

SANMOTION Products

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SANYO DENKI Group contributes to society by developing environmentally friendly products that enhance the performance, quality, and reliability of our customers' equipment.

This article provides an overview of the SANMOTION products developed in 2024, highlighting their features and how they contribute to our customers and society.

First, we have expanded the lineup of the *SANMOTION G* servo system, which combines “powerful” performance and “friendly” features, by adding new motors with rated outputs of 1.8 to 5 kW and new amplifiers with output current capacities of 75, 100, and 150 A.

In terms of “powerful” features, the new models offer improved servo performance and environmental durability compared to the current models. This helps improve the performance of customers' equipment and ensures reliable operation even in harsh environments. Moreover, the servo motors and servo amplifiers have been made smaller, lighter, more efficient, and easier to use, making them “friendly” to both the environment and users.

Next, we developed the *SANMOTION G* 2-axis integrated AC servo amplifier to support equipment downsizing and energy savings.

The amplifier is available in four models: two output capacities, each

available with or without a built-in regenerative resistor.

Compared to using two single-axis servo amplifiers, these models reduce size, weight, and wiring, offering a greater flexibility in equipment design. They also contribute to energy savings by reducing standby power consumption and effectively using regenerative energy. Moreover, they feature simplified high-precision 2-axis synchronized, programmable operation, making them easy to use for our customers.

Below is an overview of these new products and their features.

■ *SANMOTION G* Medium-Capacity AC Servo Systems

A servo system is an important element in equipment and has a great impact on the performance, quality, and reliability of equipment. Therefore, servo systems need to provide high responsiveness, precise command-following performance, and high reliability. They also need to be energy efficient to contribute to carbon neutrality.

In 2022, we initially launched the *SANMOTION G*, a servo system that combines “powerful” performance and “friendly” features, with a lineup of 30 W to 1.5 kW servo motors and 10 to

50 A servo amplifiers. Widely adopted by our customers, these models have contributed to reducing the size and weight of machines while enhancing functionality and performance.

To meet the growing demand for use in larger machines and equipment, we have recently expanded the lineup with new 1.8 to 5 kW servo motors and 75, 100, and 150 A servo amplifiers.

Their features are as follows.

1. Powerful servo performance

We increased the output area by

10% by optimizing the servo motor's electromagnetic field structure and windings, and by improving the servo amplifier's voltage utilization rate at high speeds—when voltage saturation occurs.

Also, the frequency response of the speed control has been increased by 1.4 times by speeding up the control cycle and improving the torque control. Furthermore, the positioning time was reduced to one-third by compensating for the effects of friction and gravity, which hinder settling.

In addition, we used structural and thermal simulations to improve rigidity and reduce operating temperature, further enhancing environmental durability. This enables use at altitudes of up to 2000 m. Moreover, compared to the current models, the motor's vibration resistance has been doubled to 50 m/s², making it suitable for use in harsher environments.

2. Strong reliability

We have added an overshoot suppression feature to the servo amplifier's speed control, improving the command-following performance.

We also subdivided the servo amplifier's alarms to better identify the causes of power device errors, enabling quicker troubleshooting and minimizing downtime.

Furthermore, we added an overload level monitoring feature. This makes it possible to determine how much margin is left before an overload alarm is triggered, maximizing the motor's performance by optimizing the operation cycle time.

3. Friendliness to the environment

Efficiency of the servo motor was improved by 3% through optimization

of the electromagnetic field structure and windings. Also, by reducing the size and thickness of the encoder, the new motors are up to 9% shorter and 11% lighter.

By using a low-loss power device and a control circuit with reduced power consumption, the servo amplifiers achieve a 0.6% gain in efficiency with 12% increase in inverter switching frequency. In addition, the amplifier housing material has been changed from sheet metal to plastic, reducing the amplifier weight by up to 19%.

These improvements help make customer equipment more compact and energy efficient.

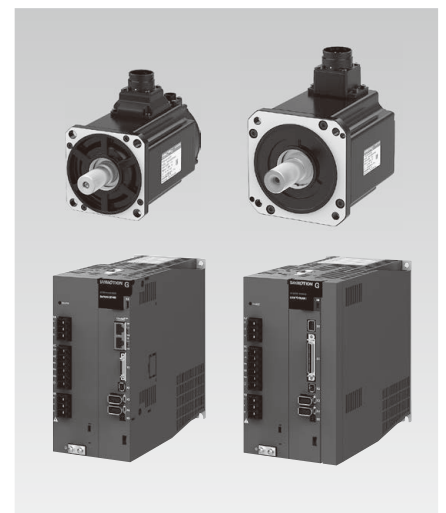
4. Friendliness to customers

We replaced the screw-fitting type power connectors of the servo motors with circular push-pull connectors, making cable attachment more user-friendly. Moreover, both the servo motors and amplifiers are designed to be dimensionally identical and mounting-compatible with our conventional products, making replacement with the *SANMOTION G* easy for customers.

Furthermore, the servo amplifier has a new function for adjusting the switching frequency at any motor

speed. This feature allows users to tailor the low-noise mode to their device's operation, reducing unpleasant high-frequency noise during low-speed operation. This is especially beneficial in applications like collaborative robots and medical devices, ensuring safe and quiet operation near people.

As described above, this new AC servo system combines high performance and reliability, compact and lightweight design, and low noise. With its powerful yet environmentally and user-friendly features, it enhances the value of our customers' equipment while contributing to achieving the carbon neutrality.



■ **SANMOTION G 2-axis Integrated AC Servo Amplifier**

To contribute to the realization of a sustainable society, servo systems need to further reduce their environmental impact and improve their energy conversion efficiency. Additionally, ease of equipment startup and maintenance is becoming increasingly important.

To meet these needs, we developed the *SANMOTION G* 2-axis integrated AC servo amplifier—a user-friendly solution that contributes to equipment downsizing and energy savings.

This product is available in four models: 20 A and 30 A output capacities, each available with or without a built-in regenerative resistor. It comes with an EtherCAT* interface for connections with a host controller.

Its features are as follows.

1. Compact and lightweight

Compared to using two units of the *SANMOTION G* single-axis AC servo amplifier, the new amplifier has a 38%

reduced installation footprint and 19% reduced weight. This provides a greater flexibility in equipment design, allowing installation in confined spaces or inside equipment.

2. Wiring and energy savings

With the new product, cable wiring and standby power consumption have been reduced by 35% and 36%, respectively. It also efficiently uses regenerative energy across both axes, improving overall energy efficiency and contributing to energy savings in customers' equipment.

3. User friendliness

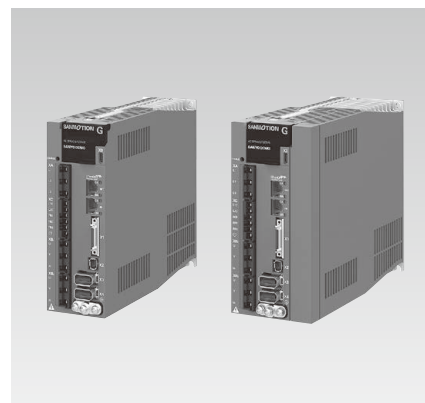
The new product comes with a function that simplifies synchronized and programmable operation of the two axes with high precision. This improves the performance of machinery while eliminating the need for complex control on customers' equipment.

Moreover, the setup software displays the servo amplifier's status and

operation trace waveforms of two axes simultaneously, making equipment startup and maintenance easier.

In summary, the new 2-axis integrated servo amplifier features a compact, lightweight design with enhanced energy efficiency and ease of use, helping customers increase equipment value and reduce environmental impact.

Details on this product are covered in a separate article in this issue.



* EtherCAT is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

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Development of the *SANMOTION G* 2-Axis Integrated AC Servo Amplifier

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1. Introduction

To help support a sustainable society, servo systems need to further reduce environmental impact and improve energy conversion efficiency.

Servo-driven equipment typically consumes a significant amount of power, raising demand for energy-efficient servo systems.

As equipment becomes smaller and more versatile, servo amplifiers—once installed in control panels—are increasingly being mounted inside equipment and on moving parts, driving the need for more compact, lightweight designs.

Moreover, servo systems are required to enhance equipment performance, simplify system startup, and enable quick troubleshooting.

To meet these market demands, we have developed a 2-axis integrated servo amplifier that is user-friendly and helps customers develop smaller, lighter, and more energy-efficient equipment.

This article starts by introducing the specifications and appearance of the *SANMOTION G* 2-axis integrated AC servo amplifier (hereinafter, “new product”)—the latest addition to the *SANMOTION G* servo systems lineup. Next, we’ll introduce the features and the key development points of the new product.

2. Outline of the New Product

2.1 Appearance and dimensions

Figure 1 shows the new product. The lineup consists of four models: 20 A (Model No. GADWA22□H) and 30 A (Model No. GADWA33□H) output capacities, each available with or without a built-in regenerative resistor.

As shown in the outline drawing in Figure 2, the new product has a height of 160 mm, the same as a *SANMOTION G* single-axis servo amplifier,⁽¹⁾ and uses a standardized connector. This design allows both single-axis and 2-axis integrated servo amplifiers to be installed in the same equipment.

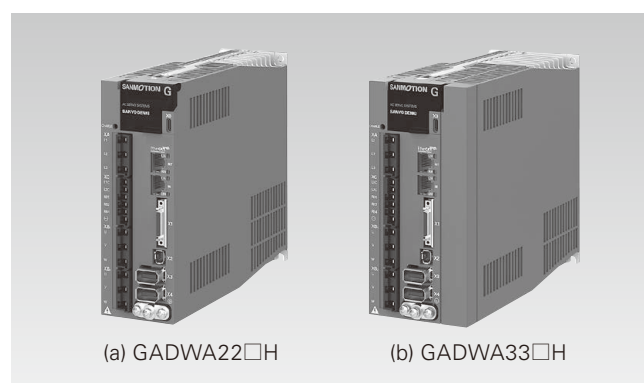


Fig. 1 Appearance of the new product

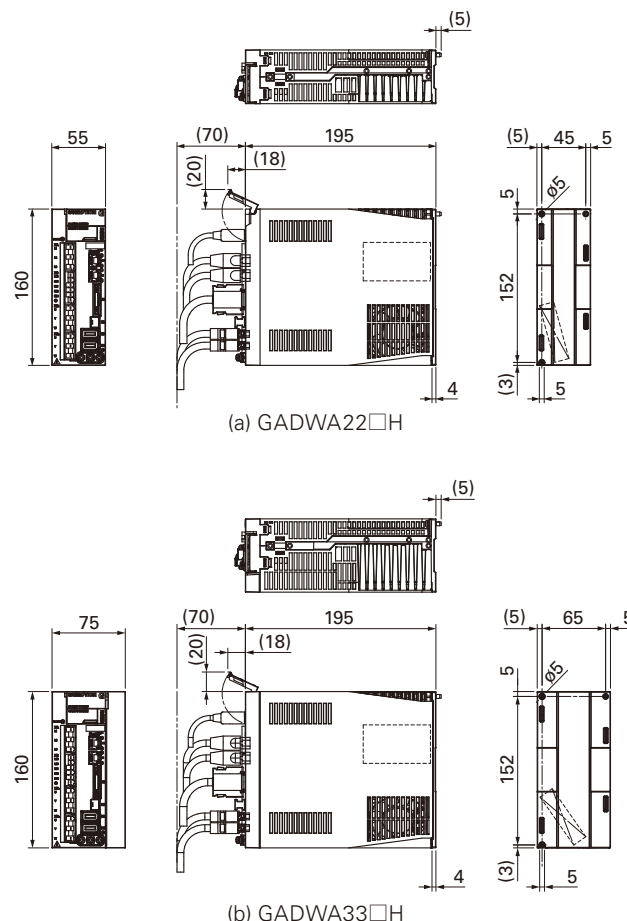


Fig. 2 Dimensions (Unit: mm)