

**AL** SERIES

# AL40G AL60G

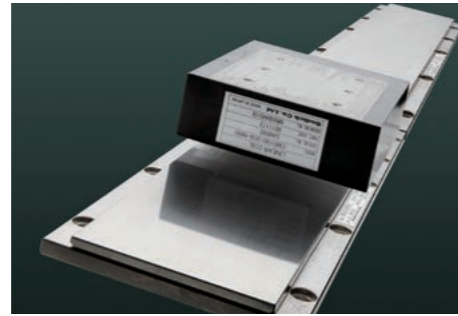
Linear Motor Drive  
High-speed & High Precision Die-Sinker EDM



# 5 Core Technology

## Die-sinker EDM for Precision Mold and Precision Parts Machining

### 5 Core Technologies



Sodick continually invests in research and development to provide useful products for customers.

We develop and manufacture in-house the best electric discharge machines by combining five core technologies: linear motors, motion controllers, power supply devices, discharge devices and ceramics.

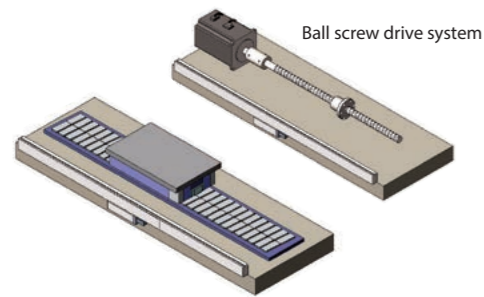
Our new products AL40G and AL60G are a new generation of precision die-sinker EDM that is a fusion of the linear motor control technology accumulated over 20 years, the latest discharge control technology, and artificial intelligence (AI).



### Linear Motor Drive System

#### Features of linear motors

Among the many features of our linear motors, the biggest are high speed and high response. These are achieved because of no abrasion during movement and no need to have ball screws. Conventional drive systems use ball screws to convert rotary motion into linear motion. With this method, however, mechanical conversion errors adversely affect the tracking performance of the high-speed servo. Thanks to linear movement, there are no conversion errors from rotary motion in linear motors, and direct drive achieves accurate positioning and quiet, high-speed operation.



Ball screw drive system

Linear motor drive system

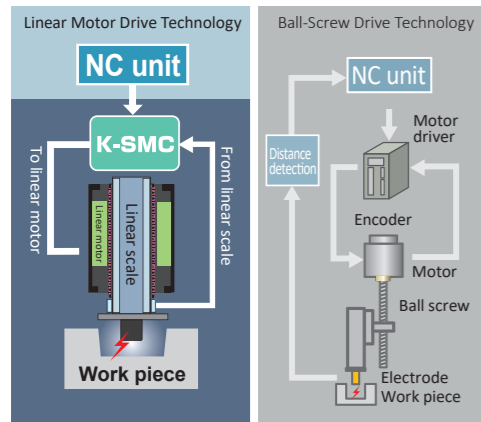
#### High performance linear motors developed and manufactured by Sodick

A high-thrust linear motor developed and manufactured in-house allows stop, acceleration, constant speed, deceleration and stop operations at high speed and with high response. Also, backlash is eliminated, which is impossible with conventional ball screw drive systems, and accurate axis movement is maintained semipermanently.

### Sodick Motion Controller (K-SMC)

Linear motors have an ideal direct drive mechanism. With excellent high-speed movement and positioning accuracy, because there is no mechanical contact, high responsiveness and long-term stability, maintainability, and reliability are maintained. The performance of the linear motor used in this drive system is maximized by combining the motor with the K-SMC motion controller that Sodick has refined over many years.

Since the new AL series of die-sinker EDM does not use ball screws, direct position detection with no axis movement error is possible. Unlike conventional methods, in which the state of the detected discharge gap is monitored by the NC unit and controlled through a motor driver, the Sodick motion controller directly monitors and controls the linear motor. Therefore, real-time control without delay upon gap detection has been realized. This achieves high response and precise control.



Tech 1

1

Tech 3&4

3&4

Tech 2

2

Tech 5

5

### Equipped with the New Numerical Control Unit SP Power Supply + New Stable Electrical Discharge System Arc-less 4

The numerical control unit SP power supply is an ideal power supply device that supports a variety of machining and operations. By adopting the latest M4-LINK CNC board, the communication speed and processing speed have been improved, and the motor control response speed has been more than doubled.

Equipped with the latest Arc-less 4 stable electrical discharge system, the performance of the die-sinker EDM has been dramatically improved, with higher speed, suppression of electrode wear to the utmost limit, and realization of a wide variety of machining surface finishes, from satin finish to mirror surface.



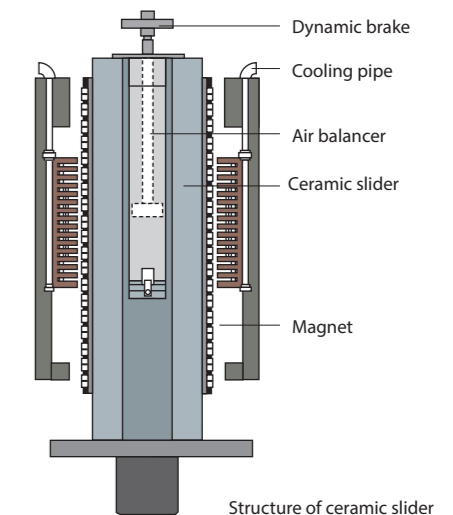
### Ceramic Parts

An in-house manufactured lightweight ceramic slider with high rigidity and low thermal displacement is adopted for the main spindle linear motor slide part. By mounting linear motors on the left and right sides of the slide part in a well-balanced manner, and offsetting the magnetic attraction force, shifting and warpage of the slide part is prevented, achieving high straightness and smooth driving.

Through high straightness and smooth driving realized by synergy with a high-speed and high-response linear motor, high-speed and stable deep rib machining has been achieved. In addition, the high-speed jump effectively discharges the machining tips, reducing abnormal arcs and machining shape defects attributed to secondary discharge, and greatly reducing machining time.

#### Advantages of ceramics

- Because of its light specific gravity, if it is used for moving parts such as a table, light weight can be achieved and eventually the load on the motor can be reduced.
- Because of its small linear expansion coefficient, thermal displacement in response to environmental temperature changes is suppressed.
- With its excellent insulation properties, fine discharge energy during finishing work can be transmitted accurately between electrodes.



Structure of ceramic slider



## High-rigidity Structure & Excellent Workability

In addition to realizing high-rigidity machine structure by an optimal design created using the latest CAE analysis technology, we pursued improving operator workability as well.

Since the three-sided automatic vertical machining tank moves up and down in conjunction with the machining fluid level, the workpiece being machined is highly visible. Because of the openness when the machining tank is lowered, the workpiece status can be checked from left and right, making preparation easy for complicated jobs.

The fluid level adjustment knob, jet suction adjustment knob, and the jet and suction pressure gauge are all arranged on the front side of the machining tank, enabling efficient setup work.

## Total Temperature Control TH COM

Through sensing, the temperature of each component of the machine is precisely corrected and the Thermal Commit (TH COM) function, which provides various diagnostic functions, minimizes thermal displacement due to temperature changes in the installation environment and during high-speed driving.



## LN Pro AI

Our new products AL40G and AL60G have a large 19-inch touch panel with excellent operability. Furthermore, the LN Professional AI (LN Pro AI) condition advisor, which continually provides optimum machining conditions through artificial intelligence (AI) is standard equipment, and it is possible for beginners to experienced users to take maximum advantage of the machining performance of the AL40G and AL60G. Simple four-step operation (shape selection, machining plan, detailed conditions, position setting) allows the best performance, depending on the purpose.



## Equipped with all the Latest Machining Circuits as Standard TMM4, TPC4, BSN4

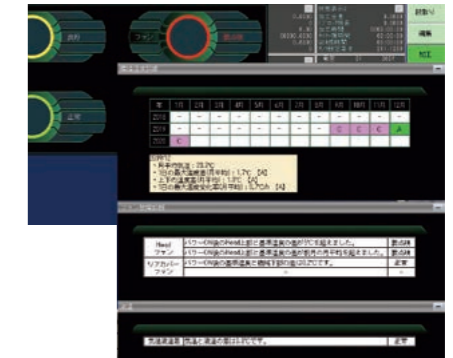
New controls and circuits have been prepared to improve the quality and speed of all discharge machining areas. Those improvements include high speed in rough machining using short-pulse high-peak current (TMM4 circuit), high speed in the intermediate finishing area by improving fitness to narrow gaps (TPC4 control), and uniform and high speed discharge in the finishing area by accurate pulse control (BSN4 circuit).

# Sodick-**IoT**

## AIM (AI Maintenance)

**Supports productivity improvement through analysis, investigation and monitoring**

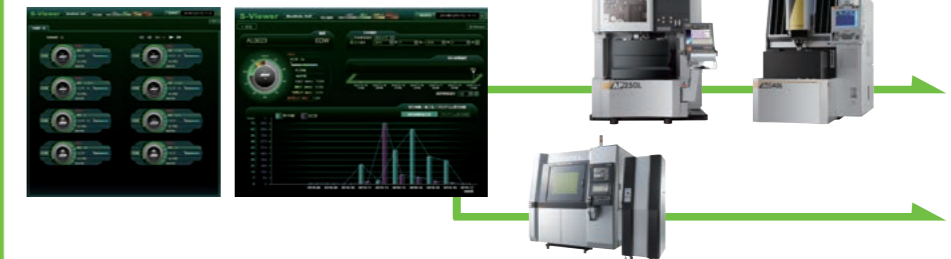
AI Maintenance (AIM) monitors and automatically diagnoses each status of the machine, including the operation status, maintenance status, and machine installation environment. This boosts the machine's operation rate, reduces machining defect rates and improves traceability.



## S-Viewer

This software inspects each NC unit at a fixed interval to collect data.

The operating condition of the registered NC unit can be centrally managed to improve the machine operation rate.



## SEIKAnet

Sodick's network system uses standard network protocols.

NC programs can be transferred between the machine and a PC, or between machines.

## LQ e-mail

Efficient process monitoring is supported, by transferring error and stop information by e-mail, and by checking the operating conditions from a remote location.

## Automation System (Option)

We propose a complete automation system (automatic workpiece/electrode exchange system) that uses articulated robots, etc. By taking full advantage of a machining tank incorporating a three-sided vertical mechanism that takes an automation system into consideration, a system tailored to customer needs can be developed.



# AL40G AL60G

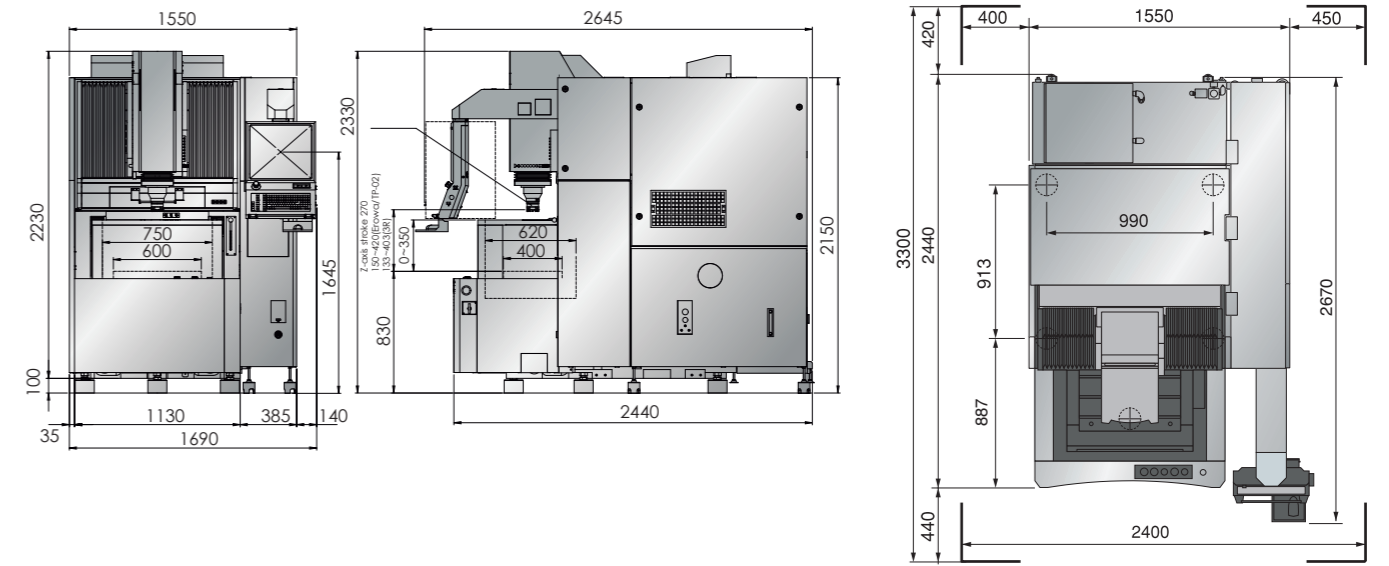
Machine Tool		AL40G		AL60G			
Work Table Size (W x D)		600 x 400 mm (Ceramic)		750 x 550 mm (Ceramic)			
Work Tank Inner Dimensions (W x D x H)		750 x 620 x 350mm		950 x 740 x 450mm			
Work Tank Fluid Level (Min to Max)		100 to 300 mm		150 to 400 mm			
Work Tank Capacity		190 Liters		330 Liters			
X Axis Travel		400 mm		600 mm			
Y Axis Travel		300 mm		420 mm			
Z Axis Travel		270 mm		370 mm			
Clamping Chuck	Automatic	EROWA	COMBI	ER-020025	EROWA	COMBI	ER-020025
		EROWA	ITS	ER-007521	EROWA	ITS	ER-007521
		3R	COMBI	3R-460.86-2	3R	COMBI	3R-460.86-2
		3R	MACRO	3R-600.86	3R	MACRO	3R-600.86
		TP-02			TP-02		
Max Weight of Electrode		50 kg		50 kg			
Max Workpiece Weight		550 kg		1500 kg			
Distance Between Electrode and Table Top		150 to 420 mm <sup>*1</sup>		200 to 570 mm <sup>*1</sup>			
Distance from Floor to Table Top		830 mm		850 mm			
Machine Tool Dimensions (W x D x H)		1550 x 2440 x 2330 mm		1740 x 2785 x 2570 mm			
		(Includes a Power Supply and Dielectric Tank)		(Includes a Power Supply and Dielectric Tank)			
Machine Tool Weight		4000 kg (Includes a Power Supply and Dielectric Tank)		5150 kg (Includes a Power Supply and Dielectric Tank)			
Air Pressure		0.65 MPa <sup>*2</sup>		0.65 MPa <sup>*2</sup>			
Air Flow		100NL/min		100NL/min			
Total Power Input		3-phase, 50/60 Hz, 10 kVA		3-phase, 50/60 Hz, 10 kVA			

\*1 EROWA/TP specification \*2 If required air pressure is not met, Pressure Booster (Option) must be installed.

Dielectric Tank		AL40G		AL60G	
Dielectric Fluid		EDM Oil		EDM Oil	
Dielectric Tank Capacity		285 Liters		465 Liters	
Required Amount		330 Liters		560 Liters	
Filtration		Replaceable Paper Filters		Replaceable Paper Filters	

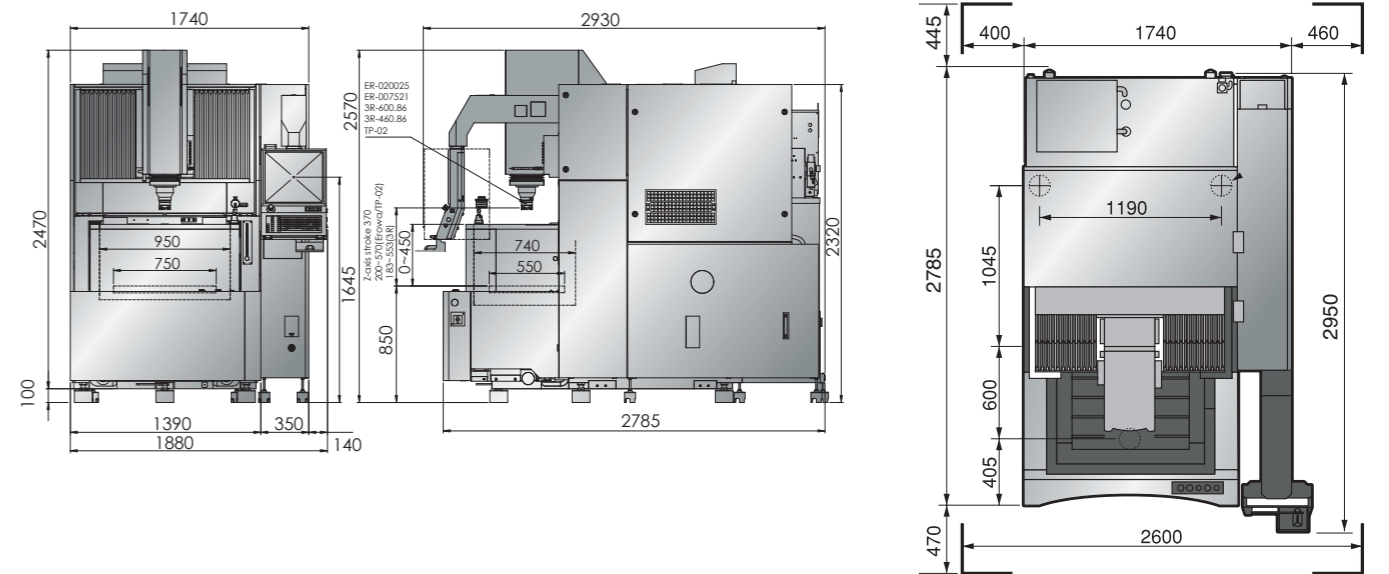
CNC Power Supply SP/SP-E	
Max. Machining Current	40A
Discharging Power Supply Unit	Optimum Pulse Control [Arc-less 4, TMM 4, TPC 4, BSN 4, SVC]
Power Requirement	AC200V, 50/60 Hz
NC Unit	Multitask OS, K - SMC-LINK Method (M4 - LINK)
User's Memory Capacity	Editing: 100,000 Blocks
	Saving: 30 MB
Memory Device	SSD Card, Dedicated USB Memory
Input Format	Dedicated USB Memory, Multi Touch Panel, Keyboard, LAN
Display Type	19-inch TFT-LCD
Character Set	Kanji (JIS Level 1 Kanji Characters), Alphabetic Characters, Numeric Characters, etc.
Keyboard	Standard 101 Keyboard, Function Key
Positioning Command	Incremental and Absolute
Max. Input Command	±999999.999/±99999.9999/±9999.99999 (switchable)
Machining Conditions Storage Capacity	1000 Conditions (C000 to C999)
Offset Setting Storage Capacity	1000 Conditions (H000 to H999)
Program Sequence Number Assignment	N000000000 to N999999999
Number of Coordinates	60
Simultaneous Control Axes	Max. 4 Axes (SP-E: 6 Axis Specification/8 Axis Specification)
Min. Input Command	0.001 μm
Min. Drive Unit	0.01 μm
AJC Speed	XY Axes : Max. 10 m/min, Z Axis : Max. 36 m/min
Max. Feed Rate	XYZ Axis 6 m/min
Position Detection Mechanism	Full - closed Loop (Linear Scale)
Drive Mechanism	Linear Motor
Compensations	Pitch Error Correction, Plane Pitch Error Correction, Torque Correction for Each Axis
Graphics	XY/ YZ/ ZX Plane, Graphics Drawing During Machining, Background Graphics Drawing, LORAN Shape Drawings, Discharge Graphs, etc.
IoT	Compatible to S-VIEWER (Compatible to MT-CONNECT : Option)
Maintenance	AI Maintenance

## AL40G



Unit: mm

## AL60G



Unit: mm

Linear Motor Drive  
High-speed & High Precision  
Die-Sinker EDM

# AL40G/AL60G



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