

EDNC

H.E.A.T.



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H294Ec 2109(SJ-T)



Rib-machining time is reduced by half

EDNC series machines are for medium and large size dies/molds, such as automobile exterior/interior parts and home appliance parts. There are a lot of rib shapes in core mold of resin molding. That's the challenge we need to overcome seeking for shorter lead-time. The newly developed technology H.E.A.T. realizes high-speed rib machining.

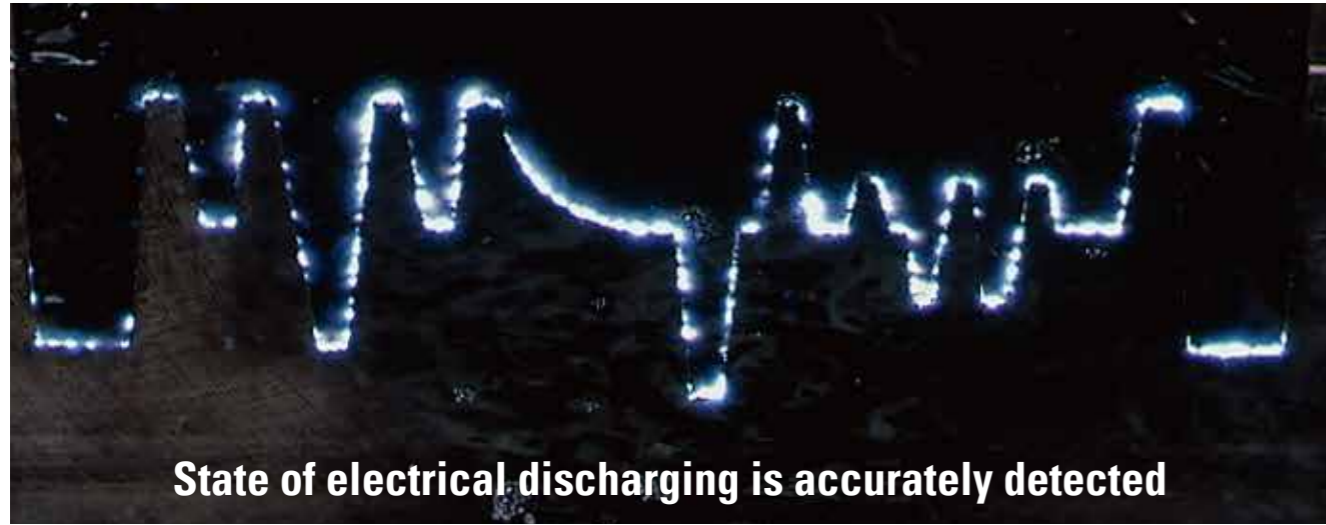


EDM machines can contribute to dies/molds production especially in machining thin and deep shape.

H.E.A.T. Technology

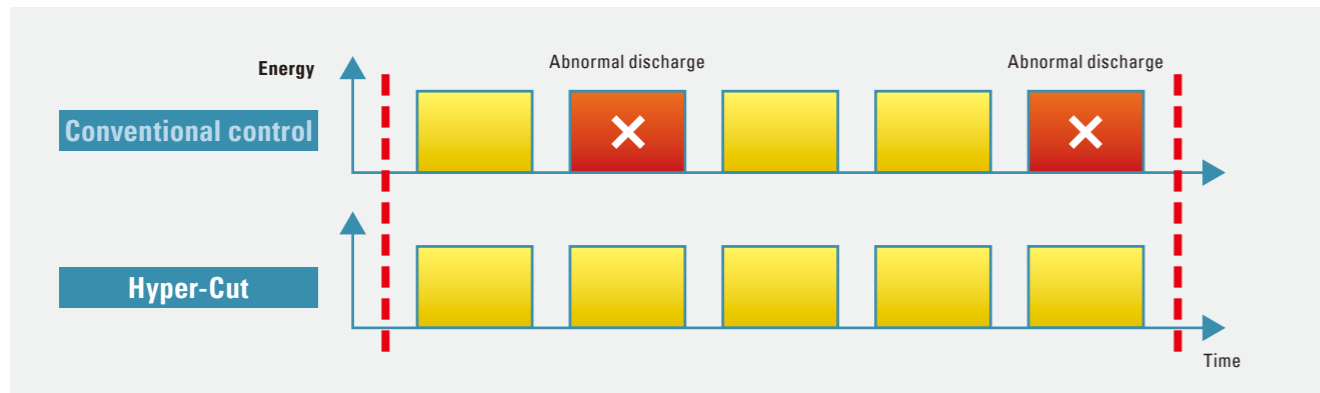
- Discharge control technology Hyper-Cut
- Super Spark
- High speed jump HS-Rib

Hyper-Cut

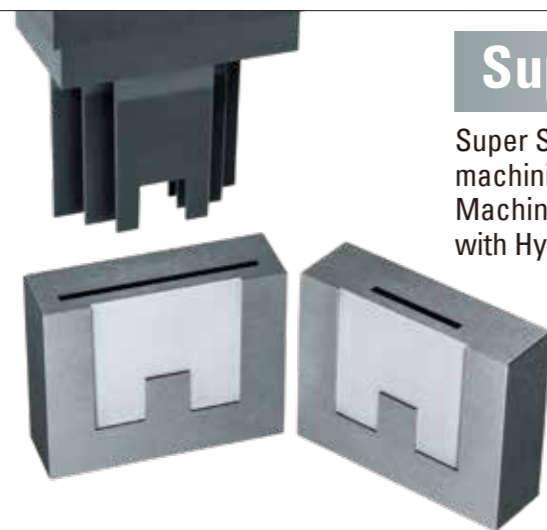


State of electrical discharging is accurately detected

Hyper-Cut is a control technology that increases electrical discharge energy per unit time. By accurately detecting discharge state, occurrence rate of abnormal electrical discharge is decreased.



- **Machining time is shortened by 30%**
- **Wear of graphite electrode is reduced to 1/10**
(Comparison to the conventional generator <MGH 5 generator>)



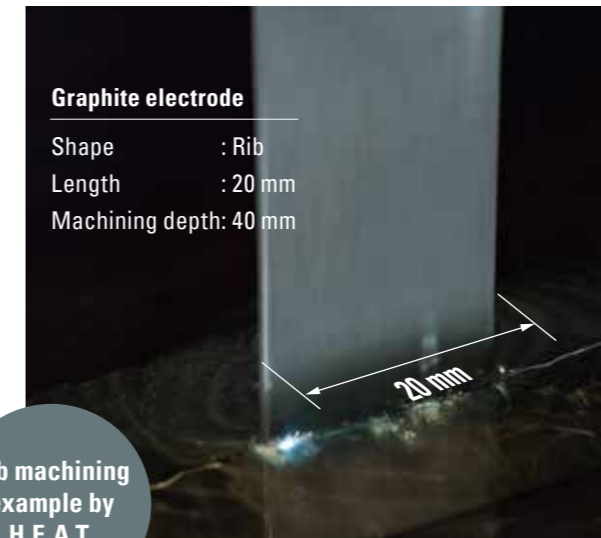
Super Spark

Super Spark is a control technology which shortens rough machining time regardless of electrode and workpiece material. Machining time can be further shortened by combination use with Hyper-Cut.

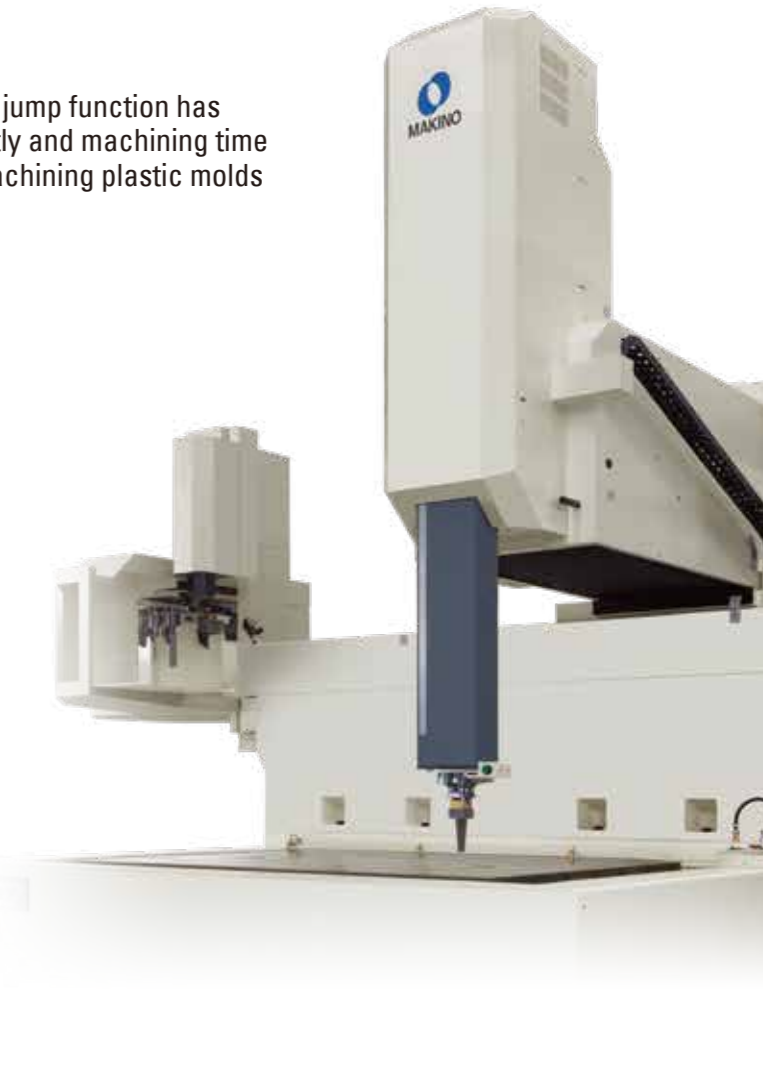
HS-Rib

In order to realize high-speed rib machining, the Z-axis jump function has been enhanced. Machining chip is discharged efficiently and machining time is drastically shortened. It is particularly effective in machining plastic molds with many rib-shapes and pin-gates.

Jump speed 20m/min



Graphite electrode
 Shape : Rib
 Length : 20 mm
 Machining depth: 40 mm



Machining time ▶

| | | |
|---|---------------|------------------------|
| Conventional machining 5 m/min jump | 6 hr. 9 min. | ← 65% reduction |
| H.E.A.T. Hyper-Cut+Super Spark +HS-Rib (20m/min jump) | 2 hr. 11 min. | |

Length wear ▶

| | | |
|---|---------|------------------------|
| Conventional machining 5 m/min jump | 0.9 mm | ← 90% reduction |
| H.E.A.T. Hyper-Cut+Super Spark +HS-Rib (20m/min jump) | 0.09 mm | |



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

Applying the latest interface technologies used for smartphones and tablets, Makino's Hyper*i* provides operators with simple and natural way of operation.

Easy programming

Machining program can be created easily on the user-friendly graphical screen.

Machining type menu



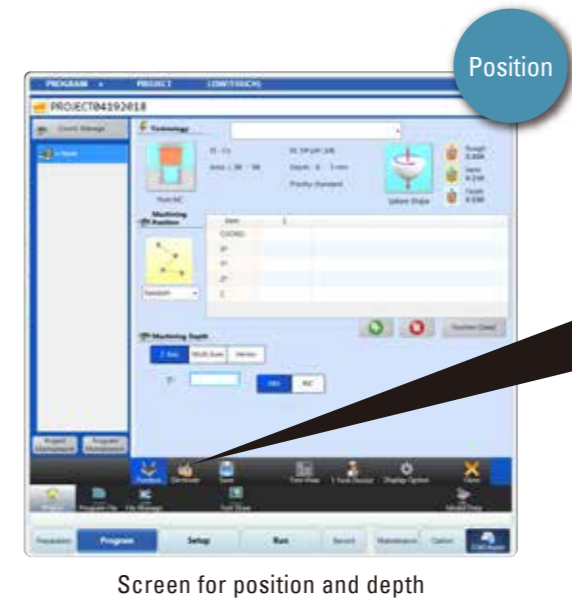
Proper machining condition is automatically determined by selecting machining shape on the menu and inputting workpiece material and electrode material etc.

Program

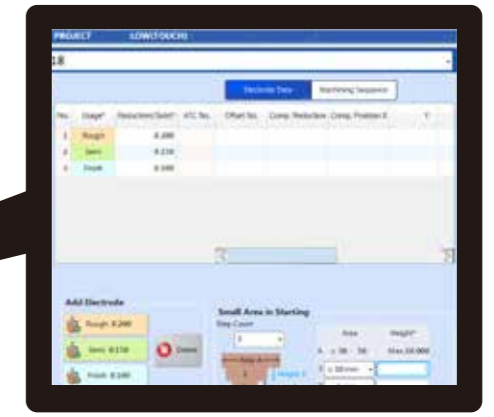


Orbit

Orbit pattern / Electrode dimension reduction
Three types of orbit patterns, Circle/Square/Sphere, are equipped. Each type has 2D and 3D motion patterns to create optimal programs for machining various shapes.



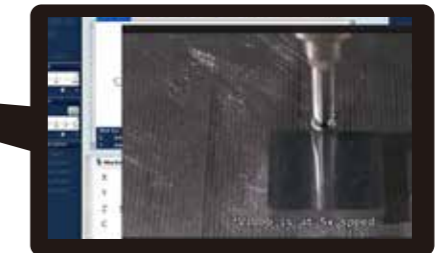
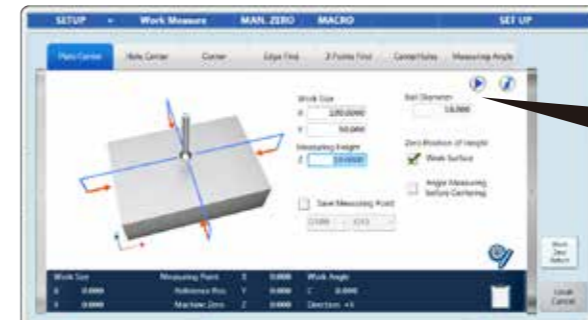
Screen for position and depth



Electrode setting
Screen for tool pot number and order of machining

Setup

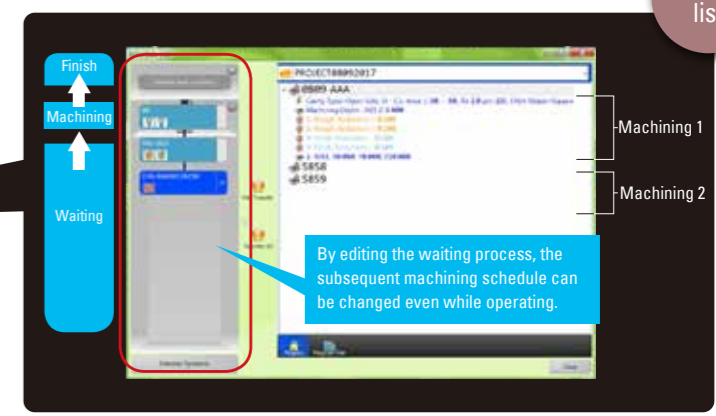
Setup screens such as Plate center, Hole center, Corner, Edge Find, 3 Points Find, CenterHoles, Measuring Angle, etc. help operators operate intuitively.



EDM Assist
Explanation movies are available.

Schedule-run

Continuous operation of multiple programs can be easily done.



Schedule list

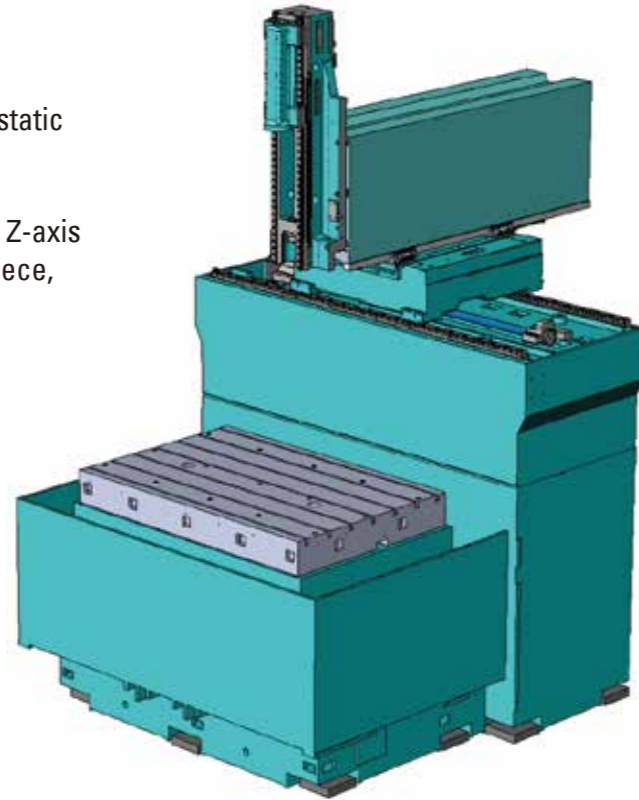


E-Tech doctor
E-Tech doctor is an advanced help function that suggests ways to improve various problems interactively.
Example: "Since the discharge state is bad, I want to know how to improve."

Machine structure

High rigidity machine structure maintains its static accuracy over long period of use.

The table is fixed and the head moves in X, Y, Z-axis directions. Even in machining a heavy workpiece, attitude of the head is kept stable.



Large size machine with long Y-axis, handling large size molds (EDNC17/EDNC22)



Ideal for large molds of square size, which have been increasing in recent years. The structure of RAM is rigid, and the head is very small, the amount of deflection is minimized even when machining locations far from the origin.

Accessibility / Easy operation

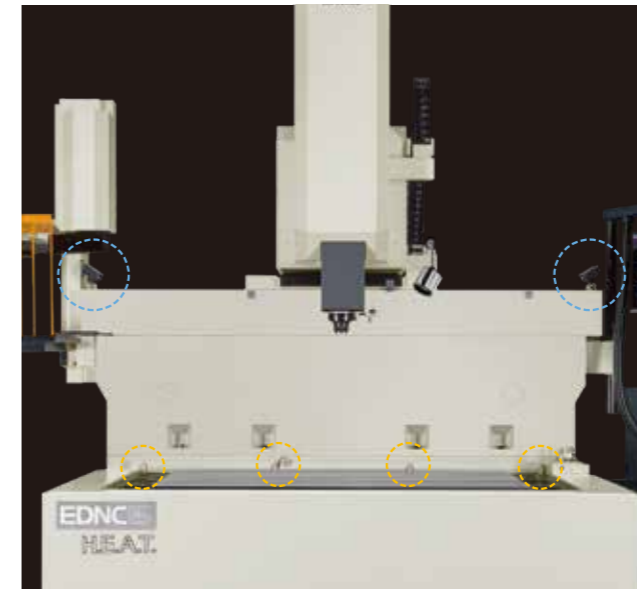
Thanks to the vertically sliding drop-tank design, three sides of work tank are fully open. Operator can access to the table freely.* Daily operations such as setting, measuring, checking, etc. are easy. Furthermore, it can be a key function for automation.

*EDNC20/21/22 are excluded.



For safety and maintenance

Safety unit



Automatic fire extinguisher

When heat (60°C) is detected, extinguishing agent is flushed.

Flame sensor (optional equipment)

When flame is detected, machine stops instantly. (Required for automation system)

Consumables manage screen

| Item | Residual | Life | Use | Last | Next | Time | Estimate |
|----------------------|----------|--------|-----|------------|------------|----------|----------|
| Dielectric fluid | 3500/52 | 470000 | 82% | 04/19/2017 | | | SP |
| Dielectric fluid | 800/52 | 420000 | | 04/19/2017 | | | SP |
| VPSA Battery | 839/68 | 800 | 9% | 04/19/2017 | 04/19/2017 | 09:42 AM | SP |
| Basic Unit Battery | 823/68 | 800 | 9% | 04/19/2017 | 04/19/2017 | 09:42 AM | SP |
| Machining Tower 1 | 26/52 | 4800 | 87% | 04/22/2017 | | | SP |
| Machining Tower 2 | 39/52 | 4800 | 42% | 04/19/2017 | | | SP |
| Timer 1 | 80/81 | 100000 | 60% | 04/19/2017 | | | SP |
| Timer 2 | 1/11 | 100000 | 1% | 04/19/2017 | | | SP |
| Turbidimeter Counter | 200/80 | 800 | 9% | 04/19/2017 | 04/19/2017 | 09:42 AM | SP |
| Turbidimeter Counter | 200/80 | 800 | 9% | 04/19/2017 | 04/19/2017 | 09:42 AM | SP |

When time of replacement of consumables such as dielectric fluid filter, battery, etc. comes, colors of the cells are changed to notify operator.

Energy saving

Energy saving power supply unit

The newly developed energy saving power supply unit, which has average power capacity of 80A (100 at peak), is equipped as standard specification. Its productivity is much higher than conventional one.

Power saving function

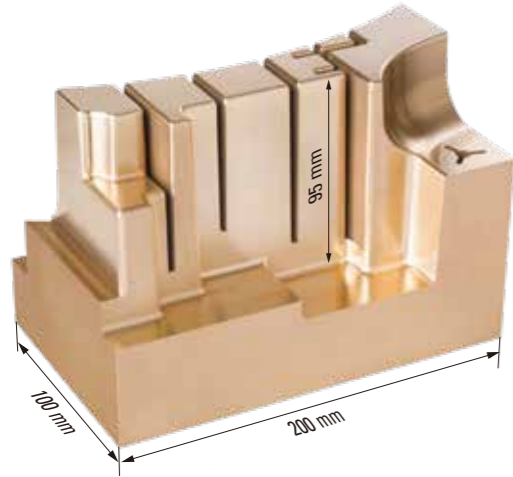


Dielectric fluid cooling unit, pumps, fans, etc. stop during idle time.

Machining example

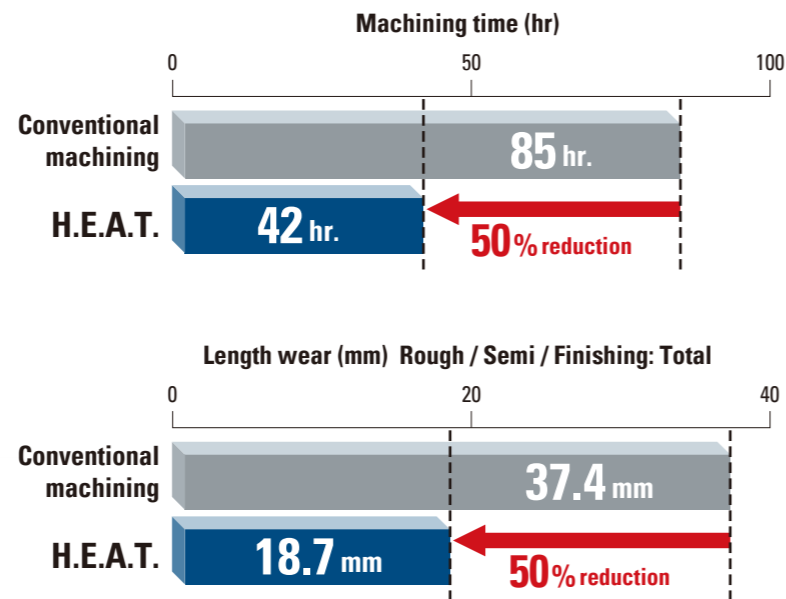
Machining of beryllium copper

H.E.A.T. shortens machining time by **50%** and reduces electrode wear by half.



Multi-rib, rocket rib machining

Electrode : Graphite (ISO-63)
 Number of electrodes: 3
 Workpiece material : Beryllium copper (Moldmax HH)
 Surface finish : Ra 1.8 μm



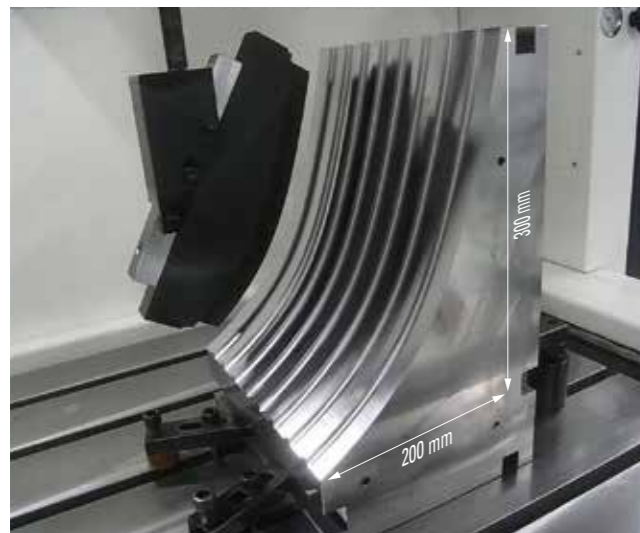
Beryllium copper

It is used for injection molds and mold insert parts, because it has excellent cooling efficiency as the thermal conductivity is ten times as high as that of steel, two times that of aluminum. It is effective in preventing molding defects and shortening cycle time by good mold release characteristic.

Side machining

Machining speed in X-Y direction is drastically improved.

Machining time is reduced by **50%**.



Machining example: Side-rib machining

Electrode : Graphite (ISEM-8)
 Workpiece material: SKD61
 Machining depth : 20mm
 Machining time : 32 hr. 10 min.

Advantage of side machining

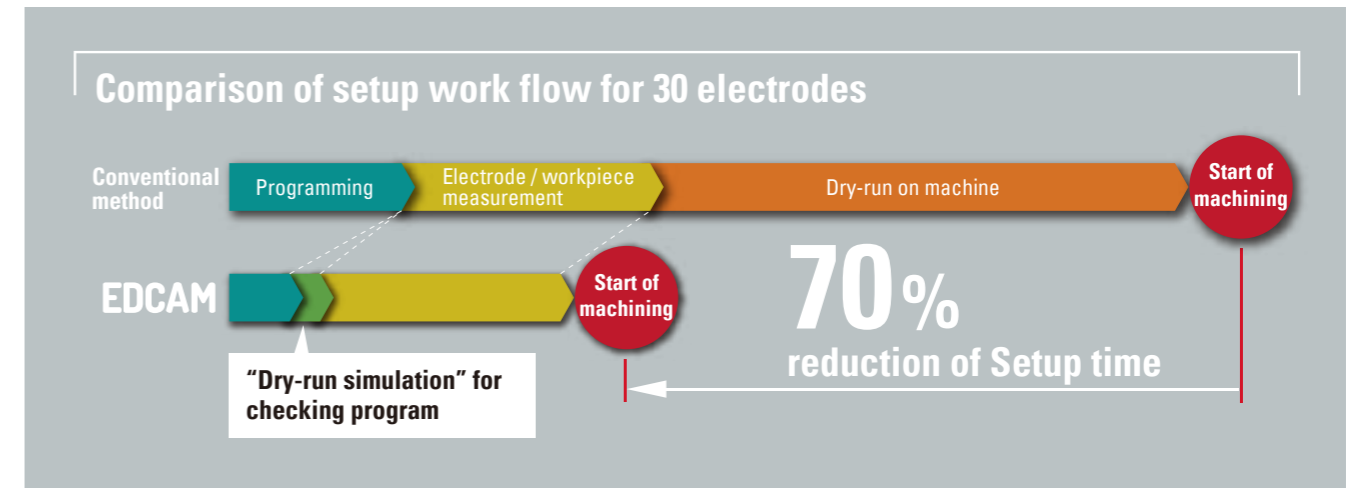
Side machining is suitable for deep side rib machining, because discharge area in X-Y direction can be larger than that of normal machining in Z-axis direction.



CAM system for EDM machines

EDCAM (Software, sold separately)

Less setup time - dry-run can be skipped



The epoch-making CAM system which eliminates manual input and on machine dry-run.

Dry-run simulation

Dry-run is performed on PC. It is possible to check machining position, electrode shape, interference between electrode and workpiece, etc.

Easy programming

Data necessary for machining can be read directly from CAD. Mistakes caused by manual input is totally eliminated. Furthermore, proper machining condition can be automatically selected based on machining area. As the user interface is as same as that of machine controller, operator can use EDCAM easily.

For efficient electrode machining

Vertical Machining Center

V SERIES Graphite specification

| Model | Travels (X, Y, Z axis) mm |
|-------|---------------------------|
| V22 | 320 × 280 × 300 |
| V33i | 650 × 450 × 350 |
| V56i | 900 × 550 × 450 |
| V77 | 1200 × 700 × 650 |
| V77L | 1500 × 700 × 650 |





EDNC6



EDNC17



EDNC8



EDNC20

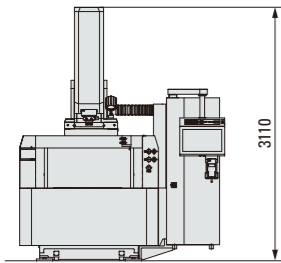
Photo: Without HS-Rib specification



EDNC22

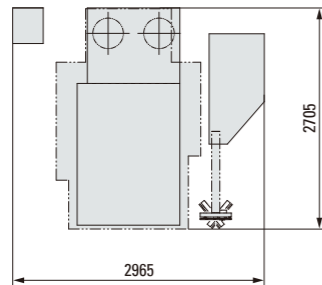
EDNC6

Front view



3110

Layout

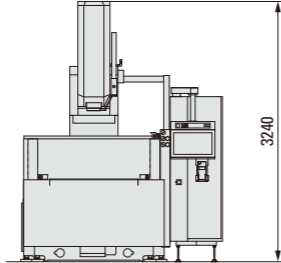


2965

2705

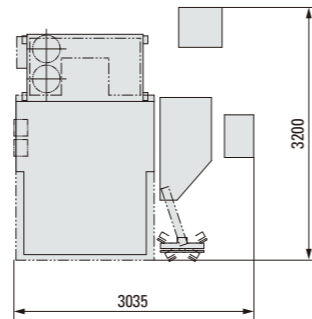
EDNC8

Front view



3240

Layout

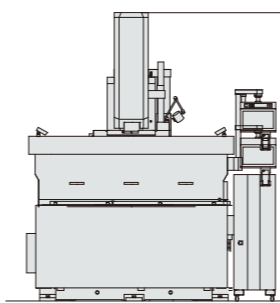


3035

3200

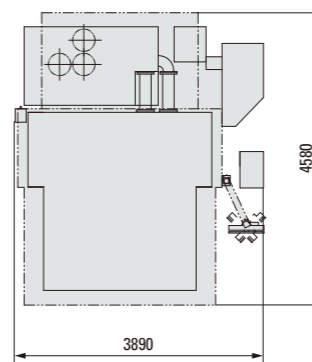
EDNC17

Front view



4500

Layout

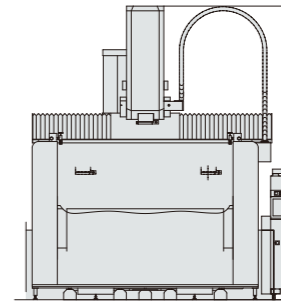


3890

4580

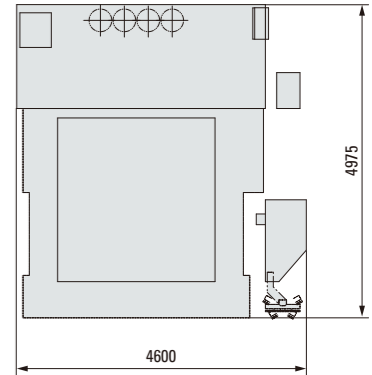
EDNC20

Front view



4680

Layout

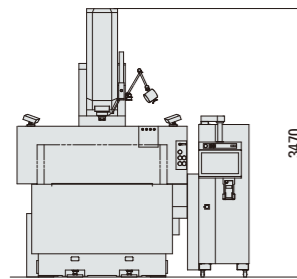


4600

4975

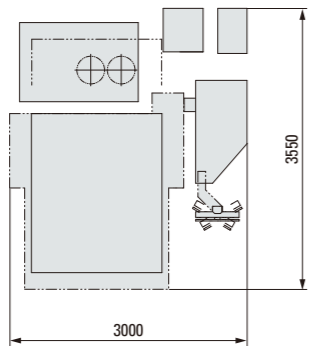
EDNC10

Front view



3470

Layout

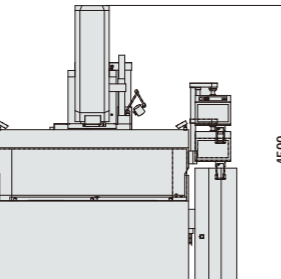


3000

3550

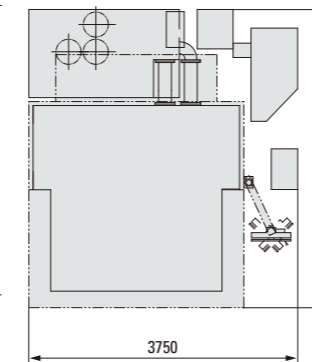
EDNC15

Front view



4500

Layout

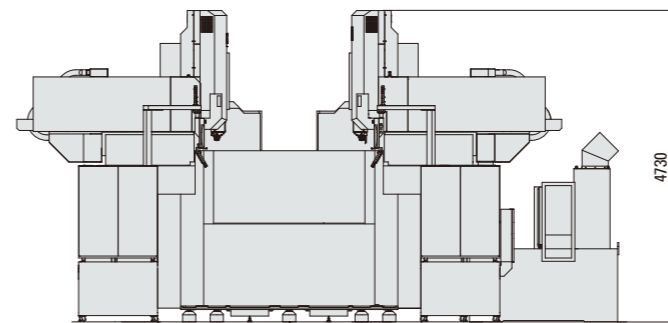


3750

4160

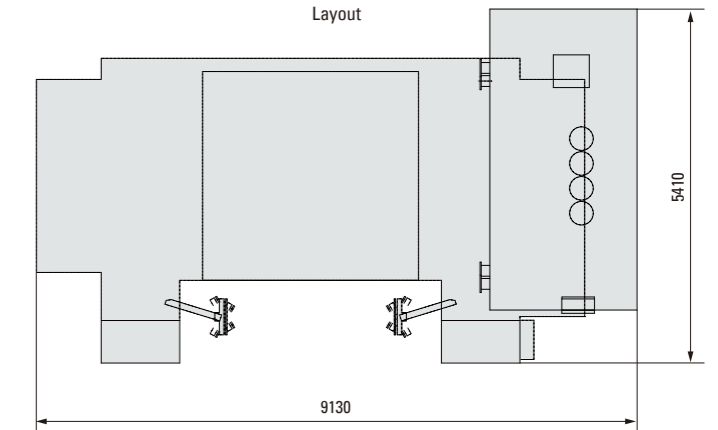
EDNC22

Front view



4730

Layout



9130

5410

* In addition to the space for the machine main body, space for movable parts and maintenance is also required.

Machine Specifications

| | | EDNC 6 | EDNC 8 | EDNC 10 | EDNC 15 | EDNC 17 | EDNC 20 | EDNC 22 | | |
|--|---|--|----------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|
| Axis travels (X × Y × Z) | mm | 650 × 450 × 500 | 800 × 500 × 500 | 1000 × 600 × 500 | 1500 × 700 × 800 | 1700 × 1150 × 800 | 2000 × 700 × 800 | 2200 × 2200 × 800*3 | | |
| Work tank inner dimensions (W × D × H) | mm | 1100 × 750 × 450 | 1400 × 900 × 500 | 1500 × 1100 × 500 | 2500 × 1400 × 800 | 2500 × 1600 × 800 | 2800 × 1800 × 1050 | 2600 × 2780 × 1150 | | |
| Maximum fluid height | mm | 400 | 450 | 450 | 750 | 750 | 1000 | 1050 | | |
| Table working area (W × D) | mm | 800 × 550 | 1100 × 700 | 1300 × 950 | 2000 × 1000 | 2000 × 1350 | 2500 × 1300 | 2300 × 2500 | | |
| Rapid traverse | mm/min | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | | |
| Work tank opening | | Sliding drop-tank | Sliding drop-tank | Sliding drop-tank | Sliding drop-tank | Sliding drop-tank | Work tank door | Work tank door | | |
| Maximum electrode weight | HS-Rib | Standard head electrode mounting plate specification | kg | 100 (High speed jump16) | 100 (High speed jump16) | 100 (High speed jump16) | 100 (High speed jump16) | 100 (High speed jump16) | 100 (High speed jump16) | |
| | | Standard head chuck spec.*1 *2 | kg | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) | 85 (ATC8, high speed jump 16) |
| | | MA head specification*1 *2 | kg | 35 (ATC8, high speed jump 16) | 35 (ATC8, high speed jump 16) | 35 (ATC8, high speed jump 16) | 50 (ATC8, high speed jump 16) | 50 (ATC8, high speed jump 16) | 50 (ATC8, high speed jump 16) | 50 (ATC8, high speed jump 16) |
| | | MR head specification*1 *2 | kg | 45 (ATC8, high speed jump 16) | 45 (ATC8, high speed jump 16) | 45 (ATC8, high speed jump 16) | 60 (ATC8, high speed jump 16) | 60 (ATC8, high speed jump 16) | 60 (ATC8, high speed jump 16) | 60 (ATC8, high speed jump 16) |
| | Without HS-Rib | Standard head electrode mounting plate specification*1 | kg | 100 (High speed jump 16) | 300 (High speed jump 16) | 300 (High speed jump 16) | 500 (High speed jump 16) | - | 500 (High speed jump 16) | - |
| | | Standard head chuck spec.*1 *2 | kg | 85 (ATC8, high speed jump 16) | 150 (ATC8, high speed jump 16) | 150 (ATC8, high speed jump 16) | 150 (ATC8, high speed jump 16) | - | 150 (ATC8, high speed jump 16) | - |
| | | MR head specification*1 *2 | kg | 50 (ATC8, high speed jump 16) | 100 (ATC8, high speed jump 16) | 100 (ATC8, high speed jump 16) | 100 (ATC8, high speed jump 16) | - | 100 (ATC8, high speed jump 16) | - |
| Maximum workpiece weight | kg | 1500 | 3000 | 3000 | 10000 | 10000 | 10000 | 20000 | | |
| Z-axis bottom point | Standard head specification (distance from electrode mounting plate to table) | mm | 350 | 350 | 400 | 350 | 350 | 550 | 600 | |
| | MA/MR head specification*1 (distance from chuck lower surface to table) | mm | <EROWA>280 <system3R>262.5 | <EROWA>280 <system3R>262.5 | <EROWA>330 <system3R>312.5 | <EROWA>280 <system3R>262.5 | <EROWA>280 <system3R>262.5 | <EROWA>480 <system3R>462.5 | <EROWA>530 <system3R>512.5 | |
| Distance from floor to table surface | mm | 900 | 1030 | 1210 | 1470 | 1470 | 1450 | 1450 | | |
| Table T-slot (width × number) | mm | 14 × 4 | 18 × 5 | 18 × 7 | 18 × 5 | 18 × 7 | 18 × 8 | 18 × 12 | | |
| Machine size HS-Rib (standard) (W × D × H) | mm | 2965 × 2705 × 3110 | 3035 × 3200 × 3240 | 3000 × 3550 × 3470 | 3750 × 4160 × 4500 | 3890 × 4580 × 4500 | 4600 × 4975 × 4680 | 9130 × 5410 × 4730 | | |
| Machine weight (including power supply unit) | kg | 6400 | 9200 | 12000 | 25000 | 25000 | 25000 | 38000 | | |
| Floor space | mm | 3250 × 3650 | 3450 × 3700 | 3500 × 4300 | 4300 × 5000 | 4500 × 5200 | 5000 × 5700 | 9400 × 6000 | | |

Dielectric Fluid Supply Unit

| Type | | Integrated with machine | Integrated with machine | Stand-alone | Stand-alone | Stand-alone | Stand-alone | Stand-alone |
|-------------------|---------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Volume | L | 800 | 1200 | 1500 | 4500 | 4800 | 7200 | 10500 |
| Filtration system | Type | External pressure-type paper filter | External pressure-type paper filter | External pressure-type paper filter | External pressure-type paper filter | External pressure-type paper filter | External pressure-type paper filter | External pressure-type paper filter |
| | Number of filter elements | 6 | 6 | 6 | 9 | 9 | 12 | 12 |
| Number of ports | Suction | 1 | 1 | 1 | 1 | 1 | - | - |
| | Flushing | 1 | 2 | 2 | 2 | 2 | 4 | 4 |

ATC*1

| | | | | | | | |
|--|--------------|--------------|-----------|-----------|-----------|-----------|-----------|
| Number of tools (ATC5, 10 tools are pick-up types. Others are rotating types.) | 5, 8, 16, 32 | 5, 8, 16, 32 | 8, 16, 32 | 8, 16, 32 | 8, 16, 32 | 8, 16, 32 | 8, 16, 32 |
|--|--------------|--------------|-----------|-----------|-----------|-----------|-----------|

*1: Optional specification/Optional equipment *2: Chuck adapter (optional equipment) *3: X-axis: Left/ right heads, each 1150 mm

Standard Specifications

- ES200A power supply unit 80A (peak 100A)
- HS-Rib
- Set of centering/measuring probes
- Portable control panel
- Automatic fire extinguisher
- Automatic power shutoff
- Dielectric fluid cooling unit
- Super Spark*4
- Super Spark Gr
- Ethernet (1000BASE-T / 100BASE-TX / 10BASE-T)
- NC program memory 10GB
- Anti-virus software
- EDM Explorer
- HyperConnect (including Email notification function)
- USB flash memory interface

Optional Specifications / Optional Equipment

- ATC
- MA head
- MR head
- Chuck specification (EROWA, 3R)
- Scale feedback (only EDNC6 / 8)
- HQSF*5
- DD circuit*6
- Satin finish machining circuit*7
- Satin finish machining circuit/ Carbide machining circuit package*8
- Sludge separator
- SL unit
 - SL Type 1: Large-capacity suction unit*9
 - SL Type 2: Large-capacity suction unit*10 + Sludge separator
- Air booster
- Flame sensor
- Vibration sensor
- Circuit breaker
- Power supply line filter
- Carbide machining circuit*11
- Ultra-fine machining / Carbide machining circuit package*10
- Additional run hour meter
- Signal tower (1, 2 or 3 layer)
- Work light
- Chuck adapter
- Universal holder
- Holder base
- Dielectric fluid distributor unit (3 suction ports)
- Dielectric fluid distributor unit (10 flushing ports)
- Flushing unit
- Flushing nozzle set
- Flushing and suction unit with hose
- Clamp set
- Tool set
- Power supply unit specification*8 (160A (peak 200A), 240A (peak 300A))

*4: Not selectable on EDNC17 and EDNC22
 *5: Requires DD circuit
 *6: Necessary for HQSF
 *7: Equipped as standard on EDNC6. Included in HQSF
 *8: Not selectable only on EDNC6
 *9: Not selectable for HS-Rib (standard)
 *10: Not selectable for HS-Rib (standard) and HQSF
 *11: Selectable only on EDNC6

C-axis

The following C-axis types can be selected

| | Indexing accuracy (degree) | Spindle speed (min ⁻¹) |
|---------|----------------------------|------------------------------------|
| MA head | ±0.00417 | 10 - 1,000 |
| MR head | ±0.00417 | 1 - 10 |



Availability of optional specifications on EDNC Series machine

| Optional specification/Optional equipment | Effect | EDNC6 | EDNC8 | EDNC10 | EDNC15 | EDNC17 | EDNC20 | EDNC22 |
|--|---|-------|-------|--------|--------|--------|--------|--------|
| HQSF | For improving best surface finish (satin machined surface/glossy surface) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Carbide machining circuit | Required for carbide machining | ○ | — | — | — | — | — | — |
| Ultra-fine machining circuit/ Carbide machining circuit package*12 | For surface finish of Rz1μm and Ra0.15μm or less in small area machining | ○ | — | — | — | — | — | — |
| Satin finish machining circuit | For improving surface finish (satin machined surface) | — | ○ | ○ | ○ | ○ | ○ | ○ |
| Satin finish machining/ Carbide machining circuit package*14 | Required for carbide machining | — | ○ | ○ | ○ | ○ | ○ | ○ |
| DD circuit*15 | For improving machining stability of finishing of 150x150 or larger area | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

*12: Including carbide machining circuit *13: Including Ultra-fine machining circuit and carbide machining circuit *14: Including satin finish machining circuit
 *15: DD circuit is secured to the table and power supply line is connected to the electrode. ATC cannot be used together with DD circuit.