

Power Systems Division

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In 2018, Japan endured a succession of natural disasters including torrential rains and earthquakes, such as the Osaka earthquake in June, torrential rains in West Japan in July, and the Hokkaido Eastern Iburi earthquake in September. This served to remind us of the reality that Japan truly is a disaster-prone country. The Japanese government is therefore investing in infrastructure to prepare for a potential mega earthquake in the Nankai Trough or Tokyo metropolitan area.

The private sector is also focusing on disaster management and BCP (business continuity planning), with particular attention is being paid to the importance of “securing power.”

Power outage countermeasures

include uninterruptible power supplies (UPS) for short-term use and diesel engine generators (DEG) for long-term use.

As a well-established manufacturer of power supplies, SANYO DENKI has developed various types of UPSs and DEGs offering high efficiency and high reliability, and is making continuous efforts to contribute to such countermeasures.

In 2018, the Power Systems Division developed and launched the following products.

In the small-capacity UPS field, we developed the *SANUPS N11B-Li*, *SANUPS N11C-Li*, and *SANUPS A11K-Li*, which are all equipped with lithium-ion batteries (LIB).

The N11B-Li and N11C-Li are passive standby UPSs. The A11K-Li

is a double-conversion online UPS, and we added short-term backup models to the existing lineup.

We also developed a 1 kVA model for the *SANUPS E11B*, a hybrid UPS.

In the medium-capacity UPS field, we developed the *SANUPS A22A*, a highly reliable, modular double-conversion online UPS, for which 5 kVA modules can be configured for parallel operation.

In the engine generator field, we developed the *SANUPS G53A*, an emergency diesel generator for outdoor use compliant with Japan’s Fire Service Law, a building disaster management requirement.

This article will provide an overview of these products and technologies, and summarize their features.

■ Small-Capacity UPS *SANUPS N11B-Li*, *SANUPS N11C-Li*, and *SANUPS A11K-Li*

We developed the following new models to expand our lineup of LIB-equipped UPSs characterized by wide operating temperature ranges and maintenance-free operation.

SANUPS N11B-Li: 3 kVA 100 V model⁽¹⁾ and 1 kVA 200 V model;

SANUPS N11C-Li⁽²⁾: 1.5 kVA, 3 kVA, and 5 kVA 100 V models; and

SANUPS A11K-Li short-term backup model: 1 kVA, 1.5 kVA, 2 kVA, 3 kVA, and 5 kVA 100 V models.

Fig. 1, 2, and 3 show the appearance of the *SANUPS N11B-Li*, *SANUPS N11C-Li*, and *SANUPS A11K-Li* short-term backup models, respectively.

The *SANUPS N11B-Li* features the passive standby topology and an ingress protection rating of IP65 for outdoor use.

The *SANUPS N11C-Li* features the passive standby topology and is for indoor use only.

The *SANUPS A11K-Li* short-term backup model has a backup time of 8 to 15 minutes and features the

double conversion online topology. By developing a dedicated LIB, we successfully reduced the product weight by up to 44% compared with our current UPS (A11K lead-acid battery type).

The operating temperature range of the *SANUPS N11B-Li* is -20°C to +50°C, while that of the *SANUPS N11C-Li* and the *SANUPS A11K-Li* is -20°C to +55°C, meaning that all three products can be used with confidence even in extremely cold or hot environments.

All series are equipped with a battery management unit and feature a data interface between the UPS and LIB. LIBs can be used safely because their status is monitored, and mutual protective operations and error detections are performed between the UPS and LIB.

(1) For details, see Technical Report No. 45.

(2) For details, see Technical Report No. 46.



Fig. 1 *SANUPS N11B-Li*



Fig. 2 *SANUPS N11C-Li*



Fig. 3 *SANUPS A11K-Li* short-term backup model

■ Small-Capacity UPS *SANUPS E11B*

For backup applications such as servers, we developed the *SANUPS E11B*, a UPS featuring the hybrid topology.⁽³⁾

This new series is available in 1 kVA output capacity and in 100 and 200 VAC single-phase 2-wire input/output voltages.

Figure 4 shows the appearance of the *SANUPS E11B* (1 kVA).

The hybrid topology allows the UPS to automatically select the optimal operation mode for any given input power condition, achieving energy savings while stably supplying high-quality power to loads.

The input voltage range is 55 to 150 V for the 100 V model, and 110 to 300 V for the 200 V model. In addition, this product has a wide input frequency range from 40 to 120 Hz. Even when input power is unstable, it can minimize switching over to battery operation, preventing battery drain.

Its wide -10 to +55°C operating temperature range enables the UPS to operate stably even in extreme temperature environments.

The input plug and output outlet shapes can be selected to suit the specific country or region, and the wide input voltage and operating temperature

ranges described above positions this as a product that can be used globally.

In 2019, we plan on launching 1.5 kVA, 2 kVA, and 3 kVA models.

(3) A UPS design that automatically switches between double conversion and standby topologies according to the input power conditions.



Fig. 4 *SANUPS E11B* (1 kVA)

■ Modular UPS, SANUPS A22A

We developed a highly reliable modular UPS, the *SANUPS A22A*, as a power solution for mission-critical infrastructure equipment, such as 24-hour data centers.

With this UPS, you can connect 5 kVA inverter modules (up to 21) in parallel. This enables us to suggest a system optimized for customer load conditions.

This UPS is available in two models with the same input of 3-phase 4-wire 400 VAC and different output and scalability: a model scalable up to 105 kVA with 3-phase 4-wire 400 VAC output, and a model scalable up to 50 kVA with and single-phase 2-wire 200 VAC output.

We also developed a model that can connect to up to 4 inverter modules specifically designed for applications 20 kVA or less.

Figure 5 shows the appearance of the *SANUPS A22A*.

This UPS uses a system in which the 5 kVA inverter modules suppress circulating current individually. The overall system reliability has been improved by not depending on the reliability of common parts.

The inverter module can be used

for both the 3-phase 4-wire 400 VAC model and the single-phase 2-wire 200 VAC model.

By adopting the 3-level circuit method for both the rectifier and inverter, we have achieved the industry-leading⁽⁴⁾ efficiency level of 94.5%. This reduces running costs and contributes to energy saving.

With a wide input voltage range from -40% to +15%, even when input power is unstable, it can minimize switching over to battery operation, thereby preventing battery drain.

Furthermore, backup time can be easily extended by adding battery modules with the same dimensions as the inverter module.

The A22A uses a simple plug-in connection for the inverter modules and battery modules so they can be added or removed while running, making maintenance work quick and easy.

Details of this product are provided in the “New Product Introduction” section of this report.

(4) Based on our own market research as of August 7, 2018, conducted among online UPSs on the market with equivalent voltage and capacity.



Fig. 5 *SANUPS A22A*

■ Emergency Diesel Generator *SANUPS G53A*

We developed the *SANUPS G53A*, an emergency diesel generator for outdoor use compliant with Japan's Fire Service Law for building disaster management in the emergency diesel generator market.

This product comes with three rated output capacities: 200/230 kVA, 250/290 kVA, and 290/320 kVA.

Figure 6 shows the appearance of the *SANUPS G53A*.

The *SANUPS G53A* satisfies the Nippon (Japan) Engine Generator Association requirements: Design Requirements for Emergency Use Engine-driven Power Generators (NEGA C 311), so it can be used safely.

The main feature of this product is its IoT functions, that is, it can connect to a LAN or peripheral devices via

a general purpose interface such as Ethernet or RS-485 thanks to the on-board general-purpose programmable logic controller.

A broad, flexible range of customization is available, and customers can choose from various options to suit their specific application, such as cold climate specifications, salt-resistant coating, and a 400 V output.

Combined with our UPSs, it can supply stable power without interruptions. Standard operation time is 2 to 3 hours. However, extended long-term backup is possible by connecting an optional large-capacity fuel tank.

Details of this product are provided in the "New Product Introduction" section of this report.



Fig. 6 *SANUPS G53A*



Tetsuo Suzuki

Joined SANYO DENKI in 1984.

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Works on the development and design of power supply units.