

Reusable Storage Battery System for Consumers Compatible with Virtual Power Plants

Fuji Electric has been developing and demonstrating technologies by participating in the Virtual Power Plant (VPP) Demonstration Project promoted by the Ministry of Economy, Trade and Industry since FY2016, along with the Kansai Electric Power Company, Incorporated and others. In FY2017, we developed a reusable storage battery system for consumers that is compatible with VPP, co-operating with Japan Benex Corporation and Sumitomo Corporation. We have developed a standard system for the VPP Demonstration Project, whose electricity storage control is based on our technology. The following functions can be used as needed:

- (1) Peak cut and demand control functions
- (2) Business continuity planning (autonomous operation) function
- (3) State of charge (remaining capacity) control function
- (4) VPP linkage function

Furthermore, the electricity storage unit has achieved a loading efficiency twice that of previous products as the result of using the high-density loading design technology of Japan Benex Corporation. Reusable storage batteries equivalent to 24 EVs are housed in a 20-foot container. We will offer various customers this product as an auxiliary power source mainly at times of peak power demand in factories and buildings.



“WX Series” Large-Capacity UPS, Employing Module Control Function

In the UPS market, demand of high power supply reliability is increasing for UPSs used especially for data centers, which are expected to grow. The “UPS7400WX-T3U” of the “WX Series” large-capacity UPS employing module control function is designed for the North American market. Each UPS module is configured with a capacity of 330 kVA, and multiple modules can be combined to flexibly adapt to the customer facilities. The figure shows, from left to right, a UPS configuration composed of an I/O module, control module and 4 UPS modules.

- (1) A module redundancy control function allows the inverter to continuously supply power even when a failure occurs by disconnecting a failed module. Furthermore, the disconnected module can be repaired while the UPS continues to supply power, thus improving the reliability of the UPS power supply.
- (2) The UPS efficiently operates over a wide range of equipment loads by controlling each module to run and stop so that the load current value of each module can be within high efficiency region.



New Push-In Type Products That Contribute to Reducing Wiring Hours for Panels

Fuji Electric has offered new screwless products that contribute to reducing wiring work of controlboards: “GT-A” molded case circuit breakers and earth leakage circuit breakers, “SK” magnetic contactors, “TK” thermal overload relays, “CP30F” circuit protectors, and spring terminals for relay and timer sockets.

All models utilize a push-in mechanism, which requires no special skills and allows anybody to quickly complete wiring by simply inserting the product, delivering usability. The use of this push-in type design is a Japan first for components for main circuits (molded case circuit breakers, earth leakage circuit breakers, magnetic contactors, etc.).

Moreover, these products have acquired major overseas standard certifications such as IEC and UL.



“FRENIC-eFIT” Environmentally Resistant Inverter

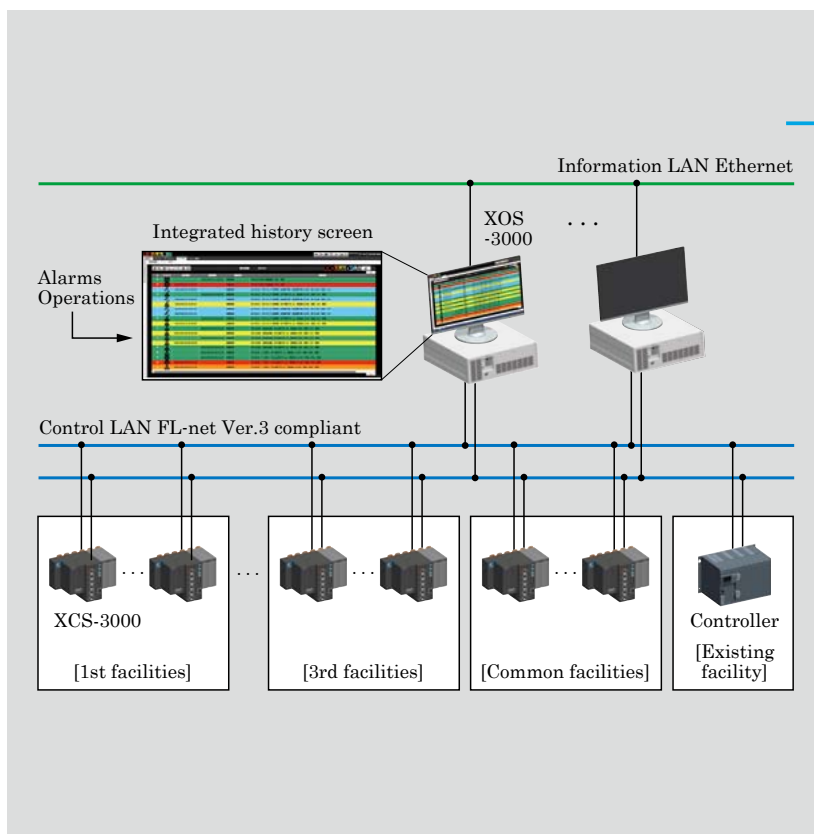
We developed the “FRENIC-eFIT” as an inverter that can be installed without using a protection housing in harsh environments such as outdoors or in the ambience susceptible to corrosive gases where inverters cannot usually be installed. The main features are as follows:

- (1) Compliant with IEC standards environmental parameters (4K4H, 4C4, 4S3) and capable of a wide range of applications even in harsh environments.
- (2) Equipped with low-loss All-SiC modules, It achieves a totally-enclosed self-cooled structure with fanless cooling for all capacity models. Furthermore, it provides maintenance-free operation without requiring fan cleaning or replacement.
- (3) Optionally available with a Bluetooth keypad panel. A user can remotely edit function codes and monitor information of the inverter using a mobile device.

Replacement of Large-Scale Monitoring and Control System of Steel Plants by Using “MICREX-View XX”

Fuji Electric has replaced the large-scale monitoring and control systems of a steel plant by utilizing the latest model “MICREX-View XX.” The features of the system after the replacement are as follows:

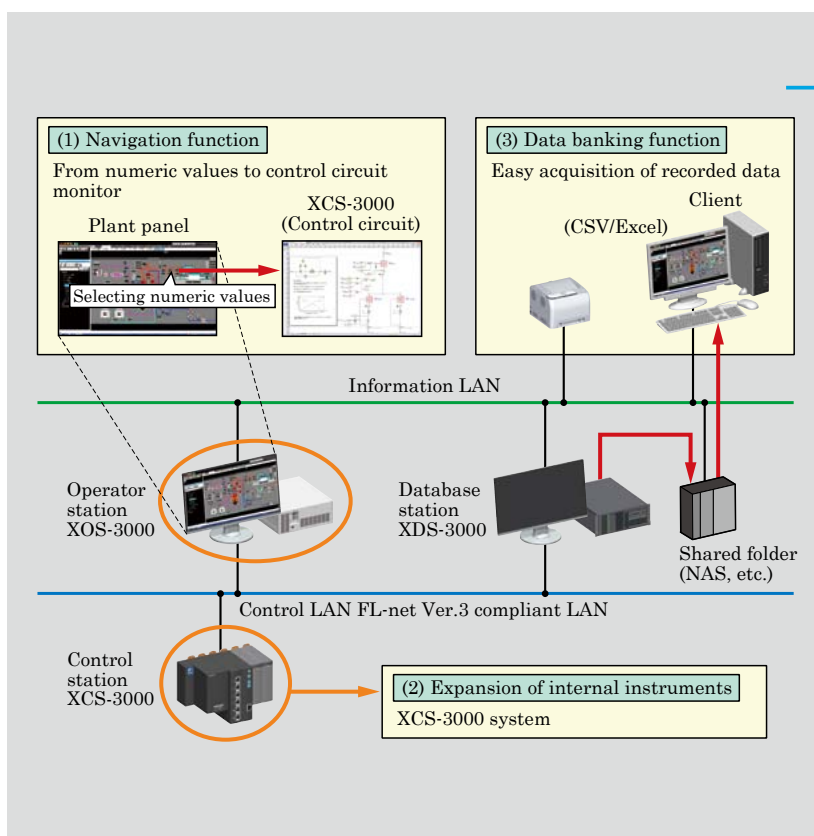
- (1) The “XOS-3000” operator station’s integrated history screen makes it easy to correlate operating actions with abnormalities by the facilities, thus speeding up the identification of abnormality causes.
- (2) The use of the “XCS-3000” high-speed large-capacity controller can integrate control functions to achieve an optimal system configuration and improve maintainability.
- (3) Using an open network (FL-net Ver. 3 compliant) for the control LAN allows the system to increase the volume of communication data and integrate other systems, achieving high scalability.

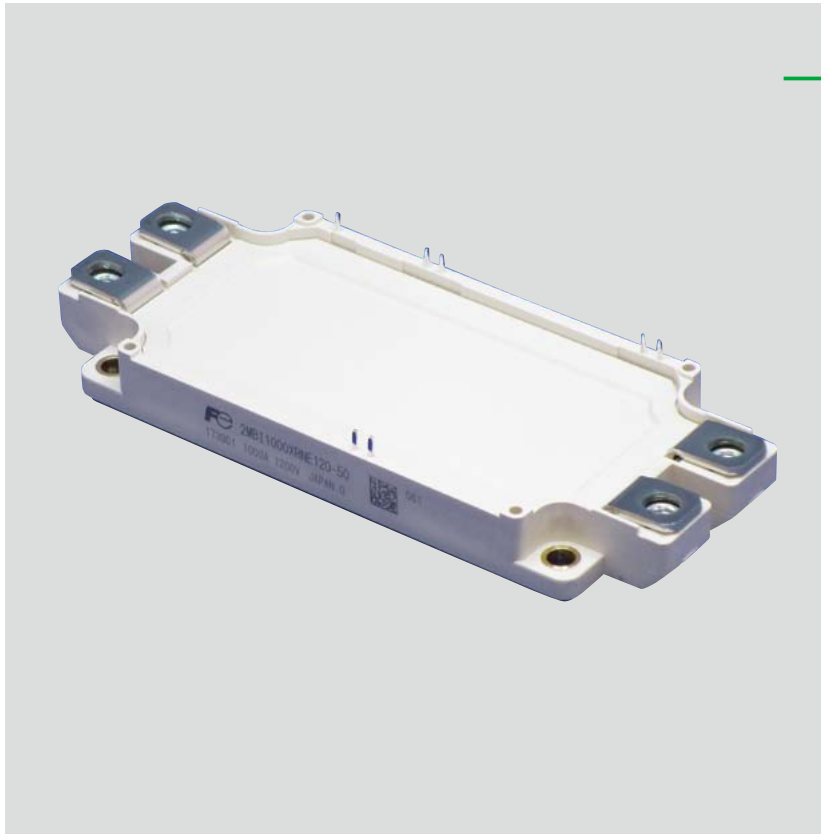


“MICREX-View XX” Functional Enhancement

Fuji Electric has enhanced the functionality of the “MICREX-View XX” monitoring and control system to help customers manufacture high-quality products, stabilize operation and easily monitor operation.

- (1) We have developed the navigation function that links the value indication of a control loop (internal instrument) on a plant panel to a control loop application (control circuit), thereby making it possible to monitor the screen and check the operation of the control circuit.
- (2) Cost effectiveness has been increased by improving the processing performance of the control station at each control cycle (200 ms and 1 s) by 20% or more and increasing the number of internal instruments from 416 to 512.
- (3) We have also developed a data banking function that makes it easy to retrieve recorded data such as historical data of operations, alarms, trends and reports from clients on an information LAN with csv or other format files.








7th-Generation “X Series” RC-IGBT Module for Industrial Applications “Dual XT”

In order to meet the market demand of the smaller size, lower power dissipation and higher reliability for IGBT modules, Fuji Electric has developed a reverse-conducting IGBT (RC-IGBT) that integrates an IGBT and a FWD on a single chip. We are expanding the line-up of the 7th-generation “X Series” RC-IGBT modules for industrial applications that has a rated voltage of 1,200 V and have developed the “Dual XT” equipped with RC-IGBTs.

The maximum rated current of the new module has expanded to 1,000 A, while the “Dual XT” of the 6th-generation “V Series” IGBT module for industrial applications have a maximum rated current of 600 A. Compared with the conventional product that uses the same package, the new product greatly improves the junction temperature rise of the chip during actual operation. It is expected that this module will contribute to the further increase of the output and the reliability for power converters.

Package		Type 1B	Type 2B	Type 3LB
Dimensions (mm)		W 62 × D 20 × H 12	W 68 × D 26 × H 13	W 126 × D 45 × H 13
Rated voltage	Gate structure			
1,200 V	Trench	25 A, 50 A	75 A, 100 A	200 A, 300 A, 400 A
1,700 V	Trench	—	—	<270 A

Series Expansion of Modules Equipped with SiC Trench MOSFETs

SiC devices have been attracting attention on account of their potential to help achieve a low-carbon society through reduced power consumption.

Fuji Electric has been developing All-SiC modules that utilize a newly structured package that uses copper pin connections and plastic molding technology. This newly structured package not only reduces internal inductance, but also makes high-temperature operation possible, thus enabling high-speed and highly reliable SiC devices. We have developed rated capacity 1,200 V/25 to 400 A All-SiC modules equipped with breakdown voltage of 1,200 V SiC trench MOSFET chips for the newly structured package. Moreover, we plan to develop an SiC trench MOSFET chip with a breakdown voltage of 1,700 V to expand the line-up of All-SiC modules with ratings of 1,700 V/max. 270 A.



Start of Commercial Operation of Yamagawa Binary Power Station of Kyuden Mirai Energy Company, Incorporated

The Yamagawa Binary Power Station is the plant (Gross output: 4,990 kW) that Fuji Electric received the order from Kyuden Mirai Energy Company, Incorporated as engineering, procurement and construction project (except civil work). This power station is located in the Yamagawa Power Station, which is a geothermal power plant owned by Kyushu Electric Power Co., Inc. The commercial operation began on February 23, 2018.

In the binary system, low-boiling working fluid is vaporized by the heat source and the turbine is rotated by the vapor. The generator coupled with the turbine generates electricity. This power station effectively utilizes the heat of the brine that had been directly returned to the reinjection wells at the Yamagawa power station. Normal pentane has been used as a working fluid.

The turbine and generator were manufactured at our Kawasaki Factory and Suzuka Factory, respectively. The brine is highly corrosive and accordingly, an appropriate corrosion resistant material was selected for the heat exchangers.



Multi-PCS for Storage Batteries and Photovoltaic Power Generation

Photovoltaic power generation has the advantage of being clean energy that does not emit CO₂; however, it has the disadvantage of supplying an unstable amount of power since output is influenced by solar radiation. The number of power plants using storage batteries has been increasing because this output fluctuation brings instability for power systems. For these types of power plants, Fuji Electric can offer a multi-PCS that is capable of connecting photovoltaic cells and storage batteries through DC/DC converters. This multi-PCS has the industry's largest capacity with a DC input of 1.5 MW for both photovoltaic cells and storage batteries and an AC output of 1.1 MVA. In the case of combining a conventional photovoltaic power generation PCS and a storage battery PCS, a power plant is required to use a system interconnection transformer for each PCS. In contrast, the multi-PCS enables interconnection via a single transformer, thus contributing to reduction in system costs and installation area.



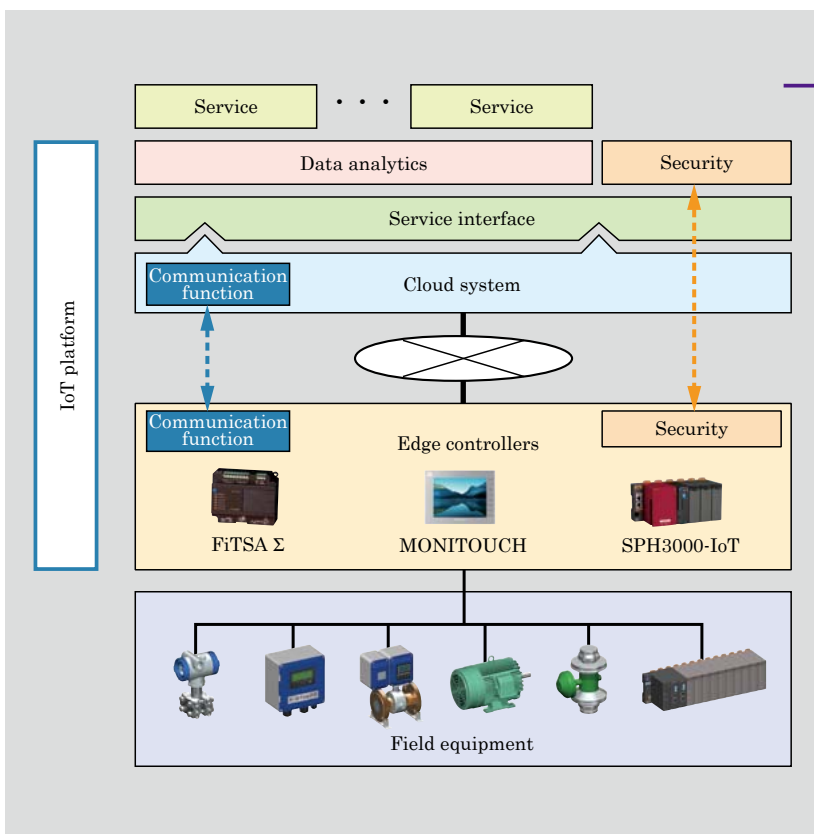
Fresh-Brew Drip Coffee Machine for Overseas Markets

Fuji Electric has utilized the technology cultivated in the development of cup vending machines to create a counter-top fresh-brew drip coffee machine for overseas markets.

By acquiring UL and NSF standard certifications, we have demonstrated a high-degree of safety. We aim to offer this model to the global market, including the United States, China and other Asian countries.

The main features are as follows:

- (1) The newly developed brewer (component for extracting coffee) uses our unique stainless steel mesh filter to extract high-quality coffee as good as coffee extracted with a paper drip method.
- (2) The machine can supply larger volume of coffee than existing one to meet the wide-ranging requirements of overseas markets. It is also equipped with wide cup stage space that a large-size bottle cup be located in.



Fuji Electric's Common Infrastructure IoT Platform

The IoT platform is the infrastructure for IoT service that collects data from field equipment and provides new value for customers by utilizing data analytics technology. The platform equipped with service interface functions for easily implementing services on the basis of a general-purpose cloud system, edge controllers for collecting field data, communication functions for connecting the cloud system and edge controllers and security functions for protecting systems and data (see the figure).

The IoT platform delivers highly reliable and highly stable operation, reduces operating costs and facilitates the addition of new services, users and equipment by scaling out system resources.

We plan to start utilizing the platform in FY2018.



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