

Reliable Local Controller for ITER Coil Power Supply

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In this paper, we propose improved control systems which meets ITER (International Thermonuclear Experimental Reactor) requirements.

Among the various devices delivered by Korea, the controller (local controller) for AC/DC Converter, which supplies power to ITER superconducting coil, should control AC/DC converter to supply direct current of up to 68 kA continuously for few weeks to months. In this case, the superconducting coil stores maximum energy of gigajoule units. In addition, it also is needed to control in extreme environments, such as high level of electromagnetic disturbance. For these reasons, the local controller for ITER AC/DC Converter should not only be designed as highly reliable system but also reliably communicate various data for diagnosis and research as a large-scale fusion scientific experiments device. Therefore, the local controller's Conventional system, Interlock system and Safety system need to operate with high reliability and to transmit accurate measured/calculated data through the optimized design for each system feature.

Conventional system is consists of Interface Controller, Alpha Controller and Analog-to-digital converting Controller. It is configured 5 kHz UDP and 10 Hz TCP communication redundancy method and the digital fault recorder function is applied to improve performance of data transmission. Also, it is designed able to accurate diagnosis by delivering timestamped data to the parent system using Precision Time Protocol in accorded with specification of IEEE 1588.

Interlock System is consists of Slow / Fast Local Interlock Controller (S-LIC / F-LIC). S-LIC is configured by redundant power supply and redundant communications as well as highly reliable (SIL-3) PLC for system reliability. F-LIC is designed with analog board without processor and configured redundant power supply for the fast and accurate action for protection.

Safety system is consists of redundant power supply is configured and highly-reliable (SIL-3) PLCs to monitor the safety relevant signals and to transmit them to parent system for protection of worker.

In this paper, the above designs have been applied to each system to meet the requirements of ITER and to ensure the improvement and high reliability of the system.

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