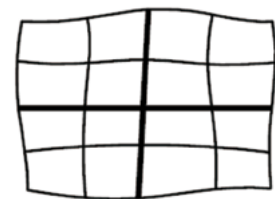


- Cutting wire diameter: 4 > 0.20 mm
- Work piece material: SKD-1
- Work piece thickness: 20.0 mm
- Processing aperture: 12.0 mm
- Pin size: 4 > 11.996 mm

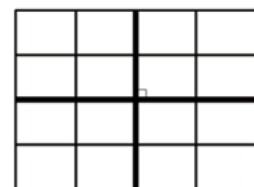


10 nm grating feedback

X, Y, U, V axis, 10 nm grating ruler as standard configuration, precisely controlling the position output of each axis.



Pre-correction



Post-correction

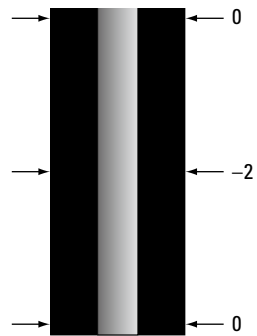
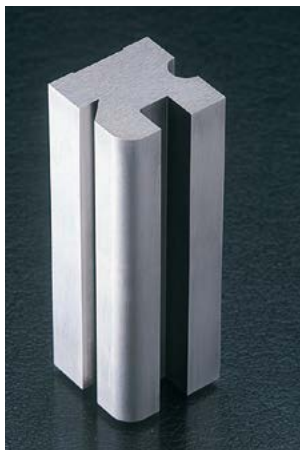


High Precision Corner Control Strategy-PVG

Corner precision is the key element of stamping moulds. Excellent corner strategy must meet the precise control of corner gaps of different thicknesses to ensure the punching accuracy of corners and avoid burrs. At the same time, for precision strippers in high-precision stamping moulds, or fine blanking moulds, arc corners must maintain very good cylindricity to achieve precise guidance and uniformity of the end faces of the punched parts; the Makino machine tool PVG function, through the arc corner strategy, refines control of arc corners, and the servo precisely adjusts the size and straightness of arc parts.

Uniform surface precision and straightness of punch machining

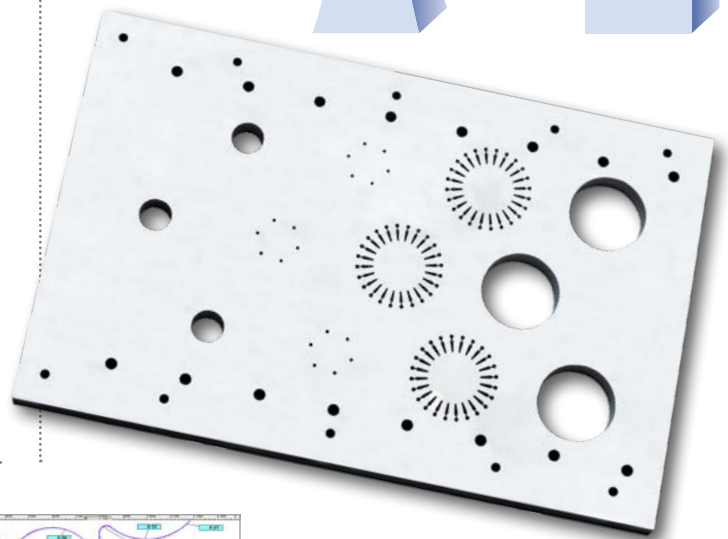
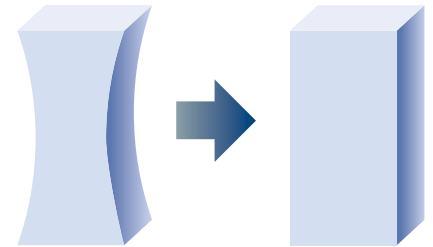
GS function, to ensure the straightness, accuracy and smoothness of punch processing. As a design dimension, the middle of the punch is slightly smaller than 1 μm , and slides in line with the stripper plate.



Punch thickness: 70 mm
Wire diameter used: 0.20 mm
Number of machining knives: 4

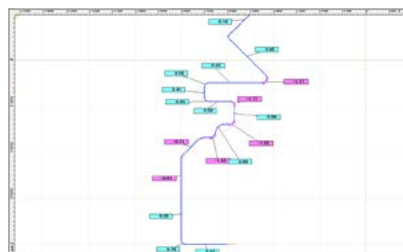
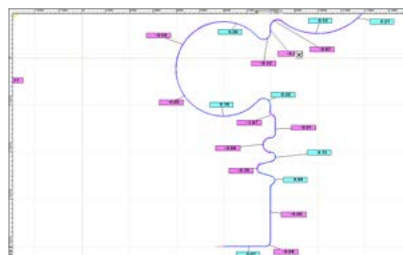
GS cutting

The GS function improves the straightness of processing from the first cut and reduces the load of finishing processing, thereby reducing the number of punch cutting knives and improving dimensional accuracy.



High precision arc corner

The arc corner precision can directly avoid cumulative positioning error caused by arc interference, and ensure the accurate punching position of the progressive mould.



Template name: multi-row motor rotor template

Machine model: UPX400
Cutting material: super hard G3
Work piece size: 20 x 20 x 15 mm
Diameter of wire used: 0.20 mm copper wire
Processing time: 2 h and 29 min.
Number of knives used: 5
Smoothness: Ra 0.083 μm
Shape accuracy: $\pm 1.5 \mu\text{m}$
Arc size: R0. 18 mm~R 2.5 mm

Superior power supply design doubles punching life

High frequency digital power

E W 2 0 0 B brand new digital power supply, ultra-high frequency pulse design, shorter pulse width time. Can increase the finishing material removal rate by up to three times, reducing the number of knives and improving the finish.

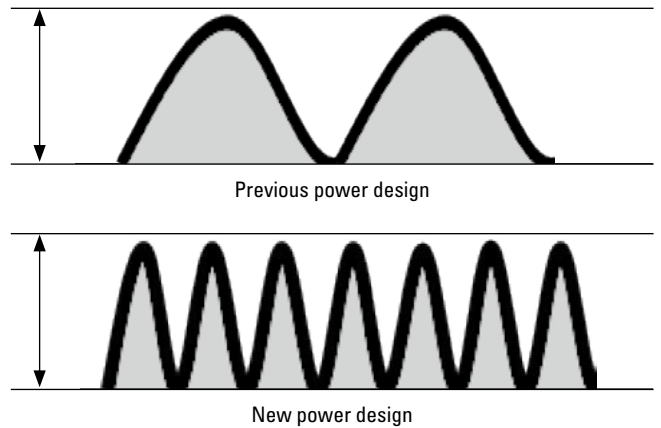
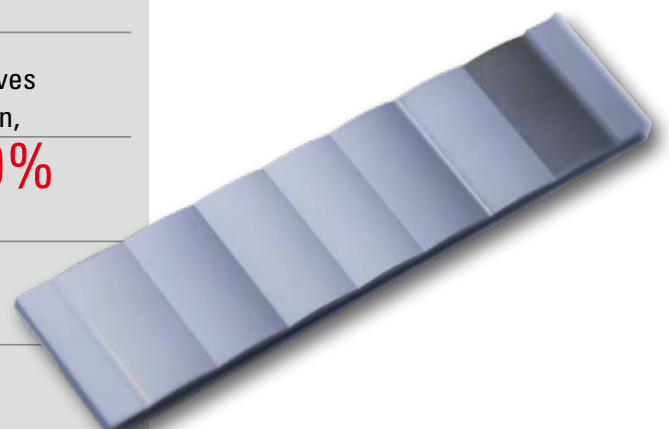
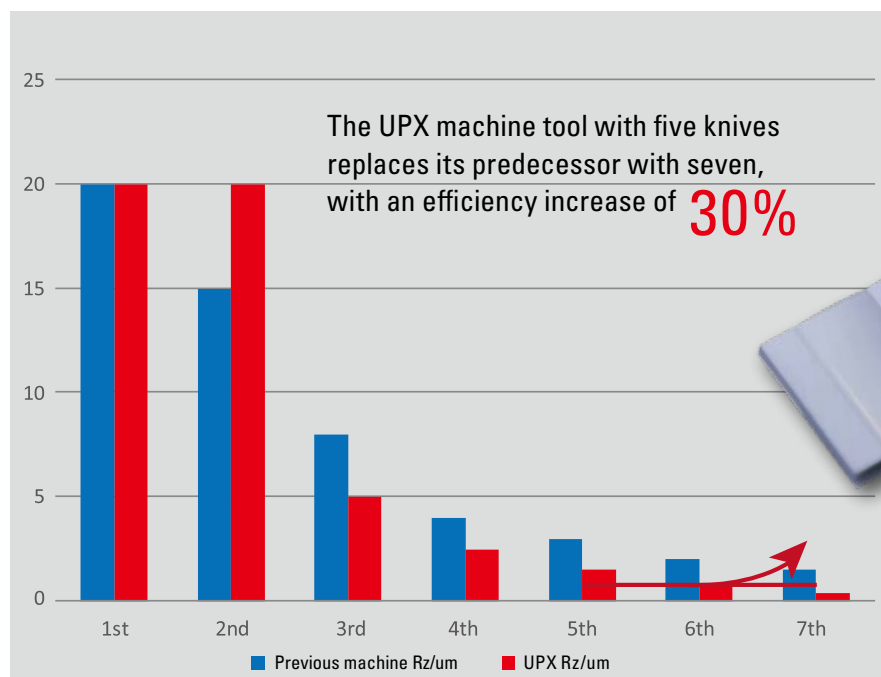
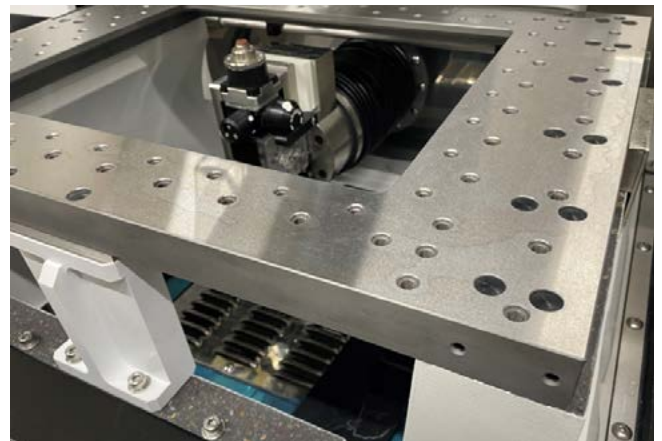


Table-top insulation design

Insulated table design. The floating capacitance becomes smaller, which is conducive to improving the high-frequency pulse and increasing timeliness, reducing the energy loss of the finishing pulse.

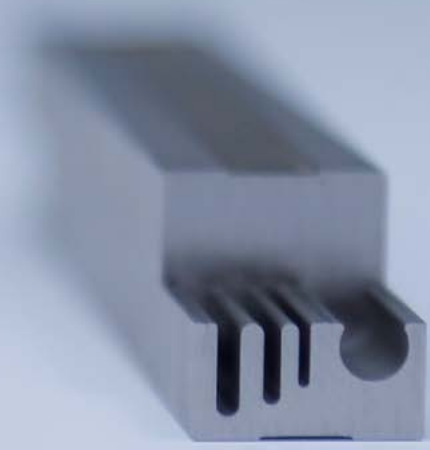
The capacity for finishing smoothness is greatly improved. Under the premise of achieving the same finish, maximum efficiency can be increased by up to 30 per cent. At the same time, finishing capacity is greatly expanded, and the surface finish is closer to the results of oil machining.



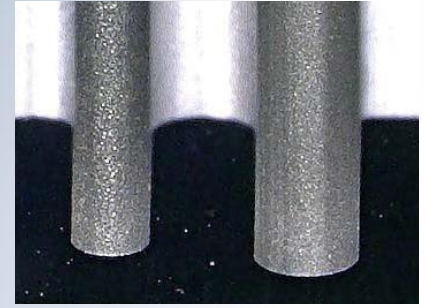
Machine model: UPX400
 Diameter of wire used: medium 0.20 mm
 Processing time: 2 h and 29 min.
 Number of knives used: 1-7
 Material thickness: 20 mm
 Material grade: WC/RD30

Mould-friendly design doubles punch life!

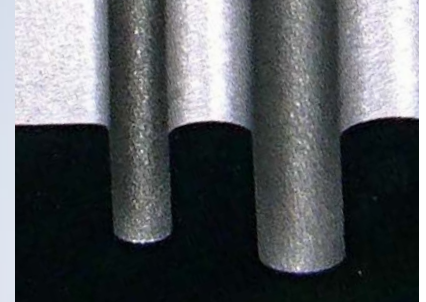
The new power supply has a good adjustment effect on punches with complex shapes. While the cutting remains precise, the inner and outer arcs maintain consistent smoothness and precision.



UPX series machine tools keep the smoothness of their inner and outer arcs and the precision of their dimensions highly consistent.

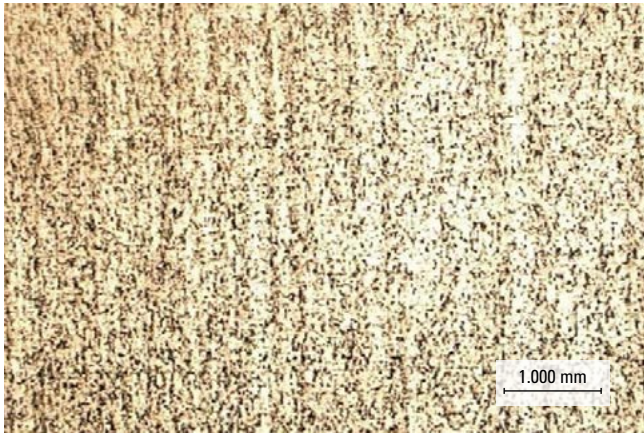


Previous processing result

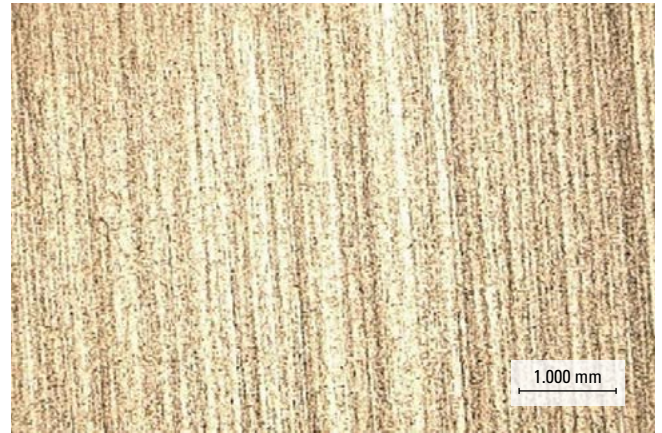


Processing results of UPX models

Improved surface quality; no traces after polishing of new power source processing surface



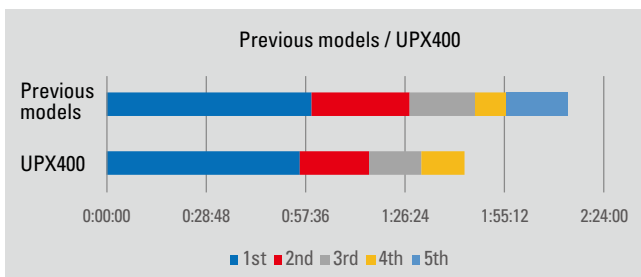
New power source processing surface
(4 pass 2.4 $\mu\text{m Rz}$)



Previous power source processing surface
(5 pass 2.8 $\mu\text{m Rz}$)

Cases of special-shaped fitting machining

Even complex machining shapes can easily be handled by the UPX series machine tools, maintaining the same surface finish and achieving machining accuracy with fewer cuts.



Machine model: UPX400
 Diameter of wire used: medium 0.20 mm
 Number of knives used: 4
 Material thickness: 60 mm
 Fitting clearance: 2 μm

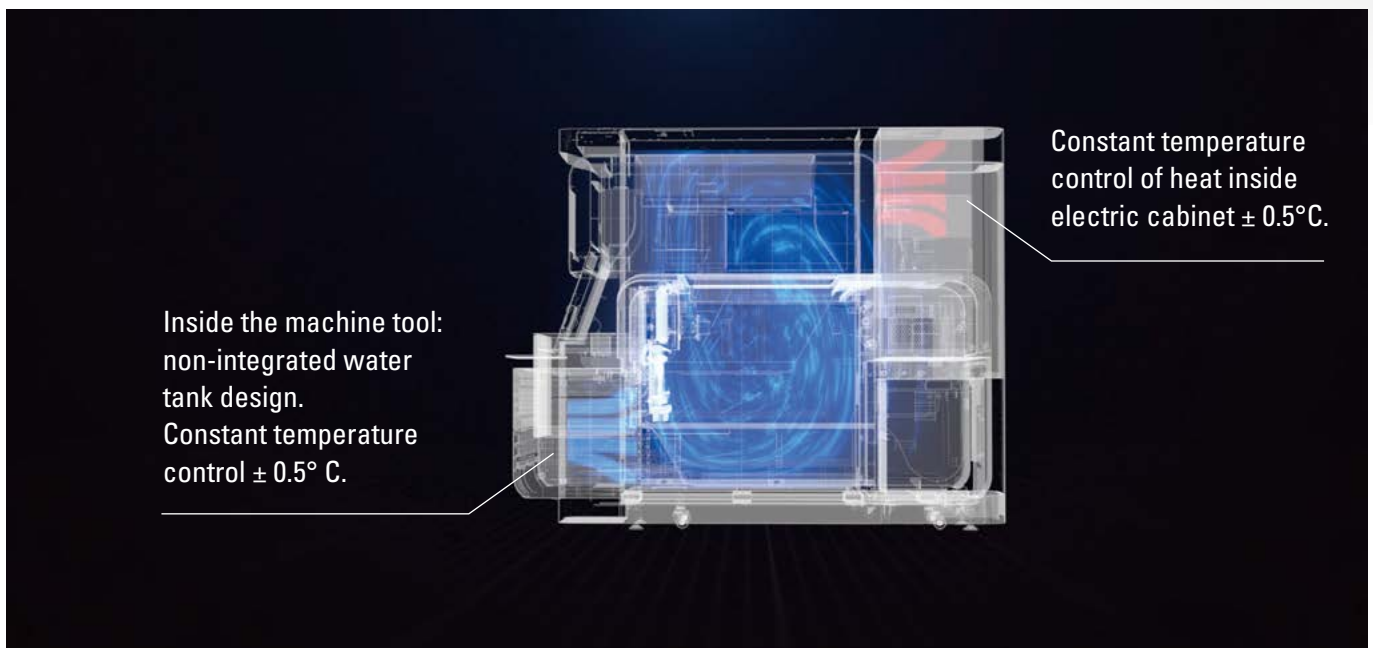


High rigidity design

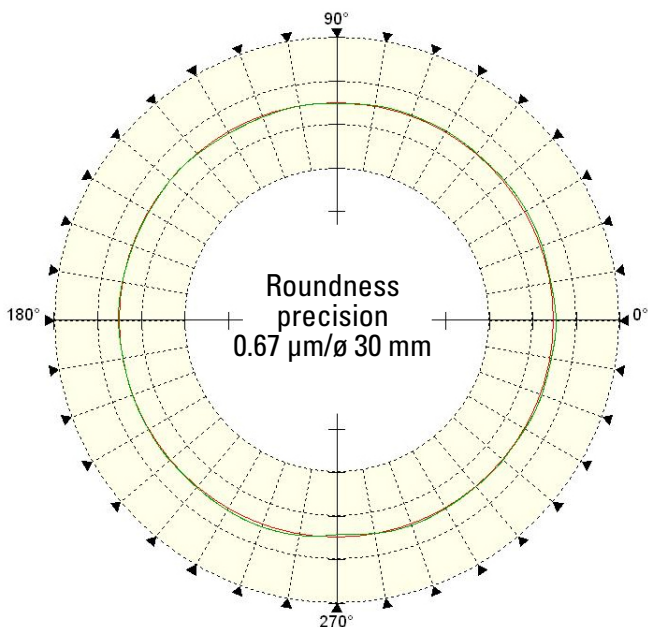
The new generation equipment adopts a fixed-style table-top design. The load-bearing part is directly supported by the machine tool. The shaft-moving load is constant, maintaining stable output. Super large diameter ball screw maintains constant and stable precision output.

Sound thermal stability control

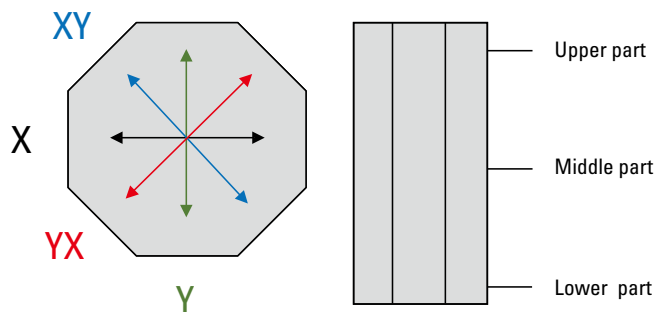
The machine tool serves directly as the carrier of the machining fluid, ensuring its temperature synchronicity with the machine tool in real time. Constant temperature cooling inside the electric cabinet: eliminates protracted processing and heat deformation of the machine tool caused by heating of the electric cabinet.



Measured value of roundness processing



Dimensional accuracy

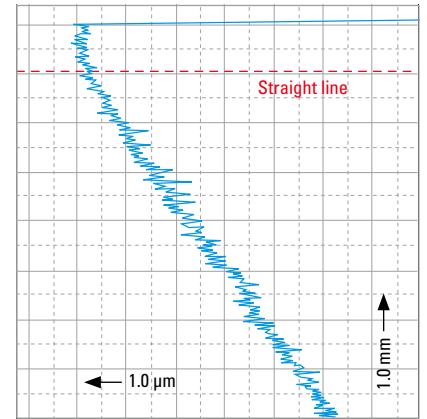
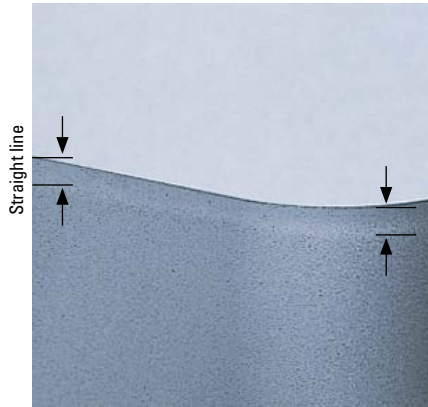


	X	Y	XY	YX
Upper	14.9988 mm	14.9989mm	14.9993 mm	14.9996 mm
Middle	14.9990 mm	14.9989mm	14.9990 mm	14.9994 mm
Low	14.9986 mm	14.9990mm	14.9983 mm	14.9987 mm

Measuring instrument: Carl Zeiss three-coordinate measuring machine, CONTURAG3

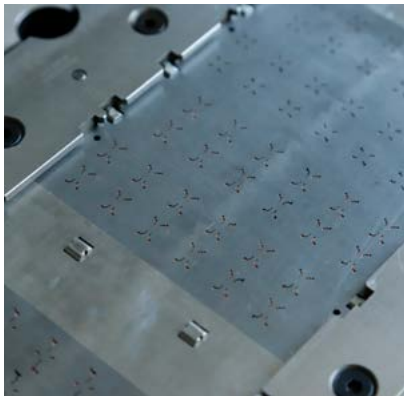
High-precision wire guide mechanism

The UPX machine tool adopts a high-precision circular guide wire design, which can achieve high-precision machining of fine angles, strictly control the uniformity of the fine-angle knife edge, and accurately control the depth of anti-jumping, Achieving smooth, uniform cutting edges on workpieces with variable heights.



- Curved knife edge**

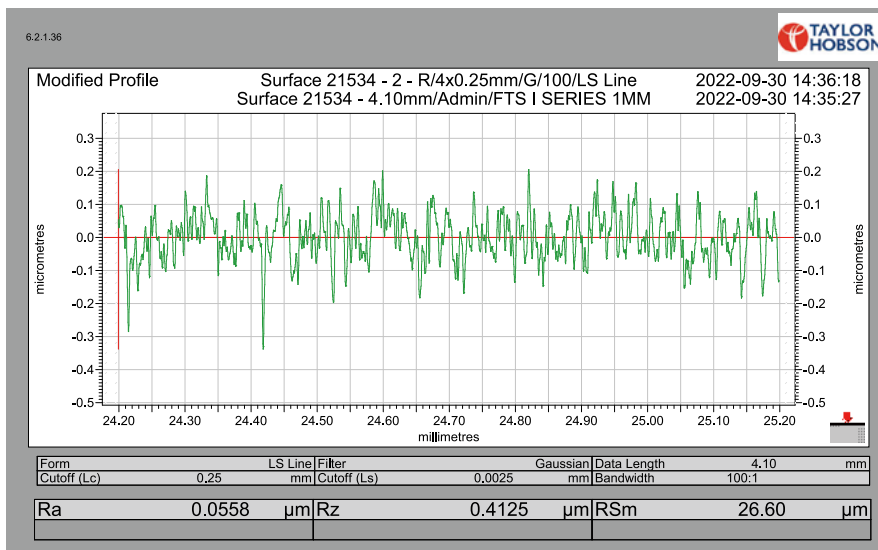
Machine model: UPX400
 Wire diameter used: \varnothing 0.20 mm
 Workpiece material: SKD-11
 Blade length: 1.000 mm



- Lower mould edge**

Wire diameter used: \varnothing 0.20 mm
 Workpiece material: KD20
 Knife edge length: 0.8 mm
 Blanking slope: 0.133°
 Anti-chip depth: 0.005 mm

Best finish



Processing machine tool: UPX400
 Diameter of wire used: \varnothing 0.20 mm
 Number of machining knives: 7
 Processing materials: RD30
 Thickness of material: 20 mm

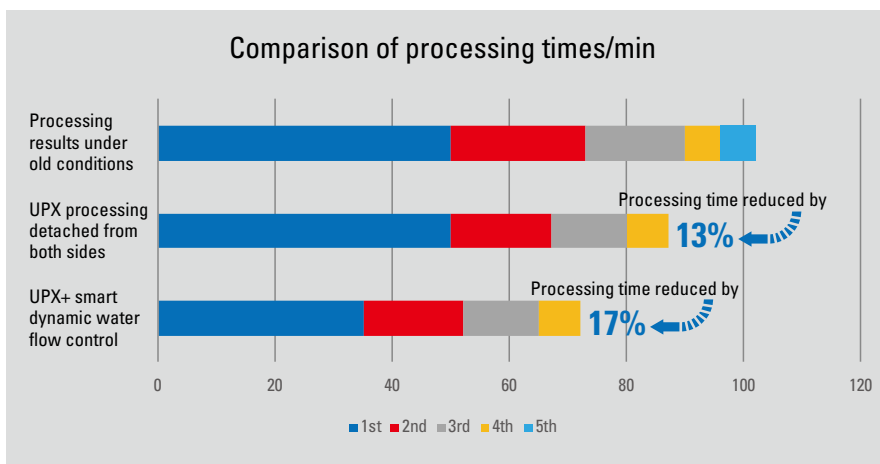
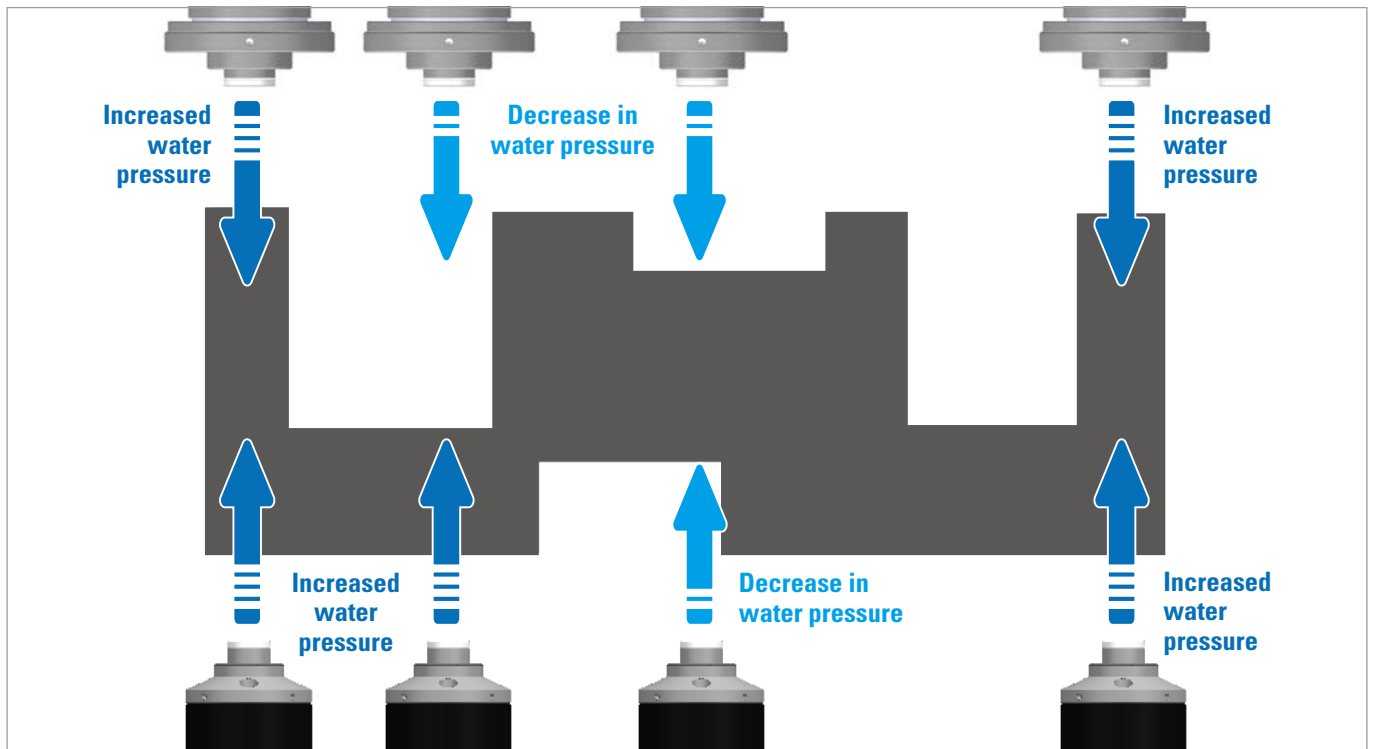
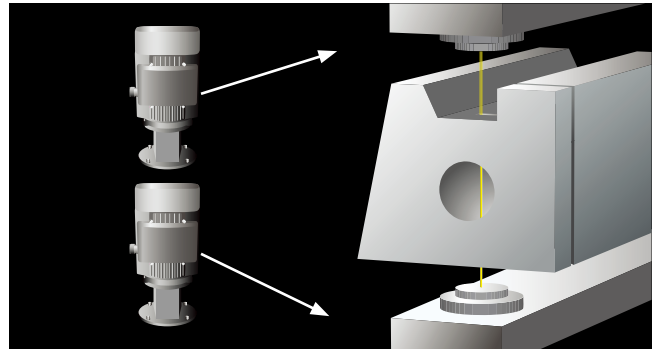


Unique dual pump design

The upper and lower independent water pumps designed by digital frequency conversion can make adaptive adjustment of the water pressure of the upper and lower heads respectively, reducing the risk of disconnection and improving the accuracy of the work piece at the step difference.

Smart dynamic jet control

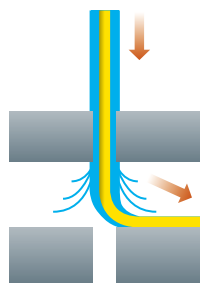
The newly designed smart dynamic jet intelligent control function under the latest power supply combines precision and efficiency, reduces the risk of disconnection and improves precision when the position of the template hanger is in the pocket hole.



HDE Automatic threading system

Automatic threading

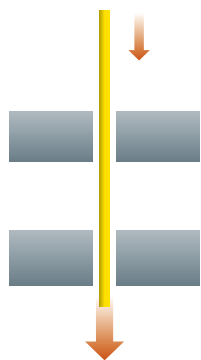
Hollow shapes, narrow slit holes, fine holes, and thread breaks are difficult to thread automatically. The newly developed non-water threading system can effectively solve these problems.



Automatic threading of hollow workpieces

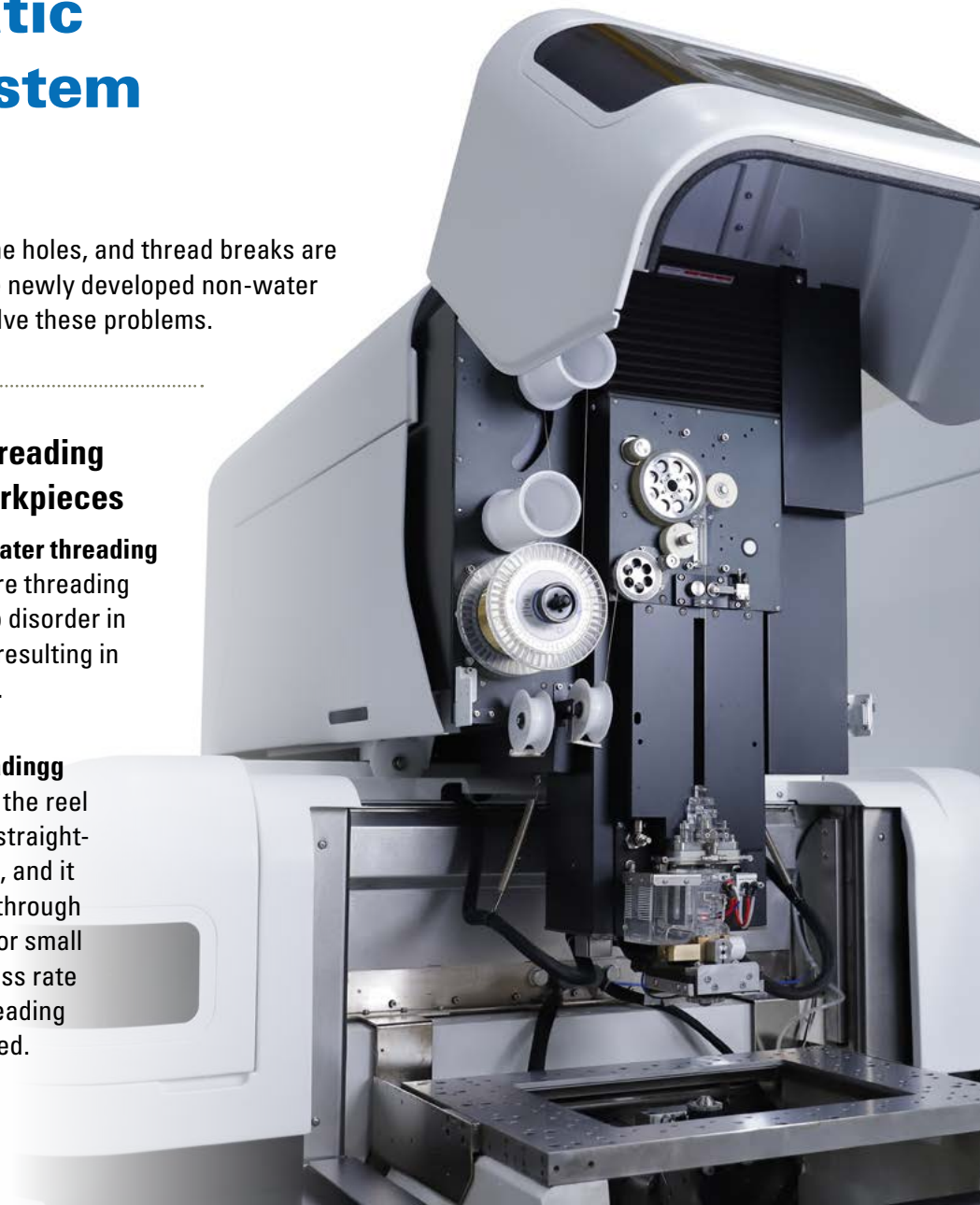
High pressure water threading

The high-pressure threading water is prone to disorder in the narrow gap, resulting in threading failure.

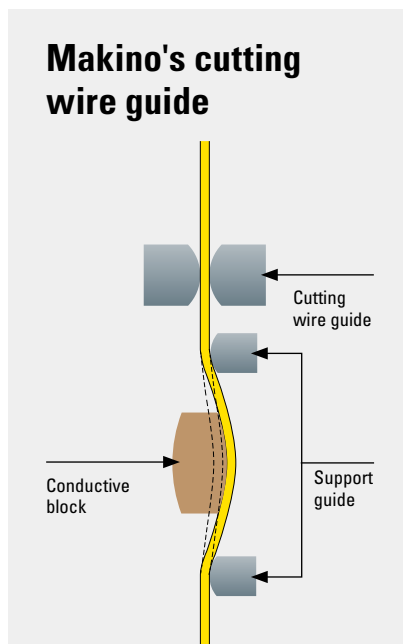
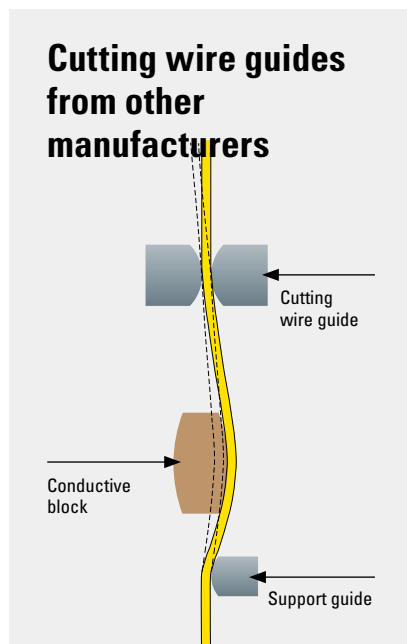


Non-water threading

After the wire of the reel is annealed, the straightness is improved, and it is easily passed through narrow grooves or small holes. The success rate of automatic threading has been improved.



The servo motor maintains constant tension for a long time without regular correction.

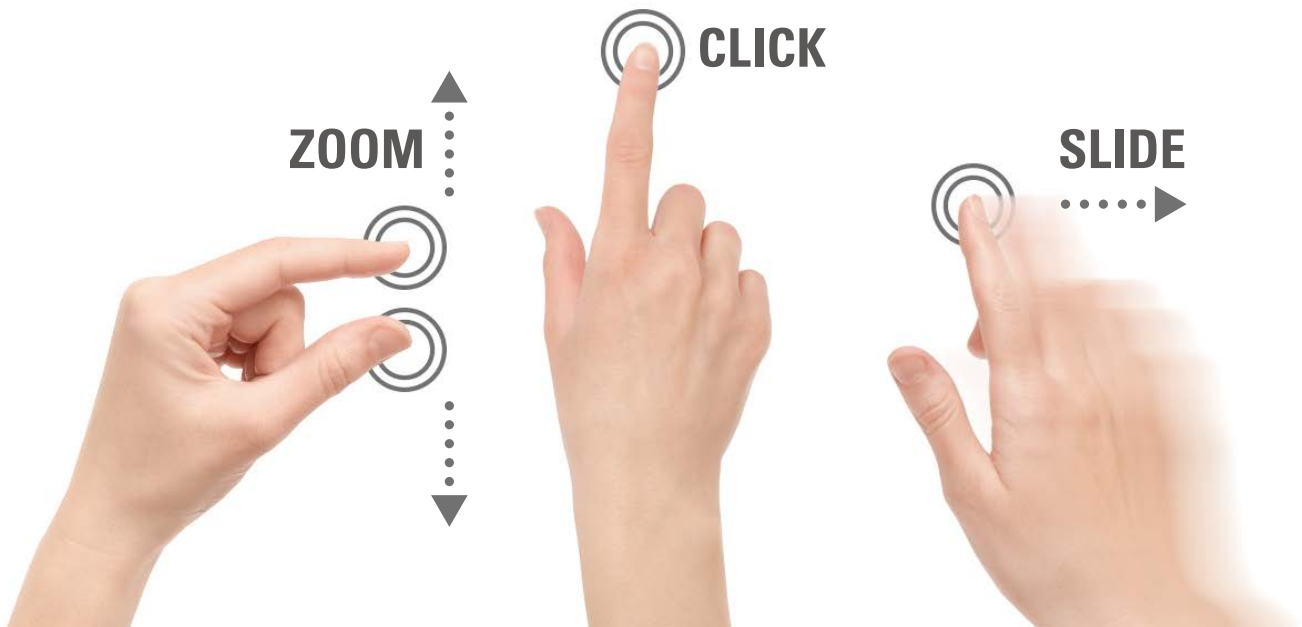
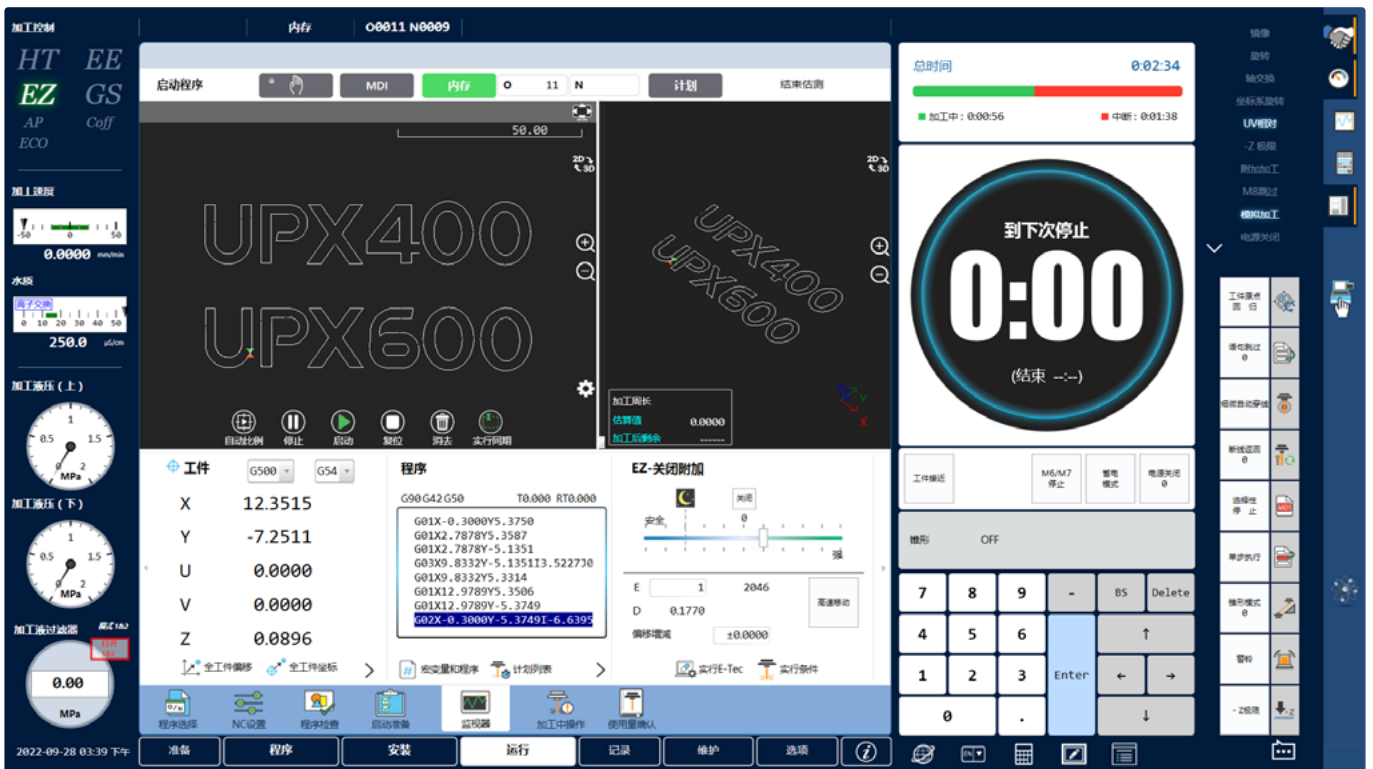


Saving time in verticality adjustments

An additional support guide is fitted between the wire guide and the conductive block. The centre position of the cutting line can be maintained even if the conductive block wears excessively. Line squareness adjustments should only be performed when using new guides or when performing periodic maintenance.

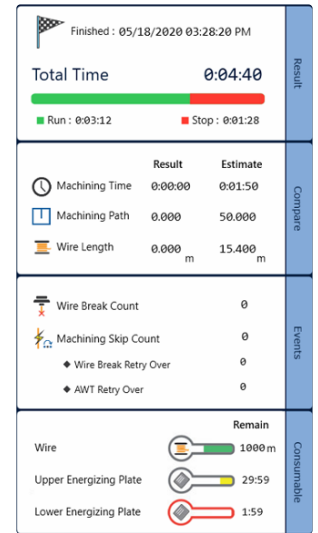
Controller Hyper *i*

The new generation smart control system enhances the operating experience, is simple and easy to learn, operates smoothly, and improves operating efficiency by 30%. The new generation Hyper *i* can still “drag, zoom in, and zoom out” like a tablet PC. At the same time, the new operating platform has been upgraded to run faster, overall operation is smoother, and the operating experience has been raised to a higher level.



QV Assit

The new generation smart control system achieves “all functions on one screen”. There is no need to switch pages to find the functions you require. When you operate it, it will switch to the new function panel in real time in accordance with your operating needs, and automatically provide the functions you need.



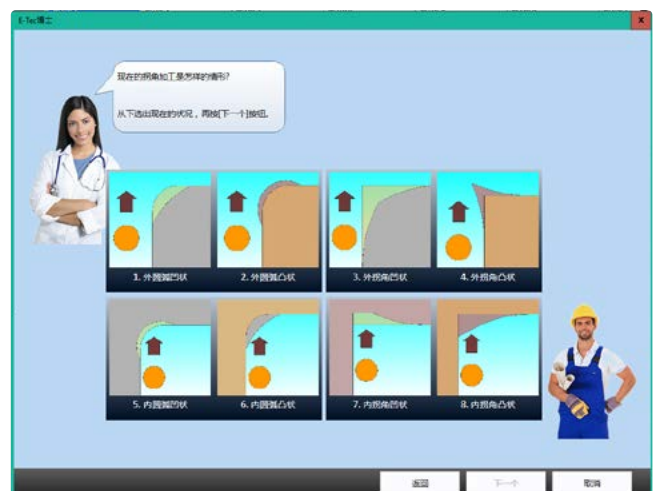
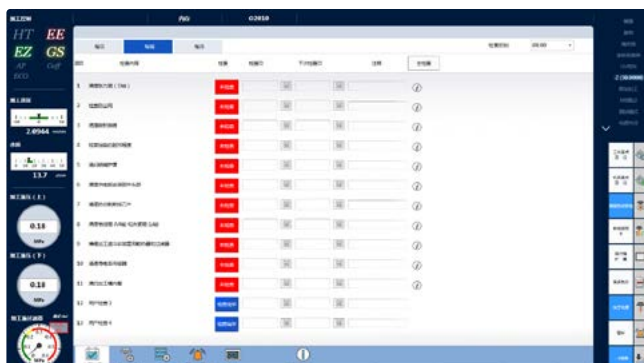
Through the QV window, the function interface will pop up automatically, or the processing time can be evaluated, or the working time can be calculated after processing is completed. During interrupted processing, it can also automatically provide the various functions that need to be used. It greatly improves operating efficiency and enhances the operating experience.

E-Doctor Two hours to learn conditional manufacturing

Once E-Doctor is launched, it can easily solve the problems encountered in processing. Abstract problems are made concrete and visualized. In graphic and text form, the user is guided in learning how to deal with processing problems and debug conditions.

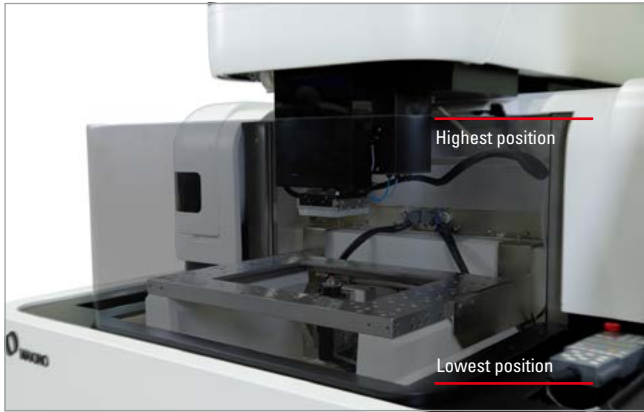
Real-time brochure tracking

Where something will not click, the Hyper i smart system, the position of the small "Z" mark, equipped with synchronous manual index and video guidance, enable the user to view the solution to the alarm or warning in real time, and to learn troubleshooting and maintenance of the machine tool through video.

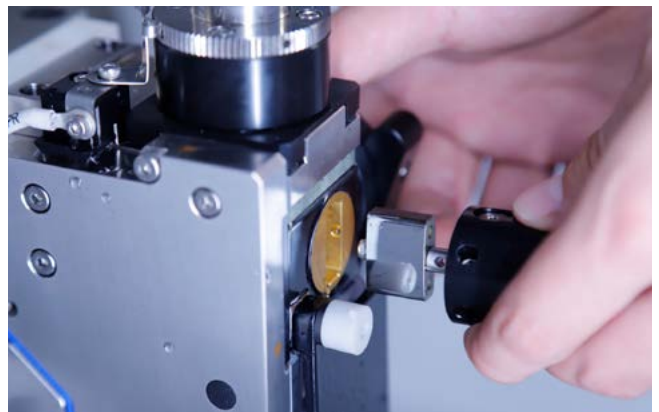
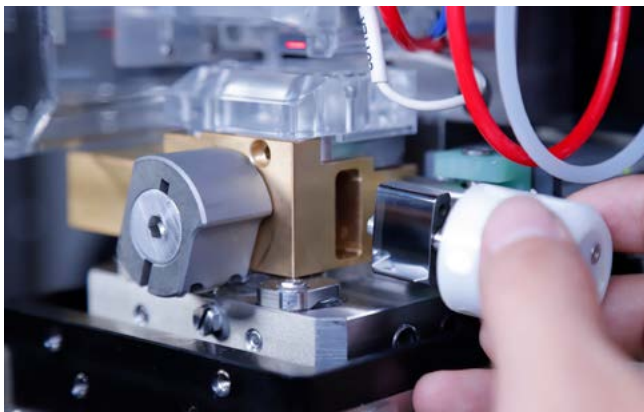


Easy to operate

The three-sided rising and declining work table easily accesses the processing area, facilitating the automatic clamping of work pieces. It is convenient for the operator to check the processing status of the work piece, and machine tool maintenance and component disassembly can be performed with ease.

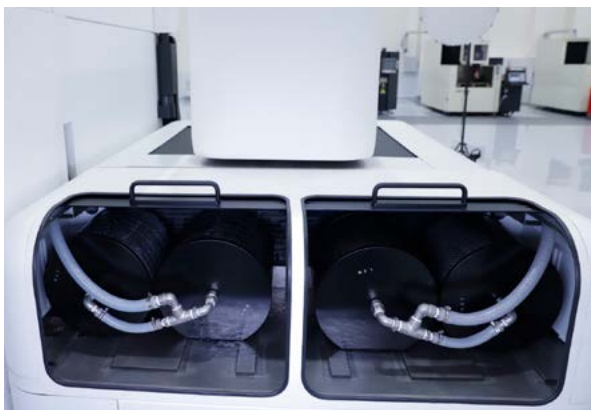


The conductive block adopts a knob-type design. Each time the position is updated, it is positioned by the card position and rotated one revolution to complete the operation.



The filters adopt a “dry and wet” separation design. At the same time, every two filters use a separate air-drying system, and there is no need to stop the machine when replacing a filter.

In order to maintain long-term accuracy, the sliding guard adopts a self-cleaning design, and clean water continuously washes away dirt to maintain long-term positioning accuracy.



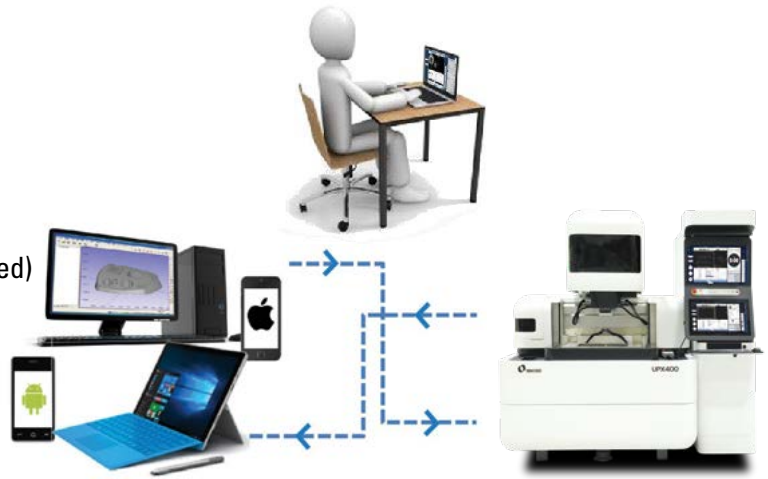
Flexible

EDM cloud service

(optional, Hyper Connect function must be configured)

Remote technical support

- Remote training, technical support, problem handling
- Remote upgrade



Makino Cloud Service Mobile Client

- Online repair
- Dispatch status and equipment status monitoring

Makino Cloud Academy Platinum Membership

- Vast resources to facilitate the learning of machining technology
- Machining centre, discharge equipment training course
- Technology forum



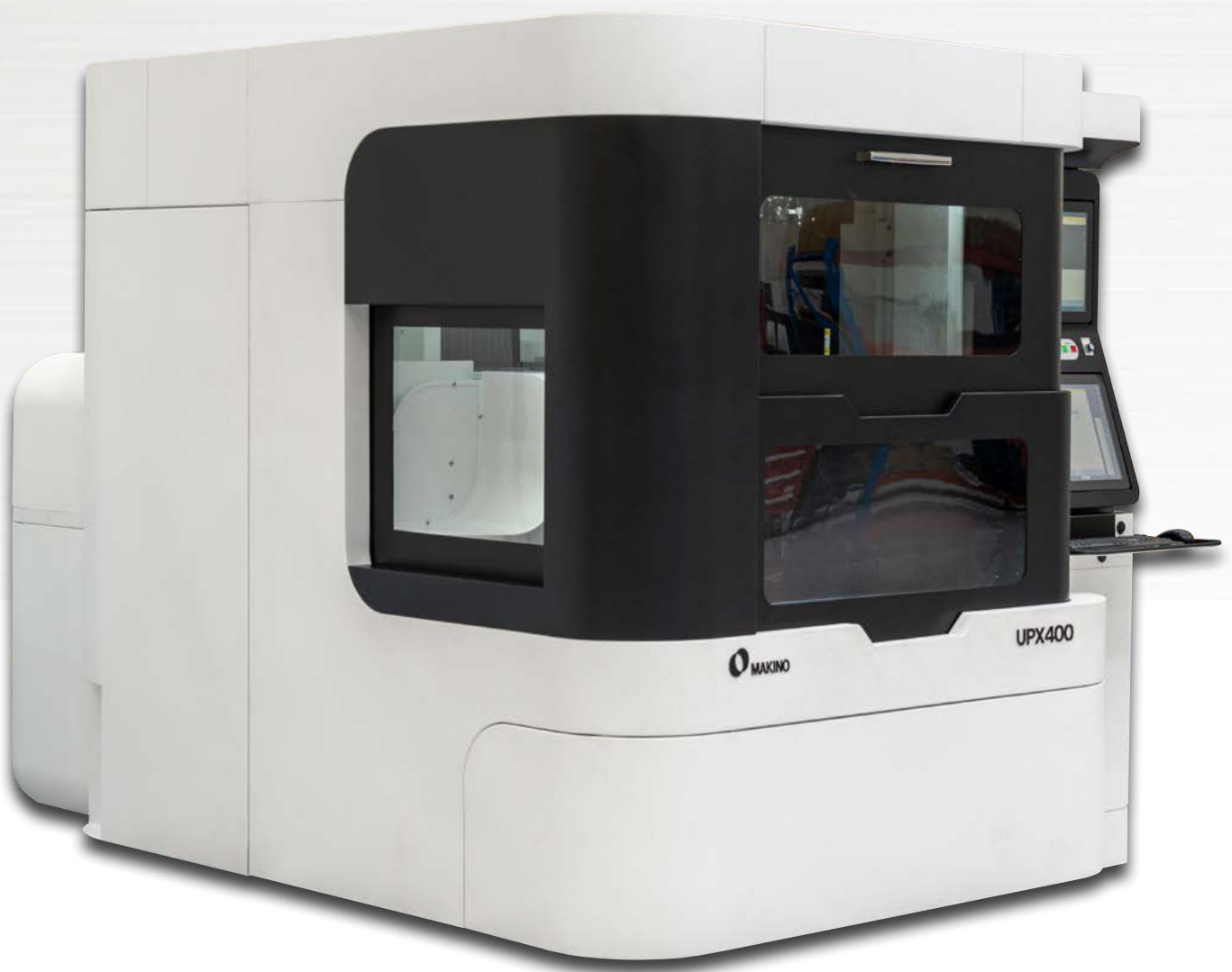
Second screen (optional)

The second screen expands the scope of use of the machine tool, and can help the user operate the computer from the machine tool end, even conducting secondary development and installation of necessary software.

OPC UA/MT Connect (optional)

Provides working status and related information, facilitating user's management of MES information.

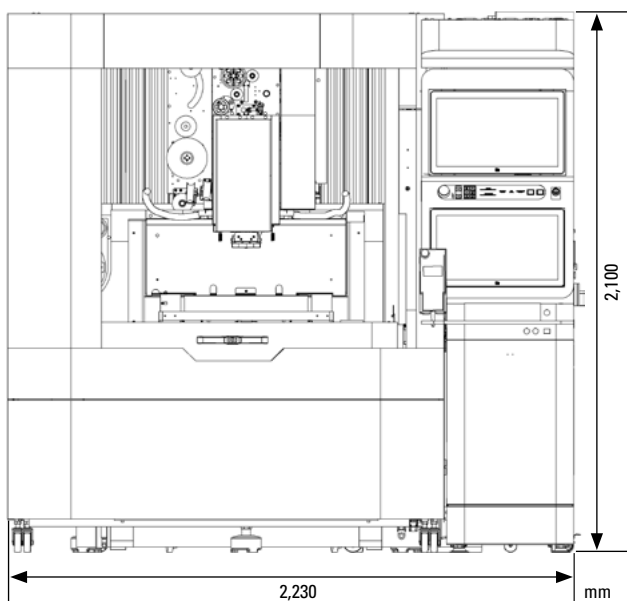




UPX400



Front view



* The dual screen in the illustration is an optional item.

	UPX400
Axis travels (X x Y x Z)	400 x 300 x 250 mm
Axis travels (U, V)	±225, ±150 degrees
Work table size	600 x 480 mm
Maximum work piece size	780 x 590 x 230 mm
Table height	950 mm
Wire diameter	ø 0.10, ø 0.15, ø 0.20, ø 0.25
Maximum workpiece load	600
Machine weight	5,200 kg

Specifications

	UPX400
Axis travel (X x Y x Z)	400 x 300 x 250 mm
Axis travel (U x V)	±225 x ±150 mm
Work table size	660 x 480 mm
Maximum work piece size	780 x 590 x 230 mm
Table height	950 mm
Wire diameter (mm)	ø 0.10, ø 0.15, ø 0.20, ø 0.25
Effective angle	±8°
Maximum cutting angle	±45°
Maximum work piece load	600 mm
Threading mode	Anhydrous threading end-of-line regeneration
Working tank movement mode	Overall rising and declining
Processing fluid capacity	700 L
Ion cartridge capacity	20 L
Processing fluid filter	4 units
Machine size	2,230 x 2,779 x 2,131 mm
Machine weight	5,200 kg
Temperature control	±0.5°C
Best finish	Rz 0.4 µm / Ra 0.05 µm

Power control unit Hyper i	
Specification item	Specification
Model	EW200B
Circuit mode	Transistor pulsing
Maximum processing current	30A
Current setting	128 levels
Voltage setting head	35 levels
Range of rest	256 levels
Power stabilization circuit	standard
Cooling method inside the power supply	Forced air/ water cooling
LL circuit	standard

Injection nozzle diameter and starting hole diameter (faced nozzle processing)

		Starting hole (mm)												
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4~
Thickness	0 ~ 30	No Spray	No Spray	No Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray
	30 ~ 50	No Spray	No Spray	No Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray
	50 ~ 100	No Spray	No Spray	No Spray	No Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray	Spray
	100 ~ 200	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray	No Spray

- Spray
- Spray
- Spray
- No Spray

Standard specifications

- High precision waterless threading system (HDE)
- Immersion processing specifications
- Automatic water level setting
- Air pressure flushing of processing fluid filter
- Program memory 10GB
- EDM resource device manager
- Hyper connect
- Grating ruler XYUV
- Ultra large touch screen (22 inches)
- Square work table

Optional specifications

- Automatic grease lubrication system¹
- Threading nozzle ø 00.5 mm, ø 0.7 mm
- 20 mm in large angle device / ø 0.25 mm in medium
- Large capacity spool 5-20 kg¹

★ Optional equipment

- ★ Maintenance set (not including taper correction jig)
- ★ Operating set
- ★ Work piece cleaning gun
- ★ Anti-rust function
- ★ Taper correction jig
- ★ Alarm lights (three layers)
- ★ EDM cloud service
- ★ Add a second display (including keyboard and mouse)

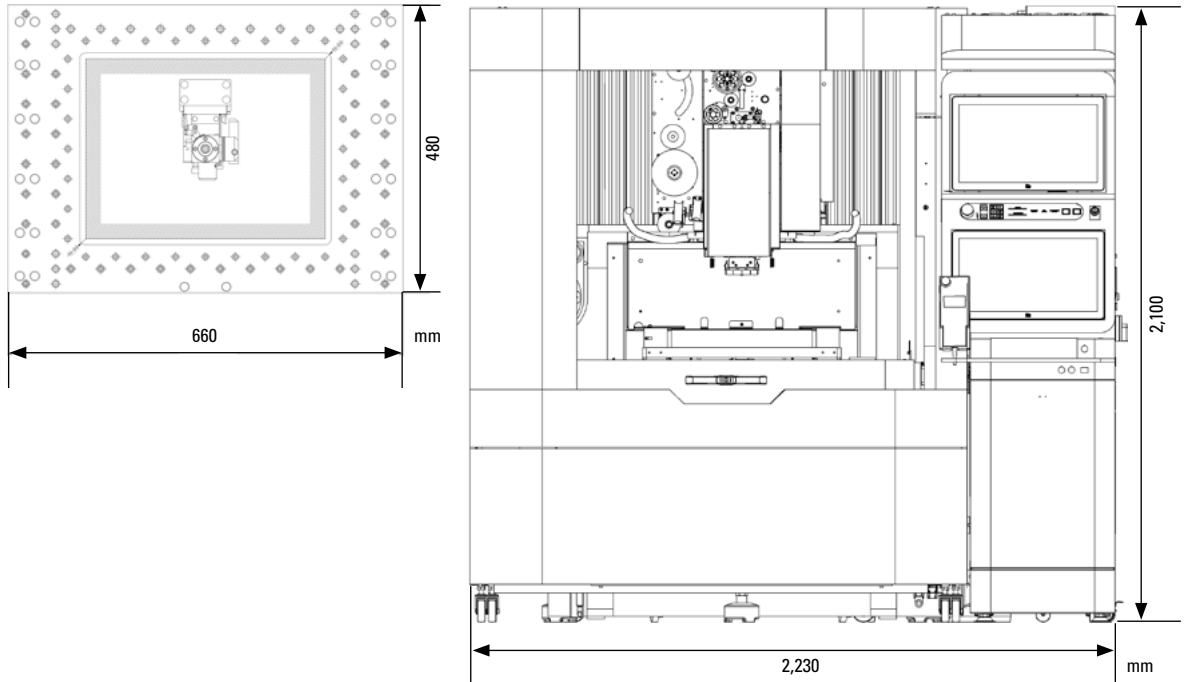
Control system

- HOPC UA
- MT Connect
- MEL Makino communication interface
- MEL Makino automated developer kit

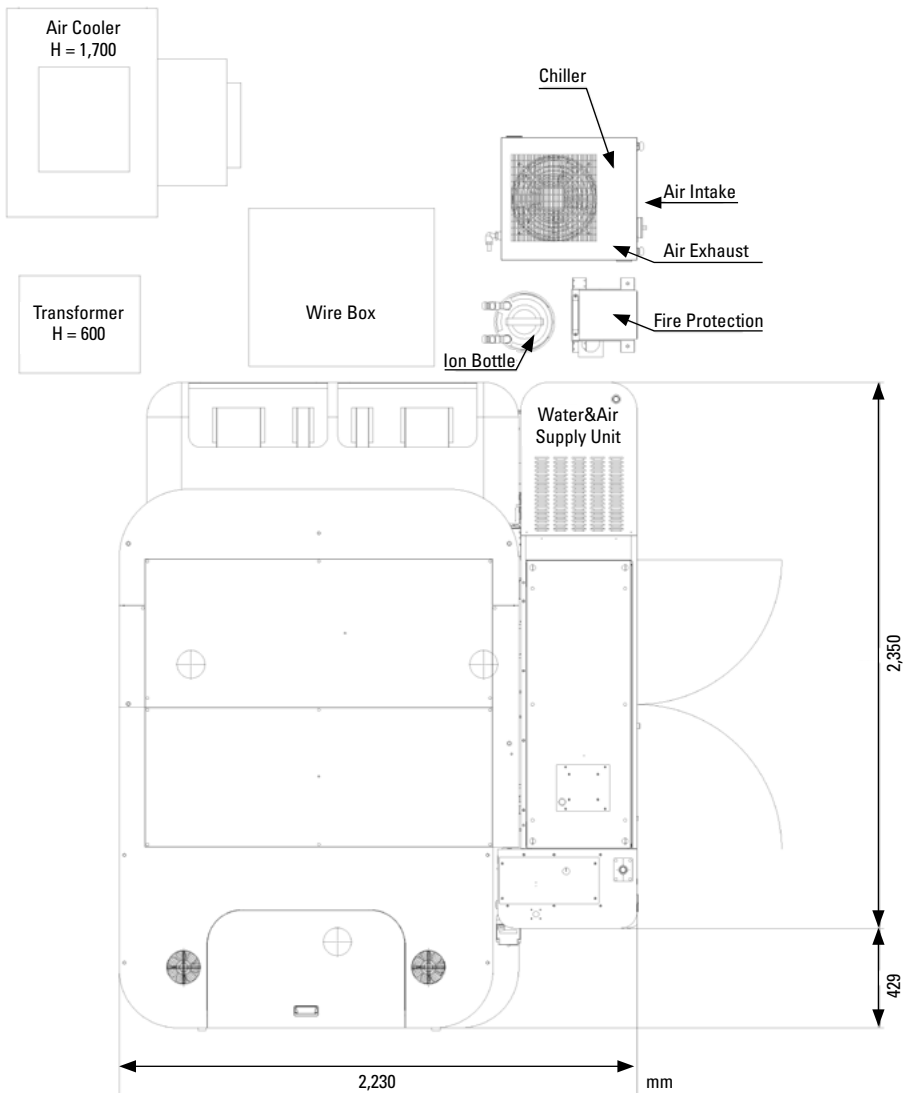
¹ May not later be modified

UPX400

Front view



Floor plan



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