Equipment and Construction Work for Machine Installation

1. Floor area and foundation work

	Required installation space (including maintenance area) mm		
	Width	Depth	Height
UPV-3	1855	2625	2050
UPV-5	2160	2735	2100

It is recommended that a foundation be prepared for installation a machine, because a solid foundation is essential for maintaining high accuracy.
Allowable vibration : 0.7 m/s² (0.07G) maximum

2. Factory air-conditioning equipment

Recommended optional temperature : 20 ± 0.1°C

	UPV-3	UPV-5
Heat release rate kw (kcal/h)	6.4 (5504)	6.4 (5504)

Operating temperature range 10 - 35°C
Relative humidity: 75 % maximum (without any condensation)

3. Measures against electromagnetic interference

It is recommended that EDM machines be installed in a shielded room to avoid electromagnetic interference.
In addition, use of the optional power supply line filter is recommended if there is a possibility that electromagnetic noise from the power supply line might affect the operation of other equipment.

4. Electrical work

	UPV-3	UPV-5
Power supply specification	AC 3-phase, 200V ±10%, 50/60 Hz, power factor	
Total power consumption (kVA)	8	8
Breaker capacity (A)	30	30
Circuit breaker	50mA current sensitivity for the inverter circuit (when not installed in a shielded room)	
Power line size (mm²)	5.5	5.5
Recommended grounding	Class C grounding using 5.5 mm² ground wire (maximum ground resistance of 10 Ω)	

5. Provision of compressed air supply

0.6 MPa, 100 L/min (equivalent to a 1.5 kW compressor)
Connection port : 8 mm dia. High coupler (standard equipment)

6. Factory environment

The following factory environment is recommended for maintaining high machine accuracy at all times.
- EDM machines should be isolated from equipment that produces dust.
- EDM machines should not be exposed to direct sunlight or discharges from an air-conditioning system.
- EDM machines should not be partially heated by a stove or other heating device.

MAKINO

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ISO 9001
ISO 14001
BUREAU VERITAS
Certification

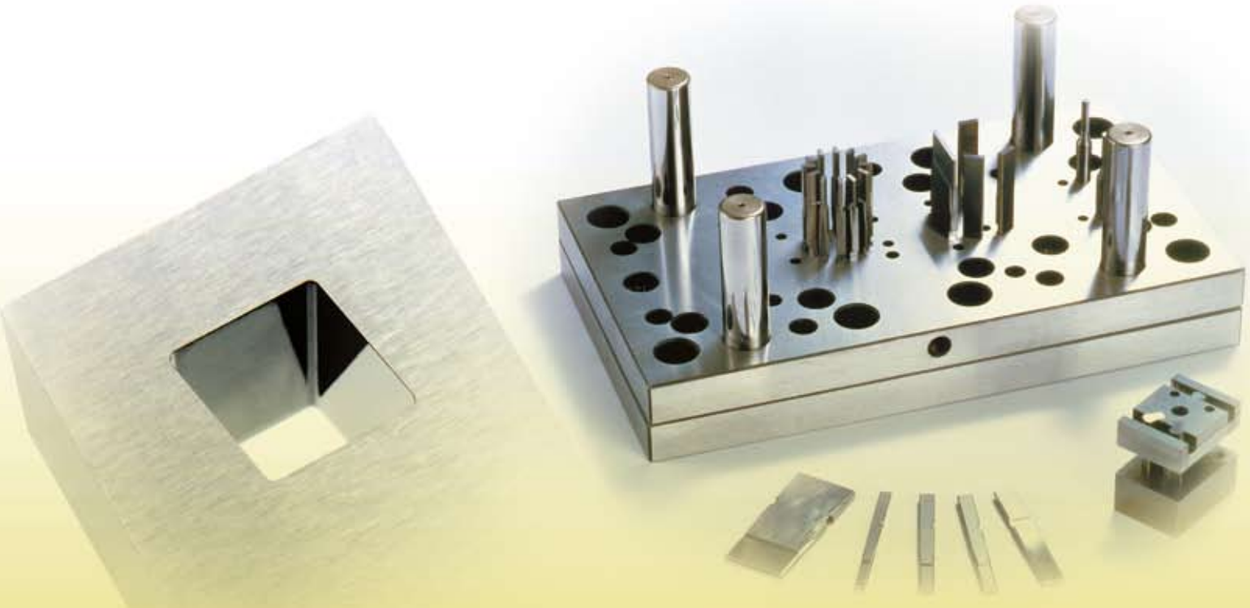
* The specifications in this catalog may be changed without prior notice to incorporate improvements resulting from ongoing R&D programs.
* The machines displayed in this catalog are fitted with optional equipment.
* This product, including technical data and software, may be subjected to the Japanese Foreign Exchange and Foreign Trade Law. Prior to any re-sale, re-transfer or re-export of controlled items, please contact Makino to obtain any required authorization or approval.

H-273E 1004/2(SJ-M)

Oil Dielectric Wire EDM for Tungsten Carbide Machining

UPV-3 · UPV-5

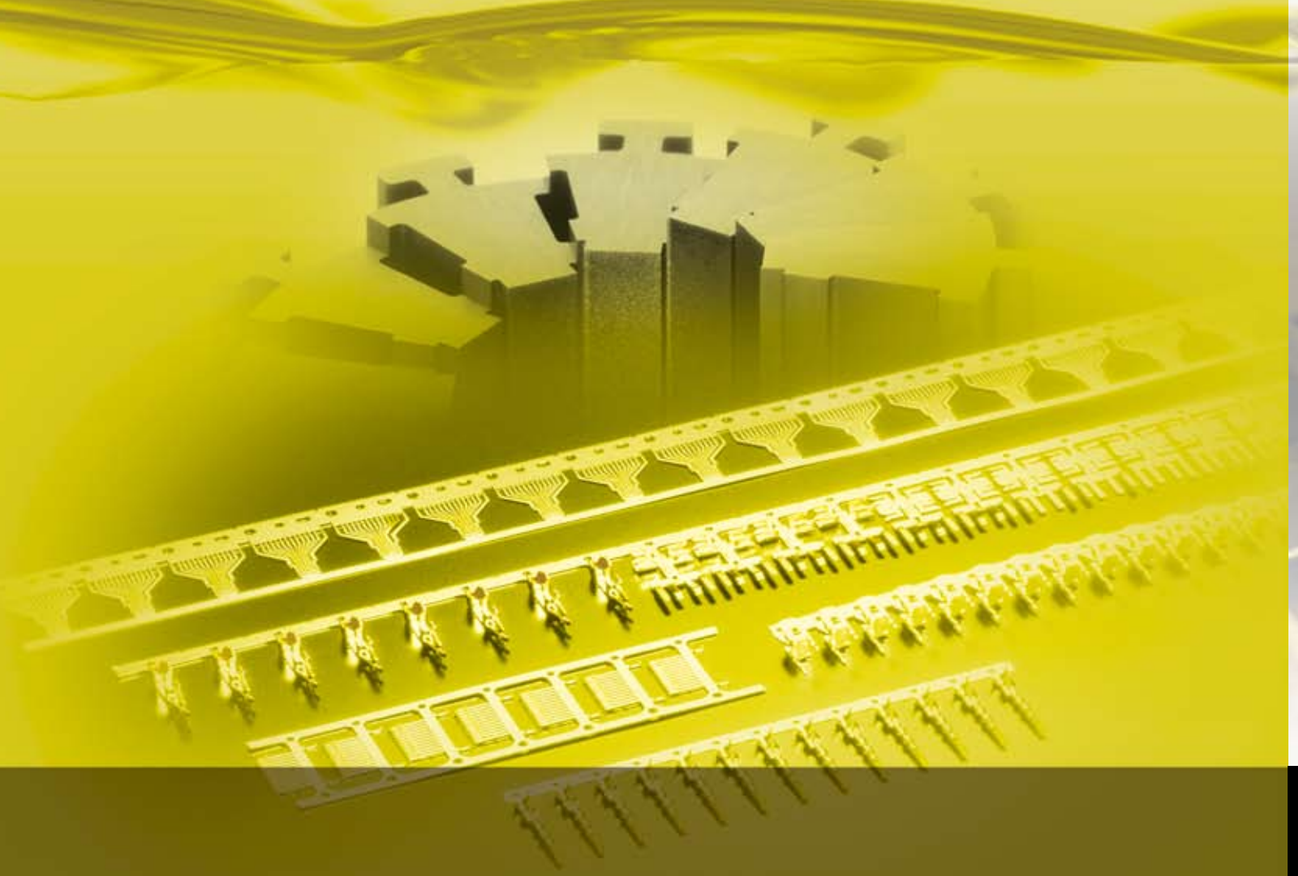
MAKINO



Surface finish: 0.2 μm Rz

（0.03μm Ra）

Meeting the growing demands for improved surface finish and shape accuracy of precision metal stamping dies.

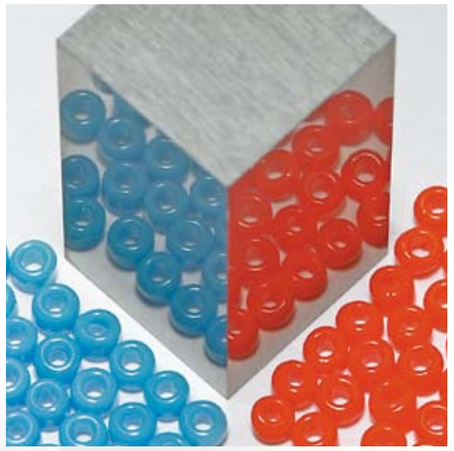


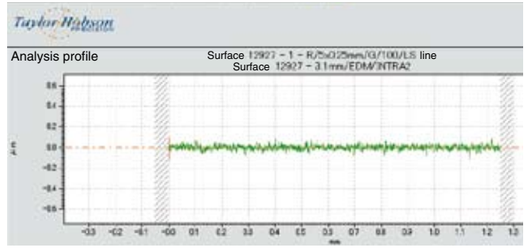
SPG Ⅱ machining circuit

The SPG Ⅱ machining circuit generates micro pulses that work to enhance the best surface finish and machining accuracy.

Surface finish: 0.2 μm Rz（0.03μm Ra）

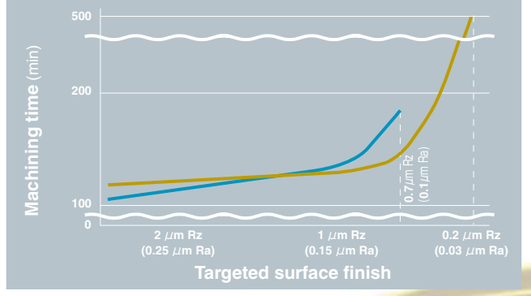
Under standard machining conditions, the UPV machines deliver a surface finish of 0.2 μm Rz, which is required for the cutting blades of die plates used in precision metal stamping operations. Superb surface finishes minimize the post-machining polishing process.





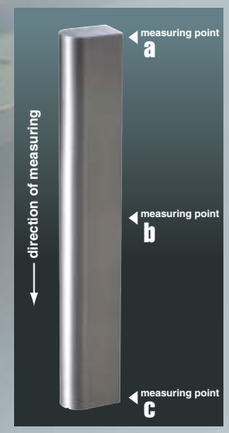
Workpiece material	: Tungsten carbide (G5)
Wire used	: 0.2 mm dia. brass wire
Plate thickness	: 20 mm
No. of machining passes	: 10
Surface finish	: 0.2 μm Rz

Machining time comparison for ☐water-based and ☐oil-based dielectric fluids



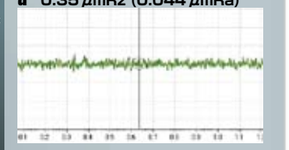
Surface finish of 0.4 μmRz (0.05 μmRa) with a workpiece thickness of 100 mm

A uniform surface finish of superb quality is achieved over the entire length of the thick workpiece.



Workpiece material	: Tungsten carbide (G5)
Wire used	: φ0.25 mm
Plate thickness	: 100 mm
Straightness	: 0.5 μm / one side

a 0.35 μmRz (0.044 μmRa)



b 0.36 μmRz (0.046 μmRa)

c 0.32 μmRz (0.043 μmRa)

PVG functions

Optimal control prevents wire breakage

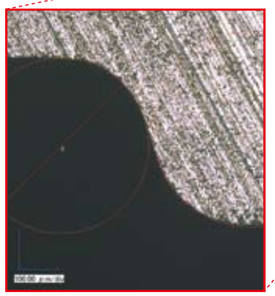
P-Cut

The machine constantly monitors the condition of the discharge pulse. If an unusual spark is detected, the discharge pulse is controlled to the optimal condition to prevent the wire from breaking.

Shape accuracy: ±0.5 μm (actual measured value)

V-Corner

Wire feed delay and material removal are automatically controlled to machine precise shapes and corners with exacting accuracy. Excellent shape accuracy maintains uniformclearance between the die and punch, thereby extending die service life.



Straightness: 0.5 μm (one side)

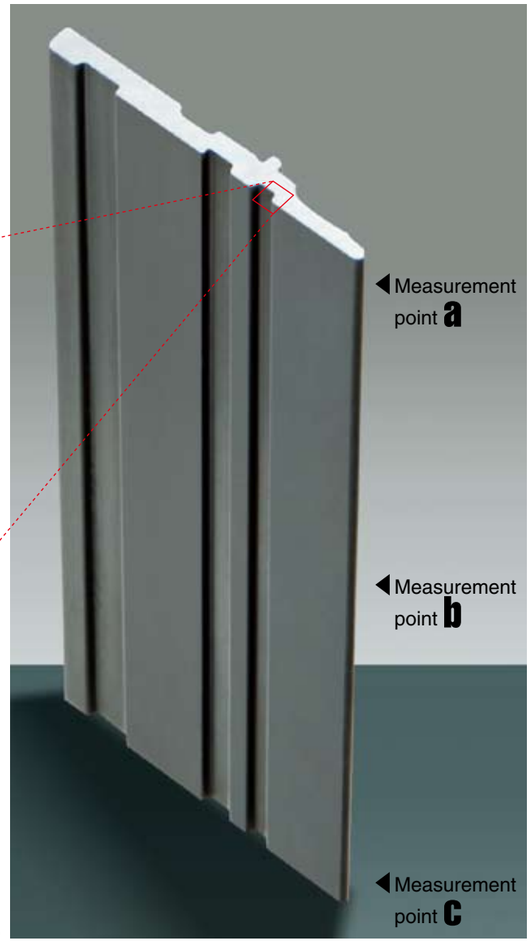
GS-Cut

Punches are machined with superb accuracy and very little straightness error, making it possible to eliminate burrs on precision stamped products.

(actual measured values)

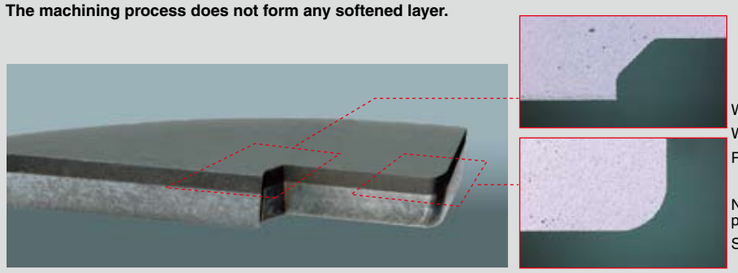
	Straightness (one side)
a	0 μm
b	0 μm
c	0.5 μm

Workpiece material : Tungsten carbide (G5)
Wire used : 0.2 mm dia. brass wire
Plate thickness : 50 mm
No. of machining passes : 8
Surface finish : 0.8 μm Rz (0.05μm Ra)



Machining of polycrystalline diamond (PCD)

The machining process does not form any softened layer.

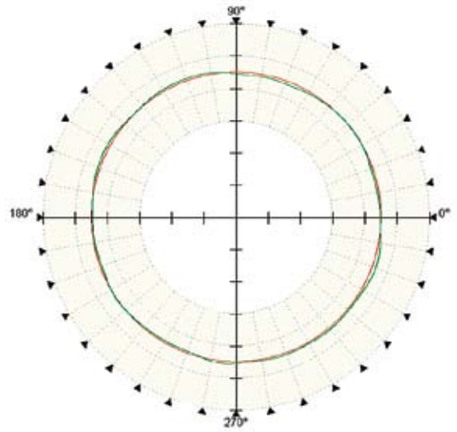


Workpiece material : PCD＋tungsten carbide
Wire used : 0.2 mm dia. brass wire
Plate thickness : PCD: 0.6 mm
: Tungsten carbide 1 mm
No. of machining passes : 5
Surface finish : 1.5 μm Rz (0.19μm Ra)
(actual measured value)

Outstanding performance

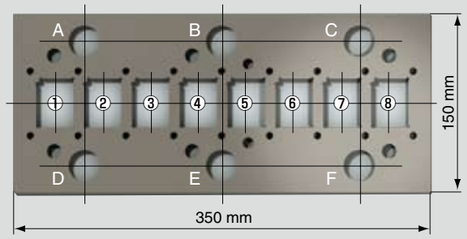
The UPV machines are built to deliver outstanding performance, thanks to their optimum axis layout, highly rigid construction and the rigorous inspections conducted in every assembly process.

Roundness: 0.8 μm (actual measured value)



Workpiece material : Tungsten carbide
Wire used : 0.2 mm dia. brass wire
Plate thickness : 20 mm
Machined diameter : 20 mm
No. of machining passes : 10

Pitch accuracy: ±1 μm (actual measured value)



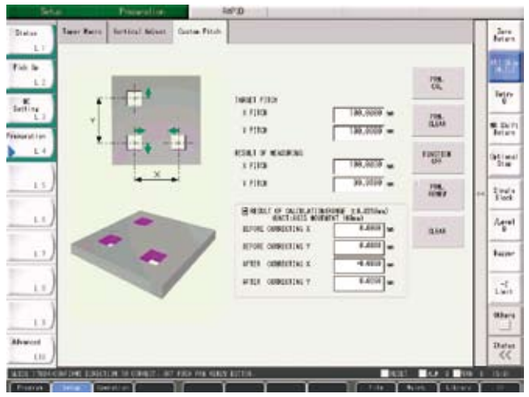
Pitch accuracy (μm)

	X	Y
A	O(datum point)	O(datum point)
B	−0.7	0
C	−1.2	+0.1
D	−0.2	+0.5
E	−0.7	+0.6
F	−1	+0.4

	X	Y
①	O(datum point)	O(datum point)
②	+0.2	+0.1
③	−0.2	0
④	−0.5	+0.2
⑤	−0.8	+0.2
⑥	−0.8	+0.3
⑦	−0.9	+0.2
⑧	−1	+0.3

Custom pitch function

This function facilitates high-accuracy pitch machining according to the accuracy standard of the measuring instrument used. This accomplished by simply entering the targeted pitch accuracy and the data measured for an actual machining job. This function is especially effective when the ambient temperature of the machining area differs from that of the measurement room.

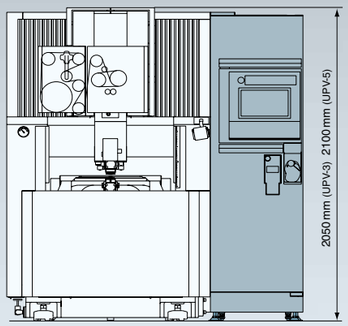


Cutting edge machining for stamping

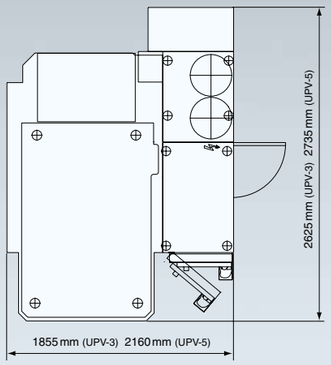
The PICO guide system facilitates high-accuracy machining of micro tapers. This new guide system, combined with precise servo control, produces uniform machining along the entire length of the cut detail.

Workpiece material : Tungsten carbide (G5)
Wire used : 0.2 mm dia.
Plate thickness : 20 mm
Length of straight portion : 5 mm
Taper angle : 6°
Surface finish : Straight portion (cutting edge) 0.5 μmRz (0.07 μmRa)
Taper portion 0.5 μmRz (0.07 μmRa)

Front view



Floor plan



Oil Dielectric Wire EDM for Tungsten Carbide Machining

UPV-3

Axis travels (X × Y × Z)	: 370 × 270 × 220*1 mm
Axis travels (U × V)	: ±50 × ±50 mm
Wire electrode diameter	: 0.05*2, 0.07, 0.1, 0.15, 0.2, 0. 25 mm
Dielectric fluid	: Oil-based

Oil Dielectric Wire EDM for Tungsten Carbide Machining

UPV-5

Axis travels (X × Y × Z)	: 550 × 370 × 220*1 mm
Axis travels (U × V)	: ±50 × ±50 mm
Wire electrode diameter	: 0.05*2, 0.07, 0.1, 0.15, 0.2, 0. 25 mm
Dielectric fluid	: Oil-based

*1 Z-axi ; 100 mm for machining; 120 mm for setup work *2 Optional specifications

Safety measures

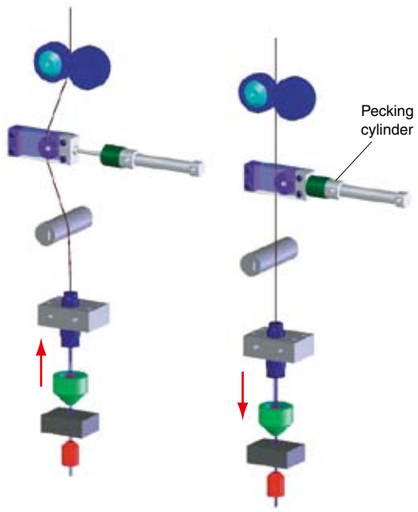
Splattering of the dielectric fluid is prevented to keep the shop environment clean.
Safety devices are also provided to deal with unforeseen situations.
• Dielectric fluid temperature sensor •Automatic fire extinguisher
• Flame sensor (optional specification) • Dielectric fluid splattering detection sensor

Automatic wire threading

High-performance twin-jet automatic wire threading system

The machines come with a twin-jet system that discharge small-diameter, high-pressure fluid jet through nozzles provided at the top and inside of the PICO guide on the upper head. The powerful twin jets and the wire pecking feed system thread the wire tip through the PICO guide at high speed. The wire tip removes any sludge sticking to the inside surfaces of the guide to achieve stable automatic threading at all times. Any burrs that develop at the wire tip are corrected to a sharp that allows the wire to pass through.

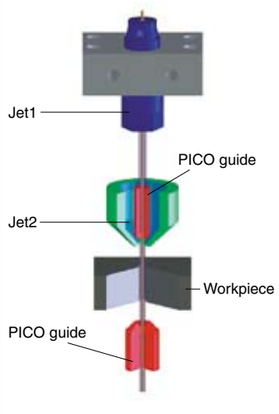
Pecking feed system



The pecking cylinder pulls the wire up during automatic threading

Twin jets discharge high-pressure streams of machining fluid to thread the wire through the PICO guide quickly.

Twin jet system



(patent pending)

Removal of sludge

After sludge removal

Suppressing guide wear

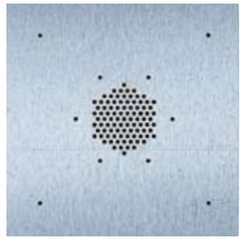
Sludge that sticks to the round guide can become an abrasive cause guide wear. The twin-jet system removes sludge from the PICO guide system every time automatic threading is done. This feature works to maintain high accuracy over long periods of use.

High-speed automatic wire threading

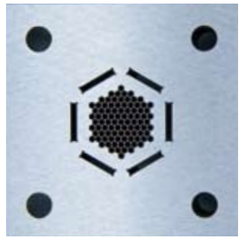
A new wire feed system accomplishes automatic threading in as little as 10 seconds.*High-speed pecking action enables quick retries if the wire is blocked when threading small-diameter start holes.

*The interval from the first-wire breakage to the next breakage in continuous automatic threading.
Threading conditions: wire dia.:0.2mm, plate thickness: 25mm, start hole dia.: 3mm

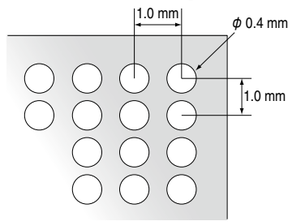
Automatic wire threading through 0.4mm diameter, start holes in close proximity at a 1mm pitch.



Star holes before machining



After machining



The wire is thread automatically through 0.4mm diameter start holes in close proximity at a 1mm pitch. The optimum fluid jet diameter can be selected to match the workpiece thickness and start hole diameter. Fluid jets are easy to replace and available in diameters of 0.5, 0.7, 1.0 and 1.5mm.

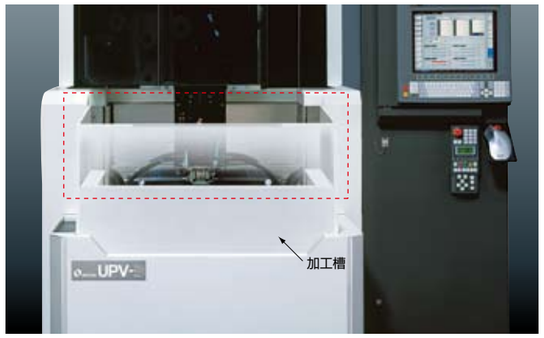
Further pursuit of enhanced ease of use

Operator friendliness design

UPV series adopt Makino's renowned drop tank design that opens wide on three sides for outstanding access to the workpiece. Thanks to this superb design, workpiece loading/unloading is done quickly and easily.

Wire reel loading ease

UPV series machines can be fitted with a 10kg wire reel . The position for installing the reel is designed low to reduce the operator's workload.



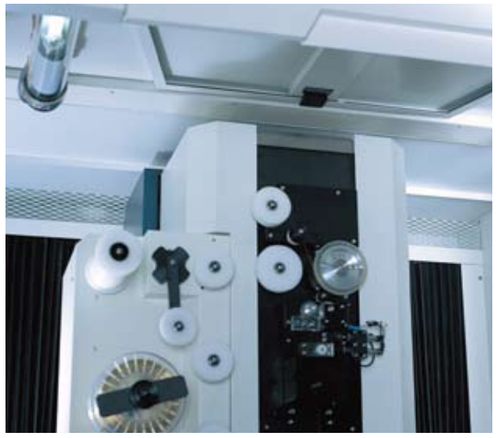
Machining fluid splatter guard

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.

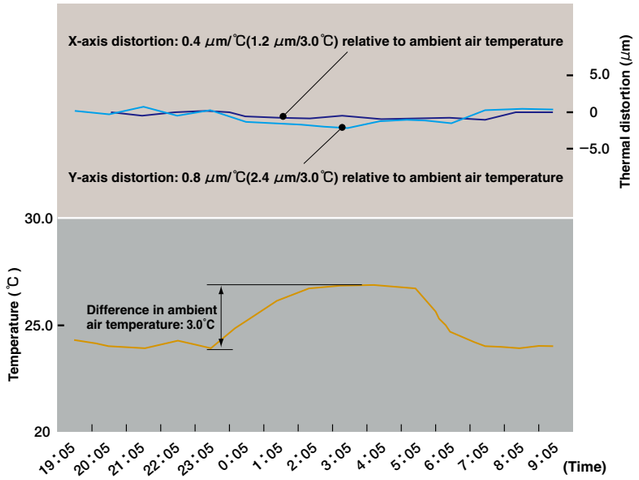
Thermal Guard (optional specification)

The entire machine is enclosed in covers to prevent machine attitude changes due to variation in the shop temperature. Temperature-controlled air is also circulated through the machining chamber and cast-iron structural components of the machine to ensure high accuracy over long hours of machining.



Machining camber inlet for temperature-controlled air

Thermal distortion in XY axes relative to ambient temperature change

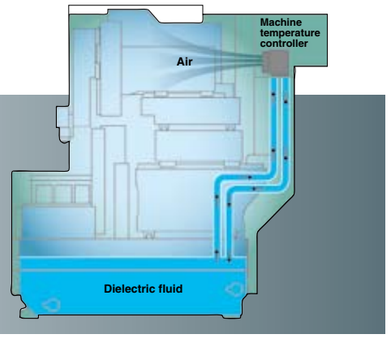


High machine rigidity facilitates precision EDM with an oil-based dielectric fluid

High machine rigidity was achieved by conducting structural analyses that assumed the toughest usage conditions in all axes. Stable machine accuracy is maintained against changes in the center of gravity accompanying axis motions and weight changes due to the workpiece load and the dielectric fluid fill level.

Machine temperature control

This interior of the machine is kept to the same temperature as the dielectric fluid, which is controlled by the dielectric fluid cooling unit. This reduces thermal distortion of cast iron machine components to provide high-accuracy machining. Moreover, the dielectric fluid cooling unit incorporates and inverter system to minimize the temperature difference between its On/Off states. The temperature is controlled with high accuracy to within ±0.1℃



Machine Specifications

			UPV-3	UPV-5
Travels	Travels (X×Y×Z axes)	mm	370×270×220*1	550×370×220*1
	Travels (U×V axes)	mm	±50×±50	←
Tables	Table working area	mm	630×450	810×550
Machining	Wire electrode diameter	mm	0.05*2, 0.07, 0.1, 0.15, 0.2, 0.25	←
	Maximum taper angle		±15 deg / 100t	←
Workpiece	Maximum workpiece size	mm	780×590×100	960×690×100
	Maximum workpiece weight	kg	350	550
	Dielectric fulid tank capacity	L	485	630
Machine	Machine dimensions (W×D×H)	mm	1855×2625×2050	2160×2735×2100
	Floor space (W×D)	mm	2580×3225	2885×3335
	Machine weight	kg	4100	5000

*1 Z axis : For machining 100 mm + For setup 120 mm
*2 Optional specifications

MGW-SV Power Supply Unit

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

Standard Specifications

- Oil-based machining specification
- PICO guide
- SPG Ⅱ Machining circuit
- Square table
- Automatic tank height setting function
- Machine temperature control
- Drop tank design
- Taper machining unit
- Automatic wire threading unit
- Fine-hole automatic wire threading unit
- Jet nozzle (1.0 mm dia.)*1
- Dielectric fluid cooling unit
- Work light (halogen light)
- Automatic fire extinguisher
- Automatic power failure recovery
- Power supply line filter
- Multifunction portable control panel
- Trackball mouse
- USB Flash Memory
- Custom pitch
- Ethernet 10/100 BASE-TAX

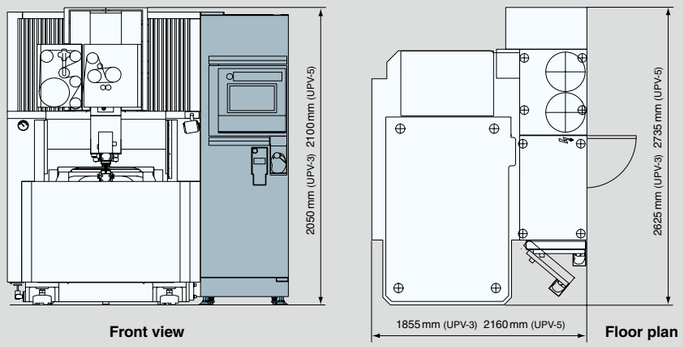
*1 The taper angle is limited depending on the jet nozzle diameter used.

Optional Specifications
★ Optional Equipment

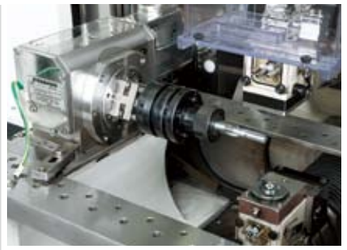
- Thermal guard specification
- 0.05 μm scale feedback (X, Y, U, V axes)
- High accuracy specification
- Additional filters (2 standard filters + 2 additional filters)
- NC index unit
- Special customer-specified machine colors
- ★ Large- capacity wire supply unit (20 kg)
- ★ Jet nozzle (0.5, 0.7, 1.5 mm dia.)
- ★ Workpiece clamp set
- ★ Workpice support
- ★ Maintenance set
- ★ Standard supplies set (standard set of consumables)
- ★ Alarm signal tower (1,2 or 3 lamps)
- ★ Program Master
- ★ Flame sensor

Optional specification are not retrofittable.

Standard Specification



The machine's specification can comply with CE regulation. Please contact your Makino sales representative for details.



NC index unit