Development of "SANUPS P73E" Power Conditioner for Photovoltaic Systems

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1. Introduction

The adoption of photovoltaic systems for home use has proliferated in large part due to greater awareness among the general public of environmental issues. However, in comparison, utilization of photovoltaic systems in public and industrial applications has not advanced to a similar degree, despite the fact that the potential demand is believed to be comparable with that for home-use systems.

To address this situation, Sanyo Denki developed the "SANUPS P73D" power conditioner for photovoltaic systems in 2004. This product has the potential to reduce the overall costs of operating a photovoltaic system, in the hope of promoting greater acceptance of these systems for public and industrial use.

On the heels of this accomplishment, in 2005 we developed the "SANUPS P73E" power conditioner for photovoltaic systems. In addition to the main feature mentioned above, this new model offers a flexible response to the variety of needs and options required by our customers, which have grown in recent years. The improvements found in the "SANUPS P73E" are aimed at the further proliferation of photovoltaic systems for public and industrial use, and have greatly enhanced our lineup of power conditioners.

Details on the development and features of the "SANUPS P73E" are outlined below.

2. Development Background

The previously developed "SANUPS P73D" was designed to facilitate the adoption of photovoltaic systems by providing a means of standardization, such as the use of uniform interfaces, and the simplification of customers' electric power consultations (explained in detail below) by the acquisition of JET certification.

Another of our conventional models, the "SANUPS PMC-TD", is a stationary power conditioner for photovoltaic systems that also can flexibly accommodate the various needs of customers, by the use of its system options. However, the "SANUPS PMC-TD" features standard expandability for its autonomous operation and charged operation functions, and the extra cost of such functionality, often unnecessary for the operation of systems connected to utilities, has been a concern in the past.

In this way, we clearly recognized the need for a product combining the easy system adoption of the standardized and JET-certified "SANUPS P73D", and the flexible expandability of functions offered by "SANUPS PMC-TD".

3. Features

3.1 Vertically Configured Stationary Power Conditioner

The "SANUPS P73D" power conditioner is designed for vertical installation, and installs easily on walls and shelves. If no wall or shelf is available for installation, the system should be installed on the floor using a dedicated stand designed (and available as optional equipment) for that purpose.

When configuring systems with capacities of 20kW or greater, the floor space needed for installation increases in proportion to the number of power conditioner units in use. With this in mind, the "SANUPS P73E" was developed as vertically configured stationary unit, in which 10kW units are stacked in the same manner as the conventional "SANUPS PMC-TD". This method enables a power conditioner with a total output between 10kW and 60kW to be configured without the need for additional space for installation.

Fig. 1 shows the external appearance of "SANUPS P73E" 10kW, Fig. 2 shows an example of the system configuration, and Fig. 3 display the system's circuit diagram.

3.2 Small and Lightweight

The volume of the conventional, stationary "SANUPS PMC-TD" 10kW model is 0.364m3 with external dimensions of 600mm (w) by 580mm (l) by 1045mm (h), while the new "SANUPS P73E" 10kW model is only 0.272m3 with external dimensions of 550mm (w) by 600mm (l) by 825mm (h), making it about 25% more compact than the "SANUPS PMC-TD".

Fig. 1: "SANUPS P73E" 10kW

Fig. 2: Example of System Configuration of "SANUPS P73E"

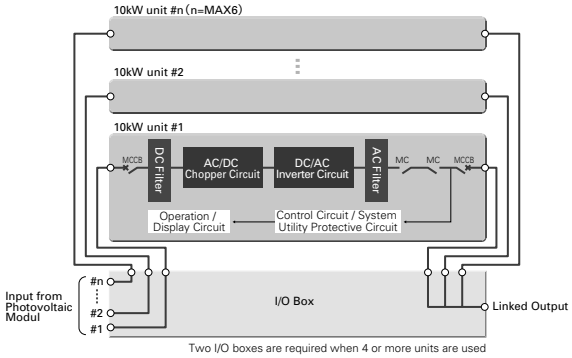

Fig. 3: Circuit System Block of "SANUPS P73E"

Additionally, the weight of the "SANUPS PMC-TD" 10kW model is 125kg, while the "SANUPS P73E" 10kW model weighs 85kg, a weight reduction of approximately 32%.

3.3 JET Certification

When a photovoltaic system is selected for use with commercial power systems, the system manufacturer and the customer/end user are required to consult with the local electric power company in order to obtain its approval. Such meetings are referred to as an electric power consultation, and Sanyo Denki has devoted a sizeable amount of time and labor to preparing the materials required for these consultations, as well as for various operations with the conventional "SANUPS PMC-TD" model.

Through these efforts, Sanyo Denki has successfully acquired JET certification1 for the "SANUPS P73E" 10kW unit2, in order to simplify the electric power consultation procedures and reduce the amount of time and labor involved in the process.

3.4 Standardization of Communication Protocol between Power Conditioner Models

Our power conditioner models share the same external communication interface (RS-485) and communication protocols, enabling cross-platform communication between the "SANUPS PMC-TD", "SANUPS P73D", and "SANUPS P83A". This compatibility

Table 1: Main Specifications of the "SANUPS P73E"

Item		P73E103KJ	Notes
Output Capacity		**10kW**	
Method	Main Circuit Method	Self Communication,Voltage Control Type	
	Switching Method	High Frequency PWM	
	Insulation Method	Transfomer-Less system	
DC Input	Rated Voltage	DC300V	
	Maximum Allowance Input Voltage	DC500V	
	Input Operation Voltage Range	DC200～500V	Rated Output Range DC280～450V
	Maximum Power Point Tracking Range	DC200～450V	
AC Output	Number of Phases / Wires	3-Phase 3-Wire	S-Phase Earth
	Rated Voltage	AC202V	
	Rated Frequency	50 / 60Hz Auto-identification	Fixed installation option also available
	AC Output Current Distortion Ratio	(Total) 5%≧ (Each) 3%≧	Output Current Ratio
	Output Power Factor	0.95%≦	At rated output
	Linkage Classification	Low Pressure / High Pressure	
	Efficiency	92%	Rated load efficiency based on JIS C8961
Interactive Protection		Over-voltage (OV)	
		Under-voltage (UV)	
		Over-frequency (OF)	
		Under-frequency (UF)	
		Over-voltage Ground Fault (OVGR)	OVGR installed externally
Independent Operation Detection	Passive Method	Voltage Phase Jump Method	
	Active Method	Non-effective Power Fluctuation Method	
Environment of Use	Ambient Temperature	-10～40°C(50°C)	Can be operated with output control between 40～50℃
	Relative Humidity	30～90%	Non-condensing
	Altitude	2000m≧	

permits greater freedom in expanding existing systems as well as the output capacity configuration.

3.5 Environmental Considerations

To reduce its environmental impact, chromium-free steel plating is used for the outer shield sheeting and the inner structure of the "SANUPS P73E".

3.6 Options

The following options can be added to the I/O box to meet a variety of customer specifications:
(1) Transducer (insolation intensity, temperature, total AC power)
(2) Analogue signal output for insolation intensity and temperature
(3) External power supply (AC100V/AC200V)

4. Specifications

Table 1 shows the main specifications of the "SANUPS P73E".

5. Conclusion

In summary, this report has outlined the major features and refinements of the new "SANUPS P73E" power conditioner.

With the development of this product, we have further strengthened our product lineup of power conditioners for use with photovoltaic systems. We believe that this product will contribute to greater adoption of photovoltaic systems for public and industrial use, since it is even more responsive to the needs and requirements of our customers.

We pledge to continue advancing the development of products that will satisfy the diverse demands of customers, and make improvements in RoHS-compatibility, efficiency and costs savings, so that we may promote the proliferation of photovoltaic systems and make a contribution to environmental conservation.

Note 1) JET: Japan Electrical Safety & Environment Technology Laboratories
Note 2) JET: 10kW unit (model No.: P73E103KJ) Registration No.: P-0097

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