Servo Systems Division

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This document summarizes the main product developments for the Servo Systems Division in 2012.

The AC power input 2-phase stepping driver of the "SANMOTION F2" series was developed as a stepping motor driver with high performance and a wide input power range.

For servo motors, we added a 220 mm sq. medium inertia/low inertia servo motors to enhance the "SANMOTION R" series lineup, which is being well-reputed in the market. The Servo Systems Division also developed a small capacity, high precision AC servo motor for the "SANMOTION R" series to address the soaring cost and uncertain supply of rare earth in recent years.

Finally, an AC servo amplifier equipped with PROFINET interface was developed as part of the Advanced Model lineup of the "SANMOTION R" series. PROFINET communication has acquired a large share in the European and Asian markets and is advocated by PROFIBUS & PROFINET International.

The following is an overview and features of each product.

■ "SANMOTION F2" Series – AC Power Input 2-phase Stepping Driver

Stepping motors are used in a wide variety of applications due to their ease of control. In line with the high speed/high accuracy shift of equipment in recent years, there is a strong demand for higher performance and amongst this, the demand to reduce speed fluctuation during stepping motor operation is also prevalent. The AC power input 2-phase stepping driver of the "SANMOTION F2" series was developed in response to this demand.

The new model has the following features:

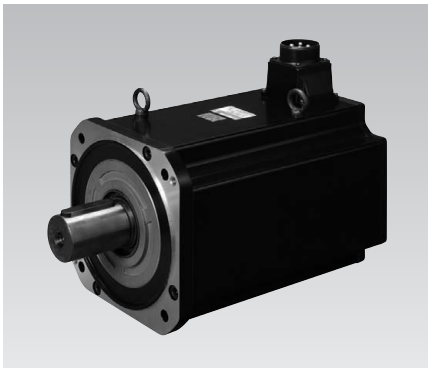
- More than a 10% reduction in speed fluctuation compared to our conventional product due to a high speed current loop control and adoption of a new PWM control.
- More than a 10% increase in torque compared to our conventional product due to a wide input power range (supporting 240 V AC) and achievement of excitation current 4 A.
- To improve user-friendliness at system start-up and maintenance work, setup software with a waveform monitor function, proven on AC servo amplifiers, was developed.

■ "SANMOTION R" Series – 220 mm sq. Medium/Low Inertia AC Servo Motors

The AC servo motors of the "SANMOTION R" series are being well-reputed by the market as small, high performance products. This time, we have enhanced the lineup further by developing 220 mm sq. AC servo motors adopted on a large number of industrial robots, injection molding machines. Regarding the rotor inertia moment of the developed products, we prepared two types, medium inertia and low inertia, to suit the relevant application.

The new models include the following features.

- In order to satisfy the demand for high speed equipment, maximum RPM is improved by around 1.3 to 2 times compared with our conventional product.
- To contribute to reduction of equipment tact time, maximum torque is improved by around 1.2 times compared with our conventional product.
- By significantly revising the servo motor internal design, a continuous stall torque ratio of less than 0.8% has been achieved for cogging torque.
- Reducing the mass of the servo motor was one of the main targets of this development and compared with our conventional product, the newly developed servo motor is approximately 20% lighter. We believe this will greatly contribute to making industrial robots and various other robots smaller and lighter.
- The product lineup consists of a medium inertia product with motor output of 7.0 kW to 25 kW, a low inertia product with motor output of 20 kW to 25 kW, a 200 V AC input product and a 400 VAC input product.



■ "SANMOTION R" Series – Small Capacity, High Precision AC Servo Motor

Due to the soaring cost and uncertain supply of rare earth in recent years, there is a lot of focus on the cost and supply issues of products which use rare earth magnets. Dysprosium, which is classified as a heavy rare earth element, is particularly important to improve the temperature characteristic of magnets and as such, is used in the magnets of servo motors. Sanyo Denki, in preparation for the reduction in rare earth availability likely to occur in the future, has significantly reduced magnet usage and taken action to achieve dysprosium-free magnets. This newly developed AC servo motor is dysprosium-free, uses fewer magnets and offers high precision.

The new model includes the following features.

- By combining an optimized design support tool, magnetic field simulation CAE and three-dimensional CAD to achieve an optimal design, the new model maintains a maximum torque equivalent to our conventional product while reducing magnet usage by approximately 60%.
- The feed shaft for machine tools, which are required to offer high precision machining, was one of the main focuses and as such, its cogging torque and speed fluctuation was reduced, and the current frequency property improved. Cogging torque was reduced by approximately 30% compared with our conventional product. Speed fluctuation was also reduced between 18% and 30%, and the current frequency response was improved between 2.4 dB and 4.1 dB.
- The product lineup consists of the following:
  60 mm sq. 200 W, 400 W
  80 mm sq. 750 W

2 different motor capacities were prepared for the low-speed product (max. speed: 3000 min^{-1}) and high-speed product (max. speed: 6000 min^{-1}), so that the servo amplifier could be used on industrial robots as well as machine tools.

■ "SANMOTION R" Series – ADVANCED MODEL AC Servo Amplifier with PROFINET Interface

Recent years have seen the rapid spread of high-speed serial communication using industrial Ethernet to servo systems used on industrial machines such as machine tools, industrial robot and injection molding machines. In line with this trend, in 2009 Sanyo Denki was one of the first group to launch a servo amplifier equipped with the EtherCAT interface on the market.

This time, to enhance our product lineup of servo amplifiers with serial communication, we have developed a servo amplifier equipped with PROFINET interface, the Ethernet version of the PROFIBUS interface that has acquired a large share of the markets in Europe and Asia. The model has the following features:

- Several features of the Advanced Model servo amplifiers in the "SANMOTION R" series already well-reputed in the market.
- The positioning operation generator, in addition to the normal trapezoid positioning command, a jack profile function and S-curve function have been equipped.
- The sequential positioning function was added and the homing mode was also improved in order to suit various applications.

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Joined Sanyo Denki in 1983.
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Worked on the design and development of servo systems.