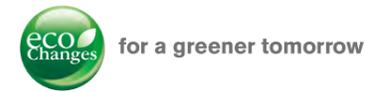


Global Partner. Local Friend.



EA Series

FACTORY AUTOMATION

MITSUBISHI ELECTRIC NC EDM Systems EA Series Medium&Large

EA

series



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MITSUBISHI ELECTRIC CORPORATION HEAD OFFICE: TOKYO BLDG., 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

Energy and Electric Systems

A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices

A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance

Dependable consumer products like air conditioners and home entertainment systems.

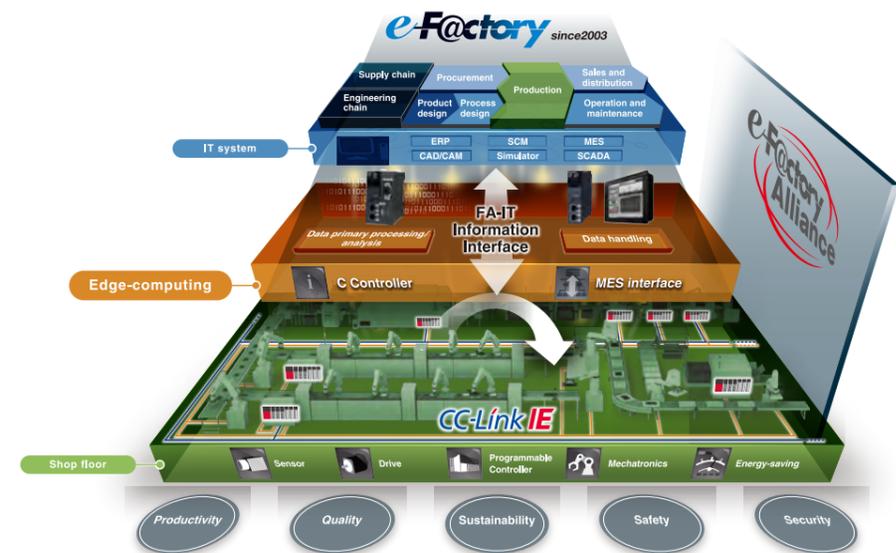
Information and Communication Systems

Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems

Maximizing productivity and efficiency with cutting-edge automation technology.

Mitsubishi Electric continues the challenge to be the only one FA machine and systems supplier delivering total customer satisfaction.



Mitsubishi Electric is a world-leading general electrical and electronic products manufacturer with wide-ranging business reach, from appliances for the home to systems used in outer space. Global-scale business development is in five business domains: heavy electrical machinery and systems, industrial automation, information and communication systems, electronic devices, and home appliances. Producing general electrical machinery for over 90 years, as Mitsubishi Electric's Factory Automation Systems Business Group, we have supported manufacturing in Japan, China, and Asia, and around the globe. In doing so, we have accumulated and refined technologies for FA control, drive control, automation, and manufacturing that are utilized to expand and improve a vast product lineup, such as controllers, drives, and automation and power distribution control products. In addition to product components like those listed above, we are quick to propose systems such as e-F@ctory and iQ Platform as solutions for production site innovation. As a comprehensive supplier of FA products and systems, Mitsubishi Electric will continue to respond to the voice of customers and deliver products of the utmost quality throughout the world.

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

1964



DM201
Thyristor power supply
Hydraulic servo system
Production started 1964



DM500+DE90T
Began shipment in Nov. 1965



DM250+DE30T
Transistor pulse power supply
Began shipment in Feb. 1967



DM100
Began shipment in Dec. 1971



DM300N+EP120M
Began shipment in Jul. 1972



DK700
Began shipment in Oct. 1974



DK280
Began shipment in Apr. 1976



DK140
Began shipment in Sep. 1978



DK360NC
Began shipment in May 1980



M35K
Began shipment in May 1986



M25KC4
Equipped with ultralow-wear
power supply
(slope control system)
Began shipment May 1986



M55C6
Equipped with 16bit CNC
Began shipment in Dec. 1982



M25C3
Began shipment in Dec. 1982



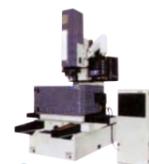
M55
Began shipment in Dec. 1982



M35C2
Began shipment in May 1982



M30
Motor servo system
Began shipment in Jan. 1982



M85KW
Began shipment in Feb. 1987



M115K
Began shipment in Jan. 1998



EML20
Began shipment in Aug. 1988



M35J
Began shipment in May 1989



M35S
Began shipment in Dec. 1989



M65E
Began shipment in Mar. 1990



V35F
Equipped with 32bit CNC and FUZZY Control
Began shipment in Feb. 1991



EA12E
Equipped with 64bit CNC
Began shipment in Aug. 1999



EDSCAN8E
Began shipment in May 1996



EX30
Began shipment in Jun. 1996



EX8
Began shipment in Jan. 1995



VX20
Began shipment in Jan. 1995



VX10
Began shipment in Dec. 1994



ADMAQ-E
Began shipment in Oct. 1994



VP35F
NS powder specifications
Began shipment in Jun. 1992



EA8
Began shipment in Oct. 1999



VA10
Began shipment in Apr. 2001



MA2000
Equipped with thermal
displacement compensation
Began shipment in May 2001



EA8P
Began shipment in Feb. 2004



EA12V
Equipped with V power supply
(tungsten carbide circuit standard equipment)
Began shipment in Apr. 2004



EA8PV
Equipped with ultrafine matte
finish circuit (NP circuit)
Began shipment in Jun. 2006



EA28V
Began shipment in Jan. 2007



EA12PS
Began shipment in Feb. 2016



EA8PS
Began shipment in Feb. 2016



EA12S
Began shipment in Mar. 2015



EA8S
Began shipment in Feb. 2014



EA8PV ADVANCE
Began shipment in Feb. 2008



EA28V ADVANCE
Began shipment in Feb. 2008



EA12V ADVANCE
Equipped with ADVANCE control device
Began shipment in Feb. 2008

2008

EA Series Medium & Large

Medium & Large size machine

Standard model pursuing multi-function and productivity



EA Series

Medium & Large

NC-EDM Systems

An extensive product lineup ready to support the most diversified needs, from high-precision machining of small workpieces to highly productive machining of large workpieces. Mitsubishi Electric die-sinking EDMs offer comprehensive solutions that contribute to improving the productivity of customers' facilities.

Ultrahigh-accuracy machine

MA2000

Flagship model integrating advanced technologies



High-accuracy machine

EA-PS Series

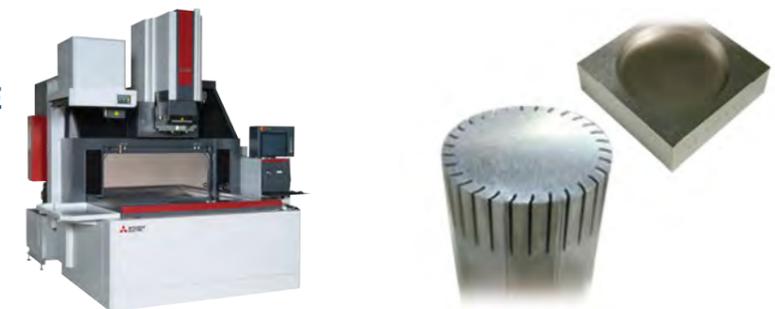
High-grade model compatible for various uses



High-performance machine

EA-V ADVANCE Series

High-class model pursuing accuracy and productivity



Productivity machine

EA-S Series

Supports various machining needs in pursuit of higher productivity



Large-size high-performance machine

EA ADVANCE Series

Standard model pursuing high performance and high productivity



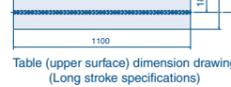
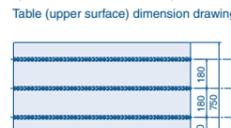
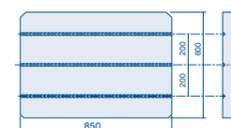
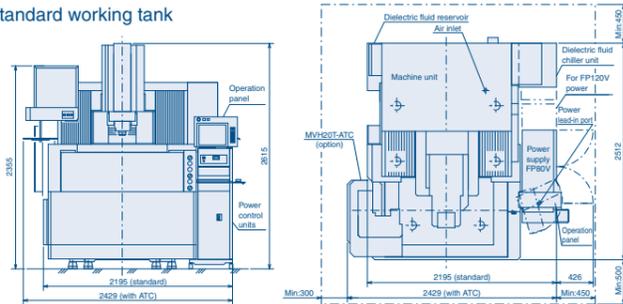
Medium-size high-performance machine
EA28V ADVANCE
EA28V ADVANCE
 Long stroke specifications



Photo: EA28V ADVANCE Long stroke specifications
 MVH20T-ATC C-axis(option)

Photo: C-axis(option)

Standard working tank



Electrode mounting table dimension drawing

* The 3R/ EROWA electrode holder is used when the built-in C-axis/ automatic clamp (option) is provided.

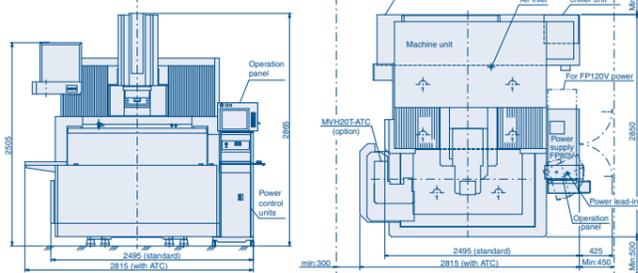
Standard functions

- Tungsten carbide machining circuit
- Fine matte finish circuit (PS circuit)
- Glossy mirror finish circuit (GM2 circuit)
- Narrow gap circuit
- Thermal displacement compensation system
- Z-axis linear scale
- High-accuracy positioning circuit
- Automatic elevation tank
- Working tank fluid flow adjustment function
- High-function manual operation box
- DNC H/W

Option

- Column up 150mm (5.9in) specifications
- High-accuracy built-in C-axis
- High-accuracy built-in spindle
- Automatic clamp
- Large electrode adaptor
- LS-10T ATC/LS-20T ATC
- MVH-20T ATC/MVH-40T ATC
- NS powder specifications
- XY-axis linear scale
- Z-axis stroke 450 specifications
- Emission/suction automatic changeover
- Programmable flushing nozzle (eight nozzles) + Automatic changeover
- Fluid pressure 3-step changeover
- Dielectric fluid distributor
- Special working tank (including 150mm (5.9in) column up)
- Long stroke specifications
- FP120V
- IDPM
- Ultrafine matte finish circuit (NP2 circuit)
- FP-V power supply extension unit

Long stroke specifications / Special working tank



Standard machine specifications

| | | EA28VM ADVANCE | EA28VM ADVANCE <Long stroke specifications> |
|----------------------------------|--|--------------------------------|--|
| Machine unit | Dimensions (W x D x H) [mm] | 2195x2512x2615 | 2495x2850x2865 |
| | Total system weight [kg] | 5400 | 5950 |
| Machine travels (X x Y x Z) [mm] | | 650x450x350 | 1000x470x450 |
| Spindle | Distance between table and electrode mounting surface [mm] | 425 to 775 ^(Note 1) | 575 to 1025 |
| | Max. electrode weight [kg] | 200 | 200 |
| Method | | Automatic elevation tank | Automatic elevation tank |
| Working tank | Inner dimensions (W x D x H) [mm] | 1100x810x450 | 1400x900x550 |
| | Fluid level adjustment range (from top of table) [mm] | 100 to 400 | 150 to 500 |
| Table | Dimensions (W x D) [mm] | 850x600 | 1100x750 |
| | Max. workpiece dimensions (W x D x H) [mm] | 1050x760x350 | 1350x850x450 |
| | Distance between floor and top of table [mm] | 900 | 900 |
| | Max. workpiece weight [kg] | 2000 | 2000 |
| T-slot | | Three slots at 14-200mm pitch | Four slots at 14-180mm pitch |
| Dielectric fluid reservoir | Capacity (initial dielectric fluid supply amount) [ℓ] | 390 (595) | 740 (1070) |
| | Filtering method [mm] | Three fine paper filters | Three fine paper filters |
| | Dielectric fluid chiller unit [mm] | Unit cooler | Unit cooler |

(Note 1) In the case of the special working tank, it becomes 575 to 925 mm (22.6" to 36.4").

Distance between table and electrode mounting surface

| | | 3R MACRO | EROWA ITS50 | 3R Combi | |
|-----------------|------|------------|----------------|------------|------------|
| | | | | MACRO | Jr |
| C-axis | [mm] | 300 to 650 | 317.5 to 667.5 | 300 to 650 | 310 to 660 |
| Spindle | [mm] | 279 to 629 | 296.5 to 646.5 | 279 to 629 | 289 to 639 |
| Automatic clamp | [mm] | 300 to 650 | 317.5 to 667.5 | 300 to 650 | 310 to 660 |

Standard delivery entrance

| | Width [mm] | Height [mm] |
|--|------------|-------------|
| Standard specifications | 2063 | 2660 |
| LS-10T ATC specifications | 2250 | 2660 |
| LS-20T ATC specifications | 2475 | 2660 |
| MVH-20T ATC specifications | 2297 | 2660 |
| MVH-40T ATC specifications ^(Note 2) | 2168 | 2660 |

(Note 2) With the MVH40T-ATC specifications, the ATC unit and holder are removed before shipment. A crane or lifting device is required when installing the system.

C-axis/ATC (option)

| | | | 3R | | EROWA | |
|-----------------------------|---------------------------|--|-------|-------|-------|----------|
| | | | MACRO | Combi | ITS | COMBI |
| C-axis | Max. electrode weight | 50 ^(Note 3) | ○ | ○ | ○ | ○ |
| | Speed | 1 to 30 [min ⁻¹] | ○ | ○ | ○ | ○ |
| Spindle | Max. electrode weight | 10 ^(Note 3) | ○ | ○ | ○ | ○ |
| | Speed | 1 to 1500 [min ⁻¹] | ○ | ○ | ○ | ○ |
| LS-10T ^(Note 10) | Max. electrode dimensions | 54x54x200 [mm] | ○ | ○ | ○ | - |
| | Max. electrode weight | 5kg/electrode ^(Note 4) Magazine total: 20kg | ○ | ○ | ○ | - |
| LS-20T ^(Note 10) | Max. electrode dimensions | 54x54x200 [mm] | ○ | ○ | ○ | - |
| | Max. electrode weight | 10kg/electrode ^(Note 4) Magazine total: 40kg | ○ | ○ | ○ | - |
| MVH20T | Max. electrode dimensions | 70x70x200 [mm] ^(Note 5) | ○ | ○ | ○ | (Note 9) |
| | Max. electrode weight | 10kg/electrode ^(Note 5) Magazine total: 80kg ^(Note 6) | ○ | ○ | ○ | (Note 9) |
| MVH40T | Max. electrode dimensions | 70x70x200 [mm] ^(Note 6) | ○ | ○ | ○ | (Note 9) |
| | Max. electrode weight | 10kg/electrode ^(Note 6) Magazine total: 80kg ^(Note 7) | ○ | ○ | ○ | (Note 9) |

(Note 3) For MACRO Jr of 3R combi and Compact of EROWA COMBI, the weight is 2.5kg/electrode.
 (Note 4) MACRO of 3R combi, the weight is 5kg/electrode, and is 2.5kg/electrode with MACRO Jr.
 (Note 5) Please contact a Mitsubishi Electric representative if the electrode exceeds the specified dimensions
 (Note 6) For MACRO of 3R Combi, the weight is 5kg/electrode, is 2.5kg/electrode with MACRO Jr, and Compact of EROWA COMBI, the weight is 2.5kg/electrode.
 (Note 7) For MACRO and MACRO Jr of 3R Combi, the magazine total is 40kg.
 (Note 8) MVH40T-ATC, electrodes exceeding the specified dimensions cannot be mounted even if space is provided in the magazine because there will be interference with the machine.
 (Note 9) ATC can be used with EROWA ITS50, but not with EROWA Compact (manual only).
 (Note 10) LS-10T/LS-20T ATC can not be mounted for the long stroke specifications.

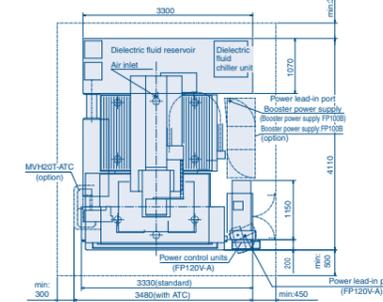
Large-size high-performance machine
EA40 ADVANCE
EA50 ADVANCE specifications



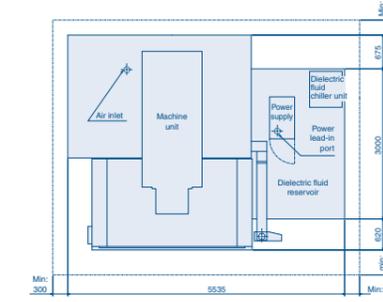
EA40 ADVANCE specifications
 MVH20T-ATC/C-axis (option)

EA50 ADVANCE specifications
 Automatic filter system and booster power supply (option)

EA40 ADVANCE



EA50 ADVANCE



(Unit: mm (in))

Options

- High-accuracy built-in C-axis
- Automatic tool changer^{(Note 1)*}
- Automatic filter system
- Booster power supply
- Programmable flushing nozzle section (eight nozzles) + automatic changeover
- Lighting
- Dielectric fluid distributor
- Special working tank
- Large electrode adaptor (for built-in C-axis)
- Maximum electrode weight 500kg (1102lb.) specifications (EA40 ADVANCE)

(Note 1) Please contact a Mitsubishi Electric representative for details on the EA40/50 ADVANCE specifications ATC.

Standard machine specifications

| | | EA40M ADVANCE specifications | EA50M ADVANCE specifications |
|---|--|------------------------------------|------------------------------------|
| Machine unit | Dimensions (WxDxH) [mm] | 3050x3633x3140 | 4280x4295x4100 |
| | Total system weight [kg] | 12000 | 20000 |
| Machine travels | (XxYxZ) [mm] | 1000x600x450 | 1500x600x600 |
| | Extra travel for workpiece loading [mm] | None | X-axis left 600 |
| Spindle | Distance between table and electrode mounting surface [mm] | 450 to 900 | 500 to 1100 |
| | Max. electrode weight [kg] | 300(500) ^(Note 2) | 500 |
| Working tank | Method | Automatic vertical front door | Automatic vertical front door |
| | Inner dimensions (WxDxH) [mm] | 2000x1200x700(XK210A) | 2500x1600x850(XK270) |
| Table | Fluid level adjustment range (from top of table) [mm] | 310 to 650 | 400 to 800 |
| | Dimensions (WxD) [mm] | 1400x950 | 2000 x 1350 |
| | Max. workpiece dimensions (WxDxH) [mm] | 1900x1100x600 | 2400x1500x750 |
| | Distance between floor and top of table [mm] | 860 | 1300 |
| Dielectric fluid reservoir | Max. workpiece weight [kg] | 5000 | 10000 |
| | T-slot | Five slots at 14-200mm pitch | Seven slots at 14-200mm pitch |
| Capacity (initial dielectric fluid supply amount) [ℓ] | | 2650 | 5200 |
| | Filtering method | Two paper filter | Four paper filter |
| Standard functions | Dielectric fluid chiller unit | Unit cooler | Unit cooler |
| | Thermal displacement compensation function | Standard | Standard |
| Manual operation box | Operation panel | - | Pendant with turning arm |
| | Automatic dielectric fluid supply/ drain | High-function manual operation box | High-function manual operation box |
| | | Standard | Standard |

(Note 2) The maximum electrode weight 500kg (1102lb.) specifications are available as an option for the EA40 ADVANCE specifications.
 (Note 3) Ensure that the floor is thick enough to install a large-size machine.

Special working tank (option)

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

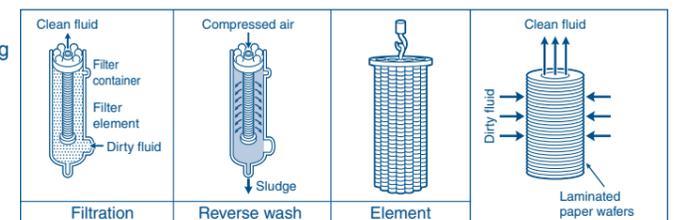
| Model | Working tank | Inner dimensions [mm] | Max. workpiece dimensions [mm] | Table electrode mounting surface distance [mm] | Fluid level adjustment range [mm] | Required column up [mm] | Door method | Dielectric fluid reservoir capacity | Remarks |
|---------------|--------------|-----------------------|--------------------------------|--|-----------------------------------|-------------------------|-------------------------------|-------------------------------------|----------------------|
| EA40M ADVANCE | XK212A | 2000x1200x800 | 1900x1100x700 | 550 to 1000 | 360 to 750 | 100 | Automatic vertical front door | 3400 ℓ | |
| | XK240A | 2300x1600x700 | 2200x1500x600 | 450 to 900 | 310 to 650 | - | Automatic vertical front door | 3400 ℓ | Dummy workpiece 400L |
| | XK261A | 2500x1200x800 | 2400x1100x700 | 550 to 1000 | 360 to 750 | 100 | Automatic vertical front door | 3400 ℓ | Dummy workpiece 400L |
| EA50M ADVANCE | XK291A | 2800x1600x1100 | 2700x1500x1000 | 700 to 1300 | 500 to 1050 | 200 | Automatic vertical front door | 6300 ℓ | Dummy workpiece 400L |

Automatic filter system

- Long-life laminated paper wafers with outstanding filtering performance are used
- Reverse washing eliminates filter replacement (Option for EA40/50 ADVANCE specifications)

Automatic filter

| Type | Capacity | Remarks |
|------|----------|-------------------------------------|
| TF50 | 4000 ℓ | EA40 ADVANCE specifications(XK212A) |
| TF63 | 6300 ℓ | EA50 ADVANCE specifications(XK270) |



Functions and Features

Integration of advanced machining technologies and ADVANCE control equipment
Supports various types of EDM machining



Realizes high-speed and low electrode wear machining

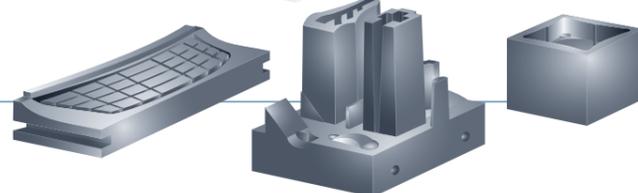
Machining time up to 40% shorter compared to conventional model



Electrode wear to 80% improved compared to conventional model



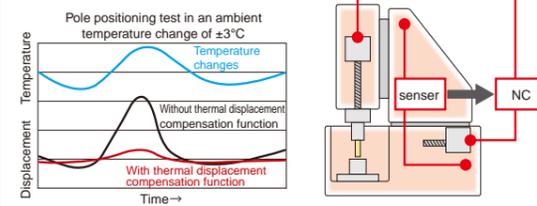
Large size machining



Machining Accuracy

Refer to Page 13

- Thermal displacement compensation system to be reduced thermal displacement caused by temperature changes
- Highly rigid and accurate built-in C-axis, which increased permission moment of inertial

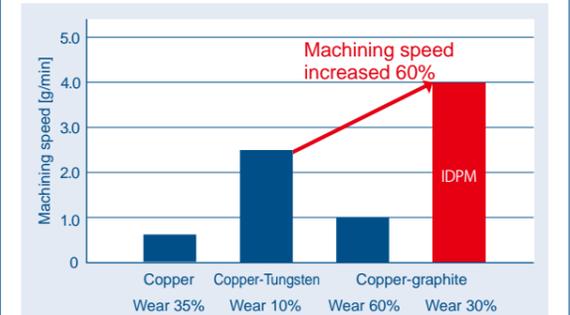


Productivity

Refer to Page 15-16



- IDPM reduces graphite electrode wear up to 80%
- Machining speed is improved up to 60% with using IDPM and copper-graphite electrode



Machining performance may vary depending on machine specifications and electrode materials.

Workability / Operability

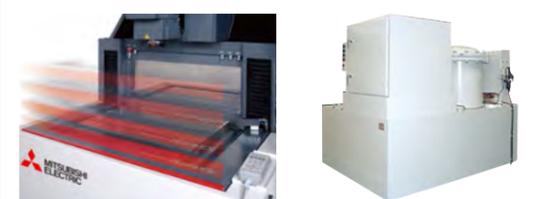


Refer to Page 17

- Machining conditions and programs suitable for various shapes can be created (Shape Expert)
- 3-sided automatic elevation tank standardized. Improved access for workpiece setup(EA28V ADVANCE)
- Reverse wash function is effective in achieving high performance over a long time.



Machining program screen Machining condition search screen



LS-20T (automatic tool changer) MVH-40T (automatic tool changer)

Automation compatibility

Refer to Page 18

- Continuously run multiple programs on a schedule
- Two kinds of ATC can be selected as LS type and MVH type (LS type is EA28V ADVANCE only)



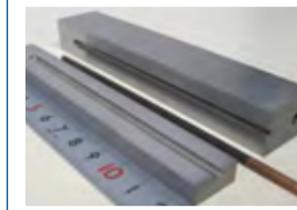
Built-in scheduler screen



LS-20T (automatic tool changer) MVH-40T (automatic tool changer)

Machining Samples

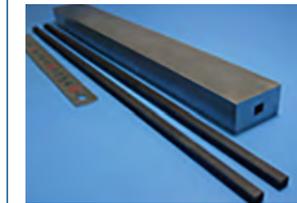
▶ Example of machine sample



Deep Machining

| | |
|-------------------|-----------------|
| Model | EA28V ADVANCE |
| Electrode | copper(φ3.0mm) |
| workpiece | Steel(NAK80) |
| Surface roughness | Rz8.0μm/Ra1.2μm |
| Depth | 110mm |

- Machining speed 20 to 30% improvement with deep machining of L / D > 30 (With FF mode) (L : depth, D : Electrode diameter)
- SS jump 5 realizes high speed jump in Z axis machining
- Suppression of load and heat influence by optimization of speed and acceleration control



Graphite Deep Machining

| | |
|-------------------|---|
| Model | EA28V ADVANCE long stroke specifications |
| Electrode | Graphite(TTK-5) |
| workpiece | Steel(SKD11) |
| Surface roughness | Rz15μm/Ra2.0μm |
| Depth | 300mm |

- Maximum workpiece height up to 450 mm by long stroke specifications
- High Speed and low consumption machining with graphite electrode is realized by IDPM and SS jump 5



Rib Machining with graphite electrode

| | |
|-------------------|-----------------|
| Model | EA28V ADVANCE |
| Electrode | Graphite(EX-70) |
| workpiece | Steel(SKD61) |
| Surface roughness | Rz10μm/Ra1.5μm |
| Depth | 50mm |

- Graphite electrode achieves a length consumption ratio of 0.04%
- IDPM control reduces generation of protrusions during low consumption machining
- SS jump 5 realizes uniform machining surface even in deep rib machining



Deep Die Casting

| | |
|-------------------|--------------------------------|
| Model | EA40 ADVANCE specifications |
| Electrode | Graphite(EX-70) |
| workpiece | Steel(SKD61) |
| Surface roughness | Rz15μm/Ra2.4μm |
| Depth | 150mm |

- High speed and stable machining is realized for the machining with a complex and complicated electrode



Die Casting for Automobil

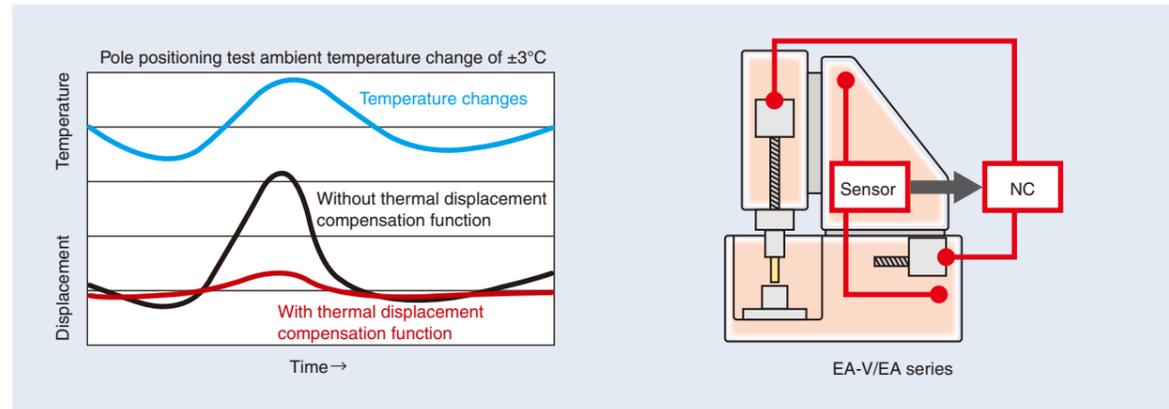
| | |
|-------------------|-----------------|
| Model | EA28V ADVANCE |
| Electrode | Graphite(EX-70) |
| workpiece | Steel(SKD61) |
| Surface roughness | Rz7.9μm/Ra1.0μm |

- Uniform matte surface is realized for even for the large machining area.
- Low consumable machining with IDPM realizes stable machining and abnormal waste reduction

Machining Accuracy

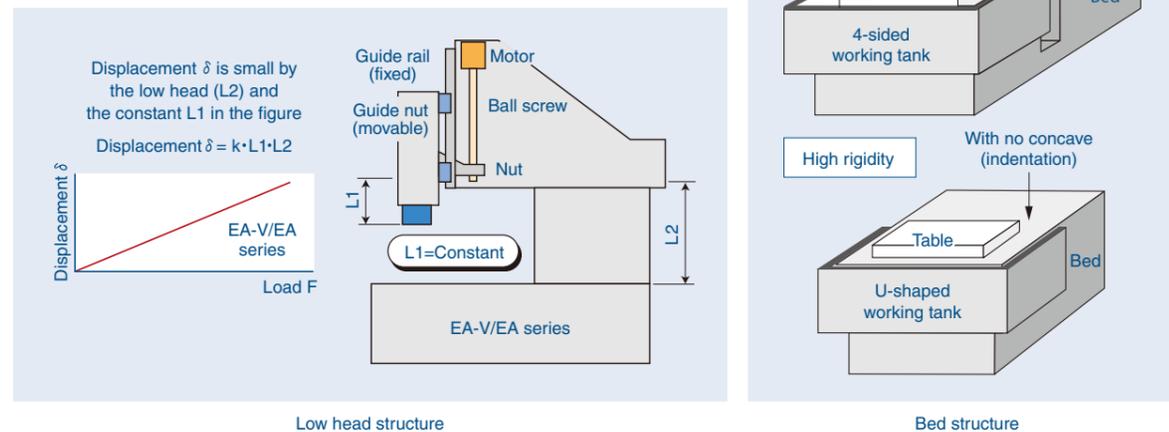
Thermal displacement compensation system (EA28V ADVANCE)

- Semi-cabin structure reduces the effect of external temperature fluctuation
- Thermal displacement compensation system to be reduced thermal displacement caused by temperature changes



High rigidity construction

- Highly rigid Z-axis thanks to low head structure
- Highly rigid integrated bed structure with no concave section (indentation)
- Improved servo responsiveness using direct drive method



High-accuracy built-in C-axis / high-accuracy built-in spindle

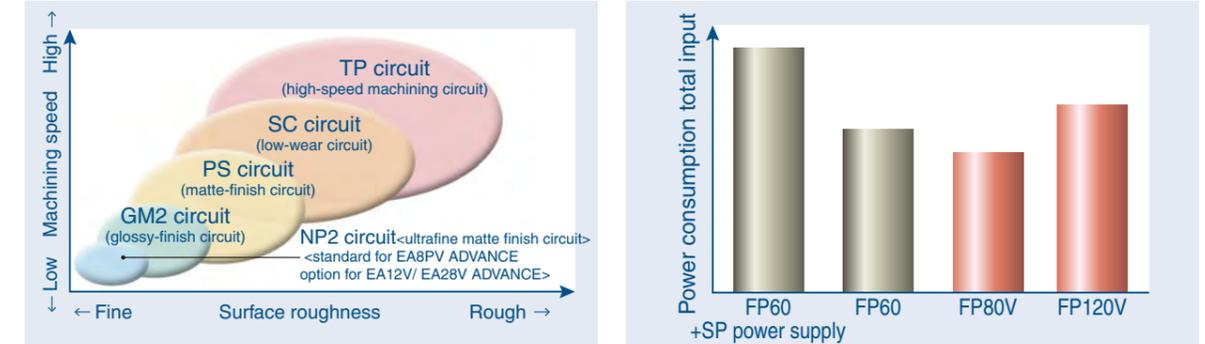
- Highly accurate helical machining and index machining are possible
- Highly rigid and accurate built-in C-axis with increased permission moment of inertia



Machining Performance

FP-V Power supply (EA28V ADVANCE/EA40 ADVANCE specifications)

- Circuits suitable for various machining
- Energy saving power supply reduces operating cost



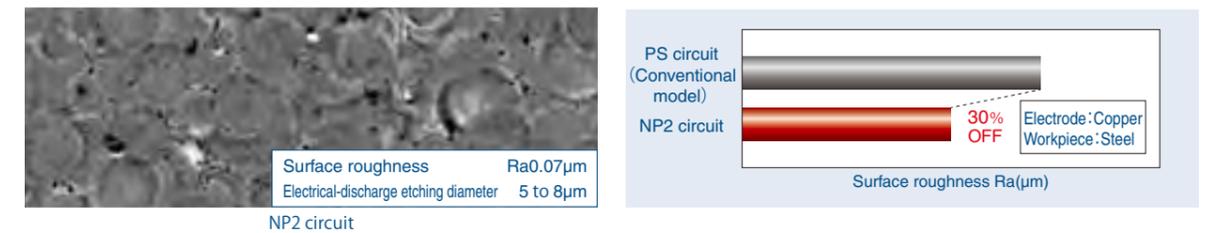
FP120V power supply (EA40/50 ADVANCE specifications Standard)

- Machining speed increased by around two times when machining with a graphite electrode
- Machining speed increased by around two times when machining tungsten carbide



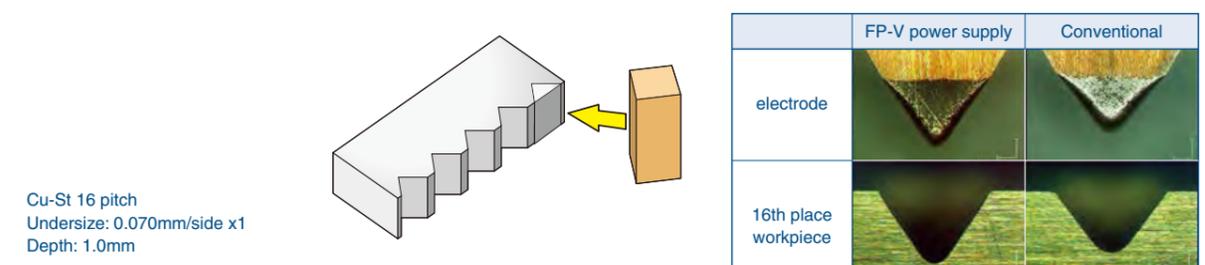
High-quality ultrafine finishing function (NP2 circuit) (EA28V ADVANCE option)

- Improved fine best surface roughness by NP2 circuit
- Improvement of best surface roughness of steel



Narrow gap circuit

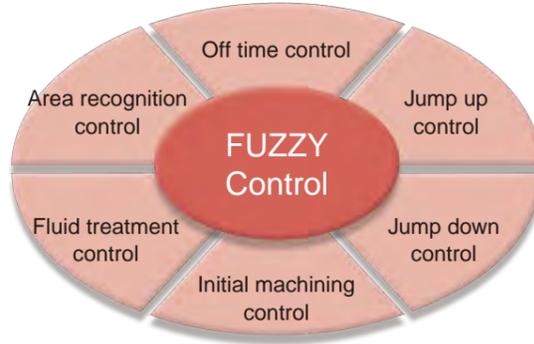
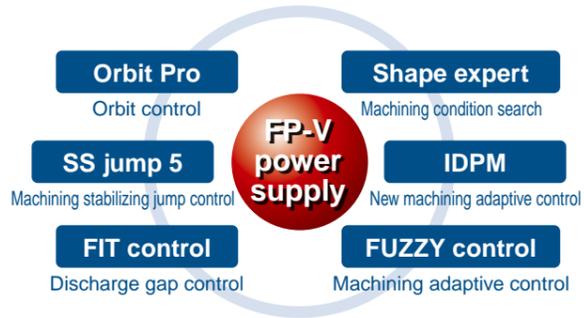
- Compatible with small undersize amounts of 0.015 to 0.030mm per side
- Small in-corner R realized by suppressing electrode wear for small undersize machining



Productivity



High-speed machining is realized using advanced machining control



IDPM
 •Intelligent Digital Power Master: Adaptive control to be integrated ever developed technologies
 •Integrated Discharge Power Monitor: Adaptive control to reduce abnormal discharge with detecting discharge pulse

Machining adaptive control: IDPM

High-speed/Low-wear machining with graphite electrodes

•IDPM reduces graphite electrode wear up to 80%

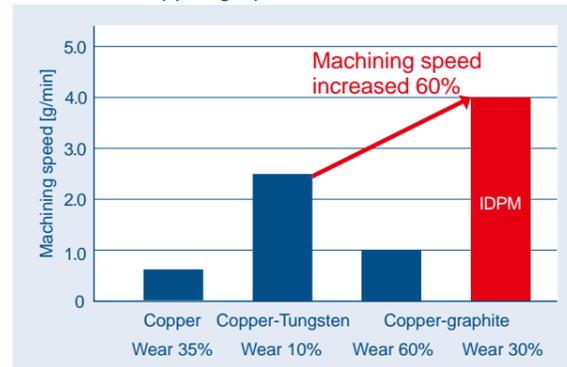


*Above data is a comparison with a conventional Mitsubishi Electric EDM (EA Series).



Tungsten carbide high-speed machining

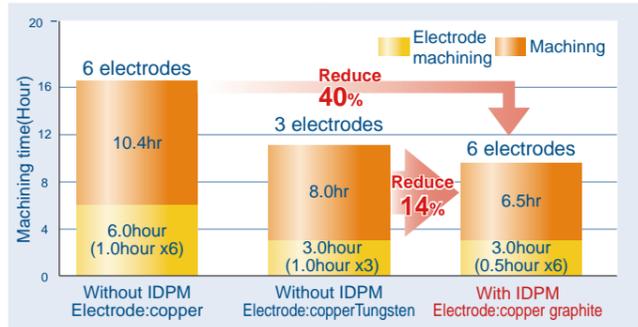
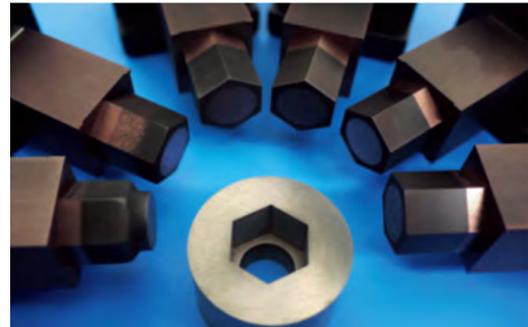
•Machining speed is improved up to 60% with-using IDPM and copper-graphite electrode



*Machining performance may vary depending on machine specifications and electrode materials.

Improve productivity of tungsten carbide

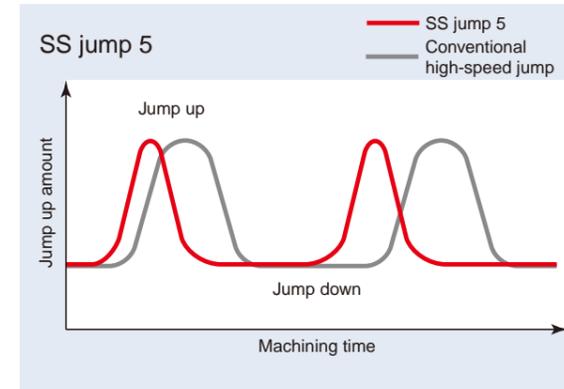
•The time required for electrode creation and machining is reduced by 40% compared to the time using copper electrodes and without IDPM.
 •The time required for machining is reduced by 14% compared to the time using copper-tungsten electrodes and without IDPM.



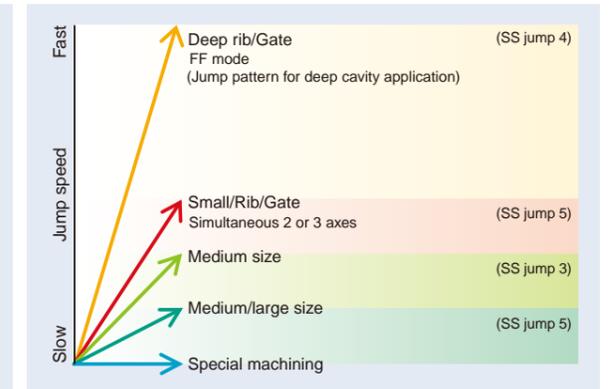
Machining stabilizing jump control (SS jump 5)

•Jump control suitable for various shapes is realized by optimizing smoothing of jump up operation and speed/acceleration control

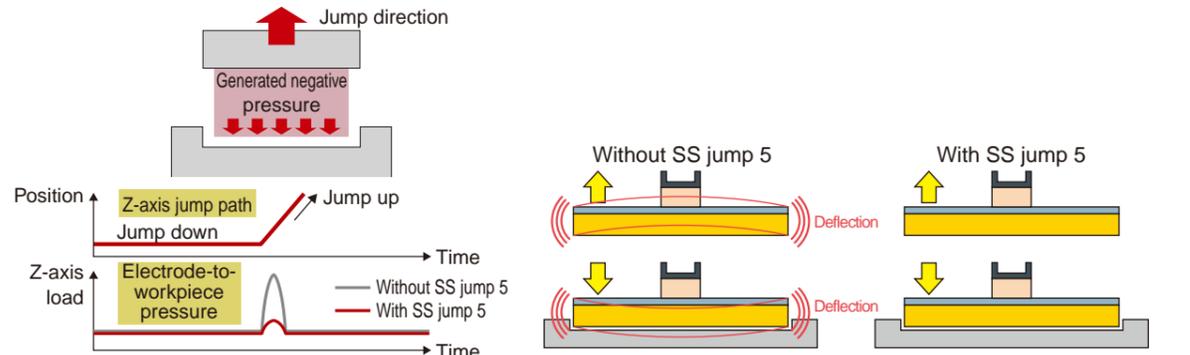
Machine vibration when jumping is suppressed, realizing high-speed jump



Jump control suitable for various shapes is realized

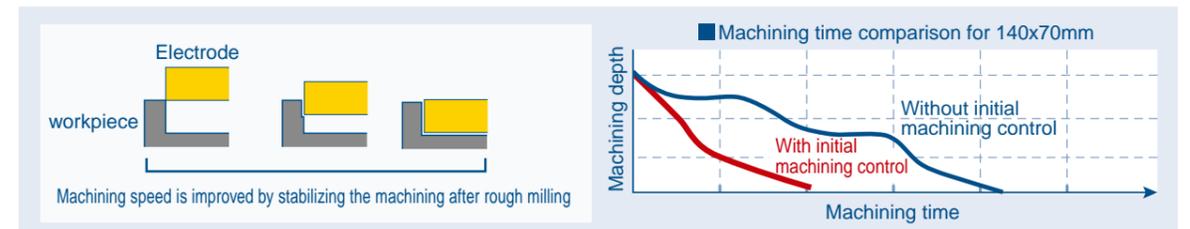


Machining time reduced for the uniform fine finish machining using medium-size electrode

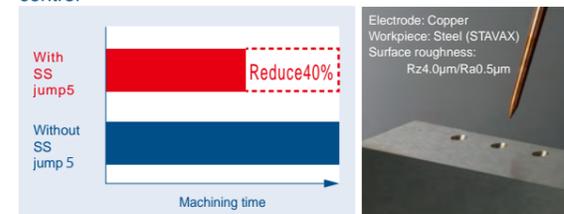


Machining optimization control: Initial machining control

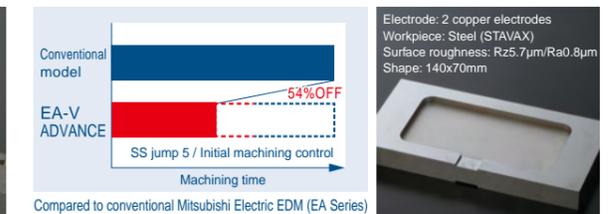
•Faster machining is realized with improved initial machining control for the start of machining after rough milling. Machining time reduced up to 50% for the start of machining after rough milling



Machining time is reduced up to 40% by optimizing smoothing of simultaneous 2 or 3 axes operation and speed/acceleration control



Machining time reduced for the uniform fine finish machining using medium-size electrode



Workability / Operability

Easy-to-use control (ADVANCE control unit)



NUI
Natural
User
Interface

▶programming
Movie



Ergonomic design

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

ESPERADVANCE - Easy Programing and machining condition search -

- Programing is possible simply by inputting the machining start position and machining depth, etc., into a table format
- Machining conditions and programs suitable for various shapes can be created (Shape Expert)

Machining program screen Machining conditions search screen

Machining contents of shape expert

Electrode/Workpiece measurement

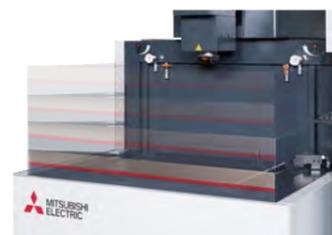
- Electrode measurement screen for electrode alignment
- Workpiece measurement screen for workpiece alignment

Electrode measurement screen Workpiece measurement screen

Electrode measurement

Workpiece measurement

3-sided automatic elevation tank (EA28V ADVANCE standard)



- 3-sided automatic elevation tank standardized. Improved access for workpiece setup



Automatic filter (EA40/50 ADVANCE specifications option)



- Effective for medium to large-size EDMs which discharge large quantities of sludge. Reverse wash function is effective in achieving high performance over a long time.
- Effective for medium and large die sink EDM with many sludge

Automation

Auto tool changer

LS type (only EA28V ADVANCE)

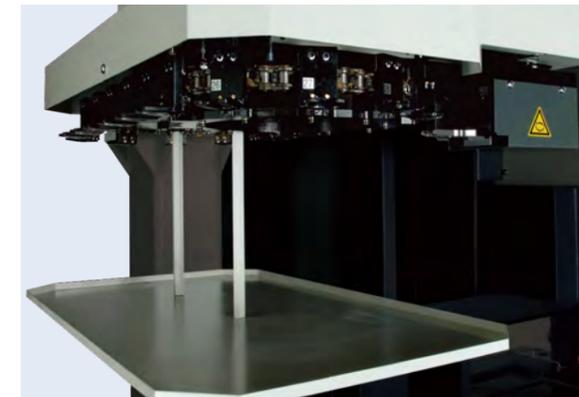


10T



20T

MVH type



20T



40T

Built-in scheduler

| No. | L No. | COMMENT | STATUS | ELEC MNT | PALLET MNT |
|-----|------------|---------|--------|------------|------------|
| 1 | 1*AP*DEMO1 | | READY | INPUT CMP | INPUT CMP |
| 2 | 2*AP*DEMO2 | | READY | INPUT CMP | INPUT CMP |
| 3 | 3*AP*DEMO3 | | EDIT | INPUT CMP | INPUT CMP |
| 4 | 4*AP*DEMO4 | | LOCK | INPUT CMP | INPUT CMP |
| 5 | 5*AP*DEMO5 | | EDIT | OUTPUT CMP | NO INPUT |

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

Power Supply / Control Specifications and Options

Power Supply and Control Specifications

| Model | | EA28VM ADVANCE | | EA40M ADVANCE specifications | EA50M ADVANCE specifications |
|-------------------------------------|---|--|----------|------------------------------|------------------------------|
| Power supply unit | Power supply model | FP80V-A | FP120V-A | FP120V-A | |
| | Maximum machining current peak [A] | 80 | 120 | 120 | |
| | Standard machining circuit and functions | Transfer pulse circuit (TP circuit), Ultralow-wear machining circuit (SC, α-SC circuit), Fine-matte finish circuit (PS circuit), Glossy mirror-finish circuit (GM2 circuit), FUZZY control, SS Jump5, Intelligent Digital Power Master (IDPM, optimum machining control) | | | |
| | Power supply system | Compact, resistor-less, low-heat generation, power regenerating energy-saving method | | | |
| Control unit | C31EA-2 | | | | |
| Input method | Keyboard, USB flash memory, network | | | | |
| Pointing device | Touch panel, mouse | | | | |
| Display | 15-in color TFT-LCD | | | | |
| Display characters | Alphanumeric characters | | | | |
| Control system | CNC closed loop | | | | |
| Number of controlled axis | Maximum four axis | | | | |
| Setting (command) unit | XYZ ... 0.1μm, C (rotary axis) ... 0.0001° | | | | |
| Minimum drive unit | XYZ ... 0.1μm, C (rotary axis) ... 0.0001° | | | | |
| Maximum command value | ±99999.9999mm/±9999.9999 inch | | | | |
| Position command format | Incremental/Absolute value combination | | | | |
| Interpolation function | Linear, circular, spiral | | | | |
| Orbit mode | Fixed pattern and random path, 3D pattern | | | | |
| Orbit control system | 4 types (free, semi-fixed, fixed, variable) | | | | |
| Scale magnification | 0.000001 to 99.999999/0.001 to 99999.999 | | | | |
| Graphics | X-Y/Z-Z-X plane, solid, table scale, automatic machining path drawing, orbit block drawing | | | | |
| Automatic programming | ESPERADVANCE | | | | |
| Program No. designation range | 1 to 99999999 | | | | |
| Sequence No. designation range | 1 to 99999 | | | | |
| Subprogram | Nesting levels: 30 | | | | |
| Manual feed | High-speed, low-speed, inching (1μm/10μm), extension mode (high-speed/low-speed) Maximum feedrate XYZ: 2000 mm/min | | | | |
| Manual input positioning | Screen input | | | | |
| Graphic check | 3D display compatible, high-speed graphic drawing | | | | |
| Screen basic menu | 15 types (file, setup, machining support, monitor, maintenance, e-manual, know-how display, E-condition, NC program, variable, coordinate value, alarm troubleshooting, 3D viewer, calculator, USB removal) | | | | |
| Network specifications | Ethernet port (10/100BaseT (X) port RJ45 connector) 1 port (Note 1) | | | | |
| RS232C interface | | | | | |
| Maintenance functions | Consumption rate control (time display) | | | | |
| Outline dimensions (W x D x H) [mm] | FP80V-A: 400 x 900 x 1763 (Operation panel 500 x 175 x 346) FP120V-A: 500 x 840 x 1610 (Operation panel 546 x 170 x 346) | | | | |
| Weight [kg] | 260 | | 300 | | |

(Note 1) Refer to below table for the network specifications option combinations.

Control unit functions

C31 (Advance control unit) control unit functions

| NC functions | Corner chamfer command | Maintenance functions |
|---|--|------------------------------------|
| Year, month, date display | Linear angle command | Maintenance check |
| Character string replace function | Backlash compensation | Alarm display |
| Teaching function | Pitch error compensation | (with troubleshooting guidance) |
| Machining start time designation function | Soft limit (inside/outside prohibit) | e-manual (electronic manual) |
| Automatic return | Reference block | System update over web |
| Start point return | Automatic zero point return | Automatic positioning functions |
| Axis rotation | Electrode multiple deviation compensation | Edge positioning |
| Program support function | (Electrode rotation compensation) | Hole center positioning |
| E.S.P.E.R ADVANCE | Machining functions | Pole center positioning |
| E.S.P.E.R ADVANCE Navigator | Fuzzy Pro Plus adaptive control | Electrical-discharge positioning |
| Memory operation | Machining results graph, machining results table | Width center positioning |
| Offset | Master Pack | Slot center positioning |
| Coordinate value read | Orbit machining | 3-point center positioning |
| Time read | Side servo machining | 2 to 4 face positioning |
| Workpiece coordinate system (106 coordinates) | Offset machining | Repeated positioning |
| Coordinate rotation | Inclined machining | Check functions |
| Figure rotation | Contour machining (spindle required) | Graphics (machining shape drawing) |
| Axis change | C-axis machining (C-axis required) | Single block |
| Mirror image | | Dry run |
| Scales for XY-axis | | Block delete |
| Function computations | | 3D graphic check |
| Corner R command | | 3D viewer |
| | | (Parasolid data display) |
| | | EPX format data read |

Power Facilities Capacity

| Model ^(Note 2) | EA28VM ADVANCE | | EA28VM ADVANCE Special work tank | | EA40VM/50VM ADVANCE specifications |
|--|----------------|----------|----------------------------------|----------|------------------------------------|
| Power supply | FP80V-A | FP120V-A | FP80V-A | FP120V-A | FP120V-A |
| Maximum machining current average [A] | 60 | 100 | 60 | 100 | 100 |
| Maximum machining current peak [A] | 80 | 120 | 80 | 120 | 120 |
| Dielectric fluid chiller unit[kW] | 1.74 | 3.5 | 1.74 | 3.5 | 3.5 |
| Total input capacity[kVA] | 9.0 | 13.0 | 10.0 | 14.0 | 19.0 |
| Machine's generated heating value [kW] ^(Note 3) | 5.4 | 7.8 | 6.0 | 8.4 | 11.4 |

(Note 2) Please contact a Mitsubishi Electric representative regarding EA50 ADVANCE specifications.
(Note 3) The machine's generated heating value is a reference value.
Please add 3[kW] for machine-generated heat value with SP power supply specifications

Network Connection Specifications (FTP and DNC S/W)

Data such as NC programs, machining conditions and variables can be exchanged between a personal computer and EDM. One IP address must be prepared for each EDM within the user's in-house network.

| Required specifications | Image | Remarks |
|---|-------|---|
| Operate on the EDM side, and receive data from personal computer | | Uses Explorer on EDM side and receives data to common HDD on the EDM side. After that, data I/O operation is required. |
| Operate on the EDM side, and send data directly to the EDM's NC | | Data can only be received via data I/O operation. |
| Operate on the personal computer side, and send data to the EDM | | Uses Explorer on personal computer-side and common HDD on EDM-side. After that, data I/O operation is required for the EDM. |
| Operate on the personal computer side, and send data directly to the EDM's NC | | Commercially available DNC software must be installed on the personal computer-side. Refer to DNC specifications documentation for details. |

Options

Options and retro t specifications differ according to country and region; please contact a Mitsubishi Electric representative for details.

Main options correspondence table: ● Standard equipment, ○ Can be added after installation, ● Cannot be added after installation, × Not available

| Model | EA28VM ADVANCE | EA28VM ADVANCE <Long stroke specifications> | EA40M ADVANCE | EA50M ADVANCE | |
|--|---|---|---------------|---------------|---|
| Machine main unit | Lubricant | Automatic lubrication unit | ○ | ○ | |
| | Scale | Scale feedback specifications | ○ | ○ | |
| | Thermal Buster (Thermal displacement correction system) | Z-axis | ○ | ○ | |
| | | XY-axis | ○ | ○ | |
| Column up specifications | ●150mm | 150mm | 100mm | 200mm | |
| Advanced-function manual operation box | ○ | ○ | ○ | ○ | |
| LED light | ○ | ○ | ○ | ○ | |
| Working tank | Automatic elevation tank | ○ | ○ | ○ | |
| | Automatic vertical front door | ○ | ○ | ○ | |
| | Special working tank | ●(Note 1) | ○(Note 1) | ○ | ○ |
| Dielectric fluid system | fluid filter | Paper filter 2 pc. specifications | ○ | ○ | ○ |
| | | Paper filter 3 pc. specifications | ○ | ○ | ○ |
| | | Paper filter 4 pc. specifications | ○ | ○ | ○ |
| | | Automatic filter | ○ | ○ | ○ |
| | Cooler | Dielectric fluid chiller unit (unit cooler) | ○ | ○ | ○ |
| | | Dielectric fluid chiller unit (for booster power supply) | ○ | ○ | ○ |
| | Fluid system | Dielectric fluid automatic supply/drain | ○ | ○ | ○ |
| | | Emission/suction automatic changeover | ○ | ○ | ○ |
| | | Programmable flushing nozzle (eight nozzles) + Automatic changeover | ○ | ○ | ○ |
| | | Dielectric fluid distributor | ○ | ○ | ○ |
| Power supply | Main Power supply | FP80V-A | ○ | ○ | ○ |
| | | FP120V-A | ○ | ○ | ○ |
| | Special power supply | NP2 circuit (Ultrafine matte finish circuit) | ○ | ○ | ○ |
| | | Narrow gap circuit | ○ | ○ | ○ |
| | | FP-V power supply extension unit | ○ | ○ | ○ |
| IDPM | ○ | ○ | ○ | | |

(Note 1) When the special working tank is at the lowest limit, the upper end of the working tank is approx. 95mm (3.7") above the table.

| | EA28VM ADVANCE | EA28VM ADVANCE <Long stroke specifications> | EA40M ADVANCE | EA50M ADVANCE | | |
|-------------------|---|---|---------------|---------------|---|---|
| Head-side tooling | High-accuracy built-in C-axis ^(Note 2,3) | ○ | ○ | ○ | | |
| | High-accuracy built-in spindle ^(Note 2) | ○ | ○ | ○ | | |
| | Automatic clamp ^(Note 2) | ○ | ○ | ○ | | |
| | Removable holder (3R-16M-MACRO-R specifications) | ○ | ○ | ○ | | |
| ATC | Large electrode adaptor | ○ | ○ | ○ | | |
| | | ○ | ○ | ○ | | |
| | | ○ | ○ | ○ | | |
| | | ○ | ○ | ○ | | |
| | LS | 10 T | 3R-MACRO | ○ | ○ | ○ |
| | | | 3R-Combi | ○ | ○ | ○ |
| | | | EROWA-ITS | ○ | ○ | ○ |
| | | | 3R-MACRO | ○ | ○ | ○ |
| | | 20 T | 3R-Combi | ○ | ○ | ○ |
| | | | EROWA-ITS | ○ | ○ | ○ |
| 3R-MACRO | | | ○ | ○ | ○ | |
| 3R-Combi | | | ○ | ○ | ○ | |
| MV | 20 T | EROWA-ITS | ○ | ○ | ○ | |
| | | 3R-MACRO | ○ | ○ | ○ | |
| | 40 T | EROWA-ITS | ○ | ○ | ○ | |
| | | 3R-Combi | ○ | ○ | ○ | |
| Control unit | Communication | External signal output (M code) ^(Note 5) | ○ | ○ | ○ | |
| | | External signal output (M code with answer) ^(Note 6) | ○ | ○ | ○ | |
| | | DNC H/W ^(Note 7) | ○ | ○ | ○ | |
| | | FTP | ○ | ○ | ○ | |
| | | DNC S/W | ○ | ○ | ○ | |
| | | RS232C interface | ○ | ○ | ○ | |
| | | NS powder specifications | ○ | ○ | ○ | |
| Software | Electronic manual (e-manual) | ○ | ○ | ○ | | |
| | Built-in scheduler | ○ | ○ | ○ | | |
| | ESPERADVANCE PRO ^(Note 8) | ○ | ○ | ○ | | |
| | Protect mode | ○ | ○ | ○ | | |
| | Anti-virus protection | ○ | ○ | ○ | | |
| | Power saving function | ○ | ○ | ○ | | |
| | Infrared flame detector | ○ | ○ | ○ | | |
| Safety | Double automatic fire extinguisher specifications | ○ | ○ | ○ | | |
| | Run timer | ○ | ○ | ○ | | |
| Display | 3-color warning light | ○ | ○ | ○ | | |
| | Instruction manual (paper edition) | ○ | ○ | ○ | | |
| Others | Paint color designation | ○ | ○ | ○ | | |

(Note 2) Select the chuck from the following types: 3R MACRO, 3R Combi, EROWA ITS, EROWA COMBI
(Note 3) Specifications are slightly different for EA28V ADVANCE and EA40/50 ADVANCE specifications
(Note 4) Please contact a Mitsubishi Electric representative for details on the EA40/50 ADVANCE specifications ATC.
(Note 5) It is necessary for attaching an automation system (electrode / workpiece automatic changer unit)

(Note 6) The external signal output (M code with answer) is necessary for attaching external equipment which requires an answer signal.
(Note 7) LAN cable should be all straight wiring type with shielding connector, category 5 (100BASE-TX compliant), STP (four shielded twist pair). A switchable hub that can ground the shielded LAN cable should be used.
(Note 8) A personal computer is required for ESPERADVANCE PRO.

Protect mode

Protecting data from thoughtless changes, forbidding data taken out



Anti-virus protection

Defends machines against the threat of computer viruses (LAN, USB) Pattern file can be used semi-permanently without renewal



Options

Head-side tooling

Removable holder



3R-16M-MACRO-R specifications

Automatic clamp



Clamp spindle side holder with air chuck
(photo shows EROWA-ITS chuck specifications)

High-rigidity C-axis



Supports parallel electrode setup and index machining
Supports fluid emission from spindle center
(photo shows 3R-MACRO chuck specifications)

* Tooling should be selected

ATC

LS-10T(automatic tool changer)



Change up to 10 electrodes
Supports continuous machining using many electrodes

LS-20T(automatic tool changer)



Change up to 20 electrodes
Supports continuous machining using many electrodes

MVH-20T/40T(automatic tool changer)



Change up to 20/40 electrodes
Supports continuous machining using many electrodes

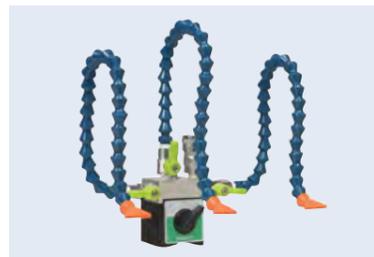
Dielectric fluid system and others

Dielectric fluid distributor



Sprays dielectric fluid between the workpiece and electrode during pitch machining

Large electrode adapter



Distributes dielectric fluid into three flows and sprays onto the machining section

Large electrode adapter



Prepare two T-slots and electrode mounting table installation screw
(photo shows EA28V ADVANCE specifications)

LED light



Power-supply specifications for LED light require DC24V.

Infrared flame detector



Catches infrared rays from flames and stops power supply

Specifications are subject to change without notice, and appearance may be different from the photo.

Automation Support



LS-10T/20T Tool changer

•Automatic electrode replacement enables continuous operation



Automatic electrode/workpiece changer(1 robot, 2 EDMs)

•Robotic transfer devices automatically change electrodes and workpieces, enabling continuous operation



Peripheral equipment/System extension options

Scheduling system

E.S.P.E.R SCHEDULE

- Execute continuous schedule operation of EDMs with job management(*) (manage up to five EDMs)
- 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

(*) A personal computer is required for installing applications

Machine remote monitor

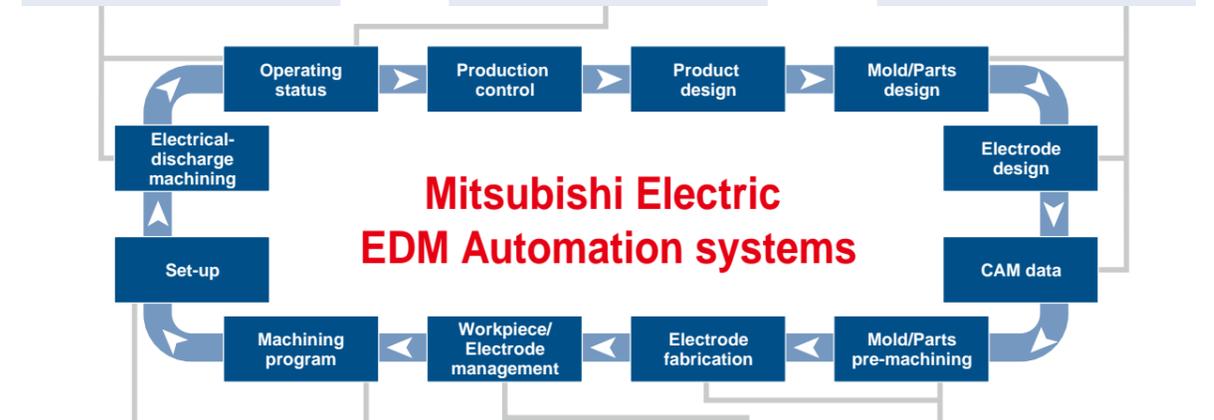
RemoteMagic II

- Visualizes workshop with monitor and notification for improving machine operating ratio
- Remotely monitor machining with a personal computer
- Mail notifications when an alarm occurs

3D CAD/CAM system

AD

- 3D electrode model can be created easily, and electrode design CAD system handling orbit deformation
- Die-sinking electrical-discharge CAM system, which calculates machining positions automatically and eliminates value input mistake
- Operations can be sequenced to wire, milling and hole machining CAMs



Touch probe

- Support in-line setup
- Reduces core alignment measurement and measuring time of workpiece position (Note 3)
- Speeds up machine operation by use of installed measuring programs

Offline automatic programming system

ESPERADVANCE PRO

- 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 AD or EPX compatible CAD/CAM

(*) A personal computer is required for installing applications.

ID tag system

- Mounting status of carrier device robot is managed by ID tag which mounted electrode and workpiece pallets (Note 2)
- Electrode and workpiece pallets can be identified to prevent mounting mistakes and program registering mistake
- Workpiece and electrode can be easily managed using ID tag system and scheduler

Presetter

- Supports setup operation at machine offline, and setup time can be reduced (Note 1)
- The usage of offline setup system will improve machine runtime
- Electrode and workpiece can be easily managed using ID tag system and scheduler

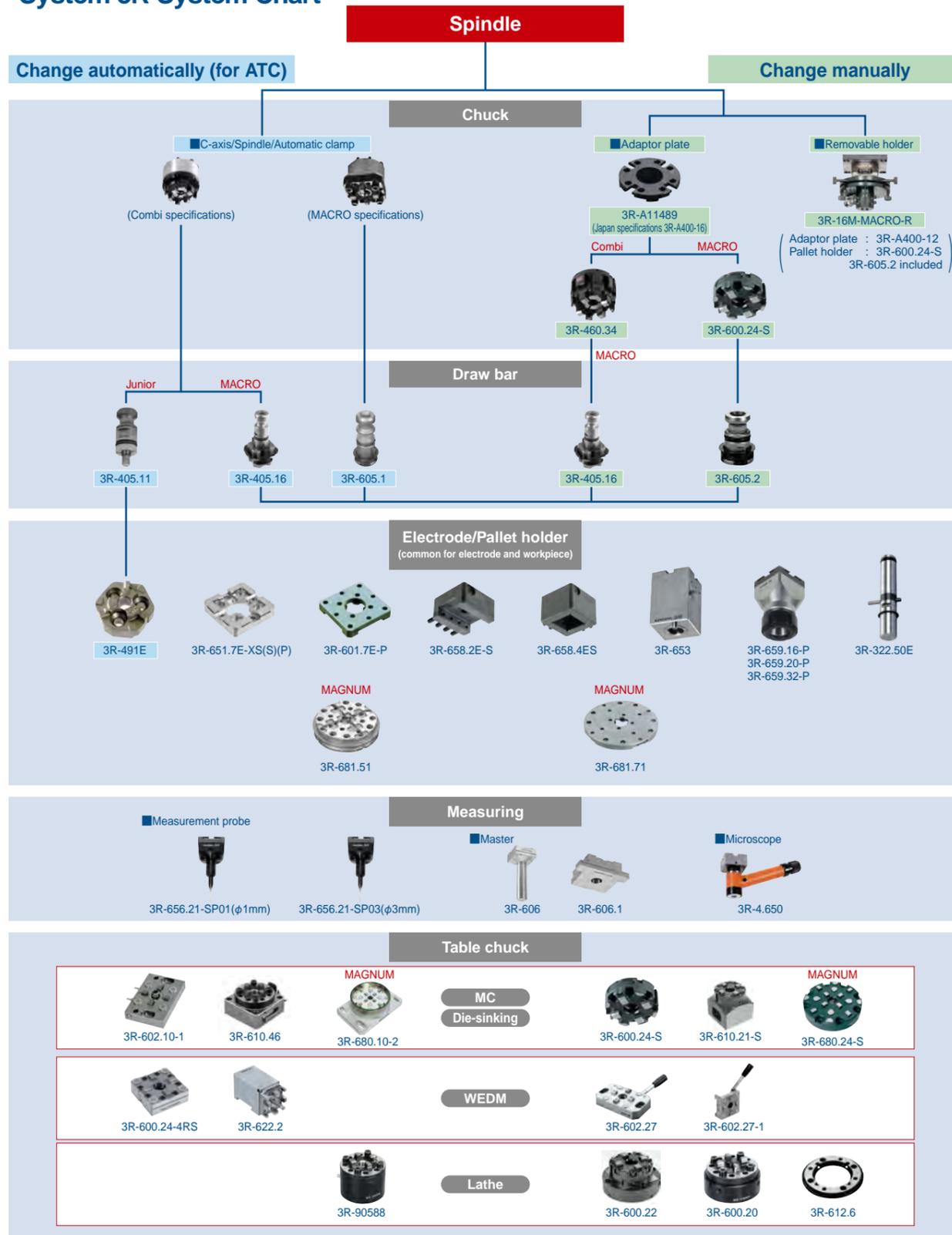
(Note 1) Please contact a Mitsubishi Electric representative for more information regarding the presetters and coordinate measuring machines.

(Note 2) Please contact a Mitsubishi Electric representative for more information regarding the ID tag systems.

(Note 3) Please contact a Mitsubishi Electric representative for more information regarding the touch probes.

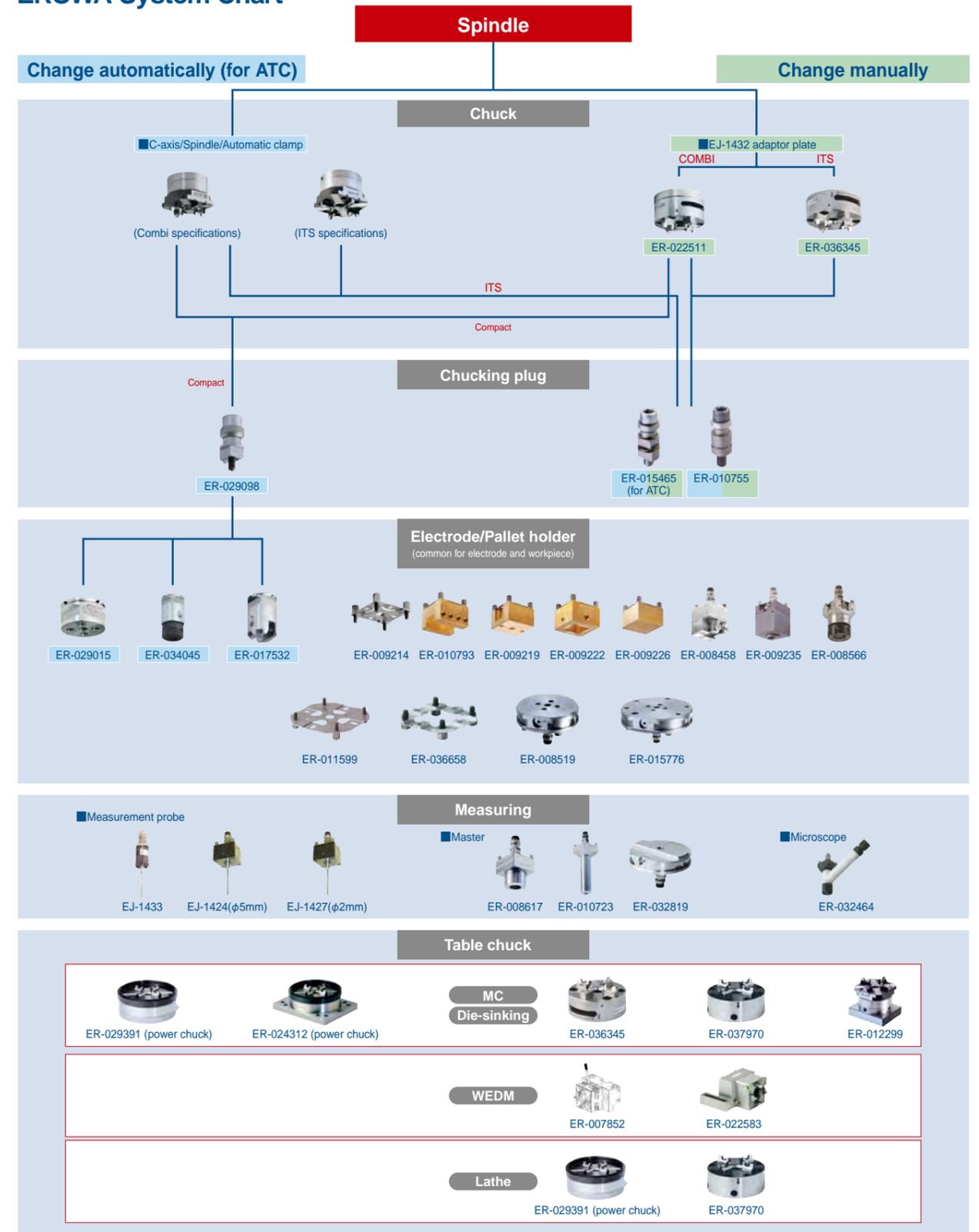
Tooling

System 3R System Chart



* Please contact System 3R Co., Ltd. for detailed tooling specifications.

EROWA System Chart



* Please contact EROWA Japan Co., Ltd. for detailed tooling specifications.

Preparation for Machine Installation / Cautions

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 tooling and electrode

It normally takes one to two months for tooling delivery, so please place orders as early as possible

| | |
|---|--|
| 1) Determination of tooling and electrode | |
| 2) Order, preparation or manufacture | |

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) 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 x width) (m) | |
| 3) Constant-temperature dust-proof room entrance dimensions (height x 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 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 EDMs

Always use dielectric fluid which has a flash point of 70°C or more. Prepare the following dielectric fluid when operating the EDMs.

■Dielectric fluid example <JX Nippon Oil & Energy Metal Work EDF-K2>

Table of dielectric fluid properties

| Item | Product brand | Metal Work EDF-K2 |
|--|---------------|---------------------|
| Density g/cm ³ (@ 15:) | | 0.770 |
| Flash point : (PM) | | 93 |
| Kinematic viscosity mm ² /s (@ 40:) | | 2.2 |
| Appearance | | Clear and colorless |

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

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

Table of dielectric fluid properties

| Item | Product brand | Shell Paraol 250 |
|--|---------------|---------------------|
| Density g/cm ³ (@ 15:) | | 0.797 |
| Flash point : (PM) | | 92 |
| Kinematic viscosity mm ² /s (@ 40:) | | 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 (41°F to 95°F)
 - Temperature fluctuation will directly affect machine accuracy. To maintain performance accuracy, select a place with minimal temperature fluctuation.
 - 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 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
 - EA8S/12S, EA28V ADVANCE, EA40/50 ADVANCE specifications
 - Select a floor where vibration or impact will not be conveyed.
 - As a reference, the vibration level should have a max. amplitude of 5µm or less at a 10 to 20Hz frequency.
 - MA2000, EA8PS, EA12PS
 - 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.

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. Machine heating value

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

$$\text{Heating value (kW)} = \text{Equipment capacity (kVA)} \times 0.6$$

Example: For EA12PS + FP80PS, 7.0kVA x 0.6 = 4.2kW

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

3. Power-supply equipment

- Primary wiring
 - Normal machining : 3-phase 200/220VAC±10% 60Hz, 3-phase 200VAC±10% 50Hz
 - High-accuracy machining : 3-phase 200/220VAC±4% 60Hz, 3-phase 200VAC±4% 50Hz
 - An automatic voltage regulator (AVR) should be used if voltage fluctuations exceed that value above.
 - Do not power on in instantaneous power failure occurrence that exceeds 20msec.
 - A single-phase AC night power source for the automatic fire extinguisher : 100VAC±10%(50/60Hz)
- Power capacity
 - Facility capacity [kVA] = Total power input (Machine input + power supply input + dielectric fluid chiller unit input) [kVA]
 - Refer to page 21 for details on the machine, power supply and dielectric fluid chiller unit
- 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.

| Total facility capacity[kVA] | No-fuse breaker | Earth-leakage breaker |
|------------------------------|-----------------|-----------------------|
| ~12 | NF50-CV (50A) | NV50-CV (50A) |
| 12~22 | NF100-CV (100A) | NV100-CV (100A) |
| 22~33 | NF225-CV (150A) | NV225-CV (150A) |

The breakers in the table allow for the rush current of the transformer in the power supply panel. • Selecting the power input cable size
The following table 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.

| Total facility capacity [kVA] | Cable size [mm ²] | Total facility capacity [kVA] | Cable size [mm ²] |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| ~9 | 5.5 | 15~21 | 22.0 |
| 9~12 | 8.0 | 21~28 | 30.0 |
| 12~15 | 14.0 | | |

4. Grounding work

- The EDMs must always be grounded to prevent external noise, radio disturbance and earth leakage.
- Install a 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.



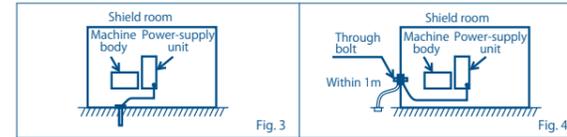
5. Primary air equipment

- The standard EA28V ADVANCE do not require an air source, but an air supply must be prepared when using the optional high-accuracy built-in C-axis etc.
- Hose diameter : 1/4 hose (hose sleeve outer diameter: φ9.0 (0.35"))
- Pressure : 0.5 to 0.7MPa (7.2.5 to 101.5psi) (0.6MPa (87) or more when using EROWA tooling specifications)
- Flow rate : 27ℓ/min or more (2.65cu.ft./min.)

6. Shield room

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

1. Ground the EDM in the shield room (Fig. 3).
2. If the EDM cannot be grounded in the shield room, connect the 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.



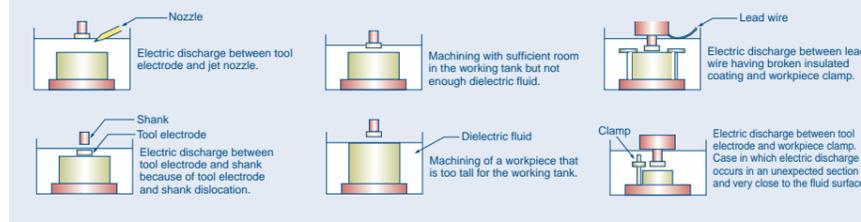
Precautions for selecting earth-leakage breaker

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 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).

Cautions

Preventing fires and accidents with EDMs

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 (FP60EA, FP60MA, 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
- Install an extra fire extinguisher in addition to the automatic fire extinguisher enclosed with the 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

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 of Hazardous Materials Safety Techniques Association 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 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°, 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

- (1) Terms of repairment free of charge
- 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.

(2) Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- ① Damages caused by any cause found not to be the responsibility of Mitsubishi.
- ② Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- ③ Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- ④ Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

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.

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* Not all products are available in all countries.



Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC



Power monitoring, energy management



Compact and Modular Controllers



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Visualisation: HMIs



Numerical Control (NC)



Robots: SCARA, Articulated arm



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Transformers, Air conditioning, Photovoltaic systems

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- ④ Fukuyama Works**
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- ⑥ Power Distribution Systems Center**
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Mitsubishi Electric Automation Manufacturing (ChangShu) Co., Ltd.
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- ⑤ China (Dalian)**
Mitsubishi Electric Dalian Industrial Products Co., Ltd.
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