Development of Static Transfer Switch "SANUPS S11A"

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1. Introduction

The servers and routers that make up a network system in a data center must be able to provide stable operations and reliability. Therefore, customers look for highly reliable power supplies for the equipment.

In modern network systems, the servers are becoming more reliable due to dual power receiving systems for the power supply. However peripheral devices such as routers usually use single system power supplies that may result in power outages when there are problems with the power supply. The power supplied to these peripheral devices needs the same high reliability that is found with servers.

With this in mind, the power switching device "SANUPS S11A" was developed in order to provide single system input devices with high reliability. Dual power is received, and if an error occurs from one of the power supplies, the device can switch to an operational system.

This document introduces an overview of the features of the product.

2. Product Overview

The newly developed "SANUPS S11A" receives 100 V of dual alternating current and outputs one of the two systems. The device is made for installation in a 19-inch rack.

This device provides output without momentary power breaks*(1) when switching and does not contain a voltage control function, so the voltage drop is kept as low as possible when switching.

The hybrid switch used on the "SANUPS S11A" combines a semiconductor and mechanical switch to achieve no-break transfer and low voltage drop.

Fig. 1 shows a photograph of the "SANUPS S11A".

Fig. 1: "SANUPS S11A"

*(1) Without momentary power breaks
Defined as a momentary power break time that is less than 1/4 of the cycle according to JEM-TR185 "User Guidelines for Commercial Semiconductor AC UPS".

3. Circuit Configuration

Fig. 2 shows the circuit configuration for "SANUPS S11A".

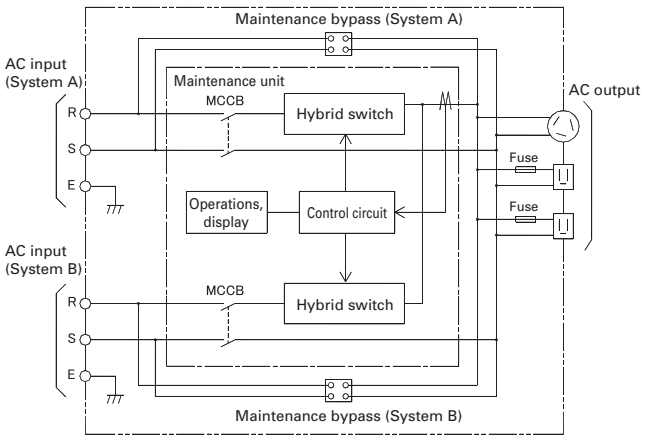

Fig. 2: "SANUPS S11A" circuit configuration

This device is constructed from the hybrid switch, control circuit, operations/display area, and maintenance bypass circuit on each system.

3.1 Main circuit

As described in the overview, the switch provides high speed switching and low voltage drop through the use of a hybrid switch that combines a semiconductor switch that uses IGBT and a mechanical relay switch.

The hybrid switch cuts and inputs current with IGBT. When the current is being input, the relay contact closes after IGBT turns on. When the current is cut, the relay contact opens before IGBT is turned off. Therefore, the mechanical switch should operate at higher speeds.

3.2 Control circuit

Error detection for AC input, display for output current, and other controls such as switching sequence can all be controlled at once with the CPU to reduce the number of parts required.

4. Features

4.1 High speed system switching

The power break time for the "SANUPS S11A" is 2 ms to quickly switch to an operational system. Figs. 3 and 4 show waveforms for output voltage when switching.

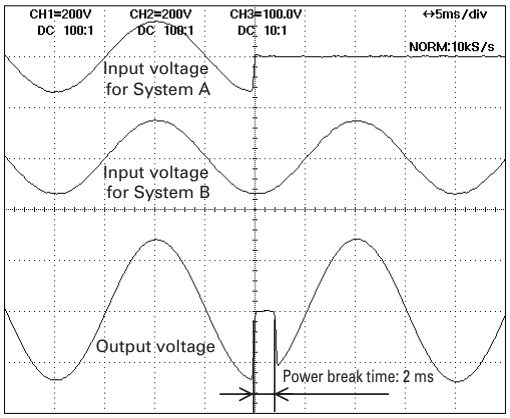

Fig. 3: Output voltage waveform during input outage (phase difference 0°)

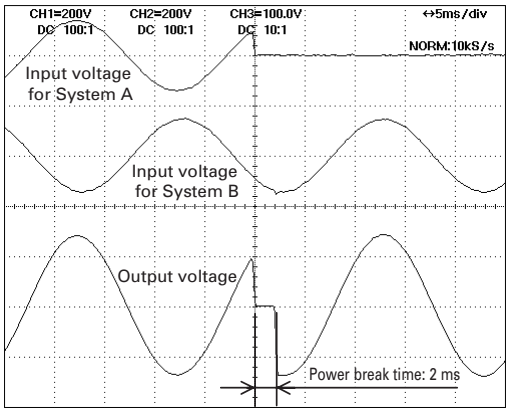

Fig. 4: Output voltage waveform during input outage (phase difference 180°)

The "SANUPS S11A" has three switching modes.

(1) Auto-switching

This mode automatically switches to an operational system when there is an error in the input power supply.

(2) Manual switching

Press the "SELECT" switch on the front of the "SANUPS S11A" to select the input system to use.

(3) Periodic auto-switching

This mode automatically switches the system every 5,000 hours. (Selected with the DIP switch)

By using this function, the two systems can be used equally. Furthermore, this function can check for errors on the hybrid switch while on standby, which prevents switching failure when there is an outage or other error in the input power supply.

4.2 Low voltage drop

The voltage drop with the "SANUPS S11A" is suppressed to 2 V or less, which means that voltage drop does not need to be taken into consideration when installing the equipment.

4.3 Simple operations and display function included

(1) Simple mimic bus (LED display)

By connecting the simple mimic bus on the front of the "SANUPS S11A", the input power status and the power supply status can be checked very easily. The power supply display LED flashes when there is an error in the power supply, indicating an error in the system voltage. It also includes the input switch that is used in manual mode.

(2) Status display (8-segment LED display)

The display shows voltage errors for each system and connection errors before turning on the power to the main MCB. If there are no errors, the display shows "On". When operating, the load and output current can be determined at a glance. The display also generates alarms such as errors in the input power supply by using the LED to alternately display the current and the error code. This makes the status display an important part of solving problems when alarms are generated.

4.4 Regular selection possible

After switching systems due to errors in the power supply, when the original power supply returns to normal, the "SANUPS S11A" can be set to automatically return to the original power supply or to remain connected to the current power supply.

4.5 Error warning with alarm buzzer

When an alarm occurs, the buzzer sounds to notify the user about

the error. (The buzzer can also be turned off with the settings.)

4.6 Error notification with external transfer signal

The following external transfer signals can be sent.

(1) Input power supply error (System A)

(2) Input power supply error (System B)

(3) Device error

4.7 Easy construction and maintenance

(1) Construction

The connections can be performed easily by connecting the inputs to the terminal block and the outputs to the outlet. (1 for 30 A and 2 for 15 A)

(2) Maintainability

The switch and control areas are combined into one unit that can be easily replaced from the front even when mounted into a rack. If the unit happens to malfunction, it can be replaced without stopping output. (When performing maintenance on the unit, switch to the maintenance bypass circuit.)

5. Specifications

Table 1 shows the specifications for the “SANUPS S11A”.

Table 1: Specifications for “SANUPS S11A”

	Item	S11A302	Remarks
Model	**Rating type**	Continuous	
	Cooling method	Natural cooling	
AC input	**No. of inputs**	2 systems	
	No. of phases and wires	Single phase, dual wire	
	Rated voltage	100 VAC	
	Voltage fluctuation range	±15%	
	Rated frequency	50/60 Hz	
AC output	**No. of phases and wires**	Single phase, dual wire	
	Rated voltage	100 VAC	
	Rated current	30 A	
	Rated frequency	50/60 Hz	Same as AC input
	Voltage drop	2 V or less	
	Switching time	2 ms	
	Overload capacity	120% (30 s), 200% (1 cycle)	During rated input
	Overcurrent protection	MCCB	
Display	**Status**	LED	Input, output, error
	Output current	Digital display	
Other	**Switching method**	Automatic or manual	
	External signal	Error, input error (system A, system B)	Open collector
	Maintenance bypass circuit	Available	
	Dimensions	430×350×88 mm	W×D×H
Environment	**Ambient temperature**	0 to 40°C	
	Relative humidity	20 to 90%	No condensation

6. Conclusion

As information communication technology becomes more connected to our daily lives, an increase in quality will become even more important for society.

As the demands increase for reliability in equipment that makes up network systems, the power supplied to the equipment must also become more reliable. Therefore, there will also be an increasing need for devices that supply the appropriate power for the power configuration used in the equipment.

We will continue to quickly develop products in order to meet market demands and provide users with products that will satisfy their needs.

We would like to express our thanks to many people who gave us help and advice in developing and manufacturing this equipment.

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