MAKINO

EDNC Series

NC Electrical Discharge Machines

MAKINO

The expanding world of EDM

As a result of technological innovations in metal cutting processes, most die and mold machining operations are now done on machining centers. At the same time, though, dramatic progress has been achieved in the machining speed, accuracy and surface finish of electrical discharge machining. Die and mold makers are now taking another look at the many benefits of EDM. Makino's EDNC Series incorporates a wide variety of advanced features to deliver optimum machining performance that clearly demonstrates the expanding possibilities of EDM machines.

Speaker grille

Conventional machining **210 hr.** → Machining time → **Super Spark 150 hr.**

Conventional machining **Rz 16 ~ 20 μm** → Surface finish → **HQSF machining Rz* 8 ~ 10 μm**

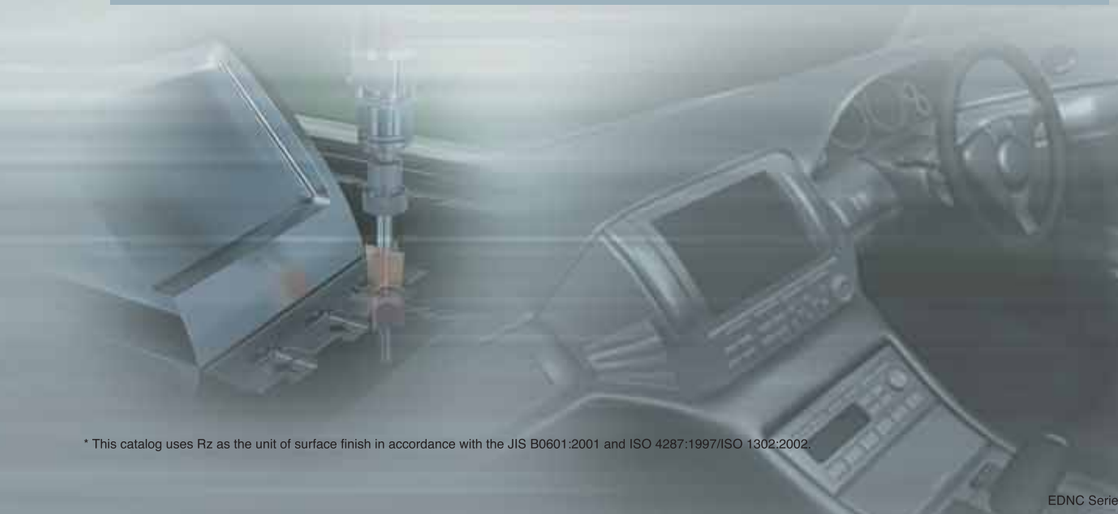
Electrode material	: Graphite	Depth of cut	: 2 mm
Workpiece material	: Carbon steel (S55C)	Electrode dimension reduction	: 0.15 mm (one side)
Workpiece dimensions	: 900×600×130 mm	No. of electrode used	: 2

Rib machining

Conventional machining **13 hr. 30 min.** → Machining time → **Super Spark 10 hr. 10 min.**

Conventional machining **Rz 15 μm** → Surface finish → **HQSF machining Rz* 8 μm**

Electrode material	: Graphite	Depth of cut	: 120 mm
Workpiece material	: Tool steel (NAK80)	Electrode dimension reduction	: 0.20 mm (one side)
Workpiece dimensions	: 80 × 80 × 150 mm	No. of electrode used	: 3



* This catalog uses Rz as the unit of surface finish in accordance with the JIS B0601:2001 and ISO 4287:1997/ISO 1302:2002.

EDNC series

EDNC65/EDNC65S

EDNC157 / EDNC157S

EDNC207/EDNC207S

EDNC85/EDNC85S

EDNC106/EDNC106S

EDNC2015-2H/EDNC2015S-2H

	EDNC65	EDNC85	EDNC106
Travels X × Y × Z mm	650 × 450 × 350	800 × 500 × 400	1000 × 600 × 500
Work tank inner dimensions W × D × H mm	1100 × 750 × 450	1400 × 900 × 500	1500 × 1100 × 500
Maximum fluid height mm	400	450	450
Table working size mm	800 × 550	1100 × 700	1300 × 950
Table height mm	890	1030	1200
Maximum workpiece load kg	1500	3000	3000
Maximum electrode weight kg	100	300	300
Machine dimensions W × D × H mm	2450 × 2605 × 2730	2500 × 2860 × 2900	2200 × 3160 × 3530

EDNC157	EDNC207	EDNC2015-2H
1500 × 700 × 500	2000 × 700 × 600	2000 × 1500 × 600
2500 × 1400 × 800	2800 × 1600 × 1050	3100 × 1800 × 1000
750	1000	950
2000 × 1000	2500 × 1200	2500 × 1450
1480	1320	1300
10000	10000	10000
500	750	300
3455 × 3610 × 4150	3800 × 4130 × 4510	6280 × 3800 × 4750

*The HQSF process is available on EDNC S-Series machines.

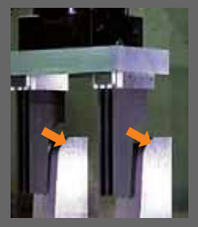
Super Spark (Optional equipment)

Dramatic reduction of machining time

Machining time is dramatically reduced in many different processes where high-speed jump motions cannot be used, such as when machining with heavy electrodes, in side milling and in machining multiple ribs.

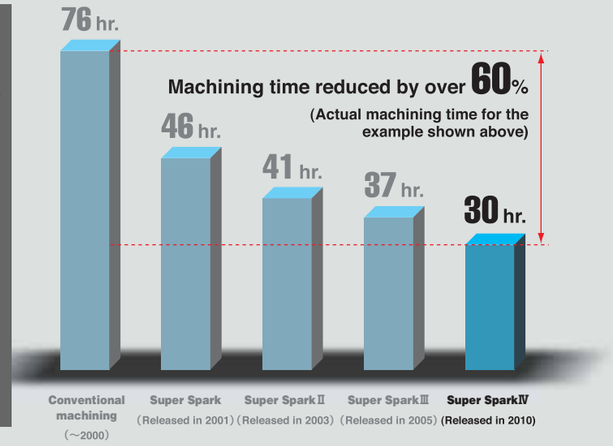
Advances in Super Spark

Since Super Spark was first developed in 2001, it has been improved several times to achieve substantially shorter machining times.



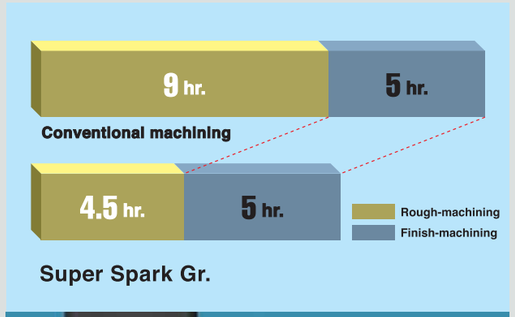
• Side milling (3-axis machining) of multiple ribs

Electrode material	: Graphite
Workpiece material	: Carbon steel (S55C)
Workpiece dimensions	: 80 × 100 × 200 mm (×2)
Depth of cut	: 30 mm
Electrode dimension reduction	: 0.2 mm (one side)
No. of electrode used	: 2 (rough 1 + finish 1)
Surface finish	: Rz 8 μm



Super Spark Gr. (Optional equipment)

Super Spark Gr. is a new servo control technology that enables to keep wider gap for electric discharge.
Rough machining time with graphite electrode is drastically reduced. Moreover, deeper hole than L/D=40, that was impossible to be machined with conventional way, can be machined.



• Rib-shape machining

Workpiece material	: Carbon steel (S50C)
Machining depth	: 30mm
Electrode material	: Graphite
Electrdde reduction	: 0.5mm (one side)
Machining time	: Rough machining 4.5 hr.
	: Finish machining 5 hr.
Surface finish	: Rz 12 μm

• Deep hole: L/D=40

Workpiece material	: Carbon steel (S50C)
Machining depth	: 200mm
Electrode material	: Graphite
Electrode size	: 5mm × 5mm
Electrdde reduction	: 0.5mm (one side)
Machining time	: 19 hr. 30 min.
Surface finish	: Rz 18 μm

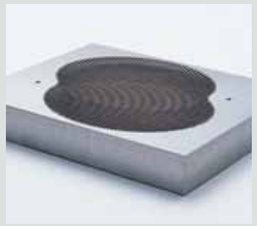
HQSF Available on EDNC S-Series

Improves surface finishes remarkably

Makino's HQSF (High Quality Surface Finish) process uses a special μSC additive that is mixed into the dielectric fluid. This process delivers superior surface finishes that were previously unobtainable.

1 Surface roughness is reduced by half while achieving the same machining time.

The same effect is obtained with both graphite and copper electrodes.



Workpiece material	: Stainless steel (STAVAX)
Electrode material	: Graphite
Workpiece dimensions	: 200 × 200 × 30mm
Electrode dimension reduction	: 0.15 mm (one side)
No. of electrode used	: 3
Depth of cut	: 7 mm

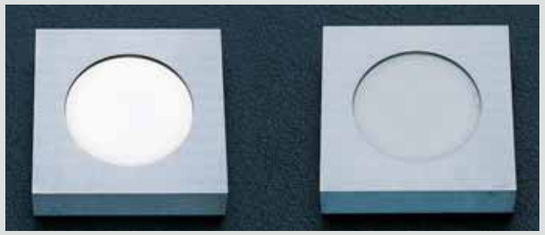
	Without HQSF	With HQSF
Surface finish	Rz 10 μm	Rz 5 μm
Machining time	20 hr.	

Workpiece material	: Tool steel (NAK80)
Electrode material	: Copper
Workpiece dimensions	: 80 × 100 × 200 mm
Electrode dimension reduction	: 0.2 mm (one side)
No. of electrode used	: 2
Depth of cut	: 12 mm

	Without HQSF	With HQSF
Surface finish	Rz 4 μm	Rz 2 μm
Machining time	22 hr. 30 min.	

2 Shorter polishing time

The HQSF process is effective in improving the surface finish of both glossy and satin machined surfaces. Polishing time is reduced because of the shallow thermal recast layer.

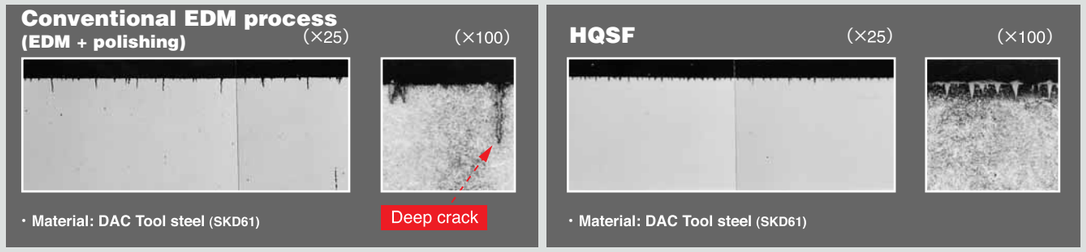


Glossy machined surface　　Satin machined surface

3 Longer die/mold life

There is no formation of cracks that affect die/mold life.

Cross-sectional views of crack morphology after a 2,000-cycle heat crack test



*Micrographs courtesy of Hitachi Metals, Ltd.

High-efficiency machining process combining the strengths of metal cutting and EDM

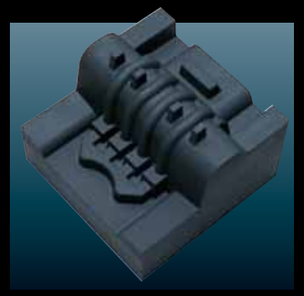
Machined in a metal cutting process alone
47 hr.

No. of tools used : 30

Machining time reduced by **32 %**

Machined by EDM alone
58 hr.

Machining time reduced by **45 %**



Full-form electrode

Machined in a combined process of metal cutting and EDM
32 hr.

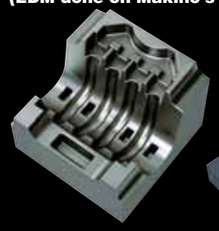
Roughing & semi-finishing
(metal cutting done on Makino's V56i VMC)

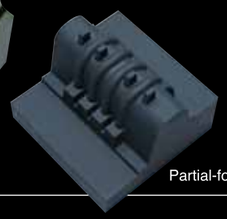
Number of tools used reduced from 30 to 15

Leaves a uniform amount of material (0.3 mm) for finishing by EDM

Metal cutting time : 11 hr.

Finish machining
(EDM done on Makino's EDNC65S NC EDM machine)





Partial-form electrode

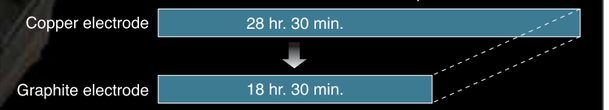
Uniform finishing stock minimizes electrode wear.
Number of electrodes used reduced from 2 to 1

EDM time : 21 hr.

Effective use of graphite electrodes

It is widely known that graphite electrodes facilitate high-efficiency rough machining over a large area. Due to recent improvements in electrode materials, graphite electrodes are also increasingly being used for precision machining jobs.

Electrode material	: Graphite
Workpiece material	: Tool steel (NAK80)
No. of electrode used	: 2
Electrode dimension reduction	: 0.15 mm (one side)
Machining time	: 18 hr. 30 min.
Surface finish	: Rz 5 μm



Example of thin rib machining in the core of a cellular phone charger holder

The use of graphite electrodes reduced EDM time by 35% compared with copper electrodes, when the final surface finish was set at Rz 5 μm. Post-machining polishing time can also be reduced with graphite electrodes by obtaining a stable surface finish. The number of electrodes used per rib is the same for both copper and graphite. One electrode each is used for roughing and finish machining.

1 Easy to manufacture graphite electrodes

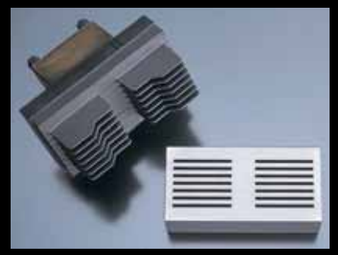
Graphite electrodes can be machined at faster speeds than copper electrodes and machining can be done efficiently even with relatively long tools. Graphite's excellent machinability allows the production of highly accurate electrodes because the machining process does not produce any warping or burrs. Graphite electrodes are also easy to polish. Makino's V-GRAPHITE Series of vertical machining centers can machine graphite electrodes at high speed with superb accuracy. These machines are fitted with a powerful dust collector that reliably collects worrisome graphite dust to keep the working environment clean. The machines also support a wire EDM process.

2 Outstanding EDM performance

Graphite electrodes improve EDM performance not only in rough machining but also for finish machining jobs. With a thermal expansion coefficient that is only one-fourth that of copper, graphite facilitates high-accuracy machining with little thermal expansion.

3 Only one-fifth the weight of copper

Graphite's light weight makes it easier to handle electrodes. An ATC can be used to change electrodes without worrying about the allowable weight limit.



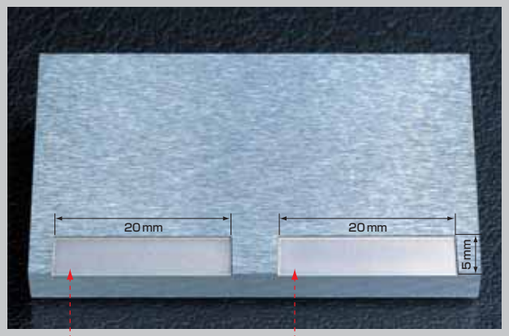
Example of multiple rib machining of a die casting die heat sink

Electrode material	: Graphite
Workpiece material	: Tool steel (NAK80)
Workpiece dimensions	: 200 × 80 × 100 mm
Depth of cut	: 20 mm
Electrode dimension reduction	: 0.15 mm (one side)
Machining time	: 17 hr. 50 min.
No. of electrode used	: 2 (rough 1 + finish 1)
Surface finish	: Rz 8 μm

Super Surface Gr. (Optional equipment) Available on EDNC65

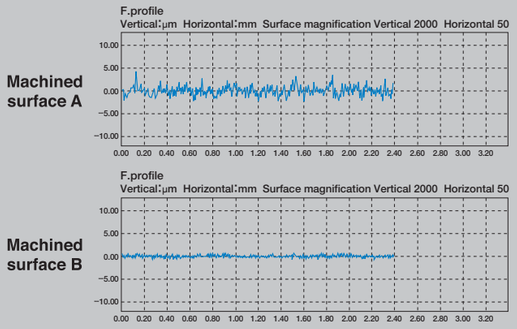
Super Surface Gr. enables Rz 1 μm surface-finish in small size rib machining with graphite electrode.

* Super Surface Gr. Inclueds carbide machining circuit.



Machined surface A

Machined surface B
(using Super Surface Gr.)

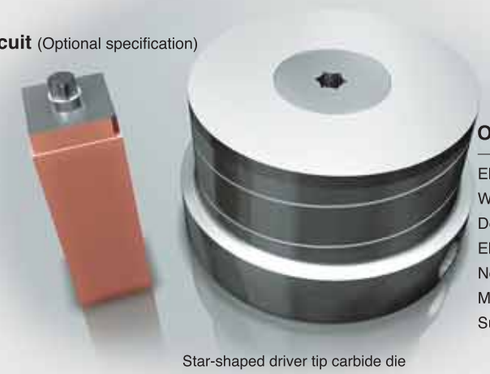


Workpiece material	: Stainless steel (STAVAX)
Electrode material	: Graphite
Electrode dimension reduction	: 0.8 mm (one side)
Depth of cut	: 5 mm

	Machined surface A	Machined surface B
Surface finish	Rz 4μm	Rz 1μm
Machining time	55 min.	1 hr. 40 min.

Ultra-fine machining circuit (Optional specification)

The Ultra-fine machining circuit provides surface finishes of Rz 1 μm or better and also substantially shortens polishing time.
(The machining area is limited.)



Star-shaped driver tip carbide die

Option used: Ultra-fine machining circuit

Electrode material	: Copper tungsten
Workpiece material	: Carbide
Depth of cut	: 3.0 mm
Electrode dimension reduction	: 0.035 mm (one side)
No. of electrode used	: 4
Machining time	: 2 hr. 14 min.
Surface finish	: Rz 0.9 μm

Availability of Optional Specifications on EDNC Series Machines

Optional specification	Benefits	EDNC65	EDNC85	EDNC106	EDNC157	EDNC207
Super Spark	Shorter machining time	○	○	○	○	○
Super Spark Gr.	Faster Rough-machining speed with graphite electrode	○	○	○	○	○
Super Spark Package	Super Spark + Super Spark Gr.	○	○	○	○	○
HQSF *2	Improved surface finish	○	○	○	○	○
Super Surface Gr. *3 (including carbide machining circuit)	Surface finish of Rz 1 μm in small size rib machining with graphite electrode	○	—	—	—	—
Ultra-fine machining circuit (including carbide machining circuit)	Surface finish of Rz 1 μm or better in small areas (up to 10 mm × 10 mm)	○	—	—	—	—
Carbide machining circuit	Necessary for machining hardened materials (60 A power supply is recommended when rough machining an area of 20 mm × 20 mm or larger)	○	—	—	—	—
DD circuit *4	Suppresses electrode dimension wear when finish machining an area of 150 mm × 150 mm or larger	○	○	○	○	○
CPBOX1	Improves best surface finish (satin machined surface) by 30%	—	○	○	○	○
CPBOX2	CPBOX1 + carbide machining circuit	—	○	○	○	○

*1 Optional specifications listed on the table except HQSF can be retrofitted after installation.
*2 HQSF: Available on S-specification machines
*3 Not available with Ultra-fine machining circuit
*4 DD circuit: The DD circuit is secured to the table and the power supply line is connected to the electrode. An ATC cannot be used together with the DD circuit.

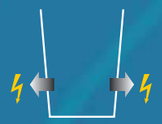
Intelligent Expert System

Simply select the desired package of machining conditions and the machine automatically selects the optimum machining process.

Shorter machining time

P-Pulse

Reduces rough machining time by automatically controlling the machining current to the optimal level matching the change in the EDM area as machining proceeds.



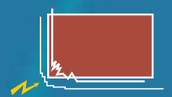
CJ-Jump

Provides suitable jump motions to the sides of the electrode for effective chip evacuation. This shortens the machining time for finishing side surfaces.

High-speed Jump

Stabilizes the machining process by eliminating gas accumulation along the sides of the electrode when machining narrow, deep shapes. This reduces rough machining times.

Enhanced accuracy



V-Cut 3

Optimally controls orbital motions even when machining intricate shapes, thereby improving shape accuracy and machining speed in finish machining jobs.

Improved machining stability

A-Jump

Provides effective jump motions in relation to the machined depth and spark discharge by optimally controlling the magnitude, cycle and speed of jumps.

R-Servo

Stabilizes the machining process by optimally controlling discharge servo motions in side surface EDM and other jobs with start holes, where chip evacuation is poor and unstable.

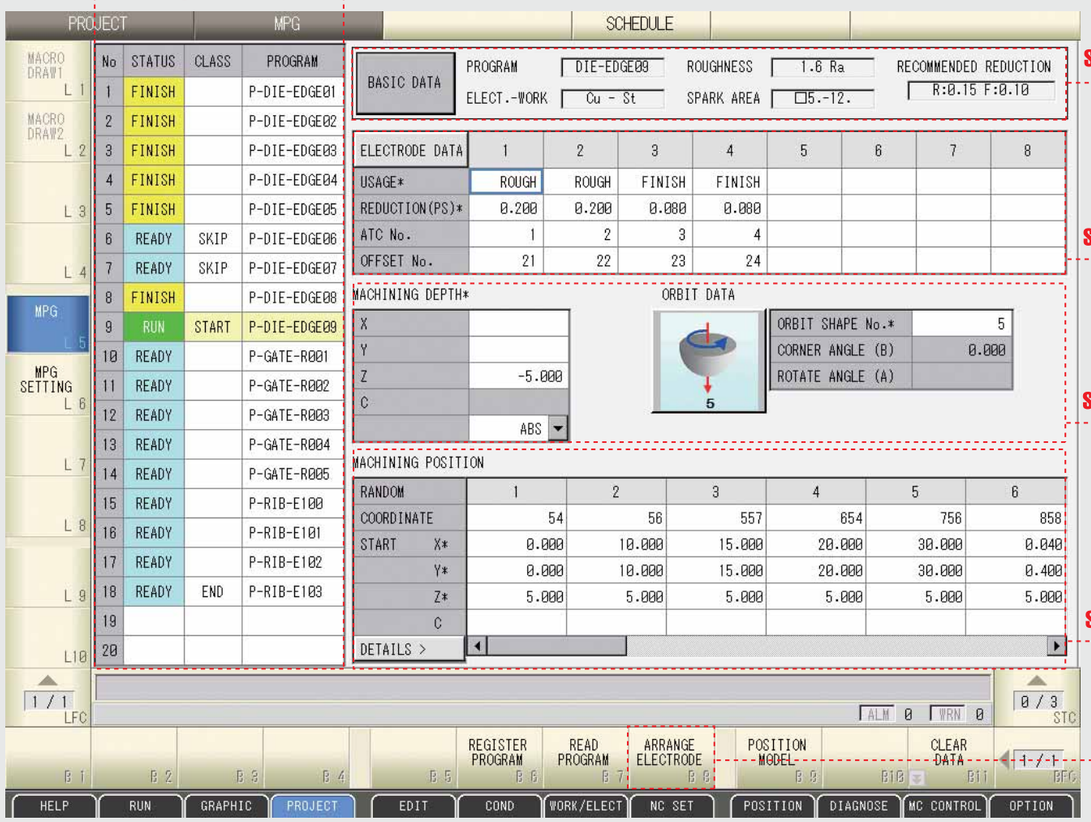
S-Control

Stabilizes the machining process quickly by optimally controlling the machining conditions and jump speed in situations where the EDM area is extremely small, such as at the start of machining.

MPG

1 minute data input and 1 screen for checking

Machining schedule screen



STEP 1 Input the basic data
(Program name, workpiece and electrode materials, spark area, required roughness, etc.)

STEP 2 Input the electrode data
(Electrode use, reduction, ATC No., offset No., etc.)

STEP 3 Input the machining depth, and select the desired orbital motion pattern

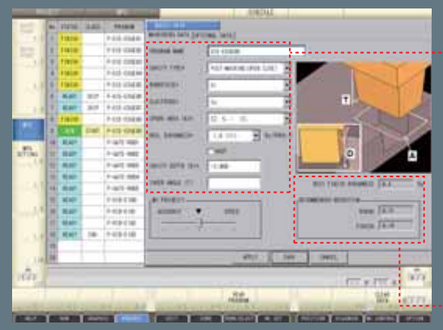
STEP 4 Input the machining position

Machining program completed!

These four steps are all that is needed to create a machining program.
Programming takes less than one minute.

Enter the basic data

The machining conditions are automatically selected only by entering the basic data necessary for the machining.



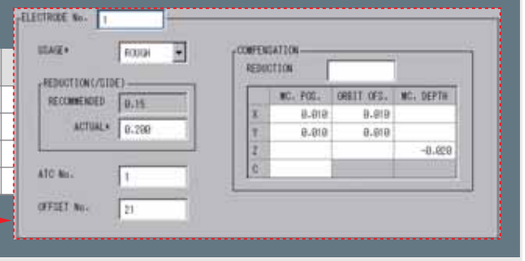
Realizable surface roughness and recommended reduction amounts of rough and finish electrodes are displayed.

Enter the electrode data

Electrode data from rough to finish machining can be registered.
(Maximum 8 pieces)

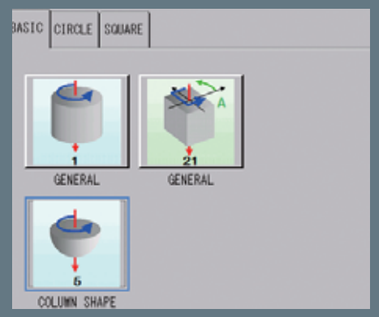
ELECTRODE DATA	1	2	3	4	5	6
USAGE*	ROUGH	ROUGH	FINISH	FINISH		
REDUCTION(PS)*	0.200	0.200	0.080	0.080		
ATC No.	1	2	3	4		
OFFSET No.	21	22	23	24		

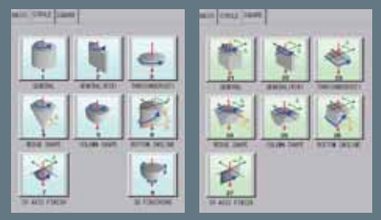
Machining position is adjustable every electrode.



Basic orbit motion patterns

Orbit motion patterns used frequently are displayed.



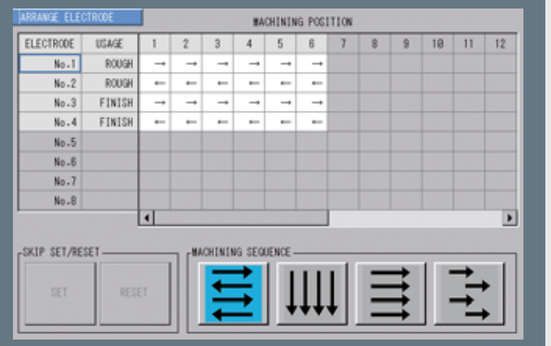


A variety of orbit motion patterns are available.

A variety of patterns can be selected from circle and square orbit patterns.

Assign electrode screen

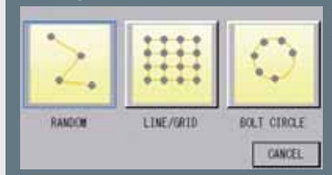
Machining sequence pattern and skip can be set.



Flexibility for changing machining programs

The order of the programs registered in the machining schedule screen can be changed as desired even while machining. (However, a program being executed cannot be changed.) It is also possible to skip over programs not being used. Machining can begin with the electrodes that are ready, even if all the electrodes have not been prepared yet.

Improved patterns for machining multiple items of the same type



Three types of patterns can be selected for machining multiple same-shape items.

Makino's unique design allows open access from three sides

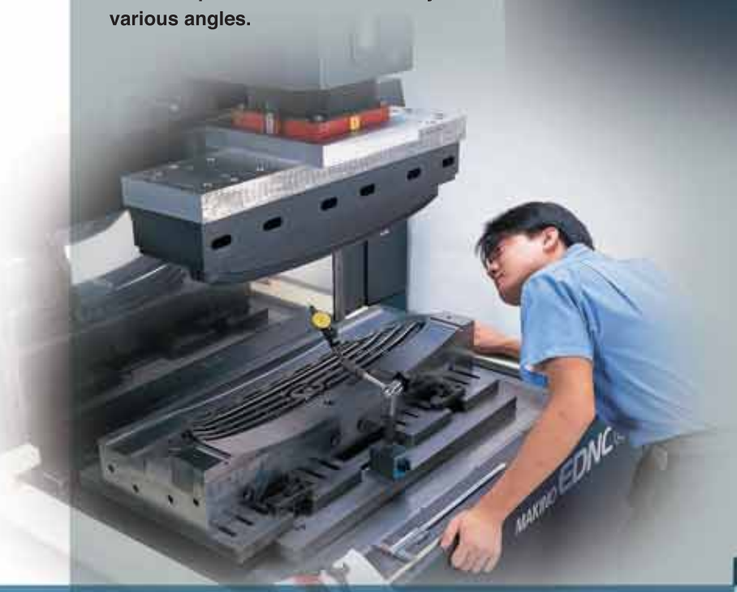
Makino's patented drop tank design allows fully open access to the table from three sides. This superior accessibility makes it remarkably easy to set up and measure workpieces, check the condition in the work tank, and perform other tasks that are done repeatedly every day.

Easy to set up even large workpieces

Workpieces can be put on the table not only from the front, but also from either the right or left side if necessary.

Outstanding accessibility

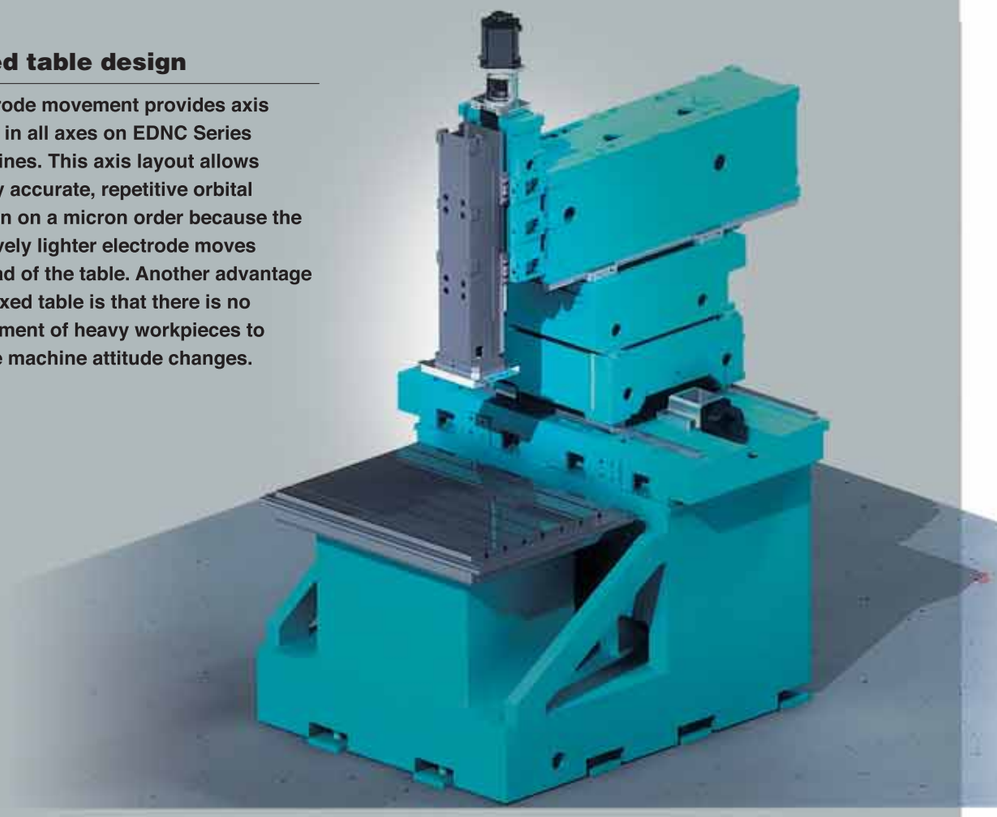
The workpiece can be seen easily from various angles.



Reliable performance based on Makino's long tradition as a machine tool builder

Fixed table design

Electrode movement provides axis travel in all axes on EDNC Series machines. This axis layout allows highly accurate, repetitive orbital motion on a micron order because the relatively lighter electrode moves instead of the table. Another advantage of a fixed table is that there is no movement of heavy workpieces to cause machine attitude changes.



Drop tank design

The work tank height can be set to match the height of the workpiece being machined.

MA head/MR head

MA head (Optional specification)

・Minimum indexing increment in the C-axis : 0.001° Spindle speed : 10～1000 min⁻¹

MR head (Optional specification)

・Minimum indexing increment in the C-axis : 0.001° Spindle speed : 1～10 min⁻¹

Maximum electrode weight (including holder) (Kg)

Change method	Mount system	Head type	EDNC65	EDNC85	EDNC106	EDNC157	EDNC207	EDNC2015-2H
ATC	Chuck	MA head・MR head・Standard head (chuck specification)	8	8	8	8	8	8
Manual			20	20	20	20	20	20
Direct mount-ing	Face plate	Standard head (face plate specification)	100	300	300	500	750	300
	Adapter	MA head	50	100	100	100	700	250
		MR head	60	100	100	100	700	250
		Standard head (chuck specification)	85	150	150	150	700	250

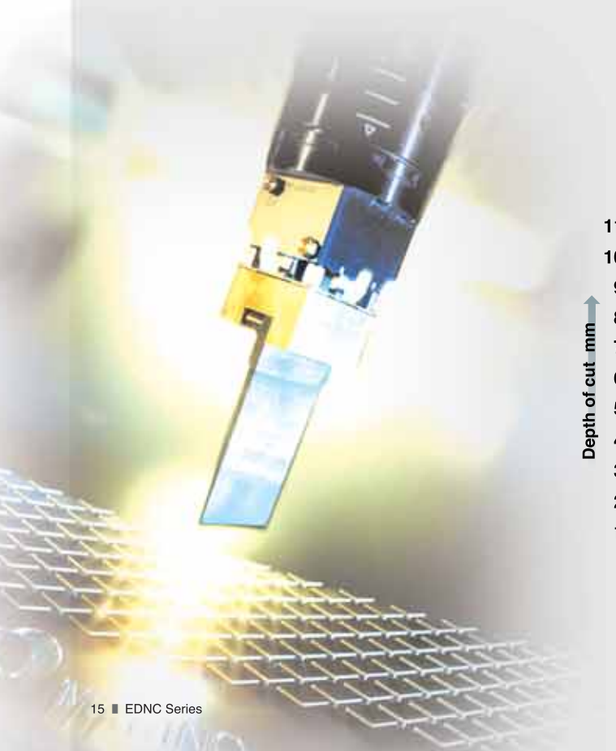
Rib Head specification (Optional specification)

Featuring an ultralight machining head that utilizes the characteristics of a linear motor along with continuous machining using an ATC.

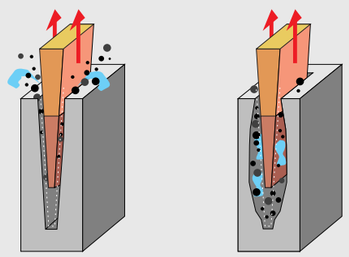
Controlled axis : W axis
Axis travel (W axis) : 150 mm
Chuck system : EROWA ITS・system3R MACRO Jr
Max. electrode weight : 5 kg
Jump speed : 40 m/min

Rib head applicable models

・EDNC65 ・EDNC85 ・EDNC106
・EDNC157 ・EDNC207

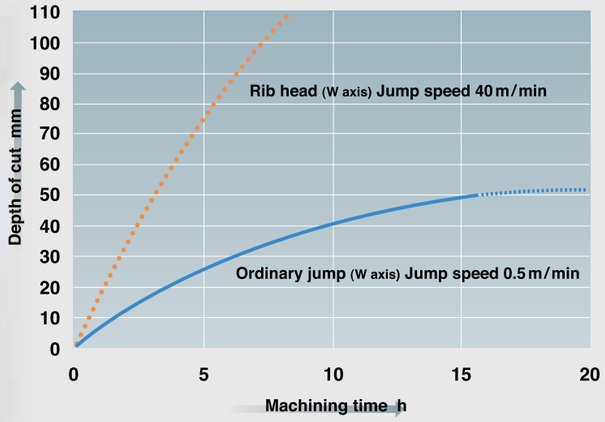


Superior side surface definition without any undercutting (rough machining)



・Rib Head machining ・Conventional jump machining

The suction effect produced in high-speed jump machining improves sludge and gas evacuation performance for markedly shorter machining times.

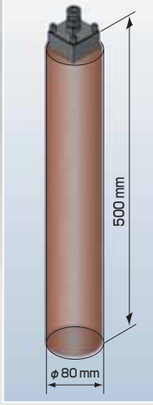


ATC variations

Max. electrode size: Outer diameter × length (including the holder) (mm)

		Chuck system	EDNC65	EDNC85	EDNC106	EDNC157	EDNC207
Pick-up type 5		EROWA ITS	φ 80 × 300	φ 80 × 300	–	–	–
		system3R MACRO	φ 80 × 300	φ 80 × 300	–	–	–
Rotating type 8,16,32	Ordinary condition	EROWA ITS	φ 80 × 280	φ 80 × 280	φ 80 × 260	φ 80 × 500	φ 80 × 500
		system3R MACRO	φ 80 × 260	φ 80 × 260	φ 80 × 240	φ 80 × 480	φ 80 × 500
	With adjacent pots on both sides empty	EROWA ITS	φ 180 × 250	φ 280 × 280	φ 280 × 260	φ 400 × 500	φ 280 × 500
		system3R MACRO	φ 180 × 230	φ 280 × 260	φ 280 × 240	φ 400 × 480	φ 280 × 500
Rotating type 48	Ordinary condition	EROWA ITS	φ 70 × 280	φ 70 × 280	–	–	–
		system3R MACRO	φ 70 × 260	φ 70 × 260	–	–	–
	With adjacent pots on both sides empty	EROWA ITS	φ 180 × 250	φ 280 × 280	–	–	–
		system3R MACRO	φ 180 × 230	φ 280 × 260	–	–	–

* With 1 empty pot on either side・ With 3 empty pots・ With 4 empty pots
* EDNC106 is not available with a 32-tool ATC.
* With the 8-tool and 32-tool ATC of the EDNC157, only one pot on either side can be empty. Accordingly, the maximum electrode size is 180 mm dia. × 500 mm for EROWA ITS and 180 mm dia. × 480 mm for system 3R.
* EDNC2015-2H has a dedicated ATC. Each side holds 10 electrodes, and the maximum electrode size is 80 mm dia. x 500 mm. When adjacent pots on either side are empty, the maximum electrode size is 280 mm dia. × 500 mm.



Maximum electrode length: 500 mm

Extended bars are sometimes used in machining the ribs of large, intricately shaped molds, such as those of automotive instrument panels. Electrodes up to 500 mm in length can be changed automatically on the EDNC157, 207 and 2015-2H machines.

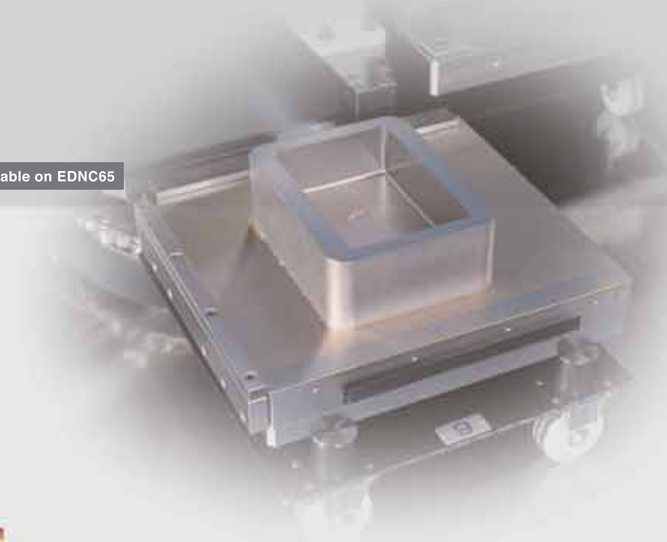
Maximum electrode weight for ATC operation: 8 kg (including the holder)

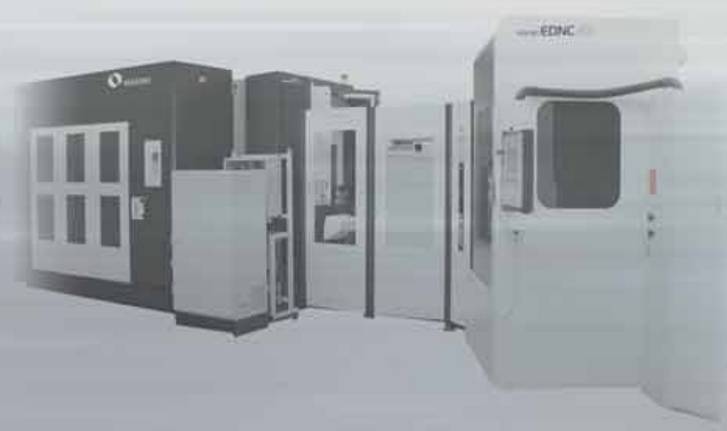
Systematization

Pallet Magazine Specification

Available on EDNC65

	EDNC65
No. of pallet	10 pallets
Pallet size area	350 × 350 mm
Maximum allowable weight (including pallets)	120 kg





Lineup of Makino's NC EDM machines designed for machining small workpieces

EDAC1

Travels	: 220 × 180 × 220 mm
Work tank inner dimensions	: 450 × 350 × 200 mm
Maximum workpiece weight	: 50 kg
Maximum electrode weight	: 5 kg

EDFH1

Travels	: 220 × 180 × 300 mm
Axis travel (W axis)	: 220 mm
Work tank inner dimensions	: 450 × 350 × 200 mm
Maximum workpiece weight	: 50 kg
Automatic change minimum electrode dia.	: φ0.08 mm

EDAF2

Travels	: 350 × 250 × 250 mm
Work tank inner dimensions	: 700 × 500 × 300 mm
Maximum workpiece weight	: 500 kg
Maximum electrode weight	: 50 kg

EDAF3

Travels	: 450 × 350 × 350 mm
Work tank inner dimensions	: 850 × 650 × 400 mm
Maximum workpiece weight	: 800 kg
Maximum electrode weight	: 75 kg

Please see the catalog of each machine for further details.

Total Support System

Data flow

Generation of electrode model & Generation of electrode machining program

Information about electrode EDM positions, shape and amount of dimension reduction (EPX format)

Generation of EDM program

EDM program

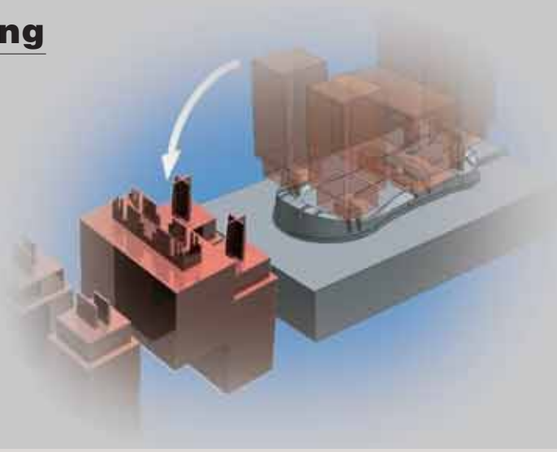
Generation of EDM schedule

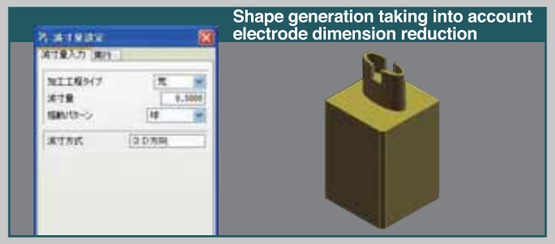
Electrode generation support tool

EZ electrode modeling

Generates electrode models from CAD data

This software for generating electrode models is installed in Makino's FF/eye 3-D CAD/CAM system. An electrode model can be generated in just one minute by simply selecting the portions of the die/mold model to be EDMed. An electrode machining program can be generated easily from the electrode model using FF/eye.
Data on electrode EDM positions, shapes and amount of dimension reduction are output in the EPX format to EDM.





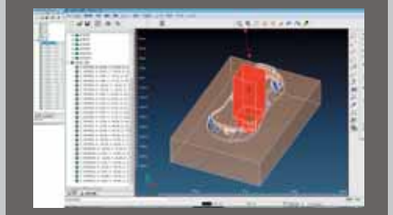
This program incorporates a variety of handy functions for setting the electrode extension, orbit motion patterns, electrode dimension reduction, reference plane used for centering and other parameters. These functions greatly simplify the troublesome tasks involved in making electrodes.

CAM System for NC EDM machine

EDcam

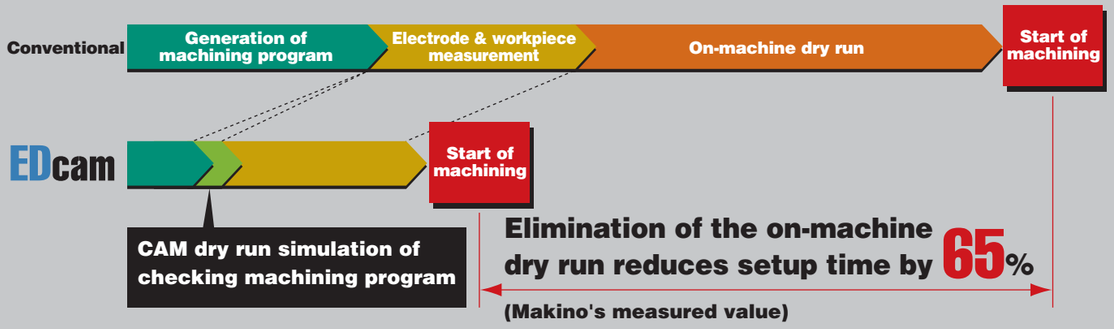
Enables electrode machining programs to be generated entirely on a PC

Operators have so far manually input the EDM positions of each electrode while looking at a work instruction sheet. Over 50% of EDM errors, however, are reportedly caused by incorrect entry of machining positions.
This means that mistakes in the final EDM process can result in large losses. EDcam imports machining position data in the EPX format and generates a machining program automatically, thereby eliminating the need for dry runs.



- **Dry run simulation**
  In addition to the generation of machining programs without manual input, the machining positions, electrodes, and other details can be checked by the dry run simulation on the PC screen.

Comparison of the setup work flow for 30 electrodes



Mold machining support tool

μCell EDM

Generates EDM schedules and facilitates off-machine setups

This system can be connected to as many as three EDM machines and one pre-setter. (Or measuring instrument) It substantially improves machine uptime by enabling one operator to supervise a cell of EDM machines and by supporting off-machine setups. Machining schedule changes are easy to make, and machining can begin even if all the electrodes are not ready yet.

*MicroboMP453etc.

- **Function for generating machining schedules**
  Machining schedules can be generated for individual workpieces and electrodes. Changes additions and deletions can easily be made to a machining schedule if rush jobs or interruptions occur while the schedule is being executed.
- **Function for managing electrodes**
  This function is used to manage the status of electrodes, offset values, the number of times electrodes have been used and other information, not only for electrodes on the machine but also for those waiting to be set up.

- **Function for managing workpieces**
  This function manages the offset values of workpieces and machining programs and the electrode to be used.
- **Monitoring function**
  This function enables the operator to know at a glance the progress of a machining schedule and the status of electrodes and workpieces waiting to be machined.

Environment and Construction Work for Machine Installation

1. Provision of compressed air supply

・With the EDNC85 standard specification (standard head) machines:
no compressed air supply is needed.
With the HQSF specification and EDNC65 standard specification:
0.6 MPa, 100 L/min (equivalent to a 0.75 kW compressor)
・With the ATC, MA/MR head and pallet magazine specification:
0.6 MPa, 200 L/min (equivalent to a 1.5 kW compressor)
Connection port: 8 mm dia. high coupler (standard equipment)

2. Factory environment

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

3. Factory air-conditioning equipment

Recommended ambient temperature: 20±1˚C

	EDNC65(S)	EDNC85(S)	EDNC106(S)
Heat release rate (kW)	5.9(7.4)	6.5(8.0)	7.7(9.2)
(kcal/h)	5074(6364)	5590(6880)	6622(7912)

	EDNC157(S)	EDNC207(S)	EDNC2015-2H
Heat release rate (kW)	13(15)	14(14)	26
(kcal/h)	11180(12900)	12040(12040)	22360

Operating temperature range: 10～35˚C
Relative humidity: 75% maximum (with no condensation)
The heat release rate varies depending on the power supply unit used.

4. Measures against electromagnetic interference

It is recommended that EDM machines be installed in a shielded room.
In addition, use of the power supply line filter (optional equipment) is recommended in cases where electromagnetic noise from the power supply line might affect the operation of other equipment.

5. Electrical work

	EDNC65(S)	EDNC85(S)	EDNC106(S)	EDNC157(S)	EDNC207(S)	EDNC2015-2H
Power supply specification	AC200 V ±10% 50Hz/60 Hz ±2%					
Main power consumption (kVA)	10(12.5)	11(13.5)	12(14.5)	10(10)	10(10)	13(右・左)
Power consumption of dielectric fluid supply unit (kVA)	–	–	–	12(12)	14(14)	14
Breaker capacity (A)	50(75)	50(75)	75	50／75	50／75	75(右・左)/75
Circuit breaker/	Inverter circuit: 50 mA current sensitivity (when not installed in a shielded room)					
Power line size (mm^2)	14					
Recommended grounding	C grounding using 14 mm^2 ground wire (ground resistance of 10 Ω maximum)					

For the EDNC106 and higher models, the power supply unit of the dielectric fluid
• Supply unit is separate from the main power supply unit.
• For the EDNC2015, the electrical work details differ depending on the specification selected. Please contact Makino for detailed information.

6. Fire Service Law and fire prevention ordinances

The installation of EDM machines is subject to the provisions of the Fire Service Law and fire prevention ordinances. When handling Type 4 No. 3 oils (having a flash point from 70˚C to less than 200˚C) such as dielectric fluid, coolant and the like in the same place, the following procedures should be completed at the competent fire station depending on the total quantity of such materials being handled.
1. When the quantity of hazardous materials exceeds 2,000 L
・It is necessary to apply for the requisite permit for the general handling of hazardous materials at the factory.
・Under the fire prevention ordinances, it is necessary to report equipment that involves the use of flame.
2. When the quantity of hazardous materials is from 400 to 2,000 L
It is necessary to report the storage and handling of small quantities of hazardous materials at the factory.
・Under the fire prevention ordinances, it is necessary to report equipment that involves the use of flame.
3. When the quantity of hazardous materials is less that 400 L
・Under the fire prevention ordinances, it is necessary to report equipment that involves the use of flame.

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MAKINO

EDNC2015-2H/EDNC2015S-2H

EDNC207/EDNC207S

EDNC157 / EDNC157S

EDNC106/EDNC106S

EDNC85/EDNC85S

EDNC65/EDNC65S

EDNC series

Machine Specifications

	EDNC65 / EDNC65S	EDNC85 / EDNC85S	EDNC106 / EDNC106S	EDNC157 / EDNC157S	EDNC207 / EDNC207S	EDNC2015-2H / EDNC2015S-2H
Axis travel X × Y × Z mm	650 × 450 × 350	800 × 500 × 400	1000 × 600 × 500	1500 × 700 × 500	2000 × 700 × 600	2000 × 1500 × 600
Work tank inner dimensions (W × D × H) mm	1100 × 750 × 450	1400 × 900 × 500	1500 × 1100 × 500	2500 × 1400 × 800	2800 × 1600 × 1050	3100 × 1800 × 1000
Maximum fluid height mm	400	450	←	750	1000	950
Table size (W × D) mm	800 × 550	1100 × 700	1300 × 950	2000 × 1000	2500 × 1200	2500 × 1450
Rapid traverse mm/min	5000	←	←	←	3000	←
Work tank opening	Slides vertically automatically	←	←	←	Front panel slides vertically automatically	←
Maximum electrode weight kg	100	300	←	500	750	Right head:300 Left head:300
Maximum workpiece weight kg	1500	3000	←	10000	←	←
Lowest point of Z-axis						
Standard head (distance from electrode mounting surface to table) mm	350	←	400	650	750	←
MA/MR head specifications mm	<EROWA>280	←	<EROWA>330	<EROWA>580	<EROWA>830	<EROWA>680
(distance from chuck bottom to table)	<system3R>262.5	←	<system3R>312.5	<system3R>562.5	<system3R>812.5	<system3R>662.5
Table height mm	890	1030	1200	1480	1320	1300
Table T-slots (width × number) mm × psc	14 × 4	18 × 5	18 × 7	18 × 5	←	18 × 7
Machine dimensions (W × D × H) mm	2450 × 2605 × 2730	2500 × 2860 × 2900	2200 × 3160 × 3530	3455 × 3610 × 4150	3800 × 4130 × 4510	6280 × 3800 × 4750
Machine weight (including power supply case) kg	6400	9200	12000	25000	←	40000

*The values differ depending on the specification. Please contact your Makino sales representative for further details.

Dielectric Fluid Supply Unit

Type		Integrated with machine	←	Stand-alone	←	←	←
Dielectric fluid volume	L	800	1200	1500	4500	6000	←
Filtration system	Type	External pressure-type paper filter	←	←	←	←	←
	No. of filter elements	6/3	6/6	←	9/9	12/12	←
No. of dielectric fluid ports	Suction	1	←	←	←	2	5
	Flushing	1	2	←	1	4	5

NC Power Supply Unit Specification

Maximum machining current	30A
Voltage settings	8 levels
Current settings	90 levels
Power supply stabilizing circuit	(built-in circuit)
Cooling system	Forced air cooling
Construction of case	Completely hermetically sealed

Standard Specifications

- MGH NC power supply unit (30A)
- Dielectric fluid cooling unit
- Automatic fire extinguisher
- Potable control panel
- Automatic power shutoff
- Set of centering/measuring probes
- Ethernet 10/100 BASE-TX
- USB Flash Memory supported

Optional Specifications ● / Optional Equipment ■

- ● ATC
- ● MA head
- ● MR head
- ● Rib head
- ● Scale feedback system
  (EDNC85 and lower models only)
- ● HQSF function
  (Facilitates retrofitting of HQSF)
- ● SL Unit
  - SL Type 1: Large-capacity suction unit
  - SL Type 2: Large-capacity suction unit with magnetic sludge separator

  Please select the SL Type 1 with EDNC-Series machines because they come with a standard magnetic sludge separator.
- ● Transor filter system

- ■ Air booster
- ■ Flame sensor
- ■ Vibration sensitive device
- ■ Circuit breaker
- ■ Power line filter
- ■ 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 blow ports)

- ■ Flushing unit
- ■ Flushing nozzle set
- ■ Flushing and suction unit with hose
- ■ Clamp set
- ■ Tool set
- ■ Power supply specification (60A, 120A and 240A)
- ■ Titanium booster
  (requires 120A power supply)
- ■ RS232C interface
- ■ EPX (Electrode position executor)

EDNC series

EDNC65/EDNC65S

EDNC85/EDNC85S

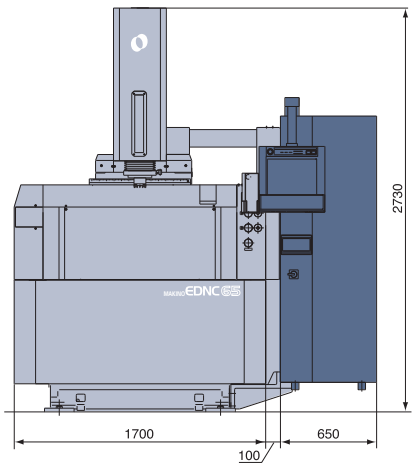
EDNC106/EDNC106S

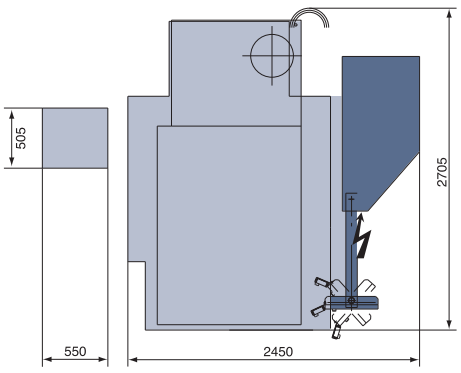
EDNC157 / EDNC157S

EDNC207/EDNC207S

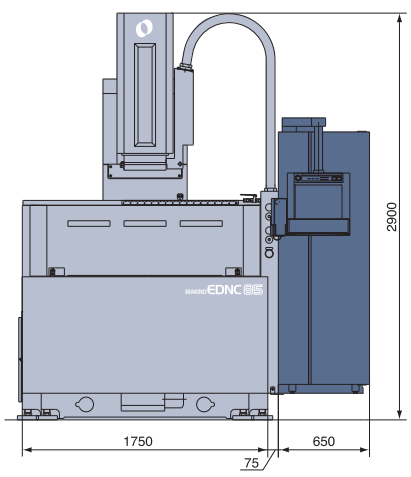
EDNC2015-2H/EDNC2015S-2H

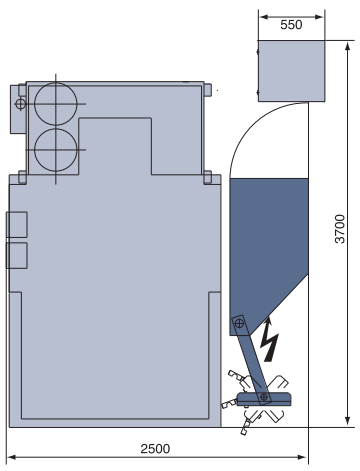
EDNC65/EDNC65S



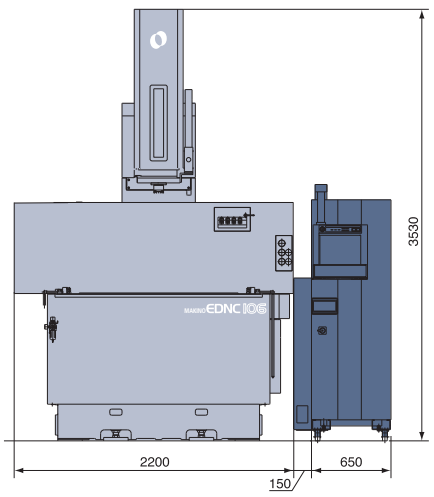


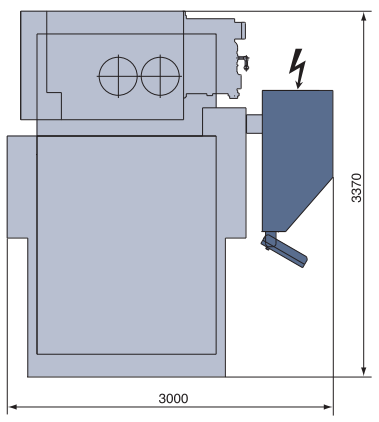
EDNC85/EDNC85S



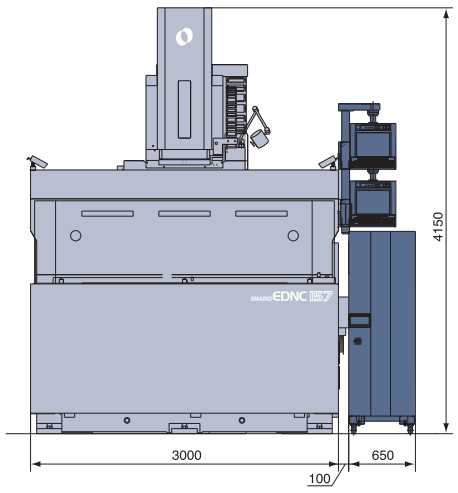


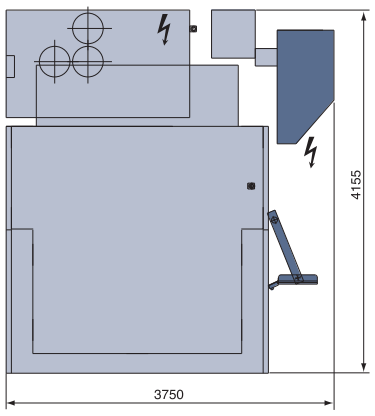
EDNC106/EDNC106S



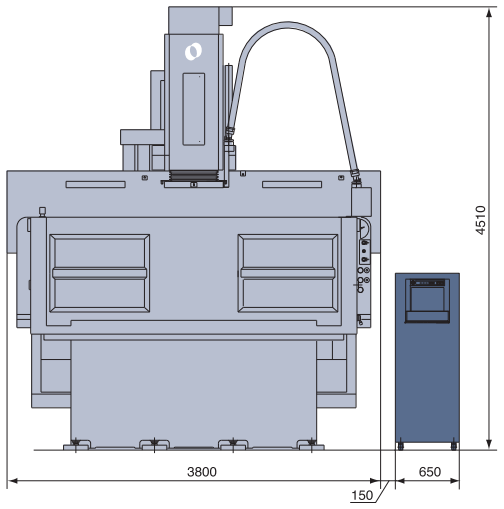


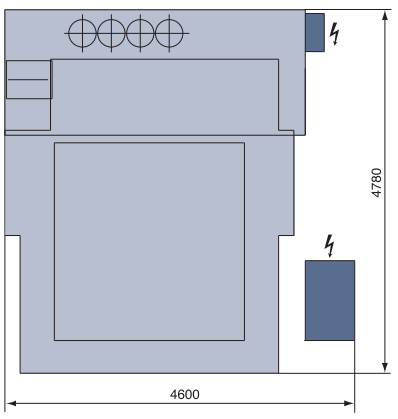
EDNC157 / EDNC157S



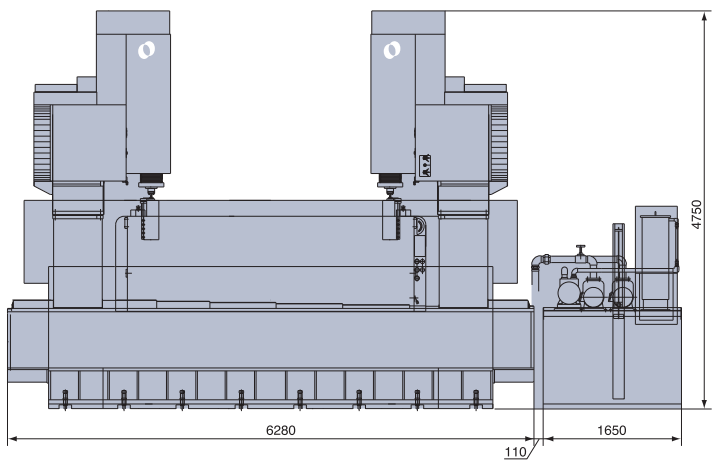


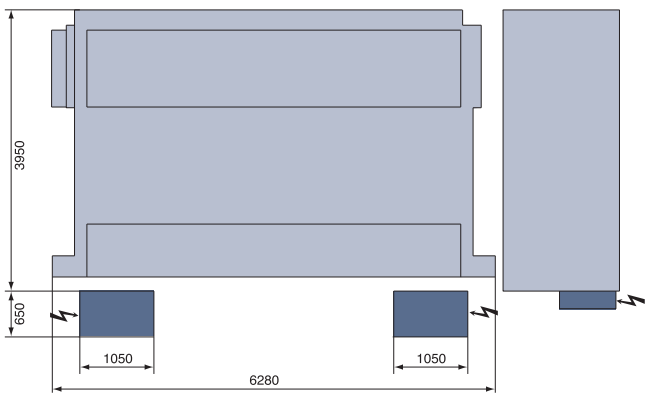
EDNC207/EDNC207S





EDNC2015-2H/EDNC2015S-2H





*The values differ depending on the specification. Please contact your Makino sales representative for further details.