

# Servo Systems Division

Shigeto Murata

The technological achievements of our Servo Systems Division during 1998 are described below:

With respect to servo amplifiers, "PV" and "PY" were completed for UL (Underwriters Laboratories) certification and the "PQ" series of network compliant, multiple axis amplifiers were successfully commercialized.

In our stepping system section, "STEPSYN H" Series 42 mm sq. and 5 phase AC Multi-step driver were commercialized.

In our servo motor section, notable events were the completion of the UL specification compliant "P" Series, the commercialization of the 20 mm sq. AC servo motor, and the completion of the induction type "S" series servo motors and the low noise, external cross-flow type fan.

In our sensor section, we have completed the electromagnetic induction type absolute sensor and the hollow axis compatible magnetic incremental sensor.

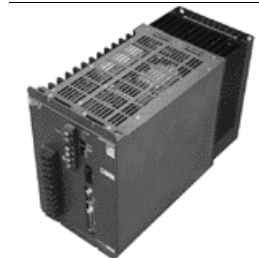
With regard to controllers, we have commercialized our industrial PC "S-MAC PC" of industrial PCs which reflects our efforts for FA total solutions.

These products represent the three technological orientations of our company and the details are as given below:

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## Development of PY0A300 Large Capacity Servo Amplifier

The newly developed PY0A300 is our latest addition to the "PY" series servo amplifiers which now consists of PY0A015, - 030, - 050, - 100, - 150, and - 300. It has extended the capacity range of adaptable motors from about 5kW to 15kW at once and we expect to be able to satisfy a much wider range of customers' demands.



"PY" is the higher end compatible model of "PZ" and uses many of the "PZ"s' resources. In addition, it has a reinforced PC interface and, as a result, is provided with various monitoring functions. It can also be directly connected to any PC running Windows 95® (Optional).

Note: Windows95 is a registered trademark of Microsoft Corporation.

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## Entire Servo Amplifiers "PY" Series Line Is Now UL Certified

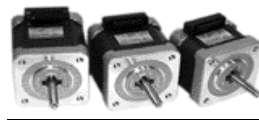
All servo amplifiers "PY" series products (PY0A015 to 300) have now been certified by UL. The "PY" series amplifiers are high end products especially designed with integration into machine tools, chip mounters, and robotics in mind, but are also usable with any general purpose industrial equipment.

They have already been declared as CE-marking conformable products and become popular among customers producing Europe bound products. We are now also looking at expanding our participation in the U.S. market to a wide range of products on this occasion of the recent UL certification approval.

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## High Torque 42mm sq. Stepping Motors

A high torque model has been newly developed and added to the series of 42 mm sq. "STEPSYN." In line with the existing models, the new products are also 33 mm, 41 mm and 48 mm in length.



The main characteristics are as described below:

1. We have succeeded in lowering the noise level by modifying the internal structure to be more vibration resistant through the optimization of the magnetic circuit design.
2. We have increased the torque by 20% over the existing models and successfully improved the efficiency.
3. The connector is now mounted directly on the motor. The adoption of the connector terminal type has made the motor much easier to handle as compared with previous models which had lead wires extending directly from inside the motor.

These highly functional new 42 mm sq. stepping motors with increased torque may be our answer to users' demands for motors of reduced diameters.

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## Stepping Motor Drivers

We have developed a CE marking compliant 5 phase AC multi-step driver. It is applicable to two output types of 5 phase PENTASYN motors: 0.75A/phase and 1.5A/phase.



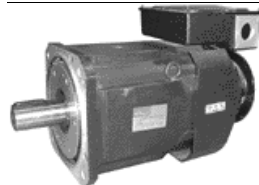
The main characteristics are as follows:

1. In compliance with CE marking based on EC Directive (low voltage directive and EMC directive).
2. It uses single phase 100-230V for the power supply.
3. Smooth rotation even in the low speed range with "Auto-micro function" that divided pulses (1/10 fixed) and enable micro step driving in full step pulses on half-step pulses supplied.
4. The resolution setting of the micro-step function ranges over 16 different resolution settings from 1/1 to 1/250.
5. Having same height as that of our PU0 AC servo amplifier, easy mounting can be achieved when this and PU0 Amplifier will be mounted together in the same control box.

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## Servo Motors Conforming to International Standards

Measures have been taken to make the servo motors more conformable to international standards as part of the globalization of the products as follows:



1. A UL approved model has been added to the "P" series of servo motors (15kW or below). The insulation system was made to the Type F specification at our own discretion in order to take the full advantage of the motor's performance.
2. A new CE marking compliant large capacity servo motor "P6" (20 to 30kW) was added to the product line. A new low noise cross-flow fan has been developed with water jetting proof IPX5 performance for improved environmental characteristics.

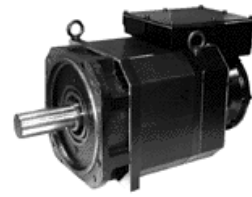
## Smallest Capacity AC Servo Motor

1. We have developed small capacity (10W and 20W) AC servo motors with a 20 mm sq. flange as a smallest capacity motor in P5 series. It is the smallest motor of type aimed for use in chip mounters, semiconductor manufacturing facilities, or small robotics.
2. In order to reduce but heat-influence from motor to sensor, new heat-insulating construction have been developed. This construction consist of one block molded resin and aluminum part and others. Heat insulating performance from motor and heat dissipation from sensor advanced significantly. The adhesion between the resin and aluminum uses stable chemical bonding and is secure.



## Development of Spindle Motor "S4" and AC Servo Motor "S6"

1. "S4" (2.2 to 5.5kW) was redeveloped as a fanless motor with the simple and durable structure characteristic of an induction motor, while reducing the acoustic noise level (10dB lower than the current model) and prolonging the product life.
2. A new cross-flow cooling fan was developed specifically for use in "S4" (7.5 to 22kW) and "S6" (22 to 30kW) fans to reduce the impedance in the ventilation path for cooling the motor and to raise the cooling system efficiency. This will ensure sufficient air volume and low noise operations (5dB lower than the current model).



## Development of Cross-Flow Fan

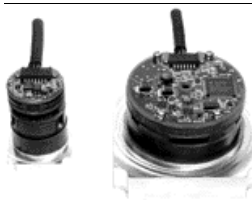
Motor cooling technology is growing in importance in keeping with the increasing capacity and decreasing size of induction and synchronous motors. For this reason we developed an unusual cross-flow fan. The cross-flow fan can be classified between the centrifugal blower and the axial flow fan in terms of its characteristics for securing air volume and low noise. It is improved in a dust free and water jetting performance (IP45 obtained) and can operate over a wide range of voltages (200-230V).



(The details of this item are discussed in another chapter.)

## Revolving Type, Electromagnetic Induction Absolute Sensors

A new wire-saving type has been newly developed and added to the "SANCODER" line (generic description for all Sanyo Denki sensors) together with the basic type product developed last year. Further advanced in modularization, it has turned out to be a high cost-performance sensor provided with intelligent functions. The main characteristics of this sensor are:



1. It features both ways communication and the command request functions. The new circuit design resulted in reducing the number of leads wires from 13 to 7.
2. The "position data ripple" has been substantially reduced (by 25% to 50% in comparison with our existing models) by the implementation of the data self-alignment method.
3. The automatic temperature compensation system has been newly developed. "Temperature drift" and "absolute angular error" have been significantly

reduced (by 50% from our existing models).

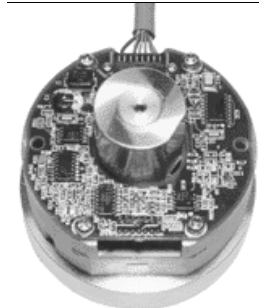
4. Fail-safe design. It contributes to our customers' safe operations with "data self-diagnosis function."

It will be ready for volume production from April, 1999.

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## Magnetic Incremental Sensors Adaptable to a Hollow-axis

A magnetic sensor has been newly added to the "SANCODER" line. This sensor is expected to be highly reliable for applications in severe environment such as fine particulate or oil mist, featuring a type adaptable to the hollow-axis. The main characteristics are listed below:



1. It consists of a magnetic drum and MR device for improved oil-resisting quality.
2. Fail-safe design. It is provided with "data self-diagnosis function" to contribute to the safe operation of customers' equipment.
3. It has improved modularization with the role of each component having been carefully reviewed. This helped acquire a wide range of energy saving features related to the testing and assembly processes. The hollow-axis feature is high on demand as it is expected to contribute to size reduction.

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## Industrial PC "S-MAC PC"

An industrial PC was developed and placed on the market. "S-MAC PC" will form the core of the "S-MAC" system which is intended as a total FA solution.



The characteristic features of "SMS-10" in the "S-MAC PC" series are described in the following paragraphs:

1. Environmental performance have been improved by modification to the hard disc free construction (compact flash memory is mounted normally ) and passive air cooling.
2. Wider range of applications due to the improvement of the network communication interface.
3. The modularization and low cost functions by the implementation of PC/104 Bus.

Please refer to previously issued documents for the details of "S-MAC PC" (see Note).

Note: Sato et al: The development of an Industrial PC "S-MAC PC" and "S-MAC" components, No. 6 pp. 26-34 SANYO DENKI Technical Report, Nov. 1998.

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### Shigeto Murata

Joined company in 1965  
Servo Systems Division  
Worked on development and  
design of servo system