Pursuing Machining Accuracy and Speed Handed Down for Generations

The history of Mitsubishi Electric EDMs is the history of electrical-discharge machining.

Mitsubishi Electric EDMs have continued to advance to answer market needs, which continue to change with the times. We have searched for specifications which answer those needs, and are now leading the world of electrical-discharge machining with a powerful line-up for new machining fields.
Product Line-up

**Compact, high-speed, high-accuracy EDM**

**EA8PV ADVANCE**
46-bit CNC
(Vertical front door)

**EA8PV ADVANCE**
46-bit CNC
(Automatic elevation tank)

**High-speed, multi-function EDMs**

**EA12V ADVANCE**
46-bit CNC
(Automatic elevation tank)

**EA28V ADVANCE**
46-bit CNC
(Automatic elevation tank)

**Ultraprecision EDM**

**MA2000**
64-bit CNC
(Automatic elevation tank)

**Compact EDM**

**EA8**
64-bit CNC
(Vertical front door)

**EA12D**
64-bit CNC
(Vertical front door)

**Large-sized EDMs**

**EA30**
64-bit CNC
(Automatic vertical front door)

**EA40**
64-bit CNC
(Automatic vertical front door)

**Medium-sized EDMs**

**EA50**
64-bit CNC
(Automatic vertical front door)
**Fine High-accuracy Machining**

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**Example of connector part machining**

**Model:** EA8PV ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.5µm, Ra: 0.1µm  
**Machining time:** 3.5 hours

An even higher-grade surface is needed for rib machining of plastic molds, which are hard to polish.

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**Example of ultrafine matte finish surface**

**Model:** EA12V ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 2 copper electrodes  
**Surface roughness:** Rz: 0.4µm, Ra: 0.06µm  
**Machining time:** 3.5 hours

**Electrode wear suppression circuit:** SC circuit (standard for all models)  
- Reduces wear by 10 to 20% (comparison with conventional Mitsubishi Electric EDM)

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**Ultrafine surface**

**Model:** NP2 circuit (standard for EA8PV ADVANCE, option for EA12V / EA28V ADVANCE)  
- Realizes Rz: 0.4µm (Ra: 0.06µm)

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**Deep machining**

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**Example of rib machining**

**Model:** EA12V ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.125µm, Ra: 0.25µm  
**Machining time:** 3.5 hours

**Super-low-wear circuit:** SC circuit (standard for all models)  
- Reduces wear by 10 to 50% (comparison with conventional Mitsubishi Electric EDM)

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**Example of gate machining**

**Model:** EA12V ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.60µm, Ra: 0.10µm  
**Machining time:** 3.5 hours

**Machining stabilizing jump control: SS jump 4 (standard for all EA ADVANCE models)**

- High-speed jump is improved in 2-axis machining by optimizing smoothing of jump up operation and speed / acceleration control
- The load onto Z-axis is reduced by optimizing the speed / acceleration control, and the load and heat effect is minimized during high-speed jump
- Machining speed is increased by 20 to 30% using FF mode at a starting condition in deep cavity application

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**High-grade gate machining**

**Super-low-wear circuit:** SC circuit (standard for all models)  
- This circuit is effective when machining with copper electrodes, during which low-wear machining is essential
- The electrode wear is reduced by 10 to 50% during rough machining with an undersize amount of 0.07mm per side or more (0.0028") (comparison with conventional Mitsubishi Electric EDM)
- By suppressing the electrode wear and reducing the number of electrodes used, the total machining time can be shortened and costs can be reduced

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**Reducing electrode loading and stabilizing machining**

- Reduces wear by 10 to 50% (comparison with conventional Mitsubishi Electric EDM)

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**Examples of rib machining**

**Model:** EA12V ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.125µm, Ra: 0.25µm  
**Machining time:** 3.5 hours

**Example of gate machining**

**Model:** EA12V ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.60µm, Ra: 0.10µm  
**Machining time:** 3.5 hours

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**Ultrafine matte finish circuit:** NP2 circuit (standard for EA8PV ADVANCE, option for EA12V / EA28V ADVANCE)  
- Realizes Rz: 0.4µm (Ra: 0.06µm)

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**Example of narrow gap machining**

**Model:** EA8PV ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 2 copper electrodes  
**Surface roughness:** Rz: 0.60µm, Ra: 0.10µm  
**Machining time:** 3.5 hours

**Reducing electrode loading and stabilizing machining**

- Reduces wear by 10 to 50% (comparison with conventional Mitsubishi Electric EDM)

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**Example of connector part machining**

**Model:** EA8PV ADVANCE  
**Workpiece material:** STAVAX  
**Electrode material:** 3 copper electrodes  
**Surface roughness:** Rz: 0.5µm, Ra: 0.1µm  
**Machining time:** 3.5 hours

An even higher-grade surface is needed for rib machining of plastic molds, which are hard to polish.
High-performance machining with graphite electrode

Example of die cast mold machining
- Model: EA28V ADVANCE
- Workpiece material: SKD61
-surface roughness: Rz 15µm, Ra 2.4µm
- Machining time: 53 hours
- Electrode material: Graphite
- Workpiece material: Tungsten carbide (G3 or equivalent)
- Surface roughness: Rz 1.0µm, Ra 0.15µm
- Machining speed: increased by 10 to 20%
- Electrode wear: reduced by 1/3
- Tungsten carbide machining technology is a standard feature
- Automatic machining for processing-resistant materials such as conductive ceramics and sintered diamonds/boron nitrides
- Expanded machinables: titanium and cobalt alloys used in medical parts can also be machined with electrical-discharge machining. The high-performance of EDMs with the FP-V power supply is also suitable for machining various special materials used in aircraft.

Suppressing displacement movement caused by room temperature changes

Thermal displacement compensation function (standard for all EA ADVANCE models)
- Tested by Pole Positioning in an ambient temperature change of ±3°C
- Without thermal displacement compensation function
- With thermal displacement compensation function
- Temperature changes
- Displacement
- Time

Stable machining accuracy and high repeatability

High-speed deep rib machining

Adaptive machining control: GF2 control (option for all EA ADVANCE models)
- Rough machining can be stabilized and the speed increased by using these controls together with the jump control

Machining speed increased by 10 to 20%
Electrode wear increased by 10 to 20%
(comparison with conventional Mitsubishi Electric EDM)

Suppresses electrode wear and shape deformation

High-speed machining with low wear and less edge deformation

Tungsten Carbide Machining Technology is a standard feature of the FP-V power supply found in all EA ADVANCE models
- Machine even tungsten carbide at high speed with low electrode wear
- Electrode wear ratio is reduced by 1/3

High-speed machining of processing-resistant materials

FP-V power supply extension unit (option for all EA ADVANCE models)
- High-grade machining circuit for processing-resistant materials such as conductive ceramics and sintered diamonds/boron nitrides
- It is effective and realizes surfaces with less defect and crack for high-resistance materials, which can not be machined on the previous power supply
- High-grade finish surface is realized in the processing resistant materials using the NP2 circuit

Extends machining applications

Electrode wear when machining tungsten die
- Electrode wear length
- Machined surface
- Cross-section of tungsten-machined workpiece
- Machined surface with few cracks

Examples of machining medical parts
- Model: EA28V ADVANCE
- Workpiece material: Chromium-cobalt alloy
- Surface roughness: Rz 10µm, Ra 1.5µm

Electrode wear when machining tungsten die
- Electrode wear length
- Machined surface
- Cross-section of tungsten-machined workpiece
- Machined surface with few cracks

Examples of cutting chip punch machining
- Model: EA28V ADVANCE
- Workpiece material: Tungsten carbide (G3 or equivalent)
- Surface roughness: Rz 1.0µm, Ra 0.15µm
- Machining speed: increased by 10 to 20%
- Electrode wear: reduced by 1/3
- Tungsten carbide machining technology is a standard feature
- Automatic machining for processing-resistant materials such as conductive ceramics and sintered diamonds/boron nitrides
- Expanded machinables: titanium and cobalt alloys used in medical parts can also be machined with electrical-discharge machining. The high-performance of EDMs with the FP-V power supply is also suitable for machining various special materials used in aircraft.

High-grade machining with processing-resistant materials

FP-V power supply extension unit (option for all EA ADVANCE models)
- High-grade machining circuit for processing-resistant materials such as conductive ceramics and sintered diamonds/boron nitrides
- It is effective and realizes surfaces with less defect and crack for high-resistance materials, which can not be machined on the previous power supply
- High-grade finish surface is realized in the processing resistant materials using the NP2 circuit

Extends machining applications

Electrode wear when machining tungsten die
- Electrode wear length
- Machined surface
- Cross-section of tungsten-machined workpiece
- Machined surface with few cracks

Examples of machining medical parts
- Model: EA28V ADVANCE
- Workpiece material: Chromium-cobalt alloy
- Surface roughness: Rz 10µm, Ra 1.5µm

Electrode wear when machining tungsten die
- Electrode wear length
- Machined surface
- Cross-section of tungsten-machined workpiece
- Machined surface with few cracks
**High-grade Finish**

Glossy surface machining

- Model: EA12V ADVANCE
- Workpiece material: SKD11
- Electrode material: Copper
- Surface roughness: Rz:0.5µm, Ra:0.07µm
- Machining time: 7 hours

When finishing in large areas with NS powder, a uniform and high-grade finished surface can be attained compared to surfaces machined with normal dielectric fluid. Pinholes and stains are suppressed, and the time required for the mold finishing process is greatly reduced. An easy-to-polish matte surface finish, and polish-less glossy surface finish can be realized.

**High quality finish surface using large area electrode**

NS powder (option for EA12V / EA28V ADVANCE)

- An uniform matte surface and polish-less glossy surface can be machined simply by adding NS powder to the dielectric fluid

**Glossy surface machining**

- Model: EA12V ADVANCE + NS powder specifications
- Workpiece material: SKD11
- Electrode material: Copper
- Surface roughness: Rz:0.5µm, Ra:0.07µm

Contact your local Mitsubishi Electric sales office or dealer for details on purchasing NS powder.

**Other Machining**

**Examples of contour machining**

- Model: EA12V ADVANCE + fine-hole specifications
- Workpiece material: SKD11
- Electrode material: Copper
- Surface roughness: Rz:0.5µm, Ra:0.07µm

- Model: EA28V ADVANCE
- Workpiece material: SKD11
- Electrode material: Copper
- Surface roughness: Rz:0.5µm, Ra:0.07µm

Fine holes approx. ø0.2 to 1.0mm in size can be machined with the Fine-hole jig option. This function can also be used as a start hole for wire EDM processing.

**Example of fine-hole machining**

- Model: EA12V ADVANCE + High-accuracy built-in C-axis
- Workpiece material: SKD11
- Electrode material: Copper
- Surface roughness: Rz:0.5µm, Ra:0.07µm

**Example of ZC-axis machining**

- Model: EA12V ADVANCE + C-axis specifications
- Workpiece material: SKD11
- Electrode material: Copper tungsten
- Surface roughness: Rz:2.0µm, Ra:0.30µm

**Example of feed screw machining**

- Model: EA12V ADVANCE
- Workpiece material: Aluminum alloy
- Electrode material: Copper
- Surface roughness: Rz:17.6µm, Ra:2.9µm

Complex shapes containing screws and cams can be machined through using a combination of various electrode shapes and the C-axis unit.

**FP I power supply, FP-V power supply**

- The FP I power supply equipped in the EA ADVANCE Series, and the FP-V power supply equipped in the EA ADVANCE Series can be used for machining molds, and for electrical-discharge machining in various applications and fields.
- Extremely hard materials, which are difficult to mill or grind, as well as special materials and ultrathin areas can also be machined.

**Full of useful options**

- The EDM is used in a variety of applications and fields. Optimum machining can be realized with various special specifications such as the indexing unit (A, B and C axes), spindle unit, special working tank and column up (Options may be limited according to the model. Refer to the product information section for details).
Machining

Refined style, high-performance energy-saving power supply, ample know-how

**Machining**

**Machining stabilizing jump control**: SS jump 4

- High-speed jump is improved in z-axis machining by optimizing the smoothing of the jump operation and speed/acceleration control

**Machine**

Semi-cabin structure

- Reduce thermal displacement caused by temperature changes
- Reduces thermal displacement caused by temperature changes
- Stabilizes the accuracy during long-time continuous machining

**Fine-finishing circuit (NP2, GM2 circuits)**

- Optimum surface machining aiming to eliminate polishing
- Realizes Rz 0.4μm (Ra 0.06μm) with matte and glossy surface

**Wear suppression circuit, narrow gap circuit**

- Compatible with small undersize amounts of 0.015 to 0.030mm per side

**Machining adaptive control**

- Automatically adjusts to optimum conditions according to the machining state
- Performance of machining with graphite electrode is improved (FP2 control option)

**Maintenance**

**Working tank**

- The three-sided drop tank improves access for work setup
- Adjustable high-volume fluid flow rates increases the range of no-flush machining

**Net-ADVANCE**

Advanced support services using net technology

- Update system software via the Web!
- This is available only to DIA-X-NET.COM members.
- Update system software to the latest version from the support website DIA-X-NET.
- Simultaneously update EDM contents (e-manual, alarm guide, technical know-how)

**DIAX−NET.COM**

http://www.diax-net.com/
ADVANCE Control Unit

Supporting machining of various shapes with optimum machining conditions and easy programming

**Machining support**

**ESPERADVANCE**

Advanced program support functions

- **Navigator**
  - Simple programming method even for beginners
  - Easily create programs by following the on-screen instructions

- **Electrode Workpiece measurement**
  - Simple measurement patterns (pole, hole, 2-face, 3-face, 4-face)
  - Core deviation can be set when multiple electrodes are used
  - Preset workpiece coordinates (max. 106 types)

- **3D check**
  - Display workpiece layout and electrode movement as animations using 3D models

- **Schedule registration**
  - Continuously run multiple programs on a schedule
  - Schedules can be added and edited during machining

**Machining program**

- Programming is possible simply by inputting the machining start position and machining depth, etc., into a table format

**Machining programming support function**

- Improve programming capabilities with Undo and Redo function
- Programs easily modified with batch changes of depth and undersize calculation
- M Pack is easily modified with the Insert, Delete, Copy and Redo functions

**Main menu**

- **File**
  - Exchange program data with external computers
  - M Pack is easily modified with the Insert, Delete, Copy and Redo functions

- **Set-up**
  - Workpiece and electrode measurements are supported with graphical screens
  - Machining state is displayed in real-time

**Machining condition search (shape expert)**

Machining conditions and programs suitable for various shapes can be created

- **Cavity**
  - Increased orbit pattern line-up
  - Set machining condition to match the pocket rib and edge rib

- **Rib**
  - Set machining condition to match the pocket rib and edge rib

- **Thread**
  - Programs for rough/finish machining with one electrode are supported

- **Gate**
  - Easily create programs for sub-gate machining

**User customization**

- Freely rearrange switches and status displays which are used frequently
- Graphical and easy-to-understand screen settings

**Machining conditions (ME Pack)**

- Machining condition can be easily changed, which are “head to set” starting condition down or “head to change overlap amount between machining conditions
- Graphical and easy-to-understand screen settings

**Approach amount and overlap amount can be easily modified**

- Optimum machining conditions for shape are searched and set

- Input start position and machining depth

- The ADVANCE control unit is incorporated only in ADVANCE models
Extensively using 3D CAD data at the workshop

ACCESSIBLE CAD/CAM SYSTEM

- Batch output of the machining position coordinates, core alignment position, 3D models and machining instructions.

3D CAD/CAM

- EPX-compatible CAD/CAM
- EPX data

- 3D CAD data (Parasolid)

- Cutting simulator
- Simulation results: Workpiece model after cutting (STL format)

ADVANCE CONTROL UNIT FUNCTIONS

3D IMPORT
- Read in machining instruction information (EPX) and 3D models of electrodes and workpieces (Parasolid) from CAD/CAM

3D VIEW MACHINING POSITION CONFIRMATION
- Display 3D models of electrodes and workpieces simultaneously to match the machining position

MEASUREMENT POSITION CONFIRMATION
- Display 3D models of electrodes and workpieces to easily check the core alignment measurement position

3D CONFIRMATION DURING SET-UP
- Easily designate 3D models even during set-up
- Carry out work while comparing with the actual part

ADVANCE CONTROL UNIT

Industry first! Area recognition and machining condition optimization considering rough pre-milling.

3D-EXPERT

- Changes in the electrical-discharge machining area are accurately calculated with 3D models of the electrode and workpiece
- Optimum machining conditions are generated at the start of electrical discharge, thus increasing the machining stability and speed
- The cutting simulation results and workpiece data (STL) can be used to attain an effect even when rough-milling the workpieces

Analysis of machining area changes

Generation of optimum machining conditions

Examples of machining where area changes
- Area is calculated accurately taking workpiece and electrode shape into consideration
- Machining conditions for rough machining can be set easily, thus increasing the machining stability and speed

Simulation results: Workpiece model before electrical-discharge machining

Elements of machining where area changes
- Workpiece Graphite electrode
- After electrical-discharge machining

EOS ADVANCE SERIES

- 64-bit Control Unit
- Power Supply/Control

Sample data: Workpiece model (STL or Parasolid)

Workpiece before electrical-discharge machining

Graphite electrode

Electrode model (Parasolid)

After electrical-discharge machining

The ADVANCE control unit is incorporated only in ADVANCE models.
EA ADVANCE Series Product Introduction

### UA ADVANCE

**Uniting High-accuracy Technology with High-speed FP-V Power Supply Control Technology**

Machining accuracy ±0.003mm (0.00011") achieved (Note 1)

Compact, high-performance, high-accuracy EDM

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

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**EA8PV ADVANCE**

**Outstanding screen operability**
- 5-inch LCD touch panel
- Machining conditions search (shape EXPERT)

**Utilizing CAD data**
- Machining instruction information (EPI) can be read from CAD/CAM
- 3D data (Parasolid) can be read in

**High-speed FP-V power supply**
- Machining speed and electrode wear are both improved
- Tungsten carbide machining circuit is standard equipment
- Energy-saving power supply is standard equipment (20% reduction compared to Mitsubishi Electric FP power supply)
- FP-V power supply extension unit available for processing resistant material (option)

**Ultrafine finish machining**
- Ultrafine finish surface NP2 is provided
- Machine narrow pitch connectors using the narrow gap circuit

**Advanced machining control**
- High-speed jump is realized with machining stabilizing jump control (SS jump 4)

**High-accuracy technology perfect for ultra-precise machining**
- Thermal displacement compensation function, refined with the MAC02, the technology is improved
- Highly accurate setup is possible with the dielectric fluid circulation function
- High pitch accuracy is possible with shift electrodes and multiple setup machining

**Outstanding machine operability**
- Maintenance space has been arranged at the back of the machine, to improve workability
- Easily clean sludge in the dielectric fluid reservoir to improve workability
- Maintenance space has been arranged at the back of the machine

**Machine unit (standard specifications)**
- Various values in parentheses are for automatic elevation tank

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### Advanced Control Unit

- **C-axis (option)**
- **C-axis/ATC (option)**

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### Machine Specifications

- **Working tank inner dimensions:** 750 x 2000 x 2000 (mm) (29.5 x 78.7 x 78.7)
- **Accessories:** 300kg (661lb.) (Note 1)
- **Machine unit dimensions:** 1450 x 1900 x 2000 (mm) (57.0 x 74.8 x 78.7)
- **System total weight:** 2005kg (4436lb.)
- **Dielectric fluid reservoir capacity:** 160 L (42.5 gal.)

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<table>
<thead>
<tr>
<th>Model</th>
<th>Machine Dimensions (W x D x H)</th>
<th>Total system weight</th>
<th>Max. loading weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAPMV ADVANCE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Dimensions (W x D x H)

- **Table:** 900 x 600 x 300 (mm) (35.4 x 23.6 x 11.8)
- **Spindle:** 335 (13.2) (inch) (inch)
- **Machine Installation Precautions:**
  - **Note 1:** For MACRO II and combination of EPX/COMBI, the width is 335 (13.2) (inch)
  - **Note 2:** When using four electrodes, the dimensions are 70 x 70 x 100 (mm) (2.7 x 2.7 x 3.9)

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**Distance between table and electrode mounting surface**
- **Total solution machine specifications**
- **Total solution machine specifications**

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**Ultrafine finish surface NP2 is provided**
- Machine narrow pitch connectors using the narrow gap circuit

---

**High-accuracy technology perfect for ultra-precise machining**
- Thermal displacement compensation function, refined with the MAC02, the technology is improved
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- Maintenance space has been arranged at the back of the machine
- Easily clean sludge in the dielectric fluid reservoir
- Maintenance space has been arranged at the back of the machine

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**Machine Installation Precautions**
- **Note 1:** For MACRO II and combination of EPX/COMBI, the width is 335 (13.2) (inch)
- **Note 2:** When using four electrodes, the dimensions are 70 x 70 x 100 (mm) (2.7 x 2.7 x 3.9)
- **Note 3:** For MACRO of 3R-Combi, the weight is 5kg (11lb.)/ electrode, and is 2.5kg (5lb.)/ electrode with automatic elevation tank
- **Note 4:** When using four electrodes, the dimensions are 70 x 70 x 100 (mm) (2.7 x 2.7 x 3.9)
- **Note 5:** When using four electrodes, the dimensions are 70 x 70 x 100 (mm) (2.7 x 2.7 x 3.9)
High-performance die-sinking EDM with FP-V power supply

Outstanding machine operability
- High-speed jump is realized with machining stable jump control (SS jump 4)

High-accuracy technology
- A self-setting table mechanism is incorporated
- Thermal displacement compensation function, refined with the MARUSO, is provided
- High accuracy attained with the fluid circulation function

MACRO Jr (3R-Combi)
- 3R-MACRO Jr of 3R-Combi and Compact of EROWA-COMBI, the weight is 2.5kg (5lb.

Outstanding screen operability
- 15-inch LCD touch panel
- Machine conditions search (shape EXPERT)

Utilizing CAD data
- Machining conditions search (shape EXPERT)
- Machining condition information (EPK) can be read from CAD/CAM
- 3D data (Parasolid) can be read in

Advanced machining control
- High-speed jump is realized with machining stable jump control (SS jump 4)

High-grade machining
- Ultrafine matte finish circuit (NP2 circuit)
- GF2 control
- FP120V
- Dielectric fluid distributor
- Automatic clamp
- High-accuracy built-in C-axis
- Column up (100mm)
- Nozzles)
- Working tank inner dimensions 800 x 800 x 360mm (31.5 x 31.5 x 14.2"
- Spindle dimensions 410 x 320 x 260mm (16.1 x 12.6 x 10.2"
- System total weight 3725kg (8216lb.)
- Dielectric fluid reservoir capacity 3424 (75gal.)

Standard functions
- Multi-user tool setting circuit
- Free machining circuit (PS circuit)
- Green zone linear circuit (GZM circuit)
- Bore profile circuit
- 3D machining compensator system
- K177-axis linear scale
- High-speed positioning circuit
- Working tank fluid flow adjustment function
- 4-axis

Options
- Shape expert : example of HOLE
- Shape expert : example of RADIUS
- 4-axis
- 3R-MACRO Jr of 3R-Combi and Compact of EROWA-COMBI, the weight is 2.5kg (5lb.

Machine unit (standard specifications)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Advance control unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine dimensions (W x D x H)</td>
<td>1980 x 980 x 1380mm</td>
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<tr>
<td>Total system weight</td>
<td>3725kg</td>
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<tr>
<td>Axis stroke</td>
<td>350 x 350 x 200mm</td>
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<tr>
<td>Spindle</td>
<td>NS-400D (15000rpm)</td>
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<tr>
<td>Working tank</td>
<td>Automatic magazine</td>
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<tr>
<td>Spindle power</td>
<td>12kW (16hp)</td>
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<tr>
<td>Working tank dimensions (W x D x H)</td>
<td>900 x 250 x 200mm</td>
</tr>
<tr>
<td>Spindle power</td>
<td>12kW</td>
</tr>
<tr>
<td>Dielectric fluid</td>
<td>Opaque fluid</td>
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<tr>
<td>Fluid circulation function</td>
<td></td>
</tr>
<tr>
<td>Thermal displacement compensation function</td>
<td></td>
</tr>
</tbody>
</table>

C-axis/ATC (option)

- C-axis Max. electrode weight 8.8kg (19.4lb.)
- Max. electrode weight 8.8kg (19.4lb.)
- Min. electrode 4.4kg (9.7lb.)
- Max. electrode 8.8kg (19.4lb.)
- Min. electrode 4.4kg (9.7lb.)
- Max. electrode 8.8kg (19.4lb.)
- Min. electrode 4.4kg (9.7lb.)
EA ADVANCE Series Product Introduction

Outstanding Operation and Maintenance Performance

New High-speed, High-accuracy Medium-sized Model with Exceptional Performance

High-speed FP-V power supply

- Finishing performance and tungsten carbide machining performance equal to the EA28V ADVANCE
- Optimized machining technology enables low-wear machining with graphite electrodes
- FP-V power supply extension unit available for processing resistant material (option)

Advanced machining control

- Machine in large-volume operations to as small as with advanced SD June
- Adjustable high-volume fluid flow allows the range of tool-finish machining
- Machine performance using graphite electrode improved with GF2 control (option) greatly improves machining speed for rib shapes and electrode wear in formed mold shapes

High-rigidity and high-accuracy technology

- Machine stability improved by increasing the machine structure's rigidity
- Mitsubishi Electric original thermal displacement compensation function and semi-cabin structure are adopted
- Machine temperature fluctuation suppressed to a minimum with fluid circulation function

Outstanding machine operability

- The three-sided drop tank improves access for work setup (with working tank multi-position function)
- Standard high-function manual operation box with coordinate display
- Easy workpiece loading using hand throttle
- Machine zero point position at center of the XY-axis stroke corresponding to medium to large electrodes

Machine unit (standard specifications)

- Dimensions (W x D x H): 2195 x 2512 x 2615 (in)
- Inner dimensions (W x D x H): 2063 x 1100 x 810 (in)
- Machine Installation

Machine Functions

- Electrical functions: Ultrafine matte finish circuit (NP2 circuit), Special working tank (including three slots at 14-200 pitch)
- High-speed FP-V power supply: Power lead-in port, Control unit temperature fluid, Power supply

Machine Control

- Advanced control unit
- Utilizing 3D CAD data

Special Working Tank

- Electrode mounting table dimension drawing
- Electrode mounting table dimension drawing

Inlet Dimensions (W x D x H): 2063 x 1100 x 810
- C-axis (option)
- C-axis (option)
- C-axis (option)
- C-axis (option)
- C-axis (option)
- C-axis (option)
- C-axis (option)
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Refined Style, High-performance, Energy-saving Power Supply, Ample Know-how

**Machine**

- Highly rigid machine structure (EA Series)
  - Highly rigid Z-axis enabled with low head structure
  - Outstanding servo Z-axis design achieved using direct drive method
  - Highly rigid integrated bed structure with no indentation (concave sections)

- Thermal displacement compensation function (EA30/40/50)
  - Reduces thermal displacement caused by temperature changes
  - Stabilizes accuracy during long-time continuous machining

**Set-up**

- Powerful measurement and positioning functions
  - Ample electrode and workspace measurement patterns
  - Easy positioning and presetting
  - Workpiece coordinate system compatible with multiple workpieces

**Program**

- E.S.P.E.R. II
  - Easy programming Format method
  - Complicated machining programs well supported
  - Compatible with multiple electrodes and multiple set-up machining

- Machining condition search
  - Consolidation of years of machining know-how
  - Easy-to-use search methods
  - Machining technology developed with user

- Machining circuit
  - Optimum machining for detailed workpieces is possible

**Fuzzy Pro Plus**

- Constantly monitors the machining state
- Automatically adjusts to optimum conditions according to the machining state
- Enables high-speed machining during deep machining

**Machining**

- FP II power supply
  - Power consumed that does not contribute to machining is greatly reduced

- Jump control
  - Machine vibration when jumping is suppressed, allowing stable machining even in large areas
64-bit Control Function (MA2000, EA, VA Series)

**Workpiece set-up**

**Workpiece measurement**

Ample workpiece measurement functions
- Workpiece can be measured easily simply by inputting the required items
  - Pole center
  - Hole center
  - Corner

**Ample workpiece measurement functions**
- Workpiece can be measured easily simply by inputting the required items

**Coordinate preset function**
- The coordinates for various workpieces can be set easily (max. 106)

**Various parameters for measurement**
- The parameters required for measurement can be set

**Electrode set-up**

**Electrode measurement**

Ample electrode measurement functions
- Electrode can be measured easily simply by inputting the required items
  - Pole center
  - Hole center
  - 2-face

**Ample electrode measurement functions**
- Electrode can be measured easily simply by inputting the required items

**Electrode alignment setting function**
- Set the electrode core alignment when using multiple electrodes

**Machining program creation**

**Machining programming tool E.S.P.E.R**

Create programs with easy inputs
- Programs can be created easily by inputting the required fields in a matrix format
  - Machining position input
  - Machining depth input

**Machining condition selection and search**
- Machining conditions can be selected simply by inputting each setting field on an interactive screen

**E.S.P.E.R Navigator**
- Machining programs can be created easily by following on-screen instructions and inputting the required information

**Optimum machining conditions according to application**
- HybridPack
  - Optimum machining conditions according to application

**Machining condition expert**
- HybridPack
  - Optimum machining conditions according to application

**Download from the support website (DIAX-NET.COM)**
- Registered members can download latest machining conditions free of charge
  - http://www.diax-net.com/

**Setting the machining position and machining depth**
- Inputting the electrode data

**Various parameters for measurement**
- Machining conditions can be selected simply by inputting each setting field on an interactive screen

**Graphic display of details**
- HybridPack registration screen
**MA2000**

Flagship EDM Model Combining Advanced Technologies

---

**Temperature control technology for high-accuracy machining**

- Full-cabin structure shuts out the effect of external temperature fluctuation
- EDM's general temperature is constantly controlled with fluid circulation
- Mitsubishi Electric original high-accuracy thermal displacement compensation function is added

**High-accuracy built-in C-axis**

- High-accuracy built-in C-axis realizes stable machining
- High-accuracy helical machining and index machining are possible
- High-accuracy built-in spindle (option) is also available

**Servo control technology providing both accuracy and speed**

- Highly rigid roller guide is adopted for the X, Y and Z axes
- X, Y and Z axes are equipped with an absolute value linear scale as standard equipment
- Perfect for high-accuracy pitch machining

**Long continuous machine operation with automation**

- Machine specifications are suitable for high-accuracy continuous machining
- Machine operation rate is improved with long automatic operation
- Operation can easily be sequenced with peripheral equipment such as an ATC and workplace changer

---

**Granite table (upper surface) dimension drawing**

**Ultrahigh-accuracy die-sinking EDM**

\[\pm (\text{Note 1}) \]

The machining accuracy follows the Mitsubishi Electric machining conditions.

---

**Table: Working tank inner dimensions (mm)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MA2000M</th>
<th>MA2000A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>6505</td>
<td>4805</td>
</tr>
<tr>
<td>Length</td>
<td>6500</td>
<td>4800</td>
</tr>
<tr>
<td>Height</td>
<td>3400</td>
<td>2700</td>
</tr>
</tbody>
</table>

---

**Example of pitch machining accuracy**

- Workpiece SKD61: four copper electrodes
- Mitsubishi Electric machining conditions

- ±500: 6000kg (13000lb.)
- ±390: 6000kg (13000lb.)

---

**C-axis/ATC (standard specifications)**

- Max. electrode weight: 90kg (198lb.)
- Magenta total: 40kg (88lb.)

---

**C-axis/ATC (option)**

- Max. electrode weight: 10kg (22lb.)
- Magenta total: 20kg (44lb.)

---

**Specifications and Options**

- Standard functions: Programmable flushing nozzle, X, Y and Z axes (optional), Automatic tool change
- Advanced functions: High-accuracy built-in spindle, High-accuracy built-in C-axis

---

**Reference**
EA8 / EA12D
Powerful Functions in a Compact Body

A standard EDM with high productivity and cost performance

FP1 power supply
- Standard low-wear machining circuit and finishing circuit
- High-grade finishing, suitable for die machining, is possible
- Energy-saving specifications incorporate no-resistance method

Highly accurate and rigid machine structure
- Highly rigid structure has low head
- Highly rigid bed structure has no concave section
- An optimum design and compact body have been attained using CAE structure analysis

Fuzzy adaptive control
- Machining conditions are optimally controlled to match the machining state
- Stable machining is realized with SS jump
- Optimum machining according to the flushing method (no-flush, emulsion, fluid jet, suction) is possible

Improved workability with GUI
- Dedicated language is not required for any process from set-up to machining
- Navigation method allows even beginners to operate easily
- Various machining applications are possible with the HybridPack (GUI : Graphical User Interface)

Specifications and Options

<table>
<thead>
<tr>
<th>Standard delivery entrance IFAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1673 (65.8) x 1502 (59.1) x 1252 (49.2)</td>
</tr>
<tr>
<td>1888 (74.3) x 1888 (74.3) x 1650 (64.9)</td>
</tr>
<tr>
<td>2150 (84.6) x 2524 (99.3)</td>
</tr>
<tr>
<td>700 (27.5) x 500 (19.6) x 250 (9.8)</td>
</tr>
<tr>
<td>110 to 200</td>
</tr>
<tr>
<td>250 to 600</td>
</tr>
<tr>
<td>200 to 400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. electrode dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.4 x 77.1 x 93.5</td>
</tr>
<tr>
<td>30.3 x 19.6 x 9.8</td>
</tr>
<tr>
<td>41.3 x 27.5 x 17.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. electrode weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 (110)</td>
</tr>
<tr>
<td>500 (110)</td>
</tr>
<tr>
<td>500 (132)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.9 to 22.7</td>
</tr>
<tr>
<td>10.6 to 22.4</td>
</tr>
<tr>
<td>11.0 to 22.8</td>
</tr>
<tr>
<td>11.2 to 23.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Load F (MACH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>278 to 578</td>
</tr>
<tr>
<td>271 to 571</td>
</tr>
<tr>
<td>281 to 581</td>
</tr>
<tr>
<td>287 to 587</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Load F (OTHER BRANDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0 to 16.8</td>
</tr>
<tr>
<td>6.6 to 16.5</td>
</tr>
<tr>
<td>7.0 to 16.9</td>
</tr>
<tr>
<td>7.1 to 17.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>178 to 428</td>
</tr>
<tr>
<td>170 to 420</td>
</tr>
<tr>
<td>180 to 430</td>
</tr>
<tr>
<td>182.5 to 432.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magazine total:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5kg (11lb.)/ electrode</td>
</tr>
<tr>
<td>70 x 70 x 100 (2.7 x 2.7 x 3.9)</td>
</tr>
<tr>
<td>10kg (22lb.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other features</th>
</tr>
</thead>
</table>
| Metrics:  
| 25 (55) |
| 40 (88) |
| 50 (110) |
| 100 (220) |

<table>
<thead>
<tr>
<th>Total Solutions Machine Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x D x H)</td>
</tr>
<tr>
<td>Machine dimensions (W x D x H)</td>
</tr>
<tr>
<td>Spindle stroke</td>
</tr>
<tr>
<td>Spindle</td>
</tr>
<tr>
<td>Guide rail</td>
</tr>
<tr>
<td>Guide nut (movable)</td>
</tr>
<tr>
<td>Load F (MACH)</td>
</tr>
<tr>
<td>Load F (OTHER BRANDS)</td>
</tr>
<tr>
<td>Magazine total:</td>
</tr>
<tr>
<td>Magazine dimensions:</td>
</tr>
</tbody>
</table>

Distance between table and electrode mounting surface

<table>
<thead>
<tr>
<th>Distance between table and electrode mounting surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 x 70 x 100 (2.7 x 2.7 x 3.9)</td>
</tr>
<tr>
<td>10kg (22lb.)</td>
</tr>
</tbody>
</table>

(Note 1) For MACRO Jr of 3R-Combi and Compact of EROWA-COMBI, the weight is 2.5kg (5lb.)/ electrode.
(Note 2) When using four electrodes, the dimensions are 70 x 70 x 100 (2.7 x 2.7 x 3.9).
(Note 3) C-axis & ATC can be used with EROWA ITS50, but not with EROWA Compact (manual only).

A built-in C-axis and automatic clamp (option) is provided.
**MA, EA Series Product Introduction**

**EA30 / EA40 / EA50**

Diverse Line-up for Machining Large Workpieces

---

**Thermal displacement compensation function (EA30/EA40/EA50)**

- Temperature sensors constantly monitor changes in the environment
- Axes are controlled in real-time based on changes in temperature
- Highly accurate machining, less affected by the work environment, is possible

---

**Automatic vertical front door (EA40/EA50)**

The working tank door opens and closes automatically when a button is pressed. In addition, work safety and operability are enhanced as the front door's clamp is automatically latched.

---

**Machine unit (Standard specifications)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Machine unit dimensions (W x D x H)</th>
<th>Max. workpiece dimensions (reference)</th>
<th>Max. workpiece weight</th>
<th>Table top size (Reference)</th>
<th>Table structure</th>
<th>Dielectric fluid temperature control unit</th>
<th>Filter method</th>
<th>Compressed air</th>
<th>Machine unit dimensions (W x D x H)</th>
<th>Max. workpiece dimensions (reference)</th>
<th>Max. workpiece weight</th>
<th>Table top size (Reference)</th>
<th>Table structure</th>
<th>Dielectric fluid temperature control unit</th>
<th>Filter method</th>
<th>Compressed air</th>
</tr>
</thead>
<tbody>
<tr>
<td>EA30M</td>
<td>2000 x 1500 x 800 (78.7 x 59.1 x 31.5)</td>
<td>1600 x 1100 x 500 (63.0 x 43.3 x 19.7)</td>
<td>250 to 500 (9.8 to 19.6)</td>
<td>1000 x 500 (39.4 x 19.7)</td>
<td>Four way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1000 (39.4)</td>
<td>2000 x 1500 x 800 (78.7 x 59.1 x 31.5)</td>
<td>1600 x 1100 x 500 (63.0 x 43.3 x 19.7)</td>
<td>250 to 500 (9.8 to 19.6)</td>
<td>1000 x 500 (39.4 x 19.7)</td>
<td>Four way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1000 (39.4)</td>
</tr>
<tr>
<td>EA40M</td>
<td>2400 x 2000 x 1000 (94.5 x 78.7 x 39.4)</td>
<td>2000 x 1500 x 700 (78.7 x 59.1 x 27.6)</td>
<td>300 to 600 (11.8 to 23.6)</td>
<td>2000 x 1000 (78.7 x 39.4)</td>
<td>Five way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1200 (47.2)</td>
<td>2800 x 2000 x 1000 (94.5 x 78.7 x 39.4)</td>
<td>2000 x 1500 x 700 (78.7 x 59.1 x 27.6)</td>
<td>300 to 600 (11.8 to 23.6)</td>
<td>2000 x 1000 (78.7 x 39.4)</td>
<td>Five way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1200 (47.2)</td>
</tr>
<tr>
<td>EA50M</td>
<td>3000 x 2400 x 1400 (118.1 x 94.5 x 55.1)</td>
<td>2400 x 1900 x 900 (94.5 x 74.8 x 35.4)</td>
<td>350 to 700 (13.8 to 27.6)</td>
<td>2400 x 1500 (94.5 x 59.1)</td>
<td>Six way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1500 (59.1)</td>
<td>3600 x 3000 x 1400 (140.6 x 118.1 x 55.1)</td>
<td>2400 x 1900 x 900 (94.5 x 74.8 x 35.4)</td>
<td>350 to 700 (13.8 to 27.6)</td>
<td>2400 x 1500 (94.5 x 59.1)</td>
<td>Six way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1500 (59.1)</td>
</tr>
</tbody>
</table>

---

**Special working tanks (option)**

In addition to the standard working tanks above, the following special working tanks are available for the EA30/EA40/EA50.

<table>
<thead>
<tr>
<th>Model</th>
<th>Working tank</th>
<th>Inner dimensions (W x D x H)</th>
<th>Max. workpiece dimensions (W x D x H)</th>
<th>Max. workpiece weight</th>
<th>Table top size (Reference)</th>
<th>Table structure</th>
<th>Dielectric fluid temperature control unit</th>
<th>Filter method</th>
<th>Compressed air</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKX145A</td>
<td>1400 x 1000 x 400 (55.1 x 39.4 x 15.7)</td>
<td>1200 x 850 x 350 (47.2 x 33.5 x 13.8)</td>
<td>200 to 450 (7.9 to 17.7)</td>
<td>1000 x 550 (39.4 x 21.7)</td>
<td>Four way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1000 (39.4)</td>
<td></td>
</tr>
<tr>
<td>CKX210A</td>
<td>2000 x 1500 x 600 (78.7 x 59.1 x 23.6)</td>
<td>1600 x 1200 x 500 (63.0 x 47.2 x 19.7)</td>
<td>300 to 600 (11.8 to 23.6)</td>
<td>2000 x 1050 (78.7 x 41.3)</td>
<td>Five way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1200 (47.2)</td>
<td></td>
</tr>
<tr>
<td>CKX291A</td>
<td>2800 x 2200 x 900 (110.2 x 86.6 x 35.4)</td>
<td>2400 x 1800 x 800 (94.5 x 70.8 x 31.5)</td>
<td>450 to 900 (17.7 to 35.4)</td>
<td>2800 x 1500 (110.2 x 59.1)</td>
<td>Six way</td>
<td>Coolant bath</td>
<td>T-slot</td>
<td>1500 (59.1)</td>
<td></td>
</tr>
</tbody>
</table>

---

**Automatic filter system**

- Long-life laminated paper withers with outstanding filtering performance are used
- Reverse washing eliminates filter replacement (option for EA40/EA50)

---

**Options**

- Automatic tool changer (Note 1)
- Automatic filter system
- Booster power supply
- Programmable flushing nozzle section (right nozzle) + automatic changeover
- Lighting
- Dielectric fluid distributor
- Special working tank (for built-in C-axis)
- Minimum electrode weight 500kg (1100lb.) specifications (EA40)

(Note 1): Contact your local Mitsubishi Electric sales office or dealer for details on the EA40 and EA50 AEC.
## Machine Specifications and Options

### Options and retrofit specifications differ according to country and region, so please check with your dealer.

### Machine Specifications

<table>
<thead>
<tr>
<th>Machine Specifications</th>
<th>EA8PV ADVANCE</th>
<th>EA12VM ADVANCE</th>
<th>EA28VM ADVANCE</th>
<th>MA2000M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance between table</td>
<td>550 (1210)</td>
<td>550 (1210)</td>
<td>2000 (4400)</td>
<td>1625 x 1717 x 2000</td>
</tr>
<tr>
<td>Dielectric fluid temperature control unit</td>
<td>Unit cooler</td>
<td>Unit cooler</td>
<td>Unit cooler</td>
<td>Unit cooler</td>
</tr>
<tr>
<td>Automatic filter</td>
<td>100 x 100 x 100</td>
<td>100 x 100 x 100</td>
<td>100 x 100 x 100</td>
<td>100 x 100 x 100</td>
</tr>
<tr>
<td>Vertical front door</td>
<td>540 (1000)</td>
<td>540 (1000)</td>
<td>540 (1000)</td>
<td>540 (1000)</td>
</tr>
<tr>
<td>Max. loading weight</td>
<td>50 (110)</td>
<td>1000 (2200)</td>
<td>50 (110)</td>
<td>50 (110)</td>
</tr>
<tr>
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<td>1000 (2200)</td>
<td>1000 (2200)</td>
<td>1000 (2200)</td>
</tr>
</tbody>
</table>

### Options

- **Main-option correspondence table**
- **Standard equipment**
- **Can be added after installation**
- **Cannot be added after installation**
- **Not available**

#### Options

- **Lighting (fluorescent lamp)**: Effective for medium-to-large-sized EDMs which discharge large quantities of sludge.
- **High-function manual operation box**: LCD display improves workability. Workspace coordinates can be set from manual operation box. Jog feedrate can be changed between 50 and 150% with override function.

### Diagrams

- **Programmable flushing nozzle selection**
- **Dielectric fluid distributor**

- **TF20**: Sprays dielectric fluid between workpiece and electrode during pinching machining.

- **Spreads dielectric fluid into three boxes and sprays onto machining section.**

---

(Note 1) When the special working tank is at the lowest level, the upper end of the working tank is approx. 250mm (10") above the table.

(Note 2) The shuttle-type ATC cannot be used with the programmable flushing nozzle.

(Note 3) Four programmable flushing nozzles can be selected for the EA8PV ADVANCE model with a tank.

(Note 4) FP100EA power supply.

(Note 5) MA2000M also available as a separate machine.
Options and retrofit specifications differ according to country and region, so please check with your dealer.

### Options

<table>
<thead>
<tr>
<th>Head-side tooling</th>
<th>MDX2000M</th>
<th>EAM</th>
<th>EA120M</th>
<th>EA30M</th>
<th>EA40M</th>
<th>EA60M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote control (3R-MACRO &amp; specification)</td>
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<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
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<td>Large electrode adapter</td>
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<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
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</table>

#### Note 13
A personal computer is required for ESPERADVANCE.

#### Note 11
The external signal output (M code with answer) is necessary for attaching external equipment which requires an M code output.

#### Note 10
It is necessary for attaching an automation system (electrode / workpiece automatic changer unit).

#### Note 7
An infrared flame detector and MVH-ATC and automation system can not be combined.

#### Note 5
The shuttle ATC cannot be used with the programmable flushing nozzle.

#### Note 1
Select the chuck from the following types: 3R-MACRO, 3R-Combi, EROWA-ITS, EROWA-COMBI.

#### Note 14
DNC H/W is required for the EA series.

### Network Connection Specifications (DNC, FTP option)

Data such as NC programs, machining settings and variables can be exchanged between a personal computer and EDM.

The required options differ according to the model and purpose, and can be confirmed with the following tables. One IP address must be prepared for each EDM within the user’s in-house network.

#### Data Transmission

- **RS232C interface**
- **DNC S/W**
- **DNC H/W (Note 12)**
- **External signal output (M code with answer) (Note 11)**
- **External signal output (M code) (Note 10)**

### Control unit

- **Communication**
  - **Network Connection Specifications**
    - **DNC S/W (Note 14)**
    - **FTP for EA ADVANCE series**

### Software

- **Software**
  - **Multi function**
  - **RS232C standard on internal**
  - **Printer interface**
  - **Protect mode**
  - **Volume / Pitch冠名**
  - **Safety**
    - **Infrared flame detector**
    - **Conformal film setting and user specifications**
  - **Display**
    - **Run timer**
    - **3-color warning light**
    - **Large / Warning light**

### Head-side tooling

- **Compatible with fluid emission from spindle center**
- **Compatible with continuous machining using multiple electrodes**

### Shuttle-4T (automatic tool changer)

- **Compatible with fluid emission from spindle center**
- **Compatible with continuous machining using multiple electrodes**
- **Change up to four electrodes**

### Shuttle-7T (automatic tool changer)

- **Compatible with fluid emission from spindle center**
- **Compatible with continuous machining using multiple electrodes**
- **Change up to seven electrodes**

### MVH-20T (automatic tool changer)

- **Change up to 20 electrodes**

### MVH-40T (automatic tool changer)

- **Change up to 40 electrodes**

### Protect mode

- **Protecting data from thoughtless changes, forbidding data taken out**

### Virus infection prevention

- **Unnecessary of pattern file update, possible virus measure semi-permanently**

- **Measuring threat from the inside**
  - **Dedicated mixer**
  - **Continuous measurable**
  - **NS powder**

- **Fine-hole jig specifications**
  - **Removable, and compatible for ø15 to 3.0mm fine-hole machining**

- **Infrared flame detector**
  - **Catches infrared rays from furnace and stops power supply**

### Measuring threat from the inside

- **Dedicated mixer**
  - **Removable, and compatible for ø15 to 3.0mm fine-hole machining**

- **Infrared flame detector**
  - **Catches infrared rays from furnace and stops power supply**

### Measuring threat from the outside

- **Guarding in response to the alarm**
  - **Virus infection prevention**
  - **Protect mode**

### Machine Specifications and Options
System 3R System Chart

Spindle

Change automatically (for ATC)

[Images of tooling components and specifications]

Change manually

Chuck

[Images of tooling components and specifications]

Electrode/Pallet holder (common for electrode and workpiece)

Table chuck

[Images of tooling components and specifications]

Measuring

[Images of measuring tools and specifications]

* Contact System 3R Japan Co., Ltd. for detailed tooling specifications.

EROWA System Chart

Spindle

Change automatically (for ATC)

[Images of tooling components and specifications]

Change manually

Chuck

[Images of tooling components and specifications]

Electrode/Pallet holder (common for electrode and workpiece)

Table chuck

[Images of tooling components and specifications]

Measuring

[Images of measuring tools and specifications]

* Contact EROWA Japan Co., Ltd. for detailed tooling specifications.
### Power Supply/Control Specifications

#### Power Supply and Control Specifications

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Power Supply model</th>
<th>EAP4M ADVANCE</th>
<th>EAP12M ADVANCE</th>
<th>EAP30M ADVANCE</th>
<th>EAP8M ADVANCE</th>
<th>EAP8M ADVANCE</th>
<th>EAP12M ADVANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply model</td>
<td>FP70A / FP70B</td>
<td>FP70A / FP70B</td>
<td>FP110A / FP110B</td>
<td>FP70A / FP70B</td>
<td>FP70A / FP70B</td>
<td>FP70A / FP70B</td>
<td></td>
</tr>
<tr>
<td>Power supply current</td>
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<td>80</td>
<td>120</td>
<td>80</td>
<td>120</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Input method</td>
<td>Keyboard, USB flash memory, Ethernet</td>
<td>USB flash memory, RS-232C</td>
<td>Keyboard, USB flash memory</td>
<td>Keyboard, USB flash memory</td>
<td>Keyboard, USB flash memory</td>
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<tr>
<td>Display</td>
<td>Touch panel, menu</td>
<td>Touch panel, menu</td>
<td>Touch panel, menu</td>
<td>Touch panel, menu</td>
<td>Touch panel, menu</td>
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</tr>
<tr>
<td>Network specification</td>
<td>Ethernet, CNC closed-loop</td>
<td>Ethernet, CNC closed-loop</td>
<td>Ethernet, CNC closed-loop</td>
<td>Ethernet, CNC closed-loop</td>
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</tr>
<tr>
<td>Graphics</td>
<td>X-Y plane, X-Y plane, solid, table scale, background drawing</td>
<td>X-Y plane, X-Y plane, solid, table scale, background drawing</td>
<td>X-Y plane, X-Y plane, solid, table scale, background drawing</td>
<td>X-Y plane, X-Y plane, solid, table scale, background drawing</td>
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<tr>
<td>Manual feed</td>
<td>High-speed, low-speed, inching (1µm/10µm), extension mode (high-speed/low-speed)</td>
<td>High-speed, low-speed, inching (1µm/10µm), extension mode (high-speed/low-speed)</td>
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<tr>
<td>Graph check</td>
<td>2D display compatible, high-speed graphic drawing</td>
<td>2D display compatible, high-speed graphic drawing</td>
<td>2D display compatible, high-speed graphic drawing</td>
<td>2D display compatible, high-speed graphic drawing</td>
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<tr>
<td>Network specifications</td>
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<td>Ethernet port (10/100Base-T) port RJS connection 1 port</td>
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<tr>
<td>Basic menu</td>
<td>(Included in machine dimensions)</td>
<td>(Included in machine dimensions)</td>
<td>(Included in machine dimensions)</td>
<td>(Included in machine dimensions)</td>
<td>(Included in machine dimensions)</td>
<td>(Included in machine dimensions)</td>
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</tr>
<tr>
<td>Outline dimensions (W x D x H)</td>
<td>(Pendant 546 (21.5) x 170 (6.7) x 346 (13.6))</td>
<td>(Pendant 546 (21.5) x 170 (6.7) x 346 (13.6))</td>
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**Control unit functions**

<table>
<thead>
<tr>
<th>C31 (Advance control unit) control functions</th>
<th>C30 control unit functions</th>
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<tbody>
<tr>
<td>EAP4M ADVANCE</td>
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</tr>
<tr>
<td>Power supply model</td>
<td>FP70A / FP70B</td>
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<td>Touch panel, menu</td>
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<td>Display characters</td>
<td>Alphanumeric characters</td>
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<td>Network specification</td>
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<td>Basic menu</td>
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</tr>
<tr>
<td>Weight (kg)</td>
<td>250 (550)</td>
</tr>
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</table>

**Machine, power supply and dielectric fluid temperature control unit combinations**

<table>
<thead>
<tr>
<th>Power supply model</th>
<th>Power supply</th>
<th>Total input capacity [kW]</th>
<th>Maximum grease heating value [kW/m³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAP4M ADVANCE</td>
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<td>EAP12M ADVANCE</td>
<td>FP70A / FP70B</td>
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<td>EAP30M ADVANCE</td>
<td>FP70A / FP70B</td>
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</tr>
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<td>EAP8M ADVANCE</td>
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<td>EAP8M ADVANCE</td>
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<td>45</td>
<td>8.4</td>
</tr>
</tbody>
</table>

**Note:** Contact your local Mitsubishi Electric sales office or dealer regarding EAP4M and EAP12M.

**Note (2):** The machine’s generated heating value is a reference value. Refer to page 45 for details on calculating the value.
Mitsubishi Electric EDM Automation Systems

A step forward in machine specification that results in high productivity

Machine specification suitable for continuous automatic operations

- Suppresses accuracy issues caused by temperature change by using thermal displacement compensation function during continuous operations
- Minimizes machine temperature changes during machining by using fluid circulation function
- Automatic elevation tank position can be set in program
- Maintenance can be done without interfering machine operation, due to structures of automatic lubrication unit and filter
- Easy maintenance due to indicators of days and time for replacement of maintenance items

Advanced system supportive of continuous automatic operation

- Ample memory for continuous automatic operation when using 106 work coordinates or machining position up to 999 places in one program
- Electrodes and workpiece can be automatically measured, and machining coordinates can be automatically compensated based on the measured core alignment and inclination data
- Scheduling can be easily managed with built-in scheduler, which can manage programs, workpieces and electrode information
- Easy maintenance due to indicators of days and time for replacement of maintenance items

Application supportive of continuous operation

Offline automatic programming system

- Offline programming and program management is possible
- Same screens and operability as ESPERADVANCE, and compatible with 64-bit models (MA, EA Series machining condition search is also available)
- Import data from CamMagicAD or EPX compatible CAD/CAM

Scheduling system

- Execute continuous schedule operation of EDMs with job management
- Control ID numbers, as well as monitor the mounting state of electrodes and the state of communications with the EDM and electrode / workpiece changing unit

Continuous automatic operation system configuration

ATC+C-axis specification

- Basic configuration for continuous operation when using many work pieces and many electrodes
- Machine Up-Time can be improved by changing electrodes by MVH-ATC
- High-accuracy built-in C-axis and LS20T-ATC is standard for MA2000

Electrode / workpiece automatic changing unit specification

- Automation system specification using a robotic system
- Machine configuration of electrode and workpiece can be changed depending on machine configuration
- Machine Up-Time is improved by using offline setup system

Multiple machines control system specification

- Automation system specification for controlling multiple machines with a robotic system
- A cell system can be built which controls die-sinking, wire, milling and a coordinate machine
- Managing multiple machines with a scheduler system is enhanced

Work-piece/Electrode set-up method

In-line set-up method

- Set-up method for continuous operation which measures core alignment of electrode and workpiece using measuring program and compensation function
- An effective system for cases requiring high-accuracy core alignment and measurement before machining
- The measuring accuracy is improved when using a touch probe is used as a reference position

Off-line set-up method

- Set-up method for continuous operation which measures core alignment of electrode and workpiece using presetter and coordinate measuring machine
- Is effective for cases that include many machines, electrodes, and work pieces
- ID system provides easy management of electrodes and work pieces
- (Note 1) A personal computer is required for installation.

(Note 2) Contact your local Mitsubishi sales office or dealer regarding available carrier device robots.
(Note 3) Contact your local Mitsubishi sales office or dealer for more information regarding system configurations.

(Note 4) A personal computer is required for installing applications.
**Peripheral equipment/System extension options**

**Machine remote monitor**
- Remote monitoring using a personal computer
- Sensing of the alarm

**3D CAD/CAM system**
- 3D model can be created easily, and cutting data for CAM system can be automatically generated
- Operation can be sequenced to wire, milling and hole machining

**RemoteMagic II**
- Visualizes workshop with monitor and notification
- Remote monitoring

**CamMagic AD**
- Remote monitoring and operation
- Monitoring machine operation remotely

**Electrical-discharge machining**
- Machine setup and pre-machining
- Machine operation

**Machining program**
- Machine control
- Machine operation

**Parts pre-machining**
- Machine control
- Machine operation

**Electrode design**
- Machine control
- Machine operation

**Electrode fabrication**
- Machine control
- Machine operation

**Workpiece/Electrode management**
- Machine control
- Machine operation

**Mold/Part design**
- Machine control
- Machine operation

**CAM data**
- Machine control
- Machine operation

**Operating status**
- Machine control
- Machine operation

**Presetter**
- Presetter
- Coordinate measuring machine

**Touch probe**
- Touch probe

**ID tag system**
- ID tag system

**ID tag**
- ID tag system

**Pallet tooling**
- Unique functionality can be handled on magnetic chucks

**Main pallet tooling configuration and machine specifications**

**Figure**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>System 3R</th>
<th>Dyna series</th>
</tr>
</thead>
<tbody>
<tr>
<td>W (mm)</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>H (mm)</td>
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<td>100</td>
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<tr>
<td>Weight (kg)</td>
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<td>5</td>
</tr>
<tr>
<td>Max. workpiece height (mm)</td>
<td>30.0</td>
<td>30.0</td>
</tr>
</tbody>
</table>

* Each model should be equipped with a high-accuracy built-in C-axis and 3R-Macro or Erowa ITS tooling.
* The max. workpiece height varies depending on pallets and fixtures.
* Contact System 3R Japan Co., Ltd. for detailed tooling specifications.
* Contact EROWA Japan Co., Ltd. for detailed tooling specifications.

**Main pallet tooling configuration and machine specifications**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>System 3R</th>
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<tr>
<td>W (mm)</td>
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**Table**

<table>
<thead>
<tr>
<th>Pallet</th>
<th>Maximum workpiece height (mm)</th>
<th>Maximum workpiece height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3R-681.51</td>
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<tr>
<td>3R-680.10-2</td>
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</tr>
<tr>
<td>3R-776.1</td>
<td>340.0</td>
<td>340.0</td>
</tr>
<tr>
<td>3R-772.1</td>
<td>330.0</td>
<td>330.0</td>
</tr>
<tr>
<td>3R-770.1</td>
<td>320.0</td>
<td>320.0</td>
</tr>
</tbody>
</table>

* Each model should be equipped with a high-accuracy built-in C-axis and 3R-Macro or Erowa ITS tooling.
* The max. workpiece height varies depending on pallets and fixtures.
* Contact System 3R Japan Co., Ltd. for detailed tooling specifications.
* Contact EROWA Japan Co., Ltd. for detailed tooling specifications.
Preparation for Machine Installation

Checklist for machine installation

1. Determining the machining details
   • Determine the workpiece
   • Determine the machining side
   • Determine the pre-processing side
   • Determine the post-processing side
   • Check each item, and make sure that no item or order is overlooked

2. Preparation of installation fixtures
   • Mat the installation platform
   • Prepare or manufacture the fixtures

3. Preparation of tooling and electrode
   • Preparation of tooling and electrode
   • Order, preparation or manufacture
   • It normally takes one to two months for tooling delivery, so please place orders as early as possible.

4. Training of programmers and operators
   • Select the programmers and operators
   • Apply for training sessions

5. Confirmation of foundation work and power supply work
   • Foundation work
   • Power supply work (including grounding works, air source and other work completion)
   • If there is any possibility of radio disturbance, refer to the "EDM Radio Disturbance and Countermeasures", and investigate the state beforehand. Class C grounding is recommended.
   • Prepare the following air source: 0.5 to 0.7MPa, flow rate of 27l/min or more (38l/min or more when using a built-in spindle, 0.6MPa or more when using EROWA tooling specifications)
   • Prepare an air hose with inner diameter of 2.0mm or more (coupler socket 20SH is enclosed with the machine)
   • Install the EDM in an environment with no corrosive gases, fine powders, or combustible powders.
   • The EDM must always be grounded to prevent external noise, equipments will not enter through the common grounding. Contact your local fire department for details.

6. Confirmation of delivery route
   • Traffic restrictions to factory
   • Road width
   • Entry road
   • Factory entrance and width of gate in factory
   • Factory building entrance dimensions (height x width)
   • Confirm the routes inside and outside the factory before delivery

7. File applications to fire department
   • Confirm the dielectric fluid amount
   • File applications to fire department (EDMs already installed must also be filed)
   • Application for "Handling the 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/hazardous material amount of 2,000l or more"
   • The applications must be filed before the EDM is installed. The required applications differ according to the region, so contact your nearest fire department for details

8. Preparation for Machine Installation

9. Preparation of foundation site
   • Foundation site
   • Flooring
   • Confirmation of floor area
   • Confirmation of foundation floor
   • Foundation work

10. Confirmation of power supply (including grounding works), air source and other work completion
   • Power supply
   • Air source
   • Other work completion

11. Training of programmers and operators
   • Select the programmers and operators
   • Apply for training sessions

12. Confirmation of installation fixtures
   • Mat the installation platform
   • Prepare or manufacture the fixtures

13. Preparation of tooling and electrode
   • Preparation of tooling and electrode
   • Order, preparation or manufacture

14. Determination of tooling and electrode
   • Determination of tooling and electrode

15. Foundation work
   • Foundation work

16. Power supply work (including grounding works, air source and other work completion)
   • Power supply work (including grounding works, air source and other work completion)

17. Confirmation of foundation site
   • Confirmation of foundation site

18. Confirmation of power supply (including grounding works), air source and other work completion
   • Confirmation of power supply (including grounding works), air source and other work completion

19. Preparation of foundation site
   • Preparation of foundation site

20. Confirmation of foundation site
   • Confirmation of foundation site

21. Preparation of tooling and electrode
   • Preparation of tooling and electrode

22. Determination of tooling and electrode
   • Determination of tooling and electrode

23. Training of programmers and operators
   • Training of programmers and operators

24. Confirmation of foundation site
   • Confirmation of foundation site

25. Preparation of tooling and electrode
   • Preparation of tooling and electrode

26. Determination of tooling and electrode
   • Determination of tooling and electrode

27. Foundation work
   • Foundation work

28. Power supply work (including grounding works, air source and other work completion)
   • Power supply work (including grounding works, air source and other work completion)
Precautions

Preparation for Machine Installation

Selecting the power facility capacity

Before installing an EDM, ensure that sufficient power capacity can be supplied to meet the total power input requirements. The total power input requirements include the power for the main unit and accessories (options).

<table>
<thead>
<tr>
<th>Facility capacity (kVA)</th>
<th>Total power input (Machine input + power supply input + dielectric fluid temperature control unit input) (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~12</td>
<td>~12</td>
</tr>
<tr>
<td>12~22</td>
<td>12~22</td>
</tr>
<tr>
<td>22~33</td>
<td>22~33</td>
</tr>
<tr>
<td>33~50</td>
<td>33~50</td>
</tr>
</tbody>
</table>

*Please refer to page 45 for the combination of machine and power supply type.

No-fuse breaker and earth-leakage breaker

When selecting a no-fuse breaker or earth-leakage breaker for the primary side of the EDM, calculate the total facility capacity, and select the breaker using the following table as a reference. The breakers in the following table allow for the rush current of the transformer in the power supply panel.

<table>
<thead>
<tr>
<th>Total facility capacity (kVA)</th>
<th>No-fuse breaker</th>
<th>Earth-leakage breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>~12</td>
<td>NF50-CW (50A)</td>
<td>NV50-CW (50A)</td>
</tr>
<tr>
<td>12~22</td>
<td>NF100-CW (100A)</td>
<td>NV100-CW (100A)</td>
</tr>
<tr>
<td>22~33</td>
<td>NF225-CP (150A)</td>
<td>NV225-CP (150A)</td>
</tr>
<tr>
<td>33~50</td>
<td>NF225-CP (200A)</td>
<td>NV225-CP (200A)</td>
</tr>
</tbody>
</table>

Precautions for selecting earth-leakage breakers

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

Selecting the power input cable size and input power voltage

The following is a guide for calculating the appropriate power cable size to use based on total capacity. The cable size should be sufficient to allow some leeway.

<table>
<thead>
<tr>
<th>Total facility capacity (kVA)</th>
<th>Cable size (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~12</td>
<td>5.5</td>
</tr>
<tr>
<td>9~12</td>
<td>8.0</td>
</tr>
<tr>
<td>12~15</td>
<td>14.0</td>
</tr>
<tr>
<td>15~21</td>
<td>22.0</td>
</tr>
<tr>
<td>21~26</td>
<td>30.0</td>
</tr>
<tr>
<td>28~34</td>
<td>98.0</td>
</tr>
</tbody>
</table>

Stabilizing the power supply

EDM power supplies use the latest electronics technologies. Any large fluctuation in the voltage can cause an EDM to deviate from its optimum working conditions, and cause a reduction in efficiency. Although fluctuations within approx. ±5% of the rated voltage will not cause a problem, an automatic voltage regulator (AVR) should be used to stabilize fluctuations of ±10% or more that last for a long period of time (e.g., operating the EDM at 180V when rated voltage is 200V).

Harmonic distortion

Harmonic distortion in the power supply could affect machining operation even when there is no voltage fluctuation. If such a problem occurs, avoid use near equipment that generates harmonic distortion, or provide measures such as a line filter.

Preventing fires and accidents with EDMs

Cautions

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

- Ensure that the upper part of the workpiece is submerged by 50mm (1.97in) or more (FP100EA, FP100MA, FP80V) or 100mm (3.94in) or more (FP100EA, FP120V) 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 EDM.
- Always keep the area clean and tidy, and do not store flammable materials near the EDM.

Stabilizing the power supply

Electric discharge between tool electrode and jet nozzle.

Machining with sufficient room in the working tank but not enough dielectric fluid.

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 machining of Hazardous Materials Safety Techniques Association is used (for tank capacities less than 2,000 L, 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 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.

Type test approved proof

It has passed the type test of electrical-discharge machining of Hazardous Materials Safety Techniques Association. Subject machines: EABM, EA12VM ADVANCE, EA28VM ADVANCE

A tank which has passed the type test of electrical-discharge machining of Hazardous Materials Safety Techniques Association is used.

Diaphragm 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.
Mitsubishi Electric Wire-cut EDMs

Ample lineup corresponding to needs for part machining to high-accuracy mold machining. Mitsubishi Electric helps to improve our customers’ productivity with total solutions covering machine, power supply, adaptive control, automation systems and networks.

Contact your local Mitsubishi Electric sales office or dealer for more details.