Servo Systems Division

Toshihiko Baba

This document summarizes the main product developments for the Servo Systems Division in 2008.

In the field of servo motors, we have developed the "SANMOTION R" series mid-capacity AC servo motor, which is an expansion of the reputable "SANMOTION R" series AC servo motor. We have also developed a "SANMOTION R" series 14 mm square AC servo motor as a small diameter servo motor.

In the field of servo amplifiers, last year, we introduced the "SANMOTION R" series ADVANCED MODEL, which improved on the functions and performances of the "SANMOTION R" series AC servo amplifiers. We have adjusted this servo amplifier to the functional safety standards.

Additionally, the "SANMOTION R" series AC servo amplifier built-in positioning function model has been added to the lineup of serial interface types.

In the field of stepping motors, our reputable thin-type stepping motor lineup has been expanded with a 42 mm square, two-phase thin type stepping motor. Finally, in response to the strong demand from the European market, we have developed the "SANMOTION F" series stepping motor with integrated driver and built-in CANopen interface.

The following provides an overview and features for these products.

■ "SANMOTION R" Series Mid-Capacity AC Servo Motor

With increasing usage in the industrial robots market, we estimate that there are over 1 million industrial robots available for manufacturing equipment. The "SANMOTION R" series small capacity AC servo motor developed in 2006 is used in many robots with weight capacity of 5 kg or less for the assembly of electronic and electric devices.

Now, building on the design of the "SANMOTION R" small capacity AC servo motor, we have developed a "SANMOTION R" series mid-capacity AC servo motor for robots with larger weight capacity. The lineup includes four models, 220mm square type with rated output 5kw and 130mm square type with rated output 550w, 1.2kw, or 2kw.

The "SANMOTION R" mid-capacity AC servo motor includes the following features.

- The maximum rotation speed is 1.3 times faster than our previous products and the maximum instantaneous torque is 20% higher.
- The optimization of the motor magnetic circuit, improvement of the occupancy factor of the wound wire, and adoption of the thin-type absolute encoder achieved a 20% improvement in contraction of the total length compared to our previous products.
- The optimization of the motor's magnetic circuit has also achieved a reduction of its cogging torque. This

amplitude value is 0.5% or lower at the continuous stall torque ratio, This is the top ratio in the industry.

- A holding brake of motor is one of important functions for industrial robot applications. The power loss for the holding brake on this new product is about 50% less compared to our previous products.

■ "SANMOTION R" Series 14 mm Square AC Servo Motor

Digital consumer electronics, such as cellular phones and digital cameras, have on board a large number of electronic components. As these digital consumer electronics have become smaller in recent years, the electronic parts that make up these products have also rapidly become smaller. The mounting equipment for electronic parts faces an increasing demand for smaller actuators in order to support the mounting of smaller electronics parts.

SANYO DENKI already sells a 20 mm square AC servo motor as a small size, small diameter, but in order to handle demand for servo motors with an even smaller size and smaller diameter, we have thus developed the "SANMOTION R" series 14 mm square AC servo motor.

This product includes the following features.

- The innovation of new wire-winding technology leads to a small size of 14mm square. This size is the top in the industry.
- The adoption of ultra-small absolute encoders appropriate for small-size servo motors.
- These ultra-small absolute encoders possess 131,072 divisions per rotation, giving the encoders a resolution that is optimal for positioning applications.
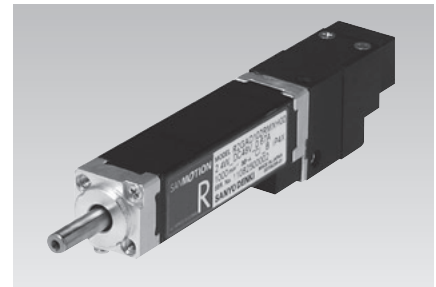
■ Safety Model Added to "SANMOTION R" Series AC Servo Amplifier ADVANCED MODEL

Recently, awareness of functional safety has spread in Europe for equipment that uses electrical/electronic/programmable electronics, and standards related to safety are being established for control devices including servo amplifiers. At the same time, not just European but also Japanese manufacturers of machine tools and robot are also beginning to demand compliance with functional safety on servo amplifiers. In response to this demand, a safety model has been added to the "SANMOTION R" series AC Servo Amplifier ADVANCED MODEL lineup.

The first step in safety compliance is the integration of the safe torque off function. The main compliant standards are as follows.

- IEC61508 (Functional safety of electrical/electronic/programmable electronic safety-related systems) SIL = 2
- ISO13849-1, EN954-1 (Safety of the machinery control systems) CAT.3, PL=d
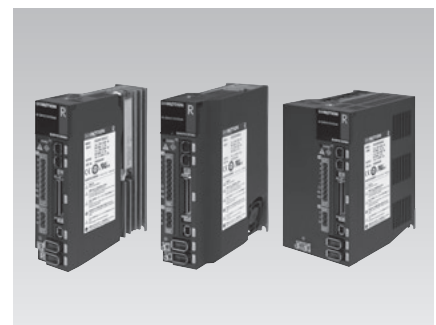
■ Serial Interface Type Added to "SANMOTION R" AC Servo Amplifier Built-in Positioning Function Model

The "SANMOTION R" series AC servo amplifier built-in positioning function model is reputable because it allows the motion profile to be registered in the servo amplifier, which reduces the load on the host controller. Additionally, since serial connection interface is becoming increasingly popular as the connection between the servo amplifier and the host controller, various types of serial communication are suggested in the servo amplifier market. Against this background of trends, a serial interface type has been added to the lineup for the "SANMOTION R" series AC servo amplifier built-in positioning function model.

The physical layer of serial communication uses RS-485 and the communication protocol uses Modbus-RTU protocol. A programmable controller (sequencer) is widely used for Modbus. The parameters required for the motion profile can be edited and monitored from the host controller via the Modbus-RTU, and we hope that customers experience greater convenience.
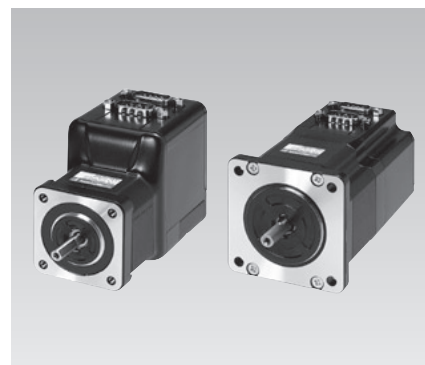
■ "SANMOTION F" Series Stepping Motor with Integrated Driver and Built-in CANopen Interface

"SANMOTION R" series AC servo amplifier with built-in CANopen interface were released in 2007 and have a good reputation in the European market, with inquiries from new customers and subsequent adoption. Stepping motors with integrated drivers, that achieve the wire-saving and simplified systems, have rapidly expanded the application. Because of this situation and due to demands from the European market, we have developed a stepping motor with integrated driver and built-in CANopen interface.

This product includes the following features.

- The CANopen communication specification is compliant with device profile DS-402.
- The following 3 operation modes are available.
- · Profile Velocity mode
- · Profile Position mode
- · Homing mode
- The stepping motor used as a base is a 5-phase 42 or 60 mm square motor.
- Innovation of new motor control method reduces vibrations at full-speed range.

- The use of a new power circuit and a new current control method have improved the loss in the driver by 15% compared to our previous models.


■ "SANMOTION F" Series Small-size 2-phase 42 mm-square Thin-style Stepping Motor

The 2-phase, 50 mm square thin-style stepping motor that was released in 2007 has a good reputation in applications with strict constraint in installation space requirements, such as semiconductor manufacturing equipment and mounting equipment for electronic parts. We have achieved further miniaturization of the motor and developed a 42 mm square 2-phase thin-style stepping motor.

This product includes the following features.

- Industry leading thinness of 11.6 mm due to optimized motor construction.
- Industry leading torque in the thin-type stepping motor due to optimized magnetic characteristics of the stator core.
- Three motor lengths are available to fit different installation space requirements. (L= 11.6 mm, 18.6 mm, 25.6 mm)
- RoHS compliant.
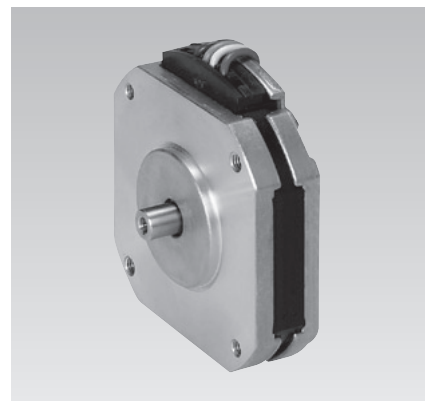
Toshihiko Baba
Joined Sanyo Denki in 1983.
Servo Systems Division
Worked on the design and development of servo systems.