MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow eco Changes

Wire-cut EDM Systems
MX Series

MX
series

BREAKTHROUGH INNOVATION

Exceeded the limit of accuracy, speed, and technology - oil wire-cut EDM

Reach the new top of wire-cut EDM

MX600

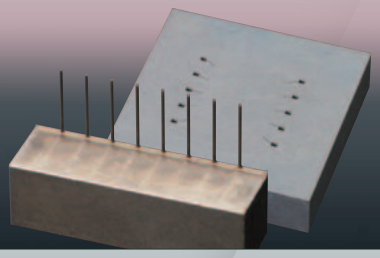
Wire-cut EDM Systems Line up

Model line-up covers your machining needs
from piece parts to super-accurate mold making

Ultrahigh accuracy machines

MX600

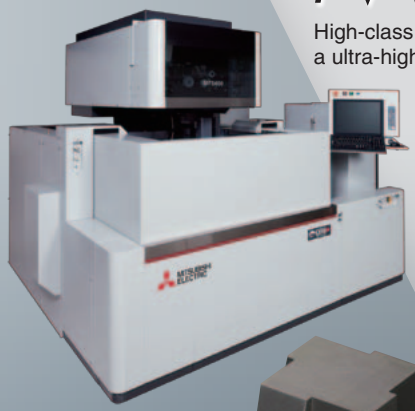
Flagship model incorporating
extreme precision machining

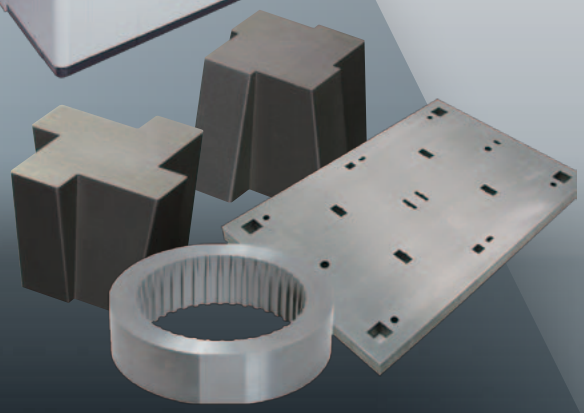


Oil

MP Series

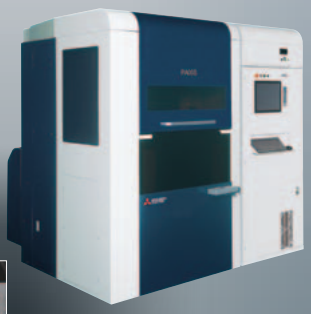
High-class model incorporating
a ultra-high accuracy machining

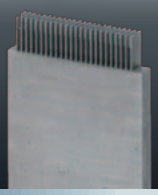




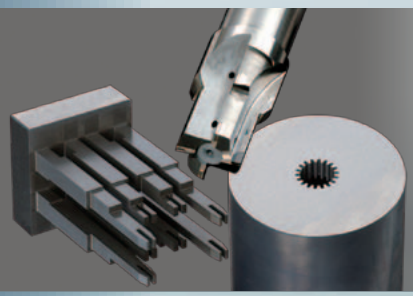
PA05S ADVANCE

Flagship model incorporating
extreme precision machining





Micro slit width 23μm



High-performance machine

MV-R Series

High-performance model innovating
next-generation high-performance machine

High-productivity machine

MV-S Series

Standard model pursuing
a cost performance standard machine

Ultra-high accuracy is achieved
in a precision parts machining
of electronic parts

ADVANCE PLUS
4-axis LSM (XYUV linear shaft motor)
Automatic vertical front door (with automatic lock)

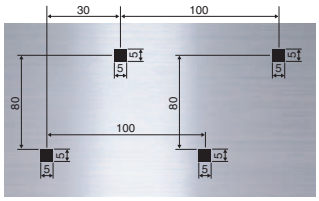
Oil wire-cut EDM with small footprint and small capacity reservoir

MX600

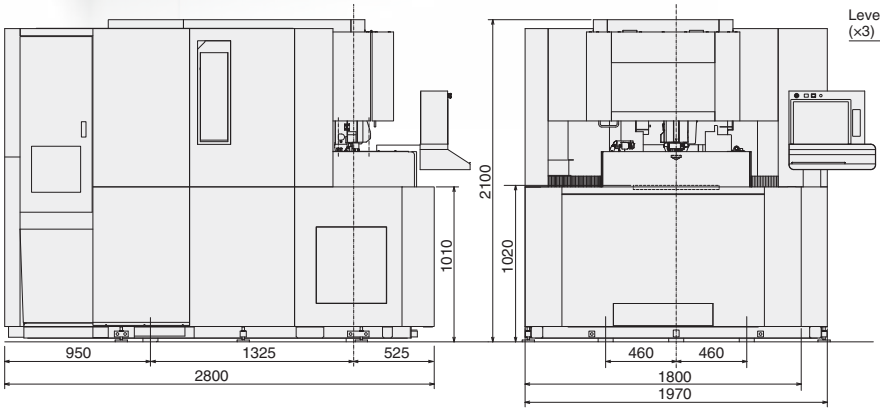
Machining accuracy ±2μm achieved (note 1)

(Note 1) The machining accuracy follows the Mitsubishi Electric machining conditons.

- Workpiece : Steel (PD613 t20mm (SKD11 improved steel)) HRC56-57 after quenching the workpiece, sub-zero treatment, high thermal tempering, stabilizing treatment and demagnetization are conducted.
- Wire electrode: ø0.2/BS
- Room temperature: 20°C±1°C

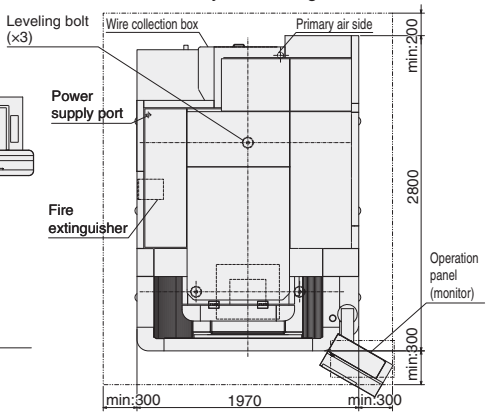


Outline drawing

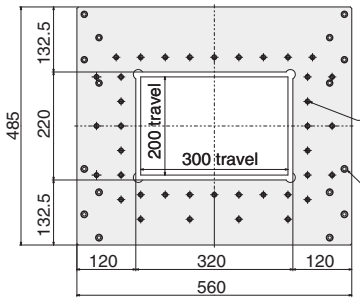


Layout drawing

[Unit : mm]



Machine unit dimensions Width : 1970mm, Height : 2100mm



One-piece 4-sided table hardened stainless steel

38-M8 tapped holes

Table mounting holes

Full-cabin specification

Standard machine specifications

Machine unit	Model		MX600
	Max. workpiece dimensions	[mm]	620×610×100
	Max. workpiece weight	[kg]	300
	Table dimensions	[mm]	560×485 (4-sided)
	Machine travels (XxYxZ)	[mm]	300×200×180 XY axis OPT-drive specifications
	Machine travels (UxV)	[mm]	±35x±35 UV axis OPT-drive specifications
	Max. taper angle	[°]	15°(max. 100mm)
	Wire diameter	[mm]	(0.03~)0.04~0.2
	Weight	[kg]	3400
Dielectric fluid reservoir	Tank capacity	[ℓ]	300 (oil)
	Filtration method		Paper filter (2)
	Dielectric fluid chiller unit		Unit cooler
Working tank	Internal dimensions	[mm]	662×688.5
	Fluid level adjustment range (from top of table)	[mm]	50~170

General input		[kVA]	13.5
Required air rate	Air pressure	[Mpa]	0.5~0.7
	Air rate	[ℓ/min]	75 or more

Standard functions

- Advanced manual control box
- Oil specialized power supply (nPV power supply)
- Super finish circuit (nFS circuit)
- LAN/W
- DNC
- File server connection (FTP)
- Angle Master (S/W)
- Anti-virus protection
- Sleep mode

Options

- Full-cabin specification
- ø0.03 automatic wire threading
- Infrared flame detector
- External signal output
- Angle Master ADVANCE Ⅱ (S/W)
- 3-color warning light
- Run timer
- Option box
- LED light
- High-accuracy wire-alignment device

Functions and Features

Stable and highly accurate machining by digital control for oil wire-cut EDM

ADVANCE PLUS control improves energy efficiency and security

Energy savings

- The amount of energy consumed in standby between job end/start times is greatly reduced (sleep mode)

ADVANCE PLUS × ODS × nPV

Power consumption reduced up to 69%

Compared to conventional Mitsubishi Electric Wire-cut EDM (FA Series)

Security

- Anti-virus protection is provided as standard by one of the world leaders in security control
- Pattern file can be used semi-permanently without renewal

ADVANCE PLUS × McAfee An Intel Company

McAfee is a registered trademark of McAfee, Inc. in the United States and other countries

Defends machines against the threat of computer viruses (LAN, USB)

High-value-added function is available (option) Angle Master ADVANCE Ⅱ

- Taper accuracy of ±0.01° and dimensional accuracy of ±5μm are realized
- ODS provides high accuracy even when cutting a UV independent tapered shape
- Taper accuracy is improved regardless of wire angle direction using Angle Master ADVANCE Ⅱ

Angle Master ADVANCE screen

Measuring jig

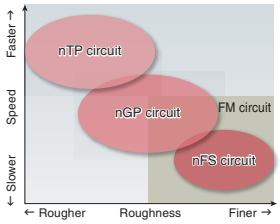
Productivity

► Refer to page 9-10

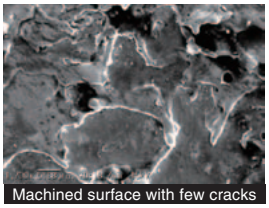
ADVANCE PLUS

nPV power supply specialized for oil wire-cut EDM

- Submicron surface finish with minimal cracks is achieved using nFS circuit
- High-speed machining is realized even using oil wire-cut EDM
- ø0.04mm wire electrode capable of achieving highly accurate small in-corner R(Minimum in-corner R 25µm)



nPV power supply



Machined surface picture

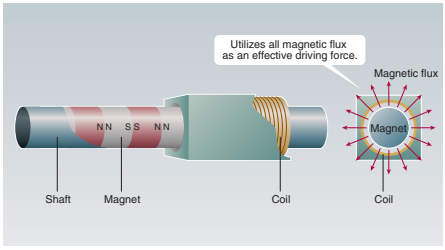
nPV
nano Pulse V-power supply

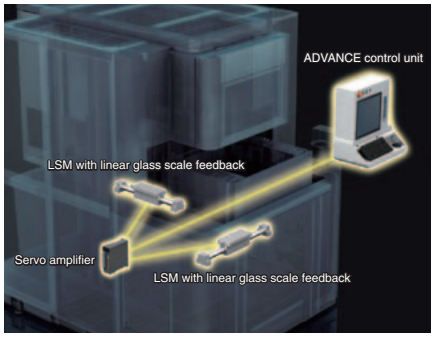
Oil specialized power supply

Accuracy

► Refer to page 11-12

- Equipped with a linear shaft motor
- Highly rigid structure and high-accuracy linear guide
- High-speed fiber-optic communications and a linear shaft motor Combined synergistically





Optical drive system

ODS
Opt Drive System

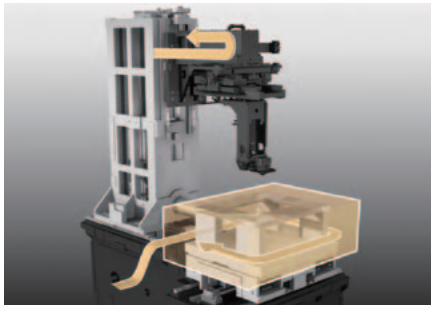
Linear shaft motor + High-speed fiber-optic communications

Stability

► Refer to page 13-14

ADVANCE PLUS

- Full-cabin specification (option) shuts out the effect of external temperature fluctuation
- Ultrahigh accuracy is realized by controlling temperature of machine body synchronously with dielectric fluid temperature (Thermal buster)
- Isolation structure avoids heat and vibration influence to the machine body
- Optimum structure shape obtained with CAE analysis, and highly rigid cast materials are incorporated



Temperature change of machine body is reduced by thermal buster

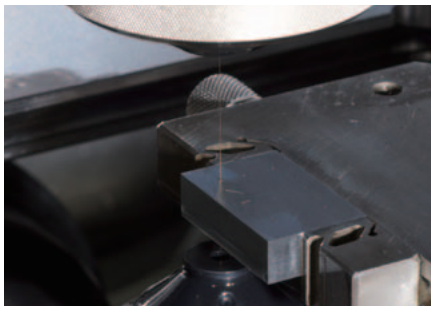
RIS
Rigidity & Isolation Structure

High rigidity + Structure with heat / vibration isolation

Intelligent AT

► Refer to page 15-16

- ø0.03mm automatic wire threading (option)
- Automatic threading of ø0.04mm wire electrode available
- Stable automatic threading is realized with retry function for all wire electrode diameters available
- Wire threading into a small hole for small shape machining is possible.



Automatic threading with ø0.05mm wire electrode into the starting hole

Intelligent AT

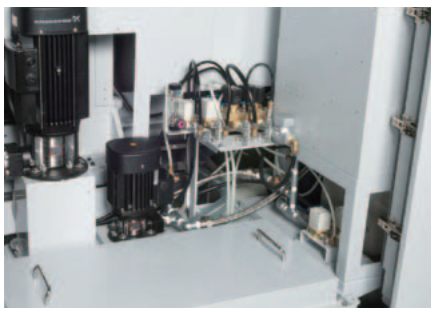
Innovative automatic wire threading

Usability

► Refer to page 17-18

ADVANCE PLUS

- Intuitive operations using touch-panel control and on-screen instructions
- Maintenance space is arranged in one place to improve workability



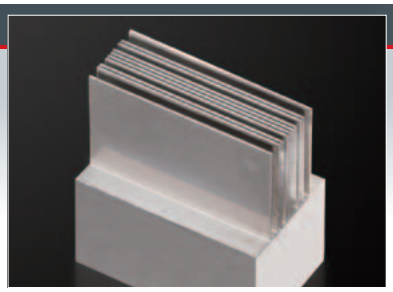
Filter mounting location at the right side of machine

NUI
Natural User Interface

Outstanding usability

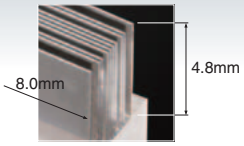
Machining Samples

Pin shape machining

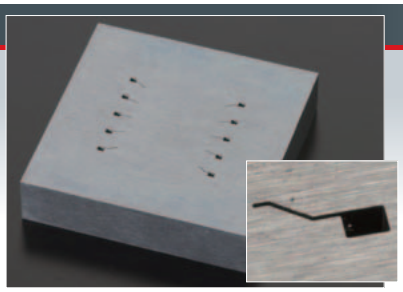


Model	MX600
Electrode material	ø0.05 / SP
Workpiece	Tungsten carbide
Workpiece thickness	Length 8mm Side 0.08mm
Surface roughness	Rz0.4μm/Ra0.05μm
Machining accuracy	±1μm

- Shape accuracy of ±1μm is realized using nPV power supply and CMA.
  L/D: 60 (0.08mm width and 4.8mm length)



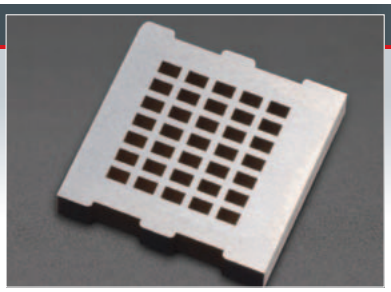
Lead frame



Model	MX600
Electrode material	ø0.05 / SP-Zn
Workpiece	Tungsten carbide (KD20)
Workpiece thickness	6mm
Surface roughness	Rz0.3μm/Ra0.04μm
Machining accuracy	Shape 1μm Pitch ±1μm

- Highly accurate pitch machining is possible using high rigidity and structure with heat/vibration isolation
- Shape accuracy of ±1μm is realized using nPV power supply and CMA
- Stable automatic threading is realized using Intelligent AT (wire insertion into the starting hole of ø0.15mm)

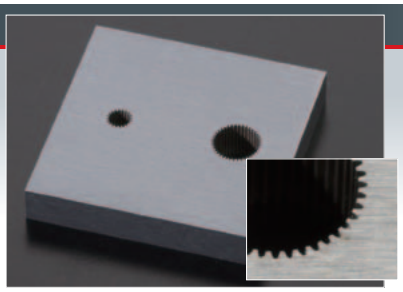
Pitch machining



Model	MX600
Electrode material	ø0.1/BS
Workpiece	Tungsten carbide (G5)
Workpiece thickness	5mm
Surface roughness	Rz0.4μm/Ra0.05μm
Machining accuracy	Pitch ±2μm

- Pitch accuracy of ±1μm is realized during long-time continuous machining
- Stable automatic threading is realized using intelligent AT during multi-machining

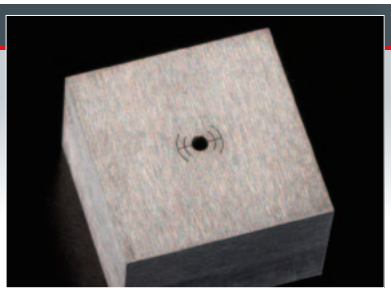
Highly accurate gear machining



Model	MX600
Electrode material	ø0.05/SP-Zn
Workpiece	Tungsten carbide (KD20)
Workpiece thickness	3mm
Surface roughness	Rz0.3μm/Ra0.04μm
Machining accuracy	±1μm

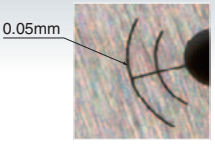
- High-grade machining with super-fine surface roughness is realized using nPV power supply
- Highly accurate gear machining is realized using ODS and CMA

Slit machining

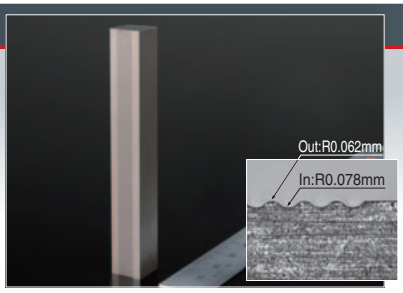


Model	MX600
Electrode material	ø0.03/tungsten
Workpiece	Tungsten carbide
Workpiece thickness	10mm
Surface roughness	Rz0.5μm/Ra0.06μm
Machining accuracy	±1.5μm

- Shape accuracy of ±1.5μm with 50μm-slit is realized using nPV power supply and servo control



Punch machining



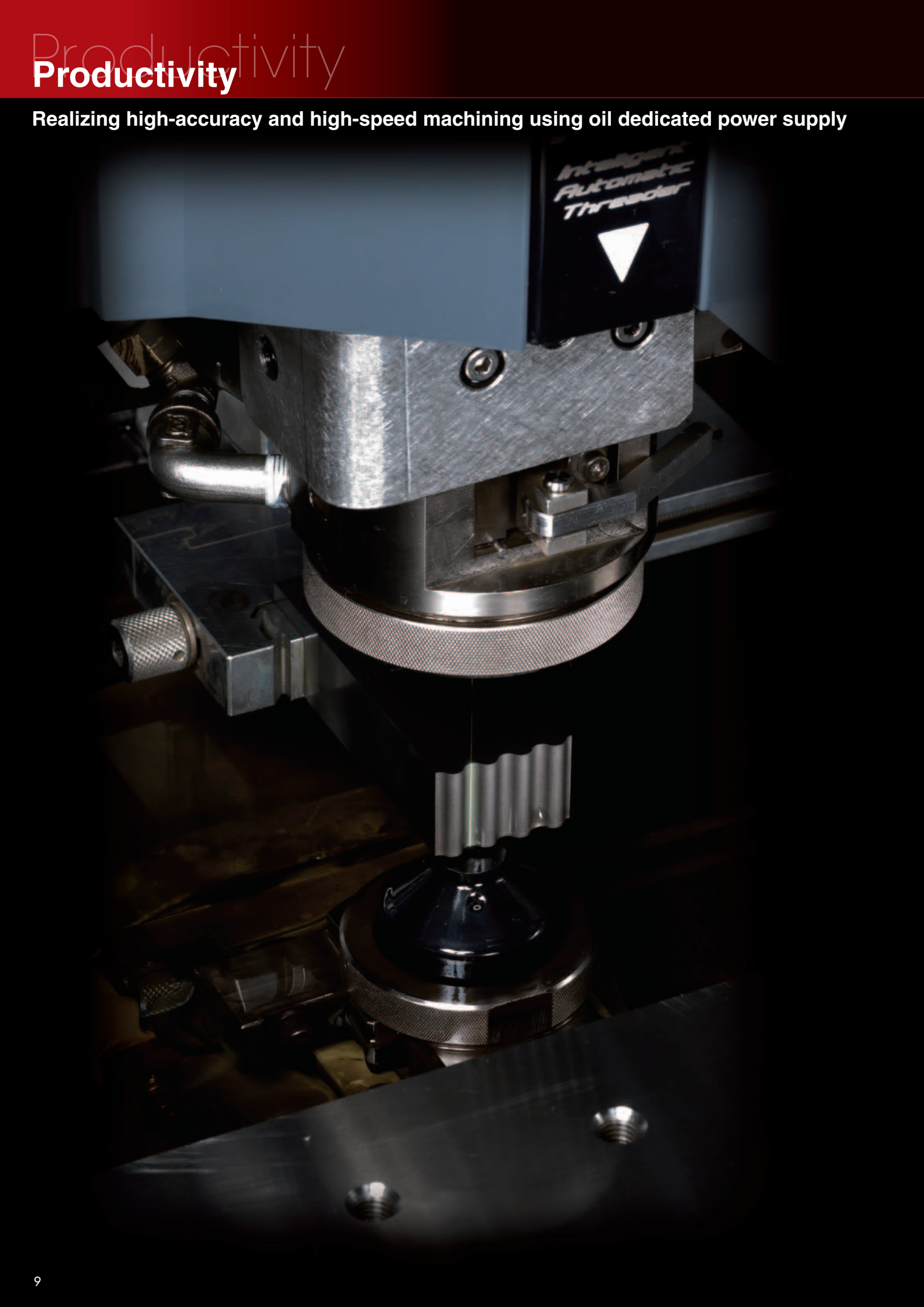
Model	MX600
Electrode material	ø0.1 / SP
Workpiece	Tungsten carbide
Workpiece thickness	80mm
Surface roughness	Rz0.61μm/Ra0.08μm
Machining accuracy	±1μm

- Shape accuracy of ±1μm and ultrafine surface finish are realized with a 80mm-thick workpiece using nPV power supply
- A corner accuracy of ±1μm is realized using ODS and CMA

The listed machining results are all based on in-house conditions and measurements.
(Note) JIS B0601: '01 and ISO 4287: '97 / ISO 1302: '02 compliant (Rz=conventional notation Ry)

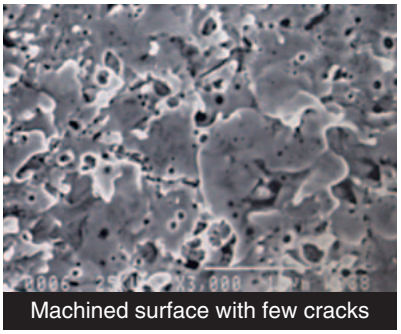
Productivity

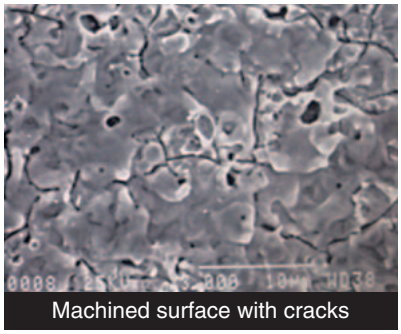
Realizing high-accuracy and high-speed machining using oil dedicated power supply



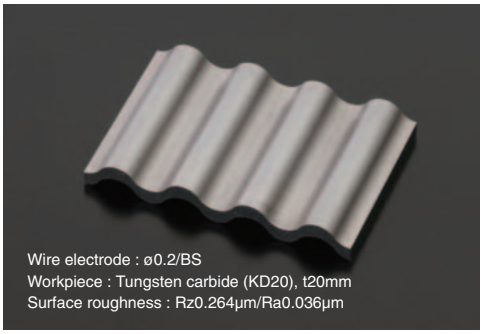
Oil dedicated nPV power supply

●Submicron surface finish with minimal cracks is achieved using nano-pulse control


Machined surface with few cracks

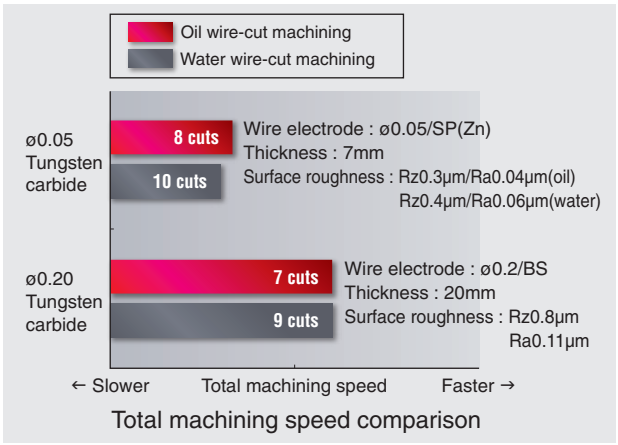

Machined surface with cracks

Machined surface picture



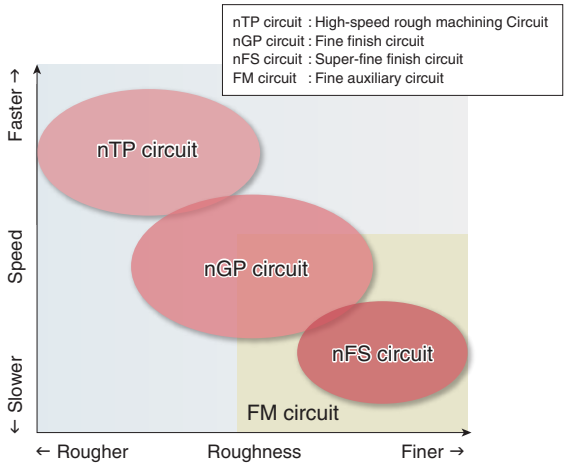
Optimum surface roughness

●Total machining speed is improved by realizing better surface roughness with good accuracy for the first cut, thus reducing the number of cuts



Total machining speed comparison

●Integrates the power supply technologies of both water wire-cut EDM and oil die-sinking EDM

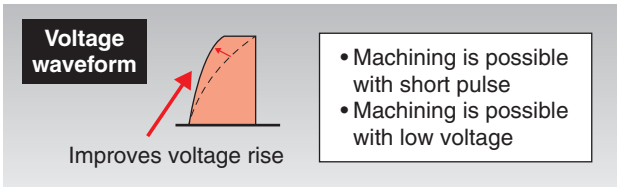


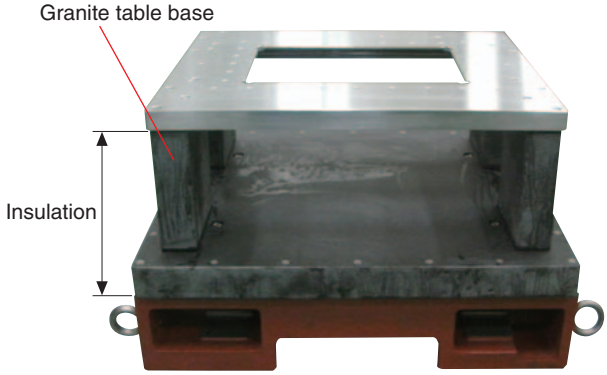
nPV power supply

Insulated worktable structure

●Improves surface finish based on electrical insulation and low-voltage machining conditions

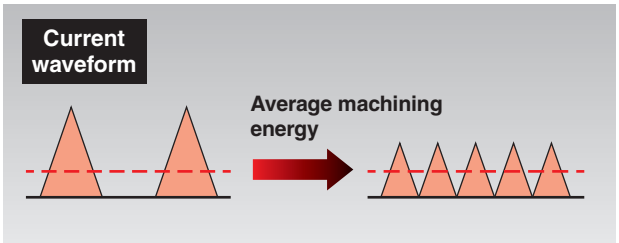
●Improves voltage rise by reducing floating capacitance





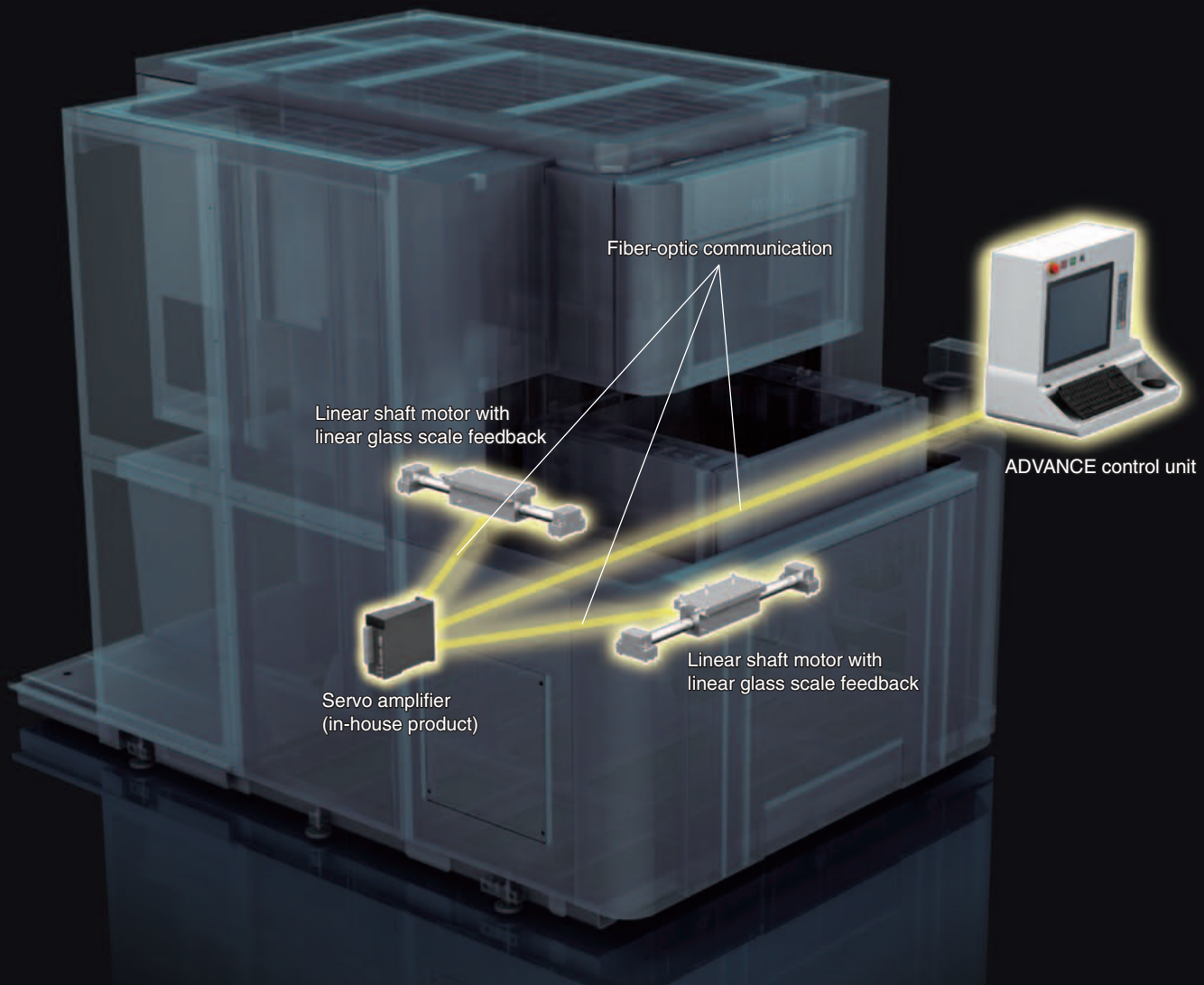
Nano-pulse control

●Improves surface finish and machining speed based on short-pulse and high-frequency machining conditions



Accuracy

Next-generation drive system and a highly sophisticated power supply control



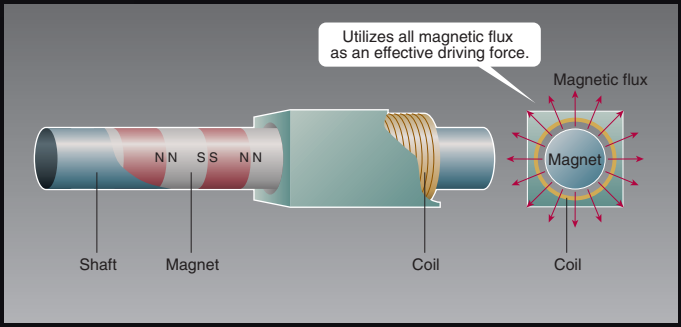
OPT-drive system ODS (Optical Drive System)

High-speed response OPT-drive system synergistically improves machining speed

- High-speed fiber-optic communications with quadruple speed
- Nano-level highly accurate active motion control
- Real-time sensing of machine and discharge conditions
- Coordinate control of machining path and power supply

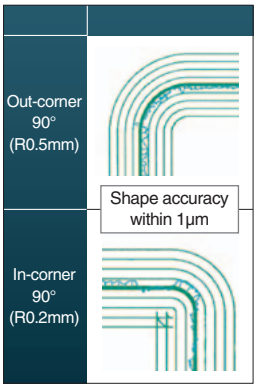
Linear shaft motor

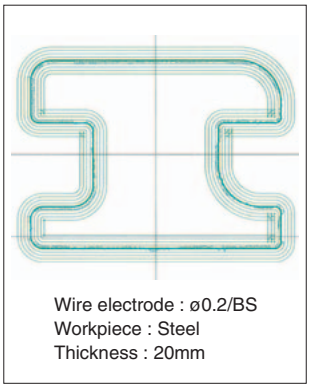
- Power consumption is reduced by utilizing a full 360° magnetic flux as the effective driving force
- Highly accurate axis movement is possible without any backlash
- Non-contact power transmission ensures stable and accurate axis movement for many years

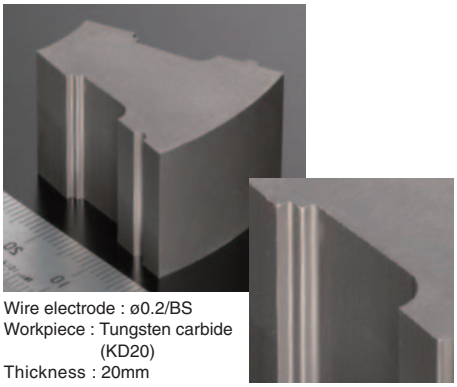


Corner machining control (CMA control : Corner Master Advance)

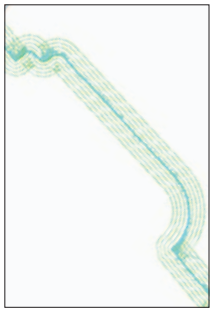
- Improves machining accuracy at extremely small in-corners and out-corners
- Realizes highly accurate shape machining even for complicated geometries with several corner types and sizes
- Corner accuracy can be controlled easily by the operator




Wire electrode : ø0.2/BS
Workpiece : Steel
Thickness : 20mm

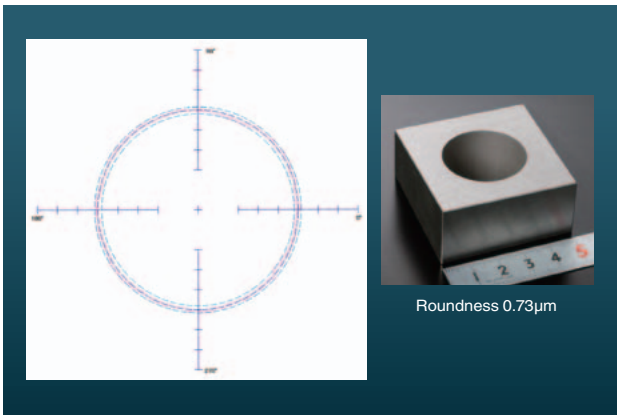

Wire electrode : ø0.2/BS
Workpiece : Tungsten carbide
(KD20)
Thickness : 20mm

Shape accuracy within 1µm



Circular accuracy (servo control : AFC Ⅲ)

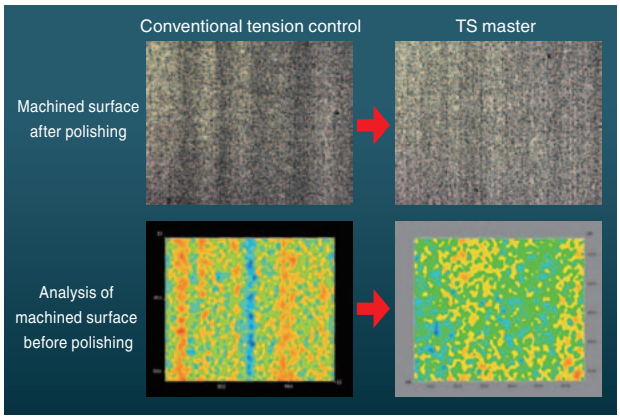
- Improves trajectory using servo control (AFC Ⅲ)



(Note) This data follows the Mitsubishi Electric machining conditions

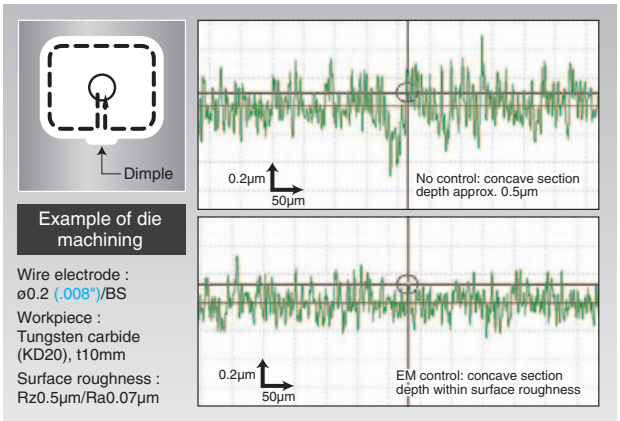
Wire tension control (TS Master)

- Reduces tension fluctuation for more stable machining
- Reduces lines on the machined surface after polishing



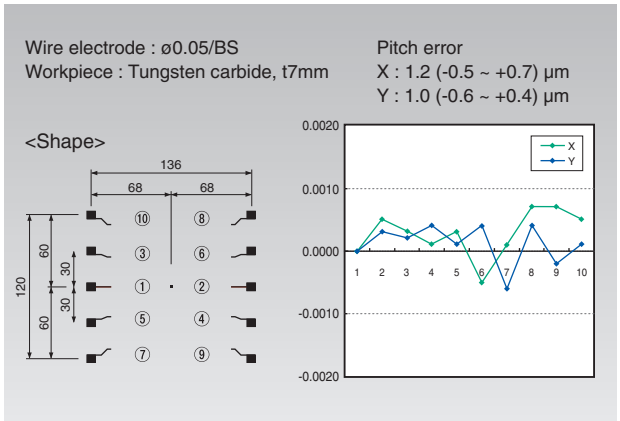
Under-cut (dimple) reduction control
(EM control : Entrance Master)

- Reduces dimples at the approach section
- Allows shape adjustment from convex to concave
- Greatly reduces polishing time



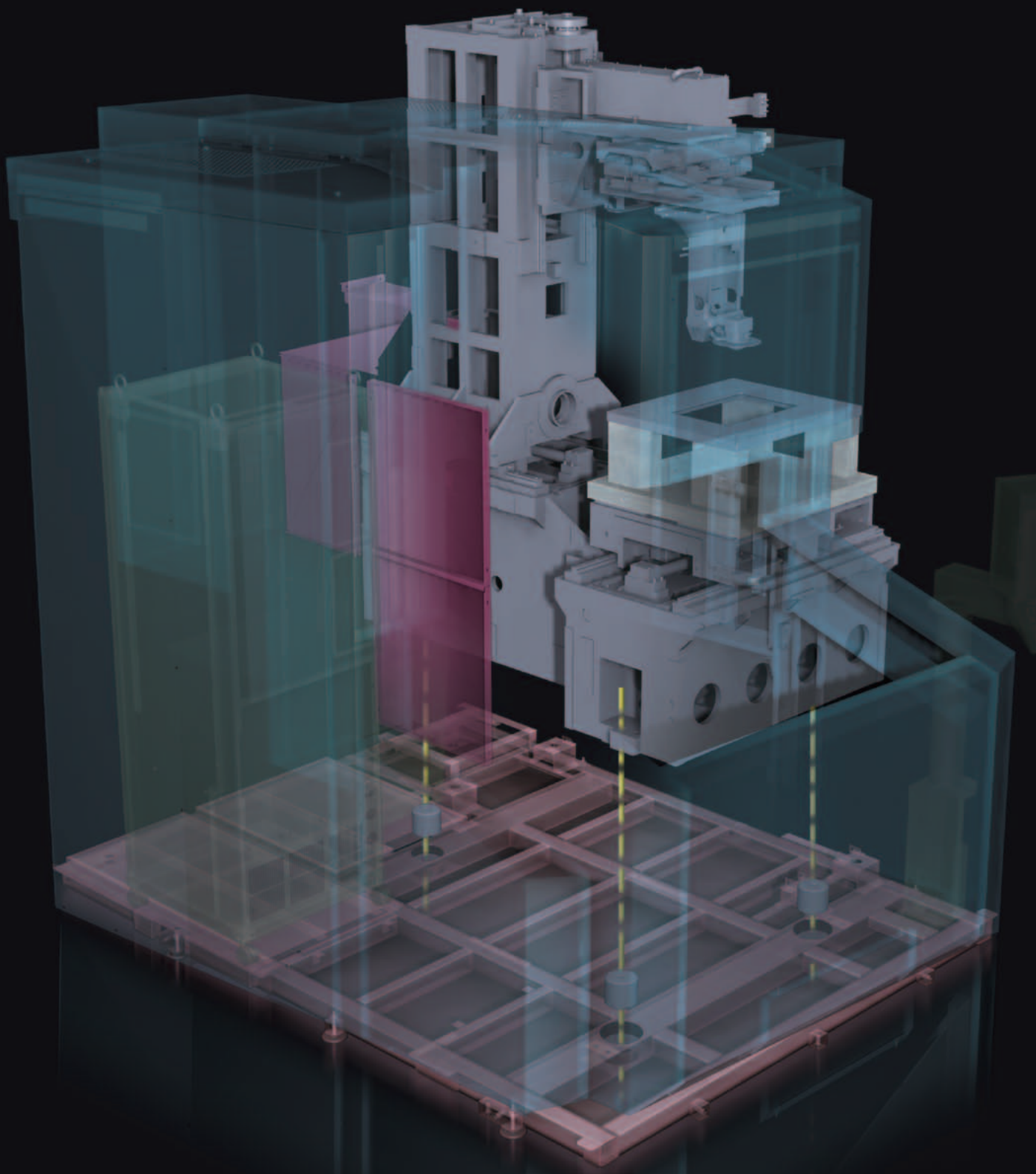
Pitch accuracy

- Ultrahigh accuracy is achieved with the OPT-drive system
- Stable machining is realized by the development of the isolation structure and fluid temperature control



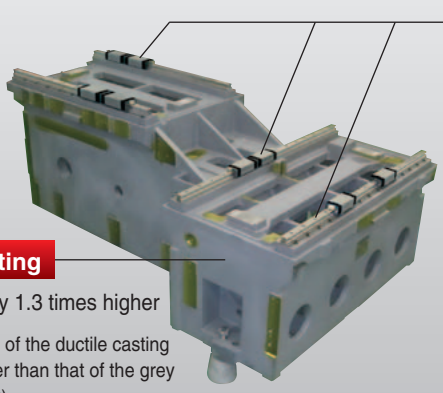
Stability

Original high-accuracy technologies for changing work environments



Highly rigid structure

●Machine rigidity using the high stiffness structure materials increased 30%

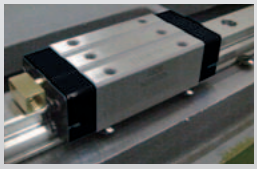


Ductile casting

●Casting rigidity 1.3 times higher

(Young's modulus of the ductile casting is 1.3 times higher than that of the grey iron casting F300)

Long linear guide



●Ultra-high accuracy linear guides are carefully installed precisely machined mounting surfaces to provide a linear straightness of 1-2μm with the long linear guide block.

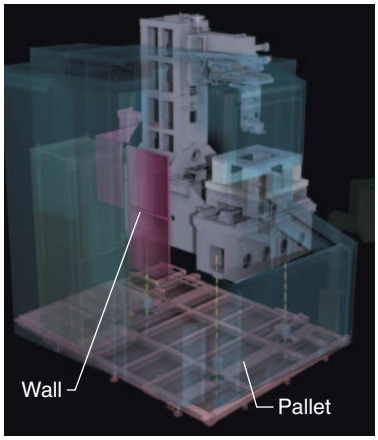
●This effort ensures precise linear movement by reducing waving of the linear guide.

Isolation structure

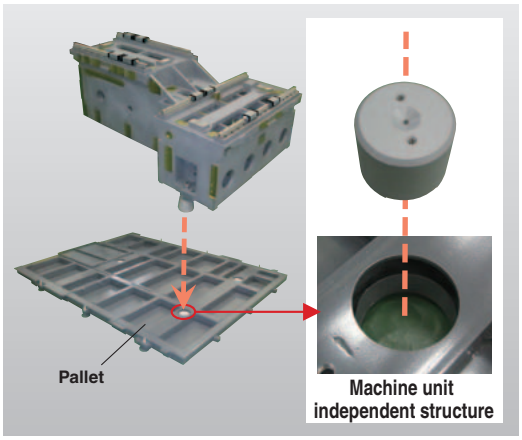
●Shuts out the effect of accuracy degradation by isolating from heat and vibration sources

●Realizes stable machining during long run machining by reducing heat effect using granite table base

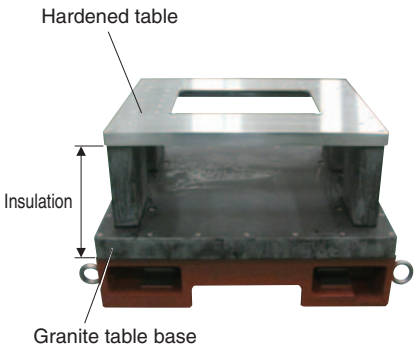
●Full-cabin specification (option) shuts out the effect of external temperature fluctuation



Isolates from heat source



Isolates from vibration source



Isolates from heat source

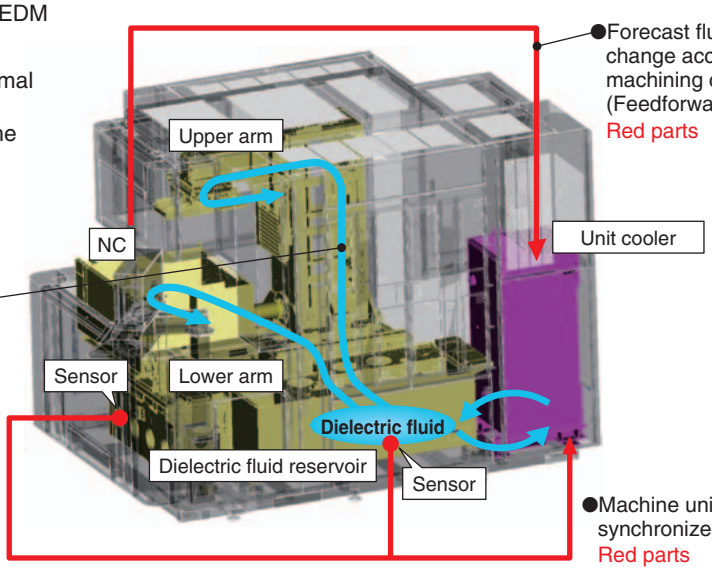
Fluid temperature control

●A chiller system is used to cool the dielectric fluid to remove the heat generated by the EDM machining process.

●This process is synchronized through thermal sensors on the machine casting while circulating the fluid through key areas of the machine structure (Thermal buster).

●Provides high-capacity unit cooler

●Reduces temperature difference of the upper/lower arm and the worktable by circulating temperature controlled fluid
Blue parts



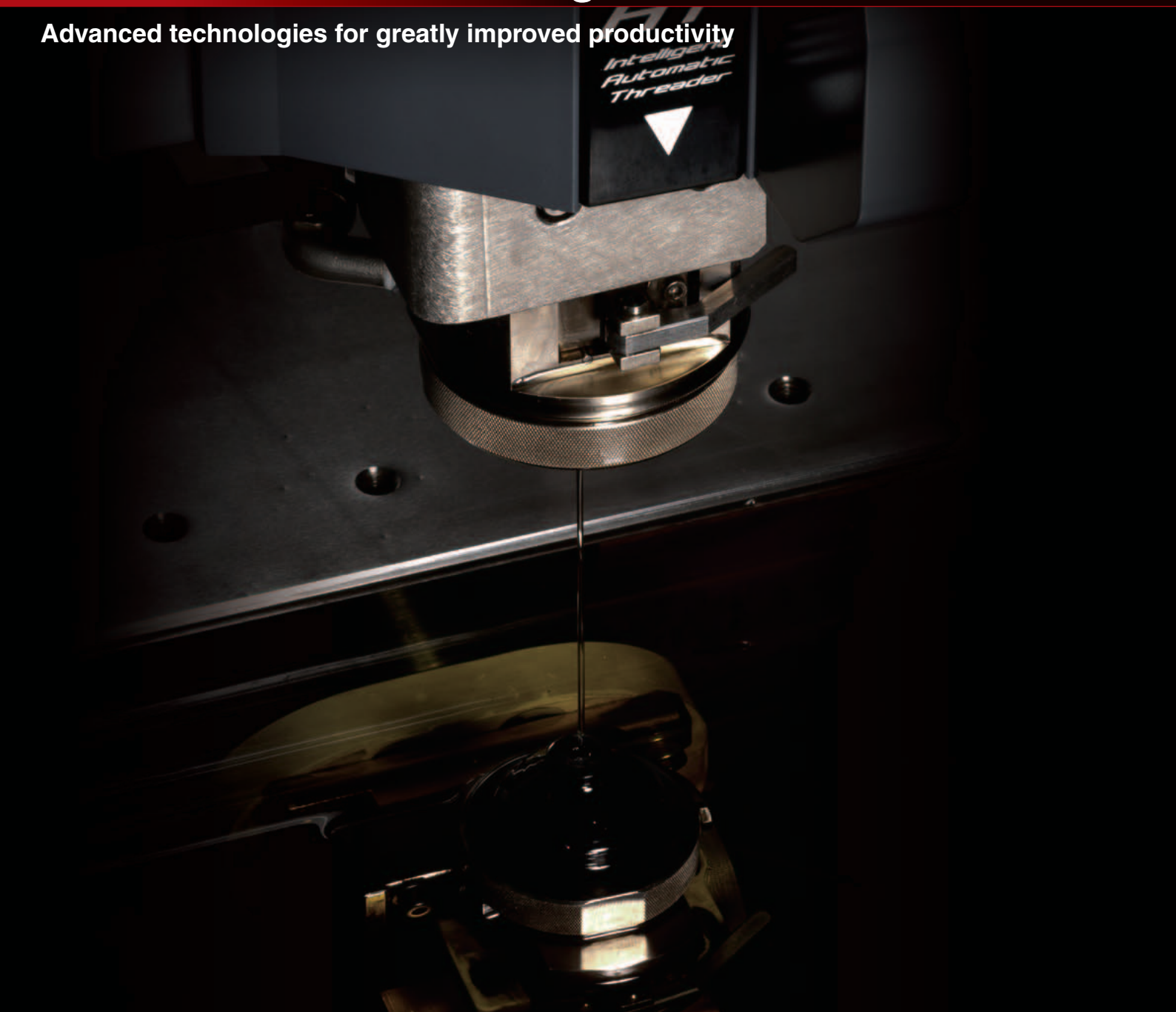
●Forecast fluid temperature change according to machining conditions (Feedforward control)
Red parts

●Machine unit temperature synchronized control
Red parts

IntelligentAT

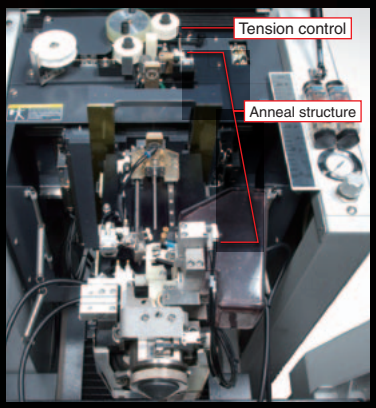
Automatic Wire Threading

Advanced technologies for greatly improved productivity

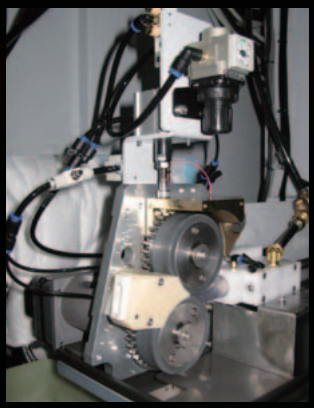


Realizes stable automatic threading with fine wire electrode

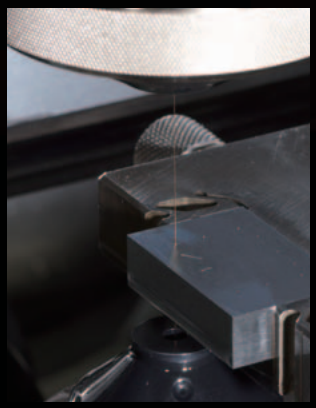
- Enhances fine wire feed performance using improved tension control
- Reduces wire dragging at the collection roller using improved wire collection structure (anti-scattering of dielectric fluid)
- Improves fine wire inserting rate using improved wire feed force



Automatic wire threading unit



Wire collection structure
(anti-scattering dielectric fluid)



Threading with ø0.05mm wire electrode

Small hole insertion

Hole diameter : ø0.15
Wire electrode : ø0.05/SP
Thickness : 10mm
Jet nozzle : ø0.3 specialized

Wire inserting rate 100%
(90% or more without retry function)

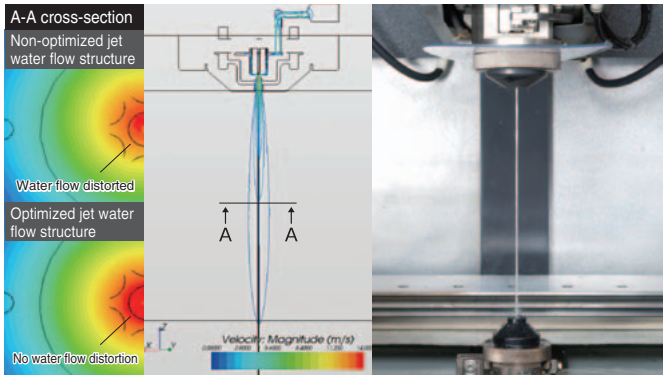
Wire electrode annealing structure

- Improved wire annealing power supply and tension control enhance wire threading (producing a curl ratio of 10% or less), which straightens the natural curl caused by spooling
- The greatly lengthened distance of annealed wire improves automatic wire threading for thick workpieces

*A curl ratio of less than 3% applied for the conventional model (FA Series)

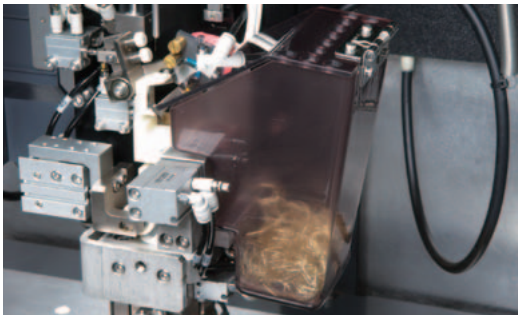
New jet water flow mechanism

- Flow analysis simulation has been used to optimize the water flow mechanism for straightening the jet stream, which improves wire threading for thick workpieces



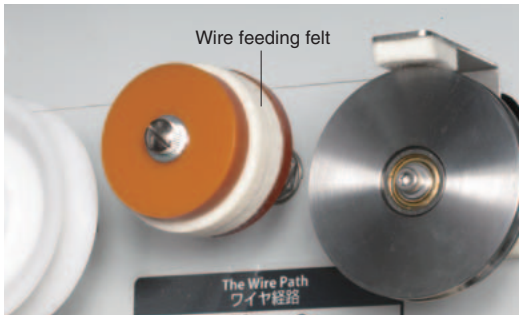
Wire collection unit

- Broken wire collection, which clears the upper guide after a wire break, has been improved so it handles even highly curled wire without hesitation



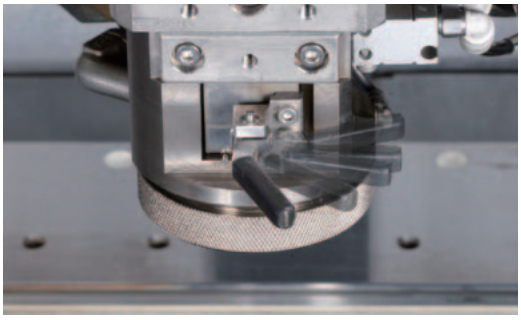
Wire feed wiper

- A felt wiper added to the wire path removes manufacturing impurities from the wire surface, which reduces slippage on the drive rollers



One-touch lever clamp mechanism

- New one-touch lever clamping system provides quick, easy and accurate power feed indexing
- The clamp lever accurately locates the power feeder with repeatable torque, unlike systems that use the set-screw method

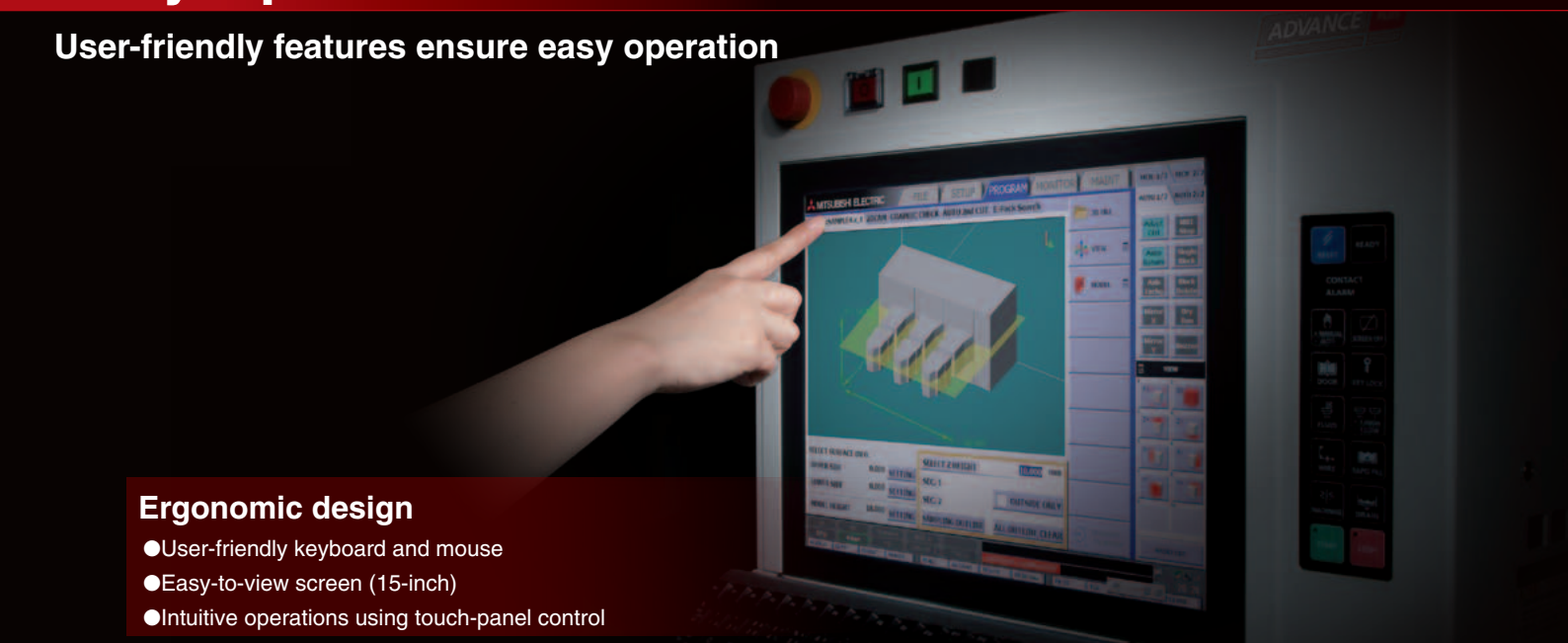


Diamond guide

- A round diamond guide is used to provide the best accuracy for both straight and taper cutting applications
- Both upper and lower guides can be replaced by simply unscrewing the flush cups

Easy Operation

User-friendly features ensure easy operation



Ergonomic design

- User-friendly keyboard and mouse
- Easy-to-view screen (15-inch)
- Intuitive operations using touch-panel control

Set-up screen

- Outstanding graphics supporting easy operations

Work alignment function

- By measuring the workpiece flatness with a dial indicator, the wire tilt can be automatically compensated to match the angle of the part, further reducing set-up time

Machining condition search function

- Interactive operation easily creates NC data with machining condition
- Job scheduling adjustment uses the schedule call back, extra job insertion and ME-pack feature

*ME-pack is a package of machining processes including offset, machining speed and adaptive control setting

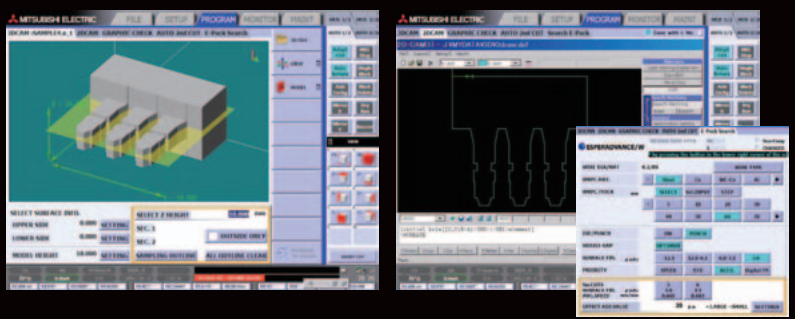
High-accuracy taper machining (Angle Master (S/W))

- Angle Master function realizes precise machining of large tapered angles
- Optimum taper specifications are automatically set to match the wire electrode angle

Advanced 3D data for machine control

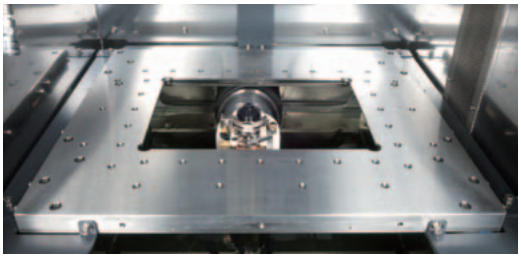
- Reads and displays 3D CAD data (Parasolid format *1) with a built-in 3D CAM
- Extracts 3D model contours with a built-in 3D CAM
- Creates NC data (EM-pack), including machining conditions, with a built-in CAM
- Improves machining performance with a 3D-PM (3D model shape analysis → optimum machining control)

*1 Parasolid is a registered trademark of UGS PLM Solutions Co., Ltd.



Hardened table and all stainless steel structure

- Equipped with a hardened table
- The working tank and dielectric supply unit are made of stainless steel
- Resistant to deterioration by dielectric fluid and sludge



Wire alignment

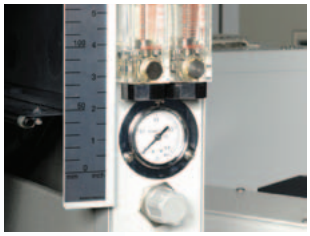
- Highly accurate wire alignment is easy using the wire-alignment device (optional)
- Taper parameter set-up is simple using the wire-alignment device

Precise positioning

- Highly accurate workpiece pick-up positioning is possible with the water flow on or when a workpiece is submerged

Dielectric fluid flow meter and jet flow adjustment valve

- Dielectric flow meters are easy to read
- The adjustable jet flow valve increases the range of work that can be done



Wire travel system

- The stability of the wire tensioning system is improved by a felt wiper and felt keeper pads that eliminate the chance of the wire jumping off the rollers

Dielectric fluid supply unit

- A large access window into the fluid tank provides easy entry for cleaning

Set-up operation

- A tool box can be put under the control panel

Filter pressure gauge and cleaning hose cock

- Easy to read the filter pressure
- Easy to access cleaning hose cock for work tank cleaning

Broken wire collection box

- Conveniently located at the front for easy maintenance

Unit cooler filter

- Chiller air filter

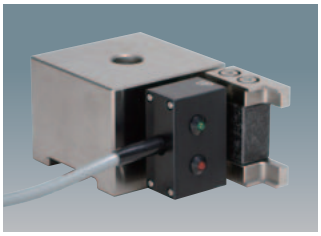
Options and Power Supply / Control Specifications

Options

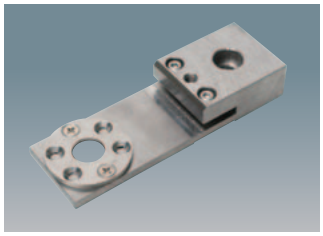
◎:Standard equipment ○:Can be retrofitted ●:Factory installation only

Option name		MX600
Machine unit	ø0.03 automatic wire threading	●
	Full-cabin specification	●
	20kg wire spool unit	○
Communications	External signal output *1	○
	LAN/W *2	◎
	DNC	◎
	File server connection (FTP) (S/W)	◎
Taper machining	Angle Master guide kit (H/W) ø0.2 (±30°) *3 *4	○
	Angle Master guide kit (H/W) ø0.2 (±45°) *3 *4	○
	Angle Master ADVANCE Ⅱ (S/W) *4	○
	Angle Master ADVANCE Ⅱ (measuring jig) *4 *5	○
Safety	Infrared flame detector	●
Display	3-color warning light *1	○
	Run timer *1	○
	Option box *6	○
Others	Instruction manual (paper edition)	○
	LED light	○
	Wire alignment device	○
	High-accuracy wire alignment device	○
Paint color designation		●

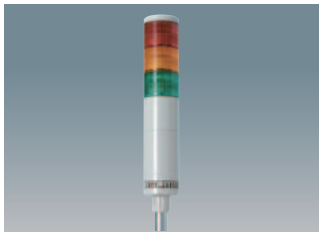
*1 Option box is needed.
*2 LAN cable should be all straight wiring type with shielding connector, category 5 (100BASE-TX compliant), STP (four shielded twist pair).
*3 Standard diamond guide and nozzle (ø7(.28")) is used for taper machining of 15 degrees or less. Angle Master guide kit (H/W) is needed for taper machining of 15 degrees or more (wire electrode for taper machining should be used).
*4 Angle Master ADVANCE (measuring jig) is needed for using Angle Master ADVANCE (S/W).
*5 Can be less than ±30 degrees when using Angle Master ADVANCE.
*6 Necessary for mounting external signal output, 3-color warning light and run timer.



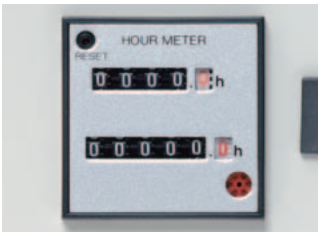
High-accuracy wire-alignment device
This device aligns the wire electrode with the table



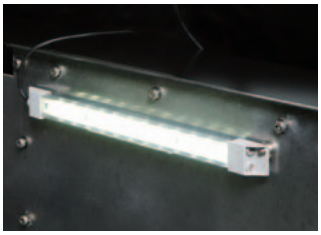
Angle Master ADVANCE Ⅱ (jig)
Measuring jig to be used for Angle Master ADVANCE Ⅱ (S/W)
Use for taper degree calculation in UV axis directions



3-color warning light
Indicates machine operating status

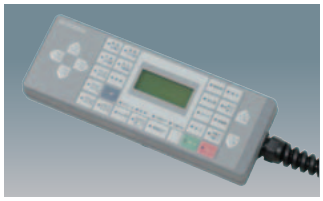


Run timer
Indicates accumulated machining time

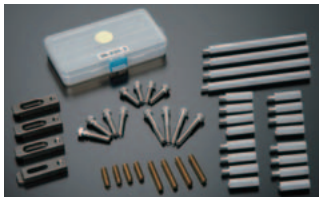


LED light
High-brightness LED lighting

Standard



Advanced manual control box
The advanced manual control box has an LCD display, and can be used for positioning, zero set and AT operations

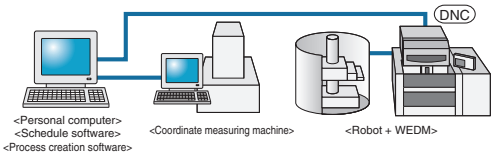


Workpiece clamp set
Clamp jigs dedicated for use in holding workpieces

Tools (tool box)

Wire-cut EDM automation system

- Accumulates workpiece measurement data
  - · Compatible for external set-up using a coordinate measuring machine
  - · Enables automatic measurement when measuring on an EDM
- Creates processes offline
- Automatically exchanges workpieces using a robot



* Please contact a Mitsubishi Electric representative for details.

Network connection specification (DNC, FTP)

Data, such as NC programs, machining conditions and variables can be exchanged between a personal computer and EDM.
The required options differ according to the models and purpose, and can be confirmed using the following table.
One IP address must be prepared for each EDM within the user's in-house network.

Required specifications	Image drawing	Required option	Supplement
Operate on the EDM side and receive data from personal computer.	Data transmission	LAN/W	Use EDM's Explorer and receive data in the common HDD on the EDM side. After that, data I/O operations are required.
Operate on the EDM side and send data directly to the EDM's NC data area.	Data transmission	FTP	Data can be received only using data I/O operation.
Operate on the personal computer side and send data to the EDM.	Data transmission	LAN/W	The personal computer's Explorer and the EDM's common HDD are used. After that, data I/O operations are required for the EDM.
Operate on the personal computer side and send data directly to the EDM's NC data area.	Data transmission	DNC	Commercially available DNC software must be installed on the personal computer side. Refer to DNC specifications operation for details.

Power supply / Control unit specifications

Compatible model		MX600
Power supply unit specifications		
Power supply unit	Model	WMX
	Power supply circuit	Regenerative transistor pulse type
	Cooling method	Completely sealed/Indirect cooling
	Maximum output current	50A
	Standard machining circuits and functions	High-speed rough machining circuit (nTP circuit) Fine finish circuit (nGP circuit) Super-fine finish circuit (nFS circuit)
	AVR	Built-in
	External dimensions [mm]	600×650×1767
	Weight [kg]	240
Control unit specifications		
Control unit	Model	W31MX-2
	NC program input method	Keyboard, USB flash memory, Ethernet
	Pointing device	Touch panel, mouse
	Display	15" color TFT
	Display characters	Alphanumeric characters
	Control method	CNC closed loop
	Number of control axes	Max. 4 axes simultaneously
	Setting unit	X, Y, U, V, Z … 1/0.1μm
	Minimum driving unit (mm)	50nm (0.000050mm)
	Max. command value	±99999.999mm
	Position command format	Combined use of increment/absolute values
	Interpolation function	Linear, circular, and spiral
	Scale magnification	0.00001 ~ 99.999999 (G code) 0.001 ~ 9999.999 (S code)
	Optimum feed control	Automatic selection of machining speed according to gap voltage sensing
	Path-retrace control	Reverse path retrace during short-circuit
	Wire offset	±99999.999mm Offset numbers: 1 to 900 (intersection point calculation)
	Basic screen menu	5 types (file, setup, machining support, monitor, maintenance)
	Automatic 2nd cut	Interactive screen method
	Machining condition (E-pack) storage	1 to 6999
	Program number command	1 to 99999999
	Sub-program	Nesting level 30
	Sequence numbers	1 to 99999
	Manual input positioning	Input on screen
	Manual operation box	High-speed, medium-speed, low-speed, ultra-slow speed, inching (0.0001mm/0.0005mm/0.0001mm) Positioning function, AT function
	Graphics	XY plane, XY-XZ plane, solid, table scaling, 3D model display, background drawing, automatic machining path drawing
	User memory capacity	1GB
	Maintenance function	Management of consumable parts (time display)
	Adaptive control	CM, EM, OM, BM
	External dimensions (mm)	494 × 175 × 346 (excluding keyboard and mouse pad)
	Weight (kg) (lb)	20 (44)

Control unit functions

W31 (ADVANCE control unit) control unit functions					
Year, month, date display	Workpiece inclination compensation	Coordinate rotation (K)	Time reading	Workpiece alignment	Sleep mode
Overlap window function	Reference block	Pattern rotation (S)	XY-axis independent scaling	Axis exchange	Maintenance check
Character string replacement function	Single block	Program no. designation	Axis rotation (AR)	Mirror image	Automatic taper degree calculation
Geometric function	Dry run		Automatic 2nd cut	Circumference calculation	Status recording
Floating decimal point function	Automatic return	Expanded AT function	Machining condition search	Backlash compensation	Data variable operation
Control command	User macro	Graphics (drawing monitor)	Block delete	Pitch error compensation	Alarm display
Corner R	Automatic positioning (hole center, edge)	Graphics (program check)	USB flash memory	Soft limit (inside/outside prohibit)	Machining time estimate
Corner chamfer	Automatic zero point return	Graphics (automatic machining shape drawing)	e-manual (electronic instruction manual)	Wire consumption estimate	Built-in 2D-CAD/CAM
Linear angle command	Machining start hole return	Graphics (surface display)	Repeated positioning	CM3 control	Built-in 3D-CAM
30-sec. short-circuit stop	Memory operation 1GB	Offset	Workpiece coordinate system (106 items)	OM control	EM control
Simultaneous 2-axis wire alignment	Program edit	Coordinate reading	3D graphic check	3D viewer (Parasolid data display)	

Preparation for Machine Installation

Machine installation checklist

Determining the machining details

Check each item, and make sure that no item or order is overlooked.

1) Determine the workpiece	
2) Determine the machining site	
3) Determine the pre-processing site	
4) Determine the post-processing site	

Preparation of installation fixtures

1) Plan the installation fixtures	
2) Prepare or manufacture the fixtures	

Preparation of consumable parts

1) Purchase consumable parts such as wire electrodes	

Training of programmers and operators

1) Select the programmers and operators	
2) Apply for training seminars	

Confirmation of foundation and power-supply work

If there is any possibility of radio disturbance, investigate it prior to starting work.

1) Confirmation of floor area	
2) Confirmation of environment (constant-temperature dust-proof room, measure for radio disturbance, prevention of external noise)	
3) Confirmation of foundation floor	
4) Foundation work	
5) Primary wiring for power lead-in	
6) Grounding work	
7) Construction of dielectric fluid (city water) supply/drainage facilities	
8) Air piping work	

Confirmation of delivery path

Check the path inside and outside the factory to avoid any trouble during delivery.

1) Traffic restrictions to factory		
Road width		
Entry road		
2) Factory entrance and width of gate in factory	(m)	
Factory building entrance dimensions (height × width)	(m)	
3) Constant-temperature dust-proof room entrance dimensions (height × width)	(m)	

Cautions
The standard delivery entrance dimensions for standard shipment delivery are given on the product line-up page.
If the entrance is smaller than the standard delivery entrance, a machine with different dimensions can be shipped.
* Please contact a Mitsubishi Electric representative for details (a separate estimate will be issued).
Note that delivery may not be possible in some cases depending on the dimensions.

File applications to fire department

The applications must be filed before the wire-cut EDM is installed.

1) Confirm the dielectric fluid amount	
2) File applications to fire department (EDMs already installed must also be filed.)	
•Application for "Facility using fire" (fluid amount less than 400ℓ)	
•Application for "Low volume hazardous material storage and handling site" (fluid amount more than 400ℓ and less than 2,000ℓ)	
•Application for "General handling site" (fluid amount 2,000ℓ or more)	

The required applications differ according to country and region; please contact your nearest fire department for details.

Oil for wire-cut EDMs

Always use dielectric fluid which has a flash point of 70˚C or more.
Prepare the following dielectric fluid when operating the wire-cut EDM.

■Dielectric fluid example (Showa Shell Sekiyu Shell Paraol 250)

•Table of dielectric fluid properties

Item \ Product brand	Shell Paraol 250
Density g/cm³(@15˚C)	0.797
Ignition point ˚C (PM)	92
Kinematic viscosity mm²/s (@40˚C)	2.42
Appearance	Clear and colorless

*Please contact the manufacturer for the Material Safety Data Sheet (SDS/MSDS).

Installation conditions

1. Installation site

①Constant-temperature dust-proof room
- Recommended room temperature 20±1°C (68°F±2)
- Usable temperature range 5 to 35°C (44°F to 95°F)
  Temperature fluctuation will directly affect machine accuracy. To maintain performance accuracy, select a place with minimal temperature fluctuation.
  Install the EDM in a constant-temperature room when performing high precision machining, even when using skim cuts.
  Note that an environment where the temperature fluctuates by 3°C (5°F) or more within 24 hours, or 1°C (2°F) or more within one hour can adversely affect machining accuracy.
  Make sure that the machine body is not subject to direct wind from air-conditioners or to direct sunlight.
- Dust-free location is recommended.
  Install a wire-cut EDM in an environment with no corrosive gases, such as acid or salt, or mist, and with low levels of dust.
  Grinding dust can adversely affect the machine's linear scales and ball screws. Pay special attention to installation location to avoid this hazard (separate from grinding machine, or install in separate room, etc.).
- Humidity Within 30 to 75%RH (with no dew condensation).
- Temperature range during transportation and storage
  -25 to 55°C (13°F to 131°F) (when power is not connected).

②Tolerable vibration of floor
- Select a floor where vibration or impact will not be conveyed.
- As a reference, the vibration level should have a max. amplitude of 2μm or less at a 10 to 20Hz frequency.
  * Consult with the contractor or vibration measuring instrument manufacturer for details on the measuring method.

③Foundation
- The floor should be concrete with a thickness of 400mm (15.7") or more so it can sufficiently withstand the system's weight.
- The floor inclination (step) must be within 6/1000 (floor inclination 6mm per 1m).

④Room construction
- The room where the EDM is to be installed must be a non-flammable or fire-proof structure.
  Please contact your local fire department for details.

⑤Ventilation of combustible vapors
- Install a ventilator to effectively remove combustible vapors and fine powders.

2. Machining heating value

Use the equipment capacity to calculate the wire-cut EDM's heating value required for designing a constant-temperature room.

Heating value (kW) = Equipment capacity (kVA) x 0.6
= 13.5kVA x 0.6
= 8.1kW

The above value is a guideline. Consult with the constant-temperature room manufacturer for details.

3. Power-supply equipment

- Primary wiring 3-phase 200/220VAC±10% 60Hz, 3-phase 200VAC±10% 50Hz
- Power capacity 10.0kVA (during normal use) (when using Ø0.2(.008")mm wire electrode)
  13.5kVA (when using the maximum)

* Use a 14mm² or thicker cable for the primary connection.

4. Grounding work

Wire-cut EDMs must always be grounded to prevent external noise, radio disturbance and earth leakage.
Install a wire-cut EDM in an environment with no corrosive gases, such as acid or salt, or mist, and with low levels of dust.
- Common grounding can be used if noise from other devices will not enter through the common grounding; the grounding cable must be connected independently to the grounding location (Fig. 2).
- Use a 14mm² grounding wire.

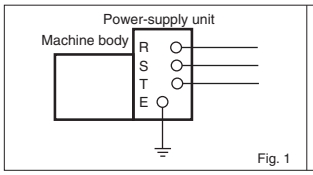


Fig. 1

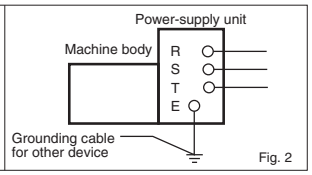


Fig. 2

5. Primary air equipment

- Hose diameter : 1/4 hose (hose sleeve outer diameter: ø9.0 (0.35"))
- Pressure : 0.5 to 0.7MPa (72 to 101psi)
- Flow rate : 75ℓ/min or more (26cu.ft./min.)

* Air (compressed air) is used to operate the automatic wire feeder and work tank door, etc. Air supplied from a normal compressor contains various impurities that could cause operation faults if they get into the pneumatic devices such as the solenoid valve. Install an air filter with a drainage discharge mechanism, etc., in the air source (primary source) piping to prevent impurities from entering the pneumatic devices.

6. Shield room

Install a shield room if a wire-cut EDM affects televisions or other communication facilities in the area. Observe the following points when installing the wire-cut EDM in the shield room.

1. Ground the wire-cut EDM in the shield room (Fig. 3).
2. If the wire-cut EDM cannot be grounded in the shield room, connect the wire-cut EDM's grounding cable to the shield room's grounding terminal (through bolt) as shown in Fig. 4.
3. Consult with a Mitsubishi Electric representative for details on installing a shield room.

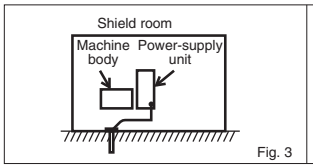


Fig. 3

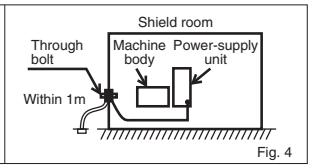


Fig. 4

Precautions for selecting earth-leakage breaker

To prevent malfunctions caused by the external noise from control units, etc., a filter is installed for the power-supply input. By grounding one end of this filter, an earth-leakage current of approx. 30 to 40mA passes through the filter. A highly sensitive earth-leakage breaker (sensitivity current 30mA) could malfunction. Thus, a medium-sensitivity earth-leakage breaker (sensitivity current 100 to 200mA) is recommended for the EDM. Class C grounding (grounding resistance of 10Ω or less) is recommended for the wire-cut EDM. Even if the sensitivity current is 200mA, the contact voltage will be 2V or less, and no problems will occur in preventing electric shock (application of tolerable contact current Class 2, 25V or less).

Disposal

The dielectric fluid, dielectric fluid filter, wire, etc., are industrial waste. These must be disposed of following national and local laws and ordinances.

Harmonic distortion

If there is harmonic distortion in the power supply, the machine operation could be affected even if the voltage does not fluctuate. In addition, the harmonic current could flow from the wire-cut EDM to the power system and adversely affect peripheral devices. If the effect of the harmonic distortion causes problems, install a harmonic suppression filter or take other measures.

Wire electrodes

Use the following wire electrodes

OB-PN(ø0.1/BS ~ ø0.2/BS)	Oki Electric Cable
HBZ-U(N) (ø0.1/BS ~ ø0.2/BS)	Hitachi Cable
SBS-HN(ø0.1/BS ~ ø0.2/BS)	Sumitomo Fine Conductors
SWP-SP(ø0.05/SP ~ ø0.07/SP)	Suzuki Metal Industry

*The wire electrodes shown above do not guarantee performance.

Recommended sliding surface lubricants

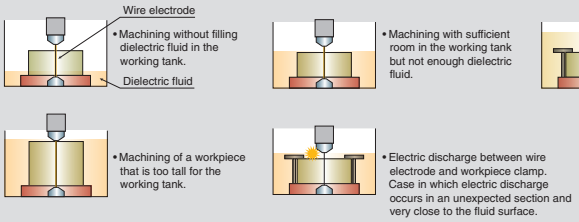
Use one of the following lubricants for sliding surface — As of March 2013

Manufacturer	Product name
Exxon Mobil	Mobil DTE26
Idemitsu Kosan	Super Hydro 68A
Showa Shell	Terrace Oil 68
JX Nippon Oil & Energy Corporation	Super Mulpas DX68

Cautions

Preventing fires and accidents with wire-cut EDM

Never attempt the following operation methods. They are extremely hazardous.



- Ensure that the upper part of the workpiece is submerged by 50mm or more from the surface of the dielectric fluid
- Never conduct spray machining as there is a risk of fire
- Do not use equipment that produces heat or sparks such as heating systems, welding machines, or grinding machinery near the wire-cut EDM
- Always keep the area clean and tidy, and do not store flammable materials near the wire-cut EDM
- Install an extra fire extinguisher in addition to the automatic fire extinguisher enclosed with the wire-cut EDM
- Ensure that the area is sufficiently ventilated
- Monitoring automatic operation: For safety purposes, make sure an operator is always present during operation, even if various safety devices are equipped, so that appropriate actions can be taken if necessary

Safety measures

A dielectric fluid temperature detector, fluid level detector, abnormal machining detector and automatic fire extinguisher, standard equipment, and a flame-resistant metal hose is used.
A tank which has passed the type test of electrical-discharge machine is used (for tank capacities less than 2,000ℓ, tanks which have passed a voluntary water leakage test).
Note that the safety devices must be periodically inspected.
Refer to the instruction manual (safety manual) when using the wire-cut EDM.

Automatic fire extinguisher

When heat is detected, a light-water solution is automatically sprayed to extinguish the fire. Machining also stops automatically at this time.
A separate 100VAC power supply is required for the automatic fire extinguisher.

Dielectric fluid temperature and fluid level detector

Machining is automatically stopped when the dielectric fluid temperature reaches approx. 60˚C, or when the fluid level drops during machining.

Terms of warranty

(1)Terms of warranty

This will differ according to country and region of sale; please contact a Mitsubishi Electric representative for details.

(2)Coverage

Parts labor and travel are included free of charge when the failure occurs during normal use for the stated Terms of the warranty (based on proper usage and maintenance as described in the operations manual and sales agreement).
Coverage exceptions:
①When a failure occurs that was caused by a machine modification that directly affects the machine's functioning or accuracy.
②When a failure occurs caused by the use of non-standard parts, consumables or lubricants.
③When a failure occurs caused by a natural disaster such as lighting, earthquake or storms and flooding.
④When the use of non-recommended consumables or aftermarket parts are used such as filters or flushing nozzles.

Please be aware that any workpiece/property damage and operation loss which may be associated with any fault of our machine are not covered by this warranty.

(3)Post Warranty / Expected Service Life

After the warranty period expires, all standard service rates and travel expenses will apply. Normal service life expectancy is 11 years after installation, but there may be some cases where discontinued electrical parts such as semiconductors and motors will reduce this period.

MEMO

MEMO

FA-related Products

PLC | MELSEC-Q Series Universal Model

Introducing the high-speed QCPU (QnUDVCPU) for faster processing of large data volumes.

◎Realize high-speed, high-accuracy machine control with various iQ Platform compatible controllers and multiple CPUs.
◎Easily connect to GOTs and Programming tools using built-in Ethernet port.
◎25 models from 10 k step small capacity to 1000 k step large capacity, are available.
◎Seamless communication and flexible integration at any network level.

Product Specifications

Program capacity	10k steps to 1000k steps
Number of I/O points [X/Y], number of I/O device points [X/Y]	256 points to 4096 points/8192 points
Basic instruction processing speed (LD instruction)	120ns to 1.9ns
External connection interface	USB (all models equipped), Ethernet, RS-232, memory card, extended SRAM cassette
Function module	I/O, analog, high-speed counter, positioning, simple motion, temperature input, temperature control, network module
Module extension style	Building block type
Network	Ethernet, CC-Link IE controller network, CC-Link IE field network, CC-Link, CC-Link/LT, MELSECNET/H, SSCNETⅢ(/H), AnyWire, RS-232, RS-422

AC Servo | Mitsubishi General-Purpose AC Servo MELSERVO-J4 Series

Industry-leading level of high performance servo

◎Industry-leading level of basic performance: Speed frequency response (2.5kHz), 4,000,000 (4,194,304p/rev) encoder
◎Advanced one-touch tuning function achieves the one-touch adjustment of advanced vibration suppression control Ⅱ, etc.
◎Equipped with large capacity drive recorder and machine diagnosis function for easy maintenance.
◎2-axis and 3-axis servo amplifiers are available for energy-conservative, space-saving, and low-cost machines.

Product Specifications

Power supply specifications	1-phase/3-phase 200V AC, 1-phase 100V AC, 3-phase 400V AC
Command interface	SSCNET Ⅲ/H, SSCNET Ⅲ (compatible in J3 compatibility mode), CC-Link IE Field Network interface with Motion, pulse train, analog
Control mode	Position/Speed/Torque/Fully closed loop
Speed frequency response	2.5kHz
Tuning function	Advanced one-touch tuning, advanced vibration suppression control Ⅱ, robust filter, etc.
Safety function	STO, SS1 SS2, SOS, SLS, SBC, SSM (compatible when combined with motion controller)
Compatible servo motor	Rotary servo motor (rated output: 0.05 to 22kW), linear servo motor (continuous thrust 50 to 3000N), direct drive motor (rated torque: 2 to 240N・m)

CNC | Mitsubishi CNC M700V Series

High-grade model equipped with advanced complete nano control

◎Achieve complete nano control with the latest RISC-CPU and high-speed optical servo network.
◎Realize super-high grade processing by combining the complete nano control, state-of-the-art SSS control and OMR control, etc.
◎Display of essential information of grouped on three screens to greatly reduce processing setup time with easy operability.
◎The M700VW Series with WindowsXPe and M700VS Series with integrated control unit and display type are available.

Product Specifications

Maximum number of control axes (NC axes + spindles + PLC axes)	16 axes (M720VW/M720VS have 12 axes)
Maximum number of part systems	Machining center system: 2 systems Lathe system: 4 systems
Least command increment	1nm (M720VW/M720VS 0.1μm))
Least control increment	1nm
Maximum program capacity	2,000kB(5,120m)
Maximum PLC program capacity	128,000 steps
Main functions (for machining center)	Simultaneous 5-axis machining, SSS control, high-speed high-accuracy control, tool nose point control, tilt plane machining, etc.
Main functions (for lathe)	Milling interpolation, 2-system simultaneous thread cutting, inter-system control axis synchronization, control axis superimposition, combination control, etc.

Laser Processing Machine | CO_2 2-Dimensional Laser Processing Machine eX-Series

A global standard CO_2 2-dimensional laser processing systems.

◎Productivity has been dramatically enhanced owing to improved acceleration and the latest control technologies exclusive to Mitsubishi Electric.

◎2 Action Cutting allows for the entire process, from job setup to parts cutting, to be completed in two simple actions.

◎When not processing, the system switches to ECO mode and the resonator stops idling. Minimizes energy consumption, reducing running costs by up to 99%*1 during standby.

*1: Compared to the previous LV-Series with Mitsubishi's designated benchmark shape.

Product specifications

Model Name	ML3015eX
Drive system	Flying optic (3-axis beam movement)
Stroke (X×Y×X) [mm]	3100×1565×150
Rapid feedrate [m/min]	X,Y axes: Max. 100; Z-axis: Max. 65
Processing feedrate [m/min]	Max. 50
Positioning accuracy [mm]	0.05 / 500 (X,Y axes)
Repeat accuracy [mm]	± 0.01 (X,Y axes)
Rated output [W]	4500

Laser Processing Machine for Substrate Drilling | GTW4 Series

Ever-evolving global standard machine

◎Newly-developed super-fast galvano and 360W high-power resonator achieve industry-leading productivity.

◎Laser beam generated by unparalleled resonator enables stable high-quality copper-direct processing on various surface treatments.

◎Single machine can support variety of processing application with Mitsubishi unique powerful laser and optimum beam control.

◎Original resonator structure, which can be refreshed by replacing some parts only, realizes low operating cost.

Product specifications

Model name	ML605GTW4(-H)-5350U/ML605GTW4(-P)-5350U/ML706GTW4-5350U
Processing workpiece dimensions [mm]	620×560/815×662
XY table maximum feedrate [m/min]	50
Laser type	CO2 laser
Oscillator power [W]	360W
Oscillator set pulse frequency	10 to 10000Hz

Robot | MELFA F Series

High speed, high precision and high reliability industrial robot

◎Compact body and slim arm design, allowing operating area to be expanded and load capacity increased.

◎The fastest in its class using high performance motors and unique driver control technology.

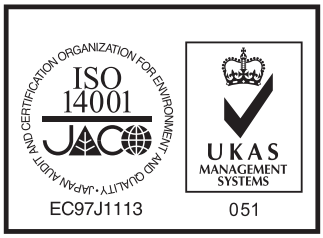
◎Improved flexibility for robot layout design considerations.

◎Optimal motor control tuning set automatically based on operating position, posture, and load conditions.

Product Specifications

Degrees of freedom	Vertical:6 Horizontal:4
Installation	Vertical:Floor-mount, ceiling mount, wall mount (Range of motion for J1 is limited) Horizontal:Floor-mount
Maximum load capacity	Vertical:2-20kg Horizontal:3-20kg
Maximum reach radius	Vertical:504-1503mm Horizontal:350-1,000mm

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)



MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI, 5-CHOME, HIGASHI-KU, NAGOYA 461-8670, JAPAN

* Not all models are supported for all countries and regions.
* Machine specifications differ according to the country and region, so please check with your dealer.
* Processing data provided in this brochure is for reference only.

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