

# Servo Systems Division

Hideyuki Ishii

Technological results of the Servo Systems Division in 2001 are introduced as follows.

- (1) The completion of absolute sensor "RA062" with multi rotation calculation function, which is highly divided and highly accurate, and requires no internal or external battery.
- (2) The completion of small incremental sensor "PP031"
- (3) The completion of incremental

sensor "PP110" for hollow-shaft servo motor.

- (4) The completion of P6 large capacity AC servo motor which adopts interior permanent magnet type (IPM) rotor.
- (5) The completion of small multi-axis servo driver "PY" Type R.
- (6) The completion of low out gas stepping motor.

These are the new products, which especially give priority to

the environment and energy conservation. We expect this to be a welcome expansion to the market by joining the conventional product group and meeting our customers' needs. The outline and the features are described as follows.

## High Resolution / High Accuracy Resolver "RA062"

We have developed next generation type multi rotation absolute sensor "RA062" series, which has a mechanical multi rotation calculation device. The resolver is built into the gear unit, and doesn't require an external battery or an electrolytic capacitor.

This sensor has four built-in resolvers united with the gear, and keeps the rotation frequency mechanically from the mutual positions of them. The resolution in one rotation is 15 bit (Manchester encoded communication) or 17 bit (start stop synchronous communi-

cations) and the number of allowable rotations of multi rotation part is 8192. The replacement of an optical absolute sensor is also possible thanks to the high absolute position accuracy. The communication specification supports the high-speed serial communications like Manchester encoded communication and start stop synchronous communications.

This is a maintenance free, environment friendly product since it has neither an external battery nor electrolytic capacitors, which are the consumable parts, and has

been certified as an eco-product under SANYO DENKI regulations.



## Small Size Optical Incremental Sensor "PP031"

Small size optical incremental sensor "PP031" was developed as an incremental sensor for a small servo motor using the horizontally developed module structure of "PP062" which is already manufactured.

The main features are as follows.

Outside diameter of sensor  
31 × 22 mm

Number of pulse  
pulse/rotation 200 ~ 2500

Module structure (constructed

with four modules; floodlight base module, hub rotation disk module, light reception board module, cable module)

The position accuracy of a fixed mask and the photo diode, which can be a problem upon modulation, was solved by matching the convex portion of the floodlight base mold and the holes on the light reception board when they are assembled.



## Hollow 60 Incremental Sensor “PP110”

To meet the demand for the hollow-shaft application of middle and large-scale AC servo motors, the hollow type incremental sensor “PP110” which is able to support up to 60mm of inside diameter of sensor installation was developed.

The main features are as follows.

1) The stability of quality and ease of assembly can be maintained as it shares a basic structure adopted from the current module “PP062”.

2) Since the inside diameter of the hub is large, the rotation disk hub module can be fixed by tightening the nut from the thrust direction to control the swinging of the rotation disk.

3) The printed circuit board is secured to the entire circular arc part of the base molding to create a structure that doesn't generate the resonance of a printed circuit board.

Along with the PP110 sensor,

there is also another hollow-shaft application sensor, the “PP075”.



Series Name	Shaft Diameter	Outside Diameter of Sensor	Number of Pulse
PP075	Less than 25mm	69 x 25mm	Less than 4096
PP110	Less than 60mm	110 x 25mm	Less than 8192

## P6 Large Capacity AC Servo Motor

The new model with the rated output of 37kW-75kW was recently developed as a large capacity model of AC servo motor “P6”. This AC servo motor uses the interior permanent magnet type (IPM) rotor and is composed of four models with output ratings: 37kW/275mm sq., 45kW / 275mm sq., 55kW / 320 mm sq., and 75kW/320mm sq.. As for the power supply voltage, AC400V is the standard specification but 37kW is supported in an AC200V and 400V application.

The features of this product are small size, high efficiency and low cogging torque. Compared with the

conventional induction type servo motor, 37kW, it achieved the motor capacity reduction of 30%, a 25% reduction in motor weight, and a reduction in the electric power loss of 40%. The cogging torque is less than 1% in rated torque ratio and a low ripple was achieved. Additionally, the number of maximum rotations of 37kW, 45kW and 55kW is 3000min<sup>-1</sup> and that of 75kW is 2000min<sup>-1</sup>, both of which are first rate speeds for such a motor.

This product is expected to contribute to miniaturization, faster performance, and energy reductions of the machines used in the

manufacture of large liquid crystal displays and injection-molding machines.



## Small Size Multi-Axis Servo Driver “PY” Type R

The new Type R which is a small multi-axis Servo Driver which was added to the “PY” series.

It essentially consists of a power supply unit which converts AC voltage into DC voltage, the driver unit which contains the inverter, the control section, with the motherboard mounting the power supply unit and the driver unit. Two kinds (15A and 30A) are prepared for the driver unit which can

drive up to a 1kW motor.

The interfaces are two kinds; the general-purpose analog/pulse train instruction and our original, RS-485 high-speed serial communications (4Mbps). These can satisfy the demands from the chip mounting industry which often uses multi-axis devices, semiconductor devices, as well as small size robots.



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## Low Out Gas Stepping Motor

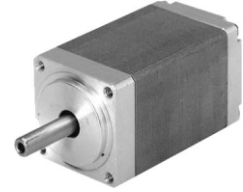
Semiconductor-manufacturing equipment requires high levels of cleanness of ambient gas in the equipment to achieve high-density integration of the semiconductor. It is indispensable for the actuator used in the device to reduce and control the generation of impure out-gas as much as possible to keep this high cleanness level.

We have added the "low out-gas stepping motor" which can reduce the amount of the gas generation by as much as 1/50 of the conventional stepping motor. The main feature is as follows.

- Models: Two types (sq. dimension of 28mm and 42mm).
- Low out gas processing
  - : Materials that generate low levels of out-gas are carefully selected and used
  - : High level washing of parts
  - : Special surface treatment and heat treatment
- The motor spec: equivalent to that of conventional stepping motor.

"Low out gas stepping motor" is the optimal product for the application that requires high cleanness such as semiconduc-

tor-manufacturing equipment and electronic microscopes.



**Hideyuki Ishii**

Joined company in 1989  
Servo Systems Division  
Worked on development and design of servo system