

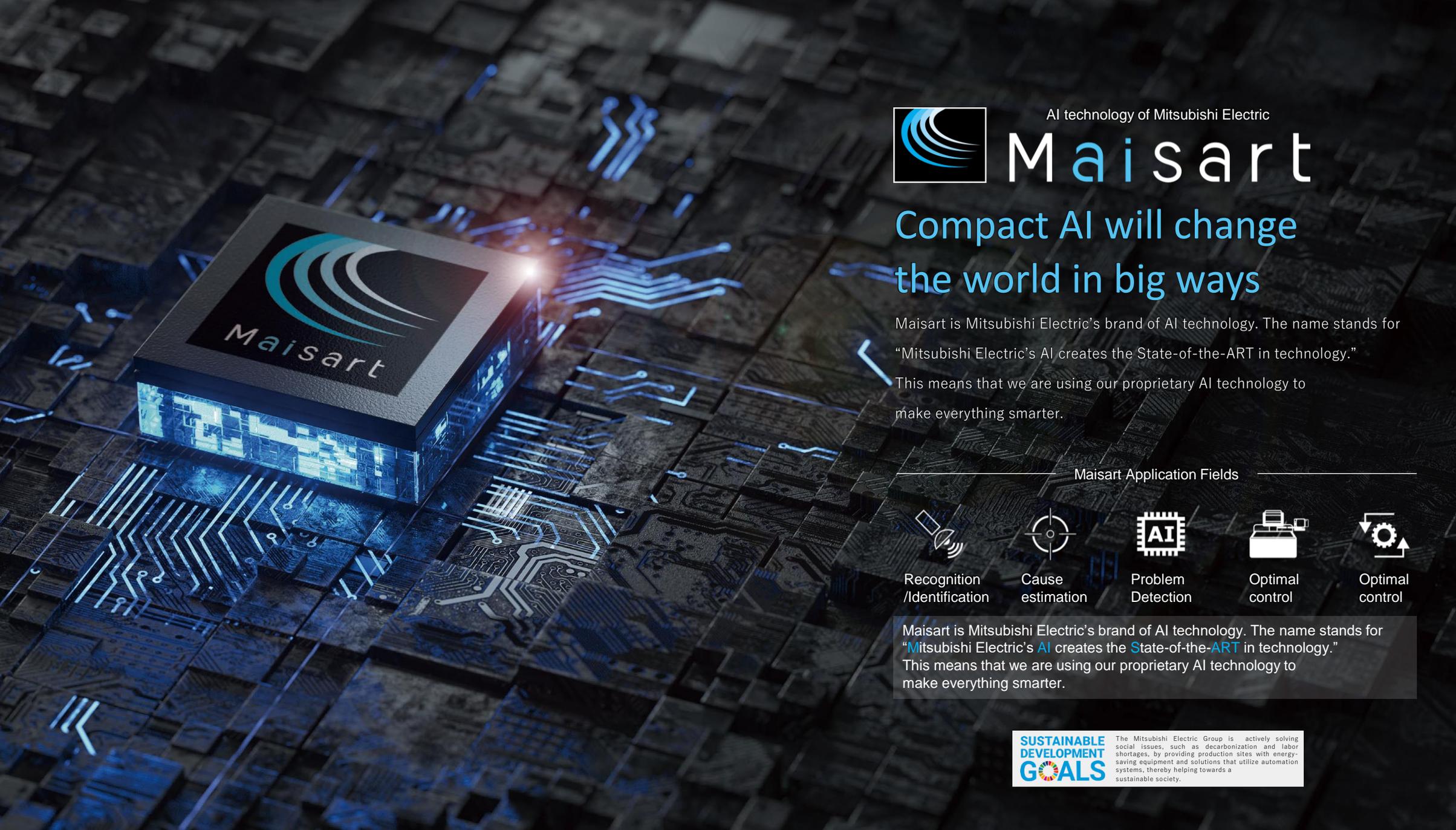
# 三菱電機放電加工機

Mitsubishi Electric EDM



AI technology of Mitsubishi Electric

# Maisart



AI technology of Mitsubishi Electric

# Maisart

## Compact AI will change the world in big ways

Maisart is Mitsubishi Electric's brand of AI technology. The name stands for "Mitsubishi Electric's AI creates the State-of-the-ART in technology."

This means that we are using our proprietary AI technology to make everything smarter.

### Maisart Application Fields



Recognition /Identification



Cause estimation



Problem Detection



Optimal control



Optimal control

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The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

# Next-generation Mitsubishi Electric's EDMs utilizing "Maisart"

## Wire-cut EDM Systems



MPseries

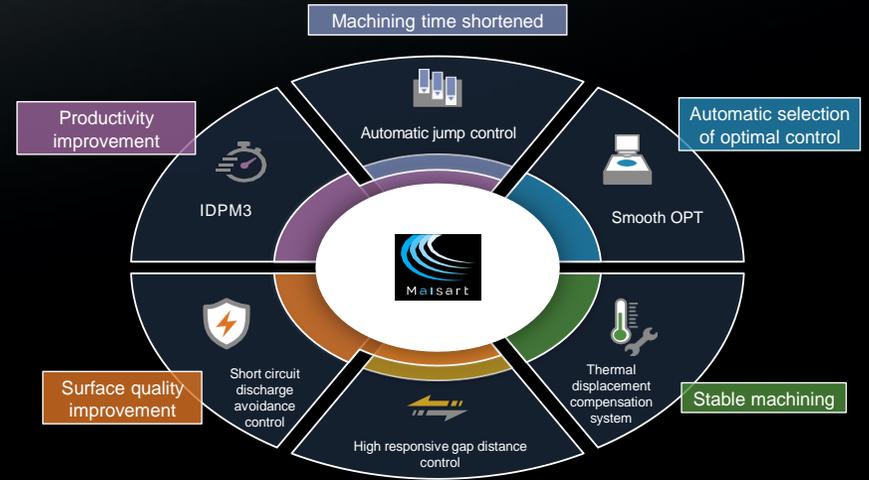
MVseries

## Die-sinker EDM Systems



SGseries

SV-P series



## Maisart for Die-sinker EDM

<b>IDPM3</b>	Improved stability in graphite electrode machining
High-speed and low-wear machining with graphite electrode is realized.	
<b>Automatic jump control</b>	Machining time shortened by optimizing jump motion
Jump motion is optimized according to changing machining conditions. Machining stability is improved, and high-speed machining is realized.	
<b>Adaptive control of machining volume change</b>	Improved stability in machining with large changes in machining amount
Stable machining is realized by preventing the reduction in machining speed due to changes in the amount of machining.	
<b>Thermal displacement compensation system</b>	Minimum effect of temperature changes on dimension accuracy
Effect of temperature changes on dimension accuracy is controlled and high-accuracy machining is realized even in wide stroke and long-time machining.	
<b>High responsive gap distance control</b>	Machining accuracy and surface quality improved by high-speed and high-accuracy axis control
High-quality and high-accuracy machining is realized by preventing short-circuits with high-speed and high-accuracy axis control.	
<b>Short circuit discharge avoidance control</b>	Improved surface quality by controlling machining energy
High-quality machining is realized by controlling the electrical discharge that adversely affects the machining surface.	

## Maisart for Wire-cut EDM

### Nozzle away control Improved stability of nozzle away machining

Stable and high-accuracy machining is realized without burdensome adjustment of machining conditions even in a stepped workpiece or nozzle away.

### Corner control Realized high-accuracy shape machining with water specifications

As for machining that roughness is more than 1.6μm and shape accuracy is ±5μm, corner control adjustment is not required even in complicated shapes.

# Nozzle Away Control

Improved stability of nozzle away machining



MX	MV-S	ADVANCE or earlier
MV-R	MV-R PLUS2	
MP	MP PLUS2	MP PLUS3

■ : Standard ■ : Option (Can be retrofitted) ■ : N/A

Thickness is detected in real time by Maisart even if thickness and nozzle distance change. Stable machining is possible by controlling the amount of machining to be optimal.

## Issues at production sites

Machining conditions are required to be set for each state.

- ▶ Machining conditions are required to be set according to amount of counterbore and thickness, and it takes time and effort to set conditions and edit programs.
- ▶ Streaks along the wire direction are generated on a stepped workpiece, and a long time polishing process is required to eliminate streaks.

## Advantages of introduction

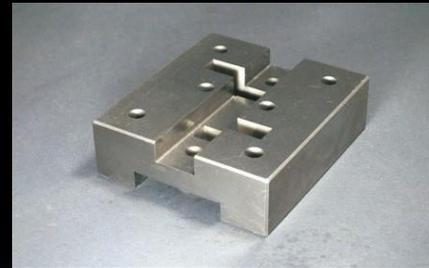
High-accuracy stepped/nozzle away machining are realized easily.

- ▶ Machining which thickness/nozzle distance and machining form are different is possible using only one machining condition without know-how.

→ **Shorter search time for conditions and trial machining time**

- ▶ Streaks on a part where thickness changes are reduced.

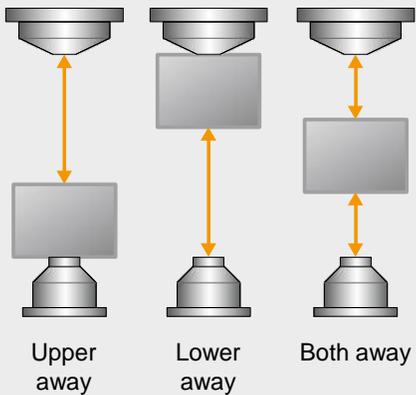
→ **Shorter polishing time**



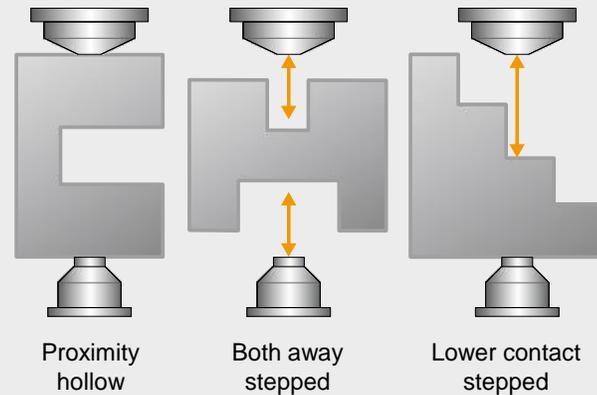
Model	MP1200
Workpiece	Steel (SKD11)
Thickness	10 to 30mm
Electrode	Φ0.2 BS
Roughness	Rz1.6μm/Ra0.20μm
Accuracy	Shape ±2μm

## Machining form

Nozzle away form



Stepped form

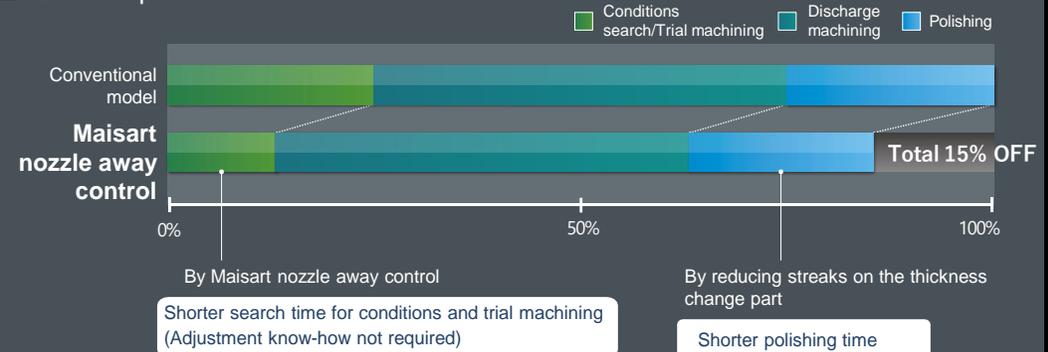


Any operator can perform high-accuracy machining without searching for machining conditions for each state and trial machining.

## Productivity improved by Maisart nozzle away control

Machining is possible using only one machining condition regardless of thickness or nozzle distance.

### Time comparison



# Corner Control

Easy high-accuracy machining with water specifications

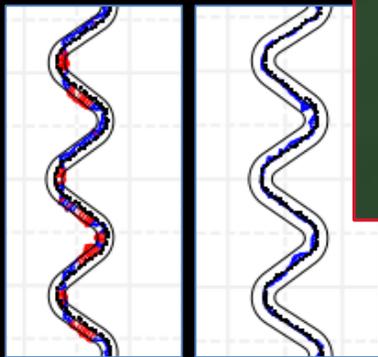
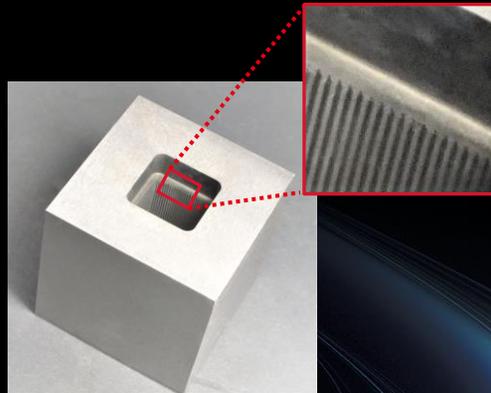


MPseries

MX	MV-S	ADVANCE or earlier
MV-R	MV-R PLUS2	
MP	MP PLUS2	MP PLUS3

■ : Standard ■ : Option (Can be retrofitted) ■ : N/A

"Small corners smaller than the wire diameter" and for "continuous corners optimal control parameters created by Maisart control improve corner shape accuracy.



With Maisart corner control



Workpiece	Steel
Thickness	50mm
Electrode	Φ0.2 BS
Number of cuts	9 times
Roughness	Rz1.6μm/Ra0.2μm
Accuracy	±2μm or less

High accuracy and high productivity by combining high speed with water specifications machine and stability with oil specifications machine

## Issues at production sites

As for high-accuracy machining, productivity is low.

- ▶ When using the water specifications machine, it is difficult to adjust the machining conditions for corners smaller than the wire diameter or for complex shapes with continuous corners.
- ▶ Machining accuracy is stable when using the machine with oil specifications machine. While on the other hand, the machining time is long

## Advantages of introduction

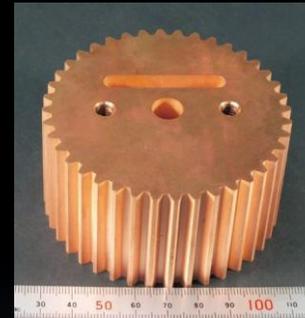
Easy high-accuracy machining even with water specifications machine

- ▶ As for machining that machining accuracy is 5μm or less and roughness is more than 1.6μm, it is not required to adjust the machining conditions even in complex shapes. Stable machining is possible using standard machining conditions.

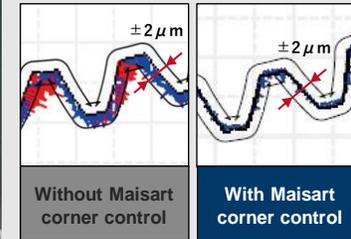
→ Trial machining time not required

- ▶ Productivity is improved with water specifications machine

→ Shorter machining time



Sample

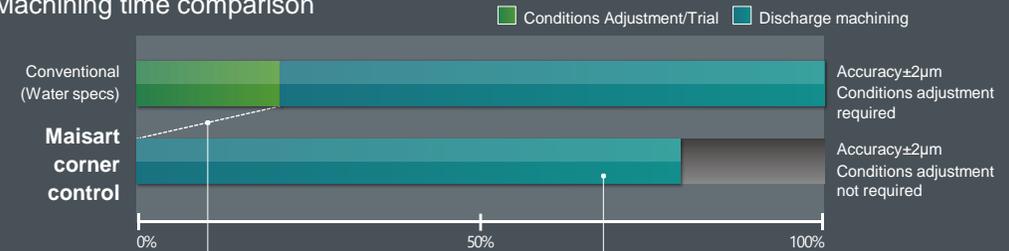


Workpiece	Copper
Thickness	40mm
Electrode	Φ0.2 BS
Number of cuts	6 times
Roughness	Rz2.4μm/Ra0.3μm
Accuracy	±3μm or less

## Productivity improved by Maisart corner control

High-accuracy machining with less corner dropping is possible without adjusting the conditions even for continuous corners.

### ■ Machining time comparison



By Maisart corner control  
Machining condition adjustment time shortened  
Machining accuracy improved

By Maisart corner control  
Accuracy equivalent to oil specifications

# Maisart Die-sinker EDM High-quality Machining Control

## Highly uniform surface quality and reduced polishing time

Variations in roughness and pinholes on the machining surface are controlled by Maisart (High responsive gap distance control, Short circuit discharge avoidance control). This control contributes to the surface quality improvement, and shortens the polishing time in post-processes.

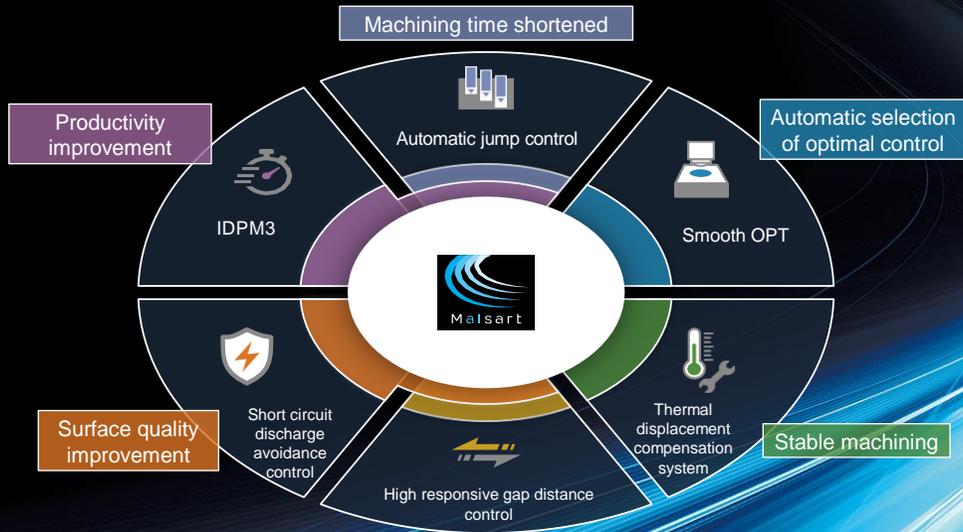
SV8P	SV12P	ADVANCE or earlier
SG8	SG12	SG28

■ : Standard ■ : Option (Can be retrofitted) ■ : N/A



SG series

SV-P series



Polishing process time after electrical discharge machining can be reduced, and the production time is shortened by up to 30%.

### Issues at production sites

Surface is uneven and polishing process takes a long time.

- ▶ Roughness of the machining surface is not uniform, and pinholes are generated.
- ▶ Polishing process after electrical discharge machining takes a long time in order to make roughness uniform and remove pinholes.

### Advantages of introduction

Reduced polishing process time.

- ▶ New machining surface quality conditions "high-quality matte" are added. Variations in roughness and pinholes on machining surface are controlled.

→ **Shorter polishing time**

- ▶ Polishing time after electrical discharge machining is shortened by controlling variations in roughness and pinholes.

→ **Shorter polishing time**

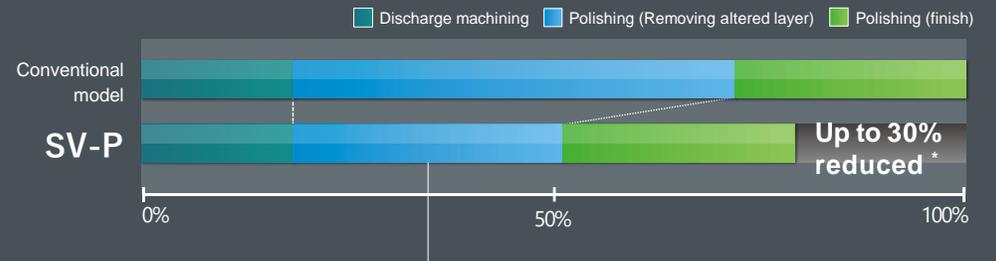


Model	SG28
Workpiece	Steel (SKD61)
Electrode	Graphite (TTK5&9)
Depth	50mm
Roughness	Rz6~7μm (Side, Bottom)

### Productivity improved by shortening polishing time

Polishing time is shortened significantly by controlling variations in roughness and pinholes.

#### Production time comparison



Polishing time to make the machining surface uniform is shortened by eliminating variations in roughness of the machining surface.

\*It may not be possible to reduce polishing time depending on the specifications (mold releasability, surface quality, accuracy) required for plastic molding.

# Maisart Die-sinker EDM

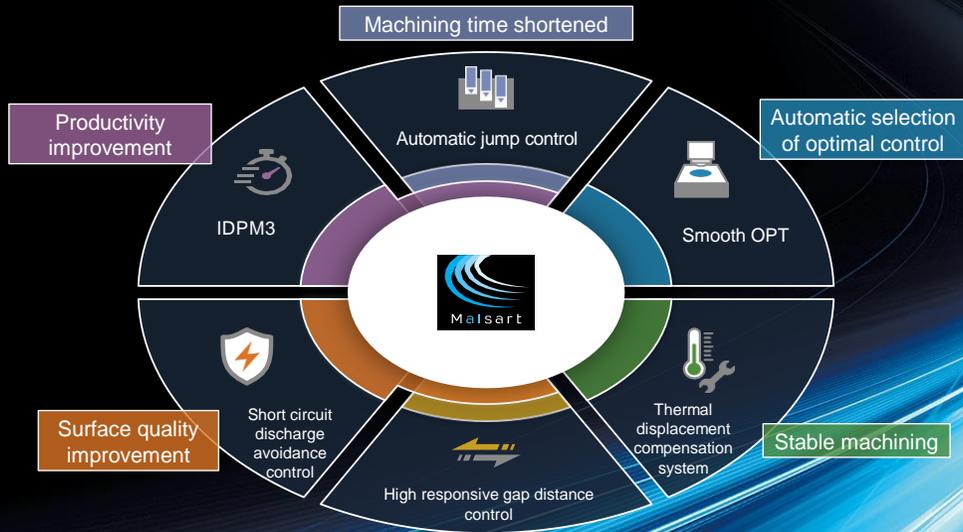
## High-speed and Low-wear Control

### Improved productivity by improving the machining performance with graphite electrodes

Realizes high-speed and low-wear machining when using graphite electrodes by Maisart (IDPM3, automatic jump control). Shortening the machining time and reducing wear in electrode contributes to improving the productivity.

SV8P	SV12P	ADVANCE or earlier
SG8	SG12	SG28

■ : Standard ■ : Option (Can be retrofitted) ■ : N/A



**Reduces time not only for the EDM process but also for pre- and post-processes too.**

### Issues at production sites

Know-how is needed to obtain stable machining.

- Wear in electrode is increased when machining with graphite electrode because the machining performance becomes unstable, and more machining time is required.
- Surface remaining in deep machining such as rib machining occurs, and polishing process takes time.

### Advantages of introduction

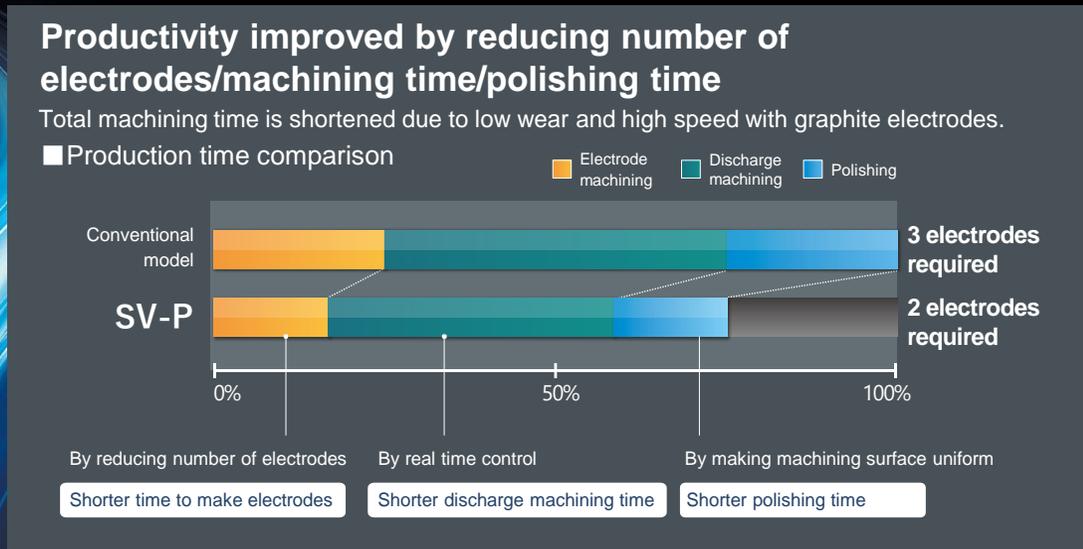
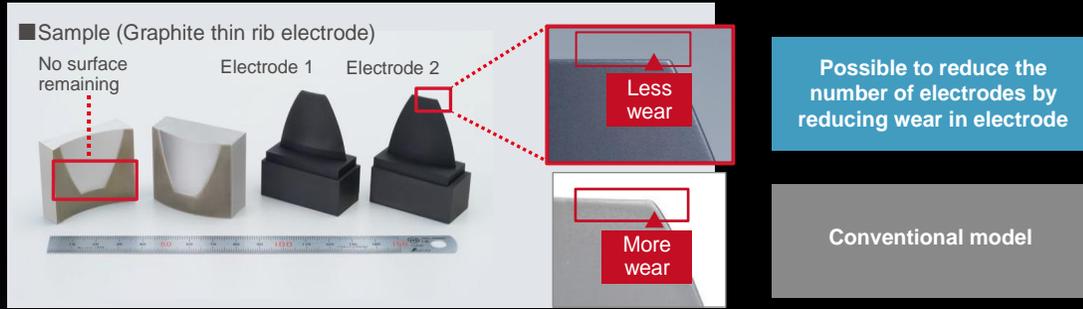
Realized stable machining performance without know-how.

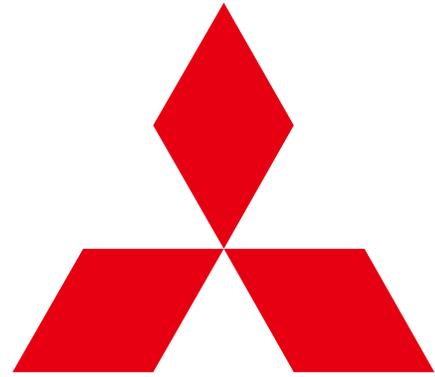
- Low-wear, high-speed and stable machining without know-how is realized by Real-time machining conditions control according to the machining state.

→ **Shorter machining time**

→ Even in deep machining shapes, uniform machining to the tip is possible and the amount of polishing is reduced.

→ **Shorter polishing time**





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ELECTRIC**

*Changes for the Better*