

Servo Systems Division

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This paper presents the technological results of the Servo Systems Division in 1999.

For servo motors, we finished making all models of the "P" series (ranging from 10W to 30kW) conform to the compliance with "UL" and CE markings. For spindles of machine tools, we commercialized fast, high-output synchronous spindle motors of the IPM structure and put them on the market.

For servo sensors, we added modular, small, high-resolution incremental and absolute types to the line-up of "SANCODER."

For servo amplifiers, we commercialized three models of small but multi-functional, high-performance "PY2." We added an analog/pulse train input type, fast serial interface family to the "PQM" series to make it possible to provide wide system integration.

For stepping motor drivers, we completed a new set of interface products for the "PM" driver which achieves low vibration and low noise and the "PB" driver that pursues fast control performance.

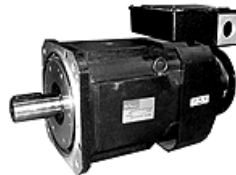
For stepping motors, we developed gears for 28mm sq. that make small, low backlash a reality and added them to the line-up.

These products aim at energy-saving and safety, achieve "small size, lightweight, and high efficiency," and meet customer needs.

Here is an overview and the features of the products just developed.

Making AC Servo Motors Conform to Overseas Standards

For models with outputs 10W to 30kW of the AC servo motor "P" series, we completed compliance with "UL" and CE-marked products to make our line-up more conforming to overseas standards. The models newly added to our line-up of compliance with "UL" products are as listed below.



1. Two models with outputs 10W and 20W, with a flange angle of 20mm ("P5" motor small-capacity models)
2. Models with outputs 20kW to 30kW ("P6" large-capacity servo motors). These models come with a unique insulated system of the F class to enable them to make full advantage of motor performance.

Spindle AC Servo Motors (IPM)

We developed synchronous AC servo motors that meet the high speed and high acceleration requirements for spindle motors for machine tools.

Main characteristics are as listed below.



1. To meet demand for faster speed and higher torque, we had to increase the capacities of the motors and amplifiers. For the present project, we developed a

motor of the buried magnet structure (IPM) and combined high speed and high torque by using motor rating and amplifier capacity identical with those of traditional models.

2. Performance

Rated output: 6kW (145% of the level of Sanyo Denki's traditional models)

Maximum motor speed 16,000min⁻¹ (130%)

Instantaneous maximum torque 45N·m (113%)

3. This made it possible to provide systems with a minimum increase in cost.

Small, High-Resolution Incremental Sensors

Small, high-resolution incremental sensors for AC servo motors were added to the series of "SANCODER." The module structure was reinforced to increase resolution by digital processing by means of a built-in circuit.



Main characteristics are as listed below.

1. Dimensions: 38mm dia. x 26mm

The inner diameter of the hub was changed to a maximum diameter of 12mm to make the models adaptable from small to large motors.

2. The built-in circuit is used to multiple the original signal 2, 4, 8 and 10-fold to achieve a maximum resolution of 45,000 divisions per revolution.

These models are also adaptable to solid and hollow motor shafts. The inner diameter is designed to be adaptable to hollow shafts 9mm dia. in small motors.

Small, High-resolution Absolute Sensors

To meet the absoluteness requirements for small motors, we developed competitive, small, low-priced optical absolute sensors and added them to the line-up of "SANCODER." Main characteristics are as listed below.



1. Dimensions: 35mm dia. x 26mm

They have been made adaptable to small motors.

2. Resolution: 11 bits/revolution to 17 bits/revolution

3. Multi-interface capability: Manchester encoded synchronous transmission and start stop synchronization

4. Fast transmission 1Mbps-4Mbps

5. Fail-safe design. These models have a "data self-diagnosis function" to help customers' equipment run safely.

Development of "PY2" Servo Amplifiers

For the servo amplifiers "PY" series, we developed small, low-priced "PY2" and added PY2A015, -030, and -050 to the line-up.

These new models will hopefully resolve the challenges (found in traditional models) related to amplifier dimensions and costs in the small-capacity range and thus satisfy a wider range of demand.

"PY2" is a model completely compatible with "PY" in terms of performance and functions. It has already received a statement of conformity to the CE markings and has already been compliance with



“UL” .

Their additional functions include real-time auto-tuning, auto-notch filter, and observer to make them more user-friendly and more supportive at system start-ups.

Interface Enhancement for Servo Amplifier “PQ” Type M

We added “A” type (PQM0A) that uses analog/pulse train as input instructions and “E” type (PQM0E) that fast serial interface (RS485, 4Mbps) as inputs to the series family of all models of network-compatible multi-axis servo amplifiers “PQ” type M (PQMA030-150).



This will hopefully increase flexibility to user interfaces in such fields as injection molding machines, semiconductor manufacturing machines and general industrial machines, and will meet a wider range of demand.

The “PQ” type M has already received a statement of conformity to the CE markings and has already been compliance with “UL” and is favorably reputed by manufacturers of equipment bound for Western countries.

The series of the processes is presented in detail in an article in this issue, entitled “Development of Large-capacity Models of Multi-axis Servo Amplifiers “PQ” .”

“PM” Driver and “PB” Driver for DeviceNet - RS-485

Using the very small angular drive of a 5-phase stepping motor and related technology of motor control , we developed a “PM” driver (which is a stepping motor drive system that achieves low vibration and low noise) and a “PB” driver (which is a small AC servo system that pursues high speed by means of the company’s unique control and is best suited for short-stroke, high hit rate fields).



These models come with interfaces for DeviceNet and RS-485.

1. DeviceNet

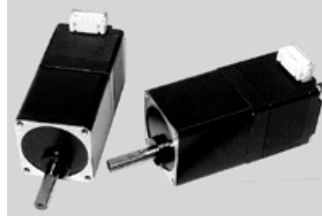
The conformity of the “PM” driver and the “PB” driver to the DeviceNet interface, which is an open communications specification, has opened up new amplifier options for specific uses, in addition to the existing “PV” amplifier for DeviceNet. For input power, the “PM” driver is for 24V DC and single-phase 100V AC, and the “PB” driver for 24V/36V DC. Basic resolution is 1,000P/R for the “PM” driver and 800P/R for the “PB” driver.

2. RS-485

The use of speed pattern generation in the amplifier similarly to DeviceNet has made it possible to meet requirements for decentralization and wiring-saving and to cut back on total costs for user devices. Another thing to be noted is that the communications format is simple, which makes it easy to develop software for the controller (primary station). Input voltage and basic resolution are identical with those of DeviceNet products.

Stepping Motors for Spur Gears

To meet the needs for stepping motors that are small, high-performance and high-precision, we developed "stepping motors with low-backlash gear boxes" for the 28mm sq., 2 phase and 5-phase H series.



Main features of the products just developed are:

1. Small and lightweight: Our geared stepping motors, with 28mm sq. in dimensions, 61.5mm in overall length, and 0.16kg in weight, achieve the smallest dimensions and lightweight.
2. A rich variety of reduction ratios: These models boast a rich variety of reduction ratio options: 1:3.6, 1:7.2, 1:10, 1:20, 1:30, and 1:36.
3. Low-backlash structure: These models are reduced in size and use a better inner structure and machining precision, resulting in low backlash.
4. Low vibration: They are low in vibration at low speeds generated by the stepping motor and achieve higher resolution in gear ratio, while achieving smooth rotation.
5. Connector connection: The power input line is based on connector connection, thus facilitating the use of the stepping motor.

Shigeto Murata

Joined company in 1965

Servo Systems Division

Worked on development and design of servo systems
