

# Multi-Interface Amplifier "PV" Series (DeviceNet and SERCOS)

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## 1. Introduction

Since Sanyo Denki has made the "Multi-Interface Declaration," we have been offering to different specific industries a group of products (industrial PCs, servo amps, stepping drivers, and I/O units) that support open networks. For example, stepping drivers and servo amps that support DeviceNet have been supplied to the semiconductor industry, and products that support SERCOS have been supplied for plastic forming machines, and general industrial machines, and so on. With so many of our products being used, there is a growing demand for size, cost reduction, remote maintenance capability, and multi-network capability within the same system.

To meet such a demand, we have developed the new servo amplifier "PV" series, PV (SERCOS) and PV (DeviceNet), both of which have standardized servo capability, function, design, and size.

## 2. "PV" Series Concept

At first, our initial development concept of the support of multi-interface was to provide the communication I/F portion separately as an option. But considering the demand for reduced size, cost, and network interface to be required in the future, we have decided it is best to keep the portion separate from the power unit. This has led us to integrate all servo control sections and the hardware portions of the communication I/F (except the connectors) into one in order to provide multi-interface, with the different software to be provided by communication specifications.

Designed for network, it offers high speed, high resolution, and high reliability along with improved maintainability and expandability.

## 3. Features of "PV" Series

- 1) The "PV" series amplifier which has the different communication connectors according to the communication specifications are all standardized in shape, design, mounting position, and connectors (for motor sensor signal and power supply input, I/O etc.) Fig. 1-1, and 1-2, show the two new amplifiers.
- 2) Motors stop with less vibration and noise, and servo capabilities such as the frequency also are improved.
- 3) High-performance CPU (32-bit RISC), larger-capacity RAM, and EEPROM are used to provide multi-interface capability and expandability of the drive functions.
- 4) Drive functions, required for general industrial machines, etc., have been added (for example, electronic gears or registration functions)
- 5) An external encoder receive circuit is standard so it can be used either as full-close control or as master encoders.
- 6) Servo parameters can be configured and saved via network, allowing remote servo adjustment.



Fig. 1-1 "PV" with DeviceNet



Fig. 1-2 "PV" with SERCOS

## 4. "PV" Series General Specifications

### 4.1 Circuit Organization

Fig. 2 is the circuit organization for this product.

As shown in the figure, the power stage has a single-phase 200V input or single-phase 100V input. The DeviceNet-compatible amplifier has another model with 48VDC input type.

The CPU controls communication, the generation of position command (at planning stage for SERCOS), parameter management, sequence processing, and alarm processing. The DSP program is controlled by the CPU and is downloaded during initialization at power-up.

### 4.2 General Specifications

Table 1 shows the general specifications for the "PV" Series products.

However, it should be remembered that baud rate or functional interpretation may differ with some communication specifications.

With a variety of software available for downloading, many functions can be customized.

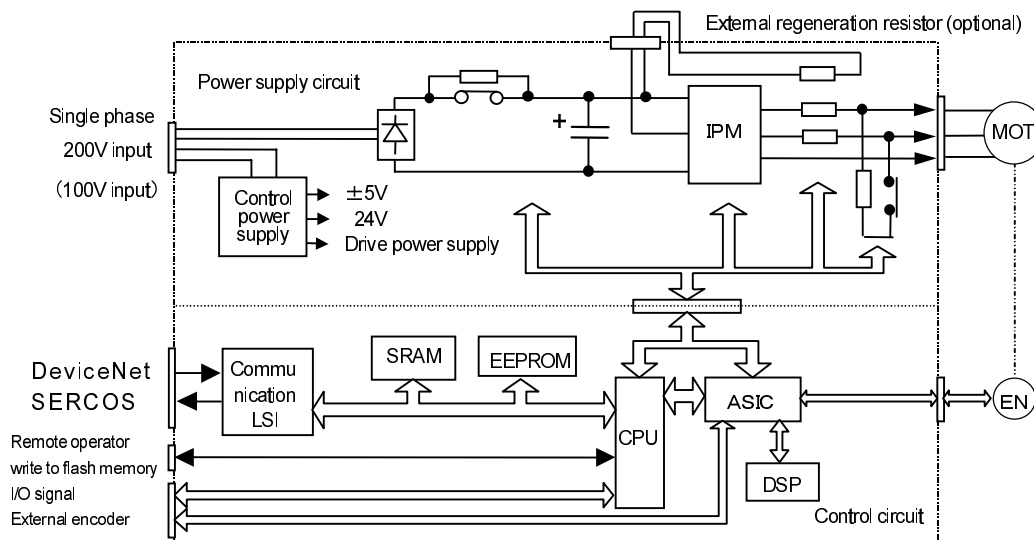


Fig. 2 Circuit Organization

Table 1 "PV" Series General Specifications

Item		General specifications
Hardware configuration	External dimensions	50mm × 172 mm × 130mm (15A) 70mm × 172mm × 130mm (30A) 105mm × 172mm × 130mm (50A)
	Power supply	200VAC (single phase), 100VAC (single phase) 24/48VDC (under development)
	Motor combination	P Series motors (P1, P2, P3, P5, P6, P8) all 2kW or less
	Leakage current	1mA or less for motor wire less than 2m long
	CPU	32-bit RISC chip and DSP
	Encoder reception	Wiring saving incremental encoder Absolute encoder with incremental signal External encoder (incremental encoder)
	Program download	Programs can be downloaded using the connector for remote operator, making it easy to add customized functions and compensators.
Servo capability/function	Frequency characteristics	Frequency characteristics of velocity loop = 400Hz (at JL=JM)
	Homing function	4 types of homing (Home, Index, Home then Index, Current Position)
	EDS file, Config file	Parameter data can be saved
	Block command function	255 points (DeviceNet only)
	Full-closed control	Available (using external encoder input)
	Absolute encoder compatibility	Compatible (provided that it's an absolute encoder with incremental signal)
	Modulo function	Applicable to infinite coordinate system applications (such as index table) Positioning method can be selected from positive direction, negative direction, and shortcut
	Registration function	When registration signal is triggered, the pre-registered action will be performed to capture the position where the signal has been triggered.
	Electronic gear	The resolution of the position coordinate as seen from upstream can be set independently in appearance from the encoder feedback resolution (at planning stage for SERCOS)

## 5. Sample Applications

Following are two sample applications of "PV" Series.

### 5.1 Semiconductor Manufacturing Equipment

It is used in the chambers of wafer-grinders. This is an example of seamless application where the servo amp "PV" and the stepping driver are controlled in the same network.

Although the communication specifications of DeviceNet is asynchronous system, adding Sanyo Denki's simultaneous start capability will put the axes in pseudo-sync with each other.

Fig. 3 is the system configuration.

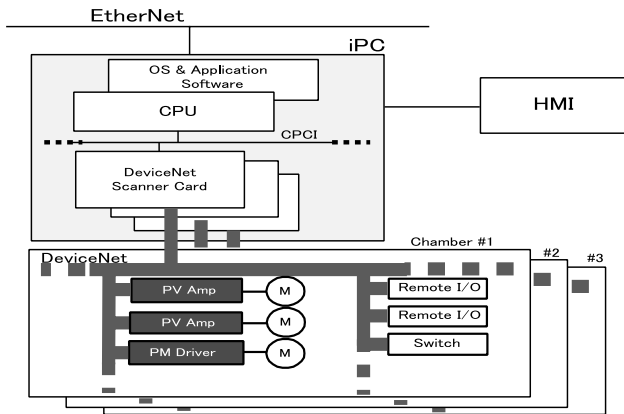


Fig. 3 System Configuration

## 5.2 General Industrial Machines

This is a sample of one coating machine (for producing wallpapers, etc.) being used on two different networks (SERCOS, DeviceNet) with one controller (Sanyo Denki's industrial PC "SMS-10" + motion control language "AML"). SERCOS is used for controlling the mechanisms that need to be synchronous. While DeviceNet is used to control feeding mechanism, lifter, and I/O, thus saving wiring and reducing size.

The controller provides unified control over the two networks, improving the performance.

Fig. 4 is the system configuration.

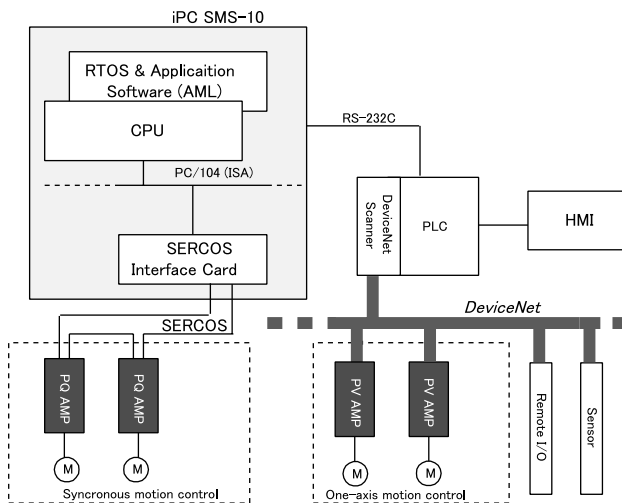


Fig. 4 System Configuration

## 6. Conclusion

We have not yet determined how we should section the servo portion, but we suppose that it will be determined eventually. If the servo portion is incorporated into the upstream motion controller, the control method would be PWM. If the motion controller is incorporated into the amplifier, it will be close to Ethernet rather than the field network. Sanyo Denki is planning to offer a series of amplifiers that support Ethernet.

We also are considering 1.5-axis amplifiers and remote maintenance that utilize networking properties, such as, monitoring messages to other drivers or self-monitoring.

\* DeviceNet is a trademark of ODVA (Open DeviceNet Vendor Association, Inc.)

\* SERCOS is an abbreviation of SERIAL Realtime COmmunication System.



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