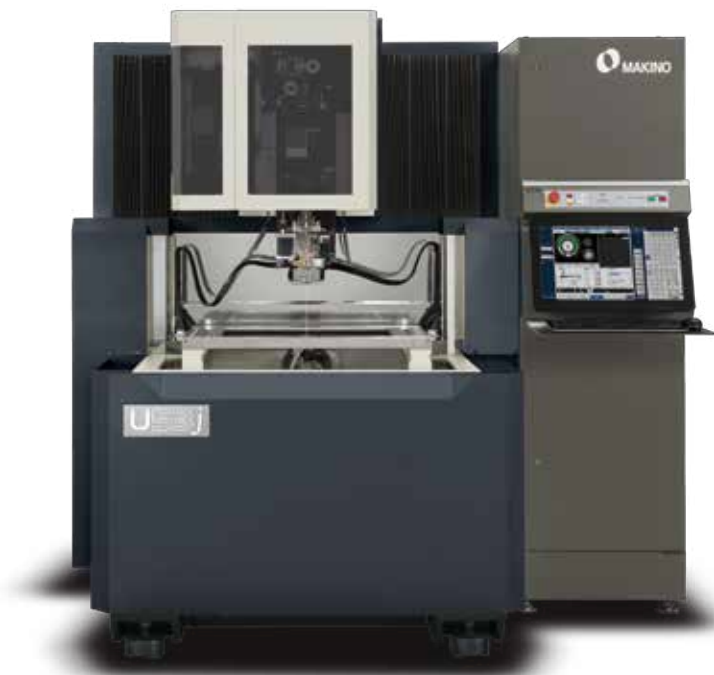


High Accuracy Wire Electrical Discharge Machines

U32j · U53j



Atsugi and Fuji Katsuyama works are certified for ISO14001 and ISO9001.

*The specifications, figures, and overviews of products, peripheral devices and accessories in this catalogue may be changed without prior notice to incorporate improvements resulting from ongoing R&D programs.
*The all products in this catalogue include the optional specifications and equipment.
*The products, including technical data and software, may be subject to the Foreign Exchange and Foreign Trade Control Law in Japan.
Prior to any re-sale, re-transfer or re-export, please contact Makino to obtain any required authorization and approval.



Open Access to the Table from Three Sides

Operator friendliness is also a critical performance parameter.

Uj Series machines provide outstanding access to the table. Lowering the vertically sliding drop tank allows completely unobstructed access to the table from three sides. Setting up workpieces and cutting out cores are among the tasks that operators have to do repeatedly every day. To make those tasks much easier to do, Makino designs all of its machines with superior operator friendliness.

Uj SERIES

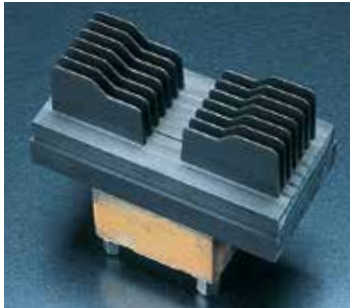
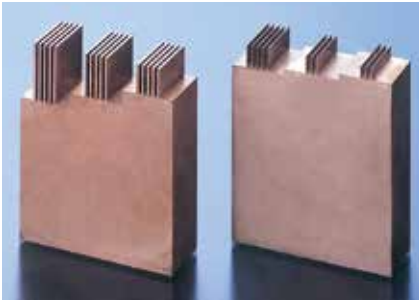


*Photo: Wire feed system (old type)

2400 Types of Machining Conditions

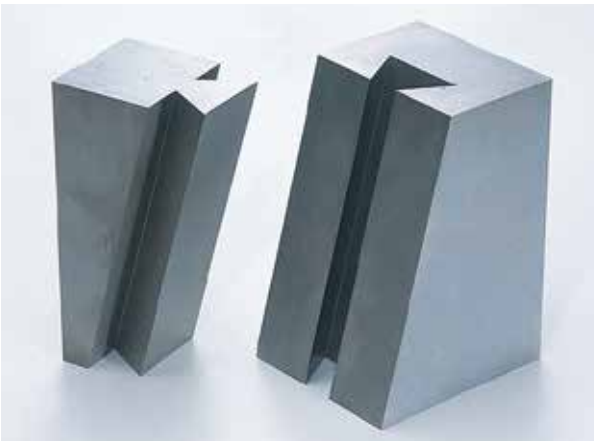
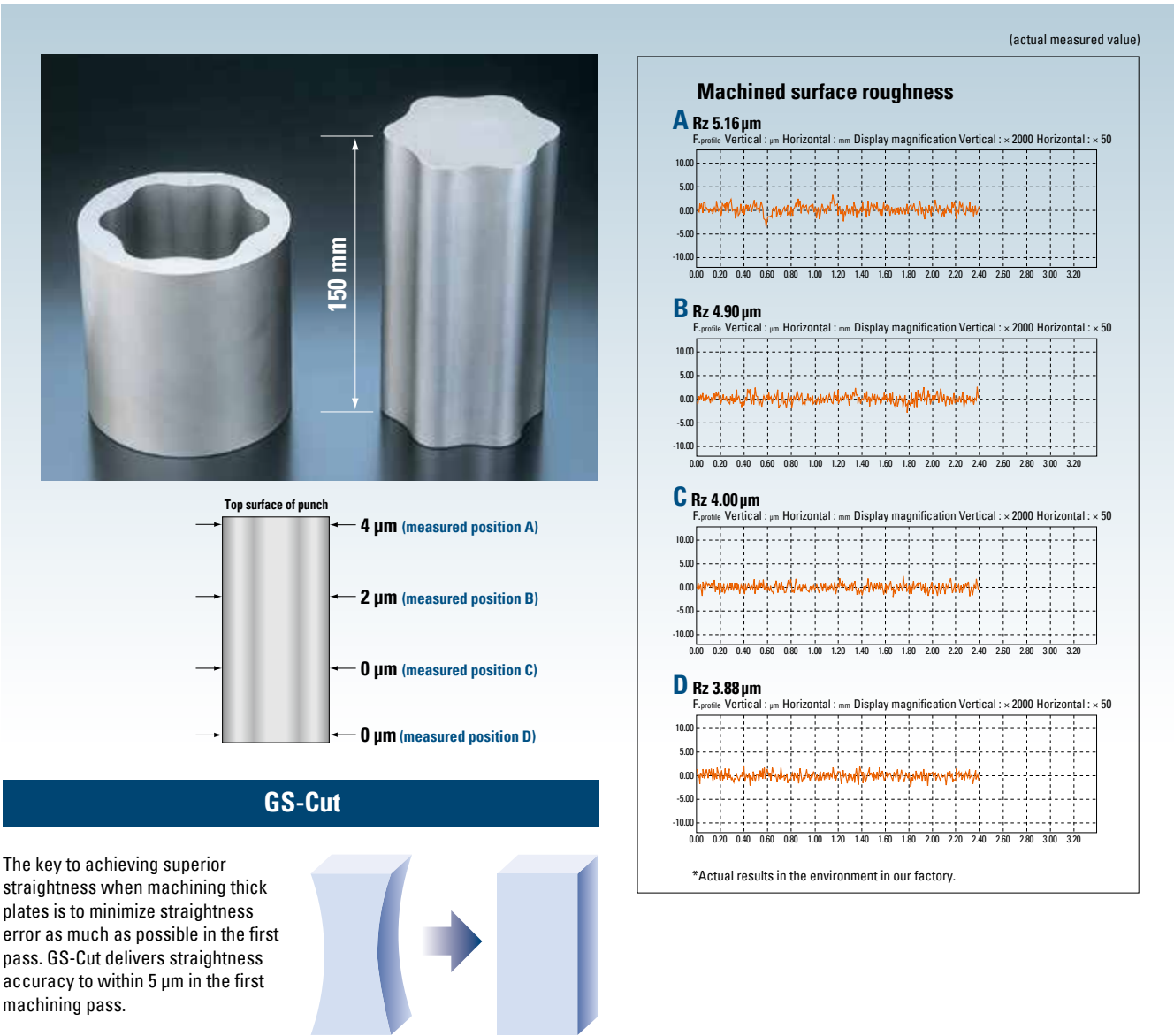
Because the range of application for wire EDM machines is continually expanding, they must be able to accommodate a wide variety of workpiece materials and machining methods.

Uj Series machines come with an impressive 2400 types of machining conditions onboard. Among them, there are 1000 conditions for machining with the dielectric fluid nozzles detached in situations where the workpiece shape or fixturing method prevents tight contact with the workpiece. Needless to say, Makino's operator-friendly Wire Wizard selects the optimum conditions from among the 2400 types available. The result is the best surface finish every time regardless of the operator's experience.



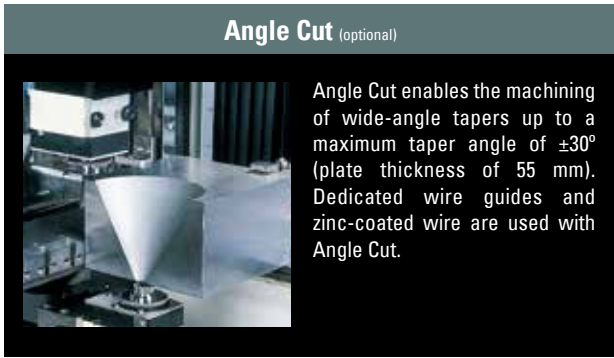
Machining Thick Plates

Even relatively thick workpieces like inserts and slides can be machined with superior straightness. A uniform surface finish of superb quality is achieved over the entire length of the workpiece.



Machining Slides

The tapers of slides are also machined with high accuracy.

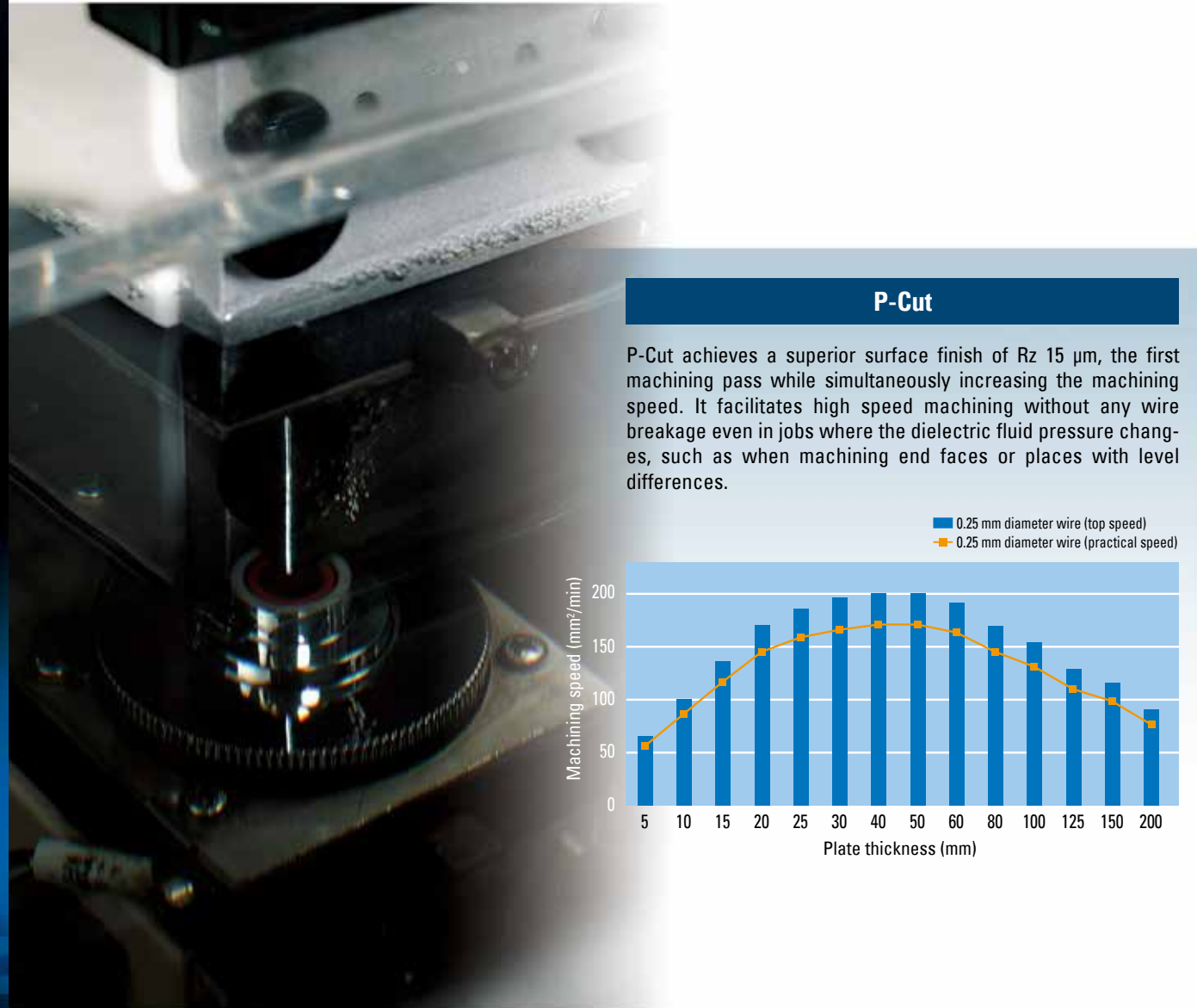


Angle Cut (optional)

Angle Cut enables the machining of wide-angle tapers up to a maximum taper angle of $\pm 30^\circ$ (plate thickness of 55 mm). Dedicated wire guides and zinc-coated wire are used with Angle Cut.

20% Increase in 1st-pass Machining Speed

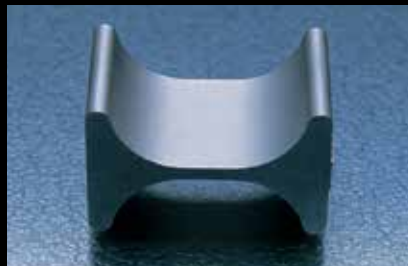
By optimally controlling discharge pulses, P-Cut delivers an actual machining speed of 200 mm² / min while automatically raising the machining conditions to the limits that still avoid wire breakage and maintain high accuracy. This control feature increases the machining speed by 20% compared with previous machines.



Machined Surfaces Free of Electrolytic Corrosion

Because no electrolytic corrosion forms on machined surfaces, they do not need any polishing.

Corrosion-free LL generator circuit



Makino's LL generator circuit keeps workpieces free of electrolytic corrosion, from roughing through finish machining. Since there is no formation of a recast layer or any precipitation of the cobalt binder from tungsten carbide materials, workpiece properties remain virtually the same as before machining. Moreover, the LL generator circuit allows fine tuning of the machining conditions to match the nature of the job, thereby ensuring high-quality machining every time.

H.E.A.T. Realizing 120 mm²/min with both nozzles away

Machining Speeds Increased by 25 to 75 %

In both nozzles away machining, H.E.A.T. technology achieves an incredible machining speed of 120 mm² / min. The combination of a high-pressure jet and H.E.A.T. technology greatly reduces the machining time for workpieces that have uneven surfaces or workpieces where sufficient machining fluid cannot be supplied to the ends. In addition, the straightness for a 150 mm thickness plate after the first machining pass is a highly accurate 5 μm (one side).

- Compatible wire diameters: 0.25, 0.3 mm (brass wire will suffice)
- Material configuration: From 25 to 200 mm thick plate
- There are also a wide range of second and third machining pass settings.

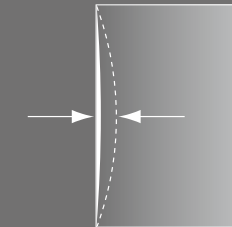
*Require additional filters (optional specification)



Workpiece material : Carbon steel (S55C)
Wire diameter : 0.25 mm brass
Plate thickness : 150 mm
Number of passes : 1
Machining nozzle position : Top and bottom separated by 8 mm

Straightness improved by 58 %

12 μm → 5 μm on one side



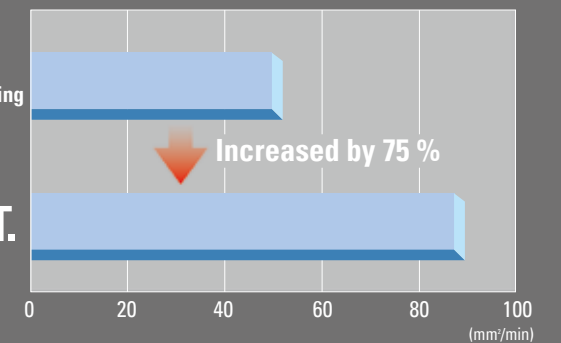
Machining speeds increased by 75 %

49.5 mm² / min 87.0 mm² / min

Conventional both nozzles away machining

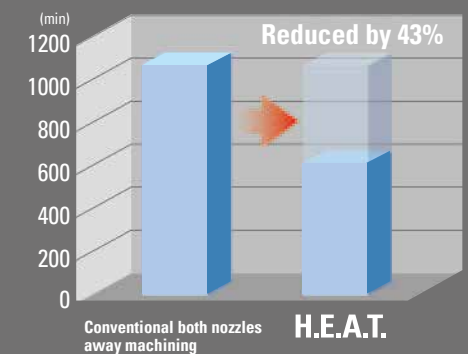
H.E.A.T.

Increased by 75 %



Machining time reduced by 43 %

17 hr. 52 min. → 10 hr. 10 min



Gear

Machining speed : 128 mm² / min

Workpiece material : Tool steel (NAK55)
Wire diameter : 0.25 mm brass
Plate thickness : 50 mm
Number of passes : 3
Machining time : 3 hr. 25 min.
Surface finish : Rz 4.8 μm



H.E.A.T. machining example

Crystal Machining Circuit for Best Surface Finish

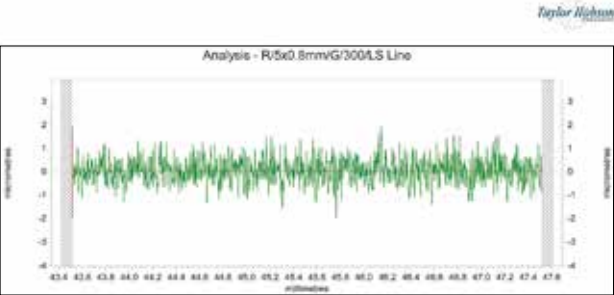
This feature is one effective solution for machining shapes that are hard to polish. It enhances the best surface finish of parts for improved mold release performance. Crystal machining requires no special insulated jigs and is performed with ordinary brass wire.



3 Pass Machining

Rz 3 μm, machining time is shortened by 20 %

The surface finish of Rz 3μm is realized within 3 pass machining. Wire consumption is reduced by 14%.

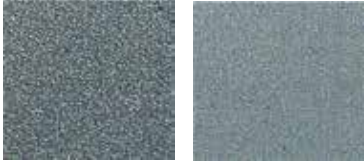


Corner Accuracy

The ability to execute corners accurately without any deflection is useful effective in machining inserts involving intricate combinations.



Ordinary machining Crystal II machining



Micrographs (×175)

Machine type ———— U32j (Crystal II)
Workpiece material ———— Tool steel (SKD-11)
Machined length ———— 209 mm
Plate thickness ———— 20 mm
Machining time ———— 4 hr. 12 min.
Wire diameter ———— 0.2 mm brass
Number of passes ———— 8

(actual measured value)

Material	U32j with Crystal II	U53j with Crystal I
Steel base (t=20 mm)	Rz 0.8 μm (Rz 2.0 μm)	Rz 1.3 μm (Rz 2.0 μm)
Carbide base (t=20 mm)	Rz 0.5 μm (Rz 1.0 μm)	Rz 0.9 μm (Rz 1.0 μm)

Figures in parentheses () are for ordinary finish machining.
*Actual results in the environment in our factory.



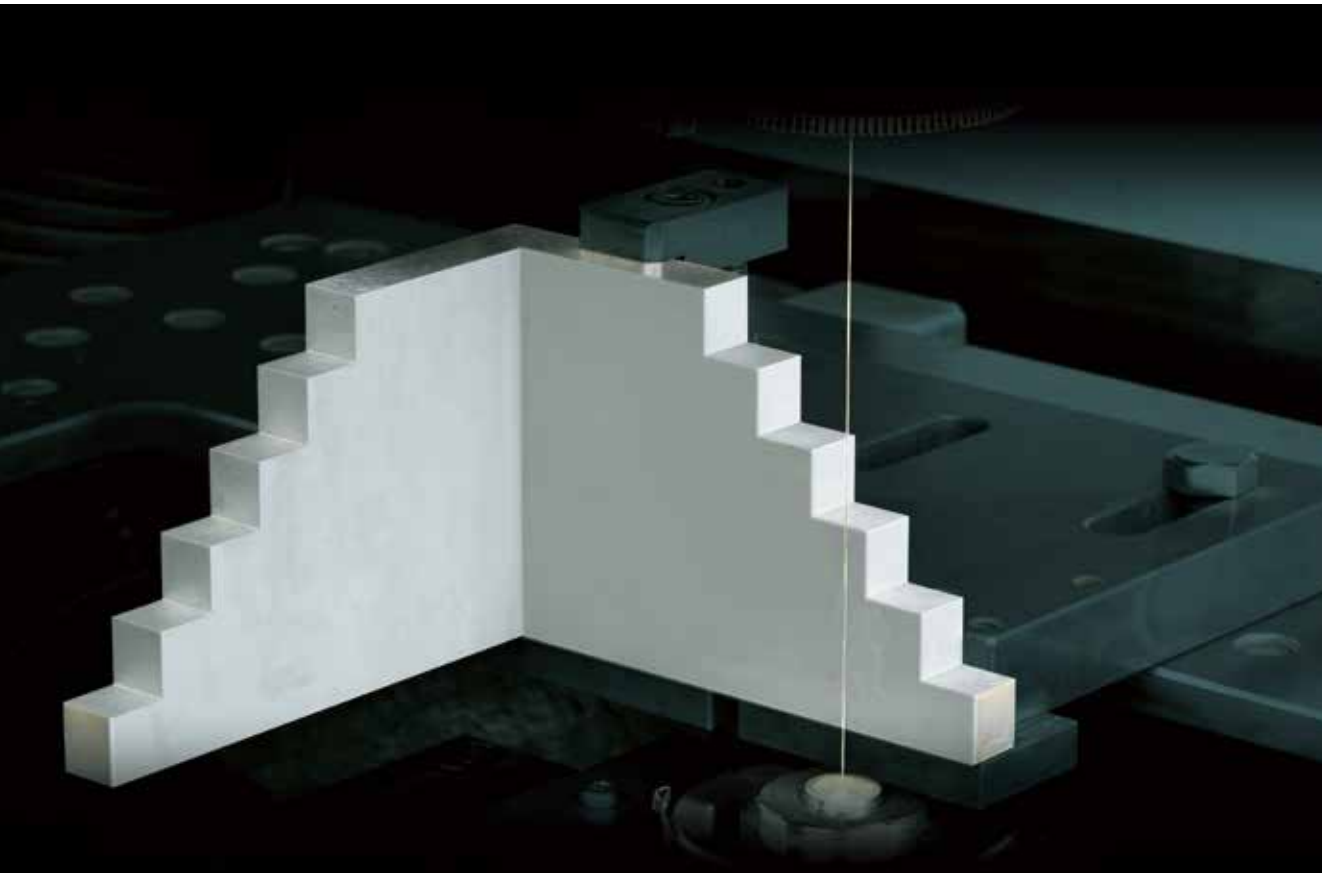
Workpiece material : Tool steel (SKD11)
Wire used : 0.25 mm dia. brass wire
Plate thickness : 80 mm
Surface finish : Rz 3 μm

TG Control Perfect control of thickness and gaps

Realizing High Accuracy with Stepped Machining

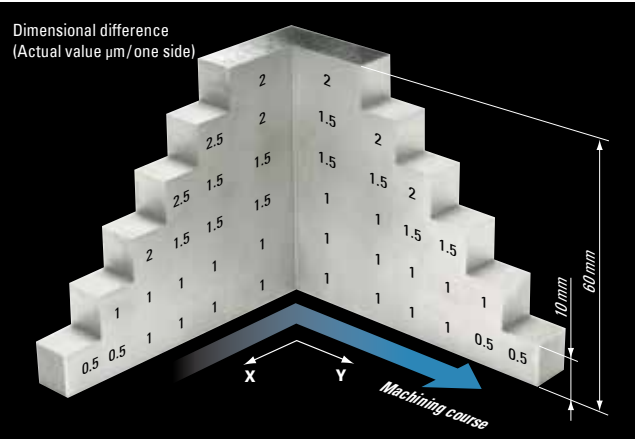
Highly accurate machining can be realized even with workpieces that have complicated level differences. The latest technology that minimizes dimensional differences caused by different plate thicknesses and lines in stepped sections when machining.

Machining settings for first and second passes available.
Compatible wire diameters: 0.2, 0.25 mm (brass wire will suffice)
Material configuration: (1) From 10 to 60 mm thick plate
(2) From 40 to 100 mm thick plate
(3) From 5 to 20 mm thick plate



Straightness

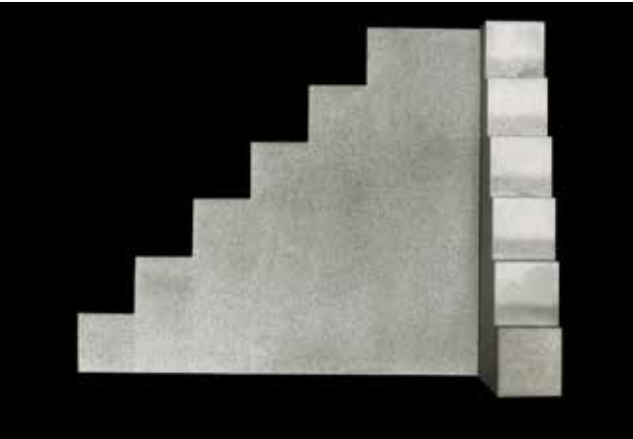
Even when processing plates with a large range of thicknesses from 10 to 60 mm, the straightness tolerance is 2 μm / one side.



There is no difference in straightness and surface finish even with different machining directions.
· Machining from the higher to lower levels of a workpiece.
· Machining from the lower to higher levels of a workpiece.
· Machining in different axis directions, such as X and Y.

Good Surface Finishing that Minimizes Lines

Hardly any lines are formed even the boundaries of steps where the plate thickness changes.

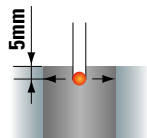
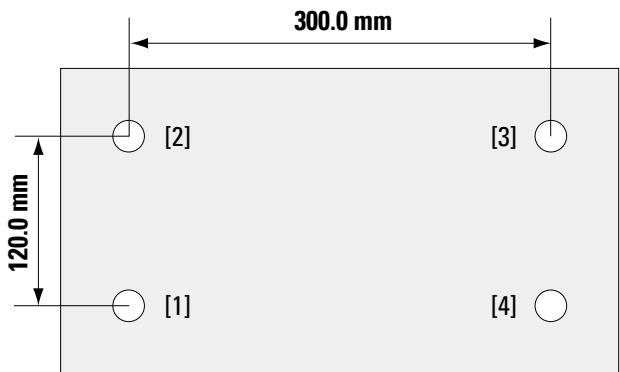


Workpiece material : Tool steel (SKD11)
Wire diameter : 0.20 mm brass
Material configuration : From 10 to 60 mm thick plate
Number of passes : 2

Features for Achieving High-Accuracy Machining

Pitch Accuracy

Pitch accuracy for machining insert holes in multiple molds



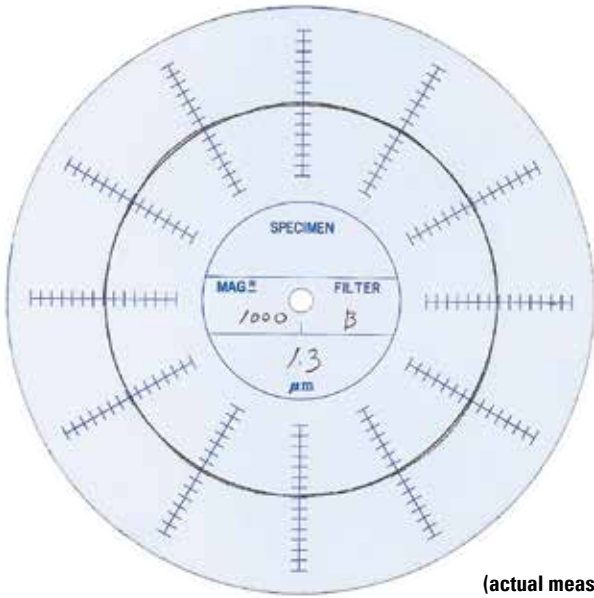
Wire used : 0.2 mm dia. brass
Workpiece material : Tool steel (SKD11)
Plate thickness : 20.0 mm
Machined shape : 20.0 mm dia.
Measuring instrument : UPMC850CARAT Carl Zeiss

(Actual measured values when using Custom Pitch)

	Pitch difference (μm)	
	X	Y
[1]	0.0	0.0
[2]	-0.1	+0.8
[3]	+0.2	+0.1
[4]	+0.1	0.0

*Actual results in the environment in our factory.

Roundness



(actual measured value)

New Contact Detection Function

New pulse method improves reference positioning accuracy

Positioning accuracy of $\pm 2 \mu\text{m}$ (40 mm thick plate)
Measurements are made in the dielectric fluid to achieve reference positioning under the same condition as during machining. In addition, this function substantially reduces electrical discharge damage to the workpiece surface due to contact detection as well as brass deposits on the workpiece.

Note: The workpiece configuration may affect the measured values in some case.

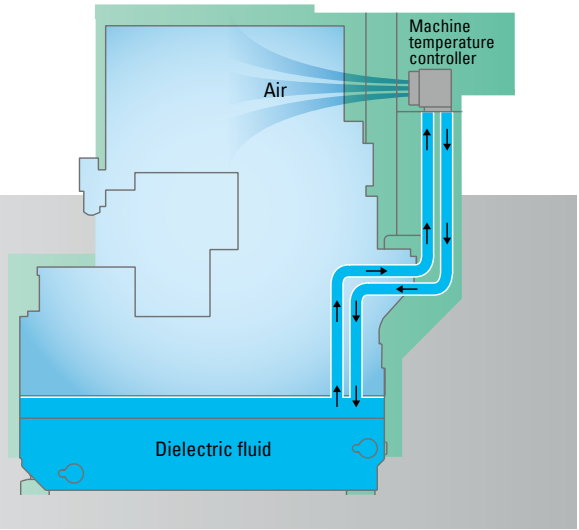
0.05 μm Scale Feedback (optional specification)

The XYUV axes can be fitted with a 0.05 μm scale feedback system for high-accuracy pitch machining in concert with Makino's Custom Pitch function.

Machine Temperature Control

The dielectric fluid cooling unit incorporates an inverter system to minimize the temperature difference between its On/Off states. The temperature is controlled with dielectric fluid to within $\pm 0.1^\circ\text{C}$.

By circulating the air synchronized with the temperature of the dielectric fluid inside the machine, controlling thermal distortion of machine body cast iron.



Thermal Guard (optional specification)

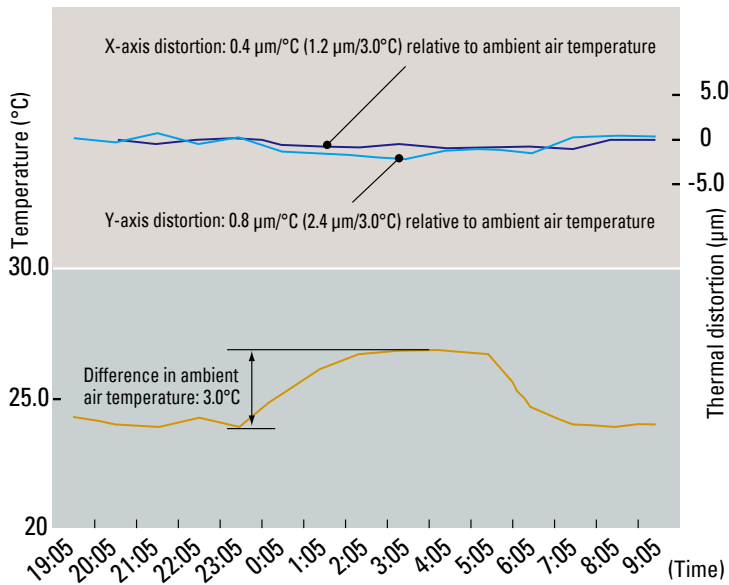
The entire machine is enclosed in covers to prevent machine attitude changes due to variation in the shop temperature.

Temperature-controlled air is circulated (machine temperature control) through the machining chamber of the machine to ensure high accuracy over long hours of machining.



*Photo: Wire feed system (old type)

Thermal distortion in XY axes relative to ambient temperature change



High-Speed Automatic Wire Threading in Just 10 Seconds



Wire Guide Mechanism

Makino's split V guide is used, which provides greater contact with the wire for effectively removing bends. Because the wire guide opens during automatic threading, the wire easily passes through the lower guide. A high-pressure water jet also straightens any kinks in the wire and guides it reliably into the start hole.

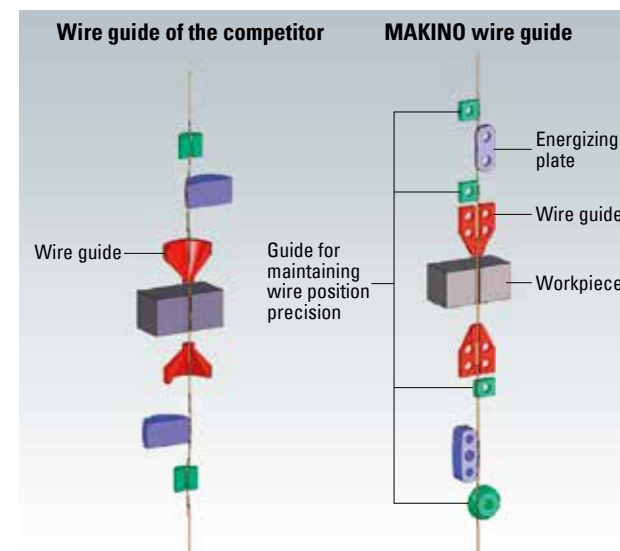
Simple Maintenance



An split V guide is used for the lower head where sludge is apt to accumulate. The guide can be cleaned by simply opening it, without removing it. (Use of the supplied K200 sludge cleaning agent is recommended if the guide is exceptionally dirty.) Cleaning takes only a few minutes. Since the guide is not removed, there is no need to align the wire vertically after cleaning.

Guide maintains excellent wire vertical alignment

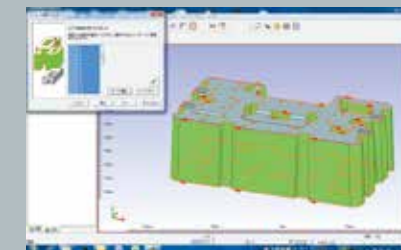
Makino's outstanding wire guide system has an additional guide positioned between the energizing plates. This prevents energizing plate wear from affecting the position of the wire



CAM system for wire EDM

WIZ

Wire Cut EDM Integrated Zone



- Wire machining part is automatically extracted from 3D model.
- Makino's 2400 types of machining conditions are built in.
- Interference, core processing, and the check of sectional shape are possible at simulation function.

Comparison of process until the machining start

Conventional CAM



WIZ



■ PC operation* ■ On-machine operation

*WIZ can be installed in the PC, the customer prepares.
The conditions in detail, please access the following URL.

Related Web Sites

[WIZ]

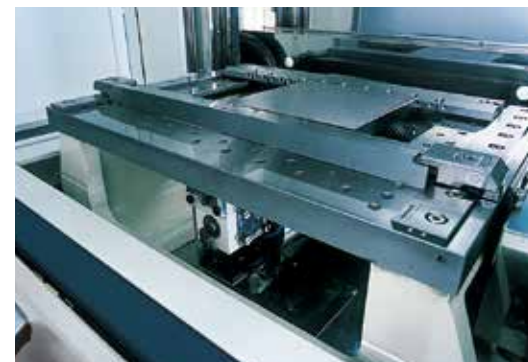
<http://www.ffcaml.makino.co.jp/wiz>



Further Pursuit of Enhanced Ease of Use

Operator Friendliness Design

Uj Series adopt Makino's renowned vertically sliding drop tank design that opens wide on three sides for outstanding access to the workpiece.
Thanks to this superb design, workpiece can be loaded and unloaded quickly and easily.



Maintenance ease

The vertically sliding drop tank can be lowered to a position considerably below the table surface. If a core is cut out by mistake and falls into the tank, it can easily be removed. Other maintenance tasks, like the replacement of the energizing plates, can be also realized efficiently.



*Photo: Wire feed system (old type)

Vertically sliding drop tank design

The dielectric fluid height changes in tandem with the height of the work tank. The height of the work tank can be set to match the thickness of the workpiece being machined. This makes it easy to confirm the machining condition even for thin workpieces. It also enables workpiece centering, core removal and other tasks to be done efficiently.

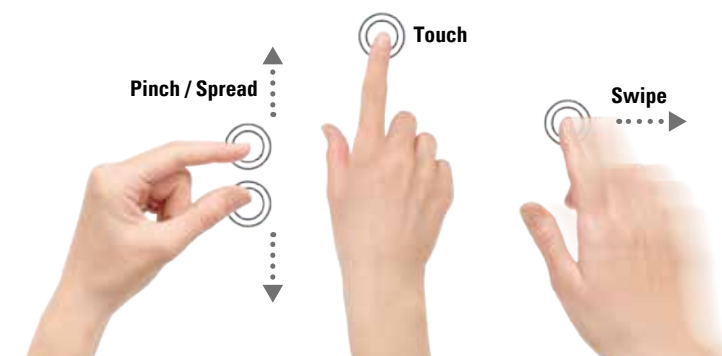
Hyper *i*

*i*ntuitive | *i*ntelligent | *i*nteractive

Makino's new controller Hyper *i* control revolutionizes the interface between the operator and the machine. Using the most current interface technologies used by SmartPhones and Tablets, Makino's Hyper *i* makes use of Pinch and Swipe, Spread functions that provide the operator with a simple and natural feel that is comfortable and extremely efficient. The user friendliness of the Hyper *i* is further enhanced with the integration of on-board digital manuals, intelligent help functions, and e-Learning training system.



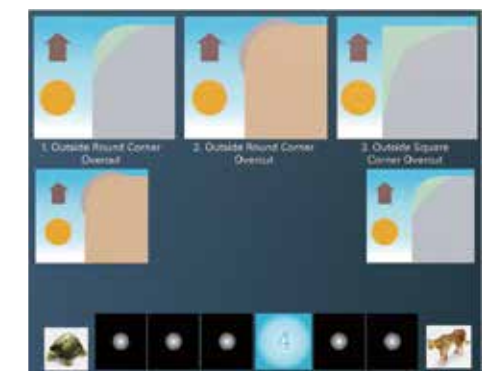
Gesture Control is the natural way to interact with the machine



*Photo: Wire feed system (old type)

High definition screen

Additional screen* is available.
The case of U3 H.E.A.T. in this photo.



E-Tech Doctor

E-Tech Doctor can make improvements in these 3 areas.

High Accuracy Wire Electrical Discharge Machines

U32j



- Axis travels (X × Y × Z) ————— 370 × 270 × 220 mm
- Taper machining axis (U × V) ————— ± 50 × ± 50 mm
- Maximum workpiece size ————— 780 × 590 × 200 mm
- Maximum dielectric fluid height — 250 mm
- Height from floor to table working area — 950 mm
- Wire electrode diameter ————— 0.05*, 0.07, 0.1, 0.15, 0.2, 0.25, 0.3 mm

(*optional specification)

High Accuracy Wire Electrical Discharge Machines

U53j



- Axis travels (X × Y × Z) ————— 550 × 370 × 220 mm
- Taper machining axis (U × V) ————— ± 50 × ± 50 mm
- Maximum workpiece size ————— 960 × 690 × 200 mm
- Maximum dielectric fluid height — 250 mm
- Height from floor to table working area — 1000 mm
- Wire electrode diameter ————— 0.05*, 0.07, 0.1, 0.15, 0.2, 0.25, 0.3 mm

(*optional specification)

Machine specifications

		U32j	U53j
Axis travels (X × Y × Z)	mm	370 × 270 × 220	550 × 370 × 220
Taper machining axis (U × V)	mm	± 50 × ± 50	± 50 × ± 50
Table size (square type)	mm	630 × 450	810 × 550
Maximum workpiece size	mm	780 × 590 × 200	960 × 690 × 200
Maximum dielectric fluid height	mm	250	250
Maximum workpiece weight	kg	600	1500
Height table surface		950	1000
Wire electrode diameter	mm	0.07, 0.10, 0.15, 0.20, 0.25, 0.30	0.07, 0.10, 0.15, 0.20, 0.25, 0.30
Maximum taper angle	degrees/ 100 mm thick plate	± 15 deg.	± 15 deg.
Dielectric fluid tank capacity	L	560	800
Number of deionizing resin per 5L		4	4
Number of dielectric fluid filters		2	2
Machine dimensions (W × D × H)	mm	1855 × 2735 × 2050	2160 × 2845 × 2100
Floor space (W × D)	mm	2580 × 3165	2885 × 3275
Machine weight	kg	4100	5000

Standard specifications

- Submerged machining
- Three-side-open drop tank
- Taper machining unit
- Automatic wire threading unit
- Fine-hole automatic wire threading unit
- Square workpiece fixture
- Machine temperature control
- Work light
- Crystal I (U53j only)
- Crystal II (U32j only)
- H.E.A.T. (additional filters required)

Power supply/Control unit Hyper i

- High definition screen (touch panel)
- Multifunction portable operation panel
- Automatic power failure recovery unit
- USB interface
- EDM Explorer
- Power supply line filter
- Custom pitch
- Ethernet
1000BASE-T / 100BASE-TX / 10BASE-T

*1 Only when pallet magazine is selected.

*2 Requires EDM Viewer connecting kit. But ignore it when MEL machine kit is attached.

*3 Not available with MEL machine kit.

Optional specifications

Optional specification is not retrofittable.

- 0.05 mm diameter wire specification
- Thermal guard specification
- 0.05 μm scale feedback (X, Y axis)
- 0.05 μm scale feedback (X, Y, U, V axis)
- Ultra high accuracy specification (including 0.05 μm scale feedback: X, Y axis)
- Ultra high accuracy specification (including 0.05 μm scale feedback: X, Y, U, V axis)
- Automatic tank height setting function
- Wire cutting device
- Additional filters
Total 4: (standard 2 + additional 2)
- NC indexing unit
- Pallet magazine (U32j only)
- Cartridge-type deionizing resin
- Workpiece rust prevention function
- Special customer-specified machine colors

Power supply / Control Unit Hyper i

Item	Specification
Model	EW100A
Circuit type	Transistor pulse circuit
Maximum machining current	30A
Current settings	128 levels
Voltage settings	35 levels
OFF intervals	256 levels
Automatic voltage regulator	Standard
Cooling system	Forced air cooling
LL generator circuit	Standard

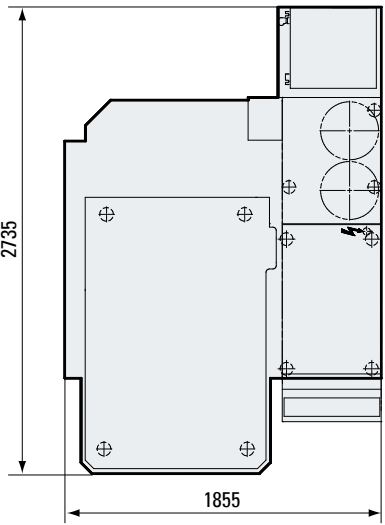


Large-capacity wire reel loader (20 kg)

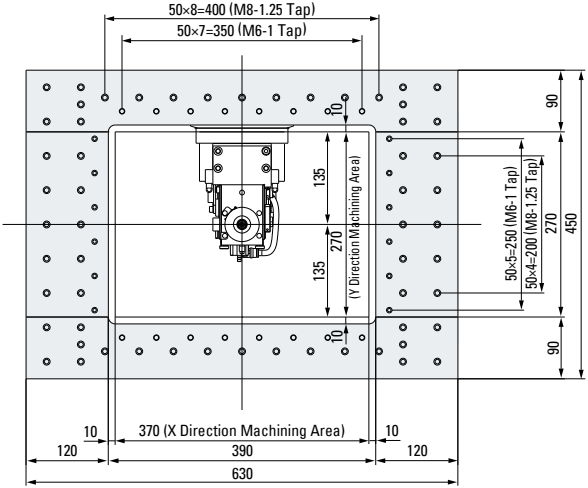
Optional equipment

- ◆ Large-capacity wire spool loader (20 kg)
- ◆ Large-capacity wire spool loader (30 kg)*1
- ◆ Workpiece clamp set
- ◆ Workpiece support
- ◆ Automatic water supply unit
- ◆ Maintenance set
- ◆ Standard supplies set (standard set of consumables)
- ◆ Angle cut set (split V guide type) (0.2 or 0.25 mm wire diameter)
- ◆ Signal tower (1 or 2, 3 lamps)
- ◆ Program Master
- ◆ Export transformer
- ◆ Circuit breaker
- ◆ MEL Development Kit
- ◆ MEL Machine Kit
- ◆ EDM Viewer*2 (Hyper i)
- ◆ EDM Viewer connecting kit*3
- ◆ External keyboard & mouse
- ◆ Additional monitor (including external keyboard & mouse)
- ◆ Anti-virus software
- ◆ WIZ CAM system for Wire-EDM (built-in, PC type)
- ◆ I/O interface RS-232C
- ◆ MTConnect interface
- ◆ OPC UA interface
- ◆ Email notified function

U32j



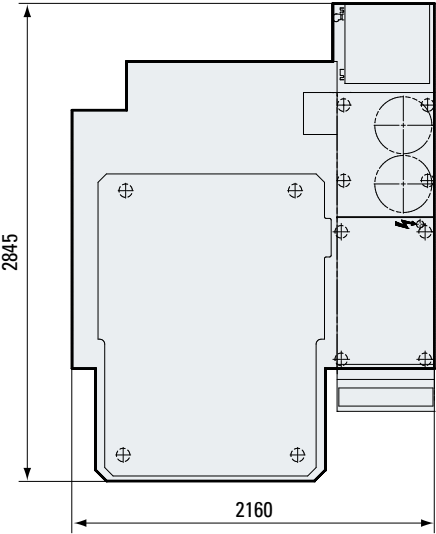
Standard specifications - Floor space (mm)



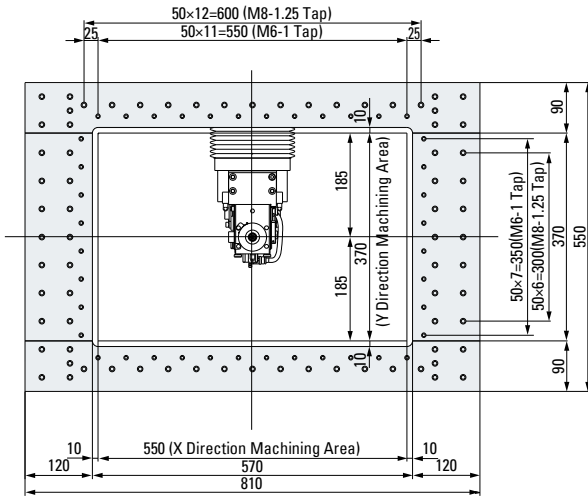
Square table (mm)

* The space for the movable parts and maintenance in addition to the space for the machine main body are required.

U53j



Standard specifications - Floor space (mm)



Square table (mm)

* The space for the movable parts and maintenance in addition to the space for the machine main body are required.